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Zoarchias microstomus, a New Stichaeid Fish from Northeastern China

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Abstract A new stichaeid fish, *Zoarchias microstomus*, is described on the basis of 7 specimens (80.3–103.1 mm TL) collected from Dalian, Liaoning Province, northeastern China. This species is similar to *Z. uchidai* from Korean waters in general appearance and meristic counts, but differs from it in having a smaller head and mouth, and truncated gill raker tips.

The stichaeid genus *Zoarchias* Jordan and Snyder, 1902, differs from other genera of the family in having confluent vertical fins without notches between them, a pointed caudal-fin tip, no pelvic fins, more than 70 dorsal-fin soft rays, and no dermal flap on the head. The species are distributed in Japan, Korea and China. During revisional studies on the genus *Zoarchias*, a new species, previously identified as *Z. uchidai* Matsubara, 1932, by Li (1979), Tian (1987), and Ding (1987), was recognized from the vicinity of Dalian, Liaoning Province, northeastern China. Although resembling *Z. uchidai*, the specimens had smaller heads and mouths, and truncated gill rakers compared with the former. Accordingly they are described below as *Z. microstomus* sp. nov. The genus *Zoarchias* is often included in the family Zoarcidae (Makushok, 1958; Amaoka, 1988; Eschmeyer and Bailey, 1990; Hatooka, 1993), but Anderson (1994) demonstrated its belonging to the family Stichaeidae, on the basis of phylogenetic evidence. His classification is followed here.

Methods

Methods for counts and measurements followed Hubbs and Lagler (1958), except as follows. Body depth was measured vertically at the anus. Preanal length is the distance from the tip of the lower jaw to the center of the anus. Eye diameter is the greatest fleshy diameter. Infraorbital width was measured from the lower margin of the orbit downward to the lower margin of the upper jaw, vertically through the center of the eye. Interorbital width is the least bony width. Counts of vertical fin spines and soft rays, and vertebrae (including urostyle) were made from radiographs. Specimens examined in this study are deposited in the following institutions: Department of Biology, Chonbuk National University, Chonju, Korea (CNUC); National Fisheries Research & Development Agency, Korea (FRDA); Fisheries Research Laboratory, Mie University, Japan (FRLM); National Science Museum, Tokyo, Japan (NSMT-P); National Museum of Natural History, Smithsonian Institution, USA (USNM).

Zoarchias microstomus sp. nov.
(New Chinese name: Duanhe xiaomianwei)
(Figs. 1A, 2A, 2B, 3A)

Zoarchias uchidai (not of Matsubara) Li, 1979: 296; Tian, 1987: 400; Ding, 1987: 305–306.

Holotype. NSMT-P 45961, female, 99.9 mm in total length (TL), Heishijiao, Dalian, Liaoning Province, China, coast of Yellow Sea (38°52′N, 121°33′E), 6 May 1985.

Paratypes. FRLM 7635, female, 85.8 mm TL, collected with holotype; FRLM 7636, male, 80.3 mm TL, collected with holotype; FRLM 13267, female, 97.4 mm TL, same locality as holotype, April or May 1985; FRLM 13268, male, 103.1 mm TL, same locality as holotype, April or May 1986; NSMT-P 45962, male, 84.0 mm TL, same locality as holotype, April or May 1985; USNM 331200, male, 92.5 mm TL, same locality as holotype, April or May 1985.

Comparative materials. *Zoarchias uchidai*: CNUC 15637, 15639, 2 specimens, 68.0 and 79.1 mm TL, respectively, Sonyu I., Misong-up, Okugu-gun, Chollabuk-do, western coast of Korea (35°50′N, 126°30′E), 23 September 1990; CNUC 19799-19803, 5 specimens, 72.5–82.7 mm TL, Kumo I., Nam-myon, Yochon-gun, Chollanam-do, southern coast of Korea (34°30′N, 127°45′E), 4 August

