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A new endemic species of *Chicoreus* from Savai'l, Samoa

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ABSTRACT A new species of Muricidae, *Chicoreus* (*Triplex*) *tangaroai* is described from the Samoan Infraprovince. This new taxa is compared with *C.* (*T.*) *thomasi* (Crosse, 1872) and *C.* (*T.*) *lorenzi* Houart, 2009, related species in the Marquesan Molluscan Province.

KEY WORDS Muricidae, *Chicoreus*, *Chicoreus* (*Triplex*), *C.* (*T.*) *tangaroai*, Samoan Islands, Samoan Infraprovince of the Polynesian Molluscan Province

INTRODUCTION

Samoa, in the south-central Pacific, comprises five volcanic islands and two coral atolls (Swains and Rose Atolls) located approximately 3,400 km to the east of the Marquesas Islands (Marquesan Molluscan Province) and approximately 1,260 km west of Fiji (Tahitian Subprovince). These include the large subaerial islands of Savai'i and Upolu (independent nation of Samoa) in the west and Tutuila to the small island of Ta'u (American Samoa) in the east. The islands are situated near the southwest margin of the Pacific Plate comprising high volcanic mountains to the west that erode to the Rose Atoll in the east. Beyond the submerged reef banks that surround the islands, the ocean floor drops quickly to depths greater than 4,000 m (see Figure 1, Wright *et. al.* 2012; Seamounts, Ridges, and Reef Habitats of American Samoa). This topographical isolation supports a unique grouping of endemic molluscan species and its designation as the Samoan Infraprovince of the Polynesian Molluscan Province (Petuch & Berschauer, 2020). Here we describe a new species of *Chicoreus,* from this region. All of the specimens of the new species imaged here are in the collections of the authors. The new species is compared with two species closely resembling taxa, *Chicoreus (T.) lorenzi* Houart, 2009, and *Chicoreus (T.) thomasi* (Crosse, 1872). All three species are similar in size and form, but differ in their dentition, spine structure and relative siphonal canal length. These differences are discussed below and illustrated in the plates. The species *Chicoreus (T.) huttoniae* (Wright, 1878) is also discussed in relation to the new species.

Abbreviations.

Terminology used to describe the primary cords in Muricidae, based on Merle, 2001 and 2005.

P	Primary cord
s	secondary cord
ad	adapical
ab	abapical
SP	Subsutural cord
IP	Infrasutural primary cord (primary cord on subsutural ramp)

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adis adapical infrasutural secondary cord (on subsutural ramp)
abis abapical infrasutural secondary cord (on subsutural ramp)
P1 Shoulder cord
P2-P6 Primary cords on the convex part of the teleoconch whorl
s1-s6 secondary cords on the convex part of the teleoconch whorl
ADP Adapertural primary cord on the siphonal canal
s7-s9 secondary cords on the siphonal canal
MP Median primary cords on the siphonal canal
ABP Abapertural primary cord on the siphonal canal
ads adapertural secondary cord on the siphonal canal
abs abapertural secondary cord on the siphonal canal
ID Infrasutural denticle
D1-D6 Abapical denticles

METHODS

Photographs were taken with a Canon EOS T3i using a 50 mm macro lens (set at f32 for 1.6 to 2.0 seconds) and a cable release, with the shell elevated over a black velvet background, set in a light tent with fixed flood lights and natural daylight bulbs.

Measurements were made using electronic dial calipers accurate to one hundredth of a millimeter. Overall shell length was measured from the tip of the protoconch straight to the distal tip of the siphonal canal. Shell width was measured at the widest point between the varices at the shoulder of the body whorl. The length of the siphonal canal was measured from the opening of the siphonal canal at the base of the aperture to the distal the tip of the siphonal canal.

The terminology used in describing *Chicoreus (Triplex) tangaroai* new species follows the terminology described by D. Merle (2001, 2005).

The holotype will be deposited in the type collection of the Division of Mollusks, Los Angeles County Museum of Natural History, Los Angeles, California ("LACM") and bears a LACM number.

