

Apletodon gabonensis, a new species of clingfish (Teleostei: Gobiesocidae) from Gabon, eastern Atlantic Ocean

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The clingfish *Apletodon gabonensis* sp. nov. is described on the basis of seven specimens and colour photographs from Gabon, eastern Atlantic Ocean. The species is small, apparently not exceeding 20 mm total length; it is characterized by having 5 dorsal-fin rays, 4-5 anal-fin rays, 25-27 pectoral-fin rays, head width in males 2.6-4.7 in SL, anus in males with urogenital papilla present but not pronounced; snout long, broad, anteriorly truncate in male, narrower and rather pointed in female; preorbital length 1.8-3.8 in head length; conspicuous maxillary barbel absent in both sexes; disc with 10-12 rows of papillae in region A, 5 rows of papillae in region B, and 5-7 rows of papillae in region C. The new species is compared with the other species of the genus; a key to the males of the 6 known species of the eastern Atlantic genus *Apletodon* is presented.

Key words: clingfishes, systematics, Gabon, distribution, identification key.

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INTRODUCTION

The clingfishes of the family Gobiesocidae are distributed worldwide in tropical and temperate seas, some also living in freshwater streams of the tropics. They occur on hard substrata, usually on rocky bottom or in coral reefs, mostly in shallow waters. Clingfishes are characterized by possessing an adhesive disc formed by the pelvic fins, the head depressed, the skin naked, one dorsal and anal fin each, and several specialized osteological characters. The family was revised by Briggs (1955), who distinguished 9 species from the eastern Atlantic and the Mediterranean, all belonging to the subfamily Lepadogastrinae. In addition, there was a single species of Chorisoichisminae from the southeastern Atlantic [*Chorisoichismus dentex* (Pallas 1769) from South

Africa]. In a recent review of the Gobiesocidae of the eastern Atlantic, a total of 13 species was recognized to occur in the area (Fricke *et al.* 2016). Subsequently, *Diplecogaster umuturali* was described from Turkey by Bilecenoğlu *et al.* (2017), and *Lecanogaster gorgoniphila* from São Tomé and Príncipe by Fricke & Wirtz (2017).

The clingfish genus *Apletodon* was first described by Briggs (1955) on the basis of *Lepadogaster microcephalus* Brook, 1890 (a junior synonym of *Apletodon dentatus*); the genus was characterized within the subfamily Lepadogastrinae by having 3 1/2 gills, the gill membranes attached to the isthmus, the disc double, the dorsal and anal fins with strong rays, normal, the subopercular region without a spine, 20-29 pectoral fin rays, the presence of small incisors in front of each jaw followed by 1-3 well

developed canines, and 6 rakers on the first gill arch. Hofrichter & Patzner (1997) found that *Apletodon* species have often been confused with the closely related genus *Diplecogaster*; they distinguished *Apletodon* by its 3 pores of the lacrymal canal (2 in *Diplecogaster*), the first anal-fin ray usually situated below the 1st and 2nd dorsal-fin ray (usually below 3rd dorsal-fin ray in *Diplecogaster*), by the presence of anal papillae (absent in *Diplecogaster*), the presence of caniniform and incisiform teeth (absent in *Diplecogaster*), and the thickening and dark pigmentation of the fin membrane of the anterior part of the dorsal and anal fin (normal in *Diplecogaster*). Briggs (1986a, b) and Hofrichter & Patzner (1997) distinguished 3 species of *Apletodon* from the eastern Atlantic Ocean and Mediterranean: *A. dentatus*, Mediterranean and Black Seas to Scotland; *A. incognitus*, NW Mediterranean Sea and Azores; *A. pellegrini*, Madeira and Canary Islands along the west coast of Africa to Port Alfred, South Africa. *Apletodon pellegrini* was listed by Briggs (1990) from the the Cape Verde, Canary, and Annobon Islands, north to Madeira, and south to South Africa, and by Vakily *et al.* (2002) from the Cape Verde Islands and Senegal. Hofrichter *et al.* (2000) described the habitat and ecological aspects of *Apletodon dentatus*, and found the species off Brittany/France in hollow bulbs of the seaweed *Saccorhiza polyschides*. *Apletodon incognitus* was recorded from the eastern Mediterranean by Bilecenoğlu and Kaya (2006). *Apletodon wirtzi* Fricke, 2007 was described from São Tome and Principe, tropical eastern Atlantic (Fricke 2007: 69; Wirtz *et al.* 2007: 17). *Apletodon barbatus* Fricke, Wirtz and Brito, 2010 was described by Fricke *et al.* (2010) from the Cape Verde Islands.

