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Review of Indo-West Pacific jawfishes (*Opistognathus*: Opistognathidae), with descriptions of 18 new species

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Abstract

Sixty species of jawfishes (*Opistognathus*) from the Indo-West Pacific are reported in an updated review, including descriptions of 18 new species: *Opistognathus albomaculatus* n.sp., *O. asper* n.sp., *O. aurolineatus* n.sp., *O. bathyphilus* n.sp., *O. biporus* n.sp., *O. challenger* n.sp., *O. erdmanni* n.sp., *O. flavidus* n.sp., *O. helvolus* n.sp., *O. hyalinus* n.sp., *O. megalops* n.sp., *O. microspilus* n.sp., *O. nigripinnis* n.sp., *O. parvus* n.sp., *O. pholeter* n.sp., *O. triops* n.sp., *O. vigilax* n.sp., and *O. wassi* n.sp.. Species accounts are provided for each species, including illustrations or color photographs, complete synonymies, specimens examined (or appropriate citation if previously published in detail), diagnosis, comparisons, etymology, and distribution maps. Geographic range extensions are reported for a number of species. An identification key is given for all species and frequency tables of important characters are also provided. The taxonomic status of *Opistognathus inornatus* and *O. rosenbergii annulatus* are discussed in detail but not completely resolved pending unavailable molecular data. Geographic variation is also described for *Opistognathus adelus, O. albomaculatus* n.sp., *O. castelnaui*, *O. margaretae*, *O. variabilis*, and *O. vigilax* n.sp. Many species are known only from holotypes and others from single localities, indicating how much more remains to be known about these jawfishes.

Key words: taxonomy, zoogeography, endemism, behavior

The first step is giving a species a name, leading to more in-depth knowledge of its evolution, ecology, and biology. (Costello 2020)

Introduction

Fishes of the family Opistognathidae (jawfishes) occur in all tropical marine regions except the eastern Atlantic Ocean and Mediterranean Sea. A few species occasionally occur in estuaries. A total of 91 valid species of *Opistognathus*, including the 18 new species treated in this monograph, have been described to date as follows: Indo-West Pacific (IWP, 60), Western Atlantic (WA, 17) and Eastern Pacific (EP, 14). The total number of valid opistognathid species, including the 18 new species and those of all four genera is 109 (Fricke *et al*. 2022). The four currently recognized genera of jawfishes are distributed as follows: *Opistognathus* Cuvier, 1816 (WA, EP, IWP), *Lonchopisthus* Gill, 1862 (WA, EP), *Stalix* Jordan & Snyder, 1902 (IWP) and *Anoptoplacus* Smith-Vaniz, 2017 (WA). The purpose of this monograph is to treat in one publication all of the currently recognized Indo-West Pacific species of *Opistognathus* including descriptions of new species. The genus *Opistognathus* has never been reviewed or revised except on a regional basis, and most references report species distribution records often with brief descriptions, listings in checklists or type catalogs, e.g., Böhlke 1953, Chen *et al*. 1997, Hutchins & Smith 1991, Nake *et al*. 2018, and Shao *et al*. 2008. The boundaries of the Indo-West Pacific (different from those of the Indo-Pacific) include the Indian Ocean and adjacent seas and the Pacific Ocean as far east as the Pacific Plate margin (Springer 1982). The present paper treats 51 nominal species originally assigned to *Opistognathus* or one of its synonyms, 42 of which are here considered to be valid species, plus 18 new species for a total of 60 valid species (Table 1). Two additional apparently undescribed species known from Japan were unavailable for inclusion in this study. One of these species is based on an unnumbered KPM-NR photograph of *Opistognathus* sp. taken by Hirohito Arima in 41 m at Tokyo Metropolis, Oshima-machi, Izu-Oshima I., Izu Island (see FishPix), and the other one is superficially similar to *O. liturus*.

TABLE 1. List of nominal Indo-West Pacific species of *Opistognathus*, in alphabetical order by species, and their current allocations. Valid species indicated by an asterisk. Two species of *Stalix* originally assigned to *Gnathypops* or *Opistognathus* are listed but not otherwise treated.

Nominal species	Author, date & page	Current allocation (if changed)
******Opistognathus adelus*	Smith-Vaniz 2010:42	
******Opistognathus afer*	Smith-Vaniz 2010:45	
******Opistognathus albicaudatus*	Smith-Vaniz 2011:35	
******Opistognathus albomaculatus*, **n.sp.**	This paper	
******Opistognathus alleni*	Smith-Vaniz 2004:210	
*******Opistognathus asper*, **n.sp.**	This paper	
******Opistognathus aurolineatus*, **n.sp.**	This paper	
******Opistognathus bathyphilus*, **n.sp.**	This paper	
******Opistognathus biporus*, **n.sp.**	This paper	
Meryogymnoides carpentariae	Whitley 1966:240	*Opistognathus evermanni* (Jordan &Snyder)
******Opisthognathus* [sic] *castelnaui*	Bleeker 1874:469	
******Opistognathus challenger,* **n.sp**.	This paper	
******Opistognathus crassus*	Smith-Vaniz 2010:47	
Opisthognathus[sic] *cuvieri*	Valenciennes 1840: no page number, Pl. 78 (fig. 3)	*Opistognathus nigromarginatus* Bleeker
******Opistognathus cyanospilotus*	Smith-Vaniz 2009:78	
******Opisthognathus*[sic] *darwiniensis*	Macleay 1878:355	
******Opistognathus decorus*	Smith-Vaniz & Yoshino 1984:19	
******Gnathypops dendritica*	Jordan & Richardson 1908:261	*Opistognathus dendriticus* (Jordan & Richardson)
******Opistognathus dipharus*	Smith-Vaniz 2010:49	
******Opistognathus elizabethensis*	Smith-Vaniz 2004:216	
******Opistognathus ensiferus*	Smith-Vaniz 2016:279	
******Opistognathus erdmanni*, **n.sp.**	This paper	
******Gnathypops evermanni*	Jordan & Snyder 1902:493	*Opistognathus evermanni* (Jordan & Snyder)
******Merogymnus eximius*	Ogilby 1908:18	*Opistognathus eximius* (Ogilby)
Opisthognathus[sic] *fasciatus*	Chan 1966:9	*Opistognathus hongkongiensis* Chan
******Opistognathus flavidus*, **n.sp.**	This paper	
******Opistognathus helvolus,* **n.sp.**	This paper	
******Opisthognathus*[sic] *hongkongiensis*	Chan 1968:178	
******Gnathypops hopkinsi*	Jordan & Snyder 1902:492	*Opistognathus hopkinsi (*Jordan & Snyder)
******Opistognathus hyalinus*, **n.sp.**	This paper	
*******Opisthognathus*[sic] *inornatus*	Ramsay & Ogilby 1887:561	
******Gnathypops iyonis*	Jordan & Thompson 1913:65	*Opistognathus iyonis* (Jordan & Thompson)
******Opisthognathus*[sic] *jacksoniensis*	Macleay 1881:570	
******Tandya latitabunda*	Whitley 1937:21	*Opistognathus latitabundus* (Whitley)
******Opistognathus liturus*	Smith-Vaniz & Yoshino, 1985:23	
******Opistognathus longinaris*	Smith-Vaniz 2010:51	
******Opisthognathus*[sic] *macrolepis*	Peters 1866:520	
Opisthognathus[sic] *macrostomus*	Smith 1935:186	*Opistognathus nigromarginatus* Rüppell
Opisthognathus[sic] *maculatus*	Alleyne & Macleay 1877:280	*Opistognathus papuensis* Bleeker
******Opistognathus margaretae*	Smith-Vaniz 1983:2	
******Opistognathus megalops*, **n.sp.**	This paper	

.....Continued on the next page

TABLE 1. (Continued)

Nominal species	Author, date & page	Current allocation (if changed)
Opistognathus microspilus,* **n.sp.	This paper	
Gnathypops moenensis	Popta 1922:28	*Stalix moenensis* (Popta)
**Opisthognathus*[sic] *muscatensis*	Boulenger 1877:662	
**Opistognathus nigromarginatus*	Rüppell 1830:114	
Opistognathus nigripinnis*, **n.sp.	This paper	
**Opistognathus ocellicaudatus*	Shinohara 2021:158	
**Opisthognathus*[sic] *papuensis*	Bleeker 1868:333	
**Opistognathus pardus*	Smith-Vaniz, Bineesh & Akhilesh, 2012:21	
Opistognathus parvus,* **n.sp.	This paper	
Opistognathus pholeter,* **n.sp.	This paper	
Batrachus punctatulus	Ramsay 1883:177	*Opistognathus papuensis* Bleeker
**Opistognathus randalli*	Smith-Vaniz 2009:87	
**Opistognathus reticeps*	Smith-Vaniz 2004:220	
**Tandya reticulatus*	McKay 1969:1	*Opistognathus reticulatus* McKay, 1969:1
Opisthognathus [sic] *rex*	Wongratana 1975:99	*Opistognathus macrolepis* Bleeker
**Opistognathus rosenbergii*	Bleeker 1856:220	
Gnathypops rosenbergi annulata	Eibl-Eibesfeldt & Klausewitz 196:421	*Opistognathus rosenbergii* Bleeker
**Opistognathus rufilineatus*	Smith-Vaniz & Allen 2007:37	
Gnathypops samoensis	Fowler & Silvester 1922:118	*Pseudogramma polyacanthus* (Bleeker) = Serranidae
**Opistognathus seminudus*	Smith-Vaniz 2004:213	
**Opistognathus simus*	Smith-Vaniz 2010:52	
**Opistognathus solorensis*	Bleeker 1853:81	
Opisthognathus [sic] *sonneratii*	Valenciennes in Cuvier & Valenciennes 1836:498	*Opistognathus nigromarginatus* Bleeker
**Opistognathus stigmosus*	Smith-Vaniz 2004:215	
Opisthognathus [sic] *suluensis*	Herre 1933:25	*Opistognathus castelnaui* Bleeker
**Opistognathus trimaculatus*	Hiramatsu & Endo 2013:20	
Opistognathus triops,* **n.sp.	This paper	
**Opistognathus variabilis*	Smith-Vaniz 2009:92	
**Opistognathus verecundus*	Smith-Vaniz 2004:218	
Opisthognathus [sic] *versluysi*	Weber 1913:262	*Stalix versluysi* (Weber)
Opistognathus vigilax,* **n.sp.	This paper	
Opistognathus wassi,* **n.sp.	This paper	

Stalix, the only other currently recognized Indo-West Pacific genus of jawfishes, has been confused with some *Opistognathus* species with which it shares the combination of a rigid upper jaw, low numbers of dorsal- and anal-fin rays and vertebrae. Species of *Stalix* are easily distinguished as a group in having the first 3–9 dorsal-fin spines transversely forked distally and the skin covering them forming a dorsal hood (at least anteriorly) to accommodate the uniquely shaped spines. The genus was revised by Smith-Vaniz (1989) with description of four new species. Two additional species were subsequently described (Shinohara 1998; Prokofiev 2015) for a total of 12 valid species. Additional undescribed species of *Stalix* are known and currently under study by the author.

To conserve space, expanded diagnoses instead of full descriptions are given for most previously described species for which the original or subsequent descriptions are relatively complete. To facilitate comparisons, all described species are included in the identification key and tables. Distribution maps and illustrations or photographs of each species are also provided. Species accounts are presented in alphabetical order by specific names.

Adults of Indo-West Pacific species range in size from the diminutive *Opistognathus parvus* n.sp., with sexually mature (gravid) females as small as 18.9 mm SL, to *O. reticulatus* and *O. inornatus* which attain at least 368- and 409- mm SL, respectively. Jawfishes have large mouths, prominent upper jaws, bulbous heads, and a unique pelvic fin arrangement consisting of one spine and five segmented rays, the outer two unbranched and often relatively thick. All jawfishes are obligatory burrow dwellers, using their large mouths to excavate and maintain their vertical burrows. Colin (1973) gave a detailed description of burrow construction for the Yellowhead Jawfish, *Opistognathus aurifrons* Jordan & Thompson, 1905, a common western Atlantic species. The substrate must be coarse enough to allow burrow construction and at the same time be "sticky" enough to keep the burrows from collapsing. Periodic burrow maintenance and house-keeping activities are a necessity, and jawfishes can often be observed spitting loose sand and debris or fecal material from their burrows. Although jawfishes are fascinating to observe and are available in the aquarium trade, their burrowing behavior makes them a challenge for the average aquarist, and in small aquaria their strong territoriality is not compatible with other fishes. Jawfishes spend most of their time in their burrows with only their heads exposed during the day but may retreat into the deeper recesses of their burrows during slack tide (Smith-Vaniz, pers. observation. Normally they venture from the relative safety of their burrows only to feed on prey items in their immediate vicinity, or to engage in brief territorial disputes with conspecifics and courtship activities. When active, they maintain a constant vigil for prey or intruders. Unless pursued by a predator, entrance into their burrows is usually tail-first. At night, when danger from potential predators is greatest, most jawfishes typically remain inactive deep in their burrows. A common Atlantic species, *Opistognathus aurifrons*, has been observed to plug its burrow openings with small stones or coral fragments as an additional defense against nocturnal predators (Colin 1972). Longley (1922) reported that another Atlantic species, *O. macrognathus* Poey, 1860, covers its burrow opening with "a piece of coral relatively huge in proportion to its own size and weight." Kuiter & Tonozuha (2004) stated that some individuals of *O. parvus* n.sp. when closely approached expanded their opercles outward to cover the burrow opening. Jawfishes are carnivores, with small crustaceans and gastropods their usual prey but some of the larger species have been caught by fishers using relatively large traditional bait.

Many specimens cited in this publication were collected by SCUBA divers using small hand-nets after the jawfishes emerged from their burrows following application of the ichthyocide rotenone (see discussion in Robertson & Smith-Vaniz 2008). This method is sometimes successful even when applied to burrows where no jawfishes were observed. Clove oil has also been used for scientific fish-collecting or capture of live jawfishes for the aquarium fish trade (Robertson & Smith-Vaniz 2010). The smaller species also can be readily caught by angling from boats using small hooks, especially with multi-hook Sabiki rigs fished just off the bottom. Most deep-water species have been collected only by trawls or angling.

The obligatory burrow-dwelling habit and patchy distributions of jawfishes combined with their cryptic behavior (and often coloration) makes them especially difficult to detect and collect. Mouth brooding behavior and a short pelagic larval stage have resulted in reduced faunal connectivity and a relatively high level of endemism in many species of jawfishes. A preference of jawfishes for rubble-bottom or sandy substrate adjacent to reef habitats has also contributed to sampling bias because a disproportionate collecting effort has been devoted to ichthyofaunas that are intimately associated with coral reefs. Fourteen of the species treated in this paper are known only from holotypes, including ten from single trawl or dredge hauls made in depths from 65 to 300 meters. Additional new species almost certainly remain to be discovered.

All species of *Opistognathus* appear to exhibit oral egg incubation. The egg mass of jawfishes consists of a single ball of demersal eggs tightly bound together by sticky tendrils (Mooi 1990). This allows the egg mass to remain together in the mouth and be more easily manipulated and aerated without falling apart. Although no special morphological adaptations are associated with oral incubation, the large mouths of jawfishes are ideally suited for that purpose (Figs. 1, 2). Some species have the inner lining of the upper jaw striped (Smith-Vaniz 2009, fig. 3); others have the oral cavity (Smith-Vaniz 2004, fig. 10; Smith-Vaniz 2009, fig. 4) or dentary membranes distinctly pigmented (*Opistognathus longinaris*). These markings, usually visible only when the mouth is opened widely, facilitate threat displays between conspecifics engaged in territoriality disputes or possibly enhance species recognition. A small mirror positioned vertically on the bottom near jawfishes can elicit those with conspicuous jaw makings to closely approach the mirror and then widely open their mouth in an attempt to threaten the reflective "intruder." In some New World jawfishes the inner jaw markings are sexually dichromic (Smith-Vaniz 1997, fig. 9),

FIGURE 1. *Opistognathus randalli* male brooding eggs, Batangas, Philippines. Photo © by Mike Bartick, used with permission.

FIGURE 2. *Opistognathus solorensis*, male with hatching eggs, Yakushima, Japan. Photo © by Jinggong Zhang, used with permission.

but this does not appear to be the case in Indo-West Pacific species. Coloration in jawfishes is highly variable with many species mottled in shades of brown, while a few are strikingly beautiful. One of the most spectacular jawfishes is the Australian *Opistognathus eximius*, which Ogilby (1920) aptly described as "being arrayed in a livery of most gorgeous splendor."

Methods and materials

Counts of median fin rays and characters associated with the vertebral column were taken from radiographs or cleared and stained specimens. Counts of dorsal- and anal-fin spines and segmented rays are presented, respectively, as Roman and Arabic numerals. The last two elements in the dorsal and anal fins have their bases in close approximation and were counted as one ray in accord with the general practice of most authors, although the ultimate element has a separate rudimentary pterygiophore or stay. Pectoral-fin ray counts include the uppermost rudimentary spine-like ray supported by the propterygium. Vertebral counts are presented as a formula: precaudal + caudal = total count. Caudal-fin procurrent and principal rays are separated by a + to distinguish dorsal and ventral counts. Procurrent caudal-fin rays are small unbranched and typically unsegmented dorsal ("upper") and ventral ("lower") rays located anterior to the principal rays. The uppermost principal caudal-fin ray is the ray articulating with hypural 5, and the lowermost principal caudal-fin ray is the ray articulating between the distal tips of the parhypural and the haemal spine of preural centrum 2, a topological definition adopted by Gill *et al.* (2016:350). Caudal vertebrae are defined as those with a haemal spine and include the terminal urostylar complex. The insertion patterns of supraneurals (predorsal bones) and their associated dorsal-fin anterior pterygiophores are referred to as the dorsal-fin interdigitation anterior pattern in the descriptions. Each supraneural is indicated by "S" and empty interneural spaces by a blank space. Neural spines are indicated by slashes and pterygiophores by Arabic numerals (see Table 2 and Fig. 3). Anal-fin interdigitation formulas are not included in the descriptions for reasons discussed under "comments on certain *Opistognathus* characters". In order to more easily compare the lateral-line terminus positions of species

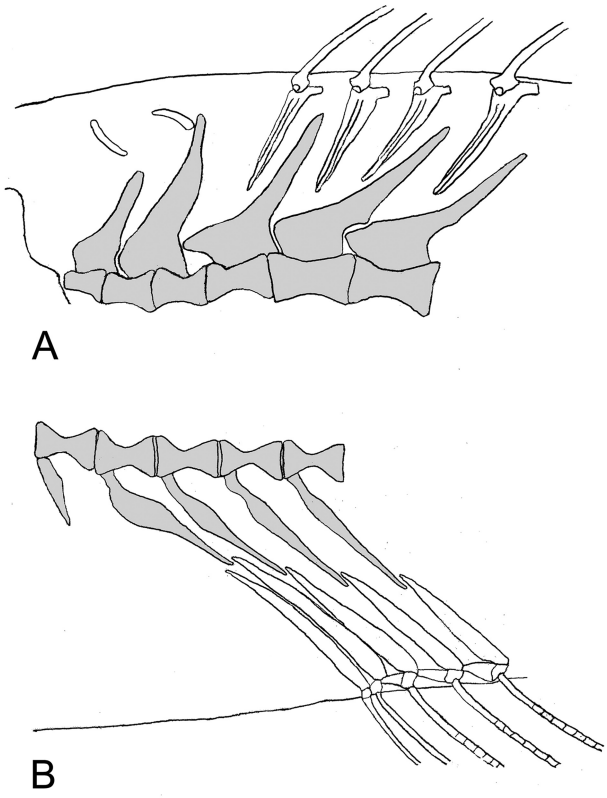

FIGURE 3. Supraneurals and anterior dorsal- and anal-fin pterygiophores of *Opistognathus hopkinsi*, KAUM-I. 78945, 100 mm SL: **A**, dorsal-fin interdigitation pattern S/S/1/1+1/1, neural spines and vertebrae shaded; **B**, anal-fin interdigitation pattern 1/1/1/1/1, haemal spines and vertebrae shaded. See methods section for discussion of interdigitation formulas and Table 2.

that have different numbers of dorsal-fin spines, the total dorsal-fin element position was enumerated (number of spines plus rays anterior to an imaginary vertical line extending below the lateral-line terminus). If the lateral-line terminus position was approximately mid-way between two dorsal-fin elements, the number was rounded, and the higher value was tabulated. The number of oblique scale rows in horizontal series is only an approximation due to the irregular size and arrangement of individual scale rows. Included in this count are all anteroventrally aligned scale rows in a horizontal series from above the tip of the opercular flap to the middle of the structural base of the caudal fin (counts of posteroventrally aligned scale rows will result in lower values). The gill raker at the junction of the upper and lower limbs of the first gill arch is included in the lower-limb count; care must be taken not to overlook the very small rakers at the anterior ends of the gill arch. Counts of gill rakers were usually made only on the right side of specimens. Names of the adductor mandibulae muscles follow Winterbottom (1974). Alternative nomenclature, in parentheses, adopted by Datovo & Vari (2013) for these muscles are: A1 (*pars malaris*), A2 (*pars rictalis*) and $A1_{\beta}$ (*pars endorictalis*).

All color photographs of jawfishes originally in right side views were reversed to appear as left side views so they correspond with the others and to facilitate comparisons. Unless otherwise indicated, all drawings are by the author usually with the aid of a camera lucida attached to a Zeiss stereoscopic microscope or traced from a high magnification digital photograph. The pencil drawings were subsequently inked and modified using Adobe Photoshop. Detection of cephalic sensory pores was facilitated in some specimens by temporary staining with a cyanine blue solution (Saruwatari *et al.* 1997).

Jawfishes have very flexible bodies with relatively loose connections between the anterior vertebrae. Preserved specimens frequently have the head and nape down-turned. In order to obtain more accurate standard length (SL) measurements of such specimens, they were held so that their heads and bodies were aligned in a more natural horizontal plane. In material examined, specimen sizes are given as mm SL, and parenthetical expressions give number of specimens, followed by the size range, if more than one. Cleared and stained specimens are indicated as "C&S". In cases where whole C&S specimens were unavailable, the right infraorbitals and jaws were usually dissected and stained, and drawings of them are shown in reverse to facilitate comparisons with other specimens where the left bones are illustrated. All measurements were made with needle-point digital calipers and recorded to the nearest 0.1 mm. Head length (HL) is the distance from the middle of the upper lip to the posterodorsal tip of the opercular flap. Postorbital-jaw length is a straight-line measurement from the posterior orbital margin at its junction with the sphenotic bone to a vertical from the posterior end of the upper jaw. Postorbital-jaw ratio is the postorbital-jaw length divided by the orbit diameter. Orbit diameter is a diagonal (posterodorsal to anteroventral) measurement of the bony orbit; the posterodorsal point of origin is the rigid sphenotic margin. Body depth is a vertical measurement from the origin of the anal fin. Caudal-peduncle depth is the least vertical dimension of the peduncle. The pigmentation pattern at the back of the throat can be a useful identification feature, but unless specimens are preserved with their mouths wide open it is necessary to strongly depress the floor of the mouth in order to observe this character. In the color pattern descriptions, stripes refer to markings aligned with the horizontal axis of the body and bands or bars refer to markings more aligned with the vertical axis of the body.

Abbreviations for institutional collections containing Indo-West Pacific jawfish specimens cited in this monograph or examined by me in previous publications are those of Fricke & Eschmeyer (2022) as follows:

AFAQ	Amateur Fisheries Association of Queensland, Australia; most specimens transferred to Queensland Museum (QM), Brisbane, Australia
ANSP	Academy of Natural Sciences of Drexel University, Philadelphia
AMS	Australian Museum, Sydney
ASIZP	Academia Sinica, Biodiversity Research Center (formerly Institute of Zoology), Taipei, Taiwan
BMNH	British Museum (Natural History), London, England
BPBM	Bernice P. Bishop Museum, Honolulu, Hawaii
BSKU	Kochi University, Department of Natural Science, Faculty of Science, Kochi, Japan
CAS	California Academy of Natural Sciences, San Francisco
CAS-SU	Stanford University, collection now at CAS
CMFRI GB	Marine Biodiversity Museum, Central Marine Fisheries Research Institute, Kochi, India
CSIRO	Commonwealth Scientific and Industrial Research Organization, Division of Marine Research, Hobart, Australia

FAKU	Kyoto University, Department of Bioresource Science, Faculty of Agriculture, Kyoto, Japan (Col lection housed at Maizuru, Japan, not Kyoto.)
FMNH	Field Museum of Natural History, Chicago, Illinois
FRLM	Fisheries Research Laboratory, Mie University, Mie-ken, Japan
FRSKU	Kyoto University, Faculty of Agriculture, Fisheries Research Station, Kyoto, Japan
HUJ	Hebrew University, Jerusalem, Israel
IORD	Tokai University, Marine Science and Technology, Institute of Oceanic Research and Development, Shimizu, Japan
KAUM-I	Kagoshima University Museum, Ichthyology, Kagoshima, Japan
KFRS	Kanudi Fisheries Research Station, National Fisheries Authority, Konedobu, Papua New Guinea (Collection vandalized and extant specimens now in Department of Zoology, University of Papua New Guinea, Port Moresby.)
KPM	Kanagawa Prefectural Museum of Natural History, Odawara, Kanagawa, Japan
LACM	Los Angeles County Museum of Natural History, California
MFLB	Marine Fisheries Laboratory, Department of Fisheries, Bangkok, Thailand
MNHN	Museum National d'Histoire Naturelle, Paris, France
MZB	Museum Zoologicum Bogoriense, Cibinong, West Java, Indonesia
NCIP	Pusat Penelitian dan Penembagan Oseanologi, Indonesian Institute of Sciences, Jakarta, Java, Indonesia
NMMBP	Pisces Collection, National Museum of Marine Biology and Aquarium, Pingtung, Taiwan
MPM	Public Museum, Milwaukee, Wisconsin
NMV	Museum Victoria, Ichthyology, Melbourne, Victoria, Australia
NMW	Naturhistorisches Museum, Wien (Vienna), Austria
NSMT-P	National Museum of Nature and Science, Zoology Department, Division of Fishes, Tsukuba, Japan
NTM	Museums and Art Galleries of the Northern Territory, Northern Territory Museum of Arts and Sci ences, Darwin, Australia
NTUM	National Taiwan University, University Museum, Taipei, Taiwan
PMBC	Phuket Marine Biological Centre, Phuket, Thailand
PNM	National Museum of the Philippines, Manila, Luzon, Philippines (see alternative institutional names in Eschmeyer's Catalog of Fishes)
QM	Queensland Museum, Centre for Biodiversity, Brisbane, Australia
RMNH	Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands
ROM	Royal Ontario Museum, Toronto, Canada
SAIAB	South African Institute of Aquatic Biodiversity, Grahamstown, South Africa (formerly RUSI: Rhodes University, J.L.B. Smith Institute of Ichthyology)
SAM	South African Museum, Cape Town
SIO	Scripps Institution of Oceanography, Marine Vertebrate Collection, La Jolla, California
SMF	Senckenberg Forschungsinstitut und Naturmuseum, Frankfurt am Main, Hessen, Germany
SMNS	Staatliches Museum für naturkunde Stuttgart, Baden-Württemberg, Germany
TMF	National Taiwan Museum, Taipei, Taiwan
UF	University of Florida, Florida Museum of Natural History, Gainesville, Florida
UMMZ	University of Michigan, Museum of Zoology, Ann Arbor, Michigan
URM	University of the Ryukyus, Naha, Okinawa
USNM	National Museum of Natural History, Smithsonian Institution, Department of Vertebrate Zoology, Washington, D.C.
UTUM	National Taiwan University, Institute of Zoology, Taipei, Taiwan
WAM	Western Australian Museum, Department of Aquatic Biology, Perth, Western Australia
WMNH	Wakayama Prefectural Museum of Natural History, Kainan, Japan
ZMB	Museum fur Naturkunde, Berlin, Germany
ZSI	Zoological Survey of India, Kolkata, India

Comments on certain *Opistognathus* characters

Dorsal- and anal-fin interdigitation patterns. (Table 2) Three dorsal-fin interdigitation anterior patterns are present. See methods section for discussion of interdigitation formulas. The dorsal fin S/S/1/1+1/1/ pattern (Fig. 3A) is typically present in 15 species and the / /S/1/1+1/1/or / / /1//1+1/1/patterns occur equally in about half of 42 other species. All 13 species with flexible upper jaw lamina posteriorly have the / /S/1/1+1/1/ pattern but the same pattern also occurs in nine species with rigid upper jaws. Supraneurals are absent in all eight species with more than 10 precaudal vertebrae, which is probably the derived condition for both supraneurals and precaudal vertebrae in the Opistognathidae.

The anal-fin interdigitation pattern /1/1/1/1/1/ (Fig. 3B), in which one pterygiophore occupies the first interneural space, is present in 43 of 58 species. Other species frequently have two pterygiophores in the first interneural space. However, in many specimens both conditions are occasionally present but it can be very difficult to distinguish them solely from digital or film radiographs; for those reasons anal-fin interdigitation patterns are unreliable and not provided in the species descriptions.

Ramus mandibularis nerve. (Table 3) In most species of *Opistognathus* the ramus mandibularis V nerve (RMV) passes under (medial to) the $A1_{\beta}$ section of the adductor mandibulae (Fig. 4) but passes over (lateral) it in ten species. (The nerve of *O. reticulatus* is tabulated as extending over the $A1_{\beta}$ muscle but in one of two specimens examined the nerve crossed thru the middle of the muscle rather than across or under it.) This nerve passes under $A1_{\beta}$ in *Stalix* and most species of *Opistognathus*, so the latter condition is probably plesiomorphic.

Cephalic sensory pores. (Table 4, Figs. 5–13). Mandibular pores were either only partially shown or omitted in many of the lateral view figures but all species of *Opistognathus* have five mandibular pore positions on each dentary; they begin near the symphysis of the lower jaw and terminate opposite the posterior end of the dentary. The first two mandibular positions are always occupied by single pores, the 3rd position by 1–5 pores (1 or 2 in most species), the 4rd position by 1–5 pores and the 5th position by 1–16 pores, except in species such as *Opistognathus margaretae*, *O. darwiniensis* (Fig. 5C), *O. inornatus* (Fig. 13B), and *O. papuensis* where they are too numerous to count accurately. Species with all mandibular pore positions occupied by single pores (Fig. 6A) also usually have single pores at each of the preopercular positions or only the dorsalmost position is bipored. Species with multiple pores in the 5th mandibular position typically also have at least bipored preopercular pore positions. Pore descriptions and mandibular pore counts are included in the text for most species.

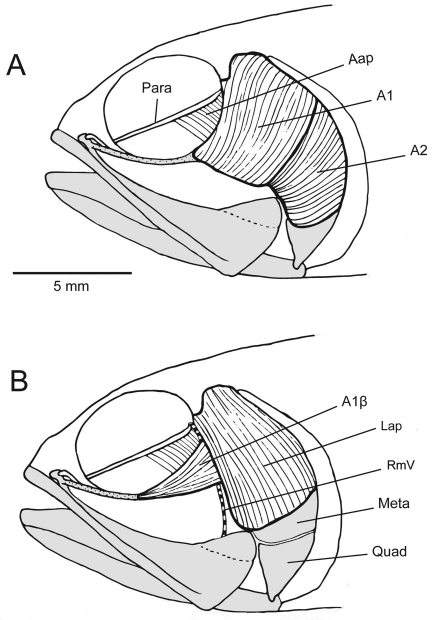

FIGURE 4. Left lateral view of cheek musculature of *Opistognathus macrolepis*, USNM 447908, 92 mm SL. **A**, all superficial muscles illustrated intact; **B**, adductor mandibulae sections 1 and 2 removed and upper jaw pulled downward to better expose ramus mandibularis V nerve (in normal position dorsal margin of upper jaw and ventral margin of $A1_{\beta}$ almost touch). Abbreviations: A1, A2 and $A1_{\beta}$ indicate separate sections of adductor mandibulae; Aap, adductor arcus palatini; Lap, levator arcus palantini; Meta, metapteryoid; Para, parasphenoid; Quad, Quadrate; RmV, ramus mandibularis V nerve.

The general nature of the pores often can be seen with the naked eye or with a microscope, but fine detail of the entire pore pattern may require partially drying with an air jet or temporary staining with cyanine blue as described by Saruwatari *et al.* (1997). A complete complement of pores is usually not fully developed in juveniles. Configuration of pores may reflect both relationships and ecology, particularly depth range. Depth ranges for some species are based on a single or only a couple of trawl collections spanning relatively wide depths while others lack precise depths because they were collected from a long reef slope; therefore, depth ranges given in Table 4 may be only approximations. Despite these limitations, a correlation between depth and proliferation of pores is obvious in some species.

Opistognathus aurolineatus n.sp. (Fig. 8A) and *O. decorus* (Fig. 8B) are relatively large deep-water species with very sparse and minute pores. *Opistognathus albicaudatus* (Fig. 7A)*, O. rosenbergi* (Fig. 5D) and *O. margaretae* are inshore species with their entire head densely covered with small pores. Some species with numerous pores, the head is completely covered with pores except for V-shaped area extending from the dorsal-fin e.g., *O. adelus* (Fig. 5A), *O. darwiniensis* (Fig. 5C), *O. variabilis* (Fig. 7D), *O. erdmanni* (Fig. 10C), and *O. seminudus* (Fig. 11B). Others with numerous pores, such as *O. inornatus* (Fig. 13B), *O. dendriticus*, and *O. papuensis*, differ in having a narrow naked area in front of the dorsal-fin origin.

Upper jaw. (Table 5) The upper jaw is an important character in jawfishes, ranging from as little as 47% HL (*O. alleni*) to a maximum of 104% HL (*O. nigromarginatus*) (Table 5). Species with the longest jaws have the posterior end of the upper jaw with a flexible maxilla, and the elongate supramaxilla is positioned anterior to the flexible part of the maxilla (Figs. 5A, C, E). The upper jaw is sexually dimorphic (longer in males) in some species with well-developed flexible maxillae, e.g., *O. castelnaui*, *O. nigromarginatus*, *O. randalli* (Smith-Vaniz 2009, fig. 23), *O. solorensis*, and *O. verecundus*. *Opistognathus variabilis* is exceptional in exhibiting pronounced geographic variation in sexual dimorphism of jaw length (Smith-Vaniz 2009:103–104, figs. 156–159). Two species, *O. adelus* (Fig. 14B) and *O. muscatensis* (Fig. 14D), have a narrowly flexible maxilla and an ovoid supramaxilla. *Opistognathus megalops* is exceptional in having a very elongate maxilla combined with a large ovoid subterminal supramaxilla (Fig. 13D). *Opistognathus iyonis* also has a flexible maxilla with a moderately ovoid supramaxilla (Fig. 10D). In most species with a rigid maxilla the supramaxilla is usually ovoid and positioned near the end of the maxilla (Fig. 14F). *Opistognathus inornatus* and *O. papuensis* have rigid upper jaws with a terminal supramaxilla that is so slender that it is apparent only in cleared and stained specimens. The tip of the depressed cirrus extends posteriorly to or beyond the orbital rim in some species. The specific name of *Opistognathus longinaris* alludes to its extremely long nasal cirrus (Fig. 104). *Opistognathus vigilax* has the anterior naris consisting of an elongate tube without a cirrus (Figs. 164, 165).

Upper lip. In most species the anterior margin of the upper lip is smooth. Large adults of at least seven species (*O. aurolineatus*, *O. inornatus*, O. *jacksoniensis*, *O. latitabundus*, *O. papuensis, O. pholeter*, and *O. reticulatus*) have the anterior margin of the upper lip with small crenulae. In a few of these species crenulae are also present mid-laterally on both the upper and lower lips. *Opistognathus macrolepis* is unique in having several small, dark lappets lining the upper lip anterior margin.

Dorsal-fin rays. (Table 7) Dorsal-fin rays range from X-XII (exceptionally XIII) spines, 10–22 segmented rays, and 21–31 total elements. Five Australian species typically have XII dorsal-fin spines (*O. inornatus*, *O. papuensis*, *O. latitabundus*, *O. reticeps*, and *O. reticulatus*), and an increased number of precaudal vertebrae (Table 10). *Opistognathus darwiniensis* is exceptional in having only X or XI spines combined with an increased number of precaudal vertebrae. The spines of *Opistognathus* range from straight with sharp "pungent" tips to tapering and slightly curved distally. Segmented dorsal-fin rays range from all branched distally to anterior one or two rays unbranched. Adults of some species have dorsal-fin spine tips with pale and swollen fleshy tabs (Table 3 continued) with unknown function.

Anal-fin rays. (Table 8) Anal-fin rays range from II–III, 10–19, total elements 13–21. Most species have II anal-fin spines, but only two (*Opistognathus iyonis* and *O. megalops*) of the 13 species that have an upper jaw with flexible lamina posteriorly have III anal-fin spines. Segmented anal-fin rays range from all branched distally to only first anterior ray unbranched.

Caudal fin. (Table 9) The caudal fin is rounded posteriorly in all species of *Opistognathus*. Procurrent rays range from 6–11, 3–6 (upper) and 3–5 (lower); procurrent rays are usually unsegmented but some of the innermost ones occasionally have a few segments distally. Branched caudal-fin rays range from 11–14. Hypural 5 is present in 38 species and absent in 21 others. Hypurals are fused in a 1+2 and 3+4 arrangement with the latter also fused to the urostylar complex.

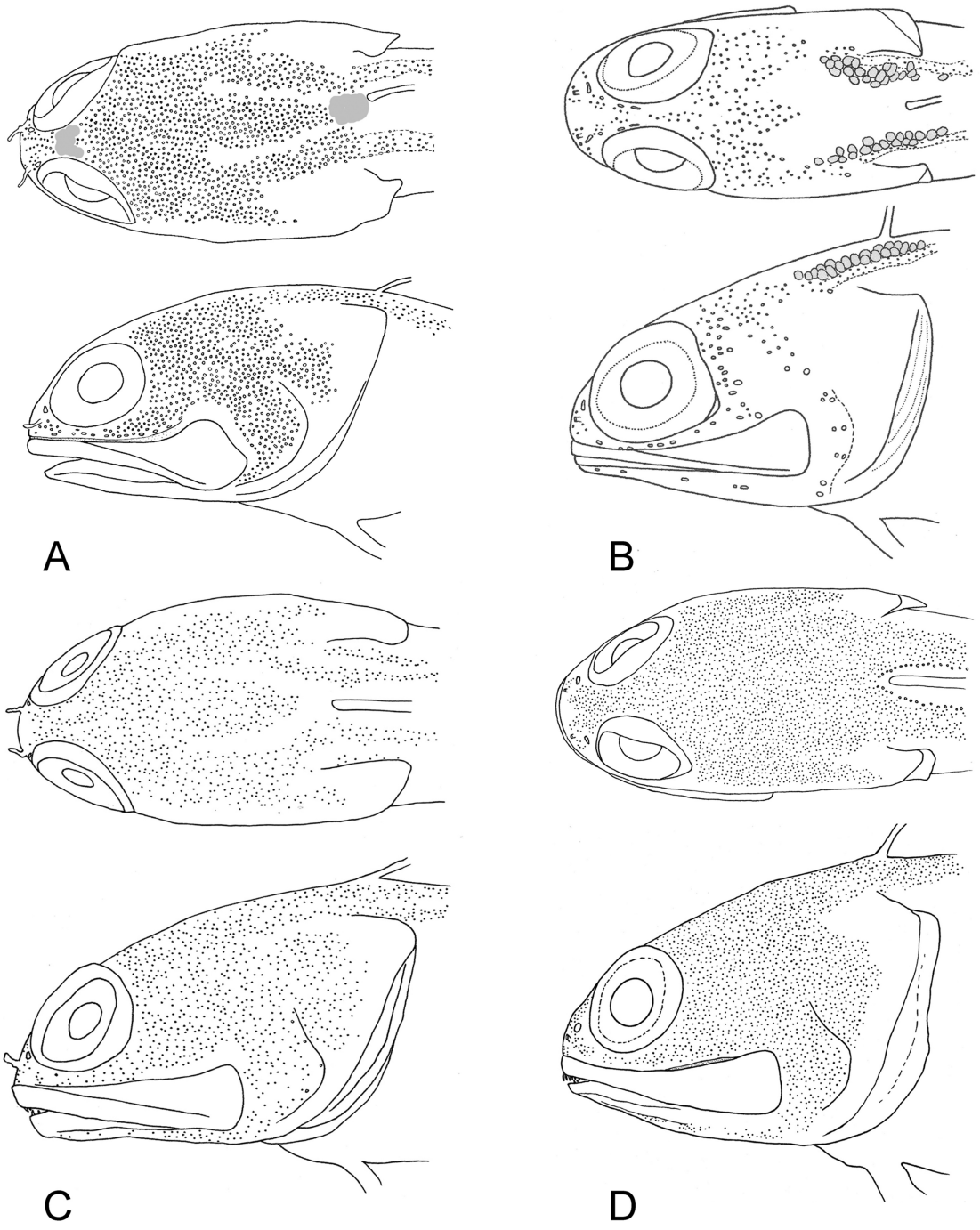

FIGURE 5. Cephalic sensory pores in selected species of *Opistognathus*: **A**, *O. adelus*, holotype, SAIAB 39747, 49.6 mm SL, Madagascar; **B**, *O. asper* n.sp., holotype, NMV A.29–729015, 50.2 mm SL, northwestern Australia (scales above lateral line shaded); **C**, *O. darwiniensis*, ANSP 144461, 93.8 mm SL, western Australia; **D**, *O. rosenbergii*, ROM 72620, 90 mm SL, Thailand.

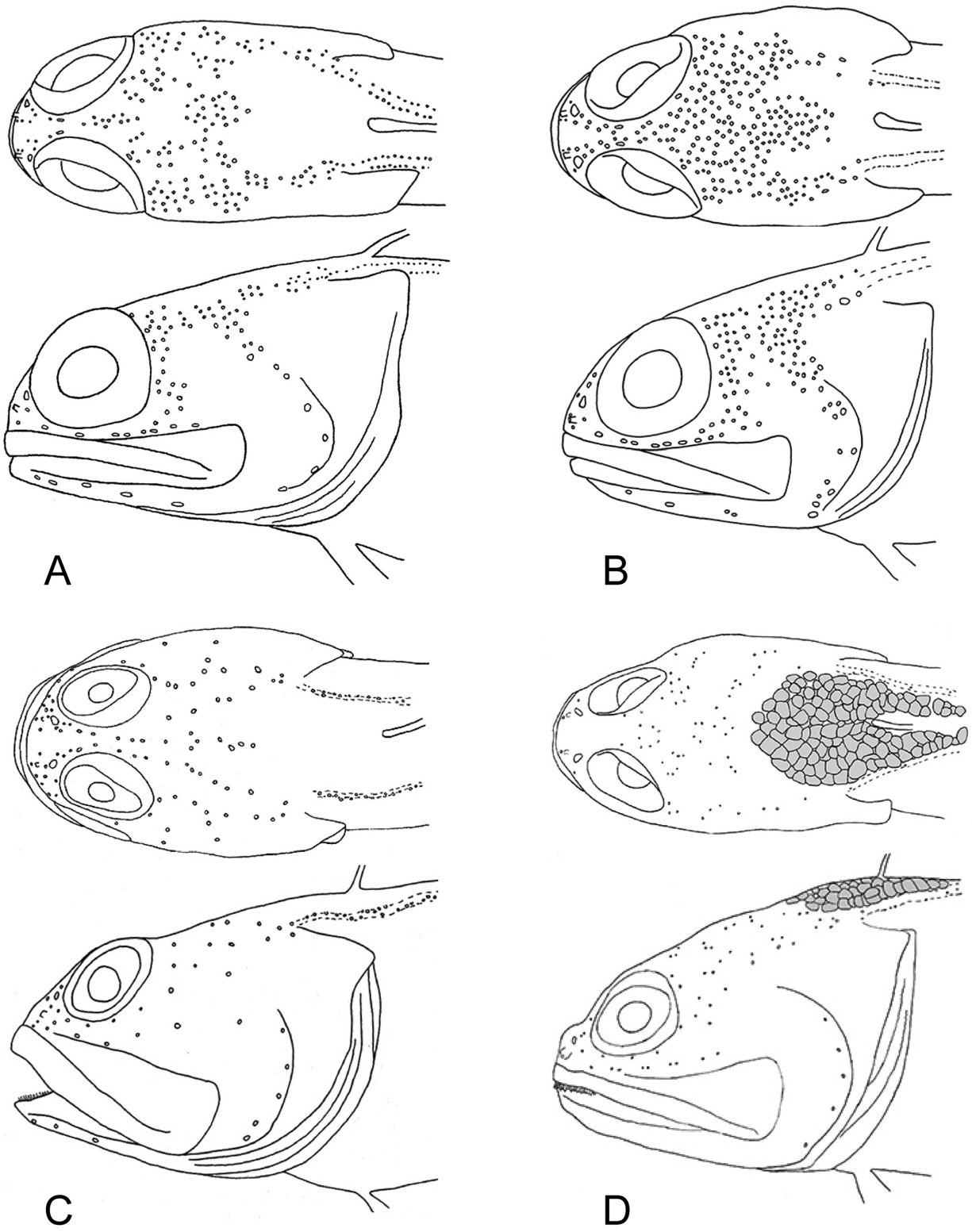

FIGURE 6 Cephalic sensory pores in selected species of *Opistognathus*: **A**, *O. afer*, holotype, SAIAB 39994, 41.2 mm SL, male, South Africa, Maputoland Reef; **B**; *O. crassus*, holotype, BPBM 32706, 35.5 mm SL, male, Maldive Islands (lateral-line pores not shown);**C**, *O. flavidus* n.sp., holotype, KAUM-I. 70089, 71.0 mm SL, East China Sea, Japan; **D**, *O. macrolepis*, KAUM-I. 24030, 73.3 mm SL, Gulf of Thailand (scales above lateral line shaded).

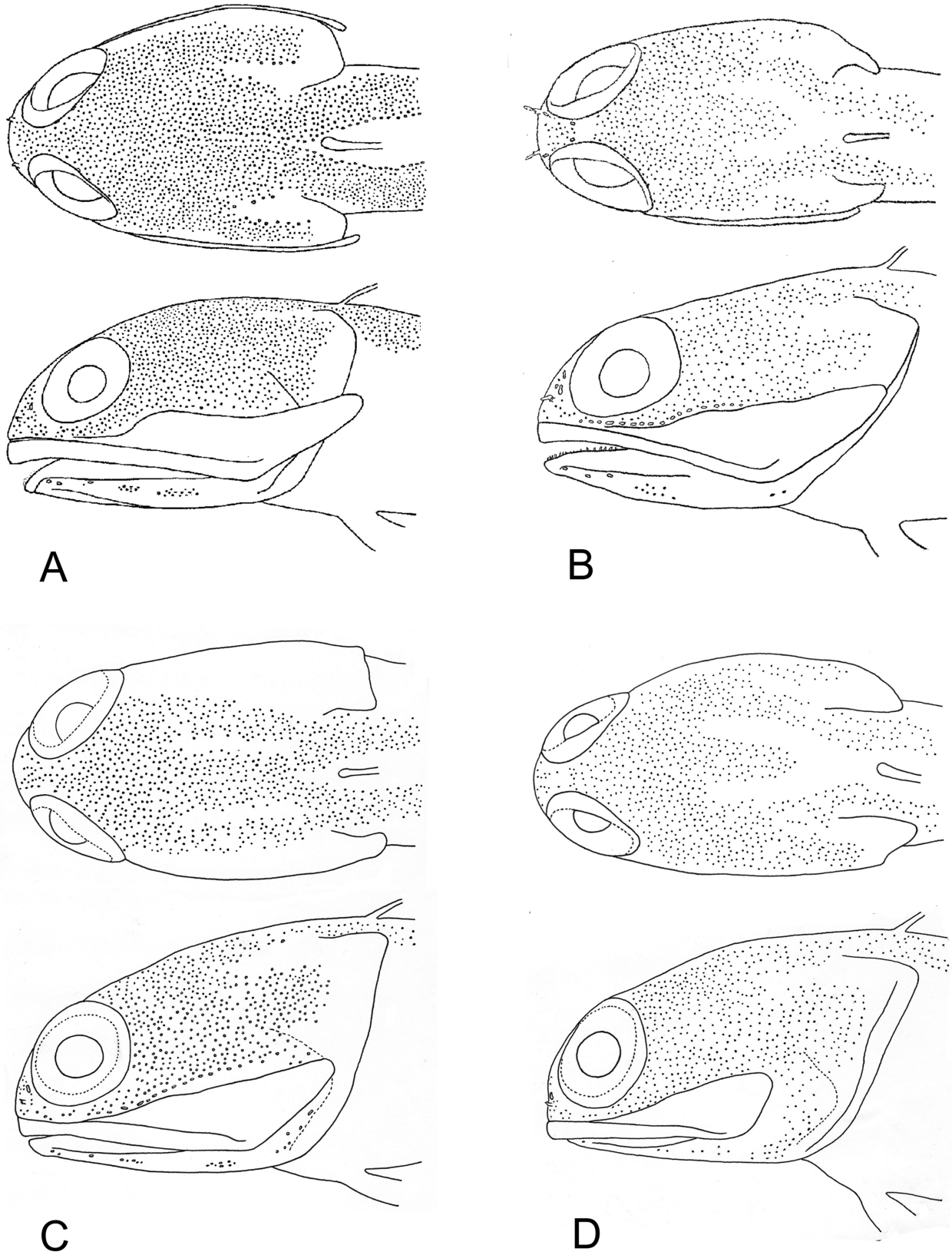

FIGURE 7. Cephalic sensory pores in selected species of *Opistognathus*: **A**, *O. albicaudatus*, WAM P.33256–001, 91.4 mm SL, male, Andaman Islands; **B**, *O. solorensis*, WAM P.33117–001, 48 mm SL, male, Brunei; **C**, *O. randalli*, AMS I. 21914–002, 76 mm SL, female, Philippines; **D**, *O. variabilis*, WAM P.32964–001, 75 mm SL, male, Halmahera.

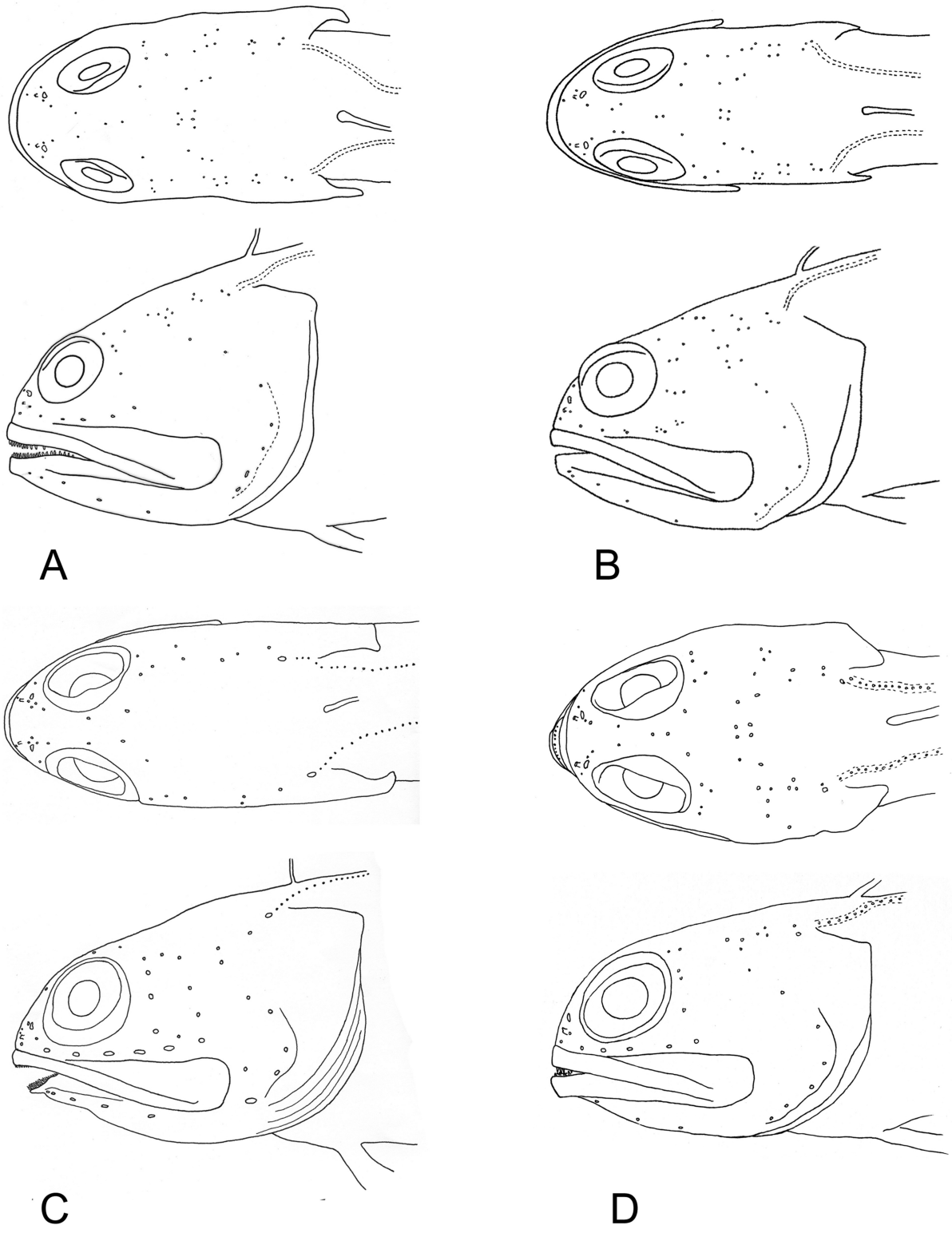

FIGURE 8. Cephalic sensory pores in selected species of *Opistognathus*: **A**, *O. aurolineatus* n.sp., holotype, MNHN 1991–362, 224 mm SL, female, New Caledonia; **B**, *O. decorus*, FAKU 48888, 127.4 mm SL, female, Okinawa, Japan; **C**, *O. pardus,* holotype, CMFRI GB.31.104.1.2, 98.8 mm SL, male, India; **D**, *O. hopkinsi*, FRSKU S178, 97.3 mm SL, male, Japan.

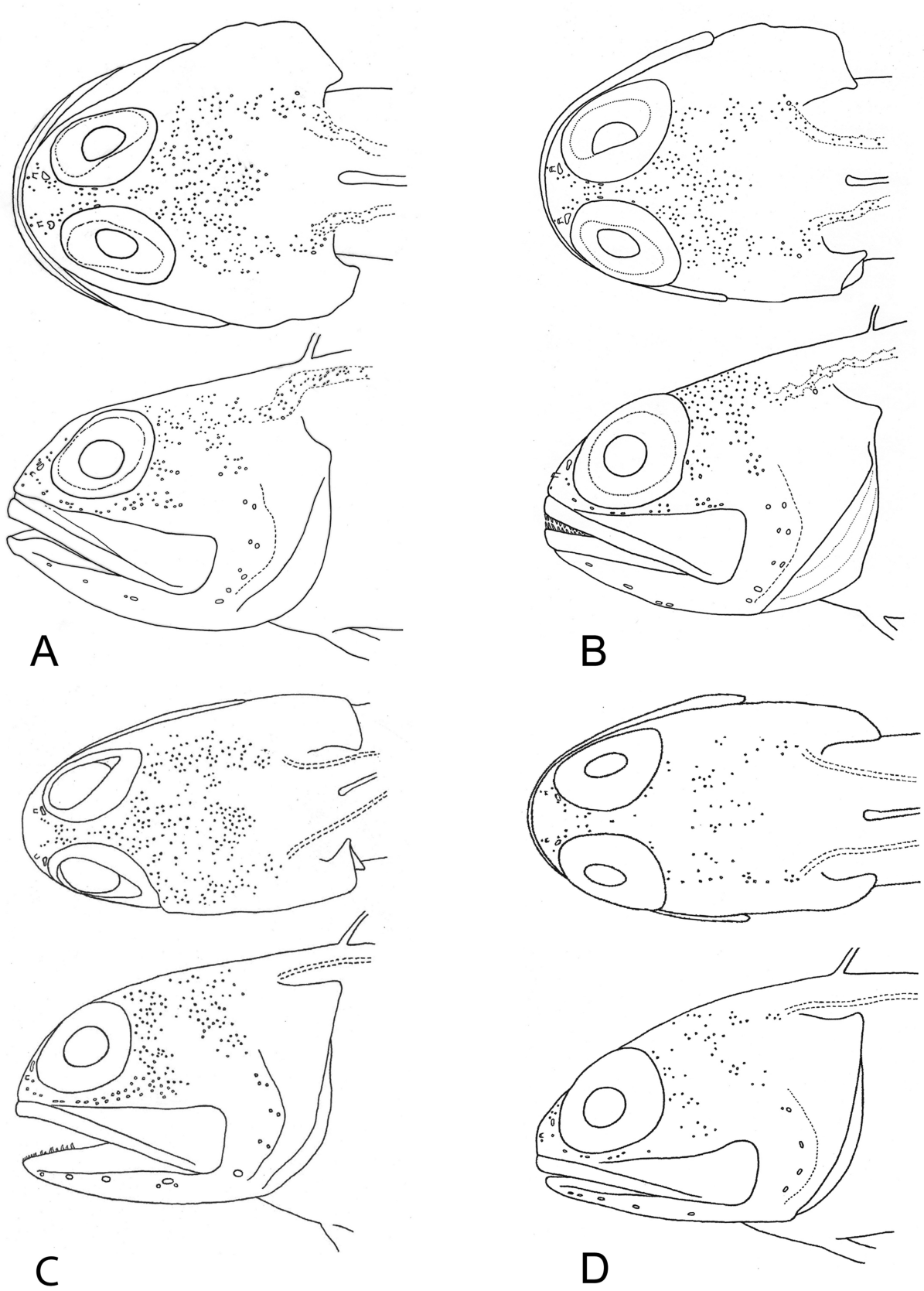

FIGURE 9. Cephalic sensory pores in selected species of *Opistognathus*: **A**, *O. bathyphilus* n.sp., holotype, MNHN 1991–361, 66.3 mm SL, female, Lord Howe Ridge, Coral Sea; **B**, *O. biporus* n.sp., holotype, SMNS 23849, 64.4 mm SL, female, Loyalty Islands; **C**, *O. rufilineatus*, holotype, NCIP 6313, 60.4 mm SL, West Papua, Indonesia (lateral line pores not shown); **D**, *O. liturus* holotype, URM-P 8134, 55.3 mm SL, Japan.

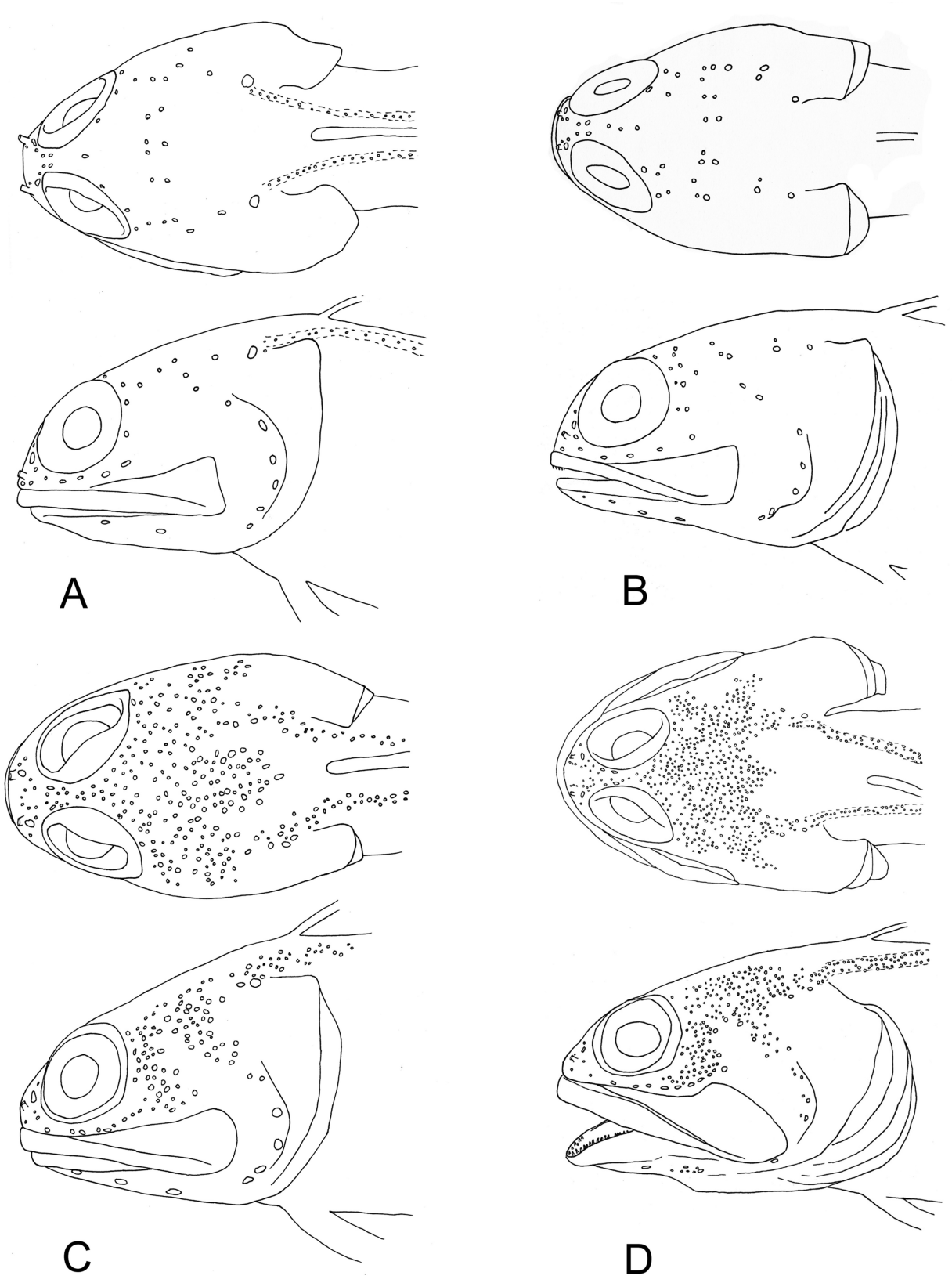

FIGURE 10. Cephalic sensory pores in selected species of *Opistognathus*: **A**, *O. hyalinus* n.sp., WAM P.33246–002, 34.4 mm SL, female, Andaman Islands; **B**, *O. parvus* n.sp., BPBM 32402, 25.8 mm SL (lateral line not shown), Komodo Island, Indonesia; **C**, *O. erdmanni* n.sp., holotype, WAM P.33073–001, 39.3 mm SL, male, Myanmar **D**, *O. iyonis*, ANSP 148087, 67.2 mm SL, female, Japan.

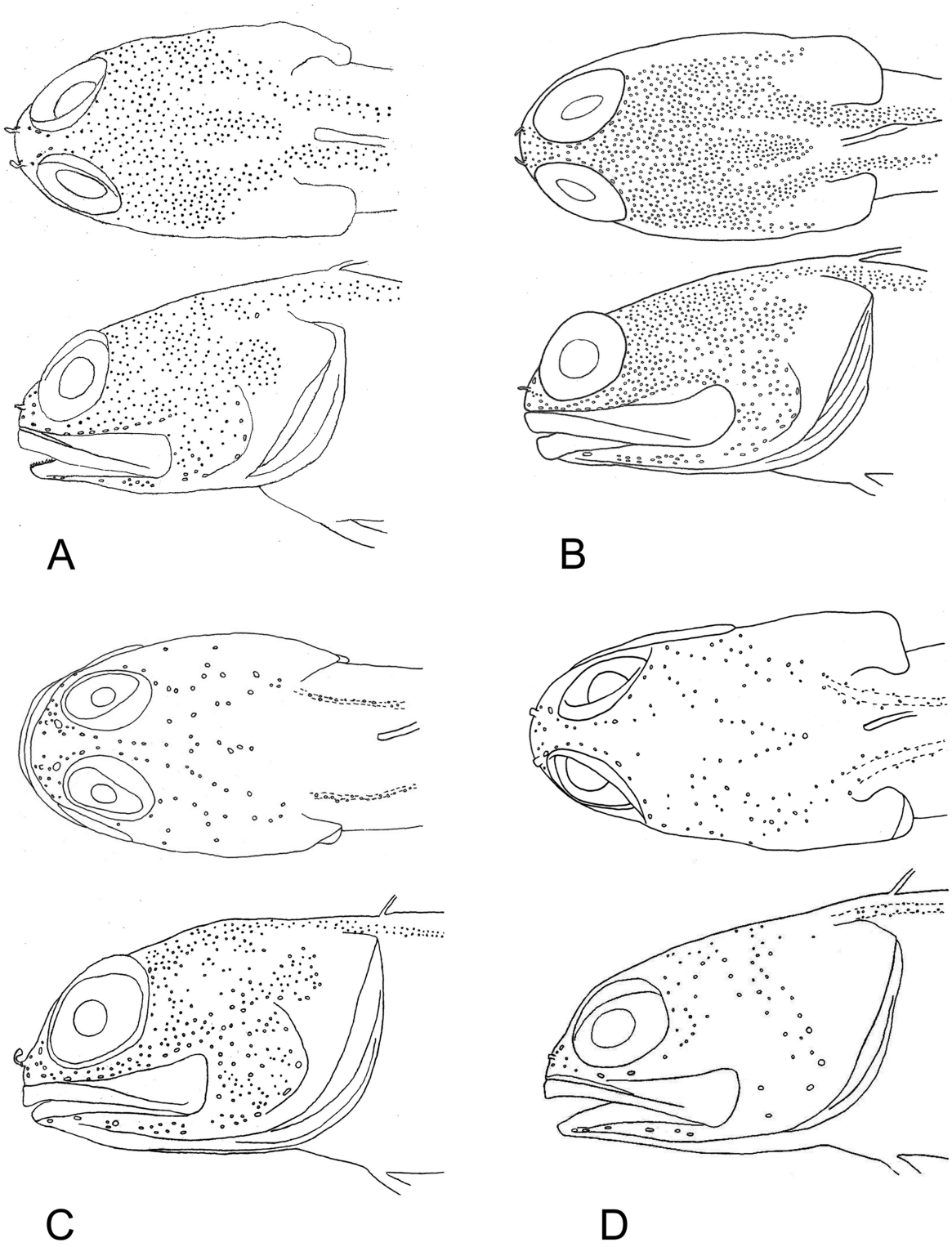

FIGURE 11. Cephalic sensory pores in selected species of *Opistognathus*: **A**, *O. pholeter* n.sp., USNM 321032, 55.9 mm SL, male, Loyalty Islands; **B**, *O. seminudus*, AMS I.17445–001, 64.0 mm SL, female, Australia; **C**, *O. stigmosus*, WAM P.29641–001, 62.5 mm SL, male, Coral Sea, Lihou Reef; **D**, *O. triops* n.sp., USNM 359743, 39.6 mm SL, female, Vanuatu.

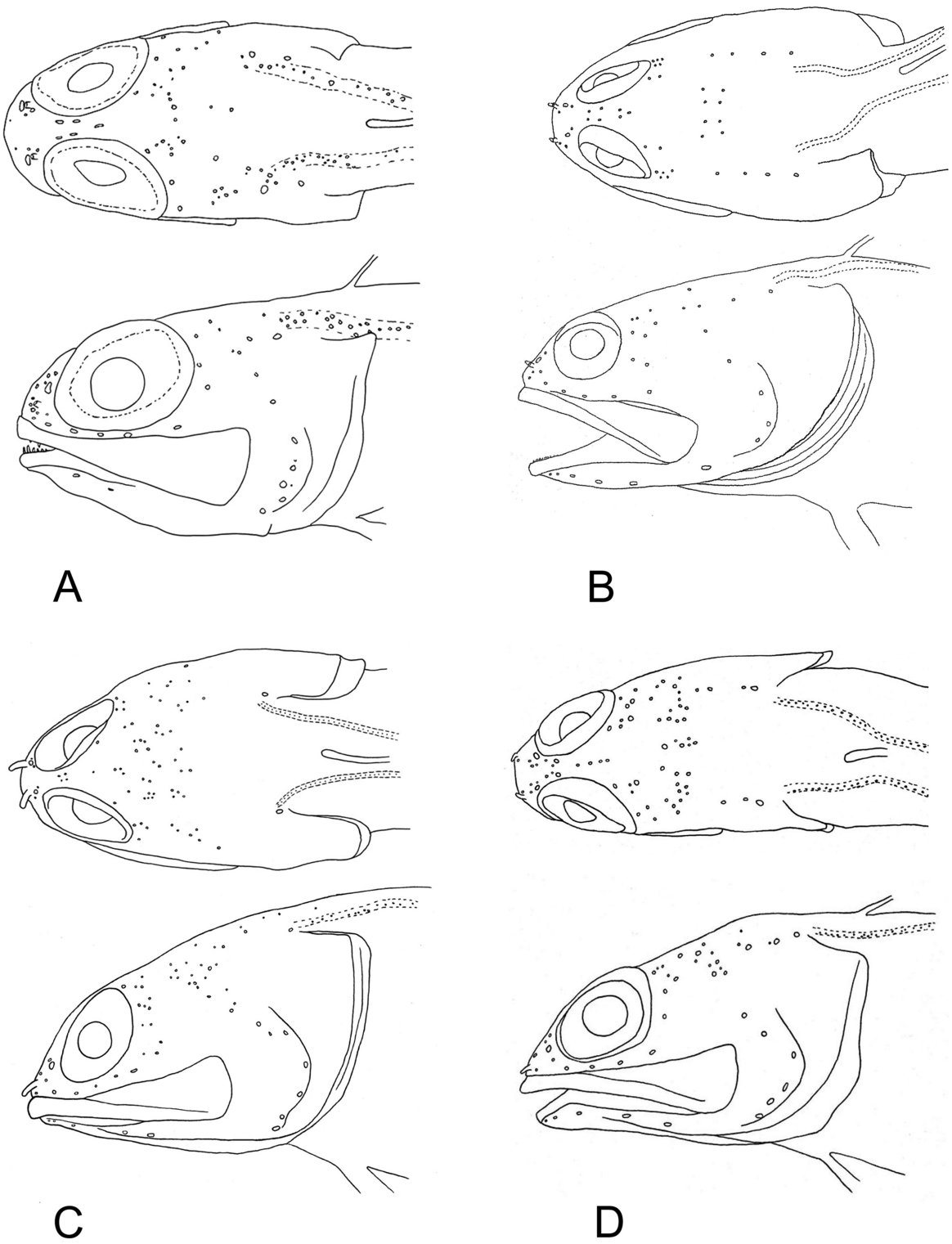

FIGURE 12. Cephalic sensory pores in selected species of *Opistognathus*: **A**, *O. microspilus*, holotype, NMMBP 13933, 53.7 mm SL, male, Taiwan; **B**, *O. nigripinnis* n.sp., holotype, NMMBP 13933, 53.9 mm SL, Taiwan (lateral line pores not drawn); **C**, *O.* vigilax n.sp., holotype, WAM P.34268–012, 45.0 mm SL, male, Brunei; **D**, *O. vigilax* n.sp., PNM 15647, 41.7 mm SL, female, Philippines.

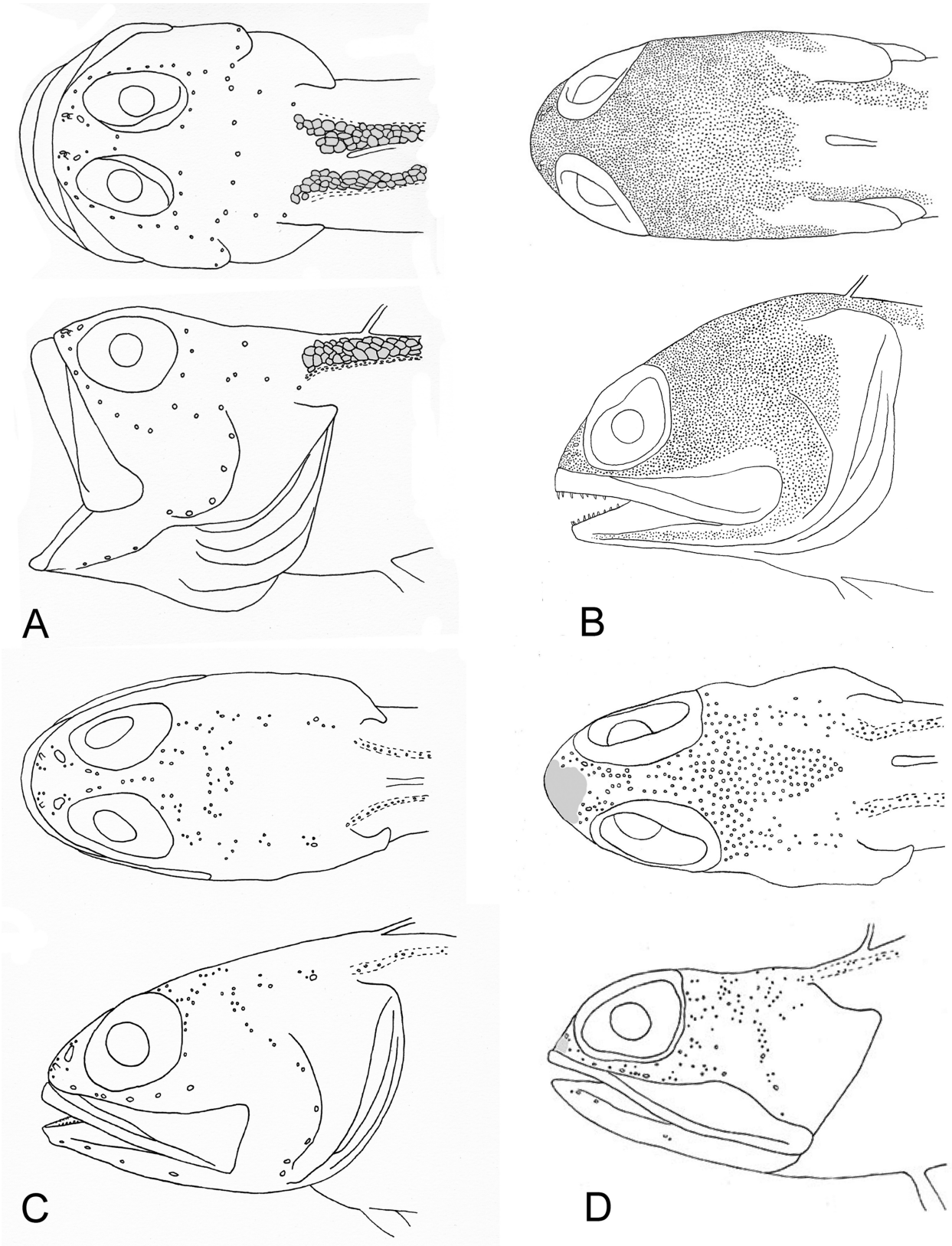

FIGURE 13. Cephalic sensory pores in selected species of *Opistognathus*: **A**, *O. challenger* n.sp., holotype, BMNH 1879.5.14.200, 76.4 mm SL, Philippines (scales above lateral line shaded); **B**, *O. inornatus*, USNM 396712, 150 mm SL, Exmouth Gulf, Western Australia; **C**, *O. wassi* n.sp., ROM 52744, 45.9 mm SL, Philippines; **D**, *O. megalops* n.sp., holotype, KAUM-I. 97065, 88.0 mm SL, Japan (damaged areas where pores could not be observed indicated by shading).

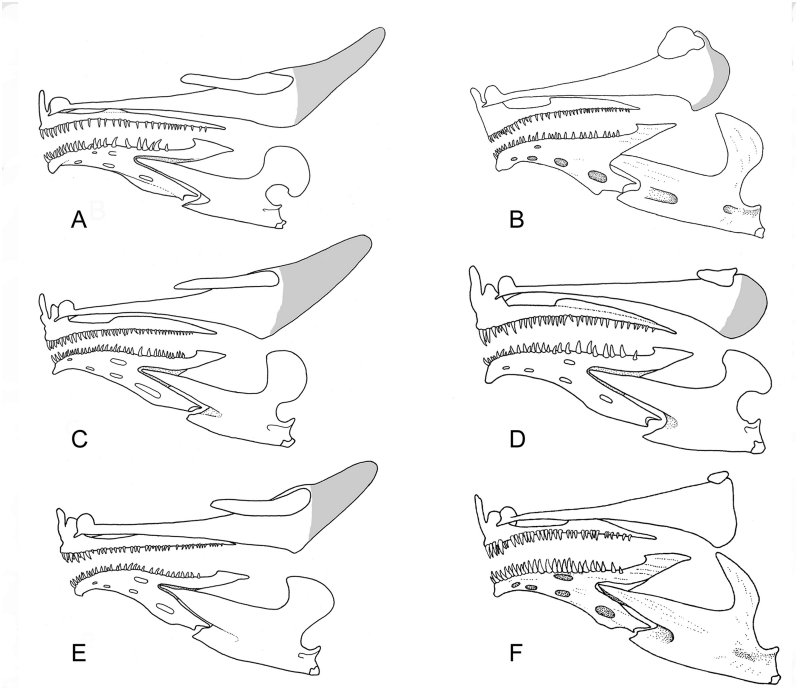

FIGURE 14. Upper jaws (flexible part of maxilla shaded) in selected species of *Opistognathus*: A, *O. nigromarginatus*, ANSP 143892, female, 63.8 mm SL; B, *O. adelus,* SAIAB 39747, female, 49.6 mm SL; C, *O. randalli*, ANSP 142964, male, 74.4 mm SL; D, *O. muscatensis*, SAIAB 7602, male, 133 mm SL; E, *O. variabilis*, BPBM 34567, female, 83.5 mm SL; F, *O. margaretae*, ANSP 149352, male, 50.7 mm SL.

Vertebrae. Vertebrae (Table 10) range from 10–13 precaudal, 15–25 caudal, and 25–35 total. Six species (*O. inornatus*, *O. darwiniensis*, *O. papuensis*, *O. latitabundus*, *O. reticeps*, and *O. reticulatus*) have 12–13 precaudal vertebrae, two species (*O. dendriticus* and *O. pholeter*) have 11 precaudal vertebrae and all others have 10. All species of the genera *Lonchopisthus* and *Stalix* consistently have 10 precaudal vertebrae suggesting that this is probably the plesiomorphic character state in opistognathids.

Lateral line. (Table 14) All but one species has a single incomplete lateral line running below the dorsal-fin base. The lateral-line terminus ranges from below dorsal-fin spine 10 to segmented ray 17 (total dorsal-fin terminus position 10–28). *Opistognathus darwiniensis* is unique in also having a ventral lateral line (Fig. 15).

In some species a series of neuromasts is present on the mid-side of the body in a single row beginning below the lateral-line terminus and ending at the base of the caudal fin. At least two distinct neuromast patterns are represented. In some species, a single neuromast occurs on every second or fourth scale while in others three neuromast are usually present on such scales. In most species these structures are very difficult to observe without histological examination especially in species with lightly pigmented scales. The neuromast pattern is especially obvious in darkly pigmented specimens of *Opistognathus variabilis*.

Infraorbitals. (Figs. 16–18) Species with similar infraorbitals are sometimes grouped together in the figures to facilitate comparisons. All opistognathids have five infraorbitals, including the lacrimal and dorsalmost infraorbital (dermosphenotic), *which is not shown in any of the illustrations*. The infraorbital (circumorbital) series is shown in reversed left side views to facilitate comparisons, although the majority are based on dissection of the right infraorbitals. The anteriormost infraorbital is the lacrimal and in most species its shape is very similar, but in *Opistognathus aurolineatus* n.sp. (Fig. 16N) and particularly *O. decorus* (Fig. 16O) it is notably robust. Some species have infraorbitals with trough-like lateral openings that includes the lacrimal, e.g., *O. hyalinus* n.sp. (Fig. 16S) and *O. parvus* n.sp. (16T), other species have the third infraorbital with a wide suborbital shelf, e.g., *O. cyanospilotus* (Figs. 16M), *O. dendriticus* (Fig. 17C), *O. eximius* (Fig. 17D), and *O. muscatensis* (Fig. 17P), but it is weakly developed or absent in others. In *Opistognathus asper* n.sp. (Fig. 16E), *O. liturus* (Fig. 16F), *O. bathyphilus* n.sp. (Fig. 16G), *O. biporus* n.sp. (Fig. 16H), O. *hongkongiensis* (Fig. 16 J), and *O. rufilineatus* (Fig. 18B) the infraorbitals are relatively slender and tubular, with wide openings for sensory canals. In these species the 3rd infraorbital lacks a suborbital shelf and has a short arm projecting posteroventrally and ending in a pore. The third infraorbital is extremely slender and

elongate in *Opistognathus reticeps* (Fig. 17G) The infraorbitals alone appear to distinguish some species or species-pairs and may prove useful as indicative of phylogenetic relationships.

Behavior

Surprisingly, little detailed knowledge exist about the behavior of Indo-West Pacific jawfishes. This monograph hopefully will stimulate more interest in jawfishes and encourage divers to make more observations and take videos of them. Deloach (1999) provided behavioral details for three species of western Atlantic Opistognathus (*O. aurifrons*, *O. macrognathus*, and *O. whitehursti* Longley, 1927) and similar behavior is probably evident in Indo-West Pacific species. Jawfishes are obligatory burrow dwellers and construct their own burrows. Unlike species of the jawfish genera *Stalix* and *Lonchopisthus,* which typically occupy habitats consisting entirely of fine mud or soft sediment and do not line their burrows, most *Opistognathus* species reinforce their burrow openings with stones, gastropod shells, and fragments of coral (Fig. 19). Stealing of building material is common and usually leads to disputes with conspecific jawfishes. I know of only one reference (Eibl-Eibesfeldt & Klausewitz 1961:423, figs. 2–3) that includes a detailed description of burrow construction of an Indo-West Pacific jawfish, *Opistognathus rosenbergii*.

Only one individual typically occupies a burrow, although it is sometimes shared with a shrimp, and competition for burrows is common (Fig. 20). Burrows are typically entered tail first unless the jawfish is actively threatened by a predator in which case entrance is head-first. However, one individual of *O. variabilis* was observed displaying briefly above its burrow followed by a rapid head-first return to its burrow; perhaps this is typical behavior for some displaying jawfishes. Maintenance and house-keeping activities of burrows are a necessity, and jawfishes have been frequently observed spitting loose sand and rubble or fecal material from their burrows (Fig. 21). Very few observations of Indo-West Pacific *Opistognathus* movements have been published, but it is likely smaller species seldom venture more than a meter from active burrows to avoid predators. An exception may apply to some of the larger Australian species such as *Opistognathus reticulatus*, in which a large gravid female "viciously attacked" two shell collectors wading in shallow water as reported by Hutchins (1974); see "Remarks" in *O. reticulatus* species account.

Based on limited observations of three of the four genera of the family (*Opistognathus*, *Stalix*, and *Lonchopisthus*), typically only males orally brood their eggs until the relatively well-developed larvae hatch (Hess 1993). Two individuals of mouth brooding Giant Jawfish, *O. rhomaleus* Jordan & Gilbert, 1881, observed at different times in the Steinhart Aquarium, were subsequently sectioned and, surprisingly, their gonads revealed that they were females (Herald 1972:199). These observations should be confirmed by examination of more individuals. While the egg ball is held in the mouth it is periodically rotated, aerated, and cleaned; the egg ball is occasionally spit-out, and then immediately picked-up and returned to the mouth of the brooding fish. The entangling tendrils of each egg hold the egg ball together (Mooi 1990) allowing it to remain intact while being manipulated by the male jawfish. About 7–10 days after hatching larvae enter the water column and drift with the current for a short time prior to settlement.

Courtship has been documented or observed in only a few species. In *Opistognathus parvus* n.sp. (Figs. 22A–B) and *O. variabilis* (Fig. 22C) the displaying male hovers vertically a short distance above its burrow to attract females. In *O. variabilis* a rapid color change to bluish-purple occurs in displaying fish probably to facilitate its notice. Despite being benthic fishes and spending most of their time in burrows, species of *Opistognathus* have well-developed swim bladders.

Geographic distributions

As discussed in the introduction, the habitat and behavior of jawfishes makes them difficult to collect. For those reasons, eight of the 18 new species described herein are known only from holotypes. Of the 60 total Indo-West Pacific species treated in this paper, 15 are known solely from holotypes and six others from single localities. The distributions (Figs. 23–36) of the recognized Indo-West Pacific species of *Opistognathus* mostly reflect collecting effort, and range extensions and additional newly discovered species should be expected. Deep-water species are especially poorly sampled, with about a dozen species occurring in depths of at least 90 meters (Table 4). The maxi-

mum depth of occurrence known for an Indo-West Pacific jawfish is 300 m for *O. helvolus* n.sp. As noted below, *O. hopkinsi* has been collected by dredge between 262–266 m, and Nakayama *et al.* (2016) reported *O. trimaculatus* from depths of about 150–250 m. One western Atlantic species, *Opistognathus leprocarus* Smith-Vaniz, 1997, was observed and collected with submersibles in 300–379 m (Smith-Vaniz 1997) and the deepest confirmed collection of any jawfish is the Western Atlantic *Lonchopisthus lemur* Myers, 1935, trawled in 375–384 m (Smith-Vaniz & Walsh 2017).

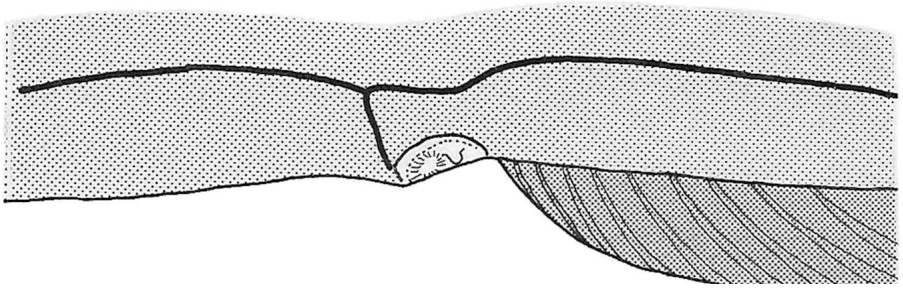

FIGURE 15. Variation in ventral lateral line (shown in black) of *Opistognathus darwiniensis*. Drawn by W.F. Smith-Vaniz.

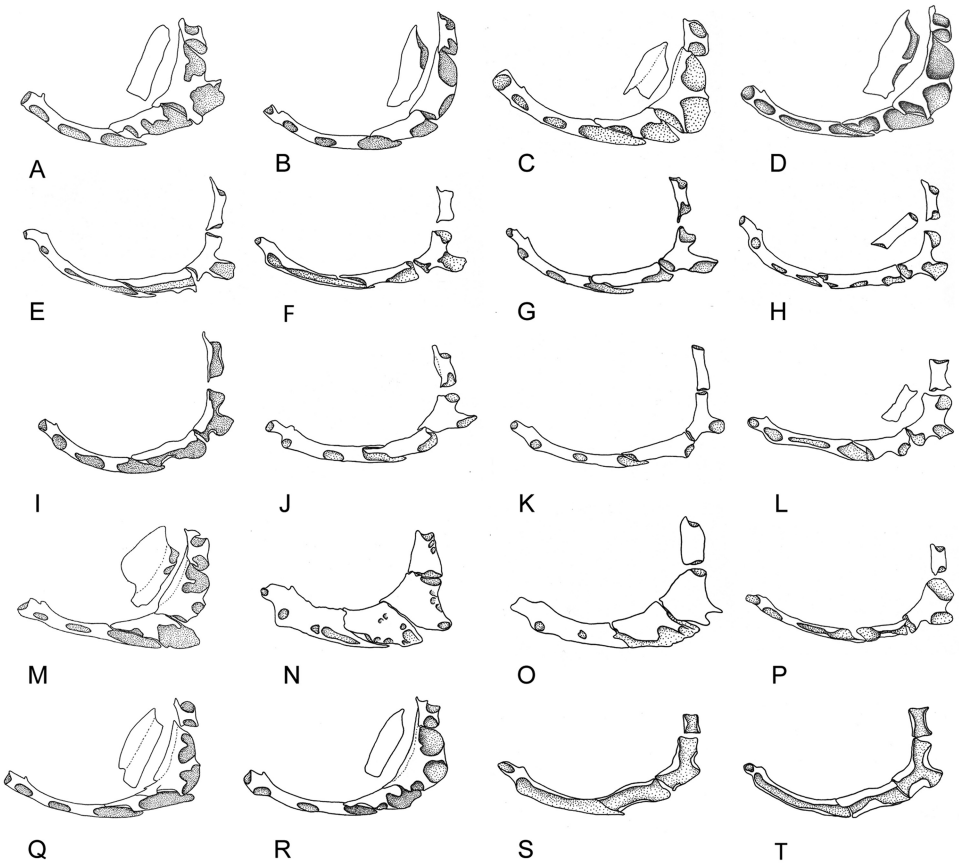

FIGURE 16. Lateral views of left infraorbitals (not drawn to scale) excluding dorsalmost infraorbital (= dermosphenotic) in selected species of *Opistognathus*, 3rd infraorbital sometimes rotated in dorsal view and SL mm lengths in parentheses: **A**, *O. adelus*, SAIAB 39747 (49.6); **B**, *O. afer*, SAIAB 7601 (39.1); **C**, *O. albomaculatus* n.sp., USNM 396236 (55.2); **D**, *O. alleni*, ANSP 157594 (54.3); **E**, *O. asper* n.sp., USNM 393589 (42.0); **F**, *O. liturus*, URM-P 8134 (55.3); **G**, *O. bathyphilus* n.sp., MNHN 1991–361 (66.3); **H**, *O. biporus* n.sp. SMNS 23849 (64.4); **I**, *O. crassus*, BPBM 32706 (35.5); **J**, *O. hongkongiensis*, NTM S.14607–011 (126.6); **K**, *O. hopkinsi*, FRSKU S178 (97.3); **L**, *O. evermanni*, USNM 396955 (92.2); **M**, *O. cyanospilotus*, ANSP 144109 (104); **N**, *O. aurolineatus* n.sp., MNHN 1991–362 (224); **O**, *O. decorus*, FAKU 48889 (145); **P**, *O. macrolepis*, AMS I.15557 (63.7); **Q**, *O. dipharus*, HUJ E62/3685 (47.2); **R**, *O. elizabethensis*, AMS I.27891–048 (66.6); **S**, *O. hyalinus* n.sp., ANSP 157595 (23.1); **T**, *O. parvus* n.sp., ANSP 162688 (22.0).

