

THE STATUS IN SINGAPORE OF *STROMBUS (DOLOMENA) MARGINATUS* *SOWERBYORUM* VISSER & MAN IN'T VELD, 2005 (MOLLUSCA: GASTROPODA: STROMBIDAE)

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INTRODUCTION

According to Chuang (1973), five species of *Strombus* are found in Singapore: *Strombus aurisdianae* (Linnaeus, 1758), *Strombus isabella* (Lamarck, 1822), *Strombus succinctus* (Linnaeus, 1767), *Strombus urceus* (Linnaeus, 1758), and *Strombus vittatus* (Linnaeus, 1758). Chou et al. (1994b) included *Strombus aratrum* (Röding, 1798), but omitted *Strombus aurisdianae* in the list of animals that were found in Singapore. *Strombus aratrum* was also mentioned in Chou et al. (1994a), where it was categorized as an endangered species. *Strombus aratrum* (misspelled as *Strombus atratum*) was classified as critically endangered in Chou & Tan (2008). Some authors consider *Strombus aratrum* to be either a junior synonym (Cernohorsky, 1967) or a subspecies (Short & Potter, 1987; Abbott, 1991) of *Strombus aurisdianae*. Thus, the number of *Strombus* species in Singapore remains at five. *Strombus isabella* is widely regarded as the junior synonym of *Strombus canarium* (Linnaeus, 1758), by the scientific community (e.g., Poutiers, 1998), although both of them are included as separate species in Chou et al. (1994b). Strombids are heavily harvested for food and the ornamental trade (Chou et al., 1994b; Tan & Chou, 2000). As a result of these anthropogenic factors as well as the degradation and destruction of marine habitats, many *Strombus* species are no longer common on our shores (Chou et al., 1994b). The finding of a new species or the rediscovery of a rare species is always important for the continuation of local conservation efforts because it reaffirms the fact that biodiversity is still thriving in Singapore waters amid intense economic development. A species of *Strombus* was recently collected in Singapore and the discovery is reported and discussed in this article.

DETAILS OF COLLECTION

Strombus species (identified as *Strombus marginatus sowerbyorum* in this article; Fig. 1) was first sighted at a sandbar in front of the National Service Resort & Country Club, 10 Changi Coast Walk, Singapore (1°18'57"N 103°58'27"E) near the mouth of a canal at 1600 hours on 7 Feb.2009 during spring low tide of 0.3 m above chart datum. On 8 Feb.2009, three specimens (Fig. 2) were collected by hand from the same locality at a similar time and tide level. The substratum on which the specimens were obtained was of fairly coarse sand and shell fragments with some silt. The specimens were deposited in the Zoological Reference Collection (ZRC) of the Raffles Museum of Biodiversity and Research (RMBR), Department of Biological Sciences, National University of Singapore (NUS) under the catalogue number of ZRC.MOL.2897. On two separate occasions, live specimens of similar appearance were sighted at other shores in Singapore, at a sandbar of sandy substratum along the stretch of Changi Beach that is closest to Carpark 7, Changi Ferry Road on 28 Apr.2009 at 0740 hours, and at a seagrass bed of silty substratum along the stretch of Pasir Ris Beach that is closest to Carpark F, Pasir Ris Park on 14 May 2009 at 0800 hours. All individual strombids encountered were buried to some extent.

SPECIMEN DETAILS

The shell lengths of the three specimens obtained from Changi are 39 mm, 41 mm and 46 mm. Shells are not conical, moderately heavy and thick (Fig. 3a-e). Shells have a moderately short conical spire consisting of six whorls, which are markedly stepped and nodulose. Body whorl is somewhat angular at the shoulder, which has one short prominent rib ventrally. At the anterior end, body whorl is attenuate and slightly curved towards the dorsal side, with numerous spiral grooves. Outer lip is moderately flaring and slightly thinned at the margin. Outer lip is not expanded posteriorly but has a long posterior process, extending onto the spire, with broad marginal undulations. Anterior or stromboid notch is distinct. Siphonal canal is short. Shells are rather smooth at the ventral. Outer lip smooth and lirate within, columella smooth and narrowly calloused. Shells have a base colour of white with closely spaced, fine lines of chestnut



Fig. 1. *Strombus marginatus sowerbyorum* in its natural habitat at Changi, Singapore. (Photograph by: K. S. Loh).

running along the length of the body whorl, interrupted by four or five equally spaced rows of white overlapping triangles across the middle, giving the impression that the shell has broad brown bands jagged at the edges. Shell patterns are a lot less obvious at the ventral side. Aperture is white and about three quarters of the shell length.

