Ichthyol Res (2009) 56:400–406
DOI 10.1007/s10228-009-0131-0

FULL PAPER

Redescription of a poorly known acropomatid, *Verilus sordidus* Poey 1860, and comparison with *Neoscombrops atlanticus* Mochizuki and Sano 1984 (Teleostei: Perciformes)

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Received: 24 December 2008 / Revised: 8 September 2009 / Accepted: 8 September 2009

Abstract A poorly known acropomatid, *Verilus sordidus* Poey 1860, is redescribed based on six specimens from the western central Atlantic. We present diagnostic characters to differentiate this species from *Neoscombrops atlanticus* Mochizuki and Sano 1984, which has been confused with this species, and designate a neotype of *V. sordidus*. This species is distinguishable from *N. atlanticus* by the proximal-middle radial of the first anal-fin pterygiophore being slender with no trough or hollow on the anterodorsal portion (vs. hollow in *N. atlanticus*), several canine teeth posterior to the large canine teeth on either side of the symphysis of the lower jaw (vs. villiform teeth posterior to enlarged canines), and by the modal numbers of pectoral-fin rays, lateral-line scales, and gill rakers on the lower limb of the first arch.

Keywords *Verilus sordidus* · *Neoscombrops atlanticus* · Acropomatidae · Anal-fin pterygiophore

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Introduction

The Acropomatidae are a basal family of perciform fishes (e.g., Johnson 1984; Nelson 2006) distributed on continental shelves and slopes, oceanic island slopes, and seamounts of tropical and temperate areas around the world. They comprise approximately 30 species in eight genera (Yamanoue 2009), many of which are found in the Indo-West Pacific, with six species recorded from the western central Atlantic (Heemstra and Yamanoue 2002). One of the Atlantic species, *Verilus sordidus* Poey 1860, was described based on a specimen from off Cuba; the genus *Verilus* has been regarded as being monotypic since that description. Heemstra and Yamanoue (2002) presented a key to species of acropomatids in the western central Atlantic and indicated that *V. sordidus* is very similar to *Neoscombrops atlanticus* Mochizuki and Sano 1984. The authors of that species overlooked this poorly known acropomatid species for comparison in their description. For this reason, we herein redescribe *V. sordidus* and compare it to *N. atlanticus* to clarify differences between them.

Materials and methods

Methods for counts and measurements follow Yamanoue and Matsuura (2001), and institutional abbreviations follow Eschmeyer (1998). All specimens examined were dissected or X-rayed to check the form of anal-fin pterygiophores. Standard and total lengths are expressed as SL and TL, respectively.

Specimens examined. Verilus sordidus (total 5 specimens): CAS 30674 (1), 219 mm SL, Ciudad de la Habana Province, Cuba; MCZ 21764 (neotype, designated in this study), 295 mm SL, off Cuba, coll. by F. Poey; USNM

9791 (1), 250 mm SL, off Cuba, coll. by F. Poey; USNM 12565 (1), 186 mm SL, off Cuba, coll. by F. Poey, 1873; USNM 271959 (1, skull, dry osteological preparation), SL unknown, off Cuba, coll. by F. Poey; USNM 271973 (1, skeleton, dry osteological preparation minus skull), apparently the same individual as USNM 271959; USNM 229535 (1), 248 mm SL, 20°42′N, 73°38′W, Atlantic off Great Inagua I., Bahamas, 0–650 m depth, 24 May 1965, R/V Oregon (paratype of *N. atlanticus*).

Comparative specimens. Neoscombrops atlanticus (total 18 specimens): CAS 44052 (2 paratypes), 174–191 mm SL, 19°57.5′N, 71°05.0′W, Atlantic, off Cabo Isabela, Dominican Republic, 275–348 m depth, R/V Silver Bay, 14 October 1963; MCZ 34773 (3), 173–189 mm SL, Straits of Florida, Havana, Cuba, 20 January 1937, coll. by L. Howell-Rivero; USNM 229531 (2 paratypes), 133–134 mm SL, 12°09′N, 72°47′W, Caribbean Sea, off El Pájaro, La Guajira, Colombia, 0–183 m depth, R/V Oregon, 1 June 1964; USNM 229532 (2 paratypes), 129–132 mm SL, 11°02′N, 75°10′W, Caribbean Sea, off Salina del Rey, Atlantico, Colombia, 183–201 m depth, R/V Oregon, 23 May 1964; USNM 232322, 123 mm SL, 12°07′N, 82°44′W, Caribbean Sea, off Big Corn I., Corn Is., Nicaragua, 192 m depth, shrimp trawl, 7 February 1967; USNM 232323 (1 of 3, paratype, cleared and stained), 139 mm SL, 12°07′N, 82°44′W, Caribbean Sea, off Big Corn I., Corn Is., Nicaragua, 192 m depth, shrimp trawl, 7 February 1967; USNM 270532 (3), 146–186 mm SL, 11°09.5′N, 74°25.0′W, Caribbean Sea, off Santa Marta, Magdalena, Colombia, 293 m depth, R/V Oregon, 19 May 1964; USNM 270803 (3), 154–167 mm SL, 11°24′N, 73°47′W, Caribbean Sea, off Guachaca, Magdalena, Colombia, 274 m depth, R/V Oregon II, 5 May 1968; USNM 289485 (1), 116 mm SL, 11°26′N, 73°30′W, Caribbean Sea, off Polomino, Magdalena, Colombia, 201 m depth, R/V Oregon II, 6 December 1968.

