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Podotreme crabs from the western Indian Ocean: description of a new species of *Tymolus* Stimpson, 1858 with a review of regional distribution of the Cyclodorippidae (Crustacea: Decapoda: Brachyura: Podotremata)

Примитивные крабы из западной части Индийского океана: описание нового вида рода *Tymolus* Stimpson, 1858 с обзором регионального распространения семейства Cyclodorippidae (Crustacea: Decapoda: Brachyura: Podotremata)

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КЛЮЧЕВЫЕ СЛОВА: глубоководная фауна, распространение, эндемизм.

ABSTRACT. The podotreme crabs of the family Cyclodorippidae from the western Indian Ocean were studied in the course of the re-examination of the Deutsche Tiefsee Expedition collection. The only species of *Tymolus* known so far from the western Indian Ocean and previously identified as *Tymolus uncifer* (Ortmann, 1892) represents a new species, *Tymolus globosus* sp.n. Remarks on the variability and gonopod morphology of *T. uncifer* from East Asia, and a new record of *Tymolus brucei* Tavares, 1991 in Japan are also presented. In general, the hypothesis regarding a rather high endemism of the Cyclodorippidae fauna of the western Indian Ocean can not be rejected. Similarly to several decapod taxa the Cyclodorippidae have not been recorded from the Arabian Sea and the waters around the Arabian Peninsula.

РЕЗЮМЕ. В ходе повторного исследования материалов Немецкой глубоководной экспедиции исследованы крабы семейства Cyclodorippidae (Podotremata). Единственный вид, отмеченный в западной части Индийского океана и определенный ранее как *Tymolus uncifer* (Ortmann, 1892) описан как новый для науки *Tymolus globosus* sp.n. Представлены также замечания по изменчивости и морфологии гоноподов *Tymolus uncifer* из восточно-азиатских вод. *Tymolus brucei* Tavares, 1991 впервые отмечен для вод Японии. На сегодняшний день гипотеза о высокой степени эндемизма фауны Cyclodorippidae западной части Индийского океана не может быть отвергнута. Подобно ряду таксонов декапод представители этого семейства пока не отмечены для Аравийского моря и вод, окружающих Аравийский п-в.

Introduction

Deep sea podotreme crabs (Brachyura: Podotremata), in particular the family Cyclodorippidae, have been subject to extensive studies on their morphology, systematics and distribution [Guinot, 1979; Tavares, 1991, 1992, 1993, 1996]. Most of the material studied by these authors originated from the Pacific and Atlantic oceans, although in the monograph of Tavares [1993] the available cyclodorripid specimens from the western Indian Ocean were treated as well. However, important material of the Cyclodorippidae of the Deutsche Tiefsee Expedition [Doflein, 1904] was not re-examined in the light of recent revisions. Examination of this collection revealed the presence in the western Indian Ocean of a separate cyclodorippid species previously erroneously identified as *Cyclodorippe uncifera* Ortmann, 1892 {contemporary name *Tymolus uncifer* (Ortmann, 1892)}. The species is described below as *Tymolus globosus* sp.n. Comparative notes on *T. uncifer* were made upon a rather extensive material from Japan deposited in the collection of the Research Institute and Museum Senckenberg, Frankfurt on Main.

Also, the type of *Tymolus brucei* Tavares, 1991 was made available through the Museum National d'Histoire Naturelle in Paris.

The following abbreviations have been used in this paper: DTE — Deutsche Tiefsee Expedition, 1898–99; Go/ 1 — gonopod 1, Go/ 2 — gonopod 2; ICZN — International Code of Zoological Nomenclature; MZUS — Musée Zoologique de l'Université, Strasbourg; NTM — Northern Territories Museum, Darwin, SMF — Senckenberg-Museum, Frankfurt am Main; ZMB — Zoologisches Museum am Museum für Naturkunde der Humboldt Universität Berlin; ZSI — Zoological Survey of India, Calcutta.

The measurements (in mm) refer to: CLO — Carapace length measured from the middle of orbital margin to the posterior margin along the line parallel to the mid-line of the body; CLR — carapace length measured from the extremity of rostrum to the posterior margin of the carapace along the carapace mid-line; CB — maximum carapace breadth; F — frontal breadth measured between the tip of lateral frontal lobes; P2–P5 — pereiopods 2–5. Other abbreviations: ovig — ovigerous; Stat. — station.

Systematic account

Order Decapoda Latreille, 1803
Infraorder Brachyura Latreille, 1803
Section Podotremata Guinot, 1977
Family Cyclodorippidae Ortmann, 1892

Tymolus globosus **sp.n.**
Figs 1–3, 4 A–C.

Cyclodorippe uncifera, Doflein, 1904: 34–35, pl. 12, Figs 4–7, pl. 38, figs 6, 7. [non *Cyclodorippe* (= *Tymolus*) *uncifera* Ortmann, 1892].

MATERIAL. Holotype: ♂ (ZMB 13612) Zanzibar Channel, DTE-Stat. 245 (05°27.9' S, 39°18.8' E), 463 m depth, R. V. *Valdivia*.

Paratype: ovig. ♀ (ZMB, unregistered), Kenya, DTE-Stat. 253 (00°27.4' S, 42°47.3' E), 638 m depth, R.V. *Valdivia*.

DIAGNOSIS. Carapace globulose, granular. Lateral margins of rostrum parallel. Dorsal margins of orbit form a wide angle posteriorly. Exorbital teeth low, lobulate, by far not reaching cornea, with lateral face somewhat concave in dorsal view. Anterolateral margin with only one weakly elevated protuberance. Pterygostomial area usually with some granular prominence. Basal segment of antennulae narrowing distally, basal segments of antennae deplaced laterally with respect to antennular basal segments. Merus of endopodite of maxilliped III ellyptoidal distally. Abdomen of male without nodules on terga. Go/ 1 bean-shaped, robust.

