AMENDMENTS TO APPENDICES I AND II OF THE CONVENTION

A. Proposal

Transfer of Pteropus insularis, P. mariannus, P. molossinus, P. phaeocephalus, P. pilosus, P. samoensis (dead specimens and parts only) from Appendix II to Appendix I; retention of P. macrotis, P. tonganus, and P. tokudae and the addition of P. speciosus and Acerodon jubatus in Appendix II under provisions of Article II, paragraph 2a; and inclusion of the remaining unlisted Pteropus species and all Acerodon species in Appendix II under provisions of Article II, paragraph 2b, i.e., for reasons of similarity of appearance (dead specimens and parts only).

B. Proponent

The United States of America

C. Supporting Statement

1. Taxonomy

1.1 Class: Mammalia
1.2 Order: Chiroptera
1.3 Family: Pteropodidae
1.4 Genus: Pteropus Erxleben, 1777.

Pteropus taxa proposed for transfer from Appendix II to Appendix I, organized by species group (following Andersen, 1912 and Honacki, et al. 1982), are listed below. All Pteropus species are listed in Table 1.

Mariannus Group	
P. mariannus mariannus Desmarest, 1822	Mariana flying fox
P. m. loochoensis Gray, 1870	Ryukyu flying fox
P. m. paganensis Yamashima, 1932	Pagan flying fox
P. m. pelewensis K. Andersen, 1908	Palau flying fox
P. m. ualanus Peters, 1883	Kosrae flying fox
P. m. ulithiensis Yamashima, 1932	Ulithi flying fox
P. m. yapensis K. Andersen, 1908	Yap flying fox
Molossinus Group	
P. molossinus Temminck, 1853	Ponape flying fox
Samoensis Group	
P. samoensis Peale, 1848	Samoan flying fox
Pselaphon Group	
P. insularis Hombron and Jacquinot, 1842	Truk flying fox
P. phaeocephalus Thomas, 1882	Mortlock flying fox
P. pilosus K. Andersen, 1908	Large Palau flying fox

As with other megachiropteran bats, the taxonomy of Pteropus is based largely on Andersen (1912). Using primarily skull and dental characters, he defined groups of related taxa (the species groups used here) within this speciose genus. Some additional species have since been recognized (e.g., Van Deusen, 1969; Felten and Kock, 1972), but much of the subsequent taxonomic revision has involved combining species described by Andersen and his predecessors on the basis of overlap in size characters (e.g., Wodzicki and Felten, 1975). Thus, many of the taxa now recognized as subspecies were previously considered to be species. Because subspecies in this genus are frequently size and/or color morphs occurring on separate islands or island groups, with limited exchange of individuals, most are discrete management units from a resource conservation perspective. Honacki, et al.(1982) provide a list of Pteropus species which is followed here, but with some presently unlisted species names altered to conform to the revisions by Koopman (1989) -- a review now in press.

1.5 Common Names

English: flying fox
French: rousette
German: Flederhunde, Flughunde

In English, the term "flying fox" is, as in other European languages, limited to Old World, megachiropteran bats. Reference to them in English as "fruit bats" is less desirable, as it invites confusion with the large radiation of frugivorous or nectarivorous microchiropterans limited to the New World. The only other bat currently listed under CITES is a New World fruit bat.

Mariana Is.	fanihi	P. mariannus
Yap Is.	maga'lau	P. m. yapensis
Samoa Is.	pe'a vao	P. samoensis
Samoa Is.	pe'a taulagi pe'a	P. tonganus
Namoluk Atoll	pwa	P. phaeocephalus or P. molossinus
Niue Is.	peka	P. tonganus

1.6 Code numbers

ISIS numbers from Honacki, et al.(1982) for the taxa proposed for transfer from Appendix II to Appendix I are given below. ISIS numbers for species proposed for inclusion in Appendix II are in the Annex.

Pteropus	ISIS 531405001024
Mariannus Group	
P. mariannus	ISIS 5301405001024025001
Molossinus Group	
P. molossinus	No ISIS number

Samoensis Group	No ISIS number
P. samoensis	No ISIS number
Pselaphon Group	
P. insularis	No ISIS number
P. phaeocephalus	No ISIS number
P. pilosus	No ISIS number

2. Biological data

2.1 Distribution

The genus Pteropus ranges from Madagascar and the Indian Ocean islands in the west, across mainland southeastern Asia, throughout the islands of the Pacific from the Ryukyu and Bonin Islands in the north, to coastal eastern Australia, New Caledonia and the Loyalty Islands in the south, east to Fiji, Tonga, Samoa and the Cook Islands (Table 2). The primary distribution is in the Pacific region, with 47 of the 57 species occurring east of the Indian Ocean.

Pteropus is primarily an island taxon, with 55 species (96.5%) having some or all of their distribution on islands (Table 2). Levels of endemism are extremely high, with thirty-five species (61.4 %) confined to single islands or small island groups. Only nine species are found in continental areas (five in Asia and four in Australia), and only two (P. lylei and P. poliocephalus) are restricted to continents.

The majority of species have limited or very limited distributions (Table 3), with 38 species (66.6 %) confined to land areas of less than 50,000 km^2. Twenty-two species (38.6 %) occur on land areas of less than 10,000 km^2.; thirteen (22.8 %) on less than 1,000 km^2. Only six (10.5 %) have a distribution of greater than 1,000,000 km^2.

Distribution of species proposed for Appendix I:

Pteropus mariannus mariannus - confined to the islands of Guam (541 km^2), a U.S. Territory, and Aguijan (7 km^2), Rota (91 km^2), Tinian (52 km^2), and Saipan (181 km^2), all part of the Commonwealth of the Northern Mariana Islands (CNMI) -- for a total of 872 km^2.

Pteropus mariannus loochoensis - found in the Ryukyu Islands of Japan, a chain which runs in an arc between Taiwan and Kyushu and has a land area of 2,196 km^2. The largest island is Okinawa (1176 km^2).

Pteropus mariannus paganensis - found only on Pagan (48 km^2), Almagan (11 km^2), and other small islands to the north in the CNMI.

Pteropus mariannus pelewensis - found only in Palau, in the Caroline Islands, with an area of 464 km^2.

Pteropus mariannus ualanus - found only on Kosrae Island (110 km^2) in the Federated States of Micronesia (FSM) of the Caroline Islands.

Pteropus mariannus ulithiensis - confined to the Ulithi Atoll of the Caroline Islands in the FSM (about 4 km^2).

Pteropus mariannus yapensis - found only on the Yap Islands in the western Caroline Islands (FSM), with a total land area of 220 km^2.

Pteropus molossinus, with no subspecies, is known only from Mortlock and Pohnpei in the eastern Caroline Islands (FSM), covering a total land area of less than 500 km^2.

Pteropus samoensis of Fiji and Samoa has two recognized subspecies.

P. s. naiwaiwensis is found in Fiji (18,330 km^2).

P. s. samoensis in the U.S. Territory of American Samoa (194 km^2) and Western Samoa (2,840 km^2).

Pteropus insularis is confined to the Truk Islands (117 km^2) in the Caroline Islands of the FSM.

Pteropus phaeocephalus is found only on the Mortlock Islands (less than 100 km^2) in the FSM.

Pteropus pilosus, presumed to be extinct, was confined to Palau with 464 km^2.

Distribution of species proposed for retention in or addition to Appendix II under provisions of Article II, paragraph 2a:

Pteropus tokudae, although probably extinct, was confined to the U.S. Territory of Guam (541 km^2).

Pteropus tonganus, with three recognized subspecies, is the most widely distributed of the listed species, occurring on a number of islands from Karkar Island off the coast of New Guinea to Samoa, covering a total land area of greater than 60,000 km^2.

Pteropus macrotis is found on New Guinea and the Aru Islands, with an estimated area of >500,000 km^2.

Pteropus speciosus occurs in the southern Philippines, Solombo Besar, and Matasiri, a land area of >11,429 km^2.

Acerodon jubatus is found in the Philippines.

Distribution, population, and trade of species proposed for addition to Appendix II under provisions of Article II, paragraph 2b:

The distribution of species proposed for Appendix II is addressed in Annex 1. Species proposed under provisions of Article II, paragraph 2b either have more extensive distributions, i.e., > 100,000 km^2, or no population size or trend data exist and/or there is no documentation of international trade available. While these species were therefore not proposed under paragraph 2a some of these species may be especially vulnerable to overharvest for international trade.

2.2 Population Trends, with Relevant Information on Population Biology

2.2.1 Population Biology. Flying foxes are long-lived animals with a low reproductive rate. Females do not produce their first young until they are one to two years old (Asdell, 1964; Nelson, 1964a, 1964b; Thomas and Marshall, 1984), give birth to only one at a time (twinning is extremely rare) (Hill and Smith, 1984), have pregnancies that last from 4 to 6 months (Marshall, 1947; Neuweiler, 1969; Racey, 1973), and care for their young for up to a year (Pook, 1977). Although lifespan in the wild is not well-documented, captive Pteropus have lived up to 17 years (Koopman and Cockrum, 1967).

Flying foxes, particularly on islands, have few natural predators (raptors and snakes) and a population biology remarkably similar to that of primates. Their limited reproductive capacity makes them especially vulnerable to catastrophic events (e.g., typhoons) and unnatural predation (e.g., overhunting). When subjected to drastic declines, their populations take a long time to recover. For reasons documented elsewhere in the conservation biology literature, island taxa, with restricted distributions, are at particularly high risk of extinction.

All wild populations of Pteropus that have been studied, except those of P. m. yapensis (Falanruw, 1984) and P. pumilus (Heideman, 1987), exhibit the same pattern - a well-defined breeding season, with one young per adult female per year. Some other pteropodid genera follow the same general pattern as Pteropus (Dwyer, 1975; Heideman, 1987; Mutere, 1967), but most breed aseasonally or exhibit two birth peaks a year (Heideman, 1987; Thomas and Marshall, 1984). Females of these latter species mate right after giving birth and, thus, are capable of producing two young per year (Falanruw, 1984; Thomas and Marshall, 1984).

2.2.2 Population Trends for flying foxes. Available data on the status of flying fox species indicate serious population declines throughout their range. Authors repeatedly cite three causes: habitat loss, overhunting, and cyclones.

