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Eptatretus chinensis: a New Species of Hagfish (Myxinidae; Myxiniformes) from the South China Sea

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Chien-Hsien Kuo and Hin-Kiu Mok (1994) *Eptatretus chinensis*: a new species of hagfish (Myxinidae; Myxiniformes) from the South China Sea. *Zoological Studies* **33**(4): 246-250. A new species of hagfish, *Eptatretus chinensis*, which was collected from a depth of 600 meters in the South China Sea (E 113°14', N 19°37'), is described. It is a six-gilled species with a three-cusp multicuspid tooth in each tooth row and slime pores in the branchial region.

Key words: *Eptatretus*, Taxonomy, South China Sea.

According to The Fishes of the Sea Islands in the South China Sea (Science Press, China, 1979), no hagfish had been reported in the South China Sea (between 110°-120°E and 4°-23°N). *Eptatretus burgeri*, living in the coastal waters off Fujian Province, China, was the only hagfish species reported in the area (Fishes of Fujian Province Editorial Subcommittee 1984: 12p.).

During our May 1989 research cruise in the South China Sea the continental slope, at depths around 600 meters, was subjected to bottom trawls. Five *Eptatretus* hagfish were captured. Their morphology was compared with *Eptatretus burgeri* and other Atlantic species of the genus *Eptatretus*, with six gill apertures and 3/3 cusps on multicuspid teeth. Morphologically, the specimens are conspecific and merit description as a new species.

MATERIALS AND METHODS

In May 1989, five hagfish were collected by trawl from about 600 meters in the South China Sea, east of Hainan Island, (E 113°14', N 19°37'). They were preserved in 10% formalin and deposited in the fish collection at the Institute of Marine Biology, National Sun Yat-sen University (NSYSU).

Terminology as well as methods of counts and measurements follow Dean (1904), Shen and Tao (1975), Fernholm and Hubbs (1981), and McMillan and Wisner (1984). Features counted and measured are shown in Fig. 1. Total length of specimen is measured from tip of the snout to the posterior margin of the tail. Gill pouches (GP) are numbered anterior to posterior. All counts are taken from the left side; all measurements are expressed in percentage of the total length.

Eptatretus chinensis sp. nov.

(Figs. 2, 3; Table 1)

Holotype: NSYSU 2866; 348 mm TL; sex not determined; South China Sea (E 113°14', N 19°37'); Depth 600 meters; May 1989.

Paratypes: Two specimens taken with holotype: NSYSU 2867; 352 and 335 mm TL.

Diagnosis: Six pairs of gill pouches and gill apertures, gill apertures arranged in a straight line (Fig. 3); slime pores (15–19) + (4–5) + (42–45) + (11–14), branchial region with slime pores; three medium unicuspid teeth in both outer and inner tooth row fused given rise to a multicuspid tooth; dental formula 10 + 3/3 + 10; no whitish mid-dorsal stripe, prominent eye spots present.

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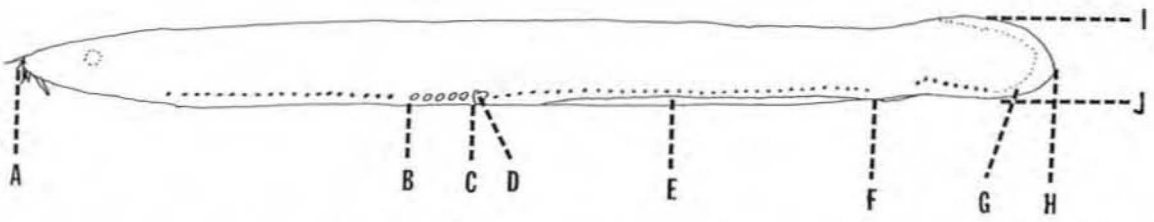

Fig. 1. Outline of an *Eptatretus* hagfish showing regions and features used in measuring and counting: A-H, total length (TL); A-B, prebranchial length; B-C, branchial length, (including all gill apertures); D, external opening of pharygocutaneous duct and the last branchial aperture; E, ventral finfold; C-F, trunk length; F, origin of cloaca; G, caudal finfold; F-H, tail length; I-J, tail depth. The linear series of dots represents the prebranchial, branchial, trunk, and tail slime pores.

Fig. 2. Left side-view of *Eptatretus chinensis*. 348 mm.

Description: Body stout, deepest at midbody, deeper than wide, laterally compressed toward tail. Tail spatulate, ventral outline not sloping downward from cloaca. Caudal finfold thickened ventrally, thinner around tail, ending dorsally over cloacal origin. Ventral finfold usually present. Color of live and preserved specimens grey brownish, ventral finfold may be whitish; distinct light colored eye spot over ocular area; edge of gill apertures and pharyngocutaneous duct usually lighter than surrounding surfaces; edge of slime pores never lighter than surrounding surfaces; six pairs of gill pouches each side, opening internally into the pharynx; external gill apertures separate; the last efferent branchial duct on the left side is connected to the end of the pharyngocutaneous duct; both ducts share a common duct opening to the outside which is larger than other openings; gill apertures separated by space of a considerable width and arranged in one straight line on each side. Tongue muscle overlies gill pouches 2 and 3. Average prebranchial length 25.39%, branchial length 7.71%, trunk length 51.87%, tail length 7.58%. Three to nine grooves behind eyespots on each side, most lying transversely, but a few lying longitudinally near middorsal part of head. No grooves lying before eyespots.

