5-YEAR REVIEW

Short Form Summary

Species Reviewed: Paye'ye' (Pacific sheath-tailed bat, *Emballonura semicaudata rotensis*)

Current Classification: Endangered

FR Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2023. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status Reviews for 133 Species in Oregon, Washington, Idaho, Montana, California, Nevada, Hawaii, Guam, and the Commonwealth of the Northern Mariana Islands. Federal Register 88(56):17611–17614.

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

Name of Reviewer(s):

Bronson Curry, 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 January 2025. The review was based on a review of current, available information since the last 5-year review for the paye'ye' (Pacific sheath-tailed bat, *Emballonura semicaudata rotensis*) (USFWS 2020, entire). The evaluation by Bronson Curry, 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/1919.

Review Analysis:

Please refer to the Recovery Plan (USFWS 2023a, entire) and the previous 5-year review for the paye'ye', published in 2020 (available at https://ecos.fws.gov/ecp/species/1919), 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 paye'ye' as endangered.

The paye'ye' is a subspecies of the Pacific sheath-tailed bat (*Emballonura semicaudata*), a cave-roosting, insectivorous bat distributed throughout multiple island groups in the Pacific (USFWS 2023b, p. 3). It is the only species of insectivorous bat known to inhabit the Mariana Islands. Historically documented on the islands of Guam, Rota, Tinian, and

Saipan, the paye'ye' is presently found only on the island of Aguiguan in the Commonwealth of the Northern Mariana Islands (CNMI), where it occurs as a single population inhabiting multiple caves in the western part of Aguiguan (USFWS 2023b, p. 26), which it shares with another cave-roosting species, the yayaguak or Mariana swiftlet (*Aerodramus bartschi*).

Aguiguan is also known locally as Goat Island due to the large number of feral goats (*Capra aegagrus hircus*) that roam freely throughout the island. Overgrazing by goats has contributed to the degradation of native forests on Aguiguan and likely inhibits the regrowth of forested habitat that was converted to agricultural land in the early decades of the 20th century (USFWS 2023b, pp. 15–16). Although no permanent settlements exist on Aguiguan today, historical land use patterns have resulted in the conversion of a large portion of the central plateau to thickets of invasive lantana plants (*Lantana camara*), which have been associated with declines in the paye'ye' population (Welch et al. 2016, in USFWS 2023b, p. 15).

New status information:

- The most recent minimum population estimate is approximately 620 individuals (USGS-PIERC 2022, p. 5) in one population on Aguiguan, which is substantially higher than previously reported observations of 359 (Wiles et al. 2011, p. 301), 323 (Liske-Clark et al. 2018, p. 7), and 322 individuals (Roark et al. 2022, p. 6). However, it should be noted that cave surveys on Aguiguan are infrequent and usually limited by logistical constraints to a subset of inhabited caves. As a result, paye'ye' population size estimates are based on a small number of surveys that do not assume complete representation of the entire population and should be approached with caution when inferring overall population numbers. The current figure is based on preliminary results from experimental videographic surveys (USGS-PIERC 2022, p. 5) and may change once the data have been fully analyzed.

- The CNMI Division of Fish and Wildlife (CNMI DFW) visited Aguiguan four times between February 2021 and June 2022. Seven out of 13 caves inspected were confirmed to be occupied by paye'ye' on at least one occasion (CNMI DFW 2022b, p. 6).

- Researchers from the U.S. Geological Survey (USGS) and CNMI DFW surveyed twelve caves on Aguiguan, June 6–14, 2022, to evaluate the use of videographic monitoring tools for paye'ye' and yayaguak on Aguiguan (USGS-PIERC 2022, p. 1). The methods tested included thermal imaging, near-infrared imaging, acoustic sampling, and the standard method of entrance/exit counts by observers stationed outside the cave entrance. Six of the twelve caves surveyed were confirmed to be used by paye'ye' (USGS-PIERC 2022, pp. 5–6). Preliminary results show that a one-hour exit count using thermal imaging recorded 620 bats emerging from the cave; by comparison, three human observers stationed outside recorded a total of 552 bats during the same time frame (USGS-PIERC 2022, p. 5). Additional survey data were collected simultaneously using near-infrared cameras and acoustic recorders, which

will be analyzed to determine whether these low-cost, open-source alternatives to thermal imaging can produce similarly reliable and replicable results.

