

First Record of Japanese Codling, *Physiculus japonica* Hilgendorf (Moridae, Gadiformes) from Korea

Jeong-Rack Koh* and Dae-Yeon Moon

National Fisheries Research and Development Institute, Busan, 619-900, Korea

The Japanese codling fish, *Physiculus japonica* (family Moridae) is recorded as new to the Korean fish fauna. The specimen was fished from the South-Eastern waters off Jeju Island, Korea in March 1999. Standard length of the specimen was 343.2 mm, with a thin barbel on lower jaw, 67 soft second dorsal rays, 71 soft anal rays and 12 lateral-line above scales. Identification key of this specimen as *P. japonica* in the family Moridae was toothless vomer, chin barbel and well-developed black ventral light organ located on the anterior of anus. We give a new Korean name Dol-dae-gu for *P. japonica*.

Key words: *Physiculus japonica*, Japanese codling, Moridae, Korean fish fauna

Introduction

Fishes in the family Moridae are characterized by the hard and well-developed skull and deep-sea habitat. While most fish are small with luminescent organs, some grow up to one meter standard length that has commercial importance in Australia and New Zealand. To date, approximately 98 species from 18 genera have been reported to occur world-wide in this family (Nelson, 1994), but questions in identification remain unsolved due to the complexity of the first dorsal spine, upper jaw morphology and color and length of chin barbel.

In Japanese waters are reported a total of 17 species from 7 genera of the family Moridae (Masuda et al. 1984; Nakabo, 2000). *Lotella phycis* is the only Morid cods species in Korean waters, but no detailed descriptions are available (Chyung, 1977; KSSZ, 1997).

Physiculus japonica is the first record from Korean waters. Morphometric description followed Cohen (1979) and Nakabo (2000). The specimen was deposited in the Ichthyological Collection of National Fisheries Research and Development Institute, Korea (NFRDI-LS 990311)

Genus *Physiculus* Kaup, 1858

(New Korean name: Dol-dae-gu-Sok)

Physiculus Kaup, 1858, Uebersicht der Familie Gadidae. Arch. Naturg., 24(1), 85-93(88). (Type

species: *Physiculus dalwigki* Kaup, 1858 by monotype).

Physiculus japonica Hilgendorf, 1879

(New Korean name: Dol-dae-gu)

(Fig. 1)

Physiculus japonica, Hilgendorf, 1879, Einige Beitre zur Ichthyologie Japan's. Sitzungsber. Ges. Naturf. Freunde Berlin, 78-81.

Physiculus maximowiczi, Herzenstein, 1896, Über einige neue und seltene Fische des Zoologischen Museums der Kaiserlichen Akademie der Wissenschaften. Ezh. Zool. Muz. Imp. Akad. Nauk, 1-14.

Material examined: Specimen NFRDI-LS 990311, 343.2 mm standard length (SL), fished from the waters off Jeju Island, 126° 33' E and 33° 30' N and unloaded at Busan City Fish Market on March 11, 1999. Compared specimens, *Lotella phycis* (NFRDI-LS 770923), 322.9 mm (SL) and NFRDI-LS 850405, 275.4 mm (SL), collected at Busan City Fish Market on September 23, 1977 and April 5, 1985.

Description: Dorsal fin rays: 9+67; anal fin rays: 71; pectoral fin rays: 25; pelvic fin rays: 6; caudal fin rays: 7/7; gill rakers: 3+8; number of lateral scales: 143. In standard length of body: head length 4.3; depth at anus 4.5; depth at caudal peduncle 32.3; snout length 20.4; predorsal length 4.1; orbit diameter 19.7; inter-orbital width 22.2;