A sixth, previously unknown species of *Apletodon* was observed and collected on 22 Nov. 2017 by the second author in Gabon. It is described in the present paper.

MATERIALS AND METHODS

Methods follow Briggs (1955) and Hofrichter Patzner (1997). The abbreviation 'SL' refers to the standard length (measured from the tip of the the snout to the middle of the caudal fin base), 'TL' to

snout to the middle of the caudal fin base), 'TL' to total length (measured from the tip of the snout to the end of the caudal fin). The adhesive disc is divided into 3 different areas: region A is the anterior portion, region B the posterior portion, and region C the centre of the disc (as illustrated by Briggs, 1955). In the description, data of the holotype are given first, followed by data of the paratypes in parentheses. Fin rays are counted using the method of Fricke (1983), where spines are expressed as Roman numerals, unbranched soft rays are expressed as lower case Roman numerals and branched rays as Arabic numerals. Subspecies classification is no longer used, following the method of Fricke *et al.* (2007); valid taxa of the species group formerly treated as subspecies are raised to species level. Specimens cited in the present paper are deposited in the following collections: CCML (Colección Ictiologica, Departamento de Biología Animal, Ciencias Marinas, Facultad de Biología, Universidad de La Laguna, Tenerife, Spain); HJ (Hebrew University of Jerusalem, Fish Collection, Jerusalem, Israel); MNHN (Muséum National d'Histoire Naturelle, Paris, France); SMNS (Staatliches Museum für Naturkunde Stuttgart, Germany); ZSM (Zoologische Staatssammlung München, Germany).

RESULTS

TAXONOMY

Apletodon gabonensis, n. sp.

Gabon clingfish (Figs. 1-3, Tab. 1)

Zoo-Bank registration:

<http://zoobank.org/urn:lsid:zoobank.org:act:57A8D1D6-C499-4A92-872C-8058BF5B90F6>

TYPES

Holotype. ZSM 47025, male, 19.6 mm SL, eastern Atlantic Ocean, Gabon, Commune d'Akanda, 2.4 km southwest of Cap Esterias, 28 km northnorthwest of Libreville, 0°35.641'N 9°18.431'E, 1-2 m depth, P. Wirtz, 22 Nov. 2017.

Paratypes. HJ 20847, 1 male, 14.3 mm SL; ZSM 47026, 2 males (12.4-12.8 mm SL) and 3 females (8.2-15.9 mm SL); collection data as for holotype.

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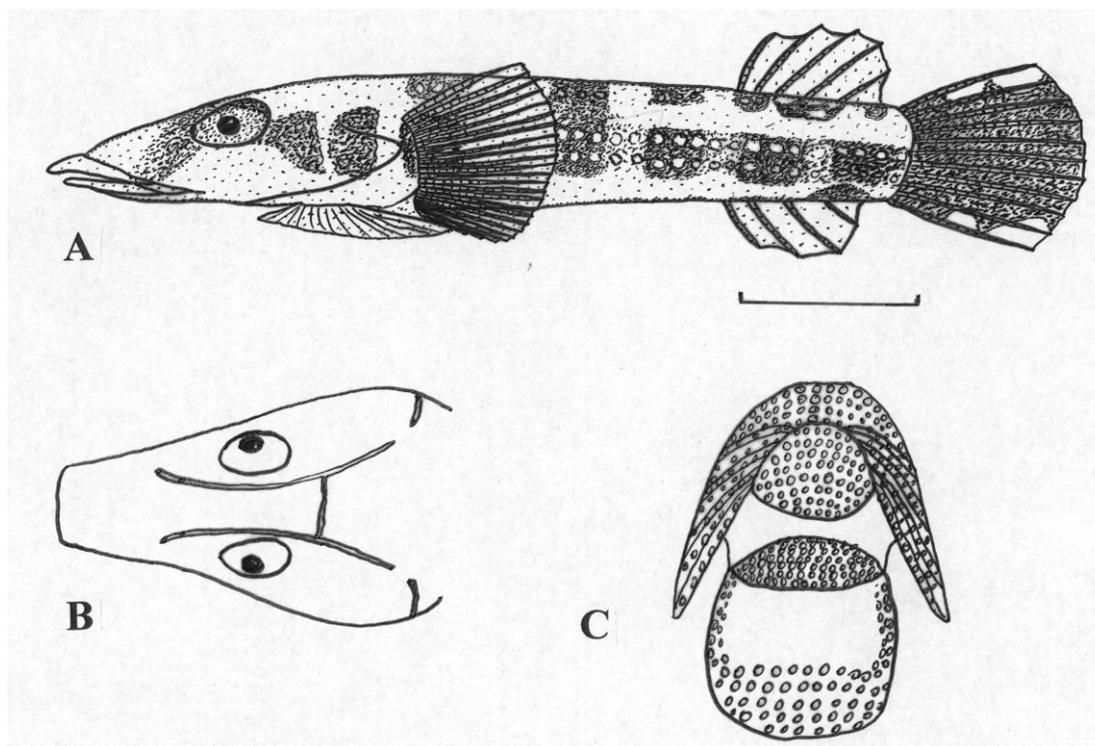