Jawfishes are absent from the Pacific Plate, except marginally (Springer 1982). The majority of species are associated exclusively with insular reefs, instead of continental habitats, exceptions (only species from multiple localities) are *O. adelus*, *O. evermanni*, *O. inornatus*, *O. jacksoniensis, O. macrolepis*, and *O. muscatensis.* Diversity of Indo-West Pacific jawfishes appears to be greatest at higher latitudes, with 20 species known from Australia or Elizabeth Reef, of which 14 are probably endemic, and 16 species (including two undescribed) are known from Okinawa or Japan, at least eight of which are probably endemic. Another 14 species of *Opistognathus*, only three which are apparently endemic (*Opistognathus challenger* n.sp., *O. dendriticus*, and *O. randalli*), are known from the Coral Triangle, which includes all of the Philippines and extends from central Indonesia to Papua New Guinea and the Solomon Islands and is considered to be the richest area for marine biodiversity (Hoeksema 2007, Allen 2008). The low number of species and endemics known from the Coral Triangle may be a collecting artifact, especially considering that the Philippines are geologically complex (Hall 2002) and poorly sampled. In the higher latitude localities of Japan and Australia there is much more fisheries research effort, including extensive trawling and dredging of soft bottom habitats. In the Coral Triangle most species have been collected by divers above 30 m and deep-water trawling on soft bottom habitats, where more unrecorded species likely occur has been very limited (M.V. Erdmann *in lit*.). In addition, population expansion following divergence resulting from Pleistocene sea-level fluctuations may have resulted in mixing of formerly allopatric species-pairs (Gaither & Rocha 2013). Eight species are known from the Red Sea or western Indian Ocean including seven endemic species. *Opistognathus nigromarginatus* has one of the widest distributions (Fig. 28), occurring from southern Africa to the Persian Gulf and South China Sea. *Opistognathus parvus* n.sp. and O. *wassi* n.sp. are also widely distributed species, occurring from Bali to Samoa and from the Great Barrier Reef or New Guinea to Japan (Figs. 34, 36). Two species are endemic to the Maldives (*O. crassus*) or Andaman Islands (*O. albicaudatus*) with two others are known only from the southern tip of India (*O. ensiferus* and *O. pardus*), and *O. variabilis* is known from the Maldives to Yaeyama Island, Okinawa (Fig. 24). *Opistognathus macrolepis* is exceptional in apparently having an antitropical distribution (Fig. 27). An unusual distribution, possibly a collecting artifact, is the occurrence of *Opistognathus hopkinsi*, a relatively common deep-water species known from Japan and Taiwan that also occurs in the Fiji Islands (Fig. 35) based on a single specimen collected with a Warren dredge in 262–266 m.

Taxonomy

Opistognathus Cuvier

Opistognathus Cuvier 1816:252 (type-species: *Opistognathus nigromarginatus* Rüppell, 1830, by subsequent designation of Rüppell 1830). Original spelling *Opistognathus*, but often misspelled in early literature. The spellings *Opisthognathus* and Opisthognathidae for the genus and family respectively, used almost universally for over a century, were shown by Briggs (1961:164) to be incorrect.

Gnathypops Gill 1862:241 (type-species: *Opisthognathus maxillosus* Poey, 1861, by subsequent designation of Jordan & Evermann 1898:2283).

Merogymnus Ogilby 1908:18 (type-species: *Merogymnus eximius* Ogilby, 1908, by original designation [on p. 2] and monotypy).

Tandya Whitley 1930:19 (type-species: *Opisthognathus maculatus* Alleyne & Macleay, 1877 [= *Opistognathus papuensis* Bleeker, 1868], by original designation).

Upsilonognathus Fowler 1946:4 (type-species: *Upsilonognathus chaplini* Fowler, 1946 [= *Gnathypops whitehursti* Longley, 1927], by original designation and monotypy).

Merogymnoides Whitley 1966:239 (type-species: *Merogymnoides carpentariae* Whitley, 1966 [= *Opisthognathus macrolepis* Peters, 1866], by original designation and monotypy).

Diagnosis. *Opistognathus* is not definable on the basis of any unique combination of characters. It differs from *Stalix*, the only other Indo-West Pacific opistognathid genus here recognized, in lacking transversely forked anterior dorsal-fin spines. Other characters of *Opistognathus* (not necessarily diagnostic) are: pelvic fin I, 5 positioned below pectoral fin with outer two segmented soft rays unbranched and inner three branched; dorsal fin continuous, X-XIII, 10–22 (exceptionally XIII); distal radials of dorsal-fin spine pterygiophores absent, which Mooi (1993) suggested may be a case of paedomorphism; anal fin II-III, 10–20; procurrent caudal-fin rays 3–6 + 3–5; principal caudal-fin rays 9+9 (most species) or 9+8; vertebrae: precaudal 10–13 + caudal 15–25 = 25–35 total; caudal fin posteriorly rounded; a single posteriorly incomplete lateral line (except *Opistognathus darwiniensis* with a second irregularly

developed ventral lateral line in region of anal-fin origin) positioned slightly below dorsal-fin base and terminating below dorsal-fin spine X to segmented ray 17; eyes relatively large, high on head; scales cycloid, cheeks and nape without scales (except *Opistognathus helvolus* n.sp. with both cheek and nape scales and *O. macrolepis* with nape scales); oblique horizontal body scale rows 21–124; branchiostegals 6; anterior and posterior ceratohyals sutured together; interarcual cartilage present; palatine teeth absent; swim bladder present.

Tables 2–16 summarize meristic and selected morphological characters used to distinguish species.

Opistognathid larvae (2.9–7.3 mm body length) have been described and illustrated by Leis & Trnski (1989) and Leis & Carson-Ewart (2000) from the Great Barrier Reef but were identified only to family. They compared opistognathid larvae with larvae of other families that could easily be misidentified. Leis & Trnski (1989) noted that "great care and assembly of a size series are usually necessary to properly identify opistognathid larvae," which are relatively nondescript. Watson (1996) described the larvae of two eastern Pacific species of *Opistognathus*. Smith-Vaniz & Richards (2006) summarized what is known about the early stages of Western Atlantic jawfishes, including illustrations of four species, 3.6–7.7 mm SL.

Etymology. From the Greek *opisthen* (behind) and *gnathos* (jaw) in reference to the very elongate upper jaw of the type species of the genus, *Opistognathus nigromarginatus*.

Nominal genera. *Opistognathus* Cuvier, 1816 is the oldest available generic name in the family, but the genus cannot be defined cladistically using traditional morphological characters. The oldest available generic name for jawfishes with rigid upper jaws is *Gnathypops* Gill, 1862, here considered to be a synonym of *Opistognathus*, see discussion in Smith-Vaniz (1997:1076). Meek & Hildebrand (1928:901) were the first to synonymize *Gnathypops* with *Opistognathus* based on the erroneous belief that these names applied to different sexes of the eastern Atlantic *Opistognathus scops.* Adults of *O. nigromarginatus*, the type-species of *Opistognathus*, and several other species have very elongate posteriorly flexible maxillae, but this character state appears to have evolved independently in putatively distantly related jawfishes. Some species with flexible maxillae have different jaw shapes (Fig. 14), including the supramaxilla.

Ogilby (1908) erected the genus *Merogymnus* for *O. eximius* because it differed from *Gnathypops* in having a greater part of the trunk without scales, teeth "without any conspicuously enlarged series" and more numerous gill rakers. These character states occur in other species of Indo-Pacific *Opistognathus* in various combinations. Recognition of a monotypic *Merogymnus* would serve no useful purpose. In a key to genera of Opistognathidae, Whitley (1966) erected the monotypic genus *Merogymnoides* for his new species *M. carpentariae* (= *O. macrolepis*) and compared the new genus only with *Merogymnus*. All the characters he mentioned that purportedly distinguish both nominal genera are trivial ones that occur in various combinations in other Indo-Pacific jawfishes and do not appear to define any phylogenetically informative clade of species. However, *O. macrolepis* and *O. evermanni* do appear to be sister species.

All authors who have treated both *Opistognathus papuensis* (the type-species of *Tandya*) and *O. darwiniensis* have assigned them to the same genus, allocating them either to *Gnathypops* (McCulloch 1914; Ogilby 1920) or *Tandya* (Whitley 1930; McKay 1969). Whitley contrasted his new genus *Tandya* only with *Gnathypops* because both nominal genera have the upper jaws rigid posteriorly, stating *Gnathypops* "differs from Australian forms in having eight dorsal spines [instead of 12 spines] and a shorter maxillary." However, the maxilla is not appreciably shorter in *O. maxillosus*, the type-species of *Gnathypops*, which has 11 (not 8) dorsal-fin spines (Smith-Vaniz 1997). Inexplicably, Whitley assigned *O. darwiniensis* to *Tandya* although it has only 10 or 11 (vs 12) dorsal-fin spines (Table 7). Five Australian species differ from all others in having the combination of 12 dorsal-fin spines and 12 or 13 precaudal vertebrae and thus could be classified as species of *Tandya*, but for reasons discussed below I do not believe recognition of the genus is warranted.

While most *Opistognathus* species typically have 11 dorsal-fin spines and 10 precaudal vertebrae, five species (*O. inornatus*, *O. papuensis*, *O. latitabundus*, *O. reticeps*, and *O. reticulatus*) typically have 12 spines (Table 7) and also have 12 or 13 precaudal vertebrae (Table 10). The only two species with 11 precaudal vertebrae (*O. dendriticus* and *O. pholeter* n.sp.) have 10 or 11 dorsal-fin spines, and almost certainly are not closely related to the preceding species. More dorsal-fin spines and precaudal vertebrae could have evolved in tandem in the ancestor that gave rise to the species assigned by some authors to *Tandya*, but the lack of character state concordance in *O. darwiniensis* leads me to retain all of them in an *Opistognathus* "catch-basket," pending independent corroborative evidence of monophyly. In addition to having a unique combination of dorsal-fin spines and precaudal vertebrae numbers, *O. darwiniensis* is exceptional in having two lateral lines (Fig. 15), but autapomorphic character states cannot be used to infer relationships and the recognition of a monotypic genus seems unwarranted and premature.

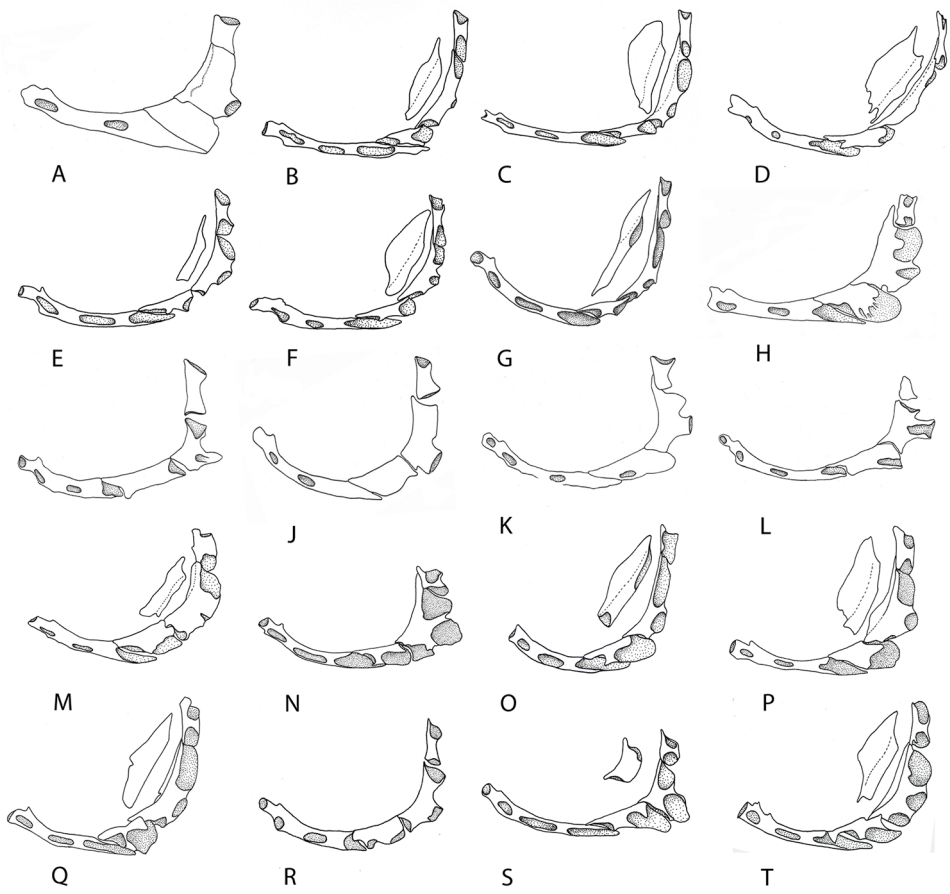

FIGURE 17. Lateral views of left infraorbitals (not drawn to scale) excluding the dorsalmost infraorbital (= dermosphenotic) in selected species of *Opistognathus*, 3rd infraorbital sometimes rotated in dorsal view and SL mm lengths in parentheses: **A**, *O. castelnaui*, CSIRO H.6442-02 (112.4); **B**, *O. darwiniensis*, ANSP 153655 (72.7); **C**, *O. dendriticus*, CAS-SU 27366 (99.7); **D**, *O. eximius*, ANSP 137474 (153); **E**, *O. latitabundus,* ANSP 137972 (90.7); **F**, *O. papuensis*, ANSP 137476 (152); **G**, *O. reticeps,* NTM S.10718-032 (63.7); **H**, *O. reticulatus*, USNM 396705 (86.5); **I**, *O. erdmanni* n.sp., WAM P.33073-009 (38.8); **J**, *O. flavidus* n.sp., KAUM-I. 70089 (71.0); **K**, *O. iyonis*, ANSP 148087 (63.8); **L**, *O. megalops* n.sp., KAUM-I. 97065 (88); **M**, *O. jacksoniensis*, ANSP 137475 (141.5); **N**, *O. longinaris*, SAIAB 39747 (41.0); **O**, *O. margaretae*, SAIAB 149352 (50.7); **P**, *O. muscatensis*, SAIAB 7602 (133); **Q**, *O. nigromarginatus,* ANSP 143892 (122); **R**, *O. pardus*, CMFRI GB.31.104.1.2 (98.8); **S**, *O. pholeter* n.sp., ANSP 142962 (45.5); **T**, *O. randalli*, BPBM 34567 (83.5).

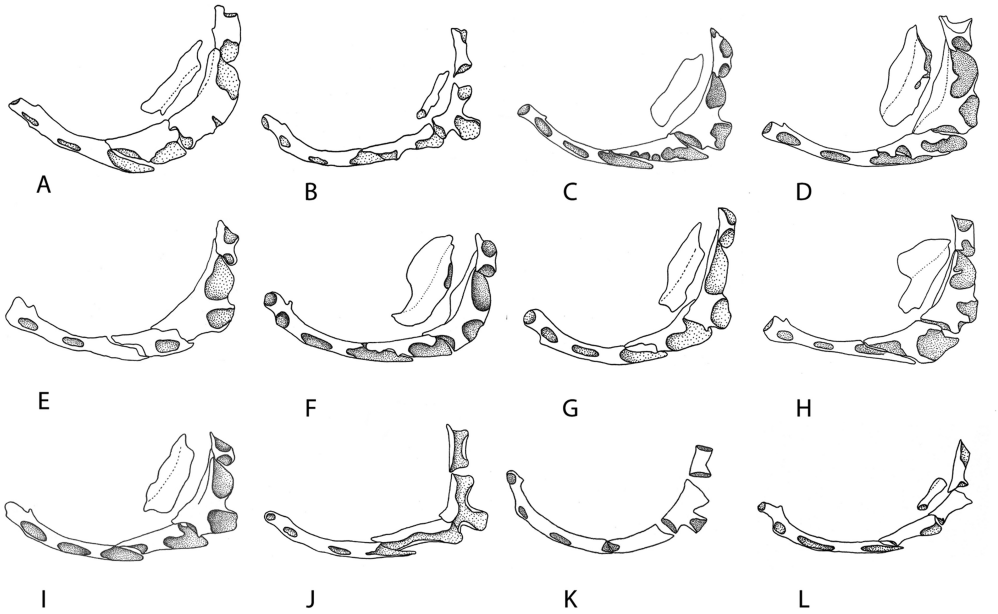

FIGURE 18. Lateral views of left infraorbitals (not drawn to scale) excluding the dorsalmost infraorbital (= dermosphenotic) in selected species of *Opistognathus*, 3rd infraorbital sometimes rotated in dorsal view and SL mm lengths in parentheses: **A**, *O. rosenbergii*, WAM P.30959-014 (116.9); **B**, *O. rufilineatus*, WAM P.32802-001 (56.1); **C**, *O. seminudus*, ANSP 142950 (55.0); **D**, *O. simus* ANSP 167418 (49.2); **E**, *O. solorensis*, WAM P. uncat., Brunei, (47.8); **F**, *O. stigmosus*, WAM P.29641-001 (62.5); **G**, *O. triops* n.sp., USNM 327793 (37.2); **H**, *O. variabilis*, BPBM 34567 (83.5); **I**, *O. verecundus*, ANSP 167416 (36.9); **J**, *O. vigilax* n.sp., USNM 122413 (31.0); **K**, *O. helvolus* n.sp., NTUM 13711 (39.8); **L**, *O. wassi* n.sp., ANSP 157683 (35.5).

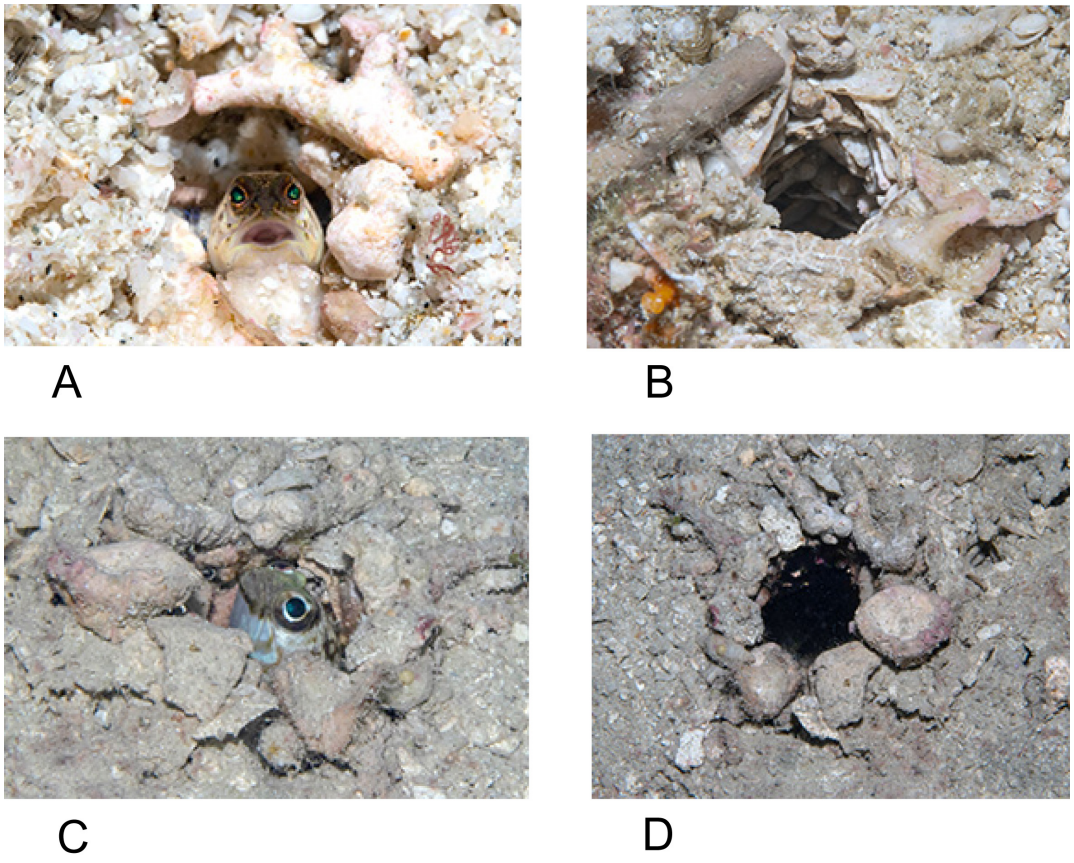

FIGURE 19. *Opistognathus* burrows with fish at entrance and withdrawn into burrow: A–B, *O. hyalinus* n.sp.; C–D, *O. wassi* n.sp. Photos by M.V. Erdmann.

FIGURE 20. *Opistognathus randalli* males engaged in a territorial dispute. Photo by W. Tan, after Tan (2007).

Relationships and phylogeny

A phylogenetic analysis of jawfishes is not attempted here, in part, because this study treats only Indo-West Pacific species, including only one of the four currently recognized genera of the family, and a plausible opistognathid sister group has not yet been identified (see discussion in Gill & Mooi 1993:332–333). However, opistognathids differ from all other fish families in having a unique arrangement of pelvic-fin rays (see above diagnosis). Tissue samples are unavailable for many species of jawfishes precluding a meaningful molecular hypothesis. Jordan & Snyder (1902:492) first proposed that the Opistognathidae and Pseudochromidae are "very closely related." Regan (1913) defined the family, recognizing three genera, *Gnathypops*, *Stalix*, and *Opistognathus* and included them in his Division 10, Trachiniformes. Berg (1940) included four families Opistognathidae, Owstoniidae, Bathymasteridae and Mugiloididae in the superfamily Trachinoidae. Gosline (1968) suggested a close relationship between the Acanthoclinidae (= subfamily of Plesiopidae) and Opistognathidae and postulated they are basal blennioids. Among a group of "serranoid" fishes with disjunct lateral lines, Böhlke (1960) listed the Grammatidae, Acanthoclinidae, Plesiopidae, Pseudochromidae, Pseudogrammidae and Pseudoplesiopidae. Springer *et al.* (1977) added the Opistognathidae to the list of families with "disjunct lateral lines" and noted several other specializations shared by these families: fewer than seven branchiostegals, anterior and posterior ceratohyals sutured together, hypurals 1 and 2 fused together and hypurals 3 and 4 fused to each other and to the urostyle. Mok *et al.* (1990) hypothesized a clade of three families (Pseudochromidae (Grammatidae + Opistognathidae)) with the latter two families as a sister group based on two synapomorphies: the first, presence of separate A1 and A2 sections of the adductor mandibulae. They also noted that these and several other so called "pseudochromoids" have a reduced number of olfactory lamellae and a ventrolateral spur on the cleithrum, but both characters are widely distributed among perciforms. In his phylogeny of the Plesiopidae, Mooi (1993) found no evidence to support the phylogenetic hypothesis of Mok *et al.* (1990). Gill and Mooi (1993) discussed why the adductor mandibulae arrangement is nonhomologous in the two families. In opistognathids the $A1_{\beta}$ section of the adductor mandibulae originates medial rather than lateral (Fig. 3) to the levator arcus palatini (Lap) in contrast to the Grammatidae where the position of these two muscles is reversed. Another proposed synapomorphy of Mok *et al*. (1990) linking grammatids and opistognathids, epaxialis muscles attached to dorsal-fin pterygiophores, is relatively common in perciform fishes, and the arrangement of these muscles in the Grammatidae and Opistognathidae clearly differs (Mooi & Gill 1995). These authors also commented "our continuing studies on the phylogenetic positions of the Grammatidae, Opistognathidae and other pseudochromoid families have failed to provide corroborating evidence for a sister-group relationship between the Grammatidae and Opistognathidae." Opercular spine flattened and fimbriate is another character of opistognathids absent in pseudochromoids. Mooi (1993:284) noted that plesiopids are "unusual among percoid families in having demersal eggs with adhesive filaments," then considered to be characteristic of only four other percoid families: Acanthoclinidae, Grammatidae, Opistognathidae, and Pseudochromidae." Subsequently, Gill & Mooi (1995) noted

that other perciforms, e.g., blennioids and gobioids, are also known to have demersal eggs with filaments and might be related.

Mooi (1990) examined the egg surface morphology of pseudochromoids and other families, but because of uncertainty in determining homology and polarity of character states he was unable to hypothesize phylogenetic relationships. He noted that differences in filament attachment and other egg surface characteristics in the Grammatidae and Opistognathidae suggest that the conditions in the two families are not homologous, and that while all opistognathids are mouth brooders, reports of such behavior in *Gramma loreto* Poey, 1868 are unreliable and probably erroneous. Wainwright *et al.* (2012) named a large molecular based clade of percomorph fishes the "Ovalentaria". In the appendix of that paper (entitled *Phylogenetic Definition of Ovalentaria*) coauthors Smith and Near gave as the official diagnosis, "species in the clade have demersal eggs with adhesive filaments extending from the egg surface." There is no evidence that this condition is homologous among the myriad component families, and as noted above, where it has been investigated, there is evidence to the contrary. Springer & Johnson (2004) described the dorsal gill-arch musculature (DGM) of over 200 families of teleostome fishes including one opistognathid, *Lonchopisthus higmani* Mead, 1959. In an appendix of the same study, Springer and Orrell presented a phylogenetic parsimony analysis based almost exclusively on DGM and gill-arch skeletal characters of 147 acanthomorph families. Their cladistic analysis had the Grammatidae, Opistognathidae, Gerreidae, and Pseudochromidae consisting of separate stepwise basal clades in a series of 20 other families all included in one of four major clades, with the Plesiopidae and Opistognathidae each included in different major clades.

A phylogenetic analysis based on 10 nuclear genes (Wainwright *et al.* 2012) revealed a well-supported clade containing Grammatidae, Opistognathidae, Gobiesocidae, and Blennioidei with 100% bootstrap values but reliability of the molecular phylogeny should be viewed with caution considering the limited infrafamilial taxon sampling involved. Based on most of the same molecular data, Betancur-R *et al.* (2017) and Hughes *et al.* (2018) also concluded that opistognathids are sister to a clade containing the Gobiesociformes and Blenniiformes. However, I know of no convincing anatomical features that support such a hypothesis. Springer (1993) gave a detailed comparison of the six families he recognized in the Blennioidei but excluded the Opistognathidae. Pending more definitive character evidence the sister group of the Opistognathidae remains uncertain.

Adults of most species of *Opistognathus* can be identified by color pattern alone, and for some species pairs color pattern similarities combined with cephalic pore patterns and infraorbital features would seem to reflect their close phylogenetic relationships. As discussed in the individual species accounts, several allopatric sister-species or species groups are hypothesized as follows: *O. decorus-aurolineatus*, *O. macrolepis-evermanni*, *O. bathyphilus-O. biporus*, and *O. solorensis-verecundus*.

Key to Indo-West Pacific species of *Opistognathus*

1 Posterior end of upper jaw with a flexible lamina (Fig. 4), but lamina weakly developed in *O. adelus* 2
- Posterior end of upper jaw rigid, without a flexible lamina 14

2 Spinous dorsal fin with prominent ocellus or dark spot 3
- Spinous dorsal fin without a prominent ocellus or dark spot 7

3 Dorsal fin with ocellated spot between spines 3 or 4–8 followed by two large, irregular blotches that extend on to body; outermost segmented pelvic-fin ray tightly bound to adjacent ray, and interradial membrane not incised distally or only slightly at tip (Persian Gulf, Socotra, Seychelles, and East African coast) . . . . . *O. muscatensis*
- Color pattern not as above; outermost segmented pelvic-fin rays not tightly bound to adjacent ray, and interradial membrane distinctly incised distally 4

4 Upper jaw rounded posteriorly with large oval supramaxilla (Fig. 10D); nape largely without pores (Fig. 10D); no pair of pale basicaudal spots; anal-fin spines 2; 4th mandibular pore position with a single pore (Korea and Japan) . . . . . *O. iyonis*
- Upper jaw of adults sword-shaped with relatively elongate supramaxilla (Fig. 4A); nape mostly covered with pores; pair of pale basicaudal spots present; anal-fin spines 3; 4th mandibular pore position with 2–8 pores 5

5 Inner lining of upper jaw and adjacent membranes with a single conspicuous black stripe that touches ventral margin of maxilla for most of its length; total gill rakers 36–45; scale rows in horizontal series 68–95 (Persian Gulf, Red Sea and western Indian Ocean to South China Sea) . . . . . ….... *O. nigromarginatus*
- Inner lining of upper jaw and adjacent membranes not as above; total gill rakers 27–33; scale rows in horizontal series 48–69 6

6 Inner lining of upper jaw and adjacent membranes with one dark stripe; area above and below esophageal opening unpigmented; lateral-line terminus below segmented rays 6–7 (southern India) …… *O. ensiferus*

- Inner lining of upper jaw and adjacent membranes with two dark stripes; area above and below esophageal opening darkly pigmented and continuous between innermost pair of upper pharyngeal tooth plates; lateral-line terminus below segmented rays 1–4 (widely distributed Indo-West Pacific, excluding Indian Ocean) …. . . . . *O. solorensis*

7 Scale rows in horizontal series 39–60 8
- Scale rows in horizontal series 69–110 10

8 Dorsal- and anal-fin segmented rays 11; caudal vertebrae 16 (Japan) . . . . . *O. megalops*, n.sp.
- Dorsal- and anal-fin segmented rays 13–15; caudal vertebrae 17–18 9

9 Upper jaw with large oval supramaxilla (Fig. 4B); anal-fin spines 2; inner lining of upper jaw and adjacent membranes with posterior black blotch and inside of mouth pale; anterior naris with well-developed cirrus on posterior rim (South Africa and northwest Madagascar) . . . . . *O. adelus*
- Upper jaw with elongate supramaxilla; anal-fin spines 3; inner lining of upper jaw and adjacent membranes with 2 brownish stripes (best developed in adult males) and pair of slightly separated dark blotches behind upper pharyngeal tooth plates; anterior naris a short tube with posterior rim longer (northern Australia) . . . . . *O. verecundus*

10 Dentary anteriorly with a wide tooth patch that extends downward outside of mouth; inner lining of upper jaw and adjacent membranes with 2 dark stripes (except only 1 or no stripe in Australian specimens); dark pigment adjacent to esophageal opening; large species attains 242 mm SL, smallest adult examined 112 mm SL (n = 33); scale rows in horizontal series 90–110 (Ryukyu Is., Okinawa, Philippines, Malaysia, Indonesia, and eastern Australia) . . . . . *O. castelnaui*
- Dentary anteriorly without a wide tooth patch that extends downward outside of mouth; inner lining of upper jaw and adjacent membranes with a single dark stripe or blotch (stripe sometimes very reduced in melanistic males of *O. variabilis*); dark pigment present or absent adjacent to esophageal opening; moderate size species, largest adult examined 116 mm SL; scale rows in horizontal series 69–96 11

11 In life, dorsal part of iris golden; caudal fin with narrow pale (blue in life) margin; lateral-line terminus below segmented dorsal-fin rays 2 or 3; lower limb gill rakers 22–26 (rarely 22); caudal vertebrae 18 (Indonesia and Philippines) . . . . . *O. randalli*
- In life, eye color not as above; caudal fin without narrow pale margin; lateral-line terminus below segmented dorsal-fin rays 3–8, rarely below ray 3; lower limb gill rakers 19–24; caudal vertebrae 19–20 (except 18 in all 9 specimens of *O. variabilis* from northern Palawan, Philippines) 12

12 Caudal fin banded, spotted or completely dark; dark blotches often present on body mid-laterally; lateral-line terminus below segmented dorsal-fin rays 3–6, typically 4–5 (Maldive Is. to Okinawa and Palau) …… *O. variabilis*
- Caudal fin uniformly pale; no dark blotches on body mid-laterally; lateral-line terminus below segmented dorsal-fin rays 6–8 13

13 Upper jaw rounded posteriorly, with only a slight flexible lamina; dorsal-fin spines moderately stout and straight without curved flexible tips; in life, opercle with prominent blue spots or blotches and caudal fin bright yellow (Andaman Sea and Bali) . . . . . *O. cyanospilotus*
- Upper jaw sword-shaped posteriorly, with well-developed flexible lamina; dorsal-fin spines slender and slightly curved distally with flexible tips; in life, opercle without blue spots or blotches and caudal fin white (Andaman Is.) . . . *O. albicaudatus*

14 Dorsal-fin spines 12–13; precaudal vertebrae 12–13 15
- Dorsal-fin spines 10–11 (except 12 spines in 1 of 8 specimens of *O. decorus* and in 1 aberrant specimen of *O. trimaculatus*); precaudal vertebrae 10–11 (except typically 12 in *O. darwiniensis*, which is unique in having two lateral lines) 19

15 Dorsal fin with 4 or 5 large, dark blotches that extend onto dorsum; lateral-line terminus below dorsal-fin spine 10 to segmented ray 5; scale rows in horizontal series 56–80 16
- Dorsal fin pigmentation not as above; lateral-line terminus below segmented dorsal-fin rays 6–13; scale rows in horizontal series 78–128 17

16 Dorsal fin with 5 dark blotches, the first blotch only on base of fin; much of inner surface of mouth, and skin connecting dentary and maxilla (hidden from view when mouth is closed) darkly pigmented; dorsum of head uniformly pigmented; total gill rakers 23–24; vertebrae 13+19–21 (northern Australia and southern Papua New Guinea) . . . . . *O. latitabundus*
- Dorsal fin with 4 dark blotches, the first two blotches extending onto distal half of fin; inner surface of mouth, and skin connecting dentary and maxilla pale; dorsum of head reticulated; total gill rakers 26–29; vertebrae 12+19 (northern Australia) . . . . . *O. reticeps*

17 Body with pale reticulate network enclosing irregular tan blotches, each of which has one to several small dark brown spots; pectoral–fin base (both laterally and mesially) with conspicuous dark spot about half diameter of eye; anal and pelvic fins white; precaudal vertebra 13 (northwestern Australia) . . . . . *O. reticulatus*
- Body with none to many dark spots on an otherwise uniformly pigmented body; pectoral–fin base not pigmented as above, either unmarked or typically with tiny spots; pelvic and anal fins usually brownish, the anal fin with or without small spots; precaudal vertebra 12 18

18 Body with numerous small, dark spots, especially on top of head; pectoral fin with several to many tiny spots (Queensland to Darwin, Australia) . . . . . *O. papuensis*
- Body spots relatively large and sparse, absent on top of head; pectoral fin typically unspotted or with few spots (Western Australia) . . . . . *O. inornatus*

19 Body with 2 separate lateral lines, the ventral one irregularly developed along lower side in region of anal-fin origin, often with one or more branches on belly; head covered with close-set, tiny, brown spots and pelvic fins usually strongly barred; precaudal vertebrae 12 or 13 (northwestern Australia) . . . . . *O. darwiniensis*
- Body with a single, dorsally positioned lateral line; color pattern not as above; precaudal vertebrae 10 or 11 20

20 Floor of mouth between dentaries and basihyal (“tongue”) dark brown (Fig. 99); lateral-line terminus below segmented dorsal-fin rays 12–18, usually 14 or 15; vomerine teeth 1–5 (eastern Australia) . . . . . *O. jacksoniensis*

- Floor of mouth between dentaries and basihyal pale (except oral membrane dark in *O. longinaris*); lateral-line terminus in advance of segmented dorsal-fin ray 11 (except below rays 13–17 in *O. alleni*); vomerine teeth present or absent 21

21 Segmented dorsal- and anal-fin rays 13-16 and 17–20, respectively; caudal vertebrae 22–25 22
- Segmented dorsal- and anal-fin rays each 10–12 and 10-11; caudal vertebrae 16–19 28

22 Floor of mouth between dentaries and basihyal ("tongue") dark brown; pelvic fins mostly dark brown; tentacle on anterior naris very long, at least 4 times maximum diameter of posterior naris; anal-fin spines 3 (southern Africa) . . . . . *O. longinaris*
- Floor of mouth between dentaries and basihyal pale; pelvic fins pale; tentacle on anterior naris about 0.5–2.0 times maximum diameter of posterior naris; anal-fin spines 2 23

23 Lateral-line terminus below segmented dorsal-fin rays 13–17; scale rows in horizontal series 21–31; body naked anterior to a vertical below segmented dorsal-fin rays 6–9 (western Australia) . . . . . *O. alleni*
- Lateral-line terminus below segmented dorsal-fin rays 4–11; scale rows in horizontal series 35–51; body naked anterior to a vertical below dorsal-fin spines 4 to segmented ray 7 24

24 Spinous dorsal fin with an oblong black spot (partially encircled by narrow white border) between spines 3–6 that extends slightly onto dorsum; sides of body uniformly pigmented; anal fin mostly uniform brown except for narrow, pale basal stripe bordered by a narrower dark stripe; dorsal-fin spines 11 (Elizabeth Reef) . . . . . *O. elizabethensis*
- Spinous dorsal fin pigmentation not as above; sides of body with a series of large pale spots; anal fin mostly pale except for narrow dark submarginal stripe; dorsal-fin spines usually 10 (except 11 in *O. triops*) 25

25 Spinous dorsal with an ocellus between spines 2–7; dorsal fin XI, 17–18; lateral-line terminus below segmented dorsal-fin rays 3–5; vomerine teeth 2-3; 4th mandibular pore position occupied by a single pore (Vanuatu and Tonga Archipelago) . . . . . *O. triops*, n.sp.
- Spinous dorsal fin without an ocellus; dorsal fin IX or X, 19–21; lateral-line terminus below segmented dorsal-fin rays 5–11; vomerine teeth absent (except 1–3 in *O. pholeter*); 4th mandibular pore position occupied by 1–5 (rarely 1) pores 26

26 Vomerine teeth 1–3; tentacle on anterior naris short, usually not extending behind posterior naris when depressed; caudal-fin rays typically with relatively narrow dark bands that give fin a speckled appearance; belly squamation varying from completely naked to posterior 2/3 scaly; precaudal vertebrae 11 (New Caledonia and Loyalty Islands) . . . . . *O. pholeter*, n.sp.
- Vomerine teeth absent; tentacle on anterior naris long, extending distinctly behind posterior naris when depressed; caudal-fin rays with slightly broader and paler bands that do not give fin a speckled appearance; belly with posterior 2/3 to 3/4 scaly; precaudal vertebrae 10 27

27 Pectoral-fin base immaculate except for a small brown spot adjacent to bases of several rays on upper half of fin; lateral body scales not pigmented so they appear to form well-defined dark, horizontal rows separated by narrow pale interspaces; a few conspicuous small, black spots present on body (Great Barrier Reef) . . . . . *O. stigmosus*
- Pectoral-fin base with a dark crescent, shaped like a reversed letter "C", that extends from opercular margin dorsally and curves downward opposite bases of pectoral rays to near ventral margin of fin (area inside crescent appears as a large white spot); lateral body scales pigmented so they appear to form well-defined dark, horizontal rows that are separated by narrow pale interspaces; no conspicuous small, black spots present on body (Philippines, Indonesia, and Solomon Islands) . . . . . *O. albomaculatus*, n.sp.

28 Body with 7 evenly spaced dark bands, the 1st band on nape, bands 2–6 extend onto dorsal fin and 7th band encircles caudal peduncle (South China Sea and Timor) . . . . . *O. hongkongiensis*
- Body coloration not as above 29

29 Head with broad pale band extending across nape from upper jaw; total gill rakers 40–46 (Japan, Taiwan, and Fiji) . . . . . *O. hopkinsi*
- Head without a pale band extending across nape from near posterior end of jaw; total gill rakers 22–35 30

30 Body scales densely speckled with large melanophores (western Pacific, including Philippines and Japan) . . *O. parvus*, n.sp.
- Body scales not densely speckled with large melanophores 31

31 Dorsal, anal, and caudal fins mostly black with one or two pale stripes or bands 32
- Dorsal, anal, and caudal fin coloration not as above 33

32 Dorsal and anal fins each with two pale stripes; middle of caudal fin with a pale band; nape naked; pelvic fins bicolored, dark except for pale unbranched outer two rays and interradial membrane; minute lappets absent on outer margin of upper lip anteriorly (Bay of Bengal, Japan, South China Sea, and Philippines) . . . . . *O. evermanni*
- Dorsal and anal fins each with one pale stripe; anterior fourth of caudal fin with a pale band; posterior half of nape scaly; pelvic fins uniformly dark; minute lappets present on outer margin of upper lip anteriorly (southeast India, southern Papua New Guinea, and gulfs of Thailand and Carpentaria) . . . . . *O. macrolepis*

33 Opercle with a conspicuous dark spot; scales on belly minute and distinctly embedded; scale rows in horizontal series 80–99 (eastern Australia) . . . . . *O. eximius*
- Opercle without a conspicuous dark spot; scales on belly, if present, small to moderate and not distinctly embedded; scale rows in horizontal series 38–69 (except 66–95 scale rows in *O. dendriticus*) 34

34 Head mostly covered with small, irregularly shaped, dark spots; outermost segmented pelvic-fin rays tightly bound to adjacent ray, and interradial membrane not incised distally (southwest India) . . . . . *O. pardus*
- Head color pattern not as above; outermost segmented pelvic-fin rays not tightly bound to adjacent ray, and interradial membrane distinctly incised distally 35

35 Middle of caudal fin with conspicuous white ringed partial ocellus; in life, pelvic fins yellow (Japan). . . . . *O. ocellicaudatus*
- Middle of caudal fin without a white ringed ocellus; in life, pelvic fins not yellow (except in O. *helvolus*) 36

36 Body with 3–7 prominent stripes; lower limb gill rakers 27–30 37
- Body without stripes as above; lower limb gill rakers 11–27 (exceptionally 27 in *O. hyalinus*) 38

37 Head with prominent dark blotches and a narrow interorbital band; in life, body with 5–7 violet stripes (Okinawa and Sulawesi) . . . . . *O. decorus*
- Head without dark blotches or a narrow interorbital band; in life, body with 3 golden-orange stripes (New Caledonia) . . . . . *O. aurolineatus*, n.sp.

38 Scales above lateral line on side of nape anterior to dorsal-fin origin; spinous dorsal fin with prominent ocellus 39
- No scale rows above lateral line on side of nape anterior to dorsal-fin origin (except in holotype of *O. asper* which has dorsal fin with 4 or 5 dark blotches); spinous dorsal fin with or without an ocellus 40

39 Segmented dorsal and anal fin rays 11; nape and cheek without scales; orbit diameter 10.0% HL; anterior margin of upper lip dark (Basilan Strait, Philippines) . . . . . *O. challenger*, n.sp.
- Segmented dorsal and anal fin rays 10; nape and cheek with scales; orbit diameter 13.8% HL; anterior margin of upper lip pale (Coral Sea east of New Caledonia) . . . . . *O. helvolus*, n.sp.

40 Chin with wide black band; lower limb and total gill rakers 23–26 and 33–37, respectively; horizontal body scale rows 51–62 (western Pacific, including Japan, Philippines, and Samoa) . . . . . *O. wassi*, n.sp.
- Chin with black band absent or narrow; lower limb and total gill rakers 17–21 and 26–32, respectively; horizontal body scale rows 39–43 41

41 Shoulder above pectoral-fin base with a dark spot approximately equal pupil diameter; anterior naris a moderately elongate tube without a cirrus (Brunei, Bali, West Papua, Philippines, Timor–Leste, and Queensland, Australia) . . . . . *O. vigilax*, n.sp.
- Shoulder above pectoral-fin base without a dark spot approximately equal pupil diameter; anterior naris short with a small cirrus 42

42 Dorsal fin with wide tan stripe that extends almost to distal margin of spinous fin and then tapers posteriorly to near base of last ray; scale rows on body appearing to form series of narrow stripes (faint or absent in some specimens of *O. hyalinus*) 43
- Dorsal fin without wide tan stripe as above; scale rows on body never appearing to form series of narrow pale stripes) . . 45

43 Dorsum with 4–5 dark blotches that extend onto dorsal fin; lower limb and total gill rakers 19–21 and 29–31, respectively; supraneurals absent (Myanmar, Mergui Archipelago) . . . . . *O. erdmanni*, n.sp.
- Dorsum without dark blotches that extend onto dorsal fin; lower limb and total gill rakers 22–26 and 33–39, respectively; supraneurals 1 or 2 44

44 Posterior infraorbital-pore positions occupied by multiple pores and preopercular pore positions bi-pored (Fig. 9C); infraorbitals (Fig. 18B) slender and tubular, 3rd infraorbital with short posterolateral projecting arm ending with large sensory canal opening; 2 supraneurals (Papua New Guinea and northwestern Australia) . . . . . *O. rufilineatus*
- Posterior infraorbital pore positions and preopercular pore positions occupied by single pores (Fig. 10A); infraorbitals trough-like, open laterally (Fig. 16S); 1 supraneural (Andaman Islands, Borneo, Indonesia, and Philippines) . . . . . *O. hyalinus*, n.sp.

45 Dorsal fin with dark stripe (grey or blue in life) along entire base of dorsal fin with remainder of fin pale (yellow in life); caudal and anal fins completely pale (in life yellow) (Japan and Taiwan) . . . . . *O. flavidus*, n.sp.
- Dorsal fin without a dark stripe along entire base of fin as above; caudal and anal fins not pigmented as above 46

46 Dorsal fin with 3 distinctly oval dark spots superimposed on a wide tan stripe; head uniformly pigmented (Japan) . . . . . *O. trimaculatus*
- Dorsal fin without 3 oval dark spots as above; head pigmentation variable, uniform to mottled or with spots 47

47 Dorsal fin with a single small black spot between spines 6–7 superimposed on narrow proximal tan stripe, with remainder of fin unpigmented (Taiwan) . . . . . *O. microspilus*
- Dorsal fin color pattern not as above 48

48 Dorsal fin uniformly peppered with fine melanophores including a dark spot between spines 3–6; in life, sides tan with 5 or 6 narrow white zig-zag bands and anal and pelvic fins uniformly peppered with fine melanophores (Taiwan) . . . . . *O. nigripinnis*, n.sp.
- Color pattern not as above 49

49 Dorsal fin with dark blotches interspaced by sharply defined pale areas approximately as wide as the blotches and blotches 2–4 with a small pale spot centered on their distal margins; cheeks mottled and primarily consisting of small pale spots (Maldive Islands) . . . . . *O. crassus*
- Dorsal fin dark blotches, if present, not as above; cheeks in most species without small pale spots) 50

50 Cheeks with a few small dark spots or blotches and sometimes with narrow dark oblique lines 51
- Cheeks without dark spots or blotches and or spinous dorsal fin with an anterior ocellus (*O. seminudus* and *O. margaretae*) or blotch (*O. dendriticus*) 54

51 Dark blotches along dorsum extend very slightly onto spinous dorsal fin; preopercle pore positions with single pores except dorsalmost bipored (Japan) ……. . . . . *O. liturus*
- Dark blotches along dorsum extend distinctly on to spinous dorsal fin; preopercular pore positions bipored 52

52 Total gill rakers 33–34; nape without dark blotch slightly in front of dorsal-fin origin (northwestern Australia). . . . . *O. asper*, n.sp.
- Total gill rakers 37; nape with dark blotch slightly in front of dorsal-fin origin 53

53 Postorbital-jaw length 27.3% head length; upper jaw extends 0.9 eye diameters behind posterior margin of orbit; posterior end of upper jaw narrower (Fig. 9A); anteriormost dorsal-fin blotch centered between spines 1–4; jaws with dark bands (northern end of Lord Howe Ridge) …….. . . . . *O. bathyphilus*, n.sp.
- Postorbital-jaw length 19.0% head length; upper jaw extends 0.6 eye diameters behind posterior margin of orbit; posterior end of upper jaw wider (Fig. 9B); anteriormost dorsal-fin blotch centered between spines 2–6; jaws without dark bands (Loyalty Islands) . . . . . *O. biporus*, n.sp.

54 Scale rows in horizontal series 28–36; lateral-line terminus below dorsal-fin segmented rays 7–11 (Great Barrier Reef) . . . . . *O. seminudus*
- Scales rows in horizontal series 39–66 (except 66–95 in *O. dendriticus*); lateral-line terminus below dorsal-fin segmented rays 2–7 55
55 Dorsum with 6 evenly spaced, large, dark blotches along base of dorsal fin that extend onto fin and end on caudal peduncle; row of 6 large white spots begins on body behind pectoral fin and ends on lower half of caudal peduncle; scale rows in horizontal series 66–95, usually >75 (Philippines and Sabah) . . . . . *O. dendriticus*
- Color pattern not as above; scale rows in horizontal series 39–66 56
56 Dorsal fin with 2–3 large black blotches on posterior half of fin that are partly encircled by wide white borders and sometimes with white spot at center (Nicobar Island specimens have dorsal-fin blotches centered with a white spot) (India, Thailand, South Vietnam, Andaman Islands, and Indonesia) . . . . . *O. rosenbergii*
- Dorsal fin coloration not as above 57
57 Spinous dorsal fin with a prominent ocellus (southern Africa and Madagascar) . . . . . *O. margaretae*
- Spinous dorsal fin without an ocellus 58
58 Segmented dorsal-rays 13–14; segmented anal-fin rays 12–14; vomerine teeth 2–3; lateral-line terminus below segmented dorsal-fin rays 2–4 (southern Africa) . . . . . *O. afer*
- Segmented dorsal-fin rays 15; segmented anal-fin rays 15–16; vomerine teeth absent; lateral-line terminus below segmented dorsal-fin rays 6–7 59
59 Caudal fin with pair of conspicuous pale basicaudal spots; no supraneurals (southern Red Sea) . . . . . *O. dipharus*
- Caudal fin without pair of pale basicaudal spots; one supraneural (St. Brandon Shoals) . . . . . *O. simus*

Species accounts

Opistognathus adelus Smith-Vaniz, 2010

Obscure Jawfish

Figures 5A, 14B, 16A, 37, 38; Tables 1–14

Opistognathus adelus Smith-Vaniz 2010:42, figs. 2A, 3A, 4–5, 6, 7A (type locality: Madagascar, Nosy Tanga, west coast of Nosy Bé, 13°23'S, 48°11'E; holotype SAIAB 49583, 47.0 mm SL). Fricke *et al.* 2018:162 (checklist of Madagascar fishes). Smith-Vaniz 2022:310, unnumbered fig., pl. 119 (description, distribution).

Material Examined. 6 specimens, 21.0–49.6 mm SL, all listed in the original description.

Expanded diagnosis. A species of *Opistognathus* having an upper jaw broadly rounded posteriorly with flexible lamina and large oval supramaxilla, extending 1.0–1.2 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 16A), relatively robust, 2nd and 3rd infraorbitals with large sensory canal openings, 3rd infraorbital with no suborbital shelf; dorsal fin XI, 13 or 14; anal fin III, 13–14; vertebrae 10+17 or 18; scale rows in horizontal series about 40–41; gill raker 9+15–16 in adults (except 6+14 in two juveniles, 21.0–23.0 mm SL); vomerine teeth absent; posterior angle of jaws and adjacent membranes with dark blotch that is visible externally; spinous dorsal fin without anterior ocellus or dark blotches; pelvic and anal fins dark, the latter with pale margin.

Comparisons. The shape of the upper jaw, especially the large oval supramaxilla (Fig. 14B), distinguishes *O. adelus* from all other Indian Ocean species of *Opistognathus*. All other species with an upper jaw having a flexible lamina posteriorly have more scale rows in horizontal series, 44–120 (vs. 40–41) and adults of all except *O. verecundus* have more total gill rakers, 27–44 (vs. 24–25).

Distribution. (Fig. 23) South Africa and northwest Madagascar in depths of 10–65 m.

Etymology. The specific epithet is from the Greek *adelos* (dim or obscure), in reference to the obscure phylogenetic relationships of this jawfish.

Remarks. The single South African specimen (SAIAB 39747), dredged in 65 m, differs from the five Madagascar specimens, collected in 5–10 m, in having one less caudal vertebra and one less segmented ray in both the dorsal and anal fins. This specimen is slightly larger than the others and has more mandibular pores. The following pore counts are for the 49.6 mm SL South African specimen, with left and right-side values in parentheses, followed by the range values (bilateral counts) for three largest, 46.2–48.9 mm SL, Madagascar specimens: 3rd mandibular position (2/3) 1; 4th position (5/4) 2–4; 5th position (18/16) 8–12. Because the number of pores increases with growth in species that typically have mandibular pore positions occupied by multiple pores, and considering the few available specimens, the apparent difference in number of pores is assumed to be within the normal range of variation. Specimens from the two localities have similar color patterns in preservation and are here considered to be conspecific.

Opistognathus afer Smith-Vaniz, 2010

African Jawfish

Figures 6A, 16B, 39, 40; Tables 1–14

Opistognathus afer Smith-Vaniz 2010:45, figs. 2B, 8–10 (original description: South Africa, Maputoland Reef, 2 km south of Kosi mouth, 26°54'S, 32°53'E; holotype SAIAB 39994, 41.2 mm SL). Smith-Vaniz 2022:310, unnumbered fig., pl. 119 (description, distribution).

Material Examined: 6 specimens, 21.7–41.3 mm SL, all listed in the original description.

Expanded diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking a flexible lamina posteriorly, extending about 0.5 to 0.75 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 16B) moderately slender and tubular with large sensory canal openings, 3rd infraorbital with slight suborbital shelf; dorsal fin XI, 13 or 14; anal fin III, 12–14; vertebrae 10+17 or 18; scale rows in horizontal series about 58–62; all mandibulopreopercular pore positions occupied by single pores; vomerine teeth 2 or 3; body with several rows of large white spots, abdomen covered with smaller white spots, and small, white, double spot on end of maxilla; dorsal fin with a dark submarginal stripe and spine tips with conspicuously pale fleshy tabs.

Comparisons. The color pattern of *O. afer* (Figs. 39, 40) readily distinguishes it from other Indian Ocean species of *Opistognathus* and it is also the only one of those species with vomerine teeth.

Distribution. (Fig. 23) Coastal areas from Mozambique and Kenya to South Africa in about 20–25 m.

Etymology. The specific epithet is from the Latin *afer* (African), in reference to the type locality.

Opistognathus albicaudatus Smith-Vaniz, 2011

Whitetail Jawfish

Figures 7A, 41, 42; Tables 1–14

Opistognathus albicaudatus Smith-Vaniz 2011:35, figs. 1–4 (original description: Andaman Islands, Fusilier Strait, 11°52.6'N, 93°3.13'E; holotype WAM P.3332–001, 94.8 mm SL). Allen & Erdmann 2012:352, color photo (brief description, distribution).

Material examined. 2 male specimens, 91.4–94.8 mm SL, listed in the original description

Expanded diagnosis. A species of *Opistognathus* having an upper jaw produced as a flexible lamina extending to or beyond rear margin of opercle (2.1–2.2 eye diameters behind posterior margin of orbit) in adult males; dorsal fin XI, 15; anal fin III, 15; vertebrae 10+18; gill rakers 11+20 or 21; scale rows in horizontal series about 72–75; in life, caudal fin uniformly white; inner lining of upper jaw and adjacent membranes with a single, conspicuous, black stripe; first gill arch with small dark blotches (8–11), with each blotch adjacent to a gill-raker base (Fig. 42).

Comparisons. The coloration of *Opistognathus albicaudatus*, especially the spotted gill arch and white caudal fin, is so distinctive that it is unlikely to be confused with any other species. Superficially it most closely resembles some long-jawed morphs of *O. variabilis*, but in addition to a different color pattern *O. variabilis* has more total procurrent caudal-fin rays (Table 9), 9–11 (vs. 6–7), and an unpored Y-shaped area is present in front of the first dorsal-fin spine (Fig. 7D) while that region of the head is completely covered with pores (Fig. 7A) in *O. albicaudatus*.

Distribution. (Fig. 24) Known only from Fusilier Strait in the Andaman Islands where found in 30–35 m.

Etymology. From the Latin *albus* (white) and *cauda* (tail).

Opistognathus albomaculatus, new species

Whitespotted Jawfish

Figures 16C, 43–45; Tables 1–15

Opistognathus species 1. Allen & Erdmann 2012:355, color photo (brief description, distribution).

Holotype. USNM 357198, holotype, 46.6 mm SL, Santa Cruz Islands, Duff I., SW of Temomoa Point, outer reef slope, 9°47'57"S, 167°05'16"E, 10–35 m, 24 Sep 1998, J. T. Williams, sta. SOL 98–30.

Paratypes. 20 specimens, 16.3–57.3 mm SL. **Philippines**: FMNH 118286 (9, 29.0–52.9) and USNM 396236 (6 , 40.5–57.3), Palawan Prov., off SE side of West Nalaut Island off western Busuanga, 12°27'N, 119°47.58'E, 10–15 m, gradual slope with rubble channel, Busuanga team, 11 Mar. 2003, sta. BUS 03–35; USNM 436245 (41.1), Oriental Mindoro, Puerto Galera off w. entrance to Manila Channel, 13°31'27"N, 120°56'44"E, 11–12 m, 12 Apr. 2015, J. T. Williams *et al.*, VERDE-379; USNM 320260 (50.2), Palawan Prov., NNE of Bararin Island (Cuyo I.), 10°52'42"N, 120°56'44"E, 0–17 m, Smithsonian team, 24 May 1978, Sta. SP 87–21; USNM 396246 (44.3) Palawan Prov., W. of Busuanga Island, 12°8.18'N, 119°31.96'E., 25–37 m, 13 Mar. 2003, Smithsonian team, Sta. BUS03–39. **Indonesia**: BPBM 32005 (16.3), Komodo Island, just E. of Toro Lin Point, 8°36'S, 119°31'6"E, 25–28 m, J.E. Randall and E. Clark, 16 Oct. 1987. **Solomon Islands**: ROM 42222 (41.6), Guadalcanal Island, Honiara, 2 km W. of Point Cruf Yacht Club, 21 m, P. Nichols and D. Evans, 4 May 1983, Sta. PN 83–02.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking flexible lamina posteriorly, extending 0.4–0.6 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 16C) relatively robust, 3rd infraorbital with very large sensory canal openings and moderate suborbital shelf; dorsal fin X, 19–21; anal fin II, 18–20; vertebrae 10+19; body with about 35–38 scale rows in horizontal series, scales absent anterolaterally forward of verticals from segmented dorsal-fin rays 5–7; vomerine teeth absent; body scale rows pigmented so they appear to form well-defined dark, horizontal rows that are separated by narrow pale interspaces; head and body with large white blotches, and pale median fins with brown stripe on outer half of spinous dorsal fin and middle of soft dorsal and anal fins; pectoral-fin base with dark crescent shaped like a reversed letter "C" that extends from dorsal margin of opercle and curves downward opposite bases of pectoral rays to near ventral margin of fin; iris with dark bars radiating from pupil.

Description. Dorsal fin X, 19–21; anal fin II, 18–20; pectoral fin 18 or 19; caudal fin: procurrent rays 3–5+3–5, segmented rays 8+7–8, middle 6–7+6–7 branched, total elements 22–24; hypural 5 absent; vertebrae: 10+23–25; last pleural rib on vertebra 10; epineurals 12; supraneurals absent; dorsal-fin interdigitation anterior pattern / / /1/1+1/1/; gill rakers 5–7 (rarely 5) +13–15 = 19–22.

Scales absent on head, nape, area above lateral line, body anterior to a vertical from dorsal-fin spines 5–7, pectoral-fin base, chest and anterior 1/4 of belly; scale rows in horizontal series about 35–48; lateral-line terminus below segmented dorsal-fin rays 5–9 (total element position (16.5–18.5); lateral-line pores numerous, arranged in multiple series above and below embedded lateral-line tubes; cephalic sensory pores very numerous, completely covering most of head, including all of predorsal area except a small area immediately adjacent to dorsal-fin origin; mandibular pore positions 1–3 occupied by relatively large, single pores, 4th position with 2 or 3 pores, 5th with 6–10 (Pores of small paratypes not counted.).

Anterior naris positioned about midway between posterior naris and dorsal margin of upper lip, and with a simple, flattened tentacle on posterior rim that when depressed reaches to or almost to margin of orbit; height of tentacle about 1.5 times maximum of diameter of posterior naris; dorsal fin low anteriorly gradually increasing in height posteriorly; profile relatively uniform with only a slight change in fin height at junction of spinous and segmented rays; dorsal-fin spines relatively short and straight, only slightly curved distally and without flexible tips; skin covering tips of spines with slightly swollen fleshy tabs; all segmented dorsal- and anal-fin rays typically branched distally; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally; posterior margin of opercle indistinct without a free margin; no crenulae on inner surface of lips; fifth cranial nerve passes under $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extends 0.4 to 0.55 eye diameters behind posterior margin of orbit; maxilla widest at end and truncate without flexible lamina posteriorly; supramaxilla present, small, and terminally positioned; premaxilla with an outer row of moderately large, sharply pointed, conical teeth that become progressively smaller and more closely spaced posteriorly and extend about 2/3 length of jaw; 2 or 3 irregular inner rows of much smaller conical teeth anteriorly, several slightly enlarged adjacent to premaxillary symphysis; dentary with an outer row of conical teeth, anterior teeth blunter and mid-lateral teeth largest; 2 or 3 inner rows of much smaller, blunt, conical teeth anteriorly, except some in innermost row slightly enlarged and canted backwards; vomerine teeth absent.

Measurements of the 57.3 mm SL holotype followed in parentheses by 8 paratypes, 40.5–55.2 mm, as percent of SL: predorsal length 30.9 (29.0–31.0); preanal length 57.1 (53.8–59.3); dorsal-fin base 68.8 (64.2–73.1); anal-fin base 37.9 (34.3–40.3); pelvic-fin length 23.5 (19.6–21.5); caudal-fin length 17.5 (18.5–22.0); depth at anal-fin origin 13.0 (13.2–17.3); caudal-peduncle depth 6.6 (6.9–8.1); head length 30.3 (30.2–33.4); postorbital-head length 18.2 (17.8–20.9); upper-jaw length 16.4 (14.9–17.1); postorbital jaw-length 5.0 (3.4–5.4); orbit diameter 9.6

(9.0–10.6). As percent of head length: postorbital-head length 60.2 (58.8–65.9); upper-jaw length 54.2 (46.6–54.3); postorbital-jaw length 16.4 (10.7–16.1); orbit diameter 31.7 (28.3–32.7).

Life coloration (Figs. 43, 44): Large irregular white spots on head, body and base of pectoral fin, mostly arranged in two horizontal rows; brown stripe on outer half of spinous dorsal fin and middle of soft dorsal and anal fins; dorsum with 8 or 9 evenly spaced dark blotches along base of dorsal fin; white spot on pectoral-fin base outlined with a dark crescent shaped like a reversed letter "C"; brown horizontal body scales with narrow pale dorsal and ventral margins giving the appearance of narrow stripes; iris red or yellow with radiating dark bars.

Color of adult in alcohol (based on ROM 42222, female): Body with 8–10 pale spots about half eye diameter in a horizontal row below lateral mid-line (1st 2 spots covered by depressed pectoral fin); another row of 8–9 less distinct spots on dorsum along dorsal-fin base that extend onto base of fin, those on body below soft dorsal fin consisting of only half spots; spaces between spots slightly darker than rest of body and appear as a series of narrow, dark blotches; body scales, excluding pale body spots and relatively light chest and venter, dark brownish with narrow pale dorsal and ventral margins which gives the visual effect of a series of slightly irregular, horizontal scale rows, the outlines of each row framed by narrow pale borders; dorsal and anal fins each with a narrow dark stripe bordered below and above by a pale stripe; the dorsal pale stripe restricted to the distal margin of the spinous dorsal fin but posteriorly much wider in both fins and overlain by a diagonal series of small, dark blotches; caudal fin with a pair of pale oblong, basicaudal spots separated by a dark intervening area, remainder of fin with several alternating dark and pale bands; pectoral and pelvic fins pale, except interradial membranes brownish near base of pelvic fin pectoral-fin base with a dark crescent shaped like a reversed letter "C" that extends from dorsal margin of opercle and curves downward opposite bases of pectoral rays to near ventral margin of fin (area inside crescent appears as a large pale spot aligned with the ventral row of pale body spots); a dark spot on humeral region of body slightly above pectoral-fin base accents a smaller, less distinct, pale spot between it and dorsal margin of dark crescent on pectoral-fin base; branchiostegal membranes dark along most of preopercular margin; head slightly mottled, paler below with a brownish blotch opposite posterodorsal margin of upper jaw, a smaller more intense spot behind orbital margin in the three o'clock position, and a pair of small but prominent dark spots on top of head (separated from each other by slightly more than 1/2 an eye diameter) located on a line midway between the posterodorsal orbital margins and the anterodorsal point of attachment of the opercle; in the interorbital region several pairs of dusky spots are present along the supraorbital rim; posterior end of upper jaw with 2 pale spots separated by narrow brown area; upper lip with dark, oblong blotch a little behind point where the maxilla begins to expand; inner lining of membrane connecting maxilla and dentary (hidden from view when mouth is closed) freckled with brown but no dark maxillary blotch or stripe as such; iris with dark bars radiating from pupil.

Comparisons. See Table 15. Only four other Indo-West Pacific species of *Opistognathus* agree with *O. albomaculatus* n.sp. in having 18 or more segmented anal-fin rays (Table 8); *Opistognathus stigmosus* is most similar to *O. albomaculatus* but lacks an inverted dark crescent on the pectoral-fin base and an inner maxillary blotch; *O. alleni* has fewer body scale rows in horizontal series, 21–31 (vs. 35–48) and lateral-line terminus below segmented rays 13–17 (vs. 7–11); *O. pholeter* n.sp., *O. triops* n.sp., and *O. elizabethensis* differ in having 1–3 vomerine teeth (vs. vomerine teeth absent), the latter two species further differ in typically having dorsal-fin spines 11 (vs. 10); in addition, *O. pholeter* n.sp. has more precaudal vertebrae 11 (vs. 10), *O. elizabethensis* lacks pale body spots and has a spinous dorsal fin with a partial ocellus (vs. no ocellus), and *O. seminudus* has fewer segmented anal-fin rays 14-15 (vs. 18-20) and caudal vertebrae 18 (vs. 23–25).

Distribution. (Fig. 25) Known from the Philippines, Indonesia (Komodo Island), Solomon, and Santa Cruz islands in about 10–35 m.

Etymology. The specific epithet is combination of the Greek *albo* (white) and *maculatus* (spotted) in reference to the double row of spots on the sides.

Remarks. The three specimens from Indonesia (Komodo Island), Guadalcanal and Santa Cruz islands differ from 18 specimens from the Philippines in having more caudal vertebrae 25 (vs. 23–24), segmented dorsal- and anal-fin rays 21, (vs. 19–21, only 1 with 21) and 19–20 (vs. 18–19), respectively. The color pattern of Philippine specimens differs primarily in having the head more conspicuously mottled, more dark spots along the orbital rims, including the postorbital area and interorbital regions, and the pelvic fin uniformly pale.

Opistognathus alleni Smith-Vaniz, 2004

Abrolhos Jawfish

Figures 16D, 46–48; Tables 1–15

Opistognathus sp. Allen & Swainston, 1988:126 color fig. 814 (brief diagnosis, common name "Abrolhos jawfish").

Opistognathus alleni Smith-Vaniz 2004:210, figs. 1, 2A, 3A, 4A (original description: western Australia, Houtman Abrolhos Archipelago, north end of Dicks Island, in Goss Passage, 28°30'S, 113°46'E; holotype WAM P.27590–030, 73.7 mm SL). Hoese & Bray 2001:1073 (synonymy, Australian distribution). Moore *et al.* 2008:38 (listed, type catalog).

Material examined. 40 specimens, 45.5–73.7 mm SL, all cited in the original description.

Expanded diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking flexible lamina posteriorly, extending 0.4–0.6 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 16D) moderately robust, 2nd and 3rd infraorbitals with large sensory canal openings, 3rd infraorbital with very slight suborbital shelf; dorsal fin X, 19 (rarely 20); anal fin II, 17–18; vertebrae 10+22, rarely 23; scale rows in horizontal series about 21–31; lateral-line terminus below segmented dorsal-fin rays 13–17; scales absent forward of verticals from segmented dorsal-fin rays 6–9; vomerine teeth 1–3; tips of dorsal-fin spines with pale fleshy tabs; dorsal fin with submarginal dark stripe and anal fin with a narrow, dark, submarginal stripe; belly with scattered white spots (Figs. 46, 47).

Comparisons. See Table 15. Only two other Australian species, *Opistognathus albomaculatus* and *O. stigmosus*, agree with *O. alleni* in typically having 10 dorsal-fin spines, 19–21 segmented rays and the tips of dorsal-fin spines with pale fleshy tabs. Both species differ from *O. alleni* in having more scale rows in horizontal series 38–48 (vs. 21–31), lateral-line terminus below segmented rays 5–9 (vs. 13–17) and no vomerine teeth (vs. 1–3 vomerine teeth). The allopatric *Opistognathus pholeter* has dorsal fin typically with 10 spines, 19–22 segmented rays and dorsal-fin spines with pale fleshy tabs but differs from *O. alleni* in having higher numbers of scale rows in horizontal series (38–45), lateral-line terminus below segmented rays 7–11 (vs. 13–17) and more precaudal vertebrae 11 (vs. 10).

Distribution. (Fig. 25) Endemic to central coast of Western Australia in 0.2 to 30 m.

Etymology. Named in honor of Dr. Gerald R. Allen whose publications have contributed significantly to knowledge of Indo-West Pacific fishes.

Opistognathus asper, new species

Ashmore Jawfish

Figures 5B, 16E, 49, 50; Tables 1–14, 16

Holotype. NMV A.29729–015, gravid female, 50.2 mm SL, northwestern Australia, vicinity of Ashmore Reef, 12°26'42"S, 123°36'03"E–12°26'58"S, 123°36'35"E, 95 m, beam trawl, D. J. Bray, 7 Jul. 2007, CMAR Cruise, sta. SS05/2007–188.

Paratypes. USNM 393589, male (42.0) and CSIRO H6597–008, ? sex (34.4), both formerly NMV A.29729-052, same collection data as holotype.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking flexible lamina posteriorly, extending about 0.7 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 16E) relatively slender and tubular, 3rd infraorbital with short posterolateral projecting arm ending with large sensory canal opening, no suborbital shelf; dorsal fin XI, 11–12; anal fin II, 10; vertebrae 10+16; total gill rakers 32–34; tips of dorsal-fin spines with conspicuous pale tabs; dorsum with a row of 5 dark blotches that extend distinctly onto dorsal fin; last blotch on dorsal fin at least as wide as anterior blotches; scale rows on body appear to form series of narrow dark stripes.

Description. (Counts for holotype given first with those of paratypes in parentheses if different.) Dorsal-fin rays XI, 11 (11–12); anal fin II, 10; pectoral fin 19; caudal fin: procurrent rays 4 (4–5); segmented rays 8+8 (8+8, 8+7), middle 11 (11–12) branched, total elements 24 (23–24); hypural 5 present; vertebrae: 10+16; last pleural rib on vertebra 10; epineurals 12; two supraneurals; dorsal-fin interdigitation anterior pattern S/S/1/1+1/1/; gill rakers 10 (10–11) + 23 (22–24) = 33 (32–34).

Scales absent on head, nape and chest; except area above lateral line anteriorly with 1 or 2 irregular rows of scales in holotype, same area naked in both paratypes, and pectoral-fin base scaly; scales rows in horizontal series about 42–44; lateral-line terminus below dorsal–fin spine 11 or segmented dorsal-fin rays 1–4, total element posi-

tion 12.0–15.0 (11.0); lateral-line pores mostly arranged in an irregular series along embedded lateral-line tubes; cephalic sensory pores relatively moderate (Fig. 5B); mandibular pore positions 1–4 occupied by single pores, 5th position either bipored (holotype) or with a single pore; most preopercular pore positions bipored.

Anterior naris positioned slightly closer to anterior margin of posterior naris than to upper lip and consisting of a short tube that when depressed does not reach margin of posterior naris; height of tube about equal maximum diameter of posterior naris; dorsal fin moderately low, slightly increasing height to about middle of spinous dorsal fin then slightly increasing in height; profile of fin gradually increasing in height posterior to junction of spinous and segmented rays; dorsal-fin spines moderately stout and straight, without curved, flexible tips; tips of dorsal-fin spines with conspicuous pale tabs; all except first one or two segmented dorsal- and anal-fin rays branched distally; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally; posterior margin of preopercle indistinct, without a free margin; no crenulae on inner surface of lips; fifth cranial nerve passes under $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extends about 0.7 to 0.75 eye diameters behind posterior margin of orbit; maxilla widest at end and rounded, without flexible lamina posteriorly; supramaxilla present, small and terminally positioned; premaxilla with an outer row of moderate conical teeth anteriorly, which become progressively smaller posteriorly; and an irregular inner row of smaller teeth anteriorly behind which are a couple of enlarged symphyseal teeth which are canted backward; dentary with an outer row of relatively small conical teeth anteriorly behind which is a single row of similar teeth followed by several irregular rows of inner symphyseal teeth, none enlarged; posteriorly dentary with a single row of about 7–10 small conical teeth, several middle ones slightly enlarged; vomerine teeth absent.

Measurements of the 50.2 mm female holotype followed in parentheses by the smaller 34.4 mm and then larger 42.0 mm paratype, as percent of SL: predorsal length 37.1 (40.8–36.9); preanal length 61.8 (66.9–64.5); dorsal-fin base 60.4 (64.2–60.0); anal-fin base 23.3 (27.8–24.4); pelvic-fin length 29.3 (33.7–35.2); caudal-fin length 30.2 (43.0–30.2); depth at anal-fin origin 25.4 (25.6–23.7); caudal-peduncle depth 13.7 (15.1–13.5); head length 37.2 (40.3–37.0); postorbital-head length 21.4 (21.2–20.6);orbit diameter 13.1 (13.5–12.3); upper-jaw length 25.2 (26.2–24.3). As percent of head length: postorbital-head length 57.4 (52.7–55.8); upper-jaw length 67.7 (65.0–65.6); postorbital-jaw length 26.2 (23.8–24.4); orbit diameter 35.1 (33.5–33.3).

Color in life (Fig. 49): Head light brown, becoming dull yellow on cheek and throat, with a few scattered dark spots or dashes smaller than pupil diameter; horizontal scale rows outlined to form narrow stripes; pectoral, pelvic, anal, and caudal fins yellow; dorsal fin with 4 or 5 proximal dark blotches superimposed on an indistinct tan stripe, remainder of fin mostly yellow except spinous dorsal fin with narrow brown distal margin.

Comparisons. See Table 16. *Opistognathus asper* agrees with the following apparently allopatric species in having rigid upper jaws, anal fin II, 10–11, dorsal fin with 4–6 dark blotches and scale rows on body often appearing to form a series of narrow horizontal stripes: *O. bathyphilus*, *O. biporus*, *O. erdmanni*, and *O. liturus*. *Opistognathus asper* differs from *O. erdmanni* and *O. liturus* in having dark blotches along dorsum extending well on to spinous dorsal fin (vs. dark blotches along dorsum extending only slightly on to spinous dorsal fin) and *O. erdmanni* also differs in lacking supraneurals absent (vs. two supraneurals); *O. biporus* and *O. bathyphilus* have nape with dark blotch slightly in advance of dorsal-fin origin (vs. nape without dark blotch) and more total gill rakers 37 (vs. 33–34).

Distribution. (Fig. 26) Known only from northwestern Australia in vicinity of Ashmore Reef where trawled in 95 m.

Etymology. The specific epithet, from the Greek *asper* (rough), is in reference to the irregular row of scales above the lateral line anteriorly in the holotype.

Opistognathus aurolineatus, new species

Threestripe Jawfish

Figures 8A, 16N, 51, 52; Tables 1–14

Opistognathus sp.1 Laboute & Grandperrin, 2000:385 (listed).
Opistognathus n.sp.1 Fricke *et al.* 2011:388 (listed in checklist of New Caledonia fishes).

Holotype. (only known specimen): MNHN 1991–362, gravid female, 224 mm SL, New Caledonia, 22°45’S, 167°10’E, trawled in 120–140 m, 16 May 1990, J. Rivaton.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking flexible lamina posteriorly, extending

about 0.9 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 16N) very broad and robust, 3rd infraorbital without suborbital shelf; dorsal fin XI, 12; anal fin II, 11; vertebrae 10+16; scale rows in horizontal series about 68 or 69; total gill rakers on first arch 39; in life, body with 3 golden stripes.

Description. Dorsal fin XI, 12; ana l fin II, 11; pectoral fin 19 (L) or 20 ; caudal fin: procurrent rays 4+4, segmented rays 8+8, middle 12 branched, total elements 24; hypural 5 present; vertebrae: 10+16; last pleural rib on vertebra 10; epineurals 17; two supraneurals; dorsal-fin interdigitation anterior pattern S/S/1/1+1/1/; gill rakers 12+27.

Scales absent on head, nape, area above lateral line, pectoral-fin base and chest; scale rows in horizontal series about 68 or 69; lateral-line terminus below segmented dorsal-fin rays 4–5 (total element position 15.5); lateral-line pores sparse, arranged in a single row centered above embedded lateral-line tubes; cephalic sensory pores sparse and minute (Fig. 8A); mandibular and preopercular pore positions all occupied by single pores.

Anterior naris positioned closer to posterior naris than to margin of upper lip, consisting of a short tube (with posterior rim longer) that when depressed does not reach margin of posterior naris; height of tube about 0.3 times maximum diameter of posterior naris; dorsal fin moderately low, gradually increasing in height to about middle of spinous dorsal fin; profile relatively uniform without a change in height at junction of spinous and segmented rays; dorsal-fin spines relatively robust and straight but slightly curved near tips; all except 1st segmented dorsal- and anal-fin rays branched distally; outermost segmented pelvic-fin ray not tightly bound to adjacent ray and interradial membrane incised distally; posterior margin of preopercle indistinct, without a free margin; series of small crenulae on inner surface of lips, best developed laterally, becoming frill-like on lower lip; fifth cranial nerve passes under $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extends about 0.9 eye diameters behind posterior margin of orbit; maxilla widest at end and rounded, without flexible lamina posteriorly; supramaxilla present, small and terminally positioned; premaxilla with an outer row of moderate canines anteriorly which become progressively smaller posteriorly and extend about 2/3 of jaw length; 3 very irregular series of smaller teeth and several symphyseal canines behind outer row anteriorly; dentary with an outer row of moderate canines, slightly larger anteriorly; 1–3 irregular series of slightly smaller teeth behind outer row on anterior half of dentary, those in innermost row hooked inward; vomerine teeth absent.

Measurements of the 224 mm holotype, as percent of SL: predorsal length 31.7; preanal length 67.1; dorsal-fin base 60.5; anal-fin base 24.9; pelvic-fin length 19.2; caudal-fin length 21.5; depth at anal-fin origin 23.7; caudal-peduncle depth 13.4; head length 35.7; postorbital-head length 22.3; upper-jaw length 23.3; postorbital-jaw length 10.5; orbit diameter 12.1. As percent of head length: postorbital-head length 62.5; upper-jaw length 65.5; postorbital-jaw length 29.4; orbit diameter 34.0.

Color in life (Fig. 51): Background coloration purple/pink, paler ventrally; orange blotch on cheek adjacent to upper jaw and on upper half of pectoral-fin base, and three narrow orange body stripes; dorsal fin with 4 proximal orange blotches, each with 2 or 3 small dark spots.

Preserved coloration. Sides with three narrow pale stripes that are difficult to distinguish, body otherwise unmarked except 6 small dark spots (about 1/3 pupil diameter) on dorsum at base of dorsal fin aligned in pairs on either side of fin; these spots, which extend slightly onto fin, positioned at bases of fin elements as follows: 1st at spine 5, 2nd at spine 10, 3rd at ray 1, 4th at ray 4, 5th at ray 7, and 6th at ray 10; caudal fin dusky, other fins pale; inner lining of upper jaw and areas adjacent to esophageal opening and upper pharyngeals pale.

Comparisons. *Opistognathus aurolineatus* and *O. decorus* are the only Indo-West Pacific species with robust bodies, relatively sparse and minute cephalic pores (Figs. 8A, 8B), dorsal- and anal-fin segmented rays 12 and 11 respectively and body with 3–7 stripes. *Opistognathus aurolineatus* differs from *O. decorus* in having head without blotches or an interorbital band (vs. head with prominent dark blotches and a narrow interorbital band), in life, body with 3 golden-orange stripes (vs. 5–7 violet stripes) and pelvic-fin length 19.2% SL (vs. 26.0–29.4% SL).

Distribution. (Fig. 27) Known only from New Caledonia where trawled in 120–140 m.

Etymology. From the Latin *aurum* (golden) and *lineatus* (striped), in reference to the three golden orange stripes on the sides of this species.

***Opistognathus bathyphilus*, new species**
Lansdowne Jawfish
Figures 9A, 16G, 53; Tables 1–14, 16

Holotype. (only known specimen) MNHN 1991–361, gravid female, 66.3 mm SL, Lord Howe Ridge, Lansdowne Bank, 21°13'59"S, 162°16'12"E, dredged in 120–150 m, R. de Forges, R/V Coriolis, Sta. "CHALCAL" D.3, 13 July 1984.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking flexible lamina posteriorly, extending about 0.9 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 16G) relatively slender and tubular 3rd infraorbital with moderate posterolateral projecting arm ending with large sensory canal opening, no suborbital shelf; dorsal fin XI, 11; anal fin II, 11; vertebrae 10+16; gill rakers 12+25; nape with a dark blotch slightly in advance of dorsal-fin origin; dorsum with a row of 5 dark blotches extending distinctly onto dorsal fin; last blotch on dorsal fin at least as wide as anterior blotches.

Description. Dorsal fin XI, 11; anal fin II, 11; pectoral fin 19; caudal fin: procurrent rays 3+3, segmented rays 9+8, middle 12 branched, total elements 23; hypural 5 present; vertebrae: 10+16; last pleural rib on vertebra 10; epineurals 15; two supraneurals; dorsal-fin interdigitation anterior pattern S/S/1/1+1/1/; gill rakers 12+25 (bilateral counts).

Scales absent on head, nape, above lateral line, most of pectoral-fin base and chest; scale rows in horizontal series about 42–45; lateral-line terminus below segmented dorsal-fin rays 4–5 (total element position 15.5); lateral-line pores moderate, arranged in an irregular series along embedded lateral-line tubes; cephalic sensory pores moderate (Fig. 9A); mandibular pore positions 1–4 occupied by single pores, 5th position bipored; preopercular pore positions bipored.

Anterior naris slightly closer to posterior naris than to dorsal margin of upper lip and consisting of a short tube that when depressed just reaches anterior margin of posterior naris; height of tube about equal to or slightly longer than maximum diameter of posterior naris; dorsal fin moderately low, gradually increasing in height to about middle of spinous dorsal fin; profile with slight increase in height at origin of segmented rays; dorsal-fin spines moderately stout and straight without curved, flexible tips; tips of dorsal-fin spines with conspicuous pale tabs; all segmented dorsal- and anal-fin rays branched distally; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally; posterior margin of preopercle indistinct, without a free margin; no crenulae on inner surface of lips; fifth cranial nerve passes under $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extends about 0.8 eye diameters behind posterior margin of orbit; maxilla widest at end and rounded, without flexible lamina posteriorly; supramaxilla present, small and terminally positioned; premaxilla with an outer row of stout conical teeth anteriorly which become progressively smaller posteriorly; 2 inner rows of smaller teeth and several enlarged symphyseal teeth (posterior ones almost horizontally aligned) behind outer row anteriorly; dentary with an outer row of moderate conical teeth anteriorly behind which are 2 irregular rows of similar teeth, posteriormost of which are slightly enlarged and canted backward; posterior half of dentary with a single row of 6 or 7 relatively widely spaced, moderate canines; vomerine teeth absent.

Measurements of the 66.3 mm holotype, as percent of SL: predorsal length 36.2; preanal length 67.9; dorsal-fin base 59.0; anal-fin base 27.8; pelvic-fin length 33.2; caudal-fin length 30.8; depth at anal-fin origin 28.3; caudal-peduncle depth 15.3; head length 39.7; postorbital-head length 20.7; upper-jaw length 27.4; postorbital-jaw length 10.9; orbit diameter 13.7. As percent of head length: postorbital-head length 52.0; upper-jaw length 69.1; upper-jaw width 19.0; postorbital-jaw length 27.3; orbit diameter 34.5.

Preserved coloration: Head with scattered small dark spots, much smaller than pupil; jaws with dark bands; pale area on nape anterior to dorsal-fin origin followed by a dark blotch; horizontal scale rows outlined to form narrow stripes; dorsal fin with 5 proximal dark blotches ringed by white dorsally and laterally; caudal fin with 6 narrow dark bands.

Life coloration unknown.

Comparisons. See Table 16. *Opistognathus bathyphilus* agrees with the following apparently allopatric species in having rigid upper jaws, anal fin II, 10–11, dorsal fin with 5–6 dark blotches and scale rows on body often appearing to form a series of narrow stripes: *O. asper*, *O. biporus*, *O. erdmanni*, and *O. liturus*. It is likely that all these species constitute a complex of closely related allopatric species. Color photographs of *Opistognathus* sp. (Fig. 103) from Japan are also superficially similar to *O. bathyphilus* and *O. biporus* but have different cheek markings.

Regrettably, these specimens are being studied by Daishuke Uyeno (Kagoshima University) who chose not to make them available for my examination.

Opistognathus bathyphilus and *O. biporus* appear to be very closely related based on morphological similarity. Both species have very similar cephalic sensory pore patterns (Figs. 9A, 9B) and infraorbitals (Figs. 16G, 16H), the same number of body scale rows ca. 42–45 in horizontal series, dorsal-and anal-fin segmented ray counts differ by only one ray, and both have 37 total gill rakers. They also have very similar color patterns with 4 or 5 prominent blotches on the basal third of the dorsal fin that are partially encircled by wide pale margins, cheeks with scattered dark spots, and a dark blotch in the same position on the nape (this blotch can just be seen in the lateral view photograph of *O. biporus* but is more obvious and darker in the drawing of *O. bathyphilus*). The holotypes of these two species are nearly the same size, 66.3- and 64.4- mm SL, and both are gravid females, but the postorbital-jaw length is much longer in *O. bathyphilus* (10.9 vs. 7.3 % SL) and the posterior end of its upper jaw is narrower than that of *O. biporus* (compare Figs. 9A and 9B). These jaw differences obviously are not due the sexual dimorphism and there appear to be some subtle color pattern differences, albeit interspecific variation cannot be accessed. The position of the first dark blotch in the spinous dorsal fin is also different. In *O. bathyphilus* the first blotch is positioned between spines 1–4 while in *O. biporus* it is more elongate and positioned between spines 2–6.

Distribution. (Fig. 26) Known only from Lansdowne Bank on the Lord Howe Ridge where dredged in 120–150 m. This bank is a submerged plateau in the Coral Sea mid-way between Australia and New Caledonia. The northern end of the Lord Howe Rise is separated from New Caledonia by the 3500 m deep New Caledonian Basin (Kulbicki *et al.* 1994) which may have contributed to the isolation of *O. bathyphilus* and *O. biporus*.

Etymology. The specific epithet, from the Greek *bathy* (deep) and *philos* (loving), is in reference to the relatively deep capture depth of this species.

***Opistognathus biporus*, new species**

Bipored Jawfish

Figures 9B, 16H, 54; Tables 1–14, 16

Holotype. (only known specimen) SMNS 23849, gravid female (64.4), Loyalty Islands, Lifou Island, Baie du Santai, SW of Récif Sheiter, off Point Lefèvre; 20°54’00”S, 167°02’25”E–20°54’18”S, 167°01’48”E, trawled in 70–126 m, coral gravel, Warren dredge, R. Fricke, R/V Alis, 21 Nov. 2000.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking flexible lamina posteriorly, extending about 0.6 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 16H) relatively slender and tubular 3rd infraorbital with short posterolateral projecting arm ending with large sensory canal opening, no suborbital shelf; dorsal fin XI, 11; anal fin II, 10; vertebrae 10+16; tips of dorsal-fin spines with conspicuous pale tabs; dorsum with a row of 5 dark blotches extending distinctly onto dorsal fin; nape with dark blotch slightly in front of dorsal-fin origin; last blotch on dorsal fin distinctly narrower than anterior blotches; head with small dusky spots or blotches.

Description. Dorsal fin XI, 11; anal fin II, 10; pectoral fin 19; caudal fin: procurrent rays 4+4, segmented rays 8+8, middle 12 branched; hypural 5 present; vertebrae 10+16; last pleural rib on vertebra 10; epineurals 14; two supraneurals 2; dorsal-fin interdigitation anterior pattern S/S/1/1+1/1/; gill rakers 11+26 (bilateral counts).

Scales absent on head, nape, above lateral line, and chest; pectoral-fin base scaly; scale rows in horizontal series about 45; lateral-line terminus below vertical from base of segmented dorsal-fin ray 3 (total element position 14.0); lateral-line pores mostly arranged in an irregular series along embedded lateral-line tubes; cephalic sensory pores moderate (Fig. 8B); mandibular pore positions 1–4 occupied by single pores; 5th position bipored; preopercular pore positions bipored.

Anterior naris positioned slightly closer to anterior margin of posterior naris than to upper lip and consisting of a short tube that when depressed does not reach margin of posterior naris; height of tube about equal maximum diameter of posterior naris; dorsal fin moderately low, gradually increasing height to about middle of spinous dorsal fin then decreasing in height; profile of fin gradually increasing in height posterior to junction of spinous and segmented rays; dorsal-fin spines moderately stout and straight, without curved, flexible tips; tips of dorsal-fin spines with conspicuous pale tabs; all except first segmented dorsal- and anal-fin rays branched distally; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally; posterior margin of preopercle distinct, with a free margin. no crenulae on inner surface of lips; fifth cranial nerve passes under $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extends about 0.5 eye diameters behind posterior margin of orbit; maxilla widest at end and rounded, without a flexible lamina posteriorly; supramaxilla present, small and terminally positioned; premaxilla with an outer row of stout conical teeth anteriorly which become progressively smaller posteriorly; 2 inner rows of smaller teeth and several enlarged symphyseal teeth (posterior ones almost horizontally aligned) behind outer row anteriorly; dentary with an outer row of moderate conical teeth anteriorly behind which are several irregular rows of similar teeth, posteriormost of which are slightly enlarged and canted backward; posterior half of dentary with a single row of 6 or 7 relatively widely spaced, moderate canines; vomerine teeth absent.

