

Chicoreus (Triplex) kahlbrocki spec. nov. (Neogastropoda: Muricidae) from the Sudan with comments on related congeners

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A new species of *Chicoreus (Triplex)* is described from the Sudan in the Red Sea. It is compared with three closely related, allopatric species from the Red Sea: *C. (T.) corrugatus* (G.B. Sowerby II, 1841); *C. (T.) ethiopi* Vokes, 1978; and *C. (T.) teva* Houart & Lorenz, 2016, as well as with *C. (T.) strigatus* (Reeve, 1849) and *C. (T.) paini* Houart, 1983 from the Indo-West Pacific. *Chicoreus (Triplex) corrugatus ethiopi* is here given the status of a valid species.

Keywords: Gastropoda, Muricidae, *Chicoreus*, Red Sea, Sudan, new species.

INTRODUCTION

The genus *Chicoreus* Montfort, 1810 is currently divided into four subgenera (Houart, 1992; Merle et al., 2011; and Houart, 2018): *Chicoreus* s.s.; *Triplex* Perry, 1810; *Rhizophorimurex* Oyama, 1950; and *Chicopinnatus* Houart, 1992, with a total of more than 80 valid species.

The number of species recognized as valid, according to different authors and MolluscaBase (2020), varies from 82 to 90. Among these subgenera, *Chicoreus (Triplex)* has the largest number of species with currently some 66 taxa, of which 9 occur in the Western Atlantic and 57 live in the tropical Indo-Pacific, from shallow water to depth of more than 300 meters for some New Caledonian species.

Currently, there are four taxa of *Triplex* endemic to the Red Sea, and a fifth member is added herein:

Chicoreus (Triplex) peledi Vokes, 1978, endemic to the Gulf of Aqaba;

C. (T.) corrugatus (G.B. Sowerby II, 1841) from the Gulf of Aqaba and the Gulf of Suez;

C. (T.) teva Houart & Lorenz, 2016 from the northern Red Sea;

C. (T.) ethiopi Vokes, 1978 from the Dahlak Archipelago, Eritrea (a specimen supposedly from Somalia was illustrated by Merle et al. (2011: pl. 66, figs 6a, b), but this locality is here considered doubtful);

C. (T.) kahlbrocki spec. nov. from the Sudan.

Three of them (*C. corrugatus*, *C. ethiopi* and *C. kahlbrocki* spec. nov.) have a split P_1 spiral cord and spine, a characteristic feature specific to these species and a stable diagnostic trait. *Chicoreus corrugatus ethiopi* has been introduced as a southern subspecies by Vokes (1978: 393), based on its somewhat narrower shape, with a higher spire. A split P_1 primary spiral cord was not referred to by Vokes. The new species described herein is found between the ranges of *C. corrugatus* and *C. ethiopi*. It also displays a split P_1 spiral cord and spine, but differs strongly from *C. corrugatus* by its spiral and axial sculpture, and by its spatulate froned spines. The obvious gap in the distributions of *C. (T.) corrugatus* and *C. (T.) ethiopi* is occupied by the new species, which does not constitute a conchological link between the northern and the southern taxa (Fig. 1). This led us to conclude that *C. ethiopi* should be separated from *C. corrugatus* on a species level.

MATERIALS AND METHODS

The six studied shells were collected alive by diving on a wreck off Port Sudan, in the Red Sea. The material used for comparison originates from the Muséum national d'histoire naturelle and from the author's collections.

The characterization of the shell morphology comprises shell shape, size, and colour, the shape of the spire, including the structure of the protoconch and teleoconch and



Fig. 1. Distribution of the *Chicoreus (Triplex) corrugatus* group in the Red Sea. Square: *C. (T.) corrugatus*; open circle: *C. (T.) teva*; full circle: *C. (T.) kahlbrocki* spec. nov.; triangle: *C. (T.) ethiopiuis*.