Verilus sordidus Poey 1860 (Figs. 1a, 2a, 3a, 4a, b)

Verilus sordidus Poey 1860: 125, pl. 12, fig. 6 (type locality: off Cuba); Jordan and Evermann 1898: 1284.

Neoscombrops atlanticus: Mochizuki and Sano 1984: 335 (in part).

Diagnosis. This species is distinguished from other acropomatids by the following combination of characters: ten dorsal-fin spines; three anal-fin spines; basioccipital fossa absent; proximal-middle radial of first anal-fin pterygiophore slender with no trough or hollow on anterodorsal portion (Fig. 2a); upper jaw with large canine tooth on either side of symphysis followed posterolaterally by a band of villiform teeth; lower jaw with a large canine tooth on either side of symphysis followed by numerous small conical teeth (Fig. 3a); pectoral-fin rays 15; lateral-line scales 43–45; gill rakers on lower limb of first arch 14–16.

Fig. 1 **a** *Verilus sordidus*, MCZ 21764, neotype, 295 mm SL, off Cuba; **b** *Neoscombrops atlanticus*, CAS 44052, paratype, 191 mm SL, off Dominican Republic

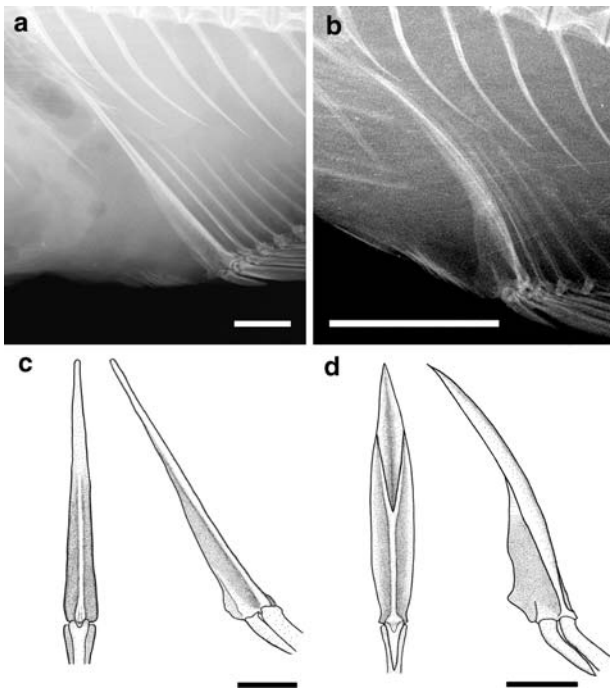

Fig. 2 Proximal-middle radials of the first anal-fin pterygiophore. **a** *Verilus sordidus*, lateral radiograph (MCZ 21764, neotype, 295 mm SL); **b** *Neoscombrops atlanticus*, lateral radiograph (USNM 232322, holotype, 123 mm SL); **c** *V. sordidus*, anterior (*left*) and lateral (*right*) views (USNM 271973, non-type, SL unknown); **d** *N. atlanticus*, anterior (*left*) and lateral (*right*) views (USNM 232323, paratype, 139 mm SL). *Bars* 10 mm

