

# A list of bats from northeastern Luzon, Philippines

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*Summary.* — In this paper we report on the first collection of bats from the coastal region in northeastern Luzon, including records of 110 bats of 11 species. We provide here a list of the species, external measurements, description of habitats, and data on habitat utilization for the four most numerous species.

*Résumé.* — Onze espèces de chauves-souris ont été capturées entre avril et novembre 1981 dans plusieurs localités du nord-est de Luçon (Philippines). C'est la première collection de Chiroptères faite dans cette région. Description des sites de captures ; mensurations des spécimens, certains appartenant à des espèces rares dans les collections ; données sur l'utilisation de l'habitat par les quatre espèces les plus abondantes.

The bats of northern Luzon are poorly known, both systematically and ecologically. This was made conspicuous by the discovery of a new genus of dwarf fruit bat (*Otopteropus*) in 1969 (Kock 1969). In this paper we report on the first collection of bats from the coastal region in northeastern Luzon, including records of 110 bats of 11 species captured at 8 sites (Fig. 1) from April to November 1981. All accessible habitats were sampled in the area between 17°41'N and 17°30'N on the eastern slope of the Sierra Madre Mountains. We provide here a list of the species, external measurements, and data on habitat utilization for the four most numerous species.

## NETTING LOCALITIES

A variety of 6, 9, and 12 m mist nets were set at irregular intervals throughout the period from April to November 1981. They were usually checked shortly after sunrise and again before nightfall. Nets were left open during the day to catch birds. Periods of netting activity and number of nets per night per time period are 26 April-5 May, 4.2 ; 11-15 May, 3 ; 5-11 August, 4.7 ; 18-28 August, 3.5 ; 6-9 October, 3 ; 20 October, 4 ; 16-21 November, 5. Specific netting sites are described below. We note a lack of agreement between local place names and those listed on topographic maps. Local names are provided in parentheses in the text ; specimens are catalogued in the Division of Mammals, Museum of Zoology, University of Michigan under local place names.

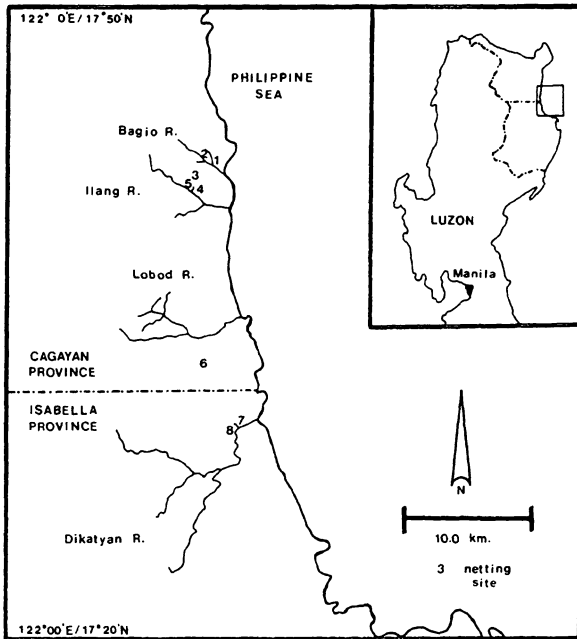


Fig. 1. — Map of 1981 collecting localities, northeastern Luzon, Philippines. Descriptions of sites are provided in text.

*Locality 1.* Abandoned agricultural fields in Bagio River Valley (Nanadukan River) were sampled. Nets were set in five different locations between .5 k and 1.0 k from the mouth of the river. It was noted that netting success was significantly higher when nets were set in the transition zone between forest and field, rather than directly in either. This narrow zone contained primarily herbacious species and climbing vines.

*Locality 2.* Several streams in Bagio River Valley (Nanadukan River) were sampled. A series of nets were set across the Bagio River and a swift-moving and a sluggish tributary in a closed canopy habitat. The swift-moving stream was less than 6 m wide between high banks which were covered with closed canopy vegetation. The other stream was sluggish, about 4 m wide, and between low banks. The banks were vegetated with shrubs, ferns, and herbs, including several members of Zingiberaceae. One net was maintained across the Bagio River, approximately 1 km from the mouth of the stream. The stream, at this point, was 12 m wide, swift-moving, and approximately .75 m deep.

