

## New Dinematiichthyini (Teleostei: Bythitidae) from the Indo-west Pacific, with the description of a new genus and five new species

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### ABSTRACT

After completion of the revision of the dinematiichthyine fishes (Ophidiiformes: Bythitidae: Brosmophycinae) of the Indo-west Pacific based on more than 6500 specimens in 2008, extensive additional material was reviewed from the collections of the Western Australian Museum and the South African Institute of Aquatic Biodiversity. This material has not only led to a better definition of the species *Brosmolus longicaudus* but also to a recognition of the following new taxa: *Didymothallus nudigena* sp. nov. from northwestern Australia, *Paradaniacistrus christmasensis* sp. nov. from Christmas Island (Indian Ocean), *Nielsenichthys pullus* gen. nov., sp. nov. from Nusa Penida, Indonesia, *Majungaichthys agalegae* sp. nov. from northern Madagascar and Agalega Islands and *Mascarenichthys remotus* sp. nov. from Rodrigues Island. The status of *Alionematiichthys* sp. 2 in Møller and Schwarzhans (2008) is resolved and placed into *A. crassiceps* Møller and Schwarzhans, 2008, thereby extending the distribution of the species to northwestern Australia.

KEYWORDS: Viviparous brotulas, Indo-west Pacific, Australia, Indonesia, Madagascar, Rodrigues Island, coral reef fishes, Dinematiichthyini, new genus, new species.

### INTRODUCTION

The review of the dinematiichthyine fishes of the Indo-west Pacific was published in four parts between 2005 and 2008 (Schwarzhans *et al.* 2005; Møller & Schwarzhans 2006, 2008; Schwarzhans & Møller 2007). Since then, two additional major collections have been made available for review. These were the ichthyological collection of the Western Australian Museum (WAM) at Perth, Western Australia, which was visited by both authors during the occasion of the Indo-Pacific Fish Congress in Perth in 2009, and from the South African Institute of Aquatic Biodiversity (SAIAB) at Grahamstown.

The WAM material provided extensive material from the Western Australian shelf with a number of specimens that allow redefinition of the rare and hitherto poorly defined *Brosmolus longicaudus*, placement of *Alionematiichthys* sp. 2 of Møller and Schwarzhans (2008) to *Alionematiichthys crassiceps* and the description of *Didymothallus nudigena* sp. nov., which was previously only known from a few female or juvenile male specimens tentatively placed in *Didymothallus mizolepis*. Material obtained from Christmas Island in the Indian Ocean has revealed the fourth species of the genus *Paradaniacistrus* – *P. christmasensis* sp. nov. Finally, recently collected fish from the shores of Sumbawa Island, Indonesia, has yielded another new genus and species

– *Nielsenichthys pullus* gen. nov., sp. nov. This discovery proves that the Indonesian Archipelago still represents one of the areas where dinematiichthyine knowledge remains poorly known and new data have to be expected from there. A male specimen from northwestern Madagascar proved to represent the same species previously recorded only from female specimens from the nearby Agalega Islands, which was tentatively placed in *Majungaichthys simplex* by Schwarzhans and Møller (2007), and is now described as *Majungaichthys agalegae* sp. nov.

The material made available for review by SAIAB was primarily collected along the eastern African shores, Madagascar and the islands of the western Indian Ocean. It has added important information about the areal distribution of *Mascarenichthys heemstrai* and yielded a new species of the same genus – *Mascarenichthys remotus* sp. nov. – endemic to the remote Rodrigues Islands.

### MATERIAL AND METHODS

Nearly 6500 specimens of Indo-west Pacific Dinematiichthyini have been reviewed for the revision published in four parts between the years 2005 and 2008. The additional material studied at WAM and from SAIAB comprised about 1000 additional specimens. However, only the material of SAIAB and specific loans from WAM are

described in the following and were counted. Any other identified but not counted specimens from WAM are not described here.

The material described herein belongs to the following institutions: AMS (Australian Museum, Sydney); BPBM (Bishop Museum, Honolulu, Hawaii); SAIAB (South African Institute for Aquatic Biodiversity, formerly RUSI (JLB Smith Institute of Ichthyology, Grahamstown); WAM (Western Australian Museum, Perth); ZMUC (Natural History Museum of Denmark, Zoological Museum, University of Copenhagen, Copenhagen). Abbreviations follow the standards for museum collections given by Fricke & Eschmeyer (2011).

Comparative material of Indo-west Pacific Dinematchthyini was described by Schwarzzhans *et al.* (2005), Møller & Schwarzzhans (2006 and 2008) and Schwarzzhans & Møller (2007). Comparative material of American Dinematchthyini was described by Møller *et al.* (2004a) and Møller *et al.* (2005). Comparative material of Bromophycinae and Bythitinae was described by Møller *et al.* (2004b).

The methods used in analysing dincmatchthyine fishes follow Møller *et al.* (2004a) and Schwarzzhans *et al.* (2005). Abbreviations used in meristic counts are: D/V = anterior dorsal fin ray above vertebra number; D/A = anterior anal

fin ray below dorsal fin ray number; V/A = anterior anal fin ray below vertebrae number; D-A = number of dorsal fin rays minus number of anal fin rays; V in D = number of dorsal fin rays per ray-bearing vertebra.

The ecology of most of the species is poorly known. From available station data we have gathered some information about habitat and depth range, but we have very little data about behaviour, live coloration or feeding. Few females were examined for reproductive data, e.g., number and size of embryos.

The distribution maps were created using Microsoft Encarta 2001 digital world atlas. Standards of fish classification, original descriptions and type catalogues follow Eschmeyer & Fricke (2011).

## TAXONOMY

### Family Bythitidae Gill, 1861

#### Subfamily Bromophycinae Gill, 1862

#### Tribe Dinematchthyini Cohen & Nielsen, 1978

**Diagnosis.** Male copulatory organ with penis and 1 or 2 (rarely 3) pairs of pseudoclaspers in cavity of ventral body wall covered by fleshy hood. First anal fin pterygiophore slightly to strongly elongate. Head pore system generally not reduced, 6 mandibular, 2–4 preopercular, 5–7 infraorbital

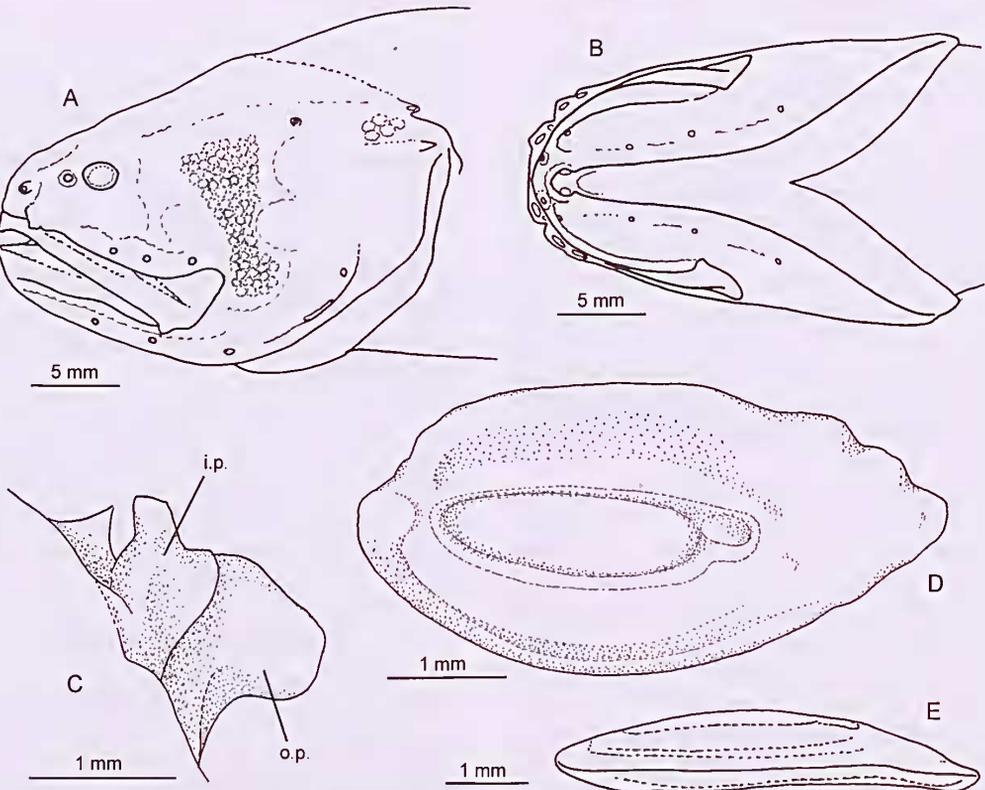


Fig. 1. *Alionematchthys crassiceps* Møller & Schwarzzhans, 2008, WAM P.25113-005, male, 75 mm SL: A, lateral view of head; B, ventral view of head; C, view of left pseudoclasper from inside; D, median view of right otolith; E, ventral view of right otolith.

and 3–4 supraorbital pores, including supraorbital pore above opercular spine. Posteriormost supraorbital head-pore tubular.

***Alionematiichthys* Møller & Schwarzhans, 2008**

Gender masculine. Type species, by original designation, *Dinematiichthys riukiensis* Aoyagi, 1954. Recent, Ishigaki Island, Ryukyu Islands, Japan.

***Alionematiichthys crassiceps* Møller & Schwarzhans, 2008**

(Figs 1, 2)

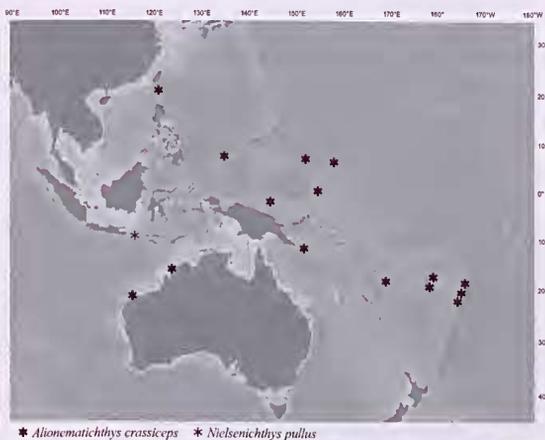
*Alionematiichthys crassiceps* Møller & Schwarzhans, 2008: 95.

*Alionematiichthys* sp. 2 Møller & Schwarzhans, 2008: 127.

