

# A new flying-fox of the genus *Pteropus* (Chiroptera: Pteropodidae) from Torres Strait, Australia

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## ABSTRACT

A new species of flying-fox (genus *Pteropus*) is described as *P. banakrisi*. This species is similar in appearance to *P. alecto* which is seasonally sympatric in the type locality, but *P. banakrisi* is much smaller and differs in dental characteristics. *P. banakrisi* is also smaller than any of the other flying-foxes currently known from Australia. The common name "Torresian Flying-fox" is proposed for *P. banakrisi*.

**Key words:** flying-fox, *Pteropus banakrisi*, Torresian Flying-fox, flying -fox systematics, Chiroptera systematics

## Introduction

The first Australian *Pteropus* was described in 1825, and by the mid-1860's this highly visible group became well known to Australian naturalists and European students of bat systematics. It was therefore surprising to capture representatives of a new taxon over 100 years later, but this is explained by the remoteness of the type locality, a small island between Cape York and the New Guinea mainland. Populations of the new species appear to be permanently present, and are sympatric with seasonal influxes of *P. alecto*.

## Methods

Specimens of *Pteropus* were collected during several visits by the authors to Torres Strait between 1988 and 1990, either being captured in mist nets or shot in fruiting trees. Relevant measurements were taken to the nearest 0.1 mm with vernier calipers. The baculum of an adult male in the type series was prepared by clearing the penis tissue using the method described in McKean *et al* (1978).

*P. banakrisi* specimens have been compared with specimens of the following species (institutions of lodgement are shown in parentheses, and mnemonics are: AM = Australian Museum, Sydney; ANWC = Australian National Wildlife Collection, CSIRO, Canberra; BM = British Museum, London, RNH = Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands; MNUH = Museum für Naturkunde an der Universität Humboldt zu Berlin, Germany):

**Australia:** *P. alecto* (AM, ANWC, RNH (skeletal only), MNUH), *P. brunneus* (BM), *P. conspicillatus* (AM, ANWC, BM), *P. macrotis epularius* (ANWC), *P. poliocephalus* (AM, ANWC), *P. scapulatus* (AM, ANWC, BM)

**New Guinea:** *P. conspicillatus* (BM), *P. hypomelanus* (ANWC), *P. macrotis* (ANWC), *P. neohibernicus* (ANWC)

**Pacific:** *P. mahaganus* (ANWC), *P. melanopogon* (ANWC), *Prayneri grandis* (ANWC)

Descriptions in Anderson (1912) of *P. admiralatum*, *P. aterrimus*, *P. cognatus*, *P. colonus*, *P. howensis*, *P. minimus*, *P. lombocensis*, *P. nawaiensis*, *P. solomonis* and *P. tuberculatus* were also compared with *P. banakrisi*.

## Systematics

Genus *Pteropus* Brisson

*Pteropus banakrisi* sp. nov.

**Holotype:**

JM 8648, adult female (skin and skull), Queensland Museum, Brisbane. Collected by mistnet on 7 December 1988 by L.S. Hall and G.C. Richards at St. Pauls Mission (10°11'S, 142°20'E) on the east coast of Moa Island, Torres Strait (see Fig. 1).

