

First Record of the Honeycomb Filefish, *Cantherhines pardalis* (Tetraodontiformes: Monacanthidae) from Korea

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ABSTRACT This is the first report of *Cantherhines pardalis* (Tetraodontiformes: Monacanthidae) from Korea. A single specimen (105.4 mm in SL) was collected from the coastal waters of Busan by gill net on 20 June, 2012. This species is characterized by having the following morphological traits: II, 34 dorsal fin rays; 31 anal fin rays; 13 pectoral fin rays; caudal peduncle without large spines; spine row on the lateral side of first dorsal spine distinct; posterior end of pelvic with encasing scales distinctly more protruding than ventral flap. This species is similar to *C. dumerilii* except for the number of spines on caudal peduncle (none in *C. pardalis* vs. two pairs in *C. dumerilii*). Based on morphological and molecular approaches, the specimen was identified as *C. pardalis*. We add *C. pardalis* to Korean fish fauna and propose the new Korean names “Yuk-gak-mu-nui-jwi-chi” for the species.

Key words: Monacanthidae, *Cantherhines pardalis*, first record, Busan

INTRODUCTION

The filefishes (family Monacanthidae), which comprise 28 genera with about 105 species, are widely distributed in tropical and temperate seas worldwide (Nelson *et al.*, 2016). Characters of this family include that the second one of two dorsal spines is usually much smaller and it may be absent, small scales in regular series make the body prickly or furry to touch, and upper jaw usually has three teeth in the outer and two in the inner series on each premaxillary (Nelson *et al.*, 2016). In Korea, 11 monacanthid species with nine genera have been reported so far (Kim *et al.*, 2005). The genus *Cantherhines* Swainson, 1839, comprises 12 valid species worldwide (Froese and Pauly, 2017), five species from Japan (Hayashi and Hagiwara, 2013) and one species from Korea (Kim *et al.*, 2005). This genus is characterized by having 32-39 soft dorsal fin rays, first dorsal spine with very small bars or obsolete and usually originating over anterior half of the eye, and three pairs of incasing scales, and no bristles or

spines on the middle of side (see Hutchins, 1977).

Recently, a single specimen of monacanthid fish having a dark brown body color was collected by gill net from the coastal waters of Busan, Korea. The specimen was identified as *Cantherhines pardalis* (Rüppell, 1837) based on the number of dorsal and anal fins, caudal peduncle without large spines, and a distinct spine row on the lateral side of first dorsal spine. In addition, nucleotide sequencing of the mitochondrial cytochrome c oxidase subunit I (COI) gene was carried out to confirm the correctness of species identification of the specimen. Since the morphological features of this species have not been reported in Korea until now, we describe the morphological characters of *C. pardalis* as an addition to the list of Korean fish fauna.

MATERIALS AND METHODS

Identification procedure basically followed the method of Hayashi and Hagiwara (2013). After a partial tissue was isolated from one specimen of *C. pardalis* to extract genomic DNA, the specimens were fixed in 10% forma-

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Fig. 1. *Cantherhines pardalis*, JNU-0765, 105.4 mm SL, gill net, Busan, Korea, June 20, 2012.

