



First record of strict snake eels, *Xyrias revulsus* Jordan & Snyder, 1901 (Anguilliformes: Ophichthidae), from Vietnamese waters

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ABSTRACT

This paper presents the first record of the strict snake eel, *Xyrias revulsus* (Jordan & Snyder, 1901), from Vietnamese waters. Eleven specimens were collected at a local fishing port in northern Nha Trang. *Xyrias revulsus* is distinguished from its congeners by a combination of the characters: a tail length shorter than the head and trunk (tail length 2.1–2.2 in TL; head length 8.6–9.8 in TL), an acute and short snout (6.0–7.6 in HL), and elongate jaws (upper jaw 2.4–2.5 in HL). The dorsal fin origin is well behind the pectoral fin tip, and the pectoral fin is moderately developed. Fresh coloration is pale brown with dark brown spots on the dorsal surface above the lateral midline, fading to pale on the ventral surface. The teeth are sharp, needle-like, and slightly recurved on the jaws and vomer. The vertebral count is 17–18 predorsal, 79–81 preanal, and 162–164 total vertebrae (n = 2). This paper provides morphological data, a detailed description, and photographs of the species, thereby extending its distributional range.

Keywords: Taxonomy, morphometrics, range, East Sea of Vietnam.

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Introduction

The family Ophichthidae (snake eels and worm eels) comprises 62 genera and 371 species worldwide [1]. The genus *Xyrias* (subfamily Ophichthinae) includes five distinct species globally: *X. anjaalai* Augustina, Sreeram, Sukumaran, Jose & Sreekumar, 2020; *X. chioui* McCosker, Chen & Chen, 2009; *X. guineensis* (Blache, 1975); *X. multiserialis* (Norman, 1939), and *X. revulsus* Jordan & Snyder, 1901 [2–4]. This genus has the following characteristics: tail slightly shorter than head and trunk; jaws elongate, a reduced or better developed pectoral fin, its length fitting six or more times in head length; dorsal fin origin above or slightly behind pectoral fin tip; teeth strong, and elongate fangs, jaws teeth not extremely enlarged; those of vomer largest, uniserial, and nearly continuous with those of intermaxillary, upper jaw teeth multiserial [2, 3, 5–8]. They are believed to be uncommon, with only a limited number of specimens in museum collections, and many species have been described based on a small number of specimens or single individuals [2, 3]. In Viet Nam, 12 genera and 36

species of the family Ophichthidae have been recorded, with four new species and five new records described in recent years, suggesting high diversity. *Xyrias revulsus* is a deepwater species known to have a broad geographic range in the Indo-west Pacific region, from Japan to South Africa, including the northeast and eastern parts of the South China Sea, such as Taiwan and the Philippines [2–4, 9–11]. However, none of the records were from Viet Nam for a period of more than 20 years [12–22]. Recently (2019–2024), eleven individuals of *X. revulsus* were collected by the first author from Luong Son fishing port (Nha Trang), which represents the first record of Vietnam. Herein, we provide a detailed description of the species based on the newly collected specimens.

Materials and methods

The sample collected from local fishermen caught at Luong Son fishing port, Nha Trang City (Fig. 1), dead specimens relaxed were fixed in 10% formalin solution and later preserved in 70% ethanol for long-term preservation.