New threats:

- There are no new threats known at this time.

New management actions:

- Habitat restoration – A habitat restoration project involving removal of invasive lantana plants, outplanting of native trees, and installation of fencing to exclude goats from outplanted areas was conducted between 2022 and 2023. This project was funded by the U.S. Department of Defense as a condition of USFWS's 2015 Mariana Islands Testing and Training (MITT) Biological Opinion. It was designed by the USFWS and implemented in partnership with the Tinian Mayor's Office (Willsey 2025, pers. comm.).

- Research – CNMI DFW conducted an assessment of cave environments on Aguiguan and Rota to inform a possible future translocation of paye'ye' and/or yayaguak to Rota (CNMI DFW 2022b, entire). A candidate release site on Rota was identified in 2020, and dataloggers were placed inside the cave to measure ambient temperature and humidity from approximately June 2020 to July 2022. Dataloggers were also placed inside three caves on Aguiguan, recording from approximately February to July 2022, although the datalogger inside one of the caves was lost after July 2021 (CNMI DFW 2022b, p. 6).

- Research – CNMI DFW proposed a genetic study to inform a possible future translocation of paye'ye' from Aguiguan to Rota, using fresh guano samples from roosting bats to avoid the risks associated with capturing bats for sample collection. However, this approach was infeasible due to the difficulty of accessing inhabited caves where samples could be collected (CNMI DFW 2022b, p. 16). Future efforts to collect genetic material are expected to require a capture and handling permit (CNMI DFW 2022b, p. 17).

- Research – CNMI DFW conducted an insect prey availability and abundance study to inform a possible future translocation of paye'ye' and/or yayaguak from Aguiguan to Rota. Samples were collected on Aguiguan, Saipan, and Rota from approximately February 2021 to June 2022, using a combination of Malaise traps, ultraviolet light traps, and hand capture (CNMI DFW 2022c, p. 4). A total of 1176 samples were collected, from which 217 species have been identified so far; many samples are still awaiting processing and classification (CNMI DFW 2022c, pp. 4, 8).

- Research – CNMI DFW plans to develop an environmental assessment to inform a possible future translocation of paye'ye' and/or yayaguak from Aguiguan to Rota (CNMI DFW 2022a, p. 4).

Table 1. Status and trends of paye'ye' from listing through current 5-year review.

Date	No. Adult Wild Individuals	Downlisting Criteria Identified in Recovery Plan	Downlisting Criteria Completed?
2015 (listing)	Insufficient data	No published recovery plan	NA
2020 (five-year review)	Insufficient data	No published recovery plan	NA
2023 (recovery plan)	Insufficient data	1. 3 stable populations on at least 2 islands with at least 500 individuals in each population for 10 years.	No
		2. Roosts and habitat supporting Downlisting Criterion 1 are protected.	No
		3. Threats to the populations in Downlisting Criterion 1 are evaluated and are found to be absent or controlled to a level where the species is able to maintain stable to growing populations.	No
2025 (five-year review)	Approximately 620 individuals (USGS-PIERC 2022, p. 5)	1. 3 stable populations on at least 2 islands with at least 500 individuals in each population for 10 years.	No
		2. Roosts and habitat supporting Downlisting Criterion 1 are protected.	No
		3. Threats to the populations in Downlisting Criterion 1 are evaluated and are found to be absent or controlled to a level where the species is able to maintain stable to growing populations.	No

Table 2. Threats to the paye'ye' and ongoing conservation efforts.

