



Three Unrecorded Marine Fish Species from Korean Waters

Jeong-Ho Park, Jin Koo Kim*, Jee Hwan Moon, and Cheol Bum Kim

Fisheries Resources Research Team, National Fisheries Research and Development Institute, Busan 619-705, Korea

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Abstracts – Three marine fish species are recorded for the first time from Korean waters: a molid (*Ranzania laevis*, 1 specimen, 279.8 mm SL) and bramid (*Pterycombus petersii*, 3 specimens, 95.3-214.0 mm SL) collected from a large purse seine off Jeju Island, in the southern sea of Korea, and a carangid (*Carangoides dinema*, 1 specimen, 194.5 mm SL) from a set net in coastal waters off Busan, in the southeastern sea of Korea. *R. laevis* is characterized by a wedge-shaped body and truncated clavus; *P. petersii* by the dorsal fin origin above or behind the posterior margin of eye, and dorsal and anal fins depressible; and *C. dinema* by a row of black blotches along the second dorsal fin base, the curved part of the lateral line longer than straight part, and 18 and 16 dorsal and anal fin rays, respectively. New Korean names are proposed for all three species.

Key words – Molidae, *Ranzania laevis*, Bramidae, *Pterycombus petersii*, Carangidae, *Carangoides dinema*, first record

1. Introduction

Sunfishes are unique epipelagic fishes occurring circumglobally in open tropical and temperate waters. The family Molidae is a very small taxonomic group, comprising only 3 genera and 4 species worldwide (Nelson 2006). Of these, *Mola mola* (Linnaeus 1758) and *Masturus lanceolatus* (Linard 1840) have already been recorded in Korea (Chyung 1977).

The bramid fishes, comprising 7 genera and about 22 species in two subfamilies, Braminae and Pteraclinae, are mostly epipelagic in open oceanic waters (Last and Moteki 2001; Nelson 2006). The world-wide distribution of the

family Bramidae was reviewed by Mead (1972), who recognized 2 species of the genus *Pterycombus* Fries, 1837.

The carangid fishes are also widely distributed throughout tropical and subtropical waters world-wide, and include many commercially important species (Suzuki 1962; Lin and Shao 1999). Classification of the family has been considered in several detailed studies, including Smith-Vaniz (1984), Gushiken (1988), Lin and Shao (1999), and Kim (2000). In Korea, the genus *Carangoides* Bleeker, 1851 is represented by *C. ferdau* (Forsskål 1775), *C. orthogrammus* (Jordan and Gilbert 1882), and *C. uii* (Wakiya 1924) (Kim 2000; Kim *et al.* 2005).

In this paper, three previously-unrecorded species, representing the above families, are listed for the first time from Korean waters, on the basis of collected specimens. Brief descriptions and comparisons are given, including keys to genera and species.

2. Material and Methods

A single specimen of *Ranzania laevis* and three specimens of *Pterycombus petersii* (Hilgendorf 1878) were collected from a large purse seine off Jeju Island, southern sea of Korea in July 2006. A single specimen of *Carangoides dinema* was caught by a set net near Busan, Korea in October 2006 (Fig. 1).

Counts and measurements followed those of Hubbs and Lagler (1964) and Nakabo (2002). Vertebral numbers were counted from radiographs. The specimens have been deposited in the National Fisheries Research and Development Institute (NFRDI) of Korea.

