5-YEAR REVIEW

Short Form Summary

Species Reviewed: Guam Tree Snail (Akaleha', *Partula radiolata*)

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 Guam tree snail (akaleha', *Partula radiolata*) (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/1530*.

Review Analysis:

Please refer to the Recovery Plan for 23 Species in the Mariana Islands (USFWS 2023, entire) and the previous 5-year review for the Guam tree snail published on August 7, 2020 (available at *https://ecos.fws.gov/ecp/species/1530*), 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 Guam tree snail as endangered.

The Guam tree snail is a small land snail endemic to the island of Guam. The adult shells are a pale straw color with brown axial rays, five whorls, and a blunt spire, and grow up to 0.8 inches (19 millimeters) long and 0.5 inches (12 millimeters) wide (Smith et al. 2008, p. 4). The Guam tree snail is found throughout Guam on the undersides of large leaves of both native and introduced trees, shrubs, herbaceous plants, and occasionally ferns, such as *Pandanus dubius*, *Annona reticulata*, *Morinda citrifolia*, *Artocarpus altilis*, *Hibiscus tiliaceus*, and *Cocos nucifera*. No clear obligate relationship with any vegetation has been identified for the Guam 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. Guam 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 (Lindstrom and Benedict 2014, p. 175; DAWR 2019, p. 130).

The lifespan of the Guam 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). Guam 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. A reproductive Guam tree snail has on average over four eggs or juveniles in the brood pouch, and a weekly birth rate of 0.172 births per adult (Bick et al. 2018, pp. 6–7).

New status information:

- The most recent minimum population estimate of the Guam tree snail is approximately 50 occurrences; at some of the sites one or two snails have been observed, and at other sites the colonies number in the hundreds or thousands (USFWS 2024, unpublished data). Surveys are generally performed prior to an intended land clearing or other land use conversion, and therefore most sites are not re-surveyed or monitored systematically over time. Accurate counts of Guam tree snails are difficult due to their low detectability, small size, and often cryptic behavior in dry and hot weather conditions. While observations of only a few individuals may indicate the presence of an undetected larger group, they may also be the remnants of a once larger, contiguous population, particularly where threats such as observed predation by the invasive New Guinea flatworm (*Platydemus manokwari*) are prevalent.

New threats:

- Land clearing – Clearing land of vegetation and vegetation maintenance (pruning and trimming of trees and shrubs) in areas occupied by the Guam 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 Guam tree snails living on the leaves, branches, and stems of the plant. As development has increased in the Mariana Islands, associated infrastructure maintenance, including roadways, 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).

- 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 management actions:

- Monitoring and surveys – Joint Region Marianas performed numerous exploratory and pre-development surveys throughout Department of Defense lands and adjacent properties. Three large colonies numbering in the thousands were reported at Tarague, San Luis, and Sasa Valley, and smaller counts were reported at colonies of less than 200 individuals on Andersen Air Force Base, Castro Beach, and near Mati (NAVFAC Marianas 2021, pp. 109–116; NAVFAC Marianas 2022, pp. 108–109).
- Habitat restoration – The proposed ungulate exclosure fence at Haputo ERA on Guam is partially constructed and awaiting repairs due to damage from Typhoon Mawar (USFWS 2020, p. 9; Loerzel 2024, in litt., entire).
- Invasive species control – Comprehensive invasive species control for brown treesnakes (*Boiga irregularis*), little fire ants (*Wasmannia auropunctata*), and other invasive species is proposed by the National Park Service to begin in 2024 at War in the Pacific National Historic Park, Asan Beach Unit, which will reduce these threats to the Guam tree snails in the park and promote native forest restoration (NPS 2024, entire).
- Invasive species control – Little fire ant treatment and control efforts began in 2022 on Marine Corps Base Camp Blaz (MCBCB) Urban Training Complex at Andersen South around a colony of approximately 131 Guam tree snails (USFWS 2022, entire).
- Translocation – Post-Typhoon Mawar in June 2023, USFWS and National Park Service staff collected and translocated 936 surviving Guam tree snails from downed vegetation along Beach Road in the Guam National Wildlife Refuge, Ritidian Unit to nearby suitable vegetation within the Refuge (Mizerek 2023, in litt., entire).

