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Littorinid fauna of Xiamen, China (Gastropoda, Littorinimorpha)

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Abstract: Littorinidae exhibits remarkable diversity in intertidal and subtidal zones worldwide, with many species closely associated with mangrove ecosystems. In recent years, the taxonomy of littorinids in the western Pacific has undergone substantial revisions through integrative studies of morphology, molecular phylogenetics, and ecological characteristics. In this paper, we report nine littorinid species recorded from various localities in Xiamen, Fujian Province, China. Specimens and live individuals were examined and photographed, their habitats documented, and certain taxonomic information updated based on the latest research.

Key words. Littorinidae, intertidal zones, mangroves, China, Fujian.

Introduction

Littorinids, commonly known as periwinkles, are small to medium-sized marine gastropods adapted to intertidal and subtidal zones. Although typically abundant and easy to collect worldwide, the considerable variation in shell morphology and overlapping geographic ranges of similar species pose substantial challenges for taxonomic studies. Over the past half-century, integrative research combining shell and anatomical characteristics, molecular phylogenetics, and ecological traits has significantly advanced our understanding of these common yet taxonomically complex snails (Reid, 1989b; Reid, 2001).

Xiamen, a coastal city in Fujian Province, southeastern China, includes the main Xiamen Island and several smaller islands and peninsulas facing the Taiwan Strait to the east. The city features an extensive and diverse coastline encompassing reefs, sandy shores, mudflats, and mangrove forests, which collectively support high malacodiversity (Liu et al., 2023). Since the 1970s, large-scale land reclamation projects have dramatically altered the coastal landscape

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through the development of airports, ports, and tourist infrastructure. Nevertheless, the creation of wetland parks with transplanted and rehabilitated mangroves has contributed to a partial restoration of biodiversity in Xiamen's intertidal zones (Chen et al., 2021; Lin & Rolán, 2024).

The littorinid fauna of Xiamen comprises species from both the temperate zones of northern China and the subtropical regions of southern China and Southeast Asia. The earliest records of littorinids from the region are found in Yen (1933), who documented four species in a monograph on the marine mollusks of Xiamen: *Littorina brevicula* (R. A. Philippi, 1844), *Littorina scabra* (Linnaeus, 1758), *Littorina intermedia* R. A. Philippi, 1846, and *Littorina melanostoma* Gray, 1839. Subsequent works by D. G. Reid included references to Xiamen specimens and addressed taxonomic issues in this group (e.g., Reid, 1998; Reid, 2001; Reid, 2007). Chinese malacologists have also contributed monographs and reports documenting littorinid species from Xiamen and adjacent areas, focusing primarily on ecological observations and shell morphology (Yi & Li, 1988; Li et al., 1994; Chen et al., 2006; Chen et al., 2021; Chen et al., 2023; Liu et al., 2023). More recently, molecular techniques have been applied to littorinid studies in China. For example, the complete mitochondrial genome of *Littoraria ardouiniana* (Heude, 1885) was sequenced, providing novel insights into this species (Chen et al., 2024).

In this paper, we record nine littorinid species from five genera, based on fieldwork conducted between 2020 and 2024 at various sites in Xiamen. We also include one additional species previously recorded by Reid (2007) but not encountered during our surveys. Shells and

Figure 1. Studied sites of Littorinidae in Xiamen.

live specimens are photographed, and selected taxonomic information is updated in light of recent research.

Materials and methods

Intertidal malacofaunal surveys were conducted at several readily accessible coastal sites in Xiamen (Table 1, Map 1). Littorinid species encountered during the surveys were documented, and representative specimens were collected from selected sites and deposited in Li-Wen Lin's private collection (LLWC, Fuzhou, China). For comparative purposes, two specimens of *Echinolittorina vidua* (A. Gould, 1859) [LLWC, Dongshan Island, Zhangzhou, Fujian Province, China], one specimen of *Littoraria flammea* (Philippi, 1847) [LLWC, Rudong, Nantong, Jiangsu Province], and one specimen of *Peasiella roepstorffiana* (G. Nevill, 1885) [LLWC, Dadonghai, Sanya, Hainan Province] were also examined. Shell photographs were taken using a Nikon D80 camera equipped with a Laowa 60 mm F2.8 2:1 macro lens and edited with Adobe Photoshop CC 2019.

Table 1. Sampling locations and corresponding districts in Xiamen

Site No.	Location names	Location names in Chinese	Districts	Districts in Chinese
Site 1	Haiwan Park	海湾公园	Siming	思明区
Site 2	Gulangyu	鼓浪屿	Siming	思明区
Site 3	Baicheng - Hulishan Fortress	白城 - 胡里山炮台	Siming	思明区
Site 4	Zengshan	曾山	Siming	思明区
Site 5	Yazhou Haiwan	亚洲海湾	Siming	思明区
Site 6	Huangcuo	黄厝	Siming	思明区
Site 7	Xiajinwan - Guanyinshan	厦金湾-观音山	Siming	思明区
Site 8	Wuyuanwan Wetland Park	五缘湾湿地公园	Huli	湖里区
Site 9	Haicangwan Park	海沧湾公园	Haicang	海沧区
Site 10	Maluanwan	马銮湾	Haicang	海沧区
Site 11	Jimei School Village	集美学村	Jimei	集美区
Site 12	Xiatanwei	下潭尾滨海湿地公园	Xiang'an	翔安区
Site 13	Qianwu	前浯	Xiang'an	翔安区

Taxonomy

Family **Littorinidae**

Genus ***Littoraria*** Gray, 1833
拟滨螺属

Type species. *Littorina pulchra* G. B. Sowerby I, 1832, by monotypy.

Littoraria melanostoma (Gray, 1839)
黑口拟滨螺
(Figures 2 A–C, E, F)

Littorina melanostoma Gray, 1839: 140; Yen, 1933: 94.
Littoraria melanostoma – Reid, 2001: 127; Zhang & Li, 2008: 470; Liu *et al*., 2023: 14, figs in text.

Material examined. Specimens from Site 9 (LLWC).

Field observations. Living individuals were observed in Sites 9, 11, 12 and 13.

Description. Adult size range 17.5–24.1 mm height. Shell yellow to yellow green, spire tall, solid, with almost straight profiles to the spire and almost flat whorls, slightly angled at the periphery. Aperture relatively large and quadrangular, varices absent. Sculpture consisting of 15–17 flat spiral ribs on the last whorl. Colour pattern consisting of brown dots aligned to form narrow axial series. Parietal callus dark purplish brown. Operculum horny, brown, semiovate, paucispiral.

