
Photo: USFWS

Terrestrial Mammal

ʻŌpeʻapeʻa or Hawaiian hoary bat

Lasiurus cinereus semotus

SPECIES STATUS:
Federally Listed as Endangered
State Listed as Endangered
State Recognized as Indigenous NatureServe Heritage Rank G5/T2 – Species Secure/Subspecies Imperiled
Recovery Plan for the Hawaiian Hoary Bat – USFWS 1998

SPECIES INFORMATION: The ʻōpe ʻape ʻa, or Hawaiian hoary bat (Family: Vespertilionidae), is Hawaiʻi ʻs only native terrestrial mammal, although sub-fossil evidence indicates that at least one other bat species was native to the islands. Following genetic markers, the hoary bat may have dispersed to the Hawaiian Islands from the mainland one to two times (Baird et al. 2015; Pinzari et al. 2020). The first emigrant may have arrived approximately ten thousand years ago, and the more recent emigrant arrived an estimated 600 years ago (Russell et al. 2015). Alternatively, one migration event occurred to the island of Maui and, from Maui, hoary bats dispersed to the other islands. This document recognizes ʻōpeʻapeʻa as a single species (*Lasiurus semotus*) with geographic separation on each island (Pinzari, et al. 2023).

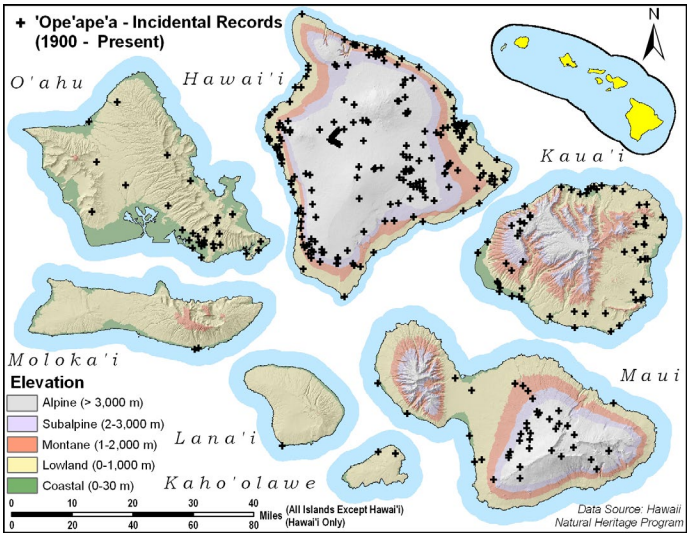
Both sexes have a coat of brown and gray fur. Individual hairs of the coat are tipped or frosted with white; hence the name "hoary" which means frosted. The older population of hoary bats on the Hawaiian Islands is typically chestnut brown in color with less white "frosting" of the fur tips—it has largely lost the "frosted" appearance. The more recent population comprises individuals that are more hoary ("frosted"), similar to mainland hoary bats. Males and females have a wingspan of approximately one-third of a meter (1 foot), and females are typically larger than males. The Hawaiian name refers to a half taro leaf or canoe sail shape; these being somewhat similar to the shape of the bat.

Data pertaining to ʻōpeʻapeʻa ecology, life history, and population estimates are limited owing largely to its cryptic and solitary nature. ʻŌpeʻapeʻa breeding has been documented on all of the main islands except for Niʻihau and Kahoʻolawe. and these studies indicate that ʻōpeʻapeʻa roost in native and non-native vegetation exceeding 15 feet in height above ground level (Montoya-Aiona, et al. 2020). The species is not observed using cracks in rocks, or human-made structures for roosting. While roosting during the day, ʻōpeʻapeʻa are solitary, although mothers and pups roost together. They begin foraging either just before or after sunset depending on the time of year. Elevation and rainfall may affect distribution and activity patterns and have been found foraging over a large range of elevation from sea level to the summit of Mauna Loa at 13,678 feet in lava tubes (Bonaccorso et al., 2016). ʻŌpe ʻape ʻa feed on a variety of native and non-

native night-flying insects, including moths, beetles, crickets, mosquitoes, and termites; and similar to other insectivorous bats, prey is located using echolocation. ʻŌpeʻapeʻa spend about half of their time in what is called a "core use area." Generally, ʻōpeʻapeʻa tend to not overlap their core use areas with other ʻōpeʻapeʻa. Core use areas vary in size probably due to the quality of habitat each ʻōpeʻapeʻa inhabits. Water courses, gullies, and edges (e.g., coastlines and forest/pasture boundaries) appear to be important foraging areas, use lava tubes on Mauna Loa and the species is also attracted to insects that congregate near lights. Mating most likely occurs between September and December. Pregnancy occurs between April to early June and females usually give birth to twins during June. Mother bats lactate from late June through August and likely stay with their pups until they are six to seven weeks old. Females exhibit philopatry to their roost sites. Little is known regarding dispersal, but inter-island dispersal is possible.

DISTRIBUTION: In Hawai'i, ʻōpeʻapeʻa have been reported from all the Main Hawaiian Islands except for Niʻihau, although specimen records exist only for Kauaʻi, Oʻahu, Maui, Molokaʻi, and the island of Hawaiʻi. ʻŌpeʻapeʻa occur in a wide range of habitats across a wide elevation gradient. On the island of Hawaiʻi, bats are found primarily from sea level to 2,288 meters (7,500 feet) elevation, although they have been observed near the island's summits (above 3,963 meters or 13,000 feet). See "Location and Condition of Key Habitat," below, for distribution by seasons.

