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All Is Not Quiet on the Western Front: High Host–Parasite (Echinodermata and Caenogastropoda) Diversity Revealed at an Australian Marine Transition Zone

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Abstract

While substantial eulimid diversity has been revealed in the Indo-West Pacific marine diversity hotspot, many neighbouring areas are still unexplored, including in Western Australia. The Houtman Abrolhos are a unique chain of islands in a well-characterised marine transition zone where tropical and temperate waters meet along the mid-west coast. During a biodiversity survey of the islands in 2025, sixty-two eulimids from 15 stations were collected, a family of marine gastropods never-before documented from this region. Here we incorporate newly collected and legacy material from the Western Australian Museum to illustrate 23 new eulimid morphospecies records for the Houtman Abrolhos. Sixteen hosts, representing all five classes of Echinodermata, were identified. Most eulimids were attached externally to their hosts, though *Stilifer utinomii* and two unidentified species of *Melanella* were found embedded in *Disasterina longispina* and *Actinopyga mauritiana*, respectively. *Apicalia angulata*, *Peasistilifer nitidula* and *Stilifer utinomii* are newly recorded for Western Australia, and *Thyca ectoconcha* and *Vitreobalcis tripneusticola* are new Australian records. The biogeographic affinities of these symbionts, like other marine life surveyed in the Houtman Abrolhos islands, are overwhelmingly tropical in nature, representing in many instances the southernmost records of otherwise widespread Indo-West Pacific species.

Keywords: Western Australia; Houtman Abrolhos Islands; micromolluscs; biodiversity; ectoparasites; gastropods; hosts

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1. Introduction

One of the most intriguing relationships between molluscs and another invertebrate group exists between gastropods in the family Eulimidae and members of the phylum Echinodermata, with a full spectrum of lifestyles ranging from ectoparasitism to endoparasitism exhibited by the gastropods [1]. In these associations, eulimids derive nutrition from epithelial tissue [2], skeletal structures [3], coelomic fluid [4], organs (such as gonads) [5] and potentially the collected food (i.e., kleptoparasitism) [6] of their echinoderm hosts. Eulimids are symbiotic with hosts in all five classes of Echinodermata, and the wide array of niches provided by different host species is postulated to have, at least in part, facilitated a great degree of speciation within the family [1,7]. There are currently more than 1000 eulimid species known globally, but it is anticipated that a further 3000 species are undescribed, making it one of the most diverse gastropod families [8].

Biodiversity surveys focused on the tropical Indo-West Pacific (hereafter referred to as IWP) have revealed substantial eulimid diversity in areas where diversity is high for marine invertebrates overall [9–11]. However, eulimids are also surprisingly speciose in other areas where they have been intensively studied, such as the deep waters of the North Atlantic [12]. Despite this, eulimids are poorly documented in most biogeographic regions, including Australia, where 134 species are known from 34 genera [13]. The last revision of Australian Eulimidae was conducted by Charles Laseron in 1955 [14], when he proposed 39 new species and 14 new genera, though most of the examined specimens originated from New South Wales. However, Laseron's taxonomic concepts were founded on the assumption that the Australian fauna is distinct from that found elsewhere, thereby necessitating much synonymisation in the later revisionary works by Anders Warén, who utilised a global scope to define the family and genera within [1,15–17]. In Western Australia (WA), Eulimidae are understudied, much like all other small-bodied molluscan groups, with regional biodiversity surveys focused only on macromolluscs until quite recently [13,18,19].

A preliminary checklist completed in 1997 lists 492 molluscs from the Houtman Abrolhos Archipelago (hereafter referred to as the Abrolhos); however, only macromolluscan groups are represented (approximately >5 cm as adults), and no effort has been made to assess the micromolluscan (<5 mm as adults) component of the fauna since [20]. As such, prior to this study, no eulimids were recorded from the islands [21]. In 2024, as part of a broader legacy collection project initiated to register and make publicly accessible pre-existing lots in the Western Australian Museum, four morphospecies belonging to six unregistered eulimid lots collected from the Abrolhos between 1976 and 1988 were found. For these reasons, it was decided that eulimids would be a focal mollusc group for the 2025 field trip to attempt to re-collect the newly identified morphospecies and discover additional new records. This would also provide the opportunity to record habitat, lifestyle and host identity, as well as the appearance of live animals, all of which are very sparsely noted for eulimids in general, despite being important taxonomic characters [1,22,23]. This basic information would inform species distributions and host preferences from regional to global scales. Furthermore, fresh material for future genetic studies was considered a priority, given the need for an integrative approach, as is best practice when describing new species.

2. Materials and Methods

2.1. Study Area

The Houtman Abrolhos are a group of low-lying islands, shallow reefs and sandy lagoons that lie 60 to 90 km from the coast of Geraldton (Figure 1) [24]. The islands are formed from Pleistocene limestone and were connected with the Australian mainland during the last glacial maximum (ca. 18,000 YBP) [25]. Macroalgae dominate the highly exposed reefs at the southern and western boundaries, while scleractinian corals form dense coral gardens in the sheltered backreefs and lagoons. The Leeuwin Current, an offshore, pole-ward flowing current, bathes the islands in tropical water, elevating sea temperatures by up to 4 degrees compared to coastal waters nearby during winter months, and transports pelagic larvae southwards [26,27]. This increase in water temperature probably surpasses the minimum thermal tolerance of many tropical organisms, thus explaining the surprising diversity of scleractinian corals and tropical fish present at such high latitudes [28,29]. Yet, there is still a strong temperate signal, with more than 20% of macromolluscan and algal assemblages composed of temperate species [20,30]. This mix of fauna, as well as a wide range of habitat types, has contributed to an echinoderm diversity of approximately 172 species, including 45 asteroid, 28 crinoid, 26 echinoid, 33 holothurian and 40 ophiuroid species [31]. As a result, the echinoderm diversity of the Abrolhos matches or even exceeds the diversity of lower-latitude coral reefs in WA [31]. Furthermore, Marsh (1994) found that the proportion of tropical echinoderm species varied significantly by class, but that overall the majority were tropical (63%), and a large proportion were endemic (22%), with a small number of temperate species (14%) [25].

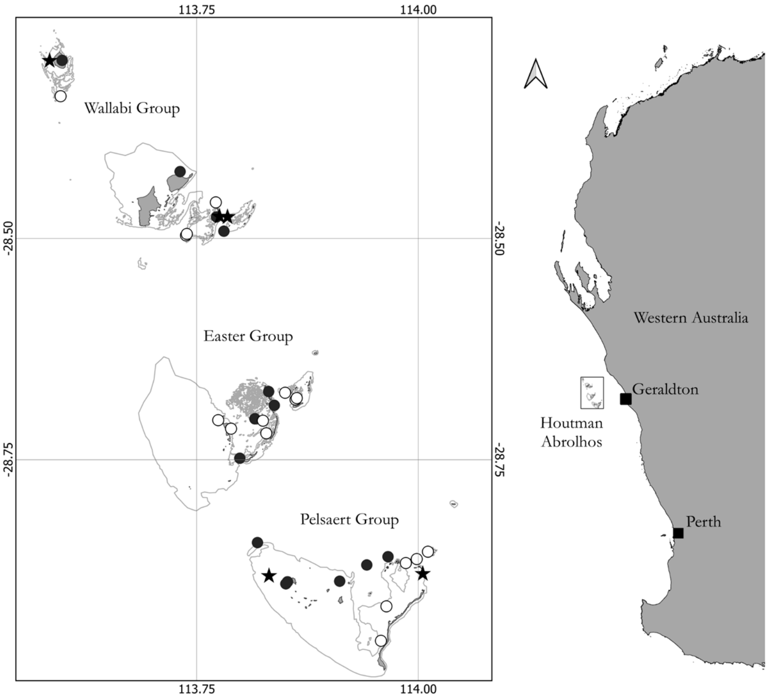

Figure 1. Stations surveyed in the Houtman Abrolhos during April–May 2025, where eulimid gastropods were collected (black dots) and not collected (open dots). The approximate locations of eulimids collected by museum staff in prior years are represented by stars.

2.2. Sampling

General biodiversity surveys took place across 31 stations distributed throughout all of the Abrolhos Island groups during April and May 2025 (Figure 1). Eulimids were targeted directly and indirectly at depths between 1 and 25 m. Potential hosts were visually examined, and those with eulimids attached were collected by hand while snorkelling and SCUBA diving or by towing a triangular dredge behind a tender. Hosts and parasites were immediately sealed inside zip-lock bags, as many eulimids will readily detach from the host when disturbed [1]. Where particularly abundant, potential hosts were also haphazardly collected, brought on deck and washed in a bucket of freshwater to irritate and detach any symbionts present. All members of a potential host species were washed consecutively, and the bucket was thoroughly rinsed before treating a different species, to avoid mistaken host–symbiont assignment. All water that contacted the bucket was passed through a 500 µm sieve, and any captured material was immediately examined under a microscope. Free-living eulimids were also collected indirectly by scrubbing rocks with a laundry brush inside fabric collection bags while diving. The bags were rinsed, sieved and the collected material examined. Additional specimens were incidentally collected in 70 mL sediment scoops and algae crawl-off samples that were sorted under a microscope with fine brushes and forceps. Any symbionts found were picked out and placed in Petri dishes with fresh seawater for later microscopic observation.

Where possible, eulimids were photographed live on their host in situ or in vitro on the research vessel. Voucher specimens were photographed live and either placed directly in 100% ethanol or boiled in freshwater for 5 s [32] to prevent the operculum from completely sealing, thereby allowing alcohol into the shell cavity upon preservation. Where many specimens of a single species were available, several individuals were placed in 70% alcohol to aid with future anatomical work. Relaxation with $MgCl_2$ was attempted, but the specimens were either still responsive to physical stimulus or had withdrawn completely. Where possible, hosts were photographed live, and tissue subsamples of tube feet (asteroids, echinoids and holothurians), arm tips (crinoids and ophiuroids) or longitudinal muscle (holothurians) were placed in 100% ethanol for future molecular examination. All material was deposited in the WAM with voucher specimens and tissue clips stored in −80 °C ultra-freezers (see Table S1 for host and parasite accession numbers).

2.3. Live Photography and Shell Images

Live specimens were photographed in situ with an Olympus TG7 (Tokyo, Japan) and Inon Z330 strobe (Kamakura, Japan). In vitro images of live specimens were captured using a Canon EOS 6D II digital camera (Tokyo, Japan) mounted on a Leica M80 stereo microscope (Wetzlar, Germany). Preserved specimens were imaged with either a Canon EOS 6D Mark II mounted on a Leica M205 stereo microscope or a Canon EOS 6D with a Canon EF MP-E 65 mm macro lens. Images were all focus stacked using Helicon Focus v. 8 (Kharkiv, Ukraine). Minor adjustments to improve image brightness and sharpness were made using Adobe Photoshop v. 26.0 (San Jose, CA, USA).

