

## NEW RECORD OF THE JAPANESE ROUGHSHARK, *OXYNOTUS JAPONICUS* YANO ET MUROFUSHI, 1985 (ELASMOBRANCHII: SQUALIFORMES: OXYNOTIDAE) IN TAIWAN

Hsuan-Ching HO<sup>1,2\*</sup> and Kazuhiro NAKAYA<sup>3</sup>

<sup>1</sup>National Museum of Marine Biology and Aquarium, Pingtung, Taiwan

<sup>2</sup>Institute of Marine Biology, National Dong Hwa University, Pingtung, Taiwan

<sup>3</sup>(Professor Emeritus) Hokkaido University, Hakodate, Hokkaido, Japan

Ho H.-C., Nakaya K. 2016. New record of the Japanese roughshark, *Oxynotus japonicus* Yano et Murofushi, 1985 (Elasmobranchii: Squaliformes: Oxynotidae) in Taiwan. Acta Ichthyol. Piscat. 46 (4): 357–360.

**Abstract.** A specimen of the rare Japanese prickly dogfish, known also as the Japanese roughshark, *Oxynotus japonicus* Yano et Murofushi, 1985, was recently collected from the north-eastern Taiwan at the Daxi fish market. It represents the first record of the family, the genus, and the species in Taiwan. Moreover, previous records were based on only 8 known specimens and the Taiwanese specimen represents the 9th specimen in the world. A detail description of the specimen is provided to document the species.

**Keywords:** taxonomy, Squalomorpha, Chondrichthyes, prickly dogfish, new record

The shark family Oxynotidae, belongs to the order Squaliformes, is a group of medium sized fishes that inhabit in the continental and insular shelves and slopes in eastern Atlantic (including Mediterranean), western Atlantic, and western Pacific. The family is uniquely characterized by the high and compressed body, triangular in cross-section with lateral ridges on abdomen, rough skin with large, prickly and close-set denticles, two high sail-like, spined dorsal fins, and blunt snout (Ebert et al. 2013). It comprises one single genus (i.e., *Oxynotus*) and five species in the world, and two of them are known from the Pacific Ocean: *Oxynotus brunniensis* (Ogilby, 1893) from South Australia and New Zealand and Japanese prickly dogfish, known also as the Japanese roughshark, *Oxynotus japonicus* Yano et Murofushi, 1985, from Japan (Yano and Matsuura 2002).

*Oxynotus japonicus* was initially described from one male specimen collected from Suruga Bay, Japan (Yano and Murofushi 1985). Subsequently, 6 additional females were collected from Suruga Bay and Enshu-nada Sea, Japan and a redescription was provided by Yano et al. (2002). Yano (2004) provided the assessment and classified it as Data Deficient of the IUCN category. Not until Tanaka (2008), one additional female was collected from Ie Island, Okinawa Prefecture. Thus far, there are only 8 known specimens in collections at present. In 2015, one female specimen of *O. japonicus* was collected from Daxi, northern Taiwan, extending its distribution range to Taiwan.

Terminology, methods for taking morphometric measurements and meristics followed Yano and Murofushi (1985). The vertebrae count is counted directly from digital films taken by digital x-ray machine set up in the National Museum of Marine Biology and Aquarium, Pingtung, Taiwan, where the specimen is deposited. Data for comparison are those provided in Yano et al. (2002). Institution abbreviations followed Fricke and Eschmeyer (2016).

Family Oxynotidae Gill, 1863  
*Oxynotus* Rafinesque, 1810  
*Oxynotus japonicus* Yano et Murofushi, 1985  
 (Figs. 1–2, Table 1)

**Material.** NMMB-P23359, female, 610 mm TL, Daxi fish market, trawled on the slop near Kueishan Island, north-eastern Taiwan, 21 March 2015, ca. 300 m, coll. H.-C. Ho.