**Material examined.** 57 specimens: 54 specimens in Møller & Schwarzhans, 2008; 3 additional specimens – WAM P.25113-005, 1 male, 75 mm SL, 1 female, 73 mm SL, 20°28'S, 116°32'E, Kendrew Island, Western Australia, 6 November 1974; WAM P.30908-002, 1 female, 90 mm SL, 16°26'S, 123°21'E, Mermaid Island, Western Australia, 18 November 1994.

**Remarks.** The three new specimens from Western Australia fall entirely within the meristic variations observed in this species, which has been widely reported from Micronesia in the northern Pacific (Palau, Chuuk) to Vanuatu, Fiji and Tonga in the southern Pacific. This is also true for the pseudoclasper morphology of the single large male included in the additional material, the massive head without cirri on the snout, the narrow scale patch on the cheek and the presence of a small scale patch above the opercular spine and finally the otolith morphology characterised by the poor distinction of ostium and cauda and the small size of the cauda.

A single previous record from the northwestern Australian coast based on a large female specimen was reported in Møller & Schwarzhans (2008) as *Alionematiichthys* sp. 2,



**Fig. 2.** Sample sites of *Alionematiichthys crassiceps* Møller & Schwarzhans, 2008, and *Nielsenichthys pullus* sp. nov. One symbol may represent several samples.

then thought to represent an undescribed species. Among the characteristics mentioned, the transformation of the upper preopercular pore to a wart stands out as the only one significantly different from *A. crassiceps*. The new specimens from the same location now show that mostly the preopercular pore is still evident and only in minor instances has it been transformed to a wart, usually on one side of the head only. Therefore, *Alionematiichthys* sp. 2 can now be confidently synonymised with *A. crassiceps*, thereby significantly extending the geographic distribution of the species to the west.

***Brosmolus* Machida, 1993**

Gender masculine. Type species, by monotypy, *Brosmolus longicaudus* Machida, 1993. Recent. Type locality: 11°50'S, 130°05'E, Beagle Gulf, Northern Territory, Australia.

***Brosmolus longicaudus* Machida, 1993**

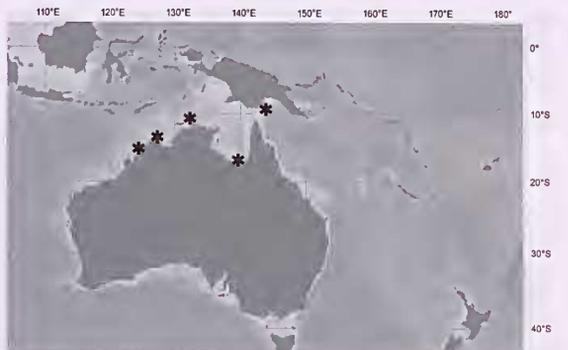
(Figs. 3, 4)

*Brosmolus longicaudus* Machida, 1993: 282; Nielsen *et al.* 1999: 120; Schwarzhans & Møller 2007: 47.

**Material examined.** 6 specimens: 3 specimens in Schwarzhans & Møller, 2007; 3 additional specimens – WAM P.28155-024, 1 female, 97 mm SL, Daru Island, Papua New Guinea, 20 September 1983; WAM P.30850-030, 1 male, 46 mm SL, 1 female, 49 mm SL, 15°26'S, 124°35'E, Umbanganan Island, Western Australia, 27 September 1994.

**Remarks.** The holotype (and only specimen at the time) described by Machida represents a male with not fully developed pseudoclaspers (see Schwarzhans & Møller 2007: fig. 9 C, D). Two additional specimens studied by Schwarzhans & Møller were small females. The additional specimens studied for this paper have yielded one large female of 97 mm SL and a male with fully developed pseudoclaspers. These new specimens now allow adequate description and comparison.

**Male copulatory organ** (Fig. 3 A,B): A single pair of (outer) pseudoclaspers about half the size of the penis. The pseudoclaspers are broad and flap like and contain two



**Fig. 4.** Sample sites of *Brosmolus longicaudus* Machida, 1993. One symbol may represent several samples.

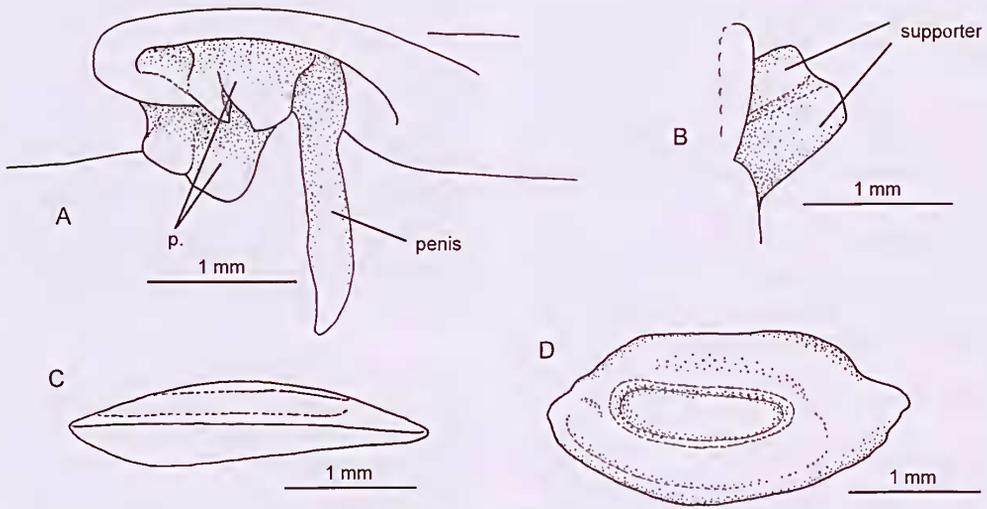


Fig. 3. *Brosmolus longicaudus* Machida, 1993, WAM P.30850-030, male, 46 mm SL: A, inclined lateral view of male copulatory organ; B, view of left pseudoclasper from inside; C, ventral view of right otolith; D, median view of right otolith.

short supporters behind each other. The pseudoclasper flap is slightly incised between the supporters in one pseudoclasper.

Further additional information includes a well preserved otolith (Fig. 3 C,D) and an extension of certain meristic ranges: dorsal fin rays 118–132, anal fin rays 90–98, caudal vertebrae 41–44, D/A 35–42.

The monotypic genus *Brosmolus* was regarded as being closely related to *Beaglichthys* Machida, 1993 by Schwarzhans and Møller (2007) and potentially considered synonymous with it, but synonymy was deferred “until the nature and distinction of the two established genera can be analyzed from a broader base of specimens”. The additional male with the small single pseudoclasper containing two supporters now clearly distinguishes *Brosmolus* from *Beaglichthys*, which has a copulatory organ with a large outer pseudoclasper with a single supporter and a smaller, complex inner pseudoclasper which is attached to the outer pseudoclasper to different extents in the three species of the genus. In fact, male copulatory organs with a single (outer) pseudoclasper and two supporters behind each other are rare in the dinematchthyines, the only other genera possessing this character are *Didymothallus* Schwarzhans and Møller, 2007 from the Indo-west Pacific and *Gunterichthys* Dawson,

1966 from tropical America. It is therefore now concluded that *Brosmolus* is most closely related to *Didymothallus*, differing in the small pseudoclasper (half the length of the penis versus as long as, or longer than, the penis), the high precaudal and total vertebrae count (14 or 15 and 56–59 versus 12 or 13 and 40–45) and the high dorsal and anal fin ray counts (118–132 and 90–98 versus 69–97 and 52–73).

***Didymothallus* Schwarzhans & Møller, 2007**

Gender masculine. Type species, by original designation, *Didymothallus criniceps* Schwarzhans & Møller, 2007. Recent. Type locality One Tree Island, Great Barrier Reef, Queensland, Australia.

***Didymothallus nudigena* sp. nov.**

(Figs 5–7; Table 1)

*Didymothallus nuzolepis* (Günther, 1867). – Schwarzhans & Møller 2007: 56 (pars: Fig. 17 C, H, K, non Fig. 17 A,B, D–J = *Didymothallus nuzolepis*).

**Material examined.** (38 specimens, 17–66 mm SL). HOLOTYPE – WAM P.27671-032, male, 47 mm SL, 16°51'S, 122°05'E, Lacepede Islands, Western Australia, Rock pool at western tip, coll. G.R. Allen & F. Wells, 29 February 1982. PARATYPES – AMS I.17060-035, 1 male, 33 mm



Fig. 5. *Didymothallus nudigena* sp. nov. Holotype. WAM P.27671-032, male, 47 mm SL.

