

**Systematic Studies on the Fishes of the Family Cobitidae
(Order Cypriniformes) in Korea. I. Three Unrecorded
Species and Subspecies of the Genus *Cobitis* from Korea.**

Ik Soo Kim

(Dept. of Biology, College of Natural Science, Jeonbuk National University)

韓國産 기름종개科 魚類의 系統分類學的 研究 1. 기름종개屬의
韓國未記錄 3種 및 亞種에 關하여

金 益 秀

(全北大學校 理科學 生物學科)

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摘 要

1974년부터 1979년까지 南韓의 主要 河川에서 採集한 기름종개屬 魚類의 標本을 同定한 結果 *Cobitis taenia striata* Ikeda, 1936, *C. taenia lutheri* Rendahl, 1935의 2亞種과 *C. granoei* Rendahl, 1935의 1種이 韓國未記錄이 었으므로 그 形態의 特徵을 記載하고 地理的 分布와 檢索表에 대하여 報告 한다. 이로써 우리나라의 기름종개屬 魚類는 모두 4種 3亞種이 된다.

INTRODUCTION

The cobitid fishes, family Cobitidae, are distributed on sandy or pebble bottom in fresh water throughout the Old World. Their body forms are elongate, compressed with great variations in color patterns. The family has been divided into three subfamilies, Cobitinae, Botinae, and Nemachilinae based on the skeletal features (Ramaswami, 1953).

Taxonomic studies on the Cobitidae have been carried out by Vladykov (1935) and Ikeda (1936, 1937) in connection with the secondary sexual characters. On the other hand, three species of genus *Cobitis* from Korea, *C. taenia*, *C. rotundicaudata*, and *C. multifasciata* were formerly reported by Uchida (1939) and Chyung (1977). Since then by observing the color pattern of the body sides and secondary sexual characters, two cobitid fishes, *C. Koreensis* Kim, 1975 and *C. longicorpus* Kim, Choi and Nalbant, 1976, were described. And then on the basis of the exter-

nal structure of the mouth, the structure of the pectoral fin, the position of dorsal fin, and the number and composition of vertebrae of *C. multifasciata*, it was transferred to the genus *Niwaella* by Sawada and Kim (1977).

In the present study on the specimens hitherto regarded as *C. taenia*, some of them were identified as *C. granoei* Rendahl, 1935, *C. taenia striata* Ikeda, 1936, and *C. taenia lutheri* Rendahl, 1935, which are new to Korea. *C. taenia striata* was formerly recorded only from Japan (Ikeda, 1936) and *C. taenia lutheri* only from the Ussuri River in Siberia (Rendahl, 1935). *C. granoei* was firstly described by Rendahl (1935) as *C. taenia granoei* based on 7 specimens from Omsk in Siberia, but Nalbant *et al.* (1970) reported that *granoei* must be retained as the valid species and also described the other subspecies of *C. granoei* from the basin of the Selenga River in Mongolia. Accordingly the present specimens of *C. granoei* are believed to be the third record in the world and also the first record in Korea.

The specimens were preserved in 10% formalin and deposited in the Biological Laboratory, Jeonbuk National University. Measurements were made generally in accordance with the methods proposed by Barnarescu *et al.* (1972) and the vertebral counts were taken from radiographs.

Cobitis taenia lutheri Rendahl, 1935

(New Korean name : Jeomjul-Jonggae)

Fig.1 and Plate 1-C, D

Cobitis taenia lutheri Rendahl, 1935 : p.330, figs. 1-4 (Lake Khanka basin).

