

## **GYMNOTHORAX CASTLEI, A NEW SPECIES OF INDO-PACIFIC MORAY EEL (ANGUILLIFORMES: MURAENIDAE)**

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**ABSTRACT.** - A new small species of moray eel found on the Great Barrier Reef, the Philippines, and Indonesia is described. It has uniform pale brown coloration with a distinctive pattern of lines of small black spots on the head and a single line of black spots along the entire lateral midline of the body; anus well before midbody; maxillae very short, maxillary and vomerine dentition biserial; and mean vertebral formula 5-48-120.

**KEY WORDS.** - Muraenidae, *Gymnothorax*

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### **INTRODUCTION**

The new species is a distinctive moray first noticed from one specimen obtained in 1969 during the Philadelphia Academy's 1969 expedition to the Great Barrier Reef of Australia, a joint trip to locate and recover the cannons jettisoned by Captain Cook in 1769 and to collect fish - both efforts successful. Included in the fish collected was a small moray with an unusual color pattern: a uniform brown background with conspicuous distinct black spots forming lines on the head and a single midlateral line along the entire body. The possibility that the spots were remnants of larval pigmentation was considered, and the specimen was put aside. During the ensuing years, additional specimens were collected, including some with mature gonads, confirming that the color pattern is characteristic for a new species. The species is here described as *Gymnothorax castlei*, based on a total of 35 specimens from 11 lots obtained during the past 28 years.

## METHODS

Methods and terminology are as defined in Böhlke (1989). Proportions are expressed in terms of total length (TL), measured from the snout tip to the tip of the tail, or head length (HL), from snout tip to the posterodorsal margin of the gill opening. Preanal length is measured from snout tip to mid-anus; body depth is measured at the gill opening and at the anus and does not include the fins; snout length is measured from snout tip to the anterior margin of the eye; upper-jaw length is 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 are obtained from radiographs as explained in Böhlke (1982); the mean vertebral formula (MVF) is expressed as the mean value for predorsal - preanal - total counts. Tooth counts are approximate and include sockets of missing teeth. Institutional abbreviations follow Eschmeyer (1998:16).

### *Gymnothorax castlei*, new species

Spotted-line moray

Figs. 1-3

**Material examined.** - Holotype - ANSP 177738, 183 mm TL; Indonesia, Flores, N of Maumere, Wailiti Reef, in sand, gorgonians and reef at 18 m (08°34'40"S 122°11'55"E); J.E.Randall, R.H.Kuiter & L.C.Reynolds, 18 Sep.1987.

Paratypes. - A total of 34 paratypes, 58-250 mm TL. ANSP 144443, 1:250 mm; Australia, Queensland, Endeavour Reef, off southern end of western edge of western half of reef, 16-20 m; J.C.Tyler et al., TSA-4, 5 Jan.1969. BPBM 28690, 1:114 mm; Australia, Great Barrier Reef, Lizard Island, North Point, coral on sand, 15 m; R.Lubbock, 28 May 1975. ANSP 141410, 2:152-153 mm; Philippines, Oriental Negros, ca. 3 km. E of Diutay Island, 0-21 m; V.G.Springer et al., SP78-16, 15 May 1978. ANSP 141416, 9:53-228 mm; Philippines, Palawan Province, NNE side of Bararin Island (Cuyo Island), 0-17 m (10°52'42"N 120°56'44"E; V.G.Springer et al., SP78-21, 24 May 1978. BPBM 28700, 1:108 mm; Philippines, Palawan Island, Honda Bay, isolated coral patch 1/2 km N of Meara Island, 10 m; R.Lubbock & R.Schroeder, 18-19 Aug.1978. BPBM 26812, 1:141 mm; Indonesia, Sulawesi, Kodingareng Keke Island (W of Ujung Pandang), reef slope, 20 m; G.Tribble & R.Rutherford, 11 Sep.1978. USNM 263101, 6:90-180 mm; Indonesia, Sulawesi, Tallabassi Bay, just off NE tip of Big Dawalawa Islet, Kabaena Island, 2-15 m (05°17'20"S 122°04'00"E); V.G.Springer et al., VGS 74-1, 25 Feb.1974. USNM 263102, 4:80-132 mm; locality as for USNM 263101; V.G.Springer et al., VGS74-2, 25 Feb.1974. BPBM 32161, 6:123-218 mm; taken with the holotype. USNM 312479, 2:100-210 mm; Indonesia, Sulawesi, Karimundjawa Island, off SW coast, N of Greater Mendangan Island, 0-12 m (05°52'30"S 119°25'40"E); V.G.Springer, VGS74-28, 29 Mar.1974. BPBM 37664, 1:110 mm; Sumatra, Kepulauan Mentawi, Siberut Island, Sarabua Bay, reef, 12-15 m (01°28'48"S 99°09'42"E); J.E.Randall, A.Kunzmann, J.-H.Steffan & L.Jonker, 23 Apr.1997.