**Fig. 1.** *Oxynotus japonicus* Yano et Murofushi, 1985, NMMB-P23359, female, 610 mm TL, fresh

\* Correspondence: Dr. Hsuan-Ching Ho, National Museum of Marine Biology and Aquarium, Pingtung, No. 2, Houwan Rd., Checheng, Pingtung, Taiwan, phone: +886 882-5392, e-mail: (HCH) [ogcoho@gmail.com](mailto:ogcoho@gmail.com), (KN) [nakaya@fish.hokudai.ac.jp](mailto:nakaya@fish.hokudai.ac.jp).

**Description of NMMB-P23359.** Head short; head before spiracle depressed; dorsal surface flat. Head behind spiracle high and elevated. Trunk long, compressed and high; ventrolateral ridge strong. Caudal peduncle short and slightly compressed, without keel and pit. First dorsal fin base very long, beginning above pectoral fin axil, ending at middle of interspace between pectoral and pelvic fin bases; base for fin-web (from spine to posterior end of base) 2/3 of interorbital width; first dorsal fin very high with sharp pointed tip and rounded free rear tip; 1st dorsal spine slightly inclined posteriorly. Second dorsal fin origin posterior to origin of pelvic fin base; base little longer than 1/2 of first dorsal fin base; base for web greater than that of 1st dorsal fin, or slightly less than interorbital width; 2nd dorsal fin with sharp pointed tip and rounded free rear tip; 2nd dorsal spine slightly inclined posteriorly, tip broken. Pectoral fin short with rounded anterior margin and very broad free rear tip; axil smooth without dermal denticles. Pelvic fin broad with rounded corners. Caudal fin with broad ventral and dorsal lobes; subterminal notch distinct.

Anterior nostril large facing forward; posterior nostril large covered with large anterior nasal flap. Eye large, oval; horizontal diameter about 1/2 of interorbital width. Spiracle large, vertically elliptical. Gill openings small, almost same in size, located before pectoral fin. Mouth small, transverse, with thick lips.

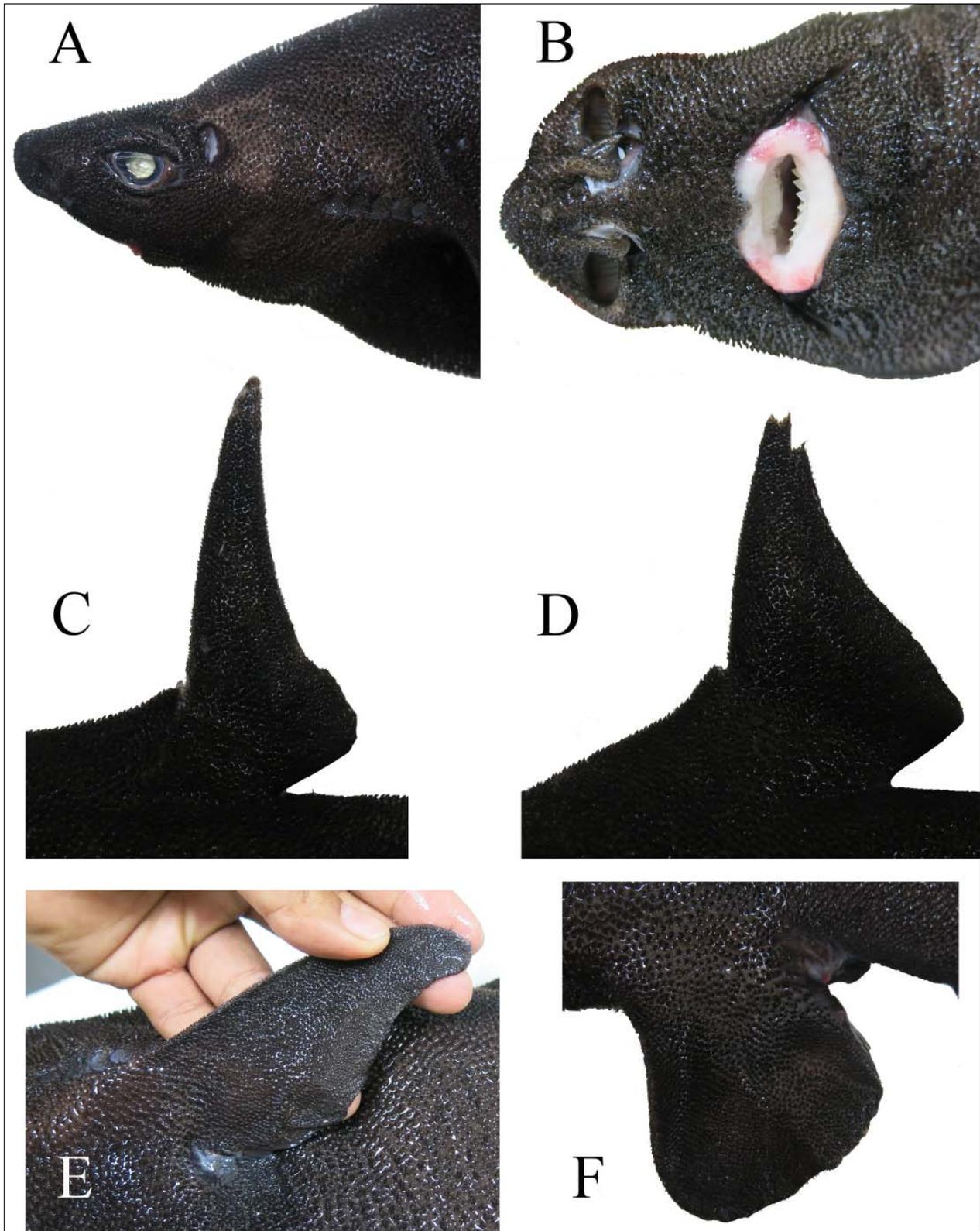
Teeth dissimilar in upper and lower jaws; width of tooth bands 12.6 mm in upper jaw, 17.3 mm in lower jaw; upper jaw teeth narrow and pointed without serrations, 3~4 rows functional. Lower jaw teeth large triangular blade-like, without serrations; only one row functional. Tooth counts 11/5+1+5.