Type locality. "Indian Ocean"

Distribution. Eastern and Southern Asia (China: Fujian and its southern regions including sea areas around Taiwan).

Habitat. In mangroves and usually on leaves near the top of mangroves. Seldom on artificial constructions like piers and breakwaters.

Remarks. *Littoraria melanostoma* is easily recognised in this genus by the colour of the shell and columella. The congeneric species *Littoraria flammea* (Philippi, 1847) from Jiangsu (Fig. 2D) which is to the north of the distribution areas of *L. melanostoma* is morphologically similar but has a thin shell with weak varices and brown banding. Intermediate specimens were also found in Zhejiang, which locates between Jiangsu and Fujian. Molecular analysis showed that *L. melanostoma* from South China and *L. flammea* had a rather closed relationship and could be a cline of the same species (Dong et.al., 2015). However, there are still no molecular data on *L. melanostoma* from the Indian Ocean, so it remains uncertain whether "*L. melanostoma*" from China is the same species as *L. melanostoma* from the Indian Ocean (Dong et.al., 2015).

Littoraria ardouiniana (Heude, 1885)
斑肋拟滨螺
(Figures 2 G–Q)

Leptopoma ardouinianum Heude, 1885: 95, plate 25, figs 8–8a.
Littoraria ardouiniana – Reid, 2001: 125; Zhang, 2008: 52, figs in text; Zhang & Li, 2008: 470.
Littoraria pallescens – Liu *et al*., 2023: 17, figs in text. **Misidentification.**

Material examined. Specimens from Sites 9 and 13 (LLWC).

Field observations. Living individuals were observed in Sites 9, 11, 13 and 12.

Description. Adult size range 12.9–22.7 mm height. Shell colour variable from yellow, brown, orange to white, spire tall, solid, with almost straight profile to the spire and almost flat whorls, highly angled at the periphery. Aperture relatively large and oval, showing exterior patterns. Varices very strong. Sculpture consisting of around 22 flat spiral ribs on the last whorl. Colour pattern variable, sometimes absent, and sometimes consisting of brown dashes aligned to form axial patterns with dashes between. Columella narrow and white. Operculum horny, light brown, semiovate, paucispiral.

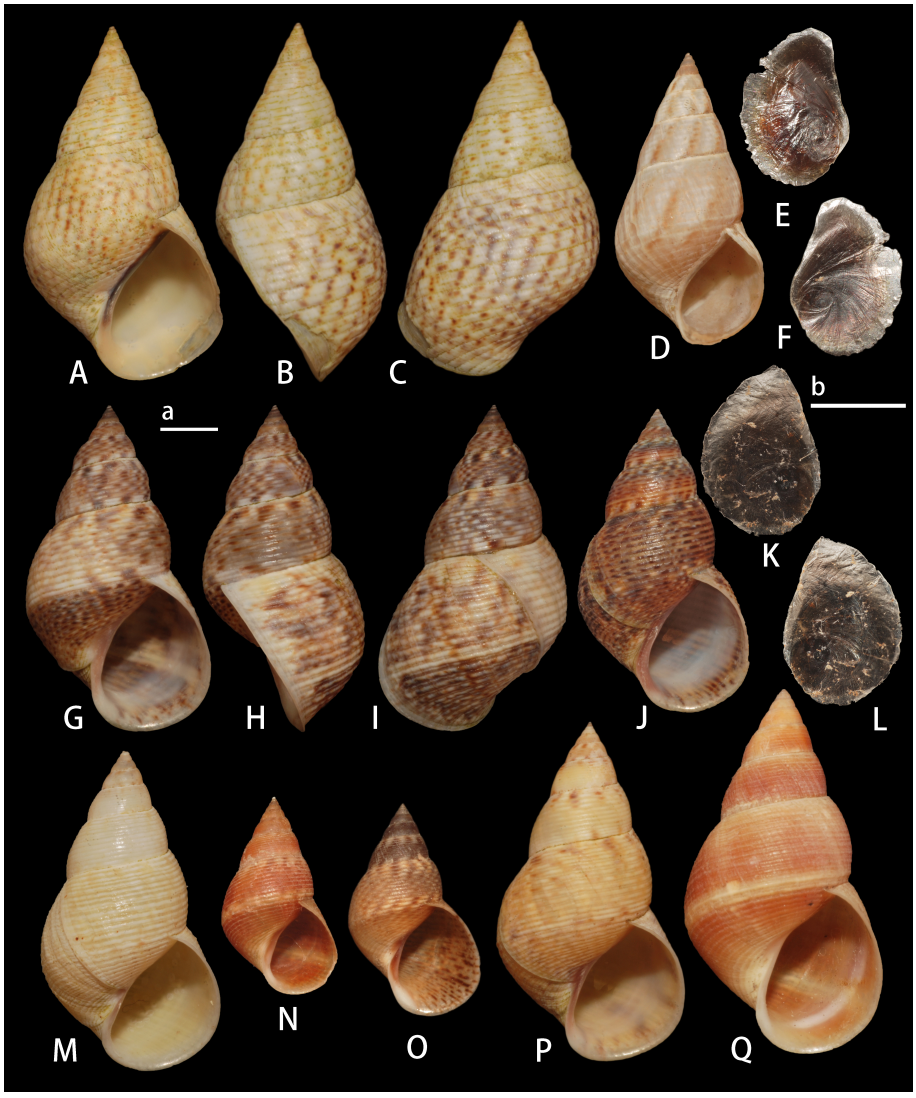

Figure 2. Specimens of *Littoraria.* **A–C**, **E–F**. *Littoraria melanostoma* from Haicangwan Park. **D**. *Littoraria flammea* from Rudong, Jiangsu Province. **G–L.** *Littoraria ardouiniana* from Haicangwan Park. **M–Q.** *Littoraria ardouiniana* from Qianwu. Photos: Li-Wen Lin. Scale bar: a = 5 mm, refers to A–D, G–J, M–Q; b = 5 mm, refers to E–F, K–L.

Type locality. "A-long, Tonkin" [Ha Long Bay, Vietnam].

Distribution. East and Southeast Asia (China: Fujian and its southern regions including sea areas around Taiwan).

