

Trygonoptera imitata sp. nov., a new stingaree (Myliobatoidei: Urolophidae) from southeastern Australia

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ABSTRACT.— A new stingaree, *Trygonoptera imitata* sp. nov., is described from material collected off southeastern Australia. It differs from *T. testacea*, with which it is sympatric off the southeastern Australian coast, in lacking a dorsal fin, having a shorter prepiracular length, deeper caudal fin, and a shorter prenasal length. It differs from a western congener, *T. mucosa*, which also lacks a dorsal fin, in having a shorter prepiracular length and is much larger. The new species is the largest *Trygonoptera* species and one of the largest urolophids. It occurs from Jervis Bay (New South Wales) south through northern Bass Strait (including Flinders Island) to Beachport (South Australia), in shallow embayments and coastal waters to depths of 120 m.

Key words. Urolophidae – *Urolophus* – *Trygonoptera* – new species – southwestern Pacific Ocean – Tasman Sea – Australia

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INTRODUCTION

The family Urolophidae comprises two genera, *Trygonoptera* Müller & Henle, 1841 and *Urolophus* Müller & Henle, 1837. Its distribution is restricted to the Indo–West Pacific, with most species occurring on Australia’s continental shelves (Last & Stevens, 1994; Last & Compagno, 1999; Séret & Last, 2003; Yearsley & Last, 2006). The genera *Urolophus* Garman, 1913 and *Urotrygon* Gill, 1863, from the eastern Pacific and western Atlantic, are now widely regarded as members of the family Urotrygonidae (McEachran *et al.*, 1996; Compagno, 2005).

The genus *Trygonoptera*, once considered a junior synonym of *Urolophus* (Paxton *et al.*, 1989), can be distinguished from that genus by the presence of broad, flattened fleshy lobes on the mid-lateral margin of each nostril (lobes absent in *Urolophus*) (Last & Stevens, 1994). Phylogenetically significant skeletal differences between the two genera were observed by Last & Gomon (1987) and Yearsley (unpubl.), and are the subject of a forthcoming paper (Yearsley & Last, in prep).

Trygonoptera contains at least 6 species, all of which are restricted to southern Australian seas (Last & Stevens, 1994; Séret & Last, 2003). Two of these species (as *Trygonoptera* sp. A and *T.* sp. B *sensu* Last & Stevens, 1994) are undescribed and bear a strong resemblance

to *T. mucosa* (Whitley 1939) and *T. testacea* Müller & Henle 1841. *Trygonoptera* sp. B is described below as a new species.

METHODS

Counts and measurements follow Séret & Last (2003). The holotype (CSIRO H 3548–01) and 5 paratypes (CSIRO H 1002–02, CSIRO H 2670–01, CSIRO H 2670–02, CSIRO H 3532–07 and NMV A 10830) were measured in full, and measurements were also made on specimens of related species to identify distinguishing characters. Meristics were taken from radiographs of the holotype and 7 paratypes. Type specimens and comparative material are deposited in the Australian National Fish Collection, Hobart (CSIRO), and ichthyological collections of the Australian Museum, Sydney (AMS), Museum Victoria (NMV) and the South Australian Museum (SAMA); their registration numbers are prefixed with these acronyms.

Trygonoptera imitata sp. nov.

Figs 1–4; Table 1

Trygonoptera sp. 2: Kuitert, 1993: p 22, col. fig.

Trygonoptera sp. B: Last & Stevens, 1994: pp 417, 423, key fig. 14, fig. 41.3, pl. 78.

Holotype. CSIRO H 3548–01, adult male 613 mm TL, east of Wilsons Promontory, Bass Strait, Victoria, 39°00' S, 146°35' E, 41–42 m, 29 Jul 1993.