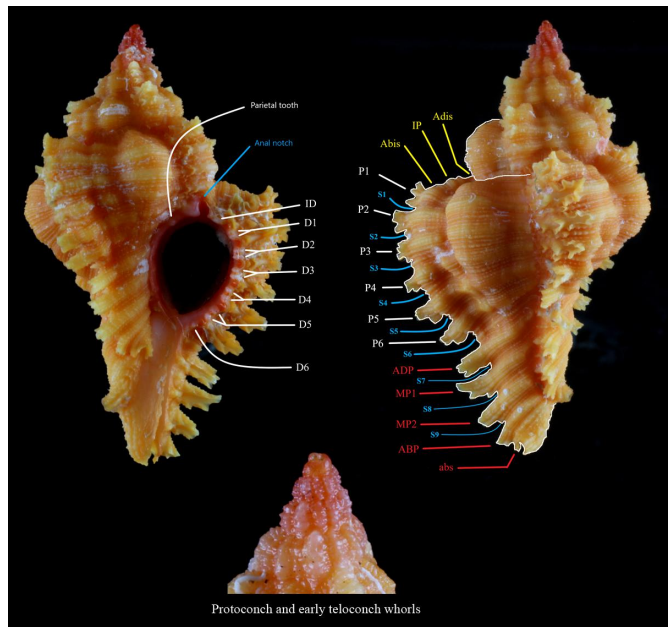

Figure 1. Terminology used in description of *Chicoreus* (*Triplex*) *tangaroai* new species (Paratype 6, apertural and abapertural views shown). The protoconch with 1.5 whorls and early teloconch whorls of the holotype (LACM 3784, measuring 46.08 mm in length) is shown at the bottom center of this Figure.

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SYSTEMATICS

Class Gastropoda
Infraorder Neogastropoda
Superfamily Muricoidea
Family Muricidae
Subfamily Muricinae
Genus *Chicoreus* Montfort, 1810
Subgenus *Triplex* Perry, 1810
Type species: *Triplex foliatus* Perry, 1810

Chicoreus (*Triplex*) *tangaroai* Berschauer, Waller & Maxwell, new species
(Figure 2 A-C; Plate 1, Figures A-D; Plate 2, Figures A-B)

Description. Shell small to medium sized for the subgenus, stout, ovate, relatively broad at shoulder, frondose, with three high varices alternating with heavy, broad intervaricial ridges, strong sutural line, subsutural ramp weakly sloping and slightly concave; spire of moderate height, narrow and acute; protoconch bright pinkish-red consisting of 1.5 whorls; shell medium to dark orange; aperture relatively small, roundly ovate, cream-white inside, outer apertural lip bright pinkish-red; columellar lip bright pinkish-red with a weak elongate white parietal tooth at the adapical extremity; anal notch bright pinkish-red, moderately deep, obvious and broad; outer lip erect, crenulated, with seven short weak white denticles within: ID, D1 to D5 split by a pinkish-red depression, D6; siphonal canal relatively short 33.4% of shell length, broad, straight, weakly bent abapically; spiral sculpture consisting of P1 to P4 in early teloconch whorls, body whorl with adis, IP, P1, s1, P2, s2, P3, s3, P4, s4, P5, s5, P6, s6, ADP, s7, MP1, s8, MP2, s9, ABP, and abs cords ornamented with small squamose threads; P1 to P6, ADP, MP1, MP2, and ABP cords terminating in broad medium length frondose spines, of which P1 to P4 spines strongly frondose and compound; operculum dark brown, ovate, with subapical nucleus and numerous concentric ridges.

Type Material. Holotype: 46.08 mm in length and 22.96 mm in width, LACM 3784. Other Material Examined: Paratypes 1 to 5 in the collection of David P. Berschauer, measuring 34.9 to 46.6 mm in length. Paratypes 6 and 7 in the collection of David B. Waller, measuring 36.8 and 47.8 mm in length. Paratypes 8 to 10 in the collection of Valda Cantamesa, measuring 41.7 to 47.5 mm in length.

