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Polychaeta Orbiniidae from Antarctica, the Southern Ocean, the Abyssal Pacific Ocean, and off South America

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Abstract

The orbiniid polychaetes chiefly from Antarctic and subantarctic seas and off South America are described based on collections of the National Museum of Natural History and new material from surveys conducted by the United States Antarctic Program and other federal and privately funded sources as well as participation in international programs. A total of 44 species of Orbiniidae distributed in 10 genera are reported from the Pacific Ocean and waters off South America and Antarctica. Twenty-one species are new to science; one species is renamed. *Berkeleyia heroae* **n. sp.**, *B. abyssala* **n. sp.**, *B. weddellia* **n. sp.**; *B. hadala* **n. sp.**, *Leitoscoloplos simplex* **n. sp.**, *L. plataensis* **n. sp.**, *L. nasus* **n. sp.**, *L. eltaninae* **n. sp.**, *L. phyllobranchus* **n. sp.**, *L. rankini* **n. sp.**, *Scoloplos bathytatus* **n. sp.**, *S. suroestense* **n. sp.**, *Leodamas hyphalos* **n. sp.**, *L. maciolekae* **n. sp.**, *L. perissobranchiatus* **n. sp.**, *Califia bilamellata* **n. sp.**, *Orbinia orensanzi* **n. sp.**, *Naineris antarctica* **n. sp.**, *N. argentiniensis* **n. sp.**, *Orbiniella spinosa* **n. sp.**, and *O. landrumae* **n. sp.** are new to science. A **new name**, *Naineris furcillata*, replaces *N. chilensis* Carrasco, 1977, a junior **homonym** of *N. dendtritica chilensis* Hartmann-Schröder, 1965, which is raised to full species status. *Leodamas cochleatus* (Ehlers, 1900) is removed from synonymy and redescribed. A **neotype** is established for *Leodamas verax* Kinberg, 1966, the type species. A general overview of *Leodamas* species is provided. The *Leitoscoloplos kerguelensis* (McIntosh, 1885) complex is reviewed and partially revised. Definitions of the genera of the Orbiniidae are updated to conform to recently described taxa. Several new synonymies are proposed following a reexamination of previously described type specimens. The morphological characters used to identify and classify orbiniids are reviewed. The biogeographic and bathymetric distributions of the South American and Southern Ocean orbiniid fauna are reviewed.

Key words: Annelida, Polychaeta, Orbiniidae, *Berkeleyia, Califia, Leitoscoloplos, Leodamas, Naineris, Orbinia, Orbiniella, Phylo, Proscoloplos, Scoloplos,* Weddell Sea, Ross Sea, Chile, Argentina, Peru, Juan Fernandez Islands, Galápagos Islands, Clarion-Clipperton Fracture Zone, new species

Introduction

Marine polychaete worms of the family Orbiniidae are important components of benthic communities from intertidal habitats to the deep sea. The most comprehensive treatments of orbiniid systematics are by Eisig (1914), Hartman (1957), Pettibone (1957), Day (1973; 1977), and Mackie (1987). Fauchald (1977) provides a valuable key to the genera and Blake (1996) updates recent literature and discusses taxonomic issues.

The modern usage of the family name Orbiniidae dates from Hartman (1936) who determined that the genus *Aricia* Savigny, 1820, genotype of the family then called the Ariciidae was preoccupied in the Lepidoptera. She therefore replaced *Aricia* with *Orbinia* Quatrefages, 1866. In a later paper Hartman (1942) renamed the family Orbiniidae. Hartman (1957) reviewed the nomenclatural history of the Orbiniidae and established two subfamilies based on the number of peristomial rings: Orbiniinae (one peristomial ring) and Protoariciniinae (two peristomial rings). Blake (2000) revised the arrangement of the subfamilies of Orbiniidae based on a phylogenetic analysis of the genera. He demonstrated that the use of peristomial ring number to separate the subfamilies as proposed by Hartman (1957) and followed by most subsequent workers was not valid because some species with a single asetigerous peristomial ring pass through a two-ring stage as part of their larval and juvenile development. Blake (2000) defined three clades based on a morphological analysis of the Orbiniidae, one of which contained the genera that Hartman (1957) had used to define the subfamily Orbiniinae. The genera *Protoaricia, Protoariciella, Schroederella,* and *Scoloplella*, previously referred to Hartman's subfamily Protoariciniinae, were also included in the first clade. Blake (2000) established the subfamily Microrbiniinae for those genera of the former subfamily Protoariciniinae that constituted the second clade. A third subfamily, the Methanoariciniinae, was established for *Methanoaricia dendrobranchiata* Blake, 2000, the unusual seep worm from the Gulf of Mexico. However, subsequent molecular phylogenies have demonstrated that *Methanoaricia* is nested within the genera comprising the Orbiniinae and that the genus *Questa* should be referred to the Orbiniidae (Bleidorn, 2005; Bleidorn *et al.*, 2009). The molecular studies also suggest that some genera are not monophyletic. Similar results suggest that common and widely distributed species of orbiniids may consist of suites of morphologically similar sibling species (Bleidorn *et al.* 2006). A more recent molecular phylogeny of orbiniids using a larger suite of species by Zhadan *et al.* (2015) also did not support the monophyly of several well-known genera; their tree topologies, however, differed from the earlier results of Bleidorn *et al.* (2009).

The Orbiniidae of South America and Antarctica are known from the works of Ehlers (1897, 1901), Hartman (1953, 1957, 1966, 1967, 1978), Hartmann-Schröder (1962a–b, 1965) and Carrasco (1977). Collectively, approximately 20 species in nine genera have been reported from these regions. As part of the present study, extensive collections from off South America, the Southern Ocean, and coastal locations around Antarctica were assembled and analyzed. Details are described below but include an examination of all relevant type materials and other collections of previously described species readily available and extensive new collections from the U.S. Antarctic Program (USAP) and other South American and Antarctic collections made available via the National Museum of Natural History (USNM). Other materials including those collected as part of international programs, and personal visits to the U.S. Antarctic base at McMurdo are described.

As part of this monograph, the definitions of all genera are updated and relevant synonymies provided. Biogeographic and bathymetric patterns of the Southern Ocean orbiniids are discussed. The sequence of genera follows earlier monographs and revisions (Hartman 1957; Day 1977).

The following 10 genera and 44 species are included in this study (synonyms are in brackets):

Subfamily Orbiniinae Hartman, 1957
Berkeleyia heroae **n. sp.**
Berkeleyia abyssala **n. sp.**
Berkeleyia weddellia **n. sp.**
Berkeleyia hadala **n. sp.**
Leitoscoloplos abranchiatus (Hartman, 1967)
Leitoscoloplos simplex **n. sp.**
Leitoscoloplos chilensis (Hartmann-Schröder, 1965). *Fide* Mackie, 1987
 [*Haploscoloplos kerguelensis chilensis* Hartmann-Schröder, 1965]
Leitoscoloplos kerguelensis (McIntosh, 1885)
 [*Haploscoloplos kerguelensis minutus* Hartman, 1953]
 [*Leitoscoloplos banzareae* Mackie, 1987]
Leitoscoloplos plataensis **n. sp.**
Leitoscoloplos mawsoni (Benham, 1921)
Leitoscoloplos geminus Mackie, 1987
Leitoscoloplos nasus **n. sp.**
Leitoscoloplos eltaninae **n. sp.**
Leitoscoloplos phyllobranchus **n. sp.**
Leitoscoloplos rankini **n. sp.**
Leitoscoloplos drakei (Hartman, 1967) **n. comb.**
Scoloplos bathytatus **n. sp.**
Scoloplos suroestense **n. sp.**
Leodamas verax (Kinberg, 1866)
Leodamas maciolekae **n. sp.**
Leodamas marginatus (Ehlers, 1897)
 [*Scoloplos* (*Leodamas*) *marginatus mcleani* Benham, 1921]
 [*Scoloplos* (*Leodamas*) *naumovi* Averincev, 1982]
Leodamas cirratus (Ehlers, 1897)
 [*Aricia ohlini* (Ehlers, 1900)]
Leodamas cochleatus (Ehlers, 1900) **n. status**
Leodamas hyphalos **n. sp.**
Leodamas perissobranchiatus **n. sp.**
Leodamas tribulosus (Ehlers, 1897)

[*Scoloplos armiger trioculata* Hartmann-Schröder, 1962b]
Califia chilensis Hartman, 1967
Califia bilamellata **n. sp.**
Orbinia orensanzi **n. sp.**
Orbinia sp.
Phylo felix Kinberg, 1866
[*Phylo felix heterosetosa* Hartmann-Schröder, 1965]
[*Orbinia* (*Phylo) minima* Hartmann-Schröder & Rosenfeldt, 1990]
Naineris setosa (Verrill, 1900)
Naineris furcillata **n. name**
[*Naineris chilensis* Carrasco, 1977. **Homonym**]
Naineris chilensis Hartmann-Schröder, 1965 **n. status**
[*Naineris dendritica chilensis* Hartmann-Schröder, 1965]
Naineris grubei (Gravier, 1908)
Naineris argentiniensis **n. sp.**
Naineris antarctica **n. sp.**
Subfamily Microrbiniinae Blake, 2000
Orbiniella annulata (Hartman, 1967)
Orbiniella spinosa **n. sp.**
Orbiniella uniformis Hartman, 1967
Orbiniella landrumae **n. sp.**
Orbiniella andeepia Narayanaswamy & Blake, 2005
"Orbiniella" branchiata (Hartman, 1967)
Proscoloplos cygnochaetus Day, 1954

Glossary

The following terms define morphological features that are used in this paper:

Abdomen: In most orbiniids of the subfamily Orbiniinae, typically defined as the long posterior part of the body where the parapodia are shifted with both the noto- and neuropodia and setal fascicles directed dorsally instead of laterally. For other species, especially of the subfamily Microrbiniinae where the parapodia are not shifted dorsally, the abdomen may be identified by changes in segment shape or setae, or may not be differentiated at all from the anterior part of the body.

Acicula: An embedded supporting spine present in most notopodia and all abdominal neuropodia. These aciculae are either fully embedded, with tips projecting, or fully projecting as heavy spines as in some species of *Leodama*s and *Berkeleyia*.

Branchiae: A respiratory extension of the body wall, in orbiniids occurring in pairs along the dorsal midline, dorsal to the notopodia; containing a central blood vessel, well supplied with capillaries; externally covered with cilia or with cilia in defined longitudinal rows.

Crenulated capillaries: Capillaries with transverse rows of barbs or camerations along shaft; in many cases the crenulations form a ladder-like array that is highly diagnostic for orbiniids.

Dorsal crest: Raised ridges or membranes, usually between branchiae on abdominal segments of some species.

Dorsal sensory organs: Small oval-shaped structures present anterior and medial to branchial bases in thoracic segments of some species. Also called "Segmentale Wimperhügel" by Eisig (1914), "dorsal organ" by Rullier (1951), and "segmental ciliary organ" by Hartman (1957). See Blake & Giangrande (2011) for discussion.

Flail setae: Short, delicate setae in abdominal notopodia or neuropodia of some species, usually spinous with finely tapering or bent tips, sometimes aristate. These setae are very difficult to see and may be restricted to the anterior abdominal segments as in *Leitoscoloplos chilensis* (see below). Originally reported by Eisig (1914) for his genus *Scolaricia*, these setae have now been encountered in several genera including *Scoloplos* which was the basis for Eisig establishing his genus. *Scolaricia* was synonymized with *Scoloplos* by Day (1973).

Furcate setae (= **lyrate setae**). Forked setae with two unequal tynes connected by a row of fine needles sometimes resembling a membrane. Tynes are seen as either pointed or blunt-tipped in light microscopy. SEM has revealed that the tynes that have blunt tips also have a hole or opening at the tip.

Interramal cirrus or papilla: A structure located between the noto- and neuropodia, typically in abdominal parapodia.

Parapodia: Biramous in Orbiniidae consisting of noto- and neuropodia that are outgrowths of the body, variously modified, and bearing setal fascicles and assorted postsetal lobes and lamellae.

Parapodial lamellae: Flattened fleshy structures, pre- or postsetal in contrast to narrow ligulate lobes.

Parapodial lobes: Usually a major conspicuous parapodial process, such as elongate pre- or postsetal notopodial or neuropodial lobes.

Peristomium: The asetigerous segment or segments immediately posterior the prostomium and anterior to the first setigerous segment. Adult orbiniids of the subfamily Orbiniinae with a single peristomial ring, juveniles or postlarvae of *Naineris* often with two rings; adults of the subfamily Microrbiniinae with 2–3 peristomial rings, some may prove to be juveniles of *Naineris* or other genera.

Prostomium: The pre-segmental part of the body anterior to the mouth, bearing the "brain" or supra esophageal ganglion, sometimes with eyespots, especially in juveniles; in orbiniids the prostomium has variable shapes, including narrow, pointed or conical, tapering to a narrow or pointed tip, or bluntly rounded to sometimes squared on anterior margin; palps and antennae absent.

Proboscis: Anteriormost part of the pharynx, in orbiniids, thin walled, eversible, either simple or with numerous branched lobes; jaws absent.

Nuchal organs: Ciliated sensory organs, in orbiniids typically paired slits or grooves located on the dorsal side of the head at the posterior end of the prostomium and anterior margin of the peristomium.

Spear-shaped or hastate setae: Modified acicular spines found in posterior thoracic neuropodia of species of *Phylo*, usually associated with a large glandular organ.

Subpodial lobe: A fleshy lobe, usually short and pointed occurring ventral to the neuropodium, sometimes single or multiple; if numerous often called **ventral fringe** or **stomach papillae**; a single lobe often called **ventral cirrus**.

Subpodial flange: An elongate fleshy extension of the body wall located ventral to the neuropodium.

Subuluncini: Thoracic neuropodial spines resembling uncini, but with a long, distally pointed tip, found in several species of *Naineris*.

Swan hooks: Setae resembling long-handled uncini of other polychaetes, found in *Proscoloplos* and *Pettibonella*.

Thorax: The anterior part of the body in orbiniids that is often broader and more depressed than the abdominal segments and with all parapodia lateral in location instead of elevated as in the genera of the subfamily Orbiniinae.

Uncini: Acicular spines found in thoracic neuropodia and sometimes abdominal neuropodia; these may be smooth, ridged, or serrated and may have blunt or notched tips; sometimes with a sheath partially encompassing the shaft and apex; sheath sometimes frayed appearing to be bristled in light microscopy. Uncini may be small and inconspicuous as in *Scoloplos*, or large and conspicuous as in *Leodamas, Orbinia, Phylo*, and *Naineris*.

Ventral fringe or stomach papillae. Numerous subpodial lobes forming a fringe sometimes encircling the entire ventral surface of individual segments of the posterior thorax and/or anterior abdominal segments of some of *Orbinia* and *Phylo*.

Ventral cirrus: See Subpodial lobe.

Materials and methods

Morphological observations. All specimens were initially studied using a Wild M5 stereomicroscope and a Zeiss RA research quality microscope equipped with Phase Contrast and Nomarski differential interference optics. Illustrations were prepared using a Zeiss Camera Lucida device. Some photomicrographs were taken using a Nikon D80 mounted on the Wild M5 and Zeiss RA microscopes. Recently, Shirlastain A in an aqueous solution was added drop by drop to some specimens in an alcohol solution in order to better contrast branchiae, cirri, or small surficial structures. This stain is temporary and readily dissipates in fresh alcohol. Specimens were prepared for SEM by critical point drying and sputter coating with gold-platinum in the facilities of the Marine Biological

Laboratory (MBL), Woods Hole, Massachusetts USA. Specimens were observed using the digital Zeiss Gemini SEM.

Materials examined as part of this study. Extensive collections of Orbiniidae from South America, Antarctica, and adjacent subantarctic islands were taken by the United States Antarctic Program (USAP) during cruises of the R/V *Hero* and USNS *Eltanin*. These materials were provided to the author by the former Smithsonian Oceanographic Sorting Center (SOSC). The SOSC collections also included specimens from western South America, the Galápagos Islands, and the Juan Fernandez Islands taken during the cruises of the R/V *Anton Bruun* for the Southeastern Pacific Biological and Oceanographic Program (SEPBOP). Additional Antarctic orbiniids taken during the U.S. Navy Deep Freeze I–IV programs of 1956–1959, together with some miscellaneous specimens were provided by the National Museum of Natural History (USNM). The late Dr. José M. Orensanz generously provided his collections of Orbiniidae from off Argentina, including oceanographic samples taken by the Instituto de Biologia de Mar del Plata (IBM) among which were valuable specimens of *Leodamas verax* and new species of *Leitoscoloplos*, *Orbinia,* and *Naineris*. Orbiniids collected as part of the Lund University Chile Expedition 1948–1949 were provided by Dr. Roy Oleröd of the Swedish Museum of Natural History (SMNH), Stockholm, Sweden. Orbiniids collected from off South America and Antarctica as part of the R/V *Vema* expeditions and some miscellaneous collections were provided by Ms. Leslie Harris of the Los Angeles County Museum of Natural History (LACM-AHF Poly). A small collection of orbiniids was provided by the Australian Antarctic Division from the vicinity of their Davis Station on Vincennes Bay along the Wilkes Coast. I personally collected living orbiniids during a short stay at McMurdo Station in January–February 2000, and most recently, orbiniids were collected during the Antarctic Benthic Deep-Sea Biodiversity (ANDEEP) surveys in 2002 and 2005 of the Drake Passage, Scotia Sea, and Weddell Sea as part of my participation in this international effort. In order to more accurately describe these collections and to compare them with previously published accounts, it was necessary to reexamine the collections, including type specimens, reported by Ehlers (1897, 1901), Hartmann-Schröder (1960, 1962b, 1965), and Hartman (1967, 1978). Hartman's collections are archived at the USNM, and Hartmann-Schröder's specimens and some of Ehlers' types are deposited in the Zoological Museum of Hamburg (ZMH). Types described by Ehlers were also located in the Zoological Museum of Berlin (ZMB) and the SMNH. Syntypes of *Leitoscoloplos mawsoni* were provided by the Australian Museum (AM) courtesy of Dr. Pat Hutchings. Specimens or SEM stubs retained by the author are indicated as (JAB). Complete station data with dates and coordinates, are included in the Materials Examined sections only for type material. Details of all samples collected from each of the major surveys cited in this study are provided in Appendix Tables A1–A9 at the back of this paper.

Abbreviations used on figures: aC, anal cirrus, br, branchia, br w/Lat lobe, branchia with lateral lobe, dL, dorsal lobe, dsO, dorsal sense organ, irC, interramal cirrus, irP, interramal papilla, neP, neuropodium, nePsL, neuropodial postsetal lobe or lamella, noP, notopodium, noPsL, notopodial postsetal lobe or lamella, nuO, nuchal organ, pyg, pygidium, per, peristomium, pr, prostomium, prob, proboscis, Set, setiger, sPod flange, subpodial flange, subPodL, subpodial lobe or lamella, vC, ventral cirrus, vL, ventral lobe.

Results

Systematic account

Family Orbiniidae Hartman, 1942

Type genus. *Orbinia* Quatrefages, 1866, designated by Hartman 1942

Diagnosis. Body elongate, usually divided into a wide, dorsoventrally flattened thoracic region formed of firm, muscular segments, and a posterior abdominal region rounded in cross section and composed of soft, fragile segments bearing dorsally elevated parapodia, or abdominal parapodia not elevated; bodies usually with indistinct body regions, or body regions absent. Prostomium of variable shapes, with anterior margin ranging from acutely pointed to bluntly rounded; 1–2 pair of eyespots sometimes present, but usually absent; paired nuchal organs present. Proboscis soft, eversible, saclike without armature, sometimes dendritically branched when everted. Peristomium composed of 1–3 achaetous rings of which the first is a true peristomial segment, with second and third, when present representing achaetous segments (Fauchald & Rouse, 1997). Paired cirriform and ciliated branchiae located mid-dorsally between the notopodia, beginning either on or just posterior to thoracic region, continuing to posterior end; or branchiae entirely absent. Small dorsal sense organs sometimes present anterior to and medial to branchiae in some thoracic and abdominal parapodia. Notopodia simple, fingerlike postsetal lobes; sometimes divided or forked. Interramal cirri sometimes present between notopodia and neuropodia of posterior thoracic and/or abdominal segments. Neuropodia well developed in thoracic region, sometimes forming elevated ridges bearing numerous setae; one to many postsetal lamellae often present, sometimes continuing ventrally as additional stomach papillae. Abdominal neuropodia extending laterally and dorsally, usually bilobed; ventral cirrus often present; ventral flange may be present. Lateral organ sometimes present between noto- and neuropodia. Notosetae including capillaries, flail setae, and furcate setae; modified spines sometimes present in abdominal notopodia. Thoracic neurosetae may include crenulated capillaries, blunt-tipped crenulated setae, crenulated or smooth uncini, and modified spines; or any combination of capillaries, uncini, and spines. Abdominal neurosetae including capillaries and sometimes flail setae with hoods or mucrons on their tips; imbedded aciculae usually present; protruding present on some genera. Pygidium simple, collarlike, sometimes with several long filamentous anal cirri.

Remarks. This diagnosis is condensed from Hartman (1957) who provided the most comprehensive modern review of the family together with summaries of the historical literature. Hartman (1957) also diagnosed most of the genera and provided a comprehensive glossary of morphological terms. Readers are referred to Hartman's monograph for further details. Apart from micromorphology now evident in the scanning electron micrographs, the morphological criteria defined by Hartman are still relevant. However, patterns of chaetogenesis of furcate and crenulated capillary setae in orbiniids revealed by Hausam & Bartolomaeus (2001) provide important clues for understanding the relationship of orbiniids with other polychaete families. Hoffman & Hausam (2007) analyzed the setal fascicle arrangement of orbiniids and found little similarity with other families suggesting another approach for using morphology to understand phylogeny among polychaete families. Further, several new setal characters have been identified in the present study that permit a finer resolution between species.

Subfamily Orbiniinae Hartman, 1957. Emended by Blake 2000.

Type genus. *Orbinia* Quatrefages, 1866, designated by Hartman 1957.

Diagnosis. Body large, with distinct regions; parapodia lateral in thoracic region, typically shifted dorsally in abdominal region. Prostomium bluntly rounded to acutely pointed; nuchal organs present; eyespots present or absent. Peristomium with 1–2 achaetous rings, separated from prostomium. Noto- and neuropodial postsetal lamellae single, simple lobes to multiple lobes, sometimes branched; subpodial lobes and stomach papillae present or absent; interramal cirri present or absent. Setae including aciculae, capillaries, furcate setae, spines, uncini, modified spear-like setae, and flail setae. Branchiae typically present, rarely absent; branchiae usually single, rarely branched; oval to flattened, with two longitudinal rows of cilia and typical orbiniid structure with two blood vessels connected by numerous capillaries; branchiae of abdominal region thinner, more elongate than on thorax. Pygidium with several long filamentous anal cirri, or cirri absent.

Inclusive genera. *Berkeleyia, Califia, Leitoscoloplos, Leodamas, Naineris, Orbinia, Phylo, Protoaricia, Protoariciella* (problematic, see below)*, Questa, Schroederella, Scoloplella,* and *Scoloplos.*

Genus *Berkeleyia* Hartman, 1971 Emended

Type species: *Berkeleyia profunda* Hartman, 1971, Mozambique Basin, 4886–5069 m.

Diagnosis. Prostomium pointed, conical; peristomium with one achaetous ring. Branchiae from posterior thoracic or abdominal segments. Thoracic noto- and neuropodia with one postsetal lobe, sometimes absent or inconspicuous on anteriormost setigers; subpodial lobes absent; abdominal setigers with simple noto- and neuropodia; neuropodia with or without ventral cirrus; interramal cirri absent. Thoracic noto- and neurosetae all capillaries. Abdominal notosetae include capillaries; pointed spines present or absent; furcate setae present or absent; neuropodia with capillaries and protruding acicular spines; or only spines.

Remarks. The genus *Berkeleyia* was established by Hartman (1971) for a single species, *B. profunda* from abyssal depths in the Mozambique Basin. *Berkeleyia* is closely related to *Leitoscoloplos* in having only camerated capillaries in thoracic neuropodia. The two genera differ markedly, however, in that species of *Berkeley*ia have well-developed acicular spines protruding from abdominal neuropodia and sometimes in abdominal notopodia. Five species of *Berkeleyia* are now known, all from the Southern Hemisphere and all but one are from abyssal depths; four new species have been encountered as part the present study:

B. profunda Hartman, 1971. Mozambique Basin, 4866–5069 m.

B. heroae, **n. sp.** South America, Staten Island, off Tierra del Fuego, intertidal to shallow subtidal. (See below).

B. abyssala **n. sp.** Antarctic seas, Drake Passage and Weddell Sea, 3111–4176 m. (See below).

B. weddellia **n. sp.** Antarctic sea, Weddell Sea, 2164 m. (See below).

B. *hadala* **n. sp.** Peru-Chile Trench, 3086–6143 m (See below).

Berkeleyia heroae **n. sp.** differs from the four deep-water species in having the abdominal neuropodial spines with a distinctly bifurcated or notched tip, but otherwise all four of the new species and the type-species from the Mozambique Basin form a well-defined group within the Orbiniidae. An additional new deep-water species has been discovered on a seamount in the Atlantic Ocean and will be described separately.

***Berkeleyia heroae* new species**

Figures 1–2A–E

Material examined. Argentina, Staten Island, off Tierra del Fuego, *Hero* Sta. 71-2-16, 27 Apr 1971, 54.773°S, 64.712°W, intertidal, low water, **holotype (**USNM 60633); Sta. 71-2-39, 24 Oct 1971, 54.797°S, 65.27°W, intertidal to 1 m, 3 **paratypes** (USNM 60634).

Description. Holotype complete, 9.5 mm long and 0.6 mm wide for 48 setigerous segments; largest paratype 9.7 mm long and 0.6 mm wide for 48 setigers. Color in alcohol: brown with several dark, diffuse pigment spots on prostomium. Thoracic region with 9–10 setigers, somewhat flattened dorsally; abdominal segments cylindrical in cross section. First 10–11 abdominal setigers with parapodia gradually shifted dorsally becoming fully shifted in middle and posterior setigers.

Prostomium conical, more or less rounded on anterior end (Fig. 1A); without eyespots. Peristomium about twice as long as subsequent setigers, with paired ciliated nuchal organs on anterolateral margin (Figs. 1A, 2A).

Thoracic and abdominal notopodia similar throughout body, with short, papillate postsetal lobes (Fig. 1A–B). Thoracic neuropodia similar to notopodia; abdominal neuropodia with short, conical lobe and low presetal lamella (Fig. 2B).

Thoracic parapodia with long crenulated capillaries. Abdominal notopodia with crenulated capillaries and 1–2 delicate furcate setae (Figs. 1C, 2E); furcate setae with 5–6 more or less basally fused, thin needles between tynes and rows of fine barbs on shaft (Fig. 1D); with SEM, rows of barbs on shaft observed to merge with bases of needles and with both structures continuous (Fig. 2E); tynes with tips bearing openings only visible with SEM (Fig. 2E). Abdominal neuropodia with 2–3 capillaries and 2–3 projecting spines; each spine with bidentate forked tips and transverse rows of barbs shaft (Figs. 1C; 2C–D).

Branchiae from abdominal setiger 19–24, continuing to posterior end (Fig. 1B); anterior branchiae short, then becoming long, straplike. Pygidium with anus directed posteriorly located between two lobes, each bearing terminal anal cirrus (Fig. 1B). Large elongate ova, approximately 75 µm in diameter, present in anterior abdominal segments of one paratype.

Etymology. The species is named for the R/V *Hero*, former research vessel of the National Science Foundation.

Remarks. *Berkeleyia heroae* **n. sp.** has abdominal neuropodial acicular spines with bifid tips, the parapodia are reduced, with only short, conical postsetal lobes, the prostomium is conical, yet rounded on the anterior margin and the thoracic region is slightly flattened instead of inflated. This species differs from the type species *B. profunda* as well as *B. abyssala* **n. sp.**, *B. weddellia* **n. sp.,** and *B. hadala* **n. sp.** (below) in having bidentate neuropodial acicular spines instead of unidentate.

Distribution. Argentina, Staten Island, intertidal to 1 m.

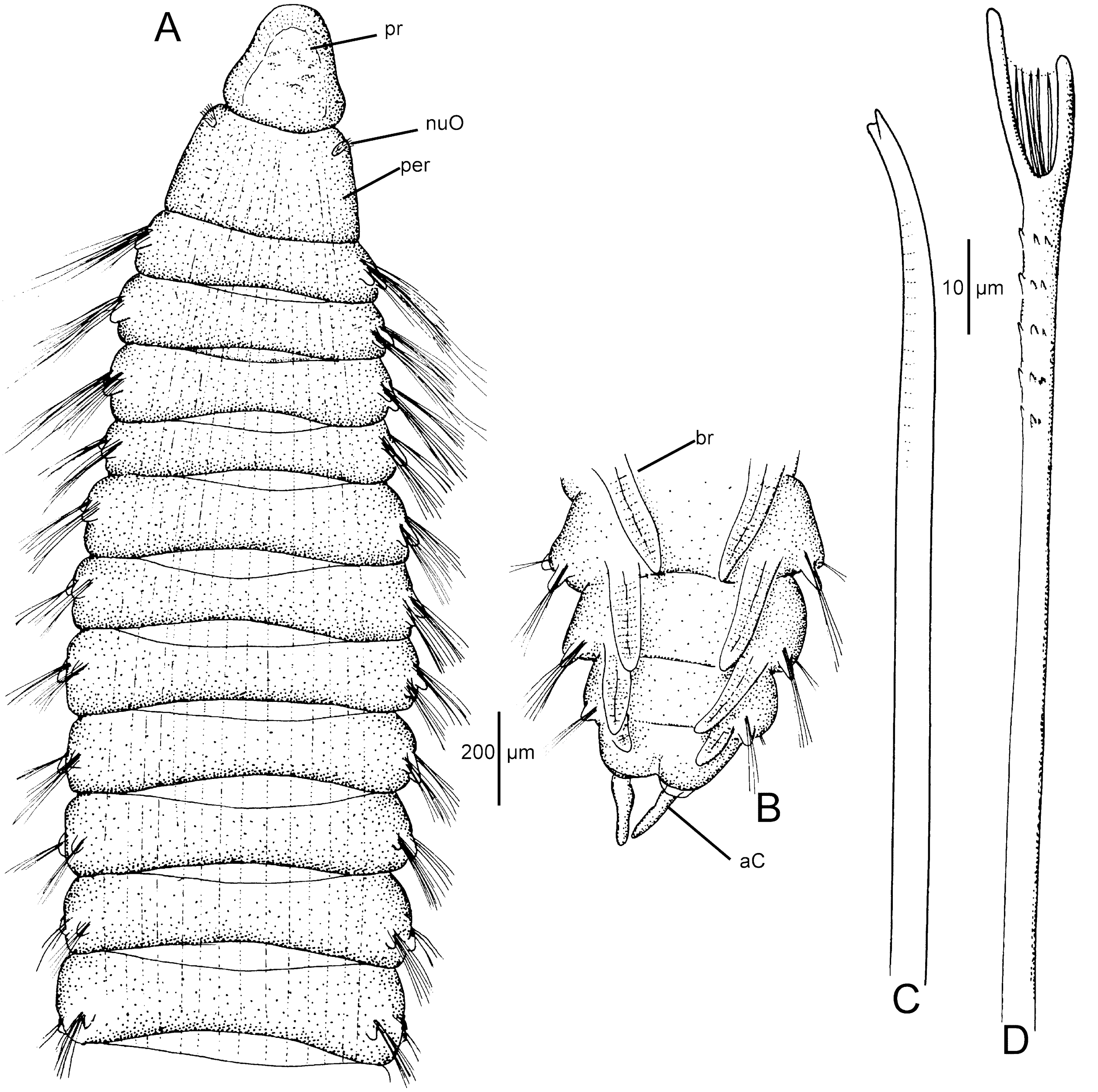

FIGURE 1. *Berkeleyia heroae* **n. sp.** Holotype (USNM 60633). A, anterior end, dorsal view; B, posterior end, dorsal view; C, abdominal neuropodial spine; D, furcate seta.

Berkeleyia abyssala **new species**
Figures 2F–G, 3

***Haploscoloplos kerguelensis*:** Hartman 1967 (in part: Sta. 311, 1063). Not McIntosh 1885.

Material examined. Drake Passage, *Eltanin* Sta. 5-311, 3 Nov 1962, 57.98°S, 70.93°W., 3911–4099 m, **holotype** (USNM 56500); Sta. 5-303, 30 Oct 1962, 62.05°S, 70.92°W, 4077–4176 m, **paratype** (USNM 69340).—Weddell Sea, *Glacier* Sta. 69-22, 3111 m (1, USNM 46606); *Eltanin* Sta. 12-1063, 3495–3514 m (1, USNM 56524).—Powell Basin, off South Orkney Islands, ANDEEP III ANT XXII-3, R/V *Polarstern*, Sta. PS-67/142-7, 3406 m (1, SEM, JAB); Sta. PS-67/150-8, 1942 m (1, SEM, JAB).

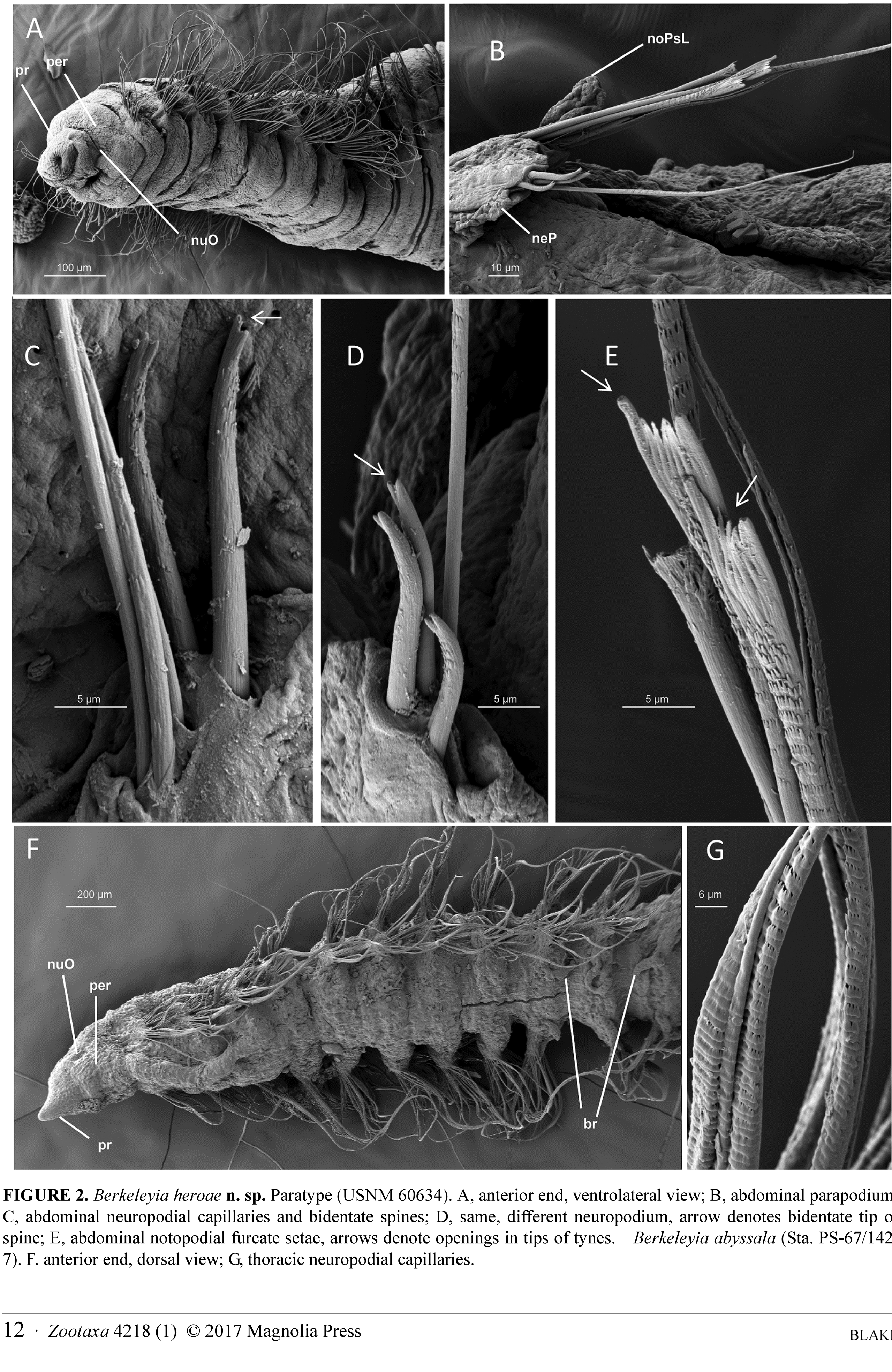

FIGURE 2. *Berkeleyia heroae* **n. sp.** Paratype (USNM 60634). A, anterior end, ventrolateral view; B, abdominal parapodium; C, abdominal neuropodial capillaries and bidentate spines; D, same, different neuropodium, arrow denotes bidentate tip of spine; E, abdominal notopodial furcate setae, arrows denote openings in tips of tynes.—*Berkeleyia abyssala* (Sta. PS-67/142-7). F. anterior end, dorsal view; G, thoracic neuropodial capillaries.

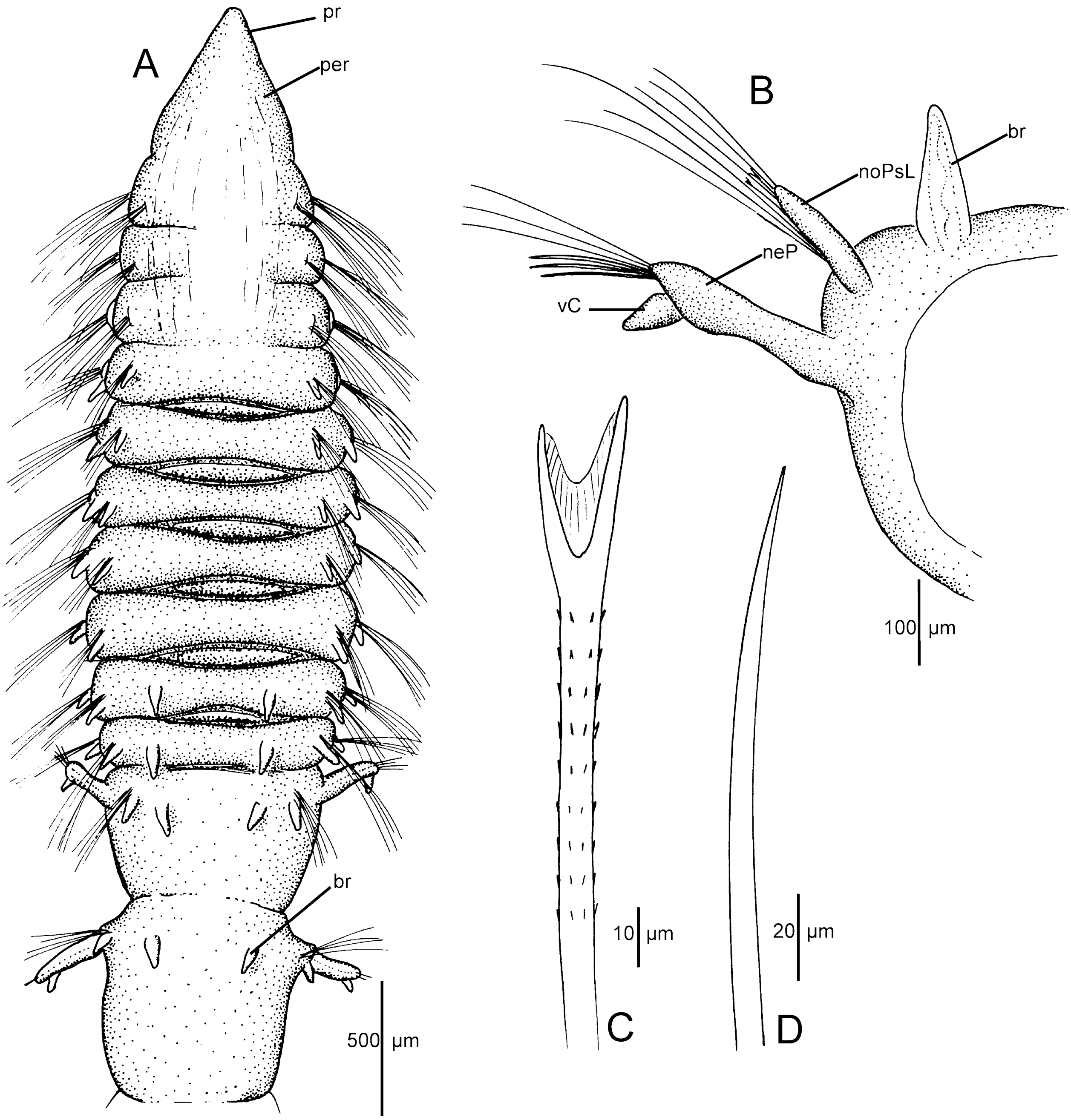

FIGURE 3. *Berkeleyia abyssala* **n. sp.** Holotype (USNM 56500). A, anterior end, dorsal view; B, anterior abdominal parapodium (setiger 12), posterior view; C, furcate seta; D, abdominal neuropodial spine.

Description. All specimens incomplete; holotype 6.5 mm long and 0.7 mm wide for 19 setigerous segments; paratype 6.5 mm long and 0.4 mm wide for 17 setigers; Weddell Sea specimens larger, up to 17 mm long and 0.8 mm wide for 52 setigers. Body cylindrical throughout, not depressed anteriorly; thoracic region widest; abdominal setigers 2–3 times longer than thoracic (Fig. 3A). Color in alcohol: light tan to opaque white.

Prostomium conical, narrowing to pointed tip on anterior margin (Figs. 2F, 3A); without eyespots; nuchal organs on posterolateral margin of prostomium (Fig. 2F). Peristomium achaetous, indistinctly separated from prostomium and setiger 1 (Figs. 2F, 3A). Thorax with 10–11 setigers, all of similar size; digitiform postsetal lobes present from setiger 4 (Fig. 3A). Abdominal notopodia with long, fingerlike postsetal lobes; neuropodia prolonged, expanded subdistally, with short ventral cirrus (Fig. 3B).

All thoracic parapodia with crenulated capillaries; capillaries with transverse rows of short barbs (Fig. 2G). Abdominal notopodia with long and short crenulated capillaries and 2–3 furcate setae; furcate setae with subequal tynes connected by row of fine needles and thin webbing, shaft with vertical rows of minute barbs (Fig. 3C). Abdominal neuropodia with 2–3 short, smooth spines (Fig. 3D) and 3–6 long, thin, non-crenulated capillaries (Fig. 2G).

Branchiae from setiger 9–10 or next-to-last thoracic setiger (Figs. 2F, 3A); each branchia short, subtriangular (Fig. 3B).

Etymology. The epithet is derived from *abyssus*, Latin for deep sea.

Remarks. *Berkeleyia abyssala* **n. sp.**, *B. weddellia* **n. sp.** (see below), and type-species *B. profunda,* all from abyssal depths differ from the shallow water *B. heroae* **n. sp.** in having the abdominal neuropodial spines with entire tips instead of bidentate. *B. abyssala* **n. sp.** differs from *B. weddellia* **n. sp.** and *B. profunda* in having branchiae from posterior thoracic setigers instead of abdominal segments. In *B. abyssala* **n. sp.** branchiae are present from setigers 9–10 whereas they are present from setiger 18 in *B. weddellia* **n. sp.,** not stated in *B. profunda*, but not illustrated before setiger 14 in Hartman (1978). *Berkeleyia abyssala* **n. sp.** also differs from the other three species in having narrow thoracic segments and elongated abdominal segments; both *B. abyssala* **n. sp.** and *B. weddellia* **n. sp.** have a ventral cirrus on abdominal neuropodia, but this is longer and more conspicuous in *B. abyssala* **n. sp.**. Abdominal neuropodial spines are similarly pointed in *B. abyssala* **n. sp.** and *B. weddellia* **n. sp.**, but blunt-tipped in *B. profunda*.

Distribution. Antarctic and subantarctic seas, abyssal depths of 3111–4176 m.

Berkeleyia weddellia **new species**

Figure 4

Material examined. Antarctica, Weddell Sea, ANDEEP III, R/V *Polarstern*, Sta. PS67/078-4, 21 Jan 2005, 71°9.49′S, 13°59.92′W, 2164 m, **holotype (**ZMH P-27782).

Description. A single incomplete specimen 4 mm long, 0.4 mm wide across thorax for 28 setigers. Color in alcohol: light tan, without pigment. Thoracic region with 11 setigers; body cylindrical in cross section, weakly flattened dorsally, abdominal segments cylindrical in cross section.

Prostomium conical, triangular in shape, tapering to narrow pointed apex (Fig. 4A–B); without eyespots; nuchal organs paired notches on anterior margin of peristomium (Fig. 4A). Peristomium with a single achaetous ring, slightly narrower than setiger 1, but similar in length.

Thorax with short, conical notopodial postsetal lobes from setiger 1, increasing in length and shape over thoracic region, initially minute, rounded, then becoming triangular at base narrowing to pointed apex by setiger 8 (Fig. 4A); neuropodia similar to notopodia with elongate postsetal lobe with triangular base near end of thoracic region; abdominal segments denoted by shift of parapodia dorsally, and abrupt change in notopodia to long, narrow, fingerlike postsetal lobe (Fig. 4C); abdominal neuropodia becoming thickened, with short ventral cirrus (Fig. 4C).

Thoracic setae all long, crenulated capillaries; abdominal notopodia with crenulated capillaries and 1–2 delicate furcate setae; each furcate seta with 5–6 thin needles between tynes and rows of fine barbs on shaft (Fig. 4D). Abdominal neuropodia with 2–3 capillaries and 2–3 long projecting smooth spines with entire pointed tips (Fig. 4C, E–F).

Branchiae from setiger 18, short at first, becoming full size by setiger 20, each branchia thick, short with rounded apex (Fig. 4C). Pygidium unknown.

Remarks. See comments under *B. abyssala* **n. sp.**

Etymology. This species is named for the collecting locality in the Weddell Sea, Antarctica.

Distribution. Weddell Sea Basin, Antarctica, 2164 m.

Berkeleyia hadala **new species**

Figure 5

Material examined. Off Western South America, Peru-Chile Trench.—Off Ecuador, R/V *Vema* Sta. V-15-63, 2681-2864 m (1, LACM-AHF Poly 5009).—Off Piura Province, Peru, W of Isla Lobos de Tierra, R/V *Anton*

Bruun Cruise 11, Sta. 69, Milne-Edwards Deep, 4591 m (1, LACM-AHF Poly 5015).—Off Libertad Province, Peru, W of Trujillo, R/V *Anton Bruun* Cruise 11, Sta. 98, Milne-Edwards Deep, 6052–5989 m (2, LACM-AHF Poly 5012); Sta. 111, Milne-Edwards Deep, 3086–3202 m, 18 Oct 1965, 08°23'S, 80°45′W, 1 **paratype (**LACM-AHF Poly 5016); Sta. 113, Milne Edwards Deep, 19 Oct 1965, 08°44'S, 80°45′W, 5986–6143 m, 14 **paratype**s, (LACM-AHF Poly 5019).—Off Chile, W of Isla Mocha, R/V *Vema* Sta. V-17-5, 16 Mar 1961, 38.25°S, 76.00°W, 3824–3739 m, 1 **paratype (**LACM-AHF Poly 5040); Sta.V-17-6, 21 Mar 1961, 37.95°S, 75.13°W, 4303–4323 m, **holotype (**LACM-AHF Poly 5001); Sta. V-17-7, W of Bahia Mansa, 22 Mar 1961, 40°32′S, 75°08′W, 3089–3279 m, 1 **paratype** (LACM-AHF Poly 5039).

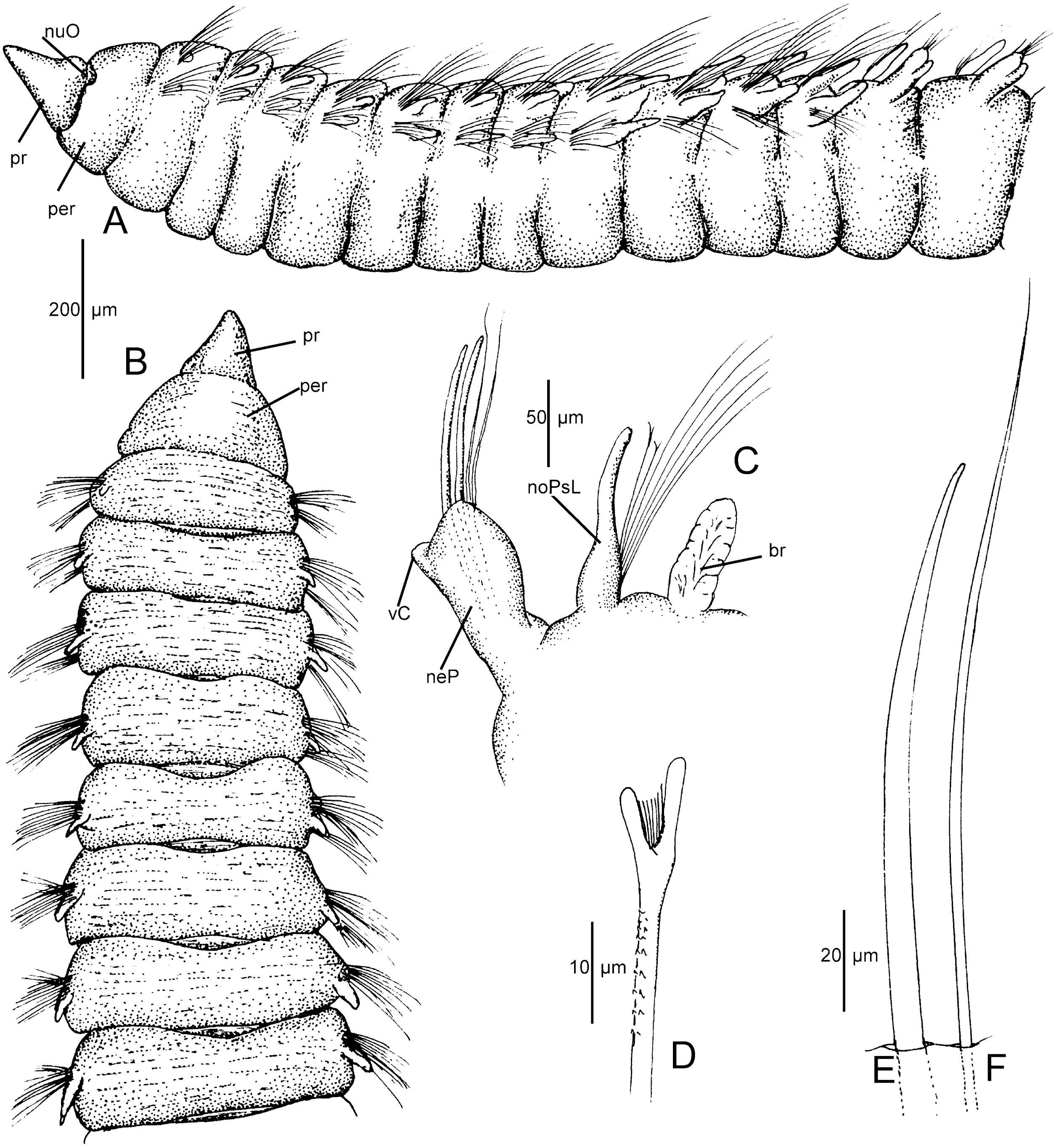

FIGURE 4. *Berkeleyia weddellia* **n. sp.** Holotype (ZMH P-277823). A, anterior end, left lateral view B, same, dorsal view; C, abdominal parapodium, posterior view; D, furcate seta; E–F, abdominal neuropodial spine and capillary.

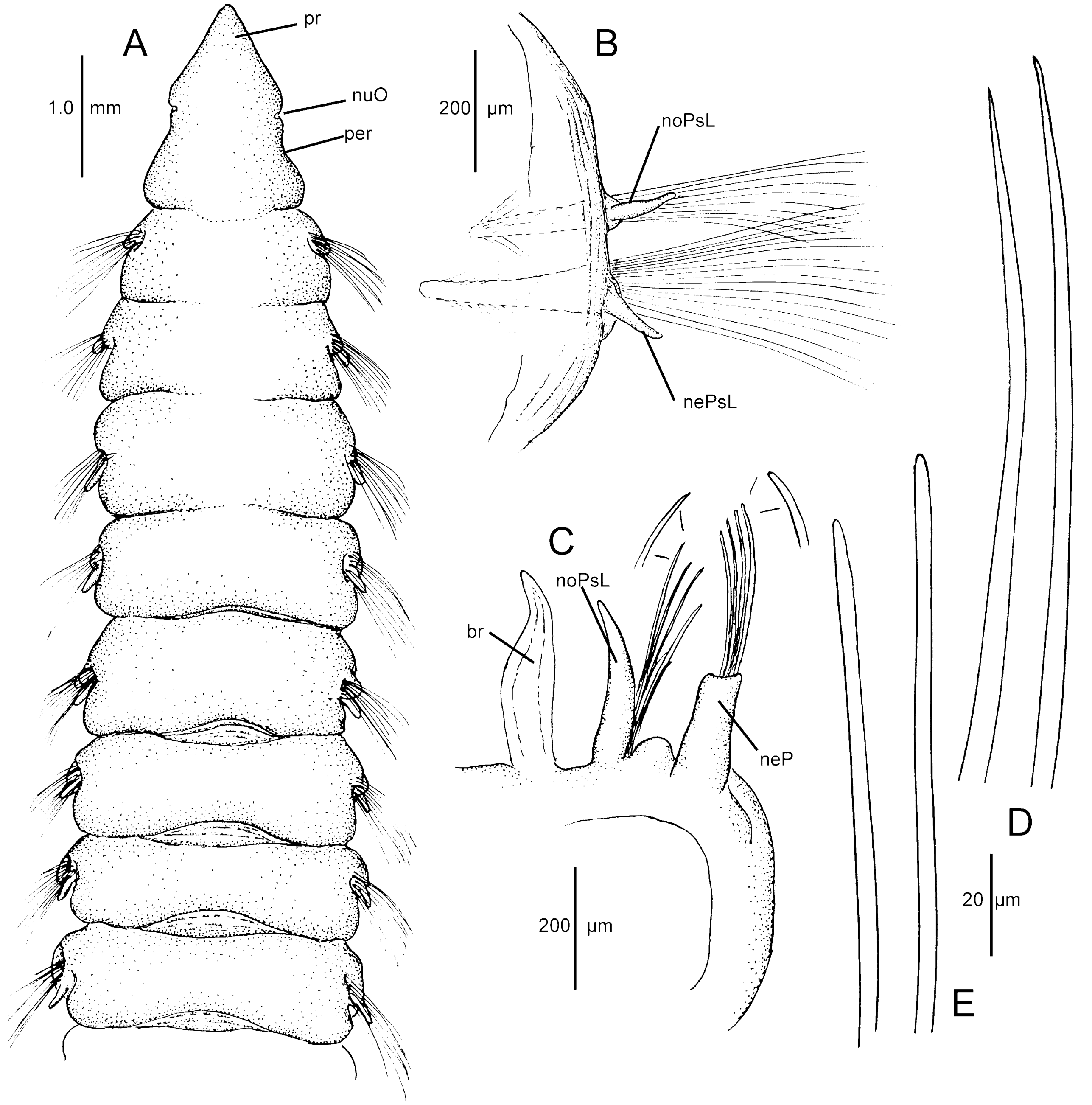

FIGURE 5. *Berkeleyia hadala* **n. sp.** Holotype (AHF-Poly 5001). A, anterior end dorsal view; B, posterior thoracic setiger, anterior view; C, posterior abdominal setiger, anterior view; D abdominal notopodial spines; E, abdominal neuropodial spines.

Description. All specimens incomplete, many poorly preserved; holotype 15 mm long, 1 mm wide across thorax for 34 setigers; other specimens with 19–30 setigers, up to 16 mm long and 1.1 to 0.8 mm wide across thorax. Color in alcohol: opaque white, without pigment. Holotype with 11 thoracic setigers; other specimens with 8–11 thoracic setigers; body cylindrical in cross section, throughout; thoracic segments narrower than wide, middle and posterior abdominal segments elongate, longer than wide.

Shape of pre-setigerous region distinctive in dorsal view (Fig. 5A), with an hour-glass shape; prostomium triangular shaped merging indistinctly with narrow anterior of peristomium, becoming wider in posterior half. Prostomium tapering to narrow pointed apex (Fig. 5A); without eyespots; nuchal organs paired notches on posterior margin of prostomium at juncture with peristomium (Fig. 5A). Peristomium with a single achaetous ring, narrow anteriorly, wider posteriorly.

Thoracic segments with short cirriform notopodial postsetal lobes from setiger 1, these increasing in length over subsequent setigers becoming elongate and fingerlike in posterior thoracic setigers (Fig. 5B); neuropodia similar to notopodia with elongate postsetal lobe (Fig. 5B); abdominal segments denoted by appearance of prolonged neuropodium bearing long, brass-colored spines (Fig. 5C); abdominal notopodia initially without postsetal lobe, this appearing over subsequent setigers, becoming elongate, fingerlike in far posterior setigers (Fig. 5C). Abdominal segments with parapodia gradually shifting to a more dorsal position.

Thoracic setae all long, crenulated capillaries; furcate setae absent. Abdominal neuropodia with 3–4 long projecting smooth brass-colored spines with entire rounded tips (Fig. 5C, E); abdominal notopodia with similar brass-colored long spinous setae, but with pointed capillary tips (Fig. 5D). No abdominal camerated setae.

Branchiae from setiger 24 on holotype, short, cirriform and inconspicuous at first, elongating and becoming slightly longer than notopodial postsetal lobe by setiger 34; branchiae slightly swollen on medial border (Fig. 5C). Branchiae not observed on other specimens, likely due to poor preservation and their fragmented nature. Pygidium unknown.

Remarks. Among the five known species of *Berkeleyia, B. hadala* **n. sp.** is unique in the Orbiniidae in having a complete transition from typical orbiniid-like camerated capillaries in thoracic setigers to non-camerated and conspicuous brass-colored smooth setae in abdominal segments. The neurosetae are elongate, thickened blunt-tipped spines, whereas the notosetae are similarly appearing elongate and thickened setae, but with pointed tips.

Etymology. This species is named for its occurrence in abyssal to ultra-abyssal depths in the Peru-Chile Trench; trench faunas are sometimes called residents of the Hadal Zone.

Distribution. Off western South America, Ecuador to Chile, lower slope, abyssal and ultra-abyssal depths 2681–6143 m.

Genus *Leitoscoloplos* Day, 1977

Type-species: *Haploscoloplos bifurcatus* Hartman, 1957, designated by Day 1977.

Diagnosis. Prostomium pointed, conical; peristomium typically with one achaetous ring, but with additional superficial annulae on some species. Branchiae lacking, or present from posterior thoracic, transitional, or abdominal setiger. Posterior thoracic setigers with 0–2 postsetal lobes and 0–2 subpodial lobes; abdominal setigers with 0–4 subpodial papillae; stomach papillae rare, interramal cirri present or absent. Thoracic neurosetae including only capillaries. Without abdominal neuropodial spines, with 2–3 imbedded aciculae present or absent.

Remarks. Day (1977) determined that the type species of *Haploscoloplos* Monro, 1933a (*H. cylindrifer* (Ehlers, 1904)) possessed an anterior row of short hooks in the thoracic neuropodia in addition to capillaries and thus belonged to the genus *Scoloplos*. He examined a specimen from near Christchurch, NZ; South Island, New Zealand, near the type locality of the species. He therefore proposed a new genus, *Leitoscoloplos* to include those remaining species formerly assigned to *Haploscoloplos*. Most of the known species of *Leitoscoloplos* were summarized by Mackie (1987). Those species have been reconsidered as part of this study. Several new species, new combinations, and new synonymies are proposed from the materials examined as part of this study and are listed below.

An assessment of branchial distribution suggests that *Leitoscoloplos* can be divided into five groups of species. Geographically, species within these groups also have some affiliation to their distribution globally. For example, the two abranchiate species in Group A are deep-sea abyssal species; the three species in Group C occur only along the Atlantic and Gulf coasts of North America, and all 11 species in groups D and E occur in the southern hemisphere of which seven occur in the Southern Ocean. The 11 species in Group B are the most ubiquitous, occurring widely over the world's oceans.

This study suggests that previous records of certain widely recorded species need to be reevaluated. For example, the record of *Haploscoloplos kerguelensis* from the eastern Mediterranean by Ramos (1976) is most certainly an undescribed species (see Discussion of *L. kerguelensis* below). Similar identifications of *Haploscoloplos* or *Leitoscoloplos kerguelensis* from Asia also need to be reconsidered (see below). One undescribed deep-sea species of *Leitoscoloplos* was recently identified from offshore Brunei Darussalam in the South China Sea (Blake unpublished).

According to this revision, *Leitoscoloplos* species are categorized as follows:

A. Branchiae absent.
1. *Leitoscoloplos abranchiatus* (Hartman, 1967). Antarctic and subantarctic seas; 1400–5338 m. (See below)
2. *Leitoscoloplos simplex* **n. sp.** Abyssal Pacific, Clarion-Clipperton Fracture Zone; 4843 m.

B. Branchiae present from middle to posterior thoracic setigers.
3. *Leitoscoloplos acutus* (Verrill, 1873) **new comb.** East coast of North America; 6–200 m.
4. *Leitoscoloplos bifurcatus* (Hartman, 1957). Australia. [branchiae from anterior to middle thoracic setigers, see Mackie (1987)]
5. *Leitoscoloplos. mammosus* Mackie, 1987. Greenland, 110 m; west coast of Scotland; 25 m.
6. *Leitoscoloplos chilensis* (Hartmann-Schröder, 1965). Peru, Chile; intertidal to 200 m. (see below)
7. *Leitoscoloplos mackiei* Eibye-Jacobsen, 2002. Indian Ocean, Andaman Sea off Thailand, 21–66 m.
8. *Leitoscoloplos mexicanus* (Fauchald, 1972). Gulf of California; 1378–1421 m.
9. *Leitoscoloplos obovatus* Mackie, 1987. East coast of North America; 300 m.
10. *Leitoscoloplos multipapillatus* Hernández-Alcántara & Solís-Weiss, 2014. Mexico, Baja California; Costa Rica, Pacific Coast; 9–54 m.
11. *Leitoscoloplos panamensis* (Monro, 1933b). Western Mexico to Pacific Panama; intertidal to 46 m.
12. *Leitoscoloplos papillatus* Eibye-Jacobsen. 2002. Indian Ocean, Andaman Sea off Thailand; 17–79 m.
13. *Leitoscoloplos pugettensis* (Pettibone, 1957). West coast of North America; intertidal to moderate depths.

C. Branchiae present from transitional segments between thorax and abdomen.
14. *Leitoscoloplos foliosus* (Hartman, 1951). East and Gulf coasts of North America; intertidal.
15. *Leitoscoloplos fragilis* (Verrill, 1873). East and Gulf coasts of North America; intertidal to shallow subtidal.
16. *Leitoscoloplos robustus* (Verrill, 1873). East and Gulf coasts of North America; intertidal to shallow subtidal.

D. Branchiae present from anterior abdominal setigers.
17. *Leitoscoloplos bilobatus* Mackie, 1987. New South Wales, Australia; 32 m.
18. *Leitoscoloplos eltaninae* **n. sp.** South Atlantic Ocean, 3742–3806 m. (see below)
19. *Leitoscoloplos geminus* Mackie, 1987. Widespread in Antarctica; shelf depths. (see below)
20. *Leitoscoloplos kerguelensis* (McIntosh, 1885). Antarctic and subantarctic seas; Intertidal to 1400 m. (see below)
21. *Leitoscoloplos latibranchus* Day, 1977. New South Wales, Australia; intertidal.
22. *Leitoscoloplos mawsoni* (Benham, 1921). Antarctica, Adelie coast. (see below)
23. *Leitoscoloplos nasus* **n. sp.** Antarctic Peninsula, 128–163 m (see below)
24. *Leitoscoloplos phyllobranchus* **n. sp.** Antarctic Peninsula; 40 m. (see below)
25. *Leitoscoloplos rankini* **n. sp.** Weddell Sea, Antarctica; 1622 m. (see below)
26. *Leitoscoloplos plataensis* **n. sp.** Argentina; intertidal to shallow subtidal. (see below)

E. Branchiae present from posterior abdominal setigers.
27. *Leitoscoloplos drakei* (Hartman, 1967) new combination. Antarctic seas; 1622–4575 m. (see below)

Leitoscoloplos abranchiatus (Hartman, 1967)

Figure 6A–C

Haploscoloplos abranchiatus Hartman, 1967: 103–104; Rozbaczylo 1985: 129.
Haploscoloplos sp. Hartman 1978: 156 (in part, Sta. 69-21).
Leitoscoloplos abranchiatus: Mackie 1987: 720.

Material examined: Scotia Sea, West Scotia Basin, Falkland Islands, *Eltanin* Sta. 6-350, 2452m, Menzies trawl (3, USNM 56455).—off Cape Horn, *Eltanin* Sta. 4-112, 20 Jul 1962, 55.52°S, 61.92°W, 4008 m, **holotype** and 7 **paratypes**, (USNM 55531–2).—off Tierra del Fuego, R/V *Vema* Sta. V-17-56, 4006 m, (1, LACM-AHF Poly 5010)—South Shetland Islands, *Eltanin* Sta. 4-138, 1437 m (3, USNM 56454).—off South Georgia, *Eltanin* Sta. 9-711, 2983–3331 m (1, USNM 60630).—Drake Passage, *Eltanin* Sta. 9-740, 384–494 m (1, USNM 61944).—South Orkney Islands, *Eltanin* Sta. 6-1082, 298–302 m (1, USNM 60631).—Weddell Sea, Antarctica, *Glacier* Sta. 69-21, 2288 m (1, USNM 61945).—Weddell Sea, ANDEEP III ANT XXII-3, R/V *Polarstern*, Sta. PS-67/078-6, 2168 m

(1, SEM, JAB); Weddell Sea, abyssal plain, ANDEEP SYSTCO ANT XXIV-2, R/V *Polarstern*, Sta. 33-14, 5338 m, 6 specimens (ZMH P-27794).—South Pacific Ocean, Albatross Cordillera, *Eltanin* Sta. 14-1250, 3638–3825 m (2, USNM 60632).

Description. A small species, up to 18 mm long, 1.0 mm wide for about 30 setigerous segments. Prostomium conical, narrowly rounded on anterior margin (Fig. 6A); peristomium deeply folded, with 2–3 superficial annuli. Thoracic region with 9–13 setigers. Thoracic parapodia with short, conical noto- and neuropodial postsetal lobes. Abdominal parapodia only weakly elevated dorsally; with short, fingerlike notopodial postsetal lobes; neuropodia flattened, prolonged, rectangular in shape, distally entire (Fig. 6B). Thoracic parapodia with fascicles of long crenulated capillaries; abdominal notopodia with capillaries and 1–2 furcate setae, each with unequal tynes connected by row of thin needles (Fig. 6C). Branchiae entirely absent. Pygidium unknown.

Remarks. This species was well described by Hartman (1967) and is illustrated here for the first time. *Leitoscoloplos abranchiatus* is readily differentiated from related forms by the numerous long, silky appearing capillaries of the thoracic region, the complete absence of branchiae, and abdominal parapodia that are lateral or only weakly elevated.

Distribution. Subantarctic and Antarctic seas, 1400–5338 m.

Leitoscoloplos simplex new species

Figure 6D–E

Material examined. North equatorial Pacific Ocean, abyssal plain, Clarion-Clipperton Fracture Zone, NOAA BIE Sta. DDT-08-93, 02 September 1993, 12°55.633′N, 128°36.011′W, 0.25 m^2 box core, 4843 m, coll. D.T. Trueblood, **holotype** (USNM 1407119).

Description. Holotype incomplete, 5.5 mm long, 0.6 mm wide across thorax for 22 setigers. Body cylindrical in cross section; parapodia lateral, abdominal parapodia only partially elevated dorsally. Thoracic and anterior abdominal segments about 4.5x as wide as long; more posterior abdominal segments about as long as wide. Thorax with eight setigers, transition to abdominal segments evident by enlargement of neuropodium and development of a ventral cirrus. Branchiae entirely absent from fragment. Pygidium unknown. Color in alcohol, light tan; no body pigment.

Prostomium conical, wide, basally tapering to rounded anterior margin; without eyespots, nuchal organs not observed (Fig. 6D). Peristomium a single ring, wider than long, about 1.5x as long as anterior thoracic setigers.

Thoracic notopodia enlarged, somewhat swollen, with narrow, finger-like postsetal lobe which becomes wider basally and more triangular in shape along thoracic segments (Fig. 6D); thoracic neuropodia not as large as notopodia (Fig. 6D); postsetal lamellae absent on setiger 1, short, fingerlike postsetal lobe present from setiger 2 and continuing through thoracic setigers (Fig. 6D); abdominal neuropodia enlarged, elongate, swollen apically with short, ventral cirrus., only partially elevated dorsally (Fig. 6E).

Thoracic noto- and neurosetae long crenulated capillaries in dense fascicles of 75 or more setae. Notosetae of first 2–3 abdominal setigers similar to thoracic segments with dense fascicles of long capillaries; subsequent abdominal segments with fewer and shorter capillaries, reduced in number to 20–25 per notopodium (Fig. 6D–E). Abdominal neurosetae few, reduced to 4–6 very fine capillaries; 1–2 embedded aciculae present (Fig. 6E).

Etymology. The species name is from the Latin *simplex* and refers to the overall lack of typical orbiniid morphology.

Remarks. *Leitoscoloplos simplex* **n. sp.** is similar to *L. abranchiatus* in lacking branchiae, having long capillary setae in dense fascicles, and by having abdominal parapodia only weakly elevated instead shifted dorsally as in most orbiniids. These two deep-sea species differ in that *L. simplex* **n. sp.** has a peristomium with a large single ring instead of 2–3 weak lobes, has ventral cirri in abdominal neuropodia instead of lacking them, and most significantly, lacks furcate setae that are present in *L. abranchiatus.*

Distribution. Abyssal Pacific, 4843 m.

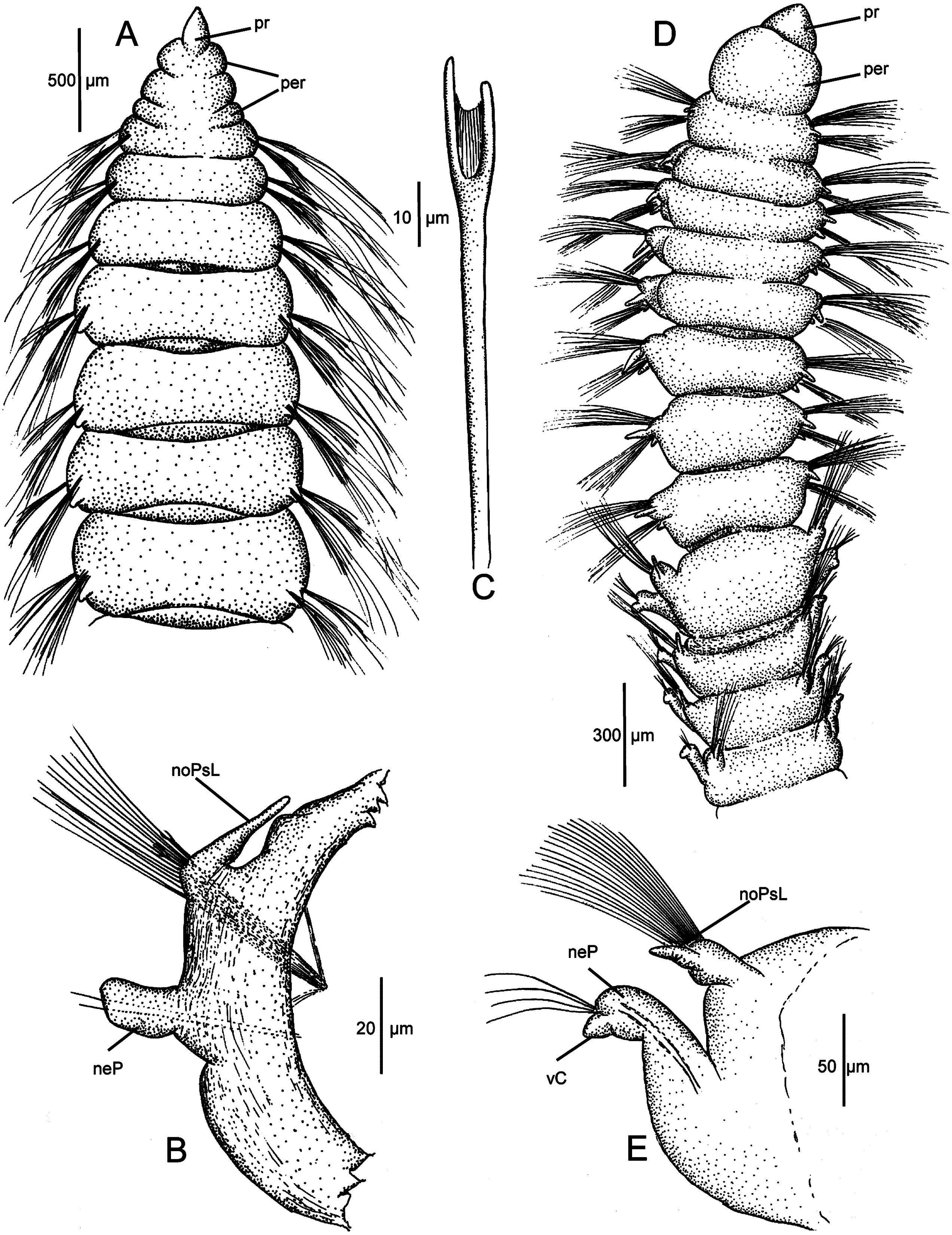

FIGURE 6. *Leitoscoloplos abranchiatus* (Hartman, 1967). Holotype (USNM 55531). A, anterior end, dorsal view; B, abdominal parapodium, anterior view; C, furcate seta.—*Leitoscoloplos simplex* **n. sp.** Holotype (USNM 1407119). D, anterior end, dorsal view; E, anterior abdominal parapodium, posterior view.

