

Observations on the natural history of Samoan bats

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On ne connaît que trois espèces de chauves-souris dans les îles Samoa. Deux sont frugivores: *Pteropus samoensis*, la plus grande, dont l'envergure peut atteindre deux mètres, presque totalement diurne et solitaire, et *Pteropus tonganus* qui est plus petite et n'est que nocturne; *Emballonura semicaudata* est grégaire et insectivore et habite des grottes.

Only two genera of bats are known to occur in the Samoan archipelago: the megachiropteran genus *Pteropus* and the microchiropteran genus *Emballonura* (Peale, 1848; Wagner, 1855; Cassin, 1858; Alston, 1874, Whitmee, 1874; Dobson, 1878; Andersen, 1912; Sanborn, 1931). A third genus, *Myotis*, has been reported for Samoa (Carter *et al.*, 1946; Tate, 1941; Dobson, 1878) but this record is based upon a single specimen collected by a Mr. Schmeltz from which Dobson (1878) erected a new species, *Vespertilio insularum*, which Tate subsequently treated as a member of the genus *Myotis* (Tate, 1941). In his description Dobson indicated that «it resembles *V. mystacinus* more closely than any other species». I suggest that *Myotis insularum* may prove not to be Samoan, but perhaps a collection of a single transient individual from a distant area or a result of mislabelling as to locality of collection. One reason for my belief that the genus *Myotis* does not occur in the type locality of *Myotis insularum* is that the Samoans recognize only two genera of bats: *pe'a* (*Pteropus*) and *pe'ape'a* (*Emballonura*). Specimens of only these two genera were brought in by natives in response to a reward offer in 1979. Another reason for my belief that *Myotis* does not occur in Samoa is that I did not observe any bats of that genus during three years of extensive field work in Samoa.

Emballonura semicaudata, described from Samoa by Peale (1848) as *Vespertilio semicaudatus*, is a small cave dwelling bat that occurs on Savai'i, Upolu, Ta'u and possibly on other islands in Samoa (Dobson, 1878; Sanborn, 1931). It is easily recognized by its small size and by the tail which penetrates the interfemoral membrane. It is gregarious; at a cave below Sauniatu, Upolu, I found a colony of over 50 individuals. These microchiropterans are insectivorous, as judged both by gut analyses and observations of their foraging at night, when they can be seen darting about in small forest gaps or along riversides, earning them the vernacular name of *pe'a vai* (water bat). The standard Samoan name for *E. semicaudata*, *pe'ape'a*, is also used for a species of cave-dwelling swallow. Many Samoans are

unaware that there is a difference between the swallows (*Collocalia spodiopygia* Peale) and *E. semicaudata* because both are difficult to capture and have superficially similar appearances, manners of flight, and foraging behaviors. The insectivorous diet of *E. semicaudata* makes them difficult to maintain in captivity.

The megachiropteran genus *Pteropus* is represented by two species in Samoa: *Pteropus tonganus* Quoy and Gaimard and *P. samoensis* Peale. *P. tonganus* is found on the islands of Upolu, Savaii, Olosega (Sanborn, 1931), and possibly other islands including Tuutuila. *P. tonganus* is called by the Samoans *pe'a fai taulaga pe'a* (flying fox which make flying fox towns) in reference to their habit of roosting colonially, often with several hundred bats in a single tree. These large flying foxes forage and apparently travel between islands in groups. On 9 March 1980 at the coastal village of Sataoa, Safata, Upolu island I counted over 300 individuals in a single flight coming in from sea at dusk and proceeding inland. They can be an agricultural pest, foraging on breadfruit, papayas, mangos, bananas and ~~several~~ fruits (*Syzygium jambos*) in and around villages; since they do not damage cash crops, however, they are considered at worst merely nuisances by the Samoans. *P. tonganus* shows a particular preference for the flowers of *Ceiba pentandra*. Gut analyses of two individuals taken at the time of *C. pentandra* flowering showed a high level of *C. pentandra* pollen in their gut. Their gregarious habits and frequent vocalizations suggest a social structure, but its exact nature is unknown. Females can often be seen flying with an infant under their wing. Weaned individuals which sometimes forage with the adults are called *tagi ti* (cries « ti ») by the Samoans in reference to the high-pitched calls they make. *P. tonganus* plays an important role in the ethnobiology of the Samoan people. Samoans characterize the vocalizations of *P. tonganus* as « ti » or « luli » much in the same way as Americans characterize the vocalization of a dog as « bark »; these flying fox vocalizations are featured in a traditional song of children: « *Luli luli le pe'a, tagi fa'amae'a, tagi lotulotu, lou taliga olea motu!* » (The flying fox cries « luli luli he cries without ceasing, he cries oh so deeply, but he will bite your ear, off!). Legends relate that the flying foxes saved the queenly person Leutogi Tupai'a. The king of Tonga, her husband, was displeased with her because she was barren and chased her into the crotch of a *Callophyllum inophyllum* tree, beneath which the villagers set a large fire. Just as the flames reached her, a large flight of *P. tonganus* extinguished the flames; *Tonumaie'a* (« saved by flying foxes ») remains a high chiefly title on Savai'i while « *Ua tatou maga fetau soifua* » (« we have had life in a *C. inophyllum* crotch ») is today a very respectful way of greeting a high chief in a kava ceremony.

