

MANAGEMENT OF FRUIT BATS ON YAP, CAROLINE ISLANDS: PAST AND FUTURE CHALLENGES

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1988 TRANSACTIONS OF THE WESTERN SECTION OF THE WILDLIFE SOCIETY 24:38-41

Abstract: Increased hunting pressure for export, commencing about 1975, resulted in a serious decline in the populations of the Yap fruit bat (*Pteropus mariannus yapensis*). Factors causing this pressure included an export market in the U.S. Territory of Guam and in Saipan, Commonwealth of the Northern Mariana Islands and increased use of firearms. Research on Yap fruit bat populations generated legislative support for hunting regulations and gun control. As a result, bat populations have increased two to five-fold between 1981 and 1986. Biological, social, and economic considerations pose a challenge for sustainable management of Yap State's fruit bats in the future.

Yap State lies in the Western Pacific and includes a group of high islands with a maximum elevation of 174 m and totaling about 100.8 km², and 15 low outer islands totaling about 19.2 km². It is one of the four Federated States of Micronesia, an emerging Pacific nation associated with the United States. Yap State's only indigenous mammals are fruit bats found on the high islands of Yap (*Pteropus mariannus yapensis*), and Ulithi atoll (*Pteropus mariannus ulithiensis*) (Falanruw, in press).

PAST USE OF FRUIT BATS

In the past, when Yap's human population was high, use of natural resources was culturally regulated (Falanruw 1982). Groups of people living more inland and having limited or no access to marine resources hunted and ate fruit bats (maga'lau). Harvesting of fruit bats was largely done with nets (Fig. 1). Flight patterns of fruit bats were observed and platforms erected near feeding trees. Bats were then netted in the evening when they came to feed. Bats were not netted from their roosts (tamabu), for fear of disturbing the colony. In this way, the colony remained in the area so that flight paths could be observed and netting locations determined.

Yap's human population declined considerably from the time that outsiders first settled on the island in about 1869, through the period of Japanese occupation (Useem 1946), reducing the number of people using the fruit bat resource. The availability of imported foods reduced the pressure further. By 1965, fruit bat populations were high and bats were a common sight at dusk and dawn even in open savanna areas where they fed on the ripe fruit of *Pandanus tectorius*.

THE FRUIT BAT TRADE

Yap's Fruit Bat

Although consumption on Yap is limited, fruit bats are sought as a specialty of the Chamorro cuisine on Guam and Saipan. After the decline of fruit bat populations and imposition of hunting restrictions on Guam, Chamorros living on Yap began to export bats from Yap to Guam, initially for home consumption, and then for sale in small stores.

The numbers of bats estimated, on the basis of import permit requests, to have been exported from Yap to Guam increased from a few in 1974 to over 7,288 in 1980 (Wiles and Payne 1986), and large numbers in the first five months of 1981 (Falanruw, in press). Initially, the export market was filled by shooting bats where their flight paths crossed roads, and in savannas. By 1979, bats were becoming wary and more difficult to harvest. When business became more commercialized and prices increased, a shift to shooting fruit bats at roost sites occurred. Exports increased and included many female bats and their young.

In 1975 the Yap legislature passed a law limiting the hunting of bats to October through December. This hunting season was ignored, and export records show more bats were exported during the closed season than during the open season (Falanruw, in press). A number of factors caused a departure from the traditional pattern of use of fruit bats. A resource traditionally utilized by a less powerful class of Yap's society acquired a high monetary value. Simultaneously, the public road system was expanded, increasing access to private lands. This resulted in the use of fruit bats by a broader group including individuals who were not the traditional users of fruit bats, and non-Yapese. The resulting unlimited exploitation was a new cultural phenomenon and rapidly reduced the fruit bat population, which had been increasing prior to 1965.

In May 1981, fruit bats became protected by law throughout the year, and accompanying legislation outlawed the possession and use of firearms on Yap. The decrease in firearms and enforcement of Yap's law by Guam Customs officials brought an end to the major trade in fruit bats from Yap.

