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A New Species of *Serranus* from São Tomé and Príncipe, Eastern Atlantic (Pisces Teleostei, Serranidae)

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Serranus pulcher **is described from São Tomé and Príncipe islands. It differs from all other eastern Atlantic** ***Serranus*** **species except** ***S. heterurus*** **(Cadenat, 1937) in a combination of the following characters: dorsal fin X,12, anal fin III,7; 42–50 pored lateral-line scales; interorbital area without scales; upper lobe of caudal fin pointed, lower lobe of caudal fin rounded.** ***Serranus pulcher*** **differs from** ***S. heterurus*** **in life color.** ***S. pulcher*** **probably also occurs off the coast of West Africa. It is the smallest known** ***Serranus*** **species in the eastern Atlantic.**

The percoid genus *Serranus* currently contains 14 valid species in the western Atlantic Ocean, one species (*Serranus sanctaehelenae*) endemic to the central Atlantic Islands of Ascension and St Helena, and six valid species in the eastern Atlantic (Eschmeyer and Fricke 2015). No *Serranus* species is amphi-Atlantic. Four of the six eastern Atlantic species (*S. atricauda*, *S. cabrilla*, *S. hepatus*, and *S. scriba*) reach into the Mediterranean Sea. A seventh eastern Atlantic species of *Serranus* is here described from the islands of São Tomé and Príncipe in the Gulf of Guinea.

Material and Methods

The specimens were obtained by SCUBA diving, with a hand-held aquarium net, at depths of about 2 to 30 m. They were preserved in ethanol or formol. Point-to-point measurements were taken on the left side of each specimen using a digital caliper with an accuracy of 0.01 mm and rounded to the nearest 0.1 mm. Body depth was measured at the beginning of the first dorsal fin. Body width was measured behind the insertion of the pectoral fins. Head length was measured from the tip of the snout to the end of the operculum, snout length from anterior edge of eye to tip of upper lip, pectoral fin length from ventral insertion to longest ray. Lateral-line scales were counted on the left side of the animal, where possible. Pored lateral-line scales are taken to the caudal-fin base and do not include those on the caudal fin itself. The last ray of the dorsal and anal fins is usually split to the base and is counted as one ray. Gill-raker counts are from the first arch and include all rudiments; counts of the upper arm are separated by a plus sign (+) from those of the lower arm, the raker whose roots span both the upper and lower arms of the gill arch is included in the count of the lower arm. The description of color patterns of living specimens is based on numerous underwater photographs by the first author and others (see Acknowledgments). Common abbreviations used include SL – standard length; TL – total length; HL – head length; D – dorsal; fin; A – anal fin; P – pectoral fin; V – pelvic [ventral] fin; Ll – pored lateral line scales.

Specimens mentioned in the present paper are deposited in the California Academy of Sciences (CAS); the Coleção Ictiológica Universidade Federal do Espírito Santo (CIUFES) at Vitoria, Brazil; the South African Institute for Aquatic Biodiversity (SAIAB); Stuttgart Natural History Museum (SMNS); Zoologisches Museum Hamburg (ZMH); and the Zoologische Staatssammlung at Munich (ZSM). Tissue samples of three specimens from Príncipe Island (ZSM uncatalogued) were sent to Benjamin Victor (Ocean Science Foundation) for DNA analysis. The results of his analysis will be published elsewhere.

Comparative material.— The following specimens were used for direct comparisons with the type specimens of the new species. Additional material used for general comments are listed in a synopsis of the eastern Atlantic members of the genus *Serranus* (Wirtz, Heemstra and Iwamoto, In prep.): *Chelidoperca africana*: SAIAB 26564, Cameroon. *Serranus accraensis*: ZSM 32516, Angola, ZSM 32596 Angola, ZSM 32610 Angola. *Serranus hepatus*: ZSM 25637, Croatia, ZSM 41914 France. *Serranus heterurus*: SAIAB 65552 Angola; SAIAB 65682, Angola; ZMH 11056 Senegal; ZMS 43051, Cape Verde Islands; ZMS 43730, Cape Verde Islands; ZSM uncatalogued, Cape Verde Islands; CAS 231614, São Tomé Island; CAS 231627, São Tomé Island; CAS 234709, Guinea; CAS 234711, Guinea. *Serranus scriba*: ZSM 23526, Greece.

