A TAXONOMIC REVIEW OF THE GENUS *PTERALOPEX* (CHIROPTERA: PTEROPODIDAE), THE MONKEY-FACED BATS OF THE SOUTH-WESTERN PACIFIC

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Morphological variation in the genus *Pteralopex* is reviewed to evaluate species limits and diagnostic criteria. Five species are recognised: *P: atrata* and *P. pulchra* from Guadalcanal, Solomon Islands; *P. anceps* from Bougainville and Buka Islands, Papua New Guinea, and Choiseul and Isabel Islands, Solomon Islands; and *P. acrodonta* from Taveuni, Fiji. A new species is described from New Georgia and Vangunu Islands, Solomon Islands. It resembles *P. pulchra* but differs in dental, cranial and pelage characters. A number of criteria previously considered diagnostic for *P. anceps* are shown to be invalid. The new species faces a high extinction risk from logging operations and pressure from expanding human populations, and an IUCN threat category of 'Critically Endangered' is proposed. All *Pteralopex* species face a high risk of extinction and conservation measures such as habitat protection are urgently required.

THE morphologically distinctive genus *Pteralopex* Thomas 1888 consists of five species of medium to large sized flying foxes. The four named species are: *P. atrata* and *P. pulchra* from Guadalcanal, southern Solomon Islands; *P. anceps* from Buka and Bougainville Islands, Papua New Guinea, and Choiseul Island, northern Solomon Islands, and *P. acrodonta* from higher elevations of Taveuni Island, Fiji (Hill and Beckon 1978; Flannery 1995). A fifth unnamed species was collected by the author in 1991 on New Georgia Island during an Australian Museum survey of the Solomon Islands. It is also recognised from the adjacent Vangunu Island (Flannery 1995). This form resembles *P. pulchra,* known only from the holotype from Guadalcana, but differs in a number of external and dental criteria. It is the only species that has been the subject of ecological research (Fisher and Tasker 1997). Very little is known about the biology of other species of *Pteralopex.*

Although thought to be a specialised off-shoot of *Pteropus* (Andersen 1912), electrophoretic (S. Ingleby and D. Colgan, unpubl. data) and DNA data (Colgan and Flannery 1995; Kirsch *et at.* 1995) suggest that *Pteralopex* is neither derived from nor closely related to *Pteropus.* Recent studies indicate that *Pteralopex* is not monophyletic and that *P. acrodonta* from Fiji is highly divergent from Solomon Island species (S. Ingleby and D. Colgan, unpubl. data).

All species of *Pteralopex* are considered to be uncommon (Mickleburgh *et at.* 1992), appear to have declined, and except for the unnamed species, are listed as 'Critically Endangered' by the IUCN (Hilton-Taylor 2000). Very few individuals of this genus were encountered in extensive mammal surveys over the past decade which targeted bats on all major islands of the Solomons and Fiji (Flannery 1995; Bowen-Jones *et al.* 1995; Fisher and Tasker 1997; Bonaccorso 1998; T. Leary pers. comm.). In addition, very few specimens of the genus exist in world museum collections and only 39 specimens have been reported in the literature (Andersen 1912; Sanborn 1931; Phillips 1968; Hill and Beckon 1978; Flannery 1991; Bonaccorso 1998).

Previous reviews of the genus (Andersen 1912; Phillips 1968; Hill and Beckon 1978) were limited by lack of available material for direct comparison of either *P. anceps* or *P. atrata.* The present study is based on material in the Australian Museum whose collection of the genus includes seven specimens each of *P. atrata* and *P. anceps,* thus enabling direct comparison between series of both taxa.

