



# First record of the Japanese land snail *Ovachlamys fulgens* (Gude, 1900) (Gastropoda, Helicarionidae) in Brazil

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## Abstract

The Japanese land snail *Ovachlamys fulgens* is reported for the first time in Brazil. We recorded the species in 2015 and 2017 in the municipalities of Santos and São Vicente in the metropolitan region of Baixada Santista, São Paulo state, southeastern Brazil. We found the species in an urban park and in a secondary forest altered by exotic plants. As this species is considered a pest and is capable of transmitting disease to humans, we propose that urgent measures be taken by the Brazilian government to control its populations.

## Key words

Bioinvasion; Baixada Santista; Atlantic Forest; eosinophilic meningitis; orchid seedlings; management of protected areas.

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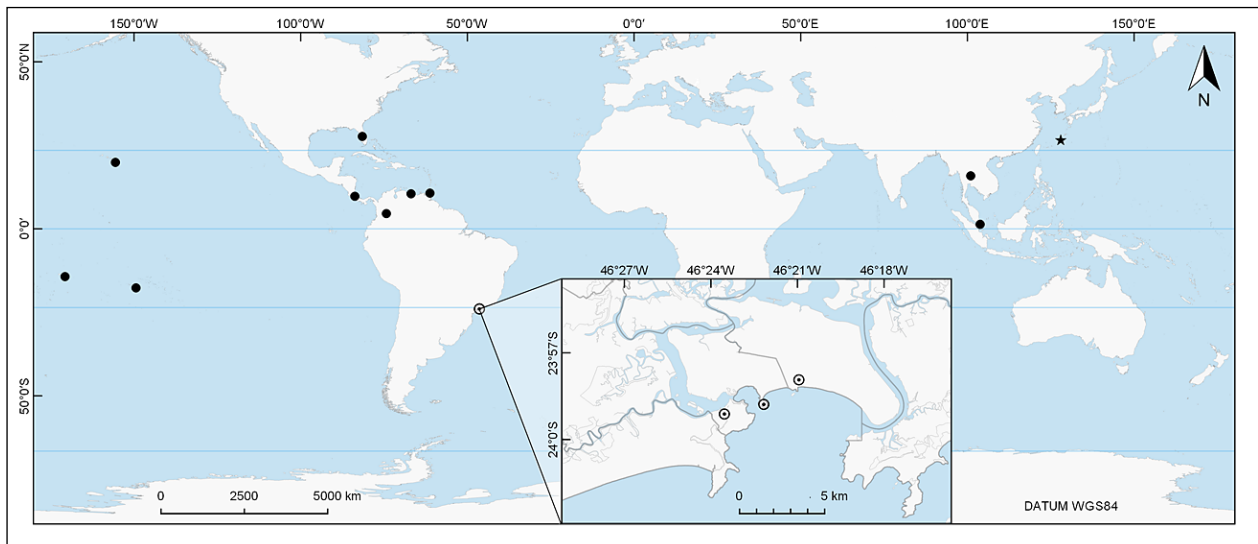
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## Introduction

*Ovachlamys fulgens* (Gude, 1900) is a small terrestrial snail (up to 7 mm long) that was described from the Loo-Choo Islands (also known as Ryukyu Islands) of Japan. In the last 30 years, it has been introduced in Singapore (Robinson and Slapcinsky 2005, Capinera and White 2011), Thailand (Capinera and White 2011, Hwang 2014), French Polynesia (Lovenburg 2009), American Samoa (Cowie 2001, Cowie et al. 2002), USA (Robinson 1999, Cowie et al. 2009), Trinidad and Tobago (Robinson and Slapcinsky 2005, Capinera and White 2011, Rutherford and Mohammed 2013), the Hawaiian Islands (Hayes et al. 2007, Cowie et al. 2008), Costa Rica (Barrientos 1998, 2000, 2003), Nicaragua (Pérez et al. 2005), Venezuela (República Bolivariana de Venezuela 2017),

and Colombia (Robinson and Slapcinsky 2005). This species prefers warm temperatures between 20–27 °C and abundant humidity (Barrientos 2000), and is thus more abundant during rainy seasons (Prado et al. 2008). It has a short life cycle and can deposit, on a daily basis, a small number of eggs that hatch within 10–14 days (Barrientos 1998). Its popular name, the jumping snail, originates from the way in which this species propels its body (jumps) when disturbed, through strong movements of the caudal horn and the back of the foot (Barrientos 2000, Capinera and White 2011).

