

Synopsis of the Stargazer Fish, Family Uranoscopidae (Perciformes) from Korea

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The taxonomic revision of the family Uranoscopidae from Korea was made on the basis of the specimens collected in the coasts of the Korea from 1986 to 1994. The key to the species and genera for classification of the family Uranoscopidae was provided with synonym and their distributions. The stargazer fishes from Korea are composed of 6 species in 3 genera: *Uranoscopus japonicus*, *U. bicinctus*, *U. chinensis*, *U. tosaе*, *Gnathagnus eolngatus* and *Ichthyoscopus lebeck sannio*.

The Korean stargazer fishes were widely distributed in the West and South Sea of Korea, but only *Ichthyoscopus lebeck sannio* distributed in the around sea of Cheju Island.

KEY WORDS: Synopsis, Stargazer Fish, Uranoscopidae

The stargazer fishes are a group of typical marine fishes, mostly living in warm and temperate sea in the world. The history of our knowledge about these fishes has begun from the description of genus *Uranoscopus* Linnaeus (1758).

It is well known that the stargazer fishes show remarkable morphological features like clavate type (Flower, 1972; Matsubara, 1979; Chu *et al.*, 1985). The systematic studies of the stargazer fishes have been carried out by many ichthyologists (Linnaeus, 1758; Gill, 1861; Liang, 1955; Berry and Anderson, 1961; Pitsch, 1989) but this taxa from Korea did not reviewed so far Mori (1952) and Chyung (1977) who listed 3 species belong to 2 genera. For the last few years, authors have reported the three new records living around the South Sea of Korea. Therefore, the present work aimed to describe the morphological characters and to review their taxonomic position and to propose a new key to the species and genera for classification of the family Uranoscopidae.

Methods of measuring and counting of

specimens used in this study was made according to the criteria of Kishimoto (1987). The examined specimens were deposited at the Department of Biology, College of Natural Science, Kunsan National University (BKNU).

Genus *Uranoscopus* Linnaeus
(Korean name : Tonggumeong-sog)

Uranoscopus Linnaeus, 1758 : 250 (type species *Uranoscopus scaber* Linnaeus, 1758, by monotypy) – Mori, 1952, Mem. Hyogo Univ. Agr., 1(3), p.125 – Chyung, 1977, Iljisa, Korea, p. 418

***Uranoscopus japonicus* Houttuyn**

(Korean Name : Eolrug-Tonggumeong) (Fig. 1)

Uranoscopus japonicus Houttuyn, 1782, Verh. Holl. Maats. Wetenschappen Haarlem, 311. Nagasaki – Mori et Uchida, 1934, J. Chosen Nat. Hist. Soc., 19, p. 31 – Mori, 1952, Mem. Hyogo Univ. Agr., 1(3), p. 125 – Chyung, 1977, Iljisa, Korea, p. 419 – Kim and Kang, 1993, Academy, Korea, pp. 356-357.

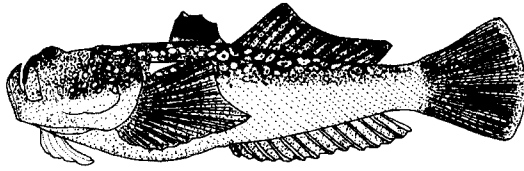


Fig. 1. *Uranoscopus japonicus*, BKNU 2201, 231.7 mm SL.

Material examined: BKNU 2110-2112, 3 specimens, 166.3-219.3 mm, in standard length (SL), Haemang-dong, Kunsan-shi, Chollabuk-do, October 10, 1992; BKNU 2550-2558 (9), 168.3-231.7 mm SL, Pusan, August 10, 1993; BKNU 2201-2208 (8), 187.4-233.9 mm SL, Tongmoon market, Cheju-shi, Cheju-do, July 6, 1994.

Description: Dorsal fin rays IV~V-13~15, anal fin rays 14-15, pectoral fin rays 18-19, ventral fin rays I, 5, preopercular spines 3 (rarely 4). Fimbriae of upper lip 6-8 and those of lower lip 23-27.

Head large and very hard, with moderately bony plates in top and side. Lower edge of preopercular with 3 spines (seldom 4). Well developed cleithral spine over twice diameter of eye (7.8% in standard length), directed obliquely up and back. External apparent bones of head, slightly concave along middorsal line. Two occipital lobes developed. Interorbital fossa not reaching line joining posterior margin of orbits. Anterior nostril tubular but posterior one slit without flap. Labial fimbriae on lower lip distinct and papillose with smooth edges but those of upper lip indistinct and knoblike or rudimentary. Cycloid scales developed in oblique rows, all directed downward and backward. Head, nape between both lateral lines, breast and belly naked. Dorsoposterior margin of pectoral fin slightly concave.