Measurements of the 64.4 mm holotype, as percent of SL: predorsal length 36.9; preanal length 65.4; dorsal-fin base 58.9; anal-fin base 25.5; pelvic-fin length 29.7; caudal-fin length 29.3; depth at anal-fin origin 26.6; caudal-peduncle depth 15.3; head length 39.8; postorbital-head length 19.6; upper-jaw length 25.5; postorbital-jaw length 7.3; orbit diameter 13.5. As percent of head length: postorbital-head length 49.2; upper-jaw length 64.1; upper-jaw width 6.5; postorbital-jaw length 19.0; orbit diameter 33.9.

Preserved coloration: Head and upper jaw with scattered small dark spots, much smaller than pupil; jaws without dark bands; pale area anterior to dorsal-fin origin followed by a dark blotch; horizontal scale rows outlined to form narrow stripes; dorsal fin with 4 or 5 proximal dark blotches.

Life coloration unknown.

Comparisons. See Table 16. *Opistognathus biporus* agrees with the following apparently allopatric species in having rigid upper jaws, anal fin II, 10–11, dorsal fin with 5–6 dark blotches and scale rows on body often appearing to form a series of narrow stripes: *O. asper*, *O. erdmanni*, *O. bathyphilus*, and *O. liturus*. *Opistognathus biporus* and *O. bathyphilus* are also similar in having nape with dark blotch.

Distribution. (Fig. 26) Known only from Lifou Island in the Loyalty Islands where dredged in 70–126 m.

Etymology. The specific epithet, from the Latin *bi* (two) and *porus* (hole), is in reference to the bipored preopercular pore positions in this species.

***Opistognathus castelnaui* Bleeker, 1859**

Castelnau's Jawfish

Figures 17A, 55–57; Tables 1–14

Opisthognathus [sic] *Sonneratii* Cuvier? [non Valenciennes] Bleeker 1851:221 (description, synonymy)

Opisthognathus [sic] *castelnaui* Bleeker 1859:238 (original description: Bulukomba, Makassar, Sulawesi, Indonesia, available by indication based on *Opistognathus sonneratii* of Bleeker 1851:221; lectotype RMNH 26979, 177 mm SL, Bulucomba, Celebes). Bleeker 1874:469, pl. 9, fig. 4 (expanded description, Singapore, Bintang, Cocos ["Novaselma"], Celebes [Bulucomba] and Batjan [Labuha]. Kyushin *et al.* 1982:183, color fig. (brief description, South China Sea).

Opistognathus castelnaui. Yoshino *in* Masuda *et al.* 1984:200, pl.191-F (brief description, Japan). Gloerfelt-Tarp & Kailola 1985:241, 349 (unnumbered color fig. (brief description, Bali). *Opistognathus castelnaui* (not of Bleeker) Fourmanoir 1965:76, fig. 48b (Nha-Trang, Viet Nam).

Opistognathus castelnaui (not of Bleeker) Fourmanoir 1965:76, fig. 48b (misidentification of *Opistognathus nigromarginatus*, Nha-Trang, Viet Nam).

Smith-Vaniz & Yoshino, 1985:24 (synonymy, description, distribution, lectotype designation). Kailola, 1987:383 (annotated checklist, Torres Strait). Shen *et al.* 1995:479, color photo 161–6 (brief description, Taiwan). Aizawa *in* Nakabo 2002:742, unnumbered figs. (pictorial guide to Japanese fishes, meristic values). Allen & Adrim 2003:34 (listed). Hoese & Bray 2006:1074 (synonymy, Australian distribution). Hayashi & Okuri 2007:40, figs. 4d, 5d, 6d, 11, 12d ("Wani-amadai," description, distribution, in key to Japanese O*pistognathus*). Shao *et al.* 2008:249 (listed, Taiwan). Smith-Vaniz 2009:75, figs. 3a, 4a, 5–8 (description, synonymy, distribution). Chen *et al.* 2010:144, color photo B (Kenting National Park, Taiwan). Allen & Erdmann 2012:352, color photo (brief description, distribution). White *et al.* 2013:146, color fig. 54.1 (brief description); Motomura *et al.* 2021:21, color photo, (brief description, Bidong Island, Malaysia). Rainboth *et al.* 2012:84 (listed, Viet Nam).

Opisthognathus [sic] *suluensis* Herre 1933:25 (original description: Philippines, Sulu Province, Sibutu Islands, Sitankai; holotype SU 25508, 161 mm SL); Here 1934:95 (listed, Jolo). Böhlke 1953:89 (listed, type catalog). Herre 1954:785 (Philippine fishes checklist). Kailola 1975:196 (listed, Darnley Island, Torres Strait).

Material examined. 32 specimens, 37–242.5 mm SL, cited in Smith-Vaniz (2009), not including the following six additional specimens: USNM 438032 (79) Philippines, Iloilo Prov., Panay Island, Iloilo City fish market; WAM P34977-001 (130), Raja Ampats, Indonesia., Fwojo, 0°24.125'S, 130°13.861'E, 23 m; NTM S.11325-001 (182), Indonesia, Bali, Denpasar fish market, sta. BCR 84–15; CSIRO H.6442–02 (112), Australia, Queensland. NE of

Whitsunday Island group, 19°40'S, 150°04'E, 73 m; QM I.39008 (139), Australia, Queensland, N. of Dugong Island, ca. 10°28'S, 143°06'E; QM I.39245 (132), Australia, Queensland, Gloucester Island, 19°59'36"S, 148°28'26"E, 24 m.

Expanded diagnosis. A species of *Opistognathus* having a upper jaw produced as a flexible lamina that in adult males extends to or beyond rear margin of opercle (1.8–3.0 eye diameters behind posterior margin of orbit); premaxilla with a single row of small canines that become smaller posteriorly and extend length of upper jaw; an inner series of small conical teeth behind outer row anteriorly; dentary teeth similar to those of premaxilla except wide anterior tooth patch extending downward outside of mouth; vomerine teeth absent; infraorbitals (Fig. 17A) robust with large openings for sensory pores; 3rd infraorbital without a suborbital shelf; dorsal fin XI, 14; anal fin III, 14; vertebrae 10+18; scale rows in horizontal series about 90–110; total gill rakers 28–33; dark pigment widely surrounding esophageal opening and extending at least to base of upper pharyngeal tooth patches; dorsal fin with 6–9 (usually 8 or 9) evenly spaced dark blotches on basal 1/3 or 1/4 of fin that extend slightly on to dorsum and in some specimens are coalesced; upper jaw and adjacent membranes of specimens from Ryukyu Islands, Philippines and Indonesia have two dark stripes but Australian specimens have one or no dark stripes (see remarks).

Comparisons. *Opistognathus castelnaui* might be confused with some individuals of *O. variabilis* with relatively elongate upper jaws but differs in having more scale rows in horizontal series, about 90–110 (vs. 68–83), dorsal fin without small dark spots centered on spines and rays (vs. with 2 or 3 rows of small dark spots centered on spines and rays), dorsal- and anal-fin segmented rays consistently 14 (vs. usually 15, except usually 14 in northern Palawan specimens and caudal vertebrae consistently 18 (vs. 19–20, except 18 in N. Palawan specimens).

Distribution. (Fig. 28) Confirmed records are from the Ryukyu Islands, Okinawa, Taiwan, Philippines, Malaysia, Indonesia, Ashmore Reef, and eastern Australia in depths of 23–100 m. Bleeker's (1851, 1874) specimens reportedly from the Cocos-Keeling Islands ("Cocos, Novaselma") are not plotted on the distribution map because it is possible they actually were obtained from Cocos Island, off the northern tip of Simeulue, Sumatra. I know of no confirmed records of *O. castelnaui* from "Kokos-eilanden," although Allen and Smith-Vaniz (1974) have determined that some of Bleeker's specimens of other species almost certainly were obtained at Cocos-Keeling.

Etymology. Named in honor of the French diplomat, explorer, and ichthyologist Francis-Louis de Castelnau (1810–1880). His recently discovered fish collections and notebooks including about 1,000 paintings of fishes, some of which were reported by Russell *et al.* (2010), are in the Zoology Museum, University of Liège, Belgium (B.C. Russell, pers. com.)

Remarks. The under-side of the upper jaw and adjacent membranes of all specimens of both sexes from Indonesia, Philippines and Ryukyu Islands have two well-developed dark stripes while the three Australian specimens from Queensland either have a weak single dark stripe, CSIRO H.6442–02, 112 mm SL, (male) or no evidence of a dark stripe QM I.39008, 139 mm (male) and QM I.39245, 132 mm SL (female).

Opistognathus challenger, new species

Challenger Jawfish

Figures 13A, 58; Tables 1–14

Opisthognathus [sic] *macrolepis* (not of Peters): Günther 1880:52 (misidentification, "Challenger" Philippine record, brief description, BMNH 1879.l5.14.200).

Holotype. (only known specimen) BMNH 1879.l5.14.200, 76.4 mm SL, Philippines, western entrance of Basilan Strait, 7°03'N, 121°48'E, trawled in 82 fathoms (149 m), HMS Challenger sta. 201, 26 Oct. 1874.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking flexible lamina posteriorly, extending 0.6 eye diameters behind posterior margin of orbit; dorsal fin XI, 11; anal fin II, 11; vertebrae 10+16; area above lateral line anteriorly with 3–4 rows of scales (Fig. 13A); body with approximately 44 oblique scale rows in horizontal series; total gill rakers on first arch 30; spinous dorsal fin with a dark spot between spines 1–2 and extending to anterior margin of spine 4, chin slightly dusky and no dark postorbital spot.

Description. Dorsal fin XI, 11; anal fin II, 11; pectoral fin 19 (L)–20 (R); caudal-fin: procurrent rays 3+3, segmented rays 8+8, branched rays 6+6, total elements 22; hypural 5 present; vertebrae 10+16; last pleural rib on vertebra 10; epineurals 17; one supraneural; dorsal-fin interdigitation anterior pattern / /S/1/1+1/1/; gill rakers 10+20.

Scales absent on head and chest, area above lateral line with 3–4 scale rows extending on sides of nape beyond dorsal-fin origin (Fig. 13A) and pectoral-fin base completely scaly; body scale rows in horizontal series about 44

(many scales missing making this count only an approximation); lateral-line terminus below dorsal-fin segmented rays 3 (L) or 1 (R); lateral-line pores mostly arranged in a single series along embedded lateral-line tubes; cephalic sensory pores relatively sparse (Fig. 13A); all mandibular and preopercular pore positions occupied by single pores.

Anterior naris positioned closer to anterior margin of posterior naris than to upper lip and consisting of a very short tube and cirrus that when depressed does not reach margin of posterior naris, height of tube shorter than maximum diameter of posterior naris; spinous dorsal fin moderately low, approximately uniform in height for its entire length; profile of fin increases in height at junction of spinous and segmented rays; dorsal-fin spines moderately stout, straight and with pungent tips; all dorsal- and anal-fin segmented rays branched distally; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally; posterior margin of preopercle distinct, with a free margin; no crenulae on inner surface of lips; fifth cranial nerve passes over $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extends about 0.6 eye diameters behind posterior margin of orbit; maxilla widest at end without a flexible lamina posteriorly; supramaxilla present, moderate and terminally positioned; premaxilla with an outer row of 4–5 slightly curved stout conical teeth anteriorly that become much smaller posteriorly; a patch of enlarged symphyseal teeth (a few almost horizontally aligned) behind outer row; dentary with an outer row of 8–9 relatively widely spaced, moderate canines, behind which is an irregular row of much smaller teeth; vomerine teeth absent.

Measurements of the 76.4 mm holotype, as percent of SL: predorsal length 29.3; preanal length 59.6; dorsal-fin base 63.7; anal-fin base 28.8; pelvic-fin length 21.3; caudal-fin length 25.5; depth at anal-fin origin 20.6; caudal-peduncle depth 11.8; head length 30.2; postorbital-head length 16.4; upper-jaw length 20.6; postorbital-jaw length 6.0; orbit diameter 10.0. As percent of head length: postorbital-head length 54.1; upper-jaw length 68.0; postorbital-jaw length 19.8; orbit diameter 32.9.

Preserved coloration (Fig. 58): After long storage in alcohol without proper temperature control, most of the color pattern has been lost except as follows: spinous dorsal fin with black spot (ringed by narrow pale margin) extending almost to distal margin of fin and beginning between spines 1–2 and terminating at anterior margin of spine 4; dark stripe about pupil diameter through middle of approximately posterior half of soft dorsal fin and an irregular series of dark blotches along base of fin; chin slightly dusky, upper lip dark with slight indication of dusky bar anteriorly, middle part of upper jaw dark; small dark blotch on upper and lower margins at base of caudal fin and pair of pale basicaudal spots; head, body and fins otherwise uniformly pale tan.

Color in life unknown.

Comparisons. *Opistognathus challenger* is the only species with an ocellus in the spinous dorsal fin that has scale rows above the lateral line anterior to the dorsal-fin origin (Fig. 13A). It also attains a much larger size than *Opistognathus wassi* n.sp. or *O. vigilax* n.sp., both of which have distinctive color patterns that are absent in the *O. challenger* holotype.

Distribution. (Fig. 36) The holotype and only known specimen was collected at the western entrance of Basilan Strait, Philippines where trawled in 149 m.

Etymology. The specific epithet refers to the famous Challenger expedition of 1872–1876 that provided the foundation for modern oceanography and the discovery of many new marine organisms (Linklater 1972), including the jawfish described herein more than a century after its collection. The name is here treated as an appositional noun.

Opistognathus crassus Smith-Vaniz, 2010

Stout Jawfish

Figures 6B, 16I, 59, 60; Tables 1–14

Opistognathus crassus Smith-Vaniz 2010:47, figs. 2C, 11–13 (original description: Maldive Islands, Ari Atoll, reef N. of Bathala Islands; holotype BPBM 32706, 35.5 mm SL). Nakayama *et al.* 2016:389 (partial comparison with *O. trimaculatus*). Smith-Vaniz 2022:311, unnumbered fig., pl. 119 (description, distribution).

Opistognathus sp. Randall & Anderson 1993:36 (listed in checklist of Maldive Islands fishes).

Material examined. Known only from the 35.5 mm SL male holotype, see above.

Expanded diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking flexible lamina posteriorly,

extending about 0.5 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 16I) slender, 2nd and 3rd infraorbitals open laterally, 3rd infraorbital with short posterolateral projecting arm, no suborbital shelf; dorsal fin XI, 11; anal fin II, 10; vertebrae 10+16; tips of dorsal-fin spines with conspicuous pale tabs; dorsal fin dark blotches interspaced by sharply defined pale areas approximately as wide as the blotches, and blotches 2–4 with a small pale spot centered on distal margin of blotch; last blotch on dorsal fin distinctly narrower than anterior blotches; dorsum with a row of 5 dark blotches that extend distinctly onto dorsal fin and alternate with sharply defined, wide pale areas; lips with wide pale bands.

Comparisons. *Opistognathus crassus* is the only Indian Ocean species with 11 segmented dorsal-fin rays (vs. 13–15) and anal fin II, 10 (vs. III, 12–15). Other Indo-West Pacific species with these low counts do not have dark basal blotches on the dorsal fin interspaced by sharply defined pale areas approximately as wide as the blotches.

Distribution. (Fig. 26) Known only from Ari Atoll, Maldive Islands in 35 m.

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

Opistognathus cyanospilotus Smith-Vaniz, 2009

Blueblotch Jawfish

Figures 16M, 61; Tables 1–14

Opistognathus sp. Kuiter & Debelius 1994:216, unnumbered color photo (Blue-spotted JawFish, habitat). Allen *et al.* 2003:298 (unnumbered color photo H, "Andaman Jawfish).

Opistognathus cyanospilotus Smith-Vaniz 2009:78, figs. 1d, 2a, 3b, 10–12 (original description: Thailand, Phuket, Koa Raja Jai Island; holotype ANSP 144110, 116.0 mm SL). Satapoomin 2011:56 (checklist, southwestern Thailand). Allen & Erdmann 2012:352, color photo (brief description, distribution).

Opistognathus solorensis. (not of Bleeker) Kuiter & Tonozuka 2004:624, unnumbered color photo H (misidentification, "Blue-spotted Jawfish", Tulamben, Bali).

Opistognathus castelnaui. (not of Bleeker) Kuiter & Tonozuka 2004:625, unnumbered color photo H (misidentification, "Blue-spotted Jawfish", Pulau Weh, Sumatra).

Material examined. 14 specimens, 70.5–116 mm SL, including the following collection not included in the original description: WAM P.33259–004 (4, 96.4–106.6), Andaman Islands, Cinque Island, 11°19.935'N, 92°43.483'E, 25 m, M.V. Erdmann, 19 Jan. 2010.

Expanded diagnosis. A species of *Opistognathus* having a mostly rigid upper jaw that is broadly rounded posteriorly, with a slightly flexible lamina and an elongate supramaxilla, and extending about 0.9–1.2 eye diameters behind posterior margin of orbit; dorsal fin XI, 15–16; anal fin III, 15; vertebrae 10+19; gill rakers 11–12+21–23; infraorbitals (Fig. 16M) moderately robust, 2nd and 3rd infraorbitals with large sensory canal openings, 3rd infraorbital with large suborbital shelf; inner lining of upper jaw and adjacent membranes with a black blotch; in life, opercle, cheeks and upper jaw with prominent blue spots or blotches; body and dorsal fin without dark blotches.

Comparisons. *Opistognathus cyanospilotus* is the only species with the upper jaw broadly rounded posteriorly with a slightly flexible lamina, anal fin III, 15, no ocellus on the spinous dorsal fin and, in life, cheeks and upper jaw with prominent blue spots.

Distribution. (Fig. 29) Known from the Andaman Sea (Cinque, Nicobar and Similan islands), northern Sumatra and Bali in depths of 12–30 m. The Bali record is based on Kuiter & Tonozuka (2004:624, color photograph H of *Opistognathus cyanospilotus* [misidentified as "*O. solorensis*"] from Tulamben, Bali).

Etymology. The specific name is derived from the Greek *kyaneos* (dark blue) and *spilotus* (spotted), in reference to the characteristic blue markings on the head (Fig. 61).

Opistognathus darwiniensis Macleay, 1878

Darwin Jawfish

Figures 5C, 15, 17B, 62–64; Tables 1–14

Opisthognathus [sic] *darwiniensis* Macleay 1878:355, pl. 9, fig. 3 (original description, Australia, Northern Territory, Port Darwin; syntypes AMS I.16401–001, 3:93–114 mm SL). Mees 1959:8 (description of specimen off Monte Bello Island, and incorrectly surmised *O. darwiniensis* is the juvenile of *O. inornatus*). Taylor 1964:278, pl.

64 (description, Arnhem Land, Northern Territory). Larson & Williams 1997:365 (listed, Darwin Harbour). Larson 1999:21, 41 (listed, Kakadu National Park, Northern Territory).

Tandya darwiniensis. Whitley 1930:19 (assigned to genus *Tandya*). Whitley 1964:52 (listed). McKay 1969:1-2 (comparison with "*Tandya inornata* and *T. reticulata*," Western Australia records, behavioral observations).

Gnathypops darwiniensis. Taylor 1964:278, pl. 64 (description, Arnhem Land).

Opistognathus darwiniensis. Stanbury 1969:209 (listed, type catalog). Allen 1985: 2425, color photo 369 (Rosemary Island, Dampier Archipelago, Australia). Allen & Swainston 1988:126, pl. 54, color fig. 815 (brief diagnosis, common name "Darwin jawfish"). McCulloch 1929: 330 (checklist of Australian fishes). Mooi 1990:462 (description of egg surface morphology). Smith-Vaniz 2004:222 (in key to Australian *Opistognathus*). Hoese & Bray 2006:1074 (synonymy, Australian distribution). Larson *et al.* 2013:106 (checklist of Northern Territory fishes). Moore *et al.* 2014:195 (listed, Kimberly region, Australia).

Material Examined. 74 specimens, 21.4–170.5 mm SL. **Northern Territory**: AMS I.16401–001 (3, 93–114) syntypes of *Opistognathus darwiniensis*, Australia, Port Darwin, Spalding, 1877; AMS I.6985–8 (4, 101–135) Port Darwin; ANSP 153655 (11, 56.5–114, including 4 C&S) Darwin Harbor; USNM 174043 (67.4) Darwin, East Point Reef; ANSP 144461 (7, 65–134) Clarence Strait, East Vernon Island, 12°05'S, 131°06'E, 0–2 m; WAM P.5055 (113) South Goulburn Island; USNM 174042 (8, 54–106, including 2 C&S) Gulf of Carpentaria, Yirrkalla Reef. **Western Australia**: WAM P.8071 (109) no specified locality; WAM P.7387 (130) Yampi Sound; WAM P.15759 (150) Broome; WAM P.28059–006 (109) Broome, Riddle Point, 0–1 m; WAM P.5062–001 (154) Point Samson, 20°38'S, 117°12'E; WAM P.25114–001 (145) Dampier Archipelago, Rosemary Island; WAM P.4357 (109) and WAM P.4390 (151) Monte Bello Islands; WAM P.22691–2 (2, 150–157); WAM P.22802–4 (3, 150–170.5) Kendrew Island; WAM P.7938-39 (2, 113–169) Locker Island, off Onslow; AMS I.17060–015 (18, 21.4–165.5) Exmouth Gulf; WAM P.26636–002 (3, 55–158) North West Cape, near Mangrove Bay, 0.4 m; WAM P.30637–001 (3, 56–65) North West Cape, off Tantabiddi Creek.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking flexible lamina posteriorly, in adults extending about 0.7 to 1.2 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 17F) relatively slender and tubular 3rd infraorbital with small sensory canal opening and slender suborbital shelf; dorsal-fin X–XI, 17–18, rarely X, 18; vertebrae typically12+18 or 19; body with 2 separate lateral lines, the ventral one irregularly developed along lower side in region of anal-fin origin (Fig. 15), often with one or more branches on belly; head covered with close-set, tiny, brown spots; pelvic and caudal fins usually strongly barred; anterior naris palmate.

Description. Dorsal fin X–XI, 17–18 (rarely X, 18); anal fin II, 14–15 (exceptionally 13); pectoral fin 19–21; caudal fin: procurrent rays 3–4+3–4, segmented rays 8+8, middle 12–14 branched, total elements 22–24; hypural 5 present; vertebrae 12–13+18–19 (typically 12+19); last pleural rib on vertebra 12 (rarely 13); epineurals 13–17; no supraneurals; dorsal-fin interdigitation anterior pattern / / /1/1+1/1/; gill rakers 8–11+16–19 = 24–30.

Scales absent on head, nape, and above lateral line anteriorly, posterior 3/4 of lateral line with 4–6 scale rows above; pectoral-fin base and chest usually with a few imbedded scales (which can easily be overlooked); scale rows in horizontal series about 67–80; lateral-line terminus below segmented dorsal-fin rays 10–15 (total element positions 21.0–25.5); lateral-line pores relatively numerous, mostly arranged in a broad series of very small pores below spinous dorsal fin anteriorly, then becoming larger and mostly in single rows above and below embedded lateral-line tubes; a second, irregularly developed, lateral line of double pores present below mid-line of body extending from near pelvic-fin origin posteriorly to middle or end of anal fin, usually with 1–3 lateral branches extending vertically downward toward the vent or across the belly (Fig. 15); cephalic sensory pores relatively numerous (Fig. 5C), in adults completely covering head (including all of nape and most of opercle); mandibular pore positions 1–2 occupied by single pores, 3rd position with 2 or 3 pores, 4th and 5th positions with numerous pores that form an unbroken continuum; preopercular pore positions all occupied by multiple pores.

Anterior naris positioned distinctly closer to posterior naris than to margin of upper lip and consisting of a short tube with a very broad tentacle on posterior rim of varying height that when depressed usually extends to about middle of posterior naris but may reach beyond orbital margin; height of tentacle varying from 1.5–3.5 times maximum diameter of posterior naris; dorsal fin moderately high anteriorly, slightly increasing in height posteriorly with profile relatively uniform without a change in height at junction of spinous and segmented rays; dorsal-fin spines relatively slender and only slightly curved, with flexible tips; skin covering tips of dorsal-fin spines distinctly thickened in specimens >150 mm SL (apparent in some specimens at 90 mm), having the appearance of a continuous fleshy

pad but without rugosities, as typically occurs in large individuals of the *O. papuensis*; all segmented dorsal- and anal-fin rays branched distally, except 1st anal ray sometimes unbranched; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally; skin surrounding 2 outermost pelvic rays often distinctly thickened in large adults; posterior margin of preopercle distinct; large specimens sometimes with a few papillae present on inner surface of upper lips; fifth cranial nerve passes over $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extends about 0.7 to 1.2 eye diameters behind posterior margin of orbit in specimens >80 mm SL; maxilla widest at end and truncate, without flexible lamina posteriorly; supramaxilla present, relatively small and terminally positioned; premaxilla with an outer row of moderate canines anteriorly that become slightly smaller posteriorly and extend entire length of upper jaw, and inner series of very small conical teeth behind outer row anteriorly; dentary with an outer row of canines (smaller than premaxillary canines) becoming slightly smaller posteriorly, and anteriorly with 1 or 2 irregular inner rows of small canines; vomerine teeth absent.

Measurements of 34 specimens, 55.8–170.5 mm, as percent of SL: predorsal length 31.0–36.7; preanal length 57.6–63.7; dorsal-fin base 62.5–72.7; anal-fin base 27.7–33.6; pelvic-fin length 19.7–27.3; caudal-fin length 22.3–29.3; depth at anal-fin origin 19.8–24.8; caudal-peduncle depth 10.5–13.3; head length 34.2–40.9; postorbital-head length 21.3–26.2; upper-jaw length 20.2–23.6; postorbital-jaw length 7.3–11.9; orbit diameter 9.6–13.8. As percent of head length: postorbital-head length 58.6–68.7; upper-jaw length 52.8–63.7; postorbital-jaw length 19.1–31.6; orbit diameter 25.2–35.4.

Color in life (Figs. 62, 63): Head and body mostly yellow/tan, covered with dark brown spots; those on head and nape, tiny, and close-set; those on sides larger and blotch-like; pectoral fins yellowish with rows of tiny dark spots; all other fins yellow with prominent black bands; spinous dorsal fin with an oblong black blotch between spines 3–5 or 6.

Comparisons. *Opistognathus darwiniensis* is the only opistognathid with two lateral lines as described above. The combination of head covered with close-set, tiny, brown spots and pelvic and caudal fins usually strongly barred also distinguishes it from other jawfishes.

Distribution. (Fig. 30) Endemic to Western Australia in depths of 1–4 m.

Etymology. The specific epithet *darwiniensis* refers to Darwin, Australia, the type locality of the species.

Remarks. In addition to *O. darwiniensis* three other Australian jawfishes, *O. latitabundus*, *O. inornatus* and *O. papuensis,* were assigned to the genus *Tandya* by Whitley (1930, 1937), and *O. reticulatus* subsequently by McKay (1969). These species (plus *O. reticeps*) agree with *O. darwiniensis* in having an increase in number of vertebrae, precaudal (typically 12 or 13) and caudal (19 or 20) (Table 10) but differ from *O. darwiniensis* in having more dorsal-fin spines, 12 (vs. 10–11, usually 11). The allopatric (non-Australian) *O. dendriticus* has a different combination of these elements, 10 or 11 dorsal-fin spines and typically 11+16 precaudal and caudal vertebrae, respectively.

Opistognathus decorus Smith-Vaniz & Yoshino, 1972

Tattooed Jawfish

Figures 8B, 16O, 65–66; Tables 1–14

Gnathypops sp. Gushiken 1972:48, color fig. 242; (Okinawa). Masuda *et al.* 1975:260, color pl. 83-B (brief description, Okinawa).

Opistognathus sp.1 Yoshino *in* Masuda *et al.* 1984:201, color pl. 191-H (brief description; Okinawa).

Opistognathus decorus Smith-Vaniz & Yoshino 1985:19, figs. 1, 2a, 3a (original description: Ryukyu Islands, Okinawa, Naha fish market; holotype ANSP 15186, 142.5 mm SL). Aizawa *in* Nakabo 2002:742 (unnumbered figs.; pictorial guide to Japanese fishes; meristic values). Allen & Adrim 2003:34 (listed). Hayashi & Okuri 2007:4, figs. 4e, 5e, 6e, 13e ("Irezumi-amadai," description, distribution, in key to Japanese *Opistognathus*).

Material examined. 8 specimens, 127–155 mm SL, including the following specimen not cited in the original description: WAM P.30815–001 (146), Manado fish market, Sulawesi, Indonesia, 134'N, 12455'E, 9 Jun. 1994, G.R. Allen.

Expanded diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking flexible lamina posteriorly; extending about 1.2 to 1.5 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 16O) very broad and robust; 3rd infraorbital with no suborbital shelf; dorsal fin XI–XII, 12 (usually XI, 12); anal fin II, 11; vertebrae 10+16; scale rows in horizontal series 56–67; total gill rakers 41–44; in life, body with 5–7 violet-blue stripes and head with prominent violet-blue blotches (Figs. 65–66).

Comparisons. *Opistognathus aurolineatus* and *O. decorus* are the only Indo-West Pacific species with robust bodies, cephalic pores sparse and minute (Figs. 8A, 8B), all mandibular pore positions with single pores, dorsal- and anal-fin segmented rays 12 and 11 respectively, robust infraorbitals (Figs. 16N, 16O), and body with 3–7 stripes. *Opistognathus decorus* differs from *O. aurolineatus* in having the head with prominent dark blotches and a narrow interorbital band (vs. no head blotches or interorbital band), in life, body with 5–7 violet stripes (vs. in life, body with 3 golden-orange stripes), and pelvic-fin length 26.0–29.4% SL (vs. 19.2% SL).

Distribution. (Fig. 27) Known only from Okinawa and Sulawesi where all specimens were obtained from fish markets. Probably a deep-water species like its sister-species *Opistognathus aurolineatus*.

Etymology. The specific epithet from the Latin *decorus* (beautiful), refers to the attractive life coloration (Figs. 65, 66) of this species.

Opistognathus dendriticus (Jordan & Richardson, 1908)

Dendritic Jawfish

Figures 17C, 67–69; Tables 1–14

Gnathypops dendritica Jordan & Richardson 1908:261, fig. 9 (original description: Philippines, Cuyo; holotype SU 20313, 129 mm SL). Herre 1934:95 (listed, Culion, Philippines). Böhlke 1953:89 (listed, type catalog). Herre 1954:785 (Philippine fishes checklist).

Opistognathus dentriticus [sic]: Schroeder 1980:187, color fig. 289 (local name, ecology, color description, Sulu Sea).

Opisthognathus dentriticus [sic]: Conlu 1986:305 (brief description).

Opistognathus dendriticus: Allen & Adrim 2003:34 (listed). Allen & Erdmann, 2012:353, color photos (brief description, distribution).

Material Examined. 45 specimens, 33.5–228.8 mm SL. **Sabah**: CAS-SU 27866 (2, 100 C&S–130), CAS-SU 32763 (2, 126–176), FMNH 51761 (2, 93–120), Sandakan District, off Pulo Nunuyan Laut, R.F. Inger, 28 Apr. 1950; FMNH 23301 (112), Sandakan District; Crane Pacific Exped., 5 Jul. 1929; USNM 365703 (169), Banggi Islands, off Balak Balak, sandy inshore area, K. Kavanaugh, 6 Oct. 1999, sta. KK 99–10–06. **Indonesia**: WAM P.31496–006 (50.5), Treko Island, 2°7'N, 123°27'E, 1–2 m, G.R. Allen, 6 Nov. 1998. **Philippines**: CAS-SU 20313 (129), holotype of *Gnathypops dendritica*, Philippines, Cuyo Island, Cuyo; ANSP 142961 (3, 42.5–174), Palawan Prov., Bararin Islands (Cuyo Island), 10°52'42"N, 120°56'44"E, 0–17 m; MNHN 84–267 (143) and MNHN 84–268 (2, 97–177), no other locality data; CAS-SU 29024 (5, 33.5–229), BMNH 1933.3.11.525 (205.5), FMNH 47354 (155) and UMMZ 100568 (2, 75-81), all from Culion, 11°43'N, 119°58'E; CAS-SU 39033 (50) Busuanga Islands., Coron; ANSP 141422 (170) and ANSP 145650 (125), Palawan Prov., Puerto Princesa City market; WAM P.31396–001 (94.5), Calamian Islands, Buluang Bay, 12°13'N, 119°52'E, 0.1–0.5 m; USNM 220926 (43), Palawan Prov., Taganayan Island, 10°57'48"N, 121°13'32"E, 2 m; USNM 122417 (133), Palawan Prov., Chase Head, "Albatross" 22 Dec. 1908; USNM 396239 (2, 124–167), Palawan Prov., Tara Island, 12°18.92'N, 120°20.2'E, 22–25 m; LACM 42487–6 (156), Palawan, Honda Bay; USNM 122418 (92), Candaraman Island., Balabae, Albatross Philippine Expedition, 4 Jun. 1909; USNM 318633 (8, 100–164), northern Busuanga Islands., Calauit, A.C. Alcala *et al.*, 1–5 May 1983; Palawan Prov., Busuanga Island, 12°'25'N, 119°8'17'E, 0–1.5 m.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking flexible lamina posteriorly, extending about 0.6 to 0.9 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 17C) relatively slender and tubular 3rd infraorbital with moderate lateral opening and wide suborbital shelf; dorsal fin X–XI, 13–14; anal fin II, 11–13; scale rows in horizontal series 66–95; vertebrae 10–11, usually 11+16-17; dorsum with 6–7 dark blotches along base of dorsal fin, sides with a double row of large pale spots, and spinous dorsal fin with a single black spot between spines 3 to 5–7.

Description. Dorsal fin X or XI (usually XI), 13–14, total = 24–25, rarely 25; anal fin II, 11–13, exceptionally 11; pectoral fin 19–21; caudal fin: procurrent rays 3–4+3–4, segmented rays 8+8, middle 12–14 branched, total elements 22–24; hypural 5 present; vertebrae 10–11+16–17= 27, typically 11+16; last pleural rib on vertebra 11; epineurals 12–15; no supraneurals; dorsal-fin interdigitation anterior pattern / / /1/1+1/1/; gill rakers 8–12+18–21 = 28–33.

Scales absent on head, nape, area above lateral-line anteriorly (but 4 or 5 scale rows present above lateral line posteriorly), pectoral-fin base (sometimes a few embedded scales) and chest; scale rows in horizontal series about

66–95; lateral-line terminus below segmented dorsal-fin rays 4–6 (total element positions 15.0–17.0); lateral-line pores numerous, arranged in a multiple series along embedded lateral-line tubes; cephalic sensory pores very numerous, completely covering all of head, nape (except for small area adjacent to dorsal-fin origin) and opercle; mandibular pore positions 1–2 occupied by relatively large single pores, 3rd position with 1–4 pores, 4th with 5–16 pores, 5th with numerous pores that are difficult to accurately count.

Anterior naris positioned distinctly closer to posterior naris than to dorsal margin of upper lip, and consisting of a very short tube, with broad, elongate tentacle on posterior rim, that when depressed extends almost to orbital rim; height of nasal tentacle about 2.0–2.5 times maximum diameter of posterior naris; dorsal fin moderately low with profile of spinous part relatively uniform, but with a noticeable change in fin height at junction of spinous and segmented rays; dorsal-fin spines moderately stout and straight, posterior spines slightly more curved and with slightly flexible tips; tips of spines with swollen fleshy tabs; all segmented dorsal- and anal-fin rays branched distally or 1st anal ray unbranched; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally; posterior margin of preopercle relatively distinct, with a free margin; no crenulae on margin of upper lip anteriorly although some specimens with a few crenulae laterally; fifth cranial nerve passes over $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extends about 0.6 to 0.9 eye diameters behind posterior margin of orbit; maxilla widest at end and truncate, without flexible lamina posteriorly; supramaxilla present, small and terminally positioned; premaxilla with an outer row of moderately large and slightly recurved teeth anteriorly that become progressively smaller posteriorly and extend about 2/3 length of jaw; 1–2 irregular series of smaller teeth and several symphyseal canines behind outer row anteriorly; dentary teeth similar to those of premaxilla except no enlarged inner, symphyseal teeth; vomerine teeth absent

Measurements of 26 specimens, 93.4–228.8 mm, as percent of SL: predorsal length 34.1–41.8; preanal length 58.8–66.1; dorsal-fin base 59.2–69.6; anal-fin base 24.5–29.0; pelvic-fin length 17.6–24.8; caudal-fin length 22.5–26.6; depth at anal-fin origin 20.4–26.9; caudal-peduncle depth 11.1–13.7; head length 36.1–42.2; postorbital-head length 22.1–26.3; upper-jaw length 23.3–28.7; postorbital-jaw length 8.8–14.4; orbit diameter 9.8–14.1. As percent of head length: postorbital-head length 57.4–67.7; upper-jaw length 61.5–71.0; postorbital-jaw length 21.8–36.4; orbit diameter 26.4–34.7.

Color in life (Figs. 67–68): Background color pale grey to yellow-tan with scattered black dots; irregular mid-lateral, wide brown stripe with dorsal and ventral extensions that partially or completely encircle large pale spots; dorsal fin with black blotch between spines 3–5 and distal margin of all spines with tipped with white fleshy tabs below which is a narrow black line; dorsum with six evenly spaced brown blotches along base of dorsal fin; soft dorsal and anal fins with brown horizontal stripe; caudal fin yellow with irregular brown bands and brown basicaudal bar separating pair of pale spots; pelvic fin without bands; upper jaw crossed by brown band near posterior end; large postorbital black band extending thru eye as an eye "mask."

Comparisons. The combination of a rigid upper jaw, dorsal fin usually XI, 13–14, dorsum with 6–7 dark blotches along base of dorsal fin and sides with a double row of large pale spots distinguishes *Opistognathus dendriticus* from all other Indo-West Pacific species of *Opistognathus*. It is also the only species that typically has 11 precaudal and 16 or 17 caudal vertebrae (Table 10).

Distribution. (Fig. 30) Known from Borneo, the Philippines, and Sulawesi (Banggai Islands) in 1–25 m.

Etymology. The specific epithet is from the Greek *dendron* (tree), in allusion to the tree-like, branching pattern of the cephalic pores.

Opistognathus dipharus Smith-Vaniz, 2010

Tail Beacon Jawfish

Figure 16Q, 70; Tables 1–14

Opisthognathus [sic] *muscatensis* (not of Boulenger). Dor 1970:22 (brief description, Dahlak Archipelago).

Opistognathus dipharus Smith-Vaniz 2010:49, figs. 2D, 14–15 (original description: southern Red Sea, Dahlak Archipelago, Um-Aabak; holotype HUJ 16975, 47.2 mm SL). Bogorodsky & Randall 2019:243 (listed, Red Sea endemic). Smith-Vaniz 2022:311, unnumbered fig. (description, distribution).

Material examined. Known only from the 47.2 mm SL male holotype, see above.

Expanded diagnosis: A species of *Opistognathus* having a rigid upper jaw lacking flexible lamina posteriorly, extending 0.9 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 16Q) moderately robust with large sensory canal openings, 3rd infraorbital with moderate suborbital shelf; dorsal fin XI, 15; anal fin III, 16; vertebrae 10+19; scale rows in horizontal series about 63–64; lateral-line terminus below segmented dorsal-fin rays 6 or 7; caudal fin with pair of conspicuous oblong, pale, basicaudal spots against dark background; inner lining of upper jaw and adjacent membranes with posterior black blotch that is externally visible; head and body various shades of brown, with darker mid-lateral stripe with irregular margins.

Comparisons. *Opistognathus dipharus* can be distinguished from all other species by its conspicuous pair of oblong pale basicaudal spots.

Distribution. (Fig. 31) Known only from the southern Red Sea. Depth not recorded but holotype collected while snorkeling hence probably < 3 m. This jawfish was photographed in its burrow but not collected by J. E. Randall at Masamirit (18°50'N, 38°46'E), southern Suakin Archipelago in 23 m.

Etymology. The specific epithet is from the Greek *di* (two, double) and *pharos* (beacon), and refers to the pair of conspicuous oblong basicaudal spots (Fig. 71) that characterize this species.

Opistognathus elizabethensis Smith-Vaniz, 2004

Elizabeth Jawfish

Figure 16R, 71; Tables 1–15

Opistognathus elizabethensis Smith-Vaniz 2004:216, figs. 3D, 8 (original description: Elizabeth Reef, north side near lagoon entrance, 29°56'S, 159°1'E; holotype AMS I.27891–010, 60.4 mm SL). Hoese & Bray 2001:1074 (synonymy, Australian distribution). Baker 2013:103 (distribution and habitat).

Opistognathus sp. Choat *et al.* 2006, 59 (listed, Elizabeth Reef).

Material examined. 4 specimens, 60.4–71.4 mm SL, all cited in the original description.

Expanded diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking flexible lamina posteriorly, extending about 0.6–0.9 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 16R) moderately wide, 3rd infraorbital largest with large sensory canal openings, no suborbital shelf; dorsal fin XI, 18 or 19; anal fin II, 17–19; vertebrae 10+23; scale rows in horizontal series about 47–51; scales absent anterolaterally forward of verticals from dorsal-fin spines 6–7; vomerine teeth 2 or 3; spinous dorsal fin with an oblong black spot (partially encircled by white border) between spines 3–6 that extends slightly onto dorsum; in life, yellowish-brown with pale blue markings in dorsal fin; in preservation, head and body uniformly tan, except largest specimen with pair of pale basicaudal spots.

Comparisons. See Table 15. The color pattern of *O. elizabethensis* readily distinguishes it from all other Australian species of *Opistognathus*. It also is the only species compared in Table 15 that has the fleshy tabs on the tips of the dorsal-fin spines dusky instead of pale. *Opistognathus seminudus* and *O. elizabethensis* are also the only two Australian species that lack pale body spots or dark orbital spots, but *O. elizabethensis* has more dorsal-fin rays 18–19 (vs. 14–16) and scale rows in horizontal series 47–51 (vs. 28–36).

Distribution. (Fig. 25) An Australian endemic known only from Elizabeth Reef, 29°56'S, 159°05'E in about 0.5–18 m. This jawfish possibly also occurs at Middleton Reef, 29°27'S, 159°07'E, approximately 60 km north of Elizabeth Reef. These two isolated reefs are the southernmost open ocean platform reefs in the world (Hobbs & Feary 2007).

Etymology. The specific epithet refers to the type locality.

Opistognathus ensiferus Smith-Vaniz, 2016

Mannar Jawfish

Figure 72; Tables 1–14

Opistognathus ensiferus Smith-Vaniz 2016:279, figs. 1, 2A (original description: India, Gulf of Mannar, Manauli Reef, Musal Tivu Island (Hare Island), 9°12'N, 79°55'E; holotype FMNH 71365, 61.5 mm SL).

Material examined. Known only from the 61.5 mm SL male holotype, see above.

Expanded diagnosis. A species of *Opistognathus* having a sword-shaped upper jaw produced as a flexible lamina, in adult males extending to rear margin of opercle (2.2 eye diameters behind posterior margin of orbit). Dorsal fin XI, 14; anal fin III, 14; vertebrae 10+18; scale rows in horizontal series about 48–52; lateral-line terminus ending below segmented rays 6–7; spinous dorsal fin with large ocellus between spines 3–6; inner lining of upper jaw and adjacent membranes with a single dark stripe; area above and below esophageal opening unpigmented.

Comparisons. *Opistognathus ensiferus* differs from the other two members of the *Opistognathus solorensis* species group (*O. solorensis* and *O. verecundus*) in having a more posterior lateral-line terminus ending below dorsal-fin segmented rays 6–7 (vs. 1–4), third mandibular pore position with 5–6 pores (vs. 1 or 2 pores); pharyngeal area without dark pigmentation (vs. with distinctive pigmentation, see Smith-Vaniz 2016, fig. 3) and inner lining of upper jaw and adjacent membranes with a single dark stripe (vs. 2 stripes); *Opistognathus solorensis* also differs from *O. ensiferus* in having more scale rows in horizontal series, 59–69, exceptionally 53 (vs. 48–52). *Opistognathus verecundus* can be distinguished from both species in typically lacking dark blotches on the spinous dorsal fin and in having fewer lower gill rakers 15–17 (17 in 1 of 24 specimens) vs. 17–20, usually 18 or more (Table 11).

Distribution. (Fig. 32) Known only from the type locality, Manauli Reef, Gulf of Mannar, India in about 1 m.

Etymology. The specific epithet, from the Latin *ensifer* (sword-bearing), is in allusion to the sword-shaped upper jaw.

Opistognathus erdmanni, new species

Erdmann's Jawfish

Figures 10C 17I, 73, 74; Tables 1–14, 16

Opistognathus species 2. Allen & Erdmann 2012:355, color photo (brief description, distribution).

Holotype. WAM P.33073–001, 38.3 mm SL, male, Myanmar, Mergui Archipelago, Clara Island (10°49.958'N, 97°52.604'E), 50–55 m, in strong current in murky area on white sand, clove oil, M.V. Erdmann, 16 Feb. 2009.

Paratypes. 4 specimens, 25.9–38.8 mm SL. USNM 396956 (37.7), male and WAM P.33073–009 (3, 25.9–38.8), all collected with the holotype.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking flexible lamina posteriorly, extending about 0.7–1.1 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 17I) moderately slender and tubular 3rd infraorbital with short posterolateral projecting arm ending in sensory canal opening, no suborbital shelf; dorsal fin XI, 11; anal fin II, 10–11; vertebrae 10+16; scale rows in horizontal series about 37–40; no supraneurals; scale rows on body appearing to form a series of narrow stripes; dorsum with 5 dark blotches, those below spinous dorsal fin extending only slightly on to fin.

Description. Dorsal fin XI, 11; anal fin II, 10–11; pectoral fin 19; caudal-fin: procurrent rays 4+3–4, segmented rays 8+8, middle 12 branched, total elements 23 or 24; hypural 5 present; vertebrae 10+16; last pleural rib on vertebra 10; epineurals 12; no supraneurals; dorsal-fin interdigitation anterior pattern / / /1/1+1/1/; gill rakers 9–10+19 or 21 = 29–31.

Scales absent on head, nape, above lateral line and chest; pectoral-fin base and chest completely scaly; scale rows in horizontal series about 37–40; lateral-line terminus below segmented dorsal-fin ray 2–4 (total element positions 13–15); lateral-line pores mostly arranged in irregular series along embedded lateral-line tubes; cephalic sensory pores relatively numerous (Fig. 10C); mandibular pore positions 1–4 occupied by single large pores, 5th position sometimes with a much smaller additional pore; preopercular pore positions simple except dorsalmost position bipored.

Anterior naris positioned midway between upper margin of upper lip and posterior naris and consisting of a short tube that when depressed does not reach margin of posterior naris; height of tube about 0.5 maximum diameter of posterior naris; dorsal fin moderately low, gradually increasing in height to about middle of spinous dorsal fin; profile of fin gradually increasing in height posteriorly; dorsal-fin spines moderately stout and straight without flexible tips; tips of dorsal-fin spines with conspicuous pale tabs; all segmented dorsal- and anal-fin rays branched distally; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally. posterior margin of preopercle indistinct, without a free margin; no crenulae on anterior margin of upper lip; fifth cranial nerve passes under $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extends about 0.7 to 1.1 eye diameters behind posterior margin of orbit; maxilla widest at end and

truncate, without flexible lamina posteriorly; supramaxilla present, moderately large and terminally positioned; premaxilla with a single row of moderate conical teeth which extend entire length of upper jaw and become progressively smaller posteriorly; an irregular patch of teeth behind outer row anteriorly, those in inner most row enlarged; dentary with an outer row of small canines, teeth on posterior 2/3 of jaw in a single row with 3 or 4 near middle of dentary larger; anterior teeth flanked by an irregular inner row of smaller teeth; vomerine teeth absent.

Measurements of the 38.3 mm male holotype followed in parentheses by four paratypes, 25.9–38.8 mm, as percent of SL: predorsal length) 38.8 (35.3–39.0); preanal length 61.6 (59.8–65.5); dorsal-fin base 65.3 (62.4–64.2); anal-fin base 30.3 (24.5–27.3); pelvic-fin length 31.5 (25.0–33.8); caudal-fin length 29.8 (27.1–32.1); depth at anal-fin origin 26.0 (22.8–25.5); caudal-peduncle depth 15.7 (13.1–14.9); head length 38.9 (36.0–38.8); postorbital-jaw length 12.9 (8.5–13.0); orbit diameter 12.9 (11.8–12.7); upper-jaw length 27.3 (24.0–27.3). As percent of head length: postorbital-head length 59.1 (55.2–60.2); upper-jaw length 70.3 (63.7–71.5); postorbital-jaw length 33.2 (21.9–34.0); orbit diameter 33.2 (30.7–33.7).

Color in life (Figs. 74, 75): Horizontal scale rows outlined to form narrow pale stripes; cheek with dark dashes; jaws with a few dark bands; upper jaw with dark bands; dorsal fin with wide tan stripe that extends almost to distal margin of spinous fin and then tapers posteriorly to near base of last ray, remainder of fin mostly yellow with tips of spines with white tabs; dorsal fin with 5 proximal dark blotches that extend slightly onto dorsum, the first blotch between spines 1-4; caudal and anal fins yellow, and pelvic fin white.

Comparisons. See Table 16. *Opistognathus erdmanni* agrees with the following apparently allopatric species in having rigid upper jaws, anal fin II, 10–11, dorsal fin with 4–6 dark blotches and scale rows on body often appearing to form a series of narrow stripes: *O. asper*, *O. bathyphilus*, *O. biporus,* and *O. liturus*. *Opistognathus erdmanni* and *O. liturus* are similar, both species differ from the others in having dark blotches along dorsum that extend only slightly on to the spinous dorsal fin (vs. extending well on to spinous dorsal fin) but *O. erdmanni* has many more cephalic sensory pores on the dorsum of the head (compare Figs. 9D and 10C), the first dark blotch on dorsum is between spines 1–4 (vs. spines 2–5), a wide tan stripe on spinous dorsal fin anteriorly that becomes narrower on posterior part of fin (vs. apparently no tan stripe on dorsal fin), and *O. erdmanni* is the only one of these species without supraneurals (vs. two supraneurals); *O. bathyphilus* and *O. biporus* also differ in having more total gill rakers 37 (vs. 29–31) and nape with a dark blotch slightly in advance of dorsal-fin origin (vs. nape without a dark blotch); *O. asper* has more total gill rakers 33–34 (vs. 31), spinous dorsal fin with narrow dark distal stripe (vs. no distal stripe) and cheek with dark spots (vs. dark dashes).

Distribution. (Fig. 26) Known only from the eastern Indian Ocean in the Mergui Archipelago off Myanmar in depths of 50–55 m.

Etymology. Named for Dr. Mark V. Erdmann of Conservation International, in appreciation for his enthusiasm for jawfishes and whose expertise in locating, collecting and photographing them has greatly aided my research.

Opistognathus evermanni **(Jordan & Snyder, 1902)**

Rainbow Jawfish

Figures 16L, 75–76; Tables 1–14

Gnathypops evermanni Jordan & Snyder 1902:493, fig. 6 (original description: Japan, Wakayama Prefecture, Wakanoura, Kii; holotype CAS-SU 6542, 62.6 mm SL). Kamohara 1952:53 (brief description, Kochi). Böhlke 1953:89 (listed, type catalog). Shiino 1972:116 (common name Rainbow jawfish). Masuda *et al.* 1975:259, color Pl. 83-A (brief description, southern Japan).

Opistognathus evermanni. Fourmanoir 1965:75, fig. 48 (color description, Nha-Trang, Vietnam). Machida *in* Masuda *et al.* 1984:200, color Pl. 191-G (brief description, Japan). Smith-Vaniz & Yoshino 1985:25 (synonymy, diagnosis, Japanese records). Okamura & Amaoka 1997:285, fig. 2 (color photograph). Smith-Vaniz 2000:612 (listed, checklist of South China Sea fishes). Aizawa *In* Nakabo 2002:741 (unnumbered figs., pictorial guide to Japanese fishes, meristic values). Sadovy & Cornish 2000:308 (Hong Kong, listed). Hayashi & Okuri 2007:43, figs. 4f, 5f, 6f, 13f "Niji-amadai," description, distribution, in key to Japanese *Opistognathus*). Ikeda & Nakabo 2015:388, Pl 127, color Fig. 2 (description, Japan). Soniyama *et al.* 2020:57 (checklist of fishes off Yamaguchi Prefecture, Japan). Mariasingarayan *et al.* 2021:786, color figs. 1-2 (Bay of Bengal, India, description). Rainboth *et al.* 2012:84 (listed, Gulf of Thailand and Viet Nam).

Material Examined. 10 specimens, 56.3–97.7 mm SL. **Japan**: CAS-SU 6542 (62.6), holotype and USNM 50279 (58.6), paratype of *Gnathypops evermanni*, both from Wakanoura, Kii; UMMZ 199004 (56.3) vicinity of Nagasaki.

Vietnam: MNHN 1964–626 (81.5) Nha-Trang; USNM 396955 (4, 92.6–97.7), Nha Trang market. **Philippines**: USNM 443376 (89.4) and USNM 443378 (82.0) Luzon, vicinity of Bauang, 16°6994'N, 120°27'E, sta. PHISH-2016-48.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking flexible lamina posteriorly, extending about 1.0 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 16L) moderately tubular, with large openings for sensory canals; 3rd infraorbital largest with very short posterolateral projecting arm ending with sensory canal opening, no suborbital shelf; dorsal fin XI, 10–12; anal fin II, 10–11; vertebrae 10+16; scale rows in horizontal series about 41–47; nape naked; outer premaxillary teeth relatively straight with distinctly blunt tips; soft dorsal and anal fins each with two pale stripes; caudal fin with one pale band; pelvic fin bicolored, dark except for pale unbranched outer two rays and interradial membrane.

Description. Dorsal fin XI, 10–12; anal fin II, 10–11; pectoral fin 19 or 20; caudal fin: procurrent rays 3+3–4, segmented rays 8+8, middle 12 branched, total elements 22 or 23; hypural 5 present; vertebrae 10+16; last pleural rib on vertebra 10; epineurals 12–14; two supraneurals; dorsal-fin interdigitation anterior pattern S/S/1/1+1/1/; gill rakers 8–11+18–21 = 26–32.

Scales absent on head, area above lateral line adjacent to or slightly beyond dorsal-fin origin with 3–5 irregular scale rows; chest squamation varying from completely naked to posterior half scaly; pectoral-fin base completely scaly; body with about 40–46 scale rows in horizontal series; lateral-line terminus below spine 10 to segmented dorsal-fin ray 2 (total element positions 10.0–13.0); lateral-line pores sparse, mostly arranged in a single, row along embedded lateral-line tubes (anteriorly lateral-line tubes on dorsal surface of scales); cephalic sensory pores relatively sparse; preopercular pore positions all occupied by single pores; mandibular pore positions 1–3 occupied by single pores, 4th position with 1 or 2 pores and 5th with 2 or 3 pores.

Anterior naris positioned closer to dorsal margin of upper lip than to posterior naris and consisting of a minute cirrus on slightly raised area; dorsal fin moderately high with a noticeable change in fin height at junction of spinous and segmented rays; dorsal-fin spines relatively slender and only slightly curved distally, with flexible tips; all segmented dorsal- and anal-fin rays branched distally or anteriormost 1 or 2 anal rays unbranched; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally; posterior margin of preopercle indistinct, without a free margin; no crenulae on margin of upper lip anteriorly; fifth cranial nerve passes under $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extends about 1.0 eye diameters behind posterior margin of orbit; maxilla widest at end and truncate, without flexible lamina posteriorly; supramaxilla present, moderately large and terminally positioned; premaxilla with an outer row of relatively elongate, blunt tipped teeth that become smaller posteriorly; premaxillary symphysis with a toothless gap on each side with an inner pair of enlarged (the anteriormost largest), slightly recurved and almost horizontally positioned teeth; dentary with an outer row of relatively elongate blunt tipped teeth that are slightly curved inward distally; posteriormost 1 or 2 dentary teeth slightly enlarged and hooked inward; dentary symphyseal teeth similar to those of premaxilla except 1–3 inner teeth on each side; vomerine teeth absent.

Measurements of the 58.6 mm SL holotype, followed in parentheses, by those of 7 specimens, 56.3–81.5 mm SL, as percent of SL: predorsal length 38.3 (36.8–39.1); preanal length 62.5 (58.4–70.1); dorsal-fin base 62.3 (57.3–63.9); anal-fin base 24.5 (23.0–26.7); pelvic-fin length 25.1 (22.0–25.6); caudal-fin length 27.5 (23.6–29.1); depth at anal-fin origin 23.7 (23.7–28.4); head length 36.9 (37.7–40.3); postorbital-head length 22.8 (20.9–24.0); upper-jaw length 26.0 (21.2–27.0); postorbital-jaw length 12.6 (8.6–13.7); orbit diameter 12.6 (10.4–13.1). As percent of head length: postorbital-head length 61.8 (54.9–62.6); upper-jaw length 70.4 (55.7–70.8); postorbital-jaw length 34.1 (21.4–35.9); orbit diameter 34.3 (27.6–34.3).

Color in life (Fig. 75): Background of head and body chocolate brown and covered with numerous small white spots and blotches; soft dorsal and anal fins mostly black with two pale stripes, the middle stripe darkest, and bases of fins with brown stripe; caudal fin with narrow pale basicaudal band and another curved one on posterior third of fin, remainder of fin black; pectoral fin yellow; pelvic fin bicolored, dark except for pale yellow unbranched outer two rays and interradial membrane.

Comparisons. *Opistognathus evermanni* and *O. macrolepis* differ from other species of *Opistognathus* having a rigid upper jaws and anal fin II, 10–12 in having mostly black dorsal fins with one or two white stripes and the anterior naris very minute. *Opistognathus evermanni* differs from *O. macrolepis* in having a naked nape (vs. posterior half of nape completely scaly), dorsal and anal fins with 2 white stripes (vs. 1 white stripe), caudal fin with a middle white band in addition to a basicaudal white band (vs. only a white basicaudal band) and upper lip without

minute lappets on outer margin anteriorly (vs. upper lip margin with minute dark lappets anteriorly). *Opistognathus evermanni* also differs from *O. macrolepis* in having the head and body with numerous small white spots.

Distribution. (Fig. 27) Known from Bay of Bengal on Parangipetta coast of southeast coast of India (Mariasingarayan *et al.* 2021), Philippines, Vietnam, Hong Kong (Sadovy & Cornish 2000), and Japan in 10–30 m. The Philippine records are based on a specimen obtained from the Dumaguete fish market (Fig. 75) and two specimens obtained from a fish market in northwestern Luzon. Smith-Vaniz & Yoshino (1985) cited 11 specimens of *O. evermanni* (not examined by me) from the following additional Japanese localities: Tokushima Pref., Tanabe Bay, Wakayama Pref., and Uwajima, Ehime Pref.

Etymology. Named for Barton Warren Evermann (1853–1932), ichthyologist of the U.S. Fish Commission and director of the California Academy of Sciences in San Francisco from 1914 until his death.

Opistognathus eximius (Ogilby, 1908)

Harlequin Smiler

Figures 17D, 77, 78; Tables 1–14

Merogymnus eximius Ogilby 1908:18 (original description: Queensland, Australia, snapper banks off Moreton Bay; holotype AMS I.9496). Ogilby 1920:24, pl. 2 (redescription, Moreton Bay). McCulloch 1929:330 (checklist of Australian fishes). Whitley 1964:52 (listed). Grant 1982:582, color pl. 302 (brief description, Queensland).

Tandya sp. Roughley 1937:272, color pl. 49, upper fig. (illustration).

Opistognathus eximius. Russell 1983:107 (common on outer slope in 20-30m, Great Barrier Reef, Capricorn Group) Mooi 1990:462 (description egg surface morphology). Johnson 1999:745 (Checklist, Moreton Bay, Australia). Smith-Vaniz 2004:222 (in key to Australian *Opistognathus*). Hoese & Bray 2006:1074 (synonymy, Australian distribution).

*Tandya latitabunda (*not of Whitley) Whitley 1937:21 (misidentification, Great Barrier Reef, Capricorn Group).

Material Examined. 23 specimens, 153–285 mm SL all from eastern Australia. AMS I.9496 (223), holotype of *Merogymnus eximius*, Queensland, Moreton Bay, snapper banks, exchange via Amateur Fishermen's Association, Sep. 1908; AMS I.12548 (209), Moreton Bay, via Amateur Fishermen's Association; ANSP 137474 (153 C&S), Moreton Bay; QM I.11401 (285), off Cape Moreton; QM I.18453 (192), Noosa Heads; ANSP 98833 (198), QM I.2840 (200), QM I.7647 (190.5), QM I.4048 (218), QM I.1541 (210), QM I.2650 (194) and QM I.8150 (227), all from Caloundra; QM I.9770 (248) and QM I.8180 (183), off Mooloolaba, 6.5 m; QM I.4400 (206), S. Leach; AMS IA.5490 (201) and AMS I.15571–011 (219), Capricorn Group, Northwest Is.; QM I.31129 (177), Fairfax Island, NW side, 23°52'S, 152°22'E, handline, 22 m, 23 Feb. 1998; AMS I.15388–007 (2, 165–191), W. of Heron Island, 23°27'S, 151°54'E; AMS IB.4548 (190), between Wistari Reef and Heron Island, 21 m; ANSP 137477 (218), Queensland coast; ANSP 82314 (250), Great Barrier Reef, Bunker group.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking flexible lamina posteriorly, extending about 0.7 to 0.9 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 17D) very slender and tubular 3rd infraorbital very elongate with large suborbital shelf; dorsal-fin rays XI, 13; anal fin II, 12; vertebrae 10+16; scales on belly minute and distinctly embedded; body with about 80–99 scale rows in horizontal series; vomerine teeth 1–3; opercle with a conspicuous dark spot; color of sides and anal blue with large yellow spots.

Description. Dorsal fin XI, 13; anal fin II, 12; pectoral fin 19–21; caudal fin: procurrent rays 3–5+4, segmented rays 8+8, middle 12–14 branched, total elements 23–25; hypural 5 present; vertebrae 10+16; last pleural rib on vertebra 10; epineurals 12–13; no supraneurals; dorsal-fin interdigitation anterior pattern / / /1/1+1/1/; gill rakers 14–17+25–28 = 39–44.

Scales absent on body anterior to verticals from dorsal-fin spines 5–7, and from head, nape, area above and below lateral line, pectoral-fin base and chest; scales on belly minute and distinctly embedded; scale rows in horizontal series about 80–99; lateral-line terminus below segmented dorsal-fin rays 4–7 (total element positions 15.0–18); lateral-line pores sparse, arranged in a single series along embedded lateral-line tubes; cephalic sensory pores relatively sparse and minute; 1st mandibular pore position occupied by a single pore, 2nd position with 1 or 2 pores, 3rd and 4th positions bipored, 5th with 6–8 pores; preopercular pore positions mostly bipored and posterior 3/4 of nape without pores.

Anterior nostril positioned about mid-way between dorsal margin of upper lip and posterior naris and consisting of a short tube with a minute tentacle, that when depressed does not reach margin of posterior naris; height of tube about 0.5 times maximum diameter of posterior naris; dorsal fin moderately low, with profile relatively uni-

form without change in fin height at junction of spinous and segmented rays; dorsal-fin spines slender and straight to slightly curved, with flexible tips; all segmented dorsal- and anal-fin rays branched distally o^{r} 1st anal ray unbranched; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally; posterior margin of preopercle indistinct, without a free margin; no crenulae on margin of upper lip anteriorly; fifth cranial nerve passes over $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extends about 0.7 to 0.9 eye diameters behind posterior margin of orbit; maxilla widest at end and rounded, without flexible lamina posteriorly; supramaxilla present, small and terminally positioned; premaxilla with an outer row of moderately small, curved teeth that become progressively smaller posteriorly and extend about 2/3 length of jaw; 1 or 2 irregular rows of smaller teeth behind outer row anteriorly, innermost 3 or 4 teeth adjacent to symphysis larger and strongly canted posteriorly; dentary teeth similar to those of premaxilla except 1–3 rows of teeth behind outer row on anterior half of dentary; no enlarged symphyseal teeth; vomerine teeth 1–3.

Measurements of 17 specimens, 153–285 mm SL, as percent of SL: predorsal length 29.1–33.8; preanal length 55.6–76.0; dorsal-fin base 62.7–69.6; anal-fin base 29.6–35.5; pelvic-fin length 19.5–26.7; caudal-fin length 24.1–28.1; depth at anal-fin origin 20.6–24.0; caudal-peduncle depth 12.4–14.4; head length 34.0–37.3; postorbital-head length 20.0–23.2; upper-jaw length 22.0–25.2; postorbital-jaw length 8.1–14.0; orbit diameter 8.9–12.5. As percent of head length: postorbital-head length 56.8–66.6; upper-jaw length 62.9–70.6; postorbital-jaw length 23.3–39.8; orbit diameter 26.0–35.6.

Color in life (Fig. 77): The most spectacular aspect of *Opistognathus eximius* coloration is the body behind the pectoral fin with a combination of a rich blue background with 2 or 3 irregular rows of large yellow spots and a blue anal fin with 2 rows of yellow spots.

Ogilby (1908:19) described the life coloration as follows:

"Golden or golden brown above; sides with two series of large, round or oval, golden spots, separated by broad blue interlacing bands; abdominal region and extremity of tail violet, with splashes of greenish gold. Head lilaceous, with irregular violet spots and bars; a deep blue blotch, prolonged backwards as an uneven band on the opercle; branchiostegal region blackish. Outer half of spinous dorsal dark olive-green, narrowly bordered above with purple, below with pale blue; the lower band is continued to the end of the soft dorsal, the outer half of which is pale olive-green, with part of the membrane blue, as also is the base. Anal blue, with a median and a basal series of golden spots. Caudal rays olive-green or purple, the interradial membrane blue. Pectoral fin pale yellowish brown, the base with one or two vertical blue bars. Ventral bluish black."

Comparisons. The spectacular life color of *Opistognathus eximius* easily distinguishes it from all other species of *Opistognathus* and it is also unique in having distinctly embedded minute belly scales.

Distribution. (Fig. 27) Endemic to eastern Australia in depths of 6.5–35 m.

Etymology. The specific epithet, from the Latin *eximius* (select, distinguished, uncommon), was incorrectly stated in the original description to mean "beautiful," but certainly is an appropriate adjective for this species. According to Ogilby (1920) the local vernacular name "smiler" was adopted because of the fine countenance of opistognathids.

Remarks. In the original description the type (reported to be 285 mm TL) was stated to be in the collection of the Amateur Fishermen's Association of Queensland. It was subsequently transferred to the Australian Museum.

***Opistognathus flavidus*, new species**

Yellowfin Jawfish

Figures 6C, 17J, 79–81; Tables 1–14

Opistognathus fasciatus (not of Chan). Shen *et al.* 1986:72, color fig. 12 (description, Taiwan).
Opistognathus evermanni (not of Jordan & Snyder). Shen 1995:479, color photo 161–7 (brief description, Taiwan).
Opistognathus hongkongiensis (not of Chan). Park *et al.* 2008:74, fig. 2 (Korea, description, color figure).

Holotype. KAUM-I. 70089, 71.0 mm SL, East China Sea, 31°38.57'N, 127°08.59'E, 110–117 m, bottom trawl, 14 Jun. 2014, Mizuki Matsunuma.

Paratypes. 4 specimens 42.6–67.6 mm SL. **Taiwan**: NTUM 6177 (56.6), gravid female, Ta-chi, 122°15'E, 24°45'N, trawled in 80–120 m, 10 Jul. 1985; NTUM 7112 (58.4), male, Ta-chi, 16 Jul. 1987; TMF 330 (42.6), male, Ta-chi, 24 Jan. 1985; NMMBP 35987 (67.6) gravid female, Daki fish market, Yilan, northeast Taiwan, 22 Aug. 2021, Shing-Lai Ng.

Diagnosis. A species of rigid upper jaw lacking flexible lamina posteriorly, extending about 0.7 to 0.8 eye diameters behind posterior *Opistognathus* having a margin of orbit; infraorbitals (Fig. 17J) moderately robust and tubular 3rd infraorbital large with 3rd infraorbital larger with 3rd infraorbital larger with short posterolateral arm ending in a sensory pore, no suborbital shelf; dorsal fin XI, 11; anal fin II, 10; vertebrae 10+16; gill rakers 9–10+20–21 = 30–32; all fins mostly uniformly pigmented (except dorsal fin with very narrow grey or blue proximal stripe).

Description. Dorsal-fin rays XI, 11; anal-fin rays II, 10; pectoral fin 19 or 20; caudal fin: procurrent rays 3–4+3, segmented rays 8+8, middle 12 or 13 branched; hypural 5 present; vertebrae 10+16; last pleural rib on vertebra 10; epineurals 15–16; two supraneurals; dorsal-fin interdigitation anterior pattern S/S/1/1+1/1/; gill rakers 9–11+21–23 = 30–34.

Scales absent on head, nape, area above and slightly below lateral line, pectoral-fin base and chest; scale rows in horizontal series about 41–46; lateral-line terminus below dorsal-fin spines 9–11 (total element positions 9.5–10.5); lateral-line pores sparse, mostly arranged in a single, irregular series along embedded lateral-line tubes; cephalic sensory pores relatively sparse (Fig. 6C); mandibulo-preopercular pore positions all occupied by single pores.

Anterior naris positioned mid-way between posterior naris and dorsal margin of upper lip; consisting of a short tube, that when depressed does not reach margin of posterior naris; height of tube shorter than maximum diameter of posterior naris; dorsal fin moderately low with profile relatively uniform with only a slight change in fin height at junction of spinous and segmented rays; dorsal-fin spines relatively slender and straight with sharp pungent tips; segmented dorsal- and anal-fin rays branched distally (holotype) or anteriormost ray unbranched; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally; posterior margin of preopercle indistinct, without a free margin; no crenulae on margin of upper lip anteriorly; fifth cranial nerve passes under $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extends about 0.7 to 0.8 eye diameters behind posterior margin of orbit; maxilla widest at end and truncate, without flexible lamina posteriorly; supramaxilla present, moderately large and terminally positioned; premaxilla with an outer row of stout conical teeth which become progressively smaller posteriorly; 1 or 2 irregular rows of smaller teeth and 2 or 3 slightly enlarged symphyseal teeth behind outer row anteriorly; dentary with 3 irregular rows of conical teeth anteriorly (those of outer row only slightly enlarged), no enlarged symphyseal teeth; 5–7 uniserial teeth laterally that are moderately enlarged; vomerine teeth absent.

Measurements of the 71.0 mm female holotype followed in parentheses by those of 4 paratypes, 42.6–67.6 mm, as percent of SL: predorsal length 34.4 (30.6–34.4); preanal length 63.2 (61.3–63.7); dorsal-fin base 59.9 (56.9–62.6); anal-fin base 26.6 (23.7–26.5); pelvic-fin length 21.8 (22.4–25.1); caudal-fin length 24.4 (23.6–27.3); depth at anal-fin origin 23.1 (20.5–24.6); caudal-peduncle depth 13.6 (11.8–15.1); head length 34.4 (31.3–33.4); postorbital-head length 20.4 (18.0–19.6); upper-jaw length 21.6 (20.3–21.9); postorbital-jaw length 8.3 (7.5–8.7); orbit diameter 10.3 (10.2–11.1). As percent of head length: postorbital-head length 59.2 (56.9–59.0); upper-jaw length 62.7 (65.0–68.1); postorbital-jaw length 24.1 (24.0–26.2); orbit diameter 29.8 (31.9–33.7).

Color in life (Figs. 79–80: Head brown dorsolaterally, becoming paler ventrally; upper lip and all except posterior end of maxilla dusky brown. Entire lower lip ventral margin dark brown. Body with three or four poorly defined dark brown oblique bands, and a narrow vertical basicaudal band. Dorsal fin bright golden yellow except narrow grey or tan proximal stripe (stripe blue in NTUM 6177, see Shen *et al.* 1986, fig. 12), tips of 1st and 4th spines and distal margins of posterior segmented rays brownish. Anal and caudal fins mostly bright yellow, except distal margins of posterior anal-fin rays and distal margins of middle caudal-fin rays brownish. Pectoral fin pale and pelvic fin whitish.

Comparisons. *Opistognathus flavidus* differs from most other species with a rigid upper jaw in lacking a prominent dark spot or ocellus in the spinous dorsal fin, head without dark spots or markings, and in having dorsal, anal, and caudal fins that are primarily yellow in life. *Opistognathus hongkongiensis* is similar to *O. flavidus* but differs in having a larger head 36.2–38.6 (vs. 31.3–34.4) and upper jaw 24.6–28.5 (vs. 20.3–21.9), more lateral-line scales 48–54 (vs. 41–46), more numerous cephalic pores, and especially in having 7 evenly spaced dark bands on the body, with the 1st band on the nape, bands 2–6 extending onto the dorsal fin, and the 7th band on the caudal peduncle.

Distribution. (Fig. 34) Known from Taiwan, Japan, and off Jeju Island, Korea (Park *et al.* 2008), where trawled in 105–117 m.

Etymology. The Latin *flavidus* (golden yellow) refers to the predominant color of the dorsal, anal, and caudal fins.

Remarks. Shen *et al.* (1986) misidentified this species as *Opistognathus fasciatus* Chan (= *O. hongkongiensis*)

and subsequently (Shen 1993) erroneously applied the name *O. evermanni* to the same specimen. In their description, Shen *et al.* (1986) also erroneously reported "vomer with small teeth," but vomerine teeth are lacking in all specimens.

***Opistognathus helvolus*, new species**
Deep-water jawfish
Figs. 18K, 82; Tables 1–14

Holotype. (only known specimen) NTUM 13711, 39.8 mm SL, male, Coral Sea, east of New Caledonia, 21°9'S, 159°11'E, 300 m, Warren dredge, KANADEE Expedition, sta. DW 5017, 20 Sep. 2017.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking flexible lamina posteriorly, extending about 0.4 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 18K) moderately slender and tubular 3rd infraorbital much larger with short posterolateral projecting arm ending with sensory canal opening, no suborbital shelf; nape and cheek scaly; dorsal fin XI, 10; anal fin II, 10; vertebrae 10+16; spinous dorsal fin with a prominent ocellus between spines 3–6; anal fins mostly yellow; body scales brown.

Description. Dorsal fin XI, 10; Anal fin II, 10; Pectoral fin 20; Caudal fin: procurrent rays 3+3, segmented rays 8+8, middle 12 branched, total elements 22; hypural 5 absent; Vertebrae 10+16; last pleural rib on vertebra 10; epineurals 15; one supraneural; dorsal-fin interdigitation anterior pattern / /S/1/1+1/1/; Gill rakers 11+21.

Scales absent on head, except present on nape and cheek (most cheek scales missing on left side), pectoral-fin base and chest scaly; scale rows present above lateral line anterior to vertical from dorsal-fin spine 8; body scale rows in horizontal series approximately 38; lateral-line terminus below dorsal-fin spine 11; lateral-line pores mostly arranged in a single series along embedded lateral-line tubes; cephalic sensory pores sparse; all mandibular-preopercular pore positions occupied by simple pores.

Anterior naris positioned closer to margin of upper lip than to posterior naris and consisting of a short tube and cirrus that when depressed does not reach margin of posterior naris, height of tube and cirrus about 1.0 times diameter of posterior naris; dorsal fin moderately low, gradually increasing in height to about middle of spinous dorsal fin then decreasing in height; profile of fin gradually increasing in height posterior to junction of spinous and segmented rays; dorsal-fin spines moderately stout and straight, some slightly curved distally but without flexible tips; all segmented dorsal- and anal-fin rays branched distally; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally; posterior margin of preopercle indistinct, without a free margin; no crenulae on margin of upper lip anteriorly; fifth cranial nerve passes under $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extends about 0.4 eye diameters behind posterior margin of orbit; maxilla widest at end and truncate, without flexible lamina posteriorly; supramaxilla present, and terminally positioned; premaxilla anteriorly with slightly curved canines, but those on most of outer row consisting of small conical teeth that become progressively smaller posteriorly and extend almost entire length of upper jaw, and anteriorly behind outer row an inner patch of large canines that are strongly canted backwards; dentary with an outer row of small conical teeth on anterior 2/3 of jaw followed by 2 or 3 large, backward, curved canines, and an inner row of small curved teeth also present on anterior 2/3 of jaw; vomerine teeth absent.

Measurements of the 39.8 mm holotype, as percent of SL: predorsal length 34.7; preanal length 70.4; dorsal-fin base 64.6; anal-fin base 26.6; pelvic-fin length 32.5; caudal-fin length 30.7; depth at anal-fin origin 23.3; head length 35.6; postorbital-head length 16.8; upper-jaw length 23.6; postorbital-jaw length 7.1; orbit diameter 13.8. As percent of head length: postorbital-head length 47.2; upper-jaw length 66.4; postorbital-jaw length 20.1; orbit diameter 38.7.

Color in life (Fig. 82): Coloration of body difficult to determine because most scales are missing due to dredge abrasion. Most remaining body scales brown. Dorsal fin with prominent ocellus between spines 3–6 followed by two wide brown blotches on lower part of fin that extend on to body; the first one near beginning of soft fin and the other one near middle of fin. Distal third of soft dorsal fin pale yellow-brown, and middle of fin with wide white stripe. Anal fin yellow proximally with most of fin golden-brown. Caudal fin very pale yellow except basicaudal band and distal third of fin golden-brown. Pelvic fin golden yellow. Background color of head and jaws yellow except upper lip, ring below ventral margin of eye, nasal cirrus and on upper part of head brown. Iris dark brown.

Comparisons. *Opistognathus helvolus* is the only Indo-West Pacific jawfish with cheek scales. *Opistognathus*

trimaculatus and *O. vigilax* are the only other species that typically have 10 dorsal- and anal-fin segmented rays, but they have very different color patterns and lack scales on cheek and above the lateral line on nape anterior to dorsal-fin origin. In addition, *O. trimaculatus* has more total gill rakers, 34 (vs. 32), while *O. vigilax* has fewer total gill rakers (26–30 vs. 32).

Distribution. (Fig. 34) Known only from the Coral Sea east of New Caledonia, where taken by Warren dredge in 300 m. The deepest record for an Indo-West Pacific opistognathid.

Etymology. The Latin *helvolus* (pale yellow) refers to the predominant coloration of this species.

Remarks. The holotype suffered considerable damage due to the collection method, including the head and opercle, complete loss of left pectoral fin (pectoral-fin ray counts were assumed to be the same on both sides in Table 8) and most body scales. Number of horizontal body scale rows was estimated by counting scale pockets following temporary staining with a cyanine blue solution (Saruwatari *et al.* 1997).

Opistognathus hongkongiensis Chan, 1968

Hongkong Jawfish

Figures 16J, 83–85; Tables 1–14

Opisthognathus [sic] *fasciatus* Chan 1966:9, fig. 1 (original description: about 20 miles south of Hong Kong, via Aberdeen fish market; holotype BMNH 1965.11.6.5, 141.8 mm SL).

Opisthognathus [sic] *hongkongiensis* Chan 1968:198 (replacement name for *O. fasciatus* Chan, preoccupied by *O. fasciatum* Longley *in* Longley & Hildebrand 1940).

Opistognathus hongkongiensis. Shen 1995:479, color photo 161-8 (brief description, Taiwan). Smith-Vaniz 2000:612 (listed, checklist of South China Sea fishes). Shao *et al.* 2008:249 (listed, Taiwan). Nakayama *et al.* 2016:389 (partial comparison with *O. trimaculatus*).Tashiro 2017:93, unnumbered color figs. (brief description, Philippines). Motomura *et al.* 2017:92, unnumbered color photos (brief description, Panay Island, Philippines).

Material examined. 6 specimens, 105–141.8 mm SL. **Taiwan**: NMMBP 11582 (139), male, Taiwan, no other data; UF 243365 (122), female, Pingtung, southwest Taiwan, Hsiao-liu-chiou Island, 22°21'16"N, 120°23'13"E, H.-C. Ho, 17 Oct. 2011. **Hong Kong**: BMNH 1965.11.6.5 (141.8), male, holotype of *Opisthognathus hongkongiensis*, about 20 miles south of Hong Kong, via Aberdeen Fish Market, 55 m, trawled on soft mud, 15 May 1964, W.L. Chan. **Philippines**: KAUM-I. 69449 (105) and KAUM-I. 69458 (106.5) Ioilo Prov., Panay Island, off Miagao, 10°37'N, 122°14'E, Feb.-Mar. 2015. **Indonesia**: NTM S.14607–011, (126.6), male, Timor, Kupang, Pasar Oebe fish market, 10°9'48"S, 123°34'24"E, B.C. Russell, 17 Jan. 1998.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking flexible lamina posteriorly, extending 0.9–1.3 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 16J) moderately slender and tubular, with large openings for sensory canals; 3rd infraorbital with short posterolateral projecting arm ending with sensory canal opening, no suborbital shelf; dorsal fin XI, 11; anal fin II, 11; vertebrae 10+16; body with about 48–54 scale rows in horizontal series; body with 7 evenly spaced dark bands, the 1st band on nape, bands 2–6 extend onto dorsal fin and 7th band encircles caudal peduncle.

Description. Dorsal fin XI, 11; anal fin II, 11; pectoral fin 20 or 21; caudal fin: procurrent rays 4+4 or 4+3, segmented rays 8+8, middle 12 or 14 branched, total elements 23 or 24; hypural 5 present; vertebrae 10+16; last pleural rib on vertebra 10; epineurals 14–16; two supraneurals; dorsal-fin interdigitation anterior pattern S/S/1/1+1/1/; gill rakers 8–11+19–22 = 29–32.

Scales absent on head, nape, area above lateral line, pectoral-fin base and chest; scale rows in horizontal series about 48–54; lateral-line terminus below segmented dorsal-fin rays 4–5 (total element position 15 or 16); lateral-line pores anteriorly mostly consisting of single series on either side of embedded lateral-line tubes; cephalic sensory pores moderate; infraorbital, supraorbital, and nape pores relatively small and consisting of multiple series but no pores on predorsal region for a distance approximately equal to orbit diameter; mandibular and preopercular pore positions mostly occupied by single pores except 5th mandibular pore position bipored.

Anterior naris positioned closer to posterior naris than to dorsal margin of upper lip; consisting of a short tube, with posterior rim slightly longer, that when depressed does not reach margin of posterior naris; height of tube shorter than maximum diameter of posterior naris; dorsal fin moderately low with profile relatively uniform without change in fin height at junction of spinous and segmented rays; dorsal-fin spines moderately stout and straight without curved flexible tips; all segmented dorsal- and anal-fin rays branched usually distally; outermost segmented

pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally. posterior margin of preopercle indistinct, without a free margin; no crenulae on margin of upper lip anteriorly; fifth cranial nerve passes under $A1_{\beta}$ section of adductor mandibulae.

Upper jaw possibly sexually dimorphic, extending 1.0 (122 mm SL female) or about 1.2 to 1.3 (3 males, 127–141.8 mm SL) eye diameters behind posterior margin of orbit; maxilla widest at end and truncate, without flexible lamina posteriorly; relatively large terminally positioned supramaxilla evident as a rounded triangular elevation posterodorsally; premaxilla with an outer row of moderate canines anteriorly, which become progressively smaller posteriorly, and extend about 2/3 length of jaw; 2–4 irregular series of smaller teeth behind outer row anteriorly; dentary with an outer row of moderate canines, slightly larger anteriorly; 1–3 irregular series of slightly smaller teeth behind outer row on anterior half of dentary; vomerine teeth absent.

Measurements of the 122.0 mm female followed in parentheses by those of five males 105.4–141.8 mm SL, as percent of SL: predorsal length 34.9 (35.2–37.0); preanal length 37.9 (62.4–66.9); dorsal-fin base 56.9 (58.3–62.4); anal-fin base 26.7 (25.0–26.4); pelvic-fin length 29.0 (25.2–30.2); caudal-fin length 27.1 (25.0–31.0); depth at anal-fin origin 23.9 (23.0–25.1); caudal-peduncle depth 14.3 (14.1–15.4); head length 36.9 (36.2–38.6); postorbital-head length 20.7 (20.6–22.6); upper-jaw length 24.6 (25.1–28.5); postorbital-jaw length 10.8 (9.6–14.1); orbit diameter 10.8 (10.9–11.8). As percent of head length: postorbital-head length 56.2 (56.8–59.7); upper-jaw length 66.8 (66.2–75.9); postorbital-jaw length 28.4 (25.4–37.1); orbit diameter 29.3 (26.7–31.8).

Color in life (Figs. 83–85): Body with 7 evenly spaced dark bands that extend onto base of fin, th[e] 1st band on nape, bands 2–6 extend onto dorsal fin an[d] 7th band encircles caudal peduncle, pale spaces between dark bands 2–6 extend distinctly onto dorsal fin; proximal half to third of fin pale blue, the proximal third to half of fin pale blue, the rest of dorsal fin yellow; caudal, anal, pelvic and pectoral fins yellow.

Comparisons. The arrangement of bands on the body of *Opistognathus hongkongiensis* readily distinguishes it from all other species of *Opistognathus*. See also "Comparisons" in account of *O. flavidus*.

Distribution. (Fig. 33) Known only from market specimens obtained from Hong Kong, Taiwan, Philippines, and Timor. Presumably, an inshore coastal species; the holotype was trawled on soft bottom in 55 m.

Etymology. Named for the type locality, Hong Kong.

Remarks. In their paper on new additions to the marine ichthyofauna, (Shen *et al.* 1986) reported *Opistognathus hongkongiensis* from Taiwan based on misidentified specimens described herein as the new species *O. flavidus* (see species account for comparison).

Opistognathus hopkinsi (Jordan & Snyder, 1902)

Olive Jawfish

Figures 8D, 16K, 14, 86–89; Tables 1–14

Gnathypops hopkinsi Jordan & Snyder 1902:492, fig. 5 (original description: Misaki, Kanagawa Prefecture, Sagami Sea, Japan (label with specimen states "Okinosa, Tokyo Bay, Japan, Imperial University"); holotype CAS-SU 6541, 106.8 mm SL). Böhlke 1953:89 (listed, type catalog). Ochiai & Asano 1964:75, fig. 1 (description, Oki Island.). Arai & Abe 1970:91, pl.18, fig. 1 (Tsushima Island). Shiino 1972:116 (common name Olive jawfish).

Opistognathus hopkinsi. Machida *In*: Masuda *et al.* 1984:200, pl. 351-B (brief description, Japan). Smith-Vaniz & Yoshino 1985:25 (synonymy, diagnosis, Japanese records). Aizawa *In*: Nakabo 2002:741, unnumbered figs. (pictorial guide to Japanese fishes, meristic values). Senou *et al.* 2006:449 (listed, Sagami Sea). Hayashi & Okuri 2007:44, figs. 4g, 5g, 6g, 13g ("Agoamadai," description, distribution, in key to Japanese *Opistognathus*).

Material examined. 9 specimens, 50.4–115.4 mm SL. **Japan**: CAS-SU 6541, male (106.8), holotype of *Gnathypops hopkinsi*, published type locality was given as Misaki, but data with the specimen states "Okinosa, Tokyo Bay, Japan, Imperial University;" FRSKU S.178 (97), Tsushima Island; UMMZ 214589 (107.6), probably Nagasaki; KAUM-I. 78944 (115), KAUM-I. 78945 (100.5) and KAUM-I. 80406 (98), Kagoshima Pref., Osumi Islands, W. of Mage-shima Island, 30°44'N, 130°49'E, 108 & 120 m, longline, 21 Sep. & 4 Oct. 2015; KPM-NI 312 (74.7), W. of Mago-jima I., Ogasawara Islands, 70 m, 28 June 1995. **Taiwan**: ASIZP 61792 (111), Kuei-Shan [Guishan] Island, 24°47'N, 122°02'E, angling in 180 m, Sou-Long Pan, 22 Nov. 2001. **Fiji Islands**: MNHN 2001–1083, male (50.4), Lau Group, Vatoa Island, 19°40'48"S, 178°10'24"W, Warren dredge, 262–266 m, Cruise BORDAU 1, R/V "Alis" sta. DW 1472, 8 Mar.1999.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking flexible lamina posteriorly, extending

about 0.8 to 1.1 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 16K) slender and tubular with small openings for sensory canals, 3rd infraorbital with short posterolateral projecting arm ending with large sensory canal opening, no suborbital shelf; dorsal fin XI, 13; anal fin II, 12; gill rakers 14–17+28–30 = 42–47; head brownish with a pale band (blue in life) extending diagonally across nape from posterior end of jaw.

Description. (Selected data for Fiji specimen in parentheses.) Dorsal fin XI, 13; anal fin II, 12; pectoral fin 20 or 21; caudal fin: procurrent rays 4+4, segmented rays 8+8, middle 12 or 13 branched, total elements 24; hypural 5 present; vertebrae 10+17 or 18 (17); last pleural rib on vertebra 10; epineurals 16–17; two supraneurals; dorsal-fin interdigitation anterior pattern S/S/1/1+1/1/; gill rakers 14–16+28–30 (17+30) = 42–46 (47).

Scales absent on head, nape, area above and slightly below lateral-line, pectoral-fin base and chest; scale rows in horizontal series about 50–55 (52); lateral-line terminus below segmented dorsal-fin rays 3–5 (total element positions 14.0–16.0); lateral-line pores sparse, arranged in a single row centered on embedded lateral-line tubes anteriorly; cephalic sensory pores relatively sparse (Fig. 8D); mandibular and preopercular pore positions all occupied by single pores.