	1	2	3
-2nd dorsal spine origin		66.6	64.0–73.1
-upper caudal fin origin		80.0	77.4–87.7
-lower caudal fin origin		77.0	72.1–80.0
1st dorsal fin:			
-overall length		25.7	25.6–32.9
-overall length from spine		7.5	8.3–9.9
-length of base		22.8	21.7–27.7
-length of base from spine		3.9	4.1–5.6
-length of posterior margin		15.2	13.9–16.8
-height		17.1	15.1–20.4
-length from tip of spine to apex of fin		12.9	11.3–16.8
-vertical height from tip of spine to base		5.1	5.0–5.9
-length of spine		–	0.3–1.0
2nd dorsal fin:			
-overall length		16.6	13.5–18.4
-overall length from spine		8.8	8.8–11.9
-length of base		13.9	11.8–14.1
-length of base from spine		5.7	5.4–6.9
-length of posterior margin		12.9	11.9–15.8
-height		13.9	12.9–18.2
-length from tip of spine to apex of fin		–	9.6–15.6
-vertical height from tip of spine to base		–	4.8–6.5
Distance between bases of:			
-1st and 2nd dorsal fins		15.1	15.3–18.6
-1st and 2nd dorsal spines		22.4	21.2–24.8
-2nd dorsal and caudal fins		8.1	8.8–10.6
-pectoral and pelvic fins		41.3	35.0–43.4
-pelvic and caudal fins		8.7	7.6–9.7
Distance between origins of pectoral and pelvic fins		46.2	40.3–49.1
Distance between inner corners of nostrils		1.3	0.9–1.3
Mouth width (scaly)		5.2	5.1–5.7
Length of gill opening:			
-first		1.0	0.8–1.6
-second		1.2	1.3–1.7
-third		1.2	0.8–1.9
-fourth		1.0	1.1–1.4
-fifth		0.9	0.8–1.2
Horizontal diameter of eye		3.9	4.0–5.2
Vertical diameter of eye		1.2	1.2–2.2
Interorbital width		7.8	8.6–10.6
-length of spine		—	0.3–1.0
Pectoral fin:			
-length of base		5.7	5.4–6.2
-length of anterior margin		16.5	15.6–19.8
-length of distal margin		5.5	4.6–7.3
-length of posterior margin		12.9	11.5–15.8
Pelvic fin:			
-overall length		10.5	10.5–13.1
-length of base		8.0	6.5–7.9
-length of anterior margin		10.1	9.6–11.9
-length of distal margin		6.0	3.9–6.9
Caudal fin:			
-length of dorsal lobe		17.6	19.2–23.4
-length of ventral lobe		12.5	10.6–16.8
-length from dorsal tip to notch		4.6	4.0–5.9
-depth of notch		1.5	1.5–3.0
Trunk width at pectoral origin		14.0	15.0–18.8
Trunk height at pectoral origin		13.8	13.6–16.4

