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Hidden diversity in deep-water bandfishes: review of Owstonia with descriptions of twenty-one new species (Teleostei: Cepolidae: Owstoniinae)

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Abstract

The bandfish family Cepolidae, comprising the subfamilies Owstoniinae and Cepolinae, is characterized, and defining characters of the three groups are identified and discussed. Characters of larvae of both subfamilies are described and illustrated. Six nominal genera of owstoniines had been proposed by various authors, but we recognize only *Owstonia* Tanaka. Utility of selected identification characters of the genus are discussed. Differences in lateral-line patterns have been the primary character used by some recent authors for recognition of two owstoniine genera, with *Sphenanthias* Weber possessing the plesiomorphic lateral-line condition. Several other patterns also occur in these fishes bringing into question the phylogenetic significance of lateral line plasticity. Sexual dimorphism in pelvic fin lengths is also present in several species. Identification keys, descriptions, synonymies, distribution maps and photographs or illustrations are provided for all *Owstonia* species for which adults are available.

Although only 15 valid species were previously known, a remarkable hidden diversity of these fishes was discovered in major museum collections with the following 21 species here described as new: *O. ainonaka* (eastern Australia), *O. contodon* (Philippines), *O. crassa* (New Caledonia and Solomon Islands), *O. dispar* (Solomon Islands), *O. elongata* (New Caledonia and Vanuatu), *O. fallax* (eastern Australia and New Caledonia), *O. geminata* (Vanuatu and Philippines), *O. hastata* (eastern Australia), *O. hawaiiensis* (Hawaiian Islands); *O. ignota* (Mariana Islands), *O. lepiota* (Tanzania), *O. melanoptera* (Philippines), *O. merensis* (eastern Australia, Torres Strait), *O. mundyi* (Kiribati, Christmas Island), *O. nalani* (eastern Australia and New Caledonia), *O. nudibucca* (eastern Indian Ocean, Mentawai Islands and off Myanmar), *O. psilos* (Western Australia), *O. raredonae* (Mozambique), *O. rhamma* (Vanuatu), *O. scottensis* (Western Australia, Scott Reefs) and *O. similis* (Madagascar). Several specimens based on small juveniles, which we describe as *Owstonia* sp., appear to be additional new species but are not formally described as such.

Key words: Pisces, Cepolidae, *Owstonia*, bandfishes, taxonomy, Indo-West Pacific

We may finally learn the true extent and intricacy of biodiversity, but innovations have increased the need for what they seemed to replace by baring the enormity of the expertise gap.... On-line repositories and genetic tools released a deluge of valuable information, although dwindling expertise struggles to validate it. Dijkstra (2016).

Introduction

The primary purposes of this paper are to call attention to the hidden diversity of the bandfish subfamily Owstoniinae, present identification keys, descriptions and comparisons for all species of *Owstonia*, and discuss the utility of certain characters as an aid to future workers. We also discuss the types of previously described species of *Owstonia* where characters and other information given in the original descriptions are erroneous. As here recognized, the genus *Owstonia* is the only member of the Owstoniinae; five other nominal genera are considered to be junior synonyms. Although 15 valid species of *Owstonia* have been described previously (Table 1), not including *Parasphenanthias microlepis* Fowler [= *O. weberi* (Gilchrist)] and *Sphenanthias pectinifer* Myers [= *O. sibogae* (Weber)], we herein describe an additional 21 new species. We are aware of several additional undescribed species of *Owstonia* mostly known from small individuals (see "Unidentified *Owstonia* specimens"). These poorly studied fishes tend to be under represented in museum collections, with 16 species known from only one or two specimens and life coloration unknown for 15 species. In part this is because species of *Owstonia* occur in depths of about 80 (*O. taeniosoma*) to 550 meters and occupy difficult to sample habitats, with most collections made with beam trawls. Submersible video recordings of two species indicate a preference for holes or crevices on rocky bottom. We hope this study will enable future workers to correctly identify the adults of *Owstonia* spp. as more collections become available, and to be encouraged to publish on those specimens.

The bandfish subfamilies Cepolinae and Owstoniinae were considered to be separate families (Jordan *et al.*, 1913:188) until they were combined by Okada and Suzuki (1956). Springer *et al.* (1977:10) discussed characters of cepolids, gave reasons why they are not closely related to pseudochromids or opistognathids, and agreed that the Owstoniidae should be synonymized with the Cepolidae Rafinesque, 1815. Mok (1988) noted that the epineurals (*sensu* Johnson and Patterson, 1995) on some trunk vertebrae are fused proximally to the corresponding ribs in two species each of *Owstonia* (Owstoniinae) and *Acanthocepola* (Cepolinae); we have confirmed this fusion (Fig. 1) in two species of *Cepola* and in all our cleared and stained *Owstonia* material. Mok (1988) stated that fusion of these bones had not been reported in other perciforms. This observation agrees with Patterson and Johnson (1995), who reported no such fusion in any ctenosquamate (they did not examine cepolids). Gill and Mooi (1993:331) added an additional synapomorphy to support monophyly of an expanded Cepolidae: presence of two rod-like, cartilage-tipped uncinate processes on the first epibranchial. To this we add that the interarcual cartilage is unusually small and ovoid and the first uncinate process is accordingly elongate (Fig. 2). In a survey of scleral ossicles, Mok and Liu (2012) noted that uniquely in the Cepolidae, these ossicles are not symmetrically aligned along the horizontal axis of the eye: "the anterior one was at the axis, whereas the posterior one was below the axis (*i.e*., at about 225°)." This condition (Fig. 3) is another synapomorphy of the family.

Based solely on molecular evidence Near *et al.* (2013) hypothesized that priacanthids are the sister group of cepolids. However, based on our examination of priacanthids, they share none of the characters diagnostic of cepolids listed above. We know of no previous hypotheses of cepolid relationships based on morphology. Leis and Carson-Ewert (2000:292) noted that a flexion larva of *Owstonia* was originally misidentified and illustrated as the priacanthid *Cookeolus boops* by Zhang (1983), an error perpetuated by Kinoshita (1988; 2014). Carson-Ewert (2000) listed priacanthids as one of nine families with which cepolid larvae could be confused; however none of these other eight familes was hypothesized to be closely related to cepolids by Near *et al.* (2013, fig S1).

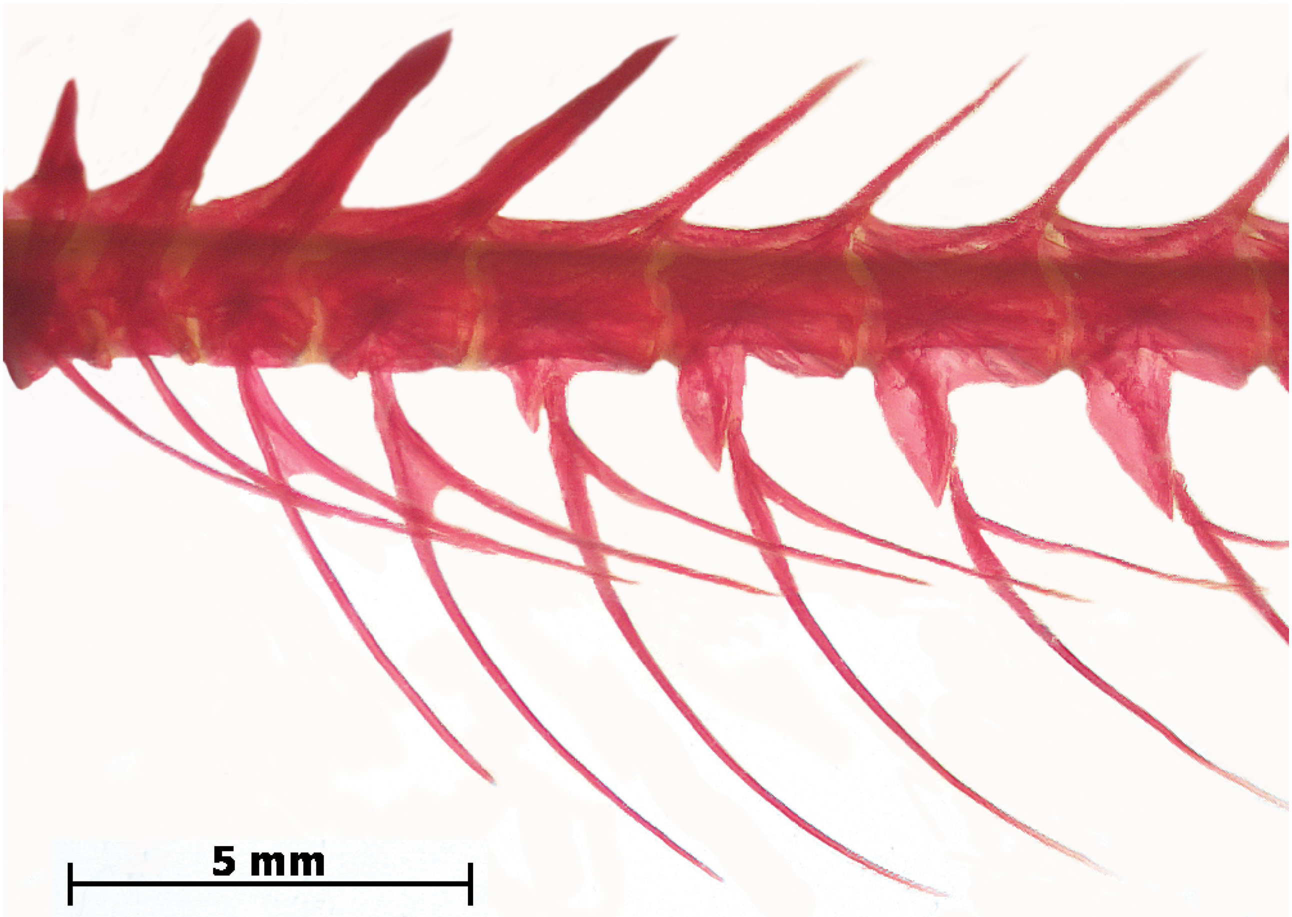

FIGURE 1. Fusion of epineurals to ribs in *Owstonia sarmiento*, ANSP 165126, 82 mm SL; a synapomorphy of the Cepolidae.

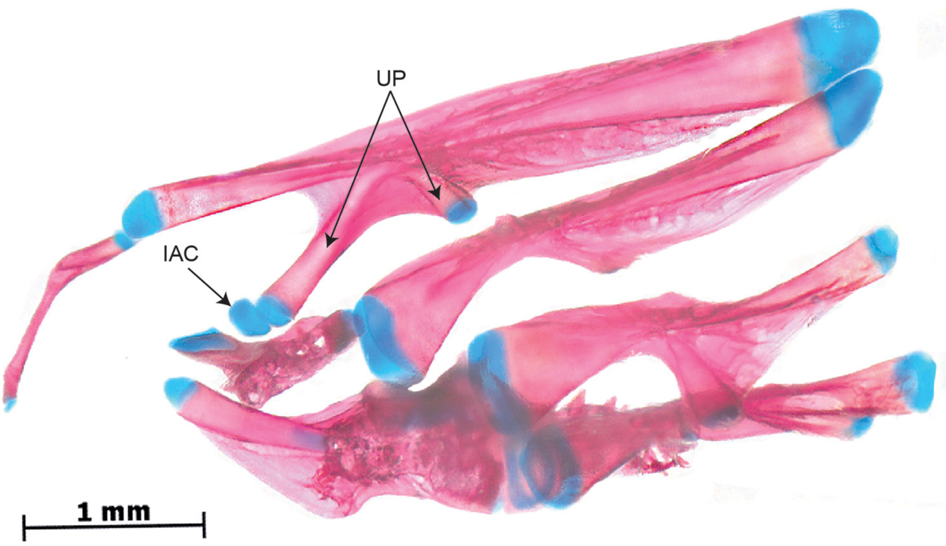

FIGURE 2. Right dorsal gill arches to show presence of two rod-like, cartilage-tipped uncinate processes on the first epibranchial and small ovoid interarcual cartilage in *Owstonia sarmiento*, ANSP 165126, 82 mm SL. Abbreviations: IAC = interarcual cartilage; UP = uncinate process.

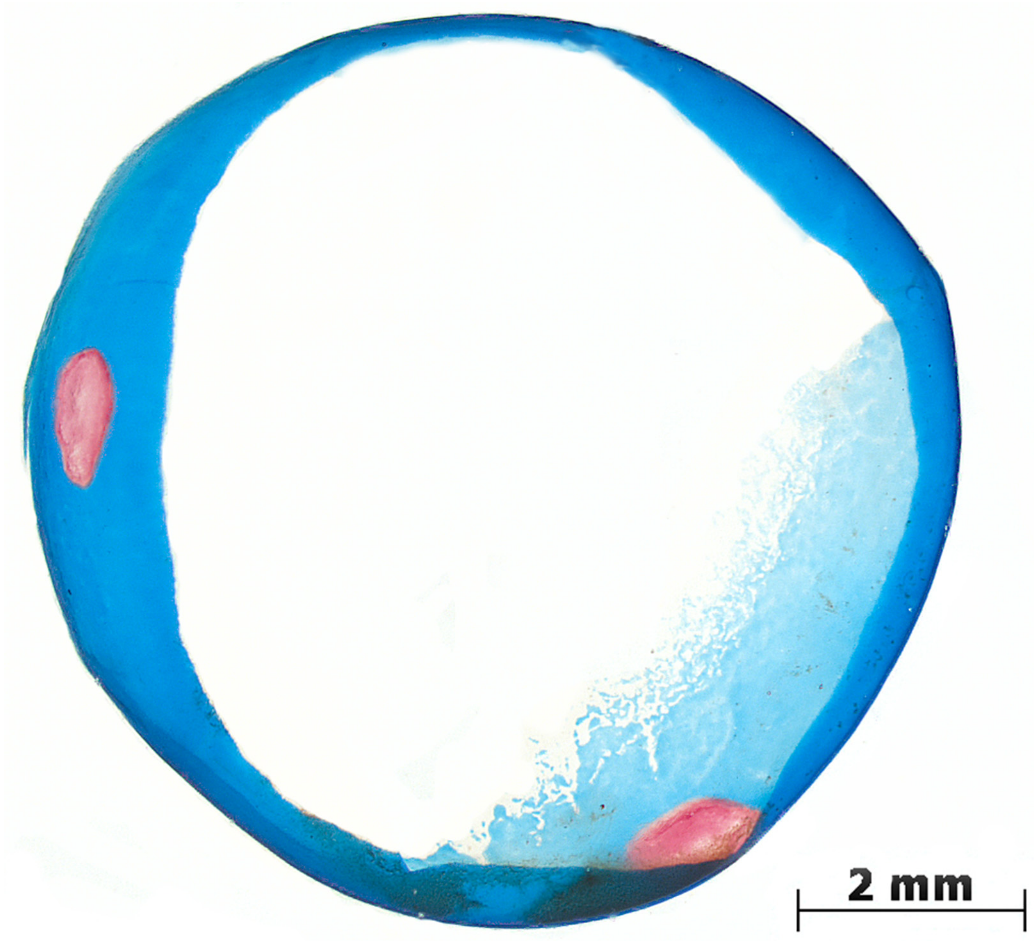

FIGURE 3. Scleral ossicles in *Owstonia sarmiento*, ANSP 165126, 82 mm SL.

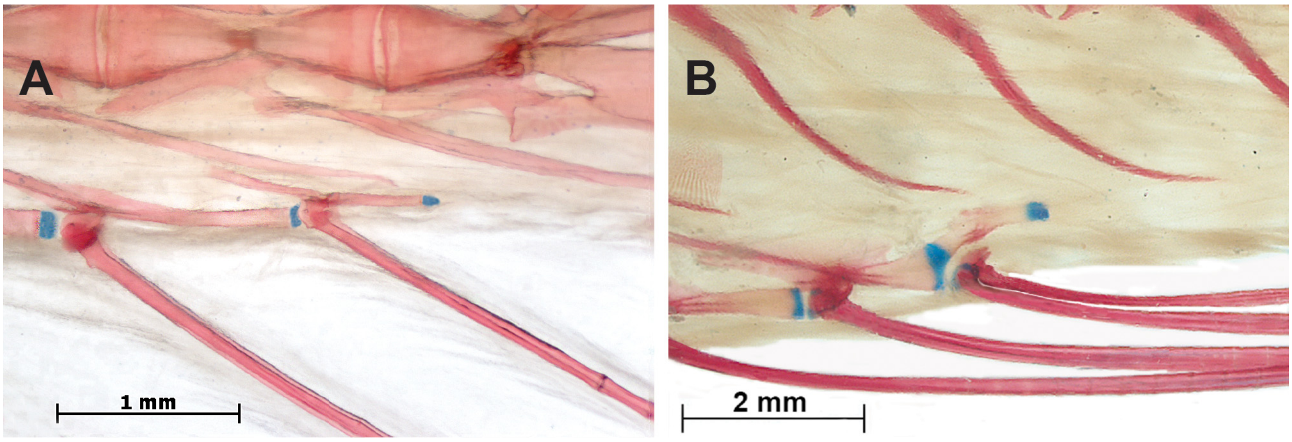

FIGURE 4. Terminal anal-fin pterygiophores in A, *Cepola macrophthalma*, USNM 427630175, 220 mm SL (condition in all cepoliines in which the dorsal- and anal-fin pterygiophores support a single ray); B, *Owstonia sarmiento*, ANSP 165126, 82 mm SL (condition in all owstoniines in which the dorsal- and anal-fin pterygiophores support 2 rays).

Members of the Cepolinae are notably elongate, with 48–79 total vertebrae and 55–90 total dorsal-fin soft rays, and have the terminal dorsal- and anal-fin soft rays attached to the caudal fin by a membrane. Owstoniines are less elongate, with only 27–33 vertebrae and 19–26 dorsal-fin soft rays, and the dorsal and anal fins are not membraneously attached to the caudal fin. Springer *et al.* (1977) stated that cepolids are more specialized than pseudochromids in having the last dorsal- and anal-fin pterygiophores supporting a single ray. However, this is true only for cepolines (Fig. 4A) because in all species of *Owstonia*, as in most percomorphs, these terminal pterygiophores support two close-set rays (Fig. 4B), also known as "split-to-base" condition. This is another difference that separates the two subfamilies. Sadovy de Mitcheson and Liu (2008:24) listed *Cepola* in one of 21 families of teleosts in which hermaphroditism has been reported but not confirmed. Members of the Cepolinae (*Acanthocepola* and *Cepola*) normally occur in burrows in relatively soft substrata in coastal areas on continental shelves, whereas most species of the Owstoniinae are often free-swimming in close contact with rocky bottom on upper slopes, oceanic crustal fragments or around atolls. Adults of the very elongate *Owstonia taeniosoma* (type-species of monotypic genus *Pseudocepola* which we consider unnecessay) may be exceptional in inhabiting muddy or sandy bottoms on continental shelves (Nakabo and Doiuchi 2013).

Materials and methods

Institutional abbreviations, based mostly on Eschmeyer *et al.* (2016), are as follows: Australian Museum, Sydney (AMS); Academy of Natural Sciences of Drexel University, Philadelphia (ANSP); Academia Sinica, Biodiversity Research Center, Taipei, Taiwan (ASIZP); The Natural History Museum, London (BMNH); Bernice P. Bishop Museum, Honolulu, Hawaii (BPBM); Laboratory of Marine Biology, Faculty of Science, Kochi University, Kochi, Japan (BSKU); California Academy of Sciences, San Francisco (CAS); Central Marine Fisheries Research Institute, Kochi, Kerala, India (CMFRI); Australian National Fish Collection, Commonwealth Scientific and Industrial Research Organization, Hobart, Tasmania (CSIRO); Kyoto University, Department of Bioresearch Science, Faculty of Agriculture, Maizuru, Japan (FAKU); Food and Agriculture Organization of the United Nations, Rome, Italy (FAO); Field Museum of Natural History, Chicago, Illinois (FMNH); Hawai‘i Undersea Research Laboratory, University of Hawai‘i (HURL); Institute of Marine Research, Bergen, Norway (IMR); Kanagawa Prefectural Museum of Natural History, Odawara, Kanagawa, Japan (KPM); Natural History Museum of Los Angeles County, Los Angeles, California (LACM); Monterey Bay Aquarium Research Institute, Moss Landing, California (MBARI); Museum of Comparative Zoology, Harvard University (MCZ); Muséum National d'Histoire naturelle, Paris, France (MNHN); Museum Victoria, Melbourne, Victoria, Australia (NMV); National Museum of Nature and Science, Zoology Department, Division of Fishes, Tsukuba, Japan (NSMT-P); Museums and Art Galleries of the Northern Territory, Northern Territory Museum of Arts & Sciences, Darwin, Australia (NTM); National Museum of the Philippines, Manila (PNM); Queensland Museum, Brisbane, Australia (QM); South African Institute of Aquatic Biodiversity (formerly RUSI), Grahamstown, South Africa (SAIAB); National Museum of Natural History, Washington, D.C. (USNM); Zoological Museum Amsterdam, Netherlands (ZMA); Zoological Museum, University of Copenhagen, Denmark (ZMUC).

The dorsal and anal fins each have two close-set terminal rays serially associated with a single distal pterygiophore (Fig. 4B) and are in supernumerary association with a bony "stay" (see Weitzman, 1962; Potthoff, 1975 and Johnson, 1980); accordingly, they are counted as one ray. Median fin-ray counts were obtained from x-rays. Counts of pectoral-fin rays include all elements; the rudimentary upper ray and ventral-most rays are exceedingly small in some specimens and can easily be overlooked. Bilateral pectoral-fin ray counts were made when only holotypes or single specimens of a species were available, and if the counts on opposite sides differed, the two numbers were separated by a diagonal line. The number of principal caudal-fin rays are counted as the number of branched rays plus two (Hubbs and Lagler, 1964; McDowall, 2003); counts, separated by a plus, distinguish dorsal from ventral caudal-fin rays. Number of cheek scale rows are often only approximations due to irregularity of the rows and because some of these scales are often missing in trawled specimens. This count represents the number of scale rows crossing an imaginary line from the eye to the angle of the preopercle. The number of oblique (anteriorly inclined) body scale rows in the mid-lateral series also are often only approximations, due to missing scales from trawl damage, and were counted along a horizontal line from the posterior margin of the opercle to the structural base of the caudal fin; in all species scales extend onto the base of the caudal fin but these scales are not included in our counts. Where cheek or body scales were missing, we attempted to approximate the count by counting scale pockets or estimating the number in a vacant space based on the size of adjacent scales. The lateral-line (LL) terminus refers to the base of the posteriomost dorsal-fin soft ray below which the LL ends. Counts of gill rakers are made along the first arch, with those on the upper limb listed first; all rudimentary rakers are counted, and the raker between the upper and lower arches is included in the lower gill-raker count. In the descriptions, counts of upper and lower rakers are separated by a plus, and numbers separated by a diagonal line indicate that the counts were obtained from opposite sides of a single specimen. The small (sometimes tiny) rakers on each end of the first arch can easily be missed, unless high magnification, strong illumination, and an air jet are used when making counts.

TABLE 1. Nominal species of owstoniines, in alphabetical order by specific name.

Species	Author, date & page	Current status (if changed)
Owstonia ainonaka, **n. sp.**	This paper	
Owstonia contodon, **n. sp.**	This paper	
Owstonia crassa, **n. sp.**	This paper	
Owstonia dispar, **n. sp.**	This paper	
Sphenanthias dorianus	Borodin 1932:80	Family Sciaenidae
Loxopseudochromis dorypterus	Fowler 1934:354	*Owstonia doryptera* (Fowler)
Owstonia elongata, **n. sp.**	This paper	
Owstonia fallax, **n. sp.**	This paper	
Owstonia geminata, **n. sp.**	This paper	
Opsipseudochromis grammodon	Fowler 1934:357	*Owstonia grammodon* (Fowler)
Owstonia hastata, **n. sp.**	This paper	
Owstonia hawaiiensis, **n. sp.**	This paper	
Owstonia ignota, **n. sp.**	This paper	
Owstonia japonica	Kamohara 1935:133	
Owstonia kamoharai	Endo *et al.* 2015:[2]	
Owstonia lepiota, **n. sp.**	This paper	
Owstonia maccullochi	Whitley 1934:[12]	
Sphenanthias macrophthalmus	Fourmanoir 1985:38	*Owstonia macrophthalma* (Fourmanoir)
Owstonia melanoptera, **n. sp.**	This paper	
Owstonia merensis, **n. sp.**	This paper	
Parasphenanthias microlepis	Fowler 1934a:462	*Owstonia weberi* (Gilchrist)
Owstonia mundyi, **n. sp.**	This paper	
Owstonia nalani, **n. sp.**	This paper	
Sphenanthias nigromarginatus	Fourmanoir 1985:40	*Owstonia nigromarginata* (Fourmanoir)
Owstonia nudibucca, **n. sp.**	This paper	
Sphenanthias pectinifer	Myers 1939:19	*Owstonia sibogae* (Myers)
Owstonia psilos, **n. sp.**	This paper	
Owstonia raredonae, **n. sp.**	This paper	
Owstonia rhamma, **n. sp.**	This paper	
Owstonia sarmiento	Liao *et al.* 2009:522	
Owstonia scottensis, **n. sp.**	This paper	
Sphenanthias sibogae	Weber 1913:211	*Owstonia sibogae* (Weber)
Owstonia similis	This paper	
Sphenanthias simoterus	Smith 1968:11	*Owstonia simotera* (Smith)
Pseudocepola taeniosoma	Kamohara 1935:136	*Owstonia taeniosoma* (Kamohara)
Owstonia tosaensis	Kamohara 1934:301	
Owstonia totomiensis	Tanaka 1908:47	
Parasphenanthias weberi	Gilchrist 1922:69	*Owstonia weberi* (Gilchrist)
Sphenanthias whiteheadi	Talwar 1973:87	*Owstonia whiteheadi* (Talwar)

Number of premaxillary and dentary teeth are not total counts and only include counts of teeth on one counterpart of each of these paired bones. Tooth sockets of missing teeth are also included in the counts. There is a toothless gap at the symphysis of the upper jaw, so it is relatively easy to determine where each premaxilla ends. Symphyseal dentary teeth, which are often slightly canted outward, are most easily distinguished from the lateral teeth when viewed in frontal view. Lateral dentary tooth counts do include the symphyseal. In several species, especially in large adults, some of the mostly "outer" lateral row teeth may extend a short distance behind the symphyseal teeth, but for convenience they are all referred to as lateral dentary teeth in the descriptions. Dentary teeth can be difficult to count accurately without strong illumination and magnification. Dentary teeth also decrease in size posterolaterally where they can be very small in some species. A small jet of air directed from a metal syringe point facilitates making tooth counts.

Measurements were usually made with needle-point dial calipers and rounded to the nearest 0.1 mm. Specimen lengths are given as standard length (SL) and measured from the anterior margin of the upper lip to the base of the caudal fin (posterior end of hypural plate). Standard length measurements in material examined sections and figure legends are rounded to the nearest mm. Head length is taken from the anterior margin of the upper lip to the posterodorsal tip of the opercular flap; upper-jaw length is from the same anterior point to the posterodorsal end of the premaxilla; orbit (bony) diameter is measured from the ventral margin of the rigid sphenotic to the inner margin of the infraorbitals. Caudal peduncle (CP) length was measured from the posterior end of anal-fin base to the mid-point of caudal-fin base; CP depth is the least depth of the caudal peduncle.

Photographs of most anatomical structures were taken with a Zeiss Axiocam using Axiovision Z-stack software attached to a Zeiss Discovery V12 stereomicroscope. Anatomical drawings by S-V were made using a Zeiss IV stereomicroscope and camera lucida attachment. The pencil drawings were then digitized and edited using ©Adobe PhotoShop.

Utility of certain *Owstonia* characters

Lateral-line patterns are surprisingly variable in *Owstonia* with four basic patterns, and are important characters useful in defining species. **Type 1 pattern** (Figs. 5A, 6A), the plesiomorphic condition characteristic of most teleosts, is present in 28 of 36 species of owstoniines (see Table 2) in which the lateral line on each side arises from the posttemporal sensory canal just above the anterodorsal margin of the gill opening, curves upward and then continues posteriorly just below the dorsal-fin base. **Type 2 pattern**, present in two species, has a vertical branch of the lateral line arising from the posttemporal sensory canal above the anterodorsal margin of the gill opening, which forms a "T" joint with the horizontal section of the lateral line below the dorsal fin (Fig. 5B) with an anterior extension extending beyond the dorsal fin origin. The anterior extension either forms a complete loop across the nape (*O. sarmiento*, Fig. 6E) or converges towards the nape mid-line but typically remains separate (*O. tosaensis*, Figs. 6B, 6F), although forming a loop in one specimen (CSIRO H6431–02). **Type 3 pattern** (Figs. 6C, 6G) is found in five *Owstonia* species, wherein the main branch of the lateral line does not join the posttemporal sensory canal, but instead continues forward past the dorsal-fin origin and typically crosses over the nape and connects with the lateral line on the opposite side forming a simple continuous loop. There are minor variations of the type-3 pattern. In *O. nudibucca* (Fig. 6D) the horizontal section of the lateral line preceding the loop has a short ventral side branch just anterior to the dorsal-fin origin, and on each side there is also a diagonal row of 2 scales arising from the posttemporal sensory canal. In the same position just above the gill opening, *Owstonia maccullochi* and *O. weberi* also typically have 2–3 scales; and in *O. totomiensis* there are 3–4 such scales. *Owstonia weberi* has a **type 4 pattern** (Fig. 6H) in which the lateral line also has no contact with the posttemporal sensory canal but is unique in having a pair of secondary side loops near the front of the primary loop that extends across the nape; these side loops are difficult to observe except in the few specimens in which all or most of the nape scales are intact.

Anal-fin pterygiophores anterior to first haemal spine (Fig. 7) range from 2 to 8, with 19 species usually or consistently having 2 anterior pterygiophores (Table 5). The relative position of these pterygiophores is a useful species identification character. Only five species exhibit any variation in these anal-fin pterygiophore positions. Species with two pterygiophores anterior to the first haemal spine typically have 11 precaudal and 17 caudal vertebrae, suggesting that this spine and vertebral combination represents the plesiomorphic character states in *Owstonia*.

TABLE 2. Summary of selected characters in species of *Owstonia*.[1]

Species	Lateral-line basic pattern[2]	Dorsal fin spines	Dorsal fin rays	Anal fin spines	Anal fin rays	Pectoral rays	Vertebrae Pc	Vertebrae Cd	Vertebrae Tot	Pterygiophore anterior to 1st haemal spine	Preopercle spines
ainonaka	simple (type-1)	III	21	I	13	22	11	17	28	2	no
contodon	simple (type-1)	-IV	23	- II	16	20-21	11	18	29	3	yes
crassa	simple (type-1)	III	19–21	I	12–13	20–21	11	17	28	2	no
dispar	simple (type-1)	III	21	I	14	22–23	11	17	28	2	yes
doryptera	loop (type-3)	III	21	I	14	21–22	11	17	28	2	yes (reduced)
elongata	simple (type-1)	-IV	24–(26)	I or (II)	(17)–19	17–19	16	16	32	8	yes
fallax	simple (type-1)	-IV	22–23	I	16	20	13	17	30	5	yes
geminata	simple (type-1)	-IV	23–24	I	16–17	17–18	13	17	30	5	yes
grammodon	simple (type-1)	III	20–22	I	13	19	11–12	16–17	28	3–4	no
hastata	simple (type-1)	-IV	22	- II	14	20–21	13	17	30	5	yes
hawaiiensis	simple (type-1)	III	19	I	13	19	11	17	28	3	no
ignota	simple (type-1)	III	20	I	13	20	11	17	28	3	no
japonica	simple (type-1)	III	21	I	(13)–14	20–22	11	17	28	2	yes
kamoharai	simple (type-1)	III	21–(22)	I	(13)–14	21–23	11	17–(18)	28–(29)	2	no
lepiota	simple (type-1)	III	23	- II	15	19	11	18	29	3	no
maccullochi	loop (type-3)	III	(21)–22	I	(14)–(16)	19–22	11–(12)	(16)–17	28	2–3	yes
macrophthalma	simple (type-1)	-IV	22–23	I	17–18	20–21	11	18	29	3	yes
melanoptera	simple (type-1)	III	21	I	14	22	11	17	28	2	no
merensis	simple (type-1)	III	20	- II	11	20	11	17	28	2	no
mundyi	simple (type-1)	III	23	I	15–16	17–18	11	18	29	3	no
nalani	simple (type-1)	III	22	- II	14	18–19	11	18	29	3	yes (reduced)
nigromarginata	simple (type-1)	III	21	I	13	19–20	11	17	28	2	yes
nudibucca	loop (type-3)	III	21	I	14	21–22	11	17	28	2	yes
psilos	simple (type-1)	III	21	I	14	21–23	11	17	28	2	no
raredonae	simple (type-1)	III	19	I	12	19	11	16	27	3	no
rhamma	loop (type-3)	III	21	I	14	19–23	11	17	28	2	yes (reduced)
sarmiento	"T" joint (type-2)	III	22-(24)	-II	14	17–20	11 (12)	(17)–18	(28)–29	3	yes (reduced)
scottensis	simple (type-1)	III	21	I	14–15	21–22	11	17	28	2–3	yes (reduced)
sibogae	simple (type-1)	- IV	23	- II	15–17	18–(20)	12	17	29	4	yes
similis	simple (type-1)	III	21	I	14	21–22	11	17	28	2	no
simotera	simple (type-1)	III	21	I	14	21–22	11	17	28	2	no
taeniosoma	simple (type-1)	III	(25)–26	I	18–19	(17)–19	15	16–(18)	31–(33)	6–7	yes
tosaensis	"T" joint (type-2)	III	23–(24)	I	15–16	19–21	(12)–13	17–18	(29)–30	4–5	yes
totomiensis	loop (type-3)	III	20–21	I	13–14	20–21	11	17	28	2	yes
weberi	2 loops (type-4)	III	20–(22)	I	13–14	(19)–21	11	(16)–17	(27)–28	2	yes
whiteheadi	simple (type-1)	- IV	21–23	I	15–16	19–20	11	18	29	2	yes

[1]Exceptional values are given in parentheses.

[2]See discussion of lateral-line patterns under "Utility of certain *Owstonia* characters."

TABLE 2. Continued.

Species	Nape scales	Cheek scales[1]	Body scales[2]	Gill rakers upper	lower	total	LL terminus below soft rays	Premaxillary dark stripe	Dentary pigmentation
ainonaka	present	6–7	46–50	15	26–27	41–42	18	mottled	yes
contodon	present	4–5	47–53	16–18	32–35	48–53	21–23	yes	yes
crassa	present	4–7	45–47	13–15	24–27	37–42	14–17	yes	yes
dispar	present	3	44–46	15	28–30	43–45	17	yes	yes
doryptera	present	5–6	45	16	26–28	42–44	15–17	yes	yes
elongata	present	3–4	30–33	15–16	26–30	41–46	20–22	yes	yes
fallax	present	3–4	40–42	15–16	29	44–45	20–22	yes	no (holotype)
geminata	present	3–4	29–32	14–16	26–29	40–44	18–22	yes	no
grammodon	present	5–6	40–45	11–14	22–27	35–40	19–22	yes	no
hastata	present	3–4	38	16	29–30	45–46	18	yes	yes
hawaiiensis	present	4	37–38	15	28	43	19–20	no	no
ignota	present	3–4	36–37	14	27	41	20	no	no
japonica	present	5–7	45–52	13–16	26–31	41–47	19–21	yes	yes
kamoharai	present	7–10	53–56	13–15	24–25	37–40	14–18	yes or mottled	yes
lepiota	absent	5–6	95	12	20	32	21	yes	yes
maccullochi	present	4–6	53–54	15–19	31–35	46–53	17–22	yes	yes
macrophthalma	present	4–5	54	16	33–34	49–50	22–23	yes	yes
melanoptera	present	7	48–53	13–14	25	38–39	7–8	yes	no
merensis	present	6	45	13	24	37	12–14	yes	no
mundyi	absent	absent	97–108	12–13	22–24	35–36	20–23	yes	yes
nalani	present	3	25–26	11	19	30	17	yes	yes
nigromarginata	present	3	35–37	14–16	26–28	40–44	16	yes	yes
nudibucca	absent	absent	38–44	16–18	27–32	44–50	14–20	yes	yes
psilos	present	5–6	ca. 32	12–14	24–27	36–40	14–20	no to weak	no
raredonae	present	3–4	31–32	14	24–25	38–39	17–18	yes	yes
rhamma	present	2–3	ca. 50	15–16	29–30	45	19–20	yes	no
sarmiento	present	2–3	27–30	12–15	24–27	36–41	16–17	yes	yes
scottensis	present	4–5	40–45	15–16	25–27	40–43	19	yes	yes
sibogae	present	3	27–30	14–18	25–32	41–48	19–23	yes	yes
similis	present	6	52–56	10	22–23	32–33	16	yes	no
simotera	present	11–12	50–60	12–13	22–25	34–38	15–18	yes	yes
taeniosoma	present	3	28	12–14	24–26	36–40	21–25	yes	yes
tosaensis	present	4–5	44–54	15–19	28–33	45–51	21–23	yes	yes
totomiensis	absent	absent	50–60	14–18	27–28	42–46	19–20	yes	yes
weberi	present	2–3	33–38	16–18	29–32	45–50	20–21	yes	yes
whiteheadi	present	3	39–41	18–21	34–39	52–60	18–23	yes	yes

[1]Approximate number of cheek scale rows.
[2]Approximate number of horizontal body scale rows.

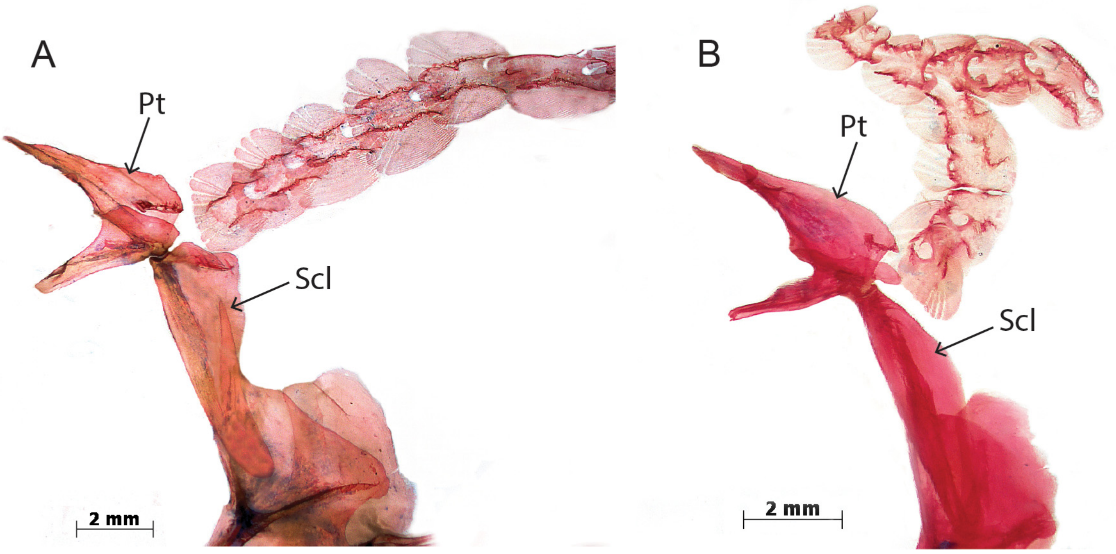

FIGURE 5. Partial lateral-line sections showing different connections (anterior to left) in two species of *Owstonia*: A., *O. taeniosoma*, CAS 133928 (type 1 pattern); B, *O. sarmiento*, ANSP 165126 (type 2 pattern). Abbreviations: Pt = posttemporal; Scl = supracleithrum.

Spines along margin of lower limb of preopercle (Fig. 8). The presence or absence of spines on the lower margin of the preopercle and their relative sizes are useful species characters. Preopercular spines are absent in 15 species and in five others, *O. doryptera, O. nalani, O. rhamma* (Fig. 8F), *O. sarmiento* (Fig. 8G), and *O. scottensis* (Fig. 8H), the spines are very small, partially obscured by skin and could easily be overlooked. Because preopercular spines are absent in one specimen of *O. scottensis* and difficult to observe in four other specimens, this species will "key out" under both alternatives in couplet 28 of the identification key. The large and widely spaced preopercular spines of *Owstonia tosaensis* (Fig. 8K) are a characteristic feature of that species. Even in some species with relatively robust spines the spines may exhibit geographic variation (Figs. 8D, 8E); see Remarks for *O. maccullochi*.

Dentition (Figs. 9, 10), Table 3. Our examination of *Owstonia* dentition, although not exhaustive, indicates that the shape and number of teeth on both the premaxilla and dentary can be useful identification characters for some species. When available, we usually examined at least four specimens including several of the larger individuals. Number of teeth typically increases with size in species with relatively high numbers of teeth, but less so in species with lower numbers of teeth. Differences in the relative number of outer premaxillary teeth appear to be useful in distinguishing some species. For example, values for *Owstonia taeniosoma* (with SL in mm followed, in parentheses, by number of outer premaxillary teeth) are: 48 (22), 83 (22), 126 (30), 142 (38), although 169 (27) is an unexpected low number of teeth in our largest specimen, BSKU 75249. In contrast to *O. taeniosoma*, number of outer premaxillary teeth in *O. maccullochi* increases only slightly with growth: 75 (12), 84 (14), 141 (14), 145 (15). In presumably mature specimens, the range of outer premaxillary teeth is 14–45 (with >35 in only six species), that of lateral dentary teeth is 9–26 (with >23 in only two species, *O. contodon* and *O. whiteheadi*), and that of dentary symphyseal teeth is 3–6. Behind the premaxillary teeth anteriorly 0–3 usually smaller, inner teeth may also be present; behind the dentary symphyseal teeth are 0–4 inner teeth. Dentary inner teeth appear to be consistently absent in 19 species. Although difficult to quantify, there are three basic tooth shapes (which are best observed anteriorly on the dentary): conical, spike-like (in 19 species) or peg-like (shorter version of spike-like teeth, characteristic of *O. contodon*, *O. sibogae*, *O. taeniosoma* and *O. tosaensis*). *Owstonia simotera* is exceptional in having distinctly spike-like symphyseal teeth in a small individual (Fig. 9D) and caniniform symphyseal teeth in the large holotype (Fig. 9E). The mid-lateral dentary teeth are longer than the others only in *O. fallax* (Fig. 10B), *O. geminata* and O. *taeniosoma* (Fig. 10K). In *O. ignota* (Fig. 10E) and *O. rhamma* (Fig. 69) the mid-lateral dentary teeth are strongly hooked.

The ecomorphology of feeding in fishes is an important and complex subject (Wainwright and Bellwood, 2002). An area of future *Owstonia* research should be a detailed study of their oral anatomy and trophic ecology, which might provide insights to their evolutionary history. Of particular interest is the function of the slender, spike-like symphyseal teeth, Figs. 9C, 9D. The shape of these relatively elongate teeth suggests that most species of *Owstonia* (see Table 3) may be detritivores, at least during some stages of their life histories. Bellwood *et al.* (2014) discussed evolutionary changes in teeth of coral reef fishes that feed directly on benthic particulate matter. It is unlikely that herbivory was an intermediate step from carnivory to detritivory in *Owstonia* because, unlike detritivorous coral reef fishes, the genus occurs predominately in the aphotic zone. The many digital radiographs and our cursory examination of the stomach contents of a couple of specimens indicate that fishes, micro-mollusks or other hard-shelled benthic invertebrates are not diet items.

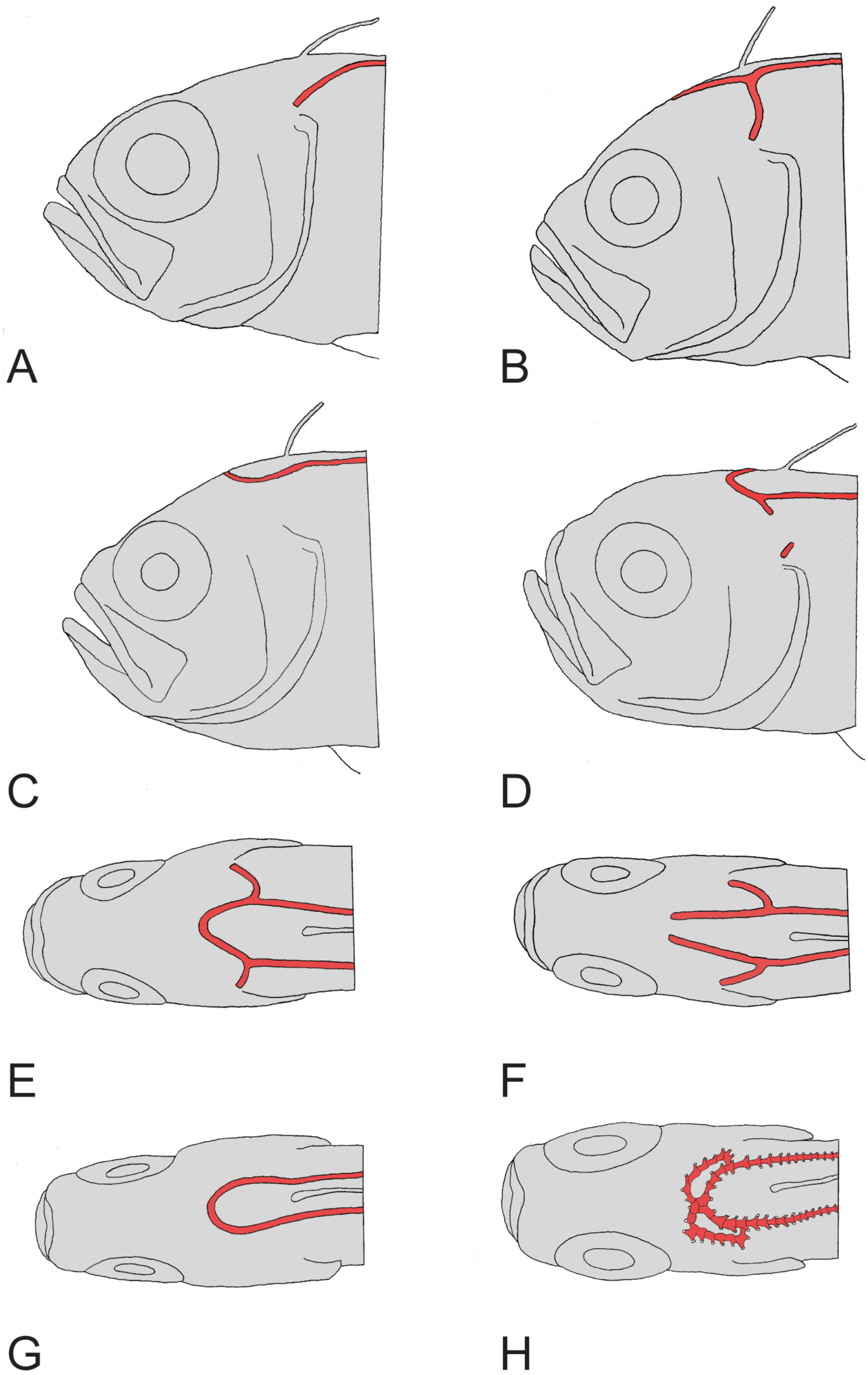

FIGURE 6. Diagrammatic illustrations of lateral-line patterns in selected species of *owstonia*: type 1 pattern: A (*O. japonica*); type 2 pattern: B, F (*O. tosaensis*), E (*O. sarmiento*); type 3 pattern: C, G (*O. maccullochi*), D (*O. nudibucca*); type 4 pattern: H (*O. weberi*). See text for detailed discussion of these patterns in owstoniines.

