

**DESCRIPTION OF FOUR NEW STINGAREES
OF THE GENUS *UROLOPHUS* (BATOIDEA: UROLOPHIDAE)
FROM THE CORAL SEA, SOUTH-WEST PACIFIC**

by

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ABSTRACT. - Four new species of urolophid stingarees are described from the Coral Sea (South-West Pacific): *Urolophus deforgesi* sp. nov. and *U. papilio* sp. nov. from the continental slope of the Chesterfield Islands; *U. neocaledoniensis* sp. nov. is more widely distributed on the slopes of the Chesterfield Islands and New Caledonia and along the northern part of the Norfolk Ridge; *U. piperatus* sp. nov. is restricted to the coast of northern Queensland (Australia). The holotype and only known specimen of a rare and unusual stingaree, *U. armatus* Val. in Müller & Henle, 1841 from New Ireland (Bismark Archipelago), is redescribed and it could represent a new genus. The new species are mainly distinguished by a combination of the following characters: disc shape (particularly its width), dorsal fin (present or absent), interorbital distance (narrow or broad), tail length (short or elongated), coloration (plain or with spots), and oral papillae, vertebrae and pectoral-fin radial counts. A key for the urolophids of the Coral Sea is provided.

RÉSUMÉ. - Description de quatre espèces nouvelles de raies pastenagues du genre *Urolophus* (Batoidea: Urolophidae) de la mer de Corail (sud-ouest de l'océan Pacifique).

Quatre nouvelles espèces de raies pastenagues de la famille des Urolophidae sont décrites de la mer de Corail (océan Pacifique Sud-Ouest) : *Urolophus deforgesi* sp. nov. et *U. papilio* sp. nov. de la pente externe des îles Chesterfield ; *U. neocaledoniensis* sp. nov. plus largement distribuée sur les pentes des îles Chesterfield et de Nouvelle-Calédonie et sur la partie nord de la Ride de Norfolk; et *U. piperatus* sp. nov. limitée à la côte nord du Queensland (Australie). L'holotype et unique spécimen connu d'*Urolophus armatus* Val. in Müller & Henle, 1841, de Nouvelle-Irlande (Archipel Bismarck), est redécrit, et il est suggéré qu'il pourrait représenter un nouveau genre. Les nouvelles espèces se distinguent principalement par la combinaison des caractères suivants: nageoire dorsale (présente ou absente), espace interorbitaire (étroit ou large), longueur de la queue (courte ou allongée) et coloration dorsale (uniforme ou avec des points). Une clef de détermination des espèces du genre *Urolophus* de la mer de Corail est fournie.

Key words. - Urolophidae - *Urolophus* spp. - PSW - New species.

Stingarees of the family Urolophidae are small to moderate-size benthic rays that occur from coasts to deep-water in temperate to tropical seas, mainly in the Indo-Pacific region. The group formerly included four genus-level taxa (*Trygonoptera*, *Urolophus*, *Urobatis* and *Urotrygon*). However, McEachran *et al.* (1996) suggested that *Urobatis* (including Western Hemisphere members of *Urolophus*) and *Urotrygon* should be relocated to a separate family the Urotrygonidae, and the Indo-Pacific *Urolophus* to the family Hexatrygonidae (along with the genus *Plesiobatis*). An Australian group, *Trygonoptera*, is often considered a junior synonym of *Urolophus* but an unpublished study by G. Yearsley has shown that members of these two groups are not congeneric. In this paper we have followed recent literature and treated *Urolophus* as exclusive of stingarees conforming to *Trygonoptera* and *Urobatis*. Whatever its familial placement, *Urolophus* is the most diversified genus with about 21 Indo-Pacific species, including four new species herein described from the Coral Sea.

For more than a decade, France and Australia have undertaken a series of exploratory research cruises to the southern tropical Indo-West Pacific in search of new resources and to compile an inventory of its deepwater biodiversity (e.g., Grandperrin *et al.*, 1990, 1995; Williams *et al.*, 1996; Séret, 1997). In this respect, the Coral Sea is defined as a broad geographical region forming part of the South-West Pacific Ocean that extends from the Tropic of Capricorn to the coasts of Papua-New Guinea, the Bismark Archipelago and the Solomon Islands to the north, and limited westward by the coasts of Queensland (Australia) and eastward by New Caledonia, the Loyalty Islands and Vanuatu.

The region harbours a highly diverse and endemic chondrichthyan fauna with many species remaining undescribed. Australian seas, with 6 *Trygonoptera* and 15 *Urolophus* species (Macleay, 1884; McCulloch, 1916; Whitley, 1940; Last *et al.*, 1983; Last and Stevens, 1994), are a centre of diversity for stingarees. Similarly, most of the species collected in

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the Coral Sea during these cruises are new to science. Prior to this study, the fauna of the region was based on three species: *U. armatus*, *U. flavomosaicus* Last and Gomon, 1987 from tropical Australia, and an undescribed species *Urolophus* sp. B from northern Queensland (Last and Stevens, 1994).

This paper includes the description of *Urolophus* sp. B and three other new species that all belong to the genus *Urolophus*. Also, the holotype and only known specimen of *U. armatus* (MNHN 2331), collected off New Ireland (Bismark Archipelago), is redescribed and its generic status discussed.

METHODS

Batoids have been measured in many ways with major variations existing in measurements around the eye, and in the mixed use of direct and indirect measurements. For example, horizontal measurements of the snout, prepiracular and disc lengths, which are widely used for skates, are more difficult to obtain accurately and logistically for sting-rays. Also, greater human error in measurements is expected in soft-bodied fishes such as rays than for firm-bodied species. We have provided below an explanation of methods used in this study to help minimise such errors and inconsistencies.

Morphometric and meristic data are represented in tables I-III. The main character suites were selected to enable comparisons to be made with data from other urolophid species. Direct measurements were found to be less variable and were used to define shape in the species descriptions. For each new taxon, the holotype and at least 5 paratypes were measured in full (range of value given in brackets in the “description”). A subset of characters appearing to be useful in discriminating species were then taken for the remaining post-juvenile paratypes. Explanations of potentially ambiguous measurements follow: snout length (direct) - taken from anteriormost margin of the eye (rather than the orbit); snout length (horizontal) - to the anteriormost margin of the orbit (often difficult to determine); snout to spiracle (horizontal) - horizontal measurement to anterior edge of spiracle; snout to spiracle (direct) - direct measurement to hind edge of spiracle; orbit diameter - approximated size of the entire eyeball; eye diameter - horizontal length across exposed eye; distance between orbits - smallest width across chondrocranium between orbits; cloacal measurements were taken to hind margin of cloaca; anterior caudal lobe measurements were taken from where the fin ceases to become discernable even as a ridge; snout tip to lower jaw - taken to the anteriormost point of the jaw, including the teeth; nasal curtain width excludes any laterally extending distal lobes; length of pelvic fin - taken from the anteriormost point of articulation

of the fin; width across pelvic-fin base - distance between points of articulation; and width across pelvic fin (max) - maximum width across pelvic-fin apices when spread.

Meristics were taken from radiographs of up to ten specimens (11 in one case) when available. Counts were obtained separately for the trunk (monospondylous centra), pre-sting tail (diplospondylous centra forward of sting origin) and terminal skeleton (centra from sting origin to tail tip) vertebrae. Pectoral-fin radial counts were taken from both sides as: propterygial, metapterygial, mesopterygial, and total radials. Tooth-row counts taken from film were often incorrect because resolution near the corners of the mouth was usually poor. Hence, counts provided herein are based only on those taken directly from specimens.

Type specimens are deposited in the Muséum National d'Histoire Naturelle, Paris (MNHN), the ichthyological collection of the Commonwealth Scientific and Industrial Research Organisation, Hobart (CSIRO), the Australian Museum, Sydney (AMS), the Queensland Museum, Brisbane (QM) and the Northern Territory Museum, Darwin (NTM); their registration numbers are prefixed with these acronyms.

FAMILY UROLOPHIDAE

Genus *Urolophus* Müller & Henle, 1841. Type species: *Raja cruciata* Lacépède, 1804 by original designation.

UROLOPHUS ARMATUS VALENCIENNES IN MÜLLER & HENLE, 1841

(Fig. 1; Tab. I, II)

Material examined

Holotype juvenile male 174 mm TL (according to Müller and Henle: 5''17.5''' = 168.9 mm) (MNHN 2331), from New Ireland (Bismark Archipelago), collected by Lesson and Garnot during the expedition of “La Coquille” (1822-1825).