Reports by early explorers and scientists indicate that aboriginal densities of flying foxes were extremely high throughout the Old

World tropics. Peale of the U.S. Exploring Expedition in the 1840's describes the forest of Samoa as being infused with the odor of bats -- "their strong odor taunts the atmosphere of the otherwise fragrant forests, and will always be remembered by persons who have visited the interesting regions inhabited by these animals" (Cassin, 1858). Today there is no odor of of bats in the forest, and one could visit Samoa and possibly never see a flying fox (E.D. Pierson, pers. comm., 1988). In the Philippines, roosts of up to 150,000 flying foxes (Pteropus vampyrus and Acerodon jubatus) were common as late as the 1920's, but the largest colonies now number no more than a few hundred individuals (Diamond, 1988; Heaney and Heideman, 1987). However, P. vampyrus occurs from the Philippines throughout Indonesia to the Malay Peninsula. In Australia in 1930, Ratcliffe (1932) reported Pteropus "camps" of up to 10 km. long and 1.3 km. wide, with estimated numbers of up to 30 million. Now, many colonies have disappeared entirely, and only a few are reported to contain more than 100,000 individuals (Pierson, 1984). In a recently completed survey of bat utilization in Indonesia and Malaysia, Fujita (1988) reports that for the past ten years hunters have been finding it increasingly difficult to locate Pteropus roosts.

2.2.3 **Population trends for the 6 taxa proposed for transfer to** Appendix I. Declines for these taxa can be attributed primarily to overhunting, specifically to supply the market in Guam (Lemke, 1986; Wiles, 1987a, c & d; Wiles and Payne, 1986).

Pteropus mariannus mariannus and P. m. paganensis (Guam and CNMI) [Trade in these species to Guam would not involve international trade]

On Guam, P. mariannus mariannus, believed to number approximately 3000 in 1957 (Lemke, 1986), its numbers were reduced to 500 to 600 in FY 1987 (Wiles, 1987c). According to Wiles, there is currently no recruitment of young into the population because of snake predation.

On Rota (Pteropus mariannus mariannus) in the CNMI, from 1983-1985, the number of flying foxes on the island declined in three out of four major colonies (Lemke, 1986). The population, estimated to be 2,150 to 2,500 individuals (Wiles, 1987b), had declined to 1,400 by November 1988, due largely to a January 1988 typhoon and subsequent poaching (Wiles, pers. comm., 1988).

A 1986 survey of the Marianas revealed that Marianas flying foxes (P. m. mariannus on the southern islands and P. m. paganensis on the northern islands) are close to extinction on three islands, declining on a fourth, and subject to illegal hunting throughout the Commonwealth, including remote islands north of Saipan (Lemke 1986).

Pteropus mariannus loochoensis (Ryukyu Islands, Japan)

No current information available.

Pteropus mariannus pelewensis (Palau, in the Caroline Islands)

The current status of this subspecies is unknown. Following a ban on firearms in 1982, and reduced hunting pressure, the population appeared to increase (Wiles, pers. comm.). The numbers of bats being exported to Guam has steadily increased in the past three years, however, and for 1987 and 1988 Palau was the major supplier to the Guam bat trade (Figure 4 and Table 2).

Pteropus mariannus ualanus (Kosrae Island, FSM)

No current population estimates available.

Pteropus mariannus ulithiensis (Ulithi Atoll, Caroline Islands, FSM)

A survey conducted by G. Wiles in November 1988 yielded a population estimate of 1,200 bats for Ulithi, the highest density (300 per km^2) yet recorded (Wiles, pers. comm., 1988), but the small size of this atoll (4 km^2), and its accessibility to Guam, places this subspecies at particular risk.

Pteropus mariannus yapensis (Yap Islands, western Caroline Islands, FSM)

Populations on Yap plummeted in the 1970s as a result of commercial exploitation (Falanruw, 1984). After protection in 1981 numbers increased and the estimated minimum population size in 1984 was 2,363 animals (Engbring, 1984). Nevertheless, this population remains at risk for international trade, since Yap is readily accessible by air to the Guam import market (Engbring, in litt., 1987).

Pteropus molossinus (Mortlock and Pohnpei, FSM)

No current estimates are available, but populations are suspected to be declining throughout the species' range. For the past three years Pohnpei and Truk have been two major suppliers to the Guam market (Table 2 and Figure 4). Recent information from G. Wiles (in litt., 1989) suggests that a substantial number of the bats being exported to Guam from Truk originate in the Mortlock Islands. Because bat populations are limited by the small land area of these islands (less than 100 km^2), commercial harvest is bound to have a seriously detrimental effect on these populations.

Pteropus samoensis (American and Western Samoa)

Interviews with local residents in both American and Western Samoa indicate that bat populations (including both P. samoensis and the more common P. tonganus) declined dramatically during the years

(1982-1986) that Samoa was the major supplier to the Guam bat trade. Although prehunting population estimates for P. samoensis are not available, extrapolations from the 1982 population estimates provided by the U.S. Fish and Wildlife Service (Amerson et al., 1982), which did not distinguish between the two species, suggests a decline of between 59% and 95% for P. samoensis between 1982 and 1986 (Pierson, in litt., 1987). P. Cox, conducting pollination research in Samoa beginning in the early 1970's, noted drastic declines in this species in the early 1980's due to overhunting and deforestation (Cox, 1984b). This non-colonial species was likely never abundant, and recent studies by Pierson and Rainey (1988) show that behavior patterns (diurnal activity, protracted soaring, lack of escape response) make it differentially vulnerable to harvest.

Populations in American Samoa were estimated by Engbring (1986) to be 657 on the main island of Tutuila. Surveys by Cox, Pierson and Rainey in 1987 and 1988 estimate the population in 1988 to be no more than 500, and possibly as few as 100, on Tutuila (pers. comm., 1988). In addition, wildlife species, including flying foxes, appear to have suffered high mortality as a result of Hurricane Tusi which hit the Manu'a Islands of American Samoa in January 1987 (Cox, 1987; Knowles, 1988).

Engbring (1986) estimated a population size of 3,690 P. samoensis for Western Samoa (1.3 bats/km^2) in 1986. In July 1988, Cox, Elmqvist, Pierson, and Rainey estimated the densities in one area of the less-developed island, Savai'i, to be no more than 0.2 bats/km2 (Pierson, pers. comm., 1988).

Sources in Western Samoa indicate that both legal and illegal shipments to Guam continue (Pierson, pers. comm.). Local chiefs comment on the declining numbers and report that foreign buyers have come to the most isolated areas of Savai'i twice in the past two years but purchased only P. samoensis in preference to the more common P. tonganus (Pierson, pers. comm.).

Pteropus insularis (islands of the Truk lagoon, FSM)

The population was estimated at 5,628 animals in 1986 (Engbring, 1986). Numbers have almost certainly declined substantially since 1986, however, because imports into Guam from Truk have increased dramatically since 1986 (Table 2 and Figure 4). On a recent trip to Truk, G. Wiles learned from agricultural extension agents there that large numbers of bats were being shipped to Guam from islands within the main Truk Lagoon (in litt., 1989). One of the agents commented on a "noticeable decline" in bat numbers on Moen, and Wiles saw only five bats in four days on this island. On another island (Tol), a colony of about 200 bats observed by J. Engbring in 1984 appears to be gone. In 1988 Truk was the second most important supplier of bats to Guam, and in the last months of FY 1988 has shipped more bats to Guam than it did in all the previous 12 months.

Pteropus phaeocephalus (Mortlock Islands, FSM)

No population estimates are available for this species, but on a trip to Truk in early 1989, G. Wiles learned that "a fair number of bats" were being harvested in the Mortlocks, moved by boat to Moen in Truk, and then shipped on the Guam (in litt., 1989). This species is limited to the small land area of the Mortlocks, and cannot possibly sustain ongoing commercial harvest.

Pteropus pilosus (Palau, in the Caroline Islands)

This species is known from only two specimens caught in the 19th century. It is probably extinct (Koopman, pers. comm., 1987), but included in this proposal to include all Pteropus spp. on Palau on Appendix I and with our understanding that trade between Palau and Guam is expected to be recognized as international trade.

2.3 Habitat

Data have been accumulating rapidly in recent years on the critical role that bats play in the pollination and seed dispersal of forest trees, many of them economically important to man (Fujita, 1988). Over 300 plant species, in 53 plant families, are known to be visited by pteropodids; at least 453 products useful to man derive from plants that rely to some degree on bats for seed dispersal or pollination (Fujita and Tuttle, 1988) Work in Africa (Thomas, 1987) and French Guiana (Tuttle, pers. comm., 1987) documents that greater than 90% of the seed deposited in cleared areas is brought by bats. Bats may be keystone species, in the sense that significant declines in forest regeneration rates and diversity would accompany their extinction.

Many Pacific plant species are assumed to be exclusively dependent on flying foxes for successful pollination (Marshall, 1983 & 1985; Cox, 1984a). On many oceanic islands, with their limited faunas, bats are often the only vertebrates capable of carrying large-seeded fruits. Additionally, bats are, in many cases, the only pollinators available for many of the forest plants, particularly those that are night-blooming. Cox (pers. comm., 1987) has estimated that at least 30% of forest trees on Samoa are bat-dependent. The kapok tree, Ceiba pentandra, economically prized for its fiber, bark, and seeds, is pollinated by numerous taxa in Africa and South America (Baker and Harris, 1959), but pollinated solely by P. tonganus on Samoa (Elmqvist et al., in prep.).

