

First Record of Two Congrid Eels (Anguilliformes, Congridae) from Korea

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Two species of the unrecorded congrid eel, *Ariosoma major* (Asano, 1958) and *Rhynchoconger ectenurus* (Jordan and Richardson, 1909) were collected for the first time from the Southern and Western Sea of Korea. *A. major* closely resembled *A. shiroanago*, but differed from the latter in having lesser number of lateral line pores before vent and vertebrae. *R. ectenurus* was very similar to *R. brachuata*, but differed from the latter in having slender tail and a great number of vertebrae. A key to the genera and species of the family Congridae from Korea was given. New Korean name "Kunhuin-bungchangeo" was proposed for the *A. major*, and "Gomunkkori-bungchangeo", *R. ectenurus*, respectively.

Key words: *Ariosoma major*, *Rhynchoconger ectenurus*, lateral line, vertebrae, Congridae

Introduction

Among the apodal fishes distributed in the world, the family Congridae is one of the largest and most diverse group of the eel families (Smith, 1989). And they were characterized by having subcylindric head and trunk, and without scales and ventral fin. The Korean congrid eels were classified into 7 genera with 8 species in the South and West Sea mainly (Lee and Park, 1994). Some of which are valuable and popular food fishes for the Korean.

Seven specimens belonging to congrid eels were collected from the Southern and Western Sea of Korea in November 1996 and May 1998. The purpose of this study is to describe it as a first record of two congrid species from Korea.

The methods of count and measurement followed mainly Asano (1962). Vertebral counts were taken from radiograph. The examined specimens are deposited in the Department of Biology, Kunsan National University (BKNU).

Genus *Ariosoma* Swainson, 1838

(Korean name : Gal bungchangeo sok)

Ariosoma Swainson, 1838, 1: 220 (type species *Ophisoma acuta* Swainson, 1838).

Ariosoma major (Asano, 1958)

(New Korean name : Kunhuin bungchangeo)

(Fig. 1)

Alloconger shiroanago major Asano, 1958, p. 191. Kagoshima (original description). *Alloconger major* Chen and Weng, 1967, p. 47, fig. 34, Taiwan.

Ariosoma shiroanago major Abe, 1987, p. 95, Japan; Masuda *et al.*, 1988, p. 27, pl. 30-L, Japan; Hatooka, 1993, p. 187, Japan.

Material examined: BKNU 3307-3309, three specimens, 405.0~437.0 mm total length (TL), off Kadokdo island, Chung-gu, Pusan, Korea, May 20, 1998.

Description: Pectoral fin rays 12~14; pores in lateral line before vent 51~53; vertebrae 145

Fig. 1. *Ariosoma major* (Asano) 534.0 mm TL. Scales indicate 30 mm.

~148.

Body depth 15.9~17.7 (16.9 ± 0.92) in total length; head length 5.9~6.4 (6.2 ± 0.29); head depth 17.1~19.6 (18.4 ± 1.25); head width 19.6~20.8 (20.2 ± 0.60); snout length 26.0~29.0 (27.5 ± 1.53); eye 35.2~37.2 (36.3 ± 1.04); interorbital width 39.4~44.9 (41.5 ± 2.96); predorsal distance 6.3~7.0 (6.6 ± 0.34); head and trunk 2.2~2.3 (2.3 ± 0.07); predorsal distance 6.3~7.0 (6.6 ± 0.34); preanal distance 2.1~2.3 (2.2 ± 0.07); tail 1.8~1.8 (1.8 ± 0.04); trunk 3.4~3.8 (3.6 ± 0.17). Head and trunk 1.2~1.3 (1.3 ± 0.07) in tail. Eye 5.5~6.3 (5.9 ± 0.40) in head, and 1.2~1.4 (1.3 ± 0.11) in snout. Snout 4.2~4.7 (4.5 ± 0.25) in head; interorbital width 6.3~7.7 (6.8 ± 0.79); anterior internasal space 16.8~20.2 (18.0 ± 1.91); posterior internasal space 6.9~7.6 (7.2 ± 0.38); predorsal distance 1.0~1.1 (1.1 ± 0.03); pectoral fin 2.8~3.0 (2.9 ± 0.11).