**Table 1**

Morphometric measurements, shown as %TL, compared with the data from other known specimens collected from Japan provided in Yano et al. (2002)

	Taiwan		Japan	
	1	2	3	4
Total length (TL) [mm]		610	505–645	
		%TL	%TL	
Snout tip to:				
-outer nostrils		2.1	1.2–3.9	
-eye		5.0	4.0–7.0	
-spiracle		10.1	9.4–10.9	
-mouth		6.9	4.6–6.5	
-1st gill opening		16.0	14.1–17.4	
-2nd gill opening		16.9	16.3–18.1	
-3rd gill opening		18.0	16.7–19.2	
-4th gill opening		19.0	18.2–20.3	
-5th gill opening		19.5	18.5–21.1	
-pectoral fin origin		19.7	18.9–21.1	
-pelvic fin origin		59.0	59.6–66.6	
-cloaca		65.7	62.2–69.1	
-1st dorsal fin origin		21.4	18.0–23.6	
-1st dorsal spine origin		40.3	37.4–43.6	
-2nd dorsal fin origin		58.2	56.0–64.8	



**Fig. 2.** *Oxynotus japonicus* Yano et Murofushi, 1985, NMMB-P23359, female, 610 mm TL; Lateral view of head (A); Ventral view of head (B); Left side of first dorsal fin (C); left side of second dorsal fin (D); ventral side of pectoral fin (E); dorsal side of pelvic fin (F)

Skin very rough. Dermal denticles large, erect, and widely separate, with one large, sharp central cusp and one cusplet on both sides. Dermal denticles on fins small. Monospondylous vertebrae 44, precaudal diplospondylous

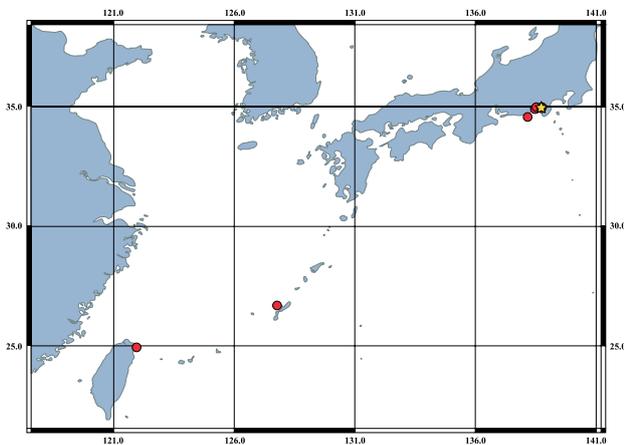
vertebrae 12, and caudal diplospondylous vertebrae 31, precaudal vertebrae 56, total vertebrae 87. Both ovaries functional; each ovary large but shrunken; some post-ovulated follicles of about 5–10 mm present in both

ovaries; many small undeveloped ova of yellowish white present. Oviduct between ostium and shell gland 7 mm in width and 20 mm in length; shell gland swollen, 13 mm in width; uterus (posterior part of oviduct) flaccid; width 18 mm in width; inner wall completely covered with numerous villi of 2–4 mm in length.

Body and fins black; head slightly pale. Lips and margin of anterior nasal flap white; pectoral fin axil pale.

**Distribution.** Known from Suruga Bay and Ie Island, Okinawa Prefecture, Japan and north-eastern Taiwan (Fig. 3). Bathymetric range 150–300 m.