Diagnosis

A species of *Urolophus* with the following combination of characters: subcircular disc; very long tail, postcloacal length more than 90% of disc length; very small eyes, about 16% of snout and 8% of head lengths; broad, cartilaginous interorbit more than 5% TL; internasal flap rectangular; nostrils small, oval, no broad lobes on posterolateral border; inner margin of spiracle oblique; small thorns and spinules on dorsal surface; lateral tail folds rudimentary; no dorsal fin; pelvic fins very short and broad, apices somewhat angular; caudal fin very low and elongate, length of hypocaudal lobe more than 9 times fin height; 89 pectoral-fin radials.

Table I. - Morphometric data expressed as percentage of TL for the holotypes of *Urolophus armatus*, *U. deforgesii* sp. nov. and *U. neocaledoniensis* sp. nov. For the new species, the ranges of variation, means and standard deviations (SD) are given for the paratypes (N).

	<i>U. armatus</i>		<i>U. deforgesii</i> sp. nov.					<i>U. neocaledoniensis</i> sp. nov.					
	Holotype MNHN 2331	Holotype MNHN 1997-3743	Min	Max	Mean	SD	N	Holotype MNHN 1997-3715	Min	Max	Mean	SD	N
Total length (mm)	174.1	317.0	219.0	342.0			14	366.0	196.0	366.0			11
Disc width	61.9	61.5	61.5	67.3	64.7	1.9	14	64.4	62.3	69.1	65.3	2.5	11
Disc length (direct)	55.3	55.3	54.4	57.2	55.5	1.0	14	59.2	57.1	61.9	59.6	1.5	11
Disc length (horizontal)	53.2	54.5	53.6	55.8	54.6	0.8	6	58.5	55.4	60.0	58.3	1.6	6
Snout to maximum width	26.3	24.7	22.6	25.5	24.1	1.2	6	26.8	26.3	28.0	26.8	0.6	6
Snout length (preorbital) (direct)	15.3	14.0	12.7	14.0	13.4	0.4	14	15.7	14.0	16.3	15.0	0.8	11
Snout length (preorbital) (horizontal)	14.0	12.6	11.4	12.6	12.1	0.5	6	14.7	11.6	14.7	13.0	1.2	6
Snout to spiracle - ant. (horizontal)	15.8	15.9	13.3	15.9	15.0	1.0	6	17.0	15.1	17.3	16.0	0.9	6
Snout to spiracle - post. (direct)	20.7	20.3	18.1	20.3	19.3	0.8	6	21.8	20.0	21.8	20.8	0.7	6
Orbit diameter	3.9	6.1	5.0	6.5	5.7	0.5	6	5.6	5.6	6.7	6.0	0.4	6
Eye diameter (cornea)	2.5	4.4	3.6	4.4	4.0	0.4	6	3.9	3.7	4.0	3.9	0.1	6
Orbit and spiracle length	5.9	7.6	6.3	7.6	6.8	0.4	6	7.1	6.7	7.5	7.1	0.3	6
Spiracle length	4.2	4.0	3.7	4.1	4.0	0.1	6	4.1	3.6	4.7	4.0	0.4	6
Distance between eyes	9.7	8.3	8.2	8.6	8.4	0.2	6	8.6	8.6	9.3	8.9	0.2	6
Distance between orbits	5.4	3.3	3.3	4.3	3.7	0.3	14	4.4	4.0	5.0	4.5	0.3	11
Distance between spiracles	9.5	8.6	8.1	9.0	8.5	0.3	14	8.1	8.1	9.6	8.7	0.4	11
Distance-snout to cloaca	49.2	54.0	51.9	55.8	54.0	1.3	6	55.5	52.7	59.4	56.0	2.5	6
Distance-cloaca to caudal fin tip	50.9	45.8	44.4	48.1	46.1	1.2	14	44.7	40.4	46.0	43.7	1.9	11
Spine origin to tail tip	29.7	23.7	23.3	26.1	24.7	1.1	6	24.8	21.9	26.1	24.5	1.7	6
Spine length (longest)	14.0	11.8	11.8	14.2	13.4	1.1	6	12.7	11.2	14.7	12.8	1.5	6
Epi-caudal lobe length	16.0	13.3	13.2	16.5	14.0	1.3	6	14.7	11.5	17.1	14.4	1.8	6
Hypo-caudal lobe length	27.1	22.1	19.4	23.9	22.3	1.4	14	22.0	17.6	23.9	21.2	1.9	11
Max. caudal height	2.8	3.9	3.4	4.5	3.9	0.4	14	3.9	3.9	5.6	4.8	0.5	11
Snout tip to lower jaw	14.6	14.0	12.5	14.0	13.3	0.7	6	14.6	13.4	15.0	14.3	0.6	6
Prenasal length (direct)	12.9	10.6	9.5	11.1	10.3	0.7	6	11.4	10.0	11.4	10.8	0.5	6
Head length to fifth gill (direct)	30.1	29.1	27.5	30.3	28.5	0.9	14	31.3	30.2	33.4	31.6	0.7	11
Mouth width	5.1	5.6	4.3	6.1	5.3	0.6	14	6.0	4.9	6.5	6.0	0.5	11
Distance between nostrils	5.5	5.4	4.3	5.5	5.0	0.4	14	6.0	5.8	6.9	6.2	0.4	11
Nasal curtain length	1.8	3.4	2.7	3.5	3.1	0.3	6	4.1	3.5	4.5	4.0	0.4	6
Nostril length	1.4	2.8	2.6	3.1	2.8	0.2	6	2.9	2.8	3.4	3.1	0.2	6
Nasal curtain (maximum width)	5.6	6.9	6.3	7.4	6.7	0.3	14	7.4	6.6	8.7	7.7	0.7	11
Width of first gill opening	1.4	1.8	1.6	1.8	1.7	0.1	6	1.9	1.9	2.3	2.1	0.2	6
Width of third gill opening	2.1	2.1	1.9	2.1	2.0	0.1	6	2.0	2.0	2.6	2.2	0.3	6
Width of fifth gill opening	1.1	1.1	1.0	1.4	1.2	0.2	6	1.3	1.0	1.5	1.2	0.2	6
Distance between first gill openings	14.2	13.2	12.3	13.4	13.1	0.3	14	14.7	12.2	15.7	14.3	0.9	11
Distance between fifth gill openings	8.2	8.3	8.1	8.4	8.3	0.1	6	8.6	8.6	9.8	9.0	0.4	6
Clasper-post cloacal length	6.3	8.9	8.9	9.8	9.5	0.5	6	9.2	0.0	10.3	6.3	4.9	6
Length of pelvic fin (max)	11.0	13.6	13.1	13.9	13.6	0.3	6	14.5	12.2	16.2	14.5	1.5	6
Width pelvic base	11.2	11.3	11.0	12.7	11.8	0.8	6	11.1	10.8	14.5	11.9	1.4	6
Width across pelvics (max.)	24.8	18.7	18.7	21.6	19.9	1.2	6	19.2	18.4	23.1	21.3	2.0	6
Tail width (pelvic axil)	4.9	5.7	4.8	5.9	5.4	0.4	6	5.2	5.2	6.5	5.8	0.5	6
Tail depth (pelvic axil)	3.8	2.8	2.8	3.3	3.0	0.2	6	3.5	3.3	3.9	3.6	0.2	6
Tail width (spine origin)	2.6	2.3	2.1	2.8	2.4	0.3	6	2.4	2.2	2.8	2.5	0.2	6
Tail depth (spine origin)	2.3	1.8	1.8	2.0	1.9	0.1	6	2.0	2.0	2.2	2.1	0.1	6

Table II. - Meristics for the *Urolophus* species: *U. armatus*, *U. deforgesi* sp. nov., *U. neocaledoniensis* sp. nov., *U. papilio* sp. nov. and *U. piperatus* sp. nov. For the new species, the ranges of variation, means and standard deviations (SD) are given for N paratypes (with additional specimens for *U. piperatus*).