*Corresponding author: jrkoh@nfrdi.re.kr

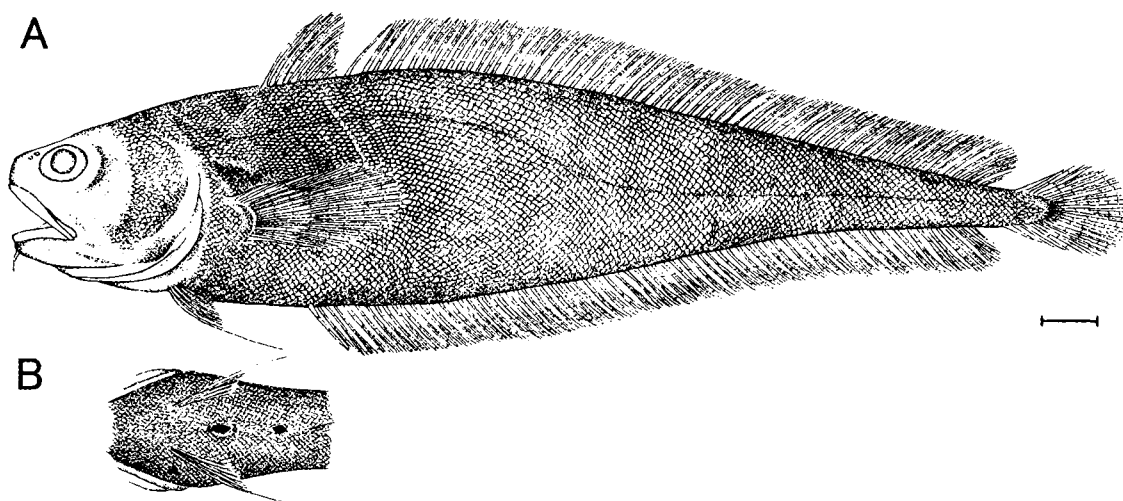


Fig. 1. Lateral(A) and ventral(B) views of *Physiculus japonica* Hilgendorf, 343.2 mm SL, Busan, Korea. Scale bar=20.0 mm.

Table 1. Morphometric measurements and counts of *Physiculus japonica* Hilgendorf collected from Busan, Korea in March, 1999

Characters	Present study	Cohen (1979)	Okamura et al. (1984)	Nakabo et al. (2000)
Number of individuals	1	1	5	-
Standard length (mm)	343.2	228	340-380	-
% of standard length				
head length	23.2	21.6	24.4-25.0	-
body depth at anus	22.0	16.5	20.4-23.8	-
body depth at caudal peduncle	3.1	2.7	5.9-6.4	-
predorsal length	24.4	25.7	27.0-29.4	-
orbit diameter	5.1	5.6	-	-
interorbital width	4.5	4.9	-	-
snout length	4.9	4.6	-	-
upper jaw length	11.0	10.4	-	-
barbel length	3.2	3.2	-	-
ventral fin length	8.3	11.3	-	-
In eye diameter interorbital width	12.1	11.2	-	-
Number of fin rays				
Dorsal fin rays	9+67	9+67	8-9+67-71	9-10+60-68
Anal fin rays	71	77	74-79	60-71
Pectoral fin rays	25	-	25-26	24-25
Pelvic fin rays	6	-	6	6-7
Number of gill rakers	3+8	3+8	3+8	-
Number of lateral scales	143	-	135-144	-

barbel length 31.3; upper jaw length 9.1. In eye diameter: interorbital width 8.3 (Table 1).

Body anteriorly thicker, caudal part of body long, slender and laterally compressed; head usually large

and the anterior slightly vertically depressed; proboscis snout rounded and blunt, not protruding; suborbital ridge slightly rising and ending by the posterior margin of suborbital; mouth rather large,

posterior end of the maxillary reach below the posterior margin of suborbital region, jaws with broad teeth in bands, upper jaw outer teeth not thick and large; no teeth on vomer and palatine; one barbel on the lower jaw; lateral line begins upper of opercle, parallel to dorsal margin up to the first dorsal fin, descending from frontal base of second dorsal fin and reaching the middle; cycloid scale and cone shape, head covered with scales except for the suborbital and lower half of snout, no scales on 1/3 of the ventral part of lower jaw, scaleless patch on belly; anus at the lower posterior of the base of pectoral fin; no scale black region (light organ) on the anterior of anus, anterior part of it in the same distance from the base of pelvic fin and anus; first dorsal fin beginning slightly posteriorly, at the base of pectoral fin, pelvic fin anterior to pectoral fin, two outer elongated fin rays.

Body color in life: Body brown, ventral part of the head and abdominal part blue, pectoral, pelvic and anal fins reddish, margin of the anal fin black.

Distribution: Benthopelagic (depth 150-800 m); the East China Sea, coastal area of the Pacific side of Southern Japan.

Remarks: Family Moridae of the order Gadiformes have a swimbladder attached to the both sides of auditory capsules of the hard skull and display good adaptational morphology in deep waters of the outer continental shelf at the depth ranging 200-2,000 m.