Habitat loss has been cited by a number of authors (Carroll, 1984; Cheke and Dahl, 1981; Diamond, 1988; Falanruw, 1984; Fujita and Tuttle, 1988; Pernetta and Hill, 1984; Racey, 1979; Wodzicki and

, 1975) as a major factor contributing to declines in flying
ɔulations. Although information is limited on habitat
ements for some species, it is evident that there is
erable ecological variation within the genus. Some species,
teropus gilliardi of New Britain, for example, appear to be
ed to montane forests; others, like Pteropus conspicillatus of
lia or P. tonganus, frequent agricultural areas.

estation, so widespread in almost all tropical areas of the
has had several identifiable consequences for flying fox
tions. Many species, particularly those inhabiting mangrove
(e.g., Pteropus vampyrus in Malaysia and Indonesia) and
d forest, have lost critical roosting areas. Mangrove swamps
ing destroyed by the woodchipping industry, for mariculture,
od, and coastal development, and lowland forest is vulnerable
icultural conversion.

loss of forest may mean the loss of critical food resources
ny species -- e.g., the loss of tamarind trees, a favorite
f P. rodricensis, has been identified as one factor in the
e of this species (Cheke and Dahl, 1981). Even P. tonganus,
appears adaptable to agricultural conversion, greatly
red native over cultivated fruits in a recent feeding test
on, pers. comm., 1987).

ing urbanization has also brought road construction and easier
to remote roosting areas (Falanruw, 1984). This means it has
asier to hunt animals at their roosts. Such disturbance can
animals to abandon a site (Wiles, 1987c), having serious
uences, particularly during the maternity season.

data

National Utilization

ction

foxes have long been an important source of food to
nal subsistence communites of the Pacific (Craven, 1988;
and Hill, 1984) and continue to be considered a delicacy in
more urbanized communities (Anon.,1988a and 1988e; Fujita,
jita and Tuttle, 1988). Records of flying foxes as a major
item occur over most of their range, from Guam (Wiles, 1987a
nuatu (Anon., 1988c), Samoa (Cox, 1983), and the Cook
(Wodzicki and Felten, 1980) to the Philippines (Heaney and
, 1987), Irian Jaya (Craven, 1988), Thailand (Lekagul and
1977), Indonesia and Malaysia (Fujita, 1988), in the
region to the Mascarenes, and Seychelles in the Indian Ocean
and Dahl, 1981; Racey, 1979). In southeast Asia, flying fox
also valued as a remedy for asthma, kidney ailments, and

"tiredness," especially amongst people of Chinese origin (Fujita and Tuttle, 1988).

Current data indicate that the introduction of firearms, and a shift from subsistence to commercial harvest have precipitated declines in flying fox populations in many parts of their range (Engbring, 1985; Wiles, 1987c; Wodzicki and Felton, 1975). The situation has become particularly critical on Guam where the demand for bats has been so great that by the late 1960's the native resource had become depleted, and Guamanians began seeking bats from other islands (Wiles and Payne, 1986). A continuing demand has led to an extensive trade (both national and international).

An investigation of bat hunting in Malaysia and Indonesia conducted in 1985-1986 revealed that the hunting of bats for human consumption is quite common (Fujita and Tuttle, 1988). One hunter interviewed in Kota Baru, Malaysia reported regularly shooting as many as 100 to 200 Pteropus "for personal consumption" from diurnal roosts of 10,000 to 15,000 Pteropus, but that such roosts were increasingly difficult to locate (Fujita and Tuttle, 1988).

Flying foxes also have considerable commercial value in many local markets (Wiles and Payne, 1986) and are a luxury item on restaurant menus in many parts of their range (Anon., 1988a and 1988b; Fujita and Tuttle, 1988). In Guam the price fluctuates with supply, but currently bats are selling for US$ 14-18 a piece (Wiles, pers. comm., 1989). In Malaysia they sell in local markets for 6-8 ringgit (US$2.50-3.30), and in Jakarta for 12,500-15,000 rupiah (ca. US $10) (Fujita and Tuttle, 1988). The species most often hunted and sold in markets and restaurants in Indonesia and Malaysia is Pteropus vampyrus, the largest bat in southeast Asia; the second most common is another large species, Pteropus hypomelanus (Fujita and Tuttle, 1988).

Although Fujita and Tuttle (1988) acknowledged difficulty in accurately estimating the volume of bat meat traded in Indonesia and Malaysia, they reported that figures provided by many bat vendors indicate that the annual sales of a single vendor could eliminate an average-sized colony (about 10,000 individuals per colony) per year.

Particular hunting practices are also likely contributing to population declines. In recent years there has been a transition from traditional hunting methods (thorny vines, nets or fish hooks (Cox, 1983; Fujita and Tuttle, 1988) to the use of firearms. In 1988, several Samoan chiefs indicated that declines in local flying fox populations began with the introduction of guns (Cox, Elmqvist, Pierson and Rainey, pers. comm., 1988).

In addition, the most intense hunting for local use seems to occur during the bats' reproductive season. Hunters in Indonesia, Malaysia, Samoa and the Cook Islands (Fujita and Tuttle, 1988; La Mositele, pers. comm., 1988; Wodzicki and Felten, 1980) identify a

"bat season" which coincides with main fruiting or flowering peaks. During this time females are often caught pregnant or with attached young. Timing reproduction to coincide with times of greatest food availability has been documented for fruit bats in the New World tropics (Fleming et al., 1972). This seasonality of hunting has important implications for the ability of populations to recover from intense hunting pressure.

Although in Australia flying foxes are not commercially harvested, they are shot as orchard pests, both in the orchards and at their roosts. When Ratcliffe (1932) surveyed the impact of flying foxes on fruit growing, he concluded economic losses were inconsequential, despite considerable grower concern. Since that time the extent of native foraging habitat available to flying foxes has declined greatly, the area and diversity of commercial fruit has increased, and modern cosmetic standards for commercial fruit are very stringent, so that damage by bats is now economically more important (Tideman and Nelson, 1987). A reversal of protective legislation in Queensland in 1984 allowed for open hunting of flying foxes.

Cultural significance of taxa recommended for Appendix I listing

Archaeological evidence indicates that the Chamorro people of the Marianas have eaten flying foxes for over 1,000 years (Lemke, 1986). Still considered a delicacy, flying foxes are served at social occasions such as village fiestas, weddings, christenings and holiday celebrations (Wiles and Payne, 1986). As long as traditional hunting practices were used, this harvest seemed to have little or no impact on flying fox population size (Lemke, 1986), but with the introduction of firearms and a cash economy, populations began to decline. Although the situation has become increasingly critical since World War II, overhunting has been depleting flying fox populations since 1930 (Wiles and Payne, 1986). Any cultural limitations on the exploitation of this resource have long been forgotten (Falanruw, 1984). Virtual elimination of bat populations on Guam led to importation from other islands at least as early as 1970 (Wiles and Payne, 1986).

In Samoa, flying foxes are consumed for subsistence in more remote areas and hunted recreationally in developed areas. As mentioned above, there is considerable concern for the conservation status of these animals. Flying foxes play an important role in Samoan legend, and even today one of the highest chiefs' titles is "Tonumaipe'a," meaning "saved by flying foxes" (Cox, 1983).

Internal (within U.S.) trade into Guam for taxa recommended for Appendix I listing

As overhunting caused the decline of Pteropus populations on Guam, residents began importing flying foxes from elsewhere in the Pacific as early as the late 1960's (Wiles and Payne, 1986). Importations

increased considerably after the passage of local protective legislation in 1973 and 1981, and U.S. Federal legislation in 1984 (Wiles, 1987d). Most flying foxes currently brought in are sold commercially, although at least half are reported as being imported for personal use (Wiles, in litt., 1988). The Guam Division of Aquatic and Wildlife Resources requires that an import permit be obtained prior to the arrival of flying foxes, and that certificates of origin accompany all shipments. Guam Customs is responsible for inspecting the shipments and verifying that the number does not exceed the number recorded on the permit. Statistics on actual imports have been compiled since 1975. As seen in Table 2, annual imports of flying foxes to Guam have ranged from 8050 in 1975 to 24,650 in 1979. Since 1975, a total of 200,414 flying foxes have been imported into Guam.

Table 3 presents statistics on the numbers of flying foxes requested for import into Guam from 1979 to 1988. Although all of these animals were not actually imported and numbers are often inflated in order to respond opportunistically to supply (Wiles and Payne, 1986), they are nevertheless important in evaluating the importance of the trade in numbers and geographic range. For example, while the number of flying foxes imported to Guam in 1986 was 13,448, almost seven times that amount--90,556--were requested for import.

In the Commonwealth of the Northern Marianas (Pteropus mariannus mariannus and P. m. paganensis), formerly part of the U.S. Pacific Trust Territory and now as a commonwealth, trade between CNMI and Guam is still considered internal trade for export/import control purposes. Most of the primarily Chamorro inhabitants live on the southern islands of Saipan, Tinian, and Rota. While consumption of local populations of P. mariannus mariannus was common on these islands from 1975 to 1981, the CNMI was also an important and consistent source of flying foxes for the Guam market, since these islands are close to Guam and many Guam residents have friends and relatives there. This trade appears to have been carried out despite the fact that flying foxes have been protected throughout the CNMI by a series of 1- and 2-year hunting mortatoria established in 1977. Combined with local consumption, this trade has resulted in a decline in numbers of this subspecies.

Also, shipments of flying foxes have entered Saipan from outside the CNMI, specifically the Caroline Islands (now in part the Federated States of Micronesia). Some of these may have been transhipped to Guam.

Until November 1986, the 900+ islands comprising the Caroline Islands formed part of the U.S. Pacific Trust Territory. The states of Yap, Truk, Pohnpei, and Kosrae at that time became the Federated States of Micronesia (FSM), a political entity independent of the United States, while the remaining state of Palau is awaiting

ratification of its compact of free association with the United States.

Yap (Pteropus mariannus yapensis and P. m. ulithiensis) became an important source of flying foxes for the Guam and Saipan markets with the decline in populations on those islands (Falanruw, 1984). Whereas initially frozen flying foxes were taken to Guam from Yap as gifts, the trade became commercialized. At the same time, the extension of Yap's public road system increased access to bat flyways, allowing greater harvest of bats in previously inaccessible areas. By 1979, flying foxes were becoming scarce on Yap. The high rate of exports continued into 1981. (Falanruw, 1984) and the population was estimated at 1000 individuals (Wiles and Payne, 1986). Flying foxes were Yap's highest-priced export commodity from 1975 to 1981, and at a Guam market value of US$ 10-15 per animal, were Yap's second to third largest export (Falanruw, 1984). With the enactment of legislation in 1981 banning hunting and possession of flying foxes throughout the year, the commercial export of flying foxes from Yap appears to have stopped (Falanruw, 1984).

Truk, Pohnpei and Kosrae, the remaining islands that were once part of the U.S. Pacific Trust Territory and now part of the Federated States of Micronesia, have also been recorded as a source of flying foxes for the Guam market. Although on the islands of Truk (P. insularis, P. phaeocephalus, and P. molossinus) flying foxes do not appear to be hunted for local use, this state was identified as the source of 907 animals from 1978 to 1982, believed to be primarily P. insularis (Wiles and Payne, 1986). Pohnpei (P. molossinus) was recorded as the source of approximately 8,000 animals from 1979 to 1984 (Wiles and Payne, 1986). Kosrae (P. mariannus ualanus) was the source of only two shipments of 27 individuals each, in 1980 and 1984; however, according to Clayshulte (in Wiles and Payne, 1986), larger numbers have been shipped from there to Pohnpei.