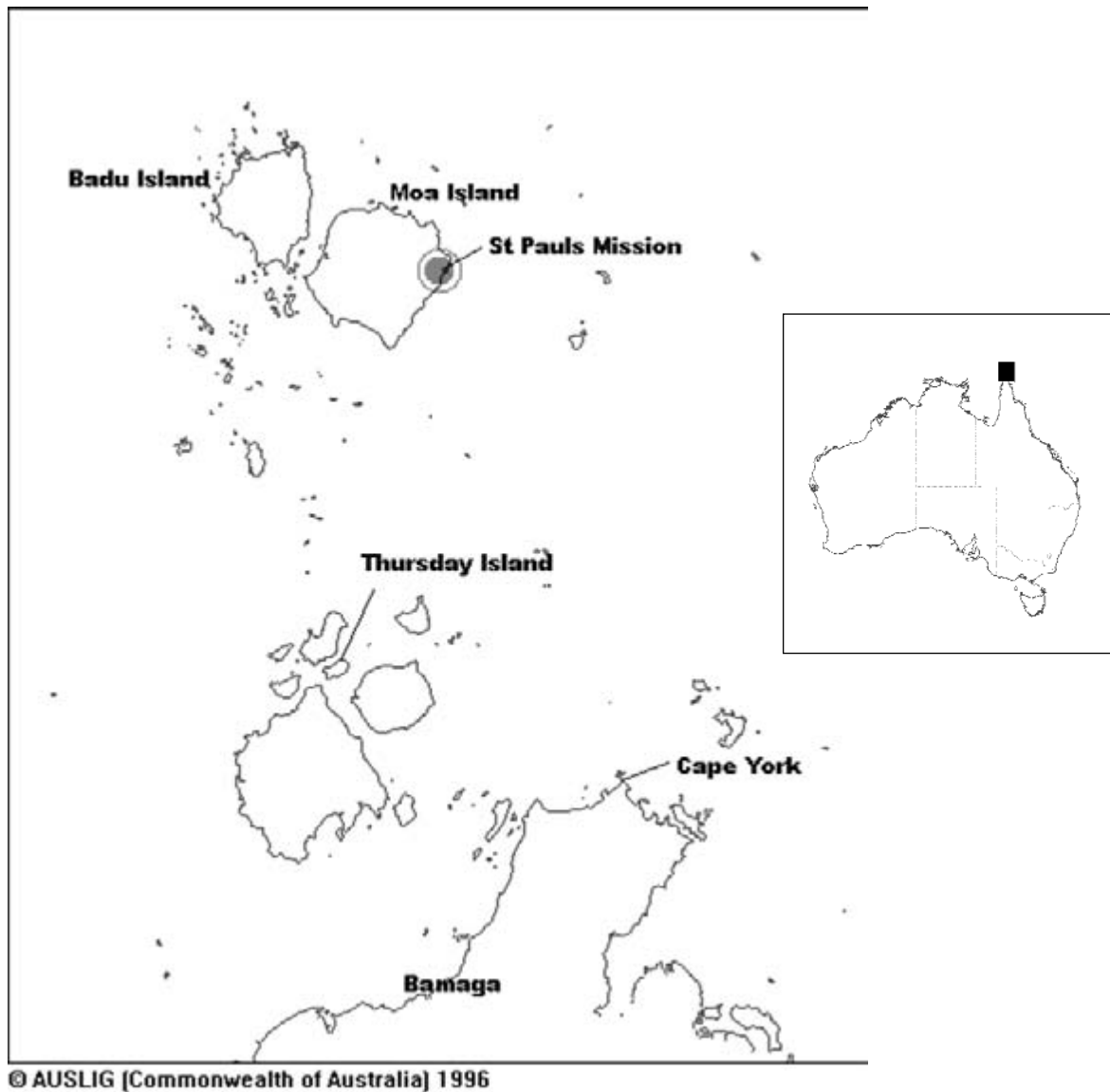


Figure. Type locality (circle) for *Pteropus banakrisi* sp. nov.

#### Paratypes:

CM 5011, adult male (in spirit with skull extracted and prepared baculum), Australian National Wildlife Collection, CSIRO, Canberra, collected at Moa Island, Torres Strait, 7 December 1988;

CM 5012, adult female (skin and skull), ANWC, CSIRO, Canberra, collected at Moa Island, Torres Strait, 7 December 1988;

M24615, adult female (prepared skeleton), ANWC, CSIRO, Canberra, collected at Moa Island, Torres Strait, 5 July 1987.