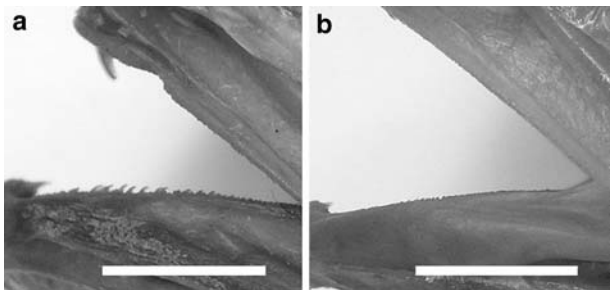

Fig. 3 Dentition of lower jaws. **a** *Verilus sordidus* CAS 30647, 219 mm SL; **b** *Neoscombrops atlanticus*, CAS 44052, 191 mm SL. *Bars* 10 mm

Description. All counts and measurements are shown in Table 1. Body compressed and relatively deep. Body and head including cheek and both jaws covered with relatively caducous cycloid and very weakly ctenoid scales (Fig. 4a, b). Bases of soft portions of dorsal fin, anal fin, pectoral fin, pelvic fin and caudal fin covered with scales. Mouth oblique and reaching to a point ventral to pupil. A pair of canine teeth near symphysis of jaws; villiform and conical teeth posterior to canine teeth in upper and lower jaws, respectively; villiform teeth on vomer and palatine, and

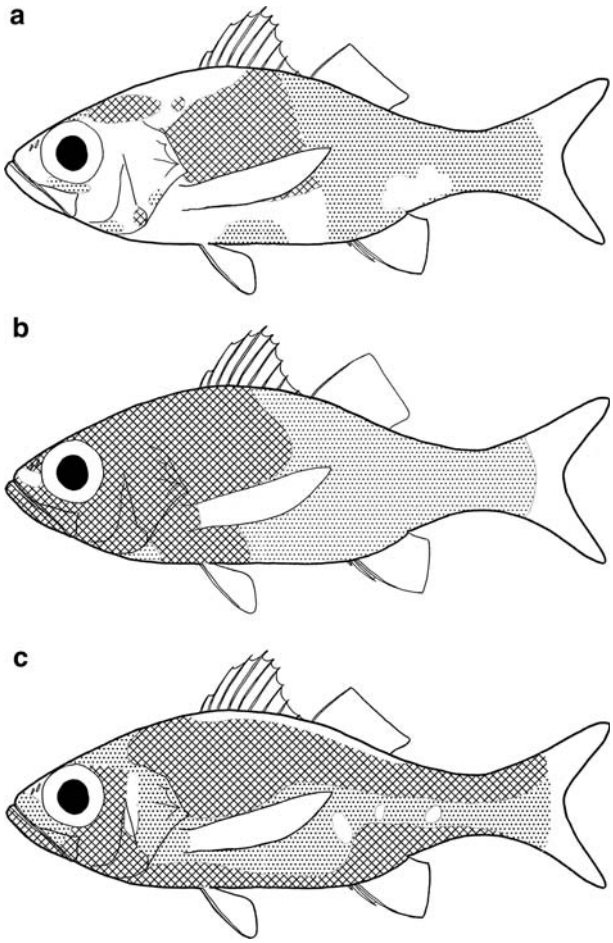

Fig. 4 Schematic depiction of squamation, indicating retained ctenoid (*checked*) and cycloid (*dotted*) scales. **a** *Verilus sordidus*, MCZ 21764, neotype, 295 mm SL; **b** *V. sordidus* USNM 9791, 250 mm SL; **c** *Neoscombrops atlanticus* MCZ 34773, 173 mm SL

conical teeth on posterior surface of vomer. Preopercular margin smooth; opercle with two weak spines and membranous edge. Nostrils proximate, anterior to orbit. Anus situated near origin of anal fin. Spinous and soft dorsal fins nearly separate, but ninth dorsal-fin spine and first soft dorsal-fin ray connected by membrane. Caudal fin forked. Basioccipital fossa absent. Proximal-middle radial of first anal-fin pterygiophore slender with no hollow or trough. No information on coloration in fresh specimens; body yellowish and dusky in alcohol.

Neotype designation. According to Poey (1860), the description of *Verilus sordidus* was based on a single specimen of 290 mm TL, but Howell-Rivero (1938) treated MCZ 21764 with 365 mm TL as the holotype. The standard length of this specimen is approximately 290 mm, but it is probable that Poey always used total lengths for descriptions of specimens (K. Hartel, personal communication). We could not find any of Poey's specimens with

Table 1 Selected counts and proportional measurements of *Verilus sordidus* and *Neoscombrops atlanticus*

