

The Status of Fruit Bats on Guam¹

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ABSTRACT: Two species of fruit bats are known from Guam in the southern Mariana Islands. *Pteropus mariannus mariannus* has declined greatly in abundance since the early 1900s. Its numbers decreased from an estimated 3,000 animals in 1958 to fewer than 50 individuals in 1978. However, by 1982, the population of this species increased to about 850 to 1,000 bats, probably through immigration of fruit bats to Guam from the island of Rota. Since then, *P. m. mariannus* appears to be declining once again with only 425 to 500 counted during a February–April 1984 census. A second smaller species, *P. tokudae*, has always been rare since it was first discovered in the early 1930s. It has not been recorded since 1968 and now is thought to be extinct. Overhunting of *Pteropus* for use as a delicacy is the main cause for their decline on Guam. Forest clearing and predation by brown tree snakes may be other contributing factors. Both species of *Pteropus* were listed as endangered on Guam by the U.S. Fish and Wildlife Service in August 1984.

OVERHUNTING AND HABITAT DESTRUCTION have reduced the populations of many island-dwelling fruit bat species in the Pacific and Indian Oceans (Wodzicki and Felton 1975, 1980, Racey 1979, Cheke and Dahl 1981, Cox 1983, Falanruw in prep.). Similar declines have occurred in the southern, inhabited portion of the Mariana Islands where two species of *Pteropus* occur, the Marianas fruit bat (*P. m. mariannus*) and the little Marianas fruit bat (*P. tokudae*) (Wheeler and Aguon 1978, Wheeler 1979, 1980, Wiles et al. in press). *P. m. mariannus* inhabits the islands from Guam northward to Saipan (perhaps even further north to Maug, depending on the validity of the subspecies description for *P. m. paganensis*) while *P. tokudae* is endemic to Guam. Fruit bats or “fanihi” (their Chamorro name) are highly sought after by Chamorro residents, who serve them as a delicacy on special occasions. Both species of bats were listed as endangered on Guam by the U. S. Fish and Wildlife Service in August 1984. *P. m. mariannus* is protected throughout the remainder of its range but is rare on Saipan,

Tinian, and Aguijan, and declining on Rota because of heavy illegal hunting (T. O. Lemke, pers. comm.). The purpose of this study was to document the abundance and distribution of fruit bats on Guam prior to their endangered listing and to complement other bat surveys recently completed in the remainder of the Marianas (Wiles et al. in press, T. O. Lemke, pers. comm.).

STUDY AREA

Located in the western Pacific, the Mariana Islands comprise 15 islands extending over 800 km in a north-south arc (Figure 1). Guam (13°28'N, 144°45'E), the largest and southernmost island, has a land area of 540 km². Northern Guam is characterized by a large uplifted limestone plateau fringed near the ocean by tall cliffs and steep hillsides that descend to narrow terraces or directly into the sea. The southern portion of the island is volcanic in origin, although some hills are capped with limestone, with a tall ridge dissected with deeply eroded ravines running along the southwestern coast. Elevations on the island range from sea level to 180 m in the north and 400 m in the south.

