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Short Communication

The first record of *Neodilatilabrum* Dekkers, 2008 (Stromboidea, Neostromboidae, Strombidae) in Australia

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ABSTRACT

Presented herein are the first verifiable records of *Neodilatilabrum* Dekkers, 2008 in Australia. The two examples of *Neodilatilabrum robustum* (Sowerby, 1875) come from Point Cartwright and Dingo Beach, Queensland. These specimens represent an anomaly, being morphologically similar to a localized South China Sea population. The possible modalities to explain its presence at this locality are discussed. This discovery reaffirms the importance of proactive engagement between citizen scientists and institutional workers to enable a greater understanding of regional species richness.

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Introduction

The recreational collecting of shells has historically been focused on creating collections of curiosities and adventuring to out-of-the-way places to explore what treasures maybe found there. However, the last decades have seen a shift toward seeking a greater understanding of the taxonomic diversity and distributional patterns of the shells collected, giving rise to the collector as citizen scientist. This transformation in recreational collecting attitude has led to a great many discoveries of both new species and range extensions being brought to the attention of researchers working on taxa that have been overlooked for many decades (Maxwell et al. 2016, 2017a, 2019a; Maxwell and Dekkers 2019).

Strombidae are relatively abundant in tropical marine ecosystems and are, therefore, well known to collectors. As such, when recreational collectors encounter an atypical shell specimen, this tends to stand out and is consequently brought to the attention of the wider collecting community and, indirectly, the researchers working in that field. These collectors often pose questions of what the organism is and how it came to occur there.

Although Strombidae are gregarious and often found in large colonies (Abbott 1960; Catterall and Poiner 1983; Cipriani et al. 2008; Maxwell et al. 2017b), this is not always apparent in death assemblages. It is possible that small localized populations of *Strombus* might exist, especially in deeper waters, and only be evidenced by rare examples. An example of a sporadically Australian appearing species is *Ministrombus minimus* (Linné, 1771), which is known to occur rarely at Dingo Beach (Queensland) on intertidal sand bars, with Beverly Swan (Townsville, Queensland) and Valda Cantamessa (Proserpine, Queensland) having found live examples over the last four decades, and no dead specimens have yet been reported.

Strombidae are recognized as rapid colonists, as shown by the recent Mediterranean dispersal of *Conomurex raybaldi* Nicolay & Romagna-Manoja, 1983 (= *Conomurex persicus* (Swainson, 1821)). Ballast water from ships has the potential to facilitate the transport of a veliger, the larval life stage of many marine organisms (Apte et al. 2000). The dispersal potential of a veliger is a function of the temperature, current speed and time to metamorphosis, with localized environmental and structural cues triggering the metamorphic process (Berg 1972; Boidron-Metairon 1992; Davis and Stoner 1994; Stoner et al. 1998; Boettcher 2005). Time to metamorphosis varies between taxa, ranging from 12 to 60 days (Wiedemeyer 1998; Brito Manzano et al. 1999; Brito Manzano and Aldana Aranda 2003, 2004; Cob et al. 2009).

Another reason why shells might occur outside their expected range is that they are discarded on the beach by people, possibly as part of expunging an old shell collection or to decorate the beach for functions, such as weddings (Smith 2016). Strombids also have significant commercial value to the craft and gift shell markets,

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Figure 1. Australian *Neodilatilabrum* Dekkers, 2008: A, Point Cartwright, Queensland, beached, 37 mm; B, Dingo Beach, Queensland, 45 mm.

often forming the basic content of gift baskets. This commercial exploitation means that species are often shipped globally before reaching the end user, who may then simply discard them on the nearest beach. When shells are exotic to the native fauna and are found as part of a survey or scientific study, they have the potential to cause a taxonomic conundrum.

This article examines the first two records for *Neodilatilabrum* Dekkers, 2008 in Queensland, Australia. I recognize seven species within the *Neodilatilabrum,* and in recognizing these seven morphologically distinct taxa, we do not follow the blunt taxonomic instrument that is Kronenberg et al. (2019) and synonymizing of the species *Neodilatilabrum sowerbyorum* (Visser and Man in 't Veld, 2005) and *Neodilatilabrum boucheti* (Thach, 2016) under *Neodilatilabrum robustu*m (Sowerby, 1875). I consider three plausible reasons for *Neodilatilabrum* to be present outside its normal range: (1) it is a representative of a previously unidentified population; (2) it was transported to the location and has subsequently died; and (3) it could have been discarded.

Material and methods

Occurrence and collection

The first example of the species of interest was found in beach drift at Point Cartwright, Queensland, in 2019 by Sue Gambini, a local enthusiast collector (see Figure 1B). The shell was collected as part of the *Australian Mollusc Species Network* national survey, which is an Internet-based citizen science project coordinated by Gavin Nichols, Coffs Harbour, New South Wales, Australia, which aims to gather information on localized species composition primarily through the analysis of beach drift accumulated death assemblages. Once Sue Gambini uploaded an image of the daily finds to the networks *Facebook* site, it was noted that the specimen was not known among the group members, leading them to reach out to the author.