Paratypes. 17 specimens. AMS I 44170–001, adult male 482 mm TL, west of Port Arlington, Port Phillip Bay, Victoria, 38°14' S, 144°49' E, 14–25 m, 15 Jun 1992; CSIRO H 35–01, female 531 mm TL, Jervis Bay, New South Wales, 35°05' S, 150°44' E, 20–30 m, 04 Apr 1984; CSIRO H 869–01, female 793 mm TL, east of Batemans Bay, New South Wales, 35°40' S, 150°26' E, 115–117 m, 10 Sep 1986; CSIRO H 999–07, adolescent male 474 mm TL, CSIRO H 1002–02, adult male 564 mm TL, Jervis Bay, New South Wales, 35°03' S, 150°45' E, 18–22 m, 14 Nov 1984; CSIRO H 2670–01, female 625 mm TL, CSIRO H 2670–02, female 643 mm TL, Tooradin Channel, Western Port Bay, Bass Strait, Victoria, 38°15' S, 145°22' E, 5 m, 28 Nov 1990; CSIRO H 3532–07, female 689 mm TL, Disaster Bay, New South Wales, 37°17' S, 150°02' E, 25–42 m, 11 Aug 1993; CSIRO H 3717–01, adolescent male 506 mm TL, south of Jervis Bay, New South Wales, 35°12' S, 150°39' E, 31–33 m, 03 Mar 1994; CSIRO H 3718–02, juvenile male 180 mm TL, CSIRO H 3718–03, juvenile male 181 mm TL, CSIRO H 3718–04, juvenile male 179 mm TL, east of Batemans Bay, New South Wales, 35°39' S, 150°26' E, 117–119 m, 22 Mar 1994; CSIRO H 4441–03, female 235 mm TL, CSIRO H 4441–05, juvenile male 217 mm TL, east of Bermagui, New South Wales, 36°23' S, 150°06' E, 27–29 m, 30 Nov 1996; NMV A 10825, female 485 mm TL, NMV A 10830, adult male 506 mm TL, NMV A 10832, juvenile male 342 mm TL, west of Port Arlington, Port Phillip Bay, Victoria, 38°14' S, 144°49' E, 14–25 m, 15 Jun 1992.

Other material. SAMA F 5063, adult male 668 mm TL, 20 miles off Beachport, South Australia, ca. 37°45' S, 139°50' E, 200–440 m, 3–4 Aug 1985.

DIAGNOSIS.— A large plain-coloured *Trygonoptera* with the following combination of characters: subcircular disc, width 62–67% TL; snout angle 122–129°; distance from snout tip to posterior edge of spiracle 17–19% of TL; eye length 19–24% of preorbital snout length, 9.3–10.9% of ventral head length; inter-eye distance 3.0–4.0 times eye diameter; short prenasal length 8.8–9.8% TL; length of main spiracular opening 1.7–2.3 times eye length; length of first gill slit 2.2–2.6 times in mouth width; tail without cutaneous folds; stinging spine(s) long, 9–13% TL when intact; dorsal fin absent; caudal fin deep (height 3.6–4.1% of TL); pectoral radials 98–107; total vertebral centra about 199–223; total diplospondylous centra about 166–185; uniform greyish brown to yellowish dorsally.

DESCRIPTION.— Disc weakly subcircular, broad, humped in largest specimens; wider than long; width 1.13 (1.05–1.12) times length, 4.65 (4.51–4.71) times distance between first gill slits; broadest at more than 2 eye diameters behind level of spiracles; anterior profile obtuse; anterior margins of disc weakly convex (straight to weakly convex); pectoral apices broadly rounded;

posterior margins of disc convex. Snout fleshy, tip bluntly angular, barely extended; snout angle 129° (122–129°); preoral snout length 2.77 (2.85–3.46) times internarial distance, 0.88 (0.85–0.94) times distance between first gill slits; direct preorbital snout length 3.07 (2.53–2.98) times interorbital distance; snout to maximum disc width 2.69 (2.60–2.83) times in disc width; interorbital space broad, weakly concave (almost flat to moderately concave); orbital region barely distinguishable from head (sometimes elevated well above interorbit), orbit diameter 1.17 (0.96–1.37) in spiracle length; eye relatively small, lateral (appearing dorsolateral where head is flattened), length 21.12% (18.90–24.39%) of preorbital snout length, 9.53% (9.28–10.86%) of ventral head length, length 1.91 (1.68–2.32) in spiracle length; lower half of eye separated from spiracle by a fleshy curtain (when eyes raised, curtain wholly below eye); curtain originating forward of anterior third of eye, inserted near posterior margin of orbit; inter-eye distance 3.55 (3.04–4.04) times eye length. Spiracles broadly sigmoid and recurved medially, continuing posteriorly well behind orbit to form a deep pocket; pocket overlain with a low, cartilaginous protuberance; greatly enlarged, dorsolateral, forming a deep, cavernous opening, much larger than orbit, interspiracular distance 2.22 (1.88–2.10) times interorbit distance.