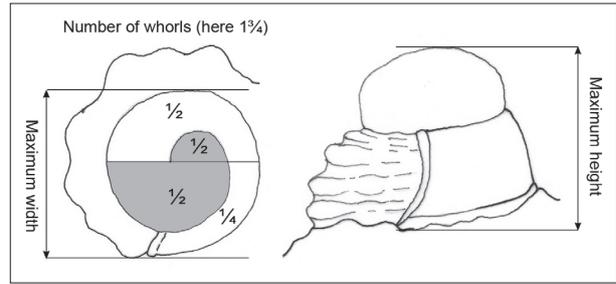
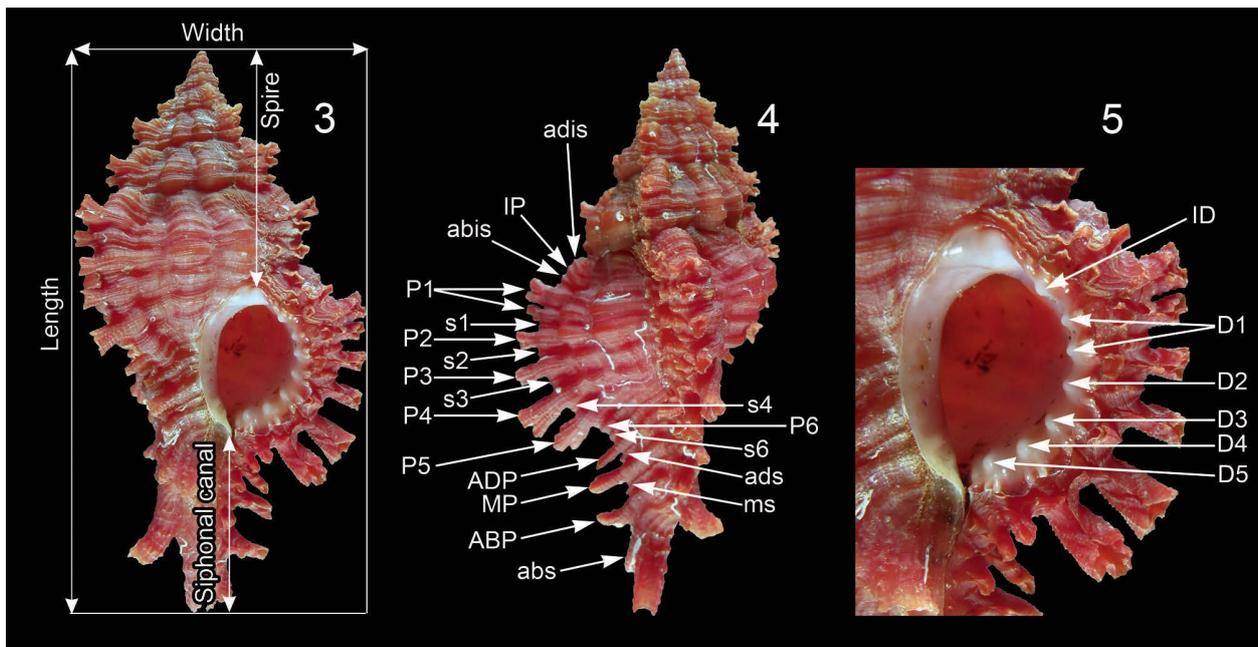


Fig. 2. Method for determining diameter, height, and the number of protoconch whorls in *Chicoreus (Triplex) kahlbrocki* spec. nov.

its number of whorls, details of the suture and of the sub-sutural ramp, details of the axial and the spiral sculpture, the aperture, the siphonal canal, and the operculum (Figs 3-5). The method used to determine diameter and height, and to count the number of protoconch whorls, follows Bouchet & Kantor (2004) as shown in Fig. 2.

The terminology used to describe the spiral cords and the apertural denticles (after Merle 2001 and 2005) is shown in Figs 4-5. The following abbreviations are used to characterize the convex part of teleoconch whorl and siphonal canal and the aperture: ab = abapical (or abapertural); abis = abapical infrasutural secondary cord (on subsutural ramp); ABP = abapertural primary cord on the siphonal canal; abs = abapertural secondary cord on the siphonal canal; ad = adapical (or adapertural); adis = adapical infrasutural sec-



Figs 3-5. *Chicoreus (Triplex) kahlbrocki* spec. nov., holotype MNHN-IM-2000-35802. 3. Selected measurements. 4. Spiral sculpture. 5. Apertural denticles.

ondary cord (on subsutural ramp); ADP = adapertural primary cord on the siphonal canal; ads = adapertural secondary cord on the siphonal canal (between ADP and MP); D1 to D5 = abapical denticles; ID = infrasutural denticle; IP = infrasutural primary cord (primary cord on subsutural ramp); MP = median primary cord on the siphonal canal; ms = median secondary cord on the siphonal canal; P = primary cord; P1 = shoulder cord; P2-P6 = primary cords of the convex part of the teleoconch whorl; s = secondary cord; s1-s6 = secondary cords of the convex part of the teleoconch whorl (example: s1 = secondary cord between P1 and P2; and s2 = secondary cord between P2 and P3, etc.).