Several important morphometric characters of *U. japonicus* were showed through the table 1. Color of body: When the fishes were fresh, upper half of body greenish brown with pale yellowish rings or spots, which are usually irregular in shape and slightly smaller than eye. Dorsal fin greenish brown, with some pale yellow cross bars. Pectoral fin pale yellow with whitish margin on ventral and posterior edges, and anal fin white. When preserved specimens in formalin solution, ground

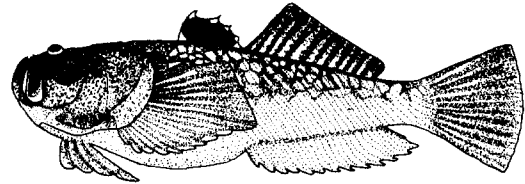


Fig. 2. *Uranoscopus chinensis*, BKNU 1899, 216.9 mm SL.

color of upper part of head and body dark brown, with base of dorsal fin. Yellow and whitish portion for fresh specimens evenly pale or white.

Distribution: West and South Sea of Korea, China, Taiwan and Japan.

Remarks: This species is similar to *U. chinensis*, but differ in having the net-like patterns in the head part and the preopercular with three spines. *Uranoscopus japonicus* was originally reported by Houttuyn (1782) on the basis of the specimen from Nakasaki, Japan. But Cuvier and Valenciennes (1829), Jordan and Snyder (1901) and Boeseman (1947) had ever raised a question in argument for Houttuyn's criteria of the fin formula. A neotype of *U. japonicus* was assigned by Kishimoto (1987) and redescribed it more detail.

***Uranoscopus chinensis* Guichenot**

(Korean name : Min-Tonggumeong) (Fig. 2)

Uranoscopus chinensis Guichenot (by Sauvage, 1882), Bull. Soc. Philomath. 7 (6), 168-176.

Uranoscopus flavipinnis, Lee, 1991, Korean J. Ichthy., 3(2), pp. 84-88.

Material examined: BKNU 746-749 (4), 132.5-196.5 mm SL, Kunsan, Chollabuk-do, July 29, 1991; BKNU 1676, 1677 (2), 193.3, 237.5 mm SL, Chollabuk-do, August 20, 1991 ; BKNU 1897-1898 (2), 186.7-221.5 mm SL, Kunsan, Chollabuk-do, September 20, 1991; BKNU 1899-1900 (2), 189.6-216.9 mm SL, Yosu, Chollanam-do, October 5, 1991.

Description: Dorsal fin rays IV-11~13, anal fin rays 12-13, pectoral fin rays 17, gill rakers 8-15, preopercular spine 4, upper labial fimbriae 14-22, lower labial fimbriae 33-37.

Eye small, body short and round, mouth large and vertical. Large head and upper part of it

depressed, body becoming slightly compressed posteriorly but outer morphology of body type showed clavate type. Anterior and posterior nostrils all tubular. Labial fimbriae on upper and lower lip with fringed edges slightly developed. Teeth on jaws conical, inner three or two series and larger than those in outer series on dentary. Scales on body characteristically developed in oblique rows directed downward and backward. Dorsoposterior margin of pectoral fin truncate. No surface on head part and opercular with net-like patterns. Lower edge of preopercular with four spines.

Several important morphometric characters of *U. chinensis* were showed in table 1.

Color of body: When specimens fresh, body reddish brown with pale yellowish net-like patterns dorsally, which are usually irregular and slightly smaller than eye in size. Head and body white ventrally. Lower part of pectoral and base of caudal fin deep yellow. Black area of first dorsal and second dorsal fin dark-brown and also those of anal fin. When specimens preserved in formalin solution, ground color of upper parts of head and body dark brown, second dorsal fin also dark brown.

Distribution: South Sea of Korea and Japan.

Remarks: Original description of *Uranoscopus chinensis* Guichenot was described by Sauvage (1882). And *U. flavipinnis* was reported by Kishimoto (1987). So Abe and Ochiai (1989) and Lee (1991) have ever recorded as *U. flavipinnis* according to Kishimoto (1987) but Pietsch and Kishimoto (1989) reported that *U. flavipinnis* come under a junior synonym of *U. chinensis*, on the basis of the comparison of important taxonomic characters between *U. flavipinnis* (Kishimoto, 1987) and *U. chinensis* (Sauvage, 1882), respectively.

***Uranoscopus bicinctus* Temminck et Schlegel**

(Korean Name : Tonggumeongi)

Uranoscopus bicinctus Temminck et Schlegel, 1843, Fauna Japnica Poiss., p. 26, pl. XB, Nagasaki – Mori et Uchida, 1934, J. Chosen Hist. Soc., 19, p. 31 – Mori, 1952, Mem. Hyogo Univ. Agr., 1(3), p. 125 – Chyung, 1977, Iljisa, Korea,

p. 419.

