

Synopsis of Family Mugilidae (Perciformes) from Korea

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The taxonomic revision of the family Mugilidae from Korea was made based on the fish specimens collected from the coasts of the Korea from July 1990 to July 1994. The family Mugilidae was classified into three species belonging to two genera: *Mugil cephalus*, *Liza haematocheilus* and *Liza carinatus*. Previously *Mugil japonicus* reported as a species from Korea was confirmed into junior synonym of *Mugil cephalus*, based on the external and internal morphological characters.

A new key to the genera and species of family Mugilidae was proposed and described their distribution in Korea.

Introduction

The first report of the mugilid fishes in Korea was by Jordan and Metz (1913) who reported *Mugil cephalus* and *Liza haematocheila*.

From the collections of Korean marine fishes which have been made by the Mori and Uchida (1934), Mori (1952) and Chyung (1977), 4 species of family Mugilidae have been already known. They are *Mugil cephalus*, *Mugil japonicus*, *Liza carinatus* and *Liza haematocheila*. The aim of the study is to make more detail redescription on the Korean mugilid fishes.

The specimens of the examined fishes were deposited at the Department of Biology, College of Natural Science, Kunsan National University (BKNU).

Methods

The specimens were collected from 7 localities (Inchon, Seoul, Yosu, Tolsando, Pusan, Sohuksando, Cheju-shi) around the coast of Korea from July 1990 to July 1994. Counts and measurements were

made in accordance with method of Hubbs and Lagler (1958) except the measurements of internal organs and otolith. The number of vertebrae and fin rays were counted by radiographs. And size of gastrics were compared the ratio of vertical and horizontal length of stomach. The preparations of the skeletal specimen are made according to the method of Taylor (1967).

Lists of the examined specimen described in description of species, respectively.

Family Mugilidae

Key to the genera and species

- 1a. Hind tip of maxilla not curved below tip of premaxilla. Preorbital bone not curved. Adipose eyelid well developed. Anal fin 8 rays. Pectoral axillary scale present. Several teeth rows in premaxillary with bicuspid except outside row. Pyloric caeca 2 Genus *Mugil* *Mugil cephalus* Linnaeus
- 1b. Hind tip of maxilla curved below tip of premaxilla. Preorbital bone curved. Adipose eye-

lid slightly or not developed. Anal fin mostly 9 rays. Pectoral axillary scale absent or slightly developed. Almost one row of teeth with incisor-like tips in premaxillary
 Genus *Liza* 2

- 2a. Back keeled in front of first dorsal fin. Pectoral axillary scale slightly developed. Pyloric caeca 5
 *Liza carinatus* (Cuvier et Valenciennes)
- 2b. Back not keeled in front of first dorsal fin. Pectoral axillary scale almost absent. Pyloric caeca 6
Liza haematocheilus(Temminck et Schlegel)

Genus *Mugil* Linnaeus, 1758

Mugil Linnaeus, 1758. Syst. Nat., ed. 10, 1:316
 (Type specimen: *Mugil cephalus* Linnaeus).

Posterior tip of maxillary not curved down below tip of premaxillary (Fig. 1A), and not exposed when mouth closed, sometimes visible as thin streak above lip; upper lip with several teeth rows, a outside row with pointed tips but several inside rows with bicuspid on tips (Fig. 5), lower lip with a thin edge, directed horizontally forward. Pectoral

axillary scale well developed. Fatty tissue(adipose eyelid) well developed and almost covered the iris of eye.Pyloric caeca was two(Fig. 7).

***Mugil cephalus* Linnaeus, 1758**

(Korean Name : Sung-eo) (Fig.1)

Mugil cephalus Linnaeus, 1758, Syst. Nat., 10th, ed., 1, p. 316 (Europe) -- Günther, 1861, Cat. Fish. Brit. Mus., Vol. III, p. 417 (Mediterranien; Coast of Madeira; Nile; Fresh-water lakes of Tunis; West coast of Africa) -- Jordan & Seale, 1905, Proc. U. S. Nat. Mus., Vol. X, p. 4 (Hong Kong) -- Oshima, 1922, Rep. Ann. Car. Mus., Vol. XIII, Nos. 3~4, p. 243 (Taiwan) -- Wang, 1933, Contr. Biol. Lab. Sci. China, Vol. IX, No. 1, p. 72, fig. 37 (Chefoo) -- Chyung, 1977, Iiji-sa, pp. 288~291 -- Chu *et al.*, 1984, Fujian Sci. Tech. Press, pp. 487~489 -- Wongratana, 1984, Nat. Hist. Bull. Siam Soc., 32(1) ; 11~20 -- Fischer et Bianchi, 1984, Food & Agr. Organ. U.N., pp. 1~56 -- Kuitert, 1993, Crawford House Press, p. 263.