SYSTEMATIC PART

Family Muricidae Rafinesque, 1815

Subfamily Muricinae Rafinesque, 1815

Genus *Chicoreus* Montfort, 1810

Subgenus *Triplex* Perry, 1810

Triplex Perry, 1810: pl. 23. Type species (by monotypy): *Triplex foliatus* Perry, 1810 (= *Murex palmarosae* Lamarck, 1822), Indo-West Pacific.

Chicoreus (*Triplex*) *kahlbrocki* spec. nov.

(Figs 1-8)

Type material. — Holotype, length 43.8 mm, width 21.5 mm; collection Muséum national d'Histoire naturelle, Paris, France, MNHN-IM-2000-35802. Paratype 1, length 38.1 mm, width 20.0 mm; collection R. Houart. Paratype 2, length 40.9 mm, width 19.9 mm; collection F. Lorenz. Paratype 3, length 44.6 mm, width 23.8 mm; collection Molluscan Science Foundation, Inc., MSF mx1644a. Paratype 4, length 43.3 mm, width 22.7 mm; MSF mx1644b. Paratype 5, length 33.3 mm, width 18.6 mm; MSF mx1644c.

Type locality, distribution and habitat. — All type specimens of *C. (T.) kahlbrocki* spec. nov. were found in concealed areas inside the chambers of the wreck of the MV Umbria at Wingate Reef off Port Sudan, 19°30'N; 37°17'E, at 10 to 30 meters. To date, known only from the type locality.

Description. — Shell small for the subgenus, up to 44.6 mm in length (paratype 3, MSF mx1644a). Length/width ratio 1.8-2.1. Slender, lanceolate, heavy, weakly spinose and strongly nodose. Subsutural ramp moderately broad, strongly sloping, highly concave. Shell entirely reddish-brown or orange. Aperture light pinkish grey.

Spire high with 1.5 to 1.75 protoconch whorls and up to 8 weakly convex, elongate, shouldered, nodose teleoconch whorls. Suture of teleoconch whorls adpressed. Protoconch small, maximum width 900 µm, height 800 µm,

whorls rounded, minutely punctate, last whorl with a narrow, single keel abapically; terminal lip raised, opisthocyrt (Fig. 6e).

Axial sculpture of teleoconch whorls consisting of varices and intervarical nodose ribs. Each varix with moderately long or short, spatulate, frondose, narrow, open primary spines. Adapical spine extending from P1 spiral cord shortest. Spines increasing in length abapically. First teleoconch whorl with 9 or 10 axial ribs; three varices per whorl and two strongly nodose, high, intervarical ribs from second to last whorl. Spiral sculpture of high, rounded, moderately broad primary and narrow secondary cords. All primary cords topped with narrow, weakly nodose threads. Last teleoconch whorl with adis, IP, abis and few additional threads on subsutural ramp, followed by P1 to P6 primary and s1-s6 secondary cords and several threads on convex part of teleoconch whorl. P1 split, P2 and P3 narrow, P4 and P5 broadest cords, approximately of same strength, P6 very narrow, s5 occasionally missing. Siphonal canal with ADP, ads, MP, ms, ABP, abs. ADP-ABP primary cords giving rise to fairly long, abapically bent spines. ADP spine narrow, MP and ADP spines broad, abs spine strongly abapically bent.

Aperture moderately large, broadly ovate. Columellar lip narrow, almost completely weakly erect except on small portion adapically, with narrow, weak folds abapically and strong parietal tooth at adapical extremity. Anal notch shallow, broad. Outer lip erect, denticulate, with moderately strong, elongate denticles within: ID, D1-D5. D1 and D3 occasionally split.

Siphonal canal moderately long, 37 to 39 % of total shell length, narrow comparatively to shell breadth, dorsally bent at tip, narrowly open, with 4 moderately long spines extending from ADP, MP, ABP and abs spiral cords.