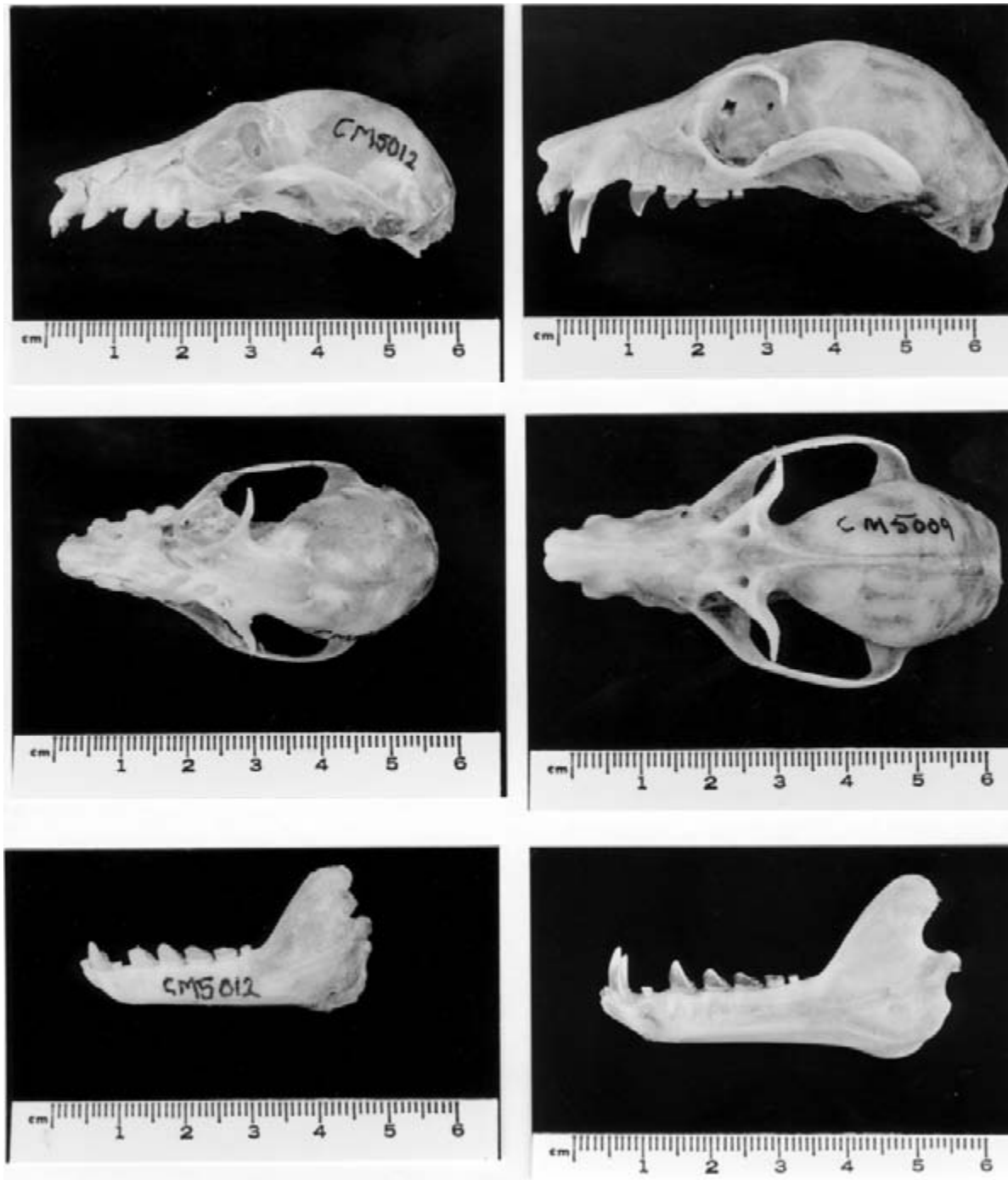
#### Diagnosis

*Pbanakrisi* most closely resembles *Palecto* in overall appearance but differs by its smaller forearm and body weight, more massive

dentition, narrower diastema in upper and lower dentition, less elongate rostrum, less expanded zygomatic arches, relatively broader post-orbital constriction, relatively shorter coronoid process, and the size and shape of the baculum (Figure 3).

