

# First Record of the Big Red Cardinalfish, *Apogon unicolor* (Apogonidae: Perciformes) from Korea

By Song-Hun Han, Maeng Jin Kim<sup>1</sup> and Choon Bok Song<sup>2,\*</sup>

Jeju Fisheries Research Institute, NIFS, Jeju 63068, Republic of Korea

<sup>1</sup>Fisheries Resources and Environment Division, West Fisheries Institute, NIFS, Incheon 22383, Republic of Korea

<sup>2</sup>College of Ocean Sciences, Jeju National University, Jeju 63243, Republic of Korea

**ABSTRACT** Two specimens of *Apogon unicolor* (81.0 mm and 96.3 mm in standard length) belonging to the family Apogonidae were firstly collected by using a gill net from the southwestern coastal waters of Jeju Island, Korea in July 2013. These species are characterized by having 26 lateral line pores, a first dorsal fin with 6 spines, 2 + 1 + 8 = 11 developed gill rakers, posterior margin of preopercle serrated, without markings and spots on the body. Our specimens are well-matched in their morphological and molecular characteristics with *Apogon unicolor* previously reported. Thus, we newly add this species to the Korean fish fauna and propose its new Korean name “Jin-hong-eol-ge-bi-neul” because the overall fish body and fins reveal deep red colors.

**Key words:** Apogonidae, *Apogon unicolor*, first record, Jeju Island, Korea

## INTRODUCTION

The cardinalfishes (family Apogonidae) comprise 385 species in 40 genera worldwide (Fricke *et al.*, 2022). Among them, 14 species in 5 genera were known in Korea (MABIK, 2021). The family Apogonidae is characterized by having two separated dorsal fins, small size (usually under 12 cm), and scales usually ctenoid (Nelson, 2006).

The genus *Apogon* comprises 54 species worldwide (Fricke *et al.*, 2022) and 2 species from Korea (MABIK, 2021). It is characterized by having a dorsal fin with 8~13 rays, lateral line scales less than 29, predorsal region scaled, anal fin rays 8, preopercular flap not extending past the vertical edge (Mabuchi *et al.*, 2014).

In this study, we firstly collected two specimens of *Apogon unicolor* by a gill net in the coastal waters of Jeju Island, Korea on July 4, 2013. As *A. unicolor* has not been reported in Korea yet, we described the morphological characters of specimens to add to the Korean fish fauna. In addition, we carried out nucleotide sequencing of the mito-

chondrial cytochrome c oxidase subunit I (COI) gene to confirm the accuracy of species identification of two specimens.

These two specimens were preserved in 10% formalin for a week and then transferred to 70% ethanol. Counts and measurements are followed by the methods of Randall (2001). The examined specimens were deposited at the Fish Genetics and Breeding Laboratory, Jeju National University (JNU), Korea.

## TAXONOMIC ACCOUNTS

### *Apogon unicolor* Steindachner and Döderlein, 1883

(New Korean name: Jin-hong-eol-ge-bi-neul)

(Fig. 1; Table 1)

*Apogon unicolor* Steindachner and Döderlein, 1883: 2 (type locality: Japan); Jordan and Snyder, 1901: 749 (Japan); Hayashi in Masuda *et al.* 1984: 148 (Japan and Taiwan); Fraser, 1998: 990 (Philippines); Randall and Lim, 2000: 614 (South China Sea); Larson *et al.*, 2013: 108 (Australia); Ogimoto *et al.*, 2022 (Japan).

**Material examined.** JNU 1130 and 1131, 81.0 and 96.3

저자 직위: 한송현 (해양수산연구소), 김맹진 (해양수산연구소), 송춘복 (교수)

\*Corresponding author: Choon Bok Song Tel: 82-64-754-3471,

Fax: 82-64-756-3493, E-mail: cbsong@jejunu.ac.kr



Fig. 1. *Apogon unicolor*. JNU1131, 96.3 mm SL, Jeju Island.