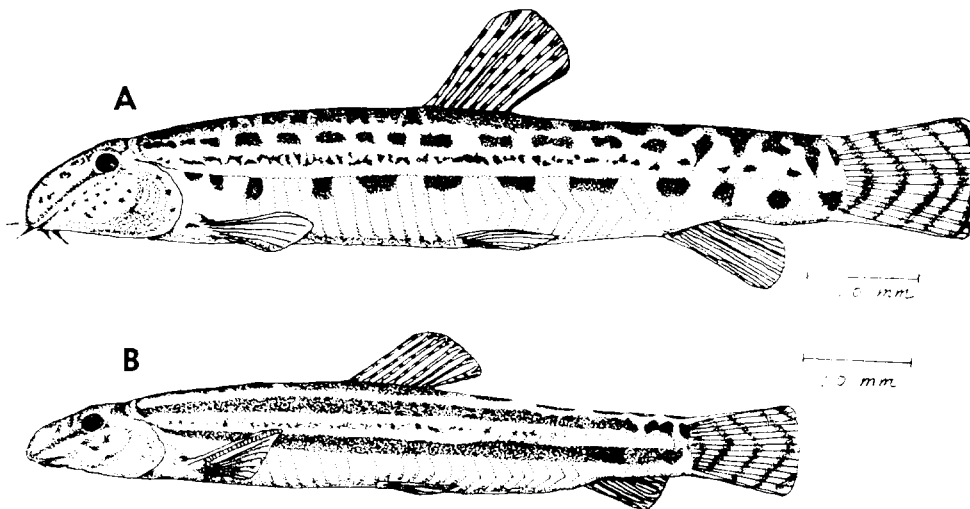


Fig. 1. *Cobitis taenia lutheri* Rendahl, from Kwangsan-gun, Jeonranam-do Province, Korea.
A: female 75.8 mm in standard length,
B: male 61.2 mm in standard length.

Material examined : 13 males 61.0–65.7 mm (SL), 8 females 59.1–80.5 mm, Songjeong-eub, Kwangsan-gun, Jeonranam-do Pro. (Youngsan R.), June 2, 1973, I.S. Kim ; 1 male 50.9 mm, 6 females 57.0–69.0 mm, Gosan-myon, Wanju-gun, Jeonrabug-do Pro. (Mangyong R.), June 30, 1973, I.S. Kim ; 1 male 58.0 mm, 22 females 70.0–81.5 mm, Jeongju-eub, Jeongeub-gun, Jeonrabug-do Pro. (Dongjin R.), June 2, 1973, I.S. Kim ; 2 males 62.0–65.5 mm, 2 females 67.0–71.0 mm, Banwoel-myon, Whaseong-gun, Gyonggi-do Pro. (Banwoel Reservoir), June 6, 1966, S.W. Kang ; 7 males 51.4–59.4 mm, 7 females 53.6–74.3 mm, Anseong-eub, Anseong-gun, Gyonggi-do Pro. (Anseong R.), August 2, 1979, I.S. Kim.

Diagnosis: Color patterns on body sides generally show sexual dimorphisms. Body depth and caudal peduncle depth generally very high. Myomeres 14 between pectorals and ventrals.

Description: D.III-7, A.III-5; Vert. 19–20 + 20–22 (39–41). Body relatively high, greatest depth 15.8–18.3%* (average 16.0), head 19.1–22.8 (20.7) of standard length. Predorsal length 48.2–51.2 (49.7), pectoral-ventral distance 27.6–35.4 (31.2), ventral-anal distance 24.2–27.5 (25.7), caudal peduncle length 12.4–13.8 (13.11), caudal peduncle depth 9.5–10.8 (10.0) of standard length. The snout length 34.3–46.6 (39.3), eye diameter 16.2–21.4 (18.1), and the 3rd pair of barbel 15.9–22.7 of head length. Caudal peduncle depth 71.3–83.9 (76.6) of caudal peduncle length.

Body covered by minute round scale with median focal area. Lateral line short, not exceeding the length of pectoral fins. Suborbital spine concealed in the skin. Myomeres 14 between pectorals and ventrals.

Main color light yellow. Dark brown color patterns generally show sex dimorphisms ; males have two longitudinal dark brown band running along the sides of body just like *C. taenia striata*, but female a row of 10–18 quadrangular dark brown spots just like *C. taenia taenia*. Large dark brown spots on the back before and behind dorsal fin. Dorsal fin and caudal fin with rows of dark speckles.