	<i>U. armatus</i>	<i>U. deforgesi</i> sp. nov.					<i>U. neocaledoniensis</i> sp. nov.				
	Holotype MNHN 2331	Holotype MNHN 1997-3743	Min	Max	Mean	N	Holotype MNHN 1997-3715	Min	Max	Mean	N
Tooth rows:											
upper jaw	?	29	28	33	29.5	6	33	27	34	30.5	6
lower jaw	24	28	27	31	28.83	6	32	24	32	29.667	6
Pectoral-fin radials:											
propterygials	44	49	44	49	47.05	10	48	46	50	48.045	11
mesopterygials	8-10	12	8	13	10.8	10	10	7	11	9	11
metapterygials	35-37	39	39	44	42.1	10	41	38	45	41	11
Total	89	100	96	102	99.89	10	99	95	102	98.571	11
Vertebrae:											
monospondylous (trunk)	30	31	31	35	33.9	10	30	30	34	32.273	11
diplospondylous (to sting)	54	55	51	56	53.8	10	53	49	56	52.727	11
post-sting tail	67	70	63	70	66.6	10	66	59	67	63.1	11
Total	151	156	151	157	154.3	10	149	144	153	147.7	11
		<i>U. papilio</i> sp. nov.					<i>U. piperatus</i> sp. nov.				
		Holotype MNHN 1997-3720	Min	Max	Mean	N	Holotype CSIRO H 1156-04	Min	Max	Mean	N
Tooth rows:											
upper jaw		25	24	28	25.29	7	34	32	35	34	6
lower jaw		25	25	31	27.14	7	39	30	39	35	6
Pectoral-fin radials:											
propterygials		48-49	48	52	49.73	11	52	45	52	47	18
mesopterygials		11-12	8	13	10.68	11	11	9	15	11	18
metapterygials		44-46	44	49	46	11	45-43	40	45	42	18
Total		104-106	104	110	106.4	11	106-108	98	108	102	18
Vertebrae:											
monospondylous (trunk)		32	30	35	32.73	11	34	30	35	32	18
diplospondylous (to sting)		52	48	57	52.27	11	54	50	59	53	18
post-sting tail		68	64	71	65.7	11	68	60	68	64	11
Total		152	147	153	150.7	11	156	146	156	148	18

Description

Disc subcircular, much wider than long, width 1.12 times length, 4.36 times distance between first gill slits; greatest breadth more than 2 eye diameters behind level of spiracles; anterior margins slightly concave, obtuse; apices very broadly rounded. Snout tip broadly extended. Eye very small, 16.3% preocular snout length, 8.3% ventral head length. Spiracle slightly larger than orbit, its inner posterior margin weakly oblique, indented towards hind orbit; interspiracular distance 1.75 times interorbit. Mouth small, double concave, width 34.6% in snout tip to lower jaw; single, median, finger-like oral papilla, with several minute knob-like papillae irregularly scattered along lower jaw and on floor of the tongue; oral velum strongly crenulated; weak

patch of suboral papillae below symphysis of lower jaw. Internasal flap very short, almost rectangular, no lobe at angle, width 3.10 times length, 1.01 times internasal distance; fringe weak, indistinct. Posterolateral border of nostril entire, lacking flattened, fleshy lobe; nostrils longitudinal, almost oval, short, 1.4% TL. Body mostly smooth but with some denticles; single enlarged thorn on mid-scapular region, partly embedded denticles on snout, and supra- and interorbital; 4 indistinct rows of small, sharp, widely spaced spinules on hind midline of disc, single row of similar widely spaced spinules on dorsal midline of tail before stings; 2 stings, upper longest. Tail very long, postcloacal length 92.1% disc length; weakly depressed anteriorly, tapering dorsally gradually behind pelvic-fin insertions,

Table III. - Morphometric data expressed as percentage of TL for the holotypes of *Urolophus papilio* sp. nov. and *U. piperatus* sp. nov. The ranges of variation, means and standard deviations (SD) are given for the paratypes (N).

	<i>U. papilio</i> sp. nov.						<i>U. piperatus</i> sp. nov.					
	Holotype MNHN 1997-3720	Min	Max	Mean	SD	N	Holotype CSIRO H 1156-04	Min	Max	Mean	SD	N
Total length (mm)	399.0	252.0	399.0			12	484.0	297.0	436.0			6
Disc width	74.7	73.0	78.7	75.9	1.6	12	65.5	66.7	70.0	68.0	1.2	6
Disc length (direct)	62.9	60.5	63.8	62.4	0.9	12	56.3	56.1	59.4	58.1	1.4	6
Disc length (horizontal)	62.2	59.1	62.2	60.9	1.0	7	55.1	55.0	58.7	56.7	1.5	6
Snout to maximum width	31.3	26.0	31.3	28.9	1.7	7	26.2	23.9	29.6	26.5	1.8	6
Snout length (preorbital) (direct)	19.2	16.2	19.3	18.4	0.9	12	15.3	13.3	16.3	14.8	1.2	6
Snout length (preorbital) (horizontal)	17.8	15.1	17.8	16.6	0.3	7	14.2	12.2	15.0	13.9	1.2	6
Snout to spiracle - ant. (horizontal)	22.1	18.9	22.1	20.4	1.1	7	16.5	13.0	18.4	16.6	2.0	6
Snout to spiracle - post. (direct)	25.6	23.1	25.6	24.6	0.8	7	21.1	19.7	22.9	21.5	1.2	6
Orbit diameter	6.1	5.2	6.7	5.9	0.5	7	4.4	4.6	6.1	5.3	0.6	6
Eye diameter (cornea)	4.7	3.7	4.7	4.0	0.3	7	3.6	3.2	5.1	4.2	0.7	6
Orbit and spiracle length	8.2	7.0	8.2	7.6	0.4	7	6.3	6.4	7.8	7.1	0.6	6
Spiracle length	5.0	3.8	5.1	4.5	0.5	7	3.2	3.4	4.3	4.0	0.3	6
Distance between eyes	9.9	9.0	9.9	9.5	0.3	7	8.6	8.2	9.0	8.5	0.4	6
Distance between orbits	5.2	3.9	5.2	4.5	0.3	12	3.8	3.9	4.6	4.2	0.3	6
Distance between spiracles	10.4	9.4	10.5	9.9	0.4	12	7.7	8.1	8.9	8.6	0.3	6
Distance-snout to cloaca	60.1	57.7	60.3	59.1	1.0	7	52.5	51.0	53.9	52.9	1.2	6
Distance-cloaca to caudal fin tip	40.4	38.1	42.3	40.6	1.1	12	47.7	45.3	47.2	46.2	0.8	6
Spine origin to tail tip	24.8	24.2	25.1	24.7	0.3	7	23.8	23.2	24.7	24.2	0.6	6
Spine length - longest	13.8	12.8	15.0	14.0	0.8	7	14.8	13.6	15.3	14.3	0.7	6
Epi-caudal lobe length	13.9	13.9	16.2	15.3	0.8	7	11.7	12.0	16.0	13.3	1.4	6
Hypo-caudal lobe length	19.2	19.2	23.3	21.2	1.1	12	18.5	18.4	22.0	20.3	1.2	6
Max. caudal height	4.5	4.1	5.1	4.6	0.4	12	3.9	3.5	4.1	3.9	0.2	6
Snout tip to lower jaw	17.7	16.2	18.9	17.2	1.0	7	15.5	14.6	16.6	15.4	0.9	6
Prenasal length (direct)	12.3	12.3	13.8	12.9	0.6	7	11.8	10.7	13.3	12.0	1.0	6
Head length to fifth gill (direct)	34.9	33.6	35.3	34.4	0.7	12	31.3	29.6	33.0	31.3	1.3	6
Mouth width	7.6	6.2	7.6	6.7	0.4	12	6.3	5.3	6.9	6.2	0.7	6
Distance between nostrils	8.4	7.4	8.4	7.7	0.8	12	6.0	5.0	6.6	6.0	0.6	6
Nasal curtain length	5.2	3.7	5.2	4.3	0.5	7	3.6	3.1	3.9	3.6	0.3	6
Nostril length	2.8	2.6	3.4	3.8	0.3	7	3.6	2.3	3.5	2.9	0.4	6
Nasal curtain (maximum width)	9.9	8.5	9.9	8.9	0.4	12	7.8	6.5	8.2	7.7	0.7	6
Width of first gill opening	2.3	1.5	2.4	2.1	0.4	7	1.9	1.8	2.3	1.9	0.2	6
Width of third gill opening	3.4	2.1	2.4	2.3	0.1	7	2.0	2.1	2.3	2.2	0.1	6
Width of fifth gill opening	1.4	1.2	1.5	1.3	0.1	7	1.0	0.7	1.5	1.2	0.3	6
Distance between first gill openings	14.6	14.3	15.5	15.0	0.3	12	12.8	12.8	14.4	13.5	0.7	6
Distance between fifth gill openings	9.8	8.7	9.8	9.4	0.5	7	8.0	7.7	9.2	8.4	0.6	6
Clasper-post cloacal length	10.7	5.8	10.7	7.3	1.9	7	8.8	9.0	10.7	9.7	0.7	6
Length of pelvic fin (max.)	13.5	12.5	14.4	13.7	0.6	7	9.2	9.2	10.4	9.9	0.5	6
Width pelvic base	12.7	10.2	12.7	11.1	0.8	7	13.4	13.4	15.8	14.7	0.9	6
Width across pelvics (max.)	17.2	16.7	22.6	19.3	2.3	7	17.1	18.5	20.7	19.6	1.0	6
Tail width (pelvic axil)	4.9	4.2	5.2	4.8	0.4	7	5.6	4.7	6.6	5.7	0.7	6
Tail depth (pelvic axil)	2.8	2.8	3.3	3.1	0.2	7	3.1	2.9	3.5	3.2	0.2	6
Tail width (spine origin)	2.2	2.2	2.9	2.6	0.2	7	1.9	2.0	2.4	2.1	0.1	6
Tail depth (spine origin)	2.0	1.9	2.2	2.0	0.1	7	1.7	1.7	2.0	1.8	0.1	6

almost rounded immediately behind sting; width 1.29 times depth at pelvic-fin insertions, 1.11 at sting origin; lateral cutaneous tail folds rudimentary, confined to midlateral surface before stings. No dorsal fin; pelvic fins very broad, short, length 2.24 in greatest width across both fins, apex angular; caudal fin very elongate and narrowly lanceolate, hypocaudal lobe 9.71 times fin height. `

