

First Record of the Pelagic Stingray, *Pteroplatytrygon violacea* (Dasyatidae, Myliobatiformes) from Korea

By Byeong Yeob Kim, Meang Jin Kim¹ and Choon Bok Song*

College of Ocean Sciences, Jeju National University, Jeju 63243, Republic of Korea

¹West Fisheries Research Institute, National Institute of Fisheries Sciences, Incheon 22383, Republic of Korea

ABSTRACT A single specimen (1,058 mm TL) of *Pteroplatytrygon violacea*, belonging to the family Dasyatidae, was firstly collected by using drift gill net in the north-western coastal waters of Jeju Island, Korea on 6 July, 2017. This species was characterized by having a broadly rounded snout, five pairs of gill openings, tail with a large spine, ventral tail fold not reaching to the tip of tail, no dorsal fold, and ventral surface of disc dark purple. Based on such morphological characters, the specimen was identified as *P. violacea* and confirmed with the nucleotide sequence of the mitochondrial cytochrome c oxidase subunit I gene. We added *P. violacea* to the Korean fish fauna and propose the new Korean names, “Bo-ra-saek-ga-o-ri-sok” and “Bo-ra-saek-ga-o-ri” for the genus and species, respectively.

Key words: Dasyatidae, *Pteroplatytrygon violacea*, new record, Jeju Island

INTRODUCTION

The family Dasyatidae, which belongs to the order Myliobatiformes, has six genera with about 68 species worldwide (Froese and Pauly, 2017). This family is characterized by following morphological characters: disc width less than 1.3 times of disc length; no caudal fin; tail long (distance from cloaca to the tip much longer than breadth of disc), very slender to whiplike, without dorsal fin but the tail with one or more long, poisonous spines (Nelson *et al.*, 2006). Seventeen dasyatid species with seven genera have been reported in Japan (Yamaguchi *et al.*, 2013) and six species with two genera in Korea up to the date (NIBR, 2011).

At the commercial fishing ground for the yellow croaker, a single specimen of unrecorded dasyatid species was caught in the north-western coastal waters of Jeju Island (off Biyangdo Island) by using drift gill net. The specimen was identified as *Pteroplatytrygon violacea*, based on the shape of snout and tail, and color of the ventral surface. This species is widely distributed tropical and subtropical

areas of the Atlantic, Pacific and Indian Oceans (Mollet, 2002), and it has been found from the surface to a depth of 381 m but usually in the upper layer to 100 m (Mundy, 2005; Antonenko *et al.*, 2015). Because of exploitation and lack of assessment, this species was placed under “Least Concern” status in the IUCN Red List of Threatened Species. Thus, the knowledge of its biology, migration and its exact taxonomic position is still found wanting (IUCN, 2017). The Korean name and a brief description of *P. violacea* was previously reported with a sample collected in overseas (NFRDI, 1999), but this species has not been caught in Korean waters so far. We firstly collected a single specimen of *P. violacea* from the north-western coastal waters of Jeju Island in Korea, and the morphological characteristics of *P. violacea* were described in order to be added to the list of Korean fish fauna.

MATERIALS AND METHODS

Identification procedure of the specimen collected from Jeju Island was followed by the method of Yamaguchi *et al.* (2013). After a small piece of muscle tissue was sampled from the fresh specimen to extract genomic DNA,

*Corresponding author: Choon Bok Song Tel: 82-64-754-3471,
Fax: 82-64-756-3493, E-mail: cbsong@jejunu.ac.kr

the specimen was stored in the freezer maintaining its temperature at -50°C . Measurements followed the method of Wallace (1967) and Ebert (2014). The examined 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 DNA sequences (617 bp) of the mitochondrial cytochrome c oxidase subunit I (COI) gene. Genomic DNA extraction and PCR were performed according to Chang *et al.* (2016). The DNA sequence of COI gene (Accession No.: MG573151) obtained from the present specimen was compared with those of *P. violacea* (USA California, GU440486; Italy, KT307373; Morocco, KT307370; India, KF899656) deposited at the National Center for Biological Information (NCBI) databases. The genetic distances between them were calculated using the program MEGA 7.0 (Kumar *et al.*, 2016).

