Megataxa 016 (1): 001–232
https://www.mapress.com/mt
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ISSN 2703-3082 (print edition)
MEGATAXA
ISSN 2703-3090 (online edition)

https://doi.org/10.11646/megataxa.16.1.1
http://zoobank.org/urn:lsid:zoobank.org:pub:0AC91FF7-0A79-47EC-95C6-0FC661AE68FF

MEGATAXA

16

New species and records of Scalibregmatidae (Annelida) from the Atlantic Ocean, Indian Ocean, Pacific Ocean, Southern Ocean, and adjacent seas

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Magnolia Press
Auckland, New Zealand

Submitted: 23 Jan. 2025; accepted by J. Williams: 2 Apr. 2025; published: 14 Apr. 2025

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JAMES A. BLAKE
New species and records of Scalibregmatidae (Annelida) from the Atlantic Ocean, Indian Ocean, Pacific Ocean, Southern Ocean, and adjacent seas
(*Megataxa* 16)

232 pp.; 30 cm.

14 April 2025

ISBN 978-1-77973-351-1 (Paperback)

ISBN 978-1-77973-352-8 (Online edition)

FIRST PUBLISHED IN 2025 BY

Magnolia Press

P.O. Box 41-383

Auckland 1041

New Zealand

e-mail: megataxa@mapress.com

https://www.mapress.com/mt

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ISSN 2703-3082 (Print edition)

ISSN 2703-3090 (Online edition)

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Abstract

A large collection of scalibregmatid polychaetes has been assembled from offshore monitoring and reconnaissance surveys conducted in the Western North Atlantic Ocean, Gulf of Mexico, Eastern North Pacific Ocean, Southern Ocean, and South China Sea. The materials from these projects and others from several museum collections have yielded specimens from ten genera and 76 species, of which 54 are new to science. The type species of the genera *Asclerocheilus*, *Axiokebuita*, *Oligobregma*, *Scalibregmella*, *Sclerobregma*, and *Mucibregma* are redescribed either from type material and/or specimens from near the type locality. The type-species of *Axiokebuita* (*A. millsi*) is revalidated and redescribed based on new material off eastern North America. *Scalibregma brevicaudum* Verrill, 1873 is revalidated based on the holotype from Long Island Sound and numerous new collections from northeastern North America. The ten genera treated are as follows: *Asclerocheilus* 16 species with 12 new to science; *Axiokebuita* six species with three new to science; *Hyboscolex* six species with five new to science; *Oligobregma* 14 species with 11 new to science; *Parasclerocheilus* one new species; *Pseudoscalibregma* eight species with five new to science; *Scalibregma* 19 species with 15 new to science; *Scalibregmella* two species with one new to science; *Sclerobregma* two species with one new to science, and *Mucibregma*, one species. Most new species are from offshore or deep-water habitats and, except in areas with a history of extensive monitoring, are represented by relatively few individuals. Known species of each genus with five or more species are tabulated, compared, and reviewed. The depth intervals of all scalibregmatids are tabulated in order of increasing depth. Lists of deep-water scalibregmatids are updated. Of 141 known species of Scalibregmatidae, 73 or 52 % occur in depths of 1000 m or greater. Of the 54 new species included in this report, nine occur from the intertidal to 100 m; four occur from 100 to 500 m; six occur from 500 to 1000 m; and 34 species or 63% occur in depths greater than 1000 m, with 12 of these ranging into abyssal depths of ~3000 m or deeper. The status of *Mucibregma spinosa* Fauchald & Hancock, 1981 is reviewed and, although poorly preserved and damaged, is confirmed as a species of Scalibregmatidae, albeit unique with acicular spines on all parapodia. The holotype of the enigmatic deep-water genus and species *Neolipobranchius glabrus* Hartman & Fauchald, 1971 is demonstrated to be an indeterminate juvenile of the genus *Travisia* and, with the genus becoming a junior synonym of *Travisia*, the species is declared a *species inquirenda*.

Key words: *Asclerocheilus*, *Axiokebuita*, *Hyboscolex*, *Oligobregma*, *Mucibregma, Neolipobranchius, Parasclerocheilus*, *Pseudoscalibregma*, *Scalibregma*, *Scalibregmella*, *Sclerobregma*, deep sea

Introduction

Scalibregmatids are burrowing infaunal deposit-feeding worms that are widely distributed but usually rare and not commonly collected in nearshore habitats, being more typically found in offshore and deep-water sediments (Blake 2020). All scalibregmatids have an areolated appearance to their bodies due to annulated rows of raised pads across individual segments. They usually have bodies that are either elongate with an expanded anterior end and with a narrow abdominal region (arenicoliform or fusiform) or short, thick, and without an expanded anterior end (maggot shaped), but some species having more linear bodies may also occur (Blake 2020; this study). Most scalibregmatids have a prostomium with protruding frontal or lateral horns of varying lengths, often providing a T-shape to the anterior end. Parapodia are biramous with simple podial lobes; dorsal and ventral cirri occur in posterior parapodia of some genera. Branchiae, when present, are limited to a few anterior segments and have numerous branches. Setae include capillaries, furcate setae, and various kinds of acicular spines. Apart from several early histological studies (Danielssen, D.C. 1859; Ashworth 1901; Dehorne & Dehorne 1913), the internal anatomy of scalibregmatids is poorly known.

The morphology, biology, and systematic history of Scalibregmatidae were reviewed in detail by Blake (2020). As part of that review, 15 genera and 70 species were recognized as valid. Recently, seven additional species from deep water off eastern Australia were described by Blake (2023) and ten species from offshore Brazil were described by Mendes *et al*. (2023, 2024a–c) bringing the total of known species to 87. Of these, the majority of known species are from depths greater than 100 m.

The present study brings together materials collected or analyzed by the author over many years as part of large-scale reconnaissance and monitoring surveys along the U.S. Atlantic, Gulf, and Pacific coasts as well as the Southern Ocean, Antarctica, and SE Asia. Other collections and relevant type materials provided by various museum curators and colleagues were also examined. In total, This work includes 76 species, 54 of which are new to science. Several known species are redescribed, one new combination and synonymy is proposed, and two species are revalidated. The holotypes of the enigmatic scalibregmatid genera and species *Mucibregma spinosa* Fauchald & Hancock, 1981 and *Neolipobranchius glabrus* Hartman & Fauchald, 1971 are examined and discussed.

Materials and methods

Materials examined as part of this study. Specimens examined in this study are largely from numerous surveys conducted by the author and his colleagues over many years together with selected materials from earlier studies lodged in various museums. Samples from the Atlantic Ocean include specimens collected by the late Drs. Howard Sanders and Robert Hessler as part of their Gay-Head to Bermuda transect and other Atlantic Ocean deep-sea locations from the 1960s. Monitoring surveys on Georges Bank (1981–1985) and along the entire U.S. Atlantic continental slope and rise (ACSAR) were performed in 1983–1987 for the then Minerals Management Service

(MMS), now the Bureau of Ocean Energy Management (BOEM). A supplemental survey off Cape Hatteras, North Carolina (1992) was also performed for MMS by the Virginia Institute of Marine Sciences (VIMS). The MMS surveys were performed in anticipation of oil and gas exploration in poorly known environments. Samples from deep water in the Gulf of Mexico off Louisiana were collected at selected platform and oil and gas pipeline routes for Total E&P USA. Deep-water samples from the Southern Ocean and Weddell Sea were collected as part of the ANDEEP surveys on the R/V *Polarstern*. Deep-water samples from off northern California were collected as part of site selection and subsequent long-term monitoring of the San Francisco Deep-Ocean Site (SF-DODS) intended for disposal of dredged material from San Francisco Bay (see Blake *et al*. 2009). Near shore samples from British Columbia, Canada, off Ridley Island were collected as part of a proposed oil and gas export facility for the BG Group. Deep-water samples from the South China Sea off Brunei, the Island of Borneo, were collected as part of surveys of sites intended for oil and gas exploration. Several programs in the northeastern U.S. associated with sewage disposal, dredged material disposal, and energy development were also conducted: (1) long-term monitoring surveys in Boston Harbor and Massachusetts Bay for the Massachusetts Water Resources Authority (MWRA) sewage disposal monitoring program; (2) Long Island Sound for dredged material disposal monitoring for the U.S. Army Corps of Engineers (USACE) Disposal Area Monitoring Program (DAMOS) Program; (3) New Bedford Harbor benthic monitoring for the US Environmental Protection Agency (USEPA) relative to PCB contamination, and various reconnaissance surveys for energy-related windfarm and pipeline projects offshore New York and New Jersey. Scalibregmatids from Georges Bank and the Gulf of Maine collected as part of the extensive surveys along the U.S. Atlantic continental shelf conducted by Drs. Roger Theroux and Roland Wigley were provided by the National Marine Fisheries Service (NMFS), Woods Hole.

Other specimens loaned by various museums and/or colleagues were also examined. Deep-sea materials from cruises of the R/V *Anton Bruun* in the Indian Ocean as part of the International Indian Ocean Expedition (IIOE) and Southeastern Pacific Ocean as part of the Southeastern Pacific Biological and Oceanographic Program (SEPBOP) were provided by the Los Angeles County Museum of Natural History (LACM) as well as nearshore collections from Chile were provided by the Swedish Museum of Natural History (SMNH). Specimens from off Costa Rica were provided by the Scripps Institution of Oceanography (SIO).

The collections on which this study is based are archived with the Los Angeles County Museum of Natural History (LACM-AHF Poly); National Museum of Natural History, Smithsonian Institution (USNM); Museum of Comparative Zoology, Department of Invertebrate Zoology, Harvard (MCZ IZ); California Academy of Sciences, Department of Invertebrate Zoology (CASIZ); Santa Barbara Museum of Natural History (SBMNH); Scripps Institution of Oceanography (SIO-BIC); Yale Peabody Museum (YPM); Swedish Museum of Natural History, Stockholm (SMNH); the National Museum of Canada, Ottawa (NMCA); and the Zoological Museum of Hamburg, Germany (ZMH).

Sample handling and preservation. Samples from the SF-DODS, ACSAR Program, Gulf of Mexico surveys and off Brunei, and some samples from the ANDEEP surveys were collected with a 0.25-m^2 box core (BC) from which subcores measuring 10 x10 x 50 cm were obtained and extruded. The upper 10 cm of each of nine or ten subcores were used for biology; other subcores were used for sediment chemistry, grain-size, and total organic carbon analyses. During processing, the loose upper flocculent sediment was gently washed from the surface of each subcore directly into a jar and preserved in buffered 10% formalin without any sieving in the field. The more compact remainder of the sediment was extruded onto a 300-µm-mesh sieve and gently washed; the residue was retained and preserved in a separate jar. Both fractions were re-sieved in the laboratory. The samples from the Sanders/Hessler deep-water surveys in the Atlantic Ocean and the more recent deep-water survey off eastern Australia and some of the ANDEEP samples were collected using towed epibenthic sleds (EBS) or anchor dredges (AD) hauled over defined distances. These samples were also separated from the sediment with fine-mesh sieves. Surveys and various reconnaissance and monitoring projects along the U.S. Atlantic coast were mainly collected with 0.05 m^2 or 0.10 m^2 modified van Veen grab samplers (vVG) or a 0.1 m^2 Smith-McIntyre grab (SMG) and sieved with 0.5 mm sieves. All offshore projects performed by MMS were sieved with a 0.3 mm mesh. In some cases, the sieve sizes and sample processing methods are not known. If preserved in formalin, all samples were transferred to 70–80% ethyl alcohol (ETOH) within 48 hours of collection. For long-term storage, most samples are retained in 70% ETOH. Some specimens provided by SIO from off Costa Rica were subsampled and preserved in 95% ETOH for DNA analysis.

Morphological observations. Specimens were examined using a Wild M-5 stereomicroscope and a Zeiss RA research microscope equipped with phase contrast optics. Photomicrographs were taken with a Nikon D7100 camera mounted on both the stereo- and compound microscopes. For observation, specimens were first stained with an aqueous solution of Shirlastain A to highlight difficult-to-see surficial morphology. Some specimens were stained with a saturated solution of Methyl Green (MG) in 70% ethyl alcohol (ETOH) in order to identify staining patterns of subdermal glands evident on some species. Measurements of small specimens and parts were taken with a calibrated micrometer on the compound microscope; large specimens were measured directly with a metric ruler, usually during observations with the Wild M-5. Line drawings were first sketched in pencil using a drawing tube or camera lucida on the Zeiss RA microscope and later transferred to Dura-Lar® matte film and inked. The photographs and drawings were subsequently edited in Photoshop CS3®. A few specimens were prepared for

observation with the scanning electron microscope (SEM) using facilities of the Marine Biological Laboratory (MBL) in Woods Hole, Massachusetts. Specimens were prepared by dehydrating them from 100% ETOH followed by critical point drying and then sputter-coating with gold-palladium after mounting on stubs. Specimens were observed and photographed using the digital Zeiss Gemini SEM at the MBL.

Abbreviations used on figures. anC, anal cirrus(i); anL, anal lobes; aLmo, anterior lip of mouth; br, branchiae; dC, dorsal cirrus; dCr, dorsal crest; dRdg, dorsal ridge; eye, eye(s); eyeS, eyespot(s); ; fH, frontal horn; gl, gland; intL, interramal lobe; intP, interramal papilla; latH, lateral horn; mo, mouth; noL, notopodial lamella (lobe); neL, neuropodial lamella (lobe); neO, neck organ; nuO, nuchal organ; per, peristomium; pig, pigment; pLmo, posterior lip of mouth; pr, prostomium; pyg, pygidium; vC, ventral cirrus; vGr, ventral groove; vMidL, ventral mid-line; vRdg, ventral ridge.

Other abbreviations. AD, anchor dredge; ANDEEP, ANtarctic benthic DEEP-sea biodiversity; ant., anterior; BC, box corer; EASIZ, Ecology of the Antarctic Sea Ice Zone; EBS, epibenthic sled; fr/s., fragment/s; juv, juvenile; MG, Methyl Green stain; MltG, multigrab; MUC, multicorer; NC, North Carolina; NE, northeast; post., posterior; OCSEAP, Outer Continental Shelf Environmental Assessment Program; SC, South Carolina; SE, southeast; set, setiger; SMG, 0.1 m^2 Smith-McIntyre grab; SW, southwest; TV-G, grab with an associated live video camera; U.S., United States; TOC, total organic carbon; USACE, United States Army Corps of Engineers; vVG, van Veen Grab; WoRMS, World Register of Marine Species.

Systematic Account

Family Scalibregmatidae Malmgren, 1867

Type genus: *Scalibregma* Rathke, 1843, by monotypy.

Diagnosis. (after Blake 2020): Body variably shaped: (1) elongate and narrow throughout, (2) fusiform, (3) thick, maggot-shaped, or (4) elongate arenicoliform with anterior segments greatly expanded; with no more than 30 to 60 setigerous segments. Body with one to five annular rings on each segment; each ring usually composed of elevated pads; distribution of these rings and pads differs among species; venter with mid-ventral groove or ridge formed of elevated pads along body, limited to one part of body or entirely absent. Prostomium either bilobed or T-shaped with two frontal or lateral horns, sometimes long, ciliated, and functioning as palps; eyespots present or absent; nuchal slits present. Proboscis eversible, soft, unarmed. Peristomium achaetous; dorsal ring typically single, encompassing prostomium; ventral part with one to three rings forming upper and lower lips of mouth. Branchiae present or absent, when present limited to four to six or fewer anterior setigers, always with multiple branches, usually dichotomous. Parapodia biramous, with weakly developed podial lobes; interramal sensory organs or papillae present; dorsal and/or ventral cirri present or absent in middle and posterior segments, when present often with internal tubular glands; postsetal lamellae rarely present. Setae all simple, including capillaries, furcate setae present or absent, acicular spines on anterior segments present or absent; short spinous setae often present anterior to capillaries on setigers anterior to those where furcate setae begin. Pygidium with two or more lobes; anal cirri present or absent.

Genus *Asclerocheilus* Ashworth, 1901

Table 1

Type species: *Lipobranchius intermedius* Saint-Joseph, 1894. Designated by Ashworth (1901).

Synonym: *Kebuita* Chamberlin, 1919: 390. **Type species**: *Eumenia glabra* Ehlers, 1887. *Fide* Blake 2000.

Diagnosis. Body elongate, arenicoliform. Prostomium with a pair or lateral or frontal horns. Parapodia of posterior segments reduced; dorsal and ventral cirri absent; interramal papillae or lobe present or absent; postchaetal lamellae absent. Branchiae absent. Setae include capillaries, furcate setae, and large, conspicuous curved spines on setigers 1, 1–2, 1–3, or 1–4, sometimes accompanied by short spinous setae anterior to spines. Pygidium with long anal cirri.

Remarks. There is considerable confusion in the literature regarding the morphology of *Asclerocheilus intermedius* (Saint-Joseph, 1894), the type-species of the genus. Although morphological details of specimens from European waters were presented by Saint-Joseph (1894), Ashworth (1915), and McIntosh (1922, 1923) most subsequent summaries appear to be based on specimens reported by Fauvel (1914, 1927) probably because these are the only references with multiple illustrations of the anterior end and acicular spines. Unfortunately, the material examined by Fauvel (1914) and used as representative of the species was from off the Azores in deep water (1390 m) whereas the European records are all from nearshore or shallow shelf depths. To date, there are no illustrations or recent descriptions of *A. intermedius* from European waters. It is likely that the specimens reported by Fauvel (1914, 1927) from deep water off the Azores represent a separate, undescribed species.

In the present study, four specimens from the coast of France identified as *A. intermedius* were examined and an up-to-date illustrated description of the type-species is provided, allowing a better interpretation of species from other localities. In addition, the holotype of *A. glabrus* (Ehlers, 1887) from the Caribbean Sea was re-examined. All known species of *Asclerocheilus*, including an unnamed species from the Azores, are summarized in Table 1. The following 16 species of *Asclerocheilus*, 12 new to science, are reported here; one new combination is proposed.

TABLE 1. Comparison of morphological characters of all 31 known species of *Asclerocheilus* Ashworth, 1901, organized by number of setigers with acicular Spines[1, 2].

Species/ character	Setae Setiger 1	Setae Setiger 2	Setae Setiger 3	Setae Setiger 4	Arrangement & Structure of acicular spines	Prostomium	Peristomium	Furcate setae: Occurrence Morphology	Eyes: Structure & Color	Segmental annulation	Pygidium	Distribution	Reference
Acicular spines on Setiger 1													
***A. acirratus* (Hartman, 1966)**	Ac+C C	F+C F+C	F+C F+C	F+C F+C	5–6 Ac in 1st row; each recurved tapering to aristate tip; 2nd row all C	T-shaped w/ lH	A short smooth ring dorsally	From set 2; unequal tynes w/ denticles directed toward opposite tyne	2 pair double rows, red	Quadriannulate in middle & posterior segments	A smooth ring; anC not observed	S California, offshore in algae; shallow subtidal	Hartman 1966; 1969; Blake 2000
***A. alaskaensis* sp. nov.**	Sp+Ac+C C	Sp+C C	F+C F+C	F+C F+C	NoP Ac set 1 in 2 rows w/ 3-4 thin Ac w/ curved tip in 1st row & 4–5 heavier Ac in 2nd row w/ hirsute hooked tip	V-shaped, best seen ventrally; w/ 2 broadly rounded lateral lobes on ant margin	A single ring encircling pr; ventrally forming ant lip of mouth	Set 3, both tynes nearly equal; each w/ denticles directed toward opposite tyne	Absent	Quadriannulate from sets 5–6	W/ 4 short lateral cirri &/ broad ventral multilobed flange	NE Pacific, Alaska, Stephens Passage S of Juneau, ca. 50 m	This study
***A. crenulatus* sp. nov.**	Ac + C C	F+C F+C	F+C F+C	F+C F+C	Sp abs; noP Ac set 1, in 2 rows; w/ 5–6 spines 1st row , 2–3 in 2nd row; spines hirsute w/ aristate tips	Wedge-shaped w/ dC & w/ 2 short, rounded fH & 1 medial & 2 lat lobes forming crenulated ant margin	A single ring, incomplete dorsally by pr dC & ventrally by oral vestibule	Set 2, unequal tynes; ea w/ denticles	Absent	Triannulate set 3 to end, w/ few ant set quadriannulate on venter; raised pads few, not 1in ant set	Not observed	NE Pacific, Central California, offshore in rocks, 90–125 m	This study
***A. mexicanus* Kudenov, 1983**	Ac C	F+C F+C	F+C F+C	F+C F+C	Ac in 2 rows, w/ 5–6 in 1st row & 4–5 in 2nd row; Ac tapering to pointed aristate tip	T-shaped, w/ 2 weak lH	W/2 rings dorsally & laterally; ventrally fused w/ set 1	From set 2; unequal tynes w/ denticles	2 pair, thick, ?color	Uni- & biannulate anterior & posterior; tri- & quadriannulate in middle of body	W/ 3 anC	Gulf of Mexico; shallow subtidal; 19–43 m	Kudenov 1985
***A. shanonae* Eibye-Jacobsen, 2002**	Ac Ac+C	F+C F+C	F+C F+C	F+C F+C	NoP Ac in 2 rows w/ 6 in each row; Ac tapering to pointed tip; neP w/ 1st row of short Ac & 2nd row C	W/ 2 thick tapering frontal lobes	"Weakly biannulate"	From set 2; tynes nearly equal (1.2)	2 pair dark brown, diagonal bands, anterior b& largest	Tri & quadriannulate in middle body	W/ 4 anC	Thailand & Andaman Sea, 40–60 m	Eibye-Jacobsen 2002

.....*continued on the next page*

TABLE 1. (Continued)

Species/ character	Setae Setiger 1	Setae Setiger 2	Setae Setiger 3	Setae Setiger 4	Arrangement & Structure of acicular spines	Prostomium	Peristomium	Furcate setae: Occurrence Morphology	Eyes: Structure & Color	Segmental annulation	Pygidium	Distribution	Reference
***A. tropicus* Blake, 1981**	Ac+C C	F+C F+C	F+C F+C	F+C F+C	NoP Ac in 2 rows, 5–6 per row; 2nd row + C; Ac thick, curved w/ hirsute pointed tip	W/ 2 flaring lobes	A single smooth ring complete dorsally	From set 2 to post end; tynes unequal, smallest ca ½ length of larger one; w/ denticles	2 groups ocelli, orange	Ant & post set bi-annulate; middle segs tri-annulate	W/ 4–5 anC	Ecuador; 8–9 m; ?Brazil	Blake 1981; Nogueira 2002; Mendes *et al*. 2024c
Acicular spines on Setigers 1–2													
***A. alatus* sp. nov.**	Ac+C Sp+C	Ac+C Sp+C	Sp+C F+C	F+C F+C	Ac set 1–2 in a single noP only followed by 2–3 rows of capillaries; Ac curved, tapering to pointed tip	2 large flaring, pointed fH	A single narrow ring dorsally, divided mid-ventrally by narrow groove from prostomium to oval mouth, surrounded by narrow lobes	Set 3 neP; set 4 noP to end, tynes subequal w/denticles	Absent	No annulae set 1–3; Set 4 to post end biannulate to triannulate	W/ ca. 6 short ventral lobes	Pacific Ocean off N California, 2500–2850 m	This study
***A. ashworthi* Blake, 1981**	Ac+C F+C	Ac+C+F F+C	F+C F+C	F+C F+C	NoP Ac set 1 in 2 rows w/ C in 2nd row; set 2 w/ Ac in 1st row & C in 2nd row; Ac heavy, curved w/ pointed hirsute tip	T-shaped w/ weakly developed lH	A single ring dorsally & laterally; ventrally forming ant lip of mouth	From set 1 in NeP, set 3 in NoP to post end; tynes very unequal, w/ denticles	Absent	Uniannulate becoming triannulate in middle & post segs	W/4 short anC	Sub-Antarctic; 200–400 m	Blake 1981
***A. bergingianus* Ushakov, 1955**	Ac+C C	Ac+C C	F+C F+C	F+C F+C	NoP Ac Set 1 & 2 in 2 rows; + C in 3rd row; Set 2 w/ Ac in 1st row, w/ C in 2nd row; Ac curved, smooth, tapering to sharply hooked tip	Frontal, shifted ventrally; w/ 2 recessed horns	A single narrow ring	Not stated, but assumed to begin 3, continuing to post end; tynes unequal; w/ denticles on inner margin	Absent	Not reported	Truncate w/ 5 anC: 4 large lateral & 1 short medial	Bering Sea; 986 m	Ushakov 1955, 1965

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TABLE 1. (Continued)

Species/ character	Setae Setiger 1	Setae Setiger 2	Setae Setiger 3	Setae Setiger 4	Arrangement & Structure of acicular spines	Prostomium	Peristomium	Furcate setae: Occurrence Morphology	Eyes: Structure & Color	Segmental annulation	Pygidium	Distribution	Reference
***A. brigitteae* sp. nov.**	Sp+Ac+C C	Sp+Ac+C C	F+C F+C	F+C F+C	NoP Ac Set 1 in 2 rows w/ spines of 1st row hirsute w/ fine tip; 2nd row smooth w/ recurved tip; Set 2 Ac in 1 row smooth; Sp thin w/ pointed tips	Frontal shifted ventrally; w/ 2 oval-shaped frontal lobes	A single narrow ring	From set 3 to end; unequal tynes, w/ denticles	Absent	Set 1–5 not annulated, then quadriannulate to end	W/ 4 short anC	Southern Ocean, Scotia Sea, 2079–2151 m; Weddell Sea, 1035 m	This study
***A. californicus* Hartman, 1963**	Ac+C C	Ac+C C	F+C F+C	F+C F+C	Set 1–2, w/ Ac in 2 rows & C in 3rd row; Ac heavy, weakly curved, tapering to pointed, hirsute tip	2 broad flaring lobes	A single complete lobed ring dorsally; ventrally forming lateral lips of mouth	From set 3 in both noP & neP; tynes very unequal w/ denticles	Absent	Quadriannulate along most of body	Bulbous w/ 4 anC	S California; canyons in slope depths, 542–890 m	Hartman 1963; 1966; 1969; Blake 2000
***A. capensis* Day, 1963**	Ac+C Ac+C	Ac+C Ac+C	F+C F+C	F+C F+C	Set 1 w/ 15+ Ac in noP & only few in neP; set 2 w/ 6 Ac in noP; Ac heavy, curved to fine tip; neP Ac not as heavy as noP	2 lH	A single ring complete dorsally, incomplete ventrally by mouth	From set 3 to end; unequal tynes, w/ denticles	Absent	Quadriannulate from set 7 to end body	Not observed	South Africa, 183 m	Day 1963, 1967
***A. elisabethae* Eibye-Jacobsen, 2002**	Ac+C C	Ac+C F+C	F+C F+C	F+C F+C	NoP Set 1–2, w/ 3–5 rows of recurved blunt-tipped Ac & long C in post rows	2 narrow elongate fH	"Weakly biannulate"	From noP set 3 & neP set 2; tynes nearly equal (1.2)	2 pair orange-brown, diagonal bands	Set 3–18 quadriannulate	W/ 5 anC: 4 lateral, 1 mid-ventral	Thailand, Andaman Sea, 70–80 m	Eibye-Jacobsen 2002
***A. franciscanus* sp. nov.**	Sp+Ac+C C	Sp+Ac+C C	F+C F+C	F+C F+C	NoP Ac set 1 w/ Ac in 2 rows + C; Set 2 w/ Ac in 1st row, w/ C in 2nd row; Ac curved, hirsute, tapering to pointed tip; spS present ant to Ac of 1st row on set 1–2	Triangular, directed toward venter; w/ 2 rounded lH	A single ring, dorsally entire, ventrally forming lateral lips of mouth	From set 3; tynes unequal, one about twice as long as other; w/ denticles on inner margin	Absent	Quadriannulate from set 4	W/ 5 anC: 4 lateral & 1 ventral	Pacific Ocean off N California, continental slope depths, 1020–2750 m	This study

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TABLE 1. (Continued)

Species/ character	Setae Setiger 1	Setae Setiger 2	Setae Setiger 3	Setae Setiger 4	Arrangement & Structure of acicular spines	Prostomium	Peristomium	Furcate setae: Occurrence Morphology	Eyes: Structure & Color	Segmental annulation	Pygidium	Distribution	Reference
***A. intermedius* (St. Joseph, 1894)** TYPE SPECIES	Ac+C C	Ac+C F+C	F+C F+C	F+C F+C	Set 1 w/ Ac in 2 rows + C 3rd row; set 2 w/ 1st row Ac + C 2nd row; Ac w/ hirsute tip; spS not observed	2 short rounded lobes, not horns	A single narrow ring complete dorsally, mid-ventrally ant lip of mouth; post lip w/ row of short rounded lobes	From set 2 in neP and set 3 in noP; unequal tynes; w/ denticles	Absent	Quadriannulate along most of body	W/ 3 anC, 2 dorsal & 1 ventral	E North Atlantic; Brittany coast of France; English Channel, shallow water	Saint Joseph 1894; Southern 1914; McIntosh 1922, 1923; Hamond 1962; This study
***A. kudenovi* Blake, 2000**	Sp+Ac+C Sp +C	Ac+C F+C	F+C F+C	F+C F+C	NoP set 1 w/ Ac in 2 rows + 3rd row long C; set 2 w/ Ac 1st row +C 2nd row; Ac curved, pointed, hirsute; spS ant to Ac on set 1	T-shaped, 2 flaring lobes	A single complete thickened ring dorsally; ventrally forming lateral lips of mouth	From set 2 in neP; set 3 in noP; unequal tynes w/ denticles	2 pair double rows, red	Quadriannulate from set 4 near post end	W/ 4 anC	Central California; shelf depths in rocks; 90–120 m	Blake 2000
***A. magellaniensis* sp. nov.**	Sp+Ac+C C	Ac+C C	F+C F+C	F+C F+C	NoP Set 1 w/ 2 rows Ac; + 3rd row long C; set 2 w/ Ac & C; Ac set 1 w/ hooked & hirsute tip; Ac set 2 pointed, hirsute; spS ant to Ac on set 1	Shifted ventrally w/ 2 lateral oval lobes	A single, narrow achaetous ring, entire dorsally, ventrally forming upper and lower lips of mouth	From Set 3 in noP- & neP; unequal tynes w/ denticles	Absent	Dorsal: Set 2 biannulate, set 3–4 triannulate, set 5 quadriannulate: Ventral: Set 2–3 uniannulate, set 4–5 triannulate, set 6 & following quadriannulate	W/ 6 short anC	Chile, Straits of Magellan, 249–392 m	This Study

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TABLE 1. (Continued)

Species/ character	Setae Setiger 1	Setae Setiger 2	Setae Setiger 3	Setae Setiger 4	Arrangement & Structure of acicular spines	Prostomium	Peristomium	Furcate setae: Occurrence Morphology	Eyes: Structure & Color	Segmental annulation	Pygidium	Distribution	Reference
***A. pseudocollare* (Schüller & Hilbig, 2007) n. comb**	Sp+Ac+C ±Ac+C	Sp+Ac+C C	F+C F+C	F+C F+C	NoP Set 1 w/ 2 rows Ac, 1st row Ac heavy w/ hirsute tip; 2nd row set 1 & 1st row set 2 w/ narrower Ac tapering to pointed tip curving inwards toward shaft; NeP set 1 w/ or w/o single thick blunt tipped Ac	2 short oval-shaped lateral lobes	A narrow ring dorsally complete ; ventrally ant lip of mouth	From set 3 in both noP & neP; unequal tynes w/ denticles	Absent	Quadriannulate from set 4–5 to end of body	W/ 4 short anC	Southern Ocean, Scotia Sea, 2892 m	Schüller & Hilbig 2007; This study
***A. triangularis* sp. nov.**	Sp+Ac+C Sp+C	Sp+Ac+C Sp+C	F+C F+C	F+C F+C	NoP Ac set 1 w/ 2 rows, Ac + 3rd row C; set 2w/ Ac in 1st row + C in 2nd row; Ac long curved, pointed, w/ hirsute tips; NeP set 1 w/ or w/o 1 blunt-tipped Ac	V-shaped, w/ broad frontal margin, flaring laterally; lateral lobes not horns	A single narrow ring, w/ lobes dorsally; forming anterior opening of mouth ventrally; post lip of mouth w/ row of short lobes	From set 3 in noP- & neP; unequal tynes w/ denticles	1 pair minute, widely spaced in juvs; absent adults	Triannulate from set 3	Narrow, w/ 4 anC	Pacific Ocean off N California, 2240–2250 m	This study
Acicular spines on Setigers 1–3													
***A. abyssalis* Blake, 2023**	Sp+Ac Sp+Ac	Sp+Ac Sp+Ac	Sp+Ac Sp+Ac	C C	NoP & NeP of set w/ 1–3 rows of large Ac & short Sp alternating or ant to Ac; Ac large, curved, smooth w/ rounded tip	2 short frontal lobes	A single lobed ring complete dorsally, surrounding mouth ventrally; mouth w/ 9-10 narrow lobes	Post set; 1 long tyne, 2nd tyne a short spur	Absent	Bi-annulate anterior & post; tri-annulate in middle segments	W/ ca. 10 lobes surrounding anal opening	E Australia, NSW, abyssal depths, 3952–4280 m	Blake 2023

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TABLE 1. (Continued)

Species/ character	Setae Setiger 1	Setae Setiger 2	Setae Setiger 3	Setae Setiger 4	Arrangement & Structure of acicular spines	Prostomium	Peristomium	Furcate setae: Occurrence Morphology	Eyes: Structure & Color	Segmental annulation	Pygidium	Distribution	Reference
***A. aurospinosus* sp. nov.**	Ac Ac	Ac Ac	Ac Ac	C C	All Ac large, gold-colored; Ac set 1 in 2 rows; set 2–3 in a single row; w/o C or Sp; Ac thick and thin, and w/o or w/o hirsute shafts; some Ac w/ hooked tips	Short w/ 2 oval-shaped fH	A single ring, entire dorsally, merged w/ pr ventrally forming upper lip of mouth	Absent	Absent	Triannulate form set 3	Not observed	Indian Ocean, off Natal, South Africa, 1360 m	This study
***A. blakei* Mendes, De Pavia & Rizzo, 2024c**	Ac+C Ac+C	Ac+C Ac+C+F	Ac+C+F Ac+C+F	F+C F+C	NoP Ac curved, pointed w/ aristate-like tips w/ 2 rows set 1–2 & 1 row set 3; NeP w/1 row set 1–3	Trapezoidal w/ 2 short lH	A single ring dorsally, biannulate ventrally forming aLmo; pLmo on set 1, bulbous w/ narrow lobes on ant margin	From set 2 neP, set 3 noP; w/ unequal tynes w/ denticles	1 pair small in juvs; absent in adults	Set 1–2 biannulate dorsally, then triannulate; ventrally triannulate then quadriannulate	W/ ca. 10 short lobes around an; bearing 6 long anC	Off Brazil, Campos Basin, 693–1908 m	Mendes *et al*. 2024c
***A. caroliniensis* sp. nov.**	Sp+Ac Sp+Ac	Sp+Ac Sp+Ac	Sp+Ac Sp+Ac	C C	Ac in single rows, preceded by Sp; Ac set 1–2 heavy, curved, tapering to narrow tip; Ac set 3 narrower, tapering to hirsute pointed tip	2 elongate, fH.	a single narrow ring complete dorsally; enlarged ventrally forming posterior lip of mouth; oral opening bordered by 8–9 large rounded lobes	Absent	Absent	Set-1–2: uniannulate; Set 3–10 triannulate; 11 to end: biannulate	W/ 4–5 large lobes; anC absent	U.S. SE Atlantic, off the Carolinas, 1988–1993 m	This study

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TABLE 1. (Continued)

Species/ character	Setae Setiger 1	Setae Setiger 2	Setae Setiger 3	Setae Setiger 4	Arrangement & Structure of acicular spines	Prostomium	Peristomium	Furcate setae: Occurrence Morphology	Eyes: Structure & Color	Segmental annulation	Pygidium	Distribution	Reference
***A. geiseae* Mendes, De Pavia & Rizzo, 2024c**	Ac+C Ac+C	Ac+C Ac+C+F	Ac+C+F F+C	F+C F+C	NoP Ac set 1–2 in 2 rows; spines w/ rounded tips; Set 3 w/ 1 row, spines pointed; NeP Ac 1 row set 1–2; spines curved, pointed; Sp not observed	Triangular w/ 2 long fH	A single ring dorsally, 1 or 2 rings ventrally; aLmo, w/ lat per lobes + post end of pro; PLmo w/ raised pad w/ narrow lobes	From NoP set 3; NeP set 2; w/ unequal tynes w/ denticles	Absent	Mostly quadriannulate along most of body; venter w/ mid-ventral ridge of 1 pad per seg	Short, anus surrounded by crenulated margin bearing 4 long anC	Brazil, southern region, mouth of Rio Doce River, 11–50 m	Mendes *et al*. 2024c
***A. glabrus* (Ehlers, 1887)**	Ac Ac	Ac Ac	Ac Ac	C C	Ac in a single row, each long, narrow, tapering to pointed tip	2 frontal horns	A single narrow ring, complete, slightly enlarged ventrally, w/ mouth surrounded by small lobes	From mid-body; w/ 1 long tyne & short 2nd tyne; w/ denticles	Absent	Set 1–5 uniannulate then triannulate along most of body	W/ a ring of small lobes around anus; anC absent	Straits of Florida, 320 m; Caribbean Sea, 424–1435 m	Ehlers 1887; Augener 1906; Hartman 1938; This study
***A. jonesi* sp. nov.**	Sp+Ac+C Sp+Ac+C	Sp+Ac+C Sp+Ac+C	F+Ac+C F+C	F+C F+C	NoP set 1 w/ heavy recurved pointed Ac 1st row & thinner Ac & C 2nd row, 3rd row C; set 2 w/ 8–9 Ac 1st row & C 2nd row; set 3 w/ 4–5 Ac + C. NeP set 1 w/ 7–8 Ac 1st row & C 2nd row; set 2 w/ 3–4 Ac+C in tight fasc. Sp short, pointed, set 1–2 ant to Ac	V-shaped, bifid on anterior margin, w/ short lateral lobes	A single narrow ring dorsally; ventrally w/ pair of lobes lateral to oral opening; mo ant to swollen pLmo extending on to set 1	Set 3 to end, both w/ denticles	Absent	Quadriannulate from setiger 5	Not observed	N Gulf of Mexico, off Louisiana, 921 m	This study

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TABLE 1. (Continued)

Species/ character	Setae Setiger 1	Setae Setiger 2	Setae Setiger 3	Setae Setiger 4	Arrangement & Structure of acicular spines	Prostomium	Peristomium	Furcate setae: Occurrence Morphology	Eyes: Structure & Color	Segmental annulation	Pygidium	Distribution	Reference
***A. nathanae* sp. nov.**	Sp+Ac+C C	Sp+Ac+C C	Ac+C C	F+C F+C	NoP set 1 w/ 4–5 Sp & 5–6 Ac in 1st row & 2–3 Ac & 5–6 C in 2nd row; set 2 w/ 3–4 Sp & 3–4 Ac in 1st row & C in 2nd row; set 3 w/ 4 Sp & 1–2 Ac + C. Ac heavy, curved, tapering to narrow hirsute tip	2 narrow lH at 45° angle	Two multilobed rings on dorsal & lateral sides; ventrally w/ 5–6 transverse lobes forming lateral lips of oral groove w/ mouth bordered posteriorly by small lobes	Set 4 to end; both noP- & neP; unequal tynes, w/ denticles	Absent	Quadriannulate except set 1–2	Narrow tubular; not observed	S China Sea, off Brunei, Isl of Borneo, 1866–1947 m	This study
A. shanei Hartmann-Schröder 1994	Ac Ac	Ac Ac	Ac Ac	C C	Set 1–3 w/ 1 row Ac in noP & neP; set 1 ca. 9 Ac in set 1–2 & 4–5 in set 3; Ac thick, curved, hirsute neP Ac thinner than noP	2 forwardly directed fH	A single ridged ring dorsally w/ medial notch; ventrally surrounding mouth	Posterior noP only (from ca. set 30); 2 unequal tynes w/ denticles	Absent	Ant & post biannulate; middle segs triannulate	W/ 6 papillae, anC absent	Tasmania ca. 125 m	Hartmann-Schröder 1994
***A.* sp. F**	Ac+C Ac+C	Ac+C Ac+C	Ac+C Ac+C	C C	Ac Set 1–3 in noP & neP; Ac curved blunt tip	2 elongate, lH	A single complete ring dorsally	Not reported	Absent	Not reported	W/ ring of lobes around anus	E North Atlantic, off Azores, 1385 m	Fauvel 1909, 1914 as *A. intermedius*

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TABLE 1. (Continued)

Species/ character	Setae Setiger 1	Setae Setiger 2	Setae Setiger 3	Setae Setiger 4	Arrangement & Structure of acicular spines	Prostomium	Peristomium	Furcate setae: Occurrence Morphology	Eyes: Structure & Color	Segmental annulation	Pygidium	Distribution	Reference
Acicular spines on Setigers 1–4													
***A. neubertae* sp. nov.**	Sp+Ac+C Sp+Ac+C	Sp+Ac+C Sp+Ac+C	F+Ac+C F+C	F+Ac+C F+C	NoP set 1–2 w/ 2 rows lrg, curved hooked Ac w/ Sp in 1st row & 1–2 aristate Ac & C in 2nd row; Set 3 w/ 4 blunt-tipped Ac & 3–4 F in 1st row & 3 Ac & 12–15 C in 2nd row; Set 4 w/ 4–5 F, 2–3 narrow Ac & + C. NeP set 1 w/ Sp & 5 narrow Ac in 1st row & C in 2nd row; Set 2 w/ Sp & Ac in 1st row & C in 2nd row; Set 3–4 w/ F + C	Reduced dorsally; V-shaped ventrally, forming ant lips of mo; ant margin rounded, w/ 2 short lat lobes	A single, narrow ring, complete dorsally; interrupted ventrally by mouth; w/ oral opening surrounded by ca. 9 lobes	Set 3 to end; both noP & neP subequal tynes w/ fine denticles	Absent	Quadriannulate except set 1–2	Not observed	Pacific Ocean off N California, 2670 m	This study
A. heterochaetus, Kudenov & Blake, 1978	Ac+C Ac+C	Ac+C Ac+C	Ac+C Ac+C	Ac+C Ac+C	Ac in noP- & neP set l–4; noP set 1 2 rows of 5–8 Ac in 1st row & 6–9 in 2nd row + C; noP set 2–4 & neP set 1–4 1 row Ac + C in 2nd row; Ac of set 1 thick, curved; Ac set 2–4 thin, slender; all Ac curved, pointed, hirsute	T-shaped, 2 elongate lateral horns	A single ring, complete dorsally & laterally; ventrally forming ant lip of mouth; posterior lip on set 1	In middle & post set of both rami; unequal tynes	2 pair, V-shaped	Ant & post set bi- & triannulate; most of body w/ 4–6 annulations per seg	W/ 5 anC	SE Australia; shallow subtidal	Kudenov & Blake 1978

[1.] *Asclerocheilus tasmanius* Kirkegaard, 1996 was transferred to *Oligobregma* by Blake (2023).

[2.] *Oligobregma blakei* Schüller & Hilbig, 2007 and *O. pseudocollare* Schüller & Hilbig, 2007 are herein transferred to *Asclerocheilus* with *O. blakei* a new synonym of *O. pseudocollare*.

Abbreviations: abs, absent; Ac, acicular spine(s); anC, anal cirri; aLmo, anterior lip of mouth; ant, anterior; C, capillaries; ca., about; ea, each; F, furcate (lyrate) setae; fH, frontal horns; juv(s), juveniles(s); lH, lateral horns; neP, neuropodia; noP, notopodia; pLmo, posterior lip of mouth; post, posterior; pr, prostomium; seg, segment(s); set, setiger(s); Sp, short spinous setae; Setae: Upper letters = notosetae; lower letters = neurosetae; w/ = with; wo/ = without.

1. *Asclerocheilus intermedius* Saint Joseph, 1894, NE Europe, shallow water.
2. *Asclerocheilus alaskensis* **sp. nov.** NE Pacific Ocean, Alaska, Stephens Passage, near Juneau, ca. 50 m.
3. *Asclerocheilus alatus* **sp. nov.** NE Pacific Ocean, off northern California, 2850 m.
4. *Asclerocheilus aurospinosus* **sp. nov.** Indian Ocean, off Natal, South Africa 1360 m.
5. *Asclerocheilus beringianus* Ushakov, 1955. Bering Sea, 986 m.
6. *Asclerocheilus brigitteae* **sp. nov.** Southern Ocean, Antarctica, 1035–2151 m.
7. *Asclerocheilus caroliniensis***. sp. nov.** W North Atlantic Ocean, off SE United States, 1988–1993 m.
8. *Asclerocheilus crenulatus* **sp. nov.** NE Pacific Ocean, Central California, offshore, epifaunal on rocks, ca. 93–125 m.
9. *Asclerocheilus franciscanus* **sp. nov.** NE Pacific Ocean, off northern California, 1020–2750 m.
10. *Asclerocheilus glabrus* Ehlers, 1887. Caribbean Sea, 424–1435 m.
11. *Asclerocheilus jonesi* **sp. nov.** U.S. Northern Gulf of Mexico, off Louisiana, 921 m.
12. *Asclerocheilus magellaniensis* **sp. nov.** Chile, Straits of Magellan, 249–392 m.
13. *Asclerocheilus nathanae* **sp. nov.** South China Sea, off Brunei, 1866–1947 m.
14. *Asclerocheilus neubertae* **sp. nov.** NE Pacific Ocean, off northern California, 2670 m.
15. *Asclerocheilus pseudocollare* (Schüller & Hilbig, 2007) **n. comb**. Southern Ocean, Antarctica, 2079–2892 m.
16. *Asclerocheilus triangularis* **sp. nov.** NE Pacific Ocean, off northern California, 2240–2250 m.

Asclerocheilus intermedius (Saint-Joseph, 1894)

Figures 1–2

Lipobranchius intermedius Saint-Joseph, 1894: 113, Pl. V, figs. 146–147. **Not** Fauvel 1909: 149; 1914: 238, pl. XXI, figs. 13–18.

Asclerocheilus intermedius: Ashworth 1901: 294, 297; 1915: 409–410; Southern 1914: 137; McIntosh 1922: 14; 1923: 470, pl. 138, figs. 8, 8a; Hamond 1962: 574–576, figs. 9–10. **Not** Furreg 1925: 155–156; Fauvel 1927: 125–126, fig. 45 a–e; Hartmann-Schröder 1971: 379; 1996: 431–432; Hartman 1961: 18–182; Hartman & Fauchald 1971: 81.

Material examined. **France, Bay of Brest,** coll. V. Le Garrec, 0.1 m^2 SMG, IMPECAPE Project, **Sta. Bindy**, 28 Oct 2016, 48.31538°N, 4.36494°W, 1.3 m, maerl bed (2, MCZ IZ 171902); Maerl Observation Project, **Sta. Keraliou**, 14 Oct 2019, 48.3671°N, 4.43637°W, 2.0 m, maerl bed (1, MCZ IZ 171903); REBENT Project, **Sta. Rozegat**, 04 Jun 2020, 48.32195°N, 4.37117°W, 1.1 m, maerl bed (1, MCZ IZ 171904).

Description. All specimens complete, largest (Rozegat, MCZ IZ 171904) 9.1 mm long, 1.5 mm wide across mid-body with 43 setigers; smaller specimen (Bindy, MCZ IZ 171902) 5.2 mm long, 0.65 mm wide with 35 setigers. Body sausage shaped, thickened anteriorly and along most of body (Figs. 1A–C, 2A), rounded in cross section along most of body, becoming dorsoventrally flattened and tapering posteriorly (Figs. 2A–C). Setigers 1–2 relatively smooth, without annulations (Fig. 1A–C); from setiger 3 dorsally, and along most of body, each segment quadriannulate (Figs. 1A–C, 2A–B); far posterior setigers bi- or triannulate (Fig. 2C), venter weakly biannulate from setiger 2, quadriannulate from setigers 4–5 (Figs. 1C, 2A). Parapodia enlarged swollen elongate mounds or pads along most of body, best seen in lateral view (Fig. 2A–C); each bearing notch from which noto- or neurosetae emerge; parapodial cirri entirely absent; postsetal lobes or lamellae absent. Ventral surface with mid-ventral ridge from setiger 2 continuing posteriorly as an elongate row of pads or swellings where annular rings meet mid-ventrally (Figs. 1C, 2A–B). Color in alcohol light tan.

Prostomium V-shaped, best seen ventrally (Fig. 1C), with a narrow transverse ridge on anterior margin with a pair of short rounded lateral swellings or lobes (Figs. 1A–C, 2A); distinct frontal or lateral horns not present; eyespots absent; nuchal organs not observed. Peristomium a single narrow ring posterior to prostomium (Fig. 1A–C); mid-ventrally forming smooth anterior lip or border of mouth; posterior lip with a row of short, rounded lobes on anterior border of setiger 1 (Fig. 1C); proboscis not everted on any specimens.

Acicular spines in notopodia of setigers 1–2 only, not present in neuropodia; spines of setiger 1 in two rows with 3–4 large curved spines in first row (Figs. 1D, 2E) and 4–6 narrower spines in second row (Fig. 1E) followed by a row of long capillaries; setiger 2 with 3–4 spines in anterior row (Fig. 1F) followed by long capillaries in second row. Individual spines long, curved or recurved, tapering to narrow pointed tip; spines hirsute at tip produced by short protruding fibrils only visible at 1000x (Fig. 1D–F). Short spinous setae not observed with light microscopy anterior to acicular spines. Furcate setae from setiger 2 in neuropodia and setiger 3 in notopodia; furcate setae in noto- and neuropodia numbering 3–5 per fascicle along entire body; furcate setae anterior to longer capillaries; each furcate seta with long tapering tyne and shorter second tyne; each tyne with short denticles on inner edge directed toward opposite tyne (Figs. 1G, 2F).

Pygidium with three terminal anal cirri; two dorsal and one ventral to anal opening (Fig. 2C–D).

Remarks. *Asclerocheilus intermedius* (Saint-Joseph, 1894) is the type-species of the genus, but has not been the subject of any recent systematic review and the history of the species is confused. The original description by Saint-Joseph (1894) was based on material collected in shallow waters on the Brittany coast of France. The exact location, a small islet or rock called "*Gleglin*" is not identified on local maps. However, the species has been collected at several locations on the Atlantic coast of France near or along the English Channel in recent investigations

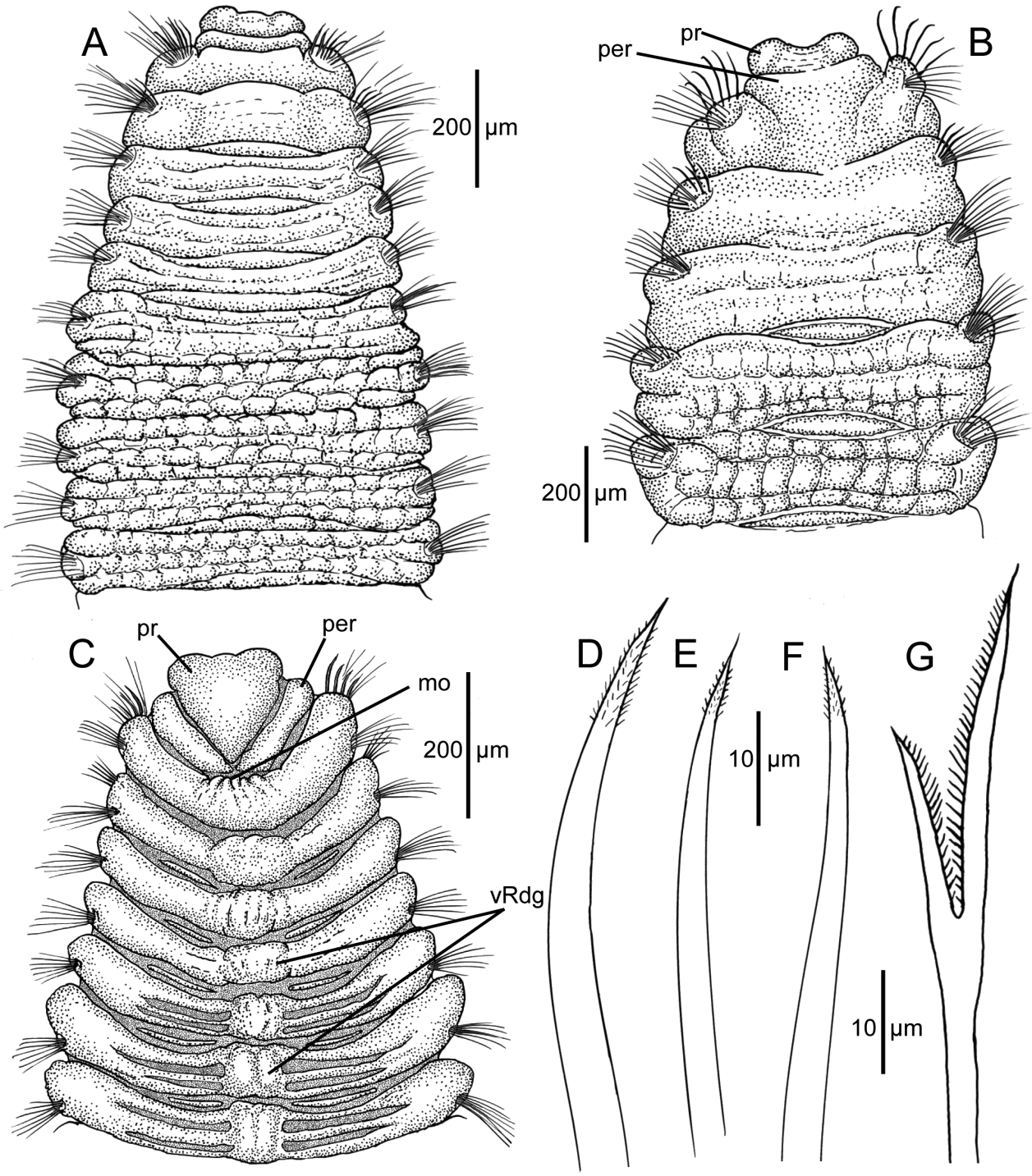

FIGURE 1. *Asclerocheilus intermedius* (St. Joseph, 1894). A, anterior end, dorsal view; B, anterior end, dorsal view of smaller specimen; C, anterior end ventral view; D–E, acicular spines from first and second rows of setiger 1; F, acicular spine from setiger 2; G, furcate seta from mid-body notopodium. A, C, specimen from Keraliou (MCZ IZ 171903); B, specimen from Bindy MCZ IZ 171902); D–G, setae, specimen from Rozegat (MCZ 171904).

including the sites in the Bay of Brest where the specimens examined here were collected.

The original account by Saint-Joseph (1894) stated that there were acicular spines in setigers 1–3 (segments 2–4) of which those of the first setiger were large and that these decreased in size and number over setigers 2–3. He also indicated that prostomial eyespots and parapodial cirri of posterior segments were absent. Other important characters such as the nature of the prostomium (frontal horns) and peristomium, number of segmental annuli, and presence or absence of anal cirri were not mentioned. The only illustration was of an acicular spine from setiger 1 and another of a segmental organ (= nephridium). Saint Joseph referred his species to the genus *Lipobranchius*,

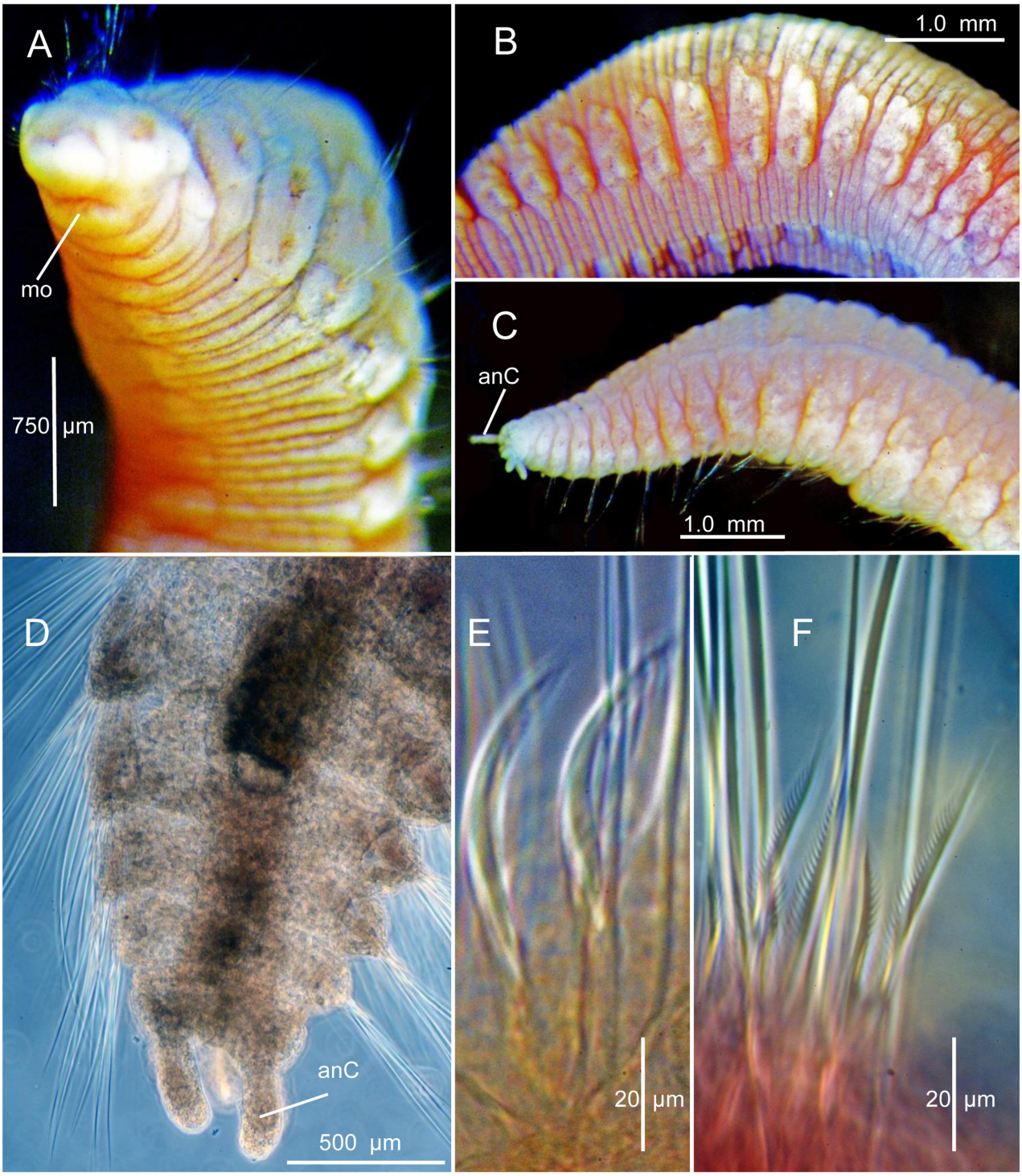

FIGURE 2. *Asclerocheilus intermedius* (St. Joseph, 1894). A, anterior end, ventral frontal view; B, middle body segments, left lateral view; C, posterior segments and pygidium, right lateral view; D, posterior end, dorsal view; E, acicular spines and capillaries, setiger 1; F, furcate setae and capillaries, mid-body notopodium. A–C, E–F specimen from Rozegat (MCZ 171904); D, specimen from Keraliou (MCZ IZ 171903). A–C, stained with Shirlastain A.

but noted that it differed from *L. jeffreysi*, in having spines on setiger 1. *Lipobranchius intermedius* was subsequently referred to a new genus, *Asclerocheilus*, by Ashworth (1901), who noted that the species was more closely allied to the genus *Sclerocheilus* by having acicular spines in setiger 1, but lacked the characteristic ventral cirrus of posterior setigers. There is no indication, however, that Ashworth examined any specimens of Saint Joseph's species.

The next account of *Asclerocheilus intermedius* in European waters was by Southern (1914) who collected the species from Blacksod Bay, Ireland, in 1.8 m in *Laminaria* holdfasts and dredged in Ballynakill Harbor in 2–5 m. Southern did not provide any morphological information

except to note that eyespots and ventral cirri were absent. Southern's specimens were subsequently examined and reported by McIntosh (1922, 1923) who observed large recurved acicular spines on segment 2 (= setiger 1) in the neuropodia (1923: Pl. 138, fig. 8a) and slender capillaries in the notopodia (1923: Pl. 138, fig. 8); no spines were observed in the notopodia. These observations suggest that he examined the specimen in ventral view because no known species of Scalibregmatidae has acicular spines in the neuropodia and not in the notopodia.

Fauvel (1909, 1914) reported and provided a detailed illustrated description (1914) of specimens he identified as *Lipobranchius intermedius* from 1385 m off the island of São Miguel, in the Azores (37.11°N, 29.094°W). Fauvel's specimens have a prostomium bearing two elongate forwardly directed horns arising laterally from a button-shaped prostomium that lacks eyespots; the peristomium is large and broad (a single ring), setigers 1–3 have acicular spines in both noto- and neuropodia, parapodial cirri are absent, and the anal opening is surrounded by a ring of short lobes, anal cirri are absent. Fauvel (1927) used these characters and some of the illustrations to characterize *Asclerocheilus intermedius* in his "*Faune de France*" volume on sedentary polychaetes, believing that his specimens from the Azores represented the species despite the fact that his specimens came from deep-water (1385 m) and European records were all from shallow water (<10 m). Unfortunately, despite that Fauvel's material was from deep-water from off the Azores, and distant from shallow-water type-locality off the Brittany coast of France, his concept has come to be recognized as characterizing the species (e.g., Furreg 1925; Hartmann-Schröder 1971, 1996). In fact, the specimens from the Bay of Brest examined in this study reveal a different suite of characters suggesting that Fauvel's specimens from off the Azores represent an undescribed species, here referred to as *Asclerocheilus* sp. F for Fauvel.

Based on the current observations, the main differences between the European and Azorean specimens are that European *Asclerocheilus intermedius* have a reduced prostomium with short rounded lateral swellings or lobes instead of prominent frontal or lateral horns, and acicular spines occur in the notopodia of setigers 1–2 and not in neuropodia whereas *A*. sp. F has a pair of large forwardly directed lateral horns arising from the prostomium and acicular spines occur in setigers 1–3 in both noto- and neuropodia. These differences place these two taxa into two separate species groups (see Table 1). Hamond (1962) correctly reported and illustrated the nature and arrangement of the anterior acicular spines on notopodia of setigers 1–2, the nature of the prostomium, and anal cirri of specimens he identified as *A. intermedius* from samples collected on the coast of Norfolk (UK). Hamond's observations are similar to the present observations of the Bay of Brest materials, and definitely represent the correct interpretation of the species, but his observations appear to have been entirely overlooked.

Asclerocheilus intermedius is one of 11 species of the genus to have large acicular spines limited to the notopodia of setigers 1–2. Of these, *A. intermedius* is the only intertidal or shallow water species and the only known species recorded from the North Atlantic Ocean. All other species in this group are from continental shelf or deep-water slope habitats in the Pacific, Indian and Southern oceans. Morphologically *A. intermedius* is the only species in the group to have three anal cirri (two dorsal and one ventral); the other species have 4–6 anal cirri. Other differences including the nature of acicular spines and prostomial horns are provided in Table 1.

Biology. Maerl beds are an important marine component and habitat in shallow-water European embayments where the present specimens of *Asclerocheilus intermedius* were collected. Living maerl is a purple-pink hard seaweed that forms spiky underwater carpets on the seabed, known as maerl beds. Maerl is a type of coralline algae, which deposits lime in its cell walls as it grows, creating a hard, brittle skeleton.

Distribution. Northeast Atlantic Ocean, along the coast of France and UK in shallow waters.

Asclerocheilus alaskaensis new species

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Figure 3

Material examined. **NE Pacific Ocean, Alaska, Stephens Passage, near Juneau**, coll. H.R. Jones, Jul 1996, AJ Mine winter trawl survey, **Sta. R-3**, Rep. 5, 58.3040°N, 134.7095°W, ca. 50 m, **holotype** (CASIZ 165339).

Description. Holotype only specimen, complete, with 37 setigers, 4.8 mm long, 0.38 mm wide across anterior setiger 4, 0.51 mm wide across mid body. Body elongate, generally circular in cross section, only slightly expanded in middle segments, tapering posteriorly. Setigers 1–4 without annular rings; setiger 5 with four weak rings (Fig. 3A–B), continuing as quadriannulate from setiger 6 to posterior end; elevated pads on annular rings poorly developed, indicated by breaks along rings, best developed ventrally. Color in alcohol light tan.

Prostomium V-shaped, best seen ventrally; with two broadly rounded lateral lobes on anterior margin; dorsally with posterior margin hidden by peristomium (Fig. 3A); ventrally merged with peristomium (Fig. 3B); eyespots absent; nuchal organs not observed. Peristomium a single complete ring, reduced mid-dorsally (Fig. 3A); ventrally forming anterior lip of mouth (Fig. 3B). Mouth a narrow, curved opening between peristomium and setiger 1; with a single mid-ventral lobe on anterior lip and numerous small lobes on posterior lip (Fig. 3B); proboscis not observed.

Parapodia reduced to inconspicuous mounds along body with setal fascicles arising from grooves or narrow slits. Setae include short spinous setae, acicular spines, capillaries and furcate setae. Acicular spines present only in notopodia of setiger 1 (Fig. 3A), absent in neuropodia. Notopodial acicular spines of setiger 1 in two rows with 3–4 spines in first row and 4–5 spines in second row, capillaries only in third row (Fig. 3G); 1–2 short spinous

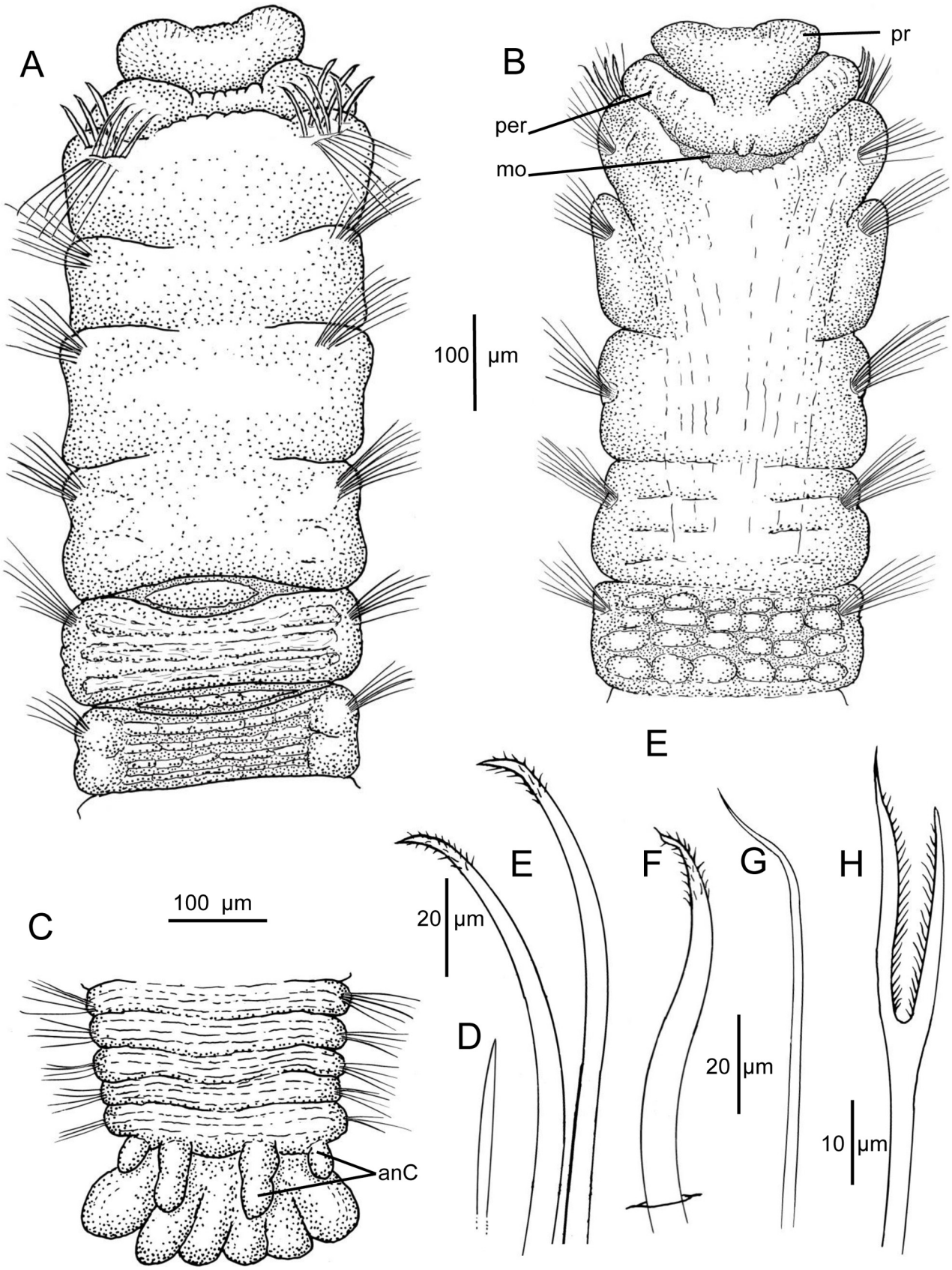

FIGURE 3. *Asclerocheilus alaskaensis* **sp. nov.** Holotype (CASIZ 165339): A, anterior end, dorsal view; B, anterior end, ventral view; C, posterior end, dorsal view; D, short spinous seta from setiger 2; E, acicular spines from row 1, setiger 1; F, acicular spine from row 2, setiger 1; G, capillary seta, setiger 1; H, furcate seta from posterior notopodium.

setae present anterior to acicular spines on setiger 1 and capillaries of setiger 2; short spinous setae weakly curved with pointed tip (Fig. 3D). Acicular spines of first row on setiger 1 long, narrow with curved hirsute tip (Fig. 3E); spines of second row, heavy, curved, with hirsute, hooked tip (Fig. 3F); furcate setae from setiger 3 with tynes subequal, each with fine denticles directed toward opposite tyne (Fig. 3H).

Pygidium with four short lateral cirri and a broad flange with rounded lobes ventral to anal opening (Fig. 3C).

Remarks. Among species of *Asclerocheilus* having spines only on the notopodia of setiger 1, *A. alaskaensis* **sp. nov.** is unusual in having two different kinds of spines, with heavy curved spines in the first row and thinner spines with a curved tip in the second row. These spines are hirsute as is typical of most species of the genus. In addition, the pygidium differs from all known scalibregmatids in having four short lateral cirri and a broad ventral flange with large lobes.

Etymology. The species is named for its occurrence in Alaska.

Distribution. Northeastern Pacific Ocean, Alaska, Stephens Passage near Juneau, ca. 50 m.

Asclerocheilus alatus new species

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Figure 4

Material examined. **Eastern North Pacific Ocean, Continental slope off northern California,** west of Farallon Islands, SF-DODS Benthic Monitoring Program, R/V *Point Sur*, coll. J.A. Blake, **Sta. 92**, 24 Sep 2002, 37.75°N, 123.583°W, 2850 m, **holotype** (LACM-AHF Poly 14823). **Sta. 3**, coll. 05 Dec 1996, 37.684°N, 123.489°W, 2500 m, 1 **paratype** (LACM-AHF Poly 14824).

Description. Holotype complete, elongate, generally rectangular in cross section, venter without longitudinal grooves or ridges; with 40 setigers, narrow at first, becoming widest by about setiger 6–8, then tapering to posterior end; 12 mm long, 2 mm wide at about setiger 6, far posterior segments 0.5 mm wide. Dorsal and ventral surfaces of setigers 1–3 relatively smooth, without annulations; bi- and tri-annulated rows with elevated pads present from setiger 4 on both dorsal and ventral surfaces to end of body (Fig. 4A–B). Parapodia enlarged rounded lobes on setigers 1–3; rest of body with noto- and neuropodia with low rounded podial mounds; parapodial cirri entirely absent. Color in alcohol opaque white.

Prostomium a relatively small pear-shaped lobe, pointed on anterior margin with a pair of large, expanded, subterminal wing-like horns directed laterally at a 45-degree angle ventrally merging with prostomium into Y-shaped structure (Fig. 4A–B); eyespots absent; nuchal organs not observed. Peristomium a single narrow ring posterior to prostomium dorsally; divided mid-ventrally by a narrow channel extending from prostomium to mouth, similar to a vestibule (Fig. 4A–B). Mouth an oval opening surrounded by a ring of narrow lobes (Fig. 4B). Proboscis not everted.

Acicular spines in notopodia of setigers 1–2 (Fig. 4A), absent in neuropodia; spines in anterior row followed by capillaries in three rows in setigers 1–2; spines numbering 7–8 in setigers 1–2; notopodia of setiger 3 with a few anterior short spinous setae anterior to capillaries, these not regarded as acicular spines. Neuropodia of setigers 1–2 lacking acicular spines, but with a few inconspicuous short spinous setae anterior to long capillaries. Most notopodial spines broken, when intact, each curved, tapering to pointed tip, not hirsute (Fig. 4D); all capillaries long, thin, with smooth shafts lacking external fibrils (Fig. 4E). Furcate setae short, present from setiger 3 in neuropodia and setiger 4 in notopodia, these anterior to long capillaries; each furcate seta with long tapering tyne and a shorter straight second tyne; each tyne with short denticles on inner edge directed toward opposite tyne (Fig. 4F).

Pygidium terminating in six short lobes, three on either side of anal opening (Fig. 4C).

Remarks. *Asclerocheilus alatus* **sp. nov.** belongs to a group of species having acicular spines on setigers 1–2 (Table 1). Of these, *A. alatus* **sp. nov.** has the acicular spines limited to the notopodia of setigers 1–2 instead of being present in both podia. Initially, the short spinous setae of setiger 3 were thought to be acicular spines; however, they are so much narrower than those of setigers 1–2 that they are considered to represent short spinous setae or newly emergent capillaries rather than actual acicular spines. At the same time, furcate setae are present in the neuropodia of setiger 3 but do not begin in the notopodia until setiger 4.

The prominent enlarged wing-like prostomial horns are characteristic of this species and differ from all other known species of *Asclerocheilus*. Although the oral morphology has not been reported for most species of *Asclerocheilus* and scalibregmatids in general, the nature of the vestibule-like channel extending from the prostomium to the oval-shaped oral opening surrounded by a ring of lobes has not been reported previously in the family.

Etymology. The epithet is from the Latin *alatus* for winged, in reference to the wing-like frontal horns on the prostomium that characterize this species.

Distribution. This species is rare and has only been collected from lower continental slope depths off northern California, 2500–2850 m.

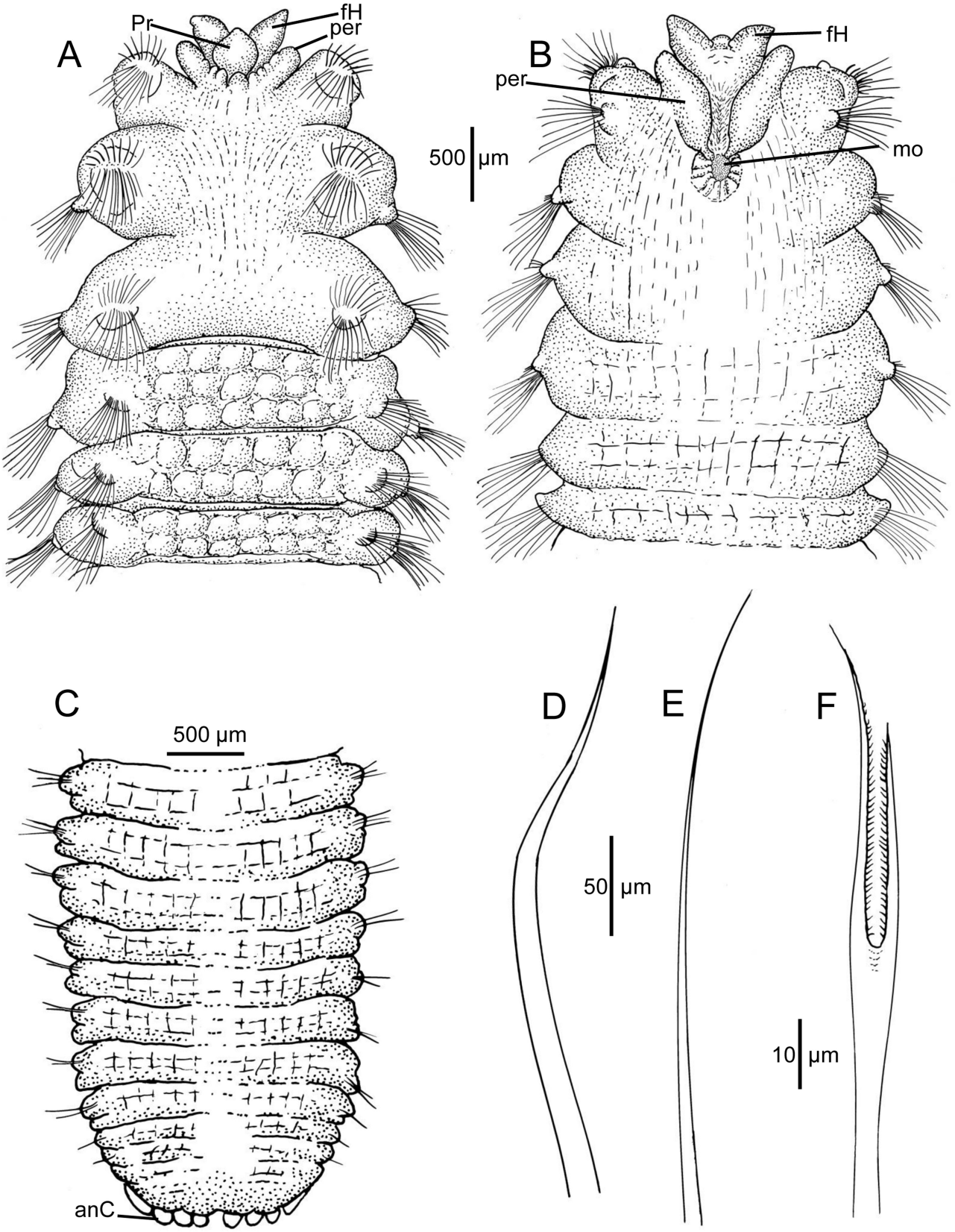

FIGURE 4. *Asclerocheilus alatus* **sp. nov.** Holotype (LACM-AHF Poly 14823): A, anterior end, dorsal view; B, anterior end, ventral view; C, posterior end, dorsal view; D, acicular spine, setiger 1; E, capillary seta, setiger 1; F, furcate seta, posterior neuropodium.

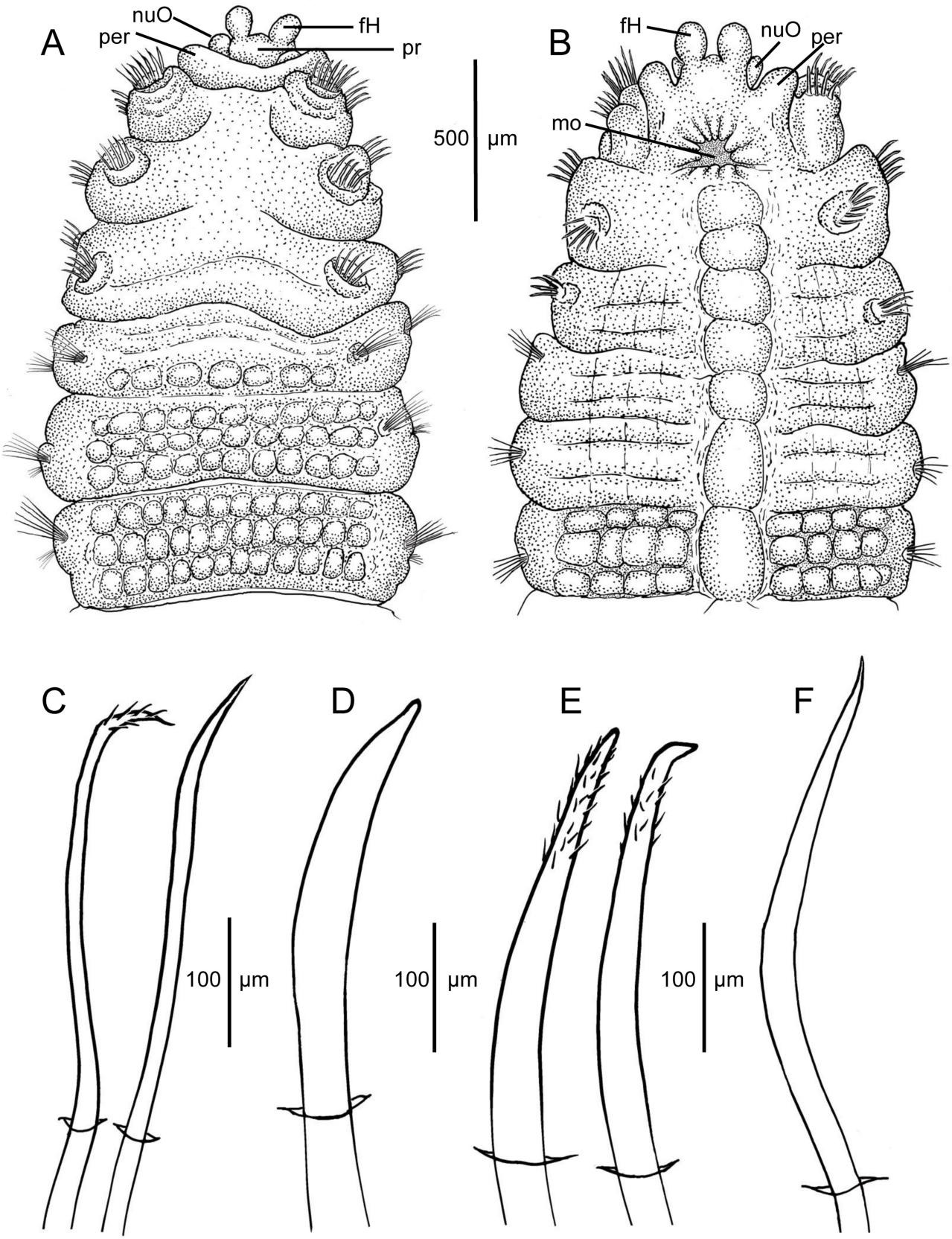

FIGURE 5. *Asclerocheilus aurospinosus* **sp. nov.** Holotype (LACM-AHF POLY 13569): A, anterior end, dorsal view; B, anterior end, ventral view; C, acicular spines from first row, notopodium of setiger 1; D, acicular spine from second row of notopodium setiger 1; E, acicular spines from neuropodium, setiger 1; F, acicular spine, from neuropodium, setiger 3.

Asclerocheilus aurospinosus new species

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Figure 5

Material examined. **Indian Ocean, South Africa, Natal, continental slope off Durban**, International Indian Ocean Expedition, R/V *Anton Bruun*, **Sta. AB 389-C**, coll. Olga Hartman, 07 Sep 1964, Agassiz trawl, 30.200°S, 32.017°E, 1360 m, **holotype** (LACM-AHF Poly 13569).

Description. Holotype only specimen, mostly complete, with far posterior segments tattered and torn; with 30 setigers, 26 mm long, about 3.0 mm wide across bulbous anterior segments, followed by posterior segments about 1.6 to 2.0 mm wide. Body with distinctly bulbous anterior region consisting of pre-setigers through setiger 6; thereafter body becomes narrow and dorso-ventrally flattened. Dorsum and venter of setigers 1–2 without annular rings (Fig. 5A); dorsum of setiger 3 weakly biannulate, becoming triannulate by setiger 4 and continuing posteriorly, setiger 5 and following with annular rings three rows of elevated blocks (Fig. 5A); venter with triannulate rings from setiger 3, but with raised pads not evident until setiger 6 (Fig. 5B). Venter with large mid-ventral pads from setiger 2 continuing posteriorly along entire body (Fig. 5B); blocks of anterior setigers large and prominent through about setiger 10, thereafter not conspicuous, reduced to narrow mid-ventral ridge. Parapodia enlarged oval lobes on setigers 1–3; rest of body with noto- and neuropodia reduced, inconspicuous with setae arising directly from simple rounded mounds; parapodial cirri entirely absent. Color in alcohol light tan.

Prostomium reduced, obscured dorsally by peristomium (Fig. 5A) and ventrally merged with peristomium forming anterior lip of mouth (Fig. 5B); anterior margin with two elongate and thickened oval-shaped frontal horns each directed anteriorly (Fig. 5A–B); eyespots absent; nuchal organs everted as swollen lobes between prostomium and anterior border of peristomium (Fig. 5A). Peristomium a single narrow ring surrounding prostomium dorsally (Fig. 5A); ventrally merged with prostomium forming anterior lip of mouth at level of setiger 1 consisting of a semi-circle of eight elongate lobes; posterior lip on anterior border of setiger 2 with transverse row of 5–6 short lobes Fig. 5B); proboscis not observed.

Setigers 1–3 each with rows of large prominent golden-colored acicular spines in both noto- and neuropodia; these not accompanied by either short spinous setae or capillaries. Notopodia of setiger 1 with two kinds spines, with anterior row of 3–4 elongate narrow curved spines tapering to hooked tips, some hirsute (Fig. 5C); second row with 5–6 large curved spines tapering to blunted tip, these not hirsute (Fig. 5D). Neuropodia of setiger 1 with 4–5 thickened spines tapering to blunted tip, some hirsute, some with hooked tip (Fig. 5E). Spines of noto- and neuropodia of setiger 2 curved, some hirsute, similar to neuropodial spines of setiger 1, numbering 6–8 per fascicle. Setiger 3 with noto- and neuropodia with six heavy spines, each tapering to pointed, smooth tip (Fig. 5F). Capillaries from setiger 4 smooth, lacking external fibrils arranged in fascicles of only 8–10 setae, best observed on anterior setigers; capillaries often broken or sheared off in posterior setigers. Furcate setae not observed in any setiger along body, confirmed by examination of slide mounts from posterior parapodia.

Posterior end not observed.

Remarks. *Asclerocheilus aurospinosus* **sp. nov.** belongs to a group of ten species of *Asclerocheilus* having acicular spines in setigers 1–3. Of these, five species have spines in both noto- and neuropodia and also lack accompanying capillaries on those same setigers: *A. abyssalis* Blake, 2023, *A. aurospinosus* **sp. nov.**, *A. caroliniensis* **sp. nov.**, *A. glabrus* (Ehlers, 1887), and *A. shanei* Hartmann-Schröder, 1994 (see Table 1). Of these, *A. aurospinosus* **sp. nov.** from deep-water off South Africa and *A. caroliniensis* **sp. nov.** from deep-water off the SE United State are most similar by entirely lacking furcate setae. The two species differ in that *A. aurospinosus* **sp. nov.** has short, oval-shaped frontal horns instead of long, thick frontal horns and lacks short spinous setae anterior to the acicular spines on setigers 1–3 instead of having them as in *A. caroliniensis* **sp. nov.** In addition, the annulated rows with raised annular pads are prominent on *A. caroliniensis* **sp. nov.** from setiger 1 and the acicular spines are in a single row in setigers 1–3 whereas in *A. aurospinosus* **sp. nov.** the raised pads are not evident until setigers 4–5 and the acicular spines are in two rows in setiger 1 and single rows in setigers 2–3.

Etymology. The epithet *aurospinosus* is from *aureus* Latin for golden and *spina*, Latin for spine, in reference to the large, distinctly gold-colored acicular spines that occur in the noto- and neuropodia of setigers 1–3 of this species.

Distribution. Indian Ocean, off Natal, South Africa, 1360 m.

Asclerocheilus beringianus Ushakov, 1955

Figure 6

Asclerocheilus beringianus Ushakov, 1955: 135, figs. 116 I–L; 1965: 292, figs. 116 I–L; Levenstein 1966: 48.—**Not** Hartman 1965: 48; Hartman & Fauchald 1971: 122; Hobson 1974: 71–72; Hobson & Banse 1981: 60, fig. 12a; Blake *et al*. 1987: C-5; Maciolek *et al*. 1987b: D-4; Hilbig 1994: 943; Blake 2000: 137–138, fig. 6.2; Imajima 2009: 141–142, figs 46–47.

Description (Interpretation and illustrations based on Ushakov 1955/1965). A large species, with up to 70 setigers, 25 mm long and 4 mm wide. Prostomium directed ventrally, retracted into setiger 1 and peristomium (Fig. 6A), best viewed in anterior view; anterior margin bearing two tentacular outgrowths (frontal horns); eyespots absent; nuchal organs not reported. Peristomium a single ring (Fig. 6A), ventral and dorsal configuration not reported; nature of oral morphology not reported, but everted proboscis said to be spherical, with numerous folds. Parapodia reduced, without dorsal and ventral cirri; interramal papilla present on anterior setigers and presumably along entire body

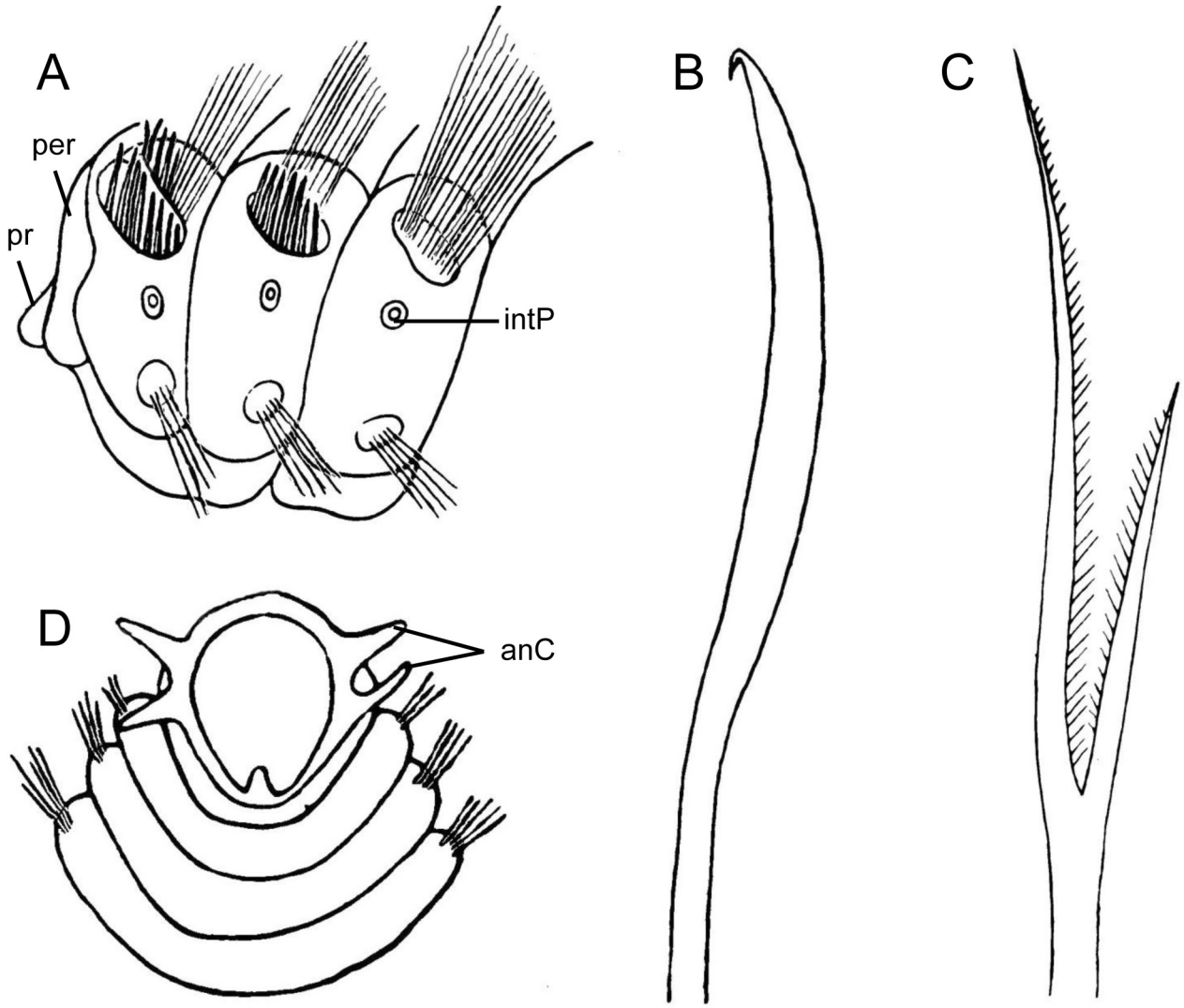

FIGURE 6. *Asclerocheilus beringianus* Ushakov, 1955. A, anterior end, left lateral view; B, acicular spine; C, furcate seta; D, posterior end, terminal view. All redrawn from Ushakov 1955, not to scale.

(Fig. 6A). Setae include acicular spines, capillaries, and furcate setae. Acicular spines and capillaries present on notopodia of setigers 1–2, spines absent on neuropodia; spines of setiger 1 arranged two rows on setiger 1 with 10–12 spines in first row and second row with 6–8 spines accompanied by capillaries; setiger 2 with 6–8 spines in first row with capillaries in second row; individual spines with heavy curved shaft tapering to sharply hooked tip (Fig. 6B); short spinous setae anterior to spines not reported. Origin and numbers of furcate setae not stated, but likely from ca. setiger 3; individual furcate setae with unequal tynes, with denticles on inner margins (Fig. 6C). Pygidium with four large lateral cirri (Fig. 6D) and one small ventral cirrus bordering anal opening.

Remarks. Following the original report of *Asclerocheilus beringianus* from the Bering Sea in 986 m by Ushakov (1955, 1965), the species has been reported widely (e.g., Hartman 1965, N. Atlantic, deep water; Hobson 1974 NE Pacific, Washington & British Columbia shelf depths; Blake *et al*. 1987 U.S. SE Atlantic; Maciolek *et al*. 1987b U.S. NE Atlantic; Blake 2000, NE Pacific, California slope depths; Imajima 2009, off Japan). These widely distributed records are likely based on observations of the occurrence of acicular spines on notopodia of chaetigers 1 and 2 and of the recessed prostomium not readily visible in dorsal view. It is now apparent after examining numerous specimens of *Asclerocheilus* that there are several different species having these characteristics. Further, other characters important in defining species of *Asclerocheilus* were not mentioned by Ushakov. For example, the body shape, nature and number of segmental annular rings, and the presence or absence of a mid-ventral ridge or groove were not reported. One characteristic illustrated by Ushakov was that the blades of the acicular spines were smooth and tapered to a sharply hooked tip; in contrast Blake (2000) and Imajima (2009) illustrated these spines with a strongly hirsute shaft and a fine but not hooked, tip. It is clear that most, if not all, of the non-Arctic records of *Asclerocheilus beringianus* likely belong to other undescribed species.

Distribution. Bering Sea, 986 m.

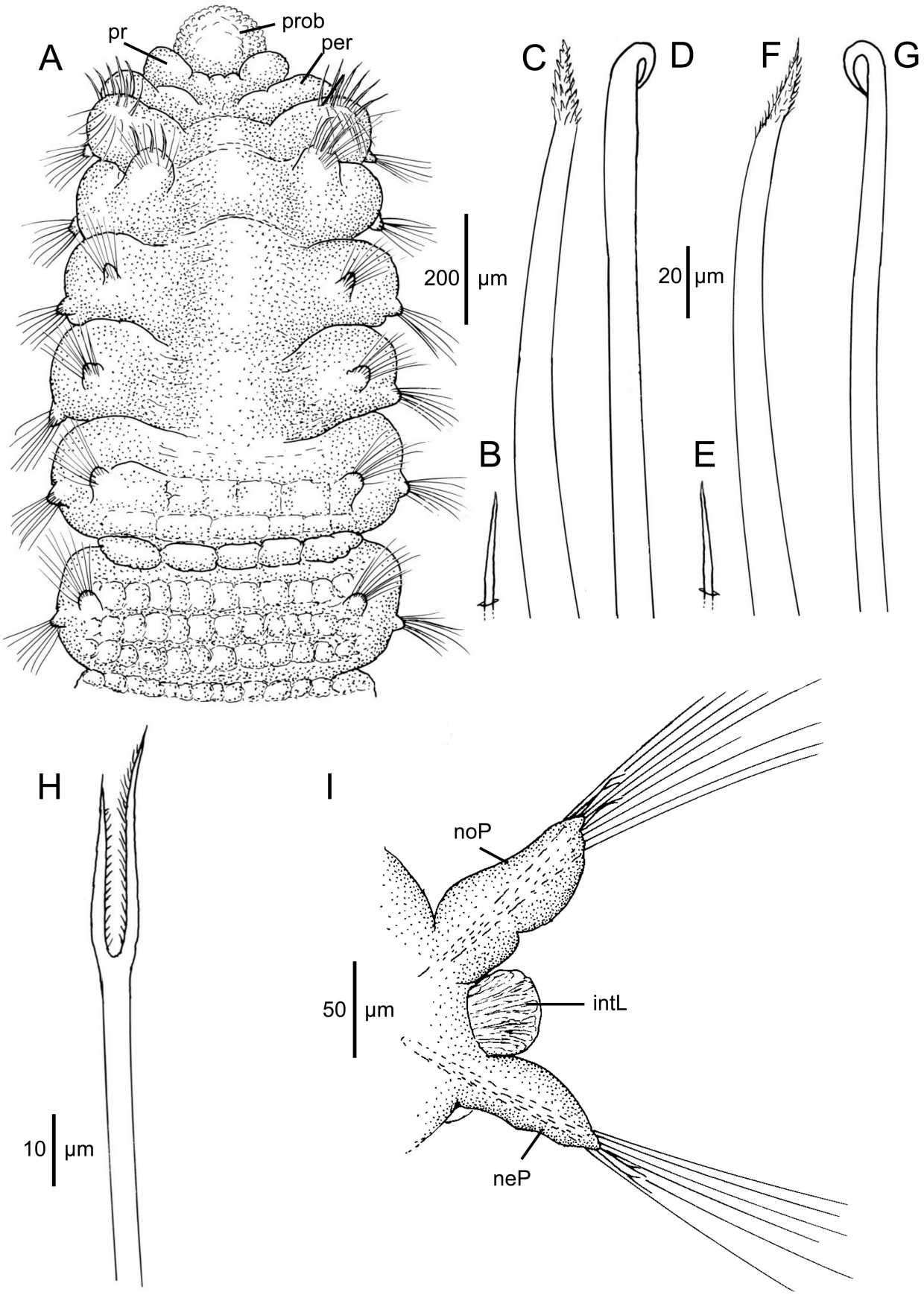

FIGURE 7. *Asclerocheilus brigitteae* **sp. nov.** A. Anterior end, dorsal view; B–D, short spinous seta and two acicular spines from notopodium setiger 1, left side; E–G, short spinous setae and two acicular spines notopodia setiger 1, right side; H, furcate seta, posterior neuropodium; I, posterior parapodium, anterior view. A–H, paratype (ZMH-ANN-030781); I, holotype (ZMH-ANN-030779).

***Asclerocheilus brigitteae* new species**
urn:lsid:zoobank.org:act:CC17B034-A73A-4AAE-B71F-1776AA2A65AF
Figures 7–8

Material examined. (*7 specimens*) **Southern Ocean, Antarctica**, **R/V *Polarstern*, ANDEEP III (ANT-XXII/3)**, **Scotia Sea,** off Antarctic Peninsula, W of Nelson Island, **Sta. 153-4**, coll. 29 Mar 2005, S.A. Doner, BC, 63.225°S, 64.613°W, 2079 m, **holotype** (ZMH-ANN-030779), 1 **paratype** (ZMH-ANN-030780).—**Scotia Sea,** off South Orkney Islands, **Sta. 150-5**, coll. 20 Mar 2005, S.A. Doner, BC, 61.818°S, 47.47°W, 2151 m, 1 **paratype** (ZMH-ANN-030781).—**Weddell Sea,** off Cape Norvegia, **Sta. 74-5**, coll. 20 Feb 2005, S.A. Doner, MUC, 71.302°S, 13.939°W, 1035 m, 4 **paratypes** (ZMH-ANN-030782).

Description. Holotype (ZMH-ANN-030779) largest complete specimen available, 4.8 mm long, 1.0 mm wide across swollen middle segments, with 45 setigers; paratype (ZMH-ANN-030781) a 15-setiger anterior fragment 2.6 mm long, 0.64 mm wide. Color in alcohol white to light tan.

Body fusiform, greatly expanded in anterior or middle segments, narrow anteriorly and with a long posterior region (Fig. 8A). Body with first five setigers not annulated, with three annulations weakly developed on setiger 6, then subsequent segments becoming quadriannulate along most of body (Figs. 7A, 8B).

Pre-setiger region short, truncated on anterior margin with prostomium and peristomium shifted ventrally (Fig. 8B). Prostomium with two oval-shaped lateral lobes (Fig. 7A), not forming separate horns; eyespots absent; nuchal organs not apparent. Peristomium a narrow ring between prostomium and setiger 1 (Fig. 7A),ventrally forming smooth anterior lip of mouth, oral opening a simple groove between setiger 1 and peristomium; posterior lip with 4–5 lobes; proboscis everted as simple oval lobe (Fig. 7A).

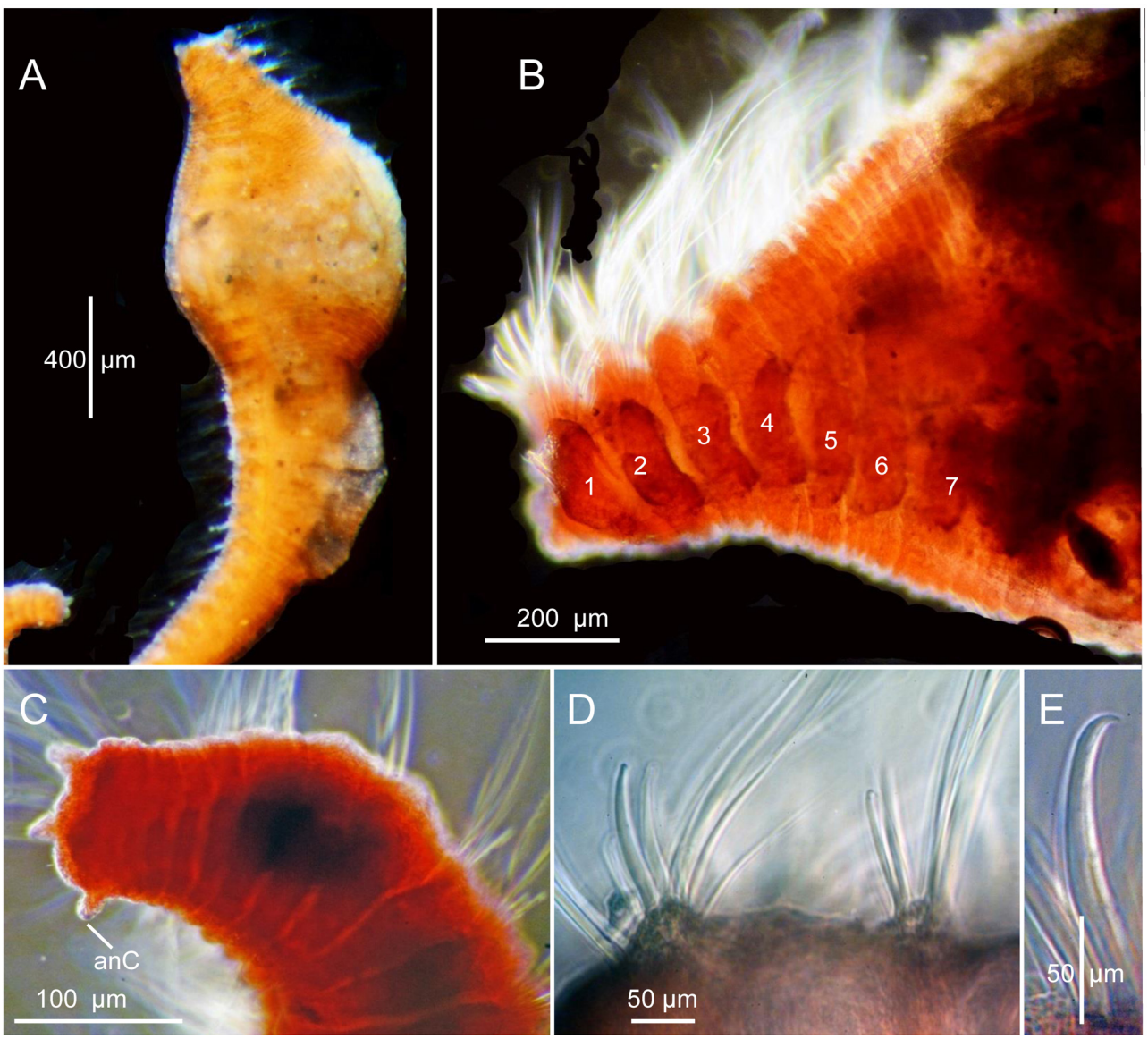

FIGURE 8. *Asclerocheilus brigitteae* **sp. nov.** A, entire worm in left lateral view; B, same, anterior end, left lateral view; C, posterior end, dorso-lateral view; D, notopodial acicular spines from setigers 1–2; E, notopodial acicular spine from second row of setiger 1. A–B, D–E, holotype (ZMH-ANN-030779); C, paratype (ZMH-ANN-030782). A–C, stained with Shirlastain A.

Individual setigers with widely separated noto- and neuropodia along most of body, each with an elongate mound from which setae emerge; dorsal and ventral cirri absent; a large rounded interramal lobe with internal glands present (Fig. 7I). Notopodia of setigers 1–2 with short, thin spinous setae (Fig. 7B, E), large acicular spines (Figs. 7C–D, F–G; 8D–E) and capillaries (Fig. 8D); neuropodia of setigers 1–2 with all capillaries. All noto- and neuropodia from setiger 3 with an anterior bundle of 4–5 furcate setae and a larger fascicle of 15 or more capillaries; short spinous setae few but visible at 400x on anterior margin at base of acicular spines of first row on setigers 1–2, these straight with pointed tips (Fig. 7B, E). Acicular spines of setiger 1 in two rows followed by a row of capillaries; first row with heavy spines tapering to a hirsute tip (Fig. 7C, F); second row with thinner spines tapering to a smooth narrow recurved tip, curving inward toward shaft on concave side and typically merging with shaft (Fig. 7D, G). Spines of setiger 2 in a single row, spines with smooth narrow recurved tips followed by row of smooth capillaries. Furcate setae with unequal tynes, each bearing denticles directed toward opposite tyne (Fig. 7H).

Pygidium with 4 short cirri surrounding anal opening (Fig. 8C).

Remarks. *Asclerocheilus brigitteae* **sp. nov.** is a distinctive species. Among species with acicular spines limited to setigers 1–2, eight species have acicular spines limited to the notopodia (Table 1). Of these, *A. brigitteae* **sp. nov.** is the only one to have two distinctly different kinds of acicular spines: (1) heavy spines with a hirsute tip in the first row of setiger 1 and (2) narrower spines with a non-hirsute and distinctly recurved tip in the second row of setiger 1 and first row of setiger 2. In addition, the prostomium only has two lateral swollen lobes instead of distinct frontal or lateral horns as in most other species of the genus. Short spinous setae were observed anterior to the acicular spines on setigers 1–2; these are very thin, with straight shafts and pointed tips and only observed with high magnification of at least 400x.

Etymology. This species is named for Dr. Brigitte (Hilbig) Ebbe, polychaete systematist, and a long-time friend and colleague. Dr. Ebbe directed box core sampling on all three legs of the ANDEEP surveys and provided some of the materials used in this study.

Distribution. Southern Ocean, Antarctica, Scotia Sea, 2079–2151 m; Weddell Sea, 1035 m.

Asclerocheilus caroliniensis new species

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Figure 9

Asclerocheilus sp. 1: Blake *et al.* 1987: C-5; Hilbig 1994: 943.

Material examined. (*8 specimens*) **Western North Atlantic Ocean, Southeastern U.S., off Charleston, South Carolina, U.S. South ACSAR Program,** coll. J.A. Blake**. Sta. 15**: **Cruise SA-5**, R/V *Gyre*, coll. 18 Sep 1985, Rep. 2, 32.2°N, 76.704°W, 1991 m, **holotype** (USNM 1741686); Rep. 1, 32.2°N, 76.704°W, 1988 m, (1 juv, USNM 1741687); **Cruise SA-4**, R/V *Cape Hatteras*, coll. 16 May 1985, Rep. 1, 32.2°N, 76.703°W, 1993 m, (1 juv, USNM 1741688); Rep. 2, 32.201°N, 76.703°W, 1991 m, **paratype** (USNM 1741689).—**Off Cape Fear, North Carolina**, **Sta. 12**, **Cruise SA-6**, R/V *Cape Hatteras*, coll. 21 Nov 1985, Rep. 2, 33.006°N, 76.122°W, 2002 m (2, USNM 1741690); Rep. 3, 33.006°N, 76.124°W, 1994 m (2, USNM 1741691).

Description. Holotype (USNM 1741686) largest specimen, mostly complete, some middle segments and far posterior end damaged. Body generally sausage-shaped, narrow over anterior seven setigers, then enlarged on setigers 8–10, then narrowing to posterior end; with 28 setigers, 15 mm long, about 1.5 mm wide along most of body except for short, enlarged section of 2.0 mm wide across setigers 8–10. Dorsum with setigers 1–2 uniannulate, setigers 3–10 triannulate (Fig. 9A), remaining setigers biannulate; venter similar except setigers 1–2 triannulate. Parapodia reduced, only slightly enlarged on setigers 1–3; rest of body with no prominent podial lobes; parapodial cirri entirely absent. Paratype (USNM 1741691) smaller, complete, with 26 setigers, 4.5 mm long, 0.5 mm across setiger 2, 0.93 mm wide across mid-body. Segmental annulations not as clear due to preservation, but setigers 1–2 uniannulate, most middle and posterior segments biannulate; raised pads low, not conspicuous. Color in alcohol light tan to opaque white.

Prostomium prominent, Y-shaped, with two elongate and thickened dorsolateral horns, each directed anteriorly at about a 45-degree angle (Fig. 9A); eyespots absent; nuchal organs everted as swollen lobes between the prostomium and anterior border of peristomium, each with elongate opening (Fig. 9A). Peristomium a single narrow weakly lobed ring surrounding prostomium dorsally (Fig. 9A), enlarged ventrally forming posterior lip of mouth; oral opening surrounded by 8–9 large, rounded lobes with multilobed proboscis fully everted on holotype (Fig. 9A).

Setae of setigers 1–3 each with a single row of large brass-colored acicular spines in both noto- and neuropodia, accompanied by short spinous setae, these typically observed anterior to larger spines in same position usually occupied by furcate setae in more posterior setigers; spinous setae no more than 1/3 length of large acicular spines (Fig. 9C–D). Acicular spines of setigers 1–3 numbering 6–7 per noto- and neuropodium; each spine distinctly tapering to narrow tip, those of setigers 1–2 with narrow blunt tip (Fig. 9C); acicular spines of setiger 3 with pointed, hirsute tip (Fig. 9D). Setae from setiger 4 through middle segments with 9–10 simple capillaries in both noto- and neuropodia; posterior setigers with 7–9 capillaries in noto- and neuropodia. Capillaries smooth, lacking external fibrils. Furcate setae not observed in any setigers along body; prepared slide mounts from anterior and posterior parapodia confirmed lack of furcate setae.

Pygidium of paratype damaged, but with 4–5 large lobes surrounding anal opening (Fig. 9B); cirri not observed.

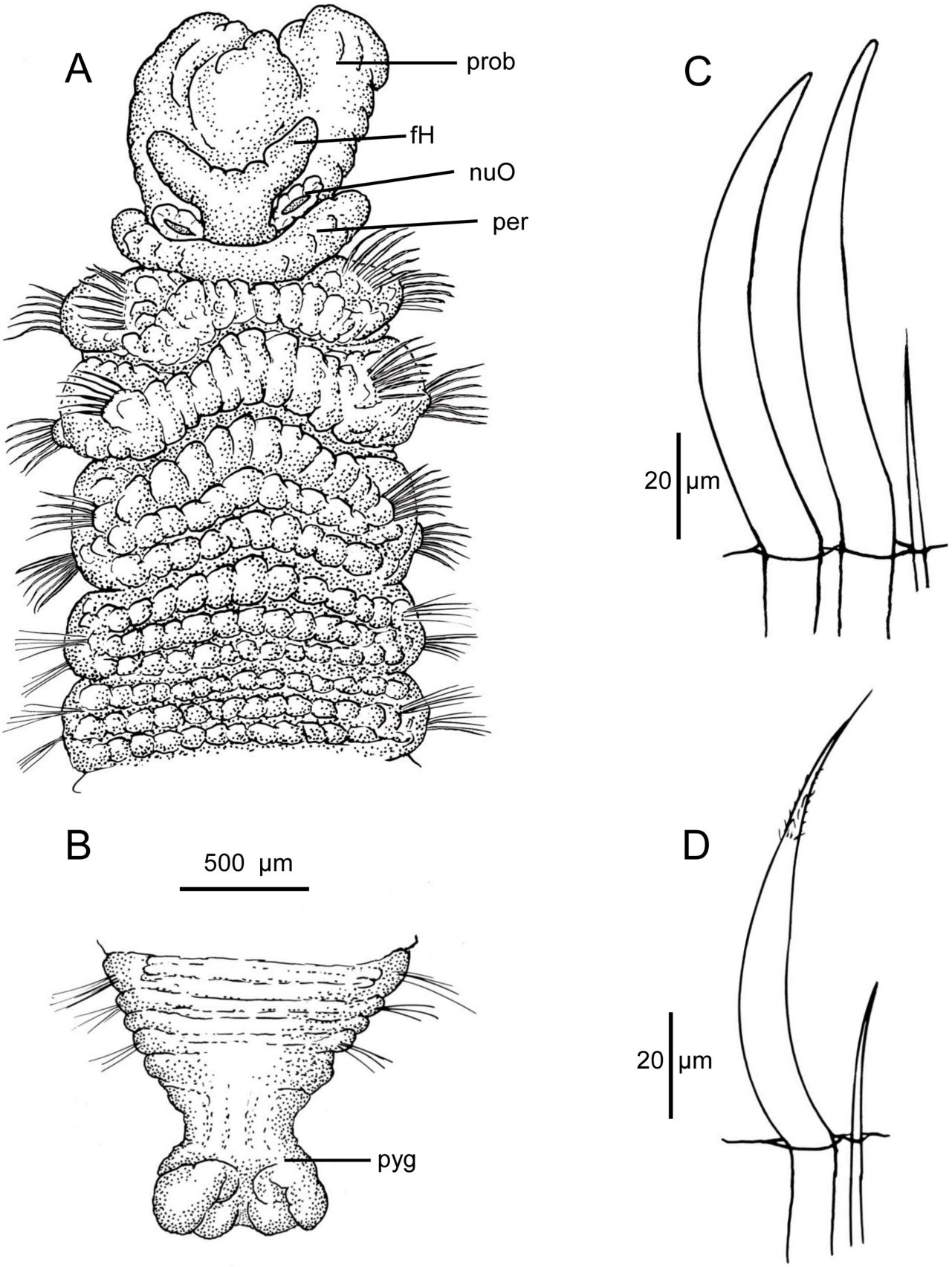

FIGURE 9. *Asclerocheilus caroliniensis* **sp. nov.** A, Anterior end, dorsal view; B, posterior end and pygidium, dorsal view; C, notopodial spines and short spinous seta, setiger 1; D, notopodial spine and short spinous seta, setiger 3. A, C–D, holotype (USNM 1741686); B, paratype (USNM 1741689).

Remarks. Among deep-water species of *Asclerocheilus* having acicular spines on setigers 1–3, *A. caroliniensis* **sp. nov.** from bathyal depths off the U.S. SE Atlantic is most similar to *A. abyssalis* Blake, 2023, from deep-water off eastern Australia. Both species have acicular spines in the noto- and neuropodia of setigers 1–3 accompanied by short spinous setae anterior to the spines. However, furcate setae are entirely absent in *A. caroliniensis* **sp. nov.** and present in posterior setigers in *A. abyssalis* as a unique seta having a short, spur-like tyne and a long tapering one. *Asclerocheilus caroliniensis* **sp. nov.** is also similar to *A. aurospinosus* **sp. nov.** from off SE Africa in entirely lacking furcate setae, but differs in that it has short spinous setae anterior to the acicular spines on setigers 1–3 and a pair of long frontal horns, whereas *A. aurospinosus* **sp. nov.** lacks short spinous setae anterior to the acicular spines and has a pair of short oval-shaped frontal horns.

Biology. *Asclerocheilus caroliniensis* **sp. nov.** was only rarely encountered at two locations: Sta. 12 off Cape Fear, North Carolina, and Sta. 15 off Charleston, South Carolina, both from the 2000 m depth contour (Blake *et al*. 1987, Blake & Grassle 1994). Both stations, but especially Sta. 15, had sediments with a relatively high sand content of about 40%. Sta. 12 was dominated by the polychaetes *Prionospio* sp. 2 (5.6%), *Aurospio dibranchiata* Maciolek, 1981 (4.5%), *Pholoe* sp. (4.4%) and the isopod *Gnathia* sp. 2 (4.3%), whereas Sta. 15 was dominated by the polychaete *Microrbinia linea* Hartman, 1965 (23.2%).

Etymology. The epithet *caroliniensis* is based on the location of these specimens from off North and South Carolina in the Western North Atlantic.

Distribution. Western North Atlantic Ocean, off the Carolinas, 1988–2002 m.

Asclerocheilus crenulatus new species

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Figure 10

Material examined. **Eastern North Pacific Ocean, California, Santa Maria Basin off Purisima Point**, MMS Phase I Reconnaissance Program, hard bottom survey, rock scraping, M/V *Bonne Chance*, HOV *Diaphus*. **Sta., BRA 16A–B,** coll. 23 Jul 1984, A.D. Lissner, 34.759ºN, 129.837ºW to 34.765ºN, 129.829ºW, 93–125 m, **holotype** (LACM-AHF Poly 14825).

Description. A small species, holotype only specimen, mostly complete, broken into two parts with handling, with 35 setigers, 6.2 mm long, 0.3 mm wide across anterior setigers 7–8, 0.5 wide across middle expanded middle segments at about setiger 15. Body slender, only weakly expanded from setigers 11–15, with segments elongate; narrower than anterior and posterior segments. Annular rings not prominent along body, triannulate from setiger 3 to end, a few anterior setigers quadriannulate especially on venter; raised pads apparent only in anterior setigers; venter with enlarged medial pads on setigers 2–5 forming ventral ridge, thereafter not apparent (Fig. 10B). Color light tan.

Prostomium short, as wide as long, weakly wedge-shaped with anterior margin appearing crenulated due to five rounded lobes (Fig. 10A–B); these include a pair of short rounded frontal horns separated by a narrow middle lobe and two lateral prostomial lobes; prostomium narrowing posteriorly bearing a triangular dorsal crest separating dorsal peristomial ring into two parts (Fig. 10A); eyespots absent; ventrally, posterior part of prostomium narrowing to form a vestibule towards mouth; no separate anterior lip present; posterior lip of mouth on setiger 1 consisting of 8–9 narrow lobes bordering mouth and with a row of thicker lobes on posterior part of setiger 1 (Fig. 10B). Peristomium a single smooth ring dorsally interrupted by prostomial crest and ventrally by prostomial vestibule leading to mouth.

Parapodia on setiger 1 large rounded dorsal lobes bearing acicular spines; subsequent dorsal and all ventral parapodia short conical lobes bearing capillaries and furcate setae; posterior parapodia lacking dorsal and ventral cirri. Acicular spines of setiger 1 limited to notopodia, accompanied by a few capillaries; short spinous setae not observed. Acicular spines in two rows, with 5–6 spines in first row and 2–3 in second row; 1–2 capillaries in first row and 3–4 in second row; all spines hirsute near tip, with thick shafts tapering to fine arista-like tip (Fig. 10C–E). Furcate setae from setiger 2, with only 2–3 per noto- and neuropodia throughout, each with subequal tynes bearing short denticles on inner margins directed toward opposite tyne (Fig. 10F). All capillaries with smooth shafts, anterior noto- and neuropodial fascicles with 8–10 long setae; posterior setigers with only 3–5 capillaries and 1–2 furcate setae.

Posterior end not available.

Remarks. *Asclerocheilus crenulatus* **sp. nov.** is one of only six species of the genus to have acicular spines limited to setiger 1 and one of five with these spines limited to the notopodia. Other species in the group have a prostomium with distinct frontal or lateral horns and a smooth anterior margin; in contrast *A. crenulatus* **sp. nov.** has five lobes on the anterior prostomial margin with a short medial lobe between two frontal horns and two rounded lateral lobes giving the prostomium the appearance of having multiple anteriorly directed lobes. In addition, the prostomium tapers posteriorly to a dorsal crest that divides and splits the dorsal peristomial ring.

Biology. *Asclerocheilus crenulatus* **sp. nov.** was collected from rock scrapings as part of an ROV survey offshore central California suggesting that the species is epifaunal rather than infaunal as most other scalibregmatids.

Etymology. The epithet *crenulatus* is from the Latin *crena* for notch, in reference to the scalloped or notched appearance of the anterior margin of the prostomium.

Distribution. E North Pacific Ocean, Central California, offshore, epifaunal on rocks, ca. 93–125 m.

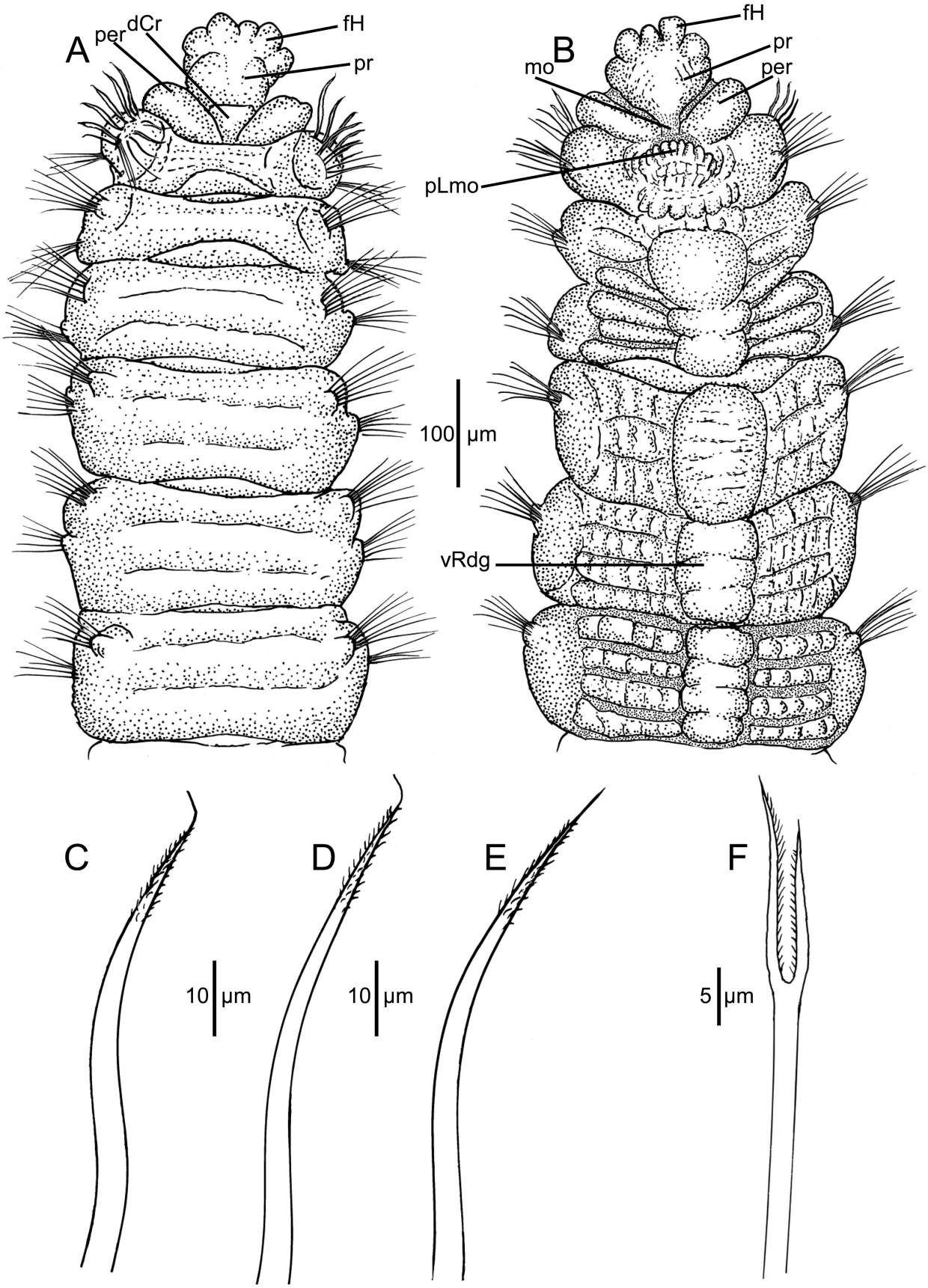

FIGURE 10. *Asclerocheilus crenulatus* **sp. nov.** Holotype (LACM-AHF Poly 14825): A, anterior end, dorsal view; B, anterior end, ventral view; C–E, anterior acicular spines, notopodia, setiger 1; F, furcate seta, posterior neuropodium.

***Asclerocheilus franciscanus* new species**
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Figures 11–12

Asclerocheilus beringianus: Blake 2000: 137–138, fig. 6.2. **Not** Ushakov 1955, 1965.

Material examined. (*9 specimens*) **Eastern North Pacific Ocean**, **California, off San Francisco, U.S. EPA 102 Site Survey**, R/V *Point Sur*, coll. J.A. Blake, south of Pioneer Canyon: **Sta. 4-7**, 18 Sep 1991, 37.225ºN, 123.125ºW, 1020 m, **holotype**, (CASIZ 245236). **Sta. 4-5**, 17 Sep 1991, 37.226ºN, 123.271ºW, 1920 m, 1 **paratype** (CASIZ 245237). **Sta. 4-10**, coll. 17 Sep 1991, 37.188ºN, 123.088ºN, 1760 m, 1 **paratype** (CASIZ 245238). North of Pioneer Canyon, **Sta. 3-14**, 15 Sep 1991, 37.392°N, 123.36ºW, 1880 m, 2 **paratypes** CASIZ 245239).—**SF-DODS Benthic Monitoring Program**, **west of Farallon Islands**, R/V *Point Sur*, coll. J. A. Blake, **Sta. 6**, 26 Sep 2003, 37.668ºN, 123.451ºW, 2710 m, 1 **paratype** (LACM-AHF Poly 14826). **Sta. 27**, 26 Sep 2003, 37.682ºN, 123.532°W, 2750 m, 1 **paratype** (LACM-AHF Poly 14827). **Sta. 50**, 24 Sep 2003, 37.708°N, 123.432°W, 2160 m (1, LACM-AHF Poly 14828). **Sta. 52**, 26 Sep 2003, 37.716°N, 123.432°W, 2240 m (1, LACM-AHF Poly 14829).

Description. Body elongate, expanded in anterior or middle segments, narrowing only in posterior-most segments (Fig. 11A). Holotype (CASIZ 245236) complete, 7.6 mm long, 0.77 mm wide, with 37 setigers; paratype from Sta. 27 (LACM-AHF Poly 14827) larger, incomplete, 12 mm long, 1.0 mm wide, with 42 setigers. Color in alcohol light tan, without pigment.

Prostomium reduced, triangular, best seen in ventral or anterior view (Fig. 12B); shifted somewhat ventrally and depressed into peristomium; obscured by peristomium in dorsal view (Fig. 12A); anterior margin bearing two rounded lateral horns (Fig. 12A–B); eyespots absent; nuchal organs large and bulbous, visible lateral to prostomium when everted. Peristomium a single, narrow achaetous ring, entire dorsally (Fig. 12A), ventrally forming lateral lips around mouth; posterior lip on anterior margin of setiger 1 (Fig. 12B). Proboscis a smooth sac when everted.

Setiger 1 with single ring, visible dorsally; setigers 2–3 biannulate and triannulate dorsally (Fig. 12A), uniannulate and triannulate ventrally (Fig. 12B); setiger 4 and following segments quadriannulate; annuli divided dorsally and ventrally into lumpy blocky pads providing complex areolated appearance to body surface (Fig. 12A–B). Pads of annuli becoming swollen along ventral midline from setiger 3, forming distinct longitudinal ridge to about setiger 15 (Fig. 12B), thereafter these becoming depressed, forming ridge within mid-ventral groove. Parapodia swollen, with conspicuous setal tori throughout; parapodial cirri and lamellae absent. Interramal sense organ small, inconspicuous, from setiger 1.

Setae include short spinous setae, acicular spines, furcate setae, and capillaries. Acicular spines present in notopodia of setigers 1–2, absent in neuropodia; acicular spines hirsute, tapering to fine aristate-like tip

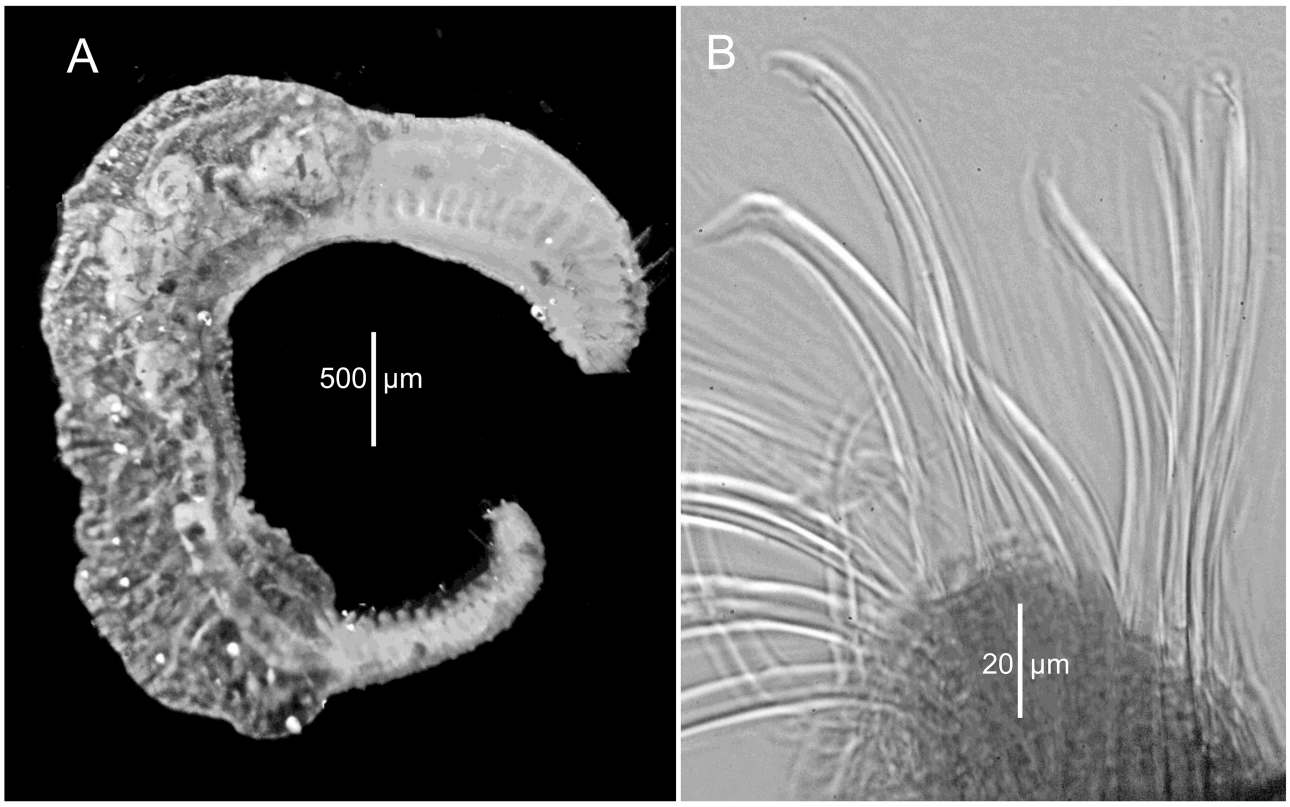

FIGURE 11. *Asclerocheilus franciscanus* **sp. nov.** Holotype (CASIZ 245236): A, entire worm in right lateral view; B, Acicular spines, setiger 1.

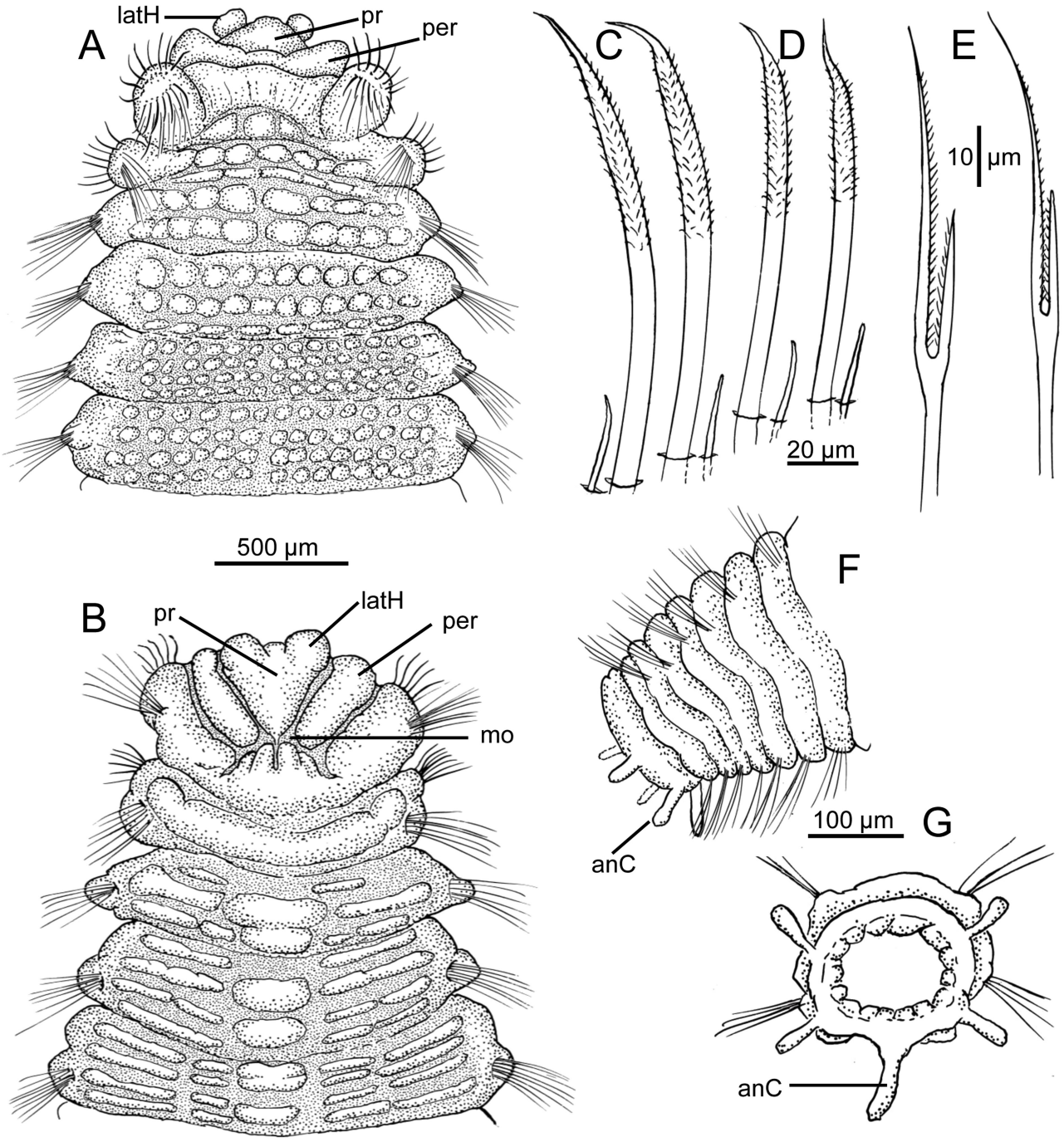

FIGURE 12. *Asclerocheilus franciscanus* **sp. nov.** A, anterior end, dorsal view; B, anterior end, ventral view; C, notopodial acicular spines and short spinous setae, setiger 1; D, notopodial acicular spines and short spinous setae, setiger 2; E, furcate setae, posterior parapodium; F, posterior end, ventrolateral view; G, pygidium in terminal view, venter at bottom. A–E, paratype, Sta. 27 (LACM-AHF Poly 14827); F–G, holotype (CASIZ 245236).

(Figs. 11B, 12C–D), sometimes curved; setiger 1 with three setal rows, with 8–9 spines in first row and about 6–7 spines in second row, these thinner, more sharply pointed than those of first row (Fig. 12C), third row with16–20 capillaries; setiger 2 with 6–8 spines in first row (Fig. 12D), second row with capillaries. Short thin spinous setae present anterior to acicular spines in row 1 of both setigers 1–2 (Fig. 12C–D); these numbering about 8–12 in those locations. Notosetae of setiger 3 and all neurosetae arranged in two rows, with setae of first row shorter and thinner than setae of second row. Furcate setae from setiger 3 located anterior to capillaries along entire body; furcate setae few at first, increasing to 7–10 per fascicle; each furcate seta with unequal tynes bearing distinct bristles on inner margins (Fig. 12E).