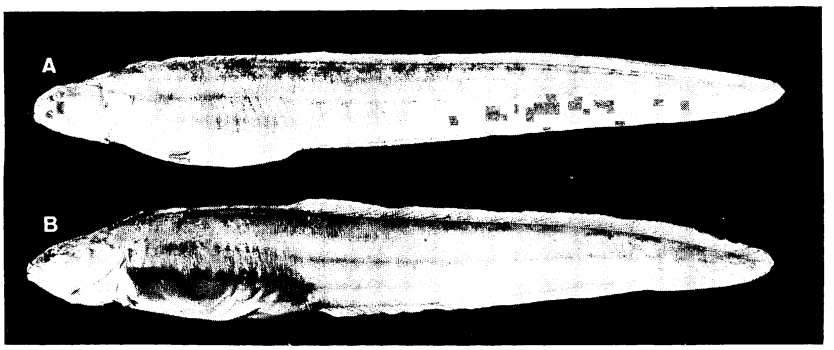

Fig. 1. A) *Zoarchias microstomus* sp. nov., holotype, NSMT-P 45961, female, 99.9 mm TL; B) *Z. uchidai*, FRLM 13775, female, 96.8 mm TL.

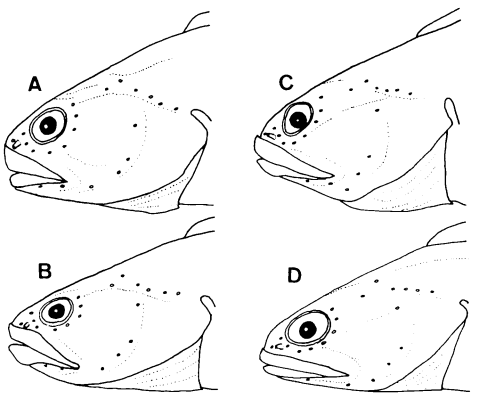

Fig. 2. Heads of *Zoarchias microstomus* and *Z. uchidai*. A) *Z. microstomus*, holotype, NSMT-P 45961, female, 99.9 mm TL; B) *Z. microstomus*, paratype, FRLM 13268, male, 103.1 mm TL; C) *Z. uchidai*, FRLM 13775, female, 96.8 mm TL; D) *Z. uchidai*, NSMT-P 46417, male, 92.1 mm TL.

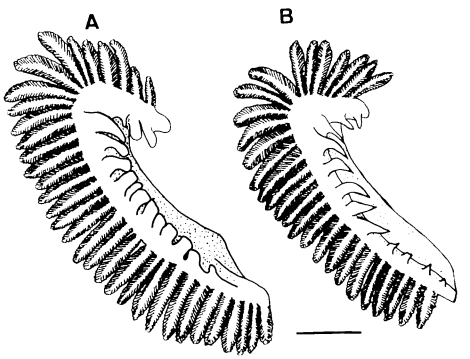

Fig. 3. Right first gill arches of *Zoarchias microstomus* and *Z. uchidai*, showing the gill rakers. A) *Z. microstomus*, paratype, FRLM 13267, female, 97.4 mm TL; B) *Z. uchidai*, NSMT-P 46417, male, 92.1 mm TL. Scale indicates 1 mm.

1993; FRDA 2179, 2 specimens, 1 male and 1 female, 92.1 and 85.1 mm TL, respectively, Pyonsan-myon, Puan-gun, Chollabuk-do, western coast of Korea (35°38′N, 126°15′E), 15 April 1990; FRLM 13775, female, 96.8 mm TL, collected with FRDA 2179; NSMT-P 46417, male, 92.1 mm TL, collected with FRDA 2179.

Diagnosis. A species of *Zoarchias* with 14–18 dorsal-fin spines, 101–103 total vertebrae, small head (13.1–14.1% TL), short upper jaw not extending beyond the cephalic sensory pore just behind the orbit, and truncated gill raker tips.

Description. Counts and measurements of the types are shown in Table 1 and compared with *Zoarchias uchidai*.

Body deep, elongated, compressed, tapering posteriorly; head small, snout rounded; jaws subequal, upper jaw slightly longer than lower; mouth small, upper jaw reaching to cephalic sensory pore just behind orbit in males, upper jaw just reaching to posterior margin of eye in females (Fig. 2A, B); both lips developed, upper just reaching nostril. Teeth on jaws, palatines and vomer small, conical; teeth on upper jaw in 3 rows, forming 1 anteriorly, those on lower jaw in 2 (3 in USNM 331200) rows, forming 1 anteriorly, those on palatines in a single row (in 2 partial rows in FRLM 13267 and USNM 331200); vomer with 4 to 6 teeth in a round patch; teeth on upper jaw smaller than those on lower jaw, palatines, and vomer, except for those in outermost row, which are almost equally-sized or larger. Nostrils tubular, single on each side; interorbital space wide, somewhat convex. Gill membranes connected under throat forming a free fold; gill rakers short, tips truncated (Fig. 3A); pseudobranch developed with 5

