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First Record of Three Barracudina Fishes (Aulopiformes: Teleostei) in Korean Waters

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Abstract – Three barracudina fishes (Paralepididae) were newly recorded from the southern sea of Korea. *Lestidium prolixum* is characterized by a single band of luminous ducts on the midventral line and absence of a papilla anterior to the eye. *Lestrolepis intermedia* and *L. japonica* are similar in having a black papilla immediately in front of the eye and two bands of luminous ducts on the midventral line. However, the dorsal fin of *L. intermedia* is located more posterior along the body than that of *L. japonica*, and *L. intermedia* have larger number of anal fin rays 42 (vs. 36-40) and vertebrae 95 (vs. 86-87) than *L. japonica*.

Key words – Paralepididae, *Lestidium prolixum*, *Lestrolepis intermedia*, *Lestrolepis japonica*, Korean waters

First erected by Rosen (1973) currently comprises the order Aulopiformes, 4 suborders, 14 families, 44 genera and about 236 species (Baldwin and Johnson 1996; Sato and Nakabo 2002). Based on pectoral fin length and number of vertebrae, the family Paralepididae had been subdivided into two subfamilies (Paralepidinae and Sudinae) (Nelson 1994), but a subsequent cladistic study revealed such a division to have been artificial (Sato and Nakabo 2002).

Commercially unimportant, although a significant food web component (Post 1986), the family Paralepididae (barracudinas) includes elongated body form fishes with small needle-like teeth, which inhabit deeper open oceans world-wide (Harry 1953a, b; Nelson 2006). Of the world-wide total of 13 genera and about 56 species (Nelson 2006), all of the 13 genera and 21 species are represented in Japan (Nakabo 2002b), and 5 genera and 15 species in China (Wu *et al.* 1999). However, only 3 species, *Lestidium prolixum* Harry, 1953, *Lestidiops luetkeni* (Ege 1933), and *Lestrolepis intermedia* (Poey 1868), have been recorded from Korean waters (Yoo *et al.* 1994), on the basis of larval specimens collected around Jeju Island.

During a bottom trawl survey in 2005 and 2006 in the southern sea of Korea, we collected three unrecorded species of the family Paralepididae (Fig. 1). Each is described herein, including a new Korean name. A key to genera and species is given.

Measurement methods followed Hubbs and Lagler (1964) and Nakabo (2002a). Vertebrae and fin rays were counted from radiographs prepared by soft X-ray (Hitex Co., Japan). In addition, some fin rays were counted by stereomicroscope after partial dissection, followed by staining with Alizarin Red S. They are presently deposited in the National Fisheries Research and Development Institute (NFRDI) of Korea.

Family Paralepididae

(New Korean family name: Hwa-sal-chi-gwa)

Body elongate, slender and compressed. Snout elongate, pointed, mouth terminal with projecting lower jaw. Both jaws with small needle-like canines. No fin spines. Dorsal

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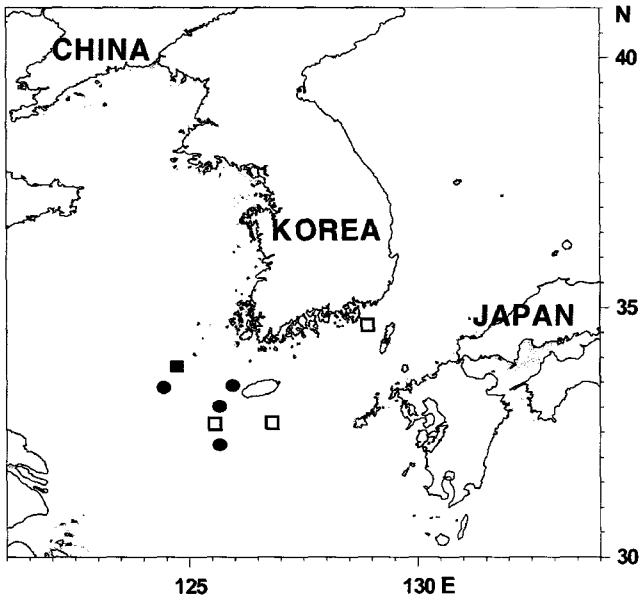

