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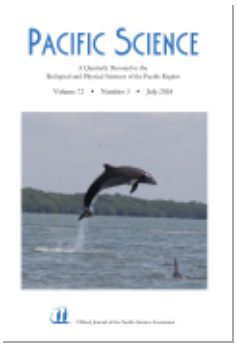

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Rediscovery of *Pacificella variabilis* (Gastropoda: Achatinellidae) on Easter Island[1]

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Abstract: The achatinellid *Pacificella variabilis* Odhner, 1922, is reported for the first time since its original description from its type locality, Easter Island (Rapa Nui), South Pacific Ocean, Chile. Specimens were found living on the bark of a lemon tree in Hanga Roa town and among the endemic grass *Paspalum forsterianum* on Motu Nui Islet. A redescription of the shell based on scanning electron microscopy (SEM) is provided. This represents the first report of the habitat of the species on Easter Island.

Keywords: Rapa Nui, redescription, type locality, Polynesia, scanning electron microscopy, snail

Easter Island or Rapa Nui, the easternmost Polynesian island, has a notoriously depauperate terrestrial mollusk fauna, represented by only nine land snail species, all of them nonindigenous taxa (Naranjo-Garcia and Appleton 1998, Boyko and Cordeiro 2001, Araya 2015). A single documented land snail species belonging to a monotypic genus is considered endemic: the extinct *Hotumatua anakenana* Kirch, Christensen & Steadman, 2009. There is also evidence of several fossil land snail species present in the island, which remain undescribed (Kirch et al. 2009). Among the land snails described for Rapa Nui, *Pacificella variabilis* Odhner, 1922, was originally considered native to the island (Odhner 1922). However, further records of identical shells coming from several Pacific localities led Pilsbry and Cooke (1933) to determine that *P. variabilis* may not be native to outlying Polynesian islands such as Palmyra or Easter Island. A subsequent work by Cooke and Kondo (1961) presented several new records for *P. variabilis* and a rather extensive distribution for the species, including several islands of the Pacific. *Pacificella variabilis* is now recognized as the achatinellid species with the largest known distribution. Although this species has been listed in several inventories of the fauna of Rapa Nui (Cooke and Kondo 1960, Boyko and Cordeiro 2001, Kirch et al. 2009), it has not been found in field collections in the island since its original description by Odhner (1922). As part of ongoing studies reviewing Chilean terrestrial mollusks (Miquel and Araya 2013, 2015, Araya and Aliaga 2015), here we present the rediscovery of *P. variabilis* on Easter Island and a new record for the species on Motu Nui Islet; a detailed description by scanning

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electron microscopy (SEM) of shells of the type locality is provided.

MATERIALS AND METHODS

Specimens of *P. variabilis* were collected from the bark of a dead lemon tree from the town of Hanga Roa (32 specimens; August 2016) and by sweeping, with an entomological net, the endemic grass *Paspalum forsterianum* at Motu Nui Islet (two specimens; August 2012) (Figure 1). The search time on this last locality corresponded to approximately 2 hr. Voucher specimens from Hanga Roa were deposited at the Museo Nacional de Historia Natural (MNHNCL 203428) in Santiago, Chile. Shell measurements were made using a dissecting microscope with up to 100× magnification, and the microscopic structures were measured and examined from scanning electron microscope (SEM) images.

RESULTS

Systematics

Order STYLOMMATOPHORA Schmidt, 1855
Superfamily PUPILLOIDEA Turton, 1831
Family ACHATINELLIDAE Gulick, 1873
Genus *Pacificella* Odhner, 1922
Type species: *Pacificella variabilis* Odhner, 1922, by original designation

Pacificella variabilis Odhner, 1922
Figure 2*A–F*

Pacificella variabilis Odhner, 1922:249, pl. 8, figs. 15–17; Klemmer and Zizka, 1993:24; Preece, 1998:357, figs. 9*n*, *o*, *p*, *q*, 10*c;* Boyko and Cordeiro, 2001:18; Brook, 2010:184; Christensen and Weisler, 2013:88; Kerr and Bauman, 2013:32; Araya, 2015:1739.

Tornatellina (*Tornatellinops*) *impressa normalis* Pilsbry & Cooke, 1915:175 (in part, specimens from Palmyra Island only).