Body elongated, posterior half of body compressed. Head and trunk subcylindrical. Snout moderately long, the tip rather blunt. Upper lip with free narrow upturned labial flange. Eye moderately large, the diameter a little shorter than length of snout. Anterior nostril tubular, locating on surface of near the tip of snout. Posterior nostril ovoid, opening a little before middle anterior margin of eye. The gap of mouth reaching to below middle of eye. Tongue short, broad and free in front. Teeth small, cornical, and mostly blunt. Patch of teeth on premaxillary slightly exposed in front of closed mouth. Maxillary band of teeth setting irregularly in 3 to 4 series anteriorly,

in rather regular 2 ones posteriorly; on lower jaw in irregularly 5 to 6 series anteriorly, in 2 ones posteriorly. Vomerine band of teeth, set in 3 to 4 series, extending posteriorly to about two-third of mandibular band. Pharyngeal teeth rather large, and pointed. Cephalic and lateral sensory pores well developed; cephalic sensory pores 28 in total number on the side of head inclusive of those on occipital region: 6 on supraorbital canal, 8 on infraorbital canal, 8 on mandibular canal, 3 on preopercular canal and 3 supratemporal commissure respectively ($6+8+8+3+3=28$) (Fig. 3: A₁, A₂). Lateral line scales *Anago*-type (Lee and Park, 1994). Caudal fin short. Tail longer than head and trunk, and stout in touch. Color of head and body light brown above, paler lower; dorsal, anal and caudal pale with dark margin. Air bladder is connected with the tip of the stomach anteriorly by a pneumatic duct and struck dorsally all over to the bases of parapophysis of the abdominal vertebrae, reaching to the 51st pore in lateral line before vent (Fig. 4A). Alimentary canal and air bladder pale.

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

Remarks: *Ariosoma major* closely resembled *A. shiroanago*, but it is distinguished from the latter in having lesser number of lateral line pores before vent and vertebrae, and broader pharyngeal patches of teeth and width of lateral line scales (Table 1). This species also resembled *A. obud* reported originally by Herre (1923), but differed from it in having more numerous lateral

Table 1. Comparison of the counts and morphological characters of the genus *Ariosoma*

Characters	Present study	Asano (1958)		Lee and Park (1994)
		<i>A. major</i>	<i>A. shiroanago</i>	<i>A. shiroanago</i>
Pectoral fin rays	12~14	12~13	11~13	13
Pores in lateral line before vent	51~53	52~53	56~59	56~60
Number of vertebrae	145~148	144~147	156~161	157~160
Upper and lower pharyngeal patch of teeth	broad	broad	narrow	narrow
Width of lateral line scales	broad	broad	narrow	narrow
Shape of otolith	round	round*	angle*	angle

* from Asano (1962).

line pores before vent (40 in *A. obud*). Asano (1958, 1962), Hatooka (1993) and Lee and Park (1994) described that *A. shiroanago* and *A. major* were relationships of subspecies each other. But the authors are thought that *A. major* has to classify into separated species from subspecies reported by the formers, because *A. major* appeared into sympatric in off Kadokdo Island of Pusan with *A. shiroanago* which was four specimens of 342.1~355.4 mm total length, and largely differed from *A. shiroanago* in taxonomic characters (Table 2).

Genus *Rhynchoconger*

(Jordan and Hubbs, 1925)

(New Korean name: Gomunkkori bungchangeo sok)

Rhynchoconger Jordan and Hubbs, 1925, pp. 192 & 196 (*Leptocephalus ectenurus* Jordan and Richardson)

Rhynchoconger ectenurus

(Jordan and Richardson, 1909)

(New Korean name: Gomunkkori bungchangeo) (Fig. 2)

Leptocephalus ectenurus Jordan and Richardson, 1909, p. 171, pl. 56, Takao, Formosa (original description).

Rhynchoconger ectenurus Chen and Weng, 1967, p. 53, fig. 39, Taiwan; Abe 1987, p. 100, Japan; Masuda *et al.*, 1988, p. 28, pl. 31-G, Japan; Hatooka, 1993, p. 190, Japan.

