



## Comments on the snake-eel genus *Xyrias* (Anguilliformes: Ophichthidae) with the description of a new species

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### Abstract

Comments on the snake-eel genus *Xyrias* (Anguilliformes: Ophichthidae) with the description of a new species. *Xyrias chioui*, a new robust snake-eel species, subfamily Ophichthinae, is described on the basis of a specimen caught at 60–70 m depth on a benthic longline off Changbin, Taitung County, eastern Taiwan. It is distinguished from its congeners by having fewer vertebrae (126), 3 postorbital cephalic pores, and biserial rather than multiserial mandibular dentition. A key to the species of *Xyrias* is provided. Additional records of *X. revulsus* from the Arafura Sea and off New South Wales, Australia, extend its depth range from a few to 300 meters. The generic diagnosis of *Xyrias* is expanded such that the maxillary dentition ranges from a biserial to a multiserial condition.

**Key words:** Ophichthidae, *Xyrias*, new species, Taiwan

### Introduction

Snake eels of the genus *Xyrias* are uncommonly captured, generally large in size, and are ferocious in appearance. They are unknown to most fishermen and very rare in museum collections. Their fossorial habits and the moderately deep sand bottoms which they occupy limit their capture to hook-and-line and, rarely, by bottom trawling. Three species are known and were recently reviewed by McCosker (1998): *X. revulsus* Jordan and Snyder (1901), known from Japan to Natal, South Africa, including specimens from Australia, Philippines, and the East China Sea, from a few meters to 300 m depth; *X. multiserialis* (Norman 1939), from the Gulf of Aden and off Somalia, between 220–322 m depth; and *X. guineensis* (Blache 1975), only from Pointe-Noire, Congo, from 300 m depth. To this handsome cadre we add a new species captured by Captain Jiun-Shiun Chiou off eastern Taiwan, and take pleasure in naming it in his honor.

### Materials and methods

Counts and measurements follow those used in McCosker (1998). Head pore terminology follows that of McCosker et al. (1989: 257) such that: the supraorbital pores (SO) are expressed as the ethmoid pore + pores in the supraorbital canal, e.g., 1+3; the infraorbital pores (IO) are expressed as pores along the upper jaw + those in the vertical part of the canal behind the eye (the "postorbital pores"), e.g., 4+3, in that frequently the last pore included along the upper jaw is part of the postorbital series; and the preopercular and mandibular pores (POM) are treated together, e.g., 2+5. Vertebral counts (which include the hypural) were taken from radiographs. Vertebral notation and definitions are described in Böhlke (1982). The mean vertebral formula

(MVF) is expressed as the average of predorsal/preanal/total vertebrae. The holotype of the new species is deposited in the National Taiwan Ocean University (TOU-AE).

## Taxonomy

### Genus *Xyrias* Jordan and Snyder, 1901

*Xyrias* Jordan and Snyder 1901: 868 (type species *Xyrias revulsus* Jordan and Snyder 1901, by original designation and by monotypy).

**Diagnosis.** Ophichthid eels, subfamily Ophichthinae, tribe Ophichthini (*sensu* McCosker 1977), with the following combination of characteristics: jaws elongate; snout short, subconical; eye small to moderate; anterior nostril in upper lip in a short tube and laterally directed, ovate, with a minute flap; posterior nostril in upper lip and covered by a flap; dorsal-fin origin above or behind pectoral-fin tips; postorbital strut absent; two preopercular pores; teeth strong, conical, not extremely enlarged, those of vomer largest, uniserial and widely spaced; anterior intermaxillary teeth exposed before lower jaw tip, lower jaw teeth uniserial, those of upper jaw biserial or with an outer uniserial row, flanked by a large inner multiserial patch which broadens posteriorly; gill arches typically ophichthine, fifth ceratobranchial ossified, upper pharyngeal tooth plates united by a suture. A more detailed description of the gill arches, hyoid apparatus, pectoral girdle, and other osteological characters of *X. revulsus* is provided in McCosker (1977: 84).

