

5-YEAR REVIEW

Short Form Summary

Species Reviewed: Pupu kani oe or Lāna‘i tree snail (*Partulina semicarinata*)

Current Classification: Endangered

FR Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2022. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status Reviews for 167 Species in Oregon, Washington, Idaho, Montana, California, Hawaii, Guam, and the Northern Mariana Islands. Federal Register 87(90):28031–28034.

Lead Region/Field Office: Region 1/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawai‘i

Name of Reviewer(s):

Diane Sether, Ph.D., Invertebrate and Wildlife Biologist, PIFWO

John Vetter, Animal Recovery Coordinator, PIFWO

Megan Laut, Recovery Team Manager, PIFWO

Methodology used to complete this 5-year review: This review was conducted by staff of the PIFWO of the U.S. Fish and Wildlife Service (USFWS), beginning in February 2024. The review was based on a review of current, available information since the last 5-year review for the Pupu kani oe or Lāna‘i tree snail (*Partulina semicarinata*) (USFWS 2020a, entire). The evaluation by Diane Sether, Ph.D., Invertebrate and Wildlife Biologist, was reviewed by John Vetter, the Animal Recovery Coordinator, and Megan Laut, the Recovery Program Manager.

Background:

For information regarding the species’ listing history and other facts, please refer to the USFWS Environmental Conservation Online System database for threatened and endangered species at <https://ecos.fws.gov/ecp/species/5895>.

Review Analysis:

Please refer to the Recovery Plan for 44 Species from the Islands of Maui, Moloka‘i, Kaho‘olawe, and Lāna‘i (Maui Nui), Species Report, and the previous 5-year review for the Lāna‘i tree snail published on August 6, 2020 (available at <https://ecos.fws.gov/ecp/species/5895>) for a complete review of the species’ status, threats, and management efforts. No new threats or no new information regarding the species biological status have come to light since listing to warrant a change in the Federal listing status of the Lāna‘i tree snail as endangered.

Partulina semicarinata is an endangered tree snail endemic only to the wet forests of Lāna‘ihale, on Lāna‘i, in areas where annual precipitation is greater than 75 in (190 cm). The oblong to ovate shells of adult *Partulina semicarinata* are 0.6 to 0.8 inches (in) (16 to 20 millimeters (mm)) long, have 5 to 7 whorls, and range in color from rusty brown to

white, with some individuals having bands around the shells (Pilsbry and Cooke 1912-1914b), have 5 to 7 whorls, and have white, yellow, black, or other shades as a base color with a variable number of spiral bands of varying width or with no banding (Pilsbry and Cooke 1912-1914b, 84-86). The shell has a distinctive keel that runs along the last whorl, which is more distinctive in juvenile snails than it is in adults (Pilsbry and Cooke 1912-1914b, pp. 84–86). The shell may coil to the right (dextral) or the left (sinistral), and both types of shells can be found in a single population. Only snails with the same coil type can mate. *Partulina* tree snails reach adult size in 4 to 7 years, growing from a live birth size of about 4.5 mm. Upon reaching adult size, the snails stop growing and form a thickened edge or lip along the opening of the shell. A tree snail may attain an age that exceeds 15 years.

Lāna‘i tree snails are simultaneous hermaphrodites, meaning they have both male and female reproductive organs, which are functional at the same time. Hermaphroditism is a form of sexual reproduction in which the snail can act as the female or male during mating. The species is not known to self-fertilize. After mating, the Hawaiian tree snails can store sperm and may produce live young for a year or more without breeding (Sischo 2019 in litt., entire). The species exhibits the late maturity and low reproductive rate characteristic of other Hawaiian tree snails belonging to the family Achatinellidae.

