

STUDY ON THE PLECTOGNATH FISHES—B. THE FAMILY CANTHIGASTERIDAE.*

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With 14 figures

ABSTRACT

S. C. Shen and P. C. Lin (1973). *Study on the Plectognath Fishes—b. The family Canthigasteridae*. Bull. Inst. Zool., Academia Sinica, 13(1): 15-34. The sharpbacked puffers (or sharpnosed puffers) of the family Canthigasteridae from the waters around Taiwan and its adjacent islands have been reviewed, and eight species are recognized as belonging to one genus. Three of them, *Canthigaster valentini* (Bleeker), *C. rivulatus* (Temminck and Schlegel) and *C. amboinensis* (Bleeker) are common in the shallow coastal waters of the northern, north-eastern and south-western coastal areas. Five species, *C. bennetti* (Bleeker), *C. janthinopterus* (Bleeker), *C. coronatus* (Vaillant and Sauvage), *C. solandri* (Richardson), and *C. compressus* (Procé) are rare in the areas of southeastern, south-western and Lan-yü. Two species, *C. coronatus* and *C. compressus* are the first to have been found in the fish-fauna around the waters of Taiwan.

The tropical Indo-Pacific sharpbacked puffers (or sharpnosed puffers) of family Canthigasteridae which contains a single genus *Canthigaster*, are distinguished from the tetradontid puffers by their minor features. The canthigasterids have longer and sharply pointed snout, back keeled and ventral fleshy ridge, no lateral line, no spinous dorsal and ventral absent, the nostrils are minute and inconspicuous with a low rim, far before the eye.

The systematic status of the canthigasterids from the waters around Taiwan and its adjacent islands was very confused. Chen (1969)⁽⁶⁾ listed three species, *C. rivulatus*, *C. valentini* and *C. jactator* in his book of "A Synopsis of the Vertebrates of Taiwan". In it, *C. jactator* collected from Lan-yü was reported by Chang (1960)⁽⁶⁾,

the specimen has been preserved in the Museum of the Department of Zoology, National Taiwan University, which was cataloged with the number NTUM 002134. In 1968⁽⁴⁾ and 1969⁽⁵⁾, Chang and Lee described two species, *C. valentini* and *C. margaritatus* which were found in the coastal lines of the southern-most part of Taiwan. In 1967⁽²⁰⁾ and 1970⁽²¹⁾, Yang reported three species as the same as those of Chen in 1969⁽⁶⁾. In 1971⁽¹⁵⁾, Jones *et al.* listed only the name of five species, *C. amboinensis*, *C. bennetti*, *C. solandri*, *C. valentini* and *C. janthinopterus* in their "Marine Biological Survey of Southern Taiwan and Emphasis on Corals and Fishes".

Regarding the research work on the canthigasterids in the past few years, six species were recognized except *C. jactator* (Jenkins). We found

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that that the specimen of *C. jactator* (NTUM 002134) was misidentified by Chang (1960)^(a) and Chen (1969)^(a). The specimen is quite different from the original description of *C. jactator* in having black spot circled by white ring at the base of dorsal fin, and several wave lines below the eye and it is only restricted in the waters of Hawaii.

Specimens used for the present study were collected intensively and extensively in the year round from the waters around Taiwan and its adjacent islands since 1968. As shown in figure 1 and table 1, nearly all of the collected species of canthigasterids appear from April to September, and most of them found in the southwestern coast of Taiwan.

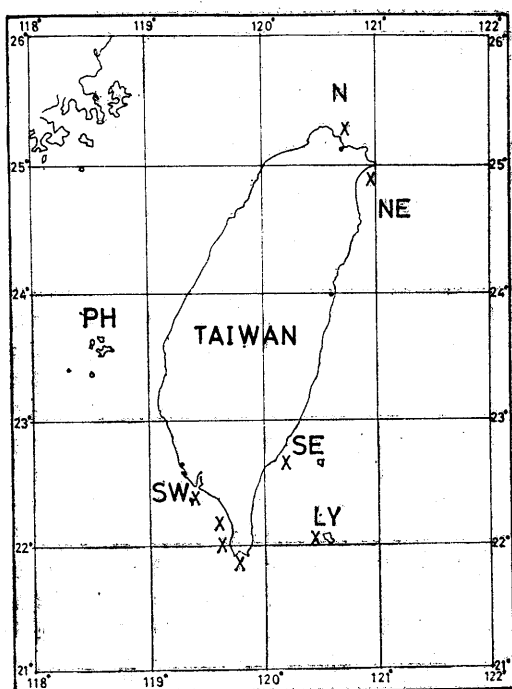


Fig. 1. Showing the Collecting Areas Around the Coast of Taiwan and its adjacent Islands.

The number of fin elements and vertebrae were taken from radiographs. The measurements are expressed in percentages of the standard length (SL) and head length (HL); and pro-

TABLE 1

The canthigasterid fishes occurred in different months, depths, and areas of Taiwan from 1968-73.

Species	Months												Depth (meters)	Collecting areas					
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		N	NE	SE	SW	LY	PH
<i>C. janthinopterus</i> (Bleeker)				x	x				x		x		5-20				+		
<i>C. compressus</i> (Procé)						x							15				+		
<i>C. bennetti</i> (Bleeker)				x			x		x			x	10-20				+		
<i>C. amboinensis</i> (Bleeker)					x			x	x		x		5-15				+		
<i>C. solandri</i> (Richardson)				xx		x		x	x		x		5-20				+		
<i>C. valentini</i> (Bleeker)				x		x		x	x		x		2-15		+				
<i>C. coronatus</i> (Vaillant and Sauvage)				x									10-20						
<i>C. rivulatus</i> (Temminck and Schlegel)			x	x	xxx	x	x						2-15	+	+		+		

portions in standard length and head length are expressed in parenthesis. All species are deposited at the Museum of the Department of Zoology, National Taiwan University.

Key to species of the family Canthigasteridae

1. Body with blackish brown crossbands.2
- Body without blackish brown crossbands.3
- 2(1). Four irregular blackish brown crossbands on body, each band bordered by a serial of black dots with each dot circled by white ring; the first band on interorbital; the second and third bands much broader on back, descending downward and tapering ventrally to the level of the lower base of pectorals; the fourth band in <-shape on back of tail, extending forward ventro-obliquely and tapering to mid-lateral; a light reddish yellow horizontal band bordered by ocelli arranged in two or three longitudinal series, extending from lower part of pectoral base to lower jaw; head, sides, and tail with many blackish spots, each spot bordered with reddish yellow ocelli.*C. coronatus* (p. 17, fig. 2)
- Four irregular blackish brown crossbands on body; the first band on occiput extending downward along hind border of eye, some extending forward to the upper part of snout; the second and third bands much broader on back, descending downward and tapering ventrally to lower belly; the fourth band is a triangular saddle on back of tail; head, body and tail spotted with many orange or brown ocelli.*C. valentini* (p. 19, figs. 3-4)
- 3(1). Dorsal rays 9 or rarely 10; anal rays 9. ...4
- Dorsal rays 11-12; anal rays 11 (rarely 12). Back and sides with short dark brown bars; several obliquely light blue lines on cheek or dots forming parallel rows of lines or stripes; bases of dorsal, anal and pectorals black.*C. amboinensis* (p. 21, fig. 5)
- 4(3). Two dark horizontal bands on lateral sides of body. Some young specimens with blue vermiculating lines on snout and upper part of body.*C. rivulatus* (p. 23, figs. 6-7)
- No dark horizontal bands on lateral sides of body.5
- 5(4). Length of caudal peduncle longer than deep or as long as deep.6
- Length of caudal peduncle shorter than deep.7
- 6(5). Back and sides with numerous small round reddish spots, each spot with a small bluish dot in center; three to five short bluish <-shape lines on the back of the tail, and with many bluish spots on its lateral sides, each spot with a minute reddish dot in center.*C. bennetti* (p. 25, fig. 8)
- Back and lateral upper sides of body and tail with undulated dark lines, sometimes those lines forming by small dots; small round dark spots on cheek; dark brown vertical lines on caudal fin.*C. compressus* (p. 27, fig. 9)
- 7(5). Sides of body and tail with numerous pale spots; back with many blue spots; several blue horizontal lines or spots on lower jaw; ocellus sometimes present below dorsal fin.*C. janthinopterus* (p. 28, figs. 10-12)
- Cheek, body and caudal fin spotted with numerous dark-edged blue ocelli; back with several blue horizontal lines; interorbital and snout with many blue transverse lines; three or four unequal blue horizontal lines on cheek.*C. solandri* (p. 31, figs. 13-14)

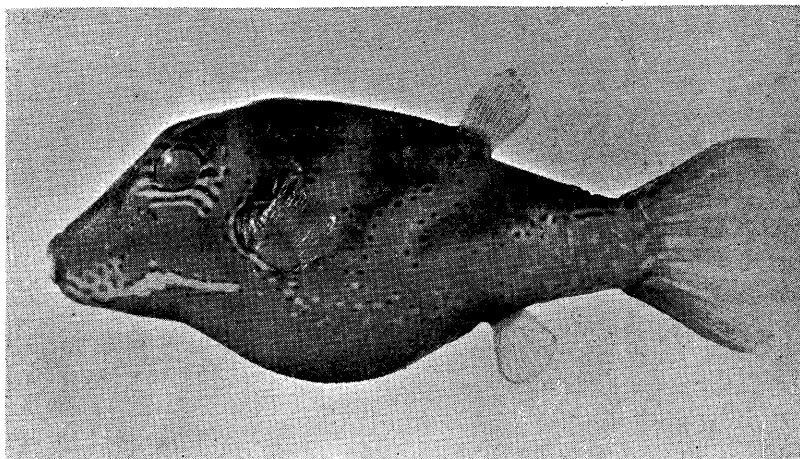
Canthigaster coronatus

(VAILLANT and SAUVAGE)

Fig. 2

Tetraodon (Anosmius) coronatus VAILLANT and SAUVAGE, Revue Magazine Zoologie, (3)3, 1875, p. 286-87 (Hawaii).