*Corresponding author. E-mail: taengko@daum.net

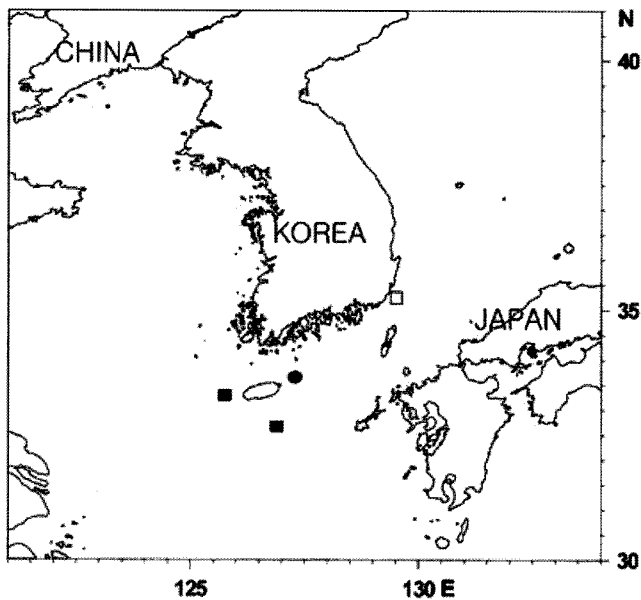


Fig. 1. Map showing the sampling area. (solid circle, *Ranzania laevis*; solid rectangles, *Pterycombus petersii*; open rectangle, *Carangoides dinema*).

3. Results and Discussions

Genus *Ranzania* Nardo, 1840

(New Korean name: Sswae-gi-gae-bok-chi-sok)

Ranzania Nardo, 1840: 105 (type species: *Ranzania typus*).

Ranzania laevis (Pennant, 1776)

(New Korean name: Sswae-gi-gae-bok-chi)

(Fig. 2; Tables 1, 2)

Ostracion laevis Pennant, 1776: 129, pl. 19, fig. 54 (type locality: Cornwall, England).

Ranzania truncata: Folwer, 1936: 1123, fig. 470 (West Africa).

Ranzania typus Nardo, 1840: 111 (Mediterranean Sea); Ebenezer and Joel, 1984: 360, fig. 1 (Tamil Nadu, India).

Ranzania makua: Jordan and Snyder, 1901a: 262, unnumbered fig. (Sendai, Japan).

Ranzania laevis: Phillipps, 1942: 245, fig. 6 (New Zealand); Fraser-Brunner, 1951: 95, fig. 3; Parenzan, 1978: 79, unnumbered fig. (Mediterranean Sea); Fischer *et al.*, 1981: 2, unnumbered fig. (Eastern Central Atlantic); Jardas and Knežević, 1983: 1, fig. 1 (Adriatic Sea); Matsuura in Masuda *et al.*, 1984: 366, pl. 334 (Japan); Heemstra in Smith and Heemstra, 1986: 908, pl. 144; De Bruin *et al.*, 1994: 259,

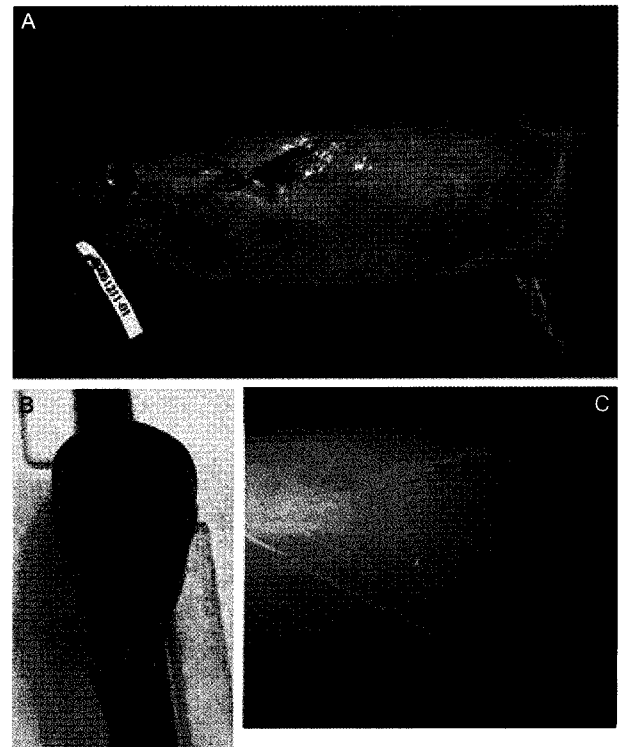


Fig. 2. *Ranzania laevis* (Pennant), juvenile, NFRDI 20061211-01, 279.8 mm SL, 127°00'-127°30'E, 33°30'-34°00'N, off Jeju Island, southern sea of Korea. (A, lateral view; B, front view; C, X-ray of caudal part).

unnumbered fig. (Sri Lanka); Randall, 1999: 31 (listed, Pitcairn Islands); Wu *et al.*, 1999: 802 (listed, China); Hutchins, 2001: 3968, unnumbered fig. (Western Central Pacific); Hatooka in Nakabo, 2002b: 1435, unnumbered fig. (Japan); Castro and Ramos, 2002: 271 (Canary Islands, Spain); Dulčić and Lipej, 2002: 191 (listed, Eastern Adriatic Sea); Parenti, 2003: 4 (cosmopolitan); Dennis *et al.*, 2004: 84 (listed, Puerto Rico).