Fig. 1. *Apletodon gabonensis* sp. nov., ZSM 47025, holotype, male, 19.6 mm SL, Gabon. A Lateral view; B dorsal view of head showing lateral-line system; C disc. Scale bar 4 mm.

DIAGNOSIS

A species of *Apletodon* with 5 dorsal-fin rays, 4-5 anal-fin rays, 25-27 pectoral-fin rays; head width in males 2.6-4.7 in SL; anus in males with urogenital papilla present but not pronounced; anal-fin length in distance between anus and anal-fin origin 1.2-1.5; snout long, broad, anteriorly truncate in male, narrower and rather pointed in female; preorbital length 1.8-3.8 in head length; conspicuous maxillary barbel absent in both sexes; disc with 10-12 rows of papillae in region A, 5 rows of papillae in region B, and 5-7 rows of papillae in region C; head and body of male light brown, snout and cheeks green with white spots, top of head with red spots, sides of body with five dark brown bars bearing white spots.

DESCRIPTION

Dorsal-fin v (v); anal-fin iv (v); pectoral-fin xxvi (xxv-xxvii); pelvic-fin I, 4 (I, 4); caudal-fin xi(xi). Gill rakers on 3rd arch 10 (8-10). Measurements of the type specimens in Tab. 1.

Upper jaw with 2 (2) canines and 5 (4) incisors, surrounded by numerous undifferentiated conical teeth. Lower jaw with 2 (2) canines and 6 (6) incisors, surrounded by undifferentiated conical teeth.

Head lateral line system with 2 pores in nasal canal, 2 pores in postorbital canal, 3 pores in lacrymal canal, 1 upper and 1 lower pore in preopercular canal, and no pores in mandibular canal.

Head broad, depressed. Head length 32.6 (42.7-44.1) % SL (2.3-3.1 in SL). Maximum body depth 14.3 (16.8-18.3) % SL (5.5-7.0 in SL). Maximum head width 22.4 (21.4-38.3) % SL (2.6-4.7 in SL). Maximum (horizontal) orbit diameter 8.7 (6.8-9.8) % SL (3.8-6.5 in head length). Snout long, broad, anteriorly truncate in male (Fig. 1B); narrower and rather pointed in female. Preorbital length 17.9 (10.5-14.6) % SL (1.8-3.8 in head length), in males significantly longer than in females. Interorbital distance 9.7 (8.8-11.0) % SL (3.4-4.6 in head length). Upper

jaw length 14.3 (14.5-19.5) % SL. Lower jaw length 10.2 (12.1-16.9) % SL. Maxillary barbel absent. Anus situated closer to anal-fin origin than to disc; male with a short urogenital papilla which is present but not pronounced; distance between disc and anus 18.9 (15.3-22.0) % SL, distance between anus and anal-fin origin 11.2 (9.8-14.6) % SL. Preanus length 65.3 (71.2-75.8) % SL (1.3-1.5 in SL). Caudal-peduncle length 3.6 (3.4-4.4) % SL (22.7-29.5 in SL). Caudal-peduncle depth 13.3 (8.1-12.7) % SL (7.5-12.4 in SL) (Fig. 1A).