Canthigaster cinctus JORDAN and EVERMANN, Bull. U.S. Fish Comm. vol. 23, (1903) 1905, p. 433,



95.6 mm SL

Fig. 2. *Canthigaster coronatus* (Vaillant and Sauvage)

- fig. 189 (Hawaiian Islands, Polynesia). JORDAN and SEALE, Bull. U. S. Bur. Fish. vol. 25, (1905) 1906, p. 373 (Hawaii). FOWLER, Mem. B. P. Bishop Mus. vol. 10, 1928, p. 466 (Honolulu, Lisiansky Islands); GOSLINE and BROCK, Handbk. Hawaiian Fish. 1960, p. 300, fig. 274 (Hawaiian Islands). MARSHALL, Fish. Great Barr. Reef *Qld.* 1965, p. 499, pl. 62, fig. 482 (Queensland). BURGESS and AXELROD, Pac. Mar. Fish. bk. 1, 1971, pp. 110-111. AXELROD and EMMENS, Exot. Mar. Fish. 1971, p. 259.
- Canthigaster valentini* ABE, Bull. Biogeogr. Soc. Japan, vol. 14, no. 1, 1949, pp. 3-4 (Japan); Fig. Fish. Col. 1964, p. 246, col.-fig. 738 (Japan). MATSUBARA, Fish Morph. Hier. pt. 2, 1955, p. 1017 (Japan). KAMOHARA, Rept. Usa Mar. Biol. Stat. vol. 4, no. 1, 1957, p. 56 (Ankyaba); Ibid. vol. 11, no. 1, 1964, p. 72 (Sagami Bay). de BEAUFORT, Fish. Indo. Aust. Archip. vol. 11, 1962, p. 366 (Palawan!; Solor; Ambon!; Ceram; Kei Islands!; New Guinea). OKADA, Illust. Encycl. Faun. Japan, vol. 2, 1966, p. 414, fig. 1063 (Japan). CHANG and LEE (in part), Yearbk. Taiwan Mus. vol. 11, 1968, p. 70 (Heng-chun). TOMIYAMA and ABE, Encycl. Zool. Illust. Col. 1969, p. 16, col.-fig. 42 (Japan).
- Canthigaster coronatus* TYLER, Proc. Acad. Nat. Sci. Phila. vol. 119, no. 2, 1967, p. 53-73 (Hawaii; Philippines; Seychelles; Red Sea; Africa).

Description: Based on two specimens, 95.6 mm

and 40.2 mm SL, collected from southwestern coast of Taiwan under 10-20 meters deep.

The following counts and measurements are based on both adult and young specimens, and recorded first for the adult specimen and young specimen respectively.

Dorsal rays 9, 9; anal rays 9, 9; pectoral rays 17, 16; caudal rays 5+6, 5+6; vertebrae 9+9, 9+9.

In SL: Head length 36.3 (2.7), 40.8 (2.5); height of head 40.6 (2.5), 39.8 (2.5); distance from tip of the snout to origin of the dorsal fin 71.1 (1.4), 69.2 (1.5), to origin of the anal fin 75.3 (1.3), 79.6 (1.3).

In HL: Snout 57.1 (1.8), 48.8 (2.1); interorbital 45.7 (2.2), 35.4 (2.8); horizontal diameter of the eye 22.9 (4.4), 26.8 (3.7); postocular portion 18.9 (5.3), 24.4 (4.1); longest rays of the dorsal fin 41.1 (2.4), 37.8 (2.7); longest ray of the anal fin 33.7 (3.0), 32.9 (3.0); longest ray of the pectoral fin 36.6 (2.7), 36.6 (2.7); least depth of the caudal peduncle 42.3 (2.4), 37.8 (2.7), length of it 50.3 (2.0), 47.6 (2.1).

Body oblong irregularly, somewhat thick, fairly compressed laterally; back slightly rounded, with a ridge-keel, slightly in adult,

strongly in young; ventral profile a uniform arch from chin to caudal, with a black fleshy ridge extending from posterior jaw to vent; head deep, sharply pointed, profile straight from dorsal to snout; snout produced, profile elongate; lips thin but fleshy; mouth small, with two broad tooth-plates in each jaw; eyes small, high up and far back; nostrils minute rounded depressions; gill openings short and c-shape, below and behind the eye; interorbital broad, slightly concave; dorsal truncate; anal slightly round, its origin merely behind dorsal; pectorals fan-like; caudal slightly rounded; skin smooth, but with very minute prickles covered on cheek, back, sides and abdomen.

Color on head and body brownish above, paler below; body with four irregular blackish brown crossbands, each band bordered by a serial black dots circled with white ring; the first one on interorbital; the second one much broader on back merely behind occiput or above pectorals, descending over the base of pectorals; the third one triangular in shape on mid-back of the body covering the anterior part of dorsal fin and its base, and tapering ventrally downward to the same level of the lower base of pectorals; the fourth one in >-shape on back of the tail merely behind dorsal fin, extending forward obliquely and tapering, ending to mid-lateral or below anterior margin of the base of dorsal fin; a light reddish yellow horizontal band extending from belly to front and lower of pectorals; sides of head, body and caudal peduncle scattered with many blackish spots, each spot bordered with reddish yellow ocelli; three ocelli arranged in two or three longitudinal series bordering the horizontal band; several blackish brown horizontal lines radiating from the eyes, its interspaces reddish yellow; all fins uniform pale yellowish; caudal fin with pale round spots, and blackish brown on upper and lower margins.

Young: Color in preserved specimen umber on head, body and fins; the ocelli

and the horizontal band pale creamy; cross bands and spots blackish.

Remarks: The present species always confused with *C. valentini*, but it differs from *C. valentini* in having a reddish yellow horizontal band extending from lower jaw to anterior base of pectorals, the first cross band on interorbital, the second and third bands not extending to the abdomen, the fourth band forwards obliquely and extending to the mid-side of the body, and lines radiating from the eyes. It is not commonly found in the shallow bays of south-western part of Taiwan.

Distribution: Widespread in the tropical Indo-Pacific, from Africa to the Philippines, northward to southern part of Japan, eastward to Hawaii, southward to Queensland.

Material examined: NTUM 001401, 40.2 mm SL, Hou-pi-hu, 1970-6-20; NTUM 001402, 95.6 mm SL, Wan-li-tung, 1973-4-1.

Canthigaster valentini (BLEEKER)

Figs. 3 & 4

- Tetraodon Valentini* BLEEKER, Nat. Tijds. Ned. Indië, vol. 4, 1853, p. 130 (Amboina).
Psilonotus Valentini BLEEKER, Atlas Ichth. 1865, pl. 208, fig. 1.
Canthigaster Valentini BLEEKER, Atlas. vol. 5, 1865, p. 80 (Amboina, Ceram).
Tetrodon valentini GÜNTHER, Cat. Fish. Brit. Mus. vol. 8, 1870, p. 305 (Amboina, Zanzibar); Jour. Mus. Godeff. 1910, p. 474. BOULENGER, Ann. Mag. Nat. Hist. London, ser. 6, vol. 20, 1897, p. 374 (Rotuma).
Tropidichthys valentini REGAN, Trans. Linn. Soc. London, ser. 2, Zool. vol. 12, 1908, p. 253 (Maldives, Haddumati, Seychelles).
Tropidichthys Valentini WEBER, Fische Sib.-Exp. 1913, p. 587.
Canthigaster valentini HERRE, Philipp. Jour. Sci. vol. 25, no. 4, 1924, p. 499 (Cabadian, Leyte. Puerto Princesa, Palawan). SMITH, Ann. Mag. Nat. Hist. ser. 13, vol. 1, 1958, p. 60, pl. 1 D (Aldabra); Fish. South. Africa, 1965, p. 420, pl. 94, fig. 1208 (Delagoa Bay northwards). YANG, Yearbk. Taiwan Mus. vol. 10, 1967, p. 50 (Liu-kiu yü). CHANG and LEE (in part), Yearbk. Taiwan Mus. vol. 11, 1968, p. 70, fig. 24 (Heng-chun).

CHEN, Syn. Vert. Taiwan, vol. 1, 1969, p. 239 (Liu-chiu yü). YANG, Yearbk. Taiwan Mus. vol. 13, 1970, p. 137 (Liu-chiu yü). EXELROD and EMMENS, Exot. Mar. Fish. 1971, p. 264. JONES, *et al.*, Inst. Oceanogr. N.T.U. Taiwan, spe. publ. no. 1, 1972, p. 92 (Heng-chun). TYLER, Proc. Acad. Nat. Sci. Phila. vol. 119, no. 2, 1967, pp. 53-73 (South Pacific. Tuamotu Archipelago, New Hebrides; North Pacific, Caroline Islands, Marianas Islands, New Guinea; Philippines, China, South Viet Nam, Borneo, Indonesia, Ceylon, Seychles Islands; Amirante Islands; Mauritius, Madagascar, Comoro Islands, East Africa Coast).