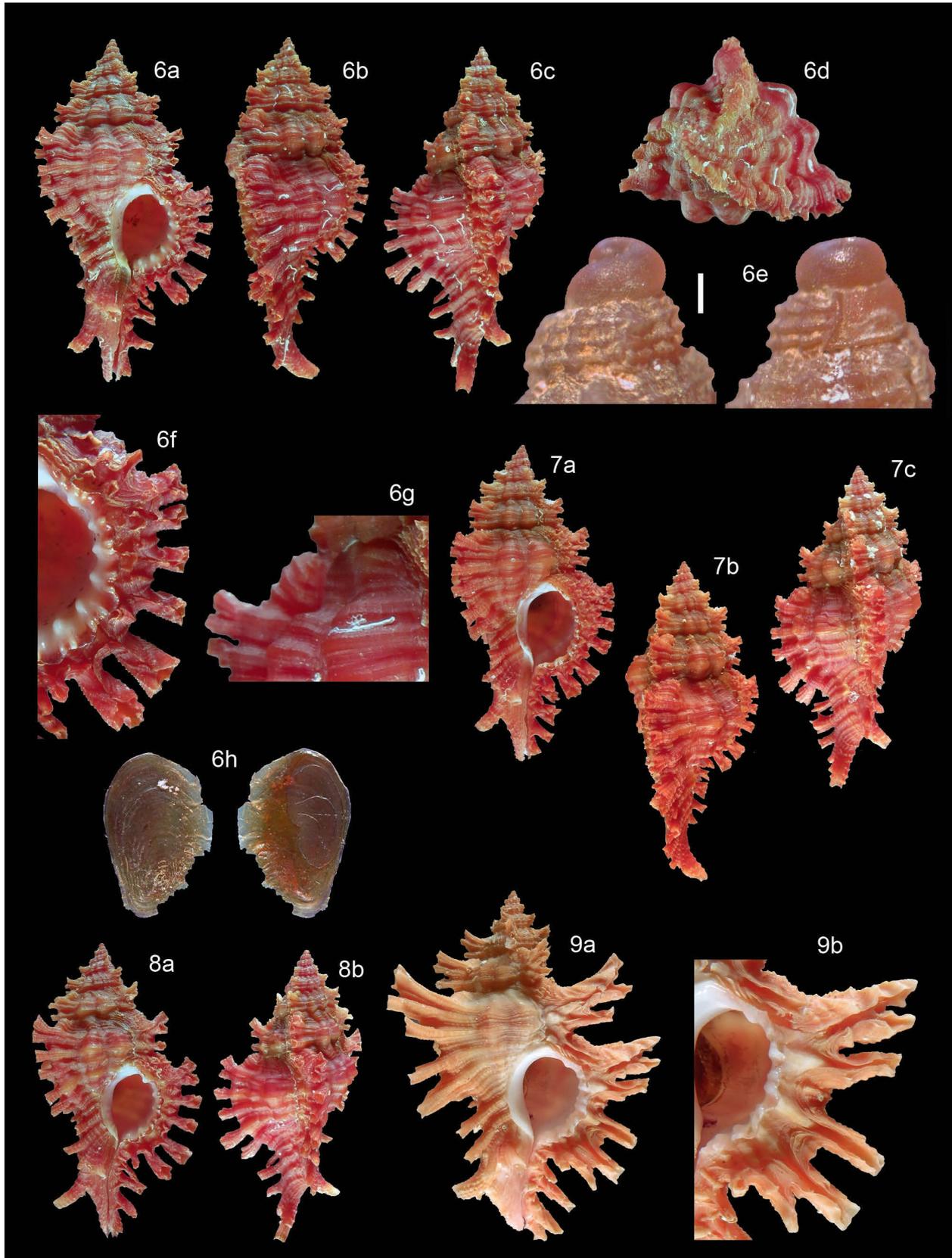
Operculum dark brown, ovate, with apical nucleus in lower right. Attached surface with about 4 or 5 growth lines and broad callused rim (Fig. 6h).

Etymology. — Named in honour of Sven Kahlbrock, underwater photographer and dive guide stationed in Hurghada, Egypt. Sven has been involved in the discovery of numerous new molluscan species from the northern Red Sea.