No material examined.

Distribution: South sea of Korea, Japan and China.

***Uranoscopus tosae* (Jordan et Hubbs)**

(Korean Name : Binul-Tonggumeong) (Fig. 3)

Zalescopus tosae Jordan and Hubbs, 1925, Mem. Carn. Mus., 10(2), p. 312.

Uranoscopus tosae, Lee, 1992, Kor. J. Ichthy., 3(2), 84-88.

Material examined: BKNU 20041 (1), 166.9 mm SL, Kunsan, Chollabuk-do, March 27, 1992.

Description: Dorsal fin rays IV-13, anal fin rays 13, pectoral fin rays 17, gill rakers 3+12, preopercular spine 4, upper labial fimbriae 9, lower labial fimbriae 23.

Eye small, body short and round form, mouth large and vertical. No surface on head and body with any net-like bands and black spots. First dorsal fin black, second dorsal dusky, anal and ventral fin whitish, but pectoral and caudal fin blackish. Labial fimbriae of upper and lower lips, very weak and short. Head slightly depressed at frontal and occipital regions. Teeth on upper and lower jaws, conical shapes, two rows of upper jaw and anterior two rows, and lateral one row of teeth on lower jaw. Many cycloid scales, embedded in nape between both lateral lines. Developed oblique rows directed downward and backward embedded many cycloid scales along the oblique lines. Dorsoposterior margin of pectoral fin concave some. Lower edge of preopercular with four spinous processes. Blackish respiratory valve with many black spots, fairly narrower and longer than orbit. Nostril pores placed in front of eye with two types, anterior nostril tubular and posterior slit.

Several important morphometric characters of

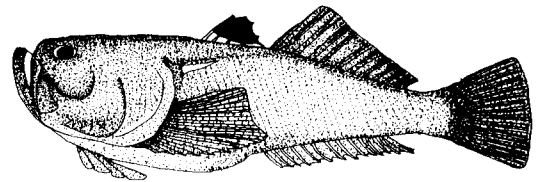


Fig. 3. *Uranoscopus tosae*, BKNU 20041, 166.9 mm, SL.

U. tosae were showed in table 1.

Color of body: Body surface has dark blackish brown without any net-like patterns and black spots in head and trunk. The surface of body and fins except dorsal fin showed redish when the specimen was fresh before put in the stock solution. But when the specimen preserved in 10% formalin solution, the redish color was slowly disappeared. Color upper portion of both lateral lines of body showed almost dark blackish and middle portion of body have blackish, and ventral parts showed almost whitish in adult male.

Distribution: South Sea of Korea and Japan.

Remarks: *Uranoscopus tosae* was close resemble with *U. oligolepis* in morphological features but the unique characters having only *U. tosae* are to embed the scales in nape between both lateral lines, to have 4 process of preopercular and to make anterior nostril pore tubular and posterior slit. Chu *et al.* (1985), Abe and Ochiai (1989) and Masuda *et al.* (1988) also mentioned that *U. tosae* is close similar to *U. oligolepis* in exomorphological features except having the scales in nape between the both lateral lines. Shen (1984) reported that respiratory valve of *U. oligolepis* prolonged into broad flap filament and shorter than orbit, but those of *U. tosae* was fairly longer and narrower than orbit.

Genus *Ichthyoscopus* Swainson
(Korean Name : Kunmunyi-Tonggumeong-sog)

Ichthyoscopus Swainson, 1839. Hist. Nat. Fish. etc. 2 : 296 (type species : *Ichthyoscopus inermis* Cuvier, 1829 [= *Uranoscopus lebeck* Bloch and Schneider, 1801] by subsequent designation of Gill, 1861).

Ichthyoscopus lebeck sannio Whitley
(Korean Name : Kunmunyi-Tonggumeong) (Fig. 4)

Ichthyoscopus sannio Whitley, 1936, Mem. Queens. Mus., II(1), 45-46, (Bowen, Queensland).

Material examined: BKNU 1706 (1), 242.2 mm SL, Tongmoon market, Cheju-shi, Cheju-do, May 15, 1986.

Description: Dorsal fin rays II, 18, pectoral fin

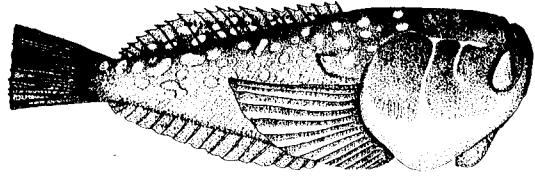


Fig. 4. *Ichthyoscopus lebeck sannio*, BKNU 1706, 242.2 mm, SL.

rays 17, anal fin rays 16, upper labial fimbriae 25, lower labial fimbriae 49.