**Remarks.** *Xyrias* was, until recently, known only from very few specimens of the type species. The only record of *Xyrias* from the East China Sea was that of *X. revulsus* from Diaoyu Island (Tan (1983). McCosker (1998) reviewed the genus and included *Ophichthus multiserialis* Norman (1939) and *Ophisurus guineensis* Blache (1975) within it. He examined all of the type specimens as well as four additional specimens. To that list we add the following new records and information concerning *Xyrias revulsus*. Two uncatalogued specimens from the Northern Territory Museum of Australia were bottom trawled from the Arafura Sea, one (790 mm TL) from east of Evans Shoal (09°46'S, 130°14'E, 270–300 m depth), the other (603 mm TL) from north of Bathurst Island (09°47'S, 130°25'E, 265–275 m depth). They have 19/78/157 and 20/78/158 vertebrae, respectively. *Xyrias revulsus* has also been observed and photographed by scuba divers, reducing their depth range to a few meters. The unmistakable snout of *X. revulsus* extending from a shell and gravel substrate was photographed by K. Iwai at 25 m depth off the Izu Peninsula, Japan (Anon. 1996: 1). Several individuals were seen and photographed by divers Akos and Donata Lumnitzer at depths under three meters off Kurnell, New South Wales, Australia. The Lumnitzers observed as many as three eels each dive, but only at night.

The dentition of the new species, as described below, requires an expanded diagnosis of *Xyrias*. Its three described congeners have a posterior patch of maxillary teeth medial to the outer row of uniserial teeth; the new species has two linear uniserial rows of maxillary teeth separated by a trough. Other than that, it appears to be very similar in physiognomy and general morphology to its congeners.

### Key to the species of *Xyrias*

- 1a. Head and trunk longer than tail; snout length more than twice in upper jaw; pectoral fin 5.9–6.5 in head length (HL); center of eye above or before middle of upper jaw; total vertebrae 126–160 ..... 2
- 1b. Head and trunk shorter than tail; snout longer, about twice in upper jaw; pectoral fin longer, 3.6–6.1 in HL; center of eye behind middle of upper jaw; total vertebrae 194–199 ..... *X. guineensis*
- 2a. Body, head and tail covered with numerous small to medium brown spots; inner row of maxillary teeth in a broad patch; total vertebrae 140–160 ..... 3
- 2b. Body, head and tail without brown spotting; inner row of maxillary teeth uniserial; vertebral formula 19/61/126 .....

- ..... *X. chioui*, new species
- 3a. Head 7.2–7.8 in total length (TL); pectoral fin 3.6–4.3 in HL; middle of orbit above middle of upper jaw; mean vertebral formula (MVF) 16.7/67.3/140.3; total vertebrae 140–141 ..... *X. multiserialis*
- 3b. Head 9.1–9.6 in TL; pectoral fin 5.3–6.1 in HL; snout shorter, rear margin of orbit above middle of upper jaw; MVF 17.8/77.8/157.2; total vertebrae 155–160 ..... *X. revulsus*

## Species description

### *Xyrias chioui*, new species

(Figs. 1–4)

**Holotype.** TOU-AE 1561, 819 mm TL, male, Changbin (23°17'N, 121°27'E), Taitung County, Taiwan, caught on a benthic longline set upon a sand bottom at 60–70 m depth by Jiun-Shiun Chiou, Oct. 2004.

**Diagnosis.** A moderately elongate species of *Xyrias* with tail 47% and head 12% of TL; dorsal-fin origin well behind pectoral tips; pectoral fin spatulate, elongate, 5.9 in HL; snout short, 2.7 in jaw; upper jaw elongate, 2.6 in HL; center of eye in anterior 40% of upper jaw; labial cirri and barbels absent; eyes not elevated; head pores minute, supraorbital pores 1+3, infraorbital pores 4+3, preoperculomandibular pores 2+6; teeth numerous, conical, needle-like, biserial on maxilla and uniserial on mandible and vomer; coloration in preservative pale ventrally, becoming brown dorsally, pectoral fins brown, median fins with a thin dark margin. Vertebral formula 19/61/126.