The main cause for the introduction of *O. fulgens* in different localities is the exchange of plants (Robinson 1999). *Ovachlamys fulgens* is also largely associated with human activities (Barrientos 2000) and particularly with



**Figure 1.** Geographical distribution of *Ovachlamys fulgens*. The star indicates the type locality of the species (Loo-Choo Islands, Japan). The dots indicate records as invasive, of which the black and white dot indicates the new records in Brazil.

agriculture and horticultural activities (Robinson 1999, Barrientos 2000, Robinson and Slapcinsky 2005, Ruthford and Mohammed 2013). It is considered a pest in some plant and food crops, such as *Dracaena marginata* Lam. (Ruscaceae) (Capinera and White 2011), orchids (Capinera and White 2011), avocado (*Persea americana* Mill., Lauraceae) (Capinera and White 2011), mango (*Mangifera indica* L., Anacardiaceae) (Capinera and White 2011), and *Heliconia* spp. (Heliconiaceae) (Barrientos 1998).

## Methods

We found *O. fulgens* in vegetation and leaf litter. We fixed live specimens in 100% ethyl alcohol and housed the specimens at the Museu de Zoologia da Universidade de São Paulo (MZSP) in São Paulo state, southeastern Brazil. Collection permits were granted by the Instituto Chico Mendes de Conservação da Biodiversidade (SISBIO; license 57969).

## Results

On 29 September 2015, we collected 1 live specimen of *O. fulgens* on Ilha Porchat (23°58'47" S, 046°22'10" W; 70 m above sea level [a.s.l.]), municipality of São Vicente, São Paulo state, Brazil (MZSP 134505). Ilha Porchat is a small island now connected to a larger island (Ilha de São Vicente) and is located very close to the mainland. On 14 July 2017, we collected 3 individuals (2 live and 1 shell) in the same locality (MZSP 134506). We found the species in the leaf litter of a very disturbed patch of Atlantic Forest (Floresta Ombrófila Densa Submontana; *sensu* Veloso et al. [1991]) along with *Megalobulimus paranaguensis* (Pilsbry & Ihering, 1900) and *Rectartemon iheringi* (Thiele, 1927) (only *R. iheringi* was collected; MZSP 134649). On 13 June 2017, we found 1 live specimen in Ilha de São Vicente, specifically in the Orquidário

Municipal de Santos (23°57'56" S, 046°20'57" W; 15 m a.s.l.), municipality of Santos, São Paulo, Brazil (MZSP 134507). This is a small urban park with numerous native and exotic trees that exhibits and sells orchids in addition to offering other recreational activities. The individual was active on moist leaf litter and found along with *Achatina fulica* (Bowdich, 1822) (MZSP 134508), *Subulina octona* (Bruguière, 1792) (MZSP 134509), and *Assimineia* sp. (MZSP 134510) specimens. On 27 May and 3 June 2017, we collected 17 specimens of *O. fulgens* in the continental area of the municipality of São Vicente, specifically in Japuí (23°59'06" S, 046°23'25" W; 65 m a.s.l.), São Paulo, Brazil (MZSP 134511–2). In Japuí, we found the species in an area that once had residences, although these had been removed; this area also forms part of the Xixová-Japuí State Park. We found adult and juvenile individuals during the day, both active and inactive, under the leaf litter of the soil and in the vegetation up to 2 m in height. We observed that most adult specimens were active under the leaf litter, except for 1 that we observed on a leaf in an area with soggy soil and plenty of exotic *Hedychium coronarium* J. Koenig (Zingiberaceae). We observed some inactive juveniles on the abaxial surface of leaves next to the midrib and petioles of the exotics *Dieffenbachia amoena* Bull (Araceae) and *Schefflera actinophylla* (Endl.) Harms (Araliaceae). All 3 observation localities are close to one another and form part of the so-called Região Metropolitana da Baixada Santista, southeastern Brazil (Fig. 1).