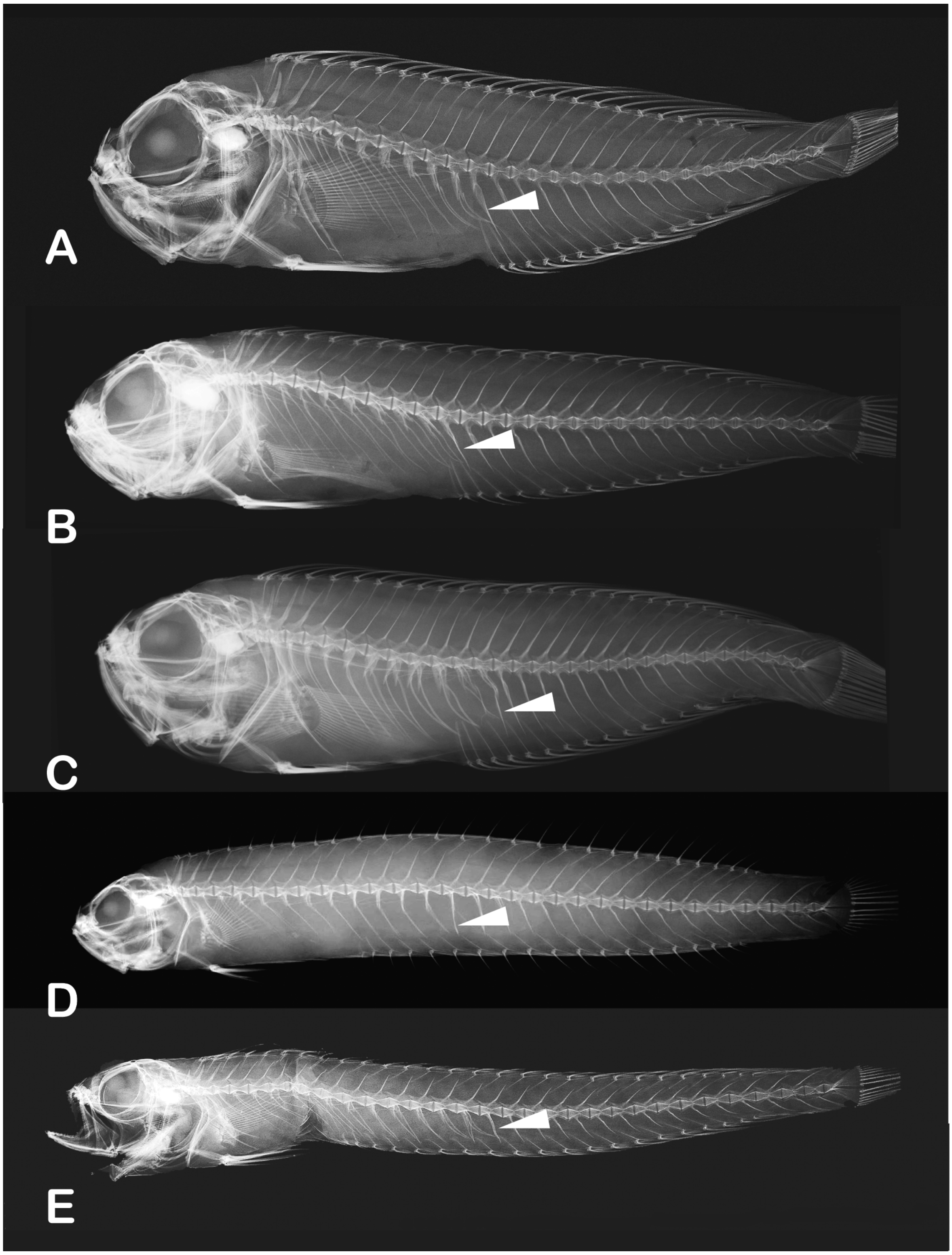

FIGURE 7. Radiographs of selected species of *Owstonia* to show number of anal-fin pterygiophores anterior to first haemal spine (indicated by white arrowhead): A, *O. japonica*, NSMT P.32720, 137 mm SL, Japan; B, *O. sarmiento*, AMS I.25826–007, 76 mm SL, eastern Australia; C, *O. tosaensis*, CSIRO H.6431–03, 155 mm SL, western Australia; D, *O. taeniosoma*, BSKU 75249, 169 mm SL, Japan; E, *O. elongata*, MNHN 2014–29345, 111 mm SL, New Caledonia. Number of anterior anal-fin pterygiophores in these specimens are: A = 2, B = 3, C = 4, D = 6 and E = 8.

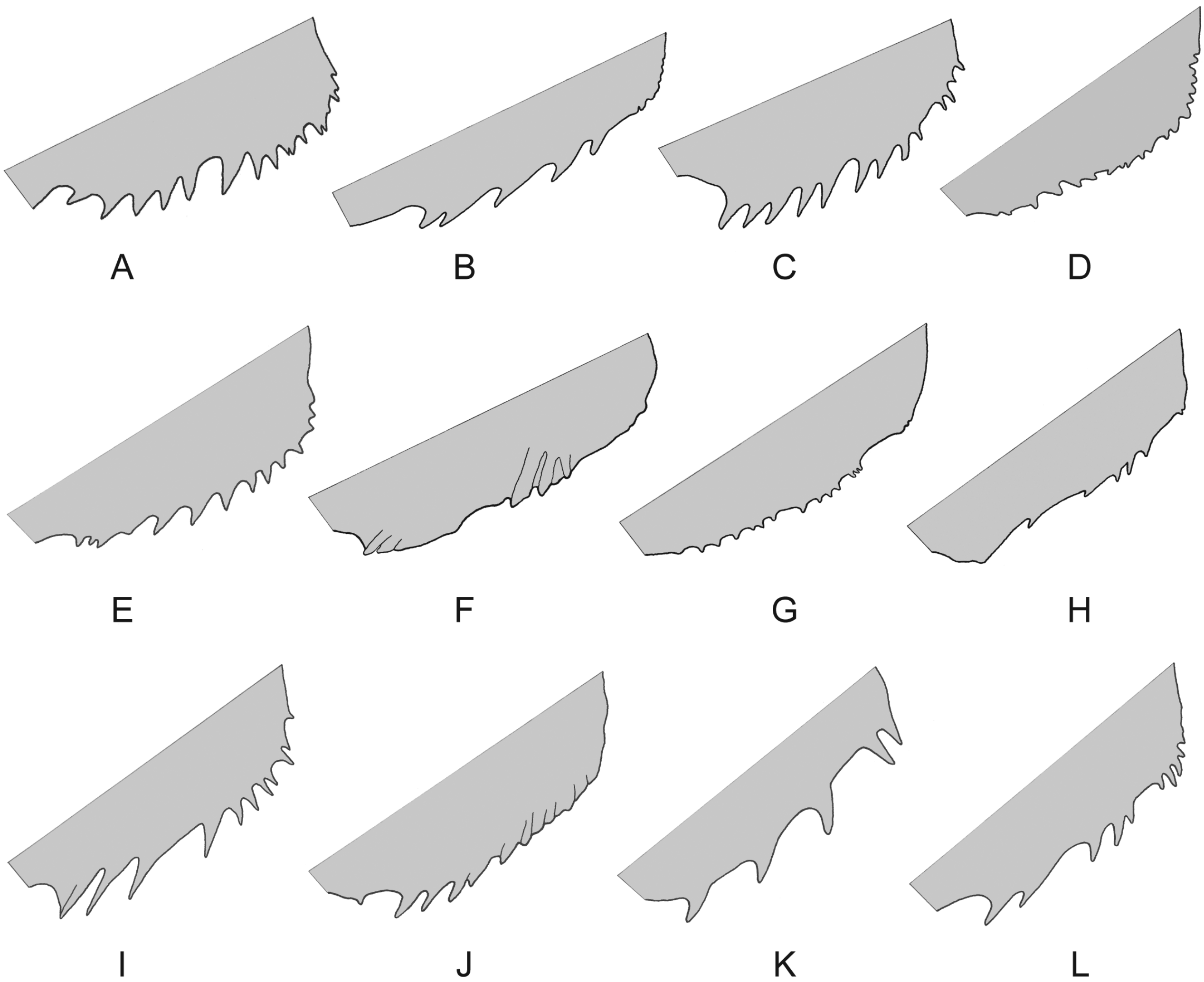

FIGURE 8. Margins of preopercle lower limb (not drawn to scale), showing relative spine development in selected species of *Owstonia*: A, *O. contodon*, USNM 438013, 162 mm SL; B, *O. elongata*, USNM 432454, 110 mm SL; C, *O. geminata*, ASIZP 68128, 79 mm SL; D, *O. maccullochi*, holotype (right side reversed), AMS IA.5815, 156 mm SL; E, *O. maccullochi*, NTM S.11765–001, 146 mm SL; F, *O. rhamma*, holotype, MNHN 1995–0005, 102 mm SL; G, *O. sarmiento*, ANSP 165126, 82 mm SL; H., *O. scottensis*, CSIRO H.7136–04, 103 mm SL; I, *O. sibogae*, ANSP 152035, 113 mm SL; J, *O. taeniosoma*, CAS 133928, 126 mm SL; K, *O. tosaensis*, ANSP 153169, 100 mm SL; L, *O. weberi*, ZMUC P.531552, 127 mm SL.

Scales. Several authors (Myers, 1939; Prokofiev, 2010) have commented on owstoniine cycloid scales, which have weak creulations to strongly scalloped projections that usually form points on their apical border (Fig. 11). We have not made a detailed survey of these structures, which are present in all species. However, their distributions and relative development may possibly be species specific. Scale crenulae are absent on the majority of scales of *O. maccullochi*, relatively short but present on most of scales of *O. crassa. Owstonia sibogae* and *O. taeniosoma* have some scales that are strongly scalloped but these scales are not uniformly distributed.

The number of oblique body scale rows in the mid-lateral series ranges from about 25 to 108. The number of scale rows is not strongly correlated with body elongation, *e.g.* the two species with the fewest number of scales, *Owstonia elongata* and *O. sarmiento*, have very different body shapes. Cheek scale rows (Fig. 12) range from 2 to 12 but because of their irregularity and the tendency for some cheek scales to frequently be lost in trawl specimens, these counts are often difficult to make. Two species, *O. totomiensis* and *O. nudibucca*, lack cheek scale rows, although 1 or 2 isolated scales may be present.

Papillae in slight depression behind tip of premaxillary ascending processes (Figs. 13, 14). There are some obvious differences in the number and arrangement of these papillae, although strong magnification and illumination and careful manipulation are required to observe them. Submersion in alcohol also facilitates observation of papillae. Most species have 4 papillae arranged in two rows, although the spacing of the papillae and their shapes vary from bluntly rounded (Figs. 13, 14E) to strongly tapered in *O. mundyi*, (Fig. 14D). *Owstonia totomiensis* is unique in having a straight posterior row of about 8−10 small papillae flanked anteriorly by an irregular cluster of 18−20 papillae (Fig. 14F).

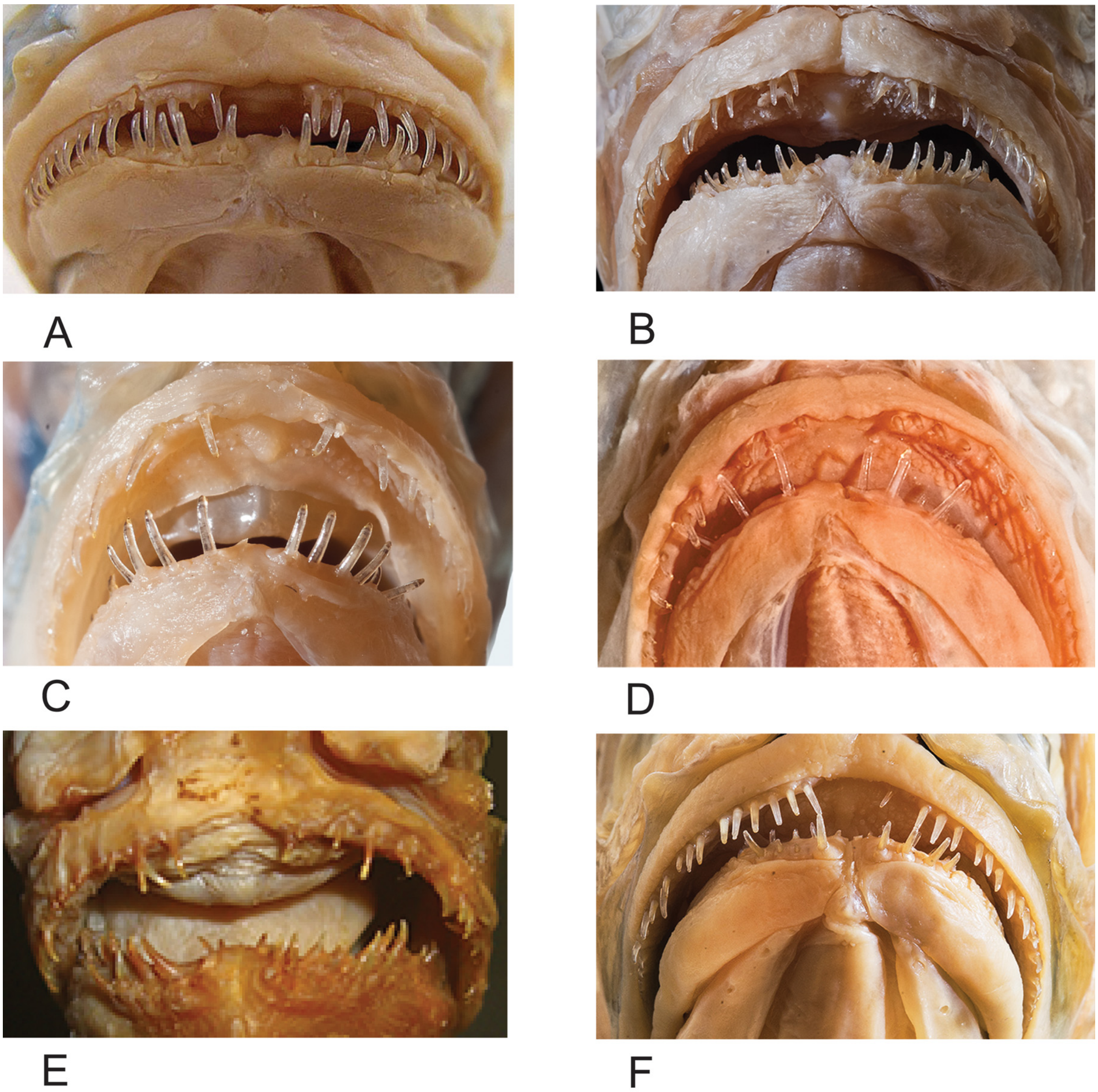

FIGURE 9. Frontal view of teeth in selected species of *Owstonia* (note widely spaced, spike-like, symphyseal, dentary teeth in C and D): A, *O. ainonaka*, AMS I.33437–002, 213 mm SL; B, *O. kamoharai*, CSIRO 3596, 282 mm SL; C, *O. psilos*, NTM S.12608–002, 75 mm SL; D, *O. simotera*, USNM 276514, 65 mm SL; E, *O. simotera*, SAIAB 605, 298 mm SL (photo by Ofer Gon, © SAIAB); F, *O. weberi*, ANSP 146627, 317 mm SL.

Pigmentation of membrane connecting maxilla, premaxilla and dentary (Fig. 15). Most cepolids (both subfamilies) have the membrane connecting the maxilla and premaxilla darkly and conspicuously pigmented (herein referred to as a premaxillary stripe). A similar stripe also occurs in several other percoid families that occupy burrows or holes. The stripes in *Owstonia* are not sexually dimorphic as in some jawfishes (Opistognathidae). A premaxillary stripe is present in most species of *Owstonia* but in three species it is usually (*O. psilos*) or consistently absent (*O. hawaiiensis* and *O. ignota*). In most species the "stripe" is continuous to near the anterior end of the premaxilla (Figs. 15A, 15B), but in *O. sibogae* (Fig. 15C) and *O. taeniosoma* the stripe extends only about 1/2 the premaxillary length, 3/4 the length in *O. similis,* and in *O. elongata* the stripe length is variable, ranging from about 3/4 of the premaxilla length to its entire length (in the holotype). In *O. ainonaka* (Fig. 15D) and a few specimens of *O. kamoharai* the stripe is mottled and consists of several irregular dark blotches.

TABLE 3. Numbers of teeth and types of dentary symphyseal teeth in species of *Owstonia*.[1]

Species	No. specimens examined[2]	SL range (mm)	Premaxillary outer teeth	Premaxillary inner teeth	Dentary lateral teeth[3]	Dentary inner teeth	Dentary Symphyseal teeth	Dentary Symphyseal teeth type
ainonaka	1	213	19–22	2–3	8–9	3	4–5	spike-like
contodon	7	145–303	27–33	0	18–25	2–4	4–6	peg-like
crassa	6	78–190	15–22	2	8–12	1–2	3–5	spike-like
dispar	1	82	14	0	10–12	1	3	spike-like
doryptera	1	65	16–18	0	9	1	5–6	spike-like
elongata	5	87–111	18–27	0	12–20	3–4	4–5	conical
fallax	2	96–110	31–34	0	16–19	4	6	conical
geminata	3	55–79	22–31	0	14–19	1	2–3	conical
grammodon	4	67–127	33–39	1–2	15–18	2–4	3–4	conical
hastata	2	124–133	20–21	0	10–14	2–3	4–5	conical
hawaiiensis	1	124	34–35	2–3	15	3	3–4	conical
ignota	1	118	38–39	2–3	15–16	3	3–4	conical
japonica	7	127–174	14–23	1–2	8–12	1–3	4–6	conical
kamoharai	7	122–408	15–24	0–3	8–14	1–2	4–7	spike-like
lepiota	1	58	15–17	0	8	1	3	conical
maccullochi	11	84–213	12–18	0–2	7–11	0–2	3–4	spike-like
macrophthalma	2	49–67	28–37	0–1	19–23	0–2	2–3	spike-like
melanoptera	1	116	18–19	0–1	14–15	1	3–4	spike-like
merensis	1	56.5	9–14	0	8–9	1	3–4	spike-like
mundyi	3	121–128	19–24	1–2	9–15	2–3	2–3	conical
nalani	3	45–54	20–25	0	10–16	0–2	4	spike-like
nigromarginata	2	65–68	15–18	1–2	9	1–2	3–4	spike-like
nudibucca	3	93–288	17–23	0	12–17	1–2	3–5	spike-like
psilos	8	64–180	15–24	0–1	7–12	1–2	3–5	spike-like

……*continued on the next page*

TABLE 3. (Continued)

Species	No. specimens examined[2]	SL range (mm)	Premaxillary outer teeth	Premaxillary inner teeth	Dentary lateral teeth[3]	Dentary inner teeth	Dentary Symphyseal teeth	Dentary Symphyseal teeth type
raredonae	1	97	35	2	19–20	1	4	conical
rhamma	2	50–102	14–22	0–2	11–12	1–2	3–4	conical
sarmiento	4	58–84	18–28	0	10–12	0–1	3–5	spike-like
scottensis	5	70–110	12–20	0	9–15	0–3	3–4	spike-like
sibogae	8	82–156	29–41	0	15–26	5–6	1–4	peg-like
similis	1	89	10–13	0	8–10	1	3	spike-like
simotera[4]	2	65–298	14–23	0	8–10	1	3–?	spike-like[4]
taeniosoma	5	83–169	22–38	0	13–23	1–3	4–6	peg-like
tosaensis	6	148–228	20–28	0–1	10–18	1–2	3–6	peg-like
totomiensis	3	134–285	14–21	0–1	7–15	1–2	4–7	spike-like
weberi	11	49–317	15–21	0	12–19	1–2	4–5	spike-like
whiteheadi	2	144–158	39–45	0	21–26	0–1	5–6	spike-like

[1]See text discussions of teeth in Materials and methods and general section on dentition.

[2]Tooth count ranges for single specimens are based on bilateral tooth counts.

[3]Dentary lateral tooth counts do not include symphyseal teeth.

[4]Dentary symphyseal teeth are spike-like only in 65 mm SL specimen, compare Figs. 9D and 9E.

TABLE 4. Frequency distributions of dorsal-, anal- and pectoral-fin rays in species of *Owstonia*.

	Dorsal fin										Anal fin											Pectoral fin[1]						
	Spines		Soft rays								Spines		Soft rays									rays						
Species	III	IV	19	20	21	22	23	24	25	26	I	II	11	12	13	14	15	16	17	18	19	17	18	19	20	21	22	23
ainonaka	1				1						1				1												2	
contodon		8					8				8							8							10	6		
crassa	7		1	5	1						7			1	6										10	4		
dispar	2				2						2					2										1	1	2
doryptera	2				2						2					2										3	1	
elongata	–	11						2	8	1	10	1							1	4	6	10	9	3				
fallax	–	2				1	1				2							2							4			
geminata	–	3					1	2			3							2	1			5	1					
grammodon	5			4	–	1					5				5									5				
hastata	–	2				2					–	2				2									3	1		
hawaiiensis	1		1								1				1									2				
Hawaiian larvae	6		2	4							6			1	5							X	X	X	X	X	X	X
ignota	1			1							1				1										2			
japonica	13				13						13				1	12									8	11	6	
kamoharai[2]	14				13	1					14				1	13									1	8	17	8
lepiota	1						1				–	1					1							2				
maccullochi	24				1	23					24					2	21	1						2	10	31	2	
macrophthalma	–	2				1	1				2								1	1					1	3		
melanoptera	1				1						1					1											2	
merensis	1			1							–	1	1												2			
mundyi	3						3				3						1	2				2	3					
nalani	3					3					–	3				3							2	2	–	2		
nigromarginata	2				2						2				2									1	3			
nudibucca	3				3						3					3										2	4	
psilos	10				10						10					10										3	9	9
raredonae	1		1								1			1										2				
rhamma	2				2						2					2								2	–	1	–	1
sarmiento	25					23	1	1			–	25				25						3	13	10	4			
scottensis	5				5						5					4	1									7	2	
sibogae	–	19					18	1			–	19					2	15	2				6	21	3			
similis	1				1						1					1										1	1	
simotera	2				2						2					2										2	2	
taeniosoma	9								1	8	9									8	2	5	9	1				
tosaensis	12						10	2			12						2	10						1	14	7		
totomiensis	5			1	4						5				1	4									3	5		
weberi	39			3	35	1					39				4	35								4	21	9		
whiteheadi[2]	–	6			1	4	1				6						1	5						5	3			

[1]Both fins counted separately.

[2]Includes counts of 6 type specimens given in the original description.

TABLE 5. Frequency distributions of vertebral counts and anterior anal-fin pterygiophore positions in species of *Owstonia*.

	Vertebrae																Pterygiophores anterior to 1st haemal spine						
	Precaudal						Caudal			Total													
Species	11	12	13	14	15	16	16	17	18	27	28	29	30	31	32	33	2	3	4	5	6	7	8
ainonaka	1							1			1						1						
contodon	8								8			8						8					
crassa	7							7			7						7						
dispar	2							2			2						2						
doryptera	2							2			2						2						
elongata						11	11								11								11
fallax			2					2					2							2			
geminata			3					3					3							3			
grammodon	3	2					2	3			5							3	2				
hastata			2					2					2							2			
hawaiiensis	1							1			1							1					
Hawaiian larvae	6							6			6							1	5				
ignota	1							1			1							1					
japonica	13							13			13						13						
kamoharai[1]	14							13	1		13	1					10						
lepiota	1								1			1						1					
maccullochi	23	1					1	23			24						19	5					
macrophthalma	2								2			2						2					
melanoptera	1							1			1						1						
merensis	1							1			1						1						
mundyi	3								3			3						3					
nalani	3								3			3						3					
nigromarginata	1							1			1						1						
nudibucca	3							3			3						3						
psilos	10							10			10						10						
raredonae	1						1			1								1					
rhamma	2							2			2						2						
sarmiento	21	3						4	20		1	23						24					
scottensis	5							5			5						4	1					
sibogae		19						19				19							19				
similis	1							1			1						1						
simotera	2							2			2						2						
taeniosoma					9		6	2	1					6	2	1					3	6	
tosaensis		6	6					8	4			2	10						5	7			
totomiensis	5							5			5						5						
weberi	37						1	36		1	36						37						
whiteheadi	2								2			2					2						

[1]Includes vertebral counts given in original description for 6 type specimens of *Owstonia kamoharai*.

TABLE 6. Frequency distributions of upper and lower limb gill rakers in species of *Owstonia*.

		Upper limb gill rakers										Lower limb gill rakers																					
Species	SL range mm	10	11	12	13	14	15	16	17	18	19	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	mean
ainonaka[1]	213						2												1	1													26.5
contodon	145-303							3	4	1															1	1	4	2					33.9
crassa	78–190				1	4	2										1	3	2	1													25.4
dispar[1]	82						2														1	1											28.5
doryptera	56–65							2											1	1													26.5
elongata	55–111						4	3											1	1	3	–	2										28.1
fallax[1]	96–110						1	3													1	3											28.8
geminata[1]	55-79					4	1	1											2	2	1	1											27.2
grammodon	50.5–127		2	–	2	1									1	1	1	1	1														24.0
hastata	124–133							2														1	1										29.5
hawaiiensis[1]	124						2														2												28.0
ignota[1]	118					2														2													27.0
japonica	88–174				1	2	5	5											2	1	1	5	3	1									28.7
kamoharai[2]	122–408				8	5	1									1	4	7	2														24.5
lepiota	58			1									1																				20.0
maccullochi	75–213						2	1	5	6	5											1	–	3	3	6	2	4					32.8
macrophthalma[1]	49–67							4																		2	2						33.5
melanoptera[1]	116				1	1												2															25.0
merensis	56.5				1												1																24.0
mundyi	121–128			1	2											2	1																23.3
nalani	54		1									1																					19.0
nigromarginata	65–68					1	–	1											1	–	1												27.0
nudibucca[1]	93-288							1	1	4										1	–	2	–	1	2								30.0
psilos	64–180			2	6	2											1	6	2	1													25.3
raredonae[1]	97					2											1	1															24.5
rhamma	50–102						1	1														1	1										29.5
sarmiento	44–84			2	4	3	1										2	3	3	2													25.5
scottensis	70–108						3	2										1	–	4													26.5
sibogae	58–156					2	3	7	–	1										1	2	3	2	3	2								29.8
similis[1]	89	2													1	1																	22.5
simotera[1]	65–298			2	2									1	1	–	2																22.7
taeniosoma	83–169			2	2	2											2	1	3														25.2
tosaensis	100–228						1	4	3	4											1	1	5	4	–	1							30.3
totomiensis[1]	134–306					4	–	3	–	1										1	7												27.9
weberi	49–317						5	6	2	1										1	2	5	2	3	1								29.5
whiteheadi[3]	144–360						1	2	1	1	1																	2	3	–	–	1	36.2

[1]Bilateral counts.

[2]Includes counts of Endo *et al.* (2015).

[3]Includes counts of Talwar (1972).

TABLE 7. Frequency distributions of total gill rakers in species of *Owstonia*.

		3										4										5										6		
Species	SL range mm	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	n	mean
ainonaka[1]	213												1	1																			2	41.5
contodon	145–303																			1	–	3	2	1	1								8	50.6
crassa	78–190										3	3	–	1																			7	39.9
dispar[1]	82														1	–	1																2	44.0
doryptera	56–65													1	1																		2	42.5
elongata	55–111												1	1	2	1	–	2															7	43.6
fallax[1]	96–110															2	2																4	44.5
geminata[1]	55–79											2	2	–	–	2																	6	41.7
grammodon	50.5–127						3	1	–	–	–	1																					5	36.2
hastata	124–133																1	1															2	45.5
hawaiiensis[1]	124														2																		2	43.0
ignota[1]	118												2																				2	41.0
japonica	88–174												1	2	3	3	2	2															13	43.7
kamoharai[2]	122–408							1	4	2	5	2																					14	38.2
lepiota	58			1																													1	32.0
maccullochi	75–213																1	1	1	1	2	7	1	–	4	2							20	50.3
macrophthalma[1]	49–67																				2	2											4	49.5
melanoptera[1]	116									1	1																						2	38.5
merensis	56.5								1																								1	37.0
mundyi	121–128							3																									3	36.0
nalani	54	1																															1	30.0
nigromarginata	65–68											1	–	–	–	1																	2	42.0
nudibucca[1]	93–288															1	1	–	1	–	1	2											6	47.5
psilos	64–180								3	2	4	1																					10	38.3
raredonae[1]	97									1	1																						2	38.5
rhamma	50–102																2																2	45.0
sarmiento	44–84							1	2	–	4	2	1																				10	38.7
scottensis	70–108											1	–	2	2																		5	42.0
sibogae	58–156												1	1	–	1	3	3	2	2													13	45.4
similis[1]	89			1	1																												2	32.5
simotera[1]	65–298				1	1	–	–	2																								4	35.3
taeniosoma	83–169							1	1	2	–	2																					6	38.2
tosaensis	100–228															1	4	–	1	3	–	1											10	46.5
totomiensis[1]	134–306													2	2	1	2	1															10	43.8
weberi	49–317													1	1	2	5	–	3	1	1												14	42.4
whiteheadi[3]	144–360																					1	–	–	–	3	–	1	–	–	–	1	6	54.7

[1]Bilateral counts.

[2]Includes counts of Endo *et al*. (2015).

[3]Includes counts of Talwar (1972).

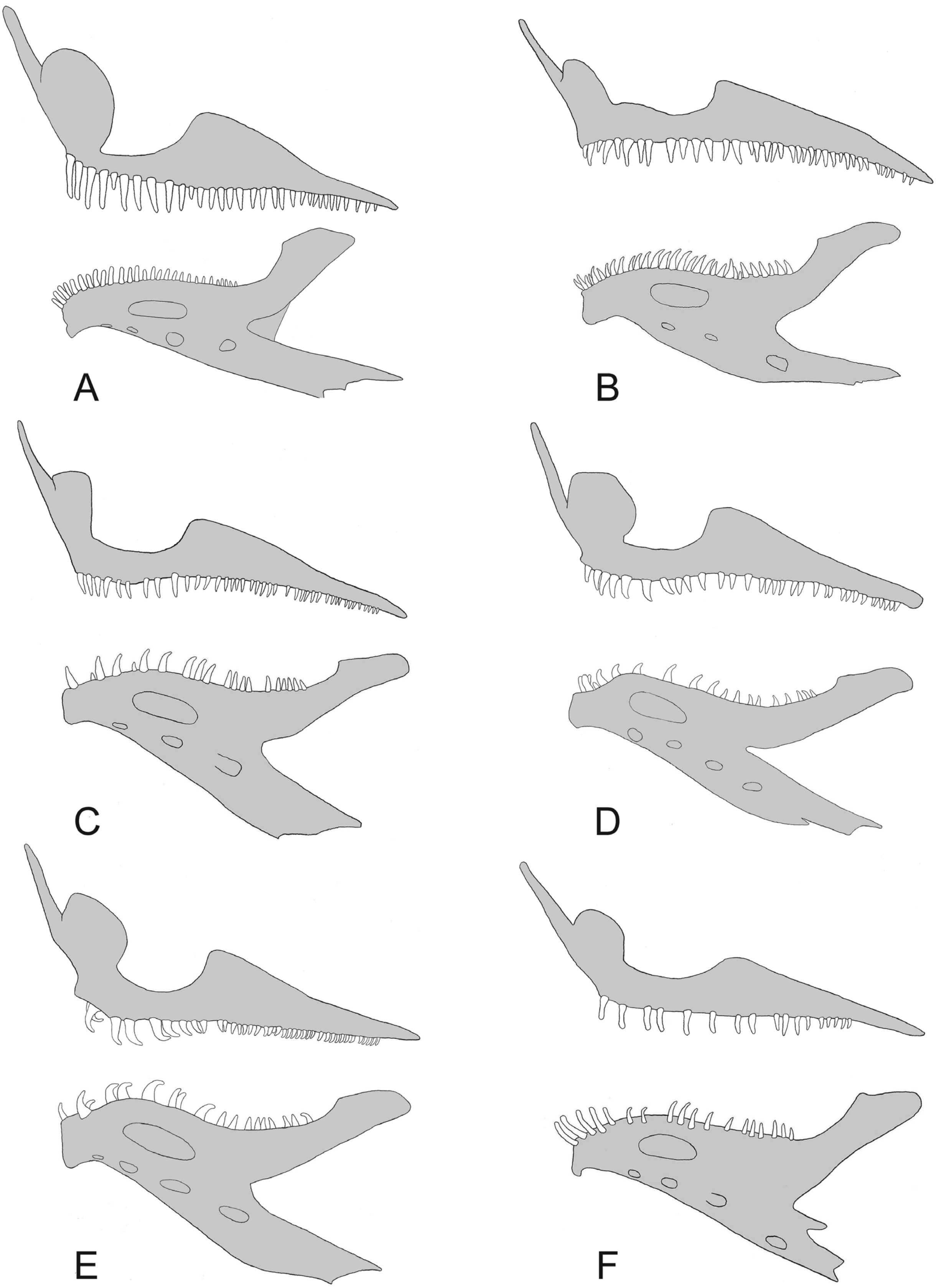

FIGURE 10. Premaxilla and dentary (mostly right side reversed) to show dentition in selected species of *Owstonia*. A, *O. contodon*, USNM 438013, 162 mm SL; B, *O. fallax*, CSIRO H.763–06, holotype, 110 mm SL; C, *O. grammodon*, USNM 149321, 127 mm SL; D, *O. hawaiiensis*, BPBM 29600, holotype, 124 mm SL; E, *O. ignota*, USNM 344400, holotype, 118 mm SL; F, *O. japonica*, ANSP 151948, 136 mm SL.

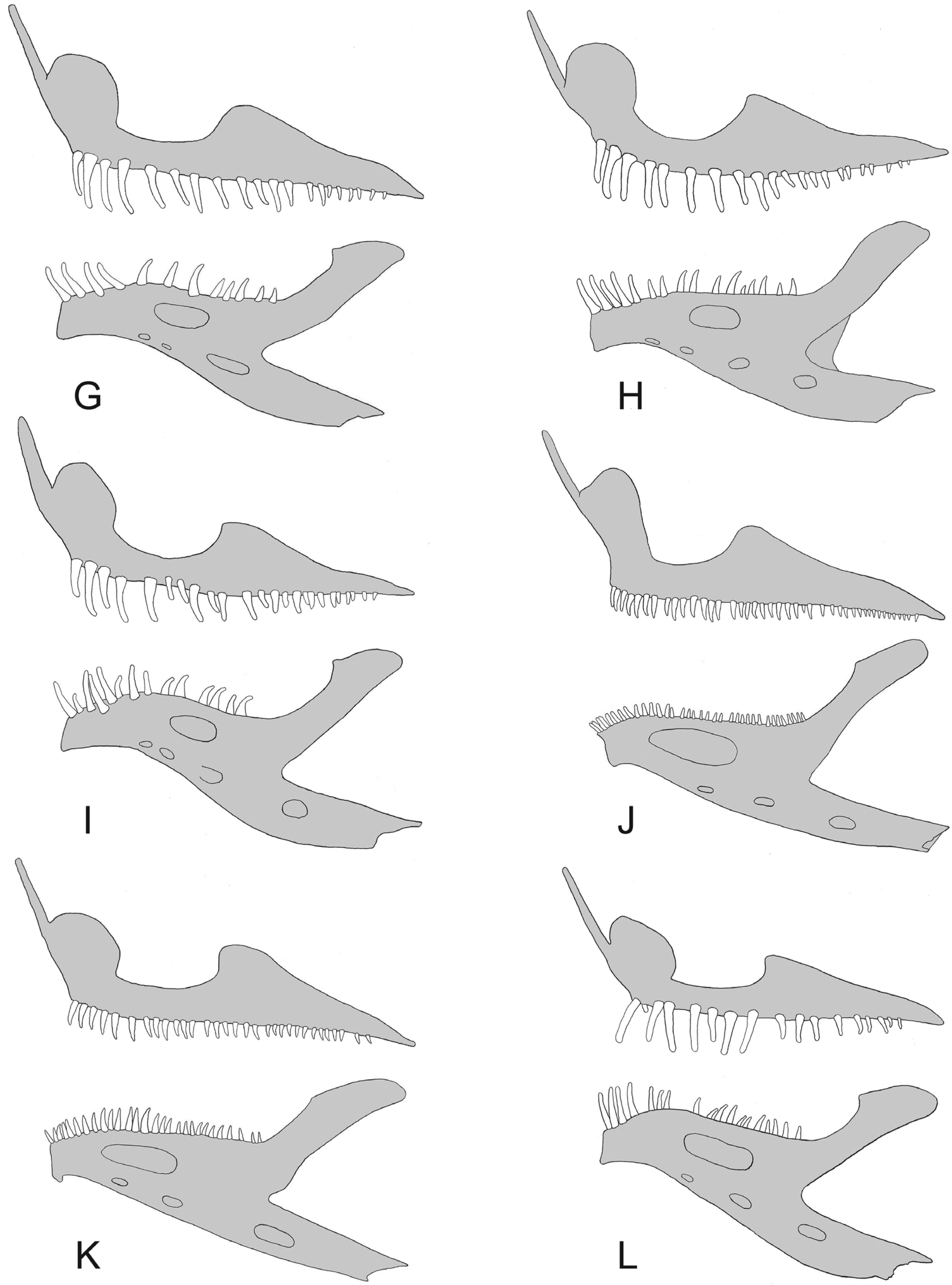

FIGURE 10. (Continued). G, *O. kamoharai*, NTM S.12631–017, 122 mm SL; H, *O. melanoptera*, AMS I.36454–005, holotype, 116 mm SL; I, *O. psilos*, NMV A.29733–007, 125 mm SL; J, *O. sibogae*, ANSP 152035, 123 mm SL; K, *O. taeniosoma*, CAS 1 33928, 126 mm SL; L, *O. weberi*, USNM 410299, 118 mm SL.

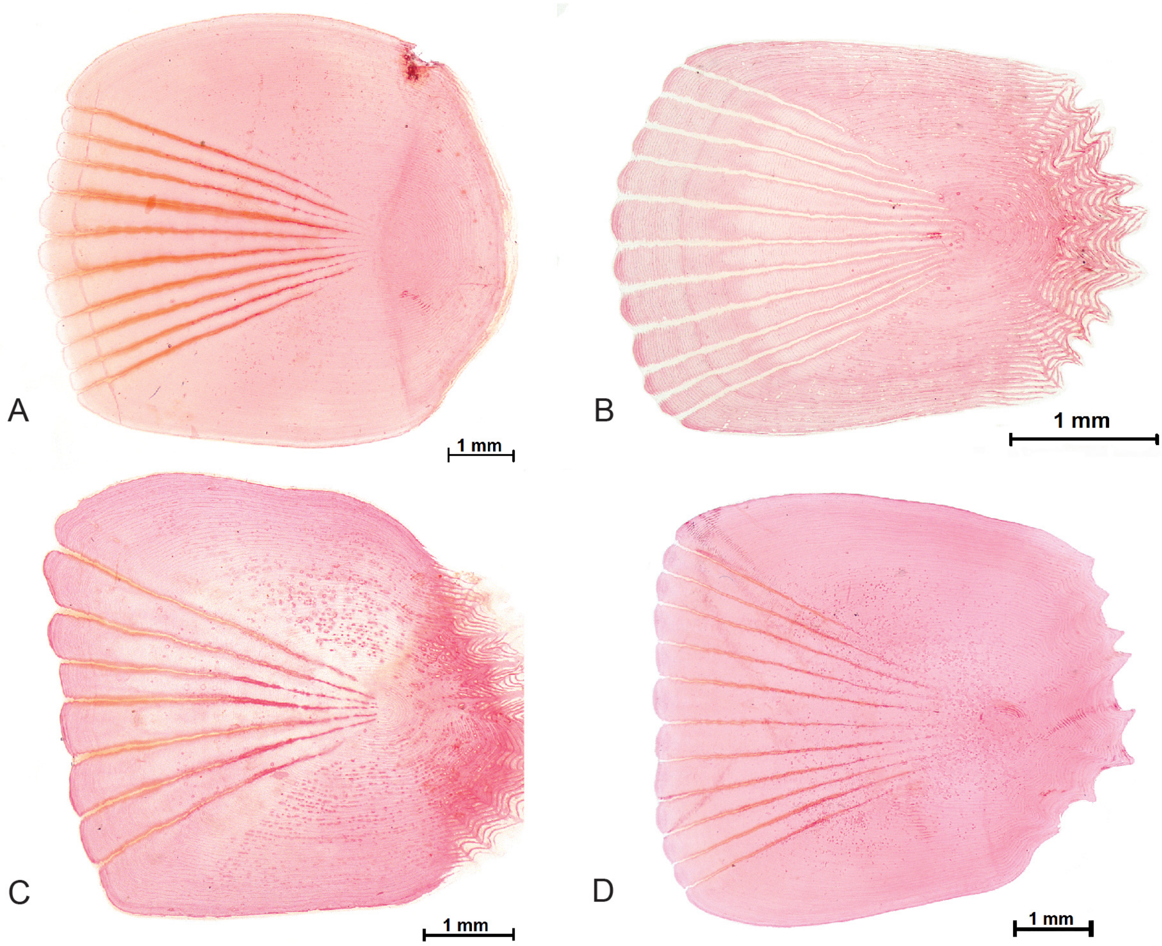

FIGURE 11. Body scale removed from left side just posterior to pectoral fin in selected species of *Owstonia*: A, *O. maccullochi*, AMS I. 37598–007; B, *O. melanoptera*, AMS I.36454; C, *O. taeniosoma*, CAS 133928; D, *O. weberi*, AMS I.28137–003.

The inner membrane covering the posterior part of the dentary is also darkly pigmented in most species of *Owstonia* but is unpigmented in *O. geminata*, *O. grammodon*, *O. hawaiiensis*, *O. ignota*, *O. melanoptera*, *O. merensis*, *O. psilos*, *O. rhamma,O. similis,* and the holotype of *O. fallax*.

Pigmentation of dorsal fin. Conspicuous black blotches (or distal stripes*) are present on the dorsal fin in small individuals of *O. crassa*, *O. doryptera**, *O. merensis*, *O. nigromarginata**, *O. nudibucca*, *O. psilos*, *O. similis*, and *O. simotera* but are absent in presumed adults of at least 24 species. The 116 mm SL holotype, and only known specimen, of *O. melanoptera* retains prominent black pigment in the dorsal fin, and traces of a blotch are also present in the smallest (147 mm SL) paratype of *O. kamoharai*. In life, adults of *O. japonica*, *O. simotera*, *O. nudibucca* and *O. totomiensis* usually have dark red, interradial markings or a distal stripe anteriorly on the dorsal fin, but these are not apparent in preserved specimens.

Recognition of owstoniine genera. Gilchrist (1922) compared *Parasphenanthias* only with *Sphenanthias* Weber, and distinguished his new genus primarily on the basis of its low number of dorsal-fin spines. He believed, based on Weber's (1913) erroneous description and poor drawing of *S. sibogae*, that it had nine spines. Weber's error undoubtedly was attributable to the fact that the dorsal-fin soft rays (like the spinous rays) are all very slender in *Owstonia* (and in other cepolids), and many of the anterior rays are unbranched or very weakly branched only at their tips. Unless particular attention is given to whether these soft rays are segmented (or the configuration of their serially associated distal radials can be observed, *e.g.*, in a radiograph), some of them could be easily miscounted as spines. Weber and de Beaufort (1931:115) subsequently opined that even the taxonomic position of *Sphenanthias sibogae* as a member of the Owstoniidae was doubtful. Fowler (1934b) assigned *Parasphenanthias* to the Pseudochromidae, although Barnard (1927:492) had previously synonymized it with *Owstonia* in the Owstoniidae. Fowler (1934a) described two new owstoniine genera, *Loxopseudochromis* and *Opispseudochromis*, based primarily on differences in dentition of single species, but did not differentiate either genus from any other genera. *Pseudocepola* was established by Kamohara (1935) for his new species *P. taeniosoma* based on its elongate body, large scales, and the mistaken belief that *Sphenanthias* had nine dorsal-fin spines. *Owstonia elongata* agrees with *O. taeniosoma* in having large scales, a very elongate body and a high number of vertebrae; however, *O. sarmiento* and *O. sibogae* have similarly large scales but shorter bodies and fewer vertebrae. Although Japanese authors (Okada and Suzuki, 1956; Masuda *et al.*, 1984; Nakabo, 2002; Endo *et al.*, 2016) have continued to recognize *Pseudocepola* as a valid monotypic genus, we do not believe that the combination of characters present in *P. taeniosoma* is sufficient to justify recognition of a separate genus. It and its putative sister-species *O. elongata* appear to represent one end of a continuum of meristic values present in relatively stubby to elongate species. Myers (1939) also noted that *Owstonia taeniosoma* "is an exceedingly elongate species", but did not assign it to a separate genus. The mosaic pattern of character states in the various species of *Owstonia* would require either describing additional new genera or retaining them all in a single genus as we have done here in accord with Prokofiev (2010).

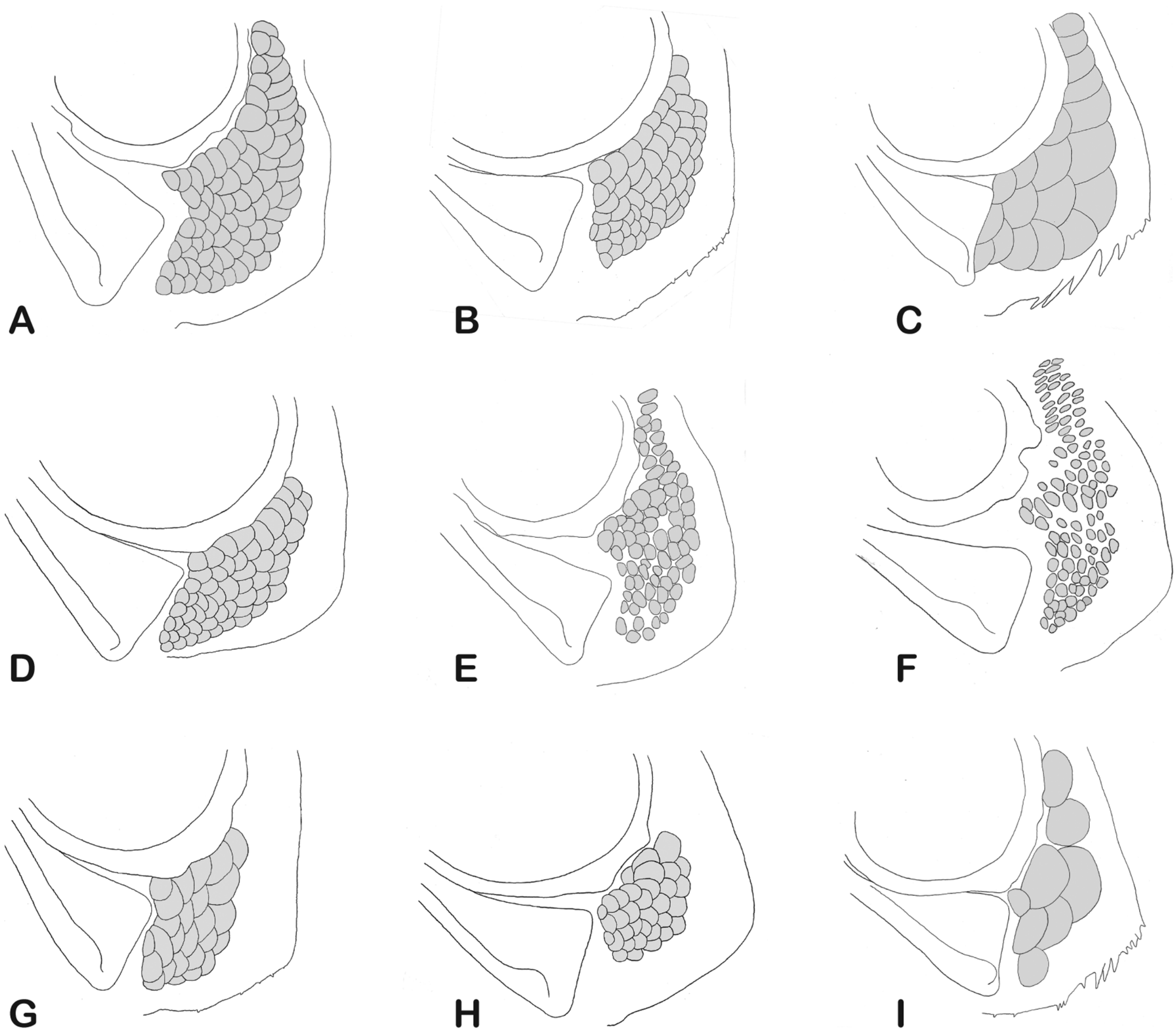

FIGURE 12. Cheek scales on left side in selected species of *Owstonia*: A, *O. ainonaka*, AMS I.33437, 213 mm SL; B, *O. doryptera*, USNM 93166, 65 mm SL; C, *O. elongata*, MNHN 2008–1350, 110 mm SL; D, *O. grammodon*, USNM 93167, 67 mm SL; E, *O. kamoharai*, NTM S.12631–017, 206 mm SL; F, *O. kamoharai*, CSIRO H.2099–007, 408 mm SL; G, *O. maccullochi*, AMS I.25806–012, 141 mm SL; H, *O. raredonae*, SAIAB 82406, 97.4 mm SL; I, *O. sibogae*, CAS 33843, 126 mm SL.

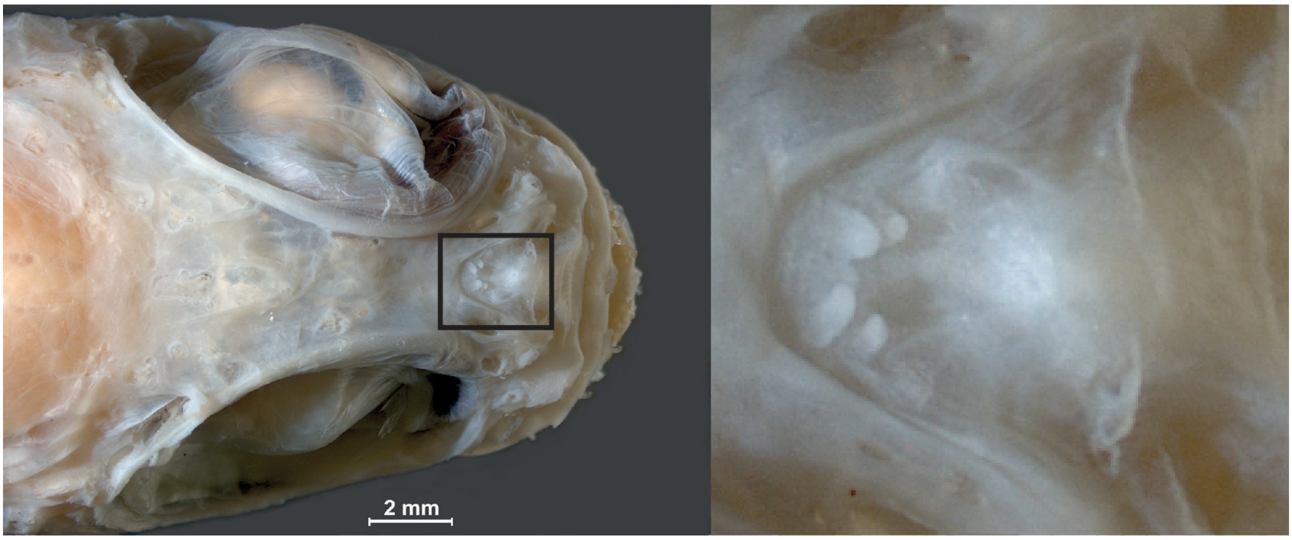

FIGURE 13. Position of slight depression at posterodorsal tip of ascending premaxillary processes (dorsal view, anterior to right) containing four papillae outlined by box in *Owstonia doryptera*, paralectotype, USNM 410302, 56.3 mm SL.