Pygidium bulbous, relatively smooth, with four lateral and one medial anal cirrus (Figs. 12F-G, 11A).

Remarks. Among species of *Asclerocheilus* having acicular spines in the notopodia of setigers 1–2 and absent in neuropodia, *A. franciscanus* **sp. nov.** from deep-water

off northern California belongs to a group of species that have historically been identified as *A. beringianus* from the Bering Sea because the prostomium is directed toward the venter and best observed in ventral or anterior view. With several species now known with this characteristic, *A. franciscanus* **sp. nov.** is most similar to *A. beringianus* from the Bering Sea in 938 m and *A. magellaniensis* **sp. nov.** from Chile in 249–392 m.

Of these species, *A. magellaniensis* **sp. nov.** has six anal cirri and distinct lobes on the anterior and posterior lips of the mouth; *A. franciscanus* **sp. nov.** has five anal cirri and distinct lobes only on the posterior lip of the mouth, whereas *A. beringianus* has five anal cirri but no information is available on the oral morphology. Ushakov (1955, 1965) illustrated the acicular spines of *A. beringianus* with a smooth shaft tapering to a sharply hooked tip, in contrast both *A. franciscanus* **sp. nov.** and *A. magellaniensis* **sp. nov.** have a single type of spine that is hirsute and tapers to a fine point that is not hooked.

Etymology. The epithet *franciscanus* is based on the specimens being collected from sites offshore of San Francisco Bay.

Distribution. Eastern North Pacific Ocean, offshore San Francisco Bay near Pioneer Canyon, and west of Farallon Islands, continental slope depths, 1020–2750 m.

Asclerocheilus glabrus (Ehlers, 1887)

Figures 13–14

Eumenia glabra Ehlers, 1887: 169–172, pl. 45, figs. 1–4.
Oncoscolex heterochaetus Augener, 1906: 159–161, pl. 6, figs. 110–112. **Fide** Hartman 1938: 14.
Kebuita glabra: Hartman, 1938: 14–15; Pocklington & Fournier 1987: 110–112, fig. 3A–C.
Asclerocheilus glabrus: Blake 2000: 135.

Material examined. **Western North Atlantic Ocean, Straits of Florida**, U.S. Coast Survey, Steamer *Blake*, coll. Alexander Agassiz, 1877–1878, **off Havana, Cuba,** approx. 23.167°N, 82.392°W, 320 m (175 fathoms), **holotype** of *Eumenia glabra* Ehlers (MCZ IZ ANNa-695).

Description. A moderately sized species, thickened throughout with a sausage or maggot-shaped body (Fig. 13A–C); holotype complete, with ca. 50 setigers, 2.8 cm long and 0.8 cm wide across mid body; another specimen, reported by Augener (1906), with 40–50 setigers, 3.3 cm long and 0.6 cm wide across mid body. Body narrowest over first 4–5 setigers, then enlarged over most of body, posterior end narrow, possibly regenerating. Setigers 1–3 generally smooth, becoming triannulate from setiger 4; and continuing over most of body, however, segments in

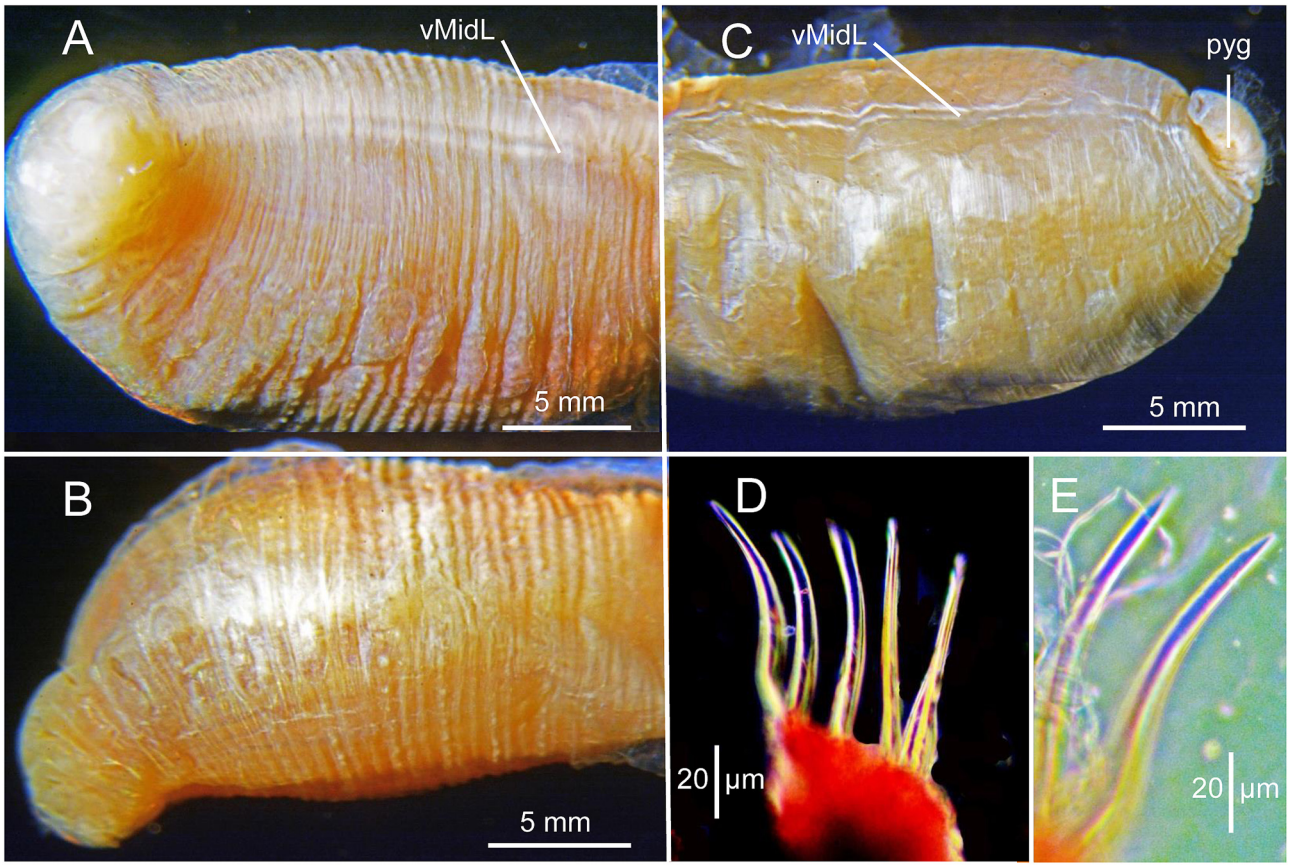

FIGURE 13. *Asclerocheilus glabrus* (Ehlers, 1887). Holotype (MCZ IZ ANNa-695): A, anterior end, ventral view; B, anterior end, left lateral view; C, posterior end, ventrolateral view; D, acicular spines, setiger 1; E, acicular spines, setiger 3. All stained with Shirlastain A.

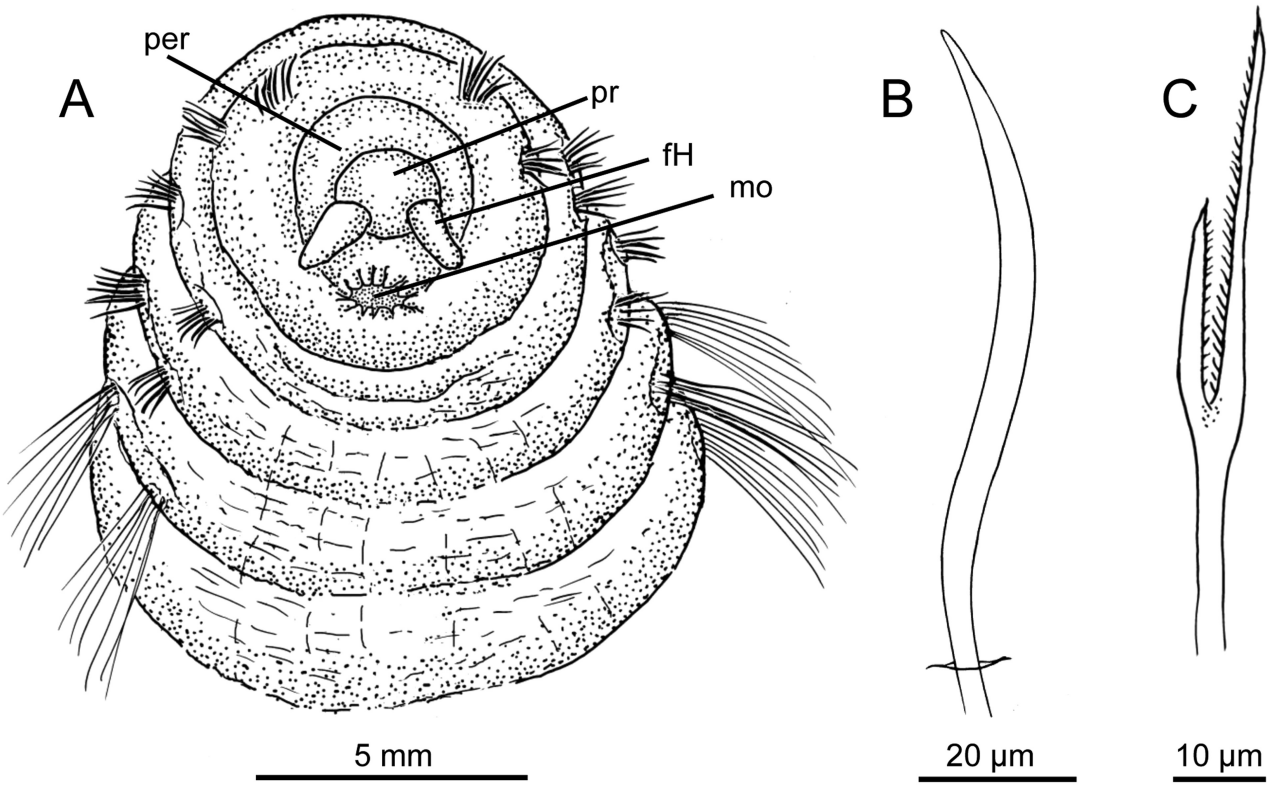

FIGURE 14. *Asclerocheilus glabrus* (Ehlers, 1887). Holotype (MCZ IZ ANNa-695): A, anterior end, frontal view; B, acicular spine, set 1; C, furcate seta, posterior setiger. A, redrawn from Ehlers 1887; B–C, originals.

second half of body stretched, annular rings not evident. Parapodia reduced to low mounds along body. Body with dorsum rounded in cross section (Fig. 14A) with venter flattened, bearing a narrow mid-ventral ridge along body (Fig. 13A–B). Specimen generally in good shape except for some sloughing of outer epidermal tissue, mainly in posterior half of body. Color in alcohol grey.

Prostomium small, oval, reduced; only observed in frontal view, slightly recessed into peristomial ring and setiger 1; with a pair of narrow frontal horns (Fig. 14A); eyespots absent; nuchal organs not observed. Peristomium a single narrow smooth ring surrounding prostomium (Fig. 14A); slightly enlarged ventrally, merged with setiger 1, surrounding mouth; oral opening surrounded by a ring of small lobes (Fig. 14A). Proboscis not everted.

Setae include acicular spines, capillaries, and furcate setae. Setigers 1–3 each with a single row of large brass-colored acicular spines in both noto- and neuropodia, not accompanied by either capillaries or short spinous setae (Figs. 13D, 14A–B). Setigers 1–3 with six acicular spines in both noto- and neuropodia of setiger 1; 10–11 spines in notopodia of setigers 2–3 and 6–7 spines in neuropodia of setigers 2–3; spines long narrow tapering to pointed tip, some with recurved shafts (Figs. 13D–E, 14B). Setae from setiger 4 through middle segments with 9–10 simple capillaries in both noto- and neuropodia; posterior setigers with 7–9 capillaries in noto- and neuropodia. Capillaries smooth, lacking external fibrils. Furcate setae not observed in anterior setigers, 3–4 present in posterior noto- and neuropodia, anterior to longer capillaries. Furcate setae with unequal tynes, shortest about one-half length of longer one, both denticles on inner margin (Fig. 14C).

Posterior end narrow, tubular with about eight setigers terminating in narrow pygidium with terminal anus surrounded by numerous narrow lobes (Fig. 13C); anal cirri absent.

Remarks. *Asclerocheilus glabrus* was described by Ehlers (1887) from 175 fathoms (320 m) off Havana, Cuba (as *Eumenia glabra*). *Oncoscolex* (*Eumenia*) *heterochaetus* was described by Augener (1906) from off St. Vincent in the Caribbean Sea in 424 (775 m) and 785 fathoms (1435 m). Both have been considered to be the same species, both by Augener himself and Hartman (1938) who was the first to re-examine Ehlers' holotype. Ehlers (1887) was vague regarding the nature of the acicular spines on setigers 1–3, whereas Augener (1906) correctly reported their arrangement and morphology. The nature of the acicular spines and an overall revised diagnosis was presented by Hartman (1938) who referred the species to the genus *Kebuita*. Pocklington & Fournier (1987) also examined Ehlers' holotype (as *Kebuita glabra*) and confirmed Hartman's observations. Blake (2000) synonymized the genus *Kebuita* with *Asclerocheilus* at the same time referred *K. glabra* to *Asclerocheilus*. The present re-examination of Ehlers' holotype is therefore the third and provides a few additional details to permit comparison with other species of *Asclerocheilus* having acicular spines on three anterior setigers (Table 1).

Among species of *Asclerocheilus* having acicular

spines on setigers 1–3, *Asclerocheilus glabrus*, from slope depths in the Caribbean Sea, *A. aurospinosus* **sp. nov.** from slope depths off East Africa, and *A. shanei* Hartmann-Schröder, 1994 from 135 m off Tasmania are the only ones to have those spines not accompanied by capillaries or short spinous setae. In addition, these species either lack furcate setae (*A. aurospinosus* **sp. nov.**) or they occur only in posterior setigers (*A. glabrus* and *A. shanei*). *Asclerocheilus glabrus*, however, is readily distinguished from its congeners by its sausage or maggot-shaped body and a reduced, oval prostomium that can be seen only in frontal view, being slightly recessed into the peristomial ring and setiger 1.

Distribution. Western North Atlantic Ocean, Straits of Florida, 320 m; Caribbean Sea off St. Vincent, 424–1435 m.

Asclerocheilus jonesi new species

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Figure 15

Material examined. **Gulf of Mexico, off Louisiana. Matterhorn Platform Survey,** R/V *Brooks McCall*, coll. J. A. Blake, Chief Scientist. **Sta. M-5E**, 09 Nov 2008, BC, 28.742°N, 88.805°W, 921 m, **holotype** (MCZ IZ 171905).

Description. A moderately sized species, holotype only specimen, mostly complete, with 28 setigers, 17.9 mm long and 1.5 mm across setiger 5. Body elongate, arenicoliform, widest across setigers 5–7. Dorsum without distinct annulated rings on setigers 1 (Fig. 15A); setiger 2 a narrow posterior ring and might be intersegmental; setiger 3 with two distinct rings, each with eight raised blocks; setiger 4 with three annular rings consisting of 8–10 prominent raised blocks (Fig. 15A), these include an anterior row that is partially intersegmental with the previous setiger; from setiger 5 each segment with four annular rings consisting of transverse rows of 12 or more smaller raised blocks. Venter similar with setiger 1 lacking annular rings, setiger 2 with large raised medial block and a narrow partial ring that might be intersegmental; setiger 3 with two rings, and setiger 4 with three rings (Fig. 15B), all setigers quadriannulate rows from setiger 5. From setiger 4 a medial longitudinal row of raised blocks begins, extending to posterior end of body (Fig. 15B); these mid-ventral to each of the quadriannulate transverse rows. Color in alcohol light tan.

Prostomium short, V-shaped, divided dorsally into two parts by transverse notch; anterior part deeply incised medially into two wing-like lobes, each bearing a short, oval papillae instead of distinct horns (Fig. 15A); posterior part a dorsal crest bordered by peristomium (Fig. 15A); eyespots absent; nuchal organs not observed. Peristomium a single narrow ring surrounding prostomium dorsally, generally smooth with a few rounded mid-dorsal lobes (Fig. 15A); ventrally extending as a pair of lobes lateral to mouth (Fig. 15B). Mouth or oral opening without distinct anterior lip, instead posterior margin of prostomium and lateral peristomial ring form a type of vestibule leading to mouth (Fig. 15B); posterior lip an enlarged multilobed swelling extending onto setiger 1 (Fig. 15B). Posterior lip presumably expands upon eversion of pharynx; not everted on holotype.

Setae include acicular spines, capillaries, furcate setae from setiger 3 and short spinous setae anterior to acicular spines in setigers 1–2. Notopodia of setigers 1–3 and neuropodia of setigers 1–2 with acicular spines. Notopodia of setiger 1 with 10–11 heavy spines in 1st row, 4–5 spines and 5–6 capillaries in 2nd second row, all capillaries in 3rd row; setiger 2 with 8–9 spines in 1st row and capillaries in 2nd row; setiger 3 with 4–5 spines in anterior row, 30+ capillaries in 2nd row and 2–3 furcate setae anterior to spines. Neuropodia of setiger 1 with 7–8 acicular spines in 1st row and capillaries in 2nd row; setiger 2 with 3–4 spines and 12–15 capillaries in tight fascicle; setiger 3 with furcate setae and capillaries. Notopodia and neuropodia from setiger 4 with short furcate setae and long capillaries, continuing to posterior end. Notopodial acicular spines of setiger 1 large, heavy, recurved tapering to rounded or pointed tip (Fig. 15C); spines of setiger 2 not as heavy, straight, tapering to aristate tip (Fig. 15D); spines of setiger 3 thin, tapering to aristate tip (Fig. 15E). Neuropodial spines of setigers 1–2 narrow, aristate, similar to those of notopodia of setiger 3. Minute short pointed spinous setae on noto- and neuropodia of setigers 1–2 barely visible on medial margin of first row of acicular spines. Furcate setae from setiger 3 with long subequal tapering tynes with each tyne bearing short denticles on inner edge directed toward opposite tyne (Fig. 15F).

Pygidium and details of anal cirri unknown.

Remarks. Among the five species of *Asclerocheilus* having acicular spines in the notopodia of setigers 1–3 and also in the neuropodia, *A. jonesi* **sp. nov.** is the only one to have the neuropodial spines limited to setigers 1–2. *Asclerocheilus jonesi* **sp. nov.** is also unusual in having a prostomium with a bifid anterior margin bearing short rounded lobes on the lateral margins instead of distinct frontal or lateral horns.

Etymology. This species is named for Mr. Howard Jones, Marine Taxonomic Services, Corvallis Oregon, USA. Mr. Jones was part of our sampling team for various deep-water surveys including the Matterhorn Platform survey on which the present species was collected. Mr. Jones is also an authority on polychaetes and a long-time friend and colleague.

Distribution. Northern Gulf of Mexico, off Louisiana, 921 m.

Asclerocheilus magellaniensis new species

urn:lsid:zoobank.org:act:88E41992-94F8-4982-8F41-2DB857FC318D
Figure 16

Neolipobranchius sp.: Maurer & Williams 1988: 692 (in part).

Material examined. **Chile, Strait of Magellan,** Tiera del Fuego, E of Fuerte Bulnes, R/V *VEMA*, **Sta. V-17-**

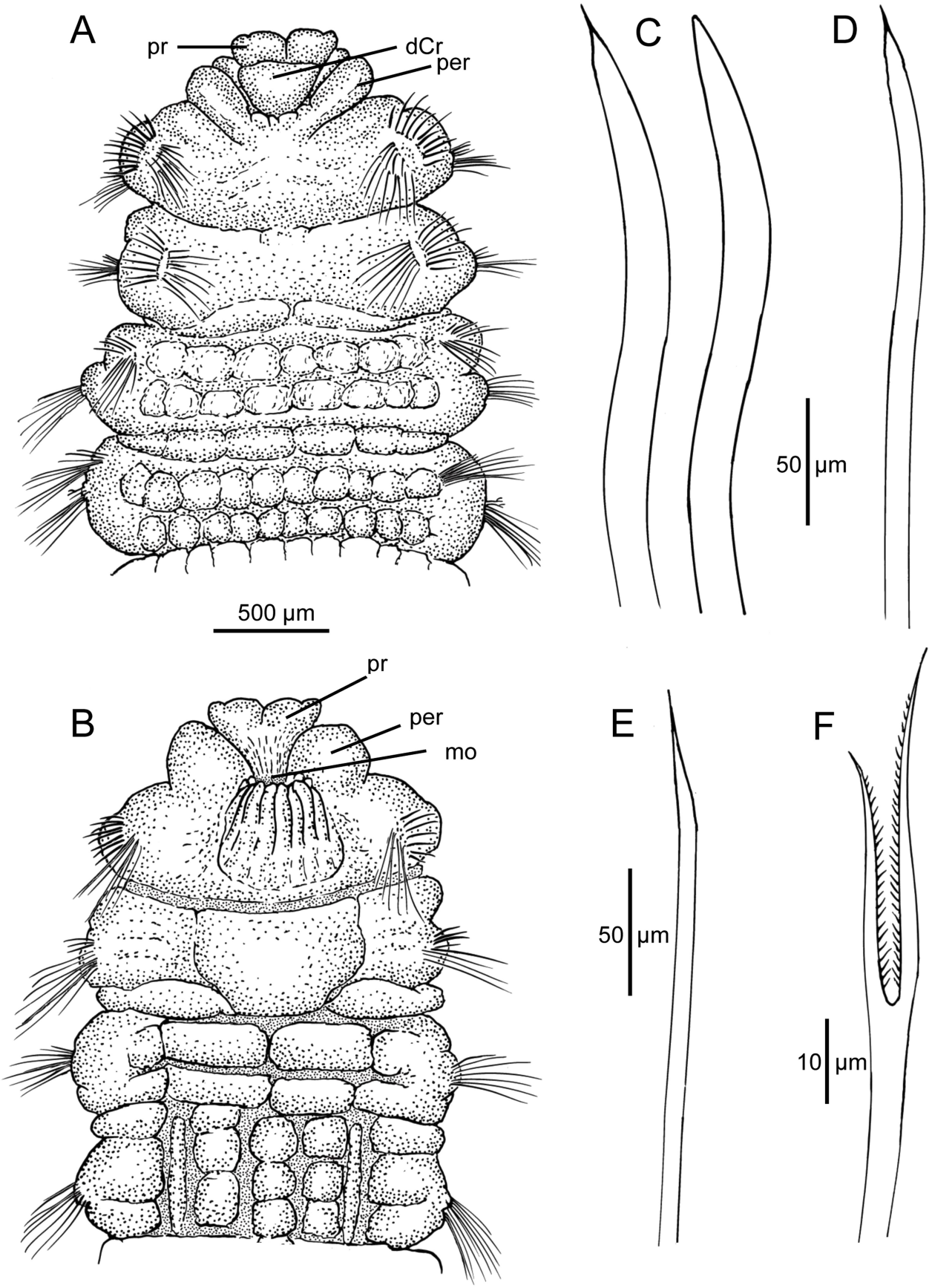

FIGURE 15. *Asclerocheilus jonesi* **sp. nov.** Holotype (MCZ IZ 171905): A, anterior end, dorsal view; B, anterior end, ventral view; C, two notopodial acicular spines, from anterior row, setiger 1; D, notopodial acicular spine, setiger 2; E, notopodial acicular spine, setiger 3; F, furcate seta from posterior neuropodium.

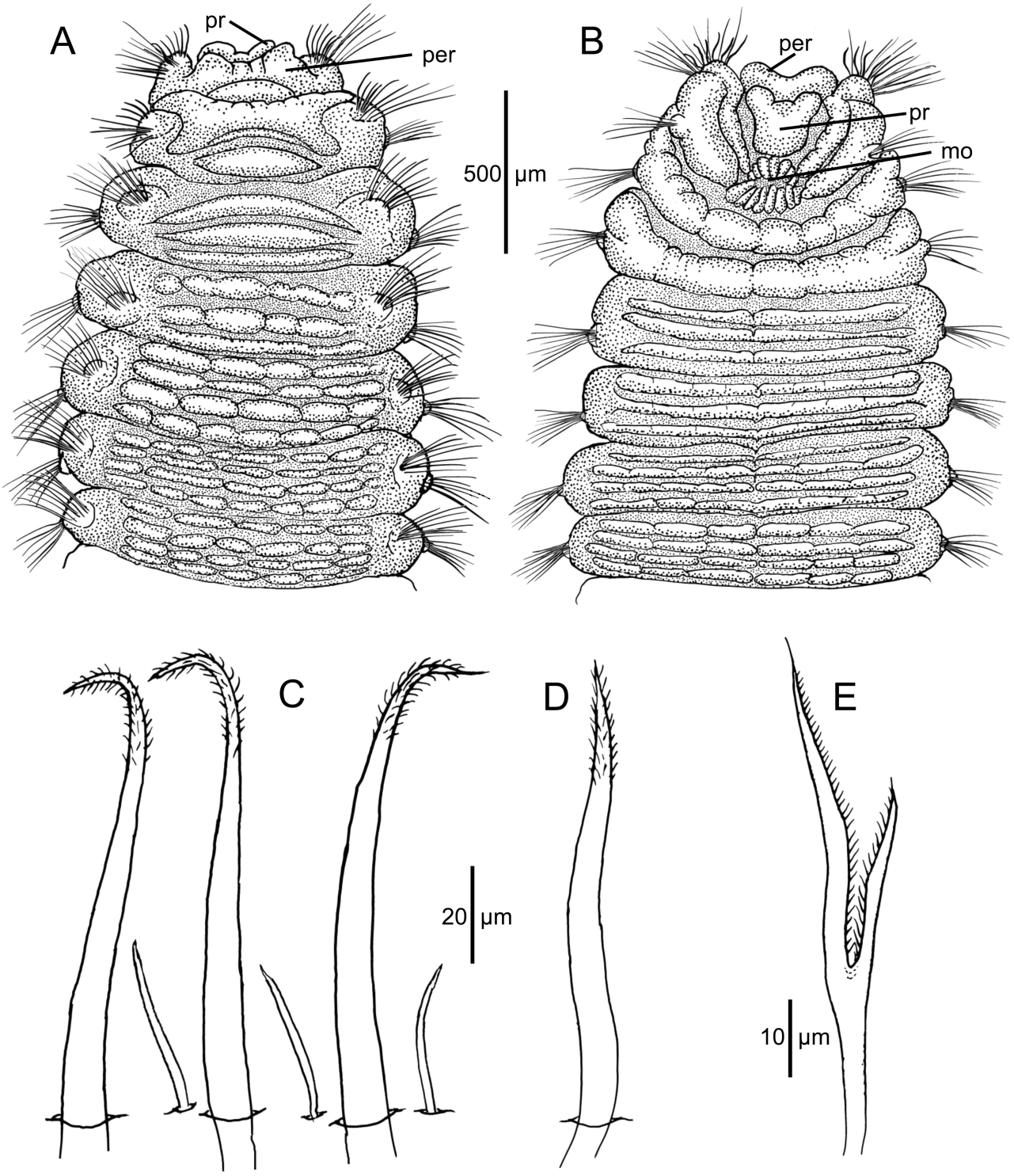

FIGURE 16. *Asclerocheilus magellaniensis* **sp. nov.** Holotype (LACM-AHF Poly 13586): A, anterior end, dorsal view; B, anterior end, ventral view; C, three acicular spines and short spinous setae from notopodia setiger 1; D, acicular spine from setiger 2; E, furcate seta from posterior notopodium.

022, coll. Lamont-Doherty Geological Observatory, 29 Mar 1961, Menzies trawl, 53.633°S, 70.842°W, 249–392 m, **holotype** (LACM-AHF Poly 13586), 2 **paratypes** (LACM-AHF Poly 14830).

Description. Body elongate, arenicoliform, only moderately expanded in anterior half, narrowing posteriorly. Holotype complete, but with damage, with 52 setigers, 13.5 mm long, 1.2 mm wide at about setiger 10, narrowing to 0.7 mm wide in posteriorly. Paratype smaller, also complete, but with damage to posterior end, with 37 setigers, 6.9 mm long, 1.1 mm wide anteriorly, with 37 setigers; paratype larger, incomplete, 12 mm long, 1.0 mm wide, 0.6 mm wide posteriorly. In cross section dorsal surface rounded, ventral surface flattened with

deep ventral groove along middle and posterior setigers. Color in alcohol light tan, without pigment.

Pre-setiger region shifted ventrally with prostomium depressed into peristomium, best observed in anterior and ventral view, obscured by peristomium in dorsal view (Fig. 16A–B). Prostomium reduced, cup-shaped, as wide as long, anterior margin bearing two short lateral lobes directed anteriorly at about 30 degrees (Fig. 16A–B); eyespots absent; nuchal organs not observed. Peristomium a single, narrow achaetous ring, entire dorsally (Fig. 16A), ventrally forming upper and lower lips of mouth; upper lip with 6–7 narrow lobes; lower lip with 8–9 narrow lobes, bordered laterally by setiger 1 (Fig. 16B). Proboscis not observed.

Setiger 1 shifted ventrally with prostomium and peristomium, but visible dorsally (Fig. 16A–B); dorsally, setiger 2 biannulate, setigers 3–4 triannulate, setiger 5 and following quadriannulate (Fig. 16A). Ventrally, setigers 2–3 uniannulate, setigers 4–5 triannulate, setigers quadriannulate from setiger 6 (Fig. 16B). Annuli along most of body narrow, divided dorsally and ventrally into narrow blocked pads providing complex areolated appearance to body surface. Ventral midline from setiger 3, with narrow mid-ventral groove evident from setigers 3–4; this groove deepening in middle body, forming prominent longitudinal groove to end of body; mid-ventral ridge absent. Parapodia swollen, with conspicuous setal tori throughout; parapodial cirri and lamellae entirely absent. Interramal sense organs small, inconspicuous, from setiger 2 as rounded knobs, situated close to notopodia.

Setae include short spinous setae, acicular spines, furcate setae, and capillaries. Acicular spines present in notopodia of setigers 1–2, absent in neuropodia; acicular spines curved, hirsute, tapering to fine aristate-like tip (Fig. 16C–D), some curved; setiger 1 with spines in first two setal rows with eight spines in first row and seven spines in second; third rows with about 20 capillaries; setiger 2 with 6–7 spines in first row, second row with capillaries. Short thin spinous setae present anterior to acicular spines in row 1 of both setigers 1–2 (Fig. 16C); these numbering about 7–8 in those locations, each narrow, pointed. Notosetae of setiger 3 and all neurosetae arranged in 2 rows, with setae of first row shorter and thinner than setae of second row. Furcate setae from setiger 3 located anterior to capillaries along entire body; each furcate seta with distinctly unequal tynes each bearing distinct bristles on inner margins (Fig. 16E); tyne ratio 1.9.

Pygidium present on holotype as a ring of about 12 short lobes surrounding anal opening; three lateral lobes on holotype bearing short tapering anal cirri; however, their lateral position and presence of scars or stubs of missing cirri suggest that six anal cirri should be the final number when complete.

Remarks. *Asclerocheilus magellaniensis* **sp. nov.** belongs to a group of 13 species that have acicular spines limited to setigers 1–2 and a subgroup of 11 that have these spines limited to the notopodia (Table 1). Of these, four species including *A. beringianus* from the Bering Sea in 986 m, *A. magellaniensis* **sp. nov.** from the Straits of Magellan in 249–392 m, *A. brigitteae* **sp. nov.** from the Southern Ocean around Antarctica in 1035–2115 m, and *A. franciscanus* **sp. nov.** from 1020–2750 m off northern California have the pre-setiger region shifted ventrally so that the prostomium is best observed in an anterior or frontal view. This configuration of the pre-setiger region was first described for *A. beringianus* by Ushakov (1955/1965). Of these species, *A. magellaniensis* **sp. nov.** has six anal cirri, and distinct lobes on the anterior and posterior lips of the mouth, *A. franciscanus* **sp. nov.** has five anal cirri and distinct lobes only on the posterior lip of the mouth; *A. beringianus* has five anal cirri and no information available on the oral morphology, and *A. brigitteae* **sp. nov.** has four anal cirri.

These specimens were among numerous samples identified as *Neolipobranchius* sp. by Maurer & Williams (1988) and presumed to be scalibregmatids. The collections were deposited in the LACM and reviewed as part of this study. The majority of specimens identified as *Neolipobranchius* sp. actually included several branchiate and abranchiate species of *Travisia*. The present specimens of *A. magellaniensis* **sp. nov.** were the only ones to actually be scalibregmatids. Blake (2015) examined the holotype of *Neolipobranchius glabrus* Hartman & Fauchald (1971) from the North Atlantic Ocean and determined it to be a juvenile and likely not a scalibregmatid because all of the typical scalibregmatid characters were absent. Blake (2020) later suggested the specimen was a juvenile of *Travisia* and noted problems in published phylogenetic studies due to erroneous usage of *Neolipobranchius* as a scalibregmatid. See below for further morphological comments on *Neolipobranchius*, which is formally referred to the genus *Travisia*.

Etymology. The species is named after the Strait of Magellan, where it was collected.

Distribution. Chile, Straits of Magellan, 249–392 m.

Asclerocheilus nathanae new species

urn:lsid:zoobank.org:act:4B7C89C0-245C-4E6A-B45C-A41EC18976D3

Figure 17

Material examined. **South China Sea, off Brunei, Island of Borneo**, **Site CA2**, R/V *Emma*, coll. P.A. Neubert, Chief Scientist, BC, **Sta. SE2**, 29 Jun 2011, 5.523°N, 113.705°E, 1947 m, **holotype** (MCZ IZ 171906); **Sta. TA1**, 01 Jul 2011, 5.37°N, 113.402°E, 1866 m, 1 **paratype** (MCZ IZ 171907).

Description. A small species, holotype complete, but pygidium somewhat damaged; grub-like, with 20 setigers, 3.2 mm long, 1.1 mm wide across middle of body, narrowing to tubular pygidium; paratype incomplete, with 20 setigers, 3.5 mm long. Body with dorsum rounded, venter weakly rounded, with shallow mid-ventral groove along body from setiger 1 (Fig. 17B). Holotype annulated with transverse rows of raised plates from setiger 2. Setiger 1with mid-dorsal area with a few raised plates, setiger 2 with two transverse rows of plates, then all segments with four rows of plates (Fig. 17A); venter with

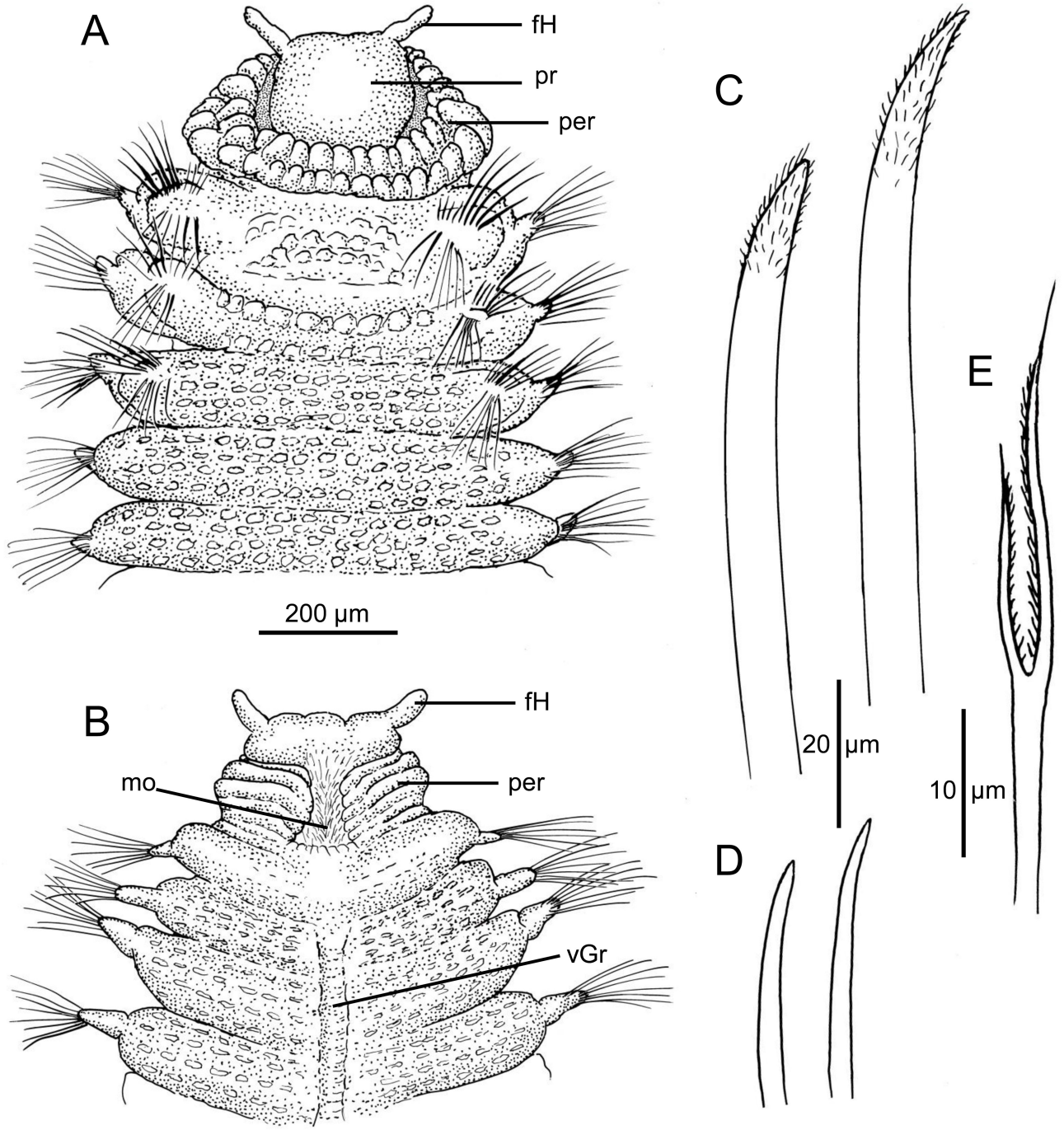

FIGURE 17. *Asclerocheilus nathanae* **sp. nov.** Holotype (MCZ IZ 171906): A, anterior end, dorsal view; B, anterior end, ventral view; C, acicular spines from setiger 1; D, short spinous setae anterior to acicular spines of setiger 1; E, furcate seta from posterior setiger.

setiger 1 smooth, becoming quadriannulate from setiger 2 (Fig. 17B). Notopodia of setigers 1–3 larger, rounded lobes from which acicular spines and capillaries emerge in two rows; from setiger 4 parapodia elongate lobes, somewhat pointed apically with setae emerging from tips (Fig. 17A–B); parapodial cirri entirely absent. Color in alcohol light tan.

Pre-setiger region relatively short, about as long as first 1½ setigers (Fig. 17A). Prostomium 4-sided, about as long as wide; anterior margin broad, bearing two narrow lateral horns projecting at about 45-degree angle (Fig. 17A–B). Peristomium dorsally with two multilobed rings surrounding lateral sides (Fig. 17A); peristomium ventrally with 5–6 transverse lobes meeting mid-ventrally forming lateral lips of mouth (Fig. 17B); mouth a groove or vestibule extending posteriorly from prostomium between lateral lips, bordered posteriorly by a row of small lobes near anterior border of setiger 1 (Fig. 17B); proboscis not everted. Eyespots absent; nuchal organs not observed.

Acicular spines in notopodia of setigers 1–3, not present in neuropodia. Notopodia of setiger 1 with 4–5 short spinous setae (Fig. 17D) and 5–6 heavy spines in first row (Fig. 17C) and 2–3 spines and 5–6 capillaries in second row; setiger 2 with 3–4 short spinous setae and 3–4 heavy spines in first row and capillaries in second row; setiger 3 with 3–4 short spinous setae, 1–2 heavy spines, and 3–4 capillaries in first row and capillaries in second row. Notopodia from setiger 4 with short furcate setae and long capillaries. Acicular spines heavy, curved tapering to narrow rounded tip, hirsute with numerous fibrils projecting over curved tip (Fig. 17C). Short spinous setae curved, tapering to pointed tip (Fig. 17D). Neuropodia of setiger 1 and following segments with spreading fascicle of numerous capillaries; furcate setae from setiger 4. Furcate seta with a long tapering tyne and a shorter second tyne; each tyne with short denticles on inner edge directed toward opposite tyne (Fig. 17E).

Pygidium narrow, tubular, somewhat damaged, anal cirri not present.

Remarks. Among species of *Asclerocheilus* with acicular spines in setigers 1–3, only *A. nathanae* **sp. nov.** has the acicular spines limited to the notopodia.

Etymology. This species is named for Ms. Desiree Nathan, Kuala Lumpur, Malaysia, who was overall Project Manager for the Petronas Carigali Brunei Ltd., and Total E&P Deep Offshore Borneo B.V. environmental surveys conducted offshore Brunei by AECOM and the author and colleagues in 2011.

Distribution. South China Sea, off Brunei, Island of Borneo, 1866–1947 m.

Asclerocheilus neubertae new species

urn:lsid:zoobank.org:act:E6229E4C-9649-40F6-AEAD-D4276B78AB75

Figure 18

Material examined. **Eastern North Pacific Ocean, Continental slope off northern California,** west of Farallon Islands, SF-DODS Benthic Monitoring Program, R/V *Point Sur,* **Sta. 16**, coll. 15 Oct 2000, coll. J.A. Blake, 37.632°N, 123.448°W, 2670 m, **holotype** (LACM-AHF Poly 14831).

Description. A small species, holotype incomplete, with 20 setigers, 5.8 mm long, and 1.3 mm wide across setiger 5. Body elongate, sausage-shaped, thick through setigers 10–11, then narrowing posteriorly. Dorsum with setigers 1–2 without distinct annulated rings, setiger 3 with one ring on posterior margin, then all following setigers quadriannulate with rings consisting of about 15 raised pads (Fig. 18A); venter with setigers 1–2 without annular rings, setiger 3 with three raised transverse ridges, following setigers quadriannulate with each row interrupted by large raised pads along ventral midline producing raised ridge (Fig. 18B). Color in alcohol light tan.

Pre-setiger region shifted toward venter, with frontal horns best viewed in ventral or frontal view (Fig. 18B). Prostomium pear-shaped, best seen ventrally; anterior margin smooth, bearing a pair of short, rounded lobes arising from lateral margin (Fig. 18B); posteriorly obscured by large rounded dorsal peristomial crest (Fig. 18A); eyespots absent; nuchal organs not observed. Peristomium a single ring interrupted dorsally by large rounded dorsal crest (Fig. 18A); ventrally peristomium and prostomium, forming several lobes surrounding mouth opening, extending on to setiger 1 (Fig. 18B).

Noto- and neuropodia rounded lobes along most of body, each bearing setal fascicles; dorsal and ventral cirri absent. Setae consist of short spinous setae, acicular spines, furcate setae, and long capillaries. Acicular spines present in noto- and neuropodia of setigers 1–4. Notopodia of setigers 1–2 with setae in two rows with six large, curved hooked spines and 8–10 short spinous setae in 1st row and 1–2 thick aristate spines and ca. 12 capillaries in 2nd row; setiger 3 with four narrow blunt-tipped spines and 3–4 furcate setae in 1st row and three spines and 12–15 capillaries in 2nd row; setiger 4 with setae arranged in a single curved fascicle with 4–5 furcate setae, 2–3 narrow acicular spines, and more than 20 capillaries. Neuropodia of setigers 1–2 with setae in two rows; setiger 1 with 2–3 short spinous setae and five long thin recurved acicular spines in 1st row and 10–12 long capillaries in 2nd row; setiger 2 with 3–4 short spinous setae and six recurved acicular spines in 1st row and about 10 capillaries in 2nd row; setigers 3–4 with furcate setae and long capillaries in 1st row, and all capillaries in 2nd row. Short spinous setae thin, with short, pointed tip (Fig. 18C). Acicular spines from first row of notopodia of setigers 1–2 long, curved, tapering to unusual hooked tip (Fig. 18C); acicular spines of second row with straight shaft tapering to distinctly aristate tip (Fig. 18D); acicular spines of notopodia of setiger 3 simple, straight, tapering to narrow tip (Fig. 18E–F). Acicular spines of neuropodia of setigers 1–2 distinctly recurved, tapering to long pointed tip (Fig. 18G). Furcate seta with long subequal tapering tynes, each bearing short denticles on inner edge directed toward opposite tyne (Fig. 18H).

Pygidium and details of anal cirri not observed.

Remarks. *Asclerocheilus neubertae* **sp. nov.**, a rare deep-water species from off northern California, is only the second species of the genus to be reported with acicular spines on setigers 1–4 (see Table 1). The first, *A. heterochaetus* Kudenov & Blake, 1978, is known only from southeast Australia in shallow water; this species has acicular spines on both noto- and neuropodia of setigers 1–4; in contrast, *A. neubertae* **sp. nov.** lacks acicular spines on the neuropodia of setigers 3–4. Short spinous setae reported here for *A. neubertae* **sp. nov.** were not reported for *A. heterochaetus*, but these setae are difficult to observe and their absence needs to be confirmed by a re-examination of the original collection. Other differences between the two species include: eyespots are present, furcate setae occur from middle body segments, and a T-shaped prostomium with long frontal horns in *A. heterochaetus*; in contrast, eyespots are absent, furcate setae are present from setiger 3, and the prostomium is pear-shaped and bears short lateral lobes in *A. neubertae* **sp. nov.**

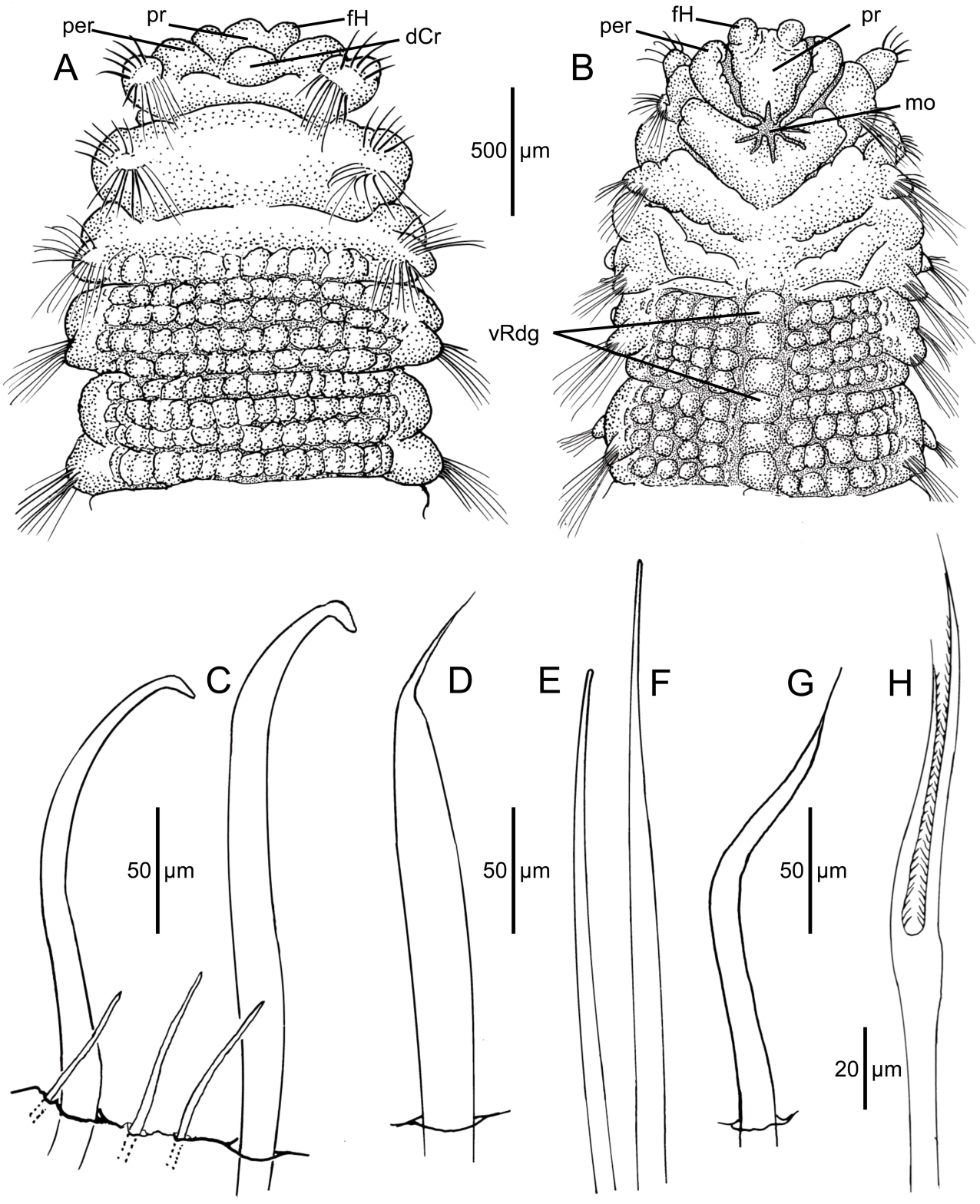

FIGURE 18. *Asclerocheilus neubertae* **sp. nov.** Holotype (LACM-AHF Poly 14831): A, anterior end, dorsal view; B, anterior end, ventral view; C, hooked acicular spines and short spinous setae, notopodium setiger 1, first row; D, aristate acicular spine, notopodium setiger 1, second row; E–F, acicular spines, notopodium setiger 3; G, acicular spine, neuropodium setiger 3; H, furcate seta, neuropodium, posterior setiger.

Etymology. This species is named for my long-time friend and colleague, Dr. Pamela L.A. Neubert. Dr. Neubert was a scientist on many of the SF-DODS surveys and a key member of the project team.

Distribution. Eastern North Pacific Ocean, off northern California, lower continental slope, 2670 m.

Asclerocheilus pseudocollare (Schüller & Hilbig, 2007) new combination

Figure 19

Oligobregma blakei Schüller & Hilbig, 2007: 37–38, fig. 1. **New synonymy**.

Oligobregma pseudocollare Schüller & Hilbig, 2007: 38–40, fig. 2.

Material examined. (21 specimens) **Southern Ocean, Antarctica, ANDEEP I (ANT XIX/3)**, R/V *Polarstern*, Scotia Sea, NW of Elephant Island, **Sta. 46-7**, 30 January 2002, EBS, 60.6390°S, 53.956°W, 2889–2892 m, **holotype** (ZMH-ANN-P24733), 19 **paratypes** (ZMH-ANN-P 24734) of *Oligobregma pseudocollare*, and **holotype** (ZMH-ANN-P24732) of *Oligobregma blakei*.

Description. A small species, most specimens incomplete; holotype of *O. pseudocollare* (ZMH-ANN-P24733) incomplete, 6.5 mm long, 1.3 mm wide with 30 setigers; an incomplete paratype of *O. pseudocollare* (ZMH-ANN-P 24734) with 21 setigers, 5.8 mm long, 1.2 mm wide across setiger 8, and 0.7 mm wide across posterior setigers; holotype (ZMH-ANN-P24732) of *Oligobregma blakei* a juvenile, but complete, 3 mm long, 0.5 mm wide for 19 setigers. Color in alcohol opaque white.

Body only weakly expanded in anterior setigers, narrowing posteriorly with some far posterior setigers appearing moniliform. Body with first three setigers not annulated; setiger 4 weakly triannulate when dorsal and ventral interramal rings included, setigers 5–6 triannulate dorsally (Fig. 19A) and quadriannulate ventrally (Fig. 19B), subsequent segments quadriannulate along most of body. From setiger 4, a large mid-ventral raised plate present (Fig. 19B), continuing as a ventral ridge along venter.

Pre-setiger region short; prostomium V-shaped (Fig. 19A) with narrow, curved frontal margin with two short oval-shaped lateral lobes or horns (Fig. 19A–B); eyespots absent; nuchal organs not apparent. Peristomium a single ring between prostomium and setiger 1 with weakly developed lobes mid-dorsally and mid-ventrally (Fig. 19A–B), ventrally forming anterior lip of mouth; posterior lip of mouth a raised mound on setiger 1 composed of about seven narrow lobes (Fig. 19B); oral opening a simple groove between setiger 1 and peristomium (Fig. 19B); proboscis a simple oval lobe when everted.

Individual setigers with widely separated noto- and neuropodia along most of body (Fig. 19C); each with low, weakly developed podial lobes from which setae emerge, these becoming more elongate posteriorly with rounded interramal mound; dorsal and ventral cirri entirely absent; interramal papilla not well defined or entirely absent.

Notopodia of setigers 1–2 with short, thin spinous setae (Fig. 19E), large acicular spines (Figs. 19D) and capillaries; neuropodia of setiger 1 with capillaries, but with a single smooth acicular spine present on two paratypes (Fig. 19F), other specimens with no acicular spines visible on neuropodia. All noto- and neuropodia from setiger 3 with an anterior bundle of 3–4 furcate setae and a larger fascicle of 15 or more capillaries. One to three short spinous setae visible at 400x anterior to acicular notopodial spines on setigers 1–2, these with straight shafts tapering to pointed tips (Fig. 19E). Notopodial acicular spines of setiger 1 in two rows followed by a row of capillaries; setiger 2 with acicular spines in one row followed by capillaries; acicular spines with recurved shaft tapering to a finely hirsute pointed tip (Fig. 19D); some spines appearing aristate; neuropodia of setiger 1 with a single smooth blunt-tipped spine present or absent (Fig. 19F). Capillaries smooth, external fibrils not observed. Furcate setae with unequal tynes, each bearing denticles directed toward opposite tyne (Fig. 19G).

Pygidium a simple collar, anal cirri not observed.

Remarks. An examination of the holotype of *Oligobregma blakei* Schüller & Hilbig, 2007 and the holotype and 19 paratypes of *O. pseudocollare* Schüller & Hilbig, 2007, all from same sample in the Scotia Sea off Elephant Island (ANDEEP I Cruise PS67, Sta. 46-7), reveals that all specimens belong to the same species. As First Reviser and in agreement with the ICZM Article 24.2, I here designate *O. pseudocollare* as the senior synonym and refer *O. blakei* to synonymy as the junior synonym because the only specimen of *O. blakei* is a juvenile. In addition, all of these specimens lack the dorsal and ventral cirri that characterize *Oligobregma* species and therefore are transferred herein to the genus *Asclerocheilus*.

Asclerocheilus pseudocollare, a deep-water species (2889–2892 m), differs from its Antarctic congener, *A. ashworthi* Blake, 1981, a shallow-water species (223–397 m), in having a prostomium with short rounded lateral lobes instead of two large lateral lobes in a T-shaped arrangement and by having two kinds of anterior acicular spines instead of one. *Asclerocheilus pseudocollare* is also similar to another Antarctic species, *A. brigitteae* **sp. nov.**, in having both short spinous setae and acicular spines on setigers 1–2, but differs in that it has only a single type of pointed hirsute acicular spine in setigers 1–2, whereas *A. brigitteae* **sp. nov.** has both pointed notopodial hirsute spines and a non-hirsute spine with a recurved tip in setiger 1.

Distribution. Southern Ocean, Antarctica, Scotia Sea, 2889–2892 m.

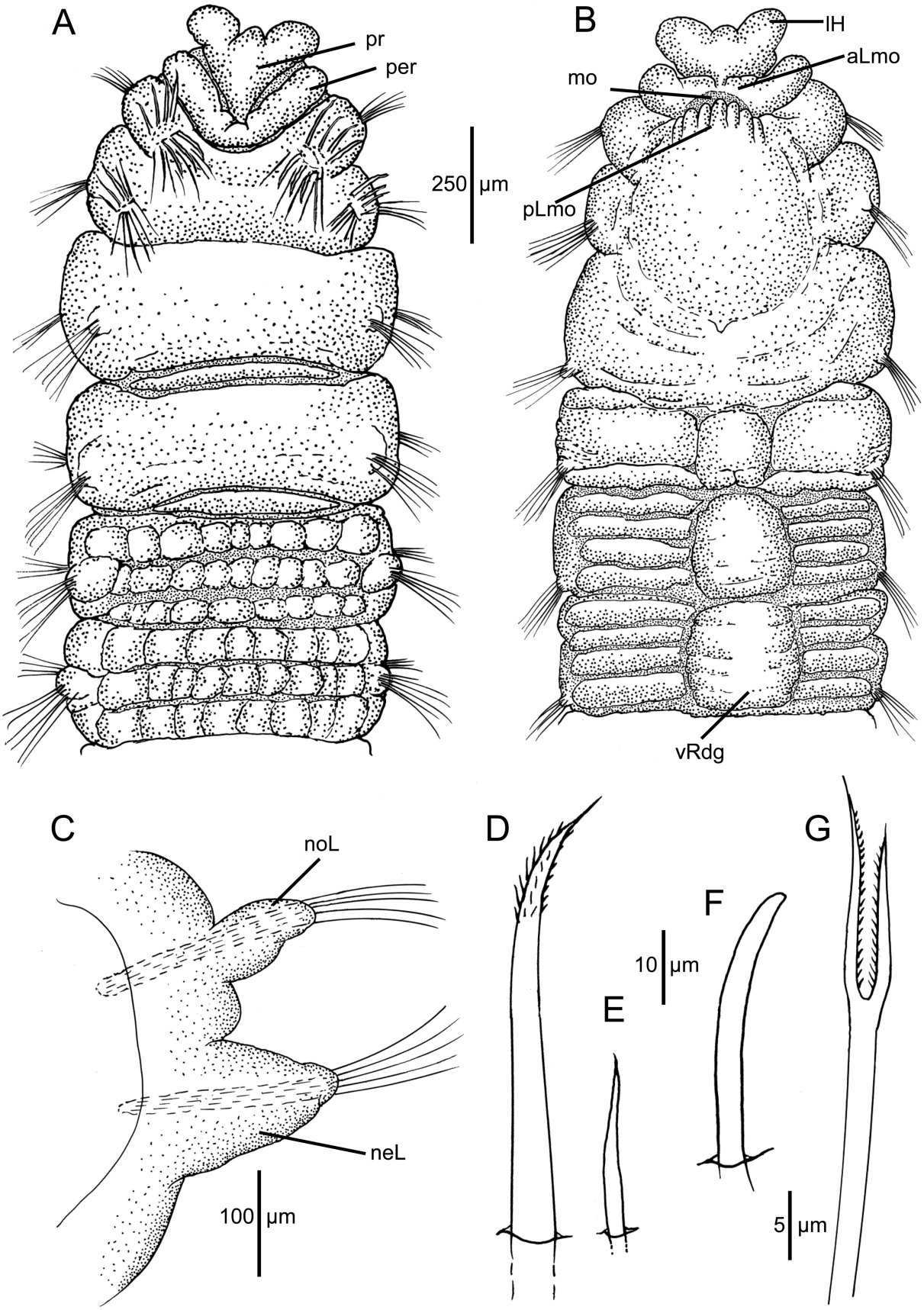

FIGURE 19. *Asclerocheilus pseudocollare* (Schüller & Hilbig, 2007) **n. comb**. Paratype (ZMH, P-24734): A, anterior end, dorsal view; B, anterior end, ventral view; C, posterior parapodium, posterior view; D, notopodial acicular spine, setiger 1; E, short spinous notoseta, setiger 1; F, neuropodial acicular spine, setiger 1; G, furcate seta, posterior neuropodium.

***Asclerocheilus triangularis* new species**
urn:lsid:zoobank.org:act:825B344F-AB85-4551-9952-D5563FD68C27
Figures 20–21

Material examined. **Eastern North Pacific Ocean, Continental slope off northern California, west of Farallon Islands**, SF-DODS Benthic Monitoring Program, R/V *Point Sur*, **Sta. 52**, coll. 15 Sep 2005, J.A. Blake, 37.717°N, 123.4670°W, 2250 m, **holotype** (LACM-AHF Poly 14832); 26 Sep 2003, coll. J.A. Blake, 37.716°N, 123.466°W, 2240 m, **paratype** (LACM-AHF Poly 14833).

Description. A small species, holotype mostly complete, fusiform in shape, narrow anteriorly and posteriorly, expanded in mid-body (Fig. 20A–B); in cross section, dorsum rounded, venter flattened with shallow mid-ventral groove along body from about setiger 4 (Fig. 21B); with 21 setigers, 4.6 mm long, 0.5 mm wide across set 2, 1.35 mm wide in middle. Paratype complete, but smaller, body narrower, not as fusiform, with 27 setigers, 3.1 mm long and 0.6 mm wide across setiger 10. Holotype with setigers 1–2 relatively smooth with a single intersegmental annulation (Fig. 21A), entire ventrally (Fig. 21B); setiger 3 enlarged, with annulations not apparent apart from one or two intersegmental rows (Fig. 21A–

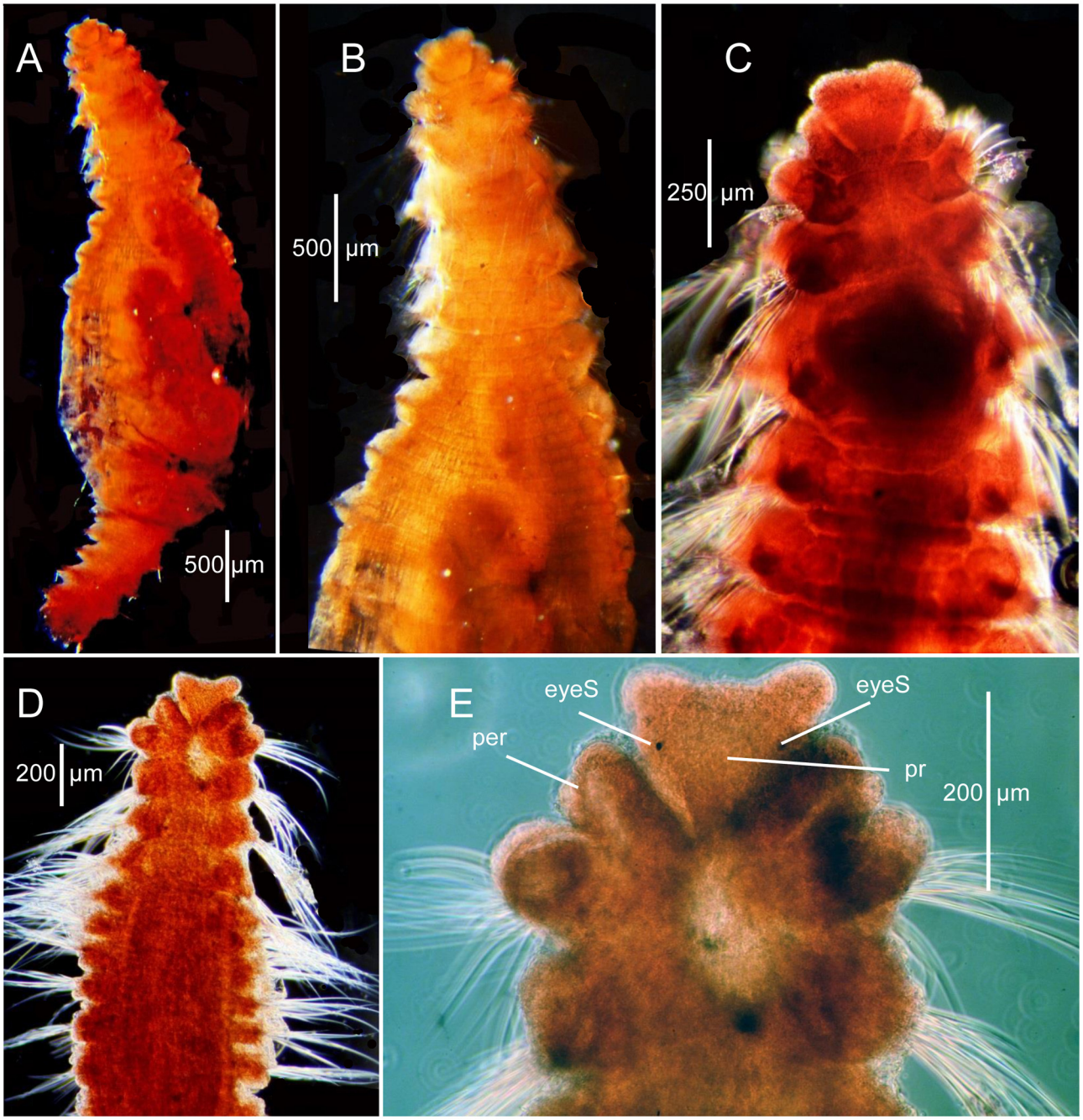

FIGURE 20. *Asclerocheilus triangularis* **sp. nov.** A, entire worm, dorsal view; B, anterior half of worm, dorsal view; C, anterior end, dorsal view; D, anterior half, dorsal view; E, prostomium and setigers 1–2, dorsal view. A–C (holotype (LACM-AHF Poly 14832); D–E Paratype (LACM-AHF Poly 14833). All stained with Shirlastain A.

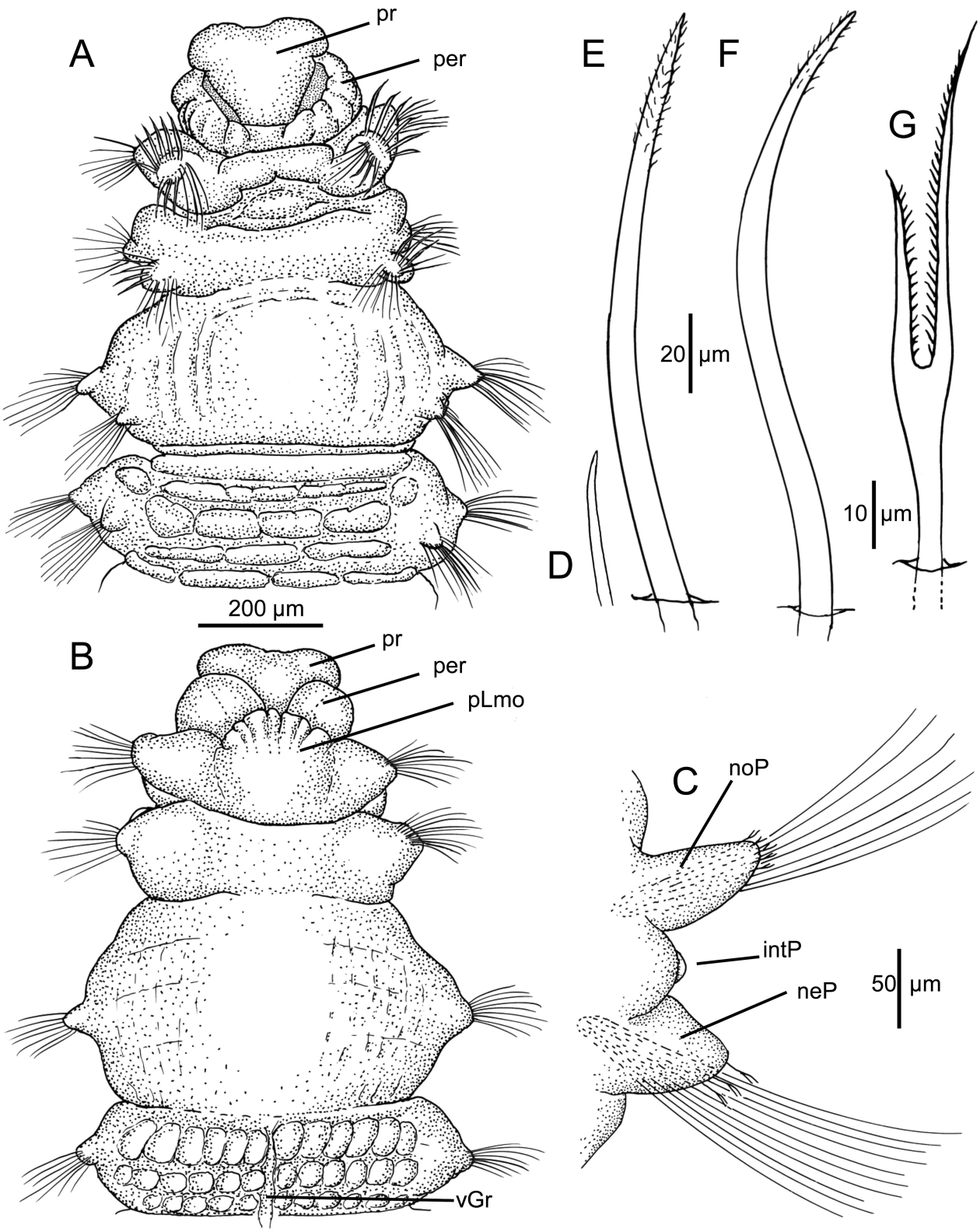

FIGURE 21. *Asclerocheilus triangularis* **sp. nov.** Holotype (LACM-AHF Poly 14832): A, anterior end, dorsal view; B, anterior end, ventral view; C, posterior parapodium, anterior view; D, short spinous seta, anterior to acicular spines, setiger 1; E–F, acicular spines, notopodia setiger 1; G, furcate seta, posterior neuropodium.

B); from setiger 4 and continuing posteriorly, segments triannulate, both dorsally and ventrally (Fig. 21A–B). Parapodia inconspicuous low mounds along most of body, with setae emerging from notch or depression; notopodia of setigers 1–2 enlarged, with emergent acicular spines; far posterior noto- and neuropodia narrow, elongated, somewhat pointed; interramal papilla present (Fig. 21C); parapodial cirri entirely absent. Color in alcohol light tan.

Prostomium triangular or V-shaped (Figs. 20B–E, 21A), anteriorly with a wide thickened ridge with a pair of rounded lateral lobes or short lateral horns (Fig. 21A–B); posteriorly narrow, recessed under peristomium on holotype (Fig. 21A), visible on paratype (Fig. 20D–E); a pair of widely spaced small eyespots present on paratype (Fig. 20E), absent on holotype; nuchal organs not observed. Peristomium a single narrow multi-lobed ring dorsally, overlapping posterior end of prostomium on holotype (Fig. 21A); open mid-dorsally on paratype, with posterior dorsal border of prostomium exposed (Fig. 20D–E); mid-ventrally peristomium contributing to anterior lip of mouth; posterior lip of mouth enlarged on setiger 1, with a curved row of short, rounded lobes (Fig. 21B); proboscis not everted.

Setae include short spinous setae anterior to acicular spines (Fig. 21D), acicular spines (Fig. 21E–F), furcate setae (Fig. 21G) and capillaries. Acicular spines in notopodia of setigers 1–2 only, not present in neuropodia; spines of setiger 1 in two rows with 6–7 spines in first row and 4–5 spines in second row accompanied by 3–4 capillaries; setiger 2 with 3–4 spines in anterior row followed by long capillaries in second row. Individual spines long curved or recurved, tapering to narrow pointed hirsute tip (Fig. 21E–F). Short spinous setae anterior to acicular spines in notopodia of setigers 1–2 and capillaries in neuropodia of setigers 1–2; spinous setae short, thin, with pointed tips (Fig. 21D). Furcate setae from setiger 3 in both noto- and neuropodia, numbering 3–4 per fascicle along entire body; furcate setae anterior to longer capillaries; each furcate seta with long tapering tyne and a shorter second tyne; each tyne with short denticles on inner edge directed toward opposite tyne (Fig. 21F).

Pygidium with four narrow anal cirri.

Remarks. Of the 13 species of *Asclerocheilus* having acicular spines on setigers 1–2, five have been reported in depths of 2000 m or greater: *A. alatus* **sp. nov.**, *A. franciscanus* **sp. nov.** and *A. triangularis* **sp. nov.**, all from the continental slope off northern California, and *A. brigitteae* **sp. nov.** and *A. pseudocollare* from Antarctic seas. These five deep-water species are contrasted as follows according to details in Table 1. *Asclerocheilus alatus* **sp. nov.** has a small, pear-shaped prostomium with two flaring wing-like frontal horns; notopodial acicular spines are all curved spines with pointed tips; the pygidium has about six short lobes but no anal cirri. *Asclerocheilus brigitteae* **sp. nov.** has a short prostomium with a crenulated anterior margin with two large lateral lobes in place of distinct lateral horns; notopodia with two types of acicular spines; the first has a heavy shaft and hirsute tip and second is narrower, smooth, and has a long recurved pointed tip that curves back toward the shaft; four short anal cirri are present. *Asclerocheilus franciscanus* **sp. nov.** has heavy, curved, hirsute spines tapering to filamentous or aristate-like tips; the prostomium is V-shaped with two rounded lateral lobes or horns; the pygidium has five anal cirri, four lateral and one ventral. *Asclerocheilus pseudocollare* has a V-shaped prostomium with a narrow rounded frontal margin and two oval-shaped lateral lobes or horns; hirsute notopodial acicular spines that taper to a fine, aristate-like tip; neuropodia of setiger 1 with or without simple blunt-tipped spines; pygidium with four short anal cirri. *Asclerocheilus triangularis* **sp. nov.** has a V-shaped prostomium with frontal horns reduced to simple lateral lobes; acicular spines are long, pointed, and with hirsute tips; the pygidium has four narrow anal cirri.

Asclerocheilus triangularis **sp. nov.** further differs from *A. franciscanus* **sp. nov.** by having the dorsal and ventral surfaces of setigers 1–3 smooth and lacking annulated rings; whereas in *A. franciscanus* **sp. nov.** setiger 1 has a single ring, visible dorsally, and setigers 2–3 are biannulate and triannulate; ventrally, setigers 2–3 are uniannulate and triannulate. A pair of widely spaced eyespots are present on the smaller paratype of *A. triangularis* **sp. nov.**, but are absent on the larger holotype suggesting they are lost with growth. However, apart from intertidal or shallow subtidal species, eyes or eyespots are rarely found on scalibregmatids from offshore habitats. Therefore, the presence of a pair of small eyespots on the paratype of this deep-water species (>2000 m) is highly unusual. The only other offshore species with eyes encountered in this study is *Axiokebuita oculata* **sp. nov.** from a seamount off Costa Rica at a depth of 243 m (see below).

Etymology. The epithet is from the Latin, *triangularis*, having three angles or triangular in shape in reference to the V-shaped prostomium.

Distribution. A rare species collected only twice from lower continental slope depths off northern California, 2240–2250 m.

Genus *Axiokebuita* Pocklington & Fournier, 1987

Table 2

Type species: *Axiokebuita millsi* Pocklington & Fournier, 1987 by monotypy.

Diagnosis. (Modified from Blake 2020): Body elongate, with segments similar throughout, some species with a fusiform shape; segments with one to four annulated rings composed of small, inconspicuous elevated pads, best developed on middle and posterior segments; or pads entirely absent; venter with weakly developed median ridge. Prostomium triangular to pentagonal, truncate on anterior margin with long subterminal ciliated lateral horns; eyespots present or absent; nuchal organs in narrow grooves on posterior part. Peristomium with two or three rings; first ring large, complete, formed from large expanded lobes, weakly incised dorsally, divided into upper and lower lips of mouth ventrally; unique

paired ciliated ventral "*neck organs*" present posterior to lower lip of mouth; second and third rings narrow, not modified. Parapodia with narrow ventral postsetal cirrus. Branchiae absent. Setae include capillaries throughout; short simple spinous setae present or absent on setiger 1; spinous serrated setae with hooded tips present or absent; furcate setae absent; long, natatory-like capillaries present or absent. Pygidium reduced, with short anal cirri or with two ventral pad-like lobes typically covered with papillae. Numerous cilia and ciliary patterns present on lateral horns, prostomium, and interramal papillae; unique paired ciliated patches present or absent on ventral side of body.

Remarks. The genus *Axiokebuita* and its type species, *A. millsi*, were originally described from upper slope depths off Nova Scotia (Pocklington & Fournier, 1987). In the same article, the authors recognized *Kebuita minuta* Hartman (1967) from Antarctica as a distinct species of *Axiokebuita* and referred it to their new genus while at the same time identifying some of the larger and more robust Antarctic specimens as *A. millsi,* thus implying that their species was bipolar in distribution. These authors noticed that the genus *Scalibregmides* Hartmann-Schröder, 1965 was similar to their *Axiokebuita* but considered that it differed in the shape of the body, being elongate vs. short bodied, and in having furcate setae instead of lacking them. The very similar genus *Speleobregma* Bertelsen, 1986 was not considered by Pocklington & Fournier (1987); however, other publications have discussed either *Scalibregmides* or *Speleobregma* as possibly being synonymous with *Axiokebuita* despite only minimal differences between them (Martinez *et al.* 2013; Blake & Hilbig 1990). The main morphological difference between *Speleobregma* and *Axiokebuita* appears to be the presence of hooked neuropodial spines in *Speleobregma* that are not reported for *Axiokebuita*. Blake & Hilbig (1990) reported hooked neuropodial spines similar to those found in *Speleobregma lanzaroteum* Bertelsen, 1986 in what they identified as *A. millsi* from hydrothermal vents on the Juan de Fuca Ridge. That vent specimen is here described as a new species, *Axiokebuita verenae* **sp. nov.** (see below).

Subsequent reports of *Axiokebuita* spp. were from the Juan de Fuca Ridge, Northeast Pacific, and off New England in slope depths by Blake & Hilbig (1990 as *A. millsi*), off Norway by Persson & Pleijel (2005 as *Axiokebuita* sp.), and other areas of the North Atlantic by Parapar *et al*. (2011). The latter authors provided a detailed account of specimens of *A. minuta* from the Bellingshausen Sea, Antarctica, and, based on new observations and reviews of older records and accounts, concluded that *A. millsi* and *A. minuta* were the same species with Hartman's name taking priority (but see below). Martínez *et al*. (2013) described *A. cavernicola* from marine caves in the Canary Islands and redescribed *Speleobregma lanzaroteum* based on new collections of the species. A new abyssal species of *Axiokebuita*, *A. australis* Blake, 2023, was recently described from deep water off SE Australia.

Several features of *Axiokebuita* species are characteristic for the genus and differ from most Scalibregmatidae, including: (1) Presence of long subterminal lateral prostomial horns (termed palps by Parapar *et al*. 2011 and Martínez *et al*. 2013) that are ciliated and likely assist in feeding and burrowing; (2) paired sensory neck organs on the peristomium ventral to the mouth and separate from the prostomial nuchal organ, believed to be sensory in nature; (Martínez *et al*. [2013] also reported neck organs on *Speleobregma lanzaroteum*, but they are unreported in other scalibregmatids); (3) a unique pygidium present on some species that bears a pair of ventral lobes sometimes covered with minute papillae; (4) absence of furcate setae and acicular spines; (5) the presence of ciliary bands on the prostomial horns and elsewhere on the prostomium and body; (6) a narrow cirriform neuropodial lobe or cirrus associated with the neurosetae; and (7) short rounded notopodial lobes termed "*dorsal knobs*" by Parapar *et al.* (2011) that occur below the notosetae in roughly the same location as the lateral sense organs or papillae that occur widely in scalibregmatids. Parapar *et al*. (2011) considered it to be an interramal papilla displaced from the midpoint between the podial lobes closer to the notochaetae. However, in *A. australis* this structure is an oval-shaped cirrus; in most specimens of *A. minuta*, it is short and has an incised or bilobed tip.

Because the synonymy of *Axiokebuita millsi* and *A. minuta* by Parapar *et al*. (2011) implies that *A. minuta* is a bipolar and potentially a cosmopolitan species, this deserves some comment. By definition, a bipolar species has a range that encompasses many thousands of miles and biogeographic provinces between the two poles. In deep water where both *A. millsi* and *A. minuta* are reported, bipolarity is more likely than for non-invasive shallow-water species that need to cross and adapt to numerous temperature and salinity regimes to become bipolar. In the deep sea, there are few barriers to dispersal given sufficient time (Grassle & Morse-Porteous 1987) and there are many deep-water polychaete species that have been reported with wide geographic ranges. However, bipolar species in general are few and with careful study are usually found to consist of closely related sibling species. One previously purported bipolar scalibregmatid species is *Scalibregma inflatum* with the type-locality in Norway and numerous reports from Antarctica. Blake (2015) recently demonstrated differences between *S. inflatum* and the Antarctic populations and established a new species, *S. australis* Blake, 2015 for the Antarctic specimens. The basis of this work is the use of new characters that have largely been overlooked in previous descriptions, including the nature of the ventral peristomial rings and morphology of the lips surrounding the mouth, the presence and morphology of a mid-ventral ridge, and details concerning the number and distribution of elevated pads on the annular rings. One obvious difference between the *A. millsi* and *A. minuta* specimens examined by the author is body shape. *Axiokebuita millsi* tends to have a thicker and more fusiform body (see Pocklington & Fournier 1987, fig 1, and Fig. 22A in this study for a specimen from off New England), whereas *A. minuta*

TABLE 2. Comparison of morphological characters of the seven known species of *Axiokebuita* Pocklington & Fournier, 1987 and one species of *Speleobregma* Bertelsen, 1986.

Species/Characters	Prostomium	Peristomium	Parapodia	Setae	Segmental annulation	Pygidium	Distribution	References
***Axiokebuita millsi* Pocklington & Fournier, 1987** TYPE SPECIES	Short weakly pentagonal dorsally, w/ 2 lrg lat horns; venter w/ groove leading to mo	Lrg dorsally, w/ medial notch; venter w/2 narrow rings & lrg post ring forming post lip of mo; w/ medial notch; w/ 2 neO; obscured ventrally	Reduced, w/ short rounded noP lamella, bifid post & long, digitiform neP cirrus	All thin C; some post long, natatory-like	Dorsal, set 1–5 biannulate, set 6 to end, triannulate, few far post. quadriannulate; ventral, set 1–2 biannulate, set 3 to end tri- & quadriannulate	An opening w/ ca. 8 lobes; ventrally w/ 2 papillated lat lobes	W North Atlantic Ocean, 680–1343 m	Pocklington & Fournier, 1987; This study
***A. australis* Blake, 2023**	Pentagonal w/ 2 short thick lat horns; venter obscured by proboscis w/ numerous lobes on oral opening	Lrg, dorsally, w/ medial crest & lat divided into 2 rings; venter w/ neO, partially obscured	Reduced to blister-like swelling; noP w/ oval-shaped dorsal lamella; neP w/ elongate digitiform cirrus	All thin C	Dorsally set 1–4 biannulate, rest mostly uniannulate; ventrally, most uniannulate	A simple plate with 6–8 small lobes around an; w/o papillae	Off E Australia, 2793–4064 m.	Blake 2023
***A. cavernicola* Martinez, di Domenico &Worsaae, 2013a**	Dorsally circular, broadly rounded ant w/ 2 thick lat horns; narrow post extension; nuO in lat furrows	Lrg dorsally w/ medial insertion post pro; venter w/ post lip of mo w/ 2 neO & narrow medial notch	Reduced, w/ noP oval-shaped & neP a digitiform cirrus	All thin C	Quadriannulate, best developed in post set	Pyg w/ numerous small lobes around an; w/ 2 large ventral papillated lobes	Canary Islands, marine caves	Martinez *et al*. 2013 a–b
***A. minuta* (Hartman, 1967)**	Pentagonal, tapering post to narrow extension; w/ broad ant margin w/ 2 lrg subterminal lat horns; venter obscured by per & oral morph	Lrg dorsal ring w/ deep medial notch w/ post extension of pr + 2nd narrow ring ant set 1; venter enlarged, w/ 2 neO; & ring of lobes around oral opening	Reduced, noP w/ short rounded bifid lobe; neP long, digitiform cirrus	All thin elongate C	Set 1–2 triannulate; quadriannulate from set 3 to end; elevated pads weakly developed	W/ 2 ventral papillated lobes lat to an	Antarctica, 245–1582 m.	Hartman 1967; Blake 1981; Parapar *et al*. 2011; This study

.....continued on the next page

TABLE 2. (Continued)

Species/Characters	Prostomium	Peristomium	Parapodia	Setae	Segmental annulation	Pygidium	Distribution	References
***A. oculata* sp. nov.**	Pentagonal, tapering post to narrow tip; w/ broad ant margin w/ 2 lrg subterminal lat horns; a pair of prominent eyes present	lag w/ 2 rings; ant ring large, inflated w/ deep mid-dorsal notch encompassing post prost; 2nd ring, narrow. Venter enlarged, w/ ca. 14 lobes around mo; post to mo narrow groove present; neO present	Reduced, noP w/ short rounded bifid lobe; neP long, digitiform cirrus	All thin capillaries; neS more numerous than noS	All segments uniannulate; raised pads not present	With 2 ventral densely papillated lobes lat to an	E North Pacific Ocean, off Costa Rica, Las Gemelas Seamount, on rock, 243 m.	This study
***A. shackletoni* sp. nov.**	Short, pentagonal, with 2 thick subterminal lat horns; narrow lat ridge between pro and per extending into per groove	W/ 2 rings dorsally, 1st lrg w/ deep pro notch; 2nd narrow entire; venter lrg, swollen; w/ medial ridge, w/ 2 neO; mo surrounded by ca. 12 lobes	Reduced; noP w/ short lobe ventral to noS, some notched; neP with fingerlike lobe dorsal to neS	All parapodia w/ C; short spinous setae on Set 1; each slightly curved w/ pointed tips	Set 1– uni- or biannulate; set 3 to end mostly quadriannulate; raised pads only weakly developed	An surrounded by short lobes; w/ 2 lrg ventral papillated lobes lat to an	Antarctica, Weddell Sea, 1970–4928 m.	This study
***A. verenae* sp. nov.**	Pentagonal, dorsally w/ curved front, w/ 2 long subterminal lateral horns; w/ narrow lobes in per groove	W/ 3 rings dorsally, ant largest w/ mid-dorsal gap; 2 smaller rings w/ weak raised pads; ventral morph obscured	Reduced, noP w/ short lobe ventral to noS, & digitiform neL	NoS all C; neS include C & short spinous setae w/ hooked tip & serrated shafts	All sets uniannulate; set 1–7 w/ large raised pads, then pads not present until far post segs	Pyg w/ 2 lrg papillated ventral lobes	E North Pacific Ocean, hydrothermal vents, Juan de Fuca Ridge, 1545 m.	Blake & Hilbig 1990; This study
***Speleobregma lanzaroteum* Bertelsen, 1986**	Pentagonal, w/ curved ant margin, w/2 long, curved lat horns, post end narrow, rounded, nested within notch on ant per	W/ 2 rings dorsally, ant largest w/ deep mid-dorsal gap in which post pro nested; post ring narrow; venter w/ 2 neO & numerous lobes around mo	Reduced, noP w/ small papilla; neP w/ digitiform neL	NoS all capillaries; NeS w/ capillaries & spinous setae with hooked tips and serrated shafts	All sets uniannulate, w/ raised pads; intersegmental grooves prominent	Pygidium w/ 2 lrg papillated ventral lobes	Canary Islands, marine caves	Bertelsen 1986; Martinez *et al*. 2009; 2013a–b

Abbreviations: an, anus; ant, anterior; C, capillaries; ca., about; lat, lateral; lrg, large; morph, morphology; mo, mouth; neO, neck organ; neP, neuropodium; neL, neuropodial lobe; neS, neurosetae; noP, notopodium; noS, notosetae; nuO, nuchal organ(s); per, peristomium; post, posterior; pro, prostomium; set(s), segment(s); set(s), setiger(s); w/, with; w/o, without.

tends to have a more slender sausage-shaped body (see fig. 5A of Parapar *et al*. 2011 from Antarctica).

Furthermore, specimens of *Axiokebuita millsi* have a more distinct mid-ventral ridge line than specimens of *A. minuta*. Parapar *et al*. (2011) noted that North Atlantic specimens have longer setae than Antarctic specimens. This is confirmed by new observations of North Atlantic material from off New England in which the specimens have setae sufficiently long to be called "*natatory-like*". Based on these additional observations, *A. millsi* and *A. minuta* should be retained as separate species. Furthermore, there are no taxonomic accounts that actually compare specimens identified as *A. millsi* from the areas off Nova Scotia and New England with those of the eastern North Atlantic. Given the fusiform bodies of specimens from the Canadian and American locations and the more slender bodies of *Axiokebuita* sp. from off Norway by Persson & Pleijel (2005), it is likely that more than one species is involved. The specimen from near hydrothermal vents on the Juan de Fuca Ridge identified as *A. millsi* by Blake & Hilbig (1990) is a different species based on overall morphology and the presence of slender spinous chaetae with pointed tips that these authors recorded. This species is formally described here as *Axiokebuita verenae* **sp. nov.** (see below).

Collections of Antarctic *Axiokebuita* from deep-water in the Weddell and Scotia Seas collected as part of the EASIZ II and ANDEEP I–III by the author and others provided by the Zoological Museum of Hamburg (ZMH) suggest that two distinct species are present in Antarctica: *A. minuta* from shelf and upper bathyal depths and *A. shackletoni* **sp. nov.** from lower bathyal and abyssal depths to nearly 5000 m (see below).

In contrast to the known records of *Axiokebuita millsi, A. australis, A. minuta, A. oculatus* **sp. nov.**, *A. shackletoni* **sp. nov.** and *A. verenae* **sp. nov.** in offshore habitats, *A. cavernicola* Martínez, Di Domenico & Worsaae, 2013 from the Canary Islands is from a marine cave that is accessible only by diving. Martínez *et al*. (2013, 2014). These authors stated that the worms from the cave inhabit rocky crevices that are similar to crevicular habitats of the deep-sea *Axiokebuita* species, suggesting a distributional or evolutionary pathway for the genus from the deep sea to the shallow-water caves. However, apart from *A. oculatus* **sp. nov.** from a seamount off Costa Rica, there is little evidence that deep-sea *Axiokebuita* species inhabit anything other than soft sediments as is typical of nearly every deep-sea scalibregmatid known. All known species of *Axiokebuita* and the closely related genus *Speleobregma* are summarized in Table 2. The following seven species of *Axiokebuita* are here recognized with one revalidated and three new to science. An additional likely undescribed species reported from Norway by Persson & Pleijel (2005) is also listed.

1. *Axiokebuita millsi* Pocklington & Fournier, 1987. **Revalidated**. Deep-water habitats, W North Atlantic Ocean.
2. *Axiokebuita australis* Blake, 2023. Abyssal depths, off eastern Australia.
3. *Axiokebuita cavernicola* Martínez *et al*., 2013. Shallow marine caves, Canary Islands.
4. *Axiokebuita minuta* (Hartman, 1967). Shelf and bathyal depths, Antarctica.
5. *Axiokebuita oculata* **sp. nov.** E North Pacific Ocean, off Costa Rica, Las Gemelas Seamount, on rock.
6. *Axiokebuita shackletoni* **sp. nov.** Southern Ocean, Weddell Sea, bathyal and abyssal depths.
7. *Axiokebuita verenae* **sp. nov.** Deep-water hydrothermal vents on the Juan de Fuca Ridge.
8. *Axiokebuita* sp. E. North Atlantic Ocean, Norway, Trondheimsfjord, 180–280.

Axiokebuita millsi Pocklington & Fournier, 1987 Revalidated

Figures 22–23

Axiokebuita millsi Pocklington & Fournier, 1987:108–110, figs. 1–2). **Not** Blake & Hilbig 1990: 242–243, Fig. 13.

Axiokebuita minuta (Hartman) *sensu* Parapar *et al*. 2011, 2021 (in part). **Not** Harman 1967.

Material examined. (*4 specimens*) **Western North Atlantic Ocean, off New England, U.S. North Atlantic ACSAR Program**, coll. G.W. Hampson, Chief Scientist. **Sta. 3**, **Cruise NA-5**, *R/V Cape Hatteras*, Rep. 3, coll. 28 Apr 1986, 41.025°N, 66.338°W, 1343 m (1, USNM 1741692); **Cruise NA-6**, R/V *Cape Hatteras*, Rep. 3, coll. 25 Jul 1986, 41.025°N, 66.338°W, 1333 m (2, USNM 1741693). **Sta. 10**, **Cruise. NA-6**, R/V *Cape Hatteras*, Rep. 1, coll. 26 Jul 1986, 39.802°N, 70.088°W, 1228 m (1, USNM 1741694).

Description. A small species, body fusiform-shaped (Fig. 22A), more or less rectangular in cross section, without dorsal or ventral grooves, but with thin white line extending along middle of venter, likely ventral nerve cord. Body with about 25 setigers, with anterior six setigers and posterior 7–8 setigers narrow and middle section bearing enlarged expanded segments; largest specimen (USNM 1741692) complete, with 25 setigers, 6.9 mm long, 0.64 mm wide across setiger 3, 1.4 mm wide across expanded middle section; second complete specimen (USNM 1741693) with 25 setigers, 6.5 mm long, 0.47 mm wide across setiger 3 and 1.4 mm wide across expanded middle segments. Individual segments with 1–3 rows of elevated pads across dorsum; setigers 1–5 with a biannulate pattern; setiger 6 to end triannulate (Fig. 23A), larger specimens with some posterior setigers quadriannulate; expanded middle segments with annulated patterns obscured; venter with setiger 1 biannulate and following segments triannulate, but individual pads obscured or not as prominent (Fig. 23B). Color in alcohol light tan.

Prostomium small, weakly pentagonal in shape with broadly curved anterior margin bearing two thick subterminal lateral horns (Figs. 22A–B, 23A), each lateral horn with fine cilia evident along margins; eyespots absent; nuchal organs not observed. Entire prostomium elevated and distinctly separated from large, smooth peristomium

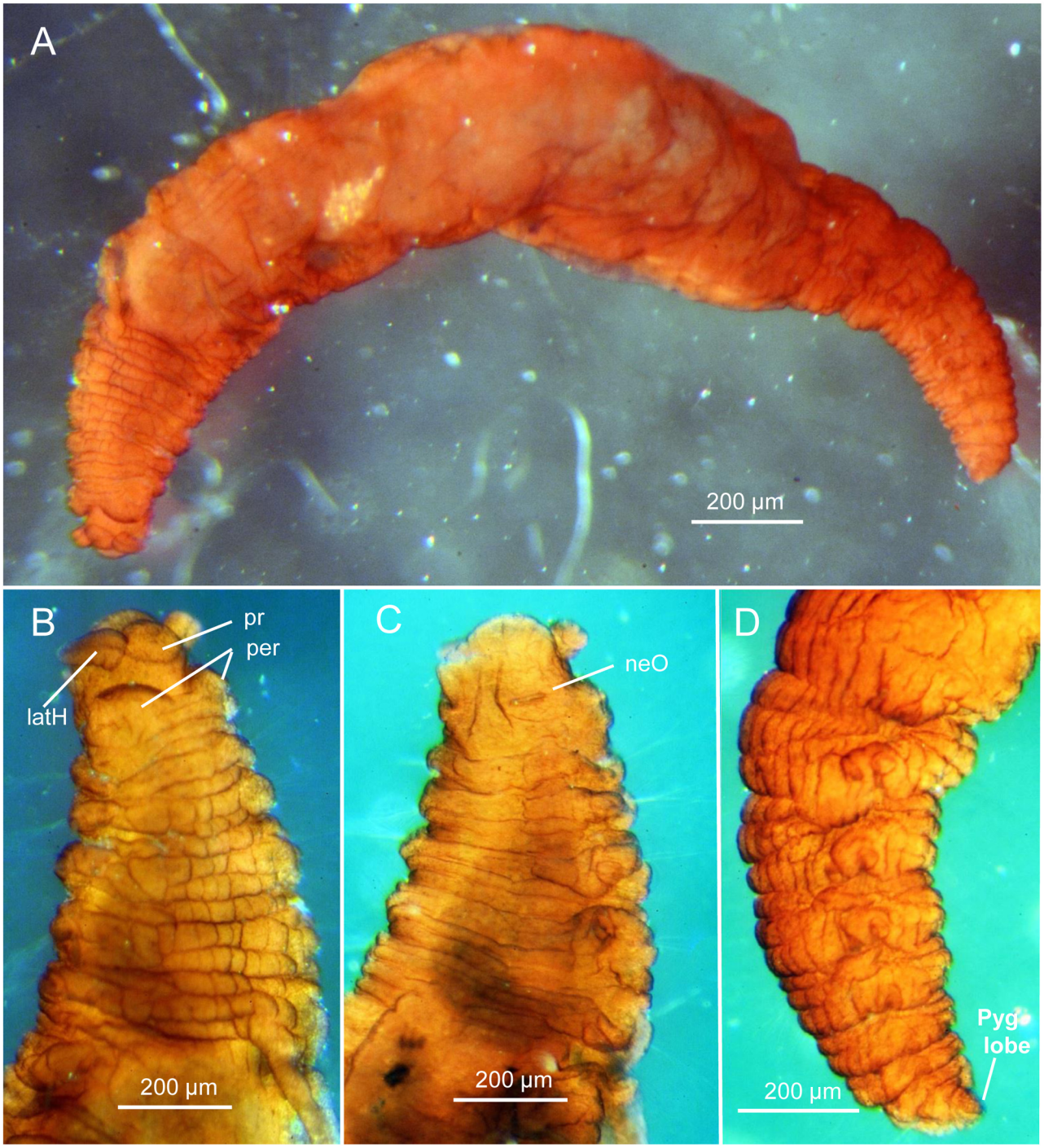

FIGURE 22. *Axiokebuita millsi* Pockington & Fournier, 1987. (USNM 1741692): A, entire worm, left lateral view; B, Anterior end, dorsal view; C, anterior end, ventral view; D, posterior end, right lateral view. All stained with Shirlastain A.

(Figs. 22A–B, 23A); ventrally with vestibule-like groove extending to mouth (Fig. 23B). Peristomium large dorsally with a distinct mid-dorsal notch encompassing posterior border of prostomium (Figs. 22B, 23A); anterior lateral margins of peristomium thickened, continuing ventrally as two narrow rings lateral to prostomium and larger mass forming posterior lip of mouth (Fig. 23B); posterior lip with 7–8 large rounded lobes and a deep medial groove (Fig. 23B) that likely allows expansion when proboscis everted; laterally a pair of transverse swellings or neck organs present on either side (Figs. 22C, 23B).

Parapodia reduced throughout, without podial lobes and with setae arising directly from body wall; notopodia with a single short, stubby postsetal lamella located slightly ventral to setal fascicle; neuropodia with an elongate fingerlike postsetal lamella located slightly dorsal to setal fascicle (Fig. 23D); both podial lamellae present from setiger 1 to posterior end. Notopodial lamellae of far posterior setigers sometimes with bifid or notched tip. Setae all thin capillaries arranged in tight setal bundles; capillaries of posterior setigers long, natatory-like; short spinous setae and furcate setae entirely absent.

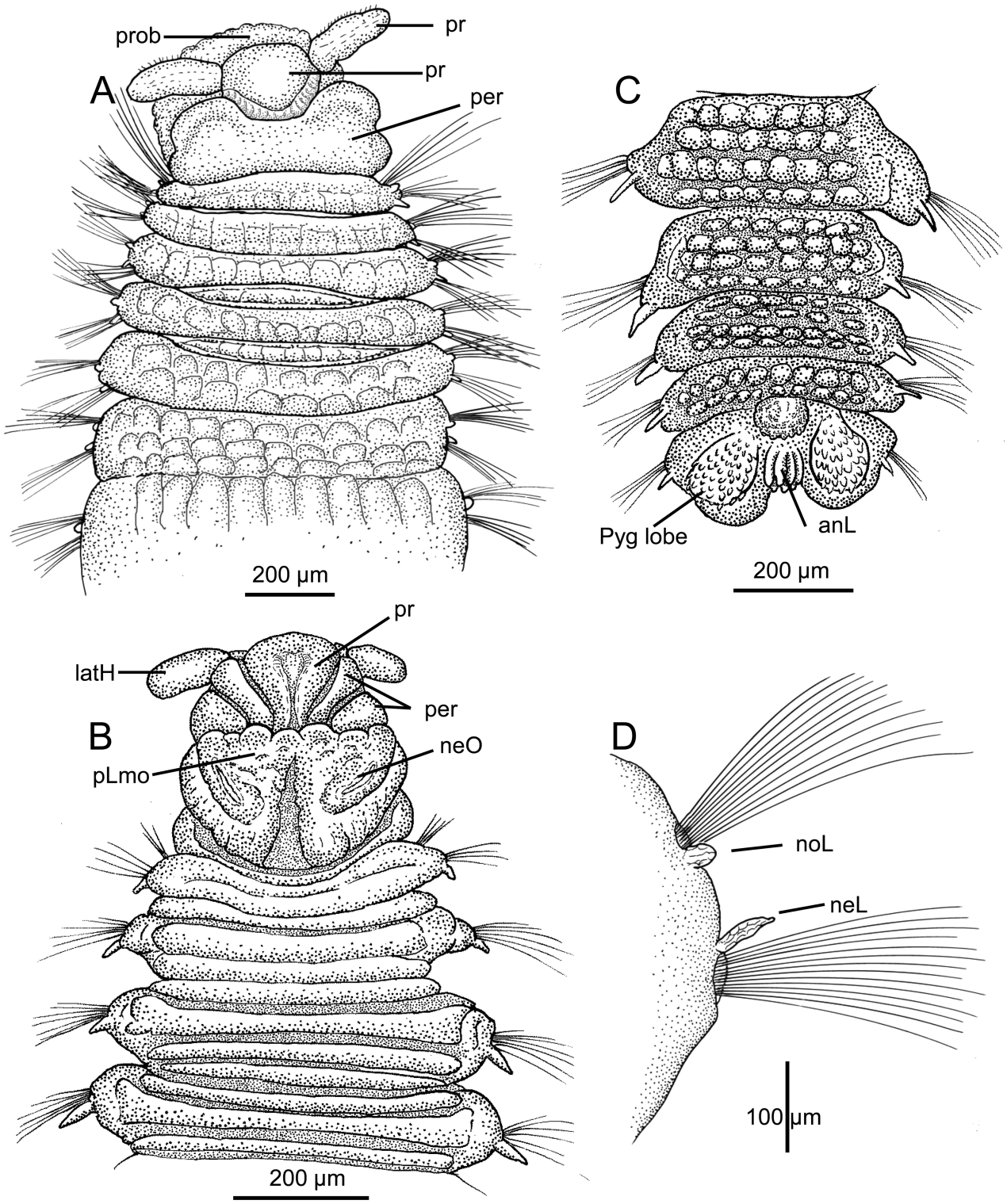

FIGURE 23. *Axiokebuita millsi* Pockington & Fournier, 1987. A, anterior end, dorsal view; B, anterior end, ventral view; C, posterior end, ventral view; D, posterior parapodium, anterior view. A, D (USNM 1741693); B, C, (USNM 1741692).

Pygidium with elongate lobes around anal opening (Fig. 23C) and a ventral pair of large rounded pygidial lobes lateral to anal opening (Figs. 22D, 23C), these each with minute papillae; anal cirri absent.

Remarks. *Axiokebuita millsi* was originally described by Pocklington & Fournier (1987) as a new genus and species based on a single specimen from off Nova Scotia in 680 m and another from the Davis Strait off Baffin Island in 532 m. In addition, they examined several specimens of *Kebuita minuta* Hartman, 1967 from Antarctica that they referred to their new genus and even designated some of those as paratypes. In so doing, they

considered that several Antarctic specimens were the same as their Atlantic material and referred those to *A. millsi* thus making their species bipolar.

Parapar *et al*. (2011) conducted a more extensive study of the Antarctic collections including newer more recently collected materials as well as three specimens from Trondheim Fjord, Norway, and concluded that all represented a single species, *A. minuta*, referring *A. millsi* to synonymy and thus creating a cosmopolitan species. Unfortunately, these authors did not examine any specimens from off eastern North America to confirm the identity of the type-species, *A. millsi*. As is evident in the materials reported here, specimens identified as *A. millsi* from off New England differ significantly from the concept of *A. minuta sensu lato* presented by Parapar *et al*. (2011).

Axiokebuita millsi differs from *A. minuta* and most other species of the genus in having a more fusiform body, like most scalibregmatids, and in having an enlarged peristomium that ventrally forms the posterior lip of the mouth and has a distinct longitudinal groove that likely expands when the proboscis is everted; in addition, the ventral aspect of the prostomium bears a groove that suggest it serves as a vestibule anterior to the mouth. *Axiokebuita minuta* has no ventral peristomial groove and the oral opening is shifted anteriorly, obscuring the prostomium. In addition, *A. minuta* has a distinct second narrow peristomial ring that is not present in *A. millsi*. Although segmental annulation can be variable, the available specimens of *A. millsi* are biannulate on setigers 1–5, then mostly triannulate along the rest of the body, with a few far posterior setigers quadriannulate. In contrast, the segments of *A. minuta* are triannulate on setigers 1–2 and either tri- or quadriannulate thereafter.

Distribution. Western North Atlantic Ocean, Nova Scotia to off New England, bathyal depths, 680–1343 m.

Axiokebuita australis Blake, 2023

Axiokebuita australis Blake, 2023: 277–279, figs. 3–4.

Description (condensed from Blake 2023). Body thick, sausage-shaped; with about 20 setigers, 10 mm long and 2 mm wide. Setigers 1–4 biannulate, but most of body with uniannulate segments; elevated pads best observed in anterior and posterior setigers. Color in alcohol light tan with no pigmentation.

Prostomium narrow, pentagonal in shape, straight across anterior end with two thick subterminal lateral horns; eyespots absent. Peristomium large, irregularly encompassing prostomium dorsolateral and with a weakly developed medial dorsal crest at posterior end of prostomium; surrounding mouth ventrally; proboscis partially emergent, with lobes surrounding mouth.

Parapodia reduced to blister-like swellings. Notopodia with single short, oval to rounded lamella ventral to notosetae; neuropodia with an elongate, fingerlike lamella; both lamellae from setiger 2 or 3 continuing to posterior end. Setae all thin capillaries with notosetae long, up to 35–45 per fascicle, neurosetae fewer; short spinous setae and furcate setae absent.

Pygidium a simple plate composed of 6–8 thickened lobes surrounding anal opening.

Remarks. *Axiothella australis* is the only species of the genus reported from the western Pacific Ocean and was the first reported to occur in abyssal depths (>3000 m), the second is *A. shackletoni* **sp. nov.** from the Weddell Sea in Antarctica (see below). Morphologically, *A. australis* is the only species of the genus reported to entirely lack papillated ventral pygidial lobes.

Distribution. Western Pacific Ocean, lower continental slope and abyssal plain off SE Australia, Tasmania and Victoria, 2793–4064 m.

Axiokebuita minuta (Hartman, 1967)

Figures 24–25

Kebuita minuta. Hartman, 1967: 131–132; 1978: 179, fig. 27A–B; Blake 1981: 1153–1154, fig. 11a–b.

Axiokebuita minuta: Pocklington & Fournier 1987: 108–113 (in part); Parapar *et al*. 2011: 150–159, figs. 2–8 (in part, Figs. 2–6 only).

Material examined. (*100 specimens*) **Southern Ocean, Antarctica, South Orkney Islands, USNS *Eltanin*, Sta. 1079**, coll. 13 Apr 1964, Blake trawl, 61.433°S – 61.40°S to 41.917°W, 593–598 m, **holotype** (USNM 56622).—**Weddell Sea, N of Cape Norvegica, R/V *Polarstern*, EASIZ-II, Cruise ANT XV/3, Sta. 48**, coll. A. Brandt, 30 Jan 1998, MltG, 70.868°S, 10.488°W, 245 m (4, ZMH-ANN-P25821; 1, ZMH-ANN-P 25822; 2, ZMH-ANN-P25824; 2, ZMH-ANN-P 25825). **Sta. 68**, coll. 01 Feb 1998, MltG, 70.837°S, 10.62°W, 268 m (2, ZMH-ANN-P 25823).—**ANDEEP II, Cruise ANT XIX-4, R/V *Polarstern*, Weddell Sea, E of Antarctic Peninsula**, **Sta. 133-3**, coll. A. Brandt, 07 Mar 2002, EBS, 60.336°S, 54.239°W, 1122 m, (7, ZMH-ANN-P 24615; 2, ZMH-ANN-P 25825). **South Sandwich Islands**, **Sta. 143-1**, coll. A. Brandt, 25 Mar 2002, EBS, 28.744831°S, 58.744831°W, 774 m (58, ZMH-ANN-P26460).—**ANDEEP III Cruise ANT XIX-4, R/V *Polarstern*, E Weddell Sea, off Cape Norvegia, Sta. 74-6**, coll. A. Brandt, 20 Feb 2005, EBS, 71.306999°S, 13.97183°W, 1047 m (4, ZMH-ANN-P 26965; 2, ZMH-ANN-P 26968). **Scotia Sea, N of Antarctic Peninsula**, **Sta. 133-2**, coll. A. Brandt, 16 Mar 2005, EBS, 62.778831°S, 53.042831°W, 1582 m (2, ZMH-ANN-P26421; 12, ZMH-ANN-P26962; 1, ZMH-ANN-P26963).

Description. A small to medium sized species, body elongate, sausage-shaped, expanded in middle segments tapering anteriorly and posteriorly; with up to 24–25 setigers, with 1–5 anterior setigers and posterior 7–8 setigers narrow, with middle section bearing enlarged expanded segments. Body more or less rectangular in cross section, without dorsal or ventral grooves. Holotype (USNM 56622) complete, 8 mm long, 3 mm wide with 23 setigers; larger complete specimens include (ZMH-ANN-P26962) with 22 setigers, 12 mm long and 2.5

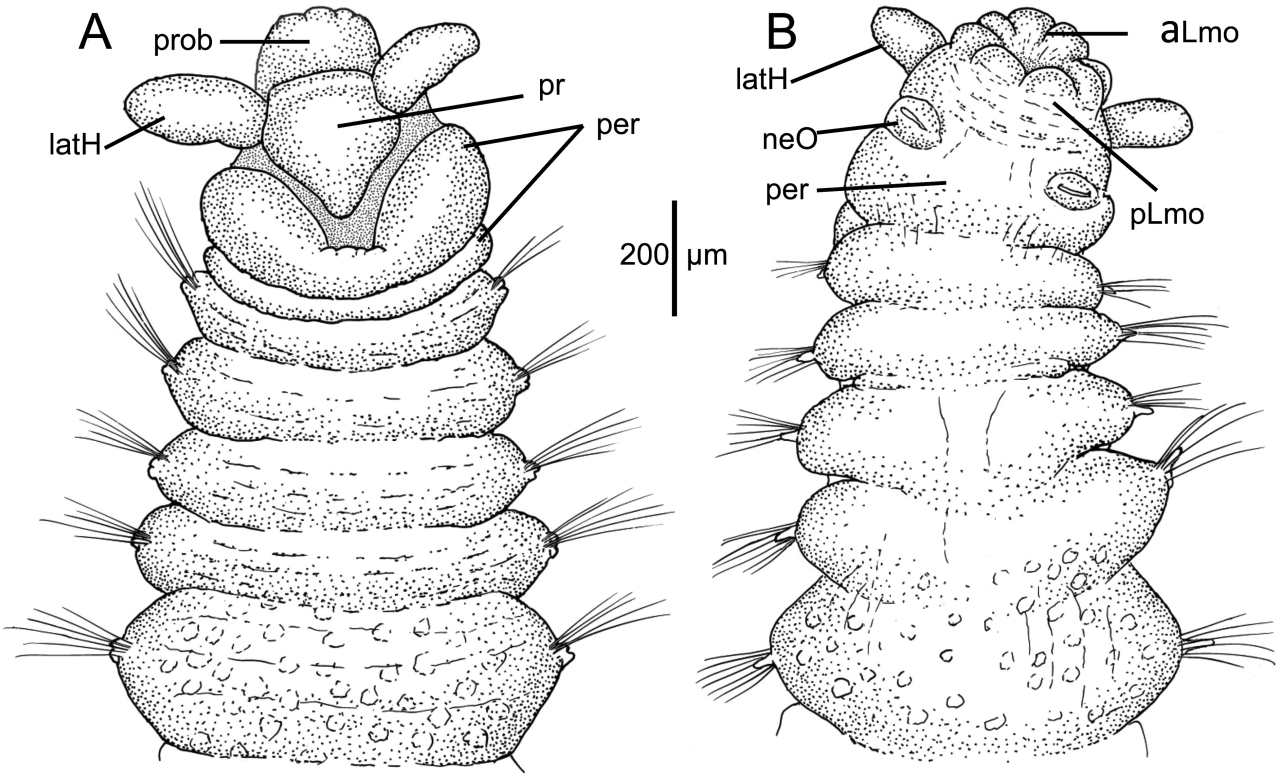

FIGURE 24. *Axiokebuita minuta* (Hartman, 1967). (ZMH-ANN-P26460): A, anterior end, dorsal view; B, anterior end, ventral view.

mm wide and (ZMH-ANN-P 25822) with 24 setigers, 13 mm long and 3 mm wide. Individual segments with 3–4 rows of annular rings across dorsum; setigers 1–2 with a triannulate pattern, following setigers with quadriannulate pattern; elevated pads along annular rings only weakly developed; rings of anterior setigers typically entire with pads best developed in posterior setigers; venter with similar pattern. Color in alcohol white to light tan.

Prostomium pentagonal in shape with broad anterior margin bearing two subterminal lateral horns (Figs. 24A, 25A), each thick with rounded tip and with fine cilia evident along margins; eyespots absent; nuchal organs not emergent on any specimens. Dorsal surface of prostomium on some specimens with broad depression on anterior half; prostomium separated from peristomium by distinct groove of variable width; nuchal organs arising from this groove when emergent. Peristomium dorsally with two rings, anterior ring large, inflated, with deep mid-dorsal notch encompassing posterior border of prostomium; second ring, narrow about one-third as wide as following setiger 1(Fig. 24A). Ventral surface of peristomium with large anterior section surrounding mouth with oral opening surrounded by 8–10 narrow lobes (Fig. 24B); proboscis large, inflated when everted. Posterior to oral opening, peristomium broad, flattened, bearing pair of transverse neck organs with ciliated groove (Fig. 24B).

Parapodia reduced throughout, without podia and with setae arising directly from body wall; notopodia with a single short, bifid postsetal lamella (Fig. 25B–C); neuropodia with an elongate fingerlike postsetal lamella (Fig. 25D); both podial lamellae present from setiger 1 to posterior end; dorsal lobes reduced and more difficult to observe in largest specimens. Setae all capillaries arranged in spreading fascicles.

Pygidium with a pair of ventral rounded lobes lateral to anal opening (Fig. 25E); each with surface covered with small papillae; anal cirri absent.

Remarks. *Axiokebuita minuta* is widespread in the Southern Ocean in continental shelf and slope depths to about 1600 m; deeper records refer to *A. shackletoni* **sp. nov.** and reports of *A. millsi* are unaccepted (see above). *Axiokebuita minuta* and *A. shackletoni* **sp. nov.** are similar in having a second narrow posterior ring on the dorsal surface of the peristomium, but differ in that *A. shackletoni* **sp. nov.** has a raised ridge that borders the prostomium and extends into a mid-dorsal peristomial groove; *A. minuta* has no such structure. In addition, *A. shackletoni* **sp. nov.** has a prominent ridge between the pair of neck organs, whereas the peristomial surface of *A. minuta* is smooth. In addition, short spinous setae are present anterior to the long capillaries on both the noto- and neuropodial of setiger 1 in *A. shackletoni* **sp. nov.** Such short setae are not present on the specimens of *A. minuta* available for study and have not been reported previously for any other species of this genus.

Biology. Oocytes were present in most specimens from (ZMH P-26460) and were 40–45 µm in diameter with a conspicuous germinal vesicle. Records suggest that the species ranges from shallow continental shelf depths to continental slope depths of about 1600 m. Deeper

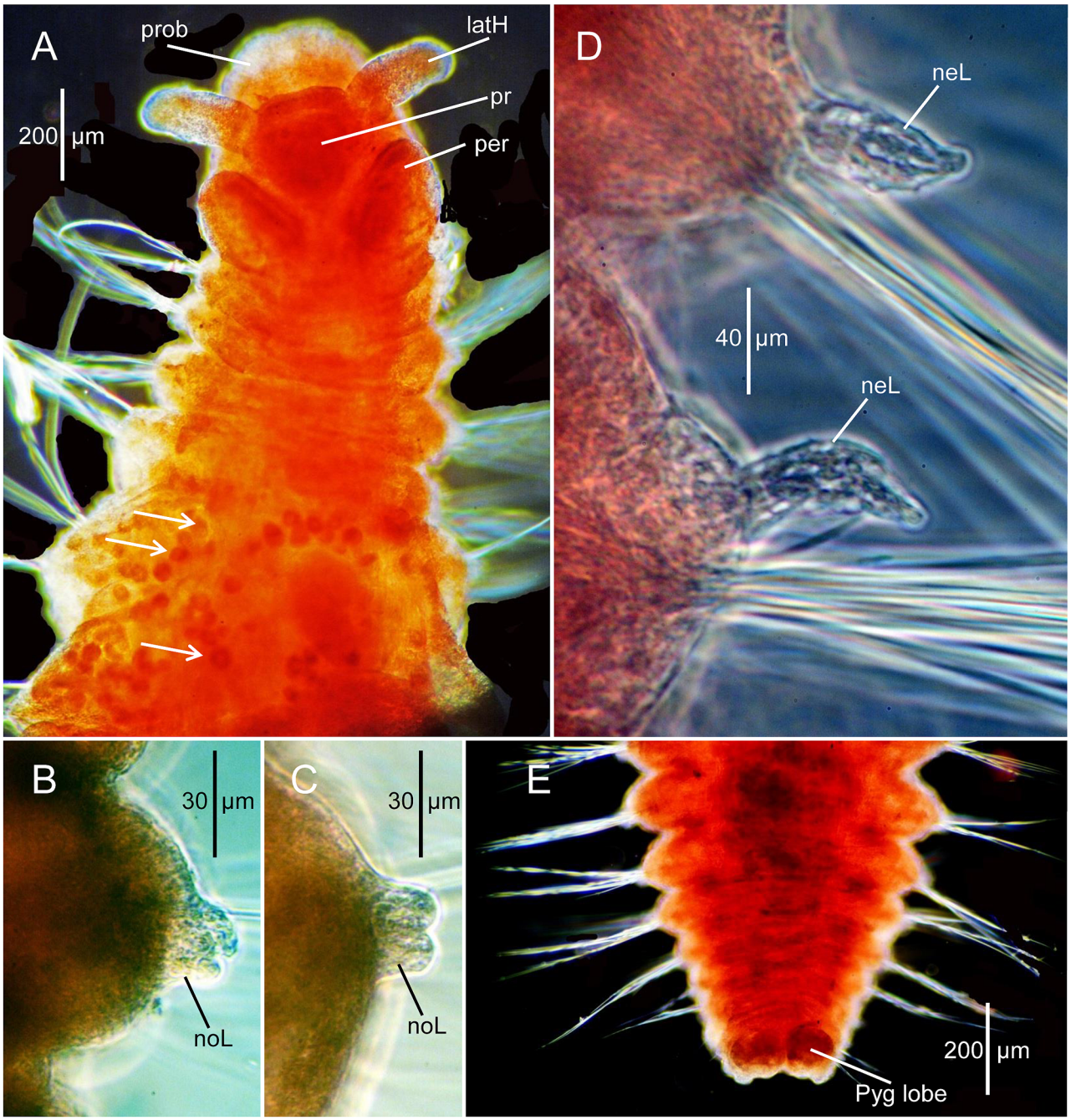

FIGURE 25. *Axiokebuita minuta* (Hartman, 1967). (ZMH-ANN-P26460): A, anterior end, dorsal view; B–C, notopodial lobe in two views; D, neuropodial lobes from adjacent setigers; E, posterior end, ventral view. All stained with Shirlastain A. Arrows point to ova.

records are here referred to *Axiokebuita shackletoni* **sp. nov.**, a closely related abyssal species (see below).

Distribution. Southern Ocean, Antarctic seas in continental shelf and upper bathyal depths, 245–1582 m.

Axiokebuita oculata new species

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Figures 26–27

Axiokebuita **sp. nov.** Rouse *et al*. 2022: 201, figs. 49.2 d & g.

Material examined. **E North Pacific Ocean, Off Costa Rica, Las Gemelas Seamount, near Isla del Coco,** R/V *Falcor*, ROV *SuBastian*, **Site S0225** Bio Box 4, Rep. 4 (rock), 20 Jan 2019, coll. G. Rouse & A. Hiley, 4.9871°N, 87.4433°W, 243 m, **holotype** (SIO-BIC A10151), **paratype** (SIO-BIC A18596).

Description. A medium sized species with an elongate body, narrow anteriorly and posteriorly, widest in middle segments (Fig. 26A); holotype (SIO-BIC

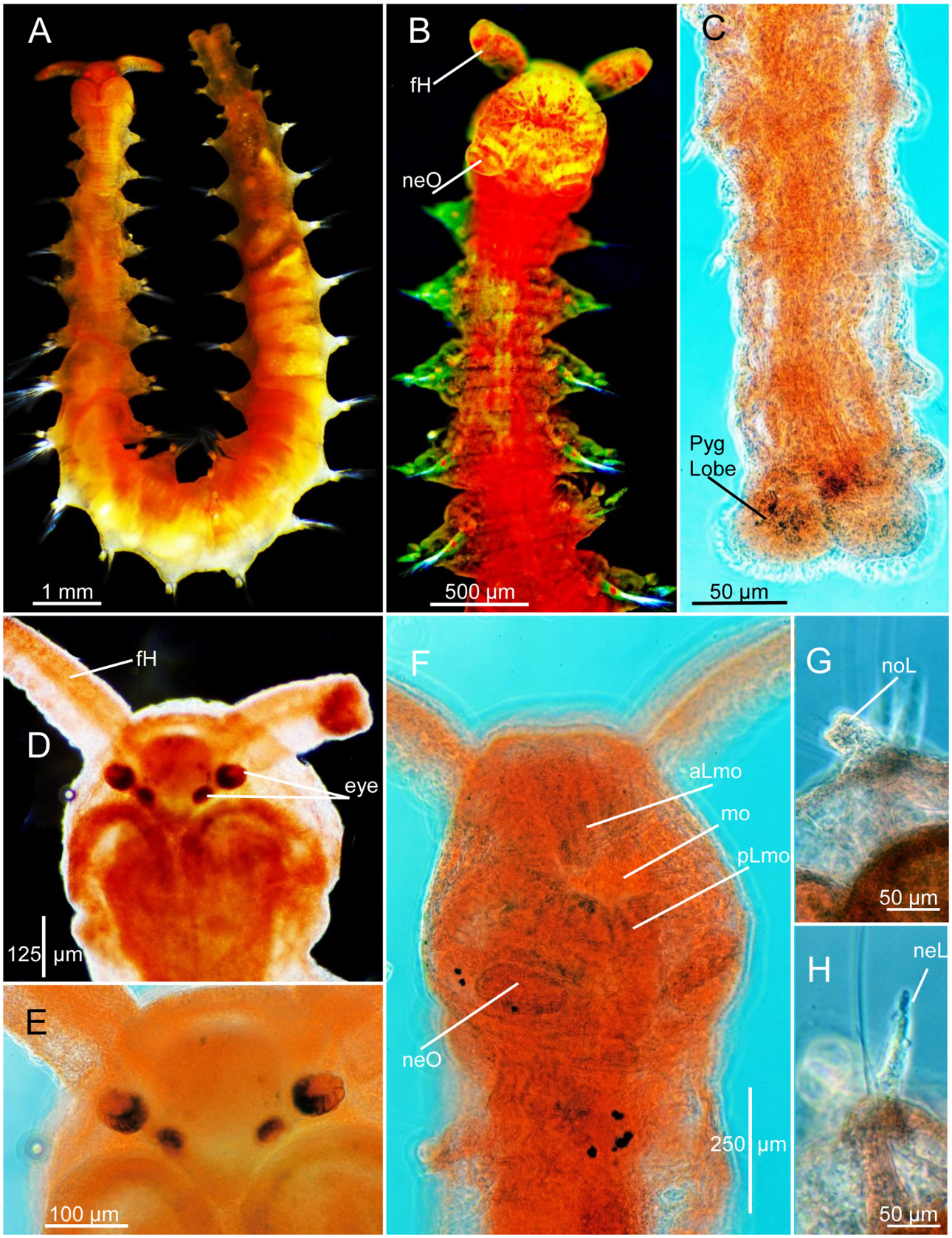

FIGURE 26. *Axiokebuita oculata* **sp. nov.** A, entire worm, dorsal view; B, anterior end, ventral view; C, posterior end, ventral view; D, pre-setigerous region, dorsal view, showing frontal horns and prostomial eyes; E, same, closer view of prostomial eyes; F, anterior end, ventral view; G, notopodial lobe from posterior parapodium; H, neuropodial lobe from posterior parapodium. A–B, D–E, paratype (SIO-BIC A18596); C, F–H, holotype (SIO-BIC A10151); A–B photographs from life by G. Rouse, rest by author.

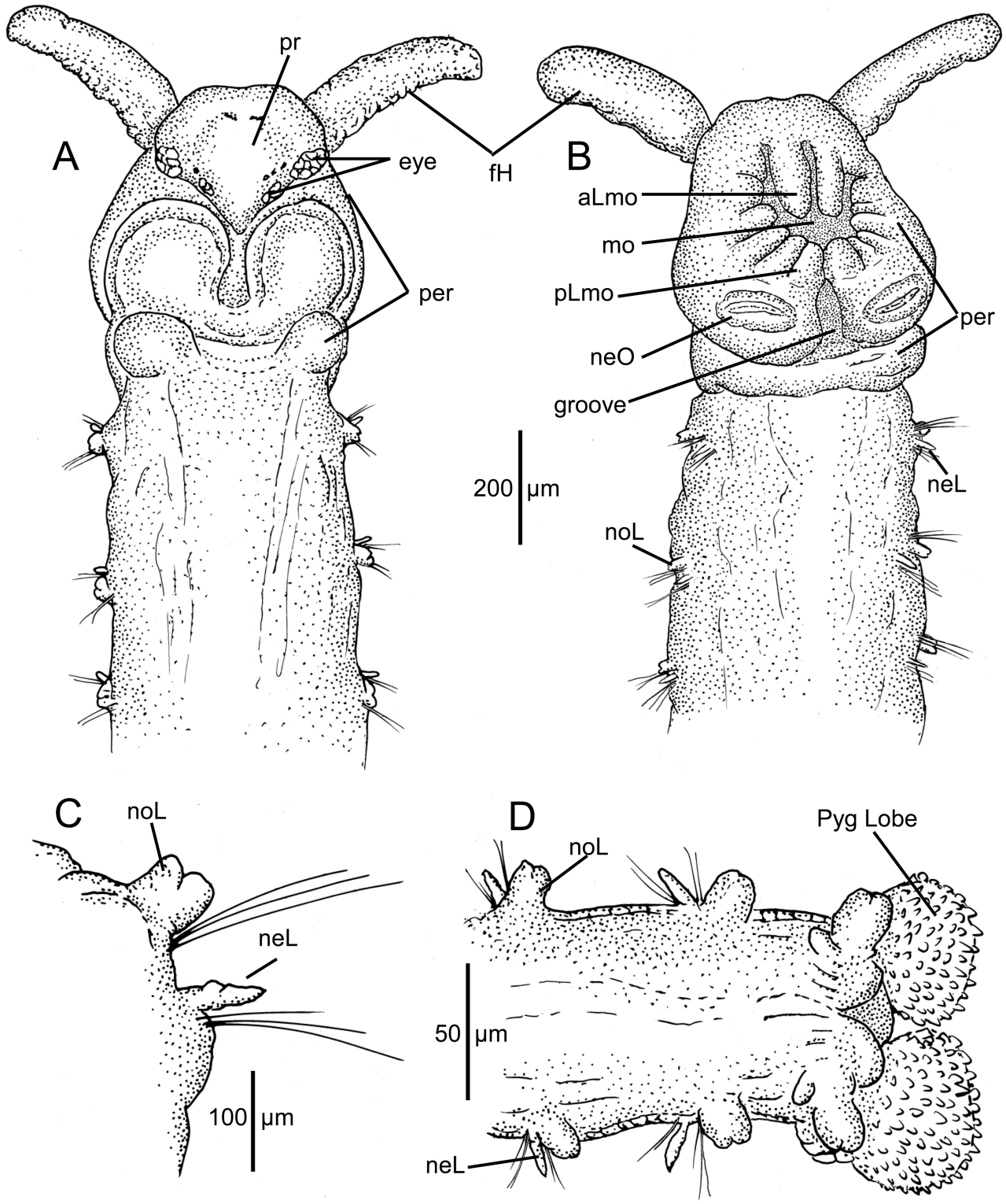

FIGURE 27. *Axiokebuita oculata* **sp. nov.** Holotype (SIO-BIC A10151): A, anterior end, dorsal view; B, anterior end, ventral view; C, posterior parapodium, posterior view; D, posterior end, dorsal view.

A10151) complete, smaller specimen with 24 setigers, 4.1 mm long, 0.2 mm wide across setiger 3, 0.4 mm wide across setiger 11; paratype (SIO-BIC A18596) larger, with pre-setiger region and setigers 1–3 present, rest of body removed for DNA analysis after photograph taken of specimen in life, showing complete specimen with 23 setigers, approximately 21 mm long and 2.0 mm wide across setiger 11 (Fig. 26A). Body oval in cross section; individual segments without annular rings, raised pads, or mid-ventral groove or ridge. Color in alcohol light tan with black pigment spots evident on prostomium and elsewhere, but these variable (Fig. 26C, F).

Prostomium pentagonal in shape dorsally (Fig. 27A), with broadly rounded anterior margin bearing two

subterminal elongate and thickened frontal horns that taper to a rounded tip (Figs. 26A–B, 27A–B); ciliated grooves not observed; nuchal organs not observed; two pairs of prominent eyes present, with anteriormost eye of each pair about three times larger than smaller one (Figs. 26D–E, 27A); each eye multicellular with distinct darkly pigmented reddish cells forming a cup surrounding larger clear multicellular areas that presumably form a lens (Fig. 26E). Peristomium with two dorsal rings, anterior ring large, inflated, with deep medial notch encompassing posterior border of prostomium (Fig. 27A); second ring narrow, about as wide as following setiger 1 with a pair of rounded lobes (Fig. 27A). Ventral surface of peristomium enlarged, surrounding mouth with about 12 narrow lobes roughly forming lateral and posterior lips of mouth (Figs. 26B, 27B) and two thick lobes forming anterior lip (Fig. 27B); narrow post-oral groove present posterior to mouth (Fig. 27B); a pair of neck organs present lateral to post-oral groove, each with a transverse ciliated groove (Figs. 26F, 27B). Second peristomial ring narrow a simple ring anterior to setiger 1 (Fig. 27B).

Parapodia reduced throughout, with setae arising directly from body wall; notopodia with a single short lamella or papilla arising near base of notosetae (Figs. 26G, 27C); neuropodia with an elongate fingerlike neuropodial lamella medial to setal fascicle (Fig. 26H, 27C); both podial lamellae present from setiger 1 to posterior end; most notopodial lamellae short with apical notch producing a bifid tip (Fig. 27C). Setae all capillaries arranged in spreading fascicles; notopodia with no more than 4–5 capillaries; neuropodia of anterior setigers with 10–12 capillaries, generally longer than those of notopodia.

Pygidium with a pair of ventral rounded lobes lateral to anal opening; each with surface covered with numerous small papillae (Figs. 26C, 27D); anal opening bordered dorsally by pair of rounded lobes (Fig. 27D), anal cirri absent.

Remarks. *Axiokebuita oculata* **sp. nov.** is the only one of the seven known species of the genus to have prostomial eyes. These eyes are large, prominent, and clearly exhibit a dark reddish pigment cup encompassing several large, clear cells that presumably serve as a lens. These appear to be true eyes in having a pigment cup and lens rather than eyespots that are small and uniformly pigmented. However, histological studies are needed to ascertain the nature of their morphology. In addition, the sub-oral peristomial groove is unusual and has only been observed previously on the type species, *A. millsi* (see above).

GenBank Accession Number: PQ468463 for mitochondrial cytochrome c oxidase subunit I (COI); from **paratype** (SIO-BIC A18596).

Etymology. The epithet *oculata* is from the Latin, *oculatus*, for eye, in reference to large red lensed eyes present on this species.

Distribution. E North Pacific Ocean, off Costa Rica, Las Gemelas Seamount, on rock, 243 m.

Axiokebuita shackletoni new species

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Figure 28–29

Kebuita minuta: Blake, 1981: 1153–1154, fig. 11a–b (in part).

Axiokebuita minuta: Parapar *et al*. 2011: 150–159, figs. 2–8 (in part, Fig. 8 only).

Material examined. (*24 specimens*) **Southern Ocean, Antarctica, Weddell Sea, abyssal plain off Cape Norvegia**, R/V *Polarstern*, ANDEEP III, Cruise XXII-3, **Sta. 80-9**, coll. A; Brandt, 23 Feb 2005, EBS, 70.640831°S, 14.714330°W, 4928 m, **holotype** (ZMH-ANN-030783) and 5 **paratypes** (ZMH-ANN-P26966). **Sta. 81-8**, coll. 24 Feb 2005, EBS, 70.50133°S, 14.58033°W, 4419 m, 1 **paratype** (ZMH-ANN-P26967).—**Weddell Sea, abyssal plain off Antarctic Peninsula**, R/V *Polarstern*, ANDEEP II Cruise ANT XIX-4, **Sta. 131-3**, coll. J.A. Blake, 05 Mar 2002, EBS, 65.330498°S, 51.527°W, 3049–3050 m, 3 **paratypes** (ZMH-ANN-P6457).—**Scotia Sea**, **South Sandwich Islands,** R/V *Polarstern*, ANDEEP II Cruise ANT XIX-4, **Sta. 139-10**, coll. J.A. Blake, 21 Mar 2002, BC, 58.238°S, 24.349°W, 3925 m (1, MCZ IZ 171908). **Sta. 141-10**, coll. A. Brandt, 23 Mar 2002, EBS, 58.417999°S, 25.012831°W, 2258–2313 m (11, ZMH-ANN-P26458).—**Scotia Sea, off South Orkney Islands,** R/V *Polarstern*, ANDEEP III, Cruise XXII-3, **Sta. 150-6**, coll. A. Brandt, 20 Mar 2005, EBS, 61.818829°S, 47.4585°W, 1970 m (2, ZMH-ANN-P26964).

Description. A medium sized species, body elongate, sausage-shaped, thickened and robust throughout, weakly expanded in anterior and/or posterior setigers (Fig. 28A); with up 22–24 setigers. Body rounded in cross section, without dorsal or ventral grooves, but venter with a thin mid-ventral white line extending along most of body, not producing ridge or groove, likely representing ventral nerve cord. Holotype (ZMH-ANN-030783) complete, 8.5 mm long, 1.8 mm wide with 22 setigers; largest complete paratype (ZMH ANN-P26967) 11 mm long, 1.2 mm wide with 22 setigers; other complete paratypes include (ZMH-ANN-P6457) 10.5 mm long and 2.2 mm wide with 22 setigers, and another from same sample 9.5 mm long and 1.2 mm wide with 24 setigers. Individual segments with 3–4 rows of annular rings across dorsum from about setigers 3–4 (Figs. 28A–B, 29A); setigers 1– 3 with annular rings only weakly developed; most of body with a quadriannulate pattern; individual rows along most body of without distinct raised pads or blocks; these evident only in pre-pygidial segments (Fig. 29C). Color in alcohol white to grey.

