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Siderea flavocula, a new species of moray eel (Anguilliformes: Muraenidae) from Oman

Eugenia B. Böhlke* and John E. Randall**

Abstract

Siderea flavocula, a new species of moray taken off central and southern Oman, is described. It is distinguished by its coloration of plain brown head with contrasting pale snout and chin and distinctive pattern of dark spots which appear as large hexagons on body and fins, its short jaws, the presence of molariform vomerine teeth, and the lack of median fang-like intermaxillary teeth. The mean vertebral formula is 4-54-126.

Introduction

Ichthyological field work in recent years in the Persian Gulf, Gulf of Oman, and Arabian Sea coast of Oman by the junior author and colleagues has resulted in the discovery of a surprising number of new species and new records of inshore fishes. Forty-one have been described as new (three in new genera), and another nine are under study. Most of these fishes have been collected along the southern coast of Oman. Part of the reason for such a preponderance of new material for this region has been limited collecting effort there and part is the unique environment created by seasonal upwelling generated by the southwest monsoon. The cold, nutrient-rich, upwelled water causes high plankton productivity, and the inshore benthos includes macroalgae that one would not expect for a subtropical region. Temperate algae and tropical corals may be seen flourishing on the same reefs. The fish fauna also displays an odd mixture of species otherwise known from higher latitudes, tropical species, and the newly discovered endemics. The moray eel described below is the forty-second new species to be named since 1985 in the seas bordering the coast of Oman.

When first observed and photographed underwater, the new moray was believed to be *Siderea thyrsoidea* (Richardson) because of its pale head. When specimens were collected, however, the striking pattern of dark hexagonal spots on the body, quite unlike that of the finely mottled *S. thyrsoidea*, became appar-

* Academy of Natural Sciences of Philadelphia, 1900 Benjamin Franklin Parkway, Philadelphia, PA 19103-1195, U.S.A.

** Bernice Pauahi Bishop Museum, 1525 Bernice St., Honolulu, HI 96817, and Hawaii Institute of Marine Biology, University of Hawaii, Box 1346, Kaneohi, HI 96744.

ent. It was then thought that the eel might be *Gymnothorax rhodocephalus* Bleeker, but comparison of the long, fang-like teeth of *G. rhodocephalus* and the short, primarily triangular teeth of the Oman moray ruled out this identification. Further study revealed our specimens to be an undescribed species. Our classification of this species in the genus *Siderea* Kaup follows current custom and is provisional. A revision of the Muraenidae, based on the examination of specimens on a worldwide basis, is needed and could result in the changing of some generic names.

Materials and methods

Type specimens have been deposited in the Academy of Natural Sciences of Philadelphia (ANSP) and the Bernice P. Bishop Museum, Honolulu (BPBM).

Methods and terminology are as defined in Böhlke et al. (1989). Measurements include total length (TL), measured from the snout tip to the tip of the tail; head length (HL), from snout tip to the posterodorsal margin of the gill opening; preanal length, from snout tip to mid-anus; body depth at gill opening and at anus, not including the fins; snout length from snout tip to the anterior margin of the eye; upper jaw length from snout tip to the external inner angle of the mouth; lower jaw length from tip of lower jaw to the external inner angle of the mouth. Vertebral counts were obtained from radiographs; the mean vertebral formula (MVF) is expressed as the mean values for predorsal - preanal - total counts. Tooth counts are approximate and include sockets of missing teeth.

Table 1 presents measurements of the holotype and paratypes as percentages of the total length or the head length, and vertebral and tooth counts. Some of the measurements are given in the text as proportions of the total length or head length: the mean is given in the Diagnosis; under Description the value for the holotype is listed first, followed by the range for paratypes, in parentheses.

Siderea flavocula, new species

Figures 1-5

Holotype. BPBM 36155 (407 mm TL); Arabian Sea off central coast of Oman, east side of Masirah Island, 6 m, quinaldine; J.L.Earle; 20 Nov. 1993.

Paratypes. ANSP 173400 (1, 308) and BPBM 36382 (2, 147-150); Arabian Sea off southern Oman, Rahah Bay, tide pools on rocky point on west side, 0-2 m, rotenone; J.E.Randall, J.P.Hoover, I.McLeish; 6-8 Feb. 1993.

Diagnosis

A moderately stocky moray with short jaws; head plain brown, snout and chin white or pale; body and fins patterned with irregular dark brownish black spots forming hexagon pattern behind head; anus at midbody, preanal length 2.0 in TL; head 9.2 in TL; depth at gill opening 21 in TL; jaw teeth uniserial, vomerine teeth biserial. Mean vertebral formula 4-54-126.