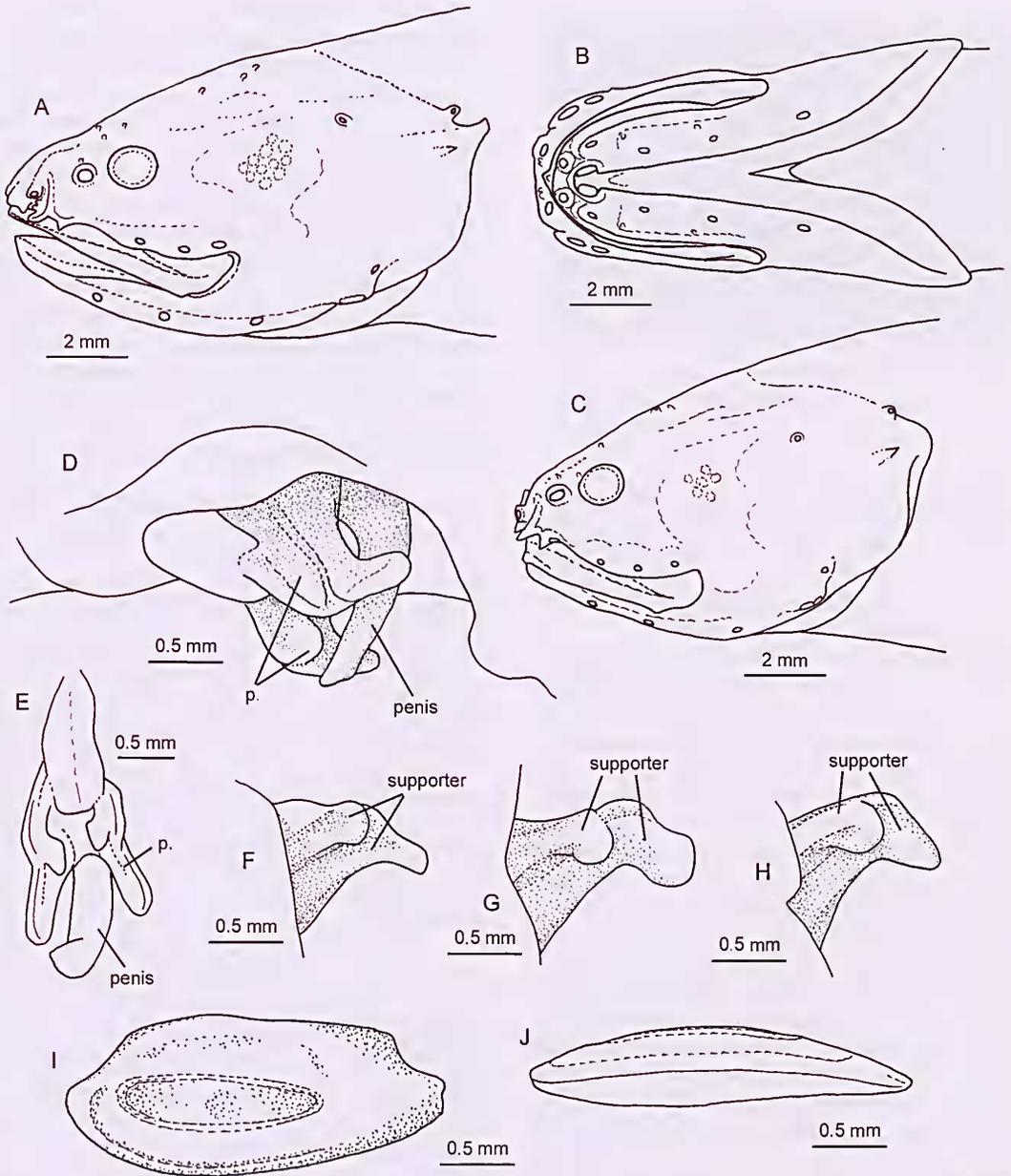


Fig. 6. *Didymothallus nudigena* sp. nov.: A, lateral view of head, holotype; B, ventral view of head, holotype; C, lateral view of head, WAM P.22431-050, female, 45 mm SL; D, inclined lateral view of male copulatory organ, holotype; E, ventral view of male copulatory organ, holotype; F, view of left pseudoclasper from inside, holotype; G, view of left pseudoclasper from inside, WAM P.22431-050, 49 mm SL; H, view of left pseudoclasper from inside, WAM P.22431-050, 43 mm SL; I, median view of right otolith, holotype; J, ventral view of right otolith, holotype.

SL, 1 female, 44 mm SL, 22°15'S, 114°15'E, Exmouth Gulf, Western Australia; BPBM 17405, 1 female, 45 mm SL, 20°S, 116°E, Kendrew Island, Dampier Archipelago, Western Australia; WAM P.22431-050, 8 males and 10 females, 17–49 mm SL, 20°S, 116°E, Dampier Archipelago, Western Australia, 5 November 1971; WAM P.25111-033, 1 female, 51 mm SL, 20°S, 116°E, Dampier Archipelago, Western Australia; WAM P.27368-014, female, 35 mm SL,

17°58'S, 122°14'E, Broome, Western Australia, July 1981; WAM P.27967-038, 1 male, 37 mm SL, 24°29'S, 113°25'E, off Beagle Hill, Western Australia; WAM P.27980-065, 1 male, 42 mm SL, 20°26'S, 115°35'E, Montebello Islands, Western Australia; WAM P.28417-021, 1 male, 47 mm SL, 2 females, 27–49 mm SL, 17°21'S, 122°09'E, Coulomb Point, Western Australia, 1 September 1981; WAM P.31013-010, 6 specimens, 22°06'S, 114°31'E, Exmouth Gulf,

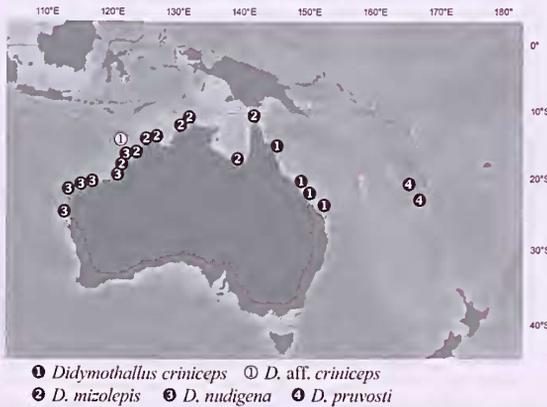


Fig. 7. Sample sites of the species of the genus *Didymothallus* Schwarzhans & Møller, 2007. One symbol may represent several samples.

Western Australia; WAM P.31015-031, 1 female, 51 mm SL, 22°07'S, 114°29'E, Exmouth Gulf, Western Australia; WAM.P.31392-002, female, 30 mm SL, 16°S, 122°E, Beagle Bay, Western Australia, 28 August 1997; WAM.P.31506-001, 1 male, 51 mm SL, 1 female, 66 mm SL, 20°28'S, 116°52'E, Dolphin Island, Western Australia.

**Diagnosis.** Vertebrae 12+28–31=40–43, dorsal fin rays 78–90 (95), anal fin rays 57–69, V in D 1.9–2.3. Head with few small, non-imbriate scales on upper cheeks only. Single (outer) pseudoclasper wing-shaped with two slender supporters, anterior supporter shorter than posterior one with small distal appendix on inner face, posterior supporter curved, hockey-stick shaped. Otolith with undivided short sulcus, its centre anterior to centre of otolith, sulcus not inclined, otolith length to otolith height 2.25–2.35, otolith length to sulcus length 1.9–2.1.

**Description** (Figs. 5, 6). The principle meristic and morphometric characters of *Didymothallus nudigena* are shown in Table 1. Body slender, mature at about 30 mm SL. Head and body slender. Head with scale patch only on upper cheek consisting of few, small, non-imbriate scales covered by thin skin and thus difficult to observe (Fig. 6A, C). Horizontal diameter of scales on body about 1.1% SL, in 17–23 horizontal rows. Maxillary ending far behind eyes, dorsal margin of maxillary covered by upper lip dermal lobe, posterior end slightly expanded, with small knob. Anterior nostril positioned low,  $1/4$ – $1/5$  the distance from upper lip to anterior margin of eye. Posterior nostril small, about  $1/4$  the size of eye. Opercular spine with free tip, pointed. Anterior gill arch with 10–15 rakers, thereof 2–4 elongate. Pseudobranchial filaments 1.

**Head sensory pores** (Fig. 6A–C). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior): three posterior pores about  $1/2$  the size of three anterior pores. Mandibular pores 6 (3 anterior and 3 posterior); first anterior mandibular pore without cirrus. Preopercular pores: 3 lower, first and second with joined opening; third non-tubular; tubular upper preopercular pore.

**Dentition** (of holotype). Premaxilla with 3 outer rows of granular teeth and one inner row of larger teeth anteriorly. Antermost teeth in inner row up to  $1/2$  diameter of pupil. Vomer horseshoe-shaped, with 1 row of about 5 large teeth up to  $2/3$  diameter of pupil. Palatine with 1 row of about 7 large teeth up to  $1/2$  diameter of pupil. Dentary with 4 outer rows of granular teeth and 1 inner row of larger teeth anteriorly, up to about  $2/3$  diameter of pupil.

**Otolith** (Fig. 6I–J). Elongate in shape, length to height 2.25–2.35 (48–66 mm SL) and moderately thin (otolith height to otolith thickness about 2.0). Anterior tip slightly pointed, posterior rim expanded. Dorsal rim with rounded pre- and angular postdorsal angles, section in between long and straight, small concavity towards anterior and posterior tips; ventral rim gently curved, deepest anterior

Table 1. Meristic and morphometric characters of *Didymothallus nudigena* n. sp.

	Holotype WAM P.27671-032	Holotype + 22 paratypes	N
	Mean (range)		
Standard length in mm	47	37.5 (26–49)	23
<b>Meristic characters</b>			
Dorsal fin rays	87	86.0 (78–95)	23
Caudal finrays	14	14.4 (14–16)	15
Anal fin rays	64	63.7 (57–69)	23
Pectoral fin rays	20	20.4 (18–22)	14
Precaudal vertebrae	12	12.0 (11–12)	23
Caudal vertebrae	30	29.3 (28–31)	23
Total vertebrae	42	41.3 (40–43)	23
Rakers on anterior gill arch	6+3-1+1	11.9 (10–15)	22
Pseudobranchial filaments	1	1.0 (0–1)	22
D/V	5	5.5 (5–6)	23
D/A	28	27.5 (22–31)	23
V/A	14	14.2 (14–15)	23
<b>Morphometric characters in % of SL</b>			
Head length	25.1	24.9 (23.9–25.8)	13
Head width	11.7	11.4 (10.0–12.3)	13
Head height	14.0	14.3 (12.0–15.3)	13
Snout length	5.7	5.5 (5.1–5.8)	13
Upper jaw length	11.7	12.4 (11.4–14.1)	13
Diameter of pigmented eye	2.2	2.5 (2.1–3.1)	12
Diameter of pupil	1.4	1.5 (1.1–1.9)	13
Interorbital width	6.0	5.9 (5.2–6.7)	13
Posterior maxilla height	3.7	3.7 (3.5–3.8)	12
Postorbital length	17.4	17.7 (16.8–18.4)	13
Preanal length	47.9	48.8 (45.0–52.0)	13
Predorsal length	29.6	30.3 (28.5–33.7)	13
Body depth at origin of anal fin	14.6	14.9 (12.9–16.5)	13
Pectoral fin length	14.4	14.1 (12.8–17.7)	12
Pectoral fin base height	5.2	5.7 (4.9–6.4)	13
Ventral fin length	20.0	20.1 (15.8–25.0)	20
Base ventral fin – anal fin origin	29.8	30.9 (27.8–34.3)	13

of the middle. Inner face moderately convex, outer face flat to slightly concave, both smooth. Otolith length to sulcus length 1.9–2.1. Sulcus positioned slightly towards anterior, with fused eolliculi, not inclined towards otolith axis. Ventral furrow distinct, close to ventral rim of otolith, curved upwards anteriorly and posteriorly.

**Axial skeleton.** Neural spine of vertebra 4 (–5) inclined and (5) 6–8 (9) depressed. Parapophyses present from vertebrae 6 to 12. Pleural ribs on vertebrae 2 to 11. First anal fin pterygophore elongate, sometimes reaching tip of last precaudal parapophysis in males but rarely in females.

**Male copulatory organ** (Fig. 6 D–H). Single pair of large (outer) pseudoclaspers, wing-shaped, tips bend backward, with two long supporters, anterior being considerably shorter than posterior, with small distal appendix on inner face, posterior supporter curved, hockey-stick shaped. Penis curved, slightly longer than pseudoclaspers, pointed, with broad base.

