



ISSN 0301-4223 (Print)  
ISSN 1175-8821 (Online)



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To cite this article: K. Walton (2017) *Hygromia cinctella* (Draparnaud, 1801) (Mollusca: Gastropoda: Hygromiidae): a new adventive land snail for New Zealand, *New Zealand Journal of Zoology*, 44:1, 9-13, DOI: [10.1080/03014223.2016.1210653](https://doi.org/10.1080/03014223.2016.1210653)

To link to this article: <https://doi.org/10.1080/03014223.2016.1210653>



Published online: 28 Jul 2016.



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RESEARCH ARTICLE



# *Hygromia cinctella* (Draparnaud, 1801) (Mollusca: Gastropoda: Hygromiidae): a new adventive land snail for New Zealand

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## ABSTRACT

*Hygromia cinctella* is a medium-sized, pulmonate land snail native to the Mediterranean region and is undergoing rapid range expansion in Europe. Several living specimens were collected from an urban garden in the Wellington suburb of Brooklyn in 2015 and 2016, and constitute the first records of this species from New Zealand. Searches in surrounding suburbs have so far failed to find further snails. Eradication from Brooklyn may be viable but it seems likely that the species occurs elsewhere and the potential threat it poses to native species and agriculture, should it become established in New Zealand, appears low.

## ARTICLE HISTORY

Received 20 May 2016  
Accepted 27 June 2016

## KEYWORDS

Biosecurity; exotic;  
gastropod; invasive;  
non-indigenous; pest; snail

## Introduction

New Zealand has one of the richest indigenous terrestrial gastropod faunas, relative to land area, in the world (Solem 1984; Barker 1999, 2005; Overton et al. 2009), comprising between 900 and 1100 species (Solem 1984; Overton et al. 2009; Spencer et al. 2009). Human settlement has led to extensive land modification (Ewers et al. 2006), ongoing degradation of natural habitats (Norton & Miller 2000; Ewers et al. 2006) and the introduction of numerous adventive species (Barker 1999; Clout & Lowe 2000). Many adventives, including gastropod taxa (Barker 2002a; Reaser et al. 2007; Cowie et al. 2009), constitute a significant threat to native species, ecosystems and agriculture (Mack et al. 2000; Kolar & Lodge 2001; Hayden & Whyte 2003; Brockerhoff et al. 2010; Pyšek & Richardson 2010; Brown & Barratt 2015). Compared with vertebrates, the diversity, distribution and deleterious effects of exotic invertebrates are more seldom noticed or researched (Barker 1999; Brockerhoff et al. 2010; Stringer & Hitchmough 2012).

*Hygromia cinctella* (Draparnaud, 1801) is a medium-sized, herbivorous land snail native to the Mediterranean region and is rapidly expanding its range in Europe (Řihová & Juříčková 2011; Dedov et al. 2015). The species has also been detected by customs officials on numerous occasions between 1985 and 2009 in the USA, where it briefly established in 2004 and was purported to have displayed massing and clustering behaviours (Michalak & Price 2012). Such aggregations have not been recorded elsewhere, including the UK, where the species became established in 1950 (Kerney 1999) and where it can occur in fairly high densities (Jon Ablett, Natural History Museum, London, pers. comm. 2015).

Michalak and Price (2012) listed *Hygromia cinctella* as a potential pest to crops such as wheat and alfalfa hay, claims not supported by published literature or observations in the natural range of the species, although con-familial species are significant crop pests in Australia and further afield (Baker 2002). *Hygromia cinctella* is notably omitted from the review by Cowie et al. (2009) of species considered a risk to the USA.

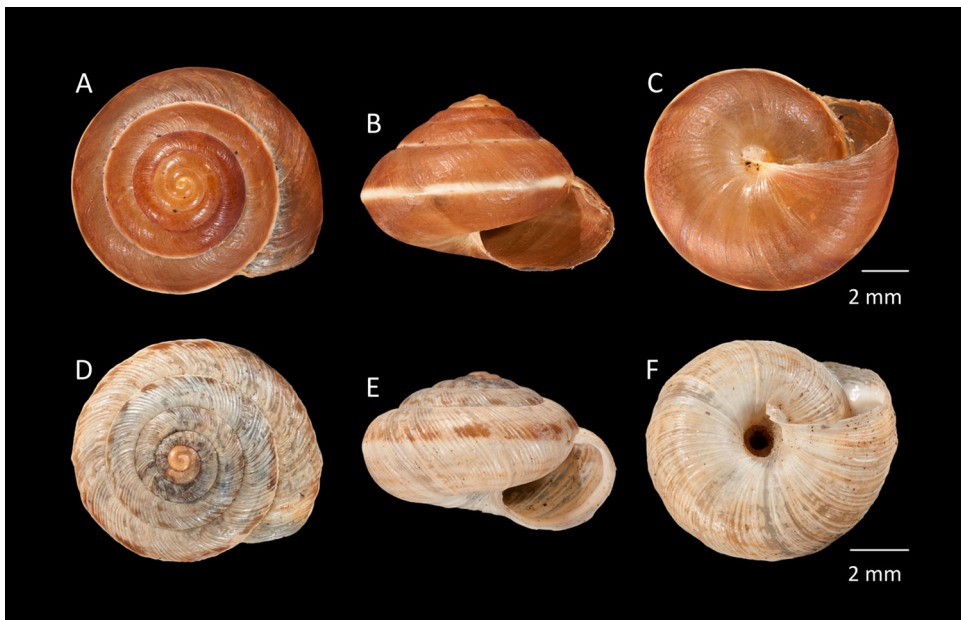
## Discovery

In the period between May 2015 and April 2016, 25 live *H. cinctella* and over 40 shells were collected from a 100 m strip of exotic herbs and shrubs at the end of Reuben Avenue in the Wellington suburb of Brooklyn (40°18.53'S, 174°45.63'E). The first specimens were discovered by the author crossing a concrete path at night during light rain. A shell was brought into the Museum of New Zealand Te Papa Tongarewa (NMNZ hereafter) and identified by malacologist Dr Bruce Marshall. Five shells, two with bodies in situ, the latter preserved in 98% ethanol, were subsequently deposited as voucher specimens at NMNZ (M.318161; Figure 1A–C).