Habitat. In mangroves and usually on leaves near the top of mangroves, also common on artificial constructions like piers and breakwaters.

Remarks. The population of *Littoraria ardouiniana* (Heude, 1885) from Xiamen is

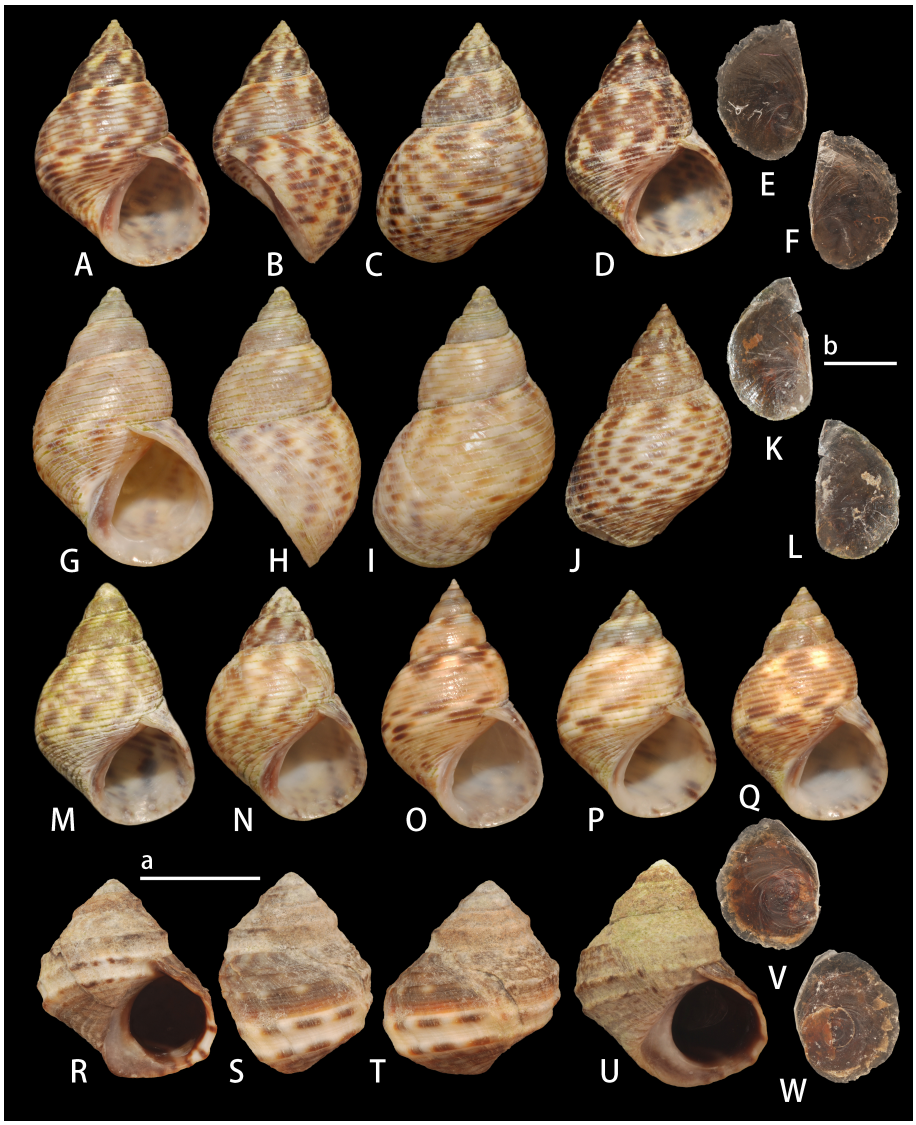

Figure 3. Specimens of *Littoraria* and *Littorina.* **A–F.** *Littoraria articulata* from Haicangwan Park. **G–Q.** *Littoraria sinensis* from Haicangwan Park. **R–W.** *Littorina brevicula* from Hulishan Fortress. Photos: Li-Wen Lin. Scale bar: a = 5 mm, refers to A–D, G–J, M–Q, R–U; b = 2 mm, refers to E–F, K–L, V–W.

sometimes confused with *Littoraria pallescens* (R. A. Philippi, 1846) which is sympatric in South China. Generally, there are less but stronger ribs on shells of *L. pallescens* compared with shells of *L. ardouiniana*. *L. pallescens* was proved to be from Southern China (Hainan and Taiwan) with evidence of anatomical and molecular studies, and *L. ardouiniana* was recorded in Guangxi in the south and some areas in Fujian in the north (Reid, 2001; Chen *et al*., 2024).

Littoraria sinensis **(R. A. Philippi, 1847)**

中华拟滨螺

(Figures 3 G–Q)

Littorina sinensis R. A. Philippi, 1847: 16.
Littorina scabra – Yen, 1933: 92. Misidentification.
Littorina (*Littorinopsis*) *scabra* – Qi *et al*., 1989: 29, pl. 5, fig. 4; **Misidentification.**
Littoraria sinensis – Reid, 2001: 125, fig. 38–52, 56–64, 68; Lin & Rolán, 2024: 11, fig. 10I.
Littorina intermedia – Zhang *et al*. 2008: 46, fig. 51. **Misidentification.**

Material examined. Specimens from Site 9 (LLWC).

Field observations. Living individuals were observed in all Sites.

Description. Adult size range 9.5–11.6 mm height. Shell cream with patterns of brown dashes on ribs and with whitish dashes between. Degree of axial alignment of dashes variable from tessellated pattern to short stripes. Spire high-turbinate, whorls rounded, 7–9 primary spiral ribs on spire whorls, suture impressed, periphery of the last whorl not angulated. Mature lip not flared, aperture cream with exterior patterns. Columella concave, purple brown. Operculum horny, brown, semiovate, paucispiral.

Type locality. China.

Distribution. East Asia (China: sea areas from Bohai Sea to Hong Kong; Japan).

Habitat. Various intertidal environments including reefs from the lowest to the highest water line, mangroves and artificial constructions like piers and breakwaters.

Remarks. Except its sympatric species *L. articulata*, *L. sinensis* is conchologically similar to *Littorina scabra* (Linnaeus, 1758) and *Littoraria intermedia* (R. A. Philippi, 1846) from South and Southeast China (Taiwan, Guangdong and Hainan). *L. scabra* has a larger adult shell with strong spiral ribs and sometimes with a carina on the last whorl, and its sympatric species *L. intermedia* has a taller spire and less inflated whorls (Reid, 2001; Reid, 1986 a; Ohgaki, 1992). *L. scabra* and *L. intermedia* has not been recorded in Xiamen or other areas of Fujian Province yet.