**FIGURE 1.** Holotype of *Xyrias chioui*, TOU-AE 1561, 819 mm TL, soon after capture (photo by Kar-Hoe Loh).



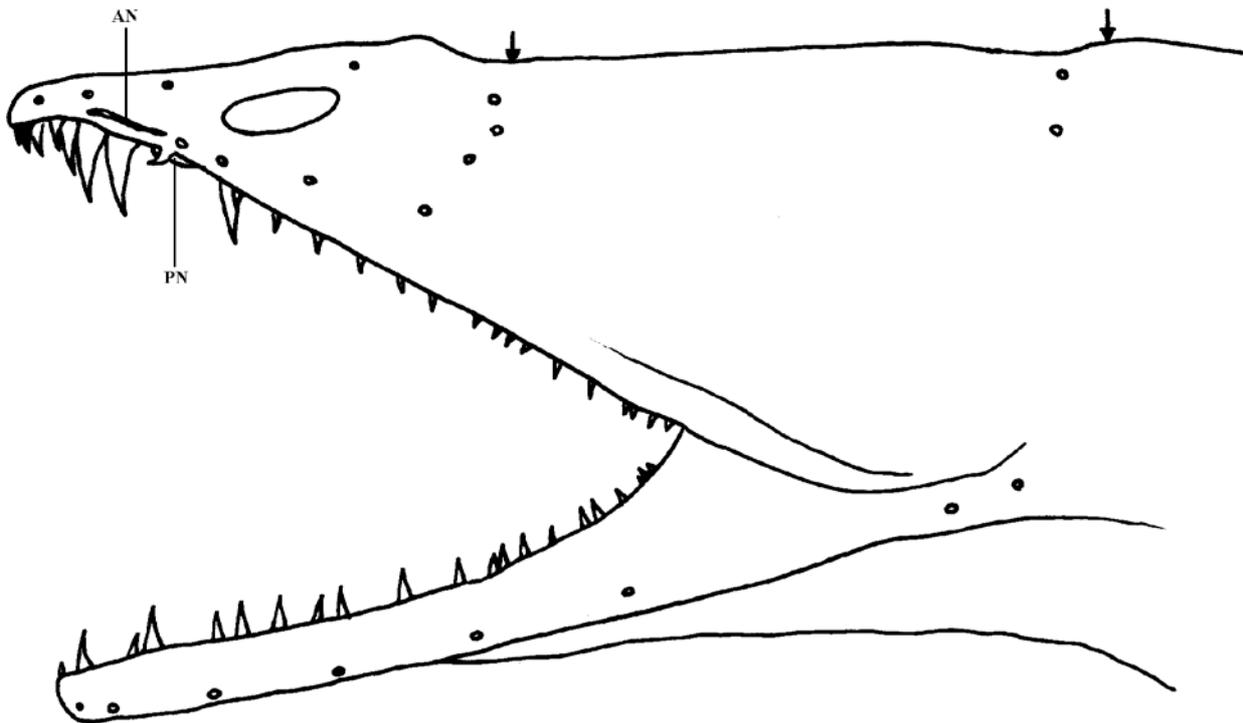
**FIGURE 2.** Head of holotype of *Xyrias chioui*, TOU-AE 1561, 819 mm TL, soon after capture (photo by Kar-Hoe Loh).

**Counts and measurements (in mm) of the holotype.** Total length 819; head 101; trunk 334; tail 384; predorsal distance 167; pectoral-fin length 17.1; pectoral-fin base 5.2; body depth at gill openings ~35; body width at gill openings ~23; body depth at anus ~32; body width at anus ~24; snout 14.3; tip of snout to rictus 39.0; tip of lower jaw to rictus 38.6; eye diameter 6.2; interorbital distance 6.6; gill opening height ~12; isthmus width 14.1. Vertebral formula 19/61/126. Weight before preservation 497.5 g.