Most recent workers have followed Smith (1968) in recognizing *Owstonia* and *Sphenanthias* as separate genera solely on the basis of their different lateral-line configurations. *Sphenanthias* has the simple plesiomorphic condition (type 1 pattern) while the type species of *Owstonia*, *O. totomiensis*, has a type 3 pattern. Recognition of two genera might be reasonable if only two types of lateral-line patterns were present in the Owstoniinae. However, as discussed previously, there are at least four different lateral-line patterns, not counting additional but consistent minor variations. There is little correlation between the various lateral-line patterns and other characters, including meristic values. Other evidence that lateral-line patterns are too variable to be used to define genera of owstoniines is a specimen from Japan (CAS 133935) we identify as *O. japonica* although it has a type 3 pattern with a complete nape loop, unlike 12 other specimens of that species all with a simple type 1 pattern. For the above reasons we agree with Prokofiev (2010) that recognition of *Sphenanthias* is unjustified. If there were to be a generic classification based on lateral-line patterns, we believe it should be based on the loss of the typical posttemporal connection. We have established that there is considerable plasticity in the evolution of owstoniine lateral-line patterns, as in other fishes (see Webb, 2014), but to understand the significance of this variation studies of the ontogenetic development of the system and the underlying nerve connections are required.

Genus *Owstonia* Tanaka 1908

Owstonia Tanaka, 1908:46 (type species *Owstonia totomiensis* Tanaka 1908 by monotypy).
Sphenanthias Weber, 1913:210 (type species *Sphenanthias sibogae* Weber 1913 by monotypy).
Parasphenanthias Gilchrist, 1922:69 (type species *Paraspheniantias weberi* Gilchrist 1922 by monotypy).
Loxopseudochromis Fowler, 1934a:354 (type species *Loxopseudochromis dorypterus* Fowler 1934 by monotypy).
Opsipseudochromis Fowler, 1934a:355 (type species *Opsipseudochromis grammodon* Fowler 1934 by monotypy).
Pseudocepola Kamohara, 1935:135 (type species *Pseudocepola taeniosoma* Kamohara 1935 by original designation and monotypy.

Diagnosis. *Owstonia* differs from all other cepolids in having the dorsal and anal fins not connected to the caudal peduncle by a membrane. It also has fewer dorsal- and anal-fin ray counts, dorsal fin III-IV, 19–26 (vs. 0-III; 54–89), anal fin I-II, 11–19 (vs. 0–I, 50–101); and fewer caudal and total vertebrae 16–18 and 27–33 (vs. 40–67 and 48–79).

Description. Cepolids ranging in size as adults from about 70 (*O. sarmiento*) to 408 mm SL (*O. kamoharai*) with dorsal and anal fins not connected to caudal peduncle by a membrane; dorsal fin III-IV (2 supernumerary), 19–26; anal fin I-II (typically 1 supernumerary (Fig. 16A), except 2 in *O. sarmiento* (Fig. 16B); dorsal- and anal-fin spines and soft rays relatively thin and flexible and in some species difficult to distinguish; pectoral-fin rays 17–23; caudal fin unforked with middle rays longest and notably elongate in most species, 1.3–3.6 times in SL; principal caudal-fin rays 17 (9+8 = branched rays plus one dorsal and ventral unbranched ray); procurrent caudal-fin rays (Johnson, 1980) 2–4+2–3; procurrent spur absent (Johnson, 1975); vertebrae 11–15 precaudal, 16–18 caudal, total 27–33; supraneurals absent; first dorsal-fin pterygiophore inserted between first and second neural spines; a single postcleithrum on each side; pelvic fin I,5 without an axillary scale and the first (outermost) soft ray unbranched or only weakly branched distally; scales cycloid, variously crenulate or scalloped (Fig. 11); dorsal and anal fins without scales; cheeks naked or scaly (most species); oblique body scale rows in mid-lateral series 27–108; mouth large, oblique and terminal; maxilla exposed, without a supramaxilla, and usually with a darkly pigmented premaxillary stripe or "moustache" (absent in *O. hawaiiensis* and *O. ignota* and in most specimens of *O. psilos*); adults with 30–60 total gill rakers; branchiostegals six, branchiostegal membranes separated from each other, free from isthmus; lower limb of preopercle smooth or with weak to strong spines (Fig. 8); palatine and vomer without teeth; infraorbitals 5, including dermosphenotic, with moderate to well-developed suborbital shelf; swim bladder well developed.

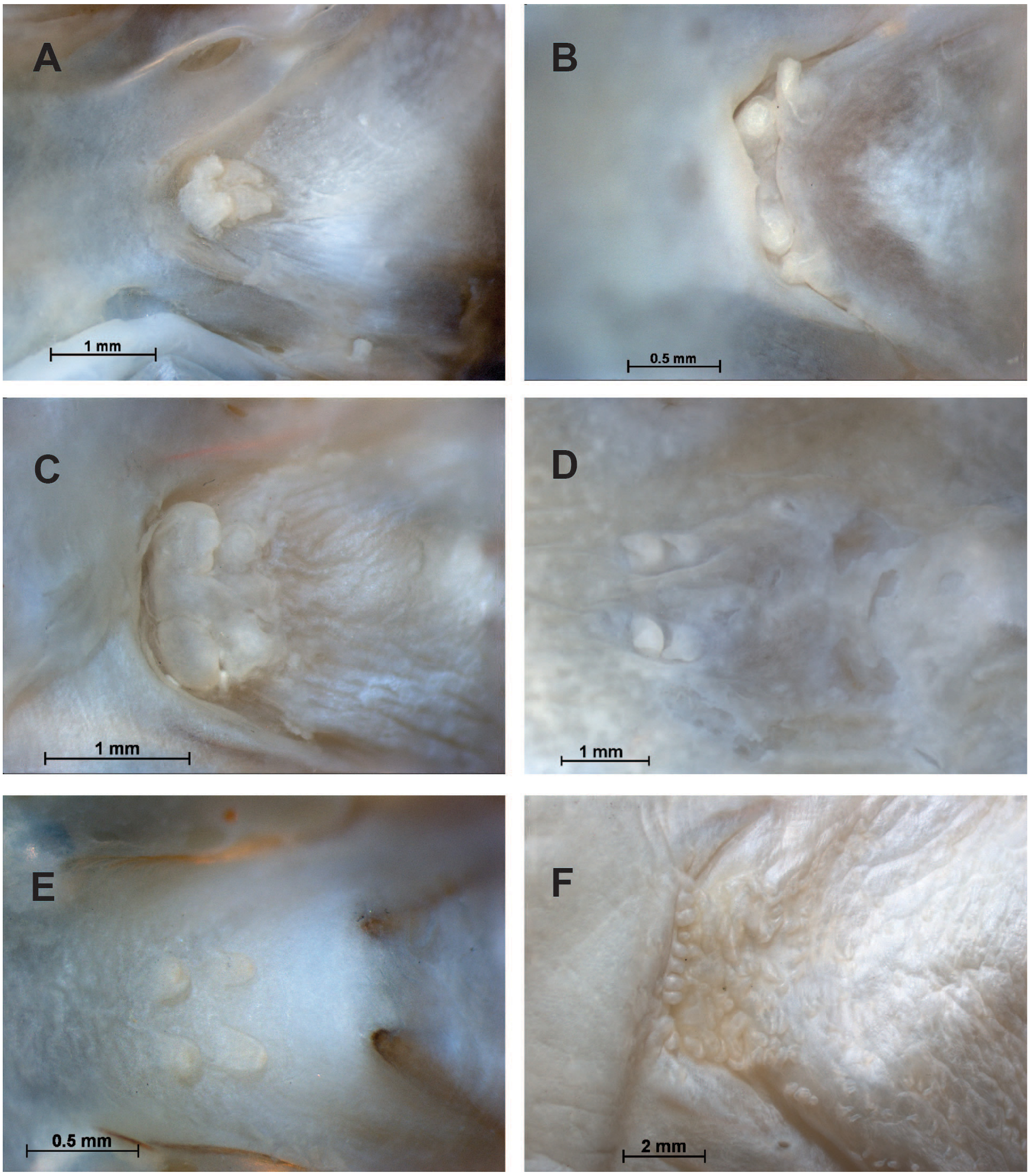

FIGURE 14. Arrangement and relative sizes of papillae in slight depression at tip of ascending premaxillary processes (dorsal view, anterior to right) in selected species of *Owstonia*: A, *O. crassa*, MNHN 2002–3720; B., *O. dispar*, MNHN 2002–3720; C, *O. maccullochi*, CSIRO H5946–20; D, *O. mundyi*, USNM 427880; E, *O. sarmiento*, NTM S.11782–001; and F, *O. totomiensis*, NSMT–P77978.

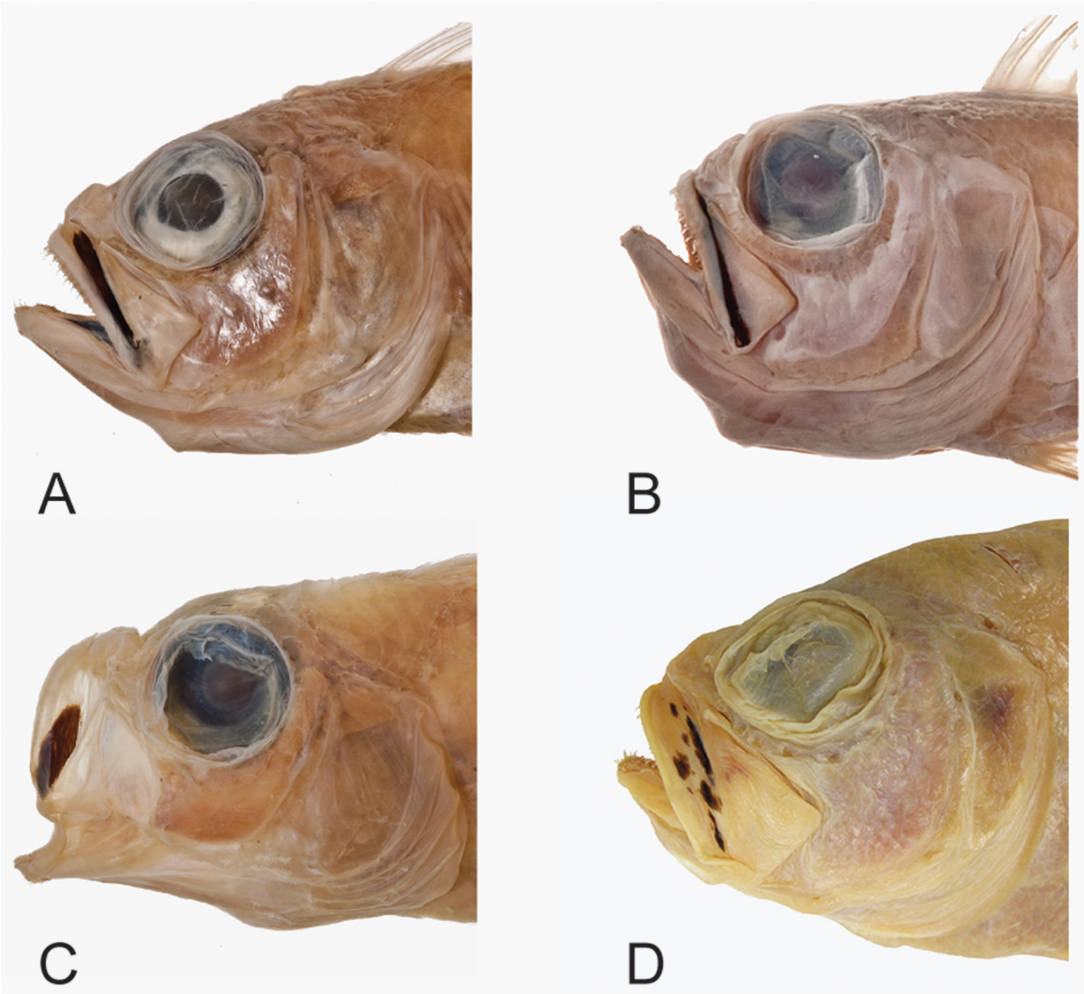

FIGURE 15. Premaxillary stripes in selected species of *Owstonia*: A, *O. hastata*, NTM S.11779–002, 124 mm SL; B, *O. nudibucca*, ANSP 151993, 224 mm SL, Mentawai Islands; C, *O. sibogae*, CAS 32914, 96 mm SL, Philippines; D, *O. ainonaka*, AMS I.33437–002, 213 mm SL. Photographs by Sandra J. Raredon.

Larvae. (Figs. 17–20) The eggs of the cepolid subfamily Cepolinae were first described and illustrated by Holt (1891, pl. XLVIII, fig. 2) based on a female *Cepola macrophthalma* (= *C. rubescens*) found in the stomach of a skate. Fage (1918, fig. 26), described and illustrated a 6 mm preflexion larva of this species from specimens collected from the Western Mediterranean and the Sea of Marmara. Clark (1920, fig. 8) described and illustrated a 7 mm preflexion specimen from off Plymouth, England, and Russell (1976, fig. 48) illustrated three early preflexion specimens, also from off Plymouth, and noted the gradual diminution of head spination in larger specimens. The most complete developmental series of cepolines, again based on *C. macrophthalma,* is the classic Italian monograph of Montalenti (1956),which was published in four parts between 1931 and 1956 (see Ahlstrom 1962). Montalenti on plate XXXIII included 14 figures, most of which were hand-colored. Cepoline larvae are characterized by distinctive features that appear early in postflexion and persist, though gradually diminishing, through transformation (Leis & Carson-Ewart 2000, fig. 67). All cepoline larvae have a prominent, median, serrate supraoccipital ridge that extends posteriorly as an elongate spine and bears a smaller spine anterior to the divergence of the former, an elongate, median, serrate spine at the angle of the preopercle with several smaller serrate spines on either side, a variously developed supracleithral spine, serrate supraocular and dentary ridges, and rugose frontals and opercles (Figs. 17–20). These features are reminiscent, to varying extents, of those seen in priacanthid and holocentrid larvae, among others (see Leis & Carson-Ewart 2000:191).

Larvae of the Owstoniinae (= *Owstonia*) are much less common in collections and were not recognized until Fourmanoir (1976) described and illustrated (Fig. 90) a 13.2 mm transforming postflexion specimen. Postflexion *Owstonia* bear no resemblance to pre- or postflexion cepolines and actually more closely resemble the larvae of

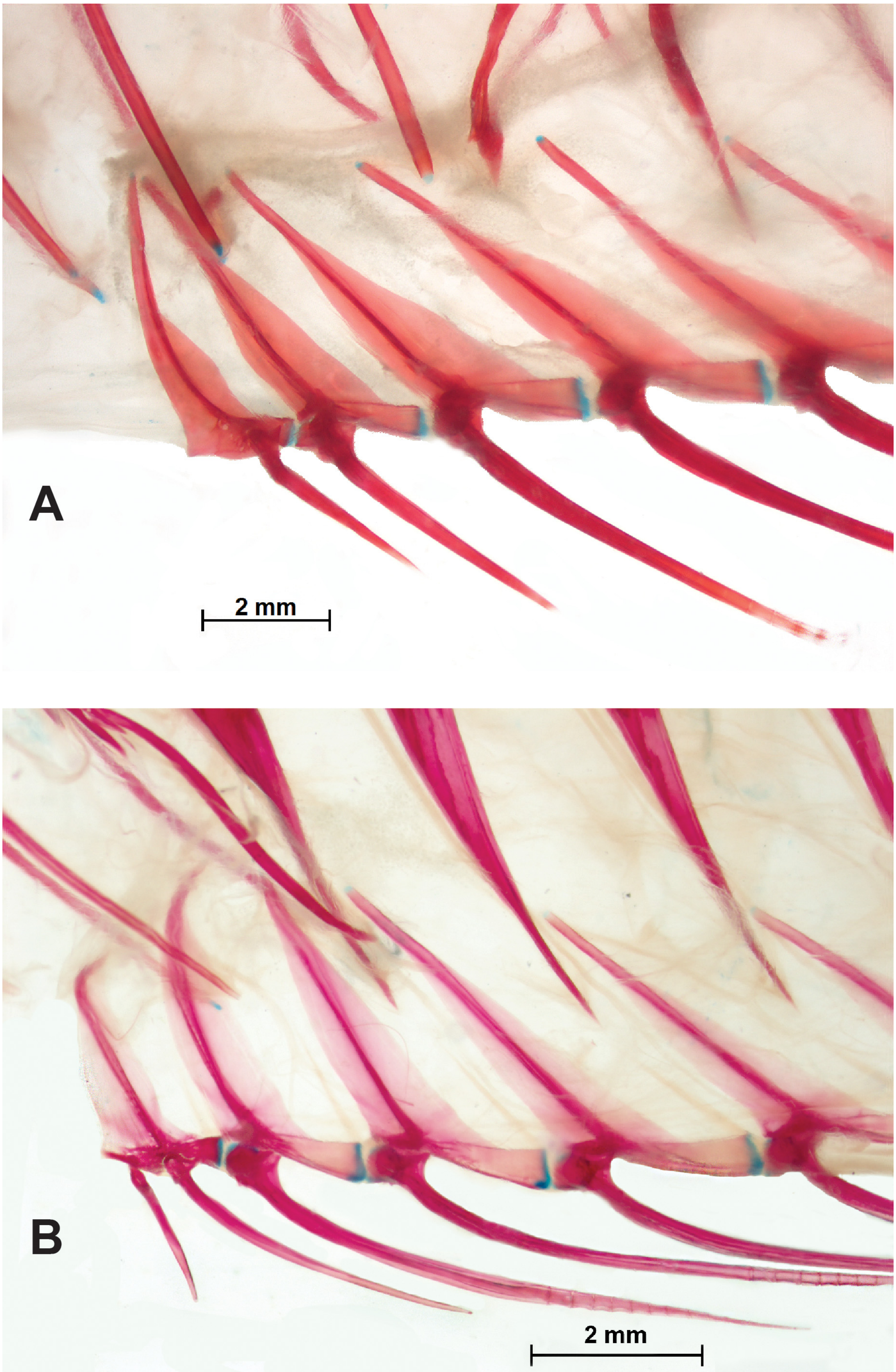

FIGURE 16. Anal-fin spines on first pterygiophore: A, *Owstonia sibogae*, ANSP 152035 (1 supernumerary spine); B, *O. sarmiento*, ANSP 165126 (2 supernumerary spines).

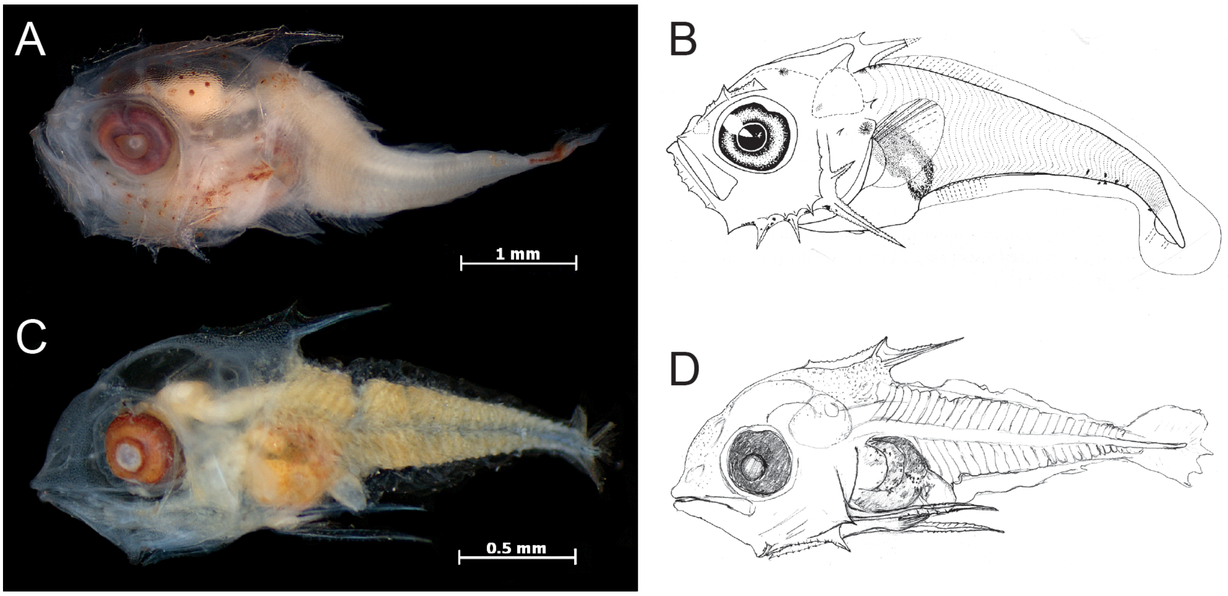

FIGURE 17. Preflexion larval cepolids: A, Cepolinae, LACM 36040–13, 4.7 mm NL; B, *Acanthocepola*, 4.7 mm NL, from Leis and Carson-Ewart (2000, fig. 67); C, *Owstonia*, LACM 45149–20, 2.8 mm NL; D, drawing of C by Rick Feeney, LACM.

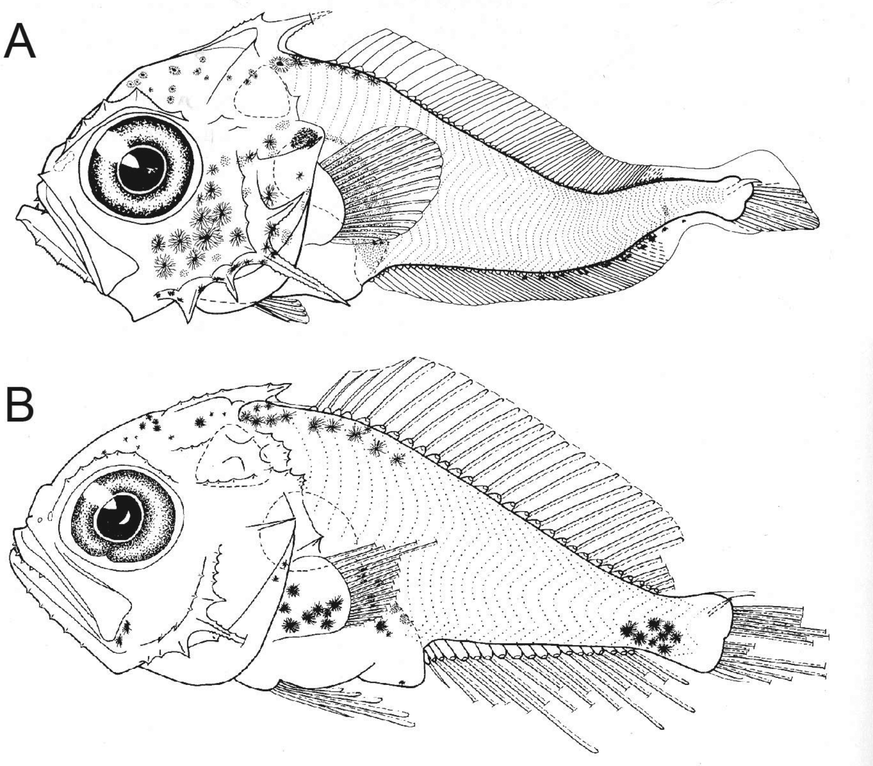

FIGURE 18. Flexion larval cepolids: A, *Acanthocepola*, 5.9 mm SL; B, *Owstonia*, 6.9 mm SL. From Leis and Carson-Ewart (2000), figs. 66, 67.

uranoscopids (see Leis & Carson-Ewart 2000, fig. 156), as first noted by Mundy (1990) or chaetodontids (see Micklich *et al.* 2009, fig. 7), because of the plate-like expansion of several of the head bones. On the other hand preflexion/flexion *Owstonia* are strikingly similar to larval cepolines, and exhibit all the features described above for the latter (Figs. 17, 18). The serrate spine at the angle of the preopercle is longer than the other peopercular spines, but not as distinctly elongate as it is in cepolines. The similarity to cepoline larvae begins to diminish at flexion, as the supraoccipital, preopercular and supracleithral spines recede and several head bones begin to expand to form plate-like structures. This distinctive transformation appears to occur over a very short size range (Fig. 19). We have seen very few preflexion *Owstonia* larvae, but all of those, illustrated here for the first time (Fig. 17), have the well developed, pungent supraoccipital and preopercular spines that characterize cepoline larvae at all stages. On the other hand all postflexion *Owstonia* larvae (Fig. 20) lack the pungent spines of preflexion cepoline larvae and exhibit instead the extensive plate-like expansions of the posttemporal and preopercle that characterize these larvae until transformation. Thus, larval cepolids are very similar in early ontogeny, but the morphological trajectory of owstoniines changes drastically postflexion. The largest untransformed *Owstonia* specimen we have seen is 57.6 mm (*O. lepiota*), the next largest, only 17 mm. The smallest fully transformed specimen we have seen is 26 mm (*O. taeniosoma*), so we presume that transformation typically occurs between 17–26 mm.

FIGURE 19. Postflexion larval *Owstonia*, lateral view left, dorsal view right: A, AMS I.36418–0025, 4.9 mm SL; B, AMS I.19742–032, 6.9 mm SL.

Etymology. The genus *Owstonia* was named for Alan Owston (1853–1915), amateur naturalist, yachtsman (Fig. 21), and collector of Asian wildlife, notably fishes from Japan and China; see Wikipedia for more details of Owston's extraordinary life. A collection of 1364 of Owston's Asian fishes was donated to the Carnegie Museum of Natural History, Pittsburgh (transferred to the FMNH in 1952).

Distribution. Most species of *Owstonia* have been collected only from relatively deep water (155–550 m) on hard bottom substrata, where many localities have not been sampled with appropriate trawl gear, and are therefore poorly represented in natural history collections. Accordingly, our knowledge of the distributions of the 36 species we recognize is partly a reflection of collection effort, and we are certain that more undescribed species remain to be discovered. However, a few generalizations about *Owstonia* distributions can be made from examination of the maps (Figs. 22–27). Five species, *O. lepiota*, *O. raredonae*, *O. similis*, *O. simotera* and *O. weberi*, appear to be restricted to the western Indian Ocean from South Africa to Kenya and Madagascar (Fig. 27) (not counting one apparently undescribed species based on a small individual from Madagascar), and *O. whiteheadi* known only from near the southern tip of India. No species occurs on both sides of the Indian Ocean, and no species has been collected from both the western and eastern sides of Australia. Two species, *O. psilos* and *O. scottensis*, are restricted to Western Australia (*Owstonia* sp 1, based on two small individuals, probably is a third such species); two others, *O. kamoharai* and *O. tosaensis*, have ranges that extend from Japan to Western Australia, but there are no collections of them from between these two localities, and they are also absent from eastern Australia. Four species are known only from eastern Australia, *O. ainonaka*, *O. hastata*, *O. maccullochii*, and *O. merensis* from Torres Strait; two others, *O. fallax* and *O. taeniosoma*, also occur in eastern Australia but are more widely distributed. Ten species occur in the Philippine Archipelago, including *Owstonia* sp. (based on two specimens, not treated by us, that are being described elsewhere by Y.-C. Liao), with four of these species, *O. doryptera*, *O. macrophthalma*, *O. melanoptera*, *O. nigromarginata*, known only from their original type localities. As the result of collecting effort during multiple French expeditions, six species have been collected off New Caledonia, although none of them is restricted to the immediate vicinity of that island. The absence of any *Owstonia* species from off New Guinea is most likely a collecting artifact.

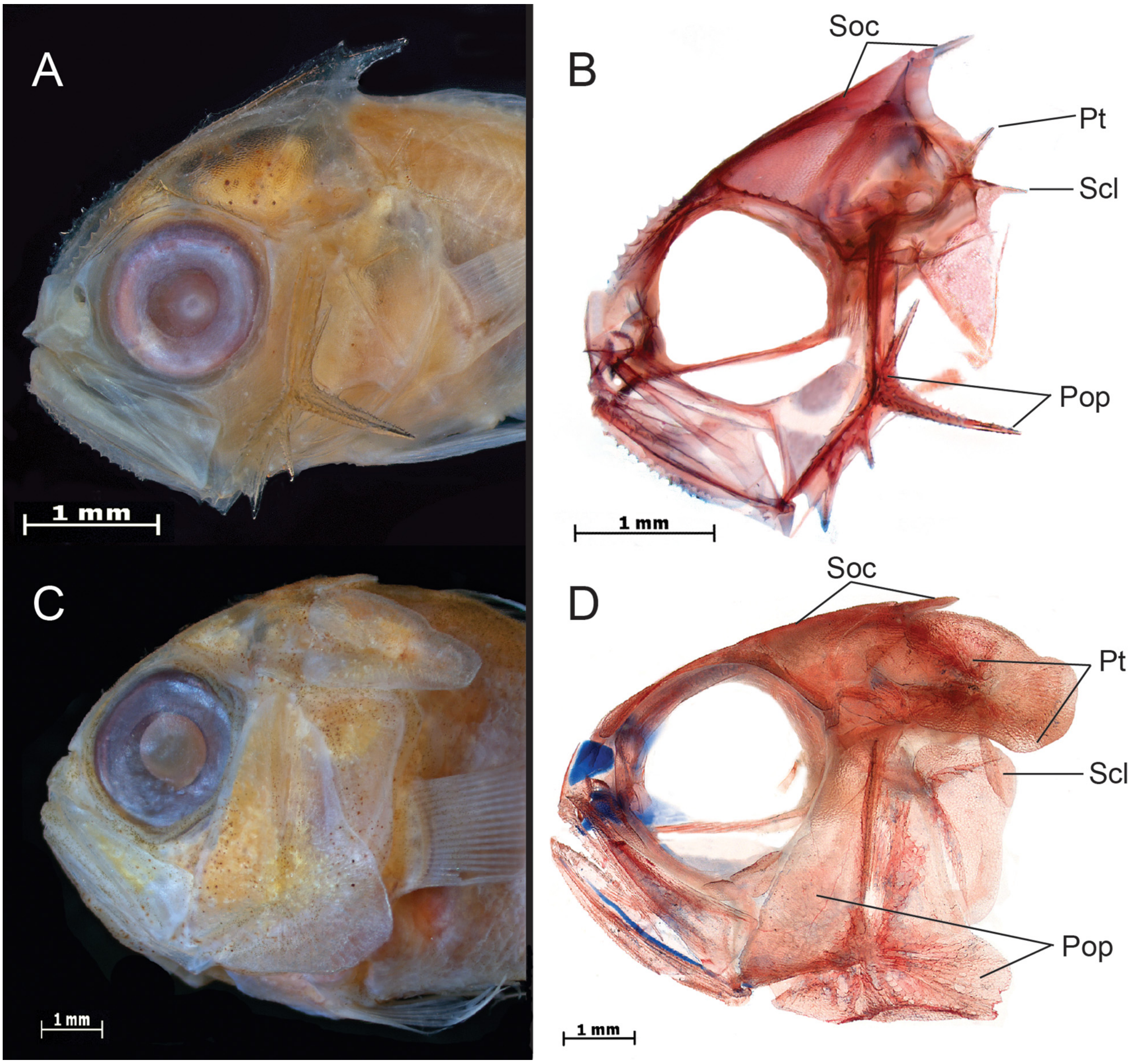

FIGURE 20. Heads of postflexion larval cepolids, A–B *Acanthocepola* Dana Sta. 3881, 9 mm SL (B cleared and stained); C, *Owstonia*, LACM 45967, 13.3 mm SL; D, *Owstonia*, USNM 307399, 13.2 mm SL, cleared and stained. Abbreviations: Pop = preopercle; Pt = posttemporal; Scl = supracleithrum; Soc = supraoccipital.

Key to species of *Owstonia*

1. Lateral line extends anteriorly beyond dorsal-fin origin 2
   Lateral line does not extend anteriorly beyond dorsal-fin origin, originates at posttemporal sensory canal near anterodorsal margin of gill opening (Fig. 6A), curves upward and backward then continues posteriorly just below dorsal-fin base 9
2. Lateral line makes contact with posttemporal sensory canal above anterodorsal margin of gill opening and has a vertical section that makes a "T" connection with horizontal section of lateral line running just below dorsal-fin base (Fig. 6B) 3
   Lateral line does not make contact with posttemporal sensory canal above anterodorsal margin of gill opening, instead continues as an uninterrupted horizontal line just below dorsal-fin base (Fig. 6C) (except in *O. nudibucca*, which has a short ventral side branch slightly anterior to dorsal-fin origin) 4
3. Anal fin II, 14; lateral line makes a complete loop across nape (Fig. 6E); total gill rakers on first gill arch 36–41; anal-fin pterygiophores anterior to 1st haemal spine 3 (Philippines, Sulawesi, New Caledonia and eastern Australia) . . . . *O. sarmiento*
   Anal fin I, 15–17; lateral line on opposite sides of nape converging toward mid-line of nape anteriorly (Fig. 6F) but rarely joined to form a complete loop; total gill rakers on first gill arch 45–51; anal-fin pterygiophores anterior to 1st haemal spine 4–5 (Japan, Taiwan, Philippines and western Australia) . . . . *O. tosaensis*
4. Cheek scales absent, except 1 or 2 scales often present in about 4 o'clock position immediately below eye 5

Cheek scales present (caution: scales often missing due to trawl abrasion) 6

5. Caudal peduncle depth in adults 2.3–3.0 times in its length; lateral line makes complete loop across nape, and horizontal section has a short ventral side branch slightly anterior to dorsal-fin origin (Fig. 6D); total gill rakers on first arch 47–50 (eastern Indian Ocean, Mentawai Is. and off Myanmar) . . . . *O. nudibucca* **n. sp.**

Caudal peduncle depth 1.3−1.7 times in its length; lateral line makes complete loop across nape, but horizontal section lacks a short ventral side branch slightly posterior to dorsal-fin origin; total gill rakers on first arch 42–46 (Japan) . . . . *O. totomiensis*

6. Lateral line makes complete loop across nape and also has a pair of secondary loops near front of primary loop that may be difficult to discern; anal fin I, 13–14 (Indian Ocean) . . . . *O. weberi*

Lateral line usually makes complete loop across nape but lacks a pair of secondary loops near front of primary loop (LL apparently does not make a complete nape loop in *O. rhamma*, see description); anal fin I, 14–16 7

7. Anal fin I, 15–16 (rarely I, 14); dorsal fin III, 21–22 (typically 22); gill rakers 17–19 + 31–35 = 49–54 (eastern Australia) . . . . *O. maccullochi*

Anal fin I, 14; dorsal fin III, 21; gill rakers 16 + 26–29 = 42–45 8

8. Dorsal fin with narrow black stripe distally between 2nd spine and 1st soft ray; depressed pelvic fin extending only to anal-fin origin; cheek scale rows 5–6; premaxilla without inner teeth anteriorly (Philippines) . . . . *O. doryptera*

Dorsal fin without narrow black stripe distally between 2nd spine and 1st soft ray; depressed pelvic fin extending to anal-fin soft rays 2 or 4; cheek scale rows 2–3; premaxilla with 2 inner teeth anteriorly (Vanuatu) . . . . *O. rhamma* **n. sp.**

9. Body scales small, about 95 in horizontal oblique rows; dorsal and anal fins III, 23 and II, 15 respectively; cheek scale rows 5–6 (Tanzania). . . . . *O. lepiota* **n. sp.**

Body scales moderate to large, about 25–60 in horizontal oblique rows (except 97−108 in *O. mundyi*, which differs in having naked cheeks and anal fin I, 15−16); dorsal and anal fin counts not in above combination; cheek scale rows varying from 0–5 10

10. Dorsal-fin spines IV 11

Dorsal-fin spines III 18

11. Dorsal-fin soft rays 24–26 (exceptionally 24); anal-fin soft rays 17–19 (exceptionally 17); precaudal vertebrae 16; anal-fin pterygiophores anterior to 1st haemal spine 8 (New Caledonia and Vanuatu) . . . . *O. elongata* **n. sp.**

Dorsal-fin soft rays 21–24; anal-fin soft rays 14–17 (except 18 in holotype of *O. macrophthalma*); precaudal vertebrae 11–13; anal-fin pterygiophores anterior to 1st haemal spine 2–5 12

12. Anal fin I, 15–18 13

Anal fin II, 14–17 16

13. Anal fin I, 17–18; oblique body scale rows in mid-lateral series about 54 (Philippines) . . . . *O. macrophthalma*

Anal fin I, 15–16; oblique body scale rows in mid-lateral series about 29–42. 14

14. Total gill rakers 52–60; teeth in outer row of each premaxilla 39–45; vertebrae 11 + 18 (western Indian Ocean) . . . . *O. whiteheadi*

Total gill rakers 40–45; teeth in outer row of each premaxilla 22–32; vertebrae 13 + 17 (eastern Australia, New Caledonia and Vanuatu) 15

15. Oblique body scale rows in mid-lateral series about 40−42; pectoral-fin rays 20; premaxillary stripe long, extending entire length of premaxilla (eastern Australia and New Caledonia) . . . . *O. fallax* **n. sp.**

Oblique body scale rows in mid-lateral series about 29−32; pectoral-fin rays 17 or 18; premaxillary stripe short, extending about 2/3 length of premaxilla (Vanuatu and Philippines) . . . . *O. geminata* **n. sp.**

16. Oblique body scale rows in mid-lateral series about 47−53; lower limb gill rakers 32−35; vertebrae 11 + 18; anal-fin pterygiophores anterior to 1st haemal spine 3 (Philippines) . . . . *O. contodon* **n. sp.**

Oblique body scale rows in mid-lateral series 25–38; lower limb gill rakers 25−32; vertebrae 12−13 + 17; anal-fin pterygiophores anterior to 1st haemal spine 4–5 17

17. Premaxillary stripe short, extending about 1/2 length of premaxilla; anal-fin II, 15–17, typically 16; vertebrae 12 + 17; anal-fin pterygiophores anterior to 1st haemal spine 4 (Vietnam, Philippines and Indonesia) . . . . *O. sibogae*

Premaxillary stripe long, extending entire length of premaxilla; anal-fin II, 14; vertebrae 13 + 17; anal-fin pterygiophores anterior to 1st haemal spine 5 (eastern Australia) . . . . *O. hastata* **n. sp.**

18. Dorsal fin III, 25–26 (typically 26); anal fin I, 18–19; head length 15.5–21.1% SL; anal-fin pterygiophores anterior to 1st haemal spine 6–7 (Japan, Andaman Sea, New Caledonia and eastern Australia) . . . . *O. taeniosoma*

Dorsal fin III, 19–23; anal fin I, 12–16 or II, 11–14; head length 24.9–35.5% SL; anal-fin pterygiophores anterior to 1st haemal spine 2–3 (except 4 in two specimens from Taiwan tentatively identified as *O. grammodon*) 19

19. Membrane between maxilla and premaxilla without a dark stripe or if present weakly developed (a few scattered melanophores or pale brown incomplete stripe in *O. psilos*) 20

Membrane between maxilla and premaxilla with brown to jet-black stripe or dark blotches (caution: stripe may be hidden from view when mouth is closed and is weakly developed in *O. merensis*) 22

20. Dorsal fin III, 21; anal fin I, 14; dark pigment usually present anteriorly in dorsal fin (absent in some specimens from Rowley Shoals); anal-fin pterygiophores anterior to 1st haemal spine 2 (Western Australia) . . . . *O. psilos* **n. sp.**

Dorsal fin III, 19–20; anal fin I, 13; dark pigment absent in dorsal fin of adults; anal-fin pterygiophores anterior to 1st haemal spine 3 21

21. Teeth in outer row of each premaxilla 34–35; mid-lateral dentary teeth only slightly hooked and smaller (Fig. 10C); cluster of about 5 minute papillae between the posterior pair of relatively large papillae behind tip of ascending process of premaxillae (Hawaiian Is.) . . . . *O. hawaiiensis* **n. sp.**

Teeth in outer row of each premaxilla 38–40; mid-lateral dentary teeth more strongly hooked and larger (Fig. 10D); no cluster of about 5 minute papillae between posterior pair of relatively large papillae behind tip of ascending process of premaxillae (Mariana Is.) . . . . *O. ignota* **n. sp.**

22. Anal fin II, 11 or II, 14 23
Anal fin I, 12–16 24

23. Anal fin II, 11; dorsal fin with prominent dark pigment restricted to interradial membranes between 2nd spine and 3rd soft ray; oblique body scale rows in mid-lateral series about 45 (Torres Strait, Murray Is.) . . . . *O. merensis* **n. sp.**
Anal fin II, 14; dorsal fin pigmentation uniformly pale; oblique body scale rows in mid-lateral series 25–26 (New Caledonia and Vanuatu) . . . . *O. nalani* **n. sp.**

24. Anal fin I, 12; dorsal fin III, 19; total vertebrae 27 (Mozambique) . . . . *O. raredonae* **n. sp.**
Anal fin I, 12–16 (I, 12 only in 1 of 7 specimens of *O. crassa*); dorsal fin III, 19–23; total vertebrae 28−29 25

25. Dorsal fin anteriorly with narrow, black distal stripe; preopercle lower limb margin with very weak spines (Philippines) . . . . *O. nigromarginata*
Dorsal fin without narrow, black distal stripe; preopercle lower limb margin without spines in most species 26

26. Tip of depressed pelvic fin not extending to anus; premaxillary stripe not continuous, usually consisting of several unconnected dark blotches (except continuous in some specimens of *O. kamoharai*) 27
Tip of depressed pelvic fin extends at least to anus; premaxillary stripe continuous, not consisting of several unconnected dark blotches (except in some specimens of *O. kamoharai*). 28

27. Caudal fin relatively long and lanceolate, 54.5% SL; cheek scales larger and abutting adjacent scales (Fig. 12A); closed upper jaw extending to vertical from posterior margin of pupil (eastern Australia). . . . . *O. ainonaka* **n. sp.**
Caudal fin relatively short and rounded posteriorly, 33.7–40.0% SL; cheek scales smaller, some separated from adjacent scales (Figs. 12E, 12F); closed upper jaw usually extending slightly beyond vertical from posterior margin of orbit (Japan and Western Australia) . . . . *O. kamoharai*

28. Preopercle lower limb margin with spines (caution: in some specimens spines are mostly skin covered and can easily be overlooked; *O. scottensis* will key out under both alternatives of this couplet) 29
Preopercle lower limb margin without spines. 31

29. Cheek scale rows 3 (Solomon Is.). . . . . *O. dispar* **n. sp.**
Cheek scale rows 4–7 30

30. Orbit diameter 10.4–13.9% SL; in fresh specimens, median fins with white margins and dorsal and caudal fins with narrow, dark red submarginal stripe (Japan) . . . . *O. japonica*
Orbit diameter 15.3–17.5% SL; in fresh specimens, fins mostly uniform red, without white margins (Western Australia, Scott Reefs vicinity,) . . . . *O. scottensis* **n. sp.**

31. Teeth in outer row of each premaxilla relatively small, 33–39; anal fin I, 13 (Sulawesi and Taiwan) . . . . *O. grammodon*
Teeth in outer row of each premaxilla moderate sized, 12–24; anal fin I, 14−16 (except I, 12−13 in *O. crassa*) 32

32. Dorsal fin III, 23; cheeks and nape naked; oblique body scale rows in mid-lateral series 97−108; anal-fin pterygiophores anterior to 1st haemal spine 3 (Kiribati, Christmas Is.) . . . . *O. mundyi* **n. sp.**
Dorsal fin III, 19–21; cheeks and nape scaly; oblique body scale rows in mid-lateral series about 45−60; anal-fin pterygiophores anterior to 1st haemal spine 2 33

33. Cheek scale rows 11–12 (Mozambique). . . . . *O. simotera*
Cheek scale rows 4–7 34

34. Anal fin I, 12–13; dorsal fin III, 19–21, usually 20 (see Table 4); if present, dark pigmentation anteriorly in dorsal fin only on interradial membranes between soft rays 1–5; lateral line ends below dorsal-fin soft rays 14–17 (New Caledonia and Solomon Is.) . . . . *O. crassa* **n. sp.**
Anal fin I, 14; dorsal fin III, 21; if present, dark pigmentation anteriorly in dorsal fin on interradial membranes between spine 2 and soft rays 3–5; lateral-line terminus variable, see next couplet 35

35. Lateral line ends below dorsal-fin soft rays 7 or 8 (caution: this character useful only in specimens with most or all scales immediately below the dorsal-fin base intact); inner membrane covering posterior part of dentary pale; oblique body scale rows in mid-lateral series ca. 32 (Philippines) . . . . *O. melanoptera* **n. sp.**
Lateral line ends below dorsal-fin soft rays 17−19; inner membrane covering posterior part of dentary pale or black; oblique body scale rows in mid-lateral series about 40−56 36

36. Inner posterior part of dentary black; interradial membranes of posterior anal-fin rays pale; gill rakers 15−16 + 25–27 = 40−43 (Western Australia, Scott Reefs vicinity) . . . . *O. scottensis* **n. sp.**
Inner posterior part of dentary pale; interradial membranes of posterior anal-fin rays with heavy concentration of melanophores; gill rakers 10 + 22–23 = 32−33 (Madagascar) . . . . *O. similis* **n. sp.**

Owstonia ainonaka new species
(Figure 28)

Holotype. AMS I.33437–002, 213 mm SL, Australia, NSW, off Coffs Harbour, 30°18'S, 153°26'E, 183 m, Tony Nyssen, 2 Sep. 1992.

Diagnosis. A species of *Owstonia* with LL pattern type 1; lower limb margin of preopercle without spines; all cheek scales abutting adjacent scales; dorsal fin III, 21; premaxillary stripe consisting of several, irregular, dark blotches; caudal fin lanceolate.

FIGURE 21. Alan Owston (1853–1915), modified photograph from Wikipedia.

Description. A species of *Owstonia* with LL pattern type 1, consisting of a simple lateral line that originates from posttemporal canal near anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base to soft ray 18. Dorsal fin III, 21; anal fin I, 13; pectoral fin 22; gill rakers 15 + 26 or 27 = 41–42. Vertebrae: precaudal 11, caudal 17, total 28; anal-fin pterygiophores anterior to 1st haemal spine 2. Oblique body scale rows in mid-lateral series about 46/50 in addition to 4 scales on base of caudal fin; nape scaly and cheek scale rows 6–7, with adjacent scales abutting each other (Fig. 12A). Lower limb margin of preopercle without spines. Papillae in slight depression behind tip of premaxillary ascending processes 4, arranged in 2 almost equally spaced pairs. When mouth closed upper jaw extends only to vertical from posterior margin of pupil. Teeth in outer row of premaxilla 19/22; 2/3 inner teeth anteriorly. Teeth in lateral row of each dentary 8/9, including at anterior end a row (left side) or irregular group (right side) of 4 blunt conical teeth as large as adjacent symphyseal teeth; symphyseal teeth 4 or 5, short and spike-like (Fig. 9A), and with 3 smaller inner teeth behind the anterior row or group of lateral teeth. Pelvic fin short, depressed fin does not extend to anus. Caudal fin lanceolate. Caudal fin 1.8 times in SL; head 3.3 times in SL; body depth at anal-fin origin 3.6 times in SL.

Color pattern in alcohol: Adults with dorsal fin uniformly pale; membrane connecting maxilla and premaxilla with irregular shaped, large, dark brown blotches (Fig. 15D), and inner membrane covering posterior part of dentary black. Life coloration unknown.

Proportional measurements of 213 mm SL holotype as percentages of SL: predorsal length 59.6; preanal length 28.5; dorsal-fin base 58.5; anal-fin base 63.4; pelvic-fin length 27.7; caudal-fin length 54.5; body depth at anal-fin origin 28.1; head length 30.7; upper jaw length 16.5; jaw depth 8.4; orbit diameter 11.4. As percentages of head length: upper jaw length 53.9; orbit diameter 38.3.