Genus *Pteroplatytrygon* Fowler, 1910

(New Korean name: Bo-ra-saek-ga-o-ri-sok)

Pteroplatytrygon Folwer, 1910: 474 (type species: *Pteroplatytrygon violacea* (Bonaparte, 1832))

Disk width much greater than length, front margin broadly convex. No upper tail fold after caudal spines (Fowler, 1910).

Pteroplatytrygon violacea (Bonaparte, 1832)

(New Korean name: Bo-ra-saek-ga-o-ri)

(Fig. 1; Table 1)

Trygon violacea Bonaparte, 1832: fasc. 1, punt. 6 (type

locality: Italy, western Mediterranean Sea).

Pteroplatytrygon violacea: McEachran and Fechhelm, 1998: 181 (Gulf of Mexico); Carpenter and Niem, 1999: 1505 (Central Pacific); Randall and Lim, 2000: 583 (South China Sea); Bilecenoglu *et al.*, 2002: 26 (Turkey); Mundy, 2005: 106 (Hawaii); Gomon *et al.*, 2008: 141 (Australia); Hsu *et al.*, 2013: 254 (Taiwan); Yamaguchi *et al.*, 2013: 222 (Japan); Parin *et al.*, 2014: 39 (Russia); Last and Stewart, 2015: 200 (New Zealand).

Material examined. JNU-1461, one specimen, 1,058 mm in total length (TL), northwestern Jeju Island, 6 July 2017, by using drift gill net.

Description. Measurements for the present specimen are shown in Table 1. Body trapezoid (body broad and disc wedge shaped), depressed and disc width about 1.3 times longer than disc length; the body covered with slimy mucous; distance between the tip of snout and eye about 7.5 times the disc width or 0.8 times the interorbital width; upper surface of the disc and tail covered with close-set prickles; eyes moderately size with thick eyelid, smaller than spiracles, its length 0.6 times spiracle length and close to spiracles; no dorsal and anal fin; mouth small; several rows of teeth present in the mouth, oral teeth small and rounded; teeth counts about 38 rows in upper and 35 rows in lower jaw; gill openings small, five pairs on underside of front half of pectoral disc; third gill slits larger than others, but fifth shorter; pelvic fins small and oar shaped; tail less than twice disc length; tail with distinct ventral fold, dorsal fold absent; ventral fold not