DESCRIPTION. Carapace globulose, with pterygostomial margin well visible dorsally and forming a right arc, nearly as broad as long, enlarged in latero-branchial area, with maximum breadth at level of anterolateral prominence evenly covered with moderately-sized granules, nodules on carapace surface absent, flanks moderately pilose (Figs 1, 2A,C). Protogastric areas subdivided by indistinct longitudinal grooves. Metagastric and cardiac areas well defined and swollen.

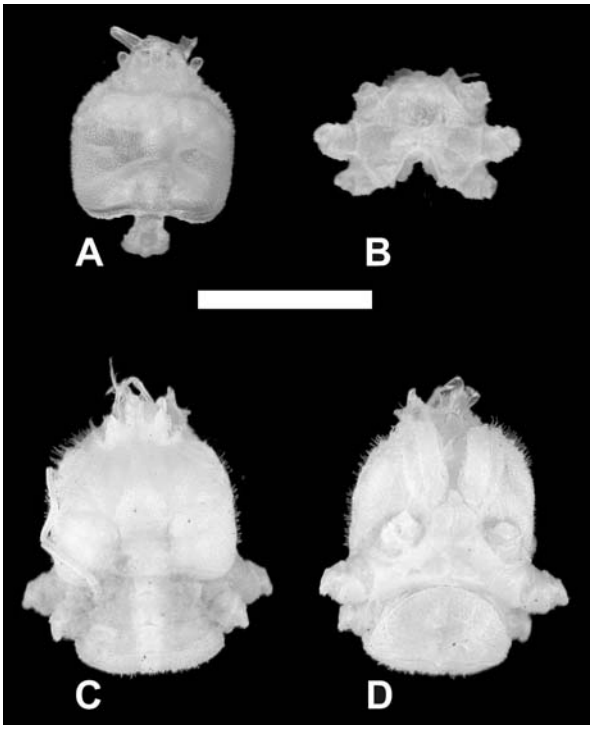

Fig. 1. *Tymolus globosus* sp.n.: A, B — Holotype, ♂, (ZMB 13612), cephalothorax (A), thoracal sternites (B); C, D — Paratype, ♀ (ZBM), dorsal view (C), ventral view (D).

Рис. 1. *Tymolus globosus* sp.n.: A, B — голотип ♂, (ZMB 13612), цефалоторакс (A), торакальные сегменты (B); C, D — паратип ♀ (ZBM), дорсально (C), вентрально (D).

Front comprises 30% of maximum carapace breadth, consists of four lobes (laterals = inner supraorbital lobes), medians (or rostrum) represent a bifurcation on a basis which has parallel lateral margins and is produced beyond subtriangular laterals. Orbits rather shallow, their posterior dorsal margins form broad angle and not a cleft. Exorbital teeth low, lobulate, by far not reaching cornea, with lateral face somewhat concave and not reaching pterygostomial margin in dorsal view. Inner suborbital tooth short, spiniform, located somewhat more laterally than basal segment of antennae (Fig. 2C). Ocular peduncles rather long, produced beyond orbital teeth, retractile, covered with thin setae, somewhat swollen in basal part and constricted towards cornea; cornea distinct but not pigmented; three sensilla like setae are situated distally [Doflein, 1904: Taf. XLVI, fig. 6].

Pterygostomial area with three to five spinules or spiniform tubercles (Fig. 2B, C), two to three such tubercles on hepatic area. There is only one weakly developed protuberance which corresponds to «saillie antero lateral» [Tavares, 1993]. Anterolateral prominence reduced to a minor knob. Posterior margin beset with spiniform granules. Sternum with distinct suture between segments III and IV, pre-coxal parts elevated, especially markedly at cheliped level.

Endostome markedly narrowing anteriorly, extending beyond front and resembling a roof rain channel, lateral margins serrated (Fig. 2B). Antennulae long: basal segment truncatedly conical, narrowed distally, second segment cylindrical, third segment longest, little broadening distally; outer ramus consists of eight articles, the breadth of which markedly decreases proximally, with long sensilla like setae