Prostomium pentagonal in overall shape (Figs. 28B, 29A) with broad anterior margin bearing two thick subterminal lateral horns that taper to a narrow, rounded tip, each with fine cilia evident along margins; eyespots absent; nuchal organs not emergent on any specimen. Dorsal surface of prostomium with posterior lateral margins elevated into a V-shaped ridge separating surface into anterior and posterior parts (Figs. 28B, 29A); this narrow ridge extending posteriorly into a mid-

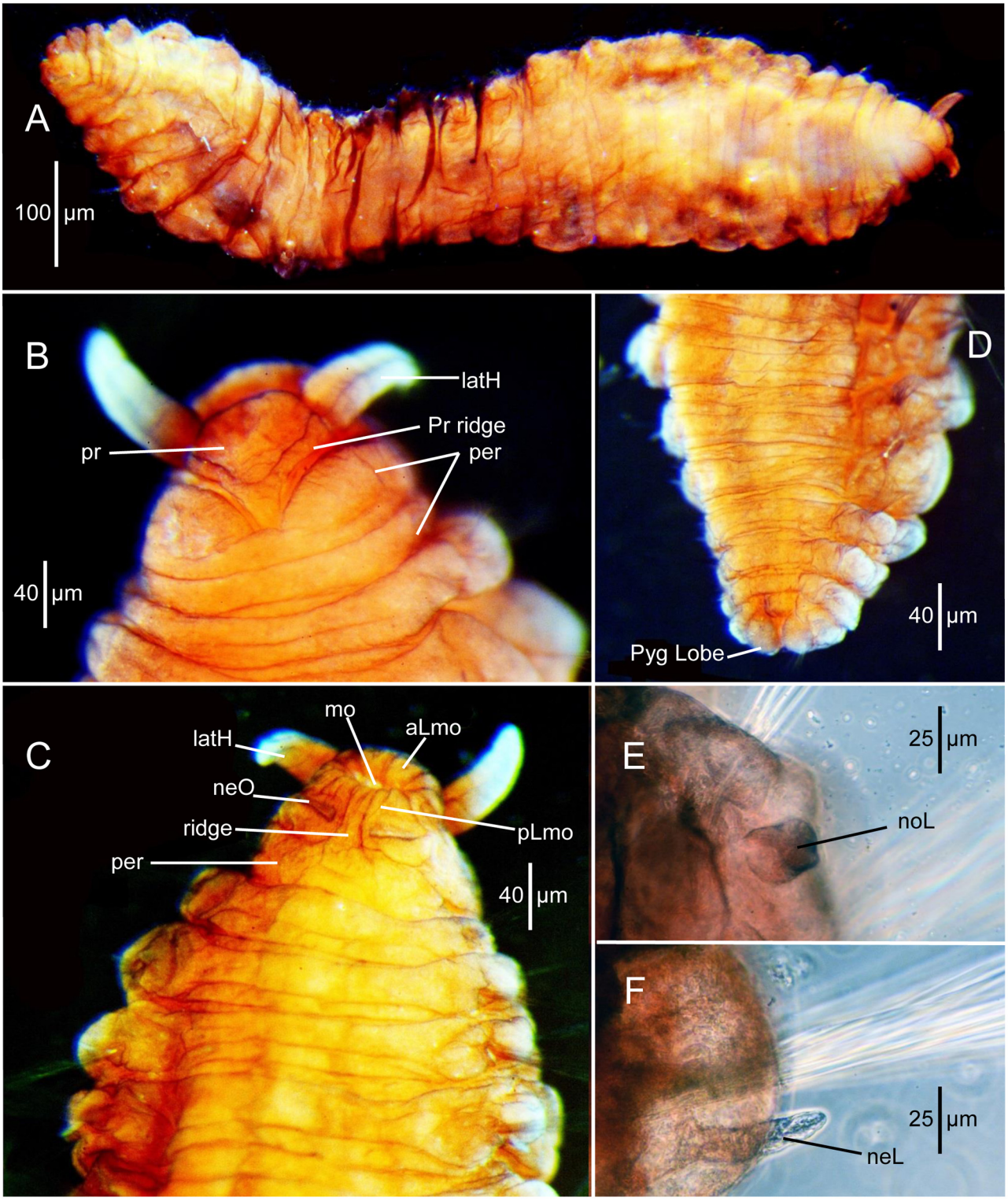

FIGURE 28. *Axiokebuita shackletoni* **sp. nov.** Holotype (ZMH-ANN-030783): A, entire worm, dorsal view; B, anterior end, dorsal view; C, anterior end, ventral view; D, posterior end, ventral view; E, notopodium, posterior setiger; F, neuropodium, posterior setiger. All stained with Shirlastain A.

dorsal notch on peristomium; narrow groove separating posterior prostomial ridge from peristomium (Figs. 28B, 29A). Peristomium dorsally with two rings, anterior ring large, inflated, with deep mid-dorsal notch encompassing posterior border of prostomium; second ring narrow, about as wide as setiger 1 (Figs. 28B, 29A). Ventral surface of peristomium enlarged, with large anterior section bearing oral opening surrounded by about 12 narrow lobes, with pair of mid-ventral lobes continuing posteriorly as a ridge (Figs. 28C, 29B); pair of rounded neck organs present lateral to ridge, each with a transverse ciliated groove.

Parapodia reduced throughout, without podial lobes

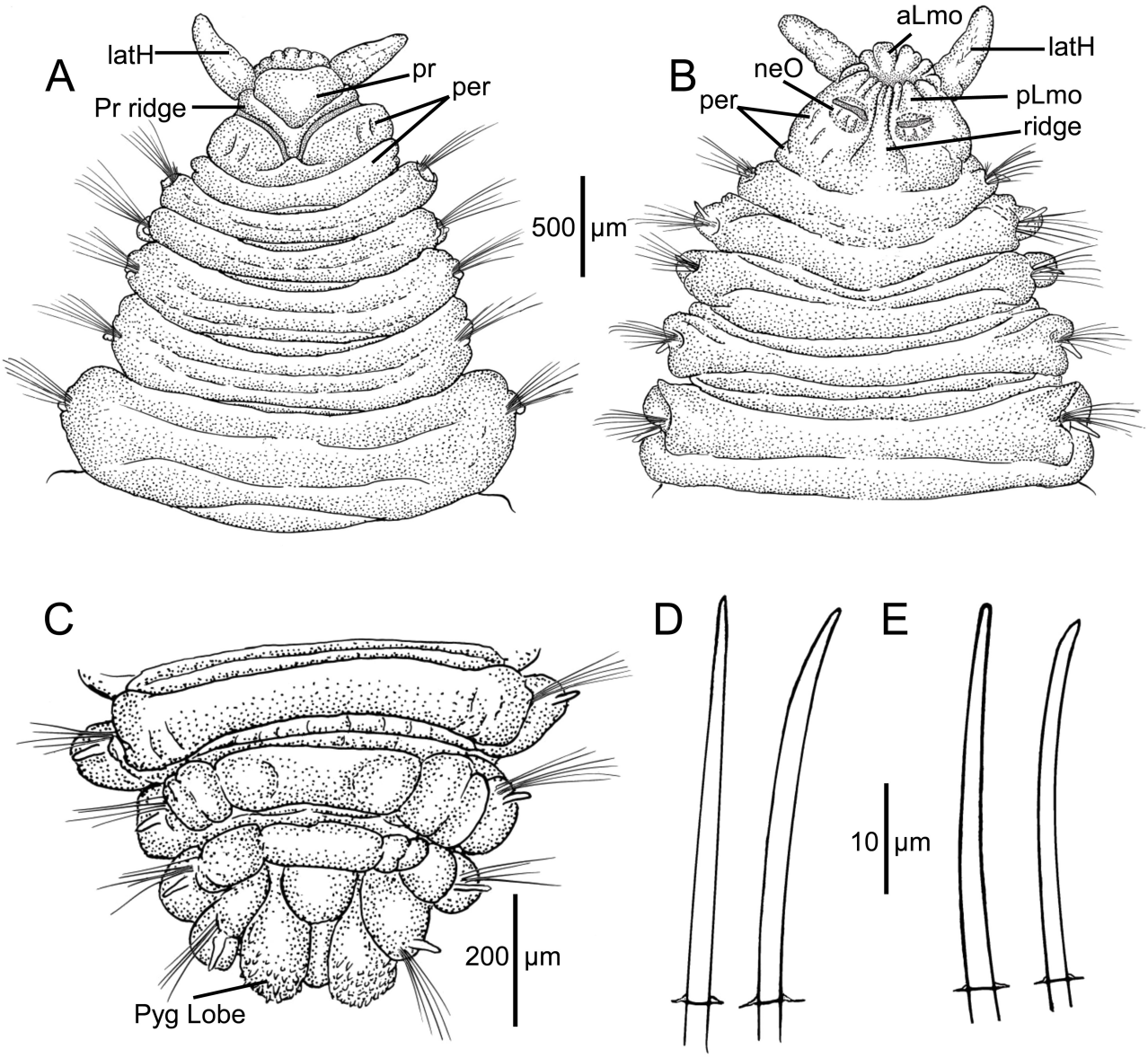

FIGURE 29. *Axiokebuita shackletoni* **sp. nov.** Holotype (ZMH-ANN-030783): A, anterior end, dorsal view; B, anterior end, ventral view; C, posterior end, ventral view; D–E, short spinous setae, setiger 1 notopodia (D), neuropodia (E).

and with setae arising directly from body wall; notopodia with a single short notopodial lamella or papilla arising near base of notosetae (Fig. 28E); neuropodia with an elongate fingerlike neuropodial lamella (Fig. 28F); both podial lamellae present from setiger 1 to posterior end; dorsal lamella reduced and difficult to observe in largest specimens, some with apical notch appearing to have a bifid tip. Setae include short spinous setae and capillaries. Capillaries arranged in spreading fascicles; 4–5 short spinous setae observed anterior to long capillaries on both noto- and neuropodia of setiger 1; each narrow, thin, tapering to blunt tip (Fig. 29D–E); similar short spinous observed on many other scalibregmatids including most species in this report.

Pygidium with a pair of ventral rounded lobes lateral to anal opening; each with surface covered with numerous small papillae (Figs. 28D, 29C); anal opening best observed dorsally, surrounded by short lobes; anal cirri absent.

Remarks. *Axiokebuita shackletoni* **sp. nov.** is a deep-sea species that was found in collections from the Antarctic surveys in the Weddell Sea and Scotia Sea that were part of the ANDEEP program. Specimens were both collected by the author and others were included among collections in the Zoological Museum in Hamburg that had been identified as *Axiokebuita minuta*. The two species are similar but differ in several respects. The most obvious difference is the presence in *A. shackletoni* **sp. nov.** of a prominent ridge between the prostomium and peristomium on the posterior lateral border of the prostomium that extends into a mid-dorsal peristomial groove. Such a ridge is not present on other species of the genus. The ventral surface of the peristomium is enlarged in both species, but *A. shackletoni* **sp. nov.** has a prominent ridge between the pair of neck organs, whereas the peristomial surface of *A. minuta* is smooth. In addition, short spinous setae are present anterior to the long capillaries on both the noto-

and neuropodia of setiger 1. Such short spinous setae are not present on the specimens of *A. minuta* available for study or any other species of the genus.

Etymology. This species from deep-water in the Weddell Sea is named in honor of Sir Ernst Shackleton (1874–1922), legendary Antarctic explorer. Shackleton's Imperial Trans Antarctic Expedition (1914–1917) became trapped by ice in the Weddell Sea, resulting in his ship the HMS *Endurance* eventually sinking, leaving all hands on the ice. Shackleton and crew man-hauled their life boats across the ice to open water, where they launched the boats, eventually landing on Elephant Island. With no hope of rescue, Shackleton and a small crew left by boat for South Georgia, where, after arriving, they trekked over the mountains to the whaling station at Grytviken where they were able to locate a vessel and eventually rescue the crew. No members of this expedition were lost despite their numerous misfortunes. Recently the location of the *Endurance* was discovered on the seafloor in the Weddell Sea upright, in relatively good condition after more than 100 years after sinking.

Distribution. Southern Ocean, Antarctica, from bathyal into abyssal depths: 1970–4928 m.

Axiokebuita verenae new species

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Figure 30

Axiokebuita millsi: Blake & Hilbig 1990: 242–243, Fig. 13. **Not** Pocklington & Fournier, 1987.

Material examined. **Northeastern Pacific Ocean, hydrothermal vents on the Juan de Fuca Ridge**, Southern Axial Seamount, Hell vent, HOV *Pisces* IV dive P-1725, slurp sample on basalt, coll., 25 Jul 1986, V. Tunnicliffe, 45.932°N, 130.013°W, 1545 m, **holotype** (NMCA 1989-0097A).

Description. A moderately-sized species, short and thickened throughout, sausage-shaped; body more or less rectangular in cross section except posterior end rounded dorsally, flattened ventrally; without dorsal or ventral grooves. Body with 21 setigers, 13.5 mm long and 3.5 mm wide across middle body segments. Individual segments uniannulate with distinct row of raised pads on first seven setigers (Fig. 30A), then individual pads not evident until last 2–3 setigers (Fig. 30B). Color in alcohol light tan.

Prostomium pentagonal, with curved frontal margin, bearing two long subterminal lateral horns (Fig. 30A); with narrow posterior lobe extending between notch in anterior peristomial ring; without eyespots; nuchal organs not observed. Peristomium with three rings dorsally, anteriormost large, smooth, encompassing prostomium and with mid-dorsal groove containing posterior extension of prostomium (Fig. 30A); two subsequent rings each with weakly developed raised pads; ventrally these three rings obscured by enlarged everted proboscis; emergent proboscis soft, smooth, lacking papillae.

Parapodia reduced, similar throughout body, with setae emerging directly from body wall; notopodia with short, papillate postsetal lamella (Fig. 30C), some with split or bifid tips; neuropodia with narrow digitate postsetal lamella (Fig. 30C). Notosetae include 10–12 long capillaries; neurosetae more numerous, including long capillaries and short spinous setae with slightly expanded tips bearing a transparent hood and finely serrated shafts in neuropodia (Fig. 30D). Furcate setae absent.

Body terminating in two large ventral lobes, each with numerous minute papillae visible only with 400x (Fig. 30B).

Remarks. *Axiokebuita verenae* **sp. nov.** is unusual in having the peristomium divided into three dorsal rings; the venter and nature of the oral morphology is obscured by the large everted proboscis. In addition, the lateral prostomial horns are larger and more elongate than in other species and for the holotype at least, are directed at right angles to the body. The serrated spinous neurosetae have not been observed in other species of *Axiokebuita*; however, they are similar to those described for *Speleobregma lanzaroteum*, a closely related genus and species from an anchialine cave on Lanzarote Island in the Canary Islands.

Etymology. This species is named for Dr. Verena Tunnicliffe, original collector of the species.

Distribution. NE Pacific, hydrothermal vents on the Juan de Fuca Ridge, 1545 m.

Genus *Hyboscolex* Schmarda, 1861

Table 3

Type species: *Hyboscolex longisetosa* Schmarda, 1861, by monotypy.

Synonyms: *Oncoscolex* Schmarda, 1861. **Type-species**: *Oncoscolex dicranochaetus* Schmarda, 1861, by monotypy. *Fide* Kudenov & Blake 1978.

Diagnosis. Body elongate, arenicoliform. Prostomium with frontal horns; eyespots present or absent. Parapodia of posterior segments without dorsal or ventral cirri; interramal papillae or lobe present or absent; postchaetal lamellae absent. Branchiae absent. Setae include capillaries, furcate setae, and sometimes a few inconspicuous short spinous setae, blunt or bifurcated among capillaries of setigers 1–2; large conspicuous acicular spines absent. Pygidium with or without anal cirri.

Remarks. Species of *Hyboscolex* lack characters that are found on other genera such as acicular spines, branchiae, or prominent podial lobes with dorsal and ventral cirri. As such the nature of the pre-setiger region, body shape, annular rings, and pygidial morphology are important. Prior to the present study, most known species were from intertidal or shallow-water depths. The only deep-water species known was *H. reticulatus* (McIntosh, 1885) from off New Zealand in 2012 m. Including the new species described herein, there are thirteen known species of *Hyboscolex* (Table 3). The following species are included in this study:

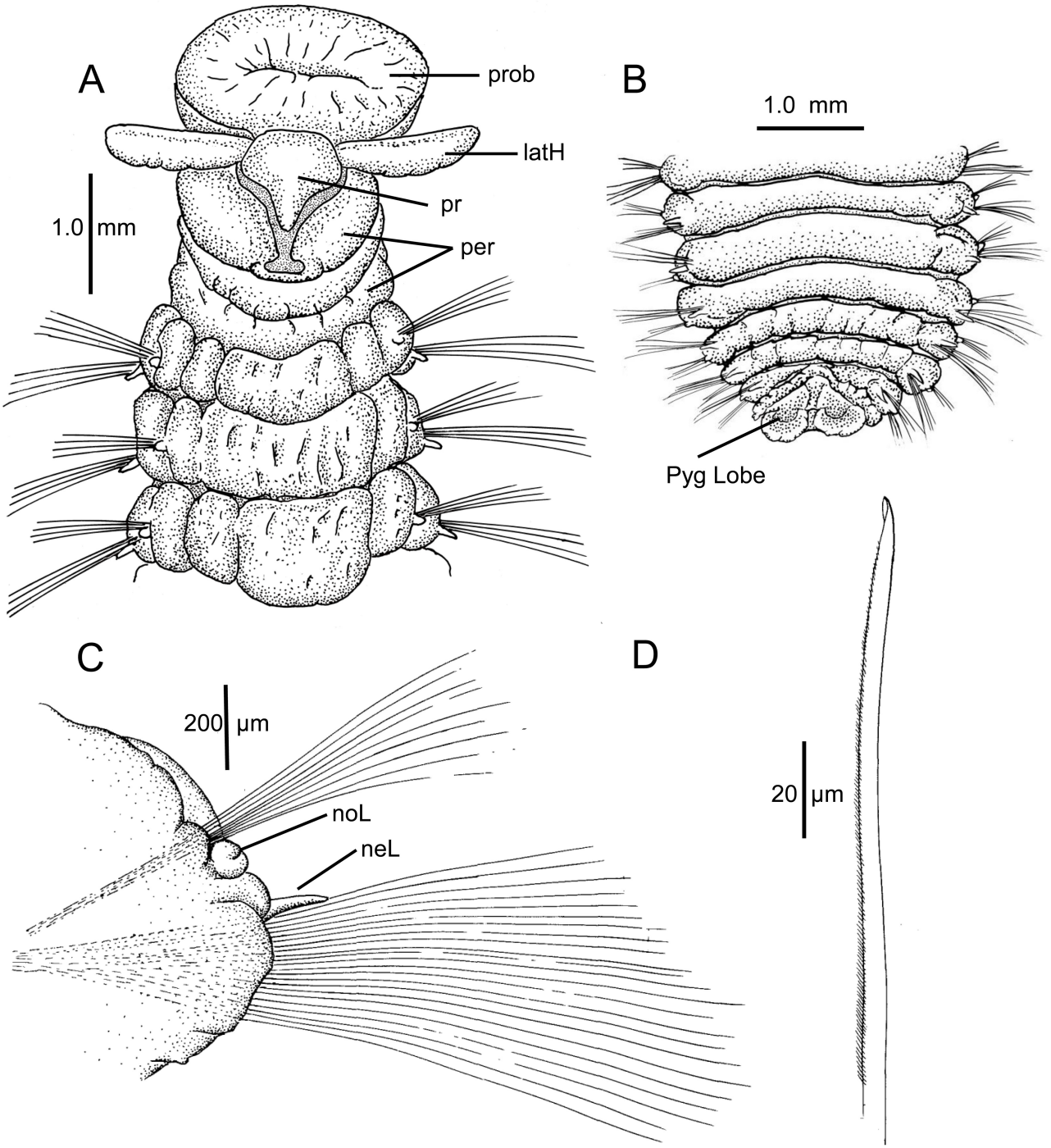

FIGURE 30. *Axiokebuita verenae* **sp. nov.** Holotype (NMCA1989-0097): A, anterior end, dorsal view; B, posterior end, ventral view; C, posterior parapodium, anterior view; D, posterior neuropodial spinous seta.

1. *Hyboscolex antarcticus* **sp. nov.** Weddell Sea, Antarctica, in abyssal depths, 4069 m.
2. *Hyboscolex ehlersi* **sp. nov.**, SE Pacific Ocean, Chile, intertidal.
3. *Hyboscolex farallonensis* **sp. nov.**, E North Pacific Ocean, off northern California, 2160–2400 m.
4. *Hyboscolex harrisae* **sp. nov.**, Sweden, Skagerrak, 50–100.
5. *Hyboscolex pacificus* (Moore, 1909), North Pacific Ocean: Costa Rica, to Canada, intertidal to shallow subtidal.
6. *Hyboscolex reesi* **sp. nov.**, Northern Gulf of Mexico, off Louisiana, 818–878 m.

TABLE 3. Morphological characters of the thirteen known species of *Hyboscolex* Schmarda, 1861[1].

Species/ Character	Prostomium	Peristomium	Furcate Setae	Eyes: Occurrence Morphology	Segmental annulations	Posterior end	Unique characters	Distribution	References
***Hyboscolex longisetosus* (Schmarda, 1861)** TYPE SPECIES	2 short lat lobes	Single smooth ring, dorsally	? present all sets; w/ unequal tynes w/ denticles	2 large ea consisting of smaller fused parts	Ant and post sets smooth; middle sets triannulate.	5 small anal cirri	Parapodia reduced; per a single narrow ring	South Africa, intertidal	Schmarda 1861;Willey 1904; Day 1967
***H. antarcticus* sp. nov.**	T-shaped, w/ 2 narrow, elongate, lat directed horns; w/ dCr	Single smooth ring, dorsally, overlapping pro dCr	Absent	Absent	Quadriannulate	Not observed	Large sausage-shaped body; absence of furcate setae; quadriannulate segments; narrow laterally directed horns	Antarctica, Weddell Sea, 4069 m	This study
***H. dicranochaetus* (Schmarda, 1861)**	T-shaped, w/ 2 short, laterally directed horns	Single smooth ring, dorsally; pLmo ventrally	Present all sets; w/ unequal tynes	2, H-shaped	Set 1–5, 30 to end biannulate; middle segments triannulate	Pyg w/ 4–6 lobes around anus; elongate cirri absent	Per a single smooth ring	Australia, widespread, intertidal	Schmarda 1861; Kudenov & Blake 1978
***H. ehlersi* sp. nov.**	Short, w/ pair of oval-shaped lateral horns	Single ring recessed into set 1 dorsally; ventrally lat single lat rings forming aLmo	From set 2; w/ unequal tynes, w/ denticles	Absent	Set 1–4 smooth; 6 to 30 triannulate; post set uniannulate	Pyg complete ring around anus; w/ short lobes, anC absent.	Pre-set region recessed into set 1; per not visible dorsally; no dorsal crest; Sp present set 1 ant to caps.	Chile, intertidal	This study
***H. equatorialis* Blake, 1981**	Short, diverging lateral lobes	Single smooth dorsal ring; not evident ventrally	From set 2; w/ unequal tynes	2 groups of small red spots	Set 4–5 biannulate; triannulate from 6 to ca. 20; then biannulate to end	Pyg w/ 4 short cirri surround anus	Per a single narrow smooth ring	Ecuador, Peru, intertidal to 10 m	Blake 1981

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TABLE 3. (Continued)

Species/ Character	Prostomium	Peristomium	Furcate Setae	Eyes: Occurrence Morphology	Segmental annulations	Posterior end	Unique characters	Distribution	References
***H. farallonensis* sp. nov.**	Oval-shaped w/ frontal horns	Single multilobed dorsal ring; ventrally obscured	From set 2; w/ unequal tynes, w/ denticles	Absent	Triannulate along entire body	Simple ring, anC absent	Per a single lobed ring w/ mid-dorsal gap	Off N California, 2350–2400 m	This study
***H. harrisae* sp. nov.**	Short lat lobes	Single multilobed ring dorsally & laterally; ventrally forming aLmo	From set 3, 2–3 per podium; w/ unequal tynes and denticles	Absent	Dorsally w/ 2 rings set 2, then 3 annular rings to end; ventrally set 1–4 smooth; triannulate from set 5 to end	Pyg w/ ring surrounding anus w/ dorsal gap; anC & lobes absent	Per a single ring w/ large lobes; eyes absent; set 3–5 w/ short, postsetal lobes in notopodia	Sweden, Skagerrak, 50–100 m	This study
***H. oculatus* (Ehlers, 1901)**	Recessed into set 1; w/ pair of triangular-shaped diverging horns	Single smooth, ring dorsally; ventrally aLmo	Absent	2 lrg triangular shaped	Ant sets triannulate, post sets biannulate	An surrounded by long furrows; anC absent	Absence of furcate setae; w/ large eyes	Chile, intertidal	Ehlers 1901 a–b; Ashworth, 1901; Blake 1981
***H. pacificus* (Moore, 1909)**	T-shaped, w/ 2 diverging lat lobes	Single smooth ring dorsally & laterally; bordering aLmo ventrally	Present, unequal tynes w/ denticles	2 pairs parallel eye spots	Set 1–2 smooth; 3–4 biannulate; then triannulate and w/ 4 annulae in middle sets; decreasing posteriorly	W/ 6–7 anC	Eyes a pair of 2 rows; 6–7 anal cirri	Costa Rica, California to British Columbia ?Japan; intertidal to shallow water.	Moore 1909; E. Berkeley 1930; Berkeley & Berkeley 1941, 1952; Hartman 1969; Blake & Ruff 2007. This study

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TABLE 3. (Continued)

Species/ Character	Prostomium	Peristomium	Furcate Setae	Eyes: Occurrence Morphology	Segmental annulations	Posterior end	Unique characters	Distribution	References
***H. quadricinctus* Kudenov, 1985**	Two forwardly diverging lat horns	Single smooth ring dorsally; fused w/ set 1 ventrally	Present all sets; w/ unequal tynes	2 pairs parallel eyespots in diverging rows	Set 2–4, 27–43 biannulate, 5–6 triannulate, 7–26, quadriannulate	W/ 4–6 anC	Capillaries hirsute; per a single smooth ring	Gulf of Mexico, off E Florida, intertidal to 30 m.	Kudenov 1985
***H. reesi* sp. nov.**	Short, semi-circular w/ 2 narrow frontal horns; w/ post dorsal crest	Single smooth ring dorsally; ventrally forming aLmo	From set 2–3, w/ unequal tynes w/ denticles	Absent	Reduced, pads not apparent; 1–5 smooth; 6–20 biannulate; rest triannulate	Ring surrounding anus; anC absent	Reduced annular rings; short dorsal pro crest; mouth w/ numerous lobes	Gulf of Mexico, off Louisiana, 818–878 m	This study
***H. reticulatus* (McIntosh, 1885)**	Two lateral horns; w/ dorsal crest	A single smooth dorsal ring; ventral not observed	Present, long shaft, protruding	Absent	Set 1–5 uniannulate; from set 6 biannulate; post set ?	AnC absent	Parapodial lobes not evident until mid-body; absence of anC.	Off New Zealand, 2012 m.	McIntosh 1885
***H. verrucosa* Hartmann-Schröder, 1979**	Retracted, directed ant as small lobe surrounded by per; w/ 2 small ant lat lobes ?horns	Single ring in 2 parts dorsally and 2 ventrally as aLmo	From ca. set 16; ea w/ one tyne very short, 1/3 length of long tyne; w/ denticles	Absent	W/ 3 raised pigmented bands per seg	Pyg bulbous with 4 short cirri	Body maggot-like w/ pro & Per reduced & directed ant; furcates ea w/ 1 very short tyne	W. Australia, Pt Hedland & Broome, Intertidal	Hartmann-Schröder, 1979

[1.] *Hyboscolex homochaetus* (Schmarda, 1861) is not included due to lack of morphological detail and no subsequent reports.

Abbreviations: an, anus; aLmo, anterior lip of mo; anC, anal cirri; ant, anterior; C, capillaries; ca., about; dCr, dorsal crest; ea, each; lat, lateral or laterally; lrg, large; per, peristomium; pig, pigment(ed); pLmo, posterior lip of mouth; post, posterior; pro, prostomium; pyg, pygidium; seg(s), segment(s); set, setiger(s); Sp, short spinous setae; w/, with; wo/ without.

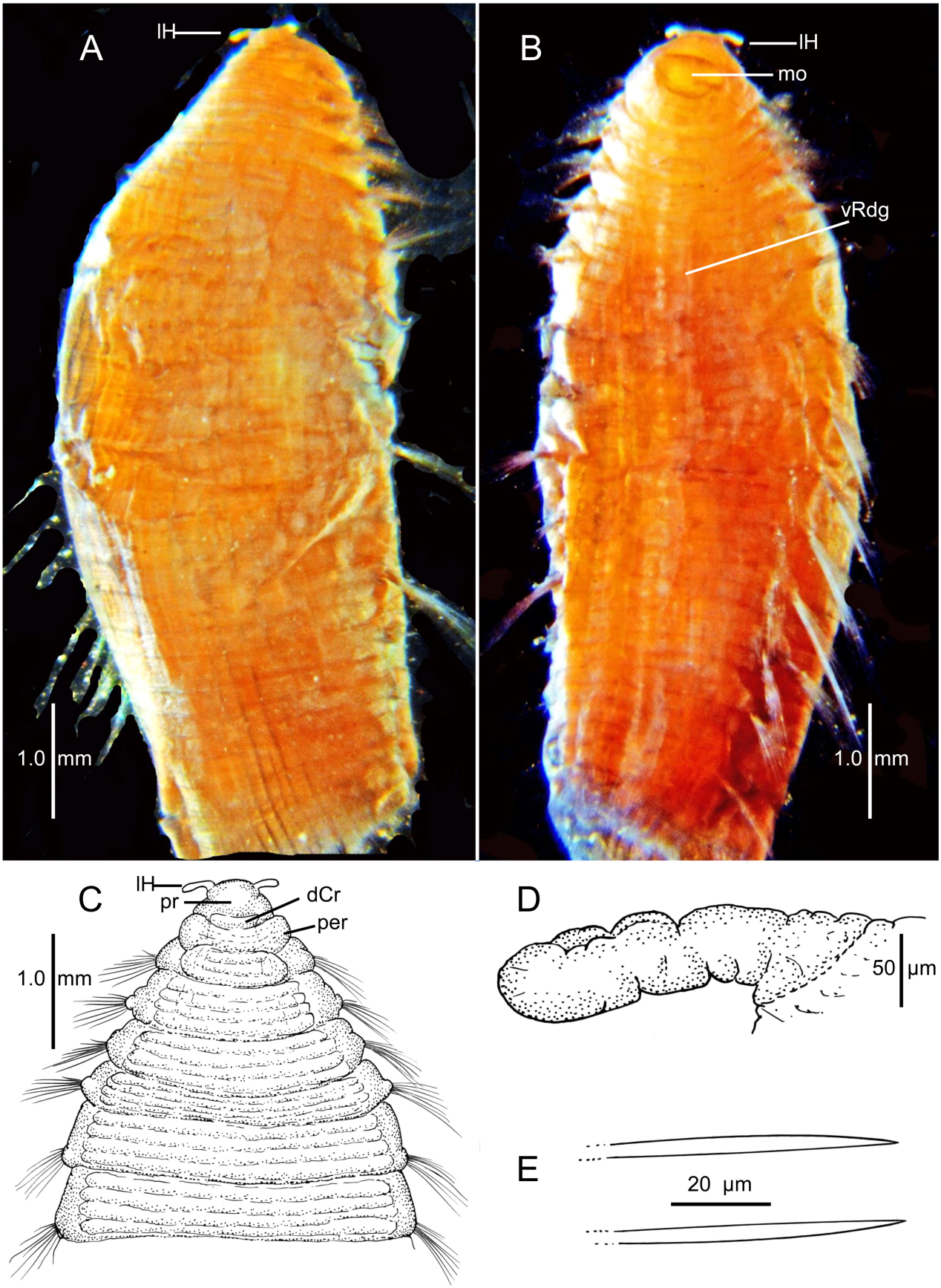

FIGURE 31. *Hyboscolex antarcticus* **sp. nov.** Holotype (ZMH-ANN-030784): A, anterior end, dorsolateral view; B, anterior end, ventral view; C, anterior end, dorsal view; D, left lateral antenna or horn; E, short spinous setae, notopodia setiger 1. A–B, stained with Shirlastain A.

***Hyboscolex antarcticus* new species**
urn:lsid:zoobank.org:act:8B4A571C-848A-4E14-99AA-6D458FDAD057
Figure 31

Material examined. Southern Ocean, **Weddell Sea, abyssal plain West of Antarctic Peninsula, R/V *Polarstern*, ANDEEP II Cruise ANT XIX-4, Sta. 134-4**, coll. A. Brandt, 09 Mar 2002, EBS, 65.2700°S, 48.06350°W, 4069 m, **holotype** (ZMH-ANN-030784) and 2 **paratypes** (ZMH-ANN-P26459).

Description. A potentially large species, all specimens incomplete with posterior segments torn away; holotype with 14 setigers, 10 mm long, and 2.8 mm wide across setiger 8; large paratype of a similar size. Body large, sausage shaped (Fig. 31A–B); rounded dorsally, somewhat flattened ventrally; venter with mid-ventral ridge produced by paired medial blocks (Fig. 31B). Annular rings present from setiger 1 triannulate, rest quadriannulate (Fig. 31C); rings with individual blocks not apparent dorsally with ring being a continuous low ridge (Fig. 31C); venter similar but with raised blocks more apparent. Parapodia reduced to short, rounded lobes, appearing rounded in cross section and narrow and triangular in dorsal or ventral view; postsetal lobes or lamellae absent; dorsal and ventral cirri absent. Distinct ciliated interramal papilla or sense organ present along most of body. Setae emerging directly from podial lobes. Color in alcohol opaque white.

Prostomium short, semi-circular, about as wide as long (Fig. 31C); anterior margin with two narrow lateral horns (Fig. 31A, C), each with 3–4 lobes (Fig. 31D); a short transverse dorsal crest present anterior to peristomium (Fig. 31C); eyespots absent; nuchal organs not observed. Peristomium a single smooth ring posterior to prostomium dorsally, overlapping prostomial crest (Fig. 31C); ventrally encompassing mouth; oral opening oval (Fig. 31B), surrounded by about 10 elongate lobes; proboscis not everted on any specimen.

Setae include simple capillaries and short spinous setae; acicular spines and furcate setae absent. Six to eight short spinous setae present anterior to first row of capillaries on setiger 1; these narrow, sharply pointed (Fig. 31E). Capillaries long, relatively smooth, in dense fascicles of 50 or more on holotype and large paratype; smaller paratype with fewer setae.

Posterior end and pygidium not observed.

Remarks. *Hyboscolex antarcticus* **sp. nov.** was discovered among samples provided by the Zoological Museum of Hamburg that had originally been identified as *Axiokebuita minuta*. Among 12 known species of *Hyboscolex, H. antarcticus* **sp. nov.** is the first species from abyssal depths (4069 m) and only the second to lack furcate setae. The two other species of *Hyboscolex* that occur in deep water are *H. farallonensis* **sp. nov.** from off northern California in 2160–2400 m and *H. reticulatus* (McIntosh, 1885) from off New Zealand in 2012 m. The only other species reported to lack furcate setae is *H. oculatus* (Ehlers, 1901a) from the intertidal zone in Chile. *Hyboscolex antarcticus* **sp. nov.** is readily recognized by the large, sausage-shaped body and quadriannulate annular rings on all segments from setiger 2.

Etymology. The name *antarcticus* is based on the species being collected from the seas surrounding the continent of Antarctica.

Distribution. Southern Ocean, Weddell Sea, in abyssal depths, 4069 m.

***Hyboscolex ehlersi* new species**
urn:lsid:zoobank.org:act:968A275B-F6F2-4471-BDEE-60AB6A21EFC6
Figures 32–33

Material examined. **SE Pacific Ocean, Chile, Lund University Chile Expedition (1948–1949)**: **Chile, Golfo de Ancud,** Isla Quenu, Punta Pinto, western side, coll. 16 Dec 1948, **Sta. M22**, 41.821°S, 73.171°W, intertidal, rocks in sand, **holotype** (SMNH type-9921).

Description. A moderately sized species, holotype 14 mm long, 0.8 mm wide, with about 78 setigers. Body elongate, with anterior segments slightly wider than middle and posterior segments; posterior segments tapering to narrow posterior end (Fig. 32A). Body rounded in cross section without longitudinal dorsal or ventral grooves or ridges. Setigers 1–4 generally smooth both dorsally and ventrally, setiger 5 with two distinct annular rings dorsally, triannulate ventrally (Figs. 32B, 33A–B); setiger 6 dorsally triannulate, each ring with raised pads (Figs. 32B, 33A–B), continuing to about setiger 30, thereafter segments with only a single smooth ring; each segment separated by a deep groove. Parapodia of anterior setigers reduced, with setae appearing to arise directly from body wall; from about setiger 7 or 8, setae arising from a depression or notch between a pair of swollen mounds; noto- and neuropodia best seen in lateral view, most prominent in middle body segments (Fig. 32A); separate parapodial cirri entirely absent. Color in alcohol tan.

Pre-setiger region recessed into setiger 1 (Fig. 33A), best seen in frontal or ventral view (Fig. 33B). Prostomium short, semi-circular, with slightly curved transverse anterior border bearing a pair of short oval-shaped frontal horns; eyespots absent; nuchal organs not observed. Peristomium a single smooth narrow ring posterior to prostomium (Fig. 33B) not visible dorsally where recessed into setiger 1 (Fig. 33A); ventrally surrounding prostomium and forming anterior lip of mouth; oral opening a transverse slit bordered anteriorly by 9–10 indistinct lobes and posteriorly by about nine narrow lobes (Fig. 33B); proboscis not observed.

Setae include simple capillaries along entire body, furcate setae from setiger 2, and short spinous setae anterior to capillaries on setiger 1; acicular spines entirely absent. Capillaries long, smooth (Fig. 33C), numbering about 7–10 per fascicle and with 3–4 short furcate setae anterior to capillaries. Furcate setae each with long tapering tyne and a shorter second tyne; each tyne with short denticles on inner edge directed toward opposite tyne (Fig. 33E). Short spinous setae on setiger 1 numbering about 4–5 per fascicle, about as thick as capillaries (Fig. 33D).

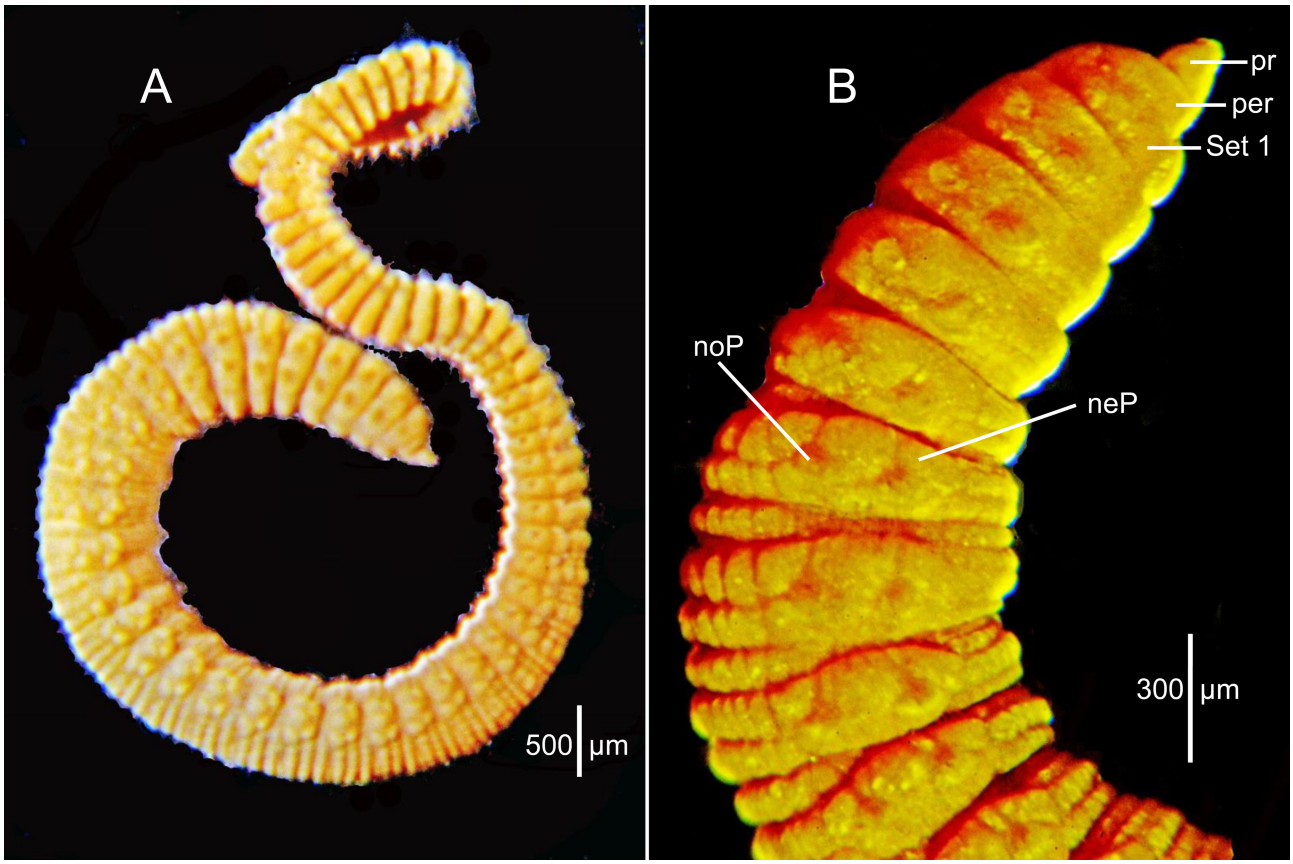

FIGURE 32. *Hyboscolex ehlersi* **sp. nov.** Holotype (SMNH type-9921): A, entire worm, right lateral view; B, anterior end, right lateral view. Stained with Shirlastain A.

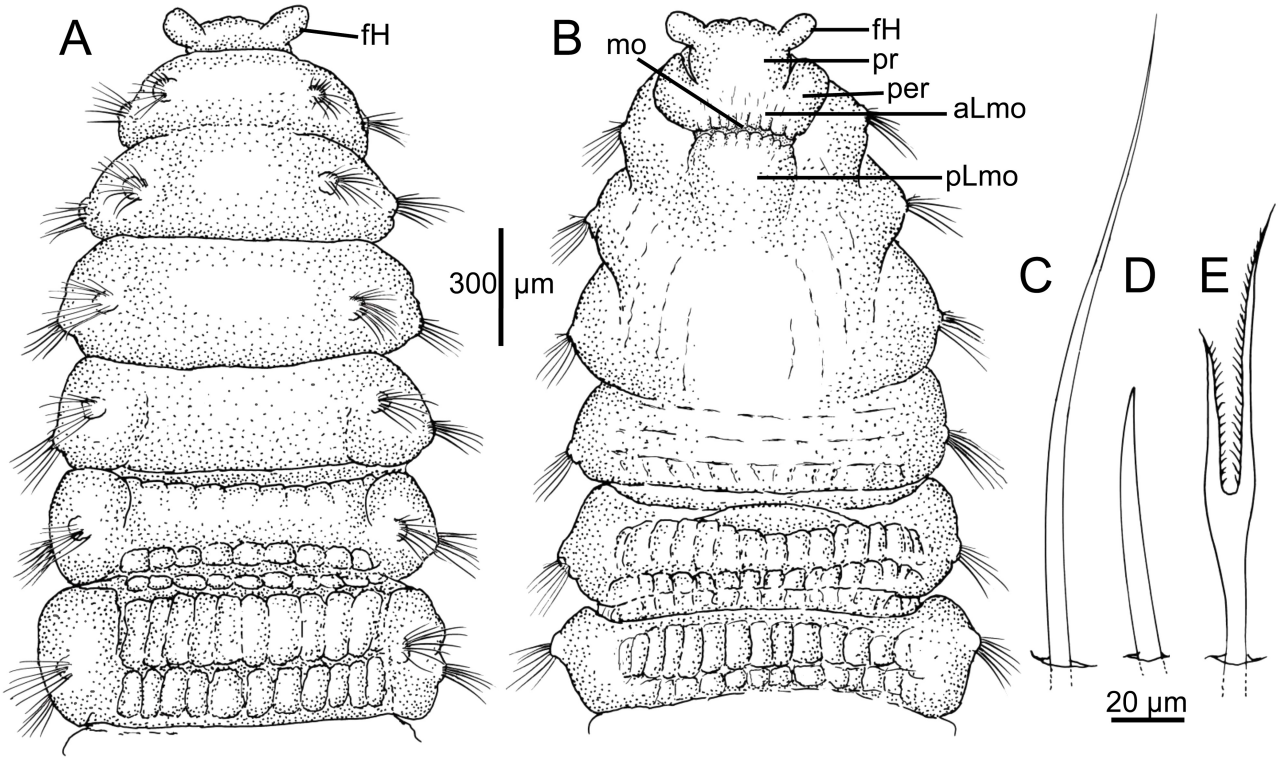

FIGURE 33. *Hyboscolex ehlersi* **sp. nov.** Holotype (SMNH type-9921).: A, anterior end, dorsal view; B, anterior end, ventral view; C, capillary seta, setiger 1; D, short spinous seta anterior to capillaries, setiger 1; C, furcate seta, setiger 2, neuropodium.

Pygidium a narrow complete ring surrounding anal opening; with short lobes, anal cirri absent.

Remarks. Details of collection and hydrographic data of the Lund University Chile Expedition were reported by Brattström & Dahl (1951). Initially this specimen was thought to represent *Hyboscolex oculatus* (Ehlers, 1901a), also known from Chilean waters. However, Ehlers (1901b) provided an excellent account of the species and the lack of eyespots in the present specimen resulted in a more careful comparison with his original description. Ehlers (1901b) was very clear in stating that he was unable to find furcate setae on his specimens. He certainly knew about furcate setae having provided considerable detail about them in his earlier description of *Asclerocheilus glabrus* (as *Eumenia glabra* Ehlers, 1887). In contrast, the present specimen has 3–4 furcate setae in the noto- and neuropodia from setiger 2. In addition, short spinous setae are present anterior to the capillaries on setiger 1; these are typically considered to be homologs of the furcate setae that occur in a similar position on following setigers (Mackie 1991). The only other species of *Hyboscolex* from shallow waters that lacks eyespots is *H. harrisae* **sp. nov.** from Sweden in 50–100 m; that species has furcate setae from setiger 3 instead of setiger 2 as in *H. ehlersi* **sp. nov.** Other species are from deep-sea habitats.

Etymology. This species is named for Professor Ernst Heinrich Ehlers (1835–1925), prominent German zoologist and polychaete systematist. He was a Professor at the University of Göttingen and prepared monographs on polychaetes of coastal Chile and Patagonia.

Distribution. Southeastern Pacific Ocean, Chile, intertidal.

Hyboscolex farallonensis new species

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Figures 34–35

Material examined. (*4 specimens*) **Eastern North Pacific Ocean, Continental slope off northern California,** west of Farallon Islands, SF-DODS Benthic Monitoring Program, R/V *Point Sur*, **Sta. 33**, coll. J.A. Blake, 20 Oct 2000, 37.7°N, 123.45°W, 2400 m, **holotype** (LACM-AHF Poly 14834); 1 **paratype** (LACM-AHF Poly 14835). R/V *Point Sur*, **Sta. 50**, coll. J.A. Blake, 24 Sep 2002, 37.716°N, 123.432°W, 2160 m, 1 (CASIZ 245240). R/V *Oceanus*, **Sta. 52**, coll. J. Nakayama, 19 Oct 2018, 37.717°N, 123.467°W, 2350 m, 1 **paratype** (CASIZ 245241).

Description. A small species, sausage shaped, holotype complete with 23 setigers, 4.5 mm long, widest 1.38 mm at about setiger 10. Body generally thickened throughout, narrowest at anterior and posterior ends (Fig. 34A). Body generally rounded dorsally and flattened ventrally in cross section; venter with mid-ventral groove, best developed along posterior setigers.

Body with distinct annular rings evident from setiger 2 along entire body with ring pattern basically triannulate (Fig. 35A); however, annular rings largely obscured over expanded middle and posterior sections where epidermis becomes stretched and thin. Parapodia of anterior setigers distinct mounds along most of body, best developed, becoming triangular, in posterior setigers with distinct rounded interramal ciliated sense organ present between noto- and neuropodia (Fig. 35B); separate parapodial cirri entirely absent. Color in alcohol tan.

Prostomium oval shaped, with a slightly curved transverse anterior border bearing a pair of elongate frontal horns directed anteriorly (Figs. 34B, 35A), narrowing posteriorly, merging with peristomium; eyespots absent; nuchal organs not observed. Peristomium a single ring posterior and lateral to prostomium dorsally, with two lobes on either side separated medially by narrow furrow (Fig. 35A). Details of ventral side and oral structure obscured by everted proboscis, but transparency of everted proboscis on holotype suggests anterior and posterior lips of mouth with short lobes (Fig. 34B).

Setae include simple capillaries along entire body, furcate setae from setiger 2; short spinous setae anterior to capillaries on setiger 1 not observed; acicular spines entirely absent. Capillaries number about 7–10 per fascicle; 3–4 short furcate setae anterior to capillaries, furcate setae each with long tapering tyne and a slightly shorter second tyne; each tyne with short denticles on inner edge directed toward opposite tyne (Fig. 34C).

Pygidium a narrow ring surrounding anal opening; anal cirri absent.

Remarks. Among the 13 known species of *Hyboscolex*, only four are found in deep water: *A. antarcticus* **sp. nov.** from the Weddell Sea (abyssal depths of 4069 m), *A. farallonensis* **sp. nov.** from off Northern California (2300–2400 m), *H. reesi* **sp. nov.** from off Louisiana in the Gulf of Mexico (818–878 m), and *H. reticulatus* McIntosh, 1885 from off New Zealand (2012 m). Of these, *H. farallonensis* **sp. nov.** is the only one to have triannulate segments along the entire body and a multilobed instead of entire dorsal peristomium. *Hyboscolex harrisae* **sp. nov.** from shelf depths in the North Sea of Sweden also has a multilobed peristomium, but that species has short lateral lobes on the prostomium instead of distinct frontal horns and furcate setae from setiger 3 instead of setiger 2.

Etymology. The epithet *farallonensis* is derived from the sample location on the continental slope off Northern California, west of the Farallon Islands.

Distribution. Eastern North Pacific Ocean, off northern California, 2160–2400 m.

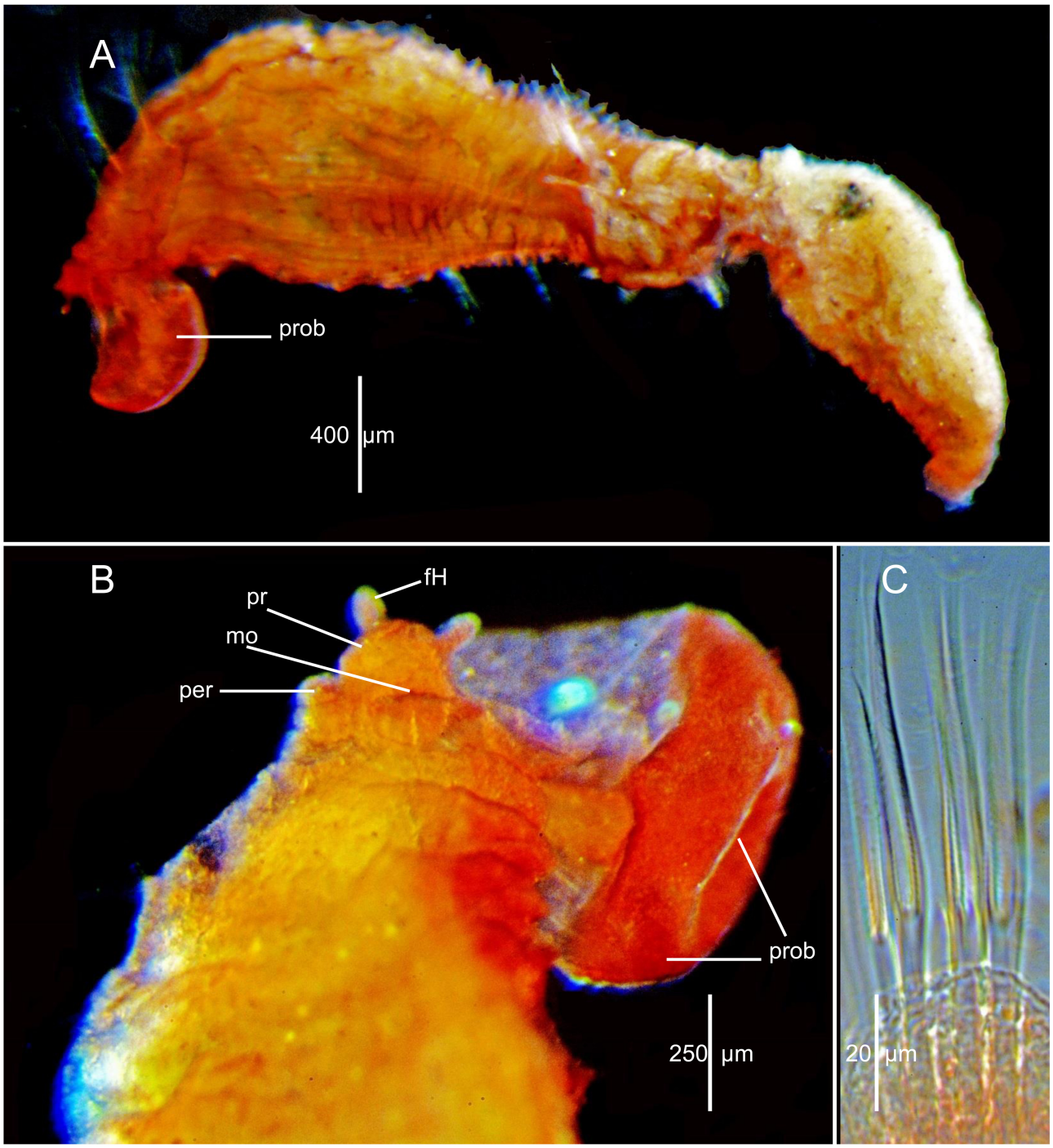

FIGURE 34. *Hyboscolex farallonensis* **sp. nov.** Holotype (LACM-AHF Poly 14834): A, entire worm, right lateral view; B, anterior end, ventral view; C, furcate setae from mid-body setiger. A–B stained with Shirlastain A.

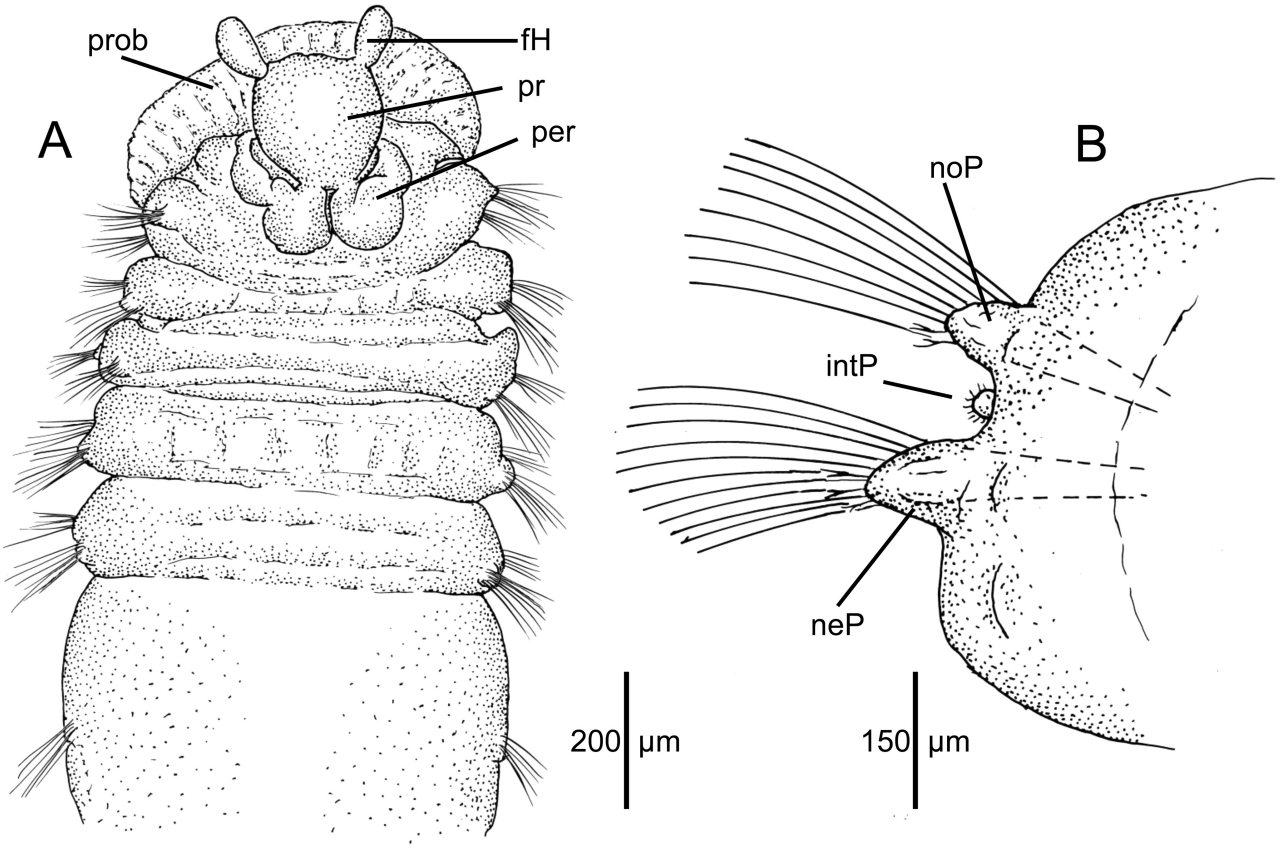

FIGURE 35. *Hyboscolex farallonensis* **sp. nov.** Paratype (Sta. 52, CASIZ 0000): A, anterior end, dorsal view; B, posterior setiger, posterior view.

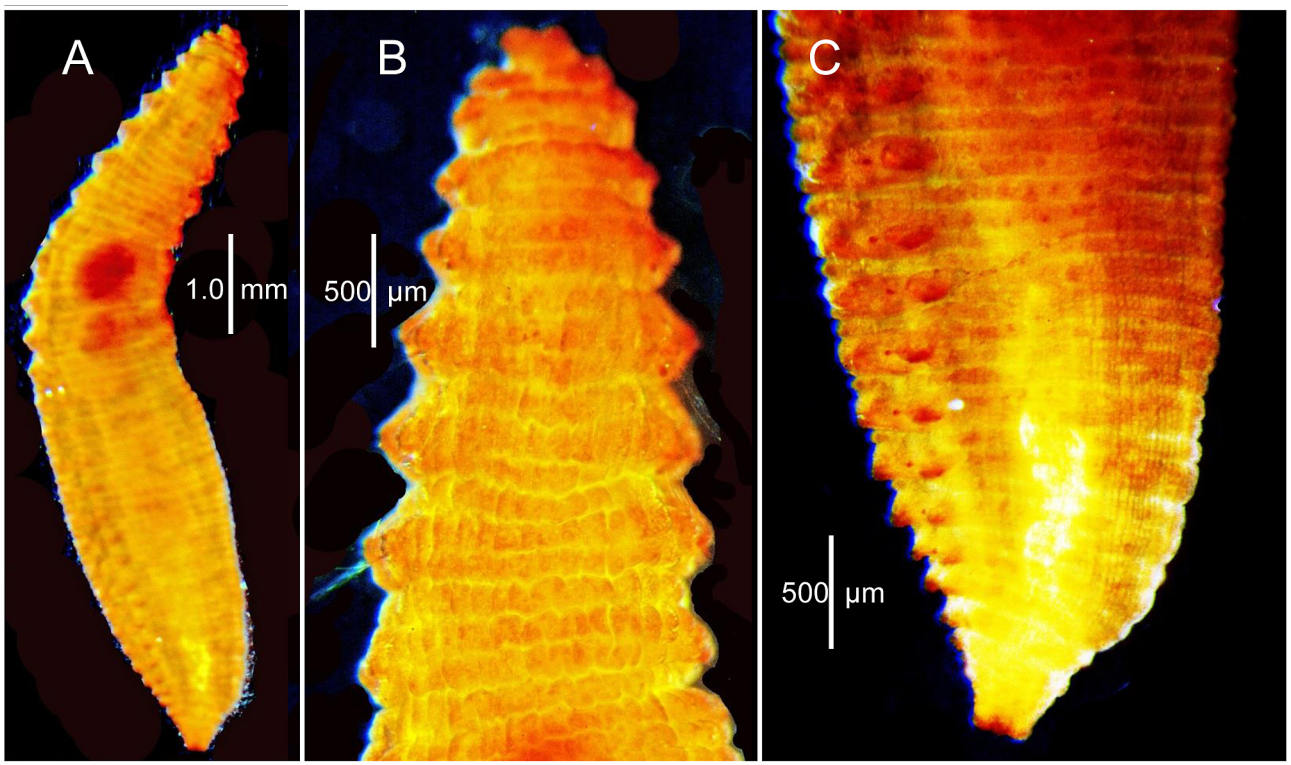

FIGURE 36. *Hyboscolex harrisae* **sp. nov.** Holotype (LACM-AHF Poly 13307): A, entire worm, dorsolateral view; B, anterior end, dorsal view; C, posterior end, dorsal view. Stained with Shirlastain A.

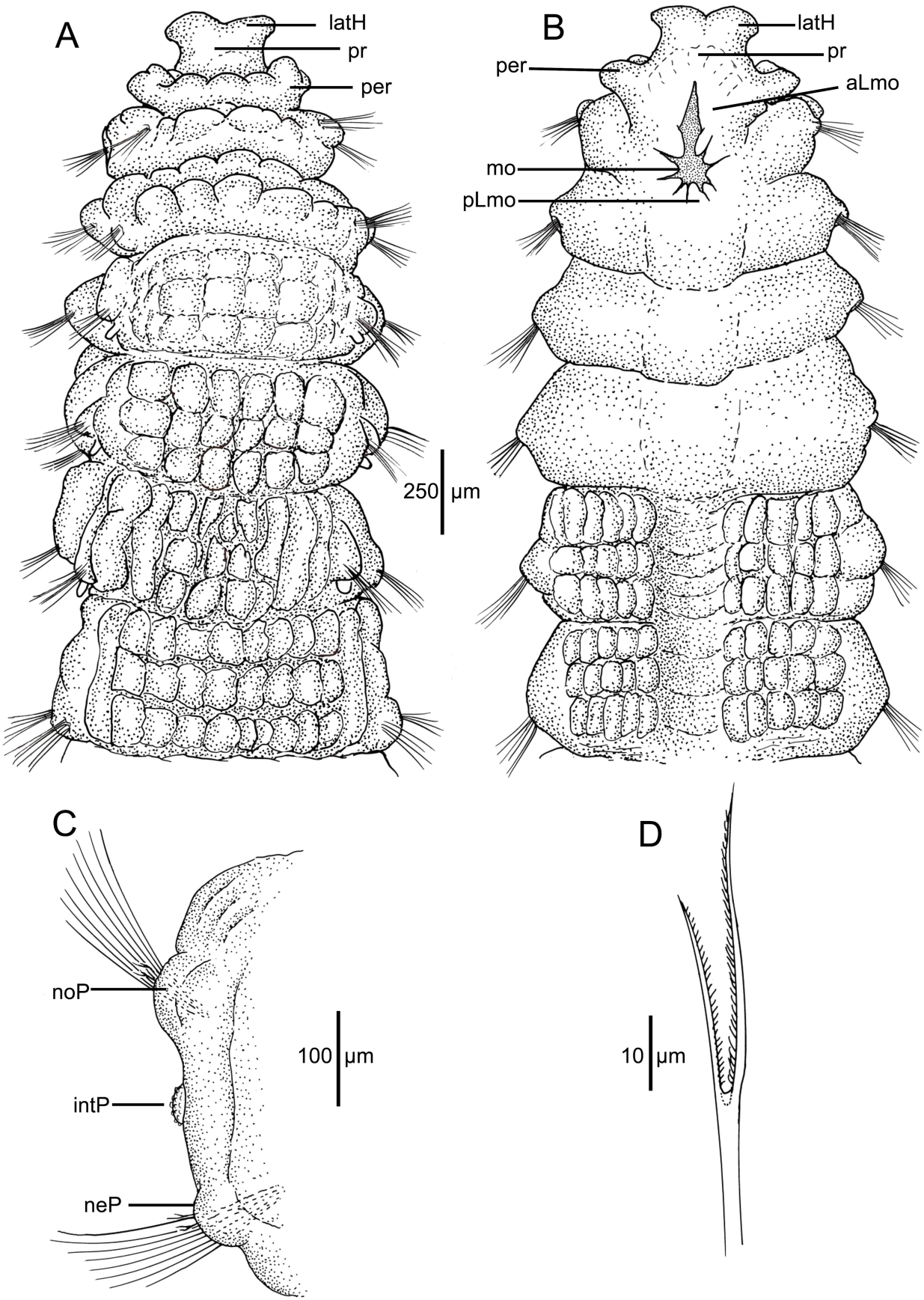

FIGURE 37. *Hyboscolex harrisae* **sp. nov.** Holotype (LACM-AHF Poly 13307): A, anterior end, dorsal view; B, anterior end, ventral view; C, posterior parapodium, anterior view; D, furcate seta, mid-body setiger.

Hyboscolex harrisae new species

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Figures 36–37

Material examined. **Northeastern Atlantic Ocean, North Sea, Sweden,** Västra Götaland County, Skagerrak, Kosterfjord, off Tjarno Marine Station: coll. 03 Apr 2002, L.H. Harris & A. Nygren, R/V *Nereus*, biological dredge, **Sta. LH-Tjarno 3**, 58.882°N, 11.095°E to 58.882°N, 11.098°E, 50–100 m, **holotype** (LACM-AHF Poly 13307).

Description. A small species, holotype complete, sausage-shaped (Fig. 36A), with 33 setigers, 7.4 mm long, 0.9 mm wide across setiger 3, 1.4 mm wide across thickened middle body section. In cross section, body generally rounded dorsally, flattened ventrally with distinct mid-ventral groove from setiger 5 to near posterior end (Fig. 37B). Dorsal surface with one annular ring on setiger 1, two rings on setiger 2 and three rings across setiger 3, continuing with three rings to near posterior end (Figs. 36B, 37A); ventrally, setigers 1–4 smooth, lacking annular rings; then triannulate from setiger 5 to near posterior end (Fig. 37B); venter with annular rings interrupted by mid-ventral groove continuing posteriorly. Parapodia swollen elongate mounds along most of body (Fig. 37C), with setae emerging directly from these; best seen in lateral view; interramal papillae (Fig. 37C) present from anterior setigers to posterior end; parapodial cirri entirely absent. Notopodia with short postsetal lobes present on setigers 3–5, otherwise postsetal lobes absent on remaining notopodia and all neuropodia. Color in alcohol light tan.

Prostomium with an anterior transverse ridge extending laterally, bearing a pair of short lateral horns (Fig. 37A–B); eyespots absent; nuchal organs not observed. Peristomium a single narrow multilobed ring posterior to prostomium with 5–6 lobes on dorsal surface (Fig. 37A); mid-ventrally encompassing mouth; oral opening surrounded by nine lobes (Fig. 37B); proboscis not observed.

Setae include simple capillaries and furcate setae; acicular spines and short spinous setae entirely absent. Capillaries numbering about 7–10 per fascicle, with 2–3 short furcate setae anterior to capillaries. Furcate setae from setiger 3; each with long tapering tyne and shorter second tyne; each tyne with short denticles on inner edge directed toward opposite tyne (Fig. 37D).

Pygidium with a dorsally incomplete ring surrounding anal opening; anal cirri absent (Fig. 36C).

Remarks. *Hyboscolex harrisae* **sp. nov.** is the first species of the genus to be described and named from European waters and is only the second known species of the genus to have a multilobed peristomial ring, the first being *H. farallonensis* **sp. nov.** from deep-water off northern California (see above and Table 3). These two species, in addition to being separated by geography and depth, also differ in that *H. harrisae* **sp. nov.** has short lateral peristomial lobes instead of distinct frontal horns and furcate setae from setiger 3 instead of setiger 2.

Biology. According to Ms. Harris, this specimen was collected by dredge in very fine silty sediments; the net with a fine mesh also retained shells, ascidians, sea urchins, small rocks and coarse sand.

Etymology. This species is named for Ms. Leslie H. Harris, Senior Collections Manager of polychaetes at the Los Angeles County Museum of Natural History. Ms. Harris, together with Dr. Arne Nygren, collected this excellent specimen. Ms. Harris provided it to me for study.

Distribution. Sweden, Skagerrak, 50–100 m.

Hyboscolex pacificus (Moore, 1909)

Figures 38–39

Sclerocheilus pacificus Moore, 1909: 282–283, Pl.9, fig. 59; Treadwell 1914: 221; Chamberlin 1918: 179.

Oncoscolex pacificus: E. Berkeley 1930: 68; Rioja, 1941: 729; Berkeley & Berkeley 1941: 47; 1952: 59, fig. 122; Ushakov 1955: 315, fig. 116; Imajima 1961: 11–13, fig. 1; Hartman 1969: 311–312.

Oncoscolex pacificus borealis Imajima & Hartman, 1964: 304.

Hyboscolex pacificus: Blake 2000: 131; 2020: 334. figs. 7.6.3.10, D–E, H; Blake & Ruff 2007: 386–387, Plate 172, fig. A.

Material examined. (*39 specimens*). **Eastern North Pacific Ocean, Monterey Bay, California**, Pacific Grove, Beach Point**,** coll. M.H. Spaulding for J.P. Moore, 06 Jul 1905, 36.636°N, 121.937°W, intertidal, **holotype** (CASIZ 20713); Ocean view, coll. R.V. Chamberlin, Jul 1909, 36.620900°N, 121.903016°W, intertidal (1, MCZ IZ 44981).—**San Diego County, Point Loma**, coll. O. Hartman, 12 May 1937, 32.665°N, 117.242°W, intertidal, rocky habitat (10, LACM-AHF Poly 13566).—**Los Angeles County, San Pedro, off Point Fermin**, coll. R. Wetzer & D. Pentcheff, 14 May 2016, **Sta. MBC 16910/ RW16.033**, R/V *Yellowfin*, biological dredge, 33.673°N, 118.224°W to 33.671°N, 118.224°W, 21.5 m, shale rocks with pholad holes (7, LACM-AHF Poly 8817).—**Los Angeles County, Malibu, Malibu Pier,** pile scrapings, coll. N.D. Pentcheff, R. Wetzer, K. Omura, 30 May 2008, SCUBA, 0–6.4 m, 34.037°N, 118.674°W, NPS & National Geographic Bioblitz Survey, 1 specimen (LACM-AHF Poly 14760). **Sta. MBC 16896/RW16.011**, coll. R. Wetzer, J. Wall, K. Omura, D. Pentcheff & L. Harris, 04 Apr 2016, snorkel with hand scrapings, 34.037°N, 118.676°W, 0–4 m, pier piling epifauna dominated by *Mytilus* and *Phragmatopoma californica,* 1 specimen (LACM-AHF Poly 8638).—**Ventura County, Point Mugu, S of State Park boundary,** coll. R. Wetzer, D. Pentcheff & T. Magalhães, 29 Nov 2016, **Sta. MBC 17828/RW16.349**, 34.066°N, 118.998°W, intertidal sandstone & sand, among *Phragmatopoma californica* tubes, 7 specimens (LACM-AHF Poly 9293).—**San Luis Obispo Bay, Avila Beach,** large flat reef, from rocks at low tide near cliff, coll. K.H. Woodwick, 03 Mar 1962, **Sta. L-9**, 35.175°N, 120.726°W, from rocks, low intertidal, 1 specimen (MCZ IZ 71909).—**San Mateo County, Moss Beach**, coll. O. Hartman, Jun 1933, 37.525°N, 122.518°W, intertidal (9,

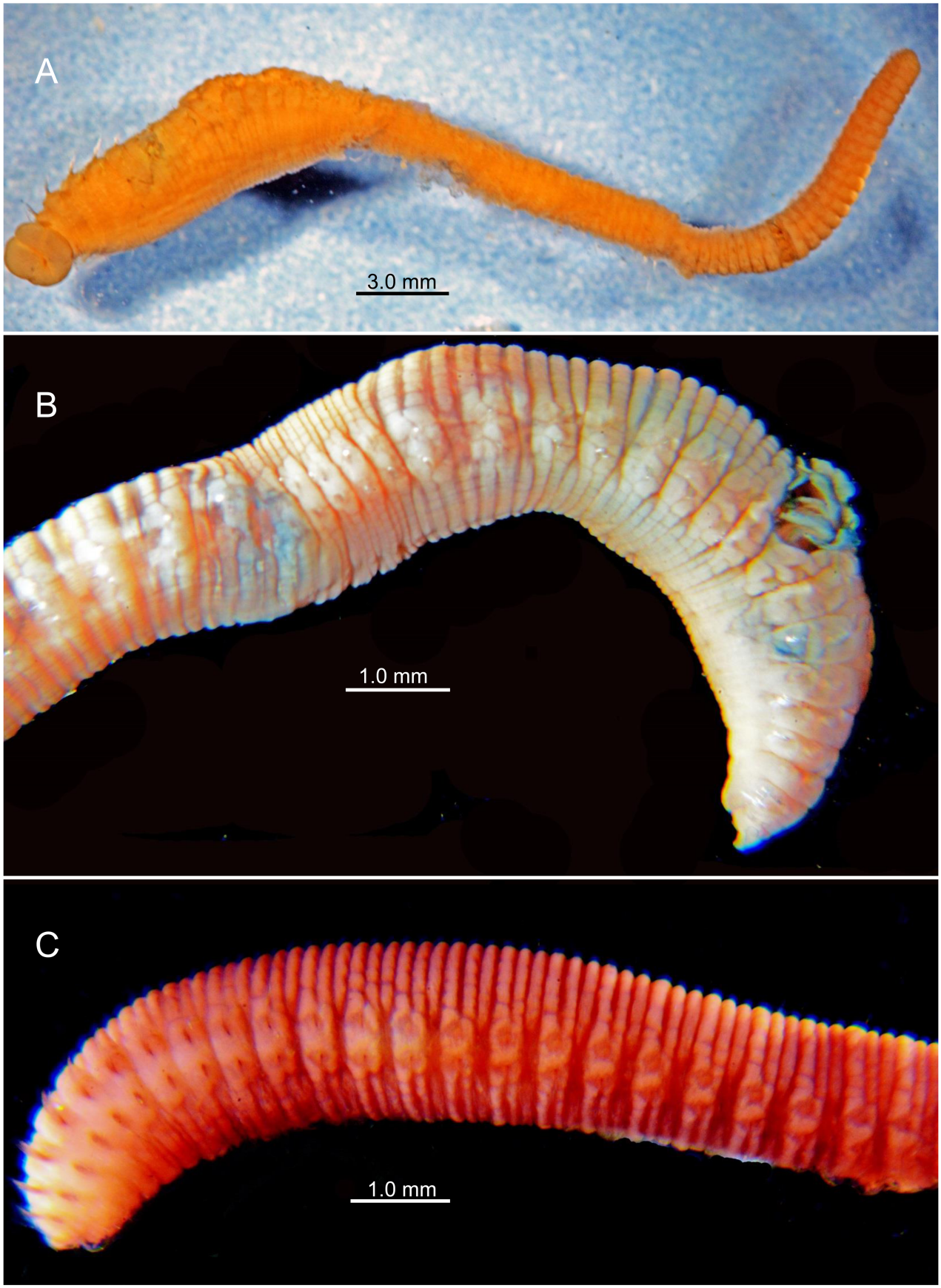

FIGURE 38. *Hyboscolex pacificus* (Moore, 1909): A, entire worm, ventrolateral view; B, anterior end, right lateral view; C, posterior end, right lateral view. A, holotype (CASIZ 20713); B, (MCZ 44981); C, (LACM-AHF Poly 13566). All stained with Shirlastain A.

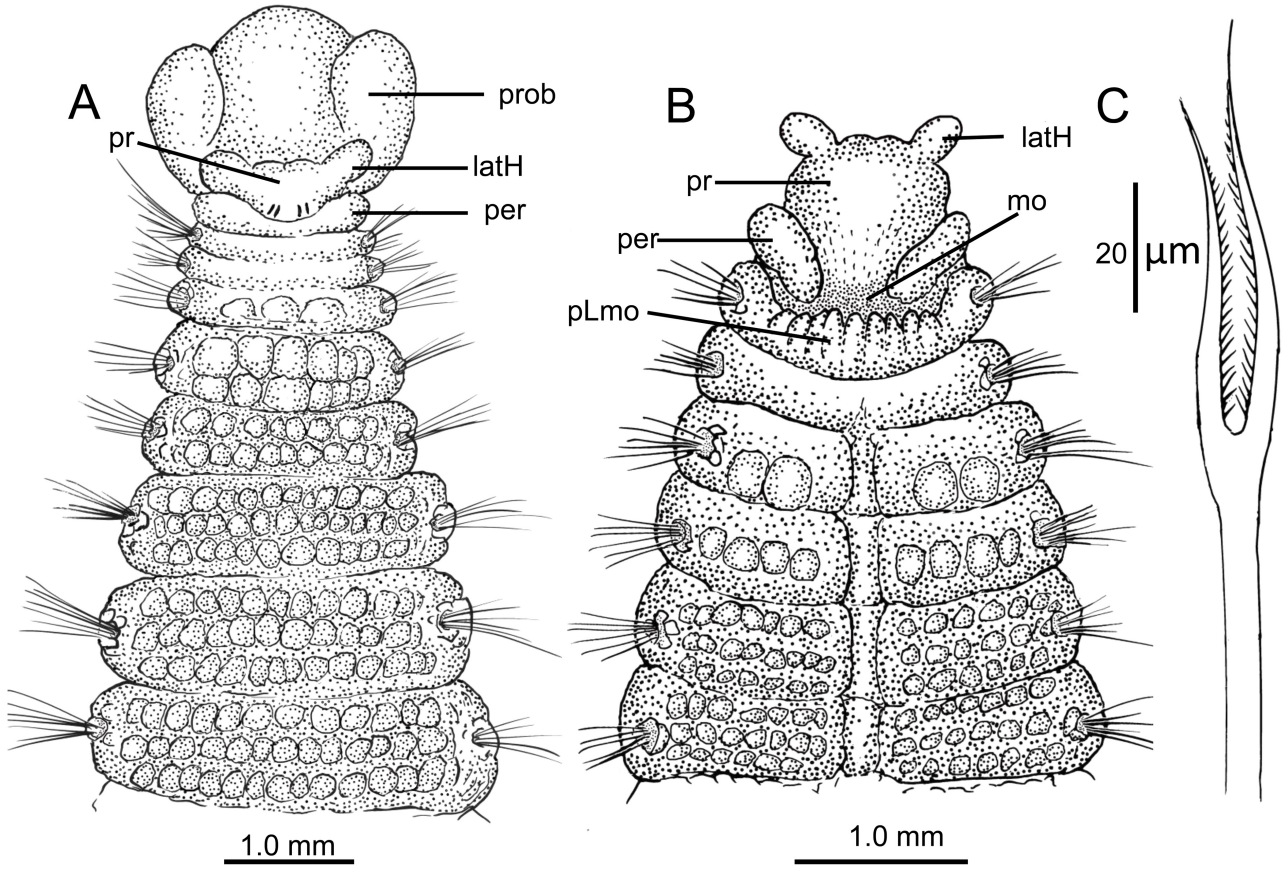

FIGURE 39. *Hyboscolex pacificus* (Moore, 1909): A, anterior end, dorsal view; B, anterior end, ventral view; C, furcate seta. A, holotype (CASIZ 20713); B–C, (MCZ IZ 44981).

LACM-AHF Poly 13567).—**San Francisco Bay**, coll. C. Piotrowski & K. Dandridge, 23 Jul 2003, Pier 39, inner floating docks, 0–1 m, 37.81°N, 122.41°W (1, CASIZ 168682).

Description. A large species, body arenicoliform in shape, but only weakly expanded in anterior setigers, then followed by long narrow abdominal region (Fig. 38A–C); body generally rounded in cross section; venter somewhat flattened with shallow mid-ventral groove along body (Fig. 39B). Holotype (CASIZ 20713) complete with 65 setigers, 35 mm long, 3.0 mm wide across expanded setigers (ca. 6–7), about 1.5 mm wide across posterior setigers (Fig. 38A); largest specimen (LACM-AHF Poly 13566) with 72 setigers, 45 mm long, 2.5 mm wide across anterior segments and ca. 2.0 mm wide posteriorly; another specimen (MCZ 44981) smaller, mostly complete, with 30 setigers, 20 mm long, 2.5 mm wide across widest anterior segments at about setiger 10. Holotype with dorsum of setigers 1–2 lacking annulations, setiger 3 with a single annulated row, setigers 4–5 biannulate, becoming triannulate from setiger 6 and continuing posteriorly (Fig. 39A); venter similar except setiger 4 uniannulate on some specimens (Fig. 39B). Color in alcohol light tan, eyespots typically black, or sometimes dark red, no other pigment observed.

Prostomium short, about as wide as long, curved or weakly notched across anterior margin, bearing two prominent lateral horns directed anteriorly at about a 30–45-degree angle (Fig. 39A); two pairs of parallel elongate eyespots present in holotype (Fig. 39A) and all other specimens, but may be faded in some (MCZ (44981); eyespots black or dark red; nuchal organs not observed. Peristomium a single smooth narrow ring posterior to prostomium entirely encircling dorsum (Fig. 39A), with no crest; ventrally becoming lateral lips of mouth (Fig. 39B); mouth opening with 6–7 long lobes forming posterior lip of mouth on anterior border of setiger 1 (Fig. 39B). Oral morphology obscured on holotype due to large, everted proboscis (Fig. 39A).

Parapodia short oval mounds with elongate notch from which setae arise along most of body (Fig. 38B–C). Distinct ciliated interramal sense organ present along most of body located close to notopodia.

Setae include simple capillaries and furcate setae. Capillaries in dense fascicles with 30 or more setae and 4–6 short furcate setae anterior to capillaries. Setigers 1–2 with 6–8 short, thin capillary-like setae anterior to first row of long capillaries in noto- and neuropodia. Furcate setae from setiger 3; each with long tapering tyne and slightly shorter second tyne; each tyne with short denticles on inner edge directed toward opposite tyne (Fig 39C); furcate setae short, with tynes only visible anterior to and at base of capillaries.

Posterior end of holotype enlarged, blunt, without

any observed lobes or anal cirri (Fig. 38A). Among newly reported specimens, posterior end terminates in cuff-like pygidium with minute lobes surrounding anus; 4–5 short anal cirri observed only in small, curled specimens (LACM-AHF Poly 8817); other larger specimens lacking anal cirri.

Remarks. As listed in the synonymy, there have been numerous reports of *Hyboscolex pacificus* since the original description by Moore (1909) as *Sclerocheilus pacificus*. Originally described from near Monterey, California, the species has subsequently been reported from Mexico to British Columbia as well as from Russian waters in the Sea of Japan and the Kurile Islands by Ushakov (1955) and from near Hokkaido, Japan by Imajima (1961) and Imajima & Hartman (1964). The latter authors established a new subspecies, *O. pacificus borealis*, for the records from British Columbia and the northwestern Pacific. The subspecies was said to differ from the California specimens in having anal cirri instead of lacking them. Anal cirri have not been previously reported for specimens from California. However, 4–5 anal cirri are newly reported herein from California specimens, albeit only in small individuals. Up to six short anal cirri were reported E. Berkeley (1930) from British Columbia (Canada), four anal cirri by Ushakov (1955) from the Kurile Sea, and 6–7 by Imajima (1961) from Japan. With the presence of anal cirri now confirmed throughout the reported range of the species and other morphological traits being equal, the separate subspecies established by Imajima & Hartman (1964) is not necessary.

The most unusual characteristic of *H. pacificus* are the eyespots that occur dorsally as two darkly pigmented lines or bands on either side of the prostomium. *Hyboscolex pacificus* is most similar to *H. quadricincta* Kudenov, 1985 reported from the northeastern Gulf of Mexico from shallow shelf depths in having similar eyespots and parapodia. According to Kudenov (1985), the two species differ in that *H. quadricincta* has quadriannulate segments along most of the body instead of bi- and triannulate as in *H. pacificus*. Kudenov (1985) also noted that the tynes of the furcate setae were more unequal with a tyne ratio of 2.4 in *H. quadricincta* compared to 1.7 in *H. pacificus*. However, the two species are otherwise similar and in the present study, the tynes of the furcate setae of *H. pacificus* were of nearly equal length (Fig. 39C).

Distribution. North Pacific Ocean: Costa Rica, California to British Columbia, intertidal to shallow subtidal ca. 20 m; Kurile Islands, Sea of Japan; intertidal, Hokkaido, Japan, intertidal.

Hyboscolex reesi **new species**

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Figures 40–41

Material examined. (*4 specimens*) **Northern Gulf of Mexico, off Louisiana. Matterhorn Platform Survey,** R/V *Brooks McCall*, coll. J. A. Blake, Chief Scientist. **Sta. M-3W**, 10 Nov 2008, BC, 28.742°N, 88.831°W, 850

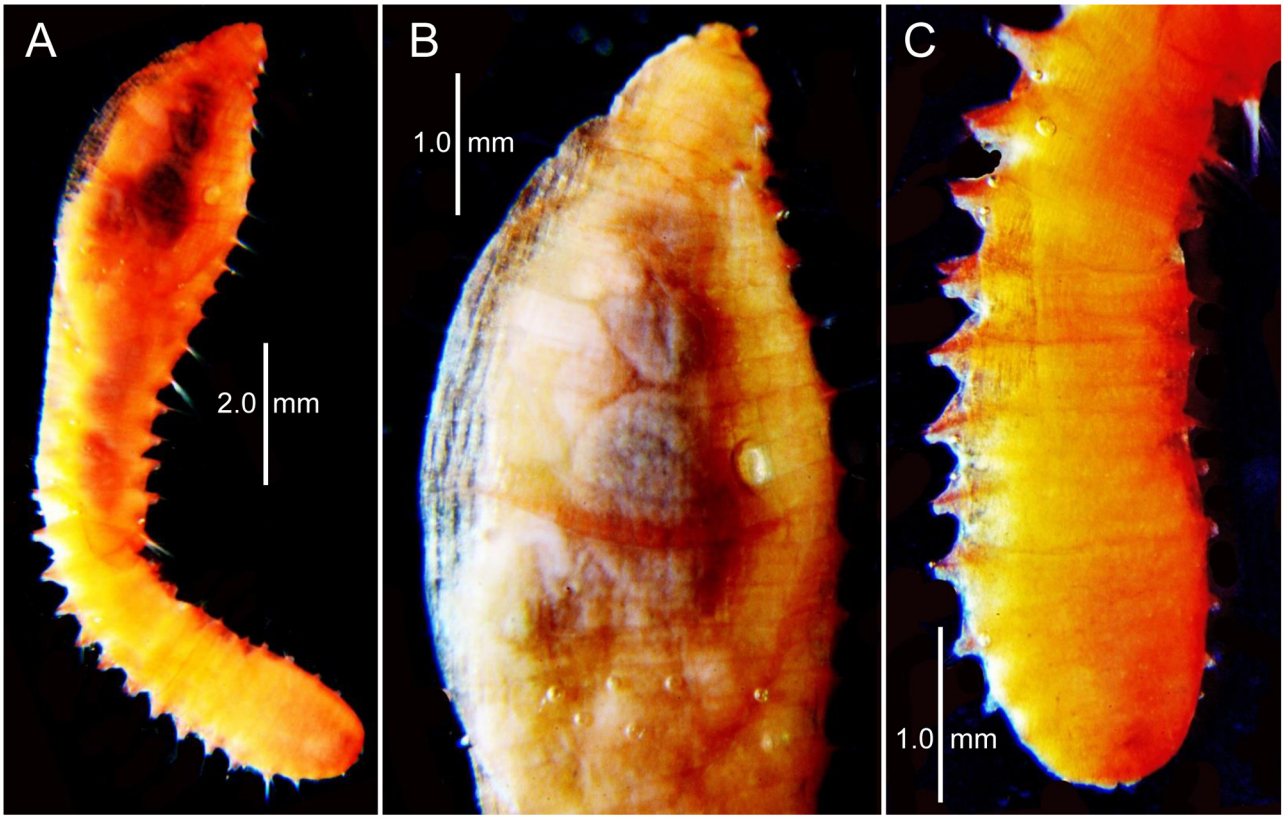

FIGURE 40. *Hyboscolex reesi* **sp. nov.** Holotype (MCZ IZ 171910): A, entire worm, dorsal view; B, anterior end, dorsal view; C, posterior end, dorsal view.

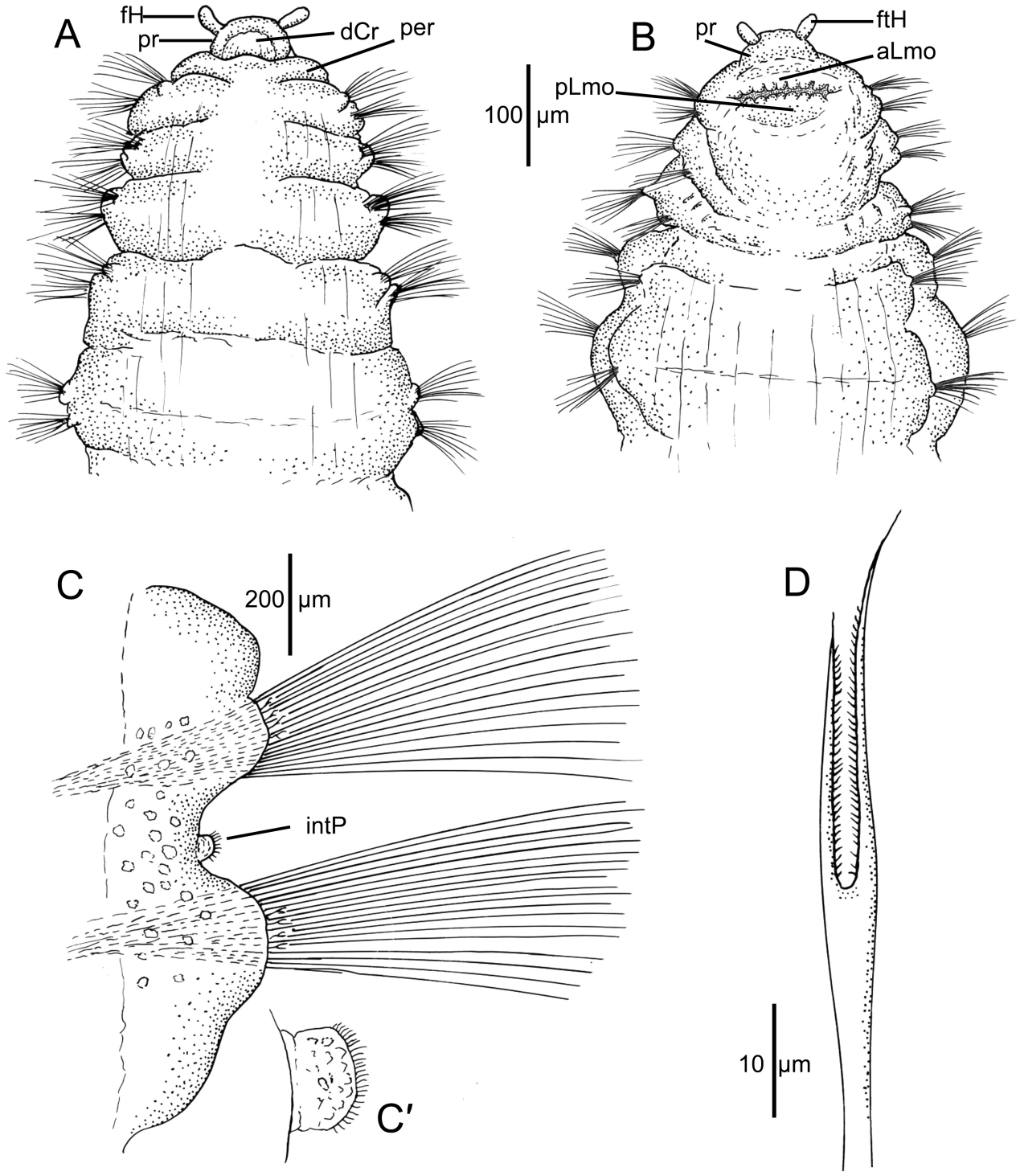

FIGURE 41. *Hyboscolex reesi* **sp. nov.** Holotype (MCZ IZ 171910): A, anterior end, dorsal view; B, anterior end, ventral view; C, setiger 16, anterior view, C' detail of interramal papillae [not to scale]; D, furcate seta from posterior neuropodium.

m, **holotype** (MCZ IZ 171910); **Sta. M-2S**, 10 Nov 2008, BC, 28.738.738°N, 88.826°W, 878 m, 1 **paratype** (MCZ IZ 171911); **Sta. M-3E**, 10 Nov 2008, BC, 28.742°N, 88.82°W, 868 m, 1 juv (MCZ IZ 171912); **Sta. M-5W**, 10 Nov 2008, BC, 28.742°N, 88.847°W, 818 m, 1 **paratype** (MCZ IZ 171913).

Description. A moderately large species, fusiform in shape; holotype (MCZ IZ 171910) complete with 30 setigers, 14.2 mm long, 1.0 mm wide across setiger 2, 3.9 mm wide across mid-body, and 1.7 mm wide across posterior setigers (Fig. 40A–B). A smaller paratype (MCZ IZ 171911) complete with 30 setigers, 8.9 mm long, 0.75 mm wide across setiger 2; middle setigers 1.9 mm wide. In cross section body rounded dorsally, flattened ventrally; without longitudinal dorsal or ventral grooves or ridges; venter with mid-ventral white line along body,

likely ventral nerve cord. Annular rings reduced, elevated pads not apparent or conspicuous along body (Figs. 40A–C, 41A–B); setigers 1–5 smooth, not partitioned (Fig. 41A); setigers 6–20 biannulate; setigers 20 to end triannulate. Parapodia short, rounded lobes over first ten setigers, thereafter noto- and neuropodia short narrow lobes, appearing rounded in cross section (Fig. 41C), narrow and triangular in dorsal or ventral view; postsetal lobes or lamellae absent; dorsal and ventral cirri absent. Distinct ciliated interramal sense organ present along most of body (Fig. 41C, C′). Setae emerge from tips of podial lobes. Color in alcohol light tan.

Prostomium short, semi-circular, rounded across anterior margin with two narrow frontal horns projecting at about 45-degree angles anteriorly (Fig. 41A–B); short dorsal crest present anterior to peristomium (Fig. 41A); eyespots absent; nuchal organs not observed. Peristomium a single smooth narrow ring posterior to prostomium across dorsal surface and extending laterally, mid-ventrally encompassing mouth; oral opening a transverse slit bordered by about nine lobes on anterior and posterior lips (Fig. 41B); proboscis not everted on any specimen.

Setae include simple capillaries, short spinous setae, and furcate setae; 1–3 short spinous setae observed anterior to capillaries on setiger 1. Capillaries in dense fascicles with 50 or more setae and with 4–6 short furcate setae anterior to capillaries from setiger 3; each furcate seta with long tapering tyne and a shorter second tyne; each tyne with short denticles on inner edge directed toward opposite tyne (Fig. 41D).

Pygidium with terminal anus, no anal lobes or cirri present (Fig. 40A, C).

Remarks. *Hyboscolex reesi* **sp. nov.** is the second species of the genus to be described from the Gulf of Mexico and by extrapolation also the second from the western North Atlantic Ocean. The first, *H. quadricincta*, was described by Kudenov (1985) from intertidal and shallow-water depths (~1–30 m) from eastern Florida whereas *H. reesi* **sp. nov.** is a deep-water species from the continental slope (~800 m) off Louisiana. *Hyboscolex reesi* **sp. nov.** is characterized by having a short, semi-circular prostomium partially obscured by a large dorsal peristomial crest, short frontal horns, bi- and triannulate segments with pads reduced, no anal cirri, no eyes, and numerous short lobes on the anterior and posterior lips of the mouth. The nature of the prostomial dorsal crest and reduced annular rings are unique within the genus. *H. quadricincta*, on the other hand, has no prostomial crest but does have a pair of diverging parallel eyespots, similar diverging frontal horns, bi-, tri-, and quadriannulate annular rings with prominent pads, and 4–6 anal cirri.

Etymology. This species is named for the late Dr. Bryant Eugene Rees (1912–1985), Professor of Biology at California State University, Fresno, California, in recognition of the role he played in my professional development. Professor Rees was a member of my MS graduate committee and an important mentor. He was an entomologist, specializing in the larvae of Coleopterans. He provided advanced instruction in zoology and anatomy, and also taught graduate-level courses in scientific illustration techniques and the principles of taxonomy and zoological nomenclature, both of which have been important components of my own research.

Distribution. Northern Gulf of Mexico, off Louisiana, 818–878 m.

Genus *Oligobregma* Kudenov & Blake, 1978

Type species. *Pseudoscalibregma aciculata* Hartman, 1965. Designated by Kudenov & Blake (1978).

Diagnosis. Body elongate and arenicoliform. Prostomium T-shaped with two prominent frontal horns; eyespots present or absent; nuchal organs present. Peristomium achaetous, surrounding prostomium dorsally and forming upper and lower lips of mouth ventrally. Branchiae absent. Parapodia with well-developed dorsal and ventral cirri; interramal papilla present or absent. Large acicular spines present on anterior setigers. Capillaries present in all parapodia; furcate setae present anterior to capillaries; some species with short, slender, blunt, or pointed spinous setae anterior to capillaries of setigers 1, 2, or 3 in place of furcate setae. Pygidium with four or more anal cirri.

Remarks. *Oligobregma* with 30 species and *Asclerocheilus* with 31 species are the two largest genera in the family (Tables 1 & 4). Both genera are characterized by lacking branchiae and having acicular spines on anterior setigers. They differ in that *Oligobregma* has well-developed and prominent dorsal and ventral cirri in middle and posterior parapodia while *Asclerocheilus* lacks parapodial cirri. The two genera also differ ecologically with the majority of *Oligobregma* species (28) being from the deep-sea (> 500 m) (Table 4) and only two from shallow depths (<100 m). In contrast, 16 species of *Asclerocheilus* are from deep water and 12 are from shallow water (<400 m) (Table 1). Both genera have species found in abyssal depths of ca. 3000 m and deeper: *Oligobregma* has 15 and *Asclerocheilus* has one. All known species of *Oligobregma* are summarized in Table 4. In the present study, 14 species of *Oligobregma* are treated, 11 of which are new to science.

1. *Oligobregma aciculata* (Hartman, 1965), North Atlantic Ocean, abyssal depths, 4367–4977 m.
2. *Oligobregma acsarum* **sp. nov.** Western North Atlantic Ocean, New England to the Carolinas, 2864–3015 m
3. *Oligobregma acutaspinosum* **sp. nov.** Western North Atlantic Ocean, off the Carolinas, 800 m.
4. *Oligobregma brychiatum* **sp. nov.** Southern Ocean, Scotia Sea; South Sandwich Trench, 3065–5194 m.
5. *Oligobregma chromatum* **sp. nov.** South China Sea, off Brunei, Island of Borneo, 1999 m.
6. *Oligobregma escanabis* **sp. nov.** E North Pacific Ocean, Gorda Ridge, 3305 m.
7. *Oligobregma emmae* **sp. nov.** South China Sea, off Brunei, Island of Borneo, 1325–1958 m.

TABLE 4. Morphological comparison of the 30 known species of *Oligobregma* Kudenov & Blake, 1978, organized by number of setigers with acicular spines.

Species/ Character	Setae Setiger 1	Setae Setiger 2	Setae Setiger 3	Setae Setiger 4	Structure & arrangement of acicular spines	First furcate setae	Prostomium	Peristomium	Segmental Annulation Patterns	Dorsal and Ventral Ciiri	Pygidium	Distribution	References
Species with acicular spines on setigers 1–2													
O. chromatum **sp. nov.**	Sp+Ac+C C	Sp+Ac+C C	F+C F+C	F+C F+C	Ac in 1 row, set 1–2 w/ Sp & C. Ac each weakly curved, w/ hirsute rounded tips	Set 3	Oval, broadly rounded w/ 2 lH; eyes abs	A single multilobed ring	Weakly triannulate w/ numerous pigmented glands	dC a large elevated glandular lobe; vC a narrow glandular ridge	No anC	South China Sea, off Brunei, Island of Borneo, 1999 m	This study
O. escanabis **sp. nov.**	Sp+Ac+C 0	Sp+Ac+C Sp+Ac+C	F+C F+C	F+C F+C	Set 1 uniramous; set 2 both rami; Ac curved, sickle-like, hirsute along concave edge	Set 3	Short, truncated, w/ 2 short lateral lobes; eyes abs	Large, smooth, merged w/ set 1	Set 1–2 smooth; set 3 triannulate; set 4 quadriannulate to end	dC erect conical cirri; vC asymmetrical directed laterally	Unknown	Pacific Ocean, hydrothermal vents, Gorda Ridge, abyssal 3305 m.	This study
O. oculata Kudenov & Blake, 1978	Ac+C Ac+C	Ac+C Ac+C	F+C F+C	F+C F+C	Ac in set 1–2 in both noP & neP; spines "delicate acicular."	Set 3	T-shaped, w/ digitiform lateral lobes; w/ a large U-shaped eyespot	A single ring, ventrally merged w/ set 1	Set 1 smooth; Set 2 biannulate; Set 3 triannulate; rest w/ 4 or 5 annulations	dC narrow, as long as wide; vC digitate, 3 times as long as wide; large int Pap	"At least" 2 anC	S of New Caledonia, 57 m;	Kudenov & Blake 1978
Species with acicular spines on setigers 1–3													
O. aciculata (Hartman, 1965)	Sp+Ac+C Sp+Ac+C	Sp+Ac+C Sp+Ac+C	Sp+Ac+C C	F+C F+C	Ac recurved, hirsute w/ finely pointed tips	Set 4	V-shaped, w/2 short rounded frontal lobes; eyes abs	A single ring	Set 1–3 smooth; then bi-to triannulate anteriorly; quadriannulate post	dC short, rounded; vC, triangular, pointed; w/ intP	W/ 5 anC	North Atlantic, abyssal, 4367–4977 m	Hartman 1965; Hartman & Fauchald 1971; This study
O. acsarum **sp. nov.**	Sp+Ac Sp+Ac	Sp+Ac Sp+Ac	Sp+Ac+C Sp+Ac+C	F+C F+C	Set 1–2, w/ 2 rows of Ac + 3–4 Sp; set 3 w/ noP & neP w/ 1 row Ac & 2nd C. Ac heavy, curved, to pointed hirsute tip + 1 narrow smooth, aristate Ac in noP set 1	Set 4	V-shaped, w/2 short forwardly directed lobes; eyes abs	A single ring, smooth, complt dorsally; lobed & incomplt ventrally	Obscured on ant set; quadriannulate post	Both cirri triangular, VC asymmetrical w/ broad base; intP present, on vC.	W/ 5 anC	W North Atlantic, off N & S Carolina, 2999–3015 m; off New England, 2864 m	This study

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TABLE 4. (Continued)

Species/ Character	Setae Setiger 1	Setae Setiger 2	Setae Setiger 3	Setae Setiger 4	Structure & arrangement of acicular spines	First furcate setae	Prostomium	Peristomium	Segmental Annulation Patterns	Dorsal and Ventral Ciiri	Pygidium	Distribution	References
O. acutaspinosis **sp. nov.**	Sp+A+C C	Sp+A+C C	Sp+A+C C	F+C F+C	NoP set 1–2 w/ 1 row 8–10 Ac + 3–4 Sp+1–3 C; set 3 w/ 3–4 Ac + long C; NeP set 1–3 all C. Ac narrow, curved, narrowing to hirsute, aristate tip	Set 4	Oval wider than long, w/ 2 short, frontal lobes; eyes abs	A single ring, smooth, complt dorsally; ventrally forming aLmo	Quadriannulate from set 4; obscured dorsally in expanded setigers	Both cirri w/ broad bases; dC triangular with internal striated glands; vC irregular glandular lobes, not striated	Damaged, no cirri observed	W North Atlantic, off S Carolina, 800 m	This study
O. aristata Blake, 2023	Ac+C Ac+C	Ac+C Ac+C	Ac+C C	C C	Ac in noP/neP of set 1–2; noP set 1–2 w/ 1st row of 6–7 Ac & 2nd row long capillaries; set 3 with 3–4 Ac & C; Nep set 1–2 w/ 3–4 Ac & C, set 3 all C. Ac curved, narrowing to terminal arista; Sp absent	Set 5–6	V-shaped, w/2 short forwardly directed lobes; these notched in holotype; eyes abs	A single ring, smooth dorsally; ventrally w/ 2 lobes latl to mo	Set 1 a single large medial pad; set 2 uniannulate; set 3–4 triannulate; set 5–10 inflated, obscured; set 11–22 tri- or quadriannulate	dC large, inflated, w/ nipple-like tip directed dorsally; vC asymmetrical, nipple-like tip directed laterally	Unknown	Off Australia lower continental slope and abyssal depths, 2793–4031 m;	Blake 2023
O. brychiatum **sp. nov.**	Ac+C Ac+C	Ac+C Ac+C	Ac+C Ac+C	C C	NoP set 1 w/Ac in 2 rows, set 2–3 w/ Ac + C in 1 row & 2nd row all caps; NeP w/ Ac + C in single row; Ac, heavy, curved, hirsute, tapering to aristate tip; Sp absent.	5–6	Triangular, anterior border entire w/ rounded lat margins; no horns	W/ two rings; dorsally merging w/ post border of pr; ventrally w/ 1 ring around mouth	Triannulate from set 2	Both dorsal & ventral cirri triangular with pigmented glands	W/ 5 anC when present	Antarctica, Scotia Sea; South Sandwich Trench, 3065–5194 m	This study
O. collare (Levenstein, 1975)	Ac +C C	Ac +C C	Ac +C C	F+C F+C	NoP Ac in 2 rows set 1–2 & 1 row set 3; C mostly in 2nd rows. Ac recurved tapering to finely pointed hirsute tip.	Set 4	V-shaped w/ 2 short forwardly directed rounded lobes; eyes abs	W/ 2 rings, 1 narrow, 2 large, both smooth	Set 1–2 smooth; set 3 to mid-body triannulate; post set quadriannulate	dC short, bluntly triangular; vC short, conical; w/ interramal Pap	Up to 8 cirri	Southern Ocean &Antarctica, 1622–6070 m	Levenstein 1975; Blake 1981

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TABLE 4. (Continued)

Species/ Character	Setae Setiger 1	Setae Setiger 2	Setae Setiger 3	Setae Setiger 4	Structure & arrangement of acicular spines	First furcate setae	Prostomium	Peristomium	Segmental Annulation Patterns	Dorsal and Ventral Ciiri	Pygidium	Distribution	References
O. emmae **sp. nov.**	Ac +C Ac +C	Ac +C Ac +C	Ac +C C	F+C F+C	NoP set 1–2 w/ 1 row of 6–7 Ac & 2nd row C; set 3 w/ 3–4 Ac & 4–5 C; neP set 1–2 w/ 3–4 Ac + C. Ac heavy, curved, hirsute, tapering to aristate tip	Set 4	Semi-circular, broadly rounded anteriorly, w/2 short oval fH; eyes abs	W/ 1 ring dorsally; ventrally forming pLmo	Not apparent ant; triannulate post	dC & VC elongate w/ pigmented striated internal glands	Two lobes; anC absent	South China Sea, off Brunei,1325–1958 m.	This study
O. hampsoni **sp. nov.**	Sp+Ac+C Sp+Ac+C	Sp+Ac+C Sp+Ac+C	Sp+Ac+C Sp+Ac+C	F+C F+C	NoP set 1–2 w/ 1 row of 7–10 Ac & 2nd row C; set 3 w/ 5–6 Ac & C; neP set 1–2 w/ 3–4 Ac + C. NoP Ac heavy, recurved, smooth, tapering to fine tip; NeP Ac not as heavy or curved; Sp, curved, pointed.	Set 4	Oval, as wide as long, merged with per post; w/2 short oval fH; eyes abs	Broad, not divided into rings; surrounding mo ventrally	W/ 4 or 5 annular rings; w/ low rectangular raised pads; w/ mid-ventral rdg	dC elongate, triangular; vC elongate arising from asymmetrical base, w/ rounded tip; both cirri w/ tubular internal glands	W/ 4 anC	W North Atlantic, off New England, 2103 m.	This study
O. mucronata Blake, 2015	Ac+C Ac+C	Ac+C Ac+C	Ac+C Ac+C	F+C F+C	NoP set 1–2 w/ Ac in 2 rows & set 3 in 1 row + C in 2nd row; neP set 1–3 w/ 3–5 Ac in 1st row, 2nd row all C. Ac recurved, tapering w/ terminal arista	Set 4	V-shaped w/ 2 short, forwardly directed rounded lobes; eyes abs	A double lobed ring dorsally; ventrally surrounding mo	Set 1–2 uniannulate; set 3, biannulate; set 4 and following quadriannulate	dC large, triangular, vC large, triangular, w/ broad base; w/ int Pap	W/ 4 anC	East Antarctic Peninsula, 323–912 m;	Blake 2015

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TABLE 4. (Continued)

Species/ Character	Setae Setiger 1	Setae Setiger 2	Setae Setiger 3	Setae Setiger 4	Structure & arrangement of acicular spines	First furcate setae	Prostomium	Peristomium	Segmental Annulation Patterns	Dorsal and Ventral Ciiri	Pygidium	Distribution	References
O. notiale Blake, 1981	Ac +C C	Ac +C C	Ac +C C	F+C F+C	NoP set 1–3 with set in 2 rows; w/ 8–12 Ac in 1st row & C in 2nd row. Ac weakly curved, tapering to narrowing to pointed & hirsute tip	Set 4	Short, w 2 large, diverging lat lobes; w/ 2 large eyespots	A single smooth ring	Set 1 smooth to irregular; rest quadriannulate	dC large inflated lobe; vC small, conical lobe; w/ large interramal Pap	W/5 ventral cirri	Southern Ocean, Antarctica, 18–923 m	Blake 1981
O. profundum Blake, 2023	Ac+C Ac+C	Ac+C Ac+C	Ac+C Sp+Ac+C	C Sp+C	Both rami of first row; rarely in 2nd row of set 1; NeP of set 1–2, rarely 3; 1st row only; Ac narrow w/ pointed tip	Set 5–6	Pentagonal, w/ 2 short rounded lobes, subapical; eyes abs	2 rings dorsally & lat; surrounding mo ventrally	Set 1–3 smooth; set 4–end tri- to quadriannulate	dC and vC erect; triangular w/ pointed tips	W/4 anC	Off E Australia, Tasmania to New South Wales, 3881–4176 m	Blake 2023
O. renuncula Blake, 2023	Ac+C Ac+C	Ac+C Ac+C	Ac+C C	C C	NoP spines in 2 rows set 1–2; 1st row only set 3; NeP, set 1–2, Ac and caps both rows; set 3 all caps	Set 5	V-shaped, w/ 2 short frontal horns, abs in juvs; eyes abs	2 narrow smooth rings dorsally; ventrally merged w/ aLmo	Set 1–4 two rows, set 5–13 triannulate, set 14–28 w/ 3–4 rows.	dC and vC triangular, w/ narrow rounded tips; w/ numerous elongate glands	W/ 4 anC	Off East Australia, NSW to Queensland, Coral Sea, abyssal 4005–4280 m	Blake 2023
O. tasmania (Kirkegaard, 1996)	Ac Ac	Ac Ac	Ac+C Ac+C	F+C F+C	Both rami; set 1–2 w/ 2 rows Ac; set 3 w/ 1 row Ac & 1 row caps	Set 4	Narrow, w/ 2 large 6rounded lat lobes; eyes abs	Single ring	Not reported but Fig. 6a w/ triannulate anteriorly; quadriannulate posteriorly	Not reported, but distinct parapodia w/ short rounded dorsal cirri in Fig. 6a.	No cirri observed	Tasman Sea, NW of New Zealand, 3710–3830 m	Kirkegaard 1996
O. weddelliensis **sp. nov.**	Ac+C Ac+C	Ac+C Ac+C	Ac+C Ac+C	C C	NoP Ac larger than NeP, curved, hirsute, aristate; NeP Ac not hirsute.	Set 5	Rectangular, wider than long, w/ 2 short rounded fH; eyes abs	Single multi-lobed ring	Set 1–9 w/o annular rings or obscured; triannulate rings from set 10	dC & vC symmetrical, triangular; vC larger; both w/ tubular gls	Bilobed, w/ 4 anC	Antarctica, Weddell Sea, 3935 m	This Study

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TABLE 4. (Continued)

Species/ Character	Setae Setiger 1	Setae Setiger 2	Setae Setiger 3	Setae Setiger 4	Structure & arrangement of acicular spines	First furcate setae	Prostomium	Peristomium	Segmental Annulation Patterns	Dorsal and Ventral Ciiri	Pygidium	Distribution	References
O. williamsae **sp. nov.**	Sp+Ac+C Sp+Ac+C	Sp+Ac+C Sp+Ac+C	Sp+Ac+C Sp+Ac+C	F+C F+C	NoP Ac larger than NeP; NoP set 1 w/ Ac 2 rows, large, smooth, curved; 2nd largest, w/ 1 straight spine also; set 2–3 with Ac in single row also curved. NeP Ac smaller, fewer, in 1 row; Sp ant to Ac.	Set 4	Heart shaped w/ notch between short oval-shaped fH; eyes abs	Single smooth ring, interrupted by post margin of pro	Set 1, smooth; set 2–4 biannulate; set 5 onwards mostly triannulate; rings only visible by staining	dC & vC triangular, vC larger; far post with cirri more digitiform	Pyg oval, elongate; w/ 4 anC	W North Atlantic off New Jersey, 2864 m	This Study
Species with acicular spines on setigers 1–4													
O. bakkeni Mendes *et al*. 2024	Ac+C Ac+C	Ac+C Ac+C	Ac+C Ac+C	Ac+C Ac+C	Sp absent; Ac set 1–3 all w/ curved tip; Ac set 4 straight, not curved; Ac set 1–2 in 2 rows + 1 row C; Ac set 3–4 in 1 row + 2 rows C. Sp absent	Set 3	V-shaped, w/2 long lH; eyes abs	Single smooth ring dorsally and ventrally	Set 1–2 biannulate; set 3 & following triannulate; w/ mid-ventral rdg	dC & vC short, weakly triangular w/ rounded tips; all w/ pig tubular gls; w/ intP	Not observed	Off SE Brazil, Espirito Santo Basin, 2400–2498 m	Mendes *et al*. 2024b
O. bathyala Blake, 2023	Ac+C Ac+C	Sp+Ac+C Ac+C	Sp+Ac+C Ac+C	Ac+C C	NoP w/ Ac in 2 rows set 1–3 w/ few caps; set 4 with Ac in 1st row + C 2nd row; NeP w/ Ac in 2 rows set 1–2, few in 1st row set 3; Sp ant to Ac NoP set 1–2. Spines hirsute, tapering to narrow point, some aristate.	Set 4–5	Pentagonal, as wide as long, w/ 2 short forwardly directed frontal lobes; eyes abs	Single lobed ring dorsal & lat; surrounding mo ventrally	Set 1, uniannulate; set 2–3, biannulate; set 4–13 triannulate; set 14–28 quadriannulate	dC asymmetrical, triangular w/ rounded tip; vC asymmetrical, directed anteriorly, nipple-like tip; w/ internal tubular glands	W/ 4 anC	Off SE Australia, 2694–2774 m	Blake 2023

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TABLE 4. (Continued)

Species/ Character	Setae Setiger 1	Setae Setiger 2	Setae Setiger 3	Setae Setiger 4	Structure & arrangement of acicular spines	First furcate setae	Prostomium	Peristomium	Segmental Annulation Patterns	Dorsal and Ventral Ciiri	Pygidium	Distribution	References
O. brasierae Wiklund *et al*. 2019	Ac+C Ac+C	Ac+C Ac+C	Ac+C Ac+C	Ac+C Ac+C	NoP w/ ca. 20 Ac in 2 rows set 1–2 & ca. 10 AC in 1 row, set 3–4; C in rows post to Ac. Ac curved, tapering to elongated (aristate) tip; Sp not observed..	Set 5	Triangular, w/ 2 large lat rounded lobes; eyes abs	A single smooth ring, interrupted mid-dorsally	Ant smooth; Post quadriannulate	dC conical w/ broad base; vC similar; with intPap	"A few anC"	N Equatorial Pacific, CCZ, 4425 m	Wiklund *et al*. 2019
O. cruzae Mendes *et al*. 2024	Ac+C Ac+C	Ac+C Ac+C	Ac+C Ac+C	Ac+C Ac+C	Ac noP set 1–2 in 2 ant rows +C; set 3–4 AC in 1 ant row + 2 rows C; neP set 1 w/2 rows AC + C; Set 2–4 w/ 1 row AC + 2 rows C. Ac NoP Set 1–2 heavy curved; Ac noP set 3–4 & neP 2–4 straight, thinner; Sp absent.	Set 5	Quadrangular, w/ 2 short rounded fH; eyes abs	Single smooth ring dorsally and ventrally	Triannulate; ventral ridge from set 2 w/ large medial pads	dC triangular, curved dorsally to fine point; vC same, curved ventrally	4 thin anC: 2 dorso-lateral; 2 ventro-laterao	Off SE Brazil, Santos Basin, 688–700 m	Mendes *et al*. 2024b
O. lonchochaeta Detinova, 1985	Ac+C Ac+C	Ac+C Ac+C	Ac+C Ac+C	Ac+C Ac+C	Both rami; Ac w/ expanded tip & terminal arista	Mid-body set	Oval, longer than wide, w/ 2 large thickened lat lobes; eyes abs	A single lobed ring	Set 1–4 triannulate; rest not reported	Not reported	Not reported	N Atlantic, Reykjanes Ridge, S of Iceland, 2930–2951 m	Detinova 1985; Kirkegaard 1980 (as *Ps. aciculata*)
O. menziesi **sp. nov.**	Ac+C Ac+C	Ac+C Ac+C	Ac+C Ac+C	Ac+C Ac+C	Set 1–2 w/ 2 rows Ac heavy, curved w/ fine hirsute tip; Set 3–4 w/ 1 row thin Ac, not hirsute, w/ fine tips. Sp absent.	Set 5	Oval, wider than long, w/ 2 short oval fH; eyes abs	W/ 1 multilobed dorsal ring; ventrally w/ lobes on aLmo	Set 1 w/ 2 rings dorsally, none ventrally; set 2 w/ 3 rings dorsally & 2 rings ventrally; set 3–4 triannulate, then quadriannulate to end	dC w/ triangular lobe on glandular lobes; vC short glandular lobes	Cuff-like, w/o anC	SE Pacific Ocean, Peru-Chile Trench, 3167–3318 m	This study

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TABLE 4. (Continued)

Species/ Character	Setae Setiger 1	Setae Setiger 2	Setae Setiger 3	Setae Setiger 4	Structure & arrangement of acicular spines	First furcate setae	Prostomium	Peristomium	Segmental Annulation Patterns	Dorsal and Ventral Ciiri	Pygidium	Distribution	References
O. nonatoi Mendes *et al*. 2024	Ac+C Ac+C	Ac+C Ac+C	Ac+C Ac+F+C	Ac+F+C F+C	Ac noP set 1–2 in 2 ant rows +C; set 3–4 AC in 1 ant row + 2 rows C; neP set 1–2 w/2 rows AC + C; Set 3 w/ 1 row AC + F+ 2 rows C. Ac NoP Set 1–2 heavy curved ; other Ac thinner, straighter. Sp absent	Set 3–4	Triangular, wider than long w/ 2 short fH projecting ant; eyes abs	Per a single ring dorsally; ventrally w/ 2 rings forming aLmo	Set 1 triannulate; set 2 quadriannulate to end	Posterior dC & vC both with leaf-like shape tapering to rounded tip; vC more triangular	Anus surrounded by ring of elongate lobes; w/ 4 lat anC	Off Brazil, slope of Espirito Santo, Campos, & Santos Brazilian basins, 700–3000 m	Mendes *et al*. 2024b
O. quadrispinosa Schüller & Hilbig, 2007	Ac+C C	Ac+C C	Ac+C C	Ac+C C	Ac in noP only; Ac in 2 rows set 1–2 + cap & 1 row set 3–4 w/ 2nd row C. Ac curved tapering to fine point.	Set 5	T-shaped w/ 2 elongate, curved lat lobes; eyes abs	W/ 2—3 smooth rings dorsal and lat	Ant quadriannulate; post with 5 annuli	dC short, triangular, asymmetrical; vC, long, triangular, tapering	"at least" 2 long anC	Southern Ocean; Scotia and Weddell Seas, 2258–4069 m	Schüller & Hilbig 2007
O. sphaerocirratum **sp. nov.**	Ac+C A+C	Ac+C A+C	Sp+Ac+C Sp+Ac+C	Sp+Ac+C Sp+Ac+C	Ac in rami set 1–4; most Ac in 1st row, most C in 2nd row. Ac curved, w/ hirsute pointed tip; NeP Ac thinner than NoP	Set 5	Oval, longer tan wide, w/ 2 oval-shaped lat lobes; eyes abs	A single, multilobed ring	Quadriannulate along most of body	dC large, spherical, reticulated; vC, low, elongate, reticulated	W/ 5 anC	W North Atlantic, off New England, 2071 m.	This study
O. simplex Kudenov & Blake, 1978	Ac+C Ac+C	Ac+C Ac+C	Ac+C Ac+C	Ac+C Ac+C	Ac in both rami set 1–4, w/Ac in anterior transvers rows & C in post rows; AC recurved, tapering to finely pointed tip.	Set 6	T-shaped w/ 2 thick, conical lat lobes; eyes abs	A single ring, ventrally merged w/ set 1	Set 1–2 smooth; 3–4 biannulate; 5–15 quadriannulate	dC conical, thick pointed; vC digitiform, narrow, 3 times longer than wide; w/ intPap	"at least" 2 anC	Victoria, Australia; Western Port Bay, 11 m.	Kudenov & Blake 1978

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TABLE 4. (Continued)

Species/ Character	Setae Setiger 1	Setae Setiger 2	Setae Setiger 3	Setae Setiger 4	Structure & arrangement of acicular spines	First furcate setae	Prostomium	Peristomium	Segmental Annulation Patterns	Dorsal and Ventral Ciiri	Pygidium	Distribution	References
O. tanai Wiklund *et al*. 2019	Ac+C C	Ac+C C	Ac+C C	Ac C	NoP w/ ca. 14 Ac in 2 rows set 1–2 & ca. 5 AC in 1 row, set 3–4; C in rows post to Ac; set 4 Ac, transitional; w/ 1 row caps post to Ac. Ac curved, w/ hirsute shaft narrowing to elongate hirsute tip. Sp not observed	Set 5	Oval-shaped, w/ 2 short rounded frontal lobes; eyes abs	Single smooth ring dorsally, interrupted mid-dorsally	Not observed	dC short, conical; vC, also short, conical; w/ interramal Pap	Unknown	N Equatorial Pacific, CCZ, 4137–4425 m	Wiklund *et al*. 2019
O. whaleyi Wiklund *et al*. 2019	Ac+C Ac+C	Ac+C Ac+C	Ac+C Ac+C	Ac+C Ac+C	NoP & NeP of set 1–4 w/ Ac irregularly in 1 row + post row of C. Ac curved w/ slender elongated tip. Sp not observed.	Set 11	Pear-shaped, longer than wide w/ 2 short rounded ant lobes; eyes abs; nuO large, folded	Single ring interrupted mid-dorsally, continuing laterally	Ant smooth; mid-body quadriannulate	dC short, conical w/ broad base; vC similar; w/ interramal Pap	Unknown	N Equatorial Pacific, CCZ, 4425 m	Wiklund *et al*. 2019; This study

Abbreviations: Abs, absent; Ac, acicular spine; aLmo, anterior lip of mouth; anC, anal cirrus(i); ant, anterior(ly); Atl, Atlantic; CCZ, Clarion-Clipperton Zone; complt., complete; dC, dorsal or notopodial cirri; F, furcate setae; fH, frontal horns; gl(s), gland(s); incomplt, incomplete; intPap, interramal papilla; lat, lateral(ly); lH, ,lateral horns; mo, mouth; N, north; NeP, neuropodia; NoP, notopodia; nuO, nuchal organs; NW, northwest; Pap, papilla; pig, pigment(ed); Post, posterior(ly); pr, prostomium; Rdg, ridgeS, south; SE, southeastern; Set, setiger; Sp, short spinous setae; vC, ventral or neuropodial cirri; w/, with, w/o, without; W, western.

8. *Oligobregma hampsoni* **sp. nov.** Western North Atlantic Ocean, off New England, 2103 m.
9. *Oligobregma menziesi* **sp. nov.** SE Pacific Ocean, Peru-Chile Trench, 3167–3318 m.
10. *Oligobregma mucronata* Blake, 2015. East Antarctic Peninsula, 323–912 m.
11. *Oligobregma sphaeracirratum* **sp. nov.** Western North Atlantic Ocean, off New England, 2071 m.
12. *Oligobregma weddelliensis* **sp. nov.** Southern Ocean, Weddell Sea, abyssal, 3935 m.
13. *Oligobregma whaleyi* Wiklund *et al*., 2019. N Equatorial Pacific Ocean, Clarion Clipperton Zone, 4425–4567 m.
14. *Oligobregma williamsae* **sp. nov.** Western North Atlantic Ocean, off New Jersey, 2864 m.

Oligobregma aciculata (Hartman, 1965)

Figures 42–43

Pseudoscalibregma aciculata Hartman, 1965: 182–183, Pl. 41; Hartman & Fauchald 1971; 124–125; ?Kirkegaard 1980: 90.

Oligobregma aciculata: Kudenov & Blake 1978: 430; Blake 2020: 337.

Material examined. (4 *specimens*) **Western North Atlantic Ocean, abyssal plain**, Gay Head-Bermuda Transect, R/V *Atlantis*, Cruise 268, Coll. H.L Sanders, **Sta. KK-1**, 10 Aug 1961, 36.392°N, 68.078°W, 4850 m, **holotype** (LACM AHF-Poly 502).—R/V *Atlantis II* Cruise 12, coll. H.L Sanders, **Sta. 66**, 21 Aug 1964, 38.778°N, 70.147°W, 4367 m (1, LACM-AHF Poly 13313).—R/V *Atlantis II* Cruise 23, coll. R. Scheltema, **Sta. 121**, 21 Aug 1966, 35.833°N, 65.183°W, 4977 m (2 + frags, LACM-AHF Poly 13314).

Description. A moderately sized species, all specimens elongate, only moderately enlarged in middle segments. Holotype (LACM-AHF Poly 502) incomplete, recorded by Hartman (1965) with 27 setigers, 13 mm long, 1.2 mm wide, lacking posterior end. Largest specimen from Sta. 66 (LACM-AHF Poly 13313) complete, 5.5 mm long, with 27 setigers, 0.8 mm wide across middle setigers, 0.5 mm wide across posterior segments. Body with dorsum and venter somewhat flattened; setigers 1–2 with three smooth rings, setiger 3 with four smooth rings (Fig. 42A), then with annular rings developing with raised pads and continuing quadriannulate to posterior end. Venter with a single large mid-ventral pad on each segment producing mid-ventral ridge along body from about setiger 3. Color in alcohol light tan.

Prostomium roughly triangular, tapering posteriorly, about as long as wide (Fig. 42A); anterior end with two closely spaced oval frontal horns projecting anteriorly (Fig. 42A); eyespots absent; nuchal organs not observed. Peristomium a single dorsal ring interrupted mid-dorsally by posterior border of prostomium (Fig. 42A); ventral morphology obscured by everted proboscis, but peristomial ring not evident ventrally. Mouth a distinct opening but nature of anterior and posterior lips obscured by everted proboscis. Everted proboscis bulbous, with relatively smooth surface; lobes not evident.

Parapodia largest on setigers 1–3 where setal lobes bear acicular spines and/or capillaries, reduced to rounded lobes in following anterior and middle segments. Posterior setigers with elongate noto- and neuropodia bearing prominent setal fascicles together with dorsal and ventral cirri (Fig. 42D). Dorsal cirri somewhat bulbous, semi-circular in shape, with asymmetrical base; ventral cirri triangular in shape tapering to pointed tip; both cirri with internal glands (Fig. 42D). Ciliated interramal papilla present between podial lobes.

Acicular spines present in notopodia of setigers 1–3 and neuropodia of setigers 1–2. Noto- and neuropodia of setigers 1–2 with two rows of acicular spines accompanied by short spinous setae and capillaries; short spinous setae anterior to acicular spines in first row; capillaries mainly in second row. Notopodia of setiger 3 with acicular spines and capillaries in first row and all capillaries in second row. Neuropodia of setiger 3 with two rows of capillaries. All subsequent noto- and neuropodia from setiger 4 with two rows of long capillaries accompanied by short furcate setae anterior to capillaries. Acicular spines of setigers 1–2 heavy, curved, hirsute, tapering to narrow tip (Figs. 42B, 43A); spines of setiger 3 not as heavy with hooked tips (Fig. 43B). Short spinous setae present anterior to heavy spines on setigers 1–2, these short, curved, tapering to pointed tip. Furcate setae from setiger 4 with long tapering subequal tynes, each with short denticles on inner edge directed toward opposite tyne (Fig. 42C).

Pygidium observed on only one specimen (LACM-AHF Poly 13313); this an inflated ring surrounding anal opening bearing ten short cirri, two ventral, four lateral on each side.

Remarks. The holotype of *Pseudoscalibregma aciculata* Hartman, 1965 was not available and thus not directly examined as part of this study; however, I was able to examine the specimen and other annelids in late 1977 during a visit to the Allan Hancock Foundation. At the time, J.D. Kudenov and I were finalizing our manuscript on Australian scalibregmatids and were designating Hartman's species as the type-species of our new genus, *Oligobregma*. My examination confirmed the basic morphology reported by Hartman needed to transfer it from *Pseudoscalibregma* to the new genus including the nature of the dorsal and ventral cirri as well as acicular spines being present on the notopodia of setigers 1–3.

The present description of *Oligobregma aciculata* differs from Hartman's (1965) in a few details. First, the species was originally reported to have acicular spines on both noto- and neuropodia of setigers 1–2; in fact a few notopodial spines, thinner than those of setigers 1–2 and not hirsute, are also present on the notopodia of setiger 3 but not the neuropodia on each of the specimens examined in this study. These spines are not as conspicuous as those on setigers 1–2 and easily overlooked. Another difference is that the dorsal peristomial ring is illustrated as complete by Hartman (1965), but in fact is divided into two parts mid-dorsally by a narrow groove, also easily overlooked. Hartman (1965) reported the hirsute acicular spines as

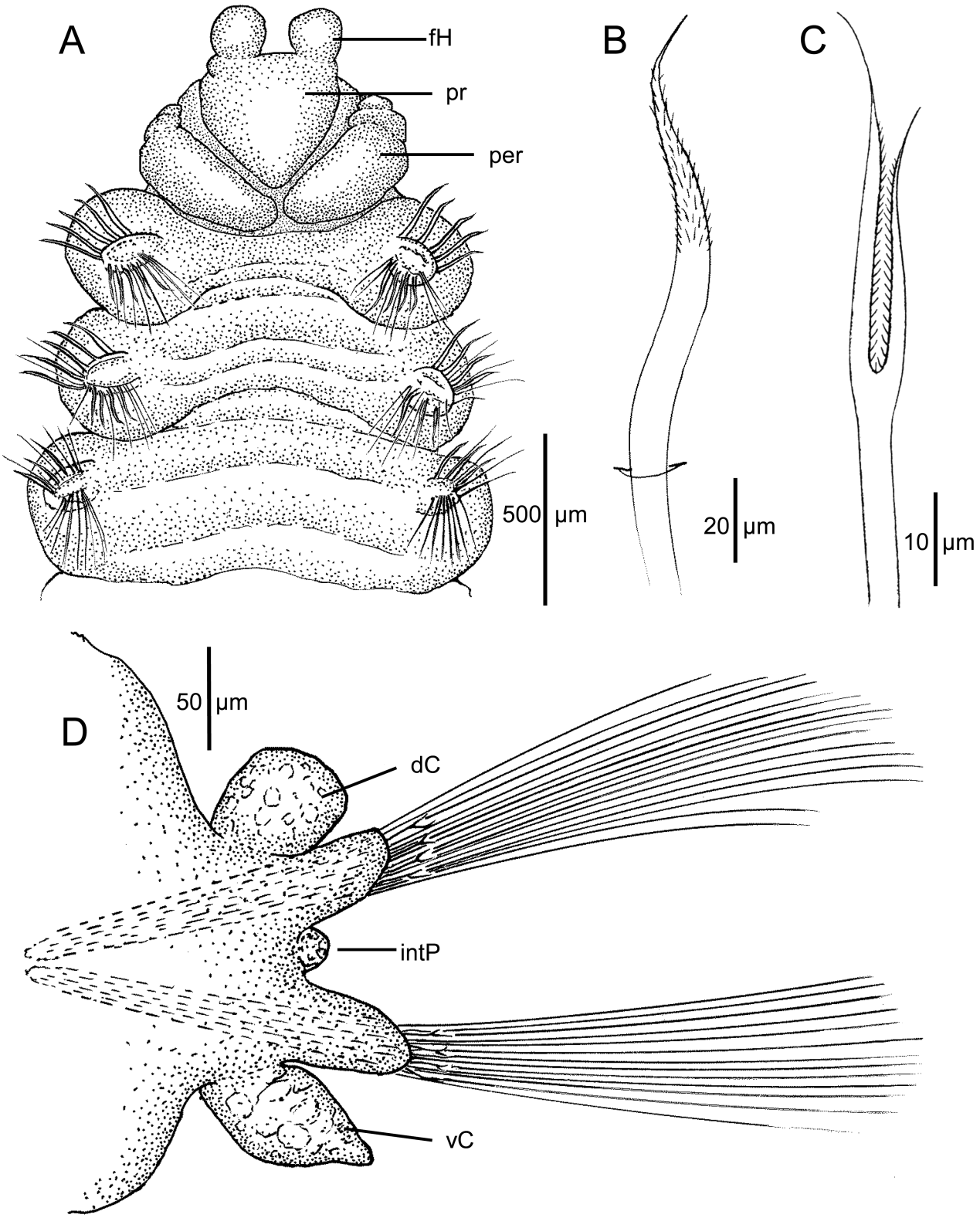

FIGURE 42. *Oligobregma aciculata* (Hartman, 1965). (LACM-AHF Poly 13313): A, anterior end, dorsal view; B, acicular spine, setiger 1, notopodium; C, furcate seta, posterior parapodium; D. posterior parapodium, anterior view.

having their tips either blunt or finely pointed. In the present study only finely pointed spines were present suggesting that the blunt-tipped spines noted by Hartman (1965) were likely broken or worn. The morphology of the dorsal and ventral cirri in the present specimens is identical in shape to those figured by Hartman (1965). The short spinous setae reported here are likely the same as the "…*slender inconspicuous capillary setae*" that accompanied the acicular setae (Hartman 1965: 182). Although Hartman (1965) correctly illustrated the

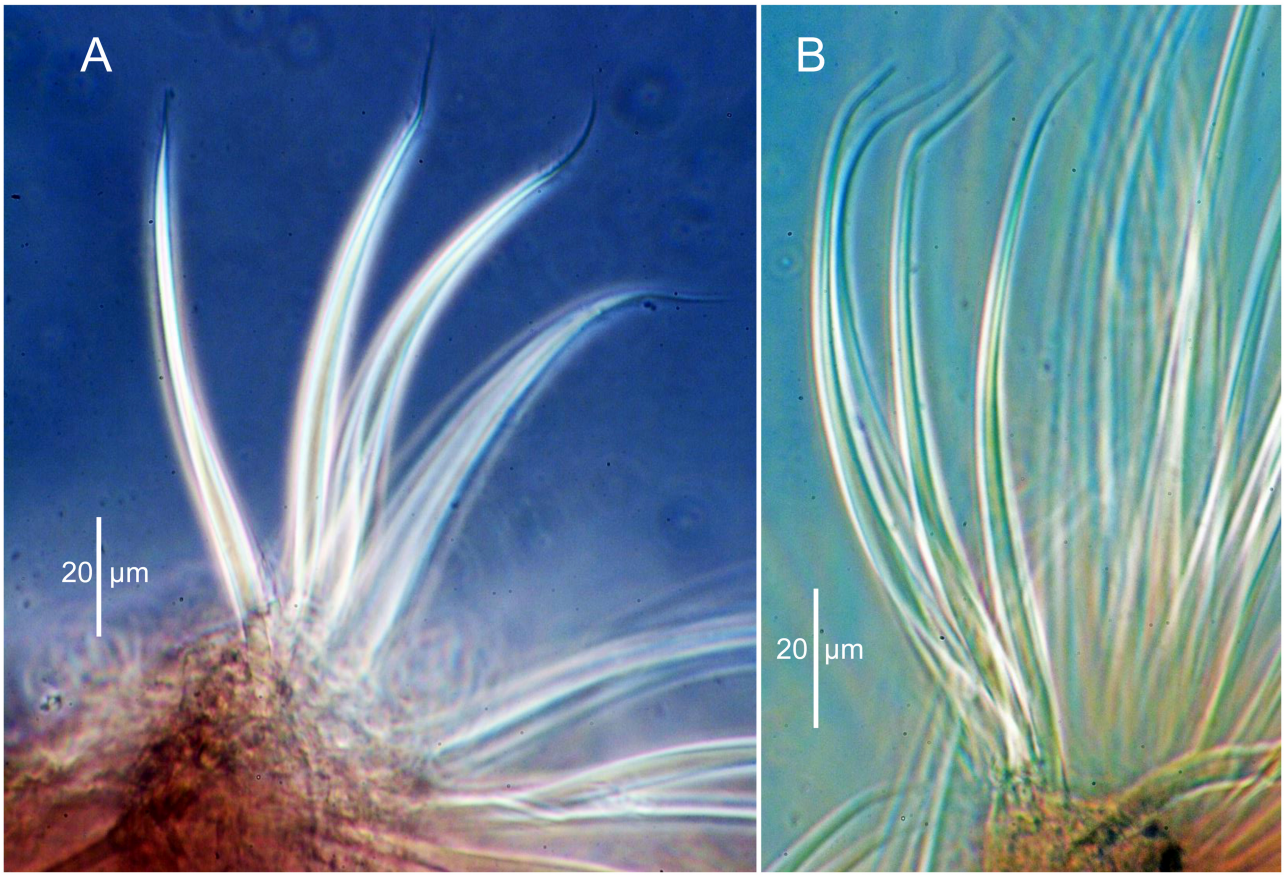

FIGURE 43. *Oligobregma aciculata* (Hartman, 1965). (LACM-AHF Poly 13313): A, notopodial acicular spines, setiger 1; B, notopodial acicular spines, setiger 3.

structure of the furcate setae, she did not report their distribution; they actually begin on setiger 4 and continue along the rest of the body.

The record of *Pseudoscalibregma aciculata* by Kirkegaard (1980) from abyssal depths of the NE Atlantic is questionable because while he reported hirsute acicular spines, he indicated they were present on setigers 1–4 instead of 1–3 and did not identify their occurrence on individual noto- and neuropodia. If spines are indeed present on four anterior setigers, this would place the specimen into a different group than *Oligobregma aciculata*.