Mouth small, slightly concave (almost straight to slightly concave); width 2.64 (2.69–3.18) in snout tip to lower jaw. Oral papillae 6 in paratype CSIRO H 2670–01 (female 625 mm TL), 3 near middle of mouth, their bases not confluent; very short, subequal in size, with expanded or bilobed tips; 1–2 similar widely separated papillae closer to mouth corners; dense external patch of pored papillae below symphysis of lower jaw, most strongly developed on midline of chin; incomplete, deep post-oral grooves extend from angle of mouth posteromedially for a distance equivalent to nostril length. Jaws strongly asymmetric; mouth directed anteroventrally, upper jaw concealed, almost dorsal to lower jaw, without exposed tooth rows; lower jaw barely visible. Teeth in paratype CSIRO H 2670–01 quincuncial, similar in size in both jaws; those near symphysis of lower jaw with suboval to rhomboidal bases; labial and lateral teeth in lower jaw with cusps reduced or absent, inner teeth more strongly pointed lingually with serrated margins; about 6 prominent median teeth near middle of tooth band (about nine rows in from symphysis) with enlarged triangular lingual cusps; bases of teeth in upper jaw broadly oval, cusps rudimentary or absent; upper tooth band in vertical plane; lower tooth band in horizontal plane when mouth closed, larger than upper band. Internasal flap well developed, narrowly skirt-shaped, not distinctly broader distally than anteriorly, width 1.39 (1.32–1.66) times length, 1.22 (1.29–1.45) times internasal distance; posterior lateral apex with a weak lobe, depressible into a deep oronasal groove; distal fringe very well developed (less so in some paratypes), its margin irregular, somewhat pointed medially, fringe overlaying lower jaw, with a deep,

A



B



Figure 1. *Trygonopectera imitata* sp. nov., adult male holotype (CSIRO H 3548–01, 613 mm TL, preserved): A. dorsal view; B. ventral view.

Table 1. Morphometric data for the holotype of *Trygonopectera imitata* sp. nov. (CSIRO H 3548–01), with ranges and means provided for measured paratypes. Measurements expressed as a percentage of total length.