Fig. 1. Map showing the collection localities of three paralepidid fishes, *Lestidium prolixum* (●), *Lestrolepis intermedia* (■), and *Lestrolepis japonica* (□), from southern sea of Korea.

fin small, origin at or behind midpoint of trunk (absent in *Anotopterus*). Adipose fin located above anal fin. Anal fin base long. Swim bladder absent. Lateral line scales embedded (Nelson 2006). Because fishes in this family bear a superficial resemblance to an arrow, the new Korean family name "Hwa-sal-chi-gwa" is proposed.

Genus *Lestidium* Gilbert, 1905

(New Korean genus name: Hwa-sal-chi-sok)

Lestidium Gilbert, 1905: 607, fig. 236 (type species: *Lestidium nudum*).

Lower jaw and palatine with canines. No black papilla in front of eye. A single luminous duct along midventral line from head to pelvic fin. Pectoral fin small. Body naked, except for the lateral line region.

Lestidium prolixum Harry, 1953

(New Korean species name: Hwa-sal-chi)

(Fig. 2A; Table 1)

Lestidium prolixum Harry, 1953b: 204, figs. 25, 28 (Shikoku and Kagoshima, Japan); Yamakawa in Okamura and Kitajima, 1984: 167, fig. 115 (Suruga Bay, Kumano-nada Sea and Tosa Bay, Japan); Fujii in Masuda *et al.* 1984: 76, pl. 68-J (Japan); Okamura in Okamura and Amaoka, 1997: 115, fig. 8 (Okinawa Islands, Japan); Wu *et al.* 1999: 506 (listed, China); Shinohara *et al.* 2001: 300 (listed, Tosa Bay, Japan); Nakabo, 2002b: 371 (key, description, Japan); Shinohara *et al.* 2005: 409 (listed,