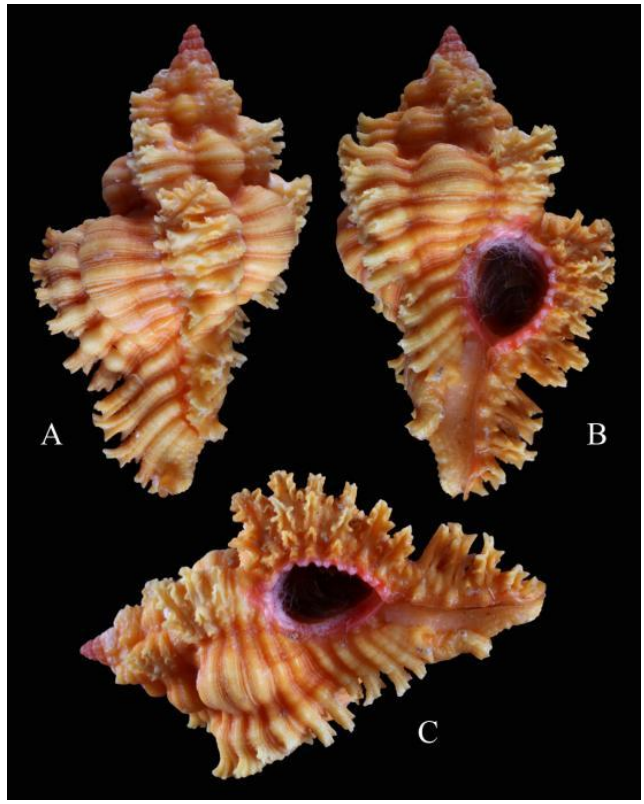

Figure 2. Holotype of *Chicoreus* (*Triplex*) *tangaroai* new species, 46.08 mm in length. **A=** abapertural view; **B=** apertural view; **C=** side view showing the edge of the lip and the strongly frondose and compound P1 to P4 spines.

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Specimen	L Length (mm)	W Width (mm)	Siphonal Canal Length (mm)	Siphonal Canal SCL/L %	L/W Ratio
Holotype	46.08	22.96	15.39	33.39	1.54
Paratype 1	34.93	22.61	11.30	32.40	1.54
Paratype 2	44.94	30.26	15.08	33.55	1.49
Paratype 3	46.56	30.15	15.60	33.50	1.54
Paratype 4	42.50	28.34	14.10	33.18	1.50
Paratype 5	42.56	30.11	14.59	34.23	1.41
Paratype 6	47.80	30.40	15.50	32.43	1.57
Paratype 7	36.80	23.50	12.20	33.15	1.57
Paratype 8	47.53	31.90	15.62	32.86	1.49
Paratype 9	41.66	28.85	13.71	32.91	1.44
Paratype 10	43.15	27.96	13.60	31.51	1.54
			Average	33.01	1.51

Table 1. Measurements of type lot specimens examined.

Type Locality. Asau, Savai'l, Samoa, at 1-3 meters on a reef; associated with orange sponges.

Distribution. Appears to be endemic to the Samoan Infraprovince.

Etymology. In the Samoan Islands, Tangaroa was a god of creation - the being who formed the islands or who raised them up from the depths of the sea. This species is named for Tangaroa, the Māori god of the sea.

DISCUSSION

Chicoreus (*Triplex*) *tangaroai* has recently been marketed by shell dealers under the name *Chicoreus* (*Triplex*) *huttoniae* Wright, 1878, which is a taxon currently synonymized under *Chicoreus* (*Triplex*) *brunneus* Link, 1807. *Chicoreus huttoniae* is a much more elongated species with less frondose spines, being rather straight and simple in form, and the true *C. huttoniae* is likely a valid species which is endemic to New Caledonia (Plate 2, Figures C-D). In contrast, to the orange colour of all known *C. tangaroai*, and a colour that is ubiquitous with *C. huttoniae* leading to significant confusion, orange is considered a rare colour form in the wide spread Indo-Pacific species *C. brunneus*. Furthermore, *C. brunneus* (particularly attractive specimens of which are often mislabeled as *C. huttoniae*) differs from *C. tangaroai* in being larger in length, lacks the compressed form, and has a simplified frond structure (see Plate 2, Figures E-J). Given the