	Holotype	Paratypes		
		Min.	Max.	Mean
Total length (mm)	613	506	689	
Disc width	67.2	62.2	64.0	63.3
Disc length (direct)	59.4	56.0	60.5	58.0
Disc length (horizontal)	58.9	55.0	60.0	57.2
Snout to maximum width	25.0	22.3	24.4	23.7
Snout length - preorbital (direct)	13.3	12.0	12.9	12.3
Snout length - preorbital (horizontal)	11.3	9.6	11.5	10.5
Snout to spiracle - ant. (horizontal)	13.5	11.4	13.1	12.0
Snout to spiracle - post. (direct)	18.5	16.6	17.8	17.4
Orbit diameter	4.6	3.9	5.3	4.4
Eye diameter (cornea)	2.8	2.4	3.0	2.7
Orbit and spiracle length	7.2	6.4	7.6	6.9
Spiracle length	5.4	5.0	5.7	5.2
Distance between eyes	10.0	8.4	10.3	9.3
Distance between orbits	4.3	4.3	4.9	4.6
Distance between spiracles	9.6	8.7	9.5	9.1
Distance-snout to post. cloaca	56.0	53.4	57.1	55.4
Distance-cloaca to caudal fin tip	43.5	42.0	46.1	43.9
Spine origin to tail tip	26.0	22.8	28.6	25.1
Spine length - upper spine	dam.	8.5	12.9	10.5
Spine length - lower spine	11.8	10.7	12.8	11.9
Spine origin (upper) to lower tip	15.7	14.2	15.6	15.1
Epi-caudal lobe length	16.7	13.4	16.9	14.7
Hypo-caudal lobe length	22.2	20.5	25.9	23.0
Max. caudal height	4.0	3.6	4.1	3.9
Snout tip to lower jaw	12.8	11.8	12.7	12.1
Prenasal length (direct)	9.8	8.8	9.6	9.3
Head length to fifth gill (direct)	29.4	26.3	28.1	27.0
Mouth width (to corners)	4.8	4.0	4.4	4.2
Distance between nostrils	4.6	3.5	4.3	3.8
Nasal curtain-length	4.0	3.2	3.7	3.4
Nostril length	1.6	1.3	1.8	1.6
Nasal lobe length	3.1	2.6	3.2	2.9
Nasal lobe width	1.6	1.3	1.7	1.5
Nasal curtain (maximum width)	5.6	4.9	5.5	5.2
Width of first gill slit	1.9	1.7	1.8	1.7
Width of third gill slit	2.3	1.7	2.0	1.9
Width of fifth gill slit	1.6	1.3	1.5	1.3
Distance between first gill slits	14.4	13.5	14.0	13.8
Distance between fifth gill slits	6.9	7.2	11.9	8.5
Clasper-post cloacal length	14.0	11.6	13.0	12.3
Length of pelvic fin (max.)	16.1	13.8	16.6	15.2
Width across pelvic base	12.0	10.4	13.6	12.2
Width across pelvics (max.)	23.6	21.4	26.6	24.1
Tail width (pelvic axil)	4.9	4.7	6.3	5.6
Tail depth (pelvic axil)	3.4	3.4	4.0	3.7
Tail width (spine origin)	3.2	2.2	3.0	2.7
Tail depth (spine origin)	2.5	2.2	2.4	2.3



Figure 2. Orbito-spiracular region of *Trygonopectera imitata* sp. nov., adult male holotype (CSIRO H 3548–01, 613 mm TL, preserved) showing the relative sizes and positions of the spiracle and orbit.

longitudinal median furrow; with a dense arrangement of pored papillae. Nostril almost longitudinal (sometimes slightly oblique), much shorter than internasal flap; posterolateral margin with a greatly expanded, flattened, fleshy posterior lobe; lobe larger than nasal aperture.

Gill slits moderately S-shaped, fringed (less evident in smallest paratypes), margin membraneous; length of first gill slit 1.16 (1.17–1.39) times length of fifth gill slit, 2.60 (2.19–2.62) times in mouth width; distance between first gill slits 3.13 (3.22–3.99) times internasal distance, 0.49 (0.49–0.53) times ventral head length; distance between fifth gill slits 1.51 (1.73–3.24) times internasal distance, 0.24 (0.26–0.44) times ventral head length.

Body entirely smooth, sensory pores usually indistinct dorsally, most obvious above margin of abdomen; subcutaneous canal system evident ventrally.

Tail relatively short, postcloacal length 73.19% (69.41–82.28%) disc length; moderately depressed anteriorly, suboval in cross-section, tapering evenly, subcircular above anterior part of hypochordal lobe of caudal fin, compressed below epichordal lobe; flattened beneath stinging spine; lateral cutaneous tail folds absent. Dorsal fin absent. Pelvic fins subtriangular, moderate (small to moderate), length 1.47 (1.45–1.79) in greatest width across both fins, outer margin broadly rounded, anterior margin weakly convex (almost straight), posterior margins moderately convex, free rear tip weakly angular. Caudal fin broadly lanceolate, epichordal-lobe length 4.22 (3.28–4.64) times fin height; hypochordal lobe 5.59 (5.20–7.11) times fin height. Clasper robust, digitiform, not depressed; tapering, narrowly rounded distally. Two stinging spines (paratypes smaller than 350 mm TL with a single spine; largest paratypes usually with two spines, lower spine typically larger than upper spine), very elongate; upper spine damaged in holotype, length 0.57–0.90 times in epichordal lobe length in four undamaged paratypes, serrated for most of its length, point pungent when undamaged, with 16 recurved serrations on left side.