Table 1. Comparison of the morphological characters of *Apogon unicolor*

Morphological characters	Present study	Jordan and Snyder (1901)	Shen and Lam (1977)	Hayashi (1984)	Ogimoto <i>et al.</i> (2022)
Number of Specimens	2	1	3	–	2
Total length (mm)	103.8~119.8	75.0	–	140.0	–
Standard length (mm)	81.0~96.3	–	44.0 (n = 1)	–	79.2~88.4
Counts					
Dorsal fin rays	VI-I, 9	VI-I, 9	VI-I, 9	VI-I, 9	VI-I, 9
Pectoral fin rays	14	13	14~15	14	14
Pelvic fin rays	I, 5	–	I, 5	I, 5	I, 5
Anal fin rays	II, 8	II, 8	II, 8	II, 8	II, 8
Developed gill rakers	2 + 1 + 8 = 11	–	2 + 1 + 7~8 = 10~11	2 + 1 + 8 = 11	2 + 8 = 10
Total gill rakers*	4 + 1 + 13	5 + 13	3~5 + 1 + 12~14	–	6 + 12
Predorsal scales	8	–	–	7~8	10
Pored lateral line scales	26	24	26	26~27	24
Scales above lateral line	2	2	3~4	–	–
Scales below lateral line	13	13	12~13	–	–

\*Number of gill rakers containing a count of rudiments

mm in standard length (SL), gill net, near Chagwido Island, Jeju Island, 4 July, 2013.

**Description.** Measurements of morphological traits for the present specimens are shown in Table 1. Measurements are revealed as a percentage against SL: body depth 34.8~37.5; body width 15.6~19.1; head length 29.6~39.1; upper jaw length 17.0~19.9; snout length 8.2~9.9; eye diameter 10.3~12.3; interorbital length 10.1~10.2; predorsal fin length 15.6~15.8; prepectoral fin length 37.5~46.3; pre-anal fin length 64.3~64.6; length of longest dorsal fin spine 15.3~15.9; length of longest pectoral fin ray 23.9~

25.2; length of longest anal fin ray 19.0~20.6; caudal peduncle depth 13.7~15.6; caudal peduncle length 22.1~24.0.

Body moderately oval and compressed, covered with ctenoid scales; anterior profile of head curved steeply; eye large, its size slightly longer than snout length and eye located above dorsal part of the head; infraorbital rim serrated; end of maxillary extends to below posterior margin of eye; teeth in both jaws form narrow bands with outer ones enlarged; nostrils present in front of the eye, first nostril with a flap, but second one without a flap; preopercle with

ridge and hind margin both serrate; lateral line abruptly descending below second dorsal fin; two separated dorsal fins: second spine of first dorsal fins and the fourth ray of second dorsal fins longest in each part of dorsal fins; anal soft rays slightly elongated; posterior end of pectoral fin extending beyond the origin of second dorsal fin base; posterior end of pelvic fins not reaching anus; caudal fin forked.

**Color when fresh.** Body and head overall reddish, but whitish red ventrally; posterior of scales dark; without markings and spots, and caudal all fins red.

**Color in alcohol.** Body uniformly pale brown; all fins pale brown.

**Distribution.** Widely distributed in Western Pacific: South China Sea (Randall and Lim, 2000), Philippines (Fraser, 1998), Taiwan (Shen and Lam, 1977), Japan (Hayashi, 1984) and Korea (present study).

**Remarks.** The present specimens were collected in the coastal waters of Jeju Island, Korea. They were characterized by having 26 lateral line pores, a first dorsal fin with six spines, the posterior margin of preopercle serrated, and 11 developed gill rakers (GR) (Fig. 2) (Shen and Lam, 1977; Hayashi, 1984). Thus, we identified our specimens *A. unicolor* based on the morphological characters.