**Diagnosis.** - A moderately small species with uniform tan or brown coloration, marked with small black spots forming lines on the head and a single row of spots and dashes along the lateral midline of the body and tail (Figs. 1, 2); body moderately elongate; anus well before midbody; head and jaws short; teeth numerous, short and rounded, maxillary and vomerine teeth biserial; MVF 5-48-120.

**Measurements (in mm) and counts for the holotype.** - Measurements (in mm) and counts for the holotype. TL 183; preanal length 83; HL 21.2; snout to dorsal-fin origin 18.9; depth at gill opening 10.5; depth at anus 9.7; length upper jaw 7.0; length lower jaw 6.7; snout 3.7; eye diameter 2.5; width interorbital 3.2; predorsal vertebrae 5; preanal vertebrae 48; total vertebrae 123. Head pores: branchial 2; supraorbital 1 + 2; infraorbital 4; mandibular 6. Teeth: outer intermaxillary 9-9; median intermaxillary 2; inner maxillary 16-16, outer

maxillary 19-20; vomerine 14; main dentary 22-23, outer dentary 8-9. A male.

**Description.** - [First number of proportions given for the holotype, followed by the range and mean for holotype and 20 paratypes in parentheses.] A moderately elongate species, depth at gill opening 17 (15-24,  $\bar{x} = 19$ ) and depth at anus 19 (17-30,  $\bar{x} = 22$ ), both in TL; anus well before midbody, preanal length 2.2 (2.2-2.4,  $\bar{x} = 2.2$ ) in TL. Head moderately short, 8.6 (7.9-9.5,  $\bar{x} = 8.6$ ) in TL, dorsal profile sloping evenly; snout rounded, overhanging lower jaw, its length 5.7 (5.1-6.7,  $\bar{x} = 6.0$ ) in HL; jaws short, upper jaw 3.0 (2.6-3.4,  $\bar{x} = 3.2$ ) in HL. Eye moderately large, 8.5 (7.5-10,  $\bar{x} = 9.1$ ) in HL, closer to rictus than to snout tip. Anterior nostril in moderate tube, just reaching lip edge; posterior nostril above anterior margin of eye, with short crenulate rim. Head pores typical (Fig. 2); supraorbital pores 1 at tip of snout (ethmoid) + 2 dorsally on snout; infraorbital pores 4, the first just behind anterior nostril, the last below posterior margin of eye; mandibular pores 6, the first at tip of lower jaw, the last below rictus; 2 branchial pores above and before gill opening. Dorsal-fin origin before gill opening, closer to gill opening than to rictus and just before anterior branchial pore. Gill opening a diagonal slit at midside. Predorsal vertebrae 3-6, preanal vertebrae 46-49, total vertebrae 118-124; MVF 5-48-120 (n = 29).

Teeth numerous, some short and rounded, no long canines; maxillary and vomerine teeth biserial (Fig. 3). Peripheral intermaxillary teeth stout and pointed, 7-9 on each side, the anterior teeth smaller; two stout teeth on midline. Maxilla short, two rows of teeth along entire extent; inner row of 10-17 long, slender, depressible teeth with rounded tips; outer row of 16-24 short rounded teeth. Vomerine teeth low and rounded, mostly biserial, usually 6-8 pairs anteriorly, followed by 2-4 single teeth; teeth fewer and irregular in males. On dentary, main inner row of 16-18 teeth consisting of 4-5 large, stout anterior teeth, followed by 12-13 increasingly shorter teeth; an outer row of 6-11 short rounded teeth enclosing large anterior teeth and extending one-fourth to one-half the length of the main row.

**Coloration.** - Uniform pale brown or tan; preserved specimens sometimes covered with heavy green mucus and appearing brownish green with pale head. Snout and head pale; small black dots marking head papillae and forming lines on posterior head and nape; jaw pores and branchial pores with fine brown rims, posterior nostril with crenulate brown rim. Body darker dorsally, with conspicuous line of black spots marking lateral-line papillae, a short vertical black slash at every second to fourth papilla (this visible even on the smallest 58-mm specimen); the black spots correspond to the vertebrae, beginning at the 4-6th vertebra and continuing almost to the hypural. Dorsal and anal fins pale.

**Distribution.** - *Gymnothorax castlei* has been taken in the Philippines, Indonesia, and on the Great Barrier Reef of Australia, at depths to 21 m.

**Etymology.** - We name this distinctive moray for Peter H.J. Castle, friend and colleague who has contributed greatly to the knowledge and understanding of morays as well as of all anguilliforms, and of their leptocephali.

**Remarks.** - A moderately small species, our largest specimen 250 mm TL. Four are males (183-229 mm), and 12 are females (109-250 mm), 7 ripe with 1.0-2.5-mm eggs.