Predorsal-fin length 80.6 (76.1-84.1) % SL (1.2-1.3 in SL). Preanal-fin length 75.0 (81.8-92.2) % SL (1.1-1.3 in SL). First rays of dorsal and anal fins basally slightly thickened in males. Prepectoral-fin length 42.9 (35.4-48.4) % SL (2.1-2.8 in SL). Prepelvic-fin length 28.6 (25.0-31.2) % SL (3.2-4.0 in SL). Predisc length 24.5 (19.4-26.8) % SL (3.7-5.2 in SL). Disc length 21.9 (21.4-32.8) % SL (3.0-4.7 in SL). Disc membrane inserting at base of 15th (15th-20th) pectoral-fin ray. Disc with 12 (10-12) rows of papillae in region A, 5 (5) rows of papillae in region B, and 5 (5-7) rows of papillae in region C (Fig. 1C). 5 (5) rows of lateral papillae in disc region A. Caudal-fin length 19.2 (13.4-25.2) % SL (4.0-7.4 in SL).

Colour in life. Ground colouration cream to light brown, depending on sea-floor colour. In colour photos taken by L. Berenger and C. Serval-Roquefort (Figs. 2-3), the male has the snout and cheeks green with white spots, eyes cream with brown spots and streaks, and the top of the head with red spots (Fig. 2); sides of body with five interrupted dark brown bars bearing white spots, with the white vertebral column visible through the flesh; fins reddish. Head of female with brown spots, sides of body with several dark brown bars, white vertebral column visible through the flesh.

Colour in alcohol. Similar to live colouration, but green and red colours fade away.

ETYMOLOGY

The name of the new species, *gabonensis*, refers to the type locality off the coast of Gabon, West Africa.



Fig. 2. *Apletodon gabonensis* sp. nov., male, Gabon. Photograph by Lucas Berenger.

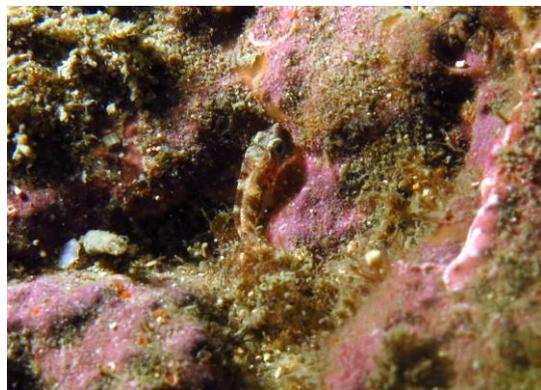


Fig. 3. *Apletodon gabonensis* sp. nov., female, Gabon. Photograph by Cathy Serval-Roquefort.

DISTRIBUTION AND HABITAT

This new species is currently known only from Gabon (Fig. 5). It was collected at 1-2 m depth, where it was moderately common on and below shallow rocks covered with algae. The most common other species in this habitat were several members of the family Gobiidae, including undescribed species (Schliewen *et al.* in prep.).

COMPARISONS

Within the genus *Apletodon*, the new species is characterized by 10-12 rows of papillae in disc region A (versus 3-6 in other species), and 6 incisors in the lower jaw (versus 2-4 in other species) (see Tab. 2). The head shapes of the 6 known species of *Apletodon* differ considerably in males. Males of *Apletodon gabonensis* have a rather long snout (seen from above) similar to