Palau, while presently part of the U.S. Pacific Trust Territory would, upon ratification of an agreement of free association, be responsible for its own trade regulations. This ratification may occur within the next 12 months. Palau has been the most consistent major supplier of flying foxes to Guam in the past decade (Wiles and Payne, 1986). Pteropus mariannus pelewensis is the primary flying fox of the Palau Islands. Since 1975, Palau has supplied over 99,000 flying foxes to the Guam market (Table 4). Exports peaked at 18,500 animals in 1979 and declined to as low as 1105 in 1983 and 2,402 in 1986 (Wiles and Payne, 1986). Exports have increased sharply in recent years, to 7,092 in 1987, 9,800 in 1988 (Wiles and Payne, 1986; Wiles, pers. comm., 1988), and 3,391 in the first quarter of 1989 (Wiles, in litt., 1989).

American Samoa, also under U.S. jurisdiction, supplied flying foxes to the Guam market between 1980 and 1986. Trade peaked at 1632 animals in 1984 and appears to have ceased since a ban on commercial hunting was instituted in 1986.

3.2. International Trade into Guam

On 3 November 1986, the Federated States of Micronesia ceased to be part of the U.S. Pacific Trust Territory and became a freely associated state in political union with the United States. Bat exports since that time are international and fall under the provision of CITES. Exports from Truk showed dramatic increases beginning in 1986. In 1988 Truk exported more flying foxes to Guam than during the entire period from 1975-1985 (Table 2), and in the last three months of FY 1989, more than for all of the previous 12 months. Pohnpei has been a consistent supplier of flying foxes to Guam since 1979, but numbers have increased dramatically in the past few years (1,075 in 1987, 1,100 in 1988, and 2,075 in the last three months of 1988).

Western Samoa (Pteropus tonganus and P. samoensis) has been an important source of flying foxes to the Guam market since 1981, coinciding with the establishment of protective measures for flying foxes on the islands of Yap and in the CNMI. Since that year a total of 33,431 animals have been imported into Guam from Western Samoa (Table 2). From 1983 through 1986, Western Samoa was the major supplier, exporting as many as 8350 in 1983 and 7,187 in 1985. Between 1981 and 1988, import permits were issued for 146,475 animals (Table 3). Information obtained during a 1988 study in Western Samoa indicates that foreign buyers have selectively sought P. samoensis, by far the less common of the two species (Cox, Pierson and Rainey, pers. comm., 1988). In early 1989, the Western Samoan government passed a law banning the export of flying foxes.

The Philippines were recorded as an important supplier of flying foxes in 1986, when 2,471 were imported into Guam from that country. Import permits had been issued for 24,925 aniamls for that year (Table 3). Three species -- Pteropus vampyrus, Pteropus speciosus, and Acerodon jubatus -- are known to have occurred in trade (L. Heaney, pers. comm., 1989; K. Koopman, pers. comm., 1988). This is a matter of particular concern for both P. speciosus and Acerodon jubatus. P. speciosus has an extremely limited, small island, distribution, and occurs in an area of extensive forest clearing and heavy hunting. Acerodon jubatus, often found roosting with P. vampyrus, is the preferred species for hunting. Also, it requires primary forest, which has declined from 60% at the end of World War II to 5% now.

Papua New Guinea was recorded as the source for 1,589 flying foxes in 1983 and 1984. For those same two years, import permits were issued for 13,500 animals (Table 3). Although no imports from that country have been recorded in recent years, there appears to be

considerable interest in exporting flying foxes to the Guam market (Anon., 1988d) (see Section 34, Potential Trade Threats).

Tonga (Pteropus tonganus) was an important source of flying foxes to the Guam market in 1983 (3,050) and 1984 (2,030) but does not appear as a source in recent years. Import permits were issued for three years (1982-1984), for a total of 26,500 animals.

Other island states recorded as having shipped small numbers of flying foxes to Guam in past years include Fiji, Vanuatu, and the Solomon Islands.

While not identified as the source of actual imports, several additional countries have been recorded as the countries of origin for flying foxes approved for import into Guam (Table 5). In 1986 import permits were issued for 700 animals from Thailand and 36 from Okinawa. Permits have been issued each year since 1986 for a total of 2,510 flying foxes from Indonesia. Information as to whether these imports occurred and what species were involved is not available at the present time.

International Trade into the Commonwealth of the Northern Marianas.

Since overhunting for local use and exportation caused dramatic declines in flying fox populations in the CNMI during the 1960s and 1970s (Lemke, 1986), flying foxes have been imported into Saipan for markets there and on Tinian. It is unclear on what legal and regulatory basis flying foxes are imported into Saipan. Wiles estimates annual imports into the CNMI to be between 3,000-4,000 based on the Chamorro population in the islands, approximately one-fourth to one-third that of Guam (Wiles, in litt., 1988).

Other International Trade

Although the best documented trade is that into Guam, trade in Pteropus species may be occurring in other parts of the Pacific region. M. Fujita (in litt., 1989) reports that both Pteropus vampyrus and P. hypomelanus (a less common species that is readily confused with P. vampyrus is confined to small off-shore mangrove islands) are traded extensively in Southeast Asia. Malaysian bats appear in markets in Singapore and probably Java; bats from Irian Jaya may be traded in Java.

3.3 Illegal Trade

Annual Reports of the Guam Division of Aquatic and Wildlife Resources document an ongoing illegal trade of flying foxes into Guam. Each year a number of shipments are confiscated for lack of import permits, certificates of origin, or because the animals originated from islands where they are protected by local legislation. From October 1, 1985 to September 30, 1986 (= "1986"), for example, Guam Customs and Quarantine Division confiscated 275

flying foxes in 27 shipments (Wiles, 1986), in "1987", 802 in 44 shipments (Wiles, 1987b), and in "1988" 503 in 47 shipments (Wiles, pers. comm., 1988).

Flying foxes are reportedly packed in coolers filled with fish and smuggled from Rota to Guam by small boats or commercial airlines (Lemke, 1986). Similarly some sources claim that flying foxes are regularly taken without permits from Western Samoa to American Samoa by ferry, and then shipped on to Guam. Also, a comparison of export figures from Western Samoa and import statistics from Guam indicate that quantities of flying foxes are being shipped from Western Samoa without the necessary export permits.

In addition, inspections of confiscated shipments document some transshipment. Animals coming into Guam from Saipan, for example, were identified by K. Koopman (pers. comm., 1988) as taxa from the Philippines. How much transshipment is occuring is unknown, as many species are similar in appearance (see Section 5 and Table 5).

3.4 Potential Trade Threats

3.4.1. Live specimens. The small trade in zoo specimens is not considered to constitute any threat to these taxa.

3.4.2. Parts and derivatives. Discrepancies between number of bats requested (Table 3) and the number actually imported into Guam (Table 2) may illustrate the potential for a greatly expanded trade. Further examination of these data graphically reveals the shifting nature of the trade. For example, Papua New Guinea was a major supplier of flying foxes in 1984, Tonga in 1983 and 1984, and the Philippines in 1986. Concern about depletion of flying fox populations by commercial harvest on various islands has led to enactment of local protective legislation (see Section 4), with the result that the trade has shifted to another source. Thus, it should be realized that granting Appendix I status to some taxa will likely place others at higher risk by driving the trade elsewhere.

4. Protection Status

4.1 National

Guam: Both *Pteropus tokudae* (now probably extinct) and *P. mariannus mariannus* were protected from hunting on Guam by local legislation in 1973, included on Guam's Endangered Species List in 1981, and listed as endangered under the U.S. Endangered Species Act in 1984.

Commonwealth of the Northern Marianas: Legislation was enacted in 1977 establishing 1- to 2-year moratoria on bat hunting. Illegal

hunting is known to have persisted despite the moratorium. P. mariannus mariannus, occurring on the southern islands, was prohibited from trade into Guam through the taxon's listing on the Guam Endangered Species in 1981. This subspecies currently has candidate Category 1 status under the U.S. Endangered Species Act for the islands of Aguijan, Tinian and Saipan, and candidate Category 2 status in Rota. Pteropus m. paganensis also has candidate Category 2 status.

Federated States of Micronesia: Yap (including Ulithi Atoll) introduced an indefinite ban on the take and export of flying foxes as well as on the possession of firearms in 1981. There are not known to be any laws protecting bats in Kosrae (Wiles and Payne, 1986). Flying foxes are not protected in Pohnpei or Truk (including the Mortlock Islands) (Wiles and Payne, 1986). Although Wiles and Payne (1986) reported bats were seldom hunted in Truk, that situation has changed with Truk currently being the third most important supplier (Wiles, in litt., 1989).

Palau: A ban on the use and private ownership of guns established in 1982 appeared to have only a temporary effect on exports to Guam (Wiles and Payne, 1986), since for the past three years Palau has been the most important supplier to the Guam market. Under Palauan law, harvesting of bats must be with nets, but some bats have been seized in Guam full of shotgun pellets, indicating problems in enforcement of this legislation (Wiles, pers. comm., 1988).

American Samoa: Legislation was enacted in 1986 prohibiting the commercial harvest and export of fruit bats and restricting hunting for private consumption. In 1988 a National Park was authorized by the U.S. Congress. When established, this park will protect critical flying fox habitat. A petition to grant Pteropus samoensis endangered species status under the U.S. Endangered Species Act has been pending since 1984. The species currently has candidate Category 2 status.

Western Samoa: Legislation banning commercial export of flying foxes was passed in early 1989 (P. Cox, pers. comm.).

Tonga: Although one roost is protected by the royal family, fruit bats may be hunted freely elsewhere (Wiles and Payne, 1986).

Australia: CITES-listed Chiroptera are listed under Schedule II, Part I of the Wildlife Protection (Regulation of Exports and Imports) Act of 1982 as amended. Domestic trade, possession, and transport are governed by state laws: each state requires import and export documentation for species crossing state borders, and states must issue local transfer documents for commercial export of protected species. Four species of flying fox, all belonging to the genus Pteropus, were removed from Queensland's list of protected fauna in 1984 (Pierson, 1984). Legislation protecting flying foxes was passed in New South Wales in 1985 (Anon., 1986).