2.4. Differentiation and Taxonomic Identification

Specimens that obviously contrasted in shell shape, colouration or host species were considered distinct and were treated separately in the field. Morphospecies concepts were further refined into individual Operational Taxonomic Units (OTUs) at the WAM Collections & Research Centre (CRC). High-quality images of the dorsal, lateral and ventral aspects of the largest or most intact specimen of each OTU were captured and combined to form a voucher image plate for future reference, with a scale bar. Where present, additional image plates were also created to capture shell and ontogenetic variability and sexual dimorphism in shell form. These image plates were compared with the voucher plates of other OTUs in the WAM collection, and OTUs that had not been encountered before were given a unique reference code (GAStropoda = GAS + sequential number). As of July 2025, around 80% of the eulimid material in the WAM collections had been registered, reviewed and assigned OTU codes. While this approach lacks the sensitivity of molecular analysis to detect species diversity (e.g., barcoding), it does allow for the comparison of fresh material with dead shells, from which DNA may be impossible, or at least difficult, to extract [33]. This is particularly relevant for eulimids as many species are known only from dry shells [12]. Image plates also help to avoid repeated handling of small, fragile shells, which increases the risk of complete loss or damage to the shell. Furthermore, if the animal within is not removed before preservation, then a small, fragile shell may be incidentally destroyed during DNA extraction [34]. Although methods exist for separating animal and shell in micromolluscs, this procedure is still seldom utilised for eulimids and may be challenging to accomplish [32]. As such, a dilemma is often posed when only a single voucher specimen is available, as a choice must be made between retaining the physical specimen and extracting molecular data (e.g., *A. wareni* Dgebuadze, Fedosov & Kantor, 2012 in [35]).

Reference books (e.g., [36]) and keys (e.g., [12]) were used to match eulimid OTUs to existing genera, and species-level identifications were completed by comparison with original descriptions, with examination of type specimen images where available. However, for most specimens, the pursuit of species-level identification ends at the “taxonomic cul-de-sac”, where type material may be lost, degraded or limited in characters (e.g., empty, dry shells) and accompanied by poor illustrations and vague descriptions that lack anatomical observations, host information or the appearance of live animals [37]. To identify new species, the types of similar genera need to be examined due to broad taxonomic uncertainty.

Types for most eulimid genera have not been sequenced and higher relationships in the family are poorly resolved; therefore, genera and species are listed alphabetically.

Hosts were identified by comparing images and field notes with the primary literature, regional species checklists and identification guides. Local echinoderm experts were also consulted, particularly to aid with the identification of crinoids. However, these provisional species assignments require further testing, such as a molecular phylogenetic approach and anatomical assessment.

3. Results and Discussion

Eulimids were found at all three major island groups in the Abrolhos and were collected at half (n = 15) of the stations surveyed (Figure 1 and Table S1). A total of 23 eulimid OTUs were identified from the newly collected expedition material and pre-existing WA Museum legacy material from the Abrolhos (Table 1).

Table 1. Host–parasite relationships and the habitats in which these were situated in the Houtman Abrolhos Islands. Island groups: E = Easter Group; P = Pelsaert Group and W = Wallabi Group.

Host Class	Host ID	Eulimid OTU	Eulimid ID	Position on Host	Habitat	Island Group
Asteroidea	*Aquilonastra cepheus*	GAS1126	*Apicalia angulata*	Ambulacrum	Under intertidal rocks	W
Asteroidea	*Archaster angulatus*	GAS1193	*Parvioris* sp.	Aboral surface of arm	Bare aragonitic sand and shell grit	P
Asteroidea	*Disasterina longispina*	GAS1134	*Stilifer utinomii*	Embedded in arm	Exposed reef flat	P
Asteroidea	*Linckia multiflora*	GAS0745	*Thyca ectoconcha*	Next to ambulacrum	Large reef patch with algae and live coral	E
Crinoidea	cf. *Comatula* sp.	GAS1191	*Curveulima* sp.	Underside of arm	Amongst coral rubble on reef slope	P
Crinoidea	*Comanthus parvicirrus*	GAS1020	*Curveulima cornuta*	Underside of arm	Amongst coral rubble on reef slopes	P and W
		GAS1192	*Curveulima* sp.	Underside of arm	Amongst coral rubble on reef slopes	E and P
Crinoidea	*Comanthus* sp.	GAS1192	*Curveulima* sp.	Underside of arm	Amongst coral rubble on reef slope	P
Crinoidea	*Dichrometra* cf. *palmata*	GAS1190	cf. *Annulobalcis* sp.	Ambulacrum	Crevice in limestone reef wall	P
Echinoidea	*Tripneustes gratilla*	GAS1189	*Vitreobalcis tripneusticola*	Unknown	Limestone reefs with macroalgae	E and P
Holothuroidea	*Actinopyga mauritiana*	GAS1011	*Melanella* sp.	Amongst tube feet	Edge of a shallow reef channel	E
		GAS1213	*Melanella* sp.	Embedded in dermis	Edge of a shallow reef channel	E
		GAS1217	*Melanella* sp.	Embedded in dermis	Edge of a shallow reef channel	E
Holothuroidea	*Holothuria atra*	GAS1003	*Peasistilifer nitidula*	Dorsal surface	Sandy reef gutter and sandy reef with algae	P and W
		GAS1216	*Melanella* sp.	Dorsal surface	Sandy reef with dead coral and macroalgae	W
Holothuroidea	*Holothuria pervicax*	GAS1195	*Melanella* sp.	Dorsal surface	Sandy reef with dead coral and macroalgae	W
		GAS1214	*Melanella* sp.	Amongst tube feet	Sandy reef with dead coral and macroalgae	W
		GAS1221	*Melanella* sp.	Amongst tube feet	Sandy reef with dead coral and macroalgae	W
Holothuroidea	*Stichopus monotuberculatus*	GAS1011	*Melanella* sp.	Amongst tube feet	Crevice in limestone reef wall	P

Table 1. *Cont.*

Host Class	Host ID	Eulimid OTU	Eulimid ID	Position on Host	Habitat	Island Group
Ophiuroidea	*Breviturma dentata*	GAS1135	*Hemiliostraca peasei*	Underside of arm	Under limestone rubble at exposed sites	E and W
Ophiuroidea	*Ophiactis savignyi*	GAS1039	Eulimidae sp.	Arm-disc junction	On *Tridacna noae* on shallow coral reef	E
Ophiuroidea	*Ophiothela mirabilis*	GAS1029	*Stilapex* sp.	Oral disc	An orange gorgonian on limestone reef	W
-	-	GAS1052	*Melanella cumingii*	Free-living	Intertidal reefs	E and W
-	-	GAS1064	*Sticteulima* sp.	Free-living	In coral rubble on barren reef slope	E
-	-	GAS1135	*Hemiliostraca peasei*	Free-living	Coarse grit under limestone overhang	P
-	-	GAS1194	*Sticteulima* sp.	Free-living	In coral rubble on barren reef slopes	E
-	-	GAS1213	*Melanella* sp.	Free-living	Under dead coral slabs on sandy reef	W

Sampling in 2025 recovered 19 OTUs from thirteen host species, whereas only four OTUs and three additional host species had been collected previously. Interestingly, none of the prior OTUs were recollected in the recent survey (Table S1). Eight OTUs were already present in the WAM collection, having been identified from other areas throughout WA (Table 2). The remaining 11 OTUs are only known from the Abrolhos. Only eight of the OTUs could be matched to described species with any level of certainty, and at least one OTU is undescribed (GAS1039). Five OTUs are identified as new records for WA, and of those, two are new records for Australia.

Table 2. Putative eulimid species from the Houtman Abrolhos Islands and their distributions. Records within Western Australia (WA) are based on specimens in the WA Museum, and those outside of WA are based on records in the literature.

OTU	Preliminary Identification	Within WA	Outside of WA
GAS1126	*Apicalia angulata* Warén, 1981	-	Queensland and Tonga [17]
GAS1190	cf. *Annulobalcis* sp.	-	-
GAS1020	*Curveulima cornuta* Laseron, 1955	Perth to Quobba	South-Eastern Australia [38]
GAS1192	*Curveulima* sp. ‘brown spotted’	-	-
GAS1191	*Curveulima* sp. ‘plain’	-	-
GAS1039	Eulimidae gen. sp.	Kimberley	-
GAS1135	*Hemiliostraca peasei* (Tryon, 1886)	Carnarvon	Indo-West Pacific [21]
GAS1052	*Melanella cumingii* (A. Adams, 1854)	Shark Bay to Cocos Keeling Islands	Indo-West Pacific [21]
GAS1214	*Melanella* sp. ‘angular aperture’	-	-
GAS1011	*Melanella* sp. ‘large, twisted’	Rowley Shoals	-
GAS1195	*Melanella* sp. ‘broad & brown’	-	-
GAS1213	*Melanella* sp. ‘red spotted’	-	-
GAS1216	*Melanella* sp. ‘broad & white’	-	-

Table 2. *Cont.*

OTU	Preliminary Identification	Within WA	Outside of WA
GAS1217	*Melanella* sp. 'slender'	-	-
GAS1221	*Melanella* sp. 'white'	-	-
GAS1193	*Parvioris* sp.	-	-
GAS1003	*Peasistilifer nitidula* (Pease, 1861)	Carnarvon to Cocos Keeling Islands	Indo-West Pacific [21]
GAS1064	*Sticteulima* sp. 'honeycomb'	-	-
GAS1194	*Sticteulima* sp. 'stripey'	-	-
GAS1029	*Stilapex* sp.	Exmouth to Ashmore Reef	-
GAS1134	*Stilifer utinomii* T. Habe, 1951	-	Australia, Japan, Vietnam [39]
GAS1215	*Thyca ectoconcha* P. Sarasin & F. Sarasin, 1887	Montebello Islands	Mozambique, Sri Lanka, Vietnam [39]
GAS1189	*Vitreobalcis tripneusticola* H. Matsuda & Nagasawa, 2019	-	Singapore, Vietnam, Japan [39]

Twenty of the OTUs were found attached to echinoderm hosts, whilst three were only found as free-living individuals (Table 1). The hosts were distributed among all five classes of Echinodermata, including four asteroids, four crinoids, one echinoid, four holothurians and three ophiuroids (Table 1). Most eulimids were only found on one host species and were attached externally. However, two individuals of GAS1134 were found in a gall on the arm of the asteroid *Disasterina longispina* (H.L. Clark, 1938), and GAS1213 and GAS1217 were found embedded in the outer body wall of the holothurian *Actinopyga mauritiana* (Quoy & Gaimard, 1834). Three different OTUs were found on more than one host species, but never at the same station: GAS1011 from two holothurians, GAS1192 from two crinoids and GAS1217 from two holothurians (Table S1).

Across the sixteen host species, four were found to host more than one eulimid OTU, with three instances where the same host species was parasitised by multiple parasites contemporaneously (Table S1). *Comanthus parvicirrus* (Müller, 1841) was parasitised by two *Curveulima* morphospecies, GAS1192 and GAS1020, at different sites across all island groups. At 'Squid Hole' in the Easter Group, a single *A. mauritiana* was found to have GAS1011 attached ventrally, while both GAS1213 and GAS1217 were embedded in the dorsum (Table S1). In two instances, GAS1003 and GAS1216 were found on *Holothuria atra* Jaeger, 1833 at separate sites but were also found together, on the same host individual in a reef gutter off the north-eastern end of East Wallabi Island. At the eastern reef edge of North Island, one *Holothuria pervicax* Selenka, 1867 hosted GAS1195, whilst another hosted both GAS1214 and GAS1221.

An overwhelming majority (83%) of the OTUs are microeulimids that measure less than five mm in height (Figure S1) [40]. Furthermore, nine OTUs (39%) were smaller than 2.5 mm in shell height, and GAS1039, the smallest eulimid found, measured less than one mm. The distribution of shell sizes, with many representatives smaller than 2.5 mm and few larger than 10 mm, is a trend reflected in other micromolluscan families [11].