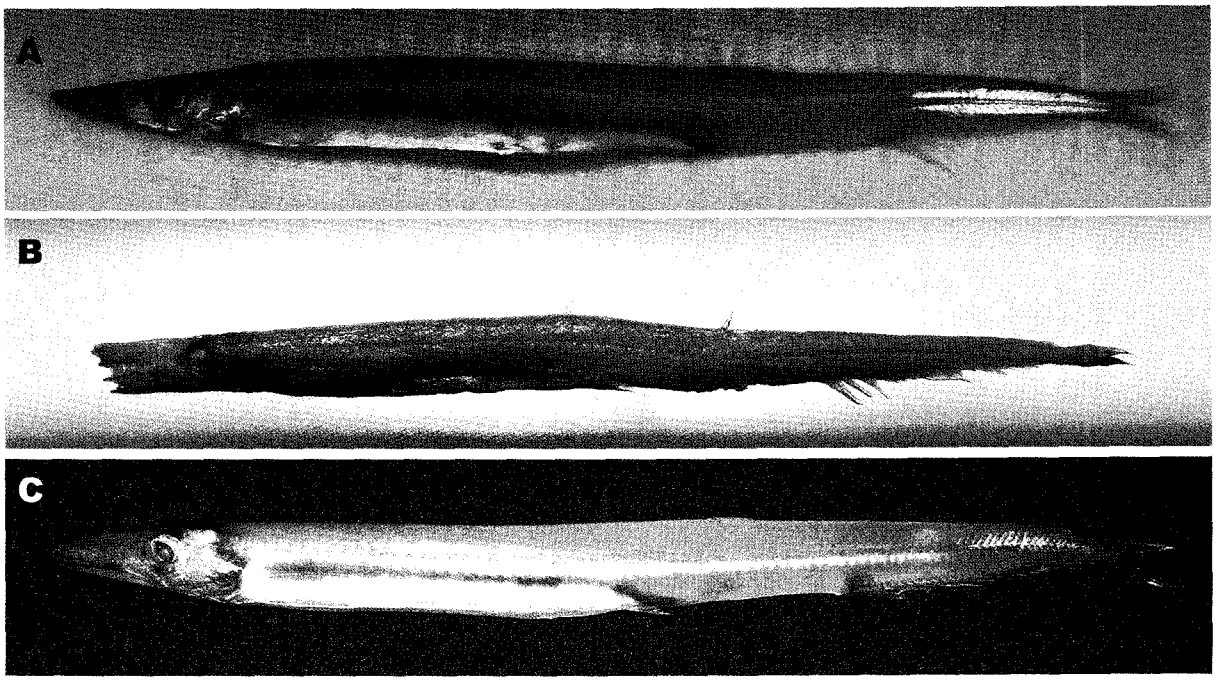

Fig. 2. (A) *Lestidium prolixum* Harry, NFRDI 20050927-05, 234.4 mm SL, 124°18'E, 33°16'N, southern sea of Korea; (B) *Lestrolepis intermedia* (Poey), NFRDI 20050927-10, 162.8 mm SL, 124°43'E, 33°46'N, southern sea of Korea; (C) *Lestrolepis japonica* (Tanaka), NFRDI 20060605-20, 176.8 mm SL, 124°51'E, 32°49'N, southern sea of Korea.

Table 1. Comparison of morphometric characteristics of *Lestidium prolixum*

	Present study	Harry (1953b)	Yamakawa (1984)
Number of specimens	6	2	5
Standard length (mm)	223.3-239.8	242-263.5	247-257
Counts			
Dorsal fin rays	10	10	9-10
Pectoral fin rays	12	12	13
Pelvic fin rays	10-11	9-11	9
Anal fin rays	30-32	30-31	30-32
Vertebrae	88-91	-	-
Measurements (% of SL)			
Body depth	7.5-8.1 (7.8)	6.9-10.0	6.8-9.0
Head length	20.0-20.6 (20.3)	19.8-21.5	21.7-22.5
Snout length	10.1-10.2 (10.1)	10.0-10.6	-
Upper jaw length	9.0-9.3 (9.2)	9.0-9.7	-
Eye diameter	3.1-3.5 (3.2)	3.6-3.8	-
Interorbital width	2.1-2.4 (2.3)	0.8-2.1	-
Predorsal length	60.7-62.0 (61.5)	59.9-62.7	62.0-64.4
Prepectoral length	20.5-21.1 (20.8)	-	-
Prepelvic length	54.5-57.3 (56.4)	56.2-58.0	-
Preanal length	74.8-77.4 (76.6)	75.1-77.4	76.7-77.9
Caudal peduncle length	5.2-5.6 (5.4)	-	-
Caudal peduncle depth	2.6-2.8 (2.7)	1.0-2.6	-

Ryukyu Islands, Japan).

Material examined

NFRDI 20050927-04~06, 3 specimens, 227.5-236.1 mm in standard length (SL), 124°18′E, 33°16′N, southern sea of Korea (around Jeju Island), 75 m depth, 27 August 2005, bottom trawl; NFRDI 20050927-24, 1 specimen, 223.3 mm SL, 125°48′E, 33°18′N, southern sea of Korea (around Jeju Island), 100 m depth, 25 August 2005, bottom trawl; NFRDI 20050927-30, 1 specimen, 226.8 mm SL, 125°47′E, 32°14′N, southern sea of Korea (around Jeju Island), 82 m depth, 1 September 2005, bottom trawl; NFRDI 20051019-01, 1 specimen, 239.8 mm SL, 126°06′E, 33°07′N, southern sea of Korea (around Jeju Island), 123 m depth, 8 September 2005, bottom trawl; collected by J. K. Kim.