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high degree of variability in form found in *C. brunneus* over its broad geographic range from Mozambique, the Indian Ocean, and throughout the Indo-Pacific (Houart, 1992), it is probable that this is in fact a diverse complex of species, which currently remained synonymized, or lumped, under that name, and that further nuanced work will reveal many regionally distinctive species. Another important character is that this new endemic species *C. tangaroai* has only 1.5 protoconch whorls, whereas the wide spread *C. brunneus* is known to have two to three protoconch whorls (Houart, 1992). Further, a species locally known in Queensland, Australia, for decades as *Chicoreus huttoniae* (Plate 2, Figures K-L) was later named *Chicoreus akritos* Radwin & D'Attilio, 1976.

Chicoreus (*Triplex*) *tangaroai* differs from *Chicoreus (T.) thomasi* (Crosse, 1872) (Plate 1, Figures E-F) in that *C.* (*T.*) *thomasi* has a proportionately stouter shell with shorter siphonal canal. The spire of *C.* (*T.*) *tangaroai* is narrower than *C.* (*T.*) *thomasi*. In *C.* (*T.*) *tangaroai* the number of primary and secondary cords is similar to that in *C.* (*T.*) *thomasi*, however, the shape and length of the varical spines are longer, more frondose and elaborate. In *C.* (*T.*) *thomasi*, the varical spines at P1 to P4 are almost absent, with the P5 to P6 varical spines being present but short, whereas the varical spines of *C.* (*T.*) *tangaroai* at P1 to P6 are of medium length, strongly frondose and compound. Similar to *Chicoreus* (*Triplex*) *banksii* (G.B. Sowerby, II, 1841), *C.* (*T.*) *tangaroai* has two median primary cords (MP1 and MP2) on the siphonal canal compared to *C.* (*T.*) *thomasi*, which has one median primary cord. The siphonal canal in *C.* (*T.*) *tangaroai* is straight whereas there is a slight curve in the siphonal canal of *C.* (*T.*) *thomasi*. The dentition, apertural lip and columellar lip of *C.* (*T.*) *thomasi* are white to light pink, compared to *C.* (*T.*) *tangaroai* in which the apertural lip and columellar lip are a bright pinkish-red and the dentition is split with white tips separated by a shallow pinkish-red depression. While some split dentition can be observed in *C.* (*T.*) *thomasi* it has no split dentition at D4 to D5, a character which is consistently observed in *C.* (*T.*) *tangaroai*, and in *C.* (*T.*) *thomasi* the denticles are long and white and extend deep into the aperture. The columellar lip extends slightly onto the body whorl in *C.* (*T.*) *thomasi* whereas there is almost no extension of the columellar lip in *C.* (*T.*) *tangaroai*. The average length to width ("L/W") ratio of *C.* (*T.*) *tangaroai* is 1.51, in comparison to *C.* (*T.*) *thomasi* which has a L/W ratio of 1.57 as reflected in the specimens examined herein.

Chicoreus (*Triplex*) *tangaroai* differs from *Chicoreus (T.) lorenzi* Houart, 2009 (Plate 1, Figures G-H) in that *C.* (*T.*) *lorenzi* has a proportionately narrower shell and longer siphonal canal than *C.* (*T.*) *tangaroai*. The top of the body whorl slopes downward in *C. (T.) lorenzi* whereas in *C.* (*T.*) *tangaroai* the slope at the shoulder is significantly less. *C.* (*T.*) *tangaroai* differs from *C. (T.) lorenzi* in that it has only 1.5 protoconch whorls, whereas *C. (T.) lorenzi* has 3.5 to 3.75 protoconch whorls (Houart, 2009). In *C.* (*T.*) *tangaroai* the number of primary and secondary cords is similar to that in *C. (T.) lorenzi*, however the P1 to P4 varical spines in *C.* (*T.*) *tangaroai* are strongly frondose and compound in comparison to *C. (T.) lorenzi*. Similar to *Chicoreus* (*Triplex*) *banksii* (G.B. Sowerby, II, 1841), *C.* (*T.*) *tangaroai* has two median primary cords (MP1 and MP2) on the