*Locality 3.* A single net was maintained across a dry gully near the top of a ridge (el. 100 m) between the Bagio (Nanadukan) ( $17^{\circ}41'N$ ,  $122^{\circ}9'E$ ) and Ilang (Malibu) Rivers ( $17^{\circ}40.5'N$ ,  $122^{\circ}9'E$ ):

*Locality 4.* A tributary to the Ilang River (Malibu) was sampled. This netting site was approximately .25 km from the confluence with the Ilang River. The stream at this point was sluggish, about 1 m deep and 6 m wide. The banks were low and covered with closed canopy trees, some bearing edible fruit.

*Locality 5.* Nets were set in abandoned agricultural fields in the Ilang River Valley (Malibu), near the stream described above. The field contained flowering and fruiting papaya (*Carica papaya*).

*Locality 6.* Nets were set on a ridge between the Dikatyán (Blos) and Lobod (Diangu) Rivers (17°33'N, 122°9'E, el. 200 m), which was selectively logged in 1978. Nets were set in clearings created by tree-fall and in 'alleys' produced by heavy equipment. Shrubs, many Urticaceae, ferns, rattans, and other climbing plants were profuse.

*Locality 7.* A series of nets were set across a tributary to the Dikatyán River (Blos River). The most successful net was set across a man-made pond, about .75 km from the confluence with the Dikatyán (Blos). The pond was approximately 11 m wide at its widest, and .5 m deep. The bank was high and steep on the west side, but opened to the east, where a small canal ran away to rice fields on the coast. A small gap occurred in the canopy over the pond, but was closed both upstream and downstream.

*Locality 8.* Nets were set in sandy flats with tall grasses along the Dikatyán River (Blos) (17°30'N, 122°10'E) at the junction of the Dikatyán and a minor tributary (see below), and in front of a small wooden bridge across the stream.

Two nets were set for one night in a montane-mossy transition forest at 800 m elevation. The canopy here was dominated by Lauraceae and Fagaceae species. No bats were caught or observed.

Several specimens of *Acerodon jubatus jubatus* and *Pteropus vampyrus* were also collected from a colony roosting in trees about 2 km south of the lower Dikatyán River (Blos River) in Barangay Canadam. The area had been selectively logged and most of the large trees removed. The thick ground cover consisted of climbing pandanus, ferns, rattans, and other climbing vines. The colony roosted in both dead and live trees on either side of a small stream. A conservative population estimate of the size of the colony is 800-1000 individuals.

The cumulative total was 168 net nights, and yielded 104 specimens. Six additional specimens were shot with a 12 gauge shot gun, giving a grand total of 110 specimens. All specimens are deposited in the Division of Mammals, Museum of Zoology, University of Michigan (UMMZ). Measurements were taken in the field and are given here as mean  $\pm$  1 standard deviation in millimeters. Weights are in grams.

#### SPECIES ACCOUNTS

##### *Acerodon jubatus jubatus* (1 skeleton).

We shot a single male on 23 April, which was roosting in the colony 2 km south of the lower Dikatyán River (Blos River). Taylor (1934) provided measurements for a series of *A. jubatus mindanensis* caught in Mindanao. Heaney and Rabor (1982) recorded one specimen from Dinagat. Measurements; total length, 290; foot, 57; ear, 33; forearm, 190; weight, 1050.

*Cynopteris brachyotis luzoniensis* (17 fluid, 5 skin and skeleton, 1 skin and skull).

*C. brachyotis luzoniensis* exhibited a marked preference for abandoned agricultural fields (see Table 1). Specimens were taken at localities 1 (2 ♀, 5 ♂), 2 (3 ♀, 6 ♂), 4 (1 ♂), 7 (4 ♀, 2 ♂). Pregnant and lactating females were captured 6 May, 6-22 August, and 7-9 October. Measurements ( $n = 19$ ): total length,  $\bar{x} = 99.6 \pm 6.1$ ; tail,  $\bar{x} = 7.1 \pm 3.3$ ; foot,  $\bar{x} = 15.1 \pm 1.7$ ; ear,  $\bar{x} = 17.2 \pm 2.9$ ; forearm,  $\bar{x} = 65.1 \pm 2.4$ .