Anterior naris positioned slightly closer to posterior naris than to dorsal margin of upper lip; consisting of a short tube, with posterior rim slightly longer, that when depressed does not reach margin of posterior naris; height of tube about equal maximum diameter of posterior naris; dorsal fin moderately low with profile relatively uniform without change in fin height at junction of spinous and segmented rays; dorsal-fin spines moderately stout and straight, without curved flexible tips; skin covering tips of spines with swollen fleshy tabs; all segmented dorsal- and anal-fin rays branched distally or anteriormost 1 or 2 unbranched; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally; posterior margin of preopercle indistinct, without a free margin; no crenulae on margin of upper lip anteriorly; fifth cranial nerve passes under $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extends about 0.7 to 1.1 (0.9) eye diameters behind posterior margin of orbit; maxilla widest at end and rounded, without a flexible lamina posteriorly; supramaxilla present, small and terminally positioned; premaxilla with an outer row of stout conical teeth anteriorly that become abruptly smaller posteriorly and extend about 2/3 of jaw length; 2 or 3 irregular series of smaller teeth and 2 or 3 somewhat larger symphyseal teeth behind outer row anteriorly; dentary with an outer row of moderate conical teeth, those on posterior half of dentary noticeably larger than anterior ones; 1–3 irregular series of slightly smaller teeth behind outer row on anterior half of dentary; vomerine teeth absent.

Measurements of the 50.4 mm SL male from Fiji followed, in parentheses, by those of 7 specimens, 97.3–115.4 mm, as percent of SL: predorsal length 34.6 (31.9–34.5); preanal length 60.2 (58.7–63.5); dorsal-fin base 60.9 (57.5–63.8); anal-fin base 26.9 (27.7–29.7); pelvic-fin length 27.2 (19.4–32.8); caudal-fin length 29.4 (23.0–27.7); depth at anal-fin origin 23.4 (20.4–22.7); caudal-peduncle depth 12.9 (11.6–13.1); head length 36.5 (32.4–34.3); postorbital-head length 20.8 (20.0–22.1); upper-jaw length 24.0 (20.3–23.9); postorbital-jaw length 10.8 (8.0–10.8); orbit diameter 12.3 (9.4–10.7). As percent of head length: postorbital-head length 54.4 (58.9–62.7); upper-jaw length 65.8 (60.0–69.0); postorbital-jaw length 29.6 (23.7–30.6); orbit diameter 33.7 (26.4–31.6).

Color in life (Figs. 86–87, 89): Head and jaws dark purple except for broad yellow-tan band extending across nape from near end of upper jaw; body with irregular yellowish-tan stripe, widest anteriorly, extending from above pectoral fin to near base of caudal fin, otherwise body dark purple dorsally, much paler mid-laterally, becoming white on head ventrally, chest and belly; dorsal fin with midlateral yellow stripe, bordered above and below by narrow dark purple stripe and distal white margin; anal and pelvic fins yellow, and middle six caudal-fin rays yellow with outer dorsal and ventral rays dark purple. The dark background coloration of a juvenile in an aquarium (Fig. 90) collected from Japan was vivid blue.

Ochiai & Asano (1964, fig. 1) gave a good illustration of a ripe female (74.4 mm SL) and described its fresh coloration as follows (items in brackets not originally included): “Ground color of body light brown, circumorbital, opercle and back of body [dorsum] darkish brown, 3 yellowish bands [= stripes] running posteriorly from base of pectoral fin to end [= base] of tail. Dorsal fin darkish brown [and] furnished with a yellowish band [stripe] on the median axis. Caudal fin yellowish, edged with dark. Pectoral fins pale except for dark edge. Pelvic fins yellowish.” Although the illustration shows the distinctive pale, diagonal, nape band, inexplicably, it was not mentioned in their description.

Comparisons. *Opistognathus hopkinsi* is the only Indo-West Pacific species of *Opistognathus* that has a pale band extending diagonally across nape from posterior end of the jaw. Only three other species, *O. dendriticus*, *O.*

parvus, and *O. eximius* agree with *O. hopkinsi* in having the combination of dorsal fin XI, 13 and anal fin II, 12 but they all have very different color patterns. In addition, the former two species have fewer total gill rakers 26–33 (vs. 42–47) and *O. dendriticus* and *O. eximius* have more scale rows in horizontal series 66–99 and 80–99, respectively (vs. 50–55).

Distribution. (Fig. 33) A relatively deep-water species (70–262 m) known from Japan, Ogasawara Islands, Taiwan, and Vatoa Island, Fiji. Ochiai & Asano (1964) gave a detailed description of a specimen (FAKU 48894) from Oki Island, Shimane Pref. "hooked with a jig" from a depth of about 110–128 m.

Etymology. Jordan & Snyder (1902) named this species for "Timothy Hopkins, of Menlo Park, California, in recognition of his invaluable aid in our explorations of Japan."

Remarks. A single specimen of *Opistognathus hopkinsi*, for which life coloration was not recorded, was collected from Vatoa Island, Fiji (Fig. 88). It has virtually identical meristic values, cephalic pore pattern, infraorbitals (right infraorbitals dissected and cleared and stained) and similar measurements (see above) as specimens from Japan and Taiwan. More importantly, this specimen also agrees in having a pale band extending across nape from posterior half of upper jaw and some of the upper and lower caudal-fin rays with dark margins (Fig. 89). The most plausible explanation for the disjunct Fiji distribution is that this relatively deep-water jawfish is more widely distributed than indicated by available collections. Richer de Forges *et al.* (2000) give details of the expedition that collected this jawfish in the Fiji Islands but do not include a list of collected fishes.

The other two jawfishes known from Fiji (*O. parvus* n.sp. and *O. wassi* n.sp.) are both widely distributed, including Japan or the Ryukyu Islands, but occur in much shallower depths.

Opistognathus hyalinus, new species

Glassy Jawfish

Figures 10A, 16S, 20A–B, 90–92; Tables 1–14

Opistognathus sp. 2. Kuiter & Tonozuka 2004:626, color photo s A-C ("White-margin Jawfish," Derawan, Kalimantan).
Opistognathus species 3. Allen & Erdmann 2012:356, color photos (brief description, description).

Holotype. PNM 15647 (previously cataloged as USNM 315660), male (32.0), Philippines, Siquijor Island, 1 km W. of Larena, 9°15.2'N, 123°34'E, 20–30.5 m, L.W. Knapp *et al.*, sta. LK 79–16, 15 May 1979.

Paratypes. 30 specimens 19.3–37.8 mm SL. **Andaman Islands**: WAM P.33246–002 (3, 33.8-36.4), Havelock Island, "the wall" just N. of island, 12°3'N, 92°57'E, 35–40 m, M.V. Erdmann, 23 Mar. 2010, sta. AND-10–1b. **Philippines**: ANSP 157595, gravid female (23.1, C&S), male (26.0), and USNM 315661, gravid female (25.2), all taken with holotype. **Indonesia**: WAM P.33476–012 (3, 26.4–36.5), Bali, Sumber Kima, 5°7'S, 114°26'E, 3–70 m, M.V. Erdmann, 8 May. 2011, sta. BAL-11-025; NCIP 6340, gravid female (27.1) and WAM P.32971–001, male (32.7), western Morotai Island, Ngele Ngele Channel, 2°9'21.2"N, 128°12'24.2"E, 36 m, at base of reef slope in white coral sand, M.V. Erdmann, 19 Apr. 2008; WAM P.32972–001 (2, 19.3–20.6), eastern Morotai Island, Teluk Sambiki, 2°6'1.9"N, 128°33'57.1"E, 40 m, on *Halimeda* sand, M.V. Erdmann, 20 Apr. 2008; USNM 396709 (2, 26.6–28.0) and WAM P.33049–001 (5, 23.0–35.0), West Papua, Numamuran Strait, Cenderawasih Bay, 2°27'S, 134°32'E, 30–35 m, M.V. Erdmann, 11 Nov. 2008, sta. CB-08–011; WAM P.33700–002 (37.8), West Papua, SE Misool Island, Nudi Rock, 70 m, M.V. Erdmann, 17 Feb. 2012; WAM P.35070–001 (33.0), West Papua, northeast Kawe Island, 12°0.196'N, 130°06.712'E, 55 m, M.V. Erdmann, 21 Feb. 2012; WAM P.35071–001 (7, 24.9–35.7), West Papua, NE Kawe Island, 40 m, M.V. Erdmann, 12 Apr. 2012; WAM P.35046–008 (28.6), Papua New Guinea, Milne Bay, Nuakata, 10°16.444'S, 151°0.857'E, 30 m, M.V. Erdmann, 20 Sep. 2019.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking flexible lamina posteriorly, extending about 0.7–1.0 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 16S) all trough-like, open laterally 3rd infraorbital with no suborbital shelf; dorsal fin XI, 10–11; anal fin II, 10; vertebrae 10+15–17, typically 16; posterior infraorbital pore positions all or mostly occupied by single pores; preopercular pore positions occupied by single pores; total gill rakers 33–39; spinous dorsal fin with a wide submarginal dusky stripe, and interradial membranes between spines 1–4 or 5 either with or without a dark blotch of variable size and intensity; other fins unpigmented.

Description. Dorsal fin XI, 10–11; anal fin II, 10; pectoral fin 20; caudal fin: procurrent rays 3+3, segmented rays 8+8, middle 12 branched, total elements 22; hypural 5 present; vertebrae 10+16 or (exceptionally) 17; last pleu-

ral rib on vertebra 10; epineurals 12–13; one supraneural; dorsal-fin interdigitation anterior pattern / /S/1/1+1/1/; gill rakers 11–14+22–25 = 33–39.

Scales absent on head, nape, above lateral line, pectoral-fin base and chest; scale rows in horizontal series about 42–47; lateral-line terminus below dorsal-fin spine 11 to segmented ray 2 (total element positions 11.0–12.5); lateral-line pores mostly arranged in a single series along embedded lateral-line tubes; terminal opening of lateral line very large and separated from penultimate pore by a relatively wide gap; cephalic sensory pores relatively sparse (Fig. 10A); all mandibular and preopercular pore positions occupied by simple pores.

Anterior naris positioned slightly closer to margin of upper lip than to posterior naris and consisting of a short tube that when depressed does not reach margin of posterior naris, height of tube about equal maximum diameter of posterior naris; dorsal fin moderately low, gradually increasing in height to about middle of spinous dorsal fin; profile of fin gradually increasing in height posteriorly; dorsal-fin spines moderately stout and straight, some slightly curved distally but without flexible tips; all segmented dorsal-fin rays and all except 1st anal-fin ray branched distally; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally; posterior margin of preopercle indistinct, without a free margin; no crenulae on margin of upper lip anteriorly; fifth cranial nerve passes under $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extends about 0.7 to 1.0 eye diameters behind posterior margin of orbit; maxilla widest at end and truncate, without flexible lamina posteriorly; supramaxilla present, moderately large and terminally positioned; premaxilla with an outer row of moderate conical teeth anteriorly which become progressively smaller posteriorly; 4 or 5 irregular series of smaller teeth behind outer row anteriorly, none recurved; dentary with a narrow band of small conical teeth anteriorly, flanked by an inner row of more pointed teeth all of which are strongly canted posteriorly (almost horizontally oriented) and extend about 1/2 length of jaw; teeth on posterior half of dentary in a single row, somewhat recurved and larger than anterior outer row teeth; vomerine teeth absent.

Measurements of the 32.0 mm holotype followed in parentheses by 10 paratypes, 23.1–37.8 mm, as percent of SL: predorsal length 34.2 (34.2–39.4); preanal length 60.6 (57.7–62.8); dorsal-fin base 63.9 (60.9–67.5); anal-fin base 27.8 (27.5–28.4); pelvic-fin length 25.9 (22.6–31.4); caudal-fin length 25.6 (23.9–28.1); depth at anal-fin origin 23.4 (21.2–25.3); head length 35.2 (35.6–37.0); postorbital-head length 20.9 (20.1–22.9); orbit diameter 10.3 (9.8–11.7); upper-jaw length 22.2 (21.4–24.3). As percent of head length: postorbital-head length 59.6 (55.1–63.6); upper-jaw length 63.1 (59.3–67.7); postorbital-jaw length 25.8 (21.6–28.7); orbit diameter 29.3 (26.1–32.3).

Color in life (Figs. 90, 91): Background color pale tan; dorsal fin with wide tan stripe that extends almost to distal margin of spinous fin and then tapers posteriorly to near base of last ray, tan stripe bordered distally by narrow white stripe for its entire length; spinous dorsal fin sometimes with black blotch or stripe between spines 1–4.

Comparisons. *Opistognathus hyalinus* differs from all other Indo-West Pacific species of *Opistognathus* having a rigid upper jaws and segmented dorsal- and anal-fin rays 10 or 11 and 10, respectively, in having a spinous dorsal fin with a wide submarginal dusky stripe and interradial membranes between spines 1–4 or 5 either with or without a dark blotch of variable size and intensity; other fins unpigmented; several short, narrow, dark stripes often present on interorbital region and behind posterodorsal margin of eye; scale rows on body sometimes appearing to form series of narrow faint stripes.

Distribution. (Fig. 34) Known from Derawan, Kalimantan (Borneo), based on published photographs (Kuiter & Tonozuka 2004), Andaman Islands, Bali, Philippines, Indonesia, including Morotai Island off Halmahera, and Papua New Guinea, Milne Bay on sand/rubble bottoms in 20–70 m.

Etymology. The specific epithet, from the Greek *hyalinus* (of glass, transparent), refers to the unpigmented caudal and anal fins of this species.

Remarks. Kuiter & Tonozuha (2004) observed a small colony of this jawfish on an open sand-rubble flat at a depth of 20–21 m at Derawan, Kalimantan. They stated that when closely approached these jawfish behaved in an interesting way by expanding their opercles outward to cover the burrow opening.

Opistognathus inornatus Ramsay & Ogilby, 1887

Spotted Pug or Brown Jawfish

Figures 13B, 93–96; Tables 1–14

Opisthognathus [sic] *inornatus* Ramsay & Ogilby 1887:561 (original description: Western Australia, Derby; syntypes AMS I.841, 198.5 and AMS I.842, 223.5 mm SL).

Gnathypops inornatus. McCulloch 1914:215, pl. 30 (description, one of Derby syntypes illustrated but color pattern based of 397 mm SL Port Hedland specimen). McCulloch 1929:330 (checklist of Australian fishes).

Tandya inornata. Whitley 1930:19 (assigned to genus *Tandya*). Whitley 1948:27 (listed, Western Australia) Whitley 1964:52 (listed). McKay 1969:1–2 (comparison with *Tandy reticulata* and *T. darwiniensis*, Western Australia records).

Opistognathus inornatus. Allen & Swainston 1988:126, pl. 54, color fig. 817 (brief diagnosis, common name "Black Jawfish"). Hutchins 2001:40 (listed, checklist of Western Australian fishes). Smith-Vaniz 2004:223 (in key to Australian *Opistognathus*). Hoese & Bray 2006:1074 (synonymy, Australian distribution). Moore *et al.* 2014:195 (listed, Kimberly region, Australia).

Material examined: 15 specimens, 150–450 mm SL. **Western Australia**: AMS I.841 (198.5) and AMS I.842 (223.5) syntypes of *Opistognathus inornatus*, Derby; WAM P.559 (274), WAM P.30638–001 (310) and WAM P.19180 (312) all without locality data; USNM 396712 (150), Exmouth Gulf, Locker Island, 21°42.385'S, 114°48.534'E, 7.5–8.5 m; WAM P.26844–001 (418), Exmouth Gulf, 21°53'S, 114°22'E, 16 m; WAM P.28018–001 (450), Exmouth Gulf, 5 m; CSIRO C.2774 (172) probably Exmouth Gulf; WAM P.7076 (367) Port Samson; AMS I.12905 (253), WAM P.30639-001 (397) and WAM P.25614–001 (329) all from Port Hedland; CSIRO CA4230 (409) E. of Port Hedland, 20°09'S, 118°04'E, 59 m; WAM P.30264–001 (217), off Dampier, 20°33'S, 116°32'E.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking flexible lamina posteriorly, extending 1.1–1.8 eye diameters behind posterior margin of orbit; premaxilla with an outer row of large canines that become smaller posteriorly and extend length of upper jaw; an inner series of small conical teeth behind outer row anteriorly that become a single row posteriorly; dentary with an outer row of moderate canines becoming slightly smaller posteriorly; infraorbitals relatively slender 3rd infraorbital with moderate sensory canal opening and large suborbital shelf; dorsal fin XII, 15–16; lateral-line terminus below segmented dorsal-fin rays 9–13; precaudal vertebrae 12+18–20 (typically 19); body of adults with spots relatively large and sparse; head without dark spots; pectoral fin usually with few or no spots; background coloration of body tan to dark brown.

Description. (Meristic and morphological data identical to those of *O. papuensis* are not repeated; see species account for that species. Dorsal fin XII, 15–16; anal fin II, 13–15 (typically 14); pectoral fin 21–23; vertebrae 12+18–20 (typically 19); no supraneurals; dorsal-fin interdigitation anterior pattern / / /1/1+1/1/; gill rakers 7–9+16–18 = 24–26.

Scale rows in horizontal series about 79–89; lateral-line terminus below segmented dorsal-fin rays 9–13 (total element positions 21.5–25.0); upper jaw extends about 1.1–1.8 eye diameters behind posterior margin of orbit; cephalic sensory pores very numerous, completely covering head except for small area in front of dorsal fin; mandibular and preopercular pore positions occupied by multiple pores that are too small to count accurately.

Measurements of 10 specimens, 172–409 mm, as percent of SL: predorsal length 32.3–36.4; preanal length 57.7–68.0; dorsal-fin base 61.4–67.4; anal-fin base 25.7–28.0; pelvic-fin length 17.2–23.4; caudal-fin length 21.2–24.2; depth at anal-fin origin 19.3–23.6; caudal-peduncle depth 11.3–13.5; head length 35.2–39.3; postorbital-head length 22.0–26.3; upper-jaw length 24.6–27.7; postorbital-jaw length 10.7–15.9; orbit diameter 8.1–12.2. As percent of head length: postorbital-head length 60.4–69.0; upper-jaw length 67.3–72.3; postorbital-jaw length 30.5–40.6; orbit diameter 22.1–31.1.

Color in life (Figs. 93, 94): Background of body pale tan to brown usually with relatively few dark spots, including a pair of vertical spots posteriorly on caudal peduncle and a large humeral blotch; head without dark spots; dorsal, anal, and caudal fins dark, sometimes with a few dark spots on base of fin; pectoral fin with relatively few or no dark spots; iris with radiating dark spokes. In preservation color pattern essentially as in life.

Comparisons. Only four other species (*O. latitabundus*, *O. papuensis*, *O. reticeps*, and *O. reticulatus*) agree with *Opistognathus inornatus* in having dorsal fins XII, 15–18. The color patterns of each of these four species distinguishes them from *O. inornatus*. *Opistognathus inornatus* and O. *papuensis* (Figs. 93–96 and 120–122) are virtually morphologically identical and can be distinguished from each other solely on the basis of color pattern with *O. inornatus* differing primarily in lacking small dark spots on top of head (refer to discussion under "Remarks" in *O. papuensis* species account).

In addition to a very distinctive color pattern, *O. reticulatus* has a different vertebral count 13+18 (vs. 12+18–21), fewer total gill rakers 21–22 (vs. 24–27), and typically more scale rows in horizontal series 90–121 (vs. 56–94); *O. reticeps* and *O. latitabundus* both typically also have fewer scale rows in horizontal series 56–64 and 63–80, respectively, (vs. 78–94), and *O. reticeps* further differs from *O. inornatus* in having the lateral-line terminus ending below dorsal-fin spine X to ray 3 (vs. rays 7–13).

Distribution. (Fig. 35) Known only from northern Western Australia; a coastal species in depths of 5–60 m.

Etymology. The specific epithet, a combination of the Latin *in* (without) and *ornatus* (decorated, adorned), refers to the mostly unspotted color pattern of large adults this species.

Remarks: *Opistognathus inornatus* is the largest Indo-Pacific jawfish, attaining at least 409 mm SL (496 mm TL). The Australian Anglers Association record for this jawfish was based on a fish caught off Broome in December 1979 that was 49 cm TL and weighted 1.25 kg.

Opistognathus iyonis (Jordan & Thompson, 1913)

Iyo Jawfish

Figures 4C, 10D, 17K, 97; Tables 1–14

Gnathypops iyonis Jordan & Thompson 1913:65, fig. 1 (original description: Japan, Shikoku, Iyo Province, Yawatahama; holotype USNM 74763, 61.9 mm SL). Choi *et al.* 2003:317, 595 (description Korea).

Merogymnus iyonis. Kamohara 1956:2 (brief description, Mimase, Japan). Honma 1958:110 (brief description, Echigo Prov., Japan). Katayama & Fujioka 1958:1156, fig. 5 (brief description, Yamaguchi Pref., Japan). Shiino 1972:117 (common name Nakedback Jawfish).

Opisthognathus [sic] *iyonis*. Kimura & Suzuki 1982:10, fig. 11 (brief description, Goza, Mie Pref., Japan).

Opistognathus iyonis. Yoshino *In*: Masuda *et al.* 1984:200, pl.191-E (brief description, Japan). Smith-Vaniz & Yoshino 1985:25 (synonymy, diagnosis, Japanese records). Myoung *et al.* 1999:139, figs.1–2 (description, Chwasari Island, Korea). Aizawa *In*: Nakabo 2002:742, unnumbered figs. (pictorial guide to Japanese fishes, meristic values). Okuri *et al.* 2004:1, color photos. (habitat, Tokyo Bay). Hayashi & Okuri 2007:45, figs. 4h, 5h, 6h, 13h, 14I ("Nirami-amadai," description, distribution, in key to Japanese *Opistognathus*).

Material Examined. 10 specimens, 17.4–67.2 mm SL, all from Japan. USNM 74763, 61.9 mm SL, holotype of *Gnathypops iyonis*, Japan, Iyo Province, Yawatahama, 32°24'N, 132°25'E, Y. Manabe. ANSP 148087 (3, 63–67, including 1 C&S), Hiroshima Bay, 7 km SW of Kurahashi Island, 20–30 m, caught on hook & line with shrimp bait; KPM-NI 26341 (62.2), off Sachiura, Tokyo Bay, Japan, 21 m, 25 June 2010, K. Konno; FAKU 50550 (17.4), Sea of Goto, 32°57.5'N, 129°30'E, 67 m; FRLM 2819 (59), Mie Pref., mouth of Ago Bay at Goza; NSMT-P.23162 (3, 51–56.8), Ushima Islands., 10 m.

Diagnosis. A species of *Opistognathus* having an upper jaw rounded posteriorly with flexible lamina and large oval supramaxilla, extending 1.1–1.3 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 17O) moderately slender and tubular, 3rd infraorbital with short posterolateral projecting arm ending with sensory canal opening, no suborbital shelf; dorsal fin XI, 14; anal fin II, 14; vertebrae 10+19; dorsal fin with a prominent ocellus between spines 5–8 or 9.

Description. Dorsal fin XI, 14; anal fin II, 14; pectoral fin 18–20; caudal fin: procurrent rays 3–4+3–4, segmented rays 8+8, middle 10–12 branched, total elements 22–24; hypural 5 present; vertebrae 10+19; last pleural rib on vertebra 10; epineurals 12–13; one supraneural; dorsal-fin interdigitation anterior pattern / /S/1/1+1/1/; gill rakers 8–12+19–23 = 27–35.

Scales absent on head, nape, body anterior to vertical from 5th dorsal-fin spine, area above and below lateral line, pectoral-fin base and anterior 1/3 of belly; scale rows in horizontal series about 45–46; lateral-line terminus below segmented dorsal-fin rays 5–9 (total element position 15–20); lateral line pores numerous, arranged in multiple series along embedded lateral-line tubes; cephalic sensory pores relatively numerous (Fig.10D), except most of nape without pores; mandibular pore positions 1–4 occupied by relatively large, single pores, 5th position occupied by 4–7 pores; preopercular pore positions mostly bipored.

Anterior naris slightly closer to posterior naris than to dorsal margin of upper lip, consisting of a short tube that when depressed does not reach margin of posterior naris, height of tube about equal maximum of diameter of posterior naris; dorsal fin moderately low anteriorly gradually increasing in height to middle of spinous dorsal fin, profile relatively uniform with a slight change in fin height at junction of spinous and segmented rays; dorsal-fin spines moderately slender and straight or slightly curved distally but without flexible tips; all segmented dorsal- and anal-fin rays branched distally or with anteriormost rays 1 or 2 unbranched; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally; upper margin of opercle straight and slightly rounded posterodorsally, not consisting of a broad truncated flap; posterior margin of opercle distinct with a free margin; no crenulae on margin of upper lip anteriorly; fifth cranial nerve passes under $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extends 1.1 to 1.5 eye diameters behind posterior margin of orbit; maxilla widest before end, then canted downward and rounded, with flexible lamina posteriorly; supramaxilla large and subterminally positioned (Figs. 4C and 10D); jaws subequal, lower slightly included; premaxilla and dentary with an outer row of relatively small conical teeth and an inner, irregular band of teeth (2–3 rows wide) anteriorly; vomerine teeth absent.

Measurements of 9 specimens, 51.0–67.2.mm SL, as percent of SL: predorsal length 28.0–29.4; preanal length 57.2–62.2; dorsal-fin base 63.8–74.6; anal-fin base 30.7–32.1; pelvic-fin length 15.1–19.3; caudal-fin length 18.9–23.8; depth at anal-fin origin 15.1–19.3; head length 29.8–31.4; postorbital-head length 16.9–20.1; orbit diameter 7.5–9.2; upper-jaw length 20.3–22.5. As percentage of head length: postorbital-head length 56.8–66.0; upper-jaw length 66.9–74.2; postorbital-jaw length 32.1–37.3; orbit diameter 27.7–30.0.

Color in life (Fig. 97): Head and body olivaceous to yellow-tan; body scales narrowly edged with brown; opercle, gill membranes, throat and abdomen pale yellow; posterior angle of jaws and adjacent membranes with dark inner blotch that is visible externally; dorsal fin with large oval black spot with narrow white margin between spines 5–8; most of dorsal and anal fins with narrow proximal blue stripe with remainder of these fins yellow, except distal margin of spinous dorsal fin with blue fleshy tabs; caudal and pelvic fins pale yellow.

Okuri *et al.* (2004) give an excellent color photograph of a *O. iyonis* in an aquarium of a live 64.5 mm SL fish caught by hook & line in 20–30 m from Tokyo Bay.

Comparisons. *Opistognathus iyonis* is the only species of Indo-West Pacific jawfish with the combination of an upper jaw with a flexible lamina posteriorly and anal fin II, 14 (vs. II, 11 or III, 13–16). Both it and *O. megalops* are the only Japanese species with a flexible lamina posteriorly, an upper jaw rounded posteriorly, and a large oval supramaxilla, but their color patterns are quite different.

Distribution. (Fig. 23) Known only from the Chwasari Islands, Korea (Myoung *et al.* 1999) and Japan in 10–67 m.

Etymology. Named for the type locality, Iyo Province, Japan.

***Opistognathus jacksoniensis* Macleay, 1881**

Southern Smiler

Figures 17M, 98, 99; Tables 1–14

Opisthognathus [sic] *jacksoniensis* Macleay 1881:570 (original description: Australia, New South Wales, Port Jackson; syntypes AMS I.16400–001, 4: 114–161 mm SL).

Gnathypops jacksoniensis. Waite 1904:240, pl. 26, fig. 2 (description, New South Wales).

Merogymnus jacksoniensis. Ogilby 1920:25 (description, Moreton Bay). McCulloch 1929:331 (checklist of Australian fishes). Whitley 1964:52 (listed). Grant 1982:582, color pl. 301 (brief description, Moreton Bay).

Opistognathus jacksoniensis. Stanbury 1969:209 (listed, type catalog). Kuiter 1993:313, unnumbered color figs. (fish in burrow; southeastern Australia). Smith-Vaniz 2004:222 (in key to Australian *Opistognathus*). Hoese & Bray 2006:1074 (synonymy, Australian distribution). Baker 2013:103, fig. 31 (distribution and habitat).

Material Examined. 32 specimens, 114–249 mm SL, all from eastern Australia. **Queensland**: AMS I. 16400–001 (4, 114-161), syntypes of *Opistognathus jacksoniensis*, Australia, Port Jackson, "Macleay, 1881." AMS I.12549 (189), ANSP 137475 (141.5 C&S), QM I.29 (189), QM I.4831 (203.5), QM I.5146 (186.5), QM I.6631 (169.5), QM I.6858 (168), QM I.7910 (176.5), QM I.7936 (176), QM I.8058 (194), and QM I.12357 (135), all from Moreton Bay; QM I.8840 (212), Wellington Point; QM I.20698 (185), 13 km E. of Mooloolaba, 60 m. **New South Wales**: AMS I.329 (203.5), AMS I.1105 (201), AMS I.1363 (3, 155–175), AMS I.3673 (158), BMNH 1890.9.23.204 (249), CAS-SU 9164 (194), and NMW 31452 (203), all from Sydney, Port Jackson; AMS IB.4501 (157), off Wooli, 64 m; AMS IB. 7514 (187), off Yamba; AMS IB.3802 (179), off Grafton District; AMS IB.7797 (169), off Arrawarra, near Woolgoolga; AMS I.24791–001 (199), off Minnie Water, 29°47'S, 153°18'E, 27 m. "**South Seas**" BMNH 1873.6.12.1 (216), no other data.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw hacking a flexible lamina posteriorly, extending 0.7 to 1.2 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 17M) moderately large, 2nd and 3rd infraorbitals with large sensory canal openings, 3rd infraorbital with moderate suborbital shelf; dorsal fin X, 16–18; vertebrae 10+20–21, typically 20; scales absent on body anterior to segmented dorsal-fin rays 1 or 2; lateral-line terminus below segmented dorsal-fin rays 12–17; sides of the body broadly reticulated with chocolate brown and floor of mouth between dentaries and basihyal ("tongue") dark brown (Fig. 99).

Description. A species of *Opistognathus* having a rigid upper jaw lacking a flexible lamina posteriorly, extend-

ing 0.7 to 1.2 eye diameters behind posterior margin of orbit; dorsal fin X, 16–18 (typically 17); anal fin II, 15–17; pectoral fin 19–21; caudal fin: procurrent rays 4+3–4, segmented rays 8+8, middle 14 branched, total elements 23–24; hypural 5 present; vertebrae 10+20 (rarely 21); last pleural rib on vertebra 10; epineurals 14–16; no supraneurals; dorsal-fin interdigitation anterior pattern / / /1/1+1/1/; gill rakers 9–11+19–21 = 28–32.

Scales absent on body anterior to below segmented dorsal-fin rays 1 or 2, and from head, nape, area above lateral line, pectoral-fin base, chest and belly; scale rows in horizontal series about 50–60; lateral-line terminus below segmented dorsal-fin rays 12–17 (total element positions 22–27.5); lateral-line pores numerous, arranged in multiple series above and below embedded lateral-line tubes; cephalic sensory pores very numerous, in adults completely covering most of head, including all of predorsal area except a small area immediately adjacent to dorsal-fin origin; mandibular pore positions 1–2 occupied by relatively large, single pores, 3rd position with 2–5 pores; 4th and 5th with continuous series of multiple pores.

Anterior naris distinctly closer to posterior naris than to dorsal margin of upper lip, and with a broad, palmate tentacle on posterior rim of varying length that when depressed usually reaches to or slightly beyond posterior rim of posterior naris; height of tentacle about 1.5 to 2.0 times maximum of diameter of posterior naris; dorsal fin moderately low anteriorly gradually increasing in height posteriorly with a noticeable change in fin height at junction of spinous and segmented rays; dorsal-fin spines moderately short and straight, at most only slightly curved distally and without flexible tips; all segmented dorsal- and anal-fin rays branched distally; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally; posterior margin of opercle distinct; many small crenulae on anterior margin of upper lip, best developed laterally, some specimens also with crenulae on margin of lower lip mid-laterally; fifth cranial nerve passes under $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extends 0.7 to 1.2 eye diameters behind posterior margin of orbit; maxilla widest at end and truncate, without flexible lamina posteriorly; supramaxilla present, small and terminally positioned; premaxilla with an outer row of stout conical teeth that become progressively smaller posteriorly; 2 or 3 irregular rows of inner teeth anteriorly, including several on innermost row adjacent to premaxillary symphysis that are moderately enlarged and canted backwards; dentary with an outer row of stout conical teeth, anterior ones slightly smaller and blunter; 3 or 4 rows of inner teeth anteriorly, including a few slightly enlarged and hooked backwards; vomerine teeth 1–5.

Measurements of 22 specimens, 135–216 mm, as percent of SL: predorsal length 30.0–35.2; preanal length 19.0–22.5; dorsal-fin base 65.0–75.5; anal-fin base 38.6–38.5; pelvic-fin length 11.6–17.1; caudal-fin length 17.7–20.6; depth at anal-fin origin 15.9–20.2; caudal-peduncle depth 5.9–10.5; head length 30.1–35.2; postorbital-head length 19.0–22.5; upper-jaw length 17.7–21.6; postorbital-jaw length 6.4–10.8; orbit diameter 8.3–9.8. As percent of head length: postorbital-head length 61.6–70.7; upper-jaw length 55.9–65.3; postorbital-jaw length 18.7–33.3; orbit diameter 26.2–31.9.

Color in life (Fig. 98): Ogilby (1920) described the life coloration as follows: “Ground-color varying from rich light brown to lemon yellow, the upper surface and sides of the trunk broadly reticulated with chocolate brown, a wavy median band, which is sometimes black, being always present; throat, chest, and belly immaculate; tail with a few irregular brown spots and wavy lines, each scale with a brown central dot. Upper surface and sides of head profusely dotted and pencilled [sic] with brown; inner posterior edges of maxillary and mandible black; distal extremity of maxillary and a broad stripe on the mandible white. Dorsal fin dark purplish brown, with a basal series of lighter spots; soft portion with an additional submarginal row of similar spots and two oblique bands posteriorly. Anal rich brown, with a light basal band. Caudal with three transverse rows of light spots. Pectoral fin pale yellow, profusely powdered with brown. Outer portion of ventrals [pelvic fins] purplish black.”

Comparisons. *Opistognathus jacksoniensis* does not seem to be very closely related to any other species, and its color pattern (see Diagnosis) easily distinguishes it from other congeners. It has a much longer lateral-line terminus than most of its congeners (Table 14), extending below segmented dorsal-fin rays 12–17.

Distribution. (Fig. 30) Endemic to eastern Australia; a coastal species not known from the Great Barrier Reef and taken in depths of about 20–70 m; also reported from Red Rock and Solitary Islands Marine Park (Baker 2013).

Ken Graham (*in lit*, 22 Oct. 2022) stated that *O. jacksoniensis* “is either very rare off northern NSW or very hard to catch with trawl gear.” Only three specimens of this jawfish were collected in 350 trawls (mostly for 30 minutes duration) using prawn gear in depths between 50–80 m off northern New South Wales.

Etymology. Named for the type locality, Port Jackson, Australia. According to Ogilby (1920) the local vernacular name “smiler” was adopted because of the fine countenance of opistognathids.

***Opistognathus latitabundus* (Whitley, 1937)**
Blotched Jawfish
Figures 17E, 100, 101; Tables 1–14

Tandya latitabunda Whitley 1937:21, pl. 2, fig. 2 (original description: Queensland, Australia, Port Newry, north of Mackay; holotype AMS IA.6958, 209 mm SL). Whitley 1964:52 (listed). Kailola 1973:9, pl. 3 (description, Yulu Island, New Guinea). Kailola 1975:196 (listed, NW of Yule and Vari Vari Island, New Guinea). Hutchins 2001:40 (listed, checklist of Western Australian fishes).

Opisthognathus [sic] *latitabundus*. Sainsbury *et al.* 1984:264, unnumbered color fig. (brief description, northern Australia); Russell & Houston 1989:83 (listed Arafura Sea).

Opistognathus latitabunda. Gloerfelt-Tarp & Kailola 1985:240, unnumbered color fig, 241, 350 (brief description, northern, Australia). Kailola 1987:383 (annotated checklist, Yule Island and SE of Redscar Bay).

Opistognathus latitabundus. Allen & Swainston 1988:126, pl. 54, color fig. 816 (brief diagnosis, common name "Blotched Jawfish"). Smith-Vaniz 2004:223 (in key to Australian *Opistognathus*).Hoese & Bray 2006:1075 (synonymy, Australian distribution). Kuiter & Debelius 2006:651, unnumbered color photo (eastern Australia). Allen & Erdmann 2012:353, color photo (brief description, distribution). Larson *et al.* 2013:106 (checklist of Northern Territory fishes).

Material examined. 24 specimens, 58.2–216 mm SL. **Papua New Guinea**: KFRS FO1308 (2, 91–168), trawled in 27 m over mud bottom, and KFRS FO2040 (148), NW of Yule Island., 08°48'S, 146°31'E; KFRS FO3726 (140), Vari Island, SE of Redscar Bay. **Torres Strait**: QM I.16873 (158), 10°'S, 143°E 22–31 m; **Queensland**: AMS IA.6958, 209 mm, holotype of *Tandya latitabunda*, Port Newry, north of Mackay. QM I.8311 (79), Proserpine, Swamp Bay. **Gulf of Carpentaria**: AMS I.15557–210 (2, 174.5–187), ANSP 137972 (91 C&S), CSIRO A.2420 (70), CSIRO A.2876 (123), CSIRO C3671 (144), and CSIRO C4473 (198). **Northern Territory**: NTM S.10939–006 (155) Groote Eylandt, 17 m; AMS I.21842–005 (178), off Cape Croaker, 10°35'S, 133°45'E, 72 m; NTM S.10031–025 (130), Cobourg Peninsula, north of Smith Point, 27 m; ANSP 153649 (208), off Port Essington, 11° 03'S, 132°16'E, 20 m; NTM S.10108–003 (183), Port Essington, 24 m; NTM S.10059–003 (58.2 C&S), Van Diemen Gulf, Chambers Bay, 12°13'S, 131°35'E, 12–15 m; NTM S.10095–005 (75), Van Diemen Gulf, Chambers Bay, 5–10 m; NTM S.619 (185), Melville Island., Snake Bay; NTM S. 10391–001 (147), Cape Van Diemen. **Western Australia**: NTM S.1079 (212), York Sound, 14°50'S, 125°00'E, 30 m; WAM P.26582–002 (207), Joseph Bonaparte Gulf, 13°21'S, 127°19'E, 90 m.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking a flexible lamina posteriorly, extending about 0.7–1.6 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 17E) slender and tubular, 3rd infraorbital largest with moderate sensory canal openings, no suborbital shelf; dorsal fin XII, 17–18; lateral-line terminus below segmented dorsal-fin rays 2–8; vertebrae 12+19–21; dorsal fin with 5 dark blotches, the first blotch only on base of fin; much of inner surface of mouth, and skin connecting dentary and maxilla (hidden from view when mouth is closed) darkly pigmented; dorsum of head uniformly pigmented.

Description. Dorsal fin XII, 17–18; anal fin II, 14–15; pectoral fin 22–24; caudal fin: procurrent rays 2–4+3–4, segmented rays 8+8, middle 12–14 branched, total elements 21–24; hypural 5 present; vertebrae 13+19–21; last pleural rib on vertebra 13; epineural 15–17; no supraneurals; dorsal-fin interdigitation anterior pattern / / /1/1+1/1/; gill rakers 8+15–16.

Scales absent on head, nape, pectoral-fin base (larger specimens often with a few embedded scales) and chest; 1 or 2 rows of scales above lateral line for entire length and usually 3 or 4 rows present adjacent to dorsal-fin origin; scale rows in horizontal series about 63–80; lateral-line terminus below segmented dorsal-fin rays 2–8 (total element positions 14–20); lateral-line pores relatively sparse, mostly arranged in a single series along embedded lateral-line tubes; cephalic sensory pores relatively numerous, except pores absent on much of nape; mandibular and preopercular pore positions occupied by multiple pores that are too small to count accurately; infra- and supraorbital pores also very numerous.

Anterior naris positioned closer to posterior naris than to margin of upper lip, consisting of a short tube with a broad tentacle on posterior rim that when depressed extends to posterior naris, occasionally to posterior margin; height of tentacle about 1.5–2.0 times maximum diameter of posterior naris; dorsal fin moderately low, increasing in height posteriorly, with profile relatively uniform without a change in height at junction of spinous and segmented rays; dorsal-fin spines relatively slender and only slightly curved, with flexible tips; skin covering tips of dorsal-fin spines somewhat rugose but without fleshy tabs; all segmented dorsal-fin rays branched distally and all except first 2 anal rays branched distally; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial

membrane incised distally; posterior margin of preopercle distinct, with a slightly free posterior margin; a few crenulae present on inner surface of upper lip mid-laterally; fifth cranial nerve passes over $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extends about 0.8 to 1.2 eye diameters behind posterior margin of orbit; maxilla widest at end and truncate, without flexible lamina posteriorly; supramaxilla present, relatively small and terminally positioned; premaxilla with outer row conical teeth with slightly blunt tips, canted outward and becoming smaller posteriorly; anteriorly an irregular inner row of very small teeth, a few slightly enlarged near symphysis; dentary outer row teeth like those of premaxilla but anterior teeth slightly larger and with one or two irregular rows of small inner teeth, the first a single row that begins mid-way on dentary; vomerine teeth absent.

Measurements of 23 specimens, 58.2–216 mm, as percent of SL: predorsal length 32.5–42.6; preanal length 60.1–67.6; dorsal-fin base 59.8–69.8; anal-fin base 23.4–28.3; pelvic-fin length 14.7–22.0; caudal-fin length 21.2–31.2; depth at anal-fin origin 20.5–27.6; caudal-peduncle depth 9.3–13.6; head length 37.1–42.7; postorbital-head length 22.4–31.2; orbit diameter 9.2–13.8; upper-jaw length 23.0–29.0 postorbital-jaw length 11.5–17.2. As percent of head length: postorbital-head length 59.1–67.4; upper-jaw length 60.6–69.4; postorbital-jaw length 25.0–45.3; orbit diameter 25.6–36.2.

Color in life (Fig. 100): Sainsbury *et al.* (1984) include an excellent color photograph of this species and described the life coloration as follows: "Body and head rosy-brown above (darker over head), cream below; 6 large black or deep red blotches along body from head to tail; a black ring around eye; inside of mouth, maxillary groove and underside of opercular flap black. Dorsal fin grey with 5 large black blotches basally and charcoal margin; caudal and anal fins charcoal; ventral and pectoral fins yellow."

Comparisons. Only five species of *Opistognathus*, including *O. latitabundus*, have dorsal fins XII, 15–18 (Table7). The color patterns of all these species are different; in addition, these four other species also differ from *Opistognathus latitabundus* as follows: *O. inornatus* and *papuensis* have the lateral-line terminus below segmented dorsal-fin rays 7–13 (vs. rays 2–8) and usually more scale rows in horizontal series 78–94 (vs. 63–80); *O. reticulatus* and *O. reticeps* both have fewer segmented dorsal-fin rays, 15–16 (vs. 17–18); *O. reticulatus* also has precaudal vertebrae 13+18 (vs. 12+18–21), usually more total gill rakers 24–27 (vs. 23–24) and scale rows in horizontal series 90–121 (vs. 63–80); and *O. reticeps* has more total gill rakers 25–29 (vs. 23–24) and lateral-line terminus below dorsal-fin spine 10 to ray 3 (vs. rays 2–8).

Distribution. (Fig. 35) Known only from northern and eastern Australia and southeastern New Guinea on mud or sand bottoms in 10–90 m.

Etymology. The specific epithet, from the Latin *latitatus* (hidden, concealed) and *bundus* (very, denoting augmentation), refers to the status of this jawfish when first named as a newly discovered species.

Opistognathus liturus Smith-Vaniz & Yoshino, 1985

Typhoon Jawfish

Figures 9D, 16F, 102; Tables 1–14, 16

Opistognathus sp. Araga & Tanase 1966:158 (listed in table of typhoon stranded fishes).

Opistognathus sp. 2. Yoshino *in* Masuda *et al.* 1984:201, pl. 351-C (brief description, Wakayama Prefecture, Japan).

Opistognathus Smith-Vaniz & Yoshino 1985:23, figs. 2b, 3b, 4 (original description: Beach [washed ashore following typhoon no. 23, 10 Sep. 1965] near Seto Marine Biological Laboratory, 33°41'N, 135°21'E, Shirahama-cho, Wakayama Prefecture, Japan; holotype URM-P 8134, 55.3 mm SL). Aizawa *In*: Nakabo 2002:742, unnumbered figs. (pictorial guide to Japanese fishes, meristic values).

Material examined. Known only from the 55.3 mm SL male holotype (see above) and below Remarks.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking a flexible lamina posteriorly, extending about 0.7 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 16F) relatively slender and tubular, with wide openings for sensory canals; 3rd infraorbital with short posterolateral projecting arm ending with large sensory canal opening, no suborbital shelf; dorsal fin XI, 11; anal fin II, 10; vertebrae 10+16; total gill rakers 31; dorsum with a row of 4 dark blotches that extend only slightly onto dorsal fin, the first between spines 1–4; spinous dorsal fin with narrow dark margin; scale rows on body appearing to form a series of narrow stripes (see Remarks); head with a few irregularly shaped dark blotches laterally only, including several aligned along posterior and ventral margins of orbit.

Description. Dorsal fin XI, 11; anal fin II, 10; pectoral fin 19; caudal fin: procurrent rays 4+4, segmented rays 8+8, middle 12 branched, total elements 24; hypural 5 present; vertebrae 10+16; last pleural rib on vertebra 10; epineural 13; no supraneurals; dorsal-fin interdigitation anterior pattern / / /1/1+1/1/; gill rakers 9+22.

Scales absent on head, nape, above lateral line, pectoral-fin base, and chest; scale rows in horizontal series about 44. (In the original description the number of scales rows in horizontal series was reported as 54 but assuming the original drawing of the holotype is accurate, there only about 44 scale rows); lateral-line terminus below segmented dorsal-fin ray 4 (total element position 15.); lateral-line pores sparse, mostly arranged in a single row along embedded lateral-line tubes; cephalic sensory pores relatively sparse (Fig. 9D); mandibular and preopercular pore positions occupied by single pores except dorsalmost preopercular pore bipored (on both sides).

Anterior naris positioned about mid-way between margin of upper lip and posterior naris and consisting of a short tube that when depressed does not reach margin of posterior naris; height of tube shorter than maximum diameter of posterior naris; dorsal fin moderately low, gradually increasing in height to about middle of spinous dorsal fin; most of segmented rays broken off but based on height of undamaged rays, profile of fin gradually increasing in height posteriorly; dorsal-fin spines moderately stout and straight without curved, flexible tips; tips of dorsal-fin spines probably with pale tabs but condition of specimen precluded determination with certainty; posterior segmented anal-fin rays branched distally (anterior dorsal-fin rays damaged); outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally; posterior margin of preopercle indistinct, without a free margin; no crenulae on margin of upper lip anteriorly; fifth cranial nerve passes under $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extends about 0.7 eye diameters behind posterior margin of orbit; maxilla widest at end and truncate, without flexible lamina posteriorly; supramaxilla present, moderately large and terminally positioned; premaxilla with an outer row of stout teeth anteriorly, behind which are 2 or 3 irregular series of smaller teeth and several enlarged symphyseal teeth (posterior ones almost horizontally aligned); posteriorly, premaxilla with a single row of teeth which become progressively smaller; dentary with an outer row of moderate canines anteriorly behind which are 2 or 3 rows of similar teeth, posteriormost teeth slightly enlarged and canted backward; posterior half of dentary with a single row of 4–6 relatively widely spaced moderate canines; vomerine teeth absent.

Measurements of the 55.3 mm SL holotype, as percent of SL: predorsal length 35.8; preanal length 63.3; dorsal-fin base 59.7; anal-fin base 27.3; pelvic-fin length 31.1; caudal-fin length 30.6; depth at anal-fin origin 25.0; caudal-peduncle depth 14.8; head length 37.8; postorbital-head length 21.9; upper-jaw length 26.2; postorbital-jaw length 8.7; orbit diameter 12.3. As percent of head length: postorbital-head length 57.9; upper-jaw length 69.4; postorbital-jaw length 23.1; orbit diameter 32.5.

Preserved coloration of holotype (Fig. 102): Head, body and fins uniformly pigmented except as noted. Dorsum with a row of four dark blotches that extend slightly on to dorsal fin: the first between spines 2–5, the second between spines 7–9, the third between spine 10 and 1st ray, and the last between rays 2–3. Spinous dorsal fin with a narrow dark distal margin. Posterior half of orbit bordered with four large dark blotches that are smaller than pupil. A few irregularly shaped dark blotches scattered on cheek and opercle. Single dark spot or blotch on maxilla, on upper lip at symphysis, on body just above pectoral-fin base and on nape near origin of lateral line.

Life coloration unknown.

Comparisons. See Table 16. *Opistognathus liturus* agrees with the following apparently allopatric species, *O. asper, O. erdmanni*, *O. bathyphilus*, and *O. biporus*, in having rigid upper jaws, anal fin II, 10–11, dorsal fin with dark blotches and horizontal scale rows on body appearing to form a series of narrow stripes (see "Remarks"). *Opistognathus liturus* and *O. erdmanni* are superficially similar but *O. liturus* has fewer cephalic sensory pores on dorsum of head, (Figs. 9D vs. 10C), the first dark blotch on dorsum is between spines 2–5 (vs. spines 1–4) and a brown stripe on dorsal fin is absent (vs. a wide pale brown stripe on spinous dorsal fin anteriorly that becomes narrower on posterior part of fin); both species differ from those listed above in having dark blotches along dorsum that extend only slightly onto the spinous dorsal fin (vs. extending well onto spinous dorsal fin), and *O. erdmanni* is the only one of these species with no supraneural (vs. two supraneurals); *O. bathyphilus* and *O. biporus* also differ in having more total gill rakers 37 (vs. 29–31) and nape with a dark blotch slightly in advance of dorsal-fin origin (vs. nape without a dark blotch).

Distribution. (Fig. 26) Known with certainty only from Japan; depth of occurrence and habitat unknown (see above type locality). Araga & Tanase (1966) noted that 83.6% of 91 species stranded by Typhoon No. 23 were inshore species.

Etymology. The specific epithet, from the Latin *liturus* (blotted), refers to the conspicuous dark markings on the head of this species.

Remarks. The above description is based largely on information given for the holotype in the original description. Based on photographs of specimens from Japan being studied by Daishuke Uyeno (Kagoshima University) that I have been unable to borrow, *O. liturus* probably has body scale rows that appear to form a series of narrow horizontal stripes like other species listed in "Comparisons." Considering the circumstances of the collection of the holotype, this subtle pigment pattern probably would not have been evident when it was illustrated.

A photographed specimen (Fig. 103) and others from Japan presumed to be the same species and deposited in the KAUM-I and KPM collections are on loan to Daishuke Uyeno (Kagoshima University). These specimens were originally cataloged as *Opistognathus liturus* and although I have been unable to examine them, the size and positions of the bold dorsal-fin spots in the photographed specimen strongly suggest that they are not that species and actually represent an undescribed species.

Opistognathus longinaris Smith-Vaniz, 2010

Long Nostril Jawfish

Figure 17N, 104; Tables 1–14

Opistognathus longinaris Smith-Vaniz 2010:52, figs. 2E, 16 (original description: South Africa, Kwazulu, Kosi mouth area, 26°53.0'S, 32°55.8'E; holotype SAIAB 40331, 41.0 mm SL). Smith-Vaniz 2022:312, unnumbered fig. (description, distribution).

Material examined. Known only from the 41.0 mm SL holotype (see above).

Expanded diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking a flexible lamina posteriorly, extending about 0.7 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 17N) moderately robust with large sensory canal openings, 3rd infraorbital largest, no suborbital shelf; dorsal fin X, 20; anal fin III, 19; vertebrae 10+24; tentacle on anterior naris at least 4 times maximum diameter of posterior naris; lateral-line terminates below segmented dorsal-fin ray 8; vomerine teeth absent; dorsal and anal fins uniformly dark; oral membrane between dentaries and basihyal ("tongue") dark brown; inner lining of upper jaw and adjacent membranes with posterior black blotch externally visible; nasal tentacle peppered with large melanophores.

Comparisons. *Opistognathus longinaris* is the only species of *Opistognathus* with the combination of dorsal fin X, 20 and anal fin III, 19. Its vertebral count of 10+24 is higher than that of any other species and the long nasal tentacle and dark dentary oral membrane are also distinctive.

Distribution. (Fig. 31) Known only from South Africa off Kwazulu where dredged in 65 m.

Etymology. A combination of the Latin *longus* (long) and *naris* (nostril) in reference to the length of the nasal cirrus.

Opistognathus macrolepis Peters, 1866

Bigscale Jawfish

Figures 3, 6D, 16P, 105–107; Tables 1–14

Opisthognathus [sic] *macrolepis* Peters 1866:520 (original description: Bangkok, Thailand; holotype ZMB 6177, 77.2 mm SL). Herre 1954:785 (misidentification of *O. challenger*, Philippine fishes checklist). Ray & Mohapatra 2015:109, color fig. 2 (description, off West Bengal, India).

Opistognathus macrolepis. Smith-Vaniz 2000:612 (listed, checklist of South China Sea fishes). Smith-Vaniz 2004:222 (in key to Australian *Opistognathus*). Hoese & Bray 2006:1075 (synonymy, Australian distribution). Rainboth *et al.* 2012:84 (listed, Gulf of Thailand). Biswas *et al.* 2013:1, fig. 2 (description of specimen from east coast of India). Yoshida *et al.* 2013:102, unnumbered color photos (description, Gulf of Thailand). Kimura *et al.* 2018:107, unnumbered color photographs (brief description, Ha Long Bay, northern Vietnam).

Merogymnoides carpentariae Whitley 1966:240, fig. 4 (original description: Australia, Queensland, Gulf of Carpentaria; holotype AMS IB.7145). Hoese & Bray 2006:1075 (synonymy, Australian distribution; synonym of *O. macrolepis* Peters).

Opisthognathus [sic] *rex* Wongratana 1975:99, fig. 1 (original description: Gulf of Thailand, Chon Buri-Khlong Dan; holotype MFLB 1975-6-17-1, 77.2 mm SL). Rainboth *et al.* 2012:84 (listed, Chor Buri, Gulf of Thailand). Smith-Vaniz *et al.* 2012:20 (junior synonym of *O. macrolepis*).

Material Examined. 13 specimens, 49–92.2 mm SL. **Thailand**: ZMB 6177 (77.2), holotype of *O. macrolepis*, Thailand, Bangkok; MFLB 1975–6–17–1 (80.3), holotype of *O. rex*, and MFLB 1975–6–17–1 (77.2), paratype, both from Gulf of Thailand, Chon Buri-Khlong, 13°24'N, 100°59'E, 16 Jun. 1974; KAUM-I. 24030 (74) Gulf of Thailand, trawled, 3 Oct. 2009. **Vietnam**: KAUM-I. 77580 (74), Ha Long Bay, 20°55'N, 107°05'E, 10 m, trawled, 12 Aug. 2015. USNM 447908. (99.2) Nha Trang market. **South China Sea**: NTUM 15216 (75.0), Taiwan market, no precise locality. **Australia**: AMS IB.7145 (65.2), holotype of *M. carpentariae*, Australia, Gulf of Carpentaria; AMS 15557–212 (2, 64.3 C&S–70.6), ex. CSIRO "paratypes" of *M. carpentariae*, Gulf of Carpentaria, 16°51'S, 141°00'E, 5.5 m, 21 Nov. 1963; only one of these specimens is a paratype but it is impossible to determine which one; both were received together with the same collection data but probably were not taken in the same station, J. Paxton, pers. com.); CSIRO 3241–42, (2, both 75, including 1 C&S), Gulf of Carpentaria, 17°17'S, 140°43.2'E, 7 m; **Papua New Guinea**: CSIRO H 8539-01 (49), NE of Bramble Cay, ca. 9°0'36"S, 143°33'36"E, trawled in 55 m, 27 Jan. 2004.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking a flexible lamina posteriorly, extending about 0.8–1.2 diameters behind posterior margin of orbit; infraorbitals (Fig. 16P) moderately slender, 2nd infraorbital trough-like, open laterally, 3rd infraorbital robust with short posterolateral projecting arm ending with large sensory canal opening, no suborbital shelf; nape partially to completely scaly (Fig. 6D); dorsal fin X–XI, 12 or 13; anal fin II, 10–12; vertebrae 10+16; outer premaxillary teeth relatively straight with distinctly blunt tips; upper lip margin anteriorly with a few minute dark lappets; dorsal and anal fins dark with single pale stripe; caudal fin with one basicaudal pale band; pelvic fins uniformly pigmented.

Description. Dorsal fin X-XI, 12–13 = 22–23 total; anal fin II, 10–12; pectoral fin 19 or 20; caudal fin: procurrent rays 3+3, segmented rays 8+8, middle 12–14 branched, total elements 22; hypural 5 present; vertebrae 10+16; last pleural rib on vertebra 10; epineurals 13–16; two supraneurals; dorsal-fin interdigitation anterior pattern S/S/1/1+1/1/; gill rakers 9–11+20–22 = 29–33.

Scales absent on head, except scales present on nape posterior to point where opercle joins body but anterior predorsal area naked (Fig. 6D), on area above lateral line and pectoral-fin base; chest completely scaly (chest naked in several specimens apparently due to trawl abrasion); scale rows in horizontal series about 41–47; lateral-line terminus below dorsal-fin spine XI to segmented ray 3 (total element positions 11.5–14.0); lateral-line pores sparse, mostly arranged in a single, row along embedded lateral-line tubes (anteriorly lateral-line tubes on dorsal surface of scales); cephalic sensory pores relatively sparse (Fig. 6D); preopercular pore positions all occupied by single pores; mandibular pore positions 1–2 occupied by single pores, 3rd position with 2 or 3 pores, 4th position with 3 pores and 5th with 4 pores.

Anterior naris positioned closer to dorsal margin of upper lip than to posterior naris with the anterior naris very minute; dorsal fin moderately high with a noticeable change in fin height at junction of spinous and segmented rays (see "Remarks"); dorsal-fin spines relatively slender and only slightly curved distally, with flexible tips; all segmented dorsal- and anal-fin rays branched distally or anteriormost 1 or 2 anal rays unbranched; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally; posterior margin of preopercle indistinct, without a free margin; a few small lappets on outer margin of upper lip anteriorly; fifth cranial nerve passes under $A1_{\beta}$ section of adductor mandibulae (Fig. 3).

Upper jaw extends about 0.9 to 1.0 eye diameters behind posterior margin of orbit; maxilla widest at end and truncate, without flexible lamina posteriorly; supramaxilla present, moderately large and terminally positioned; premaxilla with an outer row of relatively elongate, blunt tipped teeth that become smaller posteriorly; premaxillary symphysis with a toothless gap on each side of which are 2 or 3 enlarged (the posteriormost largest), slightly recurved and almost horizontally positioned inner teeth; dentary with an outer row of relatively elongate blunt tipped teeth and, on anterior half of dentary, an inner row of much smaller teeth that are slightly curved inward; posteriormost 1 or 2 dentary teeth hooked inward; dentary symphyseal teeth similar to those of premaxilla except 3 or 4 inner teeth on each side; vomerine teeth absent.

Measurements of 11 specimens, 64.3–80.3 mm, as percent of SL: predorsal length 28.7–38.0; preanal length 50.1–64.8; dorsal-fin base 60.4–67.3; anal-fin base 25.4–28.3; pelvic-fin length 20.5–28.2; caudal-fin length 21.6–31.0; depth at anal-fin origin 20.8–26.6; head length 32.5–38.5; postorbital-head length 20.6–23.2; upper-jaw length 21.3–24.8; postorbital-jaw length 8.9–11.2; orbit diameter 8.5–13.0. As percent of head length: postorbital-head length 55.3–65.5; upper-jaw length 59.6–68.1; postorbital-jaw length 28.0–30.5; orbit diameter 24.0–36.2.

Color in life (Figs. 105, 106): Head and body mostly pale brown, except upper jaw, ventral part of head and

pectoral-fin base olive, chest and belly pale white; dorsal and anal fins with narrow brown basal stripe, above which is a white stripe extending length of fin with remainder of fin black; caudal fin black with white band on anterior 4th or 5th of fin; pelvic fins bicolored, dark except for pale outer two unbranched rays and interradial membrane; body scale rows in horizontal series brown separated by narrow unpigmented areas which give the appearance of small stripes.

Comparisons. *Opistognathus macrolepis* and *O. evermanni* differ from other species of *Opistognathus* having rigid upper jaws and anal fin II, 10–12 in typically having very dark dorsal and anal fins with one or two white stripes. *Opistognathus macrolepis* differs from *O. evermanni* in having dorsal and anal fins with one white stripe (vs. two white stripes), caudal fin with only a single white basicaudal band (vs. two white bands, a middle one in addition to the basicaudal band), and a few minute lappets on outer margin of upper lip anteriorly (vs. minute lappets absent in *O. evermanni*).

Distribution. (Fig. 27) Known from east coast of southern India at kalpakkam, 12°33'N, 80°11'E (Biswas *et al.* 2013), off Digha coast of West Bengal, India 20°11'N, 88°46'E (Ray & Mohapatra 2015), northern Vietnam (Ha Long Bay), Thailand, Gulf of Carpentaria, Australia, and Papua New Guinea in 7–62 m. Apparently an antitropical species (Randall 1982; Briggs 1987) with a widely disjunct distribution.

Etymology. A combination of the Greek *makros* (large) and *lepis* (a scale), apparently in reference to the relatively large body scales of this species.

Remarks: *Opistognathus macrolepis* is exceptional in having lappets on the anterior margin of the upper lip, and it and *O. helvolus* are the only Indo-West Pacific species with nape scales.

Wongratana's (1975) illustration of the holotype of *O. rex* (here reproduced as Fig. 107) inaccurately shows no change in height at the junction of the spinous and segmented dorsal-fin rays although the change in height is comparable to that seen in *O. evermanni* (Fig. 76), and is accurately depicted in Whitley's (1966, fig. 4) drawing of the holotype of *Merogymnoides carpentariae*. Wongratana (1975) gave the standard length of the holotype as 83.0 mm SL versus my measurement of 80.3 mm.

Opistognathus margaretae Smith-Vaniz, 1983

Margaret's Jawfish

Figures 4F, 17O, 108, 109; Tables 1–14

Opisthognathus [sic] *muscatensis* (not of Boulenger) Smith & Smith 1969: pl. 8, fig. D (Seychelles, misidentification = *O. margaretae*).

Opistognathus margaretae Smith-Vaniz 1983:2, figs. 1–4 (original description: South Africa, Zululand, KwaZulu-Natal, Sodwana Bay, 27°32'S, 32°41'E; holotype SAIAB [ex RUSI] 9336, 69 mm SL). Smith-Vaniz 1986:726, fig. 225.1 (brief description). Heemstra & Heemstra 2004:376 (brief description). Smith-Vaniz 2010:39, figs. 2F, 3D (*Opistognathus* identification key). Fricke *et al.* 2018:163 (checklist of Madagascar fishes). Smith-Vaniz 2022:312, unnumbered fig., pl. 119 (description, distribution).

Material Examined. 6 specimens, 44.7–77.7 mm SL, cited in the original description plus the following two specimens: SAIAB 43681 (67.2), South Africa, Ponta Malongane, 26°46.74'S, 32°54.24"E, 22–25 m, P. C. Heemstra, T. Andrew and A. Wood, 1 Nov. 1995; SAIAB 43682 (70.5), same data as preceding except 2 Nov. 1995.

Expanded diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking a flexible lamina posteriorly, extending about 0.75 eye diameters behind orbit; infraorbitals (Fig. 17O) moderately slender and tubular, 2nd and 3rd infraorbitals with wide sensory canal openings, 3rd infraorbital with moderate suborbital shelf; dorsal fin XI, 13 or 14; vertebrae 10+18; body with about 38–52 oblique scale rows in horizontal series; scales absent forward of verticals from dorsal-fin spines 6–11; vomerine teeth absent; head densely and completely covered with small cephalic pores; spinous dorsal fin with a prominent ocellus between spines 3–5; anal fin uniformly dark (Fig. 108).

Comparisons. See Smith-Vaniz (2010, Table 1) for comparison of Indian Ocean species of *Opistognathus*. *Opistognathus margaretae*, *O. nigromarginatus* and *O. muscatensis* are the only Indian Ocean species with an ocellus in the spinous dorsal fin. In addition to having different color patterns, the latter two species have upper jaws with a flexible lamina posteriorly, Figs. 14A, 14D (vs. no flexible lamina posteriorly), anterior naris without a cirrus (vs. cirrus present), more total gill rakers 36–45 (vs. 26–29), and horizontal scale rows 68–123 (vs. 38–52).

Distribution. (Fig. 31) Known only from KwaZulu-Natal (South Africa) and Mozambique to east coast of Madagascar where collected in 18–25 and 0–1 m, respectively.

Etymology. Named for Margaret M. Smith (1916–1987), well-known South African ichthyologist, artist, and first Director of the J.L.B. Smith Institute of Ichthyology (Gon 1996; Bruton 2018; Heemstra & Bruton 1988).

Remarks. The record of *O. muscatensis* from the Seychelles is based on misidentification of *O. margaretae*. The single specimen available from Madagascar (ANSP 147308) differs from the seven African specimens in having more extensive squamation, with scales extending anteriorly on the body to below dorsal-fin spine 6 (vs. below spines 9–11); the number of scale rows in horizontal series (left/right side) is approximately 49/52 in the Madagascar specimen (vs. 38–46, mean 42.2 in southern Africa specimens). In preservation, the color patterns of the south African and Madagascar specimens are very similar although life coloration of the Madagascar specimen was unrecorded.

Opistognathus megalops, new species

Bigeye Jawfish

Figures 13D, 17L, 110; Tables 1–14

Holotype. (only known specimen) KAUM-I. 97065, 88 mm SL, Japan, Kagoshima Pref., Osumi Islands, Tanegashima Island, off Urata, 30°50'N, 131°02'E, 103–107 m, longline, 20 Aug. 2016, F/V Daisan-oyomaru.

Diagnosis. A species of *Opistognathus* having an elongate upper jaw extending to rear margin of preopercle (about 1.1 eye diameters behind posterior margin of orbit) and with large oval supramaxilla and flexible lamina posteriorly; infraorbitals (Fig. 17L) moderately slender and tubular, 3rd infraorbital with posterolateral projecting arm ending with large sensory canal opening, no suborbital shelf; dorsal fin XI, 11; anal fin II, 11; vertebrae 10+16; scale rows in horizontal series about 52 or 56; vertebrae 10+16; gill rakers 12+26; anal, caudal and pelvic fins mostly yellow and body with three purple stripes.

Description. A species of *Opistognathus* having a upper jaw broadly sword-shaped with a flexible lamina and large subterminal oval supramaxilla, extending about 1.1 eye diameters behind posterior margin of orbit; dorsal fin XI, 11; anal fin II, 11; pectoral fin 20; caudal fin: procurrent rays 3+3, segmented rays 8+8, middle 12 branched, total elements 22; hypural 5 present; vertebrae 10+16; last pleural rib on vertebra 10; epineurals 12; one supraneural; dorsal-fin interdigitation anterior pattern / /S/1/1+1/1/; gill rakers 12+26.

Scales absent on body anterior to vertical from dorsal-fin spine 4, slightly below and above lateral line to first segmented ray, pectoral-fin base, chest and belly; scale rows in horizontal series about 56 or 57; lateral-line terminus below segmented dorsal-fin rays 5 or 6 (total element positions 16.0–17.0); cephalic sensory pores moderate (13D), those in mandibular and preopercular series unrecorded due to specimen damage.

Anterior naris position and configuration unrecorded due to specimen damage; spinous dorsal fin low and profile relatively uniform in height; noticeable change in fin height at junction of spinous and segmented rays; dorsal-fin spines slender and curved distally with flexible tips; all segmented dorsal- and anal-fin rays branched distally; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally; posterior margin of preopercle indistinct without a free margin; no crenulae on margin of upper lip anteriorly; fifth cranial nerve passes under $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extends about 1.1 eye diameters behind orbit; sword-shaped maxilla with flexible lamina posteriorly and large oval subterminal supramaxilla; premaxilla with an outer series of large canines that become progressively smaller posteriorly; premaxilla anteriorly with an inner band of smaller conical teeth bordered posteriorly by larger pointed teeth, some horizontally aligned; dentary anteriorly with an outer row of moderate conical teeth, behind which is a patch of smaller teeth, and remainder of dentary with a single row of relatively large vertical canines; vomerine teeth absent.

Measurements of the 88 mm holotype, as percent of SL: predorsal length 30.3; preanal length 63.3; dorsal-fin base 60.2; anal-fin base 28.8; pelvic-fin length 20.2; caudal-fin length 21.0; depth at anal-fin origin 17.1; caudal-peduncle depth 10.0; head length 32.3; postorbital-head length 18.9; upper-jaw length 26.7; postorbital-jaw length 13.2; orbit diameter12.1. As percent of head length: postorbital-head length 58.4; upper-jaw length 82.8; postorbital-jaw length 40.8; orbit diameter 37.3.

Color in life (Fig. 110): Background coloration of body pale yellow, fading to white ventrally; three purple stripes on sides approximately width of pupil, the ventral most stripe extending from just above pectoral fin to caudal-fin base, middle stripe beginning near opercular flap and dorsalmost stripe below dorsal-fin base; head

uniformly brown with narrow yellow stripe outlining upper jaw, and lips with narrow black margin; dorsal fin with narrow proximal dark stripe running length of fin, remainder of fin pale yellow except for very narrow dark distal margin; caudal, anal and pelvic fins uniformly yellow.

Comparisons. In contrast to other Indo-West Pacific species of *Opistognathus* having an upper jaw with a flexible lamina posteriorly, *O. megalops* (Fig. 13D) and *O. iyonis* (Fig. 10D) both differ in having relatively large oval supramaxillae. *Opistognathus megalops* also has fewer segmented dorsal- and anal-fin rays 11 (vs. 13–16) and caudal vertebrae 16 (vs. 17–20). *Opistognathus megalops* further differs from *O. iyonis* in lacking an ocellus in the dorsal fin (vs. prominent ocellus in spinous dorsal fin) and in having more total gill rakers in adults 38 (vs. 27–35).

Distribution. (Fig. 23) Known only from the Osumi Islands, Japan in 103–107 m.

Etymology. A combination of the Greek *mega* (large) and *ops* (eye) referring to the large bulging eyes of this species; gender masculine.

Opistognathus microspilus, new species

Smallspot Jawfish

Figures 12A, 111; Tables 1–14

Holotype. (only known specimen): NMMBP 13933, 53.7 mm SL male, Taiwan, trawled in 200 m, J. H. Wu, 25 May 2002.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking a flexible lamina posteriorly, extending about 0.7 eye diameters behind posterior margin of orbit; dorsal fin XI, 11; anal fin II, 10; vertebrae 10+16; lateral-line terminus below dorsal-fin spines X–XI; a single black spot, approximately diameter of pupil, centered between spines 6–7, dark stripe on basal fourth of dorsal fin for its entire length and no blotches on dorsum along dorsal-fin base.

Description. Dorsal fin XI, 11; anal fin II, 10; pectoral fin 19; caudal fin: procurrent rays 3+3, segmented rays 8+8, branched rays (lower 6 branched, upper rays 6 broken off at base); hypural 5 present; vertebrae 10+16; last pleural rib on vertebra 10; epineurals 13; two supraneurals; dorsal-fin interdigitation anterior pattern S/S/1/1+1/1/; gill rakers 9+20.

Scales absent on head, nape, above lateral line, chest and pectoral-fin base; scale rows in horizontal series about 42 or 43; lateral-line terminus below dorsal-fin spine XI (R) or between spines X–XI (L); lateral-line pores mostly arranged in an irregular series along embedded lateral-line tubes; cephalic sensory pores relatively sparse (Fig. 12A); all mandibular and preopercular pore positions occupied by single pores.

Anterior naris positioned midway between anterior margin of posterior naris and upper lip, consisting of a short tube that when depressed does not reach margin of posterior naris; height of tube about equal maximum diameter of posterior naris; spinous dorsal fin moderately low, approximately uniform in height for its entire length; profile of fin increasing in height posterior to junction of spinous and segmented rays; dorsal-fin spines moderately stout and straight, without curved, flexible tips; all segmented dorsal- and anal-fin rays branched distally; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally; posterior margin of preopercle distinct, with a free margin; no crenulae on margin of upper lip anteriorly; fifth cranial nerve passes under $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extends about 0.7 eye diameters behind posterior margin of orbit; maxilla widest at end and rounded, without a flexible lamina posteriorly; supramaxilla present, small and terminally positioned; premaxilla with a single row of small conical teeth, anteriorly an irregular inner band of teeth near symphysis with some of the posterior ones almost horizontally aligned; dentary anteriorly with an outer row of relatively large conical teeth, behind which is an irregular band of smaller teeth, posteriorly teeth becoming larger and hooked backward; vomerine teeth absent.

Measurements of the 53.7 mm male holotype, as percent of SL: predorsal length 34.7; preanal length 60.0; dorsal-fin base 60.3; anal-fin base 26.6; pelvic-fin length 25.7; caudal-fin length (? broken off); depth at anal-fin origin 17.3; caudal-peduncle depth 12.0; head length 34.0; postorbital-head length 19.5; upper-jaw length 22.1; postorbital-jaw length 8.2; orbit diameter 11.7. As percent of head length: postorbital-head length 57.3; upper-jaw length 64.9; postorbital-jaw length 24.1; orbit diameter 34.3.

Color pattern in preservation (Fig. 111): Body, head, and fins mostly tan except for the following: dorsal fin with single black spot, approximately diameter of pupil, centered between segmented rays 6 and 7; dark stripe on

basal fourth of dorsal fin for its entire length and no blotches on dorsum along dorsal-fin base; upper half of maxilla peppered with fine melanophores; chin margins of upper and lower lips dark brown for most of their length. Color in life of fresh specimens unknown.

Comparisons. The combination of a rigid upper jaw and the color pattern of *Opistognathus microspilus*, especially the position of the single black dorsal-fin spot, approximately diameter of pupil, between spines 6 and 7 and the lack of discrete blotches on the dorsum along the base of the dorsal fin, distinguishes it from all other Indo-West Pacific species of *Opistognathus*.

Distribution. (Fig. 33) Known only from Taiwan where trawled in about 200 m.

Etymology. The specific epithet, *microspilus*, is a combination of the Greek *mikros* (small) and *spilos* (spot, blemish) in reference to the size of the black dorsal-fin spot.

Opistognathus muscatensis Boulenger, 1888

Robust Jawfish

Figures 4D, 17P, 112–114; Tables 1–14

Opisthognathus [sic] *muscatensis* Boulenger 1888:662, pl. 54, fig. 1 (original description: northwestern Indian Ocean, Arabian Sea, Gulf of Oman, Oman, Muscat; syntypes BMNH 1887.11.11.227–229 (3, 263–273 mm SL). Gilchrist 1909:251 (description, Durban Museum). Gilchrist and Thompson 1917:348 (listed). Fowler 1925:263 (description, Port Shepstone and Natal). Barnard 1927:443, pl.19, fig. 2 (synonym, description, Natal coast). Fowler 1934:508 (Natal coast). Smith 1949: pl.13, color fig. 385 (description, Delagoa Bay).

Opistognathus muscatensis. Smith-Vaniz 1983:7, fig.7 (synonymy, diagnosis, specimen records). Smith-Vaniz 1986:727, fig. 225.2. color pl. 112 (brief description). Randall 1995:302, color fig. 852 (description, Gulf of Oman). Smale *et al.* 1995:194, pl. 120, figs. C1, C2 (description of otolith). Heemstra & Heemstra 2004:376, unnumbered color drawing (brief description). Smith-Vaniz 2009:82, figs. 1b, 2b, 14–15 (description, synonymy, distribution). Smith-Vaniz 2010:41, figs. 2G, 3C (in *Opistognathus* identification key). Hussain & Jawad 2014:254, fig. 2 (description, Basrah, Iraq). Jawad *et al.* 2018:105 (checklist of fishes in northwest Arabian Gulf). Zajonz *et al.* 2019:73 (listed, Socotra Archipelago, Yemen). Eagderi *et al.* 2019:92 (checklist of Persian Gulf fishes). Smith-Vaniz 2022:312, unnumbered figs., pl. 119 (description, distribution).

Opistignathus [sic] *muscatensis*. Al-Abdessalaam 1995: 49, color photo ("Robust Jawfish", attains 41 cm total length, habitat).

Material examined. 21 specimens, 133–342 mm SL all cited in Smith-Vaniz (2009).

Expanded diagnosis. A species of *Opistognathus* having upper jaw rounded posteriorly with moderately flexible lamina and oval supramaxilla, extending 0.7–1.7 eye diameters behind posterior margin of orbit; dorsal fin XI, 15; anal fin III, 15; vertebrae 10+19; scale rows in horizontal series about 104–123; infraorbitals (Fig. 17P) moderately robust, 2nd and 3rd infraorbitals with large sensory canal openings, 3rd infraorbital with large suborbital shelf; outermost segmented pelvic-fin ray tightly bound to adjacent ray, with interradial membrane not incised distally or only slightly near tip of rays; dorsal fin typically with ocellated spot between 3rd or 4th and 8th spines followed by several, irregular, dark blotches that extend onto body, and a blackish streak bordering lower jaw and dorsal edge of upper jaw.

Comparisons. The color pattern of *Opistognathus muscatensis* (Figs. 112, 113) readily distinguishes it from all other species of *Opistognathus* except *O. nigromarginatus*, which differs in having scattered white spots on the dorsal fin, several vertical dark bands on the sides, and a pair of pale basicaudal spots. *Opistognathus muscatensis* typically has more dorsal- and anal-fin rays 15 (vs. 14), and the upper jaw of adults is rounded posteriorly Fig. 4D (vs. sword-shaped, Fig. 4A). In addition, *O. muscatensis* and the otherwise very different *O. pardus* are the only Indo-West Pacific species of *Opistognathus* that have the outermost segmented pelvic-fin ray tightly bound to the adjacent ray, with interradial membrane not incised distally or only slightly near tip of the two rays.

Distribution. (Fig. 28) Western Indian Ocean from the Persian Gulf off Basrah, Iraq, Socotra Island, Seychelles, and the Gulf of Oman southward to Durban, South Africa in about 30–50 m.

Etymology. Named for the type locality, Muscat, Oman.

***Opistognathus nigripinnis*, new species**
Blackfin Jawfish
Figures 12B, 115; Tables 1–14

Holotype. (only known specimen) KPM 10482, 34.0 mm SL, Japan, Wakayama Pref., Kii Peninsula, Nanbudashi, 16 m, 17 Jul. 1999, K. Yamasaki.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking a flexible lamina posteriorly, extending about 1.0 eye diameters behind posterior margin of orbit; dorsal fin XI, 13; anal fin II, 13; vertebrae 10+18; body with about 39 or 40 scale rows in horizontal series; total gill rakers on first arch 26; dorsal fin uniformly peppered with fine melanophores including a dark spot between spines 3–6; in life, background of body tan, sides with 5 or 6 narrow white zig-zag bands, anal and pelvic fins uniformly peppered with fine melanophores and caudal fin yellow.

Description. Dorsal fin XI, 13; anal fin II, 13; pectoral fin 18–20; caudal fin: procurrent rays 3+3, segmented rays 8+8, number of branched rays could not be determined, total elements 22; hypural 5 present; vertebrae 10+18; last pleural rib on vertebra 10; epineurals 13; one supraneural; dorsal-fin interdigitation anterior pattern / /S/1/1+1/1/; gill rakers 9+17.

Scales absent on head, nape, above lateral line, chest and pectoral-fin base; scale rows in horizontal series very difficult to count due to poor condition of specimen but in the approximate range of 39–40; lateral-line terminus below dorsal-fin segmented ray 3; lateral-line pores mostly arranged in an irregular series along embedded lateral-line tubes; cephalic sensory pores relatively sparse (Fig. 12B); all mandibular and preopercular pore positions occupied by single pores.

Anterior naris positioned midway between anterior margin of posterior naris and upper lip and consisting of a short tube with palmate flap that when depressed reaches margin of posterior naris; spinous dorsal fin moderately low, approximately uniform in height for its entire length; profile of fin increasing in height posterior to junction of spinous and segmented rays; dorsal-fin spines moderately stout and straight, without curved, flexible tips; all except first segmented dorsal- and anal-fin rays branched distally; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally; posterior margin of preopercle indistinct, without a free margin; no crenulae on margin of upper lip anteriorly; fifth cranial nerve passes under $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extends about 1.0 eye diameters behind posterior margin of orbit; maxilla widest at end and rounded, without a flexible lamina posteriorly; supramaxilla present, small and terminally positioned; premaxilla with an outer row of canines anteriorly that become progressively smaller posteriorly and extend entire length of upper jaw; an inner group of smaller canines behind outer row anteriorly; dentary with an outer row of moderate canines, anterior ones larger, behind which is a single row of smaller inner canines; vomerine teeth absent.

Measurements of the 34 mm holotype, as percent of SL: predorsal length 29.1; preanal length 56.8; dorsal-fin base 65.9; anal-fin base 31.8; pelvic-fin length 21. 5; caudal-fin length (broken off); depth at anal-fin origin 19.2; caudal-peduncle depth 11.8; head length 35.0; postorbital-head length 22.6; upper-jaw length 18.8; postorbital-jaw length 8.8; orbit diameter 9.1. As percent of head length: postorbital-head length 64.6; upper-jaw length 53.6; postorbital-jaw length 25.1; orbit diameter 26.0.

Color in preservation (Fig. 115): Background tan, covered with fine melanophores, sides with 5 or 6 narrow white zig-zag bands; anal, pelvic, caudal (yellow in life) and dorsal fins uniformly peppered with fine melanophores; spinous dorsal fin also with black blotch between spines 3–6; head with pale blotches and pectoral-fin base with large white area.

Comparisons. The combination of dorsal, anal, and pelvic fins peppered with a heavy concentration of melanophores and a pale caudal fin (yellow in life) distinguishes *Opistognathus nigripinnis* from all other Indo-West Pacific species of *Opistognathus* except *O. parvus*. In addition to a different color pattern, *O. nigripinnis* differs from *O. parvus* in having more segmented anal-fin rays 13 (vs.11–13, usually 12), anterior naris with a large palmate flap (vs. anterior naris consisting of a short tube without a flap) and in life, sides with 5 or 6 narrow white zig-zag bands (vs. sides without zig-zag bands).

Distribution. (Fig. 33) Known only from the Kii Peninsula, Japan in 16 m.

Etymology. The specific epithet, *nigripinnis*, is a combination of the Latin adjective *niger* (black, dark) the noun *pinna* (fin) and suffix *is*, in reference to the essentially black dorsal, anal, and pelvic fins that characterize this species.

***Opistognathus nigromarginatus* Rüppell, 1830**
Bridled Jawfish
Figures 14A, 17Q, 116–118; Tables 1–14

Opistognathus nigromarginatus Rüppell 1830:114, pl. 28, fig. 4 (original description: Red Sea, Eritrea, Massawa; lectotype SMF 591, 118.9 mm SL). Smith-Vaniz 1983:6, fig. 6 (synonymy, diagnosis, description, lectotype designation). Dor 1984: 219 (checklist of Red Sea fishes). Smith-Vaniz 1986:727, fig. 225.3 (brief description). Randall *et al.* 1994:236, color pl. 17 (diagnosis, Persian Gulf). Randall 1995:302, color fig. 853 (description, Oman). Carpenter *et al.* 1997:134, unnumbered fig. (brief description, distribution, biology). Satapoomin 1999:27, color pl IV, fig. D (listed, Cape Panwa, Phuket Island). Smith-Vaniz 2000:612 (listed, checklist of South China Sea fishes). Heemstra & Heemstra 2004:376 (brief description). Smith-Vaniz 2009:85, figs. 1a, 2c, 16–18 (description, synonymy, distribution). Motomura & Satapoomin 2009:99, color fig. (description, Andaman Sea). Smith-Vaniz 2010:39, fig. 3B (in *Opistognathus* identification key). Golani & Bogorodsky 2010: 42 (listed, Red Sea checklist). Satapoomin 2011:56 (checklist, southwestern Thailand). Allen & Erdmann 2012:353, color photograph (brief description, distribution). Rainboth *et al.* 2012:84 (listed, Viet Nam). Hylleberg & Aungtonya 2013:107 (listed, Panwa, Thailand). Eagderi *et al.* 2019, 92 (checklist of Persian Gulf fishes). Jaafar *et al.* 2019:883, color fig. 1 (description, distribution, Terengganu, Malaysia). Smith-Vaniz 2022:313, unnumbered figs., pls. 119 & 120 (description, distribution).

Opisthognathus [sic] *sonneratii* Cuvier 1816:252 (name only). Günther 1860: 254 (brief description).

Opistognathus sonneratii Valenciennes *in* Cuvier & Valenciennes 1836:498 (original description, Pondicherry, India; syntypes? MNHN A-2107 [1] and ZMB no number [1, specimen lost]).

Opisthognathus [sic] *ocellatus* Ehrenberg in Cuvier & Valenciennes 1836:498 (Red Sea, unavailable name mentioned in synonymy of *Opistognathus sonneratii*.).

Opisthognathus [sic] *cuvieri* Valenciennes in Cuvier & Valenciennes 1840: no page number, pl. 78, fig. 3 (name based solely on published figure and figure legend). Preoccupied by *Opistognathus cuvieri* Valenciennes, 1836, a different Atlantic species.

Opisthognathus [sic] *nigromarginatus*. Playfair & Günther 1867:69 (Zanzibar); Klunzinger 1871:486 (Red Sea, after Rüppell); Day 1876:266, pl. 57, fig. 5 ((synonymy, description, India).

Opisthognathus [sic] *macrostomus* Smith 1935:186, pl. 20, fig. B (original description: southwestern Indian Ocean, South Africa, Natal, KwaZulu-Natal; holotype SAIAB [formerly RUSI] 40, 138.7 mm SL).

Opistognathus castelnaui (not of Bleeker) Fourmanoir 1965:76, fig. 48b (Nha-Trang, Viet Nam).

Material examined. 25 specimens, 32.5–155 mm SL, cited in Smith-Vaniz (2009) plus the following 6 specimens, all from the Persian Gulf: BPBM 27701 (140), BPBM 29670 (102), BPBM 30287 (90), BPBM 30289 (103.5), BPBM 30846 (67) and BPBM (107).

Expanded diagnosis. A species of *Opistognathus* having a sword-shaped upper jaw produced as a flexible lamina (Fig. 14A), extending 1.4–1.8 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 17Q) moderately robust, 2nd and 3rd infraorbitals with large sensory canal openings, 3rd infraorbital with slight suborbital shelf; dorsal fin XI, 14–15, typically 14; anal fin III, 14, exceptionally 15; vertebrae 10+18; scale rows in horizontal series about 68–95; total gill rakers 36–45, usually 39–45; spinous dorsal fin typically with large ocellus between spines 4–8; dorsal fin with scattered white spots; inner lining of upper jaw and adjacent membranes with a single black stripe that touches ventral margin of maxilla for most of its length; caudal fin with a pale of pale basicaudal spots.

Comparisons. The color pattern of *Opistognathus nigromarginatus* (Figs. 116–118) distinguishes it from all other species of *Opistognathus* except *O. muscatensis*, which differs in having the dorsal fin typically with an ocellated spot between 3rd or 4th and 8th spines followed by 2 or 3 large, irregular, dark blotches that extend onto body, and a blackish streak bordering lower jaw and dorsal edge of upper jaw. In addition, *O. muscatensis* also differs in typically having more dorsal- and anal-fin rays 15 (vs. 14), and the outermost segmented pelvic-fin ray tightly bound to the adjacent ray, with interradial membrane not incised distally or only slightly near tip of the two rays.

Distribution. (Fig. 28) Southern Africa, Zanzibar, Aldabra, Gulf of Oman, Persian Gulf, Red Sea, India, Thailand, Vietnam, and Malaysia on sand/rubble bottoms in 2–17 m.

Etymology. The specific epithet, from the Latin *nigro* (black) and *marginatus* (enclosed with a border), refers to the conspicuous inner maxillary stripe of this species.

Remarks. A single specimen purchased at Kuraburi fishing port, Ranong Province, Thailand (Fig. 119) is atypical in lacking a well-defined ocellus in the spinous dorsal fin.

Opistognathus ocellicaudatus Shinohara, 2021

Eyespottail Jawfish

Figure 119; Tables 1–14

Opistognathus ocellicaudatus Shinohara 2021:158, figs. 1–5 (original description: Sagami Bay off Misaki, Kanagawa, Japan; holotype NSMT-P 125494.

Material. Known only from the 69.4 mm SL female holotype (see above).

Expanded diagnosis. Based solely on original description of Shinohara (2021). A species of *Opistognathus* having a rigid upper jaw lacking a flexible lamina posteriorly; dorsal fin XI, 11; anal fin II, 11; vertebrae 10+16; scale rows in horizontal series 42; lateral-line terminus below segmented dorsal-fin rays 2–3; gill rakers 11 + 23; spinous dorsal fin with a large blackish blotch between spines 3–7 and soft dorsal fin with two ocellated blotches ringed by white on proximal half of fin, the first brown and between rays 1–6 and the second black and between rays 9–11; distal third of soft dorsal and anal fins yellow; head uniformly brown; small black blotch on opercular flap; caudal-fin base black followed posteriorly by white vertical band continuous with large dark ocellus ringed by white on middle of fin, remainder of fin yellow; pelvic fin yellow.

Comparisons. *Opistognathus ocellicaudatus* differs from all other species of *Opistognathus* in having a conspicuous ocellus on middle of caudal fin (Fig. 119). It is superficially similar to *O. rosenbergii* but differs in having relatively sparse cephalic sensory pores (Shinohara 2021, fig. 2) versus entire head densely covered with very small pores (Fig. 5D), fewer dorsal- and anal-fin segmented rays (11 vs. 13–14), fewer horizontal body scale rows (42 vs. 57–68), and a different life coloration, most noticeably having the pelvic fins, distal third of soft dorsal and anal fins, and caudal fin posteriorly yellow vs. mostly black in *O. rosenbergii* (Figs. 136, 137).

