

5-YEAR REVIEW

Short Form Summary

Species Reviewed: Humped Tree Snail (Akaleha', *Partula gibba*)

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 humped tree snail (akaleha', *Partula gibba*) (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/61>.

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 humped tree snail published on August 7, 2020 (available at <https://ecos.fws.gov/ecp/species/61>) 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 humped tree snail as endangered.

The humped tree snail is a small land snail endemic to Guam, Rota, Aguiguan, Tinian, Saipan, Anatahan, Sariguan, Alamagan, and Pagan, in the Mariana Islands. The translucent shell is an ovate-conical shape with four and a half whorls that spiral to the left or right and meet in milky white sutures. The last whorl by the aperture is the largest. Shell color ranges from white to orange, brown, or purple, marked longitudinally with

equal lines, with a pointed apex. Adult length is 0.6 to 0.7 inches (14 to 18 millimeters), and width 0.4 to 0.6 inches (10 to 14 millimeters). The humped tree snail is found on the undersides of large leaves of mostly native and some introduced trees, shrubs, herbaceous plants, and ferns, including *Piper guamensis*, *Microsorium punctatum*, *Barringtonia asiatica*, *Mammea odorata*, *Hernandia sonora*, *Ochrosia oppositifolia*, and *Cocos nucifera*. No clear obligate relationship with any vegetation has been identified for the humped tree snail, which consumes a diet of fungi and microalgae. The species is found in colonies ranging in size from tens to hundreds of individuals in cool, shaded forest habitat and a microclimate of high humidity and reduced air movement that prevent excessive water loss. Humped 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 humped 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). Humped 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. 5), predominately outbreeding but also capable of self-fertilizing. Reproductive humped tree snails from the Saipan population were found to have on average a weekly birth rate of 0.2 births per adult (Bick et al. 2018, p. 6).

New status information:

- The most recent minimum population estimate of the humped tree snail is 15 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. The largest counts of the humped tree snail are found at the last remaining population on Guam at the Haputo Ecological Reserve Area (ERA), where over 900 snails were recorded in 2022, and Sariguan, where several thousand humped tree snails were estimated to occur in 2010 (Hadfield 2010, p. 21; Sustainable Resources Group, International, Inc. 2023, p. 7). The population on Pagan was also last surveyed in 2010, when approximately 346 humped tree snails were detected (Hadfield 2010, pp. 8–14). In 2022, systematic searches of a historic colony location on Tinian found a total of 43 juvenile and adult humped tree snails, the first positive detection of the species on Tinian since 2013. Notably, the site was searched on four occasions through the year, but snails were detected during only two of the visits (Sundance Consulting Inc. 2023, pp. 10–15). On Saipan, no snails have been detected at American Memorial Park since before a typhoon in 2015 destroyed the vegetation and likely extirpated the colony. The last remaining known occupied site on Saipan has also been subject to disturbance from roadside vegetation maintenance and a single individual was last detected in 2019 (CNMI DFW 2021, p. 4). There are 9 humped tree snail colonies known on Rota, including one colony first recorded in 2020 from information provided by a landowner, and a newly discovered

colony found along Rota's northern coast in 2023. All of the colonies on Rota remain reproductive and monthly counts fluctuate from a few individuals up to several hundred individuals per site, except for one small colony in Ilek for which no detections were made by 2023 (CNMI DFW 2021, entire; CNMI DFW 2022a, entire; CNMI DFW 2023, p. 7). One small population is known on Alamagan (CNMI DFW 2022b, pp. 15–16). We therefore estimate one population each on Guam, Tinian, Saipan, Sariguan, Alamagan, and Pagan, and 9 populations on Rota. Most humped tree snail occurrences are narrowly dispersed, and only single colonies are known on all occupied islands except for Rota. Should the humped tree snail colonies on Rota be recognized as a separate species based on genetic data (see USFWS 2020, p. 6), the remaining population of humped tree snails across the Mariana Islands would be very limited.

- 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 humped 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 humped 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. During 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 most of the known humped tree snail colonies on Saipan and Rota.
- Monitoring and surveys – Joint Region Marianas performed numerous exploratory and pre-development surveys throughout Department of Defense lands and adjacent properties, and provided an updated population count for the humped tree snail colony at the Haputo ERA (Sustainable Resources Group, International, Inc. 2023, p. 7). Quarterly monitoring surveys of the population began in the last quarter of 2022, and showed a marked decrease in observed individuals through the third quarter of

2023 after Typhoon Mawar struck Guam (Sustainable Resources Group, International, Inc. 2023, p. 17–24).