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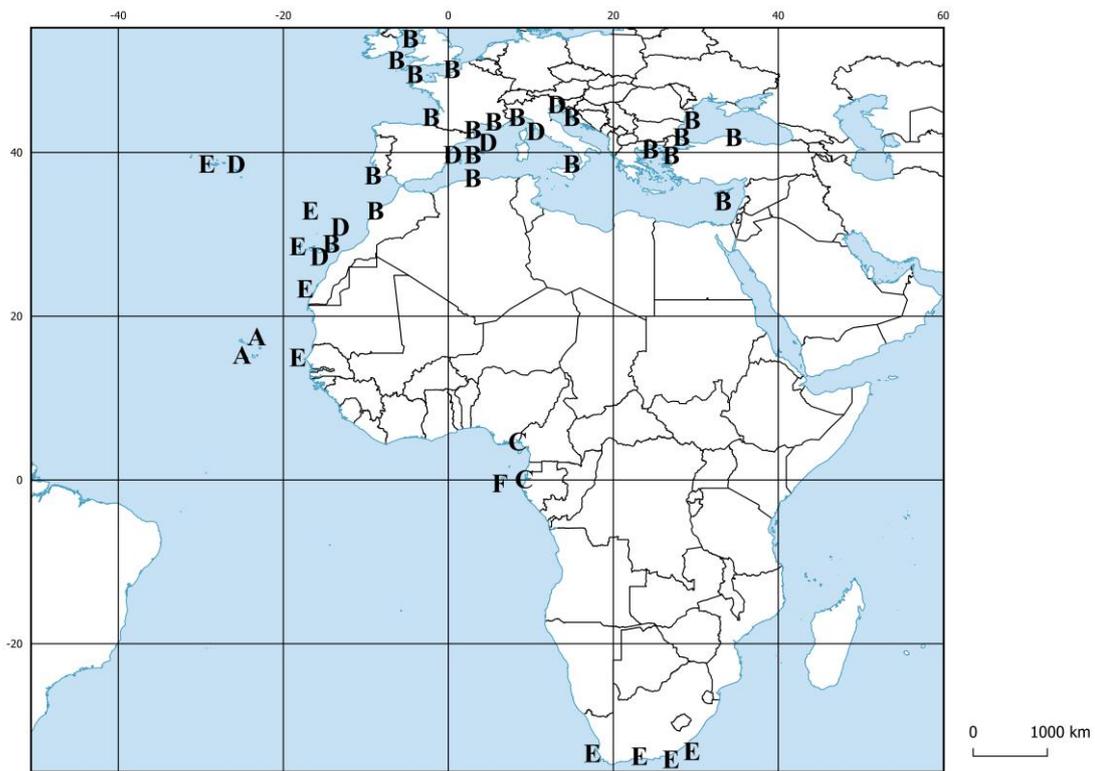


Fig. 5. Geographical distribution of the species of *Apletodon*. A *Apletodon barbatus*; B *Apletodon dentatus*; C *Apletodon gabonensis* n. sp.; D *Apletodon incognitus*; E *Apletodon pellegrini*; F *Apletodon wirtzi*.



Fig. 4. *Apletodon wirtzi* Fricke, 2007, male, São Tomé Island. Photograph by Claudio Sampaio.

Apletodon wirtzi, but the tip less pointed and broader; the snouts of the males of the other four species are distinctly shorter. Unfortunately, the

females of *A. gabonensis* n. sp. examined in the present study are too small to show sufficiently distinguishing characters to differentiate them from females of *A. incognitus*, *A. pellegrini* and *A. wirtzi*, except that they show a colouration which is very similar to that of male *A. gabonensis* n. sp. *Apletodon wirtzi* and *A. gabonensis* are not only similar in the head shape of males but also in the greenish colour of the head of males (compare Figures 2, 4). They are probably sister species.

DISCUSSION

The small species of the genus *Apletodon* are cryptic and easily overlooked. Because of their external similarity, they have probably often been confused in the past. Old distribution records must therefore be considered with caution. An example is the alleged presence of *A. pellegrini* at

Annobon Island, which is probably a misidentification of *A. wirtzi*. Previous records of *Apletodon pellegrini* from the Cape Verde Islands were probably based on *A. barbatus*. The record of this species from Madeira Island also appears doubtful.

Five small specimens of *Apletodon* from Cameroon (SMNS 25472, Limbe, Province de Sud-Ouest, 3°59'49"N 9°12'18"E) were identified as *A. wirtzi* by Fricke *et al.* (2010). However, it is highly likely that these specimens are actually *A. gabonensis* n. sp.. Additional material is necessary to confirm this record.

It is surprising to find two similar but different species of *Apletodon* at the islands in the Gulf of Guinea and at the coast of Gabon. However, in a similar distribution pattern, the small stomatopod *Protosquilla calypso* Manning, 1974 has been

recorded from the islands of Annobon, São Tomé, Príncipe and Bioko, while the closely related and similar *Protosquilla folini* (Milne-Edwards, 1867) occurs at the Cape Verde Islands, Senegal, Ghana and Congo (Manning 1977).