Soft parts of the specimens are shown in Fig. 4. The narrow foot has a grey and white mottled appearance. The animal has a long proboscis, which is white with grey bands. The tentacles are orange. The eyes are well developed and each has white-black-yellow concentric rings around a black centre. It has a serrated operculum attached to the hind end of the foot. The operculum is elliptical and brown with a darker shade at the middle.

DISCUSSION

The specimens presented in this article closely resemble a specimen that is deposited in the ZRC under the catalogue number ZRC 1975.4.21.16 (Fig. 5). The only difference is the longer posterior process in the ZRC specimen. A label with the ZRC specimen indicates that it was collected off Singapore at 4–5 fathoms by “Shark” Coll.” on 1 Feb.1926. The museum specimen is labeled as *Strombus succinctus*. However, our *Strombus* species specimens and the ZRC *Strombus succinctus* specimen, both of which we will refer collectively as Singapore’s *Strombus* species for the rest of the article, do not appear to be similar to the *Strombus succinctus* or *Strombus marginatus succinctus* figures illustrated in Sowerby (1842), Abbott (1960), and Wolfe (1977), which have a slender, elongate shape, and a taller spire. Singapore’s *Strombus* species also does not match the text descriptions of *Strombus m. succinctus* in Rao (1970: 111), which has “a single, rounded distinct knob on the dorsum of the body whorl”. As the name *Strombus succinctus* (Linnaeus, 1767) has a long history of nomenclatural and taxonomic problems (Kronenberg, 2008), it is highly possible that the ZRC specimen was misidentified. A comparison of diagnostic shell features suggests that Singapore’s *Strombus* species belongs to the new subspecies *Strombus marginatus sowerbyorum* described in Visser & Man In’t Veld (2005). Furthermore, the locality of our specimens is within the distribution range of *Strombus marginatus sowerbyorum*, which is from Japan to northwest Borneo, Gulf of Thailand, and China (Visser & Man In’t Veld, 2005). This name does not appear to have been previously recorded in Singapore. We have also yet to encounter any publication with a similar looking shell that has Singapore as its locality, except for a Changi specimen that was misidentified as *Strombus marginatus robustus* in the internet (see Frank, 1998 onwards). The misidentification is not surprising since the five