*Haplonycteris fischeri* (22 fluid, 2 skin and skeleton, 3 skeleton).

*H. fischeri* exhibited a marked preference for forest habitat and was often the only species caught in nets set away from water or agricultural fields. Of the 22 bats caught in nets set on the ridge between Dikatyan and Lobod Rivers, 18 were *H. fischeri*. This species was also the only one retrieved from nets along trails between Bagio and Ilang Rivers. Specimens were taken at localities 1 (5 ♀, 6 ♂), 3 (1 ♀, 1 ♂), 6 (6 ♀, 3 ♂), and 7 (3 ♀, 2 ♂). Pregnant and lactating females were taken 11 May, 9 August, 6-7 October, 17-19 November. This species was first described by Lawrence (1939) from Mindoro, who provided partial measurements. Measurements were also provided by Heaney *et al.* (1981), for a series from Negros Oriental and Heaney and Rabor (1982). Measurements ( $n = 27$ ): total length,  $\bar{x} = 75.3 \pm 4.6$ ; foot,  $\bar{x} = 12.5 \pm 1.5$ ; ear,  $\bar{x} = 13.6 \pm 1.5$ ; forearm,  $\bar{x} = 52.1 \pm 1.8$ .

*Macroglossus minimus lagochilus* (9 fluid, 3 skin and skeleton).

This bat was recovered from all habitats sampled, but most frequently from open field areas. This may indicate habitat preference, as *M. minimus* is nectarivorous and *C. papaya* and a number of unidentified trees were flowering at the time of study. Specimens were taken from localities 1 (2 ♀, 2 ♂), 2 (2 ♀, 1 ♂), 4 (3 ♀, 1 ♂), and 6 (1 ♀). Pregnant and lactating females were recovered 7 August and 21 October. This series, although within the range of measurements for the species, is smaller than that taken from a series from Dinagat (Heaney and Rabor 1982), Panay (Taylor 1934), or Negros (Heaney *et al.* 1981), suggesting that some geographical variation is present. Measurements ( $n = 12$ ): total length,  $\bar{x} = 63.5 \pm 3.8$ ; foot,  $\bar{x} = 11.3 \pm 0.8$ ; ear,  $\bar{x} = 13.2 \pm 1.0$ ; forearm,  $\bar{x} = 40.0 \pm 1.0$ .

*Otopteropus cartilagonadus* (1 fluid, 1 skeleton).

Both individuals were captured at locality 7. A pregnant female was caught 30 April, and a non-pregnant female was caught 6 May. Only five specimens had been taken previously, all from northern Luzon. The measurements of these specimens does not differ appreciably from those taken by Kock (1969). Measurements for the pregnant and non-pregnant females: total length, 70,73; foot, 11,14; ear, 14,14; forearm, 48,48; weight, 17,21.

*Ptenochirus jagori* (28 fluid, 4 skin and skeleton, 3 skeleton).

This was the most abundant bat to be recovered from the study area. Although recovered from all habitats sampled, it was most common over water. Specimens were taken at localities 1 (3 ♀, 1 ♂), 2 (3 ♀, 10 ♂), 4 (2 ♀), 6 (2 ♀), 7 (7 ♀,

4 ♂), and 8 (2 ♀, 1 ♂). Pregnant and lactating females were taken 4 May, 6-10 August, 10 October, and 22 October. Measurements ( $n = 25$ ): total length,  $\bar{x} = 122.0 \pm 7.5$ ; tail,  $\bar{x} = 10.9 \pm 1.2$ ; foot,  $\bar{x} = 19.5 \pm 1.2$ ; ear,  $\bar{x} = 19.0 \pm 1.2$ ; forearm,  $\bar{x} = 80.0 \pm 3.1$ .

*Pteropus vampyrus lanensis* (4 fluid, 1 skeleton).

Two males, a pregnant female, and a female with a nursing young were shot on 23 April. These individuals were roosting in the same colony as the *A. jubatus* described above. Measurements ( $n = 4$ ): total length,  $\bar{x} = 285.7 \pm 14.5$ ; foot,  $\bar{x} = 54.0 \pm 3.5$ ; ear,  $\bar{x} = 37.0 \pm 3.9$ ; forearm,  $\bar{x} = 183.0 \pm 3.4$ .