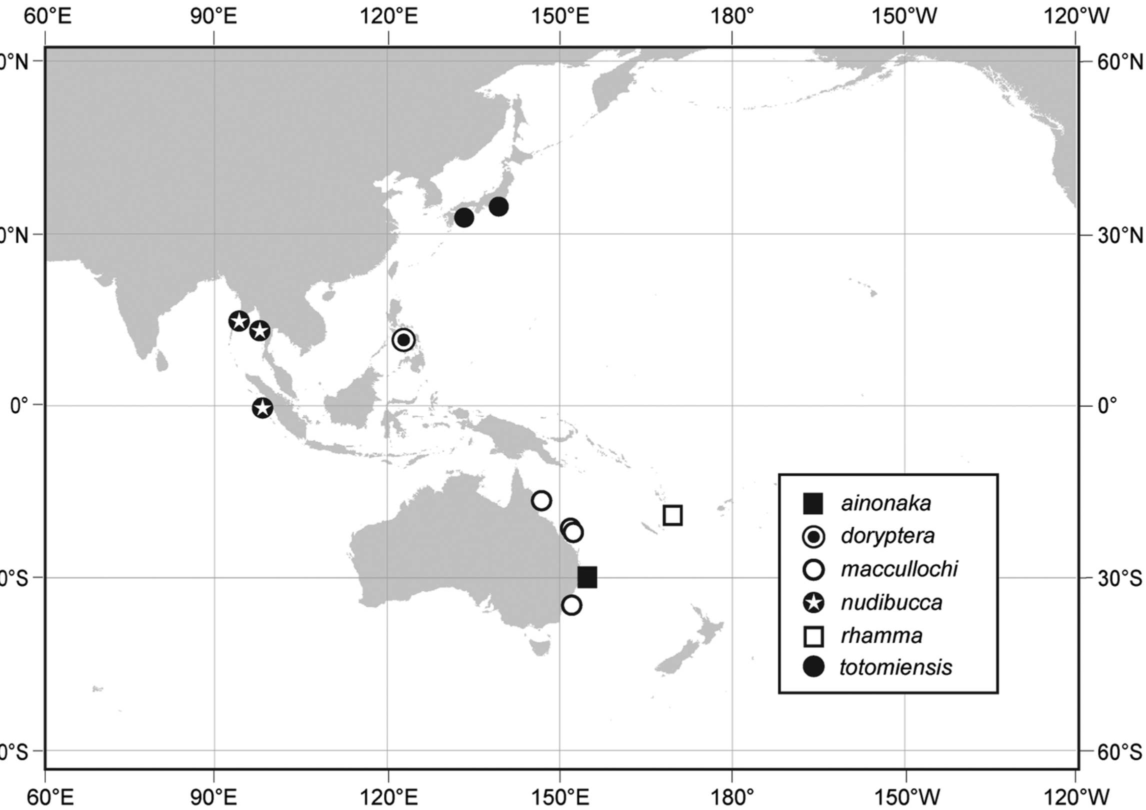

FIGURE 22. Distributions of selected species of *Owstonia* based on specimens examined.

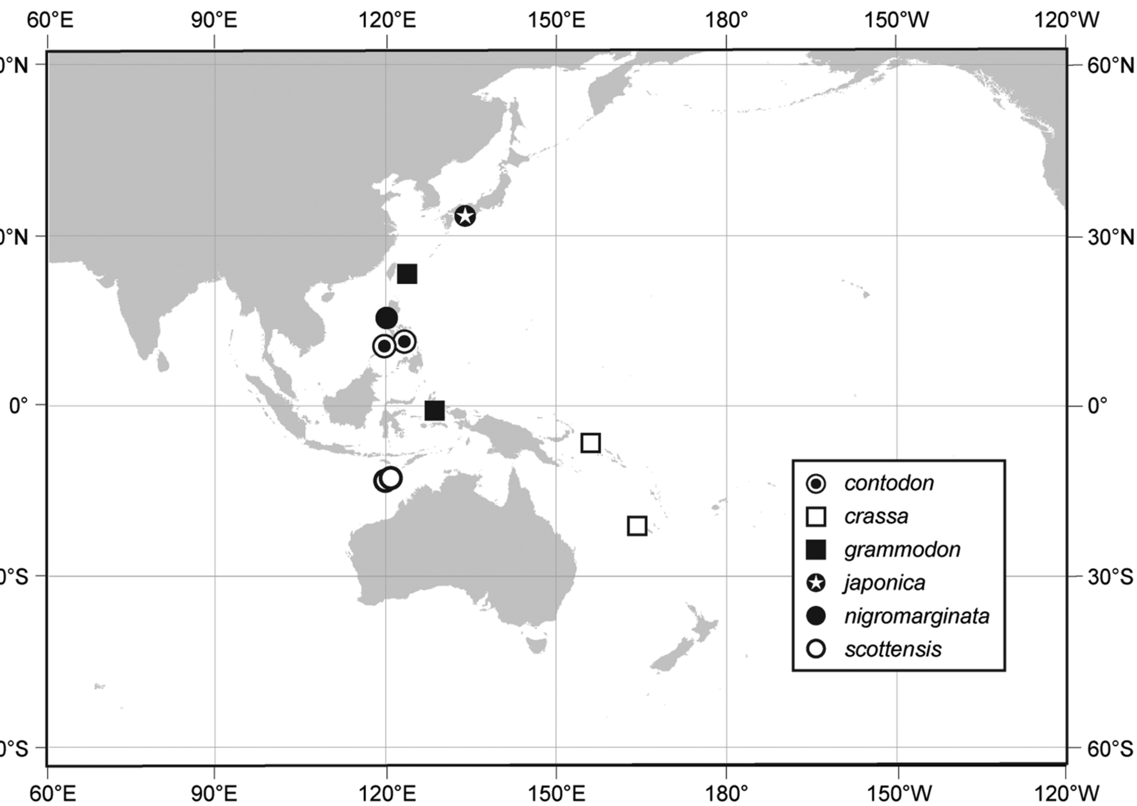

FIGURE 23. Distributions of selected species of *Owstonia* based on specimens examined.

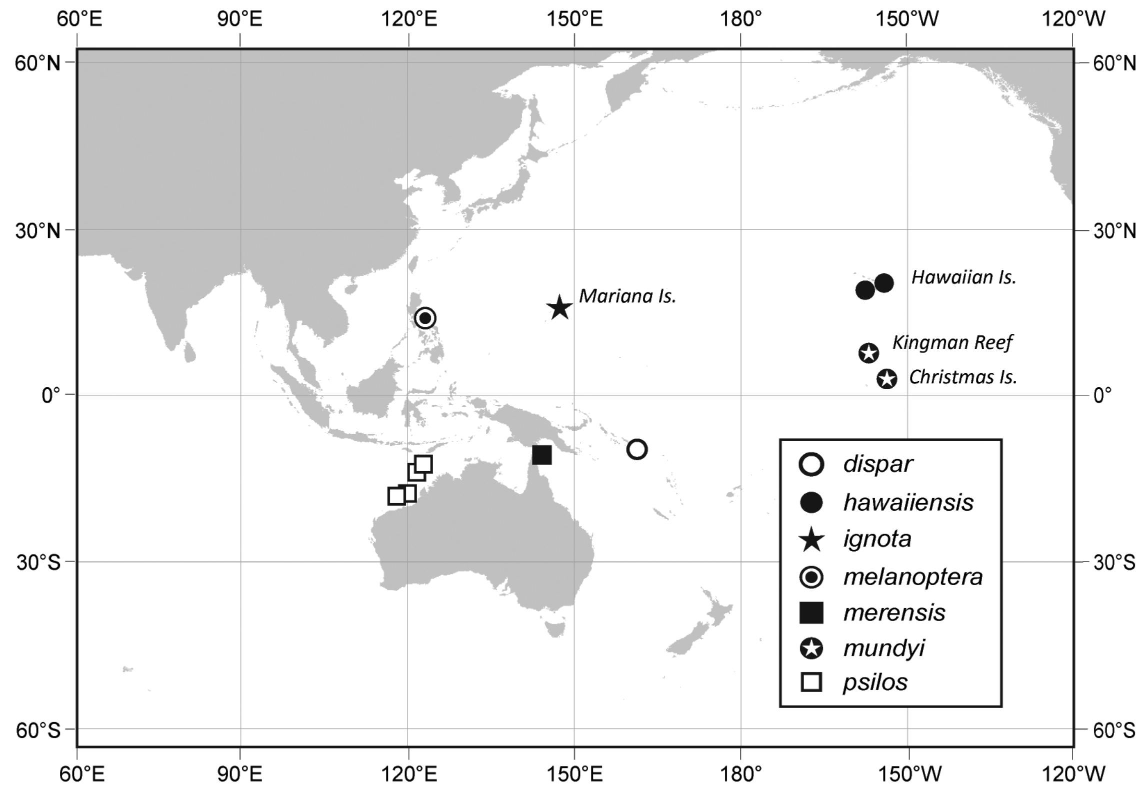

FIGURE 24. Distributions of selected species of *Owstonia* based on specimens examined, except records of *O. mundyi* from Kingman Reef based solely on submersible videos, and possibly could have been misidentifications of *O. hawaiiensis*.

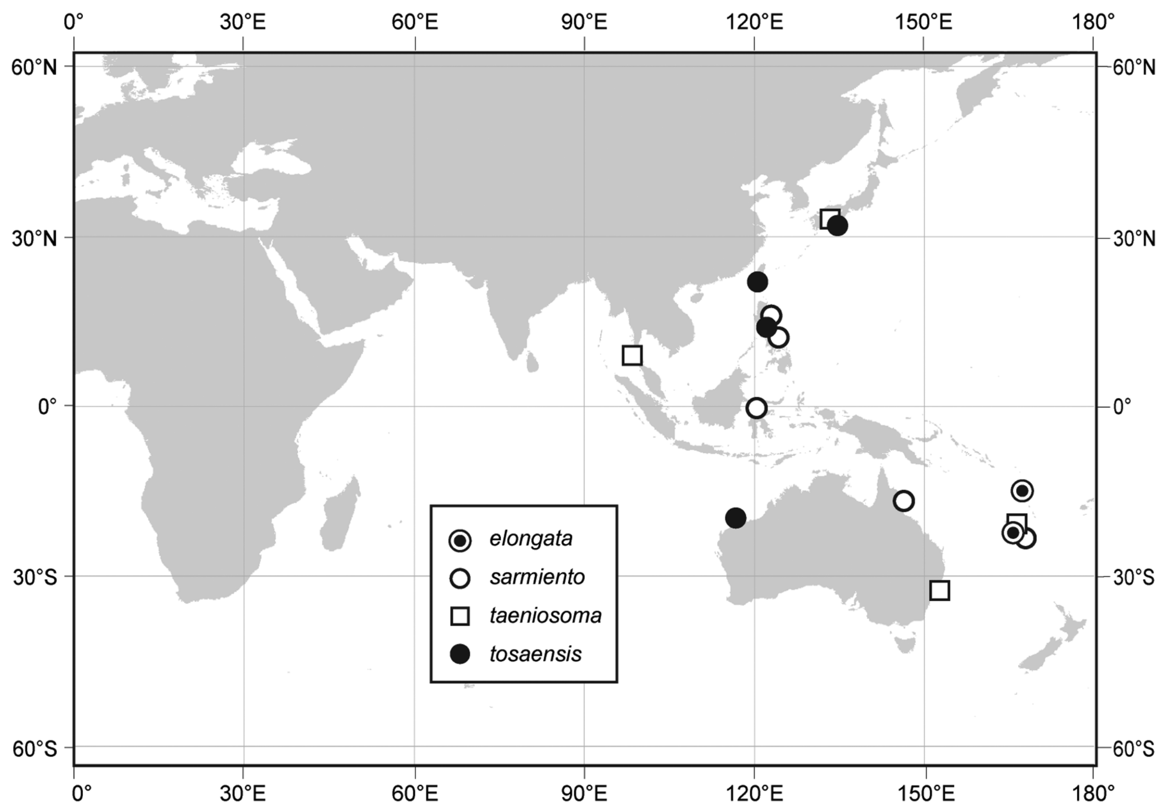

FIGURE 25. Distributions of selected species of *Owstonia* based on specimens examined.

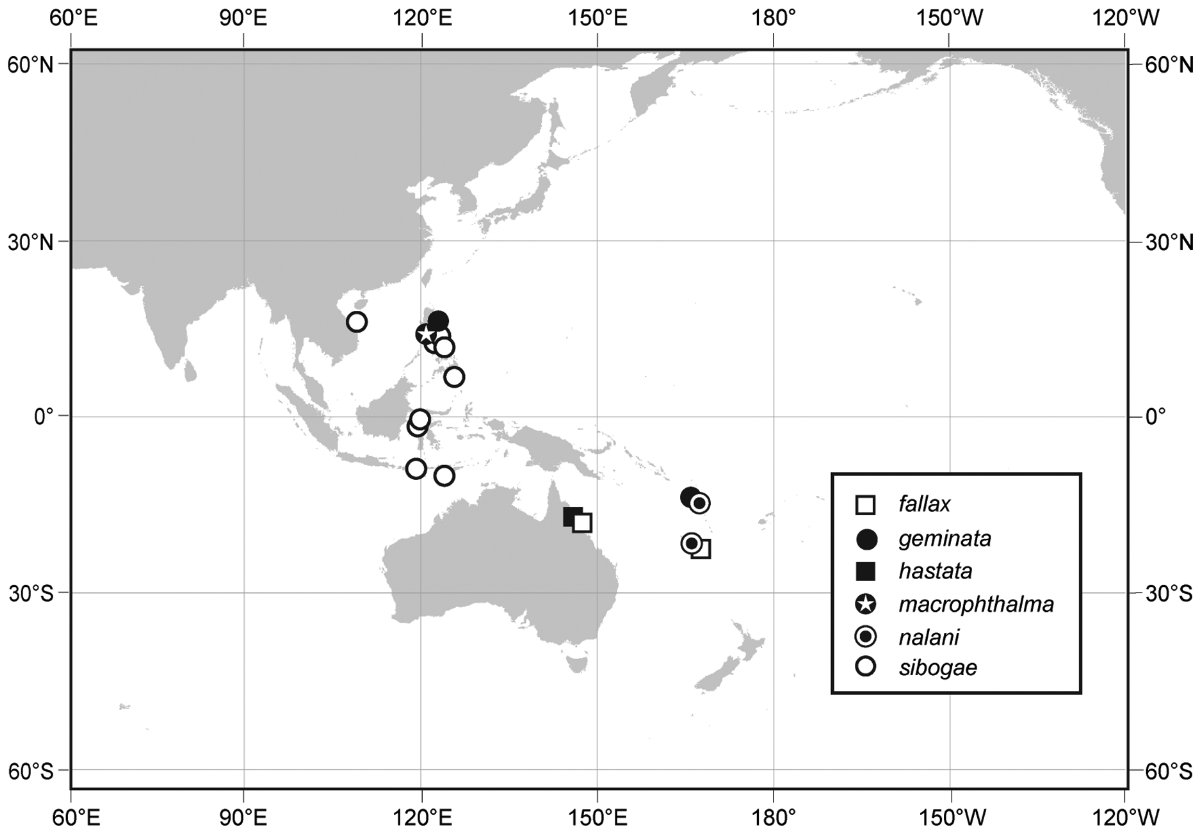

FIGURE 26. Distributions of selected species of *Owstonia* based on specimens examined.

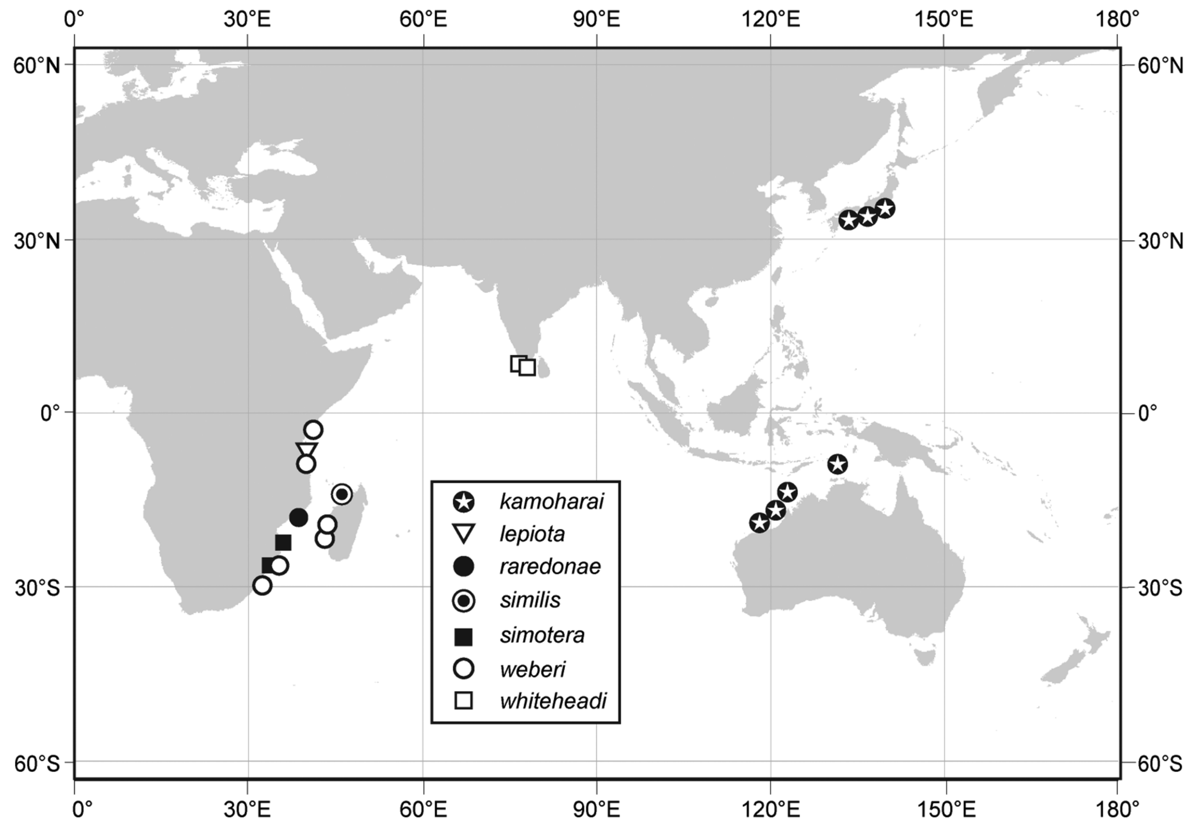

FIGURE 27. Distributions of selected species of *Owstonia* based on specimens examined.

FIGURE 28. *Owstonia ainonaka*, holotype, AMS I.33437–002, 213 mm SL, Australia, NSW off Coffs Harbour. Photograph by Sandra J. Raredon.

Comparisons. The allopatric *O. kamoharai* and *O. crassa* are the only two species that might be confused with this new species but differ (characters of *O. ainonaka* in parentheses) as follows: *O. kamoharai* has a caudal fin that is rounded posteriorly (vs. lanceolate) and shorter, 33.7–40.0% SL (vs. 54.5%), smaller cheek scales many of which are slightly separated from adjacent scales (vs. larger scales that abut adjacent scales), and when mouth completely closed upper jaw usually extending to or slightly beyond vertical from posterior margin of orbit (vs. upper jaw extends only to vertical from posterior margin of pupil). *Owstonia crassa* has a continuous premaxillary stripe (vs. irregular dark blotches) and an upper jaw extending to or slightly beyond vertical from posterior margin of orbit (vs. upper jaw that extends only to vertical from posterior margin of pupil). *Owstonia psilos* resembles *O. ainonaka* in having a short pelvic fin that does not extend behind anus but differs in having the premaxillary stripe absent or pale and incomplete (vs. irregular dark blotches) and anal fin I, 14 (vs. I, 12–13). *Owstonia maccullochi* superficially resembles *O. ainonaka* but differs most obviously in having LL pattern type 3 (vs. LL pattern type 1), lower limb margin of preopercle with spines (vs. preopercle without spines), anal fin I, 14–16 (vs. I, 13), and continuous premaxillary stripe (vs. irregular dark blotches).

Distribution. (Fig. 22) Known only from southeastern Australia where trawled in 183 m.

Etymology. A combination of the first (Ai) and last name (Nonaka) of the second author's wife in appreciation for her valuable assistance with this study. The name is treated as a noun in apposition.

Owstonia contodon new species
(Figures 29, 30)

Holotype. PNM 15193 (ex USNM 438011), 165 mm SL, female, Philippines, Iloilo Prov., Panay Island, found in Iloilo City "super" fish market, exact locality and depth of capture unknown (vendor stated that he received the shipment containing these fresh fish from Palawan); Exped. Philippines 2015 FDA Survey, PHIL-2015–15; tissue voucher number PHI-401; 23 Jul. 2015; J. T. Williams, K. Carpenter, M. Mendiola, M. Flores and D. Carpenter.

Paratypes. 7 specimens, 146–303 mm SL, all from the Philippines: MNHN 2002–2971 (1, 146), Philippines, Leyte Island, 11°42'3.6"N, 121°45'10.8"E, beam trawl in 205–214 m, Exped. MUSORSTOM 3, sta. 143, Jun. 1985; USNM 438013 (1, 162), same collection data as holotype; USNM 437757 (1, 303), USNM 437759 (1, 260), USNM 437761 (1, 240), USNM 437766 (1, 262), USNM 437775 (1, 193), same collection data as holotype except PHIL-2015–07, 17 Jul. 2015.

Diagnosis. A species of *Owstonia* with LL pattern type 1; dorsal-fin spines IV, 21–23; anal-fin spines II, 16; oblique body scale rows in mid-lateral series 47–53; preopercle lower limb margin with about 8−11 spines; dark premaxillary stripe.

Description. (When counts vary, those of the paratypes are given in parentheses.) A species of *Owstonia* with LL pattern type 1, consisting of a simple lateral line that originates from posttemporal sensory canal near anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base to soft rays 21 (20−23). Dorsal fin IV, 23; anal fin II, 16; pectoral fin 20 (20−21); gill rakers 17 (16-18) +33

(32−35) = 50 (48−53). Vertebrae: precaudal 11, caudal 18, total 29; anal-fin pterygiophores anterior to 1st haemal spine 3. Oblique body scale rows in mid-lateral series about 47/51 (48−53); nape scaly and cheek scale rows 4−5. Preopercle lower limb margin with about 8−11 spines (Fig. 8A). Pattern of papillae in slight depression behind tip of premaxillary ascending processes not clearly discernible, although small papillae can be seen in some specimens. Teeth in outer row of each premaxilla 27/30 (29−33), no inner teeth. Teeth in lateral row of each dentary teeth 20/23 (18−25) including a few at anterior end that continue behind symphyseal teeth; symphyseal teeth 4−6, relatively short and peg-like, and with 2−4 inner teeth anteriorly. Pelvic fin long, depressed fin extending to anal-fin soft rays 4–7, except to behind last ray in largest 303 mm SL (male). Caudal fin lanceolate. Caudal fin 1.4–2.1 times in SL; head 3.7–5.4 times in SL; body depth at anal-fin origin 4.2–5.1 times in SL.

FIGURE 29. *Owstonia contodon*, USNM 437757, male, 303 mm SL, Philippines, Palawan. Photograph by Jeffrey T. Williams.

FIGURE 30. *Owstonia contodon*, holotype, NPM 15193, female, 165 mm SL, Philippines, Palawan. Photograph by Jeffrey T. Williams.

Color pattern in alcohol: Adults with dorsal fin uniformly pale; membrane connecting maxilla and premaxilla with prominent black stripe extending to near anterior end of premaxilla, and inner membrane covering posterior part of dentary also black. In fresh specimens, upper part of head and body reddish orange becoming grayish purple to white below; dorsal, anal and caudal fins orange-red; pectoral fin pink to orange- red and pelvic fins pink or gray with elongate outermost ray paler; iris reddish orange.

Proportions of 165 mm SL holotype are given first, followed by those of 7 paratypes, 145–303 mm SL (in parentheses), as percentages of SL: predorsal length 30.0 (18.5−25.8); preanal length 46.0 (23.6−52.0); dorsal-fin base 60.9 (66.7−71.0); anal-fin base 39.1 (36.3−41.6); pelvic-fin length 39.0, in 6 presumed females 145−262 mm SL (34.9–46.0) and in 1 male 303 mm SL (84.8); caudal-fin length 66.1 (46.6−71.0); body depth at anal-fin origin 23.9 (19.4−23.6); head length 25.8 (18.7−26.8); upper jaw length 12.2 (9.8−12.4); upper jaw depth 5.7 (4.4−6.2); orbit diameter 9.3 (6.6−10.3). As percentages of head length: upper jaw length 47.2 (46.2−52.7); orbit diameter 36.2 (34.9−38.5).

Comparisons. The following three species with LL pattern type 1 have and the same number of dorsal- and anal-fin spines as those of *O. contodon* but differ (with characters for *O. contodon* given in parentheses) as follows: all three have fewer oblique body scale rows in mid-lateral series, 27–38 (vs. 47−53); *Owstonia hastata* further differs in having anal fin II, 14 (vs. II, 16) and more precaudal vertebrae and pterygiophores anterior to 1st haemal spine 13 and 5 respectively (vs. 11 and 3); *O. sibogae* has cheek scale rows 3 (vs. 4−5) and a shorter premaxillay stripe, extending only about 2/3 length of premaxilla (vs. long premaxillary stripe, extending entire length of premaxilla); *O. elongata* usually has anal-fin spines I (exceptionally II, see Table 4) (vs. II), cheek scale rows 3 (vs. 4) and more precaudal vertebrae and pterygiophores anterior to 1st haemal spine 16 and 8 respectively (vs. 11 and 3).

Etymology. The specific epithet is a combination of the Greek *kontos* (short) and *odon* (tooth), in reference to the peg-like symphyseal dentary teeth (Fig. 10A).

Distribution. (Fig. 23) Known only from the Philippines. Collected from Leyte Island, where trawled in 205–214 m; holotype and other paratypes reportedly caught off Negros Oriental. Photographs seen by us of other specimens (not retained) taken by Abner Bucol at Dumaguete fish market were reportedly collected from the local area.

***Owstonia crassa* new species**
(Figures 31, 32)

Holotype. MNHN 2002−3164, 157 mm SL, New Caledonia, 22°6'S, 167°10'1.2"E, beam trawl in 500–550 m, Exped. MUSORSTOM 4, sta. 242, 3 Oct. 1985.

Paratypes. 6 specimens, 54−190 mm SL: **New Caledonia** MNHN 2014−2932, (1, 81), 21°13'58.8"S, 165°55'12"E, beam trawl in 490–530 m, Exped. Bathus 1 sta. 657; MNHN 2002−3190 (1, 78), 22°9'S, 167°12'18"E, beam trawl in 470–480 m, Exped. MUSORSTOM 4, sta. 124, 3 Oct. 1985; MNHN 2014−142 (1, 86), no precise New Caledonia locality. **Solomon Islands** MNHN 2014−1366 (1, 190), 10°26'S, 161°22'E , Salomon Boa 3 cruise, R/V Alis sta. 2837, beam trawl in 381–422 m, 22 Sep. 2007; MNHN 2006−298 (2, 54−81), 8°32'13.2"S, 157°48'14.4"E, beam trawl in 380–537 m, Exped. Solomon 2, sta. 2272, 5 Nov. 2004.

Diagnosis. A species of *Owstonia* with LL pattern type 1; dorsal fin III, 19–21; anal fin I, 12–13; lower limb margin of preopercle without spines; prominent dark premaxillary stripe; adults with 15–22 teeth in outer row of each premaxilla.

Description. (Where counts vary, those of the paratypes are given in parentheses.) A species of *Owstonia* with LL pattern type 1, consisting of a simple lateral line that originates from posttemporal sensory canal near anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base to soft rays 14 (15–17). Dorsal fin III, 20 (19–21); anal fin I, 13 (12–13); pectoral fin 20 (20–21); gill rakers 14 + 26/27 (13–15) + (24–27) = 40/41 (37–42). Vertebrae: precaudal 11, caudal 17, total 28; anal-fin pterygiophores anterior to 1st haemal spine 2. Oblique body scale rows in mid-lateral series about 45–47; nape scaly and cheek scale rows 4–7. Lower margin of preopercle without spines. Papillae in slight depression behind tip of premaxillary ascending processes 4, arranged in 2 closely spaced pairs with the posterior pair elongate in several specimens (Fig. 14A); two of the paratypes (MNHN 2014–142 and MNHN 2014–2932) also have small flaps on the anterior pair of papillae. When mouth completely closed upper jaw extending to or slightly beyond vertical from posterior margin of orbit. Teeth in outer row of each premaxilla 18/22 (15–21), with anterior teeth relatively short and middle ones longest; 2 smaller inner teeth usually present. Teeth in lateral row of each dentary 9/11 (8–12), including 3−5 at anterior end that continue in a row behind symphyseal teeth in larger specimens; symphyseal teeth 3/5 (3–4), short and spike-like, and with 1–2 smaller inner teeth anteriorly. Pelvic fin short, depressed fin extends only to anal-fin origin. Caudal fin lanceolate. In six specimens 83–169 mm SL, caudal fin 1.9–2.8 times in SL; head 4.7–6.0 times in SL; body depth at anal-fin origin 4.6–6.9 times in SL.

Color pattern in alcohol: Proximal half of interradial membranes of dorsal-fin soft rays 1–4 or 5 black in five paratypes (54–86 mm SL), persisting as dusky smudges smaller than pupil diameter in holotype and absent in largest paratype (190 mm SL); membrane connecting maxilla and premaxilla with prominent black stripe extending to near anterior end of premaxilla, and inner membrane covering posterior part of dentary also black, at least in adults. Life coloration unknown.

Proportions of 157 mm SL holotype are given first, followed by those of 5 paratypes, 78–190 mm SL (in parentheses), as percentages of SL: predorsal length 28.7 (28.8–31.3); preanal length 56.2 (56.7–62.3); dorsal-fin base 62.2 (53.7–65.6); anal-fin base 28.3 (26.7–31.9); pelvic-fin length 25.4 (24.5–28.0); caudal-fin length 53.0 (36.2–51.0); body depth at anal-fin origin 27.4 (26.5–30.5); head length 31.5 (29.8–32.8); upper jaw length 18.5 (16.4–18.1); upper jaw depth 9.3 (7.6–9.0); orbit diameter 14.0 (12.9–15.9). As percentages of head length: upper jaw length 58.6 (51.0–59.5); orbit diameter 44.5 (43.0–48.3).

FIGURE 31. *Owstonia crassa*, holotype, MNHN 2002−3164, 157 mm SL, New Caledonia. Photograph by Sandra J. Raredon.

FIGURE 32. *Owstonia crassa*, MNHN 2006–0298, 54 mm SL, Solomon Islands. Photograph by Sandra J. Raredon.

Comparisons. Three other species, *Owstonia grammodon*, *O. hawaiiensis* and *O. ignota*, have the same first four diagnostic characters of *O. crassa* but differ (characters for *O. crassa* given in parentheses) as follows: all three species have more outer premaxillary teeth, 33–39 (vs. 15–22) and adults and small individuals have pale dorsal fins (vs. smaller paratypes, 54–86 mm SL, of *O. crassa* with a prominent dark blotch between dorsal-fin soft rays 1–4 or 5, persisting as faint dusky smudges in holotype but absent in largest paratype); *Owstonia hawaiiensis* and *O. ignota* also differ in lacking a premaxillary stripe (vs. prominent premaxillary stripe). *Owstonia psilos* is superficially similar but consistently has anal fin I, 14 (vs. I, 12–13) and premaxillary stripe absent, incomplete or very faint (vs. prominent dark stripe).

Etymology. The specific epithet is from the Latin *crassus* (thick, fat or stout), in reference to the general appearance of the holotype.

Distribution. (Fig. 23) Known only from New Caledonia and the Solomon Islands where trawled between 380–550 m.

Owstonia dispar new species
(Figure 33)

Holotype. MNHN 2002−3720, 82 mm SL, Solomon Islands, 10°12'7.2"S, 161°28'1.2"E, beam trawl in 381–383 m, Exped. Solomon 1, sta. 1837, 5 Oct. 2001.

Diagnosis. A species of *Owstonia* with LL pattern type 1; dorsal fin III, 21; anal fin I, 14; lower limb margin of preopercle with about about 8–9 spines; depressed pelvic fin extending to slightly behind anus; cheek scale rows 3.

Description. A species of *Owstonia* with LL pattern type 1, consisting of a simple lateral line that originates from posttemporal sensory canal near anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base to soft ray 17 (both sides). Dorsal fin III, 21; anal fin I, 14; pectoral fin 23/22; gill rakers 15 + 30/28 = 43–45. Vertebrae: precaudal 11, caudal 17, total 28; anal-fin pterygiophores anterior to 1st haemal spine 2. Oblique body scale rows in mid-lateral series about 44–46; nape scaly and cheek scale rows 3. Lower limb margin of preopercle with about 8–9 spines. Papillae in slight depression behind tip of premaxillary ascending processes 4, the anterior 2 papillae partially embedded on each end of a slightly raised ridge of skin that closely abuts the posterior 2 papillae, which are widely spaced and more obvious because they are not associated with a ridge of skin (Fig. 14B). Teeth in outer row of each premaxilla 14, 0/1 inner tooth anteriorly. Teeth in lateral row of each dentary 10/12; symphyseal teeth 3, spike-like, and with 1 inner tooth anteriorly. Pelvic fin short, depressed fin extending to slightly behind anus (distinctly short of anal-fin origin). Caudal fin lanceolate. Caudal fin 2.1 times in SL; head 3.3 times in SL; body depth at anal-fin origin 3.8 times in SL.

Color pattern in alcohol: Dorsal fin uniformly pale; membrane connecting maxilla and premaxilla with prominent black stripe extending to near anterior end of premaxilla, and inner membrane covering posterior part of dentary also black. Life coloration unknown.

Proportions of 82 mm SL holotype as percentages of SL: predorsal length 29.2; preanal length 63.0; dorsal-fin base 63.4; anal-fin base 31.4; pelvic-fin length 24.9; caudal-fin length 46.6; body depth at anal-fin origin 26.3; head length 30.6; upper jaw length 16.1; upper jaw depth 7.9; orbit diameter 13.7. As percentages of head length: upper jaw length 52.7; orbit diameter 44.7.

FIGURE 33. *Owstonia dispar*, holotype, MNHN 2002−3720, 74 mm SL, Solomon Islands. Photograph by Sandra J. Raredon.

Comparisons. The allopatric *Owstonia scottensis* and *O. japonica* share most of the diagnostic characters of *O. dispar* but differ (characters of *O. dispar* in parentheses) as follows: *O. scottensis* has more cheek scales 4–5 (vs. 3), larger orbit diameter 15.3–17.5% SL (vs. 13.7%), depressed pelvic fin extending to or slightly beyond anal-fin origin (vs. pelvic fin extending to slightly behind anus), and in fresh specimens the median fins are uniformly red (life color of *O. dispar* unknown); *O. japonica* differs by having more cheek scale rows, 5–7 (vs. 3), shorter upper jaw at similar sizes, 14.4% SL (vs. 16%), depressed pelvic fin extending to anal-fin origin (vs. pelvic fin extending to slightly behind anus), and each dentary with 4–6 blunt, conical symphyseal teeth (vs. 3 spike-like symphyseal teeth).

Etymology. From the Latin *dispar* (different) in reference to the discovery of yet another new species of *Owstonia*.

Distribution. (Fig. 24) Known only from the Solomon Islands type locality where trawled in 381–383 m.

Owstonia doryptera **(Fowler)**
(Figure 34)

Loxopseudochromis dorypterus Fowler, 1934a:354, fig. 106 (original description; off northern Mindanao Island, R/V Albatross sta. D.5516; depth 175 fms [320 m]).

Material examined. 2 specimens, 56–65 mm SL: USNM 93166 (64.8), here designated as lectotype of *Loxopseudochromis dorypterus*, Philippines, off northern Mindanao, Point Tagolo Light, 8°46'N, 123°32'30"E, 320 m, R/V Albatross sta. D.5516, 9 Aug. 1909; USNM 410302 (56), paralectotype, same data as lectotype.

Diagnosis. A species of *Owstonia* with LL pattern type 3; cheek scale rows 5–6; oblique body scale rows in mid-lateral series about 45; dorsal fin with interradial membranes between 2nd spine and 1st soft ray black distally.

Description. A species of *Owstonia* with LL pattern type 3, consisting of a lateral line that does not contact posttemporal sensory canal near anterodorsal margin of gill opening, but instead continues posteriorly just below dorsal-fin base and anteriorly beyond the dorsal-fin origin and makes a complete loop across nape; lateral line ends below dorsal-fin soft rays 15 (17), on right side only of lectotype and paralectotype respectively. Dorsal fin III, 21; anal fin I, 14; pectoral fin 21–22; gill rakers 16 + 26–28 = 42–44. Vertebrae: precaudal 11, caudal 17, total 28; anal-fin pterygiophores anterior to 1st haemal spine 2. Oblique body scale rows in mid-lateral series about 45; nape scaly and cheek scale rows 5–6 (Fig. 12B). Lower limb margin of preopercle with about 12−14 very small, mostly skin-covered spines. Papillae in slight depression behind tip of premaxillary ascending processes 4, arranged in 2 almost equally spaced pairs, the posterior pair slightly larger (Fig. 13). Dentition of lectotype in poor condition, description applies only to paralectotype. Teeth in outer row of each premaxilla 16/18, with 6–9 anterior teeth spike-like; no inner teeth anteriorly. Teeth in lateral row of each dentary 9; symphyseal teeth 5 or 6, spike-like, and with 1 inner tooth anteriorly. Depressed pelvic fin extending to anal-fin origin in the lectotype. Caudal fin lanceolate. Caudal fin 2.4–2.5 times in SL; head 2.8–2.9 times in SL; body depth at anal-fin origin 3.6 times in SL

Color pattern in alcohol: Dorsal fin of lectotype with interradial membranes between 2nd spine and 1st soft ray black distally; this dark fin pigmentation is also shown in Flower's (1943a, fig. 106) drawing of the specimen. Membrane connecting maxilla and premaxilla with prominent black stripe extending to near anterior end of premaxilla, and inner membrane covering posterior part of dentary also black. Life coloration unknown.

Proportions of 65 mm SL lectotype are given first, followed (in parentheses) by those of 56 mm paralectotype, as percentages of SL: predorsal length 30.7 (34.6); preanal length 59.4 (58.6); dorsal-fin base 62.3 (65.2); anal-fin base 30.4 (31.1); pelvic-fin length 25.7 (25.4); caudal-fin length 40.6 (42.5); body depth at anal-fin origin 27.6 (27.5); head length 34.9 (35.3); upper jaw length 19.3 (19.2); upper jaw depth 7.7 (8.2); orbit diameter 16.0 (17.3). As percentages of head length: upper jaw length 55.3 (54.3); orbit diameter 45.8 (48.9).

FIGURE 34. *Owstonia doryptera*, lectotype, USNM 93166, 65 mm SL, Philippines, Mindanao. Photograph by Sandra J. Raredon.

Comparisons. *Owstonia rhamma* and *O. maccullochi* are the only other species with LL pattern type 3 and scaly cheeks, but both have pale dorsal fins (at least in adults). *Owstonia rhamma* also agrees with *O. doryptera* in having very reduced preopercular spines but differs in having a lateral line with an incomplete nape loop (vs. nape loop complete in *O. doryptera*), fewer cheek scale rows 3 (vs. 5–6) and several of the mid-lateral dentary teeth noticeably enlarged (Fig. 69). *Owstonia maccullochi* typically has more dorsal- and anal-fin soft rays (see Table 4), 22 and 15 respectively (vs. 21 and 14 in *O. doryptera*) and more oblique body scale rows in mid-lateral series 53–54 (vs. 45).

Etymology. A combination of the Greek *dory* (spear) and *pteron* (fin), which according to Fowler (1934a) is "with reference to the long pointed soft vertical fins."

Distribution. (Fig. 22) Known only from northern Mindanao, Philippines where trawled in 320 m. The two type specimens, both collected during the Albatross Expedition, are in poor condition. See Smith and Williams (1999) for history of the Albatross Philippine Expedition and its fishes.

Owstonia elongata **new species**

(Figure 35)

Holotype. MNHN 2014–2934, 111, Vanuatu, 15°7'58.8"S, 166°52'58.8"E, beam trawl in 191–248 m, Exped. MUSORSTOM 8, sta. 118, 9 Oct. 1994.

Paratypes. 10 specimens, 63–117 mm SL: **Vanuatu** MNHM 2008–1350, (3, 80–117) and USNM 432454 (2, 110–111), taken with the holotype. **New Caledonia** MNHN 2001–3368 (4, 48–88) 20°57'S, 165°34'58.8"E, beam trawl in 205–212 m, Exped. BATHUS 1, sta. 667, 14 Mar. 1993; MNHN 2004–2445 (1, 63), 21°52'12"S, 166°49'58.8"E, beam trawl in 255–360 m, Exped. BATHUS 1, sta. 646, 10 Mar. 1993.

Diagnosis. A species of *Owstonia* with LL pattern type 1; dorsal fin IV, 24–26; oblique body scale rows in mid-lateral series 30–33; total gill rakers 36–40; body depth at anal-fin origin 10.8–14.0% SL; precaudal vertebrae and pterygiophores anterior to 1st haemal spine 16 and 8 respectively.

Description. (Where counts vary, those of the paratypes are given in parentheses.) A species of *Owstonia* with LL pattern type 1, consisting of a simple lateral line that originates from posttemporal sensory canal near anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base to soft rays 20 (22). Dorsal fin IV, 25 (24–26); anal fin I, 19 (I, 18–19, except 1 specimen with II, 17); pectoral fin 17 (17–19); gill rakers 16 (15–16) + 28 (26–30) = 43 (41–46). Vertebrae: precaudal 16, caudal 16, total 32; anal-fin pterygiophores anterior to 1st haemal spine 8 (Fig. 7E). Oblique body scale rows in mid-lateral series about 30–33; nape scaly and cheek scale rows 3 or 4, Fig. 12C. Lower limb margin of preopercle with 5–8 spines (Fig. 8B). Papillae in slight depression behind tip of premaxillary ascending processes 4, arranged in 2 closely spaced but distinct pairs. Teeth in outer row of each premaxilla 22/27 (18–23); no inner teeth anteriorly. Teeth in lateral row of each dentary 18/20 (12–17), including 1−3 at anterior end that continue in a row behind symphyseal teeth; symphyseal teeth 4−5, short and conical, and with 3–4 smaller inner teeth anteriorly. Pelvic fin possibly sexually dimorphic, depressed fin length extending to posterior margin of anus or to anal-fin soft ray 2. Caudal fin lanceolate. In 6 specimens, 87.5–117.5 mm SL, caudal fin 1.7–2.9 times in SL; head 5.1–6.3 times in SL; body depth at anal-fin origin 7.1–9.1 times in SL.

Color pattern in alcohol: Adults with dorsal fin uniformly pale; membrane connecting maxilla and premaxilla with prominent black stripe extending to near anterior end of premaxilla, and inner membrane covering posterior part of dentary also black. Life coloration unknown.

Proportions of 110 mm SL holotype are given first, followed by those of 4 paratypes, 88–117 mm SL (in parentheses), as percentages of SL: predorsal length 16.6 (15.6–18.8); preanal length 38.1(36.0–42.2); dorsal-fin base 73.0 (69.3–74.5); anal-fin base 50.7 (47.7–54.0); pelvic-fin length 22.5 (15.9–22.5); caudal-fin length 50.4 (34.1–50.4); body depth at anal-fin origin 11.4 (10.8–14.0); head length 18.9 (15.8–19.7); upper jaw length 8.5 (7.6–8.8); upper jaw depth 3.7 (3.6–4.4); orbit diameter 7.1 (6.5–7.6). As percentages of head length: upper jaw length 45.1 (44.0–47.9); orbit diameter 37.6 (38.6–40.9).

Comparisons. *Owstonia elongata* is superficially most similar to *O. taeniosoma* in having a relatively small head and low numbers of oblique body scale rows in mid-lateral series and cheek scales, but differs (characters of *O. elongata* in parentheses) as follows: dorsal-fin spines III (vs. IV), deeper body with depth at anal-fin origin 14.5–18.4% SL (vs. 10.8–14.0%), more total gill rakers 41–46 (vs. 36–40), and fewer precaudal vertebrae and pterygiophores anterior to 1st haemal spine, 15 and 6–7 respectively (vs. 16 and 8). *Owstonia fallax*, *O. hastata* and

O. sibogae are also superficially similar in having IV dorsal-fin spines and relatively few oblique body scale rows in mid-lateral series but differ in having fewer precaudal vertebrae 12–13 (vs. 16) and pterygiophores anterior to 1st haemal spine 4–5 (vs. 8), and a deeper body depth at anal-fin origin 17.5–25.8% SL (vs. 10.8–14.0%).

Etymology. From the Latin *elongatus* (prolonged), in reference to the elongate body of this species.

Distribution. (Fig. 25) Known only from New Caledonia and Vanuatu where trawled in depths of 191–248, 205–212 and 255–360 m.

Remarks. One 87-mm SL specimen (MNHN 2001−3368) is exceptional in having two anal-fin spines. This is the only case of a species of *Owstonia* exhibiting intraspecific variation in number of anal-fin spines (see Table 4).

FIGURE 35. *Owstonia elongata*, holotype, MNHN 2014–2934, 111 mm SL, Vanuatu. Photograph by Sandra J. Raredon.

Owstonia fallax **new species**
(Figure 36)

Holotype. CSIRO H.763–06, 110 mm SL male, Queensland, Australia, NE Hinchinbrook Island, 17°49'S, 146°51'E, 170 m, sta. SOO685/55, 1 Dec. 1985.

Other material. 1 specimen, 96 mm SL: **New Caledonia** USNM 276516 (1, 96), Noumea, off barrier reef taken from stomach of tilefish, *Branchiostegus wardi*, 250 m, P. Fourmanoir, 2 Apr. 1974.

Diagnosis. A species of *Owstonia* with LL pattern type 1; dorsal fin IV, 22–23; anal fin I, 16; oblique body scale rows in mid-lateral series 40–42; precaudal vertebra and anal-fin pterygiophores anterior to 1st haemal spine 13 and 5 respectively.

Description. (When counts vary, those of the holotype are given first, followed in parentheses by those of the New Caledonia specimen.) A species of *Owstonia* with LL pattern type 1, consisting of a simple lateral line that originates from the posttemporal sensory canal near the anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base to soft rays 20 (22). Dorsal fin IV, 22 (23); anal fin I, 16; pectoral fin 20; gill rakers 16 (15/16) + 29 = 45 (44/45). Vertebrae: precaudal 13, caudal 17, total 30; anal-fin pterygiophores anterior to 1st haemal spine 5. Oblique body scale rows in mid-lateral series about 42 (ca. 40); nape scaly and cheek scale rows 3–4. Lower limb margin of preopercle with small spines. Papillae in slight depression behind tip of premaxillary ascending processes 4, arranged in 2 closely spaced but distinct pairs. Teeth in outer row of each premaxilla 32/31 (34/34); no inner teeth anteriorly. Teeth in lateral row of each dentary 17 (16/19), including 3 at anterior end that continue in a row behind symphyseal teeth and with mid-lateral teeth longer and hooked backward (Fig. 10B), like those of *O. geminata*; symphyseal teeth 6 (6), short and conical, larger than lateral teeth, and with cluster of 4 inner teeth anteriorly. Pelvic fin length possibly sexually dimorphic in length, depressed fin extending to anterior margin of anus in holotype and almost to anal-fin origin in paratype. Caudal fin lanceolate. In holotype followed by paratype, caudal fin 1.8, 2.6 times in SL; head 4.5, 4.6 times in SL; body depth at anal-fin origin 5.0, 5.7 times in SL.

Color pattern in alcohol: dorsal fin uniformly pale; membrane connecting maxilla and premaxilla with prominent black stripe extending to near anterior end of premaxilla, and inner membrane covering posterior part of dentary pale in holotype and dark in other specimen. In a note with the New Caledonia specimen, Fourmanoir recorded the life coloration as "body pink, eyes yellow, supraorbital rim blue."

Proportions of 110 mm SL holotype are given first, followed (in parentheses) by those of the 96 mm specimen, as percentages of SL: predorsal length 20.8 (19.7); preanal length 45.1 (41.7); dorsal-fin base 68.2 (70.5); anal-fin base 44.0 (42.6); pelvic-fin length 17.6 (18.5); caudal-fin length 54.4 (38.6); body depth at anal-fin origin 20.2 (17.5); head length 22.4 (21.9); upper jaw length 10.8 (10.3); upper jaw depth 4.3 (4.8); orbit diameter 8.3 (9.0). As percentages of head length: upper jaw length 48.3 (47.1); orbit diameter 36.8 (41.0).

FIGURE 36. *Owstonia fallax*, holotype, CSIRO H 763–06, 110 mm SL, male, Queensland, Australia. Photograph by Sandra J. Raredon.

Comparisons. *Owstonia fallax* has most of the diagnostic characters of *O. geminata* but differs in having fewer oblique body scale rows in mid-lateral series 29−32 (vs. 40–42), pectoral-fin rays 17 or 18 (vs. 20), and a shorter premaxillary stripe extending about 2/3 length of premaxilla (vs. entire length of premaxilla). *Owstonia hastata* is superficially most similar to *O. fallax* but differs (with characters for *O. fallax* given in parentheses) as follows: anal fin II, 14 (vs. I, 16), pelvic fin 34.4–42% SL (vs. 17.6–18.5%), and lower limb margin of preopercle with about 11 or 12 well-developed spines (vs. small weak spines). *Owstonia sibogae* is also superficially similar to *O. fallax* but differs as follows: anal fin II, 15−17 (vs. I, 16), precaudal vertebrae 12 (vs. 11), anal-fin pterygiophores anterior to 1st haemal spine 4 (vs. 5), and lower limb margin of preopercle with about 8−10 well-developed spines (vs. 10–15 small spines). Other species with LL pattern type 1 and IV dorsal-fin spines differ in having anal fin II, 14–17 or I, 17–19 (vs. I, 16), except anal fin I, 15–16 in the Indian Ocean *O. whiteheadi* which has more total gill rakers 52–54 (vs. 40–45), teeth in outer row of each premaxilla 39–45 (vs. 31–34), and fewer precaudal vertebrae and anal-fin pterygiophores anterior to 1st haemal spine 11 and 2 respectively (vs. 13 and 5).