Confusion has arisen as to whether *P. anceps* is

conspecific with *P. atrata.* Recent authors (Hill and Beckon 1978; Flannery 1991, 1995; Bonaccorso 1998) recognised *P. anceps* as a separate species but Laurie and Hill (1954) and Phillips (1968) considered *P. anceps* to be conspecific with *P. atrata.* Andersen (1909) described *P. anceps* from a single subadult from Bougainville. His review of the genus (Andersen 1912) was based on six specimens, five of which were *P. atrata.* The study of Hill and Beckon (1978) was similarly limited. Phillips (1968) reported five additional specimens of *P. anceps* but did not examine any *P. atrata.* Hill and Beckon (1978) re-examined the holotype of *P. anceps* and provided detailed justification for its elevation to species status. However, examination of the series of both taxa in the Australian Museum collection has revealed that many of the diagnostic criteria cited by Hill and Beckon (1978) for *P. anceps* do not apply.

The primary focus of this paper is to clarify species limits and diagnostic morphological criteria in *Pteralopex.* A review of morphological variation in the genus was prompted by the need to determine the status of the taxon from New Georgia and Vangunu Island in relation to *P. pulchra,* and to clarify the status of *P. anceps.*

METHODS

Standard skull and dental measurements are used in this paper. I follow Hill and Beckon (1978) in adopting dental nomenclature of Miller (1907). Capitalised colours in the text conform to the colour nomenclature of Smithe (1975). Statistical analyses were run using Systat version 7.0 for windows (SPSS Inc, 1997). Abbreviations used for institutional collections housing specimens referred to in the text are: AM, Australian Museum, Sydney; BMNH, British Museum of Natural History, London; FMNH, Field Museum of Natural History, Chicago; USNM, United States National Museum, Washington.

SYSTEMATICS

Pteralopex taki new species

Holotype. Australian Museum number M22320 female in alcohol, skull removed; field number LA374. Captured by H.E. Parnaby and I. Aujare on 25 June, 1990 in a mist-net set on a ridge top. Samples of liver, heart, kidney and breast muscle frozen in liquid nitrogen and stored at -76° C. The holotype is evidently a young adult as the basioccipita1-basisphenoid suture is not fully fused.

Type Locality. Mt Javi, 8° 31' S, 157° 52' S, 5 km north of Patutiva Village, Marovo Lagoon, New Georgia Island, Solomon Islands. Elevation ~50 m. The holotype was collected in secondary rainforest at an old village site, abandoned in the early 1900's. The site is surrounded by primary rainforest.

Diagnosis. General body size similar to that of *P. pulchra* but differs markedly in the shorter body fur which is uniform dull light brown rather than black and which lacks the yellowish coloured ventral fur. The posterior cingulum of PM^3 terminates labially in a small distinct cusp in *P. pulchra,* but in *P. taki* the low cingulum terminates without forming a cusp (Fig. 1). All teeth of *P. taki* are larger than the holotype of *P. pulchra.* PM^1 is conspicuously larger than in *P. pulchra,* being about twice the size. For example, mean width for *P. taki* is 1.2 mm (range = 0.9-1.3 mm, n = 9) compared to 0.7 mm in *P. pulchra* (Figs 1,2). PM^4- PM^4 (inner, cingula) relatively greater in *P. taki:* mean = 8.68 mm (range = 8.5 -9.0, n = 9) compared to 7.9 mm for *P. pulchra;* The second lower incisors (I_2) are distinctly larger and their lingual margins almost touch in *P. taki* but are separated by more than half their breadth in *P. pulchra* (Fig. 1). It differs from *P. acrodonta* in less dense pelage; the less cuspidate PM^4 and upper and lower molars; reduced relative size of M^2 and M_3 which differ markedly in cusp morphology from M^1 and M_2 respectively (Figs 1, 13); postorbital processes fused to zygomatic arch but do not extend to the zygomatic arch in *P. acrodonta* (Figs 3, 13); conspicuously narrower least interorbital breadth (Fig. 4) and postorbital breadth. Wing digit 4 phalanx 2 is clearly longer than phalanx 1, but are subequal in *P. acrodonta* (Fig. 5). It differs from *P. atrata* and *P. anceps* in smaller size: e.g., forearm length of adults < 130 mm; greatest skull length < 60 mm; C^1-M^2 < 24 mm; and in brown rather than dark or black dorsal and ventral fur. Least interorbital breadth narrower than all other species of the genus: mean = 7.31 mm (range = 6.4 - 7.9, n = 9) compared to 8.1 mm for *P. pulchra;* mean = 9.40 mm (range = 9.1 - 9.7, n = 4) for *P. acrodonta;* mean = 8.93 mm (range = 8.4 - 9.6, n = 7) for *P. atrata,* and mean = 10.08 mm (range = 9.5 - 10.7, n = 6) for *P. anceps* (see Tables 1,2; Fig. 4).