Similar habitat elsewhere on Reuben Avenue and along adjoining Ohiro Road was searched but no further specimens were found. *Hygromia cinctella* is most active at night and in wet conditions although snails have been observed crawling during light rain in daylight. The species appears highly mobile and would be capable of moving several metres in a single night.

## Description

The shell of *H. cinctella* (Figure 1A–C) grows to about 12 mm and is roundly trochiform with up to six whorls with very fine commarginal riblets and a keeled periphery. The shell



**Figure 1.** A–C, Shell of *Hygromia cinctella* (Draparnaud, 1801), Reuben Avenue, Brooklyn, Wellington, M.318161, dorsal, side and ventral views, respectively. D–F, Shell of *Candidula intersecta* (Poirot, 1801), Eastbourne Beach dunes, Wellington, M.032022, dorsal, side and ventral views, respectively.

is thin and shades of fairly uniform light to chocolate brown, with a distinct lighter band encircling the periphery. The umbilicus is almost closed and the aperture simple, lacking a pronounced thickening in the immediate inner side of the rim of the aperture lip as in the common, widespread and con-familial introduced species *Candidula intersecta* (Poiret, 1801) (Figure 1D–F). The soft parts are mostly dark grey with irregular cream or light grey patches.

Several native species in the family Charopidae (such as *Serpho* spp.) have a similar shell profile although these have distinctive colour patterns and are unlikely to occur in the exotic or frequently disturbed scrub preferred by *H. cinctella*. Juvenile specimens of the common, introduced garden snail *Cornu aspersum* (Müller, 1774), which share a similar habitat, are more rotund, lack the sharply keeled periphery, have more lightly calcified shells, a less tightly coiled protoconch and different colour patterns.

## Discussion

Many snail-monitoring techniques familiar to New Zealand conservation workers involve searching quadrats by scratching through litter looking for snails. As *H. cinctella* is a moderately small and inconspicuous semi-arboreal species that frequently lives both within green foliage and under fallen wood, these methods may prove relatively ineffective. Aggressively shaking small introduced plants or beating them with a stick, then putting the resulting litter and adjacent loose top-soil through a sieve of about 5 mm mesh and finally searching the larger fraction for snails proved an effective means of determining presence or absence in Brooklyn.

*Hygromia cinctella* has a broad and expanding range in Europe that encompasses climatic conditions found throughout New Zealand and, although it appears vulnerable to frost (Davies 2010), it has survived both summer and winter conditions in Wellington. Adventive species often exhibit a lag-time before expanding their range or becoming a pest (Simberloff & Gibbons 2004; Didham et al. 2007). Several related species with similar ecologies, also of European origin, such as *Candidula intersecta* and *Cochlicella barbara* (Linnaeus, 1758), have become abundant and widespread in New Zealand since their introduction in the mid-to-late 1800s (Barker 1999). None of these species appear to be predated to any significant extent in New Zealand.

The most likely vector for *H. cinctella* dispersal is via soil containing its eggs, perhaps involving potted plants, or attachment to agricultural or road maintenance machinery. The species also frequently lives on or under timber and building supplies (Říhová & Juříčková 2011). Eradication from Reuben Avenue seems plausible given the relatively confined locality. Use of an indiscriminate molluscicide in the urban gardens of Reuben Avenue is unlikely to be an issue as rare or range-restricted native snails are not present there. Winter would be the best time for an eradication programme as the snails appear less active, perhaps aestivating, during warmer months. It seems possible, however, that the Reuben Avenue population is not unique in New Zealand. Brooklyn is a suburb far from the Port of Wellington, Wellington Airport or any nursery or agricultural centre, and seems an unlikely entry point to New Zealand. Accordingly, it seems probable that there is another source population in the Wellington region. Although the species has not yet been recorded elsewhere, very few people in New Zealand would recognize it or its significance.

Few native snails inhabit exotic scrub- and grass-land (Barker 2002b) and similarly, adventive species seldom pervade far into undisturbed habitats (Fine 2002; Levine et al. 2004). Given the species' preference for disturbed habitat and exotic vegetation (Říhová & Juříčková 2011; Dedov et al. 2015), it appears unlikely that *H. cinctella* will pose a significant threat to native species, either directly or through competition. Should *H. cinctella* become established and eradication efforts not be implemented or fail, the species may well spread to exotic gardens and scrub-land through much of the North Island and northern parts of the South Island. It is impossible to say if there will be any negative effects, but it seems likely that *H. cinctella* will prove to be neither a crop pest nor a significant threat to native snails or fauna.

## Acknowledgements

Many thanks to Bruce Marshall at the Museum of New Zealand Te Papa Tongarewa for his comments on the manuscript and identification of *Hygromia cinctella*. Thanks also to Jean-Claude Stahl for his photographic expertise and providing the images. Jon Ablett of the Natural History Museum, London, provided much appreciated comments on the prevalence of the species in the UK.

Associate Editor: Dr Jonathan Banks.

## Disclosure statement

No potential conflict of interest was reported by the author.

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