Distribution. (Fig. 26) Known only from Sagami Bay off Misaki Japan, 35°08.824'N, 139°35.213'E, near mouth of Tokyo Bay where collected by hook and line in 97 m. *Opistognathus ocellicaudatus* probably also occurs south of Tokyo Bay because the coastline near its mouth is influenced by the warm Kuroshio Current before it changes course to an easterly direction where it is influenced by the cold Oyashio Current (Shinohara 2021).

Etymology. From the Latin *ocellus* (eye) and *caudatus* (tail) in reference to the prominent ocellus on the caudal fin.

Opistognathus papuensis Bleeker, 1868

Papuan Jawfish or Speckled smiler

Figures 17F, 120–122; Tables 1–14

Opisthognathus [sic] *papuensis* Bleeker 1868:333 (original description: Indonesia, Waigiu [= Waigeo Island]; holotype RMNH 18093, 203 mm SL). Boeseman 1954:271, unnumbered fig. (rediscovery and redescription of holotype). Munro 1958:247 (listed, Waigeu).

Gnathypops papuensis. Bleeker 1874:473, pl. 9, fig. 2 (description). Taylor 1964:276 (description, Goulburn Island, Australia).

Opisthognathus [sic] *maculatus* Alleyne & Macleay 1877:280, pl. 9, fig. 3 (original description: Australia, Queensland, Torres Strait, Palm Island; holotype AMS I.16402–001, 139 mm SL). Saville-Kent 1889 (Port Darwin). Boeseman 1954:271 (synonymized with *Opistognathus papuensis*).

Batrachus punctatulus Ramsay 1883:177 (original description: Australia, Queensland, Torres Strait; holotype AMS I.1254, 259 mm SL). McCulloch 1914:217 (synonym of *Opistognathus maculatus*). McCulloch 1929:330 (checklist of Australian fishes, synonym of *Gnathypops maculatus*).

Gnathypops maculata. Ogilby 1920:27, pl. 3 (description, Dobo, Aru Island).

Gnathypops maculatus. McCulloch 1929:330 (checklist of Australian fishes).

Tandya maculata. Whitley 1932:296 (Low Isles, Australia). Marshall 1963:327, color pl. 48 (brief description).

Tandya papuensis. Whitley 1964:52 (listed).

Opistognathus papuensis. Munro 1967:444, pl. 46, fig. 850 (brief description). Kailola 1987:383 (listed annotated checklist). Randall *et al.* 1990:356, color photo (brief description, common name "Papuan Jawfish"). Larson & Williams 1997:365 (listed, Darwin Harbour). Allen & Adrim,2003:34 (listed). Smith-Vaniz 2004:223 (in key to Australian *Opistognathus*). Hoese & Bray 2006:1075 (synonymy, Australian distribution). Larson *et al.* 2013:107 (checklist of Northern Territory fishes).

Opistognathus maculatus. Stanbury, 1969:209 (listed, type catalog).

Material examined. 20 specimens, 139–339 mm SL. **Indonesia**: RMNH 18093 (203) holotype of *Gnathypops papuensis*, Waigeo. **Northern Territory**: NTM S.10577–002 (184) N. of Wessel Island; NTM S.10021–001 (229) Cobourg Peninsula, Sandy Island, 6 m; USNM 174044 (212) Goulburn Island; BPBM 28883 (2, 209–225) Darwin, N. of East Point, 12 m; NTM S.10455–002 (158) Port Essington, Black Point. **Queensland**: AMS I.16402–001 (139) holotype of *Opisthognathus maculatus*, Palm Island; AMS I.1254, (259), holotype of *Batrachus punctatulus*, Torres Strait. SIO 61–133 (151) Torres Strait, Friday Island, 10°35.2'S, 142°08.5'E.ANSP 137476 (152 C&S) Rib Reef off Townsville; QM I.9067 (246) Dunk Island; AMS IB.8357 (270) Magnetic Island; QM I.11402 (339) off Cairns; QM I.4742 (268) Low Isles, 16°18'S, 145°35'E; AMS I.33645–001 (233) Cape York, near Weipa, Albatross Bay, Westminster Reef, 9 m; AMS I.3427 (219) and AMS I.3428 (256) Thursday Island; AMS I.15557–211 (245) and CSIRO C3670 (148) Gulf of Carpentaria, 16°40'S, 140°53'E, 13 m.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking a flexible lamina posteriorly, extending about 0.9 to1.5 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 17F) relatively slender, 3rd infraorbital with moderate sensory canal openings but no posterolateral projecting arm and a large suborbital shelf; dorsal fin XII (exceptionally XIII), 15–17; anal fin II, 13–15; vertebrae 12+19; lateral-line terminus below segmented dorsal-fin rays 7–11; vertebrae 12+19; body with numerous small spots, especially on dorsum of head; pectoral fin with several to many tiny, dark spots; background coloration of head and body light tan to pale yellow.

Description. Dorsal fin XII-XIII (exceptionally XIII), 15–17; anal fin II, 14–15; pectoral fin 21–23; caudal fin: procurrent rays 3–5+3–4, segmented rays 8+8, middle 12–14 (typically 13) branched, total elements 22–24; hypural 5 present; vertebrae 12+19; last pleural rib on vertebra 12; epineurals 14–16; no supraneurals; dorsal-fin interdigitation anterior pattern / / /1/1+1/1/; gill rakers 8–9+16–18 = 24–27.

Scales absent on head, nape and chest; pectoral-fin base usually partially scaly but scales often embedded and difficult to see; scales usually absent (occasionally up to 6 rows present) above lateral line anteriorly, posterior 2/3 of lateral line with 2–8 scales rows above; scale rows in horizontal series about 78–94; lateral-line terminus below segmented dorsal-fin rays 7–11 (total element positions 19.0–23.0); lateral-line pores relatively sparse, mostly arranged in a single series along embedded lateral-line tubes; cephalic sensory pores very numerous, except pores absent on much of nape; mandibular and preopercular pore positions occupied by multiple pores that are too small to count accurately.

Anterior naris positioned closer to posterior naris than to margin of upper lip and consisting of a short tube with a broad tentacle on posterior rim that when depressed extends to or nearly to margin of posterior naris; height of tentacle about 0.5–1.5 times maximum diameter of posterior naris; dorsal fin moderately low, increasing in height posteriorly, with profile relatively uniform without a change in height at junction of spinous and segmented rays; dorsal-fin spines relatively slender and only slightly curved, with flexible tips; skin covering tips of dorsal-fin spines distinctly rugose in large specimens but without fleshy tabs; all segmented dorsal-fin rays branched distally and all except first 1 or 2 anal rays unbranched; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally; posterior margin of preopercle distinct; large specimens sometimes with a few crenulae on anterior margin of upper lip and on inner surface of lower lip mid-laterally; fifth cranial nerve passes over $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extends about 0.9–1.5 eye diameters behind posterior margin of orbit; maxilla widest at end and truncate, without flexible lamina posteriorly; supramaxilla present, relatively slender and terminally positioned; premaxilla with an outer row of large canines that become smaller posteriorly and extend length of upper jaw; an inner series of small conical teeth behind outer row anteriorly that become a single row posteriorly; dentary with an outer row of moderate canines becoming slightly smaller posteriorly; vomerine teeth absent.

Measurements of 18 specimens, 148–399 mm, as percent of SL: predorsal length 33.2–39.0; preanal length 60.0–68.4; dorsal-fin base 62.6–70.2; anal-fin base 25.3–29.8; pelvic-fin length 18.5–24.9; caudal-fin length 21.8–25.0; depth at anal-fin origin 19.6–24.8; caudal-peduncle depth 11.7–13.5; head length 37.1–41.5; postorbital-head length 22.2–26.9; upper-jaw length 24.5–28.0; postorbital-jaw length 11.3–16.1; orbit diameter 9.8–12.6. As percent of head length: postorbital-head length 57.6–68.2; upper-jaw length 63.7–71.3; postorbital-jaw length 27.6–41.9; orbit diameter 25.8–33.5.

Color in life (Figs. 120–122): Background coloration of head and body light tan to pale yellow, and usually without a dark humeral blotch; top of head, pectoral fin and body with relatively small dark spots, dorsal and anal fins sometimes with a few dark spots on base of fin; caudal peduncle usually without a pair of vertically positioned dark spots; iris with radiating dark spokes. In preservation color pattern essentially as in life.

Comparisons. Only four other species (*O. inornatus*, *O. latitabundus*, *O. reticeps*, and *O. reticulatus*) agree with *Opistognathus papuensis* in having dorsal fins XII, 15–18. *Opistognathus inornatus* is most similar to the allopatric *O. papuensis* but differs in lacking small dark spots on top of head and has a relatively large dark humeral blotch and a pair of vertically positioned dark spots on the caudal peduncle (typically absent in *papuensis* but see below "Remarks"). In addition to a very distinctive color pattern, *O. reticulatus* has a different vertebral count 13+18 (vs. 12+18–21) fewer total gill rakers 21–22 (vs. 24–27) and typically more scale rows in horizontal series 90–121 (vs. 78–94); *O. reticeps* and *O. latitabundus* both typically also have fewer scale rows in horizontal series 56–64 and 63–80, respectively, (vs. 78–94), and *O. reticeps* further differs from *O. papuensis* in having the lateral-line terminus ending below dorsal-fin spine 10 to ray 3 (vs. rays 7–13).

Distribution. (Fig. 35) Specimens of *Opistognathus papuensis* are available only from eastern and northern Australia in 6–16 m. There are unconfirmed historical records from Waigeo and the Aru Islands, Indonesia. In his paper on the rediscovery of the holotype of *Opistognathus papuensis*, Boeseman (1952) did not question the accuracy of the Waigeo type locality of the species. Bleeker relied on others for collection of the majority of his specimens and a labeling error or specimen mix-up could have occurred. However, Ogilby's (1920) redescription of *Gnathypops maculata*, which clearly refers to *O. papuensis*, was stated to have been based on a 346 mm TL specimen from Dobo, Aru Islands, Indonesia collected by John Colelough, who presented it to the Amateur Fisherman's Association of Queensland. Unfortunately, this specimen could not be located in the Queensland Museum in Brisbane or the Australian Museum in Sydney, where most of the AFAQ fish collection had been previously transferred.

Etymology. Named for Papua (New Guinea).

Remarks. In a footnote, McCulloch (1914) correctly recognized that *Batrachus punctulatus w*as a synonym of *Opistognathus maculatus*, but apparently was unaware of Bleeker's earlier description of *Opistognathus papuensis*, a senior synonym of both names. He distinguished *O. maculatus* (= *papuensis*) from *O. inornatus* entirely on color pattern, primarily the distribution and relative size of spots on the fins and body and assigned both nominal species to the genus *Gnathypops*. The extent of spotting varies even between individuals of the same nominal species. Adult specimens from Western Australia referable to *Opistognathus inornatus* typically have few or no spots on the pectoral fin and head, and usually have a few moderately large spots on the body (Figs. 93–96). In contrast, the holotype of *Opistognathus papuensis* and adults of most specimens from Queensland, Cape York and Torres Strait (including specimens in the Queensland Museum not listed in material examined) typically have between 80–150 small black spots on the pectoral fin, and the head and body are covered with numerous small black spots all about the same size. Some specimens from the Northern Territory have as few as 5–12 spots on the pectoral fin and relatively few and generally larger body spots, with some spots much larger than others. Although these specimens are not completely intermediate between those of the eastern Australian *O. papuensis* and the western Australian *O. inornatus*, the nature of their color patterns suggest a relatively recent contact zone between what was once two allopatric populations. A photographed specimen from the tip of northern Australia identified as *O. papuensis* (Fig. 122) has a color pattern somewhat intermediate between the two nominal species.

As discussed by Springer & Williams (1990), Voris (2000), Gaither *et al*. (2011), and Gaither & Rocha (2013), during the past 140,000 years major sea-level lows have vacillated from about 50 to at least 130 m lower than present levels, resulting at times in an almost complete land barrier between the Indian and Pacific oceans (Gaither *et al* 2011, fig. 6). The existence of numerous sister species with disjunct distributions on opposite sides of the region occupied by the emergent land mass that formerly united northern Australia and New Guinea is congruent with the existence of such an historical vicariant event.

In the interest of nomenclatural stability, *O. papuensis* and *O. inornatus* are both recognized as valid species. However, given the relatively minor color pattern differences that distinguish the eastern Australian *Opistognathus papuensis* and Western Australian *O. inornatus*, and what appears to be a contact zone of genetic mixing between the two formerly allopatric populations in northern Australia, a molecular study is needed to help determine if specific rank is justified.

Opistognathus pardus Smith-Vaniz, Bineesh & Akhilesh, 2012

Leopard Jawfish

Figures 8C, 17R, 123; Tables 1–14

Opistognathus pardus Smith-Vaniz, Bineesh & Akhilesh 2012:21 figs. 1–5 (original description: SW coast of Indian, off Quilon,

Kerala; holotype CMFRI GB.31.104.1.2, 98.8 mm SL). Smith-Vaniz,2022:313, unnumbered fig., pl. 120 (description, distribution).

Material examined. Known only from the 98.9 mm SL male holotype (see above).

Expanded diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking a flexible lamina posteriorly, extending about 1.0 eye diameters behind posterior margin of orbit; dorsal fin XI, 11; anal fin II, 11; vertebrae 10+16; scale rows in horizontal series 42–44; gill rakers 15–16+25; infraorbitals (Fig. 17R) moderately slender and tubular, 3rd infraorbital with moderate sensory canal openings and very short posterolateral projecting arm ending with sensory canal opening, no suborbital shelf; outermost segmented pelvic-fin ray tightly bound to adjacent ray, with interradial membrane not incised distally; head with numerous small, irregular-shaped, dark spots (Fig. 123); throat, gill membranes, pectoral fins, anal fin, and dorsal- and caudal-fin margins yellow; dorsal fin mostly dusky yellow with 3 pale blue ocelli with dark centers on proximal half of fin.

Comparisons. *Opistognathus muscatensis* and *O. pardus* are the only Indo-West Pacific species with the outermost segmented pelvic-fin ray tightly bound to the adjacent ray, with interradial membrane not incised distally, but these two allopatric species have different meristic values and color patterns.

Etymology. From the Greek *Pardos* (leopard), in reference to the distinctive spotted head pattern characteristic of this species.

Distribution. (Fig. 31) Known only from off Quilon, Kerala, SW coast of India where taken by shrimp trawlers between 110–220 m.

Opistognathus parvus, new species

Dwarf Jawfish

Figures 10B, 16T, 22A–B, 124–126; Tables 1–14

Opistognathus sp. A. Wass, 1984:24 (color description, Samoan record).
Opistognathus n.sp. Mooi 1990:462, fig. 3a (description of egg surface morphology).
Opistognathus sp. Randall 2005:345, unnumbered photo (Dwarf Jawfish, description, distribution).
Opistognathus species 4. Allen & Erdmann 2012:356, color photographs (brief description, distribution).

Holotype. ANSP 133404, male (24.0), American Samoa, Tutuila Island, Fagaalu Bay, 30.5 m, Richard C. Wass, 1975.

Paratypes. 58 specimens, 13.0–30.5 mm SL. **Brunei**: WAM P.33119–002 (6, 13.0–23.8), Colombo Shoals, 5°12.401'N, 114°43.641'E, 32 m, M.V. Erdmann, 25 May 2009. **Indonesia**: WAM P.35072–001 (24.2), Lembeh Strait, "Goby a Crab", 1°29.592'N, 125°11.151'E, 25 m, M.V. Erdmann, 22 Aug. 2019; WAM P.35073–001 (6, 21.5–24.7), Halmahera, Bacan Island, Todallu, 0°20.371'S, 127°18.153'E, 20 m, M.V. Erdmann, 6 May 2012; WAM P.33241–002 (3, 22.4–25.4), West Papua, Matan Island, 0°57.446'S, 131°8.759'E, 40 m, M.V. Erdmann, 24 Jan. 2010; WAM P.33097–001 (20.0), Misool Island, Wasankaina Island, 2°1'S, 130°41'E, 15–30 m, G.R. Allen, 26 May 2009, sta. IND-09–022; USNM 396702 (2, 18.0–28.0) and WAM P.32861–001 (3, 25.8–30.5) West Papua, Triton Bay, bat cave on north side, 3°50'S, 134°2'E, 15–40 m, M.V. Erdmann, 1 Feb. 2007, sta. RA-07–008; WAM P.33087–001 (6, 20.0–28.4), West Papua, Papisol Point, 4°10'S, 132°50'E, 20–40 m, G.R. Allen and M.V. Erdmann, 20 Mar. 2009, sta. IND-09–008; BPBM 32402 (3, 21.8–27.6) Komodo Island, just E. Toro Lin Point, 8°36'S, 119°36'06"E, 25–28 m, J.E. Randall and E. Clark, 16 Oct; 1987; WAM P.35046–009 (2, 22.5–23.0), Papua New Guinea, Milne Bay, Nuakata, 10°16.444'S, 151°0.857'E, M.V. Erdmann, 20 Sep. 2019, MVE 19–065. **Philippines**: FMNH 118281 (2, 18.9–23.8), Palawan Prov., Culion Island, reef on E side of small harbor at south tip of island, 11°40.55'N, 119°58.48'E, 3–26 m, Busuanga Exped., 8 Mar. 2003, sta. BUS03–23; WAM P.3296–001 (20.3), Palawan Prov., Bacuit Bay, Depeldet Island., 11°8'15.2"N, 119°23'33.7"E, 20 m, M.V. Erdmann, 12 Jun. 2007; WAM P.32996–001 (2, 22.0–22.9) Palawan Prov., Cagbule Reef, 11°28'N, 119°31'E, 37–38 m, M.V. Erdmann, 8 Jun. 2008, sta. PHI-08–033. **Santa Cruz Islands**: USNM 352354 (3, 13.8–27.0), 10°12'51"S, 166°4'34"E, 10–35 m, J.T. Williams *et al.*, 19 Sep. 1998. **Fiji Islands**: ROM 42223 (22.0) Astrolabe Reef, S. of Darwin, 18°46'38"S, 178°31'57"E, 30 m, R. Winterbottom *et al.*, 6 Apr. 1983, sta. WE 83–47. **Samoa**: ANSP 133405 (2, 21.6–22.8) and USNM 220924 (22.5), same data as holotype; ANSP 162688 (8, 15.5–22.6, including 2 C&S) and USNM 315662 (4, 21.8–23.4) Tutuila Island, Taema Bank, 35 m, R.C. Wass, 19 Jul. 1976; ANSP 162689 (22.4) Tutuila Island, Larsen Bay, 61 m, R.C. Wass, 3 Feb. 1976.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking a flexible lamina posteriorly, extending about 0.5 to 0.7 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 16T) all trough-like, open laterally, no suborbital shelf; dorsal fin X–XI, 11–13 (typically 12); anal fin II, 11 or 12; vertebrae 10+17–18; spinous dorsal fin with an incomplete ocellus between spines 3–6; body scales densely speckled with large melanophores, especially in males.

Description. Dorsal fin XI, 11–13 (typically 12); Anal fin II, 11 or 12 (rarely 11); Pectoral fin 20–22 (exceptionally 22); Caudal fin: procurrent rays 3+3, segmented rays 8+8, middle 11–12 branched, total elements 22; hypural 5 present; Vertebrae 10+17 (exceptionally 9–10+18); last pleural rib on vertebra 10; epineurals 10–12; one supraneural; dorsal-fin interdigitation anterior pattern / /S/1/1+1/1/; Gill rakers 9–11+18–22 = 27–33.

Scales absent on head, nape, above and slightly below lateral line, body anterior to vertical from 3rd dorsal-fin spine, pectoral-fin base and chest; scale rows in horizontal series about 40–45; lateral-line terminus below segmented dorsal-fin ray 1–3 (total element positions 13–14); lateral-line pores mostly arranged in a single series along embedded lateral-line tubes; terminal opening of lateral line very large and separated from penultimate pore by a relatively wide gap; cephalic sensory pores relatively sparse (Fig. 10B); all mandibular and preopercular pore positions occupied by simple pores.

Anterior naris positioned closer to margin of upper lip than to posterior naris and consisting of a short tube that when depressed does not reach margin of posterior naris, height of tube about equal maximum diameter of posterior naris; dorsal fin moderately low, gradually increasing in height to about middle of spinous dorsal fin then decreasing in height; profile of fin gradually increasing in height posterior to junction of spinous and segmented rays; dorsal-fin spines moderately stout and straight, some slightly curved distally but without flexible tips; all segmented dorsal- and anal-fin rays branched distally; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally; posterior margin of preopercle indistinct, without a free margin; no crenulae on margin of upper lip anteriorly; fifth cranial nerve passes under $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extends about 0.5 to 0.7 eye diameters behind posterior margin of orbit; maxilla widest at end and truncate, without flexible lamina posteriorly; supramaxilla present, relatively small and terminally positioned; premaxilla with an outer row of moderate conical teeth anteriorly which become progressively smaller posteriorly; 3–4 irregular rows of much smaller blunt teeth behind outer row anteriorly, none enlarged or canted backwards; dentary with an outer row of small conical teeth, those mid-laterally slightly larger; 2–3 inner rows of smaller and blunter teeth anteriorly, none canted backwards; vomerine teeth absent.

Measurements of the 24.0 mm holotype followed in parentheses by those of 10 paratypes, 21.8–30.5 mm, as percent of SL: predorsal length 34.6 (32.8–38.1); preanal length 55.8 (55.2–61.7); dorsal-fin base 67.9 (61.4–72.4); anal-fin base 33.3 (27.3–32.2); pelvic-fin length 23.3 (19.4–29.8); caudal-fin length 24.2 (20.7–25.3); depth at anal-fin origin 20.8 (17.4–20.3); head length 32.9 (30.1–35.6); postorbital-head length 19.6 (19.0–21.8); upper-jaw length 21.0 (19.1–20.9); postorbital-jaw length 9.8 (6.1–8.5); orbit diameter 9.2 (8.2–12.2). As percent of head length: postorbital-head length 59.5 (58.4–70.6); upper-jaw length 63.9 (56.8–64.5); postorbital-jaw length 29.8 (17.5–28.0); orbit diameter 27.9 (27.1–34.5).

Color in life (Figs. 22A–B, 124, 125): Sides, dorsal and anal fins densely speckled with melanophores and caudal fin with relatively few melanophores; males darker with body, dorsal and anal fins dark brown to blackish, head usually pale brown to yellowish with darker blotches and bars, except head white in displaying fish (Fig. 22A-B); females much lighter with diffuse brown blotches and streaks on pale head, and fins mostly yellow. Both sexes with prominent, white-edged ocellus (dorsal part of black spot usually without white edge) between dorsal-fin spines 3–6, pelvic fin and branchiostegal membranes yellow. Iris yellow to red without radiating spokes.

Comparisons. No other Indo-West Pacific species of *Opistognathus* has the dorsal and anal fins and body scales densely speckled with large melanophores, especially in males, and the spinous dorsal fin with an incomplete ocellus between spines 3–6. Only three other species (*O. dendriticus*, *O. eximius*, and *O. hopkinsi*) agree with *Opistognathus parvus* in having the combination of dorsal fin XI, 13 and anal fin II, 12 but they have very different color patterns, more scale rows in horizontal series 50–99 (vs. 40–45) and adults attain a much larger size.

Distribution. (Fig. 34) *Opistognathus parvus* has a broad Indo-West Pacific distribution ranging from Indonesia (Komodo Island) to Okinawa, from Brunei to Fiji, Samoa, and the Santa Cruz Islands. The record for Okinawa (Minna-Jima Island) is based on a photograph taken by Satoshi Ueda on 7 Jun. 2000 of a displaying male in 15–18 m. The Dwarf Jawfish has been collected on sand/rubble bottoms near reefs in 10–61 m.

Etymology. The specific epithet, from the Latin *parvus* (little), refers to the diminutive size of this jawfish. The recommended common name for this species is dwarf jawfish.

Remarks. *Opistognathus parvus* is one of the smallest known species of *Opistognathus* with one gravid female (FMNH 118281) only 18.9 mm SL. Mark Erdmann (in lit.) observed large colonies of over 100 individuals of *O. parvus* at several different locations in coastal conditions with lowered salinities and high sedimentation consisting of fine, silty mud/sand bottoms. All of these fish had yellow-tinged fins and the dorsal fin with an ocellus, and some had dark bodies (Fig. 124) which they were capable of "turning on and off."

Opistognathus pholeter, new species

Figures 11A, 17S, 127–129; Tables 1–15
Hidden Jawfish

Opistognathus new species Kulbicki & Williams 1997:19 (listed; Ouvéa Atoll, New Caledonia).
Opistognathus sp. 2 Laboute & Grandperrin 2000:385 (listed).
Opistognathus n.sp. 2 Fricke *et al.* 2011:388 (New Caledonia checklist).

Holotype. CAS 78892, 60.6 mm SL, New Caledonia, Noumea, rocky tide pool near Camp Goetige, W. M. Chapman *et al.* 28 Mar. 1944, sta. C-24.

Paratypes. 119 specimens, 38.0–61.6 mm SL. **New Caledonia**: CAS 15802 (35, 40.3–61.3), AMS I.22109–001 (10, 39.7–42.6), ANSP 142962 (22, 40.8–61.6, including 2, 44.3–45.5 C&S), USNM 220925 (20, 38.0–42.8), all with same data as holotype; CAS 15801 (38.8), Noumea, S. of Anse Vate, from tidepool, W.M. Chapman *et al.*, 27 Mar. 1944, Sta. C-23; BPBM 11471 (50), Noumea, Anse Vate, lagoon off N. side, 4.6 m, J.E. Randall and P. Fourmanoir, 16 Aug. 1971; BPBM 28173 (6, 34.5–42.1), Noumea, Ile aux Canards, 3–5 m, R. Lubbock and P. Fourmanoir, Mar. 1975; ROM 63915 (4, 15.8–62.2), Noumea, SW side of Isle Rédika, 22°31'20"S, 166°36'30"E, 6–11 m, R. Winterbottom *et al.*, 12 Sep. 1991, sta. RW91–21; MNHN 1980–320 (46), "Pointe Ma," P. Fourmanoir; BPBM 33940 (51.7) and USNM 315664 (5, 30.7–51.0), lagoon SE of St. Vincent Pass, 22°2.1'S, 165°57.8'E, 2–4 m, M. Kulbicki, J. E. Randall *et al.*, 21 Mar. 1990; MNHN 1991–360 (44.7), 21°24'S, 166°2'E, "Vauban" Sta. DW 710, 30–31 m, Richer de Forges, 10 Jul. 1986; SMNS 26574 (6, 42.0–52.8) and SMNS 27047 (2, 49.8–55.7), Goro Bay, ca. 22°19'S, 167°01'E, R. Fricke, 2006. **Loyalty Islands**: BPBM 22520 (43.2), Ouvea, outside reef N. Pleiades du Nord, Ilots Deguala, 15 m, J. E. Randall *et al.*, 5 Jan. 1979; USNM 321032 (3, 55.9–63.0), Ouvéa Atoll, Bagaat Islet, 20°37'18"S, 166°16'8"E, 21.5 m, 16 Nov. 1991, J.T. Williams *et al.*, sta. JTW 91–9.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking a flexible lamina posteriorly, extending 0.6 to 0.9 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 17S) moderately slender except 2nd and 3rd infraorbitals much larger with large sensory canal openings, 3rd infraorbital with no suborbital shelf; dorsal fin IX–XI, 19–22; anal fin II, 17–19, rarely 17; vertebrae 11+22–24, typically 23; scale rows in horizontal series about 39–51; scales absent anterolaterally forward of verticals from dorsal-fin spines 4–6; vomerine teeth 1–3; dorsal and anal fin with a narrow dark basal stripe; caudal fin with 4–5 dark bands.

Description. Dorsal fin IX–XI, 19–22 (rarely 22), total = 30–31; anal fin II, 17–19; pectoral fin 18–21; caudal fin:4–5+4–5, segmented rays 8+8, middle 12–14 branched, total elements 23–26; hypural 5 absent; vertebrae 11+22–23 (typically 23); last pleural rib on vertebra 11; epineurals 13–16; no supraneurals; dorsal-fin interdigitation anterior pattern / / /1/1+1/1/; gill rakers 7–9+15–18 = 23–28.

Scales absent on head, nape, area above and slightly below lateral line and body anterior to a vertical below dorsal-fin spines 4-6, pectoral-fin base and chest; belly squamation varying from completely naked to posterior 2/3 scaled; scale rows in horizontal series about 39–51; lateral-line terminus below segmented dorsal-fin rays 7–11 (total element positions 17.0–21.0); lateral line pores moderate, arranged in multiple series along embedded lateral-line tubes; cephalic sensory pores numerous (Fig. 11A), in adults head completely covered with pores except for V-shaped area in front of dorsal-fin origin; mandibular pore positions 1–3 occupied by relatively large, single pores, 4th position occupied by 1-3 (usually 2) pores, 5th with 3–7 pores.

Anterior naris about midway between posterior naris and dorsal margin of upper lip, consisting of a raised tube with a short to moderate tentacle on posterior rim that when depressed does not reach or barely extends to margin of posterior naris; height of tentacle about 0.5 to 1.0 times maximum of diameter of posterior naris; dorsal fin very low anteriorly gradually increasing in height posteriorly; profile relatively uniform without only a slight change in fin height at junction of spinous and segmented rays; dorsal-fin spines moderately short and straight, not curved distally and without flexible tips; tips of spines with slightly swollen fleshy tabs; all segmented dorsal- and anal-fin

rays branched distally; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally; posterior margin of opercle distinct with a free margin; anterior margin of upper lip with many small crenulae (some large adults also with crenulae on lower lip mid-laterally); fifth cranial nerve passes under $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extends 0.6 to 0.9 eye diameters behind posterior margin of orbit; maxilla widest at end and truncate, without flexible lamina posteriorly; supramaxilla small and terminally positioned; premaxilla with an outer row of moderate conical teeth that extend entire length of upper jaw and become progressively smaller posteriorly; 2 or 3 irregular rows of teeth behind outer row anteriorly, those on innermost row horizontal; dentary teeth similar to those of premaxilla except 2 rows of slightly smaller teeth behind outer row on about anterior half of dentary, those on inner most row canted backward; vomerine teeth 1–3.

Measurements of the 60.6 mm holotype followed in parentheses by those of 20 paratypes, 38.0–61.3 mm, as percent of SL: predorsal length 29.6 (28.4–31.6); preanal length 57.3 (52.4–58.0); dorsal-fin base 67.9 (65.7–72.7); anal-fin base 35.3 (34.7–39.5); pelvic-fin length 18.5 (16.8–21.6); caudal-fin length 19.5 (17.0–21.5); depth at anal-fin origin 15.4 (15.0–17.8); caudal-peduncle depth 8.6 (7.7–8.9); head length 31.4 (28.4–32.0); postorbital-head length 21.1 (19.3–21.7); upper-jaw length 16.9 (14.6–17.6); postorbital-jaw length 7.4 (5.6–8.1); orbit diameter 8.7 (7.8–9.5). As percent of head length: postorbital-head length 67.4 (64.0–71.0); upper-jaw length 54.0 (47.8–56.9); postorbital-jaw length 23.7 (18.2–25.9); orbit diameter 27.9 (27.1–29.7).

Color in alcohol (Figs. 127, 128): Head and body tan to rich brown, with a few scattered small black dots on scales; body with scale rows in horizontal series separated by narrow pale areas which gives the appearance of small stripes, and row of 7–8 pale spots on lower half of sides and poorly defined row of pale spots below dorsal fin; 5-8 small white spots covered by pectoral fin and pectoral-fin base with large white spot; upper jaw with dark blotch near beginning of supramaxilla; orbit ringed by small black spots and iris red without radiating spokes; spinous dorsal fin without an ocellus and tips of dorsal-fin spines with white fleshy tabs; soft dorsal fin with two horizontal rows of brown or black spots centered on rays and a black ventral stripe extending length of fin; anal fin pale except for narrow black stripe extending length of fin; caudal fin with narrow brown bands; pelvic fin pale without bands.

Comparisons. See Table 15. Only five other Indo-West Pacific species of *Opistognathus* agree with *O. pholeter* in having II, 17 or more anal-fin rays (Table 8); all of these species have fewer precaudal vertebrae 10 (vs. 11); *O. alleni* has fewer scale rows in horizontal series, 21–31 (vs. 39–51, except for *O. seminudus* with 28-36), and lateral-line terminus below segmented rays 13–17 (vs. 7–11); *O. stigmosus* and O. *albomaculatus* both differ in lacking vomerine teeth (vs. 1–3 vomerine teeth) and *O. albomaculatus* further differs in having an iris with several narrow dark spokes radiating from pupil (vs. no radiating spokes); *O. elizabethensis* differs in lacking pale body spots, no small dark orbital spots and spinous dorsal fin with a partial ocellus (vs. no ocellus).

Distribution. (Fig. 25) Apparently endemic to New Caledonia and the Loyalty Islands where collected in 2–30 m.

Etymology. The specific epithet is from the Greek *pholeter* (one who hides or lives in a den) in allusion to the fossorial behavior, a characteristic of all known jawfishes.

Opistognathus randalli Smith-Vaniz, 2009

Goldspecs Jawfish

Figures 1, 14C, 17T, 20, 21, 22C, 130; Tables 1–14

Opistognathus sp. Kuiter 1992: 144, unnumbered color photos (“Gold-specs Jawfish,” habitat, Flores and Bali). Kuiter & Debelius 1994:216, unnumbered color photo (Gold-specs Jawfish, habitat). Kuiter 1992:144, unnumbered color photos (“Gold-specs Jawfish,” Flores and Bali islands). Steene 1998:58, 114-115, unnumbered color photos “Randall’s Jawfish,” oral egg incubation and social interactions). Anderson 2000:123, fig. 146 (color photograph, Indonesia). Kimura & Matsuura 2003: 59, unnumbered color photo (“Gold-specs Jawfish,” brief description, Sulawesi). Kuiter & Tonozuka 2004:623, color photos A–E (“Gold-specs Jawfish,” mouth brooding documented, Flores Is.). Allen 2006:83, unnumbered color photo (“Gold-specs Jawfish,” mouth brooding documented, Sulawesi). Tan 2007:29-31, unnumbered color photos (“Gold spec Jawfish,” territoriality, combat; mouth brooding, burrow shared with shrimp, Manado, Sulawesi).

Opistognathus sp. 2. Kuiter & Debelius 2006:651, unnumbered color photo (spitting rubble, Indonesia, Flores Is.).

Opistognathus randalli Smith-Vaniz 2009:87, figs. 1c, 2d, 3c, 4c–d, 19–22, 24 (original description: Philippines, Palawan Province, Cocoro Island (Cuyo Is.), 10°53’9”N, 121°11’34”E; holotype ANSP 142963, 87.2 mm SL). Allen & Erdmann 2012:355, color photo (brief description, distribution). Taquet & Diringer 2012:89 (color photo).

Material examined. 61 specimens, 19–108.5 mm SL, all cited in the original description.

Expanded diagnosis. A species of *Opistognathus* having an upper jaw sword-shaped, produced as a flexible lamina (Fig. 14F), extending 1.5–2.3 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 17T) moderately robust, 2nd and 3rd infraorbitals with large sensory canal openings, 3rd infraorbital with large suborbital shelf; dorsal fin XI, 14–16, typically 15; anal fin III, 14–15; vertebrae 10+18; lateral-line terminus below segmented dorsal-fin rays 1–4, typically 2 or 3; caudal vertebrae 10+18; inner lining of upper jaw and adjacent membranes with a single conspicuous black stripe; dorsal, anal and caudal fins with narrow, pale (blue in life) distal margins; in life, dorsal portion of iris golden.

Comparisons. The life coloration of *Opistognathus randalli* (Figs. 21, 130) consisting of the combination of dorsal portion of iris golden, caudal fin with narrow blue distal margin, and pale gray body with 7–10 yellow-orange bands distinguishes it from all other species of *Opistognathus* that have an upper jaw with a flexible lamina posteriorly. As discussed below, it is also the only species in which adult females typically have a small dark spot or blotch anteriorly on the spinous dorsal fin that is absent in males. It also differs from *O. variabilis* in having more body scale rows, approximately 84–96 (vs. 68–83), more lower gill rakers 22–26, usually 23–26 (vs. 19–24, usually 20–22) and a shorter lateral line with terminus below segmented ray 1–4, rarely 4 (vs. 3–6, usually 4 or 5).

Distribution. (Fig. 29) Brunei, Indonesia, Philippines, and Taiwan in 5–32 m. The Taiwan record is based on a photograph of ASIZ P 80918 from Taipei.

Etymology. Named in honor of renowned Bernice P. Bishop Museum ichthyologist, the late Dr. John E. Randall (1924–2020). See partial Randall biographies by Greenfield (2001) and Randall (2001).

Remarks. *Opistognathus randalli* is the only known Indo-West Pacific jawfish with a sexually dichromic dorsal fin. Females typically have a small black spot between dorsal-fin spines 2–3 (Fig. 21) that is lacking in males. The jaws also exhibit sexual dimorphism, adult males usually have longer upper jaws than females (Smith-Vaniz 2009, fig. 23). The common name Gold-specs Jawfish refers to the color of the eye dorsally, which in life resembles the bright reflection of gold spectacles (Figs. 1 and 20).

Opistognathus reticeps Smith-Vaniz, 2004

Reticulated Jawfish

Figures 17G, 131, 132; Tables 1–14

Opistognathus reticeps Smith-Vaniz 2004:220, figs. 2D, 3F, 11 (original description: Australia, Northern Territory, Darwin Harbour, east arm, 12°29'S, 130°53'E; holotype NTM S.10553–004, 99.4 mm SL). Smith-Vaniz 2004:223 (in key to Australian *Opistognathus*). Hoese & Bray 2006:1075 (synonymy, Australian distribution). Moore *et al.* 2008:38 (listed, type catalog). Larson *et al.* 2013:107 (checklist of Northern Territory fishes). Moore *et al.* 2014:195 (listed, Kimberly region, Australia).

Material examined. 8 specimens, 19.4–117.3 mm SL, all cited in the original description.

Expanded diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking a flexible lamina posteriorly, extending about 0.7–1.0 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 17G) very slender and tubular, 3rd infraorbital very long, no suborbital shelf; anterior naris with broad flap; dorsal fin XII, 15–16; vertebrae 12+19; scale rows in horizontal series 56–64; lateral-line terminus below dorsal-fin spine 10 to segmented dorsal-fin ray 3; dorsal fin with 4 dark blotches, the first 2 brown and extending onto distal half of fin and the last two black and on basal third to half of fin (Fig. 132); dorsum of head reticulated; pectoral and caudal fins yellow and pelvic fin white.

Comparisons. Only four other species of *Opistognathus* (*O. inornatus*, *O. latitabundus*, *O. papuensis*, and *O. reticulatus*) have dorsal fins XII, 15–18; the color pattern of *Opistognathus reticeps* (Figs. 131, 132) differs from all these species; *O. reticulatus* has a different vertebral pattern, 13+18 (vs. 12+19); *O. latitabundus* typically has more scale rows in horizontal series, 63–80 (vs. 56–64) and *O. inornatus* and *O. papuensis* also have more scale rows 78–94 (vs. 56–64), the latter two species also have the lateral-line terminus extending to below segmented dorsal-fin rays 7–13 (vs. spine 10–ray 3); *O. latitabundus* also has fewer total gill rakers, 23–24 (vs. 25–29).

Distribution. (Fig. 35) Endemic to northwestern Australia (Northern Territory and Western Australia); a coastal species found in about 1.5–29 m.

Etymology. The specific epithet is from the Latin *rete* (net) and *ceps* (head), in reference to the reticulated dorsum of the head that is a distinguishing feature of the species.

***Opistognathus reticulatus* (McKay, 1969)**
Leopard Jawfish
Figures 17H, 133–135; Tables 1–14

Tandya reticulata McKay 1969:1, fig. 1 (original description: Western Australia, Broome; holotype WAM P.15758, 287 mm SL). McKay 1970:16 (second Broom specimen). Hutchins 1974:182, fig. 1 (aggressive behavior; color description). Hutchins & Smith 1991:34 (listed, type catalog).

Opistognathus reticulatus. Allen & Swainston 1988:126, pl. 54, color fig. 818 (brief description, common name "Leopard Jawfish"). Hutchins 2001:40 (checklist of Western Australian fishes). Smith-Vaniz 2004:223 (in key to Australian *Opistognathus*). Hoese & Bray 2006:1076 (synonymy, Australian distribution). Moore *et al.* 2014:195 (listed, Kimberly region, Australia).

Material examined. 15 specimens, 35–368 mm SL, all from western Australia. WAM P.15758 (287), holotype of *Tandya reticulata*, Western Australia, Broome, R.J. Baird, 1 Sep. 1965. WAM P.16397 (359) Broome, ca. 1968; WAM P.22030 (368) Dampier Archipelago, Adele Island., Prince, Jul. 1972; WAM P.31096–011 (3, 35–86.5) and USNM 396705 (86.5), Cape Talbot, Sandy Island, 13°45'S, 126°48'E, J.B. Hutchins, 28 Nov. 1995; WAM P.31085–024 (78), Long Island, Vansittart Bay, 13°59'S, 126°20'E, 0.3 m, J.B. Hutchins, 24 Dec. 1995; USNM 396705 (99.2), Kimberly, Berthier Island, 14°29.5'S, 125°00'E, 0.5–1.5 m, S.M. Morrison, 26 Nov. 1966; WAM P.25669-001 (2, 174–240.5) Port Warrender, Walsh Point, 14°34'S, 125°50'E, B. Hutchins, 22 Oct. 1976; WAM P.30851–015 (3, 41.7–52.5), Montogomerly Reef, 15°59'S, 124°17'E, 0.5 m, G.R. Allen and H. Morrison, 28 Sep. 1994; WAM P.30932–001 (93), Lord Island, 16°09'S, 123°28'E, F. Wells, 26 Nov. 1994.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking a flexible lamina posteriorly, extending about 0.7–1.0 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 17H), relatively large, 2nd and 3rd infraorbitals robust and scalloped laterally, 3rd infraorbital with no suborbital shelf; dorsal fin XII, 16; lateral-line terminus below segmented dorsal-fin rays 6–10; vertebrae 13+18; body with pale reticulate network enclosing irregular tan blotches, each of which has one to several small, dark spots; pectoral-fin base (both laterally and mesially) with conspicuous dark spot about half diameter of eye.

Description. Dorsal fin XII, 16; anal fin II, 13–14; pectoral fin 21–22; caudal fin: procurrent rays 3–4+3, segmented rays 8+8, middle 12–13 branched, total elements 22–23; hypural 5 present; vertebrae 13+18; last pleural rib on vertebra 13; epineurals 14–16; no supraneurals; dorsal-fin interdigitation anterior pattern / / /1/1+1/1/; gill rakers 7–8+14–15 = 21–23; scale rows in horizontal series about 90–121; lateral-line terminus below segmented dorsal-fin rays 6–10 (total element positions 18.0–21.5).

Scales absent on head, nape, pectoral-fin base and chest; no scales above lateral line anteriorly, 4–8 rows above lateral line posteriorly; body with about 90–129 scale rows in horizontal series; lateral-line terminus below segmented dorsal-fin rays 6–10 (total element positions 18–22); lateral-line pores relatively sparse, mostly arranged in a double series above and below embedded lateral-line tubes; cephalic sensory pores relatively numerous, except pores absent on much of nape; mandibular pore positions 1–2 usually with single pores, all others and preopercular pore positions occupied by small multiple pores that are very difficult to count accurately; infra- and supraorbital pores also very numerous.

Anterior naris positioned closer to posterior naris than to margin of upper lip and consisting of a short tube with a broad tentacle on posterior rim that when depressed extends to orbital rim; height of tentacle about 2.0–3.0 times maximum diameter of posterior naris; dorsal fin moderately low anteriorly, increasing in height posteriorly, with profile relatively uniform without a change in height at junction of spinous and segmented rays; dorsal-fin spines relatively slender with only slightly curved flexible tips; skin covering tips of dorsal-fin spines distinctly rugose in large adults but without fleshy tabs; all except 1st segmented dorsal-fin ray and 1st or 2nd segmented anal-fin ray branched distally; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally; posterior margin of preopercle distinct; crenulae present on anterior margin of upper lip; eye flap well-developed (Fig. 135) in some specimens, perhaps functioning to shield the eye from sun glare in shallow water; fifth cranial nerve passes over $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extends about 1.2–1.6 (in 174- and 240- mm SL specimens) to 1.9 (in 351- and 368- mm specimens) eye diameters behind posterior margin of orbit; maxilla widest at end and rounded, without flexible lamina posteriorly; supramaxilla present, relatively small and terminally positioned; premaxilla with outer row of very large conical teeth that become progressively smaller posteriorly and extend three-fourths length of jaw; anterior half of

premaxilla with 1–3 inner rows of smaller conical teeth, innermost row slightly enlarged and hooked backward; dentary with large conical teeth in outer row, anterior ones smallest; anteriorly an irregular row of very short conical teeth behind which are 2–3 much larger hooked teeth on each side of symphysis; vomerine teeth absent.

Measurements of 5 specimens, 174–368 mm SL, as percent of SL: predorsal length 31.6–35.2; preanal length 59.6–66.9; dorsal-fin base 63.6–78.3 anal-fin base 25.3–28.7; pelvic-fin length 16.2–20.2; caudal-fin length 19.8–22.6; depth at anal-fin origin 19.3–22.5; caudal-peduncle depth 11.0–12.3; head length 34.2–37.2; orbit diameter 6.4–9.8; upper-jaw length 21.7–23.6. As percent of head length: postorbital-head length 63.2–72.7; upper-jaw length 63.3–65.4; orbit diameter 18.4–26.3.

Color in life (Fig. 133). Body with reticulate network of vivid white lines enclosing irregular dark blotches, each of which has one to several dark spots smaller than pupil diameter; background body coloration white, ventrally becoming creamy yellow; head pale brown with scattered reticulated pale markings and small scattered dark blotches; pectoral fin pale yellow except base (both laterally and mesially) with conspicuous dark spot about half diameter of eye; soft dorsal, caudal, and anal fins bright golden yellow; pelvic fin white.

Comparisons. Only four other species of *Opistognathus* (*O. inornatus*, *O. latitabundus*, *O. papuensis*, and *reticeps*) agree with *O. reticulatus* in having dorsal fins XII, 15–18; the color pattern of *Opistognathus reticulatus* (see above Diagnosis) differs from all of these species; in addition, *O. reticulatus* has a different vertebral pattern, 13+18 (vs. 12+18–20 or 13+19–21 in *O. latitabundus*) and more scale rows in horizontal series, 90–121 (vs. 56–94) and fewer total gill rakers, 21–23 (vs. 23–29).

Distribution. (Fig. 35) An Australian endemic known only from the Kimberley region of northwestern Australia where collected in 0.3–1.5 m.

Etymology. The specific epithet, from the Latin *reticulatus* (netlike), refers to the reticulated color pattern of this species.

Remarks. In a note with the eye-catching title "Fish Attacks Man," Hutchins (1974:182) gave the following account of an encounter with a large gravid female *Opistognathus reticulatus*:

"While walking in knee deep water on the reef that surrounds Adele Island near Derby, a shell collector, Mr. I. Prince, and his companion were, in his own words, 'viciously attacked by a ferocious looking fish.' The fish was first observed lying between two rocks but as they approached closer it sprang out at them snapping at their ankles. Mr. Prince attempted to move away from the fish's apparent domain but the fish had him rounded up." As the fish was about 400 mm in length with a row of sharp teeth in both jaws Mr. Prince was forced to defend himself. A large rock finally halted the attack, stunning the fish. Mr. Prince was curious to know what sort of fish would so convincingly press home an attack so he had it frozen and sent to the Western Australian Museum for identification."

Because this jawfish (WAM P.22030) is a large female (368 mm SL) with ripe eggs, Hutchins surmised that her condition may have been a factor in the unprovoked attack.

***Opistognathus rosenbergii* Bleeker, 1856**

Rosenberg's Jawfish

Figures 5D, 18A, 136–138; Tables 1–14

Opistognathus Rosenbergii Bleeker 1856:220 (original description: Nias Island, Indonesia; holotype RMNH 5957, 98.5 mm SL). Bleeker 1874:474, pl. 9, fig. 1 (description). Day 1876:267, pl. 58, fig. 5 (description, India).

Opisthognathus [sic] *rosenbergii*. Günther 1860:256 (after Bleeker, brief description). Ray & Mohapatra 2015:109, color fig. 1 (description, off West Bengal, India).

Gnathypops rosenbergi annulata Eibl-Eibesfeldt & Klausewitz 1961:421, pl. 21, fig. 1, pl. 22, figs. 4–6 (original description: Nicobar Islands, Great Nicobar, Ganges Harbor; holotype SMF 5422, 116.3 mm SL).

Opistognathus rosenbergii. Krishnan & Mishra 1993:231 (Visakhapatam, India). Smith-Vaniz 2000:612 (listed, checklist of South China Sea fishes). Allen & Adrim 2003:34 (listed). Motomura & Satapoomin 2009:99, color fig. (description, Andaman Sea). Satapoomin 2011:56 (checklist, southwestern Thailand). Allen & Erdmann 2012:354, color photo (brief description, distribution). Rainboth *et al.* 2012:84 (listed, Nha Tran). Hylleberg & Aungtonya 2013:107 (listed, Panwa, Thailand). Biswas *et al.* 2013:2, color fig. 3 (description, Kalpakkam, India). Shinohara 2021:161 (compared with *O. ocellicaudatus*).

Material examined. 20 specimens, 57.5–116.9 mm SL. **India**: ANSP 97859 (57.5), Madras; AMS I.15599–004 (100), Madras; CAS-SU 14556 (2, 93.5–103), Madras, Ennur Fisheries Station; ZSI F7655/2 (2, 86.5–87), Madras

Harbor, 20 m; ANSP 126638 (85), Bay of Bengal, Pondicherry, Veerampatinam fishing village. **Nicobar Islands**: SMF 5422 (116), holotype of *Gnathypops rosenbergi annulata*, SMF 5423 (108, male) and SMF 5424 (100, gravid female) paratypes, Great Nicobar Island, Ganges Harbor, 10 m, Xarifa-Expedition, I. Eibl-Eibesfeldt, 9 Aug. 1958. **Thailand**: ROM 72620 (90) and USNM 367128 (89.7), southern Phuket, Cape Phanwa, 7°47'43"N, 98°24'45"E, 9 m, sandy mud, U. Satapoomin, 13 Nov 2000; KAUM-I. 33442 (116.7), Ranong Prov., Pak Nam Ranong fishing port, 9°56'N, 98°35'E, trawled, 7 Dec. 2010. **South Vietnam**: MNHN 1964–627 (70); UF 243404 (2, 80–102), Fhan Thiet. **Indonesia**: RMNH 5957 (98.5), holotype of *Gnathypops rosenbergii*, and RMNH 5957 (99), "plesiotype" of *G. rosenbergii*, Nias Island; WAM P.30959–014 (117), Rinca Island, SE coast at Torowalu Bay, 08°46'S, 119°43'E, 0–1 m, G.R. Allen, 4 Apr 1995; WAM P.34344–012 (65), West Papua, Raja Ampats, southwestern Batanta, 01°26'S, 130°32'E, silty bay in 26 m, G.R. Allen and M.V. Erdmann, Feb. 2015.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking a flexible lamina posteriorly, extending about 0.6 to 0.9 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 18A) relatively robust and tubular, 2nd and 3rd infraorbitals with large openings for sensory pores, 3rd infraorbital with slender suborbital shelf; dorsal fin XI, 13; anal fin III, 13–14, typically 13; vertebrae 10+17; body scale rows in horizontal series about 55–66; dorsum and side of head covered with numerous small cephalic pores; posterior half of dorsal fin with 2–3 large black blotches with or without a white spot in their centers (see "Remarks"), partially encircled by wide white borders; pelvic fins black.

Description. Dorsal fin XI, 13; anal fin III, 13; pectoral fin 21–22; caudal fin: procurrent rays 4–5+4–5, segmented rays 8+8, middle 12–14 branched, total elements 24–26; hypural 5 present; vertebrae 10+17; last pleural rib on vertebra 10; epineurals 12–13; one supraneural; dorsal-fin interdigitation anterior pattern / /S/1/1+1/1/; gill rakers 10–12+20–23 = 30–35.

Scales absent on head, nape, area above lateral line, pectoral-fin base (sometimes a few embedded scales present) and chest; body with about 55–66 scale rows in horizontal series; lateral-line terminus below segmented dorsal-fin rays 2–6 (total element positions 13.0–16.5); lateral-line pores very numerous, arranged in a multiple series along embedded lateral-line tubes; cephalic sensory pores very small and numerous (Fig. 5D), completely covering all of head, nape and opercle; mandibular pore positions 1–2 occupied by relatively large single pores, 3rd position with 4–9 pores, all others and preopercular pore positions occupied by multiples pores too numerous to accurately count.

Anterior naris positioned about mid-way between dorsal margin of upper lip and posterior naris; consisting of a very short tube, with a short tentacle on posterior rim, that when depressed does not reach margin of posterior naris; height of tentacle about equal maximum diameter of posterior naris; dorsal fin moderately low with profile relatively uniform without change in fin height at junction of spinous and segmented rays; dorsal-fin spines moderately slender and straight, posterior spines slightly more curved and with flexible tips; all segmented dorsal- and anal-fin rays branched distally; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally; posterior margin of preopercle relatively distinct, with a free margin; no crenulae on margin of upper lip anteriorly; fifth cranial nerve passes under $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extending about 0.6 to 0.9 eye diameters behind posterior margin of orbit; maxilla widest at end and truncate without a flexible lamina posteriorly; supramaxilla small and terminally positioned; premaxilla with moderate conical teeth in outer row that become progressively smaller posteriorly (all rather widely spaced) and extend 2/3 length of jaw; 1–3 rows of much smaller inner teeth anteriorly, except 2–3 inner teeth on each side of premaxillary symphysis somewhat enlarged and canted backwards; dentary with outer row of conical teeth (anterior ones mostly slanted forward), those on posterior 1/2 of bone hooked posterolaterally; 1–3 irregular, inner rows of much smaller, mostly blunt teeth anteriorly, those in innermost row all hooked backwards; vomerine teeth absent.

Measurements of 17 specimens, 70.4–116.9 mm (those of the 3 types, 100–116.3 mm SL, of *Gnathypops rosenbergi annulata* in parentheses), as percent of SL: predorsal length 29.3–35.6 (31.9–34.8); preanal length 53.7–60.1 (54.0–57.1); dorsal-fin base 63.6–67.6; anal-fin base 30.6–37.7; pelvic-fin length 17.5–20.8 (17.8–18.3); caudal-fin length 20.3–26.0 (23.1–23.8); depth at anal-fin origin 19.5–24.6 (23.2–24.5); caudal-peduncle depth 10.5–12.7 (11.6–12.6); head length 31.3–35.9 (31.3–33.8); postorbital-head length 19.7–22.9 (20.1–21.2); upper-jaw length 18.5–21.3 (20.4–21.0); postorbital-jaw length 6.3–9.2; orbit diameter 9.0–12.1 (11.4–11.7). As percent of head length: postorbital-head length 60.7–65.7 (58.9–61.6); upper-jaw length 56.7–63.6 (58.5–60.9); postorbital-jaw length 19.5.0–27.9; orbit diameter 27.7–34.0 (32.5–33.1).

Color in life (Figs. 136–137). Head and body pale tan fading to white ventrally; mid-laterally six irregular

darker bands on sides, the first two wedge-shaped and the others joined in middle to form an irregular mid-lateral stripe; dorsal fin with five dark blotches separated by white margins, the posterior 2 or 3 blotches black and joined dorsally; distal half of anal fin black, with a broad white stripe above and 2 or 3 blotches black and partially ringed by white; caudal fin with a pair of white basicaudal spots followed by semicircular white band on middle of fin, the remainder of fin black; pelvic fin mostly black and pectoral fin pale yellow.

Comparisons. *Opistognathus rosenbergii* is the only species with soft dorsal fin with 2–3 large black blotches partially encircled by a wide white margin, and pelvic fins mostly black.

Distribution. (Fig. 23) Known from India, Thailand, South Vietnam and Indonesia (Nias, Komodo and Nicobar Islands and Raja Ampats) usually in coastal waters with muddy sand or soft bottoms in 1–26 m.

Etymology. Named for Carl Benjamin Hermann von Rosenberg (1817–1888) German geographer and zoologist who worked in the Dutch East Indies and is perhaps best known for his book (with autobiographical preface) *The Malayische Archipelago* (1878).

Remarks. The three available specimens from the Nicobar Islands agree with 17 *Opistognathus rosenbergii* specimens from other localities in having virtually identical morphological characters and similar color patterns but differ in having the dark dorsal- and anal-fin blotches with a conspicuous white spot on their centers (Fig. 138). Solely on the basis of that color pattern distinction, Eibl-Eibesfeldt & Klausewitz (1961) recognized the Nicobar specimens as a new subspecies, *O. rosenbergii annulatus*. One of the paratypes has one incomplete dorsal-fin ocellus. Although the photograph of the preserved holotype does not show the prominent pale caudal-fin band seen in Figs 137–138, it is evident in a photograph given in the original description of *Gnathypops rosenbergi annulata*.

I know of no other marine fishes endemic to the Nicobar Islands and, unless now unavailable molecular data indicate otherwise, I do not believe subspecific or separate species recognition is warranted. It would be interesting to know if this *O. rosenbergii* color morph is restricted to Nicobar Island.

A prominent dark spot or inverted triangle, about 2.0–2.5 mm in diameter, is present on the tip of the basihyal ("tongue") in 10 specimens from South Vietnam, Nias, Nicobar Island, Raja Ampats, Indonesia (Rinca Island), and Papua New Guinea but it is absent in all specimens from India (7) and Thailand (3). Specimens with and without the spot occur in similar size specimens of both sexes.

Opistognathus rufilineatus Smith-Vaniz & Allen, 2007

Redlined Jawfish

Figures 9C, 18B, 139–141; Tables 1–14

Opistognathus rufilineatus Smith-Vaniz & Allen 2007:37, figs. 2–5 (original description: Indonesia, Irian Jaya [western New Guinea], Barat Province, north Triton Bay; original longitudinal coordinate given as 34°47'01"S but should have been 3°47'01"S; holotype NCIP 6313, 60.4 mm SL). Allen & Erdmann 2012:354, color photo (brief description, distribution).

Material examined. 6 specimens, 37.3–60.7 mm SL, including the following four specimens not included in the original description. WAM P.32862–001 (60.7,? sex) and USNM 396710 (54.4, male), both from the type locality; WAM P.33819–002 (37.3), Pula Ekka, about 20 km SW of Fakfak, 20°58.050'S, 132°06.843'E, 50–55 m, sta. IND-13-003, M.V. Erdmann, 21 Jan. 2013; and NMV A.29690–007 (45.3, male), northwestern Australia, off Broome, 17°46'06"S, 120°43'09"E–17°45'57"S, 120°42'56"E, 97–109 m, benthic sledge, M. F. Gomon, 20 Jun. 2007, CMAR Cruise, SS05/2007 097.

Expanded diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking a flexible lamina posteriorly, extending 0.7–1.0 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 18B) slender and tubular, 3rd infraorbital with a large sensory canal openings including a short posterolateral projecting arm ending with large sensory canal opening, no suborbital shelf; dorsal fin XI, 10–11 (usually 11); anal fin II, 10; vertebrae 10+16; posterior infraorbital-pore positions occupied by multiple pores; most preopercular pore positions bi-pored; body with narrow red-brown or pale brown stripes outlining each yellow-tan horizontal scale row (Fig. 139–141); dorsum and dorsal fin without dark spots, blotches or distinctive markings; pectoral, pelvic, anal, and caudal fins yellow; cheeks with a few scattered, small, dark spots and narrow oblique lines. Gill rakers 10–11+22–23 = 32–34.

Comparisons. The combination of essentially uniformly pigmented fins, sides of body with narrow pale brown or reddish-brown stripes outlining each yellow-tan lateral scale row, and cheeks with a few scattered, dark, brown spots and narrow, short lines distinguishes *Opistognathus rufilineatus* from other species of the genus. Some speci-

mens of *Opistognathus hyalinus* appear to have scale rows with faint stripes but they differ in lacking prominent cheek markings, have fewer head pores (Figs. 10A vs. 9C) including preopercular pore positions occupied by single pores (vs. mostly bipored positions).

Distribution. (Fig. 26) Known from the type locality, Triton Bay, West Papua Province, Indonesia (western New Guinea) and three recently collected specimens, one from northwestern Australia (see below Remarks) and WAM P.32800–001 (2, 52–55) from north Misool in the Raja Ampat Islands where collected on silt/rubble bottoms in 20–50 m (see below Remarks).

Etymology. The specific epithet, from the Latin r*ufus* (reddish) and *lineatus* (line), refers to the striped color pattern of the species.

Remarks. The four specimens from the type locality were collected in 20–50 m. A recently collected specimen from northwestern Australia (Fig. 140) was taken by benthic dredge in 97–109 m and agrees with the other specimens in all aspects except in having fewer total gill rakers (32 vs. 33–34) and in being essentially yellow, with pale brown (versus red-brown) narrow stripes outlining each lateral scale row.

Opistognathus seminudus Smith-Vaniz, 2004

Halfnaked Jawfish

Figures 11B, 18C, 142, 143; Tables 1–15

Opistognathus seminudus Smith-Vaniz 2004:213, figs. 2B, 3B, 4B, 5–6 (original description: Australia, Great Barrier Reef, Capricorn Group, One Tree Island, reef flat at SW end of island; holotype AMS I.22794–001, 59.7 mm SL). Hoese & Bray 2001:1076 (synonymy, Australian distribution).

Opistognathus sp. Russell 1983:107 (moderately common on outer slope in 1–15 m, Great Barrier Reef, Capricorn Group)

Material examined. 79 specimens, 17.7–86.2 mm SL, all cited in the original description, plus 5 specimens subsequently examined from Queensland Australia: vicinity of Endeavour Reef AMNH 212446 (34.1), AMNH 212524 (36.8), AMNH 212735 (45.1) and MacKay Reef AMNH 213845 (2, 41.2–44.9).

Expanded diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking a flexible lamina posteriorly, and sexually dimorphic in adults extending 0.6–0.9 (females) and 0.8–1.1 (males) eye diameters behind posterior margin of orbit; infraorbitals (Fig. 18C) moderately robust, 3rd infraorbital much larger and with short posterolateral projecting arm ending with large sensory canal opening, no suborbital shelf; dorsal fin X–XI (exceptionally X), 14–16; anal fin II, 14–15; vertebrae 10+18–19, exceptionally 19; scale rows in horizontal series about 28–36; scales absent forward of verticals from ultimate spine to segmented dorsal-fin ray 2; vomerine teeth 1–3; spinous dorsal fin with an ocellus between spines 2–5 and spine tips with white fleshy tabs; inner lining of upper jaw and adjacent membranes dark brown, and a dark diagonal blotch externally on upper jaw at rictus of mouth; several irregular, wavy rows of pale marking or oblong spots on body and a wedge-shaped basicaudal blotch extending onto middle caudal-fin rays.

Comparisons. See Table 15. *Opistognathus seminudus* differs from all other species of *Opistognathus* with two anal-fin spines and spinous dorsal fin with an ocellus in having segmented dorsal-fin rays 14–16 (vs. 11 or 17–19) and scale rows in horizontal series 28–36 (vs. 37–62).

Distribution. (Fig. 25) An Australian endemic known only from the Great Barrier Reef in about 0.5–22 m.

Etymology. The specific epithet, from the Latin *semi* (half) and *nudus* (bare, naked), refers to the naked anterior half of the body.

Opistognathus simus Smith-Vaniz, 2010

Cargados Jawfish

Figure 18D, 144; Tables 1–14

Opistognathus simus Smith-Vaniz 2010:52, figs. 2H, 7B, 17 (original description: western Indian Ocean, St. Brandon Shoals (Cargados Carajos), about 3.2 km E. of Raphael Island., ca. 16°20’S, 59°38.5’E; holotype USNM 315658, 66.4 mm SL). Smith-Vaniz 2022:313, unnumbered fig. (description, distribution).

Material examined. 3 specimens, 49.2–66.4 mm SL, all cited in the original description.

Expanded diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking a flexible lamina posteriorly, extending 0.6–0.7 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 18D) moderately robust with 3rd infraorbital much larger with large sensory canal openings and moderate suborbital shelf; dorsal fin XI, 15-16; anal fin III, 15–16; vertebrae 10+19; body with about 53–62 scale rows in horizontal series; cephalic sensory pores numerous, completely covering most of head, including all of predorsal area except a small area immediately adjacent to dorsal-fin origin; scales absent forward of verticals from segmented dorsal-fin rays 5 or 6; vomerine teeth absent; inner lining of upper jaw and adjacent membranes with externally visible posterior black blotch (Fig. 144); black irregular midlateral stripe; dorsal fin pale except for narrow submarginal stripe below which is a series of small, dusky spots on each spine and ray extending anteriorly from distal third of fin to middle of fin posteriorly; caudal fin uniformly pale. Life coloration unknown.

Comparisons. *Opistognathus simus* and *O. dipharus* agree in having rigid upper jaws and very similar meristic values but differ from other Indian Ocean species in having anal-fin segmented rays 15–16 (vs. 10–14 or 19) and caudal vertebrae 19 (vs. 16–18 or 24); additionally, *O. dipharus* differs in having the caudal fin with a pair of conspicuous oblong basicaudal spots.

Distribution. (Fig. 31) Known only from the western Indian Ocean at St. Brandon Shoals (Cargados Carajos) in depths of 0.2–1.3 m.

Etymology. The specific epithet, from the Latin *simus* (pugnosed), refers to the blunt snout.

Opistognathus solorensis Bleeker, 1853

Solor Jawfish

Figures 2, 7B, 18E, 145–149; Tables 1–14

Opistognathus solorensis Bleeker 1853:81 (original description: Indonesia, Lawajong, [Solor Island]; neotype RMNH 31660, 62.3 mm SL). Bleeker 1874:471–2, pl.9, fig. 3 (description, Solor, Amboina, Goram). Bleeker 1983, pl. 421, color fig. 1. Smith-Vaniz 2000:612 (listed, checklist of South China Sea fishes). Allen & Adrim 2003:34 (listed). Allen *et al.* 2003:298 color photo (Solor Jawfish, description, habitat, distribution). Allen 2009:62, color photo (same as preceding). Allen & Erdmann 2012:355, color photos (brief description, distribution). Smith-Vaniz 2016:278, figs.2B, 3A, 5–10 (redescription, neotype designation RMNH 31660). Tashiro *et al.* 2018:233, color figs. 1 & 3 (description, Osumi Islands, Japan).

Opisthognathus [sic] *solorensis* Günther 1860:256 (brief description).

Opistognathus sp. 1 Motomura & Harazaki 2017:36, pl. 3E (Yaku-shima Island, Japan).

Material examined. 102 specimens, 14–74.5 mm SL all cited in Smith-Vaniz (2016).

Expanded diagnosis. A species of *Opistognathus* having a sword-shaped upper jaw produced as a flexible lamina, and dimorphic (longer in adult males) extending 1.1 to 2.4 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 18E) moderately robust, 3rd infraorbital largest with very large sensory canal openings, no suborbital shelf; dorsal fin X–XI (rarely X), 13–15 (typically 14); anal fin III, 14; vertebrae 10+17–19, typically 18; body with about 58–69 scale rows in horizontal series (except 53 in single specimen from Guimaras Island, Philippines); lateral-line terminus ending below segmented rays 1–4; spinous dorsal fin with 1–3 (usually 1 or 2) dark spots; inner lining of upper jaw and adjacent membranes with two dark stripes; area above and below esophageal opening darkly pigmented and continuous between innermost pair of upper pharyngeal tooth plates (Smith-Vaniz, 2016, fig. 3A).

Comparisons. *Opistognathus solorensis* differs from the other two members of the *solorensis* species group as follows: *O. ensiferus* has the inner lining of upper jaw and adjacent membranes with 2 dark stripes (vs. 1 stripe), lateral-line terminus below dorsal-fin segmented rays 1–4 (vs. 6–7), pharyngeal area with distinctive dark pigment on area above and below esophageal opening and continuous between innermost pair of upper pharyngeal tooth plates, see Smith-Vaniz, 2016, fig. 3 (vs. lacking dark pigmentation), and from *O. verecundus* in having dark blotches on the spinous dorsal fin (vs. spinous dorsal fin without dark blotches), more lower limb gill rakers, 17–20 (vs. 15–17), and more body scale rows in horizontal series, 53–69 (vs. 44–54).

Distribution. (Fig. 32) Indo-West Pacific from Brunei, Philippines, Borneo, Indonesia, Papua New Guinea, and Palau to Taiwan and Japan in about 0.5–30 m. Occurrence of the species from the Osumi Islands (Tanega-shima, Yaku-shima and Kuro-shima) southern Japan, is based on Tashiro *et al.* (2018) including the record from Yaku-shima Island.

Etymology. Named for Solor, the type locality, a small island off the SE end of Flores Island (8°45’S, 123°30’E), Indonesia.

Remarks: In his original description Bleeker reported the number of blackish blotches in the spinous dorsal fin as 1–3. There is usually only a single blotch in the spinous dorsal fin but specimens from the Molucca Islands and Great Tobea Island, Sulawesi, have 2 dark blotches, the first between spines 2–4 or 2–5 and another slightly smaller blotch centered on the next posterior spine. Tashiro *et al.* (2018) documented specimens from the Osumi Islands, Japan with 3 spinous dorsal-fin blotches.

Essentially all-yellow individuals of *Opistognathus solorensis* are known from Palau (Smith-Vaniz 2016, fig. 9c) and Sulawesi (Fig. 147). Orange morphs of *O. solorensis* have also been observed at Lembeh Strait and are occasionally included in the aquarium trade (Smith-Vaniz, per. obs.).

Opistognathus stigmosus Smith-Vaniz, 2004

Figures 11C, 18F, 150, 151; Tables 1–15

Spot-eyed Jawfish

Opistognathus stigmosus Smith-Vaniz 2004:215, figs. 3C, 7 (original description: Australia, Queensland, Escape Reef, 15°49'S, 145°50'E; holotype AMS I.22583-004, 70.5 mm SL). Hoese & Bray 2001:1076 (synonymy, Australian distribution). Moore *et al.* 2008:38 (listed, type catalog).

Opistognathus sp. Randall *et al.* 1990:356 (color photo (brief description; Lizard Island and Lihou Reef, Coral Sea).

Material examined. 4 specimens, 42.9–70.5 mm SL, all cited in the original description.

Expanded diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking a flexible lamina posteriorly, extending 0.4–0.5 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 18F) moderately slender, 2nd and 3rd infraorbitals tubular with large sensory canal openings, 3rd infraorbital with large suborbital shelf; dorsal-fin with 10 spines and 19 segmented rays; anal fin II, 18; vertebrae 10+23; scale rows in horizontal series about 38–45; lateral-line terminus below segmented rays 7–8; scales absent anterolaterally forward of verticals from dorsal-fin spines 5–7; vomerine teeth absent; lower half of sides with horizontal row of 7 or 8 large white spots, the largest with a dark brown border and covered by appressed pectoral fin (Fig. 151), head and sides punctuated with widely scattered small dark brown spots, other dark spots ring orbital rim, those in interorbital region very dark and symmetrically arranged in bilateral pairs.

Comparisons. See Table 15. The only other Australian species that agrees with *Opistognathus stigmosus* in lacking an ocellus in the dorsal fin, having a dorsal fin with 10 spines and typically 19 segmented rays is *O. alleni*, which differs in having fewer scale rows in horizontal series, 21–31 (vs. 38–45), lateral-line terminus below segmented rays 13–17 (vs. 5–9) and vomerine teeth 1–3 (vs. vomerine teeth absent). The allopatric *Opistognathus pholeter* also lacks an ocellus in the spinous dorsal fin and has the dorsal fin typically with 10 spines and 19–22 segmented dorsal-fin rays but differs from *O. stigmosus* in having vomerine teeth and more precaudal vertebrae 11 (vs. 10).

Distribution. (Fig. 25) An Australian endemic known only from the Great Barrier Reef and Lihou Reef, Coral Sea (17°25'S, 151°39'E), in about 20–29 m.

Etymology. From the Latin *stigmosus* (full of marks) in reference to the conspicuous, small, dark spots on the head of this species.

Opistognathus trimaculatus Hiramatsu & Endo, 2013

Threespot Jawfish

Figure 152; Tables 1–14

Opistognathus sp. Yamada *et al.* 1997:1, unnumbered color photo (East China Sea).

Opistognathus trimaculatus Hiramatsu & Endo 2013:19, figs. 1–3 (original description: off Kochi City, central Tosa Bay, southern Japan, trawled in about 150 m, holotype NSMT-P111154. Ikeda & Nakabo 2015:388, pl. 127, color fig. 1 (southern Japan); Nakayama *et al.* 2016:388, figs. 1–2 (redescription, East China Sea).

Material. 3 specimens 66.9–72.0 mm SL. NSMT-P 111154 (72.0), holotype, Tosa Bay, off Kochi City; BSKU 37494 (69.9), Tosa Bay, off Muroto; FAKU 64816 (66.9), W. of Yaku-shima Island, 30°27'N, 127°45'E, Kagoshima, Japan.

Expanded diagnosis. Based solely on descriptions of Hiramatsu & Endo (2013) and Nakayama *et al.* (2016). A species of *Opistognathus* having a rigid upper jaw lacking a flexible lamina posteriorly, extending about 0.7 eye diameters behind posterior margin of orbit; dorsal fin XI–XII, 10; anal fin II, 10; vertebrae 10+16; body with about 47–50 scale rows in horizontal series; gill rakers 11–13+21–23 = 34; dorsal fin with 4 dark blotches on proximal half to two-thirds of fin that are superimposed on a light brown stripe extending entire length of fin, the 1st blotch between bases of dorsal-fin spines 2–3 or 4–5 is small and faint in contrast to the other three which are much larger, darker and oval; in life, anterior half of caudal fin with broad white band and posterior half yellow (Fig. 152).

Comparisons. The combination of segmented dorsal- and anal-fin rays 10 and dorsal fin with three large oval spots distinguishes *Opistognathus trimaculatus* from all other species.

Distribution. (Fig. 34) Known from Tosa Bay and Kii Channel off Japan, and East China Sea (Nakayama *et al.* (2016) in about 120–250 m; probably widely distributed on the continental shelf of the southern region of the Japanese Archipelago.

Etymology. From the Latin *tri* (three) and *macula* (spot) in reference to the three large blotches on the dorsal fin of the holotype.

Opistognathus triops, new species

False-eye Jawfish

Figures 11D, 18G, 153, 154; Tables 1–15

Holotype. USNM 327793, male, 37.2 mm SL, Tonga Islands, Ha'apai Group, Ofolanga Island, 19°36'15"S, 174°28'15"W, deep reef slope off SW side of island, depth 21–32 m, 12 Nov. 1993, J. T. Williams *et al.*, Sta. JTW 93–30.

Paratypes. 2 specimens, 35.8–39.6 mm SL. USNM 342223 (35.8), Vanuatu, Epi Island, 16°35'34"S, 168°9'25"E, Ringdove Bay NW end of island just S of Lamen Island, fringing coral reef at center of bay, depth 12–24 m, 15 Jun. 1996, J. T. Williams *et al.*, sta. JTW 96–42. USNM 359743 (39.6), Vanuatu, Epi Island, 16°43'36"S, 168°8'42"E, Revolien Bay, depth 15–21 m, 27 May 1997, J.T. Williams *et al.*, sta. JTW 97–39.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking a flexible lamina posteriorly, extending 0.6–0.7 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 18G) moderately slender, 2nd and 3rd infraorbitals relatively large, with large sensory canal openings, 3rd infraorbital with moderate suborbital shelf; dorsal fin XI, 17 or 18; anal fin II, 17; vertebrae 10+22 or 23; scale rows in horizontal series about 45–49, scales absent anterolaterally forward of verticals from segmented dorsal-fin rays 4–5; vomerine teeth 2 or 3; spinous dorsal fin with an ocellus between spines 2–7.

Description. Dorsal fin XI, 17 or 18; anal fin II, 17; pectoral fin 19–20; caudal fin: procurrent rays 9 or 10, segmented rays 8+8, middle 12 branched, total elements 26; hypural 5 absent; vertebrae 10+22 or 23 last pleural rib on vertebra 10; epineurals 12–13; two supraneurals; dorsal-fin interdigitation anterior pattern S/S/1/1+1/1/; gill rakers 8–9+16–18 = 24–27.

Scales absent on head, nape, area above and slightly below lateral line, body anterior to a vertical below 4th or 5th dorsal-fin spine, pectoral-fin base and chest; belly completely scaled; scale rows in horizontal series about 45–49; lateral-line terminus below segmented dorsal-fin rays 3–5 (total element positions 14.0–17.0); lateral-line pores moderate, mostly arranged in single series above and below embedded lateral-line tubes; cephalic sensory pores moderate, covering most of head except for area adjacent to dorsal-fin origin (Fig. 11D); mandibular pore positions 1–4 occupied by single pores (pores 2–4 relatively large), 5th position occupied by 2–4 pores.

Anterior naris about midway between posterior naris and dorsal margin of upper lip, consisting of a raised tube that when depressed does not reach margin of posterior naris; height of tube about 0.5 times maximum of diameter of posterior naris; dorsal fin low anteriorly gradually increasing in height posteriorly; profile relatively uniform with only a slight change in fin height at junction of spinous and segmented rays; dorsal-fin spines moderately short and straight, tapering distally with flexible tips; tips of spines with slightly swollen fleshy tabs; all segmented dorsal- and anal-fin rays branched distally; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally; posterior margin of opercle distinct with a free margin; no crenulae on margin of upper lip anteriorly; fifth cranial nerve passes under $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extends 0.6 to 0.7 eye diameters behind posterior margin of orbit; maxilla widest at end and truncate

without flexible lamina posteriorly; supramaxilla small and terminally positioned; premaxilla with an outer row of moderate canines that become progressively smaller posteriorly, with an inner patch of canines anteriorly; dentary with an outer row of small canines, those mid-laterally larger, and an inner patch of canines anteriorly; vomerine teeth 2 or 3.

Measurements of the 37.2 mm holotype followed in parentheses by those of two paratypes, 35.8–39.6 mm, as percent of SL: predorsal length 34.1 (29.7–33.7); preanal length 56.7 (50.0–57.6); dorsal-fin base 68.3 (69.8–69.9); anal-fin base 35.0 (36.4–37.1); pelvic-fin length 24.6 (20.5–21.8); caudal-fin length 22.7 (19.5–22.7); depth at anal-fin origin 17.2 (15.4–16.7); caudal-peduncle depth 9.0 (8.7–9.3); head length 34.3 (31.6–35.3); postorbital-head length 21.6 (19.6–21.3); upper-jaw length 18.8 (17.3–19.9); postorbital-jaw length 6.3 (6.0–7.3); orbit diameter 10.5 (9.8–10.5). As percent of head length: postorbital-head length 63.1 (60.4–61.9); upper-jaw length 54.9 (54.9–56.4); postorbital-jaw length 19.6 (19.0–20.7); orbit diameter 30.6 (29.6–31.0).

Color in life (Fig. 153, 154): Head tan, mottled with irregular white spots and smaller brown dots, and orbit posteriorly with two larger brown spots; upper jaw with dark blotch near beginning of supramaxilla; dorsal fin with black spot ringed by white beginning at spines 2 or 3 and ending between spines 5–7; tips of dorsal-fin spines with white fleshy tabs; soft dorsal fin with two horizontal rows of brown spots centered on rays; anal fin pale except for narrow black stripe; caudal fin with narrow brown bands; body with scale rows in horizontal series separated by narrow pale areas which gives the appearance of small stripes, and row of 7–8 pale spots on lower half of sides; breast and belly light tan to gray; pectoral-fin base with large white spot. Iris orange or red with a few black spokes radiating from pupil.

Comparisons. See Table 15. Only five other Indo-West Pacific species of *Opistognathus* (*O. albomaculatus*, *O. alleni*, *O. elizabethensis*, *O. pholeter*, and *O. stigmosus*) agree with *O. triops* in typically having II, 17 or more anal fin rays (Table 8); *O. albomaculatus* differs in having a dark inverted crescent on pectoral-fin base, spinous dorsal fin with a stripe (vs. ocellus) and no vomerine teeth (vs. 2–3 teeth); *O. alleni* has fewer scale rows in horizontal series, 21–31 (vs. 45–49); *O. pholeter* lacks a spinous dorsal-fin ocellus and lateral-line terminus below rays 7–11 (vs. 3–5); *O. elizabethensis* lacks pale body spots and the spinous dorsal-fin ocellus is incomplete ventrally; and *O. stigmosus* lacks vomerine teeth, has lateral-line terminus below rays 5–7 (vs. 3–5), and fewer horizontal scale rows 38–45 (vs. 45–49).

Distribution. (Fig. 25) Known only from Tonga and Vanuatu in depths of about 12–32 m.

Etymology. The specific epithet, from the Greek *tri* (three) and *ops* (eye) in reference to the third "eye" formed by the characteristic ocellated spot in the spinous dorsal fin. To be treated as a noun in apposition.

Opistognathus variabilis Smith-Vaniz, 2009

Variable Jawfish

Figures 14E, 7D, 18H, 22C, 155–158; Tables 1–14

Opistognathus sp. Randall & Anderson 1993:36 (listed, checklist of shorefishes of Maldive Is.). Kuiter & Debelius 1994:216, unnumbered color photo (Variegated Jawfish, brief description).

Opistognathus variabilis Steene 1998:102 (unnumbered color pl. (*nomen nudum*, common name "Blue Jawfish," courtship display, Lembeh Strait, Sulawesi). Smith-Vaniz 2009:92, figs. 1e-f, 2e, 3d, 4e-f, 25–41 (original description: western Halmahera, Tanjung Bobo, 1°2'35"N, 127°23'55"E; holotype NCIP 6348, 73.2 mm SL). Chen *et al.* 2010:144, color photo A (Kenting National Park, Taiwan). Smith-Vaniz 2010:39 (in *Opistognathus* identification key). Satapoomin 2011:56 (checklist, southwestern Thailand). Ho & Shao 2011:43 (checklist of Taiwan fish types). Allen & Erdmann 2012:358, color photos (brief description, distribution). Hibino *et al.* 2016:33, figs. 1–4 (Yonaguni I., Yaeyama Islands, Japan). Smith-Vaniz 2022:314, unnumbered figs., pl. 120 (description, distribution).

Opistognathus n.sp. A. Myers 1999:124, fig. 1, pl. 49D, 49F ("Variable JawFish," brief description, Palau).

Opistognathus solorensis (not of Bleeker) Kuiter & Tonozuka 2004:624, color photos A (Sulawesi, Bitung) and B, E, G (Tulamben, Bali).

Material examined. 71 specimens, 16–73.2 mm SL, all cited in the original description.

Expanded diagnosis. A species of *Opistognathus* having an upper jaw somewhat sword-shaped but length and shape geographically variable, produced as a moderate to well-developed flexible lamina, and dimorphic (usually longer in adult males at localities where both sexes co-occur, but some females have very elongate upper jaws (Fig. 4G) at localities where single specimens were collected) extending 0.9 to 2.3 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 18H) moderately large, 2nd and 3rd infraorbitals much larger with large sensory

canal openings, 3rd infraorbital with moderate suborbital shelf; dorsal fin XI, 14–16 (14 typical only in northern Palawan); anal fin III, 14–16 (14 typical only at northern Palawan); vertebrae 10+18–20, usually 19; scale rows in horizontal series about 68–83; lateral-line terminus below segmented rays 3–6, typically 4 or 5; inner lining of upper jaw and adjacent membranes with one dark stripe mostly on ventral margin; color pattern highly variable (Figs. 155–158) ranging from orangish brown to mostly blue (Fig. 22C), with 7 or 8 mid-lateral blotches; dorsal fin with very narrow white margin, and 7 or 8 evenly spaced dark blotches along base.

Comparisons. Some individuals of *Opistognathus variabilis* with relatively long upper jaws might be confused with *O. castelnaui* but differ in having fewer body scale rows in horizontal series 68–83 (vs. about 90–110), dorsal-fin with 2 or 3 rows of small dark spots centered on spines and rays (vs. no small dark spots centered on dorsal-fin spines and rays), dorsal- and anal-fin segmented rays usually 15, except 14 in 8 of 9 northern Palawan specimens (vs. segments rays consistently 14) and caudal vertebrae 19 or 20, except 18 in all 9 northern Palawan specimens (vs. caudal vertebrae consistently 18), see Smith-Vaniz (2009, Table I). Some individuals of *Opistognathus solorensis* might easily be confused with *O. variabilis* but in addition to several meristic differences, *O. solorensis* has the inner lining of the upper jaw with two dark stripes (vs. a single stripe) and lacks small dark spots centered on the dorsal-fin spines and rays.

Distribution. (Fig. 24) In the Indian Ocean known from Maldive Islands and Sri Lanka, and throughout most of central western Pacific including Palau, Taiwan, Iriomote and Yonaguni islands, and Okinawa Pref., Japan (Hibino *et al.* 2016) but not Australia or southern New Guinea (although it is known from the Bird's Head region of northern New Guinea); one questionable record from Vanuatu is not plotted on the distribution map. *Opistognathus variabilis* has been collected in 1–36 m.

Etymology. The specific epithet, from the Latin *variabilis*, refers to the remarkable morphological and color pattern variation of this species.

Remarks. *Opistognathus variabilis* exhibits a surprising amount of geographic variation, including meristic values and life colors (Figs. 156–159); extent of sexual dimorphism of upper-jaw length is discussed and documented in detail by Smith-Vaniz (2009:102–104). Given the mosaic distributions of characters and lack of sympatric occurrences of any of the various morphs, only a single species could be objectively recognized at least in the absence of molecular data.

Opistognathus verecundus Smith-Vaniz, 2004

Bashful Jawfish

Figures 18I, 159; Tables 1–14

Opistognathus n.sp. Larson & Williams 1997:366 (listed, Darwin Harbour).

Opistognathus verecundus Smith-Vaniz 2004:218, figs. 2C, 3E, 9, 10 (original description, Australia, Northern Territory, Cobourg Peninsula, Coral Bay, 11°11'S, 132°4'E; holotype NTM S.10016-003, 52.6 mm SL). Hoese & Bray 2006:1076 (synonymy, Australian distribution). Moore *et al.* 2008:38 (listed, type catalog).

Material examined. 29 specimens, 14.2–52.6 mm SL, all cited in the original description.

Expanded diagnosis. A species of *Opistognathus* having an upper jaw sexually dimorphic with a flexible lamina posteriorly, end of maxilla slightly rounded (females) becoming increasingly elongate and scimitar-shaped (adult males); infraorbitals (Fig. 18I) moderately slender except 3rd infraorbital much larger with large sensory canal openings and slight suborbital shelf; dorsal fin X–XI, 14–15 (typically XI, 14); anal fin III, 14 (rarely 13 or 15); vertebrae 10+18–19, exceptionally 19; scale rows in horizontal series 44–54; lateral-line terminus below segmented dorsal-fin rays 2–4; gill rakers 8–9+15–17 = 23–26; vomerine teeth absent; inner lining of maxilla and adjacent membranes with two brownish stripes; dorsal and anal fins with dusky blotches and small pale spots that tend to form rows (Fig. 159); caudal fin with narrow dark bands .

Comparisons. This species appears to be most closely related to the allopatric *O. solorensis*, known from Indonesia, Philippines, and Taiwan. Both species have essentially identical upper jaw structures, dentition, fin ray and vertebral counts and buccal pigmentation. *Opistognathus verecundus* differs from *O. solorensis* in having fewer gill-rakers, 15–17 (vs. 18–20) on lower limb and a total of 23–26 (vs. 27–33) on first gill arch, 44–54 oblique scale rows in horizontal series (vs. typically 58–69), and only brown spots or markings anteriorly on the spinous dorsal fin, (vs. usually 1 or 2 black spots in this position).

Distribution. (Fig. 32) Known only from the type locality off Cobourg Peninsula, northern Australia where collected in 5–6 m.

Opistognathus vigilax, new species

Watchful Jawfish

Figures 12C–D, 18J, 160–166; Tables 1–14

Opistognathus species 5. Allen & Erdmann 2012:357, unnumbered color photo (brief description, Brunei).

Holotype. WAM P.34268–012, 45.0 mm SL, Brunei, northeast Ampa, 4°58.412'N, 114°23.706'E, 30 m, M.V. Erdmann, 24 Apr. 2014.

Paratypes. 10 specimens, 14.7–41.8 mm SL: **Brunei**: WAM P.34268–013 (8, 14.7–41.8) same data as holotype; WAM P.33119–001 (2, 19. 5–26.6), Colombo Shoals, site 27, 5°12.401'N, 114°43.641'E, 28–32 m, M.V. Erdmann, 25 May 2009.

Other material. 12 specimens, 23.0–41.7 mm SL. **Philippines**: PNM 15647 (previously USNM 436450), (41.7), Oriental Mindoro, Puerto Galera, 13°30'45"N, 120°54'28"E, 21–26 m, sta. VERDE 2015-37, J. Williams *et al.*, 30 Apr. 2015; CAS 238777, (33.4) same locality as PNM 15647; USNM 122413 (31.0 C&S), USNM 122414 (2, 23.8–27.9), USNM 122415 (32.0) and USNM 122416 (2, 23.8 C&S–27.4), all from Mindanao, Gulf of Davao, Linao Point, 7°04'48"N, 125°39'38"E, trawled in 51 m, "Albatross" sta. D .5253, 18 May 1908 (The Albatross specimens are faded and in very poor condition.) **West Papua**: WAM P.34402–003 (2, 23–26), Raja Ampats, Misool Island, 02°13.103'S, 130°33.936'E, outer reef, 60–70 m, M.V. Erdmann, 18 Jun. 2015. **Timor–Leste**: WAM P.33752–002, (29.4), Manatuto, 8°30.977'S, 126°4.388'E, outer reef, 22–46 m, M.V. Erdmann, 21 Aug. 2012, sta. TL-12-017. **Eastern Australia**: CSIRO H6509–02, (38.0), gravid female, north of Princess Charlotte Bay, Queensland, Australia, 13°51'S, 144°03'E, trawled in 47 m, 6 Oct. 2004, GBR/TS site 2672.