Description. The body fur is shorter and much sparser than that of *P. pulchra.* Colour photographs of the holotypes of *P. taki* and *P. pulchra* when alive are given in Flannery (1995: 242-243). Length of guard hairs on the shoulders about 17 mm compared with 25 -27 mm in *P. pulchra;* fur length between the ears about 9 mm compared to about 13 mm. Dorsal surface of tibia sparsely furred, about 6 mm compared to about 15 mm. Pelage on back, neck and head sparse and fine: colour (from alcohol specimen) close to Olive-Brown. Ventral fur longer, denser and woollier than dorsal pelage with individual hairs much thicker than on dorsum; colour paler than dorsum due to frequent admixture of pale golden-coloured hairs, close to Buff-Yellow. Dorsal surface of forearms nearly naked; sparse covering of fur on proximal half of dorsal surface of tibia comparable with specimens of *P. atrata,* which is far more sparse than in *P. pulchra.*
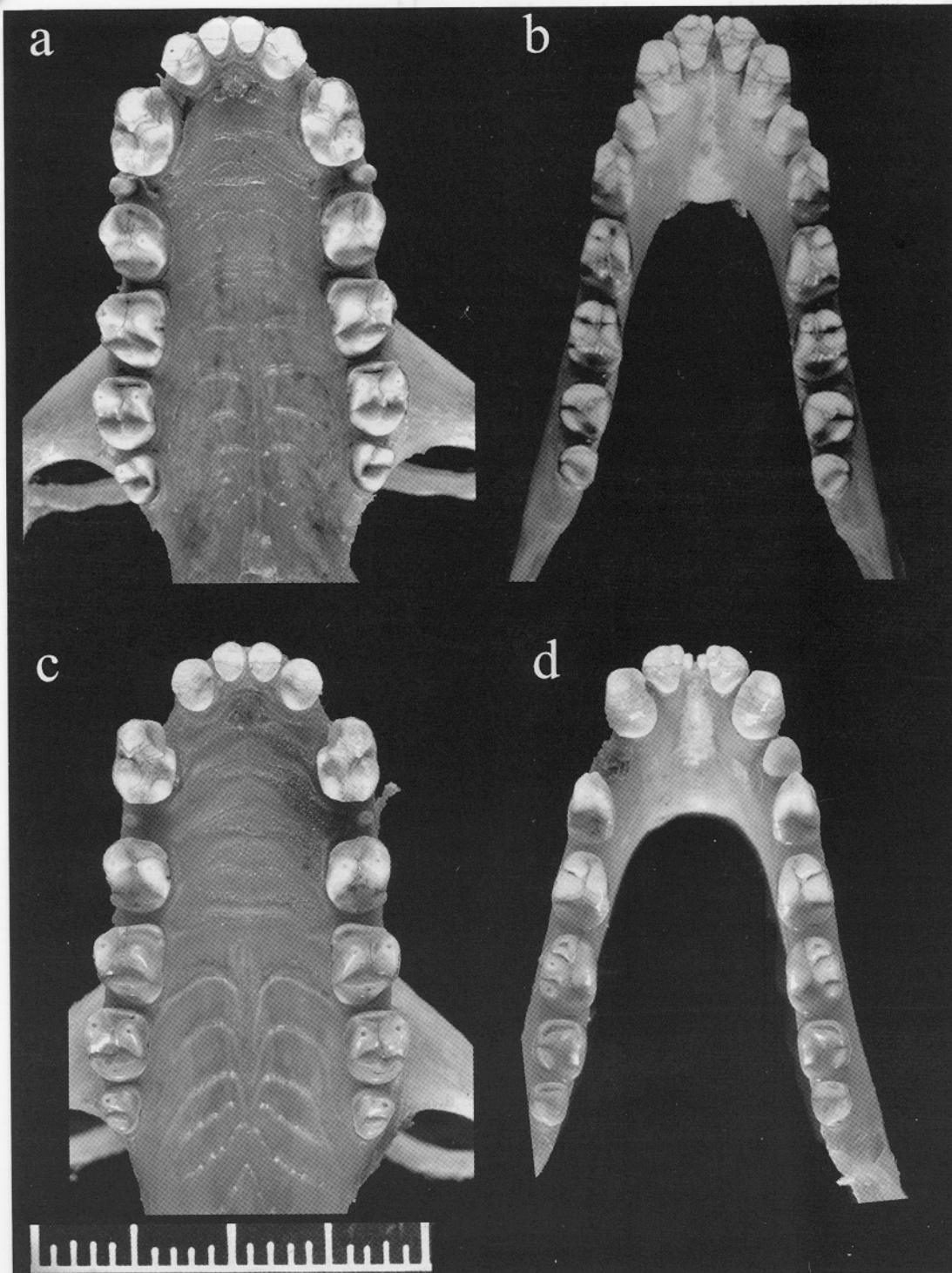
Fig. 1. Dentition of: **a** and **b**, *P. taki* holotype (AM M22320); **c**, and **d** *P. pulchra* holotype (AM M21842). Scale divisions are mm.