Out of 30 known species of *Oligobregma*, 14 have acicular spines on setigers 1–3. Of these only four lack neuropodial spines on setiger 3: *O. aciculata* from the North Atlantic Ocean, *O. emmae* **sp. nov.**, from the South China Sea, and *O. aristata* Blake, 2023 and *O. renuncula* Blake, 2023, both from deep-water off eastern Australia. Of these, *O. aciculata* is the only one reported to have short spinous setae anterior to the larger acicular spines of setigers 1–3 and the morphology of the dorsal and ventral cirri is entirely different from those of the other three species. In addition, the occurrence of at least 10 short anal cirri in *O. aciculata* differs from all other species for which the pygidial morphology is known. No other species has more than four or five anal cirri.

Biology. All of the four known specimens of *Oligobregma aciculata* were collected by the late Dr. Howard L. Sanders from three samples collected along the Gay-Head Bermuda Transect, which encompassed stations from off New England to off Bermuda. Stations A-KK, AII-66, and AII-121 were all from the abyssal plain in depths of 4367–4977 m. Station A-KK is located along the main transect from New England to Bermuda, while Sta. AII-66 is located to the west of Sta. A-KK and Sta. AII-121 is located to the east of Sta. A-KK. The three samples are in line trending due east of Chesapeake Bay with increasing distance and depth across the abyssal plain: Sta. AII-66 (535 km distance; 4367 m depth), Sta. A-KK (730 km distance; 4850 m depth) and Sta. AII-121 (980 km distance; 4977 m depth). Station information for these samples can be found in Hartman (1965).

Distribution. North Atlantic Ocean, abyssal plain, 4367–4977 m.

Oligobregma acsarum new species

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Figures 44–45

Material examined. (*6 specimens*) **Western North Atlantic Ocean, southeastern U.S., off Cape Fear, North Carolina,** U.S. South ACSAR Program, coll. J.A.

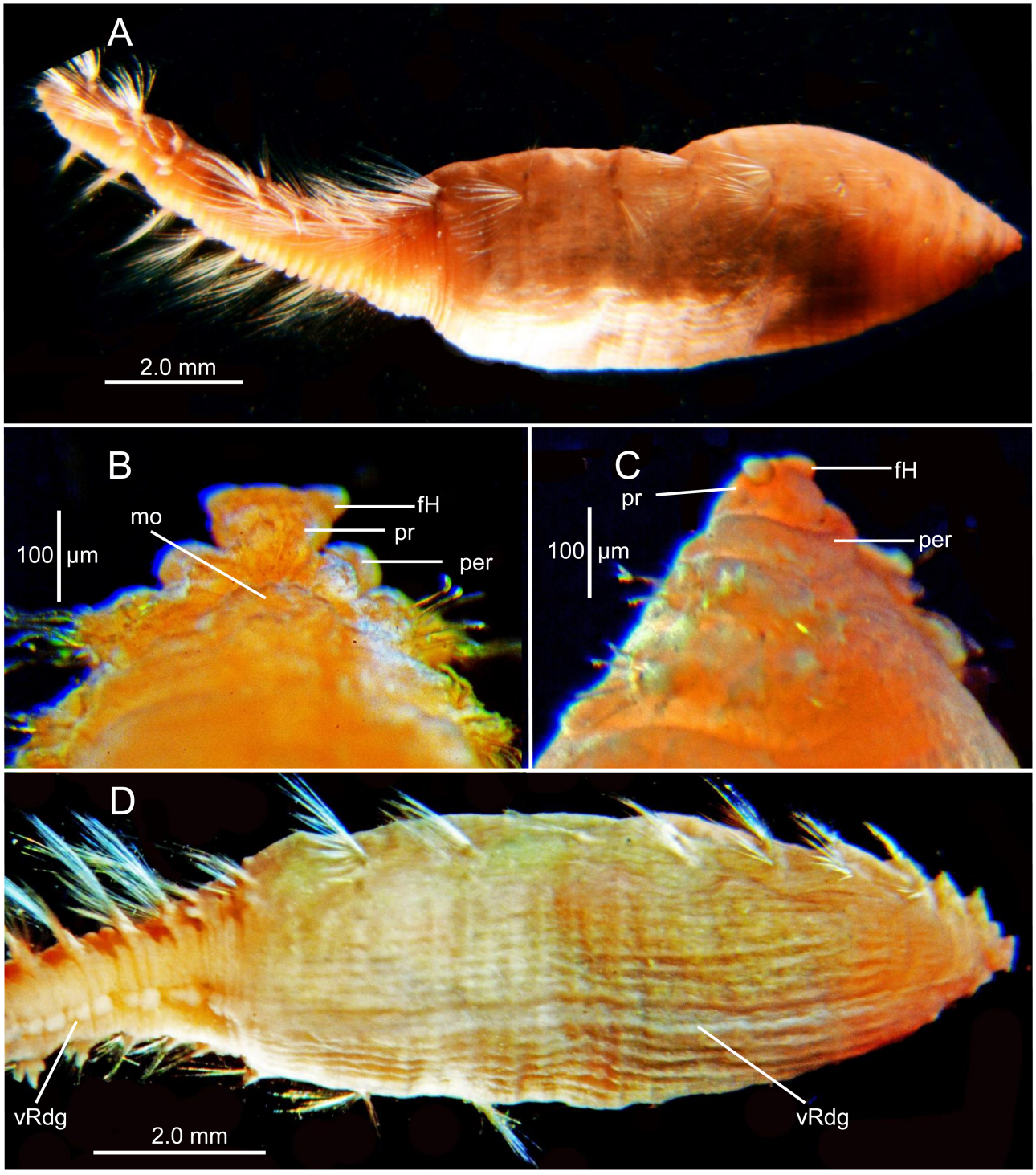

FIGURE 44. *Oligobregma acsarum* **sp. nov.** Holotype (USNM 1741695): A, entire worm, right lateral view; B, anterior end, ventral view; C, anterior end, dorsolateral view; D, Anterior end, ventral view. All stained with Shirlastain A.

Blake. **Sta. 13**, **Cruise SA-5**, R/V *Gyre*, Rep. 1, coll. 21 Sep 1985, BC, 32.921°N, 75.833°W, 3006 m, **holotype** (USNM 1741695); **Cruise SA-4**, R/V *Cape Hatteras*, Rep. 1, 21 May 1985, BC, 32.92°N, 75.83°W, 3015 m, 1 **paratype** (USNM 1741696); **Cruise SA-6**, R/V *Cape Hatteras*, Rep. 1, 20 Nov 1985, BC, 32.919°N, 75.838°W, 2999 m, 1 **paratype** (USNM 1741697); Rep. 3, 21 Nov 1985, BC, 31.921°N, 75.835°W, 3006 m, 1 **paratype** (USNM 1741698).—**off Charleston, South Carolina**, **Sta. 16**, **Cruise SA-4**, R/V *Cape Hatteras*, Rep. 2, 15 May 1985, BC, 31.587°N, 75.173°W, 3003 m, 1 specimen (USNM 1741699).

Description. A large species, all specimens sausage-shaped over first half of body, then narrow along posterior half (Fig. 44A, D). Holotype (USNM 1741695) incomplete with 20 setigers, 15.5 mm long, 3.6 mm wide across expanded segments, 0.9 mm wide across narrow posterior segments; paratype (USNM 1741698) smaller,

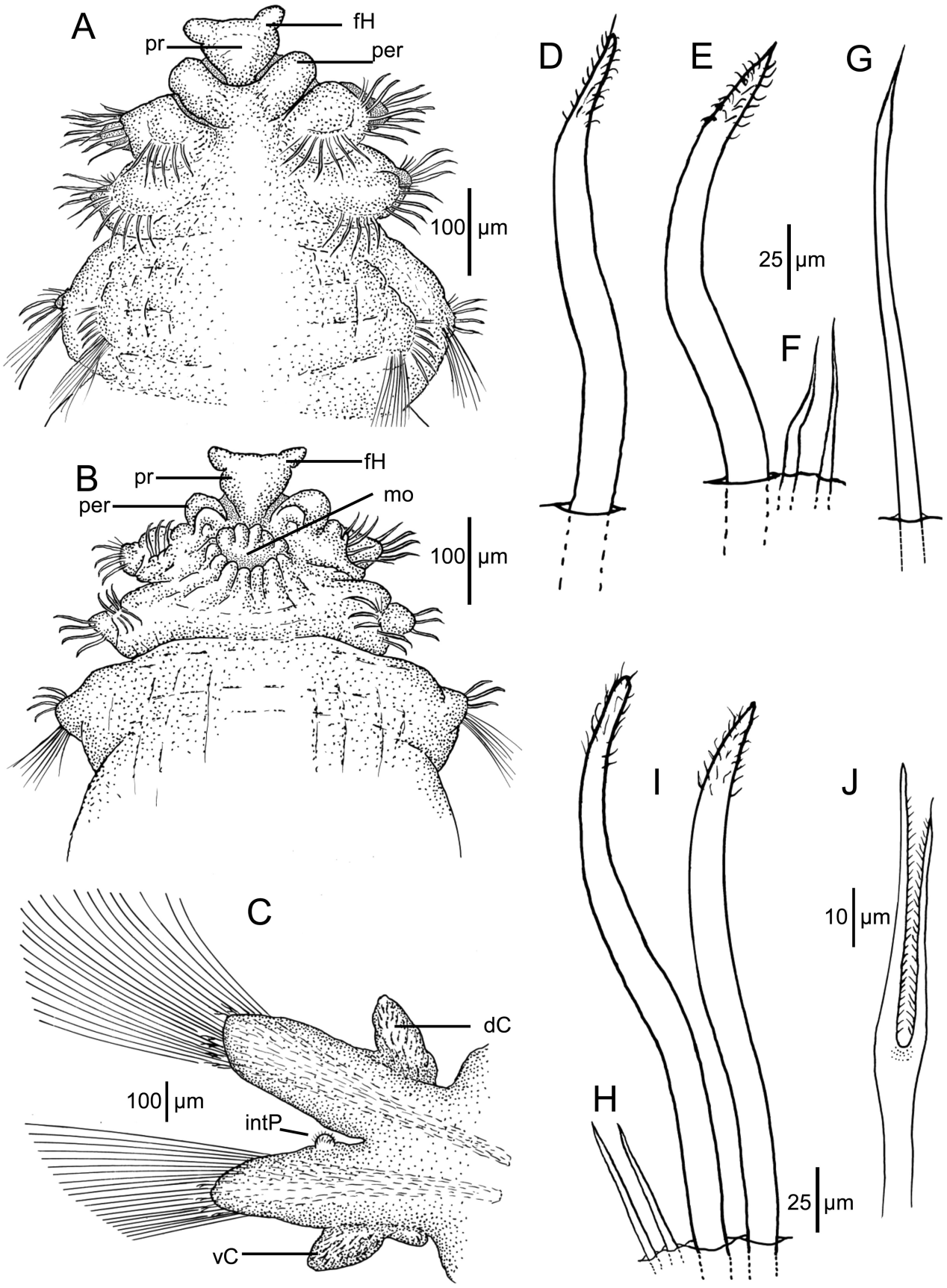

FIGURE 45. *Oligobregma acsarum* **sp. nov.** Holotype (USNM 1741695): A, anterior end, dorsal view; B, anterior end, ventral view; C, posterior parapodium, anterior view; D. acicular spine setiger 1; E, acicular spine setiger 1; F, short spinous setae, setiger 1; G, narrow pointed spine, setiger 1; H, short spinous setae, setiger 2; I, acicular spines setiger 2; J, furcate seta, posterior neuropodium.

complete, with 31 setigers, 5.2 mm long, 1.1 mm wide across expanded anterior setigers. Body oval in cross section, with dorsum rounded, venter weakly rounded, with shallow mid-ventral groove along expanded part of body from about setiger 2 (Fig. 44D); narrow, non-expanded posterior segments with ventral groove only at interface between segments, continuing as a raised ridge along segments between segmental interfaces. Segmental annular rings obscured on expanded segments; posterior segments all quadriannulate with raised pads. Color in alcohol light tan.

Pre-setiger region relatively short, about as long as first 1½ setigers. Prostomium weakly pentagonal, widest anteriorly tapering posteriorly, about as long as wide; broad across anterior margin, bearing two narrow horns projecting laterally or at about 30-degree angle (Figs. 44B–C, 45A–B); eyespots absent; nuchal organs not observed. Peristomium a single entire ring surrounding prostomium dorsally and laterally, continuing ventrally with 2–3 lobes anterior to base of oral opening (Figs. 44B–C, 45A–B); mouth a distinct opening surrounded by about 12 lobes elevated above mid-ventral surface of peristomium and onto setiger 1 (Figs. 44B, 45B); proboscis not observed.

Parapodia reduced to rounded lobes in anterior and middle segments; largest on setigers 1–3 where elongate setal lobes bear large acicular spines. Posterior narrow section with elongate noto- and neuropodia bearing prominent dorsal and ventral cirri (Fig. 45C). Dorsal and ventral cirri both triangular in shape; ventral cirrus with larger base becoming asymmetrical (Fig. 45C). Both cirri with internal striations, possibly glandular. Ciliated interramal papilla present, but on base of neuropodium instead of between podia (Fig. 45C).

Acicular spines present in noto- and neuropodia of setigers 1–3. Noto- and neuropodia of setigers 1–2 with two rows of spines (Fig. 45D–E, G, I) accompanied by 3–4 short spinous setae anterior to spines (Fig. 45F, H) but no capillaries; setiger 3 with noto- and neuropodia with one row of acicular spines and a second row with capillaries; these acicular spines also accompanied by 2–3 short spinous setae. All subsequent noto- and neuropodia from setiger 4 with fascicles of long capillaries accompanied by short furcate setae at base of fascicles. Acicular spines of setigers 1–3 heavy, curved, tapering to narrow tip, some hirsute with numerous fibrils projecting over curved tip (Fig. 45D–E, I); setiger 1 also with at least one narrow pointed spine (Fig. 45G); setigers 1–3 with 2–4 short spinous setae present anterior to heavy spines, curved, tapering to pointed tip (Fig. 45F, H). Noto- and neuropodia from setiger 4 with short furcate setae and long capillaries; furcate setae each with a long tapering tyne and a somewhat shorter second tyne; each tyne with short denticles on inner edge directed toward opposite tyne (Fig. 45J).

Pygidium narrow, tubular, with five anal cirri, one ventromedial, two each dorso- and ventrolateral.

Remarks. *Oligobregma acsarum* **sp. nov.** from deep-water off the Carolinas is one of eight species of the genus to be reported with acicular spines on the noto- and neuropodia of setigers 1–3. *Oligobregma hampsoni* **sp. nov.** from deep-water off New England and *O. williamsae* **sp. nov.** from deep-water off New Jersey also belong in this group. The three species may be distinguished by the nature of the acicular spines. In *O. acsarum* **sp. nov.**, the large acicular spines are thick and taper to a short hirsute tip; in addition, a narrow smooth-shafted spine is also present in setiger 1. In contrast, all of the acicular spines of *O. hampsoni* **sp. nov.** and *O. williamsae* **sp. nov.** are long, recurved, and taper to narrow, non-hirsute tips.

Other differences between the three species include the morphology of the dorsal and ventral cirri of posterior setigers and the location and shape of the frontal horns. In *O. acsarum* **sp. nov.** the interramal papilla is located on the neuropodium rather than exactly between the two rami as in other scalibregmatids. The frontal horns of *O. acsarum* **sp. nov.** are located on the anterior margin of the pentagonal-shaped prostomium and directed at about 30-degree angle, whereas in both *O. hampsoni* **sp. nov.** and *O. williamsae* **sp. nov.**, the frontal horns are oval-shaped, more medially located, and directed anteriorly.

Etymology. The epithet *acsarum*, is derived from ACSAR, the acronym used by the project team for the Atlantic Continental Slope and Rise Program during which this species was collected.

Distribution. Western North Atlantic Ocean, SE USA, off North and South Carolina, 2999–3015 m.

Oligobregma acutaspinosum new species

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Figures 46–47

Material examined. **Western North Atlantic Ocean, southeastern U.S., off Charleston, South Carolina,** U.S. South ACSAR Program, coll. J.A. Blake. **Sta. 14**, **Cruise SA-6**, R/V *Cape Hatteras*, Rep. 3, coll. 18 Nov. 1985, BC, 32.395°N, 77.018°W, 800 m, **holotype** (USNM 1741700). **Cruise SA-5**, R/V *Gyre*, Rep. 2, BC, 32.395°N, 77.021°W, 799 m, 1 **paratype** (USNM 1741701).—**Off Cape Fear, North Carolina**, **Sta. 11**, **Cruise SA-5**, R/V *Gyre*, Rep. 1, coll. 23 Sep 1985, BC, 33.08°N, 76.385°W, 796 m (1, USNM 1741702).

Description. A small species, holotype (USNM 1741700) with 30 setigers, 4.7 mm long, 0.6 mm wide across setiger 3 and 1.2 mm wide across expanded section at about setiger 9. Body greatly expanded from about setigers 4–10, then narrowing for about eight setigers, then expanded again before narrowing in last few setigers (Fig. 46A). Specimen from Sta. 11 (USNM 1741702) complete, with 27 setigers, 2.6 mm long, and 0.7 mm wide across expanded middle segments. Expanded parts of body filled with silt obviously from ingesting fine sediment particles. In cross section, expanded parts of body with dorsum greatly expanded, balloon-like (Fig. 46A–B); venter flattened, with no grooves or ridges apparent. Segments from setiger 4 quadriannulate (Fig. 47A–B), but annular rings entirely obscured on expanded segments. Color in alcohol light tan.

Pre-setiger region short, about as long as first two

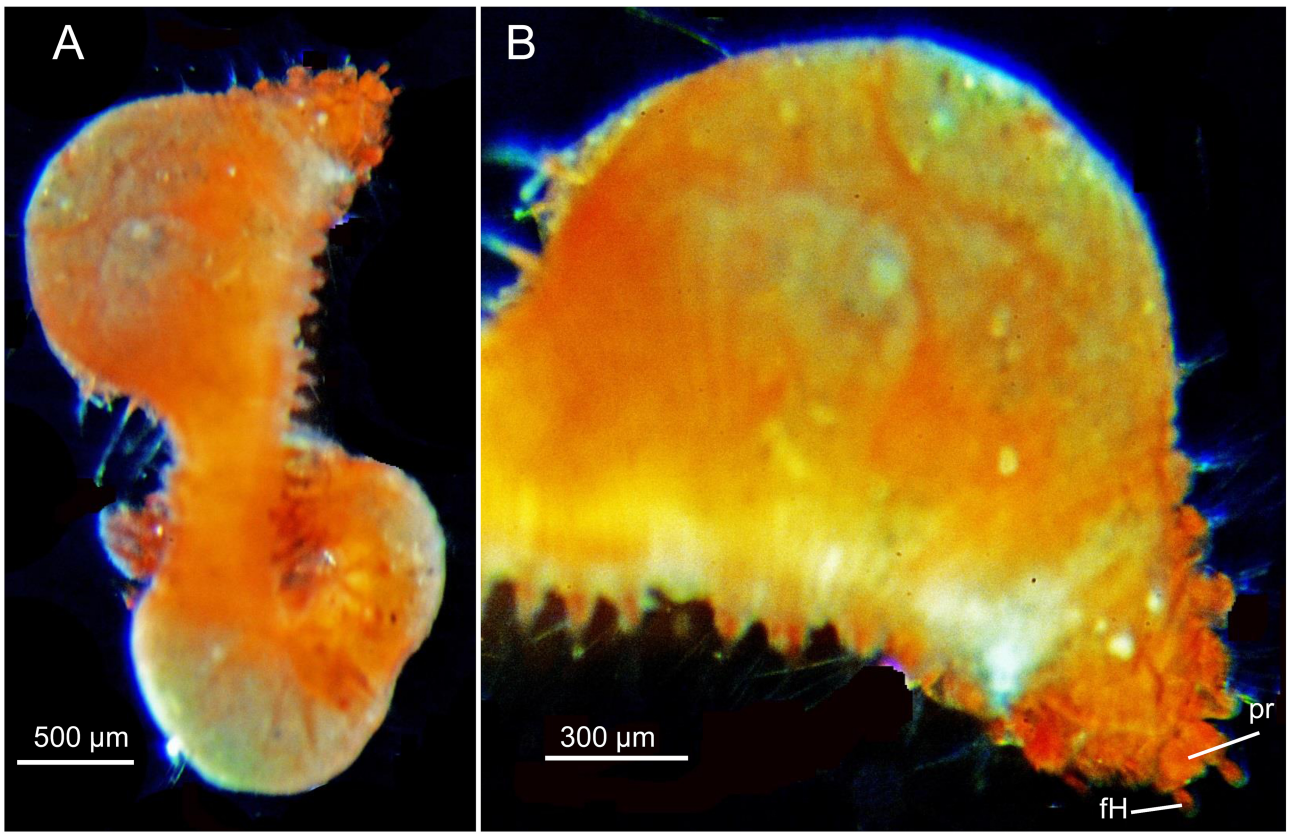

FIGURE 46. *Oligobregma acutaspinosum* **sp. nov.** Holotype (USNM 1741700): A, entire worm, dorsolateral view; B, anterior end, right dorsolateral view.

setigers (Fig. 47A–B). Prostomium broadly rounded, slightly wider than long, weakly pointed on anterior border, bearing two oval frontal horns arising from lateral margins, projecting anteriorly (Fig. 47A–B), these barely evident on juvenile (USNM 1741702); eyespots absent; nuchal organs not observed. Peristomium a single entire ring surrounding prostomium dorsally and laterally (Fig. 47A); ventrally merging with anterior lobes surrounding large oral opening extending over setiger 1 (Fig. 47B). Mouth a large opening surrounded by eight large lobes anteriorly and laterally and five narrow posterior lobes (Fig. 47B). Entire mouth elevated above ventral surface; proboscis not observed, presumably retracted.

Parapodia reduced to rounded lobes in first few setigers, then with distinct noto- and neuropodia projecting along body; dorsal and ventral cirri present from about setiger 15 to end. Both dorsal and ventral cirri arising from broad basal attachment; dorsal cirrus bearing a short, triangular-shaped dorsal attachment bearing several distinct, darkly pigmented and striated glands (Fig. 47C). Ventral cirrus low, swollen, with 2–3 rounded lobes (Fig. 47C). Large ciliated interramal papilla present between podia (Fig. 47C).

Large acicular spines present in notopodia of setigers 1–3; entirely absent in neuropodia. Notopodia of setigers 1–2 with a curved row of 8–10 acicular spines (Fig. 47E) accompanied by 3–4 short spinous setae anterior to spines (Fig. 47D) and 1–3 thin capillaries; setiger 3 with notopodia with a curved row of 3–4 acicular spines and a fascicle of about 15 long capillaries. Neuropodia of setigers 1–3 with 10–12 capillaries. All subsequent noto- and neuropodia from setiger 4 with fascicles of long capillaries accompanied by short furcate setae at base of fascicles. Acicular spines of setigers 1–3 narrow, curved, tapering to pointed tip, some setae aristate, hirsute with numerous projecting fibrils along curved tip (Fig. 47E). Short spinous setae of setigers 1–3 much smaller than acicular spines, these curved, tapering to pointed tip (Fig. 47D). Furcate setae from setiger 4, each with long tapering subequal tynes, with short denticles on inner edge directed toward opposite tyne (Fig. 47F).

Pygidium narrow, tubular, damaged on holotype; specimen from Sta. 11 (USNM 1741702) with five anal cirri.

Remarks. Among species of *Oligobregma* with acicular spines in setigers 1–3, only three have the acicular spines limited to the notopodia: *O. acutaspinosum* **sp. nov.** from off the US SE coast, and *O. collare* Levenstein, 1975 and *O. notiale* Blake, 1981, both from Antarctic seas. Of these, *O. collare* and *O. acutaspinosum* **sp. nov.** have similar oval-shaped projecting frontal horns, triangular-shaped dorsal cirri in posterior parapodia, and lack eyespots, however, *O. acutaspinosum* **sp. nov.** has an oval-shaped prostomium and one peristomial ring, whereas *O. collare* has a V-shaped prostomium and two peristomial rings. *Oligobregma notiale* has large, laterally projecting prostomial horns, large rounded and inflated dorsal cirri, and prominent prostomial eyespots.

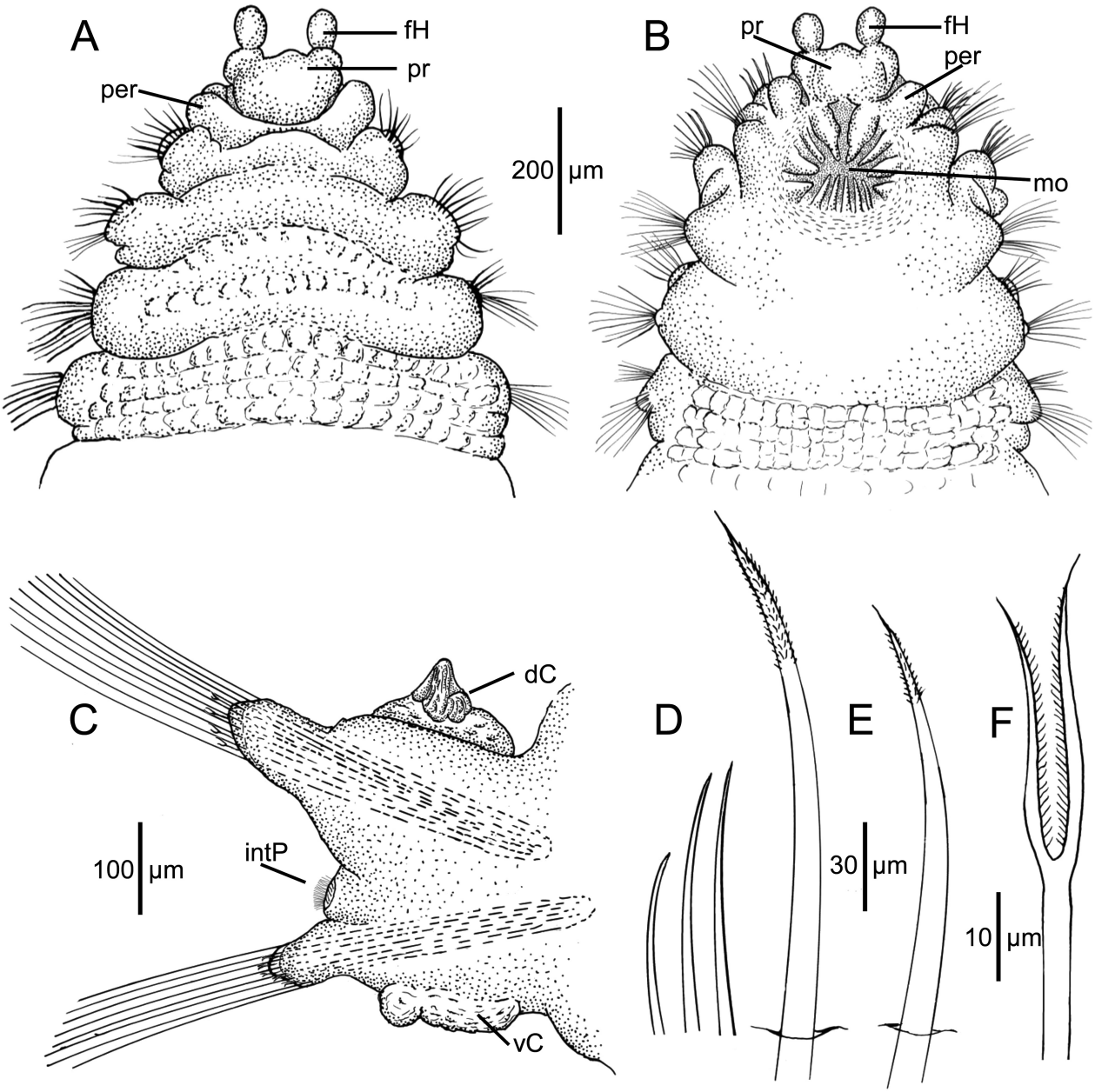

FIGURE 47. *Oligobregma acutaspinosum* **sp. nov.** Holotype (USNM 1741700): A, anterior end, dorsal view; B, anterior end, ventral view; C, posterior parapodium, anterior view; D, short spinous notosetae, setiger 1; E, long and short acicular spines, notopodia, setiger 1; furcate seta, posterior setiger.

Oligobregma acutaspinosum **sp. nov.** differs from *O. notiale* in having one instead of two peristomial rings, ventral cirri consisting of an asymmetrical closely adhering glandular lobe instead of a symmetrical triangular lobe, and quadriannulate segments along the body instead of triannulate rings that become quadriannulate only in posterior segments.

Biology. More than 550 quantitative box core samples from the Canadian boundary to off the Carolinas were collected as part of the U.S. ACSAR program but *Oligobregma acutaspinosum* **sp. nov.** was encountered only at Stations 11 and 14, both 800 m sites off North and South Carolina, respectively. Station 14, with 436 species of benthic invertebrates collected from nine box core samples (0.81 m^2) over three surveys, had the highest species richness and diversity for any site during the entire U.S. ACSAR program (Blake *et al*. 1987; Blake & Grassle 1994). *Microrbinia linea* Hartman, 1965, a small threadlike orbiniid polychaete was the dominant benthic invertebrate at the site (Blake 2021).

Sediment grain size at Station 14 (9 samples taken over three surveys) yielded the following results taken from Blake *et al*. (1987): percent sand: $\bar{x}$= 40.6 ± 2.41; percent silt: $\bar{x}$=32.95 ± 1.24; percent clay: $\bar{x}$=25.87 ± 2.31. These are well mixed sediments in a site strongly influenced by the Gulf Stream and Western Boundary Undercurrent (Blake *et al*. 1987; Blake & Grassle 1994).

Etymology. The epithet *acutaspinosum* is combined

from the Latin *acutus*, for pointed and the Latin *spina*, for thorn in reference to the finely pointed tips on the acicular spines of this species.

Distribution. Western Atlantic Ocean, SE USA, off South Carolina, 796–800 m.

Oligobregma brychiatum new species

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Figure 48

Material examined. (*7 specimens*) **Southern Ocean, Antarctica, R/V *Polarstern*, ANDEEP I (ANT XIX/3) & II (ANT XIX/4)**, coll. J.A. Blake: **Scotia Sea**, **ANI-Sta. 43-2**, 29 Jan 2002, BC, 60.449167°S, 56.082667°W, 3957 m, **holotype** (ZMH-ANN-030785), 2 **paratypes** (ZMH-ANN-030786); **ANI-Sta. 99-6**, 12 Feb 2002, BC, 61.114833°S, 59.261500°W, 5,194 m, 1 **paratype** (ZMH-ANN-030787); **ANI-Sta. 99-7**, 12 Feb 2002, MUC, 61.117667°S, 59.258833°W, 5,194.3 m, 2 **paratypes** (ZMH-ANN-030788).—**South Sandwich Trench**, **ANDEEP II-Sta. 139-7**, 20 Mar 2002, BC, 58.235000°S, 24.345500°W, 3935 m, 1 specimen (ZMH-ANN-030789).

Description. A moderately sized species, with anterior setigers expanded, posterior setigers narrow; holotype complete with 27 setigers, 9.2 mm long and 1.4 mm wide across setigers 7–8, widest of expanded segments. Other specimens small or juveniles. Body generally rectangular in cross section, more rounded in expanded segments. Prominent ventral ridge present from setiger 2, consisting of large mid-ventral paired plates on each segment, continuing to posterior end (Fig. 48B). Body with triannulate annular rings from setiger 3; with large, raised pads present over anterior segments from setiger 4 (Fig. 48A–B), then smaller, but numerous, pads on posterior segments. Color in alcohol light tan, with reddish dorsal and ventral cirri.

Prostomium weakly triangular dorsally (Fig. 48A), narrowing posteriorly, merging with anterior peristomial ring; broadly rounded across anterior margin, with two weakly rounded lateral swellings, these not developed into distinct horns (Fig. 48A); prostomium with narrow posterior end bearing narrow mid-dorsal groove or notch; eyespots absent; nuchal organs not observed. Peristomium with two rings dorsally, both of equivalent size (Fig. 48A), separated from prostomium by narrow nuchal groove, interrupted mid-dorsally by posterior extension of prostomium (Fig. 48A). Ventrally, peristomium continues as single ring merging with and surrounding large elevated oral opening surrounded by about 15 elongate lobes (Fig. 48B); proboscis not observed.

Notopodia of setigers 1–3 reduced to rounded lobes from which setae arise; subsequent notopodia well-developed, elongate, prominent; neuropodia of setigers 1–3, low, rounded, thereafter well-developed with elongate podial lobes. Dorsal and ventral cirri first evident in noto- and neuropodia from middle segments. Both cirri weakly triangular in shape; dorsal cirri smaller than ventral cirri, with the latter having an asymmetrical base (Fig. 48C); both cirri with large internal striated and reddish pigmented glands (Fig. 48C). Oval-shaped interramal papilla present between podial lobes (Fig. 48C).

Acicular spines present in notopodia and neuropodia of setigers 1–3. Notopodia of setiger 1 with setae in two rows with an anterior row of 7–8 acicular spines and a second row of 2–3 acicular spines and a fascicle of thin capillaries; notopodia of setiger 2 also with an anterior row of acicular spines but with the second row with only capillaries; setiger 3 with a curved row of 4–5 acicular spines and 5–6 long capillaries. Neuropodia of setiger 1–2 with anterior fascicle of 4–5 acicular spines and a bundle of capillaries; setiger 3 with 2–3 acicular spines and long capillaries. Acicular spines of notopodia of setigers 1–2 heavy, curved tapering to thin aristate-like tip (Fig. 48D–E); each spine heavily hirsute near tips. Short spinous setae anterior to spines absent. Setiger 4 and following setigers with noto- and neuropodia with spreading fascicles of capillaries; furcate setae present preceding capillaries from setiger 5, numbering 3–7 per fascicle, each with a pair of nearly equal tapering tynes, each tyne with short denticles on inner edge directed toward opposite tyne (Fig. 48F).

Pygidium narrow, bilobed, with up to five anal cirri present, but most missing.

Remarks. Seven species of *Oligobregma* have acicular spines in both noto- and neuropodia of setigers 1–3. Of these, two abyssal species, *O. brychiatum* **sp. nov.** from Antarctic seas and *O. profunda* Blake, 2023 from off eastern Australia, have furcate setae from setiger 5 and a peristomium with two dorsal rings. *Oligobregma brychiatum* **sp. nov.** has two rounded lobes on the lateral peristomial margins instead of distinct frontal or lateral horns, hirsute spines in setigers 1–2, smooth spines in setiger 3, and five anal cirri. In contrast, *O. profunda* has two short but distinct rounded frontal lobes on the prostomium, smooth non-hirsute acicular spines in setigers 1–3, and four anal cirri.

Etymology. The epithet *brychiatum* is from the Greek, *brychios* meaning "*from the deep*" in reference to the great depths from which this species was collected.

Distribution. Southern Ocean, Antarctica, Scotia Sea, and South Sandwich Trench, abyssal depths, 3935–5194 m.

Oligobregma chromatum new species

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Figure 49

Material examined. **South China Sea, off Brunei, Island of Borneo**, Site CA2, R/V *Emma*, coll. P.A. Neubert, Chief Scientist, BC, **Sta. JA6**, coll. 30 Jun 2011, 5.517°N, 113.608°E, 1999 m, **holotype** (MCZ IZ 171914).

Description. A small species, holotype complete with 35 setigers, 4 mm long, 0.75 mm wide across middle segments. Anterior segments 1–16 increasing in width, becoming swollen by about setiger 10, then abruptly narrow from setiger 17 to end. Body generally oval in cross

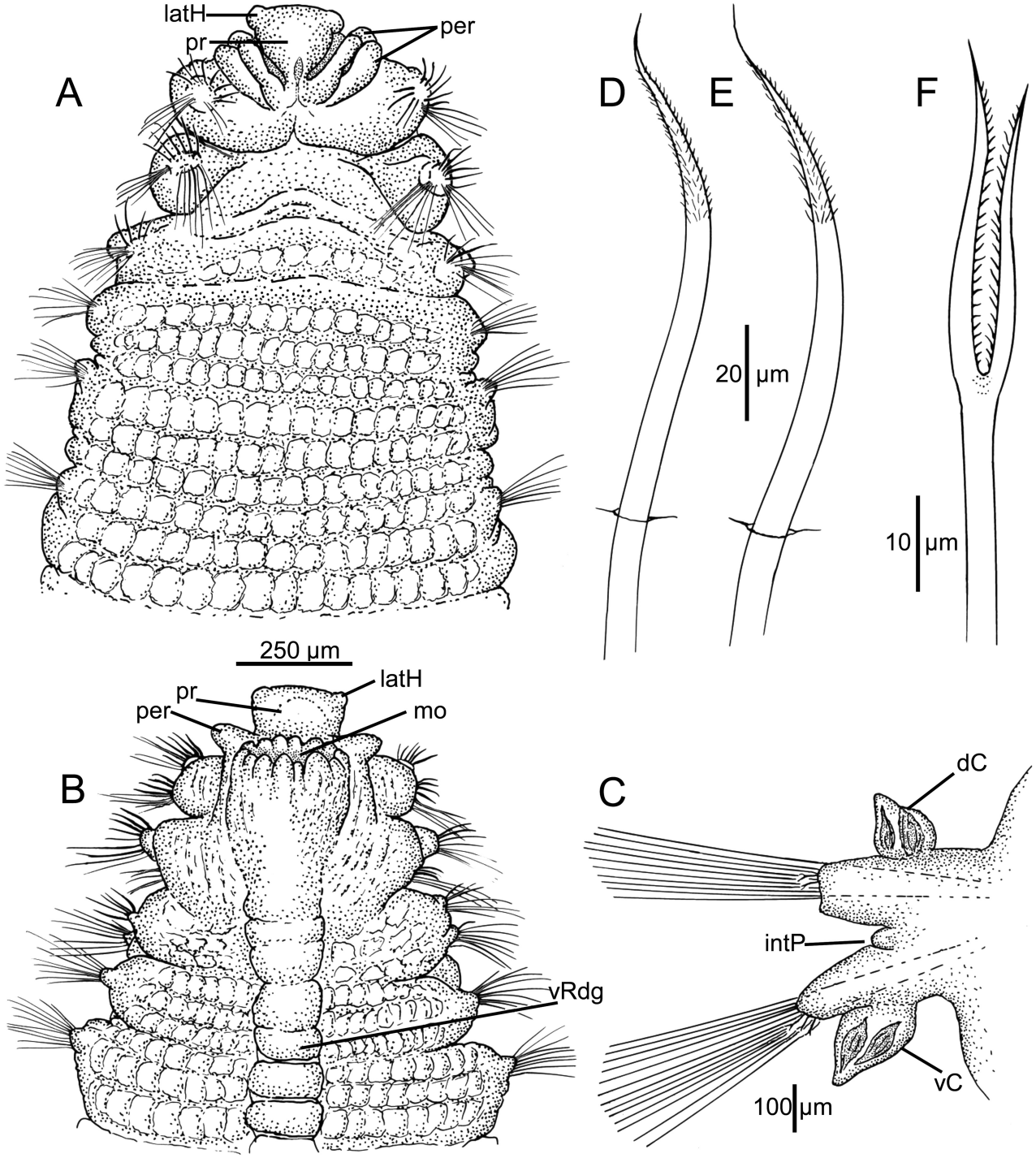

FIGURE 48. *Oligobregma brychiatum* **sp. nov.** Holotype (ZMH-ANN-030785): A, anterior end, dorsal view; B, anterior end, ventral view; C, posterior parapodium, anterior view; D–E, acicular spines, notopodia setiger 1; F, furcate seta, posterior notopodium.

section; dorsal and ventral longitudinal ridges or grooves along body absent. Body segments generally triannulate from setiger 2, but annular rings indistinct; large, raised pads not present, reduced to irregular surface with large number of darkly pigmented glands. These glands largest and most evident on or near parapodia (Fig. 49B); smaller pigmented glands irregularly scattered across each annular ring (Fig. 49A). Color in alcohol light tan with numerous pigmented glands along entire body.

Pre-setiger region relatively short, partially recessed into setiger 1. Prostomium semicircular, broadly rounded anteriorly, with two prominent horns projecting laterally or at about 45-degree angle (Fig. 49A); eyespots absent; nuchal organs not observed. Peristomium a single entire multilobed ring surrounding prostomium dorsally and laterally (Fig. 49A); continuing ventrally surrounding oral opening; mouth an oval opening surrounded by numerous small lobes; proboscis not observed.

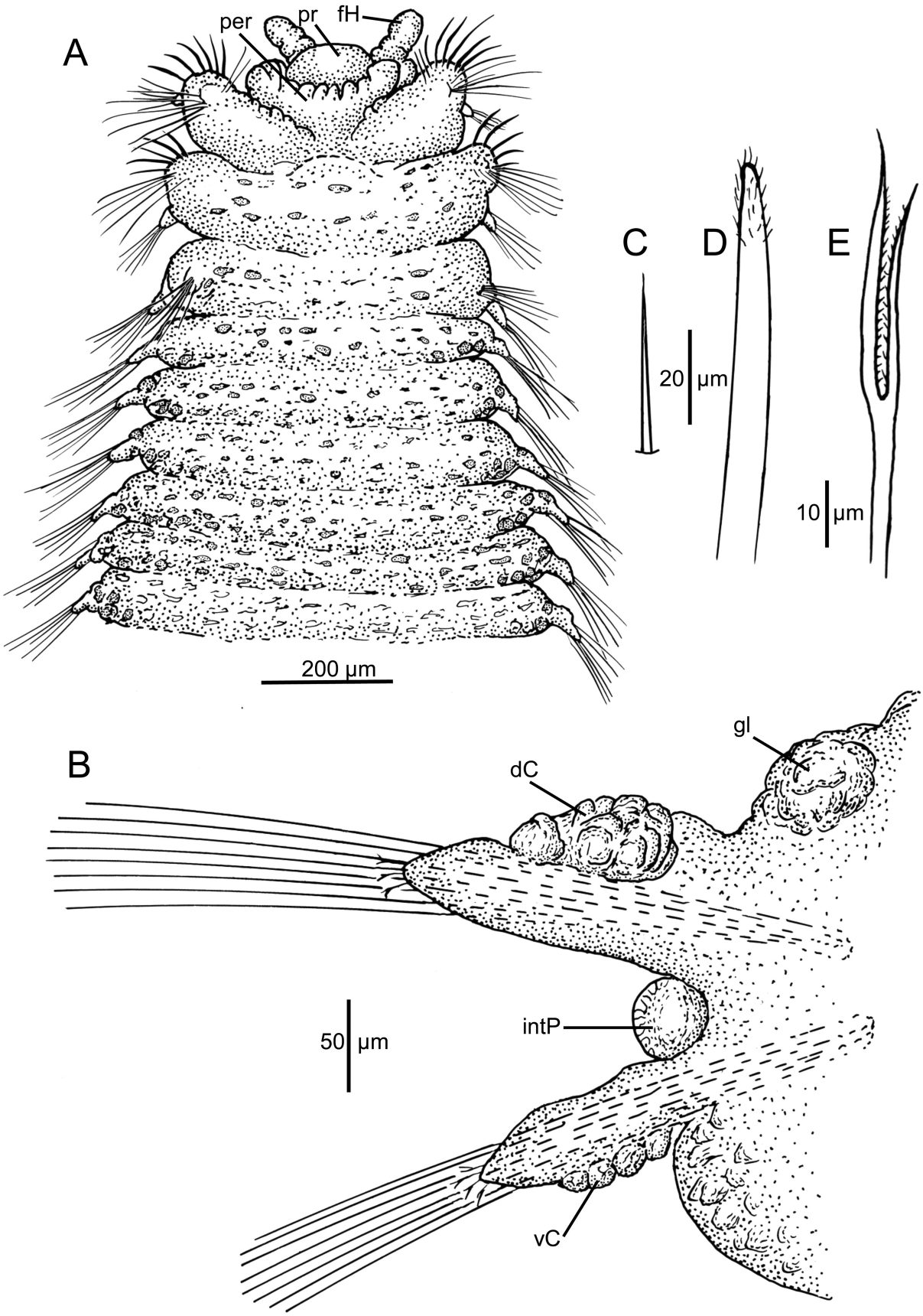

FIGURE 49. *Oligobregma chromatum* **sp. nov.** Holotype (MCZ IZ 171914): A, anterior end, dorsal view; B, posterior parapodium, anterior view; C, short spinous seta setiger 1; D, acicular spine, setiger 1; E, furcate seta from posterior neuropodium.

Notopodia of setigers 1–3 reduced to rounded lobes from which setae arise; subsequent notopodia with elongate well-developed and prominent podia; neuropodia all elongate from setiger 1. Dorsal and ventral cirri first evident in noto- and neuropodia from about setiger 4 as enlarged glands. Dorsal cirri larger and with more glands than neuropodial cirri; both consisting of irregular concentrations of pigmented glands with internal striations (Fig. 49B). Large oval interramal cirrus present between podial lobes (Fig. 49B).

Acicular spines present in notopodia of setigers 1–2; spines absent in neuropodia. Notopodia of setigers 1–2 with row of acicular spines accompanied by 3–4 short spinous setae; only capillaries present in second row; neuropodia of setigers 1–2 with spreading fascicles of capillaries; setiger 3 and following setigers with a spreading fascicle of capillaries preceded by 4–6 furcate setae in both noto- and neuropodia. Acicular spines of notopodia of setigers 1–2 heavy, curved, tapering to rounded narrow tip, each hirsute with numerous fibrils projecting over tip (Fig. 49D); short spinous setae of setigers 1–2 narrow pointed tips (Fig. 49C); furcate setae from setiger 3, each with a pair of nearly equal tapering tynes, each tyne with short denticles on inner edge directed toward opposite tyne (Fig. 49E). Some furcate setae of posterior setigers with shafts as long as capillaries.

Pygidium narrow, multilobed, surrounding anal opening; anal cirri absent.

Remarks. Among species of *Oligobregma* having acicular spines limited to setigers 1–2, only *O. chromatum* **sp. nov.** from the South China Sea has these spines limited to the notopodia. The species is readily recognized by the numerous pigmented glands on the annular rings.

Etymology. The epithet *chromatum* is from the Greek, *chroma*, for color of the skin or surface, in reference to the numerous pigmented glands and cells that are associated with the annular rings that encircle the body and the parapodia.

Distribution. South China Sea, off Brunei, Island of Borneo, 1999 m.

Oligobregma emmae new species

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Figure 50

Material examined. (*6 specimens*) **South China Sea, off Brunei, Island of Borneo**, **Site CA2**, R/V *Emma*, coll. P.A. Neubert, Chief Scientist, **Sta. TU8**, coll. 24 Jun 2011, BC, 5.36°N, 113.821°E, 1325 m, **holotype** (MCZ IZ 171915), **paratype** (MCZ IZ 171916). **Sta. ME8**, coll. 26 Jun 2011, BC, 5.406°N, 113.663°E, 1768 m, **paratype** (MCZ IZ 171917). **Sta. ME15**, coll. 27 Jun 2011, BC, 5.45°N, 113.668°E, 1892 m (1, MCZ IZ 171918). **Sta. AN8**, coll. 27 Jun 2011, BC, 5.466°N, 113.762°E, 1783 m (1, MCZ IZ 171919). **Sta. DA5**, coll. 01 Jul 2011, 5.439°N, BC, 113.477°E, 1958 m (1, MCZ IZ 171920).—**Site CA1**, R/V *Emma*, coll. J.A. Blake, Chief Scientist, **Sta. 54**, 09 Jun 2011, BC, 5.703°N, 114.2199°E, 1171 m (1 juv, MCZ IZ 171921).

Description. A small species, holotype (MCZ IZ 171915) complete, with 27 setigers, 5.3 mm long, 1.5 mm wide across expanded middle segments, 0.8 mm wide across narrower posterior segments. Paratype (MCZ IZ 171917) complete, with 26 setigers, 3.8 mm long. Body fusiform, narrow at first, then expanding from setigers 4–5 to about setiger 11, then narrowing along setigers 12–27. Apart from expanded segments, body generally rectangular in cross section. Anterior segments and expanded segments with no apparent annular rings or dorsal or ventral grooves; posterior segments triannulate, venter with mid-ventral longitudinal ridge consisting of a pair of pads at junction of each segmental ring (Fig. 50G); annular rings lacking distinct raised pads, but delimited by weakly developed transverse grooves along each row. Color in alcohol light tan with dorsal and ventral cirri of posterior segments with pigmented internal glands.

Pre-setiger region relatively short, ventrally extending onto setiger 1. Prostomium semicircular, broadly rounded along anterior margin, with two short oval frontal horns projecting at about a 45-degree angle (Fig. 50A); eyespots absent; nuchal organs observed on paratype as swollen lobes obscuring peristomium dorsally. Peristomium a single multilobed ring surrounding prostomium dorsally and laterally (Fig. 50A), interrupted dorsally by posterior extension of prostomium, continuing ventrally forming posterior lip of mouth (Fig. 50B). Mouth a large opening formed by a deep groove extending from prostomium, surrounded posteriorly by 4–6 large, rounded lobes (Fig. 50B); proboscis not observed.

Notopodia of setigers 1–3 enlarged lobes from which setae arise; from setiger 4 to about setiger 10, notopodia short triangular lobes; subsequent notopodia becoming elongate, bearing dorsal cirrus (Fig. 50A–C. Neuropodia similar except that short triangular lobes first appear from setiger 3; elongate neuropodia and ventral cirri similar in appearance to those of notopodia. Dorsal and ventral cirri elongate, swollen with prominent internal pigmented glands (Fig. 50C). Dorsal and ventral cirri of similar shape and length; initially somewhat triangular, becoming longer and digitiform posteriorly (Fig. 50C). Internal glands of dorsal and ventral cirri large, striated, with tubules evident apically (Fig. 50C). Large ciliated oval interramal cirrus present between podial lobes (Fig. 50C).

Acicular spines present in notopodia of setigers 1–3 and neuropodia of setigers 1–2. Notopodia of setigers 1–2 with anterior row of 6–7 acicular spines and a second row of 6–8 long capillaries; setiger 3 with 3–4 acicular spines and 4–5 capillaries. Neuropodia of setigers 1–2 with 3–4 acicular spines and a fascicle of capillaries; neuropodia of setiger 3 with all capillaries. Acicular spines of notopodia of setigers 1–3 heavy, curved, tapering to pointed, aristate-like tip, each spine hirsute with numerous fibrils projecting over curved tip (Fig. 50D); short spinous setae anterior to notopodial heavy spines absent; neuropodial acicular spines of setigers 1–2 smaller, less conspicuous than those of notopodia (Fig. 50E). Furcate setae from

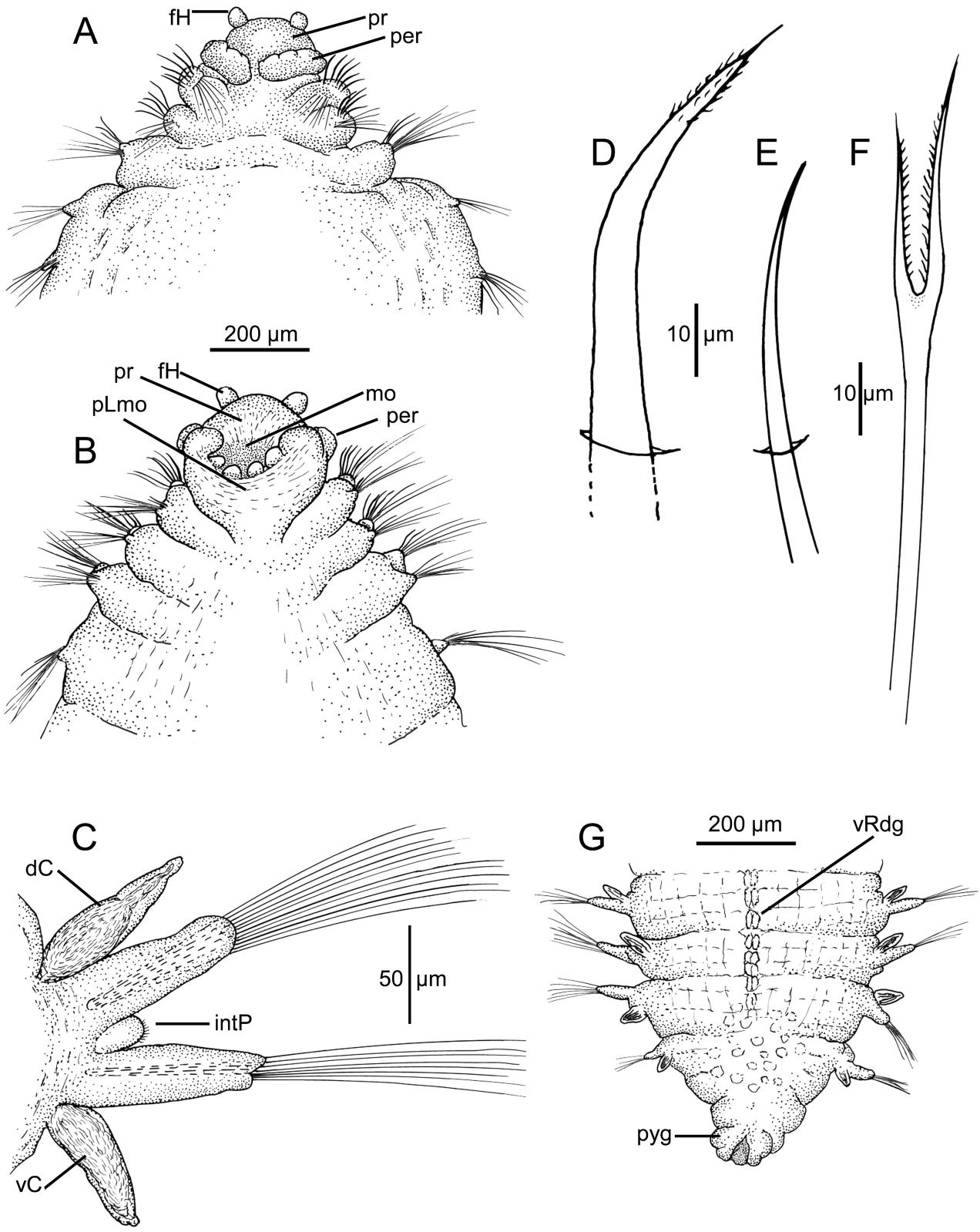

FIGURE 50. *Oligobregma emmae* **sp. nov.** Holotype (MCZ IZ 171915): A, anterior end, dorsal view; B, anterior end, ventral view; C, posterior parapodium posterior view; D, acicular spine, notopodium setiger 1; E, acicular spine, neuropodium setiger 1; F, furcate seta, posterior neuropodium; G, posterior end, ventral view.

setiger 4, each with a pair of nearly equal tapering tynes, each tyne with short denticles on inner edge directed toward opposite tyne (Fig. 50F); furcate setae of posterior setigers with long shafts, nearly as long a capillaries.

Pygidium narrow, bilobed, surrounding anal opening; anal cirri absent (Fig. 50G).

Remarks. Among species of *Oligobregma* with acicular spines on notopodia of setigers 1–3, only four species have similar spines on neuropodia of setigers 1–2. In addition to *O. emmae* **sp. nov.** from the South China Sea, the type-species O. *aciculata* (Hartman, 1965) from the North Atlantic Ocean, plus *O. aristata* Blake, 2023 and *O. renuncula* Blake, 2023, from deep-water off eastern Australia, have a similar configuration. *Oligobregma emmae* **sp. nov.** and *O. aciculata* have furcate setae from setiger 4 instead of setiger 5 as in the two Australian species. In addition, *O. emmae* **sp. nov.** lacks anal cirri, while *O. aciculata* has five cirri and *O. renuncula* has four; anal cirri are not reported for *O. aristata*. In addition, the dorsal and ventral cirri differ: both cirri are long, narrow, digitiform, and have large internal striated glands with numerous tubules in *O. emmae* **sp. nov.** In contrast, *O. aciculata* has short, rounded dorsal cirri and triangular ventral cirri; *O. aristata* has uniquely enlarged swollen dorsal cirri with a terminal nipple and the ventral cirrus arises from an asymmetrical base; *O. renuncula* has both dorsal and ventral cirri enlarged and arising from an asymmetrical base and tapering to a narrow tip, each bears numerous striated glands. *Oligobregma renuncula* further differs from other species of *Oligobregma* in having pairs of darkly pigmented nephridia present and visible ventrally within anterior and middle segments (Blake 2023).

Etymology. The epithet is from the R/V *Emma*, the research vessel used on the survey to collect samples from off Brunei.

Distribution. South China Sea, off Brunei, Island of Borneo, 1325–1958 m.

Oligobregma escanabis new species

urn:lsid:zoobank.org:act:7E183BE1-4361-47AD-984E-299E491B6F43

Figure 51

Material examined. **Eastern North Pacific Ocean, Gorda Ridge, Escanaba Trough**, **HOV *Alvin* Dive 2035**, coll. J.F. Grassle, 5 Jun 1988, 41.007°N, 127.293°W, 3305 m, box core B, **holotype** (MCZ IZ 171922).

Description. A small species, holotype incomplete with 16 setigers, 3.5 mm long, 0.6 mm wide . Body vermiform, widest anteriorly but not swollen, tapering posteriorly. Pygidium unknown. Color in alcohol light tan.

Prostomium with two frontal lobes projecting laterally (Fig. 51A); eyespots absent; nuchal organs not visible. Peristomium large, smooth, with rounded sides, merging with reduced setiger 1 (Fig. 51A). Proboscis simple, saclike.

Body segments relatively smooth dorsally, with transverse quadriannulate rows of pads from setiger 3. Parapodia with well-developed podial lobes from which spreading fascicles of setae emerge; posterior segments with long, erect conical-shaped dorsal cirri (Fig. 51C) and asymmetrical ventral cirri with broad basal attachment tapering to narrow tip; both cirri with internal tubular glands; interramal papilla present.

Setiger 1 reduced, uniramous, with single notopodial lobe bearing three short spinous setae, one long acicular spine, and 2–3 capillaries. Setiger 2 with notopodia bearing 3–4 short spinous setae, 3–4 long curved, pointed acicular spines, and 8–9 long, smooth capillaries (Fig. 51B); neuropodia with 3–4 short blunt-tipped spinous setae, 2–3 longer pointed spines intermediate between long spines of notopodia and capillaries, and 4–6 long, smooth capillaries. Setiger 3 and following segments with 3–4 furcate setae in anteriormost part of noto- and neuropodial setal fascicles, accompanied by 14–20 long capillaries in anterior setigers and 7–8 capillaries posteriorly. Short spinous setae with narrow smooth shafts, narrow blunt tips and smooth shafts (Fig. 51B); longer acicular spines, curved, sickle-like, hirsute along concave edge (Fig. 51B); furcate setae with unequal tynes, each tyne bearing fine denticles on inner edge directed toward opposite tyne (Fig. 51D).

Remarks. This species is referred to the genus *Oligobregma* because posterior parapodia have dorsal and ventral cirri, branchiae are absent, and acicular spines are present in setigers 1–2. *Oligobregma escanabis* **sp. nov.** is unusual in that peristomium is unusually large and setiger 1 is uniramous with a notopodium and acicular setae but no neuropodium; setiger 2 is biramous with acicular spines in both rami. Short spinous setae are anterior to each set of acicular spines.

Etymology. The species name refers to the Escanaba Trough of the Gorda Ridge, where the species was collected.

Distribution. Eastern North Pacific Ocean, hydrothermal vents on the Gorda Ridge, abyssal, 3305 m.

Oligobregma hampsoni new species

urn:lsid:zoobank.org:act:2ACD9018-7681-4C98-8402-3631304A99CF

Figure 52

Material examined. **Western North Atlantic Ocean, off New England,** U.S. North ACSAR Program, coll. G.W. Hampson, Chief Scientist, **Sta. 2**, **Cruise NA-6**, R/V *Cape Hatteras,* Rep. 3, coll. 26 Jul 1986, BC, 40.954°N, 66.230°W, 2103 m, **holotype** (USNM 1741703).

Description. A moderately sized species, holotype complete, with 28 setigers, 7.5 mm long and 0.9 mm wide across expanded segments at setigers 6–7. Body fusiform, gradually increasing in width from setiger 1 to setigers 8–9, then body narrowed for about 13 setigers, then expanded again for 4–5 setigers before narrowing to pygidium. Body rectangular in cross section except for dorsally rounded expanded segments. Anterior expanded

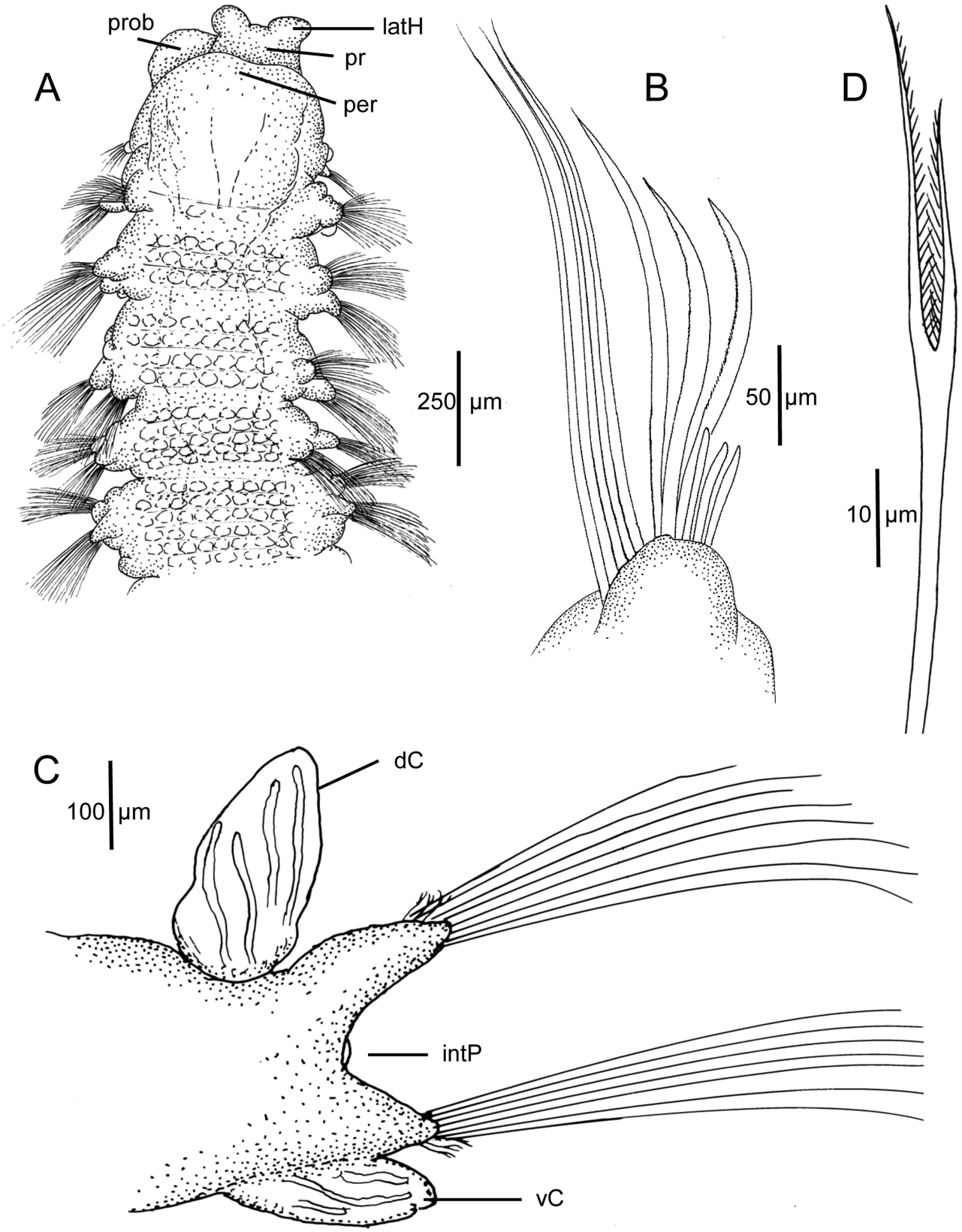

FIGURE 51. *Oligobregma escanabis* **sp. nov.** Holotype (MCZ IZ 171922): A, anterior end, dorsal view; B, notopodium, setiger 2 with short spinous setae, acicular spines, and capillaries; C, posterior parapodium, anterior view; D, furcate seta from posterior neuropodium.

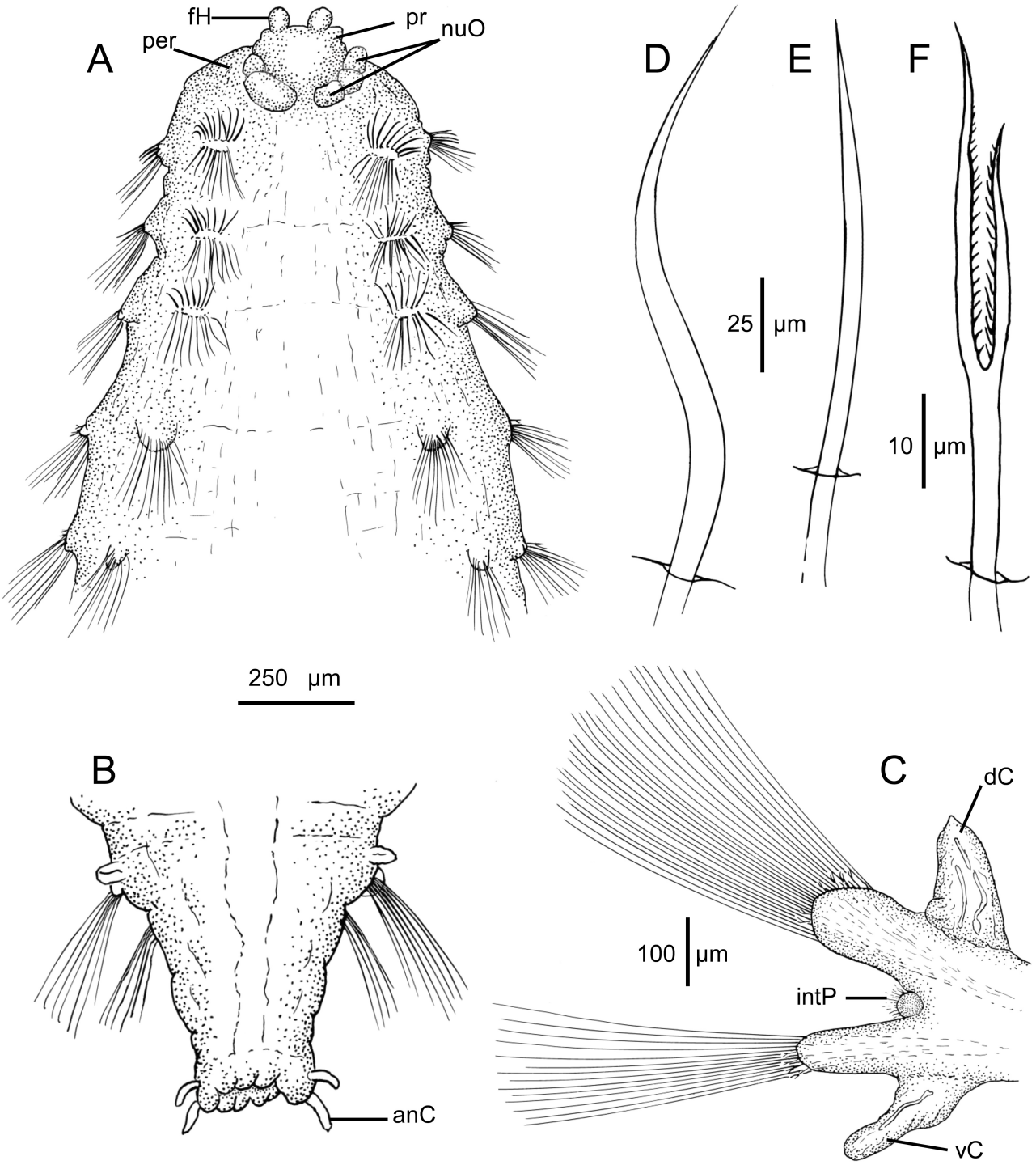

FIGURE 52. *Oligobregma hampsoni* **sp. nov.** Holotype (USNM 1741703): A, anterior end, dorsal view; B, posterior end, dorsal view; C, posterior parapodium, anterior view; D, notopodial acicular spine, setiger 1; E, neuropodial acicular spine, setiger 1; F, furcate seta from posterior neuropodium.

segments with annular rings obscured, only vaguely apparent (Fig. 52A), becoming distinct by setiger 9, with 4–5 annular rings per segment continuing posteriorly. Annular rings with low rectangular raised pads. Venter with mid-ventral ridge along narrow posterior segments composed of raised pads where one or two annular rings meet mid-ventrally. Color in alcohol light tan.

Prostomium oval, about as long as wide, narrowing posteriorly, merging with peristomium; anteriorly with two short, rounded frontal horns (Fig. 52A); eyespots absent; nuchal organs everted as 2–3 elongated inflated lobes along posterior and lateral margins (Fig. 52A). Peristomium large, smooth dorsally, merging with setiger 1 (Fig. 52A), ventrally surrounding mouth; mouth obscured on holotype by large everted proboscis.

Notopodia of setigers 1–3 enlarged lobes from

which setae arise; from setiger 4 to about 10, notopodia short triangular lobes; subsequent notopodia becoming elongate, bearing dorsal cirri. Neuropodia similar except podial lobes becoming more digitiform by about setiger 7; ventral cirri first appear by about setiger 8. Dorsal cirri erect, triangular, tapering to nipple-like tip (Fig. 52C); ventral cirri narrow, elongate arising from asymmetrical base, tapering to rounded tip (Fig. 52C). Both dorsal and ventral cirri with internal tube-like glands (Fig. 52C). Large oval interramal cirrus present between podial lobes (Fig. 52C).

Acicular spines present in noto- and neuropodia of setigers 1–3. Notopodia of setiger 1 with an anterior row of 9–10 acicular spines and a second row of 3–4 short spines and long capillaries; setiger 2 with 7–8 acicular spines in first row and 1–3 short spines and long capillaries in second row; setiger 3 with 5–6 spines in first row and long capillaries in second row. Neuropodia of setigers 1–2 with 7–8 acicular spines and capillaries in first row and all capillaries in second row; neuropodia of setiger 3 with 3–4 acicular spines and capillaries in first row and all capillaries in second row. Notopodial acicular spines heavy recurved, tapering to pointed tip (Fig. 52D); neuropodial acicular spines not as heavy, not recurved (Fig. 52E); a row of minute short spinous setae anterior to acicular spines present, each narrow with pointed tip. Furcate setae from setiger 4, each with a pair of nearly equal tapering tynes, each tyne with short denticles on inner edge directed toward opposite tyne (Fig. 52F).

Pygidium narrow, with a pair of large lateral lobes and 3–4 short medial lobes dorsally and ventrally surrounding anal opening; four short lateral anal cirri present (Fig. 52B).

Remarks. Among 13 species of *Oligochaeta* with acicular spines in setigers 1–3, *O. hampsoni* **sp. nov.** is one of eight with spines in both noto- and neuropodia (Table 4). Of these, *O. hampsoni* **sp. nov.** is the only one to lack distinct peristomial rings; instead the peristomium is broad, smooth and dorsally merges seamlessly with setiger 1. The everted nuchal organs arise from the posterior lateral margins of the prostomium and mimic peristomial rings. The large notopodial acicular spines are recurved and taper to an elongated tip; these are not aristate or hirsute as in other species.

Oligobregma hampsoni **sp. nov.** is one of four species having acicular spines in setigers 1–3 that occur in deep-water off the U.S. Atlantic coast: *O. acsarum* **sp. nov.** from off the Carolinas in abyssal depths, *O. acutaspinosum* **sp. nov.** off South Carolina in 800 m, *O. hampsoni* **sp. nov.** from off New England in lower slope depths, and *O. williamsae* **sp. nov.** in lower continental slope depths off New Jersey. Of these, *O. acutaspinosum* **sp. nov.** has spines only in the notopodia, whereas *O. acsarum* **sp. nov.**, *O. hampsoni* **sp. nov.**, and *O. williamsae* **sp. nov.** have acicular spines in both noto- and neuropodia of setigers 1–3. However, the large acicular spines of *O. acsarum* **sp. nov.** have a short pointed hirsute tip to the shaft; and a narrow smooth aristate spine is also present. Both *O. hampsoni* **sp. nov.** and *O. williamsae* **sp. nov.** have long, curved acicular spines with narrow, pointed, non-hirsute tips. The main difference with *O. williamsae* **sp. nov.**, however, is the nature of the prostomium and frontal horns. *Oligobregma hampsoni* **sp. nov.** has a prostomium with a transverse anterior margin and two short conical frontal horns. In contrast, *O. williamsae* **sp. nov.** has a narrow anterior prostomial margin that is notched and from which the two frontal horns arise close to one another, lateral to the narrow notch.

Etymology. This species is named for the late Mr. George W. Hampson, former Research Scientist at the Woods Hole Oceanographic Institution, and Chief Scientist on the survey from which this species was collected, and a close personal friend of the author.

Distribution. Western North Atlantic Ocean, off New England, continental slope, 2103 m.

Oligobregma menziesi new species

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Figures 53–54

Material examined. **Southeastern Pacific Ocean, off Peru, Peru-Chile Trench, Milne-Edwards Deep,** SEPBOP Expedition, R/V *Anton Bruun*, **Sta. AB II 166**, coll. R.J. Menzies, 01 Nov 1965, corer & Menzies trawl in tandem, 08.7°S, 80.667°W, 3167–3318 m, **holotype** (LACM-AHF Poly 13575).

Description. A small species, holotype complete with 28 setigers, expanded over first 10 setigers, then narrow posteriorly; 7.4 mm long, 1.2 mm wide at setiger 7, 0.43 mm wide across posterior setigers 18–22. Body oval in cross section, with rounded dorsum, venter weakly rounded, with mid-ventral ridge along expanded anterior segments from setiger 2 (Fig. 53B) to posterior end; ridge consisting of large, raised pads along ventral midline. Dorsal surface of setiger 1 with two rings and setiger 2 with three rings, lacking raised pads (Fig. 53A); ventral surface of setigers 1–2 modified by oral morphology, without annular rings (Fig. 53B). Dorsal surface of setigers 3–4 triannulate, then becoming quadriannulate from setiger 5 and continuing to posterior end (Fig. 53A–B). Individual raised pads from setiger 3 dorsally (Fig. 53A) and setiger 6 ventrally; pads small, numerous along each ring, interrupted ventrally by mid-ventral ridge. Color in alcohol light tan.

Pre-setiger region relatively short, about as long as setiger 1. Prostomium oval, wider than long, with rounded anterior margin bearing two oval frontal-lateral horns projecting anteriorly at about a 45-degree angle (Fig. 53A–B); eyespots absent; nuchal organs not observed. Peristomium with a single entire multilobed ring surrounding prostomium dorsally (Fig. 53A), continuing ventrally, forming anterior lip of mouth with six narrow lobes on anterior lip (Fig. 53B); posterior lip on setiger 1, with six indistinct narrow lobes; mouth a distinct opening between these two lips at level of setiger 1 (Fig. 53B); proboscis not observed.

Parapodia enlarged rounded lobes, largest on setigers 1–4 bearing large acicular spines in two rows. Posterior parapodia becoming elongate bearing dorsal

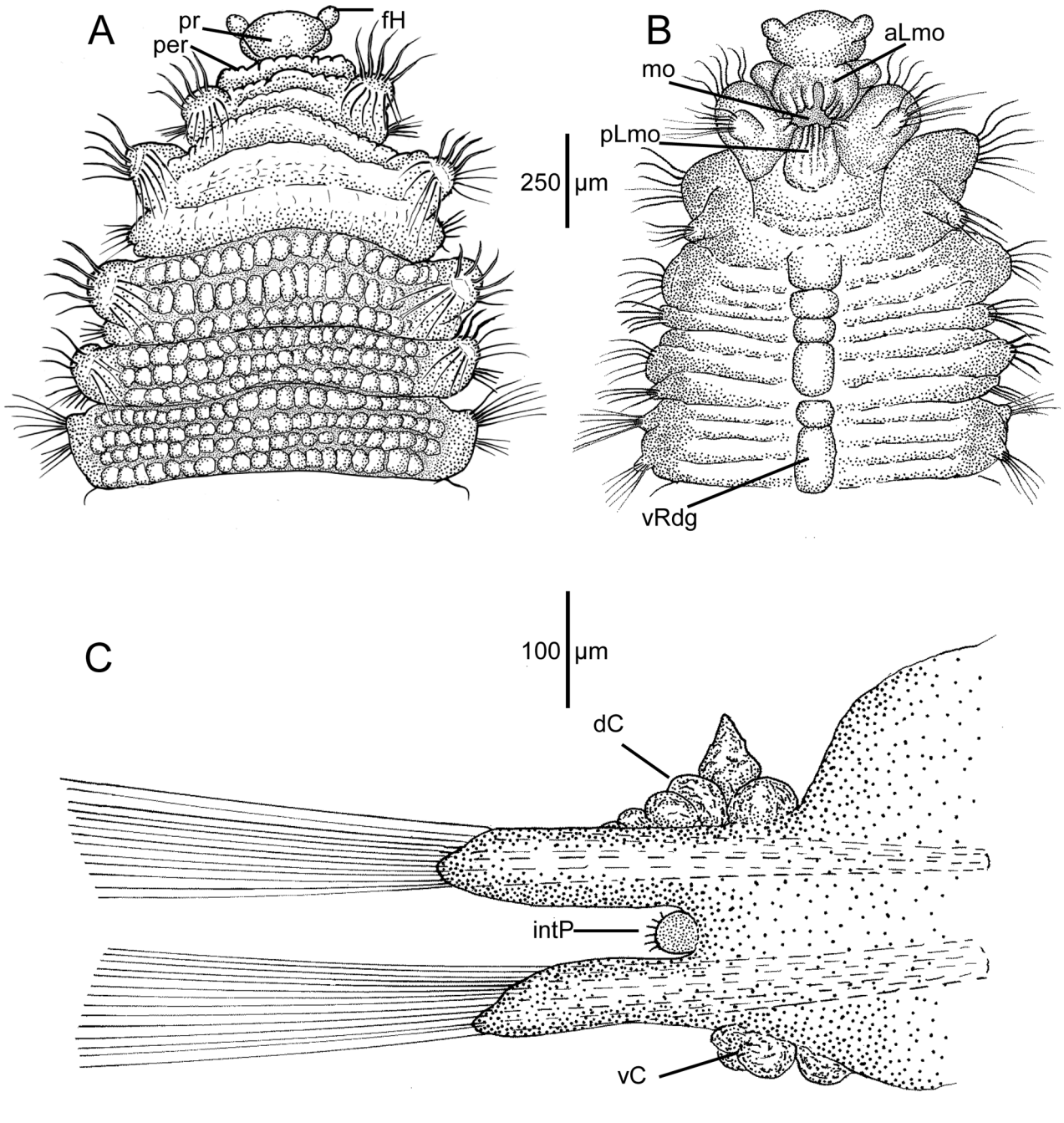

FIGURE 53. *Oligobregma menziesi* **sp. nov.** Holotype (LACM-AHF Poly 13575): A, anterior end, dorsal view; B, anterior end, ventral view; C, posterior parapodium, posterior view.

and ventral cirri. Dorsal and ventral cirri consist of large rounded glandular lobes; dorsal cirri with erect triangular cirrus arising from glandular lobes on some notopodia, others likely broken off (Fig. 53C); ventral cirri all with glandular lobes (Fig. 53C). Ciliated interramal papilla present between podia.

Setae include acicular spines in noto- and neuropodia of setigers 1–4, capillaries in all setigers, and furcate setae from setiger 5; short spinous setae anterior to acicular spines not observed. Setiger 1 with two rows of spines and a few capillaries; setiger 2 with five acicular spines in first row and three spines and capillaries in second row; setiger 3 with five spines in first row and about 10 capillaries in second row (Fig. 54F); setiger 4 with four spines in first row and capillaries in second row. All subsequent noto- and neuropodia from setiger 5 with fascicles of long capillaries accompanied by short furcate setae anterior to and at base of fascicles. Acicular spines of setiger 1 heavy, curved, tapering to narrow hirsute feather-like tip, spines arranged in two rows with spines of first row larger (Fig. 54A) than those of second row (Fig. 54B); spines of setiger 2 similar to those of setiger 1, but thinner, not

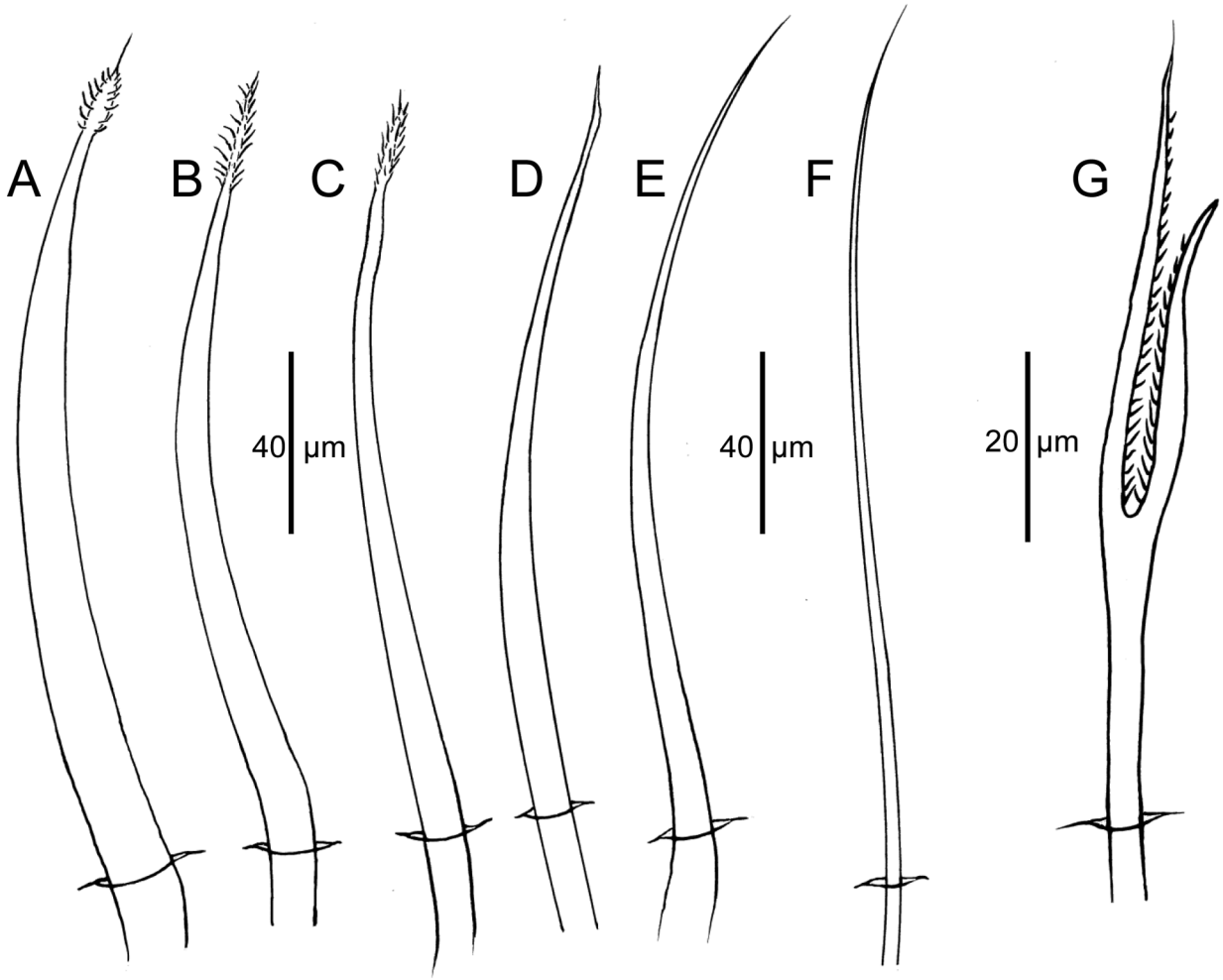

FIGURE 54. *Oligobregma menziesi* **sp. nov.** Holotype (LACM-AHF Poly 13575): A, acicular spine, notopodia, setiger 1, first row; B, acicular spine, notopodia, setiger 1, second row; C, acicular spine, notopodia, setiger 2, first row; D, acicular spine, notopodia, setiger 3; E, acicular spine, notopodia setiger 4; F, capillary notoseta setiger 3; G, furcate seta, posterior neuropodium.

as heavy (Fig. 54C); spines of setigers 3 and 4 tapering to fine, non-hirsute tip (Fig. 54D–E). Furcate setae from setiger 5, each with one long tapering tyne and a slightly shorter second tyne; each tyne with short denticles on inner edge directed toward opposite tyne (Fig. 54G).

Pygidium damaged, but cuff-like with lobes surrounding anal opening; anal cirri not observed.

Remarks. *Oligobregma menziesi* **sp. nov.**, an abyssal species from the Peru-Chile Trench, is most similar to *O. acutaspinosum* **sp. nov.** from the U.S. Atlantic coast off the Carolinas in 800 m and *O. chromatum* **sp. nov.** from off Brunei in the South China Sea in 2000 m in the nature of the reduced dorsal and ventral cirri that are composed of rounded glandular lobes. Both *O. menziesi* **sp. nov.** and *O. acutaspinosum* **sp. nov.** also have short triangular-shaped notopodial cirrus arising from the dorsal rounded glands. These three species differ in the distribution of the acicular spines: *O. chromatum* **sp. nov.** has acicular spines limited to the notopodia of setigers 1–2, *O. acutaspinosum* **sp. nov.** has acicular spines in notopodia of setigers 1–3, and *O. menziesi* **sp. nov.** has acicular spines in the notopodia and neuropodia of setigers 1–4 (Table 4).

Etymology. This species is named for the late Dr. Robert J. Menzies, prominent crustacean systematist, who was Chief Scientist on several of the SEPBOB cruise legs.

Distribution. Southeastern Pacific Ocean, off Peru, Peru-Chile Trench, 3167–3318 m.

Oligobregma mucronata Blake, 2015

Oligobregma mucronata Blake, 2015: 80–84, figs. 8–9.

Material examined. **East Antarctic Peninsula, Larsen-A Ice Shelf Area, RVIB *Nathaniel B. Palmer* Cruise 2000-03**, coll. J.A. Blake, 0.1-m^2 SMG, **Greenpeace Trough**: **Sta. NBP-06**, 17 May 2000, SMG, 64.759°S, 60.179°W, 733 m (2, MCZ IZ 171923). **Sta. NBP-07B**, 18 May 2000, SMG, 64.725°S, 60.08°W, 839 m (1, MCZ IZ 171924). **Sta. NBP-16**, 19 May 2000, SMG, 64.732°S, 059.745°W, 713 m (5, MCZ IZ 171925). **Sta. NBP-17**, 19 May 2000, SMG, 64.663°S, 60.128°W, 719 m (1, MCZ IZ 171926). **Sta. NBP-19**, 20 May 2000, SMG, 64.713°S,

60.347°W, 879 m (1, MCZ IZ 171927). **Sta. NBP-22, 2**0 May 2000, SMG, 64.777°S, 60.359°W, 868 m (4, MCZ IZ 171928).—**LIS-A Area, transect along border with Larsen Ice Shelf B: Sta. NBP-13**, 19 May 2000, SMG, 64.892°S, 60.481°W, 323 m (1, MCZ IZ 171929).

Description. (Condensed and edited from Blake 2015) *Oligobregma mucronata* is a relatively small species, with body expanded through about setiger 8 then narrowing posteriorly, with up to 27–28 setigers, 11 mm long, and about 3.5 mm wide across expanded segments. Annular rings well developed, raised pads inconspicuous throughout; setigers 1–3 uniannulate to biannulate; setigers 4 and subsequent segments becoming quadriannulate; venter with prominent ventral midline from setiger 2 along entire body with a ridge formed from a single row of large pads within a groove. Prostomium V-shaped dorsally, broadly curved across anterior margin, with two short, rounded frontal horns; eyespots absent. Peristomium a single ring, with a few lobes dorsally; ventrally forming a ring of elongate lobes around mouth. Parapodia short, conical-shaped anteriorly, becoming longer posteriorly; dorsal and ventral cirri of posterior setigers becoming long and prominent, both cirri asymmetrical; dorsal cirri triangular, broad basally, tapering to narrow nipple-like tip; ventral cirri strongly asymmetrical with broad basal attachment narrowing to elongated, nipple-like tip; both cirri with darkly pigmented internal tubular-shaped glands extending toward nipple-like tips. Interramal papilla best developed in posterior parapodia. Heavy curved acicular spines present in both noto- and neuropodia of setigers 1–3; notopodial spines arranged in two rows in setigers 1–2 and single row in setiger 3, spines accompanied posteriorly by row of capillaries; neuropodia with 3–5 spines in one row in setigers 1–3, accompanied by capillaries. Spines curved, narrowing to blunt tip bearing thin terminal arista; internal fibrils in spines apparent; notopodial spines more robust than those of neuropodia. Short spinous setae absent. Furcate setae from setiger 4, with unequal tynes bearing short bristles on inner margins. Pygidium with up to four anal cirri.

Remarks. An Antarctic shelf species, *Oligobregma mucronata* is most similar to another Antarctic species, *O. brychiatum* **sp. nov.** from abyssal depths of near 4000 m in the Weddell Sea. Both species have aristate acicular spines, a single, multilobed peristomial ring, short prostomial horns, and triangular-shaped dorsal and ventral cirri with internal tubular glands. They differ in that *O. mucronata* has a V-shaped prostomium with no dorsal crest, furcate setae from setiger 4, and smooth aristate recurved acicular spines in both the noto- and neuropodia. In contrast, *O. brychiatum* **sp. nov.** has a rectangular prostomium that is wider than long with a prominent overlaying dorsal crest, furcate setae from setiger 5, and curved, hirsute aristate acicular spines in notopodia and smooth, non-hirsute spines in neuropodia.

Distribution. East Antarctic Peninsula, former Larsen Ice Shelf A area, 323–912 m.

***Oligobregma sphaeracirratum* new species**

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Figures 55–57

Material examined. **Western North Atlantic Ocean, off New England,** U.S. North ACSAR Program, coll. G.W. Hampson, Chief Scientist, **Sta. 5**, **Cruise NA-5**, R/V *Cape Hatteras*, Rep. 1, coll. 30 Apr 1986, BC, 40.085°N, 67.497°W, 2071 m, **holotype** (USNM 1741704).

Description. A large, sausage-shaped species (Fig. 55A), holotype (USNM 1741704) complete with 40 setigers, 31.5 mm long, 0.5 mm wide across expanded setigers 5–10, then narrowing to 0.35 mm wide at about setiger 20. Body oval in cross section, with dorsum rounded; venter rounded in anterior swollen section but flattened in middle and posterior setigers; with distinct mid-ventral ridge from setiger 2 to posterior end (Fig. 56B); ridge obscured on swollen setigers 5–10. Segmental annular rings obscured on expanded segments; middle and posterior setigers all quadriannulate with raised pads. Holotype a mature female with numerous small oocytes observed in coelom and parapodia. Color in alcohol light tan.

Pre-setiger region relatively short, recessed into setiger 1. Prostomium oval, longer than wide, curved across anterior margin with a pair of laterally directed oval-shaped horns (Fig. 56A); eyespots absent; nuchal organs not observed. Peristomium a multi-lobed thickened ring surrounding prostomium dorsally and laterally (Fig. 56A), continuing ventrally to base of oral opening (Fig. 56B); mouth consisting of a narrow vestibule extending from posterior margin of prostomium; five narrow lobes on setiger 1 forming posterior lip (Fig. 56B); separate anterior lip not observed, likely part of oral vestibule; proboscis not observed.

Parapodia enlarged rounded lobes on setigers 1–4, reduced to small rounded lobes from setiger 4 through expanded section (Fig. 55C); from about setiger 11, parapodia becoming elongate, with noto- and neuropodia bearing prominent dorsal and ventral cirri (Fig. 55D). Dorsal cirri large, spherical in shape with reticulated appearance due to numerous internal thread-like filaments; ventral cirri elongate, elevated but not inflated as dorsal cirri, but with similar reticulated appearance (Fig. 55D). Ciliated interramal papilla present between podial lobes (Fig. 55D, 57F).

Acicular spines present in noto- and neuropodia of setigers 1–4, typically arranged in two rows with mostly capillaries in second row: setiger 1 with 15–16 spines and 2–3 capillaries in notopodia and similar number in neuropodia; setiger 2 with 15–16 spines and about six capillaries in notopodia and 10–11 spines and about 10 capillaries in neuropodia; setiger 3 with 8–9 spines and about 15 capillaries in both noto- and neuropodia; setiger 4 transitional, with about 7 anterior spines about half the length of longer spines on setigers 1–3 and second row of 20 or more long capillaries. Notopodial spines typically heavier than neuropodial spines. Four or five short spinous setae present anterior to spines of

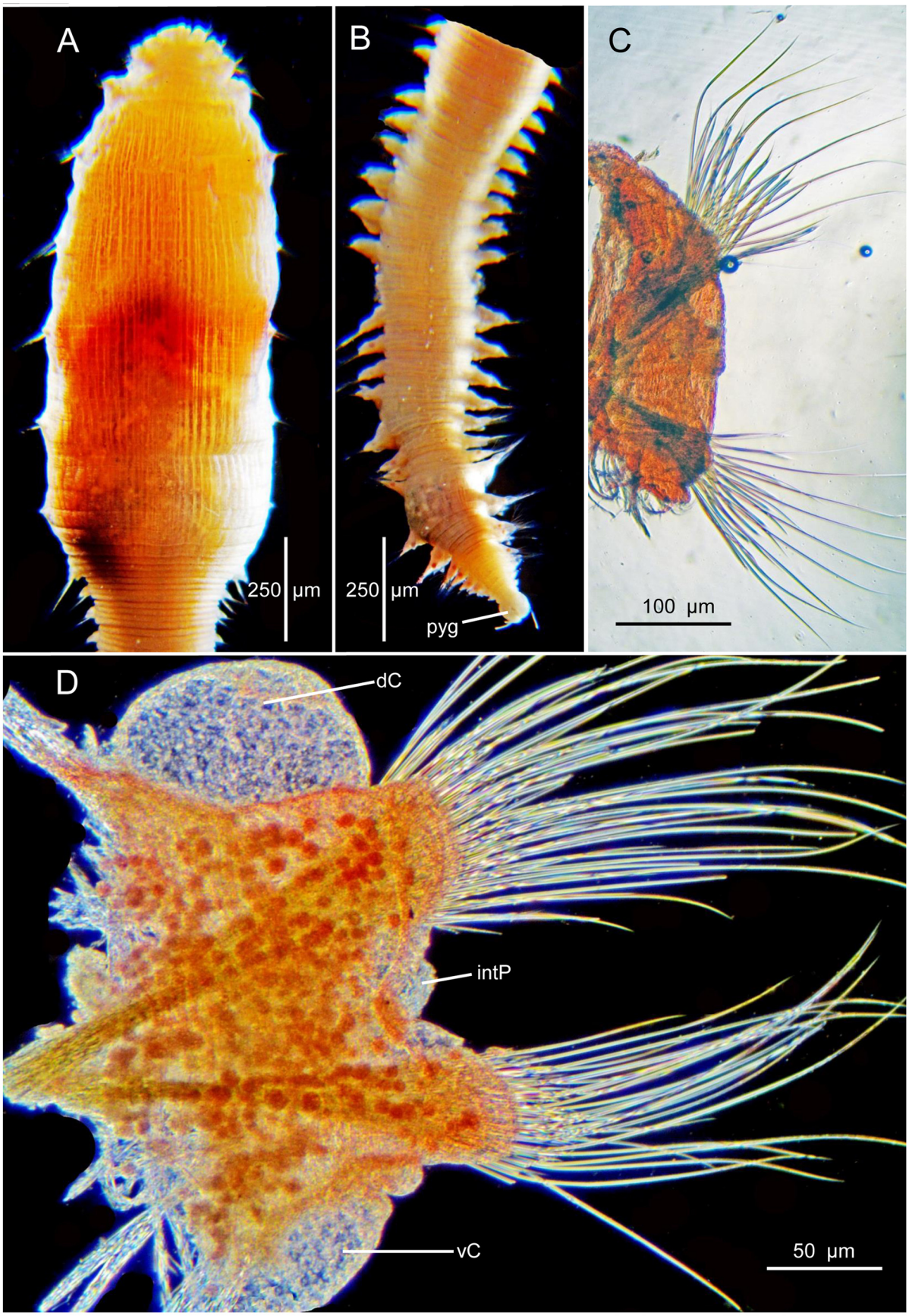

FIGURE 55. *Oligobregma sphaeracirratum* **sp. nov.** Holotype (USNM 1741704): A, anterior half of worm, dorsal view; B, posterior half of worm, dorsal view; C, setiger 3, anterior view; D, posterior parapodium, anterior view.

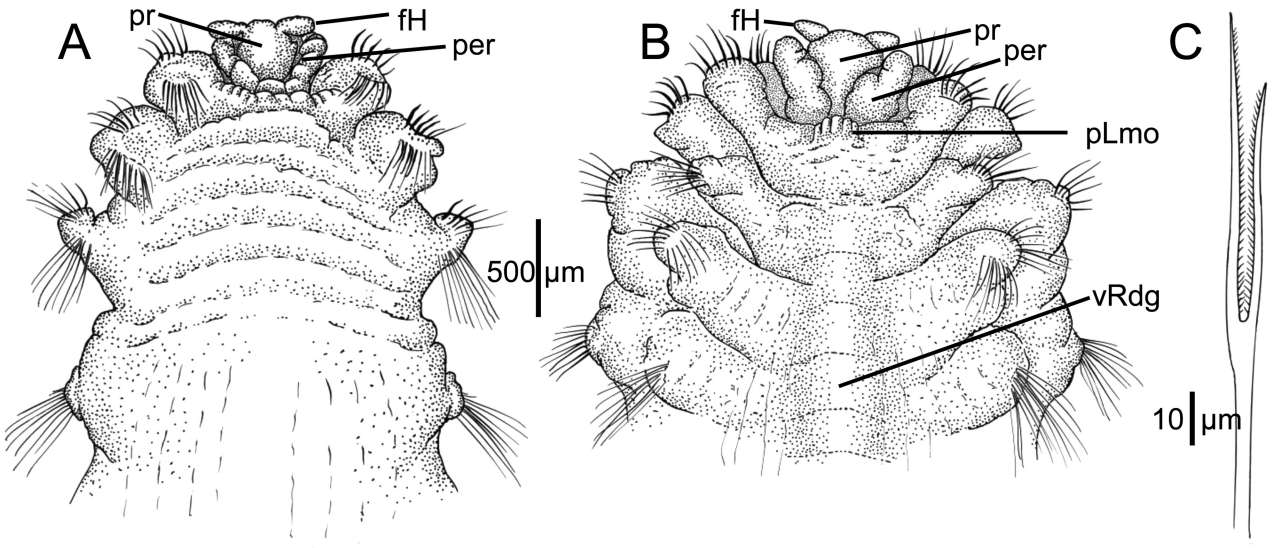

FIGURE 56. *Oligobregma sphaeracirratum* **sp. nov.** Holotype (USNM 1741704): A, anterior end, dorsal view; B, anterior end, ventral view; C, furcate seta from posterior neuropodium.

first row on setigers 3–4, not observed on setigers 1–2. Acicular spines of setigers 1–3 heavy, curved, tapering to narrow hirsute tip, appearing aristate, with numerous projecting fibrils (Fig. 57A–B); acicular spines of setiger 4 narrower than those of setigers 1–3, but with hirsute and aristate tips (Fig. 57C–D); short spinous setae on setigers 3–4 very thin, inconspicuous at base of spines (Fig. 57E). Furcate setae from noto- and neuropodia of setiger 5, replacing short spinous setae of setigers 3–4; each with a long tapering tyne and a somewhat shorter second tyne; each tyne with short denticles on inner edge directed toward opposite tyne (Fig. 56C). Furcate setae accompanied by fascicles of 25 or more capillaries along rest of body.

Pygidium a rounded lobe, with five cirri surrounding anal opening: one ventromedial, two each dorso- and ventrolateral; some missing on holotype, only two lateral cirri present (Fig. 55B, 57G), others represented by scars or stubs.

Remarks. *Oligobregma sphaeracirratum* **sp. nov.** belongs to a group species having acicular spines on setigers 1–4. Among these and other species of the genus, *O. sphaeracirratum* **sp. nov.** differs in the nature of the large spherical and reticulated notopodial dorsal cirrus that is characteristic of the species. Such a cirrus has not been observed on any other scalibregmatid.

Etymology. The epithet *sphaeracirratum* is from *sphaera*, Latin for sphere or ball and *cirra*, Latin for tendril or ringlet in reference to the large spherical dorsal cirrus on the posterior parapodia of this species.

Distribution. Western North Atlantic Ocean, off New England, continental slope adjacent to Lydonia Canyon, 2071 m.

***Oligobregma weddelliensis* new species**

urn:lsid:zoobank.org:act:0A63E9F2-E40C-4897-B0BB-4B727537EBE2

Figure 58

Material examined. **Southern Ocean, Antarctica, R/V *Polarstern*, ANDEEP II (ANT XIX/4)**, coll. J.A. Blake. **Weddell Sea, E of Antarctic Peninsula**, **Sta. 131-8**, 06 Mar 2002, BC, 65.310833°S, 51.515167°W, 3065 m, **holotype** (ZMH-ANN-030790).

Description. Holotype complete, with 28 setigers, of moderate size, 9.5 mm long, 1.1 mm wide across expanded anterior setiger 6. Setigers 1–4 narrow, then body expanded and elongated over setigers 5–9, then narrowing over setigers 10–28. Body generally rectangular in cross section except for enlarged oval expanded segments. Body with annular rings absent on setigers 1–4 (Fig. 58A–B), obscured on expanded setigers 5–9; segments triannulate from setiger 10; posterior triannulate rings with prominent raised pads on dorsal (Fig. 58D) and ventral surfaces; pads interrupted on venter by prominent mid-ventral ridge consisting of longitudinal row of large pads. Color in alcohol light tan; with dorsal and ventral cirri of far posterior setigers with darkly pigmented internal glands.

Prostomium rectangular, twice as wide as long, broad anterior margin bearing two short, rounded frontal horns arising on frontal corners (Fig. 58A–B); mid-dorsally with a rounded elevated ridge or crest extending posteriorly and merging with peristomium (Fig. 58A); ventrally forming anterior border of mouth; eyespots absent; nuchal organs not observed. Peristomium a single multilobed ring separated from prostomium laterally by nuchal groove and mid-dorsally by posterior extension of prostomium (Fig. 58A); ventrally surrounding large elevated oral opening.

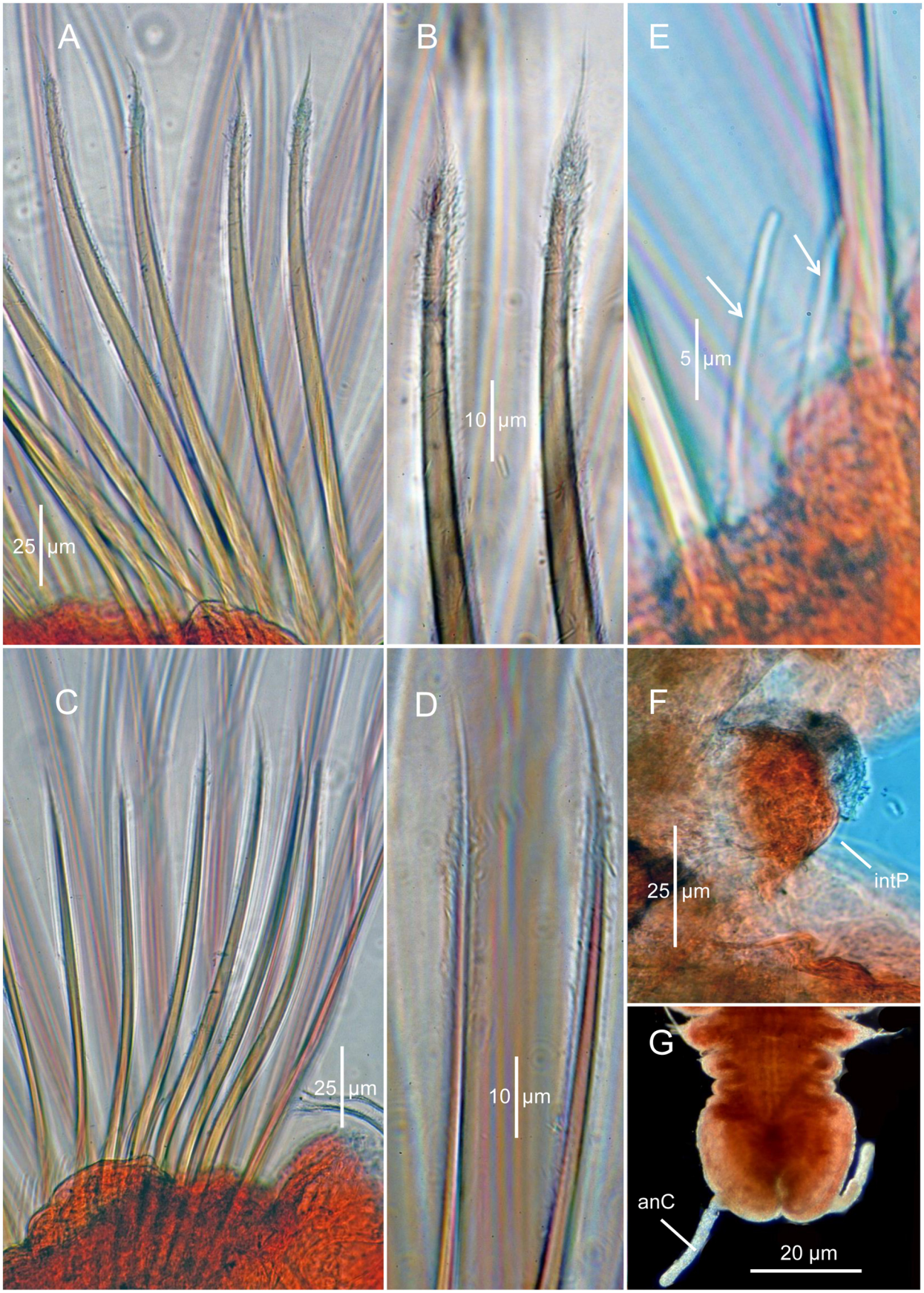

FIGURE 57. *Oligobregma sphaeracirratum* **sp. nov.** Holotype (USNM 1741704): A, notopodial acicular spines, setiger 3; B, detail of notopodial acicular spines, setiger 3; C, notopodial acicular spines setiger 4; D, detail of notopodial acicular spines setiger 4; E, short spinous setae, notopodium setiger 3; F, interramal papilla, from posterior setiger; G, pygidium, ventral view.

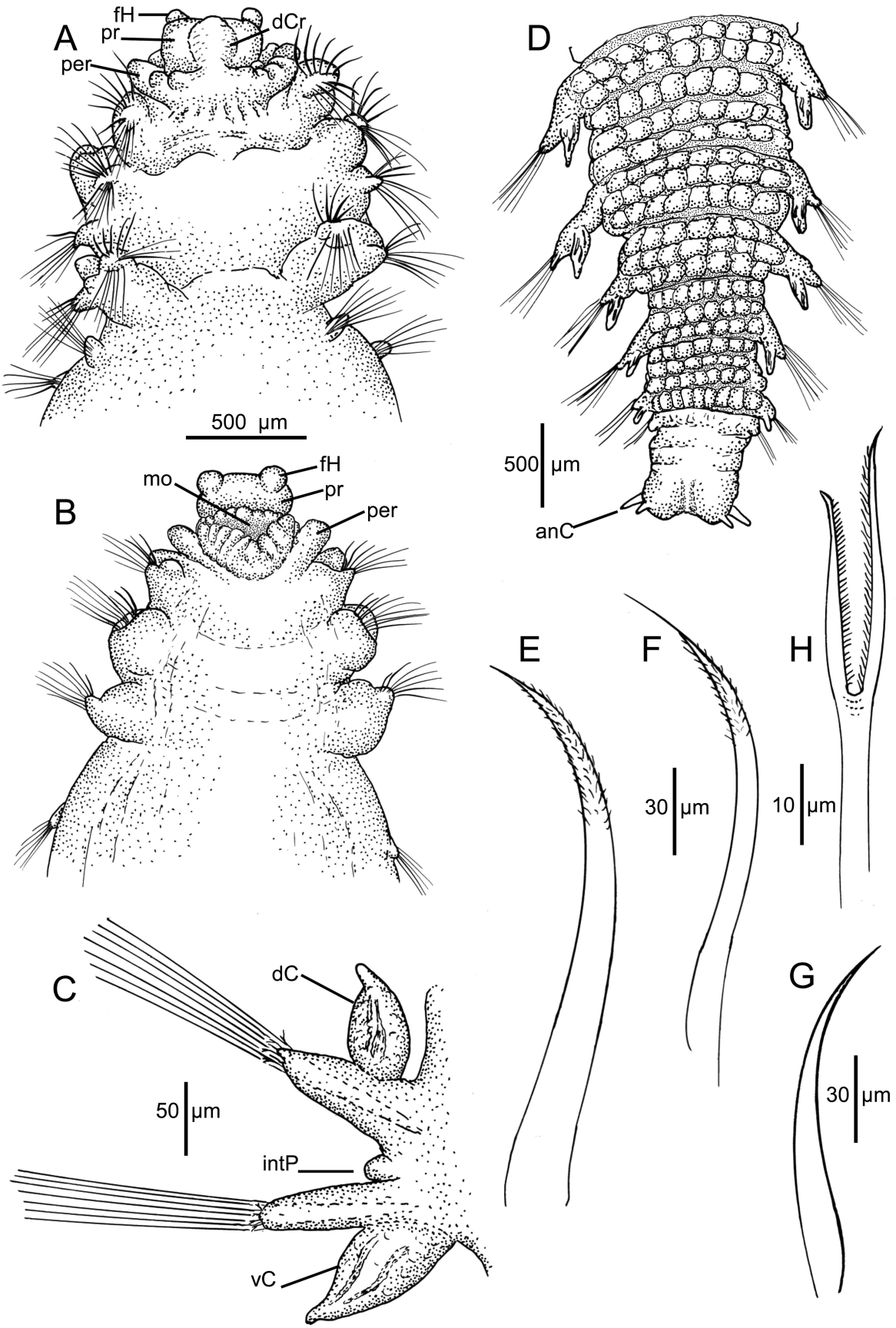

FIGURE 58. *Oligobregma weddelliensis* **sp. nov.** Holotype (ZMH-ANN-030790): A, anterior end, dorsal view; B, anterior end, ventral view; C, parapodium, posterior setiger, anterior view; D, posterior end, dorsal view; E–F, acicular spines, notopodium, setiger 1; G, acicular spine, neuropodia, setiger 1; H, furcate setae, posterior parapodium.

Mouth opening on elevated mound surrounded by about 16 thickened lobes (Fig. 58B); proboscis not observed.

Parapodia of setigers 1–3 reduced to rounded lobes from which acicular spines arise; subsequent noto-and neuropodia with short conical lobes, transitioning to more elongate and prominent podial lobes by about setiger 10, bearing dorsal and ventral cirri. Both cirri triangular in shape (Fig. 58C), with dorsal cirri smaller than ventral cirri, but both with 2–3 elongate tubular internal glands; these darkly pigmented. Short rounded interramal papilla present between podial lobes (Fig. 58C).

Acicular spines present in notopodia and neuropodia of setigers 1–3. Notopodia of setiger 1 with setae in two rows with anterior row with 6–7 large acicular spines (Fig. 58E) and a second row of 2–3 narrower acicular spines (Fig. 58F) and several long capillaries; notopodia of setiger 2 also with anterior row of acicular spines but second row only with capillaries; setiger 3 with a curved row of 4–5 acicular spines and a few capillaries and second row of 6–8 long capillaries. Neuropodia of setigers 1–2 with anterior fascicle of 3–4 acicular spines (Fig. 58G) and bundle of capillaries; setiger 3 with 2–3 acicular spines and long capillaries. Short spinous setae not present in either noto- or neuropodia. Setiger 4 and following setigers with noto- and neuropodia with spreading fascicles of capillaries; furcate setae present anterior to capillaries from setiger 5. Acicular spines of notopodia heavy, curved, tapering to thin aristate-like tip (Fig. 58E–F); each spine heavily hirsute near tip; neuropodial acicular spines distinctly different from those of notopodia in not being hirsute (Fig. 58G). Furcate setae from setiger 5, numbering 3–6 per fascicle, each with a pair of nearly equal tapering tynes, each tyne with short denticles on inner edge directed toward opposite tyne.

Pygidium narrow, bilobed, four anal cirri present (Fig. 58D).

Remarks. Among seven species of *Oligobregma* having acicular spines in both noto- and neuropodia of setigers 1–3, *Oligobregma weddelliensis* **sp. nov.** is the only one to have smooth neuropodial acicular spines instead of some being hirsute and a rectangular prostomium with an overlaying dorsal crest. Closely related species having acicular spines on setigers 1–3 include *O. acsarum* **sp. nov.** from off the U.S. Atlantic coast, *O. brychiatum* **sp. nov.** from Antarctic seas, *O. mucronatum* Blake, 2015 from the East Antarctic Peninsula, and *O. profunda* Blake, 2023 from off Eastern Australia (Table 4).

Etymology. The species is named for its occurrence in abyssal depths of the Weddell Sea, Antarctica.

Distribution. Southern Ocean, Weddell Sea, east of Antarctic Peninsula, abyssal, 3065m.

Oligobregma whaleyi Wiklund, Neal, Glover, Drennan, Rabone, & Dahlgren, 2019

Figure 59

Oligobregma whaleyi Wiklund *et al*., 2019: 63–65, fig. 27.

Material examined. **North Equatorial Pacific Ocean, Clarion-Clipperton Zone,** NOAA DOMES Site E, R/V *Melville*, **Sta. H361**, coll. 18 Jun 1983, Robert R. Hessler, 0.25 m^2 Hessler-Sandia box core, 14.701°N, 125.431°W, 4567 m, abyssal plain, surface layer of pelagic clay & siliceous particles, subsurface firmer, with manganese nodules (1, LACM-AHF Poly 13547).

Description. A single specimen available, posteriorly incomplete, with 18 setigers, 4.1 mm long, 0.36 mm wide across setiger 1, 0.89 mm wide across expanded setiger 7, 0.43 mm wide across posterior setiger 15. Body fusiform, pre-setiger region and anterior setigers 1–4 narrow, then expanded from setigers 5–13, narrowing posteriorly (Fig. 59A). Body with setigers 1–3 without annular rings, setigers 4–5 with three annular rings, setiger 6 and following segments with four annular rings; annular rings each with numerous inconspicuous pads. Color opaque white.

Pre-setiger region dorsally obscured in part by large everted nuchal organs; ventral oral morphology obscured by large, everted proboscis. Prostomium weakly V-shaped with smoothly curved anterior margin bearing a pair of short rounded frontal horns (Fig. 59B); eyespots absent; nuchal organs large, conspicuous, with numerous folds. Peristomium a single ring interrupted mid-dorsally, continuing laterally (Fig. 59A–B), ventrally obscured by everted proboscis. Proboscis damaged, but with numerous folds.

Parapodia of setigers 1–4 enlarged due to fascicles of large acicular spines; setigers 5–10 reduced to triangular pointed lobes from which setae arise; from setiger 11, podial lobes becoming longer and narrow, with dorsal and ventral cirri first appearing from setiger 12. Both cirri triangular in shape, with dorsal cirri larger than ventral cirri (Fig. 59D), both with 2–3 elongate tubular internal glands; glands darkly pigmented. Short rounded interramal papilla present between podial lobes (Fig. 59D).

Acicular spines present in notopodia and neuropodia of setigers 1–4. Notopodia of setiger 1 with acicular spines in two rows, anterior row with 7–8 heavy acicular spines (Fig. 59C) and second row of 4–5 thinner acicular spines, third row with 8–10 long capillaries; notopodia of setiger 2 also with anterior row of 6–7 heavy spines in first row and 3–4 spines in second row, 4–5 long capillaries in third row; notopodia of setiger 3 with a curved row of 5–6 acicular spines and second row of 7–8 long capillaries, no third row; notopodia of setiger 4 with four long anterior acicular spines and about 10 capillaries all in single row. Neuropodia of setigers 1–2 with anterior row of 4–5 acicular spines and second row with 6–8 long capillaries; setiger 3 with 3–4 acicular spines and 6–7 long capillaries; setiger 4 with 3–4 acicular spines and 10–12 long capillaries. Short spinous setae not present in either noto- or neuropodia. Setiger 5 and following setigers with noto- and neuropodia with spreading fascicles of long capillaries; furcate setae present anterior to capillaries from setiger 7 in notopodia and setiger 8 in neuropodia. Anterior acicular spines of notopodia of setigers 1–2 heavy, curved, tapering to thin aristate-like tip (Fig. 59C), some spines with tip bent or hooked, some with tips weakly hirsute; spines of second row thinner,

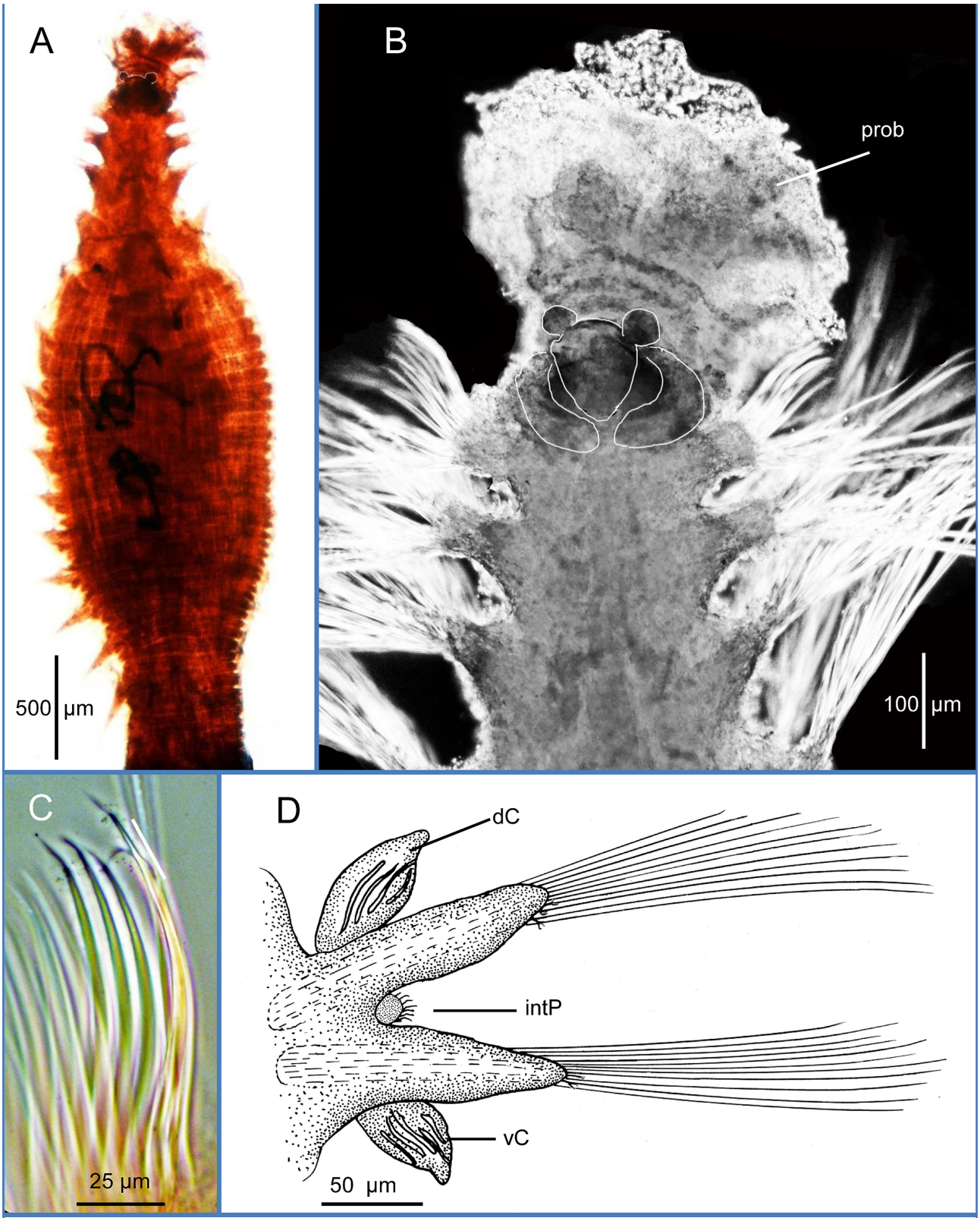

FIGURE 59. *Oligobregma whaleyi* Wiklund *et al*., 2019. (LACM-AHF Poly 13347): A, anterior 15 setigers, dorsal view; B, anterior end, dorsal view; C, acicular spines, notopodia, setiger 1; D, parapodium, setiger 17, posterior view. A, stained with Shirlastain A. A–B structures outlined in white for emphasis.

but also tapering to fine tip; notopodial spines of setigers 3–4 thinner and less curved than those of setigers 1–2, but still tapering to fine tip. All neuropodial acicular spines weakly curved, not as heavy as notopodial spines. Furcate setae from setigers 7–8, numbering 2–3 per fascicle, each with a pair of nearly equal tapering tynes, each tyne with short denticles on inner edge directed toward opposite tyne.

Remarks. *Oligobregma whaleyi* is one of eight species having acicular spines present in both noto- and neuropodia on setigers 1–4. The present record (LACM-AHF Poly 13347) is only the second specimen of the species to be identified; both records are from abyssal depths of the Clarion-Clipperton Zone (CCZ) in the Pacific Ocean (Wiklund *et al*. 2019). The holotype (NHM 822) is much larger, measuring 16 mm long and 2 mm wide across the expanded section and with 26 setigers, but was also posteriorly incomplete.

In addition to being much smaller, the present specimen differs from the original in having furcate setae first present from setigers 7–8 instead of setiger 11, but in both instances this is a more posterior occurrence than in related species where the furcate setae typically begin on setigers 2–6. Two other species from the CCZ, *O. brasierae* Wiklund *et al*., 2019 and *O. tani* Wiklund *et al*., 2019, have furcate setae from setiger 5. The main difference, however, between the current description of *O. whaleyi* and the first is that in the original description the peristomium was interpreted as "*forming smooth figure-of-8-like loops laterally to prostomium dorsally interrupted, ventrally obscured by extended proboscis*" (Wiklund *et al*. 2019: 63). However, this interpretation is incorrect. The "looped structures" lateral to the prostomium are actually everted nuchal organs that obscure the underlying peristomium. In the present specimen, large everted nuchal organs also obscure the peristomium dorsally, but by altering the lighting intensity and shifting condenser settings between bright field and phase contrast, the underlying peristomium could be observed as a single ring across the dorsum interrupted mid-dorsally by the posterior extension of the prostomium; this structure is indicated by outlining in white in Fig. 59A–B. However, the ventral peristomium and oral morphology are also obscured by the everted proboscis in both specimens.

Distribution. North Equatorial Pacific Ocean, Clarion-Clipperton Zone, abyssal depths, 4425–4567 m.

Oligobregma williamsae new species

urn:lsid:zoobank.org:act:8A077657-F110-4212-8763-370F57DB47A2

Figure 60

Material examined. (*8 specimens*) **Western North Atlantic Ocean, Off New Jersey, Gay-Head Bermuda Transect**, coll. H.L. Sanders, R/V *Atlantis II*, Cruise 12, **Sta. 72**, 24 August 1964, 38.267°N, 71.783°W, 2864 m, **holotype** (LACM-AHF Poly 13310), 7 **paratypes** (LACM-AHF Poly 14836).

Description. A moderately sized species, holotype (LACM-AHF Poly 13310) complete, with 30 setigers; body weakly fusiform, narrow from setigers 1–3, widest from setigers 4–12, then narrowing posteriorly; 6.25 mm long, 0.31 mm across setiger 2, 1.13 mm wide across expanded setiger 6, then narrowing to about 0.4 mm from setiger 12 to pygidium. Largest paratype (LACM-AHF Poly 14836) complete but damaged, with 28 setigers, 6.5 mm long. Body oval in cross section, weakly flattened ventrally. Annular rings generally obscured along body, mostly indicated by pigmented cells on raised pads (Fig. 60A); these only apparent after staining with Shirlastain A. Setiger 1 smooth with no ring apparent; setigers 2–4 biannulate (Fig. 60A), setigers 5–15 triannulate, some far posterior setigers quadriannulate, but in general annular rings not readily apparent. Venter with mid-ventral ridge present from about setigers 2–3, only weakly apparent along mid-line, not obviously raised. Color in alcohol opaque white; cells of pads on annular rings apparent only after staining with Shirlastain A.

Prostomium heart-shaped, with two prominent rounded frontal horns (Fig. 60A); anterior margin reduced to small notch; posteriorly merging with peristomial ring (Fig. 60A); eyespots absent; nuchal organs not everted. Peristomium a single smooth ring merging with posterior end of prostomium and recessed into setiger 1 (Fig. 60A); ventrally obscured by large everted proboscis.

Notopodia of setigers 1–3 with enlarged lobes from which acicular spines arise; from setiger 4 to about 13, notopodia short triangular lobes; dorsal and ventral cirri first appearing at about setiger 14. Dorsal cirri triangular-shaped tapering to nipple-like tip (Fig. 60C); ventral cirri thick, larger than dorsal cirri (Fig. 60C); far posterior setigers with dorsal cirri narrow, digitiform (Fig. 60D), ventral cirri elongate, tapering to rounded tip (Fig. 60D). Ventral cirri with a few internal tube-like glands. Distinct oval-shaped interramal papilla present between podial lobes (Fig. 60C–D).

Acicular spines present in noto- and neuropodia of setigers 1–3 (Fig. 60A). Notopodia of setiger 1 with smooth curved spines in two rows, 6–7 in first row and 3 in second row, with spines of first row narrower than those of second row (Fig. 60F–G), at least one spine not curved (Fig. 60H); third row all capillaries; setigers 2–3 with one row of 4–5 spines and two rows of capillaries. Neuropodia of setigers 1–2 with 4–5 acicular spines in first row and capillaries in second row; neuropodia of setiger 3 with 3–4 acicular spines and capillaries in first row and all capillaries in second row. Notopodial acicular spines heavy, recurved, tapering to pointed tip (Fig. 60F–G), none hirsute; largest spines in setiger 1 tapering to short aristate-like tip (Fig. 60G); neuropodial acicular spines curved, similar to those of notopodia but not as large. A row of minute short spinous setae present anterior to acicular spines in setigers 1–3; each straight, tapering to pointed tip (Fig. 60E). Furcate setae from setiger 4, each with a pair of nearly equal tapering tynes, each tyne with short denticles on inner edge directed toward opposite tyne (Fig. 60I).

Pygidium oval, elongate, with anal opening a narrow notch with short lateral lobes, with four anal cirri (Fig. 60B).

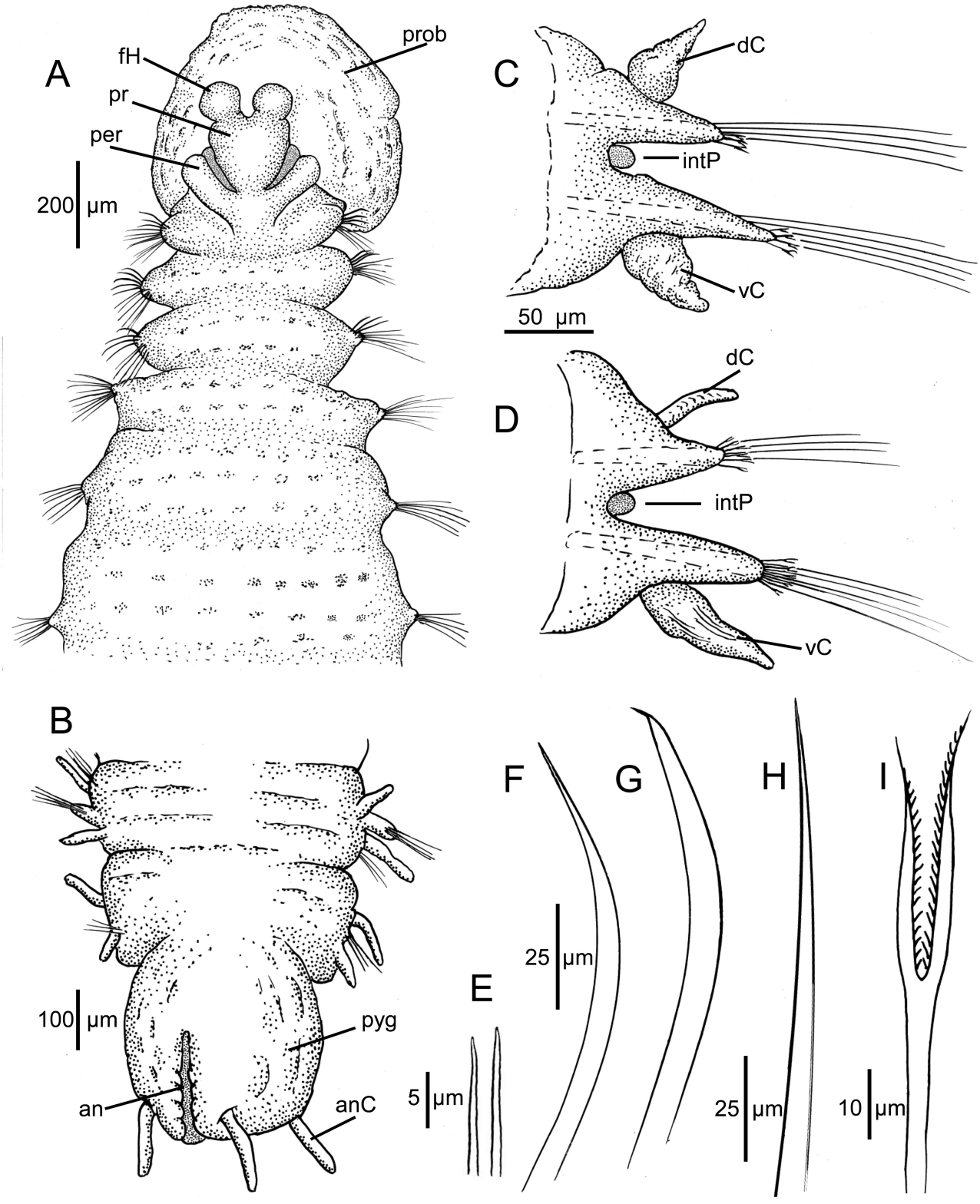

FIGURE 60. *Oligobregma williamsae* **sp. nov.** Holotype (LACM-AHF Poly 13310): A, anterior end, dorsal view; B, posterior end, dorsal view; C, posterior parapodium, anterior view; D, far posterior pre-pygidial parapodium, anterior view; E, short spinous setae, setiger 1; F, acicular spine, setiger 1, anterior row; G, large curved acicular spine, setiger 1, second row; H, straight acicular spine setiger 1, second row; I, furcate seta, posterior parapodium.

Remarks. *Oligobregma williamsae* **sp. nov.** is one of eight species of the genus to have acicular spines in both the noto- and neuropodia of setigers 1–3. Of these, three occur in the western North Atlantic; the other five occur either in the Southern hemisphere in Antarctic seas (three species) or off New Zealand and Australia (two species). All occur in deep water (Table 4).

The three Atlantic species are *O. acsarum* **sp. nov.** from abyssal (3000 m) depths off the Carolinas, *O. hampsoni* **sp. nov.** from off New England (2100 m), and *O. williamsae* **sp. nov.** from deep-water off New Jersey (2860 m). Of these, *O. acsarum* **sp. nov.** differs the most from *O. williamsae* **sp. nov.** in having a broad anterior border on the prostomium with the two frontal horns widely separated, the acicular spines are hirsute, the interramal papilla between the noto- and neuropodia is located on the neuropodium rather than between the podial lobes as in most scalibregmatids, and the pygidium has five anal cirri. In contrast, *O. williamsae* **sp. nov.** has a notch on the anterior margin of the prostomium where the two frontal horns are close to one another, the acicular spines are smooth, the interramal papilla is located between the two podial lobes, and the pygidium has four anal cirri. *Oligobregma hampsoni* **sp. nov.** has a prostomium with a transverse anterior margin and two short conical frontal horns, a broad peristomium not defined by rings, and very distinct everted multilobed nuchal organs. In contrast, *O. williamsae* **sp. nov.** has a prostomium with a narrow notched anterior margin with two frontal horns that are close to one another arising lateral to the notch, the peristomium is a distinct single ring interrupted by the posterior extension of the prostomium and posteriorly by setiger 1. In addition, the posterior dorsal and ventral cirri of both species differ in that in *O. hampsoni* **sp. nov.** the dorsal and ventral cirri are both asymmetrical, with a large triangular dorsal cirrus and an elongate ventral cirrus with a narrow tubular apex. In contrast, in *O. williamsae* **sp. nov.** the dorsal and ventral cirri are not asymmetrical, with both being triangular in shape, but with the neuropodium being more digitiform. See Table 4 for a summary of the characteristics of all known species of *Oligobregma*.

Etymology. This species is named for Ms. Isabelle P. (Izzie) Williams, a long-time friend and colleague. Ms. Williams worked with the late Dr. Howard L. Sanders, collector of this species, both at sea and in the laboratory. Ms. Williams recently helped compile and co-author the Howard Sanders Biography for the National Academy of Sciences (Brusca & Williams 2022).

Distribution. W North Atlantic Ocean, continental slope off New Jersey, 2864 m.

Genus *Pseudoscalibregma* Ashworth, 1901

Table 5

Type species. *Scalibregma parvum* Hansen, 1879. Designated by Ashworth (1901).

Diagnosis. Body elongate, arenicoliform. Prostomium T-shaped with frontal horns. Peristomium a single ring, encompassing prostomium dorsally and ventrally forming upper lip of mouth; lower lip of mouth formed from elements of peristomium and setiger 1. Parapodia of posterior segments with dorsal and ventral cirri; interramal papillae present; postchaetal lamellae absent. Branchiae absent. Setae include capillaries, furcate setae, and sometimes a few inconspicuous spinous setae among capillaries of setigers 1–2, blunt, pointed, or bifurcated, representing homologues of furcate setae found on following setigers; large conspicuous spines absent. Pygidium with long anal cirri.

Remarks. The only character that separates *Pseudoscalibregma* from *Scalibregma* is the absence of branchiae. Both genera have prominent dorsal and ventral cirri and short spinous chaetae in the first one or two chaetigers as confirmed by Imajima (2009), Bakken *et al*. (2014), and Blake (2015) for several species. Other characters of some importance are the nature of the frontal horns, peristomial rings, the annular rings along the body, and the presence, number, and form of the pygidial cirri or lobes.

Pseudoscalibregma currently includes 17 species, 16 of which are from deep-water upper slope to abyssal depths and widely distributed in the world's oceans (Table 5). Six species are from Antarctic seas, two from the North Atlantic, three from the South Atlantic, five from around the Pacific including off California, eastern Australia, Kermadec Trench, Peru-Chile Trench, Japan, and one from the South China Sea. The best known species are *P. parvum*, redescribed by Bakken *et al*. (2014), and *P. bransfieldium*, redescribed by Blake (1981, 2015). All known species of *Pseudoscalibregma* are summarized in Table 5. The following eight species, five new to science, are treated in this paper:

1. *Pseudoscalibregma parvum* (Hansen, 1879). Widespread, North Atlantic and Arctic Oceans, ca. 1200–2189 m.
2. *Pseudoscalibregma biannulatum* **sp. nov.** SE Pacific Ocean, off Peru, Peru-Chile Trench, 3177 m.
3. *Pseudoscalibregma bransfieldium* (Hartman, 1967). Antarctic Peninsula, Weddell Sea, 332–1110 m.
4. *Pseudoscalibregma gracilis* **sp. nov.** Southern Ocean, Scotia and Weddell Sea, 2076–3968 m.
5. *Pseudoscalibregma larae* **sp. nov.** W North Atlantic Ocean, New England to Carolinas, 544–805 m.
6. *Pseudoscalibregma nybakkeni* **sp. nov.** E North Pacific Ocean, off N California, 2995–2970 m.
7. *Pseudoscalibregma palmeri* Blake, 2015. Off E. Antarctic Peninsula; S Orkney Islands; Weddell Sea, 385–1953 m.
8. *Pseudoscalibregma pigmentum* **sp. nov.** South China Sea off Brunei, Island of Borneo, 2143–2154 m

TABLE 5. Morphological comparison of the 17 Known Species of *Pseudoscalibregma* Ashworth, 1901.