Littoraria articulata **(R. A. Philippi, 1846)**

斑节拟滨螺

(Figures 3 A–F)

Littorina intermedia var. *articulata* R. A. Philippi, 1846: 141.
Littorina intermedia – Yen, 1933: 93.
Littoraria articulata – Reid, 2001: 134, fig. 53–55, 65–68.

Material examined. Specimens from Site 9 (LLWC).

Field observations. Living individuals were observed in all Sites.

Description. Adult size range 9.8–12.2 mm height. Shell very similar to L. sinensis, but darker, with distinct dashes well aligned into axial strips. Spire shorter, whorls flatter, spiral groves finer. Columella longer, straighter, dark brown. Subadult shells with almost smooth surface (Figure 6 C). Operculum horny, brown, semiovate, paucispiral.

Type locality. Swan Point, Australia.

Distribution. South of East Asia, South and Southeast Asia, North Australia (China: Fujian and its southern regions).

Habitat. Various intertidal environments including reefs from the lowest to the highest water line, mangroves and artificial constructions like piers and breakwaters.

Remarks. *Littoraria articulata* is difficult to distinguish from its sympatric species *Littoraria sinensis* (R. A. Philippi, 1847) in Xiamen merely through shells. Generally, *L. articulata* has a more globose shell with flatter whorls and spiral grooves up to one quarter rib width, compared with shells of *L. sinensis* with a taller spire, slightly rounded whorls and grooves up to half to one time rib width. The length of penial filaments of these two species is distinctly different (Reid, 2001). The patterns of shells and morphology of apertures were also concluded in Reid, 2001 but these features become ambiguous when a large number of specimens from Xiamen are inspected.

Genus ***Littorina*** A. Férussac, 1822
滨螺属

Type species. *Turbo littoreus* Linnaeus, 1758, type by monotypy.

Littoraria brevicula **(Gray, 1839)**
短滨螺
(Figures 3 R–W)

Turbo breviculus R. A. Philippi, 1844: 166.

Littorina brevicula – Yen, 1933: 91; Qi et al., 1989: 28, fig. 27; Li et al., 1994: 44; Zhang, 2008: 51, text-figures; Zhang & Li, 2008: 470; Zhang et al. 2008: 45, fig. 50.

Material examined. Specimens from Site 3 (LLWC).

Field observations. Only observed in Sites 3.

Description. Adult size range 8.2–11.9 mm height. Shell biconical, dark brown to dirty white. Pattern sometimes absent, sometimes with whitish and brown spots. Shell with 3–5 strong spiral ribs. Surface of adult shells always eroded. Columella white, narrow, with pointed end. Operculum horny, brown, ovate, paucispiral.

Type locality. estuary of Yang-tze River, China.

Distribution. East Asia. This is the most widespread periwinkle species in China, whose distribution is from Bohai Sea in the north to the South China Sea in the south.

Habitat. On reefs, and only found on granite walls near the highest water line in Xiamen.

Remarks. *Littorina brevicula* is very common in intertidal zones of Bohai Sea and the

Yellow Sea, becoming the dominant molluscan species in many areas. However, the population is far less prosperous in Southeast and South China. In Xiamen, *L. brevicula* is always observed to dwell with *Echinolittorina malaccana* (Philippi, 1847) and *Echinolittorina radiata* (Souleyet, 1852), but the density is lower than these two species.