Description

Morphometric characteristics are shown in Table 1.

Body slender, elongate; skin thin, smooth, devoid of scales except posterior lateral line region; eye large; snout pointed, lower jaw slightly protruded; flexible canines at front and lateral aspect of jaws; interorbital space concave; dorsal fin origin behind pelvic fin base; dorsal and pelvic fins small; caudal fin forked; one band of luminous ducts on ventral midline; adipose fin small.

Color of fresh specimens

Body translucent; no black papilla before eye; opercular region silverfish, back internally; scaled area near tail bright silvery; abdominal cavity black; white ventrally from opercle to anus; caudal fin slightly blackish.

Color after preservation

Body uniformly light brown, with darker brown dorsally and ventrally; snout dark brown; abdominal cavity black.

Distribution

Northwest Pacific: Korea (around Jeju Island, present study), Japan (Nakabo 2002b), and China (Wu *et al.* 1999).

Remarks

Counts and measurements of the above specimens were close to those given in previous descriptions, although the head and predorsal lengths of the former were different from those of Japanese specimens (20.0-20.6% in SL vs. 21.7-22.5% and 60.7-62.0% vs. 62.0-64.4%, respectively) (Table 1), probably due to geographic variations.

The largest *Lestidium* species in the Pacific, *Lestidium prolixum* is confined to the Northwest Pacific, including Korea, Japan, and China. *L. prolixum* is distinguished from *L. atlanticum* in having the dorsal fin origin behind the pelvic fin base, just above the pelvic fin base in the latter (Nakabo 2002b).

Genus *Lestrolepis* Harry, 1953

(New Korean genus name: Jeom-hwa-sal-chi-sok)

Lestrolepis Harry, 1953a (type species: *Lestrolepis philippinus*).

Lower jaw and palatine with canines. A single black papilla in front of eye. Two luminous ducts along midventral line. Body naked, except for lateral line region. The new Korean genus name reflects the distinctive black papilla before the eye.

Lestrolepis intermedia (Poey, 1868)

(New Korean species name: Nam-bang-jeom-hwa-sal-chi)

(Fig. 2B; Table 2)

Paralepis intermedius Poey, 1868: 416 (Cuba); Ege,

Table 2. Comparison of morphometric characteristics of *Lestrolepis intermedia*

	Present study	Ege[a] (1930)	Fujii (1983)
Number of specimens	1	1	11
Standard length (mm)	162.8	236	189-234
Counts			
Dorsal fin rays	9	7-8	9
Pectoral fin rays	11	15	-
Pelvic fin rays	9	10	-
Anal fin rays	42	42-44	41-44
Vertebrae	95	92-94	91-98
Measurements (% of SL)			
Body depth	6.0	5.9	-
Head length	18.8	18.2	-
Snout length	9.6	-	-
Upper jaw length	8.6	-	-
Eye diameter	2.9	-	-
Interorbital width	2.0	-	-
Predorsal length	63.8	-	-
Prepectoral length	20.3	-	-
Prepelvic length	51.0	-	-
Preanal length	73.1	-	-
Caudal peduncle length	3.7	-	-
Caudal peduncle depth	3.1	-	-

[a] including holotype

1930: 94, figs. 24, 25 (Mediterranean and adjacent seas).

Lestrolepis intermedia: Fujii in Uyeno *et al.* 1983: 519; Fujii in Masuda *et al.* 1984: 77, pl. 68-M (Japan); Post in Smith and Heemstra, 1986: 275, fig. 81.4; Miya *et al.* 1995: 240 (listed, Boso Peninsula, Japan); Shinohara *et al.* 1996: 164 (listed, Honshu, Japan); Wu *et al.* 1999: 506 (listed, China); Randall and Lim, 2000: 592 (listed, South China Sea); Nakabo, 2002b: 371 (key, description, Japan); Moore *et al.* 2003: 195 (New England); Shinohara *et al.* 2005: 409 (listed, Ryukyu Islands, Japan).