The male specimens have round osseus (lamina circularis) at the base of the second fin ray of pectoral fins. Pectoral fins are larger in male than female.

Distribution: The present subspecies is distributed at the sandy or muddy bottoms in the rivers and reservoirs into the Yellow Sea and Ussuri R. (L. Khanka) of Siberia (Fig. 5).

Remarks: Berg (1949) pointed out that *C. taenia lutheri* is very similar to the European *C. taenia*, and must be checked on more abundant material and compared with those on the Japanese spined loach. The present specimens in Korea were also confused with both *C. taenia taenia* and *C. taenia striata*. But as Rendahl

* All values of measurements are indicated in percent.

(1935) reported in the original description, the caudal peduncle in *lutheri* is deeper than in *taenia* or *striata* from Korea (Table 1). Moreover sexual dimorphisms of color pattern on the body sides were in accordance with the original description of *C. taenia lutheri*.

***Cobitis taenia striata* Ikeda, 1936**

(New Korean name: Jul-Jonggae)

Fig. 2 and Plate 1-B

Cobitis taenia striata Ikeda, 1936, 48 (12) pp. 984–985, figs. 10, 11.

Cobitis taenia Uchida, 1939, p. 410, pl. 42.

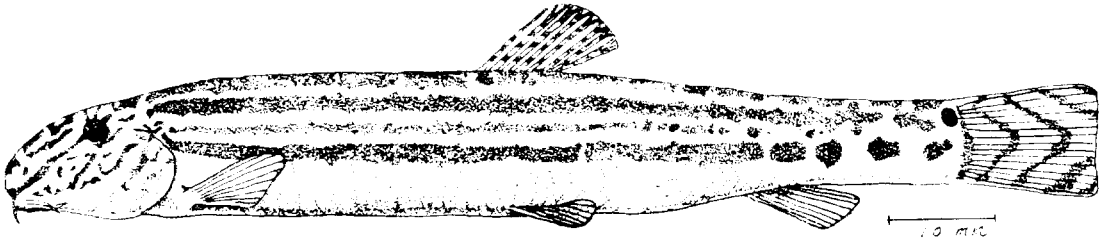


Fig. 2. *Cobitis taenia striata* Ikeda, from Jinan-gun, Jeonrabug-do Province, Korea. 89.4 mm in standard length.

Material examined: 4 males 64.5–72.2 mm, 6 females 57.7–93.1 mm, Hamabun (L. Biwa), Shiga Prefecture, Japan, June 30, 1977, K. Hosoya; 13 males 58.0–72.9 mm, 6 females 54.7–87.0 mm, Yamaguchi, Japan, October, 1979, Y. Fusioka; 3 males 52.1–65.6 mm, 4 females 58.5–76.0 mm, Shikoku (Shigenobu R.), Japan, August 11, 1972, N. Mizuno and I.S. Kim; 2 males 55.6–58.6 mm, 3 females 64.4–67.8 mm, Hyogo Prefecture (Chikusa R.), Japan, July 2, 1975, K. Hosoya; 2 males 75.4–78.6 mm, 2 females 87.1–91.8 mm, Guraegu, Gurae-gun, Jeonranam-do Province (Seomjin R.), September 30, 1975, I.S. Kim; 16 males 52.2–75.0 mm, 54 females 45.6–105.2 mm, Seonsu-myon, Jinan-gun, Jeonrabug-do Province, July 8, 1979, B.H. Yu and W.G. Cho; 1 male 72.0 mm, 2 females 82.0–90.0 mm, Ogomyon, Gogseong-gun, Jeonranam-do Province (Seomjin R.), July 22, 1976, I.S. Kim; 1 male 71.6 mm, 1 female 40 mm, Mulgeum-myon, Yangsan-gun, Gyongsangnam-do Province (Nagdong R.), August 8, 1977, T.H. Gweon.

Diagnosis: Two broad dark-brownish longitudinal stripe from opercle almost to caudal base.