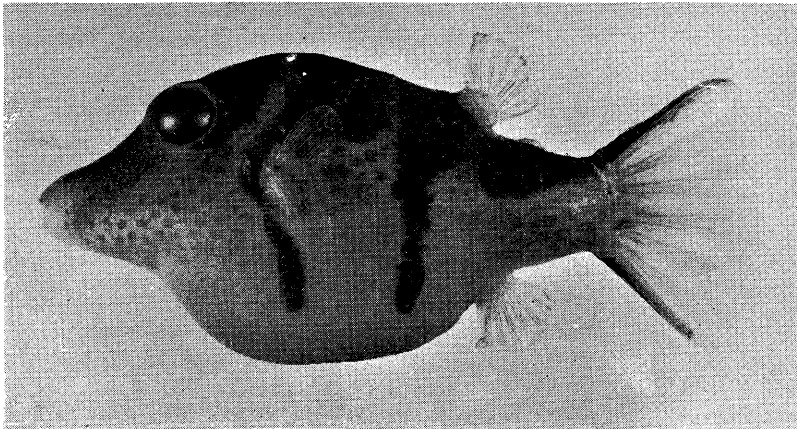
Canthigaster cinctus TANAKA, Figs. Descrip. Fish.

1912, p. 76, pl. 18, figs. 66-68 (Japan); Jour. Fac. Sci. vol. 3, pt. 1, 1931, p. 35 (Japan). HERALD, Liv. Fish. World, 1961, p. 266, col.-fig. 132.

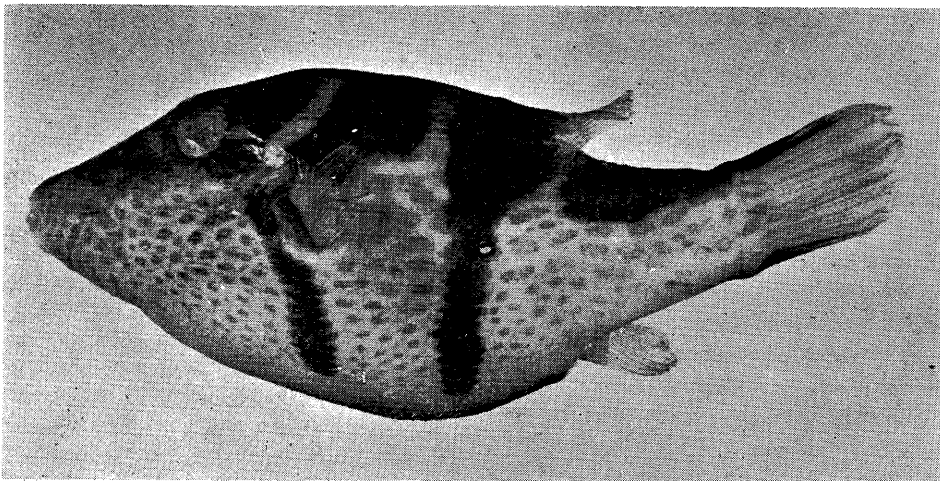
Description: Based on eleven specimens, 29.8-64.6 mm SL, collected from south-western coast of Taiwan under 2-15 meters deep.

Dorsal rays 9; anal rays 9; pectoral rays 16; caudal rays 5+6; vertebrae 9+9.

In SL: Head length 36.8-41.9 (2.4-2.7); (2.4-2.7); height of head 40.1-50.6 (2.0-2.5); distance from tip of the snout to origin of the dorsal fin 69.4-72.7 (1.4), to origin of the anal fin 74.4-81.4 (1.2-1.3).



61.0 mm SL Female



64.6 mm SL
Male

Figs. 3 & 4. *Canthigaster valertini* (Bleeker)

In HL: Snout 47.2–56.7 (1.8–2.1); interorbital 38.9–42.5 (2.4–2.6); horizontal diameter of the eye 20.0–24.8 (4.0–5.0); post-ocular portion 19.2–27.8 (3.6–5.2); longest ray of the dorsal fin 33.5–42.5 (2.4–3.1); longest ray of the anal fin 33.3–39.8 (2.5–3.0); longest ray of the pectoral fin 39.2–41.7 (2.1–2.6); least depth of the caudal peduncle 41.7–50.0 (2.0–2.4), length of it 41.6–42.5 (2.4).

Body elongate oblong, somewhat thick, fairly compressed laterally; back smoothly rounded, with a narrow ridge-keel extending from posterior part of interorbital to origin of dorsal; ventral profile a uniform arch from chin to caudal, with a fleshy ridge extending from mouth to vent in some specimens, it may be inconspicuous in others; head deep, profile elongate pointed; snout produced, its profile concave in female, straight in male; lips thin and fleshy; mouth small, with two broad tooth-plates in each jaw; eyes small, high up and far back; nostrils feebly developed, minute and surrounded by a low circular rim; gill openings short, crescent-like; interorbital moderate, concave; dorsal and anal fins slightly rounded; anal merely in advance of that of the dorsal; pectoral fin truncate; caudal truncate or slightly rounded; skin smoothly, but covered with prickles on almost entire body.

Color in female reddish yellow on head and above body, paler below; body with four irregular blackish brown crossbands; the first one on occiput part extending downwards along hind border of eye, it may be extending forward to the part of the snout; the second one much broader on back or above pectoral fin, descending to upper part of the gill opening, passing through the gill opening, it becomes narrow and extending downward to the abdomen edge, looks like <- shape from lateral view; the third one on back merely before the base of dorsal fin and tapering ventrally to abdomen; the fourth one is a triangular saddle on back of the

tail; sides of head, body and caudal peduncle spotted with many orange or brown ocelli; bases of all fins yellowish, rays pale; caudal reddish yellow or pale yellow, with blackish brown on upper and lower margin.

Color in male as described above, but the spots more numerous and more on abdomen than female; several horizontal radiating lines on hindborder of eye, none in females and juveniles; and also several brown lines around snout just behind mouth, absent in female.

Remarks: *C. valentini* differs from *C. coronatus* in having the second and third cross bands below pectorals and extending to the abdomen edge. The present species commonly found in the shallow bays of north-eastern and south-western Taiwan.

Distribution: Widespread in the tropical Indo-Pacific, from Africa to the Philippines, northward to southern part of Japan, eastward to Hawaiian Islands and Polynesia, southward to Australia.

Material examined: NTUM 001372, 34.0 mm SL, Wan-li-tung, 1970–11–7; NTUM 001373, 62.3 mm SL, Nan-wan; 1973–4–2; NTUM 0013774, 34.6 mm SL, Wan-li-tung, 1970–11–7; NTUM 001375, 64.6 mm SL, Wan-li-tung, 971–9–15; NTUM 001376, 46.8 mm SL, Tan-tz-wan, 1970–6–25; NTUM 001378, 34.2 mm SL, Tan-tz-wan, 1969–12–26; NTUM 001380, 37.0 mm SL, Hou-pi-hu, 1970–6–21; NTUM 001382 (2) 57.6 mm SL, 63.4 mm SL, respectively, Hong-tsai-keng, 1972–8–7; NTUM 001383, 61.0 mm, SL, Hou-pi-hu, 1971–9–16; NTUM 001384, 29.8 mm SL, Wan-li-tung, 1969–12–15.

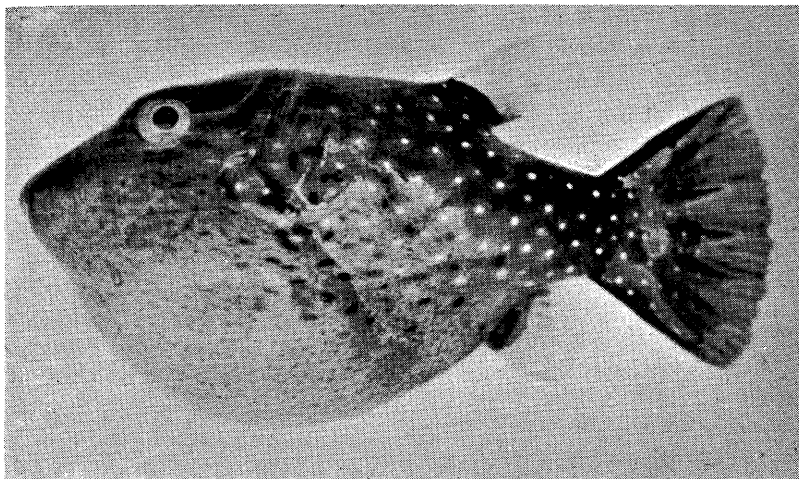
Canthigaster amboinensis (BLEEKER)

Fig. 5

Pylonotus amboinensis BLEEKER, Ned. Tijds. Dierk. vol. 2, 1865, p. 1865, p. 180 and 272 (Amboina); Atlas Ichth. 1865, pl. 208, fig. 7.

Canthigaster amboinensis BLEEKER, Atlas Ichth. vol. 5, 1865, p. 79 (Amboina).

Tetrodon amboinensis GÜNTHER, Cat. Fish. Brit. Mus. vol. 8, 1870, p. 302 (Amboina, Port Natal); Jour. Mus. Godeff. 1910, p. 472.



49.5 mm SL

Fig. 5. *Canthigaster amboinensis* (Bleeker)

Tropidichthys oahuensis JENKINS, Bull. U.S. Fish Comm. vol. 22, 1902 (1903), p. 485, fig. 32 (Honolulu).

Tropidichthys psegma JORDAN and EVERMANN, Bull. U.S. Fish Comm. vol. 22, 1902 (1903), p. 209 (Honolulu); Ibid. vol. 23, 1905, pl. 50. JORDAN and SNYDER, Proc. U.S. Nat. Mus. vol. 28, 1904, p. 125 (Honolulu).

