

***Cobitis sinensis* (Pisces, Cobitidae) from the Nakdong River, Korea**

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洛東江産 기름종개 *Cobitis sinensis*의 學名

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요 약

韓國産 기름종개의 學名使用에 정확을 기하기 위하여 우리나라 洛東江의 15 個水域에서 採集된 1,472마리의 기름종개 標本과 유럽산 기름종개 標本을 比較檢討하였다. 從前에 國內에서 *C. taenia*로 看做하였던 洛東江産 標本은 體側과 背面 斑紋의 數와 모양, 鰓수염의 길이, 및 眼下棘末端的 位置등이 유럽産 *C. taenia*와는 달리 中國産 *C. sinensis*와 더 類似하였다. 따라서 우리나라 洛東江産 기름종개 標本은 *Cobitis sinensis* Sauvage et Dabry, 1874의 學名을 使用하는 것이 妥當하다고 判斷된다.

**INTRODUCTION**

Sauvage and Dabry de Thiersant (1874) described a new species of spined loach, *Cobitis sinensis* based on a single specimen collected from Tungting Lake, Hunan, adjacent to the Yangtze River, China. Fowler (1924) synonymized it with *C. taenia*, but Nichols (1925, 1943) recognized it as another subspecies of *C. taenia* from China. Recently Chen (1981) reported again *C. sinensis* as a distinct species of China differing from *C. taenia* of Europe.

In Japan many taxonomic confusions also existed about *C. taenia* (Ikeda, 1936, 1937; Okada, 1960), but now this species includes two subspecies, *C. taenia taenia* and *C. taenia striata* (Aizawa, 1981).

In Korea Jordan and Metz (1913) recorded for the first time *C. sinensis* which had been collected in Suwon, Pusan, and Pungdong. Mori (1927) also reported about it collected in Suwon and the Apruk River, but Uchida (1939) recognized this species as *C. taenia*. Since then many Korean ichthyologists have used this scientific name, *C. taenia* about all spined loach specimens collected Korea (Chyung, 1977).

Kim and Son (1984) classified the spined loach from Korea into 8 species or subspecies:

*C. taenia taenia*, *C. taenia striata*, *C. taenia lutheri*, *C. koreensis*, *C. longicorpus*, *C. rotundicaudata*, *C. granoei* and *C. choui*. In the course of a karyotypic study on the genus *Cobitis* of the Nakdong River, it was remarked that *C. taenia taenia* of the Nakdong River was not identical with *C. taenia* of Europe in karyotype (Kim and Lee, 1986). Having had the opportunity to examine the specimens of the European *C. taenia* and the Korean spined loach, "*C. taenia taenia*" of the Nakdong River in order to resolve the taxonomic confusions, we realized that the Korean specimens differ from *C. taenia* of Europe in several principal characters and rather resemble *C. sinensis* in more characters. Hence we consider the Korean cobitid specimens of the Nakdong River to be represented *C. sinensis*, we will discuss some characters of *C. sinensis* distinguished from *C. taenia* in this paper.

### MATERIALS AND METHODS

A total of 1,472 specimens were collected using electrofishing in the Nakdong River drainage from August 1976 to July 1986. Collections were made at the following 15 localities throughout the Nakdong River drainage (Fig. 1). Numbers in parenthesis are specimen numbers observed.

- St. 1, Woonbong-myon, Namwon-gun, Chōllabuk-do (5);
- St. 2, Inwol-myon, Namwon-gun, Chōllabuk-do (769);
- St. 3, Sudong-myon, Hamyang-gun, Kyongsangnam-do (77);
- St. 4, Saengcho-myon, Sanchōng-gun, Kyongsangnam-do (91);
- St. 5, Whajōng-myon, Ueryong-gun, Kyongsangnam-do (172);
- St. 6, Sangbuk-myon, Yangsan-gun, Kyongsangnam-do (6);
- St. 7, Milyang-eup, Milyang-gun, Kyongsangnam-do (23);
- St. 8, Youl-dong, Kyongju-city, Kyongsangbuk-do (28);
- St. 9, Wolpo-myon, Kōchang-gun, Kyongsangnam-do (23);
- St. 10, Hayang-eub, Hayang-gun, Kyongsangbuk-do (1);
- St. 11, Yongchōn-eub, Yongchōn-gun, Kyongsangbuk-do (8);
- St. 12, Jōmchon-eub, Jōmchon-gun, Kyongsangbuk-do (9);
- St. 13, Yechōn-eub, Yechōn-gun, Kyongsangbuk-do (9);
- St. 14, Yongju-city, Kyongsangbuk-do (97);
- St. 15, Bongwha-eub, Bongwha-gun, Kyongsangbuk-do (52).

