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Parabothus rotundifrons (Pleuronectiformes: Bothidae), a new bothid flatfish from Saya de Malha Bank (Indian Ocean)

by

Elena VORONINA* (1), Patrice PRUVOST (2) & Romain CAUSSE (2)

Abstract. – Nine species of *Parabothus* are currently recognized. A new bothid flatfish, *Parabothus rotundifrons*, is described from six specimens. It is considered as a species of *Parabothus* because of caudal skeleton structure, moderate width of concave interorbital space in male and moderate body depth in both male and female. *P. rotundifrons* is easily separable from other congeners by having a lowest number of scales in the lateral line (48-58), biserial teeth on the upper jaw, steep dorsal profile of the head, 8-9 non-serrate gill rakers on the low limb of the first arch, perforated membrane of dorsal and anal fins. *P. rotundifrons* is known from the Saya de Malha Bank, Mascareignes Plateau, Indian Ocean.

Résumé. – *Parabothus rotundifrons* (Pleuronectiformes : Bothidae), un nouveau bothidé du banc de Saya de Malha (océan Indien).

Neuf espèces du genre *Parabothus* sont actuellement reconnues. Un nouveau Bothidae, *Parabothus rotundifrons*, est décrit à partir de six spécimens. Celui-ci est considéré comme appartenant au genre *Parabothus* de par la structure squelettique de la nageoire caudale, la largeur modérée de l'espace interorbitaire concave chez les mâles et la hauteur modérée du corps chez les mâles et les femelles. *P. rotundifrons* est aisément distinguable de ses congénères par un plus petit nombre d'écailles de la ligne latérale (48-58), deux séries de dents sur la mâchoire supérieure, un profil de tête abrupt, 8-9 épines branchiostégales non crantées sur la partie inférieure du premier arc branchial, et la membrane des nageoires dorsale et anale perforée. *P. rotundifrons* est connu du banc Saya de Malha, sur le plateau marin des Mascareignes, en océan Indien.

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New species

Parabothus is an Indo-Pacific bothid genus presently comprising nine nominal species: *P. amaokai* Parin, 1983, *P. budkeri* (Chabanaud, 1943), *P. chlorospilus* (Gilbert, 1905), *P. coarctatus* (Gilbert, 1905), *P. filipes* Amaoka, Mihara & Rivaton, 1997, *P. kiensis* (Tanaka, 1918), *P. malhensis* (Regan, 1908), *P. polylepis* (Alcock, 1889), *P. taiwanensis* Amaoka and Shen, 1993. Some of the known species have wide distribution, others are restricted to specific zones and depth ranges. Three species (*P. budkeri*, *P. malhensis*, *P. polylepis*) are known from Western Indian Ocean, one species (*P. amaokai*) from Eastern Pacific (Nazca Ridge) and five other species from Western Central Pacific.

Six bothid specimens collected during the eighth and ninth exploring cruises of medium freezer trawler *El'sk* from the Saya de Malha Bank were identified, included into the published list of materials and kept in the collection of the Zoological Institute (St. Petersburg) as *Engyprosopon* sp. (Foroshchuk, 1990). Recent re-examination revealed that these specimens are not *Engyprosopon* species with respect to the width of the interorbital space and aspects of their caudal skeleton, considered to be diagnostic generic characters. The aim of the present study is to formally describe this species, which is in fact a new *Parabothus* species.

METHODS

All measurements refer to standard length (SL), unless noted otherwise. Measurements were taken to the nearest 0.1 mm with dial calipers. Counts and measurements follow Amaoka *et al*. (1997). Radiographs were used for the osteological examination and vertebral counts. Institutional abbreviations follow Sabaj Pérez (2014).