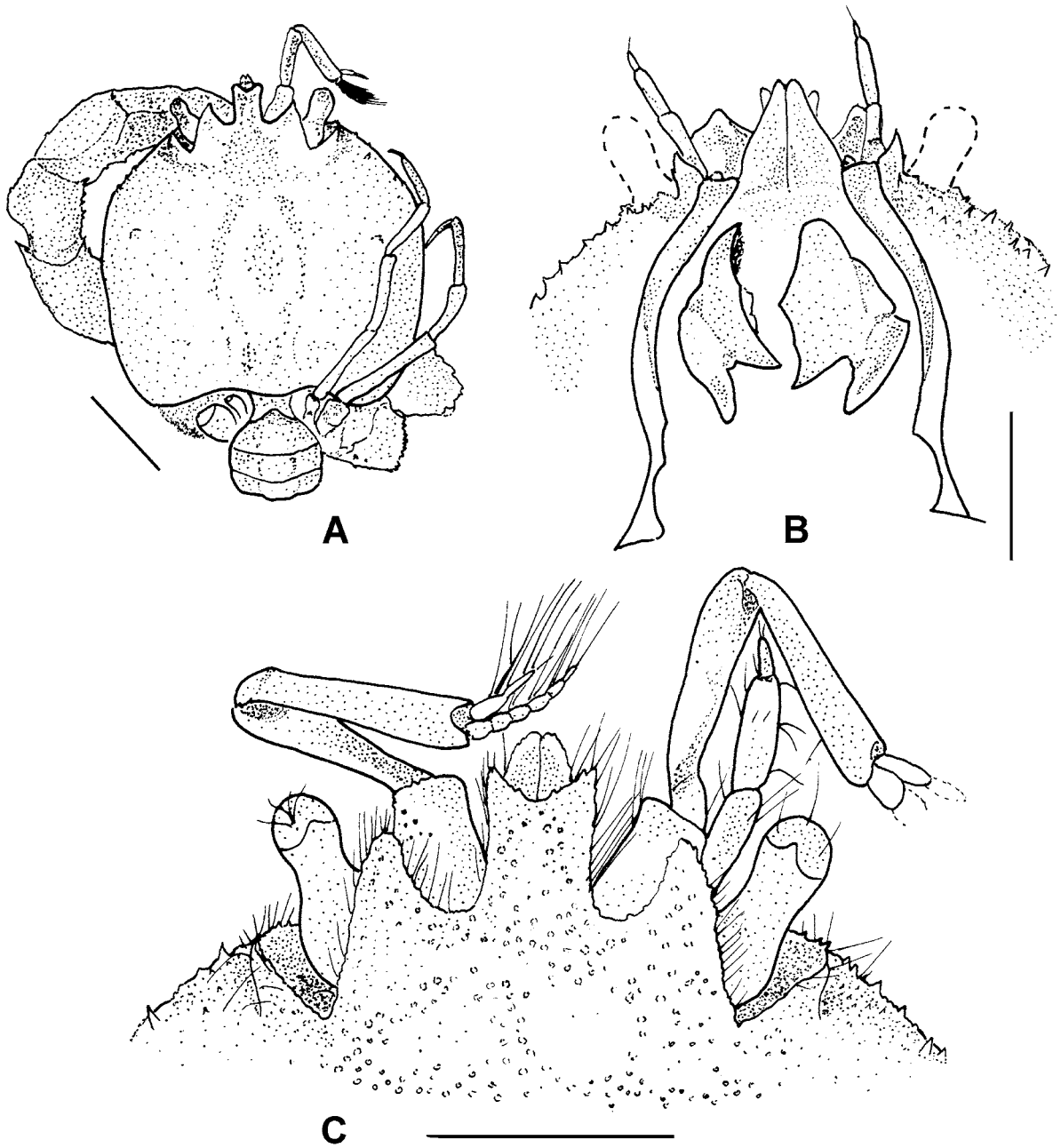

Fig. 2. *Tymolus globosus* sp.n., holotype, ♂ (ZMB 13612): A — General appearance, part of appendages is not shown; B — Anterior part, ventral view, half-schematically, mouthparts other than mandibles are not shown; C — Anterior part, dorsal view, left antenna is not shown. Scale 1 mm.

Рис. 2. *Tymolus globosus* sp.n., голотип ♂ (ZMB 13612): A — общий вид, часть конечностей не показана; B — передняя часть, вентрально, полусхематично, из ротовых придатков показаны только мандибулы; C — передняя часть, дорсально, левая антенна не показана. Масштаб 1 мм.

on mesial face; inner ramus consists of two articles and reaches penultimate article of outer ramus and has few terminal sensilla like seta [Doflein, 1904: Taf. LVI, fig. 4, Taf. LVII, fig. 3].

Antennae shorter than antennulae: basal segment longest, shifted laterally with respect to basal segment of the latter; second and third segments sub-cylindrical, slightly broadened distally, third longer than second; terminal segment conical with long sensilla like seta.

Mandibles slightly asymmetrical, outer cutting part broad, sub-triangular, molar surface underdeveloped, palp slender, completely covered by cutting part (Fig. 2B). Maxilla 1 with coxal and basal laciniae as described by Ihle [1916: fig. 50]. Maxilla 2 reduced, at least twice shorter than maxilla 1: inner lacinia not developed, outer subdivided in two lobes. Maxilliped 1 with two laciniae bearing strong bristles and a scaphognatite which reaches the frontal margin; its terminal part spoon-shaped. Maxilliped 2 with a strong palp which