Lāna‘i tree snail feeds on microbes living on the leaf, branch and trunk surfaces of its plant hosts that include *Phorium tenax* (New Zealand flax), *Metrosideros polymorpha* (‘ōhi‘a), *Broussaisia arguta* (kanawao), *Dicranopterus linearis* (uluhe fern), *Psychotria* spp. (kōpiko), *Coprosma* spp. (pilo), *Melicope* spp. (alani), *Scaevola* sp. (mountain naupaka), and dead *Cibotium glaucum* (hapu‘u fern). Occasionally, *Partulina variabilis*, a sister species of *P. semicarinata*, is found on *Psidium guajava* (guava) and *Cordyline australis* (ti) (Hadfield 1994b, p. 2).

New status information:

- The minimum population estimate of Lāna‘i tree snail in 2019 was one small population in the wild and one population protected by a predator-proof enclosure, all of which are located on Lāna‘ihale (Sischo 2019 in litt., entire; USFWS 2020b, p. 23). In January, 2020 a single individual was incidentally sighted on Pu‘u ‘A‘ali‘i Ridge (Sprague 2024, in litt., entire). In August 2020, 5 different observations were made in the same area during a tree snail survey (Sprague 2024, in litt., entire). In December 2020, May 2021, and September 2021, incidental observations were reported for a single Lāna‘i tree snail adult by three different observers at three different GPS coordinates (Sprague 2024 in litt., entire).
- Two predator-proof tree snail enclosures are built for the Lāna‘i tree snails. One, completed in 2019, was constructed around a *Partulina semicarinata* population. A second enclosure, constructed in 2018, is around an existing population of *Partulina variabilis* and may be used for a future translocation site for *P. semicarinata*.

- The Snail Extinction Prevention Program (SEPP) does not have *Partulina semicarinata* in captive rearing (Sischo 2022, p. 9; Sischo 2023, p. 8; Sischo 2024, p. 9)

New threats:

There are no new threats known at this time that were not identified in the *Partulina semicarinata* 5-Year Review (USFWS 2020a, entire) and Species Report (USFWS 2020b, entire). Wild population(s) not protected by a predator-proof enclosure are highly vulnerable to predation, as well as catastrophic and stochastic events that threaten the existence of these populations. Given the small numbers of individuals per population, each population is at risk of extirpation.

New management actions:

- Monitoring and surveys –
 - Pūlama Lāna‘i reports on incidental Lāna‘i tree snails observed while conducting predator control and during monitoring of Lānai Hale seabird burrows. A GPS location is taken when a tree snail is observed, report written, and the tree snail left in place. These observations are purely incidental or during scheduled tree snail surveys and are limited to accessible trails to avoid impacting seabird burrows. The staff are experienced biologists and trained in recognition of tree snails, existing or new threats to tree snails, and changes to the habitat that may impact the species or a known occurrence.
 - Conservation measures that benefit Lāna‘i tree snail focus on protecting the species from predation by rats and predatory snails, particularly rosy wolf snails (*Euglandina* spp.), trampling by ungulates, and destruction and loss of host plants. Wild populations may benefit from rat control, fencing, removal of ungulates, and habitat management to protect endangered plants and endangered seabirds that also occur on the mountain.
 - In 2018, Pūlama Lāna‘i completed one of two predator-proof tree snail enclosures protecting *Partulina variabilis*, a closely related species to *Partulina semicarinata*, in its natural environment (USFWS 2020a, pp. 16, 15; USFWS 2020b, p. 17). The enclosure may serve as a destination for translocation of tree snail populations that are in immediate peril in the wild and meet translocation criteria. The enclosures are maintained by Pūlama Lāna‘i with guidance from the USFWS and the State of Hawai‘i, Division of Forestry and Wildlife, Snail Extinction Prevention Program (SEPP). Changes in threats and tree snail population inside the enclosure are monitored by Pūlama Lāna‘i and SEPP and reported to the USFWS.
 - A second enclosure was constructed in 2019 around an existing population of *Partulina semicarinata* and may be used for a future translocation site for *P. variabilis*. Changes in threats and tree snail population inside the enclosure are monitored by Pūlama Lāna‘i and SEPP and reported to the USFWS. No sign of rats or rosy wolf snails inside the enclosures have been reported.