Tooth counts: 24 in lower jaw (not countable in upper jaw). Pectoral-fin radials 89 in total, 44 propterygial, 8-10 mesopterygial, 35-37 metapterygial. Vertebrae 151 in total, 30 monospondylous, 54 diplospondylous (to sting), 67 post-sting tail vertebrae.

Colour

Müller and Henle (1841) stated that the juvenile male holotype was brown, with dark, rounded, scattered and coalescent blotches. The ventral surface was white with dark margins. In preservative - plain brownish above; ventrally

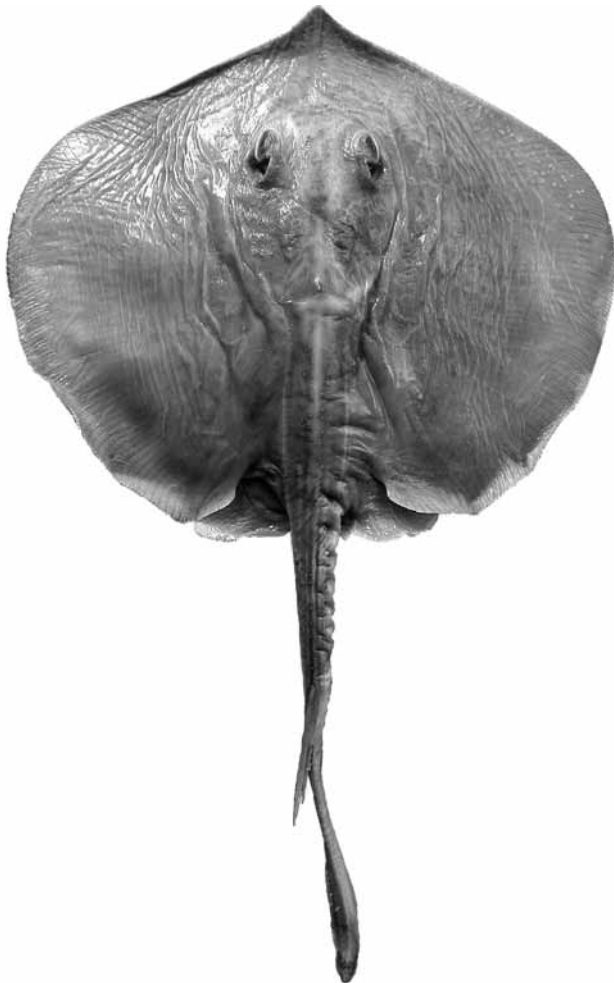


Figure 1. - Dorsal view of *Urolophus armatus*, holotype male 174 mm TL (MNHN 2331).

pale with evidence of dusky margins.

Size

Known only from the holotype, a juvenile male of 174 mm TL.

Distribution

Known only from New Ireland (Bismark Archipelago).

Remarks

The holotype remains the only known specimen of this unusual urolophid. It resembles *Plesiobatis daviesi* (Wallace, 1967) in general morphology, the presence of dorsal denticles, and in the oronasal structure. Although the type is an immature male, it is clearly much smaller than *P. daviesi* which is born devoid of denticles at about 50 cm TL. Specimens should be donated to a museum if caught.

UROLOPHUS DEFORGESI SP. NOV.

(Fig. 2; Tab. I, II)

Urolophus sp. (partim): Richer de Forges and Pianet, 1984: annexe 2 (listed); Rivaton, 1989: 147 (listed); Kulbicki *et al.*, 1990: 17 (listed).

Urolophus sp. 2 (partim): Séret, 1994: 7 (table A).

Material examined

Holotype. - MNHN 1997-3743, adult male 317 mm TL, R.V. "Coriolis", CHALCAL 1, stn. CH 2, otter trawl, Chesterfield Islands, 22°34'S-159°17'E, 330 m depth, 28 Jul. 1984.

Paratypes. - 16 specimens. 7 females, 127 mm TL (MNHN 1997-3695), 144 mm TL (MNHN 1997-3696), 152 mm TL (MNHN 1997-3694), 222 mm TL (MNHN 1997-3689), 257 mm TL (MNHN 1997-3690), 315 mm TL (MNHN 1997-3687), 342 mm TL (MNHN 1997-3686), same data as for the holotype; 4 males, 207 mm TL (MNHN 1997-3693), 239 mm TL (MNHN 1997-3688), 286 mm TL (MNHN 1997-3692), same data as for the holotype; 3 embryos males 115, 121, 126 mm TL (MNHN 1997-3697 to 3699), female 226 mm TL (AMS I 41086-001, ex. MNHN 1997-3691), male 294 mm TL (CSIRO H 5697-02, ex. MNHN 1997-3742), same data as for the holotype; male 219 mm TL (MNHN 1997-3700), R.V. "Coriolis", MUSORSTOM 5, stn. CP 320, beam trawl, 22°25'S-159°12'E, 315 m depth, 13 Oct. 1986.

Other specimens. - Chesterfield Islands: 2 females 313-314 mm TL (MNHN 1997-3719 and 1997-3718), R.V. "Vauban", CORAIL 2, stn. CP 162, beam trawl, 19°46'S-158°25'E, 203-208 m depth, 1 Aug. 1988.

Diagnosis

A small species of *Urolophus* with the following combination of characters: weakly rhomboidal disc, width less