Ears similar in size and shape to the holotype of *P. pulchra* but more conspicuous due to longer, denser fur of that species. Skin pigment of ear uniform light brown. Extensive mottling on undersurface of wings; predominant colour of ventral surface of wing membranes, off white. White colour extends laterally to fifth digit, whereas in *P. pulchra* mottling extends to wing tips. Small dark blotches absent near flanks and upper arm but becoming more numerous and coalescing towards posterior wing margin. Individual dark blotches are smaller than in the holotype of *P. pulchra*. Phalanx 2 of fourth wing digit longer than phalanx 1.

There are 14 palatal ridges (Fig. 6): five undivided anterior ridges, six median ridges all of which are divided in the mid-line except for the most posterior ridge, and three posterior ridges. The number and location of ridges closely follows the description of Andersen (1912: 435) for *P. atrata*. The last of the six median ridges extends anteriorly to separate either side of the fifth ridge. Only the last of the three most posterior ridges is divided medially. The last two of the median ridges, and all three of the most posterior ridges, have extensive serrations on their anterior surface.

Summary statistics for external and cranial measurements of the type series are given in Table 1. The majority of external and cranial measurements of the holotype of *P. pulchra* abut or fall within the range of measurements of *P. taki*. However, although the skull size and proportions are similar to the holotype of *P. pulchra,* the interorbital region is narrower for skulls of equivalent length (Fig. 4). Further, all teeth are slightly larger than in the holotype of *P. pulchra*. Crown length and breadth of selected left hand teeth for the holotypes of *P. taki* and *P. pulchra* respectively, are: C^1, 4.54 x 3.10 mm, 3.89 x 2.94 mm; PM^3, 3.9 x 3.33 mm, 3.6 x 3.06 mm; PM^4, 3.87 x 3.52 mm, 3.81 x 3.30 mm; M^1 3.80 x 3.18 mm, 3.47 x 3.04 mm. The postorbital process is fused with the sygomatic arch; the sagittal crest is well developed.