Color photographs only. (4 specimens, ca. 20–52 mm SL). **Misool**: (Fig. 163) female with eggs, ca. 52 mm SL, 65–70 m and (Fig. 167, ca. 40 mm SL, 22 m; **Brunei**: (Fig. 166A), ca. 20 mm SL, 30 m; **Bali**: (Fig. 166B), ca. 21 mm SL, 70 m.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking a flexible lamina posteriorly, extending 0.5–0.9 eye diameters behind posterior margin of orbit in specimens 32.0–45.0 mm SL; infraorbitals (Fig. 18J) relatively slender and tubular, all except lacrimal open laterally, 3rd infraorbital with short posterolateral projecting arm, no suborbital shelf; dorsal fin X–XI, 11–12 (exceptionally 10); anal fin II, 10–11; vertebrae 10+16; total gill rakers 26–30; shoulder above pectoral-fin base with dark spot approximately equal pupil diameter; small dark blotch on inner surface of pale mouth behind dark part of each dentary; dorsal fin with a prominent partial ocellus with inner dark spot beginning at spine 2 or 3 and ending between spines 3–5.

Description. (Counts of paratypes given in parentheses if different from those of holotype.) Dorsal fin XI, 11 (X–XI, 11–12); anal fin II, 10 (10–11); pectoral fin 21 (20–23); caudal fin: procurrent rays 6 (6–9), segmented rays 8+8, middle 12 branched, total elements 25; hypural 5 present; vertebrae 10+16; last pleural rib on vertebra 10; epineurals 12–13; one supraneural; dorsal-fin interdigitation anterior pattern / /S/1/1+1/1/; gill rakers 9+18 (8–10+17–21) = 27 (26–30).

Scales absent on head, nape, above lateral line, and chest; pectoral-fin base completely scaly; body with about 40/41 (37–43) scale rows in horizontal series; lateral-line terminus below dorsal-fin spine XI to segmented dorsal-fin rays 1–3, total element positions 11–13; lateral-line pores mostly arranged in a single series along embedded lateral-line tubes; cephalic sensory pores relatively sparse (Figs. 12C–D); mandibular and preopercular pore positions all occupied by single pores.

Anterior naris consisting of a moderate tube without a cirrus that when depressed reaches anterior margin of upper lip, length of tube about equal maximum diameter of posterior naris; dorsal fin moderately high, gradually increasing in height to about middle of spinous dorsal fin then decreasing; profile with a noticeable increase in height at origin of segmented rays; dorsal-fin spines moderately stout, straight and with pungent tips; segmented dorsal- and anal-fin rays unbranched distally except 1st ray unbranched; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally; posterior margin of preopercle distinct, with a free margin; no crenulae on margin of upper lip anteriorly; fifth cranial nerve passes under $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extends about 0.9 (holotype) and 0.5–0.9 (paratypes) eye diameters behind posterior margin of orbit; maxilla widest at end and truncate, without flexible lamina posteriorly; supramaxilla present, small and terminally positioned; premaxilla with an outer row of small canines anteriorly that become larger posteriorly and extend entire length of upper jaw; an inner patch of canines anteriorly, those on inner most row larger; dentary with an outer row of small canines becoming larger posteriorly, anteriorly with an inner row of small conical teeth, bordered posteriorly by a row of small canines; vomerine teeth absent.

Measurements of the 45.0 mm SL holotype followed in parentheses by those of 7 paratypes, 31.0–41.7 mm SL, as percent of SL: predorsal length 34.9 (30.9–35.8); preanal length 59.1 (60.5–64.5); dorsal-fin base 65.3 (58.0–66.7); anal-fin base 28.0 (24.3–28.4); pelvic-fin length 23.3 (18.7–22.3); caudal-fin length 28.0 (24.6–28.1); depth at anal-fin origin 21.4 (17.6–22.7); head length 35.7 (34.0–35.6); postorbital-head length 22.2 (20.6–24.2); upper-jaw length 21.1 (19.7–22.7); postorbital-jaw length 8.7–8.7); orbit diameter 9.6 (8.6–10.6). As percent of head length: postorbital-head length 62.3 (58.2–69.9); upper-jaw length 59.2 (55.7–63.6); postorbital-jaw length 24.3 (16.3–23.7); orbit diameter 26.8 (25.4–30.3).

Color in life (Figs. 160–166). Background color pale greyish tan; dark brown zigzag midlateral stripe with dorsal and ventral extensions; row of incomplete large pale spots usually present above and below midlateral stripe, including pair of basicaudal spots; five dark blotches on dorsum along dorsal-fin base extending slightly on to fin; spinous dorsal fin with a partial ocellus edged by white or yellow interradial membranes with inner black spot (which becomes brown on distal half of fin) beginning at spine 2 or 3 and ending at spine 4 or between spines 3–5; medial fins with yellowish-brown markings; shoulder above pectoral-fin base with a dark spot approximately equal pupil diameter; small dark blotch on inner surface of pale mouth behind dark part of each dentary (Figs. 166B); chin narrowly dusky; upper jaw with a dark blotch near origin of supramaxilla; narrow dark diagonal mark on cheek behind end of upper jaw.

Comparisons. *Opistognathus vigilax* is superficially similar to small specimens of *O. wassi* n.sp. although differing as follows: anterior naris a moderate tube without a cirrus (verus anterior naris with a small cirrus); shape of maxilla (posterodorsal margin of the maxilla rounded, Fig. 12C vs. acute in *O. wassi* n.sp., Fig. 13C); dark postorbital spot characteristic of *O. wassi* n.sp. present even in the smallest juveniles is absent in *vigilax*, and the dark chin band is much wider in *O. wassi* n.sp.; the dark spot (excluding the pale ring) in the spinous dorsal fin is more posteriorly positioned in *O. wassi* n.sp., beginning between spines 3–4 and ending between spines 5–8 (vs. beginning between spines 2–3 and ending between spines 2–5). *Opistognathus wassi* n.sp. also has more lower and total gill rakers, 23–26 and 33–37 (vs. 17–20 and 26–30) and horizontal scale rows 51–62 (vs. 39–43). *Opistognathus challenger* n.sp. differs in having 3 or 4 scale rows present above the lateral line anteriorly and shoulder above pectoral-fin base apparently without a dark spot approximately equal pupil diameter.

Distribution. (Fig. 36) Known from Brunei, Philippines, Indonesia (Java, Bali and Raja Ampats), Timor–Leste, and Queensland, Australia in 16–70 m but has been observed at greater depths (M.V. Erdmann, pers. com.); burrows in relatively coarse calcium carbonate sand.

Etymology. The Latin genitive adjective *vigilax* (watchful) alludes to the day-time behavior of species of *Opistognathus*, and presumably *O. vigilax*, in maintaining an almost continuous lookout for potential food organisms passing in close vicinity of their burrows.

Remarks. In most specimens the anterior naris is distinctly white (Figs. 160, 162, 165), but it is dark in a few individuals. Some juveniles, especially those from 60–70 m, have the pair of pale spots on the caudal peduncle noticeably elongate (Fig. 165) but more material is required to determine if that is typical of such specimens. The blue spots shown on the specimen in Fig. 162 are an artifact of the camera flash.

BOLD sequence COI data for a single Queensland, Australia specimen of *Opistognathus vigilax* (CSIRO H6509–02) and one from Verde Passage, Philippines (PNM 15648), differ by 2.82% in a BOLD barcode gap analysis. Unfortunately, no COI sequence data are available for *O. vigilax* specimens from other localities. Given the small sample size and the absence of any other obvious character differences, the two specimens are judged to be conspecific, with the disjunct distribution a sampling artifact. The small, inner, dark blotch on the pale mouth behind each dentary (Fig. 166B), and dark spot on the shoulder above the pectoral fin are considered to be autapomorphies of *O. vigilax*.

***Opistognathus wassi*, new species**
Chinstrap Jawfish
Figures 13C, 18L, 19C–D, 167–170; Tables 1–14

Opistognathus sp. B. Wass, 1984:24 (color description, Samoan record).
Opistognathus sp. Chen *et al.* 1997:148, fig. 11 (listed from Spratly Islands, Taiping Island [= Itu Aba Id], South China Sea). Okamura & Amaoka 1997:285 (color photograph [upper left], head of jawfish in burrow entrance). Allen *et al.* 2003:298, color photo [middle right] ("Wass' Jawfish"). Kuiter & Tonozuka 2004:625, unnumbered color photos A–E ("Ring-eye Jawfish," Bali, [Tulamben], Flores [Maumere] and Sabah [Mabula], mouth brooding documented, 15–24 m depth). Smith-Vaniz 2004:222 ("Chinstrap Jawfish," in key to Australian jawfishes). Randall 2005:345, unnumbered color photo ("chinstrap jawfish," description, distribution). Allen (R.) 2006:83 ("Ringeye Jawfish," Gorontalo, Sulawesi). Allen (G.R.) 2006:123 (listed, Isabel and Shortland I., Solomon Islands). Fricke *et al.* 2014:68 (checklist; Papua New Caledonia, Tabad Island, Madang). Nakae *et al.* 2018:242 (checklist, Amami-oshima Island, Ryukyu Islands).
Opistognathus n.sp. B. Myers 1999:124, fig. 2 ("Wass' Jawfish," brief description, Palau).
Opistognathus sp. 1. Kuiter & Debelius 2006:651, unnumbered color photo (brooding eggs, Indonesia, Flores). Hayashi & Okuri 2007:37, figs. 4a, 5a, 6a, 11, 12a ("Megane-agoamadai;" description; distribution; in key to Japanese *Opistognathus*).
Opistognathus species 6. Allen & Erdmann 2012:357, color photos (brief description, distribution).

Holotype. ANSP 133406, gravid female, 51.0 mm SL, Samoa, Tutuila Island, Tafagamanu Point, 33.5 m, 6 Nov. 1975, R.C. Wass and G. Yamasaki.

Paratypes. 35 specimens, 12.5–61.9 mm SL. **Japan**: KAUM-I. 68826 (61.9), Okinawa, Okinawa-jimi Island, Nakagima-gun, Toguchi, 26°22.08'N, 127°44.05'E, 13 Oct. 2014, You Sakurai. **South China Sea**: ASIZP 56990 (42.7) Spratly Islands, Tizard Banks and Reef, north coast of Itu Aba Island, 10°23'N, 114°22'E, 35 m, J. P. Chen, 21 Apr. 1994. **Philippines**: ROM 52744 (5, 12.5–45.9) Cebu Strait, Negros Oriental, North Bais Bay, 9°36'54"N, 123°11'06"E, 18–35 m, R. Winterbottom, 19 May 1987, sta. RW87–28; USNM 346209 (24.2) Guimaras Island, off rocky shore at Tando, 10°28'25"N, 122°28'00"E, 20 m, J. T. Williams, *et al.*, 28 Sep. 1995, sta. JTW 95–10; USNM 377438 (28.7) Mindoro, Langawa Reef, 5 km E. Mangalay Bay, 12°31'35"N, 121°30'51"E, 10–20 m, 30 May 2000, sta. MIN 00–49; USNM 379155 (37.9) Mindoro, 12°50'45"N, 120°44'58"E, 3–31 m, 2 Jun. 2000, sta. MIN 00–60; WAM P.32937–001 (51.1) northern Palawan, Bacuit Bay, Miniloc I., "Twin Rocks," 11°9'4.3"N, 119°23'47.3"E, 15 m, M.V. Erdmann, 14 Jun. 2007. **Palau**: ROM 77504 (17.8) Koror State, outer reef S of Ngerunekal Bay, 7°14'56.1"N, 134°14'18.7"E, 18–33.5 m, R. Winterbottom *et al.*, 27 May 2004, sta. RW 04–17. **Brunei**: WAM P.33119–003 (2, 21.7–23.2) Colombo Shoals, 5°12.401'N, 114°43.641'E, 28–32 m, M.V. Erdmann, 25 May 2009. **Indonesia**: ANSP 147466 (55.3) and BMNH 1982.1.20.5 (51.8) northern tip of Tidore, 0°40'N, 127°24'E, bay inside Tanjung Ebama du, 6 m, N.V.C. Polunin, 14 Nov. 1980; ANSP 167417 (17.5) Flores Island, Maumere off Pertamina dock, 33.5 m, J. E. Randall, 11 Nov. 1990; NCIP 6339 (2, 17.8–40.0) western Halmahera Is., Loloda Selatan Is. group, Pulau Adui, 1°40'26.9"N, 127°31'43.2"E, 23 m, M.V. Erdmann, 15 Apr. 2008; WAM P.32961–001 (2, 21.2–47.0) West Papua, SE Misool, Waaf Island, 2°8'56.2"S, 130°13'16.9"E, 45 m, M.V. Erdmann, 31 Jan. 2008. **Australia**: AMS I.22627–008 (52.6) Queensland, Escape Reef, 15°49'S, 145°50'E, 52–60 m, G.R. Allen *et al.*, 4 Nov. 1981, Sta. ER 81–26; **Papua New Guinea**: ANSP 157683 (35.5 C&S) Eight Mile Reef, ca. 19 km E. of Port Moresby, 30 m, P.L. Colin, 27 Oct. 1985; BPBM 36982 (27.5) D'entrecasteaux Island, 21 m, J.E. Randall, 13 Dec. 1995; WAM P.30623–005 (52.3) Madang, 5°09'S, 145°50'E, G.R. Allen *et al.*, 25 Jan. 1993. **Bismark Archipelago**: BMNH 1982.2.9.3 (35.4) Nodup (near Rabaul), 35–45 m, R. Lubbock and B. Parkinson, 29 Jul. 1975; WAM P.27826–079 (13.3) Manus Islands., Los Negros Island., 02°04'S, 147°25'E, 35–41 m, G.R. Allen, 6 Oct. 1982; WAM P.27831–001 (46.9) Manus Islands, Los Negros Island., 30–45 m, G.R. Allen, 11 Oct. 1982; WAM P.28173–001 (57.4) 6 km SE of Rabaul near South Daughter Volcano, 04°12'S, 152°13'E, 10–12 m, G.R. Allen, 8 Oct. 1983. **Solomon Islands**: WAM P.32536–005 (53.0), Santa Ysabel Island, Popongori Reef, 8°12'19"S, 159°13'50"E, sand-rubble on outer reef, 15 m, G.R. Allen, 15 May 2004. **Santa Cruz Islands**: USNM 357197 (2, 38.9–49.5) Ndendo Island, 10°44'S, 165°49'30"E, 5–28 m, J.T. Williams *et al.*, 25 Sep. 1998, sta. SOL 98–32; USNM 370285 (33.4) Ndendo Island., 10°44'12"S, 165°49'30"E, Graciosa Bay, off Shaw Point at W end of Luesalo, 3–17 m, J.T. Williams *et al.*, 26 Sep. 1998, sta. SOL 98–34. **Fiji Islands**: ROM 42224 (13.3) Suva Harbor in Rat tail Pass, 18°8'22"S, 178°23'31"E, 10–14 m, A. Emery *et al.*, 13 Apr. 1983, Sta. WE 83–51; USNM 233507 (47.2) Mamanuca Group, Malolo Island., 17°44'S, 177°03'E, 21–29 m, V.G. Springer, 26 May 1982, sta. VGS82–29. **Samoa**: ANSP 141815 (43.1), same data as holotype; USNM 220923 (29.4) Tutuila Island, Fagaalu Bay, 40 m, R.C. Wass, 1975.

Diagnosis. A species of *Opistognathus* having a rigid upper jaw lacking a flexible lamina posteriorly, extending about 0.5 to 0.9 eye diameters behind posterior margin of orbit; infraorbitals (Fig. 18L) slender and tubular, 3rd infraorbital without wide sensory canal openings, no suborbital shelf; dorsal fin X–XI, 10–12, typically 11; anal fin II, 10–11, typically 10; vertebrae 10+16, exceptionally 15; body with 51–62 scale rows in horizontal series; total gill rakers usually 33–37; chin with a conspicuous black band (Figs. 19C, 167, 168); dorsal fin with a prominent ocellus with inner dark spot beginning at spines 3 or 4 and ending at spines 5 to 8; double row of large pale spots on the side of body.

Description. Dorsal fin XI, 11 (exceptionally X, 12 or XI, 10); anal fin II, 10–11, rarely 11; pectoral fin 19–21; caudal fin: procurrent rays 3–4+3–4, segmented rays 8+8, middle 12 (14 in largest specimen) branched, total elements 22–24; hypural 5 present; vertebrae 10+15–16, exceptionally 15; last pleural rib on vertebra 10 and last epineural on ribs 14–17; one or two supraneurals (see Remarks); dorsal-fin interdigitation anterior pattern / /S/1/1+1/1/ or S/S/1/1+1/1/; gill rakers 10–12+23–26 = 33–37.

Scales absent on head, nape, above lateral line, chest, and pectoral-fin base; scale rows in horizontal series about 51–62; lateral-line terminus below spine 10 to segmented dorsal-fin ray 4 (total element positions 10.0–14.5); lateral-line pores mostly arranged in a single series along embedded lateral-line tubes; cephalic sensory pores relatively sparse (Fig. 13C); mandibular pore positions all occupied by single pores; preopercular pore positions single except dorsalmost bipored.

Anterior naris about mid-way between posterior naris and dorsal margin of upper lip, consisting of a short tube that when depressed does not reach anterior margin of posterior naris; height of tube shorter than maximum diameter of posterior naris; dorsal fin moderately high, gradually increasing in height to about middle of spinous dorsal fin then decreasing; profile with a noticeable increase in height at origin of segmented rays; dorsal-fin spines moderately stout, straight and with pungent tips; all segmented dorsal- and anal-fin rays branched distally or 1st ray unbranched; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally; posterior margin of preopercle distinct, with a free margin; no crenulae on margin of upper lip anteriorly; 5th cranial nerve passes under $A1_{\beta}$ section of adductor mandibulae.

Upper jaw extends about 0.7–0.9 eye diameters behind posterior margin of orbit; maxilla widest at end and truncate, without flexible lamina posteriorly; supramaxilla present, small and terminally positioned; premaxilla with an outer row of small canines anteriorly that become much smaller posteriorly and extend entire length of upper jaw; an inner series of very small conical teeth behind outer row anteriorly; dentary with an outer row of moderate canines becoming slightly smaller posteriorly, anteriorly with an inner row of small conical teeth, bordered posteriorly by 4 or 5 small canines; vomerine teeth absent (except a single tooth in 1 of 15 specimens).

Measurements of the 51.0 mm SL holotype followed in parentheses by those of 10 paratypes, 35.5–57.4 mm, as percent of SL: predorsal length 33.7 (34.5–40.0); preanal length 60.8 (58.8–67.6); dorsal-fin base 60.4 (55.0–63.2); anal-fin base 23.6 (21.8–26.3); pelvic-fin length 22.6 (22.6–30.7); caudal-fin length 25.8 (24.8–30.1); depth at anal-fin origin 22.2 (21.1–24.6); caudal-peduncle depth 12.8 (12.6–14.2); head length 37.2 (36.6–39.0); postorbital-head length 21.8 (21.7–23.7); upper-jaw length 22.9 (22.9–24.5); postorbital-jaw length 8.6 (8.2–10.1); orbit diameter 11.6 (10.1–13.2). As percent of head length: postorbital-head length 58.4 (57.5–62.0); upper-jaw length 61.6 (60.3–66.8); postorbital-jaw length 23.2 (20.9–27.5); orbit diameter 31.0 (27.2–33.9).

Color in life (Figs. 19C, 167–169): Background color tan except becoming white on breast and belly; sides with double row of 5 or 6 alternating pale spots larger than pupil diameter, including pair of basicaudal spots, the upper row spots irregularly connected and extending from posterodorsal margin of opercular flap to base of caudal fin, the lower row not connected and extending from near base of pectoral fin to caudal fin; spinous dorsal fin with an ocellus edged by white with inner black spot beginning at spine 3 or 4 and ending between spines 5–8, and tips of spines with white fleshy tabs; dorsal fin also with wide tan stripe that extends almost to distal margin of spinous dorsal fin and then tapers posteriorly to near base of last ray, four dark blotches on dorsum along dorsal-fin base from just behind ocellus and extending slightly on to fin; anal fin with tan stipe along base of fin; caudal and pelvic fins white or pale yellow without bands; head tan with irregular large pale blotches; black blotch at posterodorsal margin of orbit that extends across occiput and connects with its counterpart, another black blotch extends below eye and across premaxilla, lower lip and chin.

Comparisons. The color pattern of *Opistognathus wassi* is superficially similar to small individuals of *O. vigilax* (see preceding account of *O. vigilax* for detailed comparison) but is easily distinguished by having a conspicuous black chin band (Figs. 19C, 167, 168), and shoulder above pectoral-fin base without a dark spot approximately

equal pupil diameter. *Opistognathus parvus* also shares with *O. wassi* the combination of a rigid upper jaw, low numbers of dorsal- and anal-fin rays, and a partial ocellus in the spinous dorsal fin. *Opistognathus parvus* is readily distinguished by having body scales that are speckled with large melanophores, no double row of large pale spots on sides, no dark chin band, typically more segmented dorsal- and anal-fin rays, 12 (vs. 11 and 10, respectively), caudal vertebrae 17 (vs. 16), and fewer total gill rakers 27–33 (vs. 33–37). *Opistognathus challenger* differs in having 3 or 4 scale rows present above the lateral line anteriorly (vs. no scales above lateral line), spinous dorsal fin with dark spot or ocellus beginning at anterior margin of spine 1 or between spines 1–2 (vs. between spines 3–4), and oblique rows of scales in horizontal body series ca. 44 (vs. 51–62 scale rows).

Distribution. (Fig. 36) *Opistognathus wassi* has one of the widest distributions of any Indo-West Pacific jawfish ranging from Bali to Samoa and the Great Barrier Reef to Japan (Amami and Ryukyu islands). It has been collected on sand rubble bottoms near reefs in 6–52 m, with most collections from at least 30 m. The distribution map includes Japanese collections listed in Hayashi & Okuri (2007) and the following records based on uncollected specimens: Ryukyu Islands, Kume-jima (ca. 26°20'N, 127°E), jawfish partially out of burrow photographed by M. Hayashi, and Yaeyama Is., Iriomote-jima, based on color photograph (KPM-NR0016772) in FishPix. (http://fishpix.kahaku.go.jp/fishimages-e/index.html); Tulamben, Bali and Mabul, Sabah documented by Kuiter and Tonozuka (2004); Belau (Palau), photographs provided by J. E. Randall and R. F. Meyers, respectively; and Gorontalo, Sulawesi, as "the tiny Ringeye Jawfish" reported by R. Allen (2006).

Etymology. Named *Opistognathus wassi* in honor of Richard C. Wass, who generously made available his Samoan specimens, color notes and photographs of this species at the beginning of this study. The recommended common name is Chinstrap Jawfish.

Remarks. Supraneurals are very small in *O. wassi* and the anteriormost one is vestigial or absent in about half of 16 examined specimens where the quality of radiographs was good enough to make a determination.

History and conclusions

I first became interested in jawfishes about 40 years ago when the existence of more than half the currently valid species were unknown, and the scientific names used for them were often incorrect. As SCUBA diving and underwater photography became increasingly more common and affordable, sightings of jawfishes greatly expanded and attracted the attention of both laypersons and ichthyologists; this combined with the availability of more museum specimens sparked my continuous research on these unusual fishes, ultimately resulting in this monograph.

Two of the more fascinating habits of jawfishes are their obligatory burrow construction and mouth brooding behavior; these attributes, surprisingly, have been observed and mentioned in the literature for relatively few Indo-West Pacific *Opistognathus* species. These two characteristics in combination occur in few, if any, other families of marine fishes and deserve more documentation in the scientific literature. Observations on reproductive seasonality and courtship behavior are also mostly uninvestigated, and the latter may have potential as an indication of phylogenetic relationships. An important finding of this study is that many species of *Opistognathus* are known from very few or even single specimens based on available museum holdings. Fifteen species treated in this paper are known only from holotypes, and ten were taken in trawl or dredge hauls made in depths from 65 to 300 meters. This paucity of museum specimens clearly indicates the difficulty of collecting jawfishes and why knowledge of their diversity and distributions would be very incomplete and misleading without borrowing and studying material from a large number of institutions. Such effort is time consuming, incurs considerable expenses associated with loan shipments and requires permit documentation and the cooperation and patience of collection managers and curators responsible for loan approvals. If it is important to protect species for conservation purposes, then we first must know that they exist and have some idea of their actual or potential distributions. Unfortunately, the now widespread prohibition of the use of rotenone to survey fish biodiversity (see discussion in Robertson & Smith-Vaniz 2008) will also work against better museum collection documentation for these and other cryptic taxa. It has been suggested that the more fishwatchers, aquarium enthusiasts and resource managers know about charismatic fishes (such as jawfishes), the more likely they are to value their survival and encourage protection of their essential habitats. I hope this monograph will help accomplish that goal.

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TABLE 2. Dorsal-fin interdigitation anterior patterns (see methods) in Indo-West Pacific species of *Opistognathus*.

Table 2. Anterior dorsal-fin and anal-fin interdigitation patterns (see methods) in Indo-West Pacific species of *Opistognathus* . Less common patterns indicated by parentheses.

	Anterior dorsal-fin pattern			Anterior anal-fin pattern		
	S/S/1/1+1/1/	/ /S/1/1+1/1/	/ /1/1+1/1/	1/1/1/1/1/	1+1/1/1/1/1/	/ /1+1/1/1/1/
Upper jaw with flexible lamina posteriorly						
adelus	–	X	–	X	–	–
albicaudatus	–	X	–	X	–	–
castelnaui	–	X	–	X	–	–
cyanospilotus	–	X	–	X	–	–
ensiferus	–	X	–	X	–	–
iyonis	–	X	–	–	–	X
megalops n.sp.	–	X	–	–	–	X
muscatensis	–	X	–	X	–	–
nigromarginathus	–	X	–	X	–	–
solorensis	–	X	–	X	–	–
randalli	–	X	–	X	–	–
variabilis	–	X	–	X	–	(X)
verecundus	–	X	–	X	–	(X)
Upper jaw rigid posteriorly						
afer	–	–	X	X	–	–
albomaculatus n.sp.	–	–	X	X	–	(X)
alleni	–	–	X	–	–	X
asper n.sp.	X	–	–	X	–	–
aurolineatus n.sp.	X	–	–	X	–	–
bathyphilus n.sp.	X	–	–	–	–	X
biporus n.sp.	X	–	–	X	–	–
challenger n.sp.	–	X	–	–	–	X
crassus	X	–	–	X	–	–
darwinensis		–	X	X	–	–
decorus	X	–	–	X	–	–
dendriticus	–	–	X	–	X	–
dipharus	–	–	X	X	–	–
elizabethensis	–	–	X	–	X	–
erdmanni n.sp.	–	–	X	X	–	–
evermanni	X	–	–	X	–	–
eximius	–	–	X	X	–	–
flavidus n.sp.	X	–	–	X	–	–
helvolus n.sp.	–	X	–	X	–	–
hongkongiensis	X	–	–	X	–	–
hopkinsi	X	–	–	X	–	–
hyalinus n.sp.	–	X	–	X	–	–
inornatus	–	–	X	X	–	–
jacksoniensis	–	–	X	–	–	X
latitabundus	–	–	X	(X)	–	X
liturus	–	–	X	X	–	–
longinaris	–	–	X	X	–	–
macrolepis	X	–	–	X	–	–
margaretae	–	X	–	X	–	–
microspilus n.sp.	X	–	–	X	–	–
nigipinnis n.sp.	–	X	–	–	–	X
ocellicaudatus	X	–	–	X	–	–
papuensis	–	–	X	X	–	–
pardus	X	–	–	X	–	–
parvus n.sp.	–	X	–	–	–	X
pholeter n.sp.	–	–	X	(X)	–	X
reticeps	–	–	X	X	–	–
reticulatus	–	–	X	X	–	–
rosenbergii	–	X	–	X	–	–
rufilineatus	X	–	–	X	–	–
seminudus	–	–	X	(X)	–	X
simus	–	X	–	(X)	–	X
stigmosus	–	–	X	–	–	X
trimaculatus	–	–	X	**?**	–	–
triops n.sp.	–	–	X	–	–	X
vigilax n.sp.	–	X	–	X	–	–
wassi n.sp.	(X)	X	–	X	–	–

TABLE 3. Selected characters in Indo-West Pacific species of *Opistognathus* (exceptional values omitted).

Table 3. Selected characters in Indo-West Pacific species of *Opistognathus* (exceptional values omitted).

Species	Dorsal fin spines	Dorsal fin rays	Anal fin spines	Anal fin rays	Pectoral rays	Procurrent rays (total)	Scale rows horizontal	LL terminus total elements	Gill rakers (total)	Infraorbital suborbital shelf
Upper jaw with flexible lamina posteriorly										
adelus	X	XI	13-14	– III	13-14	18-19	6-8	40-41	14-15	24-25 no Fig. 16A
albicaudatus		XI	15	– III	15	20-21	6-7	72-75	16-17	31-32 yes
castelnaui		XI	14	– III	14	19-21	8-10	90-110	14-17	28-35 yes Fig. 17A
cyanospilus		XI	15-16	– III	15	19-21	8-11	93-96	17-19	31-34 yes Fig. 16M
ensiferus		XI	14	– III	14	20	9	48-52	17-18	27-29 yes
iyonis		XI	16	II –	14	18-20	6-8	45-46	16-20	27-35 no Fig. 17K
megalops n.sp.		XI	11	II –	11	19	6	52–56	16-17	38 no Fig. 17L
muscatensis		XI	15	– III	15	20-22	8-10	103-120	15-18	36-44 yes Fig. 17P
nigromarginathus		XI	14-15	– III	14	19-21	8-10	68-95	15-19	36-45 yes Fig. 17Q
solorensis		XI	14-15	– III	14	18-20	8-11	53-69	12-15	27-33 yes Fig. 18E
randalli		XI	14-16	– III	14-15	19-20	9-11	84-96	12-15	33-40 yes Fig. 17T
variabilis		XI	14-16	– III	14-16	18-20	9-11	68-83	14-17	29-39 yes Fig. 18H
verecundus	X	XI	14-15	– III	14	18-19	7-10	44-54	13-15	23-26 yes Fig. 18I
Upper jaw rigid posteriorly										
afer		XI	13-14	– III	12-14	19-21	8-10	58-62	13-15	22-23 yes Fig. 16B
albomaculatus n.sp.		XI	19-21	II –	18-20	19-20	6-10	35-38	15-19	19-22 yes Fig. 16C
alleni	X	–	19	II –	17-18	19-20	7-9	21-31	23-27	24-28 yes Fig. 16D
aspera n.sp.		XI	11-12	II –	10	19	5-9	42-44	11-15	32-34 yes Fig. 16E
aurolineatus n.sp.		XI	12	II –	11	20	8	68-69	16	39 yes Fig. 16N
bathyphilus n.sp.		XI	11	II –	11	19	6	42-45	15	37 no Fig. 16G
biporus n.sp.		XI	11	II –	10	19	8	45	14	37 no Fig. 16H
challenger n.sp.		XI	11	II –	11	19-20	6	44	12-14	30 ?
crassus		XI	11	II –	10	19	8	44	13	34 yes Fig. 16I
darwinensis	X	XI	17-18	II –	14-15	19-21	6-8	67-80	21-26	24-30 yes Fig. 17B
decorus		XI	12	II –	11	19-21	6-8	56-67	14-16	41-44 no Fig. 16O
dendriticus		XI	13-14	II –	11-13	19-21	6-8	66-95	15-17	28-33 yes Fig. 17C
dipharus		XI	15	– III	16	19	9	63-64	17-18	28 yes Fig. 16Q
elizabethensis		XI	18-19	II –	17-19	19-21	9-11	47-51	15-18	24-25 no Fig. 16R
erdmanni n.sp.		XI	11	II –	10-11	19	8	37-40	13-15	29-31 no Fig. 17I
evermanni		XI	10-12	II –	10-11	19-21	6-7	40-46	10-13	26-32 no Fig. 16L
eximius		XI	13	II –	12	20-21	7-9	80-99	15-17	39-44 yes Fig. 17D
flavidus n.sp.		XI	11	II –	10	19-21	6	41-45	10-11	30-32 no Fig. 17J
helvolus n.sp.		XI	10	II	10	20	6	38	11	32 no Fig. 18K
hongkongiensis		XI	11	II –	11	20-21	7-8	48-54	15-16	29-31 no Fig. 16J
hopkinsi		XI	13	II –	12	20	8	50-55	14-16	42-47 no Fig. 16K
hyalinus n.sp.		XI	10-12	II –	10	19-21	6	42-47	11-13	34-39 no Fig. 16S
inornatus		–	XII 15-16	II –	13-15	21-22	7-9	79-89	22-25	24-26 yes
jacksoniensis	X	–	17-18	II –	15-16	19-21	7-8	50-60	22-28	28-32 yes Fig. 17M
latitabundus		–	XII 17-18	II –	15-16	23-24	6-8	63-80	14-18	23-24 no Fig. 17E
liturus		XI	11	II –	10	19	8	44	15	31 no Fig. 16F
longinaris	X	–	20	– III	19	19	9	40-42	18	23-25 no Fig. 17N
macrolepis	X	XI	11-13	II –	10-12	19-20	6	41-47	12-14	29-33 no Fig. 16P
margaretae		XI	13-14	– III	13-14	20	8-10	38-52	14-17	26-29 yes Fig. 17O
microspilus n.sp.		XI	11	II –	10	20-21	6	42-43	10-11	29 ?
nigripinnis n.sp.		XI	13	II –	13	19	6	39-40	13	26 ?
ocellicaudatus		XI	11	II	11	21	6	42	13-14	31 ?
papuensis		–	XII 15-17	II –	14-15	21-22	6-8	78-94	19-23	24-27 yes Fig. 17F
pardus		XI	11	II –	11	20	6	42-43	13	40-41 no Fig. 17R
parvus n.sp.		XI	11-13	II –	11-12	20	6-7	40-45	12-15	27-33 no Fig. 16T
pholeter n.sp.	X	–	20-21	II –	17-19	19-20	7-10	39-51	17-21	22-27 no Fig. 17S
reticeps		–	XII 15-16	II –	13-14	22-23	6-8	56-64	10-15	25-29 no Fig. 17G
reticulatus		–	XII 16	II –	13-14	22-23	6-8	90-129	18-22	21-23 no Fig. 17H
rosenbergii		XI	13	– III	13-14	21-22	8-10	55-66	13-17	30-35 no Fig. 18A
rufilineatus		XI	11-12	II –	10-11	19-21	8	44-46	12-13	33-34 no Fig. 18B
seminudus		XI	14-16	II –	14-15	19-21	8-11	28-36	18-22	24-27 no Fig. 18C
simus		XI	15	– III	15-16	20	9-11	53-62	17	27-28 yes Fig. 18D
stigmosus	X	–	19	II –	18	20-21	9-10	38-45	17-18	22-27 yes Fig. 18F
timaculatus		XI	XII 10	II –	10	19-20	6	47-50	11-12	34 ?
triops n.sp.		XI	17-18	II –	17	19-20	9-10	20-21	15-17	38-40 yes Fig. 18G
vigilax n.sp.		XI	10-11	II –	10	20-23	6-9	39-43	11-14	26-30 no Fig. 18J
wassi n.sp.		XI	11	II –	10	19-21	6-8	51-62	11-15	33-37 no Fig. 18L

Table 3. Continued (exceptional values for vertebral counts in a few species omitted - see Table 10).

Species	Vertebrae precaudal				caudal	total	Supraneural bones	Hypural 5	Vomerine teeth	Dorsal-fin spines with fleshy tabs	5th cranial nerve under A1β	5th cranial nerve over A1β
Upper jaw with flexible lamina posteriorly												
adelus	10	–	–	–	17-18	27-28	1	+	0	–	+	–
albicaudatus	10	–	–	–	19	29	1	–	0	–	+	–
castelnaui	10	–	–	–	18	28	1	–	0	–	+	–
cyanospilus	10	–	–	–	19	29	1	–	0	–	+	–
ensiferus	10	–	–	–	18	28	1	–	0	–	+	–
iyonis	10	–	–	–	19	29	1	+	0	+	+	–
megalops n.sp.	10	–	–	–	16	26	1	+	0	–	+	–
muscatensis	10	–	–	–	16	29	1	–	0	–	+	–
nigromarginathus	10	–	–	–	18	28	1	–	0	–	+	–
solorensis	10	–	–	–	18	29	1	–	0	–	+	–
randalli	10	–	–	–	18	28	1	–	0	–	+	–
variabilis	10	–	–	–	18-20	28-30	1	–	0	–	+	–
verecundus	10	–	–	–	18	28	1	–	0	–	+	–
Upper jaw rigid posteriorly										–		
afer	10	–	–	–	17-18	27-28	0	–	2-3	+	–	+
albomaculatus n.sp.	10	–	–	–	23-25	33-35	0	+	0	+	+	–
alleni	10	–	–	–	22	32	0	+	1-3	+	+	–
aspera n.sp.	10	–	–	–	15-16	25-26	2	+	0	+	+	–
aurolineatus n.sp.	10	–	–	–	16	26	2	+	0	+	+	–
bathyphilus n.sp.	10	–	–	–	16	26	2	+	0	+	+	–
biporus n.sp.	10	–	–	–	16	26	2	+	0	+	+	–
castaneus	10	–	–	–	16	26	2	+	0	–	**?**	**?**
challenger n.sp.	10	–	–	–	16	26	1	+	0	–	–	+
crassus	10	–	–	–	16	26	2	+	0	+	+	–
darwinensis	–	–	12	–	18-20	30-32	0	+	0	+	–	+
decorus	10	–	–	–	16	26	2	+	0	–	+	–
dendriticus	–	11	–	–	16-17	27	0	+	0	+	–	+
dipharus	10	–	–	–	19	29	0	–	0	–	+	–
elizabethensis	10	–	–	–	23	33	0	–	2-3	+	+	–
erdmanni n.sp.	10	–	–	–	16	26	0	+	0	+	+	–
evermanni	10	–	–	–	16	26	2	+	0	–	+	–
eximius	10	–	–	–	16	26	1	+	1-3	–	–	+
flavidus n.sp.	10	–	–	–	16	26	2	+	0	–	+	+
helvolus n.sp.	10	–	–	–	16	26	1	–	0	–	+	–
hongkongiensis	10	–	–	–	16	26	2	+	0	–	+	+
hopkinsi	10	–	–	–	17-18	27-28	2	+	0	+	+	+
hyalinus n.sp.	10	–	–	–	16	26	1	+	0	–	+	–
inornatus	–	–	12	–	18-20	30-32	0	+	0	–	+	–
jacksoniensis	10	–	–	–	20	30	0	+	1-5	–	+	–
latitabundus	–	–	–	13	19-21	32-34	0	+	0	–	–	+
liturus	10	–	–	–	16	26	2	+	0	+	+	–
longinaris	10	–	–	–	24	34	0	–	0	–	+	–
macrolepis	10	–	–	–	16	26	2	+	0	–	+	–
margaretae	10	–	–	–	18	28	1	–	0	–	+	–
nigripinnis n.sp.	10	–	–	–	18	28	0	+	0	–	+	–
ocellicaudatus	10	–	–	–	16	26	2	+	0	–	**?**	**?**
papuensis	–	–	12	–	19	31	0	+	0	–	+	–
pardus	10	–	–	–	16	26	1	+	0	–	+	–
parvus n.sp.	10	–	–	–	17-18	27-28	1	+	0	–	+	–
pholeter n.sp.	–	11	–	–	23	34	0-1	–	1-3	+	+	–
reticeps	–	–	12	–	19	31	0	+	0	–	–	+
reticulatus	–	–	–	13	18	31	0	+	0	+	–	+
rosenbergii	10	–	–	–	17	27	1	+	0	–	+	–
rufilineatus	10	–	–	–	16	26	2	+	0	–	+	–
seminudus	10	–	–	–	18	28	0	–	1-3	+	+	–
simus	10	–	–	–	19	29	1	–	0	–	+	–
stigmosus	10	–	–	–	23	33	0	–	0	+	+	–
timaculatus	10	–	–	–	16	26	0	–	0	–	**?**	**?**
triops n.sp.	10	–	–	–	22-23	32-33	0	–	2-3	+	+	–
vigilax n.sp.	10	–	–	–	16	26	1	+	0	–	+	–
wassi n.sp.	10	–	–	–	16	26	2	+	0	–	+	–

TABLE 4. Cephalic sensory pores, relative development, and known depth range in adults of Indo-West Pacific species of *Opistognathus*

Table 4. Cephalic sensory pores, relative development, and known depth range in adults of Indo-West Pacific *Opistognathus* species.

Species	Pore illustrations	Relative development of pores in adults	Depth range (meters)
Upper jaw with flexible lamina posteriorly			
adelus	Fig. 5A (this paper)	numerous	5-10; 65
albicaudatus	ous	numerous	35
castelnaui	none	numerous	23-100
cyanospilus	none	very numerous	12-30
ensiferus	Fig. 12A *in* Smith-Vaniz (2016)	numerous	1
iyonis	Fig. 10D (this paper)	moderate	10-67
megalops n.sp.	Fig. 13D (this paper)	moderate	103-107
muscatensis	none	very numerous	30–50
nigromarginathus	none	numeros	2-17
solorensis	Fig. 7B (this paper)	numerous	0.5-30
randalli	Fig. 7C (this paper)	numerous	5-32
variabilis	Fig. 7D (this paper)	numerous	1-36
verecundus	none	numerous	5-6
Upper jaw rigid posteriorly			
afer	Fig. 6A (this paper)	moderate	22-32
albomaculatus n.sp.	none	relatively numerous	10-35
alleni	none	relatively numerous	0.2-30
aspera n.sp.	Fig. 5B (this paper)	moderate	95
aurolineatus n.sp.	Fig. 8A (this paper)	sparce (like *O. decorus*)	120-140
bathyphilus n.sp.	Fig. 9A (this paper)	moderate	120-150
biporus n.sp.	Fig. 9B (this paper)	moderate	70-126
challenger n.sp.	Fig. 13A (this paper)	sparce	149
crassus	Fig. 6B (this paper)	moderate	35
darwinensis	Fig. 5C (this paper)	numerous	1-4
decorus	Fig. 8B (this paper)	sparce (like *O. aurolineatus*)	unknown (probably deep water)
dendriticus	none	numerous	1-25
dipharus	Fig. 15 *in* Smith-Vaniz (1910)	relatively numerous	23
elizabethensis	none	moderate	0.5-18
erdmanni n.sp.	Fig. 10C (this paper)	moderate	50-55
evermanni	none	relatively sparce	10-30
eximius	none	moderate	1-35
flavidus n.sp.	Fig. 6C (this paper)	relatively sparce	80-120
helvolus n.sp.	none	relatively sparce	300
hongkongiensis	none	moderate	55
hopkinsi	Fig. 8D (this paper)	sparce	70-262
hyalinus n.sp.	Fig. 10A (this paper)	sparce	20-70
inornatus	Fig. 13B (this paper)	very numerous (like *O. papuensis*)	5-60
jacksoniensis	none	numerous	20-70
latitabundus	none	numerous	10-90
liturus	Fig. 9D (this paper)	relatively sparce	unknown
longinaris	none	numerous	65
macrolepis	Fig. 6D (this paper)	relatively sparce	7-55
margaretae	Fig. 3 *in* Smith-Vaniz (1983)	very numerous	1; 18-25
microspilus n.sp.	Fig. 12A (this paper)	relatively sparce	200
nigripinnis n.sp.	Fig. 12B (this paper)	sparce	16
ocellicaudatus	Fig. 1 *in* Shinohara (2021)	moderate	97
papuensis	none	very numerous (like *O. inornatus*)	6-16
pardus	Fig. 8C (this paper)	sparce	99
parvus n.sp.	Fig. 10B (this paper)	relatively sparce	10-40
pholeter n.sp.	Fig. 11A (this paper)	relatively numerous	2-30
reticeps	none	relatively numerous	1.5-29
reticulatus	none	relatively numerous	3–1.5
rosenbergii	Fig. 5D (this paper)	very numerous	1–26
rufilineatus	Fig. 9C (this paper)	moderate	20-50; 97-109
seminudus	Fig. 11B (this paper)	relatively numerous	0.5-22
simus	none	numerous	0.2-1.3
stigmosus	Fig. 11C (this paper)	moderate	20-29
timaculatus	Fig. 3 *in* Hiramatsu & Endo (2013)	relatively sparce	150; 120-250
triops n.sp.	Fig. 11D (this paper)	moderate	12–32
vigilax n.sp.	Figs. 12C, 12D (this paper)	relatively sparce	16-70+
wassi n.sp.	Fig. 13C (this paper)	relatively sparce	6-52

TABLE. 5. Upper jaw length, as percent head length (rounded to nearest whole number), in Indo-West Pacific species of *Opistognathus*. Asterisk indicates species with sexually dimorphic jaw lengths.

Table 5. Upper jaw length, as percent head length (rounded to nearest whole number), in Indo-West Pacific species of *Opistognathus* . Asterisk indicates species with sexually dimorphic jaw lengths.

	Upper jaw as percent head length																															Standard length		
Species	47	49	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	83	85	87	89	91	93	95	97	99	101	103	N	Min.	Max.
	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104			
Upper jaw with flexible lamina posteriorly																																
adelus	–	–	–	–	–	–	–	–	2	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	46.2	49.6
albicaudatus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	2	91.4	94.8
*castelnaui**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	2	–	1	2	–	4	2	–	5	5	1	–	–	23	112.4	242.5
ensiferus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1	–	61.5
iyonis	–	–	–	–	–	–	–	–	–	–	–	2	2	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8	51.0	67.2
megalops n.sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1	–	88.0
cyanospilotus	–	–	1	3	2	3	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	10	70.5	116.0
muscatensis	–	–	–	–	–	–	–	–	5	8	3	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	18	163.0	315.0
*nigromarginatus**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	3	–	1	3	3	6	1	–	1	1	21	66.8	139.9
*randalli**	–	–	–	–	–	–	–	–	–	–	–	–	–	2	3	3	4	2	4	4	3	4	–	–	–	–	–	–	–	29	45.7	108.5
*solorensis**	–	–	–	–	–	–	–	–	1	5	6	5	–	–	3	1	2	2	2	1	1	–	1	–	–	–	–	–	–	30	36.7	74.5
*varabilis**	–	–	–	–	–	–	5	5	5	2	6	2	3	1	3	4	3	2	1	2	–	2	3	–	1	–	–	–	–	50	37.0	96.2
*verecundus**	–	–	–	–	–	–	–	2	1	2	10	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	15	35.2	48.1
Upper jaw rigid posteriuorly																																
afer	–	–	1	3	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5	37.3	41.3
albomaculatus n.sp.	1	2	3	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	9	40.5	57.3
alleni	4	6	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	13	54.3	73.7
aspera n.sp.	–	–	–	–	–	–	–	–	–	2	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	34.4	50.2
aurolineatus n.sp.	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	224.0
bathyphilus n.sp.	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	66.3
biporus n.sp.	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	64.4
challenger n.sp.	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	76.4
crassus	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	35.5
darwinensis	–	–	–	–	2	5	20	6	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	36	60.0	170.5
decorus	–	–	–	–	–	–	–	–	–	2	4	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8	127.4	155.1
dendriticus	–	–	–	–	–	–	–	1	5	9	9	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	26	100.3	228.8
dipharus	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	47.2
elizabethensis	–	–	1	1	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	60.4	71.4
erdmanni n.sp.	–	–	–	–	–	–	–	–	1	1	1	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5	25.9	39.3
evermanni	–	–	–	–	1	–	–	1	1	1	3	1	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	10	56.3	81.5
eximius	–	–	–	–	–	–	–	–	3	6	6	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	17	153.0	285.0
flavidus n.sp.	–	–	–	–	–	–	–	–	1	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	42.6	71.0
helvolus n.sp.	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	39.8
hongkongiensis	–	–	–	–	–	–	–	–	–	–	2	1	–	2	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6	105.4	141.8
hopkinsi	–	–	–	–	–	–	1	–	1	4	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7	50.4	115.4
hyalinus n.sp.	–	–	–	–	–	1	3	5	5	7	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	23	23.1	37.8
inornatus	–	–	–	–	–	–	–	–	–	–	2	5	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	10	172.0	409.0
jacksoniensis	–	–	–	1	2	3	6	10	3	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	27	135.2	216.0
latitabundus	–	–	–	–	–	–	–	4	3	6	6	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	20	66.9	216.0
liturus	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	55.3
longinaris	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	41.0
macrolepis	–	–	–	–	–	–	3	1	4	1	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	11	64.3	80.3
margaretae	–	–	–	–	–	–	–	–	2	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6	44.7	77.7
microspilus n.sp.	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	53.7
nigripinnis n.sp.	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	34.0
ocellicaudatus	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	69.4
papuensis	–	–	–	–	–	–	–	–	2	4	7	3	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	18	147.8	339.0
pardus	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	98.8
parvus n.sp.	–	–	–	–	–	4	4	3	2	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	16	21.6	30.5
pholeter n.sp.	1	5	5	8	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	21	38.0	60.7
reticeps	–	–	–	–	–	–	–	1	2	1	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6	63.7	117.3
reticulatus	–	–	–	–	–	–	–	1	4	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7	99.2	358.0
rosenbergii	–	–	–	–	–	4	8	3	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	16	84.6	116.9
rufilineatus	–	–	–	–	–	–	–	–	–	2	1	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6	37.3	60.7
seminudus	–	–	–	–	2	6	5	7	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	24	57.9	86.2
simus	–	–	–	1	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	49.2	66.4
stigmosus	–	–	1	2	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	42.9	70.5
timaculatus	–	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	67.8	72.0
triops n.sp.	–	–	–	–	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	35.8	39.6
vigilax n.sp.	–	–	–	–	1	–	5	1	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	9	31.0	45.0
wassi n.sp.	–	–	–	–	1	–	3	5	8	2	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	20	29.4	63.0

TABLE 6. Upper jaw length, as percent standard length (rounded to nearest whole number), in Indo-West Pacific species of *Opistognathus*. Asterisks indicates species with sexually dimorphic jaws.

Table 6. Upper jaw length, as percent standard length (rounded to nearest whole number), in Indo-West Pacific species of *Opistognathus* . Asterisk indicates species with sexually dimorphic jaw lengths.

	Upper jaw as percent standard length																									Standard length		
Species	14	15	16	17	#	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	N	Min.	Max.
Upper jaw with flexible lamina posteriorly																										
adelus	–	–	–	–	–	2	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	46.2	49.6
albicaudatus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	–	2	91.4	94.8
*castelnaui**	–	–	–	–	–	–	–	–	–	–	1	1	1	3	1	4	7	3	2	–	–	–	–	23	112.4	242.5
ensiferus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	1	–	61.5
iyonis	–	–	–	–	–	–	–	3	4	1	–	–	–	–	–	–	–	–	–	–	–	–	–	8	51.0	67.2
megalops n.sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	1	–	88.0
cyanospilotus	–	1	3	5	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	10	70.5	116.0
muscatensis	–	–	–	–	–	–	1	3	13	1	–	–	–	–	–	–	–	–	–	–	–	–	–	18	163.0	315.0
*nigromarginatus**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	2	4	5	2	4	–	1	1	21	66.8	139.9
*randalli**	–	–	–	–	–	–	–	–	2	1	7	5	5	5	4	–	–	–	–	–	–	–	–	29	45.7	108.5
*solorensis**	–	–	–	–	–	–	–	5	5	5	–	4	4	3	2	2	–	–	–	–	–	–	–	30	36.7	74.5
*varabilis**	–	–	–	–	1	8	10	5	3	2	5	3	4	2	2	4	–	–	1	–	–	–	–	50	37.0	96.2
*verecundus**	–	–	–	–	–	3	5	7	3	2	1	–	1	–	–	–	–	–	–	–	–	–	–	22	30.3	52.6
Upper jaw rigid posteriuorly																										
afer	–	–	–	1	–	2	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5	37.3	41.3
albomaculatus n.sp.	–	1	6	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	9	40.5	57.3
alleni	1	6	6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	13	54.3	73.7
aspera n.sp.	–	–	–	–	–	–	–	–	–	–	1	1	1	–	–	–	–	–	–	–	–	–	–	3	34.4	50.2
aurolineatus n.sp.	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	224.0
bathyphilus n.sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	1	–	66.3
biporus n.sp.	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1	–	64.4
challenger n.sp.	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	76.4
crassus	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1	–	35.5
darwinensis	–	–	–	–	–	–	–	9	11	14	2	–	–	–	–	–	–	–	–	–	–	–	–	36	60.0	170.5
decorus	–	–	–	–	–	–	–	–	–	3	2	1	–	–	–	–	–	–	–	–	–	–	–	6	127.4	155.1
dendriticus	–	–	–	–	–	–	–	–	–	1	1	13	6	4	1	–	–	–	–	–	–	–	–	26	100.3	228.8
dipharus	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	47.2
elizabethensis	–	–	–	2	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	60.4	71.4
erdmanni n.sp.	–	–	–	–	–	–	–	–	–	–	2	1	–	2	–	–	–	–	–	–	–	–	–	5	25.9	39.3
evermanni	–	–	–	–	–	–	–	1	–	1	–	4	2	2	–	–	–	–	–	–	–	–	–	10	56.3	81.5
eximius	–	–	–	–	–	–	–	–	1	10	3	3	–	–	–	–	–	–	–	–	–	–	–	17	153.0	285.0
flavidus n.sp.	–	–	–	–	–	–	1	1	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	42.6	71.0
helvolus n.sp.	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	1	–	39.8
hongkongiensis	–	–	–	–	–	–	–	–	–	–	–	2	1	–	3	–	–	–	–	–	–	–	–	6	105.4	141.8
hopkinsi	–	–	–	–	–	–	1	1	2	1	2	–	–	–	–	–	–	–	–	–	–	–	–	7	50.4	111.2
hyalinus n.sp.	–	–	–	–	–	–	–	3	4	8	7	1	–	–	–	–	–	–	–	–	–	–	–	23	23.1	37.8
inornatus	–	–	–	–	–	–	–	–	–	–	–	2	3	4	1	–	–	–	–	–	–	–	–	10	172.0	409.0
jacksoniensis	–	–	–	1	2	11	10	2	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	27	135.2	216.0
latitabundus	–	–	–	–	–	–	–	–	–	2	3	6	2	3	3	1	–	–	–	–	–	–	–	20	66.9	216.0
liturus	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1	–	55.3
longinaris	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	41.0
macrolepis	–	–	–	–	–	–	–	3	3	4	–	1	–	–	–	–	–	–	–	–	–	–	–	11	64.3	80.3
margaretae	–	1	2	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6	44.7	77.7
microspilus n.sp.	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	53.7
nigripinnis n.sp.	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	34.0
ocellicaudatus	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	69.4
papuensis	–	–	–	–	–	–	–	–	–	–	–	6	8	2	2	–	–	–	–	–	–	–	–	18	147.8	339.0
pardus	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	98.8
parvus n.sp.	–	–	–	–	–	5	7	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	16	21.6	30.5
pholeter n.sp.	–	7	6	7	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	21	38.0	60.7
reticeps	–	–	–	–	–	–	–	–	–	–	–	3	3	–	–	–	–	–	–	–	–	–	–	6	63.7	117.3
reticulatus	–	–	–	–	–	–	–	–	1	4	2	–	–	–	–	–	–	–	–	–	–	–	–	7	99.2	368.0
rosenbergii	–	–	–	–	2	4	3	7	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	16	70.4	116.9
rufilineatus	–	–	–	–	–	–	–	–	–	–	1	2	2	1	–	–	–	–	–	–	–	–	–	6	37.3	60.7
seminudus	–	–	–	–	–	3	10	5	6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	24	57.9	86.2
simus	–	–	–	–	2	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	49.2	66.4
stigmosus	–	–	–	1	1	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	42.9	70.5
timaculatus	–	–	–	–	–	–	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	67.8	72.0
triops n.sp.	–	–	–	1	–	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	35.8	39.6
vigilax n.sp.	–	–	–	–	–	1	3	2	1	1	1	–	–	–	–	–	–	–	–	–	–	–	–	9	31.0	45.0
wassi n.sp.	–	–	–	–	–	–	–	3	–	8	7	–	–	–	–	–	–	–	–	–	–	–	–	18	29.4	63.0

TABLE. 7. Frequency distributions of dorsal-fin spines and rays in Indo-West Pacific species of *Opistognathus*.

Table 7. Frequency distributions of dorsal-fin spines and rays in Indo-West Pacific species of *Opistognathus* .

	Dorsal-fin spines				Dorsal-fin segmented rays												Total dorsal-fin elements											
Species	10	11	12	13	10	11	12	13	14	15	16	17	18	19	20	21	22	21	22	23	24	25	26	27	28	29	30	31	mean
Upper jaw with flexible lamina posteriorly																													
adelus	–	6	–	–	–	–	–	1	5	–	–	–	–	–	–	–	–	–	–	–	1	5	–	–	–	–	–	–	24.8
albicaudatus	–	2	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	26.0
castelnaui	–	29	–	–	–	–	–	–	29	–	–	–	–	–	–	–	–	–	–	–	–	29	–	–	–	–	–	–	25.0
cyanospilotus	–	14	–	–	–	–	–	–	–	12	2	–	–	–	–	–	–	–	–	–	–	–	12	2	–	–	–	–	26.1
ensiferus	–	1	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	25.0
iyonis	–	9	–	–	–	–	–	–	–	–	9	–	–	–	–	–	–	–	–	–	–	–	–	9	–	–	–	–	27.0
megalops n.sp.	–	1	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	22.0
muscatensis	–	18	–	–	–	–	–	–	–	18	–	–	–	–	–	–	–	–	–	–	–	–	18	–	–	–	–	–	26.0
nigromarginathus	–	23	–	–	–	–	–	–	22	1	–	–	–	–	–	–	–	–	–	–	–	22	1	–	–	–	–	–	25.0
solorensis	2	93	–	–	–	–	–	–	90	5	–	–	–	–	–	–	–	–	–	–	–	94	1	–	–	–	–	–	25.0
randalli	–	57	–	–	–	–	–	–	6	50	1	–	–	–	–	–	–	–	–	–	–	6	50	1	–	–	–	–	25.9
variabilis	–	70	1	–	–	–	–	–	10	56	5	–	–	–	–	–	–	–	–	–	–	10	56	5	–	–	–	–	25.9
verecundus	2	27	–	–	–	–	–	–	26	3	–	–	–	–	–	–	–	–	–	–	–	28	1	–	–	–	–	–	25.0
Upper jaw rigid posteriorly																													
afer	–	6	–	–	–	–	–	5	1	–	–	–	–	–	–	–	–	–	–	–	5	1	–	–	–	–	–	–	24.2
albomaculatus n.sp.	21	–	–	–	–	–	–	–	–	–	–	–	–	2	14	5	–	–	–	–	–	–	–	–	–	2	14	5	30.0
alleni	44	–	–	–	–	–	–	–	–	–	–	–	2	41	1	–	–	–	–	–	–	–	–	–	2	41	1	–	29.0
asper n.sp.	–	3	–	–	–	2	1	–	–	–	–	–	–	–	–	–	–	–	2	1	–	–	–	–	–	–	–	–	22.3
aurolineatus n.sp.	–	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	23.0
bathyphilus n.sp.	–	1	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	22.0
biporus n.sp.	–	1	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	22.0
challenger n.sp.	–	1	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	22.0
crassus	–	1	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	22.0
darwinensis	6	45	–	–	–	–	–	–	–	–	–	43	8	–	–	–	–	–	–	–	–	–	–	1	47	3	–	–	28.0
decorus	–	7	1	–	–	–	8	–	–	–	–	–	–	–	–	–	–	–	–	7	1	–	–	–	–	–	–	–	23.1
dendriticus	3	37	–	–	–	–	–	35	5	–	–	–	–	–	–	–	–	–	–	–	38	2	–	–	–	–	–	–	24.1
dipharus	–	1	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	26.0
elizabethensis	–	4	–	–	–	–	–	–	–	–	–	–	2	2	–	–	–	–	–	–	–	–	–	–	–	2	2	–	29.5
erdmanni n.sp.	–	5	–	–	–	5	–	–	–	–	–	–	–	–	–	–	–	–	5	–	–	–	–	–	–	–	–	–	22.0
evermanni	–	10	–	–		8	2	–	–	–	–	–	–	–	–	–	–	–	8	2	–	–	–	–	–	–	–	–	22.2
eximius	–	21	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	21	–	–	–	–	–	–	–	24.0
flavidus n.sp.	–	4	–	–	–	4	–	–	–	–	–	–	–	–	–	–	–	–	4	–	–	–	–	–	–	–	–	–	22.0
helvolus n.sp.	–	1	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	21.0
hongkongiensis	–	6	–	–	–	6	–	–	–	–	–	–	–	–	–	–	–	–	6	–	–	–	–	–	–	–	–	–	22.0
hopkinsi	–	9	–	–	–	–	–	9	–	–	–	–	–	–	–	–	–	–	–	–	9	–	–	–	–	–	–	–	24.0
hyalinus n.sp.	1	26	–	–	3	23	1	–	–	–	–	–	–	–	–	–	–	3	24	–	–	–	–	–	–	–	–	–	21.9
inornatus	–	–	15	–	–	–	–	–	–	1	14	–	–	–	–	–	–	–	–	–	–	–	–	1	14	–	–	–	27.9
jacksoniensis	30	–	–	–	–	–	–	–	–	–	1	27	2	–	–	–	–	–	–	–	–	–	1	27	2	–	–	–	27.0
latitabundus	–	–	23	–	–	–	–	–	–	–	–	2	21	–	–	–	–	–	–	–	–	–	–	–	–	2	21	–	29.9
liturus	–	1	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	22.0
longinaris	1	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1	–	30.0
macrolepis	3	8	–	–	–	1	8	2	–	–	–	–	–	–	–	–	–	–	2	9	–	–	–	–	–	–	–	–	22.8
margaretae	–	8	–	–	–	–	–	1	7	–	–	–	–	–	–	–	–	–	–	–	1	7	–	–	–	–	–	–	24.9
microspilus n.sp.	–	1	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	22.0
nigipinnis n.sp.	–	1	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	24.0
ocellicaudatus	–	1	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	22.0
papuensis	–	–	19	1	–	–	–	–	–	2	16	2		–	–	–	–	–	–	–	–	–	–	1	17	2	–	–	28.0
pardus	–	1	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	22.0
parvus n.sp.	–	45	–	–	–	2	41	2	–	–	–	–	–	–	–	–	–	–	2	41	2	–	–	–	–	–	–	–	23.0
pholeter n.sp.	59	5	–	–	–	–	–	–	–	–	–	–	–	2	46	19	2	–	–	–	–	–	–	–	–	2	44	23	30.3
reticeps	–	–	8	–	–	–	–	–	–	1	7	–	–	–	–	–	–	–	–	–	–	–	–	1	7	–	–	–	27.9
reticulatus	–	–	13	–	–	–	–	–	–	–	13	–	–	–	–	–	–	–	–	–	–	–	–	–	13	–	–	–	28.0
rosenbergii	–	16	–	–	–	–	–	16	–	–	–	–	–	–	–	–	–	–	–	–	16	–	–	–	–	–	–	–	24.0
rufilineatus	–	6	–	–	–	5	1	–	–	–	–	–	–	–	–	–	–	–	5	1	–	–	–	–	–	–	–	–	22.2
seminudus	1	66	–	–	–	–	–	–	4	60	3	–	–	–	–	–	–	–	–	–	–	4	61	2	–	–	–	–	26.0
simus	–	3	–	–	–	–	–	–	–	3	–	–	–	–	–	–	–	–	–	–	–	–	3	–	–	–	–	–	26.0
stigmosus	4	–	–	–	–	–	–	–	–	–	–	–	–	4	–	–	–	–	–	–	–	–	–	–	–	4	–	–	29.0
timaculatus	–	2	1	–	3	–	–	–	–	–	–	–	–	–	–	–	–	2	1	–	–	–	–	–	–	–	–	–	22.0
triops n.sp.	–	3	–	–	–	–	–	–	–	–	–	2	1	–	–	–	–	–	–	–	–	–	–	–	2	1	–	–	28.3
vigilax n.sp.	1	17	–	–	17	1	–	–	–	–	–	–	–	–	–	–	–	1	17	–	–	–	–	–	–	–	–	–	22.0
wassi n.sp.	1	35	–	–	1	34	1	–	–	–	–	–	–	–	–	–	–	1	35	–	–	–	–	–	–	–	–	–	22.0

TABLE. 8. Frequency distributions of anal-fin spines and rays and total pectoral-fin rays in Indo-West Pacific species of *Opistognathus*.

Table 8. Frequency distributions of anal-fin spines and rays and total pectoral-fin rays in Indo-West Pacific species of *Opistognathus*.

	Anal-fin spin		Anal-fin rays												Total pectoral-fin rays													
Species	2	3	10	11	12	13	14	15	16	17	18	19	20	36	37	38	39	40	41	42	43	44	45	46	47	48	49	mean
Upper jaw with flexible lamina posteriorly																												
adelus	–	6	–	–	–	1	5	–	–	–	–	–	–	4	1	1	–	–	–	–	–	–	–	–	–	–	–	36.5
albicaudatus	–	2	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	1	–	1	–	–	–	–	–	–	–	41.0
castelnaui	–	29	–	–	–	–	29	–	–	–	–	–	–	–	–	1	2	21	3	–	1	–	–	–	–	–	–	41.5
cyanospilotus	–	14	–	–	–	–	–	14	–	–	–	–	–	–	–	1	–	10	1	2	–	–	–	–	–	–	–	40.2
ensiferus	–	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	40.0
iyonis	9	–	–	–	–	–	9	–	–	–	–	–	–	–	1	6	1	1	–	–	–	–	–	–	–	–	–	38.2
megalops n.sp.	1	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	40.0
muscatensis	–	18	–	–	–	–	–	18	–	–	–	–	–	–	–	–	–	3	–	7	4	4	–	–	–	–	–	42.3
nigromarginathus	–	23	–	–	–	–	22	1	–	–	–	–	–	–	–	–	4	12	2	5	–	–	–	–	–	–	–	40.3
solorensis	–	95	–	–	–	1	93	1	–	–	–	–	–	8	2	50	7	10	–	–	–	–	–	–	–	–	–	38.1
randalli	–	57	–	–	–	–	35	22	–	–	–	–	–	–	3	38	4	11	–	–	–	–	–	–	–	–	–	38.4
variabilis	1	70	–	–	–	–	11	55	5	–	–	–	–	2	–	28	6	33	–	–	–	–	–	–	–	–	–	38.0
verecundus	–	29	–	–	–	1	27	1	–	–	–	–	–	15	6	8	–	–	–	–	–	–	–	–	–	–	–	36.8
Upper jaw rigid posteriorly																												
afer	–	6	–	–	1	4	1	–	–	–	–	–	–	–	–	2	–	3	1	–	–	–	–	–	–	–	–	39.5
albomaculatus n.sp.	21	–	–	–	–	–	–	–	–	–	5	14	2	–	–	13	1	5	–	–	–	–	–	–	–	–	–	38.6
alleni	40	–	–	–	–	–	–	–	4	36	–	–		–	–	23	5	12	–	–	–	–	–	–	–	–	–	38.7
asper n.sp.	3	–	3	–	–	–	–	–	–	–	–	–	–	–	–	3	–	–	–	–	–	–	–	–	–	–	–	38.0
aurolineatus n.sp.	1	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	40.0
bathyphilus n.sp.	1	–	–	1	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	38.0
biporus n.sp.	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	38.0
challenger n.sp.	1	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	39.0
crassus	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	38.0
darwinensis	51	–	–	–	–	1	47	3	–	–	–	–	–	–	–	6	–	28	7	4	–	–	–	–	–	–	–	40.0
decorus	8	–	–	8	–	–	–	–	–	–	–	–	–	–	–	1	2	5	1	1	–	–	–	–	–	–	–	40.4
dendriticus	40	–	–	1	26	14	–	–	–	–	–	–	–	–	–	1	–	21	5	5	–	–	–	–	–	–	–	40.4
dipharus	–	1	–	–	–	–	–	–	1	–	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	38.0
elizabethensis	4	–	–	–	–	–	–	–	–	1	2	1	–	–	–	1	–	2	–	–	–	–	–	–	–	–	–	39.7
erdmanni n.sp.	5	–	4	1	–	–	–	–	–	–	–	–	–	–	–	5	–	–	–	–	–	–	–	–	–	–	–	38.0
evermanni	10	–	9	1	–	–	–	–	–	–	–	–	–	–	–	2	–	3	1	3	–	–	–	–	–	–	–	40.7
eximius	21	–	–	–	21	–	–	–	–	–	–	–	–	–	–	–	–	7	4	9	1	–	–	–	–	–	–	41.2
helvolus n.sp.	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	40.0
flavidus n.sp.	4	–	4	–	–	–	–	–	–	–	–	–	–	–	–	3	–	1	–	–	–	–	–	–	–	–	–	38.5
hongkongiensis	6	–	–	6	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	41.0
hopkinsi	9	–	–	–	9	–	–	–	–	–	–	–	–	–	–	–	–	9	–	–	–	–	–	–	–	–	–	40.0
hyalinus n.sp.	27	–	27	–	–	–	–	–	–	–	–	–	–	–	–	17	–	8	–	–	–	–	–	–	–	–	–	38.7
inornatus	15	–	–	–	–	1	13	1	–	–	–	–	–	–	–	–	1	–	–	3	1	10	1	–	–	–	–	43.6
jacksoniensis	30	–	–	–	–	–	–	3	21	1	–	–	–	–	–	1	–	17	2	8	–	–	–	–	–	–	–	40.2
latitabundus	23	–	–	–	–	–	–	16	7	–	–	–	–	–	–	–	2	–	–	–	–	1	2	10	3	6	1	46.6
liturus	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	38.0
longinaris	–	1	–	–	–	–	–	–	–	–	–	1	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	38.0
macrolepis	11	–	2	8	1	–	–	–	–	–	–	–	–	–	–	2	–	6	1	–	–	–	–	–	–	–	–	39.6
margaretae	8	–	–	–	–	1	7	–	–	–	–	–	–	–	–	–	2	7	–	–	–	–	–	–	–	–	–	39.9
microspilus n.sp.	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	1	–	–	–	–	–	–	–	–	41.0
nigripinnis n.sp.	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	40.0
ocellicaudatus	1	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	42.0
papuensis	20	–	–	–	–	–	16	4	–	–	–	–	–	–	–	–	–	–	–	6	–	13	–	1	–	–	–	43.5
pardus	1	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	40.0
parvus n.sp.	45	–	–	4	41	–	–	–	–	–	–	–	–	–	–	–	–	9	2	17	–	4	–	–	–	–	–	41.6
pholeter n.sp.	68	–	–	–	–	–	–	–	–	1	60	7	–	–	2	17	–	43	1	2	–	–	–	–	–	–	–	39.4
reticeps	8	–	–	–	–	1	7	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6	–	2	–	–	–	44.5
reticulatus	12	–	–	–	–	8	4	–	–	–	–	–	–	–	–	–	–	–	–	10	1	1	–	–	–	–	–	42.3
rosenbergii	–	19	–	–	–	18	1	–	–	–	–	–	–	–	–	–	–	–	–	6	5	7	–	–	–	–	–	43.0
rufilineatus	6	–	4	2	–	–	–	–	–	–	–	–	–	–	–	2	–	3	–	1	–	–	–	–	–	–	–	39.7
seminudus	67	–	–	–	–	–	51	16	–	–	–	–	–	–	–	3	–	30	12	15	–	–	–	–	–	–	–	40.5
simus	–	3	–	–	–	–	–	2	1	–	–	–	–	–	–	–	4	3	–	–	–	–	–	–	–	–	–	40.0
stigmosus	4	–	–	–	–	–	–	–	–	–	4	–	–	–	–	–	–	2	–	1	–	–	–	–	–	–	–	40.2
trimaculatus	3	–	3	–	–	–	–	–	–	–	–	–	–	–	–	1	1	2	–	–	–	–	–	–	–	–	–	39.3
triops n.sp.	3	–	–	–	–	–	–	–	–	3	–	–	–	–	–	1	–	1	–	–	–	–	–	–	–	–	–	39.0
vigilax n.sp.	18	–	17	1	–	–	–	–	–	–	–	–	–	–	–	4	–	5	–	3	–	4	–	–	–	–	–	36.3
wassi n.sp.	36	–	2	–	–	–	–	–	–	–	–	–	–	–	–	3	7	17	1	3	–	–	–	–	–	–	–	39.8

TABLE. 9. Frequency distributions of caudal-fin rays in Indo-West Pacific species of *Opistognathus*.

Table 9. Frequency distributions of caudal-fin rays in Indo-West Pacific species of *Opistognathus* .

	Procurrent caudal-fin rays																
	Upper				Lower			Total							Branched caudal-fin rays				
Species	3	4	5	6	3	4	5	6	7	8	9	10	11	mean	11	12	13	14	mean
Species with flexible upper jaws																			
adelus	1	3	–	–	1	3	–	1	–	3	–	–	–	7.3	–	–	1	3	12.2
albicaudatus	1	1	–	–	2	–	–	1	1	–	–	–	–	6.5	–	2	–	–	12.0
castelnaui	–	8	21	–	–	23	6	–	–	8	15	6	–	8.9	–	7	4	18	13.4
cyanospilotus	–	2	9	2	–	6	7	–	–	2	4	5	2	9.5	–	1	6	6	13.8
ensiferus	–	1	–	–	–	1	–	–	–	–	1	–	–	8.0	–	–	–	1	14.0
iyonis	4	4	–	–	7	1	–	4	3	1	–	–	–	6.6	2	6	–	–	13.8
muscatensis	–	2	10	–	–	10	2	–	–	2	8	2	–	9.0	–	–	1	11	13.9
nigromarginathus	–	2	20	–	1	16	5	–	–	3	14	5	–	9.1	–	3	9	10	13.3
randalli	–	–	16	34	–	6	44	–	–	–	6	10	34	10.6	–	13	17	18	13.1
solorensis	–	10	43	7	–	33	27	–	–	9	25	19	7	9.5	–	8	4	32	13.6
variabilis	1	1	45	9	1	11	44	–	–	8	14	33	9	9.9	–	16	15	16	13.0
verecundus	–	20	9	–	3	26	–	–	3	18	7	1	–	8.2	–	4	6	12	13.4
Species with rigid upper jaws																			
afer	–	2	3	1	–	5	1	–	–	2	2	2	–	9.0	–	5	1	–	12.2
albomaculatus	16	4	1	–	17	3	1	16	1	3	–	1	–	6.5	1	7	5	2	12.1
alleni	–	44	1	–	20	25	–	–	21	23	1	–	–	7.6	–	4	20	21	13.4
asper	–	2	1	–	–	3	–	–	–	2	1	–	–	8.3	2	1	–	–	11.3
aurolineatus	–	1	–	–	–	1	–	–	–	1	–		–	8.0	–	1	–	–	12.0
bathyphilus	1	–	–	–	1	–	–	1	–	–	–	–	–	6.0	–	1	–	–	12.0
biporus	–	1	–	–	–	1	–	–	–	1	–	–	–	8.0	–	1	–	–	12.0
challenger	1	–	–	–	1	–	–	1	–	–	–	–	–	6.0	–	1	–	–	12.0
crassus	–	1	–	–	–	1	–	–	–	1	–	–	–	8.0	–	1	–	–	12.0
darwinensis	2	47	1	–	30	20	–	2	26	22	–	–	–	7.4	–	14	13	12	13.0
decorus	–	4	3	–	–	7	–	–	–	4	3	–	–	8.4	–	7	1	–	12.1
dendriticus	8	35	–	–	21	21	–	7	13	22	–	–	–	7.3	–	30	5	4	12.3
dipharus	–	–	1	–	–	1	–	–	–	–	–	–	–	9.0	1	–	–	–	11.0
elizabethensis	–	–	4	–	–	3	1	–	–	–	3	–	–	9.5	–	1	3	–	13.0
erdmanni	–	5	–	–	–	5	–	–	–	5	–	–	–	8.0	–	3	–	–	12.0
evermanni	10	–	–	–	9	1	–	9	1	–	–	–	–	6.1	1	7	–	–	11.9
eximus	1	17	2	–	–	20	–	–	1	17	2	–	–	8.1	–	16	–	–	13.7
flavidus	3	–	–	–	3	–	–	3	–	–	–	–	–	6.0	–	3	–	–	12.0
helvolus	3	–	–	–	3	–	–	3	–	–	–	–	–	6.0	–	1	–	–	12.0
hongkongiensis	1	5	–	–	2	4	–	–	–	–	–	–	–	7.7	–	4	–	–	12.5
hopkinsi	1	7	–	–	–	8	–	–	1	7	–	–	–	6.1	–	7	1	–	13.1
hyalinus	17	2	–	–	17	2	–	16	2	1	–	–	–	6.2	–	24	–	–	12.0
inornatus	1	10	1	–	5	7	–	1	4	6	1	–	–	7.6	–	4	2	4	11.0
jacksoniensis	–	24	–	–	11	13	–	–	10	14	–	–	–	7.6	–	–	–	24	14.0
latitabundus	14	7	–	–	17	4	–	14	3	4	–	–	–	6.5	–	6	7	8	13.1
liturus	–	1	–	–	–	1	–	–	–	1	–	–	–	8.0	–	1	–	–	12.0
longinaris	–	–	1	–	–	1	–	–	–	–	1	–	–	9.0	1	–	–	–	11.0
macrolepis	11	–	–	–	11	–	–	11	–	–	–	–	–	6.0	–	3	6	1	12.9
margaretae	–	1	7	–	–	8	–	–	–	–	–	1	–	9.0	–	2	5	–	12.8
microspilus	1	–	–	–	1	–	–	1	–	–	–	–	–	6.0	–	1	–	–	12.0
nigripinnis	1	–	–	–	1	–	–	1	–	–	–	–	–	6.0	–	**?**	–	–	**?**
ocellicaudatus	1	–	1	–		–	–	1	–	–	–	–	–	6.0	–	1	–	–	12.0
papuensis	1	16	–	–	6	11	–	1	5	11	–	–	–	7.6	–	2	1	15	13.7
pardus	1	–	–	–	1	–	–	1	–	–	–	–	–	6.0	–	1	–	–	12.0
parvus	27	1	–	–	28	–	–	27	–	–	–	–	–	6.0	13	22	–	–	11.6
pholeter	1	51	10	–	5	55	2	–	6	44	11	1	–	8.1	–	4	11	16	13.4
reticeps	3	2	–	–	4	1	–	3	1	1	–	–	–	6.6	–	5	–	–	12.0
reticulatus	5	6	–	–	9	2	–	5	4	2	–	–	–	6.7	–	9	2	–	12.6
rosenbergii	–	6	9	–	–	12	3	–	–	6	6	3	–	8.8	–	9	2	3	12.0
rufilineatus	–	5	–	–	–	5	–	–	–	5	–	–	–	8.0	–	5	–	–	12.0
seminudus	–	6	60	1	–	48	19	–	–	4	42	20	1	9.3	34	14	11	–	11.6
simus	–	–	1	2	–	1	2	–	–	–	1	–	2	10.3	–	–	3	–	13.0
stigmosus	–	–	4	–	–	2	2	–	–	–	2	2	–	9.5	–	–	4	–	13.0
trimaculatus	3	–	–	–	3	–	–	3	–	–	–	–	–	6.0	–	1	1	–	12.5
triops	–	–	3	–	–	2	1	–	–	–	2	1	–	9.3	–	3	–	–	12.0
vigilax	10	6	1	–	12	5	–	10	2	4	1	–	–	6.8	–	14	–	–	12.0
wassi	4	27	–	–	5	26	–	3	3	25	–	–	–	7.7	1	28	1	–	12.0

TABLE. 10. Frequency distributions of vertebral counts in Indo-West Pacific species of *Opistognathus*.

Table 10. Frequency distributions of vertebral counts in Indo-West Pacific species of *Opistognathus* .

	Precaudal					Caudal											Total											
Species	9	10	11	12	13	15	16	17	18	19	20	21	22	23	24	25	25	26	27	28	29	30	31	32	33	34	35	mean
Upper jaw with flexible lamina posteriorly																												
adelus	–	6	–	–	–	–	–	1	5	–	–	–	–	–	–	–	–	–	1	5	–	–	–	–	–	–	–	27.8
albicaudatus	–	2	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	29.0
castelnaui	–	27	–	–	–	–	–	–	27	–	–	–	–	–	–	–	–	–	–	27		–	–	–	–	–	–	29.0
cyanospilotus	–	14	–	–	–	–	–	–	–	14	–	–	–	–	–	–	–	–	–	–	14	–	–	–	–	–	–	29.0
ensiferus	–	1	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1		–	–	–	–	–	–	29.0
iyonis	–	9	–	–	–	–	–	–	–	9	–	–	–	–	–	–	–	–	–	–	9	–	–	–	–	–	–	29.0
megalops n.sp.	–	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	26.0
muscatensis	–	18	–	–	–	–	–	–	–	18	–	–	–	–	–	–	–	–	–	–	18	–	–	–	–	–	–	29.0
nigromarginathus	–	22	–	–	–	–	–	–	22	–	–	–	–	–	–	–	–	–	–	22	–	–	–	–	–	–		29.0
randalli	–	53	–	–	–	–	–	–	53	–	–	–	–	–	–	–	–	–	–	53		–	–	–	–	–	–	29.0
solorensis	–	95	–	–	–	–	–	1	92	2	–	–	–	–	–	–	–	–	1	92	2	–	–	–	–	–	–	29.0
variabilis	–	70	–	–	–	–	–	–	9	51	5	–	–	–	–	–	–	–	–	9	51	5	–	–	–	–	–	29.0
verecundus	–	29	–	–	–	–	–	–	28	1	–	–	–	–	–	–	–	–	–	28	1	–	–	–	–	–	–	29.0
Upper jaw rigid posteriorly																												
afer	–	6	–	–	–	–	–	5	1	–	–	–	–	–	–	–	–	–	5	1	–	–	–	–	–	–	–	27.2
albomaculatus n.sp.	–	20	–	–	–	–	–	–	–	–	–	–	–	3	14	3	–	–	–	–	–	–	–	–	3	14	3	34.0
alleni	–	35	–	–	–	–	–	–	–	–	–	–	34	1	–	–	–	–	–	–	–	–	–	34	1	–	–	32.0
asper n.sp.	–	3	–	–	–	–	3	–	–	–	–	–	–	–	–	–	–	3	–	–	–	–	–	–	–	–	–	26.0
aurolineatus n.sp.	–	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	26.0
bathyphilus n.sp.	–	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–		–	–	26.0
biporus n.sp.	–	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	26.0
challenger n.sp.	–	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	26.0
crassus	–	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	26.0
darwinensis	–	–	1	49	2	–	–	–	4	47	1	–	–	–	–	–	–	–	–	–	–	3	48	1	–	–	–	31.0
decorus	–	8	–	–	–	–	8	–	–	–	–	–	–	–	–	–	–	8	–	–	–	–	–	–	–	–	–	26.0
dendriticus	–	2	36	–	–	–	36	2	–	–	–	–	–	–	–	–	–	38	–	–	–	–	–	–	–	–	–	27.0
dipharus	–	1	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	29.0
elizabethensis	–	4	–	–	–	–	–	–	–	–	–	–	–	4	–	–	–	–	–	–	–	–	–	–	4	–	–	33.0
erdmanni n.sp.	–	5	–	–	–	–	5	–	–	–	–	–	–	–	–	–	–	5	–	–	–	–	–	–	–	–	–	26.0
evermanni	–	10	–	–	–	–	10	–	–	–	–	–	–	–	–	–	–	10	–	–	–	–	–	–	–	–	–	26.0
eximius	–	20	–	–	–	–	20	–	–	–	–	–	–	–	–	–	–	20	–	–	–	–	–	–	–	–	–	26.0
flavidus n.sp.	–	4	–	–	–	–	4	–	–	–	–	–	–	–	–	–	–	4	–	–	–	–	–	–	–	–	–	26.0
helvolus n.sp.	–	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	26.0
hongkongiensis	–	6	–	–	–	–	6	–	–	–	–	–	–	–	–	–	–	6	–	–	–	–	–	–	–	–	–	26.0
hopkinsi	–	8	–	–	–	–	–	7	1	–	–	–	–	–	–	–	–	–	7	1	–	–	–	–	–	–	–	27.1
hyalinus n.sp.	–	27	–	–	–	1	23	3	–	–	–	–	–	–	–	–	–	23	3	–	–	–	–	–	–	–	–	26.1
inornatus	–	–	–	12	–	–	–	–	1	10	1	–	–	–	–	–	–	–	–	–	–	1	10	1	–	–	–	31.0
jacksoniensis	–	30	–	–	–	–	–	–	–	–	29	1	–	–	–	–	–	–	–	–	–	29	1	–	–	–	–	30.0
latitabundus	–	–	–	–	22	–	–	–	–	2	18	2	–	–	–	–	–	–	–	–	–	–	–	2	18	2	–	33.0
liturus	–	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	26.0
longinaris	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1	–	34.0
macrolepis	–	11	–	–	–	–	11	–	–	–	–	–	–	–	–	–	–	11	–	–	–	–	–	–	–	–	–	26.0
margaretae	–	8	–	–	–	–	–	–	8	–	–	–	–	–	–	–	–	–	–	8	–	–	–	–	–	–	–	28.0
microspilus n.sp.	–	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	26.0
nigripinnis n.sp.	–	1	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	28.0
ocellicaudatus	–	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	26.0
papuensis	–	–	–	19	–	–	–	–	–	19	–	–	–	–	–	–	–	–	–	–	–	–	19	–	–	–	–	31.0
pardus	–	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	26.0
parvus n.sp.	1	36	–	–	–	–	–	34	3	–	–	–	–	–	–	–	–	–	35	2	–	–	–	–	–	–	–	27.0
pholeter n.sp.	–	–	69	–	–	–	–	–	–	–	–	–	2	65	2	–	–	–	–	–	–	–	–	–	2	65	2	34.0
reticeps	–	–	–	6	–	–	–	–	–	6	–	–	–	–	–	–	–	–	–	–	–	–	6	–	–	–	–	31.0
reticulatus	–	–	–	–	11	–	–	–	11	–	–	–	–	–	–	–	–	–	–	–	–	–	11	–	–	–	–	31.0
rosenbergii	–	18	–	–	–	–	–	18	–	–	–	–	–	–	–	–	–	–	18	–	–	–	–	–	–	–	–	27.0
rufilineatus	–	5	–	–	–	–	5	–	–	–	–	–	–	–	–	–	–	5	–	–	–	–	–	–	–	–	–	26.0
seminudus	–	68	–	–	–	–	–	–	67	1	–	–	–	–	–	–	–	–	–	67	1	–	–	–	–	–	–	28.0
simus	–	3	–	–	–	–	–	–	–	3	–	–	–	–	–	–	–	–	–	–	3	–	–	–	–	–	–	28.0
stigmosus	–	4	–	–	–	–	–	–	–	–	–	–	–	4	–	–	–	–	–	–	–	–	–	–	4	–	–	33.0
trimaculatus	–	3	–	–	–	–	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	26.0
triops n.sp.	–	3	–	–	–	–	–	–	–	–	–	–	1	2	–	–	–	–	–	–	–	–	–	1	2	–	–	32.7
vigilax n.sp.	–	18	–	–	–	–	18	–	–	–	–	–	–	–	–	–	–	18	–	–	–	–	–	–	–	–	–	26.0
wassi n.sp.	–	33	–	–	–	1	32	–	–	–	–	–	–	–	–	–	1	32	–	–	–	–	–	–	–	–	–	26.0

TABLE 11. Frequency distributions of upper and lower gill raker counts in species of Indo-West Pacific *Opistognathus*, excluding specimens of *O. wassi* n.sp. and *O. vigilax* n.sp.< 20 mm SL. Asterisks following species name indicates that counts were tabulated separately for both the left and right gill arches.

Table 11. Frequency distributions of upper and lower gill raker counts in species of Indo-West Pacific *Opistognathus,* excluding specimens of *O. wassi* n.sp. and *O. vigilax* n.sp. < 20 mm SL. Asterisks following species name indicates that counts were tabulated separately for both the left and right gill arches.