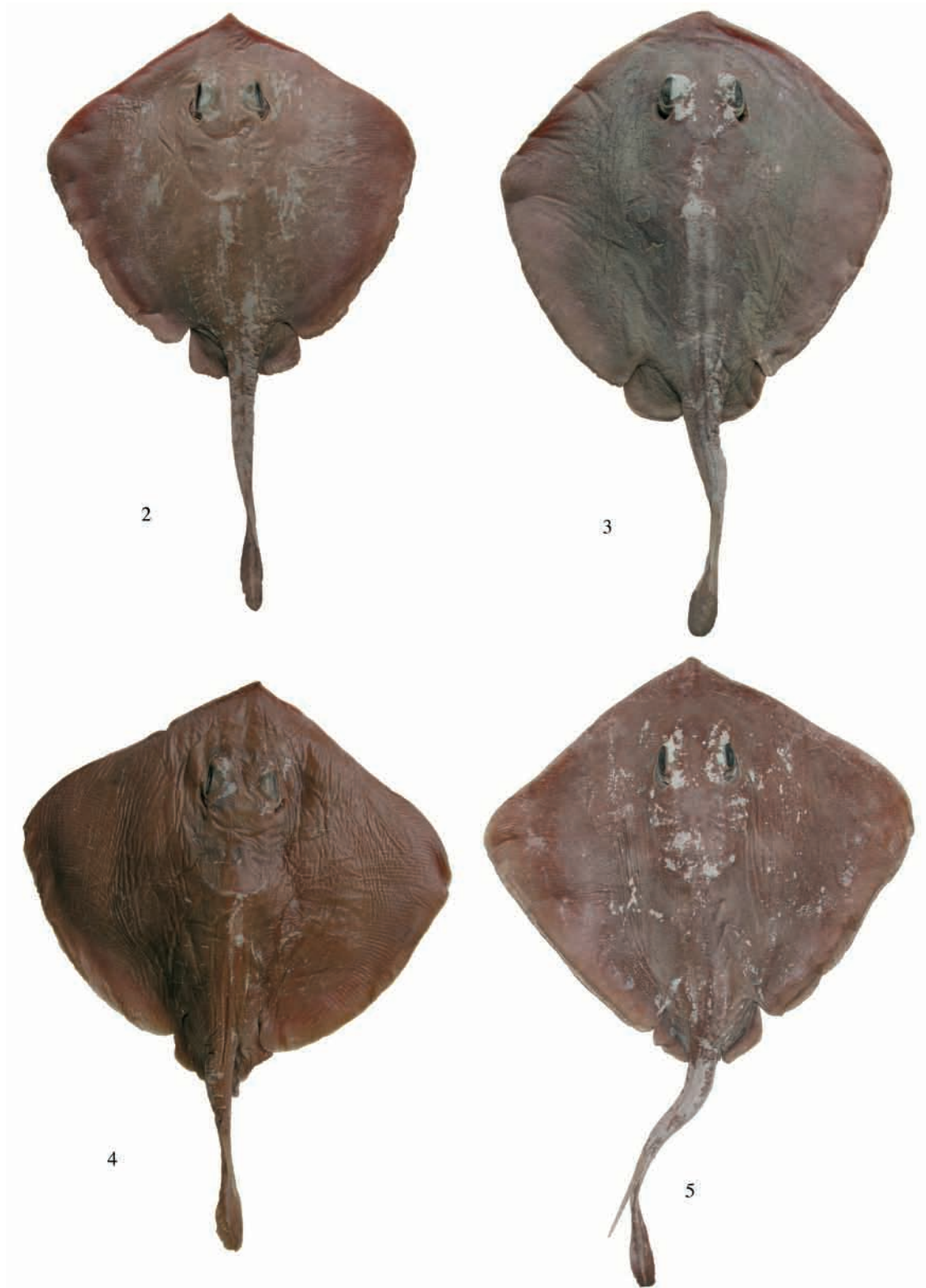


Figure 2. - Dorsal view of *Urolophus deforgesi* sp. nov., holotype adult male, 317 mm TL (MNHN 1997-3743).

Figure 3. - Dorsal view of *Urolophus neocaledoniensis* sp. nov., holotype adult male, 366 mm TL (MNHN 1997-3715).

Figure 4. - Dorsal view of *Urolophus papilio* sp. nov., holotype male, 399 mm TL (MNHN 1997-3720).

Figure 5. - Dorsal view of *Urolophus piperatus* sp. nov., holotype adult male, 484 mm TL (CSIRO H 1156-04).

than 70% TL; rather long tail, postcloacal length more than 75% of disc length; short head (ventral length mostly less than 30% TL) and snout (length to eye less than 15% TL); narrow, cartilaginous interorbit less than 4% TL; internasal flap greatly expanded posteriorly; no broad lobes on posterolateral border of nostrils; inner margin of spiracle oblique; no lateral tail folds; no dorsal fin; apices of pelvic fins rounded; 7-8 oral papillae arranged along a "W" line on mouth floor; 96-102 pectoral-fin radials; total vertebrae more than 150; dorsal surface uniform yellowish brown.

Description

Disc subcircular (weakly rhomboidal in some paratypes), much wider than long, width 1.11 (1.09-1.22) times length, 4.66 (4.65-5.19) times distance between first gill slits; greatest breadth about 2 eye diameters behind level of spiracles; anterior margins weakly convex, obtuse; apices broadly rounded. Snout fleshy, tip weakly extended. Eye moderate, 31.5 (26.5-31.9)% preocular snout length, 15.2 (12.1-15.2)% ventral head length. Spiracle slightly smaller than orbit, its inner posterior margin strongly oblique, indented towards hind orbit; interspiracular distance 2.62 (2.04-2.62) times interorbit. Mouth slightly convex, moderate, width 39.9 (39.6-43.8)% in snout tip to lower jaw; 8 (7-8) papillae on floor not arranged in a single row, but scattered on a "W" line, with the median one bifid; weak patch of suboral papillae below symphysis of lower jaw. Internasal flap rather small, diverging rapidly posteriorly with pronounced lobe at angle, width 2.05 (2.02-2.52) times length, 1.28 (1.28-1.51) times internasal distance; fringe well developed. Posterolateral border of nostril entire, lacking flattened, fleshy lobe; nostrils oblique, almost as long as internasal flap. Body entirely smooth, sensory pores indistinct. Tail relatively long, postcloacal length 82.8 (77.6-84.1)% disc length; moderately depressed anteriorly, tapering dorsally rapidly behind pelvic-fin insertions, almost rounded immediately behind sting; width 2.03 (1.46-2.04) times depth at pelvic-fin insertions, 1.30 (1.13-1.42) at sting origin; lateral cutaneous tail folds absent. No dorsal fin; pelvic fins small, length 1.38 (1.37-1.61) in greatest width across both fins, outer margin broadly rounded; caudal fin somewhat elongated and lanceolate, hypocaudal lobe 5.67 (5.08-6.69) times fin height. Claspers not massive, somewhat pointed distally.

Tooth counts: 29(28-33) in upper jaw, 28 (27-31) in lower jaw. Pectoral-fin radials 100 (96-102) in total, 49 (44-49) propterygial, 12 (8-13) mesopterygial, 39 (39-44) metapterygial. Vertebrae 156 (151-157) in total, 31 (31-35) monospondylous, 55 (51-56) diplospondylous, 70 (63-70) post-sting tail vertebrae.

Embryo similar to adult in general form except for the following: internasal flap less oblique; dark markings on ventral surface are more pronounced (subequal to interspi-

racular width at disc apex); dorsal surface paler, yellowish, not blotched; the disc is relatively larger (disc width and length 77.8% and 63.5% TL respectively); and the head is larger (ventral length 34.1% TL).

Colour (in preservative)

Dorsal surface medium brown, whitish where skin removed; eyes dark, orbit evident beneath skin. Ventral surface including mouth whitish or cream; outer margins slighter darker, but lacking a pronounced band. Margins of caudal and dorsal fins dusky, darkest in young.

Size

Reaches at least 342 mm TL; male paratype mature at 286 mm TL; neonatal juveniles about 126 mm TL.

Distribution

Known only from the continental slope adjacent the Chesterfield Islands at 203-330 m depth.

Etymology

Named in honour of IRD scientist Bertrand Richer de Forges for promoting the recent exploration of the bathyal fauna off New Caledonia and for collecting valuable fish specimens from cruise surveys. (IRD = Institut de Recherche pour le Développement).

Remarks

Distinctive stingaree that is closely related to another Coral Sea species, *U. neocaledoniensis*. They are morphologically similar to the Indian Ocean species, *U. mitosis* Last & Gomon, 1987, that also has a depressed tail, skirt-shaped internasal flap, no dorsal fin, and poorly developed lateral cutaneous tail folds but they lack an ornate dorsal colour pattern consisting of clusters of granular blotches and have more oral papillae (7-8 vs 3-4).

U. deforgesii differs from *U. neocaledoniensis* in the following: mostly with more vertebrae (151-157 vs 150 in *U. neocaledoniensis*); more divergent internasal flap; shorter disc (length 54.4-57.2% vs 57.1-61.9% TL) reaching its greatest width more anteriorly (22.6- 25.5% vs 26.3-28.0% TL); narrower interorbit (3.3-4.3% vs 4.0-5.0% TL); smaller head (ventral length 27.5-30.3% vs 30.2-33.4% TL); narrower internasal (4.3-5.5% vs 5.8-6.9% TL); and yellowish brown upper surface vs greyish.

Two female specimens (MNHN 1997-3718 and 3719), collected also off the Chesterfield Islands in 203-208 m, differ in the following features and morphometrics from *U. deforgesii*: rows of teeth in lower jaw 33-36 (27-31 in *U. deforgesii*); narrower disc (59.0-59.3 vs 61.5-67.3% TL); disc width 4.40-4.51 (vs 4.65-5.19) times distance between first gill slits; and mouth width 31.9-32.5% (vs 39.6-43.8%)

of preoral distance. These specimens, which are only in a moderate state of preservation, may be specifically distinct from *U. deforgesii*. However, more material is needed to resolve this issue.

***UROLOPHUS NEOCALEDONIENSIS* SP. NOV.**

(Fig. 3; Tab. I, II)

Urolophus sp. (partim): Richer de Forges and Pianet, 1984: annexe 2 (listed); Rivaton, 1989: 147 (listed); Kulbicki *et al.*, 1990: 17 (listed).

Urolophus sp. 2 (partim): Séret, 1994: 7 (table A).

Material examined

Holotype. - Adult male 366 mm TL (MNHN 1997-3715), R.V. "Alis", HALIPRO 1, stn. CH 879, otter trawl, Chesterfield Islands, 23°02'S-166°58'E, 350 m depth, 31 Mar. 1994.