And fourteen European specimens, *Cobitis taenia* collected in the Bega River, Roumania, in 1968 by Drs. Banarescu and Nalbant were investigated. All counts and measurements follow Banarescu *et al.* (1972). Measurements were to the nearest 0.01mm, using dial caliper.

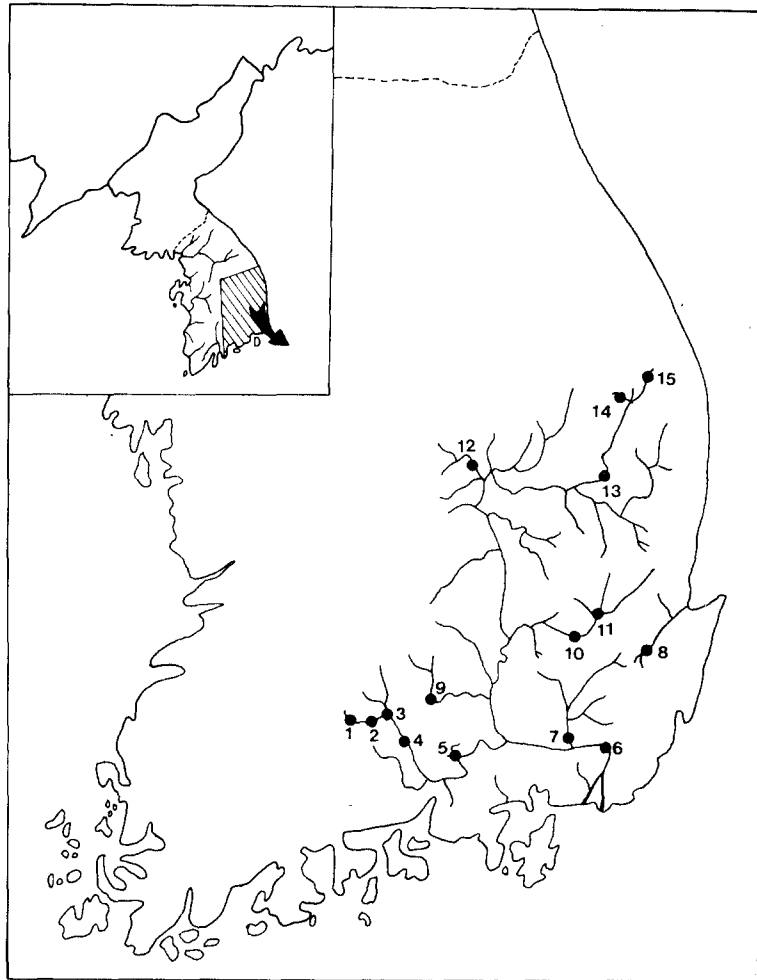


Fig. 1. Map showing the sampling localities of *C. sinensis* in the Nakdong River. Numbers refer to sampled localities (see text).

## RESULTS

Although the Korean specimens regarded as *C. taenia* previously in Korea were nearly similar to the European specimens of *C. taenia* in external features, the extensive investigations for two populations revealed the marked distinctions in their color patterns, some body proportions and the terminal position of suborbital spine.

### Color Pattern

Principal distinction of the lateral color pattern between two populations is exhibited in the third Gambetta's zone (Jeong, 1986). The third Gambetta's zone of the European specimens is broader belt composed of many minute spots on the trunk and caudal part,

but that of Korean is composed of a row of minute spots on the anterior part of trunk (Fig. 2). In the shape and number of dark brown spots on the 4th Gambetta's zone, the European specimens have usually 15 to 18 ( $M=16.5$ ) quadrangular spots; Korean 8 to 15 ( $M=11.0$ ) roundish or elliptic spots.

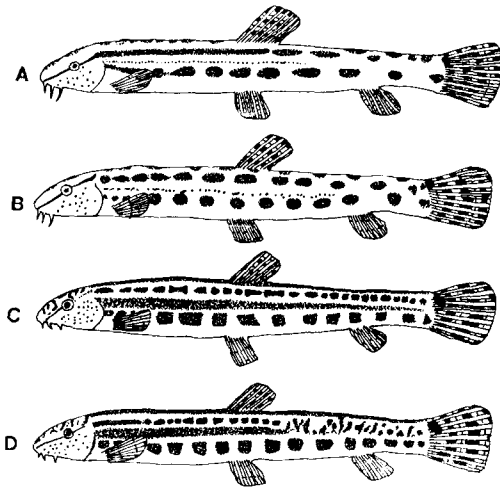


Fig. 2. Variation of the lateral color pattern.  
A-B: *C. sinensis* from Korea  
(Nakdong R.)  
C-D: *C. taenia* from Europe  
(Roumania)

In the dorsal color pattern, the European specimens have 6 to 8 squarish spots between occiput and origin of dorsal and also two brown streaks on the both sides of the dorsal spots, whereas the Korean roundish spots without streaks or with irregular speckles on the both sides of the dorsal spots. Moreover the mean number of dorsal spots between the occiput and origin of dorsal fin is more than 2 or so in European compared with Korean.