#### Pelage

*P. banakrisi* is similar in appearance to *P. alecto*, being generally black in colour both dorsally and ventrally, with the mantle colour ranging from Raw Sienna to Vandyke Brown (Kornerup and Wanscher 1978). The mantle does not encircle the neck, and extends to the bases of the ears anteriorly and to between the shoulders posteriorly. The fur of the mantle is strongly bicoloured, with the basal third or half of the hair shafts being black. Both the ventral and dorsal fur is sparsely flecked with silvery-buff tipped hairs, a



**Figure 2.** Morphology of the skull of a female paratype of *P. banakrisi* CM 5012 (left column) compared with a female *P. alecto* (CM 5009). Both specimens are from the type locality (St Pauls Mission, Moa Island, Queensland), and are lodged in the Australian National Wildlife Collection, CSIRO, Canberra.

few of which are also found on the head. A narrow area encircling the eyes and the along the sides of the muzzle has short Vandyke Brown fur.

#### External Characters

Mean values and variance of external body measurements and skull dimensions of *P. banakrisi* are compared with *P. alecto* in Table 1. Forearm lengths of *P. banakrisi* specimens range from 128 to 141 mm (n = 6), compared with 148 to 182 mm

(n = 6) in *P. alecto* specimens from Torres Strait and mainland north Queensland. A comparison of external measurements of *P. banakrisi* with those of *P. alecto* (Table 1) showed that despite *P. alecto* being a much larger bat (by forearm and bodyweight), there were no significant differences between the species in the size of appendages such as the thumb, foot and calcaneum. *P. banakrisi* is smaller than all other Australian pteropodids.

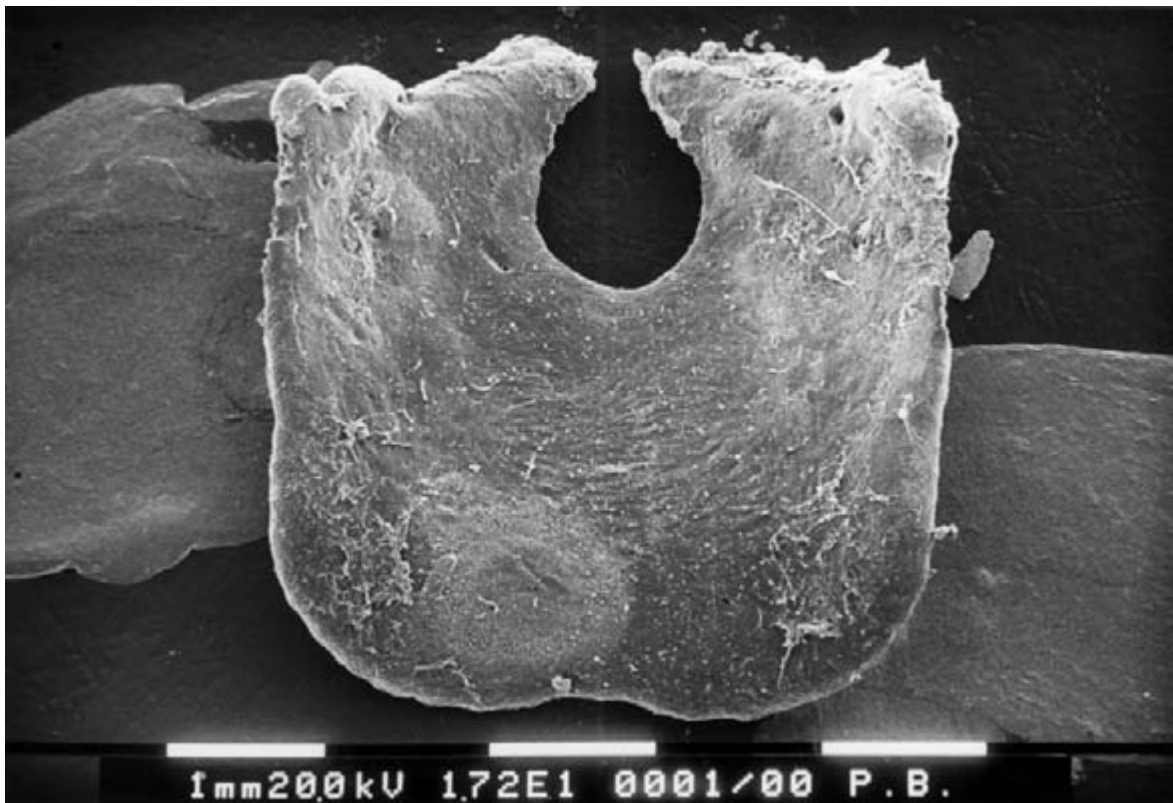


Figure 3. Scanning electron micrograph of the baculum of *P. banakrisi*. Scale bar is 0.5 mm, actual dimensions of the baculum are 4.6 mm long with a greatest width of 4.7 mm

