5-YEAR REVIEW

Short Form Summary

Species Reviewed: Fragile Tree Snail (Akaleha', *Samoana fragilis*)

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):

Lauren Taylor, Fish 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 fragile tree snail (akaleha', *Samoana fragilis*) (USFWS 2020, entire). The evaluation by Lauren Taylor, Fish 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/4835*).

Review Analysis:

Please refer to the Draft Recovery Plan for 23 Species in the Mariana Islands (USFWS 2023, entire) and the previous 5-year review for the fragile tree snail published on August 7, 2020 (available at *https://ecos.fws.gov/ecp/species/4835*) 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 fragile tree snail as endangered.

The fragile tree snail is a small land snail endemic to Guam and Rota. The conical shell has four whorls that spiral to the right and delicate spiral striations intersected with transverse growth striations. The shell is a buff color, thin and semi-transparent through which the internal organs are visible as darker marks and whitish banding. Adult length is

0.5 to 0.6 inches (13 to 15 millimeters), and width 0.4 to 0.5 inches (10 to 15 millimeters).

The fragile tree snail is found on the undersides of large leaves of mostly native and some introduced species of trees, shrubs, herbaceous plants, and ferns, including *Aglaia mariannensis*, *Artocarpus altilis*, *Hibiscus tiliaceus*, *Morinda citrifola*, *Neisosperma oppositifolia*, *Pandanus tectorius*, and *Cocos nucifera*. No clear obligate relationship with any vegetation has been identified for the fragile tree snail, which consumes a diet of fungi and microalgae. The species is found in colonies ranging in size from a few individuals to more than 1,000 snails in cool, shaded forest habitat and a microclimate of high humidity and reduced air movement that prevents excessive water loss. On Guam, at least five of the seven fragile tree snail colonies co-occur with colonies of the Guam tree snail (*Partula radiolata*). Surveys have shown the fragile tree snail has an affinity for water, as all known colonies occur near surface water sources or a shallow water table (NAVFAC Marianas 2019a, p. 8; CNMI DFW 2021, p. 34; USFWS 2024, unpublished data). Fragile tree snails are more mobile in wetter conditions, particularly after typhoon rains, when the snails will move about their home plants and, less frequently, travel to the ground to move to adjacent vegetation (Crampton 1925, p. 31; Lindstrom and Benedict 2014, p. 175; DAWR 2019, p. 130).

The lifespan of the fragile tree snail is unknown, but most partulids are slow-growing and long-lived snails. In captivity partulids become reproductively active around one year of age and live for over five years (Cowie 1992, p. 174). Fragile tree snails are ovoviviparous, meaning they produce live young from eggs which hatch within the body of the parent. The adult contains a small number of eggs and juveniles at different stages of development in the female reproductive tract and gives birth to single young at multi-week intervals. Partulids are simultaneous hermaphrodites (see USFWS 2020, p. 4), predominately outbreeding but also capable of self-fertilizing.

New status information:

- The most recent minimum population estimate of the fragile tree snail is nine populations. The Service defines tree snail populations based on their geographical regions. Populations are separated by geographical barriers such as cliffs and habitat fragmentation due to human development. In 2023, a previously undetected colony of approximately 45 fragile tree snails was found in an area slated for development in Yigo. We therefore estimate eight populations on Guam, comprised of six populations in the north and two populations in the south, and one population on Rota (Lindstrom and Benedict 2014, pp. 24–25; NAVFAC Marianas 2019b, p. 26; NAVFAC Marianas 2021, p. 116; CNMI DFW 2023, p. 10; RASP 2023, pp. 5–6; Sustainable Resources Group, International, Inc. 2023, p. 7; USFWS 2024, unpublished data). Most fragile tree snail populations are small and narrowly dispersed; six of the colonies number between five and 60 snails each, and one colony has approximately 120 snails. Only two colonies, found on military lands on Guam, have recently reported colony sizes of over 600 and 800 individuals each. Two of the colonies in Guam have not been surveyed in over 10 years and their condition is

unknown. Overall, the number of known fragile tree snail populations remains limited and the species is rare throughout the Mariana Islands.
- Overutilization is no longer considered a threat to the species as the practice of using partulid shells in jewelry and decorations appears to have ceased in the Mariana Islands (USFWS 2023, p. 21).

