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Biodiversity Record: The freshwater limpet, *Ferrissia* cf. *californica*, in Singapore

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Subject: Californian freshwater limpet, *Ferrissia* cf. *californica* (Mollusca: Gastropoda: Planorbidae: Ancylinae).

Subject identified by: Chan Sow-Yan and Lau Wing Lup.

Location, date and time: Singapore Island, Punggol Reservoir at Sengkang Riverside Park; 30 August 2020; around 1200 hrs.

Habitat: Freshwater. Urban reservoir with earth banks (Fig. 1). In lentic and sheltered environments along the shore.

Observers: Chan Sow-Yan and Lau Wing Lup.

Observation: Around seven live individuals (Figs. 2–5) were found on waterweeds, dead leaves and a discarded plastic bag. The largest examples have a shell length of about 3 mm and a height of 1 mm. The animals have varying degrees of encrustations on their shells.

The shell is fragile and cap-shaped, with a thin layer of yellowish periderm. Its aperture is large and sub-oval. Its dorsal surface is convex in lateral view (Fig. 4). The shell is wider anteriorly, narrower and rounder posteriorly, with nearly parallel sides that are slightly curved in the middle (Fig. 4). The apex is elevated, curved backwards and located off centre to the right, at about two-thirds of the length from the shell's anterior margin (Fig. 4). The shell surface is opaque with strong concentric growth lines and faint radiating striae (Figs. 4, 5). Shell colour varies from dark brown, greenish brown to amber brown (Figs. 2–5).