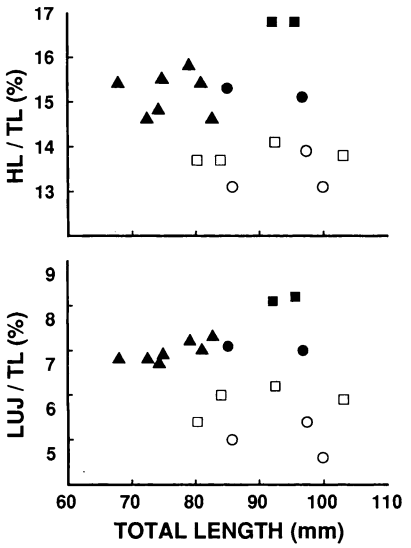

Fig. 4. Proportional differences between *Zoarchias microstomus* (open symbols) and *Z. uchidai* (solid symbols). *HL*—head length; *TL*—total length; and *LUJ*—length of upper jaw. Circles indicate females, squares males, and triangles sex-unknown specimens. Positional differences between the two species in the regression lines of TL-HL and TL-LUJ relations are significant at the 1% level ($F=37.1$ and $F=41.9$, respectively).

filaments. Scales small, cycloid, embedded, scattered sparsely on body and soft dorsal- and anal-fin membranes; head naked, lateral line absent. Stomach large, V-shaped with short pyloric portion; 2 pyloric caeca present at entrance of duodenum, one slender and somewhat elongated, the other thick and very short; intestine short, stout, N-shaped with 2 folds.

Dorsal fin originating above pectoral-fin base; spines short, strong and pointed; spinous portion much lower than soft-rayed portion. Anal-fin origin below 4th or 5th soft dorsal-fin ray; anal-fin spine short and strong. Membranes of dorsal and anal fins thick, somewhat thinner posteriorly, both spines and soft rays entirely hidden. Caudal fin small, pointed, confluent with dorsal and anal fins, notches between vertical fins absent. Pectoral fins small, rounded, fan-like, inserted below body mid-line. Pelvic fins absent.

Color in formalin.—Body grayish-brown with faintly darkish reticulated markings; dorsal and anal fins brownish, posteriorly with vertical white bands margined with black lines; anterior tip of dorsal fin black; pectoral fins without dark markings, several melanophores scattered on bases. Peritoneum pale ventrally, more heavily pigmented dorsally; stomach, pyloric caeca and intestine whitish.

Table 1. Counts and measurements of *Zoarchias microstomus* sp. nov. and *Z. uchidai*. Figures in parentheses indicate mean values

Species	*Zoarchias microstomus*		*Zoarchias uchidai*		
	Holotype	Paratypes	Holotype*	Kim and Kang (1991)	This study
Total length (mm)	99.9	80.3–103.1 (90.5)	122.3	44.5–88.3	68.0–96.8 (82.0)
Counts					
Dorsal fin rays	XVI, 83	XIV–XVIII, 81–83	XV, 78	XVI–XVIII, 77–84	XV–XVIII, 78–83
Anal fin rays	I, 78	I, 77–79	I, 69	I, 77–80	I, 74–79
Pectoral fin rays	12	11	——	11	10–11
Vertebrae	21+81	20–21+81–82=101–103	——	20+83–85=102–104	19–21+78–83=98–103
Gill rakers	3+10	2–3+9–12	3+10	——	2–3+10–12
Branchiostegal rays	7	7	——	——	7
Measurements					
As % of total length					
Head length	13.1	13.1–14.1 (13.7)	19.8	15.2–17.2	14.6–16.8 (15.5)
Predorsal length	13.1	12.8–13.7 (13.3)	——	——	13.3–15.3 (14.2)
Preanal length	34.1	34.3–36.5 (35.1)	——	——	32.0–36.4 (34.8)
Body depth	11.0	10.1–11.2 (10.8)	10.3	——	10.7–13.4 (11.9)
As % of head length					
Eye diameter	16.0	16.2–20.0 (17.9)	14.5	17.9–19.2	16.8–21.0 (18.5)
Snout length	17.6	17.9–21.8 (20.2)	20.8	——	16.8–21.0 (18.8)
Infraorbital width	19.1	16.9–21.8 (19.2)	——	——	14.9–17.6 (16.6)
Interorbital width	16.0	13.8–18.2 (15.3)	10.3	——	9.7–14.9 (13.1)
Length of upper jaw	35.1	38.4–43.8 (41.2)	——	——	43.8–49.6 (46.4)

* After Matsubara (1932).