siphonal canal compared to *C. (T.) lorenzi* which has one median primary cord. The siphonal canal is straight in both species but is proportionately longer in *C. (T.) lorenzi*. The dentition, apertural lip and columellar lip of *C.* (*T.*) *lorenzi* are light pink, compared to *C.* (*T.*) *tangaroai* in which the apertural lip and columellar lip are a bright pinkish-red. In *C.* (*T.*) *lorenzi* the denticles are long and white and extend deep into the aperture with D1 to D4 split, whereas the dentition of *C.* (*T.*) *tangaroai* is short, confined to the outer edge of the aperture, D1 to D5 split with white tips separated by a shallow pinkish-red depression. The columellar lip extends slightly onto the body whorl in *C.* (*T.*) *lorenzi* whereas there is almost no extension of the columellar lip in *C.* (*T.*) *tangaroai*. The anal notch of *C.* (*T.*) *lorenzi* is light pink, broad and less defined than in *C.* (*T.*) *tangaroai* which has a more clearly defined and obvious pinkish-red anal notch. The average L/W ratio of *C.* (*T.*) *tangaroai* is 1.51, in comparison to *C.* (*T.*) *lorenzi* which has a L/W ratio of 1.88 in its holotype illustrated by Houart, 2009.

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We thank Paul Kanner for the loan of specimens of *Chicoreus (T.) thomasi* (Crosse, 1872) and *Chicoreus (T.) lorenzi* Houart, 2009, which he collected in Colette Bay, Huku Nivu, Marquesas. We thank Valda Cantamesa for the use of images of *Chicoreus akritos* Radwin & D'Attilio, 1976, which she collected in Queensland, Australia. We thank Roland Houart for personal communications on this matter, and for the use of the images of *Chicoreus* (*Triplex*) *huttoniae* Wright, 1878, which he labeled as an orange color form of *C. brunneus* from New Caledonia.