Between June 1979 and June 1981, 21 roosting sites were located most of which were small, frequently disturbed and difficult to count. Roost counts ranged from 7 animals to 62 and 72 bats in the two largest roosts found. The latter colony was the largest found in 1984 when some 600 bats were counted as they returned to roost at dawn (Engbring 1985). Surveys in 1984 and 1986 located some 26 roosting areas and by 1986 the fruit bat population of

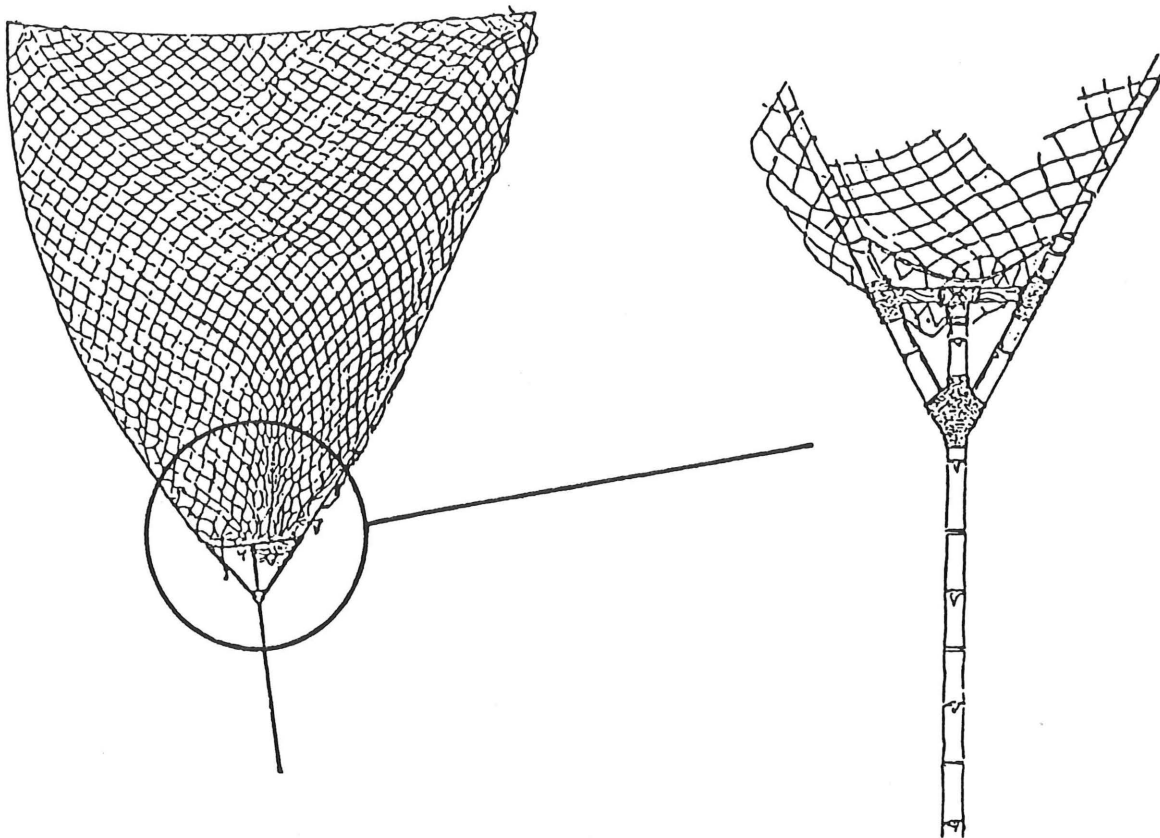


Fig. 1. The net used in fruit bat hunting, reproduced from Muller (1917). This example was 1.65 m long. The close-up drawing was based on recent interviews with elders. The handle was made of large bamboo and was about 4-5 m long. The sides of the net assembly were made of small bamboo, each side being 1.5-1.8 m long. The net is made of coconut fiber twine, which is also the material used to tie the assembly together. The cross piece is a stick. The side pieces of the net are inserted into the handle assembly, and can be removed and the net rolled up for transport.

Yap was estimated to be between 2,500 and 5,000 (Engbring 1985, 1986).

Ulithi's Fruit Bat

The fruit bats of Ulithi were described by Yamashina (1932) but appear to have been relatively inconspicuous, leading to local reports that fruit bats came to Ulithi after typhoon Ophelia in 1960. Any previous patterns of cultural use are not known, and fruit bats, whose original Ulithian name was changed to "rat of the air" (*gechelulural*), were not customarily eaten on Ulithi in recent times.

A 1986 census of the fruit bats of Ulithi yielded an estimate of some 1,200 animals for the atoll's 4.5 km² of land, about six times the density of fruit bats on Yap (Engbring 1986). Observations of feeding patterns and the local flora suggest that the Ulithi population was near carrying capacity. There is interest in harvesting these bats which feed on, among other things, breadfruit, young coconuts and coconut sap tapped for the alcoholic beverage called *achif*. Ulithi's agroforests were severely damaged by typhoon Nina in November 1986 and typhoon Orchid in January 1987, leading to renewed inter-

est in reducing the fruit bat population. A one-month season for hunting Ulithi's fruit bats by traditional methods or with air rifles was held in November 1988.