Dorsal fin single. Body short and round form. Head large and cuboid. Head slightly depressed on frontal and occipital regions. Mouth large and vertical. Body somewhat compressed, covered with embedded cycloid scales arranged in oblique rows. Developed oblique rows directed downward and backward embedded cycloid scales along it. Spots on surface of body and dorsal fin large and white about 5-8 mm diameter, but anterior region of head without any white spots. Cleithrum no spine. Upper part of pectoral base, a board-like projection with fimbriated processes in each side. Edge of respiratory valve smooth without any fringes. Labial fimbriae on upper and lower lips well developed and branched. Dorsal fin origins intraspaces of pectoral. Form of pectoral fin triangular. Lower edge of preopercular no spinous process. Two pairs of external nostril pores placed in front of eye, with branched fimbriae around pores.

Several important morphometric characters of *I. lebeck sannio* were showed in table 1.

Color of body: When specimen placed in 10% formalin solution, surface of body has brown, with white spots about 5-8 mm diameters. The pectoral, anal and caudal fin except ventral fin represented somewhat right brown without any patterns, but ventral fin with a pale and dorsal fin with several white spots likewise patterns of body surface. When the specimens with fresh, lower margin of pectoral, anal and caudal fin showed yellowish and slightly redish, but these colors are slowly disappeared in 10% formalin solution. Portion of nape behind occipital part showed more dark brown with white spots.

Distribution: Around sea of Cheju Island, Japan, China and Taiwan.

Remarks: *Ichthyscopus sannio* was reported for the first time by Whitley (1936) in Australia. Here Whitley (1936) gave emphasis *Ichthyscopus sannio* from Australian differ from the figures of Indian type mainly in their coloration, shape and proportions. Recently Masuda *et al.* (1988), Abe (1987) and Nakabo (1993) reported that this fish from Japan described as *I. lebeck* previously was classified into *I. lebeck sannio*. This species was reported for the first time by Lee and Paek (1995). On the other hand, this specimen belong to the Korean stargazer fish has interorbital fossa longer than Japanese fish described into *I. lebeck sannio* by Nakabo (1993). Pietsch (1989) mentioned that genera *Ichthyscopus* and *Astrocopus* come under most derived groups in phylogenetic relationships of the family Uranoscopidae.

Genus *Gnathagnus* Gill

(Korean name : Pureong-tonggumeong-sog)

Gnathagnus Gill, 1862 : 115 (type species *Uranoscopus elongatus* Temminck and Schlegel, 1843, by monotypy) – Mori, 1952, Mem. Hyogo Univ. Agr., 1(3), p. 125 – Chyung, 1977, Iljisa, Korea, p. 419.

***Gnathagnus elongatus* (Temminck et Schlegel)**

(Korean Name : Pureong-Tonggumeong) (Fig. 5)

Uranoscopus elongatus Temminck et Schlegel, 1846, in Siebold, Fauna Jap. Pisces : 27, pl. 9, fig. 2.

Gnathagnus elongatus, Mori et Uchida, 1934, J. Chosen Nat. Hist. Soc., 19, p.3 – Mori, 1952, Mem. Hyogo Univ. Agr., 1(3), p. 125 – Chyung, 1977, Iljisa, pp. 419-420 – Kim and Kang, 1993, Academi, pp. 355-356.

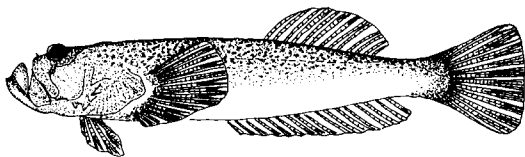


Fig. 5. *Gnathagnus elongatus*, BKNU 2001, 225.7 mm, SL.

Material examined: BKNU 2001-2002 (2), 223.8-225.7 mm SL, Incheon, February 17, 1992; BKNU 2004-2005 (2), 134.7-140.6 mm SL, Namsan-dong, Yoso-shi, Chollanam-do, August 7, 1992; BKNU 2010-2012 (3), 156.9-232.5 mm SL, Haemang-dong, Kunsal-shi, Chollabuk-do, August 15, 1992; BKNU 2122-2130 (9), 213.5-321.0 mm SL, Tongmoon market, Cheju-shi, Cheju-do, November 19, 1994.

Description: Dorsal fin rays 13-14; anal fin rays 17-18; pectoral fin rays 20-23; ventral fin rays I, 5.