Mugil cephalus cephalus Masuda, Amaoka, Araga, Uyeno and Yoshida, 1988, Japan, p. 119, pl. 104-G.

Mugil japonicus Temminck et Schlegel, 1847, Fauna Japonica, Poiss., p. 134, pl. 72, fig. 1. Nagasaki -- Chyung, 1977, Iiji-sa, p. 291, pl.

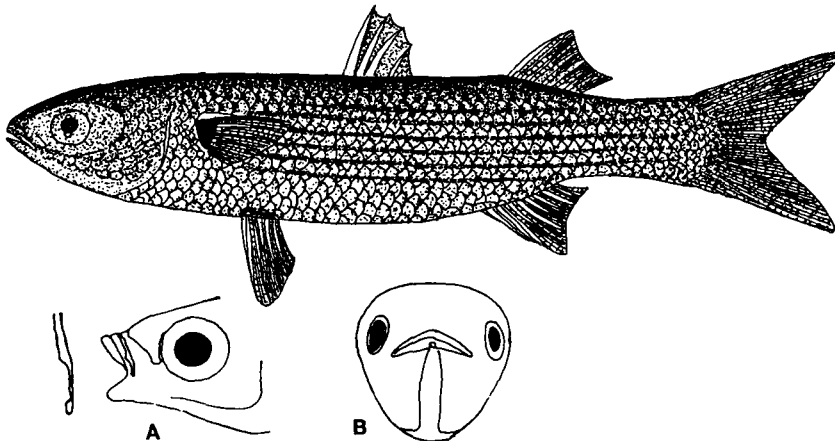


Fig. 1. *Mugil cephalus* Linnaeus, BKNU 1678, 360 mm SL.
 A: Maxilla of mouth B: Anterior view of head part.

187, 2~4; Matsubara, 1979, Ishizaki-Shoten, part 1, p. 490.

Examined specimens: BKNU 672~679, 7 individuals, 226.6~239.6 mm standard length SL, Nam-san-dong Yosu-shi Chollanam-do, October 31, 1992; BKNU 1676~1678, 3, 329.4~366.9 mm SL, Nam-po-dong Chung-gu Pusan, May 1, 1993; BKNU 1670~1671, 2, 346.0~363.0 mm SL, Hang-dong Chung-gu Incheon, February 18, 1994; BKNU 1687, 1, 172.2 mm SL, Tolsando Yochon-gun Chollanam-do, April 2, 1994; BKNU 1679, 1, 191.8 mm SL, Haemang-dong Kunsan-shi Chollabuk-do, July 10, 1992; BKNU 4310, 1,253.2 mm SL, Samchunpo-shi Kyongsangnam-do, July 17, 1994.

Description: Dorsal fin IV-9 (rarely 8), anal fin III, 8, pectoral fin rays 15~17 (mostly 16), numbers of longitudinal scales 36~40, gill rakers 31+67~68, TR. 14~15, pyloric caeca 2.

Specimens in percent of standard length : body depth 18.4~22.7 (20.5 ± 1.3)%; head length 24.3~26.7 (25.4 ± 0.6); caudal peduncle length 16.1~20.4 (18.7 ± 1.21); caudal peduncle depth 8.5~9.8 (9.2 ± 0.34); snout length 4.6~8.3 (7.1 ± 0.8); eye diameter 3.7~6.8 (5.9 ± 0.80); interorbital width 11.6~14.3 (12.8 ± 0.64); distance of first predorsal fin 46.0~51.3 (49.0 ± 1.58); distance of prepectoral fin 25.6~27.7 (26.5 ± 0.70); distance of preventral fin 36.2~39.8 (38.1 ± 0.94); distance of preanal fin 67.1~73.2 (70.3 ± 1.59); distance of second predorsal fin 69.7~75.9 (72.8 ± 1.70); distance between first and second dorsal fin 23.0~28.0 (25.4 ± 1.55). Specimens in percent of head length : snout length 18.3~32.0 (27.9 ± 3.16); eye diameter 18.8~29.5 (24.1 ± 2.96); interorbital width 45.2~55.3 (50.4 ± 2.41).