**Colour.** Live colour known from two specimens (WAM P.31015-031 and WAM P.27967-038, see Schwarzhans & Møller, 2007, Fig. 16 A as *D. mizolepis*), which both show a uniform dusky red to reddish violet body colour, lighter ventrally and darker dorsally. The vertical fins bear the same colour, but are lighter and translucent. Preserved colour is variable brown to greyish-brown, often rather dark.

**Comparison and Discussion.** Specimens of *Didymothallus nudigena* were incorporated in *D. mizolepis* in Schwarzhans & Møller (2007) due to the lack of adequate mature male specimens. It was noted, however, that it appeared that “the more western specimens (Exmouth Gulf) tend to show lower meristic numbers, lesser cheek squamation and bent supporters in the pseudoclaspers”. The new specimens now additionally obtained from the area support the presence of two species, with *D. nudigena* most reliably distinguished from *D. mizolepis* by the few small, non-imbricate scales on the upper cheek only (versus continuous imbricate scale patch on upper and lower cheek), the pseudoclasper with the short anterior and hockey-stick bent posterior supporters (versus straight and almost equal in length), the curved penis (versus straight) and the lower V in D (1.9–2.3 versus 2.2–2.6), while the previously mentioned meristic differences include a large

area of overlap. *Didymothallus nudigena* is distinguished from the other species of the genus, *D. criniceps* and *D. pruvosti*, by the higher number of dorsal fin rays (78–90 versus 69–77), the reduced scale patch on the upper cheek, the hockey-stick shaped posterior supporter of the outer pseudoclasper and the long sulcus (otolith length to sulcus length 1.9–2.1 vs 2.6).

**Distribution.** *Didymothallus nudigena* is known from northwestern Australia from 24°S and 113°E to about 16°S and 122°E, where it may overlap geographically with *D. mizolepis* known from 18°S and 122°E to the Cape York (Fig. 7).

**Etymology.** A combination from *nudus* (Latin = naked) and *gena* (Latin = cheek) owing to the reduced squamation of the cheeks. The name is intended as a noun in apposition.

#### *Majungaichthys* Schwarzhans & Møller, 2007

Gender masculine. Type species, by original designation, *Majungaichthys simplex* Schwarzhans & Møller, 2007. Recent. Type locality: 16°21'S, 43°59'E, off Cape Saint-Andre, Madagascar.

#### *Majungaichthys agalegae* sp. nov.

(Figs. 8–10; Table 2)

*Majungaichthys simplex* Schwarzhans & Møller 2007: 75 (pars: tentatively assigned specimens, Fig. 31 G, non Fig. 31 A–F = *Majungaichthys simplex*).

**Material examined.** (6 specimens, 26–40 mm SL). HOLOTYPE – WAM P.32017-008, male, 40 mm SL, 12°49'S, 48°35'E, Nosy Fisaka, northwestern Madagascar, outer reef on west side, depth 4–5 m, coll. G.R. Allen, 13 January 2002. PARATYPES – USNM 374164, 1 female, 26 mm SL, 10°19'S, 056°35'E, Agalega Islands (North Island), Mauritius; USNM 374174, 3 females, 30–35 mm SL, 10°19'S, 056°35'E, Agalega Islands (North Island), Mauritius; USNM 374175, 1 female, 32 mm SL, 10°21'S, 056°35'E, Agalega Islands (North Island), Mauritius.

**Diagnosis.** Vertebrae 12+30–32=42–44, pleural ribs on vertebrae 2–11, dorsal fin rays 71–75, anal fin rays 55–62, D/A 20–21. Distance from base of ventral fin to base of anal fin 25.5–28. Head with rounded snout, scale patch on cheeks with 4 or 5 rows on upper cheek and 2 or 3 rows on



Fig. 8. *Majungaichthys agalegae* sp. nov. Holotype. WAM P.32017-008, male, 40 mm SL.

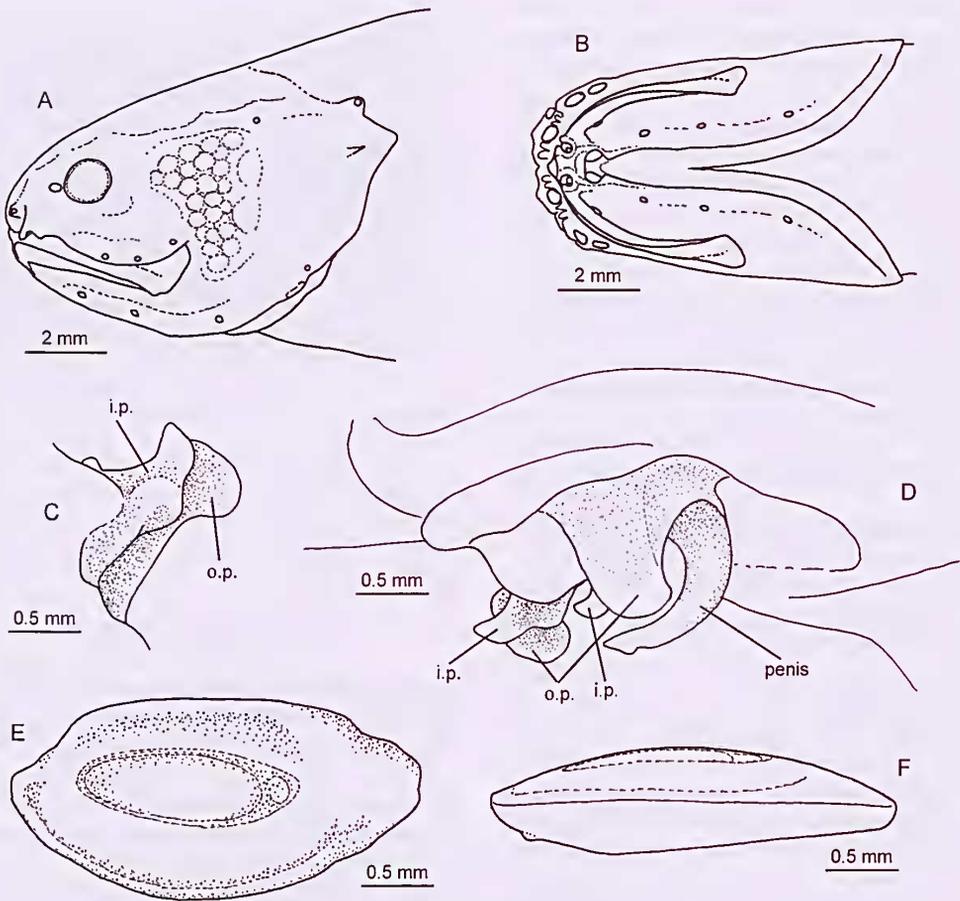


Fig. 9. *Majungaichthys agalegae* sp. nov. Holotype: A, lateral view of head; B, ventral view of head; C, view of left pseudoclasper from inside; D, inclined lateral view of male copulatory organ; E, median view of right otolith; F, ventral view of right otolith.

lower cheek. Pseudoclaspers almost equally large, 2 pairs, outer flap-shaped with broadened tip, inner narrower with anteriorly inclined tip. Otolith with indistinctly divided sulcus with extremely small cauda, ostium length to cauda length about 7:1, sulcus slightly inclined, otolith length to otolith height 2.1, otolith length to sulcus length 1.8–1.9.

**Description** (Figs 8, 9). The principle meristic and morphometric characters of *Majungaichthys agalegae* are shown in Table 2. Body moderately slender, mature at about 35 mm SL. Head with rounded front and with scale patch on cheek containing 4 or 5 vertical rows of scales on upper part and 2 or 3 vertical rows on lower part (Fig. 9 A). Horizontal diameter of scales on body about 2% SL, in 22 horizontal rows. Maxillary ending far behind eyes, dorsal margin of maxillary covered by upper lip dermal lobe, posterior end slightly expanded, with small knob. Anterior nostril positioned low,  $\frac{1}{4}$  the distance from upper lip to anterior margin of eye. Posterior nostril small, about  $\frac{1}{4}$  the size of eye. Opercular spine with free tip, pointed. Anterior gill arch with 13 short and 3 long rakers. Pseudobranchial filaments 2.

**Head sensory pores** (Fig. 9 A,B). Supraorbital pores 2 or 3. Infraorbital pores 6 (3 anterior and 3 posterior): three posterior pores about 0.25 size of 3 anterior pores. Mandibular pores 6 (3 anterior and 3 posterior); first anterior mandibular pore without cirrus. Preopercular pores: 3 lower, first and second with joined opening; third non-tubular; tubular upper preopercular pore.

**Dentition** (of holotype). Premaxilla with 4 outer rows of granular teeth and one inner row of larger teeth anteriorly. Anteriormost teeth in inner row up to 0.5 diameter of pupil. Vomer horseshoe-shaped, with one outer row of small teeth and one inner row of large teeth up to 0.3 diameter of pupil. Palatine with 2 rows of small teeth up to 0.3 diameter of pupil. Dentary with 4 outer rows of granular teeth and 1 inner row of larger teeth anteriorly, up to about 0.6 diameter of pupil.

**Otolith** (Fig. 9 E,F). Elongate in shape, length to height 2.1 (35–40 mm SL) and moderately thin (otolith height to otolith thickness about 2.0). Anterior tip slightly pointed, short, posterior rim expanded. Dorsal rim with rounded pre- and angular postdorsal angles, section in between nearly

straight, small concavity towards anterior and posterior tips; ventral rim gently curved, deepest anterior of the middle. Inner face moderately convex, outer face flat to slightly concave, both smooth. Otolith length to sulcus length 1.8–1.9. Sulcus positioned slightly towards anterior, with indistinctly separated colliculi, slightly inclined towards otolith axis. Ostium much larger than cauda (ostium length to cauda length about 7.0). Ventral furrow distinct, close to ventral rim of otolith, curved upwards anteriorly and posteriorly.

**Axial skeleton.** Neural spine of vertebra 4 inclined and 5–8 depressed. Parapophyses present from vertebrae 7 to 12. Pleural ribs on vertebrae 2 to 11. First anal fin pterygophore elongate, sometimes reaching tip of last precaudal parapophysis in male but not in female.