Species Description

***Serranus pulcher* Wirtz and Iwamoto, sp. nov.**

Figures 1–9, Tables 1–5.

Serranus sp.("São Tomé comber"), Debelius 1998: 148. Kuiter 2004:162, figs. A-D.
Serranus n.sp., Wirtz et al. 2007:8–9, fig. 8

Material Examined.— Holotype: ZSM 43868 (59 mm SL), São Tomé Island (00°25.099′N, 006°41.718′E), near wreck "Mar Vassa" on coral rubble in about 6 m depth, Jan. 2015, formol preserved, coll. Nuno Vasco Rodrigues. A small piece of the left pectoral fin is missing and the dorsal fin is slightly torn between the spinous and the soft-rayed part (figure 1a and b). Paratypes measured: ZSM 43869 (66 mm SL) same data as holotype. ZSM 43879 "Mar Vassa", São Tomé Island (00°25.099′N, 006°41.718′E), Nov. 2014, coll. Nuno Vasco Rodrigues. ZSM 43880 "Mar Vassa", São Tomé Island (00°25.099′N, 006°41.718′E), Mar. 2014, coll. Nuno Vasco Rodrigues. CAS227751 (70.5 mm SL), São Tomé Island, Kia Reef (00°25′0.01″N, 006°48′E), 25–40 ft [7.6–12.2 m], 11 Jan. 2009, coll. J.E. McCosker, D. Catania, and J.-L. Testori. CAS227753 (73 mm SL, specimen labelled DC1009), Príncipe Island (01°41′09.3″N, 007°28′07.6″E), 40 ft [12.2 m], 23 Jan. 2009; coll. J.E. McCosker and D. Catania. CAS 227754 (4 spec., 45–74 mm SL), Príncipe Island, nw side Bom Bom Is. (01°41′44.0″N, 007°24′00.3″E), 48 ft [14.6 m], 20 Jan. 2009, coll. J.E. McCosker and D. Catania. CAS227755 (1 spec.), São Tomé Island, Kia Reef (00°21′37.1″N, 006°43′08.5″E), 45–72 ft [13.7–21.9 m], 11 Jan. 2009, coll. J.E. McCosker, D. Catania, and J.-L. Testori. CAS227756 (2 spec., 75–78 mm SL), São Tomé Island, Batalleo (00°22′05.7″N, 006°45′41.6″E), 13 Jan. 2009, coll. J.E. McCosker, D. Catania, and E. Milson. CAS227757 (specimen labelled DC999), Príncipe Island, Pedro Adalia (01°42′04.0″N, 007°25′42.1″E), 21 Jan. 2009, coll. J.E. McCosker, D. Catania, and R. Van Syoc. Paratypes not measured: CAS227752 (7 juveniles), Príncipe Island, Pedro Adalia (01°42′02.3″N, 007°25′43.8″E), 52 ft [15.8 m], 19 Jan. 2009, coll. J.E. McCosker and D. Catania. CAS227757 (8 juveniles), Príncipe Island, Pedro Adalia (01°42′04.0″N, 007°25′42.1″E), 21 Jan. 2009, coll. J.E. McCosker, D. Catania, and R. Van Syoc. CAS227758 (3 spec.), Príncipe Island, Isla Santana, cave (00°14′33.1″N, 006°45′36.1″E), 62 ft [18.9 m], 28 Jan. 2009, coll. J.E. McCosker, and J.-L. Testori.CIUFES 150 (pectoral fin taken for

DNA sample), São Tomé Island; CIUFES 155 (4 spec.), São Tomé Island; ZSM uncatalogued (3 juvenile spec., tissue samples taken for DNA analysis), Príncipe Island.

