
Camaena platyodon (L. Pfeiffer, 1846), a nursery-reported first record in Hawai‘i¹

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Early detection and rapid response are critical for preventing the establishment of newly introduced species in the Hawaiian Islands. Success in these efforts depends on a collaborative network that includes taxonomic experts, resource managers, and community partners; those most likely to first encounter novel species. Among the most vital actors in this system are personnel at quarantine and inspection stations at ports of entry, as well as professionals in the plant and horticultural trade, including nursery staff (Hayes *et al.* 2023).

For nearly two decades, our team has worked closely with these partners to maintain an up-to-date inventory of non-native land snails in Hawai‘i and to build a trained network of early detectors capable of recognizing and reporting new incursions. Here, we report the first detection of *Camaena* (*Camaenella*) *platyodon* (L. Pfeiffer, 1846) in the Hawaiian Islands, based on a specimen collected at a commercial plant nursery on Kaua‘i.

Camaenidae

***Camaena platyodon* (L. Pfeiffer, 1846)**

Potential New State Record and New National Record

Although Pfeiffer (1846) indicated the type locality was unknown in his original description of “*Helix platyodon*”, subsequent authors have indicated that the native range of *Camaena* (*Camaenella*) *platyodon* is in southeast China (Qian & Zhou 2014). Despite its popularity in the international pet trade, especially via online platforms such as LAND-SNAILS.org and the PETFACTORY.de, there are no published records of this species being established outside of China. Hu *et al.* (2019) claim that this species can “*destroy crops seriously, spread zoonotic foodborne parasitic disease, and cause substantial damage to human and animal health*” (p. 2753). However, of the two sources cited to support this assertion (Butcher & Grove 2005; Qian & Zhou 2014), only Qian & Zhou (2014), an illustrated checklist of Chinese snails, actually addresses this species, but it does not substantiate the specific claims made by Hu *et al.* (2019).

1. Contribution no. 2026-002 to the Hawaii Biological Survey.

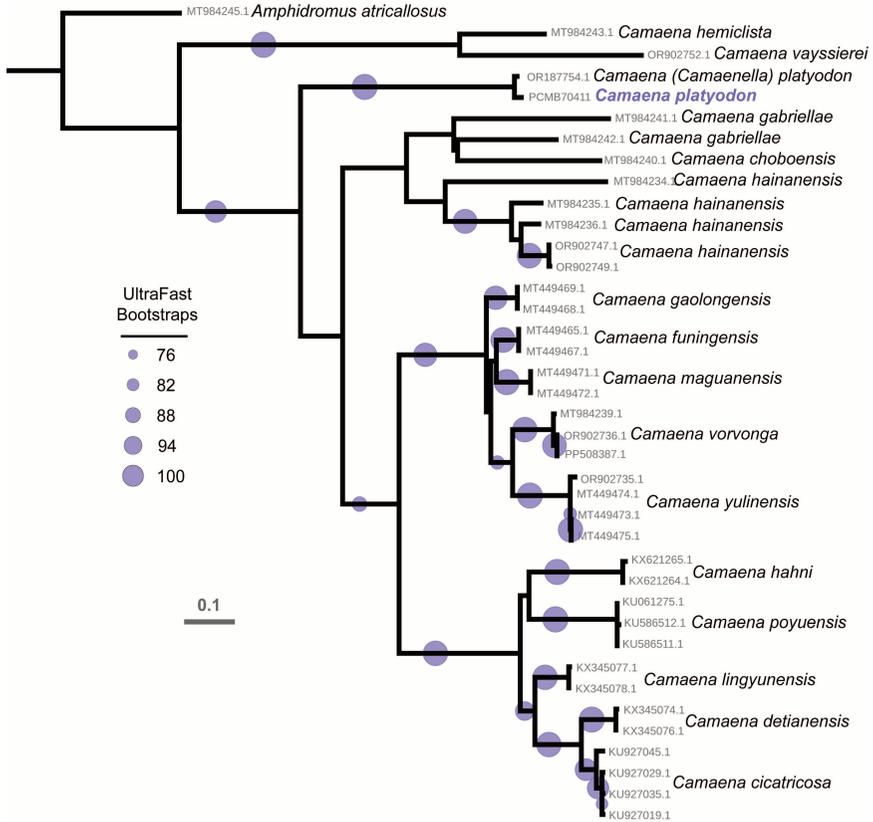


Figure 1. Maximum likelihood phylogeny of *Camaena* species based on mitochondrial cytochrome oxidase subunit I (COI) sequences, reconstructed in IQ-TREE. Node support values are indicated by blue circles representing Ultra-Fast bootstrap values ($n = 20,000$ replicates), with circle size proportional to support (see legend). The sequence from the Kaua'i specimen of *Camaena platyodon* (blue font) clusters closest to a GenBank sequence identified as *C. platyodon*, which is recovered as sister to a clade of East Asian *Camaena*, including *C. gabriellae*, *C. hemiclista*, and *C. vayssierei*.