Tooth rows about 22 in upper jaw, about 24 in lower jaw. Pectoral-fin total radials 102–103 (98–107, n=7); 45–46 (40–48) propterygial, 13–14 (11–19) mesopterygial, and 43–44 (40–46) metapterygial. Total pelvic-fin radials 1 + 20–21 (1 + 18–19 in males, n=3; 1 + 23–26 in females, n=4). Total vertebral centra about 204 (199–223); monospondylous, including synarcual centra, 35 (33–39); pre-sting diplospondylous centra 53 (52–61); total diplospondylous centra about 169 (166–185).

COLOUR.— **When fresh:** Dorsal surface uniform greyish brown or yellowish (somewhat lighter or darker in paratypes); darkest on midline of head and central disc and tail, distinctly paler toward disc margin; a few, blackish spots scattered irregularly on pectoral disc (largest female CSIRO H 869–01 feebly mottled with denser arrangement of small, black and yellowish spots; smallest juveniles more uniform, without spots or blotches); centre of tail in smallest paratypes with blackish stripe from just forward of pelvic insertion to caudal fin. Ventral surface pale over centre of disc; anterior margin dark brownish black; lateral and posterior margins of disc similarly darker than central part of disc and tail (almost black in smallest paratypes, maximum width of this area equivalent to width between fourth gill slits); similar broad, dark margin on pelvic fins; irregular dark blotches on abdomen in some specimens; tail usually uniformly dark, similar to or darker than pectoral-fin margin in largest types. Mouth and cloaca uniformly pale. Caudal fin dark brown with whitish areas where skin abraded (paratypes usually darker brownish black). Claspers dark brown (paler in some paratypes). In preservative, similar, becoming more greyish dorsally.

SIZE.— The largest specimen examined was a female of 793 mm TL and 486 mm DW (CSIRO H 869–01); largest male a non-type specimen (SAMA F 5063) of 668 mm TL; smallest adult male 482 mm TL (AMS I 44170–001). The smallest specimen available, a 179 mm TL juvenile



Figure 3. Oronasal region of *Trygonopectera imitata* sp. nov., adult male holotype (CSIRO H 3548–01, 613 mm TL, preserved).



Figure 4. Lateral view of the posterior tail of *Trygonopectera imitata* sp. nov., adult male holotype (CSIRO H 3548-01, 613 mm TL, preserved).

male (CSIRO H 3718-04) had an umbilical scar and is likely to be an embryo.

DISTRIBUTION.— Occurs off southeastern Australia from Beachport (South Australia) to Jervis Bay (New South Wales); through Bass Strait off Victoria. Not yet recorded from mainland Tasmania but has been photographed at Flinders Island (Tasmania) by one of the authors (PL), and a specimen photographed in Gulf St Vincent, South Australia (photo supplied by Peter Kyne), is probably this species. Occurs in bays and coastal waters from close inshore near beaches to depths of at least 120 m (Last & Stevens, 1994).

ETYMOLOGY.— The new species resembles *Trygonopectera mucosa* and *T. testacea* in general appearance resulting in confusion over their identities. The epithet is based on the Latin *imitator* (copy or mimic) in allusion to this similarity. Vernacular: Eastern Shovelnose Stingaree.