*A. unicolor* morphologically resembles *A. crassiceps*, *A. doryssa*, *A. erythrinus*, and *A. talboti* in body form, the pattern of scalation, and the posterior margin of preopercle (Shen and Lam, 1977). However, it is distinguishable 7~8 predorsal scales (vs. 5~6 in *A. doryssa* and *A. erythrinus*) and  $2 + 1 + 8 = 11$  GR (vs.  $3 + 1 + 14 = 18$  GR in *A. crassiceps*,  $2 + 1 + 6 \sim 7 = 9 \sim 10$  GR in *A. erythrinus*,  $1 + 1 + 7 = 9$  GR in *A. doryssa* and  $3 + 1 + 13 \sim 14 = 17 \sim 18$  GR in *A.*

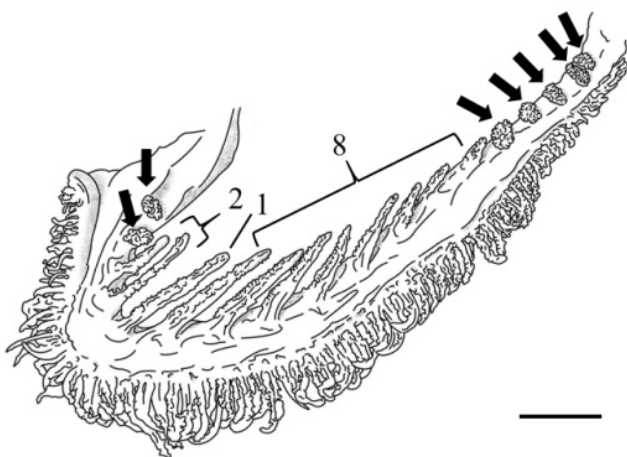
*talboti*) (Hayashi, 1984; Hayashi, 2013). Meanwhile, when this species is compared with other Korean cardinalfishes, *A. unicolor* is distinguished from others in having the first dorsal fin with six spines (vs. seven spines in other Korean cardinalfishes, except *A. semioratus*, *Gymnapogon japonicus*, and *Rhabdamia gracilis*). Although *A. unicolor* has the same spine number of the first dorsal fin as *A. semioratus*, *Gymnapogon japonicus*, and *Rhabdamia gracilis*, there are differences in the number of GR ( $2 + 1 + 8 = 11$  GR in *A. unicolor* vs.  $1 + 1 + 5 = 7$  GR in *A. semioratus*,  $1 + 1 + 7 = 9$  GR in *G. japonicus* and  $7 + 1 + 21 = 29$  in *R. gracilis*) (Hayashi, 2013). In addition, we adopted a molecular identification method based on DNA sequences (COI) to make sure of accurate species identification. The result indicated that COI sequences (1,551 bp) of present specimens were almost identical (99.81, 99.87%) to those of *A. unicolor* from NCBI (AB890023; Mabuchi *et al.*, 2014). Therefore, we identified our specimens to be *A. unicolor* based on the results of morphological and molecular characters, and we propose its new Korean name “Jin-hong-eol-ge-bi-neul” because the overall fish body and fins reveal deep red colors.

## ACKNOWLEDGEMENTS

This work was supported by a grant from the National Institute of Fisheries Science (R2022038).