Eulimidae
Genus *Annulobalcis* T. Habe, 1965

Annulobalcis includes 11 species from tropical and sub-tropical waters largely in the IWP region [21,38]. However, the type species, *Annulobalcis shimazui* T. Habe, 1965, was described from Honshu, Japan [39]. *Annulobalcis* are usually attached to crinoids, with some exhibiting strong host-specificity [1,35]. Only one species, *Annulobalcis cicatricosa* (Warén, 1981), is currently listed for Australia, and is only known from the holotype collected in northern Queensland with no host information [13,17]. In WA, a single unidentified specimen (AMS C.213248) is recorded from Esperance, which lies in a temperate zone and geographically contrasts with other Australian records that are all restricted to tropical and subtropical waters [41].

cf. *Annulobalcis* sp. GAS1190 (Figures 2A and 3A)

GAS1190 differs from *A. cicatricosa* by the lack of fine spiral sculpture, narrower apical whorls, smaller aperture and shell height, with the former measuring 4.18 mm and the latter 8.74 mm with fewer whorls (AMS C.99233). Superficially, GAS1190 most closely resembles '*Goodingia*-like 1', unidentified eulimids that were washed from *Dichrometra* crinoids off Vietnam by Dgebaudze et al. [22], but live animals differ in colour and patterning. Independent phylogenetic analyses have found members of *Annulobalcis* and *Goodingia* to be paraphyletic, thereby casting doubt on species placement within these genera until revisionary works are undertaken [22,42]. Currently, there are no records of *Goodingia* from Australia, and few *Annulobalcis* are listed beyond the east coast, making GAS1190 an important record for the state [41].

In contrast to other eulimids collected in this study, GAS1190 was found attached to the ambulacrum of its crinoid host as opposed to the underside of the arms, possibly indicating a different mode of feeding (Figure 2A).

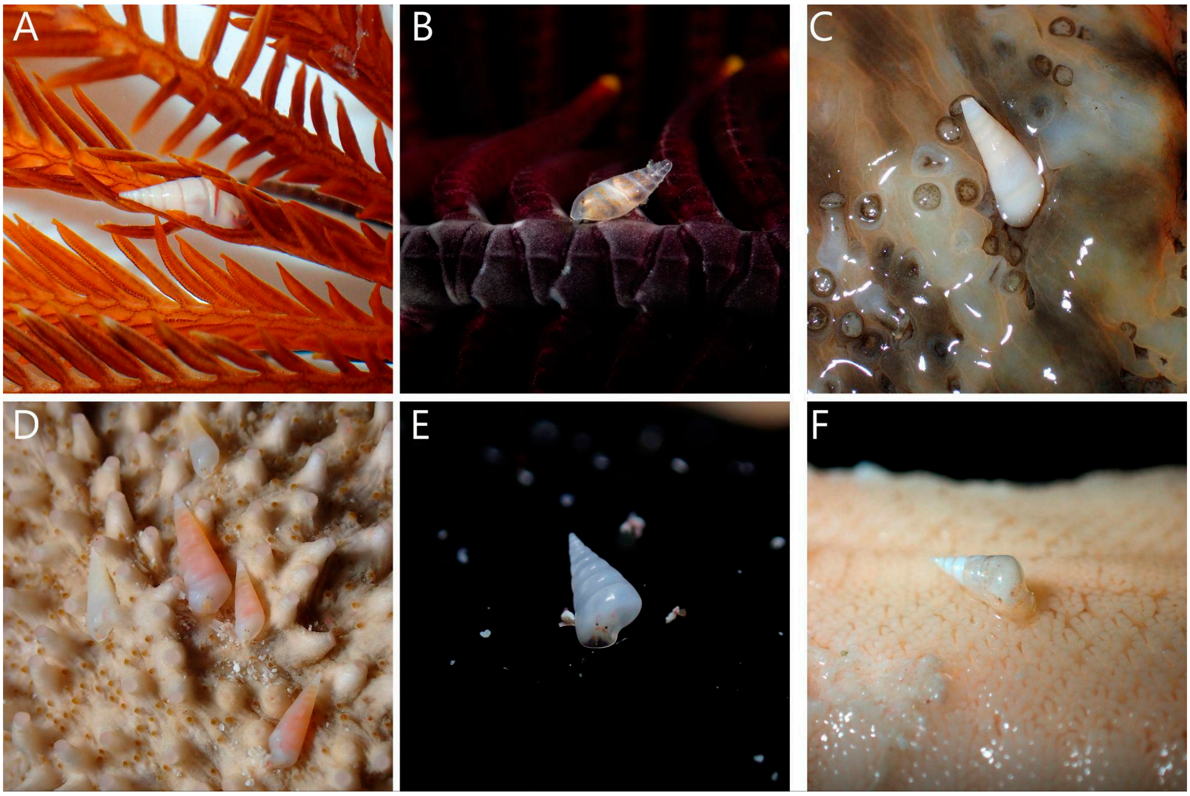

Figure 2. Live eulimids attached to their hosts. (**A**) cf. *Annulobalcis* sp. GAS1190 (WAMS124214) on *Dichrometra* cf. *palmata*; (**B**) *Curveulima cornuta* GAS1020 on an unidentified comatulid crinoid; (**C**) *Melanella* sp. GAS1011 (WAMS124216) on *Stichopus monotuberculatus*; (**D**) *Melanella* sp. GAS1214 (WAMS124166 and WAMS124168) on *Holothuria pervicax*; (**E**) *Melanella* sp. GAS1216 (WAMS124164) on *Holothuria atra*; (**F**) *Parvioris* sp. GAS1193 (WAMS124215) on *Archaster angulatus*.

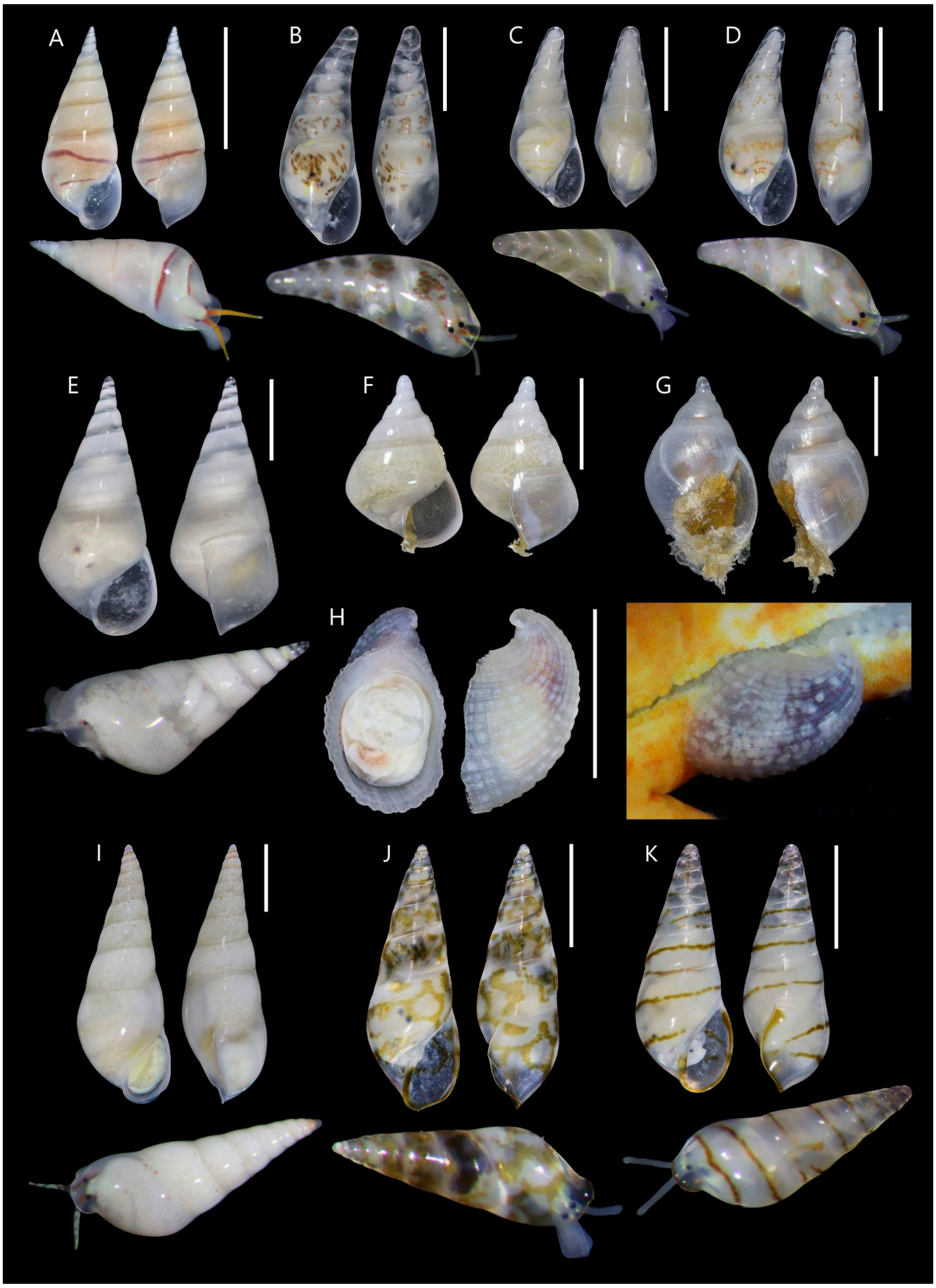

Figure 3. Eulimids collected from the Houtman Abrolhos Islands. (**A**–**E**,**H**–**K**) were live collected in 2025, while (**F**,**G**) are dry shells collected in 1976 and 1988, respectively. (**A**) *Annulobalcis* sp. GAS1190 (WAMS124214); (**B**) *Curveulima* sp. GAS1192 (WAMS124213); (**C**) *Curveulima* sp. GAS1191 (WAMS124211); (**D**) *Curveulima cornuta* GAS1020 (WAMS124212); (**E**) *Parvioris* sp. GAS1193 (WAMS124215); (**F**) *Apicalia angulata* Warén, 1981 GAS1126 (WAMS121687); (**G**) *Stilifer utinomii* GAS1134 (WAMS121700); (**H**) *Thyca ectoconcha* GAS1215 (WAMS124183) attached to *Linckia multiflora*; (**I**) *Vitreobalcis tripneusticola* GAS1189 (WAMS124231); (**J**) *Sticteulima* sp. GAS1064 (WAMS124155); (**K**) *Sticteulima* sp. GAS1194 (WAMS124154). Live shells are scaled to preserved shells. Scale bars: (**A**) = 2.5 mm; (**B**–**G**,**I**–**K**) = 1.0 mm; (**H**) = 5.0 mm.

Genus *Apicalia* A. Adams, 1862

The type species for this genus, *A. gibba* A. Adams, 1862, was collected from 130 m depth, near the Gotto Islands off Japan [43]. Later, Warén synonymised the genus with

Chryseulima Laseron, 1955 and distinguished *Apicalia* from other eulimid genera by the solid shell, convex whorls and obvious incremental scars [17]. When specimens have been found on a host echinoderm, the host has always been an asteroid [17]. Five species are known to occur in Australia, with two recorded from WA [41]. *Apiaclia brazieri* (Angas, 1877) has been collected from Exmouth Gulf in the north (AMS C.92087), and *A. echinasteri* Warén, 1981 from Greenough (AMS C.213258) and south of Cowaramup (AMS C.213257) in the mid-west and southern regions [41], respectively. Seven unidentified specimens have also been collected between Broome and Dunsborough (ANSP & AMS) [41].