**Table 2.** Meristic and morphometric characters of *Majungaichthys agalegae* n. sp.

	Holotype WAM P.32017-008	Holotype + 5 paratypes  Mean (range)	N
Standard length in mm	40	(26–40)	6
<b>Meristic characters</b>			
Dorsal fin rays	74	73.0 (71–75)	5
Caudal fin rays	15	15	1
Anal fin rays	55	58.2 (55–62)	5
Pectoral fin rays	18	18	1
Precaudal vertebrae	12	12	1
Caudal vertebrae	30	31.2 (30–32)	5
Total vertebrae	42	43.2 (42–44)	5
Rakers on anterior gill arch	10+2-1+3	16	1
Pseudobranchial filaments	2	2	1
D/V	6	6	5
D/A	21	20.8 (20–21)	5
V/A	14	13.8 (13–14)	5
<b>Morphometric characters in % of SL</b>			
Head length	26.0	–	1
Head width	13.6	–	1
Head height	15.6	–	1
Snout length	5.9	–	1
Upper jaw length	12.7	–	1
Diameter of pigmented eye	3.2	–	1
Diameter of pupil	3.0	–	1
Interorbital width	7.3	–	1
Posterior maxilla height	4.3	–	1
Postorbital length	18.6	–	1
Preanal length	47.1	–	1
Predorsal length	31.2	–	1
Body depth at origin of anal fin	16.8	–	1
Pectoral fin length	16.8	–	1
Pectoral fin base height	5.0	–	1
Ventral fin length	22.9	–	1
Base ventral fin - anal fin origin	27.8	–	1

**Male copulatory organ** (Fig. 9 C,D). Two pairs of nearly equally large pseudoclaspers; outer pseudoclasper flap-shaped, with broad basis and broadened tip; inner pseudoclasper narrower with small knob at rear margin and middle stretch of pseudoclasper and forward inclined pointed tip. Penis curved, slightly longer than pseudoclaspers, with broad base.

**Colour.** Preserved holotype uniformly chocolate brown. Live colour unknown.

**Comparison.** *Majungaichthys agalegae* was first noted in Schwarzhans and Møller (2007) from the Agalega Islands, but was tentatively placed in *M. simplex* found along the central western coast of Madagascar. The new find of an adult male from the northwestern coast of Madagascar, not far from the Agalega Islands, however confirmed the presence of a second species in the area. *Majungaichthys agalegae* differs from *M. simplex* in the lower number of dorsal fin rays (71–75 versus 78 or 79), pleural ribs on vertebrae 2–11 (versus 2–10), lower D/A (20 or 21 versus 24), the distance of the base of the ventral fin to the anal fin origin (25.5–28 versus 30–30.5) and the presence of a very small caudal colliculum (ostium length to cauda length about 7:1) in an indistinctly divided sulcus of the otolith. The pseudoclasper pattern however does not differ significantly between the two species.

**Distribution.** Known from the Nosy Mitsio Archipelago off northwestern Madagascar to the Agalega Islands.

**Etymology.** Named after the Agalega Islands, where this species was observed first. The name is intended as a noun in apposition.

#### *Mascarenichthys* Schwarzhans & Møller, 2007

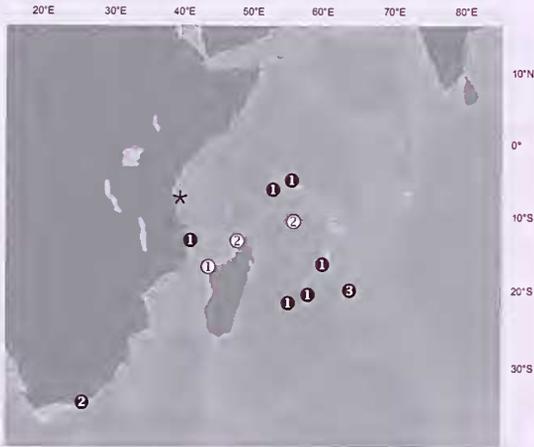
Type species, by original description, *Mascarenichthys heemstrai* Schwarzhans & Møller, 2007. Recent. Type locality: 04°39'S, 55°31'E, off eastern Mahe, Seychelle Islands.

#### *Mascarenichthys heemstrai* Schwarzhans & Møller, 2007

(Fig. 10)

**Material examined.** 97 specimens: 77 specimens in Schwarzhans & Møller (2007); 20 additional specimens – SAIAB 1951, 1 female, 37 mm SL, 1 juvenile 19 mm SL, 16°28'S, 59°35'E, St. Brandon shoals, 20 March 1971; SAIAB 2067, 2 males, 42 & 42 mm SL, 2 females, 47 & 48 mm SL, 1 juvenile, 29 mm SL, 20°16'S, 57°46'E, Mauritius, 6 March 1971; SAIAB 4191, 3 males, 28–37 mm SL, 4 females, 42–49 mm SL, 20°17'S, 57°26'E, Mauritius, 7 November 1973; SAIAB 11701, 3 males, 33–41 mm SL, 2 females, 44–47 mm SL, 12°20'S, 40°37'E, Ibo Island, Mozambique, August 1951; SAIAB 78234, 1 female, 26 mm SL, Mahe, Seychelles, 9 May 2005.

**Remarks on distribution.** The additional material confirms the presence of *M. heemstrai* at Mauritius and extends the distribution of the species to mainland East Africa along the shores of Mozambique.



① *Majungaichthys simplex* ② *Majungaichthys agalegae*  
 ③ *Mascarenichthys heemstrai* ④ *Mascarenichthys microphthalmus*  
 ⑤ *Mascarenichthys remotus* ★ *Mascarenichthys* sp.

**Fig. 10.** Sample sites of the species of the genera *Majungaichthys* Schwarzhans & Møller, 2007 and *Mascarenichthys* Schwarzhans & Møller, 2007. One symbol may represent several samples.

***Mascarenichthys remotus* sp. nov.**

(Figs 10–12; Table 3)

**Material examined.** (2 specimens, 27–30 mm SL).

**HOLOTYPE** – SAIAB 68756, male, 30 mm SL, 19°39'S, 63°28'E, Rodrigues Island, Riviere Banane, 17 September 2001. **PARATYPE** – SAIAB 118981, 1 male, 28 mm SL, same data as holotype.

**Diagnosis.** Vertebrae 12+30 or 31=42 or 43, dorsal fin rays 76 or 77, anal fin rays 62 or 63. Head with scale patch on cheeks with 4 rows on upper cheek and 2 rows on lower cheek. Two pairs of pseudoclaspers, outer pseudoclasper flap-shaped, bent outwards, with pointed tip and symmetrical fleshy expansions anterior and posterior, inner pseudoclasper small, narrow, anteriorly inclined, not hidden in below isthmus in resting position. Otolith with suleus with separate small cauda and large ostium, otolith length to otolith height 2.1.

**Description** (Figs 11, 12). The principle meristic and morphometric characters of *Mascarenichthys remotus* are shown in Table 3. Body slender, mature at about 25 mm SL, probably not growing much larger. Head with moderately pointed snout and with scale patch on check containing 4 vertical rows of scales on upper part and 2 vertical

**Table 3.** Meristic and morphometric characters of *Mascarenichthys remotus* sp. nov.

	Holotype SAIAB 68756	Paratype SAIAB ex. 68756
Standard length in mm	30	28
Dorsal fin rays	77	76
Caudal fin rays	-	-
Anal fin rays	63	62
Pectoral fin rays	20	19
Precaudal vertebrae	12	30
Caudal vertebrae	12	31
Total vertebrae	42	43
Rakers on anterior gill arch	9+2-1+2	9+2-1+3
Pseudobranchial filaments	2	2
D/V	6	6
D/A	22	21
V/A	14	14
Head length	25.2	25.9
Head width	12.0	11.3
Head height	14.5	14.4
Snout length	5.5	5.8
Upper jaw length	13.2	13.4
Diameter of pigmented eye	3.2	2.9
Diameter of pupil	2.0	1.8
Interorbital width	6.6	6.8
Posterior maxilla height	3.9	4.1
Postorbital length	16.7	18.1
Prealanal length	46.4	46.9
Predorsal length	31.5	30.8
Body depth at origin of anal fin	14.2	15.1
Pectoral fin length	15.8	16.8
Pectoral fin base height	5.2	5.7
Ventral fin length	26.6	25.7
Base ventral fin - anal fin origin	27.7	28.6

rows on lower part (Fig. 12 A, C). Horizontal diameter of scales on body about 1.5% SL, in about 20 horizontal rows. Maxillary ending far behind eyes, dorsal margin of maxillary covered by upper lip dermal lobe, posterior end expanded, angular. Anterior nostril positioned low, 1/4 the distance from upper lip to anterior margin of eye. Posterior nostril very small, less than 1/6 size of eye. Opercular spine with free tip, pointed. Anterior gill arch with 14 rakers, 3 elongate. Pseudobranchial filaments 2.



**Fig. 11.** *Mascarenichthys remotus* sp. nov. Holotype. SAIAB 68756, male, 30 mm SL.

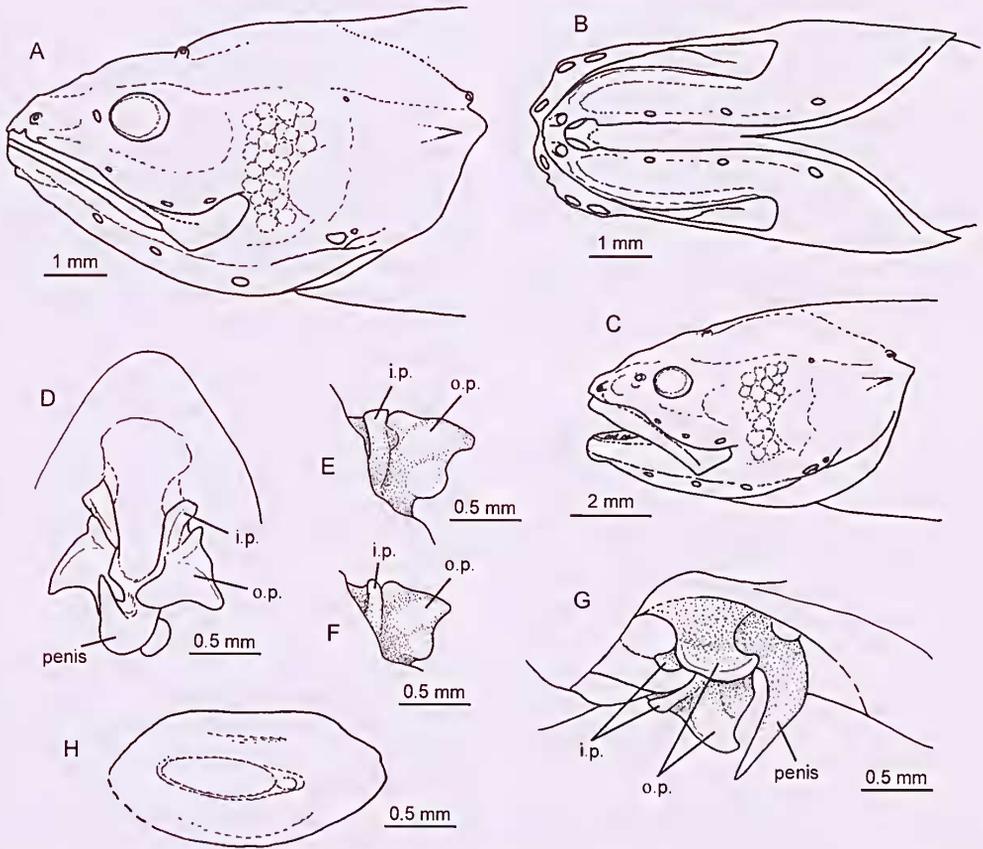


Fig. 12. *Mascarenichthys remotus* sp. nov.: A, lateral view of head, holotype; B, ventral view of head, paratype; C, lateral view of head, SAIAB 11891, male, 28 mm SL; D, ventral view of male copulatory organ, holotype; E, view of left pseudoclasper from inside, holotype; F, view of left pseudoclasper from inside, SAIAB 11891, 28 mm SL; G, inclined lateral view of male copulatory organ, holotype; H, median view of right otolith, holotype.