The Morid cod species account for 70-98 species from 17-18 genera, of which over half species belong to both genera *Physiculus* and *Laemonema* (Cohen, 1979; Nelson, 1994). Especially genus *Physiculus* are easily separated from genus *Lotella* by having luminescent organs and morphology of upper jaw. Of the Korean Moridae species, *P. japonica* has relatively thinner upper jaw with denser teeth of the similar size whereas *L. phycis* has thicker upper jaw with smaller teeth and larger outer teeth of 11-13 rows (Fig. 2).

But, with a wider distribution, some confusion arose in identification of these fishes (Kamohara, 1936; 1938). The genus *Euchichthys* was previously classified as the family Moridae, but Paulin (1983) insisted that this species was closer related to the family Melanonidae. The two Moridae species, *P. tosaensis* and *L. maximowiczi* were reclassified into

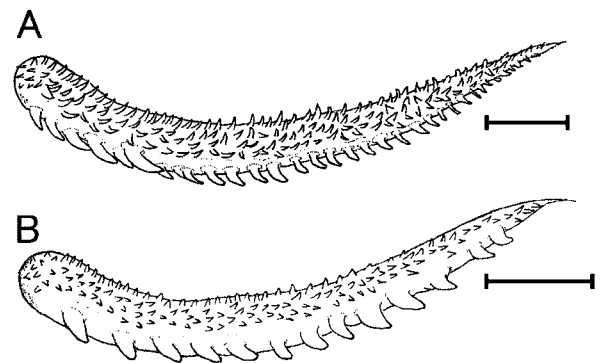


Fig. 2. Ventral view of right premaxilla with teeth. Scale bar=10.0 mm.

A. *Physiculus japonica*; B. *Lotella phycis*

L. tosaensis and *P. maximowiczi*, respectively by Cohen (1979) and he found no significant difference in characteristics between *P. japonica* and *P. maximowiczi* from their holotype. And Eschmeyer (1998) reported that the *P. maximowiczi* was junior synonym of *P. japonica*, but identification of these species has not been confirmed yet.

References

- Chyung, M.K. 1977. The Fishes of Korea. Ilji-sa Publishing Co., Seoul, 727 pp. (in Korean)
- Cohen, D.M. 1979. Notes on the morid fish genera *Lotella* and *Physiculus* in Japanese waters. Jap. J. Ichthyol., 26(3), 225-230.
- Eschmeyer, W.N. 1998. Catalog of fishes. Special Publication, California Academy of Sciences, San Francisco. 3 Vols. 2905 pp.
- Herzenstein, S.M. 1896. Über einige neue und seltene Fische des Zoologischen Museums der Kaiserlichen Akademie der Wissenschaften. Ezh. Zool. Muz. Imp. Akad. Nauk, 1-14. (in German)
- Hilgendorf, F. 1879. Einige Beiträge zur Ichthyologie Japan's. Sitzber. Ges. Naturf. Freunde Berlin, 1879, 78-81. (in German)
- Kamohara, A.T. 1936. Two new deep-sea fishes from Japan. Annot. Zool. Japon, 15(4), 446-448.
- Kamohara, A.T. 1938. On the offshore bottom fishes of Prov. Tosa, Shikoku, Japan. Maruzen, Tokyo, 86 pp.
- Kaup, J. 1858. Uebersicht der Familie Gadidae. Arch. Naturgesch., 24(1), 85-93.
- KSSZ (The Korean Society of Systematic Zoology). 1997. List of Animals in the Korean (excluding insects). Academy Press. Seoul, 489 pp. (in Korean)
- Masuda, H., K. Amaoka, C. Arago, T. Ueno and T. Yoshino 1984. The Fishes of the Japanese Archipelago. Tokai Univ. Press. Japan., 438 pp., 370 pls. (in Japanese)
- Nakabo, T. 2000. Fishes of Japan with Pictorial Keys

- to the Species, 2nd ed., Tokai Univ. Press. Tokyo, 1748 pp. (in Japanese)
- Nelson, J.S. 1994. Fishes of the The World, 3rd ed., John Wiley & Sons, New York, 523 pp.
- Okamura, O., Y. Machida, T. Yamakawa, T. Yatou, K. Nakaya and T. Kitajima. 1984. The intensive research of unexploit fishery resources on continental slopes. Tosho Printing Co. Ltd., Tokyo, 414 pp. (in Japanese)
- Paulin, C.D. 1983. Review of the morid genera *Gadella*, *Physiculus*, *Salilota* (Teleostei: Gadiformes) with description of seven new species. New Zealand J. Zoo., 16, 93-133.

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