Etymology. The specific epithet is from the Latin *fallax* (deceitful, false), in reference to its superficial resemblance to *Owstonia hastata*.

Distribution. (Fig. 26) Known from Queensland, Australia and New Caledonia in depths of 170 and 250 m.

Remarks. The New Caledonia specimen has a much shorter caudal fin than the holotype and also differs in having the inner membrane covering the posterior part of the dentary very dark (pale in holotype); with only single specimens from each locality, we are not certain that both specimens are conspecific and therefore do not designate the New Caledonia specimen as a paratype.

Owstonia geminata new species

(Figure 37)

Owstonia sibogae. Endo *et al.*, 2015:[7] and 2016:37 (misidentification of ASIZP 68128; comparative material, Philippines).

Holotype. MNHN-2016–0021, 55 mm SL, Vanuatu, 15°7'58.8"S, 166°52'58.8"E, beam trawl in 191–248 m, Exped. MUSORSTOM 8, sta. 1118, 9 Oct. 1994.

Paratypes. 2 specimens, 68–79 mm SL. MNHN 2001−3369, (1, 68), same data as holotype; ASIZP 68128, (1, 79), Philippines, Luzon, Lamon Bay, 14°27'N, 121°48'E, beam trawl in 155–160 m, Aurora sta. cp2719, Y.C. Liao and K.T. Shao, 29 May 2007.

Diagnosis. A species of *Owstonia* with LL pattern type 1; dorsal fin IV, 23–24; anal fin I, 16−17; oblique body scale rows in mid-lateral series 29–32; precaudal vertebra and anal-fin pterygiophores anterior to 1st haemal spine 13 and 5 respectively.

Description. (When counts vary, those of the holotype are given first, followed in parentheses by those of the two paratypes.) A species of *Owstonia* with LL pattern type 1, consisting of a simple lateral line that originates from the posttemporal sensory canal near anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base to soft rays 19 (19−22). Dorsal fin IV, 24 (23−24); anal fin I, 16 (I, 16–17); pectoral fin 17/18 (17); gill rakers 14 (14–16) + 27 (26−29) = 41 (40−44). Vertebrae: precaudal 13, caudal 17, total 30; anal-fin pterygiophores anterior to 1st haemal spine 5. Oblique body scale rows in mid-lateral series about 29/30 (ca. 31−32); nape scaly and cheek scale rows 3–4. Lower limb margin of preopercle with 10–15 relatively large spines (Fig. 8C). Papillae in slight depression behind tip of premaxillary ascending processes 4, arranged in 2 closely spaced but distinct pairs. Teeth in outer row of each premaxilla 23 (22−31); no inner teeth anteriorly. Teeth in lateral row of each dentary 14 (14–19), with mid-lateral teeth higher and slightly hooked backward, like those of *O. fallax*; symphyseal teeth 2−3, bluntly conical (slightly larger than lateral teeth), and with 1 inner tooth anteriorly. Depressed pelvic fin short, extending only to anus. Caudal fin lanceolate. Caudal fin 2.2–2.6 times in SL; head 3.3–4.4 times in SL; body depth at anal-fin origin 4.5–4.8 times in SL.

Color pattern in alcohol: dorsal fin uniformly pale; membrane connecting maxilla and premaxilla with prominent black stripe that extends about 2/3rd length of premaxilla, and inner membrane covering posterior part of dentary pale. Life coloration unknown.

Proportions of 55 mm SL holotype are given first, followed (in parentheses) by those of the 68 and 79 mm paratypes, as percentages of SL: predorsal length 27.0 (25.0−22.2); preanal length 50.4 (49.4−47.7); dorsal-fin base 66.2 (63.8−56.6); anal-fin base 40.2 (38.8−40.6); pelvic-fin length 22.2 (19.2−20.2); caudal-fin length 41.5 (38.5−46.1); body depth at anal-fin origin 22.2 (20.9−21.2); head length 30.4 (24.5−22.5); upper jaw length 13.1 (12.4−10.8); upper jaw depth 13.1 (5.4−5.0); orbit diameter 13.6 (11.0−10.0). As percentages of head length: upper jaw length 43.1 (50.6−47.9); orbit diameter 44.9 (44.9−44.6).

FIGURE 37. *Owstonia geminata*, holotype, MNHN-2016–0021, 55 mm SL, Vanuatu. Photograph by Sandra J. Raredon.

Comparisons. *Owstonia geminata* has most of the diagnostic characters of *O. fallax* but differs in having more oblique body scale rows in mid-lateral series 40–42 (vs. 29−32) and pectoral-fin rays 20 (vs. 17 or 18), and a longer premaxillary stripe that extends entire length of premaxilla (vs. about 2/3 length of premaxilla). *Owstonia hastata* is the only other species that shares with *O. geminata* the same number of dorsal-fin spines, precaudal and caudal vertebrae, and anal-fin pterygiophores anterior to 1st haemal spine, but differs in having anal fin II, 14 (vs. I, 16−17), fin pelvic fin 34.4–42% SL (vs. 19.2–22.2% SL), and lower margin of preopercle with about 10−12 well-developed spines (vs. 10–15 small spines). *Owstonia sibogae* is superficially similar to *O. geminata* but differs (with characters for *O. geminata* given in parentheses) as follows: anal fin II, 15−17 (vs. I, 16−17), precaudal vertebrae 12 (vs. 11), anal-fin pterygiophores anterior to 1st haemal spine 4 (vs. 5), and lower limb margin of preopercle with about 8−10 well-developed spines (vs. 10–15 small spines). The Indian Ocean *O. whiteheadi* has a longer premaxillary stripe extending entire length of premaxilla (vs. only about 2/3 length of maxilla), more total gill rakers 52–54 (vs. 40–44) and teeth on outer row of each premaxilla 39–45 (vs. 22–31), and fewer precaudal vertebrae and anal-fin pterygiophores anterior to 1st haemal spine 11 and 2 respectively (vs. 13 and 5).

Etymology. From the Latin *geminatus* (twin), in allusion to the obviously close phylogenetic relationship and superficial resemblance of this species to *Owstonia fallax*.

Distribution. (Fig. 26) Known from Vanuatu and the Philippines from two trawl collections in depths of 191−248 and 155−160 m respectively.

***Owstonia grammodon* (Fowler)**
(Figure 38)

Opsipseudochromis grammodon Fowler, 1934a:357, fig. 107 (original description; type locality erroneously given as "between Gillolo and Kayoa islands", but see Remarks).

Owstonia grammodon (*non* Fowler). Okada and Suzuki, 1956:185, fig. 1 (osteology; based on misidentification of *O. japonica*); Endo *et al.*, 2015:[7] and 2016:37 (comparative material two specimens, 102–116 mm SL from Taiwan).

Material examined. 5 specimens, 51–127 mm SL. **Sulawesi**: USNM 93167 (67), holotype of *Opispseudochromis grammodon*, Sulawesi, Doworra Islands, 0°50'S, 128°12'E, 375 m, R/V Albatross sta. D.5629, 2 Dec. 1909; USNM 149321 (1, 127) and USNM 151389 (1, 51), same data as holotype. **Taiwan**: ASIZP 59004 (1, 102) Nanfang-ao Yilan, 24.5818°N, 121.8668°E, B.H. Gao, 1 Jul. 1993; ASIZP 64630 (1,115.6), Da-xi, Yilan, 24.94°N, 121.9°E, fish market, K.-T. Shao, 27 Jun. 2004.

Diagnosis. A species of *Owstonia* with LL pattern type 1; lower limb margin of preopercle without spines; dorsal fin III, 20–22; anal fin I, 13; dorsal fin without black blotch anteriorly in adults; black premaxillary stripe; adults with 33–39 teeth in outer row of each premaxilla.

Description. A species of *Owstonia* with LL pattern type 1, conisting of a simple lateral line that originates from posttemporal sensory canal near anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base to soft rays 19–22. Dorsal fin III, 20–22; anal fin I, 13; pectoral fin 19; gill rakers 11+25 (in 67 SL holotype), 13/14+26/27 = 40 (in largest 127 SL specimen) and 13+22–23 = 35–36 (in 102–116 SL Taiwan specimens). Vertebrae (values for Taiwan specimens in parentheses): precaudal 11 (12), caudal 17 (16), total 28; anal-fin pterygiophores anterior to 1st haemal spine 3 (4). Oblique body scale rows in mid-lateral series 40–45; nape scaly and cheek scale rows 5–6 (Fig. 12D). Lower limb margin of preopercle without spines. Papillae in slight depression behind tip of premaxillary ascending processes 4, arranged in 2 almost equally-spaced pairs. Teeth in outer row of each premaxilla of holotype ca. 38 (33–39); 1 or 2 inner teeth anteriorly. Teeth in lateral row of each dentary in holotype ca. 17 (15–18), the mid-lateral teeth relatively large and slightly hooked backward; symphyseal teeth 3 or 4, relatively large and conical (Fig. 10C), and with 2 (2–4) inner teeth anteriorly. Depressed pelvic fin extending to anal-fin origin in largest (unsexed) Philippine specimen and in Taiwan specimens. Caudal fin lanceolate.

Color pattern in alcohol: Dorsal fin uniformly pale; membrane connecting maxilla and premaxilla with evidence of dark stripe extending to near anterior end of premaxilla, and inner membrane covering posterior part of dentary pigmented.

FIGURE 38. *Owstonia grammodon*, USNM 149321, 127 mm SL, Sulawesi, Doworra Island. Photograph by Sandra J. Raredon.

Proportions of 67 mm SL holotype are given first, followed (in parentheses) by those of the 127 mm SL specimen and then the 102–116 mm SL Taiwan specimens, as percentages of SL: predorsal length 29.4–(26.5, 27.3, 29.6); preanal length 55.6–(57.4, 55.4, 53.8); dorsal-fin base 59.6–(59.2, 61.9, 64.0); anal-fin base 32.9–(32.9, 31.6, 32.5); pelvic-fin length [tip broken off] –(23.8, 25.5, 26.5); caudal-fin length 38.7–(31.0, 46.1, 56.5); body depth at anal-fin origin 29.2–(26.5, 21.3, 24.0); head length 32.3–(28.2, 26.1, 28.5); upper jaw length 17.0–(16.0, 14.5, 14.9); upper jaw depth 7.9–(7.0, 6.8, 6.9); orbit diameter 16.0–(12.9, 11.2, 11.7). As percentages of head length: upper jaw length 52.8–(56.6, 55.5, 52.2); orbit diameter 49.4–(45.7, 42.7, 41.2). Life coloration unknown.

Comparisons. *Owstonia hawaiiensis* and *O. ignota*, the only other species with most of the diagnostic characters of *O. grammodon*, differ in lacking a premaxillary stripe (vs. prominent black stripe in *O. grammodon*). These two species, together with *Owstonia grammodon*, also differ from most congeners with LL pattern 1 in having relatively small and numerous teeth (33–39) in outer row of each premaxilla (see Table 3).

Etymology. A combination of the Greek *gramme* (line, or row) and *odon* (tooth), presumably in reference to the mostly single rows of teeth in the jaws.

Distribution. (Fig. 23) Known from the type locality in Sulawesi, Indonesia based on three specimens, all in relatively poor condition, taken together in the same trawl haul in 375 m, and two fish market specimens from Taiwan.

Remarks. Fowler's (1934a) original description of this species was based on a single Albatross specimen but we found two others with identical collection data. The type locality given in the original description "between Gillolo and Kayoa Islands" is erroneous for Albatross station D.5629 but correct as recorded for the holotype USNM 93167 in material examined. See Smith and Williams (1999) for history of the *Albatross* Philippine Expedition and its fishes. Fowler's counts of anal-fin rays and gill rakers (I, 17 and 8 + 21 respectively) for the holotype are also inaccurate; our counts for the same elements are I, 13 and 11 + 24. The largest Sulawesi specimen has the highest gill raker counts.

The Sulawesi specimens differ from the two Taiwan specimens in having 11 + 17 (vs. 12 + 16) vertebrae and anal-fin pterygiophores anterior to 1st haemal spine 3 (vs. 4), but are otherwise very similar, especially in having relative high numbers of teeth in the outer row of each premaxilla (33–34 in Taiwan specimens vs. 36−39 in those from Sulawesi). When more specimens from both localities become available, the taxonomic status of fish from Taiwan should be re-evaluated.

Records of *O. grammodon* from Japan by various Japanese authors are probably all based on misidentifications of *O. japonica* (see synonymy for that species), because they did not list that species in their accounts and reported I, 14 anal-fin rays (versus our count of I, 13 for *O. grammodon*, see Table 4). In addition to having a different number of anal-fin soft rays, *Owstonia japonica* has fewer teeth in the outer row of each premaxilla (14−23, vs. 33−39), more total gill rakers (41−46, vs. 35−40, see Table 7), and lower limb margin of preopercle with spines (vs. preopercular spines absent in *O. grammodon*).

Owstonia hastata **new species**

(Figure 39)

Holotype. NTM S.11779–002, 124 mm SL, Queensland, Australia, E. of Dunk Island, 18°0'S, 147°4'E, 260 m, Jan. 1986.

Paratype. AMS I.25812–010 (1, 133), Queensland, N. of Townsville, 18°0'S, 147°01'E, trawled in 222–228 m, R/V Soela, sta. SO1/86/24, 12 Jan. 1986

Diagnosis. A species of *Owstonia* with LL pattern type 1; dorsal fin IV, 22 ; and anal fin II, 14; oblique body scales 38; lower margin of preopercle with about 11 or 12 well-developed spines; pelvic fin 34.4–42.1% SL.

Description. (Where counts vary, those of the paratype are given in parentheses.) A species of *Owstonia* with LL pattern type 1, consisting of a simple lateral line that originates from posttemporal sensory canal near anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base to soft ray 18. Dorsal fin IV, 22; anal fin II, 14; pectoral fin 19–(20); gill rakers 16 + 29 (30) = 45 (46). Vertebrae: precaudal 13, caudal 17, total 30; anal-fin pterygiophores anterior to 1st haemal spine 5. Oblique body scale rows in mid-lateral series about 38; nape scaly and cheek scale rows 3–4. Lower limb margin of preopercle with about 8−12 well-developed spines. Papillae in slight depression behind tip of premaxillary ascending processes 4, arranged in 2 rows with posterior pair of papillae larger than the others. Teeth in outer row of each premaxilla 20 (21); no inner teeth anteriorly. Teeth in lateral row of each dentary 10/14 (10), with anterior ones moderately hooked and spaced apart; symphyseal teeth 4/5 (4), short and conical, and with 2/3 (2−3) inner teeth anteriorly. Pelvic fin possibly sexually dimorphic, depressed fin extending to anal-fin soft rays 4 (holotype) or 7 (paratype). Caudal fin lanceolate. Caudal fin 1.3–2.3 times in SL; head 4.5–4.6 times in SL; body depth at anal-fin origin 5.1–5.2 times in SL. In 4 specimens 67–127mm SL, caudal fin 1.8–3.2 times in SL; head 3.1–3.8 times in SL; body depth at anal-fin origin 3.4–4.7 times in SL.

Color pattern in alcohol: Dorsal fin uniformly pale; membrane connecting maxilla and premaxilla with prominent black stripe extending to near anterior end of premaxilla (Fig. 15A), and inner membrane covering posterior part of dentary also black. Life coloration unknown.

Proportions of 124 mm SL holotype are given first, followed by those of the 133 mm SL paratype (in parentheses) as percentages of SL: predorsal length 19.9 (20.7); preanal length 48.0 (46.0); dorsal-fin base 69.2 (69.2); anal-fin base 40.1 (37.3); pelvic-fin length 34.4 (42.1); caudal-fin length 54.4 (38.7); body depth at anal-fin origin 20.2 (17.5); head length 22.4 (21.7); upper jaw length 10.8 (10.3); upper jaw depth 4.3 (4.8); orbit diameter 8.2 (9.0). As percentages of head length: upper jaw length 48.3 (47.6); orbit diameter 36.8 (41.3).

FIGURE 39. *Owstonia hastata*, paratype, AMS I.1258112–010, 133 mm SL, Queensland, Australia. Photograph by Sandra J. Raredon.

Comparisons. *Owstonia fallax* is superficially most similar to *O. hastata* but differs (with characters for *O. hastata* given in parentheses) as follows: anal fin I, 16–17 (vs. II, 14), pelvic fin 17.6–19.3% SL (vs. 34.4–42%), and lower margin of preopercle with small weak spines (vs. about 11 or 12 well-developed spines). Other species with LL pattern type 1 and IV dorsal-fin spines differ in having anal fin I, 15–19 or II, 15–17 (vs. II, 14). *Owstonia contodon* further differs in having more oblique body scale rows in mid-lateral series, 47–53 (vs. 38) and precaudal vertebrae and anal-fin pterygiophores anterior to 1st haemal spine 11 and 3 respectively (vs. 13 and 5). *Owstonia sibogae* has a short premaxillary stripe extending about 1/2 length of premaxilla (vs. long stripe extending entire length of premaxilla), fewer oblique body scale rows in mid-lateral series 27–30 (vs. 38), and fewer precaudal vertebrae and anal-fin pterygiophores anterior to 1st haemal spine 12 and 4 respectively (vs. 13 and 5).

Etymology. From the Latin *hastatus* (spear-shaped), in allusion to the lanceolate caudal fin.

Distribution. (Fig. 26) Known only from Queensland, Australia where trawled in 228–260 m.

***Owstonia hawaiiensis* new species**
(Figures 40, 41)

Owstonia sp. Grigg, *et al.*, 1987:387 (Cross Seamount, photographed in 300–600 m); Chave and Mundy, 1994:389 (Hawaiian records, observations in 349–420 m).
Sphenanthias sp Mundy, 2005:418 (larvae reported from Cross and Lōʻihi seamounts to Oahu, Hawaii).

Holotype. (Only known specimen) BPBM 29660, 124 mm SL, female, Hawaiian Islands, Mauno Kea Ledge, 19°54'N, 154°57.7' W, 366 m (1200 ft), collected with suction device by E. H. Chave and B. Bartko (pilot of submersible Makalii), HURL dive 218, 9 Feb. 1984.

Other material. (See also Remarks) Six larvae 10.9–17.2 mm SL, all from off Oahu, Hawaii, 13 km off leeward side, Jul. 1978, T. A. Clarke: LACM 45959–9 (1, 12.6); LACM 45962–11 (1, 10.9); LACM 45965–7 (1, 14.6); LACM 45966–10 (1, 17.2); LACM 45967–10 (1, 13.2); LACM 45990–10 (1, 13.4).

Diagnosis. A species of *Owstonia* with LL pattern type 1; lower limb margin of preopercle without spines;

dorsal fin III, 19; no dark premaxillary stripe; adults with 34–35 teeth in outer row of each premaxilla; papillae in slight depression behind tip of ascending process of premaxillae with a cluster of about 5 minute papillae present between the posterior pair of relatively large papillae.

FIGURE 40. *Owstonia hawaiiensis*, holotype, BPBM 29660, 124 mm SL, female, Hawaiian Islands. Photograph by John E. Randall.

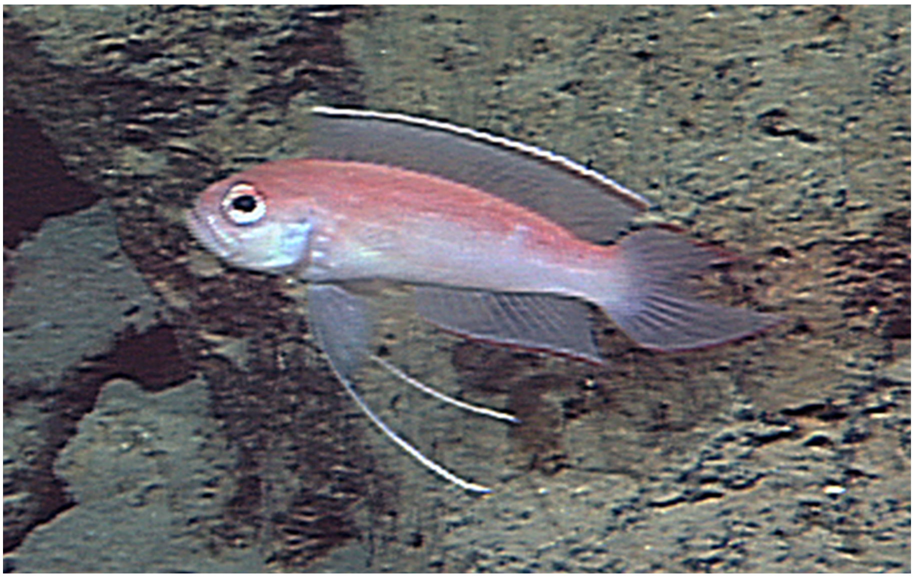

FIGURE 41. *Owstonia hawaiiensis*, male, Hawaiian Islands, 19°52'9.8"N, 156°6'4"W, Tiburon 292, depth 408.5 m, 13 April 2001. Video frame-grab, color corrected by Lonny Lundsten, image courtesy © 2001 MBARI.

Description. A species of *Owstonia* with LL pattern type 1, consisting of a simple lateral line that originates from posttemporal sensory canal near anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base to soft rays 19–20. Dorsal fin III, 19; anal fin I, 13; pectoral fin 19; gill rakers 15 + 28 = 43. Vertebrae: precaudal 11, caudal 17, total 28; anal-fin pterygiophores anterior to 1st haemal spine 3. Oblique body scale rows in mid-lateral series about 37 or 38; nape scaly and cheek scale rows about 4, left side only. Lower limb margin of preopercle without spines. Papillae in slight depression behind tip of premaxillary ascending processes 4, relatively large and arranged in 2 almost equally spaced pairs, with a cluster of about 5 minute papillae between the posterior pair of papillae. Teeth in outer row of each premaxilla 34/35, the anterior ones larger and slightly hooked; 2–3 inner teeth anteriorly. Teeth in lateral row of each dentary 15, the anterior 6 or

7 moderately slender and slightly hooked (Fig. 10D); symphyseal teeth 3–4, all conical, and with 3 similar-sized inner teeth anteriorly. Pelvic fin sexually dimorphic, depressed pelvic fin extending to1st anal-fin soft ray in female holotype, and an individual observed in video recordings off Hawai'i Island (Fig. 41) has very long pelvic fins extending to near rear of anal fin. Caudal fin lanceolate. Holotype with caudal fin 2.4 times in SL; head 3.2 times in SL; body depth at anal-fin origin 3.6 times in SL.

Color pattern in alcohol: Adults with dorsal fin pale, membrane connecting maxilla and premaxilla, and inner membrane covering posterior part of dentary unpigmented. In life, head and body red, paler below, distal margin of dorsal fin and elongate anal-fin soft ray of males white. Caudal and anal fins pale with narrow red margins, and dorsal fin with narrow submarginal red stripe, wider posteriorly. Based on submersible videos, fish from Kingman Reef, presumed to be *Owstonia mundyi*, have virtually identical life coloration.

Proportions of 124 mm SL female holotype as percentages of SL: predorsal length 29.6; preanal length 58.8; dorsal-fin base 61.4; anal-fin base 30.9; pelvic-fin length 32.4; caudal-fin length 41.9; body depth at anal-fin origin 28.1; head length 31.1; upper jaw length 16.1; upper jaw depth 7.0; orbit diameter 13.7. As percentages of head length: upper jaw length 51.8; orbit diameter 44.0.

Comparisons. *Owstonia hawaiiensis* is very similar to the allopatric *O. ignota* but differs in several subtle characters (refer to Remarks in following species account) including relatively smaller and only slightly hooked mid-lateral dentary teeth (Fig. 10D), and papillae in slight depression behind tip of ascending process of premaxillae with a cluster of about 5 minute papillae present between the posterior pair of relatively large papillae (vs. no cluster of minute papillae present in *O. ignota*). The only other congener from the central Pacific Ocean known from adults is the very distinctive *O. mundyi*, which differs from *O. hawaiiensis* in having nape and cheeks without scales (vs. nape and cheeks scaly), oblique body scale rows in mid-lateral series 97–108 (vs. 37–38) and a black premaxillary stripe (vs. premaxillary stripe absent). *Owstonia grammodon* also agrees with *O. hawaiiensis* in having most of these characters, including a low number of dorsal- and anal-fin soft rays and adults with relatively high numbers (33–39) of teeth in the outer row of each premaxilla, but differs in having a prominent black premaxillary stripe (vs. premaxillary stripe absent in *O. hawaiiensis*).

Etymology. The specific epithet is a combination of Hawaii, the type locality where it is presumably endemic, and the Latin suffix *ensis* (meaning belonging to).

Distribution. (Fig. 24) Known only from the Hawaiian Archipelago. In addition to the holotype, fish we assume to be *O. hawaiiensis* have been observed from submersibles in 342–420 m in Hawaiian waters (Chave and Mundy, 1994), in 300–600 m at Cross Seamount, 18°40'N, 158°17'W (Grigg *et al.*, 1987), and at 19°53'N, 156°6'W in 408 m (see Fig. 41).

Remarks. Six larvae from Oahu (see above) have a combination of dorsal- and anal-fin soft rays and caudal vertebral counts that match only those of *O. hawaiiensis*, *O. ignota* or *Owstonia* sp. 2 from Tarasoc seamounts, but the strong modal difference (4 vs. 3) in numbers of pterygiophores anterior to 1st haemal spine does not agree with this triad of species or with *O. mundyi* (see Table 5).We tentatively identify these larvae as *O. hawaiiensis* but do not designate them as paratypes. The very distinctive *O. mundyi,* the only other described congener known from the eastern part of the central Pacific Ocean, differs from *O. hawaiiensis*, the Hawaiian larvae and *Owstonia* sp. 2 in having no overlap in number of dorsal- and anal-fin soft rays (Table 4).

***Owstonia ignota* new species**

(Figure 42)

Owstonia **n. sp.** Myers & Donaldson, 2003:631 (listed, Saipan).

Holotype. USNM 344400, 118 mm SL, male, Mariana Islands, near Saipan, 15°36'N, 145°34'E, in vicinity of active submarine volcano (Ruby Volcano), found floating on surface over depth of 186 m, Division of Fish & Wildlife personnel, 25 Oct. 1995.

Diagnosis. A species of *Owstonia* with LL pattern type 1; lower limb margin of preopercle without spines; dorsal fin III, 19; no dark premaxillary stripe; adults with about 38–39 teeth in outer row premaxilla; papillae in slight depression behind tip of ascending process of premaxillae without a cluster of about 5 minute papillae present between the posterior pair of relatively large papillae.

Description. A species of *Owstonia* with LL pattern type 1, consisting of a simple lateral line that originates from posttemporal sensory canal near anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base to soft ray 19. Dorsal fin III, 20; anal fin I, 13; pectoral fin 20; gill rakers 14 + 27 = 43. Vertebrae: precaudal 11, caudal 17, total 28; anal-fin pterygiophores anterior to 1st haemal spine 3. Oblique body scale rows in mid-lateral series about 37 or 38; nape scaly and cheek scale rows about 3 or 4. Lower limb margin of preopercle without spines. Papillae in slight depression behind tip of premaxillary ascending processes 4, relatively large and arranged in 2 almost equally spaced pairs. Teeth in outer row of each premaxilla 38/39, anterior ones larger and more strongly hooked; 2–3 inner teeth anteriorly. Teeth in lateral row of each dentary 15/16, with 6 or 7 of the anterior ones robust and strongly hooked (Fig. 10E); symphyseal teeth 3–4, relatively large, conical, and with 2 similar-sized inner teeth anteriorly. Pelvic fin presumably sexually dimorphic, depressed pelvic fin extending beyond last anal-fin ray in male holotype. Other *Owstonia* species with individuals that have very long pelvic fins (e.g., *O. contodon* and *O. whiteheadi*) for which a reasonable number of adults are available also include individuals with relatively short fins, strong evidence of sexual dimorphism. Caudal fin lanceolate. Holotype with caudal fin 2.5 times in SL; head 4.2 times in SL; body depth at anal-fin origin 3.7 times in SL.

Color pattern in alcohol: Adults with dorsal fin pale, membrane connecting maxilla and premaxilla, and inner membrane covering posterior part of dentary unpigmented. In fresh specimen, fins and body pink or red, paler below, and elongate pelvic-fin soft ray mostly white.

Proportions of 118 mm SL male as percentages of SL: predorsal length 28.6; preanal length 52.8; dorsal-fin base 60.8; anal-fin base 33.1; pelvic-fin length 64.2; caudal-fin length 40.1; body depth at anal-fin origin 27.2; head length 29.9; upper jaw length 16.1; upper jaw depth 7.4; orbit diameter 12.3. As percentages of head length: upper jaw length 54.0; orbit diameter 41.2.

FIGURE 42. *Owstonia ignota*, holotype, USNM 344400, 118 mm SL, male, Mariana Islands, near Saipan. Photograph by Robert F. Myers.

Comparisons. *Owstonia ignota* is very similar to the allopatric *O. hawaiiensis* but differs in having larger and more strongly hooked mid-lateral dentary teeth (compare Figs. 10D, 10E) and papillae in slight depression behind tip of ascending process of premaxillae without a cluster of about 5 minute papillae present between the posterior pair of relatively large papillae (vs. cluster of minute papillae present between the posterior pair of relatively large papillae in *O. hawaiiensis*). The allopatric *O. grammodon* also shares many characters with *O. ignota*, including adults with relatively high numbers (33–39) of teeth in outer row of each premaxilla but differs in having a prominent black premaxillary stripe (vs. premaxillary stripe absent in *O. ignota*). The only other congener from the central Pacific Ocean known from adults is the very distinctive *O. mundyi*, which differs in having nape and cheeks without scales (vs. nape and cheeks scaly), oblique body scale rows in mid-lateral series 97–108 (vs. 37–38) and a black premaxillary stripe (vs. premaxillary stripe absent).

Etymology. The specific epithet, from the Latin *ignotus* (unknown), is in allusion to our initial uncertainty about how to taxonomically treat this specimen considering the minor characters that distinguish it from the holotype of *Owstonia hawaiiensis.* Furthermore, with only a single specimen of this species available, sexual dimorphism of the pelvic fin can be reasonably hypothesized but still remains unknown.

Distribution. (Fig. 24) Known only from the Mariana Islands (Ruby Volcano vicinity) type locality. It is possible that *O. ignota* is a Pacific Plate endemic (Springer, 1982), but because very few hard-bottom fishes that occur on the Pacific Plate in depths ≥200 m have been adequately sampled, their distributions are poorly known.

Remarks. Our decision to recognize *Owstonia ignota* and O. *hawaiiensis* as different species has the advantage of calling attention to both of them (despite their minor but presumably consistent distinguishing characters). With opposite sexes only and single specimens available for each of these species, we cannot dismiss the possibility that dentition differences (Figs. 10D, 10E) are due to sexual dimorphism. However, we have also been influenced by the fact that about 25% of the shore fishes of the Hawaiian Islands, including species to 200 m, are apparently endemic (Randall, 2007). The Marianas Islands are located along the western margin of the Pacific Plate near the eastern edge of the Philippine Plate. Although the geological history of the region is very complex (Springer, 1982), it is doubtful that a benthic deep water species whose ecology appears to be closely associated with sea-floor spreading would have a distribution that extends from near the western margin of the Pacific Plate to the Hawaiian Islands. Further discussion of the possible zoogeographic affinities of *Owstonia ignota* is unjustified in view of the limited sampling of seamounts in the central Pacific region at depths where species of *Owstonia* might possibly occur.

Owstonia japonica Kamohara

(Figures 43−45)

Owstonia japonica Kamohara, 1935:133, fig. 2 (original description; off Mimase, near Kôchi Prov., Tosa, Japan; depth 80 fms [146 m]); Endo *et al.*, 2015:[7] and 2016:37 (comparative material 19 specimens, 101–157 mm SL, listed from Japan).

Owstonia grammodon (*non* Fowler). Okada and Suzuki, 1956:185, fig. 1 (misidentification, osteological description); Kamoharai, 1961:1 (considered to be a synonym of *O. japonica*); Shiino, 1972:116 (misidentification, common name "White-edged jawfish"); Machida *in* Masuda *et al.*, 1984:201, Pl. 192-F (misidentification, brief description, color photograph); Nakabo, 2002:914 (misidentification, diagnosis, in pictorial key); Shinohara and Matsuura, 1997:306 (misidentification, listed in checklist, Suruga Bay; Japanese name Soko-amadai-modoki).

Material examined. 13 specimens, 88–174 mm SL, all from Japan: ANSP 151948 (2, 136–143), Kochi Pref., Mimase fish market, 31 Oct. 1980; ASIZ P.71559 (3, 160–169), Kochi City, Japan, 25°3"N, 121°56'W, H. Endo; BSKU 92331 (1, 142), off Kochi; CAS 133927 (1, 141), CAS 133931 (1, 141), CAS 133935 (1, 174) and CAS 133937 (1, 148), all Kochi Pref., Kochi, T. Kamohara, 1937; NSMT-P 32720 (2, 88–137), Shikoku, Kochi Pref., Tosa Bay; NSMT-P 46724 (1, 156), Shikoku, Tosa Bay, K. Matsuura, Feb. 1984.

Diagnosis. A species of *Owstonia* with LL pattern type 1 (one specimen, discussed below, is exceptional in having a lateral line with a nape loop); dorsal fin III, 21; anal fin I, 13–14 (typically 14); lower limb margin of preopercle with 5–8 spines varying from embedded under skin and difficult to see to partially exposed and moderately large; teeth in outer row of each premaxilla 14–23; in fresh specimens median fins with white margins and dorsal and caudal fins with narrow, red, submarginal stripe.

Description. A species of *Owstonia* with LL pattern type 1 (Fig. 6A) that typically originates from posttemporal sensory canal near anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base to soft rays 19–21. (CAS 133935, 1 of 13 specimens, is exceptional in having a lateral line with a complete nape loop but otherwise agrees perfectly with *O. japonica*). Dorsal fin III, 21; anal fin I, 13–14 (rarely 13); pectoral fin 20–22; gill rakers 13–16 + 26–31 = 41–47. Vertebrae: precaudal 11, caudal 17, total 28; anal-fin pterygiophores anterior to 1st haemal spine 2. Oblique body scale rows in mid-lateral series about 45–52; nape scaly and cheek scale rows 5–7. Lower limb margin of preopercle with 5–8 spines varying from embedded under skin and difficult to see to partially exposed and moderately large. (Okada and Suzuki, 1956, fig. 1, include a good drawing of the preopercular spines of *O. japonica,* which they misidentified as *O. grammodon.*) Papillae in slight depression behind tip of premaxillary ascending processes 4, arranged in 2 almost equally spaced pairs. Teeth in outer row of each premaxilla 14–23; 1 or 2 inner teeth anteriorly. Teeth in lateral row of each dentary 8–12, including 1−4 teeth at anterior end that continue behind symphyseal teeth in larger specimens; symphyseal teeth 4–6, blunt and conical, and with 1–3 very small inner teeth anteriorly. Depressed pelvic fin extending posteriorly only to anal-fin origin. Caudal fin lanceolate. In 10 specimens, 88–174 mm SL, caudal fin 1.6–2.2 times in SL; head 3.5–4.0 times in SL; body depth at anal-fin origin 3.7–4.4 times in SL.

Color pattern in alcohol: Adults with anterior part of dorsal fin uniformly pale; membrane connecting maxilla and premaxilla with prominent black stripe extending to near anterior end of premaxilla, and inner membrane covering posterior part of dentary also black. In fresh specimens, interradial membranes of dorsal fin with dark reticulations, median fins with white margins and dorsal and caudal fins with narrow, dark red submarginal stripe. Kamohara (1934) noted that in life *Owstonia japonica* is uniformly reddish and the "vertical fins finely adorned with many small white vermiculate markings, the margin being whitish."

Proportions of 13 specimens 88–174 mm SL mm SL, as percentages of SL: predorsal length 24.3–28.7; preanal length 51.2–66.2; dorsal-fin base 60.5–77.6; anal-fin base 24.4–41.3; pelvic-fin length 25.2–32.6; caudal-fin length 43.8–70.3; body depth at anal-fin origin 22.6–36.0; head length 24.9–29.5; upper jaw length 13.0–16.0; upper jaw depth 5.7–7.3; orbit diameter 10.4–13.9. As percentages of head length: upper jaw length 47.7–63.3; orbit diameter 38.7–52.1.

FIGURE 43. *Owstonia japonica*, BSKU 92331, 142 mm SL, Japan, off Kochi. Photograph courtesy Hiromitsu Endo.

FIGURE 44. *Owstonia japonica*, ANSP 151948, 143 mm SL, Japan, off Kochi. Photograph by Sandra J. Raredon.

Comparisons. *Owstonia scottensis* and *O. dispar*, the only species with most of the diagonostic characters of *O. japonica*, differ (characters of *O. japonica* in parentheses) as follows: *O. scottensis* has a larger orbit diameter 15–17.5% SL (vs. 10.4–13.9%), and in fresh specimens median fins uniformly red (vs. median fins with white margins and dorsal and caudal fins with narrow, red submarginal stripe); *O. dispar* has fewer cheek scale rows, 3 (vs. 5–7), longer upper jaw at similar sizes, 16% SL (vs. 14.4% SL), and each dentary with 3 spike-like symphyseal teeth (vs. 4–6 blunt, conical, symphyseal teeth).

Etymology. The specific epithet is the Latinized version of Japan, the type locality of the species.

Distribution. (Fig. 23) Known only from vicinity of Shikoku Island, Japan where trawled in at least 146 m.

Remarks. The original description includes data for three specimens (145–225 mm TL), with no particular individual specified as the holotype other than the statement "the type is deposited at the Biological Laboratory, Kôchi College." Subsequently, Kamohara (1961:1) stated that the holotype (BSKU) was lost.

One specimen of *Owstonia japonica* (Fig. 45) is atypical in having a type 3 lateral-line pattern with a complete nape loop but all its other characters agree well with typical specimens of *O. japonica*. This is one of several reasons why we do not use lateral-line patterns as the basis for generic groupings of owstoniine fishes. *Owstonia totomiensis*, the only other species known from Japan with a complete lateral-line nape loop, differs most obviously in lacking cheek scale rows.

Records of *O. grammodon* from Japan appear to have been based on misidentifications of *O. japonica* (see above synonymies and Remarks in *O. grammodon* account.).

FIGURE 45. *Owstonia japonica*, CAS 133935, 174 mm SL, Japan off Kochi. Photograph by Sandra J. Raredon.

Owstonia kamoharai Endo, Liao and Matsuura
(Figures 46−48)

Owstonia kamoharai Endo, Liao and Matsuura, 2015:[2], figs. 2 & 3 and 2016:32, figs. 2 & 3 (original description; Mimase fish market, off Kan-no-ura, Toyo Town, Kochi Pref., Shikoku Island, southern Japan; holotype NSMT-P 109686).
Owstonia sp. Ikeda and Nakabo, 2015:168, 441, pl. 167, color photographs 4–6 (brief description).

Material examined. 10 specimens, 122–408 mm SL: **Japan** BSKU 74538 (1, 147), Suruga Bay, off Heta, Numazu City, Shizuoka, 300–350 m, 20 Feb. 1992; BSKU 98751 (1, 263, x-ray only), off Nachi-katsuura, Wakayama, Kii Peninsula, 260 m. **Arafura Sea** NTM S.12450–005 (1, 338), N. of Bathurst Island, 9°42'S, 130°22'E, 210 m, M. Sachse, Jul. 1988; NTM S.12567–004 (1, 212), S. of Tanimbar Island, 9°20'S, 131°8'E, 298 m, Jul. 1988. **Western Australia** CSIRO 3596 (1, 282), SW of Imperieue Reef, 17°56'S, 118°21'E, 420 m, 5 Feb. 1983; CSIRO H2075–001 (1, 407), NNW of Port Hedland, 18°00'S, 118°13'E, 375 m, 11 Feb. 1989; CSIRO H2099–007 (1, 408), E. of Rowley Shoals, 16°58'S, 120°13'E, 413 m, 2 Apr. 1989; CSIRO H7136–02 (1, 408), S. of Scott Reefs, 14°16'S, 122°16'E, 358 m, R/V Heron sta. 6–6–2004 shot 2, 6 Jun. 2004; NTM S.12631–017 (2, 122–206), Western Australia, off Rowley Shoals, NW Shelf, 17°37'S, 118°40'E, 400 m, Nov. 1985.

Diagnosis. A species of *Owstonia* with LL pattern type 1; cheek scale rows 7–10, with scales relatively small and usually slightly separated from adjacent scales (Figs. 12E, 12F); caudal fin of adults rounded posteriorly; lower limb margin of preopercle without spines; dorsal fin III, 21–22 without black blotch anteriorly in adults (except smallest, 147 mm SL, paratype from Japan has four dark blotches along base of fin on interradial membranes between spine 3 and ray 4).

Description. (Includes data for 5 type specimens, including the holotype, 263–402 mm SL, from Japan based solely on original description.) A species of *Owstonia* with LL pattern type 1, consisting of a simple lateral line that originates from posttemporal sensory canal near anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base to soft rays 14–18. Dorsal fin III, 21–22 (rarely 22); anal fin I, 13–14 (rarely 13); pectoral fin 21–23; gill rakers 13–15 + 24–26 = 37–40. Vertebrae: precaudal 11, caudal 17 (rarely 18), total 28 (29); anal-fin pterygiophores anterior to 1st haemal spine 2. Oblique body scale rows in mid-lateral series about 53–56; nape scaly and cheek scale rows usually 7–10 (Figs. 12E, 12F); some cheek scales usually slightly separated from adjacent scales (Fig. 12F). Lower limb margin of preopercle without spines. Papillae in slight depression behind tip of premaxillary ascending processes all very small and difficult to discern, essentially a few larger papilla around which are smaller papillae in no regular pattern. Upper jaw when tightly closed usually extending to or slightly beyond vertical from posterior margin of orbit. Teeth in outer row of each premaxilla 15–24; 0–3 inner teeth anteriorly. Teeth in lateral row of each dentary 8–14 including 1−4 teeth at anterior end that continue behind symphyseal teeth in larger specimens; symphyseal teeth 4–7, short and spike-like (Fig. 9B), and with 1–2 inner teeth anteriorly. Pelvic fin short, depressed fin not extending to anus. Caudal fin of adults rounded posteriorly. In 7 specimens, 122–408 mm SL, caudal fin 2.6–3.0 times in SL; head 3.0–3.6 times in SL; body depth at anal-fin origin 3.9–4.2 times in SL.

Color pattern in alcohol: Adults with dorsal fin usually uniformly pale, but smallest (147 mm SL) paratype with dark blotches on interradial membranes along base between spine 3 and soft ray 4; membrane connecting maxilla and premaxilla usually with prominent black stripe extending to near anterior end of premaxilla, but mottled in three western Australia specimens (CSIRO 3596, NTM S.12450–005 and NTM S.12567–004), and inner membrane covering posterior part of dentary also black. Color of fresh specimens according to Endo et al (2016): "head, body, and fins reddish, ventral side whitish …margin of vertical fins and branched rays of caudal fin slightly whitish …; black blotches on posterior part of dorsal fin in holotype; two black spots on middle part of dorsal fin in FAKU 98751." Unpreserved fresh specimens from off Rowley Shoals (Fig. 48) also have dorsal, anal, and caudal fins with narrow white margins.

FIGURE 46. *Owstonia kamoharai*, FAKU 98751, 263 mm SL, Japan, Kii Peninsula, Wakayama. Photograph by Hiromi Ikeda.

FIGURE 47. *Owstonia kamoharai*, CSIRO H.2075–01, 407 mm SL, Western Australia, off Port Hedland. Photograph courtesy of CSIRO.

FIGURE 48. *Owstonia kamoharai*, size not recorded, Western Australia, off Rowley Shoals, continental shelf in 380–400 m. Photographer unknown.

Proportions, as percentages of SL, for 8 non-Japan specimens 122–408 mm SL listed above, and for 6 types from Japan 147–402 SL (given in parentheses), based on data given in the original description: predorsal length 27.7–32.2 (25.1–29.0); preanal length 55.1–61.5 (55.0–58.5); dorsal-fin base 59.8–66.0 (58.5–63.5); anal-fin base 27.3–31.2 (27.6–30.9); pelvic-fin length 16.6–20.1 (17.2–18.6); caudal-fin length 33.7–39.2 (36.7–40.1); body depth at anal-fin origin 23.1–25.3; head length 27.6–34.7 (27.2–30.6); upper jaw length 15.8–20.0 (16.3–18.1); upper jaw depth 6.9–9.3 (7.1–8.2); orbit diameter 8.2–15.7 (8.5–11.5). As percentages of head length: upper jaw length 56.6–69.8 (56.4–61.9); orbit diameter 30.4–45.0 (29.0–37.6).

Comparisons. Two other species, the allopatric *Owstonia ainonaka* and *O. simotera*, have most of the diagnostic characters listed above but differ (characters of *O. kamoharai* in parentheses) as follows: *O. ainonaka* has caudal fin lanceolate and relatively long, 54.5% SL (vs. rounded posteriorly and shorter, 33.7–40.0% SL), larger cheek scales that contact adjacent scales (vs. smaller cheek scales some of which are usually slightly separated from adjacent scales), and when mouth completely closed upper jaw extends only to vertical from posterior margin of pupil (vs. closed mouth with upper jaw usually extending to or slightly beyond vertical from posterior margin of orbit); adults of *O. simotera* have caudal fin lanceolate and shorter, 27.9 % SL (vs. rounded posteriorly and longer, 33.7–40.1% SL) and large curved dentary canines (vs. no large curved dentary canines). All three are large robust species with relatively high numbers of pectoral fin rays 21–23, and short pelvic fins that do not extend to anus.

Etymology. Named for Toshiji Kamohara (1901–1972) (see Okamura, 1972), who described three new species of cepolids from Japan that are still recognized as valid.

Distribution. (Fig. 27) Known from southern Japan (Shikoku and Honshu islands) in depths of about 200–350 m and from off Western Australia and the Arafura Sea, where trawled in about 200–410 m.

Remarks. The original description of *O. kamoharai* and one of the paratypes from Japan that we subsequently examined agree very well with our material from off Western Australia. *Owstonia kamoharai* is the largest species of the genus, attaining at least 408 mm SL (560 mm TL), with four of 14 specimens exceeding 400 mm SL.

Owstonia lepiota new species

(Figures 49, 50)

Holotype. USNM 344575, 58 mm SL, Tanzania, 6°52'12"S, 39°54"E, trawled in 200 m, R/V Anton Bruun cruise 9, sta. 423, 20 Nov. 1964.

Diagnosis. A species of *Owstonia* with LL pattern type 1; about 95 oblique body scale rows in mid-lateral series (fewer than 60 oblique scale rows in other species, except *O. mundyi*); nape naked and cheek scale rows 5–6.

FIGURE 49. *Owstonia lepiota*, holotype, USNM 344575, 57.6 mm SL, Tanzania. Photograph by Sandra J. Raredon.

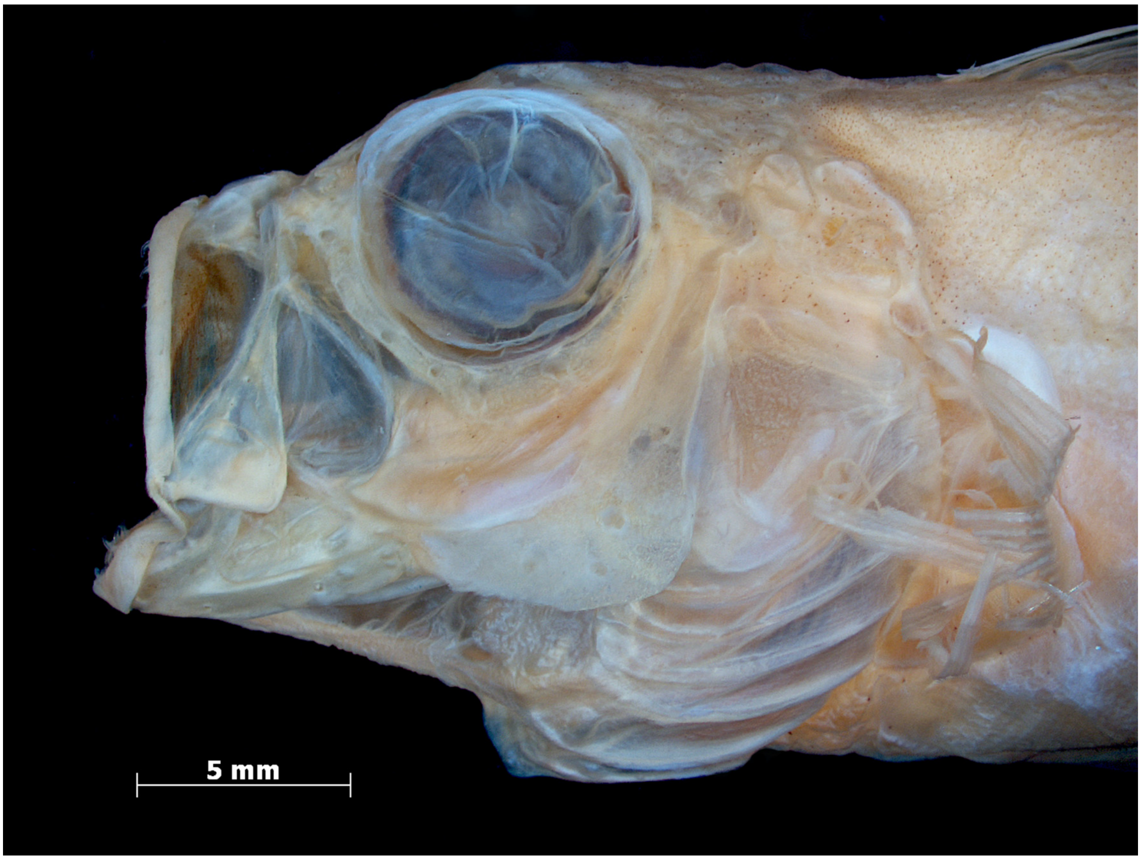

FIGURE 50. *Owstonia lepiota*, holotype, close-up of head showing enlarged posttemporal and preopercle.