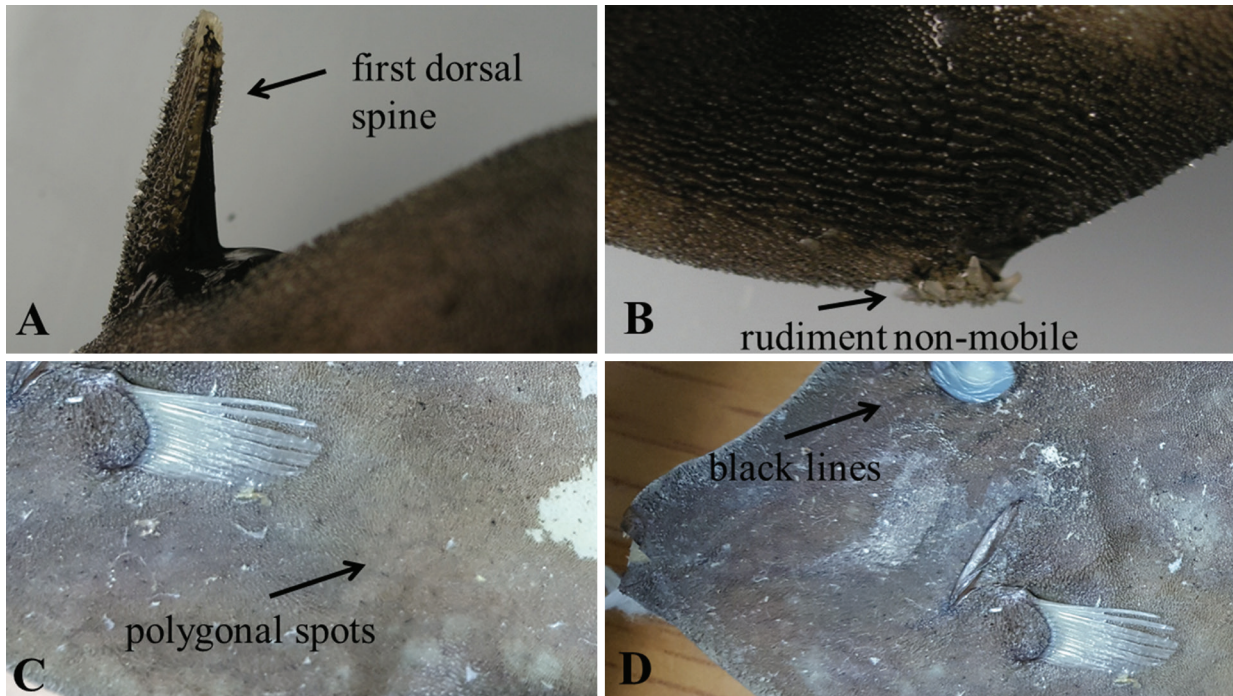


Fig. 2. A photograph showing the first dorsal spine (A), non-mobile pelvic fin rudiment (B), polygonal spots (C), and black lines (D).

lin and then preserved in 70% ethanol. Counts and measurements followed the method of Matsuura (1980). The specimen is deposited at the Fish Genetics and Breeding Laboratory of Jeju National University (JNU), Korea.

Molecular identification of the specimen was conducted by using the DNA sequences (547 bp) of COI gene. Genomic DNA extraction and PCR were performed according to Chang *et al.* (2016). The DNA sequence of the specimen was deposited at the National Center for Biological

Information (NCBI) databases (Accession no.: MF959468). This DNA sequence was compared with those of *C. pardalis* (Saudi Arabia, KY675920; Taiwan, KU945218; USA, MF041526; Madagascar, JQ349820; Australia, KP194791), *C. dumerilii* (Polynesia, JQ431522) and *C. sandwichiensis* (Polynesia, JQ431523). The phylogenetic tree (Fig. 2) was constructed and genetic distances were estimated by using the program MEGA 7.0 (Kumar *et al.*, 2016) to confirm the relationships between the DNA se-

quence from the specimen and those depositing in NCBI.

***Cantherhines pardalis* (Rüppell), 1837**

(Korean name: Yuk-gak-mu-nui-jwi-chi)

(Fig. 1; Table 1)

Monacanthus pardalis Rüppell, 1837: 57 (type locality: El-Tor, coastal waters of Sinai, Egypt).

Cantherhines pardalis: Hutchins, 1977: 55 (Australia); Matsura in Masuda *et al.* 1984: 360 (Japan); Hutchins, 1986: 884 (South Africa); Randall, 1995: 396 (Oman); Myers, 1999: 285 (Micronesian); Allen & Adrim, 2003: 64 (Indonesia).

Material examined. JNU-0765, 105.4 mm in standard length (SL), gill net, Busan, Korea. June 20, 2012.

Description. Measurements of morphological traits for the present specimen are shown in Table 1. Measurements are revealed as a percentage against SL: Body depth, 45.5; body width, 13.3; head length, 31.2; snout length, 26.6; eye diameter, 7.5; interorbital width, 9.8; length of gill opening, 10.3; snout to origin of dorsal fin, 32.3; snout to origin of anal fin length, 70.0; prepectoral fin length, 30.3; interdorsal space, 32.3; length of longest dorsal fin ray, 9.2; length of pectoral fin ray, 10.0; length of longest anal fin ray, 8.9; caudal peduncle length, 11.9; length of dorsal fin base, 37.2; length of anal fin base, 30.4; length of caudal fin, 21.6.

Body moderately compressed and deep, head body covered with minute slender spinules. Head rather acute; upper profile of snout prominently concave; lower profile slightly convex; gill slit is located below middle of eye; mouth small, terminal, upper jaw protruding slightly lower jaw, lips not obviously fleshy; consisting of three outer and two inner teeth on each side of upper jaw, extremities of inner teeth projecting between outer ones; first dorsal spine originating over anterior half of eye, armed with very small posteriorly directed barbs along each posterolateral edge (Fig. 2a), received partly into a deep groove in back when depressed; soft dorsal and anal fin rays about equal in height; pelvic fin rudiment non-mobile (Fig. 2b), and not prominently projecting rearward of ventral flap; no dense patch of bristles on caudal peduncle; caudal fin rounded.