- Habitat restoration:
 - Invasive plant species are periodically removed from inside enclosure areas. Plant material is inspected for tree snails before removal.
- Reintroductions:
 - No reintroductions from the captive population have occurred.

Table 1. Status and trends of *Partulina semicarinata* from listing through current 5-year review.

Date	No. Adult Wild Individuals	Downlisting Criteria Identified in Recovery Plan	Downlisting Criteria Completed?
2013 (listing)	3 populations in the wild (<50 individuals)	No recovery plan developed yet.	N/A
2020 (Species Report and 5-Year Review)	1 population in the wild, 1 population in a tree snail enclosure <50 individuals)	No recovery plan finalized.	No
2021 (Draft Recovery Plan)	1 population in the wild, 1 population in a tree snail enclosure <50 individuals)	<u>Draft Downlisting Criterion 1:</u> At least 6 stable populations (possibly actively managed) exist on Lāna‘i. To be considered stable, a population must number at least 300 individuals distributed across all size classes combined and must have a population growth curve or index trend that is stable or positive for at least 4 of the 5 years prior to consideration of downlisting. If multiple management units have been identified for the species based on genetic characters or geography, each unit must comprise one or more of these stable populations.	No
		<u>Draft Downlisting Criterion 2:</u> Each population in Downlisting Criterion 1 occurs on suitable habitat that is managed to protect native forest vegetation.	No

		Habitat must be capable of supporting natural dispersal, expansion of the occupied range, and positive population growth as determined by the best available scientific information.	
		<u>Draft Downlisting Criterion 3:</u> All predation threats are controlled or absent around each population in Downlisting Criterion 1. Evaluation of predation risk for each population in Downlisting Criterion 1 indicate that nonnative predators are absent or that predation is unlikely to have significant short-term impacts on the population. Species-specific management actions may continue to be necessary. Measures are in place to prevent introduction of new predators or disease to the populations in Downlisting Criterion 1 and captive reared populations.	No
2024 (5-yr review)	<5 populations in the wild, 1 population in a tree snail enclosure <50 individuals)	<u>Draft Downlisting Criterion 1:</u> At least 6 stable populations (possibly actively managed) exist on Lāna‘i. To be considered stable, a population must number at least 300 individuals distributed across all size classes combined and must have a population growth curve or index trend that is stable or positive for at least 4 of the 5 years prior to consideration of downlisting. If multiple management units have been identified for the species based on genetic characters or geography, each unit must comprise one or more of these stable populations.	No

		<p><u>Draft Downlisting Criterion 2:</u> Each population in Downlisting Criterion 1 occurs on suitable habitat that is managed to protect native forest vegetation. Habitat must be capable of supporting natural dispersal, expansion of the occupied range, and positive population growth as determined by the best available scientific information.</p>	No
		<p><u>Draft Downlisting Criterion 3:</u> All predation threats are controlled or absent around each population in Downlisting Criterion 1. Evaluation of predation risk for each population in Downlisting Criterion 1 indicate that nonnative predators are absent or that predation is unlikely to have significant short-term impacts on the population. Species-specific management actions may continue to be necessary. Measures are in place to prevent introduction of new predators or disease to the populations in Downlisting Criterion 1 and captive reared populations.</p>	No

Table 2. Threats to *Partulina semicarinata* and ongoing conservation efforts.