Burma: No Chiroptera listed.

China: No Chiroptera are listed on the schedules of protected species published in 1985 under the Environmental Protection (Provisional) Law of 1979.

Hong Kong: No Chiroptera listed on Animals and Plants (Protection of Endangered Species) Ordinance revised edition of 1978.

India: Under the Wildlife Protection Act of 1972, Chiroptera are listed as vermin in Schedule V: no license is required to hunt vermin so long as authorized hunting methods are used.

Indonesia: No Chiroptera listed on list of species protected under Wildlife Protection Ordinance of 1931 and Wildlife Protection Regulation of 1931, nor under subsequent ministerial decrees.

Japan: No Chiroptera listed under Foreign Exchange and Foreign Trade Control law.

Laos: No protected species lists available.

Macao: No protected species lists available.

Nepal: No Chiroptera listed under National Parks and Wildlife Conservation Act of 1973 nor under Rules and Amendments.

Pakistan: CITES is implemented through the Imports and Exports (Control) Act of 1950 and subsequent Trade Control Orders. According to CITES Notification 446 of 28 September 1987, the export of all wild mammals, reptiles, and protected indigenous birds from Pakistan is prohibited, including the export of all parts, products, and derivatives, with the exception of a limited number of hunting trophies which may be authorized by the Management or Scientific Authority. This ban has been extended by the Government of Pakistan until August 1989. No Chiroptera are included on lists pertaining to domestic trade, possession, and transport.

Papua New Guinea: No Chiroptera are listed under the Fauna Protection and Control Act (Chapter 154), the subsidiary legislation of the International Trade (Fauna and Flora) Act of 1979 implementing CITES that governs domestic trade, possession and transport of wildlife.

Peninsular Malaysia: Pteropus vampyrus and Pteropus hypomelanus are protected under Schedule II, Part III of Act 76, Protection of Wildlife Act of 1972. This prohibits their importation, exportation, and hunting for trophies but otherwise poses no restriction, except that no bat hunting is allowed after 2300h. A license to hunt bats is not required.

Sarawak, Sabah: No protection of bats under current legislation.

Philippines: No Chiroptera listed.

Singapore: No Chiroptera listed.

Sri Lanka: No Chiroptera listed on Flora and Fauna Protection Ordinance of 1939 nor subsequent regulations.

Taiwan: Not known whether any Chiroptera are listed under wildlife protective legislation.

Thailand: No Pteropus are listed under the Wild Animals Reservation and Protection Act of 1960 nor subsequent ministerial regulations.

4.2. International

In 1987, nine Pteropus spp. were included in Appendix II of CITES:

Pteropus insularis, P. mariannus, P. macrotis, P. molossinus, P. phaeocephalus, P. pilosus, P. samoensis, P. tokudae, and P. tonganus.

4.3. Additional Protection Needs

Despite national legislation protecting flying foxes in a number of countries (see Section 4.1) and the addition of nine Pteropus spp. to Appendix II of CITES in 1987, large numbers of bats continue to be imported into Guam -- the trade showing a greater than 100 percent increase in the last three months of 1988. Continued population declines and increased harvest of many Appendix II taxa argue for moving most of these taxa to Appendix I. The unpredictable, shifting nature of the trade (Table 2), plus the difficulties of distinguishing among species (Table 5) argues for including the entire genus under Appendix II.

5. Information on Similar Species

Similarity of appearance for a diverse array of poorly known endemic taxa in a rapidly shifting trade is an important aspect of this proposal. This problem is specifically noted in the Berne criteria. Morphological identification of many Pteropus species requires discrimination of skull and dental characters based on the relative size of particular features. The most accessible external features, such as pelage color and size, which might be used by wildlife agents to sort large lots of bats, are not sufficent to distinguish many taxa.

Table 4 allocates Pteropus species, on the basis of similarity of appearance, in a matrix of body size and color pattern categories. Although a few taxa have quite distinctive characteristics (i.e., a dark eye ring for P. conspicillatus or a brown forehead patch for P.

temmincki), many Pteropus species look very similar to each other. There are seven basic color morphs identified by Anderson (1912), but as can be noted from this table, there is often considerable intraspecific color variation. Thus, some taxa fall in several categories. Although size (based on forearm length) can help to separate adult members of similar species, there is always the potential that the juvenile of a larger taxon could be confused with an adult of a smaller taxon in the same color pattern category.

At the generic level, Pteropus and Acerodon are closely allied and distinguishable only by dental characters. Koopman (1989) has transferred several species from Pteropus to Acerodon in his review awaiting publication. Acerodon has already appeared in the Guam trade in shipments from the Philippines (Koopman, pers. comm., 1988). Thus, a restriction on trade in Pteropus is likely to effectively include Acerodon. However, the characters separating these genera from other flying foxes are simple external features.

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Table 1. Species of the genus Pteropus, organized by species group (based on Honacki, et al. 1982 and Koopman, 1989).

Subniger Group
- Pteropus hypomelanus Temminck, 1853
- Pteropus mearnsi Hollister, 1913
- Pteropus pumilus Miller, 1911
- Pteropus speciosus K. Andersen, 1908
- Pteropus griseus (E. Geoffroy, 1810)
- Pteropus faunulus Miller, 1902
- Pteropus admiralitatum Thomas, 1894
- Pteropus brunneus Dobson, 1878
- Pteropus howensis Troughton, 1931
- Pteropus sanctacrucis Troughton, 1930
- Pteropus ornatus Gray, 1870
- Pteropus dasymallus Temminck, 1825
- Pteropus subniger (Kerr, 1792)

Mariannus Group
- Pteropus mariannus Desmarest, 1822
- Pteropus tonganus Quoy and Gaimard, 1830

Argentatus Group
- Pteropus caniceps Gray, 1870
- Pteropus argentatus Gray, 1844

Niger Group
- Pteropus rufus E. Geoffroy, 1803
- Pteropus seychellensis Milne-Edwards, 1877
- Pteropus voeltzkowi Matschie, 1909
- Pteropus niger (Kerr, 1792)

Melanotus Group
- Pteropus melanotus Blyth, 1863

Livingstonei Group
- Pteropus melanopogon Peters, 1867
- Pteropus livingstonei Gray,1866

Chrysoproctos Group
- Pteropus chrysoproctos Temminck, 1837
- Pteropus rayneri Gray, 1870
- Pteropus fundatus Felten and Kock, 1972

Molossinus Group
- Pteropus lombocensis Dobson, 1878
- Pteropus rodricensis Dobson, 1878
- Pteropus molossinus Temminck, 1853

Samoensis Group
- Pteropus samoensis Peale, 1848
- Pteropus anetianus Gray,1870

Table 1.[CONTINUED]

Pselaphon Group
- Pteropus tokudae Tate, 1934
- Pteropus insularis Hombron and Jacquinot, 1842
- Pteropus phaeocephalus Thomas, 1882
- Pteropus pselaphon Lay, 1829
- Pteropus pilosus K. Andersen, 1908
- Pteropus tuberculatus Peters, 1869
- Pteropus nitendiensis Sanborn, 1930
- Pteropus vetulus Jouan, 1863
- Pteropus leucopterus Temminck, 1853

Personatus Group
- Pteropus temmincki Peters, 1867
- Pteropus personatus Temminck, 1825

Vampyrus Group
- Pteropus lylei K. Andersen, 1908
- Pteropus giganteus (Brunnich,1782)
- Pteropus vampyrus (Linnaeus, 1758)

Alecto Group
- Pteropus alecto Temminck, 1837

Conspicillatus Group
- Pteropus conspicillatus Gould, 1850
- Pteropus ocularis Peters, 1867

Neohibernicus Group
- Pteropus neohibernicus Peters, 1876

Poliocephalus group
- Pteropus macrotis Peters, 1867
- Pteropus pohlei Stein, 1933
- Pteropus poliocephalus Temminck, 1825

Scapulatus Group
- Pteropus gilliardi Van Deusen, 1969
- Pteropus woodfordi Thomas, 1888
- Pteropus mahaganus Sanborn, 1931
- Pteropus scapulatus Peters, 1862

Year	Saipan	Tinian	Rota	Palau	Yap	Truk	Pohnpei	Kosrae
1975	150	100	1800	5000	1000	0	0	0
1976	1900	150	1800	13500	3000	0	0	0
1977								
1978	1000	450	1200	12250	4250	200	0	0
1979	1800	350	750	18500	2750	0	250	0
1980	1100	200	400	9750	8500	200	3500	0
1981	1100	150	700	8250	3000	300	500	0
1982	150	0	366	6764	0	207	366	0
1983	0	0	0	1105	0	0	310	0
1984	0	0	0	4025	0	0	334	27
1985	0	0	0	1464	0	37	458	0
1986	54	0	7	2402	0	739	204	0
1987	5	0	14	7092	17	646	1075	0
1988	6	0	1	9800	15	1200	1100	0

Year	Am. Samoa	W. Samoa	Tonga	Niu Gini	Vanuatu	Philippines	Total
1975	0	0	0	0	0	0	8050
1976	0	0	0	0	0	0	20350
1977				200			
1978	0	0	0	0	0	0	19350
1979	0	0	0	0	0	0	24400
1980	1000	0	0	0	0	0	24650
1981	500	750	0	0	0	0	18000
1982	40	2700	0	0	0	200	10793
1983	30	8350	3050	50	0	0	12895
1984	1632	6649	2030	1539	12	0	16258
1985	853	7187	0	0	0	0	10084
1986	525	7035	0	0	0	2471	13448
1987	0	300	0	0	0	171	9404
1988	0	460	0	0	0	150	12732

Table 2. Numbers of frozen flying foxes imported into Guam by year (October 1- September 30). Data are largely lacking for 1977. Compiled from Payne, 1986; Wiles, 1981, 1982, 1983, 1984, 1985, 1986, 1987 and pers. comm.