Material examined

NFRDI 20061211-01, 279.8 mm in standard length (SL), 127°00'-127°30'E, 33°30'-34°00'N, off Jeju Island, Korea, 26 July 2006, large purse seine, collected by J. H. Moon.

Description

D. 19; P₁. 13; A. 18; Clavus 20; Vert. 18. Measurements are shown in Table 1. Body elongate, prominently compressed; strongly truncate posteriorly; mouth terminal, oval, always open; teeth fused, completely hidden by projecting skin; gill opening small, pore-like, in front of pectoral fin; no

Table 1. Comparison of counts and measurements of *Ranzania laevis*

	Present study	Jordan and Snyder (1901a)	Fowler (1936)	Jardas and Knežević (1983)
Number of specimens	1	2	-	5
Total length (mm)	292.9	101.6-508.0	-	530-560
Standard length (mm)	279.8	-	-	490-528
Counts				
Dorsal fin rays	19	17	17-19	17-18
Pectoral fin rays	13	13	13	13-14
Anal fin rays	18	18	19	18-20
Clavus rays	20	19	18-22	17-19
Vertebrae	18	-	-	-
Measurements (% of SL)				
Body depth	35.1	45.1	< 50.0 ^a	53.0
Body width	15.5	-	-	-
Head length	39.8	35.3	-	36.6-37.1
Postorbital length	19.3	-	-	16.7
Snout length	14.3	16.6	-	13.8-14.3
Eye diameter	6.4	5.9	-	6.1-6.7
Interorbital width	10.0	-	-	-
Predorsal length	93.6	-	-	88.7-88.4
Prepectoral length	38.8	-	-	37.8-41.7
Preanal length	89.2	-	-	-
Preanus length	81.8	-	-	-
Pectoral fin length	14.5	-	-	20.8-21.0
Length of longest dorsal ray	20.7	-	-	26.5-30.3
Dorsal fin base length	9.5	-	-	9.2-13.3
Length of longest anal ray	18.9	-	-	28.0
Anal fin base length	9.4	-	-	9.2-11.4

^a% of total length**Table 2.** Comparison of morphological characteristics in three genera of the family Molidae

Characteristics	Genus		
	<i>Ranzania</i>	<i>Mola</i>	<i>Masturus</i>
Body form	wedge	oval	oval
Maximum size	< 80 cm	> 3 m	> 3 m
Pectoral fin shape	pointed	rounded	rounded
Clavus shape	truncated	rounded	pointed
Body depth in total length	2.1-4.0	0.8-1.8	0.8-1.8
Clavus rays no.	20-22	12-16	-

lateral line; no swim bladder; no pelvic fin; fins without spines; caudal fin replaced by a rudder-like lobe (clavus), supported mostly by fin ray elements derived from dorsal and anal fin elements; dorsal and anal fins similar, triangular, located posteriorly on body; pectoral fin pointed; skin leathery and thick, with small hexagonal scales.

Color when fresh

Body overall gray, with light silver sheen; bluish-black

dorsally; light brown ventrally and posteriorly; clavus white; all fins, except for clavus, black; gill opening dark.

Color after preservation

Body overall ivory; dusky dorsally; light brown ventrally; dorsal, pectoral, and anal fins black.

Distribution

Cosmopolitan: Korea (off Jeju Island, present study), Japan (Hatooka 2002b), China (Wu *et al.* 1999), Indo-Pacific, and Atlantic (Fraser-Brunner 1951).