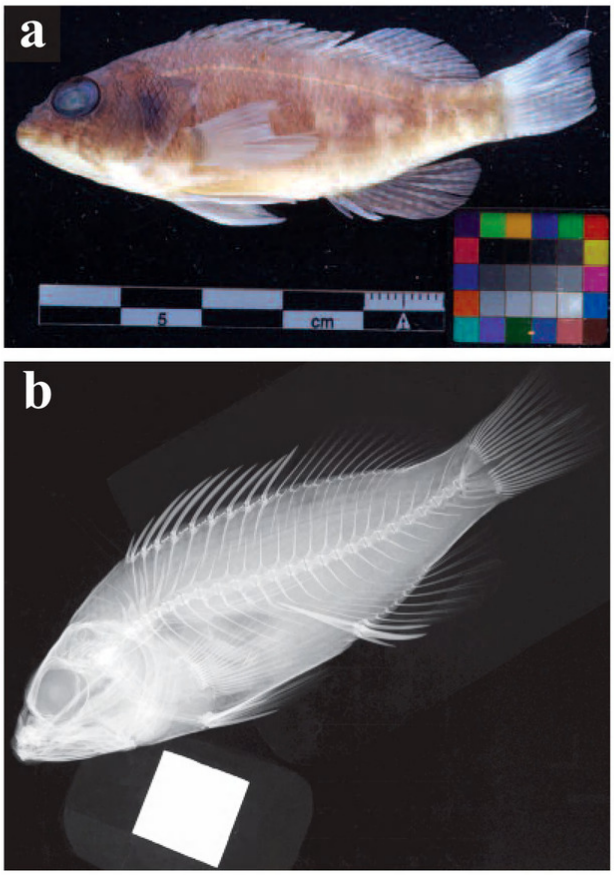

FIGURE 1. Holotype of *Serranus pulcher* sp. nov. ZSM 43868 (59 mm SL) left side: a) in alcohol; b) radiograph (photos Dirk Neumann).

DIAGNOSIS.— Dorsal rays X,12; dorsal fin notched between spinous and soft part; anal rays III,7; pectoral rays usually 15 (rarely 14 or 16); pelvic rays I,5; gill rakers 6–9+12–14 (19–23 total); pored lateral-line scales 42–49; circumpeduncular scales 20–25, usually 22–24; interorbital without scales. Caudal fin truncate, the upper lobe slightly produced, lower lobe rounded. Dorsal, anal, and pectoral fins scaly near base. Scales ctenoid, not deciduous; 5–6 rows of scales from the beginning of the dorsal fin to the lateral line; three opercular spines, the middle one largest, the upper one often obscure, the lower one sometimes invisible to the naked eye; rear margin of anterior nostril forming a flap usually fringed with 4–6 long cirri that reach well past the rear nostril; posterior nostril a simple opening lacking a raised rim. Lips red with dark bands; a short moustache-like red streak behind end of maxillary, running across hind margin of dentary and almost meeting opposite streak at midventral line and enclosing ivory-white of mandibular rami; another red diagonal streak running from upper edge of maxillary, across lower edge of preopercle, across interopercle and branchiostegal rays, to base of pelvic fin, and enclosing white of preopercle, interopercle and chest. Size to at least 9 cm total length.

DESCRIPTION.— Measurements and counts are presented in tables 1–5. Body relatively slender and compressed, width over pectoral bases about half of HL, greatest body depth about 2.7–3.2 in SL and less than HL, which is about 2.4–2.6 in SL. Dorsal and ventral profiles gently curved from tip of snout to caudal fin. Snout shorter in length than orbit diameter; both substantially more than interorbital width. Lower jaw projecting slightly beyond upper jaw; maxilla extending to below posterior half of pupil. Preopercle margin serrated with flattened spines, those at angle largest. Mouth large with upper jaw reaching to the level of the rear edge of the eye or beyond. Premaxillary teeth in a narrow band, the outer series spaced and slightly enlarged; one or more large canines at anterior end. Dentary with a band of small teeth flanked by a series of slightly enlarged outer teeth that become larger posteriorly. Vomerine tooth band broadly V-shaped, followed on each arm by narrow band of small palatine teeth.

Dorsal rays X,12; first 4–5 spines of dorsal fin graduated, the 3rd to 5th spines longest, the spines following subequal; the soft rays slightly higher than longest spines, the 3rd to 5th ray longest; a slight notch in fin profile. Anal rays III,7; anal fin relatively high, its posterior tip somewhat pointed; spines shorter than soft rays, the first spine more than half length of second and third spines, the second spine longer and stouter than the others. Pectoral 14–16, usually 15 soft rays; pectoral fin broad-based, its origin about on same vertical as those of dorsal and pelvic fins; the tip

of pectoral fin extends to, or almost to, anus. Pelvic rays I,5; the distal tips of the soft rays sometimes reach the level of the anus but often they are shorter. Caudal fin with usually 15 (one specimen with 17) branched rays; caudal fin truncate; dorsal lobe slightly produced, ventral lobe rounded at tip (Fig 2). Lateral line slightly arched over pectoral fin and from there on parallel to dorsal profile. Scales on the nape from the beginning of the dorsal fin forward to the level of the serrated edge of the preoperculum, but not further forward (i.e., interorbital without scales); scales present on operculum (7 oblique rows of scales) and preoperculum (6 rows), but absent in all areas in front of eyes; six branchiostegal rays. Rear margin of anterior nostril forming a flap usually fringed with five (rarely four or six) finger-like cirri that reach well past the rear nostril; rear nostril a round hole without raised rim.