Dental morphology resembles that of *P. atrata* and *P. pulchra* but differs as follows. The posterior cingulum of PM^3 terminates labially in a small distinct cusp in *P. pulchra* but in *P. taki* the low cingulum terminates without forming a cusp. Lower incisors (I_1 and I_2) are relatively larger and closer together than in *P. pulchra;* I_1 nearly twice the size of *P. pulchra* and nearly in contact though in *P. pulchra* left and right I_1 separated by about half the breadth of the tooth; I_2 relatively larger than that of *P. pulchra* and nearly in contact, or separated by less than half the breadth of the tooth, whereas in *P. pulchra* I_2 are separated by slightly more than half the breadth of the tooth. The anterolingual cusp of PM_3 is fused with the main anterior cusp in *P. pulchra* but is variably fused or
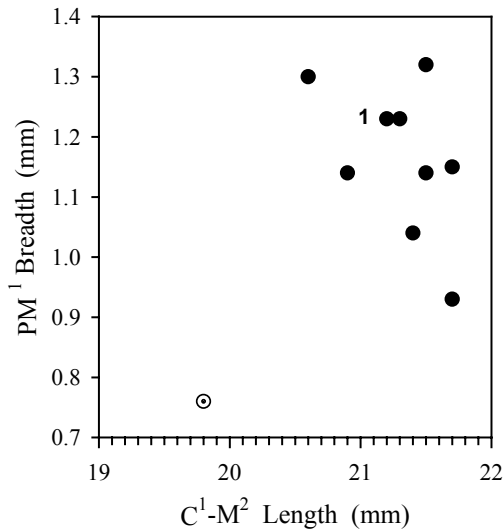

Fig. 2. Plot of PM^1 breadth against C^1-M^2 length for *P. pulchra* holotype (AM M21842) ⊙ and nine adult specimens of *P. taki* ●. **1**, *P. taki* holotype (AM M22320).

unfused in different specimens of *P. taki.* PM_1 and PM_4 similar to *P. pulchra.* Lower canines are more massive but otherwise similar to *P. pulchra.* Anterolingual cusp of M_1 split into two cusps in the holotype of *P. taki* but is variably bifurcated being a single cusp as in *P. pulchra* in one specimen, but split into two cusps in four specimens. The posterolabial cusp of M_1 is more developed in *P. pulchra*.

Etymology. The specific name *taki* (pronounced 'tarkee') is based on the name for this bat in the language of the people of Vangunu Island.

Paratypes: a total of 22 - New Georgia Island: Mt Javi (8° 31' S, 157° 52' E), M26623, M26629, M27627, M27629-30, M27634, M27638-39, Tironusa (8° 32' S, 157° 52' E), M27631, M27641; Vangunu Island: Patutiva village (8° 34' S, 157° 52' E), M26624-26, M27628, M27632-33, M27636, M27640, M27642, Vivila (8° 41' S, 157° 52' E), M27626, M27635, M27637.

Distribution. New Georgia Island, Vangunu Island, Solomon Islands. Apparently locally extinct on Kolombangara Island following logging operations from 1966 to 1980 (Fisher and Tasker 1997).

Conservation status. This species is not listed in the latest *IUCN Red List of Threatened Species* (Hilton-Taylor 2000). A threat category of 'Critically Endangered' is proposed, based on criteria A3cd (IUCN 2000). The relevance of these subcriteria are:

i) subcriterion 3c. This requires a population decline of ≥ 80 % over the next 10 years or three generations (which ever is greater), based on an inferred or suspected decline in area of occupancy, extent of
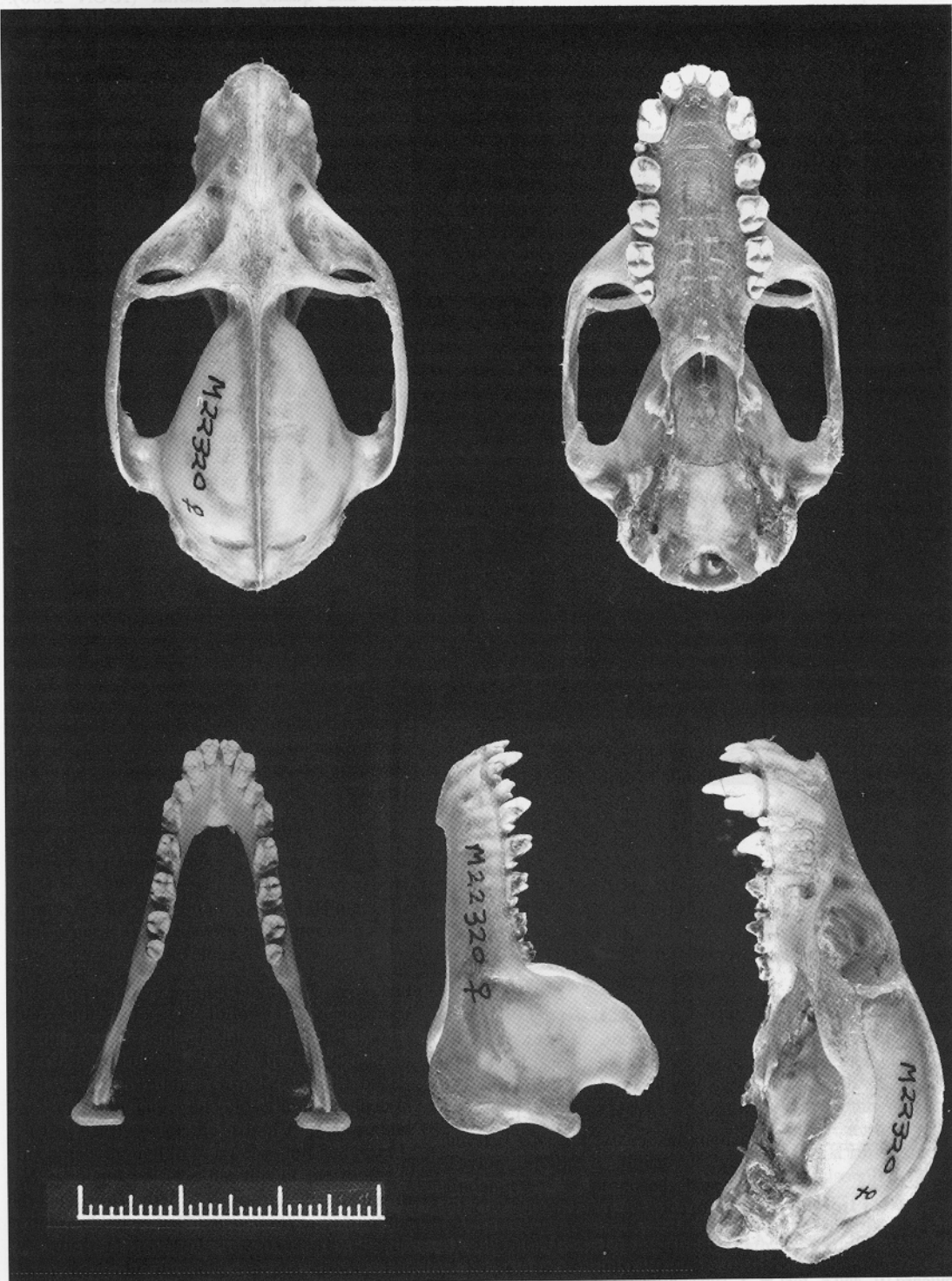
Fig. 3. Skull and jaw of holotype of *P. taki*. Scale divisions are in mm.
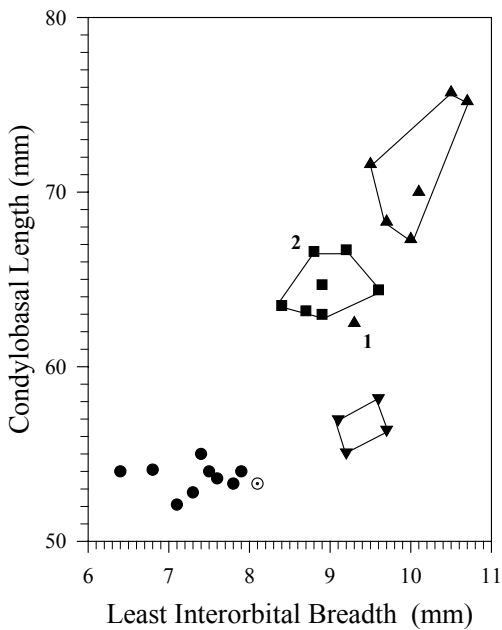
Fig. 4. Plot of condylobasallength against least interorbital breadth of *P. taki* .●; *P. pulchra* ⊙, *P. acrodonta* ▼; *P. atrata* ■ and *P. anceps* ▲ 1, subadult *P. anceps* holotype; 2, *P. atrata* holotype. Includes measurements from Hill and Beckon (1978).
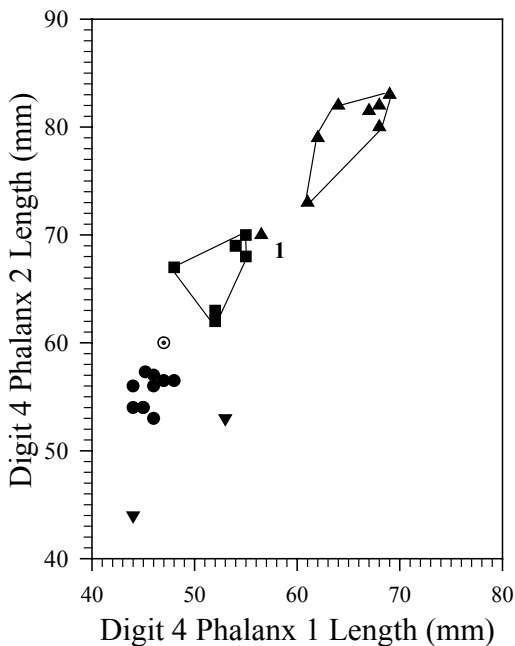