	Upper gill rakers														Lower gill rakers																
Species	5	6	7	8	9	10	11	12	13	14	15	16	17	mean	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	mean
Upper jaw with flexible lamina posteriorly																																	
adelus	–	–	–	–	4	–	–	–	–	–	–	–	–	9.0	–	–	1	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	15.7
albicaudatus	–	–	–	–	–	–	2	–	–	–	–	–	–	11.0	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	20.5
castelnaui	–	–	–	–	2	2	13	11	2	–	–	–	–	11.3	–	–	–	–	–	3	2	8	12	5	–	–	–	–	–	–	–	–	20.5
cyanospilotus	–	–	–	–	–	–	8	6	–	–	–	–	–	11.4	–	–	–	–	–	–	–	1	4	6	3	–	–	–	–	–	–	–	21.8
*ensiferus**	–	–	–	–	1	1	–	–	–	–	–	–	–	9.5	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	–	18.5
iyonis	–	–	–	2	1	2	2	2	–	–	–	–	–	10.1	–	–	–	–	–	–	2	2	2	2	1	–	–	–	–	–	–	–	20.6
megalops n.sp.	–	–	–	–	–	–	–	1	–	–	–	–	–	12.0	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	26.0
muscatensis	–	–	–	–	–	–	–	1	6	4	2	2	–	13.9	–	–	–	–	–	–	–	–	–	–	2	4	4	2	2	1	–	–	25.1
nigromarginathus	–	–	–	–	–	–	–	–	2	6	7	7	–	14.9	–	–	–	–	–	–	–	–	–	–	1	1	5	8	5	–	2	–	26.0
randalli	–	–	–	–	–	–	1	10	31	13	–	–	–	13.0	–	–	–	–	–	–	–	–	–	3	17	11	19	5	–	–	–	–	22.7
solorensis	–	–	–	–	15	28	27	3	1	–	–	–	–	10.3	–	–	–	–	3	28	33	10	–	–	–	–	–	–	–	–	–	–	18.7
variabilis	–	–	–	–	–	6	14	26	13	3	1	–	–	11.9	–	–	–	–	–	–	7	27	13	11	2	3	–	–	–	–	–	–	20.7
verecundus	–	–	–	11	13	–	–	–	–	–	–	–	–	8.5	–	–	10	13	1	–	–	–	–	–	–	–	–	–	–	–	–	–	15.6
Upper jaw rigid posteriorly																																	
afer	–	–	–	6	–	–	–	–	–	–	–	–	–	8.0	–	3	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	14.5
albomaculatus	1	6	13	–	–	–	–	–	–	–	–	–	–	6.6	3	9	8	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	14.3
alleni	–	–	–	13	26	1	–	–	–	–	–	–	–	8.7	–	–	–	11	27	2	–	–	–	–	–	–	–	–	–	–	–	–	16.8
*asper** n.sp.	–	–	–	–	–	5	1	–	–	–	–	–	–	10.2	–	–	–	–	–	–	–	–	–	2	2	2	–	–	–	–	–	–	23.0
aurolineatus n.sp.	–	–	–	–	–	–	–	1	–	–	–	–	–	12.0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	27.0
*bathyphilus** n.sp.	–	–	–	–	–	–	–	2	–	–	–	–	–	12.0	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	25.0
*biporus** n.sp.	–	–	–	–	–	–	2	–	–	–	–	–	–	11.0	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	26.0
*challenger** n.sp.	–	–	–	–	–	2	–	–	–	–	–	–	–	10.0	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	20.0
crassus	–	–	–	–	–	–	1	–	–	–	–	–	–	11.0	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	23.0
darwinensis	–	–	–	5	10	26	10	–	–	–	–	–	–	9.8	–	–	–	4	16	21	10	–	–	–	–	–	–	–	–	–	–	–	17.7
*decorus**	–	–	–	–	–	–	–	–	2	13	1	–	–	13.9	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	7	6	1	28.4
dendriticus	–	–	–	1	1	6	21	3	–	–	–	–	–	10.8	–	–	–	–	–	5	3	19	5	–	–	–	–	–	–	–	–	–	19.8
*dipharus**	–	–	–	–	–	2	–	–	–	–	–	–	–	10.0	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	18.0
elizabethensis	–	–	–	4	–	–	–	–	–	–	–	–	–	8.0	–	–	–	3	1	–	–	–	–	–	–	–	–	–	–	–	–	–	20.3
erdmanni n.sp.	–	–	–	–	1	4	–	–	–	–	–	–	–	9.8	–	–	–	–	–	–	1	–	4	–	–	–	–	–	–	–	–	–	20.6
evermanni	–	–	–	2	3	1	3	–	–	–	–	–	–	9.6	–	–	–	–	–	3	1	2	3	–	–	–	–	–	–	–	–	–	19.6
eximius	–	–	–	–	–	–	–	–	–	3	7	7	1	15.3	–	–	–	–	–	–	–	–	–	–	–	–	5	7	5	1	–	–	26.1
flavidus n.sp.	–	–	–	–	2	2	–	–	–	–	–	–	–	9.5	–	–	–	–	–	–	–	–	1	3	–	–	–	–	–	–	–	–	21.7
helvolus n.sp.	–	–	–	–	–	–	1	–	–	–	–	–	–	11.0	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	21.0
*hongkongiensis**	–	–	–	1	4	3	–	–	–	–	–	–	–	9.3	–	–	–	–	–	–	–	2	3	3	–	–	–	–	–	–	–	–	21.1
*hopkinsi**	–	–	–	–	–	–	–	–	–	6	3	1	2	11.6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6	–	6		29.0
hyalinus n.sp.	–	–	–	–	–	–	4	8	6	2	–	–	–	12.3	–	–	–	–	–	–	–	–	–	–	4	7	8	–	1	–	–	–	24.4
inornatus	–	–	2	11	2	–	–	–	–	–	–	–	–	8.0	–	–	–	4	10	1	–	–	–	–	–	–	–	–	–	–	–	–	16.8
jacksoniensis	–	–	–	–	7	20	2	–	–	–	–	–	–	9.8	–	–	–	–	–	–	7	17	5	–	–	–	–	–	–	–	–	–	19.9
latitabundus	–	–	–	23	–	–	–	–	–	–	–	–	–	8.0	–	–	18	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	15.2
liturus	–	–	–	–	1	–	–	–	–	–	–	–	–	9.0	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	22.0
*longinaris**	–	–	–	1	1	–	–	–	–	–	–	–	–	8.5	–	–	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	15.5
macrolepis	–	–	–	–	2	4	3	–	–	–	–	–	–	10.1	–	–	–	–	–	–	–	6	2	1	–	–	–	–	–	–	–	–	20.4
margaretae	–	–	–	–	–	3	4	1	–	–	–	–	–	10.7	–	–	–	–	6	2	–	–	–	–	–	–	–	–	–	–	–	–	17.3
*microspilus**	–	–	–	–	2	–	–	–	–	–	–	–	–	9.0	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	20.0
nigripinnis	–	–	–	–	1	–	–	–	–	–	–	–	–	9.0	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	17.0
ocellicaudatus	–	–	–	–	–	–	1	–	–	–	–	–	–	11.0	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	31.0
papuensis	–	–	–	4	15	–	–	–	–	–	–	–	–	8.8	–	–	–	4	12	3	–	–	–	–	–	–	–	–	–	–	–	–	16.9
*pardus**	–	–	–	–	–	–	–	–	–	–	1	1	–	15.5	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	25.0
parvus n.sp.	–	–	–	–	6	24	6	–	–	–	–	–	–	10.0	–	–	–	–	1	10	4	8	11	2	–	–	–	–	–	–	–	–	19.7
pholeter n.sp.	–	–	4	31	17	–	–	–	–	–	–	–	–	8.2	–	–	11	24	13	4	–	–	–	–	–	–	–	–	–	–	–	–	16.2
reticeps	–	–	–	1	6	1	–	–	–	–	–	–	–	9.0	–	–	–	–	2	5	1	–	–	–	–	–	–	–	–	–	–	–	17.9
reticulatus	–	–	3	8	–	–	–	–	–	–	–	–	–	7.7	–	8	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	14.3
rosenbergii	–	–	–	–	–	3	11	4	–	–	–	–	–	11.1	–	–	–	–	–	–	–	4	7	2	5	–	–	–	–	–	–	–	21.4
rufilineatus	–	–	–	–	–	1	5	–	–	–	–	–	–	10.8	–	–	–	–	–	–	–	–	–	2	4	–	–	–	–	–	–	–	22.8
seminudus	–	–	–	32	30	1	–	–	–	–	–	–	–	8.5	–	–	–	14	41	8	–	–	–	–	–	–	–	–	–	–	–	–	16.9
simus	–	–	–	–	–	3	–	–	–	–	–	–	–	10.0	–	–	–	–	1	2	–	–	–	–	–	–	–	–	–	–	–	–	17.7
stigmosus	–	–	1	2	1	–	–	–	–	–	–	–	–	8.0	–	–	1	1	1	1	–	–	–	–	–	–	–	–	–	–	–	–	16.5
trimaculatus	–	–	–	–	–	–	2	–	1	–	–	–	–	11.7	–	–	–	–	–	–	–	–	1	–	2	–	–	–	–	–	–	–	22.3
*triops** n.sp.	–	–	–	2	4	–	–	–	–	–	–	–	–	8.7	–	–	–	1	1	4	–	–	–	–	–	–	–	–	–	–	–	–	17.5
vigilax n.sp.	–	–	–	4	10	2	–	–	–	–	–	–	–	8.9	–	–	–	–	1	8	3	3	1	–	–	–	–	–	–	–	–	–	18.7
wassi n.sp.	–	–	–	–	–	8	15	4	–	–	–	–	–	10.9	–	–	–	–	–	–	–	–	–	–	8	11	7	1	–	–	–	–	24.0

TABLE 12. Frequency distributions of total gill raker counts in species of Indo-West Pacific *Opistognathus*, excluding specimens <20 mm SL. Asterisks following species name indicates that counts were tabulated separately for both the left and right gill arches.

Table 12. Frequency distributions of total gill raker counts in species of Indo-West Pacific *Opistognathus,* excluding specimens < 20 mm SL. Asterisks following species name indicates that counts were tabulated separately for both the left and right gill arches.

	Total gill rakers																													
Species	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	mean
Upper jaw with flexible lamina posteriorly																														
adelus	–	–	–	–	–	1	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	24.7
albicaudatus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	31.5
castelnaui	–	–	–	–	–	–	–	–	–	2	1	4	5	7	7	2	2	–	–	–	–	–	–	–	–	–	–	–	–	31.8
cyanospilotus	–	–	–	–	–	–	–	–	–	–	–	–	3	5	2	4	–	–	–	–	–	–	–	–	–	–	–	–	–	32.5
*ensiferus**	–	–	–	–	–	–	–	–	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	28.0
iyonis	–	–	–	–	–	–	–	–	1	2	–	1	1	–	4	–	1	–	–	–	–	–	–	–	–	–	–	–	–	31.1
megalops n.sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	38.0
muscatensis	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	3	3	1	2	2	1	–	1	–	–	–	38.9
nigromarginathus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	2	8	4	2	2	2	1	–	–	41.0
randalli	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	2	5	12	11	12	9	3	–	–	–	–	–	–	–	37.1
solorensis	–	–	–	–	–	–	–	1	8	18	24	16	5	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	28.9
variabilis	–	–	–	–	–	–	–	–	–	–	4	5	10	14	11	7	7	1	3	–	1	–	–	–	–	–	–	–	–	32.6
verecundus	–	–	–	–	5	11	7	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	24.2
Upper jaw rigid posteriorly																														
afer	–	–	–	3	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	22.5
albomaculatus n.sp.	4	2	7	7	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	20.9
alleni	–	–	–	–	–	6	12	20	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	25.5
*asper** n.sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	2	1	3	–	–	–	–	–	–	–	–	–	–	–	–	–	33.2
aurolineatus n.sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1		–	–	–	–	–	–	–	39.0
*bathyphilus** n.sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	37.0
*biporus** n.sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	37.0
*challenger** n.sp.	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	30.0
crassus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	34.0
darwinensis	–	–	–	–	–	3	3	7	9	13	12	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	27.5
*decorus**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	4	7	1		–	–	42.3
dendriticus	–	–	–	–	–	–	–	–	–	4	2	6	15	4	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	30.5
*dipharus**	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	28.0
elizabethensis	–	–	–	–	–	1	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	24.8
erdmanni n.sp.	–	–	–	–	–	–	–	–	–	–	1	1	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	30.4
evermanni	–	–	–	–	–	–	–	2	1	1	1	–	2	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	30.2
eximius	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	4	3	6	3	1	–	–	–	41.5
flavidus n.sp.	–	–	–	–	–	–	–	–	–	–	–	1	2	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	31.0
helvolus n.sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	32.0
*hongkongiensis**	–	–	–	–	–	–	–	–	–	–	5	1	3	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	30.0
*hopkinsi**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	2	2	1	1	2	43.9
hyalinus n.sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	3	5	4	3	2	1	–	–	–	–	–	–	–	36.7
inornatus	–	–	–	–	–	5	8	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	24.8
jacksoniensis	–	–	–	–	–	–	–	–	–	3	8	12	5	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	29.8
latitabundus	–	–	–	–	18	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	23.2
liturus	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	31.0
*longinaris**	–	–	–	–	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	24.0
macrolepis	–	–	–	–	–	–	–	–	–	–	2	4	–	2	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	30.6
margaretae	–	–	–	–	–	–	–	2	4	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	27.1
*microspilus** n.sp.	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	29.0
nigripinnis n.sp.	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	26.0
ocellicaudatus	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	31.0
papuensis	–	–	–	–	–	1	5	11	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	25.7
*pardus**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	40.5
parvus n.sp.	–	–	–	–	–	–	–	1	3	8	4	5	11	2	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	29.7
pholeter n.sp.	–	–	–	–	2	5	23	13	7	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	24.5
reticeps	–	–	–	–	–	–	1	1	5	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	26.9
reticulatus	–	–	2	7	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	22.0
rosenbergii	–	–	–	–	–	–	–	–	–	–	–	2	5	4	2	2	3	–	–	–	–	–	–	–	–	–	–	–	–	34.0
rufilineatus	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1	4	–	–	–	–	–	–	–	–	–	–	–	–	–	33.5
seminudus	–	–	–	–	–	8	28	19	8	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	25.4
simus	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	27.7
stigmosus	–	–	–	1	–	1	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	24.5
trimaculatus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	–	–	–	–	–	–	–	–	–	–	–	–	–	34.0
*triops** n.sp.	–	–	–	–	–	1	1	–	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	26.2
vigilax n.sp.	–	–	–	–	–	–	–	4	4	4	3	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	27.6
wassi n.sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7	3	9	5	3	–	–	–	–	–	–	–	–	–	–	34.8

TABLE 13. Frequency distributions of oblique body scale rows in horizontal series in selected species of Indo-West Pacific *Opistognathus*. Asterisk following species name indicates that bilateral counts are included.

Table 13. Frequency distributions of oblique body scale rows in horizontal series in selected species of Indo-West Pacific *Opistognathus* . Asterisk following species name indicates that bilateral counts are included.

	Oblique body scale rows																														
	37	39	41	43	45	47	49	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	83	85	87					
	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	n	mean	sd		
Upper jaw with flexible lamina posteriorly																															
*adelus**	–	3	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	1	1	–	–	–	–	–	–	8	40.6	0.5		
*albicaudatus**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	1	1	–	–	–	–	–	–	4	73.3	1.5		
castelnaui	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	(see below)				
cyanospilotus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	(continued below)				
*ensiferus**	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	50.0	1.3		
*iyonis**	–	–	–	2	12	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	14	45.2	0.7		
*megalops** n.sp.	–	–	–	–	–	–	–	1	–	1		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	54.0	2.8		
muscatensis	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	(see below)				
nigromarginatus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	2	2	1	2	3	1	–	1	1	(continued below)				
randalli	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	(see below)				
solorensis	–	–	–	–	–	–	–	–	1	–	1	5	13	18	12	4	1	–	–	–	–	–	–	–	–	–	55	63.3	2.7		
variabilis	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	2	2	6	9	2	4	2	–	–	29	76.2	3.8		
verecundus	–	–	–	1	–	2	5	3	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	12	49.4	3.1		

	Oblique body scale rows (continued)																														
	89	91	93	95	97	99	101	103	105	107	109	111	113	115	117	119	121	123													
	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	n	mean	sd										
castelnaui	1	–	–	4	1	2	4	4	1	–	1	–	–	–	–	–	–	–	18	100.2	4.7										
cyanospilotus	1	2	4	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	14	92.9	2.7										
muscatensis	–	–	–	–	–	–	–	1	–	–	3	–	2	–	2	2	–	1	11	114.0	6.0										
nigromarginathus	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	16	77.0	7.0										
randalli	6	9	3	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	30	89.0	3.3										

	Oblique body scale rows																														
	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59	61	63	65	67	69	71	73				
	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	n	mean	sd	
Upper jaw rigid posteriorly																															
afer	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1	2	1	–	–	–	–	–	–	5	58.8	2.3	
albomaculatus	–	–	–	–	–	–	–	4	5	1	4	2	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	17	39.5	3.6	
alleni	1	4	14	10	8	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	38	26.7	2.2	
asper n.sp.	–	–	–	–	–	–	–	–	–	–	2	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	42.7	1.2	
*aurolineatus** n.sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1	–	–	2	68.5	0.7	
*bathyphilus** n.sp.	–	–	–	–	–	–	–	–	–	–	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	43.5	2.1	
biporus n.sp.	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	45.0	–	
challenger n.sp.	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	46.0	–	
crassus	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	44.0	–	
darwiniensis	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	5	5	7	(continued below)			
*decorus**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1	1	–	3	2	4	1	–	–	–	13	62.4	4.1	
dendriticus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	1	–	2	–	(continued below)			
*dipharus**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	2	63.5	0.7	
*elizabethensis**	–	–	–	–	–	4	2	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8	48.9	1.5	
*erdmanni** n.sp.	–	–	–	–	–	–	–	–	3	7	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	10	38.9	1.0	
evermanni	–	–	–	–	–	–	–	–	–	2	2	2	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8	42.5	2.3	
*flavidus** n.sp.	–	–	–	–	–	–	–	–	–	–	6	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8	42.5	1.6	
helvolus n.sp.	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	38.0	–	
*hongkongiensis**	–	–	–	–	–	–	–	–	–	–	–	–	–	1	4	3	1	–	–	–	–	–	–	–	–	–	–	9	50.4	1.9	
*hopkinsi**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	6	4	1	–	–	–	–	–	–	–	–	–	12	52.3	1.5	
hyalinus n.sp.	–	–	–	–	–	–	–	–	–	–	3	6	3	1	–	–	–	–	–	–	–	–	–	–	–	–	–	13	43.8	1.5	
inornatus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	(see below)			
jacksoniensis	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	7	7	5	2	3	–	–	–	–	–	–	–	25	54.2	2.9	
latitabundus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	4	3	1	4	5	(continued below)			
liturus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1	54.0	–	
*longinaris**	–	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	41.0	1.4	
macrolepis	–	–	–	–	–	–	–	–	–	1	2	3	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7	44.3	1.9	
*margaretae**	–	–	–	–	–	–	–	–	1	1	–	–	–	1	–	–	–	1	–	3	–	–	–	–	–	–	–	14	44.8	4.7	
*microspilus** n.sp.	–	–	–	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	42.5	0.7	
nigripinnis n.sp.	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	39.0	–	
ocellicaudatus	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	42.0	–	
papuensis	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	(see below)			
parvus n.sp.	–	–	–	–	–	–	–	–	2	6	3	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	14	42.6	1.6	
pholeter n.sp.	–	–	–	–	–	–	–	–	1	2	–	–	–	7	–	12	–	6	–	3	–	–	–	–	–	–	–	38	46.2	3.3	
*reticeps**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	6	4	–	1	–	–	–	–	–	12	58.6	2.0	
reticulatus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	(see below)			
rosenbergii	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	2	4	3	4	1	–	–	–	16	62.6	3.0	
*rufilineatus**	–	–	–	–	–	–	–	–	–	–	1	–	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	9	44.0	1.2	
seminudus	–	–	–	1	18	22	8	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	50	31.2	1.6	
*simus**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	1	1	2	–	–	6	57.8	3.7	
*stigmosus**	–	–	–	–	–	–	–	–	1	4	1	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8	40.8	2.8	
trimaculatus	–	–	–	–	–	–	–	–	–	–	–	–	–	1	2	–	–	–	–	–	–	–	–	–	–	–	–	3	49.0	1.7	
*triops** n.sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	3	–	1	–	–	–	–	–	–	–	–	–	6	47.2	1.7	
*vigilax** n.sp.	–	–	–	–	–	–	–	–	2	5	11	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	22	40.3	2.4	
wassi n.sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	3	5	1	1	2	–	–	15	54.9	2.8	

	Oblique body scale rows (continued)																														
	75	77	79	81	83	85	87	89	91	93	95	97	99	101	103	105	107	109	111	113	115	117	119	121							
	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	n	mean	sd				
darwinensis	8	5	2	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	36	73.8	3.5				
dendriticus	6	3	1	4	1	2	1	1	1	2	1	–	–	–	–	–	–	–	–	–	–	–	–	–	28	79.9	8.2				
eximius	–	–	1	1	–	1	1	2	3	3	1	3	2	–	–	–	–	–	–	–	–	–	–	–	18	91.9	5.6				
inornatus	–	–	2	2	1	1	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8	83.6	3.6				
latitabundus	–	1	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	22	71.2	4.8				
papuensis	–	1	1	1	–	3	1	3	2	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	14	87.2	4.9				
reticulatus	–	–	–	–	–	–	–	1	1	–	–	–	1	–	–	–	–	–	–	–	1	–	1	1	6	106.0	14.4				

TABLE 14. Frequency distributions of lateral-line terminus in relation to total dorsal-fin element position in selected species of Indo-West Pacific *Opistognathus*. When terminus ended mid-way between two elements, the higher number was used. Asterisks following species name indicates that some bilateral counts were made.

Table 14. Frequency distributions of lateral-line terminus in relation to total dorsal-fin element position in selected species of Indo-West Pacific *Opistognathus* . When terminus ended mid-way between two elements, the higher number was used. Asterisks following species name indicates that some bilateral counts were made.

	Lateral-line terminus position																				
Species	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	n	mean
Upper jaw with flexible lamina posteriorly																					
adelus *	–	–	–	–	5	2	–	–	–	–	–	–	–	–	–	–	–	–	–	7	14.3
albicaudatus *	–	–	–	–	–	–	3	1	–	–	–	–	–	–	–	–	–	–	–	4	16.3
castelnaui	–	–	–	–	1	3	16	5	–	–	–	–	–	–	–	–	–	–	–	25	16.0
cyanospilotus	–	–	–	–	–	–	–	6	6	2	–	–	–	–	–	–	–	–	–	14	17.7
ensiferus *	–	–	–	–	–	–	–	1	1		–	–	–	–	–	–	–	–	–	2	17.7
iyonis	–	–	–	–	–	–	2	5	–	–	1	–	–	–	–	–	–	–	–	8	17.1
*megalops** n.sp.	–	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	–	2	16.5
muscatensis	–	–	–	–	–	1	8	7	2	–	–	–	–	–	–	–	–	–	–	18	16.6
nigromarginathus	–	–	–	–	–	4	8	9	1	1	–	–	–	–	–	–	–	–	–	23	16.3
randalli	–	–	1	31	20	1	–	–	–	–	–	–	–	–	–	–	–	–	–	53	13.4
solorensis	–	–	13	30	25	9	–	–	–	–	–	–	–	–	–	–	–	–	–	77	13.4
variabilis	–	–	–	–	7	29	22	4	–	–	–	–	–	–	–	–	–	–	–	62	14.3
verecundus	–	–	–	3	14	7	–	–	–	–	–	–	–	–	–	–	–	–	–	24	14.2
Upper jaw rigid posteriorly																					
afer	–	–	–	1	2	3	–	–	–	–	–	–	–	–	–	–	–	–	–	6	14.3
albomaculatus n.sp.	–	–	–	–	–	1	3	9	4	2	–	–	–	–	–	–	–	–	–	19	17.2
alleni	–	–	–	–	–	–	–	–	–	–	–	–	–	4	9	12	5	5	–	35	24.9
asper * n.sp.	–	2	2	–	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	6	12.5
aurolineatus * n.sp.	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	2	16.0
bathyphilus n.sp.	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	1	15.0
biporus * n.sp.	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	14.0
*challenger** n.sp.	–	–	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	13.0
crassus	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	13.0
darwinensis	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	47	23.8
decorus	–	–	–	–	1	4	3	–	–	–	–	–	–	–	–	–	–	–	–	8	15.2
dendriticus	–	–	–	–	–	2	17	12	–	–	–	–	–	–	–	–	–	–	–	31	16.3
dipharus *	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	2	17.5
elizabethensis	–	–	–	–	–	1	–	2	1	–	–	–	–	–	–	–	–	–	–	4	16.8
erdmanni * n.sp.	–	–	–	2	5	3	–	–	–	–	–	–	–	–	–	–	–	–	–	10	14.1
evermanni	2	5	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	9	11.2
eximius	–	–	–	–	–	1	8	10	–	–	–	–	–	–	–	–	–	–	–	20	16.4
flavidus * n.sp.	6	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8	10.2
helvolus n.sp.	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8	38.0
hongkongiensis	–	–	–	–	1	4	1	–	–	–	–	–	–	–	–	–	–	–	–	6	15.0
hopkinsi *	–	–	–	–	2	5	10	1	–	–	–	–	–	–	–	–	–	–	–	18	15.6
hyalinus n.sp.	–	3	16	8	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	27	12.2
inornatus	–	–	–	–	–	–	–	–	–	–	–	–	3	6	3	3	–	–	–	15	23.4
iyonis	–	–	–	–	–	–	2	4	–	–	1	–	–	–	–	–	–	–	–	7	17.1
jacksoniensis	–	–	–	–	–	–	–	–	–	–	–	–	2	1	8	10	3	3	1	28	24.9
latitabundus	–	–	–	–	2	3	–	–	–	–	–	–	–	–	–	–	–	–	–	22	16.4
liturus	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	1	15.0
longinaris	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1	18.0
macrolepis	–	–	8	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	10	12.3
margaretae	–	–	–	–	1	1	3	3	–	–	–	–	–	–	–	–	–	–	–	8	16.0
microspilus * n.sp.	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	2	22.0
nigripinnis * n.sp.	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	14.0
ocellicaudatus	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	14.0
papuensis	–	–	–	–	–	–	–	–	–	1	1	2	8	8	–	–	–	–	–	20	22.1
parvus n.sp.	–	–	4	34	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	43	13.0
pholeter n.sp.	–	–	–	–	–	–	–	2	16	8	4	2	–	–	–	–	–	–	–	32	18.6
reticeps	1	–	1	2	1	2	–	–	–	–	–	–	–	–	–	–	–	–	–	7	13.1
reticulatus	–	–	–	–	–	–	–	–	1	1	8	–	1	–	–	–	–	–	–	11	19.9
rosenbergii	–	–	–	2	4	7	4	2	–	–	–	–	–	–	–	–	–	–	–	19	15.0
rufilineatus *	–	–	4	8	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	10	12.7
seminudus	–	–	–	–	–	–	–	–	6	15	31	7	2	–	–	–	–	–	–	61	19.7
simus	–	–	–	–	–	–	–	3	–	–	–	–	–	–	–	–	–	–	–	3	17.0
stigmosus	–	–	–	–	–	–	–	1	3	–	–	–	–	–	–	–	–	–	–	4	17.8
trimaculatus	–	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	11.5
triops * n.sp.	–	–	–	–	–	1	4	1	–	–	–	–	–	–	–	–	–	–	–	6	15.0
*vigilax** n.sp.	1	6	6	7	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	20	12.0
wassi n.sp.	1	3	8	5	6	2	–	–	–	–	–	–	–	–	–	–	–	–	–	25	12.4

TABLE 15. Comparison of selected species of Indo-West Pacific *Opistognathus* (exceptional meristic values omitted).

Table 15. Comparison of selected species of Indo-West Pacific *Opistognathus* (exceptional meristic values omitted).

Character	*albomaculatus* n.sp.	*alleni*	*elizabethensis*	*pholeter* n.sp.	*seminudus*	*stigmosus*	*triops* n.sp.
Dorsal-fin spines	10	10	11	10	11	10	11
Dorsal-fin segmented rays	19-21	19	18-19	20-21	14-16	19	17-18
Anal-fin segmented rays	18-20	17-18	17-19	17-19	14-15	18	17
Vertebrae: precaudal	10	10	10	11	10	10	10
Vertebrae: caudal	23-25	22	23	23	18	23	22-23
Vertebrae: total	33-35	32	33	34	28	33	32-33
Scale rows (horizontal)	35-48	21-31	47-51	39-51	28-36	38-45	45-49
Lateral-line terminus below	rays 5-9	rays 13-17	rays 4-7	rays 7-11	rays 7-11	rays 7-8	rays 3-5
Scales absent forward of dorsal-fin spines or rays	rays 5-7	rays 6-9	spines 6-7	spines 4-6	spine 11-ray 2	spines 5-7	rays 4-5
Vomerine teeth	absent	1-3	2-3	1-3	1-3	absent	2-3
Spots (pale body)	yes	yes	no	yes	no	yes	yes
Inverted dark crescent on pectoral-fin base	yes	no	no	no	no	no	no
Orbital rim dark spots	yes	yes	no	yes	no	yes	yes
Inner maxillary blotch	yes	no	yes	yes	yes	no	yes
Upper lip pigmentation	banded	banded	uniform	banded	banded	banded	banded
Dorsal spine fleshy tabs	pale	pale	dusky	pale	pale	pale	pale
Spinous dorsal fin pigmentation	stripe	stripe	ocellus	stripe	ocellus	stripe	ocellus

TABLE 16. Comparison of selected Indo-West Pacific species of *Opistognathus*.

Table 16. Comparison of selected Indo-West Pacific species of *Opistognathus* .

	O. asper n.sp.	*O. erdmanni* n.sp.	*O. bathyphilus* n.sp.	*O. biporus* n.sp.	*O. liturus*
Number of specimens	3	5	1	1	1
Standard length (mm)	34.4-50.2	25.9-39.3	66.3	64.4	55.3
Sex	male & female	male & female	female	female	undetermined
Lower limb gill rakers	22-24	19-21	26	26	22
Total gill rakers	32-34	29-31	37	37	31
Supraneural bones	2	0	2	2	2
Postorbital jaw length (% HL)	23.8-26.2	21.9-33.2	27.3	19.0	21.9
Preopercular pore positions	bipored, Fig. 5B	single, Fig. 10C	bipored, Fig. 9A	bipored, Fig. 9B	single, Fig. 9D
Scale rows appear to form series of horizontal stripes	yes	yes	yes	yes	? yes
Jaw with dark bands	no	yes	yes	no	? no
Caudal fin dark bands	no	no	yes	no	? no
Dorsal-fin dark spots	distinctly on fin	slightly on fin	distinctly on fin	distinctly on fin	slightly on fin
First dorsal-fin spot between spines	1-4	1-4	1-4	2-6	2-5
Spinous dorsal-fin with narrow dark distal stripe	yes	no	no	no	yes
Nape with dark blotch	no	no	yes	yes	no
Cheek pigmentation	medium dark spots	dark dashes	small dark spots	small dark spots	dark dashes

FIGURE 21. *Opistognathus randalli* female engaged in burrow maintenance Flores Island, Indonesia. Photo by R. Kuiter, after Smith-Vaniz (2009, fig. 21).

FIGURE 22. Males of *Opistognathus* in courtship display: **A–B**, *O. parvus* n.sp., Lembeh Strait; **C**, *O. variabilis*, Sulawesi. Photos of *O. parvus* by N. DeLoach and *O. variabilis* by J. E. Randall.

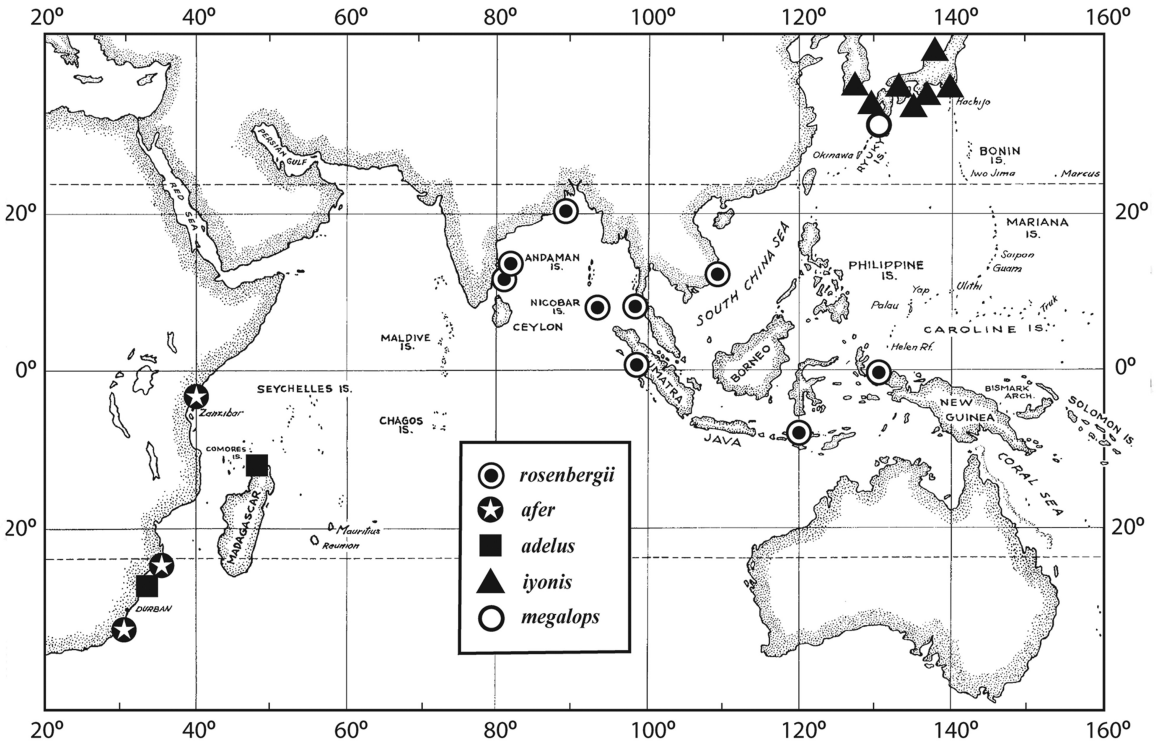

FIGURE 23. Distributions of selected species of *Opistognathus*. Also Includes confirmed literature records for *O. iyonis* and record of *O. rosenbergii* off Digha coast of West Bengal, India (Ray & Mohapatra 2015).

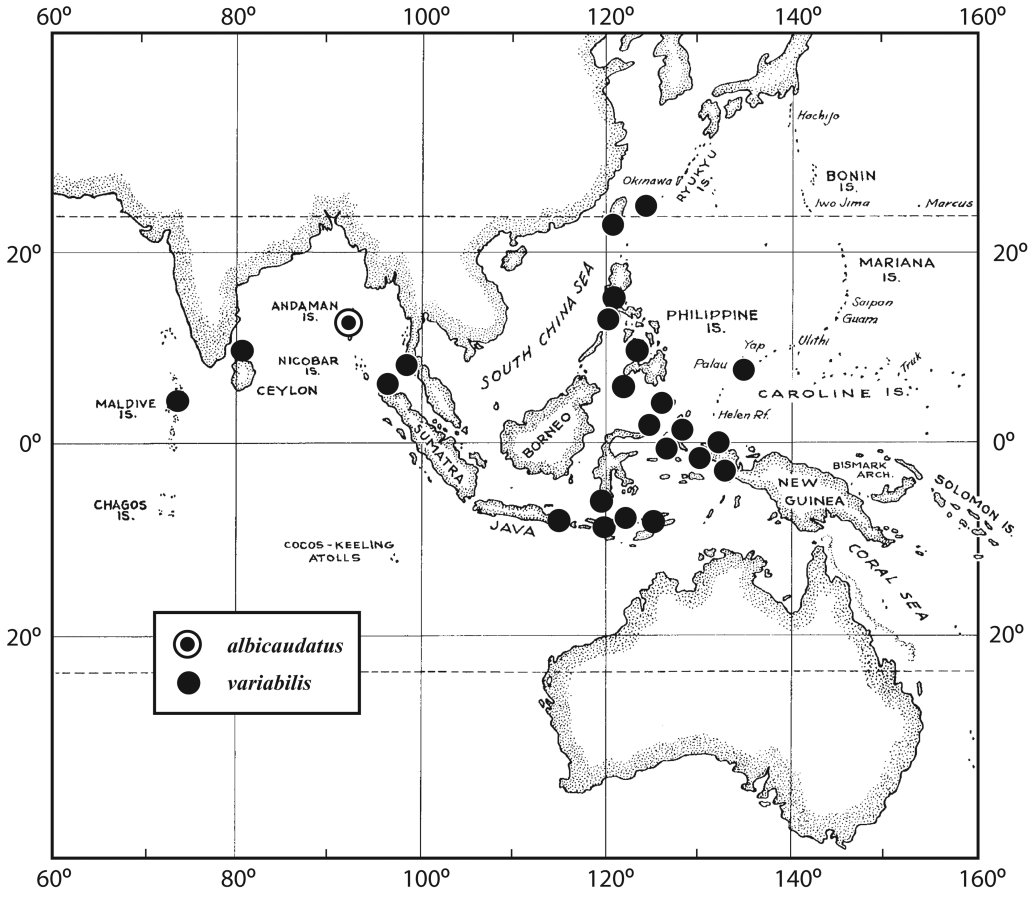

FIGURE 24. Distributions of selected species of *Opistognathus*.

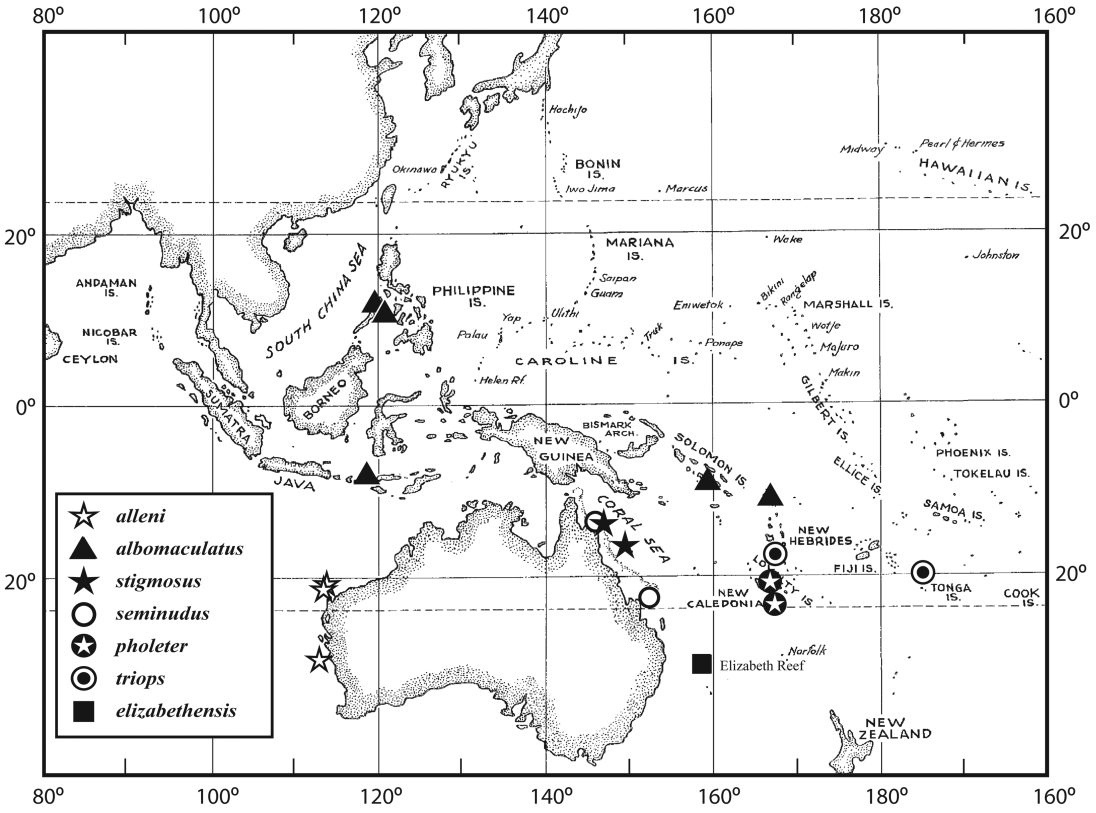

FIGURE 25. Distributions of selected species of *Opistognathus*.

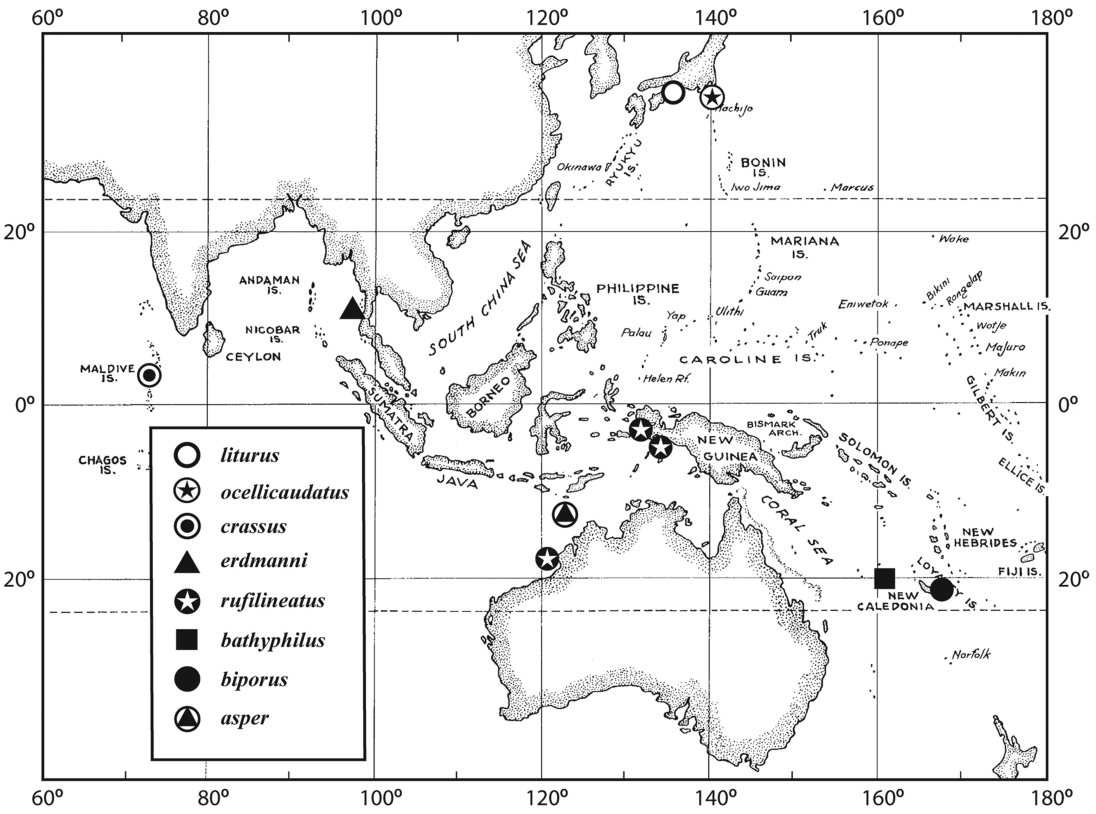

FIGURE 26. Distributions of selected species of *Opistognathus*.

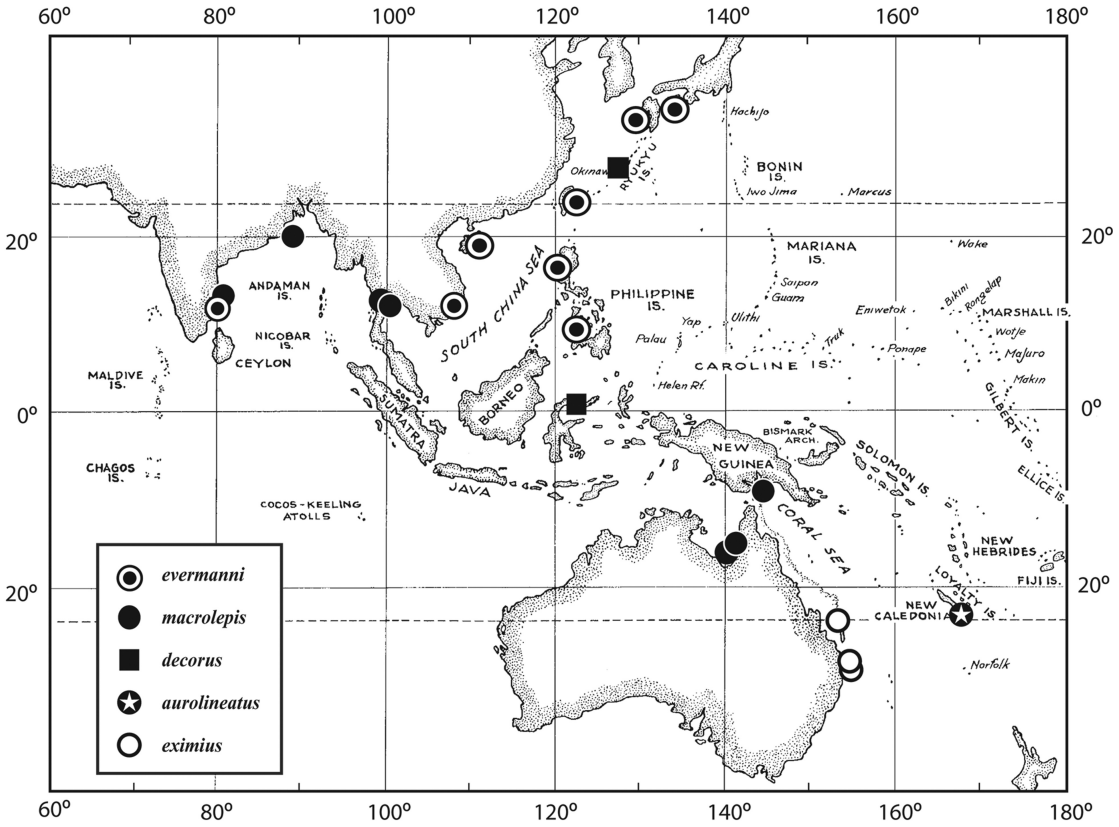

FIGURE 27. Distributions of selected species of *Opistognathus*. Includes confirmed records of *O. macrolepis* off southern coast of India (Biswas *et al.* 2013) and off Digha coast of West Bengal, India (Ray and Mohapatra 2015); and *O. evermanni* from the Bay of Bengal (Mariasingarayan *et al.* 2021).

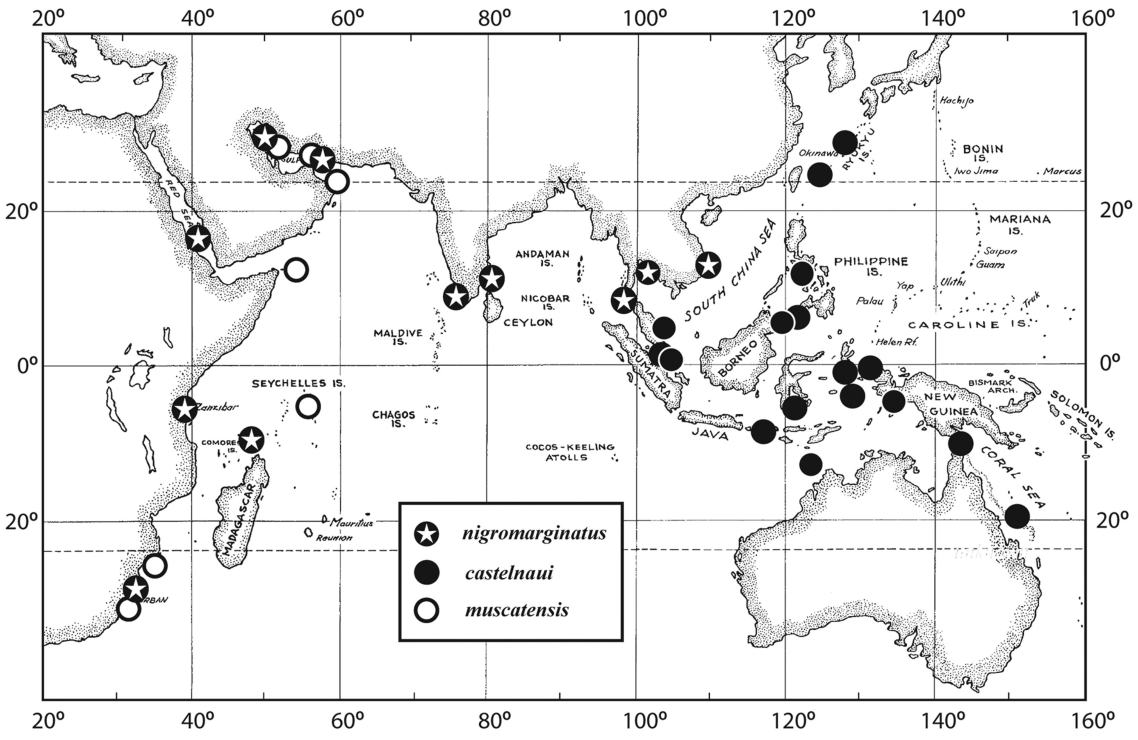

FIGURE 28. Distributions of selected species of *Opistognathus*.

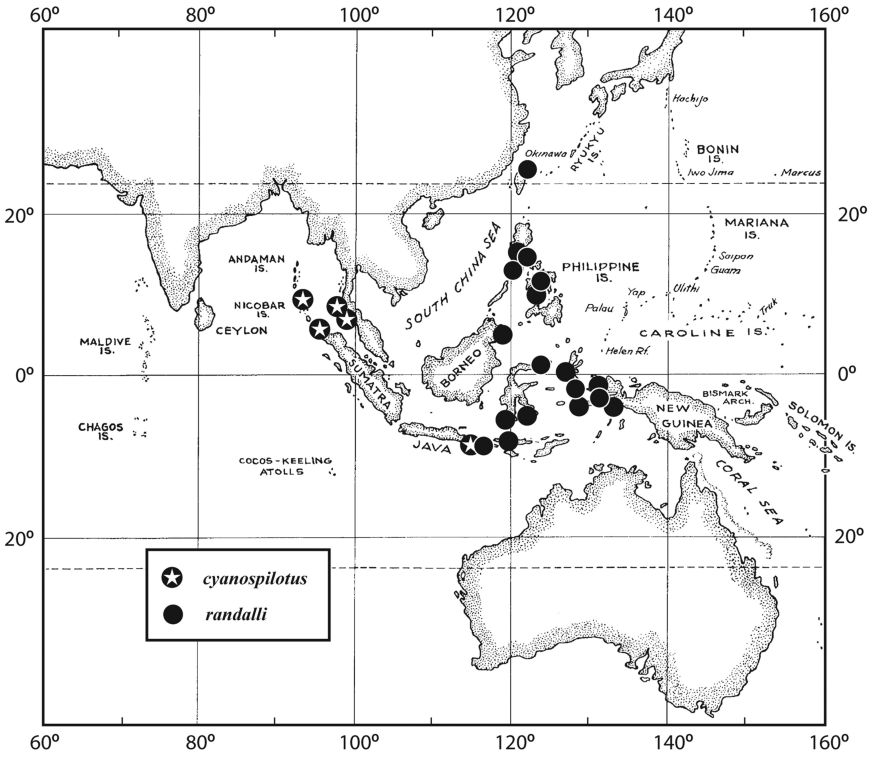

FIGURE 29. Distributions of selected species of *Opistognathus*. The Taiwan record of *O. randalli* is based on a photograph of ASIZP 080918 from Taipei. Also included are records of uncollected specimens of *O. randalli* observed by M.V. Erdmann from northern Sulawesi (Lembeh Strait and Manado) and Raja Ampat Islands (Fakfak, Cenderawasih Bay, and Triton Bay, Kaimana).

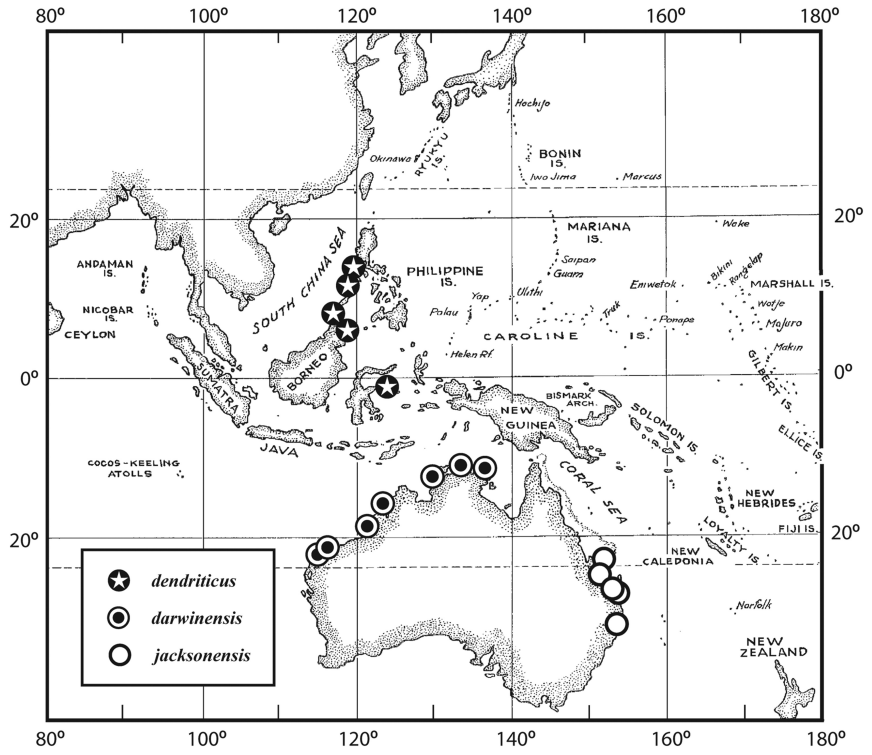

FIGURE 30. Distributions of selected species of *Opistognathus*; includes report of *O. dendriticus* from Banggai Islands, Sulawesi (Allen & Erdmann 2012).

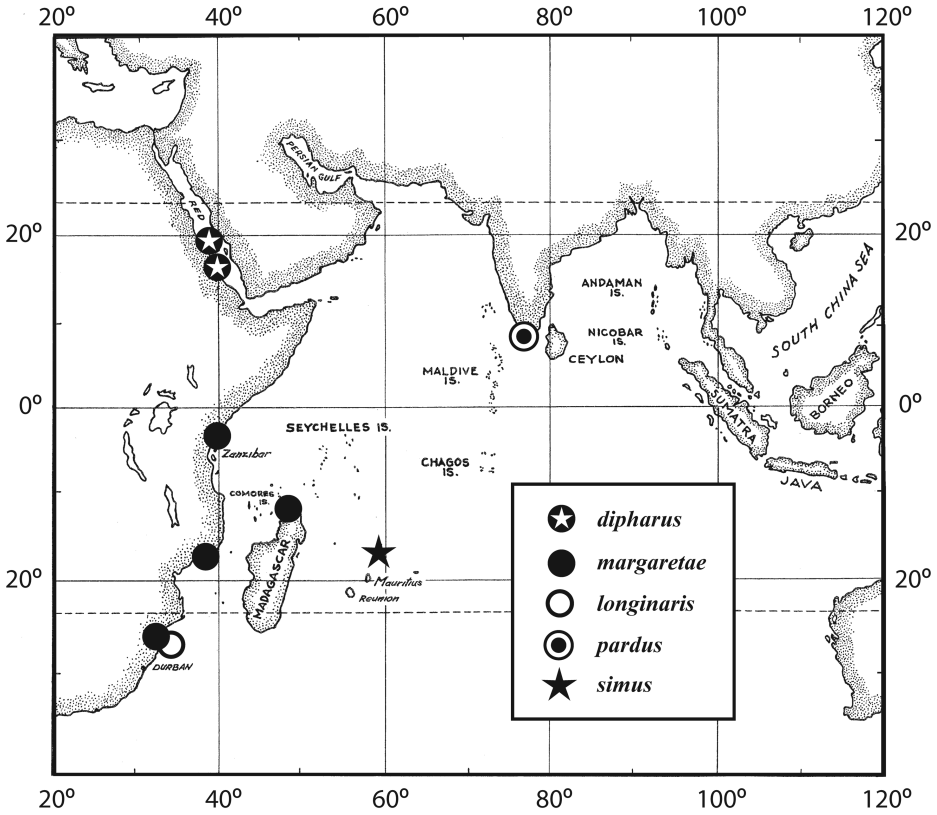

FIGURE 31. Distributions of selected species of *Opistognathus*.

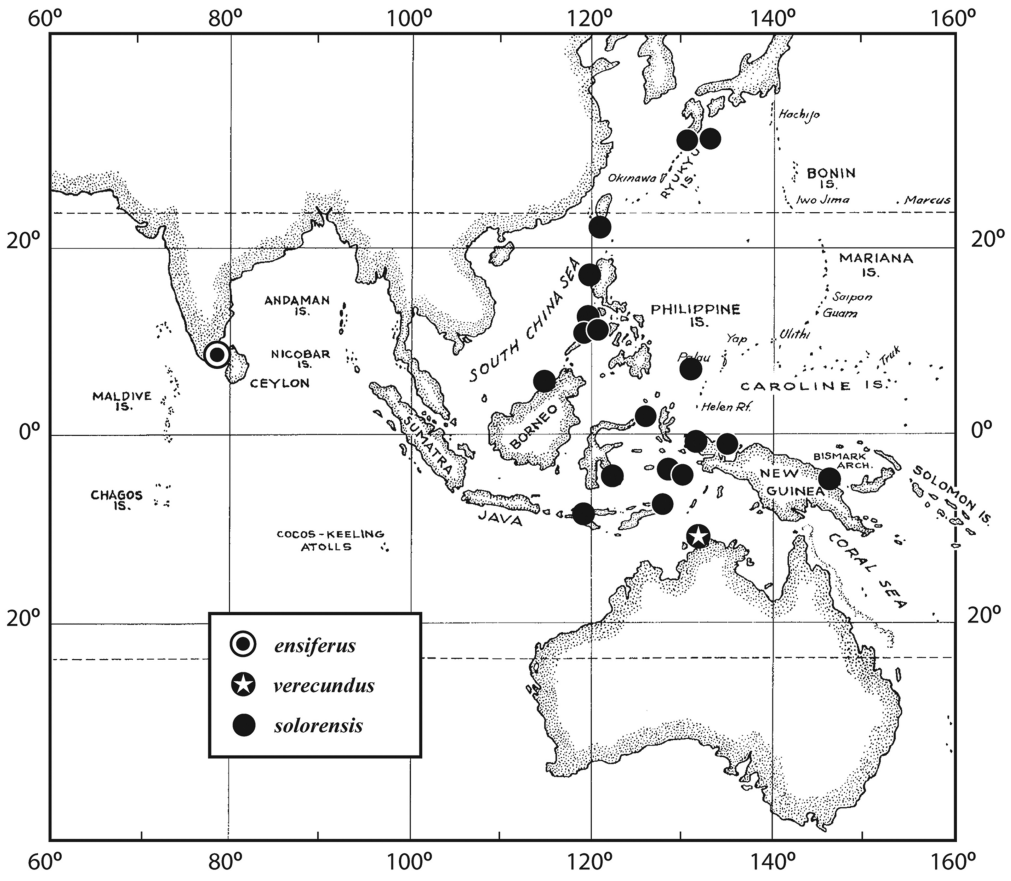

FIGURE 32. Distributions of selected species of *Opistognathus*.

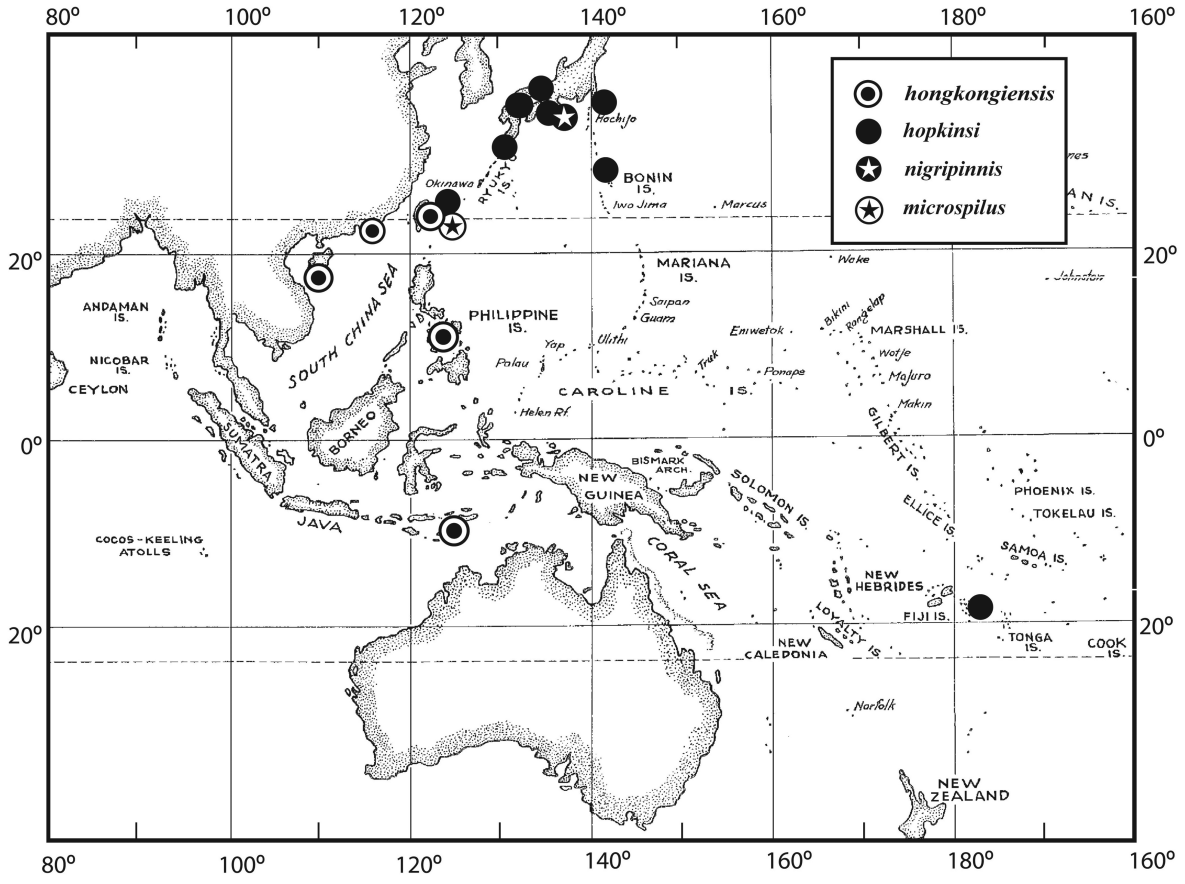

FIGURE 33. Distributions of selected species of *Opistognathus*.

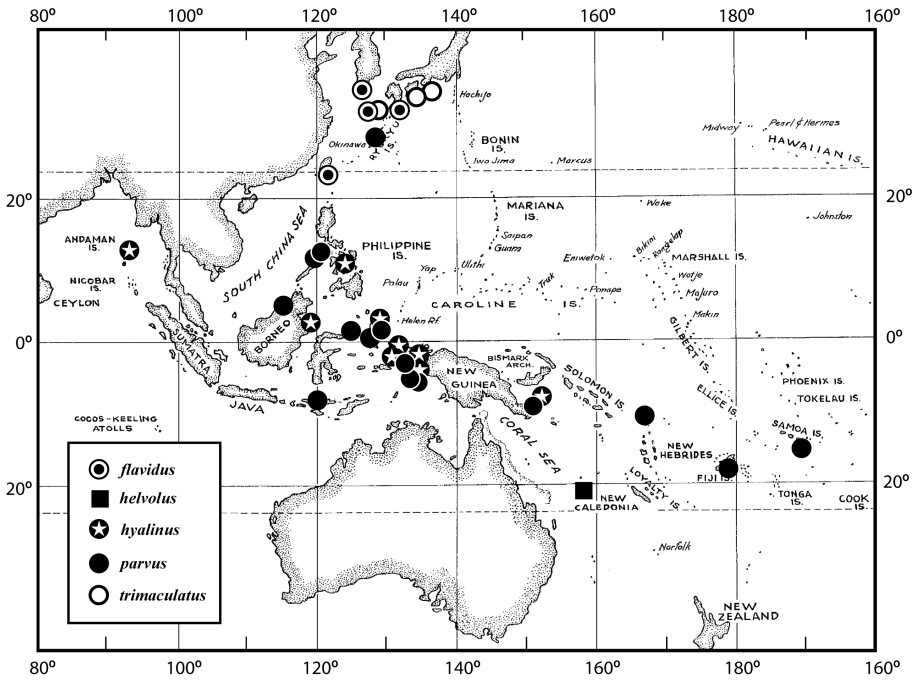

FIGURE 34. Distributions of selected species of *Opistognathus*. Includes record of *O. flavidus* (misidentified as O. hongkongiensis) off southern Korea (Park et al., 2008).

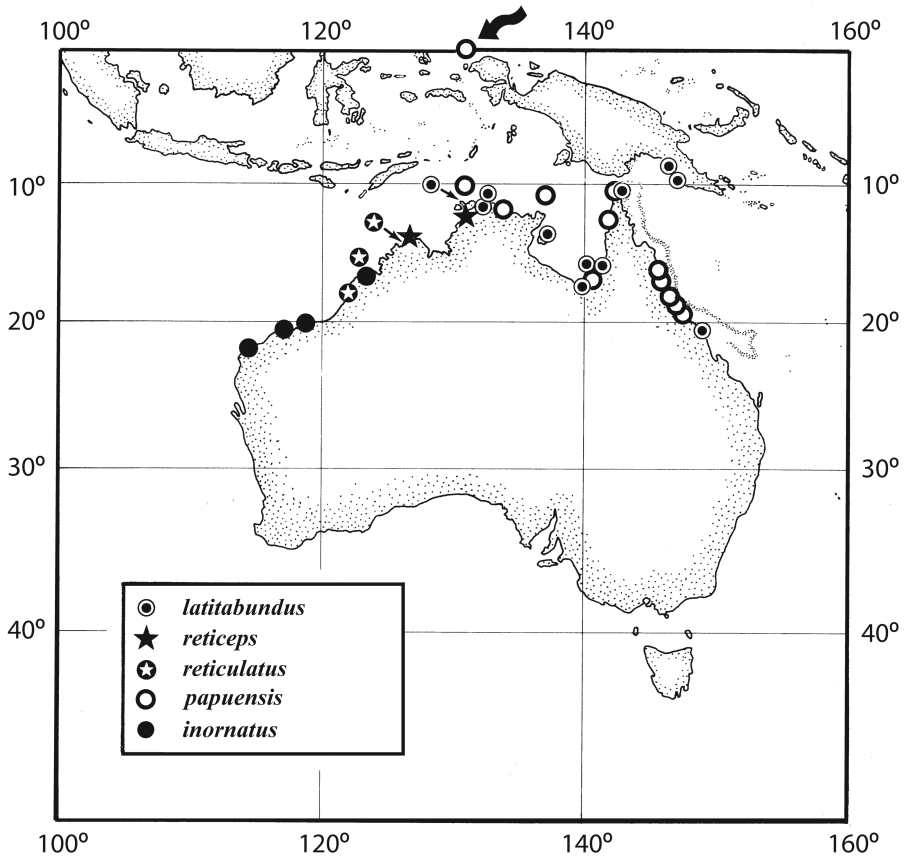

FIGURE 35. Distributions of selected species of *Opistognathus*. Unconfirmed records of *O. papuensis* from Dobo and Aru islands not plotted on the map (see distribution remarks in species account).

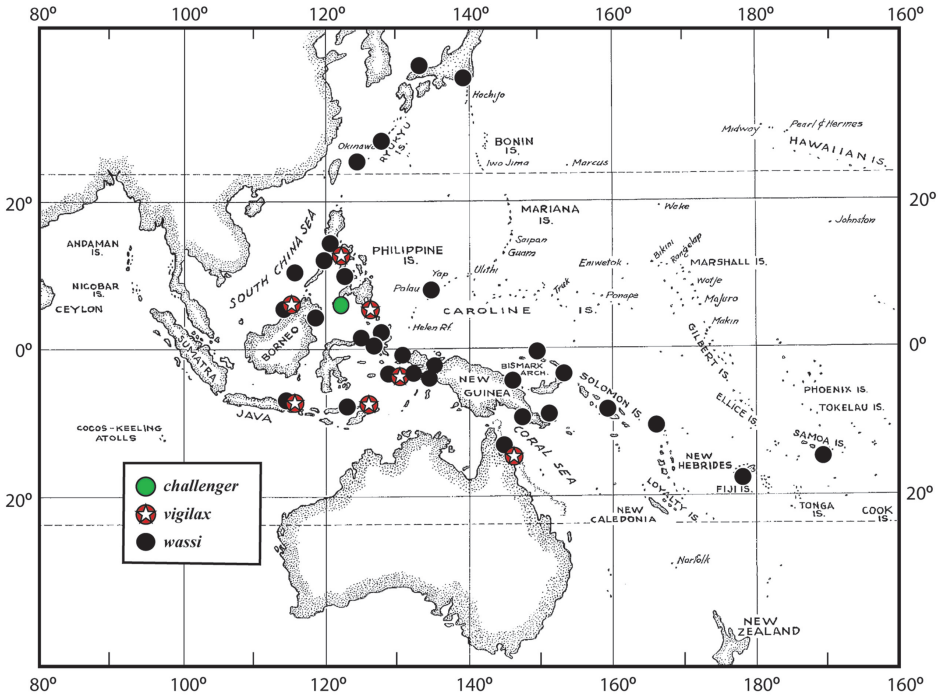

FIGURE 36. Distributions of selected species of *Opistognathus*. Includes records of uncollected specimens of *O. wassi* by M.V. Erdmann from northern Sulawesi (Lembeh Strait and Manado) and Raja Ampat Islands (Fakfak, Kaimana and Cenderawashi Bay).

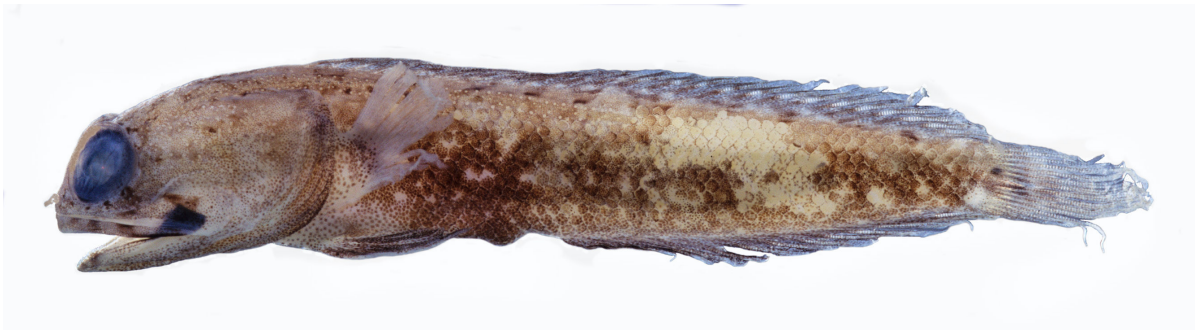

FIGURE 37. *Opistognathus adelus*, holotype, SAIAB 49583, preserved, male, 47.0 mm SL, Nosy Be, Madagascar. Photo by R.T. Bryant, after Smith-Vaniz (2010, fig. 5) © NRF-SAIAB.

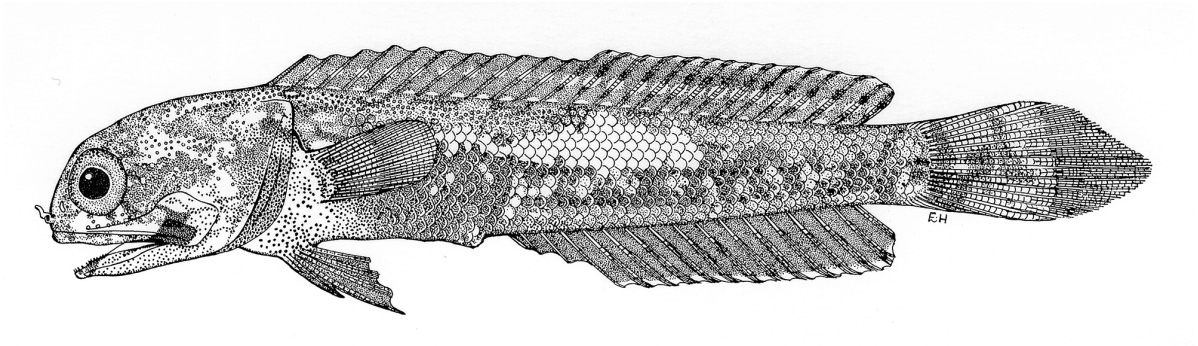

FIGURE 38. *Opistognathus adelus*, holotype, SAIAB 49583, male, 47.0 mm SL, Nosy Be, Madagascar. Drawn by E. Heemstra, after Smith-Vaniz (2010, fig. 4) © NRF-SAIAB.

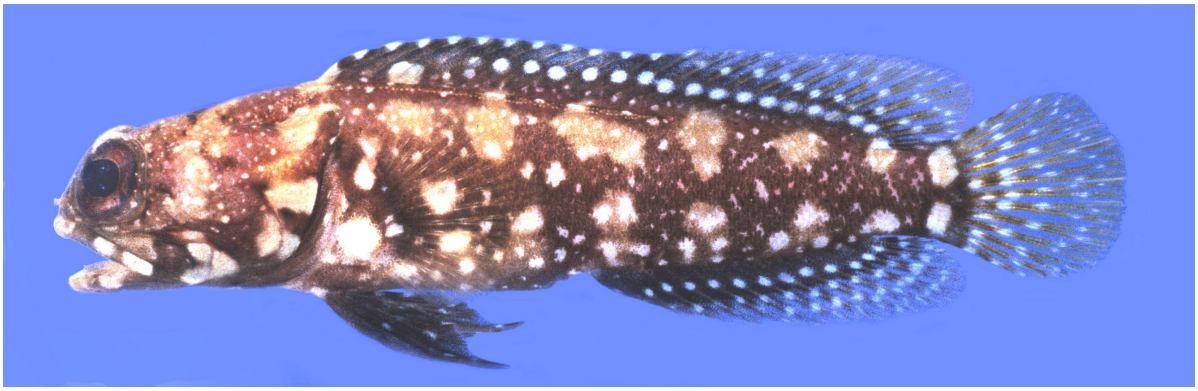

FIGURE 39. *Opistognathus afer*, holotype, SAIAB 39994, male, 41.2 mm SL, Maputoland Reef, South Africa. Photo by P.C. Heemstra, after Smith-Vaniz (2010, fig. 8) © NRF-SAIAB.

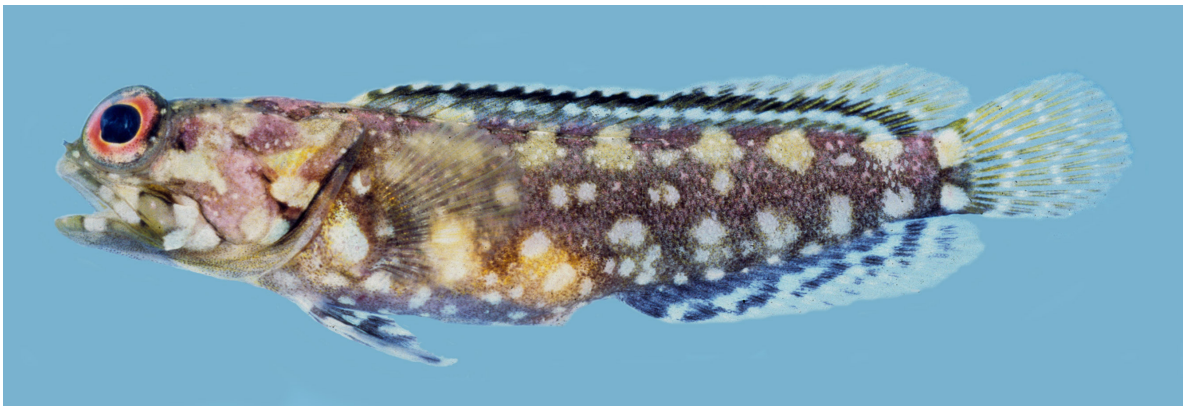

FIGURE 40. *Opistognathus afer*, SAIAB 42789, gravid female, 37.3 mm SL, Ponta Malongane, Mozambique. Photo by P.C. Heemstra, after Smith-Vaniz (2010, fig. 9) © NRF-SAIAB.

FIGURE 41. *Opistognathus albicaudatus*, WAM P.33321–001, male, 94.8 mm SL, Fusilier Strait, Andaman Islands. Photo by G.R. Allen, after Smith-Vaniz and Allen (2011, fig. 1).

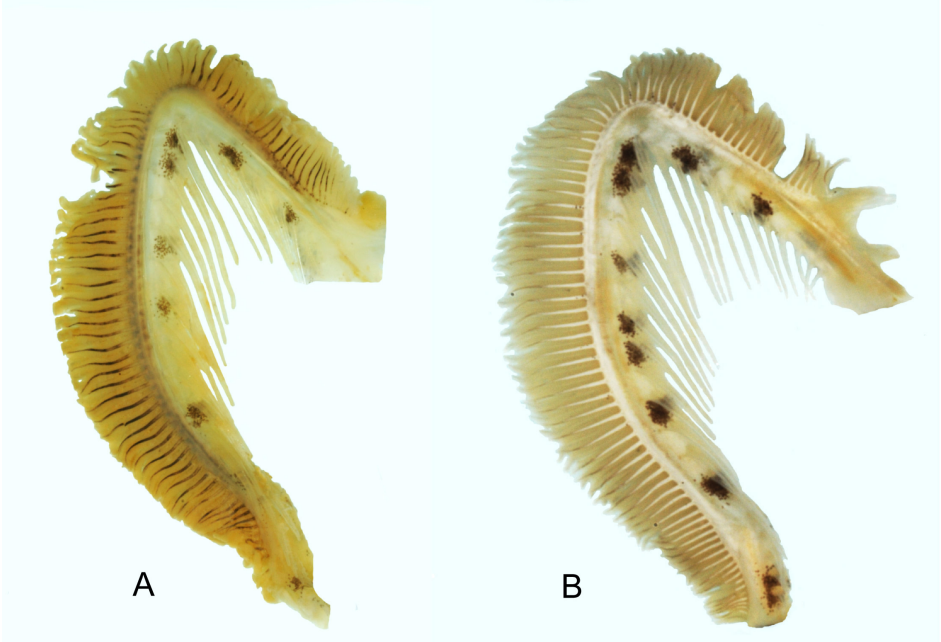

FIGURE 42. Right outer gill arches of *Opistognathus albicaudatus*: **A**, holotype, 94.8 mm SL; **B**, paratype 91.4 mm SL. Photo by H.L. Jelks, after Smith-Vaniz (2011, fig.4).

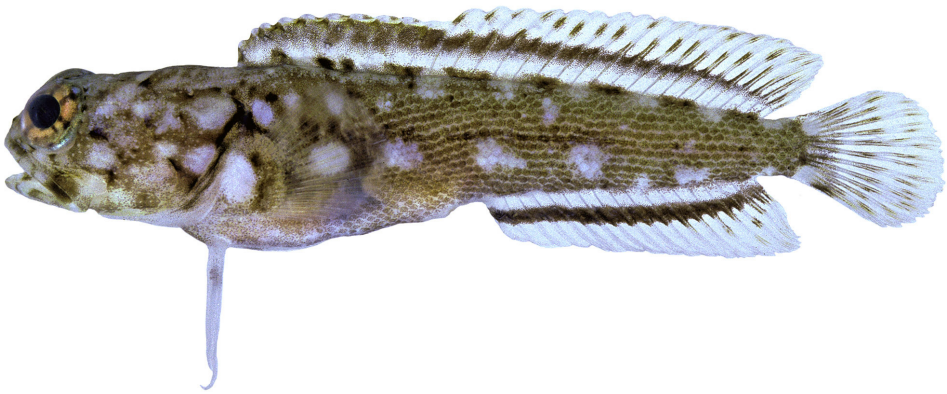

FIGURE 43. *Opistognathus albomaculatus* n.sp., holotype, female, 46.6 mm SL, Santa Cruz Islands. Photo by J.T. Williams.

FIGURE 44. *Opistognathus albomaculatus* n.sp., USNM 320260, male, 50.2 mm SL, Bararin Island, Philippines. Photo by J.T. Williams.

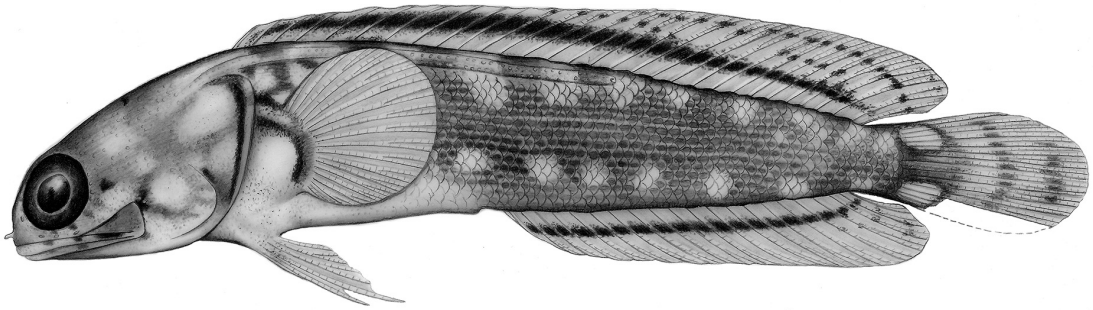

FIGURE 45. *Opistognathus albomaculatus* n.sp., ROM 42222, female, 41.6 mm SL, Honiara, Guadalcanal, Solomon Islands. Drawn by T.D. Pedersen.

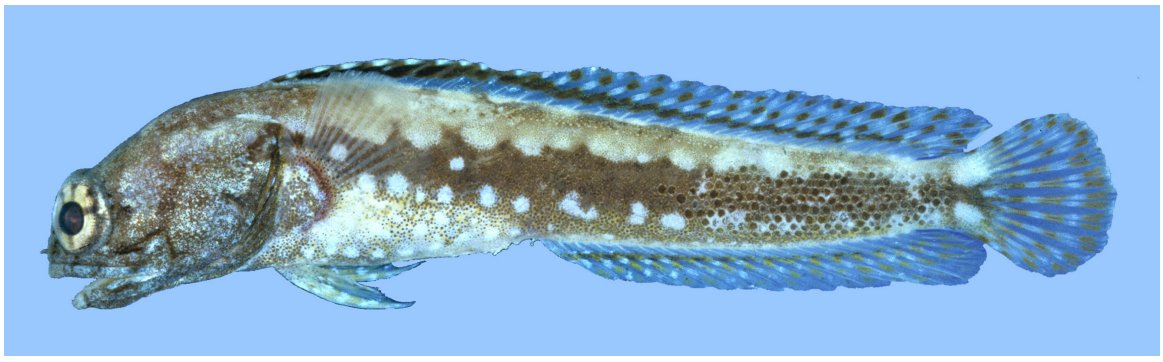

FIGURE 46. *Opistognathus alleni*, MPM 33192, 53.7 mm SL, Exmouth Gulf, Western Australia. Photo by R.D. Mooi.

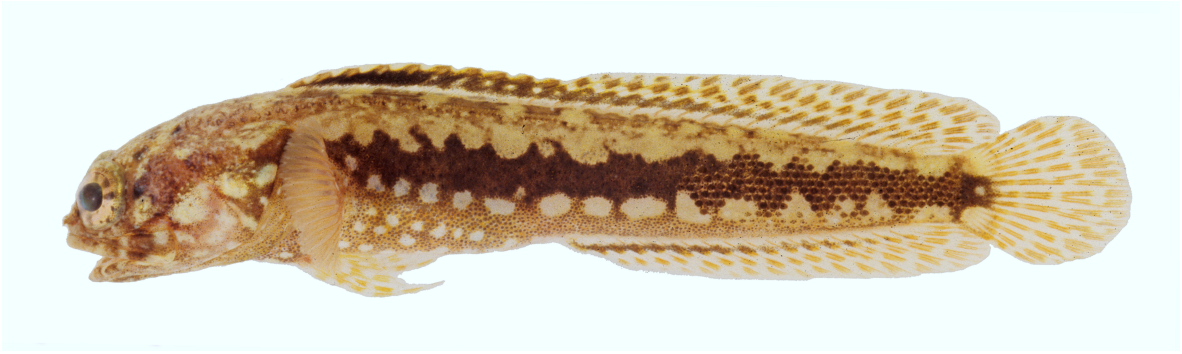

FIGURE 47. *Opistognathus alleni*, holotype, WAM P.27590–002, 73.7 mm SL, Houtman Abrolhos Archipelago, Western Australia. Photo by G.R. Allen.

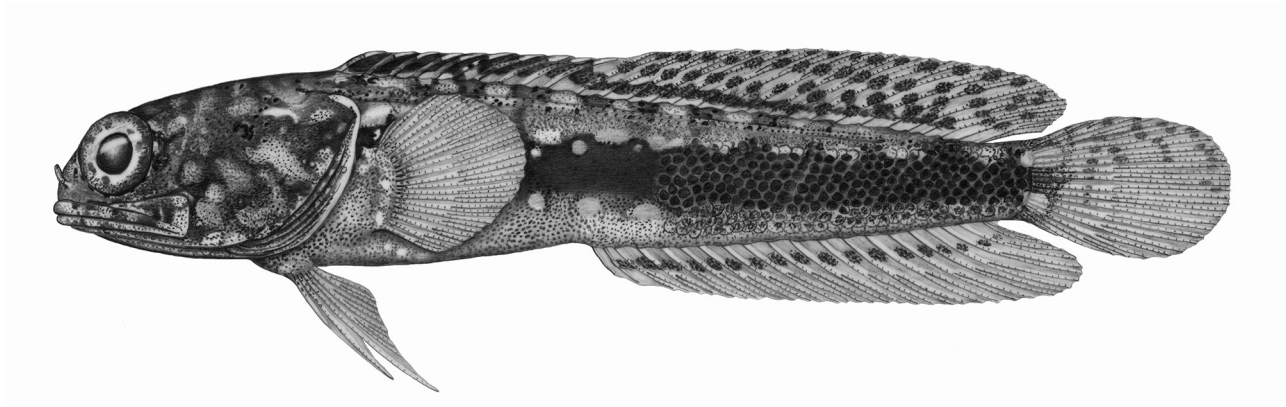

FIGURE 48. *Opistognathus alleni*, WAM P.27590–002, female, 72.4 mm SL, Houtman Abrolhos Archipelago, Western Australia. Drawn by J.R. Schroeder, after Smith-Vaniz (2004, fig.1).

FIGURE 49. *Opistognathus asper* n.sp., holotype, NMV A.29729–015, gravid female, 50.2 mm SL, vicinity of Ashmore Reef, northwestern Australia. Photo by M.F. Gomon.

FIGURE 50. O*pistognathus asper* n.sp., USNM 393589, preserved, paratype, male, 42.0 mm SL, vicinity of Ashmore Reef, northwestern Australia. Photo by S.J. Raredon.

FIGURE 51. *Opistognathus aurolineatus* n.sp., holotype, MNHN 1991–362, female, 224 mm SL, New Caledonia. Photo by J. Rivaton.

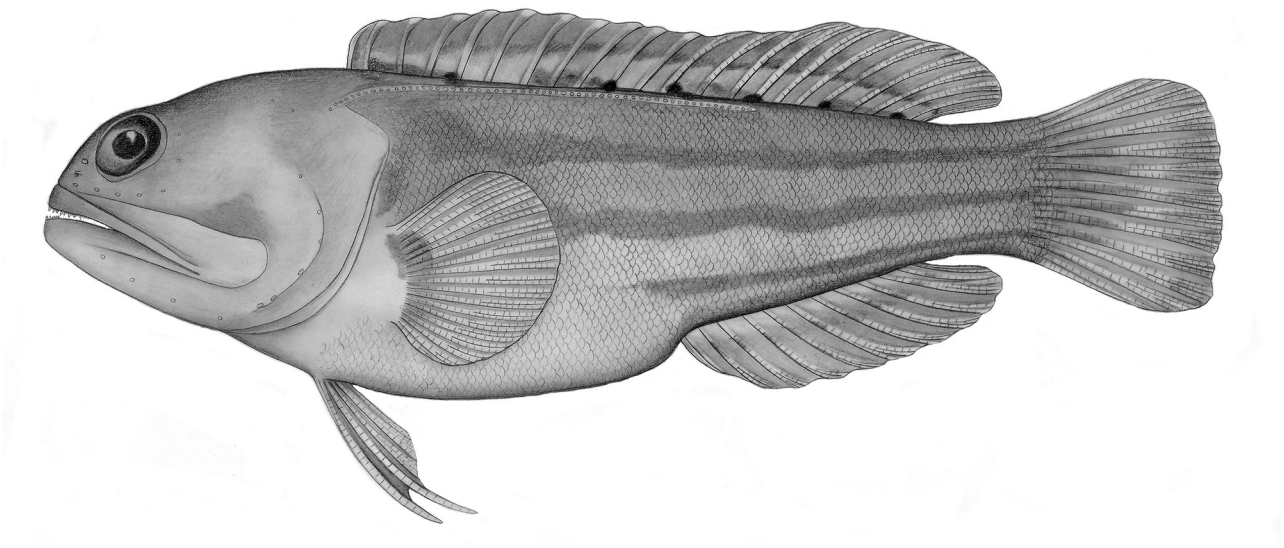

FIGURE 52. O*pistognathus aurolineatus* n.sp., holotype, MNHN 1991–362, female, 224 mm SL, New Caledonia. Drawn by T.D. Pedersen.

FIGURE 53. *Opistognathus bathyphilus* n.sp., holotype, MNHN 1991–361, gravid female, 66.3 mm SL, Lansdowne Bank, Lord Howe Ridge. Drawn by T.D. Pedersen.

FIGURE 54. *Opistognathus biporus* n.sp. , holotype, SMNS 23849, preserved, gravid female, 64.4 mm SL, Lifou Island, Loyalty Islands. Photo by H.L. Jelks.

FIGURE 55. *Opistognathus castelnaui*, WAM P.32800–001, 147 mm SL), Triton Bay, West Papua, Indonesia. Photo by G.R. Allen, after Smith-Vaniz (2009, fig. 6).

FIGURE 56. *Opistognathus castelnaui*, QM I.39245, female, 132 mm SL, Gloucester Island, Queensland, Australia. Photo by J.W. Johnson.