Guam's climate is tropical and tempera-

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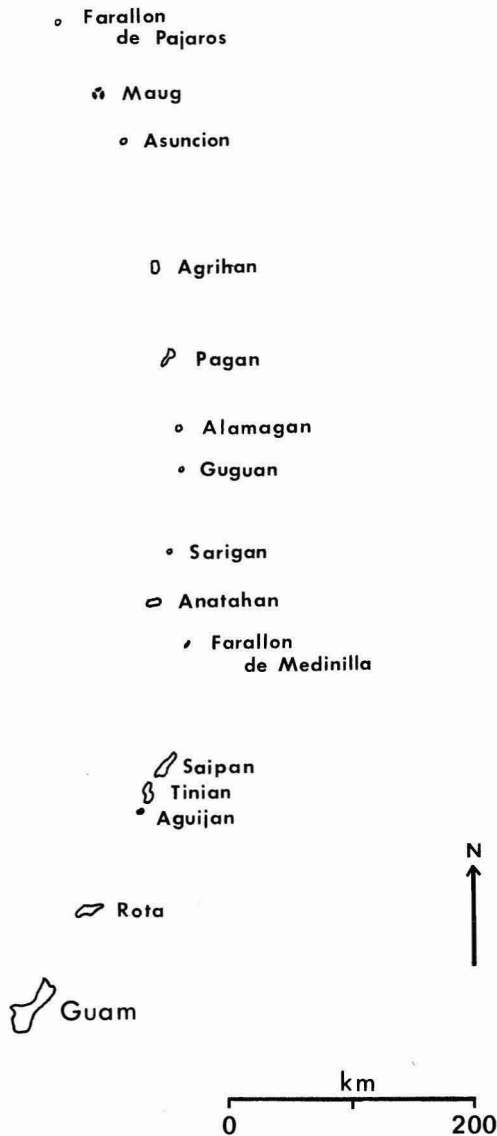


FIGURE 1. Map of the Mariana Islands in the western Pacific Ocean.

tures remain warm and relatively consistent during the year, ranging from 22 to 33°C. Annual rainfall varies considerably among years but averages 2180 mm, most of which falls from July to November. A dry season occurs between January and May when rains diminish to 0 to 150 mm per month.

Nine vegetation types have been described

for Guam (Fosberg 1960, Stone 1970) with four of these used regularly by fruit bats. Limestone forest occurs over much of northern Guam and is also found in isolated patches in the southern part of the island. Although most large inland tracts of limestone forest have been cleared or altered by development, large stands still occur along the island's northern cliffline, particularly on Andersen Air Force Base (AAFB) and Naval Communications Area Master Station (NavCAMS). Primary limestone forest is characterized by sparse undergrowth, a canopy 10 to 15 m high and scattered taller emergent trees. Common species include *Ficus prolixa*, *Aglaiia mariannensis*, *Guamia mariannae*, *Cycas circinalis*, *Neisosperma oppositifolia*, *Mammea odorata*, *Macaranga thompsonii*, *Pisonia grandis*, *Artocarpus mariannensis*, *Eleocharis sphaericus*, and *Triphasia trifolia*. Secondary growth limestone forest is shorter and has dense undergrowth. Many of the same species are present in lower abundance as well as *Pandanus tectorius*, *P. dubius*, *Hibiscus tiliaceus*, *Morinda citrifolia*, *Carica papaya* and *Cestrum diurnum*.

Ravine forest occurs on volcanic soils in southern Guam. It is lower in height and more brushy than limestone forest and frequently contains *Hibiscus tiliaceus*, *Pandanus tectorius*, *Areca cathecu*, *Ficus prolixa*, *Cycas circinalis*, *Cocos nucifera* and *Freycinetia reineckeii*.

Coconut (*Cocos nucifera*) groves exist throughout the island with large stands present from Tarague Point to Uruno Point and on Naval Magazine (NavMag). A thick understory composed commonly of *Triphasia trifolia*, *Guamia mariannae*, *Aglaiia mariannensis* and *Neisosperma oppositifolia* is often present.

Strand vegetation exists along shorelines where halophytic conditions exist. Heights of vegetation range from short ground cover to trees up to 20 m tall. *Cocos nucifera*, *Casuarina equisetifolia*, *Pemphis acidula*, *Scaevola taccada*, *Messerschmidia argentea* and *Hernandia nymphaeifolia* characterize this habitat.

Guam's human population has grown dramatically since the turn of the century, increasing from 9,700 residents in 1901 to

22,000 in 1940 to 106,000 in 1980 (U.S. Dept. of Commerce 1982). Chamorros, the indigenous people, make up about 42% of the present population.

METHODS

An island-wide survey of fruit bats was conducted from 14 February to 16 April 1984. Because most of Guam's bats roost communally in tree tops during the day, searches for colonies were emphasized during the survey.