Paratypes. - 18 specimens. New Caledonia: female 155 mm TL (MNHN 1997-3708), R.V. "Jean Charcot", BIOCAL, stn. CP 105, beam trawl, 21°30'S-166°21'E, 335 m depth, 8 Sept. 1985. Chesterfield Islands: male 304 (MNHN 1997-3701) and female 255 mm TL (MNHN 1997-3702), R.V. "Vauban", stn. 389; 2 adult males 301 mm (MNHN 1997-3712) and 352 mm TL (MNHN 1997-3711), 2 females 172 mm (MNHN 1997-3709) and 318 mm TL (MNHN 1997-3710), R.V. "Coriolis", MUSORSTOM 5, stn. CP 320, beam trawl, 22°25'S-159°12'E, 315 m depth, 13 Oct. 1986. Norfolk Ridge: 3 males 196, 282, 318 mm TL (MNHN 1997-3706, 3704 & 3703), female 125 mm TL (MNHN 1997-3707), female 328 mm TL (CSIRO H 5696-01, ex. MNHN 1997-3741), R.V. "Coriolis", CHALCAL 2, stn. CH 3, otter trawl, 24°47'S-168°09'E, 257 m depth, 27 Oct. 1986; male 301 mm TL (MNHN 1997-3705), R.V. "Coriolis", CHALCAL 2, stn. CH4, 24°44'S-168°09'E, 253 m depth, 27 Oct. 1986; adult male 329 mm TL (AMS I 41087-001, ex. MNHN 1997-3740.), R.V. "Alis", AZTEQUE, stn. 4, otter trawl, 23°39'S-168°01'E, 290-400 m depth, 13 Feb. 1990; female 277 mm TL (MNHN 1997-3713), R.V. "Alis", AZTEQUE, stn. 5, 23°38'S-168°00'E, 235-360 m depth, 14 Feb. 1990; female 239 mm TL (MNHN 1997-3714), R.V. "Alis", AZREQUE, stn. 10, 22°52'S-167°33'E, 350-360 m depth, 15 Feb. 1990; female 353 mm and embryo female 110 mm TL (MNHN 1997-3716 & 3717), R.V. "Tangaroa", HALIPRO 2, stn. BT 086, bottom trawl, 23°40'S-168°00'E, 229-428 m depth, 23 Nov. 1996.

Diagnosis

A small species of *Urolophus* with the following combination of characters: subcircular disc, width less than 70% TL; medium head (ventral length exceeding 30% TL) and snout (length to eye less than about 16% TL); broad, carti-

laginous interorbit exceeding 4% TL; internasal flap skirt-shaped, diverging slightly; no broad lobes on posterolateral border of nostrils; inner margin of spiracle oblique; lateral tail folds absent or rudimentary; no dorsal fin; apices of pelvic fins rounded; 7-10 oral papillae along a "W" line on mouth floor; 95-102 pectoral-fin radials; total vertebrae rarely exceeding 150; dorsal surface greyish brown.

Description

Disc subcircular, width 1.09 (1.02-1.15) times length, 4.40 (4.14-5.15) times distance between first gill slits; greatest breadth slightly more than eye diameter behind level of spiracles; anterior margin strongly convex (weak in some paratypes); apices broadly rounded. Snout very fleshy, tip broadly extended. Eye moderate, 24.9 (25.7-27.2)% preocular snout length, 12.5 (12.1-12.8)% ventral head length. Spiracle subequal to orbit, inner margin very oblique, indented beside hind orbit; interspiracular distance 1.85 (1.73-2.18) times interorbit. Mouth slightly convex, moderate, width 41.2 (37.7-48.1)% in snout tip to lower jaw; 8 (7-10) oral papillae not arranged in a single row, but scattered on a "W" line on mouth floor, often bifid and sometimes trifid (mainly the median one); weak patch of suboral papillae below symphysis of lower jaw. Internasal flap skirt-shaped, margins diverging slightly, width 1.84 (1.81-2.36) times length, 1.25 (1.07-1.40) times internasal distance; posterior angles not lobe-like; fringe very weak. Posterolateral border of nostril entire, lacking flattened, fleshy lobe; nostril distinctly shorter than internasal flap. Body entirely smooth, sensory pores evident but indistinct. Tail long, postcloacal length 75.4 (68.1-78.9)% disc length; moderately depressed anteriorly, tapering dorsally rapidly behind pelvic-fin insertions, almost rounded immediately behind sting; width 1.49 (1.52-1.73) times depth at pelvic-fin insertions, 1.21 (1.07-1.31) at sting origin; cutaneous tail folds absent or present as a low lateral ridge on anterior tail before sting. No dorsal fin; pelvic fins small, length 1.21 (1.33-1.82) in greatest width across both fins, outer margin rounded; caudal fin mostly short and broad, hypocaudal lobe 5.69 (3.07-4.98) times fin height. Claspers massive, broadly rounded distally.

Tooth counts: 33 (27-34) in upper jaw, 32 (24-31) in lower jaw. Pectoral-fin radials 99 (95-102) in total, 48 (46-50) propterygial, 10 (7-11) mesopterygial, 41 (38-45) metapterygial. Vertebrae 149 (144-153) in total, 30 (31-34) monospondylous, 53 (49-56) diplospondylous (to sting), 66 (59-67) post-sting tail vertebrae.

Colour (in preservative)

Dorsal surface dark greyish brown, sometimes with greenish tint; whitish where skin removed; eyes dark, but orbit indistinct. Ventral surface including mouth and tail whitish or cream; outer margin of disc dusky, extending

from level of mouth and forming broad band to hind part of disc; margin of pelvic fins and snout tip (mainly in small specimens) dark. Margins of caudal and dorsal fins dark. Dark markings more pronounced in small specimens.

Size

Reaches at least 366 mm TL; males mature at about 300 mm TL (a 282 mm male was immature); neonatal juveniles about 125 mm TL.

Distribution

Known from the continental slope of the Chesterfield Islands, New Caledonia and the northern part of the Norfolk Ridge in 229-428 m depth.

Etymology

This ray appears to be the most abundant and widely distributed stingaree in the New Caledonian region. Hence, its species name "*neocaledoniensis*" also defines the centre of its geographical distribution.

Remarks

Similar to *U. deforgesi* but has: typically fewer vertebrae (mostly less than 150 *vs* 151-157); less oblique internasal flap; longer, more rounded disc (length 57.3-61.0% *vs* 54.4-57.2% TL) reaching its greatest width more posteriorly (26.3-28.0% *vs* 22.6-25.5% TL); wider interorbit (4.3-5.0% *vs* 3.3-3.6% TL); larger head (ventral length 31.2-31.7% *vs* 27.5-30.3% TL); wider internasal (5.8-6.9% *vs* 4.3-5.5% TL); more widely spaced gills (distance between first gill slits 13.6-15.2% *vs* 12.3-13.4% TL); and greyish dorsal surface *vs* brownish. All other urolophids of this region, with the exception of *U. armatus* and *U. deforgesi* (which is partly covered with dermal denticles), have a small dorsal fin.

UROLOPHUS PAPILIO SP. NOV.

(Fig. 4; Tab. II, III)

Urolophus sp. (partim): Richer de Forges and Pianet, 1984: annexe 2 (listed); Rivaton, 1989: 147 (listed); Kulbicki *et al.*, 1990: 17 (listed).

Urolophus sp. 1: Séret, 1994: 7 (table A), 8 (fig.).

Material examined

Holotype. - Male 399 mm TL (MNHN 1997-3720), R.V. "Coriolis", CHALCAL 1, stn. CH2, bottom trawl, Chesterfield Islands, 22°34'S-159°17'E, 330 m, 28 Jul. 1984.

Paratypes. - 15 specimens. Chesterfield Islands: 6 males, 252 mm TL (MNHN 1997-3729), 273 mm TL (MNHN 1997-3725), 294 mm TL (MNHN 1997-3724), 297 mm TL (MNHN 1997-

3722), 313 mm TL (CSIRO H 5697-01, ex. MNHN 1997-3721) and 177 DW (tail damaged) (MNHN 1997-3726), 6 females, 260 mm TL (MNHN 1997-3730), 261 mm TL (MNHN 1997-3727), 272 mm TL (MNHN 1997-3728), 295 mm TL, (MNHN 1997-3723), 256 mm TL (AMS I 41085-001), 284 mm TL (MNHN 1997-3737) and 3 embryo females 138, 140, 140 mm TL (MNHN 1997-3731 to 3733), same data as for the holotype.

Diagnosis

A small-medium species of *Urolophus* with the following combination of characters: broad disc, width exceeding 70% TL; short tail, postcloacal length less than three-quarters of disc length; long snout, exceeding 17% TL; broad, rectangular internasal flap, width subequal to interspace between 5th gill slits; inner margin of spiracle parallel to longitudinal axis; tail folds rudimentary or absent; small dorsal fin; apices of pelvic fins rounded; single row of 10-13 oral papillae; no broad lobes on posterolateral border of nostrils; 104-110 pectoral-fin radials; dorsal surface uniform yellowish brown.