Threat	Listing Factor	Current Status	Conservation/Management Efforts
Agriculture and urban development	A	Ongoing	Partial—land management has reduced the threat of development
Ungulates	A	Ongoing	Partial— some strategic fencing is in place and maintained; some ungulate removal has occurred
Invasive nonnative plants	A	Ongoing	Partial—land management and invasive plant removal by Pūlama Lāna‘i
Fire	A	Ongoing	Partial— general fire management plans developed by Pūlama Lāna‘i are in place
Stochastic events (drought, hurricane)	A	Ongoing	None

Threat	Listing Factor	Current Status	Conservation/Management Efforts
Disease	C	Ongoing	Partial—Snail Extinction Prevention Program has implemented safeguards against introduction of disease and parasites to captive-reared tree snails
Predation by rats	C	Ongoing	Partial—two predator-proof snail enclosures are built by Pūlama Lāna‘i and one is occupied by <i>Partulina variabilis</i> ; extant tree snail populations may benefit from rat control to protect endangered plants and endangered seabirds on Lāna‘ihale.
Predation by Jackson’s chameleon	C	Ongoing	Partial—predator-proof snail enclosures built on Lāna‘ihale are free of Jackson’s chameleons.
Predation by predatory snails	C	Ongoing	Partial—predator-proof snail enclosures built on Lāna‘ihale are free of predatory rosy wolf snail
Predation by flatworms	C	Ongoing	Partial—predator-proof snail enclosures built on Lāna‘ihale have excluders for this threat
Inadequate existing regulatory mechanisms	D	Ongoing	Partial— restrictions on transport of invasive species to the island and inspections at the dock and airport are conducted
Loss of plant hosts	E	Ongoing	Partial—some landscape-scale plant and pathogen management
Limited numbers	E	Ongoing	Partial— enclosure built around an existing population
Low population number	E	Ongoing	Establishing new populations outside of predator-proof enclosures is not occurring because other threats in those appropriate habitats are not manageable with the current technology available to ensure success and no tree snails are available for translocation; the species is not in captivity.
Treefall	E	Ongoing	None
Climate change	E	Ongoing	None

Synthesis:

Downlisting and delisting objectives are provided in the draft recovery plan for 44 species from the islands of Maui, Moloka‘i, Kaho‘olawe, and Lāna‘i (Maui Nui) (USFWS 2021). Based on the draft and final recovery plan at least 6 stable populations of at least 300 individuals with a population growth curve that stable or positive for at least

4 to 5 years must occur before the downlisting Criterion 1 can be met; Criteria 2 and 3 are predicated on Criterion 1 being met. There are less than 6 extant populations of *Partulina semicarinata*, based on observations of a single observed adult, known in the wild, and 1 population in a tree snail enclosure. The number of total individuals is estimated at <50. The species is not represented in captive rearing. There are two existing predator-proof enclosures for Lāna‘i tree snails on Lāna‘i; one is populated by *Partulina semicarinata* and the other is occupied by *Partulina variabilis*. The *P. variabilis* occupied enclosure is suitable for translocation of *P. semicarinata*. Population(s) in the wild continue to be at risk of predation from rats, rosy wolf snails, Jackson’s chameleons, habitat-related threats, and catastrophic and stochastic events. The population within the enclosure is also at risk should the barriers fail or catastrophic or stochastic events damage the enclosure or habitat inside. With only 1–6 small populations of *P. semicarinata* known within the natural landscape, a low number of individuals in those populations, one population in captive rearing, and most threats still unmanaged across the landscape, this species continues to meet the definition of endangered.

Recommendations for Future Actions:

- Finalize the draft recovery plan with measurable downlisting and delisting criteria for the recovery of *Partulina semicarinata*.
- Conduct surveys for extant populations throughout the range of *Partulina semicarinata*.
- Monitor and assess abundance of individuals and growth trend of populations.
- Monitor populations to detect disease, assess impacts, and control outbreaks as soon as possible, if needed.
- Protect existing populations in the wild from threats.
- Establish representative populations of *Partulina semicarinata* in captive rearing programs.
- Expand the capacity of the captive rearing program and increase the number of captive-reared individuals and populations.
- Develop microclimate models and identify suitable habitat based on historical and existing species’ distributions and potential future climate conditions.
- Construct and maintain tree snail predator-proof enclosures to protect extant populations and protect translocated Lāna‘i tree snails.
- Increase numbers of populations and individuals in suitable habitat through translocation to build resilient populations with redundancy and representation.
- Identify species suitable for translocation and develop and implement translocation plans.
- Monitor management and use results to adaptively manage recovery actions.
- Control invasive, nonnative plant species that degrade the wet forest habitat of *Partulina semicarinata*.
- Develop and implement effective control methods for nonnative *Euglandina* spp. at all *Partulina semicarinata* populations in habitats.