Within most colonies, females form harems with some adult males while the remainder of the males roost in bachelor groups or solitarily in nearby trees (Wiles unpub. rep.). Under good light conditions, fruit bats are highly visible while roosting and flying and are recognizable up to 1,000 m. Colonies, particularly those containing harems, are noisy and can be easily heard 400 m away and faintly heard up to 800 m, depending on wind conditions and terrain. Searches for bats were made from hilltops, cliffs and beaches. Observation stations were selected that provided a clear view of sections of forest that varied in size from 5 to 71 ha. Using 7X binoculars or a 15-60X spotting scope, station and colony counts were made from 0615 to 0915 or from 0800 to 0930, respectively, the periods when flying and roosting bats are most visible (Wheeler and Aguon 1978, Wiles unpub. data). Counts lasted 20 to 40 min in the north and 30 to 90 min in the south, depending on the size of the area viewed and the number and proximity of other stations visited during the same morning. Counts were not made during rain or heavy winds. Only adult bats were counted during colony censuses. Since some bats were concealed in thick foliage and not visible to the observer, the total number of animals counted at roosts was increased by 10 to 20%, based on previous observations, to account for hidden individuals. In areas where bats were not easily viewed, an additional survey method was employed whereby an observer walked through forest and listened for groups of bats.

During 1981 to 1983, population estimates were made by similar but less systematic

methods. These estimates were based on counts made at colony roosts, from sightings in forested areas throughout the island and from reports by residents.

No *P. tokudae* were identified in this study, but if present, their small size when viewed from close range would have presumably distinguished them from *P. m. mariannus*. Body measurements of adult *P. tokudae* (forearm = 94-95 mm, head-rump length = 140-151 mm, weight = 152 g, wingspan = 650-709 mm) are substantially smaller than those of adult and subadult *P. m. mariannus* (forearm = 134-154 mm, head-rump length = 195-240 mm, weight = 330-577 g, wingspan = 860-1085 mm) (Tate 1934, Perez 1972, K. Koopman, pers. comm., Wiles, unpub. data). Confusion between immature *P. m. mariannus* and *P. tokudae* is certainly possible.

RESULTS

Past and Recent Abundance of P. m. mariannus

Crampton (1921) was apparently the first to comment on the abundance of Guam's fruit bats. In 1920, he observed them to be "not an uncommon sight" as they flew over forest during the daytime. During a two-month visit to Guam in 1931, Coultas (1931) noted that fruit bats were uncommon on the island and believed that the introduction of firearms had lead to their decline. He reported that bats were most abundant in northern Guam. In 1945 at the end of World War II, Baker (1948, pers. comm.) found fruit bats in the northern half of Guam to be uncommon and confined primarily to forested cliffines. He failed to locate a single colony during almost a year of field work. Reports obtained by Baker from residents indicated that fruit bats were also scarce in southern Guam. D. H. Woodside (unpub. rep.) visited the island for six months in 1958 and estimated that a maximum of 3,000 bats remained, a figure that he thought represented a "greatly reduced" population.

From 1963 to 1968, monthly counts of bats were made by biologists from Guam's Division of Aquatic and Wildlife Resources at overlooks on military lands (Perez 1972). Re-

sults from these counts indicated that the island's bat population was dropping, particularly near the Fena Lake Reservoir on NavMag where density declined from 1.4 to 0.1 bats seen per ha by 1968. During the following years, bats declined even further although little quantitative data were gathered to verify this trend. The last large fruit bat roost in southern Guam occurred on Orote Point Island in 1971 and contained 150 animals (N. Drahos unpub. rep.). In 1972, a colony with 500 to 600 bats was found on AAFB and made up the bulk of the island's population, which was estimated to be less than 1,000 animals (N. Drahos unpub. rep.). This colony disappeared soon after and from 1974 to 1977, the island's population was thought to contain fewer than 100 bats (N. Drahos unpub. rep.). Wheeler and Aguon (1978) conducted an intensive, island-wide survey in 1978 and concluded that fewer than 50 fruit bats survived on Guam.