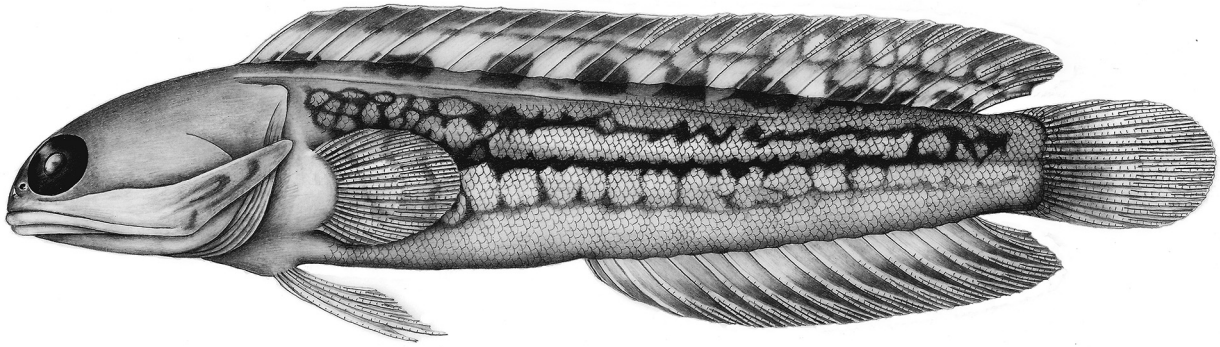

FIGURE 57. *Opistognathus castelnaui*, USNM 122380, female, 162 mm SL, Tonguil Island, Philippines. Drawn by J.R. Schroeder, after Smith-Vaniz (2009, fig. 5).

FIGURE 58. *Opistognathus challenger* n.sp., holotype, BMNH 1879.5.14.200, preserved, gravid female, 76.4 mm SL, Basilan Strait, Philippines. Photo by Z.S. Randall.

FIGURE 59. *Opistognathus crassus,* holotype, BPBM 32706, male, 35.5 mm SL, Ari Atoll, Maldive Islands. Photo by J.E. Randall, after Smith-Vaniz (2010, fig. 12) © NRF-SAIAB.

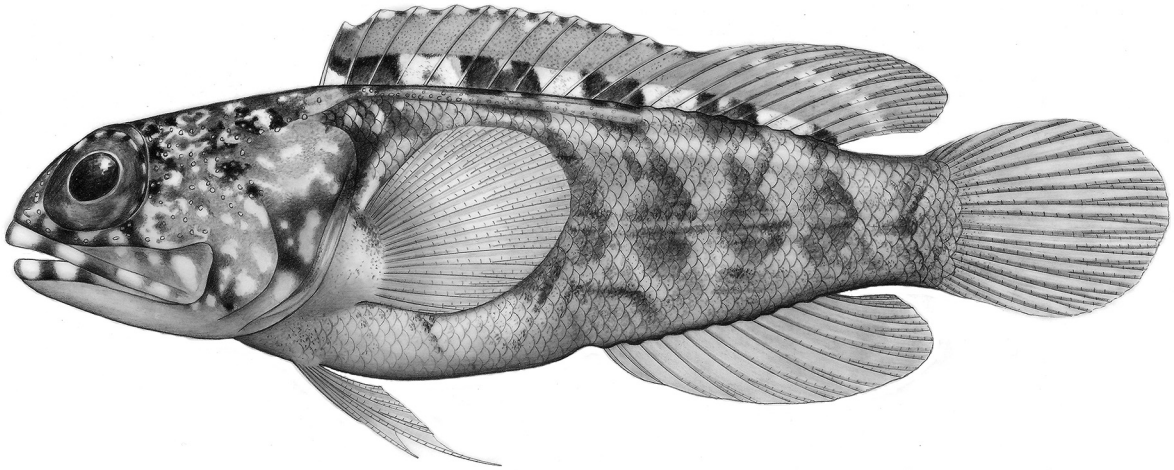

FIGURE 60. *Opistognathus crassus*, holotype, BPBM 32706, male, 35.5 mm SL, Ari Atoll, Maldive Islands. Drawn by T.D. Pedersen, after Smith-Vaniz (2010, fig. 11) © NRF-SAIAB.

FIGURE 61. *Opistognathus cyanospilotus*, WAM P.33259-004, male, 96 mm SL, Cinque Island, Andaman Islands. Photo by G.R. Allen, after Smith-Vaniz (2011, fig. 5).

FIGURE 62. *Opistognathus darwiniensis*, MPM 48423, 61.0 mm SL, Middle mangrove Island, Western Australia Photo by R.D. Mooi.

FIGURE 63. *Opistognathus darwiniensis*, ca. 120 mm SL, Wyndham-East Kimberley, Western Australia. Modified photo of G. Black.

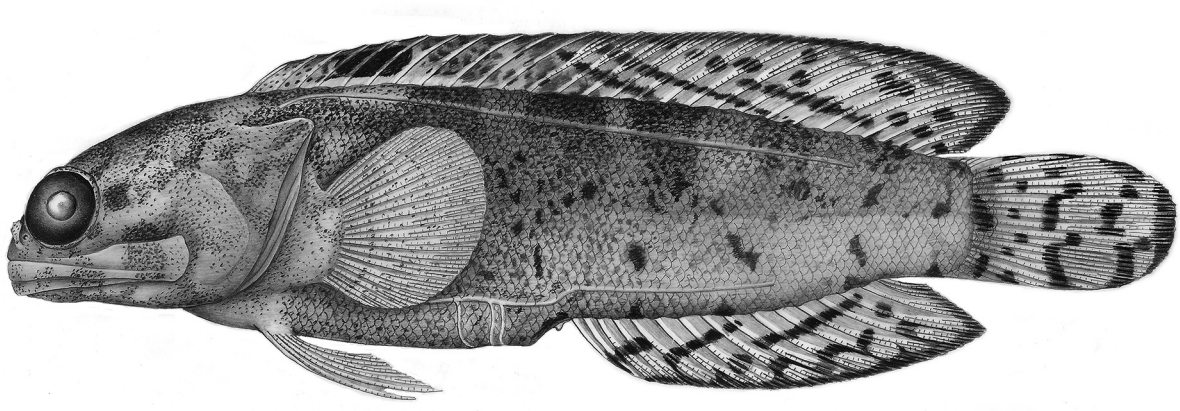

FIGURE 64. *Opistognathus darwiniensis*, AMS I.17060–015, female, 161 mm SL, Exmouth Gulf, Western Australia. Drawn by J.R. Schroeder.

FIGURE 65. *Opistognathus decorus*, URM P.3319, 143 mm SL, Okinawa. Photo by T. Yoshino.

FIGURE 66. *Opistognathus decorus*, KPM-NI 32504, 119 mm SL, Okinawa. Courtesy Kanagawa Prefectural Museum of Natural History, photo by H. Masuda.

FIGURE 67. *Opistognathus dendriticus*, USNM 396239, 124.3 mm SL, Tara Island, Busuanga, Philippines; Photo by J.T. Williams.

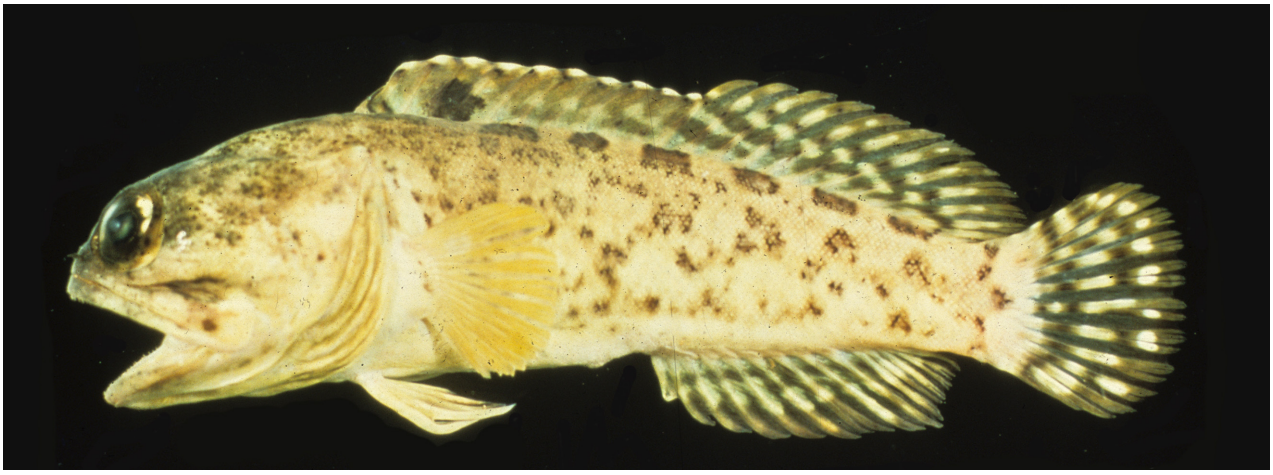

FIGURE 68. *Opistognathus dendriticus*, 175 mm SL, Palawan Prov., Philippines. Photo by R.E. Schroeder.

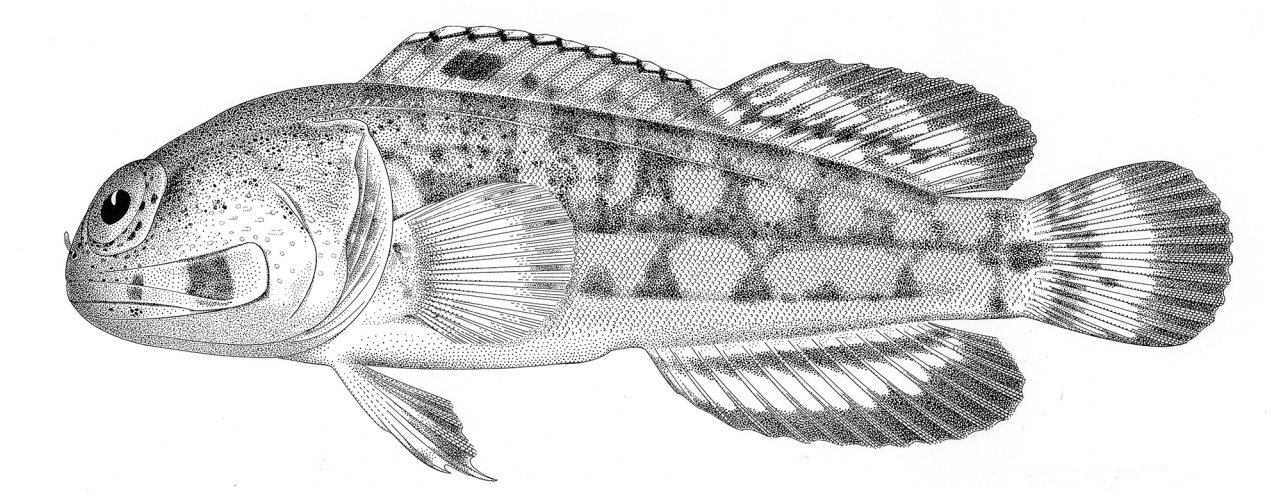

FIGURE 69 *Opistognathus dendriticus*, holotype, CAS 120313, 128.8 mm SL, Cuyo Island, Philippines. After Jordan and Richardson (1908, fig. 9).

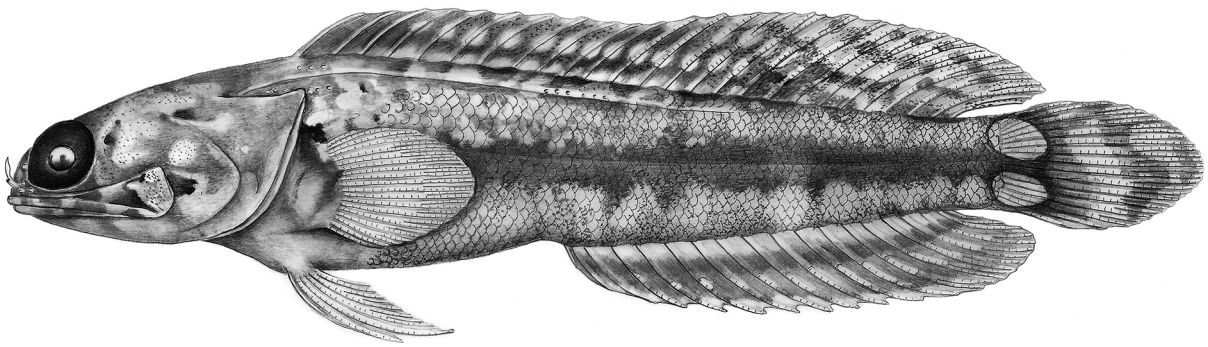

FIGURE 70. *Opistognathus dipharus*, holotype, HUJ E62/3685, male, 47.2 mm SL, Dahlak Archipelago, Red Sea. Drawn by J.R. Schroeder, after Smith-Vaniz (2010, fig. 14) © NRF-SAIAB.

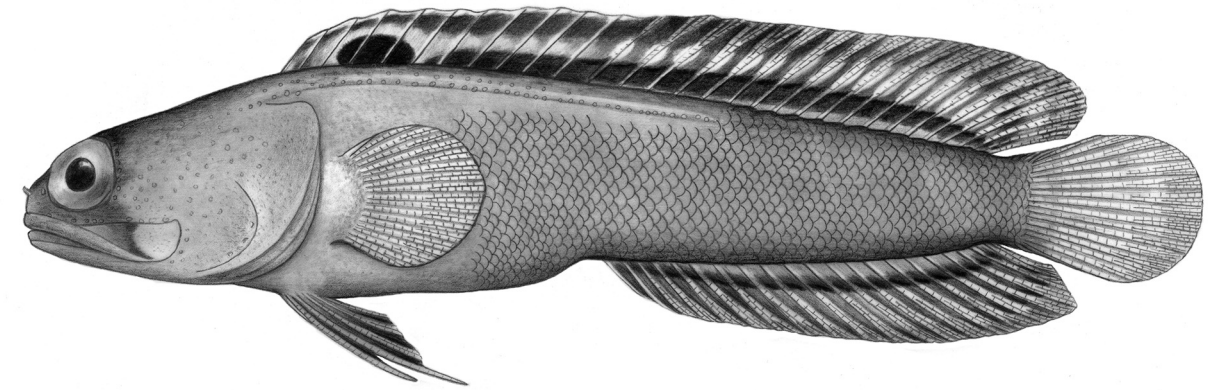

FIGURE 71. *Opistognathus elizabethensis*, holotype, AMS I.27891–010, male, 60.4 mm SL, Elizabeth Reef. Drawn by T.D. Pedersen, after Smith-Vaniz (2004, fig. 8).

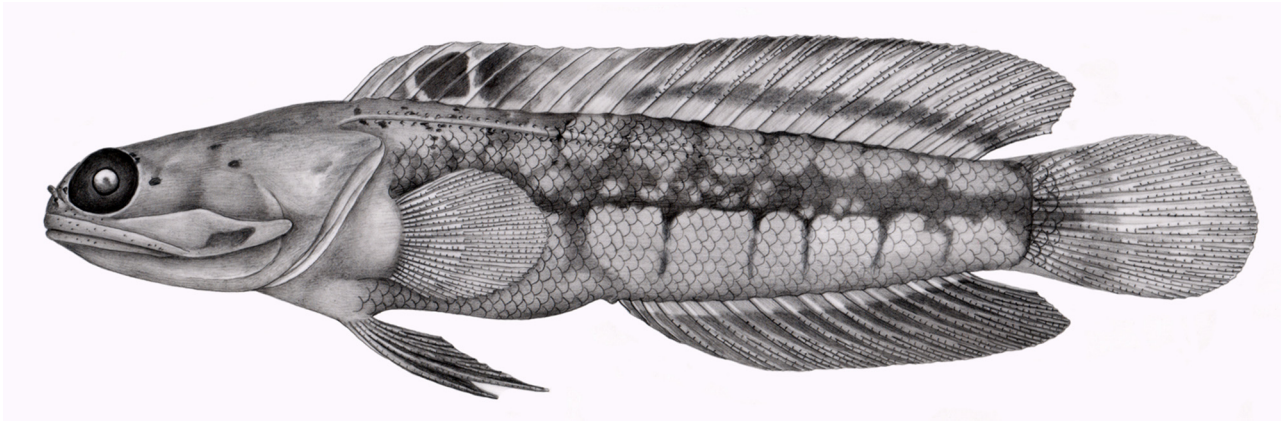

FIGURE 72. *Opistognathus ensiferus*, holotype, FMNH 71365, male, 61.5 mm SL, Gulf of Mannar, India. Drawn by J.R. Schroeder, after Smith-Vaniz (2016, fig. 1).

FIGURE 73. *Opistognathus erdmanni* n.sp., holotype, WAM P.33073–001, female, 38.3 mm SL, Mergui Archipelago, Myanmar. Photo by G.R. Allen.

FIGURE 74. *Opistognathus erdmanni* n.sp., WAM P.33073–001, ca. 39 mm SL, Mergui Archipelago, Myanmar. Photo by G.R. Allen.

FIGURE 75. *Opistognathus evermanni* n.sp., 88 mm SL, Dumaguete Mkt., Philippines, Photo by B. Stockwell

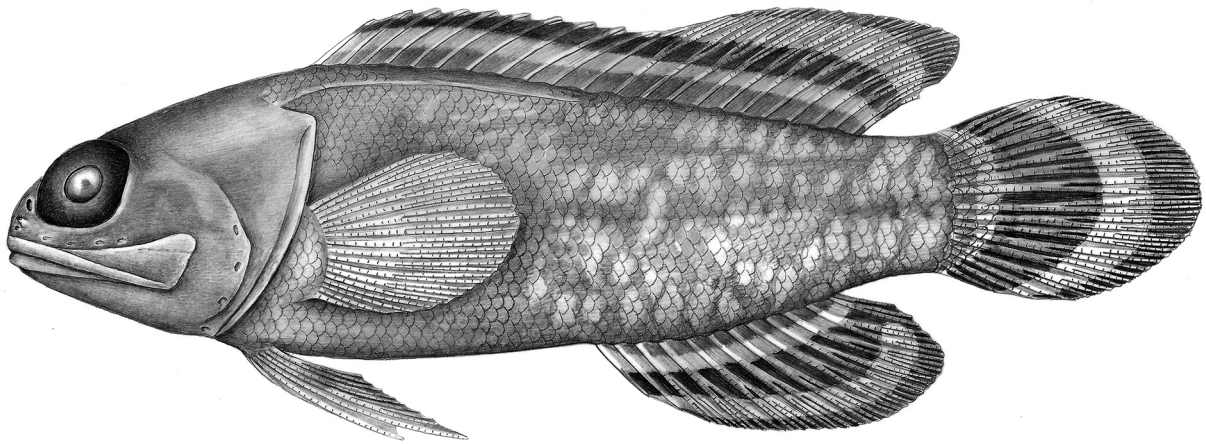

FIGURE 76. *Opistognathus evermanni*, MNHN 1964–626, male, 81.5 mm SL, Nha-Trang, Vietnam. Drawn by J.R. Schroeder.

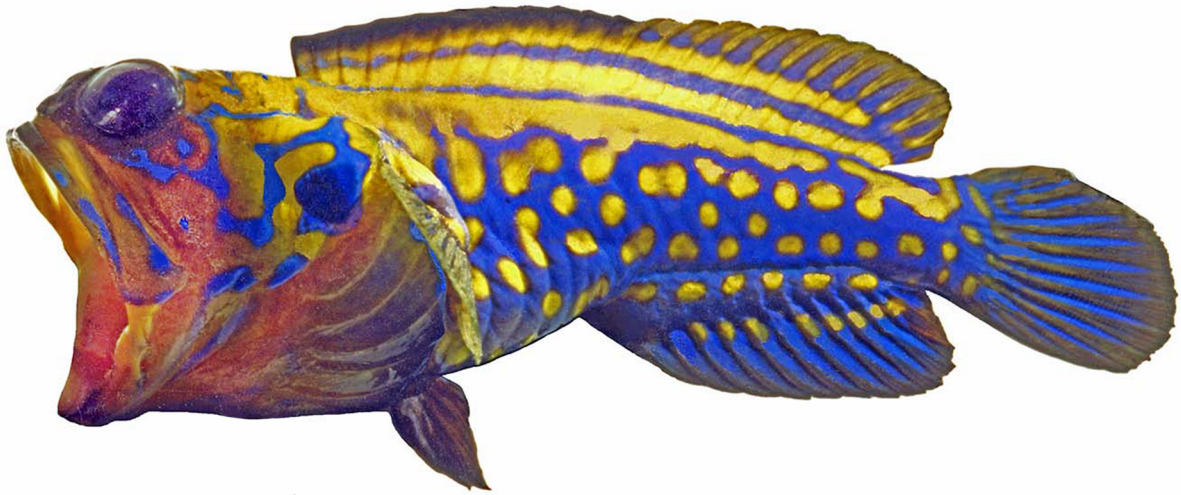

FIGURE 77. *Opistognathus eximius*, Hervey Bay, Queensland, Australia. Photo by R. March, courtesy AMS.

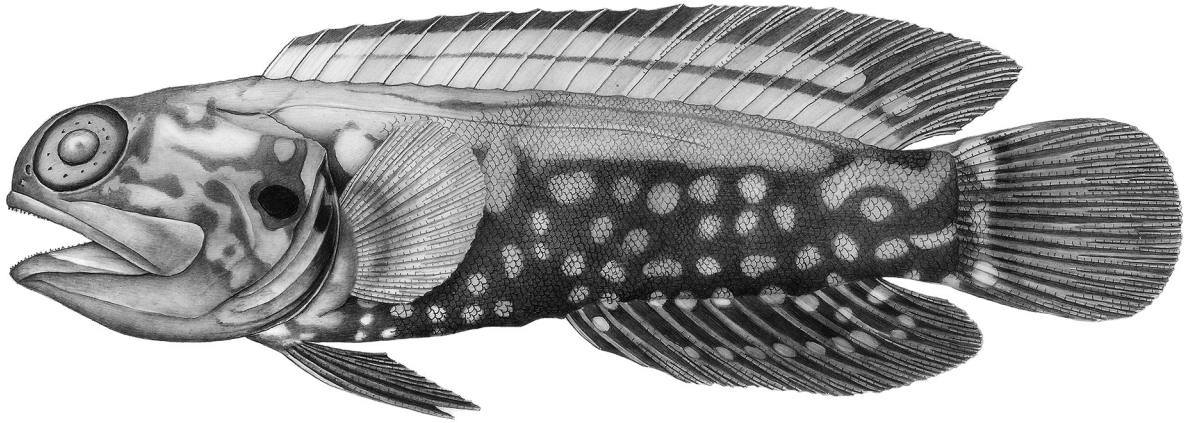

FIGURE 78. *Opistognathus eximius*, AMS I.15388–007, male, 191 mm SL, Heron Island, Great Barrier Reef. Drawn by J.R. Schroeder.

FIGURE 79. *Opistognathus flavidus* n.sp., holotype, KAUM-I 70089, 71 mm SL, East China Sea. Photo courtesy H. Motomura.

FIGURE 80. *Opistognathus flavidus* n.sp., KPM-NI 40676, 57.2 mm SL, Ehime Prefecture, S. of Cape Komo, Japan. Courtesy Kanagawa Prefectural Museum of Natural History, photo by H. Senou.

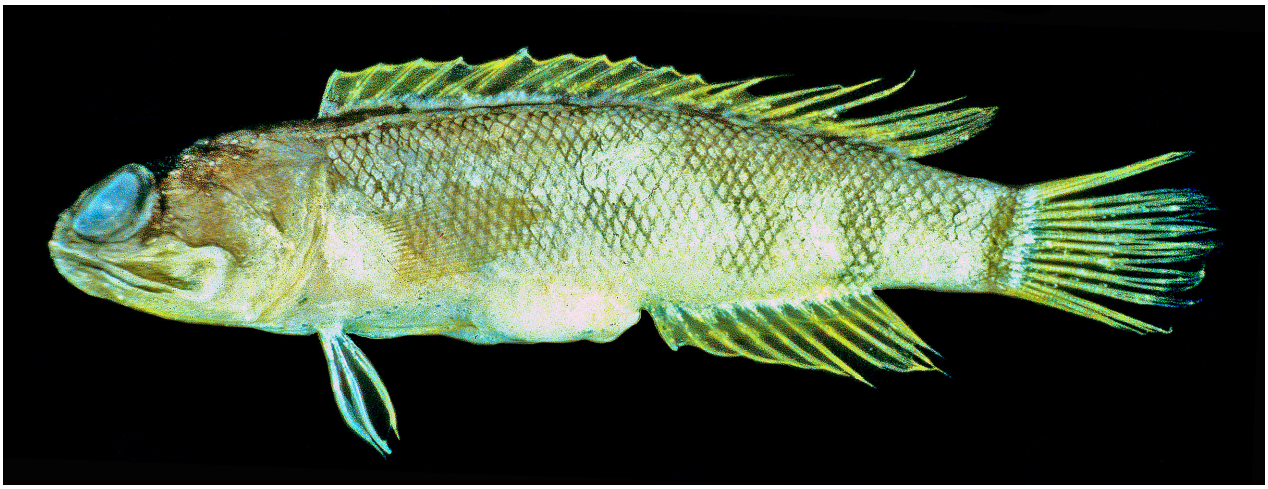

FIGURE 81. *Opistognathus flavidus* n.sp., NTUM 6177, 56.6 mm SL, Ta-chi, Taiwan. After Shen *et al.* (1986, fig. 12).

FIGURE 82. *Opistognathus helvolus* n.sp., holotype, NTUM 13711, 39.8 mm SL, Coral Sea east of New Caledonia. Photo by W.-J. Chen.

FIGURE 83. *Opistognathus hongkongiensis*, NTM S.14607–011, male, 126.6 mm SL, Timor, Indonesia. Photo by B.C. Russell.

FIGURE 84. *Opistognathus hongkongiensis*, KAUM-I. 69449, 112 mm SL, Panay Island, Philippines. Photo courtesy of H. Motomura.

FIGURE 85. *Opistognathus hongkongiensis*, UF 243365, female, 122 mm SL, Taiwan. Photo courtesy of H. Motomura.

FIGURE 86. *Opistognathus hopkinsi*, KAUM-I. 78945, 103 mm SL, Osumi Islands, Japan. Photo courtesy H. Motomura.

FIGURE 87. *Opistognathus hopkinsi*, ASIZP 61792, female, 111.2 mm SL, Guishan Island, Taiwan. Photo by P. Sou-Long.

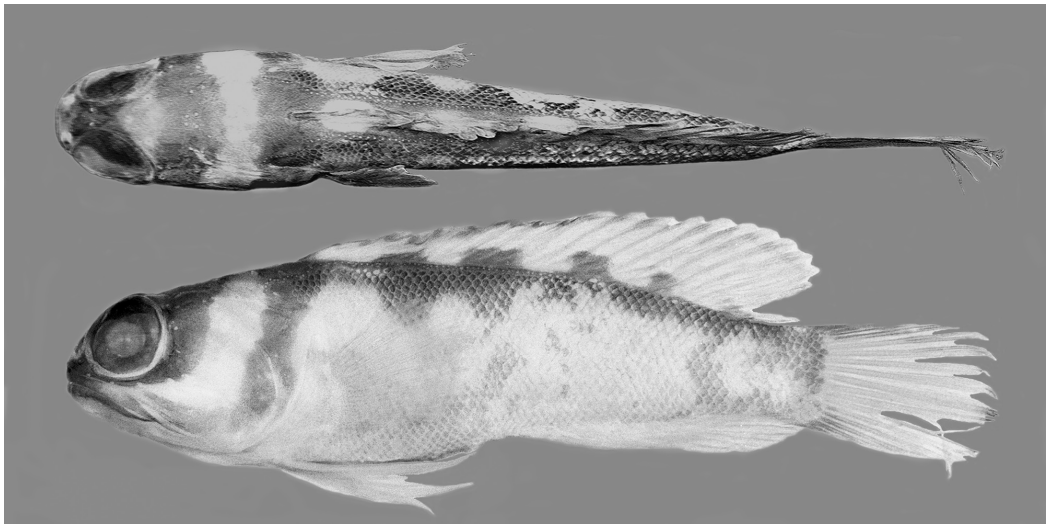

FIGURE 88. *Opistognathus hopkinsi*, MNHN 2001–1083, preserved male, 50.4 mm SL, Vatoa Island, Lau Group, Fiji. Photo by H.L. Jelks.

FIGURE 89. *Opistognathus hopkinsi*, ca. 50 mm TL, IZU Marine Park, Japan. Photo by "Feel the Sea."

FIGURE 90. *Opistognathus hyalinus* n.sp., WAM P.32971–001, male, 32.7, western Morotai Island, Indonesia. Photo by M.V. Erdmann.

FIGURE 91. *Opistognathus hyalinus* n.sp., WAM P.32972–001, 21 mm SL, eastern Morotai Island, Indonesia. Photo by M.V. Erdmann.

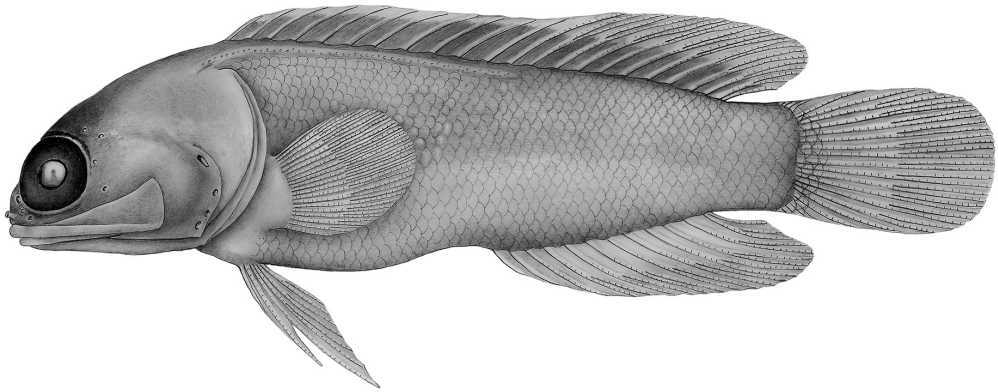

FIGURE 92. *Opistognathus hyalinus* n.sp., holotype, PNM 15647, male, 32.0 mm SL, Siquijor Island, Philippines. Drawn by J.R. Schroeder.

FIGURE 93. *Opistognathus inornatus*, CSIRO T.1714, ca. 450 mm TL, Broome, Western Australia. Photo by Lew Reynolds, courtesy of CSIRO.

FIGURE 94. *Opistognathus inornatus*, USNM 396712, 150 mm SL, Exmouth Gulf, Western Australia. Photo by S.J. Raredon.

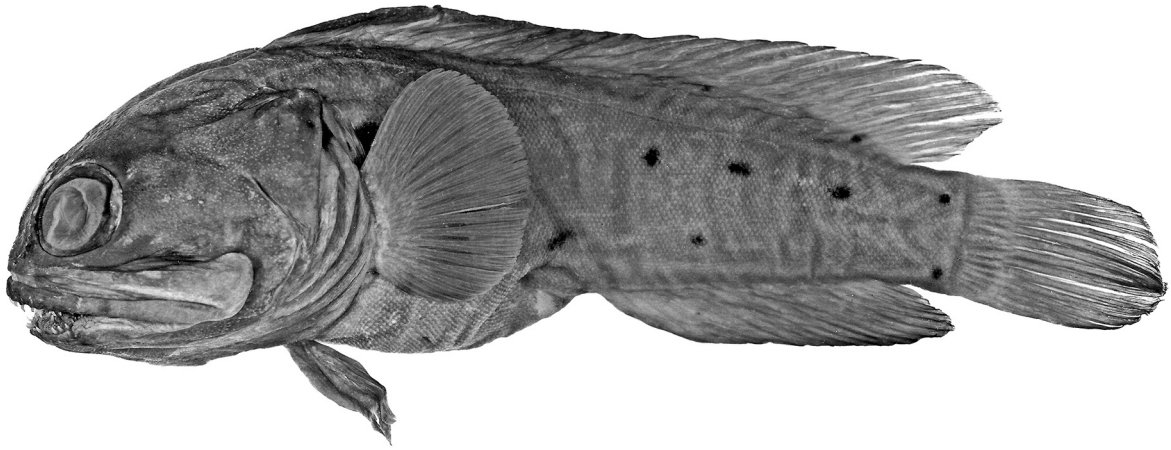

FIGURE 95. *Opistognathus inornatus*, AMS I.12905, preserved, 253 mm SL, Port Hedland, Western Australia. Photo by W.F. Smith-Vaniz.

FIGURE 96. *Opistognathus inornatus*, CSIRO C.2774, preserved, male, 172 mm SL, Exmouth Gulf, Western Australia (notch in fin due to injury). Photo by W.F. Smith-Vaniz.

FIGURE 97. *Opistognathus iyonis*, KPM-NI 26341, 62.2 mm SL, Tokyo Bay, Japan. Photo courtesy Kanagawa Prefectural Museum of Natural History and H. Senou.

FIGURE 98. *Opistognathus jacksoniensis*, 180 mm TL, Moreton Bay, Queensland, Australia (spinous dorsal fin folded down). Modified from E.M. Grant (1982, Pl. 301).

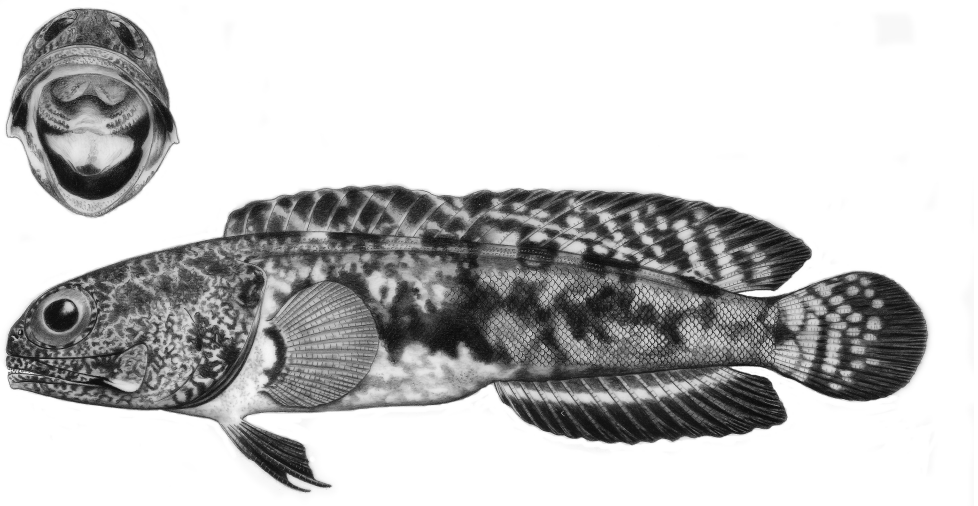

FIGURE 99. *Opistognathus jacksoniensis*, QM I.20698, female, 185 mm SL, Mooloolaba vicinity, Queensland, Australia; insert frontal view of head to show conspicuous oral pigmentation. Drawn by T.D. Pedersen.

FIGURE 100. *Opistognathus latitabundus*, CSIRO H 772–1, female, 195 mm SL, Arafura Sea, NE of Goulburn Islands. Photo by T. Carter, courtesy of CSIRO.

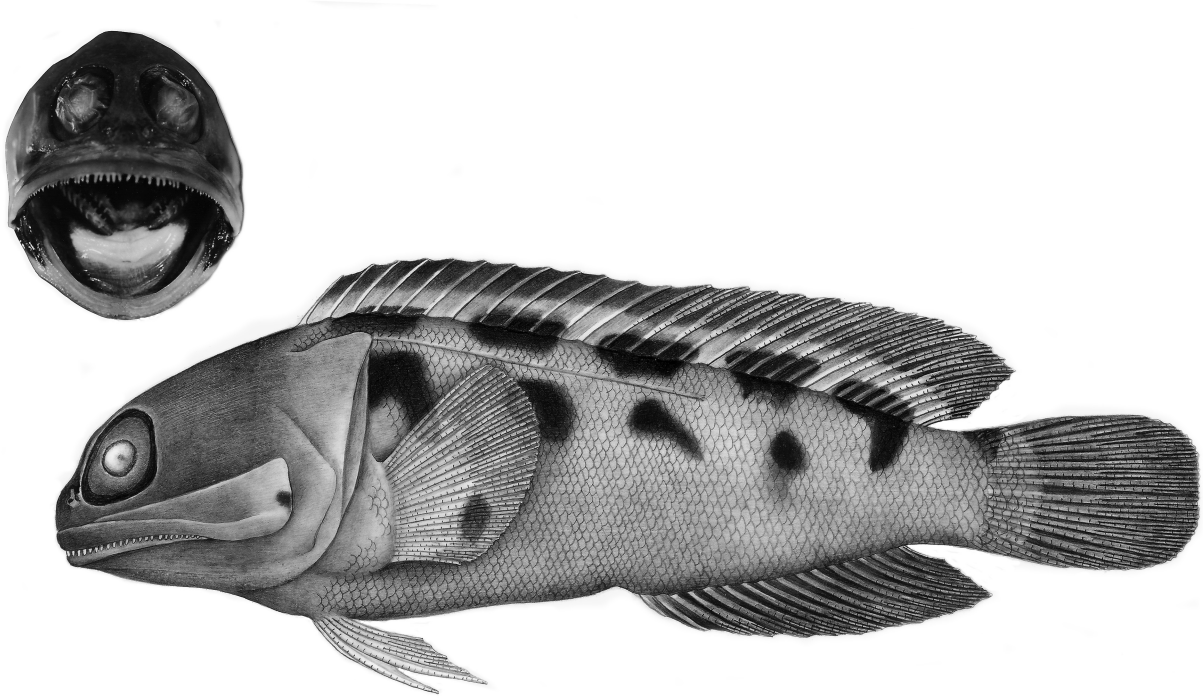

FIGURE 101. *Opistognathus latitabundus*, CSIRO C 4473, male, 198 mm SL, Gulf of Carpenteria, Australia; insert frontal view to show conspicuous oral pigmentation. Drawn by J.R. Schroeder.

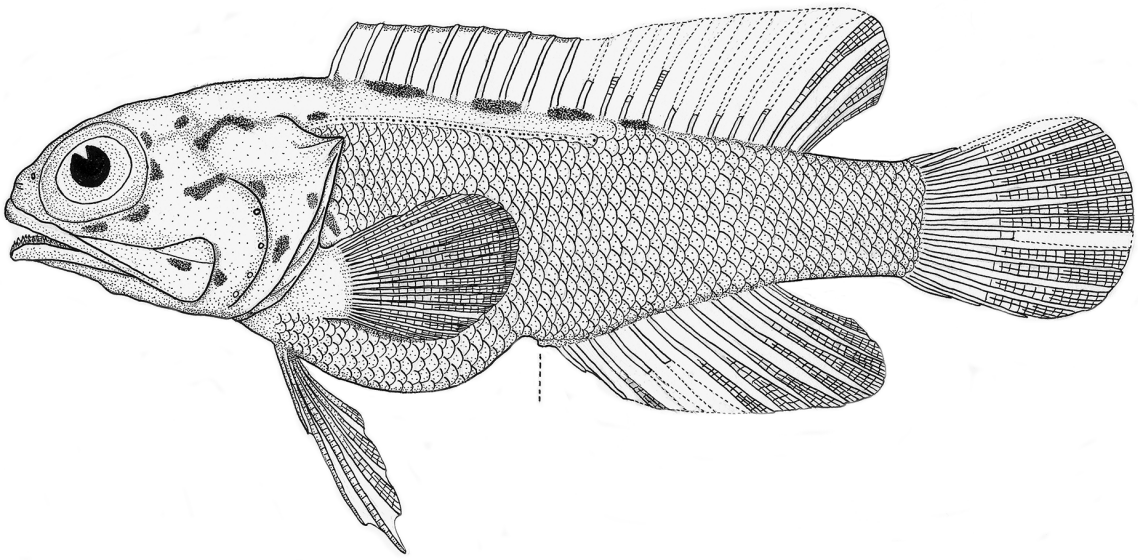

FIGURE 102. *Opistognathus liturus*, holotype, URM P.8134, 55.3 mm SL, Shirahama-cho, Wakayama Pref., Japan. Drawn by T. Yoshino, after Smith-Vaniz & Yoshino (1985, fig. 4).

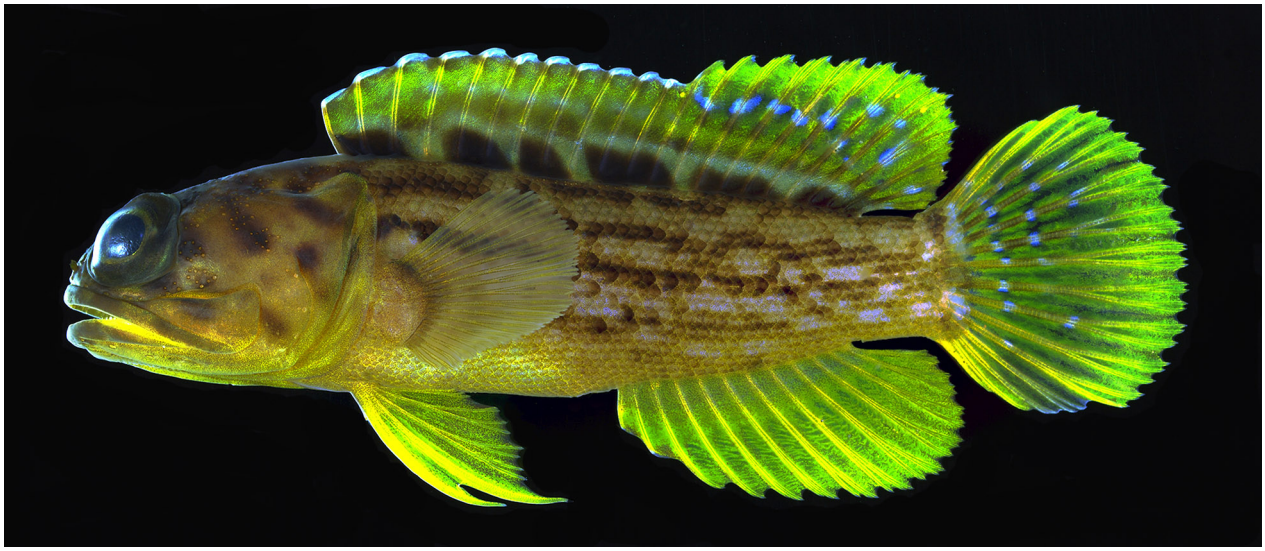

FIGURE 103. *Opistognathus* sp. 1, KAUM-I. 89691, 59.2 mm SL, koshiki Islands, Kogoshima, Japan. Photo courtesy H. Motomura.

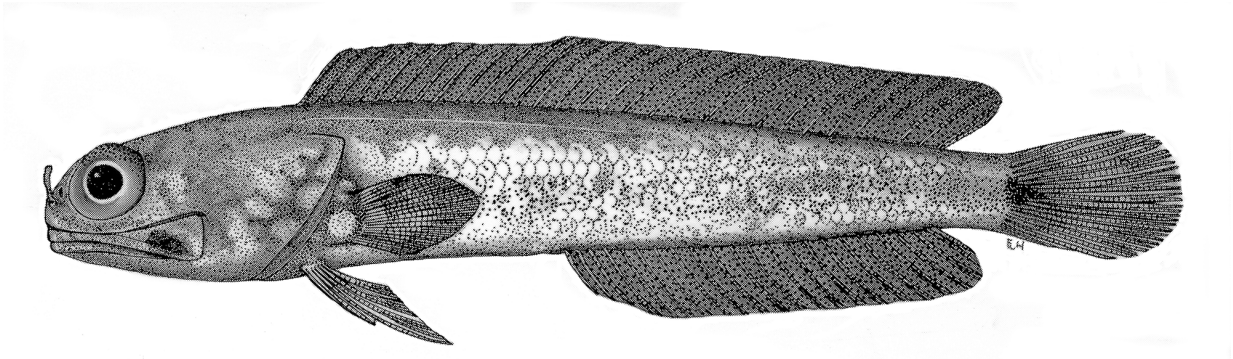

FIGURE 104. *Opistognathus longinaris*, holotype, SAIAB 39747, 41.0 mm SL, Kosi mouth area, South Africa. Camera Lucida drawing of right side of head (reversed) and pectoral-fin base pigmentation (left side). Drawn by E. Heemstra, after Smith-Vaniz (2010, fig. 16) © NRF-SAIAB.

FIGURE 105. *Opistognathus macrolepis*, KAUM-I. 23824, 63.8 mm SL, Gulf of Thailand. Photo courtesy of H. Motomura.

FIGURE 106. *Opistognathus macrolepis*, ZSI F-10576/2, 64 mm SL, Kalpakkam, India. Photo by S. Biswas, after Biswas *et al.* (2013, fig. 2).

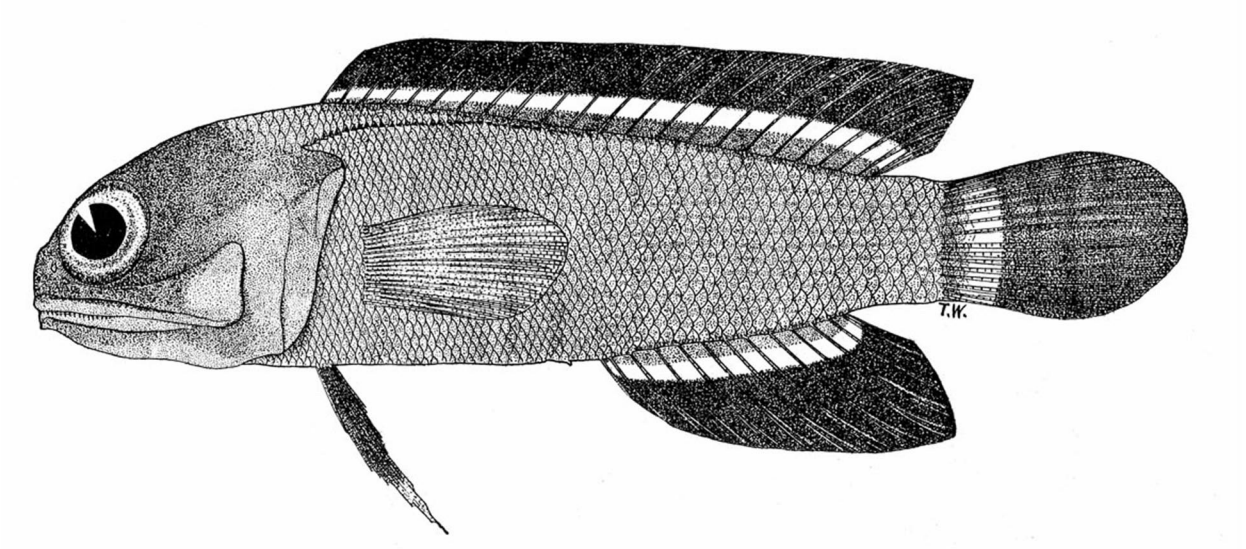

FIGURE 107. *Opistognathus macrolepis*, holotype of *Opistognathus rex*, MFLB 1975-6-17-1, male, 80.3 mm SL, Gulf of Thailand; after Wongratana (1975, fig. 1).

FIGURE 108. *Opistognathus margaretae*, SAIAB 43682, 70.5 mm SL, Ponta Malongane, Mozambique. Photo by P.C. Heemstra, after Smith-Vaniz (2021, unnumbered fig.) © NRF-SAIAB.

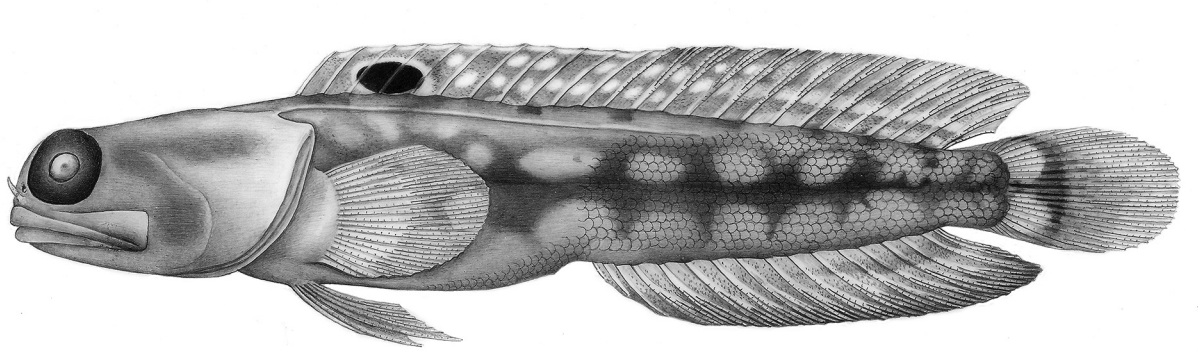

FIGURE 109. *Opistognathus margaretae*, SAIAB 7603, female, 77.7 mm SL, Shimoni, Kenya. Drawn by J.R. Schroeder.

FIGURE 110. *Opistognathus megalops* n.sp., holotype, KAUM-I. 97065, 88 mm SL, Osumi Islands, Japan. Photo courtesy H. Motomura.

FIGURE 111. *Opistognathus microspilus* n.sp., holotype, NMMBP 13933, preserved, male, 53.7 mm SL, Taiwan. Photo by S.J. Raredon.

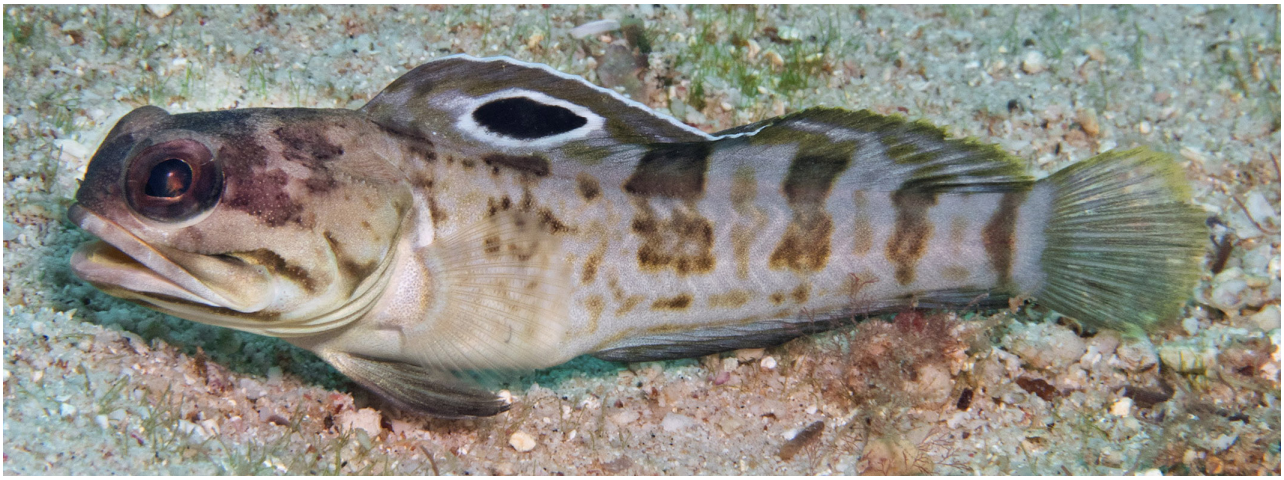

FIGURE 112. *Opistognathus muscatensis*, SMF uncat., 74 mm SL, Qariah, Socoftra. Photo by S.V. Bogorodsky.

FIGURE 113. *Opistognathus muscatensis*, Durban Aquarium, South Africa. Photo by J.E. Randall, after Smith-Vaniz (2009, fig. 15).

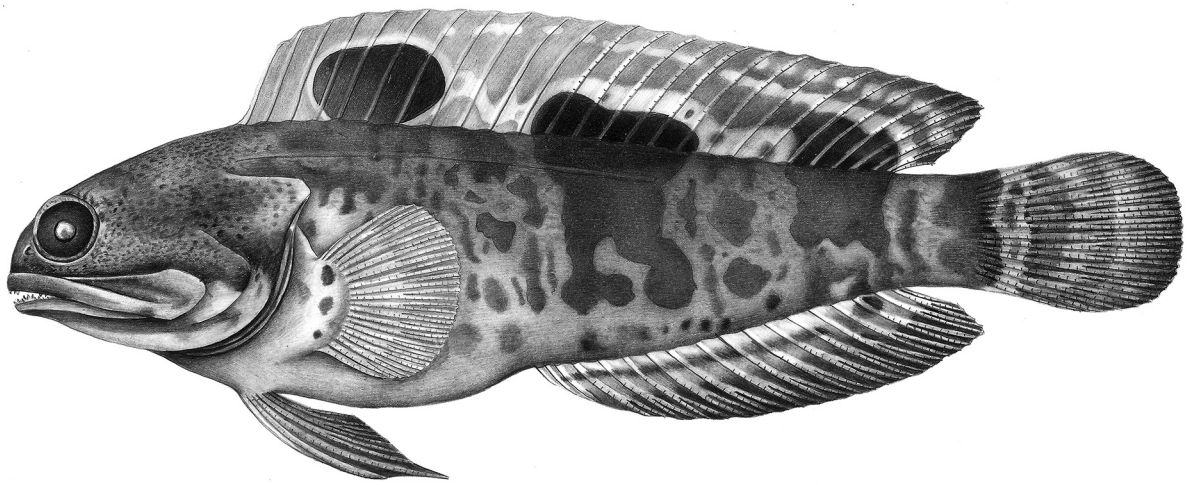

FIGURE 114. *Opistognathus muscatensis*, ANSP 87958, female, 259 mm SL, Natal, South Africa. Drawn by J.R. Schroeder, after Smith-Vaniz (2009, fig. 14).

FIGURE 115. *Opistognathus nigripinnis* n.sp., holotype, KPM 10482, 34 mm SL, Kii Peninsula, Japan. Photo courtesy Kanagawa Prefectural Museum of Natural History and H. Senou.

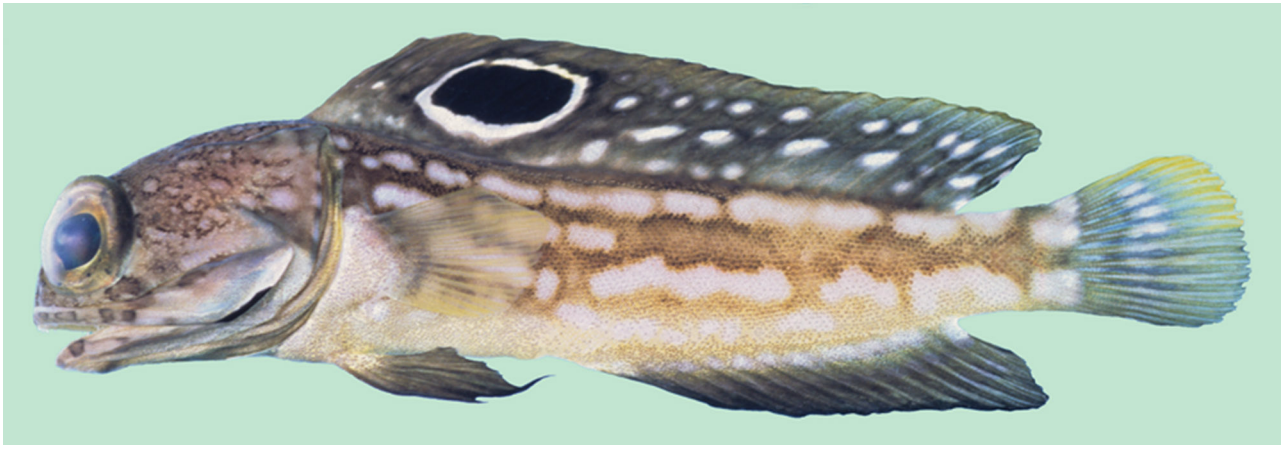

FIGURE 116. *Opistognathus nigromarginatus*, PMBC 14026, male 64 mm SL, Cape Panwa, Phuket Prov., Thailand. Photo by U. Satapoomin, after Smith-Vaniz (2009, fig. 18).

FIGURE 117. *Opistognathus nigromarginatus*, BPBM 27701, male 139.9 mm SL, Vizhinjam, India. Photo by J.E. Randall, after Smith-Vaniz (2009, fig. 17).

FIGURE 118. *Opistognathus nigromarginatus*, KAUM-I. 47576, 112 mm SL, Ranong Prov., Thailand. Photo courtesy H. Motomura.

FIGURE 119. *Opistognathus ocellicaudatus*, holotype, NSMT-P 125494, female, 69.4 mm SL, Sagami Bay, Japan. After Shinohara, 2021, fig. 1.

FIGURE 120. *Opistognathus papuensis*, AMS IB.8357, male, 270 mm SL, Magnetic Island, Queensland, Australia. Photo by J.E. Randall.

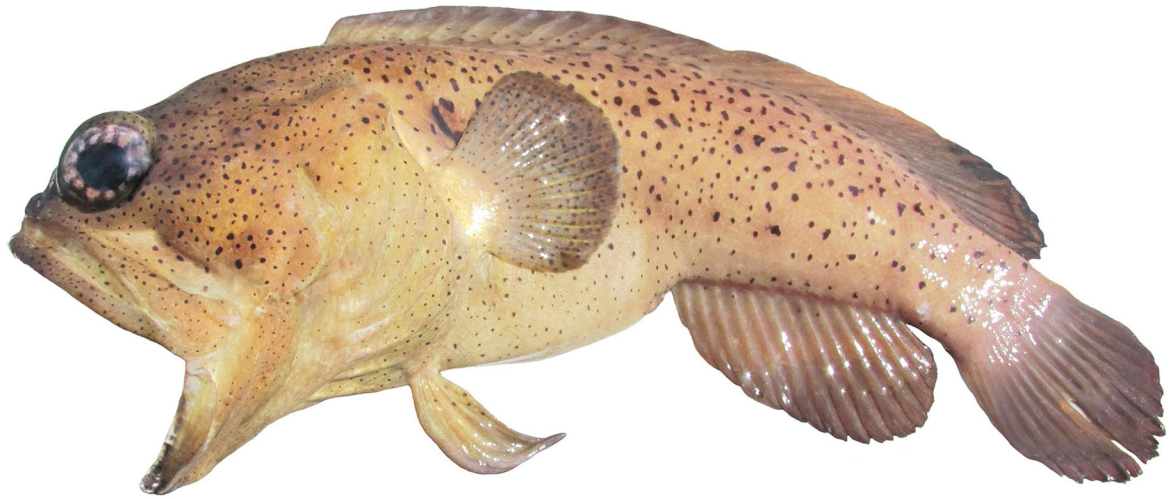

FIGURE 121. *Opistognathus papuensis*, ca. 275 mm SL, between Cape York and York Island, Queensland, Australia. Photo by C. Heron.

FIGURE 122. *Opistognathus papuensis*, ca. 150 mm SL, Mission River, Gulf of Carpentaria, Queensland, Australia. Photo by G. Black.

FIGURE 123. *Opistognathus pardus,* holotype, CMFRI GB.31.104.1.2, male, 98.9 mm SL, Kerala, Quilon, India. Photo by K.K. Bineesh, after Smith-Vaniz, Bineesh & Akhilesh (2012, fig. 1).

FIGURE 124. *Opistognathus parvus* n.sp., FMNH 118281., male, 23.8 mm SL, Culion Island, Palawan Prov., Philippines. Photo by J.T. Williams.

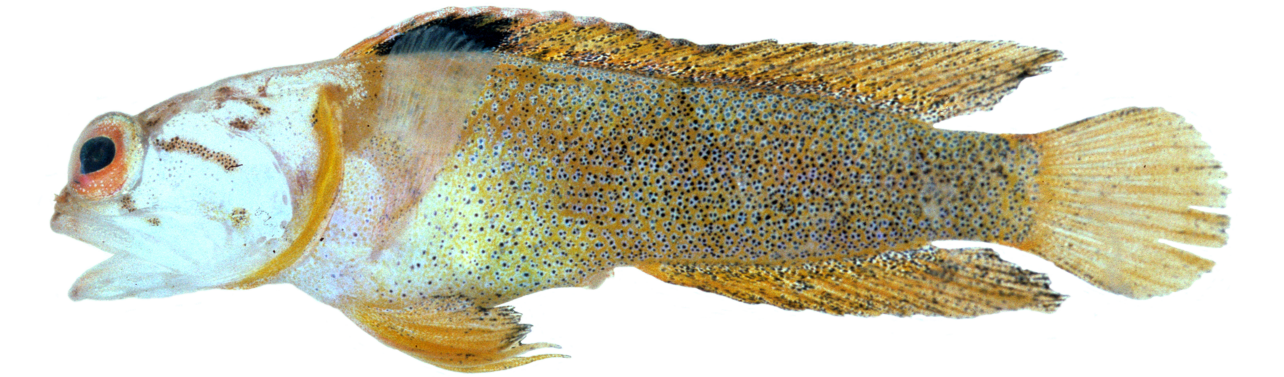

FIGURE 125. *Opistognathus parvus* n.sp., USNM 352354, male, 27.0 mm SL, Santa Cruz Island, Solomon Islands. Photo by J.T. Williams.

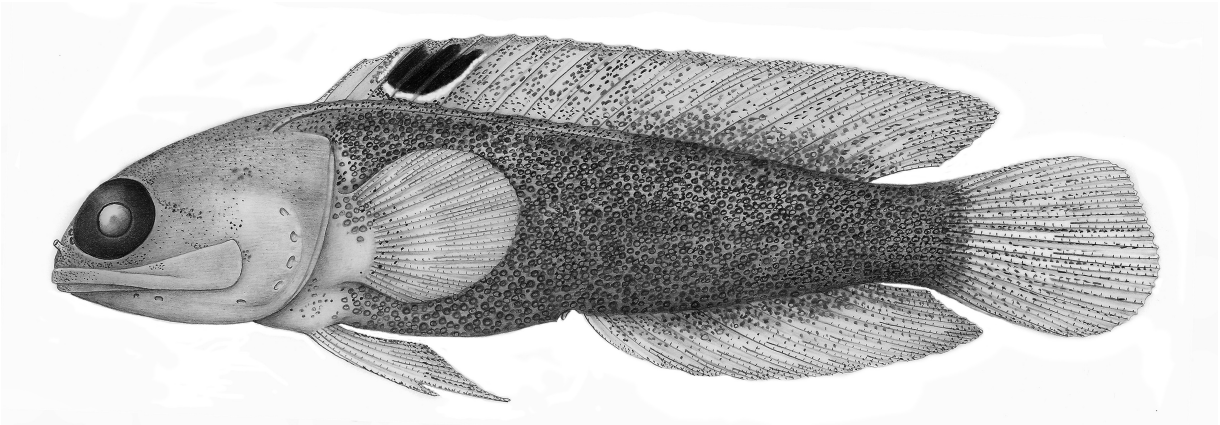

FIGURE 126. *Opistognathus parvus* n.sp., holotype, ANSP 133404, female, 24.8 mm SL, Tutuila Island, American Samoa (body scales not shown). Drawn by J.R. Schroeder.

FIGURE 127. *Opistognathus pholeter* n.sp., USNM 321032, male, 56 mm SL, Ouvea Atoll, Loyalty Islands. Photo by J.T. Williams.

FIGURE 128. *Opistognathus pholeter* n.sp., BPBM 11471, 49.7 mm SL, Noumea, New Caledonia. Photo by J.E. Randall.

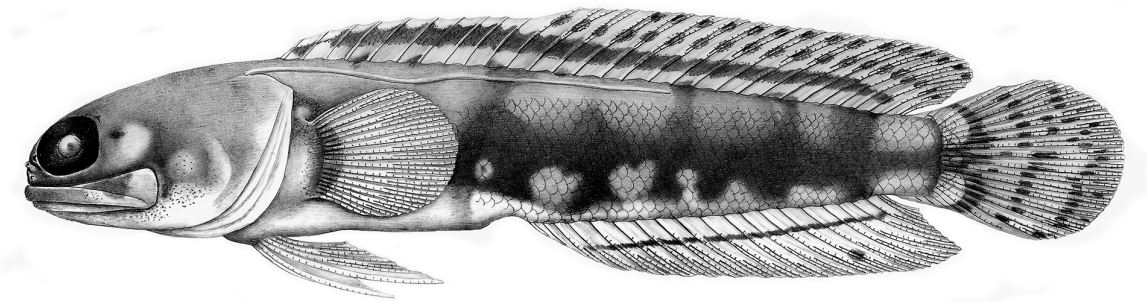

FIGURE 129. *Opistognathus pholeter* n.sp., ANSP 142962, female, 44.0 mm SL, Noumea, New Caledonia. Drawn by J.R. Schroeder.

FIGURE 130. *Opistognathus randalli*, NSMT-P, male, 63 mm SL, Sulawesi, Bitung. Photo by K. Shibukawa, after Kimura and Matsuura (2003:59, unnumbered color photo).

FIGURE 131. *Opistognathus reticeps,* NTM-S.17441-001, 130 mm SL, West Arm, Darwin Harbour, Northern Territory, Australia. Photo by M. Hammer.

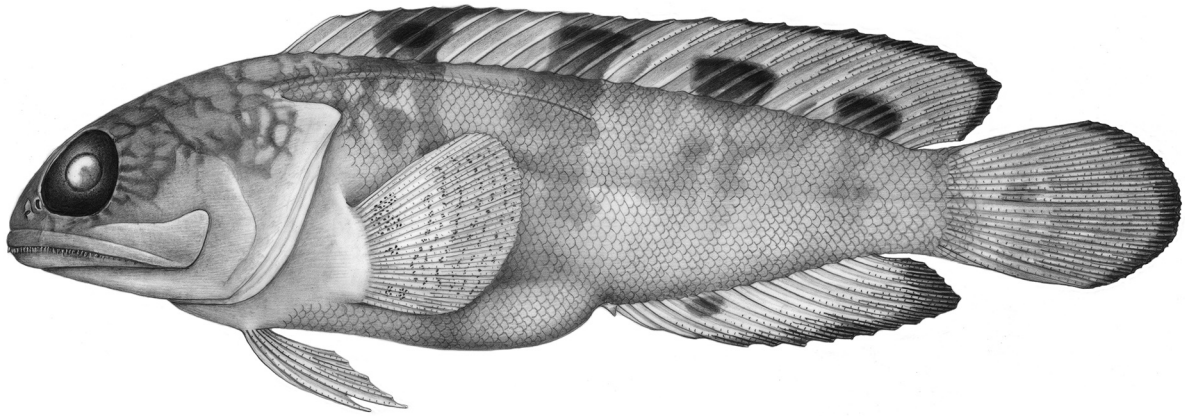

FIGURE 132. *Opistognathus reticeps,* WAM P.24227, female, 113 mm SL, Napier Broome Bay, Western Australia. Drawn by J.R. Schroeder, after Smith-Vaniz (2004, fig. 11).

FIGURE 133. *Opistognathus reticulatus*, WAM P.25669–001, male, 174 mm SL, Port Warrender, Western Australia. Photo by B.J. Hutchins.

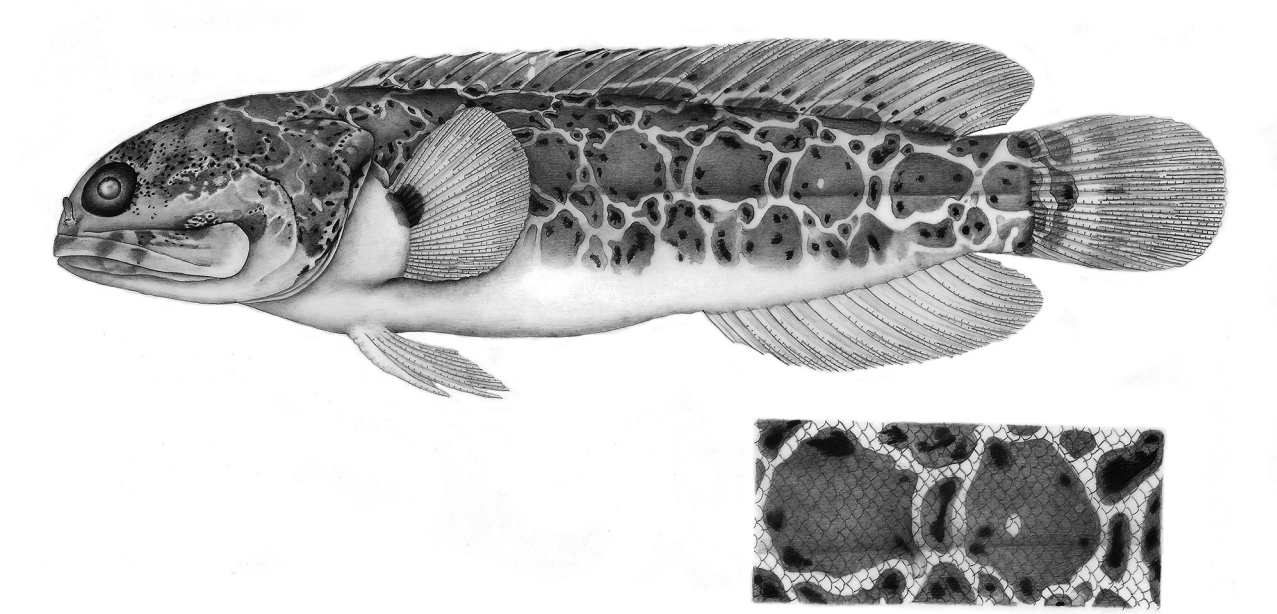

FIGURE 134. *Opistognathus reticulatus*, WAM P.22030, female, 368 mm SL, Dampier Archipelago, Western Australia; body scales not shown except in insert of area above anal fin. Drawn by J.R. Schroeder.

FIGURE 135. Frontal view of head showing eye flap of *Opistognathus reticulatus*, USNM 396708, 99.2 mm SL. Photo by S.J. Raredon.

FIGURE 136. *Opistognathus rosenbergii*, WAM P.34344–012, 65 mm SL, Raja Ampat Islands, West Papua, Indonesia. Photo by M.V. Erdmann.

FIGURE 137. *Opistognathus rosenbergii*, PMBC 15333, 102 mm SL, Cape Phanwa, Thailand. Photo by U. Satapoomin.

FIGURE 138. *Opistognathus rosenbergii*, SMF 5422, preserved, 116 mm SL (holotype of *Gnathypops rosenbergi annulata*), Nicobar Island. Photo by W.F. Smith-Vaniz.

FIGURE 139. *Opistognathus rufilineatus*, Triton Bay, Bird's Head Peninsula, West Papua, Indonesia. Photo by M.V. Erdmann, after Smith-Vaniz and Allen (2007, fig. 4).

FIGURE 140. *Opistognathus rufilineatus*, NWV A.29690–007 male, 45.3 mm SL, off Broome, Western Australia. Photo by M.F. Gomon.

FIGURE 141. *Opistognathus rufilineatus*, USNM 396710, preserved, male, 54.5 mm SL, Triton Bay, West Papua, Indonesia; Photo by S.J. Raredon.

FIGURE 142. *Opistognathus seminudus*, Great Barrier Reef, Queensland, Australia. Photo by F. Walsh.

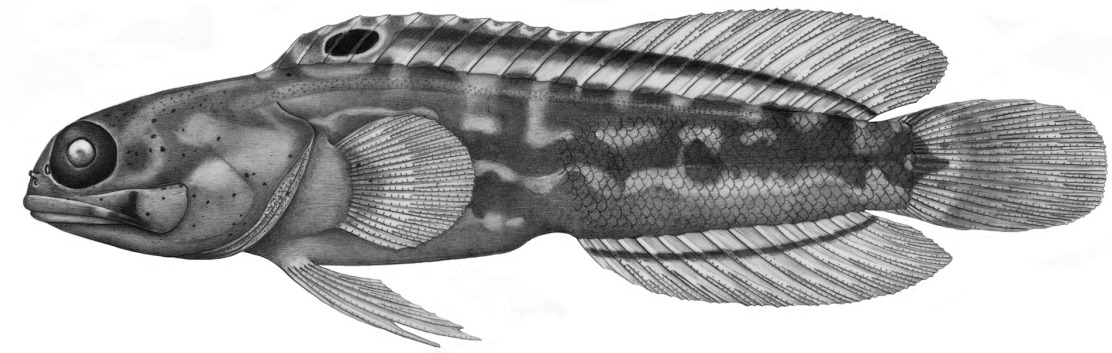

FIGURE 143. *Opistognathus seminudus*, AMS I.15681–063, male, 76.1 mm SL, One Tree Island, Great Barrier Reef. Drawn by J.R. Schroeder, after Smith-Vaniz (2004, fig. 5).

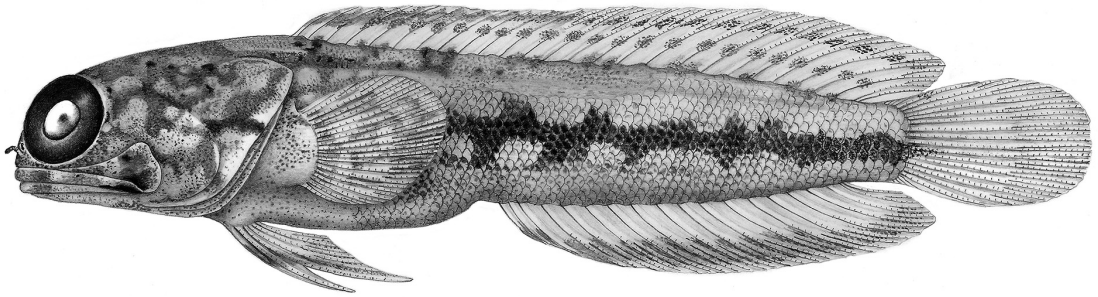

FIGURE 144. *Opistognathus simus*, holotype, USNM 315658, female, 66.4 mm SL, St. Brandon's Shoals (= Cargados Carajos). Drawn by J.R. Schroeder, after Smith-Vaniz (2010, fig. 17).

FIGURE 145. *Opistognathus solorensis*, USNM 396244, 42.8 mm SL, Palawan Prov., Busuanga, Philippines. Photo by J.T. Williams.

FIGURE 146. *Opistognathus solorensis*, KAUM-I. 67972, 48.1 mm SL, Yakushima Island, Japan. Photo courtesy the Kagoshima Museum, after Tashiro *et al.* (2018, fig. 1B).

FIGURE 147. *Opistognathus solorensis*, Lembeh Strait, Sulawesi, Indonesia. Photo by N. DeLoach, after Smith-Vaniz (2016, fig. 8).

FIGURE 148. *Opistognathus solorensis*, WAM P.33753–001, preserved, male, 57.3 mm SL, Timor–Leste. Photo by S.J. Raredon, after Smith-Vaniz (2016, fig. 6).

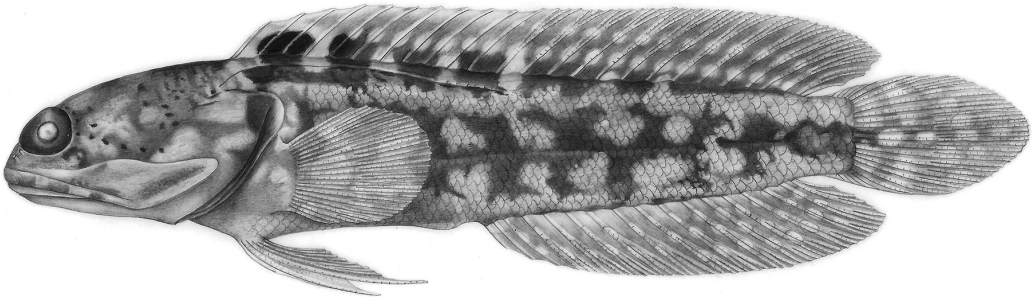

FIGURE 149. *Opistognathus solorensis*, USNM 210949, male 72.9 mm SL, Nusa Laut Island, Molucca Islands, Indonesia. Drawn by J.R. Schroeder, after Smith-Vaniz (2016, fig. 5).

FIGURE 150. *Opistognathus stigmosus*, holotype, AMS I.22583–004, 70.5 mm SL, Escape Reef, Queensland, Australia. Photo by R.C. Steene.

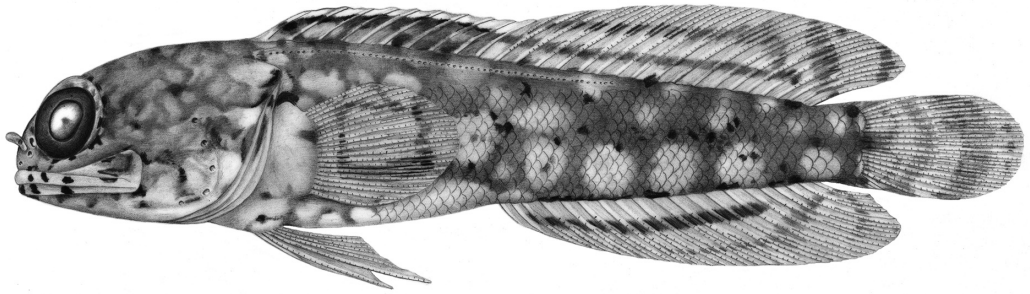

FIGURE 151. *Opistognathus stigmosus*, holotype, AMS I.22583–004, male, 70.5 mm SL, Escape Reef, Queensland, Australia. Drawn by J.R. Schroeder, after Smith-Vaniz (2004, fig. 7).

FIGURE 152. *Opistognathus trimaculatus*, holotype, NSMT-P 111154, female, 72.0 mm S, Tosa Bay, Japan. After Hiramatsu & Endo (2013, Fig. 1).

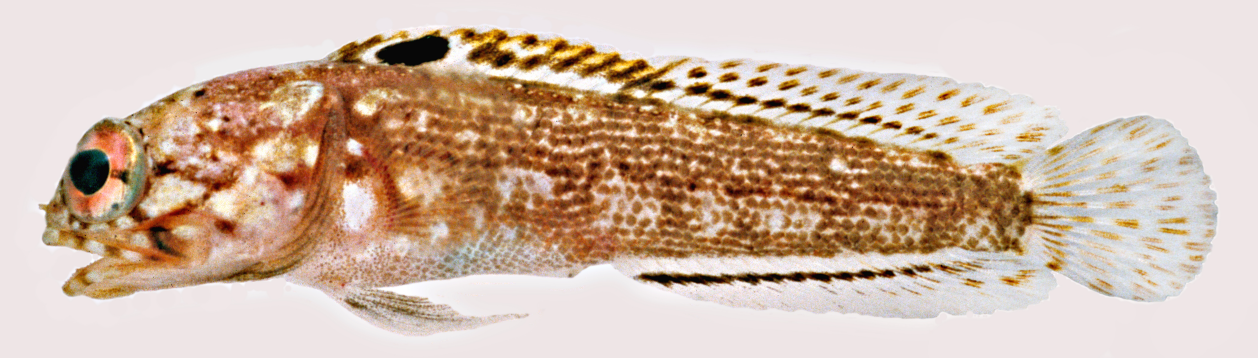

FIGURE 153. *Opistognathus triops* n.sp., holotype, USNM 359743, female, 39.6 mm SL, Epi Island, Vanuatu. Photo by J.T. Williams.

FIGURE 154. *Opistognathus triops* n.sp., USNM 342223, male, 35.8 mm SL, Epi Island, Vanuatu. Photo by J.T. Williams.

FIGURE 155. *Opistognathus variabilis*, BPBM 32707, male, 76.0, Maldives Islands. Photo by J.E. Randall, afer Smith-Vaniz (2009, fig. 27).

FIGURE 156. *Opistognathus variabilis*, USNM 373246, male 76.5 mm SL, Busuanga, Philippines. Photo by J.T. Williams, after Smith-Vaniz (2009, fig. 33).

FIGURE 157. *Opistognathus variabilis*, ASIZT 56989, male 40 mm SL, Orchid Island, South China Sea. Photo by J.P. Chen, after Smith-Vaniz (2009, fig. 36).

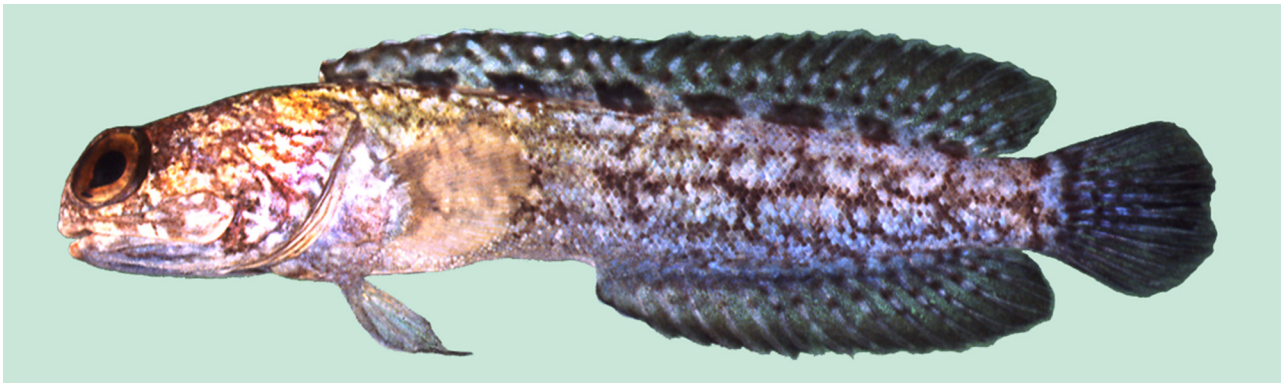

FIGURE 158. *Opistognathus variabilis*, BPBM 26560, male, 64.5 mm SL, Sulawesi, Indonesia. Photo by J.E. Randall.

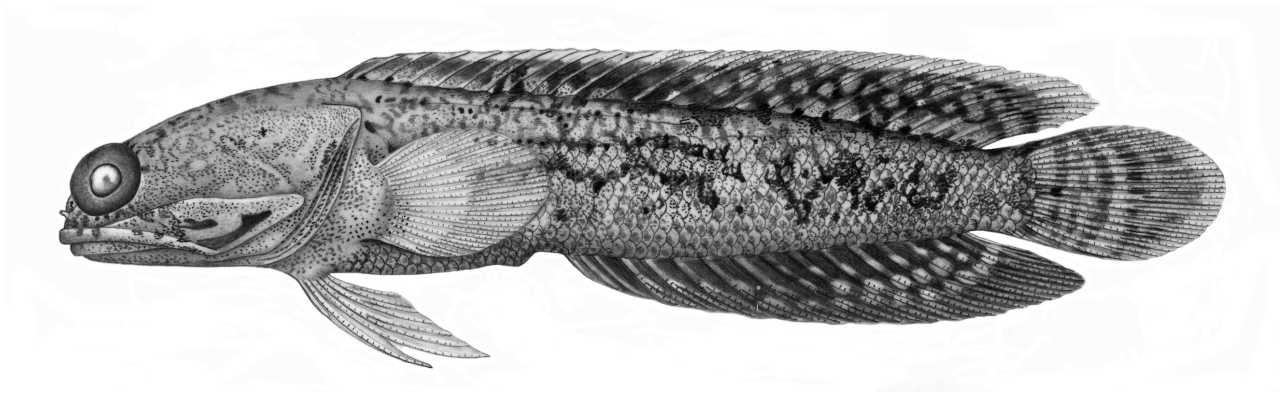

FIGURE 159. *Opistognathus verecundus*, holotype, NTM S.10016–003, male, 52.6 mm SL, Cobourg Peninsula, Northern Territory, Australia. Drawn by J.R. Schroeder, after Smith-Vaniz (2004, fig.9).

FIGURE 160. *Opistognathus vigilax* n.sp., WAM P. 33119.001, 26.6 mm SL, partially out of burrow, Pelong Pinnacle, Brunei, 16 m. Photo by G.R. Allen.

FIGURE 161. *Opistognathus vigilax* n.sp., WAM P. 33119.001, 26.6 mm SL, same data as Fig. 161. Photo by G.R. Allen.

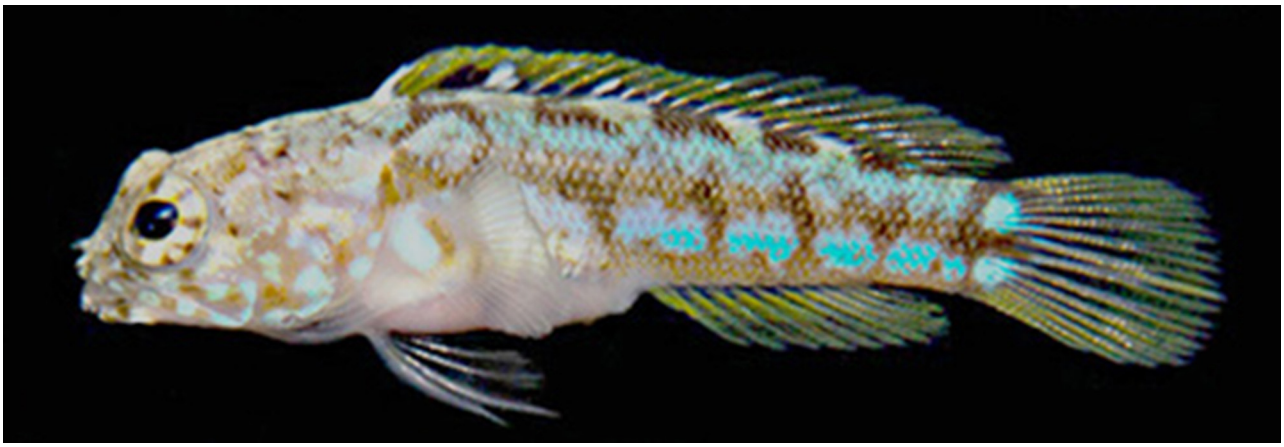

FIGURE 162. *Opistognathus vigilax* n.sp., gravid female, 52 mm SL, southeast Misool, Raja Ampat Islands, Indonesia, 65–70 m. Photo by M.V. Erdmann.

FIGURE 163. *Opistognathus vigilax* n.sp., PNM 15647 (previously USNM 436450), gravid female, 41.7 mm SL, Oriental, Mindoro, Puerto Galera, Philippines. Photo by J.T. Williams.

FIGURE 164. *Opistognathus vigilax* n.sp., holotype, WAM P. 34268–012, preserved, 45 mm SL, northeast Ampa, Brunei. Photo by S.J. Raredon.

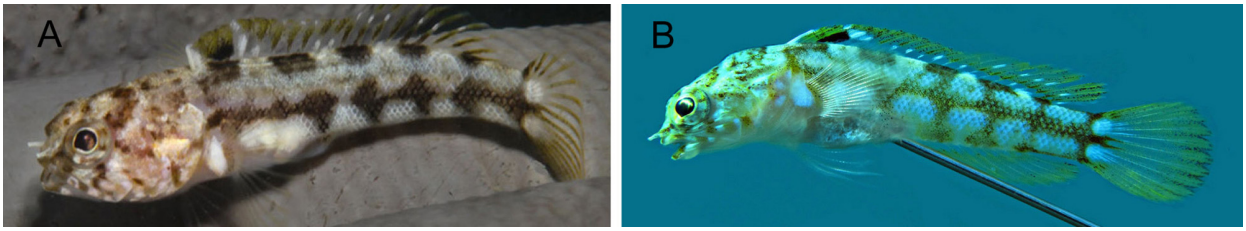

FIGURE 165. *Opistognathus* vigilax n.sp., juveniles, 20–21 mm SL: **A**, northeast Ampa, Brunei, 30 m. Photo by M.V. Erdmann; **B**, impaled on insect pen, Sumber Kima, Bali, Indonesia, 65–70 m. Photo by M.V. Erdmann.

FIGURE 166. *Opistognathus vigilax* n.sp.: **A**, 40 mm SL, north Misool, Raja Ampat Islands, Indonesia, 22 m; **B**,. frontal view of head showing inner pigmentation of lower jaw, same specimen data. Both photos by M.V. Erdmann.

FIGURE 167. *Opistognathus wassi* n.sp., partially out of burrow, Sulawesi, Indonesia. Photo by M.V. Erdmann.

FIGURE 168. *Opistognathus wassi* n.sp., holotype, USNM 357197, male, 49.5 mm SL, Cebu Strait, Philippines. Photo by J.T. Williams.

FIGURE 169. *Opistognathus wassi* n.sp., KAUM I. 68826, Okinawa, Japan. Photo courtesy H. Motomura.

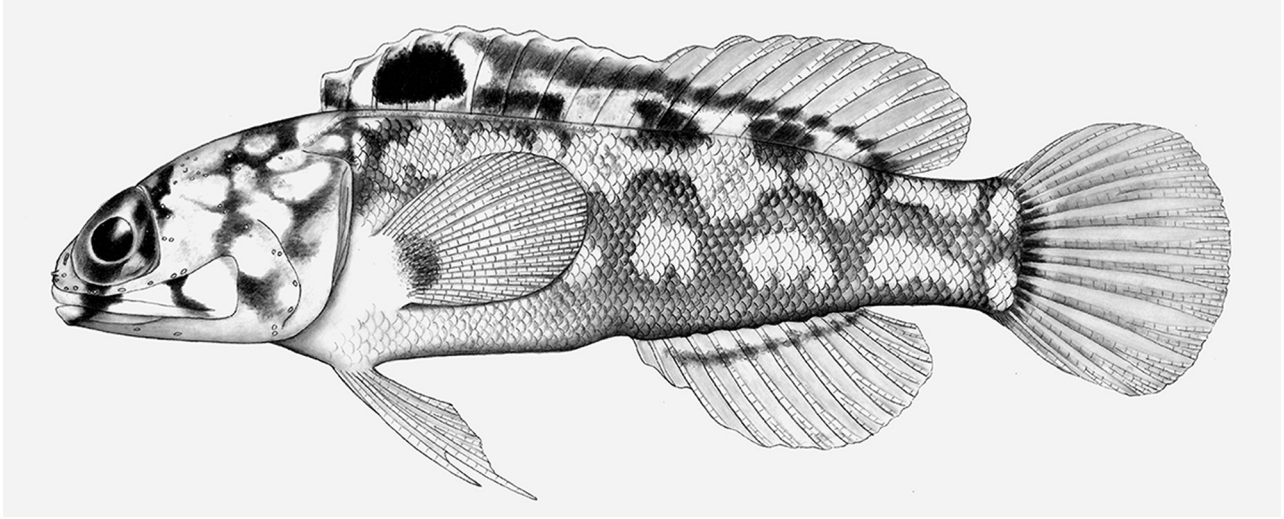

FIGURE 170. *Opistognathus wassi* n.sp., ANSP 133406, female, 51.0 mm SL, Tutuila Island, American Samoa. Drawn by T.D. Pedersen.