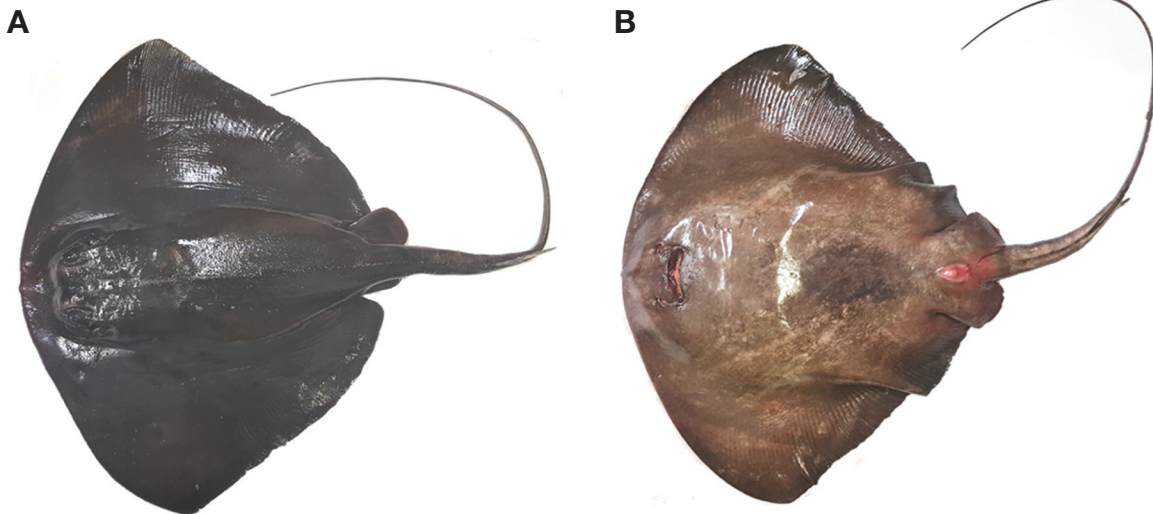


Fig. 1. *Pteroplatytrygon violacea*, JNU-1461, 1,058 mm TL, 569 mm DW, female, drift gill net, north-western coastal waters of Jeju Island, Korea, 6 July, 2017. A, dorsal view; B, ventral view.

Table 1. Morphometric characters compared between present and previous studies on *Pteroplatytrygon violacea*

Measurements	Present study (Female)	Ellis (2007) (Male)	Akhilesh <i>et al.</i> (2008) (Male)	Zacharia <i>et al.</i> (2011) (Female)
Total length (mm)	1,058 (n = 1)	995 (n = 1)	1,020 (n = 1)	910 (n = 1)
In % of total length				
Disc width	53.8	42.2	46.1	51.4
Disc length	40.6	33.7	34.3	41.4
Pre-narial length	4.9	4.3	5.1	4.5
Pre-oral length	6.8	5.3	6.3	6.0
Pre-orbital length	5.7	6.3	5.5	4.5
Pre-spiracle length	8.3	6.9	7.7	6.6
Pre-gill length (from first gill slit)	11.1	10.8	11.4	10.8
Pre-gill length (from fifth gill slit)	16.3	15.7	16.6	16.3
Eye length	3.2	1.6	1.6	3.1
Eye height	1.3	—	—	—
Interorbital width	5.3	4.1	6.6	5.3
Internarial width	4.9	4.2	4.4	4.3
Mouth width	5.3	4.9	5.4	5.4
Spiracle length	3.0	2.2	2.6	3.2
Interspiracle width	8.1	7.7	7.7	8.0
First gill slit length	1.5	—	—	—
Second gill slit length	1.7	—	—	—
Fifth gill slit length	1.2	—	—	—
Distance between first pair of gill slits	9.6	8.5	8.8	11.1
Distance between fifth pair of gill slits	6.6	6.0	6.5	8.7
Pelvic width	5.3	—	—	—
Snout to cloaca (anterior) distance	33.8	29.6	29.9	32.1
Cloaca (anterior) distance to end of tail end	62.4	71.4	70.1	57.1

reaching to the tip of tail without dorsal fold; tail narrow in backward; single prominent stinging spine on the dorsal surface of tail; a row of 46 irregular spinules facing downward runs through the middle of the body; no claspers because of female specimen.

Coloration. Dorsal side was uniformly black purple without spots, and ventral one uniformly dark purple without spots.

Distribution. Known from widely distributed tropical and subtropical areas of the Atlantic, Pacific and Indian Oceans: southern California of USA, Brazil, Russia, Japan, China, Taiwan, Indonesia, Philippines, northern India, Australia to Mediterranean, southern Africa (Compagno, 1996; Mollet, 2002). In Korea, it occurs around Jeju Island (present study).

Remarks. The present specimen collected from Jeju Island is characterized by having a broadly rounded snout, five pairs of gill openings, tail with a large sting spine, ventral tail fold not reaching to the tip of tail, no dorsal fold, and ventral surface of the disc dark purple. These morphological characteristics of the present specimen were well matched with those described by Bonaparte (1832). However, as there was no detailed measurements in the original paper (Bonaparte, 1832), we compare our measurements with those in other previous

studies on *P. violacea* (Ellis, 2007; Akhilesh *et al.*, 2008; Zacharia *et al.*, 2011) (Table 1). Although our proportional measurements of the present specimen agreed almost in its morphological characters with those of the female specimen described in Zacharia *et al.* (2011), some differences existed when compared with those of males (Ellis, 2007; Akhilesh *et al.*, 2008). These differences in measurements seem to be caused by gender or intraspecific variation. Thus, we adopted molecular identification method based on COI DNA sequences to make sure of the accurate species identification. The result indicated that COI sequence of the present specimen was almost identical (99.2~99.8%) to those of *P. violacea* from NCBI (data not shown). Thus, we identified our specimen to be *P. violacea* based on both morphological and molecular characters.