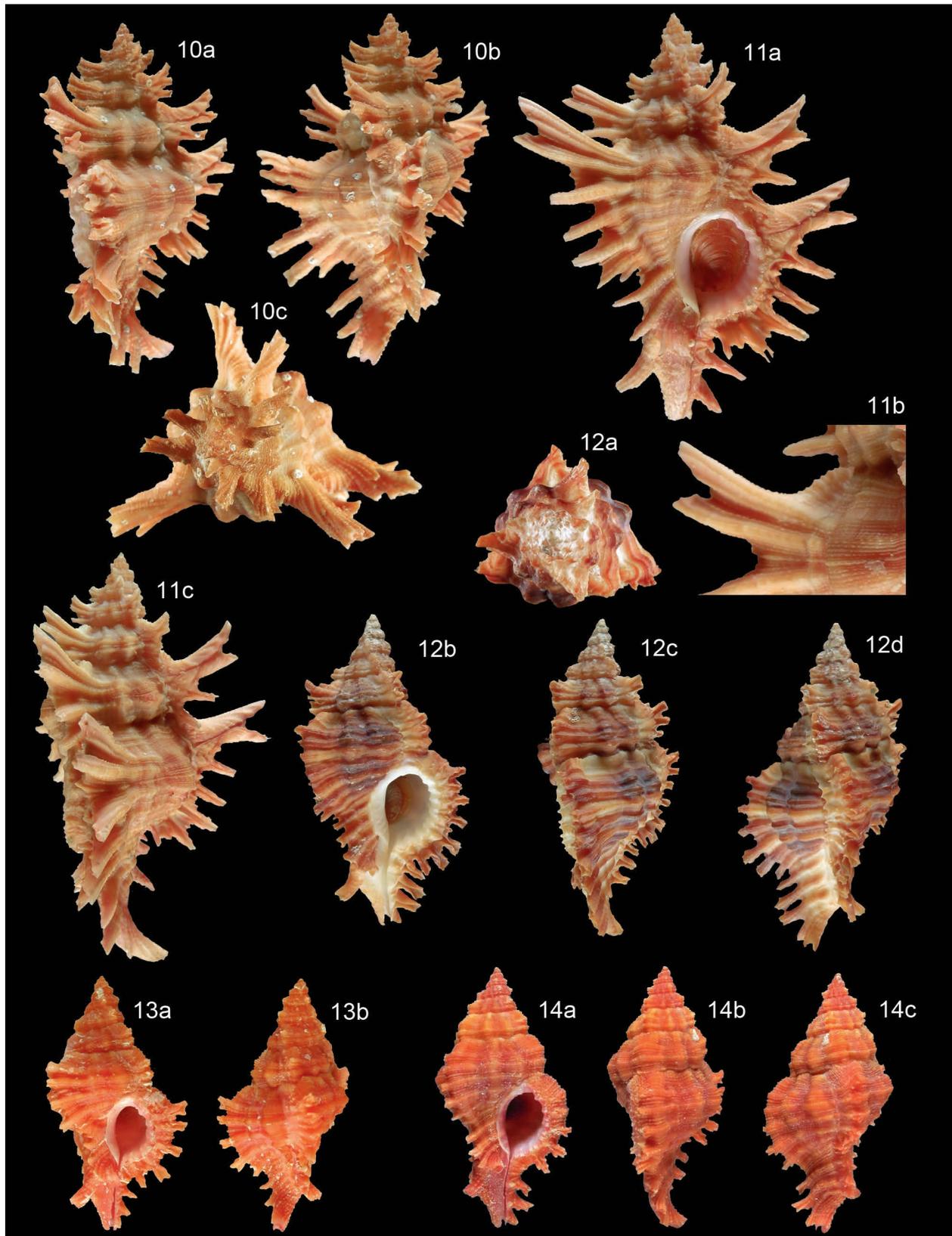
Remarks. — *Chicoreus* (*Triplex*) *kahlbrocki* spec. nov. is similar to three species endemic to the Red Sea, all sharing a medium-sized shell of 20 to 55 mm with small to medium-sized varical fronds and an orange-red colour. All these species have a small, paucispiral protoconch of 1.25 to 1.75 whorls denoting lecithotrophic larval development:

Chicoreus (*Triplex*) *corrugatus* (G.B. Sowerby II, 1841) from the Gulf of Suez and the Gulf of Aquaba, *C. (T.) ethiopiensis* Vokes, 1978 from the Dahlak Archipelago, and the recently described *C. (T.) teva* Houart & Lorenz, 2016 from the northern part of the Red Sea.