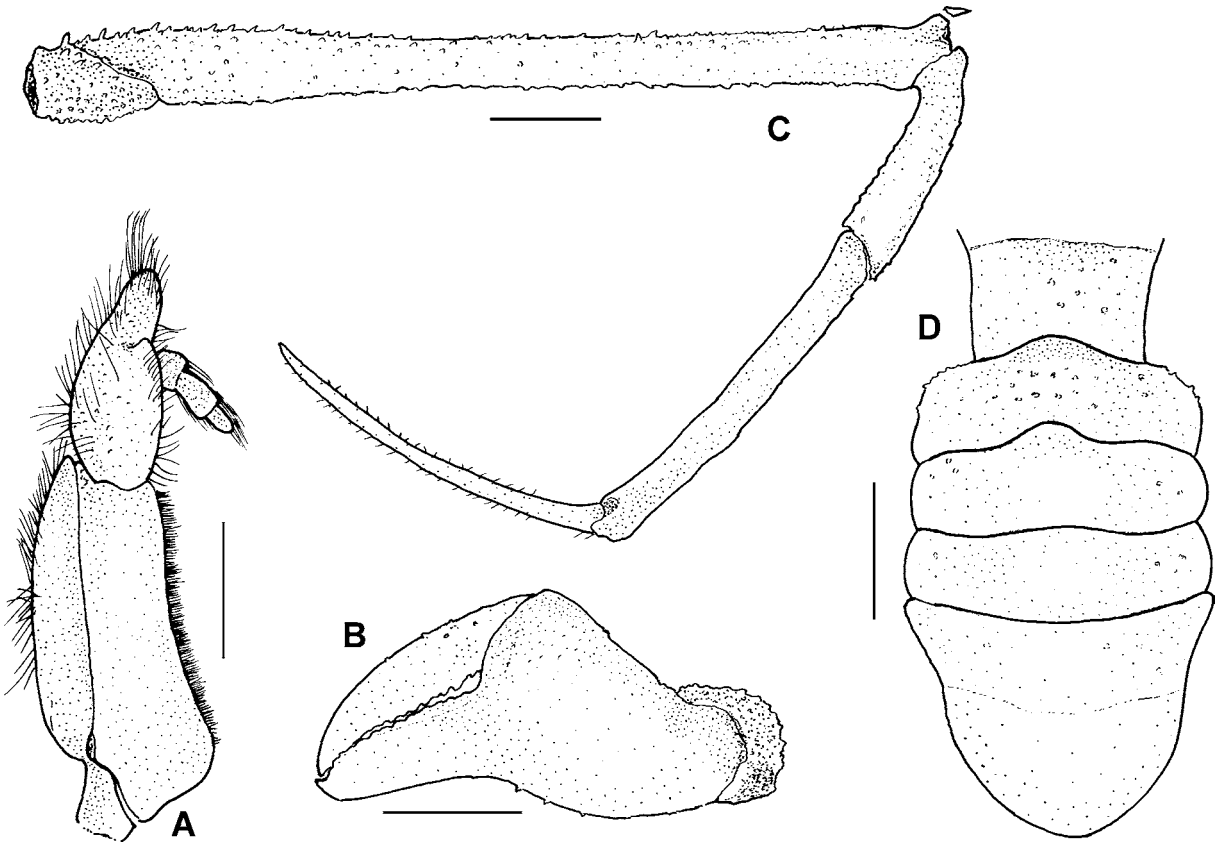

Fig. 3. *Tymolus globosus*: A — paratype, ♀ (ZMB); B–D: holotype, ♂ (ZMB 13612). A — Third maxilliped, ventral view; B — Cheliped left, outer view; C — Pereopod 2, right, posterior view; D — Abdomen. Scale 1 mm.

Рис. 3. *Tymolus globosus*: A — паратип ♀ (ZMB); B–D: голотип ♂ (ZMB 13612). A — ногочелюсть 3-й пары, вентрально; B — левая клешненосная нога, с внешней стороны; C — правая ходильная нога 2-й пары, вид сзади; D — абдомен. Масштаб 1 мм.

consists of 3 articles, terminal one being armed with strong bristles. Maxilliped III setose, granular, elongated, reaching to the distal ends of eyes. Ischium of endopodite sub-rectangular and merus elongated, ellyptoidal distally, with an incision at level of movable articles of palp (Fig. 3A); proximal article of palp longest, immovable, basally compressed and attached to dorsal surface of merus; movable articles finely and sparsely setose, second article somewhat curved, broadened distally, third article compessed, fourth (terminal) conical, shortest and armed with a bunch of fine setae. Exopodite does neither have a distal lacinia nor a flagellum [Doflein, 1904: Taf. XXXVIII, fig. 6, 7].

Gills and ridge-like structures bordering branchial cavity present on coxae of chelipeds and pereopods 2 and 3. Chelipeds equal, rather evenly granular, internal margin of carpus and lower margin of manus with sharpened conical granules and spinules (Fig. 3B). Pereopod 2 longest: coxa robust with a granular distal margin; basis shortest; ischium short, covered with spiniform granules; merus granular, somewhat shorter than carpus, propodus and dactylus taken together, with a distal spine curved mesially; carpus little broadening distally; propodus subcylindrical (Fig. 3C). Granulation decreases towards propodus which is markedly granulated only in proximal part; dactylus about as long as propodus, subcylindrical, curved, setose. Pereopod 3 somewhat shorter than pereopod 2 and with similar morphology. Pereopods 4 and 5 having a subdorsal position, slender, much shorter than anterior legs but reaching exorbital teeth (Fig. 2A), their dactyli are about half as long as the respective propodi, otherwise these legs are similar to P 2 and 3. A rather long penis starts at basal part of last pereopod coxa and is directed dorso-mesially, then bent ventrally and directed anteriorly (Fig. 4B). Abdomen of male consisting of five segments: first narrow, looking like a peduncle, others of about same breadth, third and fourth shortest; ultimate and penultimate segments fused, forming a spade-shaped construction, but suture remains relatively clear; all terga bearing scattered large granules; telson smooth (Fig. 3D).

Go/ 1 bean-shaped, with distal segment composed of two valves, narrowing distally so that lateral face is proximally convex and distally markedly concave, mesial face nearly straight; lateral valve in its distal part touches mesial valve; edges of valves sparsely beset with long bristles, distal part bears compact patches of bristles (Fig. 4C). Go/ 2 resembling an empty fire hose with a vertical lip on lateral face markedly sharpened distally.

VARIATION. The female paratype has fewer spinules on the pterygostomial area and no spinules on the hepatic area; the anterolateral prominence is reduced to a minor spinule. Sterno- abdominal cavity marked with a pair of smooth ridges along suture between thoracal somites IV and V, diverging mesially. Genital opening on coxa of P 3 circu-

Table 1. Differences between *Tymolus uncifer* and *T. globosus*.
Таблица 1. Различия между *Tymolus uncifer* и *T. globosus*.

Characters	*Tymolus uncifer*	*Tymolus globosus*
Posterior dorsal margins of orbit	In form of a narrow cleft	In form of a wide angle
Exorbital tooth	Reaching cornea	By far not reaching cornea
Pterygostomial area	Without spinules and spiniform tubercles	With few spinules or spiniform tubercles
Anterolateral protuberance	Well developed	Reduced to a minor knob or a spinule
Basal segments of antennae	In line with basal segment of antennulae and infra-orbital tooth	Shifted laterally with respect to the basal segment of antennulae
Merus of endopodite of maxilliped III	Lanceolate, narrowed distally	Ellyptoidal distally.

lar, located near junction with sternite, ca. 0.4 mm in diameter, bordered by thickened cuticle which is broader proximally (Fig. 4A). Eggs on pleopods reach 0.9 mm in diameter. Abdomen with terga more finely granulated than in male.