Parabothus rotundifrons new species
(Fig. 1, Tabs I-II)

Engyprosopon sp.: Foroshchuk, 1990: 5 (counts, morphometry)

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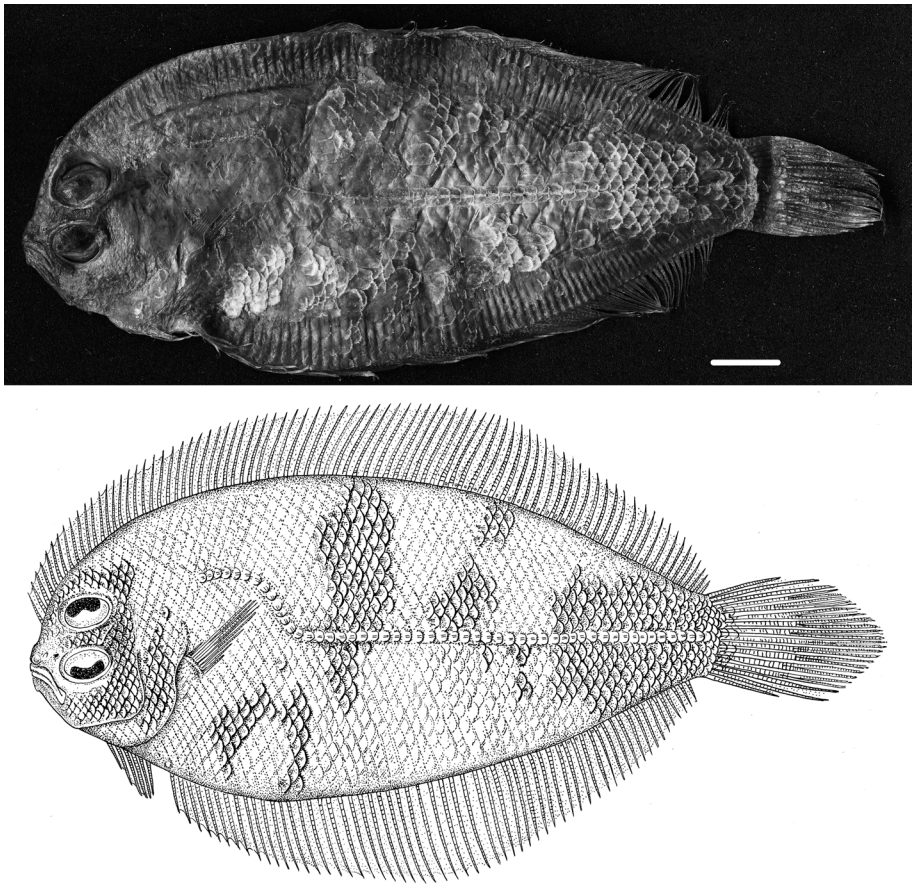


Figure 1. – *Parabothus rotundifrons* sp. nov. holotype, ZIN 49152, male, 108.5 mm SL.

Comparative material

Parabothus taiwanensis Amaoka & Shen, 1993. – MNHN 2012-0634, 8 specimens (4 females 92.3-108.2 mm SL, 4 males 73.1-99.1 mm SL), R/V *Alis*, Santo 06 cruise, station at 64, 15°66'S, 167°032'E, depth 249-252 m, West of Malo Island, Vanuatu, 4 Oct. 2006; MNHN 2012-0633, male 81.0 mm SL, R/V *Alis*, Santo 06 cruise, station at 13, 15°46'S, 167°26'E, Palikulo Bay, Aese Island, Vanuatu, depth 146-153 m, 19 Sep. 2006; MNHN 2012-0638, 5 spms (3 males 78.0-89.4 mm SL, 2 juv. 65.3 and 67.2 mm SL), R/V *Alis*, Santo 06 cruise, station at 05, 15°67'S, 167°06'E, depth 114-132 m, North-West of Malo Island, Vanuatu, 15 Sep. 2006; MNHN 2013-0329 6 spms (3 females 110.4-112.3 mm SL, 3 males 95.9-108.5 mm SL) and ZIN 55965 (female 109.8 mm SL, male 95.4 mm SL), R/V *Alis*, Santo 06 cruise, station at 33, 15°35' S, 167°17'E, depth 184-238 m, South Tutuba Island, Vanuatu, 26 Sep. 2006.

Parabothus budkeri (Chabanaud, 1943). – MNHN 1942-0031 (holotype, 84 mm SL) 27°16'N, 33°46'E, 516 fathom depth (circa 943.6 m depth), north of Shaab Abu Sadaf on Gohar Bank, Hurghada, Red Sea, Budker collector, 21 Dec. 1938; MNHN 1942-0032 (paratype, 119 mm SL) and MNHN 1942-0033 (paratype, 50 mm SL), same collection data as MNHN 1942-0031.