Tropidichthys natalensis REGAN, Tran. Linn. Soc. London, ser. 2, Zool., vol. 12 1908, p. 253 (Coetivy)

Canthigaster oahuensis JORDAN and EVERMANN, Bull. U.S. Fish Comm. vol. 23, 1903 (1905), p. 432 (Honolulu).

Canthigaster pseugma JORDAN and EVERMANN, Bull. U.S. Fish Comm. vol. 23, 1903 (1905), p. 432 (Honolulu, Samoa). JORDAN and SEALE, Bull. U.S. Bur. Fish. vol. 25, 1905 (1906), p. 372 (Hawaii).

Canthigaster amboinensis FOWER, Mem. B.P. Bishop Mus. vol. 10, 1928, p. 465 (Honolulu, Fiji, Pau Oiai, Hawaiian Islands); SCHULTZ, Bull. U.S. Nat. Mus. 180, 1943, p. 295 (Phoenix and Samoan Islands). MATSUBARA, Fish Morph. Hier. pt. 2, 1955, p. 1017 (Japan). KAMOHARA, Rept. Usa Mar. Stat. vol. 4, 1957, p. 55 (Onozo, Somachi, Japan). GOSLINE and BROCK, Handbk. Hawaiian Fish. 1960, p. 301, fig. 276 (Hawaiian Islands). de BEAUFORT Fish. Indo-Aust. Arch. vol. 11, 1962, p. 365 (Ambon!; New Guinea). SMITH, Fish. South. Africa, 1965, p.

421 (Durban). WOODS, Bull. U.S. Nat. Mus. 202, vol. 3, 1966, p. 122, pl. 142 D (Marshall and Marianas Islands). JONES, *et al*, Inst. Oceanogr. N.T.U. Taiwan. spec. publ. no. 1, 1972, p. 91 (Heng-chun).

Description: Based on ten specimens, 22.8–94.0 mm SL, collected from north-eastern and south-western coasts of Taiwan under 5–15 meters deep.

Dorsal rays 11–12; anal rays 10–11; pectoral rays 16–18; caudal rays 5+6; vertebrae 9+9.

In SL: Head length 36.2–42.9 (2.3–2.8); height of head 32.6–51.8 (1.9–3.1); distance from tip of the snout to origin of the dorsal fin 47.4–71.8 (1.4–2.1), to origin of the anal fin 55.3–79.1 (1.3–1.8).

In HL: Snout 42.1–53.5 (1.9–2.4); interorbital 35.1–42.6 (2.4–2.9); horizontal diameter of the eye 21.5–28.1 (3.6–4.7); postocular portion 24.0–33.3 (3.0–4.2); longest ray of the dorsal fin 35.7–52.6 (1.9–2.8); longest ray of the anal fin 37.2–52.6 (1.9–2.7); longest ray of the pectoral fin 43.9–59.7 (1.7–2.3); least depth of the caudal peduncle 36.8–49.6 (2.0–2.7), length of it 35.1–49.5 (2.0–2.9).

Body roughly oblong, compressed later-

ally; back keeled; ventral with a fleshy ridge from mouth to chin; head deep, snout long, profile straight from dorsal to tip of the snout in adult, slightly concave in young; lips thin and fleshy; mouth small, with two strong tooth-plates in each jaw; eyes small, high up and far back; nostrils minute depressions with a low rim, inconspicuous; gill openings short below and behind the eye; interorbital moderate, flat in adult, concave in young; dorsal fin truncate or falciform; anal rounded; pectorals fan-like or truncate; caudal truncate or slightly rounded; skin smooth, but with small prickles covered on snout, cheek, interorbital and abdomen.

Color on head and above body light brown to blackish dark, with numerous small round bluish spots; belly grayish to dark, with short dark brownish spots or bars; cheek with several obliquely blue lines or forming parallel rows of dots or stripes; several bluish lines radiating from eyes, crossing snout in some specimens; fins pale yellowish, bases darker; caudal paler to grayish brown, upper and lower margin light brown or blackish dark.

Young: In about 30 mm (SL) preserved specimens, head and body blackish to reddish brown, back and sides with numerous small round pale spots, each spot with a minute black dot in center; lower sides with many prominent black short bars; sides of head with several obliquely parallel dark lines or dots arranged in several rows; a black ocellus on each side of the dorsal fin; no lines radiating from eye. In about 23 mm specimens, no radiating lines from eye, or obliquely parallel lines on sides of head, a black ocellus on bases of the dorsal fin; lower sides of body with numerous prominent black stripes or bars.

Distribution: Widespread in the tropical Indo-Pacific, from East Indies to the Philippines, northward to southern part of Japan, eastward to Hawaii and Polynesia.

Material examined: NTUM 001360,

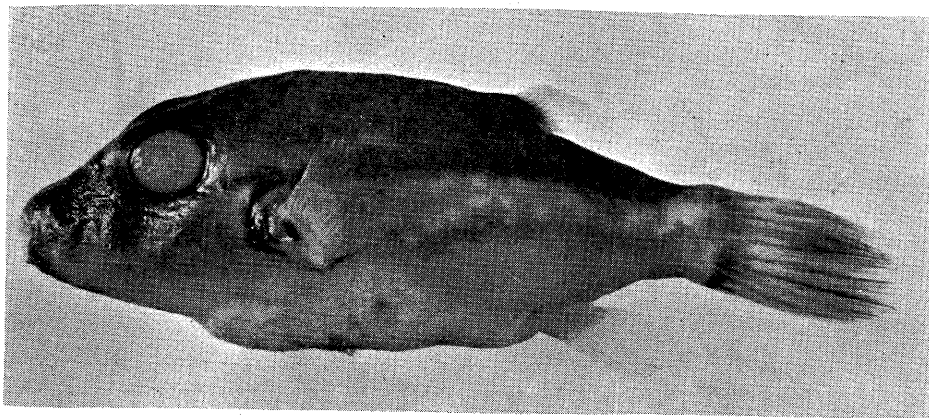
94.0 mm SL, Hou-pi-hu, 1971-9-15; NTUM 001361, 61.8 mm, SL Ken-ting, 1970-6-26; NTUM 001363, 66.0 mm SL Ta-kung, 1972-5-31; NTUM 001364, 48.0 mm, SL, Ta-kung, 1970-11-11; NTUM 001365, 22.8 mm SL, Tan-tz-wan, 1969-12-26; NTUM 001366, 71.0 mm, SL, Ou-ran-pi, 1970-6-28; NTUM 001367, 42.4 mm, SL, Ken-ting, 1970-8-24; NTUM 001368, 28.0 mm SL, Mu-pi-tao, 1969-12-29; NTUM 001370, 41.4 mm SL, Shiao-liukiu, 1970-8-18; NTUM 001371, 49.5 mm, SL, Hou-pi-hu, 1970-11-12.

Canthigaster rivulatus

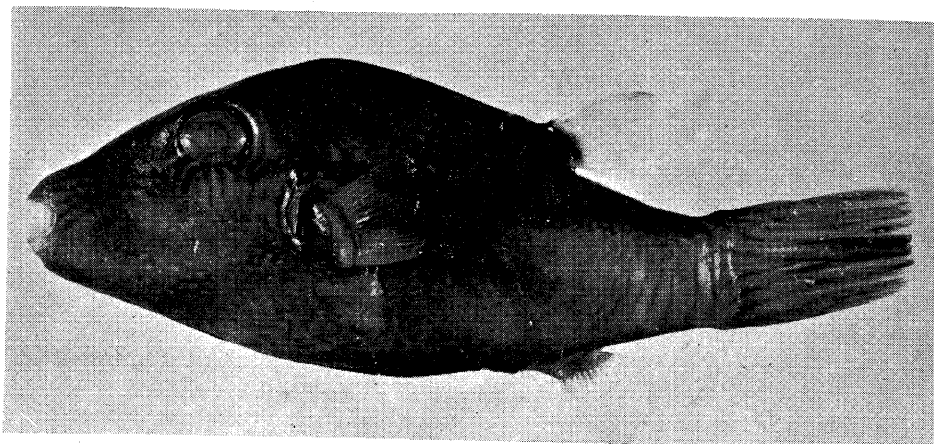
(TEMMINCK and SCHLEGEL)

Figs. 6 & 7

- Tetraodon rivulatus* TEMMINCK and SCHLEGEL, Faun. Japan. Pois. 1850, p. 285, pl. 124, fig. 3 (Nagasaki Bay, Japan).
- Tetrodon caudofasciatus* GÜNTHER, Cat. Fish. Brit. Mus. vol. 8, 1870, p. 305 (Nagasaki); Jour. Mus. Godeff. 1910, p. 473 (Hawaii).
- Eumycterias bitaeniatus* JENKINS, Bull. U.S. Fish Comm. vol. 19, 1899 (1901), p. 400, fig. 12 (Honolulu).
- Tropidichthys bitaeniatus* JENKINS, Bull. U.S. Fish Comm. vol. 22, 1902 (1903), p. 486 (Honolulu).
- Tropidichthys caudofasciatus* REGAN, Tran. Linn. Soc. London. ser. 2, Zool., vol. 12, 1908, p. 253 (Amirante, Seychelles).
- Tropidichthys epilamprus* JENKINS, Bull. U.S. Fish Comm. vol. 22, 1902 (1903), p. 485, fig. 33 (Kihei, Maui).
- Canthigaster epilamprus* JORDAN and EVERMANN, Bull. U.S. Fish Comm. vol. 23, 1903 (1905), p. 434, fig. 190.
- Canthigaster bitaeniatus* JORDAN and EVERMANN, Bull. U.S. Fish Comm. vol. 23, 1903 (1905), p. 435, fig. 191.
- Canthigaster rivulatus* SMITH and POPE, Proc. U.S. Nat. Mus. vol. 31, 1907, p. 482 (Susaki, Yamagawa). JORDAN and DICKERSON, Proc. U.S. Nat. Mus. vol. 34, 1908, p. 616 (Honolulu). JORDAN, TANAKA and SNYDER, Jour. Coll. Sci. Tokyo Imp. Univ. vol. 33, art. 1, 1913, p. 229 (Japan). FOWLER, Mem. B. P. Bishop Mus. vol. 10, 1928, p. 465 (Honolulu, Laie). TANAKA, Jour. Fac. Sci. vol. 3, pt. 1, 1931, p. 35 (Southern Japan area). MATSUBARA, Fish Morph. Hier.