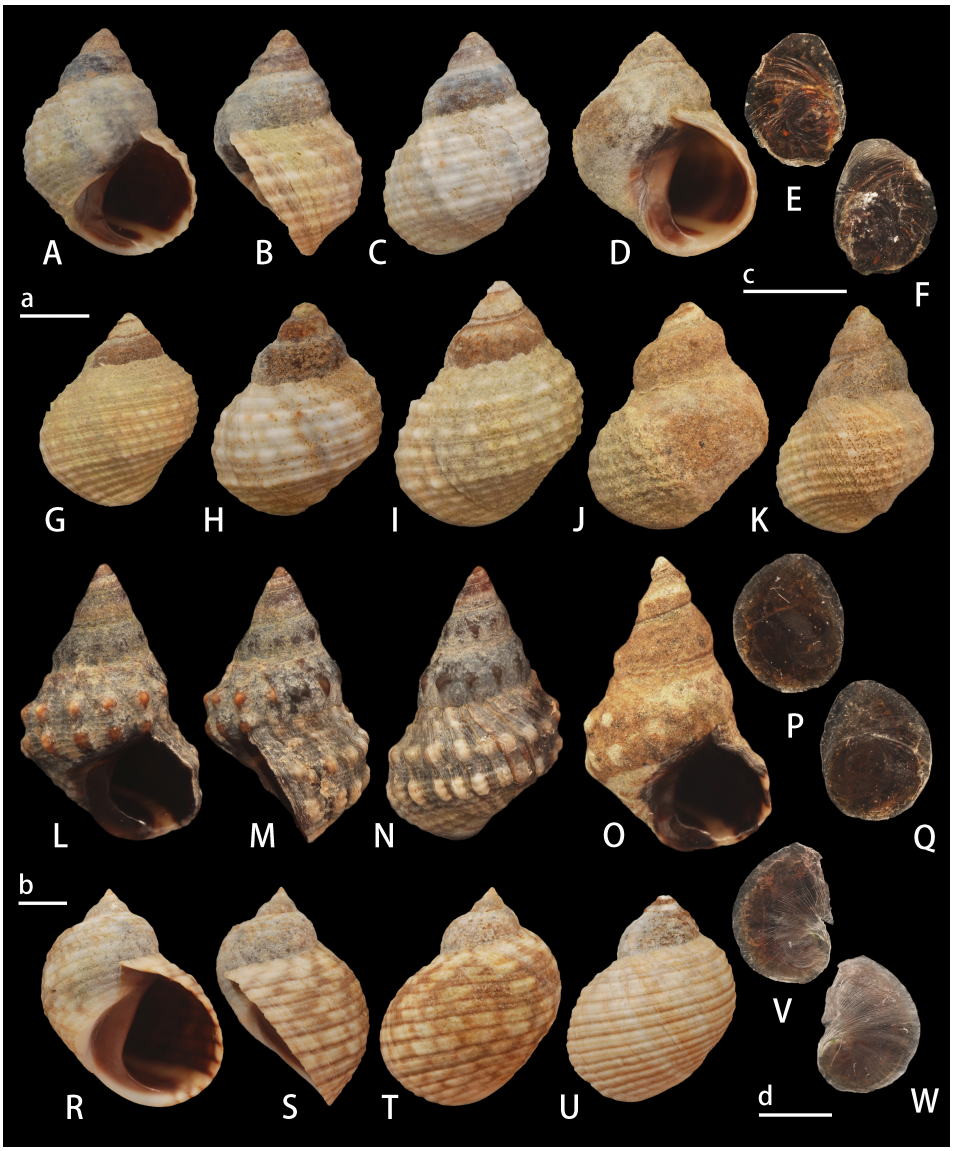

Figure 4. Specimens of *Echinolittorina.* **A–K.** *Echinolittorina radiata* from Hulishan Fortress. **L–Q.** *Echinolittorina malaccana* from Hulishan Fortress. **R–W.** *Echinolittorina vidua* from Dongshan Island, Zhangzhou, Fujian Province. Photos: Li-Wen Lin. Scale bar: a = 2 mm, refers to A–D, G–K, L–O; b = 2 mm, refers to R–U; c = 2 mm, refers to E–F, P–Q; d = 2 mm, refers to V–W.

Genus ***Echinolittorina*** Habe, 1956
棘滨螺属

Type species. *Litorina tuberculata* Menke, 1828, by original designation.

***Echinolittorina malaccana* (Philippi, 1847)**
马六甲棘滨螺
(Fig. 4 L–Q)

Litorina malaccana R. A. Philippi, 1847: vol.3: 15 (51).
Nodilittorina pyramidalis pyramidalis – Li *et al*., 1994: 44. **Misidentification.**
Nodilittorina pyramidalis – Zhang & Li, 2008: 471; Zhang, 2008: 53, text-figures; Liu *et al*., 2023: 19, text-figures. **Misidentification.**
Echinolittorina malaccana – Reid, 2007: 55, figs. 26C–D, 27–29.

Material examined. Specimens from Site 3 (LLWC).

Field observations. Living individuals were observed in Sites 2, 3, 5, 9, 10, 11, 12 and 13.

Description. Adult size range 5.9–9.3 mm height. Shell conical to high-conical, black to dark brown, paler at suture and on base; spire whorls almost flat to lightly rounded, suture not distinct; spire profile straight to slightly convex; periphery of the last whorl rounded; base profile slightly convex. Columella dark brown, short, concave, hollowed but not flared at base, anterior lip rounded; aperture dark brown with pale band at base. Sculpture of the last whorl with 2 rows of rounded nodules, white to cream, at periphery and shoulder, entire surface with 12–26 narrow spiral threads and microstriae, peripheral nodules crossed by 2–3 major threads; basal threads (below peripheral nodules) 3–8, often bearing small nodules. Operculum horny, brown, ovate, paucispiral.

Type locality. Penang, Malaysia.

Distribution. South of East Asia, South and Southeast Asia (China: Zhejiang and its southern regions including sea areas around Taiwan).

Habitat. Preferring the reefs near the highest water line and artificial constructions like piers and breakwaters. Seldom in mangroves.

Remarks. The population of *E. malaccana* from China has been misidentified as *Nodilittorina pyramidalis* (Quoy & Gaimard, 1833) for a long time (*e.g.* Li *et al.*, 1994; Zhang, 2008; Liu *et al.*, 2023). These two species are similar in shell morphology but can be distinguished through anatomical features and molecular phylogeny. *Nodilittorina pyramidalis*, whose type locality is in Jervis Bay, New South Wales, was proved to be restricted to Southeastern Australia (Reid, 2004). Other species from East to South Asia, Northern Australia and South Pacific Islands with similar nodulose shells confused with *N. pyramidalis* were also treated as separate species, such as *Echinolittorina austrotrochoides* Reid, 2007 mainly from Northern Australia and Papua New Guinea, *Echinolittorina pascua* (Rosewater, 1970) from Easter and Pitcairn Islands and *Echinolittorina cecillei* (Philippi, 1851) mainly from Japan (Reid, 2004; Reid, 2007).

Echinolittorina radiata (Souleyet, 1852)

小棘滨螺

(Fig. 4 A–K)

Littorina radiata Souleyet, 1852: 561, pl. 31, figs 46-47.
Nodilittorina millegrana – Li *et al*., 1994: 44; Zhang & Li, 2008: 471. **Misidentification.**
Nodilittorina exigua – Qi et al., 1989: 30, fig. 28; Zhang, 2008: 52, text-figure; Zhang & Li, 2008: 471; Zhang *et al*. 2008: 47, fig. 52. **Misidentification.**
Echinolittorina radiata – Liu *et al*., 2023: 495, figs in text.
Echinolittorina millegrana – Liu *et al*., 2023: 496, figs in text. **Misidentification.**
Echinolittorina radiata – Reid, 2007: 17, fig. 4, 5, 6A–B, 7.

Material examined. Specimens from Site 3 (LLWC).

Field observations. Living individuals were observed in Sites 2, 3, 5, 9, 10, 11, 12 and 13.

Description. Adult size range 6.1–8.9 mm height. Shell dirty white, fawn or blue-grey, spire whorls rounded, suture distinct, spire profile straight. Sculpture on the last whorl with 5-8 granulose ribs with granular not aligned in axial series, and brown marks between granules on ribs. Surface always eroded. Aperture brown inside with a pale band at base. Columella concave and brown. Operculum horny, brown, ovate, paucispiral.

Type locality. Touranne, Cochinchine [Da Nang, Vietnam].

Distribution. East Asia and sea areas around Vietnam (China: sea areas from the Yellow Sea to the South China Sea).

Habitat. Preferring the reefs near the highest water line and artificial constructions like piers and breakwaters. Seldom in mangroves.

Remarks. *Echinolittorina radiata* is sometimes confused with its sympatric species, *Echinolittorina vidua* (A. Gould, 1859), in Xiamen. This species has a higher spire, coarser granulate ribs, brown columella and lip, dirty white shell sometimes with indistinct brown patterns. Some Chinese essays confused this species with *Echinolittorina millegrana* (R. A. Philippi, 1848), which only distributes in Red Sea, Arabia to mouth of Persian Gulf (Reid, 2007). According to surveys from 2020 to 2024, *E. radiata* is very common in rocky environments near the highest water line in Xiamen.