The tibia is unfurred dorsally and ventrally, and the interfemoral membrane is relatively large for this sized flying-fox, as indicated by the size of the calcaneum, being the same as that of the larger Australian *Pteropus*. The ears are long and broad, and their outer margin is only slightly concave towards the tip, which reaches nearly to the eye when laid forward.

#### Skull and dentition

Figure 2 shows the morphology of the skull, and the heavier dentition of *P. banakrisi* compared with *P. alecto*. Both skulls are from adult animals, and both specimens were collected from Moa Island. The post-orbital process is shorter in *P. banakrisi* than in *P. alecto* and reaches only halfway to the zygoma. The zygomatic arch is flatter (that is, not as curved in profile) than in *P. alecto*, and the coronoid process is relatively shorter (see Figure 5). The cheek teeth are heavier in *P. banakrisi* than in *P. alecto*, especially  $M^2$ ,  $P^3$ ,  $P^4$ ,  $M^1$ ,  $M^2$ ,  $M^3$ ,  $P_3$  and  $P_4$ , and are similar in size to the frugivorous *P. conspicillatus*.  $P^1$  is very small and is virtually indistinct when the gum is intact. The surface of the upper rostral area is distinctly different by being smooth in *P. banakrisi* and sculptured in *P. alecto*. The surface of the braincase in *P. alecto* has a well developed sagittal crest while in *P. banakrisi* it is noticeably smooth (Figure 2). Palatal ridges of *P. banakrisi* follow the typical pteropodine formula of  $5 + 5 + 3$ .

#### Baculum

The baculum of the male paratype (CM 5011) was examined. The length of this bone was 4.6 mm and the greatest width was 4.7 mm. When viewed laterally the baculum is saddle-shaped, and dorsally it is horseshoe-shaped with the distal edge being slightly curved (see Figure 3). The bacula of *P. alecto* and *P. conspicillatus* are quite different (see Figure 1 in Krutzsch 1962), particularly in the shape of the proximal edge. Further, Krutzsch 1962 shows that the baculum of *P. c. conspicillatus* is U-shaped, and is not joined at the distal edge, and also shows that the baculum of *P. alecto gouldi*, though similar is much larger and has a hole in the lower centre. The bacula of *P. conspicillatus* and *P. a. gouldi* are approximately 9 x 8 mm in size, compared with approximately 5 x 5 mm in *P. banakrisi*.

#### Measurements of the Holotype

Measurements (mm) of the holotype (JM 8648, Queensland Museum) are as follows:

**External:** forearm length 139.4, head length 66.4, ear length 28.3, tibia length 67.9, foot length 40.9, calcaneum length 15.8, thumb length with claw 47.8, body weight 229g.

**Skull:** greatest length 62.8, condylobasal length 60.9, zygomatic width 31.2, interorbital width 8.8, maxillary toothrow ( $C-M^3$ ) 23.5,  $M^2 - M^2$