Lamellidea (*Tornatellinops*) *variabilis* Pilsbry and Cooke, 1933:60; Cooke, 1934:9.

Tornatellinops variabilis Cooke and Kondo, 1960:172, fig. 76*a–b;* figs. 77, 78 (distribution maps); Pilsbry and Cooke, 1933:60; Preece, 1995:286, fig. 5*H–J;* Bauman, 1996:19, fig 26.

DIAGNOSIS: A species with a minute (height up to 4 mm) elongated corneous thin shell, sculptured by fine growth lines. The shell is most characterized by the spiral sculpture on the protoconch in juvenile specimens, the strong and sharp parietal lamella, strongly twisted columella, and the small aperture.

DESCRIPTION: Shell solid, of very small size (height up to 4 mm), elongated-ovate; around 1.9 times as long as wide, imperforate. Surface shining, corneous; sculptured by faint prosocline growth lines. Spire tapering to a blunt apex. Protoconch sculptured with very fine prosocline growth lines, almost smooth in adult specimens; in juvenile specimens these axial growth lines are crossed by many fine and regular spiral striae. Protoconch-teleoconch boundary not defined; the teleoconch sculptured only with fine growth lines. Four and a half to five moderately convex whorls; last whorl convex and slightly subcylindrical, compressed below, about 0.66–0.68 of total height. Sutures impressed. Aperture relatively small (aperture height about 0.44 height), narrow ovate (about 1.50–1.54 times as long as wide), slightly oblique and prosocline (about 27° with columellar axis). Columellar margin convex, short, twisted, dilated above, with a columellar fold in its lower part (absent in adult stage) that merges with the lower lip. A strong and sharp parietal lamella, which folds downward, enters about 1/3 of a whorl inwardly; this lamella is more strongly developed in juvenile specimens. Palatal wall without visible teeth in adults. Peristome not continuous. Outer lip sharp, simple.

DISTRIBUTION: The type locality of *P. variabilis* is Easter Island, Chile (Odhner 1922), but this species is known from at least 67 islands in the Southwest Pacific Ocean (Cooke and Kondo 1960), with a wide geographical distribution from Truk, in the Carolines group (Preece 1995), to the Mariana Islands (Bauman 1996) and Easter Island (Boyko and Cordeiro 2001). The extensive range of this species seems to be related to