This species is readily identified by the pattern of black spots on the head and the conspicuous line of black spots and slashes at midside extending the length of the body. The head spots are similar to those of *Gymnothorax griseus* (Lacèpède, 1803), which sometimes also has

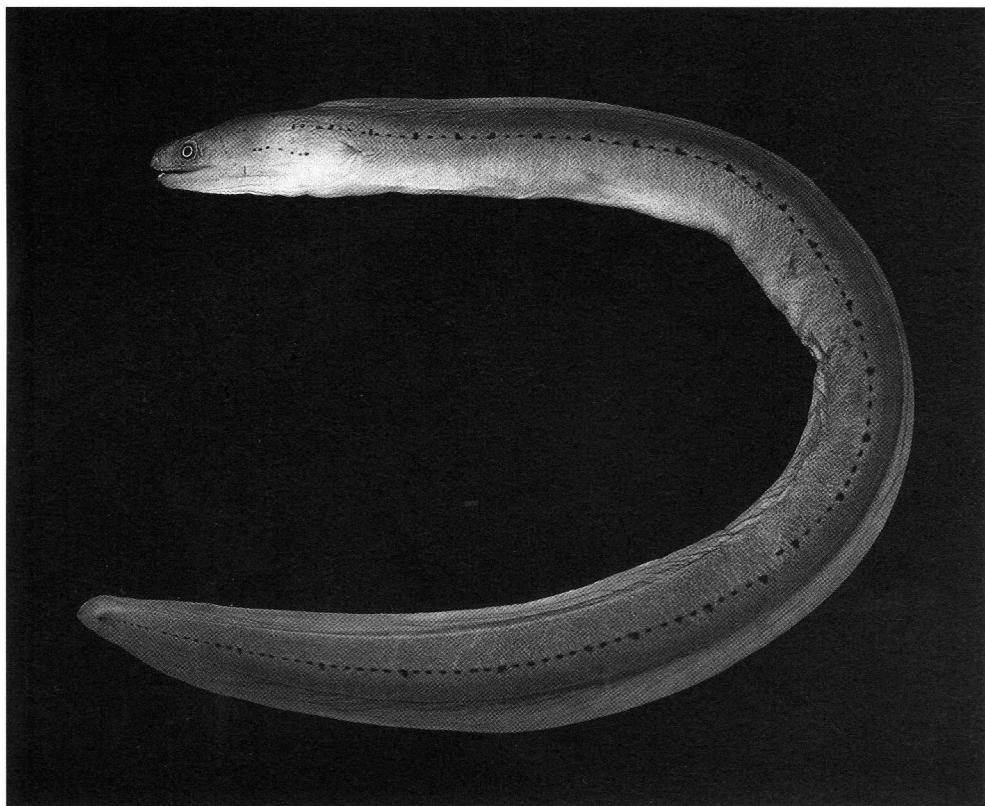


Fig. 1. *Gymnothorax castlei*, BPBM 32161, paratype, 150 mm TL; color photograph by JER.

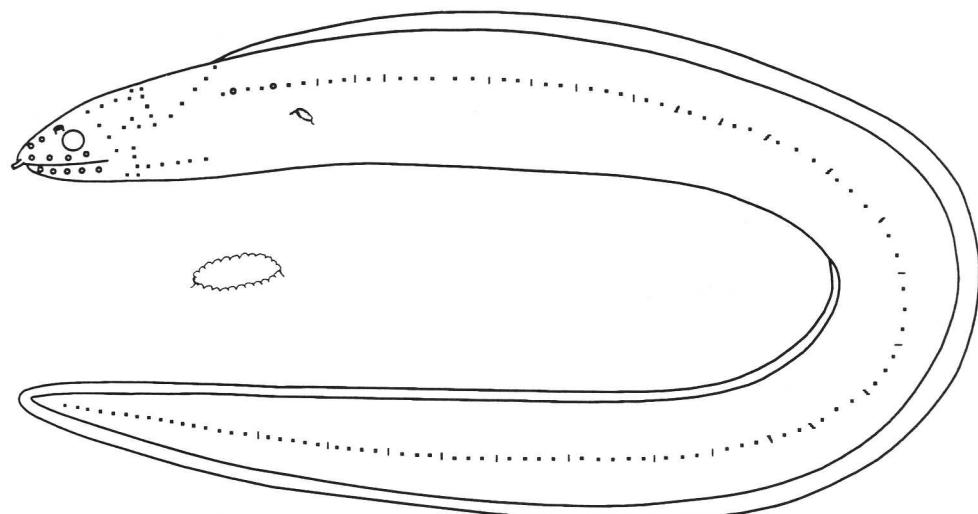


Fig. 2. *Gymnothorax castlei*, ANSP 177738, holotype, 183 mm TL; outline drawing showing head pores and spot pattern; inset showing detail of posterior nostril.