Threat	Listing Factor	Current Status	Conservation/Management Efforts
Agricultural and urban development, military training	A	Ongoing	While these threats are not present on Aguiguan, they exist elsewhere in the species' historic range and may present an obstacle to future translocation efforts.
Invasive animals (ungulates)	A	Ongoing	None
Invasive animals (rodents)	A, C	Ongoing	None
Invasive animals (brown treesnake)	A, C	Ongoing	Routine brown treesnake inspection of vessels departing Guam is common, and research into landscape-level control methods for brown treesnakes is ongoing.
Invasive plants (invasion of intact habitat)	A	Ongoing	A 2022–2023 habitat restoration project resulted in some removal of invasive plants and reforestation; see above, under "New management actions".
Typhoons	A	Ongoing	None
Climate change	A, E	Ongoing	None
Inadequate existing regulatory mechanisms	D	Ongoing	
Predation by cats	E	Ongoing	While there are no reports of feral cats (*Felis catus*) on Aguiguan, they exist elsewhere in the species' historic range and may present an obstacle to future translocation efforts.
Pesticides	E	Ongoing	While there is no active pesticide use on Aguiguan, it is used elsewhere in the species' historic range and may present an obstacle to future translocation efforts.
Limited numbers	E	Ongoing	
Roost disturbance	E	Ongoing	

Synthesis:
The current global population of the species is unknown, and only one population (inhabiting a network of caves on the island of Aguiguan) is known to occur within its range with the most recent estimate ranging up to 620 individuals. Key threats to the species include agricultural development and pesticide use, loss or degradation of foraging habitat due to invasive ungulates, inadequate existing regulatory mechanisms, and low numbers.

Downlisting and delisting objectives are provided in the recovery plan for the paye'ye' (USFWS 2023a, pp. 41–42). To be downlisted, there must be at least three stable or increasing populations of paye'ye' with consistently occupied roosts on two or more islands. To be considered stable, a population must number at least 500 individuals over a 10-year period. Roosts and surrounding forest habitat that contribute to Downlisting Criterion 1 must be protected from development and the impacts of habitat-altering invasive species, including ungulates. Long-term management commitments must be in place to maintain the quality and quantity of foraging and roosting habitat. Finally, threats to these populations—including predation, habitat alteration, and pesticides—must be evaluated and found to be absent or sufficiently controlled to enable the species to maintain stable to growing populations.

To be delisted, there must be at least six stable or increasing populations of paye'ye' with consistently occupied roosts on three or more islands. To be considered stable, a population must number at least 500 individuals over a 10-year period. Roosts and surrounding forest habitat that contribute to Delisting Criterion 1 must be protected from development and the impacts of habitat-altering invasive species, including ungulates. Long-term management commitments must be in place to maintain the quality and quantity of foraging and roosting habitat. Threats to these populations—including predation, habitat alteration, and pesticides—must be evaluated and found to be absent or sufficiently controlled to enable the species to maintain stable to growing populations. Finally, a management plan must be developed and implemented to ensure the long-term protection of habitat supporting the six populations.

Although the minimum population estimate has increased since the previous five-year review, surveys of paye'ye' on Aguiguan are logistically challenging and often limited to the most accessible caves. More consistent surveys that cover a larger proportion of roosting habitat are required, and these surveys must be repeated over a period of several years in order to obtain the population trend data needed to assess the species' progress toward recovery. Because reliable estimates of population size are unavailable, and because threats are not being managed, there are no known populations of paye'ye' that meet the downlisting requirements. Therefore, the paye'ye' continues to meet the definition of endangered, as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

- Predator/ungulate management and control – Develop and implement management programs for any invasive vertebrate predators that occur on Aguiguan or near potential translocation sites on Rota. This might include removal trapping or other

forms of lethal control for rats and cats or enhanced brown treesnake interdiction efforts at ports on Rota and Tinian. Investigate the diet of monitor lizards (*Varanus tsukumotoi*) on Aguiguan to determine whether this species should be considered a significant predator of paye'ye.