P. violacea is morphologically similar to species of the genus *Dasyatis*, but the former can be clearly distinguished from the latter by having the disc trapezoidal (vs. rhomboidal), anterior margin uniformly convex (vs. angular), ventral surface almost entirely dark (vs. pale) (Yamaguchi *et al.*, 2013). The Korean name for *P. violacea* was adopted as “Bo-ra-saek-ga-o-ri” which was previously suggested with a specimen collected in overseas (NFRDI, 1999).

ACKNOWLEDGEMENTS

This work was funded by a grant from the National Institute of Fisheries Sciences (No: R2018029), Korea.

REFERENCES

- Akhilesh, K.V., H. Manjebraayakath, U. Ganga, K.K. Bineesh and C.P.R. Shanis. 2008. Morphometric characteristics of the pelagic stingray *Pteroplatytrygon violacea* (Bonaparte, 1832) caught off Cochin, South-west coast of India, *J. Mar. Biol. Ass. India*, 50: 235-237.
- Antonenko, D.V., A.A. Balanov, S.P. Matveichuk and N.M. Bilishak. 2015. Record of rare for waters of Russia pelagic stingray *Pteroplatytrygon violacea* (Dasyatidae) in the south Kuril region. *J. Ichthyol.*, 55: 911-913.
- Bilecenoglu, M., E. Taskavak, S. Mater and M. Kaya. 2002. Checklist of the marine fishes of Turkey. *Zootaxa*, 113: 1-194.
- Bonaparte, C.L. 1832. Iconografia della fauna italica per le quattro classi degli animali vertebrati. Tomo III. Pesci. Roma, 556pp, 78 pls.
- Carpenter, K.E. and V.H. Niem. 1999. Species identification guide for fisheries purposes. The living marine resources of the western central Pacific. Batoid fishes, chimeras and bony fishes part 1 (Elopidae to Linophrynidae). FAO, Rome, v. 3: 1398-2068.
- Chang, C.H., K.T. Shao, H.Y. Lin, Y.C. Chiu, N.Y. Lee, S.H. Liu and P.L. Lin. 2016. DNA barcodes of the native ray-finned fishes in Taiwan, *Mol. Eco. Resour.*, 17: 796-805.
- Compagno, L.J.V. 1996. Family No. 30: Dasyatidae. In: Smith, M.M. and P.C. Heemstra (eds.), *Smith's sea fishes*. Springer-Verlag, Grahamstown, pp. 135-142.
- Ebert, D.A. 2014. Deep-sea cartilaginous fishes of the Indian Ocean. Volume 2. Batoids and Chimaeras. FAO Species Catalogue for Fishery Purposes. No. 8, Vol. 2. Rome, FAO, 129pp.
- Ellis, J.R. 2007. Occurrence of pelagic stingray *Pteroplatytrygon violacea* (Bonaparte, 1932) in the North Sea. *J. Fish. Biol.*, 71: 933-937.
- Fowler, H.W. 1910. Notes on batoid fishes. *Proc. Acad Nat. Sci. Philadelphia*, 62: 468-475.
- Froese, R. and D. Pauly. 2017. FishBase. World wide web electronic publication. www.fishbase.org, version (06/2017).
- Gomon, M.F., D.J. Bray and R.H. Kuitert. 2008. *Fishes of Australia's Southern Coast*. New Holland Publishers. Sydney, Australia, 928pp.
- Hsu, H.H., S.J. Joung, D.A. Ebert and C.Y. Lin. 2013. Records of new and rare elasmobranchs from Taiwan. *Zootaxa*, 3751: 249-255.
- IUCN 2017. The IUCN Red List of Threatened Species. Version 2017-2. <<http://www.iucnredlist.org>>. Downloaded on 14 September 2017.
- Kumar, S., G. Stecher and K. Tamura. 2016. MEGA7: Molecular evolutionary genetics analysis version 7.0 for bigger datasets. *Mol. Biol. and Evol.*, 33: 1870-1874.
- Last, P.R. and A.L. Stewart. 2015. 32 Family Dasyatidae. In: Roberts, C.D., A.L. Stewart and C.D. Struthers (eds.), *The Fishes of New Zealand. Volume Two. Systematic Accounts*. Te Papa Press, Wellington, 2: 97-200.
- McEachran, J.D. and J.D. Fechhelm. 1998. *Fishes of the Gulf of Mexico. Volume 1: Myxiniiformes to Gasterosteiformes*. Univ. of Texas Press, Austin, 1112pp.
- Mollet, H.F. 2002. Distribution of the pelagic stingray, *Dasyatis violacea* (Bonaparte, 1832), off California, Central America, and worldwide. *Mar. Freshwater Res.*, 53: 525-530.
- Mundy, B.C. 2005. Checklist of the fishes of the Hawaiian Archipelago. *Bishop Museum Bulletins in Zoology*, 6: 1-703.
- Nelson, J.S. 2006. *Fishes of the World*. 4th ed. John Wiley and Sons Inc., New York, p. 79.
- NFRDI. 1999. *Fishes the Pacific Ocean*. Hageul graphics, Busan, Korea, p. 224. (in Korean)
- NIBR. 2011. Fish species of Korea. In: National list of species of Korea (Vertebrates). NIBR (National Institute of Biological Resources), pp. 3-189.
- Parin, N.V., S.A. Evseenko and E.D. Vasil'eva. 2014. *Fishes of Russian Seas: Annotated Catalogue*. KMK Scientific Press, Moscow, 53: 733pp.
- Randall, J.E. and K.K.P. Lim. 2000. A checklist of the fishes of the South China Sea. *Raffles Bulletin of Zoology, Suppl.*, 8: 569-667.
- Wallace, J.H. 1967. The batoid fishes of the east coast of southern Africa. Part. 2. Manta, eagle, duckbill, cownose, butterfly and stingrays. *Investigational Report*. 16. Oceanographic Research Institute, South Africa, 56pp.
- Yamaguchi, A., Y. Anonuma, N. Yagishita and T. Yoshino. 2013. Dasyatidae. In: Nakabo, T. (ed.), *Fishes of Japan with pictorial keys to the species*, 3rd edition, Tokai University Press, Kanagawa, pp. 220-226. (in Japanese)
- Zacharia, P.U., K.K. Joshi and P. Kandan. 2011. First record the pelagic stingray *Pteroplatytrygon violacea* (Bonaparte, 1932) (Family: Dasyatidae) from the east coastal of India. *Indian. J. Fish.*, 58: 95-98.