Apicalia angulata Warén, 1981 GAS1126 (Figure 3F)

The broad, almost trochiform, shell shape combined with the angular body whorl of GAS1126 matches the description of *A. angulata* and makes this OTU easily recognisable among Abrolhos eulimids [17]. The aperture of GAS1126 is proportionally larger than the holotype of *A. angulata*, likely because the WA specimen is immature (the specimen is less than half the height of, and has fewer whorls than, the holotype) (Figures 12–16 of ref. [17]). In Australia, *A. angulata* is only known from the holotype found “on a starfish” at 18 m depth off Heron Island in far north Queensland [17]. Two smaller specimens from Tonga complete the type series, and these were also found on an unidentified asteroid [17]. “*Apicalia* cf. *angulata*” is also listed from French Polynesia, consistent with a tropical distribution for this species [44].

A single specimen was discovered on one of five *Aquilonastra cepheus* (Muller & Troschel, 1842) asteroids examined by Loisette Marsh in 1976 (WAMZ6799, Table 1 and Table S1). This appears to be the first published record of a host for *A. angulata*, and given the large geographic range of *A. cepheus*, *A. angulata* could associate with this host throughout its range [44]. GAS1126 represents the first record of *A. angulata* for Western Australia [41].

Genus *Curveulima* Laseron, 1955

The type species *C. cornuta* (Laseron, 1955), was described from beachcast shells found at Manly Beach, New South Wales [14]. Later, Warén [1] reported the species to parasitise comatulid crinoids but provided no further detail. Several other species of *Curveulima* are known from crinoids and many more from dead shells, particularly in the Mediterranean [12]. All the *Curveulima* specimens discussed here were attached to the ventral portion of the host crinoid’s arm, close to the calyx, but detached after their respective hosts were placed in zip-lock bags.

The small, curved and vitreous shells of this genus resemble *Vitreolina*, but can be differentiated based on the narrow shape of the aperture and the presence of a ridge in the lower portion of the body whorl, proximate to the columella [12,45]. Besides the type species, four additional *Curveulima* are known from Australia: *C. abrupta* (Laseron, 1955), *C. indiscreta* (Tate, 1898), *C. litoris* (Laseron, 1955) and *C. manifesta* (Laseron, 1955). *Curveulima indiscreta* is most similar to the type species, but the two cannot be differentiated using the original descriptions (besides Tate’s illustration, no other depictions or images of the type material are available online [46]). The taxonomic placements of other *Curveulima* described by Laseron [14] are questionable, and fresh material must be studied to resolve this taxonomic confusion.

Curveulima cornuta (Laseron, 1955) GAS1020 (Figures 2B and 3D)

This OTU is strikingly similar to *C. cornuta* but appears to have less convex teleoconch whorls and a more slender apical portion (Figures 65 and 66 of ref. [1]). *C. cornuta* has been previously collected from shell sand at Quobba in WA (AMS C.213262) and identified by a reputable expert [41]. Thus, additional material is required to determine whether east coast and west coast specimens represent separate species. Outside of the Abrolhos, GAS1020 is also found attached to unidentified comatulid crinoids in the shallow, nearshore waters off Perth (HC pers. obs.). The snails are commonly attached to the lateral aspect of the host crinoid's arm with the proboscis inserted between the margins of the brachial plates or, more rarely, at the base of a pinnule (Figure 2B).

The habitat type, depth, host species and position of attachment are the same as GAS1192, though the two OTUs were found at different sites.

Curveulima sp. 'plain' GAS1191 (Figure 3C)

GAS1191 can be easily differentiated from congeners based on a consistent but subtle colour pattern of yellow splotches on the mantle and the angular outer edge of the body whorl. While an angular body wall is a trait observed in some juvenile eulimids [47], there is no mistaking GAS1191 for a juvenile of GAS1020 or GAS1192, as small specimens of these OTUs possess curved body whorls and colour patterns that resemble the adults. No other *Curveulima* were found attached to cf. *Comatula* sp., and this crinoid was uncommon in 2025.

Curveulima sp. 'brown spotted' GAS1192 (Figure 3B)

The shells of GAS1192 and GAS1020 are very similar (Figure 3). However, GAS1192 has smaller whorls (i.e., shell height is shorter than GAS1020, if comparing two individuals with the same number of whorls). Additionally, the body whorl is slightly more angular in GAS1192. Although these differences are subtle, the contrasting colour patterns in live specimens, patches of larger brown spots versus scattered orange dots, consistently demarcate the two OTUs in all the specimens examined. GAS1192 was the most commonly found *Curveulima*, with five specimens collected from four sites in the Easter and Pelsaert island groups (Table 1). Four specimens were found on *C. parvicirrus* at three sites, and one individual was found on *Comanthus* sp. at another site. The hosts were hidden amongst coral rubble during the day but were observed on top of the substrate at night.

Genus *Hemiliostraca* Pilsbry, 1917

Hemiliostraca comprises 25 species, with numerous undescribed species found in tropical regions [1,38]. The type species, *Hemiliostraca peasei* (Tryon, 1886), is based on worn shells from the Hawaiian Islands [1,16,48,49]. Some characters used to define the genus include the following: a slender shell with a blunt apex, a long and narrow aperture, a lack of shell sculpture and the presence of brown coloured markings on both the protoconch and teleoconch [49]. When known, the hosts are ophiuroids [16,48–50].

Five *Hemiliostraca* occur in Australia, with numerous records of unidentified specimens from tropical to temperate waters [13,41]. *Hemiliostraca joshuana* (Gatliff & Gabriel, 1910) and *H. sobrina* (Laseron, 1955) occur in southern WA, though no records exist in online collection datasets [41,51]. A single *H. peasei* is recorded from the North West Cape (AMS C.210477), and numerous specimens have been collected in beachwash from around 350 km south at Point Quobba (WAM unpublished data).

Hemiliostraca peasei (Tryon, 1886) GAS1135 (Figure 4L)

The slender, translucent shell with flat whorls, vivid brown banding, slightly curved outer lip and keel or ridge on the body whorl proximate to the columella distinguishes GAS1135 from other eulimid OTUs from the Abrolhos. These characters also match the description of *H. peasei* (Figures 104 and 105 of ref. [1]). *Hemiliostraca peasei* has previously been reported from the ophiuroid *Breviturma dentata* (Müller & Troschel, 1842) in Japan, and our findings further support this host–symbiont association [48]. *Hemiliostraca peasei* is wide-ranging, known from the tropical and sub-tropical Indian and Pacific oceans, from Sinaloa, Mexico (ANSP19750) to Exmouth, WA (AMS C.210477) and now the Abrolhos [21].

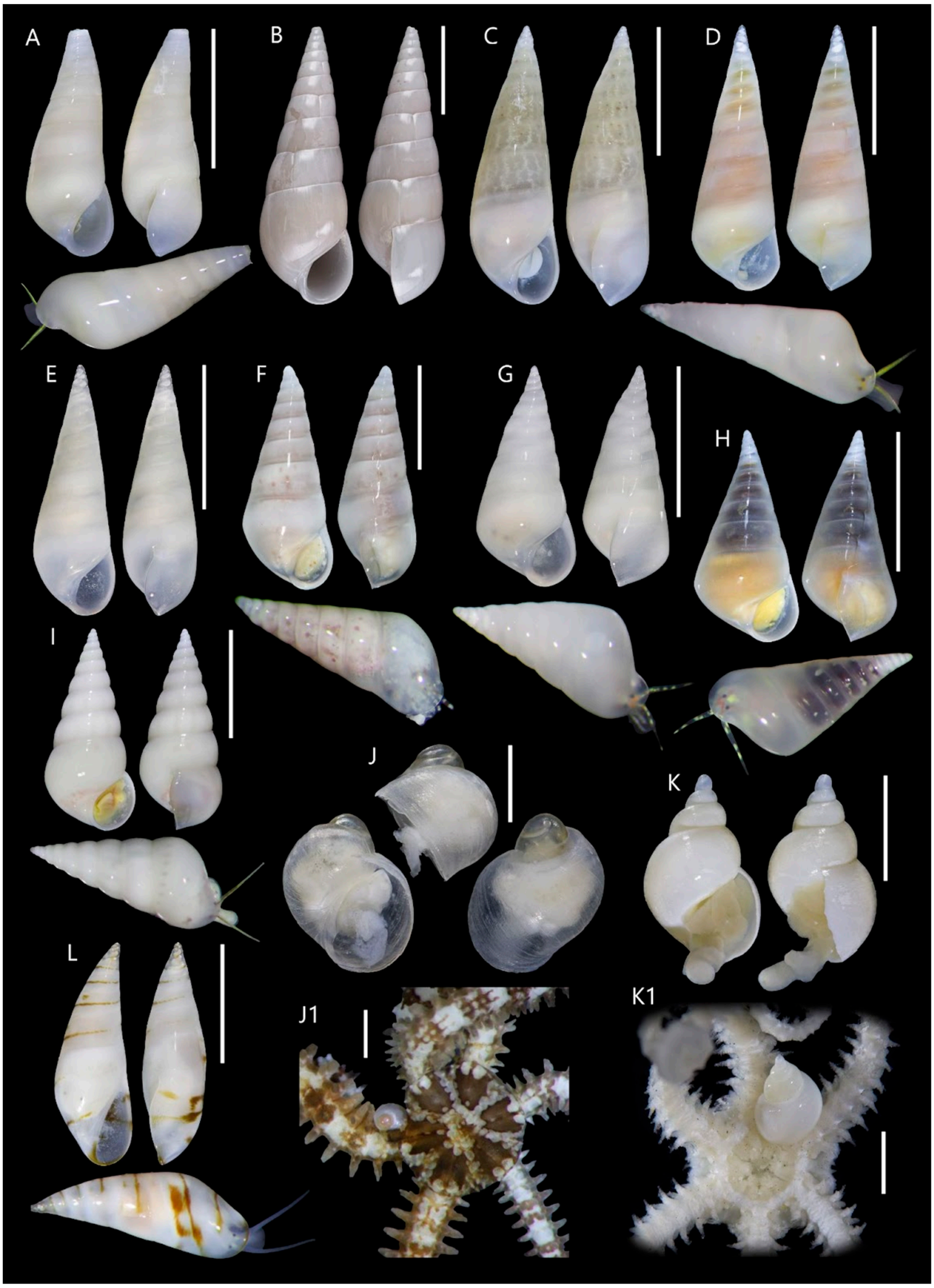

Figure 4. Eulimids collected from the Houtman Abrolhos Islands. (**A**,**C**–**J**,**L**) were live collected in 2025, while (**B**,**K**) were formalin-fixed and collected in 1977 and 1978, respectively. (**A**) *Melanella* sp. GAS1011 (WAMS124216); (**B**) *Melanella cumingii* GAS1052 (WAMS118521); (**C**) *Melanella* sp. GAS1217 (WAMS124180); (**D**) *Melanella* sp. GAS1214 (WAMS124166 shell, WAMS124168 live); (**E**) *Melanella* sp. GAS1221 (WAMS124167); (**F**) *Melanella* sp. GAS1213 (WAMS124174); (**G**) *Melanella* sp. GAS1216 (WAMS124201); (**H**) *Melanella* sp. GAS1195 (WAMS124165); (**I**) *Peasistilifer nitidula* GAS1003 (WAMS124229); (**J**) Eulimidae gen. sp. GAS1039 (WAMS124145); (**J1**) Eulimidae gen. sp. GAS1039 (WAMS124144) live on host; (**K**) *Stilapex* sp. GAS1029 (WAMS118536); (**K1**) *Stilapex* sp. GAS1029 (WAMS118536) preserved on host; (**L**) *Hemiliostraca peasei* GAS1135 (WAMS124145). Live shells are scaled to preserved shells unless indicated otherwise. Scale bars: (**A**) = 5.0 mm; (**B**) = 10.0 mm; (**C**–**E**,**G**,**I**,**L**) = 2.5 mm; (**F**,**H**,**J1**,**K**,**K1**) = 1.0 mm; (**J**) = 500 µm.