48.0 mm SL



88.0 mm SL

Figs. 6 & 7. *Canthigaster rivulatus* (Temminck and Schlegel)

pt. 2, 1955, p. 1017 (Japan). KAMOHARA, Rept. Usa Mar. Biol. Stat. vol. 5, no. 1, 1958, p. 55 (Hinuma, Iburaki Pref., Japan); Ibid. vol. 11, no. 1, 1964, p. 72 (Japan). GOSLINE and BROCK, Handbk. Hawaii. Fish. 1960, p. 302, fig. 277 (Hawaiian Islands). CHU, Syn. Fish. South. China Sea, 1962, p. 1907, fig. 841. TOMIYAMA and ABE, Encycl. Zool. Illust. Color, 1969, p. 16, col.-fig. 41 A & B (Japan). CHEN, Syn. Vert Taiwan, vol. 1, 1969, p. 239 (Keelung). YANG, Yearbk. Taiwan Mus. vol. 13, 1970, p. 139 (Keelung). BURGESS and EXELROD, Pac. Mar. Fish. bk. 1, 1971, p. 98, col.-fig. 157 (Kanagawa, Japan). HIYAMA and YASUDA Japan. Fish. 1971, p. 255, col.-fig. 344 (Japan). TOMIYAMA, Publ. Amakusa Mar. Biol. Lab. vol. 3, no. 1, 1972, p. 21 (Aitsu, Japan).

KAMOHARA, Color Illust, Fish. Japan vol. 1, 1972, p. 50, col.-fig. 1 (Japan).

Canthigaster caudofasciatus SMITH Fish. South. Africa, 1965, p. 421, fig. 1209 (Natal).

Description: Based on twenty-five specimens, 19.0 mm–88.0 mm SL, collected from northern and north-eastern coasts of Taiwan under 2–15 meters deep.

Dorsal rays 10; anal rays 9–10; pectoral rays 16–17; caudal rays 5+6; vertebrae 9+9.

In SL; Head length 37.0–42.3 (2.3–2.7); height of head 37.5–39.0 (2.6–2.7); distance from tip of the snout to origin of the dorsal fin 70.5–72.1 (1.4), to origin of the anal fin 78.1–81.0 (1.2–1.3).

In HL: Snout 30.8–54.2 (1.8–3.3); interorbital 38.0–47.1 (2.1–2.6); horizontal diameter of the eye 26.8–36.5 (2.7–3.7); postocular portion 18.3–30.8 (3.3–5.5); longest ray of the dorsal fin 34.6–47.2 (2.1–2.9); longest ray of the anal fin 34.6–41.4 (2.4–2.9); longest ray of the pectoral fin 37.9–40.4 (2.5–2.6); least depth of the caudal peduncle 28.9–39.4 (2.5–3.5), length of it 32.7–38.0 (2.4–3.1).

Body irregularly oblong, compressed laterally; back smoothly rounded, with a narrow ridge-keel extending from posterior part of interorbital to dorsal; ventral with a fleshy ridge extending from mouth to vent; head deep, long pointed; snout produced, nearly straight in adult, slightly concave in young; lips thin and fleshy; mouth small, with two broad tooth-plates in each jaw; eyes small, high up and far back; nostrils small, minute depressions with a circular rim; gill openings short, C-shape; interorbital flat, concave in young; fins truncate, except anal slightly rounded and its origin behind end of dorsal; skin smooth, but with small prickles covered on ventral sides of trunk.

Color in various patterns, in larger specimens dark brown with fine reticulating brownish lines covered the whole upper part of sides; two brownish longitudinal bands parallel each other extending backward from the anterior edge of gill-opening to base of caudal fin; caudal peduncle with many brownish vertical lines; numerous dark small spots on lower belly; several dark brown radiating lines from the lower sides of the eye; dorsal, anal and pectorals fins paler; caudal dark brown. In younger specimens brown on head and back of body, paler below; two brownish longitudinal bands extending from anterior part of pectoral, upper one running backwards to upper base of caudal, lower one inconspicuous; a black spot on upper base of dorsal. In about 50 mm (SL) specimens, two bands are very conspicuous; some specimens are intermediate between the patterns as described above. In

a specimen of 24 mm, back and upper part of body with many dark dorso-obliquely lines, a small black spot on base of dorsal.

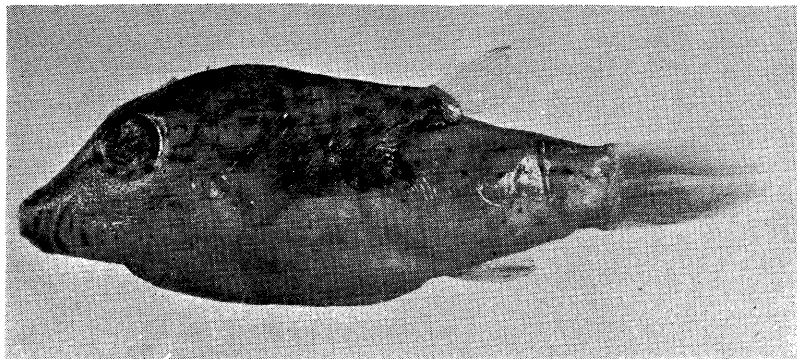
Distribution: Widespread in the tropical Indo-Pacific, from Africa to the Philippines, northward to southern part of Japan, eastward to Hawaii, southward to Queensland.

Material examined: NTUM 001385, 88.0 mm SL, Ba-do-dz, 1971-4-20; NTUM 001387 (3), 19.0 mm SL, 48.0 mm SL, 76.6 mm SL, respectively, Ao-ti, 1971-6-27; NTUM, 001388 (6), 29.6 mm SL, 32.4 mm SL, 38.6 mm SL, 39.8 mm SL, 40.1 mm SL, respectively, Fan-dz-ao, 1971-5-25; NTUM 001389 (6), 34.6 mm SL, 37.4 mm SL, 43.2 mm SL, 48.6 mm SL, 49.6 mm SL, 54.2 mm SL, respectively, Fan-dz-ao, 1970-7-17; NTUM 001390, 23.8 mm SL, Yin-ko-shih, 1969-5-15; NTUM 001392, 44.4 mm SL, Pai-sa-wan; NTUM 001394 (5), 21.0 mm SL, 21.8 mm SL, 24.2 mm SL, 24.4 mm SL, 24.6 mm SL, respectively, Su-ao, 1970-5-20.

Canthigaster bennetti (BLEEKER)

Fig. 8

- Tetrodon ocellatus* BENNETT, Fish. Ceylon, 1828-30, p. 2, pl. 21 (southern coast of Ceylon).
Tropidichthys Bennetti BLEEKER, Nat. Tijds. Indië, vol. 6, 1854, p. 504 (Amboina).
Pylonotus ocellatus BLEEKER, Atlas Ichth. 1865, pl. 214, fig. 5.
Canthigaster ocellatus BLEEKER, Atlas Ichth. vol. 5, 1865, p. 80 (Amboina, Sangi Islands, Sumatra, Goram, Baali, Celebes, Ternate, Burn, Ceram).
Tetrodon bennetti GÜNTHER, Cat. Fish. Brit. Mus. vol. 8, 1870, p. 301 (Zanzibar, East Indian Archipelago); Jour. Mus. Godeff. 1910, p. 466 (Ponape, Futuna, Tahiti).
Tropidichthys bennetti REGAN, Tran. Linn. Soc. London, ser. 2, Zool., vol. 12, p. 253 (Maldives).
Tropidichthys Bennetti WEBER, Fische Sib.-Exp. 1913, p. 586.
Canthigaster bennetti EVERMANN and SEALE, Bull. U.S. Bur. Fish. vol. 26, 1907, p. 101 (Bacon, Sorsogon Province, Luzon). HERRE, Philipp. Jour. Sci. vol. 25, no. 4, 1924, p. 502 (Bacon, Sorsogon Province, Luzon; Caldera Bay, Mindanao; and Sitanki). FOWLER, Mem. B. P. Bishop



46.0 mm SL

Fig. 8. *Canthigaster bennetti* (Bleeker)

Mus. vol. 10, 1928, p. 466 (Fakarava). SCHULTZ. Bull. U.S. Nat. Mus. 180, 1943, p. 295 (Phoenix and Samoan Islands). de BEAUFORT, Fish. Indo-Aust. Arch. vol. 11, 1962, p. 369 (21 collecting localities). MARSHALL. Fish. Great Barr. Reef. *Qld.* 1965, p. 499 (Queenslands). WOODS, Bull. U.S. Nat. Mus. 202, vol. 3, 1966, p. 126, pl. 142 B (Marshall and Marianas Islands). EXELROD and EMMENS, Exot. Mar. Fish. 1971, p. 258. JONES *et al.*, Inst. Oceanogr. N. T. U. Taiwan, spec. publ. no. 1, 1972, p. 92 (Hengchun).