Leitoscoloplos chilensis **(Hartmann-Schröder, 1965)**
Figure 7

Scoloplos kerguelensis: Monro 1936: 160 (in part). Not McIntosh 1885. *Fide* Mackie 1987.
Haploscoloplos kerguelensis chilensis Hartmann-Schröder, 1965: 194–195, fig. 178; Carrasco 1977: 68–69, figs. 1–4; Rozbaczylo 1985: 129.
Leitoscoloplos chilensis: Mackie 1987: 11–12, fig. 11.

Material examined. Chile, Punta Iloca, 34°56′S, 72°14′W, 5 Mar 1960, 50 m, fine sand with detritus, **holotype** of *Haploscoloplos kerguelensis chilensis* (ZMH-P-14863); Seno Reloneavi, the Bay off Puerto Montt, N of the light buoy NE of Isla Tengo, LUCE Sta. M-4A, 13–16 m (2, SMNH 154442); Canal Chacao, Bahía de Ancud, Lechagua, LUCE Sta. M-11A, intertidal (1, SMNH 154437); Golfo de Ancud, SW of Isla Tabon, LUCE Sta. M-44A, ca. 200 m (3, SEM, JAB); Golfo Ancud, northern part, Canal San Antonio, LUCE Sta. M-108, 60 m, (1, SMNH 154441); off Valparaiso, *Eltanin* Sta. 21-194, 137–141 m (4, USNM 69383).—Straits of Magellan, east of Isla Dawson, R/V *Vema* Sta. V-17-23, 273–280 m (2, LACM-AHF Poly 5003).

Comparative material examined. California, numerous specimens of *Leitoscoloplos pugettensis* from California (Bodega Harbor, Tomales Bay and Gulf of the Farallones) and Canada (Prince Rupert, British Columbia), intertidal to 50 m (JAB).

Description. One complete specimen 24 mm long, 1.2 mm wide for 150 setigerous segments; other specimens up to 40 mm long and 2.0 mm wide for about 90 setigers; with 13–16 thoracic setigers. Color in alcohol: light tan.

Prostomium conical, tapering to narrow anterior tip; without eyespots (Fig. 7A). Peristomium wider than long, with pair of nuchal organs on anterior lateral margin. Two specimens from Strait of Magellan with multi-lobed proboscis everted.

Thoracic notopodia with narrow elongate triangular-shaped postsetal lamella; thoracic neuropodia with elongate postsetal lamellae arising from prominent cushion or mound (Fig. 7B); abdominal segments with leaflike, subtriangular notopodial postsetal lamellae (Fig. 7C–D); neuropodia simple, bifid on tip, but lacking ventral cirrus (Fig. 7D), with prominent inflated subpodial flange present ventral to neuropodia throughout abdominal region (Fig. 7C–D); subpodial lobes absent.

Thoracic noto- and neurosetae and abdominal neurosetae all crenulated capillaries, with crenulations consisting of numerous transverse rows of barbs (Fig. 7H); abdominal notosetae including capillaries and furcate setae; furcate setae with two blunt-tipped unequal tynes connected by delicate rows of fine needles within a membrane; barbs not apparent on shaft (Fig. 7F); with SEM, tips of tynes with opening (Fig. 7G). Abdominal neurosetae smooth, not camerated, including separate dorsal fascicle of long, thin capillaries and a more ventral fascicle of 3–4 fine flail setae, not evident in middle and posterior abdominal neuropodia; flail setae curved, capillary tipped, difficult to see with light microscopy (Fig. 7C-inset).

Branchiae first present from setiger 13–16; anterior branchiae short, narrow, tapering to pointed tip; increasing in size posteriorly, with abdominal branchiae about twice as long as notopodial lobes; each branchia with distinct subapical flaglike lateral swelling (Fig. 7C–D).

Pygidium with four lobes surrounding terminal anus; two long anal cirri present (Fig. 7E).

Remarks. *Haploscoloplos kerguelensis chilensis* was raised to full species status by Mackie (1987). *Leitoscoloplos chilensis* appears to be most similar to *L. pugettensis* in numbers of thoracic setigers, general appearance of the parapodia, and form of the branchiae. The species is characterized by having branchiae first present from one of the last thoracic setigers. Each branchia has a subapical flaglike swelling directed laterally. The abdominal neuropodial lobes are bifid and a long, conspicuous subpodial flange is present.

Initially, I considered that the Chilean specimens might be conspecific with *L. pugettensis*. However, careful study of the parapodia suggested otherwise. *Leitoscoloplos chilensis* has 13–16 thoracic setigers and branchiae from about setigers 12–16; *L. pugettensis* has 14–20 setigers with branchiae from setigers 13–18. The greater number of thoracic setigers and greater range of branchial initiation in *L. pugettensis* may, however, be due to much larger specimens being recorded (Hartman 1957; Pettibone 1957; Blake 2000). The branchiae of both species have distal expansions that in *L. chilensis* are directed laterally and fully swollen in both directions in *L. pugettensis*. More important differences are with the thoracic parapodia where the neuropodial postsetal lamellae of *L. chilensis* are longer, more triangular in shape; these are shorter and more papillate than *L. pugettensis*. The short interramal papilla in anterior abdominal segments of *L. chilensis* is difficult to observe and has not been reported for *L.*

pugettensis. The discovery of flail setae in the anterior abdominal neuropodia of *L. chilensis* prompted an examination of *L. pugettensis* and these minute setae were also present in specimens examined from British Columbia (Blake unpublished) and Costa Rica (Dean & Blake 2015: Fig. 6B). To date these are the only known examples of flail setae in the genus *Leitoscoloplos*.

The very close similarity of *L. pugettensis* and *L. chilensis* suggest a cline between a single wide ranging Eastern Pacific species. The main differences are with the branchial morphology and details of the thoracic neuropodial lamellae. Differences in numbers of thoracic setigers and initiation of the branchiae are likely size related with larger specimens only available for *L. pugettensis*. The current distribution of *L. pugettensis* is from Alaska to Costa Rica (Blake 1996; Dean & Blake 2015); *L. chilensis* has not been recorded north of Chile.

Distribution. Western Chile, intertidal to 50 m; Straits of Magellan, 273–280 m.

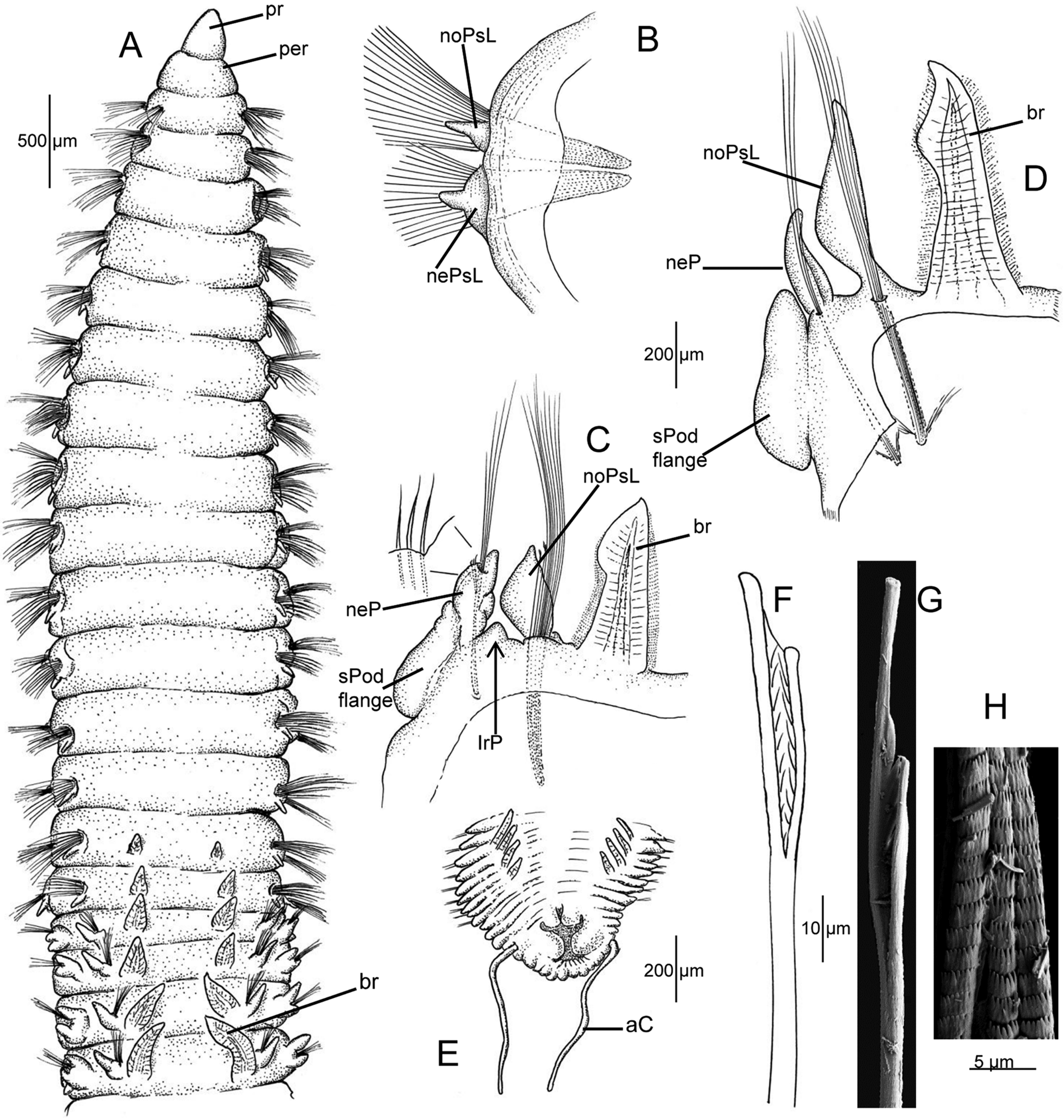

FIGURE 7. *Leitoscoloplos chilensis* (Hartmann-Schröder, 1965). Chile, Seno Reloneavi, off Puerto Montt, Lund University Chile Expedition, Sta. M-4A (SMNH 154442). A, anterior end, dorsal view; B, thoracic parapodium, posterior view; C, anterior abdominal parapodium, anterior view, arrow indicates interramal papilla, inset of flail setae (not to scale); D, middle abdominal parapodium, anterior view; E, posterior end, dorsal view; F, furcate seta; G, SEM of furcate seta with opening on tip of long tyne; H, SEM detail of barbs on thoracic capillaries.

Leitoscoloplos kerguelensis **(McIntosh, 1885)**
Figures 8, 9A–E

Scoloplos kerguelensis McIntosh, 1885: 355, pl. 43, figs. 6–8, pl. 22A, fig. 19; Ehlers 1897: 97; 1901: 169: 1913: 522; Gravier 1911: 108, pl. 5, figs. 60–63; Augener 1932a: 41. Not Fauvel 1916: 433, pl. 8, figs. 23–35; 1932: 165; 1953: 307–308, fig. 160 a–c.
Haploscoloplos kerguelensis: Monro 1939: 124 (in part); Hartman 1957: 275–276, figs. 1–3; 1966: 9–10, pl. 2, figs. 1–2; 1967: 104 (in part, not *Eltanin* Sta. 311, 428, 558, 732, 1003, 1009, 1063 and *Staten Island* Sta. 63-32, 63-63); 1978: 156 (in part, not *Glacier* Sta. 68-18, 68-55, 69-1; part of 68-1); Bellan 1972: 76; 1975: 789; Arnaud 1974: 552, 563, 638; Averincev 1982: 25–26, figs. 19–21, pl. III, figs. 6–8, table.
Haploscoloplos kerguelensis minutus Hartman, 1953: 37, figs. 11a–c; Hartmann-Schröder 1965: 194.
Haploscoloplos minutus: Hartman 1978: 156 (in part). **New synonymy.**
Leitoscoloplos kerguelensis: Hartmann-Schröder & Rosenfeldt 1988: 53 (in part); 1990: 105–106 (in part); Mackie 1987: 3–4, fig. 2.
Leitoscoloplos kerguelensis minutus: Mackie 1987: 4–5, Fig. 3. **New synonymy.**
Leitoscoloplos banzareae Mackie 1987: 8, fig. 7. **New synonymy.**

Material examined. Chile, South Pacific Ocean, W of Isla Guafo, R/V *Vema* Sta. V-17-10, 397-501 m, (2, LACM-AHF Poly 5038).—Straits of Magellan, R/V *Vema* Sta. V-17-18, 248-262 m (2, LACM-AHP Poly 5002); East of Isla Dawson, R/V *Vema* Sta. V-17-23, 273–280 m (3, LACM-AHF Poly 5003).—South Atlantic, SE of Falkland Islands, R/V *Vema* Sta. V-14-12, 361 m (1, LACM-AHF Poly 5029).—N of South Georgia, *Eltanin* Sta. 9-732, 220–265 m (1, USNM 56507); Sta. 9-734, 1299–1400 m (1, USNM 56508).—South Georgia, off Cumberland Bay, 54°11′S, 36°18′W, Swedish Antarctic Expedition, Sta. 34, 252–310 m, **syntype** of *Haploscoloplos kerguelensis minutus* (SMNH 3703).—East Antarctic Peninsula, Prince Gustav Channel, RVIB *Nathaniel B. Palmer*, Station NBP-35, 64°10.471′S, 058°505′W, 25 May 2000, Smith McIntyre grab, 651 m, (1, JAB)—South Orkney Islands, *Eltanin* Sta. 7-500, 489–490 m (1, USNM 56505); Sta. 14-1079, 593–598 m (1, USNM 56525); Sta. 12-1082, 298–302 m (2, USNM 56526); Sta. 12-1084, 298–403 m (12, USNM 56527).—South Shetland Islands, *Hero* Sta. 721-726 (1, USNM 60170); Sta. 721-742 (2, USNM 60169); Sta. 721-758 (2, USNM 60172); Sta. 721-964 (1, USNM 60166); Sta. 721-972 (3, USNM 60158); Sta. 1032 (1, USNM 60167); *Eltanin* Sta. 6-418, 311–426 m (1, USNM 56501); *Eastwind* Sta. 044, 19 Feb 1966, 62°11′S, 57°49.5′W, 747 m, coll. D. Pawson and D. Squires (1, USNM 69350); off Smith Island, R/V *Vema* Sta. V-17-43, 21 Apr 1961, 655–673 m (9, LACM-AHF-Poly 5037).—Bransfield Strait, *Eltanin* Sta. 6-410, 220–240 m (14, USNM 56521); Sta. 6-428, (1, USNM 56502); Sta. 6-437, 267–311 m (5, USNM 56503).—West Antarctic Peninsula, *Hero* Sta. 1120 (26, USNM 69381); *Eltanin* Sta. 5-272 (1, USNM 56499); Sta. 6-439 (8, USNM 56504); off Adelaide Island, *Eastwind* Sta. 004A ,24 Jan 1966, 67°53′S, 069°10′30″W, 330 m, coll. D. Pawson and D. Squires (12, USNM 69349).—Ross Sea, McMurdo Sound, W of Inaccessible Island, Deep-Freeze II, *Glacier* Sta. 2, 420 m (2, USNM 1013658).—Weddell Sea, *Glacier* Sta. 68-1, 650 m (12 USNM 46601); Sta. 69-8, 585 m (2, USNM 46605).

Description. A moderate-sized species, up to 30 mm long and 2 mm wide for about 100 setigers; average size 14 mm long and 0.9 mm wide for about 65 setigers. Color in alcohol: brown. Thoracic region inflated, not depressed, with 8–10 setigers, slightly wider than abdominal region (Figs. 8A, 9A).

Prostomium short, conical, pointed, but not acute on tip (Fig. 8A); two nuchal slits sometimes apparent in dorsolateral locations; without eyespots. Peristomium a single achaetous ring, twice as long as setiger 1 (Fig. 8A).

Thoracic parapodia all similar, inconspicuous; notopodia with short, triangular-shaped postsetal lobes, narrow at first, then becoming thicker in last thoracic setigers (Figs. 8B, 9A); neuropodia with papillate postsetal lobe arising from basal cushion (Fig. 8B). Abdominal notopodia with thin, narrow, fingerlike postsetal lobes and single, thickened, elongated neuropodia (Figs. 8C, 9C–D), sometimes with apical notch, never strongly bifurcated (Fig. 8C). Subpodial flange small, but inflated, continuous with neuropodial lobe (Figs. 8C, 9C–D).

Branchiae from setiger 13–17, short at first, increasing in length posteriorly. Branchiae more or less symmetrical, sometimes curved towards dorsal mid-line (Fig. 8C).

Thoracic setae including crenulated capillaries; neurosetae arising from broad cushion, in two rows, with some capillaries of first row short, thin, straight; setae of second row longer, thicker, and curved (Fig. 9B); notosetae similarly arranged. Abdominal notosetae including crenulated capillaries and furcate setae; in light microscope, furcate setae observed with unequal tynes connected by membrane of fine needles (Fig. 8D–E), with SEM 7–8 needles observed, individually with sharp tapering tips, lateral needles merging with tynes; tips of tynes expanded, with distinct apical opening (Fig. 9E). Abdominal neurosetae thin, weakly crenulated; aciculae sometimes with tip emergent.

Pygidium a simple ring, lacking cirri (Fig. 9D).

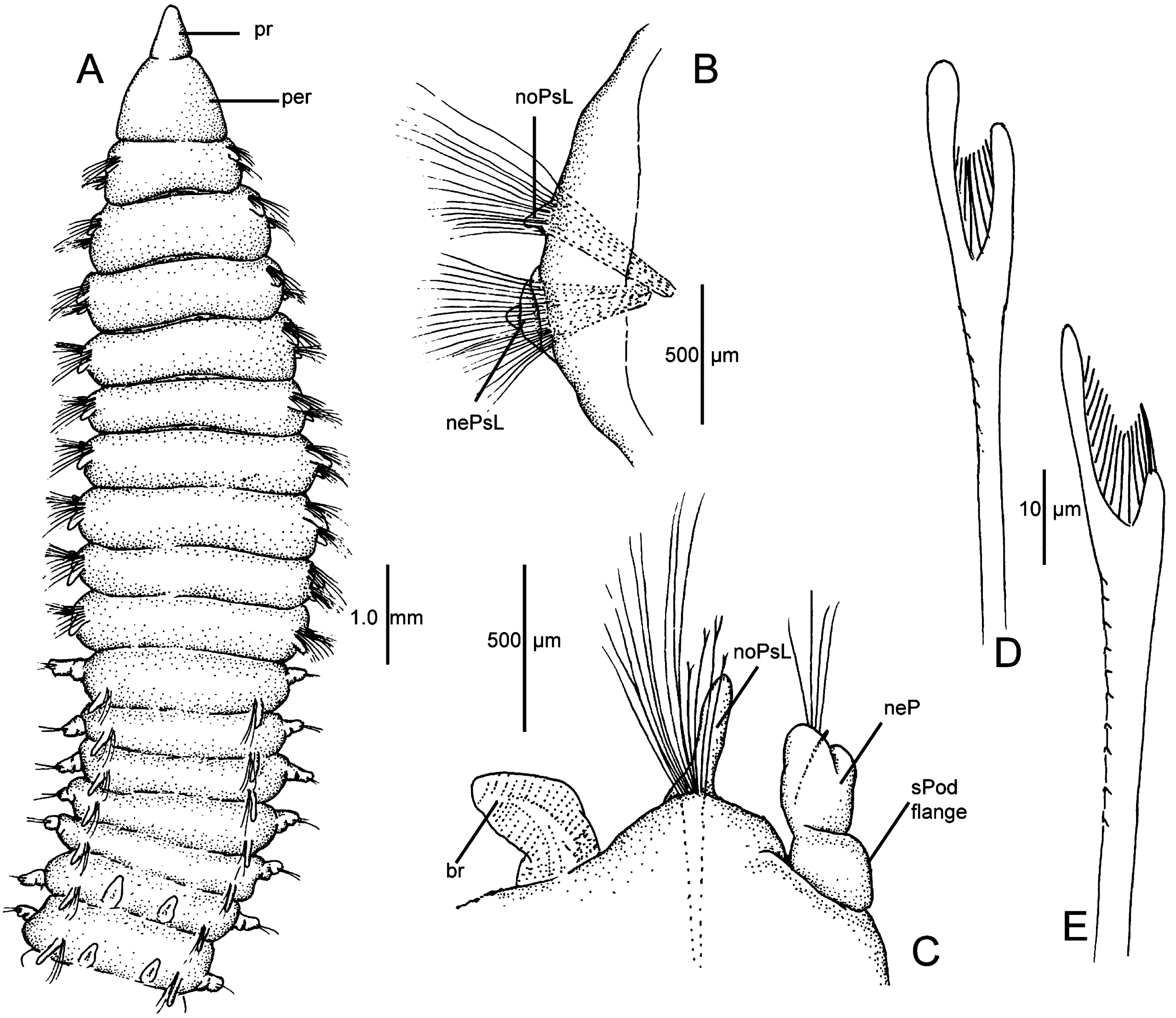

FIGURE 8. *Leitoscoloplos kerguelensis* (McIntosh, 1885). Antarctic Peninsula (USNM 56504) A, anterior end, dorsal view; B, thoracic parapodium, anterior view; C, abdominal parapodium, anterior view; D–E, furcate setae.

Remarks. *Leitoscoloplos kerguelensis* belongs to a group of species with branchiae from anterior abdominal setigers. This species includes individuals having 8–10 thoracic setigers and branchiae from setiger 13–17. Specimens having branchiae from earlier setigers or from setiger 18 or more posteriorly are here referred to other species (see below). There are numerous records of *L. kerguelensis* globally, but the species is here restricted to sub-Antarctic and Antarctic locations; some Antarctic and sub-Antarctic records are referred to other species. *Leitoscoloplos kerguelensis* has, rather than lacks furcate setae (as sometimes stated) and the prostomium is more elongate than its closest relatives. In Antarctica, *L. kerguelensis* is most closely related to *L. geminus* and *L. mawsoni,* differing primarily in having branchiae from setiger 13–17 instead of 10–12. There are further differences in details of the abdominal neuropodia, shape of the posterior branchiae, and general shape of the prostomium. There may also be important differences in details of the structure of the furcate setae, but further study is needed. However, all three species are similar and separated with difficulty. Both *L. geminus* and *L. mawsoni* are limited to relatively shallow waters, ca. 0–200 m, whereas *L. kerguelensis* has been collected from the intertidal to 1400 m, and occurs frequently in samples along the Antarctic Peninsula from 500–600 m.

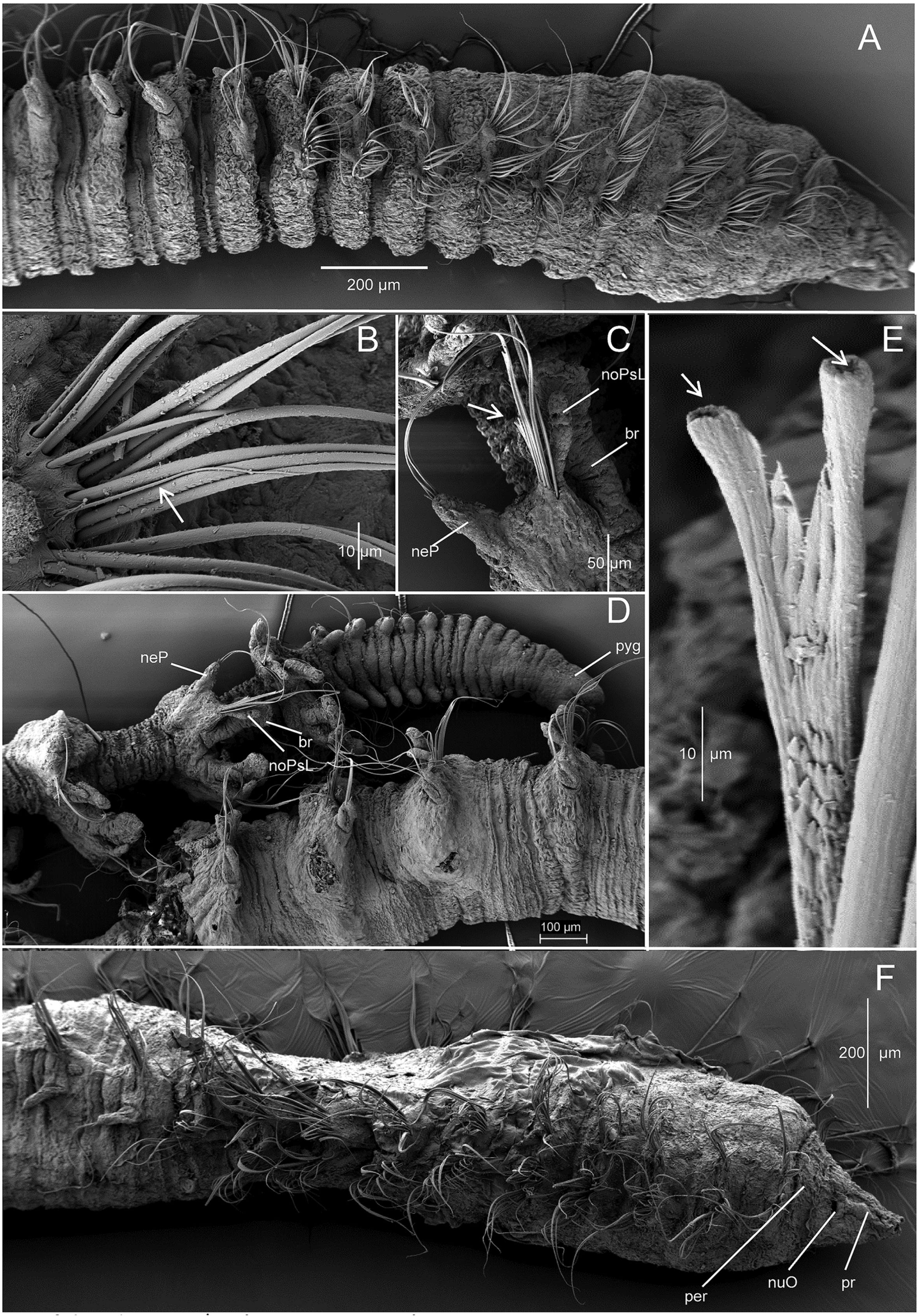

FIGURE 9. *Leitoscoloplos kerguelensis* (McIntosh, 1885). Antarctic Peninsula, Arthur Harbor (USNM 69381). A, anterior end, right lateral view; B, thoracic setae, arrow denotes a thin capillary seta of first row; C, abdominal parapodium, anterior view; D, posterior end and pygidium, dorsal view; E, furcate seta, arrows denote opening on tip of tynes.—F, *Leitoscoloplos plataensis* **n. sp.,** off Argentina, paratype (USNM 1013635). E. anterior end in right lateral view.

Leitoscoloplos banzareae agrees well with *L. kerguelensis* and is here placed in synonymy. Mackie (1987) stated that the thoracic region of *L. kerguelensis* contained 8–9 setigers compared to 10 for *L. banzareae*. In the much larger collection of *L. kerguelensis* examined here, thoracic regions with 10 setigers have been seen, thus overlapping with the stated differences with *L. banzareae.* Furthermore, the first occurrence of branchiae on *L. banzareae* is 14–15 according to Mackie (1987), within the range of 13–17 for *L. kerguelensis*.

Haploscoloplos kerguelensis minutus was originally distinguished from the stem species on the basis of its smaller size (Hartman, 1953). It was elevated to full species status by Hartman (1978). The present collections contain mature specimens that overlap the size ranges of both the stem form and the subspecies. For that reason and the lack of any other distinguishing features, *H. minutus* is referred to synonymy with *L. kerguelensis*.

Many of the published records of *L. kerguelensis* from Antarctica probably include a mixture of species. For example, records of *L. kerguelensis* by Hartmann-Schröder & Rosenfeldt (1988, 1990) from the Antarctic Peninsula and Elephant Island appear to be a mixture of *L. kerguelensis* and *L. geminus* because branchiae are reported to begin from setigers 10–14.

Scoloplos kerguelensis sensu Fauvel (1916) from the Falkland Islands has branchiae from setiger 18–20 and is likely an undescribed species. The records of *S. kerguelensis* from India by Fauvel (1932; 1953) refer to yet another unknown species because the thorax consists of 12–19 setigers and branchiae begin from setiger 20–22.

Haploscoloplos kerguelensis sensu Ramos (1976) from the eastern Mediterranean is another undescribed species having eight thoracic setigers, branchiae from setiger 14, bilobed neuropodia, and furcate setae. *Haploscoloplos kerguelensis sensu* Fauchald (1972) from deep water off Western Mexico differs from typical shallower forms in having a distinct postsetal lobe on abdominal neuropodia, and is most certainly an unnamed species. *Haploscoloplos kerguelensis sensu* Okuda (1937; 1938; 1939; 1946) is believed to represent another undescribed species.

Leitoscoloplos normalis from Australia is closely related to *L. kerguelensis*, but differs in having a distinctly bilobed abdominal neuropodium in which the inner lobe is considerably longer than the outer one (Day, 1977: 224–225, fig. 1C).

Biology. Despite being one of the most common orbiniids in Antarctica and certain subantarctic locations, little information is available on the biology of this species. Averincev (1982) identified *Leitoscoloplos kerguelensis* (as *Haploscoloplos*) from shallow sites in the Davis Sea, an area off the coasts of Queen Mary Land and Wilhelm II Land, between the Shackleton Ice Shelf and the West Ice Shelf. Russian scientists have maintained research facilities in the area since the 1960s. As part of annual collections from subtidal collections in depths of 3–45 m, Averincev (1982) concluded that the life cycle of this species was short with a one-time recruitment in January–February and a life span of approximately one year. Abundance and biomass ranged from 10–400 specimens per m^2 with a biomass of 0.12 to 4 g/m^2.

Distribution. Widespread in Antarctic and subantarctic seas: Strait of Magellan, South Georgia, Kerguelen Islands, South Orkney Islands; South Shetland Islands; Antarctic Peninsula; Ross Sea; Weddell Sea. Intertidal to 1400 m.

Leitoscoloplos plataensis **new species**

Figures 9F, 10

Material examined. Uruguay, off the mouth of the Rio de la Plata, IBM Sta. N-242, 63 m (2, USNM 1013639); Sta. N-260, 144 m (1, USNM 1013638); Sta. N-1073, 115–117 m (3, USNM 1013637); Sta. 1074, 35°29′S, 53°01′W, 112 m, **holotype** and 2 **paratypes** (USNM 1013633–4); Sta. N-1075, 68 m (1, USNM 1013636).—Argentina, IBM Sta. N-1059, 35°25.9′S, 53°27.9′W, 72–80 m, 14 **paratypes** (USNM 1013635); Golfo San Matías, SAO-1, Sta. 51, 41°08.30′S, 65°06.30′W, intertidal in gravel, coll. IBM (1, USNM 1013640).

Description. A small species, holotype complete, approximately 13–14 mm long (posterior end coiled) and 0.8 mm wide for about 100 setigers. Color in alcohol: brown. Thoracic region with first 4–5 setigers weakly inflated, not depressed, with 9–10 setigers, similar in width to anterior abdominal segments (Figs. 9E, 10A).

Prostomium short, conical, pointed, and narrow (Figs. 9F, 10A); two nuchal slits sometimes apparent in dorsolateral locations (Fig. 9F); without eyespots. Peristomium a single triangular-shaped achaetous ring, narrower, but longer than setiger 1; with prostomium forming triangular “head.”

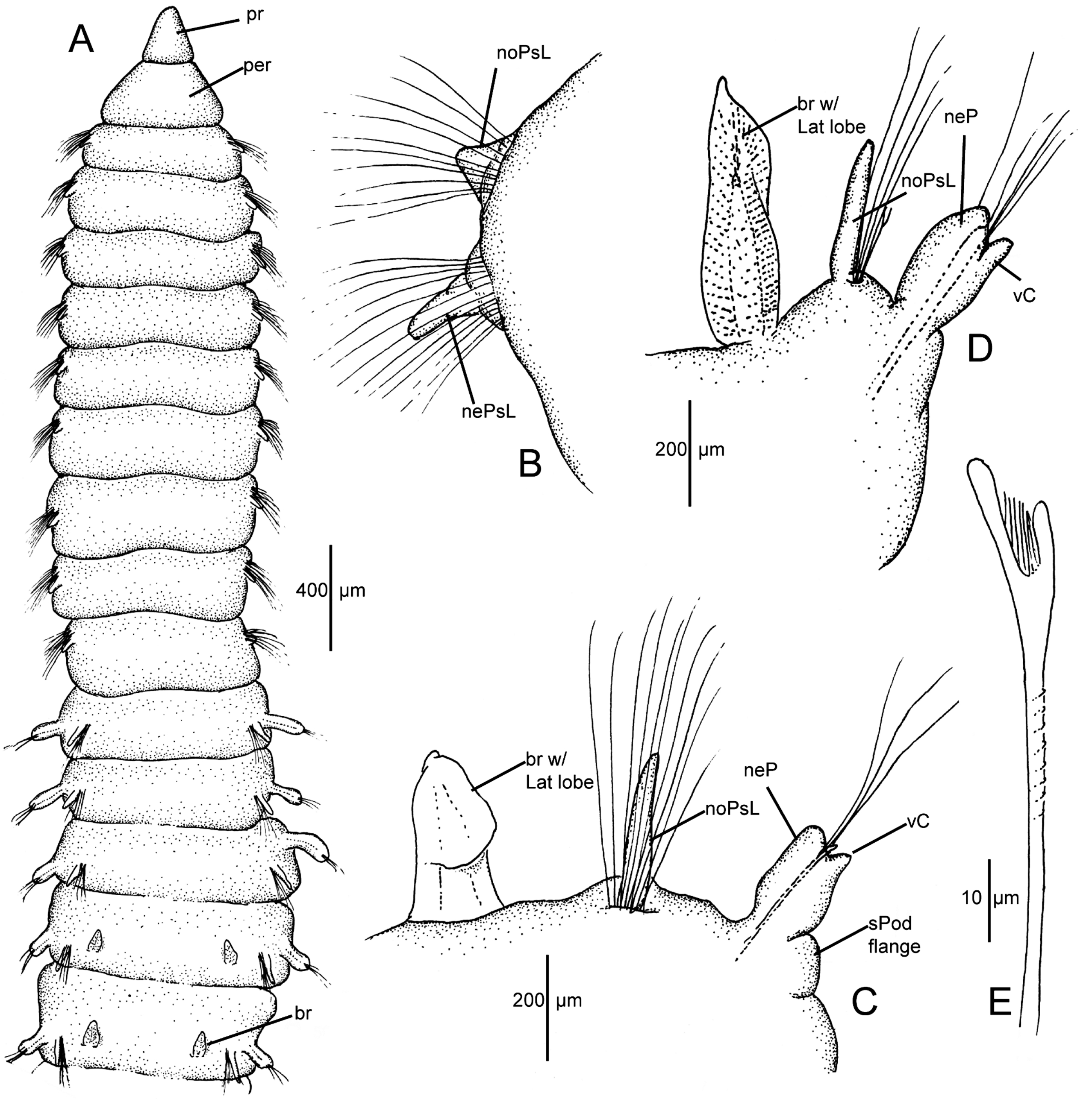

FIGURE 10. *Leitoscoloplos platensis* **n. sp.** Holotype (USNM 1013633). A, anterior end, dorsal view; B, thoracic parapodium, anterior view; C, anterior abdominal parapodium, anterior view; D, posterior abdominal parapodium, anterior view; E, furcate seta.

Thoracic parapodia all similar, inconspicuous, with elongated postsetal lobes, with notopodia short, triangular in shape (Fig. 10B); neuropodia with low basal cushion from which digitiform postsetal lobe emerges; postsetal lamellae short, narrow at first, becoming longer and thicker in last thoracic setigers. Abdominal notopodia with thin, narrow, fingerlike postsetal lobes; abdominal neuropodial lobes elongate, thickened apically with distinct ventral cirrus; subpodial flange small but distinct, continuous with neuropodial lobe (Fig. 10C–D).

Branchiae from setiger 13–16, short, triangular at first (Fig. 10A, C), then increasing in length posteriorly (Fig. 10D); branchiae asymmetrical, with large protruding lateral lobe (Fig. 10C–D).

Thoracic setae crenulated capillaries in dense fascicles with two rows of 20–25 setae per fascicle, arising from broad cushion (Fig. 10B); setae of first row shorter and thinner than those of second row. Abdominal notosetae including 8–9 capillaries and 0–2 furcate setae; furcate setae with unequal tynes connected by row of fine needles; both tynes with rounded tips, shaft with ribbed crenulations (Fig. 10E). Abdominal neurosetae including 2–3 long, smooth or weakly crenulated capillaries and 1–2 short, protruding, curved, blunt-tipped aciculae (Fig. 10C).

Pygidium a smooth, enlarged ring, lacking cirri.

Etymology. This species is named for its proximity to the Rio de la Plata.

Remarks. *Leitoscoloplos plataensis* **n. sp.** is closely related to *L. kerguelensis* in having 9–10 thoracic setigers and branchiae from setigers 13–16. *Leitoscoloplos plataensis* **n. sp.** differs in having the abdominal branchiae with a large protruding lateral lobe, ventral cirri on the abdominal neuropodia, and a different shape to the prostomium and peristomium. Further, furcate setae are rarely found in both the thoracic and abdominal notopodia of *L. plataensis* **n. sp.** but are commonly in the notopodia of *L. kerguelensis*.

Distribution. Known only from off Uruguay and Argentina, intertidal to 144 m in coarse sediments.

Leitoscoloplos mawsoni **(Benham, 1921)**

Figure 11

Scoloplos kerguelensis: Willey 1902: 275; Monro 1939: 124 (in part). Not McIntosh 1885.
Scoloplos mawsoni Benham, 1921: 78–81, pl. 9, figs. 91–94.
Leitoscoloplos mawsoni: Mackie 1987: 5–7, fig. 4.

Material examined. Antarctica: Adelie Land, Commonwealth Bay, Boat Harbor, 67°00′S, 142°36′E, 8 m, coll. J. Haswell, 15 Oct 1912, 55 **syntypes** (AM W769).—Wilkes Land, Vincennes Bay, Casey Station, coll. Australian Antarctic Division, Brown Bay, middle, Sta. S1P1R1, 04 Dec 2005, 66.272°S, 110.567°E, diver cores, 15–25 m, (50, including 15 juveniles, AM); O'Brien Bay-1, T2P1R2, 14 Dec 2006, 66.312°S; 110.515°E, diver cores, 12–25 m, (24, AM); Wilkes Bay, Sta. S2P1R3, 15 Dec 2005, 66.526°S; 110.526°E, diver cores, 10–20 m, (26, including 10 juveniles, AM); Sta. S1P2R3, 15 Dec 2005, 66.526°S; 110.526°E, diver cores, 10–20 m, (44, AM).

Description. A moderate-sized species, syntypes up to 32 mm long, 1.5 mm wide for about 100 setigers; other specimens with similar maximal measurements. Color in alcohol: light tan; large specimens from Casey Station S1P1R1 with dusky dark pigment on prostomium, peristomium, and first 3–4 setigers, most intense on prostomium and anterior peristomium. Thoracic region inflated, not depressed, with 10 setigers, wider than abdominal segments.

Prostomium short, conical, rounded or blunted on tip, not acute (Fig. 11A); two nuchal slits sometimes apparent in dorsolateral locations; without eyespots. Peristomium a single achaetous ring, tapering anteriorly, about one-fourth longer than first setiger (Fig. 11A).

Thoracic parapodia similar, inconspicuous, with short postsetal lobes with rounded tips increasing in size along thorax (Fig. 11A); notopodial lobes elongated, oval-shaped; neuropodial lobes more triangular, but with rounded, not pointed tips (Fig. 11B). Abdominal notopodial postsetal lobes short, blunt slightly asymmetrical in anterior segments (Fig. 11C), becoming longer, more symmetrical, somewhat triangular posteriorly (Fig. 11D); neuropodia short, rounded, expanded without obvious notch; subpodial flange weakly developed in anterior abdominal setigers (Fig. 11C), becoming larger, blister-like in far posterior setigers.

Branchiae from setiger 11 (rarely 12), short, strap-like at first; becoming wide at base, smoothly tapering to rounded tip (Fig. 11C–D); far posterior branchiae about twice the length of notopodia.

Thoracic notosetae arranged in single spreading fascicle of two rows, with setae of anterior row shorter and thinner; neurosetae arranged in two fascicles dorsal and ventral to postsetal lobe. Abdominal notosetae including crenulated capillaries and 0–3 furcate setae; furcate setae with unequal tynes connected by row of fine needles (Fig. 11E). Abdominal neurosetae thin, weakly crenulated.

Pygidium a simple ring, lacking cirri.

Remarks. *Leitoscoloplos mawsoni* was redescribed by Mackie (1987) and is similar to *L. geminus* in having up to 10 thoracic setigers and branchiae from setiger 11–12. The two species are difficult to separate and differentiated mostly on soft parts that may be affected by preservation. The branchiae of *L. mawsoni* are initially short and straplike, narrow basally, becoming wider basally further posterior and not appearing asymmetrical. In contrast, the branchiae of *L. geminus* are short and wide at the base from the first and triangular in shape, becoming larger and distinctly asymmetrical in posterior setigers, bending medially. The posterior neuropodial lobes of *L. geminus* are more distinctly notched than in *L. mawsoni*; the former has a more conspicuous subpodial flange with a notch separating it from the neuropodium; the flange of *L. mawsoni* is poorly developed, but both species develop enlarged blister-like flanges in posterior setigers.

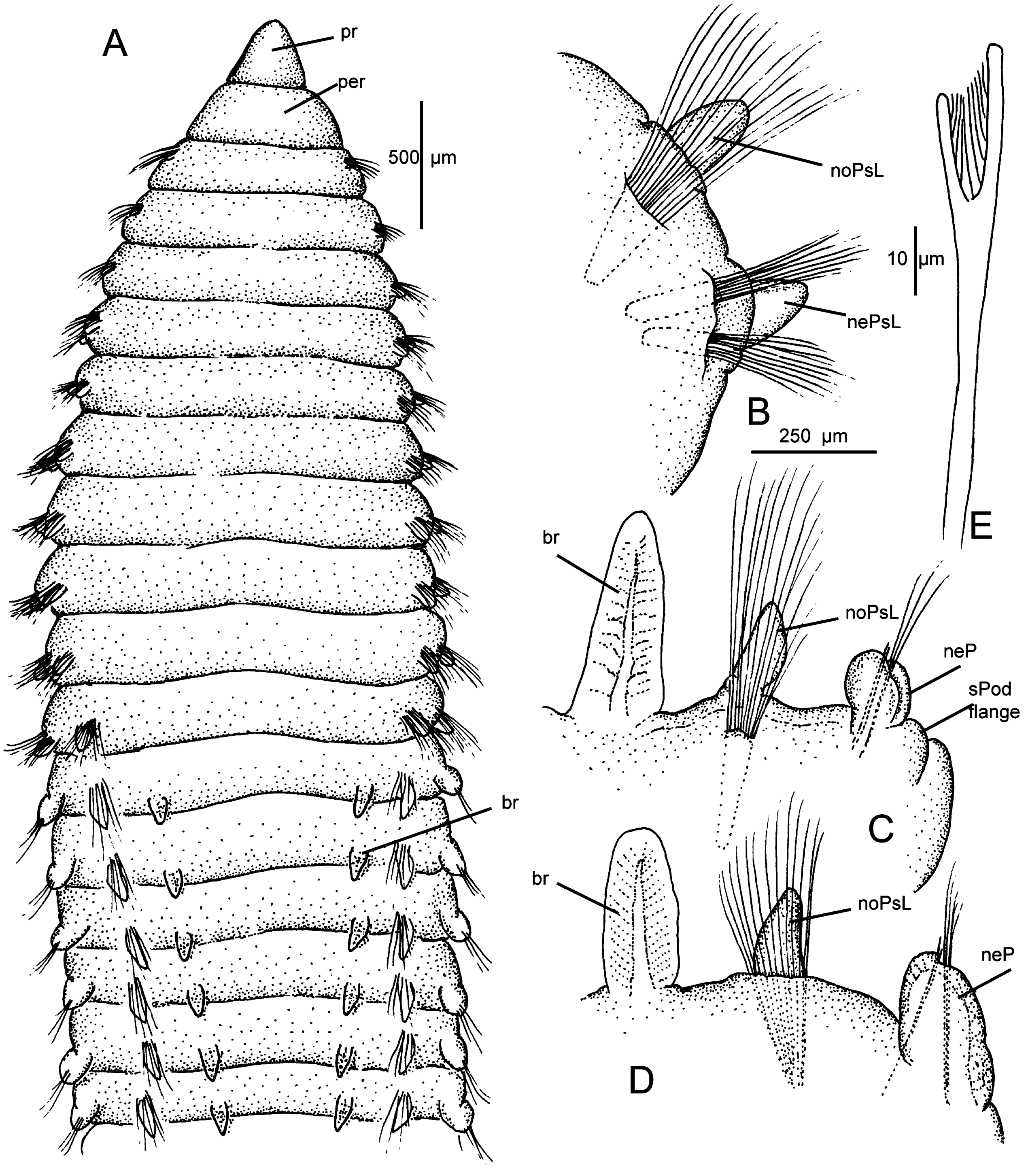

FIGURE 11. *Leitoscoloplos mawsoni* (Benham, 1921*)*. Syntype (AM W769), A, anterior end, dorsal view; B, thoracic parapodium, anterior view; C, anterior abdominal parapodium, anterior view; D, posterior abdominal parapodium, anterior view; E, furcate seta.

Biology. As is typical for Southern Ocean orbiniids, little is known concerning the biology of *L. mawsoni*. However, collections from the Australian Antarctic program from December 2005 had two obvious size classes: (1) large mature adults with ripe gametes and (2) small juveniles. Many specimens from Dec. 2005 were packed with eggs with average diameters of 215 µm.

Distribution. Southern Ocean: Adelie Land, Wilkes Land and Ross Sea; 3–25 m.

Leitoscoloplos geminus Mackie, 1987

Figures 12–13

Scoloplos kerguelensis: Monro 1936: 160 (in part). Not McIntosh 1885. *Fide* Mackie 1987.
Leitoscoloplos kerguelensis: Hartmann-Schröder 1986: 82; Hartmann-Schröder & Rosenfeldt 1988: 53 (in part); 1990: 105–106 (in part).
Leitoscoloplos geminus Mackie, 1987: 6–7, fig. 5.

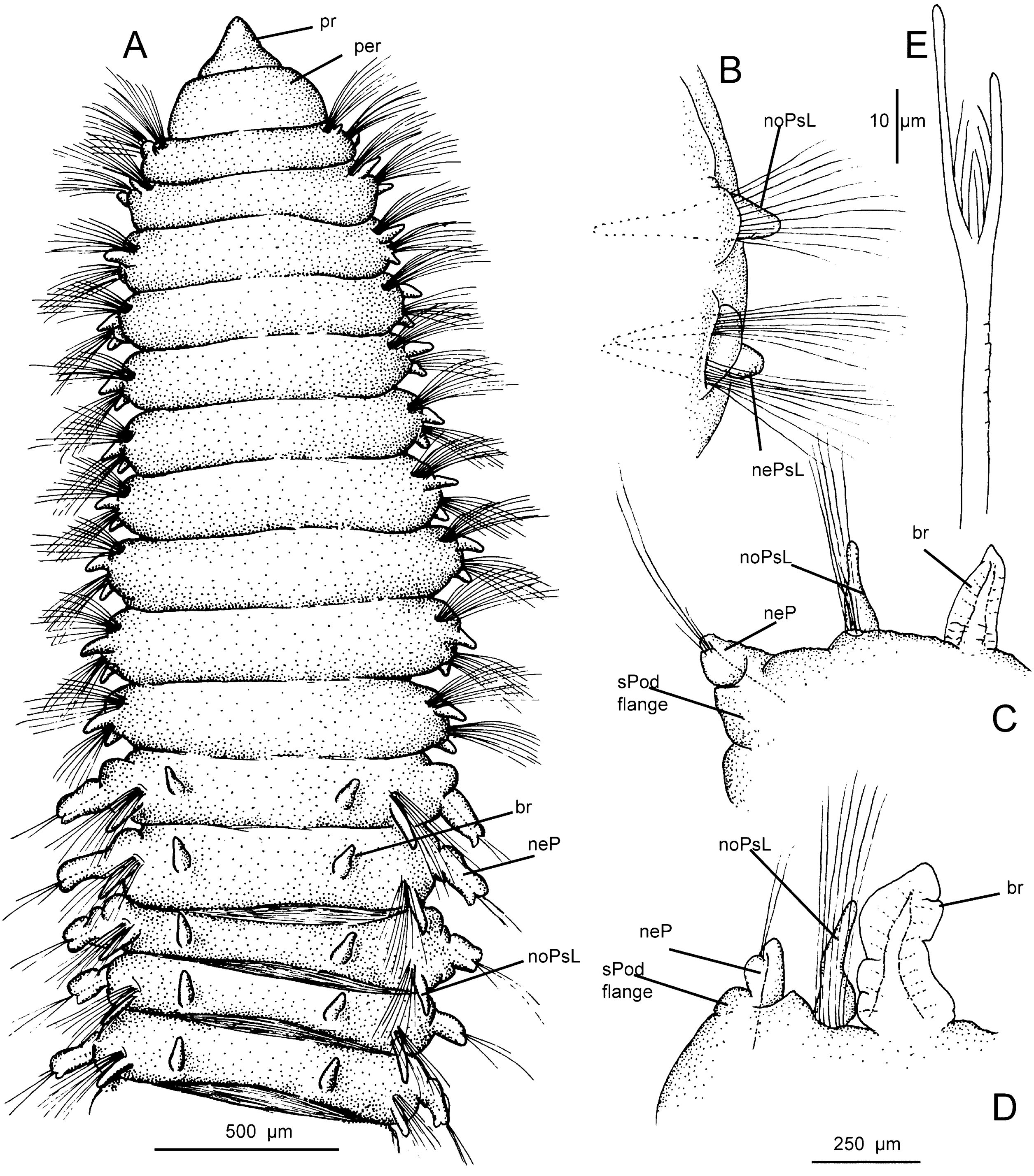

FIGURE 12. *Leitoscoloplos geminus* (Mackie, 1987). Antarctic Peninsula (USNM 187514). A, anterior end, dorsal view; B, thoracic parapodium, anterior view; C, anterior abdominal parapodium, anterior view; D, posterior abdominal parapodium, anterior view; E, furcate seta.

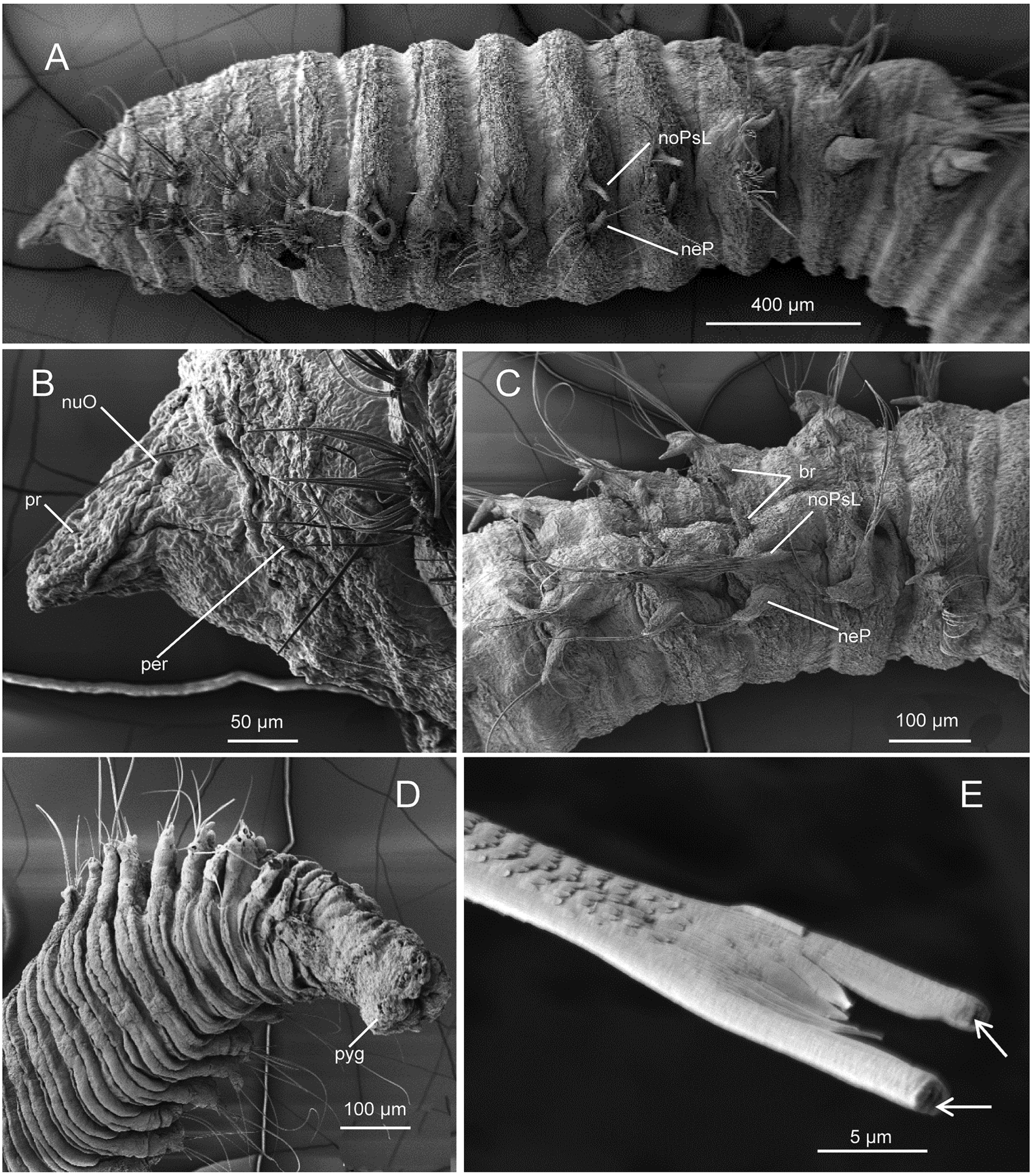

FIGURE 13. *Leitoscoloplos geminus* (Mackie, 1987). McMurdo Station, 15 Jan 2000 (SEM, JAB). A, anterior end, left lateral view; B, same, close up of prostomium, peristomium, and nuchal organ; C. middle body segments, dorsal view; D, posterior end, ventrolateral view showing pygidium; E, furcate seta, arrows denote openings on tips of tynes.

Material examined. Ross Island, McMurdo Sound, off McMurdo Station, 77°51.067′S, 66°39.880′E, 20 m, in sand and silt, coll. S. Kim and J.A. Blake, 11 Jan 2000, (11, LACM-AHF Poly 8957); same location, 30 m, in sponge mat, coll. S. Kim and J.A. Blake, 15 Jan 2000 (3, LACM-AHF Poly 8958).—Antarctic Peninsula, *Hero* Sta. 1120, 25–31 m (45, USNM 187514); Gamma Island, *Staten Island* Sta. 32-63, coll. W.L. Schmitt, 100 m (1, USNM 46389); Anvers Island, *Staten Island* Sta. 67-63, coll. W.L. Schmitt, 62 m (5, USNM 46390).—South Shetland Islands, *Hero* Sta. 721-726 (2, USNM 60170); Sta. 721-742 (6, USNM 60169); Sta. 721-752 (3, USNM 60173);

Sta. 721-819 (2, USNM 60171); Sta. 721-965 (2, USNM 60165); Sta. 721-968 (1, USNM 60159); Sta. 721-972 (2, USNM 60158); Sta. 721-975 (3, USNM 60160); Sta. 721-979 (1, USNM 60161); Sta. 721-980 (2 USNM 60168); 721-981 (1, USNM 60163); Sta. 721-983 (7, USNM 60162); Sta. 721-1033 (1, USNM 60164).—Bransfield Strait, *Eltanin* Sta. 12-1003, 210–220 m (1, USNM 56522).

Description. A moderate-sized species, up to 28 mm long, 1.5 mm wide for about 85 setigers; average size 25 mm long, 1.2 mm wide for about 65 setigers. Color in alcohol: light tan; color in life: yellow to orange, with light brown pigment around mouth opening (based on personal observations at McMurdo Station, 19 Jan 2000). Thoracic region inflated, not depressed, with 10 setigers (7–9 in juveniles), wider than abdominal segments (Figs. 12A, 13A); transition from thorax to abdomen abrupt (Figs. 12A, 13A).

Prostomium short, narrow, conical, blunted on tip, not acute (Figs. 12A, 13A–B); two nuchal slits in dorsolateral locations (Fig. 13B) without eyespots. Peristomium a single achaetous ring, at least twice as wide as long, longer than setiger 1 (Fig. 12A).

Thoracic parapodia similar, inconspicuous, with basal cushion from which setae arise; with triangular-shaped notopodial postsetal lobes and more oval-shaped neuropodial postsetal lobes increasing in size along thorax (Fig. 12B). Abdominal notopodial postsetal lobes wide basally, tapering to elongate narrow tip (Figs. 12C–D, 13C). Neuropodia short, rounded, expanded apically, with small notch from which setae arise; small subpodial flange present ventral to neuropodium, separated by a notch (Fig. 12C); in more posterior setigers, a large, blister-like subpodial swelling usually present ventral to neuropodium (Fig. 12D).

Branchiae from setiger 11–12 (10 in juveniles), usually 11, very short, inconspicuous; branchiae short, triangular at first (Fig. 12C), becoming asymmetrical and irregular in shape in posterior segments (Fig. 12D), usually bending medially.

Thoracic setae crenulated capillaries; notosetae arising from single spreading fascicle consisting of two rows, with shortest and thinnest setae in anterior row; neurosetae arising from two fascicles more or less dorsal and ventral to postsetal lobe (Fig. 12B); setae of upper fascicle often with dark bases. Abdominal notosetae including crenulated capillaries and 0–2 furcate setae; furcate setae with unequal tynes connected by row of very fine needles as interpreted in light microscopy (Fig. 12E); with SEM, individual needles appearing thicker and fewer; tynes with apical openings (Fig. 13E). Anterior abdominal neurosetae long, stiff, becoming thinner, posteriorly.

Pygidium a simple ring, lacking cirri (Fig. 13D).

Remarks. See comparative remarks under *Leitoscoloplos mawsoni*.

Distribution. Widespread in shallow Antarctic seas: Ross Sea, McMurdo Sound; South Orkneys, Antarctic Peninsula; South Shetland Islands; 20–220 m.

Leitoscoloplos nasus new species

Figure 14

Material examined. Antarctic Peninsula, *Eltanin* Station 6-439, 09 Jan 1963, 63.83°S, 62.60°W, 128–165 m, **holotype** and 3 **paratypes**, USNM 1407121–2).

Description. All specimens posteriorly incomplete; holotype 8.7 mm long, 0.6 mm wide, for 37 segments; largest paratype 8.3 mm long, 0.35 mm wide for 33 segments. Body rounded in cross section, with thoracic region slightly inflated. Thorax with 9–10 setigers, with each segment wider than long (Fig. 14A–B). Transition from thorax abrupt, denoted by reduction in number of neurosetae and change in form of neuropodial postsetal lobes. Abdominal segments narrow at first, then becoming elongate, nearly twice as long as wide with parapodia at posterior end of each elongated segment (Fig. 14C). Color in alcohol: brown.

Prostomium elongate, more than twice as long as wide; tapering anteriorly to narrow, rounded tip, sometimes curved dorsally; eyespots absent; with paired nuchal organs. Peristomium short asetigerous ring, together with prostomium forming unusually elongate “head” (Fig. 14A–B)

Thoracic notopodia short, papillate on setiger 1 and sometimes setiger 2, then becoming long, fingerlike over remaining thoracic setigers; abdominal notopodia elongate, becoming narrow more posteriorly (Fig. 14C–D). Thoracic neuropodia similar to notopodial lamellae, but overall shorter and more triangular. Abdominal neuropodia, short, thickened basally, notched distally; with subpodial flange (Fig. 14D).

Thoracic setae all long crenulated capillaries. Abdominal notopodia with 6–8 crenulated capillaries and 1–2 furcate setae; furcate setae with thin needles forming web between subequal tynes; barbs on shaft not apparent in light microscopy (Fig. 14E). Abdominal neuropodia with 2–3 thin, non-crenulated capillaries (Fig. 14D).

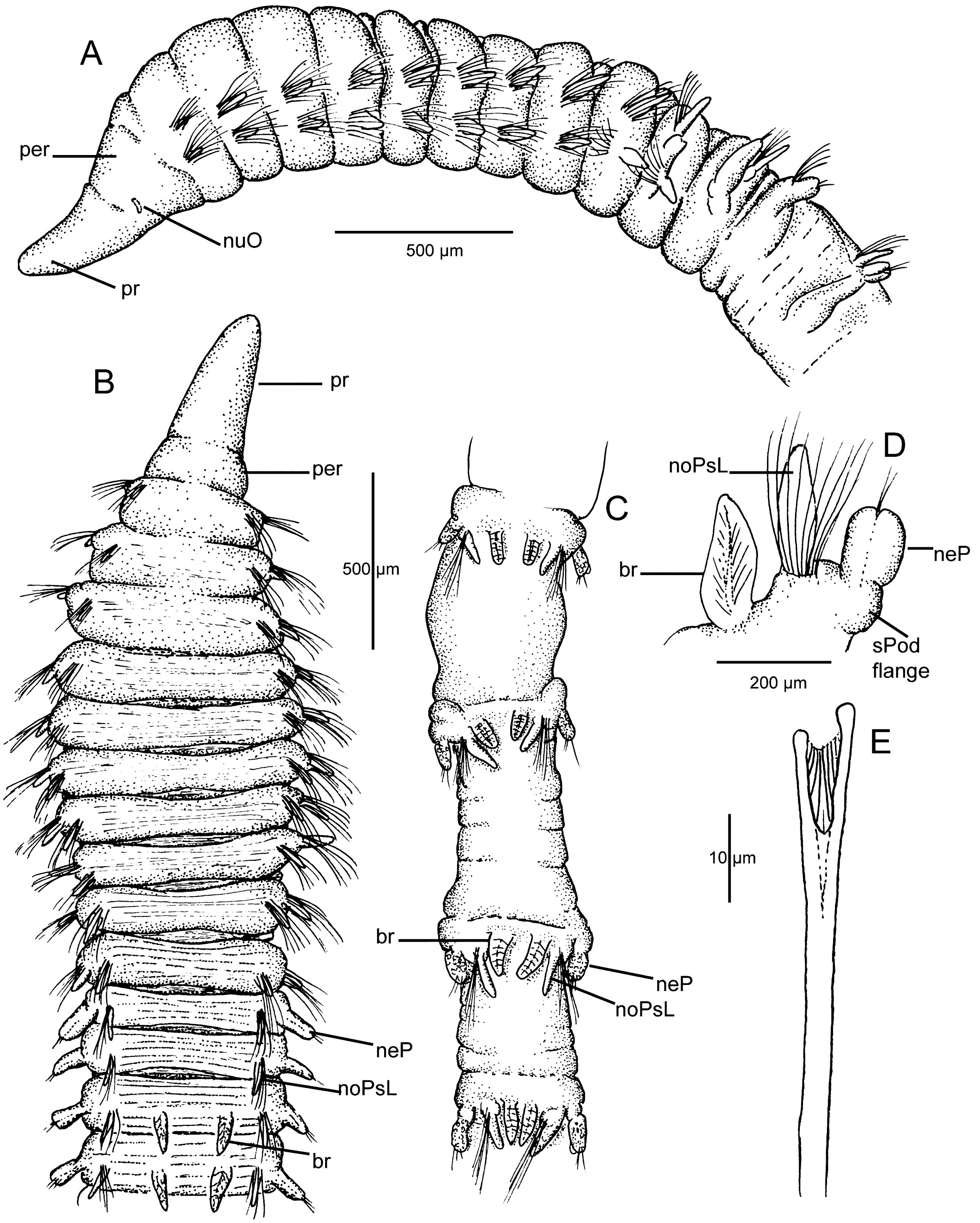

FIGURE 14. *Leitoscoloplos nasus* **n. sp.** Paratype, (USNM 1407122), A, anterior end, left lateral view; B, anterior end, dorsal view; C, middle body segments, dorsal view; D, abdominal parapodium, anterior view; E, furcate seta.

Branchiae from setiger 13–14, continuing to end of fragment; each branchia short, narrowing to rounded apex, barely longer than notopodial lobes in thoracic segments, shorter in abdominal segments (Fig. 14D). Pygidium unknown.

Etymology. The epithet is derived from the Latin *nasus* (*m*), for nose, to denote the usually elongate and narrow prostomium-peristomium that characterizes this species.

Remarks. *Leitoscoloplos nasus* **n. sp.** is another Antarctic species in the *L. kerguelensis* group with a reduced number of thoracic setigers and branchiae from anterior abdominal segments. The species is easily recognized and distinguished from other species of the genus in Antarctica and elsewhere by the elongate and unusually narrow "head" consisting of the prostomium-peristomium, and by the long, narrow abdominal segments. *Leitoscoloplos drakei* described below also has elongate abdominal segments, but this species is thin and threadlike with branchiae limited to far posterior segments.

Distribution. Antarctic Peninsula, 128–165 m.

Leitoscoloplos eltaninae new species

Figure 15

Material examined. South Atlantic Ocean, South Georgia Island, N of Shag Rocks, *Eltanin* Sta. 22-1527, 09 Jan 1963, 63.83°S, 62.60°W, 3742–3806 m, **holotype** and 3 **paratypes** (USNM 69403–4).

Description. All specimens posteriorly incomplete; holotype 16 mm long and 2 mm wide for 40 segments; paratypes of similar size. Color in alcohol: brown with darker pigment markings on prostomium and some anterior segments. Body rounded in cross section, with thoracic region slightly depressed; one paratype with mid-ventral line of body inverted, forming long groove. Transition from thorax abrupt, denoted by reduction in number of neurosetae and change in form of neuropodial postsetal lobes.

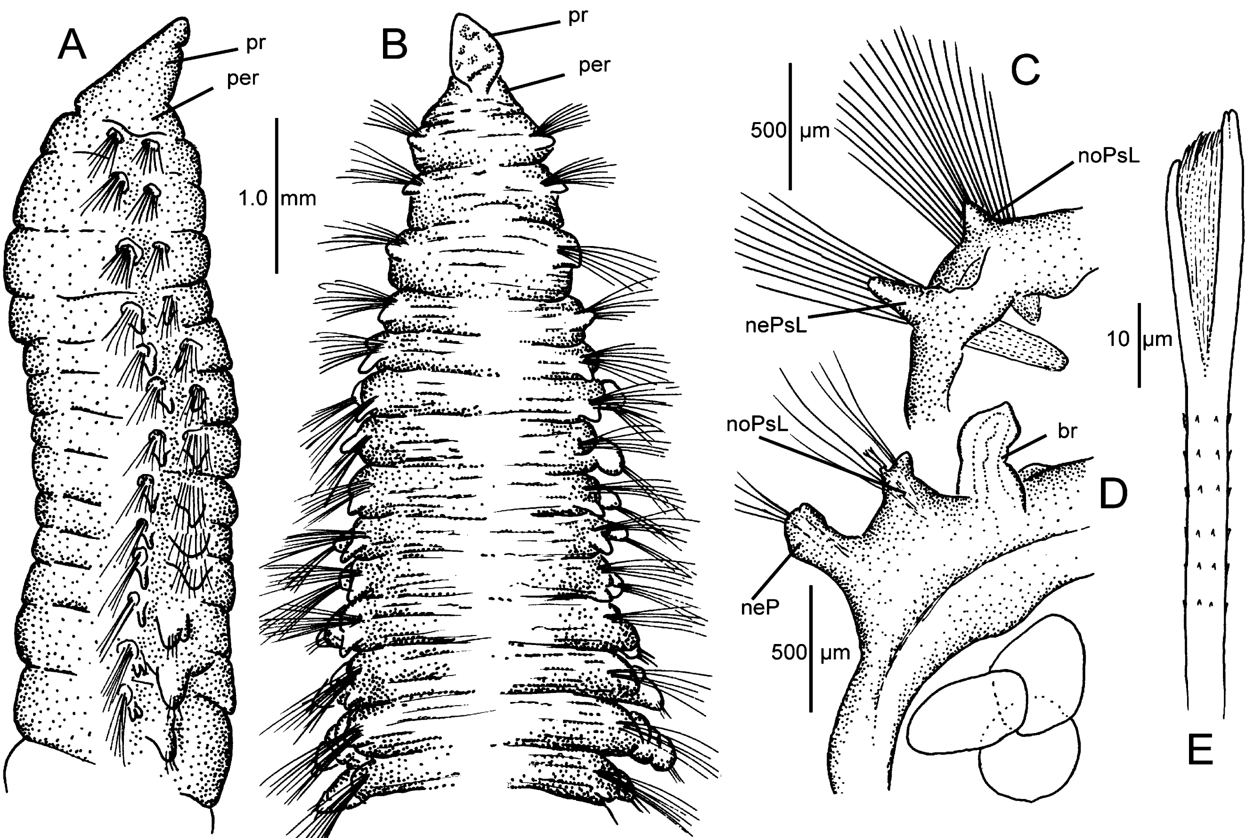

FIGURE 15. *Leitoscoloplos eltaninae* **n. sp.** Holotype (USNM 69403). A, anterior end, right lateral view; B, anterior end, dorsal view; C, thoracic parapodium, posterior view; D, abdominal parapodium, posterior view; E, furcate seta.

Prostomium conical, pointed anteriorly (Fig. 15A); without distinct eyespots, but with several groups of small pigment spots (Fig. 15B). Peristomium formed of single tapering achaetous ring.

Thorax with 10 setigers (Fig. 15A). Notopodia of setigers 1–3 inconspicuous, with short triangular-shaped digitiform postsetal lobes from setiger 4 (Fig. 15C), becoming bilobed in abdominal setigers, with ventral lobes shorter than dorsal (Fig.15D). Thoracic neuropodia with tapering digitiform postsetal lobes (Fig. 15C); abdominal neuropodia becoming apically thicker and more erect (Fig. 15D).

Thoracic setae all long crenulated capillaries. Abdominal notopodia with crenulated capillaries and 3–4 furcate setae; furcate setae with thin needles forming web between subequal tynes; with rows of short barbs on shaft (Fig. 15E). Abdominal neuropodia with 3–4 thin, non-crenulated capillaries and 2–3 imbedded simple aciculae.

Branchiae from setiger 20, continuing to end of fragment; each branchia short, stubby, barely longer than notopodial lobes (Fig. 15D). Pygidium unknown.

Holotype and one paratype with large, irregularly shaped ova, measuring 450–500 µm in largest dimension.

Etymology. This species is named for the USNS *Eltanin*, former research vessel of the United States Antarctic Research Program.

Remarks. *Leitoscoloplos eltaninae* **n. sp.** is a deep-sea species that belongs to the *L. kerguelensis* group in having branchiae first present from anterior abdominal segments. It is closest to *L. rankini* **n. sp.**, described below, in having a thorax with 10 setigers and branchiae from similar setigers (setiger 18 in *L. rankini* **n. sp.**; setiger 20 in *L. eltaninae* **n. sp.**). The two species differ in that *L. eltaninae* **n. sp.** has bilobed abdominal notopodia and entire neuropodia, whereas *L. rankini* **n. sp.** has undivided, fingerlike abdominal notopodia and bilobed neuropodia. In *L. eltaninae* **n. sp.** the branchiae are short and stubby, while in *L. rankini* **n. sp.** the branchiae are long and thin.

Distribution. South Atlantic Ocean, 3742–3806 m.

Leitoscoloplos phyllobranchus **new species**

Figure 16

Haploscoloplos minutus: Hartman 1978: 156 (in part, *Glacier* Sta. 68-Palmer II). Not Hartman 1953.

Material examined. Antarctic Peninsula, Anvers Island, Arthur Harbor, *Hero* Inlet, *Glacier* Sta. 68-Palmer II, 17 Mar 1968, 64.77°S, 64.07°W, 40 m, **holotype** (USNM 61943).