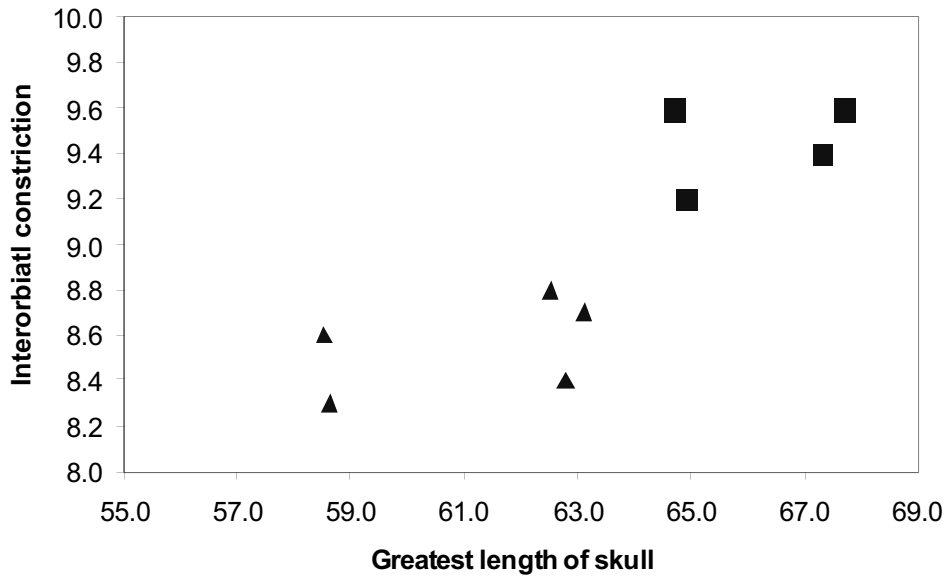


Figure 4. Greatest length of skulls of *P. banakrisi* (triangles) and *P. alecto* (squares) compared with interorbital constriction.

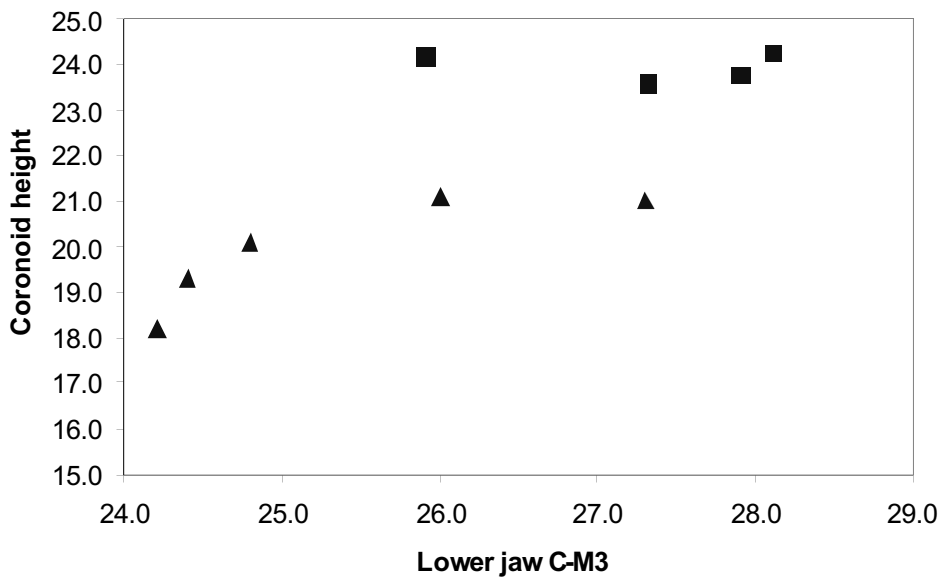


Figure 5. Distance between the outer edges of the canine and third molar on the lower jaw of skulls of *P. banakrisi* (triangles) and *P. alecto* (squares) compared with the coronoid height.