Description: Based on three specimens, 43.2 mm–57.2 mm SL, collected from south-western coast of Taiwan and Lan-yü under 10–20 meters deep.

Dorsal rays 9; anal rays 8–9; pectoral rays 14–15; caudal rays 5+6; vertebrae 9+9.

In SL: Head length 26.9–37.3 (2.7–2.8); height of head 28.6–36.4 (2.8–3.5); distance from tip of the snout to origin of the dorsal fin 54.1–71.1 (1.4–1.9), to origin of the anal fin 55.8–71.1 (1.4–1.8).

In HL: Snout 49.4–51.9 (1.9–2.0); interorbital 30.6–40.5 (2.5–3.3); horizontal diameter of the eye 23.5–24.1 (4.2); postocular portion 25.3–27.1 (3.7–4.0); longest ray of the dorsal fin 43.5–44.3 (2.3); longest ray of the anal fin 36.5–38.0 (2.6–2.7); longest ray of the pectoral fin 44.3–44.7 (2.2–2.3); least dept of the caudal peduncle 38.8–39.2 (2.6),

length of it 56.5–57.0 (1.8).

Body roughly oblong, compressed laterally; back smoothly rounded, with a keel from posterior part of interorbital to the origin of dorsal; ventral with a fleshy ridge from mouth to chin; head deep and long pointed; snout produced; profile nearly straight from occiput to tip of snout in adult, slightly concave in young; lips thin and fleshy; mouth small, with two strong tooth-plates in each jaw; eyes small, high up and far back; nostrils depressions with a circular rim; gill openings short, below and behind of eye; interorbital slightly concave; dorsal truncate; anal truncate or rounded; pectorals truncate; caudal truncate or slightly rounded; skin smooth, with very minute prickles covered on abdomen.

Color on head and above body dark brown or grayish, with numerous small round reddish spots, each spot with a small bluish dot in center, absent in lower side of younger specimens; belly yellowish or pale; cheek with three or five short bluish vertical lines, its interspaces reddish; cheek and breast with numerous small bluish dots; four bluish <-shape lines on the back of the caudal peduncle, some with spots arranged in parallel row; sides of caudal peduncle with many bluish spots, each spot with a minute reddish dot in center; several bluish lines radiating from eyes, sometimes crossing snout,

its interspaces reddish; a dark ocellus below base of dorsal fin, circled by incomplete oblong spots and bars, and with a blue stripe in its center; all fins uniformly paler.

Distribution: Widespread in the tropical Indo-Pacific, from east coast of Africa to the Philippines, northward to Taiwan, eastward to Hawaiian Islands and Polynesia, southward to Queensland.

Material examined: NTUM 001403, 57.2 mm SL, Pai-sa, 1973-4-3; NTUM 001404, 43.2 mm SL, Hou-pi-hu, 1969-12-24; NTUM 001405, 46.0 mm SL, Lan-yü, 1971-7-27.

Canthigaster compressus (PROCÉ)

Fig. 9

Tetrodon compressus PROCÉ, Bull. Sci. Soc. Philom. Paris, 1822, p. 130 (Manila, Luzon).

Psilonotus striolatus BLEEKER, Atlas Ichth. 1865, pl. 213, fig. 6.

Canthogaster striolatus BLEEKER, Atlas Ichth. vol. 5, 1865, p. 82 (Amboina, Sumbawa, Celebes, Ternate, Tirmor, Buru, Philippines).

Tetrodon striolatus GÜNTHER, Cat. Fish. Brit. Mus. vol. 8, 1870, p. 304 (Philippines, Amboina, East Indian Archipelago).

Tropidichthys compressus WEBER, Fische Sib.-Exp. 1913, p. 888.

Canthigaster compressus JORDAN and SEALE, Proc. U.S. Nat. Mus. vol. 28, 1905, p. 791 (Negro, Philippines). EVERMANN and SEALE, Ibid. vol. 31, 1907, p. 510 (Zamboanga, Mindanao). JORDAN and SEALE, Bull. U.S. Bur. Fish. vol. 26, 1907, p. 37 (Cavite, Luzon). EVERMANN and SEALE, Ibid. vol. 26, 1907, p. 101 (Philip-

pines). SEALE and BEAN, Proc. U.S. Nat. Mus. vol. 33, 1908, p. 248 (Zamboanga, Mindanao, Philippines). HERRE, Philipp. Jour. Sci. vol. 25, no. 4, 1924, p. 500, pl. 2, fig. 5 (Bantayan Island, Cebu Province; Sorsogon Province, Luzon). de BEAUTORT, Fish. Indo-Aust. Arch. vol. 11 1962, p. 371 (9 collecting localities).

Canthigaster striolatus FOWLER, Mem. B. P. Bishop Mus. vol. 10, 1928, p. 466 (Fate, Maui).

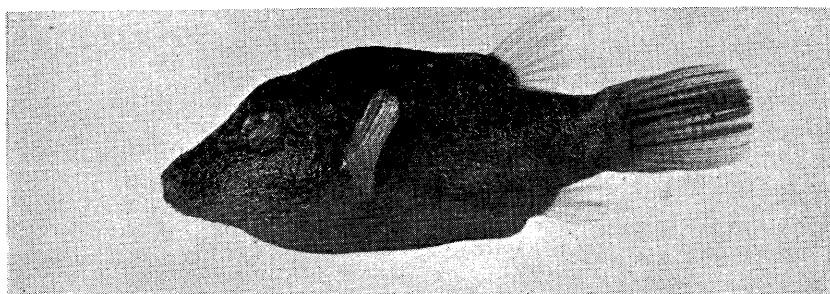
Description: Based on one specimen, 35.0 mm SL, collected from Hai-kao, south-western coast of Taiwan under 15 meters deep.

Dorsal rays 9; anal rays 9; pectoral rays 16; caudal rays 5+6; vertebrae 9+9.

In SL: Head length 43.4 (2.3); height of head 41.7 (2.4); distance from tip of the snout to origin of the dorsal fin 74.3 (1.4), to origin of the anal fin 81.1 (1.2).

IN HL: Snout 50.0 (2.0); interorbital 36.8 (2.7); horizontal diameter of the eye 23.7 (4.2); postocular portion 26.3 (3.8); longest ray of the dorsal fin 38.2 (2.6); longest ray of the anal fin 38.2 (2.6); longest ray of the pectoral fin 39.2 (2.5); least depth of the caudal peduncle 38.2 (2.6), length of it 36.8 (2.7).

Body irregularly oblong, laterally compressed; back slightly rounded, with a prominent keel; ventral profile a uniform arch from chin to caudal, with a fleshy ridge from mouth to vent; head deep, profile long pointed; snout produced, profile nearly straight from occiput to tip of snout; lips thin and fleshy; mouth small, with two



35.0 mm SL

Fig. 9. *Canthigaster compressus* (Procé)

strong tooth-plates in each jaw; eyes small, high up and far back; nostrils small and inconspicuous, with a circular rim; gill openings short; interorbital slightly concave; dorsal fin truncate; anal fin slightly rounded, its origin merely in advance of that of the dorsal; pectorals truncate; caudal rounded; skin smooth, but with very minute prickles covered on abdomen.

Color in formalin on head and body above dull brownish, lighter below body and belly; back, sides of above body and tail with undulated dark lines sometimes broken into rows of small dark spots; sides of head with small dark spots; several blackish lines radiating from the eye, crossing the snout; a large black ocellus on each side below base of dorsal, surrounded by a dusky margin; caudal dull umber, with many narrow vertical dark lines; fins all uniform whitish.

Distribution: Widespread in the tropical Indo-Pacific, from East Indies to the Philippines, northward to Taiwan, eastward to Hawaii and Polynesia, southward to northern part of Australia.

Material examined: NTUM 001353, standard length 35.0 mm, Hai-kao, 1970-6-22.

Canthigaster janthinopterus (BLEEKER)

Figs. 10-12

Tropidichthys janthinopterus BLEEKER, Nat. Tijds. Ned. Indië, vol. 8, 1855, p. 429 (Amboina).

Pylonotus janthinopterus BLEEKER, Atlas Ichth. 1865, pl. 213, fig. 2.

Canthigaster janthinopterus BLEEKER, Atlas Ichth. vol. 5, 1865, p. 82 (Amboina, Celebes).

Tetrodon janthinopterus GÜNTHER, Cat. Fish. Brit. Mus. vol. 8, 1870, p. 302 (Celebes and Amboyna); Jour Mus. Godeff. 1910, p. 471 (Ponape, Caroline Islands).

Tropidichthys janthinopterus WEBER, Fische Sib. Exp. 1913, p. 587.

Canthigaster janthinopterus FOWLER, Mem. B. P. Bishop Mus. vol. 10, 1928, p. 466 (Oceania). de BEAUFORT, Indo-Aust. Arch. vol. 11, 1962, p. 371 (Celebes; Sulu Islands!; Ambon). JONES

et al., Inst. Oceanogr. N.T.U. Taiwan, spec. publ. no. 1, 1972, p. 92 (Heng-chun).