West EcoSystem Technology performed a distribution and occupancy study of ʻōpeʻapeʻa on the island of O ʻahu from 2016 to 2021. This study found pockets of higher detections on the North Shore of O ʻahu throughout the year (Thompson and Starcevich 2022). Further data collection is needed to determine if there are any patterns or trends to ʻōpeʻapeʻa distribution and occupancy on O ʻahu.



ABUNDANCE: Collecting actual population estimates for this species is extremely labor intensive due to their cryptic and solitary behavior. Therefore, actual population estimates for each island are unknown. Pinzari et al. 2014 study suggests that the population on the island of Hawaiʻi has been stable or is slightly increasing based on occupancy models from acoustic monitoring. Genetic studies of ʻōpeʻapeʻa using mitochondrial and microsatellite markers collected from the islands of Kaua'i, O'ahu, Maui, and Hawai'i indicate that populations may be lower on the islands of O'ahu and Maui when compared to the islands of Kaua'i and Hawai'i (Pinzari et al. 2023).

LOCATION AND CONDITION OF KEY HABITAT: ʻŌpeʻapeʻa have been found roosting in ʻōhiʻa (*Metrosideros polymorpha*), pu hala (*Pandanus tectorius*), coconut palms (*Cocos nucifera*), kukui (*Aleurites moluccana*), kiawe (*Proscopis pallida*), avocado (*Persea americana*), shower trees (*Cassie javanica*), pūkiawe (*Styphelia tameiameiae*), fern clumps, eucalyptus (*Eucalyptus* spp.), cook pine (*Araucaria columnaris*), and Norfolk Island pine (*Araucaria heterophylla*) stands. A study on the island of Hawaiʻi found that bat activity varied with season and altitude, and the greatest level of activity occurred at low elevations (below 1,280 meters or 4,200 feet) from April to December (Bonaccorso et al. 2015). Because warm temperatures are strongly associated with reproductive success in this and other bat species, it has been suggested that key breeding habitat is likely to occur at sites where the average July minimum temperature is above 11°C (52°F). If true, key breeding habitat on the island of Hawaiʻi would occur below 1,280 meters (4,200 feet) elevation (Bonaccorso et al. 2015). Because bats use both native and non-native habitat for foraging and roosting, the importance of non-native timber stands, particularly those at low elevations, should be determined. Breeding sites are known for Mānuka Natural Area Reserve and scattered areas along the Hāmākua Coast.

From September 2017 to September 2018, HT Harvey conducted a study within 34, 226 hectares on this island of Maui near Haleākala to identify ʻōpeʻapeʻa habitat use and any limiting factors affecting ʻōpeʻapeʻa habitat use. ʻŌpeʻapeʻa on Maui use gulch habitat, developed low density habitat, low elevation forest woodland, and grassland habitat, in areas surrounding Haleākala (H.T. Harvey & Associates 2020).

THREATS: Bats are affected by habitat loss, pesticides, collisions with structures, and roost disturbance. A reduction in tree cover (e.g., roost sites) might be the primary reason for the species' decline in Hawaiʻi. Pesticides also may have reduced populations. Bats are known to interact and collide with wind turbines. Lastly, bats of many species are affected by predation, so predation by cats, rats, and mongoose found in Hawai'i may impact ʻōpeʻapeʻa populations.

CONSERVATION ACTIONS: The goals of conservation actions are to not only protect current populations and key breeding habitats, but also to establish additional populations thereby reducing the risk of extinction (U.S. Fish and Wildlife Service 1998). In addition to common statewide and island conservation actions, specific management directed toward ʻōpeʻapeʻa should include the following:

- Conserve known occupied habitat.
- Develop and implement conservation plans and strategies that guide the management and use of forests to reduce negative effects on known ʻōpeʻapeʻa populations.
- Support ʻōpeʻapeʻa research.

MONITORING: Continue surveys of occupancy and distribution in known and likely habitats and identify key limiting factors affecting the recovery of the species.

RESEARCH PRIORITIES: Given that little is known about ʻōpeʻapeʻa any research would contribute to the understanding of and ability to conserve this species. Research priorities for the ʻōpeʻapeʻa include the following:

- Develop standard survey and monitoring methods and procedures that will allow the accurate estimation of populations and changes in activity and/or occupancy.

- Continue to conduct occupancy and distribution surveys of all the Main Hawaiian Islands where ʻōpeʻapeʻa are found to examine distribution and habitat use trends.
- Identify key roosting and wintering sites.
- Better describe roost site characteristics and preferences.
- Increase efforts to track and monitor movements and behaviors.
- Determine the extent to which Hawaiian hoary bats use torpor.
- Better describe threats and important factors limiting recovery such as whether depredation by introduced animals or availability of prey represent constraints for populations.
- Continue to support the development of avoidance and minimization measures that can be effectively implemented to reduce collisions with wind turbines.
- Direct research findings toward the development of conservation and management actions that address the needs and deficiencies of the species and refine these approaches using an adaptive management approach.

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