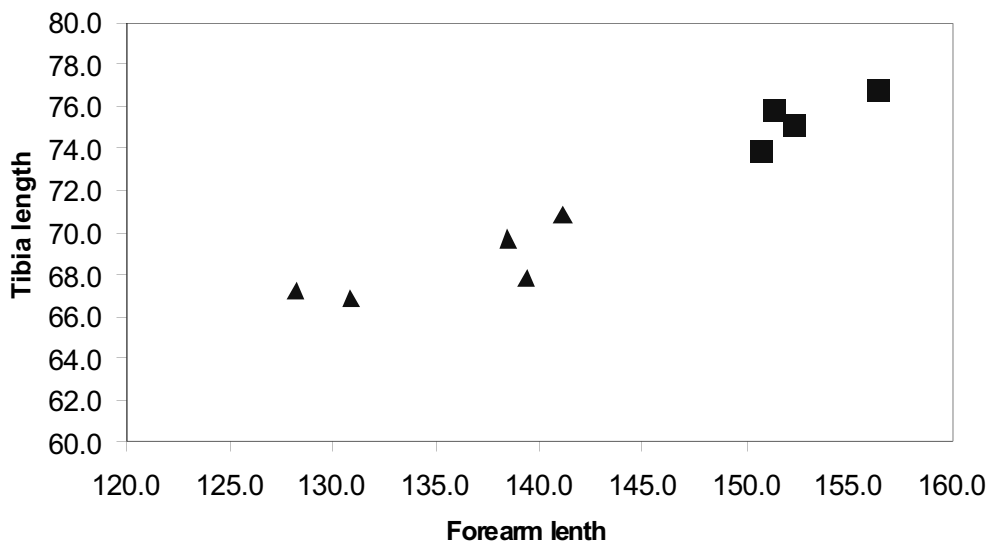


Figure 6. Forearm length of *P. banakrisi* (triangles) and *P. alecto* (squares) compared with tibia length.

14.9,  $C^1 - C^1$  11.6, palatal breadth 11.8, palatal length 36.1, lower jaw  $C - M_3$  26.0, height of coronoid process 21.1, braincase height 18.3, braincase width 23.4. Bivariate plots of several measurements are shown in Figures 4 – 6.

### Distribution

*P. banakrisi* is apparently restricted to Moa Island and the nearby offshore Iem Islet, and to date has not been found on other islands in Western Torres Strait, though Yam Island has not as yet been surveyed for this species. The type locality is St. Pauls Mission (10°11'S, 142°20'E) on the east coast of Moa Island (Figure 1).

### Etymology and common name

This distinctive species has been so named to honour the late Mr Bana Kris, a renowned hunter from the Moa Island community. His vast knowledge of this island's unique wildlife continues to be passed across generations and to wildlife researchers such as ourselves. The common name 'Torresian Flying-fox' is proposed, indicating the endemism of this species to this region.

### Discussion

*P. banakrisi* can be placed in Anderson's (1912) *P. alecto* division of 'Primary Group 3', which is characterised by the virtual absence of posterior basal ledges on the cheek teeth. Within this group, *P. banakrisi* can be distinguished from all others by its small size, pelage, and dental characters. The nearest Australian species in size to *P. banakrisi* are *P. scapulatus* Peters 1862 and *P. macrotis epularius* Ramsay 1878, but these species have considerably weaker cheek teeth that reflect their nectarivorous diet. *P. banakrisi* exhibits the much heavier dentition observed in dietary generalists (Richards 1995a) such as *P. alecto* Temminck 1837 and *P. poliocephalus* Temminck 1825, but particularly as seen in the frugivorous *P. conspicillatus* Gould 1850.

The authors were initially concerned that the type series may have been either juveniles or an example of island dwarfism in *P. alecto*. The latter prospect was discounted because specimens were collected in the same food tree as obviously larger *P. alecto*. Juvenility was discounted because all specimens examined were adults, as indicated by fused epiphyses and tooth wear, as shown in see Figure 2. Adulthood is further indicated in the holotype which is a female that had reproduced, as indicated by large nipples that had previously been suckled and it was suspected to be carrying a young at the time of collection.



Figure 7. Studio photograph of *Pteropus banakrisi*  
Photo: Noel Chopping

All other *Pteropus* species do not breed until at least their second year, but usually in their third year (Hall and Richards 2000), hence they only breed as adults. It is highly probable that *P. banakrisi* has a similar reproductive age. Furthermore, as shown in Figure 2, the dentition of the type specimen has canines with worn tips, another indicator of adulthood.

It was also initially thought that *P. banakrisi* may be a form of *P. alecto* that had morphologically attenuated due to restriction on an island. However, the distinct difference between certain characters that would be unrelated to evolving in a unique ecological niche, such as the baculum, discount this hypothesis.