Material examined

NFRDI 20050927-10, 1 specimen, 162.8 mm SL, 124°43′E, 33°46′N, southern sea of Korea (around Jeju Island), 87 m depth, 27 August 2005, bottom trawl, collected by J. K. Kim.

Description

Counts and measurements are shown in Table 2.

Body elongate, compressed; mouth large; snout pointed; flexible canines at front and lateral aspect of jaws; interorbital space concave; dorsal fin located midway between posterior end of pelvic fin base and origin of anal fin; dorsal and pelvic fins small; anal fin base long; caudal fin forked; adipose fin small.

Color after preservation

Body uniformly light brown, darker ventrally; a single papilla black; operculum black; caudal peduncle light brown; a series of small black spots along midventral line.

Distribution

Circum-tropical in all oceans: Korea (around Jeju Island, present study), Japan (Nakabo 2002b), China (Wu *et al.* 1999), Pacific, Indian, and Atlantic Oceans (Poey 1868; Ege 1930; Post 1986; Moore *et al.* 2003).

Remarks

Counts of the present specimen corresponded closely to those given in previous descriptions (Table 2). *Lestrolepis intermedia* is similar to *L. japonica* in having a black papilla and two luminous midventral lines. The former is characterized by the dorsal fin originating midway between the pelvic and anal fins (compared with more anterior in *L. japonica*). In addition, *L. intermedia* is distinguished from *L. japonica* in having 40-45 anal fin rays (vs. 36-40) and 95-97 vertebrae (vs. 84-87) (Nakabo, 2002b). Ege (1930) noted that the juvenile developmental stage began very late, from 43.5 mm SL.

The new Korean species name reflects the species preference for warmer waters.

***Lestrolepis japonica* (Tanaka, 1908)**

(New Korean species name: Jeom-hwa-sal-chi)

(Fig. 2C; Table 3)

Lestidium japonicum Tanaka, 1908: 27 (Sagami Sea, Japan); Talwar, 1970: 64, fig. 1 (Southwest coast of India).

Lestrolepis japonica: Fujii in Masuda *et al.* 1984: 77, pl. 68-N (Japan); Gloerfelt-Tarp and Kailola, 1984: 79 (southern Indonesia and northwestern Australia); Shen *et al.* 1993, 159, pl. 35-7 (Taiwan); Wu *et al.* 1999: 507 (listed, China); Randall and Lim, 2000: 592 (listed, South China Sea); Harada and Ozawa, 2003: 182 (Kagoshima Bay, Japan); Nakabo, 2002b: 371 (Key, description, Japan); Shinohara *et al.* 2005: 409 (listed, Ryukyu Islands, Japan).

Table 3. Comparison of morphometric characteristics of *Lestrolepis japonica*

	Present study	Tanaka (1908)	Harry (1953b)	Talwar (1970)
Number of specimens	3	2	8	1
Standard length (mm)	171.0-206.6	174-190	107.0-188.0	203
Counts				
Dorsal fin rays	9	9-10	9	9
Pectoral fin rays	10	10-12	10-13	11
Pelvic fin rays	9	9-10	9-10	9
Anal fin rays	36-40	42-49	36-41	36
Vertebrae	86-87	-	-	-
Measurements (% of SL)				
Body depth	7.6-10.0 (8.8)	6.3-6.9	6.7-10.1	7.2
Head length	20.2-20.8 (20.5)	19.5-20.0	17.4-21.6	21.6
Snout length	10.2-10.8 (10.6)	9.8-10.5	10.3-11.0	10.3
Upper jaw length	9.4-9.7 (9.5)	9.5-9.8	9.1-10.3	9.9
Eye diameter	3.1-3.6 (3.4)	3.2	3.2-4.1	3.4
Interorbital width	2.0-2.2 (2.1)	1.7-2.1	1.9-3.2	2.5
Predorsal length	61.3-61.5 (61.4)	-	60.3-63.8	-
Prepectoral length	21.0-21.5 (21.2)	20.1-21.6	-	-
Prepelvic length	51.9-53.4 (52.7)	51.6-51.7	50.8-53.3	-
Preanal length	73.5-75.2 (74.2)	-	73.4-80.8	-
Pectoral fin length	8.0-8.2 (8.1)	8.0-8.4	7.9-11.5	-
Distance from pectoral fin to pelvic fin	28.0-33.1 (30.3)	29.9-30.0	-	-
Distance from pelvic fin to anal fin	21.2-22.4 (21.7)	20.1-21.1	-	-
Caudal peduncle depth	2.2-2.3 (2.3)	-	1.8-2.6	-