Species/ Character	Prostomium/ eyes	Peristomium	Oral Morphology	Segmental annulations	Dorsal/Ventral cirri	Spinous setae ant setigers	Furcate setae	Pygidium	Distribution	References
P. parvum (Hansen, 1879)	Short, oval, wider than long w/ a pair of short digitate lat horns; eyes abs	A single ring dorsally, ventrally merged w/ set 1, encompassing oral opening.	Mo a transverse slit between ant & post lips; ant lip narrow; post lip larger extending to set 1, swollen; both lips w/ short lobes	Ant set biannulate w/ large raised pads; post set triannulate with pads smaller & more numerous	dC elevated, rounded knob, longer far post some w/ papillated tip; vC low, elongate w/ rounded tip; w/ rounded intP	Present ant to C on set 1; ea short, thin, tapering to pointed tip, few may be bifid	From set 2, w/ unequal tynes, w/ denticles on inner margins	Pyg w/ anus bordered by 10–12 short lobes; anC absent	N Atlantic Ocean: Arctic, E Greenland, Spitzbergen, Norwegian Sea, etc. >1715 m; off New England to Delaware, 1210–2189 m	Bakken *et al.* 2014; This study
P. biannulatum **sp. nov.**	Short, pentagonal, as wide as long; w/ pair of digitate lat horns projecting at 45-deg angle; eyes abs	A single multilobed ring dorsally, obscured ventrally by prob.	Not observed due to everted prob	Biannulate along entire body; w/ large square-shaped blocks; venter w/ lrg rectangular-shaped blocks along mid-line.	dC, rounded; vC larger triangular shaped; lrg intP between podia.	Not observed	From set 3 w/ nearly equal tynes C denticles on inner margins	Narrow, w/o visible lobes or cirri	SE Pacific Ocean, off Peru, Peru-Chile Trench, 3177 m	This study
P. bransfieldium (Hartman, 1967)	Short, ant w/ 2 long frontal horns, post w/ dorsal crest; eyes abs	Per a single ring dorsally; ventrally forming ant & post lips of mo	Mo w/ narrow ant lip, lower lip w/ 3 lobes; everted prob saclike	Biannulate along entire body; w/o raised pads along ventral mid-line	dC & vC lrg asymmetrical bulbous elevations of podial lobes; intP present	Present, ant to C on set 1; thin, curved w/ blunt tips	From set 3, w/ subequal tynes w/ denticles on inner margins	Pyg w/ 5 anC	Antarctic Peninsula; Weddell Sea, 332 –1110 m	Hartman 1967; Blake 1981; 2015. This study
P. ermindae Mendes *et al.*, 2024a	Oval, w/ 2 short lat horns; eyes abs	Per w/ 2 annulated rings, complete dorsally; ventrally	Mo w/ narrow slit; ant lip smooth; post lip swollen, w/ ca. 8 lobes	Set 1–2 biannulate, Set 3 to end triannulate	dC & vC both rounded, ellipsoid swellings; these w/ internal gls	Present, set 1–2, both podia; ea. w/ pointed tips	From set 3; unequal tynes w/ denticles on inner margin	Pyg w/ anus bordered by crenulated margin; anC absent	Off SE Brazil, 1305–1928 m	Mendes *et al.* 2024a

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TABLE 5. (Continued)

Species/ Character	Prostomium/ eyes	Peristomium	Oral Morphology	Segmental annulations	Dorsal/Ventral cirri	Spinous setae ant setigers	Furcate setae	Pygidium	Distribution	References
P. glandipodium Blake, 2023	Oval, wider than long; w/ 2 narrow lH at ca. 45-deg angle; eyes abs	Per 1 ring dorsally; ventrally forming lips of mo	Mo transverse slit bet lips; ant lip narrow, post lip lrg, swollen; ea lip w/ 6–7 lobes	Biannulate from ca set 4 both dorsal & ventral; pads abs or not well developed	dC & vC inflated, irregularly shaped w/ lrg int gls	Absent	From set 2, w/ subequal tynes w/ denticles on inner margins	Simple lobe around anus; w/ 1–4 anC	Off E Australia, 2480–4026 m.	Blake 2023
P. gracilis **sp. nov.**	Square-shaped, wider than long w/ 2 short lH; eyes abs; nuO protruding lat	Per a large single ring merging w/ reduced set 1	Mo oval, elevated on venter, surrounded by 7–8 thick lobes; prob not everted	Quadriannulate from set 2, pentannulate over narrow post sets; ea annular ring w/ pig gls on raised pads; venter with mid-ventral ridge of raised pads from set 3	dC rounded; vC elongate, becoming narrow, more pointed posteriorly; both w/ pigmented striated gls	Not observed	From set 3 w/ subequal tynes w/ denticles on inner margins	W/ 4 anC, 2 lat narrow & long & 2 ventral, short, thick	Antarctica, Scotia Sea & Weddell Sea, 2076–3068 m	This study
P. hartmanae (Blake, 1981)	Cup-shaped, w/ straight ant margin w/ 2 lH; eyes abs	W/ inflated 2 rings w/ prominent rounded lobes dorsally; ventral morph not reported	Broadly expanded, extending on to set 1	Segments tri-& quadriannulate along most of body; but not well described	dC & vC narrow, w/ numerous gls; intP present	Set 1–2 w/ short curved short spinous set w/ blunt tips ant to C	From set 3 w/ subequal tynes & denticles on inner margins	Not observed	Antarctica, Weddell Sea, 500 m	Hartman 1978 (as *P. bransfieldia collaris*); Blake 1981; 2015

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TABLE 5. (Continued)

Species/ Character	Prostomium/ eyes	Peristomium	Oral Morphology	Segmental annulations	Dorsal/Ventral cirri	Spinous setae ant setigers	Furcate setae	Pygidium	Distribution	References
P. larae **sp. nov.**	Short, oval, wider than long; ant margin curved w/ 2 fH at ca. 45-deg angle; ventrally forming ant lip mo	A single multilobed ring dorsally, merged with post pr; weakly divided into 2 rings laterally; ventrally merged w/ set 1	Oral opening on raised mound on set 1–2 surrounded by ring of small lobes; everted prob a large sac with 2–3 rings	Dorsum w/ 2 annular rings on set 1–4; triannulate from set 5 to end; ventral w/ furrow from set 5 to end w/ large rectangular pad forming ridge in groove	dC & vC triangular w/ asymmetrical base; ea w/ gls having narrow tubes extending to tip; intP ciliated, oval	Set 1 w/ short spinous set ant to C; ea w/ curved shaft &blunt or pointed tips	From set 2, w/ subequal tynes & denticles on inner margins	W/ 5 anC, 4 lateral & 1 mid-ventral	W North Atlantic Ocean, New England to Carolinas, continental slope, 544–805 m	This study
P. magalhaesi Mendes, *et al.* 2024a	Trapezoidal, w/ 2 elongate latH; w/ 2 medial eyespots.	W/ 2 smooth rings	Not reported; fig. 4A shows notch between per rings	Set 1 triannulate; Set 2 & following quadriannulate	dC & vC long, triangular; packed w/ tubular gls; inP from set 14	Set 1–2 w/short spinous set; curved w/ pointed tips	From set 3, w/ subequal tynes, w/ denticles on inner margins	Not observed	SE Brazil, 41 m.	Mendes *et al.* 2024a
P. nybakkeni **sp. nov.**	Short, oval w/ narrow post crest merging w/ per; w/ pair of conical shaped fH, projecting at ca. 45-deg angle; eyes absent	Per a single multilobed ring on dorsal & ventral surfaces; interrupted dorsally by post extension of pr	Unknown, ventral surface obscured by large everted prob, a rounded sac; oral opening w/ elongate lobes	Annular rings all biannulate; set 2–15 w/ large raised blocks, then smaller posteriorly. Mid-ventral ridge from set 2 large medial pads	dC vertical, triangular w/ narrow tip; vC an irregular rounded lobe; internal gls not observed	Set 1 w/short spinous set ant to C; each thin, pointed	From set 2; w/ subequal tynes, w/ denticles on inner margins	W 4 short anC	E North Pacific Ocean, off N California, 2005–2970 m	This study

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Species/ Character	Prostomium/ eyes	Peristomium	Oral Morphology	Segmental annulations	Dorsal/Ventral cirri	Spinous setae ant setigers	Furcate setae	Pygidium	Distribution	References
P. orientalis Imajima, 2009	Pentagonal, w/ fH projecting at ca 45-deg angle; merges post w/ per; eyes abs;	Per a single ring dorsally; ventrally obscured by prob	Everted prob w/ mo surrounded by numerous pap	All set biannulate; raised pads prominent on ant set; venter w/ mid-ventral row of rectangular pads as ridge along body	dC & vC elongate, thickened digitate lobes w/ dorsal longest; intP ciliated from set 1	Set 1 w/ short spinous set ant to C; these w/ short pointed & bifurcate set	From set 2; w/ unequal tynes; w/ denticles on inner margins	Smooth margin around anus; anC not observed	Japan, off Honshu Isl, 373–1005 m	Imajima 2009
P. pallens Levenstein, 1962	Oval ca. as wide as long, w/ 2 short oval fH; eyes abs	Per a single ring dorsally; w/2 large lobes of possible 2nd ring on set 1; venter not reported	Not reported	All set triannulate	dC short, digitate; vC larger, triangular, asymmetrical; intP, present	Set 1–2 w/ short curved thin acicular –shaped setae	Not reported	Simple rounded lobe; w/o anC	Pacific Ocean, Kermadec Trench, 8928 to 9174 m	Levenstein 1962
P. palmeri Blake, 2015	T-shaped w/ 2 fH projecting at ca. 30-deg angle; eyes abs	Per a single lobed ring dorsally; ventrally forming aLm & pLm	Mo w/ 9–10 narrow lobes on ant lip; post lip w/ ca 7 large elongate lobes	Dorsally, Set 1–2 biannulate, then quadriannulate, then triannulate from ca. set 16; venter similar, but set 1–3 uniannulate ; large mid-ventral pad from set 2 to end	dC triangular w/ pointed tip; vC asymmetrical w/ broad base & elongated rounded tip; both cirri w/ pig striated gls; intP w/ int gls	Set 1–2 w/ 3–4 short blunt-tipped spinous set ant to C	From set 3; w/ subequal tynes; w/ denticles on inner margins	W/4 anal cirri based on spec w/ 1 intact & 3 scars	E Antarctic Peninsula, Weddell Sea, 385–768 m; off S Orkney Islands, 1953 m	Blake 2015; This study

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Species/ Character	Prostomium/ eyes	Peristomium	Oral Morphology	Segmental annulations	Dorsal/Ventral cirri	Spinous setae ant setigers	Furcate setae	Pygidium	Distribution	References
P. papilia Schüller, 2008	Oval, ca. as wide as long; w/ 2 short rounded lH; eyes abs	A single ring dorsally; ventral not reported	Not reported	Not reported, all illustrated uniannulate	dC & vC both triangular; vC larger than dCl; intP absent	Not reported	From set 2 w/ unequal tynes; w/ denticles on inner margins	A ring of lobes around anus bearing ca. 8 cirri of varying lengths	Antarctica, Weddell Sea; S Sandwich Trench, 1870–3690 m	Schüller 2008
P. parapari Mendes *et al*., 2024a	Rounded, w 2 short lH; eyes abs	Per a single ring dorsal & ventral	Mo w/ ant lip not observed; post lip w/ ca 6 lobes part of 1st large mid-ventral raised pad	Set 1 biannulate, set 2–3 triannulate, set 4 & following quadriannulate; mid-ventral pads & ridge line from set 1 to end	dC & vC both becoming long, triangular to lanceolate w/ int tubular glands; intP, knob-like w/ internal gls	Present set 1, w/ 5 ant to C; ea w/ pointed tips	From set 2, w/ 4–5 per fascicle; w/ subequal tynes w/ denticles on inner margins	Triannulate lobe around anus; anC missing	SE Brazil, 970–1300 m	Mendes *et al*. 2024a
P. pigmentum **sp. nov.**	Short, rounded w/ 2 elongate lH at ca. 45-deg; w/ narrow post part merged w/ per	Per a narrow ring dorsally, poorly developed, merged w/ set 1; ventrally surrounding mo	Mo surrounded by narrow lobes on elevated mound	Rings not evident on set 1–10; biannulate from set 11 on dorsum & venter; mid-ventral ridge from set 4	dC, short, erect, triangular; vC asymmetrical low rounded ridge	Present set 1 ant to C; ea w/ pointed tips	From set 2, ca 8–10 per fascicle; w/ subequal tynes & denticles on inner margins	Juv w/ 2 short anC	S China Sea off Brunei, Island of Borneo, 1725–1999 m.	This study
P. usarpium Blake, 1981	Reduced, hidden by per; w/ 2 large diverging fH	Per a single multilobed ring enclosing pro	Not reported	W quadriannulate & pentannulate segments along entire body	dC small, triangular; vC short rounded, both cirri with striated gls; intP present	Not reported	From set 3; w/ subequal tynes & denticles o inner margins	Not observed	Antarctica, Ross Sea, 2143–2154 m	Blake 1981

Abbreviations: abs, absent; aLm, anterior lip of mouth; ant, anterior; C, capillaries; Ca, about; dC, dorsal cirrus; ea, each; fH, frontal horn(s); gl(s), gland(s); lrg, large; lH, lateral horn(s); mo, mouth; pap, papillae; per, peristomium; pig, pigment(ed); pLm, posterior lip of mouth; post, posterior; pr, prostomium; prob, proboscis; spec, specimen; set, setiger; vC, ventral cirrus; W/, with; w/o, without.

Pseudoscalibregma parvum (Hansen, 1879)

Figure 61

Scalibregma parvum Hansen, 1879: 7–8, pl. V, figs. 7–14; 1882: 35–36.

Eumenia longisetosa Théel, 1879: 49–51, pl. III, figs. 45–47, pl. IV, fig. 48.

Pseudoscalibregma longisetosum Furreg 1925: 170–176, figs. S–X.

Pseudoscalibregma parvum: Ashworth 1901: 296; Støp-Bowitz 1945: 72–75, fig. 3; 1948: 27–29, fig. 9; Hartman 1965: 183; Jirkov 2001: 368; Bakken *et al*. 2014: 102–108, figs. 1–3.

Material examined. (*73 specimens*) **Western North Atlantic Ocean, off New England, Gay-Bermuda Transect, R/V *Atlantis II* Cruise 12**, coll. H.L Sanders, **Sta. 62**, 21 Aug 1964, EBS, 39.433°N, 70.55°W, 2496 m (11, LACM-AHF Poly 13315); **Sta. 73**, 25 Aug 1964, 39.775°N, 70.722°W, 1470–1330 m (1, LACM-AHF Poly 13309). R/V *Atlantis II* Cruise 24, **Sta. 115,** 02 Aug. 1966, coll. H.L. Sanders, EBS 39.652°N, 70.404°W, 2030–2050 m (1, MCZ IZ 170356).—**Off New England, U.S. North Atlantic ACSAR Program**, coll. G.W Hampson, Chief Scientist. **Sta. 3**, **Cruise NA-3**, Rep. 2, 03 Jul 1985, BC, 41.023°N, 66.337°W, 1330 m (1, USNM 1741720). **Sta. 6**, **Cruise NA-5**, Rep. 3, 30 Apr 1986, BC, 40.084°N, 67.498°W, 2085 m (1, USNM 1741721). **Sta. 8**, **Cruise NA-1**, Rep. 1, 10 Nov 1984, BC, 40.173°N, 67.624°W, 2175 m (1, USNM 1741722); **Cruise NA-2**, Rep. 4, 29 Apr 1985, BC, 40.171°N, 67.621°W, 2185 m (1, USNM 1741723); **Cruise NA-3**, Rep. 1, 05 Jul 1985, BC, 40.171°N, 67.622°W, 2180 m (1, USNM 1741724); **Cruise NA-4**, Rep. 2, 25 Nov 1986, BC, 41.171°N, 67.622°W, 2179 m (1, USNM 1741725); Rep. 3, 25 Nov 1986, BC, 40.171°N, 67.624°W, 2182 m (1, USNM 1741726). **Sta. 9**, **Cruise NA-6**, Rep. 2, 28 Jul 1986, BC, 39.84°N, 70.027°W, 1230 m (1, USNM 1741727). **Sta. 10**, **Cruise NA-2**, Rep. 3, 03 May 1985, BC, 39.802°N, 70.087°W, 1210 m (1, USNM 1741728). **Sta. 13**, **Cruise NA-2**, Rep. 1, 05 May 1985, BC, 39.806°N, 70.918°W, 1245 m (1, USNM 1741729); **Cruise NA-5**, Rep. 1, 06 May 1986, BC, 39.799°N, 70.918°W, 1270 m (1, USNM 1741730); Rep. 2, 06 May 1986, BC, 39.803°N, 70.917°W, 1230 m (1, USNM 1741731); **Cruise NA-6**, Rep. 1, 30 Jul 1986, 39.8063°N, 70.9147°W, 1248 m (1, USNM 1741732). **Sta. 14**, **Cruise NA-1**, Rep. 2, 09 Dec 1984, BC, 39.681°N, 70.905°W, 2120 m (1, USNM 1741733); **Cruise NA-2**, Rep. 3, 02 May 1985, BC, 39.682°N, 70.904°W, 2095 m (1, USNM 1741734). **Sta. 15**, **Cruise NA2**, Rep. 1, 05 May 1985, BC, 39.668°N, 70.904°W, 2150 m (1, USNM 1741735); Rep. 3, 06 May 1985, BC, 39.668°N, 70.905°W, 2140 m (1, USNM 1741736); **Cruise NA-5**, Rep. 3, 06 May 1986, BC, 39.667°N, 70.907°W, 2160 m (2, USNM 1741737); **Cruise NA-6**, Rep. 2, 29 Jul 1986, BC, 39.668°N, 70.904°W, 2163 m (1, USNM 1741738).—**Off Delaware and New Jersey, U.S. Mid-Atlantic ACSAR Program**, coll. Rosemarie Petrecca, Chief Scientist. **Sta. 2**, **Cruise Mid-3**, Rep. 1, 02 Dec 1984, BC, 38.595°N, 72.894°W, 2015 m (1, USNM 1741739). **Sta. 5**, **Cruise Mid-3**, Rep. 1, 05 Dec 1984, BC, 38.8403°N, 72.551°W, 2085 m (1, USNM 1741740); **Cruise Mid-4**, Rep. 1, 15 May 1985, BC, 38.841°N, 72.554°W, 2080 m (1, USNM 1741741); **Cruise Mid-6**, Rep. 2, 11 Nov 1985, BC, 38.842°N, 72.553°W, 2079 m (1, USNM 1741742). **Sta. 7**, **Cruise Mid-4**, Rep. 1, 18 May 1985, BC, 38.454°N, 73.059°W, 2100 m (1, USNM 1741743). **Sta. 9**, **Cruise Mid-3**, Rep. 1, 30 Nov 1984, BC, 38.287°N, 73.2396°W, 2110 m (1, USNM 1741744); **Cruise Mid-4**, Rep. 2, 18 May 1985, BC, 38.287°N, 73.244°W, 2105 m (1, USNM 1741745). **Sta. 10**, **Cruise Mid-6**, Rep. 1, 16 Nov 1985, BC, 37.863°N, 73.334°W, 2104 m (1, USNM 1741746). **Sta. 11**, **Cruise Mid-4**, Rep. 1, 17 May 1985, BC, 38.668°N, 72.941°W, 1510 m (1, USNM 1741747). **Sta. 13**, **Cruise Mid-3**, Rep. 3, 30 Nov 1984, BC, 37.888°N, 73.752°W, 1612 m (1, USNM 1741748). **Sta. 14**, **Cruise Mid-1**, Rep. 1, 02 Apr 1984, BC, 37.897°N, 73.746°W, 1503 m (1, USNM 1741749); **Cruise Mid-6**, Rep. 1, 15 Nov 1985, BC, 37.895°N, 73.745°W, 1515 m (1, USNM 1741750); Rep. 3 15 Nov 1985, BC, 37.896°N, 73.746°W, 1499 (1, USNM 1741751).—**Off North Carolina, Hatteras Canyon, U.S. South Atlantic ACSAR Program**, R/V *Gyre*, coll. J.A. Blake, Chief Scientist: **Sta. 6**, **Cruise SA-2**, **leg 2**, R/V *Gyre*, Rep. 1, 25 May 1984, BC, 34.832°N, 75.225°W, 1974 m (2, USNM 1741752). **Off North Carolina, Cape Hatteras Benthic Survey**, R/V *Endeavor*, coll. J.A. Blake. **Sta. 10**, 05 Sep 1992, BC, 35.442°N, 74.688°W, 2003 m (28, MCZ IZ 171931).

Description. Available specimens ranging from large mature adults to juveniles, the latter identified with difficulty. Body swollen in anterior setigers, narrowing posteriorly (Fig. 61A); some larger specimens with secondary enlargement of a few posterior setigers (Fig. 61B). Largest specimen (USNM 1741732) with 33 setigers, 15 mm long, and 2.8 mm wide across expanded anterior region of setigers 1–13. Another specimen (USNM 1741724) with 32 setigers, 14 mm long, 2.3 mm wide; transition to narrower posterior setigers corresponds to transition from inconspicuous parapodia to elongate noto- and neuropodia and development of prominent dorsal and ventral cirri. Body more or less oval in cross section of expanded setigers, then becoming more rectangular in posterior setigers. Paired rows of large, raised pads conspicuous on anterior swollen segments; these transitioning to three rows on posterior setigers, with pads becoming smaller and inconspicuous. Paired rows of annular pads interrupted mid-ventrally by a longitudinal furrow extending along entire body; each anterior setiger with furrow containing a large rectangular pad. Color in alcohol light tan.

Prostomium short, pentagonal, slightly wider than long, entire across anterior margin with a pair of short lateral horns; eyespots absent; nuchal organs eversible on a few specimens, from groove between prostomium and peristomial ring. Peristomium a narrow ring dorsally, becoming larger ventrally merged with setiger 1, producing a large elevated oral opening; when everted, proboscis a large smooth sac.

Parapodia of anterior setigers reduced to short lobes or mounds on setigers of anterior swollen section. Parapodia

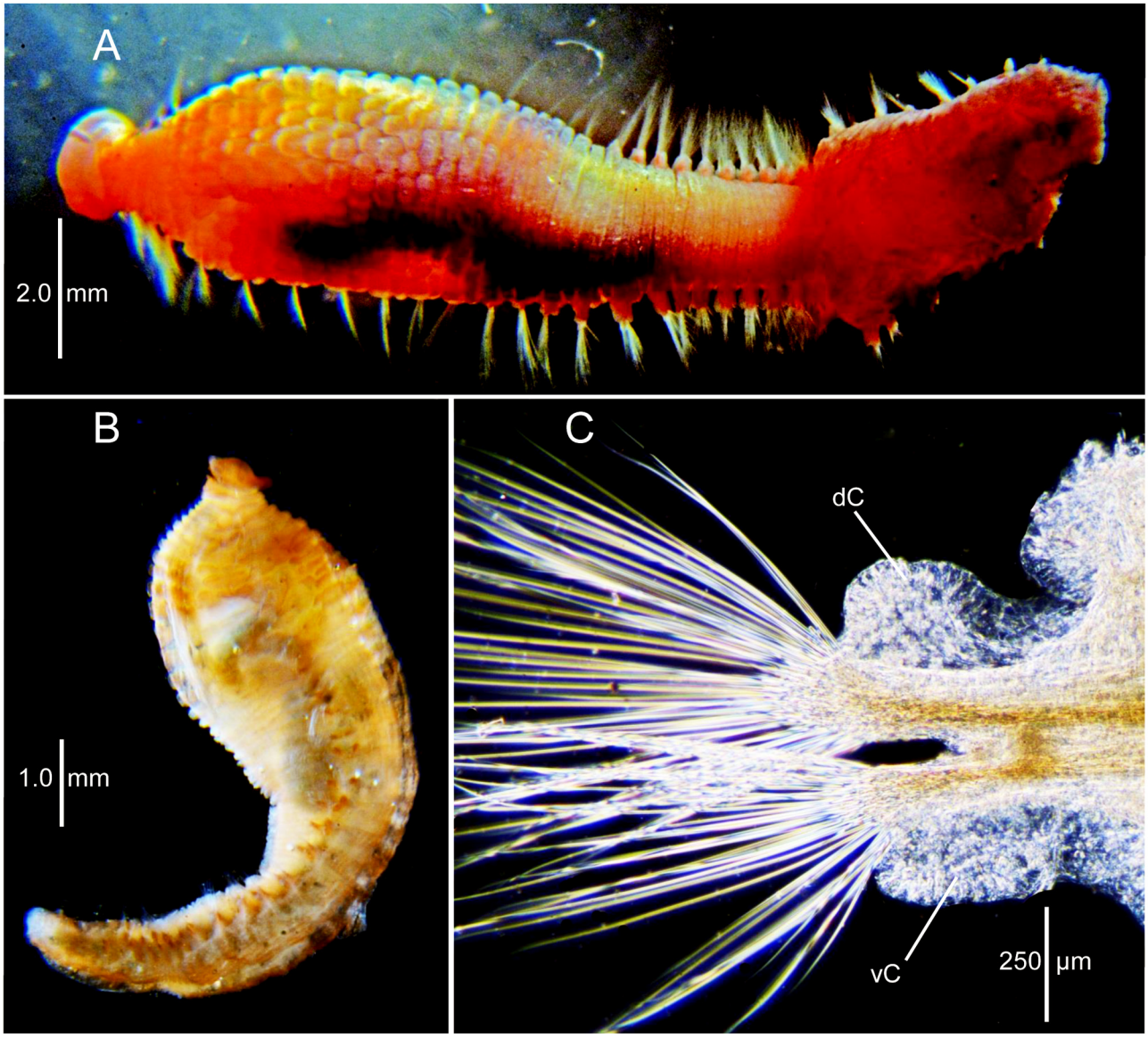

FIGURE 61. *Pseudoscalibregma parvum* (Hansen, 1879). (USNM 1741732): A, Entire worm, dorsolateral view with proboscis everted; B, entire worm, dorsolateral view; C, posterior parapodium, anterior view. Stained with Shirlastain A.

becoming more prominent by setigers 12–13 with rounded lobes becoming larger and longer; dorsal and ventral cirri developing from about setiger 14–15, fully developed by about setigers 20–25. Dorsal cirrus an elevated rounded lobe (Fig. 61C), sometimes with a weakly developed papillate tip; ventral cirrus low, elongate along base of neuropodium, not elevated, with rounded tip (Fig. 61 C).

Setae include short spinous setae in setiger 1, long, thin capillaries in all parapodia, and furcate setae from setiger 2. Short spinous setae anterior to capillaries on setiger 1 likely precursors or anlage of furcate setae found on setiger 2, anterior to capillaries; these short, very thin, tapering to finely drawn out tip. Furcate setae with unequal tynes, each with denticles on inner edge facing opposite tyne.

Pygidium with a terminal anus surrounded by 10–12 short lobes, anal cirri absent.

Remarks. The available specimens agree with the detailed description of the species provided by Bakken *et al* (2014) based on the type material of Hansen (1879) and new collections from Arctic and sub-arctic locations in the Norwegian Sea, Kara Sea (Russia), and east Greenland. Our own collections confirm the identity of the species from deep-water in the Atlantic Ocean by Hartman (1965).

Pseudoscalibregma parvum, with dorsal and ventral cirri both large, asymmetrical, and directed laterally and with rounded or large nipple-like tips, is most similar to *P. bransfieldium* (Hartman, 1967) from Antarctic seas, *P. ermindae* Mendes *et al*., 2024a from off SE Brazil, and *P. glandipodium* Blake, 2023 from off Eastern Australia. *Pseudoscalibregma bransfieldium* differs from these species in having dorsal and ventral cirri as large bulbous extensions of the podial lobes that are merged together and directed laterally; in addition, *P. bransfieldium* has five anal cirri, which *P. parvum* lacks. *Pseudoscalibregma*

ermindae has dorsal and ventral cirri that are large rounded ellipsoid swellings on the podial lobes directed dorsally or ventrally; the pygidium has a crenulated margin around the anus, with no cirri. *Pseudoscalibregma glandipodium* has dorsal and ventral cirri consisting of large inflated swellings that are irregularly shaped due to large internal glands; the pygidium bears 2–4 anal cirri. The pygidium of *P. parvum* has 1–12 lobes surrounding the anus, but no anal cirri. Further details are found in Table 5.

Distribution. Widespread in the North Atlantic Ocean including Arctic and sub-Arctic locations such as East Greenland, Jan Mayen, Spitzbergen, Norwegian Sea and Kara Sea, >1715 m (Bakken *et al* 2014). The species has been recorded from deep-water between the USA and Bermuda from 1330–2900 m (Hartman 1965); present records are from the U.S. Atlantic continental slope from off New England to North Carolina in depths of 1210–2189 m.

Pseudoscalibregma biannulatum new species

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Figure 62

Material examined. **Southeastern Pacific Ocean, off Peru, Peru-Chile Trench,** Milne-Edwards Deep, SEPBOP Expedition, R/V *Anton Bruun*, **Sta. AB II 149**, coll. R.J. Menzies, 01 Nov 1965, 5-ft beam trawl, 11.967°S, 78.583°W, 3177 m, **holotype** (LACM-AHF Poly 13574), 1 **paratype** (LACM-AHF Poly 14837).

Description. A large species; both specimens damaged, holotype largest, 18 mm long, 3.5 mm wide across setiger 6 with 20 setigers evident, but incomplete with posterior segments appearing to have epidermis stripped away; paratype complete, 18 mm long, 3.0 mm wide, with 18 setigers, also with posteriormost segments with outer epidermis damaged, but with last three setigers and pygidium intact, albeit damaged. Body linear, not expanded anteriorly as with most scalibregmatids (Fig. 62A–B). Color in alcohol distinct tan against opaque white background on proboscis, prostomium, peristomium, and pads of segmental annulations, providing this species with a readily visible and unique pigmentation pattern (Fig. 62A–B, C).

Body generally oval in cross section with dorsum rounded, venter more flattened. Annular rings first apparent from setiger 1, these distinctly biannulate along entire body with large block-like, almost square-shaped raised pads across dorsum and ventral surfaces (Fig. 62A–B, C); venter interrupted by large mid-ventral rectangular pads from setiger 2 forming low mid-ventral ridge continuing to posterior end (Fig. 62B).

Prostomium short, pentagonal in shape, as wide as long; anterior margin straight, bearing pair of narrow horns on lateral margins, horns projecting anteriorly at about a 45-degree angle (Fig. 62A, C); narrow posterior margin appearing to merge with peristomium (Fig. 62C); eyespots absent; nuchal organs not observed but likely arise from deep grooves between prostomium and peristomium. Peristomium a single multilobed ring surrounding prostomium dorsally (Fig. 62C); obscured ventrally by large everted proboscis (Fig. 62B). Oral morphology not observed on either specimen due to everted proboscis.

Parapodia of anterior setigers with noto- and neuropodia very close to one another laterally, with dense fascicles of setae arising from circular depressions; notosetae longer than neurosetae. Parapodia of posterior setigers present only on paratype; these with short setal lobes bearing dorsal and ventral cirri. Dorsal cirri short, rounded, ventral cirri larger, triangular in shape (Fig. 62E); both cirri with internal glands, but these difficult to study due to poor condition. A large rounded interramal papilla present between parapodia (Fig. 62E).

Setae include capillaries in all parapodia and furcate setae in all parapodia from setiger 3. Capillaries on anterior setigers arising as a dense circular fascicle with 50 or more setae in a bundle; notosetae longer than neurosetae. Furcate setae anterior to capillaries from setiger 3, each with a pair of nearly equal tynes, each tyne with denticles on inner edge facing opposite tyne (Fig. 62D).

Pygidium present only on paratype, damaged, consisting of narrow tube with no visible lobes or cirri.

Remarks. *Pseudoscalibregma biannulatum* **sp. nov.** is readily recognized by the biannulate pattern of large square or rectangular pads occurring as rings along the body. These pads are tan in color and as pigmented structures are conspicuous against the white background of the body. The venter has a mid-ventral line of larger pads that form a mid-ventral ridge. Although the anterior and middle setigers are thickened, there is no enlarged expanded region as is typical for most scalibregmatids.

Etymology. The epithet *biannulatum* is from *bi*, Latin for two and *annulus*, Latin for ring, in reference to the two annular rings that occur on each segment along the body of this species.

Distribution. SE Pacific Ocean, off Peru, Peru-Chile Trench, 3177 m.

Pseudoscalibregma bransfieldium (Hartman, 1967)

Eusclerocheilus bransfieldia Hartman, 1967: 130–131, pl. 39.
Hyboscolex bransfieldia: Kudenov & Blake 1978: 440.
Pseudoscalibregma bransfieldia: Hartman 1978: 180–181, fig. 28.
Pseudoscalibregma bransfieldium: Blake 1981: 1143–1145, fig. 6; Hartmann-Schröder & Rosenfeldt 1991: 75; Blake 2015: 79, fig. 6F–G.

Material examined. (*4 specimens*) **Southern Ocean: Weddell Sea, E of Antarctic Peninsula**, R/V *Polarstern*, ANDEEP II (ANT-XIX/4), coll. J.A. Blake: **Sta. PS61/132-4**, 06 Mar 2002, BC, 65.2958°S, 53.382°W, 2085 m (1, ZMH-ANN-030791); **Sta. PS61/132-5**, 07 Mar 2002, MUC, 65.295°S, 53.383°W, 2084 m (1, ZMH-ANN-030792); **Sta. PS61/133-5**, 07 Mar 2002, BC, 65.335°S, 54.2478°W, 1110 m (1, MCZ IZ 171930).—**Scotia Sea**, R/V *Polarstern*, ANDEEP III (ANT-XXII/3):

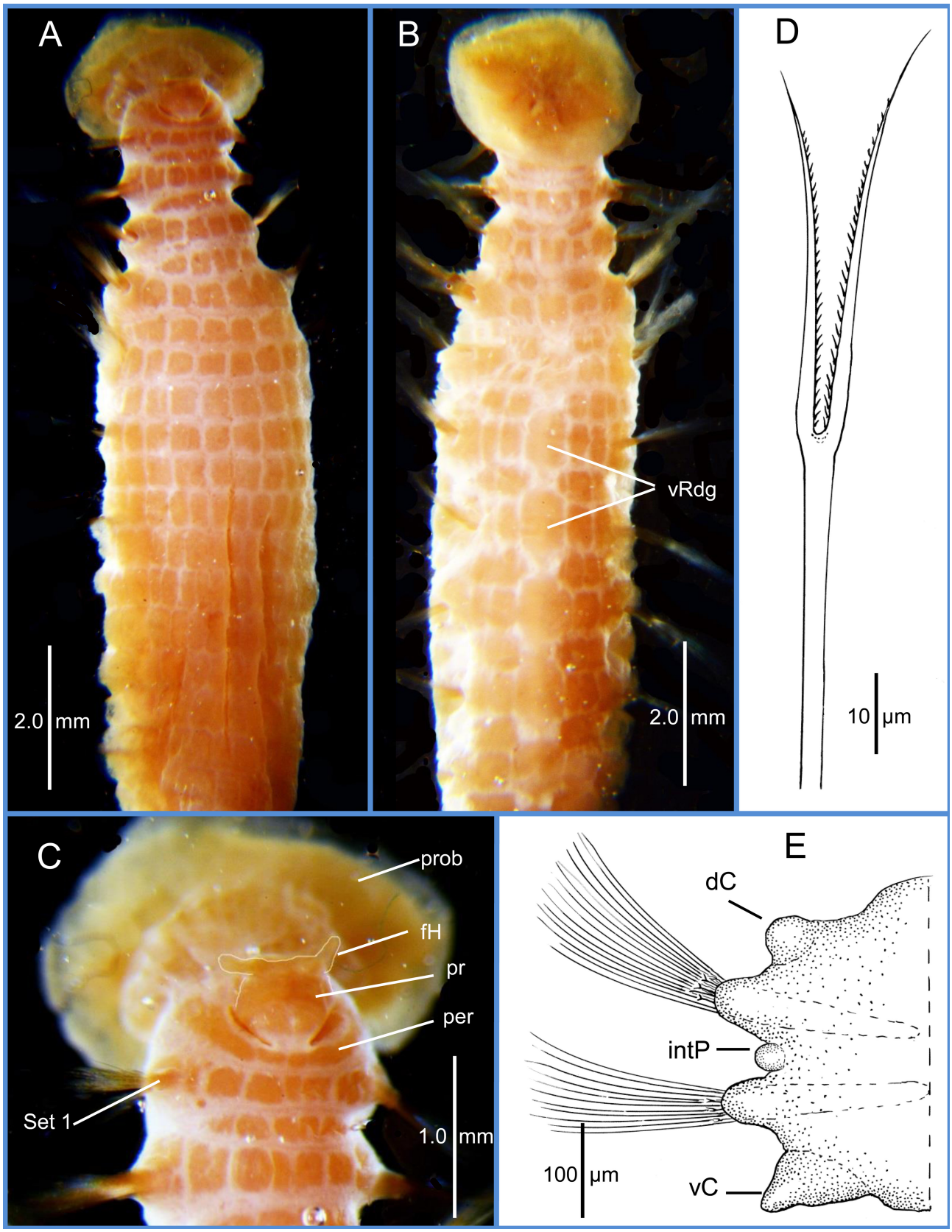

FIGURE 62. *Pseudoscalibregma biannulatum* **sp. nov.** A, anterior end through setiger 11, dorsal view; B, anterior end through setiger 11, ventral view; C, anterior end, dorsal view of pre-setiger region and setigers 1–2; D, furcate seta from posterior neuropodium; E, posterior parapodium, anterior view. A–C, holotype (LACM-AHF Poly 13574); D–E, paratype (LACM-AHF Poly 14837). Prostomium of C outlined in white for emphasis.

Sta. PS67/151-4, 1 Mar 2005, BC, 61.758°S, 47.126°W, 1181 m (1, ZMH-ANN-030793).

Description. Largest specimen available (ZMH-ANN-030792) incomplete with 26 setigers, 22 mm long, 4.5 mm wide across expanded middle setigers, 2 mm wide across posterior setigers. Body with weakly defined annular rings, segments biannulate along entire body; raised pads not present, rings defined by transverse lines; similar on both dorsal and ventral surfaces; venter with mid-ventral pads evident only from setigers 3–6; thereafter midline visible only as a low, narrow raised ridge.

Prostomium triangular, wider than long, posteriorly merging with peristomium; anterior margin with transverse ridge bearing two elongate lateral horns directed at a slight angle; eyespots absent; posterior half with raised crest on some specimens; lobed nuchal organs partially emergent from groove between prostomium and peristomium. Peristomium a single dorsal ring merged with prostomium mid-dorsally, extending laterally and onto oral morphology ventrally; mouth obscured by everted proboscis. Mouth on proboscis oval, bordered by elongate papillae.

Parapodia of anterior setigers reduced to short lobes; from about setiger 15, podial lobes becoming longer and pointed with dorsal and ventral cirri developing. Dorsal and ventral cirri large, bulbous, with asymmetrical base merged with podia along most of length; internal glands not observed.

Setae include capillaries, furcate setae, and short spinous setae. Capillaries of anterior setigers long, in 2–3 rows forming dense fascicles; few capillaries in mid-body and posterior setigers. Furcate setae from setiger 2, 4–5 per podial lobe, each with subequal tynes and with denticles on inner margins. Short spinous setae present anterior to capillaries in noto- and neuropodia of setiger 1; these narrow, curved, tapering to blunted tip. Pygidium not present, but reported with five anal cirri.

Remarks. *Pseudoscalibregma bransfieldium* has been well described in earlier reports and is easily recognized by the large inflated dorsal and ventral cirri that are asymmetrical and extend along most of the podial lobes (see Hartman 1967: Pl. 39; Blake 1981: fig. 6; 2015: fig. 6F–G). Most smaller specimens with a low raised crest on the prostomium where it merges with the peristomium. The present specimens extend the range of the species into bathyal depths.

Distribution. Widespread in Antarctic Seas, 355–2085 m.

Pseudoscalibregma gracilis new species

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Figures 63–64

Material examined. Southern Ocean, Antarctica: Scotia Sea, off Elephant Island, R/V *Polarstern*, ANDEEP I (ANT-XIX/3), coll. J.A. Blake, **Sta. 46-3**, 30 Jan 2002, BC, 60.632°S, 53.953°W, 2888 m, **holotype** (ZMH-ANN-030796).—**Weddell Sea, E of Antarctic Peninsula**, R/V *Polarstern*, ANDEEP II (ANT-XIX/4), coll. J.A. Blake: **Sta. 131-8**, 06 Mar 2002, BC, 65.311°S, 51.515°W, 3068 m, **paratype** (ZMH-ANN-030795). **Sta. 132-7,** 07 Mar 2002, MUC, 65.293°S, 53.392°W, 2076 m, **paratype** (ZMH-ANN-030794).

Description. Holotype (ZMH-ANN-030796) only large specimen, complete with 37 setigers, body elongate, mostly narrow, expanded only over setigers 7–11 (Fig. 63A); 10 mm long, 0.8 mm wide across setigers 7–8, 0.25 across posterior setigers. Two small paratypes: 25-setiger juvenile (ZMH-ANN-030795) 2.3 mm long, 0.18 mm wide across setiger 2, 0.1 mm wide across far posterior setigers; 30-setiger paratype (ZMH-ANN-030794) 3.2 mm long, 0.3 mm wide across swollen segments, otherwise 0.15 mm wide across narrow posterior setigers.

Body generally oval in cross section in anterior and posterior setigers, becoming enlarged over expanded setigers; narrow over long posterior section (Fig. 63A). Annular rings first apparent from setiger 3, distinctly quadriannulate over anterior setigers (Fig. 64A–B), then pentannulate over narrow posterior 20 setigers; annular rings with raised blocks or pads poorly developed, most prominent on dorsal surface of setigers 3–6 (Fig. 64A); not prominent on posterior setigers or on ventral surface; venter with a raised mid-ventral ridge from setiger 3 continuing to posterior end (Fig. 64B); obscured in expanded segments. Color in alcohol light tan with darkly pigmented glandular cells present along annular rings from setiger 3 to posterior end on both dorsal and ventral surfaces (Fig. 64A–B).

Prostomium short, slightly wider than long; anterior margin smoothly rounded bearing a pair of oval-shaped lateral horns (Figs. 63A–B, 64A–B); eyespots absent; nuchal organs observed on holotype as emergent ciliated lobes between prostomium and peristomium (Fig. 64A). Peristomium a single ring merged seamlessly with reduced setiger 1 (Fig. 64A). Venter with large, inflated swelling bearing mouth surrounded by 7–8 thick lobes (Figs. 63B, 64B); swollen area extending from prostomium onto setiger 1 (Fig. 64B). Proboscis not everted.

Parapodia of anterior setigers reduced to short lobes or mounds. Setiger 1 uniramous, reduced to short rounded notopodia; neuropodia entirely absent on setiger 1 (confirmed on all three specimens). Parapodia biramous from setiger 2, with setae arising from short, rounded lobes, these becoming more prominent by about setigers 11–12; dorsal and ventral cirri developing from about setigers 11–13, becoming prominent by about setiger 20. Dorsal cirrus rounded (Fig. 63E); ventral cirrus an elongate lobe (Fig. 63E), becoming narrow and more pointed posteriorly (Fig. 63D); both cirri with numerous darkly pigmented and striated internal glands (Fig. 63A, D–E); these similar in color to glands on dorsal surface of annular rings; dorsal and ventral cirri visible along body due to colored glands (Fig. 63A). Large rounded interramal papilla present between parapodia (Fig. 63E).

Setae include capillaries in all parapodia and furcate setae in all parapodia from setiger 3. Setae of setiger 1

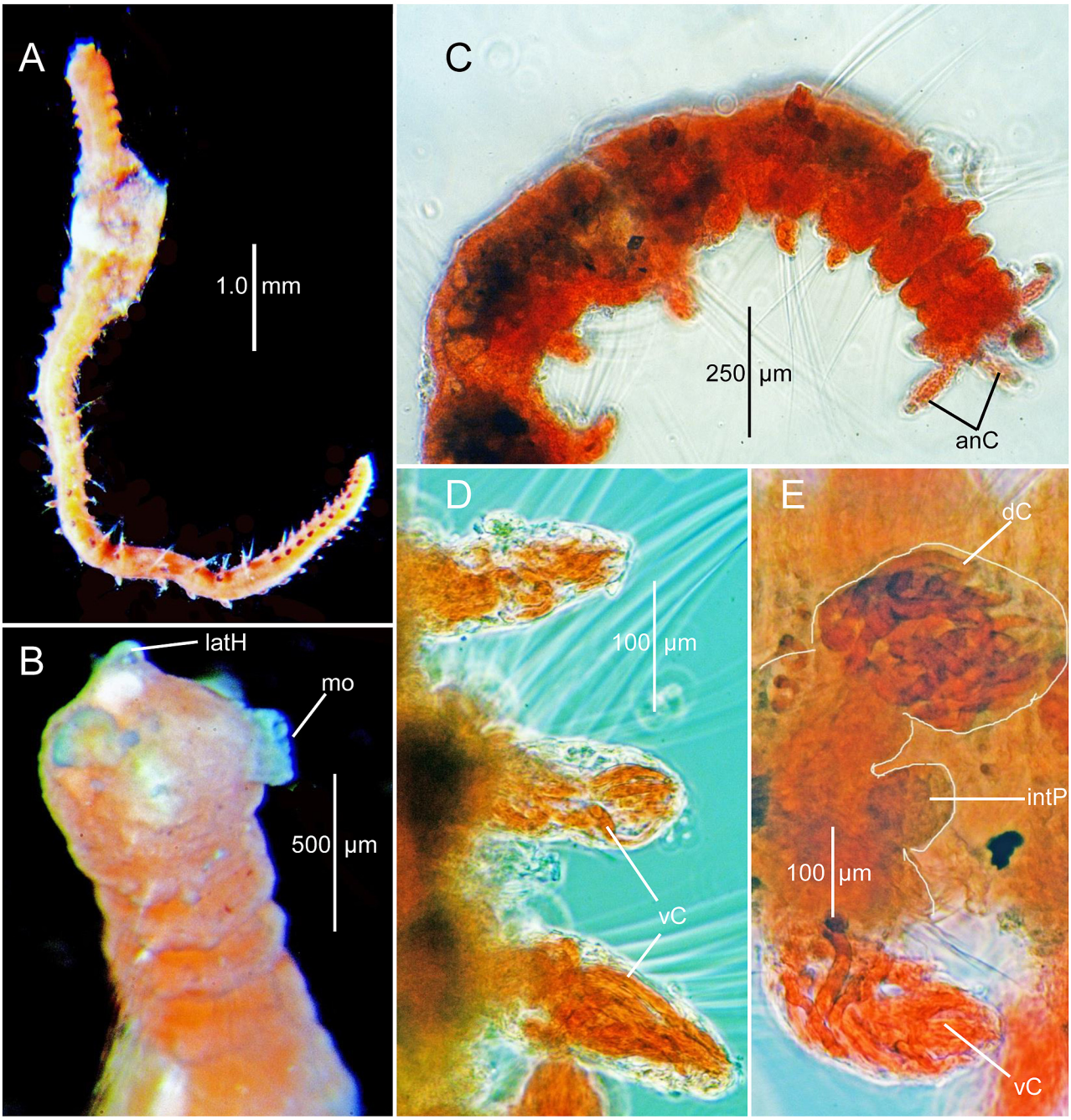

FIGURE 63. *Pseudoscalibregma gracilis* **sp. nov.** A, entire worm, lateral view; B, anterior end, ventrolateral view; C, posterior end, ventral view; D, detail of ventral cirri; E, posterior parapodium, posterior view. A–B, holotype (ZMH-ANN-030796); C, paratype (ZMH-ANN-030795); D–E, paratype (ZMH-ANN-030794). All stained with Shirlastain A; cirri and podia of E outlined in white for emphasis.

reduced to 3–4 short capillaries. Furcate setae anterior to capillaries from setiger 3; with long subequal tynes, each with denticles on inner edge facing opposite tyne (Fig. 64C).

Pygidium of holotype with some damage, but with two short anal cirri; paratypes with four cirri, two narrow and lateral and two short and terminal (Fig. 63C).

Remarks. *Pseudoscalibregma gracilis* **sp. nov.** is unusual among scalibregmatids in having a reduced and uniramous setiger 1 together with the peristomium and setigers 1–2 merged with no obvious demarcation except the setal lobes. The only other scalibregmatid known to have a uniramous setiger 1 is *Oligobregma escanabis* **sp. nov.** (see above). In *P. gracilis* **sp. nov.** the notopodium of setiger 1 is reduced to a small knob from which 3–4 short, pointed setae emerge. The complete absence of a neuropodium was confirmed on all three specimens. The reduced setiger 1 and setiger 2 are together merged with the peristomium with only the presence of the setal fascicles to denote where the peristomium and setigers are located. The short notosetae of setiger 1 may be capillaries or short spinous setae, but are difficult to observe without damage

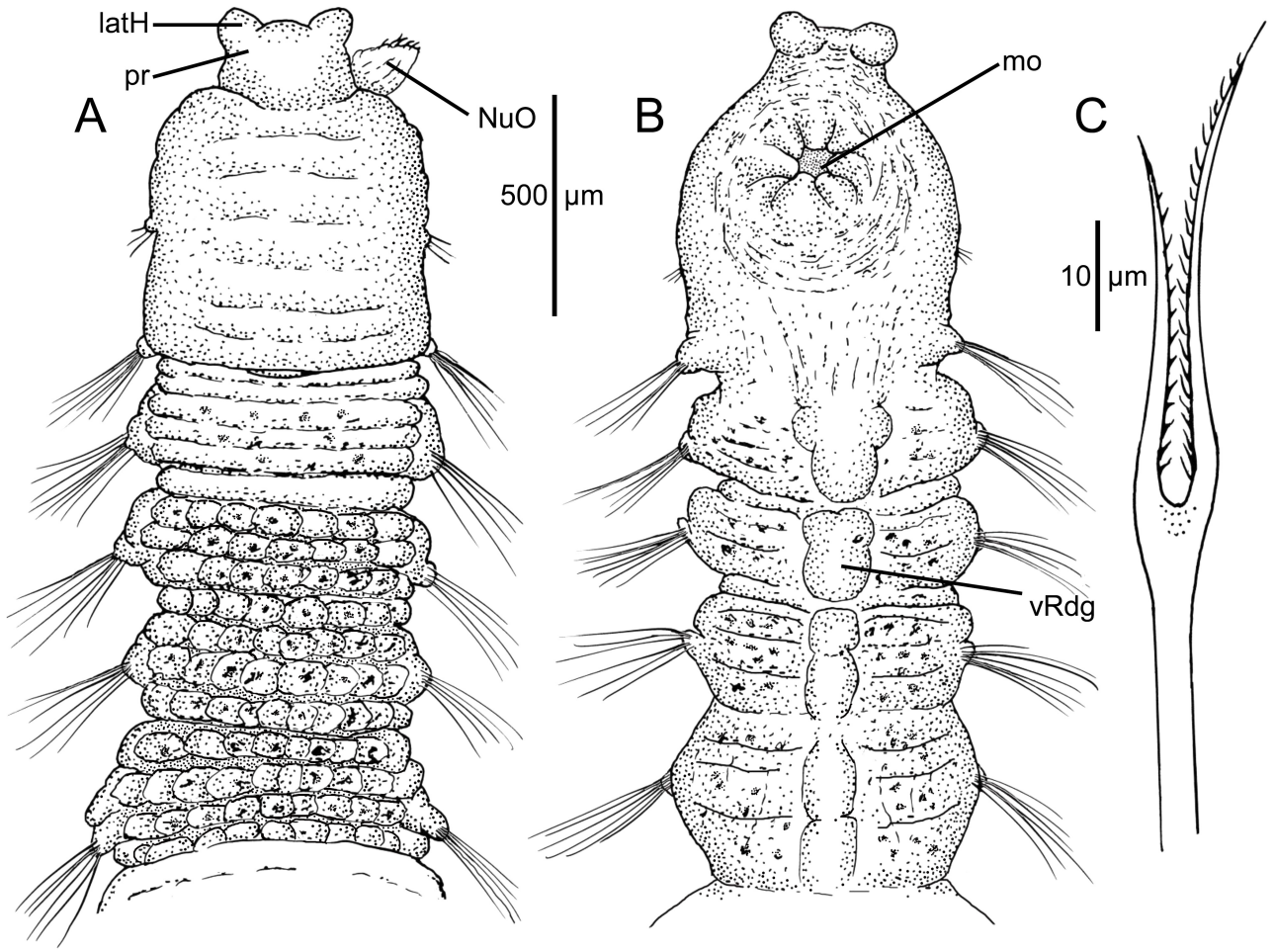

FIGURE 64. *Pseudoscalibregma gracilis* **sp. nov.** Holotype (ZMH-ANN-030796): A, anterior end, dorsal view; B, anterior end ventral view; C, furcate seta from posterior neuropodium.

to the specimens. Another unusual feature of *P. gracilis* **sp. nov.** is the presence of pigmented gland cells across the annular rings along the body, that together with the pigmented glands in the dorsal and ventral cirri provide the species with a distinctive coloration.

Etymology. The epithet is from the Latin *gracilis*, for slender or thin in reference to the unusually narrow body of this species.

Distribution. Southern Ocean, Antarctica, Scotia Sea and Weddell Sea, 2076–3068 m.

Pseudoscalibregma larae new species

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Figures 65–66

Material examined. (*67 specimens*) **Western North Atlantic Ocean, southeastern USA,** U.S. South Atlantic ACSAR Program, coll. J.A. Blake. **Off Cape Lookout**, North Carolina: **Sta. 1**, **Cruise SA-2**, R/V *Cape Hatteras*, Rep. 3, 27 Mar 1984, BC, 34.264°N, 75.763°W, 593 m, **holotype** (USNM 1741705), 4 **paratypes** (USNM 1741706), 2 SEM specimens (JAB); Rep. 1, 26 Mar 1984, BC, 34.266°N, 75.769°W, 583 m, 1 **paratype** (USNM 1741707); Rep. 2, 26 Mar 1984, BC, 34.264°N, 75.767°W, 583 m, 5 **paratypes** (USNM 1741708); **Cruise SA-1**, R/V *Columbus Iselin*, Rep. 2, 11 Nov 1983, BC, 34.273°N, 75.758°W, 640 m, 1 **paratype** (USNM 1741709); Rep. 3, 11 Nov 1983, BC, 34.267°N, 75.766°W, 580 m, 4 **paratypes** (USNM 1741710); **Cruise SA-3**, R/V *Gyre*, Rep.1, 15 Jul 1984, BC, 34.273°N, 75.763°W, 584 m, 1 **paratype** (USNM 1741711). **Off Cape Fear, North Carolina**: **Sta. 11**, **Cruise SA-4**, R/V *Cape Hatteras*, Rep. 2, 22 May 1985, BC, 33.082°N, 76.416°W, 802 m (1 juv USNM 1741712); **Cruise SA-6**, R/V *Cape Hatteras*, Rep. 1, 22 Nov 1985, BC, 33.083°N, 76.419°W, 804 m (2, USNM 1741713); **Off Charleston, South Carolina**: **Sta. 14**, **Cruise SA-4**, R/V *Cape Hatteras*, Rep. 1, 20 May 1985, BC, 32.394°N, 76.019°W, 805 m, 1 **paratype** (USNM 1741714).—**North Atlantic Ocean, Off New England,** U.S. North Atlantic ACSAR Program, coll. G.W. Hampson, Chief Scientist. **Sta. 4**, **Cruise NA-2**, R/V *Oceanus*, Rep. 1, 28 Apr 1985, BC, 40.352°N, 67.537°W, 590 m (3, USNM 1741715). **Sta. 12**, **Cruise NA-4**, R/V *Gyre*, Rep. 2, 30 Nov 1985, BC, 39.905°N, 70.010°W, 544 m (22, USNM 1741716); **Cruise NA-6**, R/V *Cape Hatteras*, Rep. 1, 30 Jul 1986, BC, 39.904°N, 70.917°W, 563 m (12, USNM 1741717); Rep. 2, 30 Jul 1986, BC, 39.904°N, 70.918°W, 559 m (7, USNM 1741718); Rep. 3,

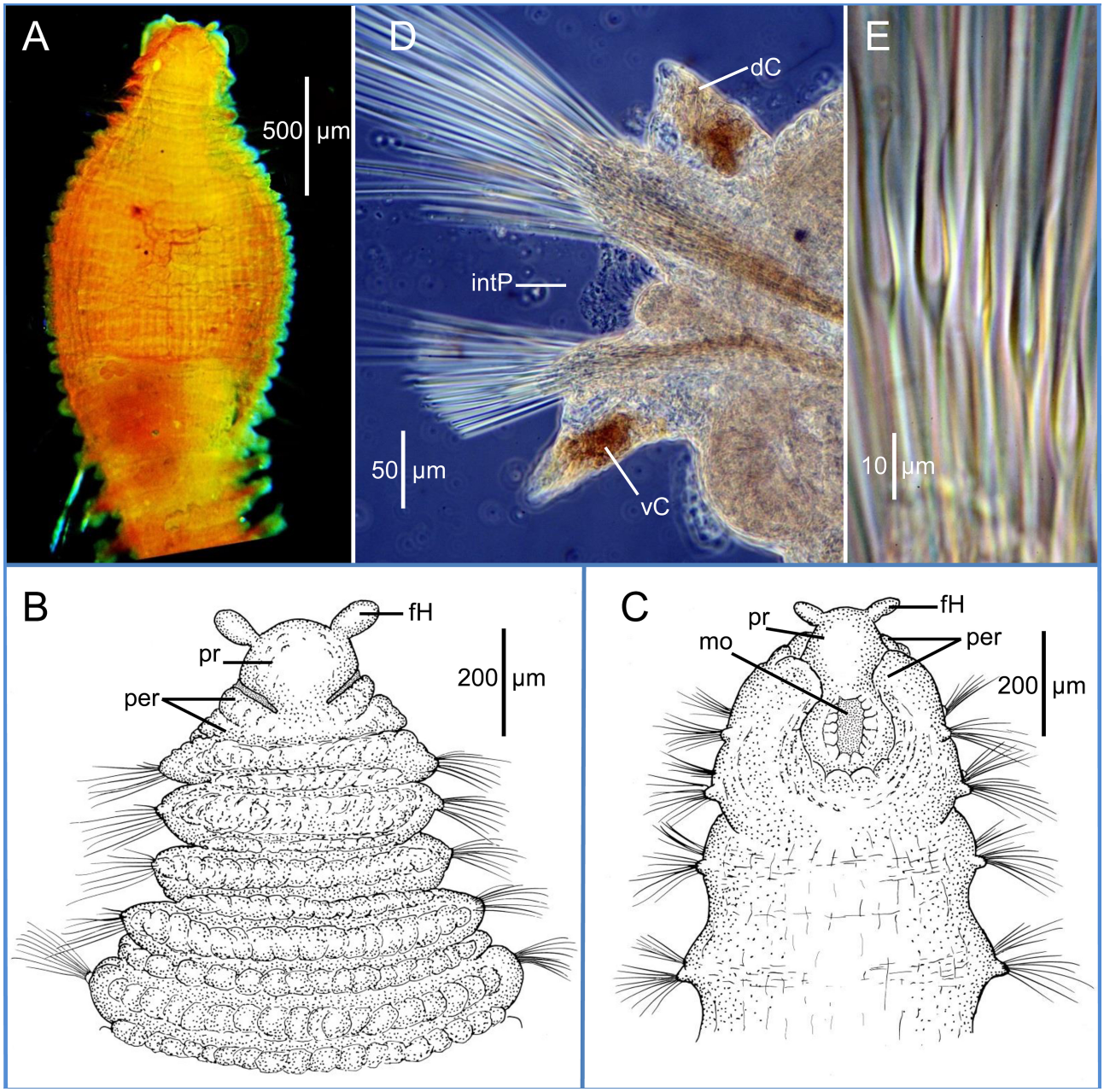

FIGURE 65. *Pseudoscalibregma larae* **sp. nov.** A, anterior half, dorsal view; B, anterior end, dorsal view; C, anterior end, ventral view; D, posterior parapodium, anterior view; E, furcate setae, posterior neuropodium. A–C, holotype (USNM 1741705); D–E, paratype (USNM 1741706). A, stained with Shirlastain A.

30 Jul 1986, BC, 39.904°N, 70.908°W, 563 m (2, USNM 1741719).

Description. Samples include specimens ranging from large mature adults to juveniles. Body fusiform to sausage-shaped, narrow over setigers 1–4, then swollen in middle setigers (~5–14) (Fig. 65A), narrowing posteriorly (setigers 15 to 30 or more) (Fig. 65A). Holotype (USNM 1741705) complete with 39 setigers, 5.6 mm long and 1.13 mm wide across expanded setigers (5–14); paratype (USNM 1741706) with 30 setigers, 5.5 mm long and 1.2 mm wide across expanded setigers (5–14); largest paratype (USNM 1741714) with 32 setigers, 10 mm long, and 2.0 mm wide across expanded anterior region of setigers 5–13. Body more or less oval in cross section of expanded setigers, then becoming more rectangular in posterior setigers. Annular rings with numerous raised pads present along entire body (Fig. 66A), rings smaller, less conspicuous than on other scalibregmatids; 2–3 rings on anterior five setigers, these prominent dorsally, barely evident ventrally; from setiger 5 and following, four annular rings present, continuing to posterior end. Paired rows of elevated pads interrupted mid-ventrally by longitudinal ridge formed of rectangular pads extending from about setiger 5 along entire body (Fig. 66B). Color in alcohol: light tan.

Prostomium short, oval, slightly wider than long, broadly rounded across anterior margin with a pair of oval lateral horns protruding at about a 45-degree angle or less

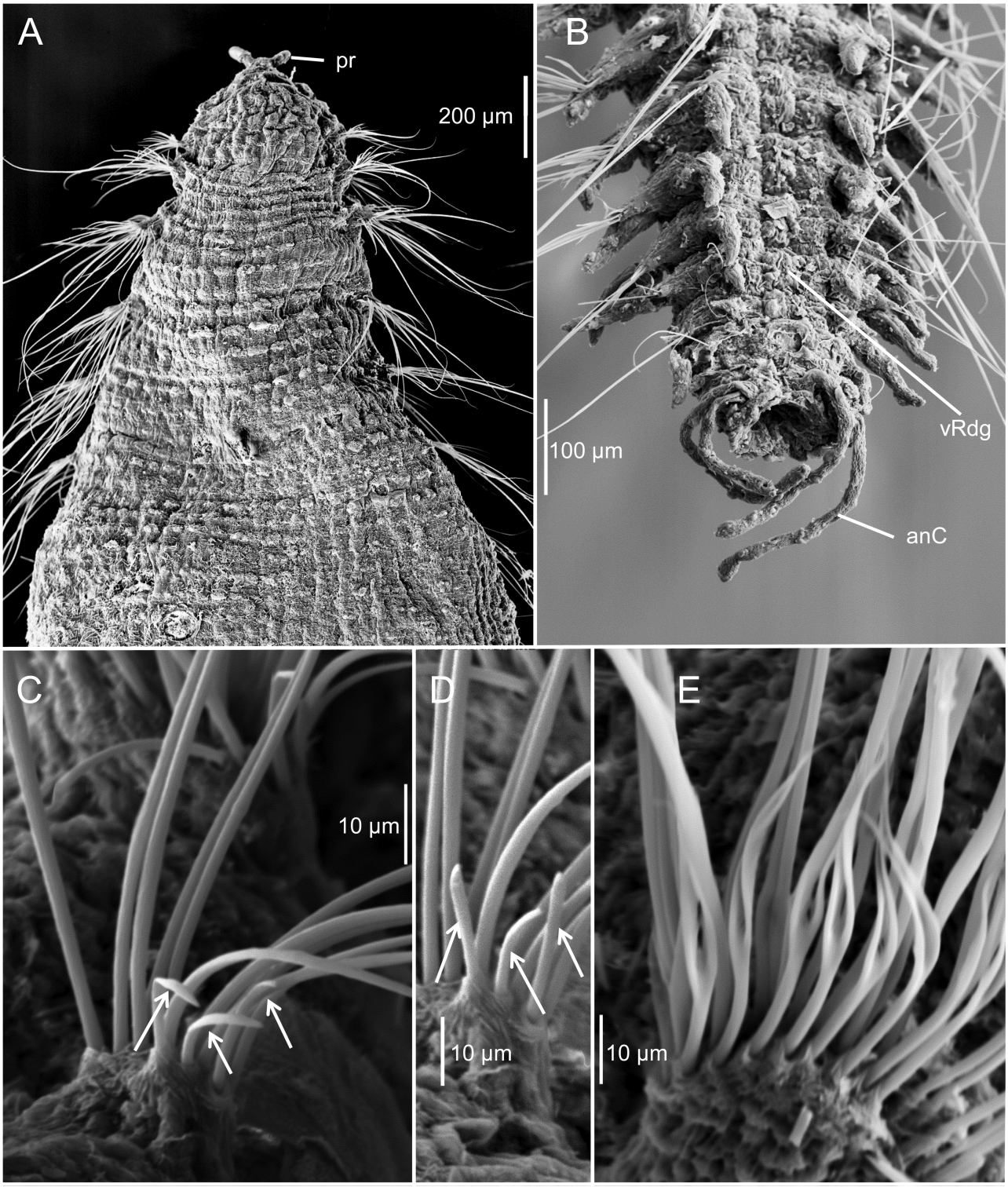

FIGURE 66. *Pseudoscalibregma larae* **sp. nov.** (SA2, Sta. 1, Rep. 3, JAB): A, anterior end, dorsal view; B, posterior end, ventral view; C, short spinous setae and capillaries, notopodia, setiger 1; D, short spinous setae and capillaries, notopodia, setiger 2; E, furcate setae and capillaries, posterior notopodium. Arrows denote short spinous setae. Original SEMs by Lara (Luzak) Parisi.

(Figs. 65B, 66A); ventrally forming anterior lip of mouth (Fig. 65C); eyespots absent; nuchal organs everted on a few specimens, arising from groove between prostomium and peristomial ring. Peristomium a narrow ring, weakly divided laterally into two parts, interrupted mid-dorsally by posterior extension of prostomium; ventrally merging with setiger 1 and forming large, raised mound containing oral opening (Fig. 65C); mouth ringed with small lobes; most specimens with proboscis everted producing a large sac with two or three lobes.

Parapodia of anterior setigers reduced to short, pointed lobes from which setae arise; these obscured on

swollen segments. Parapodia becoming more prominent by setigers 15–16 with rounded lobes becoming longer; dorsal and ventral cirri developing from about setiger 14–15 becoming prominent by about setiger 16–18. Dorsal cirrus an elevated triangular lobe (Fig. 65D); ventral cirrus more elongate, also triangular with narrow tip, sometimes appearing papillate (Fig. 65D). Both dorsal and ventral cirri with darkly stained glands from which narrow tubes extend toward tip. A ciliated rounded interramal papilla present between each noto- and neuropodium of posterior setigers (Fig. 65D).

Setae include long, thin capillaries in all parapodia, short spinous setae in setiger 1, and furcate setae in all parapodia from setiger 2. Short spinous setae anterior to capillaries on setiger 1 with blunted or pointed tips (Fig.66C–D, arrows). Furcate setae anterior to capillaries, numbering 8–10 per fascicle; each with long, nearly equal tynes, each with denticles on inner edge facing opposite tyne (Figs. 65E, 66E).

Pygidium with terminal anal opening bordered by two flaring lobes bearing five anal cirri, four dorsolateral and one ventral (Fig. 66B); most of these typically lost on available specimens.

Remarks. *Pseudoscalibregma larae* **sp. nov.** is only second species of the genus to be reported from the North Atlantic Ocean. Ecologically*, P. larae* **sp. nov.** is restricted to upper and middle slope depths of 544–805 m off the U.S. Atlantic coast, whereas *P. parvum* occurs more widely in the North Atlantic including the Arctic and in depths of about 1200–2900 m (Bakken *et. al*. 2014; this study).

Although both species are similar in overall body shape, they differ significantly in several key morphological features. *Pseudoscalibregma parvum* has large conspicuous pads on the annular rings over anterior and middle segments, dorsal and ventral cirri of posterior setigers that are low, asymmetrical, and sometimes have papillate tip, and the pygidium lacks anal cirri. In contrast, *P. larae* **sp. nov.** has numerous small, inconspicuous raised pads on the annular rings, dorsal and ventral cirri are both pointed, and triangular in shape, and the pygidium has five anal cirri.

Etymology. The species is named for Ms. Lara (Luzak) Parisi, a student investigator who worked with the author on the NSF PEET grant as a graduate assistant in 2007. Ms. Parisi investigated the juvenile morphology of our U.S. Atlantic deep-water scalibregmatids and prepared SEMs of selected species.

Distribution. Western North Atlantic Ocean, off the Carolinas, continental slope, 583–805 m; off New England, 544–590 m.

Pseudoscalibregma nybakkeni new species

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Figure 67

Material examined. (*4 specimens*) **Eastern North Pacific Ocean, Continental slope off northern California, west of Farallon Islands. Farallon Oceanic Research Expedition**, R/V *Point Sur*, coll. J. W. Nybakken, Moss Landing Marine Labs, beam trawl, 28 Feb 1992, 37.634°'N, 123.494°W to 37.639°N,123.477°W, 2970–2890 m, **holotype** (LACM AHF-Poly 13308).—**U.S. Navy 103-Site Selection Survey (1990)**, W of Farallon Islands, R/V *Farnella*, BC, coll. J.A. Blake, **Sta. L-17**, 14 Aug 1990, 37.649°N, 123.488°W, 2855 m, 1 juv (CASIZ 245242).—**U.S. EPA 102-Site Selection Survey (1991), N of Pioneer Canyon**, R/V *Pt. Sur*, coll. J.A. Blake, **Sta. 3-8**, 13 Sep 1991, BC, 37.452°N, 123.384°W, 2005 m (1, CASIZ 245243).—**SF-DODS Benthic Monitoring Program**, W of Farallon Islands, **Sta. 27**, coll. 28 Sep 2017, R/V *Oceanus*, coll. J. Nakayama, BC, 37.683°N, 123.533°W, 2819 m (1, CASIZ 245244).

Description. Holotype (LACM AHF-Poly 13308) only large specimen, incomplete with 25 setigers, 11 mm long, 1.2 mm wide across mid-body. Small specimen from EPA Sta. 3-8 (CASIZ 245243) complete with 21 setigers, 3.4 mm long, 1.2 mm wide across expanded setiger 6. Body only slightly expanded in middle segments, narrowing anteriorly and posteriorly. Body generally rectangular in cross section in anterior and posterior setigers, becoming oval in middle segments. Annular rings bi-annulate along entire body (Fig. 67A); raised blocks large, but only weakly developed, over setigers 1–15, then becoming smaller and less distinct; posterior setigers with blocks not evident, merged as a continuous ridge. Mid-ventral annular rings interrupted by a ridge consisting of enlarged mid-ventral plates extending from setiger 2; ridge extending along entire body, less prominent in posterior setigers. Color in alcohol light tan.

Prostomium short, oval, slightly wider than long; smoothly rounded across anterior margin bearing a pair of oval-shaped frontal horns projecting forward at about a 45-degree angle (Fig. 67A); with short posterior extension merging with peristomium; eyespots absent; nuchal organs not everted. Peristomium a single multilobed ring limited to dorsal and lateral surfaces, interrupted mid-dorsally by posterior extension of prostomium (Fig. 67A); ventral surface obscured by everted proboscis; proboscis a rounded sac, with oral opening surrounded by numerous elongate lobes.

Parapodia of anterior setigers reduced to short lobes or mounds, becoming more prominent by about setiger 10 with rounded lobes becoming longer; (Fig. 67B); internal glands not apparent; interramal dorsal and ventral cirri developing from about setigers 14–15. Dorsal cirrus an elevated triangular-shaped lobe, tapering to a narrow, rounded tip; ventral cirrus an irregular rounded lobe (Fig. 67B); ciliated interramal papilla present between noto- and neuropodium (Fig. 67B).

Setae include short spinous setae in setiger 1, long, thin capillaries in all parapodia, and furcate setae in all parapodia from setiger 2. Short spinous setae anterior to capillaries on setiger 1 short, very thin, tapering to finely drawn out tip. Furcate setae also anterior to capillaries, with long unequal tynes, each with denticles on inner edge facing opposite tyne (Fig. 67C).

Pygidium not present on holotype; specimen from Sta. 3-8 with four short anal cirri.

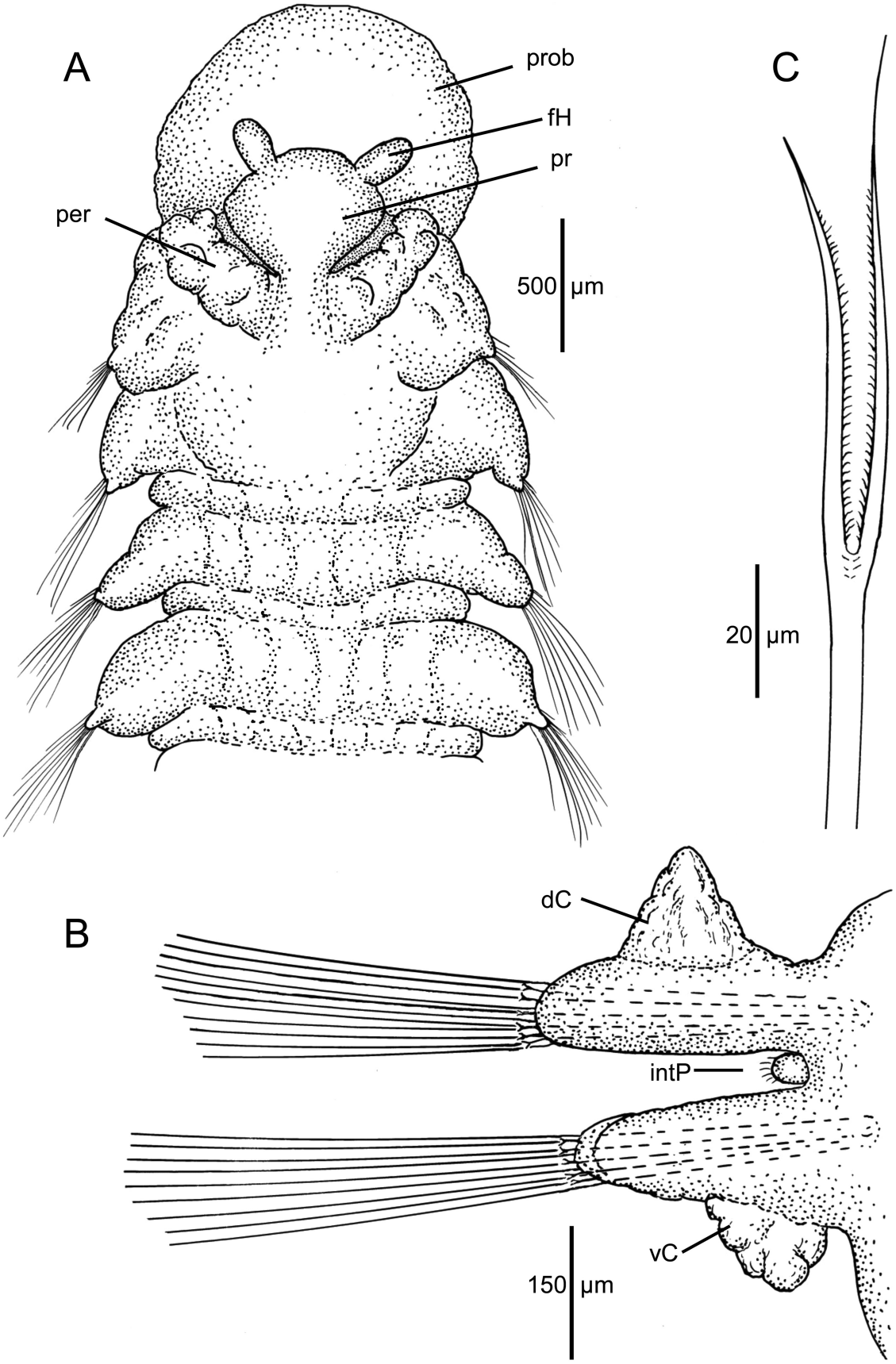

FIGURE 67. *Pseudoscalibregma nybakkeni* **sp. nov.** Holotype (LACM AHF-Poly 13308): A, anterior end, dorsal view; B, posterior parapodium, anterior view; C, furcate seta from posterior neuropodium.

Comment on Juvenile. The juvenile (CASIZ 245242) is complete with 20 setigers and measures 1.2 mm long and 0.25 mm wide. The prostomium and peristomium are as in the holotype except that large ciliated nuchal organs are emergent from the groove between the prostomium and peristomium; the frontal horns are more laterally directed but of a similar length. The shape of the dorsal and ventral cirri are similar to that of holotype except that posteriormost dorsal cirri are more elongate. The pygidium is a terminal ring surrounding the anus; one anal cirrus is attached.

Remarks. Among 27 known species of *Pseudoscalibregma*, *P. nybakkeni* **sp. nov.** from the W North Atlantic in 544–805 is the only species to have a single multilobed peristomial ring, furcate setae from setiger 2, and biannulate segments along the entire body.

Etymology. This species is named for the late Dr. James W. Nybakken (1936–2009), Professor of Marine Biology at the Moss Landing Marine Laboratories in California, and a long-time personal friend.

Distribution. Eastern North Pacific Ocean, lower continental slope off northern California, 2005–2970 m.

Pseudoscalibregma palmeri Blake, 2015

Pseudoscalibregma palmeri Blake, 2015: 76–78, figs. 6A–E, 7.

Material examined. Southern Ocean, Antarctica, off South Orkney Islands, R/V *Polarstern*, ANDEEP III (ANT-XXII/3), **Sta. PS67/150-2,** 20 Mar 2005, MUC, 61.81°S, 47.458°W, 1953 m (1, ZMH-ANN-030797).

Description. Present specimen likely a juvenile, but complete with 35 setigers, 3.9 mm long, 0.38 mm wide across setiger 2, 0.82 mm wide across expanded setiger 7, 0.18 mm wide across far posterior setigers. Body with prostomium and first two segments narrow, but swollen dorsally likely due to internal proboscis; setigers 5–9 greatly expanded, rest of body narrow. Color in alcohol light tan, with reddish pigmented glands dorsally on annular rings of setigers 2–3.

Body segments with transverse rows of pads; setigers 1–2 biannulate with pads obscured; pads not evident ventrally; subsequent setigers quadriannulate and pentannulate with narrow rings containing numerous closely spaced small pads. Venter with prominent ventral groove bearing large elevated pads from setiger 2, continuing posteriorly forming ventral ridge line with a single large elevated pad at midpoint of each segment within groove.

Prostomium with diverging frontal horns directed anteriorly; eyespots absent, nuchal organs not observed. Peristomium obscured dorsally by swelling due to internal proboscis; this visible as partially everted between oral lips.

Parapodia with elongate conical podial lobes throughout. Dorsal and ventral cirri from setiger 13, these initially short, rounded, and inconspicuous, becoming longer and more prominent posteriorly; dorsal cirri triangular, broad basally, tapering to pointed tip; ventral cirri asymmetrical with broad basal attachment and elongated, rounded tip; both dorsal and ventral cirri with prominent darkly pigmented internal glands; glands on dorsal cirri exiting toward apex and glands on ventral cirri exiting along ventral surface. Interramal papillae present between noto- and neuropodia.

Setae include capillaries, short spinous setae, and furcate setae. Capillaries in all setigers; setigers 1–2 with short spinous setae anterior to capillaries, these replaced by 2–3 furcate setae from setiger 3. Furcate seta with unequal tynes bearing short bristles on each tyne directed toward opposite tyne.

Pygidium with narrow anal opening bearing lateral anal cirri; only one anal cirrus present, but scars suggest total number is 4.

Remarks. The present specimen is a juvenile, but is the first to be complete with an intact pygidium which bears a single anal cirrus with scars and stubs suggesting that four anal cirri are likely the final number. The specimen differs from the original account (Blake 2015) in that distinctive large pigmented glands are not present on anterior setigers although smaller pigmented glands are present on some anterior parapodia. The original account reported the peristomium as a single multilobed ring; however, this is obscured in the present specimen because the dorsal surface is expanded, probably due to the internal proboscis which is partially visible between the oral lips. Other characters including the number of annular rings, the mid-ventral ridge, and the origin, shape, and nature of the glandular dorsal and ventral cirri agree well with the original account.

The species appears to be rare. The present record from off the South Orkney Islands expands the range and increases the depth range for the species.

Distribution. East of Antarctic Peninsula, Weddell Sea, 385–768 m; off South Orkney Islands, 1953 m.

Pseudoscalibregma pigmentum new species

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Figures 68–69

Material examined. (*4 specimens*) **South China Sea, off Brunei, Island of Borneo**, **Site CA2**, R/V *Emma*, coll. P.A. Neubert, Chief Scientist, **Sta. JA6**, coll. 30 Jun 2011, BC, 5.517°N, 113.608°E, 1999 m, **holotype** (MCZ IZ 171932). **Sta. AN8**, coll. 27 Jun 2011, BC, 5.508°N, 113.762°E, 1728 m (1 juv MCZ IZ 171933). **Sta. ME7**, coll. 04 Jul 2011, BC, 5.369°N, 113.624°E, 1725 m, **paratype** (MCZ IZ 171934). **Sta. SE5**, 28 Jun 2011, BC, 5.5947°N, 113.7889°E, 1947 m (1, MCZ IZ 171935).

Description. Holotype (MCZ IZ 171932) largest, incomplete with 20 setigers, 8 mm long and 1.8 mm wide across expanded segments. Two small specimens with same pigmented gland cells: juvenile from Sta. AN-8 (MCZ IZ 171933) complete with 20 setigers, 1.45 mm long and 0.26 mm wide; paratype from Sta. ME7 (MCZ IZ 171934) complete with 26 setigers, 1.7 mm long and 0.27 mm wide. Body of holotype fusiform to sausage-

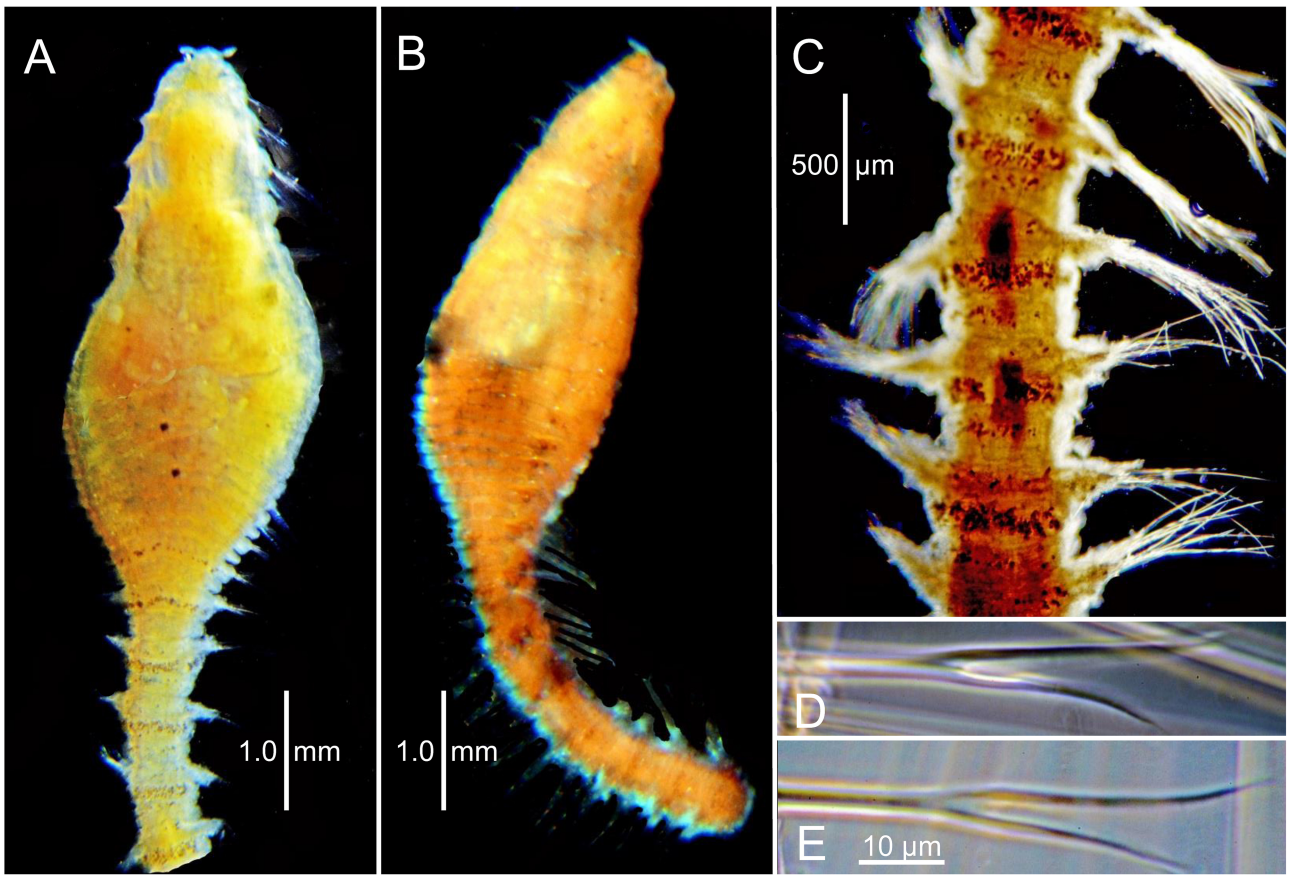

FIGURE 68. *Pseudoscalibregma pigmentum* **sp. nov.** Holotype (MCZ IZ 171932): A, entire worm, dorsal view; B, entire worm, right lateral view; C, posterior setigers, dorsal view; D–E, furcate setae from posterior neuropodium. A–C, stained with Shirlastain A.

shaped, narrow over setigers 1–5, then swollen in middle setigers (6–10), then narrowing posteriorly over setigers 12–20 or more (Fig. 68A–B). Body more or less oval in cross section of expanded setigers, then becoming more rectangular or flattened posteriorly. Annular rings poorly developed, not evident on setigers 1–10 (Fig. 69A), then biannulate from setiger 11 to end of fragment on both dorsum and venter; raised pads on annular rings small, not conspicuous. Venter with mid-ventral ridge from setiger 3 to end of body; setigers 4–8 with a single large, raised pad mid-ventrally; subsequent segments with two pads corresponding to annular rings. Color in alcohol light tan with prominent bands of darkly pigmented glands surrounding middle of each segment from setiger 11 (Fig. 68A, C).

Prostomium short, oval, about as long as wide, broadly rounded across anterior margin with a pair of narrow lateral horns protruding at about a 45-degree angle (Fig. 69A); with narrow extension dorsally, merging with peristomium; ventrally forming anterior lip of mouth; eyespots absent. Peristomium a narrow ring, poorly developed, merging with setiger 1 dorsally (Fig. 69A); ventrally forming large elevated oral opening surrounded by numerous narrow lobes.

Parapodia of anterior setigers reduced to short rounded lobes from which setae arise; these obscured on swollen segments. Parapodia of setiger 1 with noto- and neuropodia very close one another, initially thought to be single fascicle; subsequent noto- and neuropodia well separated from one another. Parapodia becoming more prominent, narrow and elongate by about setiger 11; dorsal and ventral cirri developing from about setiger 12. Dorsal cirrus a short, triangular shaped lobe; ventral cirrus asymmetrical, low, rounded (Fig. 69B). Both dorsal and ventral cirri with internal glands, but these irregular and not well defined or pigmented (Fig. 69B). Small rounded interramal papilla present between each noto- and neuropodium of posterior setigers (Fig. 69B).

Setae include short spinous setae in setiger 1, long, thin capillaries in all parapodia, and furcate setae in all parapodia from setiger 2. Short spinous setae anterior to capillaries on setiger 1 with pointed tips. Furcate setae anterior to capillaries, numbering 8–10 per fascicle; each with long, nearly equal tynes; each tyne with fine denticles on inner edge facing opposite tyne (Figs. 68D–E, 69C).

Pygidium not present on holotype; juvenile from Sta. AN-8 (MCZ IZ 171933) with two short developing anal cirri; juvenile from Sta. ME7 (MCZ IZ 171934) with damage to posterior end, lacking anal cirri.

Remarks. *Pseudoscalibregma pigmentum* **sp. nov.** is characterized by having annular rings limited to posterior setigers; in addition, the raised pads of these rings are small and inconspicuous instead of large and prominent as in related species. Characteristically, the posterior segments

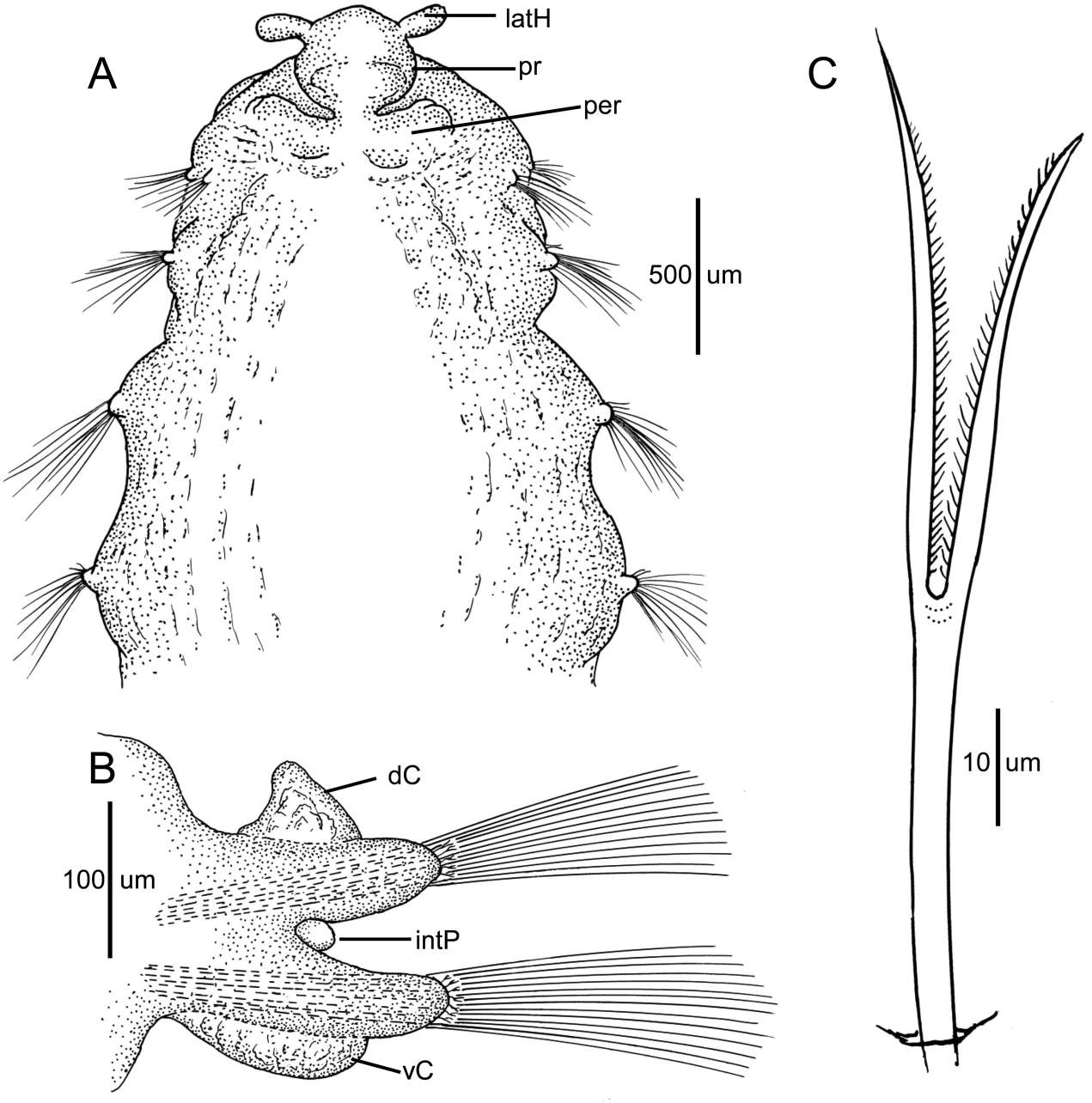

FIGURE 69. *Pseudoscalibregma pigmentum* **sp. nov.** Holotype (MCZ IZ 171932); A, anterior end, dorsal view; B, posterior parapodium, anterior view; C, furcate seta from posterior parapodium.

have rings of darkly pigmented glands that surround each segment providing a distinctive pigment pattern. Apart from pigmented eyespots that occur in a few shallow-water species, and a few species with pigmented gland cells on the annular rings, heavy body pigment is rarely observed in scalibregmatids. Both of the two juveniles have similar pigmented glands on a few anterior and middle body segments.

Etymology. The epithet is derived from the Latin, *pigmentum* for color or paint, in reference to the pigmented posterior glands of this species.

Distribution. South China Sea off Brunei, Island of Borneo, 1725–1999 m.

Genus *Scalibregma* Rathke, 1843

Type species: *Scalibregma inflatum* Rathke, 1843, by monotypy.
Synonym: *Oligobranchus* Sars, 1846. *Fide* Hartman, 1959. Type species: *O. roseus* Sars, 1846 by monotypy.

Diagnosis. Body elongate, arenicoliform, expanded anteriorly. Prostomium T-shaped with lateral horns. Parapodia of posterior segments with dorsal and ventral cirri; interramal papillae or cilia present; postsetal lamellae absent. Branched branchiae present from setiger 2 or 3, up to four pairs. Setae include capillaries, furcate setae, and a few short, blunt, pointed or bifurcated inconspicuous spinous setae among capillaries of setigers

TABLE 6. Comparison of morphological characters of the 25 known species of *Scalibregma* Rathke, 1843.

Species/ Morphology	Prostomium/ eyes	Peristomium	Oral morphology	Segmental annulations	Dorsal/Ventral cirri	Spinous setae ant setigers	Furcate setae	Pygidium	Body pigment	Distribution/ References
Species w/ Branchiae from Setigers 2–5										
S. inflatum Rathke, 1843	T-shaped; horns projected lat or ant-lat; eyes abs	A single ring dorsally; 3 rows ventrally, merging w/ aLmo	Mo a trans slit between per & set 1; aLmo w/ lrg biannulate rows of narrow pads; pLmo w/ uniannulate row of large pads on set 1	Set 1–3 triannulate; rest quadriannulate	Post long, triangular to lanceolate; int gls observed after staining	Set 1; short, smooth, pointed, usually bifurcate	From set 2; w/ subequal tynes; w/ denticles on inner margins	Pyg w/ crenulated ring around anus; w/ 5 anC, 4 ventrolateral & 1 ventral	Small glandular patches dorsal & ventral to parapodia on set 4–5	NE Atlantic, widespread in European waters, 6–130 m; Mackie (1991); Bakken *et al.* (2014)
S. aggregatum **sp. nov.**	T-shaped, ant margin weakly crenulated; w/ frontal horns directed ant-lat; w/ dCr divided in half; eyes abs	A single multi-lobed ring dorsally; 3 smooth rings ventrally lat to aLmo	Mo a narrow slit on ant border of set 1; aLmo biannulate w/ ant row irregular; post row w/ narrow lobes; pLmo w/ elongate lobes on set 1	Set 1 uniannulate; set 2–3 annulations; following quadriannulate; all rings w/ numerous small pads	Post cylindrical X-sec w/ int pig gls; dC triangular, w/ pointed tip; vC asymmetrical; w/ rounded tip	Set 1–2, short, narrow, pointed	From set 3; w/ nearly equal tynes; w/ denticles on inner margins	Pyg w/ lobed collar around anus; w/ 5 anC, 4 ventrolateral & 1 ventral	Set 4–5 w/ pig gls ventral to neuropodia; pig on dC & vC & anC	Central California, Monterey Bay, 14–16 m. This study
S. antennatum **sp. nov.**	Trapezoidal in shape; w/ 2 long anteriorly directed frontal horns; some w/ 1 or multiple lobes along length; eyes abs	A single ring merged w/ set 1, forming lat & pLmo	Mo w/ aLmo bordering narrow ciliated vestibule extending from prostomium; pLmo w/ multiple lobes	Ant sets triannulate, post quadri- & pentannulate annulations w/ numerous small pig blocks	Cirri w/ asymmetrical base, triangular tapering to pointed tip; dC larger than vC; both w/ pig tube-like gls	Set 1–2, Short, w/ blunt tips	From set 3; w/ subequal tynes; w/ denticles on inner margins	Pyg w/ numerous short lobes around anus; w/o anC	Ann rings narrow w/ pig pads producing transverse pig rows	Northern California, slope depths; 1560–2835 m. This study

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TABLE 6. (Continued)

Species/ Morphology	Prostomium/ eyes	Peristomium	Oral morphology	Segmental annulations	Dorsal/Ventral cirri	Spinous setae ant setigers	Furcate setae	Pygidium	Body pigment	Distribution/ References
S. aubreyi **sp. nov.**	Short, rounded w/ 2 short lat horns; eyes abs; ventrally forms aLmo; eyes abs	Per a single ring, w/ lumps, merges w/ set 1; ventrally forms pLmo	Mo w/ 4 elongate lobes on aLmo & 5–6 smaller lobes on pLmo	Set 1–4 wo/ annuli dorsally, then quadriannulate to post end; venter w/ 3–4 rings ant w/ large medial block; then quadriannulate to end; pads not prominent	dC flask-shaped & w/ nipple-like tip; vC longer w/ narrow tip; both w/ int striated & pig gls	Pres set 1–2 in NoP & NeP W/ 2–4 spS per fascicle; ea. short, pointe	From set 3; w/ unequal tynes; w/ denticles on inner margins; post furcates w/ long shafts	Pyg w/ a few short lobes; no anC	Body surface weakly pig, inconspicuous; dC & VC w/ pig int gls	South China Sea off Brunei, Island of Borneo, 1050–1922 m. This study
S. australis Blake, 2015	T-shaped, horns projected ant-lat; eyes abs	1 dorsal ring encompassing pro; 3 rings ventrally forming ant & pLmo	Mo a curved trans slit between per & set 1; aLmo biannulate w/ ant row of lrg lobes & 2nd row small narrow lobes; pLmo w/ 2 rows of large pads on set 1	Set 1, biannulate; 2–3 triannulate; thereafter quadriannulate; some far post set pentannulate; set 4–6 w/ 1 annular ring w/ pig gls	Short triangular then elongate & fingerlike: int gls present, dense, dark, reddish	Short, slender spS w/ finely pointed aristae-like tips, few w/ bifid tips	From set 2; w/ tynes of equal length, w/ thick denticles on inner margin	Pyg w/ ~12 lobes around an; w/ 5 anC: 2 dorsal, 2 ventral, 1 mid-ventral	Band of pig in ann rings dorsally on set 3– 5; some pig patches ventral to parapodia on set 4–5	Antarctica, widespread in shelf depths. Blake 2015, 2020, This study
S. beaufortensis **sp. nov.**	Short, wider than long, w/ crenulated ant margin & short lateral horns, or directed post; eyes abs; post end w/ transverse per dCr	Three rings dorsally, w/ middle on multilobed; ant row forming transverse dCr post to pro	Mo w/ aLmo biannulate w/ both rows w/ narrow lobes; pLmo on set 1 as mound with narrow lobes	Set 1 uniannulate; set 2 & following quadriannulate; set 2–3 ventrally triannulate, then quadriannulate; annulations w/ pig gls	Both cirri lrg, inflated, triangular heavily pigmented	Set 1–2, short, w/ blunt tips	From set 2; w/ subequal tynes; w/ denticles on inner margins	Pyg w/ 2 lrg lobes; w/ 5 anC, 4 ventrolateral & 1 ventral	Ann rings narrow w/ pig gls producing transverse pig rows	Alaskan Arctic, Beaufort Sea, 10–55 m. This study

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TABLE 6. (Continued)

Species/ Morphology	Prostomium/ eyes	Peristomium	Oral morphology	Segmental annulations	Dorsal/Ventral cirri	Spinous setae ant setigers	Furcate setae	Pygidium	Body pigment	Distribution/ References
S. brevicaudum Verrill, 1873	Oval shaped, as wide as long wide, w/ a short post dCr; w / 2 short lat horns; eyes abs	W/ 2 rings; dorsally w/ ant smooth, post multilobed; ventrally forming ant lip of mouth	Mo a narrow slit; aLmo uniannulate w/ ca. 9 elongate lobes; pLmo a thick swelling w/ 5–6 thick lobes on set 2	Set 1–4 triannulate, then quadriannulate post; a few post set pentannulate	Elongate, triangular shaped, w/ narrow tip; w/ internal pig gls	Set 1–2 NoP & NeP w/ ant row 4–6 ; short, narrow spines w/, pointed tips	From set 3; subequal tynes w/ denticles on inner margins	Pyg w/ 5 anC; 1 mid-ventral; 2 ventrolateral on either side	Set 3–6 each w/ 1 dorsal ann row w/ pig gls; neP of set 4–5 w/ pig gls	U.S. North Atlantic, shallow subtidal to shelf depths, 10–152 m. Verrill, 1873; This study
S. californicum Blake, 2000	T-shaped; horns projected lat or ant-lat; eyes abs; ventral extensions form lat lips of mouth	2 rings, 1st encircles post margin of pro, 2nd incomplete dorsally; ventrally, 3 rings lat to mo & oral lips	Mo surrounded by broad peristomial lateral lips; aLmo small, pLmo w/ 4–5 short per lobes	Set 1–4 triannulate, following sets quadriannulate or pentannulate	Cirri short, rounded from set 17–20, becoming larger & triangular by ca. set 30	Set 1–2, short, slender, spS	From set 2, w/ subequal tynes, w/ denticles on inner margin	Pyg w/ an surrounded by numerous lobes; w/ 5 long mid-ventral anC	Body yellow-orange, w/ black pig on some annular rings & dC	California, shelf depths, 90–100 m. Blake 2000, 2020. This study
S. chilensis **sp. nov.**	V-shaped; crenulated anterior margin; lat horns projecting anterior 30-deg; eyes abs	Enlarged w/ ant lobed ring lateral to pro; w/ weakly developed lat lobes	Mo a curved slit; aLmo w/ ca. 4 sets of lobes or pads, pLmo thick w/ 1st row of narrow lobes recessed into mo & 2nd row w/ 5 thick lobes	Dorsally triannulate set 1–4; quadriannulate from set 5	From set 14, small & rounded, then longer & triangular from ca. set 17; w/ internal tubular gls	Set 1 w/ 4–5 short curved spS ant to caps	From set 2, w/ unequal tynes; w/ denticles on inner margins	Not observed	Darker pig in dC & vC from internal gls; otherwise no pig evident	SE Pacific, Chile, coastal, 13–100 m. This study

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TABLE 6. (Continued)

Species/ Morphology	Prostomium/ eyes	Peristomium	Oral morphology	Segmental annulations	Dorsal/Ventral cirri	Spinous setae ant setigers	Furcate setae	Pygidium	Body pigment	Distribution/ References
S. cinthyae Mendes *et al.* 2023	Wedge shaped, w/ short oval lateral horns; eyes abs	A single ring dorsally, smooth, but w/ lat lobes; bilobed ventrally	Mo w/ aLmo & pLmo biannulate each w/ 2 rows of elongate narrow pads	Dorsally quadriannulate becoming pentannulate post; ventrally set 1–2 triannulate, then quadriannulate & pentannulate far post set	Small, rounded from set 14–17, becoming longer & narrower post, w/ pig int gls	Set 1 w/ 5–6 short, curved pointed spS ant to caps	From set 2, w/ equal tynes; w/ denticles on inner margins	Pyg w/ short lobes & 3 long anC, 1 ventral, 2 ventrolateral	Ant annular rings w/ pig gls in pads, producing rows of pig annulae	SE Brazil, 51–1000 m. Mendez *et al.* 2023
S. cornutum **sp. nov.**	V-shaped, w/ 3 blocks or lobes on ant margin w/ thick lat horns; post divided into 4 parts by medial & trans grooves; eyes abs	W/ multilobed dorsal ring; ventral	Obscured by partially everted prob; but w/ large swollen pLmo	Dorsally set 1 triannulate; quadriannulate from set 2; ventrally set 2–3 triannulate, then quadriannulate to end	Small thick rounded from set 13–15, then triangular from ca. set 20 & longer by ca. set 30 to end; each w/ darkly pig int gls	Set 1 w/ short, spS ant to caps; these curved to pointed tip, some hooked	From set 2, w/ subequal tynes w/ denticles on inner margins	Pyg w/ 6 anC, 3 on either side of anal opening	Body yellow to light orange, no other pig	Off East Africa, Mozambique Channel, 2995 m. This study
S. fimbriatum **sp. nov.**	Oval-shaped, w/ straight ant margin w/ prominent lat horns; eyes abs	W/ 2 rings, each w/ prominent lobes on ant margin obscuring pro; ventrally w/o lobes contributing to aLmo	Mo w/ ant & post lips uniannulate; per & pro w/ lobes forming aLmo; pLmo a large swelling on set 2, w/ ca. 6 lobes	Quadriannulate from set 3; ea. annular ring w/ inconspicuous pads each w/ pig gls	Small, rounded from set 14–17, becoming longer & narrower post, w/ pig int gls; vC, asymmetrical, thicker than dC; w/ pig int gls	Set 1–2 w/ 5–6 spS w/ short, curved pointed tips, ant to caps	From set 3, w/ subequal tynes & denticles on inner margins	Pyg w/ thickened multilobed collar around anus; w/ 5 anC, 1 mid-ventral, 2 ventrolateral on either side	Ann rings w/ dark m internal pig in gls along entire body	NW Atlantic Ocean, off New England, Lydonia Canyon, & non-canyon slope; 556 m. This study

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TABLE 6. (Continued)

Species/ Morphology	Prostomium/ eyes	Peristomium	Oral morphology	Segmental annulations	Dorsal/Ventral cirri	Spinous setae ant setigers	Furcate setae	Pygidium	Body pigment	Distribution/ References
S. hadrostomium **sp. nov.**	Wedge-shaped w/ 2 short lat lobes; eyes abs	A single lobed ring dorsally; ventrally w/ enlarged, bulbous pre-setiger structure	Mo a narrow slit on enlarged bulbous peristomium; w/ smooth aLmo & short lobes on pLmo	Set 1, triannulate; thereafter quadriannulate; w/ far post set pentannulate	Elongate, cylindrical in X-sec; tapering to narrow tip; w/ dark int gls	Set 1 w/ spS, slender, w/ blunt-tips in NoP; pointed in NeP	From set 2 noP & neP; tynes sub-equal, w/ denticles on inner margins	Pyg inflated; anus w/ ca. 12 elongate lobes & 5 long, thin anC arising ventrally	Red-colored segmental gls on dorsum &venter of set 5–7	Northern California, lower Continental slope & abyssal plain, 1745–3225 m. This study
S. lydoniensis **sp. nov.**	Wedge-shaped; ant margin weakly crenulated w/2 short oval lat horns; post w/ dCr; eyes abs	A single multilobed ring & smooth trans crest between per & set 1; ventrally incorporated into oral lips	Mo a narrow slit between ant & post lips; aLmo biannulate w/ irregular elongate lobes; pLmo a curved row of ca 12 lobes on set 1	Set 1–3 triannulate dorsally; ventrally w/ 2–3 annular rings; from set 4 quadriannulate along most of body; few far post set pentannulate	Cirri becoming elongate by ca. set 30; dC thick, asymmetrical tapering to narrow tip; vC, directed laterally, w/ rounded tip; both cirri w/ small gls; intP not observed	Absent	From set 2; subequal tynes w/ denticles on inner margins	Pyg w/ anus surrounded by 10–12 lobes; w/ 6 anal cirri, w/ 3 arising from 2 ventral lobes	Body yellow-orange w/ no extra pig apparent	U.S. North Atlantic Ocean, off New England, Lydonia Canyon, 555–560 m. This study

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TABLE 6. (Continued)

Species/ Morphology	Prostomium/ eyes	Peristomium	Oral morphology	Segmental annulations	Dorsal/Ventral cirri	Spinous setae ant setigers	Furcate setae	Pygidium	Body pigment	Distribution/ References
S. profundum **sp. nov.**	Pear-shaped w/ ant margin distinctly crenulated w/ 7–8 rounded lobes; w/ long lat horns directed post; post w/ 2-parted dCr; eyes abs	W/ 4 annulated rings; 1st complete dorsally; 2–4 incomplete, dorso-lateral extending ventrally & forming ant & post lips of mouth	aLmo biannulate w/ rows of pads; pLmo formed of a single row of pads; everted prob w/ at least 3 lobes	Dorsal & ventral surfaces triannulate on set 1; set 2 & following quadriannulate	First Cirri from set 14–15 thick rounded lobes; dC becoming longer & directed laterally; vC shorter, narrow, directed laterally; cirri w/ int gls	Present set 1 noP & NeP w/ pointed ant to caps	From set 2; w/ subequal tynes w/ denticles on inner margins	Not observed	Body yellow to orange; set 4–6 ea w/ 1 ann row 3–4 pads w/ reddish pig dorsal; & set 4–7 on venter	SE Pacific Ocean, off Peru, Peru-Chile Trench, 3939 m. This study
S. rhoadsi **sp. nov.**	Pro short, w/2 lat horns; dorsum w/ 2 distinct post dCr & ant depression; eyes abs	A single dorsal lobed ring; ventrally merged w/ pro forming aLmo	Mo a large opening between per & set 1; aLmo biannulate, w/ 2 rows of narrow elongate pads; pLmo narrower, w/ short lobes on set 1	Set 1–4(5) triannulate, then quadriannulate; some post set pentannulate	Small, rounded from set 15–20, becoming triangular & elongate; int pig gls pres	Set 1, spS pointed in both NoP-& NeP	From set 2; tynes unequal w/ denticles on inner margin	Pyg w/ 6 anC; 3 on each of 2 ventral lobes; anus surrounded by 9–10 lobes	Neuropodia w/ dark red gls on setigers (3)4–5	U.S. North Atlantic off Cape Hatteras, North Carolina, 530–2004 m. This study
S. ridleyensis **sp. nov.**	T-shaped, short, wider than long; curved ant margin, s/ tapering lat horns; trans dCr present; eyes abs	A single dorsal multilobed ring; ventrally w/ 2 smooth lat rings merged w/ aLmo	Mo trans on set 1; aLmo biannulate w/2 layers of lobes; pLmo on set 2, w/ 8 lobes	Set 1–5 triannulate, w/ dorsum of set 1 biannulate; quadriannulate from set 6; pads well-developed dorsally, abs on ant venter	Short, rounded from ca. set 15–16, elongate by ca. set 25; post cirri thick, cylindrical in X-sect; dC oval, w/ rounded tip; vC triangular w/ narrow tip; ea. w/ pig gls	Set 1 w/ 4–6 pointed spS in NoP & NeP	From set 2; w/ subequal tynes; denticles on inner margins	An w/ 6–8 lrg lat lobes & 4 ventral long anC, 2 on either side	Body light yellow to flesh; red pig gls dorsal & ventral on set 4–5; pig gls in dC & vC	E North Pacific Ocean, British Columbia, Canada, off Ridley Island, 9–28 m. This study

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TABLE 6. (Continued)

Species/ Morphology	Prostomium/ eyes	Peristomium	Oral morphology	Segmental annulations	Dorsal/Ventral cirri	Spinous setae ant setigers	Furcate setae	Pygidium	Body pigment	Distribution/ References
S. robustum Zachs, 1923[1]	Wedge-shaped, wider than long, w/ straight ant margin & short rounded lat lobes	Two rings	Mo between per & set 1; nature of lips not reported; proboscis not everted	Set 1 biannulate; set 2 triannulate; set 3 and following all quadriannulate	Swollen, asymmetrical w/ multiple lobes; intP illustrated	Not reported	?From set 3; w/nearly equal tynes; denticles on inner margins	Pygidium collar-like w/ an bordered by small papillae; 6 anC arise ventrally	Not reported	Arctic Ocean, ~65 m. Zachs 1923, 1925; *S. vegae* Furreg 1925 referred to synonymy by Annenkova 1937
S. sahlingi **sp. nov.**	Wedge-shaped w/ ant margin smooth w/ narrow lat horns; ventrally w/ narrow channel bordered by 4 lobes, ant to aLmo; eyes abs	W/ 2 irregular rings, interrupted mid-dorsally by 3 sequential crests post to pro; ventrally 2 rings lat to mo	Mo a narrow slit between ant & post lips; aLmo w/ 1 set of elongate pads; pLmo on set 1 as trans row of 12–14 lobes	Set 1–2 dorsally w/ 3 modified rings; from set 4 quadriannulate, w/ post set pentannulate; venter similar except set 1 only w/ pLmo	Small rounded from ca. set 12; post dC thick, w/ rounded tip; vC lrg, asymmetrical, w/ narrow tip; each cirrus w/ numerous dark gls	Set 1–2 w/ 4–6 spS w/ rounded tips	From set 3; w/ subequal tynes; denticles on inner margins	Cup-like; lobes & cirri not observed.	Body yellow-orange, w/ post dC & vC w darkly pig gls	E North Pacific Ocean off Oregon, Cascadia convergent margin, 429 m. This study
S. therouxi **sp. nov.**	Wedge-shaped as wide as long, tapering post w/ short trans dCr; w/ 2 short rounded lat horns; eyes abs	A single multilobed dorsal ring around post pro dCr; ventrally forming aLmo	Mo a trans opening between per & set 1; aLmo lrg swollen biannulate, w/ 2 layers of elongate lobes; pLmo w/ 4 lrg lobes mid set 1	Set 1–5 dorsal & 2–5 ventral triannulate, then quadriannulate; ventral set 1, uniannulate	Short, rounded, then becoming elongate & thick ca. set 25, cylindrical & triangular, w/ narrow tip; dC larger than vC; w/ pig gls	Set 1–2 w/ 4–6 spS w/ pointed tips	From set 3; w/ subequal tynes; denticles on inner margins	An w/ lrg lat lobes & 4 long ventral anC, 2 on either side.	Body yellow-orange w/ red ventral pig gls on set 4–5 & dC & vC	W North Atlantic continental shelf, off New England, Gulf of Maine, 201–245 m. This study

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TABLE 6. (Continued)

Species/ Morphology	Prostomium/ eyes	Peristomium	Oral morphology	Segmental annulations	Dorsal/Ventral cirri	Spinous setae ant setigers	Furcate setae	Pygidium	Body pigment	Distribution/ References
S. wireni Furreg, 1925	T-shaped: frontal horns short, slightly directed ant; eyes abs	W/ 2 rings	Mo between per & set 1; aLmo across entire ventral surface per; pLmo post border of set 1	Set 1 biannulate; set 2–3 triannulate; set 4 & following quadriannulate	Large, asymmetrical along entire podia; dC larger w/ pointed tip; vC smaller w/ rounded tip; intP present	Not reported; most caps w/ fibrils along one edge	?From set 3; w/ subequal tynes; w/ denticles on inner margins	Pyg w/ 5 anC; 2 thick on ea side; 1 thin ventral	Not reported	East Greenland, Franz Joseph Fjord, 3–9 m. Furreg 1925
S. velatum **sp. nov.**	Wedge-shaped; frontal horns directed laterally; eyes abs	W/ 2 lobed rings merged w/ set 1 dorsally forming hood over pro; ventrally smooth lat to pro	Mo trans slit on set 1; aLmo reduced to narrow groove; pLmo w/ 6–8 narrow lobes on set 1	Set 1–2 biannulate; rest w/ 4–5 annular rings; rings inconspicuous, as rows of pig gls	dC pear-shaped, tapering to narrow rounded tip; vC rectangular w/ broad asymmetrical base; pig tubular gls present	Set 1 w/4–5 spS ant to caps; narrow w/ rounded tips	From set 2; w/ subequal tynes; w/ denticles on inner margins	Pyg w/ 4 anC; 2 on ea side; ventrolateral	Pig gls on ann rings; pig tubular gls on dC &vC	Central & Northern California, continental shelf, 37–100 m. This study
Species w/ Branchiae from Setigers 3–5										
S. celticum Mackie, 1991	T-shaped; horns projected lat or ant-lat; 2 eyes pres dark, subdermal	W/ 2 multi-lobed rings dorsally encircling pro, & covering eyes & posterior pro ventrally bordering mo	Mo a short trans slit between per & set 1; aLmo w/ long medial fold; pLmo w/ long lobes on venter of set 1	Set 1, triannulate, following quadriannulate; far post pentannulate	Small, rounded from set 15–16,then triangular & lanceolate post; int gls pres.	Set 1–2, Short, blunt-tipped	From set 3; tynes subequal w/ denticles on inner margin	Pyg w/ crenulated ring around an; w/ 5 long anC, inserted ventrally	Patches of pig ventral parapodia on set 4–6; & dorsally on set 4–5	NE Atlantic, UK, France, Med Sea, shallow subtidal. Mackie 1991; Lomiri *et al.* 2012

.....continued on the next page

TABLE 6. (Continued)

Species/ Morphology	Prostomium/ eyes	Peristomium	Oral morphology	Segmental annulations	Dorsal/Ventral cirri	Spinous setae ant setigers	Furcate setae	Pygidium	Body pigment	Distribution/ References
S. hanseni Bakken, Oug & Kongsrud, 2014	T-shaped; horns projecting-lat; eyes abs	W/ 2 dorsal rings, partially covering post pro	Mo ventral, oval w/ broad ant & post lips	Ant sets quadriannulate; rest w/ 5–6 annuli	Short triangular from set 13–14, then elongate, lanceolate posteriorly; w/ int yellow gls	Set 1–2, Curved, blunt-tipped	From set 3; tynes unequal w/ denticles on inner margin	Pyg rounded w/ ca. 10 short lobes; w/ 5 anC	Set 3–5 w/ dorsal yellow trans pig bands; dC & vC w/ yellow gls	Norwegian Sea, shelf & slope depths 497–1243 m. Bakken *et al.* 2014
S. lanai Mendez *et al.* 2023	T-shaped; w/ lat horns projecting at ca. 45-deg; w/ 2 eyes	W/ 2 rings dorsally & ventrally	Mo a short trans slit; w/ aLmo post to 1st per ring as row of 6–8 short lobes; pLmo w/ 1 row short lobes attached to lrg anteriorly lobed pad	Set 1–2 triannulate, then quadriannulate w/ some pentannulate far post	Small, rounded from set 14–15, becoming longer & digitiform post; w/ pig int gls	Present set 1–2; short, pointed	From set 3, w/ equal tynes & denticles on inner margins	Anus w/ short lobes & 3 long anC, 1 ventral, 2 mid-ventral	Annular rings w/ or w/o small pig gls; inconspicuous	SE Brazil, 25–100 m. Mendez *et al.* 2023
S. stenocerum (Bertelsen & Weston, 1980)	Narrow ant tip, w/ closely spaced long horns directed ant; w/ 2 eyes, each V-shaped	Smooth, 2 rings apparent dorsally & laterally; ventrally encompassing mouth	Not described; Fig 6 of Bertelsen & Weston (1980) show mo w/ vertical slit bordered laterally by per	Quadriannulate in Figs 2B, C of Bertelsen & Weston (1980)	Middle & post cirri inflated becoming elongate in far post set; int gls not reported	Set 1–2, Short, slender, w/ blunt-tips	From set 3, tynes unequal w/ denticles on inner margin	Final number of anC not determined, 3 observed	Not reported	SE USA, N Carolina to Florida, 17–218 m. Bertelsen & Weston 1980; Mackie 1991

Abbreviations: abs, absent; an, anus; anC, anal cirri(us); aLmo, anterior lip of mouth; ann, annular or annulated; ant, anterior; ca., about; dC, dorsal cirri(us); dCr, dorsal crest; ca., each; Fig(s), Figure(s); int, internal; gl(s), gland(s); lrg, large; lat, lateral(ly); mid, middle; mo, mouth; neP, neuropodium; noP, notopodium; per, peristomium; pig, pigment(ed); post, posterior(ly); pLmo, posterior lip of mouth; pres, present; pro, prostomium; prob, proboscis; pyg, pygidium; rdg, ridge; set(s), setiger(s); spS, short spinous setae; trans, transverse; vC, ventral cirri; w/, with; w/o, without.

[1]Blake (2022) raised Wirén's (1883) subspecies, *Eumenia crassa* forma *arctica* to full species status in the genus *Scalibregma* because the original specimen had been examined by Furreg (1925), who used it and others as part of his description of *Scalibregma vegae* Furreg, 1925, which was subsequently referred to synonymy with *S. robustum* Zachs, 1923 by Annenkova (1937). However, the Wirén subspecies has never, by itself, been referred to *Scalibregma* and therefore, the elevation to of the subspecies to full species and synonymy with *S. robustum* suggested by Blake (2022) was not necessary.

1 to 2; large acicular spines absent. Pygidium with long anal cirri.

Remarks. Over the years, there have been numerous reports of the type-species, *Scalibregma inflatum*, from global locations, suggesting that it was cosmopolitan. The re-description of *Scalibregma inflatum* by Mackie (1991) from the northeastern Atlantic provided a baseline of the type species from the type-locality (Norway) and adjacent locations. The morphology of *S. inflatum* reported by Mackie (1991) provided a means to compare specimens from more distant locations against the morphology of the type-species. Mackie (1991) confirmed three species: *S. inflatum, S. celticum* Mackie, 1991, and *S. stenocerum* (Bertelsen & Weston, 1980), the latter having been transferred by Mackie from *Sclerobregma* to *Scalibregma*. Subsequent to Mackie's paper, five new species of *Scalibregma* were described by Blake (2000, 2015), Bakken *et al*. (2014), and Mendes *et al*. (2023). In the present study, 19 species are treated, of which 15, mostly from deep-sea habitats, are new to science. Table 6 lists all 25 known species of *Scalibregma*. The following species of *Scalibregma* are treated in this paper:

1. *Scalibregma inflatum* Rathke, 1843. NE Atlantic Ocean, 6–900 m.
2. *Scalibregma aggregatum* **sp. nov.** NE Pacific Ocean, Central California, Monterey Bay, shallow subtidal.
3. *Scalibregma antennatum* **sp. nov.** NE Pacific Ocean, continental slope off northern California, 1560–2835 m.
4. *Scalibregma aubreyi* Blake **sp. nov.** South China Sea off Brunei, Island of Borneo, 1050–1925 m.
5. *Scalibregma australis* Blake, 2015. Widespread in Antarctic seas, 10–1000 m.
6. *Scalibregma beaufortensis* **sp. nov.** Beaufort Sea, Alaskan Arctic, 10–55 m.
7. *Scalibregma brevicaudum* Verrill, 1873 **Revalidated**. W North Atlantic continental shelf, off New England, 31–112 m.
8. *Scalibregma californicum* Blake, 2000. NE Pacific Ocean, Central California, shelf depths 90–100 m.
9. *Scalibregma chilensis* **sp. nov.** SE Pacific Ocean, Chile, coastal embayments, 13–100 m.
10. *Scalibregma cornutum* **sp. nov.** Mozambique Channel, 2995 m.
11. *Scalibregma fimbriatum* **sp. nov.** W North Atlantic Ocean, continental slope off New England, Lydonia Canyon, 556 m.
12. *Scalibregma hadrostomium* **sp. nov.** NE Pacific Ocean, lower Continental slope and abyssal plain off northern California, 2240–3225 m.
13. *Scalibregma lydoniensis* **sp. nov.** W North Atlantic Ocean, continental slope off New England, Lydonia Canyon, 555–560 m.
14. *Scalibregma profundum* **sp. nov.** SE Pacific Ocean, off Peru, Peru Chile Trench, 3939 m**.**
15. *Scalibregma rhoadsi* **sp. nov.** W North Atlantic off the Carolinas, 530–2004 m.
16. *Scalibregma ridleyensis* **sp. nov.** NE Pacific Ocean, British Columbia, Canada, off Ridley Island, 9–28 m.
17. *Scalibregma sahlingi* **sp. nov.** NE Pacific Ocean, off Oregon, Cascadia convergent margin, 429 m.
18. *Scalibregma therouxi* **sp. nov.** W North Atlantic continental shelf, off New England, Gulf of Maine, 168–245 m.
19. *Scalibregma velatum* **sp. nov.** NE Pacific Ocean, Central and Northern California, shelf depths, 37–100 m.

Scalibregma inflatum Rathke, 1843

Scalibregma inflatum Rathke, 1843:184–186, pl. 9, figs. 15–21; Ashworth 1901: 237–305, pls. 13–15; Fauvel 1927: 123–124, fig. 44 (in part); Støp-Bowitz 1945: 67–72, fig. 2; Hartmann-Schröder 1971: 382 (in part); Mackie 1991: 268–271, Figs. 1–10; Hartmann-Schröder 1996: 434–435, fig. 213; Bakken *et al*. 2014: 109–110. Not Hartman 1965: 183–184; Hartman & Fauchald 1971: 125.

Description. (Summary based on Mackie 1991): A large species up to 27 mm long with 64 setigers. Color in life red to yellow orange, in alcohol grey and yellow to orange; after staining with Rose Bengal, glandular inclusions evident as patches dorsal and ventral to parapodia of setigers 4–5 and in dorsal and ventral cirri. Body covered with annulated rings; setigers 1–3 triannulate, following setigers quadriannulate with a few far posterior pentannulate. Venter with mid-ventral row of large pads producing ventral ridge along body.

Prostomium with two short laterally attached horns projecting forward at about a 40-degree angle. Peristomium a single narrow ring dorsally, expanded ventrally producing biannulate anterior lip of mouth; posterior lip a single row of large pads on setiger 1; mouth a narrow slit between lips; proboscis a smooth sac when everted.

Branchiae posterior to notopodia of setigers 2–5; each arborescent. Parapodia reduced on anterior setigers, with low presetal lobes. Dorsal and ventral cirri from setigers 14–17 according to size; these initially short and rounded, becoming elongate and triangular posteriorly; small rounded interramal ciliated papillae from setiger 1. Pygidium with small lobes surrounding anal opening; with five filiform anal cirri, one medial, two pairs ventrolateral.

Setae include capillaries in all setigers, short spinous setae in setiger 1 and furcate setae from setiger 2. Short spinous setae anterior to capillaries of setiger 1 short, tapering to fine point, some bifurcate with unequal tynes. Fully developed furcate setae from setiger 2, these with subequal tynes bearing short denticles on inner margins.

Remarks. Mackie (1991) provided a baseline description of *Scalibregma inflatum*, the type species of the genus, from northern European waters off Norway,

Sweden, Ireland, Scotland, and Wales, including specimens from near the type locality in Norway. Prior to Mackie's description, the species had been reported globally. More recent studies by Bakken *et al*. (2014), Blake (2000, 2015), and Mendes *et al*. (2023) have addressed some of these widespread reports by describing new species from the Arctic, California, and Brazil and revalidating some older taxa. In the present study, one species, *S. brevicaudum* Verrill, 1873, from the NE USA is revalidated and 15 new species are described from the W North Atlantic, NE Pacific, SE Pacific, Indian Ocean, South China Sea, and Alaskan Arctic. These new species represent a mix of shallow-water and deep-water taxa, most originally identified as *S. inflatum*.

All currently known 25 species of *Scalibregma* are documented in Table 6; twenty-one species, including *S. inflatum*, have branchiae on setigers 2–5 and four species have branchiae on setigers 3–5. With the addition of the new species of *Scalibregma*, several characters have emerged as important in separating one species from another. These are the presence or absence of a prostomial or peristomial dorsal crest, the number and shape of dorsal peristomial rings, the nature of the anterior lip of the mouth, the first setiger to have furcate setae, the number and arrangement of anal cirri, and the presence and arrangement of pigmented segmental annular rings.

Scalibregma inflatum appears to be most similar to *S. australis* Blake, 2015, a widespread Antarctic species in shelf depths to about 1000 m. Both species have a single dorsal peristomial ring, a biannulate anterior oral lip, some short bifurcate spinous setae on setiger 1, furcate setae present from setiger 2, pigmented glands present dorsal and ventral to the parapodia of setigers 4–5, and five anal cirri. A dorsal prostomial crest is absent in both species. The conspicuous differences are that S. *inflatum* has a smooth dorsal peristomial ring; the two rows of the biannulate anterior lip are prominent and equivalent in shape and size, each row having about seven or eight lobes; all five anal cirri are ventral or ventrolateral; and none of anterior dorsal annular rings are pigmented. In contrast, *S. australis* has a multilobed dorsal peristomial ring; the two rows of the biannulate anterior oral lip are unequal, with the first row consisting of 3–4 large elongate lobes and the second with 8–10 short narrow lobes; the five anal lobes include one ventral, two ventrolateral, and two dorsolateral; and most importantly, one row of the four annular rings on setigers 3–5 is pigmented and forms a band across the dorsal surface.

Distribution. NW Atlantic Ocean, Norway, Sweden, Ireland, Scotland, Wales, 6–130 m (Mackie 1991); North Sea (Hartmann-Schröder 1996); Greenland, Norwegian Arctic, Norwegian Sea <900 m (Bakken *et al*. 2014).

Scalibregma aggregatum new species

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Figures 70–71

Material examined. (*240 specimens*) **Eastern North Pacific Ocean, Central California, Santa Cruz County, Monterey Bay; coll. Moss Landing Marine Laboratory:** off Capitola, **Site 1159**, coll. 20 Aug 1971, 36.952°N, 121.937°W, 16 m, **holotype** (CASIZ 131523), 27 **paratypes** (CASIZ 245245), 148 specimens, juveniles & fragments (CASIZ 245246); **Site 1159**, coll. 03 Feb 1972, 36.9517°N, 121.9367°W, 14 m, Rep. 1 (1, CASIZ 006696); Off Sunset Beach, **Site 1105**, coll. 21 Aug 1971, 36.883°N, 121.83°W, 16.5 m (1, CASIZ 131513). Off Pleasure Point, **Site 1153**, coll. 13 Oct 1971, 36.945°N, 121.987°W, 14.5 m (61, CASIZ 131521). Off Le Selva Beach, **Site 1154**, coll. 20 Aug 1971, 36.925°N. 121.877°W. 15 m (1, CASIZ 131514).

Description. A moderately large species, holotype (CASIZ 131523) complete, with 49 setigers, 18 mm long, 3.5 mm wide across expanded segments at setiger 9 and 1.8 mm wide across posterior segments; large paratype (CASIZ 245245) with 45 setigers 21 mm long, 2.5 mm wide across anterior setigers, 1.2 mm wide posteriorly. Body arenicoliform, enlarged through about setiger 15, then tapering to narrow posterior end (Fig. 70A). Body cylindrical in anterior expanded segments, dorsum rounded in cross section; venter with distinct mid-ventral groove with central row of large pads or a ridge within a groove (Figs. 70E–F, 71A). Color in alcohol yellow to light orange (Figs. 70A–E, 71A), with darkly pigmented glands on ventral surface of neuropodia of setigers 4–5 (Fig. 70C). Posterior dorsal and ventral cirri with internal pigmented glands as well as small, pigmented cells or glands on posterior parapodia and anal lobes and cirri.

Prostomium T-shaped, as wide as long dorsally (Fig. 70B), more elongate ventrally, merging with lobes of anterior lip of mouth; anterior margin with straight anterior border with weakly crenulated surface bearing a pair of tapering horns directed laterally (Fig. 70C–D) or anteriorly at up to a 30-degree angle (Fig. 70B); distinct dorsal crest present on posterior border of prostomium and anterior to peristomium, crest divided into two parts by vertical notch or slit (Fig. 70B); eyespots absent; nuchal organs everted on some specimens as elevated ciliated lobes between prostomium and peristomium. Peristomium a single multilobed ring dorsally (Fig. 70B), divided into three smooth rings ventrally, merging laterally with anterior lip of mouth (Fig. 70C–D). Mouth a transverse opening on anterior border of setiger 1; anterior lip of mouth weakly biannulate, with two rows of narrow lobes (Fig. 70C–D), posteriormost row with 6–8 narrow lobes forming anterior lip, often recessed into mouth (Fig. 70D); anteriormost row with 6 shorter thickened lobes irregularly arranged along ventral surface of prostomium (Fig. 70D); posterior lip of mouth on setiger 1 with 7–8 elongate lobes curving from oral opening posteriorly and over mid-ventral surface of setiger 1 (Fig. 70C–D); proboscis everted on several specimens, enlarged, balloon-like with 5–6 lobes around oral opening (Fig. 71A).

Segmental annulated rows present along entire body with numerous small but distinct elevated pads prominent on both dorsal and ventral surfaces. Dorsally, setiger 1 uniannulate, setigers 2–3 triannulate, setigers 4 and following quadriannulate (Fig. 70E–F); venter also

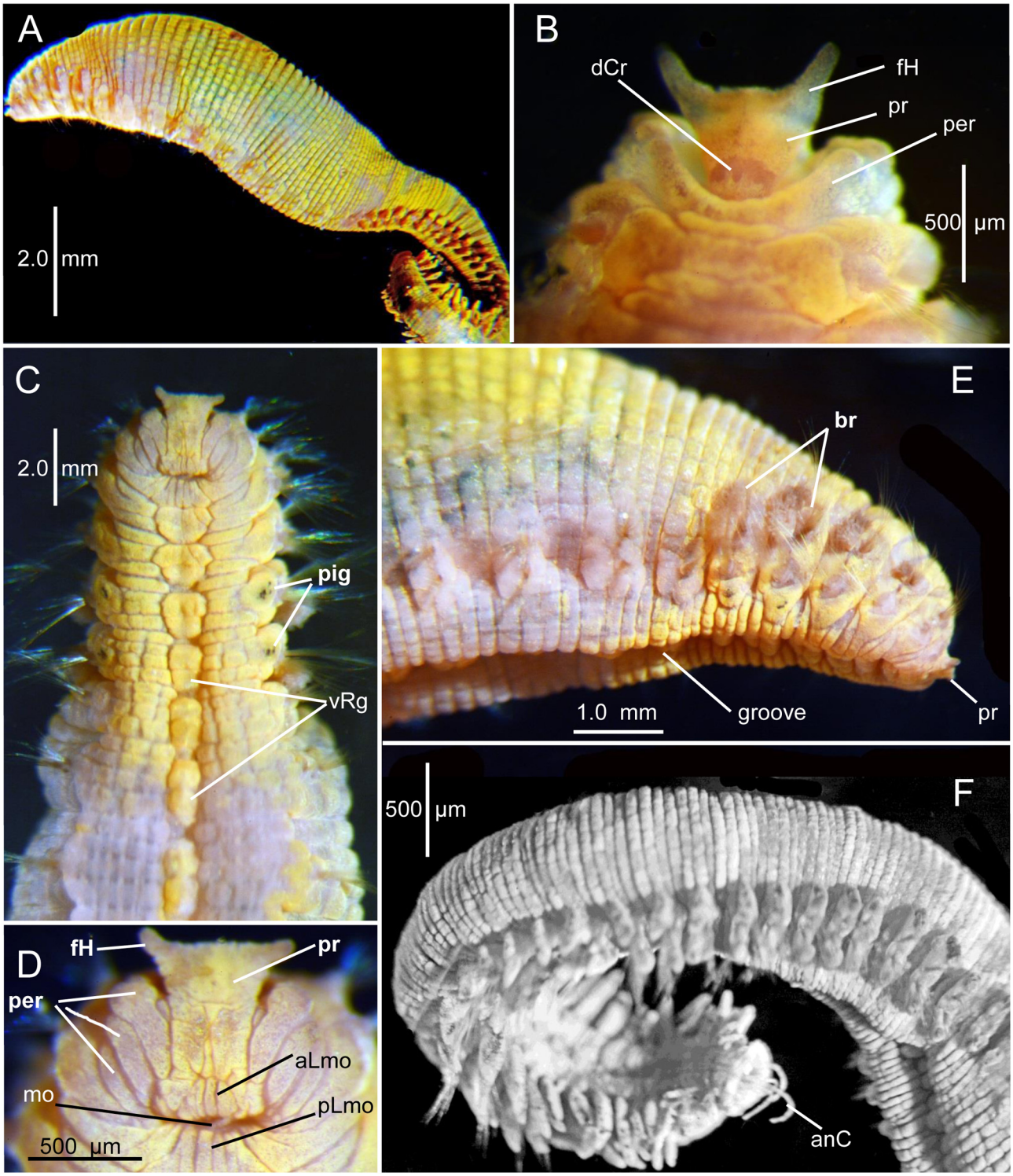

FIGURE 70. *Scalibregma aggregatum* **sp. nov.** A, entire worm, left lateral view; B, anterior end, dorsal view; C, anterior end, ventral view; D, same, detail of prostomium and oral morphology; E, anterior end, right lateral view; F, posterior end, curved with pygidium in ventral view. A, C–F, holotype (CASIZ 131523); B, paratype (CASIZ 245246).

with setiger 1 uniannulate, setigers 2–3 triannulate and following quadriannulate, but with setigers 1–3 smooth, lacking separate elevated pads, these possibly obscured due to oral morphology. Ventral midline with large medial row of pads extending from posterior lip of mouth on setiger 2 along entire body, forming prominent mid-ventral ridge (Fig. 70C); ridge depressed into mid-ventral groove from about setigers 4–5 (Fig. 70E). Each large mid-ventral pad initially broad and single, becoming narrow and double from about setigers 5–6 continuing posteriorly (Fig. 70C). Branchiae present posterior to notosetae on setigers 2–5 (Figs. 70E, 71A); these arborescent with numerous elongate filaments.