The little that is known of the ecology of the Torresian Flying Fox *P. banakrisi* is outlined in Richards (1995b) and Hall and Richards (2000). Based on regional surveys to date, *P. banakrisi* appears to be endemic to Moa Island and its environs in Torres Strait. This island is distinctive, even unique, in this region by having several large contiguous tracts of tropical rainforest. This rainforest habitat can be considered an island in itself, lying between the nearest rainforest 400 km to the north in central New Guinea, and the isolated rainforest 70 km to the south at Lockerbie Scrub on the tip of Cape York Peninsula. Less than 100 km to the north are isolated tracts of monsoon forest in New Guinea, a habitat that is similar to rainforest.

**Table 1.** Body and skull measurements of specimens of *Pteropus banakrisi* compared with *P. alecto* collected from Torres Strait, using Student's T-tests. Values are means  $\pm$  standard errors (n).

|                            | <i>P.banakrisi</i>  | <i>P.alecto</i>     | Significance |
|----------------------------|---------------------|---------------------|--------------|
| <b>External :</b>          |                     |                     |              |
| Forearm length             | 135.2 $\pm$ 2.1 (6) | 153.2 $\pm$ 1.4 (8) | p<0.01       |
| Head length                | 65.6 $\pm$ 1.3 (5)  | 70.1 $\pm$ 0.9 (8)  | p<0.05       |
| Ear length                 | 28.2 $\pm$ 0.4 (6)  | 32.9 $\pm$ 0.4 (8)  | p<0.01       |
| Tibia length               | 66.8 $\pm$ 1.7 (5)  | 74.9 $\pm$ 1.4 (5)  | p<0.05       |
| Foot length                | 37.9 $\pm$ 1.2 (6)  | 42.2 $\pm$ 0.6 (8)  | p<0.05       |
| Calcaneum length           | 17.4 $\pm$ 0.4 (5)  | 19.2 $\pm$ 0.5 (5)  | ns           |
| Thumb length               | 47.9 $\pm$ 0.9 (5)  | 42.8 $\pm$ 1.0 (4)  | ns           |
| Body weight                | 234 $\pm$ 7.6 (6)   | 480 $\pm$ 21.6 (7)  | p<0.001      |
| <b>Skull :</b>             |                     |                     |              |
| Greatest length            | 61.0 $\pm$ 2.8 (4)  | 65.8 $\pm$ 2.5 (5)  | p<0.01       |
| Condylbasal length         | 59.6 $\pm$ 2.0 (4)  | 61.3 $\pm$ 1.2 (4)  | ns           |
| Zygomatic width            | 30.5 $\pm$ 1.7 (5)  | 36.2 $\pm$ 1.5 (5)  | p<0.005      |
| Interorbital width         | 8.7 $\pm$ 0.3 (5)   | 9.3 $\pm$ 0.5 (5)   | ns           |
| Maxillary toothrow         | 22.9 $\pm$ 1.1 (5)  | 24.7 $\pm$ 0.9 (5)  | p<0.05       |
| M2 - M2 (note 1)           | 15.2 $\pm$ 0.3 (5)  | 15.7 $\pm$ 0.5 (5)  | p<0.001      |
| C1 - C1 (note 2)           | 11.5 $\pm$ 0.4 (5)  | 13.1 $\pm$ 0.7 (4)  | p<0.05       |
| Palatal breadth            | 11.6 $\pm$ 0.4 (5)  | 12.5 $\pm$ 0.2 (5)  | p<0.05       |
| Palatal length             | 34.7 $\pm$ 1.5 (5)  | 37.6 $\pm$ 1.0 (5)  | ns           |
| Lower jaw C - M3 (note 2)  | 25.3 $\pm$ 1.3 (5)  | 27.4 $\pm$ 0.9 (5)  | p<0.05       |
| Height of coronoid process | 19.9 $\pm$ 1.2 (5)  | 24.2 $\pm$ 0.5 (5)  | p<0.01       |
| Braincase height           | 18.6 $\pm$ 1.3 (5)  | 19.5 $\pm$ 0.6 (5)  | ns           |
| Braincase width            | 22.9 $\pm$ 0.7 (5)  | 23.5 $\pm$ 0.2 (5)  | ns           |

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