Description

A moderate moray, of medium size and elongation, with laterally compressed body and tapering tail; depth at gill opening 17 (17-25) in TL, depth at anus 23

Table 1. Proportions as percentage of total length or head length (*), and counts of holotype and paratypes of *Siderea flavocula*.

	BPBM 36155	BPBM 36382	BPBM 36382	ANSP 173400	Mean
Total length (mm)	407	147	150	308	
Peanal length	49.1	47.6	48.0	50.0	48.6
Head length	10.5	11.4	11.0	10.7	10.9
Snout to dorsal fin	7.4	8.6	8.9	7.1	8.0
Depth at gill opening	5.8	4.0	4.0	5.9	4.9
Depth at anus	4.3	3.8	3.7	4.7	4.2
Length of upper jaw*	31.2	29.3	29.1	28.3	29.5
Length of lower jaw*	28.0	27.5	28.5	26.7	27.7
Snout length*	15.2	16.8	17.6	16.4	16.5
Eye diameter*	10.5	9.6	9.1	10.3	9.9
Interorbital width*	14.7	12.0	12.1	13.4	13.0
Sex	female	-	-	female	
Vertebrae					
Predorsal	4	4	4	3	4
Preanal	55	53	55	55	54
Total	127	125	127	124	126
Teeth					
Intermaxillary	6-6	7-7	6-8	6-6	
Median	2	2	2	1	
Maxillary					
Inner	0-0	2-2	0-0	0-0	
Outer	7-7	11-12	9-10	7-7	
Vomerine	18	14	14	14	
Dentary					
Inner anterior	3-3	3-4	3-3	4-4	
Outer	15-17	14-17	17-17	16-17	

(21-27) in TL. Anus at or just before midbody, preanal length 2.0 (2.0-2.1) in TL. Dorsal-fin origin on head, about midway between rictus and gill opening and before anterior branchial pore; anal fin beginning immediately behind anus. Head moderate, 9.5 (8.8-9.4) in TL; snout short, 6.6 (5.7-6.1) in HL; jaws subequal and short, rictus below posterior margin of eye, upper jaw length 3.2 (3.4-3.5) and lower jaw 3.6 (3.5-3.7) in HL; eye moderate, 9.5 (9.7-11) in HL. Anterior nostril in a short broad tube; posterior nostril round, above anterior margin of eye, with raised crenulate rim. Head pores typical for morays: two branchial pores above and before gill opening, anterior pore behind dorsal-fin origin; three supraorbital pores, the anteriormost ethmoid pore on tip of snout, the second adjacent to anterior nostril, the third between anterior and posterior nostrils; four infraorbital pores, the first just behind anterior nostril, the last below posterior margin of eye; six mandibular pores along lower jaw, the first on tip of jaw, the posteriormost below rictus. Gill opening at or below mid-body.

Teeth stout, no long fangs. Six to eight outer intermaxillary teeth, short, stout and rounded anteriorly, larger and triangular posteriorly; 1 or 2 short stout median teeth of similar size. Maxillary teeth usually uniserial, 6-12 triangular teeth, directed back, decreasing in size posteriorly; smallest specimen with 12

Figure 1. Holotype of *Siderea flavocula*, BPBM 36155, 407 mm TL.

teeth plus two longer depressible inner teeth anteriorly, larger specimens with single row of 7 teeth only. Vomerine teeth 14-18, small and rounded, irregularly biserial anteriorly, the last 3 uniserial, the row beginning below level of eye and extending posteriorly beyond jaw teeth. Lower jaw with 3-4 stout inner teeth anteriorly flanked by an outer row of 6-9 close-set short teeth, continuing as row of 7-11 sharp triangular teeth.

A moray of medium size; the 308-mm specimen has developing ovaries, the 407-mm holotype appears to be a spent female; sex of the two small paratypes was not determinable by gross examination. Known only from two localities in the Arabian Sea off Oman, both shallow-water rocky areas.

Color

Coloration in alcohol: head plain reddish brown to level of occiput, snout and chin contrasting white or pale (some pigment sometimes present); head pores with unpigmented rims. Behind brown area, small dark spots on head, which become clustered to appear as an overall pattern of large hexagonal spots with irregular edges which contrast sharply with pale yellowish interspaces. Pattern extending onto fins, the pattern distinct and of uniform size on body and fins.

