

***Liardetia samoensis* (Mousson, 1865)**
(Stylommatophora: Microcystidae): another hothouse mollusc
new to Britain and the first record of this species outside Asia

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Abstract. Living populations of *Liardetia samoensis* have been observed over nine years in a hothouse in the Royal Horticultural Society Gardens at Wisley, England. The identification has been confirmed by COI mtDNA sequencing. This species was first discovered in the Pacific island of Samoa in 1861/62 and has subsequently only been reported from other Pacific islands, from Singapore, and from the Laccadive and Maldive Islands in the Indian Ocean. This is the first report of this species living outside Asia.

Key words. Hothouse alien, England, Wisley, DNA sequencing

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INTRODUCTION

An expedition in 1861/62 by the German merchant Heinrich Meyer visited the Samoan Islands in the Pacific Ocean. Among the members of the expedition was the naturalist Édouard Græffe who collected objects for the newly opened Godeffroy Museum in Hamburg. One of his particular interests was molluscs, which he collected during the 18 months he lived on Upolu, then the principal island of the Samoan archipelago. He sent his collections back to Hamburg, where they were analysed by Albert Mousson who, in 1865, published a catalogue of the molluscs found by Græffe, many of which had not previously been described (Mousson 1865).

The first mollusc in Mousson's catalogue is *Nanina samoensis*, a newly described species from Upolu. Although only found by Græffe on this one island, Mousson commented that, like some small European helicids, it might be found over a wide area, but "our knowledge is insufficient to draw conclusions. It seems to me for the time being it is better to limit its occurrence to each group of islands until more comparative studies are undertaken" (Mousson 1865: 166, translation).

In subsequent years of the nineteenth century this small snail has been found on numerous central and western Pacific islands: additional Samoan islands (as *Conulus samoensis*: Mousson 1869; as *Zonites samoensis*: Mousson 1871); Vanuatu (as *Helix ardua*: Cox 1870); Fiji (as *Zonites samoensis*: Mousson 1870; as *Nanina clayi* Liardet, 1876); Futuna (as *Zonites samoensis*: Mousson 1871); Tonga and Cook Islands (as *Zonites samoensis*: Mousson 1873); Marquesas Islands (as *Microcystis samoensis*: Garrett 1881, 1887). Gude (1913) created the genus *Liardetia* for three species from Fiji, *N. clayi* (type species), *N. samoensis*, and *Helix barkasi* Liardet, 1876. *Nanina clayi* is now considered a synonym of *L. samoensis*, with the result that *L. samoensis* is the type species of *Liardetia* (MolluscaBase 2024). We also follow MolluscaBase (2024) in treating *Liardetia* in the family Microcystidae. It was not until the start of the twentieth century that *L. samoensis* was found in the Indian Ocean when Edgar Smith (1902) discovered it (described as *Sitala vagata* E.A. Smith, 1902) on Minikoi Island, which lies between the Laccadive and Maldive archipelagoes, southwest of India. Blanford and Godwin-Austin (1908: 264) stated that "*Kaliella* [?] *vagata*" was "probably introduced, like other shells of those islands, from the Malabar coast."

But there are as yet no reports of its presence on mainland India.

Additional reports of the widespread presence of *Liardetia samoensis* on Pacific Islands continued (Baker 1938; Solem 1959, 1964, 1978; Cowie *et al.* 2002; Brook 2010; Brook *et al.* 2010) and also in Singapore (Hoong 1995). Gittenberger *et al.* (2019) reported *L. samoensis* from five Maldivian atolls and provided a detailed description of the shell and anatomy, together with a COI mtDNA sequence. To date no records have been found of *L. samoensis* living outside Asia (Fig. 1). Meanwhile, the other two *Liardetia* found on the Maldives by Gittenberger *et al.* (2019), *L. scandens* (Cox, 1871) and *L. doliolum* (L. Pfeiffer, 1846) (now reclassified as *Kaliella doliolum*), extend through South-east Asia to Australia (Stanisic *et al.* 2010).