Parapodia of setigers 1–5 with prominent anterior

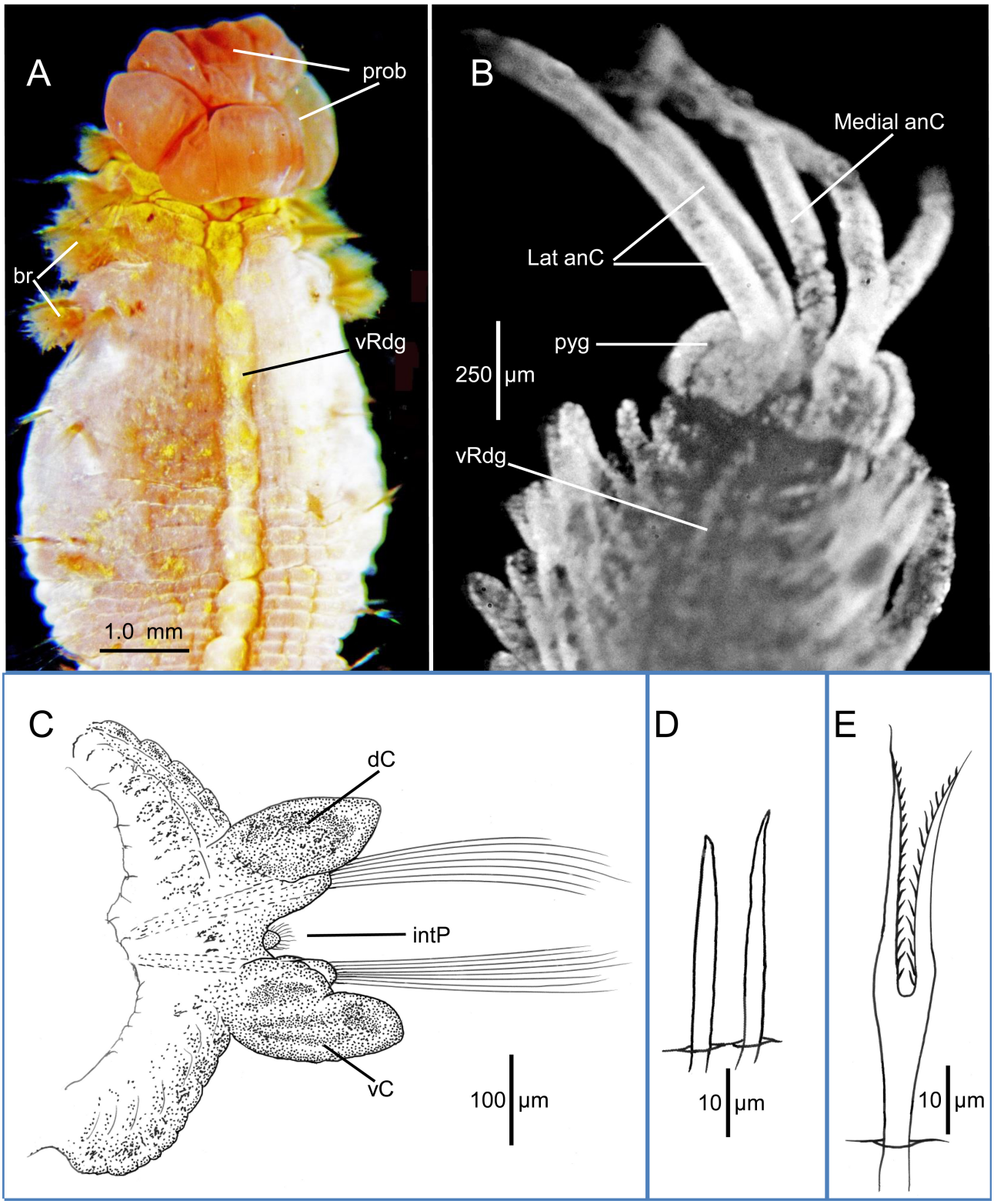

FIGURE 71. *Scalibregma aggregatuum* **sp. nov.** Paratype (CASIZ 245246): A, anterior end, ventral view of specimen with everted proboscis; B, posterior end, ventral view with all five anal cirri; C, posterior parapodium, anterior view; D, short spinous notosetae from setiger 1; E, furcate seta from posterior neuropodium.

and posterior elevated pre- and postsetal lobes with noto- and neurosetae arising between them; from setiger 6–15 parapodia similar but lobes becoming smaller; by about setiger 15 distinct noto- and neuropodia becoming prominent, with dorsal and ventral cirri evident by about setiger 17–18. Cirri initially short, rounded, and narrow, then becoming elongate and thickened by about setiger 22, continuing to posterior end; individual cirri of posterior setigers becoming thick and cylindrical in cross section; both cirri subequal, dorsal cirri triangular, tapering to

pointed tip (Fig. 71C); ventral cirri with asymmetrical base, extending laterally, elongate with rounded tip (Fig. 71C); each cirrus with numerous small glands, most with reddish pigment forming dark pattern within each cirrus (Fig. 71C). Short rounded interramal papillae, each heavily ciliated, present between podia of middle and posterior setigers (Fig. 71C).

Noto- and neuropodia of all setigers with fascicles of slender capillaries, those of anterior fascicles more numerous, arranged into 3–4 rows, setae of posterior row longest; capillaries of middle and posterior setigers fewer, arranged in 1–2 rows; all capillaries thin, with fibrils not evident in transmitted light. Setigers 1–2 with anterior row of 5–8 short, slender, narrow pointed spinous setae anterior to first row of capillaries in both noto- and neuropodia (Fig. 71D). Setiger 3 and following with 6–10 furcate setae in same anterior position as short spinous setae of setigers 1–2; each furcate seta with nearly equal tynes tapering to fine tips; with numerous denticles on inner margins directed toward opposite tyne (Fig. 71E).

Pygidium with collar surrounding anal opening (Fig. 70F), with about six thickened lobes; five long narrow anal cirri present, one mid-ventral and two on either side with each pair arising from a single lobe (Fig. 71B). Individual anal lobes and cirri with pigmented cells along length.

Remarks. *Scalibregma aggregatum* **sp. nov.** from shallow water in Monterey Bay, California, is one of two species of *Scalibregma* reported to have a posterior prostomial dorsal crest divided vertically into two parts. The other species is *S. rhoadsi* **sp. nov.** from deep-water off Cape Hatteras, North Carolina (see below). Both species also occur in dense assemblages but are differ morphologically in that *S. aggregatum* **sp. nov.** has furcate setae from setiger 3 and five anal cirri; in contrast, *S. rhoadsi* **sp. nov.** has furcate setae from setiger 2 and six anal cirri. In addition, while both species have a biannulate anterior lip of the mouth, in *S. aggregatum* **sp. nov.** the anterior row of lobes is irregular with the posterior row a regular line of narrow lobes, whereas in *S. rhoadsi* **sp. nov.** both rows have identical short lobes.

Scalibregma aggregatum **sp. nov.** is also similar to *S. therouxi* **sp. nov.** from off New England in 201–245 m in having a prostomial dorsal crest, a single multilobed dorsal peristomial ring, a biannulate anterior lip of the mouth, and furcate setae from setiger 3. They differ in that the dorsal crest of *S. therouxi* **sp. nov.** is transverse and not divided into two parts, the anterior lip of the mouth is weakly biannulate, with two layers of narrow lobes instead of a large swollen anterior lip with two layers of elongate narrow lobes, and there are four anal cirri instead of five. In addition, the prostomial horns of *S. aggregatum* **sp. nov.** are elongate and project anteriorly at about a 30-degree angle, whereas the horns of *S. therouxi* **sp. nov.** are short and project laterally.

Biology. *Scalibregma aggregatum* **sp. nov.** is a nearshore species occurring in dense aggregations. Nothing is known about their biology. The only other species of Scalibregmatidae known to have similarly dense populations are *S. rhoadsi* **sp. nov.** from off Cape Hatteras, North Carolina, and *S. ridleyensis* **sp. nov.** from some populations in southwest Alaska (see below). The majority of scalibregmatids are relatively rare and as deep burrowers not easily collected with the typical grab samplers used in most surveys.

Scalibregma aggregatum **sp. nov.** has been collected only in nearshore (14–16 m) sediments in Monterey Bay. A second species, *S. velatum* **sp. nov.**, has been found in the same areas of Monterey Bay, but in deeper water (36–40 m, see below); this latter species has also been collected farther north from off Half Moon Bay in 100 m.

A likely explanation for there being two species of *Scalibregma* in close proximity in Monterey Bay sediments has been provided by Eittreim *et al*. (2002). These authors describe a model where littoral and shallow-water coarse-grained (sandy) sediments derived from coastal erosion are moved southward by a nearshore current, whereas finer grain offshore sediments derived from riverine inputs, i.e., Salinas River and Parajo River, moves northward.

Etymology. The epithet *aggregatum* is from the Latin, meaning collected or clustering in reference to the unusually dense shallow-water populations of this species.

Distribution. E North Pacific Ocean, Central California, Monterey Bay, shallow subtidal, ~15 m.

Scalibregma antennatum new species

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Figures 72–73

Scalibregma inflatum: Blake *et al*. 1992: A-3 (in part). **Not** Rathke, 1843.

Material examined. (*29 specimens*) **Eastern North Pacific Ocean, Continental slope off northern California. W of Farallon Islands, SF-DODS Benthic Monitoring Program**, coll. J.A. Blake (1991–2007, R/V *Point Sur*), J. Nakayama (2019, R/V *Oceanus*). **Sta. 16**, 15 Oct 2000, BC, 37.632°N, 123.448°W, 2670 m, **holotype** (LACM-AHF Poly 14838); 21 Sep 2002, BC, 37.634°N, 123.449°W, 2693 m (1, CASIZ 245247). **Sta. 27**, 08 Oct 1999, BC, 37.683°W, 123.533°W, 2929 m (1, LACM-AHF Poly 14839). **Sta. 52**, 03 Oct 2004, BC, 37.716°N, 123.467°W, 2237 m (1 juv, CASIZ 245248); 29 Sep 2019, BC, 37.717°N, 123.467°W, 2350 m (1, CASIZ 245249). **Sta. 57**, 03 Oct 2000, BC, 37.717°N, 123.55°W, 2650 m (1, LACM-AHF Poly 14840); 07 Sep 2007, BC, 37.717°N, 123.55°W, 2658 m, **paratype** (CASIZ 245250). **Sta. 92**, 01 Oct 2004, BC, 37.749°N, 123.583°W, 2826 m, **paratype** (CASIZ 245251). **Sta. 108**, 26 Sep 2003, BC, 37.75°N, 123.583°W, 2670 m, **paratype** (CASIZ 245252); 03 Oct 2004, BC, 37.65°N, 123.416°W, 2736 m (1, CASIZ 245253).—**U.S. EPA 102 Site Selection Survey (1991),** R/V *Pt. Sur*, coll. J.A. Blake. **N of Pioneer Canyon**, **Sta. 3-7**, 14 Sep 1991, BC, 37.457°N, 123.325°W, 1675 m (1, CASIZ, 245255). **Sta. 3-13**, 15 Sep 1991, BC, 37.405°N, 123.334°W, 1780 m (9, CASIZ 245256). **Sta. 3-14**, 15

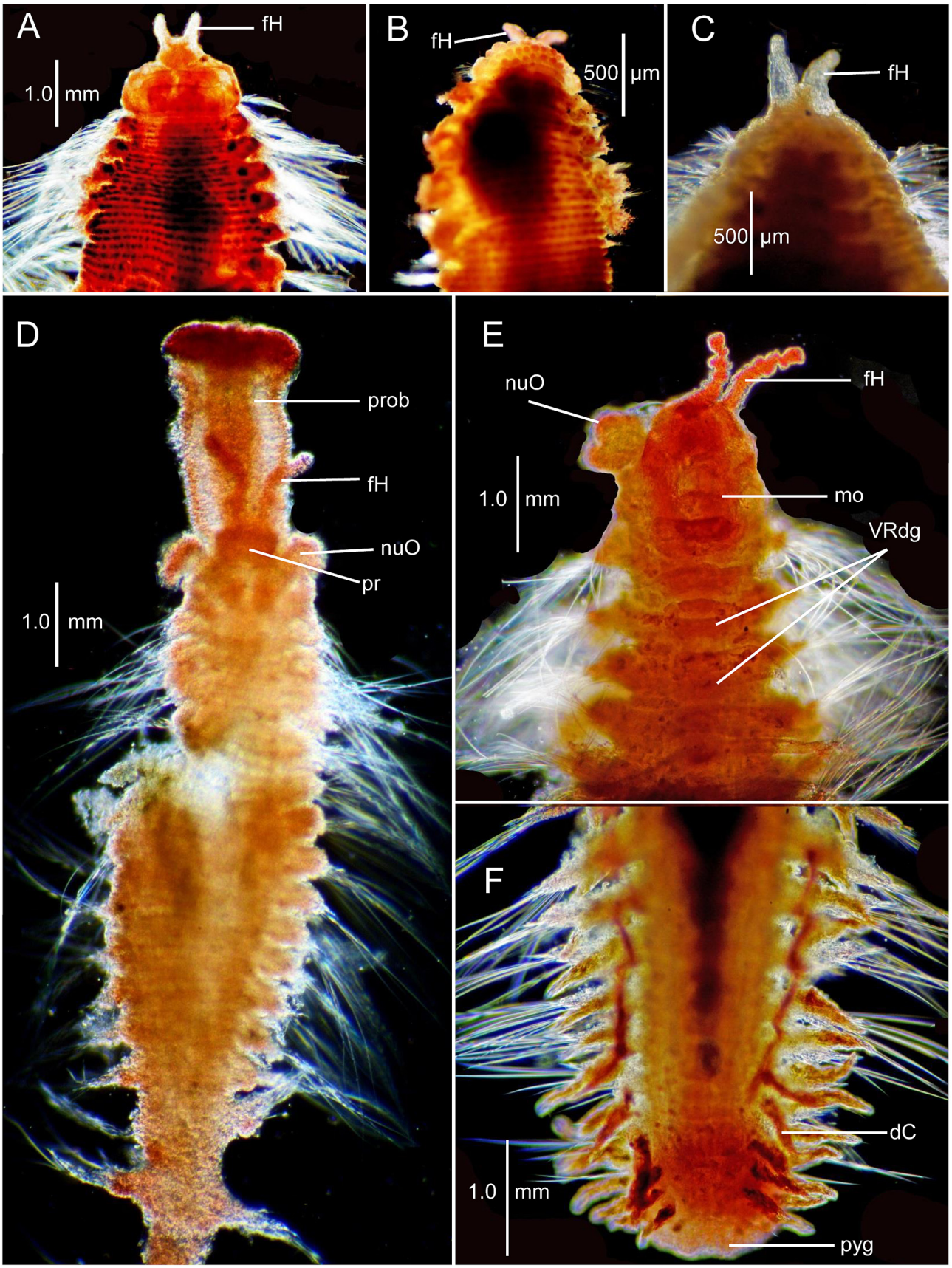

FIGURE 72. *Scalibregma antennatum* **sp. nov.** A–C, anterior end, dorsal view of three specimens; D, anterior end and most of body, dorsal view; E, anterior end, ventral view; F, posterior end, dorsal view. A, (CASIZ 245249), B, (CASIZ 245258), C, (CASIZ 245262), D, paratype (CASIZ 245251), E, 27 (LACM-AHF Poly 14839), F, (CASIZ 245260); all stained with Shirlastain A.

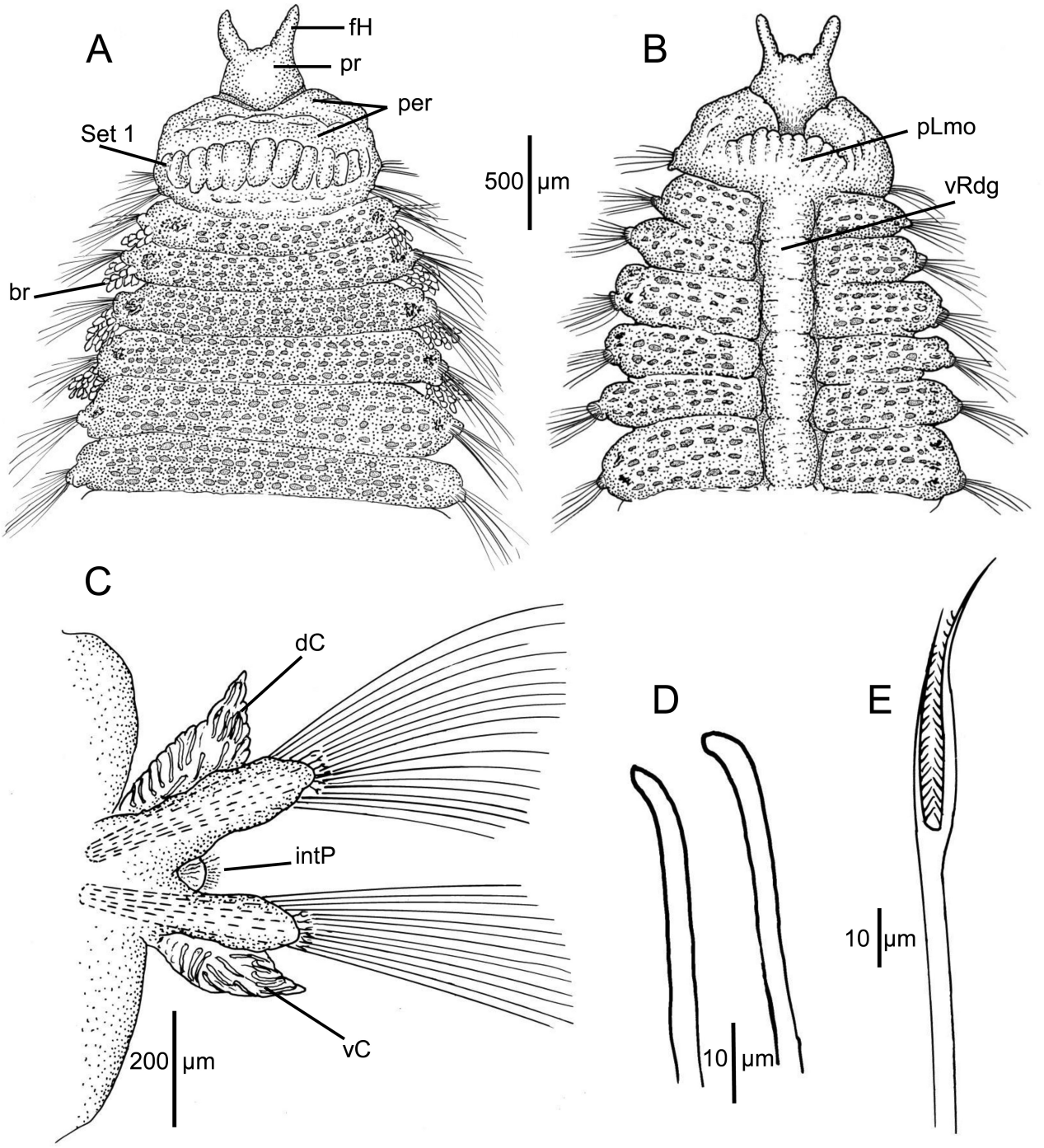

FIGURE 73. *Scalibregma antennatum* **sp. nov.** A, anterior end, dorsal view; B, anterior end, ventral view; C, posterior parapodium, anterior view; D, short spinous setae, setiger 1; E, furcate seta, posterior neuropodium. A–B, D–E, holotype (LACM-AHF Poly 14838); C, (CASIZ 245256).

Sep 1991, BC, 37.207°N, 123.36°W, 1880 m (1, CASIZ 245257). **S of Pioneer Canyon**, **Sta. 4-9**, 19 Sep 1991, BC, 37.231°N, 123.225°W, 1560 m (1, CASIZ 245258). **Sta. 4-10**, 17 Sep 1991, BC, 37.188°N, 123.254°W, 1760 m (1 juv, CASIZ 245259). **Sta. 4-15**, 19 Sep 1991, BC, 37.207°N, 123.264°W, 1730 m (1, CASIZ 245260). **Pioneer Canyon**, **Sta. C-3**, 19 Sep 1991, BC, 37.337°N, 123.147°W, 1400 m (1, CASIZ 245261). **Sta. C-7**, 19 Sep 1991, BC, 37.293°N, 123.225°W, 1840 m (1, CASIZ 245262). **Deep Transect, near Pioneer Canyon**, **Sta. DS-2**, 23 Sep 1991, BC, 37.175°W, 123.342°, 2394 m (1, CASIZ 245265).—**US Navy 103 Site Selection Surveys, W of Farallon Islands** (1990, R/V *Farnella*; 1991; R/V *Wecoma*) coll. J.A. Blake. **Sta. I-19**, 13 Aug 1990, BC, 37.64°N, 123.463°W, 2835 m (1, CASIZ 145263). **Sta. B-22**, 25 Jul 1991, BC, 37.529°N, 123.299°W, 2045 m (2, CASIZ 245264).

Description. A small to moderate sized species, body arenicoliform with anterior half of body expanded for about 15 setigers, then tapering to narrow abdominal

region (Fig. 72D). Holotype (LACM-AHF Poly 14838) complete with 37 setigers, 6.8 mm long and 1.1 mm wide across setiger 5; largest specimen (CASIZ 245256) complete with 38 setigers, 9.2 mm long and 2.1 mm wide across expanded segments. Body surface with narrow annulated rings with small pigmented pads; these most apparent on anterior setigers providing distinctive appearance (Figs. 72A, 73A–B). Color in alcohol light tan with dark reddish pigment on elevated pads of annulated rows, best seen on anterior setigers; dorsal and ventral cirri of posterior setigers with reddish tubular glands (Figs. 72A, 73A–B).

Prostomium trapezoidal in shape, about as wide as long (Figs. 72A, D, 73A–B); anterior margin with two elongate frontal horns directed anteriorly; these long and filamentous in some specimens and sometimes with a single apical lobe (Figs. 72A–C, 73A–B) or with several annulations along their length (Fig. 72D–E); nuchal organs emergent on some specimens from groove between prostomium and peristomium (Fig. 72D–E), these prominent, elongate, and ciliated; eyespots absent. Peristomium a single narrow lobed ring posterior to prostomium, dorsally merged seamlessly with setiger 1 (Fig. 73A), continuing onto ventral surface producing lateral and posterior lips of mouth (Fig. 73A–B). Mouth begins as ciliated vestibule extending from prostomium between lateral peristomial lips and continuing into multilobed posterior peristomial lips (Fig. 73B). When everted, proboscis an elongate lobe with thick anterior opening (Fig. 72D).

Segmental annulations prominent along body, with small pigmented irregularly shaped pads (Fig. 73A–B); setiger 1 with single row of large blocks dorsally, setiger 2 triannulate, following setigers quadriannulate (Fig. 73A); some posterior setigers becoming pentannulate. Ventrally, setigers 2–6 triannulate, then quadriannulate from setiger 7 (Fig. 73B). Ventral midline from setiger 2 with single large epidermal pad per segment (Figs. 72E, 73B), continuing along entire body producing distinct low mid-ventral ridge. Arborescent or dendritically branched branchiae present on setigers 2–5 posterior to notosetae (Fig. 73A).

Parapodia of anterior and middle body segments reduced to short, rounded lobes from which setal fascicles emerge; podial lobes develop thereafter, becoming longer and narrower in posterior abdominal segments. Dorsal and ventral cirri developing from mid-body about setigers 15–20, cirri initially short and stubby, becoming long and narrow by about setiger 25, continuing to posterior end; cirri of posterior setigers each with asymmetrical base, tapering to pointed tip (Fig. 73C); dorsal cirri larger and longer than ventral cirri. Each dorsal and ventral cirrus with numerous pigmented tubular glands (Fig. 73C); some glands appear to exit along length of cirrus, others concentrated near tip, exiting as a group. Interramal papilla prominent, rounded, ciliated, at base between parapodia (Fig. 73C).

All setigers with noto- and neuropodial fascicles of slender capillaries, with those of anterior fascicles more numerous, arranged in two rows, with setae of posterior row longest; capillaries of middle and posterior setigers arranged in 1–2 rows; all capillaries appear smooth, but some with numerous short inconspicuous fibrils or bristles along their length. Setigers 1–2 with additional anterior row of inconspicuous short, slender, spinous setae at base of first row of capillaries; these short spines numbering 6–8 on larger specimens, fewer on small specimens 4 mm or less in length; all spinous setae short, thick, blunt-tipped (Fig. 73D). Setigers 3 and following with furcate setae in same anterior position as short spines of setigers 1–2; each furcate seta with sub-equal tynes tapering to fine tips and with numerous denticles on inner margins directed toward opposite tyne (Fig. 73E).

Pygidium of largest specimens inflated, with anal opening surrounded by numerous small short lobes (Fig. 72F); anal cirri entirely absent.

Remarks. *Scalibregma antennatum* **sp. nov.** differs from most other species of the genus and most other scalibregmatids in the nature of the thin, elongate, anteriorly directed frontal horns, some of which are annulated along their length. *Scalibregma stenocerum* (Bertelsen & Weston, 1980) from continental shelf depths (17–218 m) along the SE US from North Carolina to Florida also has elongate frontal horns, but these are always entire and the species has a pair of V-shaped eyespots, branchiae on setigers 3–5, and short stubby dorsal and ventral cirri instead of eyespots absent, branchiae on setigers 2–5, and elongate pointed cirri as found in *S. antennatum* **sp. nov.**

Scalibregma antennatum **sp. nov.** is relatively rare among our collections. Out of nearly 300 0.1-m^2 box core samples taken as part of baseline surveys by the US EPA and U.S Navy and many years of monitoring surveys at the SF-DODS site, fewer than 30 specimens were collected. These results suggest that the species' preferred habitat has not been well sampled. In contrast, more than 100 specimens of *S. hadrostomium* **sp. nov.** were collected from the same samples (see below).

Etymology. The epithet is from the Latin, *antenna*, for a sensory appendage on the head in reference to the elongate, narrow frontal horns on this species.

Distribution. Eastern North Pacific Ocean, continental slope off northern California, 1560–2835 m.

Scalibregma aubreyi new species

urn:lsid:zoobank.org:act:040853E8-D92F-4433-A806-263DDFD5394C

Figures 74–75

Material examined. (*8 specimens*) **South China Sea, off Brunei, Island of Borneo**, **Site CA1**, R/V *Emma*, coll. J.A. Blake, Chief Scientist: **Sta. 6**, 07 Jun 2011, BC, 5.861°N, 114.182°E, 1353 m, **holotype** (MCZ IZ 171936). **Sta. 28**, 04 Jun 2011, BC, 5.472°N, 114.128°E, 1557 m (1, MCZ IZ 171937). **Sta. 61**, 31 May 2011, BC, 5.676°N, 114.221°E, 1050 m, 1 **paratype** (MCZ IZ 171938).—**Site CA2**, R/V *Emma*, coll. P.A. Neubert, Chief Scientist: **Sta. ME-2**, 26 Jun 2011, BC, 5.329°N, 113.646°E, 1666 m, **paratype** (MCZ IZ 171939). **Sta. ME-3**, 26 Jun 2011, BC, 5.343°N, 113.643°E, 1665 m,

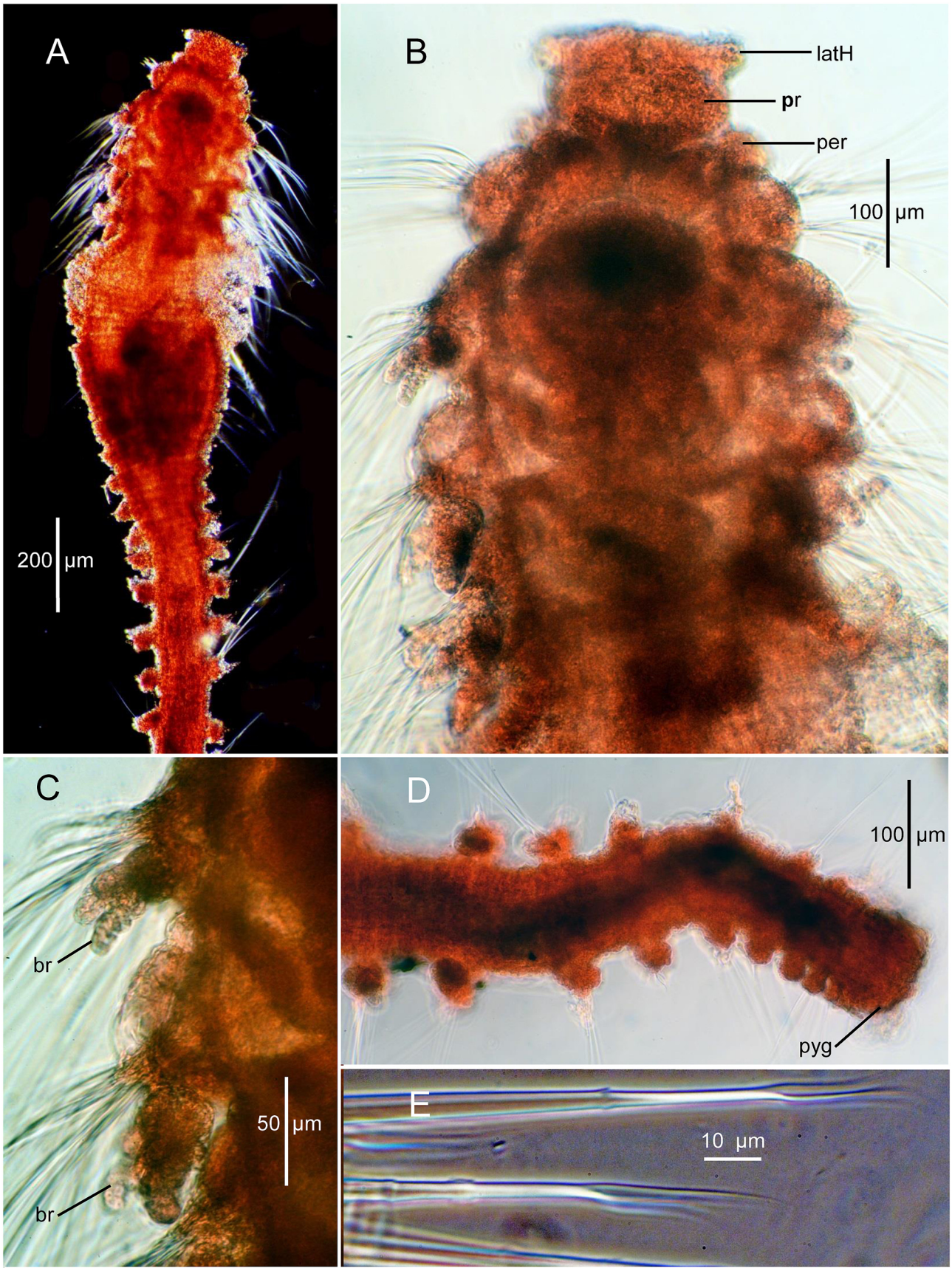

FIGURE 74. *Scalibregma aubreyi* **sp. nov.** Holotype (MCZ IZ 171936): A, dorsal view of anterior, middle, and most posterior setigers; B, anterior end, dorsal view; C, setigers 2–3 with branchiae; D, posterior end, dorsal view; E, furcate setae from posterior neuropodium. A–D, stained with Shirlastain A.

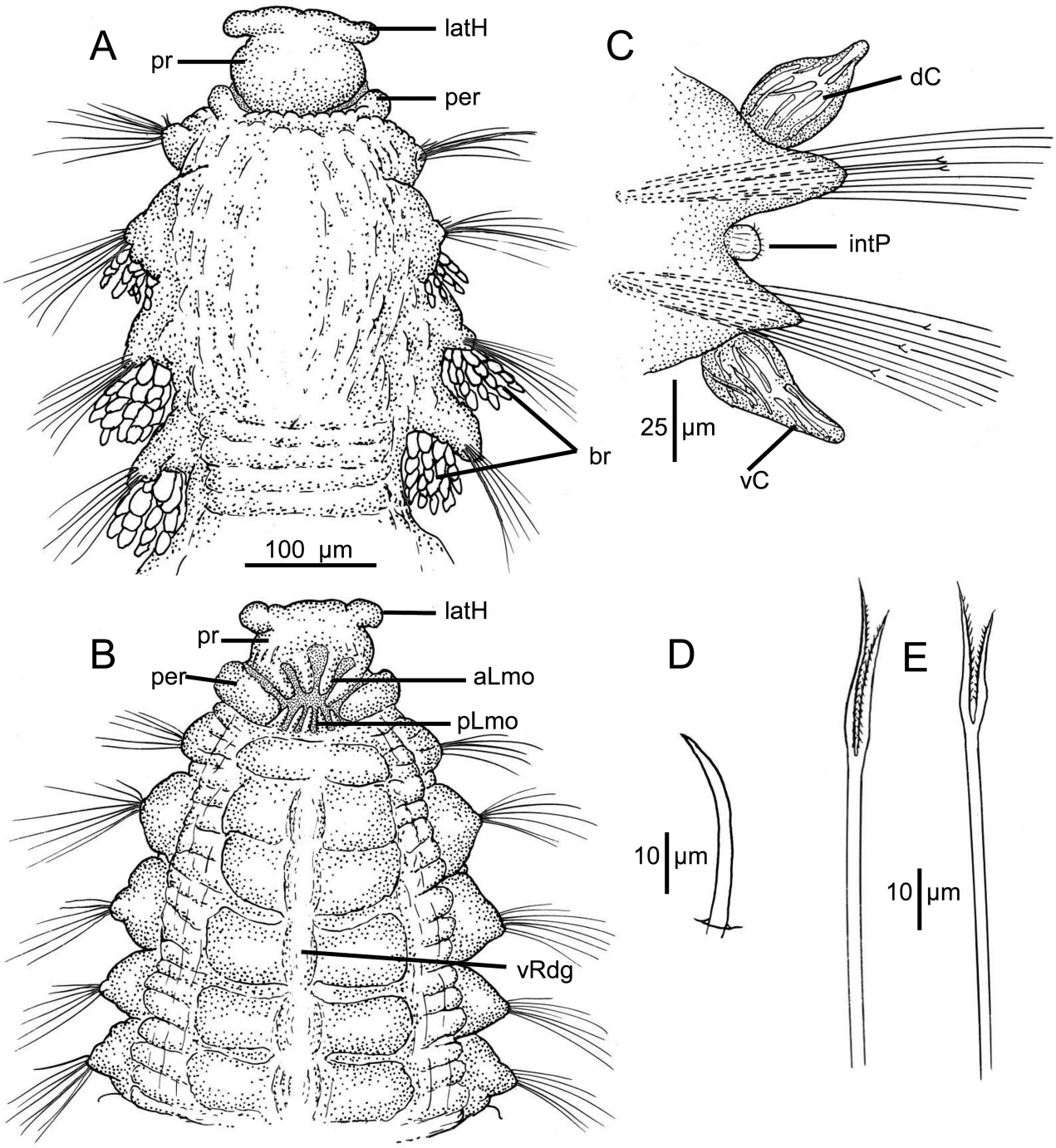

FIGURE 75. *Scalibregma aubreyi* **sp. nov.** Holotype (MCZ IZ 171936): A, anterior end, dorsal view; B, anterior end, ventral view; C, posterior parapodium, anterior view; D, short spinous seta, notopodia setiger 1; E, furcate seta posterior neuropodium.

paratype (MCZ IZ 171940). **Sta. ME-7**, 04 Jul 2011, BC, 5.369°N, 113.624°E, 1725 m (1, MCZ IZ 171941). **Sta. TU-14**, 23 Jun 2011, BC, 5.273°N, 113.807°E, 1444 m (1, MCZ IZ 171942). **Sta. JA-3**, 03 Jul 2011, BC, 5.493°N, 113.581°E, 1922 m, (1 juv, MCZ IZ 171943).

Description. A small species, body elongate, arenicoliform, expanded in anterior third, usually from about setiger 5–6, continuing for another 5–6 setigers, then tapering to long, narrow abdominal region (Fig. 74A). Holotype (MCZ IZ 171936**)** complete, with 28 setigers, 3.0 mm long, 0.4 mm wide across expanded setiger 7; larger paratype (MCZ IZ 171939) complete, but damaged, with 39 setigers, 9.5 mm long, 0.6 mm wide. Dorsal body surface with first 3–4 setigers lacking annular rings, followed by setigers with transverse rows of annulated rings (Fig. 75A), mostly quadriannulate to posterior end, but obscured on expanded segments; ventral surface tri- or quadriannulate on anterior setigers, quadriannulate along narrow posterior region; anterior setigers of venter with rings interrupted by large medial blocks and narrow elongate mid-ventral blocks (Fig. 75B); medial blocks continuing along rest of body as

weakly raised ridge between rows of annular rings. Individual pads or blocks reduced on annular rings, not prominent. Most specimens complete but either damaged or with condition degraded due to poor preservation or handling during sample processing. Color in alcohol light tan; dorsal and ventral cirri of most specimens appearing dark reddish due to internal glands; similar smaller glands variously present on dorsal or ventral surface of body or not apparent.

Prostomium short, rounded, about as long as wide; anterior border broad, slightly curved, bearing two short laterally directed rounded lobes (Figs. 74A–B, 75A–B); dorsal posterior margin of prostomium slightly overlapped by peristomial ring (Fig. 75A); eyespots absent; nuchal organs not observed; ventral prostomium forming anterior lip of mouth (Fig. 75B). Peristomium consisting of single ring dorsally with lumpy surface (Figs. 74B, 75A), merging seamlessly with setiger 1; ventrally a single ring forming posterior lip of mouth (Fig. 75B). Mouth opening surrounded by four large elongate anterior lobes forming anterior lip and 5–6 smaller narrow lobes forming posterior lip; proboscis a smooth rounded sac when everted on some specimens.

Parapodia reduced, inconspicuous anteriorly becoming larger and more conspicuous in middle and posterior setigers as narrow podial lobes from which setae arise. Dorsal and ventral cirri develop from about setigers 10–12 or mid-body; dorsal cirri initially short, rounded, becoming longer and narrower by about setiger 10–15 depending on size of specimens, continuing to posterior end; ventral cirri slightly narrower than dorsal cirri, both cirri flask-shaped, oval basally, tapering to nipple-like tip (Fig. 75C). Dorsal and ventral cirri each with darkly pigmented glands; each gland formed of narrow striated tubules appearing to exit dorsally and laterally (Fig. 75C). Interramal papillae small, inconspicuous in anterior setigers, becoming larger in middle and posterior parapodia (Fig. 75C). Arborescent or dendritically branched branchiae present on setigers 2–5 posterior to notosetae (Figs. 74B–C, 75A).

All setigers with noto- and neuropodial fascicles of slender capillaries, with those of anterior setigers more numerous, arranged into 2–3 rows, with setae of posterior row longest; capillaries of middle and posterior setigers arranged in 1–2 rows; all capillaries generally smooth, fibrils not conspicuous; setigers 1–2 with additional anterior row of 2–4 inconspicuous short, slender, pointed spinous setae in both noto- and neuropodia (Fig. 75D). Setigers 3 and following with furcate setae in same anterior position as short spinous setae of setigers 1–2; each furcate seta with subequal tynes tapering to filamentous tips and with numerous denticles on inner margins, directed toward opposite tyne (Fig. 75E). Furcate setae of posterior setigers with unusually long shafts among capillaries (Fig. 74E).

Pygidium an expanded lobe surrounding anal opening with a few short lobes, no anal cirri observed (Fig. 74D).

Remarks. *Scalibregma aubreyi* **sp. nov.** has an unusual annular ring pattern on the ventral surface where the typical quadriannulate rings are interrupted mid-ventrally by large segmental medial blocks on either side of narrow elongate blocks that represent a mid-ventral ridge. In addition, the oral morphology includes a modified uniannulate anterior lip with four large elongate lobes formed by the prostomium and a posterior lip with 5–6 smaller lobes on the peristomium. Dorsally, the prostomium is short, rounded and bears elongate lateral horns and the single peristomial ring is multilobed and merged with setiger 1.

Etymology. This species is named in memory of the late Mr. Stephen B. Aubrey, colleague, friend, and oceanographic field scientist who was a key member of our sampling team for the CA1 survey off Brunei. Mr. Aubrey also analyzed the oceanographic data collected as part of the survey including CTD data (conductivity, temperature and depth) and Valeport current meter results.

Distribution. South China Sea off Brunei, Island of Borneo, 1050–1922 m.

Scalibregma australis Blake, 2015

Scalibregma australis Blake, 2015: 61–74, figs. 1–3.

Material examined. (*163 specimens*) **Southern Ocean, Antarctica: Scotia Sea, N of Elephant Island**, R/V *Polarstern*, ANDEEP I (ANT-XIX/3), coll. J.A. Blake: **Sta. 46-3**, coll. 30 Jan 2002, BC, 60.632000°S, 53.952833°W, 2888 m (3, ZMH-ANN-030798); **Sta. 46-4**, coll. 30 Jan 2002, MUC, 60.635333°S, 53.961167°W, 2893 m (3, ZMH-ANN-030799).—**Scotia Sea**, **N. of Antarctic Peninsula**, R/V *Polarstern* ANDEEP III (ANT XXII/3), coll. S. Doner, **Sta. 153-5**, 29 Mar 2005, 63.323500°S, 64.613667°W, 2079 m (1, ZMH-ANN-030800).—**Off South Sandwich Islands**, R/V *Polarstern*, ANDEEP II (ANT-XIX/4), coll. J.A. Blake, **Sta. 141-6**, 22 Mar 2002, 58.416000°S, 25.017833°W, 2276 m (1, ZMH-ANN-030801).—**East Antarctic Peninsula**, R/V *Nathaniel B. Palmer* Cruise 2000-03 Survey of Prince Gustav Channel and Larsen Ice shelf A area, coll. J.A. Blake: **Larsen Ice shelf A, border with Larsen B**, **Sta. NBP-11**, 18 May 2000, SMG, 64.944°S, 60.321°W, 350 m (3, MCZ IZ 171944). **Sta. NBP-14**, 19 May 2000, SMG, 64.864°S, 60.557°W, 419 m (8, MCZ IZ 171945).—**Greenpeace Trough**, **Sta. NBP-18**, 20 May 2000, SMG, 64.656°S, 59.992°W, 665 m (11, MCZ IZ 171946). **Sta. NBP-19**, 20 May 2000, SMG, 64.713°S, 60.347°W, 879 m (2, MCZ IZ 171947). **Sta. NBP-20**, 20 May 2000, SMG, 64.7497°S, 60.372°W, 899 m (1 juv, MCZ IZ 171948). **Sta. NBP-22**, 20 May 2000, SMG, 64.777°S, 60.359°W, 868 m (3, MCZ IZ 171949). **Sta. NBP-23,** 21 May 2000, SMG, 64.786°S, 60.359°W, 901 m (7 MCZ IZ 171950).—**Weddell Sea**, **Sta. NBP-25,** 22 May 2000, SMG, 64.722°S, 59.641°W, 628 m (9 MCZ IZ 171951).—**Prince Gustav Channel**, **Sta. NBP-05**, 17 May 2000, SMG, 64.775°S, 60.179°W, 978 m (7 MCZ IZ 171952). **Sta. NBP-28**, 23 May 2000, SMG, 64.367°S, 58.516°W, 794 m (4 MCZ IZ 171953). **Sta. NBP-30**, 24 May 2000, SMG, 64.281°S, 58.449°W, 843 m (13 MCZ IZ 171954). **Sta. NBP-33**, 24 May 2000, SMG, 64.199°S, 58.698°W, 587 m (19 MCZ IZ 171955).

Sta. NBP-34, 24 May 2000, SMG, 64.183°S, 058.569°W, 865 m (27, MCZ IZ 171956). **Sta. NBP-35**, 25 May 2000, SMG, 64.175°S, 58.475W, W, 651 m (3, MCZ IZ 171957); **Sta. NBP-35A**, 25 May 2000, SMG, 64.175°S, 58.475°W, 651 m (6, MCZ IZ 171958). **Sta. NBP-35B**, 25 May 2000, SMG, 64.175°S, 58.475°, 651 m (14, MCZ IZ 171959).

Description. (Condensed from Blake 2015) Moderately sized species, expanded in anterior setigers, then tapering to narrow posterior end; with up to 40–45 setigers, 32–35 mm long, and about 4.5 mm wide across expanded anterior setigers. Body with prominent annular rings; dorsal surface with setiger 1 biannulate, setigers 2–3 triannulate, following setigers quadriannulate, with some far posterior setigers pentannulate; ventral surface with setigers 1–3 triannulate and following setigers quadriannulate with a few pentannulate; ventral midline from setiger 2 with a ridge formed from a single large mid-ventral pad along entire body. Color in alcohol light tan; with distinct dark reddish-colored glands on anteriormost annular rings across dorsum of setigers 3–5; some anterior neuropodia with a few isolated pigmented glands; posterior parapodia also with pigmented glands in dorsal and ventral cirri. Prostomium pentagonal, with short frontal horns; posterior margin of prostomium upturned as a crest; eyespots absent. Peristomium a single multilobed ring dorsally, divided into multiple ventral lobes as anterior lip of mouth. Anterior lip of mouth biannulate, with three large anterior lobes and 12 short lobes bordering mouth; posterior lip swollen on setiger 1 with two rows of thickened lobes; proboscis a smooth sac. Dorsal and ventral cirri present from mid-body; dorsal cirri triangular, ventral cirri narrower than dorsal cirri, oval, tapering to rounded tip; with darkly pigmented tubular glands. Interramal papillae present. Setae include capillaries, short spinous setae on setiger 1, and furcate setae. Short spinous setae slender, pointed, a few with aristate tips, others with tips split into two thin branches. Furcate setae from setiger 2 each with nearly equal tynes bearing denticles on inner margins. Pygidium with about 12 elongate lobes around anus; with five long, thin anal cirri, two dorsal, two ventral and one mid-ventral.

Remarks. *Scalibregma australis* is easily recognized by the presence of distinct dark-colored glands across the dorsum of setigers 3–5. The only other species of *Scalibregma* with similar pigmented glands on anterior setigers are *S. brevicaudum* Verrill, 1873 from shelf depths of the northeastern United States and *S. hanseni* Bakken *et al*., 2014 from deep-water in the Norwegian Sea and off Greenland. *Scalibregma hanseni*, however, differs from both *S. australis* and *S. brevicaudum* in having branchiae on setigers 3–5 instead of 2–5. In addition to widely different habitats and geography, *S. australis* also differs from *S. brevicaudum* in having furcate setae from setiger 2 instead of 3 and by having biannulate rather than uniannulate anterior and posterior lips of the mouth.

Distribution. Southern Ocean, Scotia Sea, 2888–2893m; off South Sandwich Islands, 2276 m; off East Antarctic Peninsula, 350–978 m; Weddell Sea, 2164 m.

***Scalibregma beaufortensis* new species**

urn:lsid:zoobank.org:act:23F8DFF6-F003-4A39-BB03-B85B0602BE63

Figure 76

Material examined. (*5 specimens*) **Alaska, OCSEAP, Beaufort Sea: off Pitt Point**, coll. R.E. Ruff, 11 Aug 1977, SMG, **Sta. 1542**, 71.3167°N, 152.8667°W, 55 m, sandy silt, **holotype** (CASIZ 027894), 1 **paratype** (CASIZ 245266). **Sta. D5B**, 20 Aug 1977, SMG, 70.0467°N, 144.9067°W, 10 m, 1 **paratype** (CASIZ 022615). **Sta. J2C**, 23 Aug 1977, 70.59167°N, 150.4167°W, 10 m, 2 **paratypes** (CASIZ 022820). **Off Prudhoe Bay, Sta. G4A**, 21 Aug 1978, 70.3533°N, 147.775°W, 6 m (1, CASIZ 023111).

Description. A small to moderate sized species, body elongate, arenicoliform, expanded over first third until about setiger 15, then narrowing along posterior segments. Holotype (CASIZ 027894) complete with 46 setigers, 8.0 mm long, 1.1 mm wide across expanded segments at setiger 10. Paratype (CASIZ 022615) larger, also complete but damaged, with 42 setigers, first 20 swollen, 17.5 mm long, and 2.5 mm wide across anterior setiger 15. Body with light orange cast produced by numerous small pigmented glands along annular rings and irregularly on parapodial and anal cirri.

Body with dorsum rounded and venter flattened, mid-ventral groove from setiger 2 with medial ridge formed of large pads (Fig. 76B). Body segments with numerous transverse annular rings, these mostly narrow with inconspicuous raised pads bearing small, pigmented glands (Fig. 76A–B, D). Setiger 1 with only a single transverse ridge dorsally and ventrally (Fig. 76A–B); setiger 2 with four thickened transverse ridges dorsally (Fig. 76A), interrupted ventrally by oral morphology (Fig. 76B); setigers 3 and following with four narrow pigmented annular rings dorsally (Fig. 76A); setiger 3 ventrally with three narrow rings and setiger 4 and following segments with four rings, interrupted mid-ventrally by single large medial raised pad on each setiger from setiger 2 (Fig. 76B); ventral medial pads becoming recessed into mid-ventral groove extending along entire ventral surface (Fig. 76B, D).

Prostomium short, wider than long, with curved, crenulated anterior margin bearing 7–8 distinct but short lobes and larger, rounded lateral lobes or horns (Fig. 76A–B), these may be directed slightly posteriorly (Fig. 76B); posterior end of prostomium obscured by dorsal crest, believed to be peristomial; eyespots absent; nuchal organs not observed (Fig. 76A). Peristomium with three narrow dorsal rings, with middle ring multilobed (Fig. 76A); anterior ring smooth, forming transverse dorsal crest posterior to prostomium; ventrally all three rings smooth, interrupted by oral morphology and forming lateral border of mouth (Fig. 76B). Mouth a narrow slit between anterior and posterior lips; anterior lip biannulate with two rows of elongate, narrow lobes on peristomium posterior to prostomium; posterior lip a swollen mound on setiger 2 with 8–9 narrow anterior lobes (Fig. 76B).

Anterior parapodia with short setal lobes, becoming

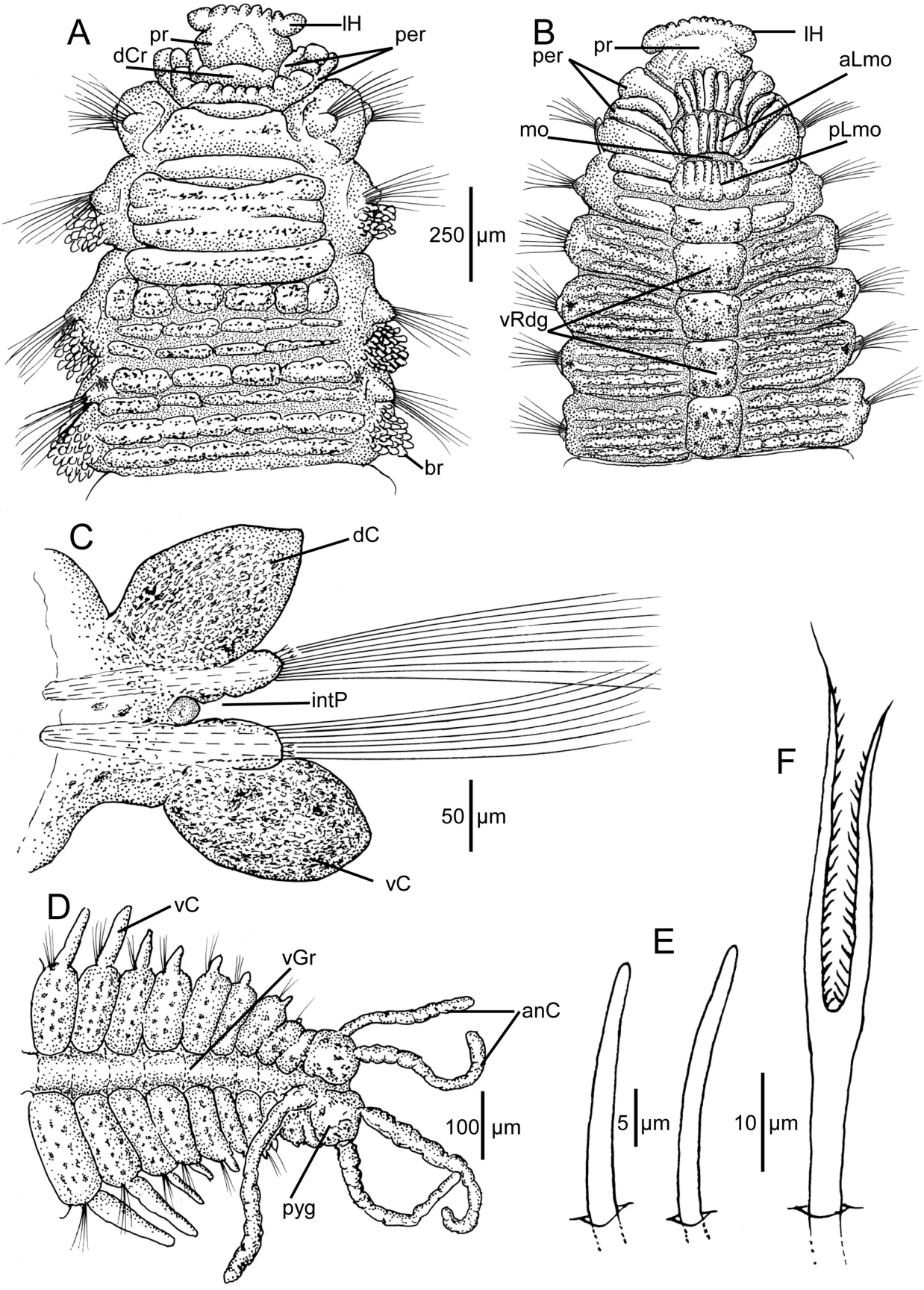

FIGURE 76. *Scalibregma beaufortensis* **sp. nov.** A, anterior end, dorsal view; B, anterior end, ventral view; C, posterior parapodium, anterior view; D, posterior end, ventral view; E, short spinous notosetae, setiger 1; F, furcate seta from posterior parapodium. A, D, E, holotype (CASIZ 027894); B, paratype (CASIZ 245266); C, F, paratype (CASIZ 022615).

larger and more conspicuous from about setiger 15 as narrow podial lobes. Dorsal and ventral cirri develop from about setiger 16 or mid-body; dorsal cirri initially short, rounded, becoming longer and narrower by about setiger 22, these continuing to posterior end; both cirri large, inflated, weakly triangular (Fig. 76C), oval in cross section, tapering to narrow tip. Dorsal and ventral cirri each with numerous darkly pigmented internal glands; interramal papillae small, oval (Fig. 76C). Branchiae on setigers 2–5, posterior to notosetae, arborescent with numerous individual filaments (Fig. 76A).

All setigers with noto- and neuropodial fascicles of slender capillaries, with those of anterior fascicles more numerous, arranged into 2–3 rows, setae of posterior row longest; capillaries of middle and posterior setigers arranged in 1–2 rows; all capillaries generally smooth, fibrils not conspicuous; setiger 1 with additional row of short spinous setae anterior to capillaries, numbering 4–5 in both noto- and neuropodia; these narrow, tapering to rounded tips (Fig. 76E). Setiger 2 and following with furcate setae in same position as short spines of setiger 1; anterior parapodia with 2–3 furcate setae, increasing to 5–6 in posterior setigers; each furcate seta with subequal tynes tapering to filamentous tips and numerous denticles on inner margins, directed toward opposite tyne (Fig. 76F).

Pygidium with a pair of large rounded lobes bearing five elongate anal cirri, one mid-ventral and two pairs on either side (Fig. 76D).

Remarks. This species was collected as part of the Outer Continental Shelf Environmental Assessment Program (OCSEAP) conducted during the 1970s to assess marine habitats relative to potential impacts of oil and gas exploration in the seas surrounding Alaska.

Scalibregma beaufortensis **sp. nov.** is characterized by having the anterior margin of the prostomium distinctly crenulated, curved and with the short lateral horns directed slightly posteriorly; and with a transverse dorsal crest at the posterior prostomial margin. The pygidium is bilobed, with five long anal cirri, including two lateral pairs and a single mid-ventral cirrus. In addition, the raised pads on the annular rings, the anal cirri, and dorsal and ventral cirri bear pigmented glands that provide the distinctive light orange coloration of this species.

Etymology. This species is named for the Beaufort Sea in the Arctic Ocean where it was collected.

Distribution. Beaufort Sea, Alaskan Arctic, sandy silt, 6–55 m.

Scalibregma brevicaudum Verrill, 1873 Revalidated

Figures 77–78

Scalibregma brevicauda Verrill, 1873: 605; 1881: 303, pl. 9, fig. 5; Hartman 1942: 12; 1944a: 341.

Scalibregma inflatum: Hartman, 1942: 12; 1944a; 341; Maciolek *et al*. 1985: B-6; Theroux & Wigley 1998: 217–218 (in part); Grassle *et al*. 2009: 880. **Not** Rathke 1843.

Material examined. (*248 specimens*) **Western North Atlantic Ocean, New England, Long Island Sound.** Off New Haven, coll. 29 May 1871, A.E. Verrill, 41.2148°N, 72.9461°W, 7–11 m, **holotype** (YPM IZ 000205).—**Long Island Sound, U.S. EPA & USACE Dredged Material Disposal Site EIS Survey, July 2002**, OSV *Peter W. Anderson*, coll. I. P. Williams & P. Winchell, 0.05-m^2 vVG: **Cornfield Shoals Disposal Site (CS): Sta. CSB92**, Rep. 1, coll. 06 Jul 2000, 41.214°N, 72.362°W, 48–49 m (3, YPM IZ 111868); **Sta. CSREF**, Rep. 2, coll. 06 Jul 2000, 41.201°N, 72.280°W, 42 m (10, YPM IZ 111869); Rep. 3, coll. 06 Jul 2000, 41.201°'N, 72.282°W, 42 m (2, YPM IZ 111870). **Sta. CSS94**, Rep. 1, coll. 06 Jul 2000, 41.21°N, 72.365°W, 50–51 m (3, MCZ IZ 171960); Rep. 2, coll. 06 Jul 2000, 41.214°N, 72.364°W, 50–51 m (1, IZ MCZ 171961); Rep. 3, coll. 06 Jul 2000, 41.214°N, 72.364°W, 50–51 m (2, MCZ IZ 171962). **New London Disposal Site (NL)**: **Sta. NL1KE**, Rep. 1, coll. 06 Jul 2000, 41.27°N, 72.051°W, 18 m (2, YPM IZ 111871); Rep. 2, coll. 06 Jul 2000, 41.272°N, 72.065°W, 18 m (2, YPM IZ 111872); Rep. 3, coll. 06 Jul 2000, 41.272°N, 72.065°W, 18 m (10, YPM IZ 111872). **Sta. NL2KE**, Rep. 1, coll. 06 Jul 2000, 41.272°N, 72.053°W, 18 m (2, MCZ IZ 171963); Rep. 2, coll. 06 Jul 2000, 41.271°N, 72.053°W, 18 m (6, MCZ IZ 171964); Rep. 3, coll. 06 Jul 2000, 41.271°N, 72.053°W, 18 m (3, MCZ IZ 171965). **Sta. NLLRF**, Rep. 2, coll. 05 Jul 2000, 41.277°N, 72.033°W, 15–16 m (7, MCZ IZ 171966); Rep. 3, coll. 05 Jul 2000, 41.277°N, 72.034°W, 15–16 m (17, MCZ IZ 171967). **Sta. NLRLC**, Rep. 1, coll. 06 Jul 2000, 41.274°N, 72.074°W, 13–14 m (4, MCZ IZ 171968); Rep. 2, coll. 06 Jul 2000, 41.275°N, 72.074°W, 13–14 m (18, MCZ IZ 171969). **Sta. NLSEA**, Rep. 1, coll. 06 Jul 2000, 41.275°N, 72.081°W, 15–16 m, (15, MCZ IZ 171970); Rep. 2, coll. 06 Jul 2000, 41.274°N, 72.081°W, 15–16 m (2, MCZ IZ 171971); Rep. 3, coll. 06 Jul 2000, 41.273°N, 72.08°W, 15–16 m (19 MCZ IZ 171972).—**Georges Bank Benthic Infaunal Monitoring Program**. coll. G.W. Hampson, Chief Scientist, 0.05-m^2 vVG: **Sta. 5-1**, **Cruise M12**, R/V *Gyre,* 05 Jun 1984, Rep. 3, 40.658°N, 67.77°W, 84 m (7, USNM 1741753); Rep. 5 (6, USNM 1741754); Rep. 6 (4, USNM 1741755). **Cruise M13**, R/V *Oceanus*, coll. R. Petrecca, Chief Scientist, 22 May 1985, Rep. 4, 40.657°N, 67.767°W, 76 m (6, USNM 1741756). **Sta. 5-18**, Cruise M12, R/V *Gyre*, coll. G.W. Hampson, Chief Scientist 05 Jun 1984, 40.558°N, 67.228°W, 152 m, Rep. 1 (3, USNM 1741757); Rep. 2 (3, USNM 1741758); Rep. 3 (3, USNM 1741759); Rep. 4 (2 juvs, USNM 1741760); Rep. 6 (5, USNM 1741761). **Sta. 5-28**, **Cruise M12**, R/V *Gyre*, Jun 1984, 40.658°N, 67.695°W, 84 m, Rep. 2 (3, USNM 1741762). **Sta. 5-29**, **Cruise M1**, R/V *Eastward*, coll. M. Rawson, Chief Scientist, 06 Jul 1981, 40.657°N, 67.782°W, 85 m, Rep. 1 (20, USNM 1741763). **Sta. 1**, **Cruise M7**, R/V *Endeavor*, coll. G.W. Hampson, Chief Scientist, 07 Feb 1983, 41.208°N, 67.243°W, 55 m , Rep. 2 (1, USNM 1741764). **Sta. 2**, **Cruise M2**, R/V *Oceanus*, 14 Nov 1981, 40.987°N, 66.932°W, 70 m, Rep. 4 (2, USNM 1741765); **Cruise M6**, R/V *Oceanus*, 21 Nov 1982, 40.987°N, 66.932°W, 71 m Rep. 6 (1, USNM 1741766); **Cruise M7**, R/V *Endeavor*, 07 Feb 1983, 40.987°N, 66.932°W, 71 m, Rep. 3 (5, USNM 1741767);

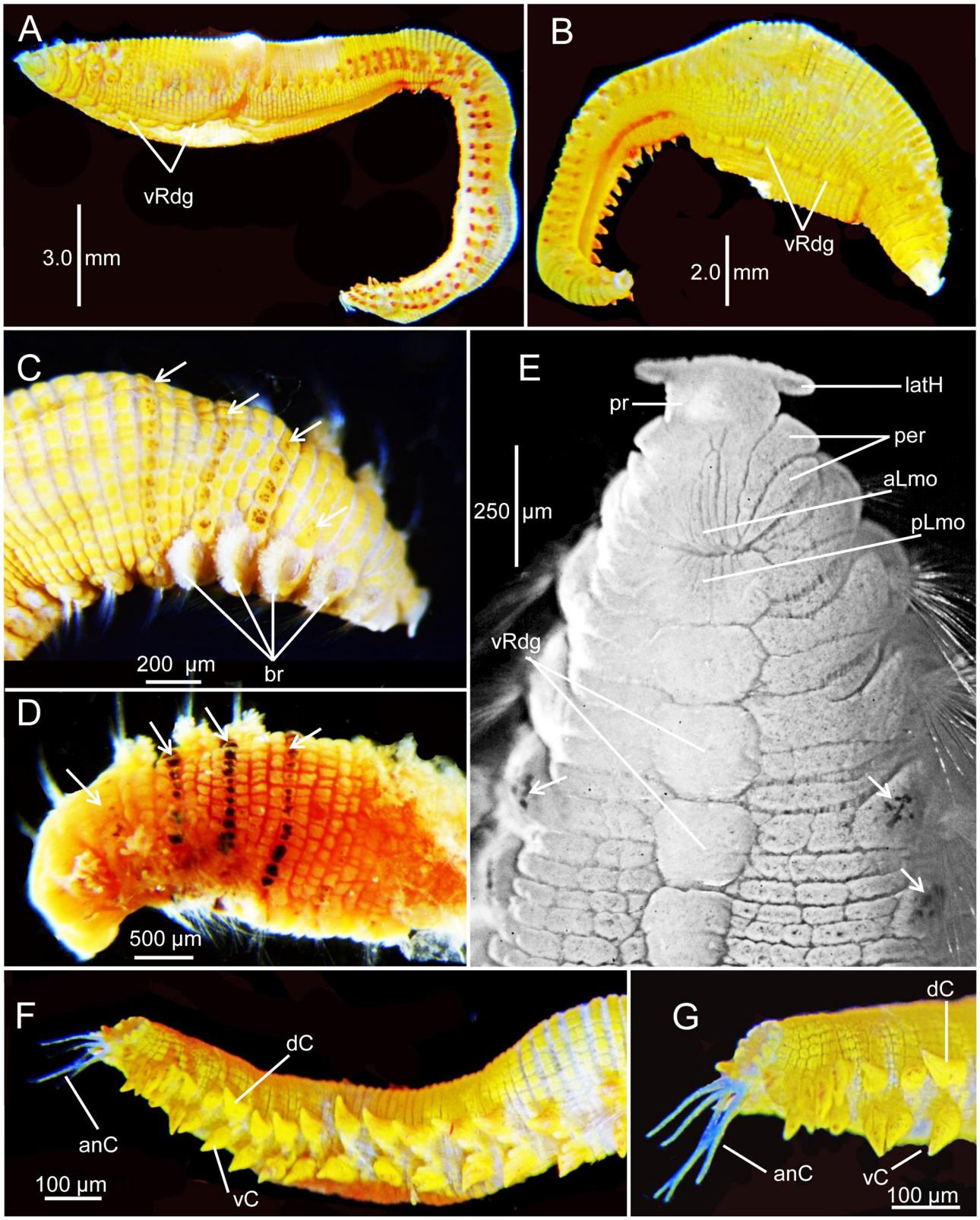

FIGURE 77. *Scalibregma brevicaudum* Verrill, 1873. A, entire worm, left lateral view; B, entire worm, right lateral view; C, anterior end, right dorsal lateral view; D, anterior end, left lateral view; E, anterior end, ventral view; F, posterior end, right lateral view; G, detail of pygidium and far posterior setigers, right lateral view. A, B, E, (USNM 1741755); C, (MCZ IZ 171960); D, holotype (YPM IZ 000205); F–G, (USNM 1741754). Arrows denote location of pads with pigmented glands.

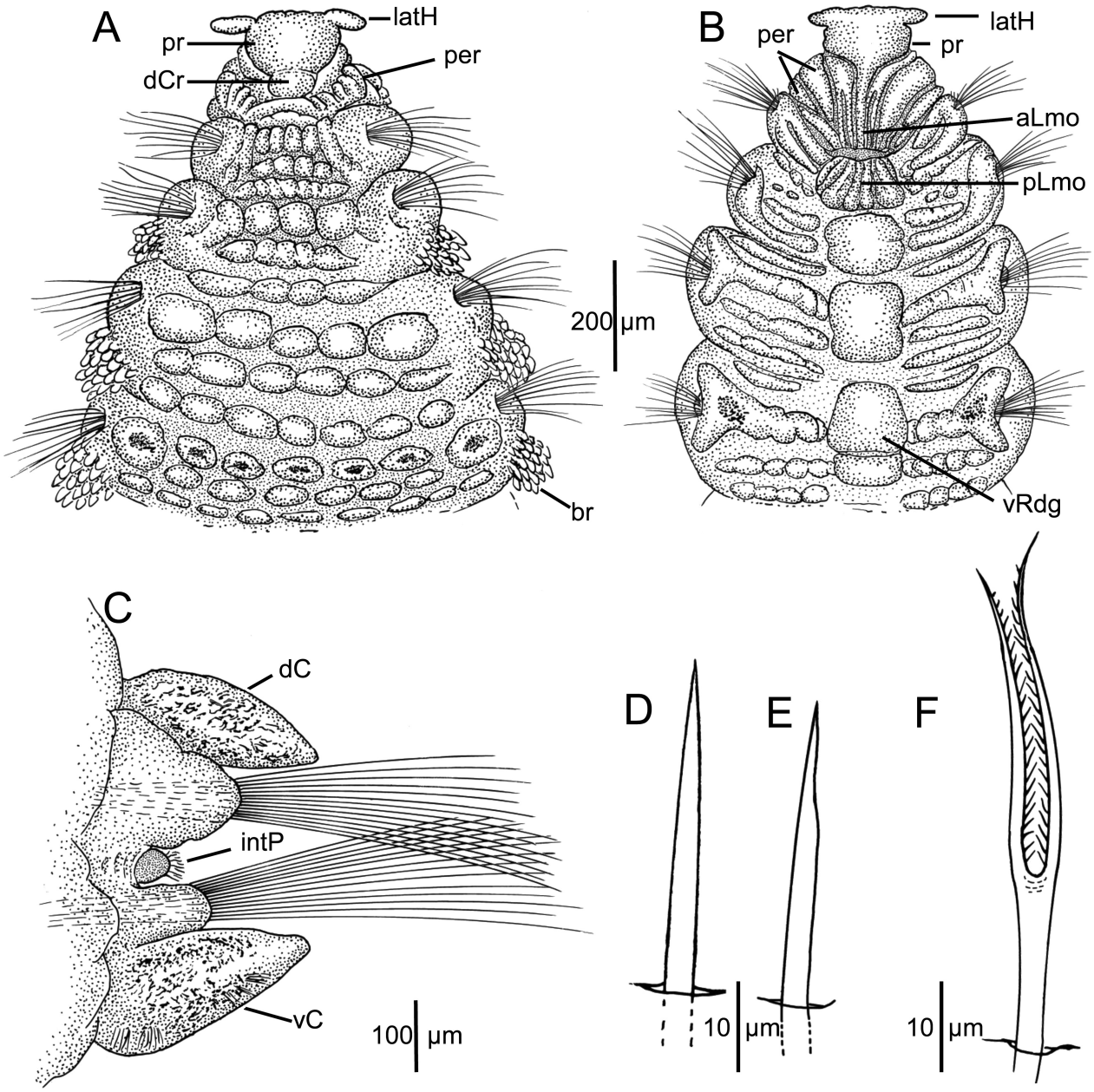

FIGURE 78. *Scalibregma brevicaudum* Verrill, 1873. A, anterior end, dorsal view; B, anterior end, ventral view; C, posterior parapodium, posterior view; D–E, short spinous setae from notopodium, setiger 1; F, furcate seta, posterior neuropodium. A–B, (USNM 1741755); C, (USNM 1741762); D–E, (USNM 1741757); F, (USNM 1741759).

Rep. 4 (3, USNM 1741768); Rep. 5 (2, USNM 1741769). **Sta. 3**, **Cruise M7**, R/V *Endeavor*, 07 Feb 1983, 40.895°N, 66.777°W, 96 m, Rep. 5 (3, USNM 1741770). **Sta. 7A**, **Cruise M7**, R/V *Endeavor*, 10 Feb 1983, 40.537°N, 67.737°W, 170 m, Rep. 6 (1, USNM 1741771). **Sta. 11**, **Cruise M3**, R/V *Endeavor*, 12 Feb 1982, 40.513°N, 68.56°W, 86 m, Rep. 1 (4, USNM 1741772); **Cruise M12**, R/V *Gyre*, 03 Jun 1984, 40.513°N, 68.562°W, 86 m, Rep. 4 (5, USNM 1741773). **Sta. 12**, **Cruise M1**, *R/V Eastward*, coll. M. Rawson, Chief Scientist, 15 Jul 1981, 40.37°′N, 68.503°W, 86 m, Rep. 3 (2, USNM 1741774). **Sta. 13**, **Cruise M1**, R/V *Eastward*, coll. M. Rawson, Chief Scientist, 07 Jul 1981, 40.492°N, 70.21°W, 86 m, Rep. 5 (1 juv, USNM 1741775); **Cruise M10**, R/V *Oceanus*, coll. G.W. Hampson, Chief Scientist, 14 Nov 1983, 40.492°N, 70.21°W, 70 m, Rep. 1 (1, USNM 1741776); **Cruise M-12**, R/V *Gyre*, 03 Jun 1984, 40.492°N, 70.21°W, 70 m, Rep. 2 (1 juv, USNM 1741777); Rep. 5 (1 juv, USNM 1741778).—**National Marine Fisheries Survey, Georges Bank**, **Cruise 22**, R/V *Gosnold*, **Sta. 1112**, 06 Aug 1963, 40.4867°N, 68.0150°W, 123 m (1 MCZ IZ 171973); **Sta. 1113**, 06 Aug 1963, 40.667°N, 68.017°W, 86 m (1, MCZ IZ 171974).—**Continental shelf off New Jersey, Liberty Excalibur Pipeline Survey**, R/V *Connecticut*, 0.05-m^2 vVG: **Sta. 35B**, 13 Aug 2008, 40.303°N, 73.775°W, 34 m (5, MCZ IZ 171975). **Sta. 39B**, 13 Aug 2008, 40.274°N, 73.711°W, 28 m (6, MCZ IZ 171976). **Sta. 43B**, 13 Aug 2008, 40.22°N, 73.685°W, 36 m (13, MCZ IZ 171977).

Sta. 45B, 12 Aug 2008, 40.193°N, 73.675°W, 38 m (6, MCZ IZ 171978).—**LEO-15 site off New Jersey, Sta. 30**, coll. R. M. Petrecca, 23 Nov 1992, 39.48°N, 74.222°W, 16 m (1, MCZ IZ 171979).—**Massachusetts Bay, MWRA Harbor & Outfall Monitoring Survey**, R/V *Aquamonitor*, 0.05-m^2 vVG, **Sta. NF 12**, Rep. 2, coll. ENSR, 07 Aug 2003, 42.39°N, 70.831°W, 35 m (3, MCZ IZ 171980). **Sta. NF 18**, Rep. 1, coll. ENSR, 06 Aug 2003, 42.3968°N, 70.8217°W, 36 m (1, MCZ IZ 171981). **Sta. NF 18**, Rep. 1, coll. ENSR, 31 Jul 2006, 42.3968°N, 70.8217°W, 36 m (1, MCZ IZ 171982). **Sta. NF 22**, Rep. 1, coll. ENSR, 7 Aug 2008, 43.45°N, 71.50°W, 30 m (2, MCZ IZ 171983). **Sta. NF 23**, Rep. 1, coll. ENSR, 01 Aug 2003, 42.398°N, 70.802°W, 36 m (1, MCZ IZ 171984). **Sta. FF-05**, Rep. 2, coll. ENSR, 30 Jul 2008, 42.133°N, 70.423°W, 65 m (1, MCZ IZ 171985). **Sta. FF 11**, Rep. 1, coll. ENSR, 14 Aug 2002, 42.658°N, 70.500°W, 88 m (1, MCZ IZ 171986).

Description. A moderately sized species, body arenicoliform, with anterior half expanded from about setigers 5–6, continuing to mid-body or about setigers 15–16, and then tapering to narrow abdominal region (Fig. 79A–B). Holotype (YPM IZ 000205) from off New Haven in Long Island Sound, mostly complete in two parts with some middle segments missing, with 25 setigers, 14 mm long, 1.6 mm wide in middle; larger specimen from Long Island Sound (MCZ IZ 171964) complete with 51 setigers, 18.5 mm long, 2.8 mm wide across expanded anterior setigers and about 1.0 mm wide across narrow posterior region; a large complete specimen with 50 setigers from Georges Bank (USNM 174756) 21 mm long, 2.8 mm wide across expanded anterior setigers and 1.2 mm wide across posterior setigers; a 48-setiger specimen from Georges Bank (USNM 1741761) 19 mm long, 3.1 mm wide across middle setigers, 1.2 mm wide across posterior setigers. Color in alcohol yellow to light orange over most of body (Fig. 77A–D, F–G). All larger specimens with one dorsal annulated row of pads each with dark red pigment glands (black on holotype, Fig. 77D) extending across setigers 3–6 on anteriormost annular ring of segment, pigment weaker on setiger 3 (Fig. 77C–D), most lateral dorsal pigment strongest and first seen in juveniles; these same specimens with a patch of dark reddish-colored glands on venter of neuropodia of setigers 4–6 (Fig. 77E) with a few continuing across one of the annular rings on same setigers, but not as prominent as on dorsal surface; similar pigmented glands evident within dorsal and ventral cirri of posterior parapodia. Small specimens and juveniles with single lateral pigment spots in same position on dorsal and ventral surfaces, but not extending as full bands across dorsum; holotype (YPM IZ 000205) collected in 1871, with glands pigmented black.

Prostomium oval-shaped, as wide as long, dorsally tapering posteriorly to short inflated crest (Fig. 78A); ventrally contributing to anterior lip of mouth (Figs. 77E, 78B); anterior margin broad, weakly crenulated, bearing two digitiform lateral horns (Figs. 77C, E, 78A–B). Peristomium with two rings; dorsally with smooth anterior ring interrupted by posterior extension of prostomium, second ring multilobed, merging with pair of transverse ridges between prostomium and setiger 1 (Fig. 78A); both rings entire ventrally, together with posterior extension of prostomium forming uniannulate anterior lip of mouth bearing up to nine elongate lobes (Figs. 77E, 78B). Mouth a transverse opening between peristomium and setiger 1; posterior lip a swelling formed of 5–6 thickened lobes extending onto setiger 2 (Figs. 77E, 78B). When everted, proboscis with several thickened lobes surrounded oral opening.

Segmental annulations prominent along body; these divided into separated elevated pads or rectangular blocks, providing areolated appearance to body surface; setigers 1–4 with three rows of elongate pads dorsally and ventrally (Figs. 77C–E, 78A–B); thereafter annular rings narrower and quadriannulate (Fig. 77A–E); rarely with a few posterior setigers pentannulate. Ventral midline from setiger 2 with large epidermal pads on each segment, becoming divided and paired from about setigers 4–6 (Figs. 77E, 78B), continuing posteriorly, producing a raised mid-ventral ridge along entire body (Fig. 77E), this recessed into groove along narrow posterior segments (Fig. 79A–B). Dense patches of arborescent or dendritically branched branchiae present on setigers 2–5 posterior to notosetae (Figs. 77C–D, 78A).

Parapodia of anterior and middle body segments to about setiger 12–14 with enlarged elongate lobes with setal fascicles emerging from a depression between them; from setigers 13–15, long and narrow podial lobes develop, from which setal fascicles emerge. Dorsal and ventral cirri first present from about setigers 15–20 or mid-body; cirri initially short, rounded, then becoming elongate and thickened by about setiger 30 (Fig. 78C), continuing to posterior end; individual cirri of posterior setigers thick, cylindrical, triangular in shape, tapering to narrow tip (Figs. 77F–G, 78C); each cirrus with numerous small internal glands; most glands consisting of groups of cells containing dark red pigment; a few striated glands also apparent, especially in ventral cirri. Interramal papillae between podia of middle and posterior setigers short, rounded, and ciliated (Fig. 78C).

All setigers with noto- and neuropodia with dense fascicles of slender capillaries, setae in anterior fascicles more numerous, arranged into 3–5 rows, with posterior row longest; setae of middle and posterior setigers arranged in 1–2 rows; all capillaries with numerous short inconspicuous fibrils or bristles along their length. Setigers 1–2 with additional anterior row of 4–6 short, slender, pointed spinous setae at base of first row of short capillaries in both noto- and neuropodia; spines of noto- and neuropodia both narrow, tapering to pointed tip (Fig. 78D–E). Setigers 3 and following with furcate setae in same anterior position as short spines of setiger 1; each furcate seta with sub-equal tynes tapering to fine tips and with numerous denticles inner margins directed toward opposite tyne (Fig. 78F).

Pygidium with anal opening surrounded by a ring of short lobes; with five long, narrow anal cirri present, one mid-ventral and two ventrolateral on either side (Fig. 77F–G).

Remarks. The original description of *Scalibregma brevicauda* from low water in Long Island Sound included the following statement: "…*each of these* (anterior four branchiate) *segments* (2–5) *has a dorsal transverse row of rather large and conspicuous blackish granules on its posterior margin, and also a black spot on the sides below* (ventral) *the branchiae*" (Verrill 1873 p. 605). This feature is present to some degree on nearly all specimens of *Scalibregma* examined from shallow-water sites from New England to New Jersey. Several of these sites, including the type locality in Long Island Sound, have been extensively sampled as part of benthic monitoring programs and numerous specimens are available. Initially, these specimens were believed to be an undescribed species. However, Dr. Nancy Maciolek called my attention to Verrill's species and this led to a review of the original description. Following a subsequent examination of Verrill's original specimen archived at the Yale Peabody Museum of Natural History (YPM IZ 0000205) it became evident it is the same species as the newly collected specimens. After 151 years, Verrill's specimen, although broken in two parts and with some middle segments missing, is in remarkably good condition (Fig. 77D) and is here considered the holotype of *Scalibregma brevicaudum*. Mr. Eric Lazo-Wasem, Senior Curator at the Yale Peabody Museum, confirm that Verrill based his description on this specimen and that it is therefore the holotype.

Scalibregma brevicaudum can be immediately recognized locally by the dorsal pigmented annular rings on setigers 3–6; the pigmented rings are the first of three or four on each segment. The internal glands of these rings are stained red or green depending on whether Rose Bengal or Methyl Green was used during the sorting or identification process. On Verrill's holotype (YPM IZ 0000205), collected in May 1871, these pigmented glands are black, which may reflect the use of an alcoholic preservative, common in those days. The neuropodia of setigers 4–6 also have a patch of stained glands, these may also continue across the venter on one of the annular rings, interrupted by the mid-ventral ridge, but they are not as conspicuous as those on the dorsum. These glandular bands are also visible when unstained, appearing as dark inclusions against the typical yellow-orange base color of the annular rings. Some specimens, especially small ones or juveniles, may have partial segmental pigment bands, but the neuropodial patches on setigers 4–6 are always present. Another distinctive feature of *S. brevicaudum* is the nature of the uniannulate anterior lip of the mouth, where up to nine elongate peristomial lobes and grooves extend from the posterior margin of the prostomium to the oral opening. The posterior lip, consisting of 4–6 thick lobes, is thickened and swollen.

Similar pigmented dorsal annular rings on setigers 3–6 also occur on *Scalibregma australis* Blake, 2015, a widespread Antarctic species, and *S. hanseni* Bakken *et al*., 2014 from deep-water Arctic and subarctic sites in the Norwegian Sea and off Greenland. However, *S. hanseni* differs from both *S. australis* and *S. brevicaudum* in having branchiae on setigers 3–5 instead of 2–5. *Scalibregma australis* differs from *S. brevicaudum* in having furcate setae from setiger 2 instead of 3 and a different oral morphology with both the anterior and posterior lips biannulate with two sets of lobes, whereas *S. brevicaudum* has both lips uniannulate.

Biology. *Scalibregma brevicaudum* is a widespread subtidal continental shelf species ranging from New England to New Jersey. While relatively common on Georges Bank and nearshore embayments, this species did not reach densities sufficient to be a dominant species in any benthic communities sampled. It appears to prefer mixed sediments with relatively high sand content such as found at Sta. 5-1 on Georges Bank, where grain size averaged 93% sand over 12 seasonal sampling surveys (1981–1984) and the CSDS and NLDS sites in Long Island Sound, which had 77–83% and 37–66% sand content, respectively, summed from surveys in February and July 2000. These totals include coarse to fine-grained sand, but not gravel-sized particles.

Etymology. Although Verrill (1873) did not provide an etymology for the name, it appears to be from *brevicaude*, Latin for short tail. This name likely refers to the short narrow posterior end that follows the expanded anterior segments.

Distribution. Western North Atlantic Ocean, widespread along nearshore and shallow shelf depths off New England, including Georges Bank, 55–152 m; off New Jersey, 16–38 m; Long Island Sound, 7–52 m; Massachusetts Bay, 36–88 m.

Scalibregma californicum Blake, 2000 Restricted

Scalibregma californicum Blake, 2000, 133–135, Fig. 6.1; Blake & Ruff 2007, 386. (In part).

Material examined. (*4 specimens*) **California, Santa Maria Basin, off Point Sal, MMS, Phase II Monitoring Program,** coll. J.A. Blake, **Sta. R-8**, BC, Cruise 2-3, M/V *Aloha*, Oct. 1987, 34.922ºN, 120.765ºW, Rep. 2 , 90 m **holotype** (USNM 186437); **paratype** (USNM 186438). **Western Santa Barbara Channel, MMS Phase I Reconnaissance**, coll. A. Lissner, R/V *Swan*, BC, **Sta. 85**, 04 Nov 1983, 34.431ºN, 120.272ºW, 113 m, **paratype** (USNM 186436); **Sta. 94**, 06 N0v 1983, 34.409ºN, 120.091ºW, 96 m, **paratype** (SBMNH 345447).

Description. (condensed from Blake 2000) Body elongate, arenicoliform, expanded in anterior half from about setiger 4 to about setigers 13–15, thereafter tapering, becoming narrow posteriorly. Holotype (USNM 186437) 17 mm long, 2 mm wide anteriorly, for 52 setigers; paratype (USNM 186438) larger, 20.5 mm long, 4.2 mm wide for 54 setigers. Body surface covered with numerous annulated rings; most annulations formed of separate elevated pads or blocks. Body pigmented yellow-orange with some darkly pigmented glands near parapodia of anterior setigers on dorsal and ventral surfaces; additional dark pigment on dorsal and ventral cirri.

Prostomium T-shaped, with lateral horns directed anteriorly at about a 30-degree angle; posterior margin

of prostomium entire, without crest; eyespots absent. Peristomium with two dorsal rings and three ventral rings encompassing mouth ventrally. Mouth surrounded by broad lateral lips extending from prostomium; anterior lip, small narrow; posterior lip wider with 4–5 lobes; proboscis a smooth sac.

Setigers 1–4 triannulate, then quadriannulate with some posterior segments pentannulate. Each annulation elevated, with those from setiger 4 divided into separated elevated pads or blocked partitions, providing complex areolated appearance to body surface. Ventral midline from setiger 2 with deep groove containing row of large epidermal pads forming mid-ventral ridge along entire ventral surface; these ventral pads bulbous, rectangular, becoming smaller and double from about setigers 6–7. Arborescent branched branchiae present on setigers 2–5. Parapodia reduced to inconspicuous setal tori; from about setigers 17–20 podial lobes becoming larger and with dorsal and ventral cirri developing; cirri initially low, rounded, becoming larger, triangular by about setiger 30, continuing to posterior end. Dorsal cirri triangular, ventral cirri oval. Interramal papillae small, inconspicuous, from setiger 1.

All setigers with noto- and neuropodial fascicles of slender capillaries, with setae of anterior fascicles more numerous, arranged into at least three rows, setae of posterior row long and spreading fascicles; more posteriorly, setal rows not distinct, setae fewer. Setiger 1 with additional row of 10–12 very short, slender, inconspicuous, pointed spines. Setigers 2 and following with 10–11 furcate setae in same anterior position as short spines of setiger 1; each furcate seta with nearly equal tynes having numerous bristles on interior margin. Pygidium with anal opening surrounded by numerous lobes; with five long, thin anal cirri arising from ventral-most lobes.

Remarks. When *Scalibregma californicum* was first described (Blake 2000), species of the genus were poorly known and most accounts globally referred local specimens to the then-presumed cosmopolitan type species *S. inflatum*. Following the redescription of *S. inflatum* by Mackie (1991), it became feasible to compare characters of local specimens with those of the type species. The original account of *S. californicum* was based on material from the continental shelf off Central California (Santa Maria Basin and Western Santa Barbara Channel). As part of that study, Blake (2000) also referred some specimens from offshore northern California to the same species. In the present study, *S. californicum* is restricted to shallow shelf depths and the deep-water specimens are here referred to another species, *S. hadrostomium* **sp. nov.** (California, bathyal to abyssal depths). Further, five additional species, *S. aggregatum* **sp. nov.** and *S. velatum* **sp. nov.** (central and northern California shelf depths), *S. antennatum* **sp. nov.** (California, bathyal depths), *S. ridleyensis* **sp. nov.** (western Canada and SW Alaska, nearshore sediments (< 30 m), and *S. sahlingi* **sp. nov.** (off Oregon, bathyal depths) have been discovered and reported herein. Thus seven species ranging from nearshore subtidal depths to bathyal and abyssal depths are now known from the eastern North Pacific. However, the numbers of specimens available for most of these species is generally low especially for the deep-water taxa and it is likely that additional species will be discovered.

Distribution. Continental shelf depths off central California, 90–113 m.

Scalibregma chilensis new species

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Figure 79

Scalibregma inflatum: Hartmann-Schröder 1965: 230–231. **Not** Rathke, 1843.

Material examined. (*5 specimens*) **SE Pacific Ocean, Chile, coll. Lund University Chile Expedition (1948–1949)**: **Seno Reloncavi**, **Sta. M4A**, 11 Nov 1948, Puerto Montt, N of light buoy, NE of Isla Tengo, triangular dredge, coarse grey sand and gravel, 41.482°S, 72.957°W, 13–16 m, **holotype** (SMNH type-9918). **Sta. M16B**, 04 Dec 1948, Piedra Azul, NW of Punta Quillaipe, triangular dredge, sand, 41.525°S, 72.804°W, 40 m (1 juv, SMNH 225283). **Sta. M40A**, 23 Jan 1949, N of Isla Quellin, triangular dredge, gravel on hard sand, 41.85°S, 72.917°W, 100 m, 1 small **paratype** (SMNH type-9919). **Sta. M145A**, coll. 16 Jul 1949, Bahia Chineui, triangular dredge, fine sand with gravel, 41.533°S, 72.025°W, 70–80 m (1, SMNH 225284).—**Golfo de Aneud, Sta. M46A**, 25 Jan 1949, Canal Caicaen, W. of Calbuco, circular dredge, coarse sand, with boulders, 41.771°S, 73.15°W, 13 m, 1 **paratype** in 2 parts (SMNH type-9920).

Description. A small species, all specimens incomplete, body arenicoliform, only weakly expanded. Holotype largest specimen, with 17 setigers, 8.4 mm long, 2.5 mm wide across setiger 6, gradually narrowing posteriorly, 1.2 mm wide across setiger 17; far posterior setigers missing. Color in alcohol dark brown, likely due to more than 70 years in alcohol; apart from dark internal glands in dorsal and ventral cirri, no additional body pigment observed; if any present, likely obscured by dark color of body.

Prostomium Y-shaped, dorsally tapering to narrow posterior end merging with peristomium (Fig. 79A); with broad crenulated anterior margin bearing a pair of lateral horns projecting forward at about a 30-degree angle (Fig. 79A–B); each horn tapering to narrow rounded tip; ventrally encompassed by peristomium and oral morphology (Fig. 79B); eyespots absent; nuchal organs contained in broad space between prostomium and peristomium dorsally, but not emergent on any specimen. Peristomium large, encompassing most of pre-setiger region; dorsally with anterior ring consisting of 3–4 lobes lateral to prostomium and a pair of transverse elongate lobes posterior to prostomium (Fig. 79A). Oral morphology complex, with mouth encompassed by enlarged anterior and posterior lips formed by ventral peristomium and setiger 1 (Fig. 79B). Anterior lip with up to four groups (quadriannulate) of transverse irregular lobes or raised plates; first two rows

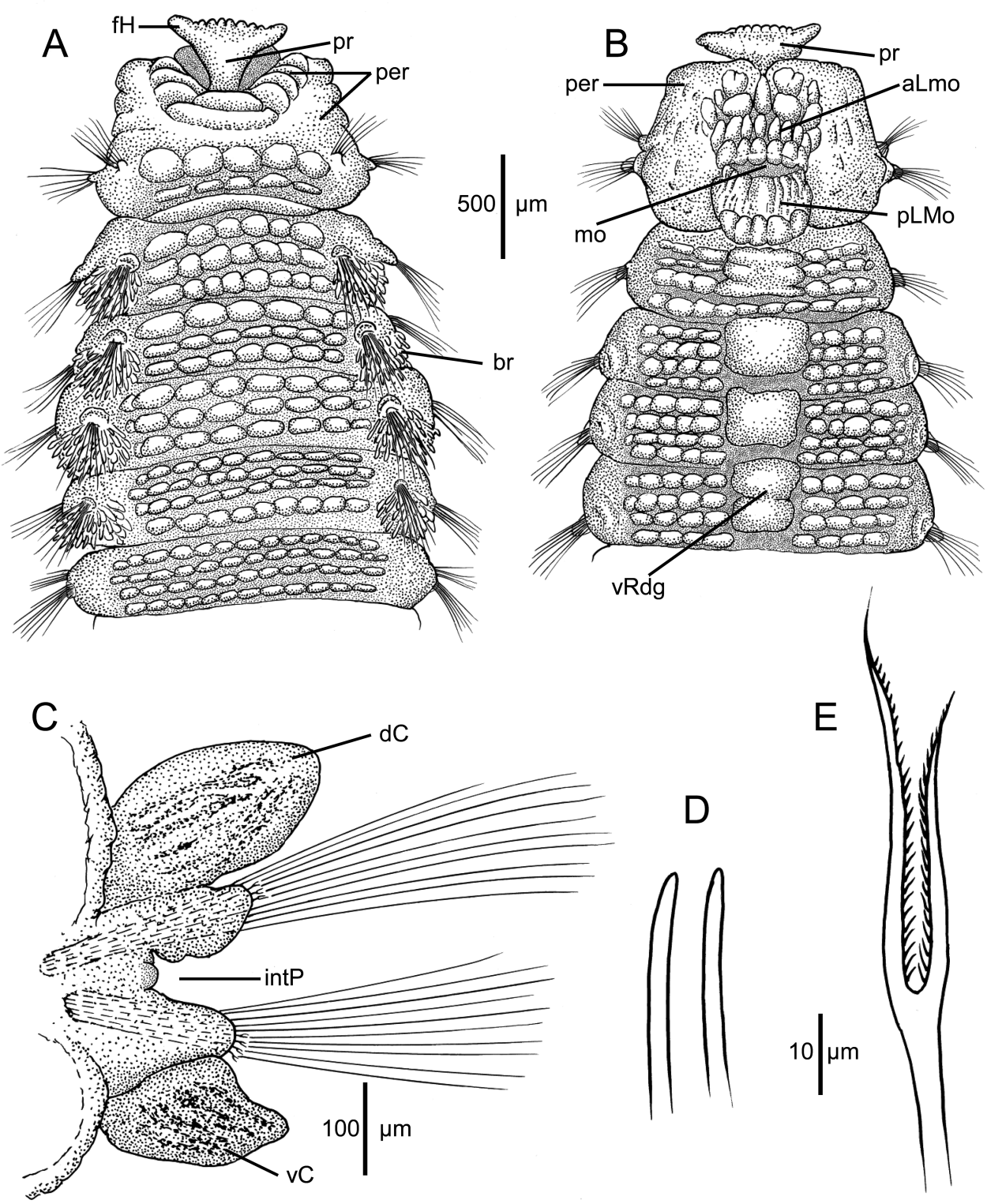

FIGURE 79. *Scalibregma chilensis* **sp. nov.** A, anterior end, dorsal view; B, anterior end, ventral view; C, posterior parapodium, anterior view; D, short spinous setae from notopodia of setiger 1; E, furcate seta from neuropodium, posterior setiger. A–B, C, holotype (SMNH type-9918); D–E, paratype (SMNH type-9919).

immediately anterior to mouth opening with 6–8 smaller elongate lobes of which posteriormost row recessed into mouth; anterior to these are 8–10 irregularly sized lobes or raised blocks positioned posterior to prostomium; posterior lip thickened, consisting of about ten elongate lobes followed by posterior row of 5–6 shorter rounded lobes (Fig. 79B); mouth a narrow transverse slit. Proboscis not observed on any specimen.

Segmental annulations prominent along body; these divided into separated elevated pads or rectangular blocks. Dorsally, setigers 1–4 triannulate; setiger 1 with two rows of pads and third row a single raised ridge (Fig. 79A);

setigers 2–4 each with three transverse rows of pads; setigers 5 and following quadriannulate with four narrow rows of numerous small pads (Fig. 79A). Ventrally, setiger 1 dominated by intricate folds forming the anterior and posterior lips (Fig. 79B); setiger 2 and following each quadriannulate with four transverse rows of small, raised pads; these rows interrupted mid-ventrally by large medial pads that continue along the body forming a distinct mid-ventral ridge (Fig. 79B); this ridge recessed into a groove in posterior setigers. Branched branchiae present on setigers 2–5 posterior to notosetae (Fig. 79A); branchiae with unusually elongate filaments, these appearing to arise from a common trunk or branch rather than as continually branched short filaments typical of most scalibregmatids (Blake 2020).

Parapodia of anterior and middle body segments to about setiger 12 with short, thick podial lobes and a pre-setal lobe with setal fascicles emerging between them; from there, podial lobes becoming longer, narrow, with emerging setal fascicles; dorsal and ventral cirri first present from setigers 14 on holotype. Cirri initially short, rounded, then becoming elongate and thickened by about setiger 16–17, continuing to posterior end; dorsal cirri larger than ventral cirri, each cirrus thick, cylindrical, triangular in shape, tapering to narrow rounded tip (Fig. 70C); each with numerous elongate tubular glands. Interramal papillae short, rounded, ciliated, between podia of middle and posterior setigers (Fig. 79C).

All setigers with fascicles of slender capillaries in both noto- and neuropodia, setae in anterior fascicles more numerous, arranged in 2–3 rows, setae of posterior row longest; capillaries of middle and posterior setigers arranged in 1–2 rows; all capillaries with numerous short inconspicuous fibrils or bristles along their length. Setiger 1 with additional anterior row of 4–5 short, slender, spinous setae at base of first row of capillaries in both noto- and neuropodia; these spinous setae narrow, tapering to narrow rounded tip (Fig. 79D). Setigers 2 and following with furcate setae in same anterior position as short spines of setiger 1; each furcate seta with sub-equal tynes tapering to fine tips and with numerous denticles on inner margins directed toward opposite tyne (Fig. 79E).

Pygidium not observed.

Remarks. Details of benthic sample collection data and hydrographic data from the Lund University Chile Expedition was reported by Brattström & Dahl (1951). Specimens of this species were also collected and identified by Hartmann-Schroder (1965) as *Scalibregma inflatum*.

Scalibregma chilensis **sp. nov.** differs from other species by having a complex oral morphology that consists of a quadriannulate anterior lip consisting of four groups of pads or lobes and a thickened biannulate posterior lip. In addition, the anterior border of the prostomium is crenulated with a row of short lobes and the peristomium is a multilobed ring with a pair of transverse elongate lobes medial and posterior to prostomium. The only other species with a modified anterior border to the prostomium are *S. cornutum* **sp. nov.** from deep water off SW Africa and *S. beaufortensis* **sp. nov.** from shallow water in the Alaskan Arctic. However, *S. cornutus* **sp. nov.** has three large thickened blocks on the prostomial margin together with similarly thickened lateral horns that curve slightly posteriorly (see below). *Scalibregma beaufortensis* **sp. nov.** has a short, thickened prostomium bearing short, rounded lateral horns or lobes and a transverse dorsal crest at the posterior margin; in addition, short lateral horns curve somewhat posteriorly and are wider than long. Also, *S. beaufortensis* **sp. nov.** has a well-defined biannulate anterior lip of the mouth with two rows of elongate lobes, whereas *S. chilensis* **sp. nov.** has a quadriannulate anterior lip with up to four groups of transverse irregular lobes or raised plates.

Etymology. The species is named for its location in Chile.

Distribution. Southeastern Pacific Ocean, Chile, coastal embayments, 13–100 m.

Scalibregma cornutum new species

urn:lsid:zoobank.org:act:3B7CC491-2313-43EA-9D15-8264473D0FB8

Figures 80–81

Material examined. **Indian Ocean, off SE Africa, Mozambique Channel, between Mozambique and Madagascar,** International Indian Ocean Expedition, R/V *Anton Bruun*, **Cruise 7, Sta. 368 C**, 16 Aug 1964, Menzies trawl, 23.00°S, 38.633°E, 2995 m, ooze & manganese nodules, **holotype** (LACM-AHF Poly 13570).

Description. A large species, holotype complete in two parts, with 50 setigers; 25 mm long, 2.0 mm wide across anterior region (pre-setigers and 1–5), about 9 mm wide across expanded setigers 6–10, and 0.8 wide across far posterior setigers. Body with prominent annular rings with rows of raised pads along entire body. Color in alcohol: yellow to light orange with no other pigmentation.

Prostomium V-shaped, narrow, longer than wide; with distinct dorsal medial groove extending anterior to posterior and transverse groove in anterior one-third forming a cross and dividing dorsal surface of the prostomium into four parts (Figs. 80A, 81A); medial groove opening posteriorly into notch then merging with peristomium; anterior margin bearing three large square-shaped blocks medial to a pair of thickened lateral horns (Figs. 80A, 81A); ventral prostomial morphology obscured by everted proboscis. Dorsally a large gap in groove between prostomium and peristomium believed to contain nuchal organs; these not everted (Fig. 81A). Peristomium with single multilobed ring encircling prostomium dorsally (Figs. 80A, 81A); ventrally surrounding oral morphology. Majority of oral morphology obscured by everted proboscis, but large swollen posterior lip of mouth clearly evident at level of setiger 1 (Fig. 80B). Proboscis large, rounded, papillated (Fig. 80B).

Segmental annulations prominent, with elevated or square-shaped pads or blocks providing rough appearance to body surface; dorsally, setiger 1 with three rows between parapodia (Fig. 80A); from setiger 2 all segments quadriannulate with narrow rows of annulated

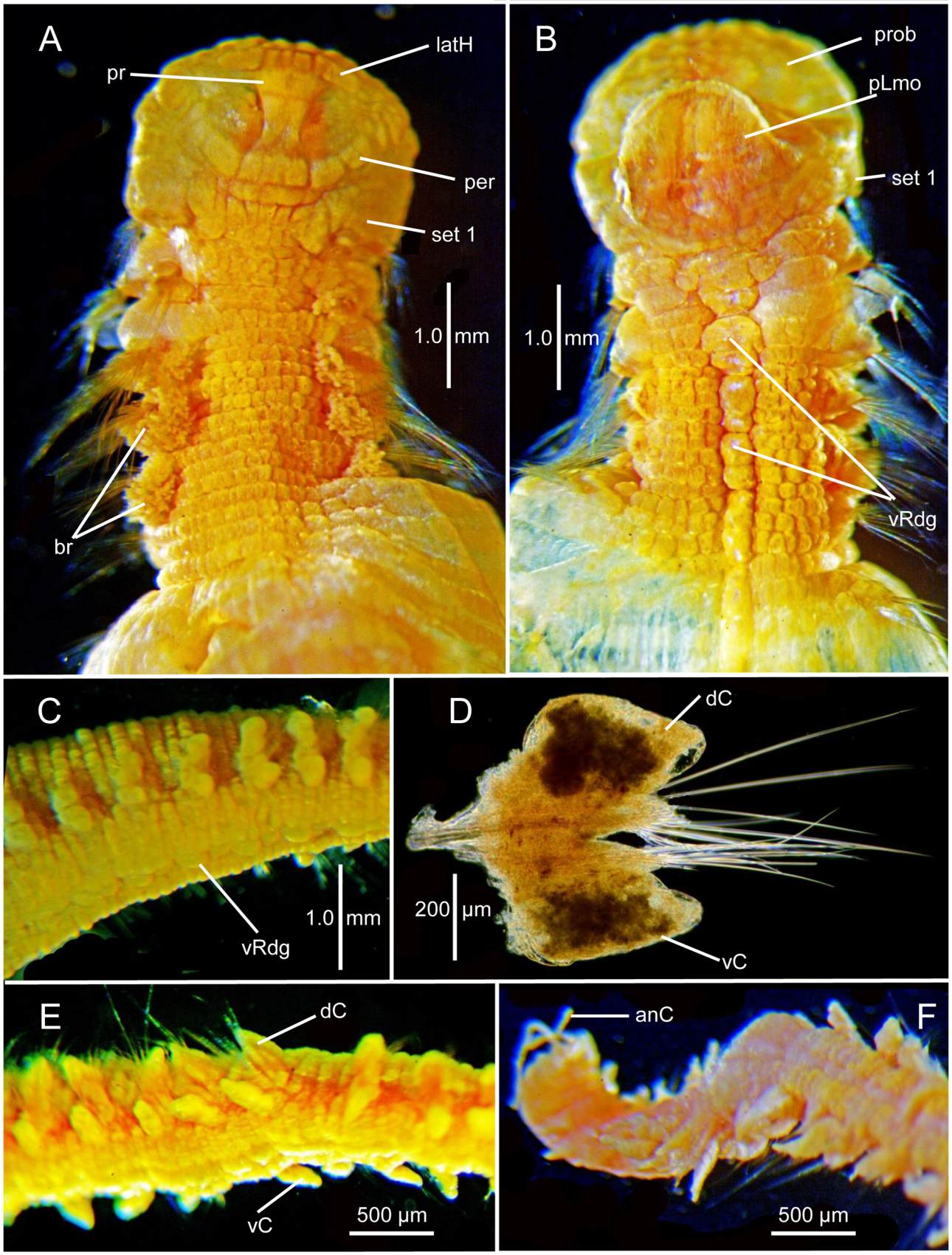

FIGURE 80. *Scalibregma cornutum* **sp. nov.** Holotype (LACM-AHF Poly 13570): A, anterior end, dorsal view; B, anterior end, ventral view; C, posterior parapodia, left lateral view; D, far posterior parapodium, anterior view; E, far posterior setigers, right lateral view; F, far posterior setigers and pygidium with anal cirri, right lateral view. All stained with Shirlastain A.

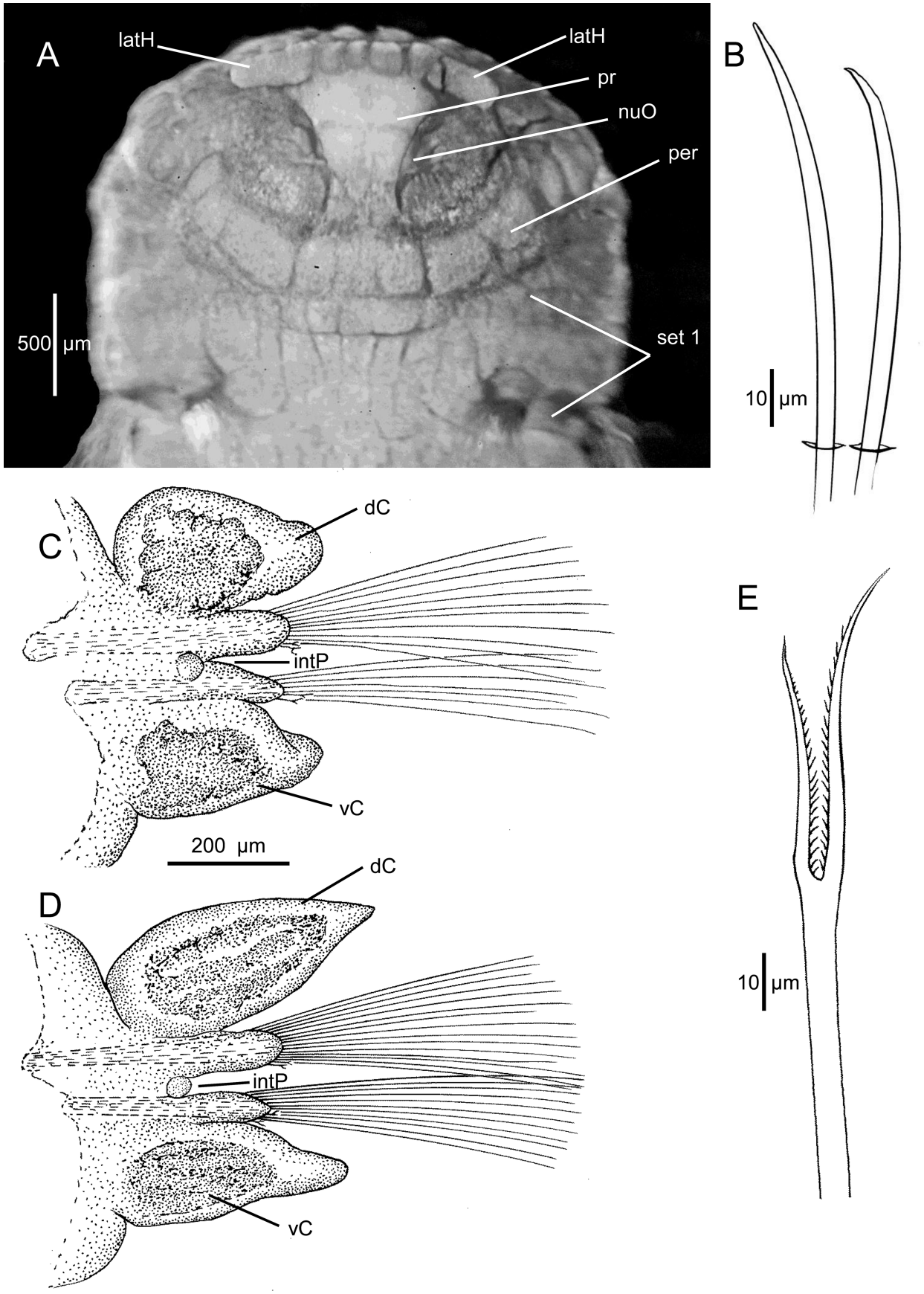

FIGURE 81. *Scalibregma cornutum* **sp. nov.** Holotype (LACM-AHF Poly 13570): A, pre-setiger region, dorsal view; B, short spinous setae, notopodium, setiger 1; C, parapodium, setiger 23, anterior view; D, parapodium, setiger 34, anterior view; E, furcate seta from posterior neuropodium.

rings (Figs. 80A, 81A); ventrally, setiger 1 obscured by everted proboscis; setigers 2–3 triannulate, with three thickened rows of elongate pads (Fig. 80B); setiger 4 and remaining setigers quadriannulate (Fig. 80B). Ventral midline from setiger 2 with pair of large epidermal pads on each segment, largest, merged on setigers 2–3, then divided and paired from setigers 4–6 (Fig. 80B–C). Branchiae on setigers 2–5 posterior to notosetae, these dense, arborescent, dendritically branched (Fig. 80A–B).

Parapodia of anterior segments reduced to thickened lobes with setal fascicles emerging from depression; dorsal and ventral cirri first evident from setigers 13–15 as thick, rounded lobes, gradually becoming longer and more prominent with distinct swollen triangular shape by about setiger 20, with dark internal glands (Figs. 80D, 81C); cirri becoming longer, more pointed, triangular in shape from about setiger 30 to end (Figs. 80E; 81D). Internal glands of cirri consisting of darkly pigmented cells, with no tubules or otherwise distinct structure (Figs. 80D, 81C–D). Interramal papillae short, rounded, located between podia (Fig. 81C–D), first evident from about setiger 20.

All setigers with fascicles of slender capillaries in both noto- and neuropodia; setae in fascicles of anterior setigers more numerous, with separate rows not readily apparent; capillaries of middle and posterior setigers arranged in 1–2 rows; all capillaries smooth in appearance, fibrils or bristles not evident along their length. Setiger 1 with numerous short, slender, spinous setae at base of anterior capillaries in both noto- and neuropodia; these curved, tapering to pointed tip, some hooked (Fig. 81B). Setigers 2 and following with 6–8 furcate setae in noto- and neuropodia in same anterior position as short spines of setiger 1; each furcate seta with one long tyne and one shorter tyne, both tapering to fine tips and with numerous denticles along inner margins directed toward opposite tyne (Fig. 81E).

Pygidium with three intact anal cirri (Fig. 80F), but stubs of missing cirri indicate that six anal cirri characterize this species, with three on either side of anal opening.

Remarks. Prior to the present study, no species of *Scalibregma* had ever been reported from abyssal depths (~3000 m or greater). In the present study three species are reported from abyssal depths: *S. cornutum* **sp. nov.** from the Mozambique Channel of SW Africa, *S. hadrostomium* **sp. nov.** from off northern California, and *S. profundum* **sp. nov.** from the Peru-Chile Trench.

Scalibregma cornutum **sp. nov.** differs from all known species of *Scalibregma* and other scalibregmatids in the nature of the anterior margin of the prostomium where three distinct medial blocks form a line across the anterior margin of the prostomium and continue as two prominent elongate laterally directed horns. In addition, the dorsal surface of the prostomium itself is partitioned by longitudinal and lateral grooves into four separate parts. The two posterior parts appear to be further subdivided and merge with the peristomium. In addition, six anal cirri have been recorded in only two other species of the genus, *S. rhoadsi* **sp. nov.** from off the SE USA in slope depths and *S. lydoniensis* **sp. nov.** from Lydonia Canyon off New England and Georges Bank. *Scalibregma profundum* **sp. nov.** also has a modified anterior prostomial margin, but with 6–7 short lobes instead of larger blocks; in addition, *S. profundum* **sp. nov.** has a unique two-part dorsal crest on the posterior extension of the prostomium. See also comments for *S. profundum* **sp. nov.** (below).

Etymology. The epithet is from the Latin *cornus*, for horn in reference to the distinctive laterally directed horns on the anterior margin of prostomium for this species.

Distribution. Indian Ocean, off SE Africa, Mozambique Channel, 2995 m.

Scalibregma fimbriatum new species

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Figures 82–83

Sclerobregma nr *stenocerum*: Maciolek *et al*. 1987b: D-4, G-3, G-11 (in part). **Not** Bertelsen & Weston, 1980.

Material examined. (*284 specimens*). **Western North Atlantic Ocean, off New England, Lydonia Canyon, southern flank of Georges Bank, U.S. North ACSAR Program,** coll. G.W. Hampson, Chief Scientist: **Sta. 7**, **Cruise NA-3**, R/V *Oceanus*, Rep. 1, 06 Jul 1985, BC, 40.458ºN, 67.671ºW, 556 m**, holotype** (USNM 1741779), 1 **paratype** (USNM 1741780); Rep. 3, 07 Jul 1985, BC, 40.458ºN, 67.670ºW, 560 m, 2 **paratypes** (USNM 1741781). **Non-type material** (mostly juveniles & postlarvae**). Sta. 7**, **Lydonia Canyon, Cruise NA-1**, R/V *Cape Hatteras*, 10 Nov 1984, Rep. 2, BC, 40.458ºN, 67.672ºW, 560 m (1, USNM 1741782); Rep. 3, BC, 40.459ºN, 67.673ºW, 560 m (14, USNM 1741783). **Cruise NA-2**, R/V *Oceanus*, 28 Apr 1985, BC, Rep. 1, 40.458ºN, 67.671ºW, 560m (1, USNM 1741784); Rep. 2, 40.458ºN, 67.670ºW, 560 m (3, USNM 1741785). **Cruise NA-3**, R/V *Oceanus*, 06 Jul 1985, BC, Rep. 1, 40.458ºN, 67.671ºW, 556 m (4, USNM 1741786); Rep. 2, 40.458ºN, 67.670ºW, 555 m (1, USNM 1741787).—**Continental slope, adjacent to Lydonia Canyon. Sta. 4**, **Cruise NA-1**, R/V *Cape Hatteras*, 04 Nov 1984, BC, Rep. 1, 40.354ºN, 67.539ºW, 565 m (7, USNM 1741788); Rep. 2, 40.354ºN, 67.539ºW, 572 m (13, USNM 1741789); Rep. 3, 40.354ºN, 67.539ºW, 530 m (19, USNM 1741790). **Cruise NA-2**, R/V *Oceanus*, 28 Apr 1985, BC, Rep. 1, 40.352ºN, 67.537ºW, 590 m (7, USNM 1741791); Rep. 2, 40.353ºN, 67.536ºW, 540 m (28, USNM 1741792); Rep. 3, 40.353ºN, 67.536ºW, 539 m (19, USNM 1741793). **Cruise NA-3**, R/V *Oceanus*, 06 Jul 1985, BC, Rep. 1, 40.353ºN, 67.536ºW, 540 m (7, USNM 1741794); Rep. 2, 40.353ºN, 67.536ºW, 560 m (18, USNM 1741795); Rep. 3, 40.353ºN, 67.536ºW, 545 m (21, USNM 1741796).—**Continental slope off Cape Cod, southeast of Lydonia Canyon. Sta. 12**, **Cruise NA-1**, R/V *Cape Hatteras*, 15 Nov 1984, BC, Rep. 1, 39.905ºN, 70.918ºW, 563 m (12, USNM 1741797); Rep. 2, 39.906ºN, 70.906ºW, 558 m (11, USNM 1741798); Rep. 3, 39.906ºN, 70.9196ºW, 553 m (11, USNM 1741799). **Cruise NA-2**, R/V *Oceanus*, 04 May 1985, BC, Rep. 2, 39.904ºN, 70.918ºW, 555 m

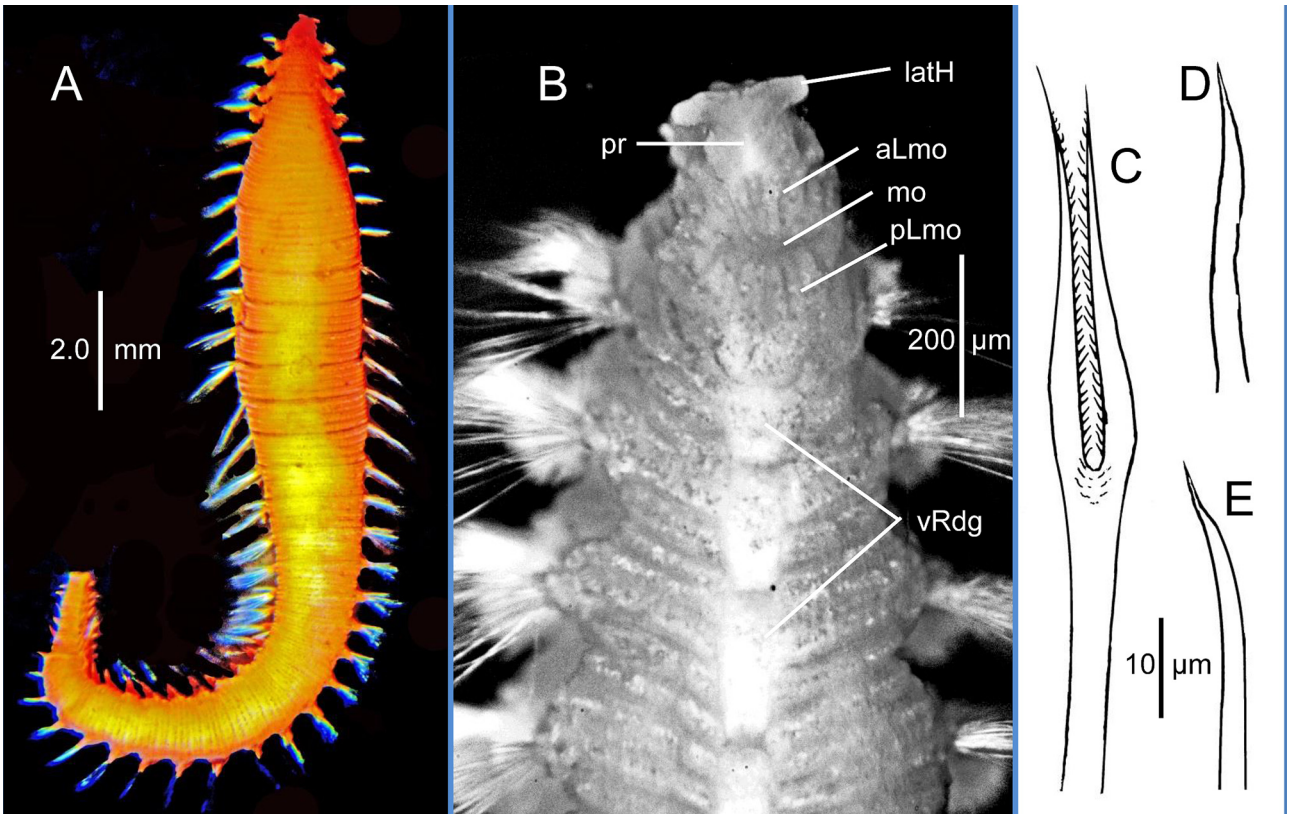

FIGURE 82. *Scalibregma fimbriatum* **sp. nov.** Holotype (USNM 1741779): A, entire worm, dorsal view; B, anterior end, ventral view; C, furcate seta from posterior neuropodium; D–E, short spinous setae anterior to capillaries, notopodia, setiger 1. A, stained with Shirlastain A.

(8, USNM 1741800); Rep. 3, 39.904ºN, 70.917ºW, 554 m (12, USNM 1741801). **Cruise NA-4**, R/V *Gyre*, 30 Nov 1985, BC, Rep. 1, 39.905ºN, 70.926ºW, 560 m (12, USNM 1741802). **Cruise NA-5**, R/V *Cape Hatteras*, 06 May 1986, BC, Rep. 1, 39.903ºN, 70.920ºW, 560 m (11, USNM 1741803); Rep. 2, 39.905ºN, 70.9195ºW, 548 m, (18, USNM 1741804); Rep. 3, 39.905ºN, 70.918ºW, 552 m (1, USNM 1741805). **Cruise NA-6**, R/V *Cape Hatteras*, 30 Jul 1986, BC, Rep. 1, 39.904ºN, 70.917ºW, 563 m (12, USNM 1741806); Rep. 2, 39.904ºN, 70.918ºW, 559 m (8, USNM 1741807); Rep. 3, 39.904ºN, 70.918ºW, 563 m (2, USNM 1741808).

Description. A moderately sized species, body elongate, arenicoliform, holotype (USNM 1741779) only weakly expanded in first third of body until setiger 14, then narrowing posteriorly (Fig. 82A); smaller paratype (USNM 1741780) not expanded anywhere along body. Holotype complete, with 40 setigers, 20 mm long, 1.0 mm wide across setiger 3, 2.0 mm wide across setiger 10 in expanded section, and 1.2 mm wide posteriorly; paratype (USNM 1741781) incomplete with 28 setigers, 9 mm long, 1.0–1.2 mm wide along available segments. Setiger 1 with two annular rings evident on dorsum (Fig. 83A), absent on venter (Fig. 83B); rest of body with annular rings on both dorsum and venter continuing along entire body; setiger 2 with three rings on dorsum (Fig. 83A) and two partial rings on venter, interrupted by oral swelling (Fig. 83B); setiger 3 and following with four annular rings (Figs. 82B, 83A); reduced to 1–3 rings in pre-pygidial segments. Venter from setiger 3 to end of body with annular rings interrupted by medial ridge composed of large elongate blocks (Fig. 83B). Color in alcohol light tan; body surface with numerous pigmented glands on annular rings (Fig. 83A–B); similar pigment evident in internal glands in dorsal and ventral cirri.

Prostomium pear-shaped, longer than wide, dorsally obscured by peristomial lobes (Fig. 83A), ventrally with posterior border and peristomium forming anterior lip of mouth (Figs. 82B, 83B); anterior margin with no apparent separate border, instead, two long, narrow lateral horns appear to arise from mid-point (Figs. 82B, 83B); eyespots absent; nuchal organs not observed. Peristomium consisting of two rings, dorsally each ring with large anterior lobes forming a fringe obscuring most of prostomium (Fig. 83B); ventrally without lobes, merging with setiger 1 and with prostomium forming anterior lip of mouth (Figs. 82B, 83B). Mouth with about six large elongate anterior lobes forming anterior lip and about six thickened lobes on large medial swelling on setiger 2 forming posterior lip (Figs. 82B, 83B); proboscis everted on paratypes as smooth sac.

Anterior parapodia reduced, inconspicuous anteriorly, becoming larger and more conspicuous from about setigers 14–15 as narrow podial lobes from which setae arise. Dorsal and ventral cirri develop from about setigers 12–14 or mid-body; dorsal cirri initially short, rounded, becoming longer and narrower by about setigers 15–16, continuing to posterior end; ventral cirri thicker than

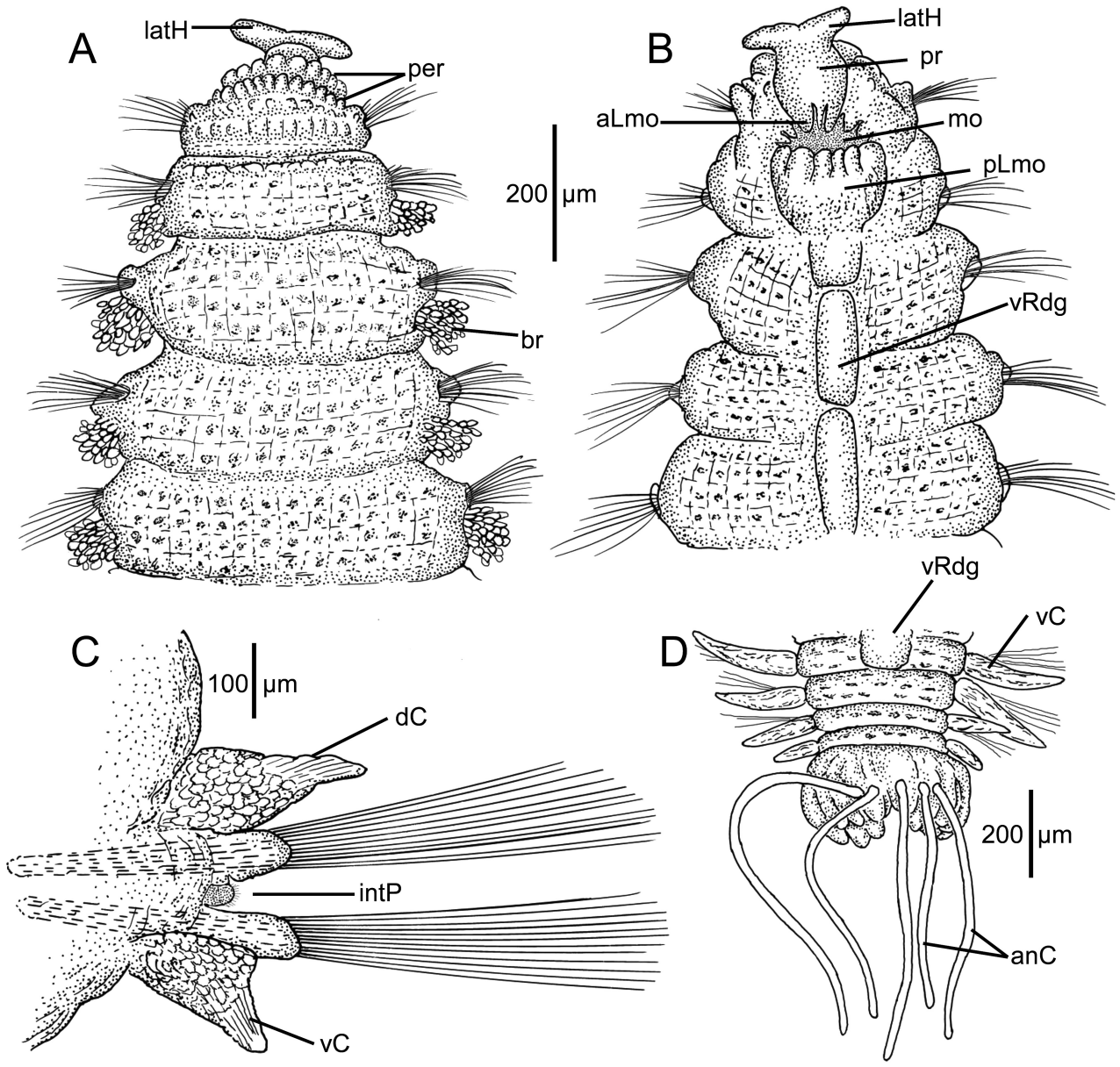

FIGURE 83. *Scalibregma fimbriatum* **sp. nov.** Holotype (USNM 1741779): A, anterior end, dorsal view; B, anterior end, ventral view; C, posterior parapodium, anterior view; D, posterior end, ventral view.

dorsal cirri, both flask- or triangular shaped, oval basally, tapering to nipple-like tip (Fig. 83C); ventral cirri with broad asymmetrical base. Dorsal and ventral cirri each with numerous pigmented glands; each gland formed of narrow striated tubules appearing to exit from narrow tips (Fig. 83C); cirri of 4–5 pre-pygidial setigers longer and narrower (Fig. 83D). Interramal papillae small, inconspicuous in anterior setigers, becoming larger in middle and posterior parapodia; each papilla oval with fine cilia (Fig. 83C). Arborescent branchiae present on setigers 2–5 posterior to notosetae (Fig. 83B).

All setigers with noto- and neuropodial fascicles of slender capillaries, with those of anterior fascicles more numerous, arranged into 2–3 rows, with setae of posterior row longest; capillaries of middle and posterior setigers arranged in 1–2 rows; all capillaries generally smooth, fibrils not conspicuous; setigers 1–2 with additional anterior row of inconspicuous short, slender, pointed spinous setae, numbering 4–6 anterior to capillaries (Fig. 82D–E). Setigers 3 and following with furcate setae in same anterior position as short spines of setigers 1–2; each furcate seta with nearly equal tynes tapering to filamentous tips and with numerous denticles on inner margins, directed toward opposite tyne (Fig. 82C).

Pygidium an expanded collar surrounding anal opening, composed of numerous elongate and thickened lobes; five long, thin anal cirri present, one medial and two ventrolateral on either side of medial one (Fig. 83D).

Juvenile and post-larval forms. The majority of non-type specimens are juveniles, less than 6 mm long, including small post-larval forms.

Remarks. *Scalibregma fimbriatum* **sp. nov.** has a

limited distribution, and despite more than 550 benthic box core samples collected as part of the U.S. ACSAR program, the species was only encountered within and adjacent to Lydonia Canyon off New England in depths of 530–590 m. Unlike most scalibregmatids, the holotype (USNM 1741779) has only moderately enlarged segments in the middle body and the smaller paratype from the same sample (USNM 1741780) is not enlarged at all. The lateral prostomial horns appear to arise directly from the anterior mid-point of the prostomium. The pre-setiger region is unusual in having two peristomial rings that bear prominent lobes on their dorsal anterior margins that overlap and obscure most of the dorsal aspect of the prostomium; ventrally the peristomium is entire, lacks distinct lobes, and forms elements of the anterior and posterior lips of the mouth. The oral morphology includes a set of elongate lobes forming the anterior lip and a set of lobes on a mid-ventral swelling that forms the posterior lip on setiger 2. In this configuration, the ventral continuation of the peristomium extends laterally along the prostomium and ventral surfaces of setiger 1 and the posterior lip of the mouth on setiger 2.

The entire body has pigmented glands in the pads along each annular ring on both the dorsum and venter. In addition, the dorsal and ventral cirri of posterior setigers have prominent pigmented glands. The two distinctive rows of lobes on the dorsal peristomial rings serve as an anterior fringe on the pre-setiger region (Fig. 83A) and serve to readily identify this species among congeners in the Atlantic Ocean.

The only other species of *Scalibregma* having a similar peristomium overlapping the prostomium dorsally and with pigmented pads on the annular rings is *S. velatum* **sp. nov.** from shelf depths of 37–100 m off central and northern California (see below). The two species differ, however, in several respects. *Scalibregma fimbriatum* **sp. nov.** has triangular dorsal and ventral cirri; short, sharply pointed spinous setae on setigers 1–2; furcate setae from setiger 3; and a pygidium with five anal cirri. In contrast, *S. velatum* **sp. nov.** has pear-shaped dorsal cirri and asymmetrical rectangular ventral cirri; blunt-tipped short spinous setae on setiger 1; furcate setae from setiger 2; and a pygidium with four anal cirri. In addition, the mouth of *S. fimbriatum* **sp. nov.** has a distinct anterior lip with a few lobes, whereas *S. velatum* **sp. nov.** has a vestibule-like groove extending from the prostomium to the mouth and lacks a distinct upper lip.

Biology. The three stations where *S. fimbriatum* **sp. nov.** occurred were along the 550 m depth contour sampled off New England as part of the U.S. North Atlantic ACSAR program (Maciolek *et al*. 1987b). The type locality, Sta. 7, is in Lydonia Canyon; the species occurred at and more abundantly at two other 550 m locations: Sta. 4, a non-canyon site immediately adjacent to Lydonia Canyon and Station 12, a slope station at the same depth interval, but approximately 500 km east of Sta. 7. It is likely that the species occurs further south, but upper slope depths were not sampled as part of the U.S. Mid-Atlantic ACSAR program off New Jersey and Delaware.

The site just outside Lydonia Canyon site (Sta. 4) was sampled three times and the percent sand in nine replicates resulted in an average sand content of 71.7%. Station 7 was also sampled three times and had a mean percent sand content of 85.8%. Station 12 was sampled five times (15 replicates) and had a mean percent sand content of 45.5%. The first two sites had an exceptionally high sand content for a deep-water site, and this might contribute to the site specificity of this species. However, there were differences in the faunal composition of each station. *Scalibregma fimbriatum* **sp. nov.** (recorded as *Sclerobregma* nr. *stenocerum*) was in each of the three dominants lists at Station 7 with 2.0–2.4 % of the fauna.

Station 7, in the canyon, was dominated by a cirratulid polychaete, *Kirkegaardia baptisteae* (Blake, 1991), with 32% of the total fauna that was identified; however, this species only accounted for 5.8% of the fauna at Station 4. No one species dominated at Station 4, instead different taxa dominated in each of the three sampling events. *Scalibregma fimbriatum* **sp. nov.** was not among the dominants at this station.

Station 12 was dominated by another cirratulid polychaete, *Kirkegaardia annulosa* (Hartman, 1965), with 6.0 to 8.8% of the fauna in any one survey. *Scalibregma fimbriatum* **sp. nov.** was in the dominants list of top 20 in four of the five surveys (as *Sclerobregma* nr. *stenocerum*), but only with 1.3 to 1.5% of the fauna (Maciolek *et al*. 1987b).

Etymology. The epithet is from *fimbria*, Latin for fringe, in reference to the unusual double row of lobes on the anterior margin of the two peristomial rings on this species.

Distribution. Western North Atlantic Ocean, off New England, Lydonia Canyon and adjacent slope, 530–590 m.

Scalibregma hadrostomium new species

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Figures 84–85

Scalibregma inflatum: Blake *et al*. 1992: A-11 (in part). **Not** Rathke, 1843.

Scalibregma californicum Blake, 2000: 133–135, Fig. 6.1 (In part).

Material examined. (*102 specimens*) **Eastern North Pacific Ocean, Continental slope off northern California. West of Farallon Islands, SF-DODS Benthic Monitoring Program,** coll. J.A. Blake (1996–2007, R/V *Cape Hatteras*), J. Nakayama (2018–2019, R/V *Oceanus*). **Sta. 27**, coll. 15 Sep 2005, BC, 37.684°N, 123.534°W, 2700 m, **holotype** (LACM-AHF Poly 14841), 1 **paratype** (LACM-AHF Poly 14842); 08 Oct 1999, BC, 37.683°N, 123.533°W, 2929 m, 1 **paratype** (LACM-AHF Poly 14843); 16 Oct 2000, BC, 37.683°N, 123.533°W, 2740 m, 1 **paratype** (LACM-AHF Poly 14844); 23 Sep 2002, BC, 37.683°N, 123.532°W, 2825 m, 1 **paratype** (LACM-AHF Poly 14845); 26 Sep 2003,

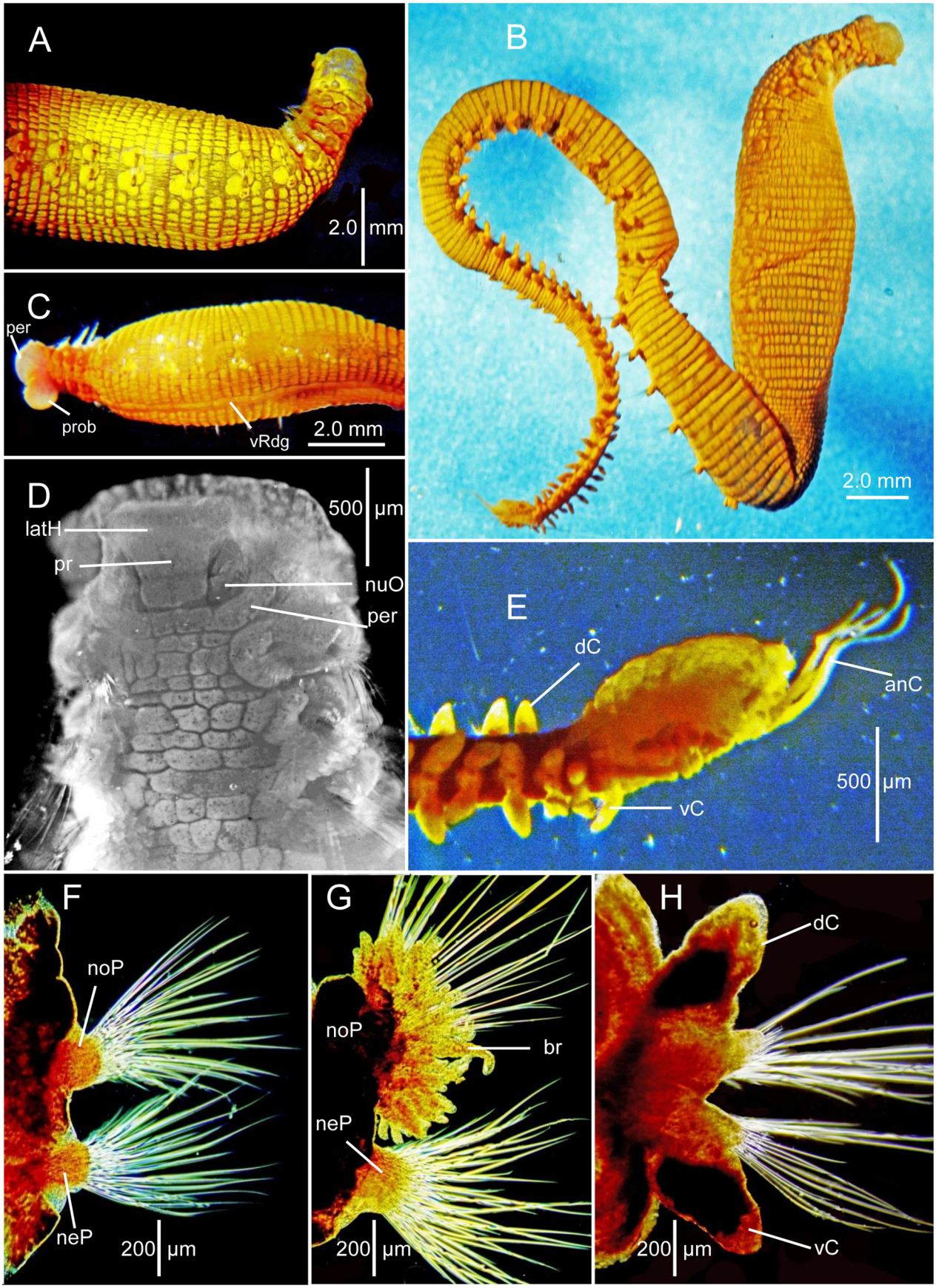

FIGURE 84. *Scalibregma hadrostomium* **sp. nov.** A, anterior end, right lateral view; B, entire worm, left lateral view; C, anterior half of worm, left lateral view; D, anterior end, dorsal view; E, posterior end, left lateral view; F, setiger 1, anterior view; G, setiger 2, anterior view; H, posterior parapodium, anterior view. A–B, E, Holotype (LACM-AHF Poly 14841); C–D, paratype Sta. 17, (CASIZ 24582); F–H, Sta. 23 paratype, (CASIZ 245288). A–C, E–H, stained with Shirlastain A.