While it is true that many land snails are known vectors of disease or cause ecological damage, there is currently little to no evidence that *C. platyodon* poses a threat beyond that of other non-native land snails, which may still be considerable (Cowie 2000; Preston *et al.* 2022). Nevertheless, its detection warrants attention due to its non-native status and potential to establish and spread into sensitive habitats in Hawai'i.

On 23 May 2024, co-author MF, who works as succulent propagator and orchid expert with the nursery, noticed an unfamiliar snail under a table and reported. This nursery had previously participated in our training program, which provides best practices for sanitation and early identification of non-native gastropods. Because of this training, the

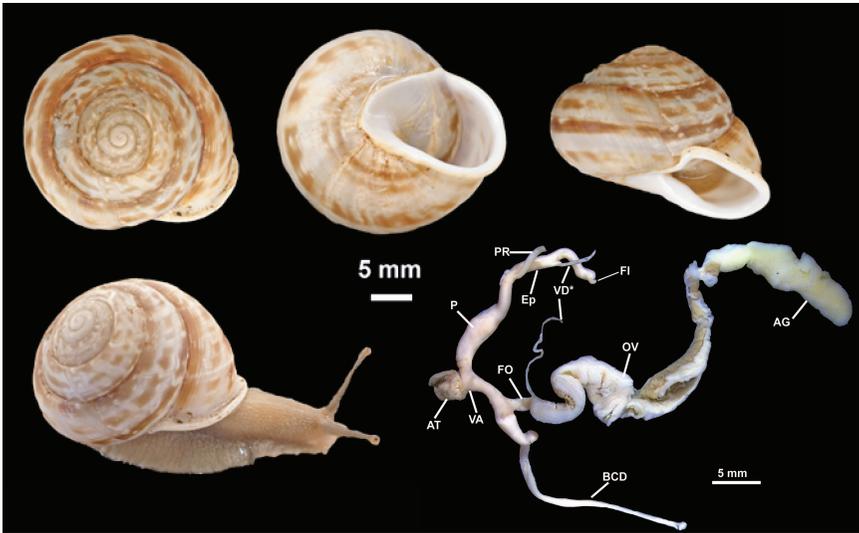


Figure 2. Shell, live animal, and reproductive anatomy of *Camaena platyodon* (L. Pfeiffer, 1846). Top row: Shell in apical, basal, and lateral views. Bottom left: Live animal in lateral view. Bottom right: Reproductive system dissected and spread to show major structures. Abbreviations: AG = albumen gland; AT = atrium; BCD = bursa copulatrix duct (bursa copulatrix bulb lost during extraction); Ep = epiphallus; FI = flagellum; FO = free oviduct; OV = oviduct; P = penis; PR = penial retractor muscle; VA = vagina; VD = vas deferens (*segment broken and displaced from epiphallus).

nursery staff recognized the specimen as unusual and immediately contacted our team for identification and guidance.

Two of the authors (SHS and MMYH) traveled to Kaua‘i on May 24, 2024, to survey the nursery for additional specimens. Despite a thorough search, no other individuals were found. The single adult specimen was collected and returned to the Bishop Museum for examination and vouchering.

This single specimen was dissected by KAH to examine reproductive anatomy, and a piece of foot tissue was used for DNA extraction and for subsequent sequencing of a portion of the mitochondrial cytochrome *c* oxidase subunit I (COI) gene. An NCBI BLASTn (<https://blast.ncbi.nlm.nih.gov>) search using the COI sequence returned a match of 98.53% (accession number OR187754.1) with the COI sequence from the whole mitochondrial genome of a specimen identified as *Camaenella platyodon* GenBank. The next closest match at 85.78% was from a different camaenid specimen identified as *Neocepolis* sp. (PP145291.1). The *Camaena* phylogeny was reconstructed using this newly developed COI sequence and others available on GenBank. Maximum likelihood analysis was implemented in IQ-Tree with a best fit partition model and support estimated with 20,000 Ultra-Fast Bootstrap replicates. The Kaua‘i specimen clustered with the other *C. platyodon* from GenBank in a clade sister to other congenics from S.E. Asia (Fig. 1).