GAS1135 were attached to the oral surface of the host's arm, near the disc and readily detached when disturbed. GAS1135 was one of the most abundant eulimids found in the Abrolhos (HC pers. obs.).

Genus *Melanella* Bowdich, 1822

Representatives of *Melanella* have slender or conical shells, distinct incremental scars that do not radically warp the suture line and a protoconch with more than two whorls [1,12]. The genus currently contains more than 240 species, accounting for almost one quarter of all known eulimids, with a cosmopolitan distribution [21,38]. Despite their ubiquity, few *Melanella*, including the type species, *Melanella dufresnii* Bowdich, 1822, have been included in phylogenetic analyses [12,47]. Ten species are known from WA, with a further eighteen found elsewhere in Australia [13].

Melanella cumingii (A. Adams, 1854) GAS1052 (Figure 4B)

GAS1052 is ubiquitous in the Pilbara region of northern WA, and there are many examples in the WAM collection (Table 2). Outside of the Pilbara, the only records of *M. cumingii* in Australia are from the Cocos (Keeling) Islands in the Indian Ocean and Bird Island in the Coral Sea [41]. The holotype is from Marutea Sud in French Polynesia, and subsequently, there have been numerous records spanning the entire IWP [21,52]. We were unable to differentiate GAS1052 from *M. cumingii* based on shell characters alone, and further studies utilising anatomy and genetics are necessary. Based on generic placement and host records for *M. cumingii* from elsewhere, we can assume that GAS1052 feeds on holothurians but possibly spends most of its time separated from the host [53].

GAS1052 is only known from three legacy records at two sites in the Wallabi and Easter groups, with specimens found in the intertidal zone and collected in 1977 and 1978 (Table S1) but not observed in 2025. While many of the specimens in the WAM collection from elsewhere in WA were taken live from intertidal reefs and sandflats, none include host information, and thus all are assumed to have been found free-living.

Melanella sp. 'large, twisted' GAS1011 Figures 2C and 4A)

GAS1011 may be distinguished from other OTUs by its large size, lack of separation between the columella and the parietal wall, irregular curvature of the shell, fluoro-yellow cephalic tentacles and lack of patterning on the foot in live specimens. Outside of the Abrolhos, this OTU has also been collected from Clerke Reef (Rowley Shoals), an atoll with fringing reefs off north-western WA (Table 2), although no host information is available.

GAS1011 was found attached to the ventral surface, amongst the tube feet, of large holothurians at two sites (Table S1; Figure 2C). Surprisingly, the hosts belonged to entirely separate orders, Synallactida and Holothuriida, which suggests that the GAS1011 may not exhibit host-specificity based on taxonomic relatedness. In both cases, the apex of the shell was missing.

Melanella sp. 'broad & brown' GAS1195 (Figure 3H)

GAS1195 is defined by a smooth, conical shell, offset apex with straight teleoconch whorls, sutural line that is distinctly warped by incremental scars and a dark visceral mass with yellow flecks visible through the translucent shell. One specimen was found attached externally to *H. pervicax*, along with GAS1221 and GAS1214, at the eastern reef edge of North Island in 2025 (Table 1).

Melanella sp. 'red spotted' GAS1213 (Figure 4F)

The minute shell size, colouration of live animals, offset protoconch, and small aperture, with a weak angle between the columella and parietal wall, distinguish GAS1213 from other OTUs found on holothurians. Two individuals were collected in rock scrubbings, and another was found embedded in the outer dermis of *A. mauritiana* (Table 1). This was the only *A. mauritiana* seen during the 2025 survey, and it is possible that GAS1213 may be found on other holothurians. The mode of parasitism appears identical to that of GAS1217, and both occupied the same host individual.

Melanella sp. 'angular aperture' GAS1214 (Figures 2D and 4D)

This OTU can be recognised by the evenly tapered shell, weakly curved outer lip profile (laterally), straight upper portion and evenly curved lower portion of the outer lip (ventrally), narrow protoconch and the orange colouration of some live individuals. Nine specimens were clustered among the tube feet of the holothurian *H. pervicax* (Figure 2D). The visceral mass of the snails was either orange, yellow or white, and the colouration was not consistent with shell size. GAS1195 and GAS1221 were also found on the same host individual.

Melanella sp. 'broad & white' GAS1216 (Figures 2E and 3G)

This OTU is distinguished by the conical, opaque and solid shell with slightly convex whorls, a small and offset apex, angular body whorl, a suture line that is warped by the incremental scars, as well as orange patches around the eyes and yellow spotted cephalic tentacles. The shell morphology of GAS1195 is similar, though the whorls are less convex and more transparent, and the two OTUs were found on different hosts (Figure 3H and Table 1). Of the six specimens examined during the 2025 survey, none showed any colouring of the visceral mass when live. All were found externally on *H. atra* (Figure 2E), and in one instance the host was shared with GAS1003. Interestingly, despite the presence of *H. atra* throughout the islands, GAS1216 were only found in the Wallabi Group (Table 1).

Melanella sp. 'slender' GAS1217 (Figure 4C)

The broad, cone-shaped protoconch easily distinguishes this OTU from the otherwise morphologically similar congener GAS1214 (compare Figure 4C,D). The tall and ovate aperture, weakly curved and slightly prosocline outer lip and tall body whorl further differentiate this OTU from other holothurian-associated eulimids. The colour of the visceral mass, with jagged, white axial bands and scattered orange dots, is unique among eulimids from the Abrolhos. Six specimens were found embedded in one *A. mauritiana*, along with GAS1011 and GAS1213.

Melanella sp. 'white' GAS1221 (Figure 4E)

This OTU was collected with GAS1195 and GAS1214 from the same host holothurian but was not recognised as different until later laboratory examination. While GAS1195 can be easily differentiated, GAS1221 differs from GAS1214 by its more rounded body whorl, more ovate aperture, slightly more curved outer lip and smaller whorls that result in a shorter shell (compare Figure 4D,E). The colouration of live specimens can appear identical for both OTUs.

Genus *Parvioris* Warén, 1981

The shells of *Parvioris* exhibit a slender shape, obvious incremental scars, flat whorls, straight outer lip and small aperture, with live specimens found externally attached to asteroids [17]. Eight species are known from Australia, but only *Parvioris australiensis* Warén, 1981 is reported from WA, where specimens were found attached to *Archaster* sp. on an intertidal sand flat in the Kimberley region [13,17]. Additionally, there are three records of unidentified *Parvioris* in WA, two in the south, from Dunsborough and Hopetoun, and one offshore from the Kimberley [41].

Parvioris sp. GAS1193 Figures 2F and 3E)

The straight profile of the outer lip, flat whorls, mucronate protoconch and asteroid host separate GAS1193 from the other Abrolhos eulimids. A single specimen was found on an *Archaster angulatus* Müller & Troschel, 1842 (Table S1). The snail was attached midway along an arm on the aboral side of the host (Figure 2F). The juvenile specimen has approximately five teleoconch whorls and a total shell height of 3.18 mm, whereas many adult *Parvoris* exceed seven whorls, with shell heights greater than 5 mm [17]. Eulimids often show ontogenetic change in shell form, making juveniles particularly difficult to identify [54,55]. As such, despite the aperture of GAS1193 being significantly larger in proportion to shell width than the holotype of *P. australiensis*, we cannot be certain that they are different species, as the size of the aperture may decrease in subsequent whorls. However, outside of the Abrolhos, at least three unidentified *Parvioris* OTUs have been found off Perth, and all differ from *P. australiensis* in adult shell form, suggesting that there is much undocumented diversity in the genus within WA (HC pers. obs.).

Genus *Peasistilifer* Warén, 1980

Six species of *Peasistilifer* are distributed in the Indian and Pacific oceans, and those with available host information have been found on holothurians [16,21,38]. *Peasistilifer* are conical with solid shells that have shorter apertures than *Melanella*, though the most notable difference is the presence of a prominent opercular peg in the former [1]. Three species are reported from Australia, *P. edulis* Hoskin & Warén, 1983 and *P. nitidula* (Pease, 1861) from north-eastern Queensland, and *P. solitaria* (Laseron, 1955) from New South Wales and Victoria [13,56]. The sole record of this genus in WA appears to be a single unidentified specimen collected from *H. atra* in Ningaloo Reef (UF 434673) [41].

Peasistilifer nitidula (Pease, 1860) GAS1003 (Figure 3I)

GAS1003 has previously been live collected from the offshore reefs of Cocos (Keeling) Islands and Ashmore on *H. atra* in 0 to 1 m of water (WAMS63497 and WAMS121913). Furthermore, a single worn shell was also collected from beachwash at Point Quobba, near Carnarvon (WAMS121768). Based on shell morphology and the appearance of live specimens, GAS1003 is identical to *P. nitidula* [56]. However, like *M. cumingii*, records of *P. nitidua* span the entire IWP, and the type locality in Hawaii is far from WA [16,21]. As best we know, these specimens represent the first published records of *P. nitidula* for WA, as prior specimens in the WAM collection were unidentified.

The evenly tapered, conical shell with convex whorls, rounded aperture and body whorl, conspicuous operculum and colouration of live animals clearly distinguish this OTU. GAS1003 was found attached externally to *H. atra*, and this host association is consistent with *P. nitidua* recorded from other localities where the snails almost always attach to *H. atra* [22,56–58].

Genus *Sticteulima* Laseron, 1955

Laseron [14] established *Sticteulima* for species with smooth, vitreous shells that possess chestnut-coloured spots and a parietal callus. Later, Matsuda et al. [49] further distinguished *Sticteulima* by the broader shell, slightly convex whorls, downward projecting aperture and the discontinuation of the body whorl line with the outer lip. Three *Sticteulima* occur in Australia, and there are numerous records of unidentified specimens in tropical and temperate waters [13,41]. *Sticteulima cameroni* Laseron, 1955 and *Sticteulima incidenta* Laseron, 1955 are reported from WA, but are absent in online collections data [41,59].

Sticteulima sp. 'honeycomb' GAS1064 (Figure 3J)

GAS1064 is one of only three eulimids from the Abrolhos with shell patterning (Figures 3 and 4). The brown, reticulate markings are unique and appear within the first three teleoconch whorls. Like GAS1194, the columella is brown in the lower portion, but the outer lip differs by lacking colour along the margin. The yellow markings around the eyes and lack of colouration on the tentacles and foot are similar to those of GAS1194. This OTU was previously known from a single specimen (WAMS84855) found amongst sieved rubble from Echuca Shoal in the north Kimberley region of WA. No host is known for either specimen (Table S1).