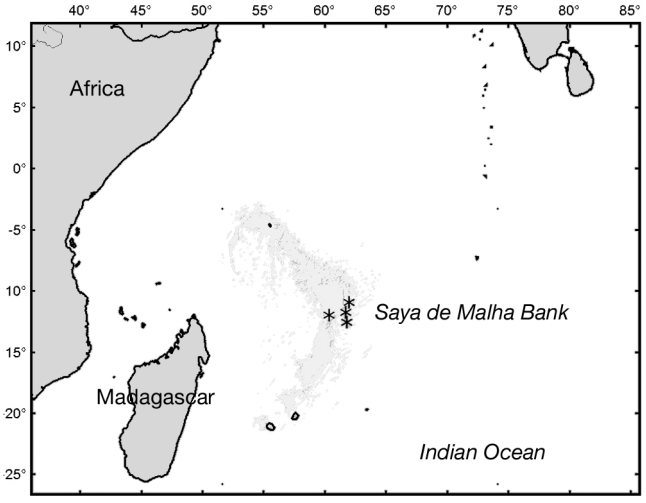


Figure 2. – Collection localities (∗) of specimens of *Parabothus rotundifrons*.

Material examined

Four males and two females collected from Saya de Malha Bank (Indian Ocean) with a size range of 73.0-108.0 mm SL.

Table I. – Comparison of morphometric characters for *Parabothus rotundifrons* and *Parabothus taiwanensis*. M: male; f: female; o: ocular side; b: blind side; na: not available; *: characters discriminating *Parabothus rotundifrons* from *Parabothus taiwanensis*.

	Parabothus rotundifrons		*Parabothus taiwanensis*	
	Holotype 108.0 mm SL m	Paratypes 73.0-97.0 mm SL 2 m + 3 f	Present study 65.0-112.13 mm SL 12 m + 8 f + 2 unsexed	Amaoka and Shen (1993) 80.4-148.5 mm SL 4 m + 1 unsexed
Morphometrics in SL				
Head length*	4.4	4.4-4.6	3.5-4.0	3.8-4.1
Body depth	2.2	2.2-2.4	2.2-2.5	2.2-2.5
Morphometrics in head length				
Snout length	5.3	4.0-5.3	3.3-4.6	4.2-5.0
Upper eye*	2.9	2.5-2.9	3.1-4.6	3.4-3.6
Lower eye*	3.1	2.5-3.3	3.2-4.6	3.4-3.7
Interorbital width*	14.4	12.2-21.5	5.5-11.0	5.8-9.8
Upper jaw (o)	3.5	2.7-3.0	2.3-3.7	2.9-3.1
Upper jaw (b)	3.1	2.7-3.1	2.3-3.1	2.9
Lower jaw (o)	2.3	2.1-2.2	1.8-2.4	2.2-2.3
Lower jaw (b)	2.2	1.9-2.0	1.8-2.3	2.0-2.3
Caudal peduncle depth*	1.9	2.0-2.1	2.3-3.0	2.3-2.5
Pectoral fin (o)	1.8	1.5-1.7	1.5-2.2	1.5-1.7
Pectoral fin (b)	2.9	2.7-3.4	2.6-3.6	2.7-3.4
Pelvic fin (o)	3.6	2.5-3.0	2.2-3.1	2.5-3.1
Pelvic fin (b)	3.4	2.4-3.2	2.6-3.5	2.8-3.4
Pelvic fin base (o)	2.7	2.5-3.3	2.4-3.7	2.7-3.2
Pelvic fin base (b)	5.2	4.9-7.9	4.2-7.7	5.7-7.6
Longest dorsal fin ray*	1.8	1.5-2.0	2.1-3.0	2.0-2.3
Longest anal fin ray*	2.0	1.5-2.0	2.0-2.9	2.0-2.2
Midcaudal fin ray	1.2	1.0-1.3	1.3-1.4	na

Table II. – Counts of ten *Parabothus* species. Abbreviations are as follows: A: Amaoka (1969); AI: Amaoka and Imamura (1990); AM: Amaoka *et al*. (1997); AS: Amaoka and Shen (1993); C: Chabanaud (1942); N: Norman (1934); P: present study; Pa: Parin (1983); S: Shen (1983); VC: Voronina and Causse (2014).