Remarks

Regarding 25 nominal species of the genus *Ranzania* Nardo, 1840, Fraser-Brunner (1951) recognized only one valid species of *Ranzania laevis* (Pennant, 1776). The genus *Ranzania* is characterized by a slender wedge-shaped body [2.1 to 4.0 in total length (TL)], truncated clavus, and pointed pectoral fin, whereas the genera *Masturus* and

Mola have a deeply oval body (0.8 to 1.8) (Ebenezer and Joel 1984; Heemstra 1986), rounded or pointed clavus, and rounded pectoral fin (Hatooka 2002b) (Table 2). Although the body depth of *Ranzania* generally increases with growth (e.g. 2.5 times at 250 mm TL, 2.25 at 430 mm TL, and 2.0 at 580 mm TL) (Fraser-Brunner 1951), the present specimen (2.9 times) appeared to be more slender than usually recorded.

Phylogenetic relationships based on morphology have shown *Ranzania* to be the most primitive molid, *Mola* and *Masturus* being closer to each other than to *Ranzania*. Accordingly, the two groups are considered to be distinctive subfamilies (Molinae and Ranzaniinae) (Fraser-Brunner 1951), supported by recent mt-DNA studies (Yamanoue et al. 2004; Bass et al. 2005).

Whereas counts of the specimen agreed with those of the previous studies, several differences in measurements (Table 1) indicated the likelihood of allometric growth in juvenile specimens. Therefore it is necessary that there be more examination based on adult specimens.

Although the Korean name, “Sswae-gi-bok”, has already been proposed by Kim et al. (1988), it is here renamed as “Sswae-gi-gae-bok-chi” so as not to be confused with that of a common pufferfish.

Key to species of the family Molidae from Korea

- 1a. Body form elongated, clavus truncated, pectoral fin pointed.....*Ranzania laevis*
- 1b. Body form oval, clavus rounded or pointed, pectoral fin rounded.....2
- 2a. Clavus rounded*Mola mola*
- 2b. Clavus pointed..... *Masturus lanceolatus*

Genus *Pterycombus* Fries 1837

(New Korean name: Nal-gae-sae-da-rae-sok)

Pterycombus Fries, 1837: 15, pl. 2 (type species: *Pterycombus brama*).

Pterycombus petersii (Hilgendorf, 1878)

(New Korean name: Nal-gae-sae-da-rae)

(Fig. 3; Table 3)

Centropholis petersii Hilgendorf, 1878: 2 (type locality: Japan).

Centropholis petersii: Jordan, 1919: 334 (Japan); Akazaki, 1982: 235, fig. 160 (Kyushu-Palau Ridge).



Fig. 3. *Pterycombus petersii* (Hilgendorf), NFRDI 20060728-01, 214.0 mm SL, 125°30'-126°00'E, 33°00'-33°30'N, off Jeju Island, southern sea of Korea.

Pterycombus petersii: Lindberg and Krasnyukova, 1971: 217, fig. 236 (Japan); Mead, 1972: 101, figs. 47, 49 (Japan and South Africa); Mochizuki in Masuda et al., 1984: 160, pl. 144-I (Japan); Smith in Smith and Heemstra, 1986: 207, fig. 207.5 (Cape Point, South Africa); Gomes, 1990: 762 (Table Bay, South Africa); Roberts, 1991: 18 (listed, New Zealand); Shen et al., 1993: 346 (Taiwan); Yatsua in Okamura and Amaoka, 1997: 328, fig. 2 (Kyushu, Japan); Wu et al., 1999: 790 (listed, China); Randall and Lim, 2000: 617 (listed, South China Sea); Last and Monteki, 2001: 2826, fig. 3 (Western Central Pacific); Shinohara et al., 2001: 325 (listed, Tosa Bay, Japan); Hatooka in Nakabo, 2002a: 813, unnumbered fig. (Japan).

Material examined

NFRDI 20060710-22~23, 2 specimens, 95.3 and 200.3 mm SL, 126°30'-127°00'E, 32°00'-32°30'N, off Jeju Island, Korea, 5 July 2006, large purse seine; NFRDI 20060728-01, 1 specimen, 214.0 mm SL, 125°30'-126°00'E, 33°00'-33°30'N, off Jeju Island, southern sea of Korea, 28 July 2006, large purse seine, collected by J. H. Moon and U. Y. Yeo.