Description. Holotype complete, broken into three parts, totaling 20 mm long and 1.2 mm wide for 56 setigerous segments. Color in alcohol: light tan. Thoracic region slightly flattened dorsoventrally; abdominal region cylindrical; middle abdominal segments moniliform.

Prostomium reduced, short, triangular, wider than long, weakly pointed anteriorly, smoothly rounded on anterior margin, recessed into large peristomial segment; nuchal organs not observed; no eyespots (Fig.16A). Peristomium superficially divided into one large and one small achaetous ring; distinct from setiger 1.

Thorax with eight setigers, all similar. Notopodia with thin, cirriform postsetal lobes throughout body (Fig.16C–D); thoracic neuropodia simple, with elliptical postsetal lobes (Fig.16C); neuropodia of middle and posterior segments dorsoventrally swollen, forming weakly developed ventral flange, surmounted by short, triangular postsetal lobe (Fig.16E).

All thoracic setae arranged in irregular fascicles of 25–30 crenulated capillaries (Fig.16C). Abdominal neurosetae including 2–3 simple, non-crenulated capillaries and 2–3 imbedded aciculae. Abdominal notosetae including 3–5 long, crenulated capillaries and 1–2 furcate setae; furcate setae with three thin needles connected to blunted subequal tynes by a thin membrane (Fig.16F).

Branchiae from setiger 17; small, stubby at first (Fig.16D), increasing in size over subsequent setigers, becoming greatly enlarged; middle and posterior setigers with enlarged, flattened, membranous branchiae with thick inner and outer gland-like supportive structures and thin membranous blade with venation (Fig.16E).

Pygidium with two lobes lacking cirri (Fig.16B).

Etymology. The epithet, *phyllobranchus*, is derived from the Greek *phyllon* for leaf; *branchos* for gill. The name is suggested by the thin membranous appearance of the branchiae.

Remarks. *Leitoscoloplos phyllobranchus* **n. sp.** is a unique species in the form of the thin, membranous branchiae that start from setiger 17.

Distribution. Antarctic Peninsula, 40 m.

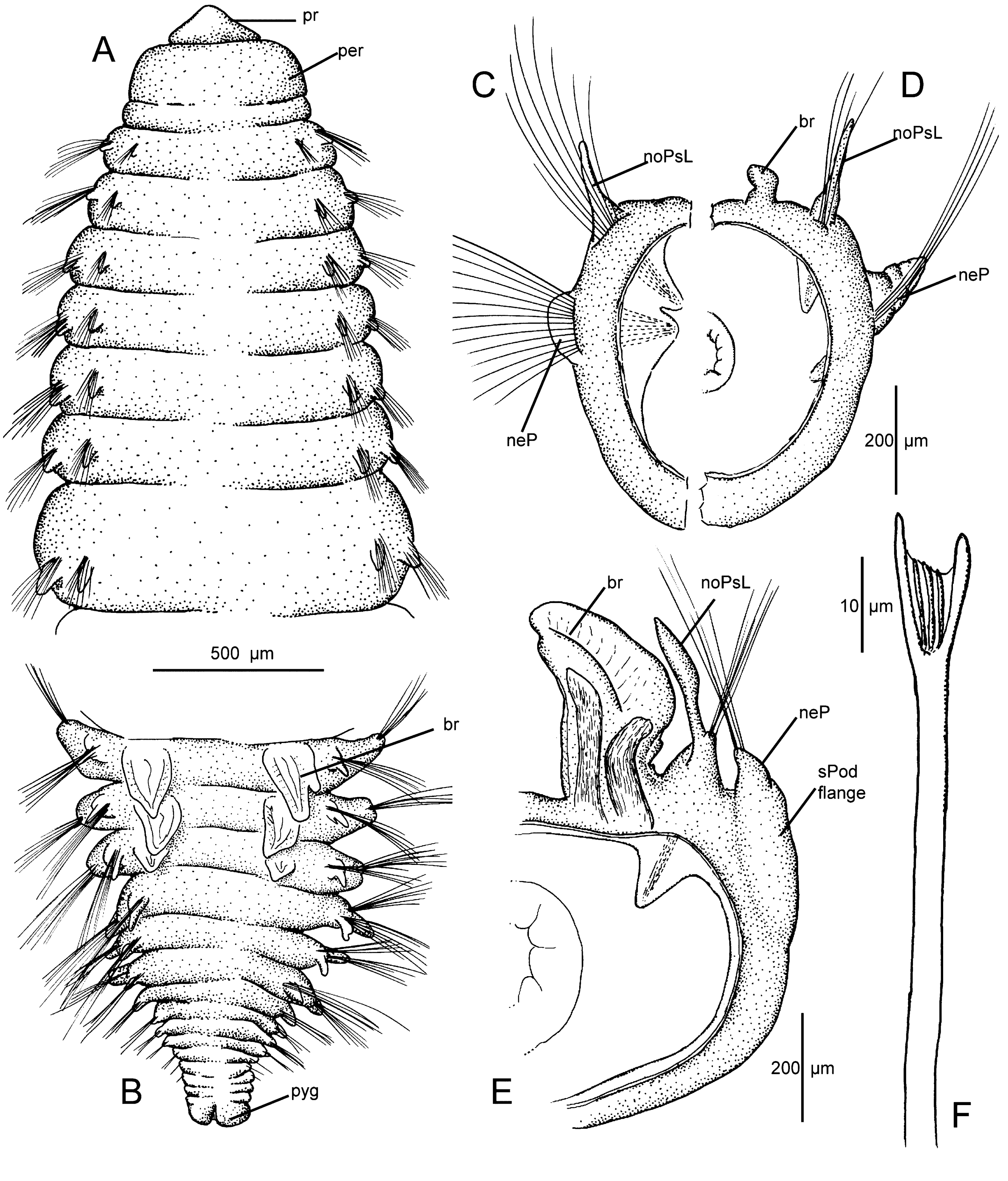

FIGURE 16. *Leitoscoloplos phyllobranchus* **n. sp.** Holotype (USNM 61943). A, anterior end, dorsal view; B, posterior end, dorsal view; C, thoracic parapodium, anterior view; D, anterior abdominal parapodium, anterior view; E, posterior abdominal parapodium; F, furcate seta.

***Leitoscoloplos rankini* new species**
Figures 17–18

Haploscoloplos sp. Hartman 1978: 156 (in part, *Glacier* Sta. 69-19).

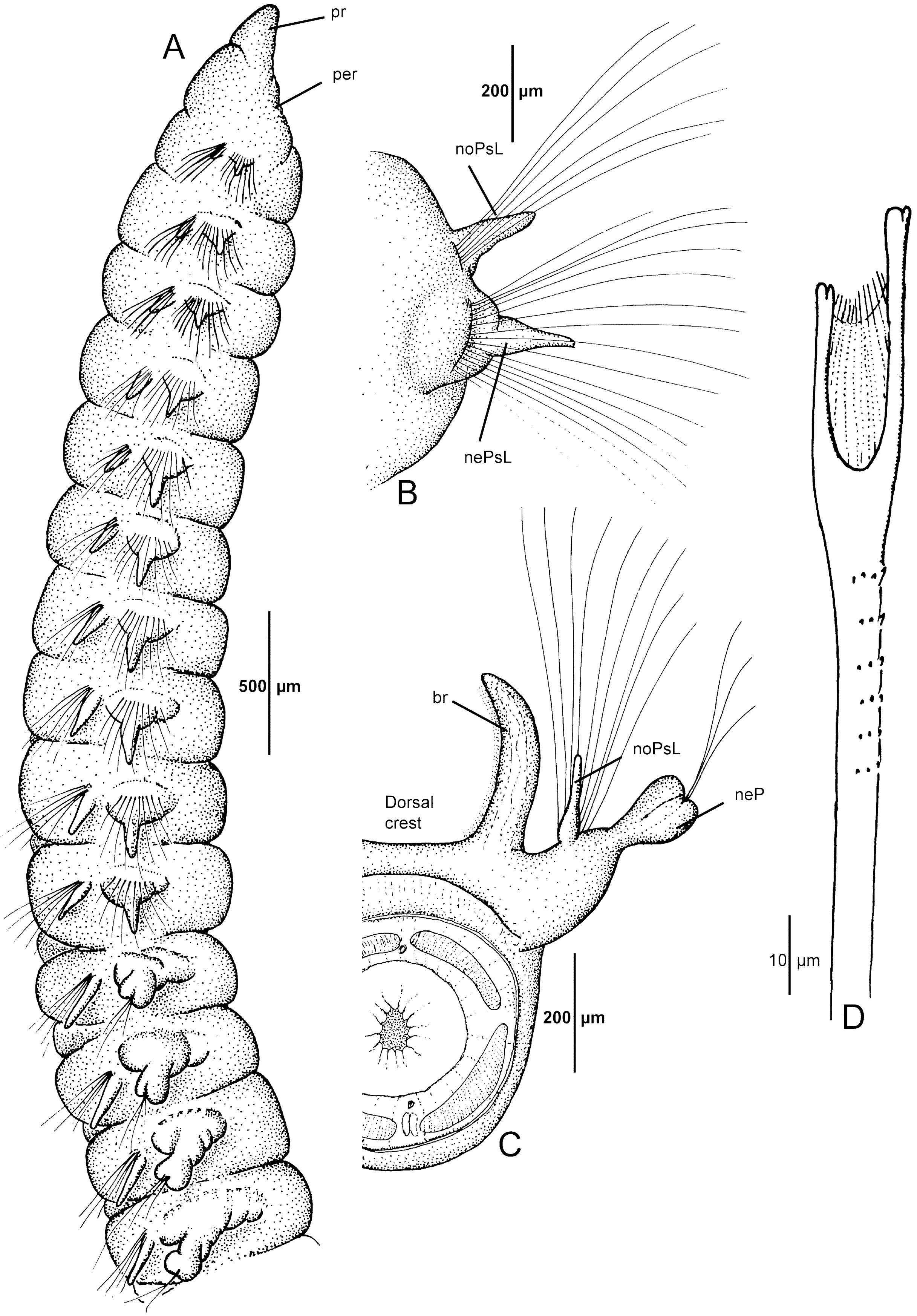

FIGURE 17. *Leitoscoloplos rankini* **n. sp.** Holotype (USNM 1013903). A, anterior end, right lateral view; B, thoracic parapodium, anterior view; C, posterior abdominal segment, posterior view; D, furcate seta.

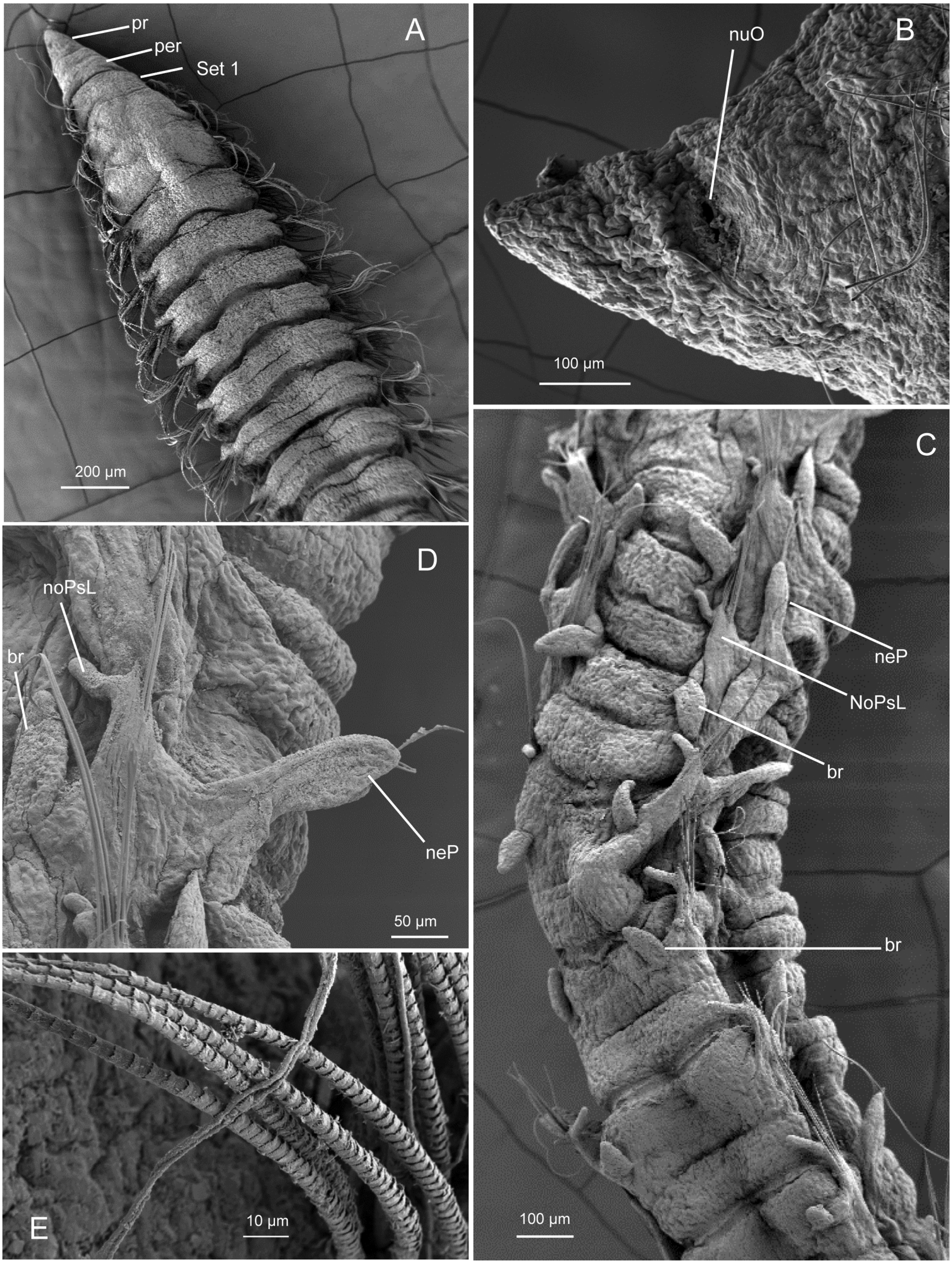

FIGURE 18. *Leitoscoloplos rankini* **n. sp.** Weddell Sea, ANDEEP I ANT XIX-3, R/V *Polarstern*, Sta. PS-61/046-3 (SEM, JAB). A, anterior end, dorsal view; B, Anterior end, left lateral view; prostomium, peristomium, and location of nuchal organ; C, middle abdominal segments, dorsal view; D, abdominal parapodium, anterior view; E, thoracic capillary setae.

Material examined. Drake Passage, ANDEEP I ANT XIX-3, R/V *Polarstern*, Sta. PS-61/43-2, 3959 m (1, SEM, JAB); Sta. PS-61/46-3, 2888 m (1, ZMH P-27799).—Weddell Sea, *Glacier* Sta. 69-19, 11 Mar 1969, 74.105°S, 32.603°W, 1622 m, **holotype** (USNM 1013903); ANDEEP III ANT XXII-3, R/V *Polarstern*, Sta. PS-67/121-6, 2618 m (1, ZMH P-27800).

Description. Holotype posteriorly incomplete, broken into three parts, 22 mm long, 1 mm wide for 50 setigerous segments; 10 thoracic setigers. Specimen from Sta. PS-61, 46-3 complete, 19 mm long, 0.8 mm wide for 80 setigers; with 11 thoracic setigers. Specimen from Sta. PS-67, 110-11 smaller, complete, in two parts, 7 mm long, 0.4 mm wide for 40 setigers; with 9 thoracic setigers.

Thoracic region widest part of body, with 9–11 setigers, rounded in cross section, not depressed (Fig. 17B). Transition between thorax and abdomen abrupt (Fig. 17A) or with one transitional segment. Abdominal segments becoming narrow in posterior one-third of body. Branchiae from setiger 18–21, small and stubby at first, becoming thin, about twice as long as notopodial postsetal lobes (Fig. 17C).

Prostomium conical, pointed; no eyespots (Figs. 17A, 18A); nuchal organs as large slit between prostomium and peristomium (Fig. 18B). Peristomium with one achaetous ring (Figs. 17A, 18A).

Thoracic segments all similar, with prominent postsetal lobes; notopodial postsetal lobes subtriangular (Fig. 17B); neuropodial postsetal lobe arising from low postsetal ridge (Fig. 17B). Middle and posterior abdominal parapodia dorsally elevated; elevated parapodia fused across dorsum, forming raised dorsal crest from which branchiae arise, best observed in posterior abdominal segments (Fig. 18C). Abdominal notopodia with narrow fingerlike postsetal lobe (Figs. 17C, 18D); neuropodia elongated, apically expanded, divided into two lobes between which setae arise (Fig. 17C); without subpodial flange.

Branchiae short at first (Fig. 18C–D), then becoming longer than notopodial lobes in far posterior segments (Fig. 17C).

Thoracic setae all crenulated capillaries (Fig. 18E); notopodial fascicles with 6–8 setae; neurosetae more numerous, arranged in two dense rows. Abdominal notopodia with 6–9 long capillaries and 3–4 furcate setae; each furcate seta with one tyne shorter than the other, both blunted on tips with apical notch; tynes connected by thin webbing composed of fine needles (Fig. 17D). Abdominal neuropodia with long and short capillaries; 1–2 very short and thin aciculae, sometimes protruding. Pygidium with two thin cirri.

Etymology. This species is named for the late Dr. John S. (Stubby) Rankin, Professor Emeritus of the University of Connecticut, friend, and teacher. Dr. Rankin was director of the sampling program during the International Weddell Sea Expedition (1968–69).

Remarks. *Leitoscoloplos rankini* **n. sp.** is a deep-sea species belonging to the *L. kerguelensis* group in having branchiae first present from the anterior abdominal region. The species differs from related forms in the nature of the inflated and elevated parapodia of the posterior abdominal segments. These parapodia are located on the posterior border of the segments and are elevated dorsally to form prominent crests. Further differences with related forms are discussed under *L. eltaninae* **n. sp.** (see above).

Distribution. Drake Passage and Weddell Sea, 1622–3959 m.

Leitoscoloplos drakei (Hartman, 1967) new combination

Figures 19–21

Orbiniella drakei Hartman, 1967: 106, pl. 34; Rozbaczylo 1985: 130.
Haploscoloplos sp. Hartman 1978: 156 (in part).
Haploscoloplos kerguelensis: Hartman 1978: 156 (In part). Not McIntosh 1885.

Material examined. Drake Passage, *Eltanin* Sta. 4-145, 11 Aug 1962, 60.00°S, 64.82°W, 3312–3532 m, **holotype** and **paratype** (USNM 55534–5).—Drake Passage, ANDEEP I ANT XIX-3, R/V *Polarstern*, Sta. PS-61/043-2, 3958 m (1, ZMH P-27789); PS-61/114-6, 2905 m, (1, ZMH P-27790).—Weddell Sea, *Glacier* Sta. 68-18, 1664 m (20, USNM 46602); Sta. 68-55, 2936 m (3, USNM 46603); Sta. 69-19, 1622 m (3, USNM 46608); Sta. 69-21, 2288 m (3, USNM 46609); Sta. 69-27, 4575 m (1, USNM 46610).—Weddell Sea, ANDEEP II ANT XIX/4, R/V *Polarstern*, Sta. PS-61/131-8, 3068 m, (1, ZMH P-27791); PS-61/132-4, 2085 m (2, ZMH P-27792); (1, SEM, JAB); Sta. PS-61/132-6, 2086 m (1, ZMH P-27793); Sta. PS-61/136-5, 4741 m (1, ZMH P-27794); Sta. PS-61/138-7, 4539 m, 4541 m (1, ZMH P-27795); Sta. PS-61/138-8, 4539 m (1, SEM, JAB), Sta. PS-138-9, 4538 m (2, JAB,

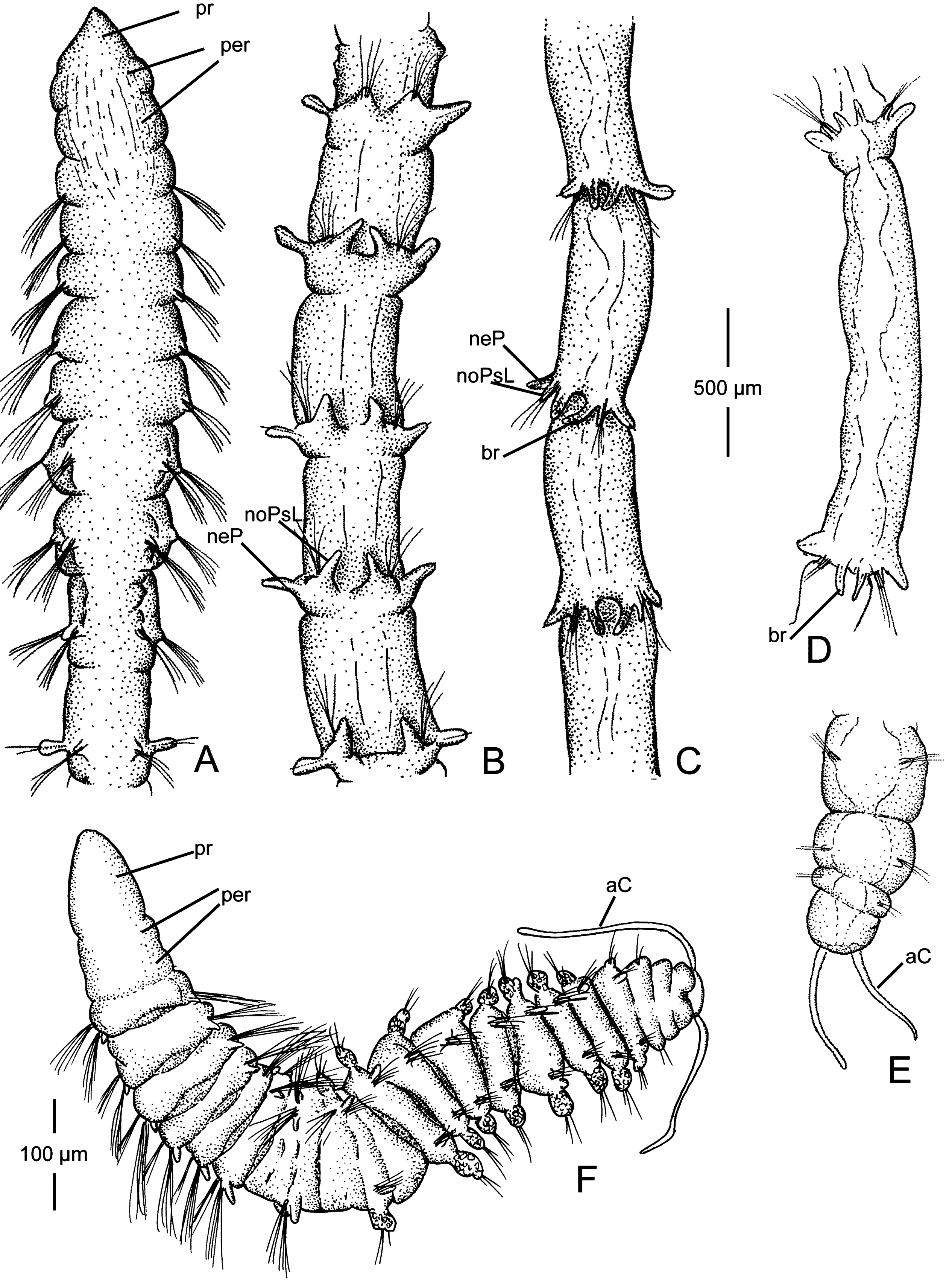

FIGURE 19. *Leitoscoloplos drakei* (Hartman, 1967). Weddell Sea (USNM 46602). A, anterior end, dorsal view; B, middle body segments, dorsal view; C, posterior body segments, dorsal view; D, far posterior segment, 5th from pygidium, dorsal view; E, pygidium and last three segments.—F, juvenile, entire animal in dorsal view (ANDEEP III, Sta. PS-67/078-8).

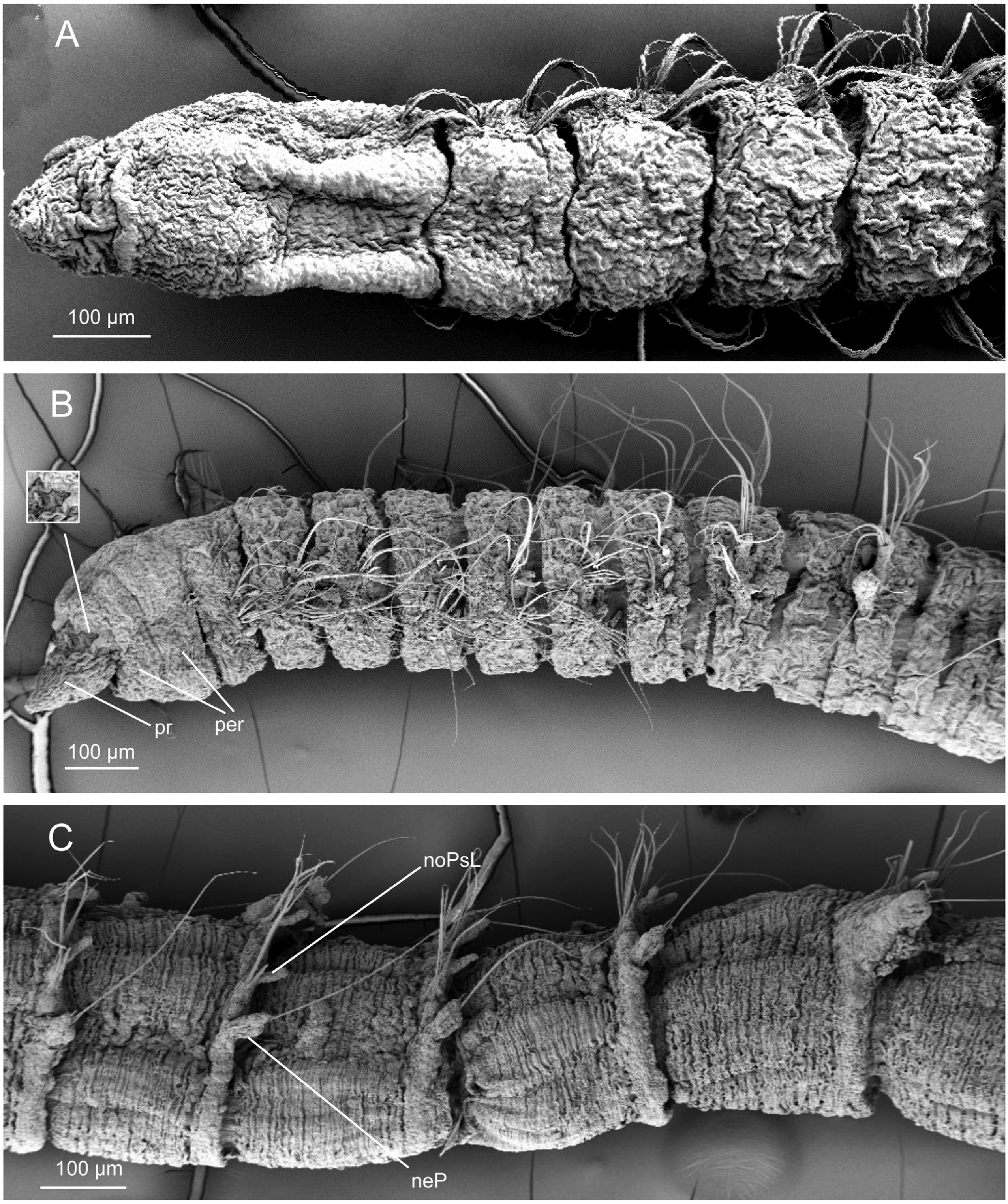

FIGURE 20. *Leitoscoloplos drakei* (Hartman, 1967). Weddell Sea, ANDEEP II Survey, Sta. PS-61/138-10, A–C, SEMs of a single specimen (JAB). A, anterior end, dorsal view; B, anterior end, left lateral view [inset of nuchal organ, not to scale]; C, middle body segments, dorsolateral view.

photographic records); Sta. PS-61/138-10, 4537 m (1, SEM, JAB); ANDEEP III ANT XXII-3, R/V *Polarstern*, Sta. PS-67/078-8, 2167 m (1 juvenile, JAB); PS-67/102-8, 4803 m (1, ZMH P-27798); Sta. PS-67/142-7, 3406 m (1, ZMH P-27797).—South African Basin, ANDEEP III Sta. PS-67/021-3, 4551 m (1, ZMH P-27796).

Description. Body thin, threadlike, fragile, largest complete Weddell Sea specimens 15 mm long, 0.35–0.5 mm wide for 36 setigerous segments; type specimens from Drake Passage shorter, due to absence of most of abdominal region. Color in life (ANDEEP I–II specimens) iridescent blue cuticle on transparent body (Fig 21A); in alcohol opaque white to light tan.

Thoracic region with 8–9 short, annulated setigers, with last segment sometimes longer, transitional (Figs. 19A, 20B); thoracic region followed by long abdominal region composed of distinctly elongated segments with parapodia located on elevated ridge on posterior border of each segment (Figs. 19 B–C, 20 C); anterior and middle abdominal segments up to 2.5x longer than wide; far posterior segments over 7x longer than wide (Figs. 19D, 21B); fragile nature of far posterior segments probably accounting for lack of complete specimens in preserved samples. Demarcation between thorax and abdomen also identified by a reduced number of neurosetae and elongation of neuropodial lobes.

Prostomium narrowing anteriorly, conical in shape (Figs. 20A–B, 21A–C) sometimes appearing pointed (Fig. 19A); appearing dorsoventrally flattened with SEM in lateral view (Fig. 20B); eyespots and nuchal organs not observed in light microscopy; nuchal organs observed in SEM (Fig. 20B, inset); peristomium swollen, sometimes elongate and fused with setiger 1 (Fig. 20A), weakly divided into two separate annulations (Figs. 19A, 20B), or not.

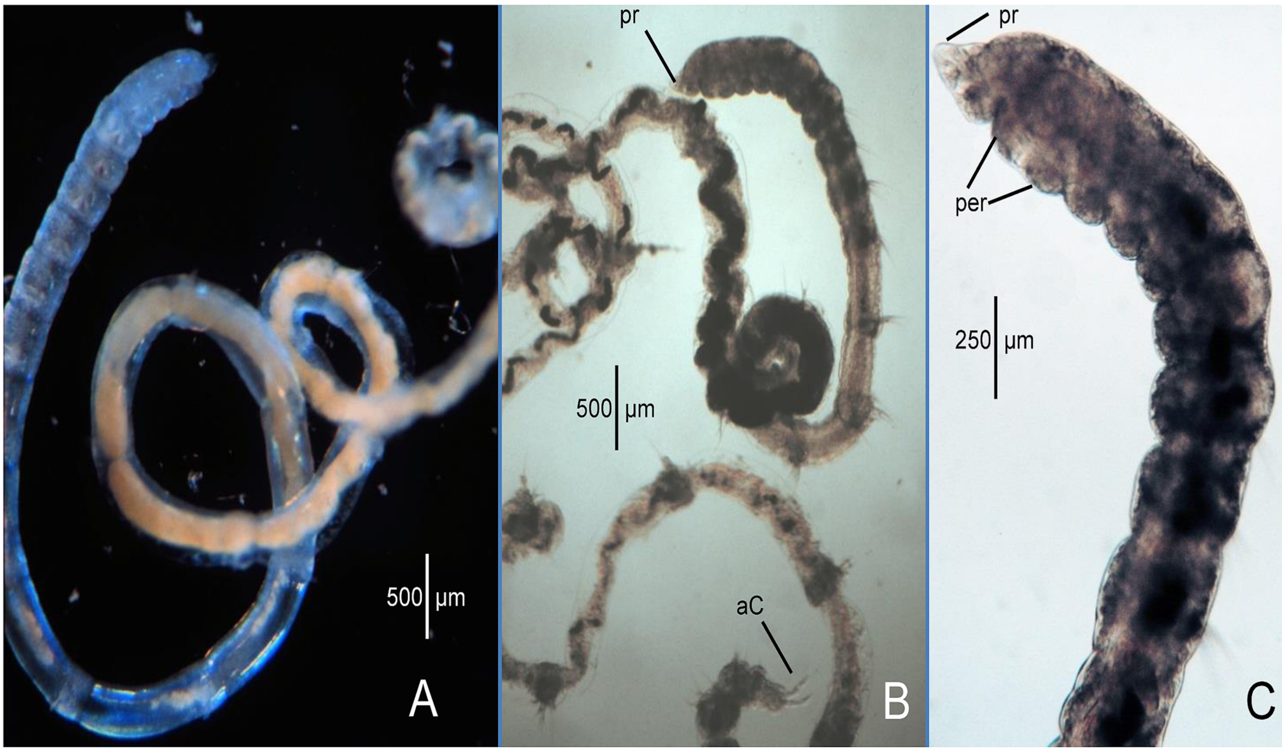

FIGURE 21. *Leitoscoloplos drakei* (Hartman, 1967). Weddell Sea, ANDEEP II Survey, Sta. Sta. PS-61/138-9. A–C, two specimens photographed from life. A, specimen viewed with reflected light, B, specimen viewed with transmitted light, note pygidium with two anal cirri, C, same specimen, detail, lateral view of anterior end.

Thoracic parapodial lobes short, stubby, indistinct (Figs. 19A, 20B); notopodia becoming elongated and cirriform in anterior abdominal setigers (Fig. 19B), then becoming narrower and more fingerlike in posterior setigers (Fig. 19C–D). Abdominal neuropodia thickened, apically expanded (Figs. 19B–D, 20C).

Thoracic noto- and neurosetae thin crenulated capillaries. Abdominal notosetae including 6–8 capillaries, furcate setae absent; abdominal neurosetae including 1–2 long capillaries; acicula imbedded, rarely with tip emergent.

Branchiae from setiger 18–20 (Fig. 19C); branchial region missing from type specimens. Pygidium with two thin anal cirri (Figs. 19E–F, 21B).

Description of juvenile. A complete juvenile believed to belong to this species was found in a sample from the Weddell Sea (Sta. PS-67/078-8) as part of the ANDEEP III Program on the RV *Polarstern*. Specimen complete, consisting of 18 setigerous segments 1.24 mm long and 0.15 mm wide (Fig. 19F). Thorax with seven setigerous segments; separation between thoracic segments and abdomen abrupt. All thoracic segments narrow, wider than long; first two abdominal segments longer, with setiger 8 about as long as wide; following abdominal segments narrow, wider than long. Thoracic noto- and neuropodia with simple fingerlike postsetal lamellae; abdominal notopodia also with simple postsetal lamellae; abdominal neuropodia expanded into inflated glandular lobe bearing weakly notched tip. Thoracic noto- and neurosetae all camerated capillaries; abdominal notosetae also camerated capillaries; abdominal neurosetae simple, smooth capillaries, some minute, hairlike. Branchiae not developed on this juvenile. Pygidium with two lobes surrounding anus; with two long, thin anal cirri.

Remarks. *Leitoscoloplos drakei* is a small, fragile deep-sea species that was depicted by Hartman (1967: pl. 34) as having two distinct asetigerous segments preceding the first setiger and with branchiae absent, resulting in her referring the species to the genus *Orbiniella*. The illustrated specimen was the paratype. The peristomial region of that specimen, upon subsequent examination, was found to have only a single asetigerous segment. The entire peristomial area is swollen and stretched on all specimens and distinct segmental boundaries are not clear, although extra grooves may be apparent providing an appearance of an extra asetigerous segment, but this is variable. Since this species has branchiae and the abdominal parapodia are elevated and modified, it belongs to the subfamily Orbiniinae instead of Microrbiniinae and is here reassigned to the genus *Leitoscoloplos*. Branchiae are lacking on the type specimens. The Weddell Sea specimens, however, are more complete, with most retaining all or part of their abdominal region.

In life, complete specimens are very fragile, with posterior abdominal segments at least 7x as long as wide. It is unlikely that such specimens would often remain intact in preservation with the typical benthic sieving procedures. However, on the ANDEEP I–II cruises, an elutriation device was used where the organisms were floated out of the sediment on to a 63µm sieve. These specimens were subsequently set up in Petri dishes in a refrigerator for later examination in life. On those specimens the body in life by reflected light was observed to be of an iridescent blue color (Fig. 21A). Branchiae were clearly present by at least setiger 20. Further, it was possible to observe the pygidium and two thin anal cirri (Fig. 21B). *Leitoscoloplos drakei* differs from other species in the nature of the elongated segments, the overall threadlike appearance of the body, and lack of furcate setae.

Distribution. Drake Passage, 3312–3532 m; Weddell Sea, 1622–4575 m; South African Basin, 4551 m.

Genus *Scoloplos* de Blainville, 1828

Type species: *Lumbricus armiger* Müller, 1776, by monotypy.
Synonym: *Scolaricia* Eisig, 1914. **Type-species:** *Scolaricia typicus* Eisig, 1914, by monotypy. *Fide* Day 1973.

Diagnosis. Prostomium pointed, usually prolonged; single achaetous peristomial ring. Branchiae first present from middle or posterior thoracic setigers or from abdominal setigers (8–26). Posterior thoracic setigers with 0–2 postsetal lobes and 0–2 subpodial lobes, never more than four lobes of both types combined; not forming ventral fringes. Thoracic neurosetae including blunt, inconspicuous uncini, few in number, not in distinct rows, and accompanied by numerous crenulated capillaries; furcate setae usually present; heavy spear-like spines and bristle-topped setae absent. Abdominal neuropodia with embedded, non-projecting acicula. Abdominal noto- and or neuropodial flail setae present or absent.

Remarks. The definition of *Scoloplos* is here emended and restricted to species having only inconspicuous spines in thoracic neuropodia accompanied with numerous capillaries, and branchiae from setiger 8–26. *Leodamas*, usually treated as a subgenus of *Scoloplos,* was raised to full generic status by Blake (2000). The latter genus has large, conspicuous spines in thoracic neuropodia, with few or no accompanying capillaries, and branchiae usually from setigers 4–6, however, another group of species has branchiae from posterior thoracic or anterior abdominal setigers. Another, but less reliable distinction between the two genera is that the abdominal neuropodial aciculae tend to be small and imbedded in *Scoloplos* species and larger and projecting in *Leodamas* species.

Pettibone (1957) distinguished between *Scoloplos* and *Leodamas* in a different manner. *Scoloplos* species were said to have a papilla in the middle of the thoracic neuropodial lobes, while *Leodamas* species lacked these papillae. While many species of *Leodamas* do have low, rounded postsetal lobes and lack papillae or cirriform lobes throughout much of the thoracic region, most species develop prolonged postsetal lobes in posterior thoracic setigers. According to Hartman (1948), the thoracic neuropodial postsetal lobes of *Leodamas verax* Kinberg, the type-species of *Leodamas*, are triangular and undivided. This structure has been confirmed in the present study.

Thus, the presence of a prolonged postsetal lobe on the thoracic neuropodium of the type-species of *Leodamas* would appear to preclude its use as a definitive character for *Scoloplos sensu stricto*.

The genus *Scolaricia* was originally distinguished from *Scoloplos* on the basis of having flail setae in abdominal neuropodia (Eisig, 1914). However, these setae have now been found in several genera and since the character is homoplasic within the Orbiniidae and not unique to *Scolaricia*, the genus was referred to synonymy with *Scoloplos* by Day (1973).

In the present study, two previously undescribed species of *Scoloplos* were encountered: *S. bathytatus*, **n. sp.**, and *S. suroestense*, **n. sp**. Another species, *S. armiger,* the type species*,* has been reported from South America (Ehlers, 1901; Rozbaczylo, 1985), but was not found in the present study.

***Scoloplos bathytatus* new species**

Figure 22, 23A–F

Scoloplos (*Leodamas*) *marginatus*: Hartman 1967: 108 (in part, Sta. 480). Not Ehlers 1897.
Scoloplos (*Leodamas*) *ohlini*: Hartman 1978: 156. Not Ehlers, 1901.
Haploscoloplos kerguelensis: Hartman 1978: 156 (in part, some found in Sta. 68-1). Not McIntosh 1885.

Material examined. Drake Passage, *Eltanin* Sta. 6-384, 25 Dec 1962, 57.03°S, 56.47°W, 3138–3426 m, 1 **paratype** (USNM 60685); R/V *Polarstern*, ANDEEP I, Sta. PS-61/042-6, 3692 m. 28 Jan 2002, box core, (1, ZMH P-27783); Sta. PS-61/046-3, 2888 m, (1, ZMH P-27784); Sta. PS-61/046-5, 30 Jan 2002, 2893.6 m, box core (1, ZMH P-27785); Sta. PS-61/114-6, 2905 m (1, ZMH P-27786); Sta. PS-61/114-8, 2905 m (1, ZMH P-27787; 1, SEM, JAB).—near South Orkney Islands, *Eltanin* Sta. 7-480, 15 Feb 1963, 58.13°S, 44.85°W, 2800 m, 2 **paratypes** (USNM 56464).—near South Georgia, *Eltanin* Sta. 9-720, 7 Sep 1963, 56.10°S, 34.02°W, 2828–2873 m, **holotype** (USNM 60684).—Weddell Sea, *Glacier* Sta. 69-22, 3111 m (3, USNM 46611); *Glacier* Sta. 68-1, 13 Mar 1969, 73°28.4′S, 30°26.9′W, 650 m (8 **paratypes**, USNM 1013915); R/V *Polarstern*, ANDEEP III ANT XXII-3, R/V *Polarstern*, Sta. PS-67/078-4, 2164 m (1, ZMH P-27788); Sta. PS-67/121-12, 2657 m (1, SEM, JAB); Sta. PS-67/153-4, 2079 m (1, SEM, JAB).

Description. A small species, mostly represented by posteriorly incomplete specimens; holotype 4 mm long, 0.5 mm wide for 20 setigers; paratype (USNM 60685) 7.5 mm long, 0.5 mm wide for 29 setigers; specimen from (ZMH P-27788) larger, complete in two parts, 13 mm long for about 57 setigers. Color in alcohol: light tan.

Body cylindrical throughout; thoracic region with 11–12 setigerous segments; peristomium and first 3–4 setigers swollen, partially inflated, with segmental boundaries somewhat obscured (Figs. 22A, 23A–B); subsequent segments smooth, distinct from one another, with prominent dorsal intersegmental annulations apparent from between setigers 4 and 5; each annulation with medial swollen area, sometimes bearing black reticulated pigment (Figs. 22A, 23A–B); ventral annulations apparent from setigers 13–14.

Prostomium elongated, pointed on anterior margin (Figs. 22A, 23A–B); no eyespots; nuchal slits observed with SEM (Fig. 23B–C); peristomium with one simple achaetous ring.

Setigers 1–2 lacking parapodial appendages, but with well-developed setal fascicles. Notopodia with minute postsetal lamellae from setiger 3 (Fig. 22A), becoming longer, cirriform over subsequent segments (Fig. 22B); thoracic neuropodia dorsoventrally elongated, with postsetal lamellae present from setiger 3–4 (Fig. 22B); initially lamellae fingerlike, becoming triangular near end of thoracic region (Fig. 22B); abdominal notopodia, elongate, fingerlike as in thoracic segments (Fig. 23E); abdominal neuropodia elongated, flattened, expanded apically, with short ventral cirrus (Fig. 23E); interramal cirri absent. Branchiae from setiger 9–10, continuing to end of fragments; each branchia broad basally, somewhat flattened (Figs. 22A, 23E).

Thoracic notopodia with fascicles of crenulated capillaries (Fig. 22E); with those of setigers 2–5 unusually long (Fig. 22A); abdominal notopodia with 2–3 non-crenulated, smooth capillaries and 3–4 furcate setae (Fig. 22C). In light microscopy, furcate setae appearing to have a web between two unequal tynes (Fig. 22C); in SEM furcate setae observed with a curved array of 8–9 teeth, fused basally, and partly free at tips connecting and fused to tynes; both tynes with a distinct apical opening (Fig. 23F). Thoracic neurosetae with 1–2 rows of uncini (Fig. 22D) and 2–3 rows of long crenulated capillaries (Fig. 22E); uncini blunt tipped, curved, bearing distinct ribs (Figs. 22D, 23D); abdominal neuropodia with 2–3 embedded or partially protruding aciculae. Posterior end with two dorsolateral anal cirri (ZMH P-27788).

A juvenile from ANDEEP I Sta. PS-61, 046-5 (ZMH P-2785), 1.5 mm long, and with same expanded thorax and long capillary notosetae found in adults. Thorax with nine setigers, branchiae from setiger 8. Noto- and neuropodia first evident from setiger 3. Fascicles of thoracic noto- and neurosetae fewer than in adults, arranged in no more than two rows; 2–3 neuropodial uncini per fascicle, only found on setigers 3–5, these with distinct ribs along shaft forming shelves along one side, with tip of uncini surrounded by partial hyaline hood on shortest emerging setae; crenulated capillaries with individual facets rib-like, each with finely barbed or serrated border. Abdominal notopodia with narrow, fingerlike lamella, slightly enlarged and rounded apically; abdominal neuropodia expanded, with short ventral cirrus. Abdominal notosetae including 1–2 furcate setae and 3–4 long, minutely serrated capillaries; abdominal neurosetae smooth capillaries or with minute, barely discernible barbs.

Etymology. *Bathytatus,* Greek for deepest.

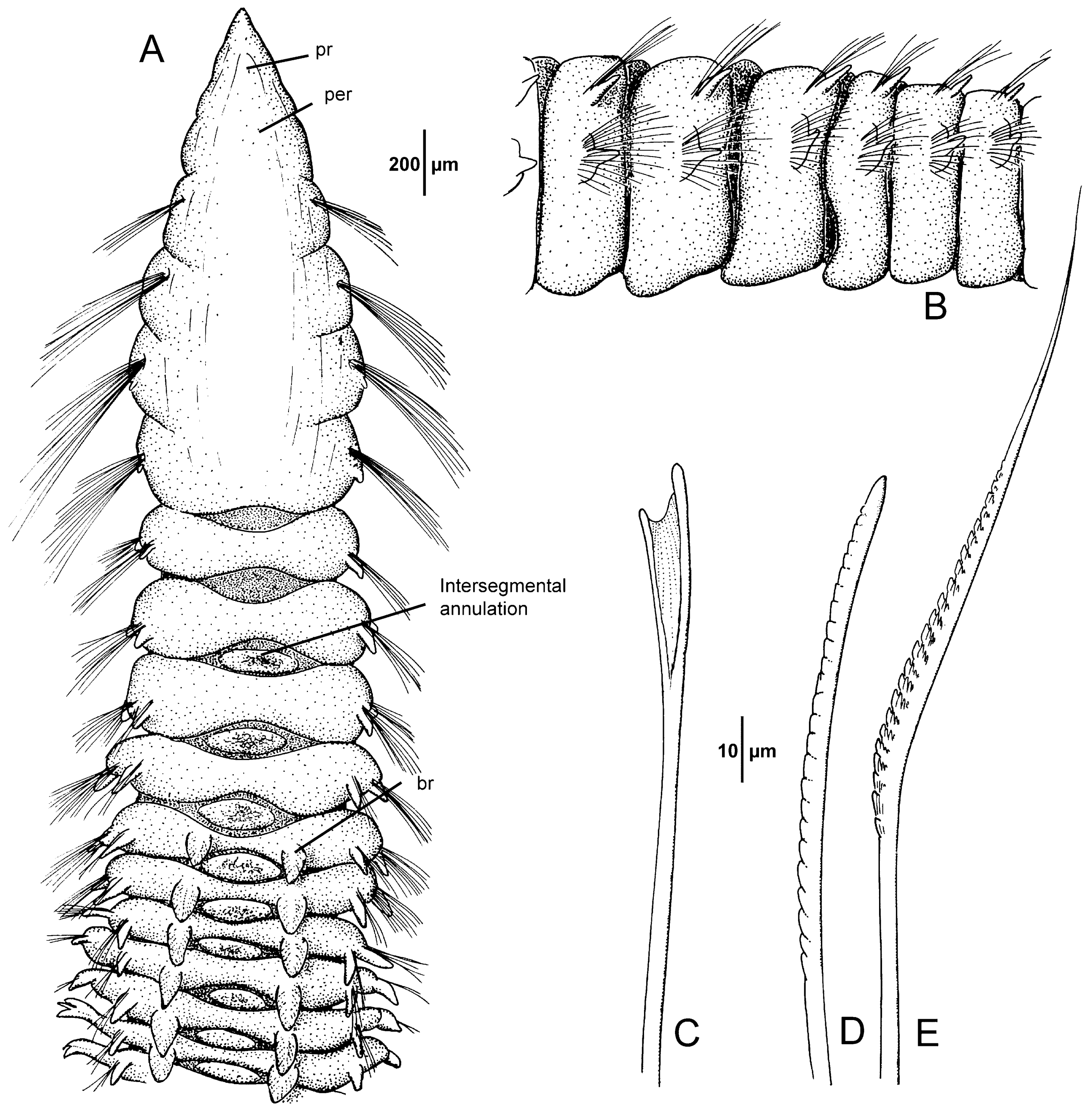

FIGURE 22. *Scoloplos bathytatus* **n. sp.** Holotype (USNM 60684). A, anterior end, dorsal view; B, thoracic setigers 6–11, left lateral view; C, furcate seta; D, thoracic neuropodial uncinus; E, thoracic neuropodial capillary seta.

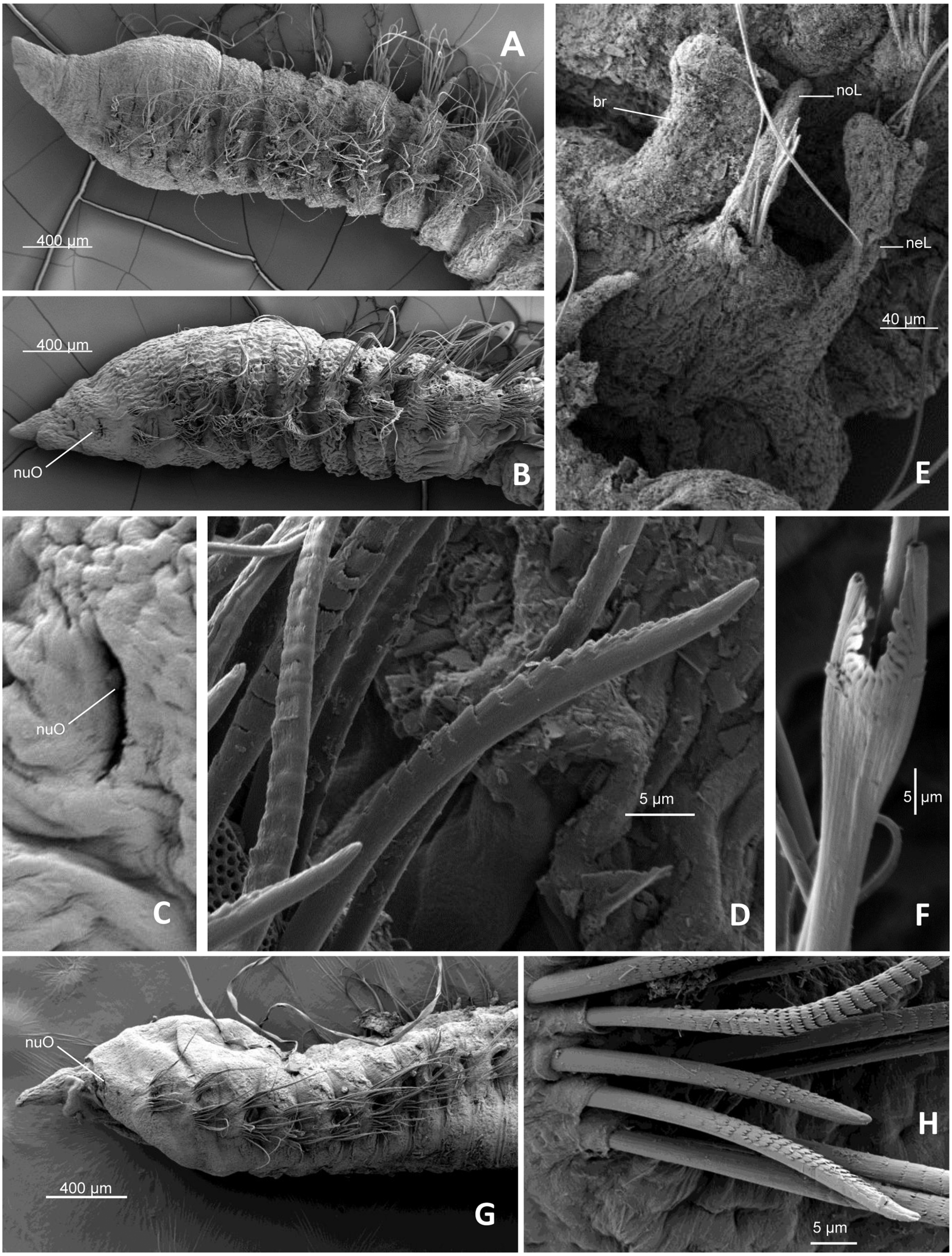

FIGURE 23. *Scoloplos bathytatus* **n. sp.** (ANDEEP III Sta. PS/121-12). A, anterior end, left lateral view; B, second specimen, left lateral view; C, nuchal organ detail from B, not to scale; D, thoracic neuropodial uncini; E, abdominal parapodium, anterior view; F, furcate seta, arrows denote openings on tip of tynes.—*Scoloplos suroestense*. Paratype (USNM 1013918). G. anterior end, left lateral view; H, thoracic neuropodial uncini.

Remarks. *Scoloplos bathytatus* **n. sp.** is a small deep-sea species that differs from related forms in having a cylindrical body throughout, and unusually long capillary notosetae in anterior setigers. The intersegmental annulations are especially prominent in this species, as is the swollen and elongated anterior end. The closest relative to *S. bathytatus* **n. sp.** appears to be *S. ehlersi* Blake, 1985, described from sediments near deep-sea hydrothermal vents at the Galápagos Rift off Ecuador. *S. ehlersi* superficially resembles *S. bathytatus* **n. sp.** in size and form, but differs significantly in having branchiae from setiger 21, an anterior abdominal segment, instead of setigers 9–10 (Blake 1985).

Distribution. Off South America, in subantarctic areas from the Drake Passage to South Georgia, 2800–3463 m; Weddell Sea, 650–3111 m.

Scoloplos suroestense new species

Figures 23G–H, 24

Material examined. Juan Fernandez Islands, Chile Bay behind Punta Suroestense, *Anton Bruun* Cruise 12, Sta. 134, 13 Dec 1965, 33°34′S, 78°55′W, shallow subtidal (<5m), **holotype** and 3 **paratypes** (USNM 1013917–8).

Description. Holotype complete, 12 mm long and 1.2 mm wide for approximately 100 segments; paratypes smaller, up to 75 segments. First four thoracic segments distinctly inflated, due to inverted proboscis visible dorsally through body wall (Figs. 23G, 24A–B); following thoracic segments distinctly depressed (Figs. 23A, 24B–C); abdominal segments rounded in cross section (Fig. 24D). Thorax with 10–15 setigers, depending upon size of specimens; smallest specimens with fewest thoracic segments, larger specimens with most thoracic segments; last 1–2 thoracic segments appearing transitional with abdominal region in having fewer, more tightly grouped setae. Color in alcohol: light tan.

Prostomium triangular, pointed anteriorly (Figs. 23G, 24A–B); no eyespots; with two ciliated dorsolateral nuchal organs on posterior border with peristomium of holotype (Fig. 24A); with SEM, nuchal organ of paratype a slit (Fig. 23A). Peristomium with a single achaetous ring completely fused to setiger 1.

Thoracic parapodia with digitiform postsetal lobes from setiger 1 (Fig. 24A–B); neuropodial lobes slightly shorter than notopodial lobes. Anterior abdominal postsetal lobes similar to those of thoracic region, with neuropodial lobes becoming reduced to short papillae in middle body segments; notopodial lobes remaining long, but shorter than branchiae (Fig. 24D). No interramal or subpodial lobes present.

Notosetae all crenulated capillaries throughout; furcate setae entirely absent. Thoracic neurosetae including 8–9 uncini located anterior to 12–14 crenulated capillaries (Figs. 23H, 24C); uncini slender, no broader than capillaries, with blunted curved tips partially covered by hyaline hood (Fig. 24E–F), in SEM hood appearing as a sheath extending from tip of shaft posteriorly (Fig. 23H); shafts with ribs that in light microscope and SEM consist of transverse rows of barbs (Figs. 23H, 24E–F), capillaries with transverse rows of barbs (Figs. 23H, 24G). Abdominal neurosetae including 2–3 straight pointed uncini (Fig. 24H) and 3–4 capillaries.

Branchiae from setiger 12–17 or first 1–2 abdominal segments (Fig. 24B).

Pygidium with terminal anus, encompassed by broad, thickened lobe, without anal cirri.

Remarks. *Scoloplos suroestense* **n. sp.** is unusual among species of *Scoloplos* in having branchiae first present from anterior abdominal setigers. In this regard, the species is closely related to *S. normalis* (Day, 1977) and *S. difficilis* Day, 1977, both from Australia (Hartman 1957; Day 1977; Mackie 1987). *Scoloplos normalis*, originally described in the genus *Leitoscoloplos* by Day (1977), was transferred to *Scoloplos* by Mackie (1987) after he discovered that the paratypes had a few short, robust and weakly serrated uncini with a close adhering hood among neuropodial capillaries of the first three thoracic setigers; one small specimen had uncini distributed over a greater range of setigers. *Scoloplos suroestense* **n. sp.**, in contrast, has 8–9 uncini and 12–14 capillaries in all thoracic neuropodia. Further the uncini of *S. suroestense* **n. sp.** have rows of barbs all along the shaft and bear a thin hyaline sheath at the tip. The nature of the thoracic neuropodial uncini on *S. suroestense* **n. sp.** also differs from the smooth shafted uncini reported by Day (1977) for *S. difficilis.*

Etymology. The epithet is taken from Punta Suroestense, near the type locality in the Juan Fernandez Islands.

Distribution. Juan Fernandez Islands, shallow subtidal.

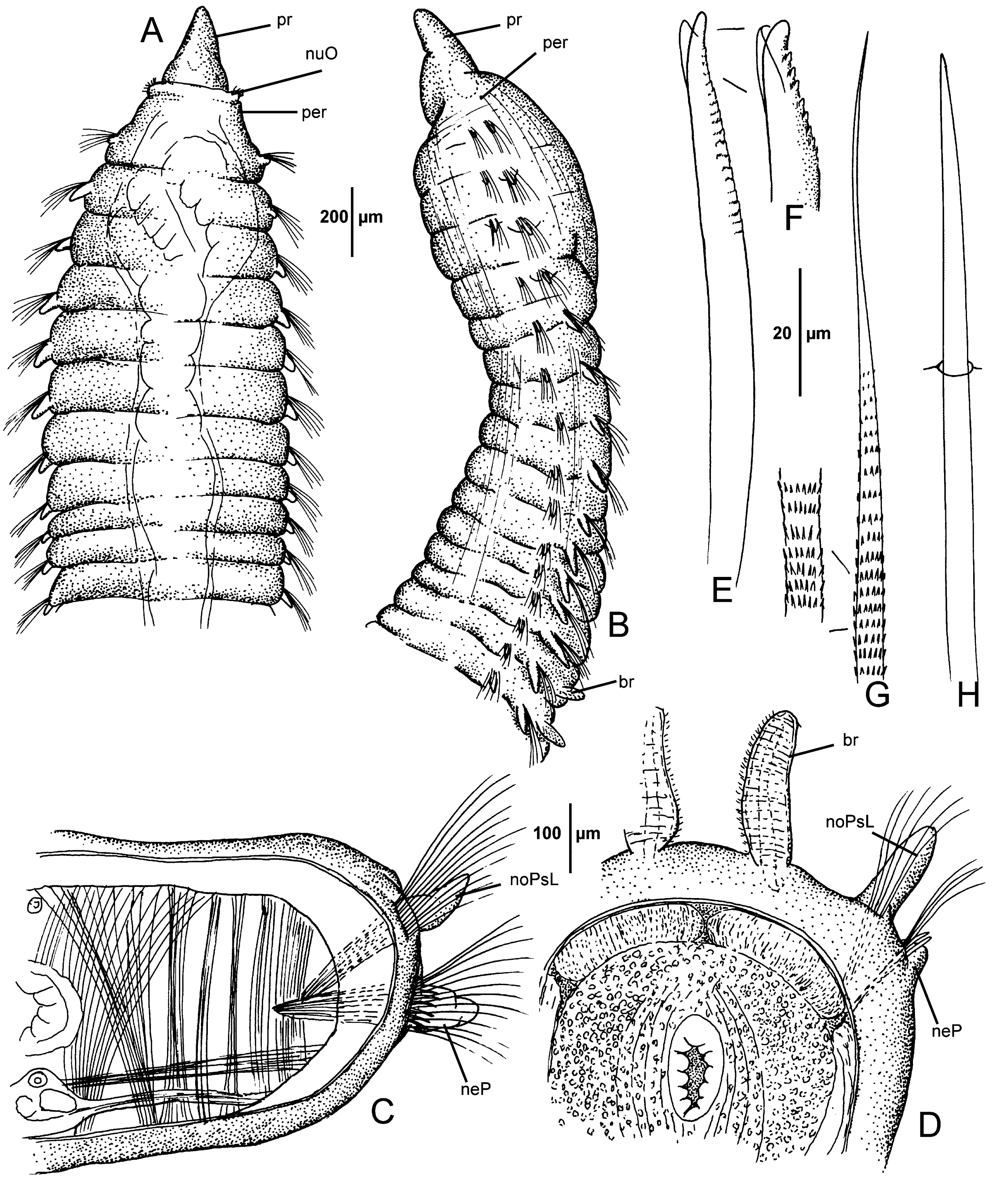

FIGURE 24. *Scoloplos suroestense* **n. sp.** Holotype (USNM 1013917). A, anterior end, dorsal view; B, anterior end, left lateral view; C, thoracic parapodium, anterior view; D, abdominal parapodium, anterior view; E–F, thoracic neuropodial uncini; G, thoracic neuropodial capillary seta; H, abdominal neuroseta.

Genus *Leodamas* Kinberg, 1866

Type-species: *Leodamas verax* Kinberg, 1866, by monotypy.

Synonym: *Branchethus* Chamberlin, 1919. **Type-species:** *Branchethus latum* Chamberlin, 1919, by monotypy. *Fide* Hartman 1957.

Diagnosis. Prostomium pointed on anterior margin, usually prolonged; most species with a single achaetous peristomial segment; immature adults of some species with two achaetous peristomial segments and adults of at least one species with vague indication of two achaetous segments. Branchiae single or multiple branches, either from anterior thoracic setigers 4–7 or from posterior thoracic setigers or first abdominal setigers. Posterior thoracic setigers with 0–2 postsetal lobes and 0–2 subpodial lobes, never more than four lobes of both types combined; not forming ventral fringes. Thoracic neuropodial uncini large, conspicuous arranged in one to many distinct vertical rows, with accompanying capillaries few or entirely lacking; heavy spear-like spines and bristle-topped setae absent. Abdominal neuropodia with projecting aciculae, either thin and inconspicuous or large and curved apically. Abdominal noto- or neuropodial flail setae present or absent.

Etymology. The generic name *Leodamas* Kinberg, 1866, is formed from *Leo*, Greek for lion, and *dama*, Latin for deer. It seems likely that Kinberg noticed the branches of the thoracic notopodial lamellae and compared them with antlers of a deer, hence the name. *Leo* is masculine, *dama* can be both masculine and feminine, but I believe this genus name is masculine as evidenced by the masculine name of the type species, *verax*.

Remarks. *Leodamas* was raised to full generic status by Blake (2000). A phylogenetic analysis demonstrated that *Leodamas* species were more closely related to species of *Orbinia, Phylo*, and *Naineris* than to *Scoloplos sensu stricto*. Previously, *Leodamas* was regarded as a subgenus of *Scoloplos*. The chief difference between species of *Scoloplos* and *Leodamas* is with the form and arrangement of the thoracic neuropodial uncini. In species of *Scoloplos* the thoracic neuropodial uncini are relatively thin, inconspicuous, and accompanied in each setal row by numerous capillaries. In contrast, the thoracic neuropodial uncini of all species of *Leodamas* are large, conspicuous and arranged in 1–7 (usually 1–4) distinct vertical rows; capillaries if present, are few in number, in separate fascicles, usually dorsal to the uncini, and relatively inconspicuous. One unique feature of several species of *Leodamas,* including the type-species, *L. verax,* is that the anterior row of uncini often extends ventrally, curving under other rows of uncini, continuing dorsally as a short posterior row. Other species of *Leodamas* confirmed to have this feature include *L. cirratus*, *L. cochleatus*, *L. cylindrifer*, *L. hyphalos* **n. sp.**, *L. maciolekae* **n. sp**., *L. marginatus,* and *L. tribulosus*. By having such large and heavy thoracic neuropodial uncini, species of *Leodamas* are more similar to species of *Naineris*, *Orbinia*, and *Phylo* than to *Scoloplos*. Most species of *Leodamas* have emergent neuropodial aciculae in abdominal segments. The appearance of branchiae on anterior thoracic setigers in most of the better known species of *Leodamas* is usually considered as another way to separate these species from *Scoloplos* where branchiae begin more posteriorly. However, some *Leodamas* species with rows of heavy thoracic neuropodial uncini do have branchiae first present from a more posterior setiger.

In order to better understand the relationships of the South American and Antarctic species of *Leodamas* encountered as part of this study, species currently assigned to *Leodamas* either as a full genus or as a subgenus to *Scoloplos* were reviewed based largely on the literature. This review suggests that species of *Leodamas* may be divided into two groups (Table 1): (A) Species with branchiae beginning from an anterior thoracic setiger (4–7) and with the thoracic neuropodial uncini typically occurring in three or more vertical rows and (B) Species with branchiae beginning from a posterior thoracic or anterior abdominal setiger and with thoracic neuropodial uncini typically occurring in only 1 or 2 vertical rows. In general this dichotomy holds up well, however *L. acutissimus* (Hartmann-Schröder, 1991) is intermediate with branchiae beginning from a posterior thoracic segment and with 3–4 vertical rows of thoracic neuropodial uncini. The following list includes all known species of *Leodamas* either derived from the literature or encountered in this study. Table 1 includes the main morphological characters as taken from key references or from actual observations. There are likely additional species of *Scoloplos* that may eventually be reassigned to *Leodamas*. The following 29 species of *Leodamas* are currently recognized.

Species with branchiae from an anterior thoracic setiger (4–7); thoracic neuropodial uncini in 3–4 or more vertical rows:

Leodamas verax Kinberg, 1866). **Type species**
Leodamas brevithorax (Eibye-Jacobsen,2002) **New combination**
Leodamas chevalieri (Fauvel, 1902) **New combination**
Leodamas cochleatus (Ehlers, 1900) **New status**

Leodamas cirratus (Ehlers, 1897) **New combination**
[*Aricia ohlini* Ehlers, 1897] **New synonymy**
Leodamas dendrocirrus (Day, 1977) **New combination**
Leodamas dubius (Tebble, 1955)
[*Scoloplos* (*Leodamas*) *rubra australiensis* Hartmann-Schröder, 1979] *Fide* Eibye-Jacobsen 2002
Leodamas fimbriatus (Hartman, 1957) **New combination**
Leodamas gracilis (Pillai, 1961) **New combination**
Leodamas hamatus Dean & Blake, 2015
Leodamas hyphalos **n. sp.**
Leodamas johnstonei (Day, 1934) **New combination**
[*Scoloplos* (*Leodamas*) *uniramus* Day, 1961] *Fide* Day 1977
Leodamas latum (Chamberlin, 1919) **New combination**
Leodamas marginatus (Ehlers, 1897)
[*Aricia marginata mcleani* Benham, 1921] **New synonymy**
[*Scoloplos* (*Leodamas*) *naumovi* Averincev, 1982] **New synonymy**
Leodamas orientalis (Gallardo, 1967) **New status**
Leodamas perissobranchiatus **n. sp.**
Leodamas rubrus (Webster, 1879)
Leodamas thalassae (Amoureux, 1982) **New combination**
Leodamas tribulosus (Ehlers, 1897)
[*S. armiger trioculata* Hartmann-Schröder, 1962b] **New synonymy**)

Species with branchiae from a posterior thoracic setiger or anterior abdominal setiger (12–40); thoracic neuropodial uncini in 1–2 vertical rows.

Leodamas acutissimus (Hartmann-Schröder, 1991) **New combination**
Leodamas agrestis (Nonato & Luna, 1970) **New combination**
Leodamas cylindrifer (Ehlers, 1904) **New combination**
[*Scoloplos* (*Leodamas*) *dendrobranchus* (Hartman, 1957)]
Leodamas maciolekae **n. sp.**
Leodamas madagascarensis (Fauvel, 1919) **New combination**
Leodamas mazatlanensis (Fauchald, 1972) **New combination**
Leodamas minutus López, Cladera & San Martín, 2003
Leodamas platythoracicus López, Cladera & San Martín, 2003
Leodamas texana (Maciolek & Holland, 1978) **New combination**
Leodamas treadwelli (Eisig, 1914)
Incertae sedis Alcandra robustus Kinberg, 1866.

As part of this review several potential taxonomic problems have been identified, largely associated with the nature of the abdominal neuropodial uncini, including their size and the degree of curvature of the curved or hooked tip. *Leodamas dubius* was originally described from West Africa by Tebble (1955). However, the original account was brief and certain key characters were not clearly discussed or illustrated. The species was subsequently reported from Viet Nam (Gallardo 1967), the Andaman Sea (Eibye-Jacobsen 2002), and Australia (Hartmann-Schröder 1979 as *L. rubra australiensis fide* Eibye-Jacobsen 2002) and Zhadan *et al.* (2015). The two latter accounts reported considerable variability in the size, shape, and degree of curvature of the abdominal neuropodial uncini. It is likely that the original West African account and the more recent reports from Asia and Australia represent different species. The only resolution to this would be to re-examine the specimens reported by Tebble (1955).

Another potential problem involves *L. johnstonei* which was originally described from southern Africa by Day (1934) and has subsequently been reported from Australia (Day 1977). Here the main issue seems to be with the presence of 1 or 2 subpodial papillae in the last thoracic and anterior abdominal segments. Other aspects of the morphology have not been so carefully compared, and given the great geographic distance between records of the species it would be of interest to compare African and Australian specimens.

Scoloplos (*Leodamas*) *mazatlanensis* described by Fauchald (1972) from deep water off western Mexico is here referred to *Leodamas*, but the species is not well described and illustrated and may not belong to this genus. The arrangement of the thoracic neuropodial uncini is not stated, only that 10–15 uncini are present per neuropodium. Further, the text suggests that there are numerous capillaries in these neuropodia as well, which if true would imply that the species belongs in *Scoloplos sensu stricto.* The original specimens need to be reexamined.

Leodamas latum was described from off Panama in 588 m by Chamberlin (1919) as *Branchethus latum* and was later reported from off Burma in 457 m by Fauvel (1932) as *Scoloplos latus*. The species does not appear to have been reported since. There are differences in the two accounts. Neither author reported the number of rows of thoracic neuropodial uncini. The uncini are described by Chamberlin (1919) as strongly striated with numerous camerations, curved in a reverse direction and taper to a fine point. Fauvel (1932) on the other hand describes a more typical stout, blunt-tipped acicula that is relatively straight, and with transverse ribs on the convex side. Chamberlin (1919) did not report an emergent abdominal neuropodial acicula. Fauvel (1932) described a stout, blunt acicula accompanied by 4–6 capillaries. Given that the two accounts are so disjunct geographically and that morphological differences are reported, it is possible that more than one species is involved and the collections, if available should be re-examined. A closely related new species, *L. perissobranchiatus* **n. sp.** differs in that the branchiae begin on setiger 4 instead of 5 and the thoracic neuropodial uncini have a lateral sheath (see below).

Scoloplos (*Leodamas*) *rubra orientalis* Gallardo, 1967 is here elevated to full species status. *Leodamas orientalis* has a ventral cirrus on the abdominal neuropodia, whereas *L. rubrus* has an elongated postsetal lobe. This also represents another very disjunct distribution: US Atlantic and Gulf coasts for *L. rubrus* and SE Asia for *L. orientalis*.

Another interesting species pair is *Leodamas gracilis* described by Pillai (1961) from Sri Lanka, Viet Nam by Gallardo (1967), the Andaman Sea by Eibye-Jacobsen (2002); and *Leodamas agrestis* described by Nonato & Luna (1970) from off NE Brazil in 20–50 m. Both species have 3–4 large pointed acicular spines anterior to the smaller and normal vertical rows of uncini that occur in thoracic neuropodia. The two species differ however, in that the vertical rows of uncini number only one in *L. agrestis* and 3–4 in *L. gracilis*. In addition, the branchiae of *L. agrestis* begin on the first abdominal segment (setiger 16) whereas branchiae begin on setiger 6 in *L. gracilis*. Thus, although these are the only two species of *Leodamas* reported with large anterior acicular spines anterior to the vertical rows of uncini of thoracic neuropodia, *L. gracilis* is related to the species in Table 1 Group A and *L. agrestis* is in Group B.