The second occurrence was a live collected specimen collected at Dingo Beach, Queensland, at low tide by Eric Haughton, a member of the *Townsville Shell Club* (see Figure 2B). The members of this club have a proud history of bringing new and interesting taxa to the notice of malacologists and having them named after them, such as *Domiporta cantamessa* Maxwell, Dekkers, Berschauer and Congdon, 2017b and *Vasitcardium swanae* Maxwell, Congdon and Rymer, 2016.

Identification

All members of the *Neodilatalbrium* are highly morphologically plastic making the complex confusing at first glance. The characteristics of the specimen were used to determine the genus based on the character set outlined in Kronenberg et al. (2019) and

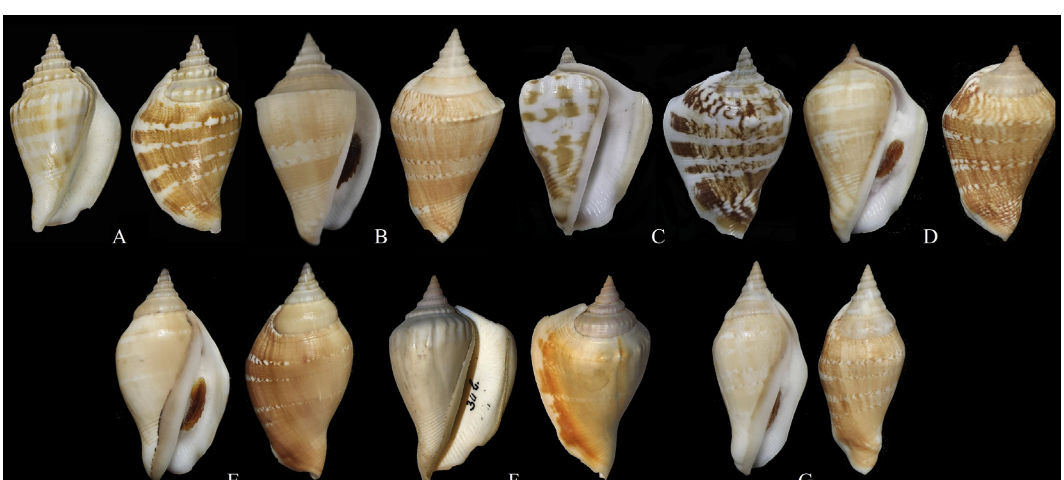

Figure 2. Members of the *Neodilatilabrum* Dekkers, 2008 (not to scale): A, *Neodilatilabrum boucheti* (Thach, 2016) Khan Hoa Province, Vietnam, 45 mm, MNHN-IM-2000-30134; B, *Neodilatilabrum marginatum* (Linné, 1758), Madras, India, 55 mm, SMC 66.002; C, *Neodilatilabrum robustum* (Sowerby, 1875), Indonesia, SMC 67.001; D, *Neodilatilabrum sowerbyorum* (Visser and Man in 't Veld, 2005), Okinawa, Japan, 48 mm, SMC 68.001; E, *Neodilatilabrum septimum* (Duclos, 1844), Balicasag Island, Philippines, 53 mm, SMC 69.002; F, *Neodilatilabrum simanoki* (Liverani, 2013), Sumatra, Indonesia, NCB Naturalis, 54 mm, RMNH MOL164040; G, *Neodilatilabrum succinctum* (Linnaeus, 1771), Madras, India, 53 mm, SMC 70.001.

Dekkers and Maxwell (2020). Once the genus was identified, the specimen was then compared and contrasted with currently recognized species within the group (Visser and Man in 't Veld 2005; Liverani 2013; Kronenberg et al. 2019; Dekkers and Maxwell 2020) and identified based on that morphological comparison. The specimens are compared with the seven existing *Neodilatilabrum* taxa: *N. boucheti* (Thach, 2016), *N. marginatum* (Linné, 1758), *N. robustum* (Sowerby, 1875), *N. septimum* (Duclos, 1844), *N. simanoki* (Liverani, 2013), *N. sowerbyorum* (Visser and Man in 't Veld, 2005) and *N. succinctum* (Linné, 1767) (Figure 2); and from this morphological comparison, a rational for taxonomic position is provided. There is a problem with the reconciliation of the Linnean collection material with the current accepted nomenclatural use of *S. succinctus*, and this species needs revision. Given the use of the name *S. succinctus* in association with organisms from Sri Lanka in terms of time (Kiener 1843; Duclos 1844; Reeve 1851; Abbott 1960) and number of publications and different authors (e.g. Horst and Schepman 1908; Iredale 1929; Dodge 1956; Dance 1974; Oliver and Nicholls 1975; Walls 1980; Kreipl et al. 1999; Bandel 2007; Dekkers and Maxwell 2020), indicates conservation of that name with its current associated semaphoront could be warranted, but this task falls outside the scope of this study.