The genus *Apletodon* is mostly confined to the eastern Atlantic (including the Mediterranean and Black Sea). While the short-snouted species are apparently distributed antiequatorially (*A. barbatus*, *A. dentatus*, *A. incognitus*, *A. pellegrini*), they are replaced in the equatorial Atlantic by two long-snouted species (*A. gabonensis* n. sp., *A. wirtzi*). Further research on the occurrence of this cryptic genus is needed, as there are still large gaps along the coasts of West Africa where the occurrence of the genus could not yet be confirmed.

Key to the Species of the Genus *Apletodon*. The key to species mainly identifies male specimens; females are often difficult to distinguish. Specimens are sexed by the presence of ovaries, and sexes are often distinguishable by their head shape (females usually have small and pointed snouts, while males usually have broader heads).

- 1a. Maxilla with a conspicuous white barbel in male; upper jaw with 4-5 incisors. ...*Apletodon barbatus*
- 1b. Maxilla without a barbel in male; upper jaw with 1-5 incisors.2
- 2a. No mandibular-canal pores.3
- 2b. Three mandibular-canal pores.4
- 3a. Snout in males short, rounded; rows of papillae in disc region A 4-5; gill rakers on 3rd arch 6; incisors in upper jaw 1-2; incisors in lower jaw 2-3; pectoral-fin rays 21-24.*Apletodon dentatus*
- 3b. Snout in males long, blunt; rows of papillae in disc region A 10-12; gill rakers on 3rd arch 8-10; incisors in upper jaw 5; incisors in lower jaw 6; pectoral-fin rays 25-27.*Apletodon gabonensis* n. sp.
- 4a. Males: head width 3.6-4.0 (mean 3.8) in SL; snout long, more or less pointed, conical, preorbital length 3.1-4.0 in head length. *Apletodon wirtzi*
- 4b. Males: head width 2.4-3.4 in SL; snout short, rounded, preorbital length 2.7-3.4 in head length.5
- 5a. Males: head width 2.9-3.4 (mean 3.3) in SL; anal papillae small, indistinct; both sexes: anal-fin length in distance between anus and anal-fin origin 1.0-1.7 (1.4).....*Apletodon incognitus*
- 5b. Males: head width 2.4-3.0 (2.7) in SL; anal papillae large, distinct; both sexes: anal-fin length in distance between anus and anal-fin origin 1.5-2.3 (1.9).*Apletodon pellegrini*.

Comparative material

Apletodon barbatus: SMNS 26427 (holotype, 14.2 mm SL), Santiago Island, Cape Verde Islands; MNHN 2009-1592 (1 paratype, 13.5 mm SL), SMNS 26428 (19 paratypes, 6.3-11.4 mm SL), USNM 396967 (1 paratype, 13.5 mm SL), Santiago Island, Cape Verde Islands; SMNS 24604 (1, 13.5 mm SL), SMNS 24605 (1, 15.0 mm SL), Sal Island, Cape Verde Islands.
Apletodon dentatus: CCML uncat., 2 specimens,

14.0-14.5 mm SL, Alegranza Island, Canary Islands, 35 m depth, A. Brito; CCML uncat., 2 specimens, 11.5-17.5 mm SL, northern Lanzarote Island, Canary Islands, 30 m depth, A. Brito; SMNS 12664, 1 specimen, 19.1 mm SL, Italy, Genoa, 44°25'N, 8°57'E, R. A. Kossmann, 1891.
A. incognitus: NMW 93029, holotype, male, France, Banyuls-sur-mer; CCML uncat., 2 specimens, 21.1-21.6 mm SL, Punta de La Sal, Gran Canaria, Canary Islands, 12 m depth, A. Brito; CCML uncat., 1