Description

Disc broad, rhomboidal, much wider than long, width 1.19 (1.16-1.28) times length, 5.11 (4.80-5.22) times distance between first gill slits; greatest breadth about 1-2 eye diameters behind level of spiracles; anterior profile angular, obtuse; apices narrowly rounded. Snout fleshy, tip weakly extended. Eye moderate, 24.2 (20.2-22.7)% preocular snout length, 13.3 (10.9-12.4)% ventral head length. Spiracle smaller than orbit, inner posterior margin parallel to longitudinal axis, almost confluent with upper margin of eye; interspiracular distance 2.01 (1.95-2.45) times interorbit. Mouth slightly convex, moderate to large, width 42.9 (35.3-41.8)% in snout tip to lower jaw; papillae on floor 11 (10-13), arranged in single row, the median one often bifid; no patch of suboral papillae. Internasal flap large, width 1.92 (1.94-2.47) times length, 1.19 (1.11-1.22) times internasal distance; posterior angles not lobe-like; fringe weak. Posterolateral border of nostril entire, lacking flattened, fleshy lobe. Body entirely smooth, sensory pores indistinct. Tail short, postcloacal length 64.2 (63.1-69.9)% disc length; moderately depressed anteriorly, tapering dorsally rapidly behind pelvic-fin insertions, almost rounded immediately behind sting; width 1.72 (1.33-1.85) times depth at pelvic-fin insertions, 1.13 (1.24-1.38) at sting origin; lateral cutaneous tail folds absent or barely distinct, confined to ventrolateral margin forward of sting when present. Dorsal fin low, base much longer than height, total length slightly less than eye diameter; pelvic fins small, length 1.28 (1.18-1.66) in greatest width across both fins, outer margin broadly rounded; caudal fin very short and broad, hypocaudal lobe 4.25 (4.07-5.34) times fin height. Claspers weakly pointed.

Tooth counts: 25 (24-28) in upper jaw, 25 (26-31) in lower jaw. Pectoral-fin radials 104-106 (104-110) in total, 48-49 (48-52) propterygial, 11-12 (8-13) mesopterygial, 44-46 (44-49) metapterygial. Vertebrae 152 (147-153) in total, 32 (30-35) monospondylous, 52 (48-57) diplospondylous (to sting), 68 (64-71) post-sting tail vertebrae.

Embryos similar to adult but with: more rounded disc apex; more pronounced lateral skin folds on tail; relatively smaller disc (width and length 71.7 and 56.8% TL respectively); shorter snout and head (13.0 and 28.3% TL respectively); narrower interorbital and nasal curtain (3.2 and 7.1% respectively); wider mouth, interspiracular distance, and gap between first gill openings (7.4, 11.2 and 17.0% respectively); yellowish dorsal surface with large, indistinct light and dark blotches; and no dark margin on ventral disc.

Colour (in preservative)

Dorsal surface uniform yellowish to brownish, whitish where skin removed; eyes dark, orbit evident beneath skin. Ventral surface including mouth whitish or cream; outer margin of disc brownish, originating at level of mouth and forming broad band (subequal to interorbital width) to hind part of disc (band indistinct in some paratypes). Margins of caudal and dorsal fins dusky, darkest in young.

Size

Adult size unknown; males mature at about 313 mm TL; well developed embryos about 140 mm TL.

Distribution

Known only from the continental slope adjacent the Chesterfield Islands at 330 m depth.

Etymology

From the Latin "*papilio*" meaning butterfly, with reference to the particularly broad "wingspan" of the disc.

Remarks

This stingaree belongs to a subgroup within *Urolophus* that includes Australian species *U. bucculentus* Macleay, 1884 and *U. flavomosaicus* Last & Gomon, 1987. Group members have a relatively wide, rhomboidal disc, broad mouth, broadly rectangular internasal flap, high oral papillae count, and a short tail with a small dorsal fin. *U. papilio* differs from these species in that it is plain coloured (rather than ornamented with fine pale spots and reticulations), and has a smaller adult size (maturing at about 31 cm TL or so vs 38-40 cm TL) (Last and Stevens, 1994). Also, it has a longer snout (preorbital length 16.2-19.3% vs 13.8-16.7% TL and prenasal length 12.3-13.8% vs 10.4-12.1% TL), narrower inter-eye space (9.0-9.9% vs 9.9-11.6% TL), narrower inter-branchial space (distance between first gill slits 14.3-

15.5% vs 15.6-17.2% TL), and longer trunk (distance snout to cloaca 57.7-60.3% vs 53.1-57.4% TL).

Furthermore, *U. papilio* differs from the Australian *U. bucculentus* in having rounded pelvic-fin apices (vs angular), a longer pre-lower jaw length 16.2-18.9% (vs 15.1-15.8% TL), a narrower tail at the pelvic-fin axil 4.2-5.2% (vs 5.9-6.3% TL), 10-13 oral papillae (vs 14-16), 24-28 tooth rows in the upper jaw (vs 28-31), and 104-110 pectoral-fin radials (vs 107-116). *Urolophus flavomosaicus*, which also occurs in the Coral Sea, is pale yellow dorsally with whitish spots and rings (rather than being darker plain coloured), is uniformly whitish ventrally (rather than having a dusky disc margin), has a white margin around the caudal fin vs a dusky margin, and has a relatively larger disc (width 78.4-83.7% vs 73.0-78.7% TL, direct length 62.5-68.4% vs 60.5-63.8% TL).

UROLOPHUS PIPERATUS SP. NOV.

(Fig. 5; Tab. II, III)

Urolophus sp. B: Last and Stevens, 1994: 41.9 (Plate 77).

Material examined

Holotype. - Adult male 484 mm TL (CSIRO H 1156-04), R.V. "Soela", Marion Reef, Queensland, 19°57'S-151°44'E, 357 m depth, 23 Nov. 1985.

Paratypes. - 6 specimens. off Queensland: female 330 mm TL (CSIRO H 1102-05), R.V. "Soela", 17°47'S-146°50'E, 200 m depth, 30 Nov. 1985; adult male 304 mm TL (MNHN 2002-0117, ex. CSIRO SR 32); adult male 314 mm TL (CSIRO H 1113-05), R.V. "Soela", 22°08'S-153°20'E, 246-254 m depth, 19 Nov. 1985; adult male 309 mm TL (CSIRO H 3551-03), R.V. "Soela", 17°11'S-146°41'E, 240-260 m depth, 1 Dec. 1985; adult male 297 mm TL (CSIRO H 718-37), R.V. "Soela", 22°56'S-151°41'E, 225-282 m depth, 19 Nov. 1985; adult male 436 mm TL (CSIRO H 2449-01), R.V. "Soela", 19°44'S-152°06'E, 368-370 m depth, 23 Nov. 1985.

Additional specimens. - 15 specimens. Coral Sea: 2 young females, 231 mm TL (CSIRO H 2450-01), 202 mm TL (CSIRO H 2450-02), R.V. "Soela", 17°33'S-149°46'E (East of Flinders Reefs, Queensland), 338-348 m depth, 3 Dec. 1985; male 300 mm TL (CSIRO H 682-04), R.V. "Soela", 18°00'S-147°03'E (NE of Townsville Plateau, Queensland), 250-252 m depth, 29 Nov. 1985; young female 218 mm TL (CSIRO H 2346-11), R.V. "Soela", 18°01'S-147°01'E (Townsville Trough, Queensland), 208-212 m depth, 29 Nov. 1985; adult male 298 mm TL (CSIRO H 5694-01), F.V. "Iron Summer" (S. Queensland), 1982/83; gravid female 270 mm TL, with an embryo of 121 mm TL (QM I 19964), 23°58'S-152°45'E, 171-216 m depth; adult male 235 mm TL (QM I 18916), 23°58'S-152°45'E, 171-216 m depth; young male

253 mm TL (NTM S 11746-010), East of Dunk Island, Queensland, 220 m depth, 8 Jan. 1986; adult male 272 mm TL and 2 young males 210 mm and 183 mm TL (NTM S 11748-019 A, B, C) no capture data; 3 new born, males 126.5 mm and 135 mm, female 151 mm TL (CSIRO H 718-23), new born male 136 mm and female 143 mm TL (CSIRO H 718-27), very young male 160 mm TL (CSIRO H 718-38), R.V. "Soela", 22°56'S-152°41'E (Capricorn Channel, Queensland), 282-225 m depth, 19 Nov. 1985.