Sticteulima sp. 'stripey' GAS1194 (Figure 3K)

The shell of GAS1194 exhibits two brown-coloured bands that run transversally, one in the centre of the whorl and one much lower that is almost entirely obscured by the growth of subsequent whorls. Additionally, the outer lip and columella are also brown and the apex has a light violet hue. This distinct shell patterning is unique among eulimids from the Abrolhos and makes identification of this OTU unmistakable (Figure 3K). GAS1194 is restricted to the Abrolhos, and no host is known for this species (Tables 1 and 2).

Genus *Stilapex* Iredale, 1925

Stilapex may be identified by thin, globose shells with convex whorls that often lack distinct growth scars and a protoconch with less than 2.5 whorls [17]. The genus currently includes 11 species, and many are known to parasitise ophiuroids in the families Ophiactidae and Ophiotrichidae [17,38,60]. Seven species are listed from Australia [13]. One species, "*Stilapex eburnea*" (sensu Odhner 1917), is reported from *Ophiothrix* sp. at 21 m depth off Cape Jaubert, near Broome, but the shells of these specimens have dissolved and the exact identity is uncertain [17,61]. Other specimens referred to as "*Stilapex eburnea*" and attributed to Deshayes and Schepman were collected outside of Australia and are apparently separate species, with Schepman's specimens now so damaged as to preclude comparison [13,61–63].

Stilapex sp. GAS1029 (Figure 4K)

GAS1029 exhibits a tall protoconch with a very rounded initial whorl, evenly inflated teleoconch whorls, colourless shell and attachment to ophiuroids. The form of the protoconch and shell shape resemble those of *S. lactarius* Iredale, 1925, which is known from mesophotic depths in the eastern Bass Strait off Tasmania [64] (Figures 45, 47 and 54, of ref. [17]). All the WAM specimens are smaller than the holotype of *S. lactarius* by at least two whorls, and only a handful of illustrations of this species exist. While no host is recorded in Australia, *S. lactarius* has been reported on *Ophiothrix* (*Ophiothrix*) *aristulata* Lyman, 1897 off Japan [17]. The WAM collection contains six GAS1029 specimens attached to *Ophiothela mirabilis* (Verrill, 1867) from Exmouth, Port Hedland and Ashmore Reef, collected between 12 and 50 m depth (WAM unpublished data). As such, while bearing some similarities with *S. lactarius*, we are unable to confidently identify GAS1029 as this species.

This OTU was not encountered during the 2025 survey and was collected by Loisette Marsh in 1978 (Table S1). The snails were all discovered on *O. mirabilis*, and five of the fourteen *O. mirabilis* examined were found with GAS1029. Three adults were attached to individual hosts, one recruit was found individually, and a sub-adult and adult individual occupied the same host.

Genus *Stilifer* Broderip, 1832

Stilifer are endoparasites that form galls in the body wall of starfishes, particularly those in the families Ophidiasteridae, Oreasteridae and Heliasteridae [15]. The shells of *Stilifer* are thin and inflated, exhibit numerous growth lines, and possess a prosocline outer lip as well as a mucronate protoconch [15]. *Stilifer concavus* and *S. variabilis* are known from tropical waters in Western Australia and are present elsewhere around Australia, along with four more species [15,41].

Stilifer utinomii T. Habe, 1951 GAS1134 (Figure 3G)

GAS1134 is the only eulimid known from the Abrolhos that is an endoparasite of asteroids, and it is easily distinguished by its colourless, ovate shell with distinct growth lines and mucronate protoconch [15]. The tall aperture, plain and slender shell, distinct columellar callus and protoconch form of GAS1134 agree with descriptions of *S. utinomii* [15,65]. *Stilifer utinomii* does not appear to show host specificity and is known throughout the IWP from at least five different asteroid hosts in the family Ophidiasteridae [15].

Two specimens were present inside a gall in the arm of *Disasterina longispina* (H.L. Clark, 1938) collected by Shirley Slack-Smith and Loisette Marsh in 1988 (Table S1). The specimens were extracted, and the dried pseudopallium of the largest individual was removed to reveal the shell and enable identification by one of us (HC). Other specimens may be present in the WAM collection but have not been identified as they have yet to be dissected from the host (HC pers. obs.). This is the first published record of *S. utinomii* in WA, as well as the first record of this species parasitising a host belonging to the family Asterinidae. Furthermore, *D. longispina* is endemic to south-western Australia, with the Abrolhos being the northern extent of its range [66].

Genus *Thyca* H. Adams & A. Adams, 1854

This genus comprises nine species that permanently attach to seastars and are easily identified by the radical change in shell form between the protoconch and the teleoconch, with the latter rapidly expanding into a cupuliform shell with pronounced sculpture [15]. Two species, *T. crystallina* (A. Gould, 1846) and *T. stellasteris* Koehler & Vaney, 1912, are known from WA [15]. *Thyca crystallina* is restricted to tropical coral reefs, with many specimens collected on the asteroid *Linckia laevigata* (Linnaeus, 1758) north of Exmouth [41]. Conversely, *T. stellasteris* has been reported from *Stellaster childreni* Gray, 1840 in "West Australia" [15], but specimens have more recently been found on *Stellaster inspinosus* H.L. Clark, 1916, collected off Rottnest Island and inside Cockburn Sound near Perth (WAM unpublished data).

Thyca ectoconcha P. Sarasin & F. Sarasin, 1887 GAS0745 (Figure 3H)

Thyca ectoconcha most closely resembles *T. hawaiiensis* Warén 1980, but has a smaller aperture relative to the diameter of the shell [15]. Furthermore, it may be differentiated from *T. crystallina* by the separation of the spire from the aperture, which are fused in *T. crystallina* [15]. This species is found on *Linckia multiflora* (Lamarck, 1816) and *Linckia guildingi* Gray, 1840, where the large female will attach to the oral surface of the host's arm and the dwarf male will attach to the snout of the female [15,22]. This is the first published record of this species in Australia [41].

While many *Linckia* were examined for symbionts during the 2025 survey, only a single specimen was found to harbour eulimids (Table S1). A large female GAS0745 was noticed on a *Linckia multiflora,* and later examination revealed a dwarf male, but this specimen was unfortunately lost shortly after images were captured (approx. 750 µm shell height).

Genus *Vitreobalcis* Warén, 1980

This genus was established for eulimids with conical shells, convex whorls and small, rounded apertures [16]. The type species, *Vitreobalcis holdsworthi* (H. Adams, 1874), was described from dry shells collected from Ceylon (Sri Lanka) and initially placed in *Apicalia* [67]. Later, in his description of the new genus, Warén [16] observed that live *V. holdsworthi* evert a large pseudopallium when feeding on the echinoid *Mespilia globulus* (Linnaeus, 1758). As such, the pseudopallium is taken to be an important character of the genus but has only been reported in *Vitreobalcis temnopleuricola* Fujioka & T. Habe, 1983, as it is the only other species for which the soft parts are known [1,68]. The sole species reported from Australia is *Vitreobalcis laevis* Warén, 1980, which is known from a single specimen found attached to a holothurian, *Synaptula lamperti* Heding, 1928, near Townsville in northern Queensland [13,16]. It was noted that *V. laevis* probably does not belong in the genus, but its placement was justified by the resemblance of the shell to that of *V. holdsworthi* [16].

Vitreobalcis tripneusticola H. Matsuda & Nagasawa, 2019 GAS1189 (Figure 3I)

This species was recently described from the host echinoid *Tripneustes gratilla* (Linnaeus, 1758), caught in lobster nets off Japan [69]. While the appearance of live animals was not included in the original description, live individuals purported to be *V. tripneusticola*, found on *Salmacis sphaeroides* (Linnaeus, 1758) in Singapore, bear similar markings to our specimens [70]. *Vitreobalcis tripneusticola* has also been recorded from Nha Trang Bay in Vietnam, though it was not stated whether the snails were found on an echinoderm [22]. Neither attachment position on *T. gratilla* nor the presence of a pseudopallium were observed during the recent survey. This OTU is the first published record of this species in Australia [13].

The small aperture, slender shell with slightly convex whorls and presence on an echinoid host separate this species from all other OTUs known from the Abrolhos. We failed to visually detect any *V. tripneusticola* on more than 75 *T. gratilla* examined, including those that did end up hosting snails, and these specimens were only discovered after washing the hosts with freshwater. Three of the collected specimens were juveniles (1.5 mm shell height), and one was an adult (3.82 mm shell height).

Eulimidae gen. sp.
Eulimidae sp. GAS1039 (Figure 4J)

More than a dozen eulimid genera are known to parasitise ophiuroids, with most being slender-shelled ectoparasites [1,71]. However, *Ophieulima* Warén & Sibuet, 1981, *Ophiolamia* Warén & Carney, 1981, *Punctifera* Warén, 1981, and *Stilapex* Iredale, 1925 are exceptions that contain taxa with globose shells [16,17,72]. GAS1121 resembles *Ophieulima*, which includes six species, although only three—*O. fuscoapicata* Warén, 1981, *O. minima* (Dall, 1927), and *O. yoshiharai* Takano, Kohtsuka & Okanishi, 2024—are extant [71]. While some features, such as growth lines, a twisted columella and a brownish protoconch are shared with members of *Ophieulima*, GAS1121 differs in being far smaller with fewer protoconch and teleoconch whorls and is found at littoral, not bathyal, depths [17,71,72]. This OTU almost certainly represents a new species; however, additional characters need to be examined prior to formal description.

GAS1121 has been collected from two sites in WA, Cassini Island in the northern Kimberley region (13°55′44.8″ S, 125°37′17.8″ E) in 2010 and 'Roo Tail Reef' in the Abrolhos in 2025 (Table S1). All specimens were attached to *Ophiactis savignyi* (Müller & Troschel, 1842). In the Abrolhos, only 3 out of 163 *O. savignyi* that were examined had snails attached, resulting in a prevalence of 1.84%. The snails were positioned on the hosts' arm, close to the lateral margin of the disc, with two instances of two parasites occupying the same host individual (WAMS80157 and WAMS124139). The snails resemble juveniles with a shell height of less than 1 mm and few teleoconch whorls (Figure 4). However, the limited resources offered by a tiny host and the consistency in size between specimens from different collection events indicate that these are adult specimens that exhibit a reduced and possibly paedomorphic form.

4. Conclusions

The discovery of 23 newly recorded eulimid species and morphospecies at the Abrolhos Islands was not surprising given the number of taxa found in comparable, albeit tropical, areas such as New Caledonia and the Kimberley [9,18]. Intriguingly, no OTUs were re-collected during the recent survey, despite the close geographical proximity of sites sampled pre-2025 and in 2025 (Figure 1; Table S1). This difference could be due to the restriction to shallow depths in 2025 (diving was limited to 25 m or less, and intertidal areas were sampled via snorkelling, with no capacity for dredging at deeper depths). Adequate sampling of a broad range of habitats is essential when targeting micromolluscs, as the bulk of species richness is composed of rare species that are sparsely distributed in the environment [11]. Nineteen eulimid OTUs were found on 16 echinoderm hosts, and if we extrapolate from the total number of echinoderms listed for the Abrolhos (n = 172), we can estimate that perhaps more than 200 eulimid species may be present in the region. This extrapolation, while speculative, clearly suggests that the current eulimid diversity totalling 31 species for the state is a massive underestimate.