On the other hand in the top head pigmentation, the European specimens have more speckles in the number from snout tip to interorbital part than the Korean. Also it is remarked that the only Korean specimens have conspicuous dark brown swelling spots on the behind of eye (Fig. 3).

### Body Proportions

In the comparison of body proportion between the two populations, besides large distinction is indicated by the third barbel length, it is easily distinguished from each other in their mean values of the body depth, the snout length and the caudal peduncle depth (Table. 1).

The third barbel is by for longer in Korean specimen-length 14.0~24.6% of head length, being about the same as eye diameter, while in European its length is very short-length 6.4~14.5% of head length, being about the half of eye diameter. The body depth of standard length in the Korean specimens is relatively deeper (mean: 15.0~16.2%) than European (mean: 13.1~14.3%). Snout length of head length is somewhat longer in

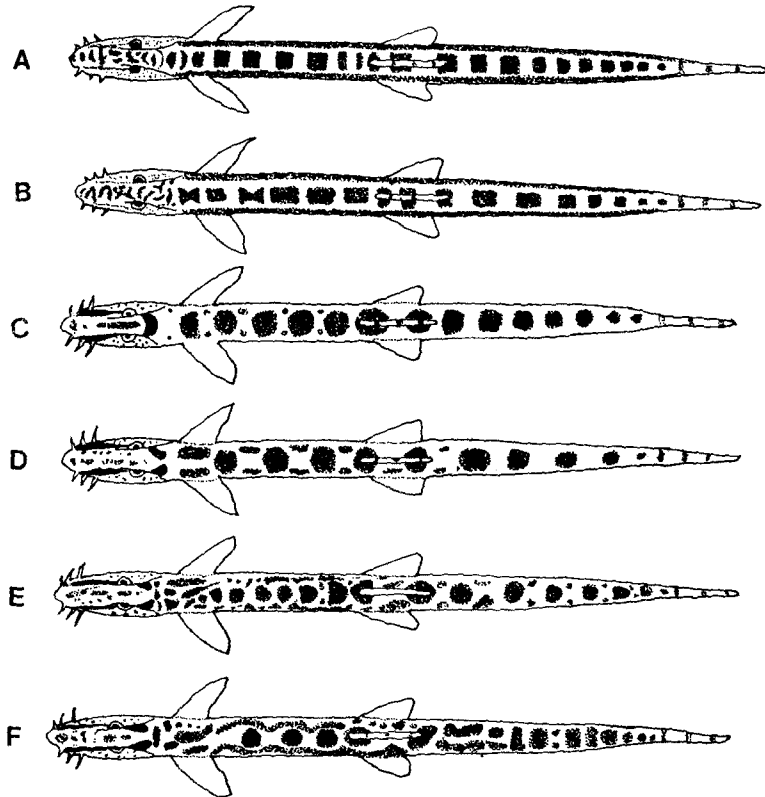


Fig. 3. Variation of the dorsal color pattern and the top head pigmentation.  
 A-B: *C. taenia* from Europe (Roumania)  
 C-F: *C. sinensis* from Korea (Nakdong R.)

Table 1. Comparison of proportional measurements between *C. sinensis* from Korea and *C. taenia* from Europe (Mean  $\pm$  1 SD, ranges in parenthesis).

Locality	No. of specimens	BD/SL	Barbel L./HL	Sonut L./HL	CPD/CPL
<i>Europe</i>					
Rumania	10	13.1 $\pm$ 1.1 (11.6-15.0)	11.5 $\pm$ 2.5 (6.4-14.5)	42.5 $\pm$ 2.1 (39.3-45.8)	57.2 $\pm$ 6.6 (46.8-68.5)
Rendahl's data	6	14.3 $\pm$ 1.2 (12.5-16.0)	—	40.0 $\pm$ 2.1 (38.5-41.7)	59.3 $\pm$ 3.9 (54.5-63.6)
<i>Korea</i>					
Bongwaha	19	15.2 $\pm$ 1.0 (14.2-17.0)	18.9 $\pm$ 1.9 (14.0-22.7)	46.4 $\pm$ 2.5 (42.9-50.4)	63.4 $\pm$ 5.1 (57.3-69.9)
Milyang	7	16.2 $\pm$ 0.5 (15.4-16.8)	18.4 $\pm$ 2.1 (15.3-21.2)	46.6 $\pm$ 1.8 (43.0-48.2)	70.5 $\pm$ 6.3 (61.2-78.8)
Saengcho	21	15.5 $\pm$ 0.7 (14.3-17.0)	18.6 $\pm$ 2.3 (16.1-24.6)	48.2 $\pm$ 1.9 (46.2-50.3)	64.3 $\pm$ 4.6 (57.3-74.2)
Whajong	23	15.0 $\pm$ 1.1 (13.6-16.6)	18.9 $\pm$ 2.9 (15.7-23.4)	45.7 $\pm$ 1.4 (43.8-48.1)	66.7 $\pm$ 10.9 (51.5-97.3)
Inwol	22	15.3 $\pm$ 1.0 (13.6-17.6)	17.9 $\pm$ 2.0 (15.1-21.2)	46.3 $\pm$ 1.7 (43.4-51.0)	71.0 $\pm$ 7.5 (57.3-88.9)