Figure 2. Paratype of *Siderea flavocula*, BPBM 36382, 150 mm TL.

Figure 3. Underwater photograph of large (estimated 550 mm TL) individual of *Siderea flavocula*.

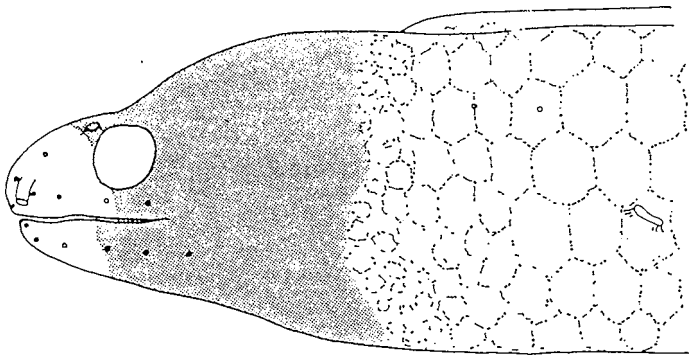

Figure 4. Paratype of *Siderea flavocula*, ANSP 173400, 307 mm TL; outline of head showing nostrils and pores; head coloration sketched. Line = 10 mm.

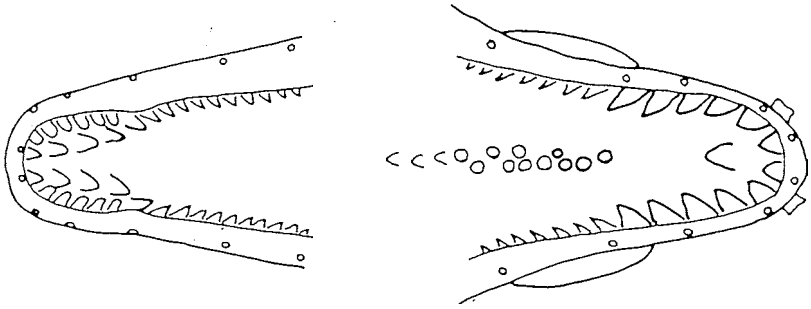

Figure 5. Diagram of dentition and placement of jaw pores of ANSP 173400, paratype of *Siderea flavocula*. Line = 10 mm.

Distal edge of dorsal fin of large specimens shading darker posteriorly; anal fin of small specimens with pale edge. Gill opening with body coloration.

Coloration in life (from kodachromes, Figures 1-3): tip of snout and chin notably white or pale tan, contrasting sharply with chocolate brown head; iris bright yellow (most visible on underwater photograph). Spots on body and fins dark brownish black, reticulum between spots yellowish. The head spots are small and extend farther back on the head of the largest photographed specimen, the hexagon pattern visible dorsally behind dorsal-fin origin.

Discussion

Siderea flavocula is distinguished by the combination of its distinct coloration with typical "*Siderea*" dentition of short jaws, no caniniform or "fang-like" teeth, and biserial molariform vomerine teeth. No other species has been described with this character combination. The pale snout and chin and bright iris are characteristic for *Siderea thyrsoidea* (Richardson, 1845), but that species differs in possessing an overall color pattern of overlapping small brown spots, and its iris color is white, not yellow. In addition , the maxillary dentition is biserial. The hexagonal appearance of the body color pattern is similar to that of *Gymnothorax rhodocephalus* Bleeker, 1865, and is also somewhat similar to that of *Gymnothorax pseudothyrsoideus* (Bleeker, 1852), but they both are elongate mo-

rays possessing the long jaws and fang-like teeth characteristic of many species of *Gymnothorax* sensu lato. The color pattern bears some similarity to that of large specimens of *Siderea picta* (Ahl, 1789), and the dentition is most similar to it; however, *picta* has the dorsal-fin origin notably farther back above the gill openings and above vertebrae 8-11, while the dorsal fin of *flavocula* begins well before the gill openings and above vertebrae 3-4.

The new species is provisionally placed in the genus *Siderea* following current custom used for Indian Ocean morays, although *Siderea* species have recently been included in *Gymnothorax* sensu lato, pending generic studies. As mentioned, muraenid genera are poorly defined and in need of comprehensive worldwide study.

Etymology

Named from the Latin *flav-*, yellow, and *ocula*, eye, in reference to the bright yellow eye, highly visible in life and in contrast to the white eye of the very similar *Siderea thyrsoidea*.

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