Body covered with moderate-sized scales, cycloid in young, becoming weakly ctenoid in adults. Several rows of large scales on opercle and cheek. Body robust, head much flattened dorsally, adipose tissue covering most of eye, except for area across pupil; Mouth terminal, with a prominent symphyseal knob at center of lower jaw, lips thin, upper lip forming anterior tip of the head, lower lip directed horizontally forward, maxillary not exposed when mouth is closed and hind tip of it not curved below tip of

premaxilla (Fig. 1A). Premaxillary angle is about 110° . Preorbital with anterior edge nearly straight and posterior edge nearly truncate; they are strongly serrated anteriorly (Fig. 4). Nostrils widely separated from each other, the anterior one pore-like and near to upper lip; the posterior one slit-like and much larger vertically situated just above the level of anterior one, and slightly closer to eye than the anterior nostril. Teeth labial, 1 to 6 rows in upper lip, upper lip with several teeth rows, a outside row with pointed tips but several inside rows with bicuspid on tips (Fig. 5), 1 to 4 rows in lower lip, outer rows unicuspid, inner rows usually bicuspid; hind end of upper jaw reaching to vertical from anterior rim of eye, preorbital bone slender and triangle, filling only half space between lip and eye and unnotched (Fig. 4). Glossohyal bone has a pair of processes posteriorly. First dorsal fin origin nearer to snout tip than to caudal fin base, second dorsal fin origin in front of vertical through mid-point of anal fin base. Pectoral axillary scale long 33 to 36% of pectoral fin length. Anal fin with 3 spines and 8 soft rays. Second dorsal and anal fins lightly scaled anteriorly and along base. Scales in lateral series 36 to 40. Branchiostegal rays 5. The margin of otolith is smooth, and sulcus is almost straight (Fig. 6). The stomach is short and hard with 2 pyloric caeca (Fig. 7), and peritoneum is black.

Body colour: Olive-green on back, silvery on both sides, shading to white below. Margin of dorsal and caudal fins dusky. Darkish grey on back and top of head in formalin, gradually paler on sides and becoming greyish silvery beneath, with about 7~8 darker stripes along flanks, anterior part of premaxilla and posterior part of maxilla darkish grey, a transverse diffuse dark spot on upper part of pectoral fin base. All fins except pelvic fins more or less darkish.

Distribution: All coastal sea of Korea, Japan, China, Taiwan, Philippines, Borneo and widely distributed in all warm sea except for tropical West Africa to the coast of Morocco.

Remarks: The taxonomic position of *Mugil japonicus* from Korea well known by Chyung (1977) was deeply rechecked in this study. Although Temminck et Schlegel (1947) and Matsubara (1979)

described as the separated species between *Mugil cephalus* and *Mugil japonicus*, based on the several taxonomic characters: the number of longitudinal scales, the body depth to standard length and distance of predorsal, but they had overlap with each other completely. Recently Abe(1989), Masuda *et al.*(1988) and Nakabo(1993) also don't dividing into the independent species according to only above criteria. As a results, *Mugil japonicus* was classified into the same species with *Mugil cephalus* when compared with the several taxonomic characters. finally I was considered that the former has to come under the junior synonym of *Mugil cephalus*. On the other hand, Chyung(1977) also emphasised that *Mugil japonicus* has to just review in future, because two species fairly resembled in morphological characters each other.

Genus *Liza* Jordan et Swain, 1884

Liza Jordan et Swain, 1884. Proc. U. S. Nat'l. Mus., 7: 261(type specimen: *Mugil capito* Cuvier).

Posterior tip of maxillary curved down below tip of premaxillary, and exposed when mouth closed. both lips thin, with some papillae at premaxillary and without plicate fringes. Pectoral axillary scale rudimentary or absent. Adipose eyelid not developed. Pyloric caeca was 5 to 6 (Fig. 7). The stomach is very short and thick. Almost one row of teeth

under the premaxillary lip with incisor-like (Fig. 5).

Liza carinatus (Cuvier et Valenciennes 1836

(Korean Name: Dungjul-sung-eo) (Fig. 2)

Mugil carinatus (Ehrenberg) Cuvier et Valenciennes, 1828~46, Hist. Nat. Poss., 11, p. 148(Red Sea) -- Day, 1878~88, Fish. India, p. 800 (Seas of India) -- Oshima, 1922, Ann. Car. Mus., Vol. XIII, Nos. 3~4, p. 247 (Taiwan) -- Wu, 1929, Contr. Biol. Lab. Sci. China, 5(4): 79 -- Mori, 1952, 1(3), p. 81.