Description: D.III-7; A.III-5; Vert. 19–21 + 21–24 (41–44). Body depth 14.0–17.8 (15.2) of standard length, head 17.8–21.8 (19.7), caudal peduncle length 12.1–17.2 (14.5), caudal peduncle depth 8.3–10.7 (9.3). Predorsal length 46.5–52.1 (49.7), pectoral-ventral distance 26.5–33.7 (31.0), ventral-anal distance 23.4–28.6 (25.7). Snout 34.7–47.3 (42.4) of head, eye diameter 12.0–19.2 (15.9)

and the 3rd barbel 11.4–22.0 (17.1) of head. Caudal peduncle depth 55.4–76.0 (67.6) of caudal peduncle length.

Body covered by minute round scales with median focal area. Lateral line short, not exceeding the length of pectoral fins. Suborbital spine concealed in the skin. Myomeres 16 between pectorals and ventrals.

Body yellowish. A series of 10–16 brownish spots on back: 0–6 in front of dorsal, 2 under dorsal base, 7–8 behind it. Two broad dark-brownish longitudinal stripes from opercle almost to caudal base with a narrow dark-brownish stripe or spots between two stripes. A blackish spot on the upper part of caudal base, separated from the longitudinal stripe. A narrow brown stripe from eye to tip of snout. Dorsal fin and caudal fin with rows of dark speckles. Total length up to 130 mm. The male specimens have round osseous process (lamina circularis) at the base of the second fin ray of pectoral fins. Pectoral fins are longer in male than female.

Distribution: This subspecies is common at the sandy bottoms along the rivers flowing into the South Sea of Korea: Seomjin R. and Nagdong R.; Japan (Fig. 5).

Table 1. Comparison of proportional measurements of 3 subspecies of *Cobitis taenia*.

HL: Head length, SL: Standard length, BD: Body depth, CPD: Caudal peduncle depth, CPL: Caudal peduncle length, Mean \pm SD. Numbers in parentheses show ranges. * Specimens sent to author by Dr. Nalbant and Dr. Banarescu in Rumania who collected them in the Danube delta, Summer 1965. ** Specimens sent to author by Mr. Hosoya in Japan who collected them in the Biwa Lake, Japan, June 30, 1977. *** Cited from the data of original description of present species by Rendahl (1935).

Species and locality	No. of specimen	HL/SL	BD/SL	COD/SL	SPL/SL	CPD/CPL
<i>C. t. taenia</i>						
Roumania*	13	19.8 \pm 0.94 (18.1–21.3)	13.1 \pm 0.80 (12.1–14.4)	8.7 \pm 0.40 (8.5–9.5)	15.2 \pm 1.15 (13.1–16.8)	56.5 \pm 5.78 (47.0–61.9)
Hamyang (Nagdong R.)	10	18.9 \pm 0.93 (17.5–20.0)	14.4 \pm 0.43 (13.6–15.0)	9.2 \pm 0.43 (8.2–9.6)	16.6 \pm 1.1 (15.0–18.0)	55.7 \pm 3.64 (50.3–64.8)
Milyang (Nagdong R.)	5	19.8 \pm 0.92 (18.7–20.7)	14.2 \pm 0.55 (13.6–15.1)	9.6 \pm 0.33 (9.0–9.9)	16.0 \pm 1.30 (14.9–17.2)	57.2 \pm 2.78 (55.5–60.9)
<i>C. t. striata</i>						
Japan**	10	19.8 \pm 0.97 (17.4–21.2)	14.7 \pm 0.45 (13.8–16.9)	9.1 \pm 0.57 (8.5–10.2)	14.7 \pm 1.30 (12.9–16.9)	62.3 \pm 6.32 (53.0–71.7)
Jinan (Seomjin R.)	70	20.1 \pm 1.06 (17.8–21.8)	15.4 \pm 0.7 (14.0–17.8)	9.4 \pm 0.57 (8.1–10.7)	14.6 \pm 1.04 (12.1–17.2)	65.1 \pm 5.9 (55.4–72.0)
Gurae (Seomjin R.)	4	19.9 \pm 0.18 (19.7–20.2)	15.0 \pm 0.8 (14.1–16.2)	8.8 \pm 0.37 (8.3–9.2)	13.1 \pm 0.56 (12.3–14.6)	67.0 \pm 5.92 (61.1–75.1)
<i>C. t. lutheri</i>						
U.S.S.R.*** (Ussuri R.)	10	21.1 (19.2–22.3)	17.4 (16.7–17.8)	10.8 (9.5–12.7)	13.4 (11.7–15.2)	80.9 (70.9–94.7)
Anseong (Anseong R.)	13	20.6 \pm 0.62 (19.1–22.8)	16.2 \pm 0.58 (15.3–17.2)	10.0 \pm 0.38 (8.9–10.8)	13.1 \pm 0.56 (12.4–13.8)	76.6 \pm 3.57 (71.3–83.9)
Naju (Youngsan R.)	20	20.6 \pm 1.10 (19.6–22.8)	16.3 \pm 0.45 (15.8–18.3)	9.8 \pm 0.77 (8.3–10.9)	15.5 \pm 0.8 (14.4–17.2)	74.3 \pm 5.10 (66.0–82.0)