Another species with an interesting history is *Scoloplos cylindrifer* originally described from South Island, New Zealand by Ehlers (1904). Ehlers had complete specimens up to 17 mm long and 115 setigers. This original description depicted a fairly typical orbiniid with a pointed prostomium, peristomium with a single ring, and parapodia consisting elongate, flattened notopodial lamellae and reduced neuropodia. All setae were described as thin hairy bristles (“dünner feilkerbiger Borsten”), undoubtedly referring to the camerated nature of most orbiniid capillaries. The presence or absence of thoracic neuropodial spines or uncini was not indicated. The branchiae were described and illustrated as single, but one was noted to have a protrusion, suggesting bifurcation. The second report of the species was by Augener (1914) from intertidal sands in SW Australia based on two specimens, one of which was missing the anterior end. A specimen from New Zealand was provided from the Bremer Museum for comparison, but it was not stated if this was one of the syntypes from Ehlers’ collection. The Australian specimen was larger, 42 mm long and with 210 segments. The nature of the parapodia and setae were not mentioned. Instead, a detailed description of the branchiae was provided; these were determined to have 2, 3, and 4 branches. The one figure (Augener 1914: Plate I, fig. 4) clearly shows dichotomous branching. Augener (1926) recorded the species from near Dunedin, South Island, New Zealand. He noted that the branchiae were from setiger 22 and had up to four branches; no information was provided on the thoracic neurosetae. The fourth report of the species was by Monro (1939) based on several specimens from Tasmania, Australia. One complete specimen was 30 mm long with 140 setigers. All setae were reported as camerated capillaries leading Monro to transfer the species from *Scoloplos* to *Haploscoloplos*. He noted that branchiae were branched with up to five filaments. Hartman (1957) referred to the species as *Haploscoloplos cylindrifer* and reviewed the reports and noted considerable variability within the species accounts, in particular that the branchiae began anywhere from setigers 17–50. None of these earlier reports made any mention of spines or uncini in the thoracic neuropodia; but projecting uncini were observed by Ehlers (1904) in the posterior neuropodia, a characteristic typical of many species of *Leodamas*. Furcate setae were not reported in any of these early accounts.

In the same paper where she reviewed the history of *Haploscoloplos cylindrifer*, Hartman (1957) described a new species, *Scoloplos* (*Leodamas*) *dendrobranchus* from various intertidal habitats in South Australia. This was another species with dendritically branched branchiae with up to six filaments reported from setiger 18, or the first abdominal setiger. In addition to capillary setae, Hartman reported that this species lacked notopodial furcate setae but had 8–14 large thoracic neuropodial uncini arranged in a distinct J-shaped row anterior to the capillaries; these uncini were reported as blunt tipped, and with no hood. She also reported the presence of projecting aciculae in posterior neuropodia. All of these characters agree with the genus *Leodamas* as defined in this study for species of Group B, where large thoracic neuropodial uncini are present in 1–2 vertical rows and branchiae begin in posterior thoracic or anterior abdominal segments.

Day (1975: 1977) reported on eight specimens from South Australia that he identified as *Scoloplos cylindrifer* that differed from earlier accounts in having instead of lacking a small group of curved, serrated hooks in addition to crenulate capillaries in thoracic neuropodia. He also had Monro's specimens in the British Museum checked and they were reported to him as also having hooks in thoracic neuropodia. For this reason, Day (1975) synonymized Hartman's (1957) *S. dendrobranchus* with *S. cylindrifer.* Day (1977) later identified numerous additional specimens of *S. cylindrifer* from most coasts of Australia and considered it to be one of the most common orbiniids he encountered. In the same paper, Day (1977) determined that because Monro (1993a) had established *Haploscoloplos cylindrifer* as the type species of his genus *Haploscoloplos* Monro, that a new genus was required because the type species had an anterior row short hooks in the thoracic neuropodia in addition to capillaries and thus belonged to the genus *Scoloplos*. In addition to the Australian material, he examined a specimen from near Christchurch, South Island, New Zealand, near the type locality of the species and thus confirmed the presence of thoracic neuropodial hooks in the species from both New Zealand and Australia. He therefore proposed a new genus, *Leitoscoloplos* to include those remaining species formerly assigned to *Haploscoloplos* (see above for earlier account of *Leitoscoloplos*). Day & Hutchings (1979) summarized the Australian and other records for the species.

Hartmann-Schröder (1981) as part of a series of papers on Australian polychaetes provided the first detailed description of the thoracic neurosetae of *Scoloplos cylindrifer* since Hartman (1957) (as *S.* (*Leodamas*) *dendrobranchus*). The thoracic neurosetae included both capillaries and uncini. The latter were arranged in a horseshoe-shaped double row with the anterior row extending from the top of the fascicle vertically, and then curving under and extending part way up the posterior border of the setal fascicle becoming a short second row (Hartmann-Schröder, 1981: Fig. 101). This is similar to what Hartman (1957) called a J-shaped row. The uncini have thick shafts, narrowing to a blunt tip; a lateral sheath is present together with transverse ribs on the concave side of the shaft. The uncini on the anterior row have less distinct ribs on the shaft than the posterior uncini (Hartmann-Schröder, 1981: Figs. 104–105). As in previous reports, furcate setae were not observed. Hartmann-Schröder (1981) also noted that flail setae were absent, branchiae were first present from setiger 18 with up to five branches, and observed abdominal neuropodia with two protruding aciculae (Hartmann-Schröder, 1981: Fig. 103).

These observations by six different investigators eventually provided details sufficient to categorize the species. Based on the definition provided in the present study, the orbiniid species "cylindrifer" belongs to the genus *Leodamas* Group B and is included as such in Table 1. *Leodamas cylindrifer* is one of several species in the genus where a vertical anterior row of neuropodial thoracic uncini curves under other setae and continues again dorsally as a short posterior row.

The status of *Alcandra robustus* described by Kinberg (1866) is uncertain. The only specimen, an anterior fragment from Brazil with the head and eight setigers, was examined by Hartman (1948, 1957). The specimen was reported as having a conical prostomium, branchiae from setiger 5, only capillaries in both noto- and neuropodia of setiger 1, and with uncini in palisaded rows from setiger 2. Uncini were illustrated by Hartman (1957) as curved with a blunt tip and with transverse rows of ribs on the convex side of the shaft. Due to the fragmented nature of the holotype, this species cannot be fully compared with other species or even confirmed as belonging to *Leodamas*.

In the present study, eight species, three new to science are reported from South American and Antarctic seas. The type species, *Leodamas verax* is redescribed from new material off Argentina and a neotype is designated. Type specimens of five of Ehlers' species have been examined and redefined, resulting in one being designated a synonym and another being resurrected from synonymy.

TABLE 1. Taxonomic Characters for 29 Species of *Leodamas*.

Species/Character	Shape of thorax in X-section	No. thoracic setigerous segments	No. rows of thoracic neuropodial uncini	Capillaries with thoracic neuropodial uncini	Structure of thoracic neuropodial uncini
Group A: Species of *Leodamas* with branchiae from anterior thoracic setigers; thoracic neuropodial uncini typically in 3 or more vertical rows					
Leodamas verax Kinberg, 1866 (= Type species)	Dorsoventrally flattened	22–24	3 vertical rows & 1 short posterior row curving ventral to rows 1–3	Absent	Blunt–tipped with groove on convex side; with weakly developed transverse ribs along shaft
Leodamas brevithorax (Eibye–Jacobsen, 2002)	Narrow, becoming depressed or flattened from setiger 4	15–17	4 vertical rows with first curving under 2–-3 and forming row 4	Few in dorsal tuft	Uncini curved with rounded tip and shaft with 5–12 transverse ridges
Leodamas chevalieri (Fauvel, 1902)	Flattened, broad	20–27	4–5 vertical rows	Present, long, becoming more numerous	Uncini straight, narrowing at tip, blunt, with lateral hood
Leodamas cochleatus (Ehlers, 1900)	Rounded, only weakly flattened dorsally	10–29 (size related)	3 vertical rows & 1 short posterior row curving ventral to rows 1–3	Absent	Uncini of anterior setigers with straight shaft, blunt tip and weak transverse ribs; transitioning to uncini with curved expanded tips with subapical notch and prominent ribs on shaft
Leodamas cirratus (Ehlers, 1897)	Dorsoventrally flattened	21–32	3 long vertical rows & 1 short posterior row curving under rows 1–3	Absent	Long, tapering; blunt-tipped with long vertical notch on concave side; weakly developed transverses ribs on shaft
Leodamas dendrocirris (Day, 1977)	Dorsoventrally flattened.	17–18	4–5 vertical rows; arrangement not stated.	Crenulate capillaries in single posterior row	Long, curved apically with blunt tip and transverse rows of ribs on convex side.
[(1)]*Leodamas dubius* (Tebble, 1955)	Dorsoventrally flattened.	15–19 or 21–23	4–5; last row short	Few with posterior row uncini	Long, curved apically to blunt tip; shaft with transverse ribs; Thai and Australian specimens with thickened hood, imparting bidentate appearance.
Leodamas fimbriatus (Hartman, 1957)	Not stated.	24–30	Up to 4 vertical rows of uncini; arrangement not stated.	Absent	Uncini of first row longest, thickest, and with sharply curved, smooth tips; uncini of following rows thinner, less curved
Leodamas gracilis (Pillai, 1961)	Short, depressed or flattened.	13–17	1 anterior row of 3–4 heavy spines; 2–3 vertical rows of numerous hooded uncini; first row curves under rows 2–3.	Crenulate capillaries in posterior row of uncini	Two types: 3–4 anterior heavy, simple spines; second curved spines with hooded tip and transverse rows of ribs on shaft

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TABLE 1. (Continued)

Species/Character	Shape of thorax in X-section	No. thoracic setigerous segments	No. rows of thoracic neuropodial uncini	Capillaries with thoracic neuropodial uncini	Structure of thoracic neuropodial uncini
Leodamas hamatus Dean & Blake, 2015	Dorsoventrally depressed, but not flattened.	13–21	2–4 vertical rows & partial 5th row	2–7 thin capillaries in dorsal tuft	Two types: anterior 4–5 setigers with straight shaft, blunt tip and thin hood on convex side; uncini of following setigers with larger thickened hood, imparting bidentate appearance
Leodamas hyphalos **n. sp.**	Inflated first 3–4 setigers, then depressed but not flattened	16–18	4 vertical rows; first row curving ventral to 2 and 3, then merging with posterior row	2–3 capillaries in superior position to last row of uncini	Shaft curved to straight, tapering to rounded apex; shaft with irregular transverse ribs
Leodamas johnstonei (Day, 1934)	Flattened dorsally, rounded ventrally	18–24	3–5 vertical rows	Few in posterior row	Shaft curving at tip; weakly serrated, with lateral flange
[(2)]*Leodamas latum* (Chamberlin, 1919)	Dorsoventrally flattened	~20	Not stated, but "setae arranged in vertical series."	Present	Elongate, curved to narrow tip, shaft with numerous transverse rows.
Leodamas marginatus (Ehlers, 1897)	Dorsoventrally flattened after first 3 setigers	14–20	3 vertical rows & 1 short transverse row curving ventral to rows 1–3	0–few in tuft superior to 3 vertical rows of uncini	Blunt-tipped with sub-terminal groove or notch & low transverse crenulated ribs on shaft (SEM)
Leodamas orientalis (Gallardo, 1967) **New status**	Broadly oval	18–21	4–5 vertical rows, 5th row from middle thoracic setigers, only ½ as long as 1–4.	1–2 in uppermost location	Curved, blunt-tipped, with up to 9 transverse ribs on concave side
Leodamas perissobranchiatus **n. sp.**	Broad, dorsoventrally flattened	11–13	3–4 vertical rows of uncini; arrangement not stated.	Long, thin silky camerated setae mixed with uncini	Distally curved, notched, with lateral flange and transverse rows of ribs along shaft
Leodamas rubrus (Webster, 1879)	Broadly oval, dorsoventrally depressed	23–28	3–5; arrangement not stated.	Few in uppermost location	Curved apically, with blunt tip and transverse ridges on convex side of shaft
Leodamas thalassae (Amoureux, 1982)	Dorsoventrally flattened	12–15	2 curved rows of large uncini.	A row posterior to uncini	Thick, curved apically, with blunt tip and numerous transverse ridges on shaft
Leodamas tribulosus (Ehlers, 1897)	Dorsoventrally flattened	22–25	5–7 dense vertical rows of uncini; first row curves under rest of uncini, merging with short posterior row	Crenulated capillaries in 2 rows posterior to uncini	Bent in posterior direction; tip with 2 pointed teeth followed by long groove on convex side flanked by lateral; shaft with rows of low transverse ribs.

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TABLE 1. (Continued)

Species/Character	Shape of thorax in X-section	No. thoracic setigerous segments	No. rows of thoracic neuropodial uncini	Capillaries with thoracic neuropodial uncini	Structure of thoracic neuropodial uncini
Group B: Species of *Leodamas* with branchiae from posterior thoracic or anterior abdominal setigers; thoracic neuropodial uncini typically in 1–2 rows					
Leodamas acutissimus (Hartmann-Schröder, 1991)	Only slightly flattened	14–20	3–4 rows	Present in single row posterior to last row of uncini	Uncini of anterior setigers smooth, curved with 4–5 transverse rows of denticles; uncini of posterior setigers straight with lateral sheath and no rows of denticles
Leodamas agrestis Nonato & Luna, 1970	Broad, dorsoventrally depressed	15	1 row, setigers 1–8; additional anterior row of 2–3 large, heavy spines setigers 7–15	Present as dorsal tuft, middle and posterior thoracic setigers	Single row of uncini, curved, tapering to pointed tip; large anterior spines short, thick, tapering to narrow tip
Leodamas cylindrifer (Ehlers, 1904)	Dorsoventrally depressed	14–17	A single J-shaped row with 8–14 uncini curving ventrally under group of capillaries; uncini reduced to ~7 in posterior thoracic setigers.	Present with ca. 12 capillaries in a vertical fascicle	Simple, blunt, distally curved, with lateral sheath or hood; shaft with transverse ribs
L. maciolekae **n. sp.**	Flattened	40	2 rows, with 1st row curving under 2nd.	Absent	Simple, weakly curved, without transverse ribs
L. madagascarensis Fauvel, 1919	Dorsoventrally flattened	24–30	2 rows, with 1st curving under 2nd.	Few in a dorsal tuft	Simple, blunt, straight; without transverse ribs
L. mazatlanensis (Fauchald, 1972)	Weakly dorsoventrally flattened	15	Not stated, but 10–15 uncini present.	Present "numerous"	Simple, curved, with 10–15 transverse shallow ridges on convex side.
L. minutus Lopez, Cladera & San Martin, 2003	cylindrical	13	1–2 rows (set 1–3), 2 rows (set 4–13)	Absent setigers 1–9; present from setiger 10	Simple, straight with weak transverse ribs
L. platythoracicus Lopez, Cladera & San Martin, 2003	Cylindrical anteriorly; flatted posteriorly	19	1 (set 1) 2 (set 2–13) 1 (14–19)	1–2 uppermost in fascicle	Simple, straight, without transverse ribs
L. texana (Maciolek & Holland, 1978)—Includes *Naineris* sp. A of Taylor (1984).	cylindrical	11–20	1 row of 5–9 uncini	1–few, in dorsal tuft	Simple, weakly curved, rounded tip, without transverse ribs
L. treadwelli (Eisig, 1914)	flattened	14–22	2 rows in anterior and middle setigers; thereafter 1 row	Absent	Simple, weakly curved, rounded tip, without transverse ribs

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TABLE 1. (Continued)

Species/Character	Emergent abdominal noto- & neuropodial aciculae	Abdominal Noto- & neuropodial flail setae	Setiger Branchiae Begin	Unique characters	Geographic Distribution	References
	Group A: Species of *Leodamas* with branchiae from anterior thoracic setigers; thoracic neuropodial uncini typically in 3 or more vertical rows					
Leodamas verax Kinberg, 1866 (= Type species)	Noto: Absent Neuro: 1–2 projecting aciculae	Absent	5–6	Thoracic notopodia 2–6 with single lobe; then with 2–4 separate branches	Off Uruguay and Argentina, intertidal to 62 m.	Hartman 1948b; 1957; This study
Leodamas brevithorax (Eibye–Jacobsen, 2002)	Noto: 2–3 thin, slightly emergent aciculae; Neuro: with 1 thin acicula	Absent	6	Narrow thorax; low number of thoracic setigers; thin emergent acicula in abdominal noto– and neuropodia	Andaman Sea, 17–79 m	Eibye-Jacobsen 2002
Leodamas chevalieri (Fauvel, 1902)	Noto: absent; Neuro: 1 simple acicula	Not stated	6	Furcate setae absent	West Africa; Red Sea, Gulf of Aden, Arabian Gulf; Indian Ocean.	Fauvel 1902, 1953; Gravier 1906; Wesenberg-Lund 1949
Leodamas cochleatus (Ehlers, 1900)	Noto: Absent Neuro: 1–2 simple aciculae	Absent	6	Change in morphology of thoracic uncini from anterior spines with straight shaft, blunt tip and weak transverse ribs to spines with curved and expanded tips with subapical notch and prominent ribs on shaft	Offshore Argentina, 454 m; Chile, Straits of Magellan; 46 m.	Ehlers 1900, 1901; This study
Leodamas cirratus (Ehlers, 1897)	Noto: absent; Neuro: with a single acicular spine with or without thin hyaline hood	Absent	6	Single subpodial lobe on posterior thoracic and anterior abdominal segments; no capillaries accompany thoracic neuropodial uncini.	SE Argentina; Falkland Islands; Straits of Magellan; South Orkney Islands; shallow subtidal, 598 m.	Ehlers 1897; Hartman 1957; This study
Leodamas dendrocirris (Day, 1977)	Noto: Absent; Neuro: 1 long acicula with smooth bent tip.	Absent	5	Thoracic notopodia divided into 2–5 separate branches continuing on abdominal segments; thoracic neuropodia with a single postsetal lamella.	Australia, New South Wales, 65 m.	Day 1977
[(1)]*Leodamas dubius* (Tebble, 1955)	Noto: absent; Neuro, 1 strongly hooked acicula.	Not stated	6–7	Furcate setae present; abdominal neuropodial uncini strongly hooked.	West Africa, 3–11 m; Thailand; Australia, Queensland.	Tebble 1955; Eibye-Jacobsen 2002; Zhadan *et al*. 2015
Leodamas fimbriatus (Hartman, 1957)	Noto: a single acicula, slightly projecting; Neuro: single aciculum projecting, slightly curved to blunt tip.	Absent	7	3–4 subpodial lobes on posterior thoracic and anterior abdominal setigers; these decreasing over about 15 abdominal segments, then disappearing.	South Australia in sand; intertidal	Hartman 1957; Day 1977

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TABLE 1. (Continued)

Species/Character	Emergent abdominal noto- & neuropodial aciculae	Abdominal Noto- & neuropodial flail setae	Setiger Branchiae Begin	Unique characters	Geographic Distribution	References
Leodamas gracilis (Pillai, 1961)	Noto: absent; Neuro: 1–2 simple, straight aciculae similar to heavy spines of thoracic neuropodia	Absent	6	Presence of two kinds of thoracic neuropodial uncini: 3–4 heavy, simple anterior spines; plus more numerous uncini in 2–3 vertical rows with hooded tip and transverse rows of ribs on shaft.	Ceylon; Viet Nam, shallow water; Andaman Sea, 19–38 m.	Pillai 1961; Gallardo 1967; Eibye-Jacobsen 2002
Leodamas hamatus Dean & Blake, 2015	Noto: absent; Neuro: large, projecting acicula with hooked tip.	Absent	6	Heavy, curved uncini in abdominal neuropodia; change in structure of thoracic neuropodial uncini from anterior to posterior of thorax.	Off Pacific Costa Rica, 11–26 m.	Dean & Blake 2015
Leodamas hyphalos **n. sp.**	Noto: absent; Neuro: 1–2 blunt-tipped aciculae.	Noto: 2 flail setae present; Neuro: Absent	6	Intersegmental annulations from setigers 8–9; notopodial flail setae;	Drake Passage in deep water; 2888–4008 m.	This study.
Leodamas johnstonei (Day, 1934)	Noto: absent; Neuro: 1 acicula, curved at tip	Noto: absent; Neuro: 3–4 crenulate with fine hairlike tips	6	Prostomium sharply pointed; 1–2 subpodial lobes in last thoracic segments and anterior abdominal setigers.	SW and South Africa; Mozambique; intertidal.—Australia, Victoria, NSW, and Qld.	Day 1934, 1967, 1977; Hartman 1957
[(2)]*Leodamas latum* (Chamberlin, 1919)	Noto: absent Neuro: 1 blunt acicula (Fauvel 1932)	Not stated.	5, stated as somite 6 by Chamberlin	Anterior thoracic branchiae single, then divided into 3–9 palmately arranged branches through middle abdominal segments; then number decreasing again in posterior abdominal segments	Off Panama, 588 m; off Burma, 457 m.	Chamberlin 1919; Fauvel 1932; Hartman 1957
Leodamas marginatus (Ehlers, 1897)	Noto: absent; Neuro: 1 projecting acicula, distally curved	Absent	6	Neuropodial subpodial lobes absent.	Southern South America; widespread in sub-Antarctic and Antarctic seas; intertidal to 1674 m	Ehlers 1897; Hartman 1957, 1966; Knox 1998; This study
Leodamas orientalis (Gallardo, 1967) **New status**	Noto: absent Neuro: 1 distally hooked acicula	Absent	6	Furcate setae with nearly equal tynes; abdominal neuropodia with ventral cirrus	Viet Nam; Andaman Sea, 21–79 m.	Gallardo 1967; Eibye-Jacobsen 2002
Leodamas perissobranchiatus **n. sp.**	Noto: absent Neuro: tip of acicula emergent	Absent	4	Branchiae single on anterior and middle thoracic segments; becoming palmately branched with 2, 3, and 4 branches in abdominal segments	Western Chile, 192 m.	This study

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TABLE 1. (Continued)

Species/Character	Emergent abdominal noto- & neuropodial aciculae	Abdominal Noto- & neuropodial flail setae	Setiger Branchiae Begin	Unique characters	Geographic Distribution	References
Leodamas rubrus (Webster, 1879)	Noto: absent; Neuro: 1 heavy spine with curved, smooth tip	Absent	6	Furcate setae with nearly equal tynes; Last thoracic and anterior abdominal segments with long, tapering postsetal lobe.	E and SE United States; Gulf of Mexico; intertidal to 200 m.	Webster 1879: Hartman 1951, 1957; Taylor 1984
Leodamas thalassae (Amoureux, 1982)	Noto: 1 present, pointed; Neuro: 1 present, pointed	Not stated	5	Prominent postsetal lobe in thoracic neuropodia; relatively few thoracic neuropodial uncini.	NE Atlantic, off Brittany coast of France, 850–1400 m.	Amoureux 1982
Leodamas tribulosus (Ehlers, 1897)	Noto: absent; Neuro: 1–2 aciculae with blunt tips.	Absent	5	Large number of thoracic uncini each curved posteriorly and with dorsal groove terminating in two pointed teeth.	Western South America, Patagonia; Argentina; intertidal to shallow subtidal	Ehlers 1897; This study
	Group B: Species of *Leodamas* with branchiae from posterior thoracic or anterior abdominal setigers; thoracic neuropodial uncini typically in 1–2 rows					
Leodamas acutissimus (Hartmann-Schröder, 1991)	Noto: not emergent; Neuro: thin curved spines, with tips emergent	Noto: absent; Neuro: present	16–18, posterior thorax	Thoracic neuropodial uncini transition from 3–4 rows of smooth curved spines with transverse ribs to straight spines with lateral sheath and no ribs.	Australia, Gladstone and Lizard Island, Qld,	Hartmann-Schröder, 1991; Zhadan (2015)
Leodamas agrestis Nonato & Luna, 1970	Noto: not emergent; Neuro: not emergent	Absent	16, 1st abdominal	Last 9–10 thoracic setigers with three large bent, pointed, acicular spines anterior to single row of pointed uncini	Off Brazil, 2–100 m	Nonato & Luna 1970
Leodamas cylindrifer (Ehlers, 1904)	Noto: imbedded; Neuro: long, sharply curved on tip	Absent	18, abdominal	Dendrically branched branchiae with up to 6 filaments. Thoracic neuropodial uncini in a single anterior row curving ventrally under row of capillaries.	New Zealand; Australia, intertidal	Ehlers 1904; Augener 1914; Hartman 1957; Day 1977; Hartmann-Schröder 1981
L. maciolekae **n. sp.**	Noto: single spine; Neuro: single thin straight acicula	Noto: Absent; Neuro: Present, with tapering mucron-like tip	29, thoracic	Large number of thoracic setigers (40); with abdominal neuropodial flail setae	Argentina, 14 m	This paper
L. madagascarensis Fauvel, 1919	Noto: not emergent; Neuro: long acicula, tip emergent	Absent	22, thoracic	Large number of thoracic setigers (24–30); thoracic neuropodial uncini simple straight, with few capillaries	SE Africa, Madagascar	Fauvel 1919; Day 1951, 1967
L. mazatlanensis (Fauchald, 1972)	Noto: not emergent; Neuro: 3–4 curved, project	Not stated	12	Not well described; thoracic neuropodial with fingerlike postsetal lobe; abdominal neuropodia with ventral cirrus.	Off Western Mexico, 2487–2560 m	Fauchald 1972

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TABLE 1. (Continued)

Species/Character	Emergent abdominal noto- & neuropodial aciculae	Abdominal Noto- & neuropodial flail setae	Setiger Branchiae Begin	Unique characters	Geographic Distribution	References
L. minutus Lopez, Cladera & San Martin, 2003	Noto: not emergent; Neuro: sigmoid acicula	Absent	12–16	Cylindrical thorax, not flattened; setigers 1–3 uniramous, notosetae absent.	Pacific Panama, intertidal	Lopez et al. 2003
L. platythoracicus Lopez, Cladera & San Martin, 2003	Noto: not emergent; Neuro: single, brown, straight acicula	Absent	20, 1st abdominal	Thorax cylindrical setigers 1–5, then distinctly flattened; thoracic neuro uncini in 1 row on setiger 1, then 2 rows, again reduced to 1 row setigers 14–19.	Pacific Panama, intertidal	Lopez et al. 2003
L. texana (Maciolek & Holland, 1978)—Includes *Naineris* sp. A of Taylor (1984).	Noto: not emergent; Neuro: narrow, thin, tip emergent	Absent	2nd to 4th abdominal	Thoracic neuropodial uncini in single row throughout	NE Colombia; Gulf of Mexico, Louisiana-Texas, 2–5 m	Maciolek & Holland 1978; Taylor 1984; Granados-Barba & Solís-Weiss 1997b
L. treadwelli (Eisig, 1914)	Noto: not emergent; Neuro: not emergent, or only the tip	Absent	Last thoracic or 1st abdominal	Thoracic neuro uncini transition from 2 rows to 1 row anterior to posterior.	Caribbean; Puerto Rico; NE Colombia; Pacific Mexico, 6–220 m	Treadwell 1901; Hartman 1957; Maciolek & Holland 1978; Leon-González & Rodríquez 1996 ; Granados-Barba & Solís-Weiss 1997a

(1) Accounts from West Africa (Tebble 1955) and Indo-Pacific (Eibye-Jacobsen 2002; Zhadan *et al.* 2015) likely represent different species. (2)Accounts from Panama (Chamberlin 1919) and Burma (Fauvel 1932) may represent different species.

Leodamas verax Kinberg, 1866
Figures 25–26

Leodamas verax Kinberg, 1866: 252.
Scoloplos (*Leodamas*) *verax*: Hartman 1948: 104–105, pl. 15, figs. 3–4; 1957: 286, pl. 31, figs. 1–4.

Material examined. Uruguay, IBM Sta. N-254, 27–30 m (1, USNM 1013643); IBM Sta. N-1071, 36–42 m, sand and shells (1, USNM 1013642).—Argentina, IBM Sta. 2287 (R/V *A. Saldanha*), 38°05′S, 56°43.5′W, 67 m, (1, USNM 1013644).—Argentina, intertidal collected by J.M. Orensanz: Bahía de San Blas, north of Riacho Jabali, Oct 1968 (1, JAB); NE of Isla Jabali, intertidal, Apr 1970 (3, 21, and 15 specimens USNM 1013646–8); Riacho Jabali, intertidal, muddy sand, Oct 1968 (17, USNM 1013652); Bahía de San Antonio, oeste, Marejada norte. coll. R. Olivier and J.M. Orensanz, 6 Feb 1971, intertidal (15, USNM 1013655); 8 Feb 1971, intertidal (1, USNM 1013656); 9 Dec 1971, intertidal (1, USNM 1013650); 11 Dec 1972, intertidal (3, USNM 1013653); Golfo San Matías, IBM Sta. SAO-III-1041, intertidal, sandy gravel, 1972, **neotype** (USNM 1013645); Las Grutas, intertidal, under mussel bed, 7 Feb 1971, coll. J. Escofet and J.M. Orensanz (7, USNM 1013651).

Description. A large species, up to 15 cm long, 2.8 mm wide, for 340 setigers. Color in alcohol: light tan to flesh colored, sometimes with dusky pigment patch in middle of prostomium.

Body dorsoventrally flattened in thoracic region, rounded in abdominal region; thoracic region with 22–24 setigers, last of which is transitional; peristomial segment and all setigerous segments readily distinct from one another; individual segments without additional annulations (Fig. 25A). Branchiae from setiger 5–6, continuing to end of body; each branchia broad basally, tapering distally (Fig. 25A–C).

Prostomium triangular in shape, bluntly pointed on anterior margin; proboscis saclike, with numerous lobes (Figs. 25A, 26A); peristomium with one simple achaetous ring, prominent anterolateral nuchal slits present (Fig. 26A, inset); eyespots absent (Fig. 25A).

Thoracic parapodia well developed, with conspicuous branched notopodial lamellae (Fig. 25A–B) and numerous golden neuropodial uncini. Notopodia with single notopodial lamella to setiger 2–6, becoming double, then triple or quadruple from about setiger 4–16 (Fig. 25A–B); branched notopodia sometimes continuing on first or second abdominal setiger. Neuropodia of thoracic setigers 1–20 without lobes or lamellae (Fig. 25B), from setiger 21–22 or transition to abdominal region, a single ventral cirrus and sometimes a second ventral cirrus (or subpodial lobe) present; these continuing into abdominal region (Fig. 25C).

Abdominal parapodia all similar, lacking interramal cirri; ventral cirrus present to about setiger 65 (Fig. 25C), second ventral cirrus (or subpodial lobe) sometimes present from about setigers 31–40; notopodial postsetal lamella of last few thoracic setigers continuing through abdominal region.

Notosetae including fascicles of crenulated capillaries in thoracic and abdominal notopodia; 1–3 furcate setae in posterior thoracic and abdominal notopodia; 1–2 straight, tapering notopodial spines in abdominal notopodia with furcate setae and capillaries (Fig. 26E); in light microscope furcate setae with unequal tynes, connected by membrane consisting of fine needles (Fig. 25F); in SEM, furcate setae with 11–12 delicate needles on each side with apical needles merging with tynes (Fig 26F), tynes with minute openings in tips, shafts with transverse rows of fine barbs (Fig. 26F).

Thoracic neuropodial uncini arranged in three long vertical rows and one shorter posterior row curving ventrally under rows 1–3 (Fig. 26B–C); uncini golden in color, thick, blunt-tipped, with lateral groove or notch, some with dark internal core (Fig. 25D–E); in SEM subterminal groove present on convex side and with elongate shaft bearing weakly developed transverse ribs (Fig. 26D); capillaries entirely lacking. Abdominal neuropodia with 1–2 projecting aciculae (Figs. 25G, 26G) and fascicle of delicate capillaries (Fig. 25C).

Pygidium short, bulbous, with anus directed dorsally, surrounded by lobed border bearing two pair of tapering anal cirri.

Remarks. *Leodamas verax* was described by Kinberg (1866) from depths of 62 m off southeastern South America. In that paper, Kinberg established the genus *Leodamas*, with *L. verax* as the type species. The species has gone unreported since its original description, although Hartman (1948; 1957) redescribed the holotype which was archived in the Swedish Museum. Subsequent to Hartman's examination, the holotype appears to have been lost; curators at the Swedish Museum have not been able to locate the specimen. I also requested a search of the collections at the Allan Hancock Foundation, on the possibility that Hartman might have inadvertently retained the holotype in her research collections, but the type was not located there. Because of the importance of *L. verax* to

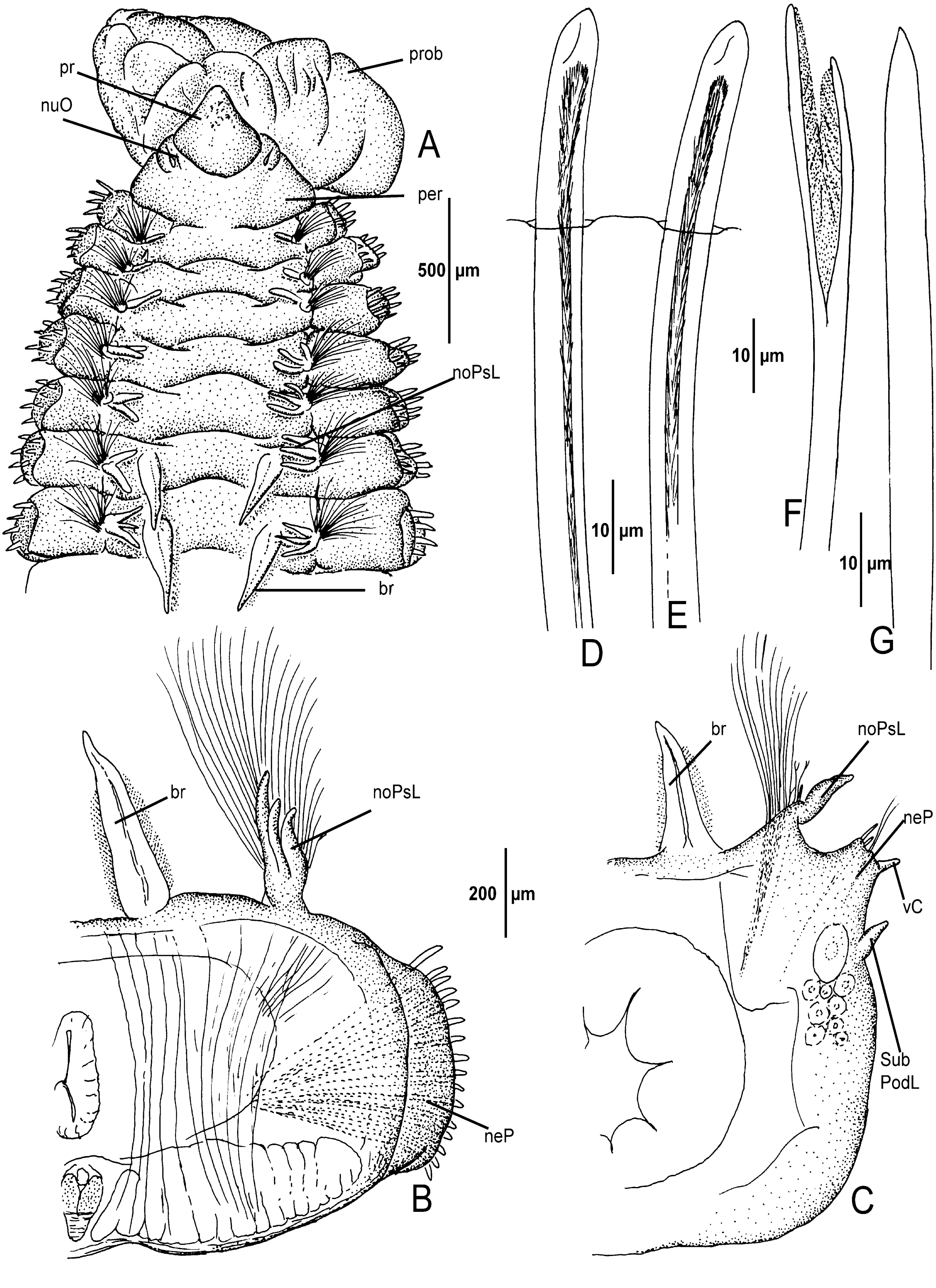

FIGURE 25. *Leodamas verax* (Kinberg, 1866). Neotype (USNM 1013645). A, anterior end, dorsal view; B, thoracic parapodium, posterior view; C, anterior abdominal parapodium, posterior view; D–E, thoracic neuropodial uncini; F, furcate seta; G, abdominal neuropodial acicula.

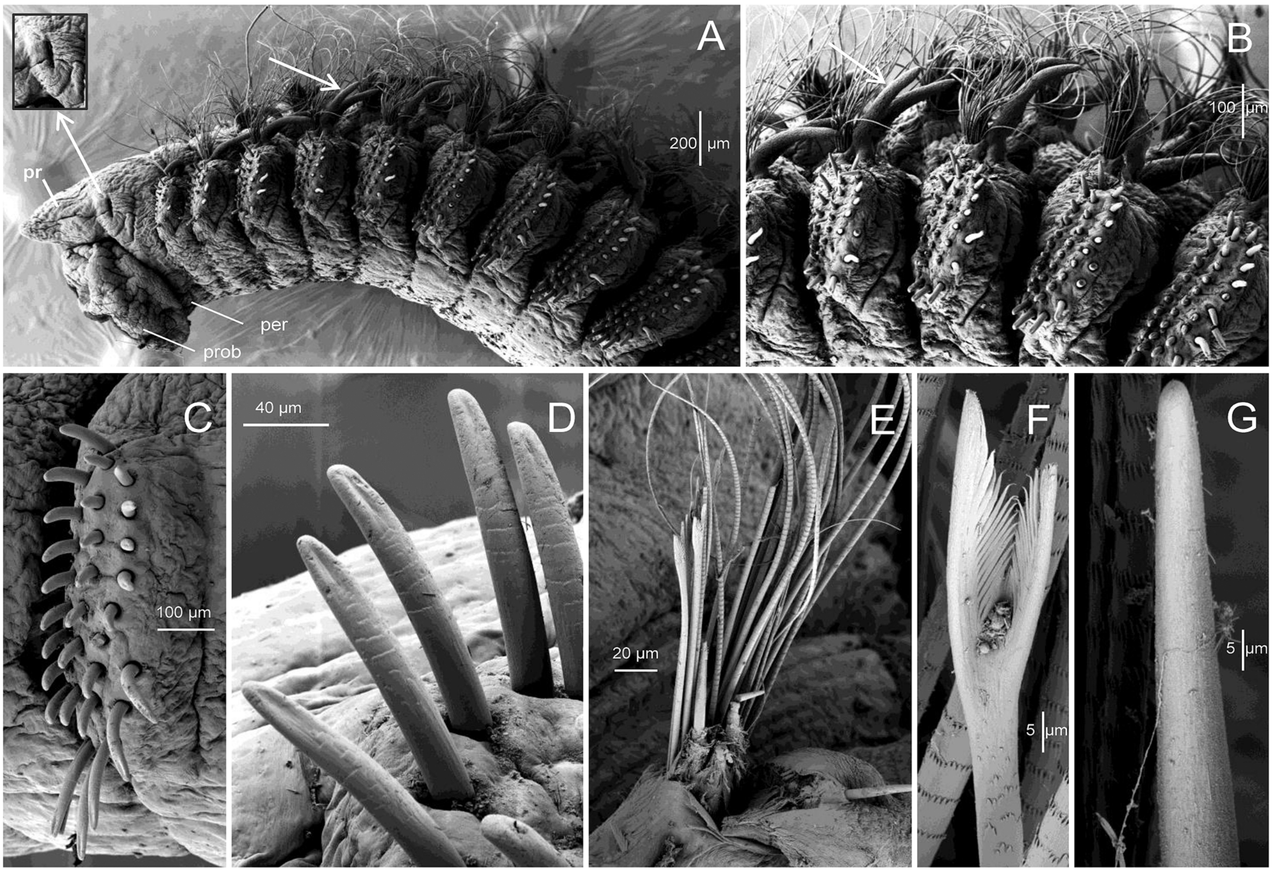

FIGURE 26. *Leodamas verax* (Kinberg, 1866). (USNM 1013651). A, anterior end, left lateral view, [inset of nuchal organ, not to scale]; B, thoracic neuropodial parapodia, lateral view; C, thoracic neuropodial parapodium, detail showing arrangement of uncini; D, thoracic neuropodial uncini, detail; E, abdominal neuropodial parapodium; F, furcate seta; G, abdominal neuropodial spine.

the nomenclature of the genera *Scoloplos* and *Leodamas*, a neotype has been designated from among the abundant new material from Argentina to replace the lost holotype (USNM 1013645).

Leodamas verax is closely related to *L. dendrocirrus* described by Day (1977) from Australia (NSW) in 65 m which also has branched notopodia. *L. verax* has 22–24 thoracic setigers instead of 17–18; capillaries are absent in thoracic neuropodia of *L. verax* and present in *L. dendrocirrus*; the thoracic neuropodial uncini of *L. verax* are generally smooth, weakly curved, blunt apically, notched on the convex side and with weak transverse ribs along the shaft; in *L dendrocirrus*, the uncini are more strongly curved, taper to a narrow tip, lack a notch, but have distinct transverse ribs on the convex side. Details may be found in Table 1. In addition, the thoracic neuropodial uncini of *L. verax* are arranged in 3 long vertical rows and with a 4th short posterior row that curves ventral to rows 1–3. This arrangement is similar to that of *L. marginatus* and several other species described in this study. *Ledodamas verax* is also the only member of the genus to have double ventral cirri present in the abdominal segments, although this feature has been observed only rarely. The new specimens agree very well with the description of the holotype provided by Hartman (1948, 1957), except that the bifurcate notopodial lobes reported by Hartman may actually consist of 2, 3, or 4 separate branches.

Distribution. Known only from off Uruguay and Argentina, intertidal to 62 m.

***Leodamas maciolekae* new species**
Figure 27

Material examined. Argentina, IBM Sta. Comp IV-62, 21 Mar 1964, 37°50′S, 57°21′W, 14 m, **holotype** (USNM 1013916).

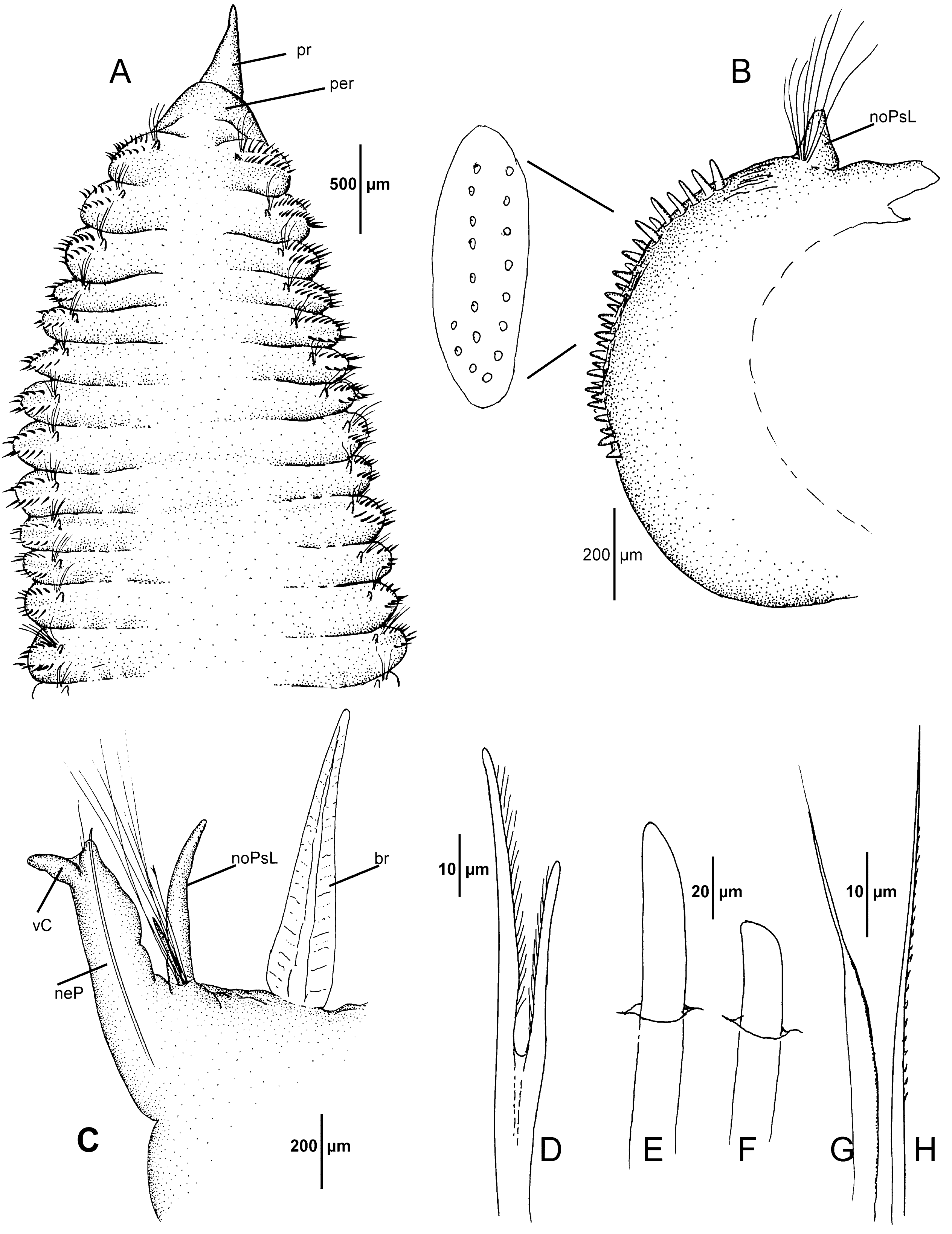

FIGURE 27. *Leodamas maciolekae* **n. sp.** Holotype (USNM 1013916). A, anterior end, dorsal view; B, thoracic parapodium, anterior view, inset = diagram of arrangement of rows of uncini, not to scale; C, abdominal parapodium, anterior view; D, furcate seta; E–F, thoracic neuropodial uncini; G, flail seta from abdominal neuropodium; H, capillary seta from abdominal neuropodium.

Description. A single nearly complete specimen measures 3 mm wide and 50 mm long for 167 setigers. Body anteriorly flattened, with first five segments somewhat inflated dorsally due to contained proboscis. Thorax 40 setigers long, with last two segments somewhat transitional; branchiae long, narrow, from setiger 29; first neuropodial postsetal lamellae from setiger 34. Color in alcohol: brown.

Prostomium sharply pointed (Fig. 27A), with distinct anterolateral nuchal slits at junction with peristomial segment. Anterior thoracic parapodia simple rings; with short notopodial postsetal lamella (Fig. 27A–B); abdominal notopodia elongate, narrow. Neuropodial postsetal lamellae first present from setiger 34, grading into abdominal neuropodial morphology on transitional setigers 39–40; abdominal neuropodia elongate, with a single laterally directed ventral cirrus (Fig. 27C); interramal cirri lacking.

Thoracic notosetae all thin, crenulated capillaries; anterior abdominal notosetae including a single emergent spine, 6–8 long capillaries, and 1–4 furcate setae bearing unequal tynes connected by row of delicate needles on inner edges (Fig. 27D). Thoracic neuropodial uncini maximally numbering about 40, arranged in two rows, with anterior row curving ventrally under second row and continuing dorsally to enclose second row as a short third row or extension (Fig. 27B, inset); uncini simple, most worn, slightly curved, lacking distinct ribs (Fig. 27E–F); capillaries entirely absent in thoracic neuropodia. Abdominal neurosetae including a single thin acicula, a single, very thin capillary (Fig. 27H), and a single flail seta; flail setae with abruptly tapering mucron-like tips (Fig. 27G).

Etymology. This species is named for Dr. Nancy J. Maciolek, polychaete systematist, in recognition of her prior work on similar species of Orbiniidae.

Remarks. *Leodamas maciolekae* **n. sp.** is referred to *Leodamas* because the thoracic neuropodial setae are dominated by large, conspicuous uncini and capillaries are absent. *Leodamas maciolekae* **n. sp.** belongs to the group of species having branchiae from posterior thoracic or anterior abdominal setigers (Table 1). There are four species that are closely related to *L. maciolekae* **n. sp.**: *L. minutus*, *L. platythoracicus, L. texana,* and *L. treadwelli.*. The main characters differentiating these five species are listed in Table 1. *L. maciolekae* **n. sp.** differs from the other four species in having many more thoracic setigers (40 instead to 11–22), complete absence of accompanying capillaries in the thoracic neuropodia, in having abdominal neuropodial flail setae instead of lacking them, by having the branchiae from a late thoracic setiger instead of transitional or abdominal segments. In the latter character, the species is closest to *L. treadwelli.* Further, the arrangement of thoracic neuropodial uncini into two rows, branchiae first present from posterior thoracic setigers and a distinctly dorsoventrally flattened thorax is also similar to that of *L. treadwelli*. However, the greater number of thoracic setigers (40 vs. 14–22) and the presence of very delicate flail setae in the abdominal neuropodia of some setigers in *L. maciolekae* **n. sp.** have not been reported for *L. treadwelli* and its relatives.

Distribution. Argentina, shallow subtidal.

Leodamas marginatus (Ehlers, 1897)

Figures 28–29A–C

Aricia marginata Ehlers, 1897: 95–97, pl. 6, figs. 150–156; 1908: 116; 1912: 23; Willey 1902: 275, pl. 45, fig. 4; Benham 1921: 77; Monro 1930: 144.

Aricia ohlini: Gravier 1911: 105–107, pl. 6, figs. 70–73. Not Ehlers 1900, 1901.

Naineris marginata: Fauvel 1916: 445, pl. 8, figs. 26–33.

Aricia marginata mcleani Benham, 1921: 78, pl. 9, fig. 90; 1927: 96–97. **New synonymy.**

Scoloplos (*Scoloplos*) *marginatus*: Mesnil & Caullery 1898: 142.

Scoloplos marginatus: Augener 1932a: 109; 1932b: 40; Monro 1936: 159; 1939: 123–124; Fauvel 1951: 762; Bellan 1972: 76; 1975: 789; Arnaud 1974: 557, 561, 638.

Scoloplos (*Leodamas*) *marginatus*: Hartman 1952: 232; 1953: 38; 1957: 289; 1966: 11, pl. 2, figs. 6–7; 1967: 108; Rozbaczylo 1985:131; Hartmann-Schröder 1986: 82; Hartmann-Schröder & Rosenfeldt 1988: 53–54; 1990: 107; Knox 1962: 345; 1998: 465, figs. 133–134.

Scoloplos (*Leodamas*) *marginatus mcleani*: Hartman 1966: 11; Averincev 1982: 26–27, Pl. III, figs. 9–13. **New synonymy.**

Scoloplos marginatus mcleani: Hardy 1977: 209–226. **New synonymy.**

Scoloplos (*Leodamas*) *naumovi* Averincev 1982: 37–38, Plate IV, figs. 1–7. **New synonymy.**

Scoloplos (*Leodamas*) sp. Hartman 1967: 108 (in part); 1978: 156.

Material examined. Chile, Patagonian region, Straits of Magellan, *Eltanin* Sta. 11-960, 64 m (1, USNM 60649).— Tierra del Fuego, *Hero* Sta. 656, 18 m (2, USNM 60676); Staten Island, *Hero* Sta. 71-2-6, 0–1 m (2, USNM

60675).—Falkland Islands, *Hero* Sta. 672, 50 m (1, USNM 60677); Sta. 676, 18 m (1, USNM 60678).—Drake Passage, *Eltanin* Sta. 9-740, 384–494 m (1, USNM 56459); Sta. 12-1089, 641 m (1, USNM 56461).—South Orkney Islands, *Eastwind* Sta. 1966-028, 188–192 m (2, USNM 67615).—N. of Elephant Island, ANDEEP I, R/V *Polarstern,* Sta. PS-61/045-1, Otter trawl, 196–269 m (1, SEM, JAB); South Shetland Islands, *Hero* Sta. 700, 38 m (1, USNM 60682); Sta. 1064, intertidal (2, USNM 60681); *Eastwind* Sta. 08, 97–113 m (3, USNM 67614); *Eltanin* Sta. 6-410, 220–240 m (12, USNM 56463, 60648); Sta. 12-1003, 210–230 m (1, USNM 56466).—Antarctic Peninsula, off Anvers Island, *Hero* Sta. 957, 190 m (1 USNM 60679); Sta. 972, 40 m (1, USNM 60680); Sta. 1101, 360–370 m (1, USNM 60683); Arthur Harbor, Sta. 1897 (1, USNM 69382).—Ross Sea, western sector, *Eltanin* Sta. 32-2075, 568 m (1, USNM 60670); Sta. 32-2085, 468–482 m (1, USNM 60671); Sta. 32-2088, 430–433 m (USNM 60672); *Staten Island* Sta. 1, 201 m (1, USNM 67613); off Ross Ice Shelf, *Eltanin* Sta. 32-2065, 473–475 m (1, USNM 60669).—Ross Sea, eastern sector, *Eltanin* Sta. 27-1869, 1565–1674 m (4, USNM 60651); Sta. 27-1870, 659–714 m (9, USNM 60652); Sta. 27-1885, 311–328 m (6, USNM 60653); Sta. 27-1896, 70–81 m (2, USNM 60654); Sta. 27-1897, 362–375 m (1, USNM 60655); Sta. 27-1901, 445–448 m (1, USNM 60656); Sta. 27-1903, 640–646 m (1, USNM 60657); off McMurdo Sound, *Eltanin* Sta. 27-1907, 891 m (2, USNM, 60658); Sta.27-1916, 728 m (1, USNM 60659); off Moubray Bay, *Eltanin* Sta. 32-1995, 344–348 m (3, USNM 60660); Sta. 32-1996, 348–352 m (1, USNM 60661); Sta. 32-1997, 523–528 m (7, USNM 60662); Sta. 32-2012, 589–608 m (1, USNM 60663); Sta. 32-2014, 567 m (1, USNM 60664); Sta.32-2031, 535 m (9, USNM 60665); off Terra Nova Bay, *Eltanin* Sta. 32-2035, 876 m (1, USNM 60666); Sta. 32-2036, 334–335 m (1, USNM 60667); Sta. 32-2039, 565–569 m (1, USNM 60668); off Cape Adare, Sta. 32-2125, 160–164 m (1, USNM 60673); Deep Freeze III, *Atka* Sta. 23, 392 m (1, USNM 67609); Robertson Bay, Deep-Freeze I, *Edisto* Sta. 3, 27 m (1, USNM 67605); Moubray Bay, Deep Freeze IV, *Northwind* Sta. 8, 134 m (1, USNM 67612).—McMurdo Sound, Deep Freeze I, *Edisto* Sta. 8, 321 m (5, USNM 67604); Deep Freeze II, *Glacier* Sta. 2, 384 m (1, USNM 67606); Sta. 6B, 250 m (2, USNM 67607); Deep Freeze III, *Glacier* Sta. BL-16, 140 m (2, USNM 67611); Burton Island Sta. 3, 433 m (8, USNM 67608); off Cape Royds, Ross Island, U.S. Navy Antarctic Expedition, Sta. 99, Jan 29, 1948, 106 m, coll. D.C. Nutt (11, USNM 23869); Sta. 104, 106 m (5, USNM 23853–4); near shore Cape Evans, off Scott's Hut, 16 Jan 2000, 9 m, coll. S. Kim (1, JAB, SEM).—Budd Coast, Vincennes Bay, near Wilkes Station, Deep Freeze III, *Atka* Sta. 29, 135 m (1, USNM 67610).—Weddell Sea, *Glacier* Sta. 69-1, 513 m (6, USNM 46612).—South Pacific Ocean, SE of New Zealand, near Antipodes Island, *Eltanin* Sta. 32-2143, 2010–2100 m (3, USNM 60674).

Description. Largest specimens posteriorly incomplete, 62 mm long, 3 mm wide for 54 setigers; type specimens reported to be 80 mm long for 102 segments (Ehlers, 1897). Color of larger specimens brown; smaller specimens opaque white to light tan.

Thoracic region with peristomium and first three setigers only slightly flattened, thereafter dorsoventrally flattened; abdominal region cylindrical in cross section. Thorax with 14–20 setigers, 11–19 according to Hartman (1966); transition to abdominal region abrupt.

Prostomium triangular in shape, narrowing to pointed anterior end (Fig. 28A), appearing somewhat flattened in lateral view (Fig. 29A); nuchal organ a broad curving slit or groove on either side (Fig. 29A). Peristomium with one simple asetigerous ring, distinctly separated from setiger 1 (Figs. 28A, 29A).

Thoracic parapodia all similar; notopodia with cirriform, postsetal lamellae (Fig. 28A); notopodial lamellae short on setiger 1, becoming full size by setiger 6–8 (Fig. 28A); thoracic neuropodia with swollen lobes from which rows of uncini emerge (Fig. 28B); a small triangular-shaped neuropodial postsetal lobe sometimes present from middle body segments. Abdominal parapodia lacking ventral and interramal cirri; each notopodium with long, cirriform postsetal lamella (Fig. 28D); neuropodium elongated truncate (Fig. 28D).

Notosetae including crenulated capillaries in thoracic and abdominal notopodia; furcate setae (Fig. 28E) present in abdominal notopodia. Furcate setae with unequal tynes connected by web of fine needles (Fig. 28E). Thoracic neuropodia with three long dorsoventral rows and one short, curved fourth transverse row of yellow uncini (Fig. 28C) curving ventral to first three rows; first and fourth row sometimes appearing to merge into U-shape ventral to rows 3 and 4; uncini thick, blunt-tipped, with lateral notch or groove (Fig. 28F–G); with SEM groove broad and flattened, continuing from rounded apex and merging with low transverse crenulated ribs extending around shaft, these not seen in light microscopy (Fig. 29C); with small group of crenulated capillaries sometimes present superior to three rows of uncini, especially in juveniles. Abdominal neuropodia with few smooth, non-crenulated capillaries; embedded acicula present in notopodia; single emergent acicula with curved tip present in neuropodia.

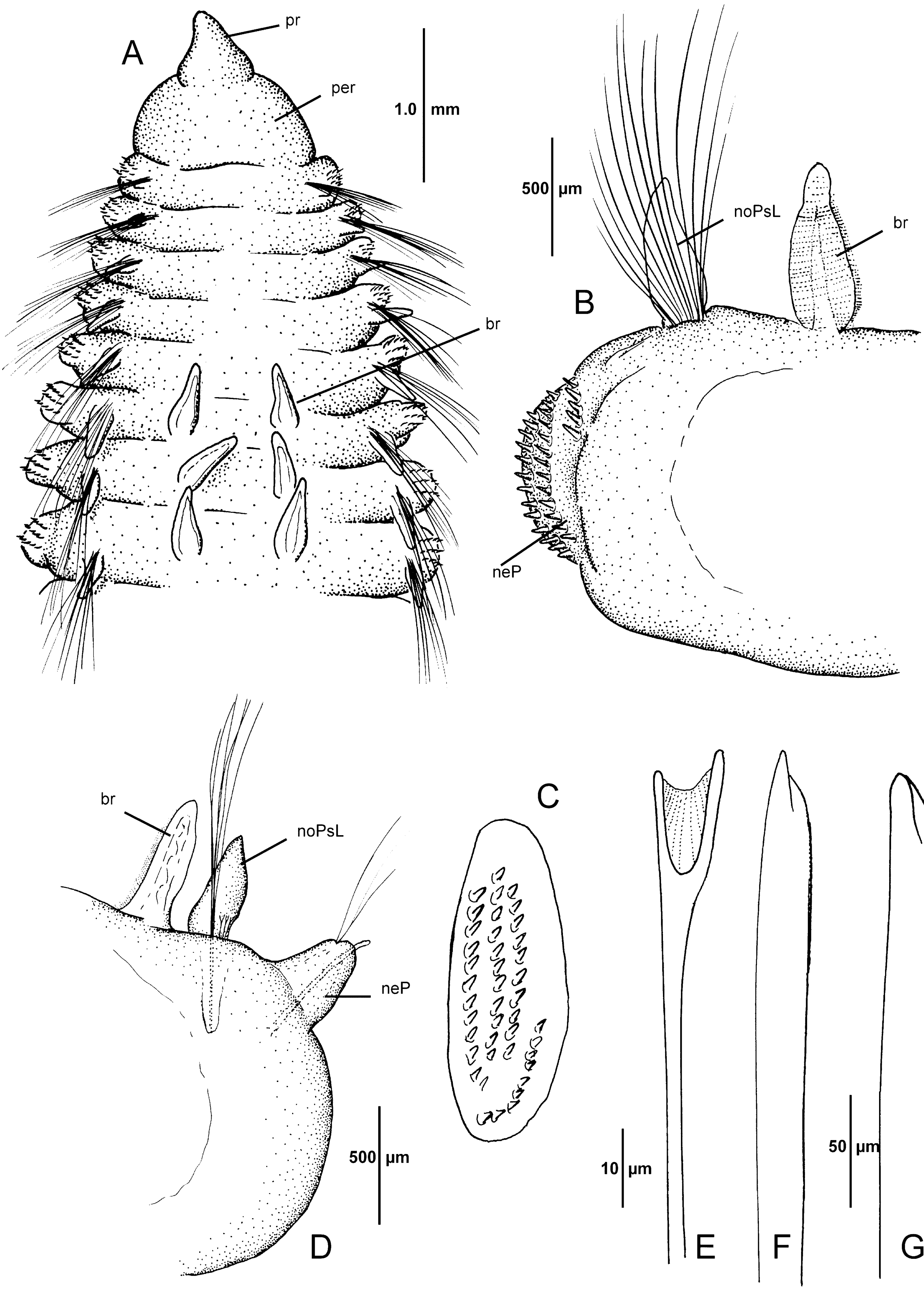

FIGURE 28. *Leodamas marginatus* (Ehlers, 1897). (USNM 60657). A, anterior end, dorsal view; B, thoracic parapodium, anterior view; C, diagram showing arrangement of thoracic neurosetae, not to scale; D, abdominal parapodium, anterior view; E, furcate seta; F–G, thoracic neuropodial uncini.

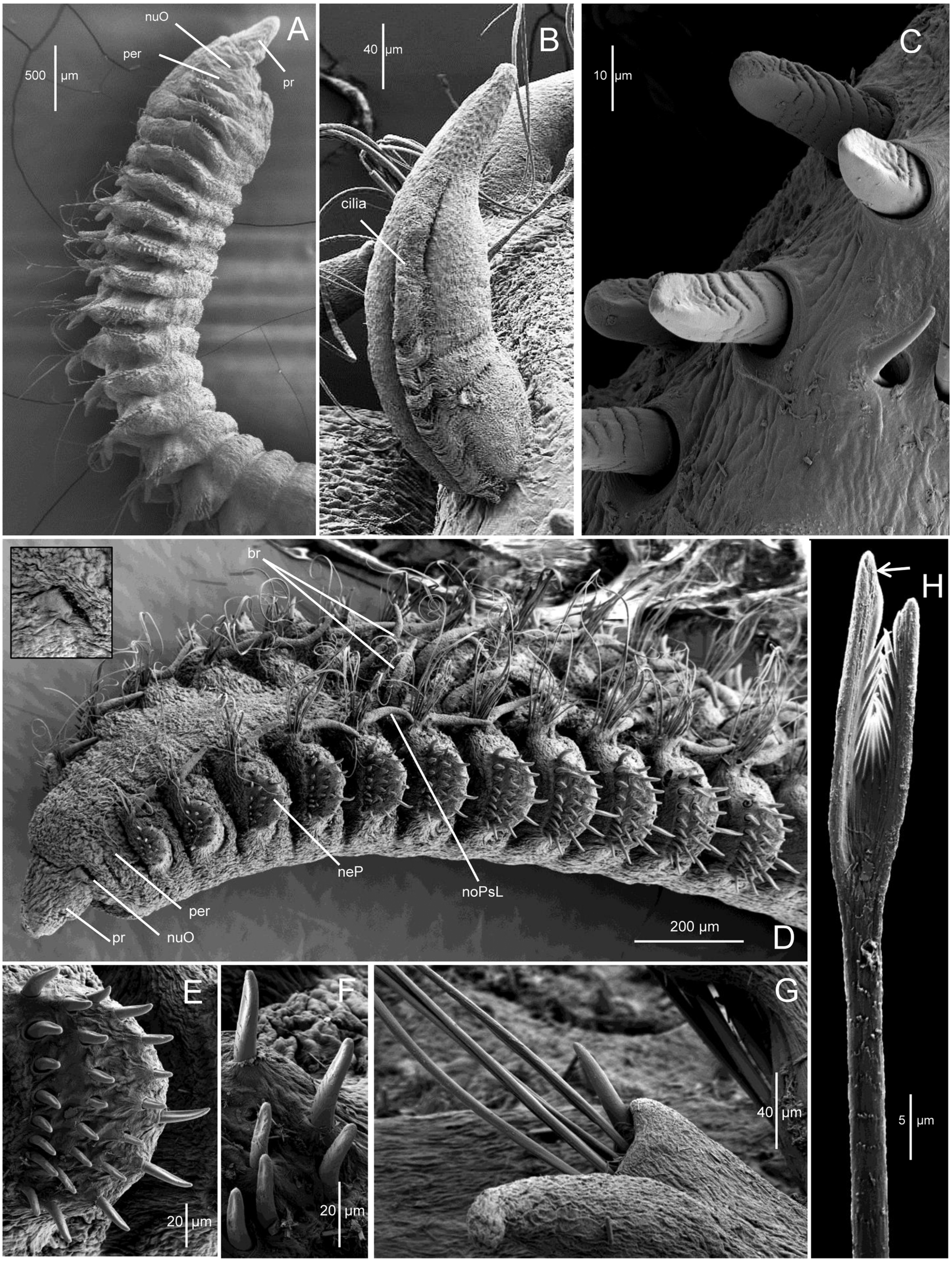

FIGURE 29. *Leodamas marginatus* (Ehlers, 1897) (ANDEEP I, Sta. PS-61/045-1), A–C. A, Anterior end, right lateral view; B, detail of branchia; C, thoracic neuropodial uncini.—*Leodamas cirratus* (Ehlers, 1897) (USNM 1013660), D–H. D, anterior end, left lateral view [inset of nuchal organ, not to scale]; E, thoracic neuropodium; F, thoracic neuropodial uncini; G, abdominal neuropodium; H, furcate seta, arrow denotes opening in tip of tyne.

Branchiae from setiger 6, continuing to end of body; each branchia thick, cirriform, tapering to rounded tip, with thick rows of cilia on medial side (Figs. 28C, 29B).

Biology. *Leodamas marginatus* is one of the few species of Antarctic polychaetes to be the subject of an investigation of its reproduction, life history, and ecology. Hardy (1977) studied two populations occurring between the littoral zone and 35 m depth on Signi Island in the South Orkney Islands (60°42′S; 45°39′W). Hardy (1977) considered his specimens of *L. marginatus* to be small, but they were larger than any encountered in the present study, being up to 99 mm long for 185 segments.

Hardy (1977) found the male: female ratio to be 1:1.85, with 38% of the population being juveniles. In mid-winter (July) the species was found to spawn a single cocoon containing an average of 551 eggs with an average diameter of 600 µm. Embryos develop slowly to the 3–4 segment stage by September. At that time the larvae hatch and burrow into the substratum where they complete their development, with metamorphosis occurring in December and January. Development is therefore direct, without any planktic larval stage. Another 30 months are required before this cohort spawns. Hence, Hardy (1977) was able to determine that three years are required for one generation of this species to develop and reproduce. Mature females live at least five years and may produce a single cocoon in each of two or three spawning seasons.

Averincev (1982) working in shallow waters in the Davis Sea found the species on rock faces with a thin layer of silt at a depth of about 25 m.

Remarks. *Leodamas marginatus* is reported to have only uncini in thoracic neuropodia (Hartman, 1957). Some specimens in the present collection, however, have a superior group of long crenulated capillaries located dorsal to the uncini. These capillaries normally occur in the smaller specimens and juveniles. *Leodamas marginatus mcleani* was distinguished from the stem form by Benham (1921) because a separate group of uncini was present posterior to the three main rows. This character appears to be typical of the species as a whole, however, and a subspecies is not supported; further in some instances, the shorter fourth row merges ventrally with the first row forming a U-shape of uncini ventral to rows 2 and 3. This arrangement is similar to several other species of *Leodamas*. See further comments with *L. cirratus* and *L. hyphalos* (below). *Scoloplos* (*Leodamas*) *naumovi* described by Averincev (1982) from shallow waters of the Davis Sea is not well described, but agrees with the characters reported here for *L. marginatus.*

Distribution. South America, Straits of Magellan and Patagonian regions; Falkland Islands; sub-Antarctic latitudes off SE Argentina and SE New Zealand; Antarctic Peninsula; Ross Sea; Weddell Sea; Intertidal to 1674 m.

Leodamas cirratus **(Ehlers, 1897)**

Figures 29D–H; 30

Aricia cirrata Ehlers, 1897: 94–95, pl. 6, figs. 148–149.
Aricia ohlini Ehlers, 1900: 217–218; 1901: 167–169, pl. 21, figs. 9–13. **New synonymy**.
Scoloplos (*Scoloplos*) *cirratus*: Mesnil & Caullery 1898: 142.
Scoloplos (*Leodamas*) *cirratus*: Hartman 1953: 38; 1957: 290; 1966: 11, pl. 2.
Scoloplos (*Leodamas*) *ohlini*: Rozbaczylo 1985: 132.

Material examined. Argentina, offshore, 190 km E Puerto San Julien, Santa Cruz, about 280 km NW of Falkland Islands, 49°35′S 64°43′W, 127 m, **holotype** of *Arica cirrata* (ZMH V1224); R/V *Vema* Sta. V-17-86, SE of Camarones, 225–227 m, 11 Jun 1961 (4, LACM-AHF Poly 5034); R/V *Vema* Sta. V-18-12, continental slope E of Deseado, 424–428 m (2, LACM-AHF Poly 5030).—Argentina, nearshore, IBM Sta. Mej-12, 24 m (1, JAB); IBM Sta. H-17, 16 m (1, USNM 1013659); IBM Sta. N-1055, 92–96 m (1, SEM stub, USNM 1013663); San Antonio Oeste, Marejada Norte (1, USNM 1013661); Golfo San Matías, Piedra Coloradas, Feb 1972, coll. Escofet and J.M. Orensanz (2, USNM 1013660); IBM Sta. Mej-12 (1, USNM 1013662).—Falkland Islands, Port William, 3 Sep 1902, Swedish Antarctic Expedition 1901–1903, Sta. 52, 51°40'S; 57°44'W, 17 m, in sand (1, SMNH 3106); Port Stanley, 9 Apr 1927, coll. W.S. Schmidt (1, USNM 24341).—Chile, Straits of Magellan, *Eltanin* Sta. 7-967, 81 m (1, USNM 56465).—Tribune Bank, 52°38′S, 70°00′W, 46 m, sand and gravel, coll. E. Nordenskold, **holotype** of *Aricia ohlini* (SMNH 551).—South Orkney Islands, *Eltanin* Sta. 12-1079, 593–598 m (1, USNM 56467).

Description. Holotype (ZMH V1224) incomplete, 24 mm long, 1.5 mm wide for 73 setigers; thoracic region narrow, with 27 setigers, flattened at first, becoming more rounded in abdominal region. Falkland Islands specimen

(SMNH 3106) incomplete, about 17 mm long and 1.5 mm wide for 54 setigers; thoracic region narrowing anteriorly, slightly depressed, with 32 setigers, last four setigers increasingly smaller, with fewer uncini. Tribune Bank specimen (SMNH 551) also incomplete, 17 mm long and 1.5 mm wide for 47 setigers; thoracic region with 21 setigers. Color in alcohol: brown.

Prostomium triangular in outline, tapering anteriorly, but not acutely pointed; without eyespots; multi-lobed proboscis present (Fig. 30A); paired nuchal organs present dorsolaterally at border with peristomium (Fig. 29D, inset). Peristomium with one well-developed achaetous ring distinctly separated from prostomium and first setiger (Figs. 29D, 30A).

Notopodial postsetal lobes from setiger 1, short, fingerlike at first, then increasing in length, becoming cirriform by setigers 4–5 (Figs. 29D, 30B), continuing through abdominal segments.

Thoracic neuropodia with setae arising from elongate thickened lobe; with short, conical postsetal lobe first present from middle of neuropodium from about setiger 25 or last 3–7 thoracic setigers (Fig. 30B); with short, cirriform subpodial lobe resembling ventral cirrus first present from last 2–6 thoracic setigers, continuing posteriorly through 18–20 abdominal setigers (Fig. 30B–C). Abdominal neuropodia with thickened elongated lobes bearing short cirriform postsetal lobe (Fig. 30C).

Thoracic and abdominal notosetae including fascicles of crenulated capillaries and 3–4 short, furcate setae; furcate setae with unequal tynes, connected by thin webbing composed of very fine needles and with smooth shaft (Fig. 30D); with SEM fine needles between tynes numbering 7–8 on a side, merging with tynes; each tyne with expanded apex, narrowing to bluntly pointed tip, but with narrow, elongate opening on inner border of tyne (Fig. 29H); shaft with transverse rows of minute barbs (Fig. 29H). Thoracic neuropodial uncini arranged in three long vertical rows and one short posterior row, similar to *S. marginatus* (Fig. 29D–E), without accompanying capillaries; uncini blunt tipped, with weakly developed subapical notch or groove and with smooth shaft (Fig. 30E–F); with SEM subapical groove, elongate, flattened extending about one-third distance to point of emergence from neuropodium, rest of shaft with weakly developed transverse ribs (Fig. 29E–F); abdominal neurosetae including capillaries and an acicular spine sometimes with thin hyaline hood (Fig. 30G), sheath not apparent in SEM (Fig. 29G).