Material examined: BKNU 4194-4197 four specimens, 470.0~529.0 mm TL, off Komso, Chinso myon, Puan gun, Chollabuk do, Korea, November 12, 1996.

Description: Pectoral fin rays 12; pores in lateral line before vent 29~31; vertebrae 155~

159.

Body depth 20.6~23.7 (22.3 ± 1.42) in total length; head length 6.8~7.7 (7.4 ± 0.42); head depth 20.1~24.9 (22.8 ± 1.98); head width 23.3~29.1 (26.1 ± 2.70); snout length 24.4~29.5 (27.0 ± 2.14); eye diameter 47.0~54.0 (51.5 ± 3.29); interorbital width 41.5~57.9 (48.8 ± 7.66); predorsal distance 7.2~8.0 (7.7 ± 0.36); head and trunk 2.9~3.3 (3.1 ± 0.16); preanal distance 2.9~3.2 (3.1 ± 0.14); prepectoral distance 6.6~7.4 (7.1 ± 0.35); tail 1.5~1.5 (1.5 ± 0.03); trunk 5.1~5.7 (5.4 ± 0.26). Head and trunk 1.9~2.3 (2.1 ± 0.15) in tail. Eye 6.9~7.1 (7.0 ± 0.08) in head, and 1.8~2.0 (1.9 ± 0.06) in snout. Snout 3.6~3.9 (3.7 ± 0.15) in head; interorbital width 5.6~8.5 (6.7 ± 1.37); anterior internasal space 13.1~14.1 (13.5 ± 0.41); posterior internasal space 6.1~7.2 (6.5 ± 0.50); predorsal distance 1.0~1.1 (1.0 ± 0.02); pectoral fin 2.8~3.3 (3.0 ± 0.20).

Body elongated, becoming compressed posteriorly on tail. Tail very long, tapering rapidly, becoming very slender toward tip and twice as long as head and trunk. Head and trunk sub-cylindrical. Snout moderately long, projecting beyond the tip of lower jaw by the distance subequal to two-thirds diameter of eye. Eye moderately large, the diameter about 1.9 times in snout. Upper lip without upturned labial flange. Anterior nostril opens on top of nasal tube, locating on surface of premaxillary patch. Posterior nostril ovoid, opening in front of upper part of eye and separated from it by a distance subequal to one thirds diameter of eye.

Patch of teeth on premaxillary much exposed in front of closed mouth (Fig. 1). Maxillary band of teeth setting irregularly in 4 series anteriorly, in rather regular 2 ones posteriorly; on lower jaw in irregularly 5 to 6 series anteriorly, in rather regular 2 to 3 ones posteriorly. Teeth on pre-

Fig. 2. *Rhynchoconger ectenurus* (Jordan and Richardson) 529.0 mm TL. Scales indicate 30 mm.

Table 2. Comparison of the morphometric and meristic characters of the genus *Rhynchoconger*

Characters	Present specimen	Chu and Chen (1958)	
		<i>R. ectenurus</i>	<i>R. brachuata</i>
Pectoral fin rays	12	11~13*	—
No. of vertebrae	155~159	128~175 (150)	71~116 (90)
Standard length / Head length	6.51~7.59 (7.19±0.50)	6.80~8.05 (7.49)	4.43~6.60 (5.39)
Standard length / Head and trunk	2.80~3.23 (3.04±0.20)	2.00~2.30 (2.16)	1.00~1.78 (1.39)
Standard length / Tail	1.44~1.48 (1.45±0.19)	1.45~1.55 (1.50)	1.56~2.00 (1.72)
End of tail	slender	slender	blunt

* from Asano (1962).

maxillary and pharyngeals pointed, but those on vomer blunt. Vomerine band of teeth extending posteriorly to about one-fourth of mandibular band. Cephalic and lateral sensory pores well developed; cephalic sensory pores 18 in total number each side of head inclusive of those on occipital region (Fig. 3: B₁, B₂): 3 on supraorbital canal near tip of snout, 5 on infraorbital canal along lower edge of upper lip, 6 on mandibular canal, 3 on preopercular canal, and one on supra-temporal commissure respectively. Lateral line scales referable to *Conger*-type (Lee and Park, 1994). Dorsal fin origin slightly before pectoral fin base. Pectoral fin moderately long, about 3 times in head. Caudal fin slender. Air bladder connected with the dorsal surface of about one thirds of the stomach anteriorly by a pneumatic duct and separated from bases of parapophysis of the abdominal vertebrae; air bladder in shape fusiform and pale; alimentary canal pale uni-

formly except esophagus and stomach with black; stomach Y shaped (Fig. 4B). Head and body light brown, but the lower half right silver or pale.