In 1980, the island's population of *P. m. mariannus* increased dramatically when a new colony with several hundred animals appeared at Pati Point (M. Wheeler unpub. rep.). Additional observations in 1981 revealed that the colony temporarily split into two groups located 1.1 km apart and numbers during counts at both sites rose from 240 bats in early April to 508 bats in mid-May 1981. The appearance of the colony in 1980 and its sudden increase in size in 1981 probably resulted from the immigration of fruit bats from Rota, which lies 60 km north of Guam. Further evidence supporting this belief was obtained from a fruit bat hunter interviewed on Rota in August 1981. He reported that after killing about 60 bats with shotguns at a roost site on the island's southwestern cliffline, he and three other hunters watched the remainder of the colony, about 150 to 250 bats, fly south over the ocean toward Guam. The reported date of the incident coincided closely with the date of the second increase in bats noted at Pati Point.

Further counts through 1981 and 1982 indicated that the colony united into a single group in mid-May 1981 and increased in size to an estimated 600 bats at the end of 1981 and 780 to 850 bats in 1982, probably as a result of natural recruitment. The combined colony

roosted at three sites during this time, switching locations twice in response to illegal hunting. During 1983, poaching pressure increased resulting in a decline in bat numbers to an estimated 500 to 600 animals. At least four, and possibly five, poaching incidents occurred at the colony causing it to change locations frequently and possibly causing it to split into two groups again. Evidence of further hunting that year was found at several flyways and feeding trees.

Sightings of solitary bats and temporary small groups of two to ten individuals were made elsewhere on the island between 1981 and 1983. Approximately 50 to 100 animals were estimated to inhabit tracts of forest within 1.5 km of the cliffline on the northern half of the island from Bija Point to Iates Point, with most animals present from Achae Point to Tarague Point. Another 25 to 50 bats were also thought to survive in southern Guam at NavMag and in the Talofof and Malojloj regions. Thus, island-wide estimates were placed at 650 to 750 bats in 1981, 850 to 1,000 bats in 1982, and 600 to 775 bats in 1983.

Present Status of P. m. mariannus

Searches for bats during the February–April 1984 survey were made during 36.9 hr of observations at 69 stations overlooking 20.21 km² of forest and from walks made along 13.5 km of forest trails (Table 1). Bats were recorded at only 11 locations, all occurring in northern Guam on U.S. Air Force land (Figure 2). The island's largest colony of *P. m. mariannus* inhabited a site 800 m south of Mergagan Point. I counted 306 bats at this roost but estimated an additional 10 to 20% (30 to 60 animals) remained concealed in foliage for a total estimate of 335 to 365 adults in the colony. Previous observations of this harem-containing colony at other locations in 1982 and 1983 indicated that it had a sex-ratio highly skewed toward females (37.5 males: 100 females) and that a mean of 18.3% of the females possessed unweaned young (Wiles unpub. data). Thus, I estimated the colony to include an additional 40 to 50 young or about 375 to 415 animals total. Two small groups of bats and solitary individuals were observed at

TABLE 1

THE NUMBERS OF *P. m. mariannus* RECORDED AND ESTIMATED TO BE PRESENT IN SIX REGIONS OF GUAM FROM FEBRUARY TO APRIL 1984

LOCATION	AREAS SURVEYED			LENGTH OF TRAILS SURVEYED (km)	NO. OF BATS RECORDED			PRESENCE OF BATS REPORTED DURING 1983	ESTIMATED BAT POPULATION
	NO. OF AREAS	OBSERVER HOURS	TOTAL AREA (ha)		ROOSTING	FLYING	HEARD		
Bijia Pt. to Achae Pt.	12	5.8	295	2.9	0	0	0	Yes	<10
Achae Pt. to Mergagan Pt.	14	7.8	299	6.6	14 ^a	7	15 ^b	Yes	50
Mergagan Pt. to Lafac Pt.	15	5.7	353	2.0	329 ^c	0	0	Yes	400-500
Lafac Pt. to Iates Pt.	10	4.7	340	1.3	0	0	0	Yes	<10
Mt. Barrigada	3	1.0	52	0	0	0	0	Yes	<5
Southern Guam	15	11.9	682	0.7	0	0	0	Yes	25
Total	69	36.9	2,021	13.5	343	7	15		475-550