There are many opportunities for confusion between the small and superficially similar snails of *Liardetia* and other “euconuloid” genera in the tropics, many of them currently treated in different families of the Trochomorphaidea (e.g. MolluscaBase 2024). As noted by Gittenberger *et al.* (2019), some authors have classified *Liardetia* with species of the Asian and African genus *Kaliella* W.T. Blanford, 1863. *Kaliella barrakporensis* (L. Pfeiffer, 1853) (Chronidae) has been reported from the Tropical Biome of the Eden Project in Cornwall (Preece & Naggs 2014), although has a substantially larger, conical shell with a distinctive keel. On the Mascarene Islands (Mauritius, Réunion & Rodrigues), Griffiths

& Florens (2006) have questioned the relationship between *Liardetia* and species of the genus *Louisia* Godwin-Austen, 1908 (Euconulidae), suggesting that the species known *Louisia duponti* may in fact be *Liardetia samoensis*. In Africa, *Afropunctum seminium* (Morelet, 1873) (Euconulidae) is very similar to *L. doliolum* (see Van Bruggen & de Winter 1992 for a detailed description). *Afropunctum seminium* has been reported across Africa and has been introduced to hot-houses in Europe, including Kew Gardens, Surrey (Reynolds 1993; Verdcourt 1993). A close similarity between the radula teeth of *A. seminium* (as figured by Van Bruggen & de Winter 1992) and that of *L. samoensis* (as figured by Gittenberger *et al.* 2019) is evident, but this may simply reflect generalities among small snails in the Trochomorphaidea. According to Stanisic *et al.* (2010, 2017), the Microcystidae are often ovoviviparous, whereas the Euconulidae are not; however, *A. seminium* is ovoviviparous also (Van Bruggen & de Winter 1992).

CURRENT STUDY

On 18 December 2014 one of the authors (TW) visited the Royal Horticultural Society Gardens at Wisley, Surrey, England (51.314, -0.478; OSGR TQ061583), as part of a survey of molluscs which may be found living in heated glasshouses in Britain and Ireland. A small euconulid-like

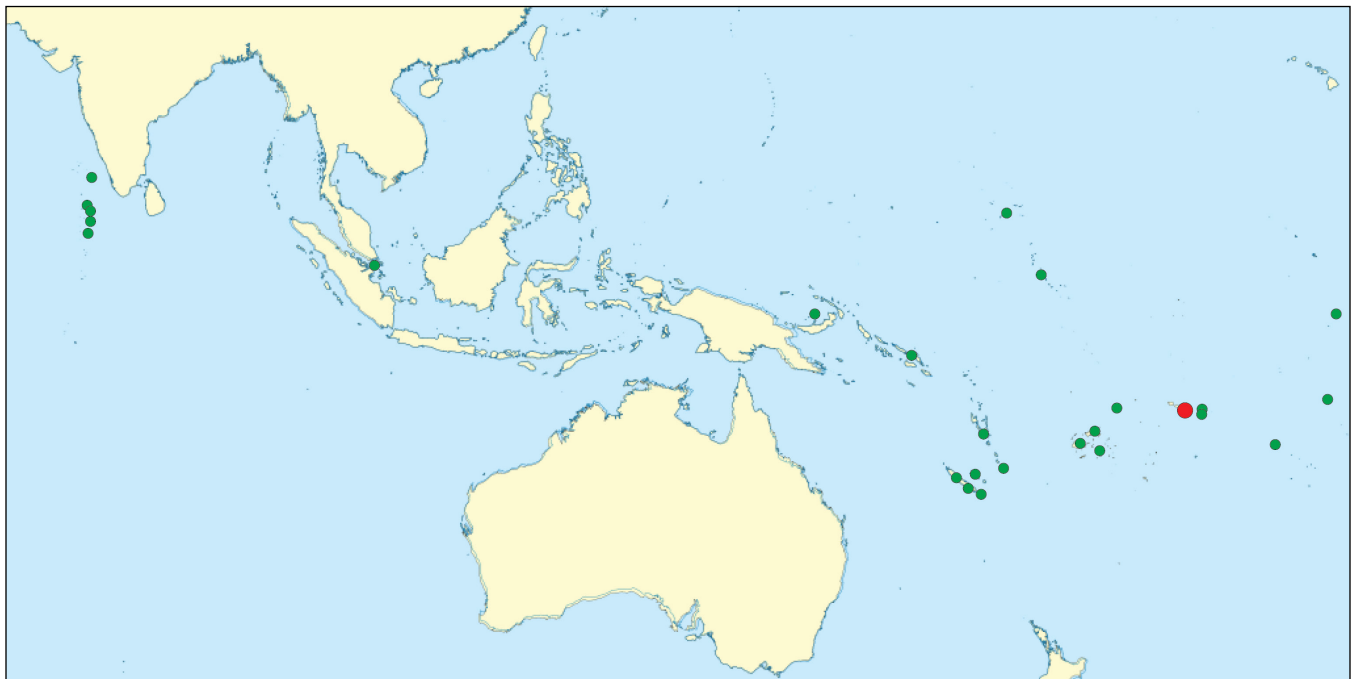


Figure 1. Locations of *Liardetia samoensis* in the literature. Red dot: Samoa, where this species was first described; green dots: other sites where the species has been reported.

snail was observed in the upper section of the Tropical Zone, grazing on damp areas of concrete walls (Fig. 2). Numerous specimens were present over about 10 m of wall. The fact that this was a breeding population was confirmed by several subsequent visits (April 2019, October 2022 and July 2023), at all of which many live specimens were found in the same area (Fig. 3). Furthermore, four live adults collected in September 2017 each contained three shelled embryos, which were visible through the shell of the body whorl.