Distribution: The West Sea of Korea, Japan, China, Taiwan.

Remarks: *Rhynchoconger ectenurus* closely resembled *R. brachuata*, but the former was largely distinguished from the latter in having slender tail and a great number of vertebrae, and in the characters of proportional measurement of head length and head and trunk length (Table 2). On the other hand, *R. ectenurus* were very similar to *Uroconger lepturus* in having slender tail, but *R. ectenurus* differed from *U. lepturus* in having a set of vomerine teeth (a single row in *U. lepturus*), 18 cephalic sensory pores (24) and lateral line scales of *Conger*-type (*Uroconger*-type).

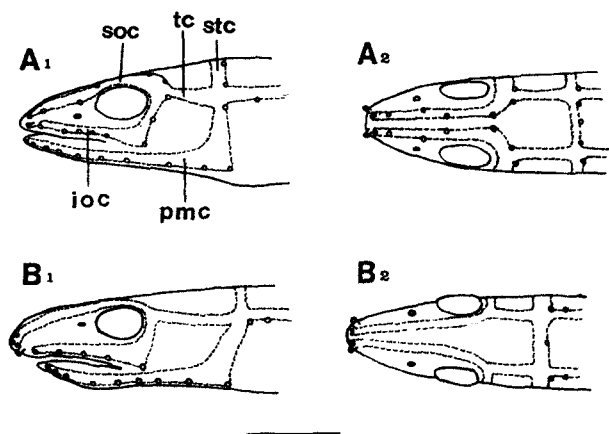


Fig. 3. Outline of lateral (A₁, B₁) and dorsal (A₂, B₂) aspects of the lateral line system of the head. A₁ · A₂, *Ariosoma major*; B₁ · B₂, *Rhynchoconger ectenurus*. ioc, infraorbital canal; pmc, preoperculo-mandibular canal; soc, supraorbital canal; stc, supratemporal commissure; tc, temporal canal. Scale indicates 20 mm.

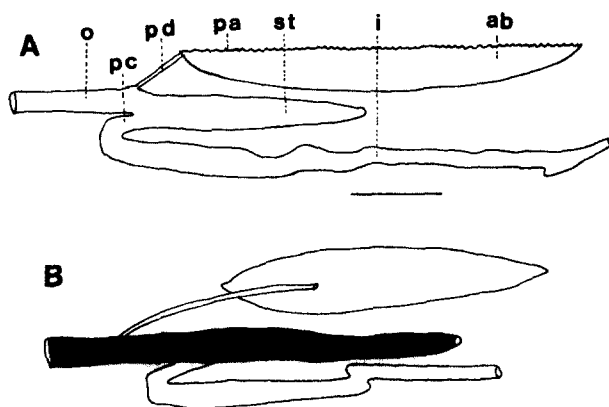


Fig. 4. Lateral aspect of the alimentary canal and air-bladder. A: *Ariosoma major*; B: *Rhynchoconger ectenurus*. ab, air-bladder; i, intestine; o, oesophagus; pa, parapophysis; pc, pylorus; pd, pneumatic duct; st, stomach. Scale indicates 20 mm.