REMARKS.— The morphological similarities between *T. imitata*, *T. testacea* and *T. mucosa* have resulted in confusion over their identity. *Trygonopectera imitata*, which attains about 80 cm TL, is the largest known member of the genus and one of the largest urolophids; *T. testacea* and *T. mucosa* attain 47 and 44 cm TL respectively. *Trygonopectera imitata* is sympatric with *T. testacea* off the south-east Australian coast but can be distinguished by the absence of a dorsal fin on the tail anterior to the stinging spine (present as a prominent fin or at least as a narrow ridge in *T. testacea*), a shorter snout to spiracle distance (direct measurement from snout tip to posterior edge of spiracle 16.6–18.5% of TL in *T. imitata* vs. 18.5–20.2% in *T. testacea*), a deeper caudal fin (3.6–4.1% vs. 3.2–3.6% of TL), and a shorter prenasal length (8.8–9.8% vs. 10.0–11.8% of TL). *Trygonopectera imitata* and its western congener, *T. mucosa*, both lack a dorsal fin but *T. imitata* has a shorter snout to spiracle distance (direct measurement from snout tip to posterior edge of spiracle 16.6–18.5% of TL in *T. imitata* vs. 18.8–20.5% in *T. mucosa*) and reach a much larger size (*T. imitata* males mature at about 48 cm TL vs. about 30 cm TL in *T. mucosa*).

As part of a concurrent study that aims to genetically

barcode Australia's fish species (Ward *et al.*, 2005, 2008), B. H. Holmes and R. D. Ward (pers. com.) found that cytochrome oxidase subunit 1 (CO1) sequences readily distinguished *T. imitata* (n=7) and *T. testacea* (n=15), with an interspecies divergence of $6.14 \pm 0.02\%$. This is well within the range of congeneric divergences in other fishes. In the same study, intraspecies CO1 sequence divergences were $0.04 \pm 0.02\%$ for *T. imitata* and $0.20 \pm 0.02\%$ for *T. testacea*. These values are characteristic of intraspecies sequence ranges for other fishes.

A recent investigation by the authors of *T. mucosa*-like specimens from Western Australia has identified additional species in the *T. mucosa* complex (Last & Yearsley, in press this series). Additional genetic material is required from *T. mucosa*-like specimens from southwestern Australia (particularly from the *T. mucosa* type locality off Albany) before reliable CO1 comparisons can be made between *T. imitata* and its western congeners.

The range of *Trygonopectera imitata* may extend onto the continental slope, but this needs to be confirmed. The largest male specimen available (SAMA F 5063, 668 mm TL) appears to be this species but was excluded from the type series because, based on its registration data, it was collected at a depth of 200–440 m. Other available specimens, including those of the type series, were collected mainly from close inshore (often less than 5 m depth) but always less than 120 m.

Comparative material.

Trygonopectera mucosa: 5 specimens. CSIRO H 898-02, immature male 305 mm TL, CSIRO H 898-04, female 277 mm TL, CSIRO H 898-05, female 313 mm TL, CSIRO H 898-06, adolescent male 318 mm TL, CSIRO H 898-08, female 285 mm TL, off Albany, Western Australia, 35°02' S, 117°53' E, 20 m, 03 Mar 1986.

Trygonopectera testacea: 5 specimens. CSIRO H 80-01 (1 of 3 specimens), female 426 mm TL, Port Hacking, New South Wales, 34°04' S, 151°10' E, 19 Nov 1984; CSIRO H 836-05, adult male 396 mm TL, north of Broughton Island, New South Wales, 32°33' S, 152°23' E, 22–36 m, 03 Oct 1985; CSIRO H 927-01, adult male 462 mm TL, east of Port Stephens, New South Wales, 32°44' S, 152°15' E, 45–63 m, 11 Apr 1985; CSIRO H 930-01,

female 432 mm TL, north of North Solitary Island, New South Wales, 29°52' S, 153°23' E, 36–54 m, 24 Mar 1985; CSIRO H 999–08, adult male 436 mm TL, Jervis Bay, New South Wales, 35°03' S, 150°45' E, 18–22 m, 14 Nov 1984.

ACKNOWLEDGEMENTS

We are especially grateful to A. Graham (CSIRO) for his helpful curatorial assistance during this study. T. Fountain, S. Riddoch and J. Pogonoski (CSIRO) assisted with the collection of meristic data, and D. Gledhill contributed to the collection of morphometric data. W. White and J. Pogonoski provided editorial comments on the manuscript. L. Conboy digitised and etched figure images. We thank P. Kyne for his photograph of a South Australian specimen, and D. Bray (NMV) for providing specimens and data, and Mark McGrouther (AMS) and Ralph Foster (SAMA) for providing access to urolophid material during the course of the study.

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