FIGURE 2. *Serranus pulcher* specimen from Príncipe Island, directly after capture (photo Dave Catania).

Counts and measurements of the holotype and paratypes in the ZSM collection are given in Table 1 and those of some specimens in the CAS collection in Table 2. Additional counts and measurements on further specimens in the CAS collection are given in Table 3. Counts and measurements taken by Phil Heemstra (SAIB) on 6 specimens from São Tomé and Príncipe, collected by P. Wirtz in 2004, are given in Table 4; these specimens apparently are lost now. Counts and measurements on 5 specimens from São Tomé Island taken by Francisco Reiner are given in Table 5; these specimens are apparently now lost.

TABLE 1: Counts and measurements (in mm) of *Serranus pulcher* holotype and ZSM paratypes.

	ZSM 43868	**ZSM 43869**	**ZSM 43879**	**ZSM 43880**
	Holotype			
SL	59.2	65.6	68.4	70.5
D	X, 12	X, 12	X, 12	X, 12
A	III, 7	III, 7	III, 7	III, 7
P	14/14	15/15	15/15	15/15
V	I, 5	I, 5	I, 5	I, 5
Ll	50	50	49	47
Circumpeduncular scales	21	22	21	24
Length V	16.4	15	15.8	15.3
Length P	17.2	16.9	18.1	18.1
Body depth	18.8	20	22.1	23.9
Head length	22	23.9	25.7	26.9
Snout length	4.9	5.6	6.8	6.9
Body width	9.3	10.3	10.8	11.7
Orbit diameter	5.7	6.1	6.3	6.2

The paratype ZSM 43879 was dissected and turned out to have the genus-typical (Erisman and Hastings 2011) hermaphroditic gonad: the ovotestis is dominated by ovarian tissue with testicular tissue restricted to the posterior and ventral part.

Color in alcohol (Fig. 1a): Alternating light and dark areas on upper and lower lip; head and upper half of body light brown; some lighter blotches on rear half of lower body; belly light; no dark spots on snout and fin membrane between the first two dorsal spines not black.

Color *in vivo*: Color extremely variable (Figs. 2–9). The following patterns appear to be most

TABLE 2: Counts and measurements (in mm) of several *Serranus pulcher* paratypes in the CAS collection.

	CAS227753	**CAS227755**	**CAS227756**	**CAS227756**	**CAS227757**
	DC1009		DC924	DC915	DC999
SL	62	57	61	59	53
D	X, 12	X, 12	X, 12	X, 12	X, 12
A	III, 7	III, 7	III, 7	III, 7	III, 7
P	15/15	16/16	16/16	16/16	18/-
Ll	44	-	47	45	47
Body depth	18	18	19.5	19	16
Head length	23	22	23.2	23.3	20
Snout length	5.4	5.8	5.3	5	4.7
Orbit diameter	5.7	6	6.2	6.4	5.2
P length	15.9	14	16.5	15	14
V length	13.7	13	16	15.4	13

TABLE 3: Counts and measurements (in mm) of additional *Serranus pulcher* paratypes in the CAS collection.