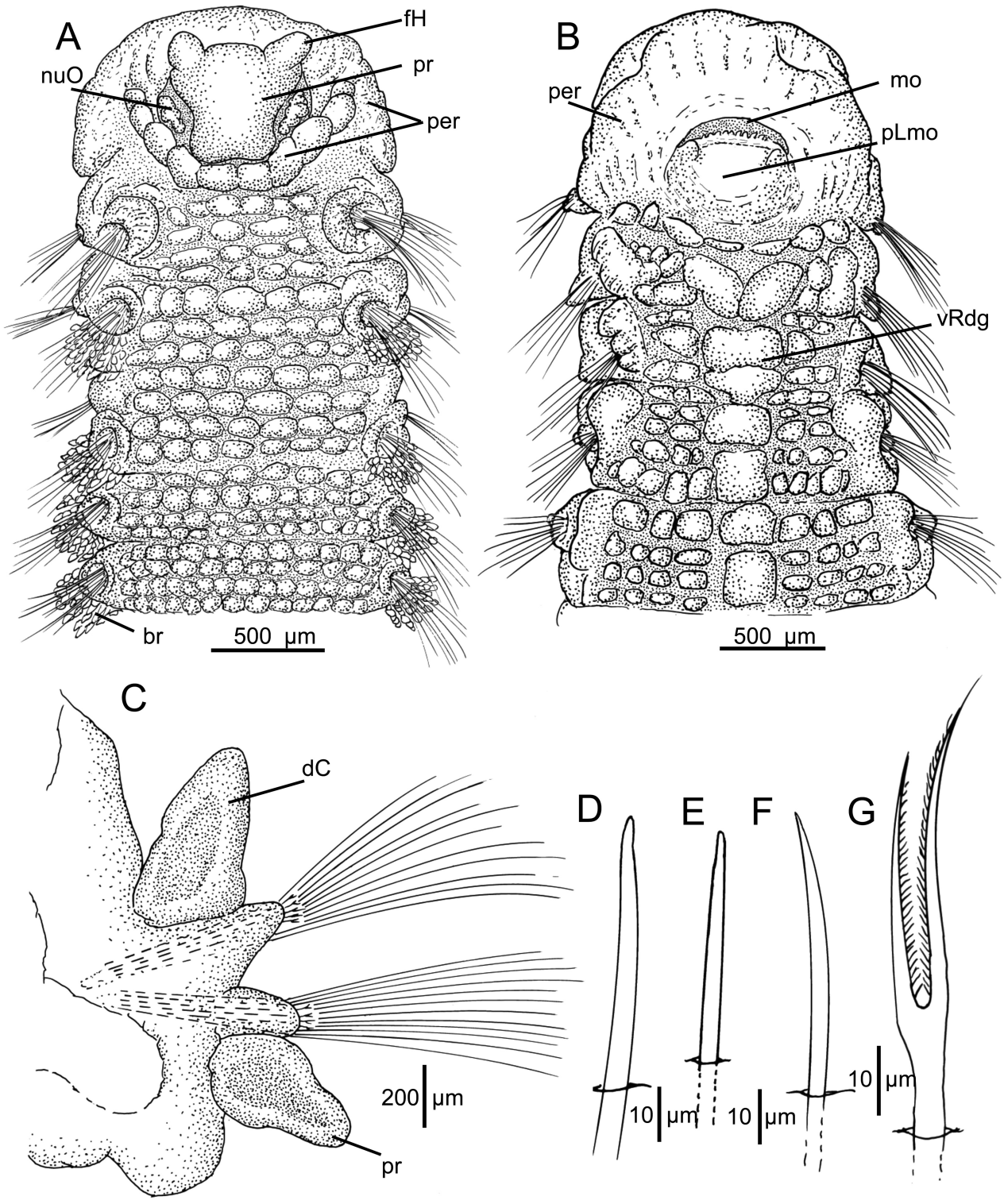

FIGURE 85. *Scalibregma hadrostomium* **sp. nov.** A, anterior end, dorsal view; B, anterior end, ventral view; C, posterior parapodium, anterior view; D–E, short spinous setae, notopodium, setiger 1; F, short spinous seta, neuropodium, setiger 1; G, furcate seta from posterior neuropodium. A–B, paratype Sta. 17 (CASIZ 245283); C–G, Sta. 23 (CASIZ 245288).

BC, 37°40.92°N, 123.532°W, 2750 m, 1 **paratype** (LACM-AHF Poly 14846). **Sta. 1**, 11 Dec 1996, BC, 37.685°N, 123.517°W, 2799 m (1, CASIZ 245267). **Sta. 6**, 16 Oct 2000, BC, 37.666°N, 123.449°W, 2730 m (3 juvs, CASIZ 245268); 22 Oct 2001, BC, 37.667°N, 123.449°W, 2770 m, 1 **paratype** (CASIZ 245269). **Sta. 7**, 13 Oct 1999, BC, 37.667°N, 123.466°W, 2805 m, 4 **paratypes** (CASIZ 245270). **Sta. 10**, 08 Oct 1999, BC, 37.666°N, 123.518°W, 3015 m (1, CASIZ 245271); 16 Oct 2000, BC, 37.667°N, 123.517°W, 3065 (7,CASIZ 245272); 22 Sep 2002, BC, 37.667°N, 123.517°W, 2739, 1 **paratype** (CASIZ 2452730); 02 Oct 2004, BC, 37.666°N, 123.516°W, 2897 (5, CASIZ 245274). **Sta. 11**, 20 Oct 2018, BC, 37.65°N, 123.517°W, 3000 m, 1

paratype (CASIZ 245275); 30 Sep 2019, BC, 37.65°N, 123.502°W, 3105 m, 2 **paratypes** (CASIZ 245276). **Sta. 12**, 05 Dec 1996, BC, 37.649°N, 123.498°W, 3000 m, 1 **paratype** (CASIZ 245277). **Sta. 15**, 23 Jan 1996, BC, 37.65°N, 123.45°W, 2835 m (1, CASIZ 245278). **Sta. 16**, 21 Sep 2002, BC, 37.634°N, 123.499°W, 2693 m (2, CASIZ 245279); 23 Sep 2003, BC, 37.634°N, 123.45°W, 2694 m (6, CASIZ 245280). **Sta. 17**, 07 Oct 1998, BC, 37.633°N, 123.467°W, 2830 m (1 juv, CASIZ 245281); 21 Sep 2002, BC, 37.634°N, 123.466°W, 2775 m, 1 **paratype** (CASIZ 245282); 24 Sep 2003, BC, 37.634°N, 123.466°W, 2750 m, 1 **paratype** (CASIZ 245283). **Sta. 18**, 08 Oct 1999, BC, 37.631°N, 123.481°W, 2900 m (1, CASIZ 245284). **Sta. 19**, 15 Oct 2000, BC, 37.633°N, 123.499°W, 2940 m (1, CASIZ 245285); 22 Oct 2001, BC, 37.633°N, 123.501°W, 3123 m (1, CASIZ 245286). **Sta. 20**, 02 Oct 2004, BC, 37.99°N, 123.517°, 3088 m (1 juv CASIZ 245287). **Sta. 23**, 14 Sep 2005, BC, 37.633°N, 123.481°W, 2820 m, 1 **paratype** (CASIZ 245288). **Sta. 24**, 22 Oct 2001, BC, 37.616°N, 123.466°W, 2680 m (1, CASIZ 245289). **Sta. 33**, 20 Oct 2000, BC, 37.7°N, 123.45°W, 2400 m (21, CASIZ 245290). **Sta. 52**, 26 Sep 2003, BC, 37.716°N,123.466°W, 2240 m (5, CASIZ 245291). **Sta. 57**, 22 Oct 2001, 37.716°N, 123.55°W, 2750 m (1, CASIZ 245292); 01 Oct 2004, BC, 37.717°N, 123.55°N, 2640 m, 1 **paratype** (CASIZ 245293). **Sta. 64**, 21 Oct 2018, BC, 37.6°N, 123.55°W, 3225 m (1, CASIZ 245294). **Sta. 116**, 27 Oct 2006, BC, 37.584°N, 123.484°W, 3052 m (1, CASIZ 245295). **Sta. 138**, 21 Oct 2018, BC, 37.55°N, 123.366°W, 3100 m, 1 **paratype** (CASIZ 245296).—**US Navy 103 Site Selection Survey, W of Farallon Islands** 1991, R/V *Wecoma*, coll. J.A. Blake. **Sta. B-9**, 24 Jul 1991, BC, 37.627°N, 123.468°W, 2070 m, 1 **paratype** (CASIZ 119536).—**U.S. EPA 102 Site Selection Survey (1991),** R/V *Pt. Sur*, coll. J.A. Blake. **North of Pioneer Canyon**, **Sta. 3-3**, 14 Sep 1991, BC, 37.454°N, 123.128°W, 2005 m (1, CASIZ 245297); **Sta. 3-12**, 15 Sep 1991, BC, 37.417°N, 123.3°W, 1745 m (5, CASIZ 245298). **Sta. 3-18**, 15 Sep 1991, BC, 37.372°N, 123.321°W, 1990 m (1, CASIZ 245299). **Sta. 3-19**, 16 Sep 1991, BC, 37.434°N, 123.333°W, 1760 m (2, CASIZ 245300).—**South of Pioneer Canyon, Sta. 4-5**, 17 Sep 1991, 37.226°N, 123.271°W, 1820 m (3, CASIZ 245301). **Sta. 4-6**, 17 Sep 1991, BC, 37.234°N, 123.281°W, 2010 m (3, CASIZ 245302). **Sta. 4-15**, 19 Sep 1991, BC, 37.207°N, 13.264°W, 1730 m (3, CASIZ 245303).—**Pioneer Canyon**, **Sta. C-5**, 19 Sep 1991, BC, 37.284°N, 123.264°W, 2065 m (3, CASIZ 245304).

Description. A large species, body arenicoliform, with anterior half expanded from about setigers 4–5, continuing to mid-body, then tapering to narrow abdominal region (Fig. 84A–C). Holotype (LACM-AHF Poly 14841) complete, with 70 setigers, 66 mm long, and 4 mm wide across expanded anterior setigers (setigers 5–16) and about 1.2 mm wide across narrow posterior region (setigers 17–70). Paratypes smaller: Sta. 10 (CASIZ 2452730), 52 setigers, 23 mm long; Sta. 11 (CASIZ 245275)49 setigers, 21.5 mm long, 3.7 mm wide; Sta. 17 (CASIZ 245282), 62 setigers, 27 mm long; Sta. 23 (CASIZ 245288), 51 setigers, 37 mm long, 4.5 mm wide; Sta. 27 (LACM-AHF Poly 14842), 40 setigers, 27 mm long; Sta. B-9 (CASIZ 119536), 66 setigers, 30 mm long, 3 mm wide. Numerous smaller specimens present, including post-larval forms of 1 mm or less and with as few as 12–15 setigers. Body surface covered with numerous annulated rings (Fig. 84A–C); most annulations formed of separate elevated pads or blocks (Figs. 84A–D, 85A–B). Color in alcohol light tan, most larger specimens with a yellow-orange cast over most of body (Fig. 84A–C); larger specimens with dark reddish-colored segmental glands on dorsum and venter of setigers 5–7; similar pigmented glands present on dorsal and ventral cirri of posterior parapodia.

Prostomium wedge-shaped, with curved anterior margin bearing two short oval-shaped lateral horns projecting anteriorly at no more than a 30–40-degree angle (Figs. 84D, 85A); prostomium narrowing posteriorly to blunt border with peristomium; nuchal organs not everted; eyespots absent. Peristomium single narrow lobed ring encompassing prostomium dorsally (Figs. 84D, 85A), continuing onto ventral surface, becoming enlarged and inflated, producing bulbous appearance to pre-setiger region (Fig. 85B). Mouth reduced to narrow curved slit, with a row of small lobes on posterior lip; anterior lip appearing smooth (Fig. 85B). When everted, proboscis a smaller lobe emergent from enlarged peristomium (Fig. 84C).

Segmental annulations prominent along body; these divided into separate elevated pads or square-shaped blocks, providing complex areolated appearance to body surface (Figs. 84A–D, 85A–B); dorsally, setiger 1 triannulate and following setigers quadriannulate; far posterior setigers pentannulate; ventrally, setiger 1 annulations obscured by enlarged overlapping peristomium (Fig. 85B); setiger 2 with three rows of irregularly spaced annulae; from setiger 3 segments quadriannulate with a few far posterior setigers pentannulate. Ventral midline from setiger 2 with a pair of large epidermal pads per segment, continuing along entire body, producing a distinct elevated mid-ventral ridge (Figs. 84C, 85B). Arborescent branchiae present on setigers 2–5 posterior to notosetae (Figs. 84G, 85A). Parapodia of anterior and middle body segments to about setiger 15–17 reduced to rounded lobes with setal fascicles emerging from a central depression (Fig. 84F); thereafter, podial lobes develop and become longer and narrow. Dorsal and ventral cirri develop from about setiger 20 or mid-body; cirri initially short and stubby, becoming long, thick, narrower by about setiger 30, continuing to posterior end; individual cirri of posterior setigers thick, cylindrical, tapering to rounded tip (Figs. 84H, 85C). Each dorsal and ventral cirrus with darkly pigmented internal glands; nature of these glands not apparent due to dense tissue of thickened cirri. Interramal papillae not apparent anywhere along body.

All setigers with noto- and neuropodial fascicles of slender capillaries (Fig. 84F–H), with those of anterior fascicles more numerous, arranged into 2–3 rows, setae of posterior row longest; capillaries of middle and posterior setigers arranged in 1–2 rows; all capillaries smooth in appearance, but with numerous short inconspicuous fibrils

or bristles along their length. Setiger 1 with additional anterior row of inconspicuous short, slender, spinous setae at base of first row of capillaries; these short spines numbering 8–12 on large specimens, fewer on specimens of 10 mm or less in length; notopodial spinous setae blunt-tipped (Fig. 85D–E); spines of neuropodial with sharper, more pointed tip (Fig. 85F). Setigers 2 and following with furcate setae in same anterior position as short spines of setiger 1; each furcate seta with sub-equal tynes tapering to fine tips and numerous denticles on inner margins directed toward opposite tyne (Fig. 85G).

Pygidium of largest specimens inflated, with anal opening surrounded by about 12 elongate lobes and five long, thin anal cirri arising ventrally (Fig. 84E).

Remarks. *Scalibregma hadrostomium* **sp. nov.** is a distinctive species due to the highly modified peristomium that has a single multilobed dorsal ring that is expanded laterally and becomes large, bulbous, and surrounds the mouth ventrally. In addition, the pygidium is elongate and bulbous and bears five long anal cirri arising ventrally.

Etymology. The epithet is from the Greek, *hadros* for well-developed and *stoma*, for mouth, in reference to the enlarged and inflated peristomium of this species.

Distribution. Eastern North Pacific Ocean, off Northern California, lower Continental slope and abyssal plain, 1745–3225 m.

Scalibregma lydoniensis new species

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Figures 86–87

Sclerobregma nr. *stenocerum*: Maciolek *et al*. 1987b: D-4, G-3, G-11 (in part). **Not** Bertelsen & Weston, 1980.

Material Examined. (*5 specimens*) **Western North Atlantic Ocean, off New England, Lydonia Canyon, southern flank of Georges Bank, U.S. North ACSAR Program,** coll. G.A. Hampson, Chief Scientist: **Sta. 7**, **Cruise NA-1**, R/V *Cape Hatteras*, Rep. 1, 10 Nov 1984, BC, 40.459ºN, 67.672°W, 560 m, **holotype** (USNM 1741809), 1 **paratype** (USNM 1741810); **Cruise NA-2**, R/V *Oceanus*, Rep. 1, 28 Apr 1985, BC, 40.458ºN, 67.671ºW, 560m, 2 **paratypes** (USNM 1741811); **Cruise NA-3**, R/V *Oceanus*, Rep. 2, 06 Jul 1985, BC, 40.458ºN, 67.670ºW, 555m, 1 **paratype** (USNM 1741812).

Description. A moderately sized species, body becoming enlarged in middle, then gradually narrowing posteriorly (Fig. 86A–B); holotype (USNM 1741809) complete, with 50 setigers, 20 mm long, 3 mm wide across setiger 10, about 1 mm wide across far posterior segments; paratype (USNM 1741812) with 54 setigers, 21 mm long, 2.5 mm wide across setiger 10. Body surface covered with numerous annulated rings formed of separate elevated pads or blocks (Fig. 86A–C). Color in alcohol yellow-orange cast over most of body due to numerous pigmented cells (Fig. 86A–D); pigment present on neuropodia of setigers 4–5, but no additional extra pigment on either parapodia or dorsal and ventral cirri.

Prostomium wedge-shaped, wider than long, with weakly crenulated anterior margin bearing two short oval-shaped lateral horns (Fig. 87A–B); dorsally, posterior end of prostomium with a short transverse crest (Fig. 87A); ventrally merging posteriorly with anterior lip of mouth (Fig. 87B); eyespots absent; everted nuchal organ present on one specimen as a thickened ciliated lobe arising from groove between prostomium and peristomium. Peristomium a single thick multilobed ring encompassing prostomium dorsally followed by a narrow, smooth transverse crest between ring and first annular row of pads on setiger 1 (Fig. 87A); peristomium continuing onto ventral surface as a smooth, narrow ring lateral to prostomium and a broad relatively smooth fleshy surface merging with anterior lip of mouth (Fig. 87B). Anterior lip of mouth biannulate, consisting of two rows of elongate narrow pads anterior to mouth (Fig. 87B); first row bordering mouth with about six narrow elongate pads and 2–3 short lateral pads (Fig. 87B); second row anterior to first on posterior margin of prostomium, consisting of about seven irregularly shaped pads (Fig. 87B). Mouth opening between peristomium and setiger 1 with posterior lip of mouth on setiger 2 consisting of about 12 thickened lobes forming a wide fan-shaped area posterior to mouth on setiger 2 (Fig. 87B). Proboscis not everted on any specimen.

Segmental annulations prominent along body; these divided into separate elevated pads or square-shaped blocks, providing areolated appearance to body surface (Figs. 86A–D, 87A–B); setigers 1–2 with three thickened rows of elongate pads dorsally (Fig. 87A); ventral surface of setigers 1–2 with 2–3 rings but these poorly developed with distinct pads not well defined (Fig. 87B); thereafter dorsal and ventral annular rings mostly quadriannulate along rest of body (Fig. 86A–D); some posterior setigers pentannulate. Ventral midline from setiger 2 with large epidermal pads on each segment (Fig. 87B); pads becoming elongate, narrow, and recessed into distinct ventral groove from about setigers 13–14, thus producing a mid-ventral ridge recessed into a groove. Dense patches of arborescent or dendritically branched branchiae present on setigers 2–5 posterior to notosetae (Figs. 86C, 87A).

Parapodia of anterior and middle body segments to about setigers 12–14 reduced to enlarged lobes with setal fascicles that emerge from a depression; thereafter podial lobes develop, becoming longer and narrow from which setae emerge. Dorsal and ventral cirri first present from about setigers 15–18 or mid-body; cirri initially short and rounded, becoming long, thick and narrower by about setiger 30, continuing to posterior end; individual cirri of posterior setigers thick, cylindrical, tapering to narrow tip; dorsal cirri with rounded, almost papillate, tip (Fig. 87C); ventral cirri asymmetrical, inflated, with narrow tip (Fig. 87C); cirri of far posterior setigers narrower and longer (Fig. 86D). Each dorsal and ventral cirrus with numerous small glands concentrated throughout; these with yellow or orange-colored pigment similar that of body surface (Fig. 87C). Distinct interramal papillae not observed anywhere along body.

All setigers with noto- and neuropodial fascicles

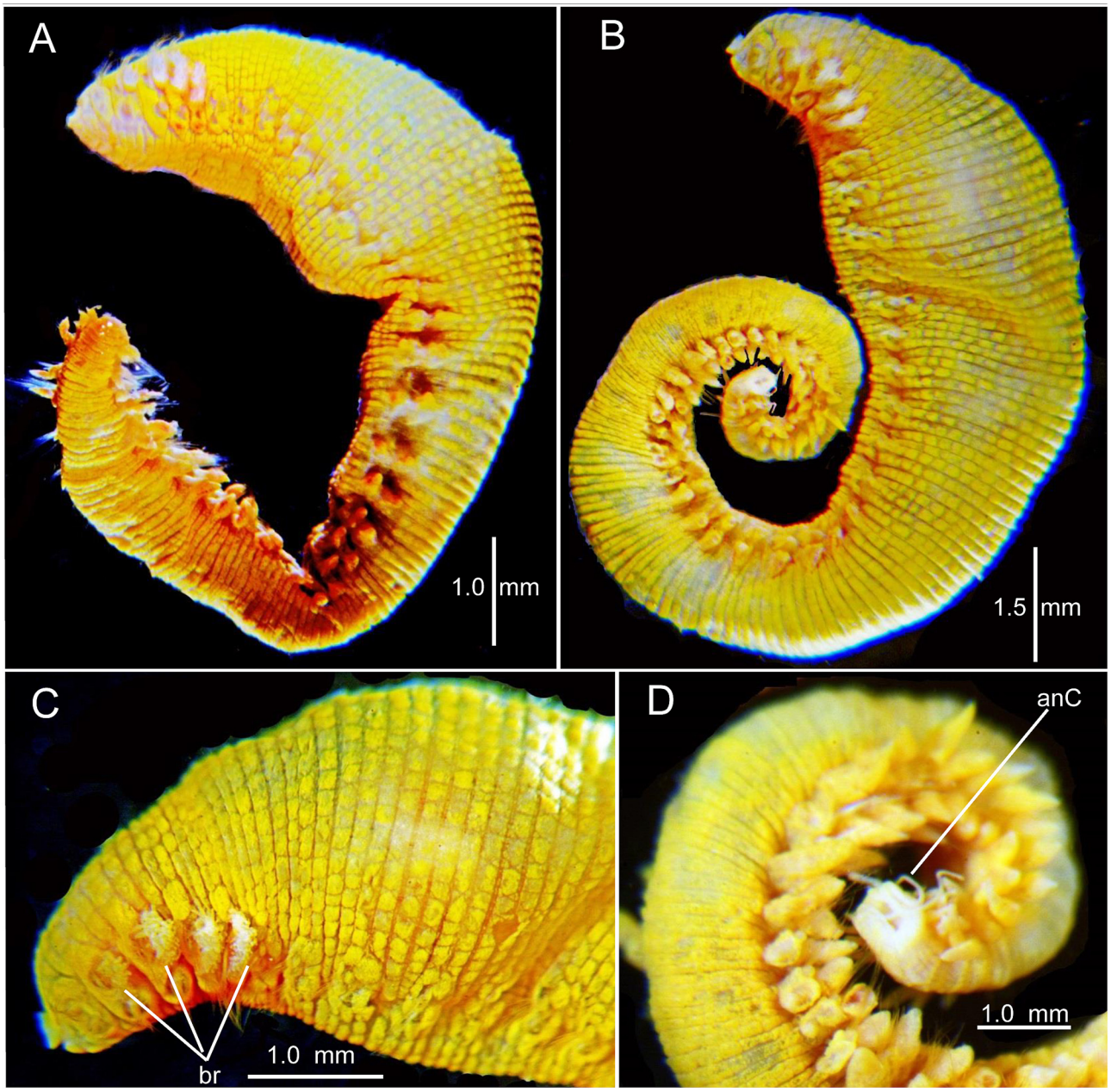

FIGURE 86. *Scalibregma lydoniensis* **sp. nov.** A, Entire worm, left lateral view; B, entire worm, left lateral view; C, anterior end, left lateral view; D, posterior end, left lateral view. A, paratype USNM 1741811); B–D, holotype (USNM 1741809).

with slender capillaries, setae in anterior fascicles more numerous, arranged into 2–3 rows, setae of posterior row longest; capillaries of middle and posterior setigers arranged in 1–2 rows; all capillaries smooth in appearance, but with numerous short inconspicuous fibrils or bristles along their length. Short spinous setae not observed on setiger 1, although numerous short, thin capillaries present. Setigers 2 and following with furcate setae anterior to capillaries; each furcate seta with sub-equal tynes tapering to fine tips and numerous denticles on inner margins directed toward opposite tyne (Fig. 87E).

Pygidium with anal opening surrounded by 10–12 lobes; anal cirri arising from two ventralmost lobes (Fig. 87D); each lobe believed to bear three anal cirri for six in total; however, holotype with only four anal cirri intact (Fig. 86D), paratype (NA3) with five cirri intact and one scar or stub apparent (Fig. 87D).

Remarks. *Scalibregma lydoniensis* **sp. nov.** is most similar to *S. rhoadsi* **sp. nov.** from bathyal depths off Cape Hatteras, North Carolina, in the nature of the prostomium, peristomium, and pygidial morphology. Both species have a posterior dorsal crest on the prostomium, a single multi-lobed dorsal peristomium, a biannulate anterior oral lip, a row of lobes on the posterior lip, and a pygidium with six anal cirri.

In *S. rhoadsi* **sp. nov.** the prostomial dorsal crest is divided into two parts, the dorsal multilobed peristomium has a large mid-dorsal lobe, and the posterior lip of the mouth has a long row of short lobes on setiger 1. In contrast, in *S. lydoniensis* **sp. nov.** the prostomial crest is a single

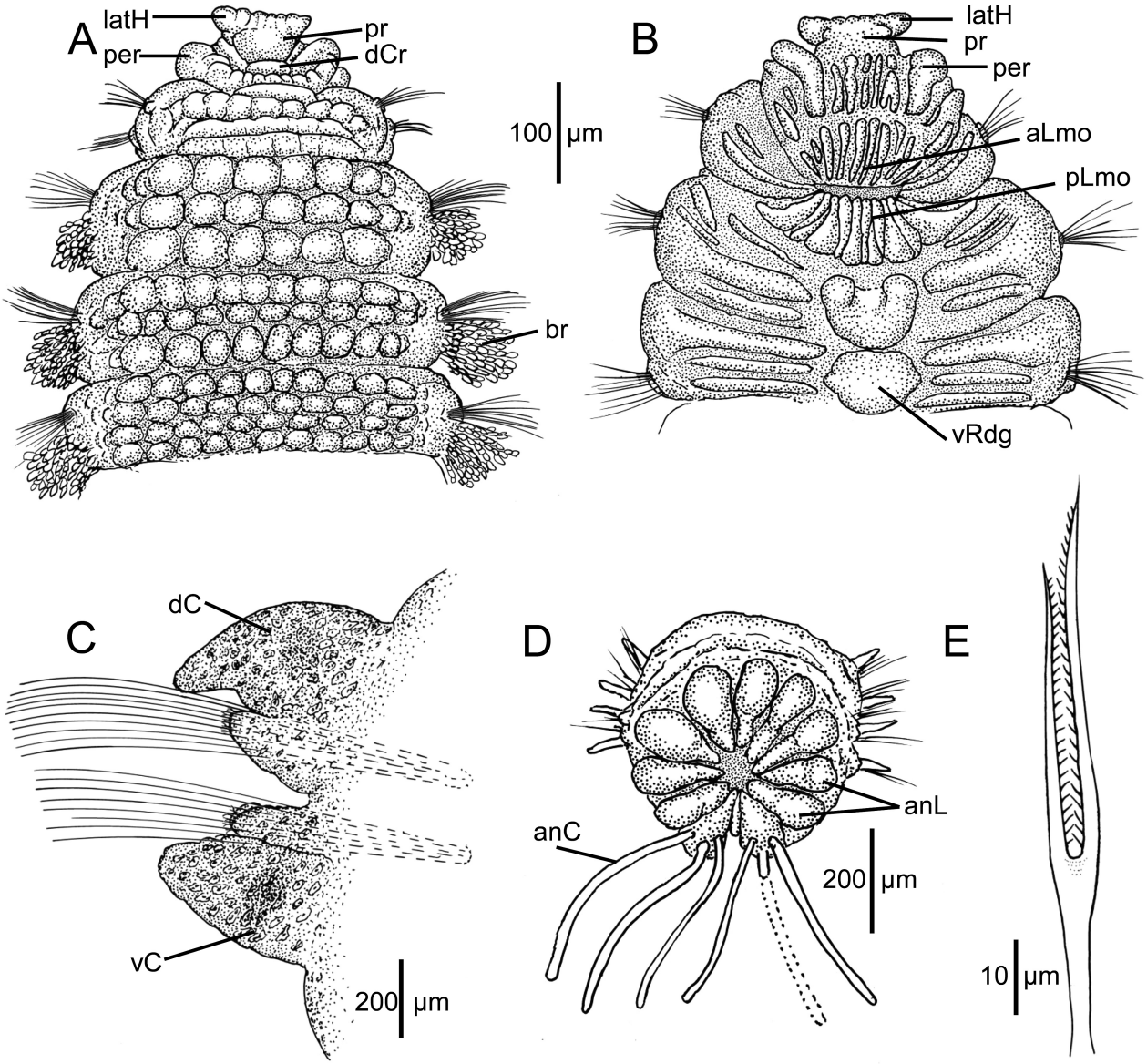

FIGURE 87. *Scalibregma lydoniensis* **sp. nov.** A, anterior end, dorsal view; B, anterior end, ventral view; C, posterior parapodium, anterior view; D, posterior end, posterior view; E, furcate seta from posterior neuropodium. A–C, E, paratype (USNM 1741810); D, paratype (USNM 1741812).

lobe, the peristomial ring is an entire row of short lobes, and the posterior lip of the mouth is an elevated group of elongate lobes. In addition, *S. lydoniensis* **sp. nov.** lacks short spinous setae on setiger 1, pigment is present on the neuropodia of setigers 4–5, a distinct interramal papilla between the parapodia is not present, and the dorsal and ventral cirri are asymmetrical and directed laterally. In contrast, *S. rhoadsi* **sp. nov.** has short spinous setae in both noto- and neuropodia of setiger 1, an interramal papilla is present between parapodial rami, and the dorsal cirri are triangular and ventral cirri are asymmetrical, with both tapering to narrow tips.

Biology. The data presented for *Scalibregma fimbriatum* **sp. nov.**, which also occurs in Lydonia Canyon, is valid for *S. lydoniensis* **sp. nov.** as well. Station 7 was sampled three times and had a mean percent sand content of 85.8%. The site was dominated by a cirratulid polychaete, *Kirkegaardia baptisteae* with 32% of the entire fauna sampled. Other abundant polychaetes at the site were *Prionospio aluta* Maciolek, 1985 (~8.5%), *Paramphinome* cf. *jefferysi* (McIntosh, 1868) (~8.3%), and *Cossura longocirrata* Webster & Benedict, 1887 (~4.5%).

Etymology. The species is named for its occurrence in Lydonia Canyon on the continental slope off New England.

Distribution. Western North Atlantic Ocean, off New England, Lydonia Canyon, 555–560 m.

Scalibregma profundum new species

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Figures 88–89

Material examined. **Southeastern Pacific Ocean, off Peru, Peru-Chile Trench**, Milne-Edwards Deep, SEPBOP Expedition, R/V *Anton Bruun*, **Sta. AB II 168**, coll. R.J. Menzies, 01 Nov 1965, 5-ft beam trawl, 08.717°S, 80.700°W, 3939 m, **holotype** (LACM-AHF Poly 13573).

Description. Holotype only specimen, incomplete with 34 setigers, damaged posteriorly, with large robust body, 44 mm long, 6 mm wide across branchiate setigers (2–5), 4 mm wide across posterior setigers. Body surface covered with numerous annulated rings formed of separate elevated pads or blocks (Fig. 88A–B, E). Color in alcohol yellow to light orange (Fig. 88A–E); dorsum of setigers 4–6 each with one annulated row with 3–4 pads each with light reddish pigment; same pigment on venter of setigers 4–7 (Fig. 88B).

Prostomium longer than wide; anterior border crenulated, with a row of short lobes across anterior margin between a pair of elongate lateral horns, horns sometimes directed posteriorly (Figs. 88C, 89A); main body of prostomium pear-shaped, tapering posteriorly, followed by dorsal crest with distinct medial separation into two parts (Figs. 88C, 89A); eyespots absent; nuchal organs not observed. Peristomium with a single annulated ring entirely surrounding prostomium dorsally and three additional partial lateral rings (Figs. 88C, 89A); lateral rings merge ventrally, forming anterior and posterior lips of mouth (Fig. 88D); anterior lip biannulate, formed by two rows of pads; posterior lip with single narrow row of pads visible. Proboscis partially everted, with at least three lobes, partially obscuring oral morphology.

Segmental annulations with numerous pads prominent along entire body; dorsally, setiger 1 with three rows between parapodia (Fig. 89A); from setiger 2 all segments quadriannulate with narrow rows of annulated rings; ventrally, setiger 1 also with three rings, but partially obscured by everted proboscis; from setiger 2 all segments quadriannulate (Fig. 88A–B, E). Ventral midline from setiger 2 with a single large epidermal pad on each segment, producing a ventral ridge along body (Fig. 88B). Branchiae on setigers 2–5 posterior to notosetae, these arborescent, dendritically branched in dense patches (Fig. 88A, E–F).

Parapodia of anterior segments prominent thickened lobes laterally with noto- and neurosetal fascicles arising near to one another (Fig. 88E); interramal papilla in an oval groove between podia. First dorsal and ventral cirri evident from setigers 14–15 as thick, rounded lobes; cirri becoming longer and more prominent by setiger 20, with dark internal glands; dorsal cirri becoming longer, narrowing to pointed tip directed laterally (Fig. 89B); ventral cirri shorter, narrower, also directed laterally (Fig. 89B); nature of far posterior cirri unknown, due to segmental damage. Internal glands of cirri consisting of clusters of darkly pigmented cells, with no tubules or otherwise distinct structure. Interramal papillae short, oval-shaped, between podial lobes (Fig. 89B).

All setigers with noto- and neuropodial fascicles of slender capillaries, grouped into curved rows; capillaries of anterior setigers more numerous, distinct rows not evident without dissection and careful observations. Capillaries of anteriormost rows shortest; all capillaries smooth in appearance, fibrils or bristles not evident along their length. Setiger 1 with numerous short, slender, spinous setae at base of anterior capillaries in both noto- and neuropodia; these curved, tapering to pointed tip (Fig. 89C). Setigers 2 and following with furcate setae in noto- and neuropodia in same anterior position as short spines of setiger 1; furcate setae of branchiate setigers numbering about 20 in a group on the medial side of fascicle; furcate setae of more posterior setigers fewer, reduced to 4–5 per fascicle. Each furcate seta with two long tynes, one slightly shorter, both tapering to fine tips and with numerous denticles along inner margins directed toward opposite tyne (Fig. 89D).

Pygidium not observed.

Remarks. *Scalibregma profundum* **sp. nov.** from the Peru-Chile Trench represents the deepest record for a species of *Scalibregma*. Most species of this genus are from shallow shelf or upper continental slope depths (Table 6). Prior to the present study, no species of the genus *Scalibregma* had been described from abyssal depths (~3000 m and greater). In the present study, three species have been discovered from these depths: *S. cornutum* **sp. nov.** from the Mozambique Channel off SW Africa, *S. hadrostomium* **sp. nov.** from off northern California, and *S. profundum* **sp. nov.** from the Peru-Chile Trench.

Of these, *S. profundum* **sp. nov.** and *S. cornutum* **sp. nov.** are unusual among species of *Scalibregma* and other scalibregmatids in the nature of the prostomium. The anterior margin of the prostomium of both species has a row of lobes or blocks that laterally connect with a pair of lateral horns; in both species, these horns are directed slightly posteriorly rather than anterior as in most other scalibregmatids. In *S. cornutum* **sp. nov.**, there are three large blocks along the anterior margin of the prostomium; whereas there are 6–7 smaller lobes along the anterior margin of *S. profundum* **sp. nov.** In addition, the prostomium of both species is divided into anterior and posterior components. In *S. cornutum* **sp. nov.** the V-shaped prostomium has a shallow transverse groove dividing it into anterior and posterior parts and the narrow posterior part is in turn divided vertically into two parts which appear to be separate posteriorly. In contrast, the prostomium of *S. profundum* **sp. nov.** is prominently divided into a relatively smooth oval-shaped anterior part and a double-lobed posterior part which serves as kind of dorsal crest between the prostomium proper and the multilobed peristomium. The only other species having a double-lobed dorsal prostomial crest is *S. rhoadsi* **sp. nov.** from continental slope depths off North Carolina (see below).

Etymology. The epithet of from the Latin *profundum*, for deep, representing the abyssal depths from which this species was collected.

Distribution. SE Pacific Ocean, off Peru, Peru-Chile Trench, 3939 m.

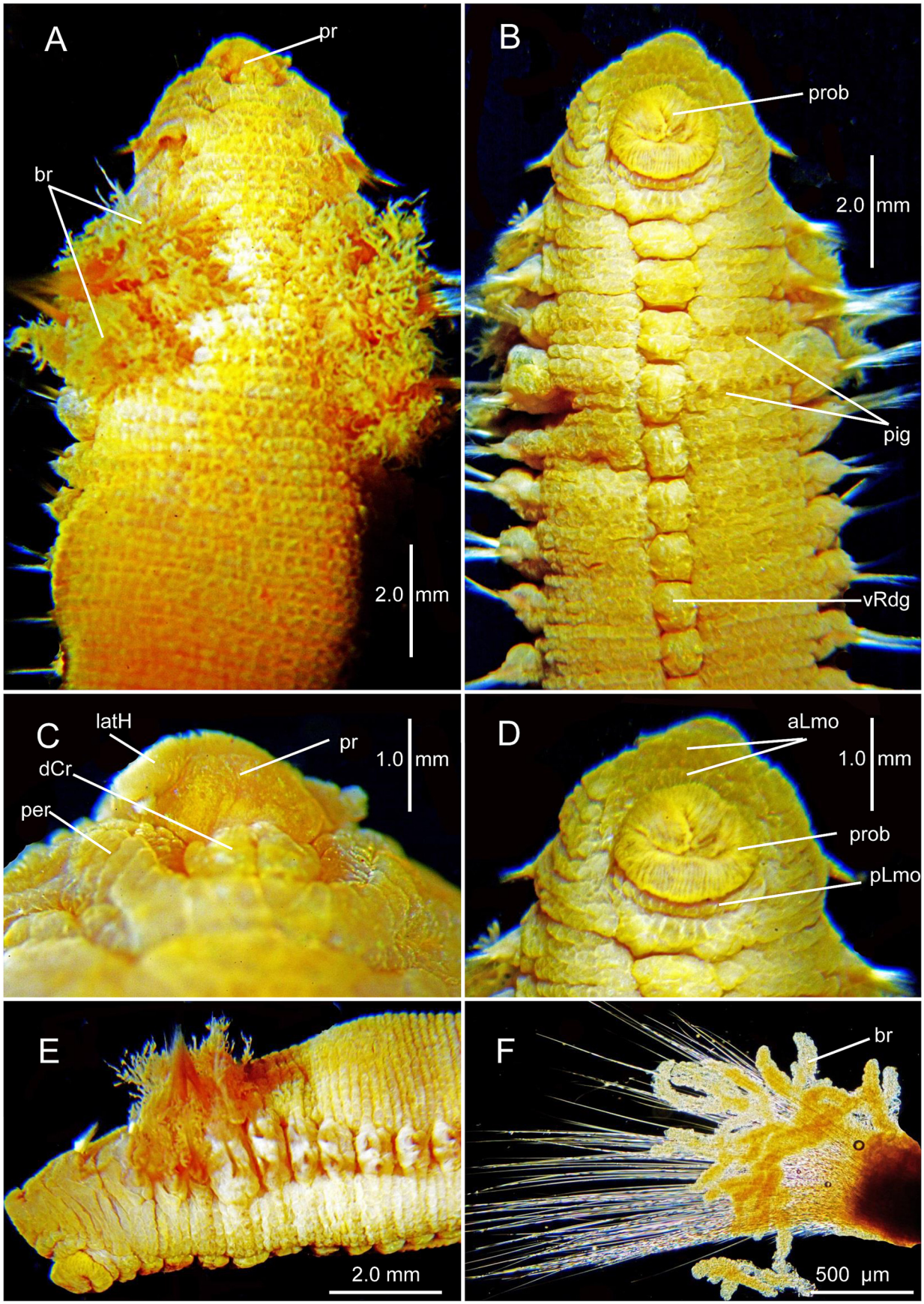

FIGURE 88. *Scalibregma profundum* **sp. nov.** Holotype (LACM-AHF Poly 13573): A, anterior end, dorsal view; B, anterior end, ventral view; C, pre-setiger region, dorsal view; D, pre-setiger region and setigers 1–2, ventral view; E, anterior end, left lateral view; F, notopodium with branchiae and capillaries, setiger 2. Stained with Shirlastain A.

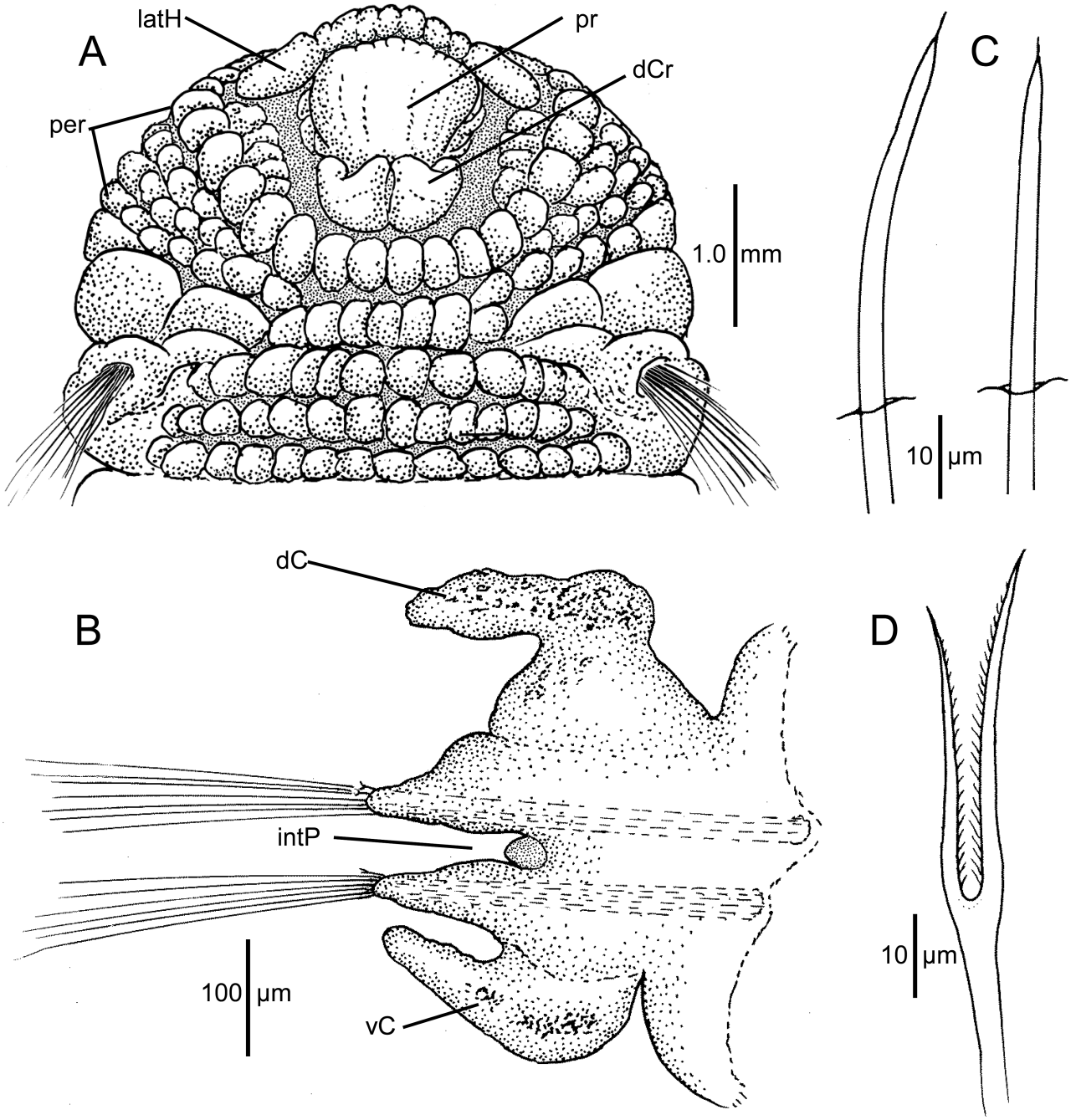

FIGURE 89. *Scalibregma profundum* **sp. nov.** Holotype (LACM-AHF Poly 13573): A, pre-setiger region and setiger 1, dorsal view; B, posterior parapodium, anterior view; C, short spinous setae anterior to capillaries, notopodia, setiger 1; D, furcate seta, posterior neuropodium.

***Scalibregma rhoadsi* new species**

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Figures 90–91

Scalibregma inflatum: Blake *et al*. 1987: 61, 67–68, 92, 95, C-5, D-5; Blake 1993: 133–134, fig. 6; Blake & Grassle 1994: 835–874; Blake & Hilbig 1994: 875–899; Hilbig 1994: 943. **Not** Rathke 1843.

Material Examined. (*17,105 specimens*). **Western North Atlantic Ocean, SE U.S., off Cape Hatteras, North Carolina: Cape Hatteras Benthic Survey**, R/V *Endeavor*, 26 Aug to 06 Sep 1992, coll. J.A. Blake. **Sta. CH-1A**, 27 Aug 1992, BC, 35.11°N, 74.832°W, 800 m, **holotype** (USNM 1741813), 15 **paratypes** (USNM 1741814), (528 additional specimens including juvs, USNM 1741815). **Sta. CH-1**, 27 Aug 1992, BC, 35.708°N, 74.776°W, 804 m, 5 **paratypes** (USNM 1741816), (404, USNM 1741817). **Sta. CH-2**, 27 Aug 1992, BC, 35.615°N,

74.778°W, 600 m, 15 **paratypes** (USNM 1741818), (420, USNM 1741819). **Sta. CH-3**, 29 Aug 1992, BC, 35.63°N, 74.769°W, 812 m, 20 **paratypes** (USNM 1741820), (954, USNM 1741821). **Sta. CH-5**, 29 Aug 1992, BC, 35.625°N, 74.721°W, 1501 m, 5 **paratypes**, (USNM 1741822), (342, USNM 1741823). **Sta. CH-11**, 29 Aug 1992, BC, 35.562°N, 74.766°W, 815 m, 25 **paratypes**, (USNM 1741824), (1400, USNM 1741825). **Sta. CH-18**, 31 Aug 1992, BC, 35.5°N, 74.794°W, 530 m, 30 **paratypes**, (USNM 1741826), (621, USNM 1741827). **Sta. CH-19**, 31 Aug 1992, BC, 35.497°N, 74.777°W, 812 m, 14 **paratypes**, (MCZ IZ 171987), (1889, MCZ IZ 171988). **Sta. CH-21**, BC, 35.502°N, 74.735°W, 1410 m, 15 **paratypes** (MCZ IZ 171989), 369 specimens (MCZ IZ 171990). **Sta. CH-26**, 02 Sep 1992, BC, 35.46°N, 74.785°W, 800 m, 15 **paratypes** (MCZ IZ 171991), (2435, MCZ IZ 171992); **Sta. CH-34**, 02 Sep 1992, BC, 35.418°N, 74.806°W, 775 m, 15 **paratypes** (MCZ IZ 171993), (1000, MCZ IZ 171994). **Sta. CH-41**, 02 Sep 1992, BC, 35.37°N, 74.872°W, 590 m, 16 **paratypes** (MCZ IZ 171995), (408, MCZ IZ 171996). **Sta. CH-42**, 04 Sep 1992, BC, 35.355°N, 74.844°W, 785 m, 15 **paratypes** (MCZ IZ 171997), (350, MCZ IZ 171998). **Sta. CH-44**, 04 Sep 1992, BC, 35.341°N, 74.807°W, 1535 m, 15 **paratypes** (MCZ IZ 171999), (354, MCZ IZ 172000). **Sta. 9**, 05 Sep 1992, BC, 35.473°N, 74.79°W, 620 m (856, USNM 1741828). **Sta. 10**, 05 Sep 1992, BC, 35.442°N, 74.688°W, 2003 m (70, USNM 1741829).—**U.S. South Atlantic ACSAR Program,** coll. J.A. Blake: **Sta. 9**, **Cruise SA-3**, R/V *Gyre*, 22 Jul 1984, BC, Rep. 1, 35.472°N, 74.795°W, 579 m (289, USNM 1741830); Rep. 3, 35.472°N, 74.793°W, 598 m (731, USNM 1741831). **Cruise SA-4**, R/V *Cape Hatteras*, 24 May 1985, BC, Rep. 1, 35.474°N, 74.791°W, 640 m, (1835, USNM 1741832); Rep. 2, 35.474°N, 74.793°W, 603 m (1022, USNM 1741833); Rep. 3, 35.471°N, 74.792°W, 623 m (930, USNM 1741834). **Cruise SA-5**, R/V *Gyre*, 25 Sep 1985, BC, Rep. 1, 35.474°N, 74.791°W, 629 m (683, USNM 1741835); Rep. 2, 35.474°N, 74.791°W, 629 m (732, USNM 1741836). Rep. 3, 35.475°N, 74.794°W, 609 m (344, USNM 1741837). **Sta. 10**, **Cruise SA-4**, R/V *Cape Hatteras*, 24 May 1985, BC, Rep. 1, 35.438°N, 74.691°W, 2003 m (3, USNM 1741838); Rep. 2, 35.439°N, 74.693°W, 1998 m (6, USNM 1741839); Rep. 3, 35.441°N, 74.688°W, 1985 m (8, USNM 1741840). **Cruise SA-6**, R/V *Cape Hatteras*, 25 Nov 1985, BC, Rep. 1, 35.438°N, 74.691°W, 2004 m (12, USNM 1741841); Rep. 2, 35.438°N, 74.686°W, 2004 m (8, USNM 1741842); Rep. 3, 35.437°N, 74.691°W, 1994 m (27, USNM 1741843).

Description. A moderately sized species, body arenicoliform, with anterior half expanded from about setigers 4–5, continuing to mid-body or about setigers 14–15, and then tapering to narrow abdominal region (Fig. 90A, C, E). Holotype (USNM 1741813) complete with 51 setigers, 19 mm long, 4 mm wide across expanded anterior setigers (setigers 5–14) and about 1.2 mm wide across narrow posterior region. Paratype (USNM 1741818) complete with 52 setigers, 20 mm long, 2.2 mm wide; paratype (USNM 1741826) complete with 46 setigers, 26 mm long, 3.5 mm wide; paratype (MCZ IZ 171995) complete with 45 setigers, 21 mm long, 3.2 mm wide. Numerous smaller specimens present, including juveniles and post-larval forms of 1 mm or less and with fewer than 20 setigers. Body surface covered with numerous annulated rings formed of separate elevated pads or blocks. Color in alcohol light tan; larger specimens with a yellow-orange cast over most of body (Fig. 90A–E); a few specimens with dark reddish-colored glands on venter of parapodia on setigers (3/4–5; similar pigmented glands present on dorsal and ventral cirri of posterior parapodia. Color of glands possibly due in part to staining with Rose Bengal during sample sorting.

Prostomium wedge-shaped, wider than long, with weakly curved anterior margin bearing two short oval-shaped lateral horns (Fig. 91A); prostomium with a pair of narrow posterior dorsal crests distinctly separated from anterior part by a groove (Fig. 91A); in addition, a shallow depression present mid-dorsally posterior to anterior margin (Fig. 91A); eyespots absent; nuchal organs everted on some specimens as elevated ciliated lobes between prostomium and peristomium. Peristomium a single thick multilobed ring encompassing prostomium dorsally (Fig. 91A), continuing onto to ventral surface producing anterior lip of mouth; anterior lip biannulate, consisting of two rows of elongate narrow pads anterior to mouth (Figs. 90F, 91B); oral opening between peristomium and setiger 1 with posterior lip on setiger 1 bordered by a row of about 6–12 lobes (Figs. 90F, 91B), smaller specimens with few lobes. When everted, proboscis with numerous thickened lobes surrounding oral opening.

Segmental annulations prominent along body; these divided into separate elevated pads or square-shaped blocks, providing complex areolated appearance to body surface (Figs. 90A–G; 91A–B); setigers 2–4(5) with three rows of thickened elongate pads dorsally and ventrally (Figs. 90B, F, 91A–B); thereafter annular rings narrower and mostly quadriannulate along rest of body (Fig. 90A–E); some posterior setigers pentannulate (Fig. 90G). Ventral midline from setiger 2 with large epidermal pads on each segment; initially these a single large pad (Figs. 90F, 91B), becoming divided and paired from about setigers 4–6; some far posterior setigers with three pads per segment (Fig. 90D); these mid-ventral pads producing a raised mid-ventral ridge along entire body. Dense patches of arborescent branched branchiae present on setigers 2–5 posterior to notosetae (Figs. 90A–B, 91A).

Parapodia of anterior and middle body to about setiger 12–14 reduced to enlarged lateral lobes with setal fascicles emerging from depression; thereafter, podial lobes develop, becoming longer, narrow, with setal fascicles emerging directly from lobe. Dorsal and ventral cirri first present from about setigers 15–20 or mid-body, cirri initially short and rounded, becoming long, thick, and narrower by about setiger 30, continuing to posterior end; individual cirri of posterior setigers thick, cylindrical; dorsal cirri with rounded, almost papillate tip (Fig. 91F); ventral cirri with blunt narrow tip (Fig. 91F). Each dorsal and ventral cirrus with numerous small

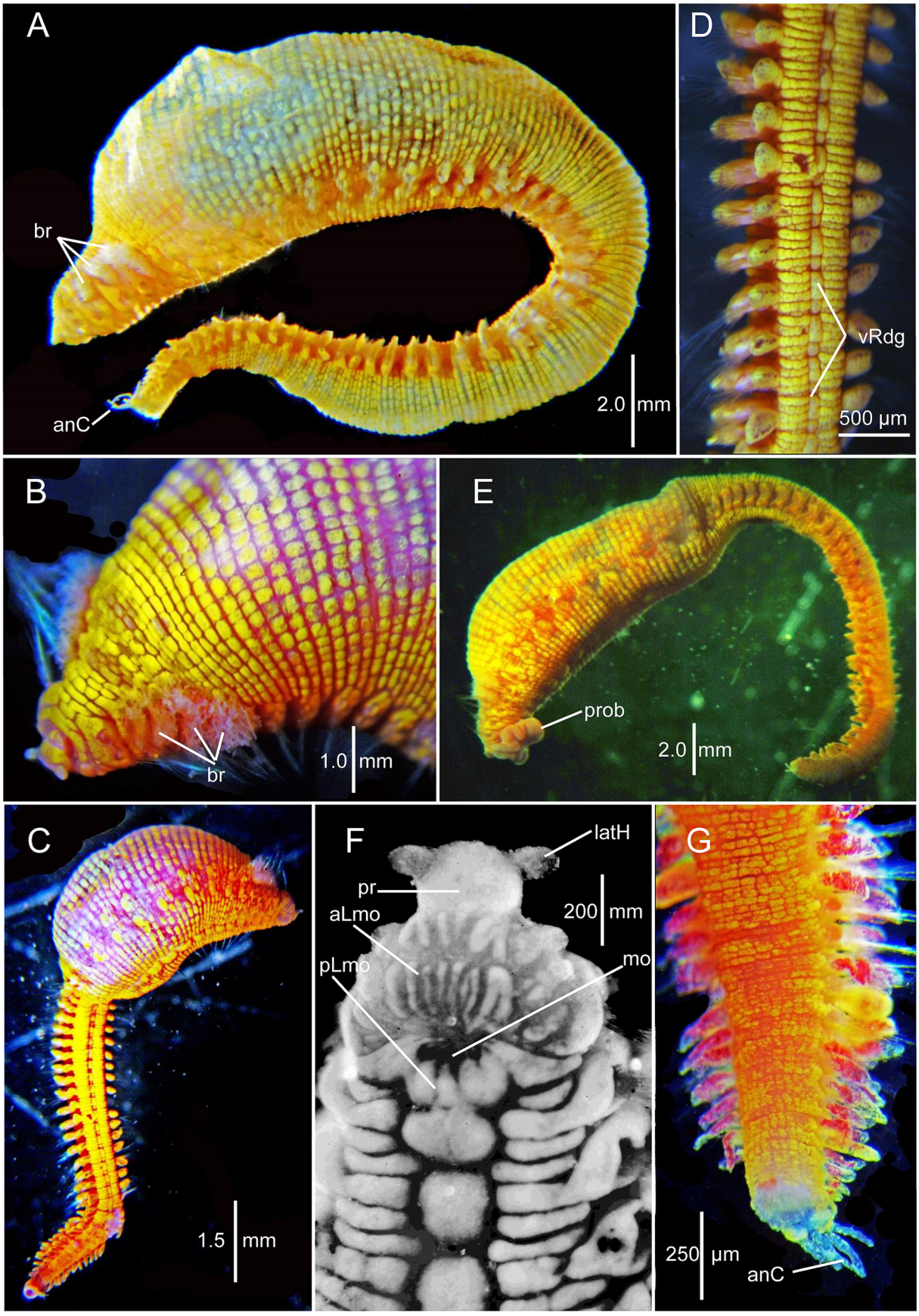

FIGURE 90. *Scalibregma rhoadsi* **sp. nov.** A, entire worm, left lateral view; B, anterior end, dorsal lateral view; C, entire worm, right lateral view; D, posterior parapodia, ventral view; E, entire worm, left lateral view; F, anterior end, ventral view; G, posterior end, dorsal view. A, holotype, (USNM 1741813); B–E, paratypes (USNM 1741814); F, Sta. 9 (USNM 1741830); G, paratype (USNM 1741826). All stained with Shirlastain A.

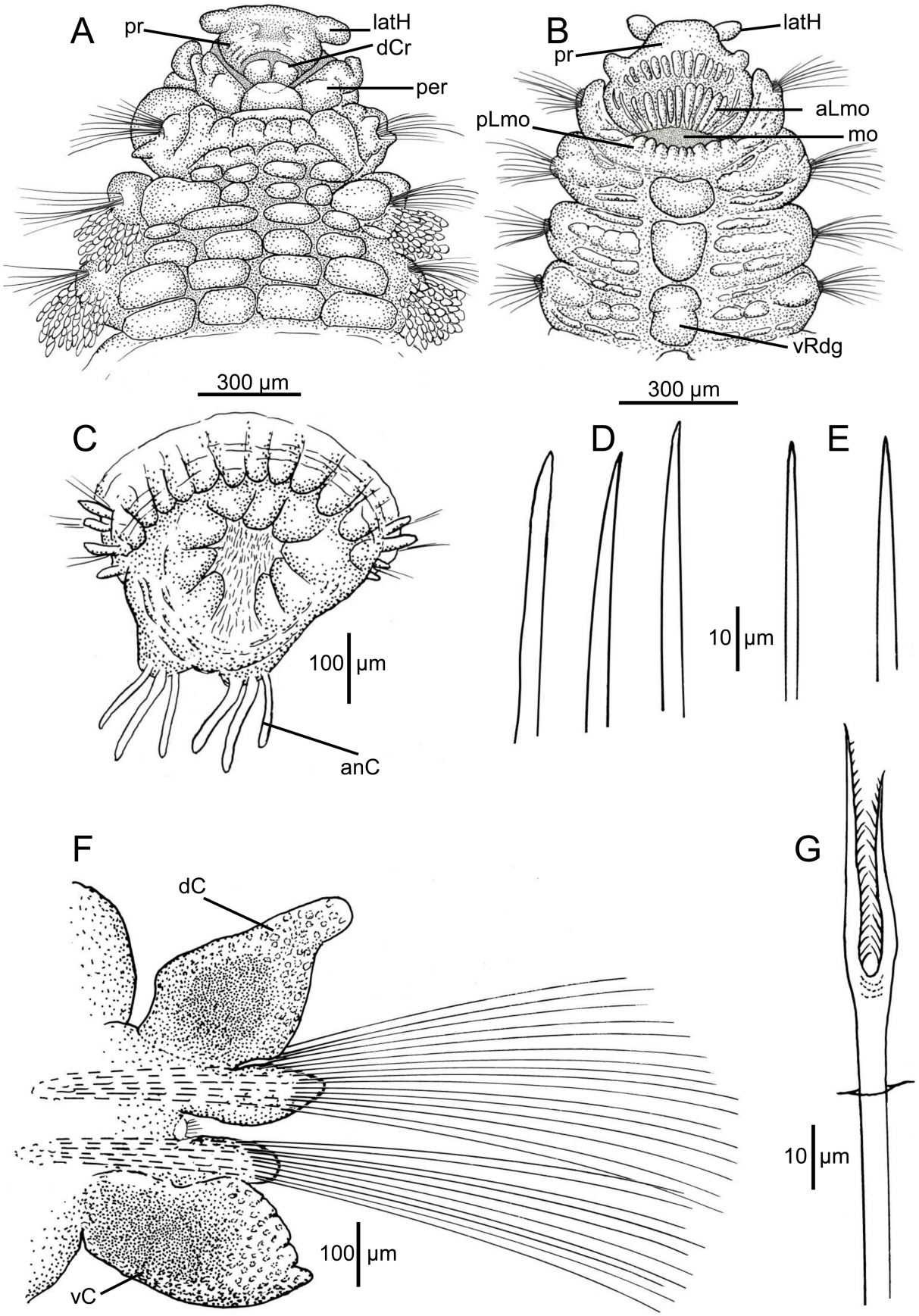

FIGURE 91. *Scalibregma rhoadsi* **sp. nov.** A, anterior end, dorsal view; B, anterior end, ventral view; C, pygidium, posterior view; D, short spinous setae anterior to capillaries, notopodia, setiger 1; E, short spinous setae anterior to capillaries, neuropodia, setiger 1; F, far posterior parapodium, posterior view; G, furcate seta. A–F, paratypes (USNM 1741814); G, (USNM 1741835).

glands concentrated in thicker part of cirrus (Fig. 91F); these with dark red pigment. Interramal papillae short, rounded, ciliated, between podia of middle and posterior setigers (Fig. 91F).

All setigers with noto- and neuropodial fascicles of slender capillaries, setae of anterior setigers more numerous, arranged into 2–3 rows, setae of posterior row longest; capillaries of middle and posterior setigers arranged in 1–2 rows; all capillaries smooth in appearance, but with numerous short inconspicuous fibrils or bristles along their length. Setiger 1 with additional anterior row of 4–6 short, slender, spinous setae at base of first row of capillaries in both noto- and neuropodia; spines of noto- and neuropodia both narrow, tapering to pointed tip (Fig. 91D–E), those of notopodia appearing slightly larger than those of neuropodia. Setiger 2 and following with furcate setae in same anterior position as short spines of setiger 1; each furcate seta with sub-equal tynes tapering to fine tips and numerous denticles on inner margins directed toward opposite tyne (Fig, 91G).

Pygidium with six long, narrow, anal cirri arising from a pair of ventral lobes, each lobe bearing three cirri (Figs. 90G, 91C); anal opening surrounded by 8–10 lobes (Fig. 91C).

Remarks. *Scalibregma rhoadsi* **sp. nov.** is another species that had previously been mistakenly identified as *S. inflatum*. The new species occurs in unusually high densities in continental slope sediments off Cape Hatteras, North Carolina. *Scalibregma rhoadsi* **sp. nov.** differs from the majority of species of the genus in having a wedge-shaped prostomium with a pair of posterior dorsal crests distinctly separated by a groove; the pygidium bears six anal cirri, single thick multilobed ring encompassing prostomium dorsally.

Scalibregma lydoniensis **sp. nov.** from off New England also has six anal cirri arising from two ventral lobes and a posterior prostomial dorsal crest, however, in *S. lydoniensis* **sp. nov.** the dorsal crest is a single undivided unit and there is no anterior depression on the prostomium as in *S. rhoadsi* **sp. nov.** In addition, short spinous setae are present in setigers 1–2 in *S. rhoadsi* **sp. nov.** and absent in *S. lydoniensis* **sp. nov.** Finally, a distinct interramal papilla is absent in *S. lydoniensis* **sp. nov.** whereas it is present in *S. rhoadsi* **sp. nov.**

Scalibregma therouxi **sp. nov.** from off New England, is another species with a prostomial dorsal crest.; This species differs from *S. rhoadsi* **sp. nov.** in having a single transverse posterior prostomial crest and a smooth dorsal prostomial surface and further differs from *S. rhoadsi* **sp. nov.** in having a few large lobes surrounding the anal opening and four anal cirri instead of 9–12 short anal lobes and six anal cirri.

Biology. The high density of benthic infauna on the continental slope off Cape Hatteras reported by Blake & Hilbig (1994) is reflected in the enormous number of specimens of *Scalibregma rhoadsi* **sp. nov.** (17,000+) reported in this study. Rhoads & Hecker (1994) postulated that the high densities of benthic infauna off Cape Hatteras are likely the result of a sedimentation process and nutrient regime that is more typical of an estuarine system than an oceanic deep-sea regime. These authors postulate that terrigenous organic matter, plankton, and seston is transported along the shelf from Chesapeake Bay and Delaware Bay south and out over the shelf at Cape Hatteras and down the slope.

Scalibregma rhoadsi **sp. nov.** was the second most abundant invertebrate at four Cape Hatteras stations at 530–620 m and the most abundant species at eight stations along the 800 m isobath. The species was also the most abundant taxon at three stations at 1410–1535 m, and ranked fourth at the 2000 m station (Blake & Hilbig 1994).

As part of a life history analysis of this species (as *S. inflatum*), Blake (1993) reported females with eggs in each of three collections at Sta. 6 (600 m) off Cape Hatteras. Eggs in various growth phases were found, with the largest eggs recorded in September 1985 (190 µm); average egg sizes were: July 1984 (n = 25, mean=150 µm, SD = ±20); May 1985 (n = 25, mean = 160 µm, SD = ±30) and September 1985 (n = 25, mean=130 µm, SD=±10); these data were not significantly different between seasons, suggesting reproduction occurs year around. Size frequency data of the specimens also did not indicate any seasonality either with regard to average sizes or size-frequency distribution over any of the three seasons observed (Blake 1993, Fig. 6). The largest specimens were observed in May 1985 and the smallest in September 1985, possibly suggesting a summer recruitment pattern as part of a shift toward smaller specimens from May to September.

Etymology. This species is named for Dr. Donald C. Rhoads, internationally recognized benthic ecologist, inventor of the sediment profile imaging camera system, and long-time colleague and friend. Dr. Rhoads was part of the Cape Hatteras project team and provided interpretation of the sedimentary and oceanographic processes relevant to understanding the nature of the unusually high infaunal densities of benthic invertebrates including scalibregmatids in the continental slope sediments off Cape Hatteras (Rhoads & Hecker 1994).

Distribution. Western North Atlantic Ocean, continental slope off Cape Hatteras, North Carolina, 530–2004 m.

***Scalibregma ridleyensis* new species**

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Figures 92–93

Material examined. (*687 specimens*) **Eastern North Pacific Ocean, British Columbia, Canada, off Ridley Island**, coll. S. A. Doner & P. S. Winchell, 0.05-m^2 vVG, MV *Metlakatla Spirit*. **Sta. B02**, 19 Sep 2012, 54.208°N, 130.336°W, 21.4 m, **holotype** (MCZ IZ 172002), 1 **paratype** (MCZ IZ 172003); **Sta. B01**, 19 Sep 2012, 54,209°N, 130.339°W, 24.5 m (1, MCZ IZ 172001); **Sta. B12**, 19 Sep 2012, 54.199°N, 130.319°W, 11.0 m, 2 **paratypes** (MCZ IZ 172004); **Sta. B14**, 20 Sep 2012, 54.205°N, 130.327°W, 9.1 m, 1 **paratype** (MCZ IZ

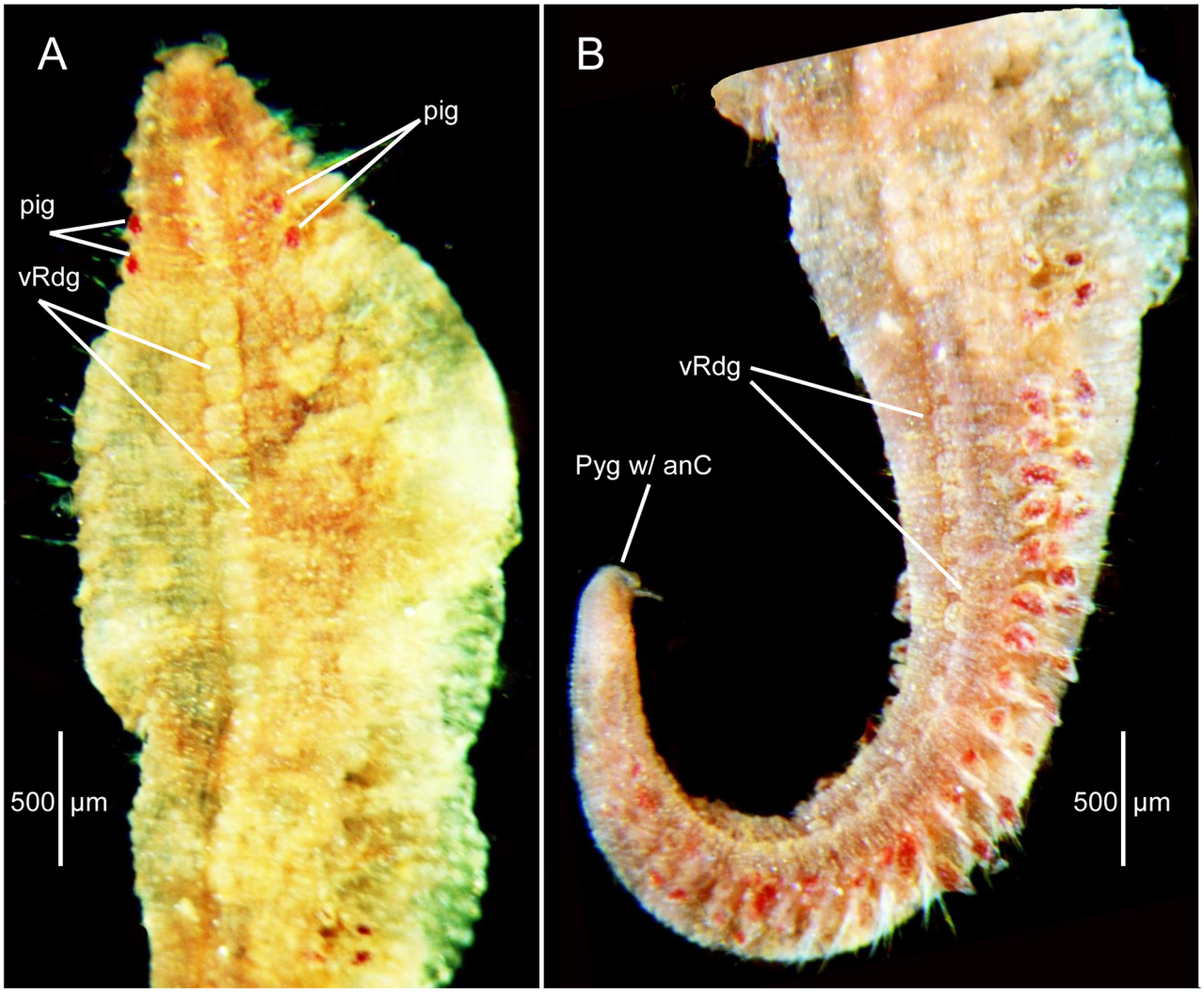

FIGURE 92. *Scalibregma ridleyensis* **sp. nov.** Holotype (MCZ IZ 172002): A, anterior end, ventral view; B, posterior end, ventrolateral view. Stained with Shirlastain A.

172005); **Sta. B22**, 21 Sep 2012, 54.198°N, 130.314°W, 20.8 m, 5 **paratypes** (MCZ IZ 172006); **Sta. B27**, 21 Sep 2012, 54.203°N, 130.316°W, 8.6 m, 1 **paratype** (MCZ IZ 172007); **Sta. B33**, 21 Sep 2012, 54.201°N, 130.307°W, 28.8 m, 2 **paratypes** (MCZ IZ 172008); **Sta. B35**, 21 Sep. 2012, 54.205°N, 130.301°W, 26.7 m (1 juv, MCZ IZ 172009).—**Alaska, SW, near BC border, Boca de Quadra Fjord**, Inner Basin, approximately 55.301°N, 30.514°W: **Sta. 6BQA041**, ca. 55.3238°N, 130.4891°W, Mar 1981, ca. 70 m, (246, CASIZ 150504); **Sta. 6BQ100**, ca. 55.317°N, 130.490°W, Mar 1981, ca. 95 m (350, CASIZ 150507); **Sta. 8BQ100**, ca. 55.317°N, 130.490°W, Sep 1981, ca. 95 m (12, CASIZ 150690); **Sta. 3BQ102**, ca. 55.3150°N, 130.4929°W, Dec 1979, ca. 90 m (63, CASIZ 150553).—**Alaska, Stephens Passage, near Juneau**, coll. H.R. Jones, Jun 1996, AJ Mine winter trawl survey, **Sta. A-3**, Rep 5, 58.3040°N, 134.7095°W, ca. 50 m (1, CASIZ 161140).

Description. A moderately large species, holotype (MCZ IZ 172002) complete with 52 setigers, 18 mm long, 2.9 mm wide across expanded segments at setiger 10 and 0.9 mm wide across posterior segments (Fig. 92A–B); smaller paratype (MCZ IZ 172003) from same station with 45 setigers, 10.5 mm long, 1.5 mm wide across setigers 9–10, 0.5 mm wide posteriorly. Body arenicoliform with setigers 6–12/15 expanded (Fig. 92A) followed by narrow posterior region (Fig. 92B). Body cylindrical in anterior enlarged segments, in cross section rounded dorsally, flattened ventrally, with mid-ventral groove bearing row of large pads or a ridge (Figs. 92A–B, 93B). Color in alcohol weakly yellow or flesh colored; with reddish pigmented glands anterior to parapodia on dorsal and ventral surfaces of setigers 4–5 (Figs. 92A, 93A–B). Posterior dorsal and ventral cirri also with internal pigmented glands (Fig. 92B); small reddish pigment spots also present on posterior parapodia and anal lobes and cirri.

Prostomium short, wider than long, T-shaped, with curved anterior border bearing a pair of laterally directed tapering horns; transverse dorsal crest present anterior to peristomium (Fig. 93A); eyespots absent; nuchal organs not observed. Peristomium a single multilobed ring dorsally (Fig. 93A), divided into two smooth rings ventrally, merging with anterior lip of mouth (Fig. 93B).

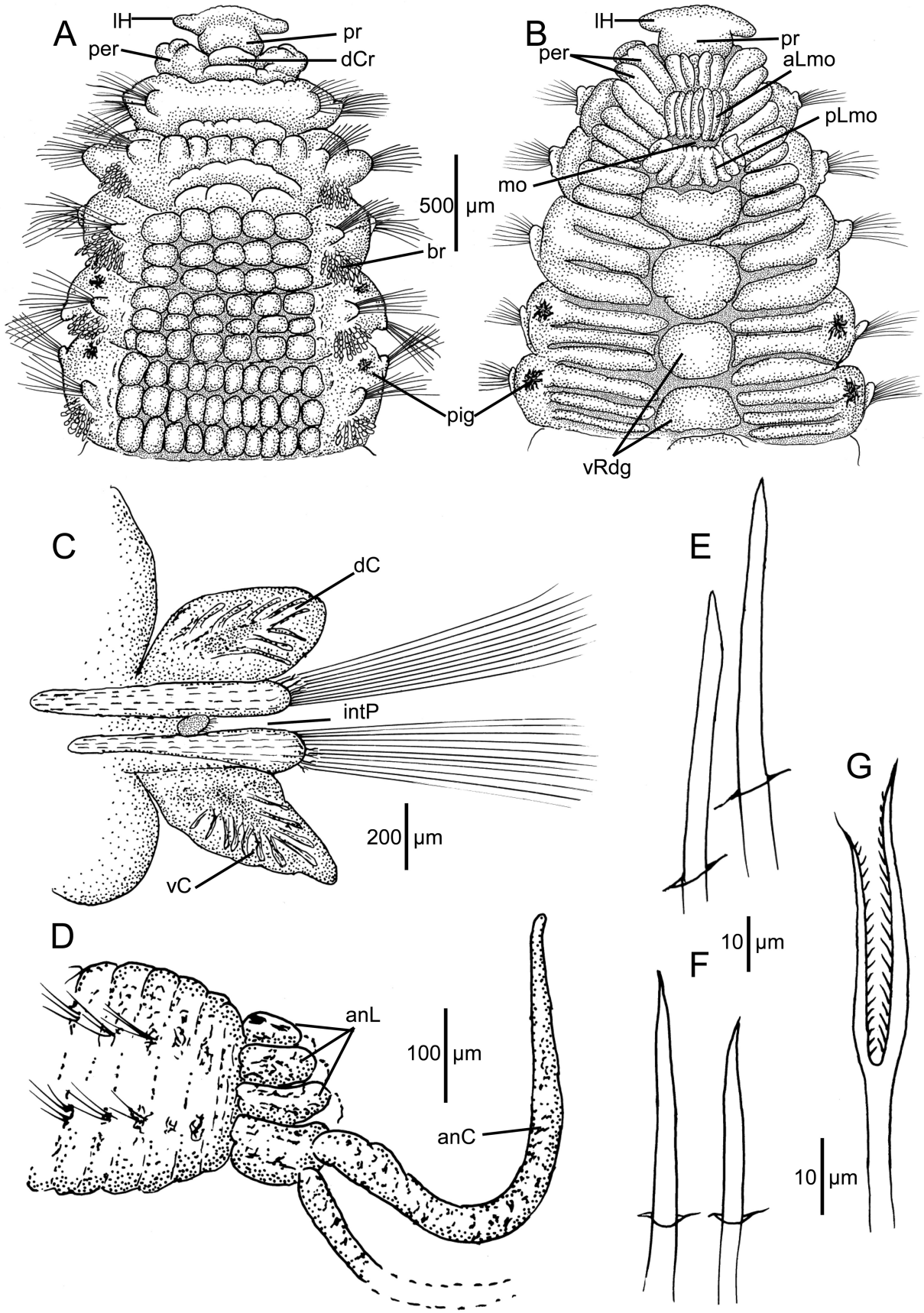

FIGURE 93. *Scalibregma ridleyensis* **sp. nov.** A, anterior end, dorsal view; B, anterior end, ventral view; C, posterior parapodium, left anterior view; D, posterior end, left lateral view; E, short spinous notosetae, setiger 1; F, short spinous neurosetae, setiger 1; G, furcate seta, posterior neuropodium. A–B, D, paratype (MCZ IZ 172003); C, E–G, paratype (MCZ IZ 172004).

Mouth a transverse opening on middle of setiger 1; anterior lip of mouth with two rows of elongate narrow lobes (Fig. 93B), posteriormost row with 7–8 narrow lobes bordering oral opening (Fig. 93B); anterior row of 5–6 short thickened lobes extending from prostomium to posterior row of lobes; posterior lip of mouth at extending onto setiger 2, formed by about eight thick lobes (Fig. 93B); proboscis not observed.

Segmental annulations present along entire body but elevated pads not overly prominent, especially on venter. Setigers 1–5 triannulate, except dorsum of setiger 1 biannulate (Fig. 93A); dorsum with elevated pads on annular rings well-developed on setigers 3–5 (Fig. 93A); venter with setigers 1–5 all triannulate, but as smooth rows, separate pads not evident (Fig. 93B). Annular rings from setiger 6 quadriannulate on both dorsum and venter; ventral midline with medial row of large pads extending from setiger 2 along entire body forming prominent mid-ventral ridge (Fig. 92A–B, 93B); ridge depressed into mid-ventral furrow in posterior setigers (Fig. 92A). Each mid-ventral pad single in anterior (Fig. 93B) and middle setigers, becoming double in posterior setigers. Branchiae present posterior to notosetae on setigers 2–5; branchiae arborescent with numerous short filaments (Fig. 93A).

Parapodia of setigers 1–5 with widely spaced lateral lobes with distinct pre- and postsetal lips with setae arising between them; expanded segments from setiger 6 with parapodia reduced to low lobes with setae emerging from a depression between them; from about setiger 12, podial lobes becoming longer, narrow, with setae emerging from lobe. Dorsal and ventral cirri first present from about setigers 15–16, cirri initially short, rounded, then becoming elongate and thickened by about setiger 25, continuing to posterior end (Fig. 93C); individual cirri of posterior setigers thick, cylindrical in cross section; cirri subequal, dorsal cirri oval, tapering to rounded tip (Fig. 93C); ventral cirri triangular in shape, tapering to narrow tip (Fig. 93C); each cirrus with granular and striated glands, both pigmented. Short, rounded interramal papillae present between podia of middle and posterior setigers (Fig. 93C).

All setigers with noto- and neuropodia with dense fascicles of slender capillaries, setae of anterior fascicles more numerous, arranged into 3–4 rows, with setae of posterior row longest; capillaries of middle and posterior setigers arranged in 1–2 rows; all capillaries thin, with minute fibrils or bristles along length, visible at 400x magnification. Setiger 1 with additional anterior row of 4–6 short, slender, pointed spinous setae at base of first row of short capillaries in both noto- and neuropodia (Fig. 93E–F); notopodial spinous setae larger than those of neuropodia. Setigers 2 and following with 6–10 furcate setae in same anterior position as short spinous setae of setiger 1; each furcate seta with sub-equal tynes tapering to fine tips and with numerous denticles on inner margins directed toward opposite tyne (Fig. 93G).

Pygidium with anal opening narrow with 6–8 large lateral lobes and four long narrow ventral anal cirri, with two arising on either side (Fig. 93D). Individual anal lobes and cirri with pigmented cells along length.

Remarks. With the addition of *Scalibregma ridleyensis* **sp. nov.** from shallow subtidal depths in western Canada and Alaska, there are now seven species of the genus identified from the Pacific coast of North America. The other six species are *S. aggregatum* **sp. nov.** (California, nearshore Monterey Bay), *S. antennatum* **sp. nov.** (California, bathyal depths), *S. californicum* Blake, 2000 (California, shelf depths), *S. hadrostomium* **sp. nov.** (California, bathyal to abyssal depths), *S. sahlingi* **sp. nov.** (off Oregon, bathyal depths), and *S. velatum* **sp. nov.** (central and northern California in shelf depths).

Morphologically, *Scalibregma ridleyensis* **sp. nov.** is the only species from the NE Pacific with a dorsal prostomial crest, biannulate anterior lips of the mouth, and four anal cirri. Other species with a prostomial dorsal crest and biannulate anterior oral lips globally are *S. lydoniensis* **sp. nov.** (W North Atlantic off New England, bathyal depths; with 6 anal cirri); *S. profundum* **sp. nov.** (SE Pacific, abyssal; with dorsal crest divided in two parts), *S. rhoadsi* **sp. nov.** (W North Atlantic off North Carolina, bathyal depths; with 6 anal cirri), and *S. therouxi* **sp. nov.** (W North Atlantic, Gulf of Maine, shelf depths). Of these, *S. ridleyensis* **sp. nov.** is remarkably similar to *S. therouxi* **sp. nov.** In addition to the prostomial dorsal crest and biannulate anterior oral lips, both species have four anal cirri arising ventrolaterally and prominent pigmented glands on the dorsal and ventral surfaces of setigers 4 and 5. However, *S. therouxi* **sp. nov.** has furcate setae from setiger 3 and short spinous setae on setigers 1–2 instead of furcate setae from setiger 2 and spinous setae limited to setiger 1 as in *S. ridleyensis* **sp. nov.** In addition, both the dorsal and ventral cirri of *S. therouxi* **sp. nov.** are triangular in shape instead of the dorsal cirrus being oval-shaped and only the ventral cirrus being triangular as in *S. ridleyensis* **sp. nov.**

The numerous specimens from Boca de Quadra from SW Alaska are in poor condition overall, likely due to sample processing at the time of collection; most specimens are incomplete, tattered, and fragmented. For this reason, the type-locality and type specimens are selected from the Ridley Island specimens, which are in excellent condition.

Biology. The paratype (MCZ IZ 172005) from Sta. B14, is a mature female with eggs measuring 146–153 µm in diameter. The six most abundant benthic invertebrate species in the Ridley Island survey with total numbers and percent of the total fauna identified to species out of more than 38,000 specimens collected were: *Nutricola lordi* (Baird, 1863) a bivalve mollusc (6325 ind.; 16.3%) and the polychaetes: *Levinsenia gracilis* (Tauber, 1879) (2096 ind.; 5.4%), *Mediomastus californiensis* Hartman, 1944b (1703 ind.; 4.4%), *Cossura pygodactylata* Jones, 1956 (1699 ind.; 4.4%), *Leitoscoloplos pugettensis* (Pettibone, 1957) (1492 ind.; 3.8%) and *Apistobranchus ornatus* Hartman, 1965 (1340 ind.; 3.5%).

Etymology. The epithet *ridleyensis* is taken from the location of the samples collected from off Ridley Island, near Prince Rupert, British Columbia, Canada.

Distribution. NE Pacific Ocean, British Columbia, Canada, off Ridley Island, subtidal, 9–29 m; SW Alaska, ~50–95 m.

***Scalibregma sahlingi* new species**
urn:lsid:zoobank.org:act:B790A014-B298-4ABF-B0B5-8F470AE24168
Figures 94–95

Material examined. **Eastern North Pacific Ocean, Off Oregon, Cascadia convergent margin,** R/V *Sonne*, Cruise 143, **Sta. 50-1**, TV-G, coll. H. Sahling, 23 Jul 1999, 44.878°N, 124.878°W, 429 m, **holotype** (MCZ IZ 172010).

Description. A moderately sized species, holotype complete with 22 setigers, but with pygidium regenerating, 13 mm long and 3.2 mm wide across expanded middle segments. Body arenicoliform, becoming greatly expanded from setigers 4–5, continuing through mid-body or about setigers 11–12, then tapering to narrow abdominal region (Fig. 94). Body surface covered with numerous annulated rings formed of separate elevated pads or blocks. Color in alcohol with a yellow-orange cast over most of body due to pigmented granules in most pads comprising annular rings; parapodia of posterior setigers with darkly pigmented glands in podial lobes and dorsal and ventral cirri.

Prostomium wedge-shaped, wider than long, with broad anterior margin bearing two elongate lateral horns (Fig. 95A–B); narrowing posteriorly, dorsally obscured by two sequential oval-shaped dorsal crests followed by a third somewhat broader crest; these crests probably peristomial; ventrally, posterior extension of prostomium bordered on either side by row of four rounded lobes forming a medial trough that may serve as a vestibule to anterior lip of mouth (Fig. 95B); eyespots absent; nuchal organs not observed. Peristomium with two rings, dorsally both bordering two mid-dorsal crests; ventrally, short thick anterior ring lateral to row of prostomial lobes and a larger posterior ring interrupted mid-ventrally by anterior lip of mouth. Anterior lip of mouth consisting of six elongate narrow lobes posterior to narrow channel formed by posterior extension of prostomium; posterior lip on setiger 1 consisting of a transverse row of 12–14 oval-shaped lobes (Fig. 95B). Proboscis not observed.

Segmental annulations prominent along body, divided into separate elevated pads or square-shaped blocks, providing complex appearance to body surface. Dorsum of setigers 1–2 triannulate, thereafter segments quadriannulate (Fig. 95A); some posterior setigers pentannulate. Dorsum of setiger 1 highly modified, with two rounded medial lobes anterior to a broad 3-part flange, followed by a short row of five pads; setiger 1 also modified ventrally, incorporated into posterior lip of mouth. Ventral midline from setiger 2 with a pair of large epidermal pads on each segment; prominent over setigers 2–6 (Fig. 95B), then obscured in mid-body and posterior

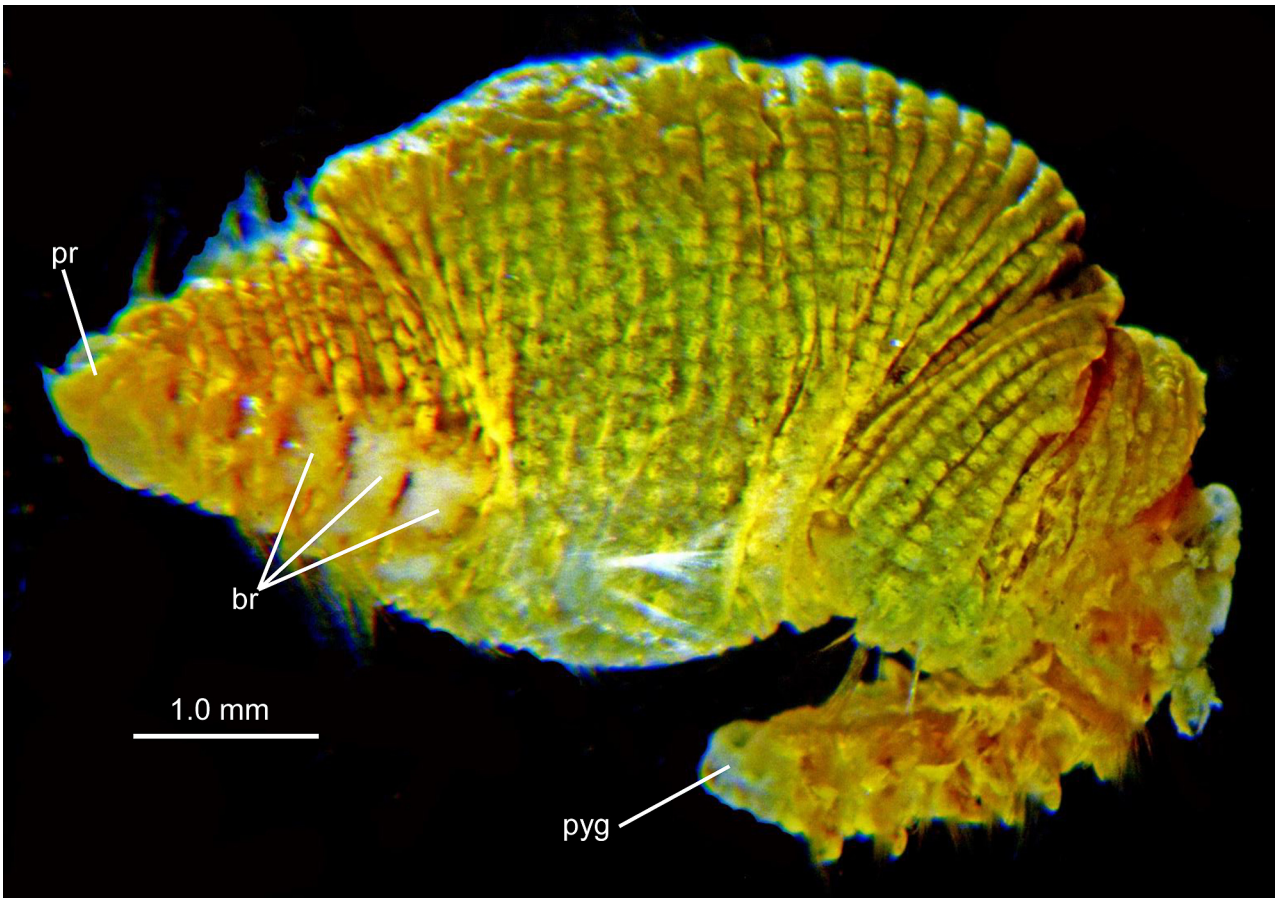

FIGURE 94. *Scalibregma sahlingi* **sp. nov.** Holotype (MCZ IZ 172010): Entire worm left lateral view. Stained with Shirlastain A.

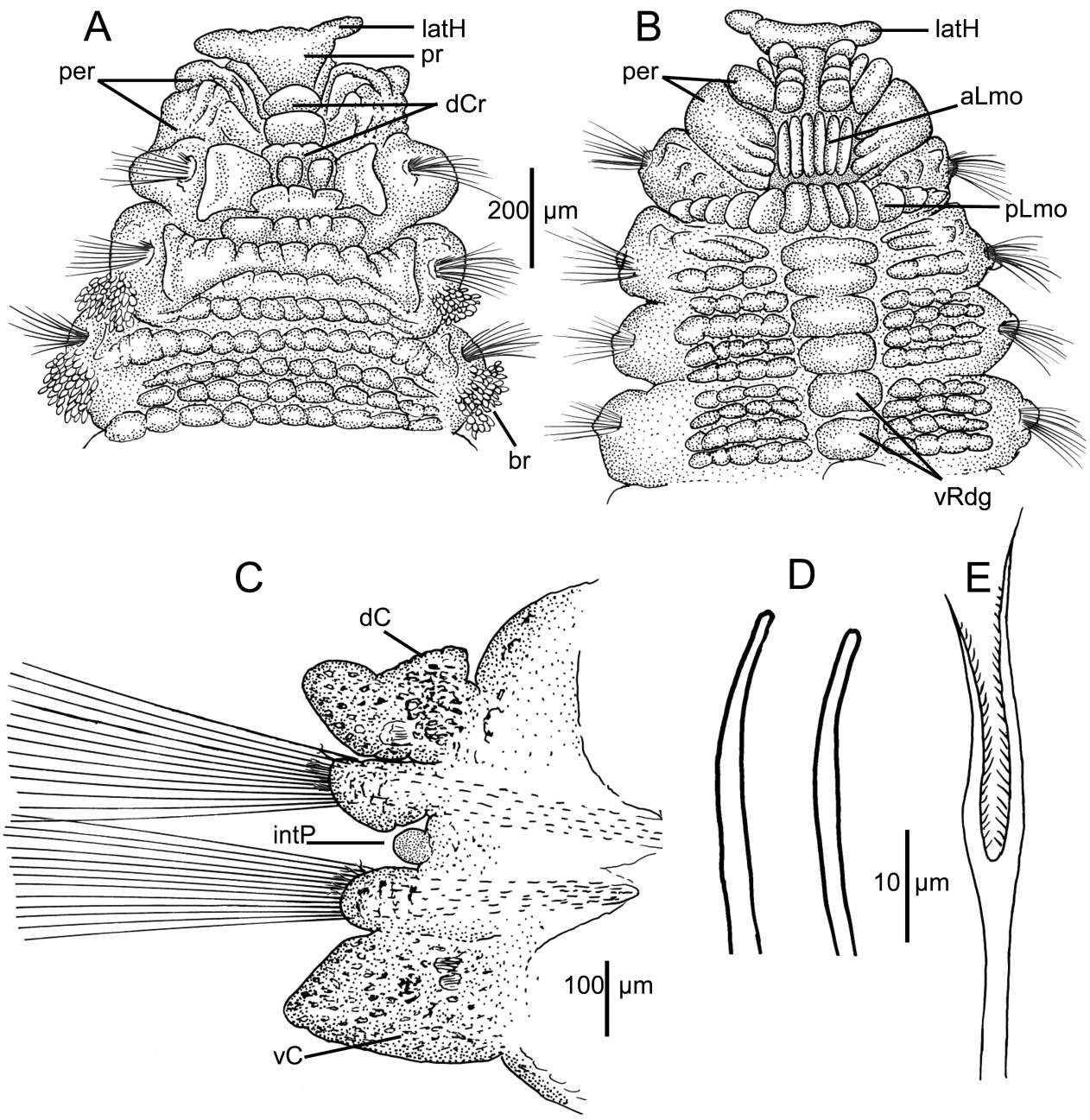

FIGURE 95. *Scalibregma sahlingi* **sp. nov.** Holotype (MCZ IZ 172010): Anterior end, dorsal view; B, anterior end, ventral view; C, posterior parapodium, anterior view; D, short spinous setae, notopodium, setiger 1; E, furcate seta, posterior neuropodium.

setigers. Branchiae on setigers 2–5, arborescent, each with numerous short branching filaments (Fig. 95A).

Parapodia of anterior and middle body segments to about setiger 10 reduced to rounded lobes with setal fascicles emerging from depression; podial lobes develop thereafter, becoming longer, narrow, with emergent setal fascicles. Dorsal and ventral cirri first present from about setiger 12 or mid-body, cirri initially short and rounded, becoming long, thick, continuing to posterior end; individual cirri of posterior setigers thick; dorsal cirri irregular, some bilobate, with anterior lobe rounded, almost papillate, tip (Fig. 95C); ventral cirri larger, asymmetrical narrowing to narrow tip (Fig. 95C). Each dorsal and ventral cirrus with numerous small glands concentrated throughout cirrus; these with dark brownish pigment; glands include clusters of small cells and few striated glands (Fig. 95C). Interramal papillae short, rounded, between podia of middle and posterior setigers (Fig. 95C).

All setigers with noto- and neuropodial fascicles of slender capillaries, setae of anterior fascicles more numerous, arranged into 3–4 rows, with setae of posterior row longest; capillaries of middle and posterior setigers arranged in 1–2 rows; all capillaries smooth in appearance, but with numerous short inconspicuous fibrils or bristles along their length. Setigers 1–2 with additional anterior

row of 4–6 short, slender, spinous setae at base of first row of capillaries in both noto- and neuropodia; spines of noto- and neuropodia both narrow, tapering to rounded tip (Fig. 95D). Setigers 3 and following with furcate setae in same anterior position as short spines of setiger 1; each furcate seta with sub-equal tynes tapering to fine tips and with numerous denticles on inner margins directed toward opposite tyne (Fig. 95E); furcate setae of posterior setigers numbering 6–10 per podium, anterior to capillaries.

Pygidium appears to be regenerating, cup-like, directed ventrally with no apparent lobes or cirri present (Fig. 94).

Remarks. *Scalibregma sahlingi* **sp. nov.** belongs to a large group of *Scalibregma* having branchiae on setigers 2–5 and with an unusual pre-setiger morphology that is not likely to be confused with any other scalibregmatids. First, the dorsal surface of the prostomium narrows posteriorly and is followed or obscured by three sequential dorsal crests, likely peristomial in origin, that are swollen and rounded on their anterior margins. Second, there are two peristomial rings that are interrupted dorsally by the three crests and ventrally by the anterior lip of the mouth. Third, the oral morphology includes an anterior lip consisting of six elongate narrow pads posterior to a narrow extension of the prostomium that is bordered on either side by a row of four rounded lobes. The posterior lip includes a transverse row of pads on the posterior border of setiger 1.

Etymology. This species is named for the late Dr. Heiko Sahling (1969–2018), marine ecologist, who collected and provided this specimen of *Scalibregma* and other polychaetes from the Cascadia margin and subduction zone off Oregon. Dr. Sahling authored an important paper on the macrofauna of the site (Sahling *et al*. 2002).

Distribution. Eastern North Pacific Ocean off Oregon, Cascadia convergent margin, 429 m.

Scalibregma therouxi new species

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Figures 96–97

Scalibregma inflatum: Theroux & Wigley 1998: 217–218 (in part). **Not** Rathke 1843.

Material examined. (*22 specimens*) **Western North Atlantic Ocean, continental shelf off New England, Gulf of Maine, National Marine Fisheries Survey,** R/V *Delaware* Cruise 61-10, 0.1-m^2 SMG: **Sta. 12A**, 28 Jun 1961, 42.883°N, 67.75°W, 245 m, clay/silt, **holotype** (MCZ IZ 172011). **Sta. 25A**, 22 Jun 1961, 43.00°N, 68.50°W, 201 m, sandy mud, 1 **paratype** (MCZ IZ 172012). **Sta**. **29A**, 28 Jun 1961, 43.60°N, 69.50°W, 201 m, muddy gravel, 1 **paratype** (MCZ IZ 172013). **Sta. 87A**, 27 Jun 1961, 43.667°N, 68.767°W, 168 m, silt/clay, 2 **paratypes** (MCZ IZ 172014).—**Massachusetts Bay, MWRA, Outfall Benthic Monitoring Program**. R/V *Aquamonitor*, coll. I. P. Williams, 0.05-m^2 vVG. **Sta. FF-04,** Rep. 3, 3 Aug 2006, 42.2882°N, 70.4250°W, 88.1 m (3, MCZ IZ 172016). **Sta. FF-05**, Rep. 3, 14 Aug 2002, 42.1334°N, 70.4223°W, 62 m (4, MCZ IZ 172017); **Sta. FF-05**, Rep. 2, 4 Aug 2004, 42.1333°N, 70.4226°W, 63 m (3, MCZ IZ 172018). **Sta. FF-09**, Rep. 2, 4 Aug 2004, 42.3125°N, 70.6568°W, 48.2 m (1, MCZ IZ 172019). **Sta. FF-09**, Rep. 2, 2 Aug 2006, 42.313°N, 70.657°W, 50 m (1, MCZ IZ 172020). **Sta. FF-09**, Rep. 2, 1 Aug 2008, 42.3125°N, 70.6565°W, 48.9 m (2, MCZ IZ 172021). **Sta. FF-10**, Rep. 2, 1 Aug 2006, 42.414°N, 70.879°W, 28.7 m (2, MCZ IZ 172022). **Sta. FF-11**, Rep. 3, 13 Aug 2002, 42.658°N, 70.5°W, 88 m (1, MCZ IZ 172023).

Description. A moderately sized species, holotype (MCZ IZ 172011) complete, with 46 setigers, 12 mm long, 2.0 mm wide across expanded anterior region, 0.8 mm wide in posterior setigers; paratype (MCZ IZ 172012) also complete, with 46 setigers, 11.5 mm long, 2.1 mm wide across anterior setigers and 0.8 mm wide in posterior setigers; largest paratype (MCZ IZ 172013) incomplete, with 28 setigers, 19 mm long, 3.0 mm wide across anterior setigers at setiger 9. Body arenicoliform, with expanded anterior region from about setigers 6–7 to 12–15, followed by long, narrow posterior region (Fig. 96A). Body cylindrical in anterior segments but with dorsum rounded and venter weakly flattened; posterior region dorsoventrally flattened. Color in alcohol yellow-orange throughout, with ventral reddish pigmented glands on setigers 4–5 on each specimen (Fig. 96D); smaller reddish glands present along body and on each anal cirrus (Fig. 96C); dorsal and ventral cirri with pigmented internal glands (Fig. 97D).

Prostomium wedge-shaped in dorsal view (Figs. 96B, 97A), about as wide as long, tapering posteriorly, terminating with short transverse dorsal crest (Fig. 97A); anterior margin smooth, bearing a pair of short rounded lateral horns not projecting anteriorly (Figs. 96B, 97A); ventrally with about five elongate lobes extending from anterior margin of prostomium to anterior border of anterior lip of mouth (Figs. 96D, 97B–C); eyespots absent; nuchal organs not observed. Peristomium a single multilobed dorsal ring encompassing posterior prostomial dorsal crest (Figs. 96B, 97A); a single mid-dorsal transverse lobe present between peristomium and setiger 1 (Figs. 96B, 97A); ventrally, peristomium divided into three lateral lobes terminating lateral to anterior lip of mouth (Figs. 96D, 97B–C). Mouth a transverse opening between peristomium and setiger 1; anterior lip of mouth large, swollen, with two layers of elongate narrow lobes (Figs. 96D, 97B–C); posterior lip with four large lobes in middle of setiger 1 (Figs. 96D, 97B–C); proboscis not observed.

Segmental annulations prominent with elevated pads visible along entire body (Fig. 96A); setigers 1–5 including branchiate segments all dorsally triannulate (Figs. 96B, 97A), thereafter quadriannulate; ventrally, setiger 1 with only single annular ring, obscured by enlarged posterior lip of mouth; setigers 2–5 triannulate, thereafter quadriannulate (Fig. 96D); ventral midline with medial row of large pads extending from setiger 2 along entire body, forming prominent mid-ventral ridge (Fig. 96D).

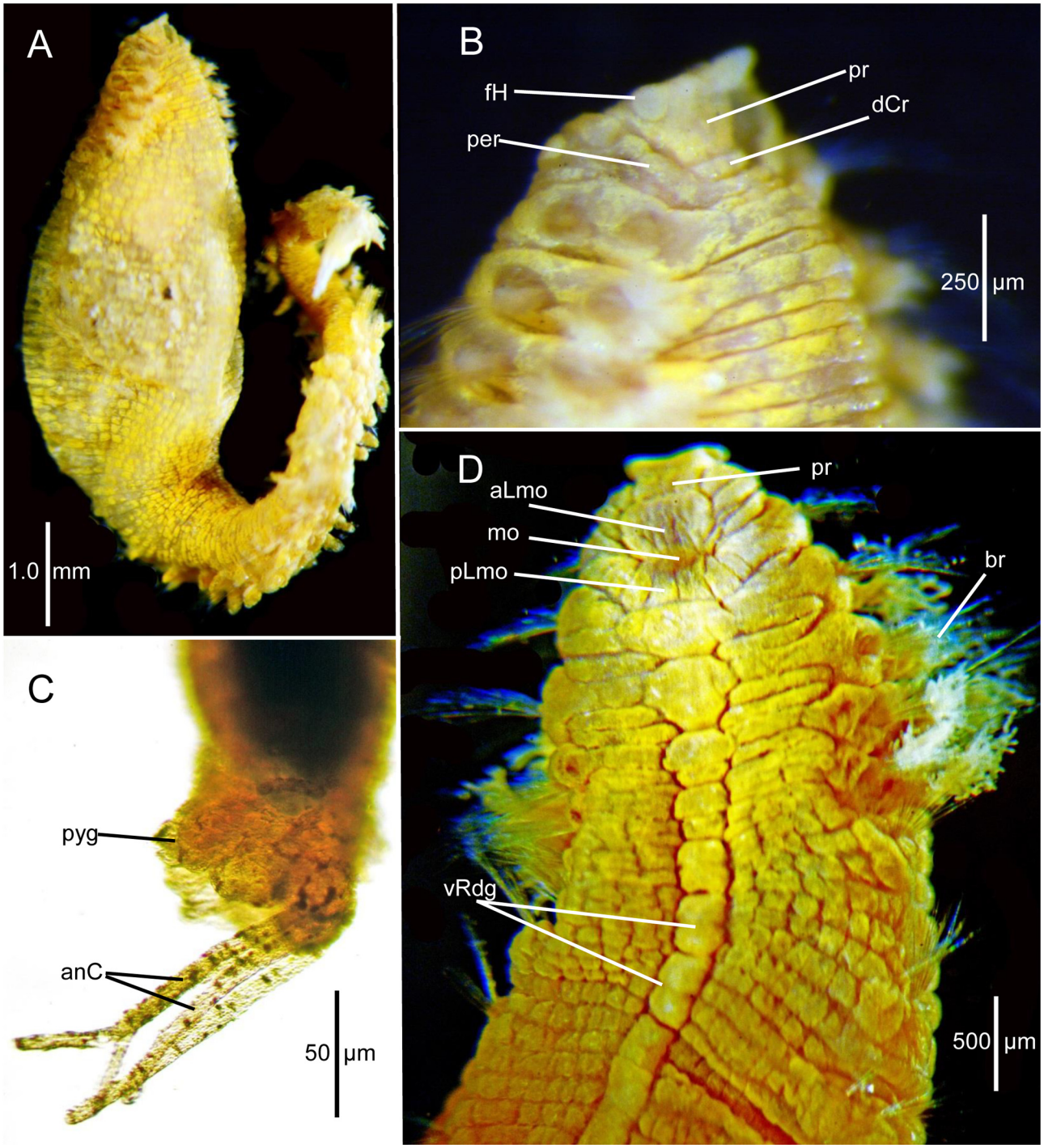

FIGURE 96. *Scalibregma therouxi* **sp. nov.** A, entire worm, left dorsolateral view; B, anterior end, dorsolateral view; C, pygidium with anal cirri, right lateral view; D, anterior end, ventral view. A–C, holotype (MCZ IZ 172011); D, paratype (MCZ IZ 172013).

Each mid-ventral pad double or in two parts, together meeting each row of ventral pads on each segment (Fig. 96D). Branchiae present posterior to notosetae on setigers 2–5; these arborescent with numerous long filaments (Figs. 96D, 97A).

Parapodia of anterior and middle body segments to about setiger 12–14 with swollen lateral lobes with setal fascicles emerging from a depression between them; thereafter, low pre- and postsetal lobes or crests present; subsequently, podial lobes becoming longer and narrow, with setal fascicles emerging from lobe. Dorsal and ventral cirri first present from about setigers 15–16 or mid-body; cirri initially short, rounded, then becoming elongate and thickened by about setiger 25, continuing to posterior end; individual cirri of posterior setigers thick, cylindrical, triangular in shape, tapering to narrow tip (Fig. 97D); dorsal cirri larger than ventral cirri; each cirrus with pigmented striated glands (Fig. 97D). Short, rounded interramal papillae present between podia of middle and posterior setigers (Fig. 97D).

All setigers with noto- and neuropodia with dense fascicles of slender capillaries, setae of anterior fascicles

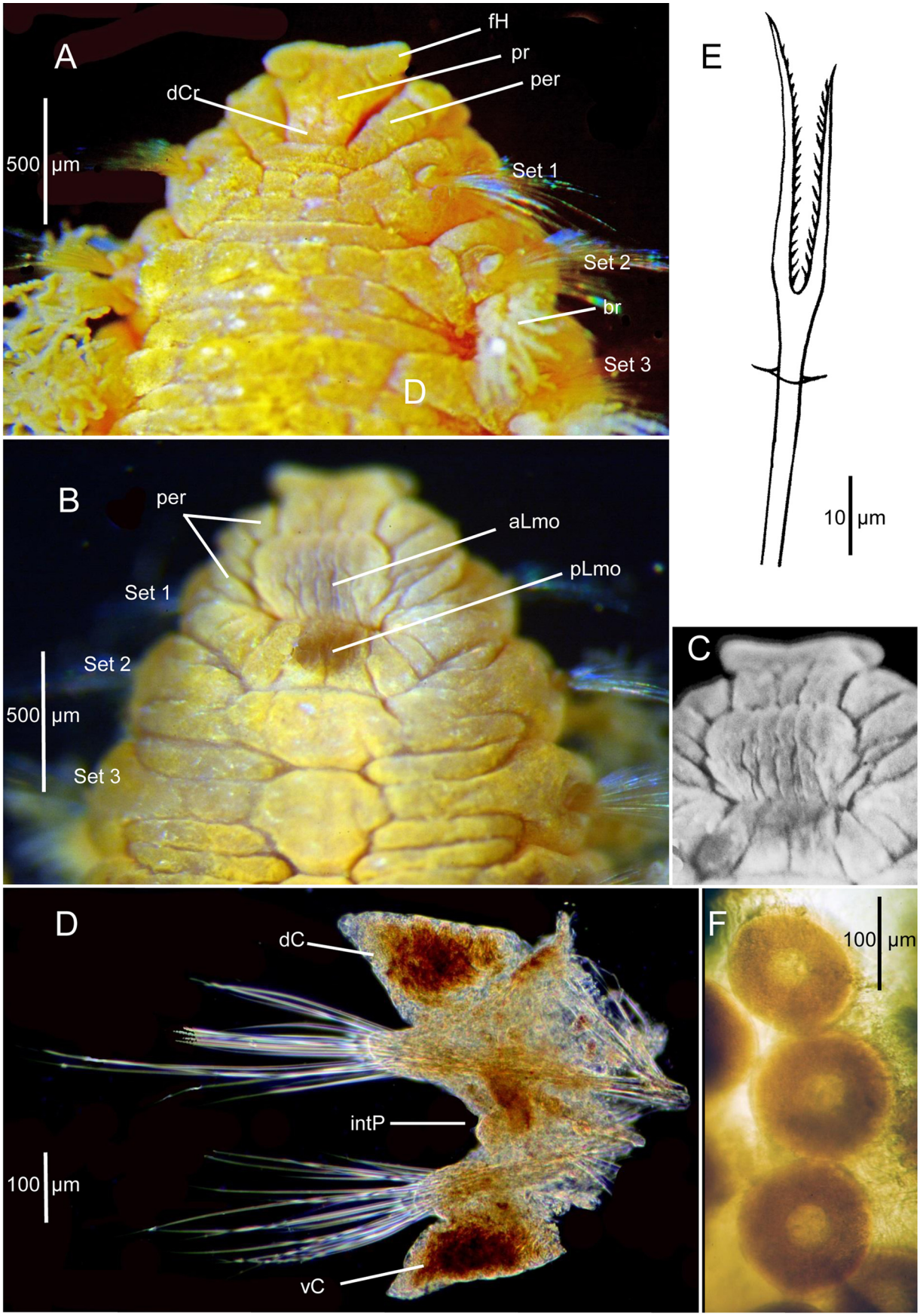

FIGURE 97. *Scalibregma therouxi* **sp. nov.** Paratype (MCZ IZ 172013): A, anterior end, dorsal view; B, anterior end, ventral view; C, detail of oral morphology; D, posterior parapodium, anterior view; E, furcate seta, posterior parapodium; F, oocytes.

more numerous, arranged into 2–3 rows, setae of posterior row longest; capillaries of middle and posterior setigers arranged in 1–2 rows; all capillaries thin, with fibrils or bristles minute, only visible at 1000x magnification. Setigers 1–2 with additional anterior row of 4–6 short, slender, narrow pointed spinous setae at base of first row of short capillaries in both noto- and neuropodia. Setigers 3 and following with 6–8 furcate setae in same anterior position as short spinous setae of setigers 1–2; each furcate seta with sub-equal tynes tapering to fine tips and with numerous denticles on inner margins directed toward opposite tyne (Fig. 97E).

Pygidium with anal opening narrow, with large lateral lobes and four long narrow ventral cirri, two on either side. Individual anal cirri with pigmented glands along length (Fig. 96C).

Remarks. *Scalibregma therouxi* **sp. nov.** has been encountered only in shelf depths in the Gulf of Maine and Massachusetts Bay but is likely more widespread along the U.S. and Canadian continental shelf.

By having a posterior dorsal crest on the prostomium together with a single multilobed dorsal peristomial ring, furcate setae from setiger 3, and short spinous setae present anterior to capillaries in setigers 1–2, *S. therouxi* **sp. nov.** is most similar to *S. rhoadsi* **sp. nov.** from the continental slope off North Carolina. *Scalibregma therouxi* **sp. nov.** differs from *S. rhoadsi* **sp. nov.** in having a few large lobes surrounding the anal opening and four anal cirri instead of 9–12 short anal lobes and six anal cirri. More importantly, *S. rhoadsi* **sp. nov.** has the posterior prostomial crest divided into two parts and the anterior half of the prostomium has an anterior depression, whereas *S. therouxi* **sp. nov.** has a single transverse posterior prostomial crest and the rest of the dorsal surface of the prostomium is smooth. Ecologically, the two species differ significantly, with *S. rhoadsi* **sp. nov.** occurring in bathyal depths from 530–2004 m; whereas *S. therouxi* **sp. nov.** has only been found in continental shelf depths of 50–245 m.

Locally, *S. therouxi* **sp. nov.** may co-occur with *S. brevicaudum.* The latter species, however, is readily identified and distinguished from the former by the distinctive dorsal pigmented annular ring on each of setigers 3–6.

Biology. Paratype from Sta. 29A (MCZ IZ 172013) with coelom filled with saucer-shaped oocytes measuring 104–116 mm wide, each with a prominent nucleus (Fig. 97F).

Etymology. This species is named for the late Dr. Roger B. Theroux (1935–2008), former biologist with the U.S. National Marine Fisheries Service, who together with the late Dr. Roland L. Wigley collected numerous benthic samples along the U.S. Atlantic coast and described benthic ecosystems.

Distribution. W North Atlantic Ocean, off New England, Gulf of Maine, 201–245 m; Massachusetts Bay, 48–88 m.

Scalibregma velatum new species

urn:lsid:zoobank.org:act:AF3695BA-9F1A-426F-8656-771DB13C95DE

Figures 98–99

Scalibregma inflatum: Blake *et al*. 1992: A-2. **Not** Rathke, 1843.
Scalibregma californicum Blake, 2000: 133–135, Fig. 6.1 (In part).

Material examined. (*8 specimens*) **Eastern North Pacific Ocean, California. Continental shelf, Half Moon Bay**, U.S. EPA 102 Baseline Survey, R/V *Point Sur***,** coll. J.A. Blake, **Sta. 2-2**, 23 Sep 1991, 0.05-m^2 vVG, 37.4697°N, 122.8525°W, 100 m, **holotype** (CASIZ 119537).—**Continental shelf, Monterey Bay**, off mouth of the Pajaro River, coll. R. Spies, **Sta. 2**, 06 May 1975, 36.8382°N, 121.8463°W, 40 m, 2 **paratypes** (CASIZ 3026); same locality, coll. Moss Landing Marine Laboratory, **Site 1175**, 21 Aug 1971, 36.8367°N, 121.837°W, 36.5 m, 1 **paratype** (CASIZ 131516). Off Pleasure Point, coll. Moss Landing Marine Laboratory, **Site 1152**, 20 Aug 1971, 36.9133°N, 122.0167°W, 36 m, (2, CASIZ 131518). Off Ellicott Slough, coll. Moss Landing Marine, Laboratory, **Site 1156**, 21 Aug 1971, 36.8833°N, 121.9167°W, 37 m, 2 **paratypes** (CASIZ 131515).

Description. A small species, body elongate, arenicoliform, only weakly expanded in first third of body until about setiger 16, then narrowing posteriorly (Fig. 98A). Holotype (CASIZ 119537) complete, with 34 setigers, 9.6 mm long, 1.1 mm wide across setiger 10 in expanded section, and 1.1 mm wide posteriorly; larger complete paratypes with similar body shapes, only weakly expanded in anterior third: largest paratype (CASIZ 131515) with 45 setigers, 16.4 m long, 2.25 mm wide across expanded setigers; another complete paratype (CASIZ 131516) with 39 setigers, 16.5 mm long, 2.1 mm wide across expanded setigers and 1.1 mm wide across posterior setigers. Body with numerous transverse annular rings, but these only weakly developed and not conspicuous; location of raised pads and individual annular rings denoted by pigmented glands within low mounds producing rows of transverse pigmented glands along entire body (Figs. 98B, F, 99A–B). Setigers 1–2 with two annular rings dorsally with pigmented glands evident on setiger 2 (Fig. 99A); ventrally with both setigers with pigmented glands (Fig. 99B). Rest of body with 4–5 rows of annular rings bearing pigmented glands (Figs. 98F, 99A). Venter with low but distinct mid-ventral ridge extending along entire body from setiger 2 (Figs. 98F, 99B–C); this ridge composed of raised blocks, usually one per segment along venter. However, this ridge not as conspicuous as in most other species and with rows of pigmented glands continuing across the surface (Figs. 98F, 99B), best observed in anterior setigers.

Color in alcohol opaque white to light tan, some specimens appearing darker, likely due to long time in preservative; as noted, body surface with numerous pigmented glands on annular rings (Fig. 98A–B); dorsal and ventral cirri with numerous pigmented tubular glands (Fig. 99D).

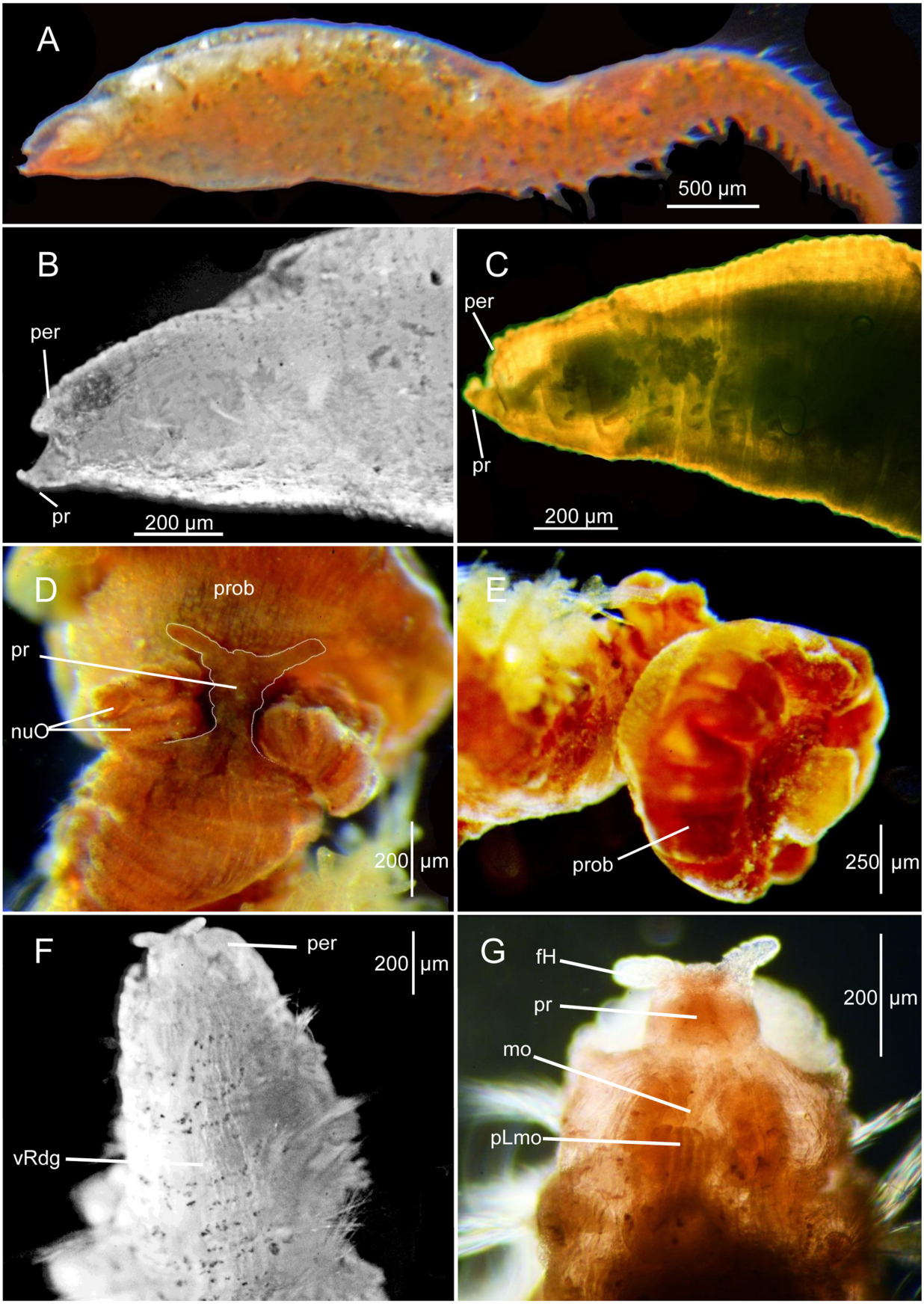

FIGURE 98. *Scalibregma velatum* **sp. nov.** A, entire worm, left lateral view; B, same, anterior end, left lateral view; C, anterior end, another specimen, left lateral view; D, anterior end, dorsal view with proboscis and nuchal organs everted; E, same specimen, front lateral view of everted proboscis; F, anterior end, ventral view, with pigmented annular rows visible; G, same, ventral view oral morphology. A–B, F–G, holotype (CASIZ 119537); C, paratype (CASIZ 3026); D–E, paratype (CASIZ 131515). A, D–E, G, stained with Shirlastain A. D, prostomium outlined to indicate structure.

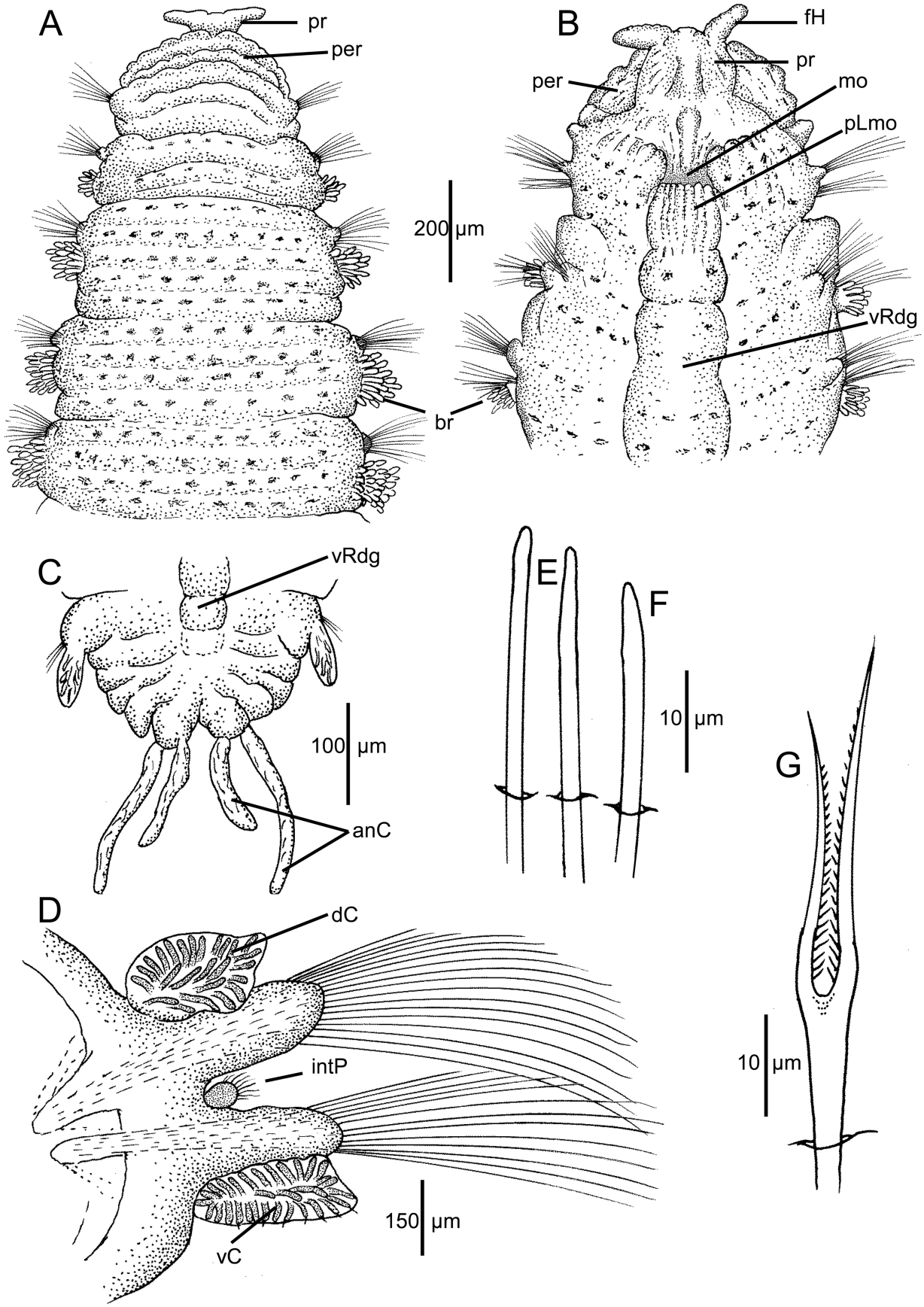

FIGURE 99. *Scalibregma velatum* **sp. nov.** A, anterior end, dorsal view; B, anterior end, ventral view; C, posterior end, ventral view; D, posterior parapodium, posterior view; E, two short spinous setae from notopodia, setiger 1; one short spinous seta from neuropodia, setiger 1; G, furcate seta from posterior neuropodium. A, C, paratype (CASIZ 3036); B, holotype (CASIZ 119537); D–G, paratype (CASIZ 31516).

Prostomium wedge-shaped, about as wide as long, mostly hidden dorsally by overlapping peristomial rings (Figs. 98B, 99A); ventrally with peristomium bordering medial groove directed toward oral opening (Fig. 99B); anterior margin narrow, slightly curved, with two narrow frontal horns arising from anterior lateral margins (Figs. 98D, F–G, 99A–B); eyespots absent; nuchal organs unusually large when everted, producing thick multiple elevated ciliated lobes (Fig. 98D); when nuchal organs everted, dorsum of prostomium visible as peristomium pressed back (Fig. 98D). Peristomium with two multilobed rings merged dorsally with setiger 1 producing a hood-like extension, overlapping and obscuring prostomium (Figs. 98B–C, 99A); ventrally smooth, forming lateral borders to a trough from prostomium to anterior border of mouth (Fig. 99B). Mouth lacking distinct anterior lip (Fig. 98G, 99B); posterior lip with elongate swelling formed by 6–8 narrow elongate lobes on setiger 1, this merging with mid-ventral lobes of ventral medial ridge (Fig. 99B); everted proboscis large, sac-like with 10–12 large lobes surrounding oral opening (Fig. 98E).

Anterior parapodia reduced, setal lobes short, becoming larger and more conspicuous from about setiger 15 as narrow podial lobes. Dorsal and ventral cirri develop from about setiger 16 or mid-body; dorsal cirri initially short, rounded, becoming longer and narrower by about setiger 22, these continuing to posterior end; dorsal cirri pear-shaped, oval basally, tapering to narrow, rounded, nipple-like tip (Fig. 99D); ventral cirri rectangular with broad asymmetrical base (Fig. 99D). Dorsal and ventral cirri each with numerous internal tubular glands; each gland internally striated, with most appearing to exit cirrus at narrow tips (Fig. 99D). Interramal papillae small, inconspicuous in anterior setigers, becoming larger in middle and posterior parapodia; each oval with fine cilia (Fig. 99D). Branchiae on setigers 2–5, posterior to notosetae, arising from pectinate bases, with individual filaments exhibiting little or no branching (Fig. 99A–B).

All setigers with noto- and neuropodial fascicles of slender capillaries, setae of anterior fascicles more numerous, arranged into 2–3 rows, setae of posterior row longest; capillaries of middle and posterior setigers arranged in 1–2 rows; all capillaries generally smooth, fibrils not conspicuous; setiger 1 with additional row of 4–5 inconspicuous short spinous setae in noto- and neuropodia anterior to capillaries; these narrow, tapering to bluntly rounded tips (Fig. 99E–F). Setigers 2 and following with furcate setae in same anterior position as short spines of setiger 1; notopodia with up to 6–8 and neuropodia with 5–6 furcate setae; each furcate seta with subequal tynes tapering to filamentous tips and with numerous denticles on inner margins, directed toward opposite tyne (Fig. 99G).

Pygidium an expanded collar surrounding anal opening, composed of 4–5 large lobes with ventral gap; four anal cirri present, both pairs ventrolateral on either side of ventral midline (Fig. 99C).

Remarks. *Scalibregma velatum* **sp. nov.** from shelf depths of 37–100 m off central and northern California is most similar to *S. fimbriatum* **sp. nov.** from off New England in Lydonia Canyon and adjacent slope depths of 530–590 m (see above). Both species have a pair of multi-lobed peristomial rings that overlay and conceal most of the dorsal prostomium and the segmental annular rings have pigmented glandular pads along the entire body.

The two species differ, however, in several respects. *Scalibregma velatum* **sp. nov.** has pear-shaped dorsal cirri and asymmetrical rectangular ventral cirri, the short spinous setae on setiger 1 are blunt tipped, furcate setae begin on setiger 2, and the pygidium has four anal cirri. In contrast, *S. fimbriatums* **sp. nov.** has triangular dorsal and ventral cirri, the short spinous setae on setigers 1–2 are sharply pointed, furcate setae are from setiger 3, and the pygidium has five anal cirri. In addition, *S. velatum* **sp. nov.** lacks a distinct upper lip to the mouth, replaced instead by a vestibule-like groove extending from the prostomium to the mouth. In contrast, *S. fimbriatum* **sp. nov.** has a more typical anterior oral lip with a few large lobes. While the dorsal and ventral cirri of both species have internal pigmented tubular glands, they are more numerous and tightly packed in *S. fimbriatum* **sp. nov.**

Biology. *Scalibregma velatum* **sp. nov.** was collected as part of surveys in Monterey Bay at depths of 36–40 m. Another species, *S. aggregatum* **sp. nov.**, was collected in higher densities from nearshore sediments at 14–16 m (see above). The occurrence of two species of *Scalibregma* in such close proximity is highly unusual but may be explained by nearshore sedimentary processes and current dynamics in Monterey Bay. Eittreim *et al*. (2002) reported that littoral and nearshore coarse-grained (sandy) sediments where *S. aggregatum* **sp. nov.** was collected are mostly derived from coastal erosion, whereas finer grained offshore sediments where *S. velatum* **sp. nov.** were collected are derived from riverine inputs from the Salinas and Parajo Rivers. These authors further report that the nearshore coarse sediments are controlled by a southward flowing long-shore current, whereas the deeper fine grained sediments are within a northward flowing offshore current. While these data appear plausible, *S. velatum* **sp. nov.** has also been collected further north off Half Moon Bay in 100 m where the sediments have high sand content and low TOC (Blake *et al*. 1992).

Etymology. The epithet is from the Latin *velo*, for cover or conceal, in reference to the annular rings of the peristomium and setiger 1 that together form an expanded, hood-like covering that effectively conceals most of the dorsal surface of the prostomium.

Distribution. Eastern North Pacific Ocean, central and northern California in continental shelf depths, 36–100 m.

Genus *Scalibregmella* Hartman & Fauchald, 1971

Type species: *Scalibregmella antennata* Hartman & Fauchald, 1971, by monotypy.

Diagnosis. (Emended from Blake 2020). Body elongate, linear, only weakly fusiform; anterior segments smooth in smaller specimens (<4 mm long), with up to two or

three annular rows of large lobate or squared pads visible dorsally on large specimens, less prominent ventrally; posterior segments with numerous narrow annular rows with numerous small pads or blocks. Ventral groove absent, but a long mid-ventral line of paired pads evident. Prostomium broad across anterior margin with two long, narrow frontal horns projecting anteriorly; eyespots absent; prominent nuchal organs on posterior margin. Peristomium a single annulated row dorsally or not obvious. Everted proboscis smooth, with row of pointed lobes surrounding mouth opening. Branchiae absent. Parapodia reduced to small mounds, conical in notopodia, more pointed in neuropodia; dorsal and ventral cirri present or absent in posterior parapodia. Setae include capillaries; furcate setae present or absent; short spinous setae present or absent; acicular spines absent. Pygidium cuff-like, anal cirri absent.

Remarks. Only two species of *Scalibregmella* are known, both from abyssal depths greater than 4700 m. Both species have long, linear bodies with little evidence of the fusiform or arenicoliform shape of most scalibregmatids. They are characterized by having a pair of long, narrow frontal horns arising from an oval-shaped prostomium. One species has distinct dorsal and ventral cirri on posterior parapodia, but these cirri cannot be confirmed in the other species due to all specimens being incomplete. One species has furcate setae, but the other lacks these and has short spinous setae along the entire body where furcate setae are usually present.

The type material of *S. antennata* from the abyssal North Atlantic Ocean has been re-examined (Blake 2020, this study) and another species, *S. pacifica* **sp. nov.**, has been discovered from the North Equatorial Pacific Ocean in abyssal depths of the Clarion Clipperton Zone.

Scalibregmella antennata Hartman & Fauchald, 1971

Figure 100

Scalibregmella antennata Hartman & Fauchald, 1971: 125–127, Pl. 20, fig. a; Blake 2020: 341–342, fig. 7.6.3.14 a–6.

Material examined. (*4 specimens*) **Western North Atlantic Ocean, abyssal plain, Gay-Head Bermuda Transect,** R/V *Atlantis II*, coll. H.L. Sanders, **Sta. AII-120**, 20 Aug 1966, EBS, 34.05°N, 66.547°W to 34.675°N, 66.583°W, 5018–5023 m, **holotype** (LACM-AHF Poly 892); **Sta. AII-122**, 21 Aug 1966, EBS, 35.833°N, 67.957°W to 35.867°N, 64.967°W, 4833 m (1, LACM-AHF Poly 7050); **Sta. AII-125**, 23 Aug 1966, EBS, 37.4°N, 65.9°W to 37.433°N, 65.833°W, 4825 m (1, LACM-AHF Poly 7049). R/V *Chain*, **Sta. Dr-99**, coll. H.L. Sanders, 31 Apr 1966, AD, 34.717°N, 66.388°W, 4977 m (1, LACM-AHF Poly 7051).