Echinolittorina vidua (A. Gould, 1859)

变化棘滨螺

(Fig. 4 R–W)

Littorina vidua A. Gould, 1859: 138.
Littorina chaoi Yen, 1936: 3-4; Yen, 1937: fig. 2, 2a, b.
Echinolittorina vidua – Reid, 2007: 111, figs 55E–F, 59–61.

Material examined. Specimens from Dongshan Island, Zhangzhou, Fujian Province, China. (LLWC)

Field observations. Living individuals were recorded in Sites 3 by Reid (2007), not observed by the authors.

Description. Adult size range 9.2–10.8 mm height. Shell turbinate to slightly patulous,

usually white, cream or pale grey ground colour with pattern of fine brown tessellation on ribs, sometimes forming axial flames, grooves brown; spire whorls rounded, suture distinct; spire profile usually concave at apex; apex often black; periphery of the last whorl rounded, sometimes slightly shouldered. Aperture dark brown inside with pale band at base Columella is purple-brown, but anterior edge and inner lip white, long, straight, wide, hollowed and slightly pinched at base. Sculpture of last whorl with about 13–16 major spiral ribs; larger ribs usually finely granulose. Operculum horny, brown, semiovate, paucispiral.

Type locality. O-shima, Amami Islands, Japan.

Distribution. Central Indo-West Pacific (China: Fujian and its southern regions including

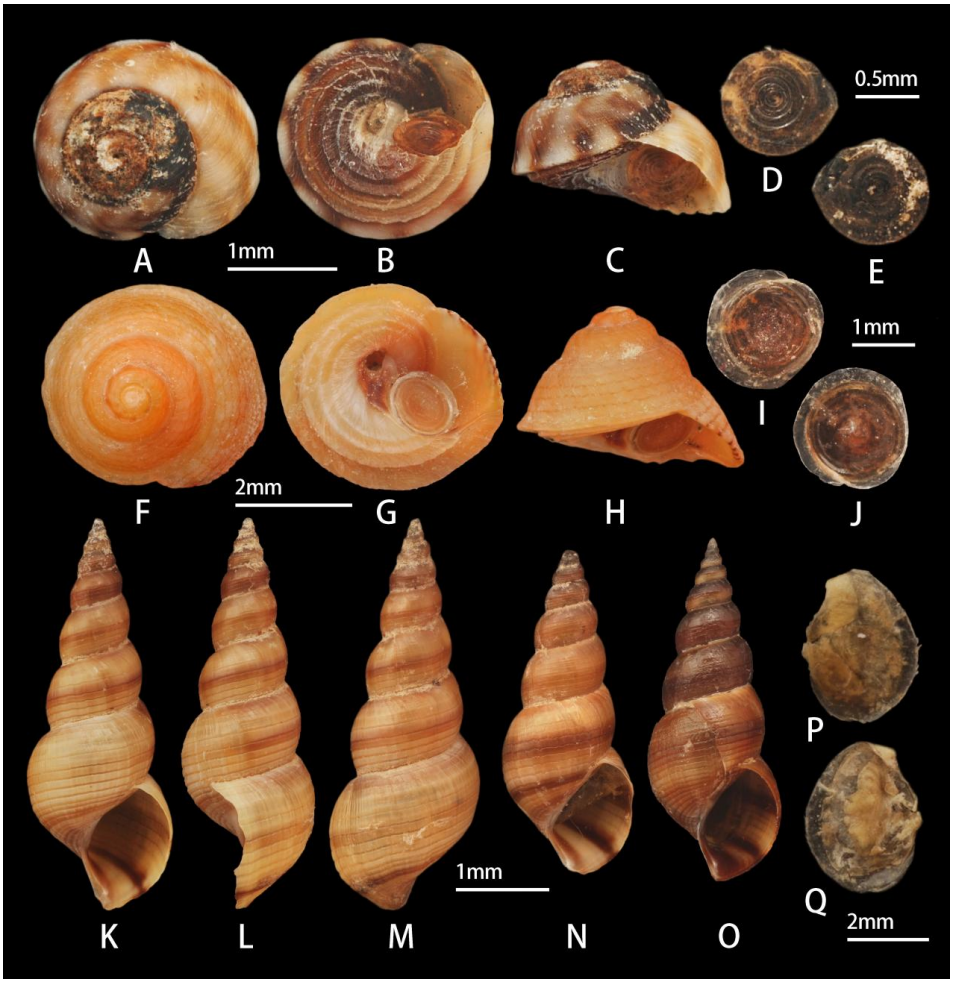

Figure 5. Specimens of *Peasiella* and *Mainwaringia.* **A–E.** *Peasiella habei* from Hulishan Fortress. **F–J.** *Peasiella roepstorffiana* from Dadonghai, Sanya, Hainan Province. **K–Q.** *Mainwaringia leithii* from Xiatanwei. Photos: Li-Wen Lin. Scale bar: a = 1 mm, refers to A–C; b = 0.5 mm, refers to D–E; c = 2 mm, refers to F–H; d = 1 mm, refers to I–J; e = 1 mm, refers to K–O; f = 0.5 mm, refers to P–Q.

sea areas around Taiwan).

Habitat. On reefs and artificial constructions like piers and breakwaters.

Remarks. *Echinolittorina vidua* is sympatric with *Echinolittorina radiata* (Souleyet, 1852) and *Echinolittorina malaccana* (Philippi, 1847) in Xiamen. Reid (2007) recorded this species from Hulishan Fortress (Pao Tai) in Xiamen without figures, and Reid summarised the characters of *E. vidua* from East Asia by having finer and more numerous ribs, brown tessellated pattern and white anterior and inner lips. Several suveys in Hulishan Fortress by the authors yielded a great number of "*E. radiata*" specimens, some of which partly match those characters of *E. vidua* but transitional forms to *E. radiata* are also seen. So, we treat all these specimens as *E. radiata* and recent developments of the population of *E. vidua* in Xiamen remains unknown. The population found in Dongshan Island in Zhangzhou to the south of Xiamen is typical with characters of East Asian *E. vidua*.