Liza carinatus: Chu *et al.* 1984, Fujian Science & Technology Press, pp. 492~493.

Liza carinata, Fischer et Bianchi, 1984, Food & Agr. Organ. U. N., pp. 1~56 -- Chyung, 1977, Ilji-sa, p. 291.

Examined specimens: BKNU 530, 1,170.3 mm SL, Tolsando Yochon-gun Chollanam-do, May 20, 1992; BKNU 685~690, 5, 86.4~186.0 mm SL, Tolsando Yochon-gun Chollanam-do, April 2, 1994; BKNU 1691~1706, 16, 163.7~176.3 mm SL, Tolsando Yochon-gun Chollanam-do, April 24, 1994; BKNU 1792~1802, 10, 125.9~199.9 mm SL, Tolsando Yochon-gun Chollanam-do, June 12, 1994.

Description: D. IV-9, A. III,9, P. 16~18, LL. 36~

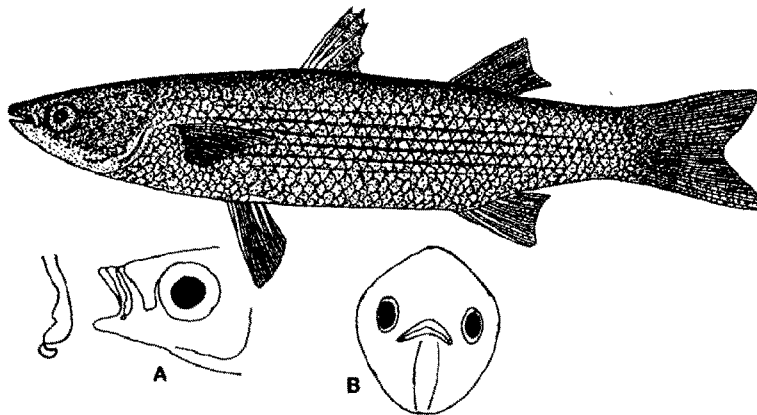


Fig. 2. *Liza carinatus* (Cuvier et Valenciennes), BKNU 1801, 193 mm SL.
A: Maxilla of mouth B: Anterior view of head part.

41, TR. 13, GR. 26~27+47~49.

Specimens in percent of standard length: body depth 16.4~24.0 (21.3 ± 1.75); head length 22.5~29.2 (24.4 ± 1.43); caudal peduncle length 17.3~20.4 (18.4 ± 1.05); caudal peduncle depth 9.2~10.7 (10.1 ± 0.33); snout length 5.5~7.5 (6.4 ± 0.50); eye diameter 4.9~7.4 (5.9 ± 0.64); interorbital width 7.8~10.3 (8.8 ± 0.63); distance of predorsal 45.4~50.0 (47.1 ± 1.14); distance of prepectoral 23.8~30.4 (25.7 ± 1.45); distance of preventral 36.2~40.3 (38.0 ± 0.96); distance of preanal 69.2~74.3 (71.7 ± 1.38); distance of second predorsal 71.2~75.9 (73.4 ± 1.20); distance between first and second dorsal 25.0~29.1 (27.5 ± 1.22). In percent of head length: snout length 23.7~28.1 (26.2 ± 1.30); eye diameter 20.9~30.7 (24.1 ± 2.43); interorbital width 32.6~40.0 (36.2 ± 2.13).

Body moderately robust, head moderately wide, higher and broad, dorsally convex, its width about equal to width of mouth cleft, a distinct keel or ridge present in front of first dorsal fin. Lips thin, lower lip with a high symphyseal knob, hind end of upper jaw reaching ventral from anterior eye margin. Hind tip of maxillary exposed when mouth is closed and curved below tip of premaxilla (Fig. 2A). Premaxillary angle is about 130° . Preorbital with many serration curved and slightly longer than that of *Mugil cephalus* (Fig. 4). Nostril widely separated from each other, the anterior one pore-like and near to upper lip, the posterior one slit-like and situated just above the level of anterior one. Premaxillary teeth with unicuspid is almost one row with incisor-like tips (Fig. 5). Glossohyal bone has not process posteriorly. First dorsal fin origin nearer to snout tip than to caudal fin base; second dorsal fin origin at vertical through end of anterior quarter of anal fin base. Pectoral axillary scale some development, anal fin with 3 spines and 9 soft rays. Scales in lateral series 36 to 41, scales on head extend forward to level of anterior nostrils, becoming weakly ctenoid in adults. The margin of otolith has many irregular wave-like serration (Fig. 6). The stomach is very short and hard with 5 pyloric caeca (Fig. 7) (Table 1).