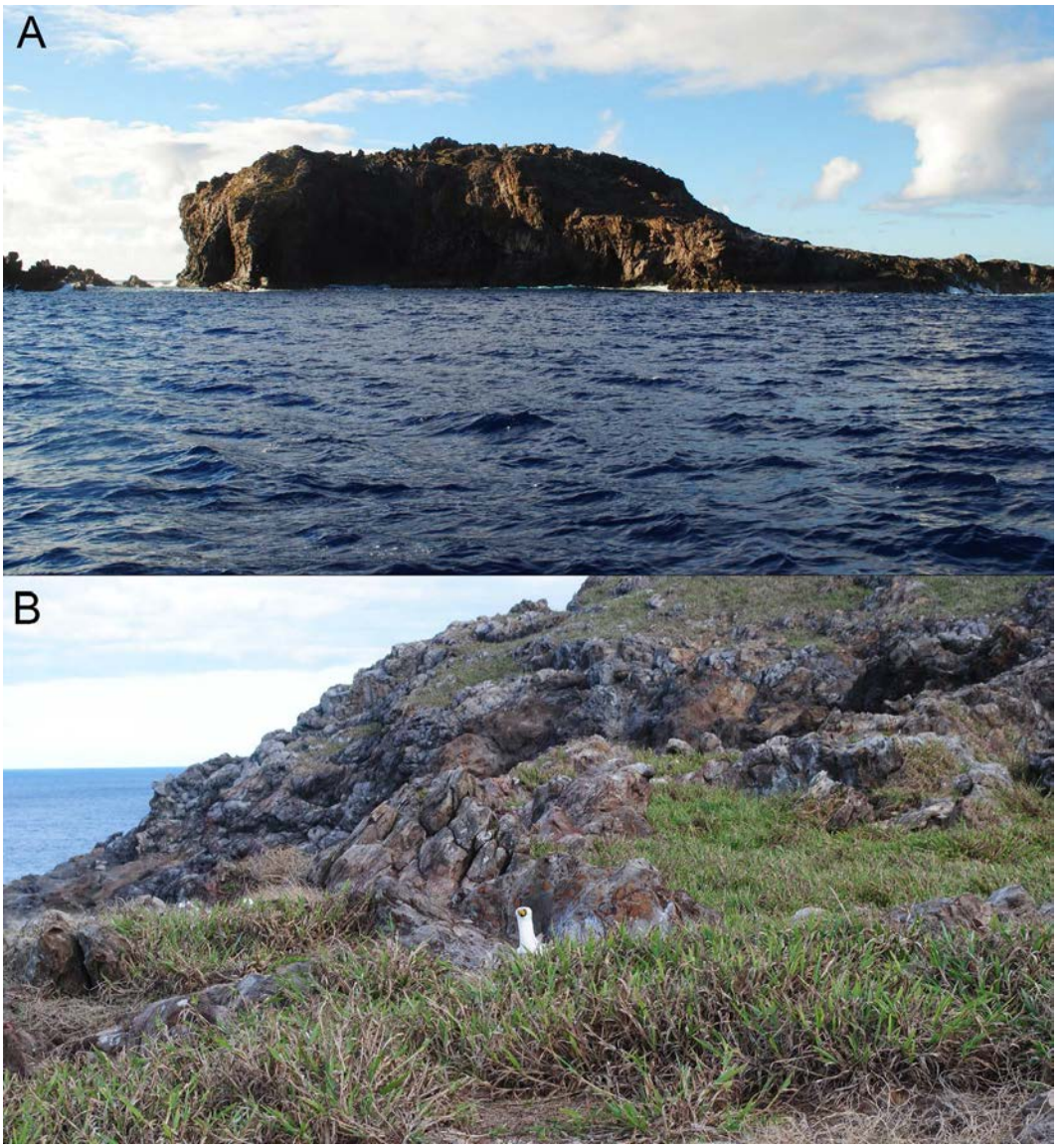

FIGURE 1. Motu Nui Islet, Easter Island: (*A*) general view, (*B*) the islet is covered with the endemic grass *Paspalum forsterianum* and is also a nesting site for several species of seabirds, one of which, a Manu kena (*Sula dactylatra*), is shown.

synanthropic (anthropochoric) dispersal by native Pacific islanders before European exploration of the Pacific (Cooke and Kondo 1960, Boyko and Cordeiro 2001); however, there are Pleistocene records of this species (before human colonization) at Henderson Island in the Pitcairn group, where it may be native (Preece 1995).

HABITAT: Although the original description of this species from Easter Island did not