**Head sensory pores** (Fig. 12 A–C). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior): three posterior pores about  $\frac{1}{3}$  the size of three anterior pores. Mandibular pores 6 (3 anterior and 3 posterior); first anterior mandibular pore without cirrus. Preopercular pores: 3 lower, first and second with joined opening; third non-tubular; tubular upper preopercular pore.

**Dentition** (of holotype). Premaxilla with 3 outer rows of granular teeth and one inner row of larger teeth anteriorly. Anteriormost teeth in inner row up to  $\frac{1}{2}$  diameter of pupil. Vomer horseshoe-shaped, with 1 outer row of small teeth and 1 inner row of larger teeth up to  $\frac{1}{3}$  diameter of pupil. Palatine with an outer row of small teeth and an outer row of larger teeth up to  $\frac{1}{3}$  diameter of pupil. Dentary with 4 outer rows of granular teeth and 1 inner row of larger teeth, up to about  $\frac{1}{2}$  diameter of pupil.

**Otolith** (Fig. 12 H). Elongate in shape, length to height 2.1 (30 mm SL). Anterior tip rounded, short, posterior rim expanded. Dorsal rim with rounded pre- and angular postdorsal angles, section in between nearly straight, small concavity towards posterior tips; ventral rim gently curved

(poorly preserved). Inner face moderately convex. Otolith length to sulcus length 1.9. Sulcus positioned slightly towards anterior, with separated colliculi, slightly inclined. Ostium much larger than cauda (ostium length to cauda length about 5.5). Ventral furrow indistinct.

**Axial skeleton**. Neural spine of vertebra (3)4 inclined and 5–8 depressed. Parapophyses present from vertebrae 7 to 12. Pleural ribs on vertebrae 2 to 11. First anal fin pterygophore elongate, reaching tip of last precaudal parapophysis.

**Male copulatory organ** (Fig. 12 D–G). Two pairs of pseudoclaspers; outer pseudoclasper flap-shaped, bent outwards, with broad basis and pointed tip, anterior and posterior margins expanded at about mid-section; inner pseudoclasper small, narrower, anteriorly inclined, connected with a ligament to isthmus, but otherwise free from isthmus. Penis curved, slightly longer than pseudoclaspers, with broad base and pointed tip.

**Colour**. Preserved colour uniformly pale. Live colour unknown.

**Comparison**. *Mascarenichthys remotus* is easily distinguished from the widespread *M. heemstrai* and the

South African endemic *M. microphthalmus* by the presence of 12 precaudal vertebrae (versus 11), the high number of dorsal fin rays (76 or 77 versus 63–73) and anal fin rays (62 or 63 versus 47–57), the shape of the pseudoclaspers with the inner pseudoclasper not hidden in a pocket of the isthmus in the resting position and the slightly more compressed otolith (length to height 2.1 vs 2.3–2.5).

**Distribution.** Endemic to the Rodrigues Islands in the southern Indian Ocean.

**Etymology.** From *remotus* (Latin = far away, distant, remote) referring to the remote location of this endemic species. The name is intended as a noun in apposition.

*Nielsenichthys* gen. nov.

(Figs 2, 13, 14; Table 4)

Gender masculine. Type species, here designated, *Nielsenichthys pullus*. Recent. Type locality: Nusa Penida, Bali, Indonesia.

**Diagnosis.** A genus of Dinematchthyini with the following combination of characters: anterior nostril placed high on snout (nearly half the distance from upper lip to anterior margin of eye). Male copulatory organ with 2 pairs of equally large pseudoelaspers connected by thin ligament. Both pseudoelaspers slender, each with single straight supporter, inner pseudoelasper positioned anterior of outer pseudoelasper. Fish small, up to about 40 mm SL length. Precaudal vertebrae 12; dorsal fin rays 84–90, anal fin rays 59–67. Head with scale patch on cheek only, no scales on operculum. Upper preopercular pore present. Maxilla expanded postventrally. Otolith elongate (otolith length to height 2.2–2.3), colliculi separated, ostium approaching close to anterior rim of otolith, ostium length to cauda length 3.3–3.8.

**Comparison.** *Nielsenichthys* belongs to the Dinematchthyini with a high position of the anterior nostril, like *Alionematchthys* Møller & Schwarzhans, 2008, *Dinematchthys* Bleeker, 1855 and *Porocephalichthys* Møller & Schwarzhans, 2008. (Certain species of the genera *Diancistrus* Ogilby, 1898, *Eusurculus* Schwarzhans & Møller, 2007 and *Lapitaichthys* Schwarzhans & Møller, 2007 may also have elevated anterior nostrils, but not less than 1/3 the distance from the upper lip to the anterior margin of the eye.) From these three genera, *Nielsenichthys*

shares the head squamation being restricted to the cheeks with *Alionematchthys* while in the other two genera the entire head is covered by scales. *Nielsenichthys* differs from all genera mentioned above by the pseudoclasper pattern consisting of a pair of equally long and slender inner and outer pseudoclaspers, the inner being positioned anteriorly of the outer and connected to it by a thin ligament (versus inner pseudoclasper much smaller than outer pseudoclasper and inserted at the same level than the outer pseudoclasper). The otoliths of *Nielsenichthys* differ from those of all other known Recent Dinematchthyini by the very close approach of the ostium to the anterior rim of the otolith, almost as if opening to it.

**Species.** *Nielsenichthys* is a monospecific genus with *N. pullus* described below from Nusa Penida near Bali, Indonesia.

**Etymology.** Named in honour of Jørgen Nielsen, Copenhagen, ZMUC, in recognition of his many contributions to the biology and systematics of the Ophidiiformes.

*Nielsenichthys pullus* sp. nov.

(Figs 2, 13, 14; Table 4)

**Material examined.** (3 specimens, 25–38 mm SL). HOLOTYPE – WAM P.33102-003, male, 38 mm SL, 08°48'S, 115°36'E, Nusa Penida, Bali, Indonesia, Sekartaji on SE side of Island, depth 15–20 m, coll. G.R. Allen & Erdmann, M., November 2008. PARATYPES – WAM P.33102-019, 1 female, 25 mm SL, same data as holotype; WAM P.33063-001, 1 female, 34 mm SL, 08°41'S, 115°28'E, Nusa Ceningan Channel, Lembongan, Indonesia, depth 13–15 m, coll. G.R. Allen, 29 November 2008.

**Diagnosis.** See generic diagnosis.

**Description** (Figs 13, 14). The principle meristic and morphometric characters of *Nielsenichthys pullus* are shown in Table 4. Body slender, mature at about 35 mm SL. Head with rounded snout and with scale patch on cheek containing 4 or 5 vertical rows of scales on upper part and 3 vertical rows on lower part (Fig. 14A); no scales on opercle. Horizontal diameter of scales on body about 1.7% SL, in 24 horizontal rows. Maxillary ending far behind eyes, dorsal margin of maxillary covered by upper lip dermal lobe, posterior end expanded, angular. Anterior nostril positioned



Fig. 13. *Nielsenichthys pullus* sp. nov. Holotype. WAM P.33102-003, male, 38 mm SL.

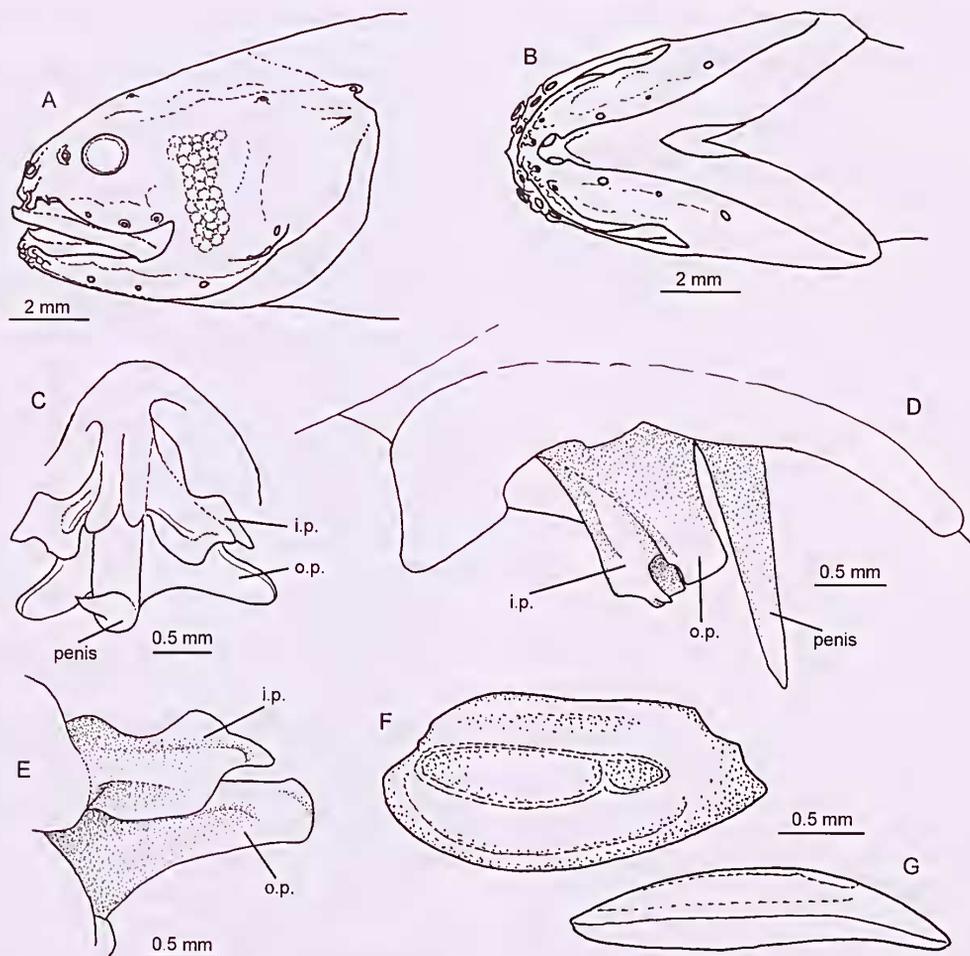


Fig. 14. *Nielsenichthys pullus* sp. nov. Holotype: A, lateral view of head; B, ventral view of head; C, ventral view of male copulatory organ; D, inclined lateral view of male copulatory organ; E, view of left pseudoclasper from inside; F, median view of right otolith; G, ventral view of right otolith.