In 2019 the species was found by the Conchological Society during a field meeting and was provisionally referred to as “*Afropunctum* cf. *seminium*” in the subsequent writeup (Cavadino 2020).

The identification of this shell was not obvious, and comparisons were made with other similar species previously reported in Britain. Initial considerations included *Kaliella barrakporensis* and *Afropunctum seminium*, but the Wisley material did not match either when compared with reference specimens in the collections at the National Museum of Wales, Cardiff (NMW) and the Natural History Museum, London. In early 2020 a COI mtDNA sequence from a Wisley animal (NMW.Z.2021.013.0017) was amplified by BR and compared to the BOLD database (Ratnasingham & Hebert 2007). It clustered unambiguously among sequences of *Liardetia scandens* from Sabah, Malaysian Borneo (no sequences of *L. samoensis* were then present in the BOLD database). This indicated that the genus *Liardetia* was a likely match. Historical specimens at NMW of *L. scandens* from New South Wales and Queensland, Australia; *L. samoensis* from Fiji; and *L. doliolum* from Malaku, Indonesia were all similar to the Wisley material, but none has quite as high a spire, and the choice between the three was inconclusive.

In August 2023 freshly collected specimens from Wisley were sent to Dr Edmund Gittenberger (Leiden University, the Netherlands) for his opinion. He and colleagues had recently reported on the terrestrial gastropods of the Maldives (Gittenberger *et al.* 2019), and those specimens were available for comparison. Together with scanning electron microscopy (SEM) he initially suggested that the Wisley snail might be *Liardetia scandens*, but with further review of the Maldivian material he became convinced that the Wisley shell more closely matched with *L. samoensis* (Fig. 4). A COI mtDNA sequence was amplified from a second Wisley individual by AG. This was done with the forward primer mICOintF (5' - GGWACWGGWTGAACWGTWTAYC CYCC - 3') developed by Leray *et al.* (2013) in combination with the newly developed reverse primer GiMaRIS_Gastr_R (5' - ACTTCDGGRTGDCCAAAAAYCA - 3'), using



Figure 2. The Wisley habitat (A) and living animal (B, C). Photos: T. Walker.



Figure 3. Shell of an individual from Wisley, 2017 (NMW.Z.2021.013.0218). Photos: B. Rowson.