Body colour: Greenish grey dorsally, silvery on side and flanks with about 7~8 darker stripes

along body sides; darkish around the eye, end of maxilla black. Dorsal, caudal and pectoral fins with the brackish spots on their basal halves. In formalin, darkish greyish blue on back of trunk and top of head, and becoming silvery beneath of body. Peritoneum is black.

Distribution: South Sea of Korea, China, Taiwan, Indian Ocean, Red Sea.

Liza haematocheilus (Temminck et Schlegel), 1845

(Korean name: Gasung-eo) (Fig. 3)

Mugil haematocheilus Temminck et Schlegel, 1845.

Fauna Jap. (Pisc.), pts. 7~9: 135, pl. 72, fig. 2.

Mugil so-iuy Basilewsky, 1855. Nour. Mem. Soc. Nat. Moscou, 10: 226, pl. 4, fig. 3.

Liza haematocheila: Chyung, 1977, Ilji-sa, p. 292 -- Chu, *et al.* 1984. Fugian Sci. Tech. Press, pp. 493~494, pl. 339 -- Masuda, Amaoka, Araga, Uyeno and Yoshino, 1988, Japan, p. 119, pl. 104-H.

Examined specimens: BKNU 882~884, 3, 170.2~196.0 mm SL, Oeun-dong Okku-gun Chollabuk-do, July 30, 1990; BKNU 1180~1184, 5, 214.2~260.6 mm SL, Haemang-dong Kunsan-shi Chollabuk-do, September 10, 1992; BKNU 1286~1290, 5, 216.4~253.1 mm SL, Hang-dong Chung-gu Inchon, February 17, 1994; BKNU 1300, 1, 229.2 mm SL, Tolsando Yochon-gun Chollanam-do, April 2, 1994; BKNU 1351~1352, 2, 181.2~221.3 mm SL, Tolsando Yochon-gun Chollanam-do, May 20, 1994; BKNU 3312~3334, 23, 180.3~243.5 mm, Kyehwado Kyehwa-myeon Puan-gun Chollabuk-do, May 31, 1992; BKNU 3312, 1, 228.1 mm, Samchunpo-shi Kyongsangnam-do, July 17, 1994; BKNU 3340~3361, 22, 153.2~178.5 mm SL, Kyehwa-do Puan-gun Chollabuk-do, August 21, 1993; BKNU 3370~3371, 2, 243.2~245.6 mm SL, Kyehwa-myeon Puan-gun Chollabuk-do, September 22, 1990.

Description: D. VI-9, A. III,9 (rarely 8), P. 16, LL 38~40, GR. 36~37+56~59, TR 13.

Specimens in percent of standard length: body

depth 15.5~19.0 (17.3 ± 1.03) 1%; head length 23.6~27.2 (24.7 ± 0.93); caudal peduncle length 17.4~22.4 (20.1 ± 1.31); caudal peduncle depth 9.2~11.0 (10.0 ± 0.44); snout length 5.7~7.1 (6.3 ± 0.37); eye diameter 3.4~4.9 (3.9 ± 0.39); Interorbital width 9.3~11.4 (10.0 ± 0.59); distance of predorsal 45.0~49.9 (46.7 ± 1.26); distance of prepectoral 23.8~27.3 (25.8 ± 0.95); distance of pre-ventral 35.3~39.0 (37.1 ± 1.00); distance of preanal 70.2~75.6 (71.2 ± 1.35); distance of second predorsal 72.5~76.4 (73.8 ± 1.04); distance between first and second dorsal 26.4~29.4 (28.0 ± 0.95). In percent of head length; snout length 21.1~29.1 (26.0 ± 2.01); eye diameter 12.5~18.8 (16.0 ± 1.63); interorbital width 38.0~47.8 (40.6 ± 2.37).

Body elongate, head wide and flatted dorsaly, ventral part roundly. Eye small and round, placed anterior part of head. Adipose tissue(eyelid) present in adults, but not developed. First dorsal fin origin nearer to end of snout than to caudal base. Interorbital surface flatted, broad and scaly, antrior and inferior preorbital bone with serration (Fig. 4). Mouth terminal, with a prominent symphysial knob at tip of lower jaw, lips thin, upper lip forming anterior tip of the head. Premaxillary teeth with uncuspid is almost one row with incisor-like tips (Fig. 5). Hind tip of maxillary exposed when mouth is closed. Posterior tip of maxillary curved down be-

low tip of premaxillary (Fig. 3A), and preorbital also curved down below tip of premaxillary with serration (Fig. 4). Premaxillary angle of mouth is about 120° . The number of pyloric caeca of stomach is six (Fig. 7). The form of otoliths have a little serration of margin and two sulcuses in external side (Fig. 6).