Canthigaster jactator JORDAN, TANAKA and SNYDER, Jour. Coll. Sci. Tokyo Imper. Univ. 33(1), 1913, p. 299 (Japan). MATSUBARA, Fish. Morph. Hier. 2, 1955, p. 1017 (Japan). OKADA, Cat. Vert. Japan, 1938, p. 220 (Japan). OKADA and MATSUBARA, Fish. Fish-like Anim. Japan, 1938, p. 295 (Japan). CHANG, China Fisher. Mouth. no. 96, 1960, p. 34 (Lan-yü). LIANG and YEH, Mus. Zool. Nat. Taiwan Univ. 1964, p. 61 (Lan-yü). YANG, Yearbk. Taiwan Mus. vol. 10, 1967, p. 50 (Lan-yü); Ibid. vol. 13, 1970, p. 138, fig. 3 A & B (Lan-yü). CHEN, Syn. Vert. Taiwan, vol. 1, 1969, p. 239, fig. 216 (Lan-yü).

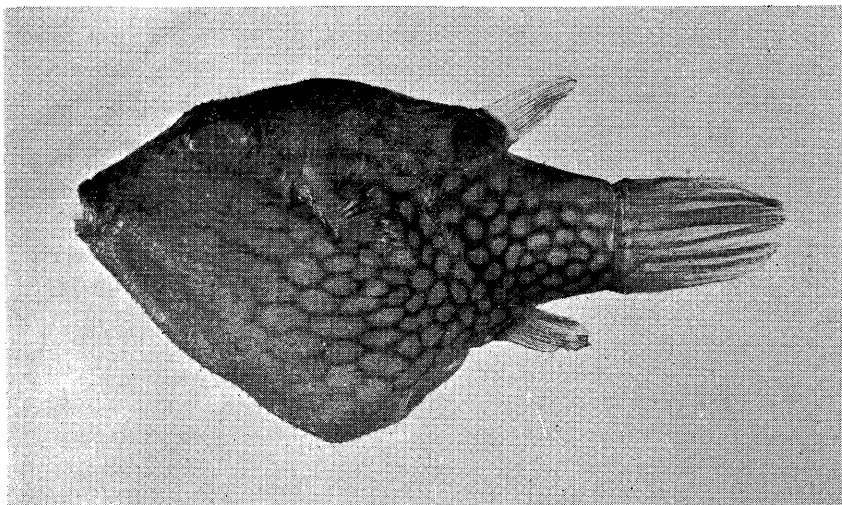
Description: Based on eight specimens, 19.0 mm-52.2 mm SL, collected from south-western coast of Taiwan and Lan-yü under 5-20 meters deep.

Dorsal rays 9; anal rays 9; pectoral rays 16-18; caudal rays 5-6+6-7; vertebrae 8-9+9.

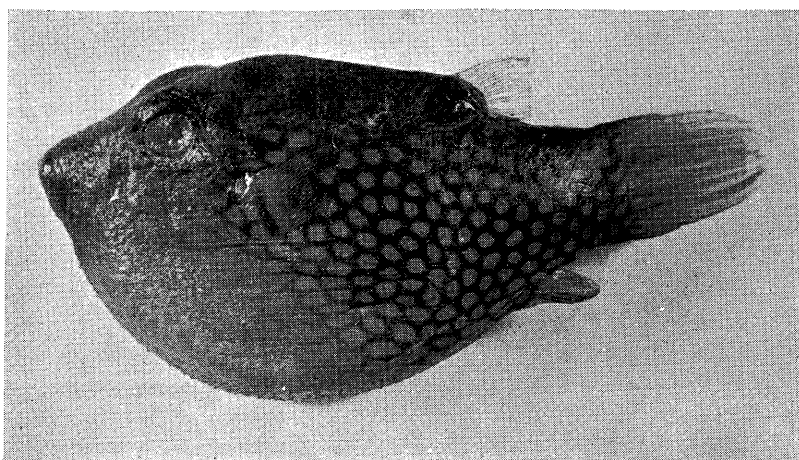
In SL; Head length 38.2-40.4 (2.5-2.6); height of head 42.0-53.4 (1.9-2.1); distance from tip of the snout to origin of the dorsal fin 70.6-77.1 (1.3-1.4), to origin of the anal fin 53.3-76.3 (1.3-1.9).

In HL; Snout 48.9-52.0 (1.9-2.1); interorbital 38.9-44.0 (2.3-2.6); horizontal diameter of the eye 23.0-26.7 (3.8-4.4); postocular portion 21.1-25.0 (4.0-4.7); longest ray of the dorsal fin 40.0-41.0 (2.4-2.5); longest ray the anal fin 36.0-43.4 (2.3-2.8); longest ray of the pectoral fin 40.0-46.1 (2.2-2.5); least depth of the caudal peduncle 38.9-57.0 (1.8-2.6), length of it 45.0-54.0 (1.9-2.2).

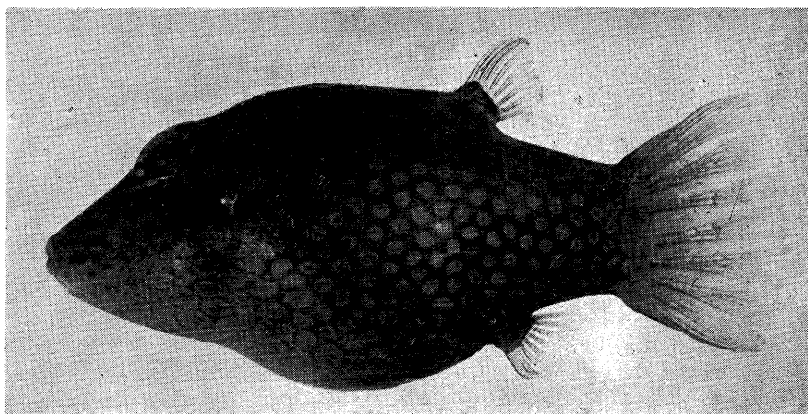
Body oblong, compressed laterally; back with a elevated keel; ventral profile a uniform arch from chin to caudal, with a fleshy ridge from mouth to vent; head deep; snout produced, sharply pointed, its profile concave, but nearly straight in a large specimen; lips thin and fleshy; mouth small, with two strong tooth-plated meeting in a produced point at the center in each jaw; eyes small,



37.6 mm SL



48.6 mm SL



52.2 mm SL

Figs. 10 - 12. *Canthigaster jar. thiropterus* (Bleeker)

high up and far back; nostrils minute depressions with a circular low rim; interorbital concave, or flat in a large specimen; gill openings short, behind and below the eye; dorsal truncate or slightly rounded; anal rounded, its origin just below the base of dorsal; pectorals falciform or fan-like; caudal truncate or slightly rounded; skin smooth on lateral side of trunk and whole tail but rather rough on back, ventral surface and head covered with prickles.

Color reddish brown, with numerous variable size of white round spots on sides and tail, but smaller on back, larger and oblong ventro-laterally; spots on back, cheek and caudal peduncle with a blue dot in its center; several bluish lines extending from mouth running backward to cheek, or those lines forming by small dots; a blotch circled by incomplete bluish oblong bars and spots, with a bluish oblong stripe in center at the base of dorsal fin; head with some bluish horizontal lines radiating from the eye; interorbital with five bluish horizontal lines; dorsal, anal and pectoral fins pale; caudal fin pale without spot.

Two specimens (NTUM 02134 & 01400) with dark brown wave lines forming a network with whitish round spaces on tail and dorsolateral side, and larger polygonal spaces on ventrolateral side; lower part of head with light paler wave lines running continuously backward connected with the network on body; a light brown spot about equal to eye at base of dorsal fin, surrounded by whitish circle; all fins uniform and dusky.

Young (19 mm SL). Color of head and body reddish brown, with numerous small round white spots, some spots with a dark dot in its center; several dark brownish lines radiating from the eye, crossing the snout; a large light brown spot, surrounded by whitish circle at base of the dorsal fin; all fins uniformly dusky.

Remarks: *C. janthinopterus* generally

appears various colorations or different spot patterns. Actually, dark blotch or ocellus sometimes developed or partially developed at base of dorsal fin; this blotch or ocellus usually surrounded by whitish circle or circled by incomplete bluish oblong bars or spots, with bluish stripe (or spot) in its center. Head usually with spoke-like lines radiating from the eye; these lines sometimes well-developed and extending to snout and also continuing to interorbital from eye to eye, sometimes poorly developed and only with short stripes which radiate from the eye or absent in others. Spots on body generally appear variably in size; these spots may be covered whole of the body (except head) or absent on ventral surface from mouth to abdomen; those of white spots on upper sides and posterior part of tail usually smaller than pupil, those on ventrolateral sides sometimes as large as or larger than pupil, sometimes forming "network".

The communications from Dr. J. E. Randall and Dr. G. R. Allen indicate that *C. janthinopterus* appears in the waters of Indo-Western-Pacific, and *C. jactator* is found only in the Hawaiian Islands. *C. jactator* differs from *C. janthinopterus* generally in having larger (or about equal to pupil) and less numerous pale spots on head and body, and about 8-11 in an approximate vertical row from the dorsal origin to the anal origin, but *C. janthinopterus* generally has more than 12 (usually 14-17), and exhibit either an ocellus or dark spot at the base of the dorsal fin and poorly developed lines or "spokes" which radiate from the eye.

Distribution: Widespread in the tropical Indo-Pacific, from East Indies to the Philippines, northward to Taiwan, southward to north-eastern part of Australia.

Material examined: NTUM 001395, 50.0 mm SL, Wan-li-tung, 1973-4-1; NTUM 001396, 48.0 mm SL, Hou-pi-hu, 1971-9-18; NTUM 001397, 48.0 mm SL, Wan-li-tung, 1970-11-7; NTUM 001398, 52.2 mm SL,

Wan-li-tung, 1973-4-1; NTUM 001442, 19.0 mm SL, Heng-chun, 1971-3-21; NTUM 001399, 55.0 mm SL, Wan-li-tung, 1973-4-1; NTUM 001400, 37.6 mm SL, Ta-kwang, 1970-11-11; NTUM 002134, 27.3 mm SL, Lan-yü, 1960-8-1.