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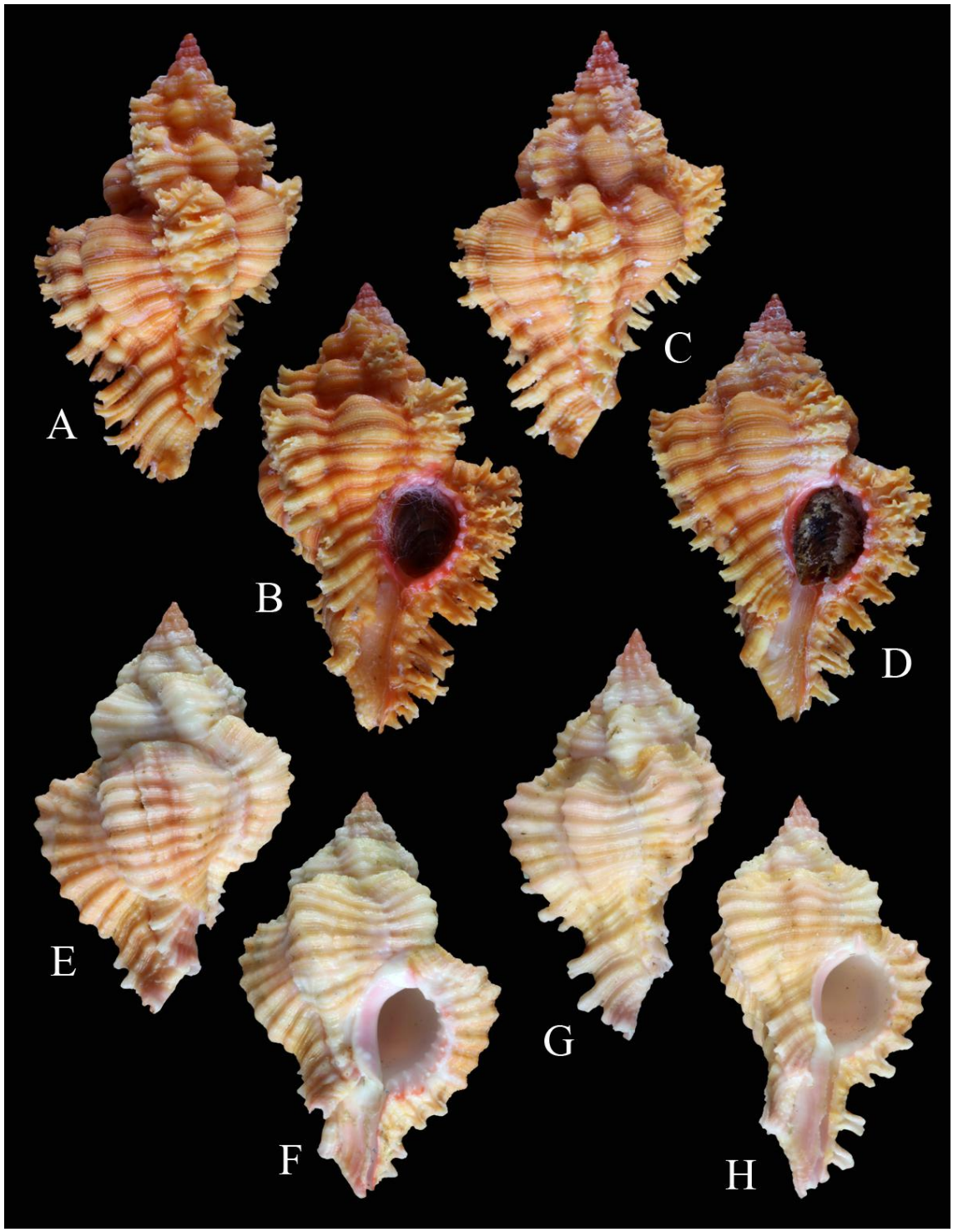

Plate 1. Comparison of *Chicoreus* (*Triplex*) *tangaroai* new species to similar species. A, B= *C.* (*T.*) *tangaroai*, Holotype measuring 46.08 mm in length, LACM No. 3784; **C, D=** *C.* (*T.*) *tangaroai*, Paratype 1 measuring 34.93 mm in length; **E, F=** *Chicoreus (T.) thomasi* (Crosse, 1872), measuring 45.43 mm in length, in the Collection of Paul Kanner, Colette Bay, Huku Nivu, Marquesas, by scuba at 15 to 20 m depth; **G, H=** *Chicoreus (T.) lorenzi* Houart, 2009, measuring 34.46 mm in length, in the Collection of Paul Kanner, Colette Bay, Huku Nivu, Marquesas, by scuba at 15 to 20 m depth.