	CAS227751	**CAS227754**	**CAS227754**	**CAS227754**	**CAS227754**
	DC880	DC986	DC987	DC989	DC988
SL	56.6	60.2	47.6	37.2	39.8
D	12	12	12	12	12
A	7	7	7		7
P	15	15	15	15	14
Ll	48	46	45	45	43
Circumpeduncular scales	21	25	23		24
Head length	23.6	23.8	19	15.1	16
Snout length	5.9	5.5	4.1	3.2	3.6
Interorbital width	2.5	3.9	3.5	2.6	2.4
Orbit diameter	5.8	5.8	4.5	3.9	4.8
Suborbital width	2.2	2.4	1.7	1.6	1.5
Postorbital length	12.5	12.9	10.4	8.2	8.5
Orbit to preopercle	8.6	8.4	6.6	5.3	5.6
Upper jaw	11.3	11.1	8.6	6.9	7.5
Predorsal length	23.1	23	18.7	15.7	15.8
Preanal length	36.8	41	30.4	25.3	25.6
Body depth	21.1	18.6	17	12	12.7
Length P	15.4	14.5	12.5	9	12
Length V	13.9	13.9	12	9	10.7

common: lips red to orange with dark bands; a short moustache-like streak behind end of maxillary, running across hind margin of dentary and almost meeting opposite streak at midventral line and enclosing ivory-white of mandibular rami; another diagonal streak running from upper edge of maxillary, across lower edge of preopercle, across interopercle and branchiostegal rays, to base of pelvic fin, and enclosing white of preopercle, interopercle and chest (Fig. 8); first rays of pelvic fins white. Juveniles can have orange, white, and dark stripes (Fig. 9).

Habitat and distribution.— On hard bottoms (rock, gravel, coral rubble, or maerl) from about 1 m (juveniles) to at least 30 m depth. The new species is currently known with certainty only from the islands of São Tomé and Príncipe, where it is apparently common in suitable habitats (Luiz Rocha and John McCosker, CAS, personal communication). If the DNA analyses of an aquarium specimen taken off Ghana (Figs. 10–11) show that specimen to be the same as *S. pulcher*, the new species is also present on the mainland coast of Africa in the Gulf of Guinea.

Table 4: Counts and measurements (in mm) of *Serranus pulcher* non-type specimens, provided by Phil Heemstra.

	H1	H2	H3	H4	H5	H6
SL	59	60	63	63	63	60
D	X,12	X,12	X,12	X,12	X,12	X,12
A	III,7	III,7	III,7	III,7	III,7	III,7
P	16/16	16/16	-	15/15	15/15	15/15
depth at D1	18.6	19.1	20.5	-	-	19
head length	22.7	24.3	24.8	25.2	24	24
snout length	5.4	5	5.4	-	6.6	5.2
orbit diameter	6.1	6.2	6.4	7	6.6	6.4
P length	16.5	16.7	18	17	17.3	14
V length	14.5	16.3	17.1	16	17.3	16
Ll	46	47	47	42	47	44

Table 5: Counts and measurements (in mm) of *Serranus pulcher* non-type specimens, provided by Francisco Reiner.

	D	A	V	P	Lateral line scales
R1	X,12	III,7	I,5/ I,5	I6/16	47/47
R2	X,12	III, 7	I,5/I,5	16/16	47/48
R3	X,12	III, 7	I,5/I,5	16/16	47/46
R4	X, 12	III,7	I,5/I,5	16/16	47/47
R5	X,12	III,7	I,5/I,5	16/16	48/48

Comparison with other eastern Atlantic species of *Serranus*.— The species most similar in morphology to *Serranus pulcher* is *S. heterurus* Cadenat, 1937. The two species share the name-giving feature of *S. heterurus*, i.e. the upper lobe of the caudal fin is pointed and the lower lobe of the caudal fin is rounded (also the case in several western Atlantic *Serranus* species). *Serranus pulcher* and *S. heterurus* are the two smallest of the eastern Atlantic *Serranus* species. *Serranus pulcher* differs from all others except *S. heterurus* in a combination of the following characters (see also Table 6): dorsal fin X, 12; anal fin III, 7; 42–50 lateral-line scales; interorbital area without scales; upper lobe of caudal fin pointed, lower lobe of caudal fin rounded.

Table 6: Main characteristics of the eastern Atlantic *Serranus* species.

Serranus	Dorsal fin	Anal fin	Pectoral fin	Lateral line scales	Total gill rakers	TL (cm)
accraensis	X, 12–13	III, 7 (–8)	17–18	45–48	18–21	20
atricauda	X, 15–16	III, (7–) 8	15–17	77–90	20–24	35
cabrilla	X, (13-) 14–15	II, 7 (–8)	15–17	69–78	18–23	40
hepatus	X, (11-) 12 (–13)	III, (6–) 7	15	(40–) 45–50	19–23	15
heterurus	X, 12	III, (6–) 7	(15–) 16–17 (–18)	44–47	(17-) 21–26	14
pulcher	X, 12	III, 7	(14–) 15 (–16)	(42-) 45–50	17–20	9
scriba	X, (14-) 15 (–16)	III, 7 (–8)	13–16	62–75	14–19	36

FIGURE 3. The most common color pattern of *Serranus pulcher*; near Santana Islet, São Tomé (photo Peter Wirtz).