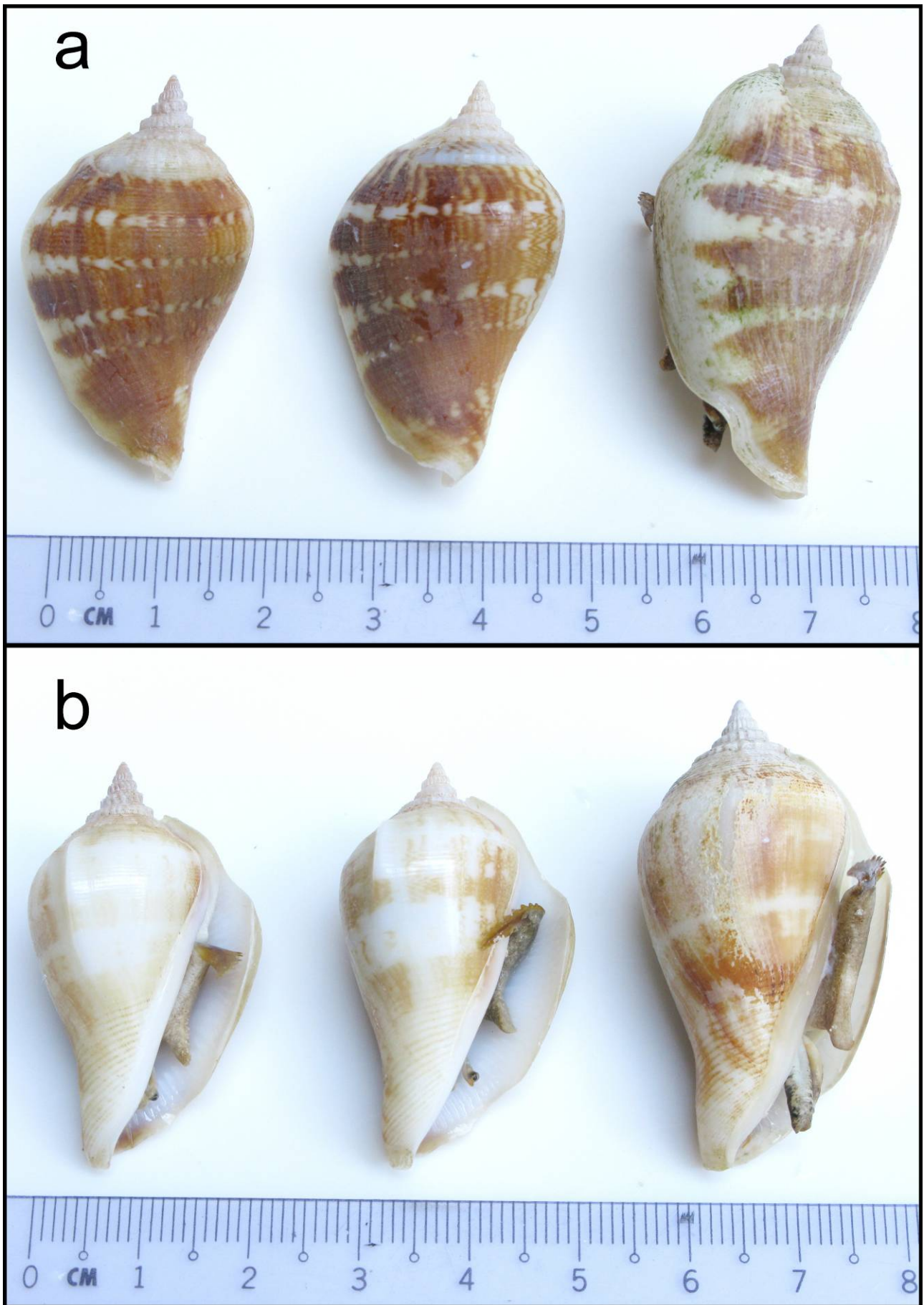


Fig. 2. (a) Ventral and (b) dorsal sides of the three specimens ZRC.MOL.2897 of *Strombus marginatus sowerbyorum* that were collected from Changi, Singapore. Scale in mm. (Photograph by: C. K. Chim).