New threats:
- Land clearing – Clearing land of vegetation and vegetation maintenance (pruning and trimming of trees and shrubs) in areas occupied by the fragile tree snail can result in both direct loss and alteration of suitable habitat, and a drier, less suitable microclimate. Removing or cutting occupied vegetation can kill or injure fragile tree snails living on the leaves, branches, and stems of the plant. As development has increased in the Mariana Islands, associated infrastructure maintenance including along roads, utility lines, and rights-of-way has resulted in increased incidences of habitat clearing and degradation impacting partulid colonies (CNMI DFW 2021, p. 35; CNMI DFW 2022, p. 12; USFWS 2024, unpublished data).

New management actions:
- Monitoring and surveys – From 2017 through 2021, the Commonwealth of the Northern Mariana Islands (CNMI) Department of Lands and Natural Resources, Division of Fish and Wildlife (DFW) performed over 200 exploratory surveys on Saipan, Tinian, and Rota, targeting areas of suitable native forest or prior known occupancy, in an effort to locate additional partulid colonies for conservation. Despite these extensive surveys, no additional colonies were found (CNMI DFW 2021, pp. 4–8). Partulid habitat surveys were performed concurrently at the forest community scale, and a partulid management plan and New Guinea flatworm (*Platydemus manokwari*) survey protocol are in development. DFW conducted regular (near monthly) population counts from 2019 through 2023 at the only known remaining fragile tree snail colony in the CNMI, located on Rota. The population has exhibited a yearly declining trend since its peak of 37 adults and four juveniles in 2020, but has been reproductive throughout the survey period. In 2023, a maximum count of 13 adults and one juvenile was recorded. Disturbance in the area of the colony from ungulates, nonnative predators, and vegetation maintenance for utilities is likely contributing to the decline.
- Monitoring and surveys – Joint Region Marianas performed numerous exploratory and pre-development surveys throughout Department of Defense lands and adjacent properties, and provided updated population counts for two of the fragile tree snail colonies on military installations (NAVFAC Marianas 2021, p. 116; Sustainable Resources Group, International, Inc. 2023, p. 7). Quarterly monitoring surveys of the population at Naval Base Guam Naval Munitions Site began in the last quarter of 2022, and showed a decrease in the estimated population size through the third quarter of 2023 (Sustainable Resources Group, International, Inc. 2023, p. 17).
- Habitat restoration – An ungulate exclosure fence was installed around the Rota colony of fragile tree snails in 2021, but due to theft, vandalism, and damage from falling debris during Typhoon Mawar, the fence was non-operational by 2023, and is pending repair (CNMI DFW 2023, p. 7). The proposed ungulate exclosure fence at

Haputo Ecological Reserve Area (ERA) on Guam is partially constructed, and also awaiting repairs due to damage from Typhoon Mawar (USFWS 2020, p. 9; Loerzel 2024, in litt., entire).

- Predator control – A rodent control program using baited camera traps and scented lure traps began in 2021 at the Rota colony of fragile tree snails. Abundance surveys showed most traps were depleted of bait and fresh rodent carcasses were observed, demonstrating the traps were effective. An increase in the number of rodents was detected at the colony post-installation, but whether this was due to the use of baits, or within the normal range of variation in rodent abundance, is uncertain.

Table 1. Status and trends of the fragile tree snail from listing through current 5-year review.

Date	No. Adult Wild Individuals	Downlisting Criteria Identified in Recovery Plan	Downlisting Criteria Completed?
2015 (listing)	3 populations: 2 populations on Guam and 1 population on Rota	No recovery plan developed yet.	N/A
2020 (5-year review)	8 populations: 7 populations on Guam and 1 population on Rota	No recovery plan developed yet.	N/A
2023 (draft recovery plan)	9 populations: 8 populations on Guam and 1 population on Rota	1. At least 10 stable populations distributed across its historical range. To be considered stable, each population must number at least 400 observed individuals distributed across all age classes, and 6 of the 10 populations must maintain populations greater than 400 observed individuals for 3 consecutive years. If differences in morphology or genetics are determined to exist based on geography, each must be represented by at least one population.	No
		2. Each population in Downlisting Criterion 1 occurs in suitable habitat that is protected from development and invasive plants and animals	No