	Vertebrae	Dorsal fin rays	Anal fin rays	Lateral line scales	Gill rakers	Sources
P. rotundifrons	10+29-30	92-99	72-78	48-58	0+8-9	P
P. taiwanensis	10+28-29	96-107	75-84	60-69	0+6-8	AS, VC, P
P. filipes	10+29-31	90-96	69-75	56-66	0+7-10	AM
P. coarctatus	9-10+32-35	106-118	87-98	88-99	0+8-11	AM
P. kiensis	10+31-33	104-119	83-95	80-88	0+7-10	A, AM
P. polylepis	—	83	63-66	82-85	?+8-9	N
P. chlorospilus	10+30-32	103-113	84-94	83-90	0+9-10	AM
P. malhensis	10+35-37	111-114	90-93	93-98	0+9-11	AI
P. budkeri	—	82-83	59-62	78-80	0-1+6-7	C
P. amaokai	10+30	103-105	87-89	70-75	0+15	Pa, AM

Holotype. – ZIN 49152, male 108.0 mm SL, Saya de Malha Bank, 11°26'S, 60°58'E, 178 m, trawl 81, 20 Apr. 1978, *El'sk* (USSR), ninth cruise (Fig. 2).

Paratypes. – ZIN 49153, female 90.0 mm SL, male 95.0 mm SL, Saya de Malha Bank, 11°42'S, 62°01'E, 235-250 m, *El'sk*, eighth cruise, trawl 109, 07 Sep. 1977; ZIN 49154, male 73.0 mm SL, Saya de Malha Bank, 11°10'S, 62°11'E, 230-232 m, *El'sk*, eighth cruise, trawl 125, 12 Nov. 1977; ZIN 49155, male 97.0 mm SL, female 78.2 mm SL, Saya de Malha Bank, 11°13'S, 62°10'E, 225 m, *El'sk*, eighth cruise, trawl 135, 14 Nov. 1977.

Diagnosis

A species of *Parabothus* with a narrow and concave interorbital space; no obvious sexual dimorphism; steep dorsal profile of the head with slight notch; 8-9 non-serrate gill rakers on the low limb of the first arch; small number of scales in lateral line (48-58); small knob on snout tip and on mandibular symphysis in both sexes; biserial teeth on upper jaw.

Description

Data for the holotype are given first, followed in brackets by the ranges for paratypes and mean for the holotype and paratypes. Morphometrics in SL, in head length and counts are shown in table I.

Dorsal fin rays 97 (92-99, 95.7); anal fin rays 73 (72-78, 74.3); pectoral fin rays 12 (11-13, 11.8) on ocular side, 9 (9-10, 9.3) on blind side; scales in lateral line 58 (48-58, 52.5); gill rakers 0+9 (0 + 8-9, 8.8); vertebrae 10+29 (10 + 29-30, 29.3).

Percent of SL: head length 22.58 (21.89-22.60, 22.26); body depth 45.53 (42.27-45.89, 44.53); snout length 4.61 (4.11-4.63, 4.43); upper eye diameter 7.74 (7.74-8.89, 8.29); lower eye diameter 7.19 (6.85-8.95, 7.82); interorbital width 1.6 (1.02-1.79, 1.46); length of ocular-side upper jaw 6.45 (6.45-8.11, 7.58); length of blind-side upper jaw 7.19 (7.19-8.18, 7.61); length of ocular-side lower jaw 9.77 (9.77-10.53, 10.29); length of blind-side lower jaw 10.41 (10.41-11.51, 11.01); depth of caudal peduncle 11.98 (10.68-11.98, 11.13); length of ocular-side pectoral fin 12.63 (12.63-15.07, 13.72); length of blind-side pectoral fin 7.74 (6.67-8.11, 7.43); length of ocular-side pelvic fin 6.27 (6.27-8.95, 7.94); length of blind-side pelvic fin 6.64 (6.64-9.18, 7.88); length of base of ocular side pelvic fin 8.48 (6.89-8.95, 7.89); length of base of blind side pelvic fin 4.33 (2.78-4.66, 3.56); length of longest dorsal fin ray 12.63 (11.13-14.21, 12.53); length of longest anal fin ray 11.34 (11.05-15.07, 12.61); length of midcaudal fin ray 18.99 (16.49-21.10, 19.02).