- 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).
- Predator control – A rodent control program using baited camera traps and scented lures began in 2021 at the humped tree snail colonies at Ilek and Lalayak on Rota. Abundance surveys showed most traps were depleted of bait, and overall, a decrease in the number of rodents was detected by the second year of camera monitoring post-trap installation.

Table 1. Status and trends of the humped 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)	13 populations or fewer range wide	No recovery plan developed yet.	N/A
2020 (5-year review)	13 populations or fewer range wide	No recovery plan developed yet.	N/A
2023 (recovery plan)	7 populations in Guam, Rota, Tinian, Saipan, Sariguan, Alamagan, and Pagan	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)	No

		and is managed to protect native forest vegetation.	
		3. Biosecurity measures are in place to prevent the introduction of new predators to the Mariana Islands, as well as the spread of existing predators to new 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 and from Guam and to Rota and Saipan, including inspections and canine detection dogs at ports of entry for brown treesnakes and other invasive species.
2024 (5-year review)	<p>15 populations: Guam (1 population of approximately 900 individuals)</p> <p>Rota (9 populations, ranging in size from a few individuals to >600 individuals)</p> <p>Tinian (1 population of approximately 43 individuals)</p> <p>Saipan (1 population of approximately ≤ 1 individual)</p> <p>Sariguan (1 population,</p>	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

	<p>estimated >1,000)</p> <p>Alamagan (1 population of 35 individuals)</p> <p>Pagan (1 population of approximately 346 individuals)</p>		
		<p>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.</p>	<p>No</p>
		<p>3. Biosecurity measures are in place to prevent the introduction of new predators to the Mariana Islands, as well as the spread of existing predators to new 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.</p>	<p>Partially; some biosecurity measures are in place to prevent the introduction of new predators to and from Guam and to Rota and Saipan, including inspections and canine detection dogs at ports of entry for brown treesnakes and other invasive species.</p>

Table 2. Threats to the humped 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.
Invasive animals (ungulates)	A	Ongoing	Ungulate exclosure fence pending repairs and ungulate removal at Haputo ERA.
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 two colonies 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	Potential	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

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 the humped tree snail’s historical range, 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 humped tree snails remain stable or increasing. The current range wide population of the humped tree snail is estimated to be 15 colonies in Guam, Rota, Tinian, Saipan, Sariguan, Alamagan, and Pagan, numbering from a few individuals to thousands per colony. Recent surveys have reported populations of 400 or more humped tree snails at the colony on Guam, and two colonies on Rota. Additionally, the colony on Sariguan was reported in 2010 to contain thousands of individuals, but follow up surveys are required to verify the colony's current condition. Systematic, long-term monitoring of colonies has been absent in almost all locations except Rota. Once the most abundant tree snail in the Mariana Islands, the humped tree snail is now found in only one colony on most of the islands in its historic range, and it is unknown if the species persists on Aguiguan, Saipan, and Anatahan. Currently, no humped tree snail colonies occur 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. No populations are known to meet the downlisting requirements. Therefore, the humped 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 – Aguiguan, Anatahan, Sariguan, and Pagan have not been surveyed in over 10 years. To estimate the current population size range wide, we recommend resurveying the structure (age classes) and distribution of the humped tree snail at these colonies. Long-term monitoring of known populations is recommended to track trends and distribution of the colonies.
- 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 humped tree snail.
- Surveys and inventories – Map the remaining habitat for the humped 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 – Identify the degree of diversity within and between populations to assess the genetic connectivity throughout the species' range (see previous genetic work on humped tree snails on Rota by Sischo and Hadfield (2017) in USWFS 2020, p. 6). Priority should be given to determine diversity within the Rota populations to assess species identity.
- Surveys and inventories– Standardize recommended survey methodology and monitoring protocols for humped tree snail colonies throughout the Mariana Islands.
- Research – Perform dietary studies for the humped 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 humped tree snail.

- Research – Research to determine the best way to control or eradicate the New Guinea flatworm from essential humped tree snail habitat will be critical to ensure the long-term persistence of the humped tree snail.
- Conserve and enhance populations – At this time there are not sufficient colonies of 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 predated on the humped 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 humped 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 humped 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.

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

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- Sundance Consulting, Inc. 2023. Final Report for Endangered Snail Monitoring on the Tinian Military Lease Area, Tinian. 101 pp.
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- [USFWS] U.S. Fish and Wildlife Service. 2020. 5-year review for the humped tree snail (*Partula gibba*). Pacific Islands Fish and Wildlife Office, Pacific Islands Interior Region 1, Honolulu, Hawaii. 15 pp.
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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 Humped Tree Snail (Akaleha', *Partula gibba*)

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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