Description. A species of *Owstonia* with LL pattern type 1, consisting of a simple lateral line that originates from posttemporal sensory canal near anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base to soft ray 21. Dorsal fin III, 23; anal fin II, 15; pectoral fin 19; gill rakers 12 + 20. Vertebrae: precaudal 11, caudal 18, total 29; anal-fin pterygiophores anterior to 1st haemal spine 3. Oblique longitudinal body scale rows in mid-lateral series about 95; nape naked and cheek scale rows 5–6. Lower limb margin of preopercle without spines. Papillae in slight depression behind tip of premaxillary ascending processes 4, arranged in 2 almost equally spaced pairs. Teeth in outer row of each premaxilla 15/17, no inner teeth anteriorly. Teeth in lateral row of each dentary 8; symphyseal teeth 3, conical, and with 1 inner tooth anteriorly. Depressed pelvic fin extending to anal-fin origin. Caudal fin lanceolate. Caudal fin 2.7 times in SL; head 3.6 times in SL; body depth at anal-fin origin 4.6 times in SL.

Color pattern in alcohol: Dorsal fin uniformly pale; membrane connecting premaxilla and dentary with brown stripe extending to near anterior end of premaxilla, and inner membrane covering posterior part of dentary also brown (brown rather than black coloration probably due to preservation history). Life coloration unknown.

Proportions of 58 mm SL holotype as percentages of SL: predorsal length 28.1; preanal length 57.3; dorsal-fin base 61.6; anal-fin base 39.1; pelvic-fin length 24.3; caudal-fin length 37.0; body depth at anal-fin origin 21.9; head length 27.8; upper jaw length 13.7; upper jaw depth 4.8; orbit diameter 10.4. As percentages of head length: upper jaw length 49.1; orbit diameter 37.5.

Comparisons. The allopatric *O. mundyi* is superficially similar to *O. lepiota* in having a high number of oblique body scale rows in mid-lateral series, 97–108 (vs. 95) and a naked nape but differs in lacking cheek scales (vs. 5–6 cheek scale rows) and having anal-fin rays I, 15–16 (vs. II, 15).

Etymology. From the Greek *lepis* (scale) and *iota* (anything small) and, in reference to the relatively small body scales. The name is treated as a noun in apposition.

Distribution. (Fig. 27) Known only from off Tanzania where trawled in 200 m.

Remarks. Although the holotype is relatively large, it has a distinctly enlarged posttemporal and preopercle (Fig. 50). These features have otherwise been observed only in *Owstonia* larvae, suggesting that this individual remained in the water column for an extended period of time, presumably due to its failure to find or detect suitable benthic habitat prior to settlement.

Owstonia macculochi **Whitley**

(Figures 51, 52)

Owstonia macculochi Whitley, 1934:[12] (original description; "30 mi. east of Sydney," New South Wales, Australia; depth 130 fms [238 m]).

Material examined. 24 specimens, 84–214 mm SL, all from eastern Australia: AMS IA.5815 (156), holotype of *Owstonia macculochi*, Australia, NSW, 30 mi E. of Sydney, ca. 33°51'30"S, 152°3'E, 238 m, K. Moller; AMS I.25802–014 (1, 84), Queensland, just N. of Townsville, 17°58'S, 146°59'E, 228 m, 1986; AMS I. 25804–012 (1, 109), Queensland, just N. of Townsville, 17°59'S, 147°3'E, 260 m, 9 Jan. 1986; AMS I. 25806–012 (1, 141), N. of Townsville, 17°59'S, 147°4'E–17°57'S,147°1'E, 264 m, 10 Jan. 1986; AMS I.25807–004 (1, 101), N. of Townsville, 17°58'S, 147°4'E, 300 m, 10 Jan. 1986; AMS I.25812–004 (1, 95), N. of Townsville, 18°0'S, 147°1'E, 222–228 m, R/V Soela sta. S01/86/24, 12 Jan. 1986; AMS I. 25821–003 (1, 213), N. of Townsville, 17°59'S, 147°1'E, 220 m, R/V Soela sta. S01/86/42, 15 Jan. 1986; AMS I.37598–007 (1, 214), Queensland, E. of Swain Reefs, 21°48'26"S, 152°59'56"E, L. Lowry and K. Dempsey, 13 Sep. 1995; CSIRO H594–20 (1, 95), NE of Townsville, 18°10'S, 147°13'E, 240 m, 8 Dec. 1985; CSIRO H649–11 (1, 114), N. of Townsville, 17°54'S, 147°4'E, 348 m, 29 Nov. 1985; NTM S.11747–011 (1, 96), Queensland, E. of Dunk Is., 17°58'S, 146°59'E, 224–228 m, Jan. 1986; NTM S.11756–003 (1, 178), E. of Dunk Is., 300 m; NTM S.11758–002 (96), E. of Dunk Is., 220 m; NTM S.11760–002 (1, 84), E. of Dunk Is., 260 m; NTM S.11765–001 (146), E. of Dunk Is., 300 m; NTM S.11769–007 (2, 100–145), E. Dunk Is., 264 m; NTM S.11772–001 (2, 101–156), E. Dunk Is., 300 m; NTM S.11781–001 (2, 95–106), E. of Dunk Is., 18°0'S, 147°5'E, 300 m; NTM S.12722–003 (1, 178), E. of Dunk Is., 300m; AMS I.37598–007 (1, 214),), Swain Reefs, E. of 21°48'S, 26"S, 152°59'56"E, 13 Sep. 1995; QM I.22039 (1, 75), Swain Reefs, E. of 21°57'S, 153°25'E, 330 m; CSIRO H1113–10 (1, 178), Queensland, S. of Saumarez Reef, 22°6'S, 153°18'E, 246 m.

Diagnosis. A species of *Owstonia* with LL pattern type 3; dorsal fin III, 21–22; anal fin I, 14–16 (usually 15); cheek scale rows 4–6; oblique body scale rows in mid-lateral series 53–54.

Description. A species of *Owstonia* with LL pattern type 3 (Figs. 6C, 6G) consisting of a lateral line that does not contact posttemporal sensory canal near anterodorsal margin of gill opening (although a diagonal row of 2 or 3 scales is typically present on its anterodorsal margin), but instead continues posteriorly just below dorsal-fin base and anteriorly where it makes a complete loop across nape; lateral line ends below dorsal-fin soft rays 17-20. Dorsal fin III, 21–22; anal fin I, 14–16 (usually 15); pectoral fin 19–22 (usually 20–21); gill rakers 15–19 + 31–35 = 46–53. Vertebrae: precaudal 11 (exceptionally 12), caudal 17 (exceptionally 16), total 28; anal-fin pterygiophores anterior to 1st haemal spine 2–3 (usually 2). Oblique body scale rows in mid-lateral series about 53–54; nape scaly and cheek scale rows 4–6 (Fig. 12G). Lower limb margin of preopercle with 13/15 weak serrations in holotype (Fig. 8D) or 7–12 moderate to strong spines (Fig. 8E) in other specimens. Papillae in slight depression behind tip of premaxillary ascending processes 4, arranged in 2 rows, those in posterior row much larger than those in anterior row (Fig. 14C). Teeth in outer row of each premaxilla 12–18, including some elongate spike-like teeth anteriorly;

0–2 inner teeth anteriorly. Teeth in lateral row of each dentary 7–11, some moderately hooked; symphyseal teeth 3–4, spike-like, and with 0–2 inner teeth anteriorly. Pelvic fin rays apparently sexually dimorphic, depressed fin extending posteriorly to anal-fin soft rays 3–5 (presumed females) and soft rays 6–10 (presumed males). Largest presumed male (AMS I.37598–007) has tips of the terminal dorsal- and anal-fin soft rays extending beyond base of caudal fin. Caudal fin lanceolate. In 18 specimens, 84–213 mm SL, caudal fin 1.4–2.2 times in SL; head 3.0–4.5 times in SL; body depth at anal-fin origin 3.5–4.4 times in SL.

FIGURE 51. *Owstonia maccullochi*, holotype, AMS IA.5815, 156 mm SL, Australia, off Sydney. Photograph by Sandra J. Raredon.

FIGURE 52. *Owstonia maccullochi*, AMS I.37598–007, 214 mm SL, Australia, off Swain Reefs. Photograph by Sandra J. Raredon.

Color pattern in alcohol: Adults with dorsal fin uniformly pale; membrane connecting maxilla and premaxilla with prominent black stripe extending to near anterior end of ascending process, and inner membrane covering posterior part of dentary also black. Life coloration unknown.

Proportions of 156 mm SL holotype are given first, followed by those of 12 specimens, 95–214 SL (in parentheses), as percentages of SL: predorsal length 24.8 (21.9–33.0); preanal length 57.3 (50.5–55.1); dorsal-fin base 65.2 (59.9–71.2); anal-fin base 34.0 (34.4–46.6); pelvic-fin length 39.5 (34.6–51.4); caudal-fin length 56.0 (46.0–72.0); body depth at anal-fin origin 28.9 (22.7–28.8); head length 27.8 (22.4–33.3); upper jaw length 15.7 (12.4–18.6); upper jaw depth 6.8 (5.5–8.9); orbit diameter 11.3 (8.3–16.1). As percentages of head length: upper jaw length 56.4 (51.4–69.9); orbit diameter 40.8 (36.9–51.1).

Comparisons. *Owstonia doryptera* and *O. rhamma*, the only other species with LL pattern 3 (although the LL of *O. rhamma* apparently differs in not making a complete nape loop, see species account) and scaly cheeks, differ (characters of *O. maccullochi* in parentheses) as follows: both of these allopatric species have fewer dorsal- and anal-fin soft rays (see Table 4), 21 and 14 respectively (vs. typically 22 and 15); *O. doryptera* has interradial membranes black between 2nd spine and 1st soft ray (vs. interradial membranes of spinous dorsal fin pale) and fewer oblique body scale rows in mid-lateral series about 44–46 (vs. 53–54); and *O. rhamma* has 3 rows of cheek scales (vs. 4–6), preopercle spines very reduced (vs. usually moderate to strong spines), lateral line with incomplete nape loop (vs. complete nape loop) and pectoral fin rays 19 (vs. 19–21, usually 20 or 21).

Etymology. Named for Australian ichthyologist Allen R. McCulloch (1885–1925); see Paxton and McGrouther (1997:193–195) for a brief review of McCulloch's ichthyological contributions and Saunders (2012) for a more detailed account.

Distribution. (Fig. 22) Known only from eastern Australia between latitudes of approximately 18°-34°S where trawled in about 220–348 m.

Remarks. Whitley (1940, fig. 31) illustrated the holotype. The approximate coordinates for the type locality are 33°51'30"S, 152°3'E, assuming Port Jackson as starting point and 30 miles (= nautical miles) east of Sydney Harbour. This locality is about 11 degrees south of our next closest record (22°6'S) of *O. maccullochi*, with 21 of 24 specimens from Dunk Island vicinity at ca 18°S latitude. Preopercular spines are somewhat variable and difficult to quantify in this species; in the holotype they are very weak, essentially serrations, weak in the larger of two specimens from Swain Reefs vicinity, and moderate to strong in all other specimens.

Contary to Liao *et al.* (2009:524), Smith-Vaniz (2001) did not synonymize *O. maccullochi* with O. *totomiensis*, and only stated that *O. maccullochi* "**may** [boldface emphasis ours] be a junior synonym of *O. totomiensis*."

Owstonia macrophthalma **(Fourmanoir)**

(Figure 53)

Sphenanthias macrophthalmus Fourmanoir, 1985:38, fig. 3 (original description; Philippines, 14°0.1'N, 120°17.1'E, MUSORSTOM II, station 2; depth 184–186 m).

Material examined. 2 specimens, 49–67 mm SL: MNHN 1982–0557 (67), holotype of *Sphenanthias macrophthalmus*, Philippines, 14°0.1'N, 120°17.1'E–13°59.9'N, 120°17.5'E, trawled in 184–186 m, MUSORSTOM II, sta. 2, 20 Nov. 1980; MNHN 1983–0558 (1, 49), paratype, Philippines, 14°1'N, 120°18.5'E–14°1.2'N, 120°17.9'E, trawled in 188–195 m, MUSORSTOM II, sta. 10, 21 Nov. 1980.

Diagnosis. A species of *Owstonia* with LL pattern type 1; dorsal fin IV, 22–23; anal fin I, 17–18; lower limb of preopercle with 9–10 small spines; gill rakers 16+33–34.

Description. (Where counts vary those of paratype are given in parentheses.) A species of *Owstonia* with LL pattern type 1, consisting of a simple lateral line that originates from posttemporal sensory canal near anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base to 23rd or (22nd) ray. Dorsal fin IV, 23 (22); anal fin I, 18 (17); pectoral fin 21 (20); gill rakers 16 + 33/34 in both specimens. Vertebrae: precaudal 11, caudal 18, total 29; anal-fin pterygiophores anterior to 1st haemal spine 3. Oblique body scale rows in mid-lateral series about 54; nape scaly and cheek scale rows 4 or 5. Lower limb margin of preopercle with 9–10 small spines. Papillae in slight depression behind tip premaxillary ascending processes 4, arranged in 2 almost equally spaced pairs. Teeth in outer row of each premaxilla 37/33 (28/32); 0 or (1) inner teeth anteriorly. Teeth in lateral row of each dentary ca. 19–23; symphyseal teeth 2–3, spike-like, and with 1/2 (0) smaller inner teeth anteriorly. Depressed pelvic fin of holotype extending to anal-fin soft ray 2. Caudal fin lanceolate. Holotype with caudal fin 2.3–2.6 times in SL; head 3.1 times in SL; body depth at anal-fin origin 3.6 times in SL.

Color pattern in alcohol: Dorsal fin uniformly pale; membrane connecting maxilla and premaxilla with prominent black stripe extending to near anterior end of ascending process, and inner membrane covering posterior part of dentary also black. Fourmanoir (1985) recorded the dominant life coloration as yellow, including the dorsal fin, with the top of head, outline of upper jaw, dorsum, base of caudal, anal and pelvic fins dark pink.

Proportions of 67 mm SL holotype are given first, followed by those of the 49 mm SL paratype (in parentheses) as percentages of SL: predorsal length 30.9 (33.6); preanal length 57.7 (53.6); dorsal-fin base 63.8 (63.1); anal-fin base 38.2 (36.2); pelvic-fin length 31.6 (27.5); caudal-fin length 43.4 (38.3); body depth at anal-fin origin 28.0 (26.1); head length 32.0 (33.8); upper jaw length 15.9 (16.2); upper jaw depth 7.7 (7.2); orbit diameter 16.4 (16.2). As percentages of head length: upper jaw length 49.8 (47.9); orbit diameter 51.2 (47.9).

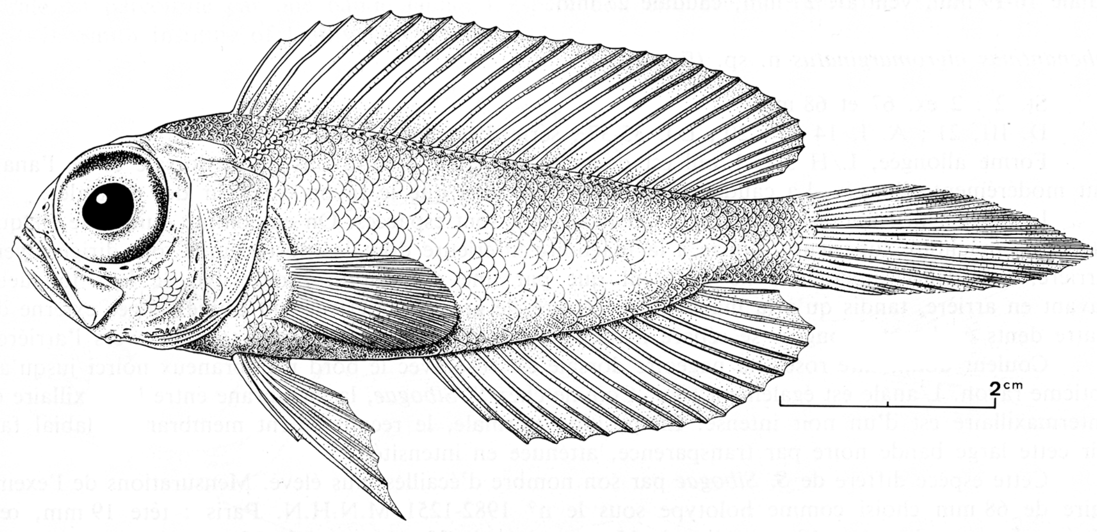

FIGURE 53. *Owstonia macrophthalma*, holotype, MNHN 1982–557, 67 mm SL, Philippines. After Fourmanoir, 1985, fig. 3.

Comparisons. Six other superficially similar species differ (with characters for *O. macrophthalma* given in parentheses) as follows: *O. geminata* and *O. hastata* have anal fin I, 16 or II, 14 (vs. I, 17–18), fewer lower gill rakers 26–30 (vs. 33–34) and more precaudal vertebrae and anal-fin pterygiophores anterior to 1st haemal spine 13 and 5 respectively (vs. 11 and 3); *O. sibogae* has a shorter premaxillary stripe, extending about 1/2 length of premaxilla (vs. long stripe, extending entire length of premaxilla), fewer oblique body scale rows in mid-lateral series 27–30 (vs. 54), larger cheek scales, in 3 rows (vs. 4–5) and anal fin II, 15–17 (vs. I, 17–18); *O. contodon* differs in having anal fin II, 16 (vs. I, 17–18) and lower limb of preopercle with 7–16 moderate spines (vs. 9–11 weak spines); *O. elongata* has fewer oblique body scale rows in mid-lateral series 30–33 (vs. about 54), shallower body depth 10.8–14.0% SL (vs. 26–28%) and more precaudal vertebrae and pterygiophores anterior to 1st haemal spine, 16 and 8 respectively (vs. 11 and 3); the Indian Ocean *O. whiteheadi* has fewer anal-fin soft rays 15–16 (vs. 17–18), more total gill rakers 50–60 (vs. 49–50) and teeth in outer row of each premaxilla 39–45 (vs. 28–37).

Etymology. A combination of the Greek *makros* (long, but used in original description to mean large) and the Greek *ophthalmos* (eye).

Distribution. (Fig. 26) Known only from the Philippine type localities where trawled in 184–195 m.

Remarks. In the original description, the number of dorsal-fin spines was erroneously reported to be III, 23–24 (actually IV, 22–23). Fourmanoir (1985) gave measurements of the holotype and smaller paratype as 68 and 52 mm SL respectively, in contrast to our measurements made with needle-point calipers of 67.2 and 49.4 mm; these discrepancies could partially be the result of specimen shrinkage. Another paratype (reportedly 70 mm SL), also from MUSORSTOM II, sta. 10, is apparently missing. Bauchot and Desoutter (1989:25) reported that the holotype was lost (subsequently found) and designated one of the original paratypes as the "neotype" (= lectotype); with discovery of the "lost" type, the original catalog numbers are used here. The above description of the holotype is based on our examination of it, including a radiograph, and supplemented by recent observations of Nalani Schnell.

Owstonia melanoptera new species

(Figure 54)

Holotype. AMS I.36454–005, 116 mm SL, Philippines, Albay Gulf, 13°8.98'N, 124°4.73'E–13°9.84'N, 124°0.01'E, trawled in 363–385m, J. Paxton, 3 Sep. 1995.

Diagnosis. A species of *Owstonia* with LL pattern type1; dorsal fin III, 21; anal fin I, 14; LL ends below dorsal-fin soft rays 7–8; oblique body scale rows in mid-lateral series about 48–53; total gill rakers 38–39; dark premaxillary stripe; dorsal fin anteriorly with a black blotch.

Description. A species of *Owstonia* with LL pattern type1, consisting of a simple lateral line that originates from posttemporal sensory canal near anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base to 8 or 7th soft ray. Dorsal fin III, 21; anal fin I, 14; pectoral fin 22; gill rakers 13/14 + 25. Vertebrae: precaudal 11, caudal 17, total 28; anal-fin pterygiophores anterior to 1st haemal spine 2. Oblique body scale rows in mid-lateral series about 48–53 (many scales missing on left side); nape scaly and cheek scale rows 7. Lower limb margin of preopercle without spines. Papillae in slight depression behind tip of premaxillary ascending processes 5, arranged in 2 rows with outer papillae in each row approximately same size and equally spaced, and the additional middle papilla in posterior row smaller than adjacent papillae. Teeth in outer row of each premaxilla 18/19; 0/1 inner teeth anteriorly. Dentary lateral row teeth 14/15; symphyseal teeth 3–4, spike-like, and with 1 inner tooth anteriorly. Pelvic fin short, depressed fin extending only to anus. Caudal fin lanceolate. Caudal fin 2.5 times in SL; head 3.1 times in SL; body depth at anal-fin origin 4.2 times in SL.

FIGURE 54. *Owstonia melanoptera*, holotype, AMS I.36454–005, 116 mm SL, Philippines, Albay Gulf; insert of dorsal fin below. Photographs by Sandra J. Raredon.

Color pattern in alcohol: Dorsal fin interradial membranes between 2nd spine to 5th soft ray black, melanophores faint between spines 2–3 but intense between spine 3 and 2nd soft ray (but with narrow clear area immediately anterior to 1st soft ray), with dark pigment extending from near base of fin to at least 2/3 length of spines and soft rays; heavy concentration of melanophores on interradial membranes of posterior 5 anal-fin soft rays, membrane connecting maxilla and premaxilla with prominent dark stripe extending to near anterior end of premaxilla, and inner membrane covering posterior part of dentary unpigmented. Life coloration unknown.

Proportions of 116 mm SL holotype as percentages of SL: predorsal length 30.9; preanal length 58.9; dorsal-fin base 59.0; anal-fin base 28.2; pelvic-fin length 20.0; caudal-fin length 40.7; body depth at anal-fin origin 23.7; head length 32.4; upper jaw length 18.9; upper jaw depth 8.4; orbit diameter 13.7. As percentages of head length: upper jaw length 58.2; orbit diameter 42.3.

Comparisons. Only two other species, *Owstonia similis* and *O. psilos*, have most of the diagonostic characters of *O. melanoptera*, at least as small individuals, but differ (with characters of *O. melanoptera* given in parentheses) as follows: *O. similis* has lateral-line ending below dorsal-fin soft ray 17 (vs. 7–8), fewer gill rakers 10 + 22–23 (vs. 13–14 + 25, see also Remarks in *O. similis* account), posterior anal-fin soft rays with heavy concentration of melanophores on interradial membranes (vs. posterior anal-fin soft rays with pale interradial membranes) and dorsal fin with interradial membranes between 2nd spine to 3rd soft ray with heavy concentration of melanophores (vs. melanophores faint between spines 2–3 but intense between spine 3 and 2nd soft ray and with narrow clear area immediately anterior to 1st soft ray); *O. psilos* has fewer oblique body scale rows in mid-lateral series about 32 (vs. about 48–53), and premaxillary stripe absent, with a few scattered melanophores or pale and incomplete (vs. premaxillary stripe well-developed).

Etymology. From the Greek *melanos* (black) and *pteron* (wing or fin), in reference to the large black blotch on the dorsal fin of the adult holotype. The name is treated as a noun in apposition.

Distribution. (Fig. 24) Known only from Albay Gulf, Philippines where trawled in 363–385 m.

***Owstonia merensis* new species**
(Figure 55)

Holotype. QM I.20664, 57 mm SL, E. of Murray Isles, 9°51'S, 144°26'E–9°53'S, 144°23'E, trawled in 480 m, C. Jones, Queensland Fisheries Service, 28 May 1983.

Diagnosis. A species of *Owstonia* with LL pattern type 1; anal fin II, 11; dorsal fin between 2nd spine and 3rd soft ray conspicuously black and with melanophores extending from base of fin to distal margin, and with interradial membrane between 3rd and 4th soft rays clear.

Description. A species of *Owstonia* with LL pattern type 1, consisting of a simple lateral line that originates from posttemporal sensory canal near anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base to soft rays 12 or 14. Dorsal fin III, 20; anal fin II, 11 (one spine lost during examination but clearly seen on digital radiograph); pectoral fin 20; gill rakers 13 + 24. Vertebrae: precaudal 11, caudal 17, total 28; anal-fin pterygiophores anterior to 1st haemal spine 2. Oblique body scale rows in mid-lateral series about 45; nape scaly and cheek scale rows 6. Lower limb margin of preopercle without spines. Papillae in slight depression behind tip of premaxillary ascending processes 4, arranged in 2 almost equally spaced pairs. Teeth in outer row of each premaxilla 9/14, with several of the anterior ones relatively elongate; no inner teeth anteriorly. Teeth in lateral row of each dentary 9/8; symphyseal teeth 3−4, spike-like, and with 1 inner tooth anteriorly. Depressed pelvic fin extending to anal-fin origin. Caudal fin lanceolate. Caudal fin (broken off); head 3.0 times in SL; body depth at anal-fin origin 3.7 times in SL.

Color pattern in alcohol: Dorsal fin between 2nd spine and 3rd soft ray conspicuously black and with melanophores extending from base of fin to distal margin, and with interradial membrane between 3rd and 4th soft rays clear; membrane connecting maxilla and premaxilla with weak dark stripe (perhaps due to fading), and inner membrane covering posterior part of dentary unpigmented. Life coloration unknown.

Proportions of 57 mm SL holotype as percentages of SL: predorsal length 32.4; preanal length 57.0; dorsal-fin base 59.1; anal-fin base 29.2; pelvic-fin length 24.1; caudal-fin length (broken off); body depth at anal-fin origin 26.7; head length 33.6; upper jaw length 19.1; upper jaw depth 9.0; orbit diameter 14.5. As percentages of head length: upper jaw length 56.8; orbit diameter 43.2.

FIGURE 55. *Owstonia merensis*, holotype, QM I.20664, 57 mm SL, Torres Strait, Murray Island vicinity. Photograph by Sandra J. Raredon.

Comparisons. No other species of *Owstonia* has the same combination of anal-fin rays as *O. merensis* (see Table 4); other species with II anal-fin spines have at least 14 soft rays (vs. 11 soft rays) and do not have small individuals with dorsal-fin pigmentation identical to that of the holotype (see above description).

Etymology. The specific epithet is a combination of "mer" the name used by Torres Strait islanders for Murray Island, the nearest island to the type locality, and the Latin suffix *ensis* (meaning belonging to).

Distribution. (Fig. 24) Known only from the type locality east of Murray Island, Australia in Torres Strait where trawled in 480 m.

Remarks. The small first spine of the anal fin became detached and lost while examining the holotype but two anal-fin spines can be clearly seen on a digital radiograph of the specimen.

Owstonia mundyi **new species**
(Figures 56–58)

Holotype. USNM 427880, 128 mm SL, gravid female, Kiribati (Line Islands), off southwest point of Christmas Island, shrimp trawl in 150 fms [= 274 m], Townsend Cromwell Cruise 60, sta. 53, R. Barkley *et al.*, 22 Aug. 1972.

Paratypes. USNM 427319 (2, 121−125 mm SL), both gravid females, same data as holotype.

Diagnosis. A species of *Owstonia* with LL pattern type 1; nape and cheeks without scales; oblique body scale rows in mid-lateral series 97–108.

Description. (When counts vary those of paratypes are given in parentheses.) A species of *Owstonia* with LL pattern type 1, consisting of a simple lateral line that originates from posttemporal sensory canal near anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base to soft rays 20–23. Dorsal fin III, 23; anal fin I, 15–16; pectoral fin 17–18; gill rakers 13+22/23 (12+23–24). Vertebrae: precaudal 11, caudal 18, total 29; anal-fin pterygiophores anterior to 1st haemal spine 3. Oblique body scale rows in mid-lateral series about 106/108 (97–105); nape and cheeks naked. Lower margin of preopercle without spines. Papillae in slight depression behind tip of premaxillary ascending processes 4, arranged in 2 almost equally spaced pairs; each papilla is slightly tapered vertically and capped with a small flap, which condition is more apparent in the holotype (Fig. 14D). Teeth in outer row of each premaxilla 20/22 (19–24); 2–3 inner teeth anteriorly. Teeth in lateral row of each dentary 9–15; symphyseal teeth 2/3 (2−3), small and conical, and with 2–3 small inner teeth anteriorly. Pelvic fin apparently sexually dimorphic, depressed fin short and extending only to anal-fin origin in the three gravid type specimens but much longer in a male tentatively identified as *O. mundyi* (see Distribution and Remarks). Caudal fin lanceolate. Caudal fin 2.1–2.4 times in SL; head 3.4–3.9 times in SL; body depth at anal-fin origin 5.0–5.2 times in SL.

FIGURE 56. *Owstonia mundyi*, holotype, (right side reversed), USNM 427880, 128 mm SL, Kiribati (Line Islands), Christmas Island. Photograph by Sandra J. Raredon.

Color pattern in alcohol: Dorsal fin uniformly pale; membrane connecting maxilla and premaxilla with prominent black stripe that extends nearly to end of ascending process, and inner membrane covering posterior part of dentary also black. Based on videos of individuals at Kingman Reef tentatively identified as *O. mundyi* (Figs. 57, 58), upper part of head and body red, becoming paler below; and presumed male (see "Distribution") with distal margin of dorsal fin and elongate pelvic-fin soft ray white. Caudal and anal fins pale with narrow red margins and dorsal fin with narrow submarginal red stripe, wider posteriorly. *Owstonia mundyi* and *O. hawaiiensis* appear to have virtually identical life coloration.

Proportions of 128 mm SL holotype are given first, followed by those of the 121–125 SL paratypes (in parentheses), as percentages of SL: predorsal length 25.1 (22.9–26.0); preanal length 50.7 (50.6–52.2); dorsal-fin base 64.6 (64.4–64.6); anal-fin base 36.0 (37.0–40.0); pelvic-fin length 21.9 (21.9–24.0); caudal-fin length 42.0 (42.0–47.0); body depth at anal-fin origin 19.4 (19.3–19.6); head length 28.4 (25.5–27.5); upper jaw length 12.3 (12.2–12.3); upper jaw depth 5.3 (4.9–5.5); orbit diameter 10.4 (9.4–11.6). As percentages of head length: upper jaw length 43.4 (40.2–43.7); orbit diameter 36.5 (37.0–42.3).

FIGURE 57. *Owstonia mundyi* ? (see discussion under Distribution), female, Kingman Reef, 338 m, submersible dive P5-654. Photograph by pilot Terry Kerby, courtesy of HURL.

FIGURE 58. *Owstonia mundyi* ? (see discussion under Distribution), male, Kingman Reef, 338 m, submersible dive P5-654. Photograph by pilot Terry Kerby, courtesy of HURL.

Comparisons. The western Indian Ocean *O. lepiota* also lacks nape scales and has a high number (95) of oblique body scale rows in mid-lateral series but differs in having 5–6 cheek scale rows (vs. naked cheek) and anal-fin rays II,15 (vs. I, 15–16 in *O. mundyi*). *Owstonia nudibucca* and *O. totomiensis*, the only other congeners that lack cheek scales, differ from *O. mundyi* most obviously in having LL pattern type 3 and fewer oblique scale rows in mid-lateral series, 38–60 (vs. 97–108).

Etymology. Named for Bruce C. Mundy, NOAA National Marine Fishery Service, Pacific Islands Fisheries Science Center, who arranged for us to receive the type specimens of this species and called our attention to important video frame grabs in support of his important submersible observations on *Owstonia* spp.

Distribution. (Fig. 24) Specimens came only from the Christmas Island type locality, and presumably the same species has also been observed and filmed (Figs. 57, 58) at Kingman Reef, 6°25.702'N, 162°26.338'W. Specimens were trawled in about 274 m at the type locality and observed in 342 m at Kingman Reef. We tentatively identify the Kingman Reef species as *O. mundyi* because Kingman Reef and Kiribati are both in the Line Island Group. However, we note that the life colors of the presumed female (Fig. 57) are remarkably similar to that of *O. hawaiiensis*; it also agrees in having a relatively short caudal fin, in contrast to the presumed male *O. mundyi* (Fig. 58) which appears to have a much longer caudal fin than that of a male *O. hawaiiensis* (Fig. 41); calculated caudal-fin lengths of the two fish, based on the video images (Figs. 41 and 58), are approximately 39% SL and 47% respectively.

Remarks. Bruce Mundy (in litt, July 2009) observed a pair of *Owstonia* at Kingman Reef (Figs. 57, 58), one with short pelvic fins and the other with long fins, alternately swimming in and out of holes on a vertical rock face. Sexually dimorphic pelvic fins occur in several other species of *Owstonia*, so a reasonable hypothesis is that a single species with sexually dimorphic fins was observed. Apparent color differences of the two photographed fish are an artifact of the different distances of the camera from each fish, affecting the intensity of illumination.

***Owstonia nalani* new species**

(Figure 59)

Holotype. MNHN 2002−3362, 54 mm SL, New Caledonia, 21°13'58.8"S, 165°55'12"E, beam trawl in 490–530 m, Exped. BATHUS 1, sta. 657, 12 Mar. 1993.

Paratypes. MNHN 2013−0158 (2, 45–49 mm SL), Vanuatu, Santo, NE Tutuba Island, 15°33'S, 167°19'19.3"E, 364–390 m, Exped. Santo 6, sta. at 58, 3 Oct. 2006.

Diagnosis. A species of *Owstonia* with LL pattern type 1; dorsal fin III, 22; anal fin II, 14; oblique body scale rows in mid-lateral series 25–26; cheek scale rows about 3; total gill rakers 30; precaudal vertebrae and pterygiophores anterior to 1st haemal spine 11 and 3 respectively.

Description. (When counts vary, those of the paratypes are given in parentheses.) A species of *Owstonia* with LL pattern type 1, consisting of a simple lateral line that originates from posttemporal sensory canal near anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base to at least soft ray 17 (left side smaller paratype only; scales immediately below posterior end of dorsal fin missing in all specimens). Dorsal fin III, 22; anal fin II, 14; pectoral fin 18/19 (19); gill rakers 11+19 (right side of holotype). Vertebrae: precaudal 11, caudal 18, total 29; anal-fin pterygiophores anterior to 1st haemal spine 3. Oblique body scale rows in mid-lateral series about 25–26 (smaller paratype only); nape scaly and cheek scale rows about 3. Lower limb margin of preopercle with about 6–9 weak spines that could easily be overlooked. Papillae in slight depression behind tip of premaxillary ascending processes 4 arranged in 2 almost equally spaced pairs; papillae difficult to clearly observe except in the larger paratype. Teeth in outer row of each premaxilla 20/24 (19–25); no inner teeth anteriorly. Teeth in lateral row of each dentary 16 (10–13); symphyseal teeth 4, spike-like (all other dentary teeth smaller with pointed tips), and with 0–2 much smaller inner teeth anteriorly. Depressed pelvic fin extending to anal-fin origin. Caudal fin lanceolate. Holotype with Caudal fin 1.9 times in SL; head 3.7 times in SL; body depth at anal-fin origin 5.1 times in SL.

Color pattern in alcohol: Dorsal fin uniformly pale; membrane connecting maxilla and premaxilla with prominent black stripe extending to near anterior end of premaxilla, and inner membrane covering posterior part of dentary also black. Life coloration unknown.

Proportions of 54 mm SL holotype as percentages of SL: predorsal length 23.9; preanal length 50.4; dorsal-fin base 65.3; anal-fin base 32.8; pelvic-fin length 21.0; caudal-fin length 53.0; body depth at anal-fin origin 19.6; head length 27.0; upper jaw length 14.6; upper jaw depth 6.9; orbit diameter 13.4. As percentages of head length: upper jaw length 53.8; orbit diameter 49.7.

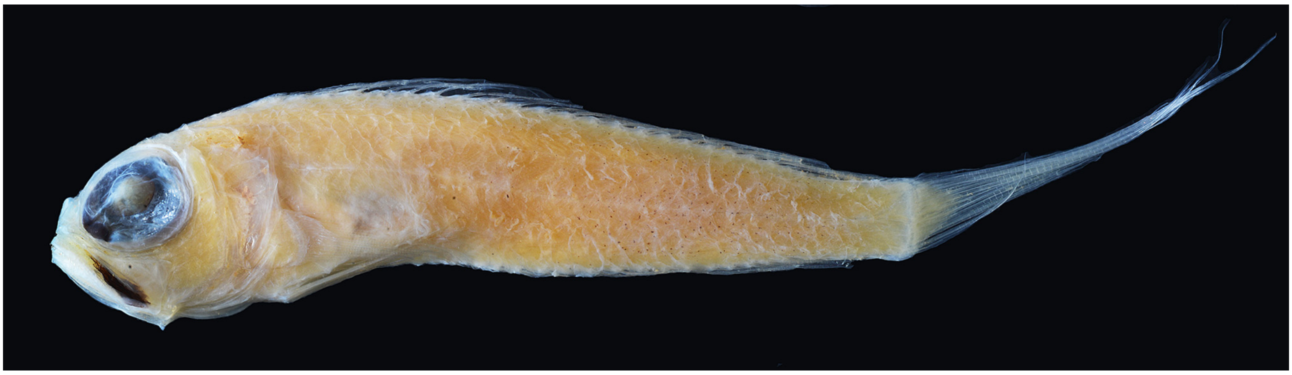

FIGURE 59. *Owstonia nalani*, holotype, MNHN 2002–3362, 54 mm SL, New Caledonia. Photograph by Sandra J. Raredon.

Comparisons. No other species of *Owstonia* has most of the above diagnostic characters of *O. nalani*. The eastern Australian *Owstonia hastata* is superficially similar but differs (characters of *O. nalani* in parentheses) in having more oblique body scale rows in mid-lateral series about 38 (vs. 25–26), total gill rakers 45–46 (vs. 30), and more precaudal vertebrae and pterygiophores anterior to 1st haemal spine 13 and 5 respectively (vs. 11 and 3).

Etymology. Named for Nalani Schell, MNHN curator of fishes, in appreciation for her outstanding assistance facilitating loans and examining type specimens of *Owstonia* in Paris.

Distribution. (Fig. 26) New Caledonia and Vanuatu where trawled in 490–530 m and 364–390 m respectively.

Owstonia nigromarginata (Fourmanoir)
(Figure 60)

Sphenanthias nigromarginatus Fourmanoir, 1985:40, fig. 4 (original description; Philippines, 14°0.1'N, 120°17.1'E, 184–186 m, MUSORSTOM II, sta. 2).

Material examined. 2 specimens 65–68 mm SL as follows: MNHN 1982–1251 (68), holotype, Philippines, 14°0.1'N, 120°17.1'E, 184–186 m, MUSORSTOM II, sta. 2, 20 Nov. 1980; MNHN 1982–1252 (1, 65), paratype, same data as holotype.

Diagnosis. A species of *Owstonia* with LL pattern type 1; unique in having a black stripe anteriorly on dorsal fin that tapers posteriorly and extends from distal third of 1st spine to the tip of 4th soft ray.

Description. (When counts vary, those of the paratypes are given in parentheses.) A species of *Owstonia* with LL pattern type 1, consisting of a simple lateral line that originates from posttemporal sensory canal near anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base to soft ray 16. Dorsal fin III, 21; anal fin I, 13; pectoral 19–20; gill rakers 16 + 28 = 44 (14 + 26 = 40). Vertebrae: precaudal 11, caudal 17, total 28; anal-fin pterygiophores anterior to 1st haemal spine 2. Oblique body scale rows in mid-lateral series about 35–37; nape scaly and cheek scale rows 3. Lower limb margin of preopercle with about 8–10 small spines. Papillae in slight depression behind tip of premaxillary ascending processes 4, all papillae nearly equally sized with lateral pairs more closely spaced together, except the paratype with one anterior papilla missing on one side. Teeth in outer row of each premaxilla 15/18 (17/18); 1 or 2 inner teeth anteriorly. Teeth in lateral row of each dentary 9; symphyseal teeth 3–4, spike-like, and with 1–2 inner teeth anteriorly. Pelvic fin probably sexually dimorphic, extending posteriorly to anal-fin soft ray 8 in unsexed holotype (between rays 3–4 in slightly smaller, but unsexed paratype). Caudal fin lanceolate. Caudal fin 1.8–(broken) times in SL; head 3.4–3.6 times in SL; body depth at anal-fin origin 3.7–4.4 times in SL.

Color pattern in alcohol: Anterior part of dorsal fin with narrow, black, distal stripe extending from spine 1 to soft ray 4; membrane connecting maxilla and premaxilla with prominent black stripe extending to near anterior end of premaxilla, and nner membrane covering posterior part of dentary also black. Fourmanoir (1985) recorded the dominant color of *O. nigromarginata* as pink, including the dorsal fin.

Proportions of 68 mm SL holotype are given first, followed by those of the 65 mm specimen (in parentheses) as percentages of SL: predorsal length 26.7(--); preanal length 59.9 (55.9); dorsal-fin base 63.5 (62.0); anal-fin base

31.8 (30.5); pelvic-fin length 53.7 (41.2); caudal-fin length 55.4 (broken off); body depth at anal-fin origin 21.8 (22.8); head length 27.9 (29.2); upper jaw length 15.3 (15.5); upper jaw depth 7.8 (6.7); orbit diameter 12.6 (11.9). As percentages of head length: upper jaw length 54.7 (53.2); orbit diameter 45.3 (40.8).

Comparisons. Other species with LL pattern type 1 and black pigment on the dorsal fin anteriorly differ in having melanophores extending to base of fin. The holotype of *Owstonia doryptera* possibly has dorsal-fin pigmentation similar to that of *O. nigromarginata* but differs in having LL pattern type 3 and a short pelvic fin extending only to anal-fin origin (vs. pelvic fin extending to anal-fin soft ray 8 in holotype and between rays 3–4 in paratype).

Etymology. A combination of the Latin *nigro* (black) and *marginatus* (margin) in reference to the black stripe anteriorly on the distal margin of the dorsal fin.

Distribution. (Fig. 23) Known only from the Philippine type locality where trawled in 184–186 m.

Remarks. Fourmanoir (1985) listed only two specimens of *Sphenanthias nigromarginatus*, which he recorded as 67 and 68 mm SL, and designated the larger specimen as the holotype. He recorded the number of anal-fin rays as I, 14 but examination of a radiograph of the holotype and our count of the paratype reveals that both specimens actually have only I, 13 anal-fin rays.

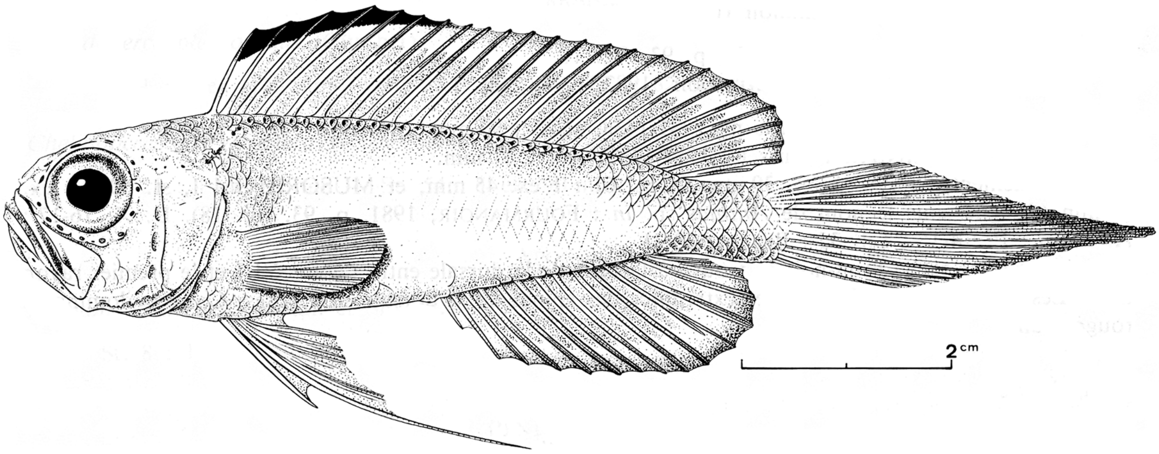

FIGURE 60. *Owstonia nigromarginata*, holotype, MNHN 1982–1251, 68 mm SL, holotype, Philippines. After Fourmanoir, 1985, fig. 4.

Owstonia nudibucca new species

(Figures 61–63)

Owstonia totomiensis. Gloerfelt-Tarp and Kailola, 1984:229, unnumbered color photo (misidentification; brief description; ANSP catalog number of photographed fish [holotype] listed on p. 347).

Holotype. ANSP 151993, 224 mm SL, Andaman Sea, Mentawai Islands, off east coast of Siberut Island, 1°22'S, 98°37'E, depth not recorded, M/V Jurong, via P.J.P. Whitehead, 1980.

Paratypes. 2 specimens, 93–288 mm SL. SAIAB 201332 (1, 288) and SAIAB 201333 (1, 93), Andaman Sea, off Gulf of Mottama (Martaban), 14°31'12"N, 93°44'24"E, 268.5 m, R/V "Dr. Fridtjof Nansen" sta. 58, Peter N. Psomadakis, 9 May 2012.

Diagnosis. A species of *Owstonia* with naked nape and cheeks; LL pattern type 3, including a short vertical side branch slightly anterior to dorsal-fin origin (Fig. 6D); oblique body scale rows in mid-lateral series 38–42; caudal peduncle depth 2.3–1.7 times in its length.

Description. (Where counts vary, those of the paratypes are given in parentheses.) A species of *Owstonia* with LL type 3, in which lateral line does not contact posttemporal sensory canal near anterodorsal margin of gill opening, continues posteriorly just below dorsal-fin base and anteriorly where it makes a complete loop across nape and also has the horizontal section of lateral line with a short ventral side branch slightly anterior to dorsal-fin origin; lateral line ends below dorsal-fin soft rays 16-17. Dorsal fin III, 21; anal fin II, 14; pectoral fin 22 (21–22); gill rakers 18 + 29/31 = 47 or 49 (16–18 + 27–32 = 45–50. Vertebrae: precaudal 11, caudal 17, total 28; anal-fin pterygiophores anterior to 1st haemal spine 2. Oblique body scale rows in mid-lateral series about 38/44 (ca. 50); nape and cheeks naked. Papillae in slight depression behind tip of premaxillary ascending processes 4, arranged in 2 almost equally spaced pairs. Lower limb margin of preopercle with about 7 or 8 (6–7) spines. Teeth in outer row of each premaxilla 17/18 (18–23), anterior 8−11 teeth moderately elongate with blunt tips; no inner teeth anteriorly. Teeth in lateral row of each dentary 14/15 (12–17); symphyseal teeth 3/4 (4–5), moderately short, spike-like (all other dentary teeth smaller with pointed tips), and with 1 or 2 (1) much smaller inner teeth anteriorly. Depressed pelvic fin extending to anal-fin origin (to soft ray 3 in larger paratype). Caudal fin lanceolate. In smallest to largest types, Caudal fin 1.6–2.0 times in SL; head 3.2, 3.8, 4.0 times in SL; body depth at anal-fin origin 4.4, 5.1, 5.8 times in SL. Caudal peduncle depth 2.3 (2.4 and 1.6 in larger and smaller paratypes respectively) times in its length.

FIGURE 61. *Owstonia nudibucca*, paratype, SAIAB 201332, 288 mm SL, Andaman Sea, Gulf of Mottama. Photograph by Peter N. Psomadakis.

FIGURE 62. *Owstonia nudibucca*, not preserved, ca. 340 mm SL, Andaman Sea, off southern Myanmar. Photograph by Oddgeir Alvheim.

Proportions of 224 mm SL holotype are given first, followed (in parentheses) first by those of the 93 mm SL and then the 288 mm SL paratypes, as percentages of SL: predorsal length 22.7 (29.4–22.3); preanal length 54.2 (54.1–48.4); dorsal-fin base 61.4 (65.4–63.4); anal-fin base 32.1 (29.7–27.6); caudal peduncle length 17.4 (13.2–20.0); caudal peduncle depth 7.5 (9.7–8.2); pelvic-fin length 31.0 (23.7–28.1); caudal-fin length 62.9 (50.5–63.9); body depth at anal-fin origin 19.5 (22.9–17.3); head length 26.3 (31.6–24.8); upper jaw length 13.4 (16.7–14.0); upper jaw depth 6.2 (7.6–5.0); orbit diameter 11.0 (15.4–9.3). As percentages of head length: upper jaw length 50.8 (52.7–56.5); orbit diameter 42.0 (48.9–37.3).