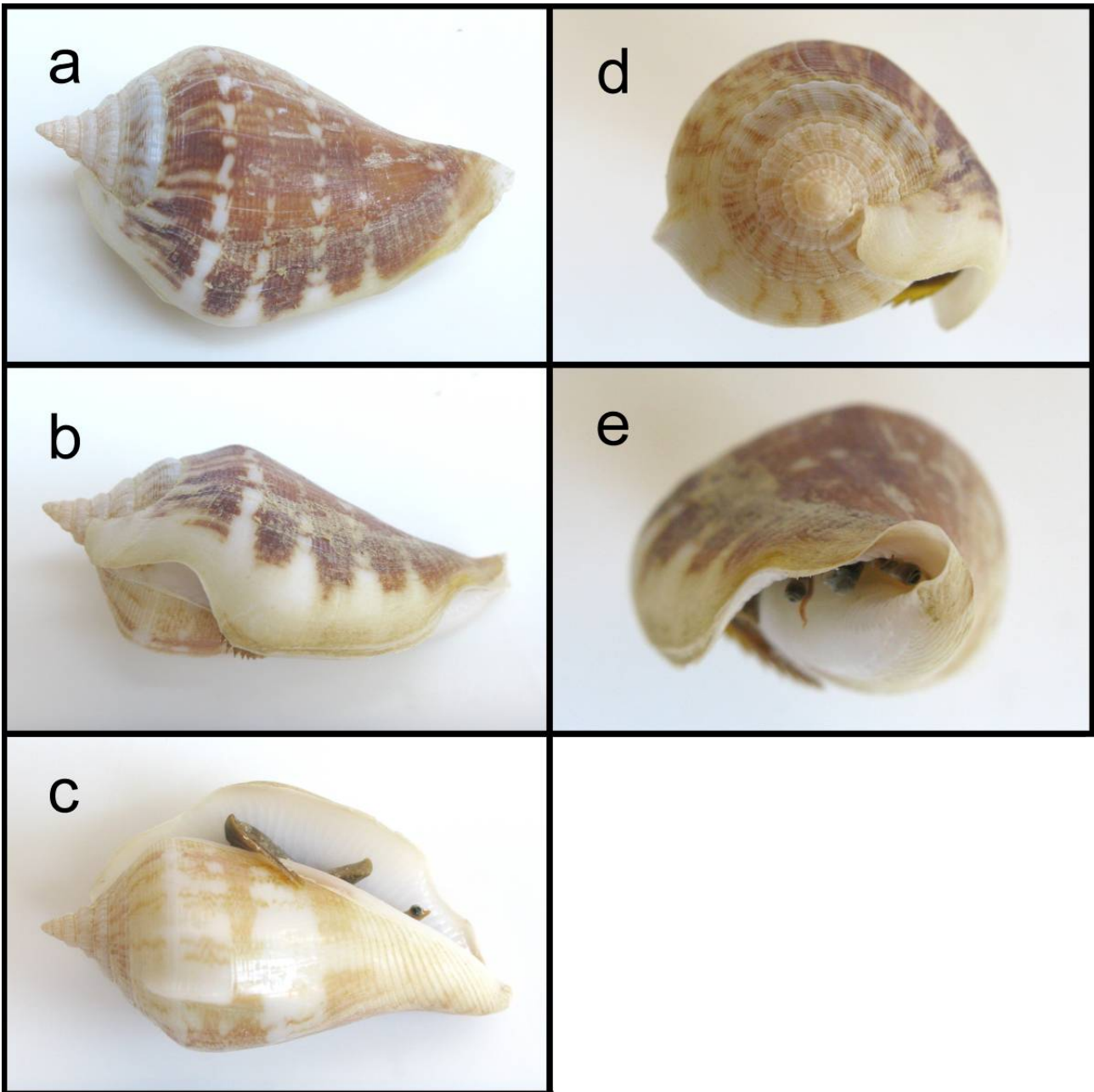


Fig. 3. (a) Dorsal side, (b) right side, (c) ventral side, (d) spire and (e) anterior side of a preserved specimen ZRC.MOL.2897 of *Strombus marginatus sowerbyorum* that was collected from Changi, Singapore. Shell length: 41 mm. (Photograph by: C. K. Chim).

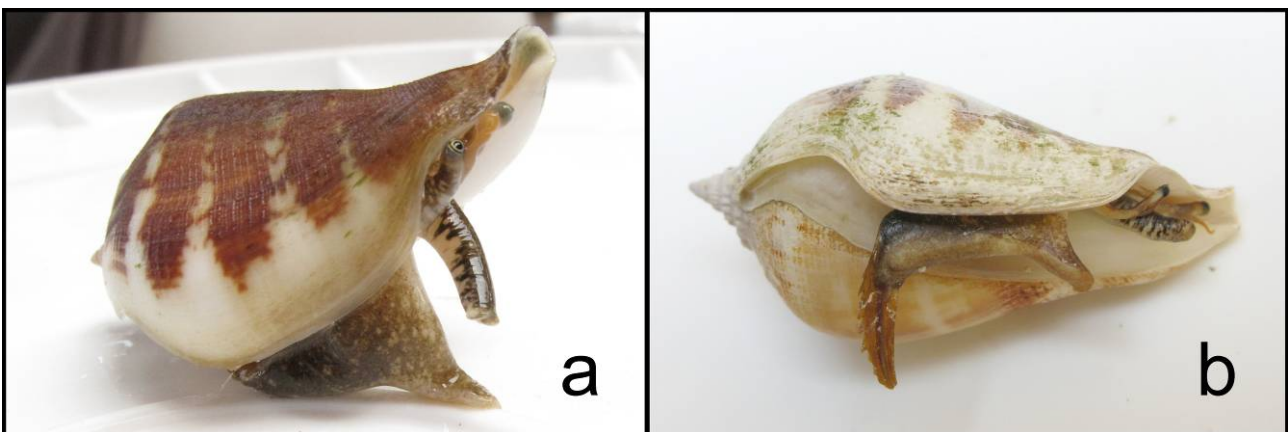


Fig. 4. (a) A live specimen and (b) a specimen that was relaxed using magnesium chloride solution and then preserved in 90% ethanol to show the soft parts of *Strombus marginatus sowerbyorum*. Shell length: 46 mm. (Photograph by: C. K. Chim).