CHALLENGES FOR MANAGEMENT

Yap State has limited local resources, and has developed a great imbalance in trade and reliance on U.S. funding during the period of the American Administration (Yap State 1982). Under the new Compact of Free Association with the U.S., development funds provided to the Government of Yap will decrease over the next 14 years, by which time the State will have to meet many more of its fiscal needs. Because of this, the State's general objectives for the use and development of local natural resources are to: (1) protect and enhance subsistence production so that the State will not become more dependent on outside resources, (2) develop local products to substitute for imports, and (3) encourage surplus production for revenue earning export.

The achievement of these objectives will require sustainable use of resources. In the case of fruit bats, Yap will be entering uncharted territory. While there are

many references to either a need to protect fruit bats, or to kill them off when they damage fruit crops, management for sustained production is unprecedented.

Personnel of the U.S. Fish and Wildlife Service think that present populations of Yap fruit bats can support hunting for subsistence use and suggest that a 20 percent annual harvest could be sustained (Engbring 1986). The commercial export of fruit bats is now more complex. In 1987 the fruit bats of Yap were included as Appendix II species under the Convention on Trade in Endangered Species (CITES) regulations. Trade in Appendix II species is allowed, but export permits are required. The issuance of such permits should be in accordance with a program of sustained management based on biological and social considerations.

Biological Considerations

Biological data on Yap fruit bats has been gathered. These data show that it is more difficult to distinguish between populations of fruit bats than previously reported, that the fruit bats of Yap can reproduce throughout the year, and that one pregnancy can follow another in rapid succession (Falanruw, in press). Roosting sites have been surveyed and populations estimated (Engbring 1985, 1986). If the fruit bats of Yap and Ulithi are to be managed for maximal sustained productivity, additional field studies would be needed to work out the reproductive ecology and population dynamics of Yap fruit bats. It appears that the protection of critical systems of roosts with nearby feeding areas would be effective. A graduated sequence of measured harvest combined with periodic population counts is needed. This, however, would require the training of local biologists to gather this data and provide information and guidance on natural resource management. Until such personnel are developed, and a management plan implemented, social factors relating to exploitation of fruit bats will predominate.

Social Considerations

Managing resources requires regulation of people's use of and impact on these resources. The traditional system regulated use of specific resources through resource use rights associated with the hierarchical social system (Falanruw 1982). Today, however, traditional limitations have been lost by default, modified, or negated as a result of new circumstances. Efforts to replace traditional limitations with western-style regulations have not been successful. The large and uncontested off-season trade in fruit bats in the 1970's was a case in point. Similar laws purporting to regulate *Trochus* harvesting and the taking of sea turtles and sea birds in Yap State have been unenforced (Marine Resources Management Division 1986). The success of current measures protecting fruit bats is due to the decrease in firearms resulting

from the gun law, and to the enforcement of Yap's laws by Guam customs officials who do not allow shipments of bats from Yap to enter Guam.

Foreign type legislation requires paid foreign style enforcement. There are currently no conservation officers in Yap State, and funds for the employment of government workers are expected to decrease. Geist (1987) provides historical evidence that placing a market value on dead specimens of vulnerable wildlife generates an infrastructure that attracts illegal activity, and protecting such wildlife from poaching is very costly. Until an adequate system of social control over resource use is developed it will not be possible to assure sustainable exploitation of fruit bats or other resources, and commercial exploitation would be unwise. Therefore, it will be important to limit the harvest of fruit bats to subsistence use.

Traditional regulations were enforced by the community as part of everyday life. Given economic realities it will be necessary for Yap to institute a neotraditional resource management system which has the support of the community. Regulations based on current cultural and socio-economic realities and bio-ecological considerations are needed. At present, local concern over resource use is largely directed towards who has jurisdiction over the exploitation of resources rather than to the conservation of those resources *per se*. If conservation is to be achieved, there must be a recognition of a need to conserve. This need is evident in the traditional practice of apportioning resources, thus protecting them from exploitation by all. A switch from preoccupation with the social aspects of the traditional class system to its function in resource management is needed.

The success of a recent program to reintroduce seed populations of giant clams into municipally controlled waters (Price and Fagolimul 1986, Marine Resources Management Division 1987), suggests that community-based resource management could still work. A municipal constabulary has recently been established to deal with social problems in villages on Yap. This community-based police force could eventually become the agents of a neotraditional system of resource use supportive of sustainable development.

ACKNOWLEDGEMENTS

I am grateful to the people who helped with this project including M. Faimau who helped with field work and drew the figures based on interviews, and to W. Gorongfel, Memog, and En for teaching me about bat hunting.

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