high, nearly at half the distance from upper lip to anterior margin of eye. Posterior nostril very small, less than  $1/6$  size of eye, with fleshy flap anteriorly. Opercular spine with free tip, pointed. Anterior gill arch with 12–14 rakers, thereof 3 elongate. Pseudobranchial filaments 2.

**Head sensory pores** (Fig. 14 A,B). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior): three posterior pores about half the size of three anterior pores, two most posterior pores tubular. Mandibular pores 6 (3 anterior and 3 posterior); first anterior mandibular pore with cirrus. Preopercular pores: 3 lower, first and second with joined opening; third non-tubular; tubular upper preopercular pore.

**Dentition** (of holotype). Premaxilla with 3 outer rows of granular teeth and one inner row of larger teeth anteriorly. Anteriormost teeth in inner row up to  $1/2$  diameter of pupil. Vomer horseshoe-shaped, with 3 outer rows of small teeth and one inner row of large teeth up to  $1/3$  diameter of pupil.

Palatine with 1 outer row of small teeth and 1 inner row of larger teeth up to  $1/3$  diameter of pupil. Dentary with 3 outer rows of granular teeth and 1 inner row of larger teeth anteriorly, up to about  $2/3$  diameter of pupil.

**Otolith** (Fig. 14 F,G). Elongate in shape, length to height 2.2–2.3 (34–38 mm SL). Anterior tip slightly pointed, posterior rim expanded. Dorsal rim with angular pre- and postdorsal angles, section in between long, nearly straight, small concavity towards anterior and posterior tips; ventral rim gently curved, deepest anterior of its middle. Inner face markedly convex, particularly posterior, outer face slightly concave. Sulcus long, close approaching anterior rim of otolith and nearly opening to it, otolith length to sulcus length 1.5–1.6. Sulcus positioned slightly towards anterior, with clearly separated colliculi, with ventrally incised collum, not inclined. Ostium larger than cauda (ostium length to cauda length 3.3–3.8). Ventral furrow

**Table 4.** Meristic and morphometric characters of *Nielsenichthys pullus* sp. nov.

	Holotype WAM P.33102-003	Holotype + 2 paratypes	N
	Mean (range)		
Standard length in mm	37	32.0 (25–37)	3
<b>Meristic characters</b>			
Dorsal fin rays	90	87.7 (84–90)	3
Caudal fin rays	13	13.7 (13–14)	3
Anal fin rays	67	63.3 (59–67)	3
Pectoral fin rays	21	21.7 (21–22)	3
Precaudal vertebrae	12	12	3
Caudal vertebrae	31	30.7 (30–31)	3
Total vertebrae	43	42.7 (42–43)	3
Rakers on anterior gill arch	9+2-1+2	13.0 (12–14)	3
Pseudobranchial filaments	2	2	3
D/V	5	5.3 (5–6)	3
D/A	28	28.7 (28–30)	3
V/A	15	14.7 (14–15)	3
<b>Morphometric characters in % of SL</b>			
Head length	25.5	26.3 (25.5–27.7)	3
Head width	14.9	13.7 (13.1–14.9)	3
Head height	16.2	15.6 (14.7–16.2)	3
Snout length	5.7	6.0 (5.7–6.3)	3
Upper jaw length	13.1	13.2 (13.1–13.4)	3
Diameter of pigmented eye	2.9	2.9 (2.9–3.1)	3
Diameter of pupil	1.6	1.8 (1.6–1.8)	3
Interorbital width	6.8	7.1 (6.8–7.4)	3
Posterior maxilla height	3.9	3.9 (3.7–3.9)	3
Postorbital length	17.2	17.5 (17.2–17.7)	3
Precanal length	49.9	47.6 (44.5–49.9)	3
Predorsal length	30.7	30.9 (30.7–31.2)	3
Body depth at origin of anal fin	17.3	15.8 (14.6–17.3)	3
Pectoral fin length	14.4	14.9 (14.4–15.3)	3
Pectoral fin base height	6.1	6.6 (6.1–7.3)	3
Ventral fin length	26.6	25.8 (23.8–27.1)	3

distinct, long, terminating close to anterior and posterior tips of sulcus.

**Axial skeleton.** Neural spine of vertebra 4 inclined and 5–8 (–9) depressed. Parapophyses present from vertebrae 7 to 12. Pleural ribs on vertebrae 2 to 11. First anal fin pterygophore elongate, reaching tip of last precaudal parapophysis in males but not in females.

**Male copulatory organ** (Fig. 14 C–E). Two pairs of large and equally long, slender pseudoclaspers, each with single straight supporter; outer pseudoclasper with blunt tip; inner pseudoclasper positioned slightly in front of outer pseudoclasper, with pointed tip and thin fleshy flaps at anterior and posterior margins. Pseudoclaspers connected with thin ligament along entire length, which however disintegrates easily to result in apparently free inner and outer pseudoclaspers (see Fig. 14 E). Penis straight, longer than pseudoclaspers, with pointed tip.

**Colour.** Dark brown after a short period of preservation.

**Comparison.** See comparison between *Nielsenichthys* and other genera.

**Distribution.** Known only from the coast around Nusa Penida near Bali.

**Etymology.** From *pullus* (Latin = dark) referring to the dark colour of the fishes. The name is adjectival.

#### *Paradiancistrus* Schwarzhans, Møller & Nielsen, 2005

Genus masculine. Type species, by original designation, *Paradiancistrus acutirostris* Schwarzhans, Møller & Nielsen, 2005. Recent. Type locality: 16°47'S, 168°21'E, Makura Island, Shephard Islands, Vanuatu.

#### *Paradiancistrus christmasensis* sp. nov.

(Figs 15–17; Table 5)

**Material examined.** (1 specimen, 68 mm SL). HOLOTYPE – WAM P.29004-006, female, 10°28'S, 105°35'E, Indian Ocean, Christmas Island, Vincent Point, northern side, 15–22 m, coll. G.R. Allen & R. Steene, 29 June 1986.

**Diagnosis.** Vertebrae 11+32=43, dorsal fin rays 78, anal fin rays 67. Head with narrow scale patch on cheeks with 3 rows on upper cheek and 2 rows on lower cheek; no scales on operculum. Stubby snout profile. Lower preopercular pore 1. Otolith with undifferentiated, short sulcus, dorsal rim



**Fig. 15.** *Paradiancistrus christmasensis* sp. nov. Holotype. WAM P.29004-006, female, 68 mm SL.

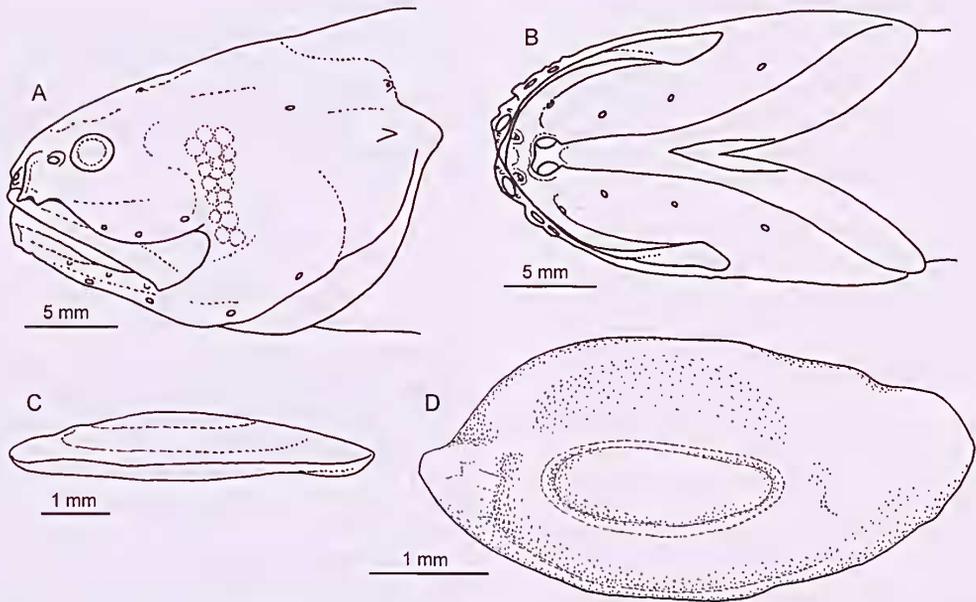


Fig. 16. *Paradiancistrus christmasensis* sp. nov. Holotype: A, lateral view of head; B, ventral view of head; C, ventral view of right otolith; D, median view of right otolith.

anteriorly expanded, posteriorly depressed, otolith length to otolith height 2.15, otolith length to sulcus length 2.3.

**Description** (Figs. 15, 16). The principle meristic and morphometric characters of *Paradiancistrus christmasensis* are shown in Table 5. Body with massive head and stubby snout. Head with narrow scale patch on cheek containing 3 vertical rows of scales on upper part and 2 vertical rows on lower part (Fig. 16 A). Horizontal diameter of scales on body about 1.7% SL, in about 25 horizontal rows. Maxillary ending far behind eye, dorsal margin of maxillary covered by upper lip dermal lobe, posterior end expanded, angular. Anterior nostril positioned low, 0.2 the distance from upper lip to anterior margin of eye. Posterior nostril small, about 0.25 the size of eye. Opercular spine with free tip, pointed. Anterior gill arch with 17 rakers, 3 of which are elongate. Pseudobranchial filaments 2.