## REFERENCES

- Fraser, T.H. 1998. A new species of cardinalfish (Apogonidae) from the Philippines, with comments on species of *Apogon* with six first dorsal spines. Proc. Biol. Soc. Wash., 111: 986-991.
- Fricke, R., W.N. Eschmeyer and R. Van der Laan. 2022. Eschmeyer's catalog of fishes: genera, species, references. Available at: <https://researcharchive.calacademy.org/research/ichthyology/catalog/fishcatmain.asp>. (accessed 22 Mar. 2022).
- Hayashi, M. 1984. Apogonidae. In: Masuda, H., K. Amaoka, C. Araga, U. Uyeno and T. Yoshino (eds.), The fishes of the Japanese Archipelago. Tokai Univ. Press, Tokyo, Japan, pp. 143-151.
- Hayashi, M. 2013. Apogonidae. In: Nakabo, T. (ed.), Fishes of Japan with pictorial keys to the species, 3rd ed. Tokai Univ. Press, Kanagawa, Japan, pp. 826-864.
- Jordan, D.S. and J.O. Snyder. 1901. List of fishes collected in 1883 and 1885 by Pierre Louis Jouy and preserved in the United States National Museum, with descriptions of six new species. Proc. U.S. Nat. Mus., 23: 739-769, Pls. 31-38.
- Larson, H.K., R.S. Williams and M.P. Hammer. 2013. An annotated checklist of the fishes of the Northern Territory, Australia.



**Fig. 2.** Morphology of gill arch of *A. unicolor* (JNU1131). Numbers: counts of developed gill rakers; arrows: rudiments. Bar indicates 2 mm.

- Zootaxa, 3696: 1-293.
- MABIK (Marine Biodiversity Institute of Korea). 2021. National list of marine species. Namu, Seocheon, Korea, 20.
- Mabuchi, K., T.H. Fraser, H. Song, Y. Azuma and M. Nishida. 2014. Revision of the systematics of the cardinalfishes (Perciforma: Apogonidae) based on molecular analyses and comparative reevaluation of morphological characters. Zootaxa, 3846: 151-203.
- Nelson, J.S. 2006. Fishes of the world, 4th ed., John Wiley & Sons, New York, U.S.A., 601pp.
- Ogimoto, K., T. Sonoyama and T. Yoshida. 2022. Second record of *Apogon unicolor* (Perciformes, Apogonidae) from Yamaguchi Prefecture, Japan. Ichthy, Nat. Hist. Fish. Jpn., 17: 11-15.
- Randall, J.E. 2001. Four new cardinalfishes (Perciformes: Apogonidae) from the Marquesas Islands. Pac. Sci., 55: 47-64.
- Randall, J.E. and K.K.P. Lim. 2000. A checklist of the fishes of the South China Sea. Raffles Bull. Zool. Suppl., 8: 569-667.
- Shen, S.C. and C. Lam. 1977. A review of the cardinal fishes (Family Apogonidae) from Taiwan. Acta Oceanographica Taiwanica, Sci. Rept. Natn. Taiwan Univ., 7: 154-192, 34 figs.
- Steindachner, F. and L. Döderlein. 1883. Beiträge zur Kenntniss der Fische Japan's (II). Denkschriften der Kaiserlichen Akademie der Wissenschaften in Wien, Mathematisch-Naturwissenschaftliche Classe, 48: 1-40, Pls. 1-7.

## 한국산 동갈돔과 어류 첫기록종, *Apogon unicolor*

한송현 · 김맹진<sup>1</sup> · 송춘복<sup>2</sup>

국립수산과학원 제주수산연구소, <sup>1</sup>국립수산과학원 서해수산연구소, <sup>2</sup>제주대학교 해양과학대학

---

**요 약** : 동갈돔과에 속하는 *Apogon unicolor* 2개체 (표준체장 81.0, 96.3 mm)가 제주도 차귀도 연안 자망에서 처음으로 채집되었다. 이 종은 측선공수가 26개, 첫 번째 등지느러미수가 6개, 새파수 11개 (2 + 1 + 8)이며, 안하골과 전새개골의 가장자리에 거치상이 있고, 체측에 무늬나 반점이 없다. 이번에 채집된 표본은 형태와 분자유전학적 특징이 기존의 보고와 잘 일치하였으며 채색에 있어서 몸체와 지느러미가 전반적으로 홍색을 질게 띠고 있어 이 종의 국명을 “진홍얼개비늘”로 제안한다.

---

**찾아보기 낱말** : 동갈돔과, 첫기록종, *Apogon unicolor*, 제주도