Body elliptical, deepest at about anterior 1/3 of body, its depth nearly half of body length. Caudal peduncle depth about 1/4 of body depth. Head small, its length about 1/4 of SL; dorsal profile steep, with a slight notch anterior to the interorbital area (Fig. 3A). Snout short, not prominent, shorter than eye diameter. Blunt rostral knob on ocular side of tip of snout. Eyes large, about equal to upper jaw length, lower eye slightly anterior to upper eye. Interorbital region moderately broad, deeply concave, without orbital spine. Nostrils on ocular side between rostral knob and upper margin of orbital ridge of lower eye; anterior nostril tubular with a posterior flap, posterior one not tubular, without flap; nostrils on blind side just below origin of dorsal fin, similar in shape but smaller than those on ocular side.

Mouth of moderate size, maxilla extending below anterior part of lower eye; prominent ventrally-directed knob on mandibular symphysis in males and females. Dentition about equally developed on both sides; teeth on upper jaw biserial, those of outer row stronger and more widely spaced than those of inner row, sometimes set irregularly; inner-row teeth close, regularly spaced; teeth on lower jaw uniserial, nearly equal in size and spacing to inner-row teeth on upper jaw. Tip of vomer not projecting far into mouth cavity. Scales large, deciduous, with short ctenii on ocular side, cycloid on blind side (Fig. 4A). Interorbital region scaled, tips of both jaws and snout naked on ocular side. Lateral line curved anteriorly on ocular side, absent on blind side. Gill rakers on first arch rather long and slender, not serrate, absent on upper limb (Fig. 4B).

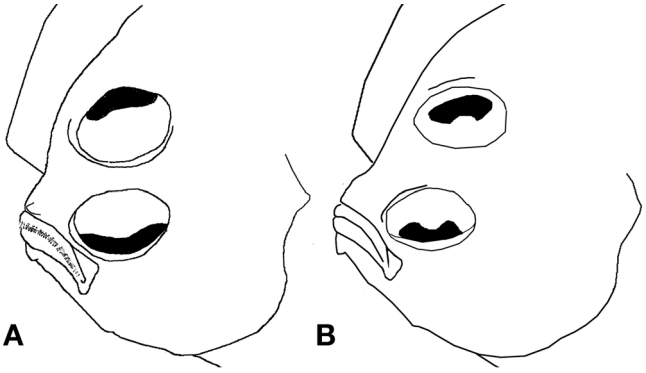


Figure 3. – Diagrammatic illustration of head of *Parabothus rotundifrons* sp. nov. **A**: Holotype, male, 108.5 mm SL ZIN 49152; **B**: *P. taiwanensis*, male, 108.5 mm SL, MNHN 2013-0329.

Dorsal fin origin on blind side, anterior to upper margin of lower eye, its height about half of head length. Anal fin origin below highest point of gill opening, it is similar to dorsal fin in shape. Bases of the membrane of the dorsal and anal fins perforated. Pectoral fin on both sides short, that on ocular side slightly longer than lower jaw length, that on blind side is half of that on ocular side.

Pelvic fin on ocular side originating at tip of isthmus, below posterior margin of lower eye; fourth ray of pelvic fin ocular side opposite first ray on blind side. Caudal fin pointed, two upper- and lowermost rays simple, other rays branched.

Vent opening on blind side, immediately anterior to origin of anal fin. Urogenital papilla on ocular side.

Colour of preserved specimens

Body with scales greyish brown, pale purple when scales are removed; no distinct colour pattern; body on blind side yellowish white. All fins uniformly greyish brown without any noticeable spots or blotches.