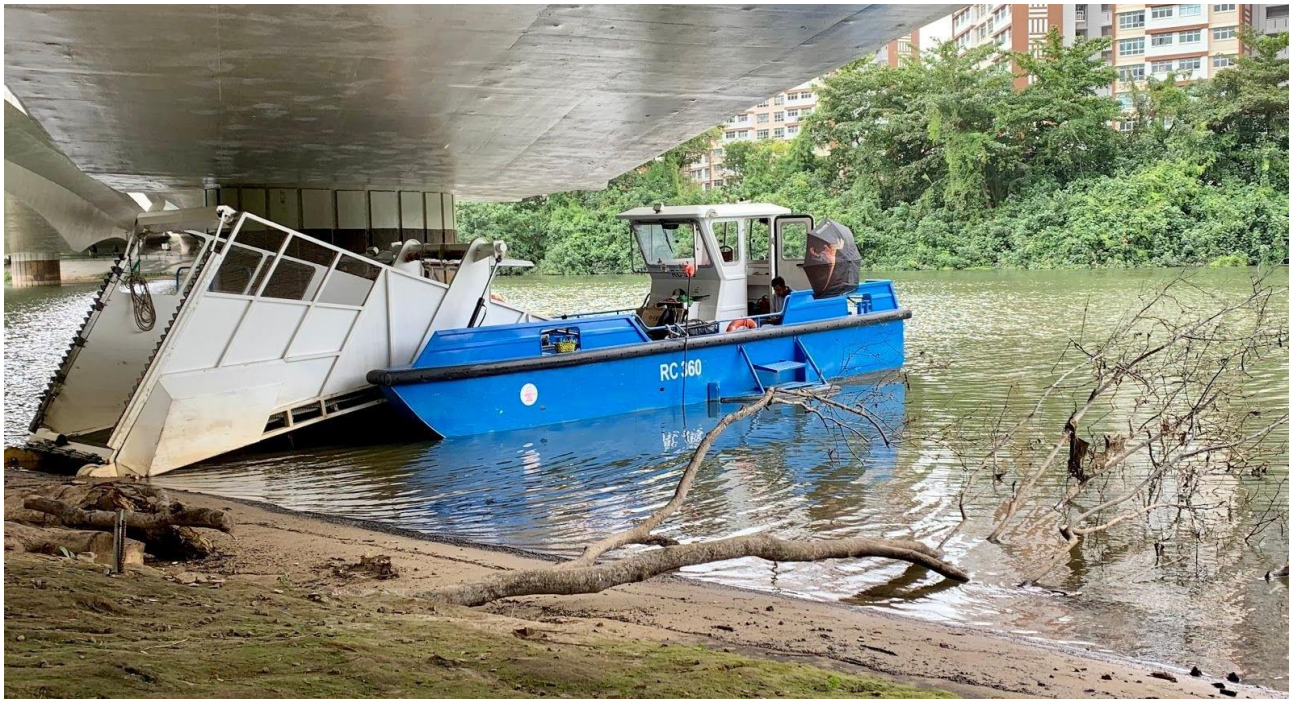

Fig. 1. The shore of the Punggol Reservoir below the flyover at Sengkang Riverside Park where examples of *Ferrissia* cf. *californica* were found. (Photograph by: Lau Wing Lup).

Fig. 2. Two live examples of *Ferrissia* cf. *californica* from Sengkang Riverside Park, each around 2 mm, with varying degrees of encrustations. (Photograph by: Lau Wing Lup).

Fig. 3. Three live examples of *Ferrissia* cf. *californica* in different growth stages with concentric growth scars, on a palm leaf stem. (Photograph by: Lau Wing Lup).

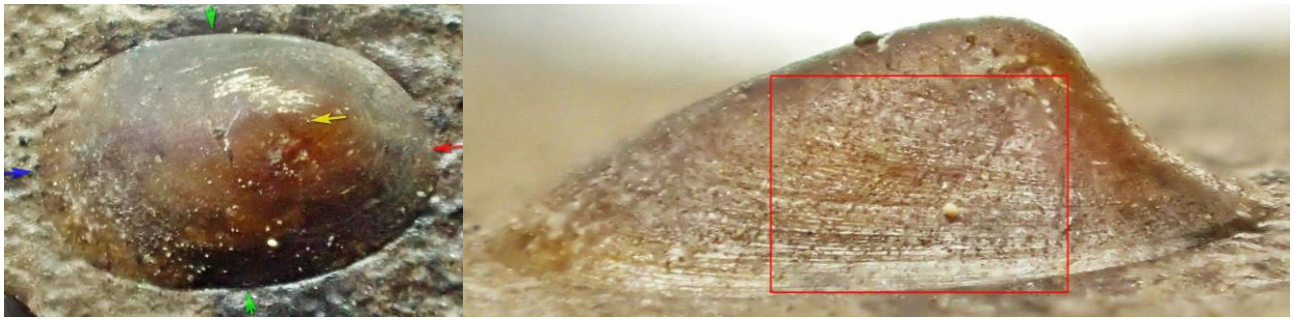

Fig. 4. A live *Ferrissia* cf. *californica* in situ on a dead leaf. The dorsal view of the shell on the left shows that the anterior part (blue arrow) is wider than the posterior (red arrow), and the sides (green arrows) are nearly parallel but curved slightly in the middle. The elevated apex (yellow arrow) is located slightly off centre to the right. The lateral view on the right shows strong concentric growth lines (red rectangle) on the surface of the shell. (Photographs by: Lau Wing Lup).

Fig. 5. Dorsal view of a live *Ferrissia* cf. *californica*. The translucent shell allows parts of the snail's flesh and the pair of black eye spots (circled red) to be seen. (Photograph by: Lau Wing Lup).

Fig. 6. A live *Ferrissia* cf. *californica* moving on the glass pane of an aquarium, showing the ventral parts of its head and foot. The green arrow points to the shell's apex; yellow arrows point to the tentacles on its head. (Photograph by: Lau Wing Lup).

Remarks: *Ferrissia* cf. *californica* was first discovered in Singapore in the early 1990s (Chan, 1996, as *Ferrissia javana*). It is believed to be an alien species that was accidentally introduced with ornamental aquatic plants. The species is frequently found on the waterweed *Hydrilla verticillata*. In Singapore, this mollusc thrives in anthropogenically influenced waters (e.g., ponds and reservoirs), but has not been reported from forest and freshwater swamps (see Lim et al., 2018). Its small size and cryptic and sessile behaviour make detection very challenging. The authors have not come across images of live examples being featured in previous literature on Singapore's malacological fauna.