- Expand and continue to implement effective control methods for rats in all *Partulina semicarinata* populations.
- Develop and implement effective control methods for Jackson's chameleon at all *Partulina semicarinata* populations.
- Control any new threats to *Partulina semicarinata* before they become widespread.
- Develop tools to enhance habitat and species survival and reproduction.
- Develop tools to inform actions that will improve species viability in situ and ex situ.
- Conduct Population Viability Analyses (PVA) for each species.
- Ensure long-term protection of all populations.
- Identify, develop, and support alliances and partnerships to plan and implement *Partulina semicarinata* habitat restoration, protection from predators, and management to benefit and recover the species.
- Conduct studies on the optimization of conservation translocation survival and success.
- Implement the Hawai'i interagency biosecurity plan to prevent the influx of new pests and invasive species into Hawai'i and more specifically the islands of Maui Nui.
- Implement public outreach and education and enforce policies that prohibit species collection and harassment.

References:

See previous 5-year reviews for additional references.

Sischo, D. 2022. Report to the U.S. Fish and Wildlife Service for native endangered species recovery permit, Permit: ES19045-3, tree snail section: Reporting period: January 1, 2021, to December 31, 2021. Department of Land and Natural Resources, Division of Forestry and Wildlife. Honolulu, Hawaii. 11 pp.

Sischo, D. 2023. Report to the U.S. Fish and Wildlife Service for native endangered species recovery permit, Permit: ES19045-3, tree snail section: Reporting period: January 1, 2022, to December 31, 2022. Department of Land and Natural Resources, Division of Forestry and Wildlife. Honolulu, Hawaii. 28 pp.

Sischo, D. 2024. Report to the U.S. Fish and Wildlife Service for native endangered species recovery permit, Permit: ES19045-3, tree snail section: Reporting period: January 1, 2023, to December 31, 2023. Department of Land and Natural Resources, Division of Forestry and Wildlife. Honolulu, Hawaii. 40 pp.

[USFWS] U.S. Fish and Wildlife Service. 2020a. 5-Year Review for *Partulina semicarinata* (Lāna'i tree snail). U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, HI. 24 pp.

[USFWS] U.S. Fish and Wildlife Service. 2020b. Species report for *Partulina semicarinata* (Pupu kani oe, Lāna‘i tree snail). Version 1.0. Pacific Islands Fish and Wildlife Office, Pacific Islands Interior Region 12, Portland, Oregon. 29 pp.

[USFWS] U.S. Fish and Wildlife Service. 2021. Draft recovery plan for 44 species from the islands of Maui, Moloka‘i, Kaho‘olawe, and Lāna‘i (Maui Nui). Portland, Oregon. xvi + 77 pages. https://ecos.fws.gov/docs/recovery_plan/Maui_Nui_Draft_RP_20211217_Signed.pdf

In Litt.

Sprague, J. 2024 in litt. Lāna‘i Tree Snails. Email between Jon Sprague, Pūlama Lāna‘i, and Diane Sether, USFWS. March 13, 2024.

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW on Pupu kani oe or Lāna‘i tree snail
(*Partulina semicarinata*)

Pre-1996 DPS listing still considered a listable entity? ___N/A___

Recommendation resulting from the 5-year review:

- Delisting
- Reclassify from Endangered to Threatened status
- Reclassify from Threatened to Endangered status
- No Change in listing status

Review Conducted By:

Diane Sether, Ph.D., Invertebrate and Wildlife Biologist, USFWS
John Vetter, Animal Recovery Coordinator, USFWS
Megan Laut, Recovery Team Manager, USFWS

For Field Supervisor, Pacific Islands Fish and Wildlife Office