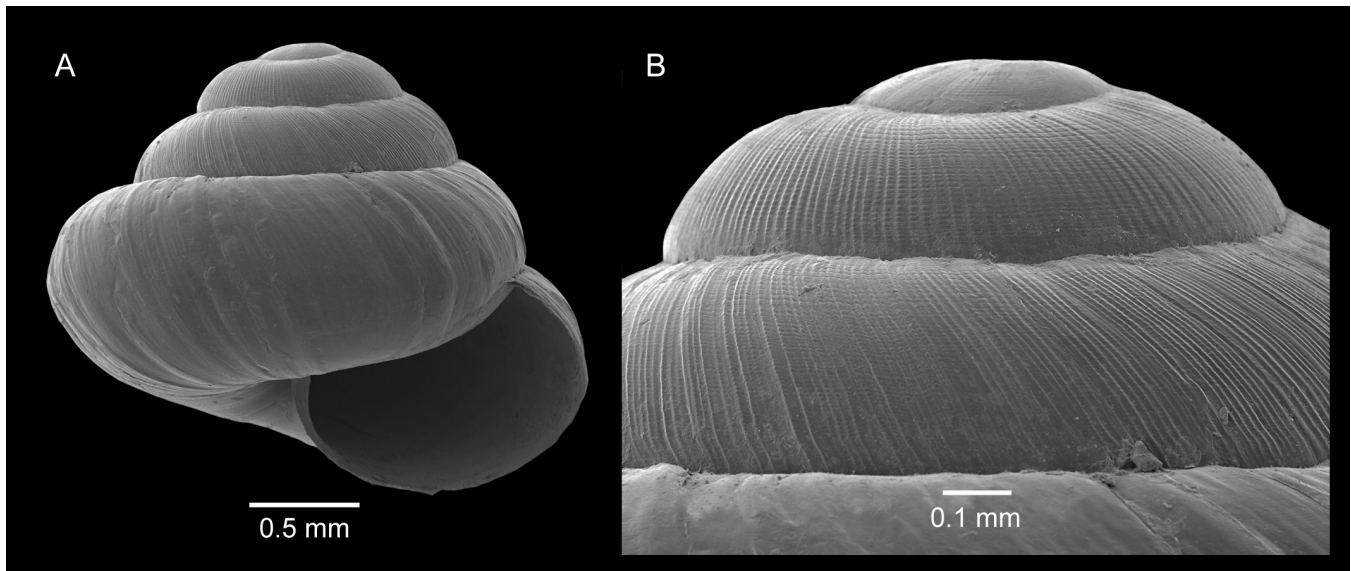


Figure 4. Scanning electron microscopy of a shell from Wisley, 2023. Photos: B.-L. van Heuven.

the following PCR program: Hold 95°/4 min; CT (55x): 95°/60"; 48°/60"; 72°/60"; Hold 72°/8 min. The resulting GenBank sequence, PP583003, matched 100% with GenBank sequence MH626432 of *L. samoensis* from the Maldives (Gittenberger *et al.* 2019). We therefore conclude that the Wisley material belongs to *L. samoensis*.

There are already reports of a *Liardetia* species being established at at least one other hothouse in Britain. Dave Guntrip (pers. comm.) collected a specimen from Whipsnade Zoo (51.845, -0.542; OSGR T1005176) on 5 May 2017 that was photographed by Peter Topley and then returned. This also appears to be a *Liardetia* species, if not *L. samoensis* then perhaps *L. scandens* judging by its fewer whorls and smoother surface. *Afropunctum seminium* is also said to be present in the hothouses at Whipsnade (D. Guntrip pers. comm.), as is the newly identified *Oxychilus translucidus* (Mortillet, 1853) (Guntrip & Rowson 2024).

DISCUSSION

The current glasshouse at Wisley was opened in June 2007, built to celebrate the bicentenary of the Royal Horticultural Society, and consists of several climatic zones with the Tropical Zone occupying nearly half of the glasshouse area. In the upper portion of this zone a path is lined on one side by a concrete wall which is continuously damp due to the high humidity maintained in the zone. The *Liardetia* snails are found in this area, both exposed on the algal covered surfaces and hidden in cracks of the concrete. A few are also present on the railings and plants across the path from the

wall. Observation of its presence over nine years, and the presence of embryos, establishes that this is a breeding population and not merely an adventitious introduction.

It is not possible to establish when this snail first arrived in the new glasshouse at Wisley. Much of the vegetation was transferred from the older glasshouses, but other plants were obtained both from other botanical gardens in Britain and from abroad to provide the very wide range of flora now present in the Tropical Zone, which is maintained at a minimum temperature of 20 °C with a relative humidity of about 70%. Whether *Liardetia* was living in the original glasshouses cannot be determined, but there are no records of its presence.

The habitat in which the *L. samoensis* is now living at Wisley is permanently damp with abundant algal growth, on which the snail presumably feeds. Environmental data from observations of Pacific island populations is limited, as few historical reports include this information. A habitat of lowland leaf litter or under dead logs or stones near the sea is mentioned by a few authors (Cox 1870; Garrett 1887; Hoong 1995; Brook 2010), and there is one mention of it occurring at an elevation of 500 feet in the New Hebrides (Solem 1962). It seems that the environment in which this species now thrives at Wisley is not typical of that of its natural oceanic sites.

This would appear to be the first record of a breeding population of *Liardetia samoensis* established outside Asia. Its most westerly reported occurrence is in the Maldivian Islands (Gittenberger *et al.* 2019). Indeed, notwithstanding the comments of Griffiths & Florens (2006) about *Louisia*

on the Mascarenes, this is the most westerly occurrence of any *Liardetia*. However, this is a very small-shelled snail, reaching a maximum diameter of only around 3 mm, and may be overlooked in appropriate habitats. There is also the difficulty of identification, as there are numerous very similar euconulid-like species from tropical regions, any one of which could conceivably be a candidate hothouse species. Appropriate warm and humid habitats to that at Wisley are present in many botanical gardens in temperate regions, and it would seem likely that this species is present elsewhere.

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