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NOTE
Decline of the Sheath-tailed Bat *Emballonura semicaudata* (Chiroptera: Emballonuridae) on American Samoa

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Abstract—The population of sheath-tailed bats has declined precipitously whereas the populations of the ecologically-similar swiftlet (cave dwelling, insectivorous bird) have not. The reasons for the initial crash are unclear but cyclones apparently contributed to the subsequent decline.

The sheath-tailed bat (including *E. sulcata* and *E. semicaudata,* Koopman 1993) is the only species of insectivorous, cave roosting bat found in Vanuatu, Palau, portions of the Federated States of Micronesia, Mariana Islands, Tonga, Western Samoa, and American Samoa (Nowak 1991, Rinke 1991). Both the sheath-tailed bat and *Chaerephon jobensis* occur in Fiji (Koopman 1993). Populations in the Marianas declined precipitously during the 1950's or 1960's (Perez 1972, Bruner & Pratt 1979, Lemke 1986). The last known sighting on Guam occurred in 1972 (Kami et al. 1976, Lemke 1986, G. Wiles pers. comm., 1993). Intensive searches by Lemke (1986) on 12 of the 14 islands or island groups in the Marianas located only four bats (in Guano Cave on Aguijan Island). A small population on Aguijan was still present in March 1992 (Rice & Taisacan 1992). It was the most common mammal found in excavations on Rota but was probably lost in the 1960's (Lemke, 1986, Steadman 1992). Bruner & Pratt (1979) reported this bat was abundant on Palau in 1976 and 1978, and Wiles (pers. comm.) found an abundant population on Palau in 1991. The status of populations on Fiji and Vanuatu are not known.

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Sheath-tailed bats were previously abundant on Upolu, Western Samoa (Ollier et al. 1979), and Cox (1983) found a colony of over 50 individuals in a cave below Sauniatu, Upolu. Pe'a Pe'a Cave in O le Pupu Pu'e National Park on Upolu formerly housed several thousand sheath-tailed bats and white-rumped swiftlets (*Aerodramus spodiopygius*), but surveys failed to find the bats there or elsewhere on the island (Ollier et al. 1979, Lovegrove et al. 1992, Park et al. 1992). A flood in the cave may have accounted for their loss at this site but not elsewhere on the island (Park et al. 1992). Three bats were found by David Butler (pers. comm.) in sea caves near Vavau Resort, Upolu, on 30 March 1994 and there are recent unconfirmed reports of a few bats at two other locations in Western Samoa (pers. comm., Department of Lands, Surveys and Environment, Western Samoa).

The situation is similar on American Samoa. Amerson et al. (1982) estimated a total population of about 11,000 bats on American Samoa in 1975–1976. About 10,000 bats were using two large caves at Anape'ape'a Cove near Afono, Tutuila and only 15 to 20 bats were reported using other caves on Tutuila (Amerson et al. 1982). It is not clear how Amerson et al.'s estimate was made, and it probably should be taken as a qualitative indication of a robust population, rather than as a precise count of the Afono colony. Knowles (1988) reported seeing 100 bats and hearing another 100 in the large cave at Anape'ape'a Cove in May 1988. Department of Marine and Wildlife Resources biologists saw no bats but heard some in this cave on 21 February 1990 and 2 May 1990. It is not clear from DMWR files whether the sounds heard were bat irritation calls or whether they mistook the echolocation clicks of swiftlets for bat vocalizations. We visited both caves at Anape'ape'a Cove on 3 November 1992. We saw one sheath-tailed bat and about 10 swiftlet nests in the large cave on this date. We returned to these caves on 21–22 November 1992 but did not see any bats. Grant visited these caves on 1 May 1993 and found 25–30 swiftlets but no bats. We explored the Afono caves with a Mini-2 bat detector on 13 September 1993. The frequency of bat calls ranged from about 20 to 60 kHz while swiftlet calls ranged up to about 35 kHz. We captured, photographed, and released a male sheath-tailed bat and saw three other individuals on this date.