Coloration. When fresh, body and head dark brown with a network of close-set polygonal spots; blue lines running from eye and gill slit to mouth; fins pale yellow-orange, the caudal rays brownish; a white spot was present at rear base of both second dorsal and anal fins. After preservation, body and head dark brown with a network of close-set polygonal spots (Fig. 2c); black lines

Table 1. Morphological traits compared between present and previous studies on *C. pardalis*

Morphological characters	Present study	Rüppell (1837) (holotype)	Myers (1999)
Specimen (no.)	1	1	–
Total length (mm)	125.0	–	–
Standard length (mm)	105.4	–	~206
Counts			
Dorsal fin rays	II-34	I-34	II-32~36
Pectoral fin rays	13	12	13~15
Anal fin rays	31	30	29~32
Caudal fin rays	i,10,i	i,10,i	–
Vertebrae	19	–	–

running from eye and gill slit to mouth (Fig. 2d); dorsal and anal fins pale yellow-white, the caudal rays brownish; a white spot not existing at rear base of both second dorsal and anal fins.

Distribution. Red Sea to South Africa and northeastward to Korea (Busan, present study), southern Japan and to southeastern Oceania (Francis, 1993; Myers, 1999). Also eastern Atlantic including Gulf of Guinea, Annobon Islands, south coast of Africa (Harmenlin-Vivien and Quérou, 1990).

Remarks. The present specimen was identified as *C. pardalis* based on morphological characters in 34 dorsal fin rays, 31 soft anal fin rays, posterior end of pelvic with encasing scales distinctly more protruding than ventral flap, caudal peduncle without large spines, and distinct spine row on the lateral side of first dorsal spine (Hayashi, 2002). Meristic characters of the present specimen were compared with those of *C. pardalis* reported by Rüppell (1837) and Myers (1999) (Table 1). Although slight differences can be seen in pectoral fin rays (13 in present specimen vs. 12 in holotype) and anal fin rays (31 vs. 30 in holotype), these traits were well agreed with those of *C. pardalis* given by Myers (1999). Therefore, these differences seem to be due to intraspecific variation. In addition, we adopted molecular identification method based on the DNA sequences of COI gene to make sure of the correctness of species identification. The result indicated that DNA sequence from the present specimen was very similar to those of *C. pardalis* obtained from NCBI (99.3~99.5% similarity), but was different from *C. dumerilii* and *C. sandwichiensis* (Fig. 3).

C. pardalis is known as having one out of three kinds of basic body color patterns including mottled grey and brown, dark brown, or grey with a network of close-set polygonal spots (Fischer and Bianchi, 1984). The present specimen has a dark brown pattern with polygonal spots. As the caudal peduncle of adult male is armed with

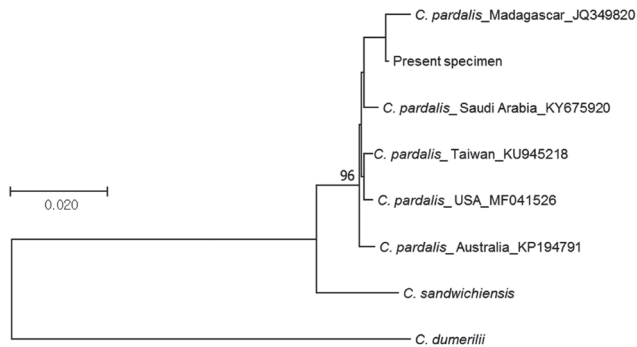


Fig. 3. The phylogenetic tree inferred using the Neighbor-Joining method.

a dense patch of fine bristles, naked in adult female and juvenile (Fischer and Bianchi, 1984), we think that the collected individual is female.

The specimen is morphologically quite similar to *C. dumerilii* inhabiting the coastal waters of Jeju Island, Korea. However, the latter can be easily distinguished from the former in having the caudal peduncle without large spines (two pairs of large spines for *C. dumerilii*) (Hayashi and Hagiwara, 2013). We herein propose the Korean name, “Yuk-gak-mu-nui-jwi-chi” for this species because it has a network of hexagonal pattern on its body.

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한국산 쥐치과 어류 1미기록, *Cantherhines pardalis*

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요약 : 쥐치과에 속하는 *Cantherhines pardalis* 1개체 (표준체장 105.4 mm)가 2012년 6월 20일에 부산 연안에서 자망에 처음으로 채집되었다. 이 종은 등지느러미 기조수 II, 34개를 갖는 점, 뒷지느러미 기조수 31개를 갖는 점, 가슴지느러미 기조수 13개를 갖는 점, 꼬리지느러미 비병부에 큰 가시가 없는 점, 첫 번째 등지느러미 극조 측면에 분명한 거치가 있는 점, 그리고 흉부 말단에 딱딱한 비늘이 돌출되어 있는 특징을 갖는다. 그리고 이 종은 형태적으로 검은쥐치 (*C. dumerili*)와 유사하지만 꼬리지느러미 비병부에 가시가 없어서, 2쌍의 가시를 가지는 검은쥐치와 형태적으로 쉽게 구분된다. 또한 유전학적 방법을 사용하여 이 표본이 *C. pardalis*임을 확인하였다. 우리나라에서 처음 보고되는 이 종을 한국 어류상 목록에 추가하였고, 국명으로 “육각무늬쥐치”를 제안하였다.

찾아보기 낱말 : 쥐치과, 무늬쥐치속, 육각무늬쥐치, 미기록종, 부산