Year	Saipan	Tinian	Rota	Palau	Yap	Ulithi	Truk	Pohnpei	Kosrae
1979	2465	312	1086	19501	4127	0	50	1391	0
1980	5297	736	2006	40257	31490	150	273	15240	200
1981	4711	878	2429	24079	11916	0	1247	8660	0
1982	650	145	1068	17097	0	0	3085	1036	50
1983	0	0	0	2811	0	0	1530	580	100
1984	0	0	0	12198	0	0	4421	1090	2050
1985	0	0	0	6973	0	0	600	1626	100
1986	0	0	0	11804	0	0	2730	2006	50
1987	0	0	0	31249	0	0	3587	4505	110
1988	0	0	50	32023	0	0	9870	5693	70

Year	Am. Samoa	W. Samoa	Fiji	Tonga	Cook Is.	Niu Gini	Vanuatu	Solomons	Philippines
1979	100	0	0	50	0	0	0	1	0
1980	629	0	50	0	0	0	0	0	200
1981	725	1850	0	0	0	0	0	0	0
1982	3480	8850	0	2400	0	0	0	0	200
1983	200	21575	0	12500	0	50	0	0	0
1984	21312	25750	0	11600	0	4500	12	0	0
1985	10600	37150	0	0	100	9000	0	0	0
1986	1505	46700	0	0	0	0	0	0	24925
1987	0	3400	0	0	0	0	0	0	0
1988	0	1200	0	0	0	30	0	0	2600

Year	Thailand	Indonesia	Okinawa	Total
1979	0	0	0	29082
1980	0	0	0	96528
1981	0	0	0	56495
1982	0	0	0	38161
1983	0	0	0	39346
1984	0	0	0	82933
1985	0	0	0	66149
1986	700	100	36	90556
1987	0	2310	0	45386
1988	0	100	0	51636

Table 3. Numbers of frozen flying foxes requested for import into Guam by year. [These numbers derive from permits filed in expectation of bat imports, for actual numbers imported see Table. 4.] Compiled from Wheeler, 1979; Anderson and Wheeler, 1980;Wiles, 1981, 1982, 1983, 1984, 1985, 1986, 1987, and pers.comm.

Table 4. Similarity of appearance among Pteropus species grouped by body size and pelage color pattern. Forearm length (given in parentheses) is used as a body size index. Asterisk indicates taxon currently on Appendix II; letter designation in parentheses is IUCN Red Book status (I=Indeterminate, V=Vulnerable, E=Endangered Ex=Extinct). Species in (or probably in) external trade are in boldface.

Color Characters	Small (86-109 mm)	Medium (110-149 mm)	Large (150-179 mm)	Very Large (180-220 mm)
Dark dorsum Dark ventrum Bright mantle	vetulus	**hypomelanus** griseus faunulus admiralitatum howensis ornatus dasymallus caniceps argentatus rodricensis (E **samoensis*** (E) anetianus vetulus lylei poliocephalus scapulatus	ornatus lylei poliocephalus	**vampyrus** neohibernicus
Dark dorsum Light ventrum Bright mantle	lombocensis **insularis***(I) phaeocephalus* (I)	**hypomelanus** **mearnsi** **pumilus** **speciosus** griseus brunneus ornatus seychellensis (V) melanotus rayneri lombocensis lylei pohlei gilliardi mahaganus	rufus seychellensis (V) voeltzkowi(V) **pilosus*** (Ex) lylei giganteus	melanopogon neohibernicus
Black dorsum Black ventrum Yellowish-buff mantle		**mariannus***(V) ocularis **tonganus***(I) **macrotis***(I)	**tonganus***(I) conspicillatus	

Table 4. cont'd.

Color Characters	Small (86-109 mm)	Medium (110-149 mm)	Large (150-179 mm)	Very Large (180-220 mm)
Uniform blackish	**molossinus***(I) **tokudae***(Ex)	**hypomelanus** admiralitatum melanotus pselaphon alecto	alecto livingstonei (E)	**vampyrus**
Dark back Pale mantle Pale rump	subniger(Ex) fundatus	rayneri	rayneri chrysoproctos	
Whole body pale Slightly contrasting mantle	temmincki personatus woodfordi	griseus tuberculatus **leucopterus**		melanopogon neohibernicus
Dark mantle Pale body		sanctacrucis nitendiensis	niger(V)	

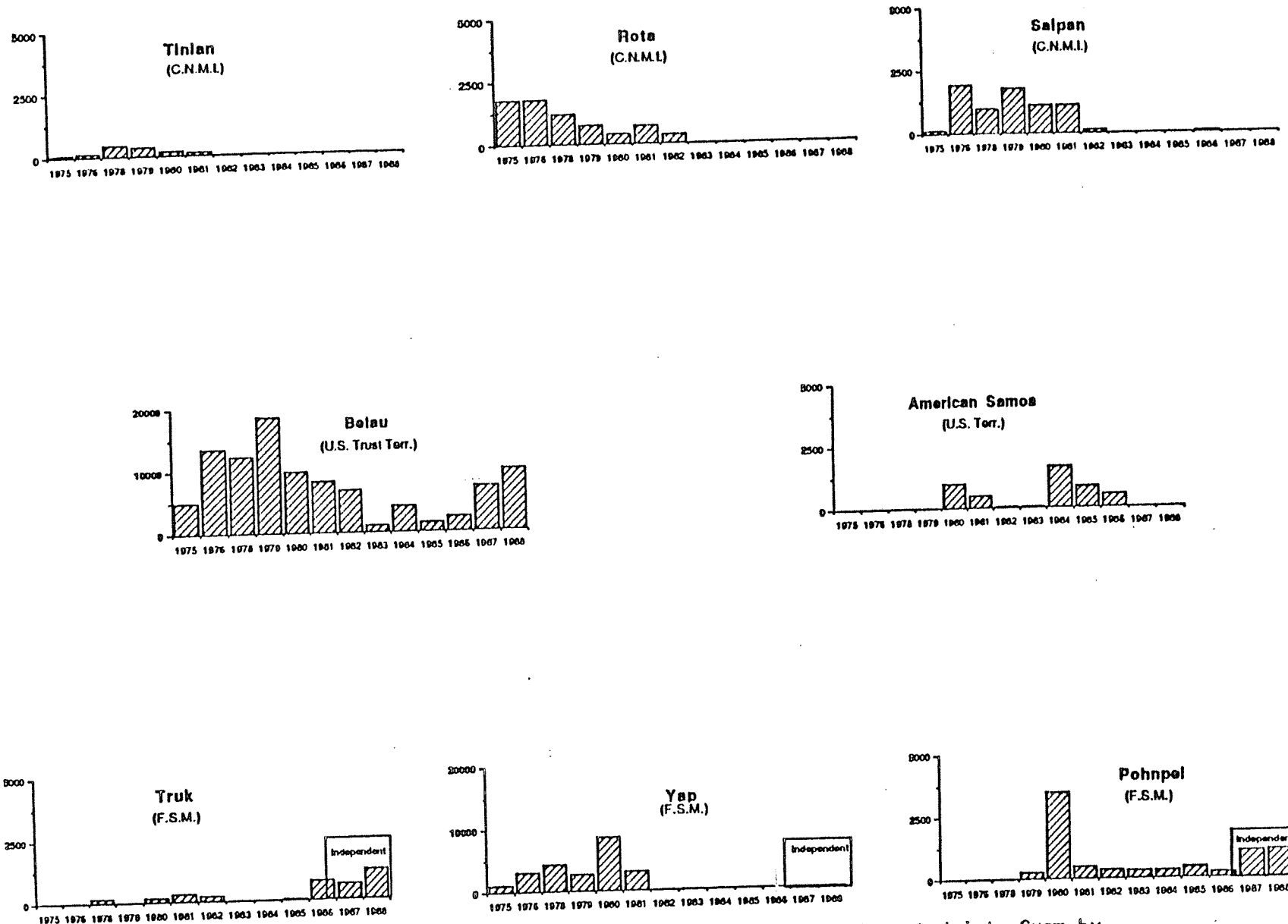

Figure 2. Internal Trade. Numbers of frozen flying foxes imported into Guam by year from the Commonwealth of the Northern Marianas (CNMI), Belau, American Samoa, and major sources in the Federated States of Micronesia (FSM). Imports from the FSM constitute international trade after November 1986. Note that the y-axis maximum values (numbers of bats) for Belau and Yap are four times larger than the other graphs.

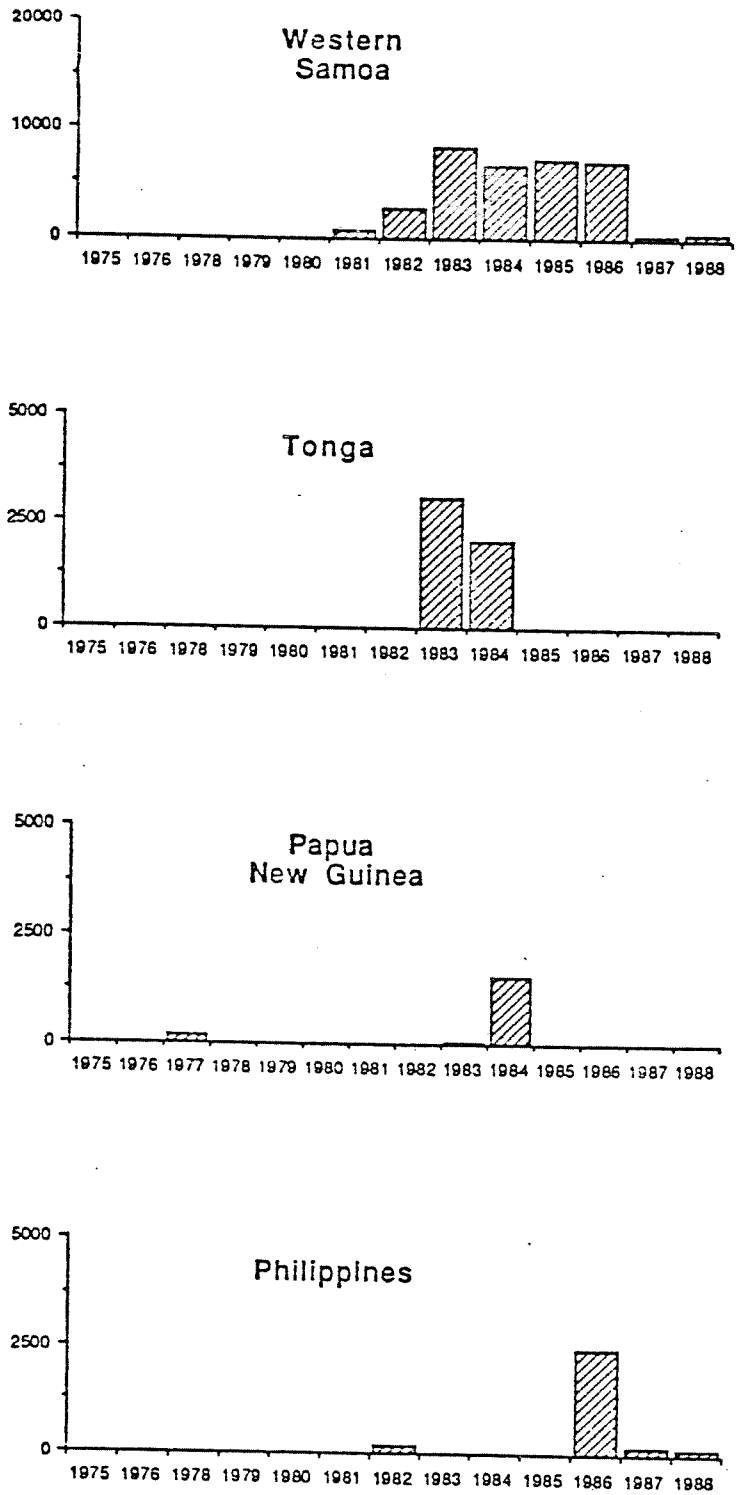

Figure 3. International Trade. Numbers of frozen flying foxes imported into Guam by year from other countries. Note that the y-axis maximum values are four times larger for Western Samoa.