Canthigaster solandri (RICHARDSON)

Figs. 13 & 14

- Tetodon solandri* RICHARDSON, Voy. Sulphur Fish. 1844, p. 125; GÜNTHER, Jour. Mus. Godeff. 1910, p.470 (Tahiti).
- Tetodon papua* GÜNTHER, Cat. Fish. Brit. Mus. vol. 8, 1870, p. 301 (Amboyna). BOULENGER, Ann. Mag. Nat. Hist. London, ser. 6, vol. 20, 1897, p. 374 (Rotuma).
- Tropidichthys papua* WEBER, Fische Sib.-Exp. 1913, p. 587 (North Ubian, Sub Province, Philippines).
- Canthigaster solandri* JORDAN and SEALE, Bull. U.S. Bur. Fish. vol. 25, 1905 (1906), p. 371 (Apia, Pago Pago). FOWLER and BEAN, Proc. U.S. Nat. Mus. vol. 71, 1927, p. 15 (Tahiti). SCHULTZ, Bull. U.S. Nat. Mus. 180, 1943, p. 295 (Phoenix and Samoan Islands). WOODS, Ibid. 202, vol. 3, 1966, p. 123, pl. 144 B (Marshall and Marianas Islands). EXELROD and EMMENS, Exot. Mar. Fish. 1971, p. 262-63. BURGESS and EXELROD, Pac. Mar. Fish bk. 1, 1971, p. 98 & 158 (Palau Islands). JONES *et al*, Inst. Oceanogr. N.T.U. Taiwan, spec. publ. no. 1, 1972, p. 92 (Heng-chun).
- Canthigaster papua* HERRE, Philipp. Jour. Sci. vol. 25, no. 4, 1924, p. 501 (Guam, Dumaguete, Bantayan, North Ubian, Sulu Archipelago).
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Description: Based on two specimens, 75.0 mm and 20.0 mm, SL, collected from Nan-wan, south-western coast and Taitung, south-eastern coast of Taiwan under 5-20 meters deep.

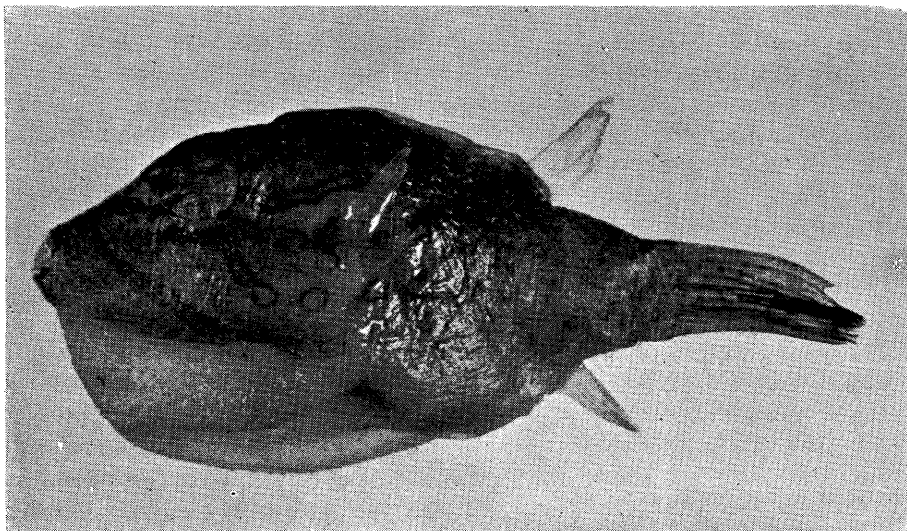
The following counts and measurements are based on both adult and young specimens, and recorded first for the adult and young specimen respectively: Dorsal rays 6, 9; anal rays 9, 9; pectoral rays 16, 16; caudal rays 5+6, 5+6; vertebrae 9+9, 9+9.

In SL: Head length 38.7 (2.6), 45.0 (2.2); height of head 48.0 (2.1), 59.0 (1.7); distance from tip of the snout to origin of the dorsal fin 69.3 (1.4), 73.0 (1.4), to origin of the anal fin 81.3 (2.2), 86.0 (1.2).

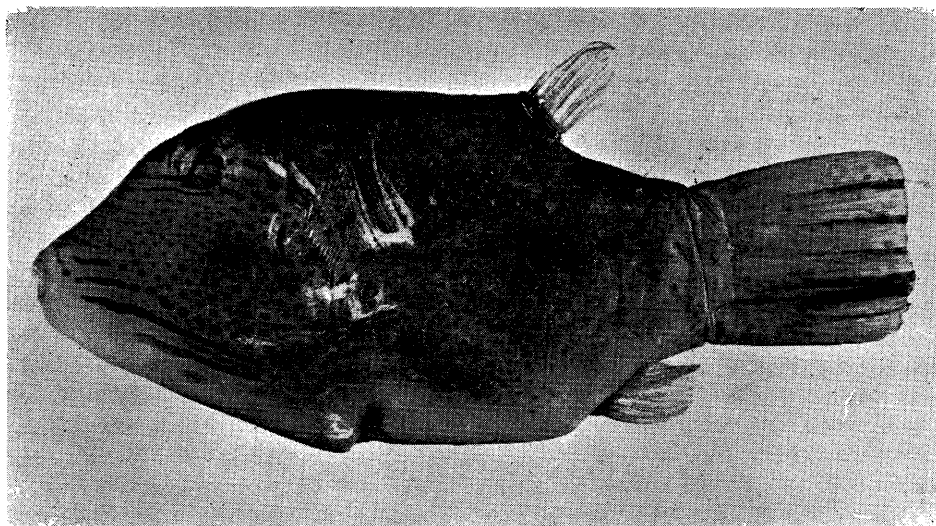
In HL: Snout 55.9 (1.8), 42.2 (2.4); interorbital 37.9 (2.6), 51.1 (2.0); horizontal diameter of the eye 19.3 (5.2), 28.9 (3.5); postocular portion 21.4 (4.7), 31.1 (3.1); longest ray of the dorsal fin 44.8 (2.2), 46.7 (2.1); longest ray of the anal fin 37.9 (2.6), 37.8 (2.7); longest ray of the pectoral fin 43.5 (2.3), 41.1 (2.4); least depth of the caudal peduncle 36.6 (2.7), 37.8 (2.7), length of it 59.3 (1.7), 33.3 (3.0).

Body roughly oblong, compressed laterally; back smoothly rounded, with a elevated keel; ventral profile a uniform arch from chin to caudal, belly with a fleshy ridge from mouth to vent; head deep; snout sharply pointed, profile concave; lips thin and fleshy; mouth small, with two strong tooth-plates, meeting in a produced at the center in each jaw; eyes small, high up and far back; nostrils inconspicuously minute with a circular low rim; interorbital moderate, concave; gill openings short; dorsal, anal, pectorals and caudal truncate; skin smooth, but with very minute prickles covered on back, cheek and abdomen.

Color brown with numerous small round bluish spots smaller than pupil, distributed irregularly on head and body, each spot with a minute dot in center; some of the spots forming the short horizontal lines crossing snout, interorbital, back of trunk, upper part of tail and even on lower cheek; and also spots larger in the middle of the trunk, smaller posteriorly or anteriorly; several dark brownish lines radiating from the eye;



20.0 mm SL



75.0 mm SL

Figs. 13 & 14. *Canthigaster solandri* (Richardson)

dorsal, anal and pectoral fins uniform, but caudal fin with many dark-edged white spots.

Young (20 mm SL). Color reddish brown with few large dark-bordered white spots on sides, tail and caudal fin; a dark ocellate spot encircled by brown border at base of dorsal fin; a white stripe, bordered by dark lines extending from snout and running backward to lower part of pectoral; another

stripe on suborbital; four stripes on inter-orbital and continuous to each eye, two of which from posterior border of eye running backward to anterior part of dorsal; all fins uniform.

Remarks: The present species differs from *C. janthinopterus* in having spots on caudal fin; the spots on sides smaller than pupil and more numerous on head; an

ocellate spot at base of dorsal fin.

Distribution: Widespread in the tropical Indo-Pacific, found in the Philippines, Taiwan and Hawaiian Islands.

Material examined: NTUM 001354, 75.0 mm SL, Nan-wan, 1971-9-20; NTUM 001357, 20.0 mm SL, Tai-tung, 1970-8-1.

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臺灣產魷形目的研究-B 扁背(或尖鼻)魷科

沈世傑 林炳智

本省產扁背(或尖鼻)魷科的魚類共分1屬8種，其中 *Canthigaster valentini* (Bleeker), *C. rivulatus* (Temminck and Schlegel) 及 *C. amboinensis* (Bleeker) 較為普遍於北部、東北部及西南部海域；*C. bennetti* (Bleeker), *C. coronatus* (Vaillant and Sauvage), *C. solandri* (Richardson), *C. compressus* (Procé), 及 *C. janthinopterus* (Bleeker) 較少見，僅發現於臺東、蘭嶼及西南部海域；*C. coronatus* (Vaillant and Sauvage), 及 *C. compressus* (Procé) 為臺灣以往沒有記錄者；前人所記述的 *C. valentini* = *C. cinctus* 實際上可分為 *C. coronatus* 及 *C. valentini*；另原臺灣所記載及描述的 *C. jactator* (Jenkins) (張, 1960；梁·葉, 1964；楊 1967, 1970；陳, 1969) 係鑑別錯誤，而實為 *C. janthinopterus*。