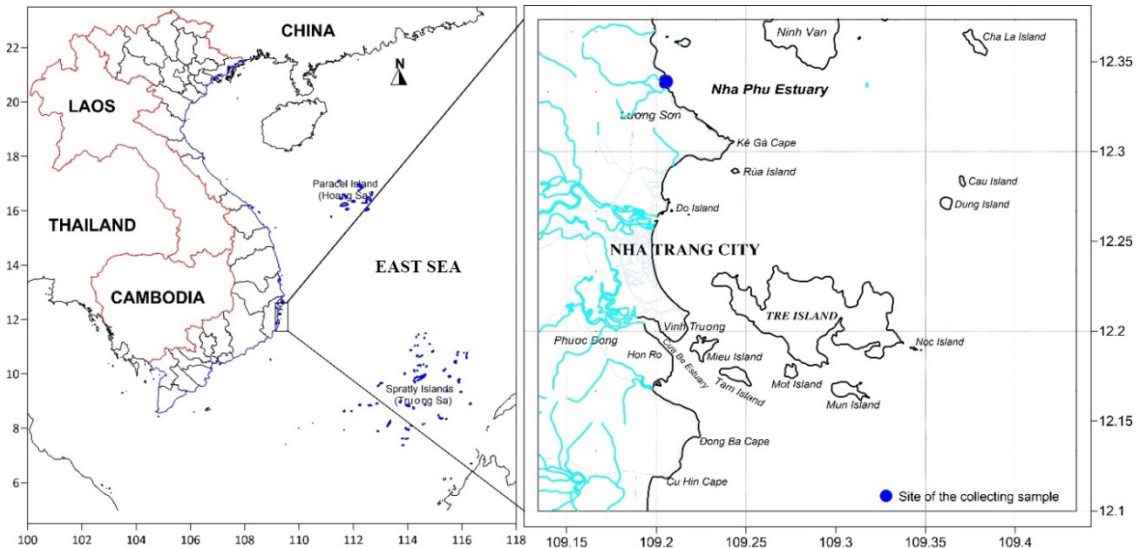


Figure 1. Map of the collected specimens *Xyrias revulsus* Jordan & Snyder

Measurements are straight-line, made either with a 1,500 mm ruler with 0.5 mm gradations for total length (TL) and tail length (recorded to the nearest 0.5 mm), or with a digital caliper for

all other measurements (to the nearest 0.1 mm). Body length (pre-anal length) comprises head and trunk lengths. Head length (HL) is measured from the snout tip to the posterior

margin of the gill opening; trunk length is taken from the end of the head to mid-anus, and maximum body depth does not include the median fins [2]. Head pore terminology follows [11]: supraorbital pores (SO); infraorbital pores (IO); preoperculomandibular pores (POM); supratemporal pores (ST); median frontal pores (F). Alcian blue was used to stain the skin of most specimens to ensure precise counts of the pores. Radiographs were taken using a digital X-ray machine at the National Museum of Marine Biology & Aquarium, Taiwan, with pins inserted at origin of dorsal and anal fins. Vertebral counts were made from digital radiograph photographs [23].

The specimens are deposited at the Institute of Oceanography, Nha Trang, Vietnam (OIM-E). Data used for comparison were either taken from the specimens examined by the authors and various publications [2–4].

Results and discussion

- Order: Anguilliformes
- Family: Ophichthidae Günther, 1870
- Genus: *Xyrias* Jordan & Snyder, 1901
- *Xyrias revulsus* Jordan & Snyder, 1901 (Figs. 2–3, Tables 1–2)
- English name: Strict snake eel
- Vietnamese name: Cá chình rắn đầu nhọn

Synonymy

Xyrias revulsus Jordan & Snyder, 1901. - Jordan & Snyder (1901) [24]: 868 (type locality: Near Misaki, Japan. Holotype (unique): CAS-SU 6476).- McCosker (1977) [25]: 84 (description of the osteological characters). - Asano (1984) [26]: 31 (short description). - McCosker (1998) [2]: 12 (short description). - McCosker (2000) [27]: 586 (checklist). - Shinohara et al. (2001) [28]: 293 (checklist). - Nakabo (2002) [29]: 220 (short description). - McCosker et al. (2006) [30]: 277 (short description).- McCosker et al. (2009) [3]: 61 (comment characters). - Zhang et al. (2010) [31]: 349 (short description). - Larson et al. (2013) [32]: 29 (annotated checklist). - McCosker (2014) [33]: 339 (provisional list). - Ho et al. (2015) [20]: 176 (annotated checklist).

- Hibino (2019) [34]: 153 (short description). - Augustina et al. (2020) [4]: 585 (comparative characters). - Psomadakis et al. (2020) [35]: 279 (short description). - McCosker (2022) [21]: 134 (short description).

Material examined

11 specimens, OIM-E.55859 (4), 514–763 mm TL, 13 April 2019. OIM-E.55860 (4), 523–610 mm TL, 20 April 2019. OIM-E.55861 (2), 726–1107.5 mm TL, 20 June 2020. OIM-E.55862 (1), 706 mm TL, 04 July 2024. All collected at Luong Son fishing port, ca. 12°20'07"N, 109°12'15"E, northern Nha Trang, Khanh Hoa Province, Vietnam, bottom trawl, depth ca. 120–180 m off southeast coast, collected by Q. V. Vo.