Branchiae from setiger 6 (Figs. 29D, 30A), each broad, basally tapering to prolonged, nipple-like extension; with lateral cilia visible (Fig. 30B–C). Branchial bases of some abdominal segments connected with low ciliated crest.

Pygidium of specimen from USNM 1013660 with anus directed posteriorly, surrounded by dorsal pair of thick lobes and four pairs of lateral cirri; dorsal most pair longest, weakly moniliform, one with bifurcate tip, other with single tapering tip; two middle pair short, stubby, sometimes one missing; ventral most pair short, narrow, tapering to pointed tip.

Remarks. The holotype was collected at a depth of ca. 125 m offshore SW Argentina and approximately 280 km NW of the Falkland Islands. The type specimen agreed very well with Ehlers' (1887) original account both with size, number of segments, and morphology. The Falkland Islands specimen was examined by Hartman (1953:38) who found it agreed with Ehlers (1897) original account; my examination of this specimen confirms this identification. Ehlers' holotype is 24 mm long for 73 segments with 27 thoracic segments; the largest specimens in the new collections are 17 mm long for 54 segments with 32 thoracic segments. The type specimen of *Aricia ohlini* from the Straits of Magellan also agrees well with *Leodamas cirratus*.

Leodamas cirratus closely resembles *L marginatus* and *L. cochleatus* in the arrangement and form of the thoracic neuropodial uncini, which are arranged into four vertical rows and have grooves on one side of the tip and transverse ridges or rows of minute barbs along the shaft seen best in SEM. In *L. cirratus*, the uncini are not accompanied by capillaries, whereas superior capillaries are sometimes present in *L. marginatus*. *Leodamas cirratus* has a single subpodial lobe or ventral cirrus from posterior thoracic and some abdominal segments; this lobe is lacking on *L. marginatus*. The prostomium of *L. cirratus* is more acutely pointed and the anterior thoracic region is less distinctly tapered than in *L. marginatus*. Further, the thoracic region of *L. cirratus* is more dorsoventrally flattened than in *L. marginatus*. Differences with *L. cochleatus* include the presence of thoracic neuropodial uncini with a broad, heavily notched apex and with distinct transverse ridges on the shafts. Additionally, *L. cochleatus* has abdominal notopodial acicular spines in addition to neuropodial (see below).

The presence of moniliform pygidial cirri appears to be unusual among orbiniids, but these have not been well studied.

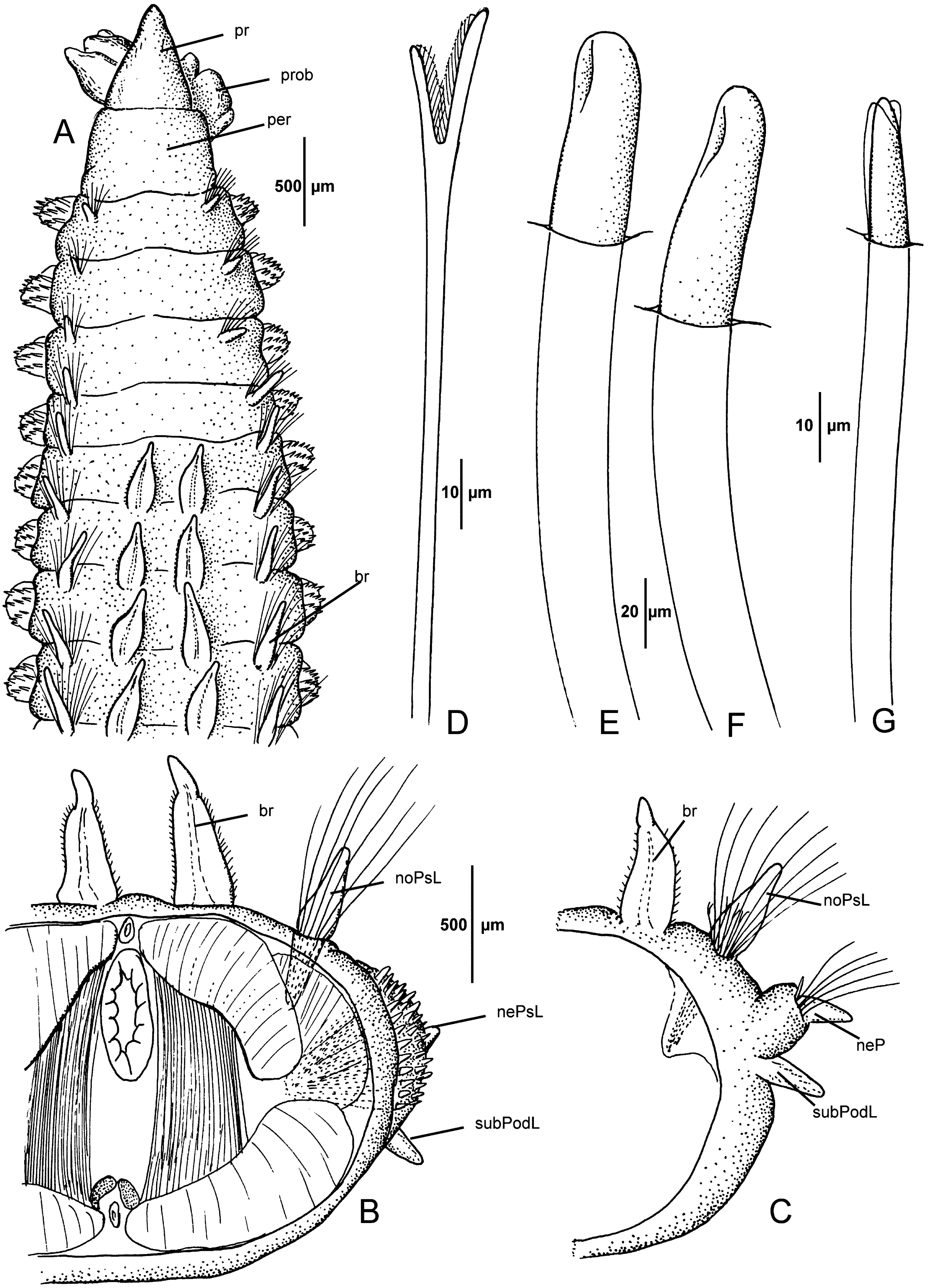

FIGURE 30. *Leodamas cirratus* (Ehlers, 1897) (USNM 1013659). A, anterior end, dorsal view; B, thoracic parapodium from setiger 26, anterior view; C, abdominal parapodium, from setiger 43, anterior view; D, furcate seta; E–F, thoracic neuropodial uncini; G, abdominal neuropodial acicula.

Distribution. Off the SE coast of Argentina, shallow subtidal to 225–428 m; Falkland Islands 17–127 m; Straits of Magellan, 45–80 m; South Orkney Islands, 593–598 m.

***Leodamas cochleatus* (Ehlers, 1900). New Status**
Figures 31–32

Aricia cochleata Ehlers, 1900:217; 1901: 166–167, pl. 21, figs. 14–21.

Material examined. Chile, Straits of Magellan, Tribune Bank, 52°38′S, 70°00′W, 46 m, sand and gravel, coll. E. Nordenskold, **holotype** of *Aricia cochleata* (SMNH 549).—Off Argentina, E of Mar del Plata, R/V *Vema* Station, V-17-101, 450–454 m, 19 Jun 1961 (5, LACM-AHF Poly 5043; 3, LACM-AHF Poly 5045).

Description. Holotype (SMNH 549) incomplete, 32 mm long, 2 mm wide for 110 setigers, color in alcohol pale yellow. Argentinean specimens all incomplete, smaller, 8–10 mm long, 0.8–1 mm wide, with 24–30 setigers (LACM-AHF Poly 5043); juveniles also present, one mostly complete, 4.5 mm long, 0.3 mm wide, with 40 setigers (LACM-AHF Poly 5045), color in alcohol tan. Body of all specimens flattened dorsally throughout, rounded ventrally, more so in the abdominal segments; body widest in thoracic segments, tapering posteriorly.

Prostomium triangular in outline, tapering anteriorly to narrow, blunt tip (Fig 31A); without eyespots; paired nuchal organs narrow slits, dorsolateral at border with peristomium. Peristomium with one achaetous ring only vaguely separated from prostomium, but well separated from first setiger (Fig. 31A).

Holotype with 29 setigers in thoracic region; smaller Argentinean specimens with 10–11 thoracic setigers. Notopodial postsetal lobes from setiger 1, fingerlike in shape, well developed from the first, increasing in size over thoracic region (Fig. 31A), continuing through abdominal segments. Thoracic neuropodia elongate thickened lobes, with no postsetal lobe or lamella present; thoracic uncini arranged in three elongate rows, with the first appearing to curve ventrally forming a fourth row behind the third, similar to that of *L. marginatus* and *L. cirratus*. Abdominal neuropodia thickened elongated lobes, with short ventral cirrus on apex of neuropodium and prominent cirriform subpodial lobe at base of neuropodium (Fig. 31B) present from first present abdominal setigers, continuing posteriorly through on all abdominal segments.

Thoracic notosetae including fascicles of crenulated capillaries; abdominal notosetae including capillaries, 1–2 straight spines with narrow pointed tips (Fig. 32F), and 1–3 furcate setae (Figs. 31I, 32H); furcate setae each with unequal tynes bearing fine needles; shaft smooth (Figs. 31I, 32H). Thoracic neuropodia with uncini arranged in three long vertical rows and one short posterior row, similar to *L. marginatus* and *L. cirratus*; without accompanying capillaries; uncini of anteriormost 2–3 setigers with straight shaft bearing weakly developed transverse ribs and with a rounded narrowing apex; with elongate narrow groove on one side (Figs. 31C–E, 32A–C); subsequent setigers with shaft of uncini developing prominent transverse ribs or rows of blunt barbs; with tip of uncini becoming expanded, curved, blunt, with subapical pocket or notch on concave side (Figs. 31F–H, 32D–E). Abdominal neurosetae including capillaries and 1–2 acicular spines with tip narrowing to curved blunt tip (Fig. 32G).

Branchiae from setiger 6, each broad, basally tapering to prolonged, narrow apical extension (Fig. 31A–B). Pygidium unknown.

Remarks. *Aricia cochleata* and *A. ohlini* were both briefly described but not illustrated by Ehlers (1900) from the same locality in the Strait of Magellan and subsequently fully described and illustrated in Ehlers (1901). Augener (1926) synonymized *A. cochleata* with *A. ohlini* based on collections from New Zealand. He did not examine the original collections and provided little justification for the synonymy. Hartman (1957, 1966), Rozbaczylo (1985) and others, however, recognized and perpetuated this synonymy with little or no discussion despite there being clear differences between the two species in Ehlers' (1901) published descriptions and illustrations. Further, if these two species were synonyms, then *A. cochleata* would have to be the valid name, having been described first in the same paper by Ehlers (1900). Both species names were referred to *Scoloplos* (*Leodamas*) by Hartman (1957) and are clearly species of *Leodamas* as defined in the present paper. Despite the assumption of synonymy, an inspection of the descriptions of these two species suggests that they are different. This was verified by examining the type specimens and additional collections. In the present paper, *Leodamas ohlini* becomes a synonym of *L. cirratus* and *L. cochleatus* is redescribed and resurrected as a distinct and valid species.

The main difference between *Leodamas cirratus* (with *L. ohlini* as a synonym) and *L. cochleatus* is with the nature of the thoracic neuropodial uncini. In *L. cirratus*, these uncini are relatively simple, straight-shafted with a weakly developed subapical notch or groove; in SEM weakly developed transverse ridges were observed. In contrast, the thoracic neuropodial uncini of *L. cochleatus* exhibit a distinct change in structure from those of the anteriormost 2–3 setigers where uncini have a relatively smooth, straight shaft bearing weakly developed transverse ridges and a narrow, rounded apex and an elongate narrow groove on one side. These uncini are replaced in middle and posterior thoracic neuropodia by spines with distinct transverse ribs or rows of blunt barbs on the shaft and with the tip of the uncini becoming expanded, curved, blunt, and bearing a subapical pocket or notch on the concave side. These differences with the thoracic uncini between *L. cochleatus* and *L. cirratus* (as *L ohlini*) were clearly described and illustrated by Ehlers (1901); *L. cirratus* is most closely related *to L. marginatus* (see above). Additional features of *L. cochleatus* not seen in *L. cirratus* are with the presence of abdominal spines (aciculae) in the neuropodia and uniquely, in the notopodia (Fig. 31B). The neuropodial spines number 1–2 and are weakly curved and blunt-tipped apically (Fig. 32F–G). The notopodial spines number 1–2 and are straight and also bluntly tipped (Fig. 31B).

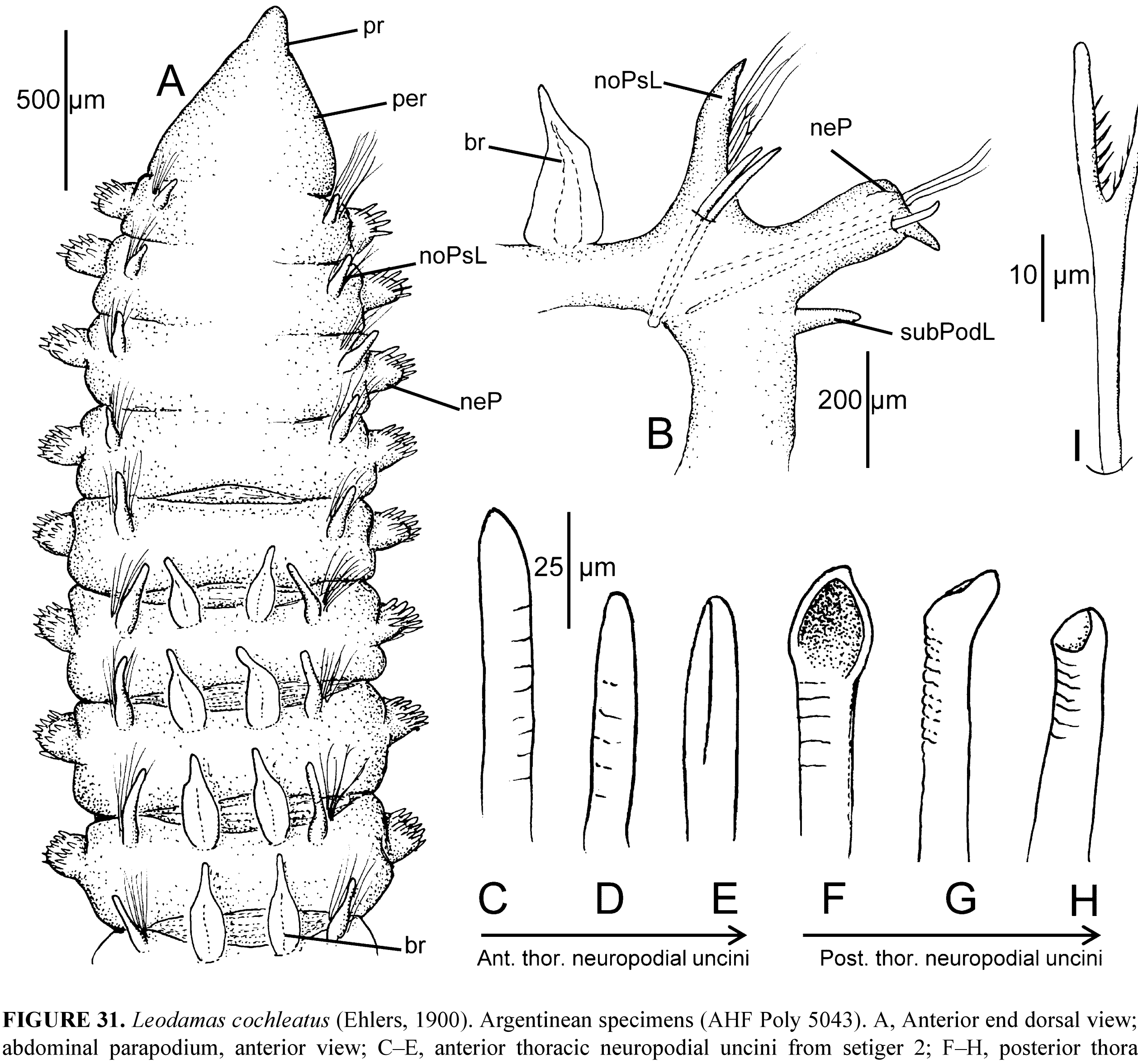

FIGURE 31. *Leodamas cochleatus* (Ehlers, 1900). Argentinean specimens (AHF Poly 5043). A, Anterior end dorsal view; B, abdominal parapodium, anterior view; C–E, anterior thoracic neuropodial uncini from setiger 2; F–H, posterior thoracic neuropodial uncini from setiger 8; I, furcate seta.

Leodamas hamatus recently described from off Costa Rica by Dean & Blake (2015), is another species where the neuropodial uncini change morphologically from anterior to posterior thoracic setigers. However, in contrast to

L. cochleatus, the posterior neuropodial spines of *L. hamatus* develop a prominent, thickened hood-like structure on the convex side of the curved spines. In addition, the abdominal neuropodial uncini of *L. hamatus* are large, heavy and curve to a pointed tip instead of being of being narrow and blunt-tipped.

Distribution. Offshore Argentina, to 454 m; Chile, Straits of Magellan; 46 m.

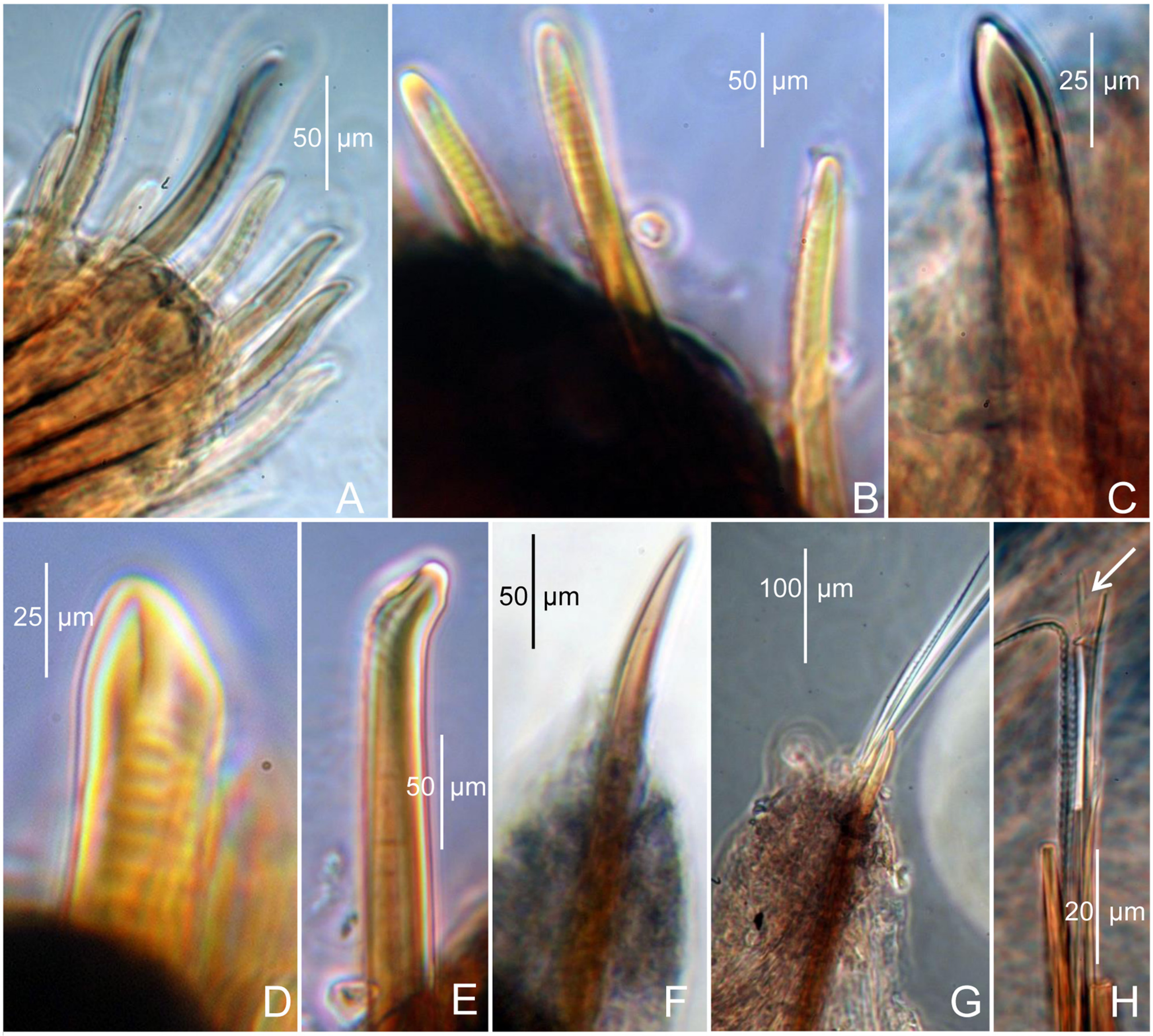

FIGURE 32. *Leodamas cochleatus* (Ehlers, 1900). Phase Contrast images from Argentinean specimens (AHF Poly 5043): A–B, anterior thoracic uncini from setiger 2; C, detail of anterior thoracic uncinus showing longitudinal notch; D–E, posterior thoracic uncini from setiger 8 showing expanded apex and notch; F, abdominal notopodial spine; G, abdominal neuropodium with spine and capillaries; H, abdominal notosetae including capillaries, spines (broken) and furcate seta.

Leodamas hyphalos **new species**

Figures 33–34

Scoloplos (*Leodamas*) spp. Hartman 1967: 108 (in part).

Material examined. Drake Passage, *Eltanin* Sta. 4-112, 20 Jul 1962, 56.03°S, 61.93° W, 4008 m, 13 **paratypes** (USNM 56456); Sta. 4-126, 29 Jul 1962, 57.20°S, 62.75°W, 3733–3806 m, **holotype** (USNM 1013904); and 13 **paratypes** (USNM 56457); Sta. 4-155, 17 Aug 62, 56.52°S, 63.25°W 3927 m, 7 **paratypes** (USNM 56458); R/V *Polarstern,* ANDEEP I, Sta. PS-61/043-2, 3958 m (1, SEM, JAB); PS-61/046-3, 2888 m (1, SEM, JAB).

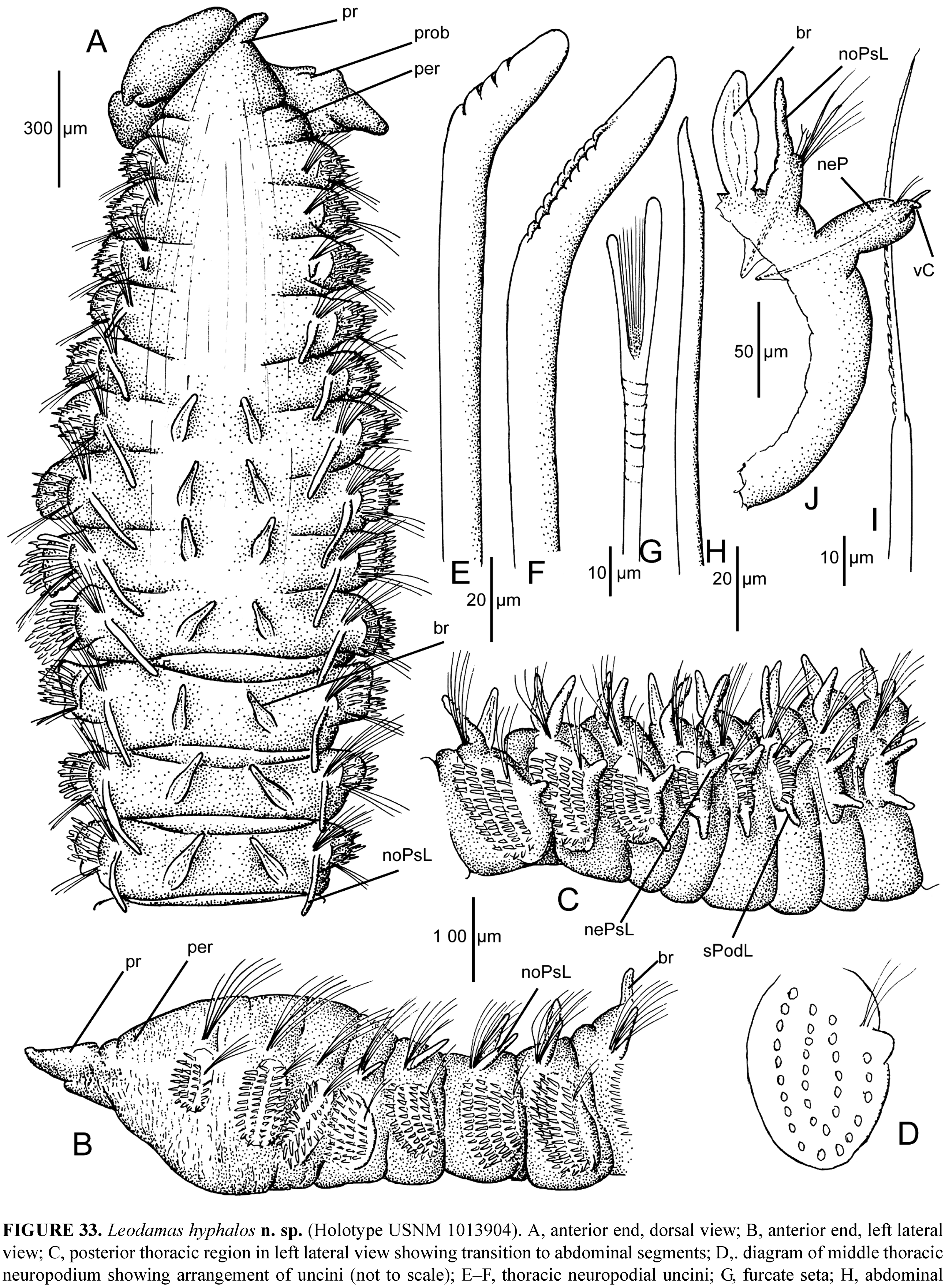

FIGURE 33. *Leodamas hyphalos* **n. sp.** (Holotype USNM 1013904). A, anterior end, dorsal view; B, anterior end, left lateral view; C, posterior thoracic region in left lateral view showing transition to abdominal segments; D,. diagram of middle thoracic neuropodium showing arrangement of uncini (not to scale); E–F, thoracic neuropodial uncini; G, furcate seta; H, abdominal neuropodial acicula; I, abdominal notopodial flail seta; J, abdominal parapodium, posterior view.

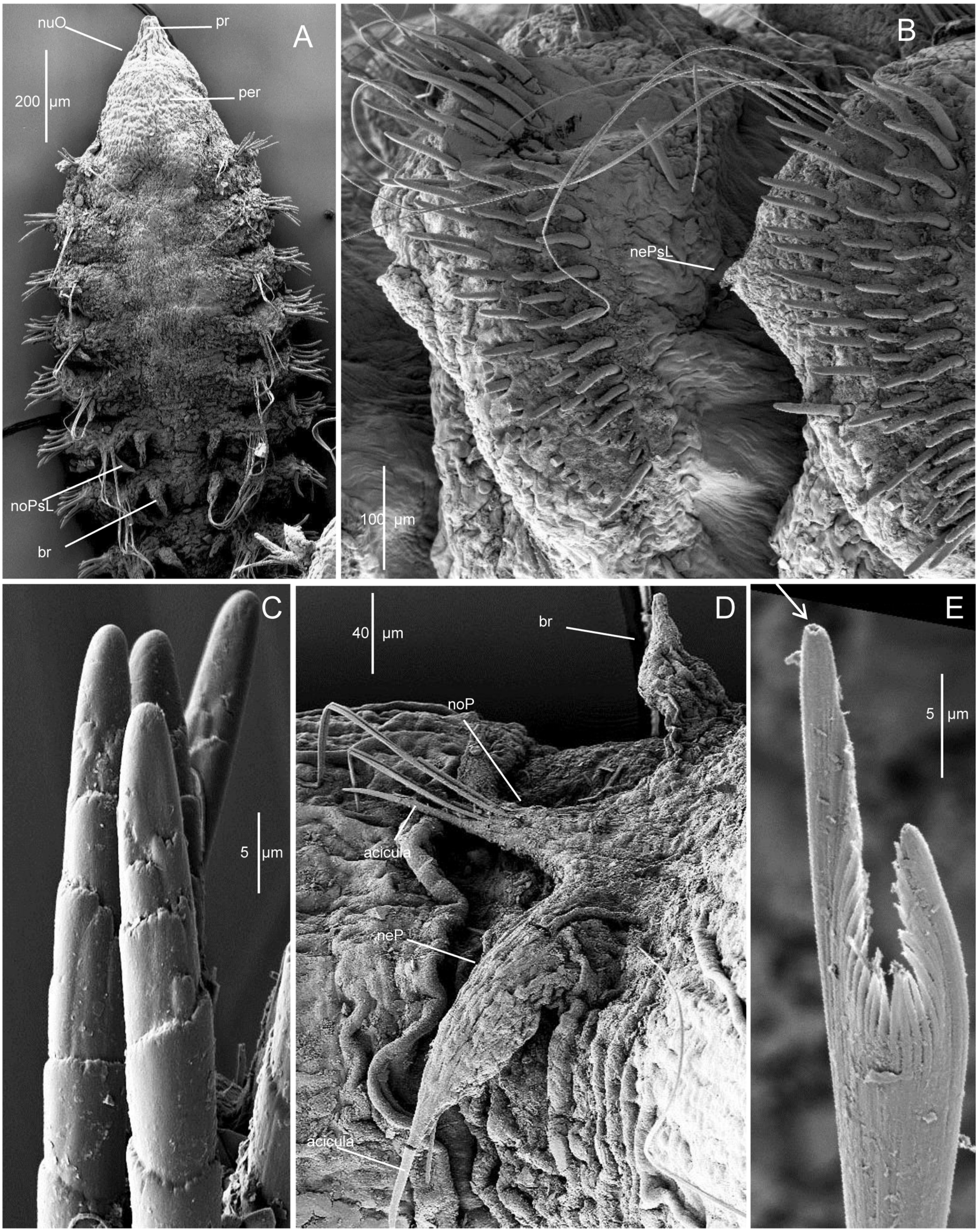

FIGURE 34. *Leodamas hyphalos* **n. sp.** (ANDEEP I, Sta. PS-61/046-3, SEMs, JAB) A, anterior end, dorsal view; B, two thoracic neuropodia in anterior view; C, thoracic neuropodial uncini, detail; D, abdominal parapodium, anterior view; E, furcate seta, arrow denotes opening in tip of tyne.

Description. Majority of specimens small, incomplete; holotype 5.5 mm long and 0.7 mm wide for 29 setigers; largest paratype 9.0 mm long and 0.6 mm wide for 34 setigers. A single, much larger incomplete specimen from ANDEEP I Sta. PS-61 046-3 broken into two parts with 82 setigers, measuring 36 mm long and 3 mm wide across thorax. Color in alcohol: light brown.

Thoracic region with 16–18 setigers, inflated in first 3–4 setigers (Fig. 33B), subsequent thoracic setigers depressed; transition to abdominal region gradual, with last three thoracic setigers having fewer setae (Fig. 33C). Intersegmental annulations first present from setigers 8–9; these weakly developed, never prominent (Fig. 33A). Branchiae from setiger 6 (Figs. 33A, 34A); thoracic and anterior abdominal branchiae basally inflated (Figs. 33A, 34A), subsequent abdominal branchiae expanded (Fig. 33J); branchiae absent from far posterior setigers.

Prostomium triangular in outline, pointed on anterior margin (Figs. 33A, 34A); eyespots absent; nuchal organs in SEM as transverse slits at border of prostomium and peristomium (Fig 34A); proboscis divided into 3–4 lobes (Fig. 34A). Peristomium with one short achaetous ring (Figs. 33A, 34A).

Thoracic notopodia with minute postsetal lamellae on setigers 1–2, barely seen in SEM (Fig. 33A), becoming larger more visible from setiger 3 (Fig. 33A), short at first, then elongating, becoming unusually long, fingerlike structures (Figs. 33A–C, 34A), continuing through abdominal region. Thoracic neuropodia with setae arising from elongated thickened lobes (Figs. 33C, 34B); postsetal lamellae from setiger 5–11, attached to posterior border of upper one-third of setal lobe (Figs. 33C, 34B); each lobe short triangular at first, then elongating in transitional region to form fingerlike lamella; a single subpodial lobe from setiger 14–15, continuing through anterior abdominal segments (Fig. 33C); absent from middle and posterior abdominal segments (Fig. 33J). Abdominal neuropodia elongated, with short ventral cirrus (Fig. 33J).

Thoracic notopodia with fascicles of numerous crenulated capillaries and a single furcate seta; abdominal notopodia with three thin crenulated capillaries, two flail setae (Fig. 33I) and 2–3 furcate setae (Figs. 33G, 34E); furcate setae thin, delicate, easily broken, with unequal tynes connected by thin webbing composed of fine needles and shaft with faint annulations (Fig. 33G); with SEM, furcate setae with 9–10 needles on each side with lateral ones merging with tynes; each tyne with minute apical opening (Fig. 34E). Flail setae with thick, non-crenulated shaft bearing thin, crenulated tips (Fig. 33I). Thoracic neuropodia with dense fascicles of blunt-tipped uncini arranged in four rows (Fig. 33B–C); uncini of anterior row typically continuing ventrally below rows 2 and 3, then merging with row 4 forming a U-shape (Fig. 33D); in some neuropodia, rows 2 and three also joined ventrally; uncini of anterior row sharply curved, with 3–5 transverse ridges (Fig. 33E), with SEM ridges appearing irregular, angular (Fig. 34C); uncini of posterior row not as sharply bent, with 9–10 transverse ridges (Fig. 33F); 2–3 long crenulated capillaries present in superior position of last row of uncini (Fig. 33B–C, 34B). Abdominal neurosetae including 1–2 simple, blunt-tipped acicula (Figs. 33H, 34D) and 2–3 thin, simple capillaries (Fig. 33J).

Etymology. *hyphalos*: Greek for submerged, in the deep.

Remarks. Of the six species of *Leodamas* encountered in this study, *L. hyphalos* **n. sp.** is the only one to bear flail setae in the abdominal notopodia. *Leodamas hyphalos* **n. sp.** is closest in morphology to *L. marginatus* in the nature and arrangement of the neuropodial uncini; both species have a few superior capillary setae dorsal to the posterior row of uncini. The thoracic neuropodial uncini of *L. marginatus* are arranged in three long vertical rows and with a short fourth row that continues ventral to the first three; in contrast, there are four long rows of uncini in *L. hyphalos* **n. sp.** with the first and last often merged ventrally and forming a U-shape. Although the majority of specimens were small, the much larger specimen from Sta. PS-61 046-3 from lower slope depths of 2888 m was similar to *L. marginatus* in size. The smaller specimens of *L. hyphalos* **n. sp.** all occurred at abyssal depths greater than 3600 m, suggesting that the species may be size limited in the deeper parts of its habitat, possibly due to limited or patchy organic input to the abyssal sediments. The close similarity of *L. hyphalos* **n. sp.** to *L. marginatus* suggests that it may be a lower slope and abyssal sibling of the widely distributed and common shelf and upper slope species.

Distribution. Known only from the Drake Passage between South America and the Antarctic Peninsula; 2888–4008 m.

Leodamas perissobranchiatus **new species**

Figure 35

Scoloplos (*Leodamas*) sp. Hartman 1967: 108 (in part, Sta. 753 only).

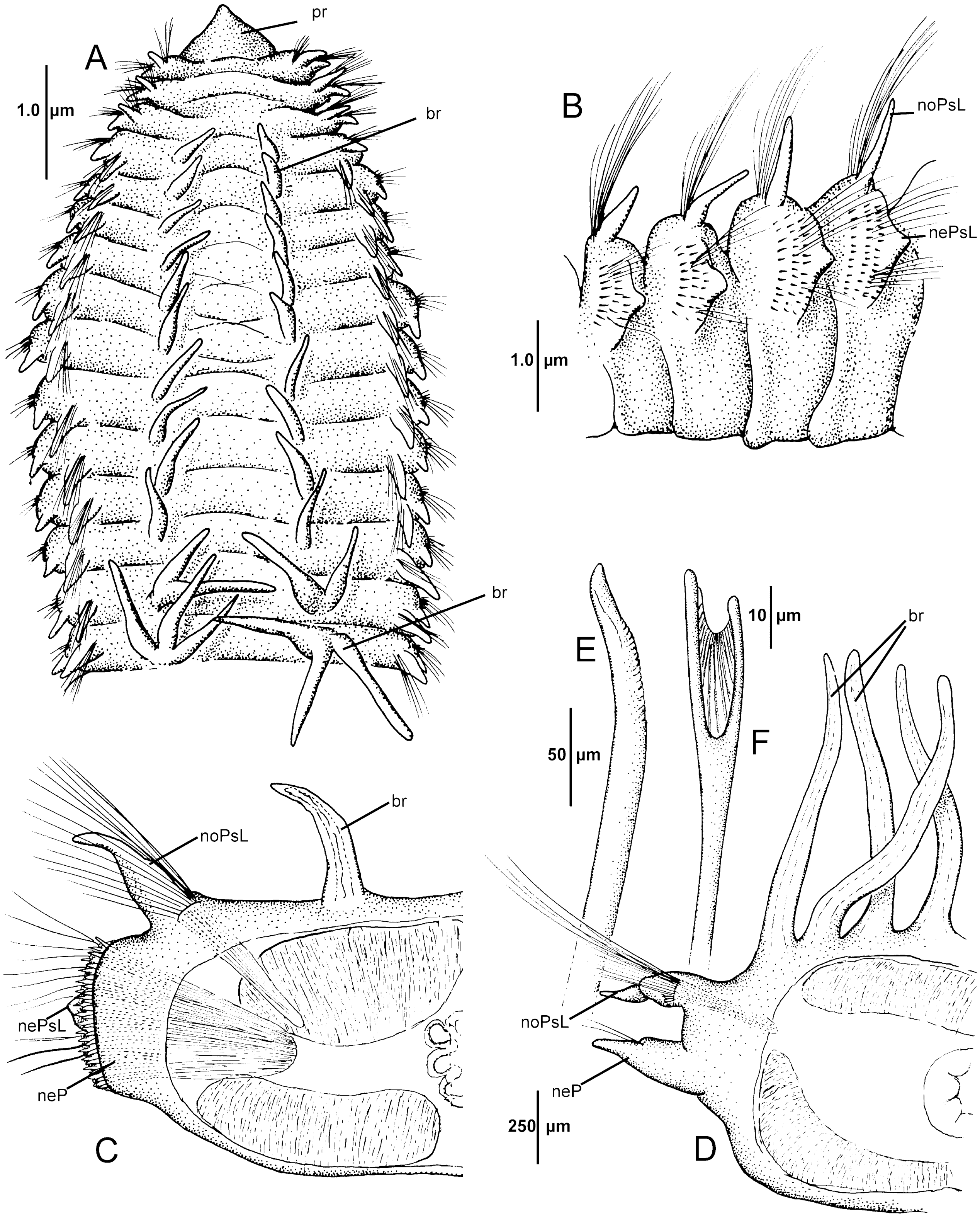

FIGURE 35. *Leodamas perissobranchiatus* **n. sp.** Holotype (USNM 1013905). A, anterior end, dorsal view; B, some anterior thoracic setigers in left lateral view; C, thoracic parapodium, anterior view; D, abdominal parapodium, anterior view; E, thoracic neuropodial uncinus; F, furcate seta.

Material examined. Western Chile, off Valparaiso, *Eltanin* Sta. 9-753, 26 Sep 1963, 33.27°S, 71.78°W, 192 m, **holotype** (USNM 1013905) and 3 **paratypes** (USNM 56460).

Description. All types incomplete, largest paratype 17 mm long, 4 mm wide for 44 setigerous segments. Thoracic region broad, dorsoventrally flattened, with 11–13 setigers, narrowing abruptly to more oval-shaped abdominal region. Color in alcohol: brown.

Prostomium reduced, pointed on anterior margin (Fig. 35A). Peristomium reduced, hidden by setiger 1 dorsally, reduced ventrally to simple ring around oral opening; nuchal slits present on lateral margins of peristomium; proboscis saclike.

Thoracic parapodia all similar, well developed, with those of anterior segments narrowest. Segmental dorsal sense organs not present. Notopodial postsetal lamellae with broad, flattened bases tapering to narrow tips (Fig. 35C); neuropodia consisting of broad tori bearing triangular-shaped postsetal lamellae (Fig. 35B–C). Abdominal parapodia all similar, shifted only about 20–45° dorsally; with cirriform postsetal lamellae (Fig. 35D).

Branchiae from setiger 4; branchiae single, flattened, acuminate on anterior thoracic setigers (Fig. 35C), becoming palmately branched from last thoracic or transitional segment of abdominal region; branchiae formed of two branches (Fig. 35A), then increasing to three and finally four branches (Fig. 35D); 4-branched arrangement continuing until about setiger 40, thereafter branches reduced to 3, then 2, and 1 in far posterior segments.

Notosetae including dense fascicles of long, crenulated capillaries in thoracic setigers and crenulated capillaries, furcate setae and cross-striated, non-crenulated capillaries in abdominal notopodia; furcate setae with unequal tynes between which fine needles connected in a web on both sides (Fig. 35F). Neurosetae of thoracic setigers in 3–4 dense rows of uncini intermixed with few long, thin silky crenulated capillaries (Fig. 35B–C); uncini distally curved, notched with lateral sheath and transverse ribs along shaft (Fig. 35E); abdominal neurosetae short, non-crenulated capillaries, few in number; tip of single acicula emergent.

Etymology. *Perissobranchiatus*: *perisso*, Greek for beyond the regular number or size; *branchos*, Greek for gill.

Remarks. *Leodamas perissobranchiatus* **n. sp.** is most closely related to *L. latum* (Chamberlin, 1919), originally described from 588 m off the Pacific coast of Panama in having branched or multiple branchiae arising from a single location. The species was later reported by Fauvel (1932) from 457 m off Burma. *Leodamas perissobranchiatus* **n. sp.** differs from *L. latum* in having branchiae first present from setiger 4 instead of 5, in having each branchia with maximally four branches in a palmate arrangement instead of nine, and in having 11–13 thoracic setigers instead of 19–20. In addition, the branchial branches of *L. perissobranchiatus* arise separately, whereas in *L. latum*, each branch arises from a common raised core. There are also differences with the thoracic neuropodial uncini; in *L. perissobranchiatus* there is a lateral sheath along the shaft that is not present in *L. latum.* Unlike most other orbiniids, *L. perissobranchiatus* **n. sp.** has the abdominal parapodia in a more lateral position, shifted dorsally to only about 20–45°, probably due to the space taken up from the bases of the additional branchiae; most dorsally oriented branchiae are present in far posterior segments. Another species of *Leodamas* with branched branchiae is *L. cylindrifer* (Ehlers, 1904) from intertidal zones in New Zealand and Australia. However, in this species the branchiae are first present from an anterior abdominal segment and are dendritically branched instead of palmate.

Distribution. Western Chile, 192 m.

Leodamas tribulosus (Ehlers, 1897)

Figures 36–37

Aricia tribulosa Ehlers, 1897: 91, pl. 6, figs. 141–147; 1901: 166; Fauvel 1907: 19.
Scoloplos (*Scoloplos*) *tribulosus*: Mesnil & Caullery 1898: 142.
Scoloplos tribulosus: Fauvel 1941: 286.
Scoloplos (*Leodamas*) *tribulosus*: Hartman 1957: 290; 1966: 13, pl. 3, figs. 1–2; Hartmann-Schröder 1962b: 129–130, figs. 151–153; 1965: 192; Rozbaczylo, 1985: 132.
Scoloplos armiger trioculata Hartmann-Schröder, 1962b: 134–135, figs. 88–89. **New Synonymy.**
Protoariciella uncinata: Elias, Vallarino & Bremec 2000: 181–184. Not Hartmann-Schröder 1962b.
Leodamas tribulosus: Bleidorn *et al*. 2009: 57–69 (molecular phylogeny).

Material examined. Argentina, Mar del Plata, intertidal, Feb 1970, coll. J.M. Orensanz (1 juvenile, JAB); Santa Clara, mussel beds, coll. R. Elias, 12 Jan 2001, (3, MCZ 135298); Golfo San Matías, Las Chañares, intertidal, Feb

1972, Coll. J.M. Orensanz (2, USNM 1013664); South of Isla Colorado, intertidal, Jan 1973, coll. J.M. Orensanz (7, USNM 1013667); Puerto Lobos Beach, intertidal, 21 Jan 1973, coll. J.M. Orensanz (1, USNM 1013666); IBM Sta. SAO-IV-1133, intertidal (5, 1013665).—Tierra del Fuego, *Hero* Sta. 71-2-8, intertidal (1, USNM 69384); Staten Island, off Tierra del Fuego, *Hero* Sta. 71-2-21, intertidal (1, USNM 60686).—Chile, Valparaiso Province, Viña del Mar, Montemar, next to Estacion de Biologia Marina, Universidad de Chile, 32°57′25″S, 71°33′W, sheltered beach, intertidal sand, coll. Eric Guiler, Feb 1955 (10, LACM-AHF Poly 5022); Puerto Montt, 19 Dec 2003, coll. I. Kruse,(3, SEM, JAB); Isla Santa Maria, Dec 2003, coll. I. Kruse, 1 specimen (MCZ 135297).—Straits of Magellan, Punta Arenas, in sand, Sep 1892, Coll. W. Michaelsen, **syntype** of *Aricia tribulosa* (ZMB 6767).—Peru, Punta Chira, ca. 30 km north of Camana, 9 Aug 1955, intertidal, coll. G. Hartmann, **holotype** of *Scoloplos armiger trioculata* (ZMH P-14965).

Description. A single complete specimen from Staten Island 8 mm long, 1 mm wide for 80 setigerous segments; larger specimens from Chile up to 40 mm long, 2.5 mm wide for about 185 segments. Anterior segments dorsoventrally flattened, abdominal segments cylindrical in cross section. Thoracic region with 22–25 segments; Peruvian specimen with 16. Color in alcohol brown with lighter areas between segments and on prostomium.

Prostomium pear-shaped, acutely pointed on anterior margin (Fig. 36A, D) or narrowing to rounded tip (Fig. 37A); juveniles with short, rounded prostomium; with 0–3 pairs of eyespots, usually only present in smallest or juvenile specimens; nuchal organs narrow vertical slits at posterior margin of prostomium (Fig. 37A); two indistinct achaetous rings preceding first setiger on smaller specimens (Figs. 36A, 37A), forming smooth circular rings, ventrally forming lateral lips of mouth; larger specimens with less distinct rings, sometimes appearing to be single achaetous segment. Specimens from Montemar with multi-lobed proboscis everted (Fig. 36D).

Thoracic notopodia simple, with fascicles of long, tapering crenulated capillaries (Fig. 37B–C); long, thin, cirriform postsetal lobe from setiger 1 (Fig. 36A, D), gradually becoming longer and thicker in last 10 thoracic setigers. Abdominal notopodia elongated with swollen, medial expansion directed laterally (Fig. 36E). Thoracic neuropodia expanded, with short, thick postsetal lobe from setiger 1 (Fig. 37B–C). Abdominal notopodia with elongate postsetal lobe, thickened basally, tapering to narrow tip (Fig. 36E). Abdominal neuropodia elongate divided apically producing short presetal lobe and elongate postsetal fingerlike lobe, between which setae emerge (Figs. 36E, 37I).

Thoracic notosetae including 10 or more long crenulated capillaries; abdominal notosetae with five or more capillaries and 2–5 furcate setae; each furcate seta with two unequal blunt-tipped tynes joined by thin membranous web composed of fine needles (Fig. 37F–G). Thoracic neurosetae including dense fascicles of uncini in 5–6 long vertical rows and one short posterior row and crenulated capillaries in 1–2 rows posterior to uncini (Fig. 37A–C); first row of uncini longest, curving ventrally below other uncini and continuing dorsally as posterior short row (Fig. 37B–C). Uncini strongly bent in a posterior direction, convex side of shaft with transverse rows of minute barbs or teeth, curving into dorsal groove terminating apically in two pointed teeth (Fig. 37D), with thin hyaline sheath observed in light microscope surrounding end of uncini (Fig. 36C), with SEM sheath a flange, extending along lateral sides of shaft to point of emergence from neuropodium (Fig. 37D); abdominal neurosetae with 2–5 crenulated capillaries and 1–2 protruding acicular spines with curved, blunt tips (Figs. 36E, 37H–J).

Cirriform branchiae from setiger 5 (Fig. 36A–B). Pygidium with several large and small lobes, anal cirri absent (Fig. 36B).

Remarks. *Leodamas tribulosus* is readily distinguished from other species by the unusual thoracic neuropodial uncini with a dorsal groove that terminates in two apical teeth and with a prominent lateral sheath. The species is common along the Chilean coast and in Patagonia where it occurs in the intertidal zone (Hartman, 1966; Hartmann-Schröder, 1962b; 1965). The holotype of *Scoloplos armiger trioculata* agrees in all particulars with *L. tribulosus,* and is herein synonymized with this species.

As part of a study of Orbiniidae phylogeny by Bleidorn *et al.* (2009), specimens identified as *Protoariciella uncinata* from Mar del Plata, Argentina were found to have the same genetic structure as *Leodamas tribulosus* from Chile and these authors concluded that the Argentinian specimens were juveniles of *L. tribulosus*. Elias *et al.* (2000) had earlier reported *P. uncinata* from Mar del Plata and noted that its morphology was variable including having a prostomium that was often pointed instead of rounded, thus further supporting the concept that juveniles of *L. tribulosus* have a rounded prostomium, two achaetous peristomial rings, and eyespots sometimes present. The same features are present in several of the smaller specimens examined in the present study. Three of the specimens given to C. Bleidorn were provided to me and were carefully examined; in addition to the characters mentioned, the thoracic neuropodial uncini have a distinct apical curvature, lateral sheath, and are bifid on the tips as in *L. tribulosus*. This does not confirm, however, that *P. uncinata* of Hartmann-Schröder (1962a) is the same species and in fact, it shares characters with *Naineris grubei*.

Distribution. Peru; Chile; Argentina; Patagonia; intertidal to low water.

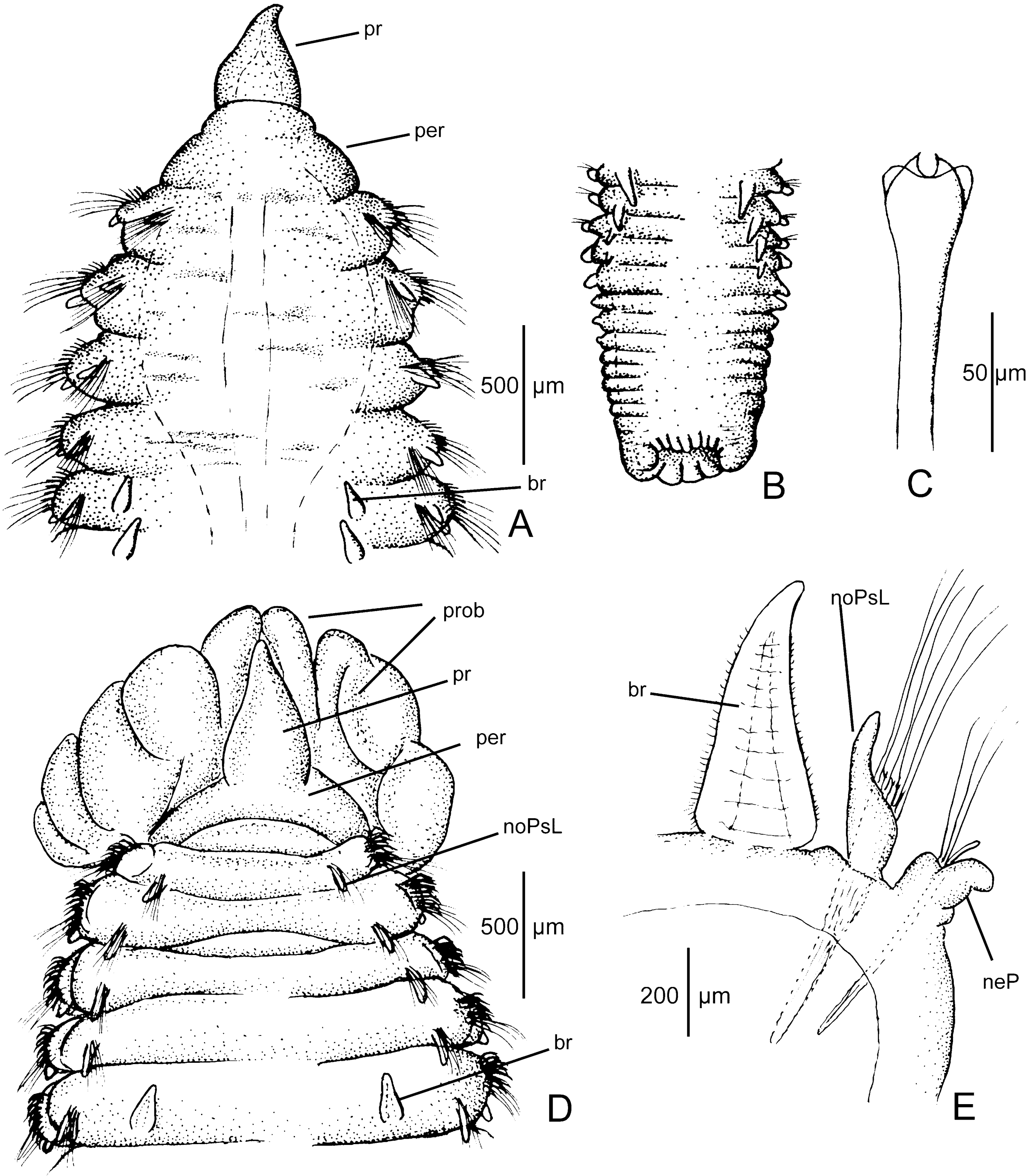

FIGURE 36. *Leodamas tribulosus* (Ehlers, 1897). Holotype of *Scoloplos armiger trioculata* (ZMH P-14965). A, anterior end, dorsal view; B, posterior end, dorsal view; C, thoracic neuropodial uncinus.— Specimen of *L. tribulosus* from Montemar, Chile (AHF Poly 5022). D, Anterior end, dorsal view; E, abdominal parapodium, anterior view.

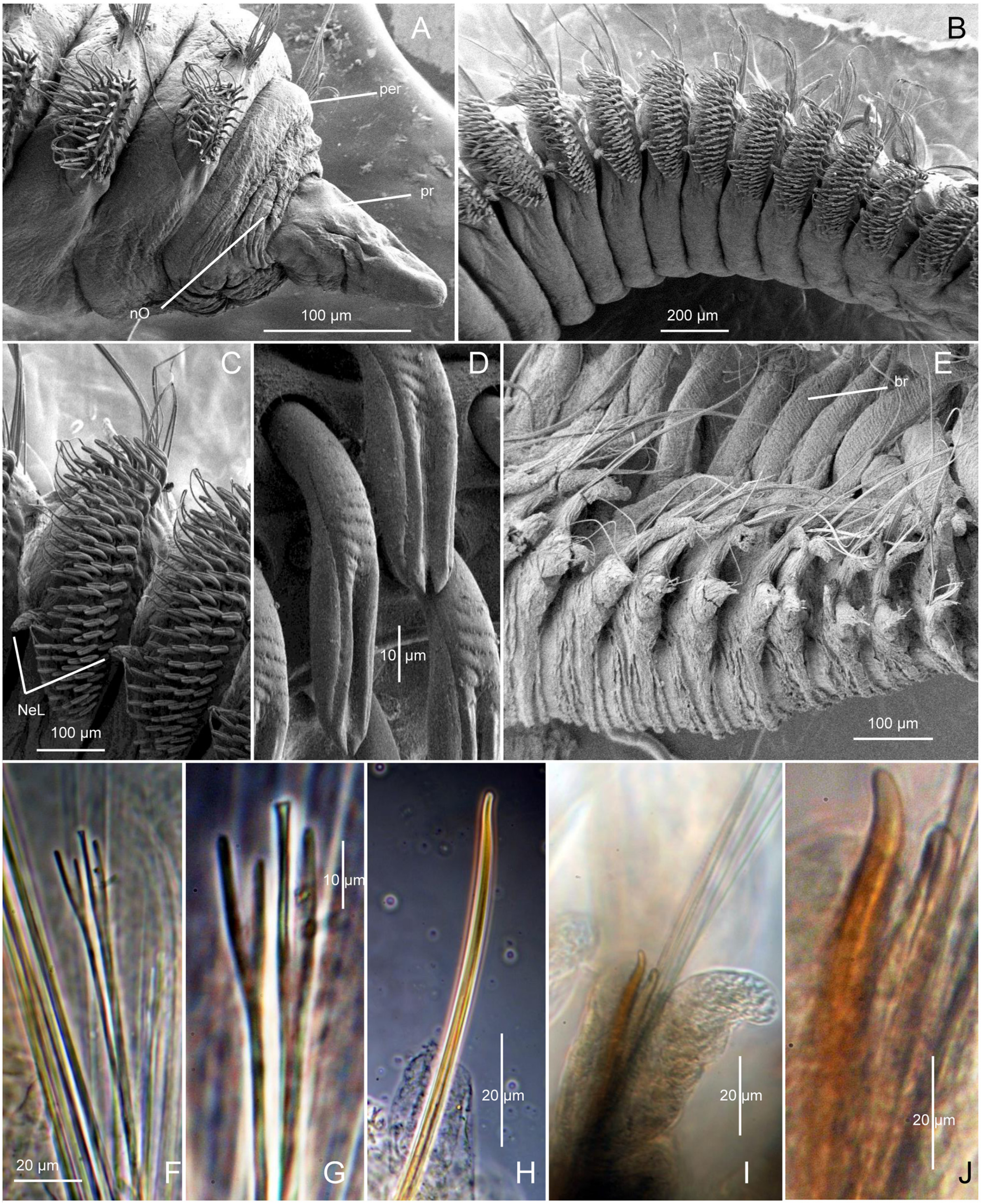

FIGURE 37. *Leodamas tribulosus* (Ehlers, 1897*)*. SEMs, specimen from Chile, Puerto Montt (JAB). A, anterior end, right lateral view; B, thoracic region, right lateral view; C, detail of thoracic neuropodia; D, thoracic neuropodial uncini; E, abdominal parapodia.—Phase Contrast Images, specimen from Chile, Isla Santa Maria (MCZ 135297): F, abdominal furcate setae; G, detail of furcate setae; H, abdominal neuropodial spine, isolated; I, abdominal neuropodium with two spines emerging from neuropodium; J, same, detail of spines.

Genus *Califia* Hartman, 1957 Emended

Type-species: *Califia calida* Hartman, 1957, by original designation.

Diagnosis. Prostomium pointed on anterior margin. Peristomium consisting of a single achaetous ring. Transition from thorax to abdomen abrupt due to distinct change in neuropodia. Branchiae from setiger 8–10; each branchia simple, lanceolate, may be lacking in most of abdominal region. Setigers 1–3 with dense fascicles of thickened uncini in neuropodia and 0 to few capillaries; 0 to few similar spines or uncini present in subsequent thoracic setigers, but capillaries numerous; neuropodial uncini with shafts either smooth or with ribs; tip of shaft with distinct sheath, often frayed, appearing bristled in light microscopy. Neuropodia with or without postsetal lobe; subpodial lobes absent. Abdominal segments lacking interramal and ventral cirri. Abdominal setae including capillaries, furcate setae, and flail setae; no uncini. Nature of pygidium unknown.

Remarks. *Califia* is characterized by having heavy spines or uncini in anterior thoracic neuropodia, with setigers 1–3 appearing visibly different from other thoracic segments. Pettibone (1957) noted that modified setae were sometimes present among the capillaries of the unmodified setiger 4 of *C. schmitti* (Pettibone, 1957). This same feature has been observed on setigers 4–5 of the holotype of *C. chilensis* Hartman, 1967; *C. bilamellata* **n. sp.** has some neuropodial uncini on all thoracic setigers (see below).

Califia is closely related to the genus *Uncorbinia* described by Hartmann-Schröder (1979) from Western Australia. *Uncorbinia* also has thickened neuropodial spines limited to the anterior segments of the thorax. In *Califia,* these anterior modified segments are biramous, with the notopodia bearing large fascicles of capillaries. In *Uncorbinia*, segments 1–4 are uniramous with notopodia entirely lacking. Furthermore, the uncini of *Califia* appear hooded on their tips due to a distinct sheath that upon wear appears bristled due to frayed fibrils, whereas the heavy spines of setigers 1–4 of *Uncorbinia* are either simple uncini or subuluncini. *Uncorbinia* has a few serrated uncini among the capillaries on the biramous setiger 5. Four *Califia* species are presently known from slope depths, one new species described here is from continental shelf depths.

Califia chilensis Hartman, 1967

Califia chilensis Hartman, 1967: 102–103, pl. 32; Rozbaczylo 1985: 128.

Material examined. Western Chile, off Chiloe Island, *Eltanin* Sta. 6-333, 27 Nov 1962, 42.93°S, 75.58°W, 3655–3651 m, **holotype** (USNM 55530).

Remarks. The holotype is the only known specimen of *C. chilensis* and is incomplete. The thorax consists of 13 setigers with branchiae from setiger 9. The species was originally differentiated from related species by the presence of three types of setae in the first three thoracic setigers: (1) crenulated capillaries, (2) short thin uncini sometimes with tips appearing bristled, and (3) larger, thicker uncini, also sometimes appearing bristled. The bristled appearance of these uncini is due to fraying of a sheath that encompasses part of the shafts best seen in SEMs of the new species, *C. bilamellata* described below. While the details of bristling and ribbing of these setae may be specifically unique to *C. chilensis*, the presence of three types of setae in setigers 1–3 has also been reported for *C. calida* Hartman, 1957 and *C. schmitti* (Pettibone, 1957). Capillaries are lacking in *C. mexicana* Fauchald, 1972. One feature overlooked by Hartman (1967), which may make *C. chilensis* specifically unique in the genus, is the presence of a row of shorter and thinner uncini among the numerous capillaries of setigers 4–5. Pettibone (1957) reported the presence of some uncini on setiger 4 in *C. schmitti,* but there have been no reports of such setae beyond setigers 1–3 in *C. calida* and *C. mexicana.* The posterior end of the holotype of *C. chilensis* is not well preserved and it is not clear if several fragments in the same vial belong to the holotype specimen. Nevertheless, abdominal setae may prove to be diagnostic for *Califia* species. Posterior notopodia of *C. chilensis* have a type of flail seta with a thickened shaft and finely tapered, ribbed capillary tip. Flail setae were not observed in specimens of *C. schmitti* collected by the author from the continental slope off the North Carolina. It would be useful to study the abdominal setae in the other species in order to determine specific differences.

Distribution. Off western Chile, 3651–3655 m.

***Califia bilamellata* new species**
Figures 38–39

Material examined. Southern Chile, Seno Reloneavi, the Bay off Puerto Monntt, N of the light buoy NE of Isla Tengo, LUCE Sta. 4A, 11 Sep 1948, 41°28′54″S, 72°57′24″W,13–16 m, **paratype** (SMNH 4351); Golfo de Ancud, SW of Isla Tabon, LUCE Sta. M-44A, 24 Jan 1949,41°58′S, 73°18′W, ca. 200 m, **holotype** (SMNH 4350).—Off Uruguay, IBM Sta. N-1073, R/V *A. Knipovich*, 115–117 m, muddy sand, 4 specimens (2, USNM 1407120), (2, SEM, JAB).

Description. All specimens incomplete; holotype 12 mm long and 1.2 mm wide for 45 setigers; paratype 6.6 mm long and 0.5 mm long for 39 setigers; largest Uruguayan specimen 15 mm long, 1 mm wide for 70 setigers. Thoracic region divided into modified anterior region consisting of three setigers with prominent neuropodial spines and few capillaries (Fig. 38A, 39A, C) followed by more typical region with numerous neuropodial capillaries and few spines extending to setiger 16–18. Color in alcohol: light tan.

First three modified thoracic setigers appearing different from following setigers due to presence of enlarged neurosetae (Figs. 38A, 39A–C). Prostomium triangular, narrowing to pointed tip on anterior margin (Figs. 38A, 39C), or blunted based on preservation (Fig. 39A); eyespots absent; nuchal organs paired transverse slits at border of prostomium and peristomium (Fig. 39A) proboscis a soft sac, partially everted on paratype. Peristomium not annulated, completely fused with prostomium (Figs. 38A, 39A).

Thoracic notopodial lamellae fingerlike from setiger 1 (Fig. 38A), short at first becoming longer and more prominent from setiger 4–5; neuropodia of Chilean specimens with single postsetal lamella from setiger 4, continuing to setiger 9, then second neuropodial lamella from setiger 10–12 (Fig. 38A), continuing to setiger 16–18, then second one lost; Uruguayan specimens with second neuropodial lamella only on last 2–3 thoracic setigers; a single subpodial lamella present through first 3–6 anterior abdominal segments (Fig. 38F). Abdominal parapodia all similar, with long, thin notopodial lobe and divided neuropodial lobe (Fig. 38F); no interramal cirrus.

Thoracic notopodia with simple fascicle of crenulated capillaries; abdominal notopodia with anterior ventral fascicle of 3–4 thick crenulated capillaries and a dorsal fascicle of 10–12 thinner crenulated capillaries, and 1–2 furcate setae (Fig. 38F). Furcate setae with unequal tynes connected by 3–4 thin needles on each side, merging and fused with tynes; tips of tynes with distinct openings (Fig. 39G–H); shafts generally smooth except for few minute barbs, but no transverse ridges.

Thoracic neuropodia with three types of setae: (1) an anterior row of short, narrow, prominently crenulated blunt-tipped uncini having a notched tip and hyaline hood or sheath (Fig. 38B, D–E); (2) heavy uncini on setigers 1–3 in second and third row with a smooth shaft and pointed to worn tip, sometimes with remnants of hyaline hood or with hood worn to frayed fibril endings or entirely absent (Fig. 38B–C), with SEM sheath sometimes frayed on tip, extending posteriorly along shaft to where weak transverse ribs apparent (Fig. 39B,E); (3) crenulated capillaries. Narrow uncini (1) present in all thoracic setigers, numbering 5–6 throughout, representing anterior row of uncini in setigers 1–3, then shifted ventrolateral in setigers 4–18 and surrounded by several rows of capillaries (Fig. 39F); heavy uncini (2) limited to second and third rows in setigers 1–3 numbering 4–5 per row (Figs. 38B, 39B, D); capillaries limited to small dorsally located fascicle in setigers 1–3, then in dense fascicles of 4–6 rows in setigers 4–18. Abdominal neuropodia with 2–3 narrow aciculae, barely emergent and 4–5 thin, weakly barbed to smooth capillaries (Fig. 38F).

Branchiae from setiger 9–10 (Fig. 38A), short, conical at first, becoming very broad at base, then triangular in middle of thoracic region; anterior abdominal branchiae short, triangular (Fig. 38F), becoming long, narrow in posterior segments. Pygidium unknown.

Etymology. The specific name, *bilamellata*, is Latin (*bi* for two; *lamella* for plate) and refers to the double neuropodial lamellae of the posterior thoracic segments.

Remarks. *Califia bilamellata* **n. sp.** is the first species of the genus to be collected from continental shelf depths; all previously described species have been recorded from slope and abyssal depths. *Califia bilamellata* **n. sp.** differs from all other species of the genus in having one type of narrow uncini present in all of the thoracic setigers in addition to the typical heavy modified uncini of setigers 1–3. The narrow uncini occur in the anterior row in setigers 1–3 and in a more ventral location in following thoracic setigers. In other species, the narrower uncini may occur in setigers 4–5, but never over the entire thoracic region (see discussion for *C. chilensis* above). By having two distinct types of uncini, the smaller of which is present throughout the thoracic region with

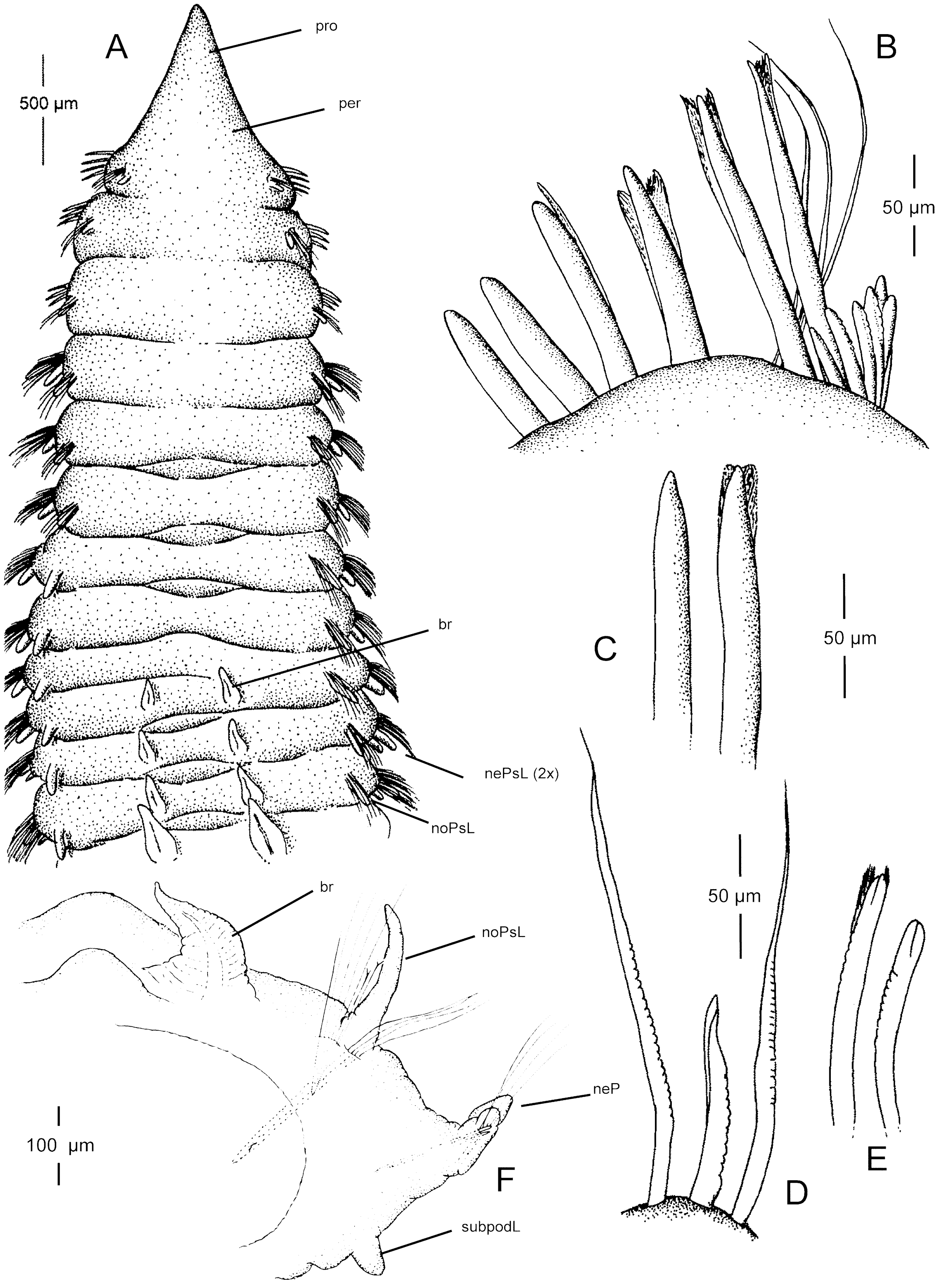

FIGURE 38. *Califia bilamellata* **n. sp.** Holotype (SMNH 43450). A, anterior end, dorsal view; B, neuropodium from setiger 2, in anterior view, dorsal to the right, ventral to the left; showing dorsal capillaries, anterior row of shorter uncini and one row of heavy spines; C, uncini from setiger 3; D, neurosetae from setiger 4, showing two capillaries and one pointed uncinus; E, neuropodial uncini from setiger 7, showing remnant of bristled hood and notched tip; F, anterior abdominal segment in anterior view.