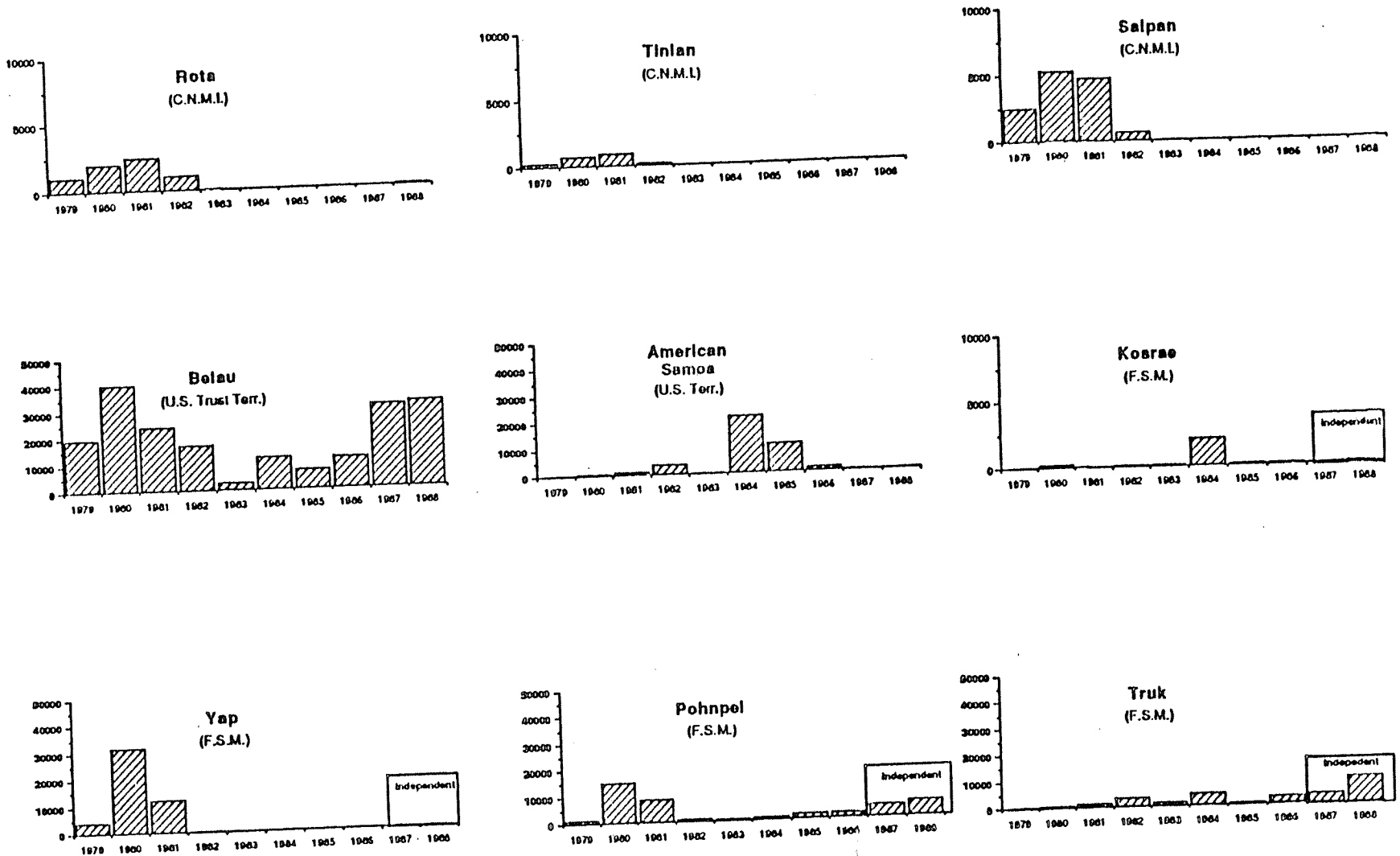

Figure 4. Requests for internal imports. Numbers of flying foxes requested for import into Guam from the Commonwealth of the Northern Marianas (CNMI), Belau, American Samoa and the Federated States of Micronesia (FSM). Imports from the FSM constitute international trade after November 1986. Note that the y-axis values are five times larger (i.e. 50000 vs 10000) on some graphs.

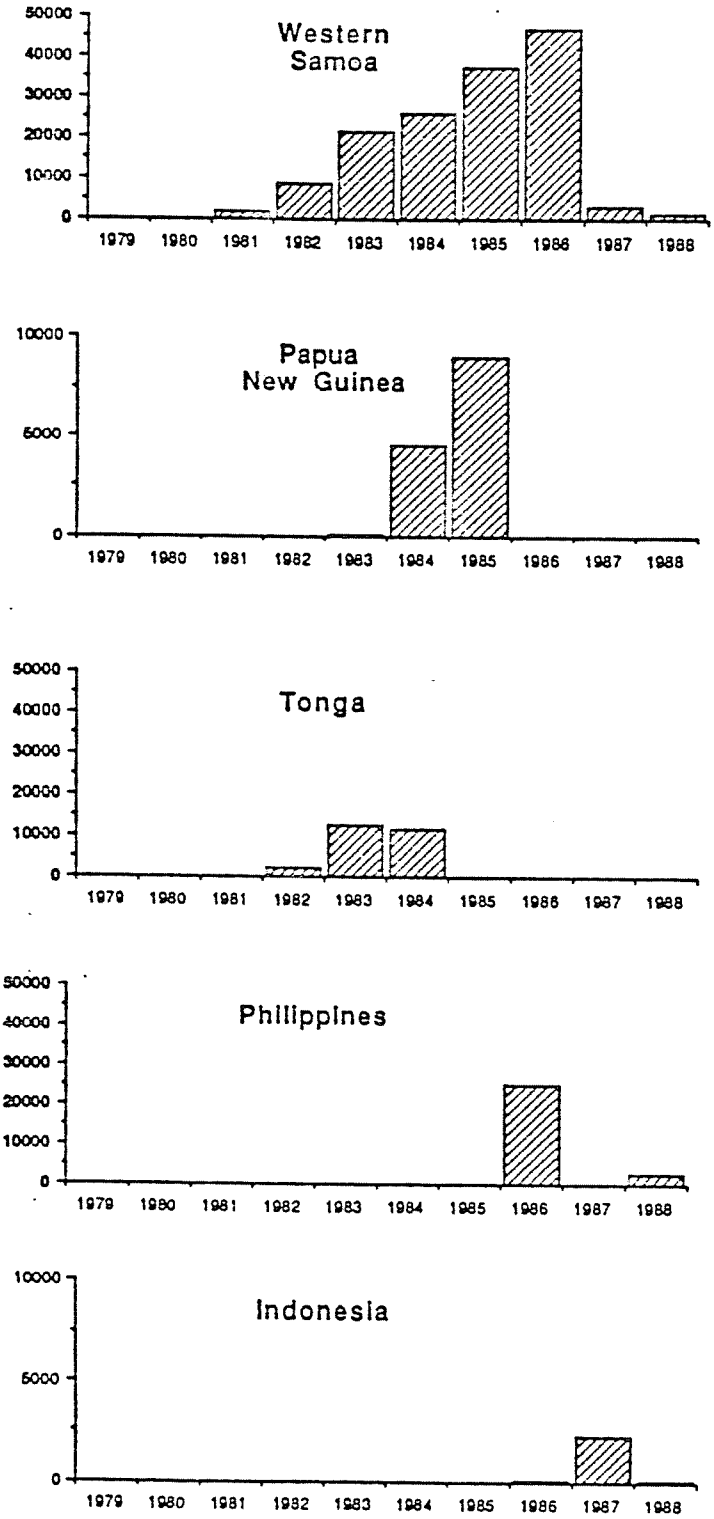

Figure 5. Requests for international imports. Numbers of flying foxes requested for import into Guam from other countries. More distant sources have been requested in recent years when bat numbers have declined or commercial harvest restricted on nearby islands. Note that maximum x-axis values are five times larger on some graphs.

Annex 1. Data for Pteropus species proposed for inclusion in App. II by reason of similarity of appearance to species in trade. (Honacki et al., 1982; Koopman, submitted).