MEASUREMENTS. Holotype CLR 3.8 mm, CB 3.9 mm, F 1.2 mm, manus (right) length 2.8 mm, manus (right) height 1.4 mm, P 2 merus 5.3 mm, P 2 carpus 1.2 mm, P 2 propodus 2.9 mm, P 2 dactylus 3 mm. Female paratype: CLR 4.8 mm, CB 4.8 mm, F 1.6 mm.

COLORATION. Unknown.

ETYMOLOGY. The epithet «*globosus*» points to a nearly globulose shape of the cephalothorax.

DEPTH RANGE. The species known from depths between 463 and 638 m.

TYPE LOCALITY.Western equatorial Indian Ocean, Zanzibar Channel.

DISTRIBUTION. East Africa.

REMARKS. Small tymolid crabs collected on board R.V. *Valdivia* off East Africa were identified by Doflein [1904] as *Cyclodorippe uncifera*, a species described some time before by Ortmann [1892]. Doflein synonymised *Cymonomops glaucomma* Alcock, 1894 with the former species and pointed out its variability with regard to either presence or absence of the pigment in the cornea. The forms with and without pigment were designated as respectively forma *melanomma* and forma *glaucomma* by Doflein [1904]. These epithets were intentionally used for description of the intra-specific variability, the forma *melanomma* of Doflein is therefore not valid in terms of the ICZN. The situation is different for *C. glaucomma*, which was introduced by Alcock originally at species level and is thus an available name. It can, however, be stated that Alcock's species is certainly not identical with the present new one, because the shape of the carapace is very different and the exorbital lobe of *T. globosus* is very low, by far not reaching the cornea (Fig. 1, 2A, C). Doflein also mentioned that he had at his disposition the material of *Cyclodorippe* (= *Tymolys*) *uncifera* from Sagami Bay, the type locality of *T. uncifer*. The comparison of this Japanese specimen illustrated by Doflein [1904: Taf. 12, fig. 7] and numerous specimens of *T. uncifer* of the Senckenberg Museum collection from several localities in Japan with the *Valdivia* material revealed, several distinctive characters of the *Tymolus* specimens from off East Africa. As a result, *T. globosus* is described here. As the type material specimens collected by the DTE were chosen. Doflein [1904] mentioned two males from the *Valdivia* Stat. 245. One of them is extant in the collection of the ZMB and has been chosen as holotype. A female from Stat. 253 is treated as paratype. The second male was probably used for microscopic studies of eyes and sensory organs which illustrations are presented by Doflein [1904: Taf. XLVI, fig. 6, : Taf. LVI, fig. 4, Taf. LVII, fig. 3]. This specimen was not included in the type series. However, the results of the morphological study made on the basis of this specimen are referred to in the description presented here.

The new species is indeed similar to *T. uncifer* known with certainty from Japan. Both species differ from other Japanese species of the genus, *T. japonica* Stimpson, 1858 and *T. dromioides* (Ortmann, 1852) by the prominent median part of the front and the absence of remarkable protuberances on all carapace areas but the anterolateral [see Sakai, 1976 and Tavares, 1991, 1992 for the characterisation of the latter species]. They are closer to *T. similis* (Grant, 1905) from north-western Australia and *T. brucei* Tavares, 1991 distributed in eastern Australia, Indonesia, the Philippines, Vietnam, and Taiwan [Tavares, 1991, 1993; Tan & Huang, 2000] and presently found in Japan (see under *T. uncifer*). Both *T. uncifer* and *T. globosus* differ from *T. similis* in a much more obtuse *vs*. spiniform anterolateral protuberance and in the absence of marked spiniform granules on the external surface of the third maxillipeds. *T. globosus* is also different from *T. similis* by much wider orbit {compare to fig. 6 in Tavares [1991]}. Both *T. globosus* and *T. uncifer* differ from *T. brucei* in having the lateral margins of rostrum parallel *vs*. slightly diverging, in the mesial face of the ex-orbital lobes not markedly exposed dorsally as in the latter species (so that the ex-orbital lobes still look tooth-like and not as a lobe in dorsal view), and in a relatively shorter merus of P2 which is usually less than the length the carpus, propodus and the dactylus taken together. Some differences may be also seen in the Go/ 1 morphology: mesial face in *T. globosus* and *T. uncifer* look distinctly concave in abdominal view (Fig. 4E–D) while that of *T. brucei* does not (Fig. 4F). The differences between *T. uncifer* and *T. globosus* are listed in Table 1.

The new species also approaches *Tymolus hirtipes* Tan & Huang, 2000 recently described from off Taiwan by its globular carapace shape and the absence or weak development of the carapapace protuberances. The following characteristic features of the latter species are important to distinguish between them: very low lateral frontal lobes, strongly reduced last two pairs of legs which are by far not reaching the exorbital teeth of the latter species, and the absence of dorsal spines at pereopod meri 2–3 [Tan & Huang, 2000]. *T. hirtipes* is (unlike *T. globosus*) a relatively large species (CW 10.2, CLR 8.5 mm) and has the distoventral part of meri, the ventral parts of propodi and dactyli of P 2 and P 3 densely covered with hairs [fig. 2A in Tan & Huang, 2000].