Remarks: Uchida (1939) regarded the stripe type of *C. taenia* from Korea as the variation of *C. taenia*. But when the stripe type of *C. taenia* of Korea is compared with the specimens of *C. taenia striata* in several localities of Japan (Shikoku, Hyogo, Yamaguchi, and Shiga Prefecture), the present specimens of Korea were in accordance with them in the proportional characters and color patterns of *C. taenia striata* in Japan (Table 1).

***Cobitis granoei* Rendahl, 1935**

(New Korean name: **Bugbang-Jonggae**)

Fig. 3 and Plate 1-H

Cobitis taenia granoei Rendahl, 1935, p.322, figs. 5,6. (Irtysh of Omsk).

Cobitis taenia sibirica Gladycov, 1935, p.73 (Siberia to Baikal inclusive).

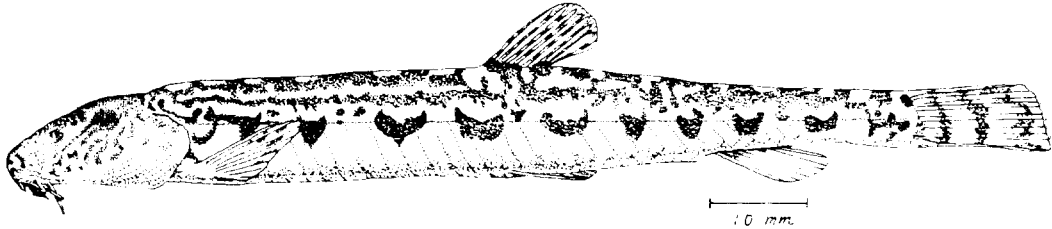


Fig. 3. *Cobitis granoei* Rendahl, from Gangreung Namdae R., Gangwon-do Province, Korea. 94.1 mm in standard length.

Material examined: 1 male 64.3 mm, 15 females 48.3–137.4 mm, Gangreung city, Gangwon-do Province (Gangreung Namdae R.), May 20, 1973, E.H. Choi; 3 males 68.0–71.2 mm, 18 females 47.0–117.5 mm, the streams of Goseong-gun, Gangwon-do Province, July 7–8, 1979, S.R. Jeon; 4 females 84.9–106.2 mm, Wangsan-myon, Myongju-gun, Gangwon-do Province (Gangreung Nam dae R.), July 8, 1973, E.H. Choi.

Diagnosis: Body slender. Body covered by minute round scales with large focal area. A series of 9–13 lateral dark brown spots is horse's hoof shape or inverted triangular shape.

Description: D.III-7; A.III-5; Vert. 21–24 + 21–23 (42–47).