Head and anterior part of body broad, depressed and flattened dorsally, tapering gradually to tail. Caudal peduncle slightly compressed. Body covered with small cycloid scales. Lateral line beginning at postero-inferior margin of supracleithrum, gradually approaching end of dorsal fin base. Dorsal fin single, its base longer than height, middle ray longest. Anal fin base much longer than height, posterior ray longest. Pectoral fin very broad. Pelvic fin close together, situated on ischium. Membranes of anal, pelvic and lower half of pectoral fins fleshy and thickened. Bones of head exposed, minutely sculptured, composed of tubercles to radial ridges. Interorbital space noticeably broad, with wide, short, deep and U-shaped fossa for relieving the ascending processes of premaxillae. Preopercle smooth on lower edge. Subopercle with smooth edge, ossified on about two-thirds of anterior lower part. Anterior and posterior nostrils, with anterior nasal valve tubiform with a slender filament and posterior nostril slit-like. Mouth protractile, large and vertical; lips without fimbriae or rudimentary fimbrial ridges. Premaxillary teeth caniniform, almost always biserial. Cleithral spine short or rudimentary, slightly flat and triangular, depressed to body. Lateral line extends along upper part of body, abruptly bend down on caudal peduncle and extends on caudal fin base. Anal fin inserted in advance of dorsal origin.

Several important morphometric characters of *G. elongatus* were showed in table 1.

Color of body: Head and body somewhat dark brown with blackish spots above; ventral half pale. Dorsal fin brown. Caudal and pectoral fin dark brown with pale margins. Pelvic and anal fin pale,

Table 1. Comparison of several morphometric characters of the five species belong to genera *Uranoscopus*, *Ichthyoscopus* and *Gnathagnus* in the family Uranoscopidae from Korea

	<i>U. japonicus</i>	<i>U. chinensis</i>	<i>U. tosae</i>	<i>I. lebeck sannio</i>	<i>G. elongatus</i>
Individual number	26	10	1	1	16
Standard length (mm)	166.3-233.9	132.5-221.5	166.9	242.2	134.7-321.0
In % of standard length					
Body depth	23.1-29.0 (25.6±1.82)	28.7-34.0 (29.5±3.50)	30.3	34.4	17.2-24.9 (19.6±2.36)
Head length	32.0-34.2 (32.9±0.75)	27.9-35.6 (33.4±2.94)	6.7	41.1	31.1-35.0 (33.2±1.31)
Predorsal distance	39.2-43.2 (41.1±1.23)	30.1-39.7 (37.1±3.19)	38.9	43.3	56.4-60.4 (57.9±1.29)
Prepectoral distance	32.4-43.3 (33.4±0.64)	27.5-36.6 (33.8±2.93)	36.8	44.0	31.1-34.3 (32.4±1.01)
Preventral distance	15.3-18.6 (16.8±0.84)	19.0-27.4 (24.4±2.63)	26.1	32.0	18.2-26.1 (21.4±2.46)
Preanal distance	52.8-60.2 (56.0±2.02)	42.9-58.6 (54.1±5.21)	58.7	53.7	49.3-57.4 (53.0±2.90)
In % head length					
Snout length	10.8-13.4 (11.9±0.78)	11.7-15.4 (12.9±1.21)	13.9	14.6	12.2-14.6 (13.4±0.72)
Eye diameter	13.2-16.6 (14.5±1.04)	13.4-14.6 (14.0±0.35)	12.9	8.5	10.5-16.6 (14.1±2.08)
Interorbital width	17.4-20.8 (18.8±1.12)	21.1-23.4 (22.0±0.75)	20.4	19.7	23.9-29.4 (26.8±2.01)
Length of inter-orbital fossa	21.8-26.6 (23.3±0.48)	23.5-24.8 (24.3±0.47)	25.6	19.3	21.8-26.3 (24.4±1.34)

with a dark band on basal half.

When fresh specimen grayish or somewhat greenish brown, with small dark brown spots above but below pale. Fins dusky, caudal, pectoral and ventral darker.

Distribution: West and South Sea of Korea, Japan, China and Taiwan.

Remarks: *Gnathagnus elongatus* divided into two subspecies, *G. elongatus elongatus* and *G. elongatus australiensis*, based on meristic value or external appearance by Kishimoto (1989) but several meristic values proposed by him are much overlapped between two subspecies in his study. Tanaka (1931), Chu *et al.* (1962, 1963) and Pietsch (1989) thought that *Ariscopus iburius* was a junior synonym of *G. elongatus*, but they gave no clear notice.