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specimen, 12.2 mm SL, La Graciosa, Canary Islands, 15 m depth, A. Brito; SMNS 21814, 1 specimen, 22.0 mm SL, Azores Islands, Faial Island, Porto Pim, 38°31' N, 28°37'20"W, P. Wirtz, Apr. 1999. *A. pellegrini*: SAIAB 10255, 1 specimen, South Africa, Knysna, under railroad bridge, D. Watts, 21 Nov 1978; SAIAB 10852, 11 specimens, South Africa, Knysna lagoon, Western Cape area, 34°02'S, 23°02'E, 8 Dec. 1979; SAIAB 14599, 7 specimens, South Africa. SAIAB 43756, 5 spec., South Africa, False Bay, Cape Province, 34°10'S, 18°37'E, R. Winterbottom, 27 Nov. 1975; USNM 198169, 1 paratype, South Africa, Knysna estuary, J.L.B. Smith, Jan. 1964; USNM 270272, 2 specimens, South Africa, Bird Island, Algoa Bay. *A. wirtzi*: SMNS 24130, holotype, male, 14.2 mm SL, Bombom Island, Principe Group, São Tomé and Príncipe, 1 m depth, P. Wirtz, Feb. 2004; MNHN 2005-0170, paratype, 1 male, 10.7 mm SL, same data as the holotype; SMNS 24446, paratypes, 5 specimens, 9.4-12.1 mm SL, same data as the holotype; SMNS 24132, paratypes, 2 specimens, 9.0-12.1 mm SL, same data as the holotype; USNM 381374, paratype, 1 male, 11.5 mm SL, same data as the holotype. *Diplecogaster bimaculata*: HUI 20575, 1 specimen, Balearic Islands, north of Cabrera, 39°13'55.08"N 2°58'58.62"E - 39°13'51.54"N 2°59'08.58"E, 57 m depth, R/V Miguel Oliver, 8 June 2016; HUI 20623, 1 specimen, Balearic Islands, southsoutheast of Mallorca, 39°13'58.44"N 3°08'35.28"E - 39°14'50.22"N 3°09'16.20"E, 95-87 m depth, R/V Miguel Oliver, R9 June 2016; HUI 20577, 7 specimens, Balearic Islands, south of Mallorca, 39°22'05.16"N 2°41'08.64"E - 39°22'06.78"N 2°41'10.68"E, 52 m depth, R/V Miguel Oliver, 9 June 2016; HUI 20593, 1 specimen, Balearic Islands, northeast of Mallorca, Menorca Channel, 39°51'06.84"N 3°28'15.84"E - 39°50'59.40"N 3°28'14.04"E, 57 m depth, R/V Miguel Oliver, 10 June 2016; HUI 20602, 2 specimens, Balearic Islands, northwest of Menorca, 39°58'54.12"N 3°39'23.46"E - 39°59'01.26"N 3°39'21.48"E, 63-64 m depth, R/V Miguel Oliver, 15 June 2016; SMNS 12541, 1 specimen, France, Pyrénées Orientales, Racou, 22 km SSE Perpignan, 42°32'30"N, 3°1'E, 5 m depth, M. Grabert, Sep. 1991; SMNS 13177, 1 specimen, Italy, Giglio Island, Bay of Campese, at Faraglione, 42°22'N, 10°52'E, 20 m depth, I. Koch, 28 Apr. 1992; SMNS 14049, 2 specimens, Italy, Giglio Island, Bay of Campese, at Trallicci, 42°22'N,

10°52'E, 8 m depth, I. Koch, 18 Apr. 1993; SMNS 19061, 2 specimens, Northern Cyprus, Karavas Alsavcak Bay, 9 km W Kyrenia/Girne, 35°21'13"N, 33°13'15"E, 0-1 m depth, R. Fricke, 19 May 1997; SMNS 19204, 2 spec., Italy, Giglio Island, Bay of Campese, 42°22'35"N, 10°52'58"E, 10 m depth, I. Koch, 14 June 1985; SMNS 20163, 8 specimens, Madeira, off Hotel Roca Mar, Caniço de Baixo, 40-70 m depth, P. Wirtz, 22 Sep. 1996; SMNS 20347, 1 specimen, Tunisia, 4 km E Tabarca, 6 km E Bone/Annaba, 36°57'22"N, 8°47'52"E, 0-6 m depth, R. Fricke, 23 May 1998; SMNS 21202, 2 specimens, Madeira, Porto Novo, 1-2 m depth, P. Wirtz, 16 Oct. 1998. *D. pectoralis*: SMNS 11916, 4 specimens, Azores Islands, Faial Island, Horta, 38°32'N, 28°38'W, P. Wirtz, Dec. 1990.

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