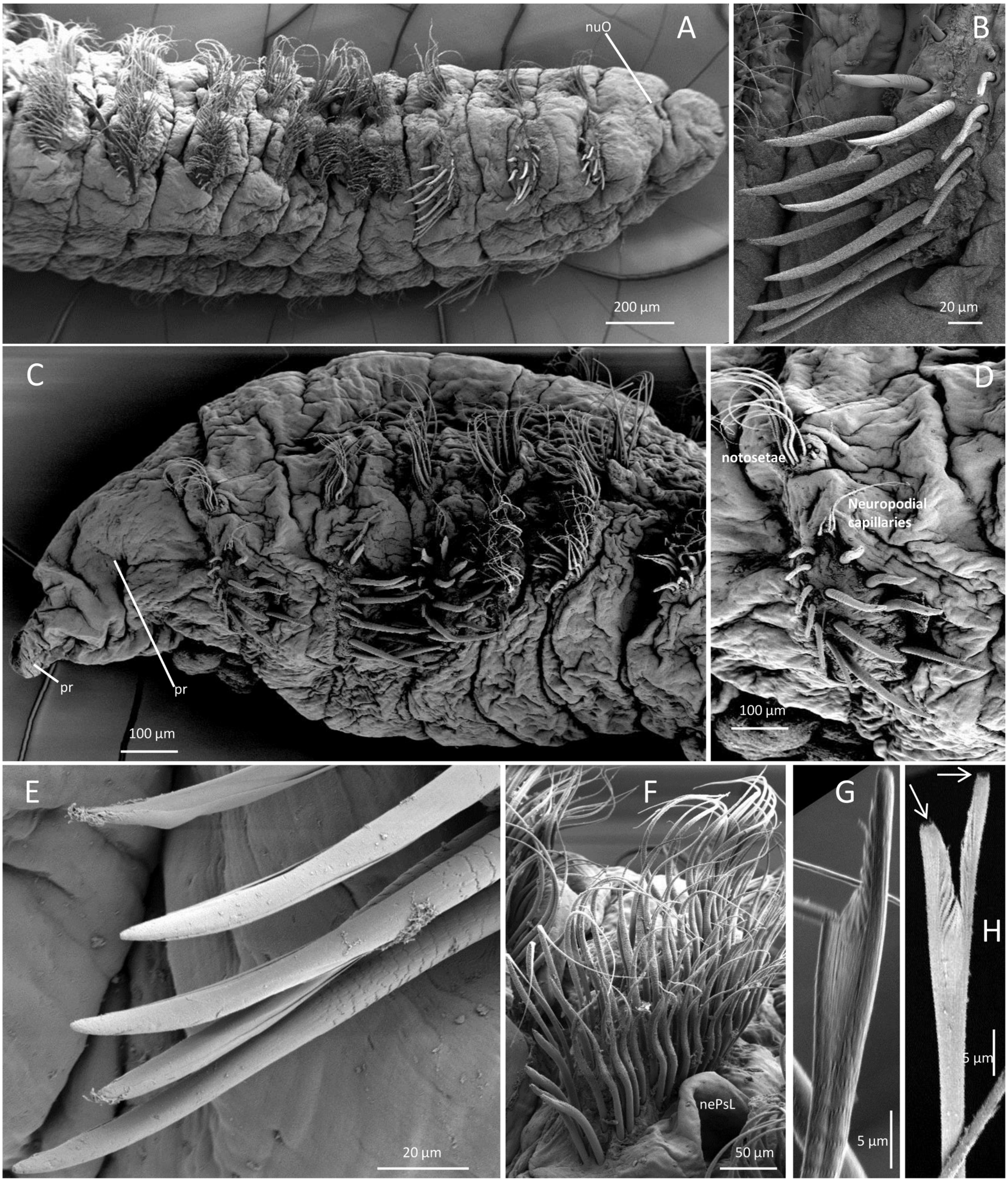

FIGURE 39. *Califia bilamellata* **n. sp.** (Specimens from off Uruguay IBM Sta. 1073, JAB). A, anterior end, right lateral view; B, fascicle of thoracic neuropodial uncini, setiger 3; C, anterior end left lateral view of another specimen; D, parapodium from setiger 1 showing notosetae and arrangement of capillaries and two types of uncini; E, detail of heavy thoracic neuropodial uncini, setiger 3; F, thoracic neuropodial setae from middle thoracic segment showing small uncini and numerous capillaries; G–H, furcate setae, arrows denote openings on tip of tynes.

capillaries, this species shares generic characters with species of *Scoloplos* and may represent a transitional species between the two genera. In addition, *C. bilamellata* **n. sp.** is unique among species of *Califia* in having two thoracic neuropodial lamellae in posterior thoracic setigers and in having an additional subpodial lobe in some anterior abdominal setigers. The Chilean and Uruguayan specimens appear to represent the same species with the only apparent difference being that the paired postsetal lamellae of thoracic neuropodia are distributed over 10 or more setigers in the former and restricted to the last 2–3 setigers in the latter. However, only six specimens of this species have been collected to date and variation is not well documented.

Distribution. Chile, 13–200 m in fine to coarse sand; off Uruguay, 115–117m in muddy sand.

Genus *Orbinia* Quatrefages, 1866

Aricia Savigny, 1820: 12, 35–36. Preoccupied. **Type-species:** *A. sertulata* Savigny, 1820, by monotypy.

Orbinia Quatrefages, 1866: 288. **Type-species:** *Aricia cuvieri* Audouin & Milne-Edwards, 1833 (=*Aricia sertulata* Savigny), designated by Hartman 1942.

Diagnosis. Prostomium conical, pointed; peristomium with 1 achaetous ring. Branchiae from thoracic setigers (5–20). Posterior thoracic segments with postsetal lobes (2–many) and subpodial lobes (3–many), usually forming ventral encircling fringe of 5 or more lobes. Thoracic neurosetae including blunt uncini, crenulated capillaries and rarely subuluncini; heavy spear-like or brush-tipped spines absent. Abdominal neuropodia with flail setae.

Remarks. Species having a modified posterior thoracic region with spearlike spines are referred to the genus *Phylo* Kinberg in accordance with Hartman (1957) and Day (1973). Species of *Phylo* are, however, closely related to *Orbinia* species in overall morphology and are often treated as a subgenus of *Orbinia.* Results of recent molecular analyses (Bleidorn 2005; Bleidorn *et al*. 2009) confirm these findings.

To date, 20 species and subspecies of *Orbinia sensu stricto* are known with two new species recently described from offshore Brazil (Leão & Santos 2016). Most have branchiae from setiger 5–7, while a small group of three species have branchiae from setiger 8 or more posteriorly. A fourth species, belonging to the latter group has been discovered from intertidal sand sediments in Argentina. A single specimen of a species with branchiae from setiger 6 has been found in the South Shetland Islands on the Antarctic Peninsula and may represent another undescribed species. This specimen is described, but not named here due to the lack of sufficient material.

***Orbinia orensanzi* new species**

Figures 40–41

Material examined. Argentina, intertidal, sand beaches, coll., J. M. Orensanz: Golfo San Matías, Las Grutas, 14 Jan 1973, 4 **paratypes** (USNM 1013910); Golfo Nuevo, Golfo San José, San Ramon, 17 Nov 1975, **holotype** and 2 p**aratypes** (USNM 1013908–9); 17 Feb 1975, 2 **paratypes** (USNM 1013911).

Description. All specimens posteriorly incomplete; holotype from San Ramon 10 mm long , 1 mm wide for 60 setigerous segments; paratypes from Las Grutas larger, up to 30 mm long, 1.2 mm wide for 95 setigerous segments. Body depressed in thoracic region; abdominal segments cylindrical. Thorax with 17–24 setigerous segments, with largest specimens having more thoracic setigers; at least 1–2 segments transitional. Color in alcohol: light brown, with white-colored sub-neuropodial abdominal flanges.

Prostomium conical, acutely pointed on anterior margin (Fig. 40A); no eyespots; nuchal organs not observed. Peristomium reduced, fused to setiger 1; proboscis with 3–4 lobes.

Thoracic setigers all similar. Thoracic notopodia with postsetal lobes from setiger 4–5, lobes short at first, becoming cirriform in middle and posterior thoracic segments (Fig. 40A, C–D), continuing on following abdominal setigers (Fig. 40E–F). Largest specimens with distinct interramal cirrus in posterior thoracic setigers, first present from about setiger 18–19 (Fig. 40D); interramal cirrus absent in abdominal segments. Thoracic neuropodia reduced to low thickened ridge from which setae emerge (Fig. 40B–C); postsetal lobes present from medial posterior edge of setiger 3–4, short at first, becoming larger, triangular-shaped cirri by setiger 10–11 (Fig. 40C); last 1–4 thoracic setigers with two postsetal lobes and 1–9 subpodial lobes on each side, forming distinct ventral fringe (Fig. 40B, D) continuing through 3–7 abdominal setigers (Fig. 40B); all subpodial lobes cirriform, expanded basally; numbers of segments with subpodial lobes dependent upon size, larger specimens with more. Abdominal parapodia elevated dorsally on large fleshy parapodial cushion (Fig. 40E); neuropodia bilobed with inner lobe or dorsal cirrus shorter; outer lobe or ventral cirrus longer (Fig. 40E–F); fleshy subpodial flanges present, with medial notch (Fig. 40E–F).

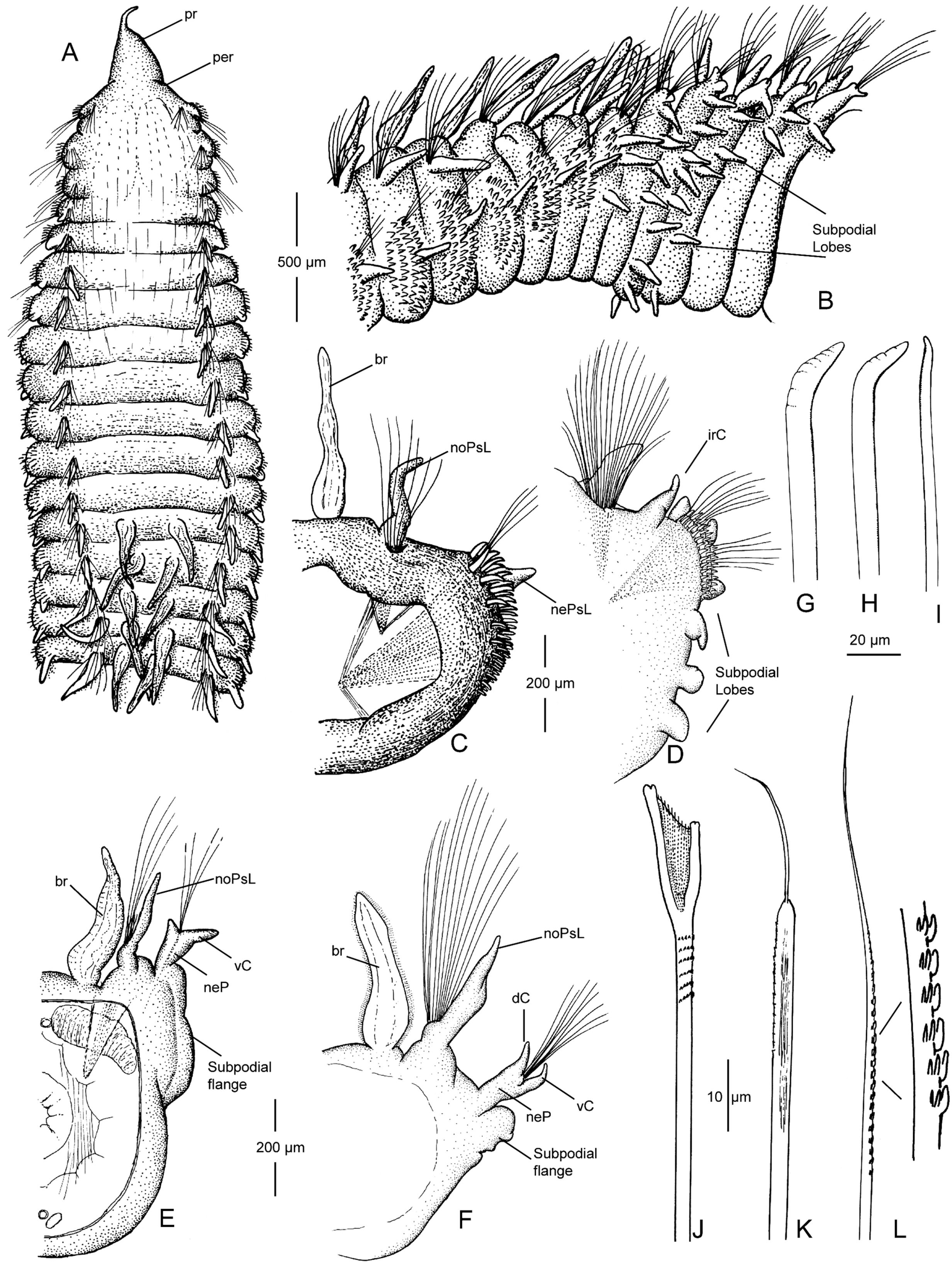

FIGURE 40. *Orbinia orensanzi* **n. sp.** Paratype (USNM 1013910). A, anterior end, dorsal view; B, posterior thoracic and anterior abdominal setigers in left lateral view showing setal and podial transition; C, anterior thoracic neuropodial parapodium, anterior view; D, posterior thoracic parapodium, anterior view; E, anterior abdominal parapodium, posterior view; F, posterior abdominal parapodium, posterior view; G–H, thick thoracic neuropodial uncini with ribs; I, thin, smooth thoracic neuropodial uncinus; J, furcate seta; K, abdominal neuropodial flail seta; L, abdominal capillary notoseta, inset not to scale.

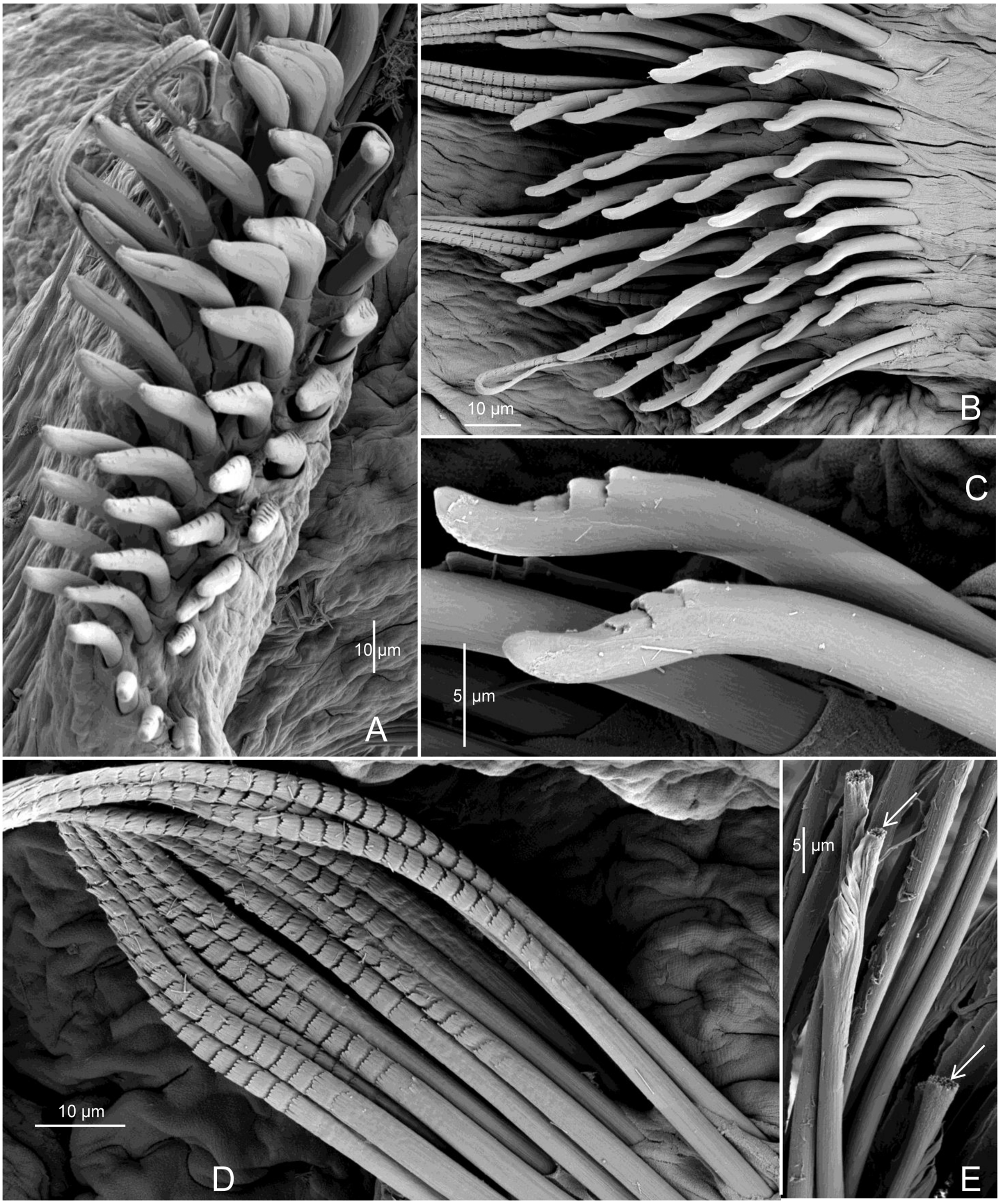

FIGURE 41. *Orbinia orensanzi* **n. sp.** Paratype (USNM 1013910). A, middle thoracic neuropodium showing arrangement of four rows of uncini and companion capillaries; B, posterior thoracic neuropodium in anterior view; C, detail of individual thick thoracic neuropodial uncini; D, thoracic notopodial capillaries; E, furcate setae, arrows denote opening in tips of tynes.

Thoracic notosetae all crenulated capillaries (Fig. 41D); abdominal notosetae including crenulated capillaries (Fig. 40L) and furcate setae (Fig. 40J); furcate setae with bifid-tipped unequal tynes connected by thin webbing composed of very fine needles (Fig. 40J), with SEM individual needles tapering to fine tip, tips of tynes flattened, with distinct opening (Fig. 41E); shaft smooth, transverse rows of barbs not apparent. Thoracic neurosetae with 4–

5 more or less vertical rows of uncini (Figs. 40B, 41A–B); with companion crenulated capillaries in superior position of last row (Figs. 40B–D, 41A–B), some posterior thoracic setigers with a few additional capillaries in middle of neuropodium (Figs. 40D, 41B); uncini of setigers 1–4 thinner, more delicate than those on following thoracic setigers, where thick, heavy uncini in superior locations grade ventrally to thinner ones (Figs. 40B–C, 41A); thickest uncini with blunted tip, curved convex side flattened, then grading into 3–4 prominent transverse ribs on convex curvature, rest of shaft smooth; ribs most prominent on anteriormost uncini (Figs. 40G–H, 41A–C), thin uncini smooth or with transverse ribs weakly developed (Fig. 40I). Abdominal neurosetae include 3–4 flail setae (Fig. 40K), a thin, imbedded acicula, and an occasional delicate, smooth capillary seta; flail setae with thickened shaft bearing delicate ribs and very thin, smooth, terminal extension piece (Fig. 40K).

Branchiae from setiger 13–18, each elongated, expanded basally (Figs. 40C, E–F).

Etymology. This species is named for the late Dr. José M. (Lobo) Orensanz, who generously allowed me to study his collections of Orbiniidae from Argentina and Uruguay, and who made significant contributions to the study of the polychaetes of Argentina and the Southern Ocean.

Remarks. *Orbinia orensanzi* **n. sp.** belongs to a small group of species having branchiae from segments posterior to setigers 5–6, including *O. hartmanae* Day, 1977 from eastern Australia, *O. riseri* (Pettibone, 1957) from eastern North America and *O. johnsoni* (Moore, 1909) from western North America. Of these, only *O. riseri* and *O. orensanzi* **n. sp.** have interramal cirri. In *O. riseri*, the interramal cirrus is present in abdominal parapodia, whereas in *O. orensanzi* **n. sp.** they are present only in thoracic parapodia. A distinct ventral cirrus, present in *O. riseri*, is lacking in *O. orensanzi* **n. sp.** Thoracic neuropodial uncini are all smooth in *O. hartmanae*, ribbed and smooth in *O. orensanzi* **n. sp.**, and ribbed with hoods in *O. riseri* and *O. johnsoni*.

Distribution. Argentina, intertidal in sand beaches.

***Orbinia* sp.**

Phylo kupfferi: Hartman 1966: 107–108 (in part). Not Ehlers, 1874.

Material examined. Antarctic Peninsula South Shetland Islands, *Eltanin* Sta. 6-437, 267–311 m (1, LACM-AHF Poly 4994).

Description. A single specimen included among USNS *Eltanin* collections from *Eltanin* Station 437 and identified by Dr. Olga Hartman, as *Phylo kupfferi* is here referred to the genus *Orbinia* because posterior thoracic modified notosetae are not present. Other specimens in the same sample are referred to *Phylo felix* (see below).

Specimen mostly complete, 0.8 mm wide across anterior thoracic region, 7 mm long for 35 setigerous segments. Color light tan in alcohol with no pigmentation. Anterior end of body swollen through setiger 5. Thoracic region with 12 setigers; no posterior modified thoracic segments. Prostomium short, triangular, pointed on anterior margin; nuchal organs not observed. Peristomium short and narrow. Branchiae from setiger 6. Pygidium unknown.

Thoracic notopodia short with inconspicuous cirriform lobes on setigers 1–5; with the branchiae they become long and prominent on setiger 6, continuing posteriorly. Thoracic neuropodia with a single postsetal lobe through setiger 6, increasing to 3–4 from setiger 7, becoming continuous with subpodial ventral fringe on setiger 11; ventral fringe continuing posteriorly to abdominal setiger 16. Abdominal notopodia with elongate dorsal cirrus; abdominal neuropodia flattened, rounded apically, with distinct ventral cirrus. Interramal cirri not present.

Thoracic notosetae long, camerated capillaries arranged in two rows; thoracic neurosetae with three rows of heavy, curved uncini and a posterior row of heavy camerated capillaries. Individual uncini with smooth curved tip followed by transverse ribs further down shaft; with light microscopy, evidence of sheath on side opposite transverse ribs. Abdominal notosetae consisting of 3–4 long, narrow camerated capillaries and 2–3 delicate furcate setae; furcate setae with unequal tynes with thin webbing between. Abdominal neurosetae with 1–2 aciculae, sometimes emergent, with curved blunted tips and 2–4 long, thin, simple capillaries.

Remarks. This specimen was among a small collection from *Eltanin* Sta. 437 identified by Hartman (1966) as *Phylo kupfferi*, here referred to *P. felix* (see below); this single specimen is the only representative of the genus *Orbinia* reported to date from Antarctica and may represent an undescribed species, but due its incomplete nature and small size, it cannot be named at this time.

Distribution. Antarctic Peninsula, South Shetland Islands, 267–311.

Genus *Phylo* Kinberg, 1866

Type-species: *Phylo felix* Kinberg, 1866, by monotypy.

Diagnosis. Prostomium pointed on anterior margin; peristomium with one achaetous ring. Branchiae first present from setiger 5–7. Posterior thoracic segments with several postsetal lobes and subpodial lobes (at least five of each type) together usually forming ventral fringe. Thoracic neurosetae including blunt uncini and crenulated capillaries; posterior thoracic segments with modified spearlike spines. Flail setae present or absent in posterior abdominal notopodia.

Remarks. Species of *Phylo* are closely related to species of *Orbinia* and differ chiefly in having the thoracic region divided into anterior and posterior regions; the posterior region bears modified spines. Phylogenetically, the modified thoracic spines are apomorphic rather than plesiomorphic but provide species of *Phylo* with an obvious and practical distinctness that makes them easy to identify. Because of this character, *Phylo* is retained as a genus, although subgeneric rank with *Orbinia* might be preferred by some investigators. Ten species of *Phylo* were reviewed by Hartman (1957), who provided detailed descriptions for three, including the type species, *P. felix* Kinberg. Additional species have been described by Day (1961; 1977), Wu (1962), Mohammad (1970), and Hartmann-Schröder & Rosenfeld (1990). *Phylo felix* was encountered in the present study and appears to be limited to South America and the Antarctic Peninsula. *Orbinia (Phylo) minima* described from the Antarctic Peninsula by Hartmann-Schröder & Rosenfeldt (1990) is represented only by small specimens but agrees well with *P. felix*.

Phylo felix Kinberg, 1866
Figures 42–43

Phylo felix Kinberg, 1866: 251–252; Hartman 1948: 105–106, pl. 15, fig. 10; 1953: 37–38; 1957: 262–265, pl. 23 (synonymy); 1966: 10, pl. 2, fig. 4 (synonymy).
Aricia michaelseni Ehlers, 1897: 88–91, pl. 6, figs. 136–140; 1900: 12; 1901: 166. *Fide* Hartman 1948.—Not Monro 1930: 144–145, fig. 54; Okuda 1937: 101; Berkeley & Berkeley 1952: 96, figs. 194–196.
Orbinia (*Phylo*) *michaelseni*: Pettibone 1963: 282, fig. 75f.
Orbinia felix: Hobson & Banse 1981: 29.
Phylo felix heterosetosa Hartmann-Schröder, 1965: 192–194, figs. 176–177; Rozbaczylo 1985: 130. **New synonymy.**
Phylo kupfferi: Hartman 1967: 107–108 (in part); Rozbaczylo 1985: 130–131. Not Ehlers, 1874.
Phylo michaelseni: Rozbaczylo 1985: 131.
Orbinia (Phylo) minima Hartmann-Schröder & Rosenfeldt, 1990: 106–107, figs. 11–17. **New synonymy**.

Material examined. Uruguay: IBM Sta. N-242, 63 m in sand (2, USNM 1013676); IBM Sta. N-250, 83 m (7, USNM 1013677); IBM Sta. N-1066, 72–86 m (1, USNM 1013678); IBM Sta. N-1073, 115–117 m (1, JAB).—Argentina, offshore, R/V *Vema* Sta. V-18-12, continental slope E of Deseado, 424–428 m (2, LACM-AHF Poly 5036, 5044); V-17-101, E of Mar del Plata, benthic trawl, 19 Jun 1961 (4, LACM-AHF Poly 5041).—Argentina, nearshore, San Antonio Bay, intertidal, 1 Jan 1973, coll. J.M. Orensanz (1, USNM 1013684); Marajada norte, high intertidal, 8 Feb 1971, coll. Panetta (5, USNM 1013685); Riacho Jabali, San Blas Bay, 4 Oct 1968, intertidal, muddy sand flats, coll. J.M. Orensanz (4, USNM 1013682); Mar del Plata, mussel bed, 19 Aug 1970, coll. J.M. Orensanz (1, USNM 1013683); Golfo San Matías, low intertidal, in gravel, IBM Sta. SAO-III-1041 (1, USNM 1013680); IBM Sta. SAO-III-1048, intertidal (1, USNM 1013679); IBM Sta. N-1054, 58–65 m, (1, USNM 1013675); IBM Sta. N-1059, 80–72 m (1, USNM 1013674); IBM Sta. N-1073, 115–117 m, (1, USNM 1407118); IBM Sta. N-1074, 112 m (1, USNM 1013673); IBM Sta. N-1075, 68 m (2, USNM 1013672; 1, USNM 1407117); Tierra del Fuego, *Hero* Sta. 651, 40 m (1, USNM 60642); Staten Island, *Hero* Sta. 659, intertidal (1, USNM 60643); *Hero* Sta. 665, 44 m (4, USNM 60644).—Falkland Islands, Teal Inlet, 2 Apr 1927, intertidal, coll. W.L. Schmidt (1, USNM 24431).—SE of Falkland Islands, R/V *Vema* Sta. M-14-12, 361 m (1, LACM-AHF Poly 5029).—Chile, Golfo de Quetalmahué, Isla Pullinque, N of Punta Ranqui, LUCE Sta. M-8B, Intertidal in mud (1, SMNH 154448); Golfo de Ancud, SW of Isla Tabon, LUCE Sta. M-44, ca. 200 m, fine sand mixed with clay (1, SMNH 154446); Seno Reloneavi, Isla Tenglo, the bay on the South Side, LUCE Sta. M-60 intertidal in sand (15, SMNH 154435); Seno Reloneavi, Piedra Azul, NW of Punta Quillaipe, LUCE Sta. M-16E, 30 m (5, SMNH 154445); Golfo Coreovado, Baja Vettor Pisani, LUCE Sta. 65A, 8 m, (1, SMNH 154443); Seno Reloneavi, E of

Isla Guar, LUCE Stas. M-144, ca. 250 m, (1, SMNH 154436); same data, Sta. M-144A (1, SMNH 154439); Seno Reloneavi, Bahía Chincui, LUCE Sta. M-145, 70–80 m, (4, SMNH 154438); SW of Valdivia, 39°59.9′S; 74°01.5′W, 15 Mar 1960, 260 m, dredged, **holotype** of *Phylo felix heterosetosa* (ZMH P-14871).—Straits of Magellan, Punta Arenas, in sand, coll. Sep 1892, W. Michaelsen, **syntype** of *Aricia michaelseni* (ZMB 6764); Voillier Cove, 54°53′S, 69°38′W, 3 Feb 1896, 18 m, in sand, coll. E. Nordenskold (2, SMNH 1398); Puerto Tor, 55°67′S, 67°06′W, 11 Feb 1896, 36–46 m, shell bottom with rocks, coll. E. Nordenskold (1, SMNH 1399); Puerto Eugenia, 54°56′S, 67°43′W, 12 Feb 1896, 18–27 m, rocks with algae, coll. E. Nordenskold (2, SMNH 1400).—Antarctic Peninsula, Bismarck Strait, *Hero* Sta. 970, 102 m (1, USNM 60645); Bransfield Strait, *Eltanin* Sta. 6-410, 220–240 m (1, USNM 56452); South Shetland Islands, *Eltanin* Sta. 6-437, 267–311 m (3, USNM 56453).—Off Elephant Island, R/V *Walther Herwig* Sta. 148, 61°12.7′S, 55°56.4′W, 134 m, **holotype** and 14 **paratypes** (ZMH 19930-1) of *Orbinia (Phylo) minima.*

Description. A large species, one complete Chilean specimen 80 mm long, 2.9 mm wide, for 240 setigers; incomplete specimens larger, up to 92 mm long. Anterior fragments of 3.5 mm wide suggesting even larger specimens; Hartman (1948) recorded one of Kinberg's fragmented specimens at 5 mm wide. Thorax with 15–19 setigerous segments; (1) anterior thoracic region with 10–12 setigers; (2) posterior region with 5–8 setigers.

Prostomium triangular, narrow, pointed on anterior margin depending upon preservation (Figs. 42A, 43A–B), peristomium a narrow asetigerous segment, smaller than setiger 1 (Figs. 42A, 43A–B); eyespots absent; nuchal organs narrow paired slits at border of prostomium and peristomium (Fig. 43B).

Thoracic notopodia, with elongate, fingerlike postsetal lamellae continuing through abdominal segments (Figs. 42A, 43B). Interramal cirrus present between noto- and neuropodia of posterior thoracic segments, continuing over most abdominal segments (Fig. 42C). Thoracic neuropodia with 2–3 postsetal lamellae from setiger 1, increasing to 9–12 over middle and posterior thoracic setigers (Figs. 42A, 43E); ventral fringe of numerous subpodial lobes or stomach papillae from setiger 11–14 (Figs. 42A, 43F), these beginning as 1–3 lobes increasing to 25 or more, nearly encircling ventral side of worm, abruptly absent from setiger 17–20, depending upon size of worms; abdominal neuropodia expanded apically, divided into two lobes; with a single ventral cirrus (Fig. 42C).

Thoracic notosetae including dense fascicles of crenulated capillaries and imbedded aciculae; abdominal notosetae including long, thin capillaries and 3–4 furcate setae; furcate setae with unequal tynes connected by a web of numerous fine needles; tips of tynes blunted, shaft with transverse rows of barbs (Fig. 42G). Thoracic neuropodia of setigers 1–10, with 4–6 rows of uncini of two types: (1) 3–5 rows of large, heavy uncini, each with curved apex surrounded by long sheath and followed by shaft with transverse ridges; sheath sometime frayed, appearing bristled (Figs. 42D, 43C–D), (2) a posterior row of narrower crenulated spines (Fig. 42E); posterior row of numerous crenulated companion capillary setae accompany uncini; from about setiger 11–12, uncini of posterior thoracic neuropodia mostly replaced by large, dark, spear-like spines (Figs. 42B, F, 43E) accompanied by numerous long, crenulated capillaries (Fig. 43E). Abdominal neurosetae including 5–6 short capillaries and 1–2 imbedded aciculae (Fig. 42C).

Branchiae from setiger 4–5 (Figs. 42A, 43B), simple, with lateral and medial cilia, continuing posteriorly (Fig. 42C).

Pygidium enlarged, swollen, turned dorsally, with two ventral rounded lobes and two dorsal lobes from which a pair of long anal cirri arise; anus located dorsally between all four lobes (Fig. 42H).

Remarks. *Phylo felix* was thoroughly reviewed, accurately described, and elegantly illustrated by Hartman (1957). The present specimens agree well with her description, although the large collection of specimens permits additional details to be added. In particular, the distribution of thoracic neurosetae is more complex in that there are many more capillaries accompanying the uncini than previously reported.

Phylo felix belongs to a small group of *Phylo* species having a conspicuous ventral thoracic fringe of papillae and an interramal cirrus in abdominal neuropodia. Hartman (1957) reported the species to have 16–18 thoracic setigers, with the posterior region generally beginning at about setiger 11. Larger specimens were found in the present materials, and there is a suggestion that the development of the posterior modified region is growth dependent. The present collections contain juveniles having 9–12 anterior thoracic setigers and 1–4 posterior modified setigers. Larger adults, on the other hand, have 16–18 anterior thoracic setigers and 6–7 posterior modified setigers. These data suggest that the size of the thoracic region increases with growth of the worm. As the number of thoracic setigers increases, the anterior thoracic segments would have to be derived from posterior modified segments that lose their modified spines and develop fascicles of the anterior uncini. The posterior modified setigers would in turn be derived from anterior abdominal setigers which change form and function. Hartman (1957) did not provide any data to indicate the sizes of the specimens she examined, but I have noted that there is variation in the number of thoracic setigers among similar sized specimens. For example, the syntype of *Phylo michaelseni*, from the Straits of Magellan, is over 11 cm long and has 19 thoracic setigers of which setigers 1–11 are anterior and 12–19 are posterior and modified. In contrast, specimens from the Nordenskold Expedition, also from the Straits of Magellan, are smaller, less than 10 cm long and yet have 16–20 thoracic setigers, of which the first 10–14 are normal and the last 15–20 are modified.

The type collection of *Orbinia* (*Phylo*) *minima,* described by Hartmann-Schröder & Rosenfeldt (1990) from the Antarctic Peninsula was examined. These specimens have nine anterior and 1–2 posterior thoracic setigers. This diminished number of thoracic setigers was used by these authors as justification for the species. However, the specimens were only 26 mm long, suggesting that they were juveniles. Further, as the *O. minima* specimens had branchiae from setiger 5 as in larger *P. felix* specimens and interramal cirri in posterior notopodia, and *P. felix* is one of only two species of *Phylo* worldwide to have this arrangement and there are no other morphological differences, *O. minima* is herein placed into synonymy with *P. felix*. Five additional specimens from the Antarctic Peninsula examined here (USNM 56452, 56453, and 60645) are also relatively small, with the same 9 + 1–2 thoracic setigers, interramal cirri in abdominal parapodia, and branchiae from setiger 5.

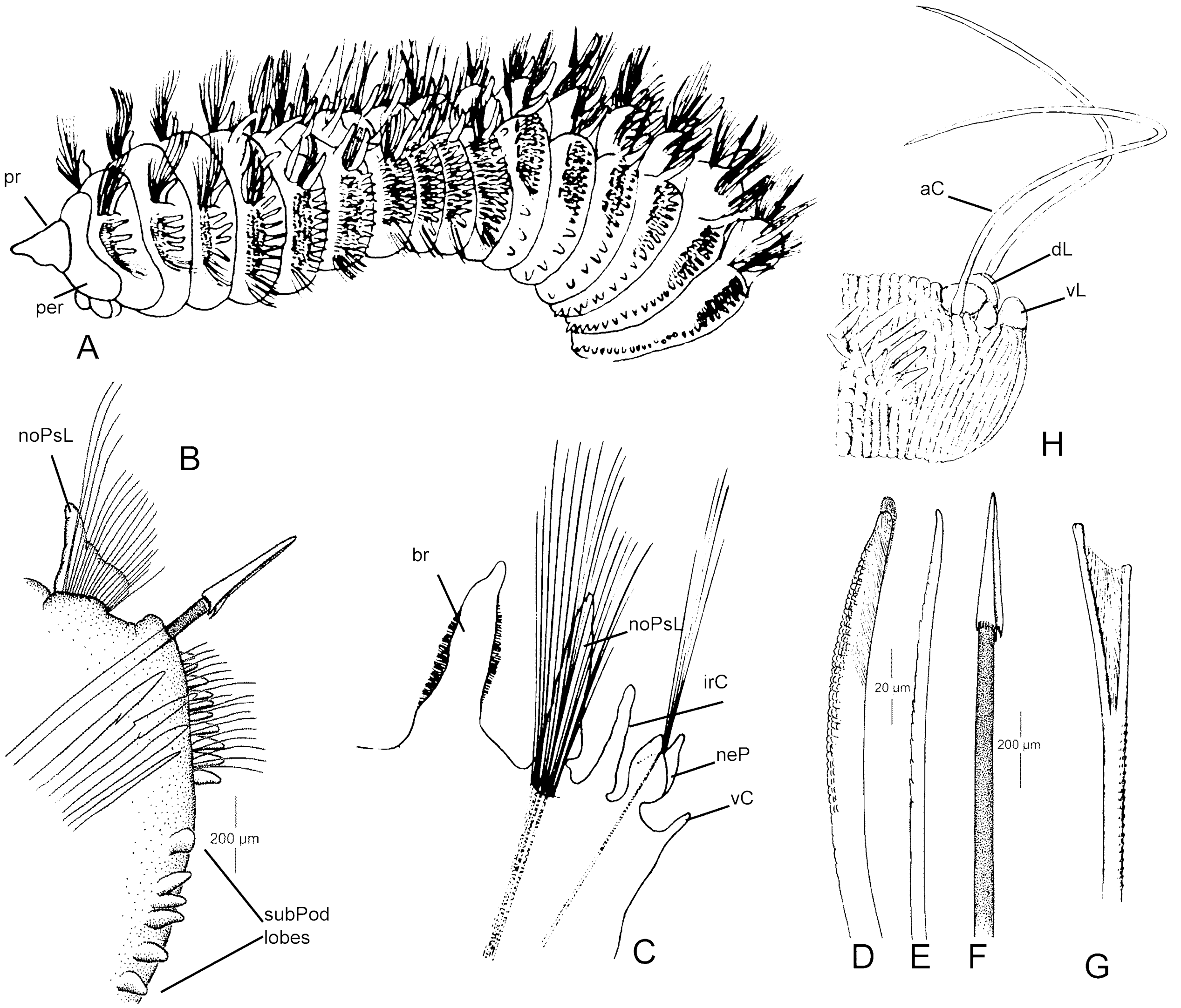

FIGURE 42. *Phylo felix* Kinberg, 1866. A, Anterior end, left lateral view; B, posterior thoracic parapodium, anterior view; C, abdominal parapodium, anterior view; D, heavy thoracic neuropodial uncinus; E, thin thoracic neuropodial uncinus; F, spear-like neuroseta from posterior thoracic setiger; G, furcate seta; H pygidium. (A, C, G, after Hartman, 1957; A, D–H, originals from LUCE, Sta. M60, SMNH 154435).

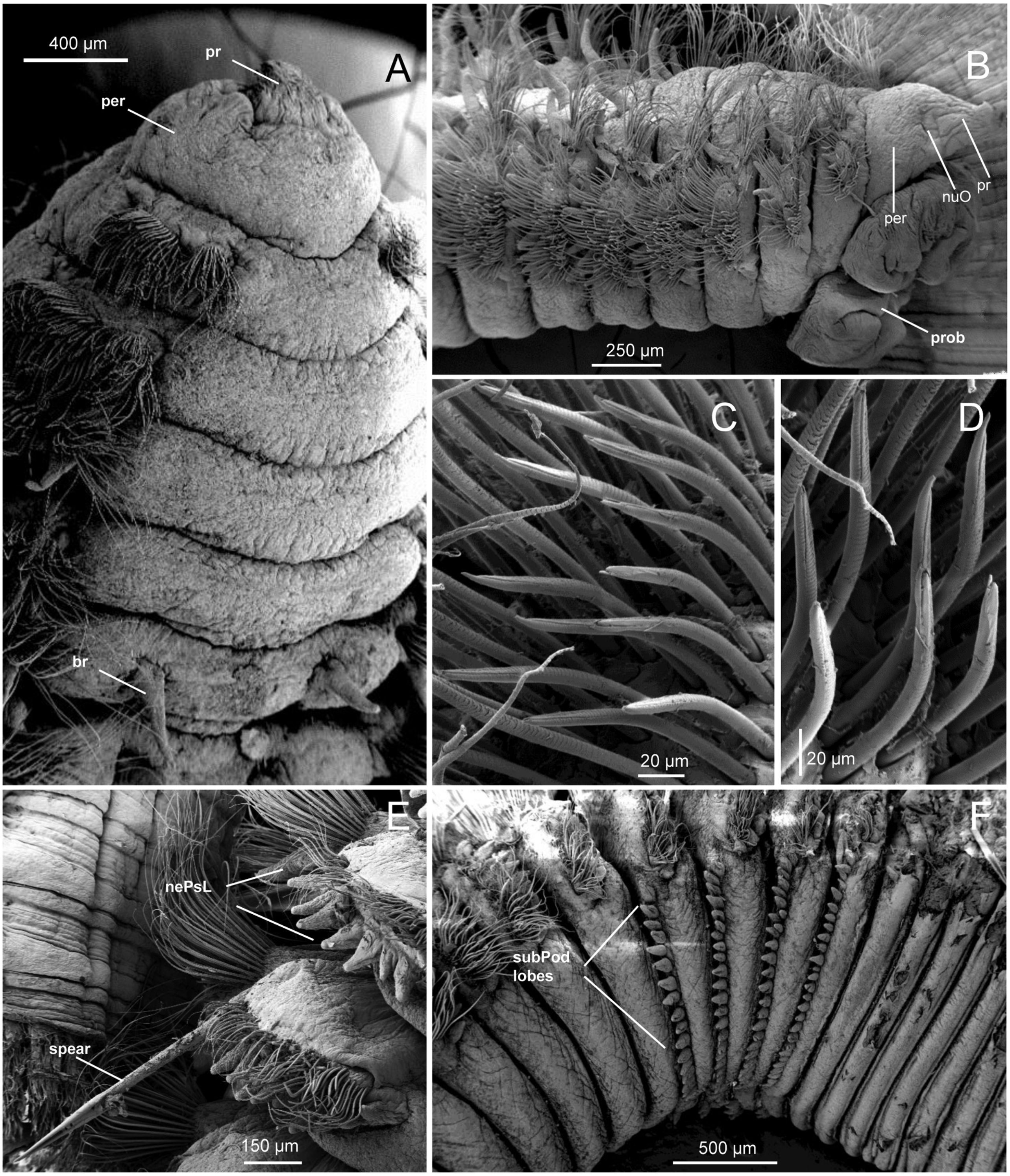

FIGURE 43. *Phylo felix* Kinberg, 1866. (LUCE, Sta. M60, SMNH 154435). A, anterior end, dorsolateral view; B, another specimen, right lateral view; C–D, thoracic neuropodial uncini; E, posterior thoracic parapodium, ventral view, with thoracic neuropodial spear; F, posterior thoracic and anterior abdominal segments showing stomach papillae.

The holotype of *Phylo felix heterosetosa* from Chile described by Hartmann-Schröder (1965), has been examined and not found to differ from the stem form. The subspecies is therefore synonymized with *P. felix* in this study.

Distribution. South America: Brazil, Uruguay, Argentina, Patagonia, Southern Chile, Straits of Magellan; Falkland Islands; Antarctic Peninsula and off Elephant Island, Intertidal to 430 m.

Genus *Naineris* Blainville, 1828

Naineris Blainville, 1828. **Type-species:** *N. quadricuspida* (Fabricius, 1780), by monotypy.
Anthostoma Schmarda, 1861. Preoccupied. **Type-species:** *Anthostoma ramosum* Schmarda, 1861 (=*Naineris laevigata*), designated by Pettibone (1957).
Lacydes Kinberg, 1866. Preoccupied. **Type-species:** *Lacydes havaicus* Kinberg, 1866 (=*Naineris laevigata*), by monotypy.
Polynaineris Pettibone, 1957. **Type-species:** *Naineris laevigata* (Grube, 1855), by original designation.
Variant spellings. *Naidonereis* Malmgren, 1867; *Nainereis* Mesnil & Caullery, 1898; *Naidoneris* Webster & Benedict, 1887.

Diagnosis. Prostomium rounded or truncate on anterior margin. Peristomium with 1–2 achaetous rings. Thorax with 12–30 or more segments; branchiae first present from setiger 2–23. Thoracic neuropodia with 0–2 postsetal lobes; no subpodial lobes. Thoracic neurosetae including capillaries, or capillaries mixed with blunt-tipped uncini, sometimes hooded, or uncini and subuluncini. Abdominal setae including capillaries and sometimes furcate setae in notopodia and capillaries and imbedded or protruding aciculae in neuropodia. Paired dorsal sensory organs present in some species.

Remarks. The following six species of *Naineris* were encountered and are treated in this paper:

N. setosa (Verrill, 1900);
N. furcillata, **new name** for *N. chilensis* Carrasco, 1977;
N. chilensis, **new status** for *N. dendritica chilensis* Hartmann-Schröder, 1965;
N. grubei (Gravier, 1908);
N. argentiniensis, **n. sp.**;
N. antarctica, **n. sp.**

The holotype vial of *N. brevicephala* Hartmann-Schröder, 1960 from Peru was examined and found to contain a syllid. Until the actual type specimen is located, *N. brevicephala* is best treated as *incertae sedis*.

Remarks on the genus *Protoariciella* Hartmann-Schröder, 1962a. *Protoariciella* was established for a small orbiniid that had two peristomial rings, and no distinct body regions, but has neuropodial uncini on a defined number of anterior setigers. The genus currently includes five species: *P. uncinata* Hartmann-Schröder, 1962a, the type species, from Peru and northern Chile; *P. heteroseta* Hartmann-Schröder, 1962b from northern Chile; *P. parauncinata* Hartmann-Schröder, 1965 from northern Chile; *P. subuluncinata* Hartmann-Schröder, 1974 from West Africa; and *P. oligobranchia* Hobson, 1976 from British Columbia. The genus appears to be confused because the type species, *P. uncinata*, was also reported to have thickened notopodial setae in the posteriormost segments (Hartmann-Schröder, 1962a:134; 1965:131, fig. 156). None of the other four species are reported to have such setae in abdominal notopodia, yet this character was included in the original generic definition (Hartmann-Schröder, 1962a:133) and was used by Rullier (1972) and Fauchald (1977) to define and distinguish *Protoariciella* from related genera. Apart from a record of *P. uncinata* from Argentina by Elias *et al*. (2000), there have been few reports of any *Protoariciella* species in recent years. However, as part of a recent molecular analysis of some Orbiniidae by Bleidorn *et al.* (2009), specimens from Argentina collected by R. Elias and identified as *P. uncinata* were included in the analysis and were found to have the same genetic structure as *Leodamas tribulosus* from Chile. Some of Elias's specimens were sent to me for examination in this study and the modified spines were clearly identical to those *of L. tribulosus* (see above). These are thus juveniles of *L. tribulosus* and were treated as such by Bleidorn *et al.* (2009). However, this does not demonstrate that *P. uncinata* of Hartmann-Schröder (1962a) is the same species.

To add to the confusion, *Naineris antarctica* **n. sp.** has two peristomial rings, but otherwise differs considerably from all of the previously described species of *Protoariciella*, found in the Antarctic collections. This new species has heavy spines in all abdominal notopodia (see below), but also has a distinct thorax and abdomen.

Given the small size of the various species of *Protoariciella* (all less than 10 mm) described thus far and the fact that two achaetous peristomial segments are characteristic of larval and postlarval stages of different species of *Naineris* and *Leodamas tribulosus*, it seems likely that the five species of *Protoariciella* are all juveniles of other orbiniids. There is no information to indicate that any of Hartmann-Schröder's specimens were sexually mature. Apart from the double nature of the peristomial rings, the new Antarctic species agrees with the definition of

Naineris to which it is here assigned. Assuming that *Protoariciella* species are indeed juveniles of other larger species, then the genus would be a synonym of either *Leodamas* or *Naineris* depending on the placement of the type-species *P. uncinata*. Both *P. uncinata* and *P. parauncinata* have bifid neuropodial uncini and may be juveniles of *N. grubei* or possibly *L. tribulosus*, whereas *P. heteroseta*, with neuropodial uncini that have entire tips might be a juvenile of *N. chilensis*. Apart from the specimens identified as *P. uncinata* by Elias *et al*. (2000) from Argentina and demonstrated to be juveniles of *L. tribulosus*, no adult specimens resembling the three South American species of *Protoariciella* were encountered in the present study.

Naineris setosa **(Verrill, 1900)**
Figure 44

Aricia setosa Verrill, 1900: 651–653.
Anthostoma latacapitata Treadwell, 1901: 203–205, figs. 61–65.
Naineris latacapitata: Treadwell 1939: 254, fig. 81.
Naineris setosa: Treadwell 1936: 55; Hartman 1942: 61, figs. 116–118; Hartman 1951: 67–70, pl. 17, figs. 1–6; Hartman 1957: 305, pl. 41, figs. 1–6; Rioja 1960: 303; Solis-Weiss & Fauchald 1989: 774–778, fig.2; Blake & Giangrande 2011: 20–26, figs.1–2; Khedhri *et al.* 2014: 83–88, fig. 2; Dean & Blake, 2015: 194, fig. 5C–G; Atzori *et al.* 2016: 2016: 1–6.

Material examined. Galápagos Islands, Isla Santa Cruz, Puerto Nunez, intertidal in rocks, *Anton Bruun* Cruise 12, Sta. 66-120 (1, USNM 60628).

Description. Galápagos Island specimen incomplete, lacking pygidium and last few posterior setigers; 50 mm long and 3 mm wide for 160 setigers. Color in alcohol: light tan.

Prostomium short, blunt, slightly rounded on anterior margin (Fig. 44A); eyespots arranged in two groups of small pigment spots; everted proboscis large, saclike, multilobed (Fig. 44A). Peristomium a single achaetous ring appearing irregular in shape, fused dorsally to posterior margin of prostomium (Fig. 44A).

Branchiae from setiger 5, continuing to posterior end; each branchia short at first, flattened, cirriform, tapering to pointed tip (Fig. 44B); branchiae increasing in length, with those of posterior abdominal segments longest and least erect. Paired dorsal sensory organs anterior and medial to branchial bases of anterior segments. Low dorsal crests present between anterior abdominal branchiae.

Thoracic notopodia broad, triangular, tapering to narrow tip (Fig. 44B); abdominal notopodia digitiform, with blunted tip (Fig. 44C). Posterior thoracic setigers with interramal swelling between neuropodia and notopodia (Fig. 44B); distinct interramal cirrus lacking in thoracic and abdominal regions. Thoracic neuropodia elongate, thickened lobes, with posterior margin forming postsetal lobe, dorsally pointed (Fig. 44B); abdominal neuropodia reduced to short, blunted postsetal lobe (Fig.44); ventral cirri lacking.

Thoracic neurosetae including dense fascicles of hundreds of capillaries arranged in 6–7 rows; capillaries of anteriormost row shorter, thicker, more strongly bent than those of subsequent rows; each capillary with minute teeth arranged in transverse rows on shaft (Fig. 44F); thoracic uncini absent. Abdominal neuropodia with few capillaries and 2–3 smooth, curved aciculae with narrow tip (Fig. 44D). Thoracic notopodia with 30–40 long, thin capillaries similar in structure to neurosetae; abdominal notosetae including capillaries and 1–2 furcate setae; each furcate seta with unequal tynes connected by webbing composed of fine needles; shaft with transverse rows of minute barbs (Fig. 44E).

Remarks. A more detailed description of *Naineris setosa* together with a review of its biology and ecology was presented by Blake & Giangrande (2011) who reported on an invasive occurrence of the species from a fish aquaculture facility in Brindisi, Italy. *Naineris setosa* is well-known from tropical and subtropical habitats in Bermuda, Florida and Gulf of Mexico, the Caribbean, and most recently from the Pacific coast of Costa Rica and Mexico (Blake & Giangrande 2011; Dean & Blake 2015). The specimen reported here from the Galápagos Islands agrees very well with those from reported from the North American locations and thus the range extends well out into the Pacific.

Distribution. Atlantic Ocean, Bermuda; Florida; Mexico, Vera Cruz; Puerto Rico, Belize; eastern Pacific, Mexico, Acapulco, Costa Rica, Cocos Islands, Galápagos Islands; invasive in the Adriatic and Mediterranean Seas.

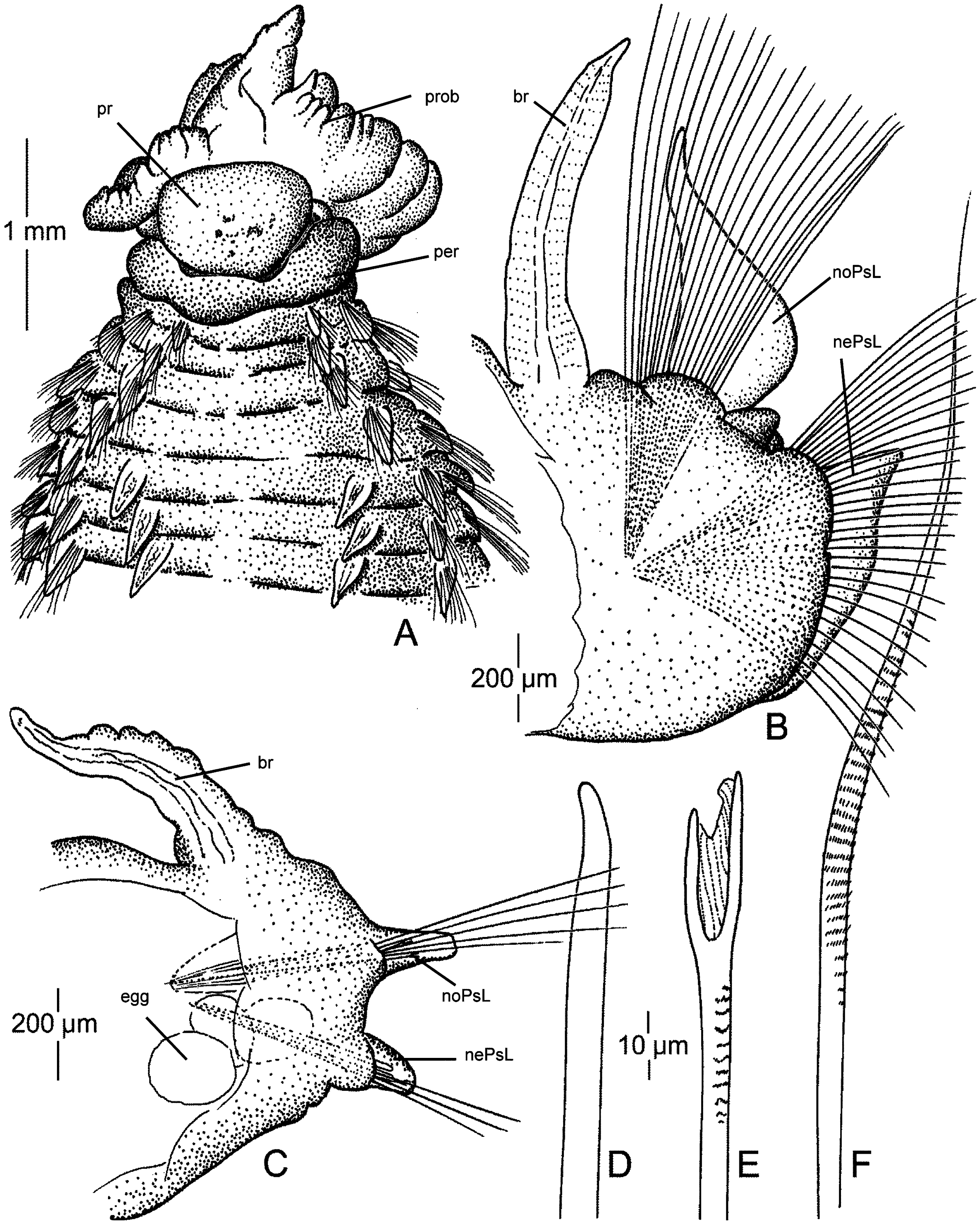

FIGURE 44. *Naineris setosa* (Verrill, 1900). Galápagos Islands, (USNM 60628). A, anterior end, dorsal view; B, thoracic parapodium, anterior view; C, abdominal parapodium, anterior view; D, abdominal neuropodial uncinus; E, furcate seta; F, thoracic neuropodial capillary seta.

***Naineris furcillata* new name**
Figure 45

Naineris chilensis Carrasco, 1977: 70–72, figs. 5–6, **homonym** of *N. dendritica chilensis* Hartmann-Schröder, 1965; Rozbaczylo 1985: 130.

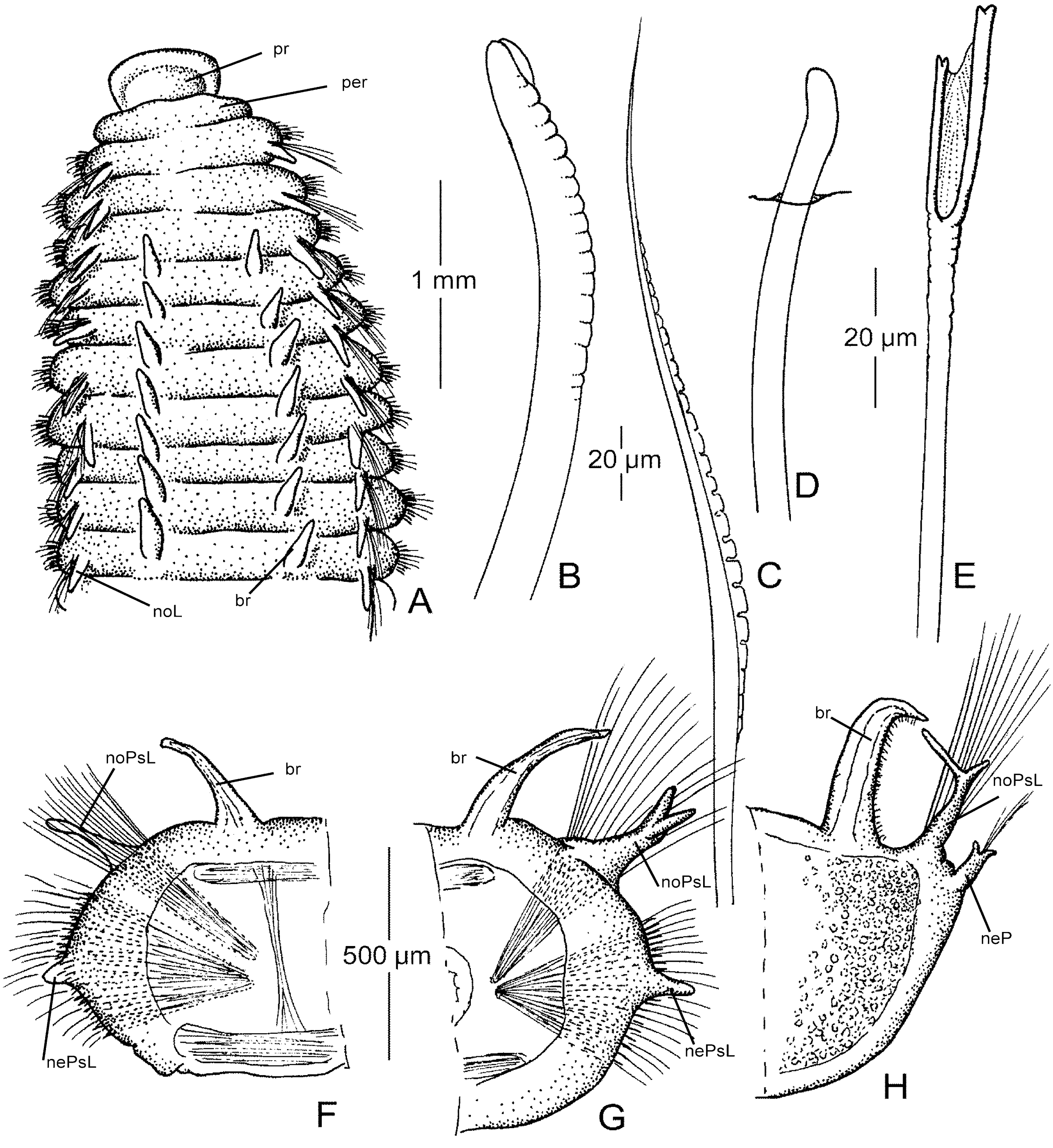

FIGURE 45. *Naineris furcillata* **n. nom.** (USNM 60639).—A, anterior end, dorsal view; B, thoracic neuropodial uncinus; C, thoracic neuropodial capillary; D, abdominal neuropodial acicula; E, furcate seta; F, anterior thoracic parapodium, anterior view; G, posterior thoracic parapodium, posterior view; H, abdominal parapodium, posterior view.

Material examined. Argentina, Staten Island off Tierra del Fuego, *Hero* Cruise 712, Sta. 664 (1, USNM 60639).—Strait of Magellan, *Eltanin* Cruise 11, Sta. 960 (1, USNM 60638).

Description. Both specimens posteriorly incomplete, with largest (USNM 60639) 23 mm long, 2 mm wide for 64 setigers. Color in alcohol: light tan to brown.

Prostomium blunt, with slightly rounded frontal margin (Fig. 45A); no eyespots; peristomium a simple achaetous ring, ventrally forming lips of mouth; proboscis partially everted, appearing dendritic. Thoracic region with 17–19 setigers, appearing dorsally compressed; 1–2 transitional segments present between thorax and abdomen; abdominal region cylindrical.

Branchiae from setiger 4, continuing to posterior end; each branchia flattened, cirriform, tapering to pointed tip (Fig. 45F–G), ciliated on inner margins; branchiae of posterior segments flatter and broader (Fig. 45H).

Thoracic notopodial postsetal lobe elongate, thin, and fingerlike, with forked tips by setiger 17–18 (Fig. 45G); subsequent notopodial lobes and those of posterior segments forked (Fig. 45H) or undivided; occurrence of forked notopodial lobes irregular from segment to segment; interramal cirrus absent. Thoracic neuropodia slightly thickened, with short, fingerlike postsetal lobe from setiger 1 (Fig. 45F); abdominal neuropodia divided into two apical lobes, between which setae emerge (Fig. 45H).

Thoracic notopodia with 30–40 long, crenulated capillaries and 3–5 furcate setae; abdominal notopodia with few capillaries and furcate setae; each furcate seta with unequal tynes having blunted, bifid tips; tynes connected by a thin membrane composed of very fine needles, shafts with transverse ribs (Fig. 45E).Thoracic neuropodia with dense fascicles of uncini (Fig. 45B) and crenulated capillaries (Fig. 45C); each uncinus with transverse ribs; abdominal neurosetae reduced to a few crenulated capillaries and 1–2 smooth, slightly curved aciculae (Fig. 45D).

Etymology. *furcillata*: Latin for forked.

Remarks. *Naineris chilensis* Carrasco, 1977 is a junior homonym of *N. dendritica chilensis* Hartmann-Schröder, 1965 and is herein renamed *N. furcillata*. The specimens described here are considered to represent the same species as Carrasco's material from western Chile. The type specimens of Carrasco's species were requested but were not provided. *Naineris furcillata* is unique in the genus in having the posterior thoracic and abdominal notopodial postsetal lobes and abdominal neuropodia with bifid or forked tips. The occurrence of forked or undivided lobes in the notopodia is variable from segment to segment, but consistent in the neuropodia; Carrasco's holotype is depicted as having only the neuropodial lobes forked.

Distribution. Argentina, Patagonian region; Chile, Strait of Magellan; 10–64 m.

Naineris chilensis Hartmann-Schröder, 1965, New Status

Figures 46–47

Naineris dendritica chilensis Hartmann-Schröder, 1965: 195–197, figs. 179–180; Rozbaczylo 1985: 130.

Material examined. Ecuador, *Anton Bruun* Sta. 66-70 (1, USNM 60641), 8–9 m; 3 juveniles (USNM 60637).—Peru, South of Callao, *Anton Bruun* Sta. 65-215, shallow subtidal (USNM 60640) .—Chile, Arica Province, Aricia, 18°29′33″S, 70°19′17″W, intertidal shale, coll. Eric Guiler, *Papudo Corvette* sta. N17, 26–28 Feb 1955 (1, LACM-AHF Poly 5021); Chile, Puerto Aguirre, coll. 21 Jul 1958, 10 m, **holotype** of *Naineris dendritica chilensis* (ZMH-P-15326).

Description. A large species, Chilean specimen [Holotype of *N. dendritica chilensis*] from Puerto Aguirre 60 mm long, 6 mm wide for approximately 250 setigerous segments. Body broad, depressed in thoracic region, cylindrical in abdominal region. Thorax with 15–30 setigers, depending upon size: larger specimens with more thoracic setigers. Branchiae from setiger 7–8, continuing to posterior end.

Prostomium broadly rounded on anterior margin (Figs. 46A, 47A); no eyespots; no nuchal organs observed. Peristomium a single narrow folded achaetous ring (Figs. 46A, 47A); proboscis large, multilobed (Fig. 46A).

Thoracic notopodial postsetal lamellae broadly triangular (Fig. 46B); abdominal notopodial postsetal lamellae similar, but not as broad and elongated (Fig. 46C). Thoracic neuropodial postsetal lobes foliaceous ridges with uppermost edge prolonged (Fig. 46B); abdominal neuropodial postsetal lobes lower, less foliaceous (Fig. 46C).

Thoracic notosetae all crenulated capillaries; abdominal notosetae including capillaries, 2–3 furcate setae and 5–6 deeply imbedded aciculae; furcate setae with unequal tynes, longest blunt on tip, shortest thin, pointed, with about 10 thin needles between tynes (Fig. 47D); shaft with numerous crowded transverse rows of barbs merging with bases of needles. Thoracic neurosetae including three rows of uncini and subuluncini intermixed with capillaries (Fig. 47B), especially in ventral-most portion of fascicles; uncini including smooth spines (Fig. 46F) and less numerous smaller, weakly ribbed uncini (Fig. 46D); subuluncini with minute barbs on capillary extension (Figs. 46E, 47B). Abdominal neurosetae including capillaries and 5–6 smooth spines (Figs. 46G, 47C).

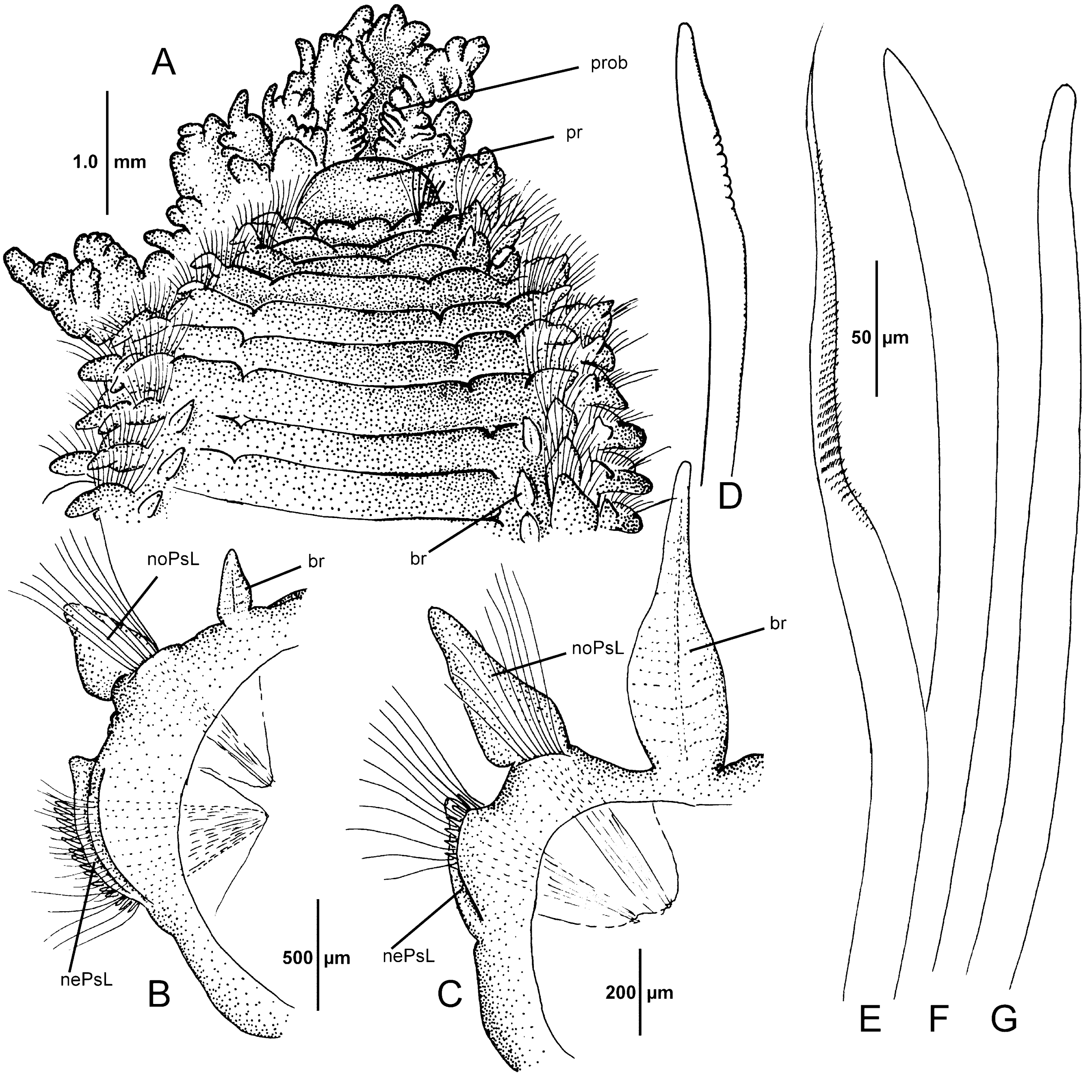

FIGURE 46. *Naineris chilensis* Hartmann-Schröder, 1965. Peru, (USNM 60641). A, anterior end, dorsal view; B, thoracic parapodium, anterior view; C, abdominal parapodium, anterior view; D, thoracic neuropodial uncinus; E, thoracic neuropodial subuluncinus; F–G, abdominal neuropodial uncini.

Abdominal parapodia dorsally elevated, forming channel with parapodia and setae of right and left sides nearly overlapping medially. Anus terminal, surrounded by lobes, cirri lacking.

Remarks. *N. dendritica chilensis* Hartmann-Schröder is here raised to full species status. This species is similar to *N. dendritica*, but differs because the neuropodial postsetal lobes are prolonged on their superior most margins instead of being reduced to a small papilla as is typical for *N. dendritica*. Furthermore, the thoracic neuropodial uncini are mostly smooth instead of being mostly ribbed. The three juvenile specimens from Ecuador (USNM 60637) have more uncini with transverse ridges in the thoracic neuropodia than the adults, but an adult identification was confirmed for the same sample and it is not known how the various setal types develop in orbiniids.

N. chilensis is also similar to *N. laevigata* Grube, 1855 originally described from the Mediterranean, but widely reported elsewhere in the Atlantic and Pacific Oceans. The branchial distribution reported for *N. laevigata* is highly variable and at odds with the majority of the genera and species examined as part of this study, where the branchiae of individual species have either a fixed segment on which they begin or at most only a narrow range of segments; exceptions are species where the branchiae begin in far posterior thoracic setigers. For *N. laevigata*, Eisig (1914) indicated most of the specimens he examined had branchiae from setigers 7–8, as in *N. chilensis*, but did range from setigers 4–11.