Key to the genera and species of family Uranoscopidae from Korea

- 1a. Dorsal fin two. Cleithral process and respiratory valve well developed
Genus *Uranoscopus*2
- 1b. Dorsal fin single. Cleithral process and respiratory valve absent or rudimentary.....5
- 2a. Preopercular spine almost 3 (rarely 4). Net-like patterns on head and body surface present
..... *Uranoscopus japonicus* Houttuyn
- 2b. Preopercular spine 4. Net-like pattern on body surface absent or partially present3
- 3a. Transverse bands on body and head surface present.....*Uranoscopus bicinctus* Trmminck et Schlegel.
- 3b. Transverse bands on body and head surface absent4
- 4a. Interorbital fossa reached to posterior end of eyes. Net-like pattern on body surface absent
.....*Uranoscopus tosae* (Jordan et Hubbs)
- 4b. Interorbital fossa not reached to posterior end of eyes. Net-like patterns on body surface present.....

- *Uranoscopus chinensis* Guichenot
- 5a. Large white spots on body surface present. Many fimbriae on both lips well developed. Membranous projection above pectoral fin base present. Pectoral fin triangular.....
Genus *Ichthyscopus*
*I. lebeck sannio* Whitley
- 5b. Many small black spots on body surface scattered. Fimbriae on both lips absent or rudimentary. No membranous projection pectoral fin base present. Pectoral fin squar.....
Genus *Gnathagnus*
 *G. elongatus* (Temminck et Schlegel)

Discussion

Members of the stargazer fishes are characterized most stringly by having dorsally or dorsolaterally directed eyes placed on or near the top of a large, flattened, cuboid head and an oblique to vertical mouth, with lips usually lined with cutaneous fimbriae, and the oblique lines

embedded the cycloid scales on the body surface and various patterns on the body surface.

Pietch (1989) described that the family Uranoscopidae was made a morphologically diverse assemblage of about 17 genera and over 70 species. Nelson (1994) also reported that 8 genera and about 50 species of the family Uranoscopidae are mostly distributed in the Atlantic, Indian and Pacific of the world, and among these stargazer fishes, genus *Uranoscopus* contains about half of these group. In regard to the Korean stargazer fishes, the first report had described by Jordan and Metz (1913). Thereafter Mori and Uchida (1934), Mori (1952) and Chyung (1977) reported that the family Uranoscopidae from Korea is three species belong to two genera. Recently Lee (1991, 1992) and Lee and Paek (1995) have added three species as new records. As a results, the family Uranoscopidae from Korea is classified into six species belong to three genera: *Uranoscopus japonicus*, *U. bicinctus*, *U. chinensis*, *U. tosae*, *Gnathagnus elongatus* and *Ichthyscopus lebeck sannio*. *Uranoscopus*

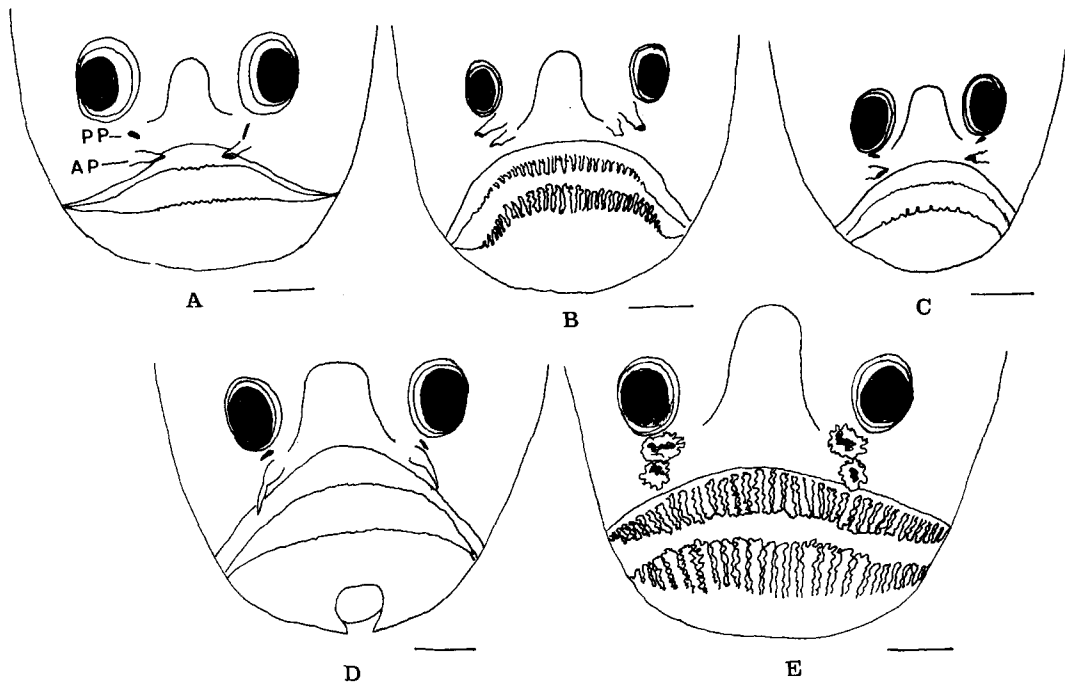


Fig. 6. Dorsal view of head and mouth part. A: *Uranoscopus japonicus*; B: *U. chinensis*; C: *U. tosae*; D: *Gnathagnus elongatus*; E: *Ichthyscopus lebeck sannio*. AP: Anterior nostril pore, PP: Posterior nostril pore. Scale bars indicate 10 mm.