Description

D. 49; P₁. 19; P₂.I, 5; A. 39-40; GR. 1+7; Vert. 47. Mea-

Table 3. Comparison of counts and measurements of *Pterycombus petersii*

	Present study	Lindberg and Krasnyukova (1971)	Akazaki (1982)	Smith (1986)
Number of specimens	3	1	1	-
Total length (mm)	113.1-270.5	500	-	-
Standard length (mm)	95.3-214.0	-	175	75-310
Counts				
Dorsal fin rays	49	50	43	48-49
Pectoral fin rays	19	19	17	21-22
Anal fin rays	39-40	40	33	39-40
Pelvic fin rays	1, 5	1, 5	1, 5	-
Gill rakers	1+7	-	2+6	1+6-7
Vertebrae	47	49	-	45-48
Measurements (% of SL)				
Body depth	36.9-37.1	-	37.0	-
Body width	9.9-12.5	-	10.9	-
Head length	21.8-23.7	-	23.8	-
Postorbital length	10.4-11.8	-	12.5	-
Snout length	4.6-5.0	-	-	-
Upper jaw length	11.6-13.1	-	12.3	-
Eye diameter	8.1-8.7	-	9.7	-
Suborbital width	2.0-3.0	-	-	-
Interorbital width	5.6-10.9	-	-	-
Predorsal length	14.4-16.0	-	-	-
Prepectoral length	21.5-22.9	-	-	-
Preanal length	29.1-30.6	-	-	-
Preanus length	25.9-29.7	-	-	-
Pectoral fin length	19.9-22.8	-	23.8	-
Length of longest dorsal ray	61.4-65.9	-	-	-
Dorsal fin base length	75.2-79.5	-	-	-
Length of longest anal ray	61.9-68.5	-	-	-
Anal fin base length	68.5-71.6	-	-	-

Measurements are shown in Table 3.

Body oval, deep and strongly compressed; snout short; eye very large; interorbital space slightly convex; mouth oblique; posterior end of maxilla extend to the middle of eye; lower jaw protruding anteriorly; both jaws with two series of short canines; dorsal and anal fins very high, with scaly sheaths at bases; dorsal fin begin above or behind posterior end of eye; pelvic fin short, inserted in advance of pectoral fin base; caudal fin forked; scales cycloid; scales without vertical median spines on head, but 10-11 rows of spines on body.

Color of specimens

Head and body overall silvery-gray; all fins, except for pectoral fin, blackish; pectoral fin white. Coloration of specimen in alcohol similar to that when fresh.

Distribution

Korea (off Jeju Island, present study), Japan (Hatooka 2002a), Taiwan (Shen *et al.* 1993), China (Wu *et al.* 1999), South Africa (Mead 1972; Smith 1986), and Southeast Atlantic (Smith 1986).

Remarks

The counts and measurements of the specimen agreed well with those of the previous studies (Table 3).

The genus *Pterycombus* is represented by only two species world-wide, *P. petersii* occurring mainly in the Indo-West Pacific, but *P. brama* Fries, 1837 in the North and Central Atlantic. The former is distinguished from the latter in having more dorsal fin rays (48-49 vs. 43-48) and fewer vertebrae (45-48 vs. 48-51), although the ranges overlap (Mead 1972; Smith 1986).

The present species is similar to *Pterclis aesticola* (Jordan and Snyder, 1901b) in having very high dorsal and anal fins, but differed from the latter in having the dorsal fin origin behind posterior margin of the eye and none of the first 5 dorsal fin rays obviously thicker than those more posterior (see Last and Moteki 2001; Hatooka 2002b).

Remains of this species, because of their hard skin and scales, are often found in the stomach contents of large tunas (Mead 1972).

The new Korean name, “Nal-gae-sae-da-rae”, is here proposed for *P. petersii*.