한국산 색가오리과(Dasyatidae) 어류 1미기록종, *Pteroplatytrygon violacea*

김병엽 · 김맹진¹ · 송춘복

제주대학교 해양과학대학, ¹국립수산물과학원 서해수산연구소

요 약 : 매가오리목, 색가오리과에 속하는 *Pteroplatytrygon violacea* 1개체 (전장 1,058 mm)가 2017년 7월 6일 제주도 북서쪽 연안에서 처음으로 유자망에 의해 채집되었다. 이 종은 넓은 주둥이를 갖는 점, 5쌍의 아가미구멍이 있는 점, 꼬리에 1개의 가시가 있는 점, 꼬리의 배쪽에 있는 피습이 꼬리끝까지 이르지 않는 점, 꼬리의 등쪽에는 피습이 없는 점, 그리고 배의 표면은 전체적으로 어두운 자주색을 띠는 것이 특징이다. 이러한 형태적 특징에 따라서 이 종을 *P. violacea*로 동정하였으며, 표본의 COI 유전자 염기서열을 이용하여 종동정을 확인하였다. 이 미기록 종은 배 표면의 체색으로 인해 기존에 붙여진 이름에 따라 종명과 속명을 각각 “보라색가오리”와 “보라색가오리속”으로 제안한다.

찾아보기 낱말 : 색가오리과, 보라색가오리속, 보라색가오리, 미기록종, 제주도