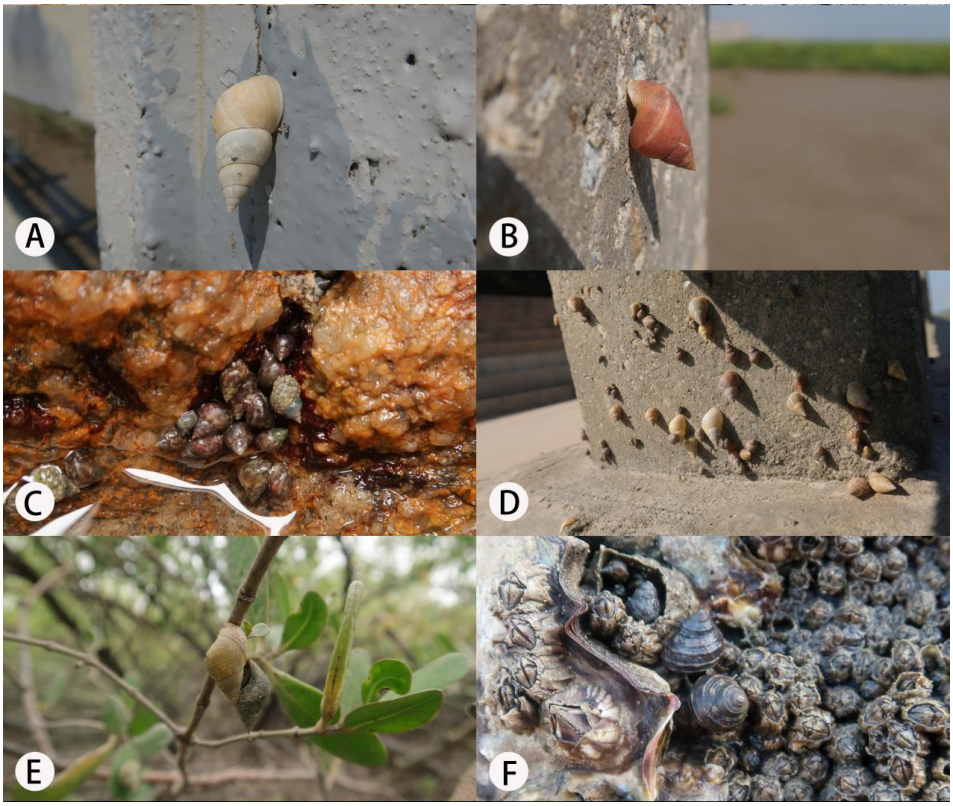

Figure 6. Living periwinckles from Xiamen. **A, B.** *Littoraria ardouiniana* on artificial seawalls, Qianwu, 25 July, 2024. **C.** *Echinolittorina* spp. and *Littoraria* spp. in gaps of granites, Baicheng, 21 May, 2022. **D.** *Littoraria* spp. on stone pillars of the railing along a seawall, Qianwu, 25 July, 2024. **E.** *Littoraria melanostoma* in mangroves, of the railing along a seawall, Xiatanwei, 30 April, 2022. **F.** *Littorina brevicula* on reefs with barnacles, Yazhou Haiwan, 18 February, 2023. Photos: Yuan-Zheng Meng.

Genus ***Peasiella*** G. Nevill, 1885
豆滨螺属

Type species *Trochus tantillus* A. Gould, 1849, type by original designation

***Peasiella habei* Reid & Mak, 1998**
波部豆滨螺
(Fig. 5 A–E)

Peasiella habei – Reid & Mak, 1998; Li *et al*., 2021: 762, fig. 1 (a, b, c, g); Lin & Rolán, 2024: 11, fig. 14. F.

Material examined. Specimens from Site 3 (LLWC).

Field observations. Living individuals were observed in Site 2 and 3, empty shells were found in sand sediment near the high-water line along the coast in Site 7.

Description. Adult size range 1.8–3.0 mm diameter. Shell fawn or cream, conical, whorls rounded with oblique brown stripe, form single rows of 7–12 brown spots at periphery, suture impressed, peripheral keel prominent, base slightly rounded, umbilicus and columella narrow, curved at base, apex usually eroded. Whorls usually smooth, with 6–11 spiral ribs ,3–5 sharp ribs at base. Operculum horny, light brown, round with a spiral growth line.

Type locality. Esu Cape, Shirahama, Wakayama Prefecture, Japan.

Distribution. East Asia (China: sea areas from Shandong to Hong Kong).

Habitat. On reefs and among algae near the lowest water line.

Remarks. Black and white stripes on shells of this species is a unique character which is different from the pure-orange shells of *Peasiella roepstorffiana* (G. Nevill, 1885) recorded from Southern China (Guangdong, Hong Kong and Hainan).

Genus ***Mainwaringia*** G. Nevill, 1885
长滨螺属

Type species *Melania paludomoidea* G. Nevill, 1885, type by original designation

Mainwaringia leithii (E. A. Smith, 1876)
莱氏长滨螺
(Fig. 5 K–Q)

Alaba (Diala) leithii E. A. Smith, 1876: 539.
Mainwaringia leithii – Reid 1986 b: 226, fig. 1–2; Chen *et al*., 2021: 1–8, fig. 2; Lin & Rolán, 2024: 11, fig. 12. I.; Xing *et al*., 2025: 1–9, fig. 1.
Mainwaringia dantaae – Liu *et al.*, 2023: 13, text-figure.

Material examined. Specimens from Site 12 (LLWC).

Field observations. Living individuals were observed in Sites 8, 9, 12 and 13, empty shells were found in sand sediment near the high-water line along the coast in Site 7.