	V. sordidus		*N. atlanticus*	
	Neotype MCZ 21764	Other specimens $n = 4$	Holotype USNM 232322	Other specimens $n = 13$
Standard length (SL, mm)	295	186–248	123	116–189
Counts (mode)				
Dorsal-fin rays	IX, I–10	IX, I–10	IX, I–10	IX, I–10
Anal-fin rays	III, 7	III, 7	III, 7	III, 7
Pectoral-fin rays	15	15	16	15–16 (16)
Lateral-line scales	43	43–45 (44)	48	45–49 (48)
Gill rakers on first arch; upper + middle + lower	8 + 1 + 15	8–9 + 1 + 14–16 (8.5 + 1 + 15)	7 + 1 + 17	7–9 + 1 + 16–18 (8 + 1 + 17)
Measurements in % SL (mean)				
Head length	38.3	37.5–38.4 (38.0)	39.1	36.0–39.1 (37.6)
Head depth	32.7	30.5–32.2 (31.3)	30.5	26.6–30.6 (29.3)
Snout length	8.92	9.75–10.2 (9.93)	9.77	9.81–11.1 (10.4)
Orbital length	14.5	13.3–14.5 (14.1)	15.2	12.5–15.1 (13.9)
Bony interorbital length	8.18	8.19–8.60 (8.42)	8.71	7.59–9.06 (8.29)
Postorbital length	16.1	15.4–15.5 (15.5)	15.0	14.0–15.6 (14.9)
Upper-jaw length	18.7	18.2–19.4 (18.7)	18.3	16.9–18.8 (17.8)
Lower-jaw length	23.7	22.5–23.9 (23.1)	23.3	21.9–24.2 (22.7)
Body depth	36.8	32.6–33.7 (33.3)	33.0	30.9–33.9 (32.2)
Snout to dorsal-fin origin	44.3	41.5–42.7 (42.1)	41.4	39.6–42.8 (40.9)
Snout to anal-fin origin	75.2	69.7–75.6 (72.9)	72.2	69.0–75.2 (72.8)
Snout to pectoral-fin origin	37.2	37.9–38.9 (38.5)	36.8	35.4–39.9 (37.3)
Snout to pelvic-fin origin	41.9	41.7–43.0 (42.5)	40.8	39.5–46.0 (42.2)
Snout to anus	68.5	63.8–71.3 (66.8)	65.1	62.8–68.8 (66.7)
Dorsal-fin base	43.8	42.3–43.7 (43.2)	40.6	40.1–42.6 (41.1)
Anal-fin base	11.6	12.1–12.5 (12.4)	13.6	10.9–13.1 (12.2)
Longest pectoral-fin ray	31.7	29.7–32.0 (30.8)	25.6	25.1–29.6 (27.2)
Pelvic-fin spine	13.7	13.1–14.5 (13.9)	13.4	12.1–14.4 (13.2)
Caudal-peduncle depth	12.2	12.9–14.1 (13.4)	10.2	9.64–12.9 (11.0)
Caudal-peduncle length	21.9	21.0–23.4 (21.9)	23.0	20.0–22.3 (21.3)

total lengths approximating 290 mm. The original number of MCZ 21764 is 141, which matches the number in Poey's description, but as pointed out by Howell-Rivero (1938), this is not a catalog number but rather a numerical designation for this species as typically used by Poey in this and other publications (Poey 1875, 1876a, b). Accordingly, we conclude that MCZ 21764 and Poey's other specimen deposited at the USNM were not used for his description, and the whereabouts and continued existence of his type are unknown; thus Howell-Rivero (1938) was mistaken in regarding MCZ 21764 as the holotype. Because of past confusion between *V. sordidus* and *N. atlanticus* (see "Discussion"), we designate MCZ 21764 as the neotype for *V. sordidus* to maintain the usage suggested here in accord with ICZN (1999, Art. 75.1).

Discussion

Heemstra and Yamanoue (2002) used the morphology of the first anal-fin pterygiophore and the dentition of the lower jaw to differentiate *Verilus sordidus* from *Neoscombrops atlanticus* in the western central Atlantic. The first anal-fin pterygiophore varies greatly in shape among acropomatid species and is thus very useful in discriminating species (Katayama 1959; Yamanoue and Matsuura 2001, 2002, 2004; Yamanoue and Yoseda 2001). *Verilus sordidus* does not have a hollow concavity anterodorsally in this bone (Fig. 2a), the condition found in some other acropomatids, such as *Malakichthys barbatus* Yamanoue and Yoseda 2001 and *Neoscombrops pacificus* Mochizuki 1979 (Yamanoue and Yoseda 2001; Yamanoue and Matsuura 2003). It differs