FIGURE 4. Color of paratype ZSM 43880 shortly before capture (photo Nuno Vasco Rodrigues).

FIGURE 5. Rare color pattern of *Serranus pulcher*, near Rolas Islet, São Tomé (photo Peter Wirtz).

FIGURE 6. Rare color pattern (frightened animal) of *Serranus pulcher* from near Rolas Islet, São Tomé (photo Peter Wirtz).

FIGURE 7. Rare color pattern of *Serranus pulcher* from Príncipe Island (photo Dave Catania).

FIGURE 8. Throat color of *Serranus pulcher*, near Santana Islet, São Tomé (photo Peter Wirtz).

FIGURE 9. Juvenile (about 4 cm TL) near Bom Bom Islet, Príncipe (photo Peter Wirtz).

FIGURE 10. *Serranus* sp. from Ghana (photo J.F. Hemdal).

FIGURE 11. *Serranus* sp. from Ghana (photo Joe Russo).

FIGURE 12. *Serranus heterurus* from the Cape Verde Islands (photo Rogelio Herrera).

FIGURE 13. *Serranus heterurus* from Senegal (photo Sebastien Blache).

FIGURE 14. Throat of *Serranus heterurus* from the Cape Verde Islands (photo Patrick Louisy).

FIGURE 15. *Serranus heterurus* in alcohol; specimen from the Cape Verde Islands (ZSM 430516) (photo Dirk Neumann).

The values of all morphological variables measured in nine specimens of *S. heterurus* (i.e., those mentioned in the description of *S. pulcher*, above) overlapped with those of *S. pulcher*. The two species differ in live color: *S. heterurus* has seven narrow white bars along a wine-red body, the first one on the opercle, the last one directly before the tail fin, a crescent-shaped light blue or white mark directly behind the eye and small blue spots on head and vertical fins (Figs. 12–14). In alcohol-preserved specimens of *S. heterurus* (Fig. 15) the white bars are often still visible, the area between the tip of the snout and the eyes bears dark spots, and the upper margin of the fin membrane between the first dorsal spines is often blackish; the crescent-shaped mark directly behind the eyes is often still visible but brown.

Etymology.— *pulcher,* Latin, meaning beautiful.

Proposed English common name.— São Tomé Comber.

Remarks.— In the aquarium literature, Hemdal (2009) described and figured a *Serranus* species from the coast of Ghana called "Peppermint basslet". It is similar to *S. pulcher* (compare Figs. 10 and 11) and almost certainly belongs to the same species. A tissue sample from a specimen collected for the aquarium trade at Ningo, east of Tema harbour in Ghana, at about 12 m depth (05°41.177′N, 000°17.510′E) will be analysed for its DNA sequence.

Many years ago, the first author sent specimens and photographs of the new species to Phil Heemstra (SAIB), who agreed to describe it. But after several years during which he apparently made no progress on the description, Heemstra agreed to send all the specimens back. In the ensuing years, as collecting efforts using SCUBA on the islands of São Tomé and Príncipe became more common (see Afonso et al. 1999 and Wirtz et al. 2007), many more specimens of the new species became available. The species was, in fact, discovered to be quite common in coastal waters of the islands. It also appeared to be a species taken by aquarium collectors on the mainland coast of Africa off Ghana, although the identity of fish from that country has yet to be confirmed. Because we are finalizing a manuscript reviewing all eastern Atlantic members of the genus (Wirtz, Heemstra, and Iwamoto, in prep.), and because the species is common and frequently observed on the islands, we felt it necessary for us to provide a name and description of the species.