**Description.** Body moderately elongate (Fig. 1), depth at gill openings 23 in TL, nearly cylindrical for much of its length, becoming laterally compressed in posterior tail region. Head and trunk slightly longer than tail; tail 2.1 and head 8.1 in TL. Snout acute when viewed from above, its lateral profile evenly sloping to eye (Fig. 2), with a minor brow behind orbit. Jaws nearly subequal. Snout foreshortened, center of eye at anterior 40% of jaw. Jaws elongate, about 2.6 in head. Lips without cirri or barbels. Anterior nostril in upper lip in a short tube and laterally directed, ovate, with a minute flap, closely followed by posterior nostril, which opens

into mouth along outer edge of lip but is entirely covered by a flap, which ends beneath anterior margin of eye. Eye small. Interorbital space flat, narrow, slightly wider than eye; a small brow exists at the intersection of dorsal-most postorbital bone and frontal bone. Median fins low (difficult to observe in preservative), ending before tail tip. Dorsal-fin origin nearly 3 pectoral-fin lengths behind pectoral-fin tips. Pectoral fins moderately elongate, about equal to distance from snout tip to rear margin of orbit, spatulate in shape. Pectoral base at 20° angle relative to body; upper edge of pectoral base attached at posterodorsal corner of gill opening, lower edge within upper 10% of gill opening. Gill openings lateral, on lower half of body. Isthmus about equal to unstretched gill opening.

Head pores (Fig. 3) minute, difficult to discern, those of mandible and preopercle inconspicuous. Single median interorbital and temporal pores. Supraorbital pores 1+3, infraorbital pores 4+3, postorbital pores 3, mandibular pores 6, preopercular pores 2. Lateral-line pores inconspicuous and difficult to count.