Key to species of the family Bramidae from Korea

- 1a. Dorsal and anal fins very high and depressible, dorsal fin originated above or before posterior end of opercle2
- 1b. Dorsal and anal fins low and not depressible, dorsal fin originated behind posterior end of opercle3
- 2a. Dorsal fin originated behind posterior margin of eye *Pterycombus petersii*
- 2b. Dorsal fin originated before posterior margin of eye *Pteraclis aesticola*
- 3a. Dorsal contour of head distinctly convex, head distinctly compressed4
- 3b. Dorsal contour of head almost straight, head slightly compressed *Taractes asper*
- 4a. Left and right fins relatively separated from each other, scales rapidly decreasing in size from caudal peduncle to caudal fin base *Taractichthys steindachneri*
- 4b. Left and right fins close to each other, scales gradually decreasing in size from caudal peduncle to caudal fin base *Brama japonica*

Carangoides dinema Bleeker, 1851

(New Korean name: Mi-neul-jeon-gaeng-i)

(Fig. 4; Table 4)

Carangoides dinema Bleeker, 1851: 365 (type locality: Java); Gloerfelt-Tarp and Kailola, 1984: 159 (southern Indonesia and northwestern Australia); Smith-Vaniz, 1986: 643, fig. 210.8 (Tanzania); Shen *et al.*, 1993: 334, pl. 90-3 (Taiwan); Lin and Shao, 1999: 52, figs. 14, 15 (Taiwan).

Carangichthys dinema: Gushiken in Masuda *et al.*, 1984: 156, pl. 140-C (Japan); Shameem and Dutt, 1986: 160 (India); Masuda and Kobayashi, 1994: 149, fig. 7

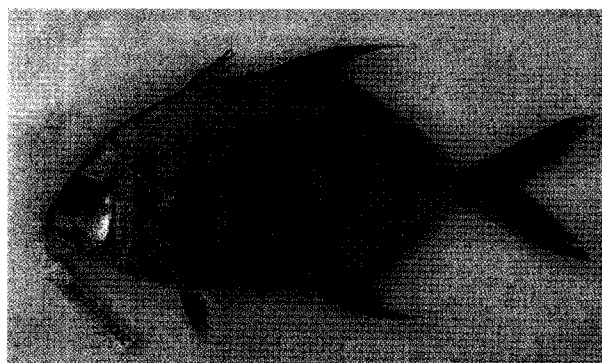


Fig. 4. *Carangoides dinema* Bleeker, NFRDI 20061211-01, 194.5 mm SL, Dongam, Gijang-gun, Busan-si, Korea.

(southern Japan); Kimura in Okamura and Amaoka, 1997: 320 (southern Japan); Senou in Nakabo, 2002: 804 (Japan).

Citula dinema: Suzuki, 1962: 178 (Mie and Kyoto, Japan).

Material examined

NFRDI 20061012-41, 194.5 mm SL, Dongam, Gijang-gun, Busan-si, Korea, 11 October 2006, set net, 20 m depth, collected by J. K. Kim.

Description

D. VIII-I, 18; P₁. i, 18; P₂. 6; A. II-I, 16; GR. 7+18; Vert. 10+14; Scutes 27. Measurements are shown in Table 4.

Body ovate, strongly compressed; snout short and pointed; both jaws with about four rows of villiform teeth; adipose eyelid not developed; jaws protruding equally; posterior end of maxilla extending to posterior margin of eye; two dorsal fins, first dorsal fin small; first anal fin with two spines; anteriormost rays of second dorsal and anal fins longest, greatly extended; lateral line curved anteriorly and straight (bearing scutes) posteriorly from below 9th~10th dorsal fin rays, curved part longer than straight part; upper rays of pectoral fin prolonged; finlet absent; caudal fin deeply forked, with the lobes equal; scales small cycloid; breast naked ventrally to origin of pelvic fin.

Color when fresh

Body bluish dorsally, golden-white ventrally; anal and caudal fins yellowish; row of about 12 dark blue blotches along base of second dorsal fin, four blotches triangular, the remainder rectangular; six dusky longitudinal strips (as large as eye diameter); dorsal fin bluish-gray; dark blue spot on posterior end of opercle.