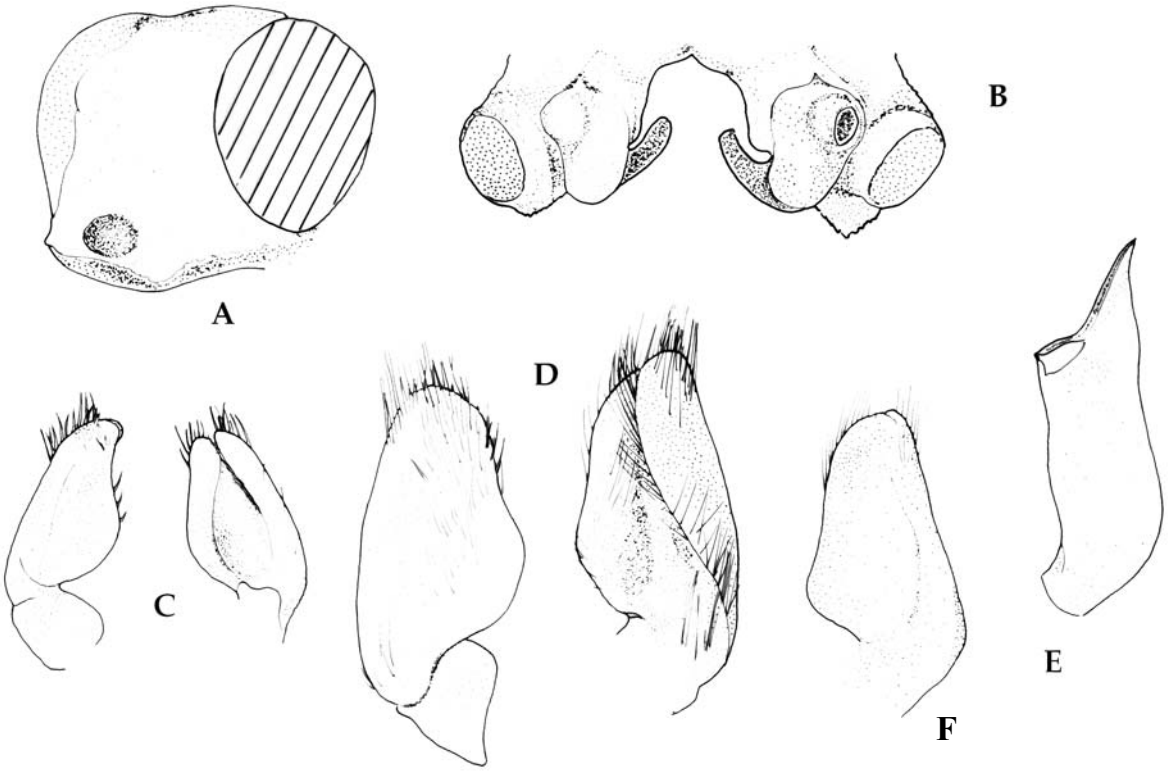

Fig. 4. Genital openings and gonopods: A — *Tymolus globosus* sp.n., paratype, ♀ (ZMB), genital opening on coxa of third pereopods, posterior view; B — *Tymolus globosus* sp.n., holotype, ♂ (ZMB 13612), coxa of fourth and fifth pereopods with peni on the latter, dorsal view with removed carapace; C — *Tymolus globosus* sp.n., holotype, ♂ (ZMB 13612), Go\ 1, right abdominal and sternal view; D — *Tymolus uncifer* (SMF 15143), 7.5x7.4 mm, Go\ 1, right abdominal and sternal view; E —*Tymolus uncifer*, same specimen, Go\2, abdominal view; F — *Tymolus brucei*, holotype, ♂ (NTM Cr-001179), Go\1, left abdominal view.

Рис. 4. Генитальные отверстия и гоноподы: A — *Tymolus globosus* sp.n., паратип ♀ (ZMB), генитальное отверстие на коксе 3-й пары ходильных ног, вид сзади; B — *Tymolus globosus* sp.n., голотип ♂ (ZMB 13612), коксы 4-х и 5-х ног с пенисами на последних, дорсально при удаленном карапаксе; C — *Tymolus globosus* sp.n., голотип ♂ (ZMB 13612), правый гонопод 1, вид с абдоминальной и стернальной поверхности; D — *Tymolus uncifer* (SMF 15143), 7,5x7,4 мм, правый гонопод 1, вид с абдоминальной и стернальной поверхности; E —*Tymolus uncifer*, тот же экземпляр, гонопод 2, вид с абдоминальной поверхности; F — *Tymolus brucei*, голотип ♂ (NTM Cr-001179), левый гонопод 1, вид с абдоминальной поверхности.

Tymolus uncifer (Ortmann, 1892)
Fig. 4D–E.

Cyclodorippe uncifera Ortmann, 1892: 560.

? *Cymonomops glaucomma* Alcock, 1894: 406. — Alcock & Anderson, 1895: pl. 14, fig. 9. — Alcock, 1896: 287–288.

Cyclodorippe uncifera, Doflein, 1904: 34, pl. 12 fig. 7. [part: only material from Sagami Bay].

Tymolus uncifer, Balss, 1922: 286. — Sakai, 1937: 70, pl. 10, fig. 2. — Sakai, 1965: 21, pl. 10, fig. 3. — Sakai, 1976: 34, pl. 8, fig. 3. — Tavares, 1991: 444–446, figs 2, 4, 8A, 9B, 10B. — Tavares, 1992: 205–206, fig. 2D. — Takeda, 1997: 232–233. — Tan & Huang, 2000: 139, fig. 4A.

Not:

Cyclodorippe uncifera, Dofflein, 1904: 34–35, pl. XII, figs 4,5,6. [= *Tymolus globosus* sp.n.].

? *Cyclodorippe uncifera* Ihle, 1916: 134, fig. 40, 43, 49, 50, 52, 57, 62.

Tymolus uncifer, Dai & Yang, 1991: 36, pl. 3, fig. 13 (2). [= *Tymolus brucei* Tavares, 1991.]

MATERIAL. 2 ♂♂ 2 ♀♀ (SMF 22356) Japan, Honshu, Kanawaga Ken, Sagami Bay, Amandai Bay, depth 400 m, 08. VI. 1950, donated by T. Sakai; 1 ♂ 1 ♀ (SMF 15140) Japan, Shikoku, Kochi-Ken, Tosa Bay in front of Mimase, 1961–63 K. Sakai coll.; 2 ♂♂♂ 3 ovig. ♀♀ (SMF), id., abt.50 m depth, from fish nets, 03. XI. 1963, T. Sakai collection, donated by K. Sakai; 1 ♂ 1 ♀ (SMF 22383) id., 17–24. III. 1964; 20 ♂♂ 16 ♀♀ 6 ovig. ♀♀ (SMF 15143) id., depth 250 m, II. 1966, K. Sakai coll.