Description

An elongate species of *Xyrias* (Fig. 2), its depth at gill openings 36.5–40.3 in TL; body cylindrical for most of its length, becoming laterally compressed in posterior tail region; hard and pointed tail tip without caudal fin. Tail slightly shorter than head and trunk; tail length 2.1–2.2 and length head 8.6–9.8 in TL. Dorsal-fin origin well behind pectoral fin tips, 6.3–7.2 in TL; pectoral fins not elongate, moderately short, its length 4.8–7.2 in HL. Snout is acute when viewed from above and short, its length 6.0–7.6 in HL; eye is small, its diameter 6.6–9.1 in HL, the center of the eye before middle of the upper jaw; jaws are its length 2.4–2.5 in HL, with the lower jaw included within the snout. Anterior nostril a short tube and laterally directed, with a minute flap on its rim; posterior nostril opens into mouth along outer margin of upper jaw, and covered by a flap extending to anterior margin of eye. Interorbital space flat, narrow and slightly wider than eye; dorsal surface of head flat, no brow at intersection of uppermost postorbital bone and frontal bone from mid-head to snout tip. Skin slightly wrinkled on head behind preopercular and chin. Head pores inconspicuous, SO 1 + 4, IO 4 + 2, POM 6 + 2 (a specimen 7+2); lateral-line pores before gill opening 9–11, before dorsal fin 16–20, before anal fin 74–86, and total 147–156.

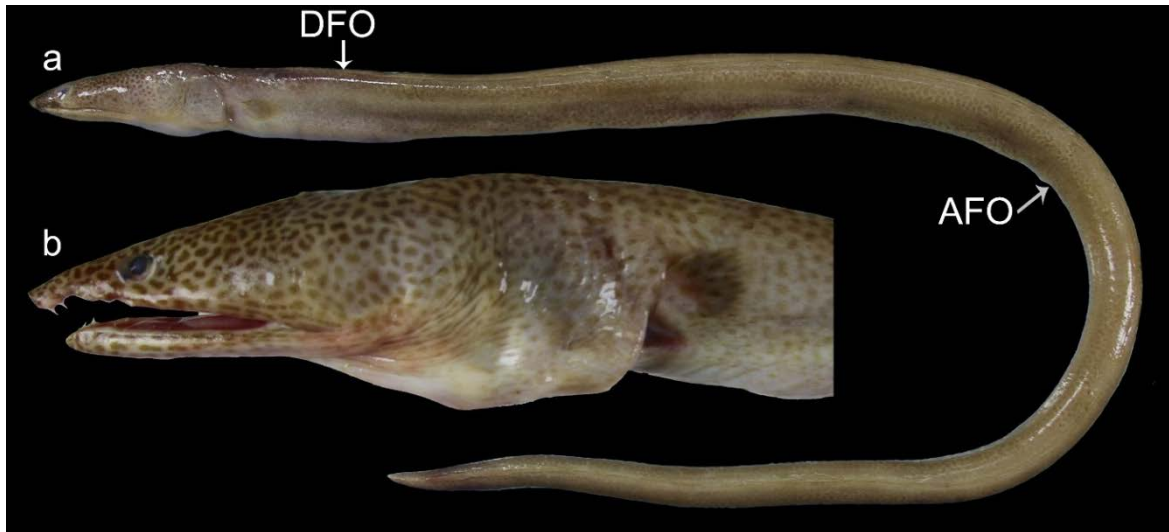


Figure 2. *Xyrias revulsus* Jordan & Snyder; a - OIM-E.55859, 664 mm TL, fresh specimen, whole body, arrows point to the dorsal fin origin (DFO) and anal fin origin (AFO), respectively; b - OIM-E.55860, 1107.5 mm TL, close-up of the lateral head view

Teeth slender, slightly recurved and needle-like (Fig. 3); intermaxillary bearing a pair of fang-like teeth at front, following by two pairs and a small tooth in the middle, then a gap along ethmoidal midline. Vomerine teeth uniserial, with 4–5 larger teeth at anterior portion and 8–9 smaller teeth at posterior portion. Maxillary with an outer row of close-set teeth and inner portion with broad band of multiple rows of teeth, two

rows of teeth from front to level of 3rd vomerine tooth, a 3rd row begins at level of 4th vomerine tooth, and posterior portion with 5–7 irregular, narrowly-spaced rows. Lower jaw uniserial, anterior teeth large and widely-spaced, becoming smaller and narrowly-spaced at posterior portion. Vertebrae: pre-dorsal vertebrae 16–17, preanal vertebrae 77–81, and total vertebrae 160–162 (n = 2); MVF 17-79-161.