Note: the following specimens were not measured because of their very bad state of preservation: young female 156 mm TL and young male 202 mm TL (QM I 18816); embryo male 99 mm TL (QM I 18822); young male 137 mm TL (QM I 18978); adult male 226 mm TL (QM I 18924); young male 209 mm TL (QM I 19977).

Diagnosis

A small-medium species of *Urolophus* with the following combination of characters: weakly rhomboidal disc, width 66.7-70.0% TL; rather long tail, postcloacal length 45.3-47.7% TL; medium snout (preorbital length 13.3-16.3% TL); broad, cartilaginous interorbit 3.8-4.6% TL; internasal flap skirt-shaped, diverging slightly; posterior angle of nasal curtain with a short, pointed lobe; inner margin of spiracle oblique; no tail fold; small dorsal fin; apices of pelvic fins angular; 7-9 oral papillae; 98-108 pectoral-fin radials; 32-35 tooth rows in upper jaw; dorsal surface pale brown to grey, often with fine black spots.

Description

Disc rhomboidal, about 1.16 (1.13-1.21) times wider than long; width 5.05 (4.80-5.24) distance between first gill slits, broadest about an eye diameter or less behind level of spiracles; anterior profile obtuse; pectoral-fin apices broadly rounded; pelvic fins subtriangular. Snout angular with a fleshy tip, distinctly extended, preorbital snout length 15.3 (13.3-16.3)% TL. Eye moderate to large, 3.6 (3.2-5.1)% TL. Interorbital distance broad, 4.01 (3.05-3.87) times in snout length. Inner margin of spiracle oblique. Mouth of moderate width, about equal 1.06 (0.91-1.09) times to the internasal distance. Oral papillae 7-9, arranged in curved irregular row; central 5-7 papillae simple, bifid or multifurcate; short, simple lateral papilla at each mouth corner; lower jaw very weakly papillate. Internasal flap skirt-shaped, posterior angle extended into a short pointed lobe; fringes very short. Disc upper surface smooth. Tail depressed (anteriorly) to oval in cross-section; rather short, postcloacal length 1.18 (1.19-1.30) times in disc length, 1.37 (1.41-1.52) times in disc width; lateral cutaneous tail folds absent. Dorsal fin low, base much longer than height, extending over origin of spine. Pelvic fin moderate, length 1.85 (1.78-2.12) in greatest width across both fins, outer margin broadly rounded. Caudal fin rather deep, hypocaudal lobe 4.72 (4.48-4.75)

times fin height. Clasper bluntly pointed.

Tooth counts: 34 (32-35) in upper jaw, 39 (30-39) in lower jaw. Pectotal-fin radials 106-108 (98-108) in total, 52 (45-52) propterygial, 11 (9-15) mesopterygial, 43-45 (40-45) metapterygial. Vertebrae 156 (146-156) in total, 34 (30-35) monospondylous, 54 (50-59) diplospondylous (to sting), 68 (60-68) post-sting tail vertebrae.

Colour

Dorsal surface greyish to pale brown; either uniform or with a few minute dark brown or black spots (most dense in juveniles). Tail mostly with a dark brown median stripe in juveniles. Dorsal fin pale brownish. Caudal fin brown with margins usually dark. Ventral surface of disc white; lateral margins dusky to distinctly mottled brown. Ventral surface of tail white, sometimes with a few brown blotches. The specimen illustrated (fig. 41.9a) in Last and Stevens (1994) is a young female of 231 mm TL (CSIRO H 2450-01); the brown flecks are more or less symmetrically arranged, with a denser patch below the eyes.

Size

Reaches at least 484 mm; the smallest mature male observed was 226 mm; a gravid female of 270 mm TL had a full term embryo of 121 mm TL (cf. remarks).

Distribution

Northern Queensland from Mackay to Cairns (including the Saumarez and Marion Reefs) in about 171-370 m.

Etymology

From the Latin "*piper*" meaning pepper, to stress the dark flecks scattered on the dorsal side of the disc.

Remarks

Urolophus piperatus is distinguished from *U. armatus*, *U. deforgesii* and *U. neocaledoniensis* by the presence of a dorsal fin. It can be distinguished from *U. papilio* by a narrower disc (width 66.7-70.0% TL vs 73.0-78.7% TL), longer tail (45.3-47.2% TL vs 38.1-42.3% TL), shape of the pelvic fin (angular vs rounded), and its dorsal coloration with dark flecks vs plain coloured.

Like *U. bucculentus* and *U. flavomosaicus*, *U. piperatus* has a dorsal fin but it can be distinguished from: *U. bucculentus* by its disc width (66.7-70.0% TL vs 73.5-80.4% TL), shape of the pelvic fin (angular vs rounded), presence of tail folds, and its maximum size (48 cm vs 80 cm TL) and dorsal coloration (flecked vs usually covered with a complex pattern of light spots and reticulations); and similarly from *U. flavomosaicus* by a narrower disc, shape of the pelvic fin (angular vs rounded), presence of tail folds, smaller size (about 48 cm vs 60 cm TL), and its coloration (flecks vs a

striking pattern of spots and reticulations).

It is possible that two species provisionally identified as *U. piperatus* may exist in our material: a large form (represented by the types) and a smaller form (represented by additional specimens from near the type localities). These forms were compared carefully but no consistent intraspecific differences were found between them based on morphometric or meristic data. However, the non-type material included two young females of 200 and 231 mm TL (CSIRO H 2450-01 & 02), and a gravid female of 270 mm TL (QM I 19964) with a full term embryo of 121 mm TL. This suggests that females of this form probably reach maturity between 231 and 270 mm TL. Similarly, the smallest adult male observed was 226 mm TL (QM I 18924) whereas a male of 210 mm (NTM S 11748-019B) was immature. Clearly males of the smaller form are capable of reaching maturity within the range of 210 and 226 mm TL which is significantly smaller than the largest known male of the species (i.e., holotype 484 mm TL). Few elasmobranchs, particularly stingarees, exhibit such extreme differences between the size of first maturity and maximum size. Molecular analysis should be used to resolve this matter.

KEY TO THE *UROLOPHUS* SPECIES OF THE CORAL SEA

- 1a.** - Body and tail with thorns, spinules, or dermal denticles *U. armatus* (New Ireland)
- 1b.** - Body and tail without thorns, spinules, or dermal denticles 2
- 2a.** - No dorsal fin on tail 3
- 2b.** - Small (sometimes rudimentary) dorsal fin present on tail 4
- 3a.** - Interorbit narrow (3.3-4.3% TL - 1.8-1.9 in snout length); head small (ventral length 27.5-30.3% TL); internasal narrow (4.3-5.5% TL - 2.0-2.3 in prenasal length); upper surface typically yellowish brown
..... *U. deforgesi* sp. nov. (Chesterfield Islands)
- 3b.** - Interorbit broad (4.0-5.0% TL - 1.6-1.8 in snout length); head large (ventral length 30.2-33.4% TL); internasal broad (5.8-6.9% TL - 1.7-1.9 in prenasal length); upper surface typically greyish brown.....
... *U. neocaledoniensis* sp. nov. (Chesterfields Islands, New Caledonia, Norfolk Ridge)
- 4a.** - Disc width usually less than 70% TL; tail elongate (postcloacal length more than 75% of disc length); inner margin of spiracle slightly oblique to longitudinal axis; apices of pelvic fins angular; dorsal surface brown to grey, usually with fine black spots. *U. piperatus* sp. nov. (Northern Queensland)

4b. - Disc width exceeding 70% TL; tail short (postcloacal length less than 75% of disc length); inner margin of spiracle almost along longitudinal axis; apices of pelvic fins broadly rounded; dorsal surface yellowish, plain or with white spots and reticulations 5

5a. - Dorsal surface plain yellowish or brownish; ventral margin of disc distinctly darker than mid-disc; disc width less than 6.5 times prenasal length; small species, possibly smaller than 40 cm and males maturing at about 31 cm TL *U. papilio* sp. nov. (Chesterfield Islands)

5b. - Dorsal surface pale yellow with complex pattern of white spots and reticulations; ventral surface of disc uniformly white, margin not darker than mid-disc; disc width more than 6.5 times prenasal length; relatively large species, reaching about 60 cm and males maturing at about 38 cm TL *U. flavomosaicus* (tropical Australia)

Other material examined

Urolophus bucculentus: CSIRO H 335, male 230 mm TL, Asutralia. - CSIRO CA 528, male 409 mm TL, Australia.

Urolophus flavomosaicus: CSIRO H 1036-28, mature male 388 mm TL, Australia. - CSIRO H 694-03, female 230 mm TL, Australia. - CSIRO CA 2869, female 348 mm TL, Australia.

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