Sexual dimorphism

Studied specimens do not display sexual dimorphism in either external morphology or coloration, except interorbital

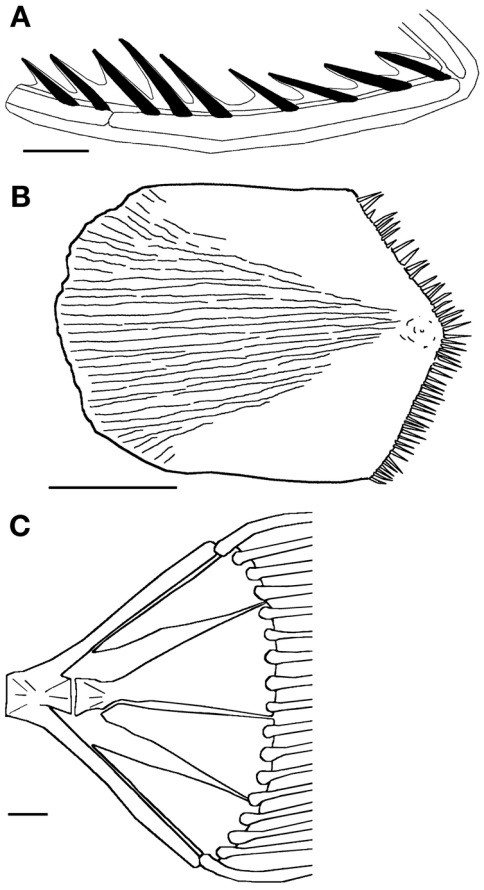


Figure 4. – *Parabothus rotundifrons*. **A**: First gill arch; **B**: Lateral line scale on ocular side; **C**: Caudal skeleton. Scale bars = 1 mm.

width, which is in females (16.9 and 21.5 in head length) somewhat narrower than in males (12.3-16.5).

Comparison

New species has a combination of characters that is only found in *Parabothus* and *Tosarhombus* – the eyes separated by a relatively wide and concave interorbital space, the parhypural-hypural-epural elements of the caudal skeleton have smooth distal margins without deep scissures (Fig. 4C), tip of the isthmus on a vertical line through the posterior margin of the lower eye. These two genera are closely related to each other (Amaoka *et al*., 1997). The genus *Tosarhombus* is characterized by an ovate body, a wide interorbital space, a strong rostral spine in males and white blotches along anterior head margin on the ocular side. The genus *Parabothus* is distinguished by an elliptical body, a narrow interorbital space, absence of rostral spine (rarely a blunt knob) in males and white blotches. The new species is considered as a member of *Parabothus* on the basis of its elliptical, not deeply ovate body, moderate width of interorbital space even in males, a small blunt knob and no white blotches on the head. It is close to *Parabothus filipes* and *Parabothus taiwanensis* in having the lowest number of lateral line scales (Tab. II). However, *Parabothus rotundifrons* is easily separable from *P. filipes* by biserial teeth, non-serrate gill rakers, short pelvic fin on ocular side in males and perforated membrane (vs uniserial teeth, serrated gill rakers, elongated pelvic fin and unperforated membrane in *P. filipes*). *Parabothus rotundifrons* is easily separable from *P. taiwanensis* by steep dorsal profile of the head with a slight notch (vs deeply concave in front of upper margin of lower eye in *P. taiwanensis*), larger number of gill rakers (8-9 vs 6-8) and smaller number of scales in lateral line (48-58 vs 60-69), shorter head (4.4-4.6 vs 3.5-4.0 in SL) and narrower interorbital area (12.3-21.5 in females vs 5.5-11.0 in head length) (Fig. 3, Tab. II). *Parabothus rotundifrons* has lower caudal peduncle depth (1.9-2.1 vs 2.3-3.0 in SL), somewhat bigger eyes (2.5-3.3 vs 3.1-4.6 in head length) and longer dorsal and anal fins rays (1.5-2.0 vs 2.0-3.0 in head length) comparatively to *P. taiwanensis*.

Distribution

Known from Saya de Malha Bank, Indian Ocean, at 178-250 m depth.

Etymology

The name *rotundifrons* is derived from Latin *rotund* (rounded) and *frons* (front) in reference to the rounded dorsal profile of head.

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