Body color: Dark grey on back and top of head in formalin, gradually paler on both side and becoming slightly silvery beneath, with about 6~7 string-like stripes along the flanks. Base of pectoral fin has not dark spot on upper part. The peritoneum is black.

Distribution: All coastal sea of Korea, Japan, China, Taiwan, Philippines.

Remarks: This species resembles *Mugil cephalus*, but differ in having 9 anal rays (versus 8), long maxilla and preorbital curved down below tip of premaxilla, and did not developed fatty tissue around eye and have not modified axillary scale at all and having 6 pyloric caeca (Fig. 7).

Discussion

Smith and Heemstra (1986) reported that the family Mugilidae distributed in the world is comprised in 13 genera and containing about 70 species.

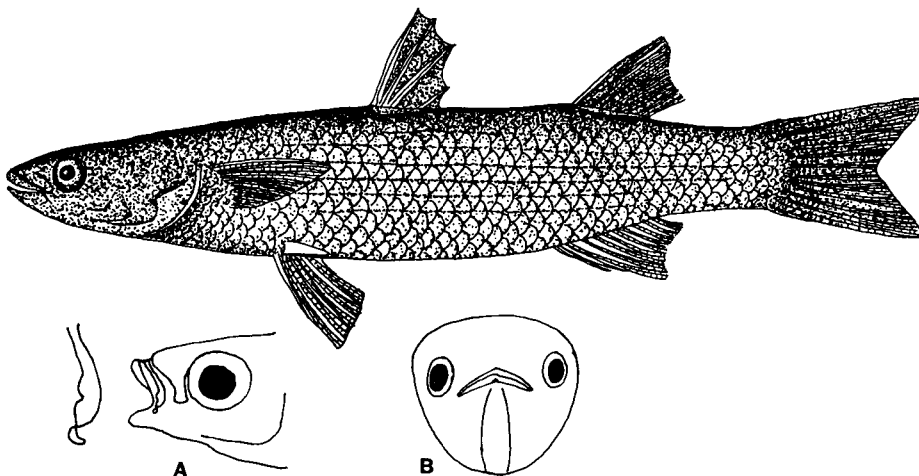


Fig. 3. *Liza haematocheilus* (Teminck et Schlegel), BKNU 1286, 253 mm SL.
A: Maxilla of mouth B: Anterior view of head part.

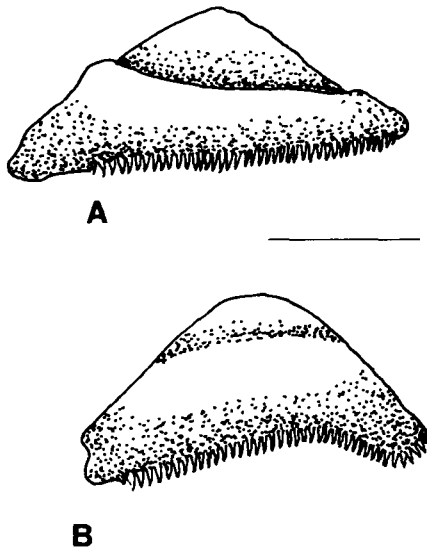


Fig. 4. Preorbital bone, A: *Mugil cephalus*, B: *Liza haematocheilus* and *Liza carinatus*, Scale bar indicates 3 mm.

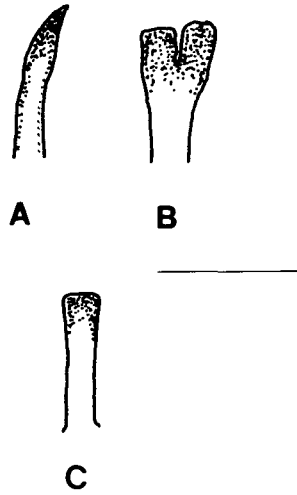


Fig. 5. The form of maxillary teeth, A and B: outside and inside teeth of *Mugil cephalus*, C: outside teeth of *Liza haematocheilus* and *L. carinatus*. Scale bar indicates 0.5 mm.