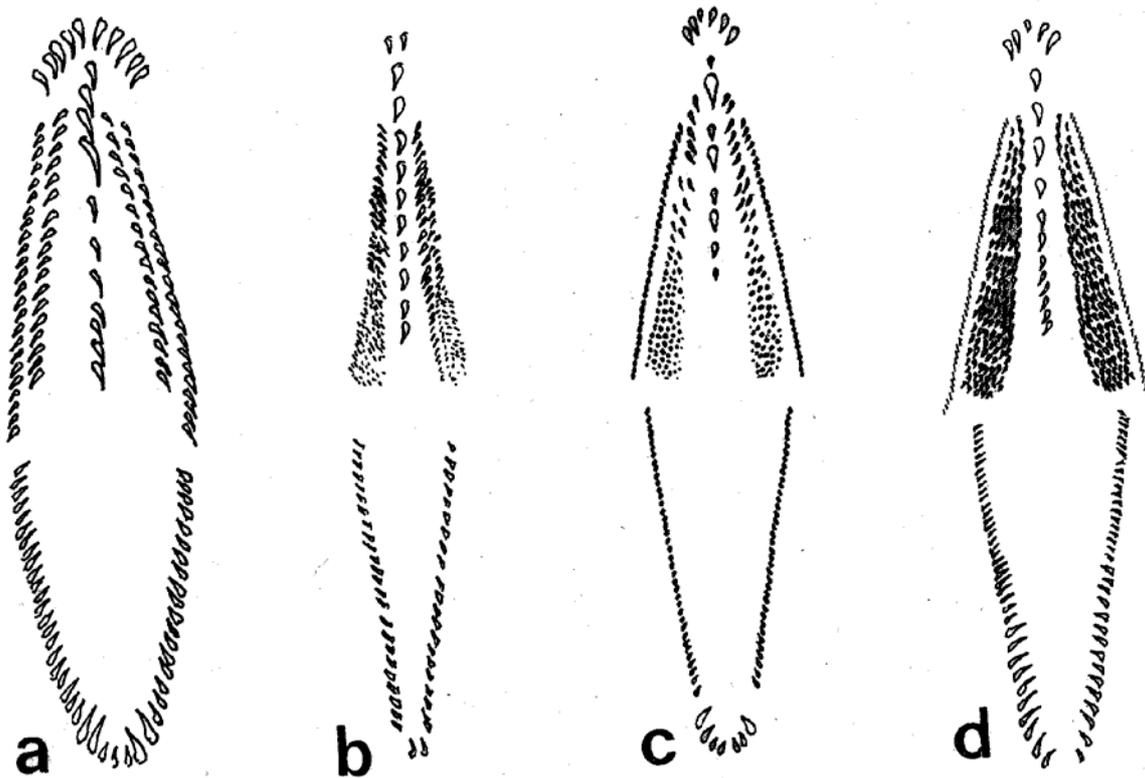


**FIGURE 3.** Diagrammatic illustration of cephalic pores and nostrils of holotype of *Xyrias chioui*, TOU-AE 1561, 819 mm TL. Arrows point to the median interorbital pore and the median temporal pore. Abbreviations: AN, anterior nostril; PN, posterior nostril.

Teeth (Fig. 4a) conical, slender, slightly recurved and needle-like. An anterior rosette of 10 small teeth, followed by 5 larger teeth (the fourth missing, the fifth the largest in jaw) along ethmoidal midline, these followed by a short gap, 2 teeth, a short gap, a single tooth, a short gap, and 4 shorter nearly equally spaced vomerine teeth. Maxillary teeth in biserial linear rows separated by a trough; an inner row of 16–22 evenly spaced teeth, the outer row of 24–28 more closely spaced slightly smaller teeth begins slightly posteriorly and extends further. Mandibular teeth uniserial, very linear, largest anteriorly, 22–28 on each side.

Coloration (when fresh) pale on ventral surface, becoming olive-brown above lateral midline. Throat, cheeks, lower jaw, snout and interorbital region pale brown. Five to six small white spots flank the anterior third of lower jaw. Palate and tongue dusky. Pectoral fins dark brown. Median fins pale olive basally with a thin dark-brown margin. Lateral-line pores unpigmented. Peritoneum pale.

**Size.** Known only from the 819 mm holotype, a male.



**FIGURE 4.** Diagrammatic illustration of the dentition of the holotypes of species of *Xyrias*: a. holotype of *X. chioui*, TOU-AE 1561; b. *X. guineensis*, MNHN 1974-186 (after Blache, 1975: fig. 8); c. *X. multiserialis*, BMNH 1939.5.24.649 (after Norman, 1939: fig. 15); d. *X. revulsus*, CAS-SU 6476 (from McCosker 1998: fig. 2).