Systematic accounts

Phylum Mollusca Linné, 1758
Superfamily Stromboidea Rafinesque, 1815
Epifamily Neostromboidae Maxwell, Dekkers, Rymer & Congdon, 2019
Family Strombidae Rafinesque, 1815
Tribe *Dolomenini* Dekkers & Maxwell, 2020
Subtribe *Doxandrina* Dekkers & Maxwell, 2020

Genus *Neodilatilabrum* Dekkers, 2008

Neodilatilabrum Dekkers, 2008: p. 58. Not *Margistrombus* Bandel, 2007: p. 153 – genus Not available (Dekkers and Maxwell 2020).

Type species: *Strombus marginatus* Linné, 1758: p. 744, no. 431 (Dekkers 2008).

Diagnosis. "Stromboidal notch sinuous. The flange is not stepped. Spire with distinct shoulder with knobs. Body whorl shiny and almost without any sculpture; expanded outer lip thickened at the inner edge and smooth. Aperture smooth within. Columellar smooth, with callous, well-marked. The anterior canal is short. The stromboid notch is moderately developed. The posterior canal is present" (Dekkers and Maxwell 2020, p. 44).

Comparative Diagnosis. The specimen has the district shoulder and knobs on the spire, and the flange is not stepped as is expected for members of the *Neodilatilabrum*. The specimen under consideration was found with *Doxander campbelli* (Griffith and Pidgeon, 1834) but lacks the subsutural cord found in *Doxander* Wenz, 1940 and was also found with *Pacificus dilatatus* (Swainson, 1821) but lacks the flange fold found in all *Dolomenina* Dekkers and Maxwell, 2020.

Neodilatilabrum robustum (Sowerby, 1875)

Lectotype: *Strombus robustus* Sowerby, 1875, p. 599, pl. 72, figs. 5, 5a.

Type Locality: Hong Kong (Abbott, 1960).

New Records (1) Point Cartwright, Queensland. Damaged and worn shell located in beach drift (Lat. -26.682 S.; Long. 153.138 E); (2) Dingo beach, Queensland. Live collected on sand bar at low tide (Lat. – 20.082 S.; 148.505 E.).

Comparative Diagnosis. The shape and form of the Point Cartwright shell general body whorl shape conform to *N. robustum* in being broadly ovate with a well-rounded weakly shouldered body whorl. The spire of the Queensland shells is indicative of *N. robustum*, being uniformly finely nodulated, and having a suture that overlaps below the shoulder and possessing a slight subsutural ramp. The Point Cartwright shell, and *N. robustum*, both share the style of the many knobs on the pre-ultimate whorl and a straight posterior sinus, unlike the strong recurved posterior sinus of *N. sowerbyorum*. The Queensland shells are akin to *N. boucheti* but lack the strongly nodulate and acute spiral whorls of that taxon. The outer lip of the Queensland shells are too broad and lacks the sinuosity of *N. septimum*. Furthermore, the Queensland shells have longer posterior canal than *N. septimum* but lack the extension of that canal found in *N. sowerbyorum* or the strongly reflected anterior of *Neodilatilabrum succinctum* from the central northern Indian Ocean is more elongated in form, with a much narrower aperture. The Australian specimens have a similar columella callosity to *N. robustum* being uniform in width and length, but the Point Cartwright shell lacks the keel on the shoulder of that species.

Discussion

The specimens contained within this paper highlight the role of citizen science in helping to inform our understanding of the diversity of regional ecological systems and highlights the role of citizen scientists as lookouts for invasive and novel taxa. This case study presents the two records of *Neodilatilabrum* from Australia. Although *Neodilatilabrum* is known from Papua New Guinea and the island chains of the eastern Coral Sea, species in that region are not conspecific with the specimen presented herein.

If there is a population of *Neodilatilabrum* in south-eastern Australia, we would expect to find more examples, given the breeding propensity of most Strombidae. However, the geographical distance between the two specimens indicates that there must be at least two distinct populations.

The specimens discussed in this article are well outside the potential drift range for veligers from that population, with the most similar form to the specimen being found in the eastern South China Sea (Dekkers and Maxwell 2020). Veligers of other taxa are known to survive in ballast water, and, given the large bulk commodity ports in New South Wales and Queensland, it is realistic to suggest that veligers twice hitchhiked their way here, given the trade between the South China Sea region and Australia (Apte et al. 2000).

Although commercially derived shells are often discarded from passing cruise liners, or used to decorate beaches for weddings and other functions, *N. robustum* is known to be used in commercial packages and has been imported into Australia from other countries, such as Vietnam, and may account for the dead collected specimen (Smith 2016), it cannot explain the living example of the species.

Conclusion

I make no judgment as to the population structure of Queensland *N. robustum* here and await more material to come forward before making any definitive conclusions as to whether or not this species is a permanent addition to the local fauna. This case study demonstrates that citizen scientists are useful for detecting taxa that may be novel to a region through knowledge of local fauna. The most obvious of the taxonomic enigmas is: does this discovery mean the distortion of species boundaries with a range extension based on trans-locational data?

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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