We could identify the collected *O. fulgens* individuals based on the following set of characteristics: small yellow-brown shell with 4 whorls, umbilicate, soft sculptures, 6–7 mm in diameter, around 4.5 mm height (Figs 2–4), with thin and brown body, with a white basal section at the foot, and a dorsal portion of the foot with striate ribs (Fig. 5). These characteristics can be found in the original description of the species (Gude 1900) as well as in other specific bibliographies (Barrientos 2008,



**Figures 2–5.** Specimens of *Ovachlamys fulgens* (MZSP 134512) found in Japu, Xixov-Japu State Park, municipality of So Vicente, So Paulo state, southeastern Brazil. **2–4** show an empty shell. **2.** Aperture view. **3.** Umbilical view. **4.** Dorsal view. **5.** A second individual, alive. Photograph (Fig. 5) by Luiz F. Ribeiro.

Capinera and White 2011). The species was also identified by its escape behavior (Teixeira 2017). However, until the reproductive anatomy and sequencing the barcoding COI are known, the species identification is only a tentative. The species identification was also corroborated as probably *O. fulgens* by Dr Zaidett Barrientos (Universidad Estatal a Distancia, Costa Rica), who reviewed our photographs of observed individuals.

## Discussion

Our records of *O. fulgens* are the first recorded in Brazil (Fig. 1). The closest records of this species are in Colombia (Robinson and Slapcinsky 2005) at a distance of several thousand kilometers. As our records were found near a port area where imported goods circulate, this occurrence is not surprising. The Baixada Santista regions encompasses the Port of Santos, the biggest seaport of Latin America, which represents an open door through which many exotic species could enter into Brazil. It is reasonable to assume that the species arrived via the import of horticultural products, as the trade of these products has been its main form of dispersal of this species throughout other regions of the world (Robinson 1999, Robinson and Slapcinsky 2005). Our data suggest that *O. fulgens* has established populations in the insular and continental areas of Baixada Santista. In Brazil, 25

species of alien land snails have already been registered (Simone 2006).

Our concern is that, in the region of occurrence of this exotic species, several practices such as the donation and trade of plant seedlings will likely further disperse this snail throughout Brazil. In Orquidrio Municipal de Santos, for example, orchids are regularly sold, and the pots used to transport these plants could disperse the species (Robinson 1999). Local and state parks in the region also often donate tree seedlings to visitors. This practice could serve as another means of dispersing *O. fulgens* in addition to other alien snails and plants, as demonstrated by Robinson (1999).

We recommend that public policies be urgently created by the Brazilian government to control the dispersion of *O. fulgens*. For example, this species could be included on the list of invasive alien species for the country, and the trade of plant and horticultural products could be prohibited in its areas of occurrence. While these proposed measures may have a negative economic impact, we would like to emphasize that such measures are also supported by the human health concerns that this species presents. *Ovachlamys fulgens* could be an intermediate host of *Angystrongylus cantonensis* (Kim et al. 2014), which causes eosinophilic meningitis disease; this disease has already been reported in the Baixada Santista region (Guerino et al. 2017). The distribution of seedlings



and plants and any related activities in localities with confirmed presence of *O. fulgens* should be prohibited to avoid its dispersion until new information arises.

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## Authors' Contributions

LT and MRB collected the data and performed the analysis; LT, CMC, and MRB wrote the text.