^a Groups of 9, 1 and 4 bats observed^b Four groups heard^c Groups of 306 and 23 bats observed

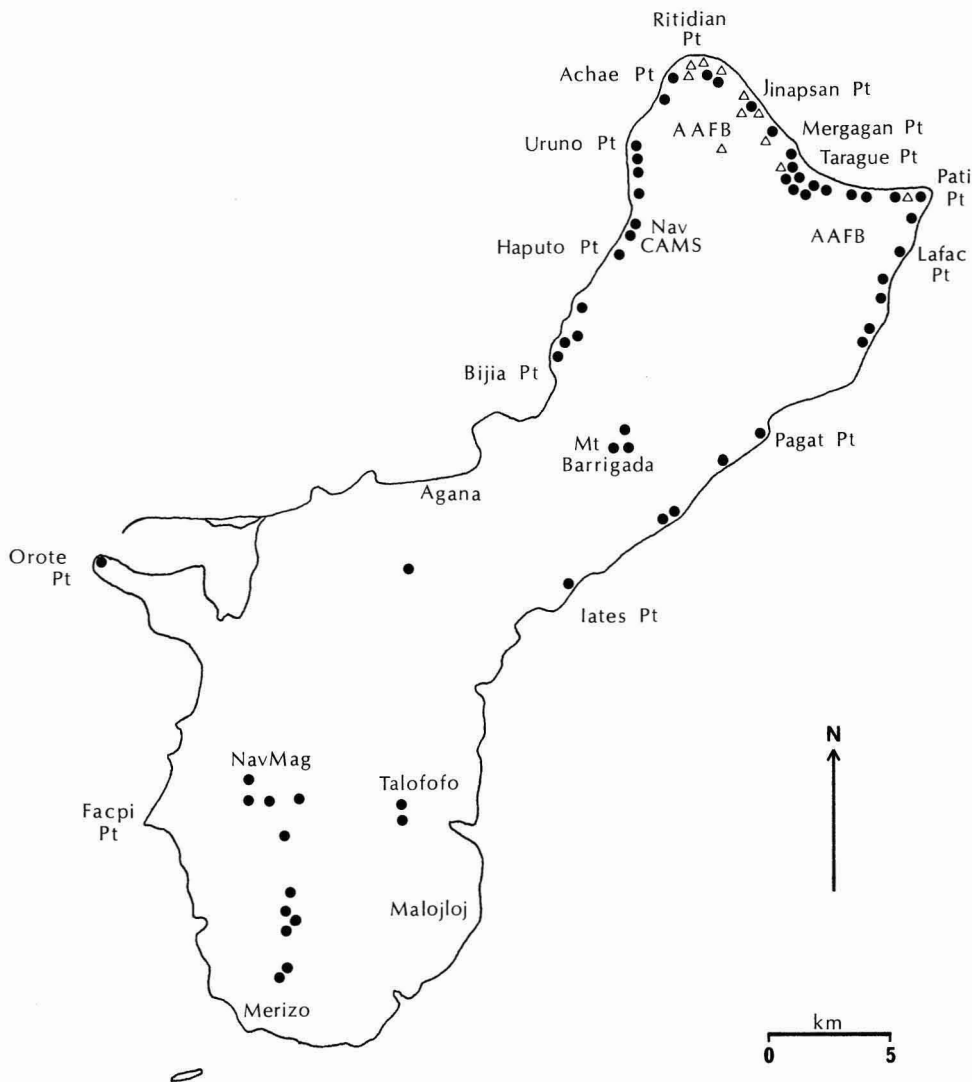


FIGURE 2. Locations where *P. m. mariannus* were seen or heard (open triangles) or not recorded (closed circles) during a survey on Guam from February to April 1984.