chinensis in Japan was described into *U. flavipinnis* by Kishimoto (1987), but Pietch and Kishimoto (1989) redescribed that *Uranoscopus flavipinnis* Kishimoto come under junior synonym of *U. chinensis* Guichenot described by Sauvage (1882).

Whitley (1936) classified *Ichthyoscopus lebeck* from Australian into *Ichthyoscopus sannio* on the basis of the several characters: their coloration, morphological characters and their measured propotion. Nakabo (1993) has classified the family Uranoscopidae according to his criteria based on the several morphological characters: the number of dorsal fin and preopercular spines, patterns of body surface. Although I also agree with Nakabo's criteria, the several morphological characters beside above three characters were became very important characters for classification of family Uranoscopidae (Figs. 6, 7, 8) (Table 1).

Especially the fimbriae of both lips of genera *Uranoscopus* and *Gnathagnus* except *U. chinensis* have very weak or short and

rudimentary, but those of genus *Ichthyoscopus* and *U. chinensis* well developed and many branched (Fig. 6). In the developed state of respiratory valves of family Uranoscopidae, those of genus *Uranoscopus* was very well, genera *Gnathagnus* and *Ichthyoscopus*, however, were not well (Fig. 7). Among the species of the genus *Uranoscopus*, the respiratory valves of *U. bicinctus*, *U. chinensis* and *U. tosae* have a long and narrow one, which is fairly longer than their eye diameter and reached over the eyes (Fig. 7D, E) but that of *U. japonicus* was very broad and short (Fig. 7A). Kishimoto (1987) mentioned that the shapes of

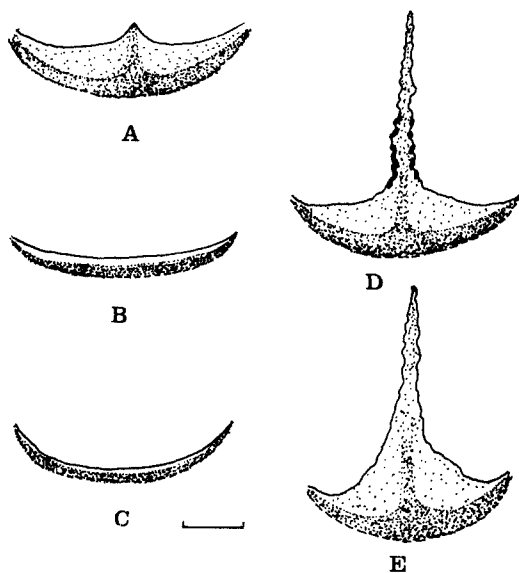


Fig. 7. Dorsal view of respiratory valve inside lower jaw. A: *Uranoscopus japonicus*, 233.9 mm SL, BKNU 2206; B: *Gnathagnus elongatus*, 268.8 mm SL, BKNU 2010; C: *Ichthyoscopus lebeck sannio*, 242.2 mm SL, BKNU 1706; D: *Uranoscopus chinensis*, 216.9 mm SL, BKNU 1900; E: *Uranoscopus tosae*, 166.9 mm SL, BKNU 20041. Scale bar indicates 10 mm.