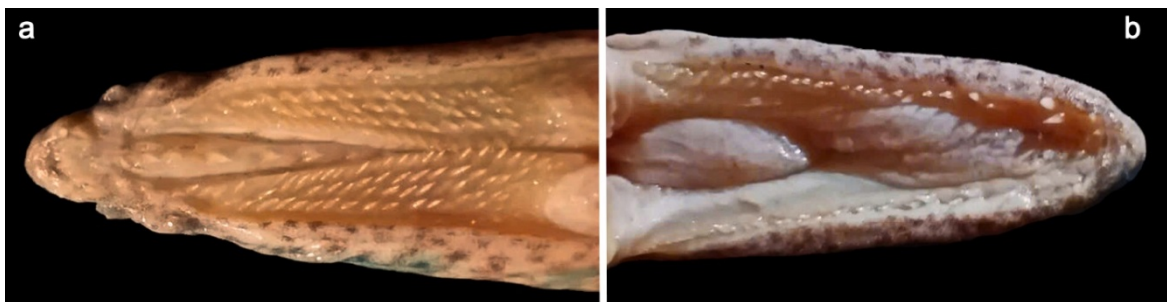


Figure 3. The dentition of *Xyrias revulsus* Jordan & Snyder, OIM-E.55859, 738 mm TL; (a) upper jaw and vomer; (b) lower jaw

Coloration

When fresh, dorsal portion light brown with numerous irregular dark-red brown spots on back and sides. Ventral side paler without marks. Dorsal fin pale brown and anal fin paler;

pectoral fin dark brown with spots and a pale margin. In the preservative (alcohol) condition, body yellowish to brown, darker dorsally, and is covered with numerous small to medium brown spots along dorsolateral surface and extending to below lateral line; fine dark brown

spots on snout, nape, cheeks, and lower jaw; pectoral fin brown with spots, dorsal and anal fins pale brown.

Specimens examined are 514–1,107.5 mm TL; the largest specimen is a ripe female with loose eggs. Other specimens are either unripe females or males with maturity stage cannot be determined.

Size

Table 1. Morphometric and meristic data of *Xyrias revulsus* Jordan & Snyder and *Xyrias anjaalai* Augustina, Sreeram, Sukumaran, Jose & Sreekumar

Characters	<i>Xyrias anjaalai</i>			
	Viet Nam ¹		Indo-Pacific ²	India ³
TL (mm)	514–1107.5		644–1128	425–900
Proportions	Mean (Range)	SD	Range	Range
<i>As % of TL</i>				
Preanal length (head and trunk)	52.1 (51.2–53.7)	1.2	-	46.3–56.9
Head length (HL)	10.9 (10.2–11.6)	0.5	10.4–11.0	10.5–12.1
Pre-dorsal length	14.8 (13.9–15.8)	0.6	-	16.4–18.9
Trunk length	41.2 (40.3–42.2)	1.2	-	40.5–44.8
Tail length	47.9 (46.3–48.8)	1.2	45.5–47.6	41.2–47.2
Body depth at gill opening	2.6 (2.5–2.7)	0.1	2.3–2.8	1.7–2.9
Body width at gill opening	2.3 (2.0–2.8)	0.2	-	-
Body depth at mid-anus	2.4 (2.2–2.6)	0.1	-	1.7–2.9
Body width at mid-anus	2.2 (1.9–2.5)	0.2	-	-
<i>As % of HL</i>				
Snout length	14.4 (13.2–16.7)	1.1	16.4–18.9	14.4–15.9
Eye diameter	8.0 (6.6–9.1)	0.9	-	7.6–10.5
Interorbital width	7.4 (6.7–10.0)	1.0	-	-
Upper-jaw length	40.4 (37.9–42.2)	1.3	-	46.0–56.9
Low-jaw length	37.9 (36.3–40.2)	1.3	-	41.9–55.4
Gill-opening height	13.1 (10.5–15.6)	1.4	-	-
Interbranchial distance	13.7 (11.9–14.4)	0.7	-	-
Pectoral-fin length	17.3 (14.0–21.0)	2.3	16.4–18.9	22.5–26.9
Pectoral-fin base	8.0 (6.5–9.2)	0.8	-	7.0–10.8
Meristics				
SO	4+1		-	4+1
IO	4+2		-	4+2
POM	6 (rarely 7)+2		-	5+2
Lateral-line pores before gill-opening	9–11		-	7–10
Lateral-line pores before dorsal fin	16–19		-	17–22
Lateral-line pores before anal fin	76–86		-	71–78
Total pores	147–156		-	-
Pre-dorsal vertebrae	16–17		-	18–21
Preanal vertebrae	77–81		-	73–76
Total vertebrae	160–162		155–160	147–149