Color pattern in alcohol: Dorsal fin of holotype with three faint traces of small dusky blotches between membranes of last spine and soft ray 4 (these blotches absent in largest paratype) and smaller paratype with interradial membranes between dorsal-fin spine 3 and soft ray 5 black; membrane connecting maxilla and premaxilla with prominent black stripe extending to near anterior end of premaxilla (Fig. 15B, 62–63), and inner membrane covering posterior part of dentary also black.

In fresh specimens body and fins range from pink to red, paler below, with iris red; the largest paratype has at least the anterior half of the dorsal fin with a narrow, dark, red distal margin (Fig. 61). Gloerfelt-Tarp and Kailola (1984) recorded the life coloration of the holotype as: "body and fins plain dark red; usually 3 dark brown patches over anterior dorsal fin membrane; black premaxillary groove."

Comparisons. *Owstonia totomiensis*, the only other species with naked nape and cheeks and LL pattern type 3, differs (characters of *O. nudibucca* in parentheses) in having horizontal section of the lateral line without a short ventral side branch slightly anterior to dorsal-fin origin (vs. short side branch present), more oblique body scale rows in mid-lateral series 50–60 (vs. 38–42), and caudal peduncle depth 1.3−1.7 (vs. 2.3–3.0) times in its length.

Etymology. From the Latin *nudus* (bare, naked) and *bucca* (cheek), in reference to the naked cheeks.

Distribution. (Fig. 22) Known from the Mentawai Islands off the east coast of Siberut Island, Indonesia and the Andaman Sea off Myanmar where trawled in 262–269 m.

Remarks. A 55-cm TL (ca. 342 mm SL) specimen (Fig. 62), photographed by Oddgeir Alvheim but not preserved, was collected from the Andaman Sea, off southern Myanmar (12°22'N, 96°51'E), trawled in 262 m, Dec. 2013. This specimen is notable for its narrow and elongate caudal peduncle (CP), depth of CP about 3.0 times in its length; measurements calculated from the photograph: CP depth 6.7 % and CP length 19.9% SL.

FIGURE 63. *Owstonia nudibucca*, holotype, ANSP 151993, 224 mm SL, Indonesia, Mentawai Is. Photograph by Sandra J. Raredon.

Owstonia psilos **new species**
(Figures 64−66)

Holotype. NMV A.29673–004, 82 mm SL, Western Australia, 17°21'30"S, 118°57'19"E–17°20'53"S, 118°56'48"E, trawled in 437–446 m, R/V Southern Surveyor, Imperieuse L23 transect, 15 Jun. 2007.

Paratypes. 9 specimens, 47–180 mm SL, all from off Western Australia: NMV A.29664–004 (1, 64), 18°46'27"S, 116°54'45"E–18°46'32S, 116°55'28"E, 400–404 m, R/V Southern Surveyor, Karratha L21 transect, 13 Jun. 2007; CSIRO H 7136–24 (1, 132, S. of Scott Reefs, 14°16'S, 122°16'E, 358 m, 6 Jun. 2004; NMV A.29664–015 (1, 47), 17°21'30"S, 118°57'19"E–18°57'19S, 17°20'53"E, 437–446 m, R/V Southern Surveyor, Karratha L23 transect, 15 Jun. 2007; NMV A. 29733–007 (1, 125) 12°36'07"S, 123°25'23"E–12°36'57"S, 123°26'12"E, 403–419 m, R/V Southern Surveyor, Ashmore L30 transect, 8 Jun. 2007; NTM S.12608–002 (1, 75), SW of Rowley Shoals, 17°51'S, 118°29'E, 415 m, 7 Nov. 1985; NTM S.12611–001 (1, 82), SW of Rowley Shoals, 17°28'S, 118°53'E, 405 m, 8 Nov. 1985; NTM S.12727–004 (2, 150–180), SW of Rowley Shoals, 17°52'S, 118°28'E, 410 m, Feb. 1990; NTM S.12728–018 (1, 149), SW of Rowley Shoals, 18°01'S, 118°23'E, 420 m, Feb. 1990.

Diagnosis. A species of *Owstonia* with LL pattern type 1; dorsal fin III, 21; anal fin I, 14; LL ends below dorsal-fin soft rays 14–20; oblique body scale rows in mid-lateral series about 32; total gill rakers 36–40; premaxillary stripe absent, with a few scattered melanophores or with an incomplete brown stripe; dorsal fin anteriorly with interradial membranes of spine 3 to soft rays 4–5 black at least distally.

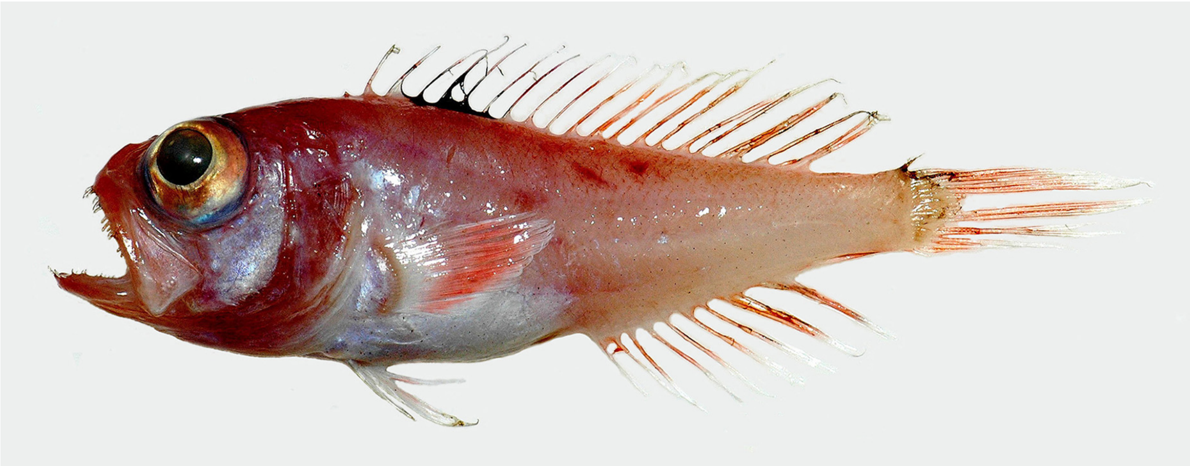

FIGURE 64. *Owstonia psilos*, paratype, NMV A.29664–004, 64 mm SL, Western Australia. Photograph by Martin F. Gomon.

FIGURE 65. *Owstonia psilos*, holotype, NMV A.29673–004, 82 mm SL, Western Australia. Photograph by Sandra J. Raredon.

Description. (Where counts vary, those of the paratypes are given in parentheses.). A species of *Owstonia* with LL pattern type 1, consisting of a simple lateral line that originates from the posttemporal sensory canal near the anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base to at least soft ray 14–20. Dorsal fin III, 21; anal fin I, 14; pectoral fin 22 (20–23); gill rakers 14 + 25 = 39 (12–14 + 24–27 = 36–40). Vertebrae: precaudal 11, caudal 17, total 28; anal-fin pterygiophores anterior to 1st haemal spine 2. Oblique body scale rows in mid-lateral series about 32 (in most specimens too many of these scales are missing to accurately count them); nape scaly and cheek scale rows about 5–6. Lower limb margin of preopercle without spines. Papillae in slight depression behind tip of premaxillary ascending processes 4, arranged in 2 almost equally spaced pairs. Teeth in outer row of each premaxilla 15-17 (15-24), 21/24 in largest specimen, with some anterior teeth moderately elongate with blunt tips; 0–1 inner teeth anteriorly. Teeth in lateral row of each dentary 8 (7–12 and 11/12 in largest specimen); symphyseal teeth 5 (3–5), spike-like (Fig. 9C), and with 1–2 inner teeth anteriorly. Pelvic fin short, depressed fin not extending behind anus (not reaching anus in three largest specimens, 125–180 mm SL). Caudal fin lanceolate. In 9 specimens, 64–180 mm SL, caudal fin 2.5–2.8 times in SL; head 2.7–3.2 times in SL; body depth at anal-fin origin 3.8–4.5 times in SL.

Color pattern in alcohol: Dorsal fin with interradial membranes of spine 3 to soft rays 4–5 with dark pigment at least distally; membrane connecting maxilla and premaxilla usually uniformly pale, occasionally (including holotype) with a few scattered melanophores or with an incomplete brown stripe, and inner membrane covering posterior part of dentary pale. A freshly collected 64 mm SL specimen (Fig. 64) has dorsal fin with prominent black blotch anteriorly extending to base of fin; remainder of dorsal, anal, caudal and pectoral fins reddish proximally with white distal margins; pelvic fin mostly white; maxilla, cheek, belly, shoulder girdle and chest ivory; opercle, throat and dorsum of head dark red; iris golden-orange; body posterior to anal-fin origin mostly pale probably due to missing scales.

FIGURE 66. *Owstonia psilos*, paratype, NMV A.29733–007, 125 mm SL, Western Australia; insert part of dorsal fin showing traces of dark blotch. Photograph by Sandra J. Raredon.

Proportions of 82 mm SL holotype are given first, followed by those of 8, 64–180 mm SL, paratypes (in parentheses), as percentages of SL: predorsal length 33.3 (29.3–36.2); preanal length 61.2 (56.9–66.1); dorsal-fin base 57.4 (52.9–68.1); anal-fin base 26.7 (27.5–31.2); pelvic-fin length 23.3 (17.1–24.5); caudal-fin length 39.4 (35.0–39.0); body depth at anal-fin origin 24.7 (22.4–26.0); head length 35.5 (31.0–35.8); upper jaw length 20.7 (18.2–20.8); upper jaw depth 9.3 (8.4–9.6); orbit diameter 16.2 (12.3–16.8). As percentages of head length: upper jaw length 58.3 (53.7–61.4); orbit diameter 45.5 (37.6–48.1).

Comparisons. Species of *Owstonia* with many of the diagnostic characters of *O. psilos* all have more oblique body scale rows in mid-lateral series 45–56 (vs. about 32), and further differ (characters of *O. psilos* in parentheses) as follows: *O. crassa* has anal fin I, 12–13 (vs. I, 14); *O. melanoptera* and *O. merensis* both have dorsal-fin interradial membranes of spine 2 to soft ray 5 black (vs. membranes of spine 3 to soft rays 4–5 black); *O. melanoptera* also differs in having the lateral-line terminus below dorsal-fin soft rays 7–8 (vs. 14–20) and *O. merensis* has anal fin II, 11 (vs. I, 14); *O. similis* has premaxillary stripe continuous and black (vs. stripe absent or incomplete) and total gill rakers 32–33 (vs. 36–40).

Etymology. The specific epithet, from the Greek *psilos* (bare, smooth, naked), is in reference to the smooth lower margin of the preopercle, and the numerous missing scales of the holotype due to trawl abrasion.

Distribution. (Fig. 24) Western Australia between about 19°-14°S, where trawled in about 360–440 m.

Owstonia raredonae new species

(Figure 67)

Holotype. SAIAB 82406, 97 mm SL, off Mozambique, 18°50.7'S, 37°13.5'E, 311–314 m; P. C. Heemstra; 29 Oct. 2007.

Diagnosis. A species of *Owstonia* with LL pattern type 1; dorsal-fin rays III, 19; anal-fin rays I, 12; lower margin of preopercle smooth; oblique body scale rows in mid-lateral series about 31–32.

Description. A species of *Owstonia* with LL pattern type 1, consisting of a simple lateral line that originates from the posttemporal sensory canal near the anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base to soft rays 17/18. Dorsal fin III, 19; anal fin I, 12; pectoral fin 18; gill rakers 14+24 or 25. Vertebrae: precaudal 11, caudal 16, total 27; anal-fin pterygiophores anterior to 1st haemal spine 3. Oblique body scale rows in mid-lateral series about 31–32; nape scaly and cheek scale rows 3–4 (Fig. 12H). Preopercle lower limb margin without spines. Papillae in slight depression behind tip of premaxillary ascending processes 4, arranged in 2 pairs, with the posterior pair bluntly rounded and the other two smaller and tapered. Teeth in outer row of each premaxilla 35; 2 slightly larger, hooked, inner teeth anteriorly. Teeth in lateral row of each dentary 19/20; symphyseal teeth 4, relatively short and bluntly conical, and with 1 inner tooth anteriorly. Depressed pelvic fin extending to slightly behind anal-fin origin. Caudal fin lanceolate. Caudal fin 2.5 times in SL; head 3.1 times in SL; body depth at anal-fin origin 3.5 times in SL.

Color pattern in alcohol: Adults with dorsal fin uniformly pale; membrane connecting maxilla and premaxilla with prominent black stripe extending to near end premaxilla, and inner membrane covering posterior part of dentary also black. In life, dorsal, caudal and pectoral fins mostly red; distal half of anal fin reddish, the rest of fin colorless, as is most of pelvic fin; head and body reddish becoming paler below with belly and chest mostly white.

Proportions of 97 mm SL holotype as percentages of SL: predorsal length 32.3; preanal length 56.8; dorsal-fin base 61.7; anal-fin base 30.9; pelvic-fin length 25.7; caudal-fin length 40.5; body depth at anal-fin origin 28.4; head length 32.6; upper jaw length 17.2; upper jaw depth 8.6; orbit diameter 15.4. As percentages of head length: upper jaw length 53.0; orbit diameter 47.3.

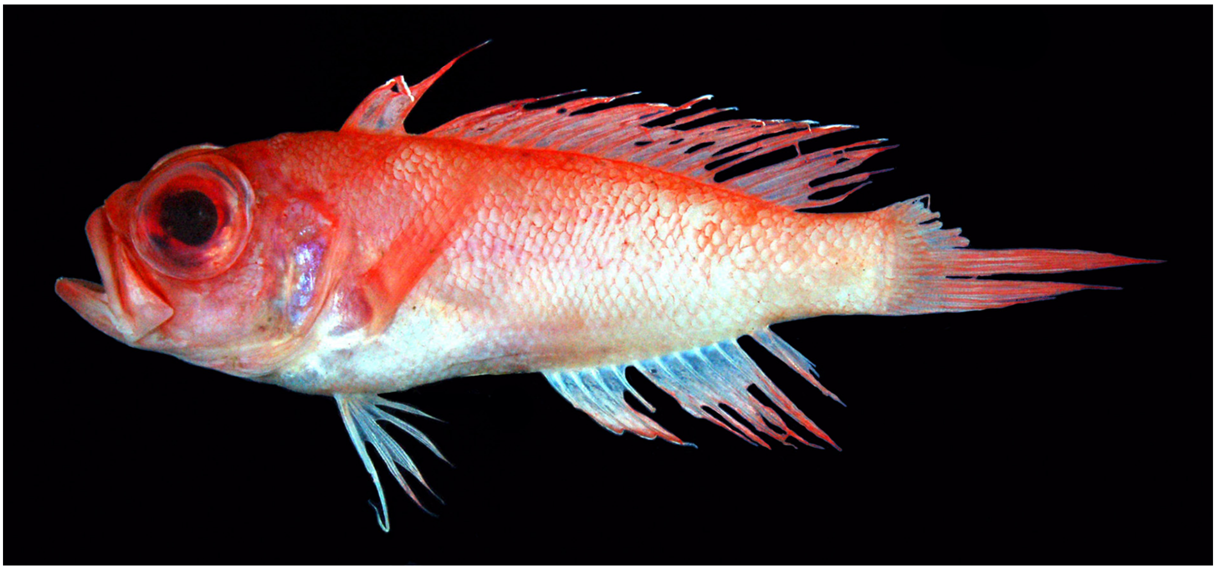

FIGURE 67. *Owstonia raredonae*, holotype, SAIAB 82406, 97 mm SL, off Mozambique. Photograph by P. C. Heemstra, © SAIAB.

Comparisons. Other species with LL pattern type 1 differ (characters of *O. raredonae* in parentheses) in having dorsal-fin rays III, 20–26 or IV, 21–26 (vs. III, 19) and anal-fin rays either I, 13–18 (except I, 11 in *O. merensis* and I, 12 in 1 of 6 Hawaiian small individuals tentatively identified as *O. hawaiiensis*) or II, 11–16 (vs. I, 12). *Owstonia raredonae* further differs from other western Indian Ocean species as follows: *O. weberi* and *O. whiteheadi* both have lower limb margin of preopercle with moderate to strong spines (vs. smooth preopercle margin), *O. similis* has oblique body scale rows in mid-lateral series 52–56 (vs. 31–32) and total gill rakers 32–33 (vs. 36–40); *O. simotera* has more cheek scale rows, 11–12 (vs. 3–4) and *O. lepiota* has more oblique body scale rows in mid-lateral series, 95 (vs. 31–32) and nape naked (vs. nape scaly).

Etymology. Named for Sandra J. Raredon, Smithsonian Institution, in appreciation of her expertise with digital radiographs and photographs, which has contributed significantly to this monograph.

Distribution. (Fig. 27) Known only from the type locality off Mozambique, where trawled in 311–314 m.

***Owstonia rhamma* new species**
(Figures 68, 69)

Holotype. MNHN 1995–0005, 102 mm SL, Vanuatu, 20°19'58.8"S, 169°49'1.2"E, MUSORSTOM 8, sta. 963, beam trawl in 400–440 m, 20 Sep. 1994.

Other material. MNHN 2013–0354, (1, 50), Vanuatu, W. of Malo Island, 15°41'16.8"S, 167°2'34.8"E, 321–336 m, Exped. Santo 6, sta. at18, 21 Sep. 2006.

FIGURE 68. *Owstonia rhamma*, holotype, MNHN 1995–0005, 102 mm SL, Vanuatu; insert below dorsal view showing suture-like appearance of lateral line. Photograph by Sandra J. Raredon.

FIGURE 69. *Owstonia rhamma* close-up of head of holotype to show large hooked dentary canines. Photograph by Sandra J. Raredon.

Diagnosis. A species of *Owstonia* with LL pattern type 3; Dorsal fin III, 21; anal fin I, 14; nape scaly and cheek scale rows 2-3; dentary with 4 or 5 mid-lateral teeth noticeably enlarged and hooked backwards (Fig. 69).

Description. (Characters of the 50 mm SL specimen that are observable are given in parentheses when they differ from the holotype; also see below Remarks.) A species of *Owstonia* with LL pattern type 3, consisting of a lateral line that does not contact posttemporal sensory canal near anterodorsal margin of gill opening, but instead continues posteriorly just below dorsal-fin base to soft rays 19/20 (16) and anteriorly for about 5 scale rows beyond dorsal-fin origin (on left side) and on right side slightly beyond dorsal-fin origin but too many scales missing on nape to determine if the lateral line makes a complete loop across nape (nape loop definitely incomplete in the small specimen). Dorsal fin III, 21; anal fin I, 14; pectoral fin 19 (21/23); gill rakers 16 + 29 (15 + 30) (left gill arch of holotype missing). Vertebrae: precaudal 11, caudal 17, total 28; anal-fin pterygiophores anterior to 1st haemal spine 2. Oblique body scale rows in mid-lateral series about 50; nape scaly and cheek scale rows 2 or 3. Lower limb margin of preopercle with 5−6 very small blunt spines which could easily be overlooked (Fig. 8F). Papillae in slight depression behind tip of premaxillary ascending processes 4, arranged in 2 approximately equally spaced pairs. Teeth in outer row of each premaxilla 16/22 (14); 2 (0) inner teeth anteriorly. Teeth in lateral row of each dentary 11/12 (11), 4 or 5 mid-lateral teeth noticeably enlarged and hooked backwards (Fig. 69); symphyseal teeth 4 (3) moderately large, conical, and with 2/1 (1) inner teeth anteriorly. Depressed pelvic fin extending to base of anal-fin soft ray 4 (2). Caudal fin lanceolate. Holotype with caudal fin 2.3 times in SL; head 3.0 times in SL; body depth at anal-fin origin 3.5 times in SL.

Color pattern in alcohol: Holotype with dorsal fin uniformly pale (small specimen with traces of melanophores distally in spinous dorsal fin); membrane connecting maxilla and premaxilla with prominent black stripe extending to near end premaxilla, but inner membrane covering posterior part of dentary pale with no trace of melanophores. Life coloration unknown.

Proportions of 102 mm SL holotype, with those of the 50 mm specimen (in parentheses), as percentages of SL: predorsal length 27.2 (27.9); preanal length 56.7 (55); dorsal-fin base 63.5 (63.6); anal-fin base 35.3 (32.9); pelvic-fin length 27.9 (31.3); caudal-fin length 44.1 (27.6); body depth at anal-fin origin 28.7 (29.3); head length 33.0 (33.8); upper jaw length 16.3 (18.7); upper jaw depth 7.3 (8.6); orbit diameter 13.5 (16.4). As percentages of head length: upper jaw length 49.3 (55.4); orbit diameter 41.0 (48.5).

Comparisons. *Owstonia maccullochi* and *O. doryptera* are the only other species with most of the diagnostic characters of *O. rhamma* but differ (characters of *O. rhamma* given in parentheses) as follows: *O. maccullochi* typically has more dorsal- and anal-fin soft rays 22 and 15 respectively (vs. 21 and 14, see Table 4) more pectoral fin rays, typically 20 or 21 (vs. 19), and more cheek scale rows 5–6 (vs. 2–3). *Owstonia doryptera* has a lateral line with a complete nape loop (vs. lateral line apparently not united as a complete loop across nape), more cheek scale rows, 5–6 (vs. 2 or 3) and no enlarged lateral dentary canines (vs. several lateral canines noticeably enlarged, Fig. 69).

Etymology. From the Greek *rhamma* (seam or suture) in allusion to the lateral line (Fig. 68), which is reminiscent of a surgeon's suture. The name is treated as a noun in apposition.

Distribution. (Fig. 22) Known only from the Vanuatu type locality and Malo Island vicinity, where trawled in 400–440 and 321–336 m.

Remarks. The small individual from near Malo Island is tentatively identified as *Owstonia rhamma* based, in part, on the Vanuatu locality and similarity of its dentition to that of the holotype, but in the absence of body and cheek row scale counts we cannot make an unequivocal identification. The relatively larger orbit diameter 13.5% SL (vs. 16.4%) and traces of melanophores on the spinous dorsal fin of Malo Island specimen are presumably size related.

FIGURE 70. *Owstonia sarmiento*, holotype, PNM 17006, 61 mm SL, Philippines, Luzon. After Liao *et al.* 2009, fig. 1A.

***Owstonia sarmiento* (Liao, Reyes and Shao)**
(Figure 70)

Sphenanthias sarmiento Liao, Reyes and Shao, 2009:255, figs. 1A, 1B (original description; Aurora, "East" Luzon, Philippines, 15.96°N, 121.78°E; depth 292–307 m).

Material examined. 24 specimens, 44–84 mm SL: **Philippines**: ASIZP 67820 (1, 63), eastern Luzon, Aurora, 16.03°N, 121.88°E, 262–278 m, 20 May 2007; ASIZP 68216 (1, 64), eastern Luzon, Aurora, 16.02°N, 121.85°E, 302–309 m, 2 Jun. 2007; ASIZP 68380 (1, 63), eastern Luzon, Aurora, 16.03°N, 121.88°E, 262–278 m, 20 May 2007; PNM 17006 (61, x-ray only), holotype, Philippines, eastern Luzon, Aurora, 15.93°N, 121.78°E, 307–292 m, 21 May 2007; USNM 93458 (1, 52), Cebu, Chocolate Island, 11°15'30"N, 124°11'E, 271 m, Albatross sta. 5194, 3 Apr., 1908; USNM 93457 (1, 71), Capitancillo Lt., between Cebu and Leyte, 10°40'15"N, 124°15'E, 291 m, Albatross sta. D5408, 18 Mar. 1909. **Indonesia**: MNHN 1988–2014 (1, 44), Sulawesi, 1°57.8'S, 119°15'E, 215 m, "Corindon" II, sta. 271. **New Caledonia**: MNHN 2002–3175 (1, 58), 22°7'12"S, 167°10'58.8"E, 415–435 m, MUSORSTOM 4 sta. cc245, 415–435 m, 3 Oct. 1985. **Australia**: NTM S.11772–001 (3, 66–78), Queensland, E. of Dunk Island, 17°15'S, 147°4'E, 300 m, Jan. 1986; AMS I.25826–007 (4, 76–80), Queensland, N. of Townsville, 17°59'S, 147°06'E, 300 m, R/V Soela, sta. SO1/86/53, 17 Jan. 1986; ANSP 165126 (2, 82 C&S–69) same data as preceding; NTM S.11782–001 (5, 80–84), E. of Dunk Island, 18°1'S, 147°7'E, 300 m, Jan. 1986; NTM S.12722–005 (2, 45–76), E. of Dunk Island, 18°0'S, 147°8'E, 300 m, Jan. 1986.

Diagnosis. A species of *Owstonia* with a LL pattern type 2 that typically forms a loop across nape; oblique body scale rows in mid-lateral series 27–30; in fresh specimens dorsal, anal and caudal-fins with a wide, white, distal margin and submarginal red stripe.

Description. A species of *Owstonia* with LL pattern type 2, consisting of a lateral line that originates from posttemporal sensory canal near anterodorsal margin of gill opening, extends upward and forms a "T" connection with horizontal section of lateral line (Fig. 5B) that extends posteriorly just below dorsal-fin base to soft rays 16−17, with the anterior section extending beyond dorsal-fin origin and forming a loop across nape (Fig. 6E). Dorsal fin III, 22–24 (typically 22); anal fin II, 14; pectoral fin 17–20; gill rakers 12–15 + 24–27 = 36–41. Vertebrae: precaudal 11–12, caudal 17–18, total 28–29 (exceptionally 28); anal-fin pterygiophores anterior to 1st haemal spine 3 (Fig. 7B). Oblique body scale rows about 27–30; nape scaly and cheek scale rows 2–3. Lower limb margin of preopercle with skin-covered spines so reduced as to be easily over-looked (Fig. 8G). Papillae in slight depression behind tip of premaxillary ascending processes 4, each pair of papillae about equally spaced (Fig. 14E). Teeth in outer row of each premaxilla 18–28, with some of anterior ones spike-like; no inner teeth. Teeth in lateral row of each dentary 10–12; symphyseal teeth 3–5, moderately short and spike-like, and with 0−1 inner teeth anteriorly. Pelvic fin probably sexually dimorphic, depressed fin ranging from extending only to anus to reaching anal-fin origin. Caudal fin lanceolate. In 10 specimens, 52–84 mm SL, caudal fin 1.5–2.0 times in SL; head 3.5–4.3 times in SL; body depth at anal-fin origin 4.5–6.4 times in SL.

Color pattern in alcohol: Dorsal fin uniformly pale; membrane connecting maxilla and premaxilla with a prominent black stripe variable in length, extending only about 2/3 distance or to end of premaxilla, and inner membrane covering posterior part of dentary also black. In the fresh holotype, head and body were rosy pink, becoming mostly white ventrally; dorsal and anal fins rosy with a relatively wide, white distal margin and submarginal red stripe; outer margin of caudal fin also has a wide white border followed by a slightly wider, dark red submarginal stripe, remainder of fin rose colored.

Proportions of 10 specimens 44–84 mm SL mm SL, as percentages of SL: predorsal length 21.8–27.4; preanal length 47.2–56.2; dorsal-fin base 62.2–68.2; anal-fin base 33.5–39.6; pelvic-fin length 17.9–28.0; caudal-fin length 47.7–71.1; body depth at anal-fin origin 15.5–21.0; head length 22.3–30.2; upper jaw length 11.1–17.2; upper jaw depth 5.2–7.2; orbit diameter 10.6–13.7. As percentages of head length: upper jaw length 49.5–58.2; orbit diameter 42.3–49.3.

Comparisons. *Owstonia tosaensis*, the only other species with LL pattern type 2, differs (characters of *O. sarmiento* in parentheses) in having more oblique body scale rows in mid-lateral series 44–54 (vs. 27–30) and cheek scale rows 4–5 (vs. 2–3), different number of anal fin rays I, 15–16 (vs. II, 14) and a very different color pattern. *Owstonia sarmiento* also is the only species in which the anal fin has 2 supernumerary spines.

Etymology. Named for Malcolm Sarmiento, then director of the Philippine Bureau of Fisheries and Aquatic Resources.

Distribution. (Fig. 25) Known from off Luzon Island, Philippines, Sulawesi, New Caledonia, and Queensland, Australia, where trawled in about 215–415 m.

***Owstonia scottensis* new species**
(Figure 71, 72)

Holotype. CSIRO H.7136–03, 100 mm SL, Western Australia, south of Scott Reefs, 14°16'S, 122°16'E, trawled in 358 m, R/V Heron sta. 6–6–2004, shot 2, 6 Jun. 2004.

Paratypes. 4 specimens, 70–110 mm SL: CSIRO H.7136−04 (2, 103–103) and USNM 427156 (1, 110), same data as holotype; CSIRO B.4011 (1, 70), SW of Scott Reefs, 14°37'S, 121°47'E, 304 m, sta. S00184/82, 16 Feb. 1984.

Diagnosis. A species of *Owstonia* with LL pattern type 1; dorsal fin III, 21; anal fin I, 14–15; oblique body scale rows in mid-lateral series about 40–45; lower limb margin of preopercle with 5–8 weak spines; cheek scale rows 4–5; dorsal fin pale anteriorly and in fresh specimens median fins mostly red; each dentary with 3–4 spike-like symphyseal teeth.

Description. (Where counts vary, those of the paratypes are given in parentheses.). A species of *Owstonia* with LL pattern type 1, consisting of a simple lateral line that originates from posttemporal sensory canal near anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base to soft ray 19 (left side holotype). Dorsal fin III, 21; anal fin I, 14 or 15; pectoral fin 20–21; gill rakers 16 + 27 (15–16 + 25–27 = 40–43). Vertebrae: precaudal 11, caudal 17, total 28; anal-fin pterygiophores anterior to 1st haemal spine 2 or 3 (3 in 1 of 5 specimens.). Oblique body scale rows in mid-lateral series about 40–45 (some scales missing on sides of body in all specimens due to trawl abrasion); nape scaly and cheek scale rows about 4–5. Preopercle lower limb margin with 5–8 weak spines (Fig. 8H). Papillae in slight depression behind tip of premaxillary ascending processes 4, arranged in 2 almost equally spaced pairs. Teeth in outer row of each premaxilla 15/18 (12–20), with some anterior teeth spike-like; no inner teeth anteriorly. Teeth in lateral row of each dentary 11/12 (9–15); symphyseal teeth 3 or 4, spike-like, and with 0–3 very small inner teeth anteriorly. Depressed pelvic fin extending to or slightly behind anal-fin origin. Caudal fin lanceolate. Caudal fin 1.9–2.6 times in SL; head 3.3–3.6 times in SL; body depth at anal-fin origin 4.1–4.4 times in SL.

Color pattern in alcohol: Adults with dorsal fin uniformly pale; membrane connecting maxilla and premaxilla with prominent black stripe extending to near anterior end of premaxilla, and inner membrane covering posterior part of dentary also black. In fresh specimens, median and pelvic fins mostly red, except anterior 1/3 of dorsal fin and 3/4 of anal fin whitish proximally; pectoral fin pale yellow and iris red; body red with paler chest and belly, but appearing mostly straw-colored in Fig. 71 due to missing scales.

Proportions of 100 mm SL holotype are given first, followed by those of 4, 70–110 mm SL, paratypes (in parentheses), as percentages of SL: predorsal length 28.8 (28.1–31.3); preanal length 52.6 (52.1–57.2); dorsal-fin base 66.4 (58.4–63.9); anal-fin base 30.6 (29.9–32.5); pelvic-fin length 25.8 (25.3–27.5); caudal-fin length 39.1 (45.4–55.4); body depth at anal-fin origin 24.3 (22.6–24.1); head length 29.2 (29.4–29.7); upper jaw length 16.0 (15.4–15.9); upper jaw depth 8.0 (7.8–8.1); orbit diameter 15.1 (15.3–17.4). As percentages of head length: upper jaw length 54.6 (51.8–53.6); orbit diameter 51.7 (51.5–59.3).

Comparisons. *Owstonia japonica* and *O. dispar* have most of the diagnostic characters of *O. scottensis* but differ (characters of *O. scottensis* in parentheses) as follows: both species have smaller orbit diameters 10.4–13.9% SL (vs. 15.3–17.5%); *O. dispar* also has fewer cheek scale rows 3 (vs. 4–5); *O. japonica* has a shorter upper jaw 13.0–16% SL (vs. 15.4–16%), each dentary with 4–6 blunt, conical, symphyseal teeth (vs. 3–4 spike-like symphyseal teeth), and in fresh specimens of *O. japonica* the median fins have white margins and a narrow, red submarginal stripe (vs. fins mostly red and without white margins); life coloration of *O. dispar* unknown.

Etymology. The specific epithet in a combination of Scott Reefs, the nearest area from where all the known specimens have been collected and the Latin suffix *ensis* (meaning belonging to). The name is treated as a noun in apposition.

Distribution. (Fig. 23) Known only from Scott Reefs vicinity, off Western Australia where trawled in 304–358 m.

FIGURE 71. *Owstonia scottensis*, holotype, CSIRO H.7136–03, 100 mm SL, Western Australia, south of Scott Reefs. Photograph by Louise Conboy, courtesy of CSIRO.

FIGURE 72. *Owstonia scottensis*, head of holotype showing position of upper jaw tightly pressed against lower margin of infraorbitals.

Owstonia sibogae (Weber)

(Figures 73, 74)

Sphenanthias sibogae Weber, 1913:595, pl 2, figs. 4 & 4a (original description; Timor Sea, 10°27.9'S, 123°28.7'E, Indonesia; depth 216 m); Weber and de Beaufort, 1932:114, fig. 20 (redescription).

Sphenanthias pectinifer Myers, 1939:19 (original description; off Dumalag Island, Davao Gulf, Mindanao, Philippines, R/V Albatross sta. D.5255; depth 100 fms [183 m]).

Owstonia pectinifer. Gloerfelt-Tarp and Kailola, 1984:229, unnumbered color photograph (brief description); Prokofiev, 2010:408, figs. 1 & 2 (*Sphenanthias* synonymized with *Owstonia*; *O. pectinifer* provisionally recognized as a valid species).

Owstonia sibogae. Endo *et al.*, 2016:37 (lectotype designation of *Sphenanthias sibogae*, ZMA 112.568, 82 mm SL, Timor Sea; comparative material six specimens, 80.5–122 mm SL).

Material examined. 19 specimens, 82–156 mm SL: **Indonesia** ZMA 119.382 (2, ca. 93–122), Timor Sea, 10°27.9'S, 123°28.7'E, 216 m, M. Weber, 2 Feb. 1900; ANSP 152035 (2, 113 C&S–156) and ANSP 152642 (1, 100), Sumbawa, Saleh Bay, 8°34'S, 117°46'E, 150–280 m, T. Gloerfelt-Tarp, 16 Jul. 1981; NMNH 1985–363 (2, 97–98), Sulawesi, 1°57.8'S, 119°15'E, 215 m, P. Fourmanoir, R/V Corindon II, sta. 271; MNHN 1985–356 (1, 58), Sulawesi, 1°57.8'S, 119°15'E, 215m, R/V Corindon II, sta. 271; BMNH 1986.10.6.61 (1, 90), Indonesia, no other data. **Philippines** USNM 93455 (1, 138), holotype of *Sphenanthias pectinifer* Myers, Mindanao, Davao Bay, E. of Dumalag Island, 7°3'N, 125°39'E, 183 m, R/V Albatross, sta. D5255, 18 May 1908; USNM 93456 (1, 104), Panalangan Point, Talajit Island, between Samar and Masbate, 11°57'N, 124°12'24"E, 250 m, R/V Albatross sta. D.5396, 15 Mar. 1909; CAS 32914 (2, 78–96), Luzon Island, Ragay Gulf, Quezon, Pusago Point, 250 m, J.E. Norton, 11 Nov. 1966; CAS 33848 (5, 90–126 C&S), Marinduque Island, SE of Salomagee I., 287–312 m, J. E. Norton, 20 Oct. 1964. **Vietnam** USNM 357481 (1, 82), vicinity of Gulf of Tonkin, 15°56'48"N, 109°30'E, 260–315 m, 16 Sep. 1963.

Diagnosis. A species of *Owstonia* with LL pattern type 1; dorsal-fin spines IV, 23–24 (rarely 24); anal fin II, 15–17 (typically16); oblique body scale rows in mid-lateral series 27–30; cheek scale rows 3; premaxillary stripe short, extending only about 2/3 length of premaxilla; inner membrane covering posterior part of dentary black.

Description. A species of *Owstonia* with LL pattern consisting of type 1, a simple lateral line that originates from posttemporal sensory canal near anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base to soft rays 19–23. Dorsal fin IV, 23–24 (rarely 24); anal fin II, 15–17 (typically16); pectoral fin 18–20; gill rakers 14–18 + 27–32 = 41–48. Vertebrae: precaudal 12, caudal 17, total 29; anal-fin pterygiophores anterior to 1st haemal spine 4. Oblique body scale rows in mid-lateral series about 27–30; nape scaly and cheek scale rows 3 (Fig. 12I). Lower limb margin of preopercle with 8–14 strong spines (Fig. 8I). Papillae in slight depression behind tip of premaxillary ascending processes 4, arranged in 2 almost equally spaced pairs. Teeth in outer row of each premaxilla 29–41; no inner teeth anteriorly. Teeth in lateral row of each dentary 15–26; symphyseal teeth 5–6 short and peg-like, and with 1–4 inner teeth anteriorly. Pelvic fin probably sexually dimorphic, depressed pelvic fin extending only to anus, to anal-fin origin (most specimens) or to soft ray 4. Caudal fin lanceolate. In 9 specimens, 90–156 mm SL, caudal fin 1.5–2.2 times in SL; head 3.8–5.2 times in SL; body depth at anal-fin origin 3.9–6.4 times in SL.

Color pattern in alcohol: Adults with dorsal fin uniformly pale; membrane connecting maxilla and premaxilla with prominent dark stripe that extends only about 1/2 length of premaxilla (Fig. 15C), and inner membrane covering posterior part of dentary also black. Gloerfelt-Tarp and Kailola (1984) recorded the life coloration as "body rosy with areas of pale yellow, maxilla, side of head and pectoral base iridescent; premaxillary groove black, fins greenish yellow, dorsal and anal fins iridescent violet."

Proportions of 10 specimens 82–156 mm SL mm SL, as percentages of SL: predorsal length 19.7–25.0; preanal length 45.4–50.9; dorsal-fin base 63.3–72.9; anal-fin base 37.1–46.5; pelvic-fin length 18.3–39.3; caudal-fin length 45.4–67.4; body depth at anal-fin origin 19.5–25.8; head length 19.3–26.0; upper jaw length 9.9–12.8; upper jaw depth 5.0–6.4; orbit diameter 8.1–11.9. As percentages of head length: upper jaw length 47.4–53.4; orbit diameter 40.1–49.8.

Comparisons. Three species have many of the diagonistic characters of *Owstonia sibogae* but differ (characters of *O. sibogae* in parentheses) as follows: *Owstonia hastata* has anal fin II, 14 (vs. II, 15–17), oblique body scale rows in mid-lateral series 38 (vs. 27–30) and more precaudal vertebrae and anal-fin pterygiophores anterior to 1st haemal spine 13 and 5 respectively (vs. 12 and 4); *O. elongata* has more dorsal-fin soft rays 24–26 (vs. 23, rarely 24), typically with anal-fin spine I, exceptionally II, see Table 4 (vs. II) and more precaudal vertebrae and anal-fin pterygiophores anterior to 1st haemal spine 16 and 8 respectively (vs. 12 and 4); *O. contodon* has more body scale rows in mid-lateral series ca. 48–53 (vs. 27–30) and premaxillary stripe extending entire length of premaxilla (vs. short stripe, extending only about 2/3 length of premaxilla). Four other species (*O. fallax*, *geminata*, *macrophthalma* and *whiteheadi*) agree with *O. sibogae* in having LL pattern type 1, dorsal-fin spines IV and spines on the lower limb of the preopercle but differ in having anal-fin spines I (vs. II). In addition, *O. geminata* has the inner membrane covering the posterior part of the dentary pale (vs. dark), and the other three species have more oblique body scale rows in mid-lateral series 39–54 (vs. 27–30).

FIGURE 73. *Owstonia sibogae*, ANSP 152035, 156 mm SL, Indonesia, Sumbawa. Photograph by Sandra J. Raredon.

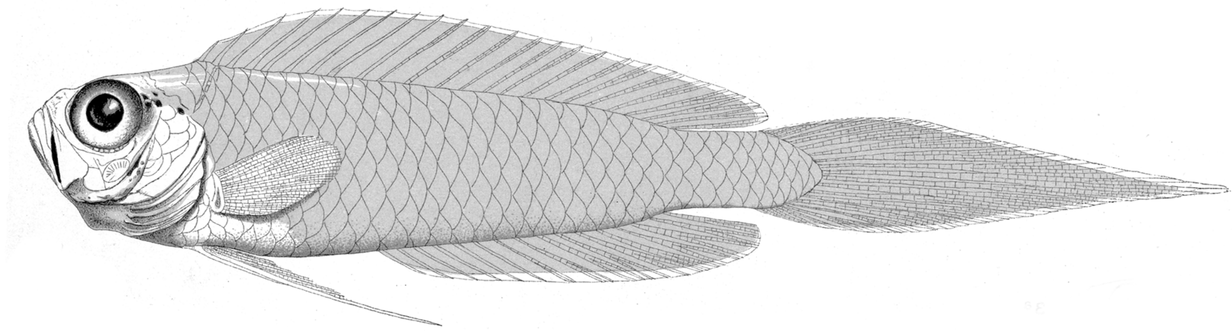

FIGURE 74. *Owstonia sibogae*, Indonesia, Timor Sea. After Weber, 1913, pl. 2, fig. 4.

Etymology. Named for the East Indies Siboga Expedition. The results of the "Siboga-Expeditie" (published in many parts from 1901 to 1986) were edited by Max Weber.

Distribution. (Fig. 26) Vietnam, Philippines, and Indonesia where trawled in 183–315 m.

Remarks. Weber's (1913) original description and drawing (Fig. 74) of *Sphenanthias sibogae* were very inaccurate, especially in reporting 9 instead of 4 dorsal-fin spines and only a single cheek scale. Myers' (1939) comparison of *Sphenanthias pectinifer* and *S. sibogae* was not based on his personal examination of any types of *Sphenanthias sibogae*. While questioning the accuracy of Weber's description, he seems to have relied primarily on the total gill raker counts (38–39) reported in Weber and de Beaufort (1931) for the holotype and three paratypes of *S. sibogae*, versus 45 for the holotype of *S. pectinifer* as justification for his new species. Total gill rakers counts ranged from 41–48 in 13 specimens of *O. sibogae* (see Table 7) we examined, suggesting that some of the very small gill rakers near the ends of the gill arch were not counted by Weber and de Beaufort. As indicated in the above synonymies, Endo *et al.* (2016) designated ZMA 112.568 as the lectotype of *Sphenanthias sibogae*.

***Owstonia similis* new species**
(Figure 75)

Holotype. MNHN 2014–1766, 89 mm SL, Madagascar, 14°29'25"S, 47°26'4"E, beam trawl in 347–448 m, R/V Miriky sta. 3291, 14 Jul. 2009.

Diagnosis. A species of *Owstonia* with LL pattern type 1; dorsal fin III, 21; anal fin I, 14; oblique body scale rows in mid-lateral series 52–56; lower limb margin of preopercle without spines; dorsal fin anteriorly with several of the interradial membranes mostly black.

Description. A species of *Owstonia* with LL pattern type 1, consisting of a simple lateral line that originates from posttemporal sensory canal near anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base to soft ray 16. Dorsal fin III, 21; anal fin I, 14; pectoral fin 22/21; gill rakers 10 + 22/23. Vertebrae: precaudal 11, caudal 17, total 28; anal-fin pterygiophores anterior to 1st haemal spine 2. Oblique body scale rows in mid-lateral series 52–56; nape scaly and cheek scale rows 6. Lower limb margin of preopercle without spines. Papillae in slight depression behind tip of premaxillary ascending processes difficult to discern with absolute certainty, but they appear to be in two closely spaced rows with 3 large, almost-touching papillae in anterior row and 2 smaller papillae on opposite ends of the posterior row. Teeth in outer row of each premaxilla 10/13; no inner teeth anteriorly. Teeth in lateral row of each dentary 10/8; symphyseal teeth 3, spike-like, and with 1 smaller inner tooth anteriorly. Pelvic fin short, depressed fin extending only to anus. Caudal fin lanceolate. Caudal fin 2.5 times in SL; head 2.9 times in SL; body depth at anal-fin origin 3.4 times in SL.

Color pattern in alcohol: Dorsal fin interradial membranes between spine 2 and soft ray 3 with heavy concentration of melanophores and anal fin with interradial membranes between posterior 5 soft rays also with heavy concentration of melanophores; membrane connecting maxilla and premaxilla with prominent black stripe extending about 3/4 length of premaxilla, and inner membrane covering posterior part of dentary pale. Life coloration unknown.

Proportions of 89 mm SL holotype as percentages of SL: predorsal length 31.4; preanal length 64.3; dorsal-fin base 60.0; anal-fin base 28.4; pelvic-fin length 23.5; caudal-fin length 39.6; body depth at anal-fin origin 29.4; head length 34.1; upper jaw length 19.1; upper jaw depth 9.7; orbit diameter 14.8. As percentages of head length: upper jaw length 56.0; orbit diameter 43.5. Head length 2.9 times in SL; body depth at anal-fin origin 3.4 times in SL.

FIGURE 75. *Owstonia similis*, holotype, MNHN 2014–1766, 89 mm SL, Madagascar. Photograph by Sandra J. Raredon.

Comparisons. *Owstonia melanoptera*, *O. psilos* and *O. scottensis* have many of the diagnostic characters of *O. similis* but differ (characters of *O. similis* in parentheses) as follows: *O. melanoptera* is most similar to *O. similis* but has lateral line ending below dorsal-fin soft rays 7 or 8 (vs. 16), more gill rakers 13–14 + 25 (vs. 10 + 22–23) and interradial membranes of posterior anal-fin soft rays unpigmented (vs. interradial membranes of posterior anal-fin soft rays with heavy concentration of melanophores); *O. psilos* has fewer oblique body scale rows in mid-lateral series, ca. 32 (vs. 52–56), more gill rakers 12–14 + 24–27 = 36–40 (vs. 10 + 22–23), membrane connecting maxilla and premaxilla typically pale with a few scattered melanophores or a pale incomplete stripe (vs. continuous black stripe present), and dorsal fin with interradial membranes between spine 3 and soft rays 4 or 5 mostly black (vs. black between spine 2 and soft ray 3); *O. scottensis* has fewer oblique body scale rows in mid-lateral series, 40–45 (vs. 52–56), more total gill rakers, 40–43 (vs. 32–33), dorsal fin pale anteriorly (vs. mostly black between spine 2 and soft ray 3); and inner membrane covering posterior part of dentary dark (vs. pale).

Etymology. From the Latin *similis* (like), in reference to similarity of the holotype to other species with a black blotch anteriorly in the dorsal fin, especially to *O. melanoptera*. An adjective.

Distribution. (Fig. 27) Known only from the Madagascar type locality, where trawled in 347–448 m.

Remarks. We cannot entirely eliminate the possibility that the total number of gill rakers (32–33) in the 88.6 SL holotype of *O. similis* compared to those (37–38) in the much larger, 116.2 SL, holotype of *O. melanoptera* is correlated with body size. However, in *Owstonia* species with relatively low numbers of total gill rakers, gill rakers usually increase only slightly by the time specimens have obtained a size of about 80 mm SL.

Owstonia simotera (Smith)

(Figures 76, 77)

Sphenanthias simoterus Smith, 1968:11, fig. 1 & pl. 6, fig. C (original description; off Bazaruto, southern Mozambique, depth 260–300 fms [= 475–549 m]).
Owstonia simoterus Smith-Vaniz, 1986:728, fig. 226.2 (brief description).

Material examined. 2 specimens, 65–298 mm SL: SAIAB 605 (298) holotype of *Sphenanthias simotera*, southern Mozambique, off Bazaruto, 475–549 m, [date not given]; USNM 276514 (1, 65), Mozambique Channel, off Delagoa Bay, 25°31.0'S, 33°26.5'E, 450–455 m, R/V Anton Bruun cruise 8, sta. 396B, 28 Sep. 1964.

Diagnosis. A species of *Owstonia* with LL pattern type 1; cheek scale rows 7–10; lanceolate caudal fin; adults with large curved dentary canines (Fig. 9E).