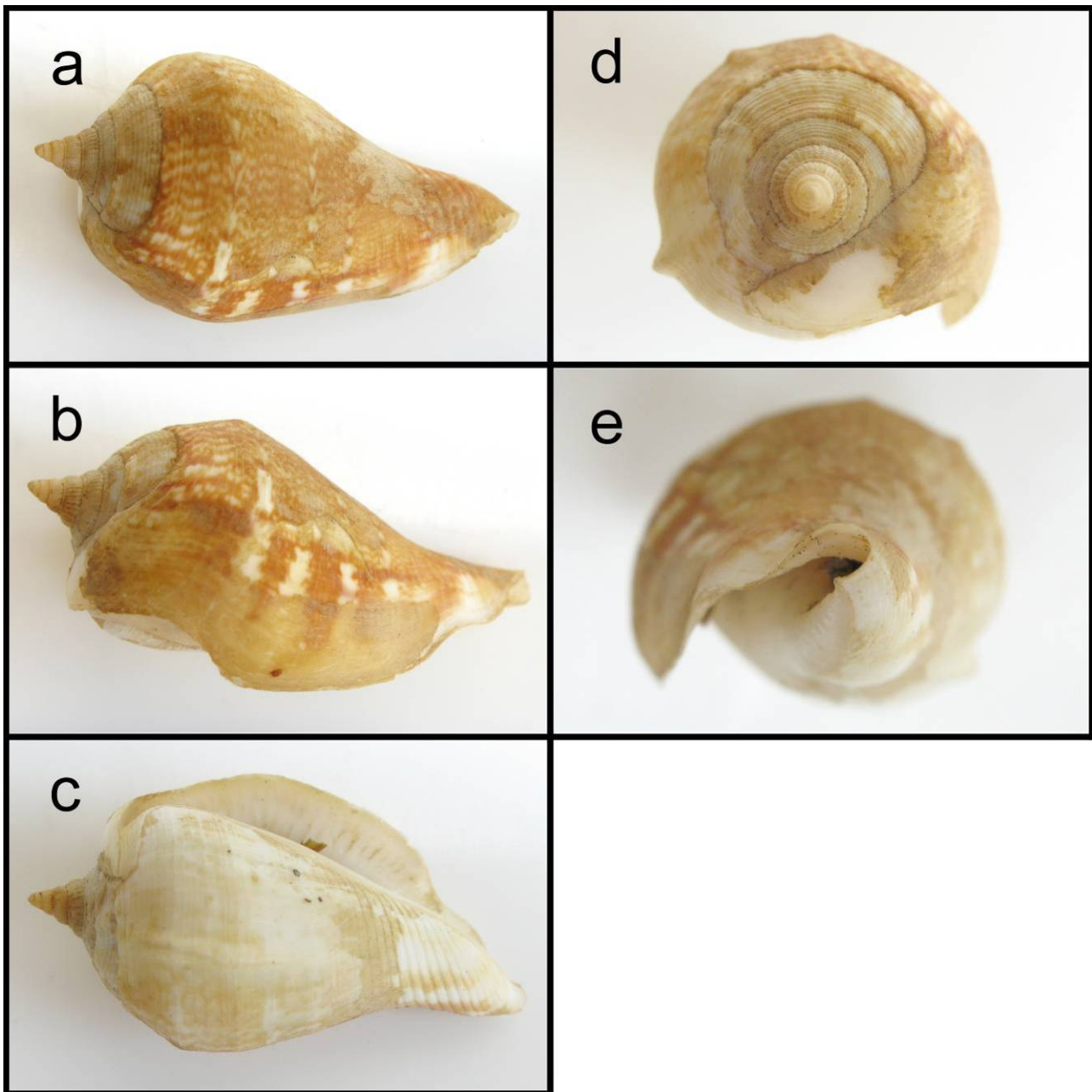


Fig. 5. (a) Dorsal side, (b) right side, (c) ventral side, (d) spire and (e) anterior side of specimen ZRC 1975.4.21.16 of *Strombus marginatus sowerbyorum* (misidentified as *Strombus succinctus*) deposited in the Zoological Reference Collection, Raffles Museum of Biodiversity Research, National University of Singapore. Shell length: 41 mm. (Photograph by: C. K. Chim).

subspecies (i.e., *marginatus*, *robustus*, *septimus*, *sowerbyorum* and *succinctus*) of *Strombus marginatus* closely resemble each other (see Visser & Man In't Veld, 2005), and *Strombus marginatus sowerbyorum* was misidentified as *Strombus marginatus succinctus* even in recent works (e.g., Raven, 2002; Cob et al., 2009).

Chuang (1973) included *Strombus succinctus* in the five species of *Strombus* that can be found in Singapore, but we do not know on the bases of his conclusions. We have not come across any specimen or illustration of *Strombus succinctus* in museums or publications that has Singapore as its locality. As the distribution range of *Strombus succinctus* is restricted to India and Sri Lanka (Linnaeus, 1767; Abbott, 1960; Visser & Man In't Veld, 2005), the record of *Strombus succinctus* in Singapore is in doubt. If Chuang had based his record of *Strombus succinctus* solely on the ZRC specimen that we have examined and discussed in this study, then the record is misidentified and should be replaced with *Strombus marginatus sowerbyorum*. The record of *Strombus succinctus* in Singapore will remain a mystery if Chuang's claim is not dependent on the museum specimen. In any case, *Strombus succinctus* is widely accepted by recent taxonomists as a subspecies of *Strombus marginatus*, and thus the discovery of *Strombus marginatus sowerbyorum* will result in two subspecies of *Strombus marginatus* recorded in Singapore. However, the number of *Strombus* species that is represented in Singapore still remains at five.

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