Most eulimids were only found on one species of host, and the relationships between *H. peasei*, *P. nitidula*, *T. ectoconcha* and *V. tripneusticola* and their respective hosts are concordant with observations from elsewhere in the IWP, suggesting strong overlap in the distributions of these taxa. Furthermore, among the relatively small number of hosts observed here, holothurians such as *A. mauritiana*, *H. atra* and *H. pervicax* all hosted multiple eulimid OTUs, sometimes simultaneously. The ease with which holothurians can be detected, collected and examined likely acts as a positive bias on our ability to discover their associated fauna. However, the abundance and relatively large biomass of these hosts in the Abrolhos, particularly in the shallow lagoons, probably also plays a role in promoting parasite abundance and diversity by facilitating niche-partitioning, where different parasites occupy separate areas of the host, thereby avoiding direct competition for resources [57].

The inability to confidently assign species names to most of the OTUs discussed here means that any biogeographic, ecological or biological information derived from them will always be burdened by doubt regarding the identity of the taxa. Thus, the term 'discovery' lacks any value beyond highlighting the presence of these animals in the Abrolhos. The purpose of an OTU is to represent a species hypothesis; thus, it should remain as a temporary label until the identity can be validated by genetic or additional morphological analyses. As mentioned in the taxa-specific sections above, eulimid taxonomy is plagued with issues related to misidentifications, paucity of material, lack of anatomical information and unhelpful type material. Even molecular barcoding of our specimens will bring little clarity, as approximately 61 putative eulimid species from 24 genera have sequences available on GenBank, far short of the 1095 species from 107 genera currently described [38,73]. As emphasised in earlier studies, a key step forward in resolving such issues involves obtaining new samples from type localities, from which DNA can be extracted, and this is especially critical for type species [37].

The majority of OTUs putatively identified in this study have tropical affinities, with *C. cornuta* being the only temperate species. This is largely consistent with the affinities of other marine invertebrate fauna in the Abrolhos, including echinoderms [25]. *Thyca ectoconcha* and *V. tripneusticola* are newly published records for Australia, and this greatly extends the range of these two species southwards by at least 3000 km. Similarly, *A. angulata*, *P. nitidula* and *S. utinomii* are previously known from tropical eastern Australia and are newly listed for Western Australia. While these species distributions are not unexpected [74] and have likely been overlooked due to small size [18,37], they could also represent tropical waifs moving south [75]. Continued monitoring is necessary to test if these newly recorded species are temporary visitors or long-term residents.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/d17110796/s1, Table S1. Collection data for eulimids from the Houtman Abrolhos Islands. Figure S1. Distribution of shell sizes among eulimid OTUs collected from the Abrolhos.

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Data Availability Statement: The data presented in this study are openly available in ALA at https://doi.org/10.26197/ala.4b19fa18-a1eb-4fbe-beaf-a5c8d791060d (accessed on 11 September 2025).

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Abbreviations

The following abbreviations are used in this manuscript: The Academy of Natural Sciences of Drexel University, Philadelphia (ANSP); Australian Museum Sydney (AMS); University of Florida (UF); Western Australian Museum (WAM); Operational Taxonomic Unit (OTU).

References

1. Warén, A. A Generic Revision of the Family Eulimidae (Gastropoda, Prosobranchia). *J. Molluscan Stud.* **1983**, *49*, 1–96. [CrossRef]
2. Ponder, W.F.; Gooding, R.U. Four New Eulimid Gastropods Associated with Shallow-Water Diadematid Echinoids in the Western Pacific. *Pac. Sci.* **1978**, *32*, 157–181.
3. Queiroz, V.; Neves, E.; Sales, L.; Johnsson, R. The Gall-Former *Sabinella troglodytes* (Caenogastropoda: Eulimidae) and Its Association with *Eucidaris tribuloides* (Echinodermata: Echinoidea). *J. Conchol.* **2017**, *42*, 371–377.
4. Mekhova, E.S.; Dgebuadze, P.Y. Trophic Interactions between Gall-Forming Molluscs *Stilifer* spp. (Gastropoda, Eulimidae) and Their Hosts (Echinodermata). *Ruthenica Russ. Malacol. J.* **2020**, *30*, 195–202. [CrossRef]
5. Dgebuadze, P.Y.; Mekhova, E.S.; Thanh, N.T.; Zalota, A.K. Diet Relationships between Parasitic Gastropods *Echineulima Mittrei* (Gastropoda: Eulimidae) and Sea Urchin *Diadema Setosum* (Echinoidea: Diadematidae) Hosts. *Mar. Biol.* **2020**, *167*, 150. [CrossRef]
6. Dgebuadze, P.Y.; Mekhova, E.S.; Zuev, A.G.; Zalota, A.K. Kleptoparasitism May Be an Additional or Exclusive Feeding Mode in Symbiotic Associations of Gastropods and Echinoderms. *Mar. Biol.* **2022**, *169*, 142. [CrossRef]
7. Takano, T. Evolution of Parasitic Strategies and Morphological Diversification in Eulimid and Pyramidellid Gastropods. Ph.D. Thesis, The University of Tokyo, Tokyo, Japan, 2016.
8. Warén, A.; Gittenberger, E. *Turbo politus* Linnaeus, 1758 (Currently *Melanella polita*; Mollusca, Gastropoda): Proposed Conservation of Usage of the Specific Name, so Conserving the Specific Name of *Buccinum acicula* Müller, 1774 (Currently *Cecilioides acicula*). *Bull. Zool. Nomencl.* **1993**, *50*, 107–111. [CrossRef]
9. Bouchet, P.; Lozouet, P.; Maestrati, P.; Heros, V. Assessing the Magnitude of Species Richness in Tropical Marine Environments: Exceptionally High Numbers of Molluscs at a New Caledonia Site. *Biol. J. Linn. Soc.* **2002**, *75*, 421–436. [CrossRef]
10. Hoeksema, B.W. Delineation of the Indo-Malayan Centre of Maximum Marine Biodiversity: The Coral Triangle. In *Biogeography, Time, and Place: Distributions, Barriers, and Islands*; Renema, W., Ed.; Topics in Geobiology; Springer: Dordrecht, The Netherlands, 2007; Volume 29, pp. 117–178. ISBN 978-1-4020-6373-2.
11. Bouchet, P. From Specimens to Data, and from Seashells to Molluscs: The Panglao Marine Biodiversity Project. *Vita Malacol.* **2009**, *8*, 1–8.

12. Bouchet, P.; Warén, A. Revision of the Northeast Atlantic Bathyal and Abyssal Aclididae, Eulimidae, Epitoniidae (Mollusca, Gastropoda). *Boll. Malacol.* **1986**, (Suppl. 2). [CrossRef]
13. Australian Faunal Directory (AFD). Available online: https://biodiversity.org.au/afd/taxa/EULIMIDAE (accessed on 11 September 2025).
14. Laseron, C.F. Revision of the New South Wales Eulimoid Shells. *Aust. Zool.* **1955**, *12*, 83–107.
15. Warén, A. Revision of the Genera *Thyca*, *Stilifer*, *Scalenostoma*, *Mucronalia* and *Echineulima* (Mollusca, Prosobranchia, Eulimidae). *Zool. Scr.* **1980**, *9*, 187–210. [CrossRef]
16. Warén, A. Descriptions of New Taxa of Eulimidae (Mollusca, Prosobranchia), with Notes on Some Previously Described Genera. *Zool. Scr.* **1980**, *9*, 283–306. [CrossRef]
17. Warén, A. Revision of the Genera *Apicalia* A. Adams and *Stilapex* Iredale and Description of Two New Genera (Mollusca, Prosobranchia, Eulimidae). *Zool. Scr.* **1981**, *10*, 133–154. [CrossRef]
18. Middelfart, P.; Kirkendale, L.; Bryce, C. Smaller Molluscs from a Multi-Taxon Survey (2012–2014) of the Shallow Marine Environments of the Tropical Kimberley Region, Western Australia. *Rec. West. Aust. Mus. Suppl.* **2020**, *85*, 117. [CrossRef]
19. Carrick, H.G.; Kirkendale, L.A. Worth More than a Thousand Words: First Video Record of Live Australian Endemic Gastropod *Pelseneeria brunnea* (Gastropoda: Eulimidae) and Offspring Parasitising Their Host *Heliocidaris erythrogramma* (Echinoidea: Camarodonta). *Molluscan Res.* **2025**, 1–10. [CrossRef]
20. Wells, F.E.; Bryce, C.W. A Preliminary Checklist of the Marine Molluscs of the Houtman Abrolhos Islands, Western Australia. In *The Marine Flora and Fauna of the Houtman Abrolhos Islands, Proceedings of the Seventh International Marine Biological Workshop*; Wells, F.E., Ed.; Western Australian Museum: Perth, WA, Australia, 1997; Volume 2, pp. 362–384.
21. GBIF Occurrence Download. Available online: https://doi.org/10.15468/dl.gbxwsx (accessed on 11 September 2025).
22. Dgebuadze, P.Y.; Mekhova, E.S.; Zvonareva, S.S. Biodiversity of Symbiotic Gastropods (Mollusca, Eulimidae) in Vietnamese Waters Barcoded. *Molluscan Res.* **2024**, *44*, 335–357. [CrossRef]
23. Takano, T.; Itoh, H.; Kano, Y. DNA-Based Identification of an Echinoderm Host for a Deep-Sea Parasitic Snail (Gastropoda: Eulimidae). *Molluscan Res.* **2018**, *38*, 212–217. [CrossRef]
24. Wells, F.E. Introduction to the Marine Environment of the Houtman Abrolhos Islands, Western Australia. In *The Marine Flora and Fauna of the Houtman Abrolhos Islands, Proceedings of the Seventh International Marine Biological Workshop*; Wells, F.E., Ed.; Western Australian Museum: Perth, WA, Australia, 1997; Volume 1, pp. 1–10.
25. Marsh, L.M. Echinoderms of the Houtman Abrolhos Islands, Western Australia and Their Relationship to the Leeuwin Current. In *Echinoderms Through Time, Proceedings of the Eighth International Echinoderm Conference: Djion, France*; David, B., Guille, A., Feral, J.-P., Roux, M., Eds.; CRC Press: Boca Raton, FL, USA, 1994; pp. 55–61. ISBN 90-5410-514-3.
26. Pearce, A.F. The Leeuwin Current and the Houtman Abrolhos Islands. In *The Marine Flora and Fauna of the Houtman Abrolhos Islands, Proceedings of the Seventh International Marine Biological Workshop*; Wells, F.E., Ed.; Western Australian Museum: Perth, WA, Australia, 1997; Volume 1, pp. 11–46.
27. Hutchins, J.B. Recruitment of Tropical Reef Fishes in the Houtman Abrolhos Islands, Western Australia. In *The Marine Flora and Fauna of the Houtman Abrolhos Islands, Proceedings of the Seventh International Marine Biological Workshop: Western Australia*; Wells, F.E., Ed.; Western Australian Museum: Perth, WA, Australia, 1997; Volume 1, pp. 83–88.
28. Veron, J.E.N.; Marsh, L.M. Hermatypic Corals of Western Australia: Records and Annotated Species List. *Rec. West. Aust. Mus.* **1988**, (Suppl. 29), 1–136. [CrossRef]
29. Hutchins, J.B. Checklist of Fishes of the Houtman Abrolhos Islands, Western Australia. In *The Marine Flora and Fauna of the Houtman Abrolhos Islands, Proceedings of the Seventh International Marine Biological Workshop*; Wells, F.E., Ed.; Western Australian Museum: Perth, WA, Australia, 1997; Volume 1, pp. 239–253.
30. Phillips, J.C.; Huisman, J.M. Influence of the Leeuwin Current on the Marine Flora of the Houtman Abrolhos. *J. R. Soc. West. Aust.* **2009**, *92*, 139–146.
31. Marsh, L.M. Echinoderms of the Montebello Islands. *Rec. W. Aust. Mus.* **2000**, *59*, 21–27.
32. Fukuda, H.; Haga, T.; Tatara, Y. Niku-Nuki: A Useful Method for Anatomical and DNA Studies on Shell-Bearing Molluscs. *Zoosymposia* **2008**, *1*, 15–38. [CrossRef]
33. Martin, K.R.; Waits, L.P.; Parent, C.E. Teaching an Old Shell New Tricks: Extracting DNA from Current, Historical, and Ancient Mollusk Shells. *Bioscience* **2021**, *71*, 235–248. [CrossRef]
34. Geiger, D.L.; Thacker, C.E. Micromolluscs in Molecular Systematics: Experiences and Best Practices. In Proceedings of the Micromolluscs: Methodological Challenges-Exciting Results: Proceedings from the Micromollusc Symposium of the 16th Unitas Malacologica World Congress of Malacology, Antwerp, Belgium, 15–20 July 2007; Zoosymposia Magnolia Press: Auckland, New Zealand, 2008; Volume 39, p. 45.
35. Dgebuadze, P.Y.; Fedosov, A.E.; Kantor, Y.I. Host Specificity of Parasitic Gastropods of the Genus *Annulobalcis* Habe, 1965 (Mollusca, Gastropoda, Eulimidae) from Crinoids in Vietnam, with Descriptions of Four New Species. *Zoosystema* **2012**, *34*, 139–155. [CrossRef]