Description. Adult size range 6.1–10.1 mm height. Shell pale yellow, with distinct brown

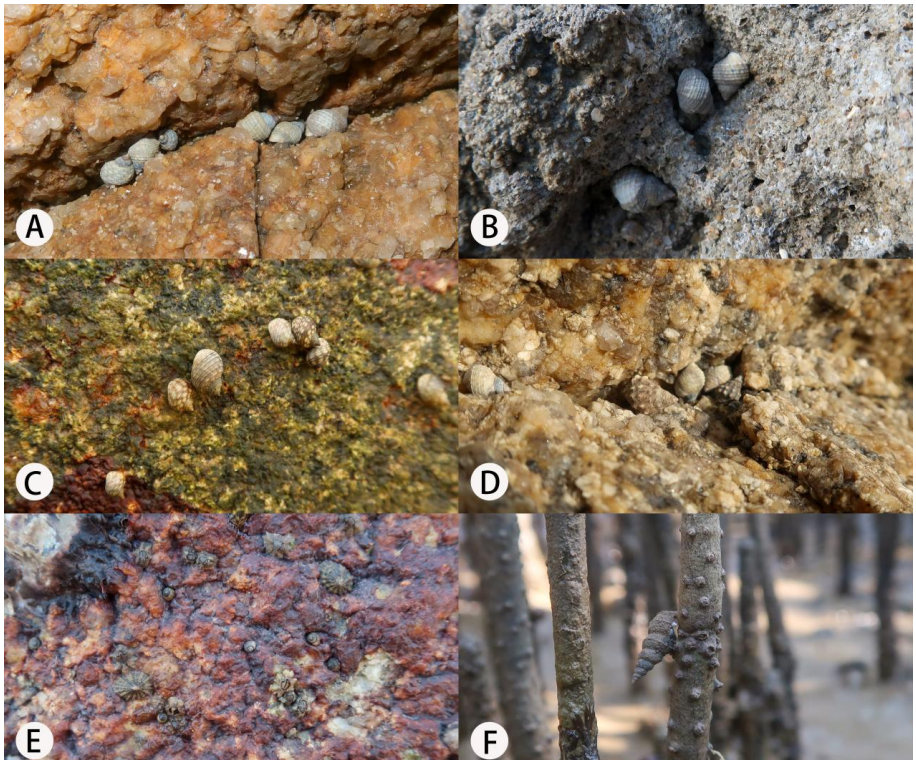

Figure 7. Living periwinckles from Xiamen and Zhangzhou. **A.** *Echinolittorina radiata* in gaps of granites, Baicheng, 12 January, 2022. **B.** *Echinolittorina radiata* on cement seawalls, Yazhou Haiwan, 18 February, 2023. **C.** *Echinolittorina vidua* on reefs, Dongshan Island, Zhangzhou, Fujian Province, 11 July, 2024. **D.** *Echinolittorina radiata* and *Echinolittorina malaccana* in gaps of granites, Yazhou Haiwan, 18 February, 2023. **E.** *Peasiella habei* on reefs near the lowest water line, Yazhou Haiwan, 18 February, 2023. **F.** *Mainwaringia leithii* on the trunk of a mangrove, Xiatanwei, 24 February, 2023. Photos: Yuan-Zheng Meng.

spiral bands, with 11-16 fine spiral ribs on the last whorl, thin, sometimes translucent, spire tall, whorls rounded, not angulated. Suture depressed, aperture oval, yellow, lip thin, sharp. Operculum horny, light yellow to transparent, semiovate, paucispiral.

Type locality. California, in error, corrected to Bombay Harbour (Tomlin, 1922).

Distribution. East, Southeast and South Asia (China: sea areas from Zhejiang to Hong Kong).

Habitat. In mangroves and usually on leaves and branches near the bottom of mangroves, also on artificial constructions like piers and breakwaters.

Remarks. *Mainwaringia leithii* from India, Malaysia, Vietnam and China have similar distinguishable thin shells with tall spires and brown spiral bands. *Mainwaringia dantaae* Y.-F. Fang, Y.-J. Peng, G.-J. Zhang & J. He, 2012 described from Shenzhen in Southern China has a thoroughly brown to yellow, thick and solid shell different from *M. leithii*. *M. dantaae* illustrated by Liu *et al.* (2023) have banded shells which match the character of *M. leithii*. Xing

Figure 8. *Echinolittorina radiata* and *Echinolittorina malaccana* gathered on piers in Hulishan Fortress, 29 December, 2022. Photos: Li-Wen Lin.

Figure 9. Transplanted mangroves in Haicangwan Park, with *Mainwaringia leithii* usually hidding on the back of the leaves, 21 August, 2021. Photos: Li-Wen Lin.

et al. (2025) synonymised *M. dantaae* with *M. leithii* through morphological and molecular analyses, while specimens of *M. dantaae* used in this study have a different coloration by having spiral colour bands like *M. leithii*, and are not from the type locality, Shenzhen. More specimens of different coloration are expected to reveal the relationship between the pure colour *M. dantaae* and the banded *M. leithii*.

Discussion

Littorinids from Xiamen are abundant in intertidal zones including reefs, mangroves and

artificial constructions like piers and breakwaters. Different species has different preference of habitat and the occurrence and density of periwinkle species in each site in Xiamen depend mainly on the environment. Various of reefs such as granites, volcanic rocks and oyster reefs provide littorinids with appropriate habitats. *E. radiata*, *E. malaccana* and *L. brevicula* prefer granites near the highest water line and *P. habei* prefers reefs near the lowest water line. Rehabilitated or transplanted mangroves and artificial constructions especially enriched the diversity of littorinids, where *M. leithii*, *E. radiata*, *E. malaccana* and *L. ardouiniana* appear in flocks.

Geographical location of Xiamen makes it an overlap of periwinkle species from tropical and temperate zones. One example is the sympatry of *L. articulata* and *L. sinensis*. *L. articulata* distributed from South China to North Australia, while *L. sinensis* distributed from Japan to South China. These two morphologically similar species confluences in Xiamen and some areas in Guangdong and Hong Kong.

A review on shells and habitats of littorinids from Xiamen is proposed and the taxonomic information is updated according to others' research on molecular analysis and anatomy of specimens from adjacent areas. Molecular analysis and anatomy of littorinids from Xiamen is expected in future studies to solve more taxonomic problems.

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厦门滨螺科软体动物区系及其分布初报

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摘 要

滨螺科（Littorinidae）物种在全球的潮间带及潮下带海域有着极为丰富的多样性，且许多滨螺种类和红树林环境有着密切联系。近年来，在包含形态学、分子生物学和生态学的综合性研究的影响下，西太平洋海域滨螺的分类发生了诸多变化。本文中作者报道了 10 个来自厦门的滨螺物种，检视并拍摄了它们的贝壳标本照片与生活状态照片，并对它们的栖息环境进行探讨。考虑到过往国内的文献资料对许多滨螺的鉴定信息都已过时，作者结合当前最新的研究成果，对这些滨螺物种的分类名称进行更新。

关键词：形态学，分类学，潮间带，红树林，中国，福建。