Strombus
ISSN 1983-2214

Strombus 30(1-2), 1–4, 2026
https://strombusjournal.org

RESEARCH NOTE

Asymmetry of eye peduncle length in *Euprotomus iredalei* (Abbott, 1960) (Mollusca: Neostromboidae: Strombidae)

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Maxwell S.J., Watt J.L., Payne M.A. (2026) Asymmetry of eye peduncle length in *Euprotomus iredalei* (Abbott, 1960) (Mollusca: Neostromboidae: Strombidae). Strombus 30(1-2): 1–4.

Stromboideans are a complex of gregarious herbivorous marine gastropods found in tropical and subtropical waters globally. This study examined the Australian endemic species, *Euprotomus iredalei* (Abbott, 1960), for which no previous morphological studies have been conducted to date (Fig. 1). This study examined the ommatophores of 39 specimens that were collected in July 2018 by commercial aquarium fishermen supplying Cairns Marine off the Western Australian coast near Karratha (± 20 km). The ommatophores, which in the case of Strombidae, consist of the eye stalk with a cephalic tentacle attached towards the distal end.

Recent studies have indicated that stromboideans are sensitive to the pollutants tributyltin (TBT) and triphenyltin (TPT), and this has been found to cause imposex in affected populations *Laevistrombus turturella* (Röding, 1798) in Johor Straits, Malaysia (Horiguchi, 2009; Cob et al., 2011). One of the purported indicators of imposex is the asymmetry in eyestalk length found in Philippine *Canarium urceus* (Linné, 1758) (= *Canarium esculentum* Maxwell, Rymer, Congdon & Dekkers, 2020) (Ruaza, 2019). Historical studies into the stromboidean eyestalk have centred on its regeneration following amputation (Gillary, 1972; Hughes, 1976) or the behaviour of the eyes during burrowing (Abbott, 1962). This is the first study to investigate further the length of the right and left ommatophore using *Euprotomus iredalei* from a pristine location (DPIRD Fisheries, 2020).

A sample (n = 39, Males = 21, Females = 18) of *Euprotomus iredalei* (Abbott, 1960) adult animals were obtained originating in Karratha, Western Australia, collected by commercial aquarium fishers diving in 10 m on clean sand near a coral reef, and supplied to Carin Marine, Queensland, in late 2018, This area is considered a pristine marine environment (DPIRD Fisheries, 2020). The maturity of this species was confirmed by the researchers, evidenced by a thickened outer lip and a formed anterior siphonal canal: this indicates that the shell had achieved terminal growth. Following collection, animals were preserved in ethanol for 6 months until the time of examination for this study, with shells deposited in the BlueSky Research Foundation Collection (BSRF 5.016). Sex was determined by the presence of a verge in males, and the animals were examined for evidence of imposex, particularly the development of a malformed verge on females (Cob et al., 2011). The eye peduncles were measured at the base where it was attached to the body of the animal (Ruaza, 2019). Each of the peduncles was classified as left and right relative to the position of the proboscis. Peduncles were

Article received on November 08 2025
Article accepted on January 02 2026

straightened with forceps and their length measured using a digital calliper with an accuracy of +/- 0.01 mm. A two-sided paired samples t-test was carried out using SPSS on the data to determine if there was a significant difference within the species between the lengths of the right and left peduncles. Additionally, the effect size of this difference was determined. The proportional sizes for each animal between left and right peduncles were calculated, and a two-sided independent samples T-test was conducted to determine if there was a significant difference in proportional lengths of the peduncles within the population and between males and females.

There was no evidence for imposex, with all animals having normal external sex organs. In all organisms examined, the left peduncle (7.32 mm ± 0.19) was significantly shorter ($t_{(38)} = 10.315$, $p < 0.001$) than the right (8.86 mm ± 0.23 SE). The effect size was large ($d = 1.05$). There were no differences in the proportional length of peduncles between females and males ($t_{(38)} = 0.056$, $p = 0.955$).

Figure 1. A sample of the *Euprotomus iredalei* (Abbott, 1960) from Karratha used in this study (photo courtesy of Uwe Weinreich).

The findings of this study showed that all animals examined had two peduncles of differing lengths. In previous studies, this difference was considered an abnormality (Ruaza, 2019), but this study provides contradictory results, indicating it is a natural anatomical trait in the target species. Stromboideans have three distinct shell growth phases: the first twelve to thirty-five days are spent in a pre-metamorphic larval form that is followed by a growth phase where the shell coils and, finally, the flaring lip growth phase, which indicates the commencement of sexual maturation (Berg, 1976; Mitton et al., 1989; Appeldoorn, 2005). The verge in males and gonads only develop once the maturing phase has commenced after the shell has reached terminal growth, defined as the formation of the out lip (Stevely, 1979; Avila-Poveda et al., 2006). Therefore, studies that do not exclude juveniles are prone to false positive imposex results with respect to undertaking comparative physiology, as males have yet to develop their mature verges. This may offer an explanation for this inconsistency, as the body form, such that verges and gonads are not fully developed until the animal has reached sexual maturity.

Stromboideans have evolved to have a shell with two anterior sinuses that enable the eye peduncles to extend past the outer lip while maintaining the aperture face down or allowing the animal to see while partially buried (Savazzi, 1991). The differing peduncle length reflects this, with the right peduncle being longer, as it is more anterior than the left, and the eye stalk has further to reach the more anterior sinus of the outer lip. Therefore, we contend that the differing lengths of eye peduncles have a relationship with the shape and form of the basal sinuses on the outer lip in the species under consideration.

In conclusion, there is widespread sexual dimorphism in the stromboidean complex in shell size, with larger females than males (Abbott, 1949, 1960; Reed, 1993; Maxwell et al., 2017, 2020, 2021a, 2021b, 2022). Furthermore, sexual dimorphism is known in relative body size, some organs and the radula (Reed, 1993, 1995; Mutlu, 2004), and more generally, Physiological morphological and molecular differences observed in non-sexual organs of male and female animals that can affect many aspects of their biological traits (Niksirat et al., 2021). However, this study determined that sexual dimorphism in peduncle length was not present in the target species.

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