Additional small caves and lava tubes on Tutuila were checked for the presence of bats and swiftlets in 1992–1994. Tutuila Island is entirely volcanic and therefore does not have the extensive limestone cave systems as seen on Niue, Rota, and parts of Guam. The shallow caves at Afulei, Sailele, Auto, Leanaosauslii Point, and Mataae Point (near the village of Matuu) and a lava tube near Ili'ili contained no bats nor swiftlets. The sea cave at Sail Rock Point is not suitable as it is continuously washed by waves and the roof of the sea cave between Maloata and Fagamalo is too wet from seepage. A shallow sea cave just south of Nuuomanu Rock housed a colony of about 300 swiftlet nests but no sheath-tailed bats on 3 July 1994. Additional sea caves exist on Tutuila but are largely inaccessible to humans. A small cave north of Alao was visited on 3 December 1992 and on 11 August 1993. On both occasions it contained only a single sheath-tailed bat. No other recent confirmed sightings have been reported on Tutuila

nor on the Manu'a Islands (Ofu, Olosega, and Ta'u). Thus, the sheath-tailed bat population on American Samoa is very small, conceivably reduced to only a few individuals (Anape'ape'a Cove and Alao Cave).

Many elderly Samoans living in the Afono region reported that the sheath-tailed bats were much more numerous in the past. The dramatic population decline on American Samoa may have occurred before 1988 (Knowles 1988) and the three recent cyclones (Tusi in January 1987, Ofa in February 1990, and Val in December 1991) may have depleted the remaining bat population. Tusi caused minimal damage to Tutuila while the other two storms were intense and prolonged. Ofa buffeted Tutuila with high winds and rain for three days while Val hovered over Tutuila for four days. Amerson et al. (1982) reported that the entrance to the large cave at Anape'ape'a Cove was nearly hidden by dense vegetation in 1975–1976. Shortly after Cyclone Ofa struck Tutuila on 3 February 1990, this cave was no longer obscured by vegetation. Much of the entrance was now filled with large amounts of fallen trees and coral rubble. Evidence was found that the walls had been washed clean by the storm surge associated with the hurricane. We suspect that the majority of sheath-tailed bats in the cave were killed when the hurricane hit. We do not know if Cyclone Val flooded the Afono cave. Bats in caves at higher elevations (e.g. Alao) would have escaped flooding.

Additionally, it is possible some bats starved during the storms since insectivorous bats generally do not fly or feed in heavy wind or rain (Thomas & Bell 1986, Erkert 1982). Cyclone Val (December 1991) remained almost stationary over the Samoan islands for four days making it likely that these small insect-eating bats were unable to feed during this protracted period. Some tropical microchiropteran bats undergo torpor to survive episodes of prolonged inclement weather (Lyman 1970, McNab 1982). Measurements made on other species of emballonurids show that they have relatively high mass-specific basal metabolic rates (McNab 1982). The mean ambient temperature for December–February in American Samoa is 27.2° C (NOAA 1991). High ambient temperatures may preclude energy savings sufficient to sustain a small (4–7g) torpid bat for four days.

Swiftlets (genus *Aerodramus*) are small diurnal, insectivorous cave- and crevice-dwelling birds with many ecological similarities to sheath-tailed bats. Both bat and swiftlet populations have declined precipitously in the southern Marianas (Lemke 1986), perhaps for similar reasons. Possible reasons for simultaneous population declines given by Lemke (1987) include heavy bombing and shelling of fortified caves during World War II, pesticides, and guano mining.

In contrast, swiftlet populations on American Samoa appear to be stable (Trail, unpubl. data), and are either stable or increasing in Western Samoa (Lovegrove *et al.* 1992) in areas where the sheath-tailed bat has apparently disappeared. Human disturbance at the two caves with bats and swiftlets on American Samoa appears to be minimal. Guano mining occurred in the Afono caves in the 1960's (Amerson et al. 1982) but it is no longer being harvested due to its high salt content as a result of flooding by the cyclones. Agricultural and mosquito-control pesticides are not widely used on Tutuila (A. Vargo, pers. comm.). We are unable

to determine why the bat population crashed in American Samoa sometime prior to 1988 and theorize the cyclones may have contributed to the continuing decline thereafter. It is therefore unclear what can be done to protect the small remaining population. There appear to be suitable caves present where human disturbance is minimal. If insecticides were a problem we would expect to see a similar population crash by the white-rumped swiftlet. The drastic decline of sheath-tailed bats in the Mariana Islands, Western Samoa, and American Samoa is alarming. Efforts should be made to assess the status of this species in Tonga, Vanuatu, and Fiji and to continue monitoring efforts in Palau.

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