Chicoreus (*Triplex*) *corrugatus* (Figs 9-11) is the clos-



Figs 6-9. *Chicoreus (Triplex)* from the Red Sea (scale bar 500 μ m). **Figs 6-8.** *Chicoreus (Triplex) kahlbrocki* spec. nov. **6a-h.** Holotype MNHN-IM-2000-35802, 43.8 \times 21.5 mm. **7a-c.** Paratype, coll. F. Lorenz, 40.9 \times 19.9 mm. **8a-b.** Paratype coll. R. Houart, 38.1 \times 20.0 mm. **9a-b.** *Chicoreus (Triplex) corrugatus* (G.B. Sowerby II, 1841), Egypt, Sinai, coll. R. Houart, 43.9 \times 32.0 mm.



Figs 10-14. *Chicoreus (Triplex)* from the Red Sea. **Figs 10-11.** *Chicoreus (Triplex) corrugatus* (G.B. Sowerby II, 1841). **10.** Egypt, Sinai, coll. R. Houart, 43.9 × 32.0 mm. **11.** Gulf of Aqaba, Sinai, coll. R. Houart, 58.6 × 43.5 mm. **Fig. 12.** *Chicoreus (Triplex) ethiopi* Vokes, 1978, Dahlak Archipelago, coll. R. Houart, 40.6 × 20.6 mm. **Figs 13-14.** *Chicoreus (Triplex) teva* Houart & Lorenz, 2016. Northern Red Sea, Egypt, Sinai, 50 km off Sharm el-Sheikh. **13a-b.** Holotype MNHN-IM-2000-30793, 28.8 × 15.0 mm. **14a-c.** Paratype coll. F. Lorenz, 29.0 × 15.2 mm.

est species with a similar, split P₁ spiral cord and spine. However, *C. corrugatus* consistently differs from *C. kahlbrocki* spec. nov. in having a less concave subsutural ramp with narrower spiral cords (Figs 6g versus 11b), lower and obviously narrower primary spiral cords, ending as short or moderately long, acute fronds on the varices, while in *C. kahlbrocki* these fronds are comparatively broader and spatulate as opposed to pointed in *C. corrugatus* (Figs 6f versus 9b). The intervarical axial sculpture consists of lower ridges in *C. corrugatus* instead of broad, nodose ribs in *C. kahlbrocki*. The length of the siphonal canal also differs in being longer comparatively to the total shell length, approximately of 32 to 36% in *C. corrugatus* and of 37 to 39% in *C. kahlbrocki*, while it is more strongly dorsally recurved in *C. corrugatus*.

Chicoreus (Triplex) ethiopiensis from the Dahlak Archipelago (Fig. 12) differs by its brown and white shell with a white aperture. It also has quite narrower spiral cords, pointed, short varical spines, a comparatively higher spire, a shorter siphonal canal, reaching 30% of the total shell length, and lower, narrower, axial intervarical ridges.

Finally, the recently described *C. (T.) teva* from the northern part of the Red Sea (Figs 13-14) differs in having a smaller shell, growing to approximately 30 mm in length, with short, frondose spines, narrower spiral cords with unsplit P₁ cord and spine, a smaller, more ovate aperture and a shorter siphonal canal, approximately 30 to 34% of the total shell length.

No other Indo-West Pacific *Chicoreus (Triplex)* species is close enough to necessitate further comparisons. The closest species, *C. (T.) strigatus* (Reeve, 1849) and *C. (T.) paini* Houart 1983, both differ in having a higher spire, different, frondose varical spines, an unsplit P₁ cord, less obvious intervarical nodes and a narrower aperture with a narrow, deep, anal sulcus.

CONCLUDING REMARKS

It is remarkable to note that all species of *Chicoreus (Triplex)* from the central to the northern Red Sea have a nearly identical uniform red colour tone. As striking as it may be in a shell held in hands, the red colour constitutes an effective camouflage in the habitat below the 10 meter mark, at which red colour is no longer perceivable. In addition, the living animals are usually covered with sponges and other commensals, dissolving the outlines of the shell.

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