**Head sensory pores** (Fig. 16 A,B). Supraorbital pores 3. Infraorbital pores 6 (3 anterior and 3 posterior): three posterior pores about half size of 3 anterior pores. Mandibular pores 6 (3 anterior and 3 posterior); first anterior mandibular pore without cirrus. Preopercular pores: 1 lower non-tubular, 1 upper non-tubular.

**Dentition** (of holotype). Premaxilla with 4 outer rows of granular teeth and one inner row of larger teeth anteriorly. Anteriormost teeth in inner row up to same diameter as pupil. Vomer horseshoe-shaped, with 3 outer rows of small teeth and one inner row of large teeth up to same diameter as pupil. Palatine with 3 rows of 10+6+10 teeth up to 0.5 diameter of pupil. Dentary with 4 outer rows of granular teeth and 1 inner row of larger teeth anteriorly, up to about same diameter as pupil.

**Otolith** (Fig. 16 C–D). Elongate in shape, length to height 2.15 (68 mm SL). Anterior tip pointed, short, posterior rim expanded. Dorsal rim with expanded predorsal area and depressed postdorsal area, section in between nearly inclined; ventral rim gently curved, deepest at about its middle. Inner face moderately convex, outer face flat. Otolith length to sulcus length 2.3. Sulcus positioned slightly towards anterior and inferior, undivided with fused colliculi, inclined by about 10°. Ventral furrow distinct, close to ventral rim of otolith, anteriorly bent upward to anterior tip of sulcus.

**Axial skeleton.** Neural spine of vertebrae 4–5 inclined and 6–8 depressed. Parapophyses present from vertebrae 7 to 11. Pleural ribs on vertebrae 2 to 10. First anal fin

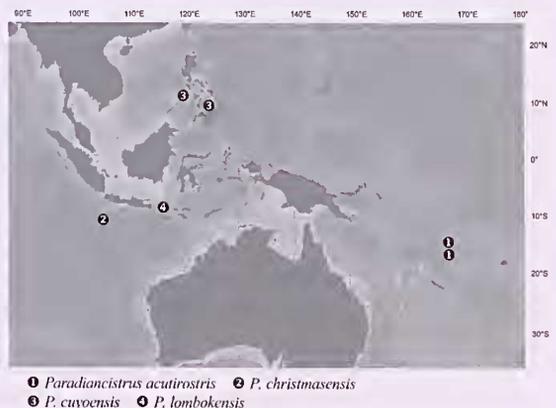


Fig. 17. Sample sites of the species of the genus *Paradiancistrus* Schwarzhans, Møller & Nielsen, 2005. One symbol may represent several samples.

**Table 5.** Meristic and morphometric characters of *Paradiancistrus christmasensis* sp. nov.

	Holotype WAM 29004-006
Standard length in mm	68
Dorsal fin rays	78
Caudal finrays	-
Anal fin rays	67
Pectoral fin rays	19
Precaudal vertebrae	11
Caudal vertebrae	32
Total vertebrae	43
Rakers on anterior gill arch	11+2-1+3
Pseudobranchial filaments	2
D/V	7
D/A	19
V/A	13
Head length	27.9
Head width	15.8
Head height	16.5
Snout length	5.9
Upper jaw length	14.8
Diameter of pigmented eye	2.3
Diameter of pupil	1.8
Interorbital width	6.8
Posterior maxilla height	4.9
Postorbital length	19.7
Precanal length	47.0
Predorsal length	34.5
Body depth at origin of anal fin	17.4
Pectoral fin length	15.6
Pectoral fin base height	5.6
Ventral fin length	15.6
Base ventral fin - anal fin origin	27.4

pterygophore elongate, not quite reaching tip of last precaudal parapophysis.

*Male copulatory organ.* Not known.

**Colour.** Preserved colour pale. Live colour not known.

**Biology.** The holotype is a gravid female, containing embryos 2.6 mm long with a yolk sac.

**Comparison.** *Paradiancistrus christmasensis* is the fourth species that has become known of this genus, which is readily recognised by the presence of only a single lower preopercular pore, a character shared only with *Pseudogilbia* Møller, Schwarzhans & Nielsen, 2004 from the tropical western Atlantic. In body shape and size, *P. christmasensis* resembles best *P. cuyoensis* Schwarzhans, Møller & Nielsen, 2005 from the northern Philippines, but differs in the narrower scale patch on the cheeks, the higher number of anal fin rays (67 versus 62–65) combined with a smaller preanal length (47% of SL versus 51–52%) and differences in shape and proportions of the otolith. *Paradiancistrus christmasensis* is thus well defined and differentiated from other *Paradiancistrus* species despite the lack of a male and the lack of knowledge of the pseudoclasper pattern.

**Distribution.** The species of *Paradiancistrus* are all rare, presently being known from one or two specimens each occurring at widely separated locations such as northern Philippines, Vanuatu, Lombok Island of Indonesia, and now the Christmas Island in the southeastern Indian Ocean.

**Etymology.** Referring to the type locality. The name is adjectival.

## DISCUSSION

The identification and description in this work of five new species of Dinematichthyini from the Indo-west Pacific demonstrate that despite the intensive review published by the authors in four parts between 2005 and 2008, the faunal inventory of the group is still incomplete. Two of the newly established species come from remote islands (Christmas Island in the northeastern Indian Ocean and Rodrigues Island), one originates from the Indonesian Archipelago, and two stem from refinements in the definition of previously described species. Another blind cave-living dinematichthyine has recently been described from Sulawesi, Indonesia – *Diancistrus typhlops* Nielsen, Schwarzhans & Hadiaty, 2009. We postulate that particularly the Indonesian Archipelago is very likely to yield further undescribed dinematichthyine species. Other, still underrepresented regions are East Africa and Madagascar, as well the Andaman Islands and the shores of Myanmar and Thailand.

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## REFERENCES

- Allen, G.R. 1985. *Fishes of Western Australia. Pacific Marine Fishes, book 9*. TFH Publications Inc.: Neptune City, New Jersey.
- Bleeker, P. 1855. Bijdrage tot de kennis der ichthyologische fauna van de Batoe Eilanden. *Natuurkundig Tijdschrift voor Nederlandsch Indië* 8: 305–328.
- Cohen, D.M. 1966. A new tribe and a new species of ophidioid fish. *Proceedings of the Biological Society of Washington* 79: 183–204.
- Cohen, D.M. & Nielsen J.G. 1978. Guide to the identification of genera of the fish order Ophidiiformes with a tentative classification of the order. *NOAA Technical Report NMFS Circular* 417: i–vii + 1–72.

- Eschmeyer, W.N. & Fricke, R. (eds.) 2011. Catalog of fishes electronic version (14 July 2011). – Internet publication, San Francisco (California Academy of Sciences). <http://research.calacademy.org/research/Ichthyology/Catalog/fishcatmain.asp>
- Fricke, R. & Eschmeyer, W.N. 2011. A guide to fish collections in the Catalog of fishes. Online version, updated 14 July 2011. – Internet publication, San Francisco (California Academy of Sciences). <http://research.calacademy.org/research/Ichthyology/Catalog/collections.asp>
- Günther, A. 1862. *Catalogue of fishes in the British Museum. Catalogue of the Acanthopterygii, Pharyngognathi and Anaeanthini in the collection of the British Museum*, 4 i–xxi + 1–534. British Museum: London.
- Machida, Y. 1993. Two new genera and species of the subfamily Bromphycinac (Bythitidae, Ophidiiformes) from northern Australia. *Japanese Journal of Ichthyology* 39(4): 281–286.
- Moller, P.R., Schwarzahns W. & Nielsen J.G. 2004. Review of the American Dinematchthyini (Teleostei, Bythitidae). Part I. *Dinematichthys*, *Gunterichthys*, *Typhliasina* and two new genera. *Aqua* 8(4): 141–192.
- Moller, P.R., Schwarzahns W. & Nielsen J.G. 2005. Review of the American Dinematchthyini (Teleostei, Bythitidae). Part II. *Ogilbia*. *Aqua* 10(4): 133–207.
- Moller P.R. and Schwarzahns W. 2006. Review of the Dinematchthyini (Teleostei: Bythitidae) of the Indo-west Pacific. Part II. *Dermatopsis*, *Dermatopsoides* and *Dipulus* with description of 6 new species. *The Beagle, Records of the Museums and Art Galleries of the Northern Territory* 22: 39–76.
- Moller P.R. and Schwarzahns W. 2008. Review of the Dinematchthyini (Teleostei: Bythitidae) of the Indo-west Pacific. Part IV. *Dinematichthys* and two new genera with descriptions of nine new species. *The Beagle, Records of the Museums and Art Galleries of the Northern Territory* 24: 87–146.
- Nielsen, J.G., Cohen D.M., Markle D.F. & Robins C. R. 1999. FAO species catalogue. Volume 18. Ophidiiform fishes of the world. An annotated and illustrated catalogue of pearl-fishes, cusk-eels, brotulas and other ophidiiform fishes known to date. *FAO Fisheries Synopsis* 125 (18): I–XI + 1–178.
- Nielsen, J.G., Schwarzahns, W. and Hadiaty, R.K. 2009. A blind, new species of *Dianeistrus* (Teleostei, Bythitidae) from three caves on Muna Island, southeast of Sulawesi, Indonesia. *Cybinum* 33 (3): 241–245.
- Ogilby, J.D. 1899. Additions to the fauna of Lord Howe Island. *Proceedings of the Linnean Society of New South Wales* 23 [for 1898]: 730–745.
- Schwarzahns, W., Moller P.R. and Nielsen J.G. 2005. Review of the Dinematchthyini (Teleostei: Bythitidae) of the Indo-west Pacific. Part I. *Dianeistrus* and two new genera with 26 new species. *The Beagle, Records of the Museums and Art Galleries of the Northern Territory* 21: 73–163.
- Schwarzahns, W. & Moller P.R. 2007. Review of the Dinematchthyini (Teleostei, Bythitidae) of the Indo-west Pacific. Part III. *Beagliethys*, *Brosmolus*, *Monothrix* and 8 new genera with description of 20 new species. *The Beagle, Records of the Museum and Art Galleries of the Northern Territory* 23: 29–110.
- Sedor, A.N. 1985. A phylogenetic hypothesis based on the male copulatory complex in dinematchthyine fishes (order Ophidiiformes, family Bythitidae). Unpublished M. Sc. thesis, University of Southern California.

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