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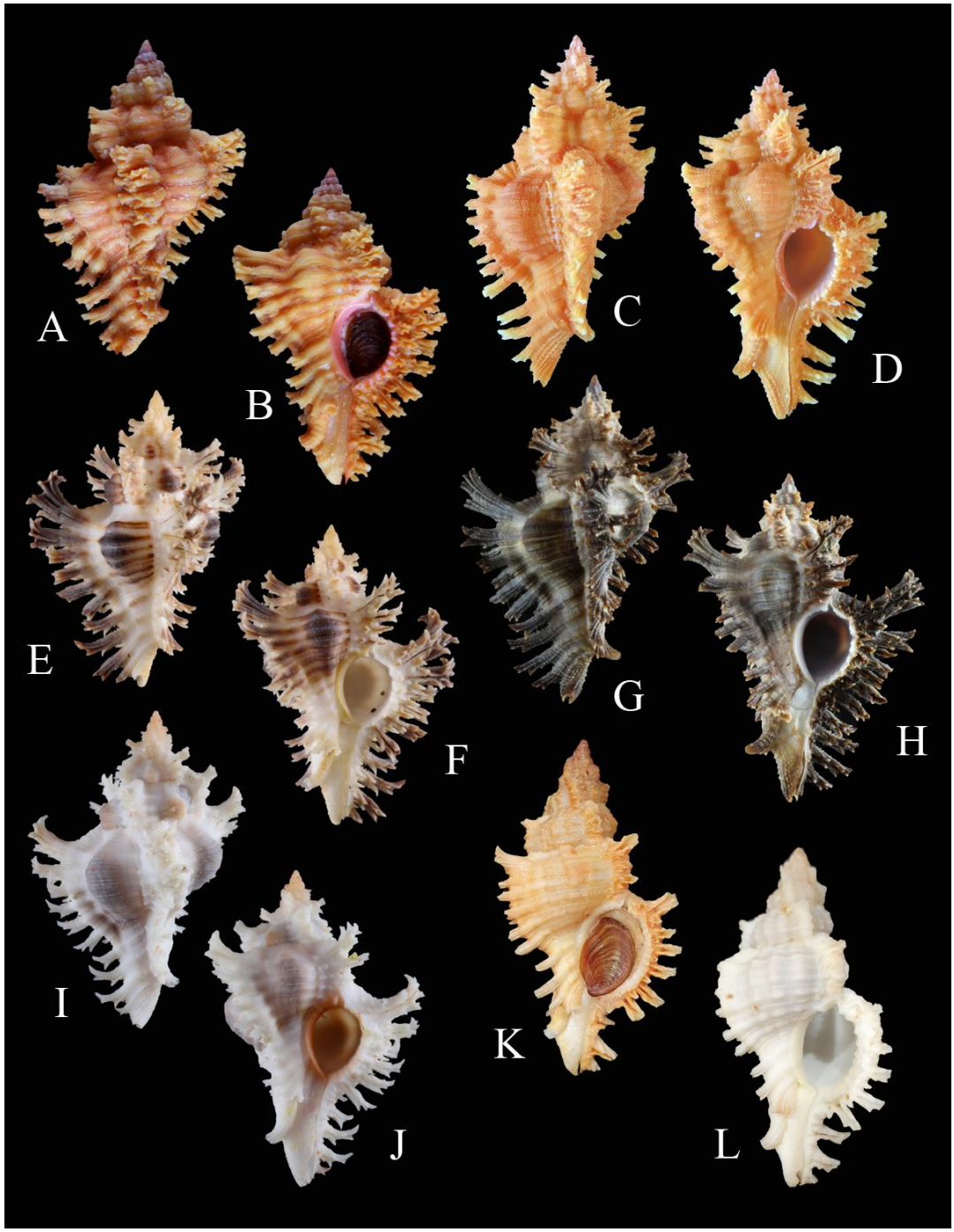

Plate 2. Comparison of *Chicoreus* (*Triplex*) *tangaroai* new species to other species mislabeled as "huttoniae". A, B= *C.* (*T.*) *tangaroai*, Paratype 5 measuring 42.56 mm in length, in the Collection of David B. Waller; **C, D=** *C.* (*T.*) *huttoniae* Wright, 1878, from New Caledonia measuring 45.3 mm, in the Collection of Roland Houart; **E, F =** *C.* (*T.*) *brunneus* Link, 1807, from the Philippines measuring 43.3 mm in length, in the Collection of David B. Waller; **G, H =** *C.* (*T.*) *brunneus* Link, 1807, from the Philippines measuring 49.2 mm in length, in the Collection of David B. Waller; **I, J=** *C.* (*T.*) *brunneus* Link, 1807, from the Philippines measuring 44.2 mm in length, in the Collection of David B. Waller; **K=** *Chicoreus akritos* Radwin & D'Attilio, 1976, measuring 65.8 mm in length, from Queensland, Australia, in the Collection of Valda Cantamesa; **L=** *Chicoreus akritos* Radwin & D'Attilio, 1976, measuring 51.7 mm in length, from Queensland, Australia, in the Collection of Valda Cantamesa.