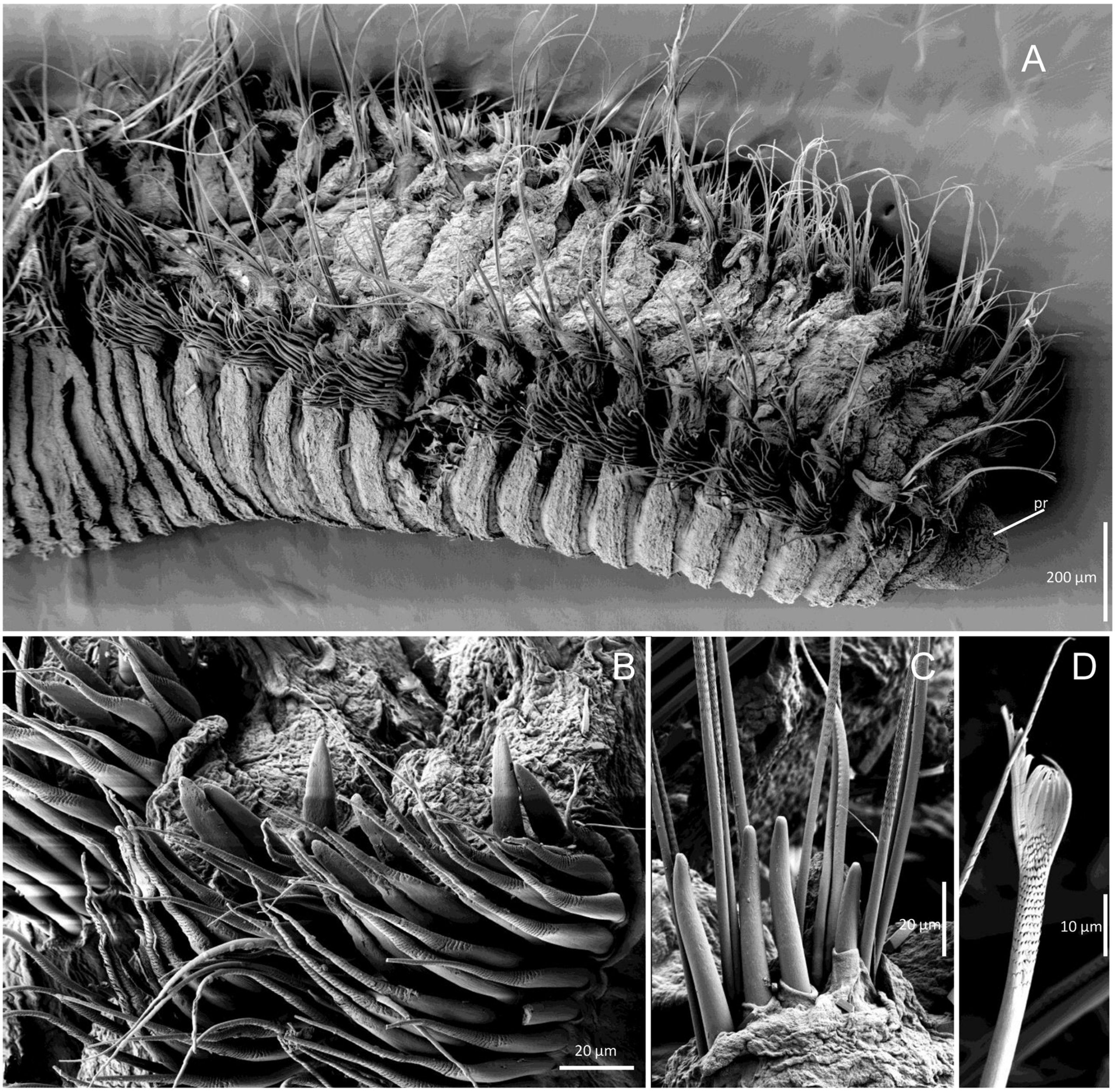

FIGURE 47. *Naineris chilensis* Hartmann-Schröder, 1965. Peru (USNM 60640). A, Anterior end, lateral view; B, thoracic neuropodial uncini and subuluncini; C, abdominal neurosetae spines and capillaries; D, furcate seta.

Hartman (1957) referred North Pacific records of *N. laevigata* to *N. dendritica*, but retained the records of *N. laevigata* of Monro (1933b) from the Galápagos Islands and Ecuador and added additional specimens from Peru. For these collections, Hartman (1957) noted a wide range from setigers 6–12 as a starting point for the branchiae suggesting that more than one species might be present. Variability in other characters was not observed and apart from notes on records from Florida (branchiae from setiger 4) little comparative information was presented by Hartman (1957). However, the branchial distribution reported for *N. laevigata* from the Americas at a minimum, is so variable, that it is likely that several species are involved. A review of the widely distributed records of *N. laevigata* is clearly needed.

Based on my own observations of *N. dendritica* from the eastern North Pacific (Blake 1996) and the few specimens of *N. chilensis* available for study, the differences between the two species are not great and they likely represent a sibling species pair with subtle parapodial and setal differences representing a clinal variation over the distribution from Canada to Chile.

Distribution. Ecuador to Chile, intertidal to 10 m.

Naineris grubei (Gravier, 1908)

Figures 48–50

Scoloplos grubei Gravier, 1908: 42–43; 1909: 646–649, pl. 18, figs. 49–57.
Naineris grubei: Hartman 1957: 303; Blake 1996: 20–22, fig. 1.8.

Material examined. Northern Chile, Iqique, LUCE Sta. M-131, intertidal, red rocks in pools (1, SMNH 154447).—Southern Chile, Seno Reloneavi, Canal Tenglo, between Isla Tengo and Angelmó, LUCE Sta. M-13, 0–6 m (1, SEM, JAB); Seno Reloneavi, Isla Tenglo, the bay on the South Side, LUCE Sta. M-60, intertidal (4, SMNH 154440); Bahía de Ancud, between Punta San Antonio and Punta Colorado, LUCE Sta. M-55, intertidal (1, SMNH 154444); Golf Corcovado, Boca del Guafo, Isla Guafo, the anchorage E of Punta Weather, LUCE Sta. M-70A, 25 m (1, SMNH 154450); Golfo de Ancud, Canal Caicaen, E of the mouth of Canal Quigua, LUCE Sta. M-45, 18 m (1, SEM, JAB).—Straits of Magellan, near the estuary of Río los Ciervos, S of Punta Arenas, LUCE Sta. M-115, intertidal (1, SMNH 154449).

Description. All specimens incomplete; largest fragment nearly complete, 85 mm long and 2.4 mm wide for 146 setigers. Color in alcohol: dark brown.

Largest specimens with prostomium truncate, slightly rounded on frontal margin (Figs. 48A, 49A, 50A); eyespots lacking; smaller specimens with prostomium more pear-shaped, blunt on anterior margin (Fig. 48A); peristomium with two achaetous rings in juveniles and smaller specimens (Fig. 49A), reduced to a single achaetous ring in larger specimens (Figs. 48A, 50A); proboscis not observed. Thoracic region with 19–20 setigers (17 according to Gravier 1909), appearing dorsally compressed; abdominal segments cylindrical in cross-section.

Thoracic notopodia elongate, cirriform from setiger 1 (Fig. 48B), continuing through thoracic (Fig. 50B) and abdominal setigers; neuropodia swollen, bearing large fascicles of setae and a single fingerlike postsetal lobe from setiger 1 (Fig. 48B); abdominal neuropodia simple, bluntly rounded, bearing a short ventral cirrus (Fig. 48C); a distinct ventral flange present; interramal cirrus lacking.

Thoracic notosetae including 30–35 long, crenulated capillaries; abdominal notopodia with 15 or more capillaries and 5–6 furcate setae; furcate setae with unequal tynes having blunted, notched tips, tynes connected by row of fine needles appearing as a thin membrane in light microscopy, shaft with ribs along one edge (Figs. 48H, 49D), in SEM 6–7 needles on either side, merging with tynes; tynes with distinct openings on tips (see arrows, Fig. 50E).

Thoracic neurosetae including 7–8 rows of numerous uncini and two rows of crenulated capillaries (Fig. 50C); uncini with ribbed shaft and a bluntly rounded tip bearing a terminal notch, appearing bifid in some angles; entire end of shaft and tip with distinct lateral flange appearing hood-like in certain views (Figs. 48D–G, 49 B–C, 50D), smaller specimens with tips of uncini appearing more notched, probably due to less wear (Fig. 49B–C); abdominal neurosetae including 1–2 thin protruding aciculae with curved blunted tips, sometimes with thin membranous mucron (Fig. 48I), and 5–6 thin crenulated capillaries.

Branchiae from setiger 4 on all specimens (Figs. 48A, 49A, 50A); branchiae small, conical at first, increasing in size rapidly over following setigers, becoming cirriform with broad base and tapering to pointed tip; branchiae on abdominal segments considerably larger than on thoracic segments, triangular in shape; branchiae heavily ciliated on both margins. Bases of abdominal branchiae close together, joined by low transverse ridge. Middle thoracic through anterior abdominal segments with pair of oval-shaped dorsal sense organs medial and anterior to branchial bases.

Remarks. *Naineris grubei* is closely related to *N. furcillata* in the shape of the prostomium, number of thoracic setigers, and distribution and form of the setae. The two species differ in that the notopodia of posterior thoracic and abdominal setigers in *N. furcillata* have a distinctly forked appearance, whereas in *N. grubei* the notopodium is simple and entire throughout. Both species have abdominal neuropodia with a short ventral cirrus. The main difference between *N. grubei* and other congeners is in the nature of the notched or bidentate tips of the thoracic neuropodial uncini.

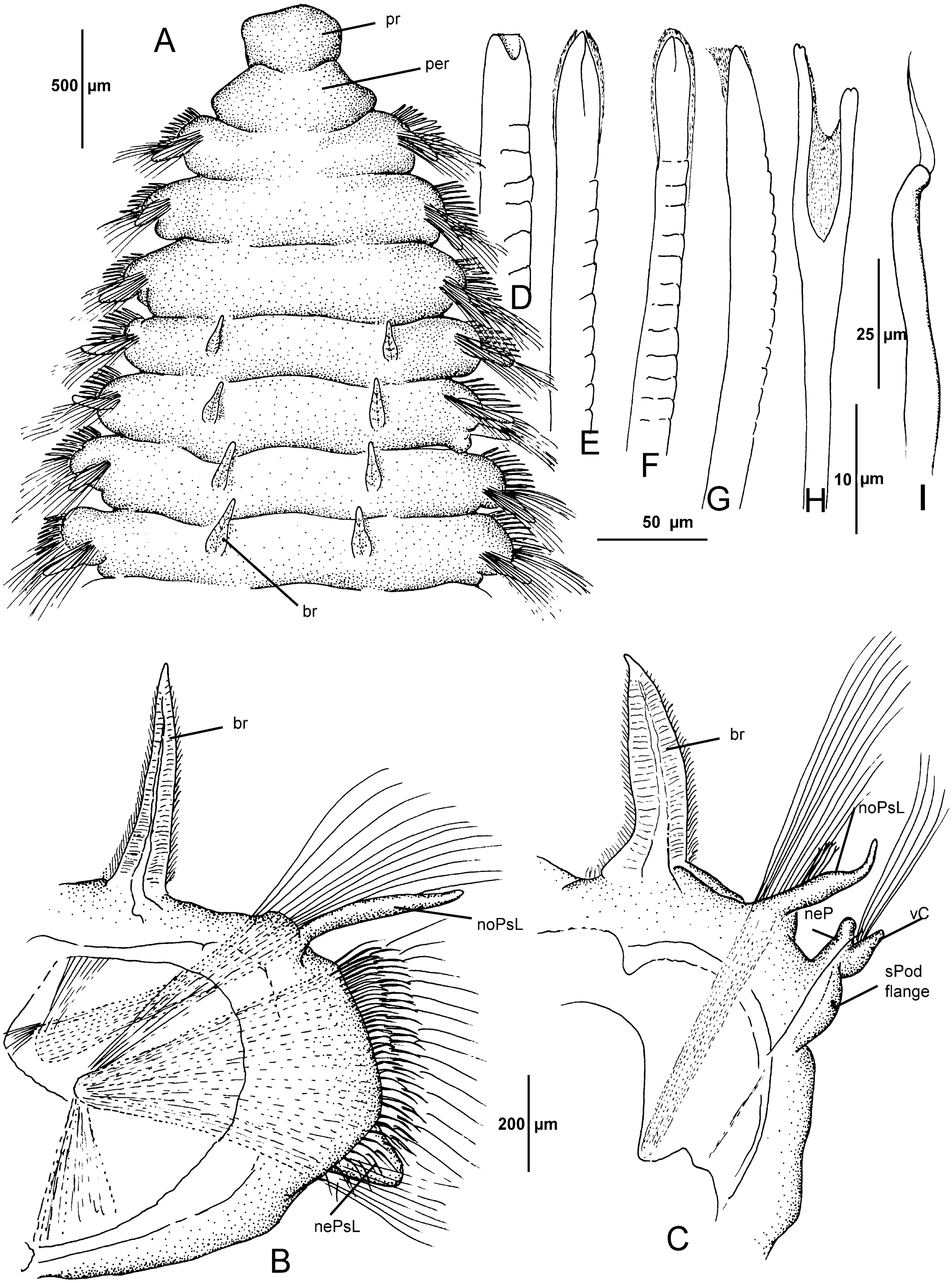

FIGURE 48. *Naineris grubei* (Gravier, 1908). Chile, Seno Reloneavi, Isla Tenglo, Sta. M60 (SMNH 154440). A, anterior end, dorsal view; B, thoracic parapodium, anterior view; C, abdominal parapodium, posterior view; D–G, thoracic neuropodial uncini; H, furcate seta; I, abdominal neuropodial acicular seta.

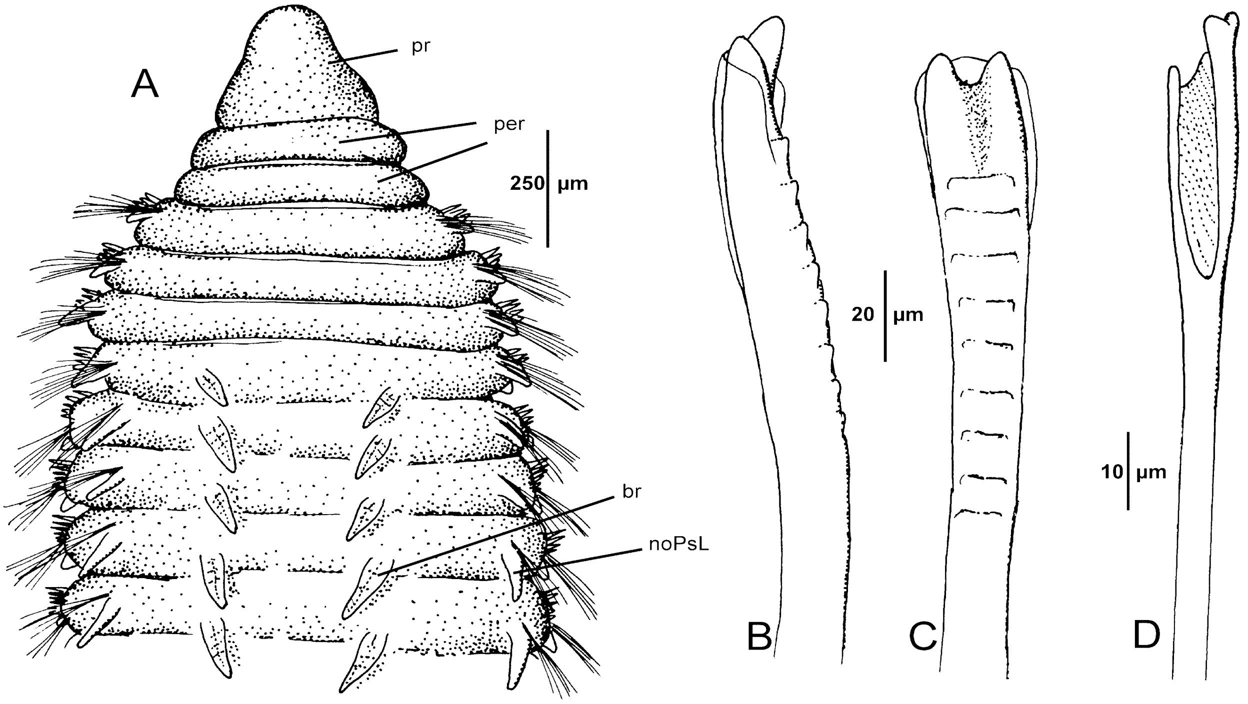

FIGURE 49. *Naineris grubei* (Gravier, 1908), Chile, LUCE Seno Reloneavi, Isla Tenglo, Sta. M60 (SMNH 154440). Juvenile. A, anterior end, dorsal view; B–C, thoracic neuropodial uncini; D, furcate seta.

The new collections provide an opportunity to expand the original descriptions of Gravier (1908, 1909). The number of thoracic setigers was reported to be 17 in the original description, while the specimens from the Lund University Chile Expedition always have 19–20. The branchiae consistently begin on setiger 4 in the Lund materials, whereas Gravier (1909) indicated that they began on setiger 7 on his specimen from Peru. The small oval dorsal sensory organs of thoracic and anterior abdominal setigers do not appear to have been reported previously. The difference in the number of thoracic setigers and position of the first pair of branchiae between the original account of Gravier (1908, 1909) and the new materials from Chile are likely due to size of the specimens. Graviers' specimens were smaller, less than 5 mm long and with less than 50 segments. These correspond closely with small specimens considered to be juveniles and identified as *N.* cf. *grubei* by Blake (1996) from southern California where the number of thoracic setigers ranged from 8–13 and branchiae first occurred from setiger 5–6.

Naineris grubei australis Hartman, 1957, an Australian species, was recently redescribed by Zhadan *et. al.* (2015). This subspecies, however, differs significantly from the stem form described here in having an entirely different kind of thoracic neuropodial uncini. In *N.* g*rubei* from South America, the thoracic neuropodial uncini have numerous transverse ribs on the shaft and a bluntly rounded tip bearing a terminal notch that apically appears bifid in most angles; a lateral flange is also present. In contrast, *N. grubei australis* has the transverse ribs and lateral sheath, but the notch is elongate and terminates in a smoothly rounded tip, not one that is bifid. In addition, Zhadan *et al.* (2015) report and illustrate subuluncini among the uncini of thoracic neuropodia of *N. grubei australis*. Subuluncini are not present in *N. grubei* reported in this study. For this reason, the subspecies from Australia should be raised to full species status: *Naineris australis* **New Status**.

Distribution. Ecuador, Peru, and Chile, intertidal to 25 m.

Naineris argentiniensis new species

Figure 51

Material examined. Argentina, Mar del Plata, Rocas Pya Chica, intertidal, Jan 1973, coll. Marchetti, **holotype** (USNM 1013686); Feb 1970, coll. J.M. Orensanz, 3 **paratypes** (USNM 1013687).

Description. A small species, holotype incomplete, 12 mm long, 0.8 mm wide for 62 setigers; paratypes of similar size, but not well preserved, one complete. Thoracic region with 12–13 setigers, with transition to abdomen abrupt, characterized by reduction of neurosetae and change from bidentate to unidentate neuropodial uncini.

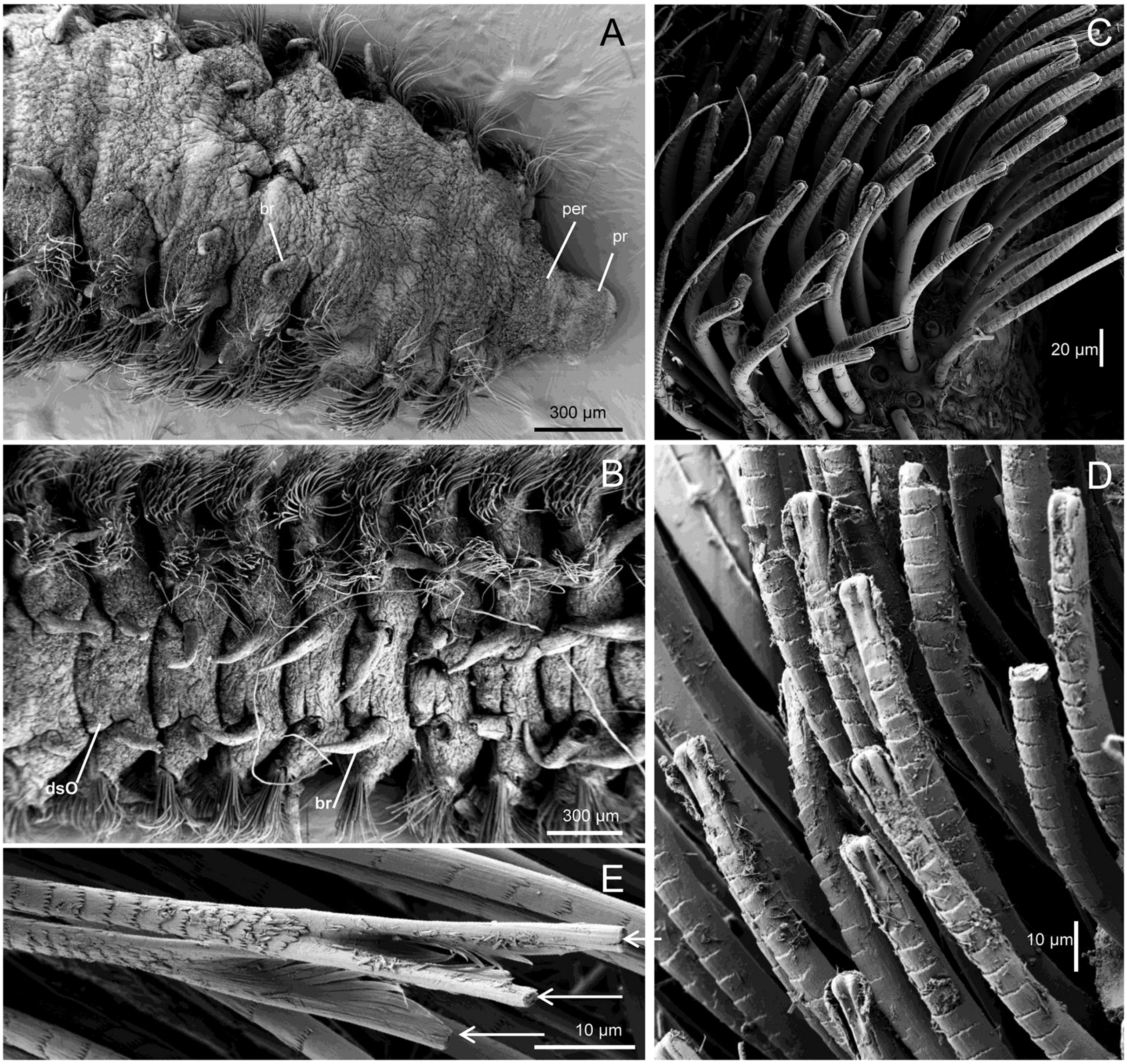

FIGURE 50. *Naineris grubei* (Gravier, 1908). Chile, LUCE, Sta. M45 (SEMs, JAB). A, Anterior end, dorsal view; B, thoracic setigers 4–13, in dorsal view; C, thoracic neuropodial uncini; D, detail of same; E, furcate seta, arrows denote opening on tips of tynes.

Prostomium about as wide as long, broadly rounded on anterior margin (Fig. 51A); no eyespots. Peristomium elongate achaetous region formed of two indistinct rings, more or less fused.

Notopodial postsetal lobes elongate, fingerlike throughout body (Fig. 51A–B). Thoracic neuropodia swollen, forming rounded tori from which setae emerge; postsetal lobes from setiger 1, continuing through abdominal region.

Thoracic notosetae crenulated capillaries. Furcate setae absent. Thoracic neurosetae including crenulated capillaries with numerous spinelets along shaft (Fig. 51C) and bidentate ribbed uncini arranged in 2–3 rows; uncini of anterior row shorter, more strongly curved, those of last row longer and straighter (Fig. 51D–F). Anterior abdominal neurosetae including curved blunt-tipped unidentate uncini and capillaries; posterior abdominal setigers with 2–3 unidentate acicular spines, at least one of which has crenulations (Fig. 51B). Branchiae from setiger 5–6 continuing to end of body.

Pygidium a rounded lobe with terminal anus; lacking cirri.

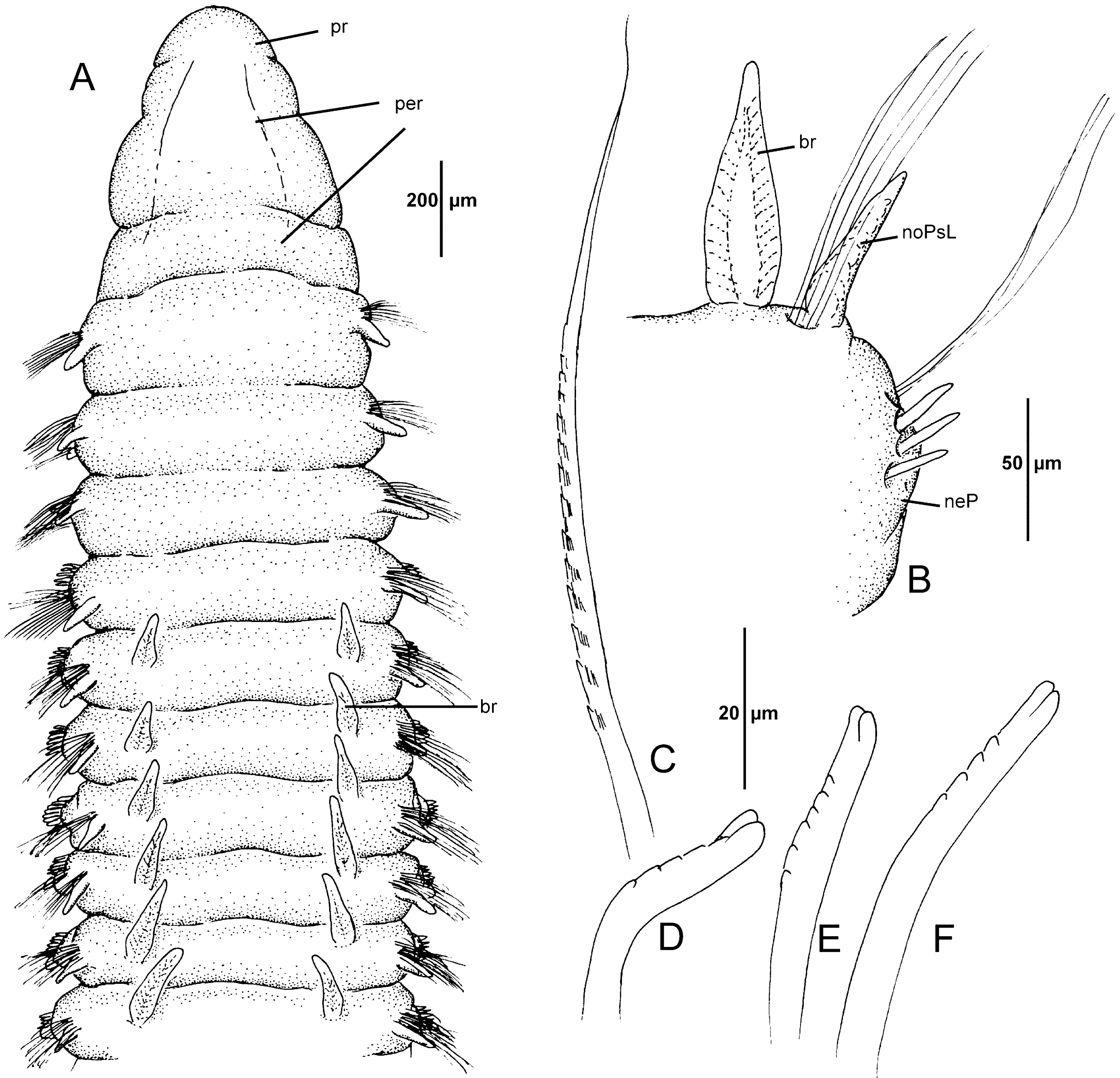

FIGURE 51. *Naineris argentiniensis* **n. sp.** Holotype (USNM 1013686). A, anterior end, dorsal view; B, abdominal parapodium, anterior view; C, thoracic capillary notoseta; D–F, thoracic neuropodial uncini from rows 1–3.

Remarks. The specimens studied here are probably juveniles. They are representative of a transitional phase between the traditional definition of a small orbiniid such as *Protoariciella,* which normally has two achaetous peristomial rings and *Naineris,* which has one. These specimens are referred to *Naineris* because juveniles of this genus are known to have two achaetous rings as larvae and juveniles and one as an adult. *Naineris argentiniensis* **n. sp.**, although represented only by small specimens, has a close relationship with *N. grubei,* known from the eastern Pacific*,* in the bifid nature of the neuropodial uncini and occurrence of branchiae from anterior thoracic segments. *Naineris argentiniensis* **n. sp.** differs considerably from *N. grubei*, however, in lacking furcate setae and flail setae, by having a broad, straplike abdominal notopodium instead of one that is thin and fingerlike, having branchiae from setiger 5–6 instead of 4, and by having low, rounded abdominal neuropodia instead of elongate, bilobed ones.

Distribution. Argentina, intertidal.

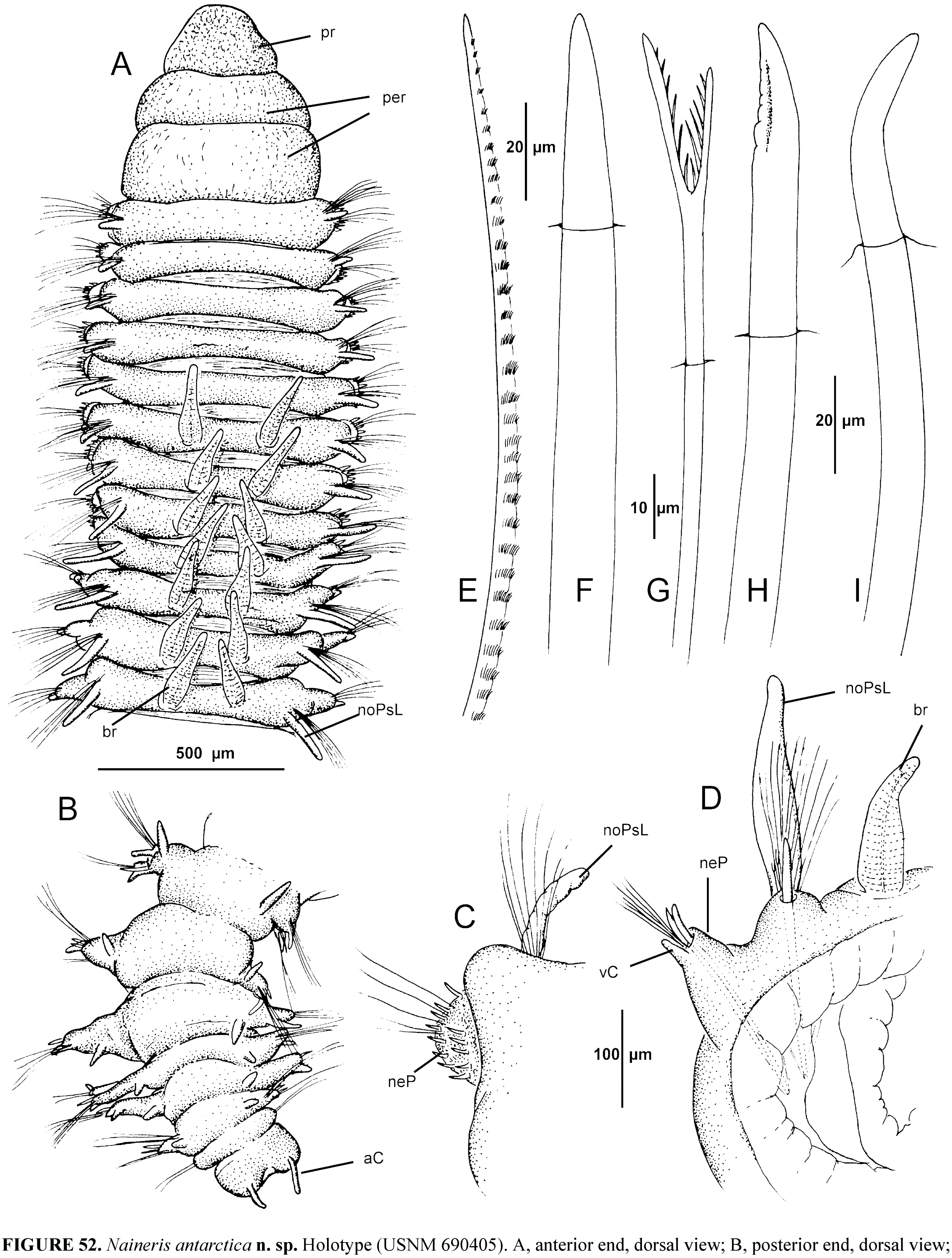

FIGURE 52. *Naineris antarctica* **n. sp.** Holotype (USNM 690405). A, anterior end, dorsal view; B, posterior end, dorsal view; C, thoracic parapodium, anterior view; D, abdominal parapodium, anterior view; E, thoracic capillary notoseta; F, abdominal acicular spine; G, furcate seta; H, thoracic neuropodial uncinus; I, abdominal neuropodial uncinus.

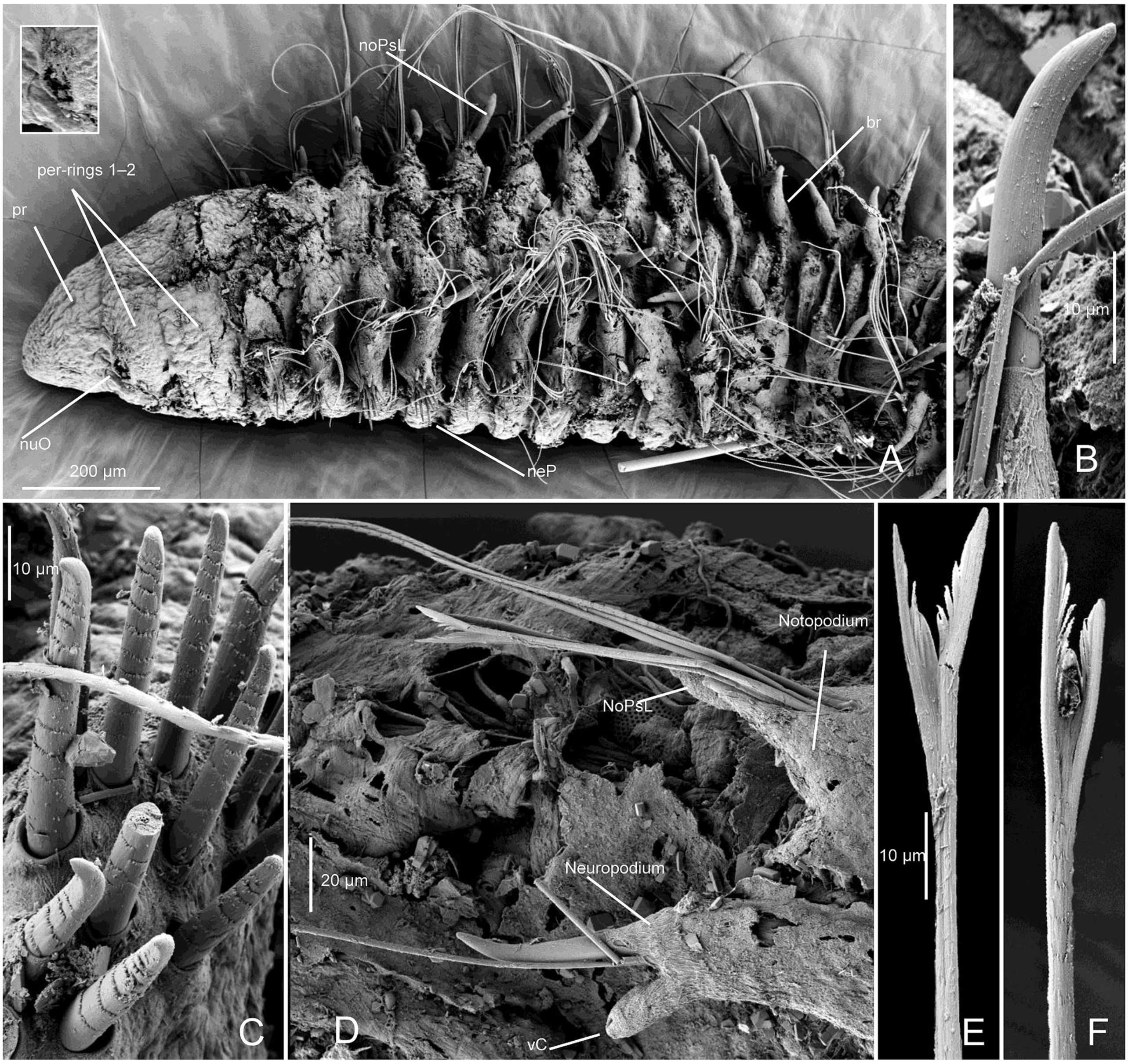

FIGURE 53. *Naineris antarctica* **n. sp.** Paratype (USN690406). A, anterior end left lateral view [inset of nuchal organ, not to scale]; B, abdominal neuropodial spine; C, thoracic neuropodial uncini; D, abdominal neuropodium; E–F, furcate setae.

***Naineris antarctica* new species**
Figures 52–53

Haploscoloplos kerguelensis: Hartman 1978: 156 (in part, Sta. 69-1). Not McIntosh 1885.

Material examined. Weddell Sea, *Glacier* Sta. 69-1, 512 m (2, USNM 46604).—Ross Sea, East of Cape Adare, *Eltanin* Sta. 32-1995, 10 Jan 1968, 72.05°S, 172.63°E, 344–348 m, **holotype** and 3 **paratypes** (USNM 690405–6); N. of Ross Island, *Eltanin* Sta. 32-2050, 22 Jan 1968, 77.03° S, 168.50° E, 909–923 m, 1 **paratype** (USNM 1013906); Ross Sea, Moubray Bay, off Cape Hallett, Deep Freeze IV, *Northwind* Sta. 8, 12 Jan 1959, 72.288°S, 170.300°E,135 m, 1 **paratype** (USNM 1013907).

Description. A small species, holotype complete, 7.5 mm long and 0.75 mm wide for 50 setigers. Thoracic region with 9–10 setigers; transition from thorax to abdomen generally abrupt, with last 1–2 thoracic setigers having fewer neuropodial uncini. Branchiae from setiger 6–7 continuing to posterior end of body (Fig. 52A–B). Anus terminal, located between two rounded lobes, each bearing thin anal cirrus (Fig. 52B).

Prostomium weakly pear-shaped, smoothly rounded on anterior margin (Figs. 52A, 53A), no eyespots; paired nuchal organs at margin of prostomium and peristomium (Fig. 53A, inset). Peristomium with two achaetous rings (Figs. 52A, 53A).

Notopodia with elongated postsetal lobes throughout body, with those of first few thoracic and last abdominal segments shortest (Figs. 52A–B, 53A). Thoracic neuropodia swollen, forming rounded tori from which setae emerge (Fig. 52C); postsetal lobes first present from setiger 6, continuing to abdominal region. Abdominal neuropodia elongate, rounded apically, with short ventral cirrus (Figs. 52D, 53D).

Thoracic notosetae including crenulated capillaries and shorter, non-capillary tipped, but sharply pointed setae (Fig. 52E), and furcate setae. Abdominal notosetae including pointed setae, 1–2 heavy, smooth acicular spines (Fig. 52D, F) and furcate setae; furcate setae with unequal tynes bearing thin needles between tynes (Fig. 52G); in SEM tynes with entire narrow tips with 4–5 needles on either side merging with tynes (Fig. 53E–F), shafts with few irregular barbs, otherwise smooth. Thoracic neurosetae including crenulated capillaries and ribbed uncini arranged in two rows (Figs. 52C, H, 53C); depression or notch visible on concave curvature of spine in light microscopy, with evidence of lateral ribs on some spines, shaft generally appearing smooth (Fig. 52H); with SEM concave side of curved apex flattened, only weakly notched, shaft with transverse rows of barbs continuing from posterior of curved apex to emergence from neuropodium (Fig. 53C). Abdominal neurosetae including a few capillaries setae and 1–2 strongly curved acicular spines (Figs. 52I, 53B, D).

Etymology. The species is named for Antarctica, because it is the only species of the genus known from the Southern continent.

Remarks. *Naineris antarctica* **n. sp.** differs from other species of the genus in having heavy acicular spines in abdominal notopodia which, with the strongly curved neuropodial aciculae provide a striking armature to the abdominal region. The paratypes from *Eltanin* Sta. 2050 have a somewhat more conical prostomium than the other specimens, but otherwise agree in all other respects.

Distribution. Antarctica, Weddell and Ross Seas, 344–923 m.

Subfamily Microrbiniinae Blake, 2000

Type genus. *Microrbinia* Hartman, 1965, designated by Blake 2000.

Diagnosis. Body small, lacking distinct regions; parapodia lateral throughout, none shifted dorsally. Prostomium broad, bluntly rounded or more elongate and conical; nuchal organs present. Peristomium with 1–3 achaetous rings, separated from prostomium. Noto- and neuropodial postsetal lamellae reduced to short lobes. Bases of podia separated throughout; setal tori simple. Setae consisting of capillaries always present, blunt-tipped spines or uncini and swan hooks present or absent; furcate setae typically absent. Branchiae typically absent, rarely present, if present; simple throughout, oval to flattened with two longitudinal rows of cilia. Pygidium with few cirri or cirri absent.

Inclusive genera. *Microrbinia, Orbiniella, Proscoloplos,* and *Pettibonella.*

Remarks. Two genera, *Orbiniella* and *Proscoloplos* and seven species including two new species were encountered in the present study. The species and genera presently assigned to this subfamily are largely defined on negative characters including the absence of distinct body regions, unmodified posterior parapodia, and often the absence of branchiae. Modified setae are rare and when present are similar to the aciculae found in larger species of the Orbiniinae. Several described species are literally microscopic in size (1–3 mm long), approximating dimensions reported for post-larvae of other orbiniids (e.g., Okuda 1946; Blake 1980), suggesting that many species of this subfamily may be juveniles of species in other orbiniid genera. This does not apply to *Microrbinia linea* Hartman, 1965, a small deep-water species off the U.S. Atlantic coast that Blake (1993) determined was sexually mature year round. Mature ova are also reported for *Orbiniella andeepia, O. uniformis*, and *O. landrumae* **n. sp.** in this paper, and *O. nuda*, and *O. plumisetosa* in previous reports (see Table 2; this study, see below). Reports of gametes or other evidence of sexual maturity in other species in this subfamily are rare.

Genus *Orbiniella* Day, 1954

Type-species: *Orbiniella minuta* Day, 1954, by monotypy.
Synonym: *Falklandiella* Hartman, 1967. *Fide* Buzhinskaja 1992: 76. **Type species:** *Falklandiella annulata* Hartman, 1967, by monotypy.

Diagnosis. Body elongate, with separation between thorax and abdomen indistinct, anterior segments may be narrower than more posterior segments, but size changing gradually over several segments, or no change in appearance between anterior and posterior segments; prostomium broad or elongate with paired nuchal organs usually present, these sometimes pigmented, eyespots present or absent; peristomium with 1–2 asetigerous rings. Noto- and neuropodia poorly developed, consisting of low tori from which setae emerge; with only simple post-setal lamellae, or these entirely absent; posterior parapodia not elevated and shifted dorsally as in genera of the Orbiniinae. Capillary noto- and neurosetae always crenulated or weakly camerated with pointed bristles apparent at relatively low magnification (100x); prominent acicular spines present or absent in noto- and neuropodia, or entirely absent; furcate setae absent. Branchiae entirely absent.

Remarks. Species of *Orbiniella* are generally small and with a simple morphology, resulting in a taxonomy that is largely based on negative characters. In this respect, it is highly likely that several of the described species are in fact juveniles or post-larval stages of other species of Orbiniidae. This is, however, very difficult to demonstrate without a good growth sequence documenting morphological change. An examination of one of the SEM images of *O. marionensis* in Gillet (1999: Fig. 2D) clearly shows that furcate setae are present in the last notopodium on the right side. This suggests that this species at least, is likely a juvenile of another orbiniid.

Table 2 provides a list of 13 species of *Orbiniella* and main morphology. Two other species do not belong in the genus: *O. drakei* is transferred to *Leitoscoloplos* (see above) and *O. branchiata* does not agree with the definition of the genus because it has branchiae, elongate postsetal lamellae, and may be a juvenile of another orbiniid (see below). Of the 13 species listed in Table 2, four occur in deep water and nine occur in shallow water.

The four deep-water species all have noto- and neuropodial acicular spines. Of these, *O. hobsonae* has crenulated acicular spines instead of smooth and *O. petersenae* is the only one to have four anal cirri. For the two remaining species, *O. andeepia* has short notopodial postsetal lamellae while *O. aciculata* has none.

Of the nine shallow-water species, both *O. landrumae* **n. sp**. and *O. marionensis* have furcate setae and with further assessment may not belong in *Orbiniella* at all. In addition, *O. landrumae* appears to have notopodial flail setae, another character not associated with *Orbiniella* and its generic assignment is thus provisional. For the remaining seven species, *O. dayi* has small noto- and neuropodial postsetal lobes that are absent in the other six species. The remaining six species all have noto- and neuropodial acicular spines or short emergent aciculae. Of these, *O. spinosa* **n. sp.** has unusual barbed or finely hirsute spines (see below). Apart from eyespots being are reported for *O. nuda, O. plumisetosa,* and *O. annulata*, and absent in *O. minuta* and *O. uniformis*, these remaining five species are similar in morphology and apart from overall body shape, prostomial shape, and the development of the two peristomial rings are separated with difficulty. The main taxonomic characters for species of *Orbiniella* are presented in Table 2. Five species, two new are treated below, with "*Orbiniella*" *branchiata* treated separately.

Orbiniella annulata (Hartman, 1967)
Figure 54A–C

Falklandiella annulata Hartman, 1967: 109–110, pl. 35; Buzhinskaja 1992: 76–77.

Material examined. Falkland Islands, *Eltanin* Sta. 8-558, 14 Mar 1963, 51.48°S, 56.63°W, 646–845 m, **holotype** (USNM 55536).—South Pacific Ocean, off Tasmania, *Eltanin* Sta. 16-1418, 86–101 m (1, USNM 60629).

Description. A small species, holotype 3.3 mm long, 0.48 mm wide for 34 setigerous segments; Tasmanian specimen only 1.5 mm long and 0.25 mm wide for 21 setigers. Body not divided into regions; segments simple, with reduced parapodia throughout, tapering somewhat posteriorly.

Prostomium sub-triangular not acutely pointed (Fig. 54A); eyespots not apparent (red eyespots reported from holotype by Hartman (1967) no longer discernable). Peristomium with two achaetous rings. Branchiae absent (Fig. 54A).

TABLE 2. Comparison of known species *Orbiniella*.[(1)]

Species	Body shape	Prostomium	Peristomial rings	Eyespots	Segmental annulations	Noto/Neuro post setal lobes or lamellae	Capillary setae	Noto/neuro acicular spines	Gametes	Pygidium	Distribution/depth range; References
O. aciculata Blake, 1985	Short, thick, only 3.2 mm long	Broadly rounded on anterior margin	2 complete, one or both narrow	Absent	Uni- and biannulate	Absent	Crenulated	1–4 large, conspicuous, acicular spines in both noto- and neuropodia	Absent	With 2 short anal cirri	Galapagos Rift, from sediments near hydrothermal vents, 2730 m. Blake 1985.
O. andeepia Narayanaswamy & Blake, 2005	Elongate, with up to 68 setigers and 120 mm long	Broadly rounded anteriorly	2 complete, relatively narrow	Absent; pigmented nuchal organs present	Uniannulate	Present, notopodia only	Crenulated	Notopodia with 1 spine; neuropodia with 2 spines	Eggs present in largest specimens	Bilobed, with 2 short cirri	Antarctica: Drake Passage, Weddell Sea, South Sandwich Slope, 2257–5338 m. Narayanaswamy & Blake 2005; This study.
O. annulata (Hartman, 1967)	Elongate, thick, with narrow segments	Triangular, weakly pointed	2 complete	Present, original descript; no longer visible	Uniannulate	Absent	Crenulated and smooth	1–2 smooth neuro aciculae	Absent	With 2 rounded lobes	Falkland Islands, 646–845 m; off Tasmania, 86–101 m. Hartman 1967; This study.
O. dayi Branch, 1998	Elongate, narrow, tapering posteriorly; up to 5 mm long	Broadly rounded	2 complete	Absent	Weakly biannulate	Present, small	Crenulated throughout	1–2 neuropodial acicular spines in posterior segments	Absent	With 2 rounded lobes	Indian Ocean, Marion Island, intertidal to 15 m. Branch 1998.
O. hobsonae Blake & Hilbig, 1990	Elongate, threadlike, 4.5 mm long	Round on anterior margin	2, 1st narrow; 2nd large; both complete	absent	Uniannulate	Absent	Crenulated (barbed) throughout	1–2 crenulated acicular spines in both noto- and neuropodia	Absent	Simple, without lobes or cirri	NE Pacific, Juan de Fuca Ridge, Endeavour Seamount, vent site, 2216 m. Blake & Hilbig 1990.
O. landrumae **n. sp.**	Short, thick anteriorly, tapering posteriorly; segments narrow	Broadly rounded, smooth on anterior margin	2 not complete dorsally	2 red, crescent-shaped eyespots present	Uniannulate	Short, noto postsetal lobes throughout; present in anterior neuropodia, absent posteriorly	Crenulated throughout	1–4 elongate crenulated neuro spines with broad blades; N.B. notopodial flail and furcate notosetae present	Eggs present, 190 µm	With 4 anal cirri, dorsal pair short, triangular; ventral pair long, cirriform	Juan Fernandez Islands, intertidal to low water. This study.

……*continued on the next page*

TABLE 2. (Continued)

Species	Body shape	Prostomium	Peristomial rings	Eyespots	Segmental annulations	Noto/Neuro post setal lobes or lamellae	Capillary setae	Noto/neuro acicular spines	Gametes	Pygidium	Distribution/depth range; References
O. marionensis Gillet, 1999	Short, up to 7 mm long, 1.3 mm wide	Short, broadly rounded	2 complete	Absent	Biannulate(2)	Noto- and neuropodial-postsetal lobes present	Crenulated	2–4 acicular spines from setiger 1 present; N.B. notopodial furcate setae present(3)	?	Rounded with one pre-anal segment	Indian Ocean, Marian Island, 95–201 m. Gillet 1999.
O. minuta Day, 1954	Short, narrow, only 2–3 mm long	Semi-circular, broadly rounded anteriorly	2 complete	Absent	Weakly biannulate	Absent	Crenulated	Short aciculae barely emerging in middle and posterior segments	?	With 2 rounded lobes	South Atlantic, Tristan de Cunha, intertidal. Day 1954.
O. nuda Hobson, 1974	Elongate, narrow, 5–11 mm long	Broadly rounded anteriorly	2 incomplete	2 subdermal	Uniannulate	Absent	"spinous" capillaries	2–4 neuropodial aciculae	Sperm present; eggs not observed	Bilobed	NE Pacific, Washington, intertidal. Hobson 1974.
O. petersenae Parapar *et al.* 2015	Elongate, narrow,	Broadly rounded anteriorly	2 complete	absent	Bi and triannulate(4)	Present notopodia only, small	Crenulated	1–3 smooth noto- and neuroaciculae	Present, oocytes ca. 60 µm(5)	With 4 short lobes	NE Atlantic, 133–197 m and 1490–1915 m. Parapar 2015(6); unpublished data by the late Mary E. Petersen.
O. plumisetosa Buzhinskaja, 1993	Elongate, weakly fusiform, narrow posteriorly	Broadly rounded on anterior margin	2 complete	2 black subdermal eyespots	Uniannulate	Absent	short smooth caps + Crenulated caps with long plumose fibrils	2–4 curved neuroaciculae	Eggs present 225 µm; sperm packets present	With 2 rounded lobes	Commander Islands, Bering Sea, intertidal. Buzhinskaja 1993.
O. spinosa **n. sp.**	Elongate, narrow, with short segments	Elongate, rounded anteriorly	2, not complete dorsally	Absent	Uniannulate	Absent	Crenulated throughout	1–2 curved neuro spines with barbed or hirsute tips	Absent	With 2 blunt lobes	Off Argentina on drifting kelp. This study.
O. uniformis Hartman, 1967	Long, linear, most segments as long as wide	Short, broadly rounded on anterior margin	2, not complete dorsally	Absent	Uniannulate	Absent	Crenulated, most thicker with curve on shaft	2–3 emergent pointed neuro aciculae	Eggs present, 150 µm	With 2 large ventral lobes; 2 short dorsal cirri	Antarctic Peninsula, shallow water; Hartman 1967; This study.

(1) Not including *O. branchiata*, likely a juvenile of another orbiniid; not including *O. drakei*, herein transferred to *Leitoscoloplos*; (2) Based on SEMs (Gillet 1999: Figs. 2B–C); (3) Notopodial furcate setae are clearly present in last notopodium on the right side of the SEM figured by Gillet (1999: Fig. 2D); (4) Line drawings in Parapar et al. (2015: Fig. 3) show only uniannulate segments along the body; (5) Measurements of oocytes taken from unpublished data on this species by the late Mary E. Petersen, who left detailed illustrations and notes. (6) Two distinct depth ranges suggest that two species are present rather than one.

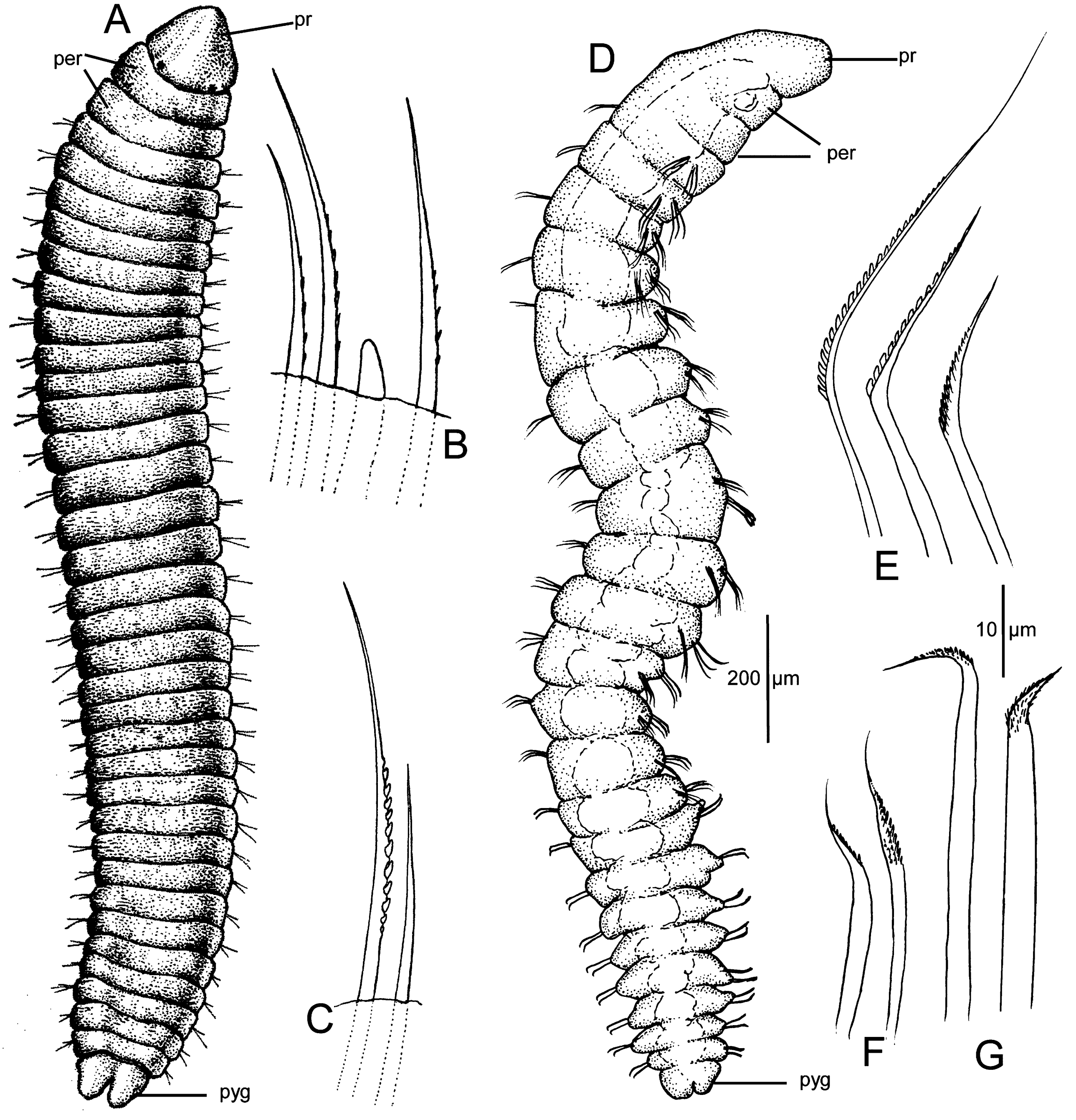

FIGURE 54. *Orbiniella annulata*. Holotype, (USNM 55536). A, entire worm in dorsal view; B, three neurosetae and acicula from fourteenth parapodium; C, notosetae from seventh parapodium—*Orbiniella spinosa* **n. sp.** Holotype (USNM 1013688). D, entire worm in dorsal view; E, notosetae from anterior setiger; F, neurosetae from setiger 12; G, neurosetae from posterior setiger. A–C, after Hartman (1967).

Parapodia represented by low mounds from which setae project; dorsal and ventral cirri absent. Notosetae including crenulated and smooth capillaries from very thin to heavy (Fig. 54C); neurosetae including crenulated capillaries with thickened shafts, tapering abruptly to long thin tips, and 1–2 smooth aciculae, first present from about setiger 12 (Fig. 54B).

Pygidium with terminal anus between two rounded lobes; without anal cirri (Fig. 54A).

Remarks. Hartman (1967) considered that *Falklandiella annulata* was related to orbiniids, but stopped short of referring the genus to the family. After examining the holotype from the Falkland Islands and the new specimen from off Tasmania, it is clear that the species should definitely be referred to the Orbiniidae. The crenulated capillaries and the heavier serrated setae are distinctive for orbiniids. There is no apparent separation of the body into a thorax and abdomen, and this is what caused Hartman (1967) the most difficulty in interpretation. The lack of distinct body regions is however, characteristic of species of Microrbiniinae and this species should be referred to the genus *Orbiniella*, first suggested by Buzhinskaja (1992) and confirmed here.

Among the nine shallow-water species listed in Table 2, *Orbiniella annulata* is most similar to *O. nuda* and *O. plumisetosa* in having eyespots and to the latter species in having complete peristomial rings instead of dorsally incomplete. *Orbiniella annulata* was described with red spots, whereas *O. plumisetosa* was reported to black subdermal eyespots. However, upon re-examination the eyespots were not visible in the holotype of *O. annulata*, having faded after 50 years in preservative.

Distribution. Falkland Islands, 646–845 m; off Tasmania, 86–101 m.

Orbiniella spinosa **new species**

Figure 54D–G

Material examined. Off Argentina, 38°46′S, 55°20′W, on drifting *Macrocystis* holdfasts, coll. J.M. Orensanz (holotype, USNM 1013688).

Description. A small species, holotype 2.1 mm long, 0.2 mm wide, for 22 setigerous segments. Body not divided into distinct regions; posterior parapodia not dorsally elevated; body cylindrical throughout, individual setigerous segments narrower than long, similar throughout, posterior most segments more flattened dorsoventrally. Setal changes mainly with neurosetae anterior to posterior. Branchiae entirely absent. Pygidium with two blunt lobes, without anal cirri (Fig. 54D). Color in alcohol light tan.

Prostomium elongate, rounded on anterior margin (Fig. 54D), eyespots absent; nuchal organs extending from posterior margin of prostomium, under first peristomial annulation. Peristomium about 1.3x as long as prostomium with two achaetous rings, each of same size, with lateral annulae not cutting across dorsum (Fig. 54D).

Parapodia reduced to low mounds from which setae emerge; no postsetal lamellae. Setae consisting of crenulated capillaries and curved spines; furcate setae absent; no evidence of imbedded aciculae. Notosetae 2–3 crenulated capillaries throughout, with longest and narrowest capillaries in anterior half of body (Fig. 54E); neurosetae shorter, generally thicker than notosetae numbering 2–3 in anterior setigers and 1–2 in far posterior setigers; anterior neurosetae spine-like capillaries (Fig. 54F); posterior setigers with longer, thicker curved spines (Fig. 54G); initially 1–2 curved spines with smooth shaft and narrow curved tip with short barbs on convex side; some far posterior spines with fine hirsute covering on apical end and curved tip (Fig. 54G).

Etymology. The name *spinosa* is from the Latin, *spina* for thorn, and refers to the distinctive neuropodial spines that characterize the species.

Remarks. The holotype of *Orbiniella spinosa* **n. sp.** was originally identified as *Falklandiella annulata*, but a more careful study suggested that a separate species with more setal complexity was evident. The morphology of the thick, sharply curved neuropodial spines differs from other species of the genus (See Table 2).

Distribution. Off Argentina, found on drifting kelp (*Macrocystis* sp.).

Orbiniella uniformis **Hartman, 1967**

Figure 55

Orbiniella uniformis Hartman, 1967: 106–107; Rozbaczylo 1985: 130.

Material examined. Antarctic Peninsula, Anvers Island, Arthur Harbor, USCG *Staten Island* Sta. 6-63, 24 Jan 1963, 64.77°S, 64.07°W, ~7 m, fish trap, **holotype**, and 2 **paratypes** (USNM 47329–30).

Description. Body long, linear, holotype 6 mm long, 0.4 mm wide for 30 setigerous segments. Body generally uniform in overall appearance, with a weakly defined thoracic region only vaguely separated from an abdominal region at setiger 6.

Prostomium short, broadly rounded on anterior margin (Fig. 55A); peristomium 3x as long as prostomium, with two smoothly rounded rings, second forming ventral oral lips. Noto- and neuropodia of setigers 1–5 with few long, thin, tapering crenulated capillaries (Fig. 55D); capillaries from setiger 6 and subsequent segments shorter, thicker, with distinct curve or bend in shaft (Figs. 55E–F); crenulations of thoracic setae extending along most of exposed setal shaft; in abdominal segments crenulations occuring only from bend of shaft. Abdominal neuropodia with 2–3 emergent, pointed aciculae (Figs. 55G–H).

Setigers 16–19 swollen, with several large eggs about 150 µm in longest dimension (Fig. 55B). Pygidium with two large ventral lobes bearing two short, dorsal cirriform appendages (Fig. 55C).

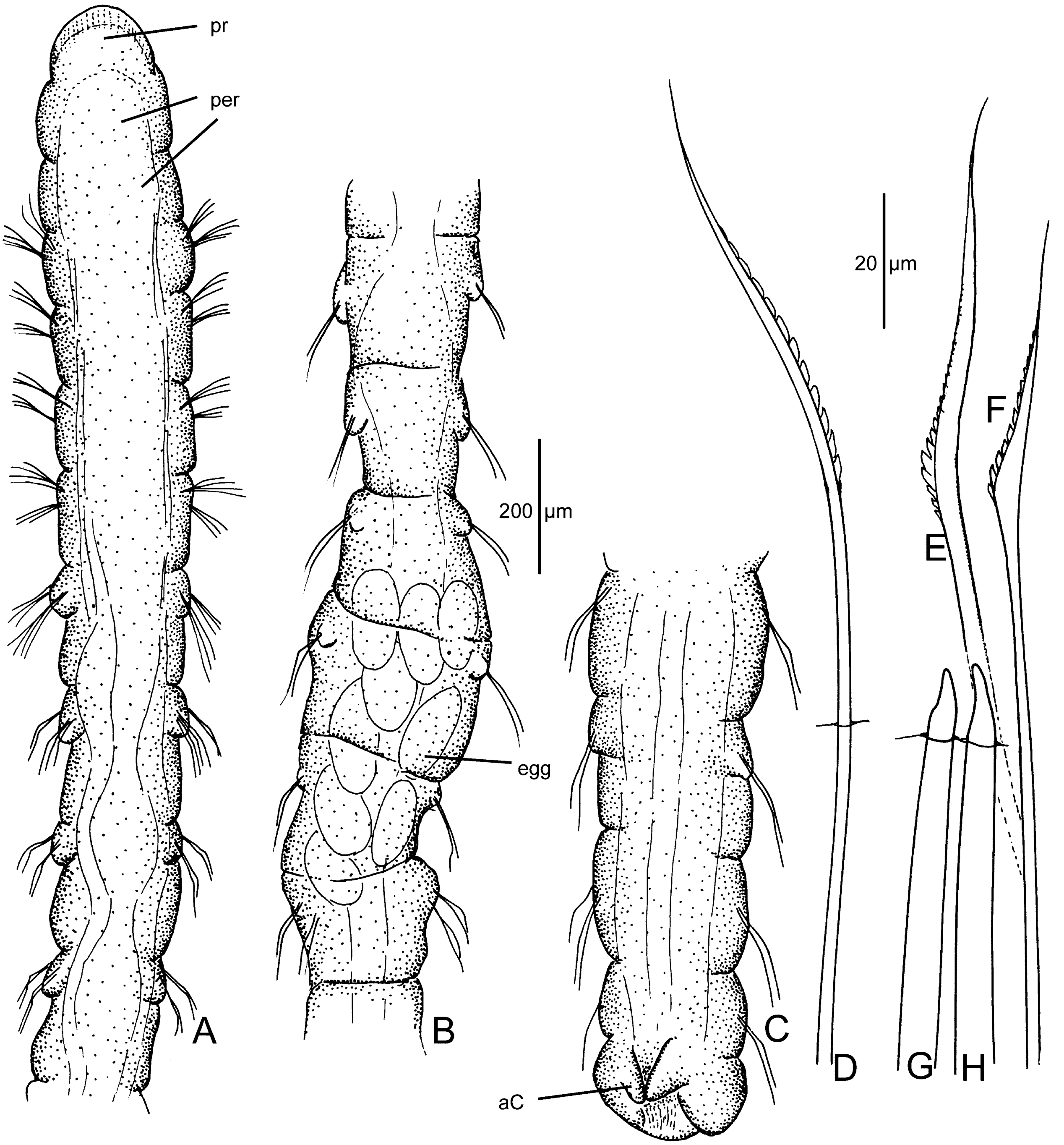

FIGURE 55. *Orbiniella uniformis* (Hartman, 1967). Holotype (USNM 47329). A, anterior end, dorsal view; B, middle of body showing ovigerous segments, dorsal view; C, posterior end, dorsal view; D, capillary notoseta from setiger 2; E–F, capillary notosetae from setiger 7; G–H, abdominal neuropodial acicula.

Remarks. *Orbiniella uniformis* was well described by Hartman (1967). Illustrations are presented here for the first time. The long threadlike nature of this species readily distinguishes it from other orbiniids encountered in this study. *Orbiniella uniformis* is most closely related to four other shallow-water species (Table 2). Eyespots are reported for *O. nuda, O. plumisetesa, O. annulata*, and absent in *O. minuta* and *O. uniformis*. Further, while the pygidium all of these species consists of two rounded lobes, *O. uniformis* is the only one with two short dorsal cirri.

Distribution. Antarctic Peninsula, low water.

Orbiniella landrumae **new species**
Figure 56

Material examined. Juan Fernandez Islands, *Anton Bruun* Cruise 12, Sta. 65-240, 12 Dec 1965, 33.622°S, 78.839°W, 26–29 m, **holotype** and 3 **paratypes** (USNM 1013912–3); Sta. 65-243, 12 Dec 1965, 33.62°S, 78.847°W, 0–10 m, 3 **paratypes** (USNM 1013914).

Description. A small species, holotype complete, 2.23 mm long, 0.29 mm wide for 23 setigers; one incomplete paratype 2.86 mm long, 0.2 mm wide for 20 setigers; other paratypes smaller. Color in alcohol: opaque white.

Prostomium smoothly rounded on anterior margin; with two crescent-shaped red eyespots (Fig. 56A). Peristomium with two indistinct achaetous rings, but distinctly separated from setiger 1. All segments similar, with no demarcation between thorax and abdomen. Notopodia with short digitiform postsetal lobes throughout; neuropodia with short postsetal lobes in anterior setigers; absent in posterior setigers.

Notosetae including 3–4 crenulated capillaries (Fig. 56B), a single flail seta (Fig. 56C) and a single furcate seta (Fig. 56D); flail seta with tapering tip and reduced numbers of crenulations; furcate seta with unequal tynes, shorter blunt-tipped, longer thinner and pointed; tynes connected by thin webbing with fine needles. Neurosetae including crenulated capillaries and 1–2 modified crenulated spines in anterior setigers and 0–1 crenulated capillaries and 3–4 spines in posterior setigers; spines unique, recurved, with broad crenulated blade terminating in pointed tip (Fig. 56E).

Branchiae absent. Some specimens with large yolky eggs up to 190 µm across widest dimension. Eggs with two nucleoli observed in germinal vesicle (Fig. 56F).

Pygidium with anus directed posteriorly, surrounded by four cirri; dorsal pair shorter, triangular in shape, ventral pair longer and cirriform (Fig. 56G).

Etymology. This species is named for Ms. Betty J. Landrum of the former Smithsonian Oceanographic Sorting Center. Ms. Landrum provided support and encouragement during the course of this study and of another project on Antarctic polychaetes.

Remarks. *Orbiniella landrumae* **n. sp.** is only provisionally referred to *Orbiniella* because it differs from related species in having notopodial furcate setae, flail setae, and an unusual type of crenulated neuropodial spine. However, the species does not have distinct body regions, parapodia are reduced, branchiae are absent, two peristomial rings are present, and the posterior parapodia are not elevated as is typical for species of *Orbiniella*. Further, large ova of 190 µm present in the holotype indicate sexual maturity. Further study is needed to more adequately address the generic placement of this species.

Distribution. Juan Fernandez Islands, intertidal to 29 m.

Orbiniella andeepia **Narayanaswamy & Blake, 2005**
Figure 57

Orbiniella andeepia Narayanaswamy & Blake, 2005: 843–846, fig. 1.

Material examined.—Drake Passage, ANDEEP I ANT XIX-3, R/V *Polarstern*, Sta. PS-61/114-7, 2900 m (1, JAB).—Weddell Sea, ANDEEP II ANT XIX-4, R/V *Polarstern*, Sta. PS-61/139-10, 3965 m (1, ZMH P-27801); PS-61/141-7, 2260 m (1, ZMH P-27802); ANDEEP III ANT XXII-3, R/V *Polarstern*, Sta. PS-67/110-4, 4700 m (1, SEM, JAB); Sta. PS-67/110-5, 4702 m (1, ZMH P-27803); Sta. PS-67/121-10, 2663 m (1, ZMH P-27804); Weddell Sea, abyssal plain, ANDEEP SYSTCO ANT XXIV-2, R/V *Polarstern*, Sta. 33-14, 5338 m (1, ZMH P-27805).

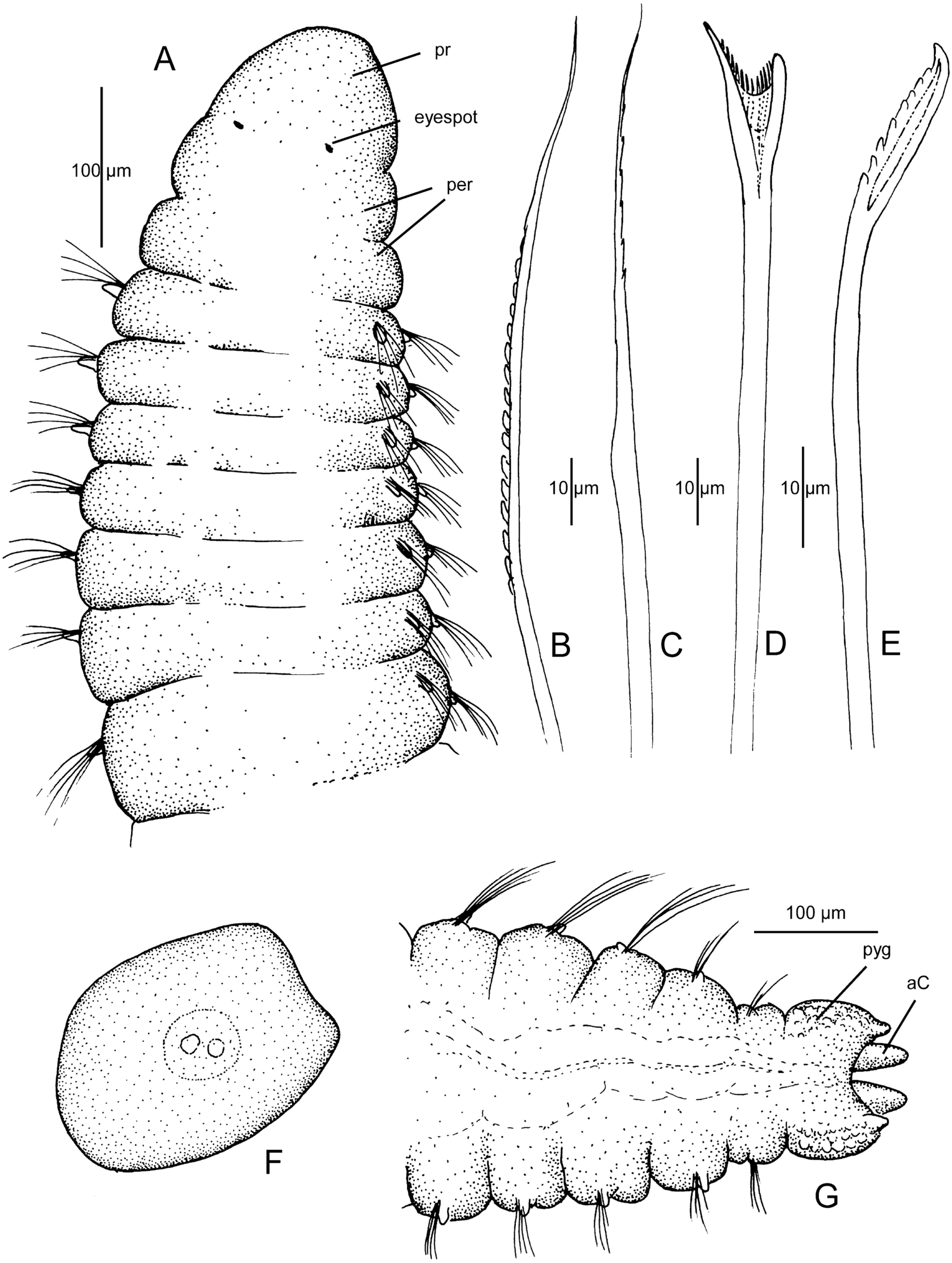

FIGURE 56. *Orbiniella landrumae* **n. sp.** Paratypes (USNM 1013914). A, anterior end, dorsal view; B, capillary notoseta from anterior setiger; C, flail seta from middle body notopodium; D, furcate seta; E, neuropodial spine from posterior setiger; F, ova; G, posterior end, dorsal view.