**Remarks.** In a recent published checklist of Chondrichthyes of Taiwan, there are 52 families and 181 species in all 13 orders (Ebert et al. 2013). One new stingray, *Neotrygon orientalis* Last, White et Serét, 2016, was described more recently. We herein add *Oxynotus japonicus* into the chondrichthyan fauna of Taiwan which brings the total number to 53 families and 183 species.



**Fig. 3.** Distribution map of *Oxynotus japonicus* Yano et Murofushi, 1985. Star indicates the type locality

The Taiwanese specimen fits to the original description well, except for the following variations that were observed. The distance from the snout tip to mouth (6.9% vs. 4.6%–6.5% TL) and the length of base of pelvic fin (8.0% vs. 6.5%–7.9% TL) are slightly larger compared to the other known specimens. The following values are slightly smaller than those of the other known specimens: distance from the snout tip to pelvic fin (59.0% vs. 59.6%–66.6% TL); distance between the 1st and 2nd dorsal fins (15.1% vs. 15.3%–18.6% TL); distance between the 2nd dorsal and caudal fins (8.1% vs. 8.8–10.6% TL); interorbital width (7.8% vs. 8.6%–10.6% TL); the overall length of first dorsal spine (7.5% vs. 8.3%–9.9% TL); the length of base from first dorsal spine (3.9% vs. 4.1%–5.6% TL); and the trunk width at pectoral origin (14.0% vs. 15.0%–18.8% TL). These differences may be attributed to individual variation.

Known specimens and localities of the materials collected.

- 540 mm TL (holotype), mature male, off Heda in Suruga Bay, Japan, 225–270 m.
- 645 mm TL, female, off Kunou-san in Suruga Bay, Japan, 350 m.
- 505 mm TL, female, off Ukusu in Suruga Bay, Japan, 300 m.
- 645 mm TL, female, off Heda in Suruga Bay, Japan, 300 m.
- 545 mm TL, female, off Kunou-san in Suruga Bay, Japan, 150 m.
- 611 mm TL, female, off Heda in Suruga Bay, Japan, 300 m.
- 594 mm TL, female, 10 miles from Omaezaki, Enshu-nada Sea, Japan.
- 561 mm TL, female, Ie Island, Okinawa Prefecture, Japan.
- 610 mm TL, female, Daxi fish market (near Kueishan Island), Taiwan, ca. 300 m.

#### ACKNOWLEDGEMENTS

We thank R.-R. Chen (NMMB-P) for curatorial assistance. One of the authors (HCH) was supported in this study by the National Museum of Marine Biology and Aquarium, Pingtung, Taiwan.

#### REFERENCES

- Ebert D.A., Fowler S., Compagno L.** 2013. Sharks of the world: A fully illustrated guide. Wild Nature Press, Plymouth.
- Fricke R., Eschmeyer W.N.** 2016. Guide to fish collections. <http://researcharchive.calacademy.org/research/ichthyology/catalog/collections.asp>
- Tanaka S.** 2008. [Occurrence record of big elasmobranch and rare chondrichthyes 2007–2008.] [Report of Japanese Society for Elasmobranch Studies] **44**: 37–39. [In Japanese.]
- Yano K.** 2004. *Oxynotus japonicus*. The IUCN Red List of Threatened Species 2004: e.T44206A10870794.
- Yano K., Matsuura K.** 2002. A review of the genus *Oxynotus* (Squaliformes, Oxynotidae). Bulletin of the National Science Museum (Tokyo) **28** (2): 109–117.
- Yano K., Matsuura K., Tsukada O.** 2002. Redescription of the rare squaloid shark *Oxynotus japonicus* from Suruga Bay and the Enshu-nada Sea, Japan. Species Diversity, **7**: 363–369.
- Yano K., Murofushi M.** 1985. A new prickly dogfish, *Oxynotus japonicus*, from Japan. Japanese Journal of Ichthyology **32** (2): 129–136. DOI: 10.1007/BF02938444

Received: 9 September 2016

Accepted: 10 October 2016

Published electronically: 31 December 2016