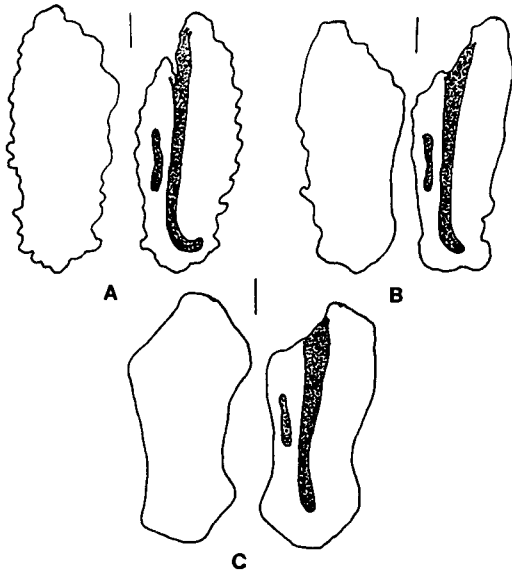


Fig. 6. The shapes of otolith, A: *Liza carinatus*, B: *Liza haematocheilus*, C: *Mugil cephalus*, Scale bars indicate 1 mm each.

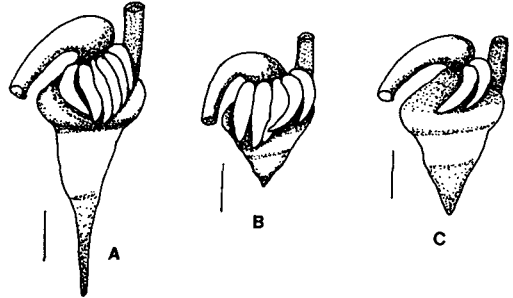


Fig. 7. The form of stomach and the number of the pyloric caeca, A: *Liza haematocheilus*, B: *Liza carinatus*, C: *Mugil cephalus*, Scale bars indicate 10 mm each.

The first mugilid fishes of Korea was described by Jordan and Metz (1913), as the two species: *Mugil cephalus* and *Liza haetomacheilus*. After that Mori

and Uchida (1934) also reported two species like those of Jordan and Metz (1913). But Mori (1952) described that the family Mugilidae from Korea were classified into four species: *Mugil cephalus*, *Mugil japonicus*, *Mugil carinatus* and *Liza haematocheila*. In the monographic works on the Korean fish, Chyung (1977) redescribed them transferring *Mugil carinatus* into *Liza carinatus*.

In the taxonomic characters between genera *Mugil* and *Liza* in the family Mugilidae, the shapes of

Synopsis of Family Mugilidae(Perciformes) from Korea

maxillary and the numbers of anal ray are very important characteristics: genus *Mugil* did not curved down below tip of premaxillary, but genus *Liza* curved down below its tip; numbers of anal rays of genus *Mugil* are 8, but genus *Liza*, 9 mostly (Table 1).

The family Mugilidae have the several modified scales in all species, the modified scales below the dorsal and ventral fins have commonly, but in axillary modified scale, only *Mugil cephalus* well developed, and *Liza carinatus* has slightly developed but *Liza haematocheilus* absent at all.

Interorbital space of *Mugil cephalus* and *Liza haematocheilus* are fairly flatted, but *Liza carinatus* is convex (Fig. 1~3B). In the premaxillary teeth, *Mugil cephalus* has several teeth rows, with outer one row teeth with pointed tips and inner several rows with bicuspid, but *Liza carinatus* and *Liza haematocheilus* have almost one row of teeth with incisor-like tips (Fig. 5).

In the shapes of the gastric portion, *Liza haema-*

tocheilus has long developed stomach, but *Mugil cephalus* and *Liza carinatus* are very short, especially that of *Liza carinatus* is a very short among three species (Fig. 7). In number of their pyloric caeca, *Mugil cephalus* has only two, but *Liza carinatus* has five, and *Liza haematocheilus* has six, respectively (Fig. 7)(Table 1). In number of gill raker *Mugil cephalus* has numerous and slender. On the other hand, Smith and Heemstra (1986) described that the number of gill rakers have no systematic significance, because they increase in numbers with growth.

In the shapes of otolith, *Mugil cephalus* has a smooth margin and almost straight sulcus on outside, and *Liza haematocheilus* has some irregular margin and a little curved tip of sulcus, but *Liza carinatus* has much irregular structures of margin and deeply curved sulcus at tip (Fig. 6).