Table 4. Comparison of counts and measurements of *Carangoides dinema*

	Present study	Wakiya (1924)	Suzuki (1962)	Lin and Shao (1999)
Number of specimens	1	1	2	4
Fork length (mm)	214.6	-	-	172-328
Standard length (mm)	194.5	154	193-220	-
Counts				
Dorsal fin rays	VIII-I, 18	VIII-I, 18	VIII-I, 18	VIII-I, 17-19
Pectoral fin rays	i, 18	-	i, 19-20	i, 18-20
Anal fin rays	II-I, 16	II-I, 17	I, 17	II-I, 15-17
Pelvic fin rays	6	-	-	-
Scutes	27	25	27	27-33
Gill rakers	7+18	-	-	7-8+18-19
Vertebrae	10+14	-	-	10+14
Measurements (% of SL)				
Body depth	47.8	42.2	45.0-45.5	-
Body width	17.5	-	-	-
Head length	25.7	26.3	26.5-30.1	-
Postorbital length	13.6	-	-	-
Snout length	9.7	7.2	-	-
Eye diameter	7.2	6.3	-	-
Upper jaw length	12.3	-	-	-
Suborbital width	4.9	-	-	-
Interorbital width	9.4	-	-	-
Predorsal length	39.9	-	30.4-33.7	-
Prepectoral length	28.2	-	-	-
Prepelvic length	32.8	-	29.5-30.0	-
Preanal length	54.4	-	57.1-58.5	-
Preanus length	45.6	-	-	-
Pectoral fin length	34.2	-	-	-
Length of longest dorsal ray	33.5	-	-	-
First dorsal fin base length	16.7	-	-	-
Second dorsal fin base length	43.5	-	-	-
Length of longest anal ray	37.7	-	-	-
First anal fin base length	2.6	-	-	-
Second anal fin base length	36.0	-	-	-
Caudal peduncle length	13.4	-	-	-
Caudal peduncle depth	5.7	-	-	-
Length of curved part	45.4	-	-	-
Length of straight part	31.4	-	-	-

Color after preservation

Body greenish-gray dorsally, white ventrally; beneath eye silvery; blotches along second dorsal fin base darker; longitudinal strips darker; black spot on posterior end of opercle; all fins gray; base of anal and caudal fins light ivory.

Distribution

Indo-Pacific: Korea (Busan, present study), Japan (Senou 2002), Taiwan (Shen *et al.* 1993), India (Shameem and Dutt

1986), Tanzania (Smith-Vaniz 1986), and southern Indonesia and northwestern Australia (Gloerfelt-Tarp and Kailola 1984).

Remarks

Counts of the present specimen agreed well with previous descriptions of *Carangoides dinema* (Table 4). This species is characterized by the row of black blotches along the second dorsal fin base, the curved part of lateral line being longer than the straight part, and fewer dorsal and anal fin

rays (Senou, 2002). Although the genus *Carangoides* is morphologically very similar to the genus *Caranx* Lacepede, 1801, the former has an underdeveloped adipose eyelid compared with the latter (Kim et al. 1999).

C. dinema is easily distinguished from other *Carangoides* in Korean waters by the lower number of dorsal (17-19 vs. 21-34 in the latter) and anal fin rays (15-17 vs. 18-27 in the latter) (Kim et al. 2005).

The new Korean name, “Mi-neul-jeon-gaeng-i”, is here proposed for *C. dinema*.

Key to species of the genus *Carangoides* from Korea

- 1a. Row of black blotches along base of second dorsal fin, 17-19 dorsal fin rays, 15-17 anal fin rays
..... *Carangoides dinema*
- 1b. No black blotches along base of second dorsal fin, 21-34 dorsal fin rays, 18-27 anal fin rays.....2
- 2a. First ray of second dorsal fin elongated, 21-23 dorsal fin rays, 18-19 anal fin rays *Carangoides uii*
- 2b. First ray of second dorsal fin not elongated, 26-34 dorsal fin rays, 21-27 anal fin rays3
- 3a. Body with vertical dark bands, without yellow dots when alive, snout length almost equal to eye diameter
..... *Carangoides ferdau*
- 3b. Body without dark bands, with yellow dots when alive, snout length longer than eye diameter
..... *Carangoides orthogrammus*

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