1. Pteropus hypomelanus, Temminck 1853, Subniger group
ISIS 5301405001024018001

Distribution
Range: Mostly on small islands from the Maldives, southeastern Asia, the Western Sumatran Islands, the Natunas, northern Borneo, Sulawesi, the northern Moluccas, coastal islands of northern New Guinea, to Bismarck and Solomons Is.
Land area (km^2): Not available.
Number of subspecies: 15

2. Pteropus mearnsi, Hollister 1913, Subniger group
ISIS 53014050010224026001

Distribution
Range: Basilan Is., Zamboanga Peninsula, Mindanao Is. (Philippines)
Land area (km^2): 17,281
Number of subspecies: 0

+ spec

3. Pteropus pumilus, Miller 1911, Subniger group
ISIS 5301405001024036001

Distribution
Range: Philippines, excluding Luzon and Palawan
Land area (km^2): 177,593
Number of subspecies: 0

4. Pteropus griseus, (E. Geoffroy) 1810, Subniger group
ISIS 5301405001024017001

Distribution
Range: From southern Moluccas and Timor to Sulawesi (Indonesia); possibly Luzon (Philippines)
Land area (km^2): 318,246
Number of subspecies: 3

5. Pteropus faunulus, Miller 1902, Subniger group
no ISIS number

Distribution
Range: Nicobar Is. (India)
Land area (km^2): 1,645
Number of subspecies: 0

6. Pteropus admiralitatum, Thomas 1894, Subniger group
ISIS 530140500102400l001

Distribution
Range: Bismarck Is., Bougainville (Papua New Guinea); Solomon Is.
Land area (km^2): 79,448
Number of subspecies: 4

7. Pteropus brunneus, Dobson 1878, Subniger group
no ISIS number

Distribution
Range: Percy Is., Queensland (Australia)
Land area (km^2): 90
Number of subspecies: 0

8. Pteropus howensis, Troughton 1931, Subniger group
no ISIS number

Distribution
Range: Ontong Java Is. (Solomon Is.)
Land area (km^2): 1,554
Number of subspecies: 0

9. Pteropus sanctacrucis, Troughton 1930, Subniger group
no ISIS number

Distribution
Range: Santa Cruz Is.(Solomon Is.)
Land area (km^2): 938
Number of subspecies: 0

10. Pteropus ornatus, Gray 1870, Subniger group
no ISIS number

Distribution
Range: New Caledonia, Loyalty Is. (France)
Land area (km^2): 21,177
Number of subspecies: 2

11. Pteropus dasymallus, Temminck 1825, Subniger group
ISIS 530140500102401300l

Distribution
Range: Green Island (Republic of China); Ryukyu Is., extreme S. Kyushu, Daito Is. (Japan)
Land area (km^2): 39,233
Number of subspecies: 5

12. Pteropus subniger, (Kerr) 1792, Subniger group
ISIS 530140500102404300l

Distribution
Range: Mauritius; Reunion (France)
Land area (km^2): 4,375
Number of subspecies: 0

13. Pteropus caniceps, Gray 1870, argentatus group
ISIS 530140500102400800l

Distribution
Range: Sulawesi,Sula Is.,Sangihe Is., Halmahera Is. (Indonesia)
Land area (km^2): 202,979
Number of subspecies: 2

14. Pteropus argentatus, Gray 1844, argentatus group
ISIS 530140500102400500l

Distribution
Range: Ambon Is. (Indonesia)
Land area (km^2): 813
Number of subspecies: 0

15. Pteropus rufus, E. Geoffroy 1803, Niger group
ISIS 530140500102403900l

Distribution
Range: Madagascar
Land area (km^2): 594,180
Number of subspecies: 2

16. Pteropus seychellensis, Milne-Edwards 1877, Niger group
ISIS 530140500102404100l

Distribution
Range: Aldabra Is., Seychelles Is.
Land area (km^2): 2,859
Number of subspecies: 3

17. Pteropus voeltzkowi, Matschie 1909, Niger group
ISIS 530140500102404800l

Distribution
Range: Pemba Is. (Tanzania)
Land area (km^2): 984
Number of subspecies: 0

18. Pteropus niger, (Kerr) 1792, Niger group
ISIS 5301405001024031001

Distribution
Range: Mascarene Islands. Now extinct on Reunion. Surviving only on Mauritius.
Land area (km^2): 1,865
Number of subspecies: 0

19. Pteropus melanotus, Blyth 1863, Melanotus group
ISIS 5301405001024028001

Distribution
Range: Small islands from the Andamans, Nicobars, Nias, Enggano, to Christmas Island
Land area (km^2): 14,260
Number of subspecies: 6

20. Pteropus melanopogon, Peters 1867, Livingstonei group
ISIS 5301405001024027001

Distribution
Range: From Sangihe Islands through central and southern Moluccas and Keis to the Arus (Indonesia).
Land area (km^2): 33,195
Number of subspecies: 3

21. Pteropus livingstonei, Gray 1866, Livingstonei group
ISIS 5301405001024020001

Distribution
Range: Comoros Islands
Land area (km^2): 1,860
Number of subspecies: 0

22. Pteropus rayneri, Gray 1870, Chrysoproctos group
ISIS 5301405001024037001

Distribution
Range: Solomon Islands
Land area (km^2): ca. 31,000
Number of subspecies: 7

23. Pteropus fundatus, Felten and Kock 1972, Chrysoproctos group
no ISIS number

Distribution
Range: Banks Is. (Vanuatu)
Land area (km^2): ca. 1250
Number of subspecies: 0

24. Pteropus chrysoproctos, Temminck 1837, Chrysoproctos group
ISIS 530140500102400900l

Distribution
Range: Ceram, Buru and surrounding small islands of the central Moluccas, Sangihe Is. (Indonesia).
Land area (km^2): 26,767
Number of subspecies: 0

25. Pteropus lombocensis, Dobson 1878, Molossinus group
ISIS 530140500102402100l

Distribution
Range: Lombok, Flores, and Alor (Indonesia)
Land area (km^2): 21,361
Number of subspecies: 2

26. Pteropus rodricensis, Dobson 1878, Molossinus group
ISIS 530140500102403800l

Distribution
Range: Rodriguez Is. (Mascarenes)
Land area (km^2): 104
Number of subspecies: 0

27. Pteropus anetianus, Gray 1870, Samoensis group
no ISIS number

Distribution
Range: Vanuatu
Land area (km^2): 14,763
Number of subspecies: 7

28. Pteropus pselaphon, Lay 1829, Pselaphon group
no ISIS number

Distribution
Range: Bonin and Volcano Islands (Japan)
Land area (km^2): 132
Number of subspecies: 0

29. Pteropus tuberculatus, Peters 1869, Pselaphon group
no ISIS number

Distribution
Range: Vanikolo Is. [Santa Cruz Islands] (Vanuatu)
Land area (km^2): 174
Number of subspecies: 0

30. Pteropus nitendiensis, Sanborn 1930, Pselaphon group
no ISIS number

Distribution
Range: Ndeni Is. [Santa Cruz Isl] (Vanuatu)
Land area (km^2): 557
Number of subspecies: 0

31. Pteropus vetulus, Jouan 1863, Pselaphon group
no ISIS number

Distribution
Range: New Caledonia, Loyalty Is. (Fr.)
Land area (km^2): 19,105
Number of subspecies: 0

32. Pteropus leucopterus, Temminck 1853, Pselaphon group
ISIS 530140500102401900l

Distribution
Range: Luzon (Philippines)
Land area (km^2): 104,689
Number of subspecies: 0

33. Pteropus temmincki, Peters 1867, Personatus group
ISIS 530140500102404500l

Distribution
Range: Central Molucca Is. (Indonesia), Bismarcks (New Guinea)
Land area (km^2): 76,425
Number of subspecies: 3

34. Pteropus personatus, Temminck 1825, Personatus group
ISIS 530140500102403300l

Distribution
Range: northern Moluccas (Halmahera), northern Sulawesi (Indonesia)
Land area (km^2): 107,629
Number of subspecies: 0

35. Pteropus lylei, K. Andersen 1908, Vampyrus group
ISIS 530140500102402200l

Distribution
Range: Thailand, Kampuchea and Vietnam
Land area (km^2): 868,809
Number of subspecies: 0

36. Pteropus giganteus, (Brunnich) 1782, Vampyrus group
ISIS 5301405001024015001

Distribution
Range: Indian subcontinent, Burma, Andaman and Maldive Islands
Land area (km^2): 5,098,897
Number of subspecies: 3

37. Pteropus vampyrus, (Linnaeus) 1758, Vampyrus group
ISIS 5301405001024047001

Distribution
Range: From Indo-China through the Malay Peninsula, Sumatra, and Borneo to the Philippines, Java, and the Lesser Syndas
Land area (km^2): 3,873,711
Number of subspecies: 7

38. Pteropus alecto, Temminck 1837, Alecto group
ISIS 5301405001024004001

Distribution
Range: From Bawean and Kangean islands (in the Java Sea) and Sulawesi to tropical Australia and extreme southern New Guinea
Land area (km^2): >1,489,726
Number of subspecies: 4

39. Pteropus conspicillatus, Gould 1850, Conspicillatus group
ISIS 5301405001024012001

Distribution
Range: From northern Moluccas (Halmahera) through New Guinea and small islands to Cape York in northeastern Australia.
Land area (km^2): ca. 1,115,000
Number of subspecies: 2

40. Pteropus ocularis, Peters 1867, Conspicillatus group
ISIS 5301405001024032001

Distribution
Range: Ceram and Buru (Indonesia)
Land area (km^2): 25,954
Number of subspecies: 0

41. Pteropus neohibernicus, Peters 1876, Neohibernicus group
ISIS 530140500102403000l

Distribution
Range: Mainland New Guinea, a few surrounding islands, and the Bismarcks
Land area (km^2): 877,716
Number of subspecies: 2

42. Pteropus pohlei, Stein 1933, Poliocephalus group
ISIS 530140500102403400l

Distribution
Range: Yapen Island (Indonesia)
Land area (km^2): 2,424
Number of subspecies: 0

43. Pteropus poliocephalus, Temminck 1825, Poliocephalus group
ISIS 530140500102403500l

Distribution
Range: Coastal eastern Australia from southeastern Queensland to islands in the Bass Strait (not Tasmania)
Land area (km^2): ca. 1,153,000
Number of subspecies: 0

44. Pteropus gilliardi, Van Duesen 1969, Scapulatus group
no ISIS number

Distribution
Range: central New Britain (New Guinea)
Land area (km^2): 36,500
Number of subspecies: 0

45. Pteropus woodfordi, Thomas 1888, Scapulatus group
ISIS 530140500102404900l

Distribution
Range: Central and southeastern Solomon Is.
Land area (km^2): 19,170
Number of subspecies: 0

46. Pteropus mahaganus, Sanborn 1931, Scapulatus group
ISIS 530140500102402400l

Distribution
Range: Bougainville (New Guinea), Santa Isabel (Solomon Islands)
Land area (km^2): 14,633
Number of subspecies: 0

47. Pteropus scapulatus, Peters 1862, Scapulatus group
ISIS 530140500102404000l

Distribution
Range: Tropical and southeastern Australia, and extreme southern New Guinea
Land area (km^2): >1,000,000
Number of subspecies: 0