other locations. A small bachelor male roost at Pati Point had 23 animals visible (estimate of 25 to 30 animals) while a second group at Jinapsan Point with several bachelors and one small harem had at least nine animals (estimate of ten to 12 animals). Eight solitary individuals were seen flying or roosting between Tarague Point and Achae Point. Several small groups of bats were heard briefly in the same area and judged conservatively to contain two to four animals each. Combining all the esti-

mates, approximately 450 to 500 *P. m. mariannus* were believed present from Achae Point to Lafac Point in northern Guam at the end of the survey in April 1984.

No bats were recorded from the southern half of the island, the northeastern or northwestern coastlines, or Mt. Barrigada (Table 1). During a survey of island swiftlets (*Aerodramus vanikorensis*) in southern Guam in May and June 1984, C. F. Aguon (pers. comm.) similarly failed to find any fruit bats

in 15 hr of observation. However, because of rare recent sightings by residents of these regions, up to 50 bats total may still inhabit these areas.

A week after the survey ended, poachers raided the Mergagan Point colony, probably killing a number of bats. Over 40 expended shotgun shells were found at the site, indicating that as many as 40 to 50 animals were killed. Combining estimates for northern and southern Guam and subtracting the poaching loss produces an estimate of approximately 425 to 500 animals for Guam's present population of *P. m. mariannus*.

Past and Present Status of P. tokudae

Always considered rare by hunters, elderly residents and scientific collectors (Baker 1948, Perez 1972), *P. tokudae* was first described by Tate (1934). Few specimens have ever been captured, the last being a female (with a large juvenile that flew away) shot by hunters on 5 June 1968 on the cliffline below Tarague Point in an area of mature limestone forest (Perez 1972, unpubl. data). This was the only individual of *P. tokudae* present among more than 100 fruit bats shot and examined during the 1960s. Aside from one possible sighting by M. Wheeler (unpub. rep.) at Ritidian Point in June 1979, no other sightings of this species have been made since 1968 despite intensive field work conducted by Wheeler in 1978 and 1979, and myself since 1981. It is not known whether *P. tokudae* roosted solitarily, in small groups, or in colonies, perhaps even forming mixed colonies with *P. m. mariannus* as do some Australian *Pteropus* (Nelson 1965). During the 1984 systematic bat survey and during other recent observations of *P. m. mariannus* colonies, no small fruit bats were seen that might have been *P. tokudae*. Thus, it is likely that this species is now extinct.

DISCUSSION

Pteropus have never been considered agricultural pests on Guam; rather, they are taken solely for human consumption. Overhunting has been the most important cause of their decline. Guam's population of *P. m. mari-*

annus was probably greatly reduced during the early 1900s when extensive hunting took place (Coultas 1931, Baker 1948). An expanding human population at that time probably fueled the demand for bats while an increased use of firearms may have made hunting more successful.

Fruit bats were removed from the Government of Guam list of unprotected wildlife in 1965. This was followed in 1966 by regulations that established a ten week hunting season for bats. During succeeding years, the lengths of seasons and bag limits became more restrictive as bat numbers continued to decrease. Finally, all hunting was prohibited in 1973 (Wheeler 1979). Additional protection was given to fruit bats in 1981 and 1984 when both species were placed on the Guam and U.S. Endangered Species Lists, respectively.