Flying foxes are also considered a great delicacy by Samoans. They ~~catch~~ capture sleeping *P. tonganus* with the thorny vines of *seu pe'a* (*Alyxia* sp.) or capture them on full moon nights by shooting them off the flowers of *Ceiba pentandra*. Human consumption, however, does not to have severely affected populations of *P. tonganus*.

Perhaps the most unusual of the Samoan bats is *Pteropus samoensis*, called *pe'a vao* (forest flying fox) by the Samoans in reference to its occurrence only within undisturbed rain forest. It occurs on Tuutuila, Savai'i, Upolu, Olosega and Ta'u islands (Sanborn, 1931). It is much larger than *P. tonganus* and may prove to be the largest bat known to science with a wing span approaching 1 meters (Peale, 1848; Anderson, 1912). It is easily distinguished from *P. tonganus* both by its larger size and by the absence of the white fur patch on the back of

which characterizes *P. tonganus*. *Pteropus samoensis* is remarkable in that it is almost strictly diurnal. During all of my field studies including three years of nocturnal observations in *P. samoensis* habitat, the earliest sighting of *P. samoensis* was at 06:28 (5 miles east of Asau, Savaii, 26 June, 1979) while the latest sighting was at 18:30 (Tapatapao, Upolu, 27 Feb. 1981), the peak of activity being between 11:00 and 14:00. The diurnal nature of *P. samoensis* has also been commented on by two other observers (Peale, 1848; Nicoli, 1909). *P. samoensis* is also unusual among bats in that during the daytime it soars, with fully extended wings, on thermal currents high above the island, thus resembling an eagle or hawk when viewed from the ground. Both the diurnal nature and soaring flight are anomalous for a bat. They may have evolved on Samoa due to the absence of raptorial and thus potentially predatory birds in the Samoan avifauna (Strong, 1932). Furthermore, the highly humid Samoan climate may tend to reduce evaporative water loss from the outstretched interdigital membranes. A unique characteristic of *P. samoensis* is that it is non-gregarious, territorial, and appears to pair bond. *P. samoensis* bats forage and sleep singly or in pairs and do not live in the massive « bat towns » characteristic of other pteropids such as *P. tonganus*. *P. samoensis* individuals or pairs appear to occupy definite territories. At the same time one or two bats can be seen in the same area repeatedly. I have observed (17:00, March 4, 1981, 4 miles north of Tafatafa, Upolu) startled two adult bats in a tree, one of which repeatedly flew around the tree, apparently attempting to arouse its companion by hitting it with its wing. Given the bats' probable fear of humans who hunt them for food, the repeated attempt to arouse its companion and their subsequent flight together away to safety is evidence in my opinion that they pair-bond.

P. samoensis forages on rainforest fruits and flowers, usually approaching a branch from the top, landing on one of the branches, and then dropping from branch to branch, occasionally climbing out to the end of a branch to forage. I have observed them eating the nut-like fruits of *Cupaniopsis samoensis* (Sapindaceae) and the fleshy inflorescences of *Freycinetia reineckeii* (Pandanaceae), which they eat in small bites (Cox, 1981). In eating they take small bites of the fruit or flower, masticate, and then spit out the solid parts, retaining only the juice. Samoans have told me that *P. samoensis* also forages on a variety of other fruits including various species and *Dysoxylum maota* (Meliaceae). In captivity they will also eat bananas but not bananas. Infants appear to thrive on baby formula administered with a needleless syringe. The absence of the white neck marking serves to distinguish *P. samoensis* infants from those of *P. tonganus*.

Several behavioral and ecological features therefore distinguish *P. samoensis* from *P. tonganus* including a nocturnal versus a diurnal habit, gregarious versus solitary behaviors, and a primary forest versus secondary forest habitats. Unfortunately the rapid destruction of the Samoan rainforests are serving to dramatically reduce the populations of *P. samoensis*, as is also opportunistic shooting of *P. samoensis* bats by pigeon hunters. In the mountains of Tapatapao, Upolu island over 30 *P. samoensis* were taken by hunters in 1979; in 1980 this figure dropped to 9, and in 1981 it dropped to zero. Given the large size of *P. samoensis* territories (about 4 km²), such a reduction of population bodes ill for the survival of the species. On the island of Tuutuila, American Samoa, I have succeeded in locating only a single breeding pair. In Western Samoa, I estimate that there are less than 50 remaining individuals on Upolu. The more primitive island of Savai'i

may support a larger population, but on a five-day expedition to the center of the island I was unable to locate a single individual. In the Manu'a group I have found an individual on the island of Ta'u but have not surveyed Ofu or Olosega. Conceivably the soaring behaviors of *P. samoensis* would make a census from aircraft possible. I suggest that *P. samoensis* faces extinction in the very near future unless immediate steps are taken to protect its habitat, prohibit its hunting, and promote its breeding in captivity. Similar pressures and lack of government concern are also threatening several other Pacific pteropid species (Bruner and Pratt, 1979; Wheeler, 1980). As Sefo, a native hunter expressed, « Ua tipi le vao, i ua sosola pe'a uma lava » (The forest has been cut, and all of the flying foxes have gone away).

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SUMMARY

Only three species of bats are known to occur in Samoan archipelago: *Pteropus t. ganus*, a gregarious, nocturnal species, and *P. samoensis*, which is almost strictly diurnal and non gregarious. *Emballonura semicaudata* is an insectivorous cave-dwelling gregarious bat.

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