Body slender. Body depth 11.2–14.4 (12.7) of standard length. Head 18.2–21.9 (20.7), caudal peduncle length 12.9–15.1 (13.8), caudal peduncle depth 6.3–8.3 (7.0) of standard length. Predorsal length 49.6–52.0 (50.6), pectoral-ventral distance 52.0–54.9 (53.3), ventral-anal distance 24.9–26.1 (25.5) of standard length. Snout 43.1–49.4 (46.4) of head, eye diameter 11.9–18.4 (14.7), and the 3rd barbel 15.6–21.6 (18.7) of head.

Body covered by minute round scales with large focal area (Fig. 4). Lateral line short, not exceeding the length of pectoral fins. Suborbital spine concealed in the

skin. Myomere 16 between pectoral and ventral.

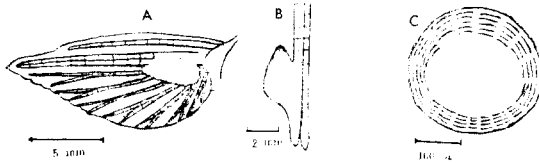


Fig. 4. Pectoral fin, lamina circularis, and subdorsal scale of *Cobitis granoei* Rendahl (male) from Gangreung Namdae R., Gangwon-do Province, Korea.

A: Pectoral fin, B: lamina circularis, C: Subdorsal scale.

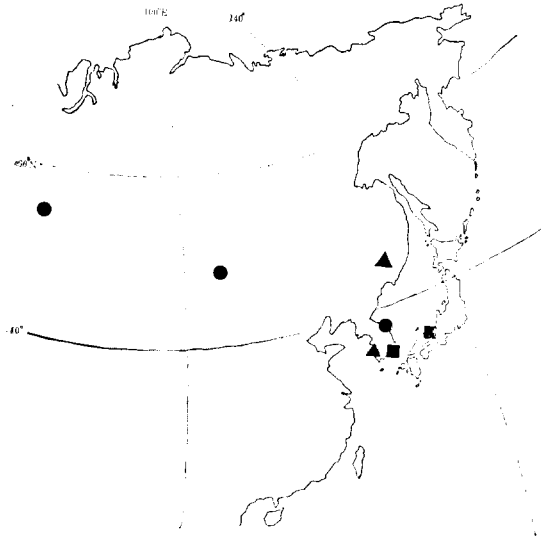


Fig. 5. Distribution of *Cobitis granoei* (●), *C. taenia lutheri* (▲), and *C. taenia striata* (■) in the world.

Body yellowish, a series of 12–17 (13.9) dorsal median dusky gray spots arranged as follows: 5–7 (5.80) predorsal, 2 subdorsal and 5–8 (6.09) postdorsal. A series of 9–13 (10.71) lateral dark brown spots, with horse's hoof or inverted triangular shape. A dusky gray line from the front of eye to the tip of snout, on each side of head. A blackish spot on the upper part of caudal base. Dorsal fin and caudal fin with rows of dark speckles. The male specimens have triangle osseous process at the base of the second fin ray of pectoral fins (Fig. 4). Pectoral fins are longer in male than in female.

Distribution: *C. granoei* is distributed in the Gangreung Namdae River and also in the rivers flowing into the East Sea to the north of it in Korea; Siberia and Mongolia (Fig. 5).

Remarks: Rendahl (1935) separated the spined loach from the Omsk of Siberia into subspecies *C. taenia granoei*. Berg (1949) regarded it as synonymy of *C. taenia sibirica*, but

Nalbant *et al.* (1970) thought that *sibirica* Gladycov represents a collective notion according to the nomenclatoric rules, and that *granoei* Rendahl must be retained as valid species. I agree with the opinion of Nalbant *et al.* who consider *C. granoei* as good species. The present specimens resemble both *C. granoei granoei* (Rendahl, 1935) and *C. granoei oliva* (Nalbant *et al.* 1970) in the body depth and caudal peduncle depth as in table 2, but the former is clearly distinguished from latters by the length of caudal peduncle: The caudal peduncle length of the present specimens is 12.9–15.1 (13.8) of standard length, while 15.2–18.6 (17.3) in *C. granoei granoei* and 16.0–19.8 (17.8) in *C. granoei oliva*. From the facts described above, it can be considered that the present specimens may be another new

subspecies of *C. granoei*. However I put off the decision of this problem in the future because these data must be checked on more abundant materials and compared with those on the Siberian spined loach.