Illegal hunting has continued despite lawful protection. The amount of poaching is difficult to quantify. From 1981 to 1984, eight cases of hunting at colonies and seven cases of night hunting along flyways or at feeding sites are known. More unrecorded incidents undoubtedly occurred. Colony hunting is the most destructive form of fruit bat hunting as animals in colonies typically roost close together in large numbers, and thus are highly vulnerable to shotgun fire. Hunters report that fifty or more fruit bats can be easily killed in a single successful raid on a roost. In the past when *Pteropus* were abundant on Guam, the hunting of solitary animals at night at flyways or fruiting trees was productive and widely practiced. However, with fewer bats in recent years, this form of hunting has become more opportunistic and now generally occurs when lone bats approach a farm, are taken incidentally by people searching for wild betel nuts and peppers, or while hunting for coconut crabs or sambar deer (*Cervus unicolor*). Bat poachers are difficult to apprehend because of rugged topography and dense forests. During the past five years, only one fruit bat poaching incident has resulted in arrests and convictions. In this case, two people were given small fines of \$100 each for killing two bats.

Forest destruction has probably been a minor factor in the decline of *Pteropus* on Guam. Large stands of native forest have

been cleared for agriculture and housing in the central and north-central portions of the island. Sizeable tracts of forest were also destroyed during the invasion and bombardment of Guam in World War II and by subsequent construction activities on newly established American military bases. Areas particularly affected were AAFB, NavCAMs and NavMag (Baker 1946). However, bats were already considered uncommon by 1931 (Coultas 1931). Sizeable tracts of forest remained after the war and are still present today, yet few bats inhabit these forest lands. Food resources and potential roosting sites seem to be adequately available and not limiting the population (Wiles unpub. data).

The impact of predation by brown tree snakes (*Boiga irregularis*) on fruit bats is unknown but potentially serious. Snakes first arrived on the island after World War II. They are a major nocturnal predator of birds and small mammals on Guam and are thought to be responsible for the nearly total disappearance of the island's forest-dwelling avifauna (Savidge 1987). Initially snakes were confined to central and southern Guam but they slowly spread northward and reached the extreme northern portion on the island by the early 1980s.

The brown tree snake appears capable of preying on bats. Stomach contents of large snakes routinely contain adult roof rats (*Rattus rattus*) (Savidge in prep.) which are similar in size to juvenile fruit bats. Only one case of snake predation on bats has been reported. A local resident related finding a 2.5-m-long snake with three young fruit bats in its stomach during October 1982 at a site 0.8 km south of Ritidian Point. Other evidence, although circumstantial, suggests that snakes may be preying on young fruit bats at roosts. The proportion of large juvenile bats in the main colony rose dramatically from 5.0% ($n = 60$) to 46.6% ($n = 88$) of all young present when roosting sites changed from Pati Point to Jinapsan Point in December 1982. Sightings of snakes and their molted skins and disappearance rates of birds indicated that snakes had inhabited Pati Point several years longer and were more common there than at Jinapsan Point. Young bats of this age are particularly vulnerable to predation because they are not

yet able to fly and are too large to be carried by their mother during night-time foraging. Thus, they are left overnight at the roosting site where they may be susceptible to nocturnal predators.

The brown tree snake may be more directly involved in the post-World War II declines of bats in southern and central Guam than originally thought. The snake has occurred there sympatrically with both species of fruit bat for the past 30 years. However, because of the recent invasion of snakes into the extreme northern end of the island, they do not share the blame for decreases in the number of fruit bats in that region prior to 1980.

Typhoons are a rare but potentially serious threat to Guam's small number of remaining *P. m. mariannus*. Strong typhoons with sustained winds of more than 250 kph strike the island about once every 10 to 15 years. Although there is no evidence that storms have ever greatly reduced fruit bat numbers on Guam in the past (probably due to a lack of serious observations), severe typhoons have been implicated in precipitous declines of *Pteropus* on several islands in the western Indian Ocean (Cheke and Dahl 1981). Gale-force winds on Guam are capable of denuding large forested areas of foliage and fruit (N. Drahos unpub. rep.) and residents have reported finding dead bats under roosting trees after strong storms. Animals not killed directly by winds could face a period of up to several months of low food supplies. In the past, when fruit bats were common throughout the island, a severe typhoon would be unlikely to have a long-lasting adverse impact on the entire bat population. However, under present conditions, with most animals concentrated in a single colony, a typhoon directly striking the roosting area could produce disastrous results.