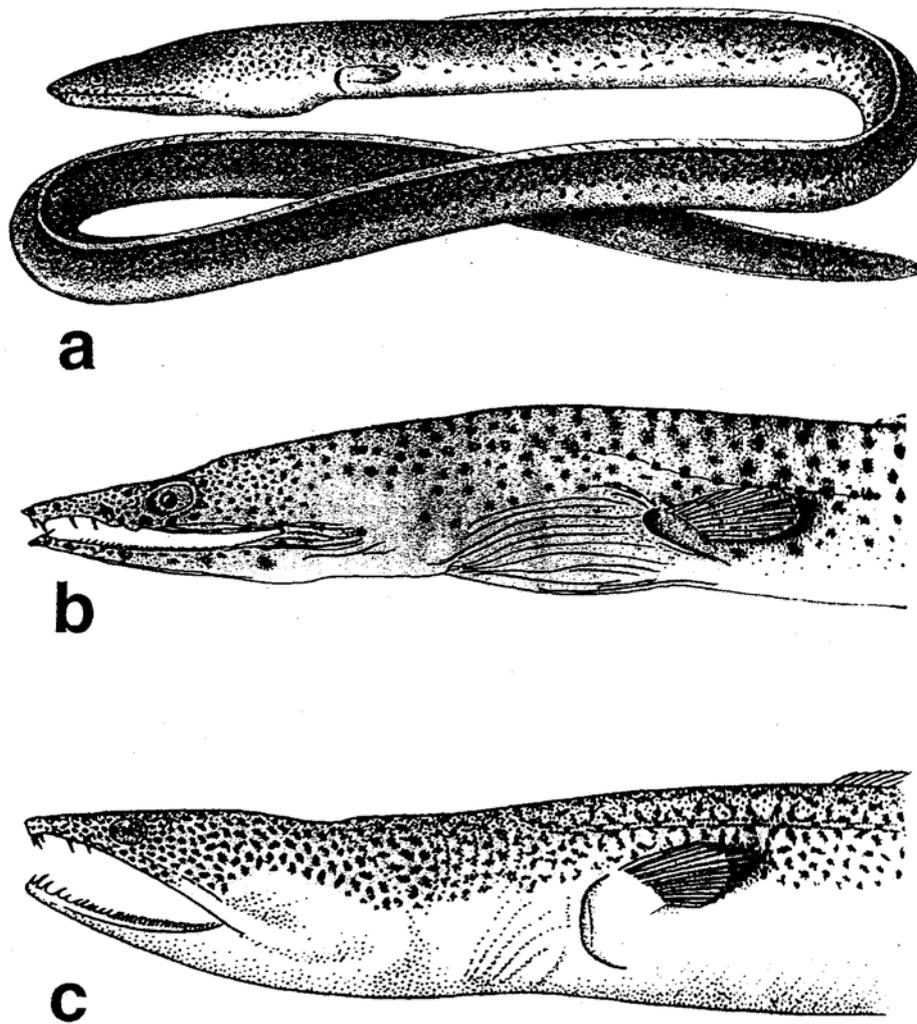
**Distribution.** Known only from the holotype, captured above a sand bottom at 60-70 m depth, off eastern Taiwan.

**Etymology.** Named *chioui* in honor of Captain Jiun-Shiun Chiou, who captured and donated this and other important eel specimens to the laboratory of the National Taiwan Ocean University.

## Discussion

The holotype is twisted and somewhat desiccated. It is mostly eviscerated, therefore our measurements of body depth are only an approximation. The dentition, however, is in very good condition.

The new species is very similar in appearance and proportions to each of its congeners. It differs from all of them (Fig. 5) in lacking dorsal spotting on the head, body and tail; in having fewer vertebrae (126 vs. 140–199); in having 3 (vs. 2) postorbital pores; and in having biserial maxillary dentition (vs. an inner patch flanking an outer row) (Fig. 4). It appears most similar to *X. revulsus* and *X. multiserialis* in having its tail slightly shorter than its head and trunk and in its body depth (23 in TL vs. 36–43 and 26–34, respectively), and differs markedly from them in lacking an inner maxillary tooth patch. It differs from its Atlantic congener, *X. guineensis*, by having a more robust body (23 in TL vs. 43–50) and in having a longer head and trunk than its tail (the reverse in *X. guineensis*). Like all *Xyrias*, its elongate jaws, strong pointed teeth, and shortened snout are probably adaptations for a lie-and-wait feeding behavior, whereby it burrows within the sand with only its snout tip and eyes expose, awaiting smaller fish prey. These behavioral and morphological adaptations are shared by other ophichthids of the genera *Echiophis* and *Brachysomophis* (McCosker et al. 1989; McCosker and Randall 2001).



**FIGURE 5.** Holotypes of species of *Xyrias* (from McCosker 1998): a. *X. revulsus*, CAS-SU 6476 (after Jordan and Snyder, 1901: fig. 16); b. *X. guineensis*, MNHN 1974-186 (after Blache, 1975: fig. 7); c. *X. multiserialis*, BMNH 1939.5.24.649 (after Norman, 1939: fig. 15).

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