Key to the genera and species of Congridae from Korea

- 1a. Tail subequal to head and trunk. Tip of tail blunt, and stout in touch. Fins without segmented soft rays. Caudal fin remarkably reduced in length. Lateral line scales referable to *Anago* type in shape. Supraoccipital bone present, but lateral ethmoid process absent 2
- 1b. Tail longer than head and trunk. Tip of tail

- rather flexible, not so hard in touch. Fins with segmented soft rays. Caudal fin moderate or well developed in length. Lateral line scales referable to either *Conger*-type or *Uroconger* type in shape. Supraoccipital bone absent, but lateral ethmoid process present 5
- 2a. A dark brownish spot have on both upper and lower posterior margin of eye. Sensory pores on head rather fewer in number, 19 on each side of head: 3 on supraorbital canal, 5 on infraorbital canal, 8 on mandibular canal, 3 on preopercular canal, and none on supratemporal commissure respectively (3+5+8+3+0=19) *genus Anago* *A. anago*
- 2b. Without a dark brownish spot behind eyes. Sensory pores on head more numerous: 27 on each side of head (6+8+7+3+3=27) *genus Ariosoma* 3
- 3a. Head and body somewhat thick brown with obscure dark pattern. Pores in lateral line before vent 53~54. Vertebrae 143 *A. anagoides*
- 3b. Head and body rather pale without dark pattern. Pores in lateral line before vent 51~59. Vertebrae 144-161 4
- 4a. Pores in lateral line before vent 56~59. Vertebrae 156~161 *A. shiroango*
- 4b. Pores in lateral line before vent 51~53. Vertebrae 144~147 *A. major*
- 5a. Edge of upper lip with upturned free flange. Caudal fin short. Lateral line scales with *Conger* type 6
- 5b. Edge of upper lip without upturned free flange. Caudal fin slender and long. Lateral line scales with *Uroconger* type 8
- 6a. Intermaxillary teeth enclosed when mouth closed. Teeth on jaws evenly or abruptly truncate, forming a cutting edge at tips. Vertebrae 142~148 *genus Conger* 7
- 6b. Intermaxillary teeth exposed when mouth closed. Teeth on jaws in bands conical, not forming a cutting edge. Vertebrae 117~124 *genus Gnathophis* *G. nystromi nystromi*
- 7a. Sensory pores surrounded by conspicuous whitish spots less than lateral line pores along dorsal side, as well as lateral line, and densely developed on top of head anteriorly. Pores in lateral line before vent 39~43 *C. myrister*
- 7b. Sensory pores not surrounded by whitish

- spots, confined on body to lateral line and sparsely developed on head. Sensory pores of lateral line before vent 35~39 *C. japonicus*
- 8a. Vomerine teeth with a set, not extending as far as vomerine shaft 9
- 8b. Vomerine teeth with a single row, extending as far as vomerine shaft to a vertical through middle of eye. Sensory pores of lateral line before vent about 46. Vertebrae about 204. Cephalic sensory pores on head 24 (5+7+7+4+1=24) genus *Uroconger* *U. lepturus*
- 9a. Dorsal fin origins between base and tip pectoral fin base. Teeth bands on maxillaries, premaxillary, and vomer in contact with each other. Vertebrae 155~159 genus *Rhynchoconger* *R. ectenurus*
- 9b. Dorsal fin origins before base of pectoral fin base. Premaxillary patch of teeth distinctively separated from vomerine band of teeth. Vertebrae 173~181 genus *Rhechias* *R. retrotincta*

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한국산 봉장어과 어류 2 미기록종

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1996년부터 1998년까지 우리나라 서·남해 연안에 서식하고 있는 봉장어과 어류를 채집하여 동정한 결과 지금까지 우리나라에서는 서식이 보고되지 않은 *Ariosoma major* (Asano, 1958)와 *Rhynchoconger ectenurus* (Jordan and Richardson, 1913)로 확인되어 한국산 미기록종으로 보고한다. *Ariosoma major*는 *A. shiroanago*와 비슷하나 항문전 측선공수와 척추골수가 많다는 점이, 또한 *Rhynchoconger ectenurus*는 *R. brachuata*와 비슷하나 꼬리가 길며, 척추골수가 많다는 점에서 이들 유사종들과 잘 구별되었다. 이들의 한국명으로는 *A. major*를 “큰흰봉장어”, *R. brachuata*를 “검은꼬리봉장어속, 검은꼬리봉장어”라고 명명하였다. 아울러 한국산 봉장어과 어류의 7속 10종에 대한 검색표를 작성 제시하였다.