TYPE LOCALITY. *Tymolus uncifer*: Sagami Bay, Honshu, Japan. – *Tymolus glaucomma*: Andaman Sea. According to the depth data given by Alcock [1894] the type specimens were presumably collected at the R.I.M.S.S. *Investigator* Stat. 13 (seven miles south east of the southern coast of Ross Island, Port Blair) and 116 (11°25'3'' N, 92°47'6'' E) with an Agassiz trawl.

TYPE MATERIAL. *Tymolus uncifer*: lectotype (male) and six paralectotypes (four males and two females) are deposited in the MZUS [Tavares, 1992]. – *Tymolus glaucomma*: syntypes, a male and a female presumably deposited in the ZSI.

EXTENDED DIAGNOSIS. Carapace sub-globular to pyriform, broadened posteriorly, maximum breadth at meso- or meta-branchial level, finely granular on elevations. Front about as wide as half of maximum carapace width, consists of four lobes (laterals = inner supraorbital lobes), medians as a bifurcation (or rostrum) on a basis with parallel margins and produced beyond subtriangular laterals. Dorsal margins of orbit form a narrow cleft posteriorly. Exorbital teeth well developed, lobulate, with lateral face concave posteriorly and convex anteriorly in dorsal view. Inner suborbital tooth

spiniform, short, in line with basal segments of antennulae and antennae. Ocular peduncles producing beyond orbital teeth, retractile, cornea distinct and may be pigmented. Pterygostomial and hepatic areas usually without prominence. Anterolateral area with a well developed protuberance. Basal segment of antennula markedly narrowed distally, basal segment of antennae not markedly shifted laterally with respect to it. Merus of endopodite of third maxillipede lanceolate, strongly narrowed distally. Merus of P 2 does not exceed length of carpus, propodus and dactylus taken together; distal spine obtuse and curved mesially. Abdomen of male with nodules along mid-line, lateral nodules may be present on last three terga.

DESCRIPTION OF GONOPODS. Go/ 1 bean-shaped, robust, with distal segment composed of two valves, narrowing distally so that the lateral face is proximally convex and distally somewhat concave; mesial face slightly concave. Lateral valve in its distal part extends beyond mesial valve. Edges of valves are rather evenly beset with long bristles, distal parts bears dense bunches of bristles which extend as bands proximally (Fig. 4D). Go/ 2 resembling an empty fire hose with an extending and markedly narrowing distally vertical lip on lateral face (Fig. 4E).

SIZE. The largest male has the following measurements: CLF 7.7 mm, CB 7.8 mm, F 2.4 mm; The largest female measures: CLF 6 mm, CB 6.3 mm, F 1.9 mm. – *T. glaucomma*: female syntype measures 6.5 x 6.5 mm [Alcock, 1896].

COLORATION. *Tymolus uncifer*: According to the colour plate of Sakai [1976: pl. 8, fig. 3] the coloration of the specimen from Japan is chalky greyish with light pink background on pereopods and carapace. Alcock [1896] describes the coloration of *Tymolus glaucomma* as chalky pink.

HABITAT. *Tymolus uncifer*: mud or sandy mud, 50–532 m depth [Sakai, 1976; Takeda, 1997]. Several stations where the species was reported were taken in a wide range of depth with the lower limit reaching 1000 m [Takeda, 1997]. It is possible, therefore that the species occurs even deeper than referred above. – *T. glaucomma*: 265–405 fathoms [= 485–741 m], near bottom temperature 8.3° C [Anonymous, 1944].

DISTRIBUTION. The undoubted distribution range includes the Pacific coast of Japan from Tosa Bay to Sagami Bay, Suruga Bay, north of Noto Peninsula to Kyushu in the Sea of Japan.

REMARKS. Examination of a rather large series of specimens revealed considerable constancy of the character states distinguishing the present species from *T. globosus*. Three of 74 studied specimens have some granular prominence on the pterygostomial margin.

T. uncifer is most similar to *T. globosus*, *T. similis*, and *T. brucei*. The differences between them are discussed under *T. globosus*. It must be noted that in Japan *T. incifer* occurs together with *T. brucei* as our examination of the SMF collection revealed a specimen of the latter species in a lot with several specimens of the former (Japan, Shikoku, Kochi-Ten, Tosa Bay, in front of Mimase, 17–24. 03. 1964, K. Sakai leg, SMF).

The status of *Cyclodorippe uncifera* sensu Ihle [1916] collected by the *Siboga* Expedition in the Indonesian waters is not clear. In his Fig. 40 Ihle gave a schematic sketch of the orbito-antennular corner in lateral view which indicated the shape of rostrum rather similar to that of *T. uncifer*a. On the other hand, the shape of ex-orbital lobes which reach cornea shows some similarity to *T. brucei*. A final statement on the identity of the *Siboga* material may only be done after its comparison with the above species.

First Doflein [1904] and then Tavares [1991] has synonymised *Cymonomops* (= *Tymolus*) *glaucomma* with the present species. Tan & Huang [2000] doubted this statement. The specimen figured by Alcock & Anderson [1895: pl. 14, fig. 9] does not show, however, a developed anterolateral protuberance which may be always seen in *T. uncifer*. The length of the merus of the second pereiopod is such that it might rather be a senior synonym of *T. brucei* Tavares, 1991, in which case it would take precedence over the later name. Also zoogeographically this would make sense. *T. uncifer* seems to be restricted to Japan. All subsequent records from other areas have proved to belong to other species. Doflein's material has been assigned to a new species in the present paper, the identity of *Cyclodorippe uncifera* sensu Ihle [1916] has been discussed under *T. globosus*, and the material figured by Dai & Yang [1991] clearly belongs to *T. brucei*. Thus, *glaucomma* would remain the only record outside Japan. The final decision about the status of *T. glaucomma* may, however, only be taken after the examination of the type that was not available to us.