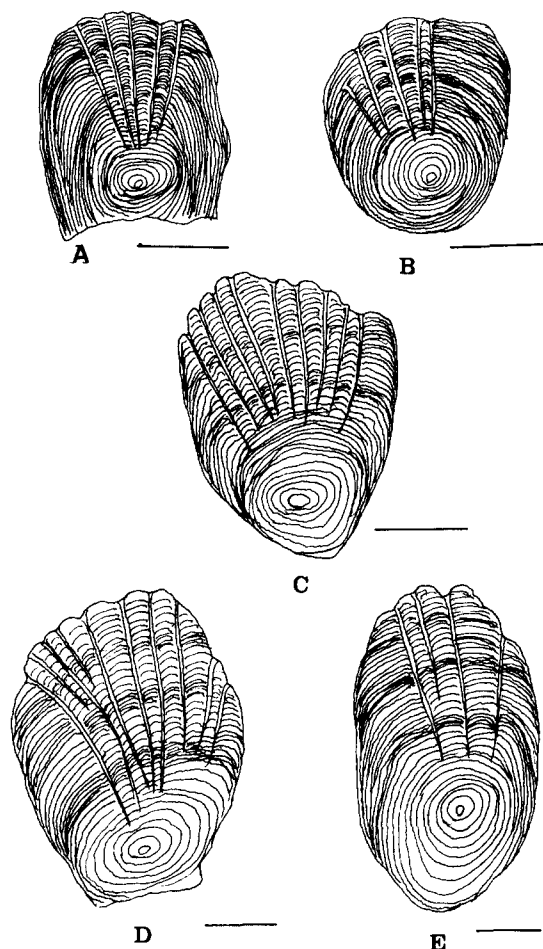


Fig. 8. The shapes of scales between first dorsal and pectoral fin base. A: *Uranoscopus japonicus*, B: *U. chinensis*, C: *U. tosae*, D: *Ichthyoscopus lebeck sannio*, E: *Gnathagnus elongatus*, Scale bars indicate 0.5 mm.

Table 2. Comparison of meristic and morphological characters among the six species of genera *Uranoscopus*, *Ichthyoscopus* and *Gnathagnus* in the family Uranoscopidae

Characters	<i>U. japonicus</i>	<i>U. bicinctus</i>	<i>U. tosae</i>	<i>U. chinensis</i>	<i>I. lebeck sannio</i>	<i>G. elongatus</i>
Dorsal fin	2	2	2	2	1	1
Preopercular spine	3	4	4	4	absent	absent
Respiratory valve	moderate	long & narrow	long & narrow	long & narrow	almost absent	almost absent
Patterns of body surface	net-like(head and body)	transverse	absent	net-like (body)	large white spots	small black spots
Form of pectoral fin	square	square	square	square	triangle	square
Labial fimbriae	weak or rudimentary	weak & short	weak & short	developed	well developed	absent or rudimentary
Interorbital fossa	short	—	long	long	long	short
Shapes of the nostrils	anterior-tubular, posterior-slit	—	anterior-tubular, posterior-slit	all tubular	all tubular with papillae	anterior-tubular, posterior-slit
Cleithrum spine	present	present	present	present	absent	short or rudimentary
% of transverse/vertical of scales	87	—	73	84	74	54

respiratory valves become very important characters of their classification in the family Uranoscopidae although their length somewhat varies according to the growth of body. The cleithral process of genus *Uranoscopus* fairly elongated but those of genera *Ichthyoscopus* and *Gnathagnus* were absent or short and rudimentary. The family Uranoscopidae has cycloid scales which embedded along the oblique line of body surface. Their morphology and the rates between transverse and vertical diameter of them represented fairly different rates according to the each species (Fig. 8) (Table 1 and 2).

Uranoscopus japonicus and *Gnathagnus elongatus* are distributed in the West and South Sea of Korea and *Uranoscopus bicinctus*, *U. chinensis* and *U. tosae* are chiefly distributed in South Sea, but *Ichthyoscopus lebeck sannio*, the around sea of Cheju Island mainly.

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한국산 통구멍과(농어목) 어류의 분류
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1986년부터 1994년까지 주로 우리나라의 西海와 南海 沿岸에서 채집된 韓國産 통구멍科 魚類에 대하여 分類學的 位置와 이들의 形態의 特徵에대하여 再檢討하였다. 그 결과 韓國産 통구멍科 어류로는 3 屬 6種으로 확인되었는데 통구멍屬 *Uranoscopus*에는 얼룩통구멍 *U. japonicus*, 통구멍이 *U. bicinctus*, 민통구멍 *U. chinensis*, 비늘통구멍 *U. tosae* 등의 4種이고, 푸렁통구멍屬 *Gnathagnus*에는 푸렁통구멍 *G. elongatus* 1種, 큰무늬통구멍屬 *Ichthyscopus*에는 큰무늬통구멍 *I. lebeck sannio* 1種 등 모두 6種이다. 이들 어류의 分類學的 主要 形態 形質로는 체표의 斑點, 전새개골 下部의 가시 수, 呼吸瓣의 形態, 鼻孔의 形態, 입술돌기의 發達 狀態 등이었다. 한편 지금까지 記載되어 온 *U. flavipinnis*는 *U. chinensis*의 synonym으로 整理되었다. 우리나라의 西海와 南海에 주로 많이 分布하고 있는 種은 *Uranoscopus japonicus*와 *Gnathagnus elongatus* 이고, 南海에는 *U. bicinctus*, *U. chinensis*, *U. tosae* 등이며 특히 *Ichthyscopus lebeck sannio*는 주로 濟州道 부근 海域에서 出現하고 있다.