- Ungulate management and control – Develop and implement management of feral ungulates on Aguiguan. Complete eradication of the feral goat population may be necessary to facilitate habitat restoration projects and natural regeneration of native plants.

- Habitat restoration – Design and implement habitat restoration projects to remove and control the further spread of invasive plants on Aguiguan. Plant native forest species and protect outplantings by controlling or excluding ungulates.

- Habitat degradation and loss – Control and monitor land clearing on Aguiguan and prevent wildfires in order to preserve native forest habitat. Strictly limit any application of pesticides on Aguiguan to ensure that the paye'ye' and its prey base are not exposed to toxic chemicals.

- Disease monitoring and control – Implement appropriate measures to avoid accidental introduction of fungal pathogens or other potential sources of disease to paye'ye' roosts on Aguiguan or future translocation sites.

- Surveys/inventories – Conduct genetic studies to refine the taxonomic status of the paye'ye' relative to other subspecies of *Emballonura semicaudata* and determine whether there is sufficient genetic diversity in the Aguiguan population to support future translocation efforts.

- Surveys/inventories – Identify potential translocation sites on Rota or other islands and conduct investigations to determine their suitability. Develop a translocation strategy and written plan with input from subject matter experts.

References:
See previous 5-year reviews for additional references.

[CNMI DFW] Commonwealth of the Northern Mariana Islands (CNMI) – Division of Fish and Wildlife (DFW). 2021. Wildlife Restoration Grant Program Project Proposal: Mariana Cave Characteristics and Swiftlet/Bat Occupancy on Aguiguan and Rota. Saipan, CNMI. 7 pp.

[CNMI DFW] Commonwealth of the Northern Mariana Islands (CNMI) – Division of Fish and Wildlife (DFW). 2022a. Wildlife Restoration Grant Program, Interim Performance Report: Environmental Assessment for Mariana Swiftlet and Pacific Sheath-tailed Bat Reintroductions to Rota (F19AF00971). Saipan, CNMI. 4 pp.

[CNMI DFW] Commonwealth of the Northern Mariana Islands (CNMI) – Division of Fish and Wildlife (DFW). 2022b. Wildlife Restoration Grant Program, Final Performance Report: Cave Characteristics and Swiftlet/Bat Occupancy on Aguiguan and Rota (F19AF00973). Saipan, CNMI. 17 pp.

[CNMI DFW] Commonwealth of the Northern Mariana Islands (CNMI) – Division of Fish and Wildlife (DFW). 2022c. Wildlife Restoration Grant Program, Final Performance Report: Insect Prey & Prey Abundance for the Mariana Swiftlet and Pacific Sheath-Tailed Bat (F20AF12001). Saipan, CNMI. 12 pp.

Roark, E., J. Guilbert, E. Kohler, J. Atalig, L.R. Sablan, C. Mendiola, B.A. Eichelberger, and S. Mullin. 2022. A rapid assessment of cave occupancy for Pacific sheath-tailed bats (fanihin ganas, *Emballonura semicaudata rotensis*) and Mariana swiftlets (chachaguak, *Aerodramus bartschi*) on Aguiguan, Mariana Islands. Micronesica 2022:1–10.

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

[USFWS] U.S. Fish and Wildlife Service. 2023b. Species report for the Pacific sheath-tailed bat (*Emballonura semicaudata rotensis*). Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii. 42 pp.

[USGS-PIERC] U.S. Geological Survey (USGS) – Pacific Island Ecosystems Research Center (PIERC). 2023. Summary of Research Activities: Population assessments of the endangered Pacific sheath-tailed bat (*Emballonura semicaudata rotensis*) and Mariana swiftlet (*Aerodramus bartschi*) on Aguiguan. 24 pp.

Personal Communications

Willsey, T.P. 2025. U.S. Fish and Wildlife Service. Description of lantana removal project implementation on Aguiguan. July 3, 2025.

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW on paye'ye' (Pacific sheath-tailed bat, *Emballonura semicaudata rotensis*)

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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