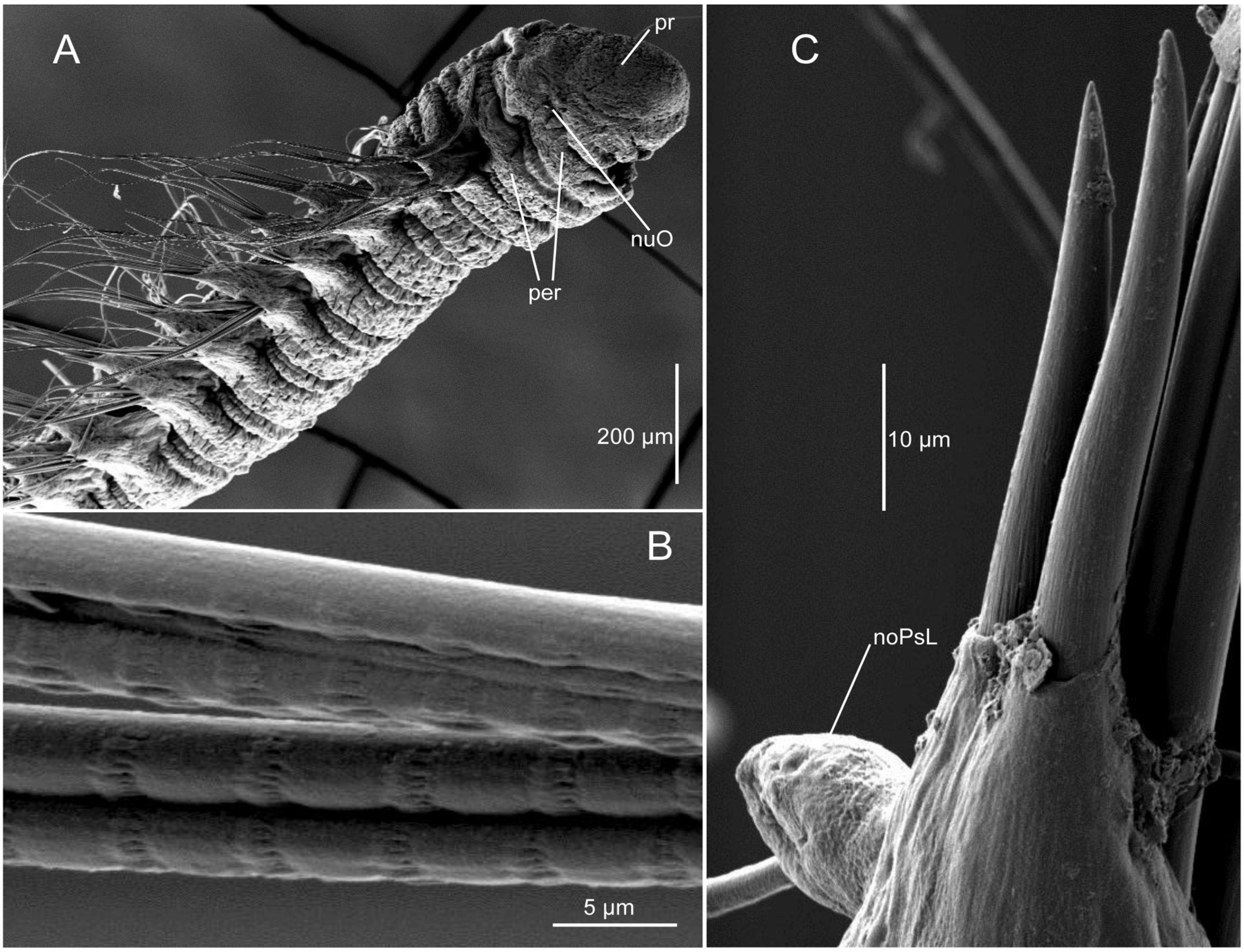

FIGURE 57. *Orbiniella andeepia* Narayanaswamy & Blake, 2005. ANDEEP III Station PS-67, 110-4 (SEMs, JAB). A, anterior end, lateral view; B, anterior capillary notosetae; C, notopodial spines and postsetal lamella.

Description. A large specimen from ANDEEP III Station PS-67, 11–12 mm long, 0.6 mm wide for 68 normal setigerous segments and four setigers as part of a narrow regenerating posterior pygidial end. Morphology of prostomium and peristomium same as originally reported for smaller specimens.

Prostomium broadly rounded anteriorly (Fig. 57A), exhibiting methyl green staining reaction; peristomium with two achaetous rings (Fig. 57A). Eyespots absent; two pigmented nuchal organs present. First 12 setigers narrower than following ones suggesting a weak differentiation of body into thoracic and abdominal regions. Each setigerous segment with prominent encircling glandular ridge or ring encompassing dorsum, venter, and parapodia; this ring occupying most of surface of narrower anterior segments, then restricted to posterior one-third of longer abdominal segments; glandular ring with a weak methyl green staining reaction. Each notopodium with a short post-setal lamella (Fig. 57C), smaller than originally reported, but proportional in size on larger specimens; neuropodial lamellae absent.

Setae including crenulated capillaries in both noto- and neuropodia (Fig 57B); 1–2 spines occurring in notopodia and neuropodia; spines smooth and pointed (Fig. 57C). Branchiae absent. Narrow posterior end appears to be regenerating; anal cirri absent.

Remarks. The larger specimens found at Sta. PS 67 110-4 confirm the generic placement of *Orbiniella andeepia*. If the original specimens had been juveniles of a larger orbiniid then adult characters of other genera would have been present in the large specimen. There is no evidence of elevated abdominal parapodia as characterizes most other orbiniids. Furcate setae and branchiae are entirely absent. The methyl green staining reaction of the prostomium and the encircling segmental ring is newly reported.

Of the four deep-water species of *Orbiniella* in Table 2, all have noto- and neuropodial acicular spines. Of these, *O. andeepia* and *O. petersenae* have notopodial lamellae while *O. hobsonae and O. aciculata* do not.

Orbiniella hobsonae has crenulated acicular spines instead of smooth spines as in the other three species. *Orbiniella aciculata* and *O. petersenae* have two and four anal cirri, respectively; *O. andeepia* and *O. hobsonae* have none. *Orbiniella andeepia* is the only deep-water species of *Orbiniella* in the Southern Ocean.

Distribution. Southern Ocean in slope and abyssal depths, 2257–5338 m.

"Orbiniella" branchiata (Hartman, 1967)

Orbiniella branchiata Hartman, 1967: 165–166, pl. 33; Rozbaczylo 1985:130.

Material examined. Drake Passage, *Eltanin* Sta. 9-740, 18 Sep 1963, 56.10°S, 66.32°W, 384–494 m, **holotype** (USNM 55533).

Description. Holotype incomplete, small, 4 mm long, 0.8 mm wide for 22 setigerous segments. Prostomium much wider than long, tapering anteriorly, rounded on anterior margin, Eyespots absent. Peristomium with three narrow asetigerous rings; separation of thorax and abdomen gradual, indistinct, occurring from setiger 14; branchiae from setiger 4, long at first, broad basally, tapering apically, continuing to posterior segments; noto- and neuropodial postsetal lobes simple, fingerlike; subpodial lobes or fringe lacking; notosetae including crenulated capillaries and furcate setae; neurosetae including thoracic and abdominal capillaries and abdominal aciculae.

Remarks. The holotype was well described by Hartman (1967). As a species of *Orbiniella*, *O. branchiata* is unusual in the presence of three achaetous peristomial rings, which should serve to readily differentiate the species from other orbiniids. However, given the small size of the holotype, the presence of branchiae, elongate postsetal lobes, and furcate setae, the species most likely represents a juvenile of another species in another genus.

Distribution. Drake Passage, 384–494 m.

Genus *Proscoloplos* Day, 1954

Type-species: *Proscoloplos cygnochaetus* Day, 1954 by monotypy.

Diagnosis. Body short, with separation between thorax and abdomen indistinct and with body segments of similar shape and size throughout, with no change in appearance between anterior and posterior segments. Prostomium broadly rounded or elongate, with paired rounded nuchal organs present; eyespots present or absent. Peristomium with two asetigerous rings. Noto- and neuropodia poorly developed, consisting of low tori from which setae emerge; with simple, tapering post-setal lamellae; posterior parapodia not shifted dorsally. Setae including crenulated capillary noto- and neurosetae and distinct swan hooks present from anterior neuropodia; furcate setae entirely absent. Branchiae present from anterior parapodia continuing posteriorly. Pygidium with four cirri.

Remarks. *Pettibonella* Solís-Weiss & Fauchald, 1989 and *Proscoloplos* are the only two orbiniid genera having swan hooks. *Pettibonella* was differentiated from *Proscoloplos* by Solís-Weiss & Fauchald (1989) in that their type-species, *P. multiuncinata* has eyes instead of lacking them, has elongate instead of short branchiae, has thoracic neuropodial uncini and capillaries, and has swan hooks of two kinds instead of one in posterior setigers. Within the Orbiniidae the presence or absence of eyespots is widespread among the genera including the closely related genus *Orbiniella*, where eyespots are typically found in shallow-water species and absent in deep-water species (see above). Differential shape and length of branchiae is a useful species-level character among orbiniids genera but is not used to define any other genus in the family. *Proscoloplos cygnochaetus* is now believed to be the only species of that genus and there are swan hooks of larger and smaller sizes within a single neuropodium (see below). The presence of thoracic neuropodial uncini is therefore the most obvious character that differentiates *Pettibonella* from *Proscoloplos* and is similar to the manner in which *Leitoscoloplos* is separated from *Scoloplos*.

Proscoloplos cygnochaetus Day, 1954
Figure 58

Proscoloplos cygnochaetus Day, 1954: 21, Fig. 3a–f; 1967: 538, fig. 23.1 E–G; Meyer *et al.* 2008: 879–889, fig. 1.

Proscoloplos confusus Hartmann-Schröder, 1962b:133–134, figs. 161–162; Rozbaczylo 1985:131.
Proscoloplos bondi Kelaher & Rouse, 2003: 909–917.

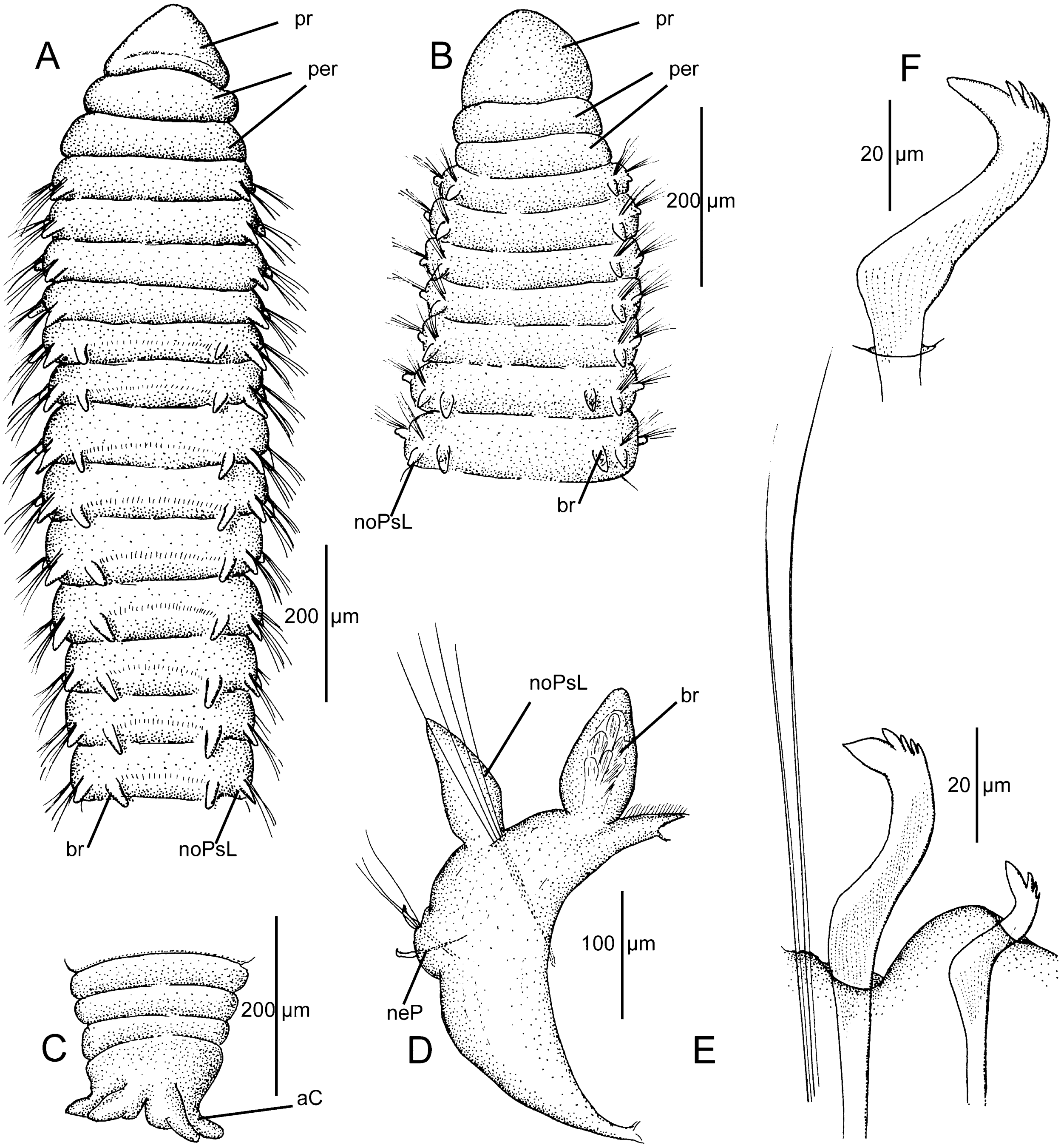

FIGURE 58. *Proscoloplos cygnochaetus* Day, 1954. A, anterior end, dorsal view; B, anterior end dorsal view another specimen; C, posterior end, dorsal view; D, parapodium from middle of body (setiger 20); E, neuropodial setal fascicle showing capillaries and swan hooks; F, swan hook. A, D–E, (USNM 65240); B–C, F (USNM 1407115).

Material examined. Juan Fernandez Islands, *Anton Bruun* Cruise 12, Sta. 65-240, 24–27 m, (1, USNM 60646).—Juan Fernandez Islands, Chile Bay, behind Punta Suroeste, *Anton Bruun* Cruise 12, Sta. 134, shallow subtidal (1, USNM 65240).—Argentina, Golfo San Matías, IBM Sta. SAO V-201 (1, USNM 1407115); Sta. SAO V-236 (1, USNM 1407116).

Description. A small species, present specimens 3.5 mm long and 0.35 mm wide for up to 40 setigerous segments. Color in alcohol: opaque white. Body cylindrical throughout, slightly expanded in anterior setigers.

Prostomium short, smoothly rounded on anterior margin; no eyespots; peristomium with two achaetous rings

(Fig. 58A–B). Anterior parapodia all similar; thoracic and abdominal region demarcated by reduction of neuropodial lobes and appearance of neuropodial swan hooks on setiger 7–9. Branchiae from setigers 5–6 (Fig. 58A–B). Body narrowing posteriorly; pygidium with two dorsal and two ventral cirri (Fig. 58C).

Notopodia of anterior and posterior setigers simple, with cirriform postsetal lobes (Fig. 58D). Notosetae all crenulated capillaries; neurosetae of first 6–8 setigers all capillaries; two neuropodial swan hooks present from setiger 7–9 (Fig. 58E); superior hook accompanied by 2–3 delicate capillaries; superior hook distinctly larger than inferior hook and with more prominent apical teeth; hooks with large main fang surmounted by 3–5 apical teeth (Fig. 58E–F); shaft of both hooks bent, with swelling at point of bend.

Branchiae from setiger 5–6, continuing to near posterior end of body; each branchia short, stubby, with several internal bacillary glands (Fig. 58B).

Remarks. The form of the neuropodial swan hooks readily differentiate this species from all other orbiniids from the area of study. These setae resemble long handled uncini found in other families, not known from any other orbiniid.

Three species of *Proscoloplos* have been described: *P. cygnochaetus* from Tristan de Cunha and South Africa by Day (1954, 1967), *P. confusus* from Chile by Hartmann-Schröder (1962b), and *P. bondi* from near Sydney, Australia by Kelaher & Rouse (2003). All three species are similar morphologically with the main characters used to separate them being minor differences in the form of the swan hooks and the segmental occurrence of branchiae and hooks. Kelaher & Rouse (2003) examined hundreds of specimens of their *P. bondi* as part of year-long collections and did not find any evidence of gametes. These authors did, however, find evidence of asexual reproduction and regeneration. Meyer *et al.* (2008) identified specimens of *Proscoloplos* from the French Atlantic coast and initiated a study to compare morphology using SEM and molecular markers ITS1 and ITS2 of specimens from France, South Africa, and Australia; SEM was used for a paratype of *P. confusus* from Chile. No characters were identified to support three species and the molecular results did not result in any clades separating the three widespread populations that would support the retention of three distinct species. Meyer *et al.* (2008) therefore suggested that both *P. confusus* and *P. bondi* were synonyms of *P. cygnochaetus*. These authors also found no evidence of gametes in any materials examined but did find regenerating specimens in the French populations. Habitats recorded for the species in Australia and France included turf algae. Hartmann-Schroder (1962b) also reported *P. confusus* from intertidal algae. In order to account for the widespread distribution of *P. cygnochaetus* Meyer *et al*. (2008) suggested that algal growth on the hulls of ships could provide a comparable habitat to support short or long-distance transport.

The specimens examined here exhibited branchiae from setigers 5–6 and swan hooks from setigers 7–9 which is within the range of variability reported by Kelaher & Rouse (2003) and Meyer *et al.* (2008). I conclude therefore, that Chilean specimens described as *P. confusus* are in fact synonymous with *P. cygnochaetus.*

Distribution. Chilean coast, intertidal with algae; off the Chilean coast and Juan Fernandez Islands, shallow subtidal, 27 m; Argentina, subtidal. Also from NSW Australia, South Africa, and the French coast in intertidal to shallow subtidal habitats associated with algae.

Discussion

The orbiniids treated in this study are mostly from the southern hemisphere including the Pacific Ocean, off western and SE South America and Southern Ocean in and around Antarctica. The 44 species including 21 new to science from these locations greatly expand our knowledge of orbiniids from these areas. The review of relevant type materials and collection of new specimens of poorly known species has also enhanced our knowledge base of this fauna.

Study of so many species has also provided access to considerable morphological variability among characters that are typically used to identify orbiniids. More character states can now be recognized to better support and refine a phylogenetic analysis using morphological data.

Study of this fauna also includes numerous new species from deep water collected from a variety older and more recent expeditions. For example, the genus *Berkeleyia*, previously known for a single deep-sea species from the Indian Ocean, includes four new species, three from deep water.

This discussion includes a brief review of relevant morphology, taxonomic and phylogenetic considerations, and biogeography. A formal phylogenetic analysis of morphological characters will be deferred to a separate paper focused on additional deep-water taxa from the northern hemisphere.

Orbiniid morphology. *Body shape and body regions.* The majority of larger orbiniids of the subfamily Orbiniinae have the body divided into a pre-setigerous region that contains the prostomium and peristomium, the thoracic region with lateral parapodia sometimes with modified setae, and an abdominal region that in the majority of species has parapodia and branchiae that are shifted dorsally. Many of the larger orbiniids have a broad thoracic region that is dorsoventrally flattened.

The far posterior segments contain a simple pygidium that is typically with two lobes and sometimes bears two or more anal cirri. A few species of the Orbiniinae, such as *Leitoscoloplos abranchiatus* and *L. simplex* **n. sp.** described in this study, have an abdominal region where the parapodia are not shifted dorsally or only partially elevated. *Leodamas perissobranchiatus* **n. sp.** also has the abdominal parapodia in a more lateral position but this is due to much of the dorsum taken up by the unusual palmately branched branchiae.

The smaller orbiniids of the subfamily Microrbiniinae have no discernable body regions and reduced parapodia that are similar along the entire body. Species of the genus *Orbiniella* also lack branchiae and have little in the way of setal diversity. A few species have been identified in the present study, such as *Orbiniella landrumae* **n. sp.** that shares some characters of both subfamilies. Some of these small orbiniids are most likely described from juveniles of larger species and require further evaluation. However, others have been found with sperm or eggs which are typically used to define a mature adult.

Prostomial shape. Historically, the shape and form of the anterior margin of the prostomium was considered a defining character separating different species into genera (Hartman 1957). Species with elongate pointed prostomial were grouped into one set of genera and those with blunted or truncated prostomia grouped into another set. However, within these general criteria are numerous intermediate forms. For example, species with pointed prostomia can range from those with acutely pointed and flexible anterior tips to those with conical tapering shapes with narrow rounded tips. Likewise, species with blunted prostomial margins may include species with broad semi-circular shapes to those with thick, truncate margins. Presumably, the individual shapes that are present within individual species serve to assist burrowing or crack propagation while moving through sediment. There is also evidence that for some species, such as *Leodamas tribulosus*, the prostomium changes during development from one that is broadly rounded anteriorly to one that becomes narrow and pointed as evidenced by juveniles being identified as a species of *Protoariciella*. Despite these limitations, the adult form of the prostomium is a useful character to help diagnose a species.

Peristomial rings or asetigerous segments. Hartman (1957) established two subfamilies in part based on the presence of 1 or 2 peristomial rings or annuli: Orbiniinae (1 ring), Protoariciniinae (2 rings). However, several studies of larval and juvenile development have clearly demonstrated for certain genera such as *Naineris*, that juveniles having two peristomial rings develop into adults that have only one ring (Blake 1996, 2000). This led Blake (2000) to reorganize Hartman's subfamilies based on a cladistic analysis, moving some genera to the Orbiniinae and establishing another subfamily Microrbiniinae for some members of the former subfamily Protoariciniinae. It is obvious that some species described as adult species within genera assigned to the Protoariciniinae with two peristomial rings were most likely juveniles of species in the Orbiniinae. In the present study, juvenile specimens identified as *Protoariciella uncinata* that had been referred to *Leodamas tribulosus* using molecular sequences (Bleidorn *et al.* 2009) are also confirmed here as having setal morphology characteristic of *L. tribulosus*. Other species, with two peristomial rings, however are most certainly valid; eggs and/or sperm have been observed in some of these species.

Parapodia. Parapodial morphology of orbiniids of the subfamily Orbiniinae differs considerably between thoracic and abdominal segments. The parapodia of thoracic segments are relatively simple with the notopodia consisting of a single postsetal lobe or lamella, although for *Leodamas verax* the notopodial postsetal lamellae have 1–4 branches. The thoracic neuropodia typically consist of an enlarged cushion from which multiple rows of setae arise. There may be no postsetal lamellae, a single medial lobe, or several that are sometimes continuous with additional subpodial lobes. In most species of *Orbinia* and *Phylo* and a few species of *Leitoscoloplos*, there are additional subpodial lamellae that form a near continuous band extending below the parapodia and sometimes encircling the venter of thoracic segments and continuing onto some abdominal segments.

Parapodia of abdominal segments of Orbiniinae are shifted dorsally in most species. This results in the branchiae, notopodia, and neuropodia projecting above the surface of the body. The notopodia typically consist of a low mound from which the setae project and an elongate postsetal lamella. An interramal cirrus is sometimes present between the noto- and neuropodia. The neuropodia consist of an elongated lobe from which setae emerge at the tip. There may be an additional ventral cirrus on the side of the neuropodium. In the transitional segments between the thorax and abdomen there may be one to a few subpodial lobes, these are important taxonomic characters when present.

The parapodia of species of the subfamily Microrbiniinae are similar along the entire body, there being no difference between what would be thoracic and abdominal segments in other orbiniids. Parapodia may consist of a short mound, or setae may arise directly from the body wall. A short postsetal lobe is present or absent in noto- and/or neuropodia.

Setae. All setae of orbiniids are simple, but there is considerable variety. A defining aspect of most orbiniid setae is the presence of transverse rows of barbs, bristles, or crests on the shafts of most capillaries, furcate setae, and several types of spines and uncini. On capillaries these are called camerations, and the term “camerated” refers to setae bearing these structures.

Capillary setae come in a wide variety of forms. The camerations may be single, double, or a form of interlocking transverse ribs best seen with SEM; however in profile in light microscopy these different forms may appear similar and details of capillaries and differences among related species have not been investigated to any extent. The overall shape of orbiniid capillaries ranges from a typical seta that gradually tapers to a fine tip as in most capillaries of other polychaetes. For some, however, the shaft may become enlarged at one point on the shaft, have longer camerations there, and then curve and taper to a fine point. These latter types of capillaries tend toward being spinous.

Furcate or lyrate setae occur in the abdominal notopodia of most species of Orbiniinae. In orbiniids, SEM is now revealing the structure of these setae in more detail. The two tynes are always unequal in length and these either terminate in a blunt or finely tapered tip; those having a blunt tip always have a distinct opening or hole in the tynes at the apex. These opening have not been previously reported in orbiniids. Between the tynes, a fine webbing or sheath of fine filaments is observed in light microscopy to connect both sides; in SEM, these are observed to be individual flattened filaments or bristles that may cross over, but do not merge with those from the opposite tyne. In some species where there are transverse camerations on the shaft, these camerations appear to be continuous with or give rise to the individual filaments between the tynes.

Thoracic neuropodial uncini are heavy spines that are found in the genera *Scoloplos, Orbinia, Phylo, Leodamas, Califia*, and *Naineris.* The uncini occur in multiple longitudinal rows and come in a variety of forms and sizes ranging from simple, smooth bluntly rounded spines to more complex curved spines with camerated shafts, flanges, depressions, and sometimes bristles apically. One variant of these found in several species of *Naineris* are called subuluncini that are similar to uncini in the same neuropodium, but taper to pointed tips. In species of *Califia* and some *Leodamas* the structure of the uncini changes from anterior to posterior thoracic segments. In *L. cochleatus*, simple smooth uncini transition to ones with an expanded notched apex. In *C. bilamellata* a row of heavy and a row of narrow spines occur in setigers 1–3 with only the narrow spines continuing posteriorly on subsequent thoracic segments. The uncini of posterior thoracic setigers in species of *Phylo* transition to a modified spear-like spine with a long shaft that projects from the body. The role of such a spine is not known but they are impressive and readily identify the species as belonging to *Phylo*. Capillaries typically occur with the neuropodial uncini. In species of *Scoloplos,* capillaries are numerous with the narrow uncini sometimes obscured by the capillaries. In most species of *Leodamas*, capillaries are either limited to a single row, in a tuft placed dorsally on the neuropodium, or capillaries are entirely absent. Several species of *Leodamas* are described in this study having an anterior row of uncini that continue ventrally and curve below other setae and then continue dorsally as a short posterior row. This type of configuration of thoracic neuropodial uncini has not been reported in other genera and it may be unique to species of *Leodamas.* Other species of *Leodamas* will likely be found with this character.

Abdominal flail setae are thin, aristate or mucronate setae found in noto- or neuropodia of some species. These are difficult to see and usually one has to be looking for them in order to detect their presence.

Spines of various types are found in abdominal neuropodia and sometimes notopodia. Species of *Leodamas* have protruding neuropodia acicula as do some species of *Berkeleyia*. These rarely have sufficient morphology to be diagnostic; the neuropodial abdominal spines of *B. heroae* **n. sp.**, however have bidentate tips. *Berkeleyia hadala* **n. sp.** has long blunt-tipped spines in the neuropodia and similar pointed spines in the notopodia. Several species of *Leodamas* have protruding neuropodial uncini that may be enlarged and have a strongly curved tip. These are important taxonomic characters.

Phylogenetic and taxonomic considerations. Blake (2000) performed a morphological cladistic analysis at the generic level and defined three separate categories that he named subfamilies: Orbiniinae, Microrbiniinae, and Methanoariciinae. The first two subfamilies are defined in this paper; the latter was for *Methanoaricia dendrobranchiata* Blake, 2000 the unusual seep worm from the Gulf of Mexico. Several phylogenetic studies using molecular sequences were published by Bleidorn *et al.* (2005, 2009) who did not confirm Blake's results and suggested that most orbiniid genera were paraphyletic. A recent analysis of the same data used by Bleidorn *et al.* (2009) but with additional species was presented by Zhadan *et al.* (2015). Their analysis using the 16S and 18S rDNA gene sequences supported the earlier results but with different groupings of species. However, the CO1 results were entirely different with species of related genera largely grouping together in the analysis, suggesting that the CO1 bar coding gene sequence was more supportive of the current arrangement of genera than those using rDNA sequences.

Some general observations based on morphology and preliminary cladistic analyses are that species of *Leodamas, Naineris, Orbinia,* and *Phylo* appear to more similar to one another than to other genera. Likewise, species of *Leitoscoloplos* and *Scoloplos* appear to more similar to one another than to other genera. These observations are largely supported by the results of the CO1 analysis by Zhadan *et al.* (2015) but not by the rDNA sequences. Interestingly, *Methanoaricia dendrobranchiata*, the seepworm, was dissimilar to all other orbiniids in the CO1 analysis thus agreeing with the morphological analysis of Blake (2000). There is obviously more work to be done in order to understand the phylogenetic relationships of Orbiniidae.

On a practical basis, the main problems with orbiniid classification at present appear to be with small species of the subfamily Microrbiniinae and in particular with the genera *Protoariciella* and *Orbiniella* which appear to contain species that display juvenile characters suggesting they may be juveniles of other orbiniids. The discovery of gametes in some of these species indicates that they are sexually mature and likely valid. Other species such as *O. spinosa* **n. sp.** have such unusual setal morphology that their validity would appear to be assured. Studies of postlarval development among different orbiniids, however, would help clarify this problem.

The range of new characters identified in this study and other recent papers on Orbiniidae demonstrate that many more characters and character states are available to both assist in identifying and separating one species from another as well as greatly expanding the data necessary to conduct a comparative phylogeny of orbiniids using morphology. To date a preliminary database has been developed, but many of the newer characters and character states identified in the present study have not been coded. As such, no effort has been made to perform such an analysis at this time. Rather than delay publication of this study further, I have decided to include a morphological cladistic analysis in a later paper that will include additional species from deep water in the northern hemisphere.

Despite problems with the present classification of Orbiniidae at the generic level, the present study does provide a practical approach to identification of taxa that can be used by ecologists and others needing to identify local species.

Biogeography. The geographic areas included in this study in general include:

Area 1: Southeastern margin of South America including Uruguay and Argentina south to Patagonia and Tierra del Fuego; this area also includes Staten Island and the Falkland Islands. One deep-water south Atlantic species is also treated here.

Area 2: Western South America from Ecuador south to the Chilean sections of Patagonia and the Straits of Magellan; this area also includes the Galápagos and Juan Fernandez Islands. One deep-water Pacific species is also treated here.

Area 3: The Southern Ocean including the various seas around Antarctica such as the Scotia Sea, Weddell Sea, Ross Sea, and the Drake Passage as well as certain subantarctic Islands, the Antarctic Peninsula, and sites along the continental margin.

In addition a few deep-water specimens from the Atlantic and Pacific Oceans are included. Table 3 lists these three geographic areas with the distributions of 43 species among them.

The results of this tabulation demonstrate a surprising degree of endemism within the three areas: 7 species occur only in Area 1; 13 species occur only in Area 2; 17 species occur only in Area 3. Only five species occur in both Areas 1 and 2, of these, only *Phylo felix* also occurs Area 3. The five species that are present in both Areas 1 and 2 occur mainly in the southern part of the South American continent. Apart from *P. felix*, the species found in the Southern Ocean are effectively isolated from South American species.

TABLE 3. Geographic and Bathymetric Distribution of 43 Species of Orbiniidae from Three Geographic Regions.

Species/Area	Atlantic & SE South America	Pacific & W South America	Southern Ocean	Bathymetric Distribution
Berkeleyia heroae **n. sp.**	–	+	–	Intertidal to 1 m
Berkeleyia hadala **n. sp.**	–	+	–	2681–6143 m
Leitoscoloplos simplex **n. sp.**	–	+	–	Abyssal Pacific Ocean, 4843 m
Leitoscoloplos chilensis	–	+	–	Intertidal to 50 m
Scoloplos suroestense **n. sp.**	–	+	–	Shallow subtidal
Leodamas perissobranchiatus **n. sp.**	–	+	–	192 m
Califia chilensis	–	+	–	3651–3655 m
Naineris setosa	–	+	–	Intertidal to subtidal
Naineris furcillata **n. name**	–	+	–	10–64 m
Naineris chilensis	–	+	–	Intertidal to 10 m
Naineris grubei	–	+	–	Intertidal to 25 m
Orbiniella landrumae **n. sp.**	–	+	–	Intertidal to 29 m.
Proscoloplos cygnochaetus	–	+	–	Intertidal to 27 m
Leitoscoloplos eltaninae **n. sp.**	+	–	–	South Atlantic Ocean, 3742–3806 m
Leodamas verax	+	–	–	Intertidal to 62 m
Leodamas maciolekae **n. sp.**	+	–	–	Shallow subtidal
Leitoscoloplos plataensis **n. sp.**	+	–	–	Intertidal to 144 m
Orbinia orensanzi **n. sp.**	+	–	–	Intertidal
Naineris argentiniensis **n. sp.**	+	–	–	Intertidal
Orbiniella annulata	+	–	–	+ off Tasmania; 86–845 m
Orbiniella spinosa **n. sp.**	+	–	–	Intertidal
Leodamas tribulosus	+	+	–	Intertidal; subtidal
Califia bilamellata **n. sp.**	+	+	–	13–117 m
Leodamas cirratus	+	+	?	17–598 m
Leodamas cochleatus	+	+	–	46–454 m
Phylo felix	+	+	+	Intertidal to 430 m
Berkeleyia abyssala **n. sp.**	–	–	+	3111–4176 m
Berkeleyia weddellia **n. sp.**	–	–	+	2164 m
Leitoscoloplos abranchiatus	–	–	+	1400–5338 m
Leitoscoloplos kerguelensis	–	–	+	Intertidal to 1400 m
Leitoscoloplos mawsoni	–	–	+	3–25 m
Leitoscoloplos geminus	–	–	+	20–220 m
Leitoscoloplos nasus **n. sp.**	–	–	+	128–163 m
Leitoscoloplos mawsoni	–	–	+	3–25 m
Leitoscoloplos geminus	–	–	+	20–220 m
Leitoscoloplos nasus **n. sp.**	–	–	+	128–163 m
Leitoscoloplos phyllobranchus **n. sp.**	–	–	+	40 m
Leitoscoloplos rankini **n. sp.**	–	–	+	1622–3959 m

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TABLE 3. (Continued)

Species/Area	Atlantic & SE South America	Pacific & W South America	Southern Ocean	Bathymetric Distribution
Leitoscoloplos drakei	–	–	+	1622–4575 m
Scoloplos bathytatus **n. sp.**	–	–	+	650–3111 m
Leodamas marginatus	–	–	+	Intertidal to 1674 m
Leodamas hyphalos **n. sp.**	–	–	+	2888–4008 m
Orbinia sp.	–	–	+	267–311 m
Naineris antarctica **n. sp.**	–	–	+	344–923 m
Orbiniella uniformis	–	–	+	Subtidal
Orbiniella andeepia	–	–	+	2257–5338 m

Bathymetric distribution of Orbiniidae. The depth distributions of 45 species are shown in Table 4. Of these the majority (31) occur in shallow depths from the intertidal to no more than 500 m. Fourteen species, however, occur deeper than 2000 m and are considered to be deep-sea species. Of these, six are in the genus *Leitoscoloplos*, three in *Berkeleyia*, two in *Orbiniella*, two in *Scoloplos*, and one in *Califia*; six of these were previously reported, eight are new to science.

In reviewing these deep-sea species, there is nothing unique relative to the morphology of these 14 species when compared with shallow-water taxa. The only item of note is the very slender, threadlike body of *Leitoscolopolos drakei* with branchiae restricted to far posterior segments and *L. abranchiata* and *L. simplex* which have no branchiae at all. Of the five known species of *Berkeleyia*, all except one occur in abyssal depths. Except for the new species *Califia bilamellata* **n. sp.** described in this study, all previously described species of *Califia* occur in lower continental slope and abyssal depths. Therefore, while the genera *Berkeleyia* and *Califia* are largely restricted to the deep sea, other genera tend to occur over a greater depth range. *Berkeleyia hadala* **n. sp.** was collected off Chile in abyssal depths and the Peru-Chile Trench to 6143 m, the deepest record for any known species of Orbiniidae.

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TABLE 4. Depth Distributions of Orbiniidae Species from Western South America, Argentina and the Seas around Antarctica.

Species/Depth range (m)	0–50	50–100	100–250	250–500	500–1000	1000–2000	2000–3000	3000–4000	4000–5000	5000–6500
Orbiniella. spinosa										
Naineris argentiniensis										
Orbinia orensanzi										
Berkeleyia heroae										
Naineris setosa										
Leodamas tribulosus										
Scoloplos suroestense										
Leodamas maciolekae										
Orbiniella uniformis										
Naineris chilensis										
Naineris grubei										
Leitoscoloplos mawsoni										
Proscoloplos cygnochaetus										
Orbiniella landrumae										
Leitoscoloplos phyllobranchus										
Leitoscoloplos chilensis										
Leodamas verax										
Naineris furcillata										
Califia bilamellata										
Leitoscoloplos plataensis										
Leitoscoloplos nasus										
Leitoscoloplos geminus										
Orbinia sp.										
Leodamas perissobranchiatus										
Phylo felix										
Leodamas cochleatus										
Leodamas cirratus										

……*continued on the next page*

TABLE 4. (Continued)

Species/Depth range (m)	**0–50**	**50–100**	**100–250**	**250–500**	**500–1000**	**1000–2000**	**2000–3000**	**3000–4000**	**4000–5000**	**5000–6500**
Orbiniella annulata										
Naineris antarctica										
Leodamas kerguelensis										
Leodamas marginatus										
Berkeleyia weddellia										
*Scoloplos ehlersi**										
*Orbiniella aciculata**										
Scoloplos bathytatus										
Califia chilensis										
Leitoscoloplos eltaninae										
Leitoscoloplos rankini										
Leitoscoloplos hyphalos										
Berkeleyia abyssala										
Leitoscoloplos drakei										
Leitoscoloplos simplex										
Leitoscoloplos abranchiata										
Orbiniella andeepia										
Berkeleyia hadala										

*Described by Blake (1985).

Antarctica collected as part of expeditions by the R/V *Vema* and R/V *Anton Bruun* in the 1960s. Dr. Brigitte (Hilbig) Ebbe translated several of Ehlers' descriptions and edited some of the text. Dr. Nancy Maciolek read and twice painstakingly edited two earlier drafts of the manuscript. Ms. Stacy Doner Tewari assisted in the preparation of material for SEM and performed much of actual scanning. Initial support for this study was arranged by Ms. Betty Landrum through a contract with the Smithsonian Institution. In 1998, the late Dr. Kristian Fauchald, then Chairman of the Department of Invertebrate Zoology, National Museum of Natural History, arranged for an additional contract to help move this study and others along. Field logistics and laboratory support for the ANDEEP cruises was provided by the National Science Foundation (NSF) under Grant No. OPP-0086665 through the University of Massachusetts. Most recently, support for the completion of this manuscript was provided by the NSF under Grant No. DEB-0118693 (PEET) through the University of Massachusetts. Drs. Harlan K. Dean and Brigitte (Hilbig) Ebbe reviewed and provided helpful comments on the final manuscript. Finally, I thank Ms. Cheryl Bright, Ms. Linda Ward, and the late Dr. Kristian Fauchald for their patience in allowing me to retain and study the USARP and SEPBOB material for all these many years.

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APPENDIX A1. USNS *Eltanin* Orbiniid Station Data.

Cruise Number	Station Number	Date	Latitude	Longitude	Sea/Gulf	Precise Locality	Depth (m)	Collecting Method
4	112	20 Jul 1962	55.52°S	61.92°W	Southern Ocean	Drake Passage	4008	Menzies trawl
4	126	29 Jul 1962	57.20°S	62.75°W	Southern Ocean	Drake Passage, South of Burdwood Bank	3733–3806	Menzies trawl
4	138	8 Aug 1962	62.00°S	61.15°W		South Shetland Islands, Livingston Island, N of	1437	Blake trawl, 10 ft
4	145	11 Aug 1962	60.00°S	64.82°W	Southern Ocean	Antarctic Peninsula	3312–3532	Menzies trawl
4	155	17 Aug 62	56.52°S	63.25°W	Southern Ocean	Drake Passage	3927	Menzies trawl
5	272	21 Oct 1962	64.90°S	68.32°W		Antarctic Peninsula	412	Menzies trawl
5	303	30 Oct 1962	62.05°S	70.92°W	Southern Ocean	Antarctic Peninsula, Drake Passage	4076–4077	Menzies trawl
5	311	3 Nov 1962	57.98°S	70.93°W	Southern Ocean	Drake Passage	3911–4099	Menzies trawl
6	333	27 Nov 1962	42.93°S	75.58°W	Off Chile,	Chiloe Island	3651–3655	Campbell grab
6	350	4 Dec 1962	55.27°S	58.90°W	Scotia Sea	West Scotia Basin	2452	Menzies trawl
6	384	25 Dec 1962	57.03°S	56.47°W	Southern Ocean	Drake Passage	3138–3426	Menzies trawl
6	410	31 Dec 1962	61.300°S	56.150°W		South Shetland Islands, Elephant Island	220–240	Menzies trawl
6	418	02 Jan 63	62.98°S	56.17°W		Antarctic Peninsula, Bransfield Strait	311–426	Blake trawl, 5 ft
6	428	03 Jan 1963	62.68°S	57.85°W		South Shetland Islands, Bransfield Strait,	662–1120	Blake trawl, 5 ft
6	437	09 Jan 1963	63.83°S	60.67°W		Antarctic Peninsula, Bransfield Strait	267–311	Blake trawl, 5 ft
6	439	09 Jan 1963	63.83°S	62.60°W		Antarctic Peninsula, Palmer Archipelago, N Of Brabant Island	128–165 m	Blake trawl, 5 ft
7	960	6 Feb 1963	52.63°S	74.93°W		Strait Of Magellan	641	Blake trawl
7	967	10 Feb 1963	53.73°S	66.18°W	Southern Ocean	Off Cape Horn	81	Blake trawl
7	480	15 Feb 1963	58.13°S	44.85°W	Scotia Sea	South Orkney Islands, North of Islands	2800	Menzies trawl
7	500	21 Feb 1963	62.10°S	45.20°W	Scotia Sea	South Orkney Islands, south of islands	489–490	Petersen grab

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APPENDIX A1. (Continued)

Cruise Number	Station Number	Date	Latitude	Longitude	Sea/Gulf	Precise Locality	Depth (m)	Collecting Method
7	558	14 Mar 1963	51.48°S	56.63°W	Scotia Sea	East Falkland Island, E Of	646–845	Blake trawl
9	711	4 Sep 1963	58.72°S	33.43°W	Scotia Sea	SE of South Georgia Island	2983–331	Menzies trawl
9	720	7 Sep 1963	56.10°S	34.02°W	Scotia Sea	Near South Georgia Island	2828–2873	Menzies trawl
9	732	12 Sep 63	53.60°S	36.00°W			220–265	Blake trawl
9	734	12 Sep 1963	53.38°S	37.18°W	Scotia Sea	South Georgia Island	1299–1400	Blake trawl, 5 ft
9	740	18 Sep 1963	56.10°S	66.32°W	Southern Ocean	Drake Passage, East of Cape Horn of	384–494	Blake trawl
9	753	26 Sep 1963	33.27°S	71.78°W	Pacific Ocean	Chile, off Valparaiso	192	Petersen grab
11	960	6 Feb 1964	52.70°S	74.93°W		Strait of Magellan	64	Blake Trawl
11	962	6 Feb 1964	53.93°S	71.25°W		Strait Of Magellan, Cape Froward	256–320	Blake trawl
12	1003	14 Mar 1964	62.68°S	54.72°W		Antarctic Peninsula, NE of Joinville Island	210–220	Blake trawl, 10 ft
12	1063	6 Apr 64	61.57°S	34.65°W	Scotia Sea	Scotia Ridge, West Of South Sandwich Islands	3495	Blake trawl
12	1079	13 Apr 1964	61.417°S	41.917°W	Scotia Sea	Scotia Ridge, SE of South Orkney Islands	593–598	Blake trawl
12	1082	14 Apr 1964	60.85°S	42.92°W	Scotia Sea	East of South Orkney Islands	298–302	Blake trawl, 5 ft
12	1084	14 Apr 1964	60.37°S	46.83°W	Scotia Sea	West of South Orkney Islands, Scotia Ridge	298–403	Blake trawl, 5 ft
12	1089	17 Apr 1964	60.78°S	53.50°W		South Shetland Islands, NE of Clarence Island	641	Blake trawl
14	1079	13 Aug 1964	61.43°S	41.92°W	Scotia Sea	South Orkney Islands	593–598	Blake trawl
14	1250	26 Aug 11964	60.07°S	132.88°W	Pacific Ocean	Southeast Pacific Basin	3638–3825	Blake trawl
16	1418	10 Feb 1965	54.87°S	159.03° E	Southern Ocean	Near Macquarie Island	86–101	Blake trawl, 10 ft
22	1527	04 Feb 1966	63.83°S	62.60°W	Scotia Sea	South Georgia Island, NW of Shag rocks	3742–3380	Blake trawl
27	1869	13 Jan 1967	71.27°S	171.75°E	Ross Sea	Victoria Land, Cape Adare	1565–1674	Blake trawl
27	1870	14 Jan 1967	71.27°S	171.52°E	Ross Sea	Victoria Land, Cape Adare	658–714	Blake trawl
27	1885	16 Jan 1967	74.50°S	170.17°E	Ross Sea	Victoria Land, Coulman Island, South of	311–328	Trawl Blake
27	1896	18 Jan 1967	76.17°S	168.28°E	Ross Sea	Victoria Land, Franklin Island	70–81	Blake trawl

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APPENDIX A1. (Continued)

Cruise Number	Station Number	Date	Latitude	Longitude	Sea/Gulf	Precise Locality	Depth (m)	Collecting Method
27	1897	18 Jan 1967	76.15°S	168.17°E	Ross Sea	Victoria Land, Franklin Island	362–375	Blake trawl
27	1901	20 Jan 1967	76.50°S	174.90°E	Ross Sea	Pennell Bank	445–448	Blake trawl
27	1903	21 Jan 1967	76.48°S	170.73°E	Ross Sea	Victoria Land, SE of Franklin Island	640–646	Blake trawl
27	1907	22 Jan 1967	77.05°S	166.25°E	Ross Sea	Victoria Land, Mcmurdo Sound	891	Blake trawl
27	1916	25 Jan 1967	77.55°S	174.72°E	Ross Sea	Victoria Land, Mcmurdo Sound, Ross Island	728	Phleger corer
28	2065	6 May 1967	43.28°S	77.03°W	Ross Sea	East of Roosevelt Island	473–475	Blake trawl
32	1996	10 Jan 1968	72.08°S	172.37°E	Ross Sea	Victoria Land, Moubray Bay, Cape Hallett, E of	348–352	Blake trawl
32	1995	10 Jan 1968	72.05°S	172.63°E	Ross Sea	E Of Cape Adare	344–348	Blake trawl
32	1997	10 Jan 1968	72.00°S	172.50°E	Ross Sea	Victoria Land	523–528	Blake trawl
32	2012	13 Jan 1968	73.97°S	170.90°E	Ross Sea	Victoria Land	589–608	Blake trawl
32	2014	14 Jan 1968	73.98°S	171.37°E	Ross Sea	Victoria Land	567	Blake trawl
32	2031	17 Jan 1968	74.82°S	172.25°E	Ross Sea	Victoria Land, Moubray Pennell Bank, West of	535	Blake trawl
32	2036	18 Jan 1968	75.02°S	168.38°E	Ross Sea	Pennell Bank, West of	334–335	Blake trawl
32	2035	18 Jan 1968	74.53°S	168.28°E	Ross Sea	E Of Cape Johnson	876	Camera grab
32	2039	19 Jan 1968	76.00°S	172.07°E	Ross Sea	Victoria Land, Moubray Pennell Bank	565–569	Blake trawl, 5 ft
32	2050	22 Jan 1968	77.03°S	168.50°E	Ross Sea	Victoria Land	909–923	Blake trawl
32	2075	30 Jan 1968	76.42°S	170.40°W	Ross Sea	Center Of Sea	568	Blake trawl
32	2085	1 Feb 1968	77.53°S	172.53°W	Ross Sea	Center Of Sea	468–482	Blake trawl, 10 ft
32	2088	2 Feb 1968	76.97°S	171.12°W	Ross Sea	Coats Land, Berkner Island, Center Of Sea	430–433	Blake trawl
32	2125	13 Feb 1968	71.37°S	170.68°E	Ross Sea	Victoria Land, Cape Adare	160–164	Blake trawl, 5 ft
32	2143	Feb 1968	49.00° S	178.00°E	Pacific Ocean	Near New Zealand, off Antipodes Islands	2010–2100	Blake trawl

APPENDIX A2. R/V *Hero* Orbiniidae Station Data.

Cruise Number	Station Number	Date	Latitude	Longitude	Precise Locality	Depth (m)	Collecting Method
712	651	20 Apr 1971	53.155°S	68.243°W	Tierra del Fuego	40	Petersen grab
712	6	21 Apr 1971	53.28°S	68.22°W	San Sebastian	1	Hand Intertidal
712	656	26 Apr 1971	54.80°S	64.70°W	Staten Island, Le Marie Strait	18	Petersen grab
712	16	27 Apr 1971	54.77°S	64.712°W	Off Cape Horn	Intertidal	Hand
712	16	27 Apr 1971	54.773°S	64.712°W	Los Estados Island, Crossley Bay	Intertidal	Hand
712	659	01 May 1971	54.858°S	64.452°W	Argentina, Staten Island off Tierra del Fuego	Intertidal	Hand
712	21	04 May 1971	54.788°S	64.312°W	Los Estados Island, York Bay, NW Arm Of Bahia York	Intertidal	Hand Intertidal
712	664	10 May 1971	54.768°S	63.965°W	Argentina, Staten Island off Tierra del Fuego	29	Petersen grab
712	665	11 May 1971	54.748°S	63.882°W	Tierra Del Fuego, Los Estados Island, North Of	44	Petersen grab
712	672	19 May 1971	54.752°S	64.122°W	Los Estados Island, W Side Puerto Ano Nuevo	50	Petersen grab
712	39	20 May 1971	54.75°S	64.168°W	Los Estados Island, Puerto Basil Hall	Intertidal	Hand
712	8	24 Oct 1971	54.797°S	65.27°W	Los Estados Island, W Side Bahia Buen Suceso	Intertidal	Hand
721	957	05 Dec 1971	64.808°S	64.182°W	Antarctic Peninsula, Palmer Archipelago, Anvers Island, transect outside Arthur Harbor	190	Petersen grab
721	964	06 Dec 1971	64.885°S	64.067°W	Antarctic Peninsula, Palmer Archipelago, Bismarck Strait	46	Petersen Gr
721	968	07 Dec 1971	64.819°S	63.527°W	Antarctic Peninsula, Palmer Archipelago, Wiencke Island, Port Lockroy	125	Petersen grab
721	970	07 Dec 1971	64.823°S	63.547°W	Off Antarctic Peninsula	102	Petersen grab
721	965	07 Dec 1971	64.820°S	63.492°W		34	Petersen grab

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APPENDIX A3. Stations Taken by the Deep Freeze I-IV Expeditions (1956-1959)

Vessel	Station	Area	Latitude	Longitude	Depth (m)	Date	Gear Type	Collector
			Deep-Freeze I					
USS *Edisto*	ED-3	Ross Sea, Kainan Bay	71.57°S	170.30°E	27	06 Feb 1956	Orange Peel grab	J.Q. Tierney
USS *Edisto*	ED-4	Ross Sea, SW Robertson Bay	71.50°S	169.53°E	400	07 Feb 1956	Orange Peel grab	J.Q. Tierney
USS *Edisto*	6	Ross Sea, Robertson B ay	73.32°S	169.25°E	100	12 Feb 1956	Dredge	J.Q. Tierney
USS *Edisto*	8	Ross Sea, McMurdo Sound	77.45°S	169.50°E	321	18 Feb 1956	Dredge	J.Q. Tierney
			Deep-Freeze II					
USCGC *Glacier*	1	Ross Sea, McMurdo Sound between Cape Royds and Cape Evans	77.50°S	166.07°E	400	28 Oct 1956	?	W.L. Tressler
USCGC *Glacier*	2	Ross Sea, McMurdo Sound, W of Inaccesible Island	77.67°S	166.23°E	384	04 Nov 1956	?	W.L. Tressler
USS *Staten Island*	19	Weddell Sea	77.62°S	43.25°W	430	11 Jan 1957	?	W.H. Littlewood
USS *Staten Island*	20-Op-5	Weddell Sea	77.13°S	45.17°W	282	21 Jan 1957	?	W.H. Littlewood
			Deep-Freeze III					
USCGC *Westwind*	7	Weddell Sea, off Filcener Ice Shelf, Vahsel Bay	77.65°S	44.83°W	256	16 Jan 1958	Dredge, triangle	J.Q. Tierney
USCGC *Westwind*	9	South Shetland Islands, Bransfield Strait, near Deception Island	62.40°S	59.75°W	166	26 Jan 1958	Dredge, triangle	J.Q. Tierney
USS *Atka*	24	Near Wilkes Station, off Vincennes Bay, between Budd and Knox Coasts	66.257°S	110.478°E	24	23 Jan 1958	?	L.W. Wilson
			Deep-Freeze IV					
USCGC *Northwind*	8	Ross Sea, Moubray Bay, off Cape Hallett	72.278°S	170.300°E	135	12 Jan 1959	Dredge, triangle	L.W. Wilson
USS *Staten Island*	10-2	Ross Sea, Victoria Land, W of Cape Adare	71.358°S	170.083°E	128	24 Jan 1959	Trawl	R.B. Starr
USS *Edisto*	20	Weddell Sea, off Vahsel Bay	77.67°S	35.50°W	384	28 Jan 1959	Trawl	?
			Miscellaneous surveys					
USS *Staten Island*	6-63	Antarctic Peninsula, Arthur Harbor	64.77°S	64.07°W	~7	24 Jan 1963	Fish trap	W.L. Schmitt
USS *Staten Island*	32-63	Antarctic Peninsula, Gamma Island, Melchior Harbor	64.323°S	62.988°W	100	06 Feb 1963	Dredge	W.L. Schmitt
USS *Staten Island*	65-63	Antarctic Peninsula, Palmer Archipelago, Weincke Island, Port Lockroy	64.80°S	64.50°W	63	01 Mar 1963	Dredge	W.L. Schmitt

APPENDIX A4. USCG *Glacier*, International Weddell Sea Expedition, 1968-1969[1]

Station	Latitude S	Longitude W	Date	Depth (m)	Gear	Location
68-1	70°07′	39°38′	06 Feb 1968	650	Epibenthic sled	Weddell Sea
68-5	76°00′	55°00′	09 Feb 1968	400	VanVeen grab	Weddell Sea
68-9	73°31′	60°03′	11 Feb 1968	526	VanVeen grab	Weddell Sea
68-18	72°46′	42°45′	18 Feb 1968	1664	Epibenthic sled	Weddell Sea
68_Palmer II	64.77°	64.07°	17 Mar 1968	40	VanVeen grab	Antarctic Peninsula, Anvers Island, Arthur Harbor, Palmer Station anchorage
69-1	74°28.1′	30°31.7′	24 Feb 1969	513	Anchor dredge	Weddell Sea
69-2	75°31′	30°08′	25 Feb 1969	412	Anchor dredge	Weddell Sea
69-4	77°05.5′	35°04′	26 Feb 1969	743	Anchor dredge	Weddell Sea
69-6	76°50′	40°55′	01 Mar 1969	513	Anchor dredge	Weddell Sea
69-7	77°16′	42°38′	01 Mar 1969	512	Anchor dredge	Weddell Sea
69-8	77°36.2′	42°30′	02 Mar 1969	585	Anchor dredge	Weddell Sea
69-10	77°50′	42°05′	04 Mar 1969	659	Anchor dredge	Weddell Sea
69-19	74.105°	32.603°	11 Mar 1969	1621	Anchor dredge	Weddell Sea
69-22	73°28.4′	30°26.9′	13 Mar 1969	3111	Anchor dredge	Weddell Sea
69-23	72°49.6′	30°29.7′	14 Mar 1969	3697	Anchor dredge	Weddell Sea

[1] John S. Rankin, Chief Scientist

APPENDIX A5. R/V *Anton Bruun* 1965-1966 Orbiniidae Station Data.

Cruise Number	Station Number	Date	Latitude (S)	Longitude (W)	Sea/Gulf	Precise Locality	Depth (m)	Collecting Method
11	69	17 Oct 1965	06°33′	82°11′	South Pacific Ocean	Peru, Peru-Chile Trench, Milne-Edwards Deep, west of Isla Lobos de Tierra	4591	Beam trawl, 5 ft
11	98	15 Oct 1965	08°24′	81°15′	South Pacific Ocean	Peru-La Libertad, Peru-Chile Trench, Milne Edwards Deep, W of Trujillo	6052–5989	Menzies trawl & Beam trawl in tandem
11	111	18 Oct 1965	08°23′	80°45′	South Pacific Ocean	Peru-La Libertad, Peru-Chile Trench, Milne Edwards Deep, W of Trujillo	3086–3202	
11	113	19 Oct 1965	08°44′	80°45′	South Pacific Ocean	Peru-La Libertad, Peru-Chile Trench, Milne Edwards Deep, W of Trujillo	5986–6143	Menzies trawl & Beam trawl in tandem
12	65-215	29 Nov 1965	N/A	N/A	South Pacific Ocean	Peru, Island near Pucusana, S of Callao	0–5	Scuba
12	65-240	12 Dec 1965	33.622°	78.839°	South Pacific Ocean	Juan Fernandez Islands	24–27	Scuba
12	65-243	12 Dec 1965	33.62°	78.847°	South Pacific Ocean	Juan Fernandez Islands Mas A Tierra Island N Side, SW Of West Bay	0–10	Scuba
12	134	13 Dec 1965	33°34′	78°55′	South Pacific Ocean	Juan Fernandez Islands, Chile Bay, behind Punta Suroestense	~5	Scuba
12	66-70	8 May 1966	02.191°	80.94°	South Pacific Ocean	Off Ecuador	8–9	Scuba
	66-120	17 May 1966	0.7583°	90.308°	South Pacific Ocean	Galapagos Islands, Isla Santa Cruz, Bahia Academy	0–12	Scuba

APPENDIX A6. R/V *Vema* Orbiniidae Station Data.

Station Number	Date	Latitude (S)	Longitude (W)	Sea/Gulf	Precise Locality	Depth (m)	Collecting Method
V-15-63	04 Dec 1958	03°15′	82°39′	South Pacific Ocean	Off Ecuador	2681–2864	Trawl
V-17-5	16 Mar 1961	38.25°	76.00°	South Pacific Ocean	NW Of Valdivia	3739–3824	Trawl
V-17-6	21 Mar 1961	37.95°	75.13°	South Pacific Ocean	Off Chile, SW Of Concepcion; W of Isla Mocha	4303–4323	Trawl
V-17-7	22 Mar 1961	40°32′	75°08′	South Pacific Ocean	Off Chile, Los Lagos Region, W of Bahia Mansa	3089–3279	Trawl
V-17-12	23 Mar 1961	43.50°	74.92°	South Pacific Ocean	Chiloe Island Off Isla De Chiloe	112	Trawl
V-17-10	23 Mar 1961	43.243°	55.412°	South Pacific Ocean	Chiloe Island W Of Isla De Chiloe	397–497	Trawl
V-17-18	28 Mar 1961	53.925°	71.280°	South Pacific Ocean	Strait Of Magellan	248–262	Trawl
V-17-23	29 Mar 1961	53.78°	70.292°	South Pacific Ocean	Canal Whiteside	278–280	Trawl
V-17-43	21 Apr 1961	62.80°	62.10°	Scotia Sea	South Shetland Islands Boyd Strait	656–670	Trawl
V-17-56	05 May 1961	56°34′	62°41′	Scotia Sea	Off Tierra del Fuego	4006	Trawl
V-17-86	11 Jun 1961	45.48°	60.10°	Gulf of San Jorge	NE Of Gulf	225–227	Trawl
V-17-101	19 Jun 1961	38.22°	55.32°	South Pacific Ocean	Mar Del Plata East Of	450–454	Trawl
V-18-12	N/R	47°09′	60°38′	South Atlantic Ocean	Off Argentina, Santa Cruse slope, E of Deseado	424–428	Trawl

APPENDIX A7. ANDEEP I-III and SYSTCO Benthic Orbiniid Stations.

Station	Date	Latitude (S)	Longitude (W)	Depth (m)	Gear
ANDEEP I					
PS61/043-2	29 Jan 2002	60°26.99′	56°5.00′	3958.8	Large Box Corer
PS61/045-1	29 Jan 2002	60°59.14′	55°11.38′	196.4	Bottom trawl
PS61/045-1	29 Jan 2002	60°58.78′	55°9.17′	269.2	Bottom trawl
PS61/046-3	30 Jan 2002	60°37.92′	53°57.17′	2888	Large Box Corer
PS61/046-5	30 Jan 2002	60°38.13′	53°57.68′	2893.6	Large Box Corer
PS61/114-6	18 Feb 2002	61°43.55′	60°43.87′	2905	Large Box Corer
PS61/114-7	18 Feb 2002	61°43.48′	60°43.50′	2900	MultiCorer
PS61/114-8	18 Feb 2002	61°43.46′	60°43.39′	2896	Large Box Corer
ANDEEP II					
PS61/131-8	06 Mar 2002	65°18.65′	51°30.91′	3068.3	Large Box Corer
PS61/132-4	06 Mar 2002	65°17.75′	53°22.92′	2085	Large Box Corer
PS61/132-6	07 Mar 2002	65°17.77′	54°0.00′	2086	Large Box Corer
PS61/136-5	13 Mar 2002	64°1.54′	39°6.41′	4741.4	Large Box Corer
PS61/138-7	17 Mar 2002	62°58.01′	27°53.87′	4541.2	MultiCorer
PS61/138-8	17 Mar 2002	62°57.72′	27°53.70′	4538.5	Large Box Corer
PS61/138-9	17 Mar 2002	62°57.90′	27°54.13′	4540.8	MultiCorer
PS61/139-10	21 Mar 2002	58°14.18′	24°20.62′	3965	Large Box Corer
ANDEEP III					
PS67/021-3	29 Jan 2005	47°40.05′	04°14.84′	4551	Large Box Corer
PS67/078-4	21 Jan 2005	71°9.49′	13°59.92′	2164	Large Box Corer
PS67/078-6	21 Jan 2005	71°9.45′	14°0.32′	2168	Large Box Corer
PS67/078-8	21 Jan 2005	71°9.48′	14°0.12′	2167	Multi corer
PS67/110-4	10 Jan 2005	64°59.95′	43°1.97′	4700	Multi corer
PS67/110-5	10 Jan 2005	65°0.00′	43° 2.01′	4702	Large Box Corer
PS67/110-10	10 Jan 2005	65°0.02′S	43° 1.97′	4704	Large Box Corer
PS67/121-10	14 Mar 2005	63°41.74′S	50° 42.99′	2621	Large Box Corer
PS67/142-7	18 Mar 2005	62°11.61′S	49° 29.45′	3406	Large Box Corer
PS67/153-3	29 Mar 2005	63°19.41′S	64° 36.77′	2077	Multi corer
PS67/153-4	29 Mar 2005	63°19.35′S	64° 36.79′	2079	Large Box Corer
PS67/153-5	29 Mar 2005	63°19.41′S	64° 36.82′	2079	Multi corer
ANDEEP SYSTCO					
Sta. 33-14	30 Dec 2007	62°00.64′	002°59.33′	5338	Agassiz Trawl

APPENDIX A8. List of Oceanographic Stations Taken by the Instituto de Biologia de Mar del Plata (IBM) (1966–1971)

Station	Latitude S	Longitude W	Depth (m)	Bottom Type	Location
N-242	N/A	N/A	63	Sand	Uruguay
N-244	36°24.5′	53°51.7′	128	N/A	Uruguay
N-248	35°36′	52°43′	170	Muddy sand	Uruguay
N-250	34°51′	52°35′	83	N/A	Uruguay
N-254	33°56.5′	53°00′	27–30	N/A	Uruguay
N-258	34°34′	53°14′	50	N/A	Uruguay
N-260	N/A	N/A	144	N/A	Uruguay
N-263	34°51′	54°04′	39	N/A	Uruguay
N-1054	35°56.5′	54°15.7′	58-65	N/A	Argentina
N-1055	36°16′	54°01.5′	92-96	N/A	Argentina
N-1056	36°30.5′	53°55′	155-192	N/A	Argentina
N-1058	35°57′	53°32′	150-156	Muddy sand	Argentina
N-1059	35°25.9′	53°27.9′	72-80	N/A	Argentina
N-1064	34°24.5′	53°27.2′	20-26	N/A	Uruguay
N-1066	34°29.2′	52°20′	72-86	Muddy sand	Uruguay
N-1070	33°50′	53°03′	20-23	N/A	Uruguay
N-1071	34°22.9′	52°37.2′	36–42	Sand & shells	Uruguay
N-1073	35°10.5′	52°42.5′	115-117	Muddy sand	Uruguay
N-1074	35°29′	53°01′	11-28	N/A	Argentina
N-1075	35°36.5′	53°32′	68	Muddy sand	Argentina
Mej-5	37°40′	56°28′	55	Hard bottom	Argentina
Mej-11	37°30′	56°30′	47	N/A	Argentina
Mej-12	37°30′	56°41′	24	N/A	Argentina
Mej-15	37°10′	56°15′	28	N/A	Argentina
Mej-18	37°16′	56°09′	48	N/A	Argentina
Mej-22	37°27′	56°29′	40	N/A	Argentina
Mej-27	37°33′	56°24′	51	N/A	Argentina
G II-3	37°56.6′	57°28.1′	16.5	Muddy sand	Argentina
G II-8	38°01′	57°26.7′	20	Muddy sand	Argentina
G II-12	38°03.9′	57°22′	N/A	Sand & shells	Argentina
G II-13	38°04.3′	57°27.2′	21	Sand & stones	Argentina
G II-14	38°03.5′	57°30.9′	N/A	Muddy sand	Argentina
SAOI-A	4 km off Las Grutas		15	Sand	Argentina
SAOI-C	Off Las Grutas		15	Sand	Argentina
SAOI-1	40°55′	64°54′	18	Sand	Argentina
SAOI-5	40°54′	64°31′	20-24	Sand	Argentina
SAOI-7	40°57.5′	64°20.5′	18-24	Stones	Argentina
SAOI-15	41°01′	64°15′	33-36	Mud & sand	Argentina
SAOI-24	41°02′	65°08.5′	15	Shell bottom	Argentina
SAOI-49	41°16′	65°04′	36	Sand & mud	Argentina
SAOI-51	41°08′30″	54°48′30″	Intertidal	Gravel	Argentina
SAOI-52	41°05.5′	65°06′	29	Sand	Argentina

......continued on the next page

APPENDIX A8. (Continued)

Station	Latitude S	Longitude W	Depth (m)	Bottom Type	Location
SAOI-53	41°00′	65°06′	38	Sand & shells	Argentina
SAOI-54	40°05.5′	65°08.5′	16.5	Sand	Argentina
SAOI-71, Sta. 26	4054′	65°02′	13-15	Fine sand	Argentina
SAOI-0113	Golfo San Matías		N/A	Sand	Argentina
SAOIII-1041	Golfo San Matías		Intertidal	Sand & gravel	Argentina
SAOIV-1133	Golfo San Matías		Intertidal	Sand	Argentina
SAOV-31	Golfo San Matías		21	Sand	Argentina
SAOV-201	Golfo San Matías		21	Sand	Argentina
SAOV-236	Golfo San Matías		Subtidal	Sand	Argentina
H-14	37°41′	54°48′	700	N/A	Argentina
H-15	37°37′	56°17′	70-80	N/A	Argentina
AII 60-282	Off the Rio de La Plata		200-250	N/A	Argentina
AII 60-284	Off the Rio de La Plata		200-250	N/A	Argentina
Comp-1	38°00′	57°27.5′	18-30	Sand	Argentina
Comp-IV	37°50′S	57°21′W	14	N/A	Argentina
WH-389	38°56	55°31′	200	N/A	Argentina

Cruise and ship identification codes: N: Oceanographic cruises of the Soviet research vessel, *A. Knipovich*, along the coasts of Argentina and Uruguay (1966 and 1968),V. Scarabino, collector.—Mej: Fisheries research cruise of the *Mejillón* I, P.E. Penchaszdeh, collector.— G II: Oceanographic cruise of the *Goyena* II, S.R. O1ivier, R. Bastida, and R. Capitoli, collectors.—SAO I-V: Golfo San Matías cruises I-II under supervision of IBM and FAO fisheries of Argentina; cruises III-IV included cooperative investigations of the federal council of the Province Rio Negro and the IBM; cruise V was fisheries investigations of selected areas in the Golfo San Matías.—H: Oceanographic cruise of the U.S. research vessel, R/V *Hero* (1971), R. Bastida, collector.— AII 60: Cruise 60 of the *R/V Atlantis II*,. Woods Hole-Oceanographic Institution (1971), off the mouth of the Rio de la Plata, R. Bastida, collector.— Comp I-V: Oceanographic cruises of the IBM in cooperation with the Argentine navy; S.R. O1ivier and Salanouve, collectors.—WH: Fisheries cruise of the *Walther Herwig* (1966).

APPENDIX A9. List of Stations From the Lund University Chile Expedition (1948–1949).

Station	Date	Latitude S	Longitude W	Depth (m)	Bottom Type	Location in Chile
M-4A	11 Sep 1948	41°28′54″	72°57′24″	13–16	Coarse, grey sand with gravel	Seno Reloneavi, the Bay off Puerto Monntt, N of the light buoy NE of Isla Tengo
M-8B	17 Nov 1948	41°50′12″	73°56′57′	Intertidal	Grey mud with some sand	Golfo de Quetalmahué, Isla Pullinque, N of Punta Rangui
M-11A	18 Nov 1948	41°53′03″	73°51′18″	Intertidal	Beach with fine sand	Canal Chacao, Bahía de Ancud, Lechagua
M-13	30 Nov 1948	41°29′16″	72°58′10″	0–6	Stones, gravel and sand with mud	Seno Reloneavi, Canal Tenglo, between Isla Tengo and Angelmó
M-16E	14 Jul 1949	41°31′30″	72°48′15″	30	Hard. grey, coarse sand	Seno Reloneavi, Piedra Azul, NW of Punta Quillaipe
M-44 & M-44A	24 Jan 1949	41°58′	73°18′	~200	Fine sand mixed with clay	Golfo de Ancud, SW of Isla Tabon
M-45	24 Jan 1949	41°46′40″	73°09′20″	18	Coarse sand with small stones	Golfo de Ancud, Canal Caicaen, E of the mouth of the Canal Quigua
M-55	25–27 Feb; 7 Mar 1949	41°51′30″	73°49′40″	Intertidal	rocks with pools	Bahía de Ancud, between Punta San Antonio and Punta Colorado
M-60	25, 29 Mar 1949	41°30′15″	72°58′50″	Intertidal	Sand	Seno Reloneavi, Isla Tenglo, the bay on the south side
M-65A	17 Feb 1949	42°46′30″	73°28′10″	8	Coarse, clean sand	Golfo Corcovado, Bajo Vettor Pisani
M-70A	19 Feb 1949	43°33′00″	74°49′00″	25	Coarse sand with some stones	Golf Corcovado, Boca del Guafo, Isla Guafo, the anchorage E of Punta Weather
M-107A	6 May 1949	41°47′18″	73°20′55″	60	Coarse sand with mud and algae	Golfo de Ancud, N of Punta Barranco at Isla Abtao
M-108	6 May 1949	41°44′10″	73°15′15″	15	Coarse shell sand and dead algae	Golfo Ancud, northern part, Canal
M-115	3 Mar 1949	53°11′	70°55′	Intertidal	Gravel and clay, mixed with mud	Strait of Magellan, near the estuary of Río los Ciervos, S of Punta Arenas
M-131	1, 4, 6 Jul 1949	20°13′10″	70°10′19″	Intertidal	red rocks with rock pools	Iquique, southern part of the town
M-144 & 144A	15 Jul 1949	41°41′00″	72°47′00″	~250	Coarse black sand with fragments of polychaete tubes	Seno Reloneavi, E of Isla Guar
M-145	16 Jul 1949	41°32′00″	72°47′00″	70–80	Fine, soft, grey sand, with small stones	Golfo de Ancud, N of Punta Barranco