Table 2 Numbers of pectoral-fin rays, lateral-line scales, and gill rakers on the lower limb of the first arch in *Verilus sordidus* and *Neoscombrops atlanticus*

Pectoral-fin rays	15	16					
Verilus sordidus ($n = 5$)	5						
Neoscombrops atlanticus ($n = 18$)	2	16					
Lateral-line scales	43	44	45	46	47	48	49
Verilus sordidus ($n = 5$)	2	2	1				
Neoscombrops atlanticus ($n = 16$)			1	3	5	4	3
Gill rakers on lower limb	14	15	16	17	18		
Verilus sordidus ($n = 5$)	1	3	1				
Neoscombrops atlanticus ($n = 18$)			2	8	8		

strikingly from *N. atlanticus*, in which the anterodorsal portion of this bone has a hollow concavity that receives the posterior extremity of the swimbladder (Fig. 2b). In addition, *Verilus sordidus* has several canine teeth posterior to the large canine teeth on either side of the symphysis of the lower jaw (Fig. 3a), whereas *N. atlanticus* has villiform teeth posterior to the enlarged canines (Fig. 3b). We examined the osteology of one specimen of each species in search of differences, but failed to find anything except for the characters described above.

Although our sample sizes are small, there also appear to be modal differences in the numbers of pectoral-fin rays, lateral-line scales, and rakers on the lower limb of the first gill arch, and the proportional head depth, longest pectoral-fin ray, and caudal-peduncle depth (Tables 1, 2, Fig. 5). Counting rakers on the lower limb of the first gill arch is made difficult by the presence of minute rakers on the anterior end of this arch. The differences observed in the proportional head depth, longest pectoral-fin ray, and caudal-peduncle depth may conceivably be related to the different size ranges examined for the two species (Table 1, Fig. 5). In addition to the above characters, the distributional patterns of cycloid and very weakly ctenoid scales on the head and body may differ between the two (Fig. 3). Available *V. sordidus* specimens have cycloid scales over much of the posterior part of the body, but *N. atlanticus* has these scales confined to the midlateral area. Additional specimens are needed for a thorough assessment of this character and to confirm observations suggesting modal differences in other characters.

Poey (1860) did not mention the anal-fin pterygiophore morphology in his description of *Verilus sordidus*, but the teeth on the lower jaw were described as: "une rangée externe de très petites dents aigües." The reference to an external row of very small sharp teeth corresponds to the condition in specimens we regard as *V. sordidus*, rather than *N. atlanticus*. In addition, all of Poey's *Verilus* specimens deposited at the MCZ and USNM are the same

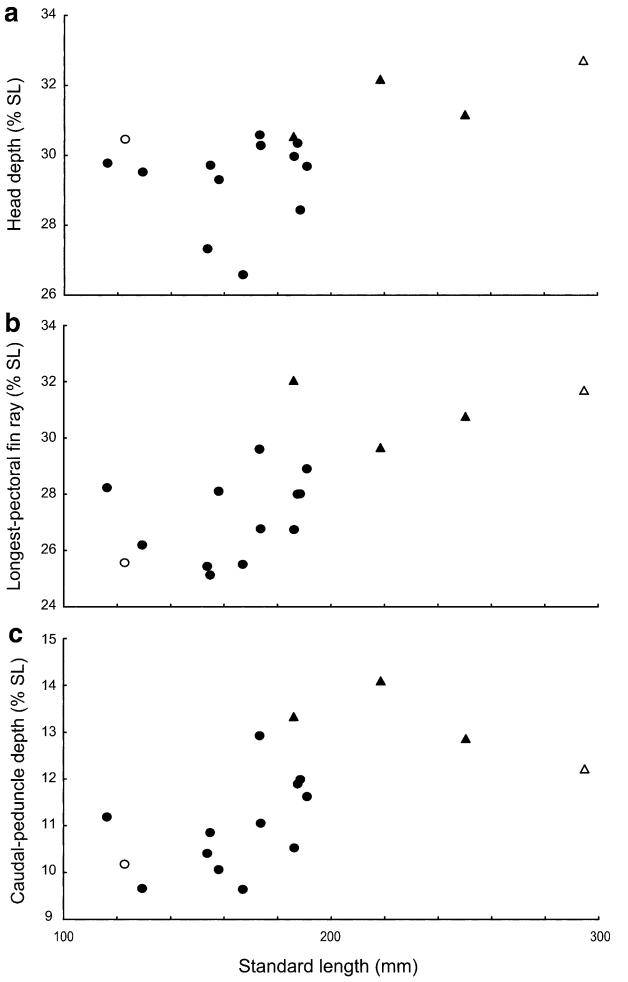

Fig. 5 Comparisons of proportional measurements of **a** head depth, **b** longest pectoral-fin ray, and **c** caudal-peduncle depth, and size in *Verilus sordidus* (*open triangles* neotype, *solid triangles* non-types) and *Neoscombrops atlanticus* (*open circles* holotype, *solid circles* other specimens)

species. Our description of *V. sordidus* based on these and other specimens is consistent with that of Poey (1860), which, among other characters, included 15 pectoral-fin rays and 45 lateral-line scales.