Description (emended from Blake 2020). Body elongate, narrow, only weakly fusiform (Fig. 100A); holotype (LACM-AHF Poly 892) with 17 setigers, 4 mm long, 0.6 mm across setiger 5, anterior segments smooth, then with two or three annular rows of large lobate or squared pads visible dorsally, pads indistinct ventrally (Fig. 100A); larger specimen (LACM-AHF Poly 7049) 7.2 mm long, anterior setigers with 2–3 annular rings with prominent pads or blocks (Fig. 100B), posterior segments with three or four rows with small pads or blocks. Ventral groove absent, but a long mid-ventral line of paired pads evident on holotype after staining with Shirlastain A.

Prostomium oval, with narrow rounded anterior border bearing two narrow elongate frontal horns (Fig. 100A–B), then widening posteriorly with posterior border obscured by peristomium; eyespots absent; inflated nuchal organs on posterior lateral margins of prostomium (Fig. 100A–B). Peristomium a single annulated ring, dorsally encompassing prostomium (Fig. 100A–B), ventrally surrounding mouth opening, but oral morphology obscured by proboscis; everted proboscis smooth, with row of short lobes surrounding apical oral opening (Fig. 100A–B).

Parapodia reduced to small mounds, conical in notopodia, more pointed in neuropodia; posterior setigers missing on all specimens so presence of dorsal and ventral cirri not determined. Setae include capillaries, short spinous setae, and furcate setae; acicular spines absent. Short spinous setae at bases of longer capillaries in setigers 1–4; these replaced by 2–3 furcate setae by setiger 5, increasing to 4–6 per podium in middle body segments; furcate setae with one tyne considerably longer, with length ratio of approximately1.6; fine denticles present on inner margins of each tyne directed toward opposite tyne (Fig. 100C). Capillaries occurring on all setigers along body; longest capillaries stiff, tapering to fine tips.

Pygidium not present on any specimen.

Remarks. *Scalibregmella antennata* is unusual among known scalibregmatids in having a narrow, linear body and long, tapering palp-like prostomial horns. The original report of the species was by Hartman & Fauchald (1971) from abyssal depths of 4800–5000 m in the Atlantic Ocean. As part of a scalibregmatid review included as part of the Handbook of Zoology series, Blake (2020) examined the original specimens of the species, archived in the Los Angeles Museum of Natural History, including the holotype (LACM-AHF Poly 892) and three other non-type or syntype specimens (LACM-AHF Poly 7049–51). The present account reiterates those findings and includes additional observations.

The description in Hartman & Fauchald (1971) was largely based on the holotype and as such is correct. However, the holotype is only 4 mm long and the body was described as smooth and lacking annulated rows. However, weak outlines of annulated rows are apparent when stained with Shirlastain A. The largest specimen is an anterior fragment 7.2 mm long (LACM-AHF Poly 7049) and distinct annular rows are evident, including two rows on the anteriormost segments and three rows in middle and posterior segments. Large elongate narrow rows with numerous small elevated pads typical of other scalibregmatids are clearly present. The peristomium consists of a single multilobed ring surrounding the prostomium dorsally; the nature of the ventral peristomium

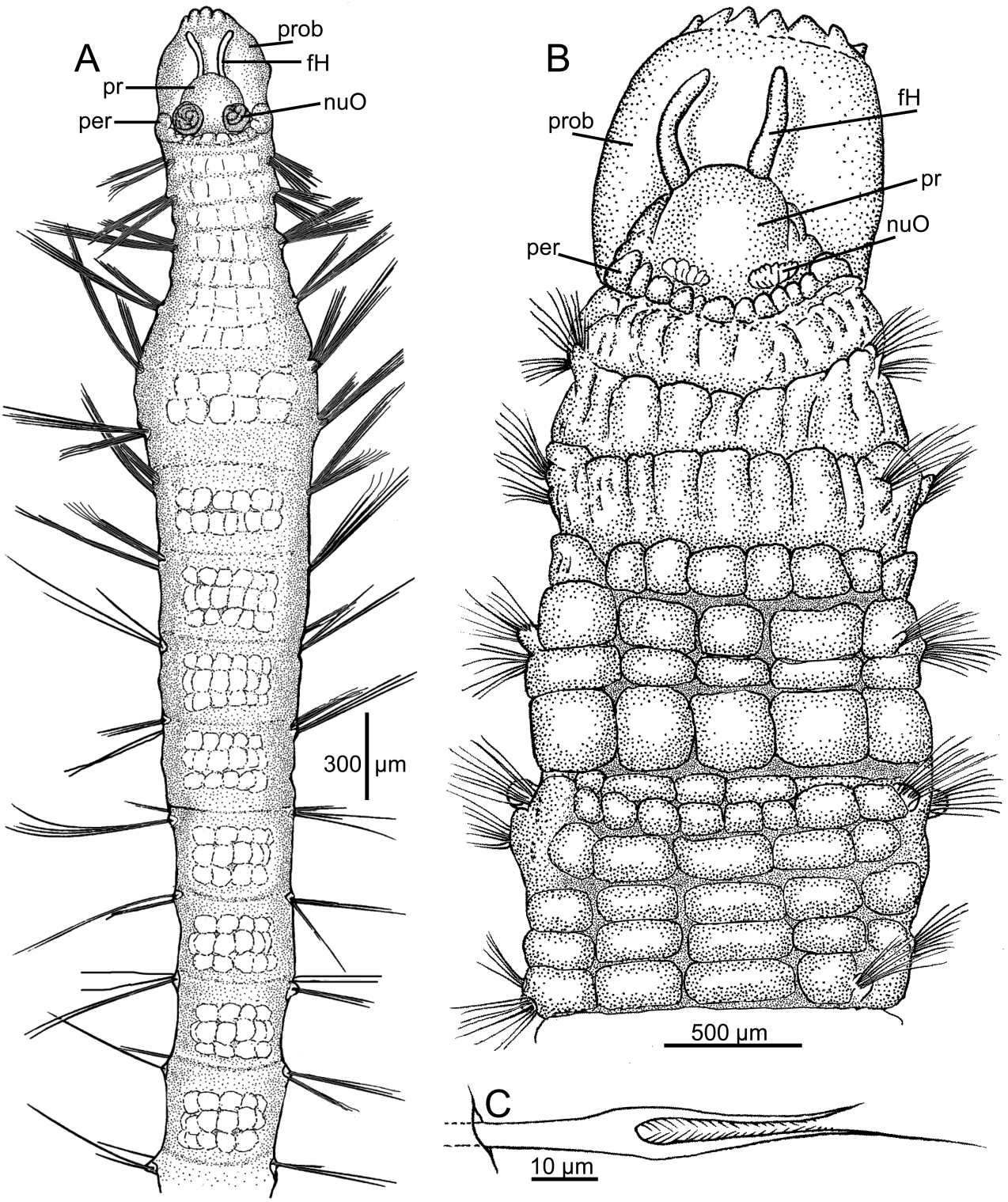

FIGURE 100. *Scalibregmella antennata* Hartman & Fauchald, 1971. A, anterior end, dorsal view; B, anterior end, dorsal view; C, furcate seta. A, C, holotype (LACM-AHF Poly 892); B, (LACM-AHF Poly 7049).

and the mouth is unknown due to the condition of the specimens and the everted proboscis.

The long, narrow frontal horns or tentacles resemble to some extent the thickened "*palps*" described for *Axiokebuita* and *Speleobregma* by Parapar *et al*. (2011) and Martínez *et al*. (2013) (see account of *Axiokebuita* above). However, after careful examination of these frontal horns on the available *Scalibregmella antennata* specimens using phase contrast optics, no evidence of cilia or a groove as reported for the other two genera was found. Furthermore, the presence of annulated rows of blocked partitions and furcate chaetae sets *S. antennata* apart from the other two genera, which lack most of the typical scalibregmatid morphology.

Distribution. North Atlantic Ocean, abyssal plain, 4825–5023 m.

Scalibregmella pacifica new species

urn:lsid:zoobank.org:act:E17B8060-490A-4AAD-A0F4-665DDE2A10DF
Figure 101

Material examined. **North Equatorial Pacific Ocean, Clarion-Clipperton Zone**, Provisional Reserve Area (PRA), R/V *Moana Wave*, **Sta. PRA 13**, coll. George D.F. Wilson, 06 Oct 1989, 0.25-m^2 BC, 12.9179°N, 128.2826°W, 4775 m, soft, light brown ooze, **holotype** (LACM-AHF Poly 13557).

Description. A small species, with narrow elongate body, not fusiform; holotype (LACM-AHF Poly 13557) complete with 30 setigers, but fragile, broken into two parts during handling, 8 mm long, and 0.4 mm wide along most of body. Body with annular rows weakly developed along body, with two rows on setigers 1–2 and three rows from setiger 3 (Fig. 101A) to posterior end; each annular row defined by transverse groups of glandular cells and vertical creases or folds in epidermal layer producing weakly developed blocks (Fig. 101A); best observed on dorsal surface, less prominent ventrally (Fig. 101B). Ventral groove absent, but a long mid-ventral row or low ridge present along entire body (Fig. 101B); this best seen after staining with Shirlastain A. Color in alcohol: light tan; dorsal and ventral cirri of posterior setigers with darkly colored dorsal and ventral cirri due to internal glands.

Prostomium oval-shaped, longer than wide with rounded anterior border bearing two narrow elongate frontal horns (Fig. 101A); eyespots absent; multilobed nuchal organs everted on posterior lateral margins (Fig. 101A). Peristomium enlarged, swollen, lateral and ventral to prostomium, not organized into distinct rings as in most scalibregmatids, merged smoothly with setiger 1 (Fig. 101A–B); mouth an oral opening bordered by about 25 short lobes or papillae (Fig. 101B).

Parapodia of anterior setigers reduced to small podial mounds from which setae arise; middle and posterior setigers with podia becoming elongate and developing triangular-shaped dorsal and ventral cirri each with darkly colored tubular glands (Fig. 101C–D).

Setae include capillaries and short spinous setae; acicular spines and furcate setae entirely absent. Short spinous setae at anterior base of first row of longer capillaries in noto- and neuropodia of all setigers from setiger 1; these few in number, only 1–2 in anterior setigers and 3–4 in posterior setigers, each short, curved, pointed (Fig. 101F). Capillaries occurring on all setigers along body, most capillaries long, tapering to fine tips (Fig. 101E).

Pygidium with two large lobes lateral to anal opening (Fig. 101C); no papillae or anal cirri observed.

Remarks. *Scalibregmella pacifica* **sp. nov.** from the abyssal North Equatorial Pacific Ocean is only the second species of the genus to be described, both species are from abyssal depths of 4700 m or greater. The first species, *S. antennata*, from the North Atlantic Ocean, is reviewed above.

These taxa are unusual among scalibregmatids in having a pair of long, narrow frontal horns arising from the anterior border of an oval-shaped prostomium and long narrow bodies while at the same time lacking branchiae, acicular spines, and anal cirri. Short spinous setae occur anterior to the capillaries in both species; in *S. antennata* these occur on setigers 1–4 and are replaced on setiger 5 by furcate setae that continue posteriorly; in *S. pacifica* **sp. nov.**, furcate setae are absent, with short spinous setae being present anterior to the capillaries along the entire body. Another morphological difference between the two species is that in *S. antennata* the peristomium is represented dorsally by a distinct multilobed ring that extends laterally and presumably encircles the mouth ventrally, but is obscured by an everted proboscis; the oral opening is surrounded by a ring of short lobes. In *S. pacifica* **sp. nov.** a separate peristomial ring is not apparent; instead it is merged with the anterior margin of setiger 1, then extends laterally and ventrally forming an enlarged proboscis-like ventral swelling with an apical mouth opening, also surrounded by a ring of short lobes. Dorsal and ventral cirri are present in posterior parapodia of *S. pacifica* **sp. nov.**; such cirri were not observed in *S. antennata*, however, since no specimens are complete their absence cannot be confirmed.

Etymology. The species is named for its location in the Pacific Ocean.

Distribution. North Equatorial Pacific Ocean, Clarion-Clipperton Zone, abyssal depths, 4775 m.

Comments on the Genera *Parasclerocheilus* Fauvel, 1928 and *Sclerobregma* Hartman, 1965

The genera *Parasclerocheilus* Fauvel, 1928 and *Sclerobregma* Hartman, 1965 are poorly known, but similar in that species of both have large acicular spines in anterior setigers, branchiae, and posterior parapodial cirri to varying degrees. At present, two species of *Parasclerocheilus* are known: *P. branchiatus* Fauvel, 1928 from intertidal sediments in India and *P. capensis* Day, 1961 from intertidal and shallow subtidal habitats in South Africa. The only known species of *Sclerobregma*, *S. branchiatum* Hartman, 1965, is a North Atlantic deep-water species. Apart from faunal summaries by Fauvel (1953) and Day (1967), the only recent report with descriptions of any of these three species was by Ong (1995), who reported *P. branchiatus* from a sand flat at Penang, Malaysia. Blake (2020) summarized these genera and provided diagnoses.

Both *Parasclerocheilus* species have acicular spines limited to the notopodia: setigers 1–4 in *P. branchiatus* and setiger 1 in *P. capensis*. Both species have six pairs of branchiae on setigers 2–7 and thus are the only scalibregmatids currently known to have more than four pairs of branchiae. In addition, both species have parapodial cirri limited to the neuropodia. *Sclerobregma*

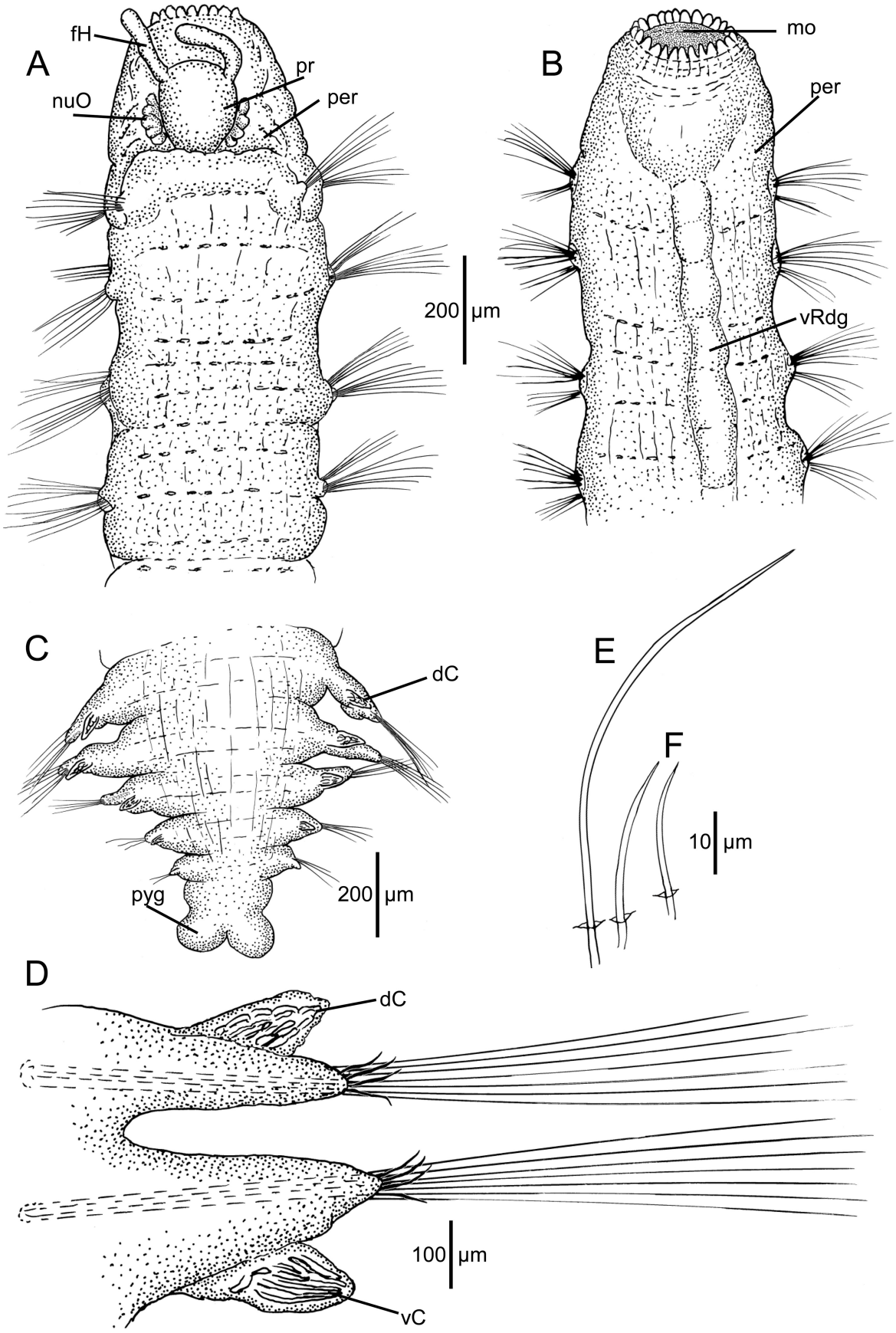

FIGURE 101. *Scalibregmella pacifica* **sp. nov.** Holotype (LACM-AHF Poly 13557): A, anterior end, dorsal view; B, anterior end, ventral view; C, posterior end, dorsal view; D, posterior parapodium, anterior view; E, short capillary seta, setiger 1; F, two short spinous setae, setiger 1.

TABLE 7. Morphological comparison of the known species of *Parasclerocheilus* Fauvel, 1928 & *Sclerobregma* Hartman, 1965.

Species/ Character	Setae Setiger 1	Setae Setiger 2	Setae Setiger 3	Setae Setiger 4	Structure ac spines	First furcate setae	Prostomium	Peristomium	Segmental Annulation Patterns	Branchiae	Posterior Parapodia	Pygidium	Distribution	References
P. branchiatus Fauvel, 1928	Ac + C C	Ac + C C	Ac + C C	Ac + C C	Lrg, curved, with hooked tip	?5 not stated	Oval-shaped, w/ 2 frontal horns; w/ 2 pair of diagonal & linear red eye spots	Single multilobed ring	Sets 1–4 biannulate, then quadriannulate w/ large blocks dorsally; smooth ventrally	6 pairs; sets 2–7, arborescent w/ long filaments; most dense in sets 4-7	Short, thick; w/o dC; w/ narrow vC located dorsal to neS; w/ intPap between podia	W/ 6 anC: 1 dorsal, 1 ventral & 2 on either side	Indian Ocean, India, Gulf of Oman; Malaysia; intertidal	Fauvel 1928, 1953; Ong 1995
P. capensis Day, 1961	Ac + C C	F+C F+C	F+C F+C	F+C F+C	W/ 5–6 lrg curved Ac	Set 2	T-shaped, w/ 2 diverging lat lobes; w/ 2 reniform eyes	Single ring	Sets 1–4 biannulate, following set quadriannulate	6 pairs, sets 2–7	Rounded w/o dC, but w/ digitiform vC	W/ 4 anC observed	S & SW Africa, intertidal to 10–20 m	Day 1961; 1963;1967
P. fonsecae **sp. nov.**	Sp+Ac+C Sp+C	Sp+C Sp+C	F+C F+C	F+C F+C	2 inner Ac lrg w/ hooked tips; 2 lrg outer spines, straight w/ hirsute, blunt tips	Set 3	Wedge-shaped, w/ 2 short lat lobes	Single ring dorsally expanded over set 1; ventrally lat lips of mo	Set 1 uniannulate, then triannulate; pads weakly developed	6 pairs, sets 2–7, arborescent with short filaments	dC w/ low swelling, not dCr; vC short narrow lobes; both w/ reticulations	Two short lobes; anC not observed	E North Pacific Ocean, Costa Rica, intertidal	This study
S. branchiata Hartman, 1965	Sp+Ac+C Sp+C	Sp+AC+C Sp+C	F+C F+C	F+C F+C	Ac 2 kinds set 1: (1) lrg, hirsute, blunt (2) small, hirsute; pointed, Set 2 thin, pointed smooth	Set 3	Pentagonal, narrow post; w/ 2 short lat horns at ca. 40-deg angle	Single thick ring dorsally, reduced ventrally	Body with 4–5 ann rings, but weakly developed in ant & expanded segs; pads inconspicuous	4 pairs, sets 2–5, pectinate w/ numerous multi-lobed filaments	Elongate, w/ dC oval to weakly triangular, inflated; vC larger, w/ rounded base & distinctly papillated tip; w/ int glands; intPap present	W/ 5 anC, 1 ventral; 2 lat on either side	W North Atlantic Ocean, 1233–2495 m	Hartman 1965; Mackie 1991; Blake 2020; This study
S. mulitaciculatum **sp. nov.**	Sp+Ac+C Sp+Ac+C	Sp+Ac+C Sp+Ac+C	F+Ac+C F+C	F+C F+C	Ac 3 kinds: (1) long, flat; (2) long recurved; (3) short recurved	Set 3	As wide as long; w/ 2 oval-shaped frontal horns	Single smooth ring	Sets 1–3 smooth; thereafter quadriannulate	5 pairs, sets 2–6 (holotype); 2–5 (small paratypes); arborescent w/ numerous filaments	dC short, flask-shaped w/ int glands & apical pap; vC long, w/ long apical papillae, w/o internal glands	W/ 4–5 anC estimated	S China Sea off Brunei, Island of Borneo, 1214–1402 m	This study

Abbreviations: Ac. Acicular spine(s), ann, annular; Ant, anterior; C, capillaries; dC, dorsal cirri; E, eastern; F, furcate setae; intPap, interramal papilla; lat, lateral; lrg, large; mo, mouth; neS, neurosetae; Pap, papilla; pr, prostomium; seg(s), segment(s); Set(s), setiger(s); S, south; SW, southwestern; sP, short spinous setae; vC, ventral cirri; w/, with; w/o, without; W, western.

branchiatum, the first and until the present study the only known species of the genus, has acicular spines in notopodia of setigers 1–2, none in the neuropodia, and four pairs of branchiae on setigers 2–5 together with well-developed and prominent dorsal and ventral cirri in posterior parapodia. Of note is that the "*ventral cirri*" of *P. branchiatus* are actually located postsetal and slightly dorsal to the setal fascicle. Thus they could be considered as interramal or postsetal lobes rather than ventral cirri. In contrast, the ventral cirri of *P. capensis* are definitely digitate and ventral to the podial lobe. The differences between numbers of branchial pairs, development of the dorsal and ventral cirri, and habitat (intertidal-shallow water vs. deep-water) would appear sufficient to justify both genera. However, as part of the present study, specimens of two additional species have been encountered that individually cross the boundaries of these generic definitions and suggest that two genera may not be necessary.

In the present study, one new species from intertidal sediments of Costa Rica agrees well with the traditional diagnosis of *Parasclerocheilus* in that acicular spines are present in the notopodia of setiger 1, a ventral parapodial cirrus is present, and there are branchiae on setigers 2–7, or six pairs, the same number as found in the first two species described in the genus. However, the new species has a dorsal swelling or ridge on the parapodium that could be interpreted as a rudimentary dorsal cirrus, which is found in *Sclerobregma*.

The second new species is from deep-water in the South China Sea off Borneo. Unlike known species of either *Parasclerocheilus* or *Sclerobregma,* this taxon has acicular spines in both noto- and neuropodia of setigers 1–3. It also has both dorsal and ventral cirri in posterior parapodia and branchiae on setigers 2–6, or five pairs, more than the usual four pairs found in scalibregmatids lacking anterior acicular spines. Based on the nature of the branchiae and the posterior dorsal and ventral cirri, the new Asian species is more similar to *Sclerobregma branchiatum* than to species of *Parasclerocheilus* and is therefore referred to the former genus.

The two genera are similar to some extent, but the more highly modified posterior parapodia and deep-sea habitats of *Sclerobregma* serve to keep the two genera separate at this time. All known species of *Parasclerocheilus* and *Sclerobregma* are summarized in Table 7.

Genus *Parasclerocheilus* Fauvel, 1928

Type species: *Parasclerocheilus branchiatus* Fauvel, 1928, by monotypy.

Diagnosis. (Emended). Body elongate, arenicoliform, expanded anteriorly. Prostomium T-shaped with lateral horns or frontal horns. Peristomium a single ring dorsally, ventrally surrounding mouth. Parapodia biramous, posterior segments with dorsal cirri absent or reduced to low swelling; ventral cirri present as simple elongate lobe; interramal papillae present; arborescent branched branchiae present on setigers 2–7, or six pairs. Setae include acicular spines on a few anterior setigers, capillaries, furcate setae present or absent; short spinous setae anterior to acicular spines present or absent. Pygidium with or without long anal cirri.

Remarks. There are two known species of *Parasclerocheilus*, *P. branchiatus* Fauvel, 1928 from The Gulf of Mannar, India, and *P. capensis* Day, 1961 from South Africa, both from intertidal or shallow water. In the present study, a new intertidal species has been discovered from Costa Rica and represents the first record of the genus in the Pacific Ocean.

Parasclerocheilus fonsecae new species

urn:lsid:zoobank.org:act:B53B3735-DE84-4CC0-BE60-DB121C81265E
Figure 102

Material examined. Eastern North Pacific Ocean, Costa Rica, Golfo Dulce, off Punta Islotes, coll. A.C. Fonseca, Nov 1996, 8.7327309°N, 83.397854°W, intertidal, **holotype** (MCZ IZ 62651).

Description. Holotype small, complete but damaged, with 40 setigers; 3 mm long, 0.6 mm wide across setiger 10. Body expanded anteriorly, tapering to narrow posterior end. Body rectangular in cross section, rounded dorsally, flattened ventrally; venter without longitudinal ridge or groove. Segmental annular rings not apparent on setiger 1, a single ring on setigers 1–2, thereafter individual segments triannulate with elevated pads small, inconspicuous (Fig. 102A). Color in alcohol light tan.

Pre-setiger region relatively short, recessed into setiger 1 (Fig. 102A). Prostomium wedge-shaped, wider than long, narrowing posteriorly; with a pair of short, rounded diverging lateral lobes (Fig. 102B); eyespots absent; nuchal organs not observed. Peristomium a single ring expanded dorsally over setiger 1 (Fig. 102A), ventrally producing a pair of pointed lobes forming anterior lips of mouth (Fig. 102B); a narrow vestibule extends posteriorly between these two lips leading to oral opening, bordered posteriorly by a posterior transverse lip consisting of about eight elongate lobes (Fig. 102B); entire mouth area swollen mid-ventrally over setiger 1; proboscis not observed.

Parapodia well-developed along entire body; enlarged rounded lobes only on setiger 1 where notopodia bear large acicular spines; parapodia thereafter reduced with noto- and neuropodia initially as short, thickened lobes, then by about setiger 20 becoming narrow and elongate; parapodia developing low dorsal swellings or elevations from about setiger 25; these remaining low with internal reticulations, not developing into distinct dorsal cirrus (Fig. 102C); ventral cirri developing as an elongate narrow lobe with rounded tip and similar reticulations (Fig. 102C). Short, rounded interramal papillae present between noto- and neuropodia (Fig. 102C). Branchiae present from posterior border of notopodia of setigers 2–7, each with short branching filaments (Fig. 102A).

Acicular spines present only in notopodia of setiger 1

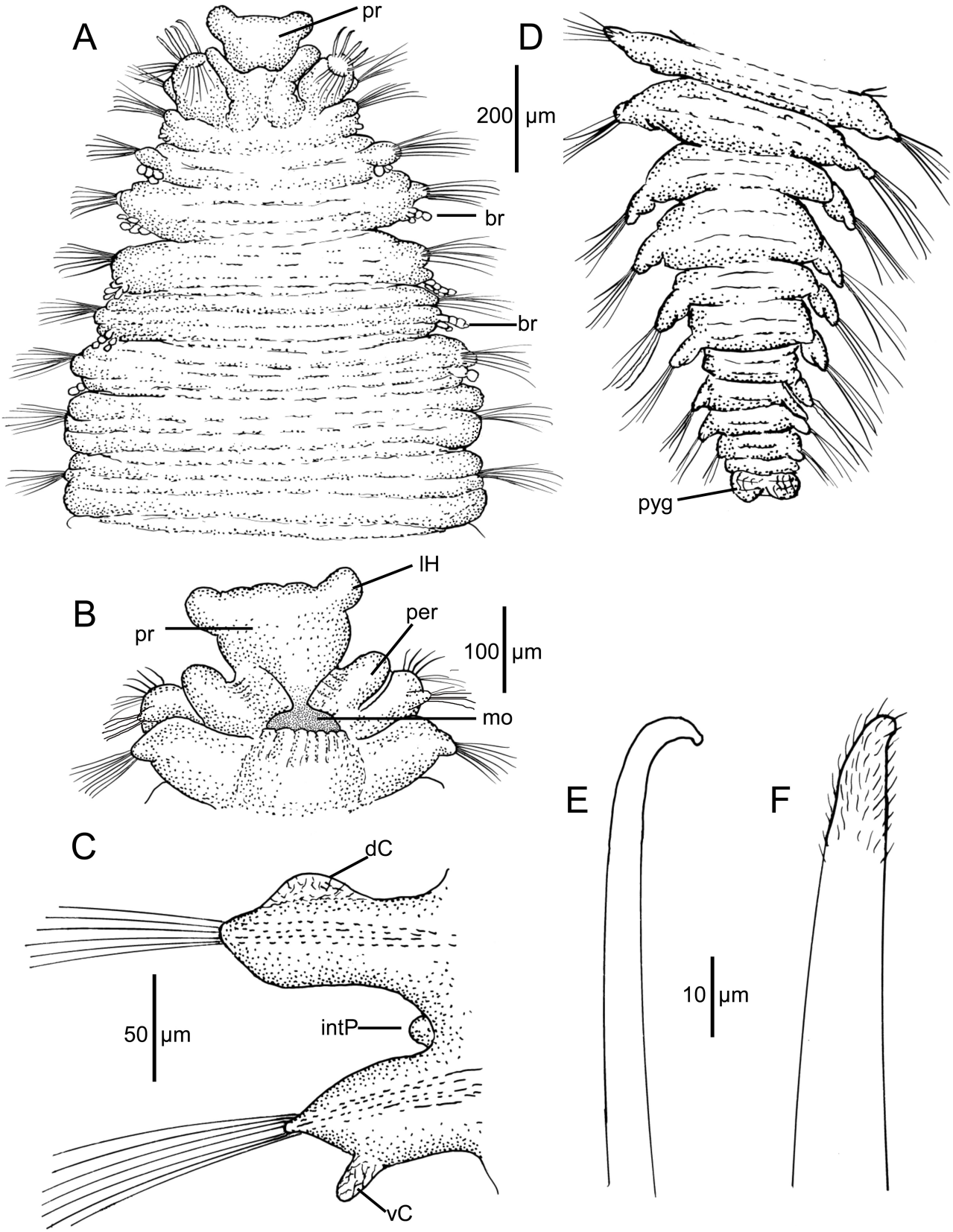

FIGURE 102. *Parasclerocheilus fonsecae* **sp. nov.** Holotype (MCZ IZ 62651): A, anterior end, dorsal view; B, anterior end, ventral view; C, posterior parapodium, anterior view; D, posterior end, dorsal view; E, hooked acicular spine, setiger 1; F, blunt hirsute spine, from setiger 1.

(Fig. 102A); absent from all neuropodia. Notopodial spines of setiger 1 in single row of four spines accompanied by a few capillaries; second row of setae all capillaries. Spines of two kinds: two inner spines narrow with curved and hooked tips (Fig. 102E); two outer spines larger, straight, narrowing to blunt hirsute tip (Fig. 102F). Both noto- and neuropodia of setigers 1–2 with a few short spinous setae anterior to larger spines or capillaries; setiger 3 with furcate setae in same location. Furcate setae with two long, but unequal tynes, with denticles on inner edge facing opposite tyne.

Pygidium with two lobes; anal cirri not present, but may have been lost (Fig. 102D).

Remarks. The holotype of *Parasclerocheilus fonsecae* **sp. nov.** is the only specimen available and is likely a juvenile. However, several characters are unusual and it should be easy to recognize this species in the future. First, the heavy acicular spines are of two different kinds, and are present only in the notopodia of setiger 1 and, apart from a few short spinous setae anterior to the acicular spines, there is no evidence of any setae other than capillaries developing in the neuropodia of setiger 1 or notopodia of setiger 2. Of the two distinctly different kinds of acicular spines occurring in the same fascicle, one is smooth and hooked while the other is thick, straight, and hirsute; these differ from the two previously described species, which only have a single type of spine. The branchiae are present posterior to the notopodia on setigers 2–7, which together with its two congeners that also have branchiae on setigers 2–7 represents the most branchial pairs (six) recorded for any known scalibregmatids (Table 7). A distinct low swelling on the notopodia of posterior setigers may represent a dorsal cirrus but this is not very prominent or conspicuous, whereas the ventral cirrus is a simple narrow lobe with rounded tip. In *P. branchiatus* from the Indian Ocean and *P. capensis* from South Africa, there is no dorsal swelling or cirrus and the ventral cirrus is a simple digitiform lobe located anterior to the setae in *P. branchiatus* and ventral to the setae in *P. capensis* (Table 7). *Parasclerocheilus fonsecae* **sp. nov.** is most similar to *P. capensis* in having the acicular spines limited to setiger 1; the type-species, *P. branchiatus* has notopodial acicular spines on setigers 1–4.

Etymology. This species is named for the late Ana C. Fonseca-Escalante, Costa Rican biologist, who collected this interesting specimen as part of her benthic ecology studies.

Distribution. Pacific Ocean, Costa Rica, Golfo Dulce, intertidal.

Genus *Sclerobregma* Hartman, 1965

Type species: *Sclerobregma branchiata* Hartman, 1965, by monotypy.

Diagnosis. (Emended) Body elongate, arenicoliform, with up to 50 setigerous segments; segments with up to 4–5 annulations along most of body; ventral groove with elevated pads present along entire body. Prostomium pentagonal with a pair of narrow frontal horns; eyespots absent; nuchal organs narrow slits posteriorly between prostomium and peristomium. Peristomium a single inflated ring, encompassing prostomium dorsally; ventrally forming upper lip of the mouth; lower lip on setiger 1. Parapodia of posterior segments with dorsal and ventral cirri, ventral cirri larger than dorsal cirri; each cirrus inflated, with numerous internal tubular glands with external openings visible as minute pores using SEM; interramal sense organ present as distinct papilla; postchaetal lamellae absent. Branched pectinate-like branchiae on setigers 2 to 5(6). Setae include acicular spines, capillaries throughout, furcate setae from setiger 3, acicular spines present on notopodia of setigers 1–2(3) and present or absent on neuropodia of setigers 1–3; few very small blunt-tipped spinous setae anterior to acicular spines on setigers 1–2, representing homologues of furcate setae found on following setigers. Pygidium with five anal cirri.

Remarks. *Sclerobregma branchiata*, the type-species, is a characteristic and widely distributed species along the U.S. Atlantic coast from off New England to the Carolinas in middle and lower continental slope depths of 1233–2495 m. The species is here redescribed based on original materials collected by the late Dr. Howard L. Sanders and extensive new collections from the ACSAR program along the U.S. Atlantic coast. A second deep-water species, *Sclerobregma multiaciculatum* **sp. nov.** was discovered in benthic samples collected off the Island of Borneo in the South China Sea in middle slope depths of 1214–1402 m.

Sclerobregma branchiata Hartman, 1965

Figures 103–106

Sclerobregma branchiata Hartman, 1965: 184–185, Pl. 42; Hartman & Fauchald 1971: 129; Bertelsen & Weston 1980: 712–713; Mackie 1991: 274–275, Figs. 23–29; Maciolek *et al*. 1987a: C-5, D-3; 1987b: 74–75, D-4, G-4–13; Blake *et al*. 1987: C-5, D-3; Hilbig 1994: 943; Blake 2020: 343–345, figs. 7.6.3.15 A–G.

Material examined. (*217 specimens*) **North Atlantic Ocean, off New England, Gay-Bermuda Transect**, R/V *Atlantis* Cruise 298, coll. R. Scheltema, **Sta. 58**, 24 May 1961, EBS, 38.572° N, 72.917°W, 1925–2075 m (2, LACM-AHF Poly 13311); R/V *Atlantis II* Cruise 12, coll. H.L Sanders, **Sta. 62**, 21 Aug 1964, ES, 39.43°N, 70.55°W, 2496 m (3, LACM-AHF Poly 13312). R/V *Atlantis II* Cruise 24, coll. H.L. Sanders, **Sta. 115,** 02 Aug 1966, EBS, 39.652°N, 70.404°W, 2030–2050 m (2, MCZ IZ 170357).—**Off New England, U.S. North Atlantic ACSAR Program**, coll. G.W Hampson, Chief Scientist. **Sta. 2**, **Cruise NA-5**, R/V *Cape Hatteras*, Rep. 1, 28 Apr 1986, BC, 40.953°N, 66.228°W, 2104 m (1, USNM 1741844); **Cruise NA-6**, R/V *Cape Hatteras*, Rep. 2, 25 Jul 1986, BC, 40.954°N, 66.228°W, 2106 m (2, USNM 1741845); Rep. 3, 25 Jul 1986, BC, 40.954°N, 66.230°W, 2103 m (1 juv, USNM 1741846). **Sta. 3**, **Cruise NA-6**,

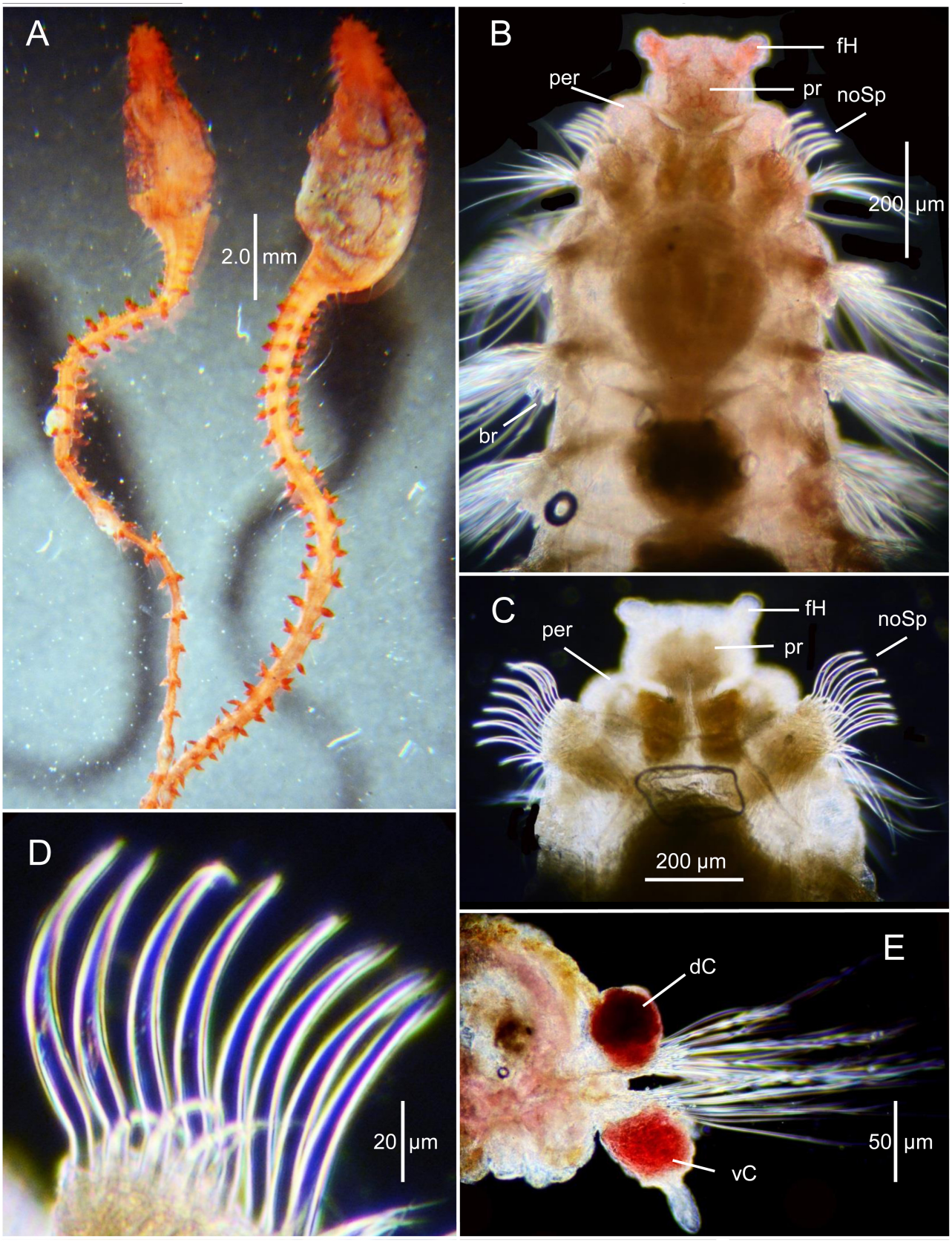

FIGURE 103. *Sclerobregma branchiata* (Hartman, 1965). A, two complete specimens showing body shape; B, anterior end, dorsal view of setigers 1–4; C, anterior end, dorsal view, setiger 1 and notopodial acicular spines; D, acicular spines from setiger 1; E, posterior parapodium, posterior view. A, (USNM 1741848); B–D, (USNM 174184); E, (USNM 1741856). All stained with Shirlastain A.

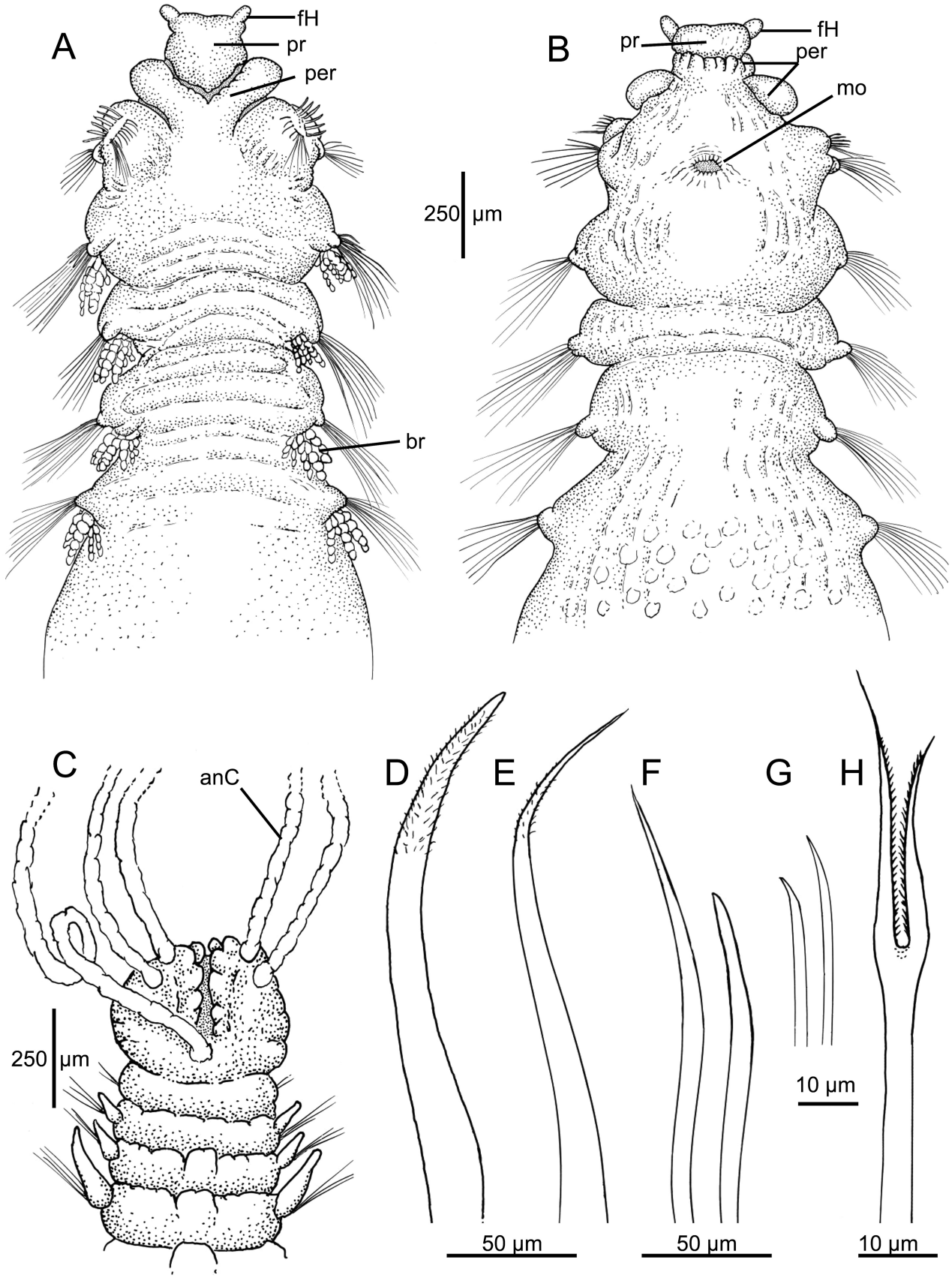

FIGURE 104. *Sclerobregma branchiata* (Hartman, 1965). A, anterior end, dorsal view; B, anterior end, ventral view; C, posterior end, ventral view; D–E, acicular spines, setiger 1; F, acicular spines, notopodia setiger 2; G, short spinous setae, setiger 1; H, furcate seta, posterior parapodium. A–B (USNM 1741855); C, D–H (USNM 1741856).

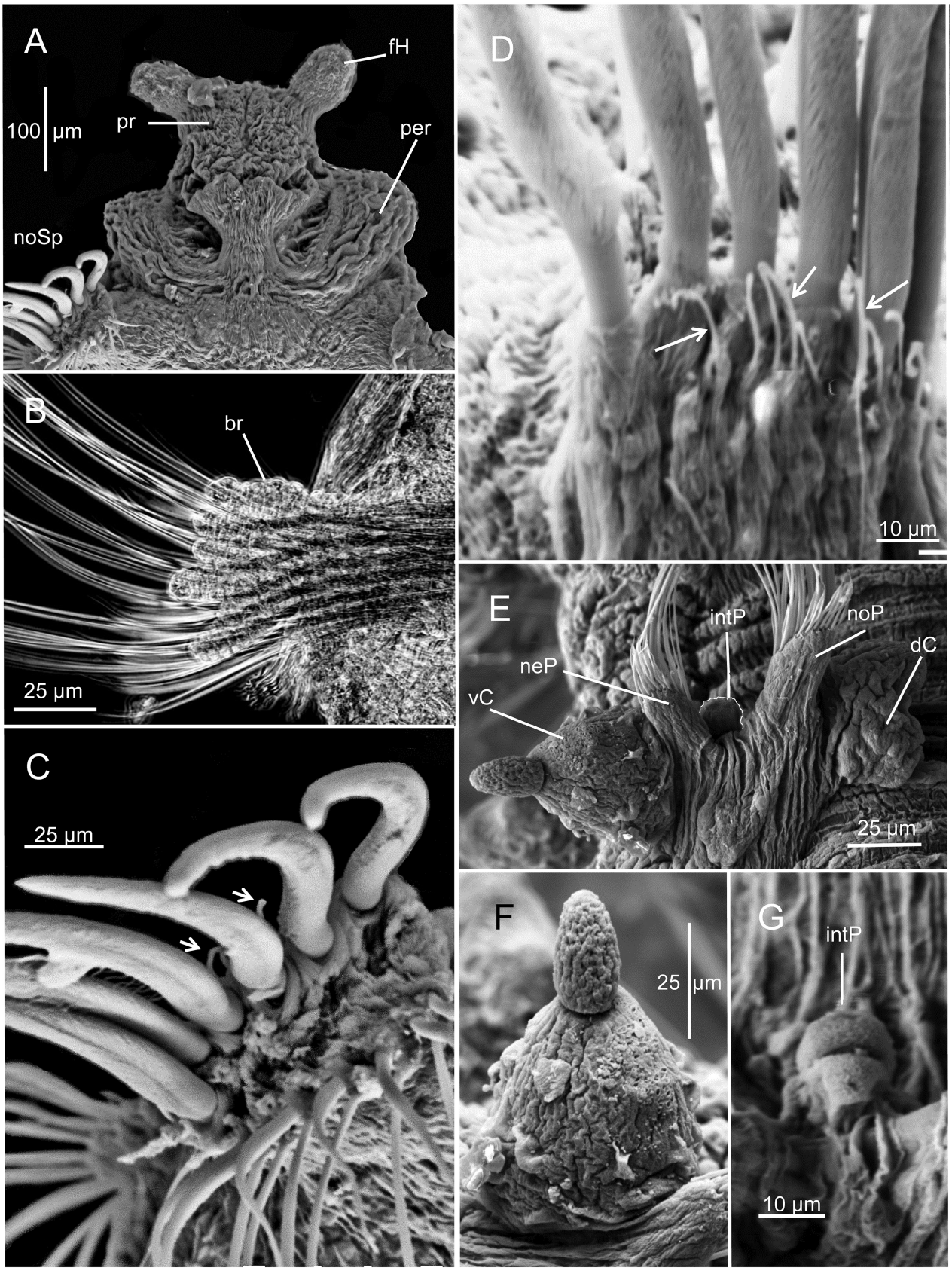

FIGURE 105. *Sclerobregma branchiata* (Hartman, 1965). A, anterior end, dorsal view; B, branchiae and notosetae, setiger 2, anterior view; C, acicular spines, setiger 1 with short spinous setae at bases (arrows), dorsal view; D, acicular spines setiger 1 with short spinous setae at bases (arrows), anterior view; E, posterior parapodium, anterior view; F, ventral cirrus, posterior parapodium, detail showing pore openings; G, detail of interparapodial papilla from posterior parapodium. A, C–G (SEM Stub, JAB from USNM 1741875; B, (USNM 1741851). Arrows indicate short spinous setae at base of acicular spines. Outline of interramal papilla on E for clarity. Original SEMs by Lara (Luzak) Parisi.

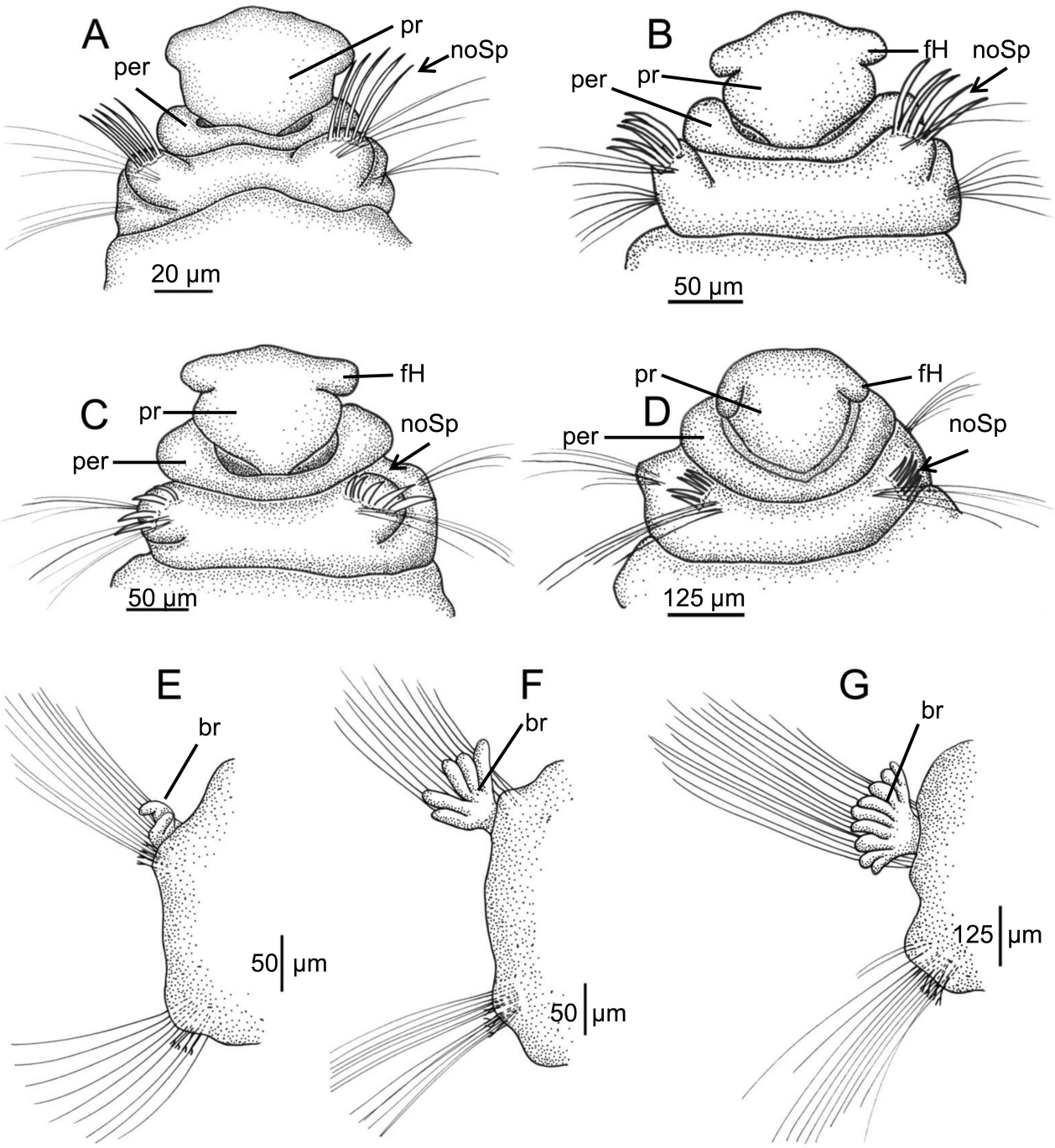

FIGURE 106. *Sclerobregma branchiata* (Hartman, 1965): Juvenile morphology: Prostomial development, A, 19 setigers; B, 26 setigers; C, 30 setigers; D, 47 setigers. Parapodial and branchial development of setiger 3, posterior view: E, 33–37 setigers; F, 37–47 setigers; G, 47 setigers or larger. All from North Atlantic ACSAR Sta. 5, Cruise NA-5, Rep. 3, 29 Apr 1986 (USNM 1741850) & Cruise NA-6, Rep. 3, 26 Jul 1986 (USNM 1741853).

R/V *Cape Hatteras*, Rep. 2, 25 Jul 1986, BC, 41.021°N, 66.334°W, 1370 m (1, USNM 1741847). **Sta. 5**, **Cruise NA-5**, R/V *Cape Hatteras*, Rep. 1, 29 Apr 1986, BC, 40.084°N, 67.499°W, 2052 m (6, USNM 1741848); Rep. 2, coll. 29 Apr 1986, BC, 40.085°N, 67.498°W, 2072 m (7, USNM 1741849); Rep. 3, 30 Apr 1986, BC, 40.084°N, 67.498°W, 2085 m (10, USNM 1741850); **Cruise NA-6**, R/V *Cape Hatteras*, Rep. 1, 26 Jul 1986, BC, 40.085°N, 67.497°W, 2063 m (1, USNM 1741851); Rep. 2, 26 Jul 1986, BC, 40.084°N, 67499°W, 2078 m (7, USNM 1741852); Rep. 3, 26 Jul 1986, BC, 40.085°N, 67.495°W, 2055 m (9, USNM 1741853). **Sta. 6**, **Cruise NA-4**, R/V *Gyre*, Rep. 1, 24 Nov 1985, BC, 40.085°N, 67.486°W, 2114 m (1, USNM 1741854); **Cruise NA-5**, R/V *Cape Hatteras*, Rep. 1, 30 Apr 1986, BC, 40.082°N, 67.486°W, 2120 m (4, USNM 1741855); Rep. 2, 30 Apr 1986, BC, 40.085°N, 67.487°W, 21104 m (7, USNM 1741856); Rep. 3, 01 May 1986, BC, 40.085°N, 67.486°W, 2109 m (7, USNM 1741857); **Cruise NA-6**, R/V *Cape Hatteras*, Rep. 1, 26 Jul 1986, BC, 40.085°N, 67.485°W, 21104 m

(6, USNM 1741858); Rep. 2, 26 Jul 1986, BC, 40.084°N, 67.484°W, 2113 m (9, USNM 1741859); Rep. 3, 26 Jul 1986, BC, 40.084°N, 67.483°W, 2113 m (7, USNM 1741860). **Sta. 8**, **Cruise NA-5**, R/V *Cape Hatteras*, Rep. 1, 29 Arp 1986, BC, 40.172°N, 67.623°W, 2147 m (1, USNM 1741861); Rep. 2, 29 Apr 1986, 40.1698°N, BC, 67.6215°W, 2165 m (3, 1741862); Rep. 3, 29 Apr 1986, BC, 40.169°N, 67.624°W, 2130 m (14, USNM 1741863); **Cruise NA-6**, R/V *Cape Hatteras*, Rep. 1, 27 Jul 1986, 40.172°N, 67.621°W, 2193 m (6, USNM 1741864); Rep 2, 27 Jul 1986, BC, 40.171°N, 67.621°W, 2193 m (3, USNM 1741865). Rep. 3, 27 Jul 1986, BC, 40.170°N, 67.621°W, 2188 m (2, USNM 1741866). **Sta. 9**, **Cruise NA-6**, R/V *Cape Hatteras*, Rep. 1, 28 Jul 1986, BC, 39.8395°N, 70.0286°W, 1233 m (3, USNM 1741867). **Sta. 13**, **Cruise NA-5**, R/V *Cape Hatteras*, Rep. 1, 06 May 1986, BC, 39.799°N, 70.918°W, 1270 m (1, USNM 1741868); **Cruise NA-6**, R/V *Cape Hatteras*, Rep. 1, 30 Jul 1986, BC, 39.806°N, 70.915°W, 1248 m (1, USNM 1741869). **Sta. 15**, **Cruise NA-5**, R/V *Cape Hatteras*, Rep 1, 04 May 1986, 39.667°N, 70.904°W, 2162 m (8, USNM 1741870); Rep. 2, 05 May 1986, BC, 39.666°N, 70.903°W, 2164 m (7, USNM 1741871); Rep. 3, 06 May 1986, BC, 39.667°N, 70.907°W, 2160 m (13, USNM 1741872); **Cruise NA-6**, R/V *Cape Hatteras*, Rep. 1, 28 Jul 1986, BC, 39.668°N, 70.905°W, 2153 m (10, USNM 1741873); Rep. 2, 29 Jul 1986, BC, 39.668°N, 70.904°W, 2163 m (10, USNM 1741874); Rep. 3, 30 Jul 1986, BC, 39.668°N, 70.903°W, 2153 m (20, USNM 1741875; SEMs, JAB).—**Off Delaware and New Jersey, U.S. Mid-Atlantic ACSAR Program**, coll. Rosemarie Petrecca, Chief Scientist. **Sta. 2**, **Cruise Mid-4**, R/V *Oceanus*, Rep. 3, 17 May 1985, BC, 38.595°N, 72.897°W, 2013 m (2, USNM 1741876); **Cruise Mid-5**, R/V *Oceanus*, Rep. 3, 05 Aug 1985, BC, 38.595°N, 72.896°W, 2005 m (2, USNM 1741877). **Sta. 6**, **Cruise Mid-5**, R/V *Oceanus*, Rep. 3, 02 Aug 1985, BC, BC, BC, 39.094°N, 72.054°W, 2080 m (2 juvs, USNM 1741878). **Sta. 11**, **Cruise Mid-5**, R/V *Oceanus*, Rep. 1, 06 Aug 1985, BC, 38.669°N, 72.941°W, 1505 m (2 juvs, USNM 1741879); Rep. 2, 06 Aug 1985, 38.669°N, 72.941°W, 1502 m (2, USNM 1741880). **Sta. 12**, **Cruise Mid-5**, R/V *Oceanus*, Rep. 2, 07 Aug 1985, BC, 38.488°N, 72.704°W, 2495 m (2, USNM 1741881); Rep. 3, 07 Aug 1985, BC, 38.487°N, 72.704°W, 2495 m (5, USNM 1741882).—**Off Cape Lookout, North Carolina, U.S. South Atlantic ACSAR Program**, coll. J.A. Blake, Chief Scientist. **Sta. 3**, **Cruise SA-1,**. R/V *Columbus Iselin*, Rep. 1, 15 Nov 1983, BC, 34.236°N, 75.674°W, 1505 m (1, USNM 1741883). **Sta. 4**, Rep. 1, 16 Nov 1983, 34.195°N, 75.659°W, 1860 m (1, USNM 1741884); Rep. 3, 17 Nov 1983, BC, 34.196°N, 75.649°W, 1937 m, (4, USNM 1741885).

Description. A moderately sized species, tadpole shaped, with narrow anterior and posterior ends and greatly expanded middle section (Fig. 103A). Hartman (1965) originally reported largest specimens with 25–30 setigers and with lengths of up to 15 mm. Present collection with larger specimens of up to 45–50 setigers and 17–18 mm long. Bodies with first five setigers narrow followed by large, expanded section of six or seven setigers and a long, narrow posterior section of 30–40 setigers (Fig. 103A). Specimen USNM 1741851 with 50 setigers, 17 mm long, 0.65 mm wide across narrow setigers 1–5, 2 mm wide across expanded segments, then about 0.5 mm wide across narrow posterior region. Expanded section more or less oval in cross section with mid-ventral ridge continuing along narrow posterior region. Most of body with 4–5 segmental annular rings, but these poorly developed on setigers 1–5 (Fig. 104A); middle segments with 4–5 annular rings obscured by expansion; narrow posterior setigers with 4–5 conspicuous narrow annular rings reduced to 1–2 rings in last few segments. Elevated pads reduced in size, not conspicuous across annular rings. Color in alcohol tan to flesh-colored, dorsal and ventral cirri of posterior segments with internal glands staining dark red, likely from Rose Bengal stain used in sample sorting.

Pre-setiger region relatively short, about as long as first 1½ setigers (Figs. 103B–C, 104A–B). Prostomium pentagonal, about as wide as long, narrowing posteriorly, pair of lateral horns arising from anterior borders at about a 40° angle; these oval-shaped, slightly longer than wide (Figs. 103B–C, 104A–B); eyespots absent; nuchal organs not everted. Peristomium a single relatively thick ring surrounding prostomium dorsally and laterally (Figs. 103B–C, 104A, 105A), reduced ventrally, continuing to anterior border of oral opening located on setiger 1 (Fig. 104B); mouth a small raised oval mound, surrounded by numerous narrow lobes in middle of setiger 1 (Fig. 104B). Proboscis observed on several specimens (e.g., USNM 1741871, USNM 1741875) as a thin transparent rather fragile appearing sac-like structure.

Parapodia rounded lobes on setigers 1–5, largest on setiger 1 where notopodia bear large acicular spines (Figs. 103B–D, 104A, 105A, C); parapodia of expanded middle segments greatly reduced; parapodia of posterior narrow segments with prominent noto- and neuropodia bearing large distinctive dorsal and ventral cirri (Figs. 103E, 105E). Dorsal cirri oval to weakly triangular shaped, inflated (Figs. 103E, 105E); ventral cirri larger, initially rounded with a narrow papillated tip (Figs. 103E, 105E–F), transitioning to a narrower tapering lobe with narrow non-papillated tip. Dorsal and ventral cirri with internal glands, retaining Rose Bengal stain. Small rounded interramal papilla present between noto- and neuropodia (Fig. 105E, G). Branchiae present from posterior border of notopodia of setigers 2–5 (Fig. 104A); branchiae pectinate consisting of numerous multiple lobed filaments arising from a common base (Figs. 104A, 105B).

Acicular spines present in notopodia of setigers 1–2, absent from neuropodia. Notopodial spines of setiger 1 in two rows accompanied by a few capillaries; anterior row with 6–8 unusually large, long, thick curved spines, with finely hirsute shafts and blunted tips (Figs. 103C–D, 104D, 105C–D), posterior spines narrower, with pointed tips (Fig. 104E); second row with 6–7 smaller spines, shafts smooth, not hirsute, narrowing to pointed tip, accompanied by 7–8 long capillaries; notopodial spines of setiger 2 with 4–5 narrow recurved spines tapering to pointed tip (Fig. 104F), accompanied by about 15 long

capillaries. Short spinous setae present anterior to large spines on setigers 1–2; these narrow, with pointed tips (Fig. 104G), barely visible next to larger acicular spines (Fig. 105C–D, arrows). Furcate setae from setiger 3, each with two long but unequal tynes and denticles on inner edges facing opposite tyne (Fig. 104H)

Pygidium oval-shaped, bilobed, with five long thin anal cirri; four cirri on posterior lateral margins; one cirrus ventromedial (Fig. 104C).

Juvenile Morphology. The smallest *Sclerobregma branchiata* specimen collected had 19 setigers; the prostomium had only two small lateral bulges, representing the earliest appearance of frontal horns (Fig. 106A). At 26 setigers, the prostomium had lateral bulges with a rounded area between them (Fig. 106B). A specimen with 30 setigers had frontal horns that were more distinct and with a less rounded anterior area (Fig. 106C). At 43 setigers, the frontal horns were longer and extended dorsolateral (Fig. 106D).

No branchiae were observed in specimens having fewer than 33 setigers. Branchiae were first observed in 33–37 setiger specimens as one or two small lobate projections on setigers 3 and 4 (Fig. 106E). In specimens with 37–47 setigers, branchiae of setigers 3 and 4 were comprised of a small number of lobes (Fig. 106F), with those on setigers 2 and 5 having fewer than three lobes. All specimens larger than 47 segments possessed well-developed multilobed branchiae on setigers 2–5 (Fig. 106G). The developing branchiae are branched in the pectinate manner characteristic of the species rather than the arborescent branchiae found in most other branchiate scalibregmatids.

Although post-larval development in scalibregmatids is poorly known, the present results differ from those of Blake (2015) where the branchiae of *Scalibregma australis* first appeared on setigers 3–4 of a 22-setiger juvenile. In the present study of *Sclerobregma branchiata* branchiae did not develop until juveniles reached 33–37 setigers.

Remarks. Hartman (1965) recorded large hirsute acicular spines in the notopodia of setiger 1 and smaller transitional spines in the neuropodia. Our specimens have hirsute acicular spines in the notopodia of setigers 1–2 but none in the neuropodia. These observations agree with Mackie (1991) who re-examined the holotype (LACM-AHF Poly 0484) and additional specimens from the Sanders collections.

As noted by Blake (2020), Hartman (1965) misconstrued the nature of the posterior parapodia of this species. The large dorsal cirrus with the nipple-like tip illustrated by her is actually the ventral cirrus, which is larger than the shorter and more rounded dorsal cirrus. The nipple-like tip of the ventral cirrus is best developed on those posterior setigers immediately following the large expanded section; thereafter the tip of the ventral cirrus becomes less of a nipple and more of a narrower pointed extension.

Another species with a nipple-like extension of the ventral cirrus is *Sclerobregma multiaciculatum* **sp. nov.** described herein from deep-water in the South China Sea (see below). However, the ventral cirri of *S. multiaciculata* **sp. nov.** are long and narrow instead of short and flask-like; in addition, there are flask-like dorsal cirri with a nipple-like tip in the new species. Additional differences between *S. multiaciculata* **sp. nov.** and *S. branchiatum* are that the first has acicular spines in the notopodia of setigers 1–3 and neuropodia of setigers 1–2 instead of spines only in the notopodia of setigers 1–2. The pectinate branchiae with rows of multiple lobes arising from a common base are the same in both species but these differ from other branchiate scalibregmatids, which have dichotomously branched branchiae.

There has been little documentation of larval or post-larval development in scalibregmatids (Blake 2000) apart from observations on *Scalibregma australis* by Blake (2015). Numerous small scalibregmatids collected from the Atlantic slope and rise in the 1980's had been identified and labeled by the taxonomic team as *Oligobregma* sp. 2 and thought to represent a new species. They possess an arenicoliform body, T-shaped prostomium, acicular spines, and dorsal and ventral cirri on posterior segments and lack branchiae. By definition, these specimens would be placed within the genus *Oligobregma* the only difference between the genera being that species of *Oligobregma* do not possess branchiae whereas they are present in species of *Sclerobregma*. However, except for the lack of branchiae, the specimens are otherwise similar to *Sclerobregma branchiata* present in the same samples.

After compiling size-related data, changes in the prostomium and initial development of branchiae could be discerned. It thus became evident that the *Oligobregma* sp. 2 specimens were actually juveniles of *Sclerobregma branchiata*. Some aspects of their morphology were documented and are presented here (see above, Juvenile Morphology), including development of the characteristic frontal horns on the prostomium and gradual development of the pectinately branched branchiae on setigers 2–5.

Biology. Although specimens of *Sclerobregma branchiata* were collected from U.S ACSAR stations from New England to the Carolinas, the species was most abundant at several stations in the North Atlantic survey area off New England: Sta. 5 (2063 m, ranked 9th), Sta. 6 (2113 m, ranked 13th), Sta. 8 (2180 m, ranked ca. 20th), Sta. 14 (2105 m, ranked 5th), and Sta. 15 (2155 m, ranked 5th) (Maciolek *et al*. 1987b). These results suggest that the species is most common at sites in about the 2050–2150 m depth range. It is noteworthy that all of these sites were dominated by the widespread deep-water spionid polychaete, *Aurospio dibranchiata* Maciolek, 1981.

Sediment data for the North Atlantic ACSAR stations where *S. branchiata* was most abundant revealed that they all had high percent sand inventories (Maciolek *et al*. 1987b): Sta. 5 (66.4%); Sta. 6 (50.2%); Sta. 8 (58.0%); Sta. 14 (48.15%); and Sta. 15 (40.4%).

Several specimens have the expanded middle segments packed with eggs measuring 160–185 μm in the widest diameter.

Distribution. Western North Atlantic Ocean, U.S. Atlantic Continental slope, 1233–2495 m.

***Sclerobregma multiaciculatum* new species.**
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Figures 107–108

Material examined. (*4 specimens*) **South China Sea, off Brunei, Island of Borneo**, **Site CA1**, R/V *Emma*, coll. J.A. Blake, Chief Scientist: **Sta. 25,** 05 Jun 2011, BC, 5.79°N, 114.18°E, 1402 m, **holotype** (MCZ IZ 172024); **Sta. 50**, 02 Jun 2011, BC, 5.716°N, 114.207°E, 1214 m, 1 **paratype** (MCZ IZ 172025). **Sta.19**, 05 Jun 2011, BC, 5.7913°N, 114.1552°E, 1487 m (1 juv, MCZ IZ 172026).—**Site CA2**, R/V *Emma*, P.A. Neubert, Chief Scientist, **Sta. TU-10**, 23 Jun 2011, BC, 5.412°N, 113.86°E, 1354 m, 1 **paratype** (MCZ IZ 172027).

Description. Body linear, not expanded (Fig. 107A), holotype (MCZ IZ 172024) incomplete, with 21 setigers, 4.6 mm long, 0.65 mm wide across setiger 2; paratype (MCZ IZ 172027) smaller, but complete, with 32 setigers, 2.2 mm long, 0.4 mm wide. Body rectangular in cross section, venter with mid-dorsal ridge, best developed in middle and posterior setigers. Segmental annular rings not apparent on setigers 1–3 (Fig. 108A–B), thereafter individual segments quadriannulate with elevated pads weakly developed, not conspicuous (Fig. 107A). Color in alcohol light tan.

Pre-setiger region relatively short, about as long as first 1½ setigers. Prostomium about as wide as long, narrowing slightly posteriorly (Figs. 107A, 108A), with a pair of diverging frontal horns arising from lateral margins, these oval-shaped, longer than wide (Fig. 108A–B); eyespots absent; nuchal organs multilobed, everted on right side of holotype (Fig. 107A), arising from groove between prostomium and peristomium. Peristomium a single relatively thickened ring surrounding prostomium dorsally and laterally (Fig. 108A), continuing ventrally to anterior border of oral opening located on setiger 1 (Fig. 108B); mouth a raised mound on setiger 1 of paratype (MCZ IZ 172027); holotype with mouth obscured by partially everted proboscis; this with large flexible opening surrounded by numerous narrow lobes (Fig. 108B).

Parapodia well-developed along entire body; enlarged rounded lobes on setigers 1–3 where noto- and neuropodia bear large acicular spines (Fig. 108A); parapodia reduced thereafter but still prominent with notopodia becoming narrow and elongate and neuropodia similar but shorter and not as narrow. Dorsal and ventral cirri developing from about setiger 15; dorsal cirri short, erect, flask-shaped with short apical papilla (Figs. 107B, 108C); dorsal cirri with darkly pigmented internal glands extending into papillated apex; ventral cirri long, narrow, with long papilla-like tip (Fig. 108C); ventral cirri relatively smooth, lacking prominent internal glands. Short, rounded interramal papillae present between noto- and neuropodia (Fig. 108C). Branchiae present from posterior border of notopodia of setigers 2–6 (5 pairs) on holotype (Figs. 107A, 108A) and on setigers 2–5 (4 pairs) on smaller paratypes; branchiae consisting of numerous branching filaments.

Acicular spines present in notopodia of setigers 1–3 and neuropodia of setigers 1–2. Notopodial spines of setiger 1 in two rows accompanied by a few capillaries; four spines of first innermost row unusually large, long, straight, flattened, narrowing to pointed tip (Figs. 107D, 108A); 4–5 spines of second outer row shorter, about half the length of spines in first row, recurved, tapering to pointed tip (Figs. 107C, 108A). Notopodia of setiger 2 with five recurved spines (Figs. 107C); second row all capillaries. Notopodial spines of setiger 3 reduced in size, transitional with only 2–3 in a row with capillaries. Neuropodial spines of setigers 1–2 smaller compared to those of notopodia, numbering about four per neuropodium, accompanied by 10–12 capillaries. Both noto- and neuropodia of setigers 1–2 with a few short spinous setae anterior to larger spines; setiger 3 with furcate setae in same location anterior to spines on notopodia and capillaries in neuropodia; all following setigers with furcate setae anterior to capillaries. All spines relatively smooth, not hirsute. Furcate setae with two long but unequal tynes, with denticles on inner edge facing opposite tyne (Figs. 107E, 108D).

Pygidium on paratype (MCZ IZ 172027) a rounded lobe, with one long anal cirrus; others likely broken off; 4–5 anal cirri likely present when intact.

Remarks. *Sclerobregma multiaciculatum* **sp. nov.** is only the second species to be discovered, and like the first, *S. branchiata*, is from deep water albeit from the South China Sea instead of the western North Atlantic Ocean. The two species differ morphologically in several ways: *S. multiaciculatum* **sp. nov.** does not have inflated anterior segments, has notoacicular spines on setigers 1–3 and neuroacicular spines on setigers 1–2, has five pairs of branchiae on setigers 2–6, posterior parapodia have a short flask-shaped dorsal cirrus with a papillate tip and a long narrow ventral cirrus, also with a papillate tip; the acicular spines are all smooth and the first row of setiger 1 has four unusually long spines at least twice the length and size of those of the second outer row, and all spines taper to a smooth pointed tip. In contrast, *S. branchiata* has a typical scalibregmatid body form with expanded anterior segments, notoacicular spines are limited to setigers 1–2 and neuroacicular spines are lacking, there are four pairs of branchiae on setigers 2–5, posterior parapodia have a weakly triangular-shaped and inflated dorsal cirrus and a large flask-shaped ventral cirrus with an inflated tip, and finally the acicular spines taper to a hirsute pointed tip.

Etymology. The epithet *multiaciculatum*, is derived from *multus*, Latin for many and *acicula*, Latin for pin or needle, in reference to the multiple kinds of anterior acicular spines present on this species.

Distribution. South China Sea, off Brunei, Island of Borneo, 1214–1402 m.

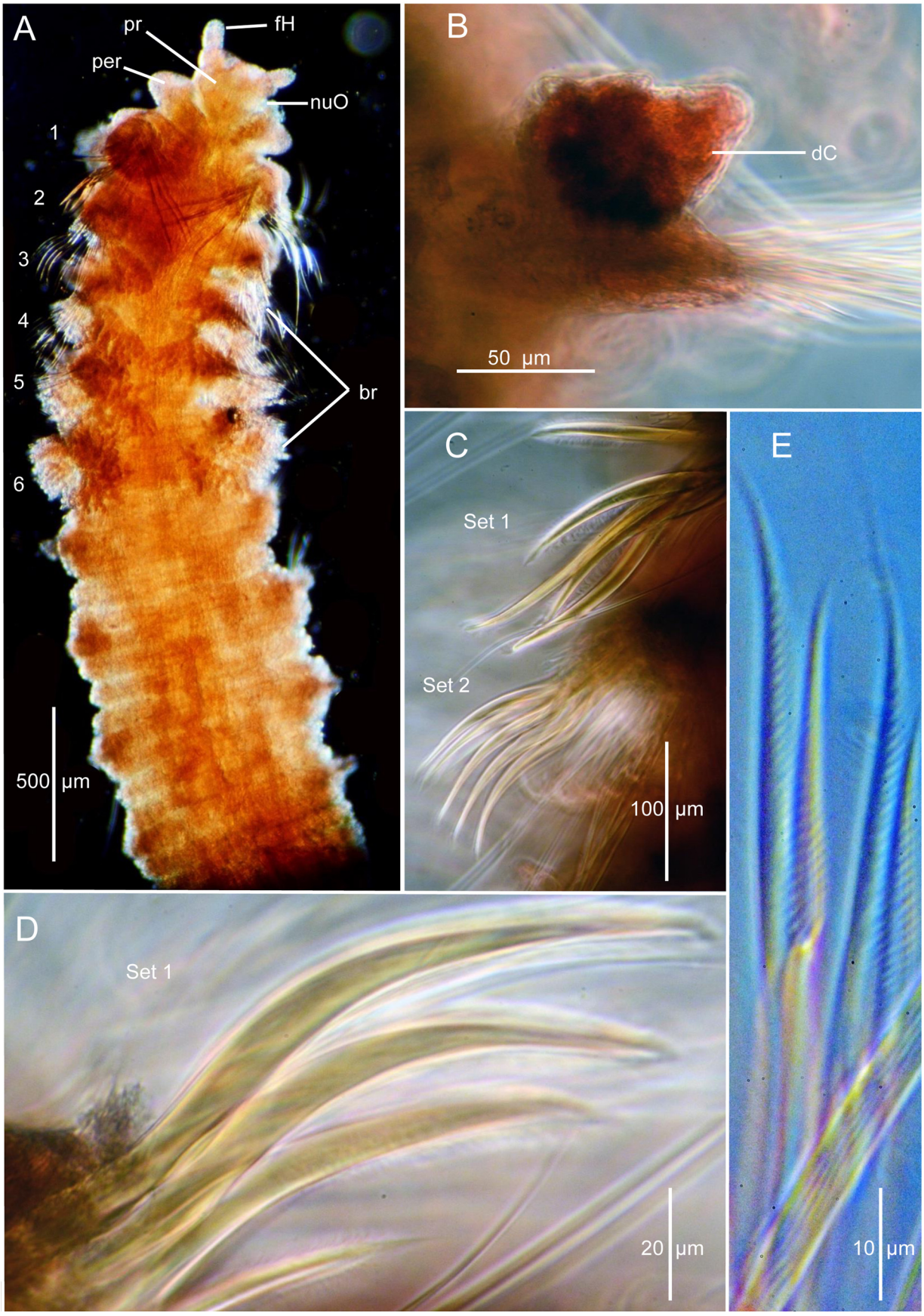

FIGURE 107. *Sclerobregma multiaciculatum* **sp. nov.** Holotype (MCZ IZ 172024): A, anterior end, dorsal view; B, dorsal cirrus, posterior parapodium, anterior view; C, notosetae setigers 1–2; D, large anterior notosetae, setiger 1; E, furcate setae, posterior parapodium. A–B, stained with Shirlastain A.

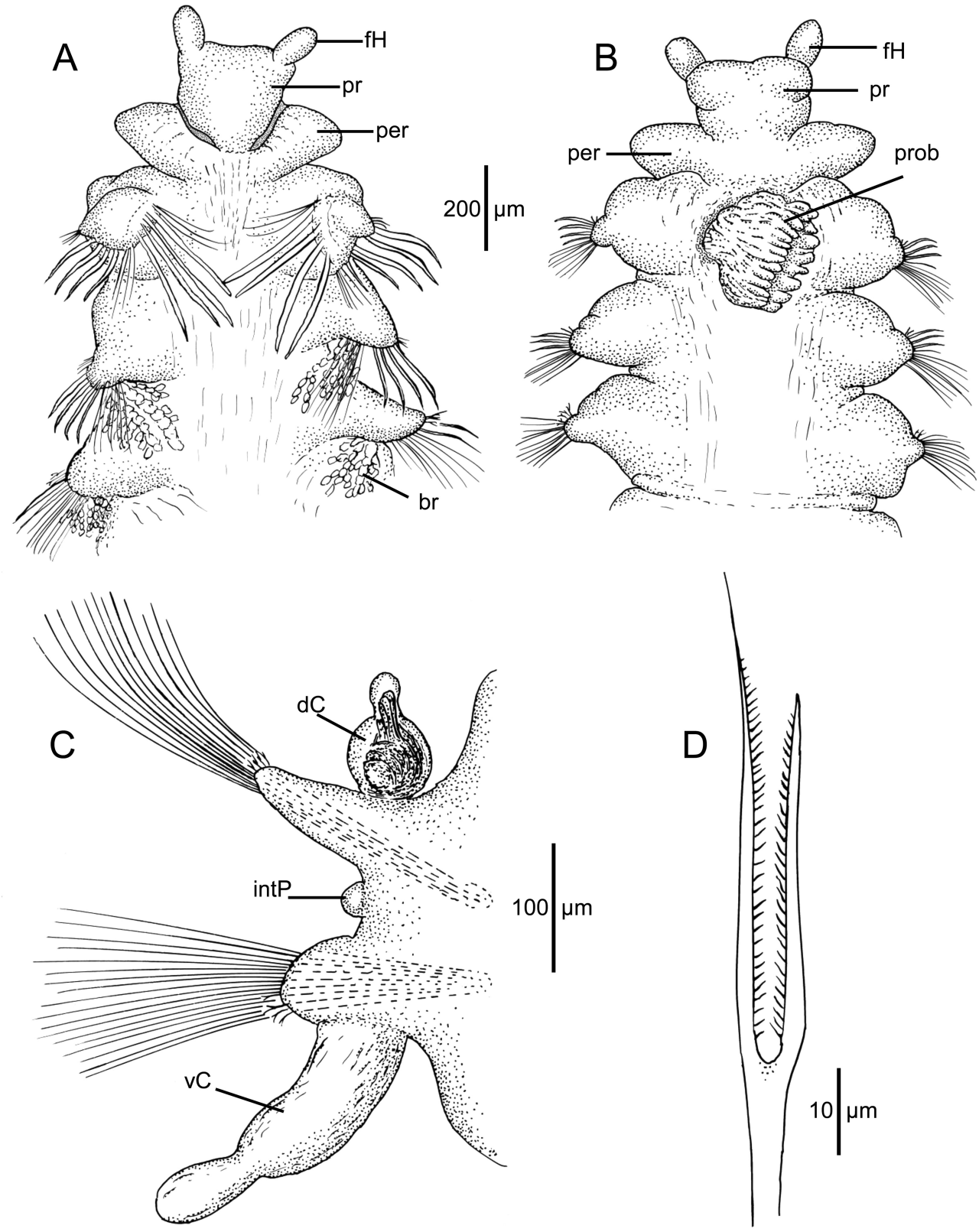

FIGURE 108. *Sclerobregma multiaciculatum* **sp. nov.** Holotype (MCZ IZ 172024): A, anterior end, dorsal view; B, anterior end, ventral view; C, posterior parapodium, anterior view; D, furcate seta, posterior parapodium.

Genus *Mucibregma* Fauchald & Hancock, 1981

Type-species: *Mucibregma spinosa* Fauchald & Hancock, 1981, by monotypy.

Diagnosis. Body elongate, arenicoliform, widest anteriorly, tapering posteriorly. Prostomium broadly rounded anteriorly with short lateral horns projecting slightly posteriorly. Peristomium with three rings dorsally; anterior ring with dorsal crest overlapping posterior margin of prostomium; ventrally forming oral lips; posterior lip large, expanded over entire peristomium, followed by narrow mid-ventral ridge. Parapodia biramous, lacking cirri or setal lobes. All setigers with 3–4 acicular spines and a few long capillaries in noto- and neuropodia; furcate setae absent. Branchiae absent. Pygidium with anal cirri.

Remarks. *Mucibregma spinosa* was described from a single specimen from deep-water off Oregon. The specimen appeared to be encased in a mucous covering according to the original authors and exhibited unusual characters for a scalibregmatid, including short spines in all parapodia (Fauchald & Hancock 1981). Kudenov (1985) suggested the specimen was a species of Fauveliopsidae. No additional specimens have been collected. In order to help understand the status of this unusual scalibregmatid the type-specimen was requested and examined. These observations confirm it to be a scalibregmatid, albeit highly unusual with acicular spines present in the noto- and neuropodia of all setigerous segments.

Mucibregma spinosa Fauchald & Hancock, 1981
Figure 109

Mucibregma spinosa Fauchald & Hancock, 1981:20: pl. 3, Figs. a–b; Kudenov 1985: 339.

Material examined. **E North Pacific Ocean, off Oregon, Cascadia Abyssal Plain**, W of Yaquina Bay, coll. Andrew G. Carey, Jr. **Sta. AD006-NAD17**, 6 Jun 1963, AD, 44.558°N, 125.243°W, 2000 m, **holotype** (LACM-AHF Poly 1146).

Description. A small species, holotype only specimen, complete with 18 setigers, 8 mm long, 1.4 mm wide across peristomium, and 0.8 mm wide across middle and posterior segments. Body segments with some evidence of annular rings, but no raised pads evident. Most middle and posterior setigers with parapodia damaged and pulled away from setae, suggesting poor preservation. Color in alcohol light tan; acicular spines distinctly brass colored along entire body.

Prostomium relatively short, wider than long, with broadly rounded anterior margin bearing narrow, pointed lateral horns directed slightly posteriorly (Fig. 109A–B); eyespots absent, nuchal organs not observed. Peristomium with three smooth rings dorsally; anteriormost ring with a distinct dorsal crest overlapping posterior margin of prostomium (Fig. 109A); ventrally forming anterior and posterior lips of mouth (Fig. 109B); anterior lip narrow, weakly lobed; posterior lip enlarged, bulbous, extending over entire peristomium with about 12 elongate lobes bordering oral opening and extending posteriorly over bulbous surface (Fig. 109B); a mid-ventral extension continuing from the expanded posterior lip along venter as a mid-ventral ridge; this appearing continuous, only weakly interrupted segmentally (Fig. 109B).

Parapodia not discernable along most of body; setal fascicles intact, but with little or no tissue left to observe nature of parapodia. Postsetal lamellae and dorsal and ventral cirri not observed. Setae include 3–4 acicular spines and 1 or 2 long thin natatory-like capillaries (Fig. 109C) on each noto- and neuropodium from setiger 1 to end of body. Short spinous setae not present on anterior setal fascicles and furcate setae entirely absent. Acicular spines conspicuous, brass-colored, thickened, straight, tapering to a narrow, rounded tip (Fig. 109C); shortest spines may have a weakly pointed tip.

Pygidium intact, a small narrow collar bearing four short anal cirri.

Remarks. *Mucibregma spinosa* has been an enigma since its original description. Fauchald & Hancock (1981) defined their new genus as a scalibregmatid having a T-shaped prostomium, one peristomial segment, and acicular spines on all setigers. In actuality, the prostomium is broadly rounded across the frontal margin with lateral horns directed somewhat posteriorly and there are three peristomial or achaetous segments not one. The authors indicated that the specimen was incomplete, but although the posterior end is damaged, a small pygidium is intact and bears at least four anal cirri. Fauchald & Hancock (1981) indicated that the entire body was encased in a tough mucous membrane, leading to the name of the genus. However, the mucous membrane appears to be the product of the poor condition of the specimen at the time of preservation and partial deterioration of surficial tissues. The extensive damage to parapodial tissue is additional evidence of problems when the specimen was preserved. The anchor dredge used to collect the sample can in and of itself result in fragile soft-bodied specimens being concentrated and/or crushed with accumulating sediment and rocks while being towed across the seafloor.

Initial observation of the holotype was of a specimen having a scalibregmatid-like anterior end, but with the body having noto- and neuropodial acicular spines similar to those seen in certain cirratulid genera (i.e., *Chaetozone*, *Cirratulus*, *Chaetocirratulus*; see Blake & Magalhães 2019). However, cirratulids do not have lateral or frontal horns on the prostomium and do not have pygidia with anal cirri. Further, there is no evidence of dorsal tentacles and segmental branchiae as found in cirratulids. I conclude, therefore, that the genus *Mucibregma* is indeed a scalibregmatid that has acicular spines on all setigerous segments instead of a few anterior setigers as in the genera *Asclerocheilus*, *Oligobregma*, *Parasclerocheilus*, *Sclerobregma*, and *Sclerocheilus*. However, the poor condition of the holotype precludes any further effort to characterize it.

Distribution. E North Pacific Ocean, off central Oregon, lower continental slope depths, 2000 m.

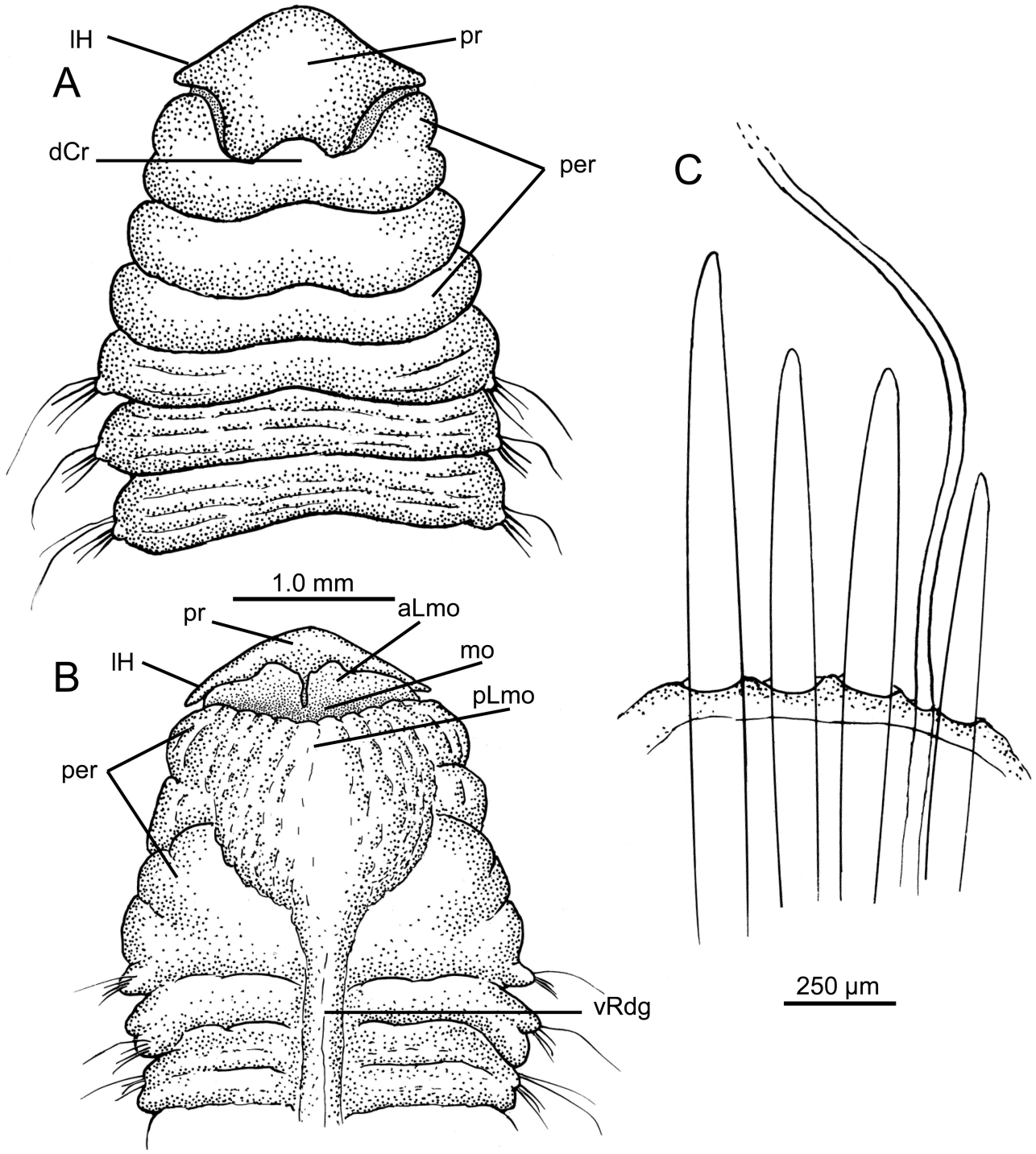

FIGURE 109. *Mucibregma spinosa* Fauchald & Hancock, 1971. Holotype (LACM-AHF Poly 1146). A, anterior end, dorsal view; B, anterior end, ventral view; C. notopodial acicular spines, mid-body setiger.

Status of *Neolipobranchius glabrus* Hartman & Fauchald, 1971

Neolipobranchius glabrus Hartman & Fauchald (1971) was described from a single specimen collected from abyssal depths of 4436 m off the coast of New England. Details of the holotype were presented by Blake (2015) and are summarized and enhanced below following an additional inspection of the holotype. The specimen is definitely a juvenile of the deep-water genus *Travisia*, Family Travisiidae Hartmann-Schröder, 1971, and not a scalibregmatid as originally placed by Hartman & Fauchald (1971) and as subsequently suggested or inferred by Persson & Pleijel (2005), Paul *et al*. (2010), and Martínez *et al*. (2013, 2014).

The genus *Neolipobranchius* is here formally synonymized with *Travisia*, albeit the species is a juvenile of an as-yet-unidentified species of deep-water North Atlantic *Travisia*.

***Travisia glabra* (Hartman & Fauchald, 1971) new combination, species inquirenda**
Figure 110

Neolipobranchius glabrus Hartman & Fauchald, 1971: 123–124, pl. 19; Blake 2015: 89–90; 2020: 328–329; Blake & Maciolek 2020: 308–309.

Material examined. **Western North Atlantic Ocean, abyssal plain**, Gay Head-Bermuda Transect, R/V *Atlantis*, Cruise 268, coll. H.L Sanders, **Sta. JJ-1**, 02 Oct Aug 1961, 37.45°N, 68.683°W, 4436 m, AD, **holotype** of *Neolipobranchius glabrus* (LACM AHF-Poly 896).

Descriptive notes and comments. The holotype is small, with 23 setigers, 2.8 mm long, 0.8 mm wide across setigers 10–12. The specimen is fragile, with a fusiform body that is narrow anteriorly, gradually thickens to about mid-body, then narrows posteriorly (Fig. 110A–B); it is damaged ventrally, with two segments separated. A faint mid-ventral line is present on the last few segments, but no ventral groove or ridge is present.

The prostomium is a narrow lobe that extends anteriorly (Fig. 110C). The peristomium is composed of at least four achaetous rings dorsally and laterally; it extends ventrally, bordering the anterior and posterior lips of the mid-ventral mouth. These achaetous segments are followed by 13 setigers that progressively increase in size, forming the expanded middle region and then the segments decrease in size to the narrow posterior end (Fig. 110A–B).

The first 13 setigers are relatively smooth, with the surficial morphology partially obscured or stretched by expansion; the last four setigers of the expanded region become progressively narrower with each of these bearing one or two distinct rings that encircle the body; these rings are expanded on their posterior margins (Fig. 110A–B). However, these rings are not annulated with elevated pads as is typical of scalibregmatids; they instead have groups or rows of numerous papillae as is characteristic for species of *Travisia*. The remaining nine segments become progressively narrower and elongate each with an expanded papilla-bearing ring on the posterior margin (Fig. 110B). The last segment is narrow and appears damaged at its terminus, suggesting that the pygidial segment is missing.

Parapodial lobes, cirri, and postsetal lamellae are absent, with setae emerging directly from the body wall. Branchiae are absent. Setae are simple narrow capillaries with no more than two or three in either noto- or neuropodium.

The specimen appears to be a post-larval juvenile of *Travisia*. The specimen had been feeding because the gut

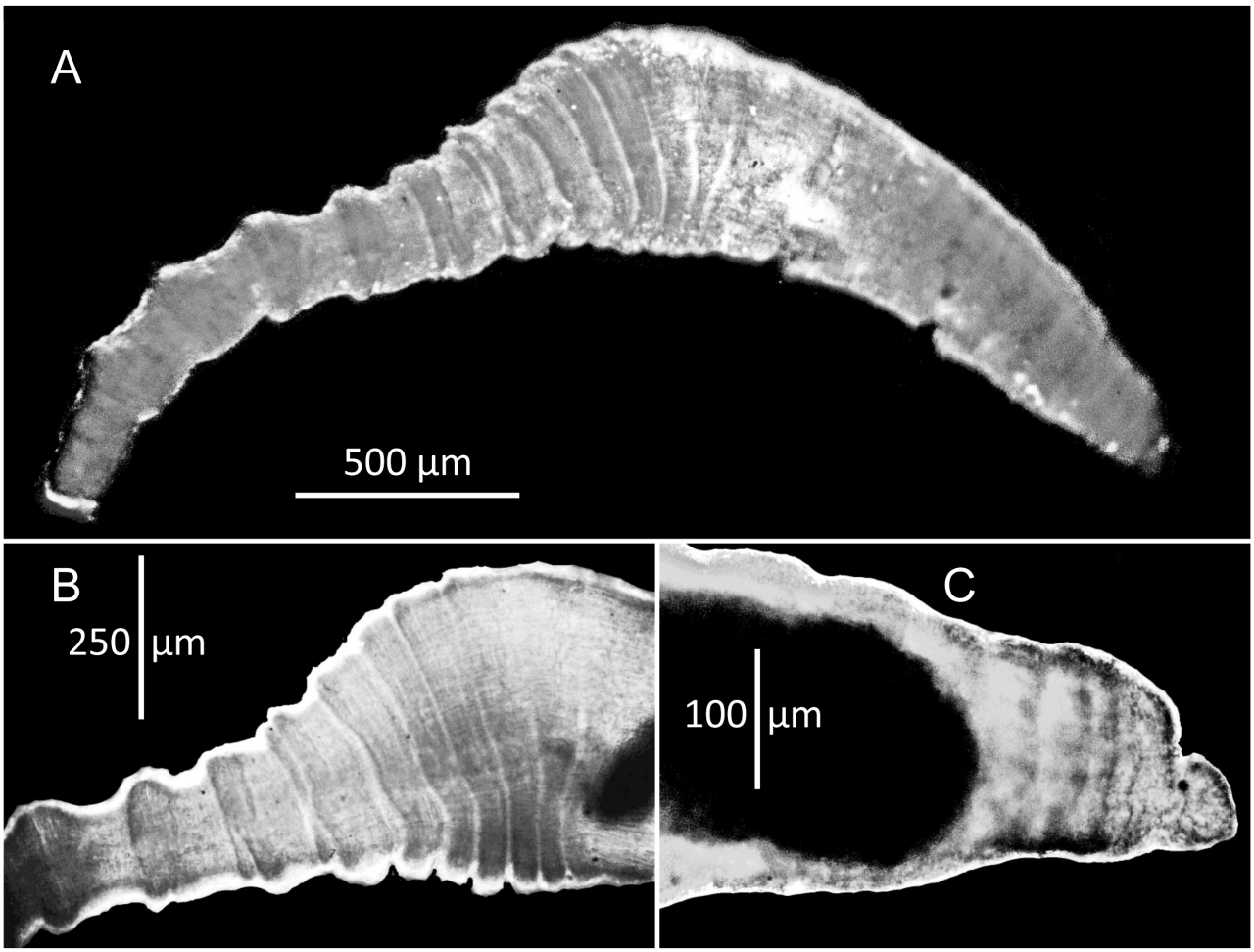

FIGURE 110. *Travisia glabrus,* **n. comb**. Holotype of *Neolipobranchius glabrus* (LACM-AHF Poly 896): A, entire worm, right lateral view; B, middle and posterior setigers, right lateral view; C, anterior end, right lateral view.

in the anterior half of the body is filled with silt. There are no distinctive morphological characters present to define this species.

Remarks. *Neolipobranchius glabrus* is not a scalibregmatid, but represents a juvenile of *Travisia*. Although the specimen is small it initially seemed feasible that it was a juvenile of *Travisia gravieri* McIntosh, 1908, an abranchiate species widely distributed in deep-water in the North Atlantic (Hartman 1965). Numerous specimens of *T. gravieri* are available from the Sanders-Hessler materials identified by Hartman (1965) and Hartman & Fauchald (1971) as well as from our own ACSAR samples collected from deep water along the U.S. Atlantic coast. However, the body habitus of *T. gravieri,* even on small specimens, is plump and bulbous, having an entirely different shape than the *N. glabrus* specimen. Another undescribed abranchiate species of *Travisia* from deep-water off the U.S. Atlantic coast collected as part of the ACSAR program is narrower, but none have been collected from similar abyssal depths as *T. glabra*. Therefore, *Neolipobranchius* is here declared a junior synonym of the genus *Travisia* and the species, *glabra*, a *taxon inquirenda*.

Specimens identified as *Neolipobranchius* sp. collected from the Gulf of Maine in ca. 200 m and their DNA sequences were reported as scalibregmatids in articles by Paul *et al*. (2010), Law *et al*. (2013), and Martínez *et al*. (2013a–b). The results were in phylogenetic trees generated by these authors that showed the *Neolipobranchius* sp. sequences nested within or adjacent to *Travisia* sequences, suggesting that the genus *Neolipobranchius* should be synonymized with *Travisia* and by implication supporting the concept that *Travisia* belonged in the Scalibregmatidae. In fact, there was no information provided regarding the morphology of the specimens from the Gulf of Maine, who identified them, or why they were referred to *Neolipobranchius*, a genus only known from abyssal depths. It is most likely these were simply juvenile specimens of a local *Travisia* such as *T. carnea* Verrill, 1873 that were not recognized as such.

To further emphasize that subsequent workers have followed information provided in the text and illustration of *N. glabra* by Hartman & Fauchald (1971) to erroneously identify offshore specimens as *Neolipobranchius*, I examined 16 samples identified as *Neolipobranchius* sp. by Maurer & Williams (1988) from offshore, mostly deep-water along the central and South American coast as part of surveys by the R/V *Anton Bruun* and R/V *Vema*. Of these, only one sample included scalibregmatids. Those specimens were from the Strait of Magellan and are identified and reported herein as *Asclerocheilus magellaniensis* **sp. nov.**; the other 15 samples identified as *Neolipobranchius* sp. by Maurer & Williams (1988) were easily recognized as at least four different branchiate and abranchiate species of *Travisia*.

Distribution. Western North Atlantic Ocean, abyssal plain, 4436 m.

Discussion

Depth Distribution of Species of Scalibregmatidae

At the time of this writing, and after some adjustments, WoRMS lists approximately 87 species of valid species of Scalibregmatidae (Read & Fauchald 2024). With the addition of 54 new species in the present study, the revalidation of two species, one species, *Oligobregma blakei* moved to synonymy, and the transfer of *Neolipobranchius* to *Travisia*, the new total number of scalibregmatid species is approximately 142. As part of this review, all of these known species of Scalibregmatidae, old and new, were compiled as a list according to their depth of occurrence.

Table 8 lists species from intertidal and shallow-water depths out to the shelf break at about 200 m and those considered as bathyal from 200 m and extending down the continental slope with abyssal depths beginning more or less at 3000 m and deeper (Rex & Etter 2010). The number of scalibregmatid species within defined depth ranges is: 0–50 m (30), 51–100 m (13), 101–200 m (6), 201–500 (6), 501–1000 m (13); 1001–1500 m (10); 1501–2000 m (12), 2001–2500 m (11), 2501–3000 m (12), 3000–4000 (10), 4000–5000 m (14), and >5000 (4). These records are for 142 species currently recognized (Read & Fauchald 2024, this study).

Blake (2023) listed 19 species of Scalibregmatidae from abyssal depths (~2800–3000 m and greater). In the present study, the number of "*abyssal*" scalibregmatids (>3000 m) is increased to 28 which represent about 20% of the known species (Table 8). However, the contribution of deep-water species to scalibregmatid diversity is much greater when the range of bathyal and abyssal depths are considered (>200 m). Of the 142 species listed in Table 8, 49 or 35% of the total occur in depths of 0–200 m. In contrast, 93 species or 65% occur in depths greater than 200 m of which 73 species or 52% occur in depths of 1000 m or greater. These data clearly demonstrate that the greater diversity of scalibregmatids occurs in deep-water habitats. The genus *Oligobregma* has the most species in deep water. Out of 30 known species, only two *Oligobregma* species occur in shallow depths (<200 m), whereas 28 species occur in depths of 700 m or deeper; of these 16 species range into abyssal depths of 3000 m or greater. In contrast, the genus *Hyboscolex* with 12 known species has eight species in shallow depths (<100 m) and only four in depths of 800 m or deeper.

Systematics of Scalibregmatidae and Comparison with Opheliidae and *Travisia*

Efforts to explore the systematic relationships of the families Scalibregmatidae and Opheliidae and the genus *Travisia* in particular have been plagued by confusing and sometimes erroneous and contradictory morphological and molecular observations. *Travisia* has traditionally been included as one of three subfamilies of Opheliidae as Travisiinae Hartmann-Schroder, 1971 (Dauvin & Bellan

TABLE 8. Depth Distribution of 142 Known Species of Scalibregmatidae by Increasing Depth[1,2].

Genus and species	Depth (m)	Location	References
1. *Parasclerocheilus fonsecae* **sp. nov.**	0–2	E North Pacific Ocean; Costa Rica	This study
2. *Scalibregmides peruanus* Blake, 1981	0–5	SE Pacific Ocean, Peru, S of Callao	Blake 1981; 2020
3. *Scalibregma wireni*	3–9	E Greenland, Franz Joseph Fjord	Furreg 1925
4. *Asclerocheilus tropicus*	8–9	SE Pacific Ocean, Ecuador; ?Brazil	Blake 1981; Nogueira 2002; Mendes *et al.* 2024c
5. *Hyboscolex longisetosus*	0–10	South Africa	Schmarda 1861; Willey 1904, Day, 1967
6. *Hyboscolex dicranochaetus*	0–10	Australia, widespread	Schmarda 1861; Kudenov & Blake 1978
7. *Hyboscolex ehlersi* **sp. nov.**	0–10	SE Pacific Ocean, Chile	This study
8. *Hyboscolex equatorialis*	0–10	SE Pacific Ocean, Ecuador to Peru	Blake 1981
9. *Hyboscolex oculatus*	0–10	SE Pacific Ocean, Chile	Ehlers 1901a; Blake 1981
10. *Scalibregmides chilensis* Hartmann-Schröder, 1965	10	SE Pacific Ocean, Chile, mussel beds	Hartmann-Schröder 1965; Blake 1981
11. *Oligobregma simplex*	11	SE Australia, Victoria	Kudenov & Blake 1978
12. *Scalibregma aggregatum* **sp. nov.**	~15 m	NE Pacific Ocean, California, Monterey Bay	This study
13. *Parasclerocheilus branchiatus*	0–20	Indian Ocean, Gulf of Oman; Malaysia	Fauvel 1928; 1953; Ong 1995
14. *Parasclerocheilus capensis*	0–20	S & SW Africa	Day 1961; 1963; 1967
15. *Hyboscolex pacificus*	0–20	NE Pacific Ocean, Canada to Costa Rica; ?Japan	Moore 1909; E. Berkeley 1930; Berkeley & Berkeley 1941; 1952; Hartman 1969; Blake & Ruff 2007; this study
16. *Sclerocheilus deriujini* Zachs, 1925	0–20	Arctic Ocean, Kola Fjord	Zachs 1925
17. *Scalibregma celticum*	6–21	NE Atlantic Ocean, UK, France, Mediterranean Sea	Mackie 1991; Lomiri *et al.* 2012
18. *Hyboscolex quadricinctus*	0–30	Gulf of Mexico, off Florida	Kudenov 1985
19. *Asclerocheilus heterochaetus*	18	SE Australia, Victoria	Kudenov & Blake 1978
20. *Sclerocheilus unoculus* Kudenov, 1985	18–37	Gulf of Mexico, off Florida	Kudenov 1985
21. *Pseudoscalibregma magalhaesi*	41	SW Atlantic Ocean, off SE Brazil	Mendes *et al*. 2024a
22. *Asclerocheilus mexicanus*	43	Gulf of Mexico, off Florida	Kudenov 1985
23. *Polyphysia caulleryi* (McIntosh, 1922)	48	NW Pacific Ocean, Japan	McIntosh 1922
24. *Asclerocheilus geiseae*	11–50	SW Atlantic Ocean, Brazil, off Rio Doce River	Mendes *et al* 2024c

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TABLE 8. (Continued)

Genus and species	Depth (m)	Location	References
25. *Lipobranchius jeffreysii* (McIntosh, 1869)	~50	NE Atlantic Ocean, North Sea, Adriatic, Skagerrak, Kattegat	McIntosh 1869; Fauvel 1927; Hartmann-Schröder 1996
26. *Asclerocheilus acirratus*	<50	NE Pacific Ocean, Southern California	Hartman 1966; 1969; Blake 2000
27. *Asclerocheilus alaskaensis* **sp. nov.**	~50	NE Pacific, Alaska, Stephens Passage, S of Juneau	This study
28. *Asclerocheilus intermedius*	<50	NE Atlantic Ocean, France, English Channel	St. Joseph 1894; Hammond 1962; this study
29. *Axiokebuita cavernicola*	<50	NE Atlantic Ocean, Canary Islands, marine caves	Martinez *et al*. 2013a–b
30. *Speleobregma lanzaroteum*	<50	NE Atlantic Ocean, Canary Islands, marine caves	Bertelsen 1986; Martinez *et al*. 2009, 2013 a–b
31. *Scalibregma beaufortensis* **sp. nov.**	55	Arctic Ocean, Beaufort Sea, Alaskan Arctic	This study
32. *Oligobregma oculata*	57	W Pacific Ocean, S of New Caledonia	Kudenov & Blake 1978
33. *Asclerocheilus shanonae*	60	Indian Ocean, Andaman Sea off Thailand	Eibye-Jacobsen 2002
34. *Sclerocheilus minutus* Grube, 1863	0–65	NE Atlantic Ocean, English Channel; France; Adriatic Sea	Grube 1863; St. Joseph 1894; Furreg 1925
35. *Scalibregma robustum*	~65 m	Arctic Ocean, White Sea	Zachs 1923. 1925; Furreg 1925 (as *A. vegae*)
36. *Asclerocheilus elisabethae*	80	Indian Ocean, Andaman Sea off Thailand	Eibye-Jacobsen 2002
37. *Polyphysia crassa* (Örsted, 1843)	13–90	NE Atlantic Ocean, North Sea, Mediterranean Sea	Ashworth 1901; Furreg 1925; Hartmann-Schröder 1996
38. *Scalibregma inflatum*	6–94	NE Atlantic Ocean, widespread	Mackie 1991; Bakken *et al*. 2014
39. *Scalibregma ridleyensis* **sp. nov.**	9-95 m	NE Pacific Ocean, British Columbia, SE Alaska	This study
40. *Scalibregma chilensis* **sp. nov.**	13–100	SE Pacific Ocean, Chile, coastal embayments	This study
41. *Scalibregma lanai*	25–100	SW Atlantic Ocean, off Brazil	Mendes *et al*. 2023
42. *Scalibregma velatum* **sp. nov.**	36–100	NE Pacific Ocean, central and northern California	This study
43. *Hyboscolex harrisae* **sp. nov.**	50–100	NE Atlantic Ocean, Sweden, Skagerrak	This study
44. *Scalibregma californicum*	90–113	NE Pacific Ocean, California, continental shelf	Blake 2000; 2020; Blake & Ruff 2007; this study
45. *Asclerocheilus kudenovi*	120	NE Pacific Ocean, central California	Blake 2000
46. *Asclerocheilus crenulatus* **sp. nov.**	93–125	NE Pacific Ocean, Central California, on rocks, ca. 93–125 m	This study
47. *Asclerocheilus shanei*	125	Australia, Tasmania	Hartmann-Schröder 1994
48. *Scalibregma brevicaudum* **Revalidated**	13–152	W North Atlantic Ocean, New England to New Jersey	Verrill 1873; Hartman 1942, 1944a; this study

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TABLE 8. (Continued)

Genus and species	Depth (m)	Location	References
49. *Asclerocheilus capensis*	183	South Africa	Day 1963; 1967
50. *Scalibregma stenocerum*	218	W North Atlantic Ocean, Carolinas to Florida	Bertelsen &Westen1980; Mackie 1991
51. *Axiokebuita oculata* **sp. nov.**	243 m	NE Pacific Ocean, off Costa Rica, Las Gemelas Seamount	This study
52. *Scalibregma therouxi* **sp. nov.**	201–245	W North Atlantic Ocean, off New England, Gulf of Maine	This study
53. *Asclerocheilus magellaniensis* **sp. nov.**	392	Chile, Straits of Magellan	This study
54. *Asclerocheilus ashworthi*	400	Sub-Antarctic seas	Blake 1981
55. *Sclerocheilus antarcticus* Ashworth, 1915	61–426	Southern Ocean, Antarctica	Ashworth 1915; Hartman 1978; Blake 1981
56. *Scalibregma sahlingi* **sp. nov.**	429	NE Pacific Ocean, Oregon, Cascadia convergent margin	This study
57. *Scalibregma lydoniensis* **sp. nov.**	555–560	W North Atlantic, off New England, Lydonia Canyon	This study
58. *Scalibregma fimbriatum* **sp. nov.**	530–590	W North Atlantic, off New England, Lydonia Canyon & slope	This study
59. *Oligobregma cruzae*	688–700	SE Brazil, Santos Basin	Mendes *et al*. 2024b
60. *Pseudoscalibregma palmeri*	385–768	Southern Ocean, E Antarctic Peninsula	Blake 2015
61. *Oligobregma acutaspinosum* **sp. nov.**	796–800	W North Atlantic, off S Carolina	This study
62. *Pseudoscalibregma larae* **sp. nov.**	544–805	W North Atlantic, New England to the Carolinas	This study
63. *Hyboscolex reesi* **sp. nov.**	818–878	Gulf of Mexico, off Louisiana	This study
64. *Asclerocheilus californiensis*	542–890	NE Pacific Ocean, S California canyons	Hartman 1963; 1966; 1969; Blake 2000
65. *Oligobregma mucronata*	323–912	Southern Ocean, E Antarctic Peninsula	Blake 2015
66. *Asclerocheilus jonesi* **sp. nov.**	921	Gulf of Mexico, off Louisiana	This study
67. *Oligobregma notiale*	18–923	Southern Ocean, Antarctica, widespread	Blake 1981
68. *Asclerocheilus beringianus*	986	Arctic Ocean, Bering Sea	Ushakov 1955/1965
69. *Scalibregma cinthyae*	51–1000	SW Atlantic Ocean, SE, Brazil, slope depths	Mendes *et al*. 2023
70. *Pseudoscalibregma orientalis*	373–1005	NW Pacific Ocean , Japan, off Honshu Island	Imajima 2009

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TABLE 8. (Continued)

Genus and species	Depth (m)	Location	References
71. *Pseudoscalibregma bransfieldium*	332–1110	Southern Ocean, Antarctic Peninsula, Weddell Sea	Hartman 1967; Blake 1981; 2015; this study
72. *Scalibregma hanseni*	497–1243	NE Atlantic, Norwegian Sea, shelf and slope	Bakken *et al*. 2014
73. *Polyphysia hystricis* (McIntosh, 1922)	470–1262	NE Atlantic, off Ireland, Porcupine slope	McIntosh 1922
74. *Pseudoscalibregma parapari*	970–1300	SE Brazil, slope depths	Mendes *et al*. 2024a
75. *Axiokebuita millsi* **Revalidated**	680–1343	W North Atlantic, off New England & Canada	Pocklington & Fournier 1987; this study
76. *Asclerocheilus aurospinosus* **sp. nov.**	1360	Indian Ocean off SW Africa	This study
77. *Asclerocheilus* sp. F (Fauvel, Azores)	1385	E North Atlantic, off the Azores	Fauvel 1909, 1914; This study
78. *Sclerobregma multiaciculatum* **sp. nov.**	1214–1402	South China Sea, off Brunei	This study
79. *Asclerocheilus glabrus*	320–1435	Straits of Florida; Caribbean Sea	Ehlers 1887; Augener 1906; Hartman1938; this study
80. *Axiokebuita verenae* **sp. nov.**	1545	NE Pacific Ocean, Juan de Fuca Ridge	This study
81. *Axiokebuita minuta*	245–1582	Southern Ocean, Antarctica, Scotia Sea, Weddell Sea	Hartman 1967; Blake 1981; Parapar *et al*. 2011; this study
82. *Cryptosclerocheilus baffinensis* Blake, 1972	1830	Davis Strait, off Baffin Island, Canada	Blake 1972; 2020
83. *Asclerocheilus blakei*	693–1908	SE Atlantic Ocean, off Brazil, Campos Basin	Mendes *et al*. 2024c
84. *Scalibregma aubreyi* **sp. nov.**	1050–1922	South China Sea, off Brunei	This study
85. *Pseudoscalibregma ermindae*	1305–1928	SW Atlantic Ocean, SE Brazil, slope depths	Mendes *et al*. 2024a
86. *Asclerocheilus nathanae* **sp. nov.**	1866–1947	South China Sea, off Brunei	This study
87. *Oligobregma emmae* **sp. nov.**	1325–1958	South China Sea, off Brunei	This study
88. *Asclerocheilus caroliniensis* **sp. nov.**	1988–1993	W North Atlantic Ocean, off N & S Carolina	This study
89. *Oligobregma chromatum* **sp. nov.**	1999	South China Sea, off Brunei	This study
90. *Pseudoscalibregma pigmentum* **sp. nov.**	1725–1999	South China Sea, off Brunei	This study
91. *Mucibregma spinosa* Fauchald & Hancock, 1981	2000	E North Pacific, off Central Oregon	Fauchald & Hancock 1981; this study
92. *Scalibregma rhoadsi* **sp. nov.**	530–2004	W North Atlantic Ocean, off Cape Hatteras, N Carolina	This study
93. *Hyboscolex reticulatus*	2012	Off New Zealand	McIntosh 1885; Blake 2020
94. *Oligobregma acutaspinosum* **sp. nov.**	2071	W North Atlantic, off New England	This study
95. *Oligobregma hampsoni* **sp. nov.**	2103	W North Atlantic, off New England	This species

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TABLE 8. (Continued)

Genus and species	Depth (m)	Location	References
96. *Asclerocheilus brigitteae* **sp. nov.**	103–2151	Southern Ocean, Antarctica, Scotia Sea, Weddell Sea	This study
97. *Pseudoscalibregma usarpium*	2143–2154	Southern Ocean, Antarctica, Ross Sea	Blake 1981
98. *Pseudoscalibregma parvum*	1210–2189	North Atlantic Ocean, off New England to Carolinas	Bakken *et al*., 2014; this study
99. *Asclerocheilus triangularis* **sp. nov.**	2240–2250	E North Pacific, N California slope	This study
100. *Hyboscolex farallonensis* **sp. nov.**	2350–2400	E North Pacific Ocean, N California slope	This study
101. *Sclerobregma branchiata*	1233–2495	W North Atlantic, off New England to the Carolinas	Hartman 1965; Mackie 1991; Blake 2020; this study
102. *Oligobregma bakkeni*	2400–2498	Brazil, slope and basins	Mendes *et al.* 2024b
103. *Asclerocheilus neubertae* **sp. nov.**	2670	E North Pacific, N California slope	This study
104. *Asclerocheilus franciscanus* **sp. nov.**	1020–2750	E North Pacific, N California slope	This study
105. *Oligobregma bathyala*	2694–2774	SE Australia, off Tasmania & Vic	Blake 2023
106. *Scalibregma antennatum* **sp. nov.**	1560–2835	E North Pacific, N California slope	This study
107. *Asclerocheilus alatus* **sp. nov.**	2500–2850	E North Pacific, N California slope	This study
108. *Oligobregma williamsae* **sp. nov.**	2864	W North Atlantic, off New Jersey	This study
109. *Asclerocheilus pseudocollare* **n. comb.**	2889–2892	Southern Ocean, Antarctica, Scotia Sea	Schüller & Hilbig 2007 (as *Oligobregma*); this study
110. *Scalibregma australis*	350–2893	Southern Ocean, Antarctica, Scotia Sea, E. Ant Peninsula, Weddell Sea	Blake 2015; this study
111. *Oligobregma lonchochaeta*	2931–2951	North Atlantic, S of Iceland	Detinova 1885
112. *Pseudoscalibregma nybakkeni* **sp. nov.**	2005–2970	E North Pacific, N California slope	This study
113. *Scalibregma cornutum* **sp. nov.**	2995	Off E Africa, Mozambique Channel	This study
114. *Oligobregma nonatoi*	700–3000	SW Atlantic Ocean, Off Brazil, slope and basins	Mendes *et al*. 2024b
115. *Oligobregma acsarum* **sp. nov.**	2999–3015	W North Atlantic off N & S Carolina	This study
116. *Pseudoscalibregma gracilis* **sp. nov.**	2076–3068	Antarctica, Scotia Sea & Weddell Sea	This study
117. *Pseudoscalibregma biannulatum* **sp. nov.**	3177	SE Pacific, Peru-Chile Trench	This Study
118. *Scalibregma hadrostomium* **sp. nov.**	1745–3225	E North Pacific, N California slope	This Study
119. *Oligobregma escanabis* **sp. nov.**	3305	E North Pacific, Gorda Ridge, vents	This Study

.....continued on the next page

TABLE 8. (Continued)

Genus and species	Depth (m)	Location	References
120. *Oligobregma menziesi* **sp. nov.**	3167–3318	SE Pacific Ocean, Peru-Chile Trench	This Study
121. *Pseudoscalibregma papilia*	1870–3690	Antarctic Sea, Weddell Sea, S Sandwich Trench	Schüller 2008
122. *Oligobregma tasmania*	3710–3830	SW Pacific, Tasman Sea off NZ	Kirkegaard 1996 (as *Asclerocheilus*)
123. *Oligobregma weddelliensis* **sp. nov.**	3935	Antarctica, Weddell Sea	This Study
124. *Scalibregma profundum* **sp. nov.**	3939	SE Pacific Ocean, Peru-Chile Trench	This Study
125. *Pseudoscalibregma glandipodium*	2480–4026	E Australia, off Tasmania, NSW	Blake 2023
126. *Oligobregma aristata*	2793–4031	E Australia, off Tasmania, NSW	Blake 2023
127. *Axiokebuita australis*	2793–4064	E Australia, off Tasmania, Vic	Blake 2023
128. *Hyboscolex antarcticus* **sp. nov.**	4069	Antarctica, Weddell Sea	This Study
129. *Oligobregma quadrispinosa*	2258–4069	Southern Ocean, Antarctic Seas	Schüller & Hilbig 2007
130. *Oligobregma profunda*	3881–4176	E Australia, off Tasmania to NSW	Blake 2023
131. *Asclerocheilus abyssalis*	3952–4280	E Australia off NSW	Blake 2023
132. *Oligobregma renuncula*	4005–4425	E Australia, NSW to Qld; Coral Sea	Blake 2023
133. *Oligobregma brasierae*	4425	Pacific Ocean, CCZ	Wiklund *et al*. 2019
134. *Oligobregma tanai*	4137–4425	Pacific Ocean, CCZ	Wiklund *et al*. 2019
135. *Oligobregma whaleyi*	4425–4567	Pacific Ocean, CCZ	Wiklund *et al*. 2019; this study
136. *Scalibregmella pacifica* **sp. nov.**	4775	Pacific Ocean, CCZ	This study
137. *Axiokebuita shackletoni* **sp. nov.**	1970–4928	Antarctica, Weddell Sea	This Study
138. *Oligobregma aciculata*	4850–4977	W North Atlantic	Hartman 1965; Hartman & Fauchald 1971; this study
139. *Scalibregmella antennata*	4800–5023	W North Atlantic	Hartman & Fauchald 1971; Blake 2020; this study
140. *Oligobregma brychiatum* **sp. nov.**	3065–5194	Antarctica, Scotia Sea; S Sandwich Trench	This Study
141. *Oligobregma collare*	1622–6070	Antarctic Seas	Levenstein 1975; Blake 1981
142. *Pseudoscalibregma pallens*	8928–9174	Pacific Ocean, Kermadec Trench	Levenstein 1962

[1].Author and date of individual species only provided for taxa not included in Tables 1–7.

[2].Note: *Hyboscolex homochaetus* (Schmarda, 1861) is not included due to lack of data and recent records.

Abbreviations: CCZ, Clarion Clipperton Zone; E, Eastern; NE, northeast; NSW, New South Wales; NZ, New Zealand; Qld, Queensland; S, South; SE, Southeast; Vic, Victoria; W, western.

1994). Several authors have postulated a close relationship between the genus *Travisia* and Scalibregmatidae based on a superficial resemblance (Ashworth 1901, Blake 2000, Rouse & Pleijel 2001) and sometimes due to the misidentification of specimens of *Travisia* as species of Scalibregmatidae.

Morphological Differences between scalibregmatids and *Travisia*. Although both scalibregmatids and travisiids are similar in gross appearance by having body segments divided by annulated rows, the morphology of the epithelium of these rows is entirely different between the two taxa. (1) The annular segmental rings of *Travisia* are composed of rows of numerous epidermal papillae the histology of which was recently described by Vodopyanov *et al*. (2014). In contrast, scalibregmatids have an epidermis composed of tall club-shaped glandular and columnar cells that are grouped into annulated rows of surficial blocked or rounded pad-like elevations that are separated from one another by grooves formed of epidermal cells. The histology of these elevated pads was originally described in detail by Ashworth (1901) and reviewed by Blake (2020). These pad-like elevations form transverse rows of species-specific patterns among the scalibregmatids. In contrast, there are no block-like or pad-like elevations in *Travisia*. Thus, despite a superficially rough epidermal surface to the body, the morphology and histological origin of the epidermis is entirely different between the two taxa. (2) *Travisia* and scalibregmatids both have lobes forming the anterior and posterior lips of the mouth, but in *Travisia* these originate from setigers 1 and 2, whereas in scalibregmatids the lobes surrounding the anterior lip originate entirely from the peristomium and the posterior lip has contributions from the peristomium or partially from setiger 1 (Blake 2015, 2020, this study). (3) Travisiids have capillary setae but, in addition, scalibregmatids have furcate setae and a wide diversity of spinous and acicular setae on anterior segments. (4) The prostomium of *Travisia* is typically narrow and either pointed or rounded and without frontal or lateral lobes; whereas scalibregmatids have a bifurcate prostomium bearing lateral or frontal lobes or horns, in most cases producing a broad T-shaped prostomium. (5) Eyespots are absent in *Travisia* and present or absent in scalibregmatids. (6) The branchiae of *Travisia*, when present, are usually single, rarely with a few lateral branches and occur from anterior to posterior segments along the body; the branchiae of scalibregmatids, when present, are limited to 4–6 anterior segments and are always dichotomously or pectinately branched, forming distinct clusters. (7) Parapodia are reduced in both taxa, but several scalibregmatid genera have well-developed noto- and neuropodial lobes in posterior segments, often with pre- and postsetal lamellae; some genera have prominent dorsal and ventral cirri often with internal glands; *Travisia* lacks dorsal and ventral cirri. (8) Parapodial lappets may be present in *Travisia* from anterior or middle segments to the posterior end; lappets are not found in scalibregmatids. (9) Scalibregmatids typically have 3–6 long anal cirri surrounding the anus; when present, travisiids have short anal lobes; long cirri are absent. Thus, despite superficial similarities, the morphological differences between scalibregmatids and *Travisia* are considerable.

Molecular analyses. Initial molecular analyses also suggested a close relationship between scalibregmatids and *Travisia* (Bleidorn *et al*. 2003, Hall *et al*. 2004). Unfortunately the 18S rDNA sequence of *Travisia forbesii* Johnston, 1840 used in their analyses was determined to actually be from a misidentified scalibregmatid, *Polyphysia crassa* (Örsted, 1943). Subsequently, the 18S rDNA sequence data for a different species, *Travisia brevis* Moore, 1923, was used by Persson & Pleijel (2005) who also found a close relationship with a supposed scalibregmatid (*Neolipobranchius* sp.) from the Gulf of Maine and from this these authors regarded "*the scalibregmatid affinity of Travisia as well corroborated*". As stated earlier in this study, the holotype and only specimen of the type species of *Neolipobranchius glabrus* has been determined to be a juvenile *Travisia* and this likely applies to other reports of the genus based on the morphology of the type species. In contrast, Rousset *et al*. (2007), found that *Travisia* grouped with opheliids based on new sequences they developed for *Travisia forbesii* from Normandie, France; these authors did not use the *Neolipobranchius* sp. sequences. Rousset *et al*. (2007: p. 56) stated "*… our analyses with new sequences for* Travisia *contradict a close relationship to Scalibregmatidae, and provide strong support for the monophyly of the traditional Opheliidae with* Travisia *included*".

Paul *et al*. (2010) developed new sequence data for four genes: 18S, 28S, 16S, and histone 3 from *Travisia brevis* Moore, 1923 and *T. pupa* Moore, 1906, both species from the northeastern Pacific coast of North America. These authors questioned the validity of the species identification made of the *T. forbesii* sequences developed by Rousset *et al.* (2007) and did not include them in their analyses; however, they did use the *Neolipobranchius* sp. sequences from the Gulf of Maine. Results of parsimony, maximum likelihood, and Bayesian analyses supported the monophyly of Opheliidae without *Travisia*: the two opheliid subfamilies, Opheliinae and Ophelininae, were sister groups to one another whereas the two *Travisia* species plus *Neolipobranchius* sp. formed a clade that was a sister group to the scalibregmatids. Paul *et al*. (2010: p. 511) went on to state: …*we propose to remove* Neolipobranchius *from the Scalibregmatidae and, instead, in future taxonomic revisions a synonymy of this genus with* Travisia *should be envisioned*". The same conclusion, based on histology and external morphology, was discussed by Blake & Maciolek (2020).

Systematic relationships. Martínez *et al*. (2013a–b) explored the systematic relationships of the cave-dwelling scalibregmatid genera *Axiokebuita* and *Speleobregma* with other genera of Scalibregmatidae and *Travisia*. The results presented by Martínez *et al*. (2013b) again supported a sister relationship between traditional scalibregmatids and a clade composed of *Travisia* and *Neolipobranchius*. Law *et al*. (2013) conducted a major study of muscular morphology and burrowing behavior of Opheliidae including *Travisia*. A phylogenetic analysis using most of the same scalibregmatids, *Travisia*, and

Neolipobranchius sequences as in Hall *et al*. (2004) yielded similar results with the traditional scalibregmatid genera and the *Travisia-Neolipobranchius* sequences being sister clades to one another. These authors supported the synonymy of *Travisia* and *Neolipobranchius* and that *Travisia* should therefore be included in the family Scalibregmatidae. Rouse *et al*. (2022) included *Travisia* in the Scalibregmatidae with little justification.

Blake & Maciolek (2020) removed *Travisia* from the Opheliidae and elevated the opheliid subfamily Travisiinae to full family status as Travisiidae Hartmann-Schröder, 1971. These authors acknowledged the superficial similarity of travisiids to scalibregmatids as sister groups, but emphasized a long list of morphological differences (also detailed above) that supported their decision. They pointed out that in all the various molecular analyses conducted over the past 20 years, none have ever demonstrated that any correctly identified *Travisia* species nested within the true scalibregmatid species clades. Globally there are 15 valid genera of scalibregmatids and following the results of the present study, more than 140 known species. To date, no single molecular phylogeny has been based on more than seven genera and or more than nine species, most with fewer. As such there have been no molecular-based phylogenies that even approach the great diversity found in the family. More importantly, many of the species tested have been misidentified. Therefore, at this juncture, the inclusion of *Travisia* within the Scalibregmatidae is not accepted, instead *Travisia* should be treated as a separate family, the Travisiidae, as proposed by Blake & Maciolek (2020).

Acknowledgements

The collection of samples from the Georges Bank Benthic Infauna Monitoring Program (aka BIMP) and Atlantic Continental slope surveys (ACSAR, aka ASLAR) was funded under contracts No.14-12-0001-29192 and No. 14-12-0001-30064 from the U.S. Department of the Interior (USDOI), Minerals Management Service (MMS), to Battelle Ocean Sciences (1982–1987). Field teams were led by the late Mr. George Hampson (WHOI; Georges Bank and U.S. North Atlantic surveys), Ms. Rosemarie Petrecca (WHOI; U.S. Mid-Atlantic surveys), and the author (Battelle Ocean Sciences; U.S. South Atlantic surveys). The separate MMS survey off Cape Hatteras, North Carolina was funded by MMS Contract No. 14-35-0001-30672 to the Virginia Institute of Marine Science (VIMS) and managed by Dr. Robert J. Diaz (VIMS) with the author, then with SAIC as Chief Scientist. The samples from DWD-106 off New Jersey were funded by the US EPA and collected after conclusion of the U.S. Mid-Atlantic ACSAR survey in November 1985. The samples from Boston Harbor and Massachusetts Bay were collected as part of the long-term benthic monitoring for MWRA in response to the siting and operation of an offshore ocean outfall. Participation by the author and Ms. Stacy A. Doner on the ANDEEP surveys in Antarctica were supported in part by NSF Grant OPP-0086665 to the author through the University of Massachusetts, Boston. Dr. Angelika Brandt is thanked for organizing and leading the ANDEEP surveys. Specimens from the Brittany coast of France were provided by Dr. Vincent Le Garrec.

Funding to process benthic samples from the SF-DODS collections off northern California was provided by Mr. Allan Ota of U.S. EPA Region 9, San Francisco; field surveys were organized and funded by the U.S. Army Corps of Engineers (USACE), San Francisco District. Samples from the Gulf of Mexico were collected as part of surveys around two oil platforms (Matterhorn and Virgo) and associated pipelines off Louisiana (2008–2010) managed by the author and funded by Total E&P USA. The benthic samples from British Columbia, Canada off Ridley Island were collected as part of a proposed oil and gas export facility for the BG Group managed by the author; collection of benthic samples was by Ms. Stacy A. Doner and Ms. Paula S. Winchell. The field work off Brunei, Island of Borneo in the South China Sea included two separate surveys in 2011. The first survey at Block CA1 was led by the author as part of a project for Total E&P Deep Offshore Borneo B.V.; the second survey at Block CA2 was led by Dr. Pamela Neubert as part of a project for Petronas Carigali Brunei Ltd. Ms. Leslie Harris (LACM) provided specimens from the Indian Ocean from the IIOP project, the Peru-Chile Trench as part of the SEPBOP, the Clarion-Clipperton zone, the Sanders-Hessler surveys in the North Atlantic, and other specimens she collected and/or identified. Specimens and data of scalibregmatids from off Costa Rica were provided by Ms. Charlotte Seid and Dr. Gregory Rouse of the Scripps Institution of Oceanography (SIO), La Jolla, California. Some support for the completion of this manuscript and SEMs was provided by NSF Grant No. DEB-0118693 (PEET) to the author through the University of Massachusetts, Boston, MA.

Curation of the materials used in this study and assignment of catalog numbers was by Ms. Katherine Ahlfeld (USNM), Mr. Adam Baldinger (MCZ), Ms. Christina Piotrowski and Ms. Johanna Loacker (CASIZ), Ms. Leslie Harris (LACM), and Dr. Lena Gustavsson (SMNH). Dr. Jenna Moore, Museum of Nature Hamburg (ZMH), Germany provided additional ANDEEP specimens including types and curated others. Owing to the numerous samples provided to these collection managers, their timely efforts are deeply appreciated. Important type and supplemental materials originally reported by Hartman (1965) and Hartman & Fauchald (1971) were provided by Ms. Leslie Harris (LACM) who also re-curated some specimens as additional species were discovered in the samples. The holotype and other data for Scalibregma brevicaudum Verrill, 1873 was provided by Mr. Eric Lazo-Wasem of the Yale Peabody Museum of Natural History (YPM). Over the years, many lab technicians at Battelle, ENSR, and AECOM carefully processed the benthic samples from these various projects that yielded the polychaete material. Senior polychaete systematists, including Dr. Brigitte (Hilbig) Ebbe, Dr. Nancy J. Maciolek, Mr. Howard Jones, Ms. Ellen Baptiste, Ms. Stacy A. Doner, and the late Mr. R. Eugene Ruff,

worked closely with the author on most of these projects and provided many of the provisional identifications. Ms. Lara (Luzak) Parisi, a graduate assistant on the NSF PEET grant prepared SEMs and data on juvenile scalibregmatids from the ACSAR project. Ms. Stacy A. Doner, Ms. Isabelle P. Williams, Ms. Paula S. Winchell, Dr. Brigitte (Hilbig) Ebbe, Dr. Pamela Neubert, the late Mr. R. Eugene Ruff, and the late Mr. Stephen B. Aubrey were key members of the field teams on several of the surveys listed above.

An initial draft of the manuscript was reviewed and edited by Dr. Nancy J. Maciolek, whose effort is greatly appreciated. During the review process, this study benefited from comments and suggestions by Dr. Brigitte Ebbe, Dr. Harlan K. Dean, and Mr. Samuel L.S.D. Mendez.

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