Description. Data for holotype based on an x-ray, the original description, and observations of Ofer Gon and Phillip C. Heemstra; where counts differ, those of the smaller specimen are given in parentheses. A species of *Owstonia* with LL pattern type 1, consisting of a simple lateral line that originates from posttemporal sensory canal near anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base to soft ray 17/18 (15). Dorsal fin III, 21; anal fin I, 14; pectoral fin 22 (21); gill rakers 13 + 25= 38 (12 + 22 = 34). Vertebrae: precaudal 11, caudal 17, total 28; anal-fin pterygiophores anterior to 1st haemal spine 2. Oblique body scale rows in mid-lateral series approximately 50−60 (50), in contrast to "about 70" given in original description; nape scaly and cheek scale rows 11–12. Preopercle lower limb margin without spines. Papillae in slight depression behind tip of premaxillary ascending processes 4, arranged in 2 almost equally spaced pairs. Teeth in outer row of each premaxilla 23/23 (14), smaller specimen with anterior 3 or 4 teeth spike-like and no inner teeth anteriorly. Teeth in lateral row of each dentary about 10 (8); smaller specimen with 3 symphyseal, spike-like teeth (Fig. 9D), and 1 smaller inner tooth anteriorly. Smith's (1968) description of the holotype states "In the lower jaw [anteriorly] on each side is a widely spaced cluster of sharp curved teeth in about 3 rows, about 10 similar teeth uniserial on each side of jaw, shorter posteriorly." Figure 9E shows the large curved dentary canines and some broken-off premaxillary teeth on right side of holotype. Pelvic fin short in holotype, depressed fin extending posteriorly to slightly behind anus. Caudal fin of adults lanceolate. Holotype with caudal fin 3.6 times in SL; head 3.5 times in SL; body depth at anal-fin origin 3.3 times in SL.

Color pattern in alcohol: Holotype with dark specks and scattered streaks on dorsal and anal fins; smaller specimen with dark blotch in dorsal fin on interradial membranes between spine 2 and soft ray 5. Membrane connecting maxilla and premaxilla with black stripe extending to near anterior end of premaxilla, and inner membrane covering posterior part of dentary pale. Smith (1968) recorded the life color as "body and fins clearly red or crimson, with dark spots on the body and specks and streaks up the membrane of the unpaired fins. There are signs of a darker red submarginal line along the dorsal."

Proportions of 298 mm SL holotype, with selected values for the 65 mm SL specimen given in parentheses, as percentages of SL: predorsal length 27.9; preanal length 53.8; dorsal-fin base 62.1; anal-fin base 30.8; pelvic-fin length 21.4 (22.6); caudal-fin length 27.9 (broken); body depth at anal-fin origin 30.1 (23.5); head length 28.2 (31.7); upper jaw length 16.5 (18.7); upper jaw depth 7.7 (8.3); orbit diameter 9.4 (13.9). As percentages of head length: upper jaw length 58.7 (59.1); orbit diameter 33.3 (43.8).

Comparisons. The allopatric *Owstonia kamoharai* is similar to *O. simotera* in having a relatively large numbers of cheek scale rows (11-12 vs. 7-10), dorsal fin with red marginal or submarginal stripe in life, other nearly identical meristic characters, and a short pelvic fin that does not extend behind anus but differs (characters of *O. simotera* in parentheses) as follows: caudal fin of adults rounded posteriorly and longer, 33.7-40% SL (vs. lanceolate and shorter, 27% SL) and no caniniform dentary teeth (vs. with large, curved, dentary canines (Fig. 9E).

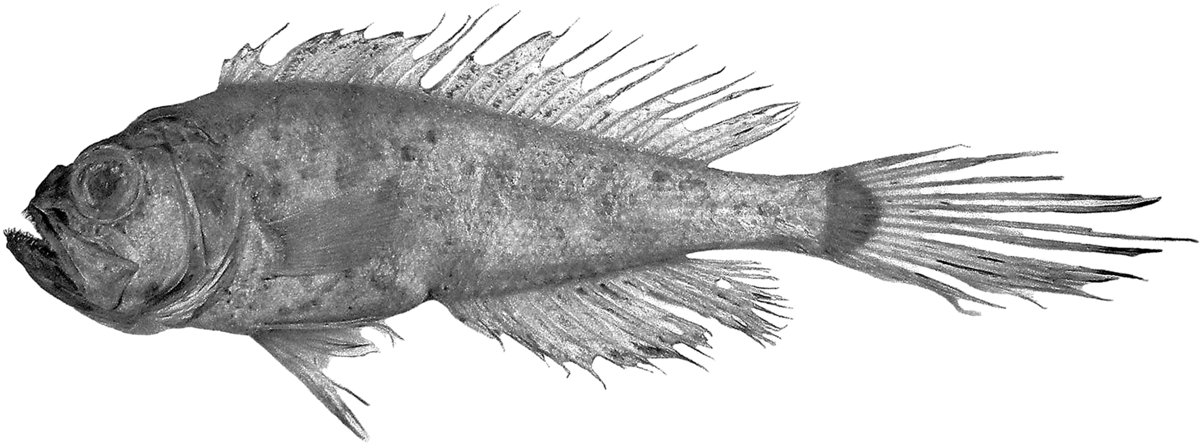

FIGURE 76. *Owstonia simotera*, holotype, SAIAB 605, 298 mm SL, Mozambique, off Bazaruto. After Smith, 1968, plate 6c, image from original photographic negative courtesy of Ofer Gon, © SAIAB.

FIGURE 77. *Owstonia simotera*, USNM 276514, 65 mm SL, Mozambique Channel. Photograph by Sandra J. Raredon.

Other western Indian Ocean species with LL pattern type 1, in addition to having lanceolate caudal fins and fewer cheek scale rows 2–7 (vs. cheek scale rows 7–10), further differ (characters for *O. simotera* in parentheses) as follows: *O. similis* has fewer upper gill rakers 10 (vs. 12–13) and dorsal fin interradial membranes between spine 2 and soft ray 3 with heavy concentration of melanophores (vs. smaller specimen with membranes between spine 2 and soft ray 5 black, and holotype with dark specks and streaks on dorsal fin membranes); *O. whiteheadi* has lower limb margin of preopercle with moderate to strong spines (vs. preopercular margin without spines) and fewer oblique body scale rows in mid-lateral series, 39–41 (vs. ca. 50−60); *O. raredonae* has fewer dorsal- and anal-fin soft rays, 19 and 12 respectively (vs. 21 and 14); *O. lepiota* has more oblique body scale rows in mid-lateral series 95 (vs. ca. 50–60), nape naked (vs. nape scaly) and more dorsal- and anal-fin rays, III, 23 and II, 15 respectively (vs. III, 21 and I, 14).

Etymology. From the Latin *simoter* (snub-nosed).

Distribution. (Fig. 27) Known only from the western Indian Ocean off Mozambique where holotype reported from 475–549 m and the other specimen trawled in 450–455 m.

Remarks. Smith (1956) reported that *O. simotera* has a series of about 70 scales from head to caudal base, and he incorrectly recorded the vertebrae as 11 + 15 (actually 11 + 17). Many body scales on holotype are missing and arranged in irregular rows making it very difficult to accurately count the number of mid-lateral scale rows. At our request, Ofer Gon and Phil Heemstra independently attempted to count oblique horizontal scale rows of the holotype and concluded that a range of approximately 50−60 is more reasonable.

***Owstonia taeniosoma* (Kamohara)**
(Figure 78)

Pseudocepola taeniosoma Kamohara, 1935:136, fig. 4 (original description; off Mimase, near Kôchi Prov., Tosa, Japan; depth 80 fathoms [146 m]); Kamohara, 1961:8 (designation of BSKU 4219 as neotype); Okada and Suzuki, 1956:190, fig. 2 (osteological description); Shiino, 1972:116 (common name Slender jawfish); Machida *in* Masuda *et al.*, 1984:201, pl. 351-D (brief description, figure after Kamohara 1935); Shin, *et al.*, 1993:436 (brief description); Nakabo, 2002:914 (diagnosis, in pictorial key).

Material examined. 9 specimens, 26–169 mm SL: **Japan** CAS 133928 (1, 126), CAS 133932 (1, 89) and CAS 133933 (1, 149) all from, Kochi Pref.; Kochi, T. Kamohara, 1937; BSKU 57075 (1, 132), Kochi Pref., Kuroshio Town, Saga fish market, Shikoku Island, 10 Aug. 2001; BSKU 71222 (1, 142), Saga fish market, 17 Jun. 2004; BSKU 75249 (1, 169), Saga fish market, 4 Jul. 2005. **Andaman Sea** USNM 344576 (1, 48 C&S), NE of Similan Islands, 8°77'N, 97°77'E, beam trawl in 0–82 m, Te Vega cruise 2, sta. 80, 4 Nov. 1963. **New Caledonia** MNHN 2004–2527 (1, 26), 20°34'58.8"S, 164°58' 58.8"E, 227–250 m, Exped. BATHUS 1, sta. dw691, 17 Mar. 1993. **Australia** AMS I.33445–002 (1, 83), New South Wales off Newcastle, 32°53'S, 151°56'E, trawled in 62–77 m, FRV Kapala, 14 Apr. 1992.

Diagnosis. A species of *Owstonia* with LL pattern type 1; dorsal fin III, 25–26; oblique body scale rows in mid-lateral series about 28; total gill rakers 36–40; body depth at anal-fin origin 14.5–21.9% SL; precaudal vertebrae and pterygiophores anterior to 1st haemal spine 15 and 6 or 7 respectively.

Description. A species of *Owstonia* with LL pattern type 1, consisting of a simple lateral line that originates from posttemporal sensory canal near anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base to soft rays 21–25. Dorsal fin III, 25–26 (rarely 25); anal fin I, 18–19 (rarely 19); pectoral fin 16–18; gill rakers 12–14 + 24–26 = 36–40. Vertebrae: precaudal 15, caudal 16–18 (rarely 18), total 31–33 (usually 31); anal-fin pterygiophores anterior to 1st haemal spine 6 or 7 (Fig. 7D). Oblique body scale rows in mid-lateral series about 28; nape scaly and cheek scale rows 3. Lower limb margin of preopercle with about 5−6 small to moderate, partially skin-covered spines (Fig. 8J). Papillae in slight depression behind tip of premaxillary ascending processes in a posterior row consisting of 3 papillae, middle papilla smallest, and with 1 or 2 smaller papillae anteriorly that do not appear to be arranged in any obvious pattern. Teeth in outer row of each premaxilla 22–38 (22 in 83 mm specimen); no inner teeth anteriorly. Teeth in lateral row of each dentary 14–30 (14 in 83 mm specimen) and with mid-lateral teeth higher (Fig. 10K), like *O. fallax*; symphyseal teeth 4−6, very short and peg-like, and with 1–4 inner teeth anteriorly. Pelvic fin short, not extending posteriorly behind anus. Caudal fin lanceolate. In 6 specimens 83–169 mm SL, caudal fin 2.5–2.9 times in SL; head 4.7–6.5 times in SL; body depth at anal-fin origin 4.6–6.9 times in SL.

FIGURE 78. *Owstonia taeniosoma*, AMS I.33445–002, 83 mm SL, Australia, NSW. Photograph by Ken Graham.

Color pattern in alcohol: Adults with dorsal fin uniformly pale; dark premaxillary stripe variable in length, short and extending only about half of premaxilla to long and extending to near anterior end of premaxilla (in largest, well-preserved specimen [BSKU 75249] the stripe is definitely only half length of premaxilla), and inner membrane covering posterior part of dentary consistently with prominent black stripe. Kamohara (1934) described the life color of *Owstonia taeniosoma* as: "Dorsal and anal light reddish, with a broad longitudinal yellow band running along the middle of each fin, whitish in margin, anterior part of anal whitish. Pectoral light reddish, ventral pale. Caudal yellowish and bordered with whitish." Unlike most species, iris is bright yellow.

Proportions of 6 specimens 88–169 mm SL, as percentages of SL: predorsal length 15.4–20.1; preanal length 36.9–45.0; dorsal-fin base 70.7–75.4; anal-fin base 40.4–51.1; pelvic-fin length 14.6–16.1; caudal-fin length 34.6–40.4; body depth at anal-fin origin 14.5–21.9; head length 15.5–21.1; upper jaw length 7.1–9.1; upper jaw depth 4.3–4.5; orbit diameter 5.7–7.8). As percentages of head length: upper jaw length 43.2–51.1); orbit diameter 36.9–42.4).

Comparisons. *Owstonia taenisoma* is most likely to be confused with *O. elongata* but differs (characters of *O. taeniosoma* in parentheses) in having fewer dorsal-fin spines IV (vs. III), deeper body depth at anal-fin origin 10.8–14.0% SL (vs. 14.5–21.9%), fewer total gill rakers 41–46 (vs. 36–40), and fewer precaudal vertebrae and anal-fin pterygiophores anterior to 1st haemal spine 16 and 8 respectively (vs. 15 and 6–7). *Owstonia taeniosoma* also superficially resembles *O. sibogae*, *O. geminata* and *O. hastata* in having large cheek scales and relatively few oblique body scale rows in mid-lateral series but differs in having fewer dorsal-fin spines, III (vs. IV); the latter two species further differ in having fewer anal-fin soft rays 14 or 16–17 (vs. 18–19), and *O. hastata* has more anal-fin spines II (vs. I).

Etymology. A combination of the Greek *taenia* (band or ribbon) and *soma* (body), in reference to the elongate body.

Distribution. (Fig. 25) Known from of Japan, Andaman Sea, and eastern Australia; a relatively shallow-water species trawled between 62–250 m.

Remarks. Kamohara's (1961) neotype designation was considered to be invalid by Eschmeyer *et al.* (2016) because it was not made in a revisionary work.

Owstonia tosaensis Kamohara
(Figures 79, 80)

Owstonia tosaensis Kamohara, 1934:301, fig. (original description; off Kochi Prefecture, Japan); Kamohara, 1935:134, fig. 3 (redescription and illustration); Shiino, 1972:116 (common name Yellowfin jawfish); Machida in Masuda *et al.*, 1984:201, pl. 192-G (brief description, color photograph); Shin et al, 1993:436, pl. 137–5 (brief description, color photograph); Nakabo, 2002:914 (diagnosis, in pictorial key); Endo *et al.*, 2016: 37(comparative material 12 specimens, 112–192 mm SL, listed from Japan and Taiwan).

Material examined. 12 specimens, 99–228 mm SL: **Japan** CAS 133930 (1, 133) and CAS 133934 (1, 149), Kochi Pref., Kochi, T. Kamohara; NSMT-P 54428 (1, 228), Shikoku, Kochi Pref., Kochi, Mimase Market. **Taiwan** ANSP 153169 (2, 100 C&S–127), Tung-Kang, fish market, 22°23'N, 120°25'E, E. Chen, 1 Dec. 1983; ASIZP 66433 (1, 126), Nanfangao, Yilan, 24.5818°N, 121.8668°E, 2 Aug. 2005, Po-Feng Lee; ASIZP 60461 (1, 173), Hengchun, Pingtung, 22°N, 120.74°E, 6 Mar. 1992, K.T. Shao. **Philippines** MNHN 1984–653 (1, 111), MUSORSTOM 2, P. Fourmanoir, no other data. **Western Australia** CSIRO H6431–02 (1, 148), CSIRO H6431–03 (2, 155–190) and USNM 427947 (1, 99), N. of Monte Bello Islands, 19°47'S, 115°18'E, 209 m, 17 May 2006.

Diagnosis. A species of *Owstonia* with LL pattern type 2 that converges toward toward mid-line of nape but rarely unites to form a complete loop across nape; oblique body scale rows in mid-lateral series 44–54; lower limb of preopercle with large, widely spaced spines (Fig. 8K); dorsal- anal- and caudal-fins without wide white distal margins.

Description. A species of *Owstonia* with LL pattern type 2, consisting of a lateral line that originates from posttemporal sensory canal near anterodorsal margin of gill opening, extends upward and forms a "T" connection with horizontal section of lateral line (Fig. 6B) that extends posteriorly just below dorsal-fin base to last ray and with the anterior section extending beyond dorsal fin and converging toward mid-line of nape but usually not united across nape (Fig. 6F) but rarely forming a complete loop across nape (complete loop in only 1 of 10 specimens). Dorsal fin III, 23–24 (usually 23); anal fin I, 15–16; pectoral fin 19–21; gill rakers 15–19 + 28–33 = 45–51. Vertebrae: precaudal 12–13, caudal 17–18; total 29–30; anal-fin pterygiophores anterior to 1st haemal spine 4–5 (Fig. 7C). Oblique body scale rows in mid-lateral series about 44–54; nape scaly and cheek scale rows 4–5. Lower limb margin of preopercle with 5–7 widely spaced, strong spines (Fig. 8K). Papillae in slight depression behind tip of premaxillary ascending processes 4, arranged in 2 almost equally spaced pairs, with anterior pair the most obvious. Teeth in outer row of each premaxilla 20–28; 0 (usually) or 1 inner tooth anteriorly. Teeth in lateral row of each dentary 10–18, including 2−5 at anterior end that continue behind symphyseal teeth; symphyseal teeth 3–6, short and peg-like, and with 1–2 smaller inner teeth anteriorly. Pelvic fin probably sexually dimorphic, depressed fin extending to anal-fin soft rays 1–5. Caudal fin lanceolate. Caudal fin 1.9–2.2 times in SL; head 3.5–4.7 times in SL; body depth at anal-fin origin 3.6–4.5 times in SL.

FIGURE 79. *Owstonia tosaensis*, BSKU 52070, 242 mm SL, Japan, off Kochi. Photograph by Hiromitsu Endo.

FIGURE 80. *Owstonia tosaensis,* ASIZP 60461, 173 mm SL, Taiwan. Photograph by Sandra J. Raredon.

Color pattern in alcohol: Adults with anterior part of dorsal fin uniformly pale; membrane connecting maxilla and premaxilla with prominent black stripe extending to near anterior end of premaxilla, and inner membrane covering posterior part of dentary also black. Kamohara (1934) described the life color of *Owstonia tosaensis* as "reddish, pale below. Anal yellowish, with two longitudinal red bands. Dorsal yellowish, with a longitudinal red band along the base. Upper half of caudal reddish, lower half yellowish." See also Fig. 79.

Proportions of 10 specimens 99–228 mm SL, as percentages of SL: predorsal length 20.7–27.1; preanal length 48.6–56.2; dorsal-fin base 60.0–71.4; anal-fin base 35.5–38.8; pelvic-fin length 28.9–41.6; caudal-fin length 45.8–64.7; body depth at anal-fin origin 22.2–28.0; head length 21.5–28.1; upper jaw length 10.9–13.9; upper jaw depth 4.5–7.0; orbit diameter 8.4–12.2. As percentages of head length: upper jaw length 48.2–54.2; orbit diameter 34.4–44.3.

Comparisons. *Owstonia sarmiento*, the only other species with LL pattern type 2, differs (characters of *O. tosaensis* in parentheses) in having in having fewer oblique body scale rows in mid-lateral series 27–30 (vs. 44–54) and cheek scale rows 2–3 (vs. 4–5), a different number of anal-fin rays II, 14 (vs. I, 15–16), and the anterior extension of lateral line forming a complete loop across nape (vs. typically not forming a complete loop). Excluding *O. sarmiento*, most species of *Owstonia* with III dorsal-fin spines also have fewer dorsal-fin soft rays, 19–22 (vs. 23–24).

Etymology. A combination of Tosa (former province of Japan, now Kochi Prefecture) and the Latin suffix *ensis* (meaning belonging to).

Distribution. (Fig. 25) Known from Japan, Taiwan, Philippines, and off Western Australia, in at least 209 m.

Remarks. Kamohara (1935) redescribed and illustrated *Owstonia tosaensis* based on a 350 mm specimen from Mimase, Japan. This specimen (BSKU 4230) was designated as a "neotype" by Kamohara (1961:8) but Eschmeyer *et al* (2016) consider the designation to be invalid.

Large adults of *Owstonia tosaensis* are distinctive in having dorsal fins with very elongate anterior soft rays, some exceeding the head length (Fig. 80).

Owstonia totomiensis Tanaka

(Figures 81–83)

Owstonia totomiensis Tanaka, 1908:47, pl. 3, fig. 1 (original description; coast of Totomi Prov., Japan); Shiino, 1972:116 (common name Bottom jawfish); Machida *in* Masuda *et al.*, 1984:201, Pl. 192-E (brief description, color photograph) Shin *et al.*, 1993:436, pl. 137–6 (brief description, color photograph); Shinohara and Matsuura, 1997:306 (listed in checklist, Suruga Bay; Japanese name Soko-amadai); Nakabo, 2002:914 (diagnosis, in pictorial key); Ikeda and Nakabo, 2015:441, pl. 167, color figs. 1–3 (description).

Material examined. 5 specimens, 134–305 mm SL all from Japan: FMNH 55424 (306), holotype of *Owstonia totomiensis*, Totomi, Honda, D. S. Jordan, 10 Feb. 1906; CAS 133936 (1, 134), Kochi Pref., Kochi, T. Kamohara, 1937; MCZ 29852 (1, 305), Sagami Bay, Alan Owston purchase, 23 Sep. 1908; NSMT-P 7151 (1, 223), Honshu, Suruga Bay, Sep. 1968; NSMT-P 77978 (1, 285), Shikoku, Kochi Pref., Kochi, Mimase fishing port, Y. Yamanoue, 6 Sep. 1999.

Diagnosis. A species of *Owstonia* with LL pattern 3; naked nape and cheeks; oblique body scale rows in mid-lateral series 50–60; caudal peducle depth 2.3–3.0 in its length.

Description. A species of *Owstonia* with LL pattern 3, consisting of a lateral line that does not contact posttemporal sensory canal near anterodorsal margin of gill opening (although a diagonal row of 2–4 scales is present at its margin), and instead continues posteriorly just below dorsal-fin base and anteriorly where it makes a complete loop across nape; lateral line ends below dorsal-fin soft rays 19–20. Dorsal fin III, 20–21; anal fin I, 13–14; pectoral fin 20–21; gill rakers 14–18 + 27–28 = 42–46. Vertebrae: precaudal 11, caudal 17, total 28; anal-fin pterygiophores anterior to 1st haemal spine 2. Oblique body scale rows in mid-lateral series about 50–60; nape and cheeks naked (except 1 or 2 embedded scales below orbit in two specimens). Lower limb margin of preopercle with about 9–11 short nubby spines. Papillae in slight depression behind tip of premaxillary ascending processes in a nearly straight posterior row of about 8−10 small papillae flanked anteriorly by irregular cluster of 18−20 papillae that are difficult to clearly discern due to the rugose skin folds (Fig. 14F). Teeth in outer row of each premaxilla 14–21 with short blunt tips; 0–2 much smaller inner teeth anteriorly. Teeth in lateral row of each dentary 7−15, including 1−4 at anterior end that continue behind symphyseal teeth; symphyseal teeth 4–7, short and spike-like, and with 1−2 small inner teeth anteriorly. Pelvic fin probably sexually dimorphic, depressed fin extends posteriorly slightly behind anus in the 223 mm SL gravid female and from anal-fin origin to 3rd soft ray in three other unsexed specimens (134–306 mm SL). Caudal fin lanceolate. Caudal fin 1.6–2.2 times in SL; head 3.4–3.9 times in SL; body depth at anal-fin origin 3.5–4.2 times in SL. Caudal peduncle depth 1.3−1.7 times in its length.

Color pattern in alcohol: Adults with anterior part of dorsal fin uniformly pale; membrane connecting maxilla and premaxilla with prominent black stripe extending to near anterior end of premaxilla, and inner membrane covering posterior part of dentary also black. In fresh specimens, dorsal fin with red distal stripe that is much wider on spinous part of fin and bordered by narrow white stripe; upper half of caudal fin with very narrow red margin; remainder of these two fins and all others pink; body and head red dorsally, gradually changing to pink and white ventrally; iris red. The prominent red spot on the maxilla of specimen BSKU 93693 (Fig. 81) is probably an atypical variation.

FIGURE 81. *Owstonia totomiensis*, BSKU 93693, 266 mm SL, Japan, off Kochi. Photograph by Hiromitsu Endo.

FIGURE 82. *Owstonia totomiensis*, KPM-NI 14300, 234 mm SL, Japan, Sagami Bay. Photograph (KPM-NR 57323) by Hiroshi Senou.

FIGURE 83. *Owstonia totomiensis*, holotype, FMNH 55424, 306 mm SL, Japan. Photograph by Sandra J. Raredon.

Proportions of 4 specimens 134–306 mm SL, as percentages of SL: predorsal length 21.5–28.0; preanal length 53.6–58.5; dorsal-fin base 60.0–65.5; anal-fin base 29.0–32.0; caudal peduncle length 15.7–18.9; caudal peduncle depth 10.6–11.8; pelvic-fin length 27.5–30.9; caudal-fin length 45.7–61.4; body depth at anal-fin origin 23.9–28.3; head length 25.8–29.3; upper jaw length 14.0–15.2; upper jaw depth 6.0–7.4; orbit diameter 10.1–11.1. As percentages of head length: upper jaw length 51.9–54.6); orbit diameter 38.0–41.1).

Comparisons. *Owstonia nudibucca*, the only other species with LL pattern 3 and naked nape and cheeks, differs (characters of *O. totomiensis* in parentheses), in having horizontal section of lateral line with a short ventral side branch slightly before dorsal-fin origin (vs. no short side branch present), fewer oblique body scale rows in mid-lateral series 38–44 (vs. 50–60), shallower body depth 17.3–22.9% SL (vs. 23.9–28.3% SL), shallower caudal peduncle depth 2.3–3.0 (vs. 1.3−1.7) in its length and more total gill rakers 47–49 (vs. 42–46).

Etymology. A combination of Totomi (former province of Japan) and the Latin suffix *ensis* (meaning belonging to).

Distribution. (Fig. 22) Known only from Japan where taken in at least 230 m.

Owstonia weberi (Gilchrist)

(Figures 84, 85)

Parasphenanthias weberi Gilchrist, 1922:69, pl. 10, fig. 2 (original description; KwaZulu-Natal coast, South Africa; depth 183–190 fms [= 335–374 m]).

Parasphenanthias microlepis Fowler, 1934b:462, fig. 35 (original description; Durban, KwaZulu-Natal, South Africa).

Owstonia weberi Smith-Vaniz, 1986:728, color figs. pl. 112, fig. 226.3 & pl. 113, fig. 226.3 (brief description).

Material examined. 39 specimens, 45–317 mm SL: **South Africa** SAIAB 11073 (ca. 81 SL, x-ray only), syntype of *Parasphenanthias weberi*, KwaZulu-Natal coast; ANSP 54940 (187), holotype of *Parasphenanthias microlepis*, Durban, Kwazulu-Natal, 335–374 m, H.W. Bell-Marley, 1932. **Tanzania** BMNH 1939.5.24.1223 (1, ca. 180 SL, x-ray only), Tanzania, John Murray Exped., 1933–1934. **Madagascar** AMS I.28137–003 (1, 139), LACM 44750–10 (1, 128), USNM 308024 (2, 120–180) and ZMUC P.531552 (1, 127), NW of Tulear, 22°19'6"S, 43°6'6"E, 330–335 m, R/V VITYAZ cruse 17 sta. 2644, 2 Dec. 1988; MNHN 1998–845 (3, 72–162), 17°16'58.8"S, 43°10'58.8"E, 540 m, sta. 73/108, FAO, 25 Sep., 1973; MNHN 2014–2933 (1, 45), 14°49'53"S, 46°59'9"E, trawled in 347–448 m, R/V Miriky sta. 3248, 7 Jul. 2009; MNHN 2014–1257 (1, 48.5), 15°25'4"S, 46°0'16"E, beam trawl in 274–313 m, R/V Miriky cruise, 3276, 12 Jul. 2009; MNHN 2014–1286 (1, 112), 15°33"37"S, 45°42'5"E, beam trawl in 350–580 m, R/V Miriky, sta. 3267, 11 Jul. 2009. **Kenya** ANSP 146627 (1, 317), 3°4'S, 40°25'E, 280 m, PCH 80–35, P.C. Heemstra, 17 Dec. 1980; SAIAB 13856 (18 spec., x-rays only) and USNM 410299 (2, 88–118), off Malindi, 3°4'S, 40°25'E. **Mozambique** USNM 276515 (2, 71 & 110 C&S), 25°12'S, 34°4'E, 230–295 m, R/V Anton Bruun cruise. 8 sta. 397A, 29 Sep. 1964; SAIAB 11074 (2, x-rays only), Mozambique, P.1896.

Diagnosis. A species of *Owstonia* with a unique LL pattern 4; dorsal fin III, 20–22 (typically 21); anal fin I, 13–14; oblique body scale rows in mid-lateral series about 33–38; adults with teeth in outer row of each premaxilla 15–21; adults with depressed pelvic fin extending to anal-fin soft rays 4–9, depending on sex of specimen.

Description. A species of *Owstonia* with LL pattern 4, consisting of a lateral line that does not contact posttemporal sensory canal near anterodorsal margin of gill opening (although a diagonal row of 2–3 scales is typically present on its anterodorsal margin), continues posteriorly just below dorsal-fin base and anteriorly makes a complete loop across nape with a secondary loop on each side of primary loop (Fig. 6H); lateral line ends below dorsal-fin soft rays 20-21. Dorsal fin III, 20–22 (typically 21); anal fin I, 13–14; pectoral fin 19–21; gill rakers 16–18 + 29–32 = 45–50. Vertebrae: precaudal 11, caudal 17 (exceptionally 16), total 28 (exceptionally 27); anal-fin pterygiophores anterior to 1st haemal spine 2. Oblique body scale rows in mid-lateral series about 33–38; nape scaly and cheek scale rows 2–3. Lower limb margin of preopercle with 6–12 moderate to strong spines (Fig. 8L). Papillae in slight depression behind tip of premaxillary ascending processes 4, arranged in 2 almost equally spaced pairs. Teeth in outer row of each premaxilla 15–21, anterior ones spike-like; no inner teeth anteriorly. Teeth in lateral row of each dentary 12–19; symphyseal teeth 4−5, relatively elongate and spike-like (Figs. 9F, 10L), and with 1–2 inner teeth anteriorly. Pelvic fin sexually dimorphic in adults; depressed pelvic fin extending to soft rays 4–5 (females) and to at least soft rays 8–9 (males). Caudal fin lanceolate. In 12 specimens, 88–317 mm SL, caudal fin 1.3–2.4 times in SL; head 3.2–4.0 times in SL; body depth at anal-fin origin 3.6–4.2 times in SL.

Color pattern in alcohol: Adults and 48.5 mm specimen (MNHN 2014–1257) with anterior part of dorsal fin uniformly pale (except concentration of melanophores present distally between 2nd spine to at least 2nd soft ray in 45 mm specimen, MNHN 2014−2933), membrane connecting maxilla and premaxilla with prominent black stripe extending to near anterior end of premaxilla, and inner membrane covering posterior part of dentary also black. In life, upper part of head and body red, changing to white below; dorsal, anal, pectoral and caudal fins red and pelvic fin white; iris red.

Proportions of 10 specimens 71–317 mm SL mm SL, as percentages of SL: predorsal length 22.7–27.8; preanal length 49.5–57.9; dorsal-fin base 62.3–66.6; anal-fin base 31.9–34.0; pelvic-fin length 32.9–54.4; caudal-fin length 46.3–78.0; body depth at anal-fin origin 18.7–27.0; head length 25.2–31.4; upper jaw length 13.6–16.9; upper jaw depth 6.2–10.9; orbit diameter 9.8–16.9. As percentages of head length: upper jaw length 51.8–57.5; orbit diameter 39.0–54.9.

FIGURE 84. *Owstonia weberi*, SAIAB 13856, 252 mm SL, Kenya, off Malinda. Photograph by Phillip C. Heemstra, © SAIAB.

FIGURE 85. *Owstonia weberi*, SAIAB 81897, 125 mm SL, off Mozambique. Photograph by Oddgeir Alvheim.

Comparisons. *Owstonia weberi* superficially resembles *O. whiteheadi*, but in addition to having a different lateral-line pattern, *O. whiteheadi* has more dorsal-fin spines IV (vs. III), anal-fin soft rays 15–16 (vs. 13–14) and teeth in outer row of each premaxilla 39–45 (vs. 15–21). *Owstonia weberi* differs from all its congeners that have a complete nape loop, none of which occur in the western Indian Ocean (characters of *O. weberi* in parentheses) as follows: *Owstonia doryptera* has very weak preopercular spines (vs. moderate to strong spines), and the holotype has interradial membranes of dorsal fin black between spine 2 and soft ray 1 (vs. dorsal fin with pale interradial membranes); *O. totomiensis* and *O. nudibucca* both have naked cheeks (vs. scaly cheeks); and *O. sarmiento* has a lateral line with a vertical section connecting posttemporal sensory canal near anterodorsal margin of gill opening to horizontal section below dorsal fin (vs. no vertical section), dorsal fin III, 23–24 (vs. III, 20–22, usually 21), and anal fin II, 14 (vs. I, 13–14).

Etymology. Named for Max Wilhelm Carl Weber (1852–1937), who is best known for his work on Siboga Expedition fishes and mammals. He was educated in Germany, later became a Dutch citizen and one of the most influential Dutch zoologists of his time; see Adler (2012:144–145) for a brief biography with emphasis on Weber's herpetological contributions, and other biographical reference sources.

Distribution. (Fig. 27) Western Indian Ocean from South Africa to Kenya and Madagascar where trawled in 274–540 m.

Owstonia whiteheadi (Talwar)

(Figures 86, 87)

Sphenanthias whiteheadi Talwar, 1973:87, fig. 1 (original description; off Quilon, India, about 9°N, 76°E; depth 300 m); Bineesh *et al.*, 2011:64, figs. 2–4 (redescription of *Sphenanthias whiteheadi*).
Owstonia whiteheadi Manilo and Bogorodsky, 2003:S112 (in list of Arabian Sea coastal fishes).

Material examined. 2 specimens, 144–158 mm SL: SAIAB 97707 (1, 157.5) and USNM 410300 (1, 144), India, SW coast near Quilon (Kerala), trawled in ca. 220–350 m.

Diagnosis. A species of *Owstonia* with LL pattern 3; dorsal fin IV, 21–23; anal fin I, 15–16; oblique body scale rows in mid-lateral series 39–41; adults with teeth in outer row of each premaxilla 39–45; adults with depressed pelvic fin extending to anal-fin soft rays 4–15, depending on sex of specimen.

Description. (Includes data of Talwar, 1972 and Bineesh *et al.*, 2011.) A species of *Owstonia* with LL pattern 3, consisting of a simple lateral line that originates from posttemporal sensory canal near anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base to soft rays 18–23. Dorsal fin IV, 21–23; anal fin I, 15–16; pectoral fin 19–20; gill rakers 18–21 + 34–39 = 52–60. Vertebrae: precaudal 11, caudal 18, total 29; anal-fin pterygiophores anterior to 1st haemal spine 2. Oblique body scale rows in mid-lateral series about 39–41; nape scaly and cheek scale rows 3. Lower limb margin of preopercle with 7–11 moderate to strong spines. Papillae in slight depression behind tip of premaxillary ascending processes 4, arranged in 2 almost equally spaced pairs. Teeth in outer row of each premaxilla 39–45, no inner teeth anteriorly. Teeth in lateral row of each dentary 21–26; symphyseal teeth 5–6, relatively small, short, and spike-like, other dentary teeth conical with pointed tips, and with 0–1 very small inner tooth anteriorly. Pelvic fin sexually dimorphic, depressed pelvic fin extending to anal-fin soft rays 4–5 (females) and soft rays 14–15 (males). Caudal fin lanceolate. In 7 specimens 140–255 mm SL (including data from Bineesh *et al.*, 2011), caudal fin 1.5–2.0 times in SL; head 3.1–3.8 times in SL; body depth at anal-fin origin 4.0–5.0 times in SL.

Color pattern in alcohol: Adults with dorsal fin uniformly pale; membrane connecting maxilla and premaxilla with prominent black stripe extending to near anterior end of premaxilla, and inner membrane covering posterior part of dentary also black. In life, body and fins mostly crimson (distal third to half of dorsal and anal fins of some females may be orange-yellow) except for black premaxillary stripe and white elongate outermost pelvic-fin ray in large males.

Proportions of 2 specimens 144–158 mm SL (also pelvic fin measurements of Talwar, 1972 and Bineesh *et al.*, 2011 for 6 females 144–240 mm SL and 5 males 140–255 mm SL), as percentages of SL: predorsal length 23.9–24.8; preanal length 47.8–53.8; dorsal-fin base 64.5–68.7; anal-fin base 31.9–36.2; pelvic-fin length 24.7–35.7 (females) and 39.8–55.6 (males); caudal-fin length 48.8–65.4; body depth at anal-fin origin 23.4–24.8; head length 29.5–30.1; upper jaw length 13.6–14.7; upper jaw depth 6.5–7.1; orbit diameter 10.0–11.2. As percentages of head length: upper jaw length 45.0–49.8; orbit diameter 33.3–38.0.

Comparisons. *Owstonia whiteheadi* is the only Indian Ocean species with IV dorsal-fin spines. *Owstonia whiteheadi* superficially resembles *O. weberi* but in addition to a different lateral-line pattern, *O. weberi* has fewer dorsal-fin spines III (vs. IV), anal-fin soft rays 13–14 (vs. 15–16) and adults with teeth in outer row of each premaxilla 15–21 (vs. 39–45). Other congeners with IV dorsal-fin spines differ (values for *O. whiteheadi* in parentheses) as follows: *O. fallax* and *O. hastata* have anal-fin ray counts of I, 16–17 or II, 14 (vs. I, 15–16), fewer total gill rakers 40–46 (vs. 52–60) and precaudal vertebrae and anal-fin pterygiophores anterior to 1st haemal spine 13 and 5 respectively (vs. 11 and 2); *O. sibogae* has fewer oblique body scale rows in mid-lateral series 27–29 (vs. 39–41), larger cheek scales, in 3 rows (vs. 4–5), and more precaudal vertebrae and anal-fin pterygiophores anterior to 1st haemal spine 12 and 4 respectively (vs. 11 and 2); *O. macrophthalma* has more anal-fin soft rays 17–18 (vs.15–16), more anal-fin pterygiophores anterior to 1st haemal spine 3 (vs. 2), and fewer total gill rakers 49–50 (vs. 52–60). *Owstonia contodon* differs in having more anal-fin rays II, 16 (vs. I, 15–16), oblique body scale rows in mid-lateral series ca. 48–53 (vs. 39–41), and anal-fin pterygiophores anterior to 1st haemal spine 3 (vs. 2).

FIGURE 86. *Owstonia whiteheadi*, male, size not specified, India. Photograph by M. Hashim, after Bineesh *et al.*, 2011, fig. 2.

FIGURE 87. *Owstonia whiteheadi*, female, 150 mm SL, India. Photograph by K. K. Bineesh, CMFRI.

Etymology. Named for the British ichthyologist Peter J. P. Whitehead (1930–1992); see Howes (1997) for a particularly interesting obituary of this enigmatic and productive biologist.

Distribution. (Fig. 27) Known only from off the southern tip of India in the Gulf of Mannar where taken by shrimp trawlers in 220–350 m.

Remarks. Talwar (1973) and Bineesh *et al.* (2011) both documented sexual dimorphism of pelvic fins in *O. whiteheadi*, with the depressed fins extending beyond anal-fin origin in both sexes and to anal-fin soft rays 14 or 15 in large males. According to Eschmeyer *et al.* (2016), the holotype of *Sphenanthias whiteheadi* (ZSI F6276/2) is deposited in the Zoological Survey of India collection in Kolkata.

Unidentified *Owstonia* specimens

The following five specimens include some that clearly represent undescribed species. Below we discuss characters of these specimens but because of the small sizes of most of them, combined with lack of complete development or damage preventing observations of some characters, we do not propose new names for any of them.

***Owstonia* sp. 1**
(Figure 88)

Material examined. CSIRO H 6368–10, 38 mm SL and CSIRO H 6368–11, 34 mm SL, Western Australia, SW of Shark Bay, 27°08'S, 112°45'E, beam trawl in 405–414 m, FRV Southern Surveyor, sta. 221005/105, 5 Dec. 2005.

Description. Lateral line originates at posttemporal sensory canal near anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base. Dorsal fin III, 19; anal fin II, 11. Vertebrae 11 + 17; anal-fin pterygiophores anterior to 1st haemal spine 2. Dorsal, anal, pelvic and pectoral fins reddish orange.

Comparisons. All other species of *Owstonia* known from western Australia (*O. kamoharai*, *O. psilos*, *O. scottensis* and *O. tosaensis*) have more dorsal- and anal-fin soft rays than this species 21–24 and 13–16 (vs. 19 and 11 respectively), and none of the 36 species we recognize have the same combination of meristic values (see Table 2). Except for having one fewer dorsal-fin soft ray, meristic values of this specimen agree with the holotype of the eastern Australian *O. merensis*, although their color patterns are very different. Furthermore, no species of *Owstonia* is known to occur on opposite sides of Australia. We defer formal description this species in the absence of adult specimens.

FIGURE 88. *Owstonia* sp. 1, CSIRO H 6368–10, 38 mm SL, Western Australia. Photograph (after being frozen for over two years) by Louise Conboy, courtesy CSIRO.

***Owstonia* sp. 2**
(Figure 89)

Material examined. MNHN 2014–163, 36 mm SL, French Polynesia, Tahiti Islands, Tarasoc seamounts, 18°19'S, 148°32'W, 380 m, R/V Alis, sta. DW3297, 21 Sep. 2009.

Description. Lateral line originates at posttemporal sensory canal near anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base. Dorsal fin III, 20; anal fin I, 13; pectoral fin 20/19; gill rakers 13 + 24. Vertebrae 11 + 17; anal-fin pterygiophores anterior to 1st haemal spine 3. Teeth in outer row of each premaxilla 38/42; no inner teeth anteriorly. Teeth in lateral row of each dentary 21/22, and 1 inner tooth anteriorly.

Comparisons. The lateral-line pattern and meristic values of the Tarasoc specimen agree with the holotype of *Owstonia hawaiiensis* (scale counts could not be obtained because many scales are missing), but it has fewer gill rakers 13 + 24 (vs. 15 + 28) which might be expected in such a small specimen. It has higher numbers of outer row premaxillary teeth 38–42 (vs. 34–35), although lower numbers of teeth might be expected in a smaller specimen. *Owstonia mundyi*, the only other species of *Owstonia* known from the region (Fig. 24), has different vertebral, dorsal- and anal-fin ray counts.

The preserved color pattern of this specimen also differs from adult *O. hawaiiensis* in having the body and membrane connecting maxilla and premaxilla with numerous small freckles and most of the dorsal and anal fins darkly pigmented. The color pattern discrepancy does not exclude the possibility of conspecificity because the pigmentation of small specimens of several other species differ from their adults; however, the higher number of jaw teeth combined with the disjunct locality suggest that this specimen is probably another undescribed species.

FIGURE 89. *Owstonia* sp. 2, MNHN 2014–0163, 36 mm SL, French Polynesia, Tarasoc seamounts. Photograph by Sandra J. Raredon.

Owstonia sp. 3
(Figures 20D, 90)

Material examined. USNM 307399, 13.2 mm SL, C&S, Lifou Island, 20°20'S, 167°21'E, 31 Mar. 1973.

Description. Lateral line undeveloped at this small size. Dorsal fin IV, 21; anal fin II, 13; vertebrae 11 + 17; anal-fin pterygiophores anterior to 1st haemal spine 3. Fourmanoir (1976:54) erroneously recorded a count of X, 14 for the anal fin. This specimen has an enlarged, plate-like posttemporal and preopercle (Fig. 20D), like all other known postflexion *Owstonia* larvae.

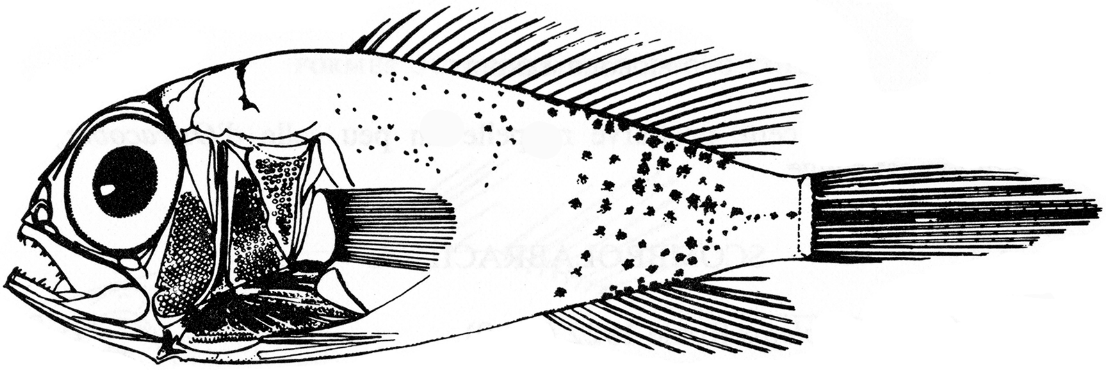

FIGURE 90. *Owstonia* sp. 3, USNM 307399, 13.2 mm SL, Lifou Island. After Fourmanoir 1976, fig. 8. See also Fig. 20D.

Comparisons. Meristic values of this larval specimen do not match any other species (see Table 2). Fourmanoir's (1976) illustration of the specimen is here reproduced as Fig. 90. He questionably identified the specimen as the Indian Ocean *Owstonia simotera* (Smith), presumably because it shares with that species a relatively large number of cheek scale rows; prior to clearing and staining the specimen we independently confirmed that it has *at least* 8 rows of cheek scales. Cheek scale row counts of 8 or more are known to occur only in two other species, *Owstonia kamoharai* and *O. simotera*. In addition to the unlikely possibility of conspecificity given the known distributions (Fig. 27) of *O. simotera* and *O. kamoharai*, the Lifou larva differs from both of these species in having more dorsal-fin spines IV (vs. III), anal-fin spines II (vs. I) and anal-fin pterygiophores anterior to 1st haemal spine 3 (vs. 2).

***Owstonia* sp. 4.**

Material examined. MNHN 2014–1838, 67 mm SL, Madagascar, 14°49'53"S, 46°59'9"E, trawled in 347–448 m, R/V Miriky sta. 3248, 7 Jul. 2009.

Description. Lateral line originates at posttemporal sensory canal near anterodorsal margin of gill opening, curves upward and backward then continues posteriorly just below dorsal-fin base. Dorsal fin III, 20; anal fin I, 13; pectoral fin 21/21; gill rakers 11 + 22; vertebrae 11 + 17; anal-fin pterygiophores anterior to 1st haemal spine 2. Too many scales are missing to count oblique body scale rows in mid-lateral series or cheek scale rows (but the latter with at least 4 rows). Preopercle without spines. Papillae in slight depression behind tip of premaxillary ascending processes 4, arranged in 2 almost equally spaced pairs. Teeth in outer row of each premaxilla 12/12; no inner teeth anteriorly. Teeth in outer row of each dentary 9; 5/4 spike-like symphyseal teeth, and 1 small inner tooth anteriorly. Dorsal fin with prominent dark spot between spine 3 to soft ray 5 on proximal 2/3 of fin, and premaxillary stripe faded but evident. Tip of pelvic fin broken off, but depressed fin extends at least to anal-fin origin.

Comparisons. The above combination of characters excludes all six western Indian Ocean species that we recognize. Characters of the Madagascar specimen agree best with small specimens of *Owstonia crassa* (confirmed records only from New Caledonia and Solomon Is.), but a Madagascar locality argues against that identification. In this specimen the dark dorsal-fin spot begins between spine 3 and soft ray 1 (vs. beginning between rays 1-2 in the smaller paratypes (54–86 mm SL) of *O. crassa*. It also has four fewer gill rakers 11 + 22 (vs. 13 + 24) than does a similar size specimen (77.6 mm SL) of *O. crassa* from New Caledonia.

History and conclusions

Our involvement in owstonine fishes has had an unusually long gestation period. It began when Walter Fischer, then in charge of the FAO species identification programme in Rome, asked the first author to prepare a Cepolidae family account for a regional identification guide (Smith-Vaniz, 1984); others followed, the most recent (Smith-Vaniz, 2001). During that 15+ year period we both independently obtained single specimens of what appeared to be new species of *Owstonia*. Although we were initially tempted to jointly describe these new species, we wisely deferred the descriptions until now because we were both engaged in more substantial studies and, more importantly, realized that what was really needed was a revision of the genus.

As this study has shown, formalin-fixed museum specimens are still relevant today, despite recent systematic studies that increasingly emphasize molecular data, often with little or no attempt to examine available preserved material deposited in more than a few institutional collections. Deep-water benthic fishes like *Owstonia* spp. that occur on rugged to nearly vertical (Fig. 57–58), hard-bottom substrata are very difficult to collect with standard gear despite being relatively speciose. This has resulted in tissue samples being available for less than a third of the 36 species of *Owstonia* recognized in this monograph, and voucher specimens associated with such material were mostly misidentified. Reasonable knowledge of their diversity and geographic distributions (see Figs. 22–27 and preceding Distribution section) also would have been impossible without examining *Owstonia* specimens housed in a relatively large number of foreign institutional collections (see Materials and methods). Undescribed species of *Owstonia* were discovered in 13 different institutional collections, with many of these new species originally found (prior to dispersal of a few paratypes) in only one (15 species) or two (5 species) such collections. Critical to our delineation of many new species were our efforts to carefully and comparatively examine characters previously used to diagnose species and to explore and identify additional diagnostic characters, both external and internal. Examination of the holotypes of previously described nominal species that were sometimes essential to establish nomenclatural priority revealed that erroneous and often misleading data were given in their original descriptions, e.g. *O. grammodon*, or important characters were not mentioned.

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