Acknowledgements

Dirk Neumann at the Zoologische Staatssammlung München took the photographs of the preserved specimens. For the loan of specimens, we are grateful to Roger Bills (SAIAB), Dave Catania (CAS), Ronald Fricke (SMNS), and Ulrich Schliewen (ZSM). Phil Heemstra (SAIAB) and Francisco Reiner (Centro Português de Estudo dos Mamíferos Marinhos, Lisbon) kindly provided data on specimens of *S. pulcher* and *S. heterurus* in their collections (Tables 4 and 5). Nuno Vasco Rodrigues captured four fresh specimens of *S. pulcher* at São Tomé Island, including the holotype, which were essential for the description of the species. Nuno Vasco Rodrigues, Rogelio Herrera, Sebastien Blache, and Patrick Louisy provided photos of living specimens of *S. pulcher* and *S. heterurus*. Jay Hemdal kindly sent a photo of the Ghana *Serranus* which is likely to be *pulcher*. We thank John McCosker, Dave Catania, and Luiz Rocha (CAS) for collecting specimens and tissue of the new species and for use of their photographs of fresh and living specimens; McCosker also kindly reviewed the manuscript and provided sage advice. The second author (TI) gratefully acknowledges Jens-Otto Krakstad and Oddgeir Alvheim, Institute of Marine Research, Bergen, Norway, for facilitating his participation in fishery surveys of the *R/V Dr. Fridtjof Nansen*, in particular those surveys in 2010 off São Tomé and Príncipe (STeP) and in 2012 in the Canary Current Large Marine Ecosystem during which specimens of *S. heterurus* and other *Serranus* species were collected. We received necessary permits and cooperation from Arlindo Carvalho, Director-Gener-

al of the Ministry of Environment, and João Pessao, Director of Fisheries, São Tomé and Príncipe (STeP). Virginia Carvalho and José Dias Sousa Lopes of STeP Fisheries were particularly helpful during the 2010 *Nansen* survey of the islands. Many thanks to Ulrich Schliewen and Dirk Neumann for providing facilities at the ZSM for the first author to examine specimens and for many helpful comments. Thanks also to Rick Feeney of the Natural History Museum of Los Angeles County for sending a copy of the unpublished Ph.D. thesis of M.R. Meisler (1987). The Centro de Ciências do Mar (CCMAR) of the University of the Algarve co-financed three trips of the first author to São Tomé and Príncipe Islands.

Literature Cited

Afonso, P., F.M. Porteiro, R.S. Santos, J.P. Barreiros, J. Worms, and P. Wirtz. 1999. Coastal marine fishes of São Tomé Island (Gulf of Guinea). *Arquipélago Life and Marine Sciences* 17A:65–92.

Cadenat, J. 1937. Recherches systématiques sur les poisons littoraux de la côte occidentale d'Afrique, récoltés par le navire Président Théodore-Tissier, au cours de sa 5e croisière (1936). *Revue des Travaux Institut Pêches Maritimes* 10(fasc. 4, no. 40):425–562.

Debelius, H. 1998. *Mediterranean and Atlantic Fish Guide*. IKAN, Frankfurt, Germany. 305 pp.

Erisman, B.E., and P.A. Hastings. 2011. Evolutionary transitions in the sexual patterns of fishes: insights from a phylogenetic analysis of the seabasses (Teleostei Serranidae). *Copeia* 2011(3):357–364.

Eschmeyer, W.N., and R. Fricke, eds. *Catalog of Fishes*, electronic version (accessed August 2015). *<http://research.calacademy.org/research/ichthyology/catalog/fishcatmain.asp>*

Hemdal, J.F. 2009. Aquarium Fishes of the Tropical Eastern Atlantic Ocean. *Advanced Aquarist's Online Magazine*. 8(6): *<http://www.advancedaquarist.com/2009/6/fish>*

Kuiter, R. 2004. *Serranidae and Plesiopidae. A Comprehensive Guide to Basslets, Hamlets, Longfins and Relatives*. Aquatic Photographics, Seaford, Australia.

Meisler, M.R. 1987. Limits and relationships of serranine seabasses, with revisions of *Serranus* and *Mentiperca* (Pisces: Serranidae). Unpublished Ph.D. thesis, University of Southern California, Los Angeles, California. 250 pp.

Wirtz, P., C.E.L. Ferreira, S.R. Floeter, R. Fricke, J.L. Gasparini, T. Iwamoto, L. Rocha, C.L.S. Sampaio, and U.K Schliewen. 2007. Coastal fishes of São Tomé and Príncipe islands, Gulf of Guinea (Eastern Atlantic Ocean) – an update. *Zootaxa* (1523):1–48.