## References

- Barrientos Z (1998) Life history of the terrestrial snail *Ovachlamys fulgens* (Stylommatophora: Helicarionidae) under laboratory conditions. *Revista de Biología Trópica* 46 (2): 285–296.
- Barrientos Z (2000) Population dynamics and spatial distribution of the terrestrial snail *Ovachlamys fulgens* (Stylommatophora: Helicarionidae) in a tropical environment. *Revista de Biología Trópica* 48 (1): 71–87.
- Barrientos Z (2003) Lista de especies de moluscos terrestres (Archaeogastropoda, Mesogastropoda, Archaeopulmonata, Stylommatophora, Soleolifera) informadas para Costa Rica. *Revista de Biología Trópica* 51 (3): 293–304.
- Capinera JL, White J (2011) Terrestrial snails affecting plants in Florida. University of Florida, Florida, 12 pp.
- Cowie RH (2001) Decline and homogenization of Pacific faunas: the land snails of American Samoa. *Biological Conservation* 99: 207–222.
- Cowie RH, Dillon Jr RT, Robinson DG, Smith JW (2009) Alien non-marine snails and slugs of priority quarantine importance in the United States: a preliminary risk assessment. *American Malacological Society* 27 (1/2): 113–132. <https://doi.org/10.4003/006.027.0210>
- Cowie RH, Hayes KA, Tran CT, Meyer WM (2008) The horticultural industry as a vector of alien snails and slugs: widespread invasions in Hawaii. *International Journal of Pest Management* 54 (4): 267–276. <https://doi.org/10.1080/09670870802403986>
- Cowie RH, Rundell RJ, Mika F, Setu P (2002) The endangered partulid tree snail *Samoana thurstoni* (Cooke and Crampton, 1930) on Olosega and the land snail diversity of the Manu'a Islands, American Samoa. *American Malacological Bulletin* 17 (1/2): 37–43.
- Gude GK (1900) Further notes on helicoid land shells from Japan, the Loo-Choo, and Bonin Islands, with descriptions of seven new species. *Proceedings of the Malacological Society of London* 4: 70–81.
- Guerino LR, Pecora IL, Miranda MS, Aguiar-Silva C, Carvalho OS, Caldeira RL, Silva RJ (2017) Prevalence and distribution of *Angiostrongylus cantonensis* (Nematoda, Angiostrongylidae) in *Achatina fulica* (Mollusca, Gastropoda) in Baixada Santista, São Paulo, Brazil. *Revista Sociedade Brasileira Medicina Tropical* 50 (1): 92–98. <https://doi.org/10.1590/0037-8682-0316-2016>
- Hayes KA, Tran CT, Cowie RH (2007) New records of alien Mollusca in the Hawaiian Islands: non-marine snails and slugs (Gastropoda) associated with the horticultural trade. *Bishop Museum Occasional Papers* 96 (2): 54–63.
- Hwang CC (2014) Annotated type catalogue of land snails collected from Taiwan (Formosa) in the Natural History Museum, London. *Zookeys* 428: 1–28. <https://doi.org/10.3897/zookeys.428.8061>
- Kim JR, Hayes KA, Yeung NW, Cowie RH (2014) Diverse gastropod hosts of *Angiostrongylus cantonensis*, the Rat Lungworm, globally and with a focus on the Hawaiian Islands. *PLoS One* 9 (5): 1–10. <https://doi.org/10.1371/journal.pone.0094969>
- Lovenburg V (2009) Terrestrial gastropod distributional factors: native and non-native forests, elevation, and predation on Mo'Orea, French Polynesia. UCB Moorea Class: Biology and Geomorphology of Tropical Islands, Berkeley, 21 pp.
- Pérez AM, Bomemann G, Campo L, Sotelo M, Ramírez F, Arana I (2005) Relaciones entre biodiversidad y producción en sistemas silvopastoriles de América Central. *Ecosistemas* 14 (2): 132–141. <https://doi.org/10.7818/re.2014.14-2.00>
- Prado J, Casanoves F, Hidalgo E, Benjamin T, Sadof C (2008) Effects of production practices on the abundance of quarantine pests in *Dracaena marginata* in Costa Rican production fields. *Journal of Economic Entomology* 101 (6): 1779–1785. <https://doi.org/10.1603/0022-0493-101.6.1779>
- República Bolivariana de Venezuela (2017) Resolución MM/No. 017/2017 of 20 March 2017. *Gaceta Oficial de la República Bolivariana de Venezuela*. [http://www.badellgrau.com/byg/upl/files/Gaceta%20Oficial%20Nro\\_%2041\\_118%2021-03-17.pdf](http://www.badellgrau.com/byg/upl/files/Gaceta%20Oficial%20Nro_%2041_118%2021-03-17.pdf). Accessed on: 2017-9-15.
- Robinson DG (1999) Alien invasions: the effects of the global economy on non-marine gastropod introductions into the United States. *Malacologia* 41 (2): 413–438.
- Robinson DG, Slapcinsky J (2005) Recent introductions of alien land snails into North America. *American Malacological Bulletin* 20: 89–93.
- Rutherford MG, Mohammed RS (2013) New and updated records of terrestrial and freshwater gastropod molluscs for Tobago, West Indies. *Living World, Journal of the Trinidad and Tobago Field Naturalist's Club*: 71–72.
- Simone LRL (2006) Land and Freshwater Molluscs of Brazil. FAPESP, São Paulo, 390 pp.
- Teixeira L (2017) *Ovachlamys fulgens* jumping. YouTube. <https://youtu.be/4CZZmaDe5jU>. Accessed on 2017-10-11.
- Veloso HP, Rangel Filho ALR, Lima CA (1991) Classificação da vegetação brasileira, adaptada a um sistema universal. Instituto Brasileiro de Geografia e Estatística, Rio de Janeiro, 124 pp.