Table 2. Comparison of proportional measurement between the present specimens of Korea and two subspecies of *C. granoei*. Numbers in parentheses show ranges.

	<i>C. granoei</i> present specimens		<i>C. granoei granoei</i> Rendahl (1935)	<i>C. granoei oliva</i> Nalbant (1970)
Locality	Gangreung	Goseong	Omsk	Selenga R.
No. of specimens	13	13	7	27
Standard length (mm)	48.3—137.4	45.7—117.4	84.0—99.0	37.6—62.5
In standard length				
Head length	20.8 (18.6—22.5)	20.3 (19.2—21.8)	18.3 (17.2—18.9)	20.0 (17.8—22.5)
Body depth	12.5 (11.2—13.9)	12.1 (11.2—13.2)	12.8 (11.5—14.8)	10.6 (6.6—12.7)
Caudal peduncle length	13.8 (13.1—15.0)	13.8 (12.9—15.1)	17.3 (15.2—18.6)	17.8 (16.0—19.8)
Caudal peduncle depth	7.3 (6.8—7.6)	7.0 (6.3—8.3)	7.6 (7.3—8.0)	6.8 (5.2—8.6)
In caudal peduncle length				
Caudal peduncle depth	52.9 (48.0—56.1)	50.1 (42.0—65.6)	44.2 (41.3—52.9)	

C. taenia lutheri, *C. taenia striata*, and *C. granoei* are seperable from the other members of the genus on the basis of characters given in the following key.

Key to the Korean species and subspecies of genus *Cobitis* and *Niwaella*

- 1a** Head elongate (18—22%). Dorsal origin midway between base of caudal and end of snout or eye*Cobitis*... 2
- 1b** Head short (12—14%). Dorsal origin backward between base of caudal and end of opercle*Niwaella*
N. multifasciata
- 2a** A row dark brown spots or stripes laterally 3
- 2b** Body covered cloudy dark brown speckles.....*C. rotundicaudata*
- 3a** A row of dark brown cross bands in body sides. Pectoral fins of male elongated with a beak-like projection at the end 4
- 3b** A row of spots (quadrangular or round) or striped bands on the body sides. Pectoral fins of males not elongated at the end..... 5.
- 4a** All of 10 or more dark brownish cross bands same in color. Pectoral fins of male elongated lamina circularis at the base*C. koreensis*
- 4b** The first or second cross bands at the back of operculum being more

- blackish than others. Pectoral fins of male semicircular lamina circularis at the base.....*C. longicorpus*
- 5a Body slender (11—13%). Body covered by minute round scales with large focal area*C. granoei*
- 5b Body deeper (13—18%). Body covered by large round scales with mediate focal area 6
- 6a Two broad brownish stripes from opercle to caudal base, a narrow brownish spots between two stripes.....*C. taenia striata*
- 6b Longitudinal rows of spots or two broad stripes with small brownish spots between two stripes in front of body sides 7
- 7a Caudal peduncle depth of caudal peduncle length low (below 65%). Both male of female longitudinal rows of spots*C. taenia taenia*
- 7b Caudal peduncle depth of caudal peduncle length high (above 65%). Color pattern generally shows sexual dimorphisms (male-striped, female-quadrangular spotted type)*C. taenia lutheri*