In the Intergeneric characters of family Mugilidae are as follows: genus *Mugil* has a short maxilla, not curved down below tip of premaxillary, but

Table 1. Comparison of taxonomic characters of the *Mugil cephalus*, *Liza haematocheilus* and *Liza carinatus*

Characters	<i>Mugil cephalus</i>	<i>Liza haematocheilus</i>	<i>Liza carinatus</i>
Hind tip of maxilla	not curved	curved	curved
Preorbital bone	stright	curved	curved
Stripes of flanks	broad	slender	broad
Adipose eyelid	well developed	a little or absent	absent
Status of glossohyal	processed	not processed	not processed
Margin of otolith	smooth	a little wave-like	deeply wave-like
Shape of sulcus of otolith	stright	slightly curved	deeply curved
Form of occipital part	flat	flat	convex
Pectoral axillary scale	well developed	absent	a little developed
Ratio of longitudinal to transverse of stomach	1.5~1.8	2.6~3.0	1.4
Numbers of pyloric caeca	2	6	5
Anal fin ray	8	8~9 (mostly 9)	8~9 (mostly 9)
Gill rakers	31+67~68	36~37+56~59	26~27+47~49
Branchiostegal rays	5	5	6
Angle of premaxillary	110°	120°	130°
Number of teeth row	several	1~2	1~2
Form of teeth of upper jaw	outer-pointed inner-bicuspid	incisor-like	incisor-like

genus *Liza* has a long one, with curved down below tip of premaxillary (Fig. 1~3A); genus *Mugil* has a triangular preorbital bone, with serration anteriorly and stright, but genus *Liza* has a curved one, with many serration anteriorly (Fig. 4); genus *Mugil* has 8 anal fin rays, but genus *Liza*, 9 (rarely 8)(Table 1). Chyung (1977) reported that preorbital bone of *Liza carinatus* has not serration, but this species has distinctly serration on it like that of *Liza haematocheilus*. In the form of glossohyal, genus *Mugil* has a pair of process in postrior tip, but genus *Liza* has not process in it; adipose tissue (eyelid) of genus *Mugil* well developed in around of eye, with covered eye and its around portion broadly except only their pupil, but genus *Liza* not developed or absent.

Masuda *et al.* (1988) had strongly emphasised that genus *Mugil* differed from genus *Liza* in the shape of maxillary and the status of curved forms of it. Matsubara (1979) easily classified them based on the taxonomic character between genera *Mugil* and *Liza* through the feature of preorbital bone, the shapes of vetebrae and their glossohyal and the form of their premaxilla and maxilla.

I have deeply recheck the taxonomic position of *Mugil japonicus* known as a independent species previously. Although Temminck et Schlegel (1947) and Matsubara (1979) described as the separated species between *Mugil cephalus* and *Mugil japonicus*, based on the several taxonomic characters: the number of longitudinal scales, the body depth to standard length and distance of predorsal, they had overlap each other completely. Recently Abe (1989), Masuda *et al.* (1988) and Nakabo (1993) don't dividing into the separated species, and they have no regard for above criteria because above characters were overlapped with two species. So I was also considered that *Mugil japnicus* was classified into the same species with *Mugil cephalus* when compared with the several taxonomic characters.

as a results, I think that the former has to come under the junior synonym of *M. cephalus*.

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韓國產 승어科 魚類의 分類

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1990년 7월부터 1994년 7월까지 우리나라의 沿岸에 서식하고 있는 승어科 어류의 分類學的 位置와 이들의 特徵을 再檢討하였다. 그 結果 승어 *Mugil cephalus*, 가승어 *Liza haematocheilus*, 등줄승어 *Liza carinatus* 등 2屬 3種으로 分類되었고 지금까지 棲息하고 있는 것으로 報告된 알승어 *Mugil japonicus*는 *Mugil cephalus*와 同一種으로 確認되어 *Mugil cephalus*의 synonym으로 整理하였다. 이들 어류의 屬間 重要 分類學的인 形質로서는 뒷지느러미의 軟條數, 上顎骨의 後端 길이와 形態, 舌骨의 形態, 眼前骨의 形態, 上顎齒의 形態 등에서 잘 구분되었고, 種間 分類學的인 形質로서는 胃의 形態, 유문수, 縱列 비늘수, 耳石의 形態, 體形, 새파수, 前上顎의 角度 등에서 獨特하게 나타났다. 이들의 棲息 地域은 *Mugil cephalus*와 *Liza haematocheilus*는 거의 같이 出現하며 우리나라의 全 沿岸에 棲息하고 있으며, *Liza carinatus*는 南海에서만 出現하고 있었다.