Material examined

NFRDI 20060605-20, 1 specimen, 176.8 mm SL, 124°51′E, 32°49′N, southern sea of Korea (around Jeju Island), 67 m depth, 22 April 2006, bottom trawl; NFRDI 20060605-24, 1 specimen, 171.0 mm SL, 126°46′E, 32°45′N, southern sea of Korea (around Jeju Island), 127 m depth, 28 April 2006, bottom trawl; NFRDI 20060719-32, 1 specimen, 206.6 mm SL, 128°35′E, 34°22′N, southern sea of Korea (around Geoje Island), 81 m depth, 14 June 2006, bottom trawl; collected by J. H. Park.

Description

Counts and measurements are shown Table 3.

Body elongate, compressed, tapering gradually; mouth large; snout pointed, lower jaw slightly protruding; interorbital space concave; flexible canines at front and lateral aspect of jaws; dorsal fin located before midway between posterior end of pelvic fin base and origin of anal fin; dorsal and pelvic fins small; anal fin base long; caudal fin forked; adipose fin small.

Color of fresh specimens

Body transparent; vertebrae white; papilla black; postorbital and abdominal regions silvery; abdominal cavity black; caudal peduncle reddish-brown, scaled area silvery; origin of anal fin with a black blotch.

Color after preservation

Body uniformly ivory; papilla black; abdominal cavity black; a series of small black spots on midventral line; caudal fin blackish.

Distribution

Western Indo-Pacific: Korea (around Jeju and Geoje Islands, present study), Japan (Nakabo 2002b), Taiwan (Shen *et al.* 1993), China (Wu *et al.* 1999), India (Talwar 1970), and Western Australia (Gloerfelt-Tarp and Kailola 1984).

Remarks

Counts and measurements of the present specimens agreed with those previously recorded, except for body

depth [present specimens mean, 8.8% in SL vs. 6.3-6.9% (in Tanaka, 1908) and 7.2% (in Talwar, 1970)] (Table 3), which seem to reflect a geographic variation.

Tanaka (1908) originally reported the number of anal fin rays of *Lestrolepis japonica* as 42-49. However, as a result of reexamination of the holotype and paratype of the species, Harry (1953b) revealed the number of anal fin rays was only 40-41, indicating Tanaka (1908)'s miscount.

This species is similar to *Lestrolepis intermedia* (see above), but has recorded fewer anal fin rays and vertebrae (Nakabo 2002b). The maximum recorded age and spawning season of the species are 4 years and from July to September, respectively (Harada and Ozawa 2003; Harada *et al.* 2003).

The new Korean species name also reflects the distinctive black papilla before the eye.

Key to genera and species of the Korean paralepidid fishes

1a. No black papilla before eye, a single luminous duct along midventral line from head to pelvic fin
Lestidium, Lestidium prolixum

1b. A distinctive black papilla before eye, two luminous ducts along midventral line from head to pelvic fin
Lestrolepis, 2

2a. Anal fin rays 40-45, vertebrae 95-97
Lestrolepis intermedia

2b. Anal fin rays 36-40, vertebrae 84-87
Lestrolepis japonica

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