Although initially reported as *Ferrissia javana* (Chan, 1996), Singapore samples seen by the authors appear to match the original descriptions of *Ferrissia californica* in Rowell (1863). However, due to *Ferrissia californica* lacking in distinctive morphological characters, coupled with the lack of molecular identification on freshwater limpets locally, the authors are unable to confirm their specific identity.

Ferrissia californica was originally described from the west coast of the United States, and has a near-cosmopolitan distribution in temperate and tropical freshwater pond ecosystems. It has been recorded (also as *Ferrissia fragilis*) as an invasive species in many places of the world, including the Azores, Hawaii, Poland, southern Europe, the Philippines, Taiwan, the Middle East and Japan (Walther et al., 2006; Walther et al., 2010; Marrone et al., 2011; Raposeiro et al., 2011; Marrone et al., 2014; Christensen, 2016; Saito et al., 2018).

In 2021, the authors also found *Ferrissia* cf. *californica* at Toa Payoh Town Park, Lower Seletar Reservoir Park and Punggol Park. The second author has also discovered some in his freshwater aquarium at home (Fig. 6). These tend to adhere to the glass panes, and were almost certainly introduced with ornamental aquatic plants purchased at aquarium shops. Compared to wild individuals, aquarium specimens tend to have clean shells and less intense colours on their soft tissues.

Literature cited:

Chan SY (1996) The families Ancylidae, Pisidiidae and Corbiculidae of Singapore. The Papustyla, 10: 3–4.

Christensen CC (2016) Change of status and name for a Hawaiian freshwater limpet: *Ancylus sharpi* Sykes, 1900, is the invasive north American *Ferrissia californica* (Rowell, 1863), formerly known as *Ferrissia fragilis* (Tryon, 1863) (Gastropoda: Planorbidae: Ancylinae). Bishop Museum Occasional Papers, 118: 5–8.

Lim WH, Li TJ & Cai Y (2018) Diversity of terrestrial snails and slugs in Nee Soon freshwater swamp forest, Singapore. Gardens' Bulletin Singapore, 70, Supplement 1: 109–121.

Marrone F, Brutto SL & Arculeo M (2011) Cryptic invasion in southern Europe: The case of *Ferrissia fragilis* (Pulmonata: Ancylidae) Mediterranean populations. Biologia, 66: 484–490.

Marrone F, Naser MD, Yasser AG, Sacco F & Arculeo M (2014) First record of the North American cryptic invader *Ferrissia fragilis* (Tryon, 1863) (Mollusca: Gastropoda: Planorbidae) in the Middle East. Zoology in the Middle East, 60: 39–45.

Raposeiro PM, Costa AC & Martins AF (2011) On the presence, distribution and habitat of the alien freshwater snail *Ferrissia fragilis* (Tryon, 1863) (Gastropoda: Planorbidae) in the oceanic islands of the Azores. Aquatic Invasions, 6, Supplement 1: S13–S17.

Rowell J (1863) Description of a new California mollusk, discovered by Rev. Joseph Rowell, at Marysville, in the waters of Feather River. Proceedings of the California Academy of Sciences, 3: 21–22.

Saito T, Do VT, Prozorova L, Hirano T, Fukuda H & Chiba S (2018) Endangered freshwater limpets in Japan are actually alien invasive species. Conservation Genetics, 19: 947–958.

Walther AC, Burch JB & O'Foighil D (2010) Molecular phylogenetic revision of the freshwater limpet genus *Ferrissia* (Planorbidae: Ancylinae) in North America yields two species: *Ferrissia* (*Ferrissia*) *rivularis* and *Ferrissia* (*Kincaidilla*) *fragilis*. Malacologia, 53: 25–45.

Walther AC, Lee T, Burch JB & O'Foighil D (2006) Confirmation that the North American ancylid *Ferrissia fragilis* (Tryon, 1863) is a cryptic invader of European and East Asian freshwater ecosystems. Journal of Molluscan Studies, 72: 318–321.