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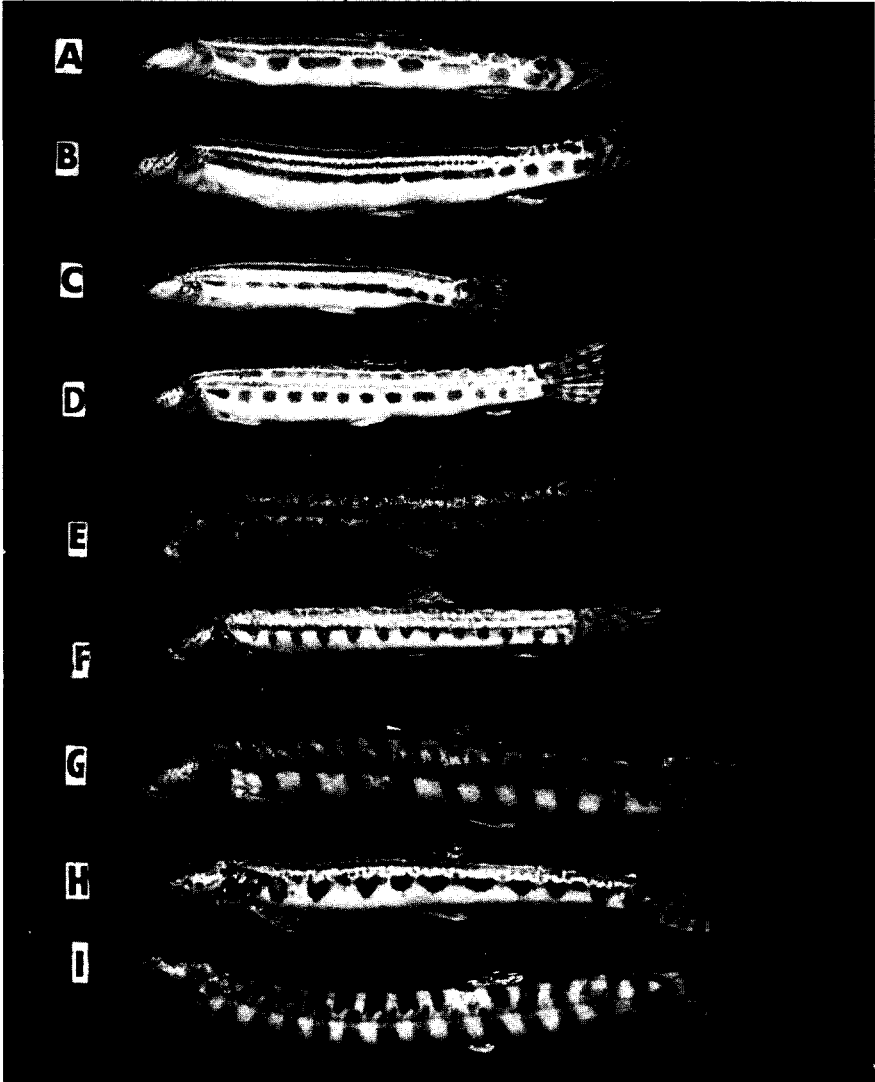


Plate 1. The species and subspecies in the genus *Cobitis* and *Niwaella* in Korea.

- A ; *C. taenia taenia* in the Nagdong River in 18 Sep., 1977. 78.3 mm in SL.
 B ; *C. taenia striata*, the Seomjin R., 8 July, 1979, 88.2 mm.
 C ; *C. taenia lutheri* (male), same in locality and date, as the female, 60.8 mm
 D ; *C. taenia lutheri* (female), the Geumgang R., 29 July, 1979, 72.4 mm.
 E ; *C. rotundicaudata*, the Han R., 28 July, 1973, 93.7 mm.
 F ; *C. koreensis*, the Han R., 5 Oct., 1974, 80.0 mm (Paratype).
 G ; *C. longicorpus*, the Seomjin R., 3 Aug., 1974, 109.7 mm (Holotype).
 H ; *C. granoei*, the Gangreung Namdae R., 8 July, 1973, 92.3 mm.
 I ; *N. multifasciata*, the Nagdong R., 18 Sep., 1977, 99.5 mm.