*Rousettus amplexicaudatus amplexicaudatus* (1 fluid).

One female was captured at locality 1 on 9 August. Lawrence (1939) noted that almost all of her specimens were recovered from cave colonies. However, Taylor (1934) remarked that he never collected this species from a cave. There were no caves in the immediate netting area, and none that we were aware of in the valley. Measurements: total length, 154; tail, 26; foot, 17; ear, 21; forearm, 72; weight, 54.

*Hipposideros diadema griseus* (1 fluid, 1 skeleton).

Both specimens were taken in locality 7. A male was netted 3 May and a pregnant female 6 May. The measurements of these individuals are smaller than others reported for *H. diadema griseus* in Luzon (Taylor 1934), but fall within the range of a series reported from Mindoro (Lawrence 1939). Measurements for the male and female: total length, 131,128; tail, 48,26; foot, 15,17; ear, 29,21; forearm, 78,72; weight, 45,54.

*Miniopterus schreibersii escholtzii* (1 skeleton).

One individual was recovered from locality 7. No measurements were taken.

*Myotis formosus rufopictus* (1 skeleton).

One individual was recovered from locality 7. Originally *M. rufopictus*, this species was synonymized with *M. formosus* by Findley (1972). Measurements: total length, 113; tail, 50; foot, 14; ear, 18; forearm, 54; weight, 17.

#### HABITAT SELECTION

Most of the published studies concerning Philippine chiropterans present systematic information pertaining to species description (see, for example, Heaney and Rabor 1982; Lawrence 1939; Sanborn 1952; Taylor 1934). Few have presented data relating to chiropteran ecology. The data presented here supplements a small body of data concerning habitat preference.

Netting results indicate apparent habitat selection by the bats. These data may be compared to netting results from a study conducted in the southern Philippines, in Negros Oriental (Heaney *et al.* 1981).

Of the nine species netted, four constituted 95 % of the total sample (see Table 1). These four were *Ptenochirus jagori*, *Haplonycteris fischeri*, *Cynopterus brachyotis*, and *Macroglossus minimus*, with 30 %, 24 %, 22 %, and 19 % of the total, respectively. The other five species were only caught one or twice.

TABLE 1. — The numbers of nine species of bats collected in northeastern Luzon, tabulated by habitat type (includes released individuals).

Species	Habitat Type					Total	%
	Primary Lowland forest	Open canopy stream	Closed canopy stream	Field forest ecotone	Abandoned agricultural fields		
<i>Cynopterus brachyotis</i>		5	11	13	1	30	22
<i>Haplonycteris fischeri</i>	20		6	8		34	24
<i>Macroglossus minimus</i>	1	1	9	13	2	26	19
<i>Otopteropus cartilagonodus</i>			2			2	1
<i>Ptenochirus jagori</i>	3	13	20	4	2	42	30
<i>Rousettus amplexicaudatus</i>				1		1	1
<i>Hipposideros diadema</i>			2			2	1
<i>Miniopterus schreibersii</i>			1			1	1
<i>Myotis formosus</i>			1			1	1
Total	24	19	52	39	5	139	100
% of total	17	14	37	28	4	100	

These same four species also constituted 93 % of the sample from Negros Oriental, but the proportions differed (16 %, 27 %, 20 %, and 31 %, respectively).

*Haplonycteris fischeri* was rarely found outside of forest habitat, but seemed to prefer open areas within it. It was seldom captured over water. The other three species were retrieved from all habitats sampled, suggesting that these three species are habitat generalists. They were often caught over water, and were probably using the open space above streams as a flyway.

The three species of insectivorous bats were all retrieved from a single net set over a pond in a stream. They were not observed in nets either upstream or downstream of the pond, perhaps indicating that these species were drinking or feeding at this pond, rather than utilizing the stream as a flyway. Insectivorous bats were never netted away from water ; sporadic observation and lack of holes in nets indicated that they were not escaping. They were, however, observed in high canopy in trees in open fields along water. This high canopy was not sampled.

Netting in habitats other than near water yielded, on the average, three species of bats. Closed canopy streams, however, yielded 8 species. The habitat with the greatest species diversity may have been so as a function of physical geography, as a number of species utilized the streams as flyways. The low number of species in other habitats may have been so as a function of feeding preferences.

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