		(i.e., ungulate-free) and is managed to protect native forest vegetation.	
		3. Biosecurity measures are in place to prevent the introduction of new predators to Guam and Rota, as well as the spread of existing predators between the islands. The predation risk of each population in Downlisting Criterion 1 is evaluated and predators are absent or are controlled to a level where populations remain stable or increasing.	Partially; some biosecurity measures are in place to prevent the introduction of new predators to Guam and Rota, including inspections and canine detection dogs at ports of entry for brown treesnakes and other invasive species.
2024 (5-year review)	9 populations: 8 populations on Guam and 1 population on Rota	1. At least 10 stable populations distributed across its historical range. To be considered stable, each population must number at least 400 observed individuals distributed across all age classes, and 6 of the 10 populations must maintain populations greater than 400 observed individuals for 3 consecutive years. If differences in morphology or genetics are determined to exist based on geography, each must be represented by at least one population.	No
		2. Each population in Downlisting Criterion 1 occurs in suitable habitat that is protected from development and invasive plants and animals (i.e., ungulate-free) and is managed to protect native forest vegetation.	No
		3. Biosecurity measures are in place to prevent the introduction of new predators to Guam and Rota, as well as the	Partially; some biosecurity measures are in place to prevent

		spread of existing predators between the islands. The predation risk of each population in Downlisting Criterion 1 is evaluated and predators are absent or are controlled to a level where populations remain stable or increasing.	the introduction of new predators to Guam and Rota, including inspections and canine detection dogs at ports of entry for brown treesnakes and other invasive species.

Table 2. Threats to the fragile tree snail and ongoing conservation efforts.

Threat	Listing Factor	Current Status	Conservation/Management Efforts
Agricultural and urban development, military training	A	Increasing	Surveys prior to land clearing; avoidance and minimization measures to reduce or avoid impacts; ongoing development of the proposed Guam Island Wide Habitat Conservation Plan.
Invasive animals (ungulates)	A	Ongoing	Ungulate exclosure fences pending repairs and ungulate removal at the colonies in Haputo ERA and on Rota.
Invasive animals (brown treesnakes)	A	Ongoing	Research into control methods for landscape-level use.
Invasive animals (rats, shrews)	A, C	Ongoing	Rodent control traps at the colony on Rota.
Invasive invertebrates (ants), including predation	A, C	Potential	Little fire ant control efforts at Haputo ERA.
Invasive plants	A	Ongoing	None
Typhoons and climate change	A, E	Ongoing	None
Predation by invasive invertebrates (New Guinea flatworms, predatory snails)	C	Ongoing	None
Inadequate existing regulatory mechanisms	D	Ongoing	Enhanced coordination between USFWS and Guam Department of Agriculture, Division of Aquatic Resources (DAWR) and DFW, including the snail working group.
Wildfire	E	Ongoing	None

Land clearing	E	Increasing	Surveys prior to land clearing and vegetation maintenance; avoidance and minimization measures to reduce or avoid impacts.
Limited numbers	E	Ongoing	None

Syntheses:
Downlisting and delisting objectives are provided in the Draft Recovery Plan for 23 Species in the Mariana Islands (USFWS 2023, pp. x–xi, 49–52). To be downlisted, at least 10 stable populations of at least 400 observed individuals distributed across all age classes must be observed throughout Guam and Rota, and six of these populations must maintain a population of at least 400 observed individuals for three consecutive years. If differences in morphology or genetics are determined to exist based on geography, each must be represented by at least one population. The populations must be in suitable habitat protected from development and invasive plants and animals, and managed to protect native forest vegetation. In addition, predators must be absent or controlled to a level where these populations of fragile tree snails remain stable or increasing. The current range wide population of the species is estimated to be nine colonies throughout Guam and Rota. Seven colonies have population sizes less than 400 individuals, with six of the colonies numbering less than 60 individuals each. While two sites have recorded populations of 400 or more fragile tree snails, neither of these sites are in managed forest habitat, secure from future development or vegetation clearing, or protected from predatory New Guinea flatworms or other key threats to the species. Systematic, long-term monitoring of colonies has been absent in almost all locations except Rota. There are no populations of fragile tree snails known to be increasing at this time and no populations are known to meet the downlisting requirements. Therefore, the fragile tree snail continues to meet the definition of endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:
- Surveys and inventories – Two of the colonies on Guam have not been surveyed in over 10 years. To estimate the current population size island wide, we recommend resurveying the structure (age classes) and distribution of the fragile tree snail at these colonies. Long-term monitoring of the colonies on Guam is recommended to track trends and distribution of the colonies. The colony on Rota was regularly monitored between 2019 and 2023; as the only known population outside of Guam, continued close monitoring of the colony is imperative.
- Surveys and inventories – Exploratory surveys of suitable habitat are required to identify additional colonies sufficient in number and size to reach the population requirements of recovery criteria for the fragile tree snail.
- Surveys and inventories – Map the remaining habitat for the fragile tree snail and assess the severity of threats, including from development and wildfires, to the persistence of the species in these areas.
- Surveys and inventories – Track individual snails using telemetry to determine their activity patterns and ability to disperse.