Military bases have been important in prolonging the existence of *Pteropus* on Guam since World War II. By limiting access to civilians and clearing few additional stands of native forest in the past 30 years, military reservations have functioned as partial refuges for fruit bats where habitat is maintained and illegal hunting is somewhat prohibited. Although bats have survived longer on these lands than in non-military areas, trespassing

poachers have gradually depleted the bats on these bases as well. At present, only AAFB, which occupies about 6,250 ha, has a fruit bat population larger than just a few isolated individuals. Although the Government of Guam has established four conservation preserves that total 1,700 ha, these have been of minimal value to *Pteropus* because of the lack of enforcement of conservation laws within them.

To satisfy the culinary demands of the local residents in the face of the scarcity of resident fruit bats on Guam, large numbers of *Pteropus* have been imported from other Pacific islands in recent years (Wiles and Payne 1986). From 1975 to 1984, approximately 8,000 to 24,000 bats were shipped annually to the island for human consumption. Although there is some risk that illegally-taken local *P. m. mariannus* may be trafficked among imported animals, this business has undoubtedly benefited the island's remaining wild bats by removing from them a significant amount of hunting pressure. However, in its present form, the trade is a cause for concern because of the severe declines in bat numbers that it has caused on some nearby islands that export bats (Wheeler 1980, Falanruw in prep., T. O. Lemke pers. comm.).

The frequency and role of colony-sized movements between islands in the southern Marianas in the past when fruit bats were once abundant can only be speculated upon. Residents report that migrations of bats between islands often occurred in the past; however, these reports have never been verified (Perez 1972). Flights of this type between Guam and Rota were apparently rare from 1980 to 1984 despite frequent hunting incidents at colonies on both islands (this study, T. O. Lemke pers. comm.). No flights are known to have occurred from Guam to Rota during this period. Movement by a large number of bats to Rota could explain the sudden drop in size of the population on Guam that occurred from 1972 to 1974 (N. Drahos unpub. repts.). Fruit bats are also believed to fly between islands in the northern Marianas (Wiles et al. in press).

Conservation Measures

Illegal hunting is a major factor preventing a recovery of *P. m. mariannus* on Guam. Al-

though most fruit bats reside on AAFB, there has been little direct protection afforded them on the base. Government of Guam conservation officers were prevented from patrolling on Air Force property from November 1983 to July 1985 because of firearm restrictions. Meanwhile, Air Force personnel are restrained in their efforts to enforce wildlife laws by a security policy that places primary emphasis on the protection of military resources. Obviously, it is necessary for conservation officers and military security police to work together in a combined effort that will reduce illegal fruit bat hunting in the future. Increased patrolling should be conducted at known roosts and near Jinapsan Point, which is a favored feeding area. Aggressive prosecution of the illegal take, sale and trespass laws is needed to deter poaching attempts.

Snake predation is potentially a second important cause of mortality to fruit bats. The impact of brown tree snakes on bats and development of snake control measures deserve immediate study.

Protection of Guam's remaining native forests is necessary, especially on military lands in the northern part of the island. These forests at present seem to be sufficient in size to support a much larger fruit bat population once a recovery is achieved. However, some of these remaining stands are threatened by a proposed expansion of facilities on AAFB and possible tourist developments in two small enclaves of private land nearby. Preservation of forest along clifflines from Lafac Point to Achae Point is most important.

Because of the likelihood of movements between islands, the conservation of fruit bats on Rota and other islands in the Marianas is vital to a recovery program for bats on Guam. Populations of *P. m. mariannus* on Rota, Aguijan, Tinian and Saipan should be considered for listing as endangered under the U.S. Endangered Species Act.

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