Korean specimens (mean: 45.7~48.2%) than in European (mean: 40.0~42.5%). And caudal peduncle length is considerably deeper in Korean (mean: 63.4~71.0%) than in European (mean: 57.2~59.3%).

### Terminal Position of Suborbital Spine

Suborbital spine represents the lateral ethmoid bones which are mobile in Cobitinae and Botinae (Nalbant, 1963). The structure of suborbital spine in the both populations very similar, but the difference of the terminal position can be easily recognized in the comparison of their specimens. The suborbital spine of European is relatively so long that its terminal passes over by far the middle of eye, while that of Korean never reaches at the middle of eye (Fig. 4).

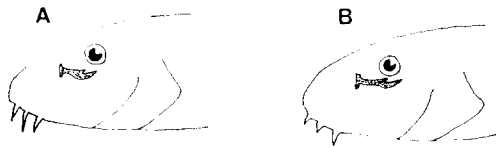


Fig. 4. Terminal position of suborbital spine.  
A: *C. sinensis* from Korea(Nakdong R.)  
B: *C. taenia* from Europe(Roumania)

### DISCUSSION

The foregoing results of the present study show that the Korean specimens compared can be taxonomically distinguished from the European *C. taenia* based on the color pattern of the body, some body proportions and the terminal position of their suborbital spines. The color pattern of body sides, barbel length and the terminal position of suborbital spine of the Korean spined cobitid specimens from the Nakdong River are rather identical with those of *C. sinensis* specifically.

Chen(1981) reported already *C. sinensis* of China which can be distinguished from *C. taenia* of Europe based on the differences of barbel length and length of suborbital spine and classified the genus *Cobitis* of China into *C. sinensis*, *C. rarus*, *C. lutheri*, *C. macrostigma*, *C. granoei* and *C. area*.

Accordingly we have ascertained that *C. sinensis* Sauvage and Dabry de Thiersant is the valid name for this species of the Nakdong River and we refer *C. taenia* to synonymy. *C. sinensis* recorded previously in Korea (Jordan et Metz, 1913; Mori, 1927) might be named for the specimen of *C. lutheri-koreensis-sinensis* complex and not for the cobitid specimen of the Nakdong River.

When *C. taenia taenia* from the Nakdong River was reported in Korea by Kim (1980), Dr. Nalbant of Roumania wrote a letter (November, 23, 1982) to Kim of authors that "*Cobitis taenia taenia*" from the Nakdong River figured 1 in the plate represents *C. sinensis* Sauvage et Dabry and not *C. taenia*. Also he pointed out that *C. taenia* does not reach the Central Asia nor at least Central Siberia.

It is very interesting that the karyotype of Korean *C. sinensis* ( $2n=48$ ) regarded as *C.*

*taenia taenia* formerly (Kim and Lee, 1986) is different from that of European *C. taenia* (Lodi and Marchionni, 1980) and Japanese *C. taenia taenia* and *C. taenia striata* (Ueno *et al.*, 1980; Saitoh *et al.*, 1984) in 50 somatic chromosomes. On the other hand the Korean *C. sinensis* is accord with Japanese *C. biwae* in the chromosome number ( $2n=48$ ), but distinguished in their karyological features.

It is clear from these results that the taxonomic status of *C. taenia lutheri* and *C. taenia striata* in Korea should be reconsidered in near future.

### ABSTRACT

Through the investigation of the numerous specimens of the European *C. taenia* and the Korean spined loach "*C. taenia taenia*" of the Nakdong River in order to resolve the taxonomic confusion, it was noticed that the Korean specimens are specifically identical with *C. sinensis* based on the shape and number of the color pattern on the body sides, the longer barbel length, and the terminal position of suborbital spine never reaching at the middle of eye. So we considered that the valid name for this species of the Nakdong River is *C. sinensis* Sauvage et Dabry rather than *C. taenia* Linne. Some characters of *C. sinensis* distinguished from *C. taenia* of Europe were compared.

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