- Surveys and inventories– Standardize recommended survey methodology and monitoring protocols for fragile tree snail colonies throughout the Mariana Islands.
- Research – Perform dietary studies for the fragile tree snail to determine what constitutes a high-quality habitat to meet the species' feeding needs. Assess what other microhabitat factors influence successful reproduction and distribution of the fragile tree snail.
- Research – Research to determine the best way to control or eradicate the New Guinea flatworm from essential fragile tree snail habitat will be critical to ensure the long-term persistence of the fragile tree snail.
- Conserve and enhance populations – At this time there are not sufficient colonies of number and size to support the population requirements needed to meet recovery criteria. Securing and managing the long-term conservation value of the remaining colonies, i.e., by conservation easements or landowner agreements, is recommended for the persistence of the species. Protect the colonies from wildfire, development, and invasive animals and plants modifying habitat and predating on the fragile tree snail.
- Regulatory protection – Facilitate or encourage regulations and policy under Territory of Guam and Commonwealth of the Northern Mariana Islands laws to ensure protection of the fragile tree snail and control of the threats of ungulates and wildfire to occupied recovery sites.
- Regulatory protection – Facilitate or encourage comprehensive land use planning in the Mariana Islands, such as habitat conservation plans, conservation benefit agreements, fire management plans, and other conservation and restoration initiatives, to generate long-term commitments and partnerships for the recovery of the fragile tree snail.

References:

See previous 5-year reviews for additional references.

[CNMI DFW] Commonwealth of the Northern Mariana Islands, Division of Fish and Wildlife. 2021. State Wildlife Grant Program Final Performance Report 2017–2021. Preventing Island Extirpations of Partulid Tree Snails Through Direct Management: F17AP00151. 44 pp.

[CNMI DFW] Commonwealth of the Northern Mariana Islands, Division of Fish and Wildlife. 2022. State Wildlife Grant Program Interim Performance Report Fiscal Year 2022. Preventing Extirpation of Partulid Snails Through Direct Management: F21AP01799. 13 pp.

[CNMI DFW] Commonwealth of the Northern Mariana Islands, Division of Fish and Wildlife. 2023. State Wildlife Grant Program Interim Performance Report Fiscal Year 2023. Preventing Extirpation of Partulid Snails Through Direct Management: F21AP01799. 13 pp.

[NAVFAC Marianas] Naval Facilities Engineering Command Marianas. 2019a. Biomonitor Support for Natural Resource Management Surveys at Joint Region

Marianas Area of Responsibility. Cooperative Agreement N40192-17-R-8005. 86 pp.

[NAVFAC Marianas] Naval Facilities Engineering Command Marianas. 2019b. Biomonitor Support for Natural Resource Management Surveys at Joint Region Marianas Area of Responsibility (Partulid Snail Survey Methods). Cooperative Agreement N40192-17-2-8005. 44 pp.

[NAVFAC Marianas] Naval Facilities Engineering Command Marianas. 2021. Joint Region Marianas Integrated Natural Resources Management Plan Summary of 2021 Projects, Guam Report. 210 pp.

[RASP] Recovery and Sustainment Partnership Initiative. 2023. *Tuberolabium guamense* Summary Report: September 2019–August 2020. 8 pp.

Sustainable Resources Group, International, Inc. 2023. ESA-Listed Snail Survey and Monitoring at Naval Base Guam Naval Munitions Site and Haputo Ecological Reserve Area, Guam. 3 pp.

[USFWS] U.S. Fish and Wildlife Service. 2020. 5-year review for the fragile tree snail (*Samoana fragilis*). Pacific Islands Fish and Wildlife Office, Pacific Islands Interior Region 1, Honolulu, Hawaii. 15 pp.

[USFWS] U.S. Fish and Wildlife Service. 2023. Recovery Plan for 23 Species in the Mariana Islands. Portland, Oregon. xiv+102 pp.

In Litteris

Loerzel, A. 2024. Email correspondence from Adrienne Loerzel, Naval Facilities Engineering Command Marianas, to Cristian Cayanan, U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, regarding ungulate fencing in Haputo Ecological Reserve Area, Guam. June 13, 2024. 1 p.

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW on Fragile Tree Snail (Akaleha', *Samoana fragilis*)

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
____X____ No Change in listing status

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