Distribution of the Cyclodorippidae in the western Indian Ocean

Recent revisions of the Cyclodorippidae [Tavares, 1993, 1994] along with the present study enable us to give an overview of the distribution data for this family in the western Indian Ocean (Table 2). Although the faunal inventory of the cyclodorippids in this region is by no way complete and most of the species are known from their type localities only, some preliminary remarks regarding the composition of the fauna may be already drawn.

After clarification of the status of the *Tymolus* specimens collected by the DTE off East Africa and the description of *T. globosus* sp.n. it appears that the cyclodorripid fauna of the western Indian Ocean does not include any species known with certainty from other corners of the Indo-Pacific. Although most of the species listed in Table 2 are known from a single or a few localities only and can not be at present referred to a certain distribution type, it appears that at least some of the cyclodorippid species of the genera *Corycodus* A. Milne-Edwards, 1880 and *Xeinostoma* Stebbing, 1920 may be endemics of the south-western Indian Ocean. Half or more of their species inhabit a rather restricted area of South Africa, Mozambique, Madagascar, and Reunion while their other representatives are known from a single locality outside of the Indian Ocean [Tavares, 1994]. A similar and even more spectacular case of shelf break/ upper slope endemism in this area is known for another podotremous group of crabs, the Dromiidae [McLay, 1993]. The distribution of the genus *Tymolus*, representatives of which are known from the Andaman Sea, South China Sea, Japan, Sulavesi Sea, Moluccas, northern and south-eastern Australia appears to be centered at the Indo-Malayan Archipelago with some species reaching the western Indian Ocean. No species of the Cyclodorippidae is known from the north-western part of the Indian Ocean

Table 2. Distribution data for the Cyclodorippidae found in the western Indian Ocean according to Tavares [1993, 1994], and the present study.
Таблица 2. Данные о распространении Cyclodorippidae в западной части Индийского океана, по Tavares [1993, 1994] и по результатам настоящего исследования.

Species	Records in the western Indian Ocean	Records elsewhere in the Indo-Pacific	Depth range
Corycodus disjunctipes (Stebbing, 1910)	Cape Natal	—	113 m
Corycodus merweae Tavares, 1993	South Africa	—	560–620 m
Corycodus decorus Tavares, 1993	South Africa	—	not known
Ketamia proxima Tavares, 1993	Madagascar	—	90-140 m
Tymolus globosus Spiridonov & Turkay, sp.n.	Zanzibar, Kenya	questionably in Indonesia	468–638 m
Xeinostoma eucheir Stebbing, 1920	South Africa, Madagascar	—	144–240 m
Xeinostoma inopinatum Tavares, 1994	Réunion Is.	—	165–750* m

* the lower depth limit of the trawling (upper limit 350 m) during which a type specimen was collected

(Arabian Sea, Gulf of Aden, Gulf of Oman). Thus, the family as a whole shows a characteristic distribution pattern with a latitudinal asymmetry in the western Indian Ocean which has been documented for various decapod species from both shallow and deep waters [Spiridonov & Zhadan, 1999]. A similar distribution pattern was recently indicated for the podotreme family Homolodromiidae [Guinot, 1995] occurring exclusively in deep water. Most of the genera of another podotremous crab family, the Dynomenidae, which are characteristic for the lower shelf, e.g. *Dynomene* Desmarest, 1823, *Hirsutodinomene* McLay, 1999, *Metadynomene* McLay, 1999, and *Acanthodromia* A. Milne-Edwards, 1880 are also not recorded in the north-western Indian Ocean while some species of the former two genera and from the latter one are known from the Atlantic and the Eastern Pacific [McLay, 1999]. Although this can not be tested statistically it appears to be unlikely that the asymmetric distribution pattern which coincides in all the above podotremous groups and particular species from other decapod families [Spiridonov & Zhadan, 1999] is just an artifact of sampling.

Certain large scale oceanographic phenomena, e.g. upwellings off Somalia, in southern Arabian waters, and off Karachi [Swallow, 1984; Longhurst, 1998] may have been operating with varying intensity through the Pleistocene serving thus as barriers to dispersal of particular taxa in and out of the north-western Indian Ocean [Sheppard et al., 1992]. It is not clear, however, whether seasonal cooling associated with the upwelling may restrict the distribution of a lower shelf/ upper bathyal species, such as most of the dynomenids and all cyclodorippids. Rather specific characteristics of the intermediate (between 200 and 1500 m depth) water masses in the region, e.g. the oxygen deficit [Wyrtki, 1973; Swallow, 1984] may restrict the distribution of some lower shelf / upper slope groups in the north-western Indian Ocean. Furthermore, the causes of the asymmetry (with regard to the Equator) of the distribution of some brachyuran groups in the western Indian Ocean may be complex and related to a remarkable pelagic production seasonality of the upwelling areas in the Arabian region [Sheppard et al., 1992; Longhurst, 1998] which probably impacts benthic communities towards decreasing their species diversity [Zezina, 1997]. While several primitive and presumably ancient brachyuran groups of the lower shelf — upper slope range, e.g. the Dynomenidae and the Cyclodorippidae appear to be absent or at least poorly represented in the Arabian Sea, the Gulfs of Aden and Oman, and the Red Sea, some originally shallow water groups, e.g. the genus *Charybdis* de Haan, 1835 (Portunidae) show indications of radiation in the deep waters of this region [Spiridonov & Türkay, 2001; Türkay & Spiridonov, 2006). This points to different roles which the north-western and the south-western parts of the Indian Ocean may have played in the formation of the deep water brachyuran fauna.

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