Table 1. Status and trends of the Guam 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)	26 populations or fewer	No recovery plan developed yet.	N/A
2020 (5-year review)	50 populations or fewer	No recovery plan developed yet.	N/A
2023 (recovery plan)	50 populations or greater	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	No

		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.	
		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. 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, including inspections and canine detection dogs at ports of entry for brown treesnakes and other invasive species.
2024 (5-year review)	50 populations or greater	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	No

		represented by at least one population.	
		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. 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, including inspections and canine detection dogs at ports of entry for brown treesnakes and other invasive species.

Table 2. Threats to the Guam 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 fence pending repairs and ungulate removal at Haputo Ecological Reserve Area (ERA).
Invasive animals (brown treesnakes)	A	Ongoing	Research into control methods for landscape-level use.
Invasive animals (rats, shrews)	A, C	Ongoing	None

Invasive invertebrates (ants), including predation	A, C	Potential	Little fire ant control efforts are ongoing at Haputo ERA and MCBCB Urban Training Complex at Andersen South.
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 and Wildlife Resources (DAWR), including the snail working group.
Wildfire	E	Potential	None
Land clearing	E	Increasing	Surveys prior to land clearing and vegetation maintenance; avoidance and minimization measures to reduce or avoid impacts.

Synthesis:

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 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 Guam tree snails remain stable or increasing. The current range wide population of the species is estimated to be approximately 50 colonies throughout Guam, numbering from a few individuals to thousands per colony. While five sites have reported populations of 400 or more Guam tree snails, none 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. Most surveys report small colony counts of less than 100 individuals (USFWS 2024, unpublished data). We know of no Guam tree snail colonies that are systematically monitored. There are no populations of Guam tree snails known to be stable or increasing at this time and no populations are known to meet the downlisting requirements. Therefore, the Guam 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 – Estimate the current population size island wide, and the structure (age classes) and distribution of the Guam tree snail within each colony site. Establish long-term monitoring sites, tracking trends and distribution of the colonies.
- Surveys and inventories – Map the remaining habitat for the Guam tree snail and assess the severity of threats, including development and wildfires, to the persistence of the species in these areas.
- Surveys and inventories – Identify the degree of diversity within and between populations to assess the genetic connectivity throughout Guam.
- 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 Guam tree snail colonies throughout Guam.
- Research – Perform dietary studies for the Guam 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 Guam tree snail.
- Research – Research to determine the best way to control or eradicate the New Guinea flatworm from essential Guam tree snail habitat will be critical to ensure the long-term persistence of the Guam tree snail.
- Conserve and enhance populations – Select colonies of sufficient number and size to support the population requirements needed to meet recovery criteria. Secure and manage the long-term conservation value of the colonies, i.e., by conservation easements or landowner agreements. Protect the colonies from wildfire, development, and invasive animals and plants modifying habitat and predating on the Guam tree snail.
- Regulatory protection – Facilitate or encourage regulations and policy under Territory of Guam laws to ensure protection of the Guam 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 Guam, 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 Guam tree snail.

References:

See previous 5-year reviews for additional references.

Bick, C.S., P. Pearce-Kelly, T. Coote, and D. Ó. Foighil. 2018. Survival among critically endangered partulid tree snails is correlated with higher clutch sizes in the wild and higher reproductive rates in captivity. Biological Journal of the Linnean Society:1–13.

[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.

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

[NAVFAC Marianas] Naval Facilities Engineering Command Marianas. 2022. Joint Region Marianas Integrated Natural Resources Management Plan Summary of 2022 Projects, Guam Report. 216 pp.

[NPS] National Park Service. 2024. Biological Assessment for Invasive Predator Control for Native Species Restoration in the War in the Pacific National Historic Park, Asan Beach Unit. 45 pp.

Smith, B.D., R. Cooper-Nurse, and A.M. Gawel. 2008. Survey of endangered tree snails on Navy-owned land in Guam. University of Guam Marine Laboratory Technical Report 125. 22 pp.

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

[USFWS] U.S. Fish and Wildlife Service. 2022. Informal section 7 consultation for little fire ant eradication, Marine Corps Base Camp Blaz Urban Training Complex (Andersen South), Guam. March 14, 2022. 7 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.

Mizerek, T. 2023. Email correspondence from Dr. Toni Mizerek, U.S. Fish and Wildlife Service, Guam National Wildlife Refuge, to Jacqueline Flores, U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, regarding relocation of snails in Guam National Wildlife Refuge after Typhoon Mawar. June 25, 2023. 1 p.

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW on Guam Tree Snail (Akaleha', *Partula radiolata*)

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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For **Field Supervisor, Pacific Islands Fish and Wildlife Office**

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