Fig. 3. Ventral view of the branchial region of *Eptatretus chinensis* showing an arrangement of gill apertures and branchial slime pores.

Etymology: The species name, *chinensis*, refers to the locality of holotype.

DISCUSSION

The five specimens belong to the genus *Eptatretus*, in which the length of branchial duct are subequal (Norman 1975). They are not specimens of *E. burgeri* because they do not have a whitish

Table 1. Characteristics of *Eptatretus* species with 3/3 cusps on multicuspids. Five *E. chinensis* specimens were examined (including holotype, paratypes, and two specimens used in molecular studies)

Character	*E. minor*[1]	*E. multidens*[1]	*E. mendozai*[2]	*E.* sp. C[1]	*E. chinensis*
Total length (mm)	223–395	337–655	350–450	380	350–375
weight(g)	22–138	164–757	184–212	154	74–106
Measurements in thousandths of TL:					
Preocular L	31–62	43–49	58–66	59	48–53
Prebanchial L	201–259	188–207	222–252	237	250–257
Branchial L	51–72	61–69	47–66	47	74–80
Trunk L	506–559	552–571	510–545	526	517–520
Tail L	139–183	169–188	162–193	190	52–148
Tail depth	53–116	39–50	80–94	57	77–85
Counts:					
Cusps on multicusp	3/3	3/3	3/3	3/3	3/3
Outer	8–11	11–12	11–13	12 + 12	10 + 10
Inner	8–10	9–11	10–12	11 + 11	10 + 10
Slime pores: (left side)					
Prebanchial	15–18	14–16	13–15	13	15–19
Branchial	4–6	5–6	5–6	4	4(5)
Trunk	41–48	52–55	45–48	44	42–45
Tail	10–12	15	12–15	14	11–14

[1]Fernholm and Hubbs 1981; [2]Hensely 1985.

Table 2. Gill apertures and dental formula of seven hagfish species from South Africa and the Pacific Ocean

Species	Gill apertures	Dental formula
E. hexatrema[1]	6	3/2
E. octatrema[1]	8	3/2
E. profundus[1]	5	3/2
E. carlhubbsi[2]	7	3/2
E. laurahubbsi[2]	7	2/2
E. strahani[2]	7	3/3
E. cirhatus[3]	7	3/3

[1]Smith and Heemstra 1986; [2]McMillan and Wisner 1984; [3]Bloch and Schneider 1801.

mid-dorsal stripe and the numbers of fused unicuspid teeth differ (3/3 as opposed to 3/2). There are only four species of *Eptatretus* with six gill apertures and 3/3 cusps of multicuspid teeth (outer/inner; Tables 1, 2), namely, *E. minor*, *E. multidens* (Fernholm and Hubbs, 1981), *E. mendozai* (Hensley, 1985), and *Eptatretus* sp. C (Fernholm and Hubbs, 1981). The former species is separable from *E. chinensis* by its possession of a whitish mid-dorsal stripe and conspicuous lack of an eye spot. *E. multidens* can be readily distinguished from *E. chinensis* by its high slime pores count (Table 1). Hensley (1985) has discussed the differences between *Eptatretus* sp. C and *E. mendozai*, by pointing out that the former differed from the latter in numbers of trunk pores (44 as opposed to 45-48) and branchial slime pores (4-5 as opposed to 6; Table 1); Anther difference noted between those two species was in coloration. Both species can be distinguished from *E. chinensis* only in body proportions. The greatest difference in body proportions is that branchial length in *E. chinensis* is greater than the preocular length. The reverse is true of *E.* sp. C and *E. mendozai* (Hensley, 1985). The other body proportions of these three species are very similar (Table 1). Dean (1904), Fernholm (1981), and Strahan (1975) stressed the importance of body proportions in hagfish taxonomy. Wisner and McMillan (1988 1990) also suggested that body proportions are important characteristics in specification of hagfishes.

McMillan and Wisner (1984) described three new species of hagfishes from the Pacific Ocean, namely, *E. carlhubbsi*, *E. laurahubbsi*, and *E. strahani*, and compared them with *E. cirrhatus* that occurs in the Australian-New Zealand area. All four species have seven pairs of gill pouches and

associated external openings. As such, they are distinguishable from *E. chinensis* by gill aperture count (Table 2).

Smith and Hemstra (1986) described three *Eptatretus* species, *E. hexatrema*, *E. octatrema*, and *E. profundus*, from South Africa. *E. hexatrema* and *E. chinensis* have the same number of gill apertures. The former species is separable from the latter by its cusps on the multicusp teeth (3/2, outer/inner). *E. octatrema* and *E. profundus* can be easily distinguished from *E. chinensis* by their gill apertures and fused unicusps teeth number (Table 2). Relying upon the above descriptions *E. chinensis* is a new species.

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南中國海盲鰻之一新種：中華黏盲鰻 *Eptatretus chinensis* (Myxinidae; Myxiniformes)

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本文描述採自南中海(E 113° 14′, N 19° 37′)水深約600公尺之新種盲鰻，中華黏盲鰻 *Eptatretus chinensis*。本種具六對鰓孔，內外列聚合齒均爲三，鰓孔區具黏液孔。

關鍵詞：黏盲鰻, 分類, 南中國海。

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