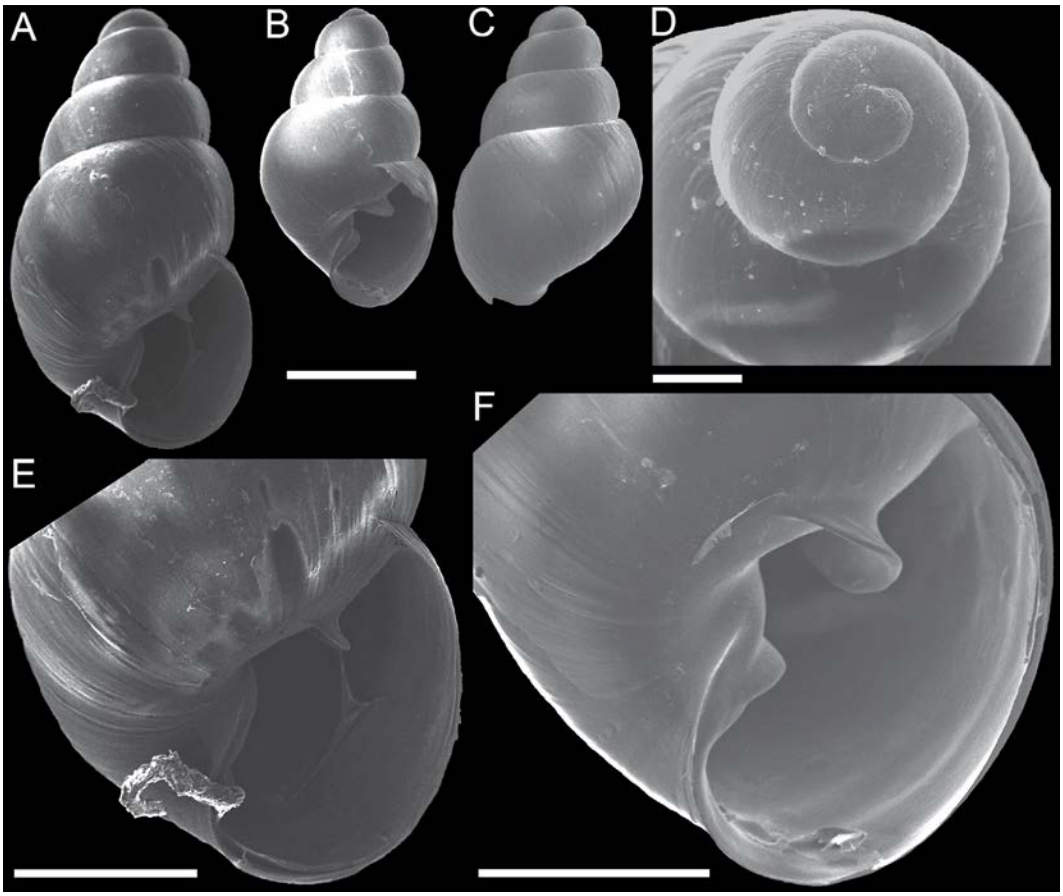

FIGURE 2. SEM images of *Pacificella variabilis* Odhner, 1922: (*A*) adult shell, apertural view; (*B*) juvenile shell, apertural view; (*C*) juvenile shell, abapertural view; (*D*) detail of protoconch of juvenile specimen; (*E*) detail of aperture of adult specimen; (*F*) detail of aperture of juvenile specimen. Scale bars: *A–C*, 1 mm; *D*, 200 μm; *E–F*, 1 mm.

document a habitat for the species (Odhner 1922), other studies have found it alive on the leaves of *Cordyline fruticosa*, in moss, and on the fern *Asplenium nidus* in Makatea in the Tuamotu archipelago in French Polynesia (Cooke 1934); on the foliage, trunks, and branches of shrubs and trees in Tonga (Atherton et al. 2015); and on the undersides of tree leaves on Rota (Bauman 1996). According to Preece (1998) *P. variabilis* is a climbing species and occurs abundantly on leaves of ferns and other plants, particularly in coastal areas. Brook (2010) also included highly modified, open, anthropogenic habitats among the ecological settings in which this species has been found. All these descriptions coincide with the habitats where the specimens reported here were collected in Hanga Roa and Motu Nui (Figure 1).

DISCUSSION

The finding reported here represents the first documented observation of *Pacificella variabilis* in its natural habitat on Easter Island and the Motu Nui Islet. Overall, shell characteristics and morphometry of the specimens reported here appear similar to those of previously described specimens, with the exception of some specimens from Henderson Island,

where a form of this species with two strong palatal folds has been found (Preece 1998: figs. 9*p*, *q*, and 10*c*). Boyko and Cordeiro (2001), in the first review of land snails from Rapa Nui, listed this species on the island, but they were not able to find specimens of *P. variabilis* in their field collection (1999); they examined only specimens of *P. variabilis* collected by K. Bäckstrom at Easter Island in 1917, which were the ones used by Odhner (1922) for the original description of the species.

The biodiversity of Rapa Nui has been strongly affected by human activities (Fischer 2005), causing extinction in different groups (Wynne et al. 2014). Also due to its remoteness, it has received relatively little attention in terms of documentation of its terrestrial biodiversity. It is only in the last few years that there has been a series of publications describing new species (Mockford and Wynne 2013, Taiti and Wynne 2015) and on resurveying of the island (Cotoras et al. 2017) and developing habitat restoration projects (Dubois et al. 2013). That research has provided better evidence of the critical state of the island flora and fauna but has also presented unexpected discoveries (Wynne et al. 2014).

Our finding shows that the species was able to survive the major environmental changes associated with sheep farming between 1895 and 1953 (Fuentes et al. 2012). From a taxonomic perspective, our study provides specimens from the type locality, allowing a more complete description of the species. One of the implications of the rediscovery of this canoe species is the possibility of using it as a tool for tracking Polynesian migration by applying molecular methods (Seelenfreund et al. 2010, Peñailillo et al. 2016).

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