The land snails of the island of Lehua, Hawaiian Islands

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The crescent shaped island of Lehua (1.1 km^2) lies just over 1 km north of the northernmost point of Ni'ihau. It is a tuff-cone crater that formed during a volcanic rejuvenation period that followed the formation of the 5-My old Ni'ihau shield volcano. Its highest point (N22°01'90.2", W160°09'80.9") is 213 m. The climate is extremely dry. Vegetation is sparse and dominated by nonnative grasses, herbs and shrubs (Wood & LeGrande 2006).

The land snail fauna of Lehua has never been reported and there were until now no collections at the Bishop Museum. Not surprisingly, given the small size of Lehua, which probably limits the possibility of evolutionary radiation, none of the species here recorded is endemic to the island. In fact, three of the four species are widespread across the Hawaiian Islands (*Lamellidea gracilis*, *Tornatellides procerulus*, *Succinea caduca*), while the fourth (*Lyropupa perlonga*) is represented by the nominotypical subspecies on O'ahu and the present subspecies on Kaua'i and Ni'ihau (Cowie *et al*. 1995). However, with the exception of *L. gracilis*, which is also known from Wake (Cowie *et al*. 1995), all are endemic to the Hawaiian Islands.

Collections were made by the authors on 12 September 2007 by collecting leaf litter and surface soil from a dry gulch on the south side of the island and sifting material back at the camp. The site was 200 m east of Lehua Camp, 15 m elevation, and the vegetation was dominated by nonnative species including *Cenchrus ciliaris*, *C. echinatus*, *Setaria verticillata*, *Ageratum conyzoides*, *Chenopodium murale*, *Portulaca oleracea*, *Pluchea indica*, *P. carolinensis* and *P.* x *fosbergii.* Nearby native plant species included *Jacquemontia ovalifolia*, *Waltheria indica* and *Cyperus javanicus*. Snail identifications were made by comparison with type and other material in the Bishop Museum (BPBM) Malacology collection, where all the collected material is deposited. Catalog numbers are BPBM Malacology Collection numbers. Latitude and longitude coordinates were recorded by GPS using the WGS 84 map datum.

Achatinellidae

Lamellidea gracilis (Pease) **New island record**

This species was described by Pease (1871) from Kaua'i (no further details). It has since been recorded from all the other main Hawaiian Islands (Ni'ihau, O'ahu, Moloka'i, Lāna'i, Maui and Hawai'i), from the Northwestern Hawaiian Islands of Kure, Laysan, Lisianski and Nihoa, and from Wake (Cowie *et al*. 1995).

Material examined: **LEHUA**: leaf litter and surface soil in dry gulch, (N22°01'55.1", W160°09'54.9"), R.H. Cowie, K.R. Wood, 12 Sep 2007 (271961, 3 dead shells).

Tornatellides procerulus (Ancey) **New island record**

Ancey (1904) described this species from Maui. Cowie *et al*. (1995) listed it in addition

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from Ni‘ihau, Kaua‘i, O‘ahu, Moloka‘i, Lāna‘i and Hawai‘i.

Material examined: **LEHUA**: leaf litter and surface soil in dry gulch, (N22°01'55.1", W160°09'54.9"), R.H. Cowie, K.R. Wood, 12 Sep 2007 (271962, 5 dead shells).

Succineidae

Succinea caduca Mighels **New island record**

Described from O‘ahu (Mighels 1845), *Succinea caduca* was also listed from Moloka‘i and Lāna‘i by Cowie *et al*. (1995) and subsequently from Kaua‘i, Maui and Hawai‘i by Holland & Cowie (2007, 2008).

Material examined: **LEHUA**: leaf litter and surface soil in dry gulch, (N22°01'55.1", W160°09'54.9"), R.H. Cowie, K.R. Wood, 12 Sep 2007 (271963, 1 dead shell).

Pupillidae

Lyropupa* (*Mirapupa*) *perlonga filocostata (Cooke & Pilsbry) **New island record**

The nominotypical subspecies was described by Pease (1871) from O‘ahu. The present subspecies was described from Limahuli on Kaua‘i by Cooke & Pilsbry in Pilsbry & Cooke (1920). Cowie *et al*. (1995) also listed it from Ni‘ihau (misspelled as “*filicostata*”).

Material examined: **LEHUA**: leaf litter and surface soil in dry gulch, (N22°01'55.1", W160°09'54.9"), R.H. Cowie, K.R. Wood, 12 Sep 2007 (271964, 2 dead shells).

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The hermit crab *Calcinus isabellae* Poupin (Crustacea: Decapoda: Anomura: Diogenidae), a new record for the Hawaiian Archipelago, including a review of the genus *Calcinus* Dana in Hawai'i

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The diogenid hermit crabs of the genus *Calcinus* are widespread in tropical and subtropical areas. They are common in littoral zones and shallow coral reef habitats, and can be facultatively associated with some corals (*e.g.*, *Pocillopora* & *Acropora*). Forty-two species are now identified, most of which were described during the last 20 years from the Indo-West Pacific (Haig & McLaughlin, 1984; Wooster, 1984; Morgan, 1991; Gherardi & McLaughlin, 1994; Poupin, 1997; Poupin & McLaughlin, 1998; Asakura & Tachikawa, 2000). This increasing number of species is a result of a better attention paid to color patterns of live and recently preserved specimens. The rapid loss of coloration in preservatives does not allow this characteristic to be used when examining museum material.

A comprehensive examination of the genus *Calcinus* from the main Hawaiian Islands was published by Haig & McLaughlin (1984). This taxonomic treatment of these shallow water hermit crabs provided the description of two new species. One of these new species was *Calcinus hazletti*, which was only known from Hawaii at that time. This species has subsequently been described from the Ogasawara (Bonin) Islands of Japan (Asakura & Tachikawa, 2003). The other *Calcinus* species described was *Calcinus laurentae*, which remains classified as an endemic to the Hawaiian Archipelago. Haig & McLaughlin (1984) recorded another seven species: [*Calcinus laevimanus* Randall, *Calcinus seurati* Forest, *Calcinus gaimardii* (Milne Edwards), *Calcinus elegans* (Milne Edwards), *Calcinus latens* Randall, *Calcinus haigae* Wooster and *Calcinus guamensis* Wooster]. Additionally, *Calcinus argus* Wooster is also present in the Hawaiian Archipelago and was recorded by Titgen (1987).

Unpublished reports have mentioned two new records of *Calcinus* from the Hawaiian Archipelago, *Calcinus isabellae* Poupin and *Calcinus revi* Poupin & McLaughlin. The presence of *C. revi* is tentative but the presence of *C. isabellae* has now been verified from material collected from the Main Hawaiian Islands and the Northwestern Hawaiian Islands.