The specimens of *V. sordidus* examined in this study were collected only from off Cuba, and the two specimens with detailed collection locality available were collected off the northern coast of Cuba, rather than the Caribbean Sea. However, *V. sordidus* has been reported from other areas of the Caribbean, including Belize (Colin 1974), Puerto Rico and Honduras (Bunkley-Williams and Williams 2004), Colombia and Venezuela (Cervigón 1992; Cervigón et al. 1993), and Cuba (Jordan and Evermann 1898; Claro 1994). We found the specimen regarded as *V. sordidus* by Bunkley-Williams and Williams (2004), USNM 28945, to be *N. atlanticus*. However, the description of *V. sordidus* in Jordan and Evermann (1898) probably represents *V. sordidus* according to their description of

43 lateral-line scales and 17 rakers on the lower part of the first gill arch, which are thought to comprise 16 on the limb plus one at the angle. We also identified numerous specimens of *N. atlanticus*, from the Caribbean and northern coast of Cuba. As Heemstra and Yamanoue (2002) were the first to present the diagnostic characters emphasized here, it is not surprising that some previous distributional records of *V. sordidus* from the Caribbean Sea may have been misidentifications of *N. atlanticus*. Because voucher specimens for many of these records were not retained, additional material needs to be examined to determine the extent of the distribution of *V. sordidus*.

These externally similar species, classified in separate genera, *Neoscombrops* Gilchrist 1922 and *Verilus*, have not been treated phylogenetically to assess the validity of the current classification. Beyond *N. atlanticus*, *Verilus sordidus* is clearly distinguishable from the remaining two species of *Neoscombrops* by the absence of the basioccipital fossa [present in *N. cynodon* (Regan 1921); also absent in *N. pacificus* Mochizuki 1979] and 43–45 lateral-line scales (37–42 in *N. cynodon*; 47–51 in *N. pacificus*) (Mochizuki 1979; Starnes and Mochizuki 1982; Yamanoue and Matsuura 2003). *Verilus sordidus* is also morphologically similar to *N. pacificus*, which occurs in the western and central Pacific (Mochizuki 1979; Starnes and Mochizuki 1982), in the shape of the first anal-fin pterygiophore (Starnes and Mochizuki 1982; Yamanoue and Matsuura 2003), dentition, and other characters. Considering these combinations of similarities in morphology between *V. sordidus* and species of *Neoscombrops*, the current generic alignments are questionable. Although dentition, by which *V. sordidus* and *N. atlanticus* differ, is considered a key character for acropomatid genera (Yamanoue and Matsuura 2007; Yamanoue 2009), the remaining species of *Neoscombrops*, *N. cynodon* and *N. pacificus*, have dentition on the lower jaw that is more similar to *V. sordidus* than to *N. atlanticus*. Thus, the current classification of these genera should be reassessed in a phylogenetic context, perhaps via multiple approaches, to determine whether realignments or consolidations might be warranted.

Remarks. We examined the type series of *N. atlanticus*, and found that the paratype, USNM 229535 is a specimen of *V. sordidus*, underscoring the aforementioned confusion between these two species.

Acknowledgments We are grateful to the following persons and institutions for specimen loans: D. Catania (CAS), K. Hartel (MCZ), S. Jewett, L. Palmer, S. Raredon, J. Williams, and R. Vari (USNM). W. Eschmeyer (CAS), K. Hartel (MCZ), and B. Collette (Systematics Laboratory, NMFS) kindly provided us with helpful comments on type specimens of *Verilus sordidus*. The first author also thanks A. Charef (Univ. Tokyo), who kindly translated the French description of Poey (1860), and A. Carvalho-Filho (Fish Bizz Ltda) for helpful comments. A portion of this study was supported by the Ito Grant for Ichthyology, Fujiwara Natural History Foundation, and Research Fellowship of the Japan Society for the Promotion of Science for Young Scientists (10824).

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