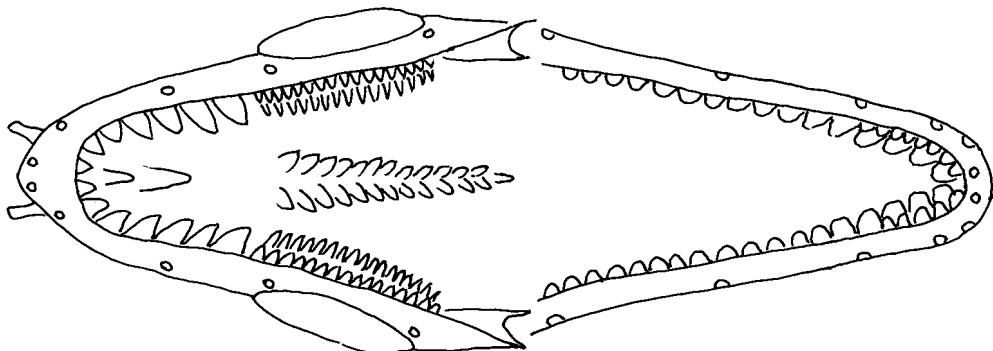


Fig. 3. *Gymnothorax castlei*, ANSP 144443, paratype, 250 mm TL; diagram of dentition.

irregular spots along the lateral line, but which seldom extend as far as the anus and never to the tail tip; the two species differ in vertebral counts (MVF 5-48-120 for *G. castlei* vs. 4-51-134 for *G. griseus*). Both species are similar in general morphology and dentition to *G. thyrsoideus* (Richardson, 1845), which has a mottled color pattern of small brown spots, and MVF of 4-50-133. *Gymnothorax thyrsoideus* is common in the islands of the central and western Pacific and is found in the eastern Indian Ocean from Cocos-Keeling Islands, the Maldives, and off Sri Lanka and India; *G. griseus* has been taken in the western Indian Ocean from Mauritius, the Seychelles, Madagascar, coastal Africa and the Red Sea. The new species is sympatric with *G. thyrsoideus* in the western Pacific and Indonesia.

The three species together form a distinctive group within the genus *Gymnothorax* sensu lato, as defined by Böhlke et al. (1989:145). *Gymnothorax griseus* and *G. thyrsoideus* have often been placed in the genus *Siderea* (as *S. grisea* and *S. thyrsoidea*), because they lack long caniniform teeth. However, the type species of *Siderea*, *Muraena siderea* = *Siderea picta*, differs from both *griseus* and *thyrsoideus* in osteological and dentition characters which suggest that *picta* is generically distinct from the others. However, all three have those characters in common with other species (e.g. *fuscomaculatus*, *marshallensis*, *melatremus*, and others) currently placed in *Gymnothorax*. It seems advisable to retain all in the catch-all genus *Gymnothorax* until a thorough generic study can be undertaken.

#### ACKNOWLEDGMENTS

We thank Susan L. Jewett and David G. Smith (USNM) for loan of specimens. Our moray studies have greatly benefitted from discussions with Peter H.J. Castle (VUW), John E. McCosker (CAS), and David G. Smith.

#### LITERATURE CITED

Böhlke, E.B., 1982. Vertebral formulae of type specimens of eels (Pisces: Anguilliformes). *Proc. Acad. Nat. Sci. Philadelphia*, 134: 31-49.

Böhlke, E.B., 1989. Methods and Terminology. In: Böhlke, E.B. (ed.). *Fishes of the western North Atlantic*. Pp.1-7. Sears Foundation for Marine Research, Memoir No. 1, Part 9, Vol. 1, Anguilliformes and Saccopharyngiformes: xvii + 655 pp.

Böhlke, E.B., J.E. McCosker & J.E. Böhlke, 1989. Family Muraenidae. In: Böhlke, E.B. (ed.). *Fishes of the western North Atlantic*. Pp.104-206. Sears Foundation for Marine Research, Memoir No. 1, Part 9, Vol. 1, Anguilliformes and Saccopharyngiformes: xvii + 655 pp.

Eschmeyer, W.N. (ed.), 1998. *Catalog of Fishes*. Vol. 1. California Academy of Sciences, San Francisco, CA, U.S.A., 958 pp.

Lacepède, B.G.E., 1803. *Histoire naturelle des Poissons*. Vol. 5. Paris: lxvii + 803 pp., 21 pl.

Richardson, J., 1845 [1844-1845]. Ichthyology. In: R.B.Hinds (ed.) *The zoology of the voyage of H.M.S.Sulpher, under the command of Captain Sir Edward Belcher, R.N., C.B., F.R.G.S., etc. during the years 1836-42*. Smith, Elder and Co., London: 51-150, pl. 35-64. [pp.51-86 publ 1844; 87-150 1845]