Distribution and ecological note. *Zoarchias microstomus* sp. nov. is known only from Liaoning Province, northeastern China. It inhabits mainly rocky shores and tidal pools containing small stones and seaweeds. The stomach contents of the paratypes consisted of polychaetes.

Etymology. From the Greek "*μικροζ*" and "*στομα*," meaning "small" and "mouth", respectively, in reference to the uniquely small mouth.

Comparison. *Zoarchias microstomus* sp. nov. is very similar to *Z. uchidai* (Fig. 1B) in meristic counts (see Table 1), position of the anal-fin spine relative to the dorsal-fin ray, and the markings on the soft dorsal and anal fins. It differs from the latter in having a smaller head and mouth (Fig. 4), the upper jaw not extending beyond the cephalic sensory pore just behind the orbit (extending far beyond the pore in the latter, see Fig. 2C, D), and truncated gill raker tips (pointed in *Z. uchidai*, see Fig. 3B).

Comments on identification of *Zoarchias uchidai*. *Zoarchias uchidai* was originally described on the basis of specimens collected from the vicinity of Pusan, South Korea (Matsubara, 1932). Originally the holotype and paratypes were deposited in the Imperial Fisheries Institute, Tokyo (presently Tokyo University of Fisheries [TUF]) and the Tyosen Fisheries Experimental Station, Pusan (presently FRDA), respectively. Today all types are considered to have been lost, as they cannot be found in either institution (K. Fujita, pers. comm.; Y.-S. Kim, pers. comm.). Although Matsubara (1932) treated "a large number of cotypes," he did not describe their morphometric and meristic characters, including data only from the holotype (a large male, 122.3 mm TL). Examples of *Zoarchias uchidai* examined here generally agreed with the original description, but appeared to have smaller heads, greater body depth, larger eyes, and more anal-fin soft rays than the holotype (see Table 1). Recently, Kim and Kang (1991) redescribed the species based on 12 specimens, in their review of Korean blennioids and zoarcoids. Their data also differed from the original description in head length, eye diameter and anal-fin ray count, but agreed well with the present specimens (see Table 1). Concerning the morphometric differences, it is known that large males of a congener, *Z. veneficus* Jordan and Snyder, have extremely long heads, which is a secondary sexual characteristic (Kimura and Sato, unpubl. data). Therefore, it is here considered that the proportional differences between the original description and the present specimens are size-related. On the other hand, there is a great discrepancy in the anal-fin ray count given in the original description and the present specimens. In the genus *Zoarchias*, the number of anal-fin soft rays (AR) is highly correlated to the total dorsal-fin ray count (TD), the regression line being represented by the formula: $AR = 0.84TD - 3.9$ ($N = 305$, $r = 0.97$, $SE = 1.2$) (Kimura and Sato, unpubl. data). Using this formula, the number of anal-fin soft rays in the holotype was calculated at 74 ± 1 on the basis of the total number of dorsal-fin rays given in the original description. This value agreed well with the present specimens. Because it is somewhat difficult to count the dorsal- and anal-fin rays without dissection or making radiographs, because of the thick fin membranes, it was concluded that the difference in the anal-fin soft ray counts is attributable to a miscount in the original description.

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中国遼寧省から得られたカズナギ属の1新種

木村清志・姜　志強

中国北東部遼寧省の大連付近の岩礁で採集された7個体（全長80.3–103.1 mm）に基づき，カズナギ属の新種 *Zoarchias microstomus*（新中国名：短頷小綿鰍）を記載した．本種は背鰭棘数が14–18本であること，全脊椎骨数が101–103個であること，頭部が短く頭長は全長の13.1–14.1%であること，上顎の後端が眼の直後にある感覚孔よりも後方に達しないこと，鰓耙の先端が截形であることによって，同属他種と明瞭に識別できる．また，本種の外観や計数形質は韓国に分布するウチダイトギンポ *Z. uchidai* とよく類似するが，頭長比や上顎後端の位置，および鰓耙の形態などによって区別できる．

（木村：〒517-07 三重県志摩郡志摩町和具志摩郵便局私書箱11号　三重大学生物資源学部附属水産実験所；姜：116023 中華人民共和国遼寧省大連市　大連水産学院水産養殖系）