Note: ¹This study; ²McCosker (1998) [2]; ³Augustina et al. (2020) [4]; -: no data is available.

Table 2. Compare the selected morphometric and meristic data of species *Xyrias*

Characters	Species					
	<i>X. guineensis</i> (Blache, 1975)	<i>X. multiserialis</i> (Norman, 1939)	<i>X. revulsus</i> Jordan & Snyder, 1901		<i>X. chioui</i> McCosker, Chen & Chen, 2009	<i>X. anjaalai</i> Augustina, Sreeram, Sukumaran, Jose & Sreekumar, 2020
Head length in TL	10.8–11	7.2–7.8	9.1–9.6	8.6–9.8	8.1	8.2–9.5
Tail length in TL	1.8–1.9	2.2	2.1–2.2	2.1–2.2	2.1	2.1–2.4
Upper jaw length in HL	–	–	–	2.4–2.5	2.6	1.8–2.3
Snout length in upper jaw length	2.0	2.3–2.9	2.7–3.4	2.4–3.1	2.7	3.0–3.7
Eye diameter in snout length	2.5	1.9–2.5	2.0–2.8	1.5–2.1	2.3	1.4–2.0
Pectoral fin in HL	6.2–6.5	3.6–4.3	5.3–6.1	4.8–7.2	5.8	3.7–4.5
No. of vertebrae	194–199	140–141	155–160	160–164	126	147–149
Coloration	Body, head and tail with spots	Body, head and tail with spots	Body, head and tail with spots		Body, head and tail without spots	Body, head and tail with spots
Resources	McCosker (1998) [2]	McCosker (1998) [2]	McCosker (1998) [2]	This study	McCosker et al. (2009) [3]	Augustina, et al. (2020) [4]

Discussion

The morphometric and meristic characters of the specimens collected from Vietnam agree well with those described in other regions [2, 3, 24]. Compared to the data from these [2, 3, 24], the Vietnamese specimens have a shorter snout length (13.2–16.7 vs. 16.4–18.9% HL and slightly more total (160–162 vs. 155–160). *Xyrias revulsus* is similar to species in the group that have the body, head, and tail covered with numerous small to medium brown spots, but can be distinguished from *X. anjaalai* Augustina, Sreeram, Sukumaran, Jose & Sreekumar, 2020 by having a shorter predorsal length, shorter upper-jaw length, shorter pectoral-fin length, but a higher number of total vertebrae (Tables 1 & 2). *X. revulsus* can be distinguished from *X. guineensis* (Blache, 1975) by having a head and trunk longer than tail, while it is the opposite for the latter species; fewer total number of vertebrae (160–162 vs. 194–199). *X. revulsus* differs from *X. multiserialis* (Norman, 1939) by head length and pectoral fin length being shorter, the number of total vertebrae being more than (160–162 vs. 140–141) (Table 2). Moreover, the tooth arrangements and number of tooth rows on the

jaws and vomer are also different among these species [2–4].

The genus *Xyrias* is restricted to the Indo-Pacific [4, 6–8, 24], and *X. revulsus* is known to occur at depths of 146–209 m [2]. The species was originally described from a unique specimen from near Misaki, Japan, and is believed to be rare, as very few individuals have been encountered, with only a few kept in museums. According to [2, 3], *X. revulsus* is widespread in the Indo-Pacific region, spanning from Japan to South Africa. However, there have been no records of its occurrence in Vietnamese waters; the main reason for this previous lack of records in Vietnam could be the difficulty of sampling from deep waters. This paper provides the first record of the species in Vietnam and extends its known distribution to the western part of the East Sea of Vietnam.

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