The shell of the specimen collected on Kaua'i is a close match to those identified as *Camaena platyodon* (Fig. 2). It is dextral, moderately elevated, helicoid, and has a rounded body whorl lacking strong peripheral angulation and approximately 5.5 whorls. Adult shells of this species range from approximately 35–45 mm in diameter and exhibit 5½ to 6 whorls, with the final whorl expanding rapidly and descending anteriorly. The shell surface is smooth to weakly striate, lacking periostracal hairs or sculpture, and is typically corneous to pale brown in coloration with irregular broken brown bands in most individuals. The aperture is large, obliquely lunate, and reflected at the margins, often with a thick parietal callous and bluntly thickened lip internally. The umbilicus is normally closed but this feature can vary with age and degree of maturity from narrowly open to closed.

Compared to other confamilials with which it might be confused, such as *Camaena cicatricosa* (O.F. Müller, 1774) it can be distinguished by having a dextral shell with a moderately elevated spire and a more evenly rounded, non-angulate body whorl that lacks sculpture (Fig. 2). Its shell lacks the more angulate or sub-angulate periphery seen in the sinistrally shelled *C. cicatricosa*, which generally exhibits a slightly more depressed, globose shell, with some exhibiting malleations or broader spiral coloration (Ding *et al.* 2016). The peristome in *C. platyodon* is also thickened and slightly reflected, and the umbilicus closed. *Camaena cicatricosa* often has a thickened and expanded lip in mature specimens, with a more open umbilicus (Ding *et al.* 2016). The combination of a dextral and moderately elevated spire, smooth rounded whorls, and closed umbilicus helps distinguish *C. platyodon* from similar congeners. These characters, along with soft body morphology and the sequence data help positively identify this species.

Although specific anatomical data for *Camaena platyodon* was not previously known, its reproductive anatomy is similar to other *Camaena* (Wang *et al.* 2020; Chen *et al.* 2024) including the type species *Camaena cicatricosa*. Like all stylommatophoran gastropods, *C. platyodon* is hermaphroditic, possessing both male and female reproductive systems. The male complex is similar to known species of *Camaena* and includes a penis with an epiphallus that inserts apically. The penial retractor muscle attaches near the mid-point of the epiphallus. A flagellum that terminates in thorn shaped tip, branches from the epiphallus above the insertion of the vas deferens. The atrium at the junction of the male and female systems is short. The female portion of the reproductive system is typical of many Stylommatophora. The vagina branches with a broad bursa copulatrix duct that narrows slowly leading to a bursa copulatrix bulb (digestive sperm storage; lost in extraction), and a short free oviduct and much longer oviduct and long albumen gland. In summary, even without species-specific dissection for comparison, *C. platyodon* exhibits a reproductive system similar to other *Camaena* species. (Fig. 2)

All collected material is deposited in the Bishop Museum (BPBM) Malacology Collection and tissue and genomic resources from each in the Pacific Center for Molecular Biodiversity (PCMB). Numbers provided include BPBM Malacology Collection numbers and PCMB numbers.

Material examined. **Kaua'i:** 1, Kaua'i Seascapes Nursery, 22.204386, -159.427309, coll. 23 May 2024, M. Funk, hand collected (BPBM 297765; MAL026270 PCMB70411)

ACKNOWLEDGEMENTS

We thank John Slapcinsky for discussing the anatomy of this specimen and helping refine the descriptive language. We also thank Carl Christensen and David Sischo for their helpful comments that improved the manuscript. Support for this work was provided in part by grants from the US Fish and Wildlife Service (F20AC11607) to KAH and NWY, US Department of Agriculture (PPA721) to NWY and KAH, and the National Science Foundation awards (DEB-2301564, DBI 1902328) to NWY and KAH. We are indebted for the support and access to lands by the many state agencies and conservation organizations and their staff across Hawai‘i who continue to work towards a better and more sustainable future for Hawai‘i and its natural resources.

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<https://doi.org/10.3897/zookeys.996.54187>