36. Okutani, T. *Marine Mollusks in Japan*, 2nd ed.; Tokai University Press: Tokyo, Japan, 2017; ISBN 9784486019848.
37. Middelfart, P.U.; Kirkendale, L.A.; Wilson, N.G. Australian Tropical Marine Micromolluscs: An Overwhelming Bias. *Diversity* **2016**, *8*, 17. [CrossRef]
38. World Register of Marine Species (WoRMS). Available online: https://www.marinespecies.org/index.php (accessed on 11 September 2025).
39. Habe, T. Description of *Annulobalcis shimazui* n. gen. et. sp. (Eulimidae). *Venus* **1965**, *24*, 106–107.
40. Geiger, D.L.; Marshall, B.A.; Ponder, W.F.; Sasaki, T.; Warén, A. Techniques for Collecting, Handling, Preparing, Storing and Examining Small Molluscan Specimens. *Molluscan Res.* **2007**, *27*, 1–50. [CrossRef]
41. Atlas of Living Australia (ALA). Available online: https://doi.ala.org.au/doi/4b19fa18-a1eb-4fbe-beaf-a5c8d791060d (accessed on 11 September 2025).
42. Takano, T.; Goto, R. Molecular and Morphological Systematics of the Crinoid-Parasitic Snail Genus *Goodingia* (Mollusca: Caenogastropoda: Eulimidae) with New Insights into Intrafamilial Phylogenetic Relationships. *Mar. Biodivers.* **2021**, *51*, 5. [CrossRef]
43. Adams, A. On Some New Species of Mollusca from Japan. *Ann. Mag. Nat. Hist.* **1862**, *3*, 295–299. [CrossRef]
44. Tröndlé, J.; Boutet, M. Inventory of Marine Molluscs of French Polynesia. *Atoll Res. Bull.* **2009**, *570*, 1–87. [CrossRef]
45. Scuderi, D.; Villari, A.; Reitano, A. Another New Eulimid (Gastropoda Eulimidae) from the Mediterranean Sea: *Vitreolina micalii* n. *sp. Biodiv. J.* **2023**, *14*, 505–512. [CrossRef]
46. Tate, R. On Some Australian Species of Eulimidae and Pyramidellidae. *Trans. R. Soc. S. Aust.* **1898**, *22*, 80–85.
47. Nakano, T.; Nishiyama, E.; Takano, T. Co-Occurrence of Gastropods of the Genus *Melanella* (Mollusca: Eulimidae) Parasitizing the Black Sea Cucumber *Holothuria leucospilota* in Central Japan: Implications for Their Geographic Distribution and Parasitic Ecology. *Zool. Sci.* **2025**, *42*, 417–424. [CrossRef]
48. Takano, T.; Yahagi, T.; Kano, Y. The eulimid snail *Hemiliostraca peasei*, the type species of the genus, parasitizes the ophiocomid brittle star *Ophiocoma dentata*. *Chiribotan* **2016**, *45*, 318–319.
49. Matsuda, H.; Uyeno, D.; Nagasawa, K. Three New Species of *Hemiliostraca* and a Redescription of *H. conspurcata* (Gastropoda: Caenogastropoda: Eulimidae) from Japan, with a Revised Diagnosis of the Genus. *Venus J. Malacol. Soc. Jpn.* **2020**, *73*, 71–85. [CrossRef]
50. Matsuda, H.; Uyeno, D.; Nagasawa, K. Two New Species of *Hemiliostraca* (Caenogastropoda: Eulimidae) from Japan and Taiwan. *Venus J. Malacol. Soc. Jpn.* **2013**, *71*, 163–174. [CrossRef]
51. Wilson, B. Superfamily Eulimoidea. In *Australian Marine Shells. Prosobranch Gastropods*; Odyssey Publishing: Kallaroo, WA, Australia, 1993; Volume 1, pp. 282–291. ISBN 978-0-646-15226-4.
52. Adams, A. Descriptions of New Species of *Eulima*, *Triphoris*, Etc. from the Collection of Hugh Cuming, Esq. *Proc. Zool. Soc. Lond.* **1851**, *19*, 276–279. [CrossRef]
53. Rehder, H.A. *The Marine Mollusks of Easter Island (Isla de Pascua) and Sala y Gómez*; Smithsonian Institution Press: Washington, DC, USA, 1980; pp. 1–167. [CrossRef]
54. Warén, A.; Crossland, M.R. Revision of *Hypermastus* Pilsbry, 1899 and Turveria Berry, 1956 (Gastropoda: Prosobranchia: Eulimidae), Two Genera Parasitic on Sand Dollars. *Rec. Aust. Mus.* **1991**, *43*, 85–112. [CrossRef]
55. Matsuda, H.; Hamano, T.; Nagasawa, K. Growth and Reproductive Cycle of *Hypermastus tokunagai* (Caenogastropoda: Eulimidae), an Ectoparasite of the Sand Dollar *Scaphechinus mirabilis* (Clypeasteroida: Scutellidae) in the Seto Inland Sea, Japan. *J. Mar. Biol. Assoc. United Kingd.* **2013**, *93*, 1041–1051. [CrossRef]
56. Hoskin, G.P.; Warén, A. *Peasistilifer edulis*, a New Eulimid Prosobranch, Parasitic on an Indo-Pacific Holothurian. *Nautilus* **1983**, *97*, 23–26. [CrossRef]
57. Takano, T.; Hasegawa-Takano, M.; Inoue, K. Habitat Selection in Two Species of Eulimidae (Mollusca: Gastropoda) Parasitic on the Black Sea Cucumber *Holothuria atra*. *Hydrobiologia* **2024**, *851*, 1779–1788. [CrossRef]
58. Will, I. Host Preference, Detection, and Dependence: The Ectoparasitic Gastropods *Melanella acicula* and *Peasistilifer nitidula* (Eulimidae) on Holothurian Hosts. *UC Berkeley UCB Moorea Cl. Biol. Geomorphol. Trop. Isl.* **2009**, 1–15.
59. Beechey, D. The Seashells of New South Wales: Release 48. Available online: https://seashellsofnsw.org.au/Eulimidae/Pages/Eulimidae_intro.htm (accessed on 11 September 2025).
60. Warén, A. Eulimid Gastropods Parasitic on Echinoderms in the New Zealand Region. *N. Z. J. Zool.* **1981**, *8*, 313–324. [CrossRef]
61. Odhner, N.H. Results of Dr E. Mjöbergs Swedish Scientific Expeditions to Australia. 1910–1913, Pt XVII, Mollusca. *Kongliga Sven. Vetensk.-Acad. Nya Handl. Stockh.* **1917**, *52*, 1–115.
62. Deshayes, G.P. *Catalogue des Mollusques de l'île de La Réunion (Bourbon)*; Notes sur l'ile de la Réunion (Borbon); Dentu: Paris, France, 1863.
63. Schepman, M.M.; Nierstrasz, H.F. *Parasitische Prosobranchier der Siboga-Expedition*; E. J. Brill: Paderborn, Germany, 1909; Volume 49.
64. Iredale, T. Mollusca from the Continental Shelf of Eastern Australia. *Rec. Aust. Mus.* **1925**, *14*, 243–270. [CrossRef]

65. Habe, T. New Parasitic Gastropods. In *Illustrated Catalogue of Japanese Shells*; Kuroda, T., Ed.; Malacological Society of Japan: Tsukuba, Japan, 1951; Volume 1, pp. 93–94.
66. Marsh, L.M.; Fromont, J. *Field Guide to Shallow Water Seastars of Australia*; Western Australian Museum: Welshpool, WA, Australia, 2020; ISBN 978-1-925040-39-5.
67. Adams, A. Descriptions of Shells from Various Localities and a New Genus of Bivalves from Mauritius. *Proc. Zool. Soc. Lond.* **1874**, *1874*, 584–586. [CrossRef]
68. Fujioka, Y.; Habe, T. A New Species of *Vitreobalcis* (Prosobranchia: Eulimidae) from the Inland Sea of Japan. *Venus Jpn. J. Malacol.* **1983**, *42*, 13–16. [CrossRef]
69. Matsuda, H.; Nagasawa, K. New Species of *Vitreobalcis* (Gastropoda: Caenogastropoda: Eulimidae) Parasitic on *Tripneustes gratilla* (Echinodermata: Camarodonta: Toxopneustidae) in Japan. *Venus J. Malacol. Soc. Jpn.* **2019**, *78*, 61–65. [CrossRef]
70. Chan, S.-Y.; Lau, W.L. Biodiversity Record: New Singapore Record of the Parasitic Snail, *Vitreobalcis tripneusticola*. *Nat. Singap.* **2022**, *15*, e2022105. [CrossRef]
71. Takano, T.; Kohtsuka, H.; Okanishi, M. First Occurrence of Ophiuroid-Parasitic Genus *Ophieulima* (Mollusca: Gastropoda: Eulimidae) in the North Pacific Ocean. *J. Mar. Biol. Assoc. U. K.* **2024**, *104*, e23. [CrossRef]
72. Warén, A.; Sibuet, M. *Ophieulima* (Mollusca, Prosobranchia), a New Genus of Ophiuroid Parasites. *Sarsia* **1981**, *66*, 103–107. [CrossRef]
73. National Center for Biotechnology Information (NCBI). Available online: https://www.ncbi.nlm.nih.gov/ (accessed on 11 September 2025).
74. Wilson, N.G.; Kirkendale, L.A. Putting the 'Indo' Back into the Indo-Pacific: Resolving Marine Phylogeographic Gaps. *Invertebr. Syst.* **2016**, *30*, 86. [CrossRef]
75. Richards, Z.; Kirkendale, L.; Moore, G.; Hosie, A.; Huisman, J.; Bryce, M.; Marsh, L.; Bryce, C.; Hara, A.; Wilson, N.; et al. Marine Biodiversity in Temperate Western Australia: Multi-Taxon Surveys of Minden and Roe Reefs. *Diversity* **2016**, *8*, 7. [CrossRef]