Fig. 5. Plot of wing digit 4 phalanx 2 length against phalanx 1 length for *P. atrata* ■; *P. anceps* ▲; *P. acrodonta* ▼; *P. pulchra* ⊙ and   *P. taki* ●.**1**, subadult holotype *P. anceps*. Based on Australian Museum specimens.

occurrence and quality of habitat (IUCN 2000). Generation length (defined as "average age of parents" IUCN 2000) is unknown for this species. Large species of *Pteropus* are considered to be long lived, with a low reproductive potential (Pierson and Rainey 1992; McIlwee and Martin 2002). McIlwee and Martin (2002) estimate generation length for *Pteropus poliocephalus* as about eight years. If generation length for *P. taki* is taken as 8 - 10 years, future population trends must consider a period of the next 24 -30 years. A major decline in extent of occurrence and quality of habitat is sure to continue over the next 10 - 15 years from logging operations and increased land clearing and removal of large roost trees for subsistence gardens, particularly given the rapidly increasing population of the Solomon Islands, which currently has a population structure dominated by younger age groups. Fisher and Tasker (1997) indicated that the primary habitat of this species is also the main areas of remaining forest of economic importance for logging, and that all commercially viable areas in the Solomon Islands are estimated to be exhausted by about 2005.

ii) subcriterion 3d -potential levels of exploitation over the next three generations of the species. Hunting pressure on this species is likely to increase with projected increase in human population, particularly if decreased habitat results in increased foraging in cultivated food trees, which are an important food item for *P. taki* (Fisher and Tasker 1997).

It is likely that this species has declined in the past few decades, and faces accelerating severe threats in the near future, i.e., within the next decade. The only ecological study of this species is that of Fisher and Tasker (1997) who reviewed the main threats to its survival. They believe that the species faces extinction unless areas of lowland primary forest are protected from logging and clearing for agriculture. Fisher and Tasker (1997) attribute the decline and probable extinction of the species on Kolombangara Island (adjacent to New Georgia Island) to intensive logging operations. Habitat modification and destruction were identified as primary threats to its survival. Removal of large trees is a primary threat, as individuals were only found roosting in larger trees (diameter at breast height > 1.5 m), which are presumably very old. Destruction of large trees continues over extensive areas from logging and clearing for gardens, in addition to periodic cyclone damage. Primary habitat was identified as old, abandoned village sites within 5 km of primary lowland rainforest. Old village sites contained both the large emergent trees required for roosting, and an increased food resource from old cultivated food trees (Fisher and Tasker 1997).

Remarks. An electrophoretic comparison of 25 loci from samples from the holotypes of *P. taki* and *P. pulchra* revealed a fixed difference at one locus (S.
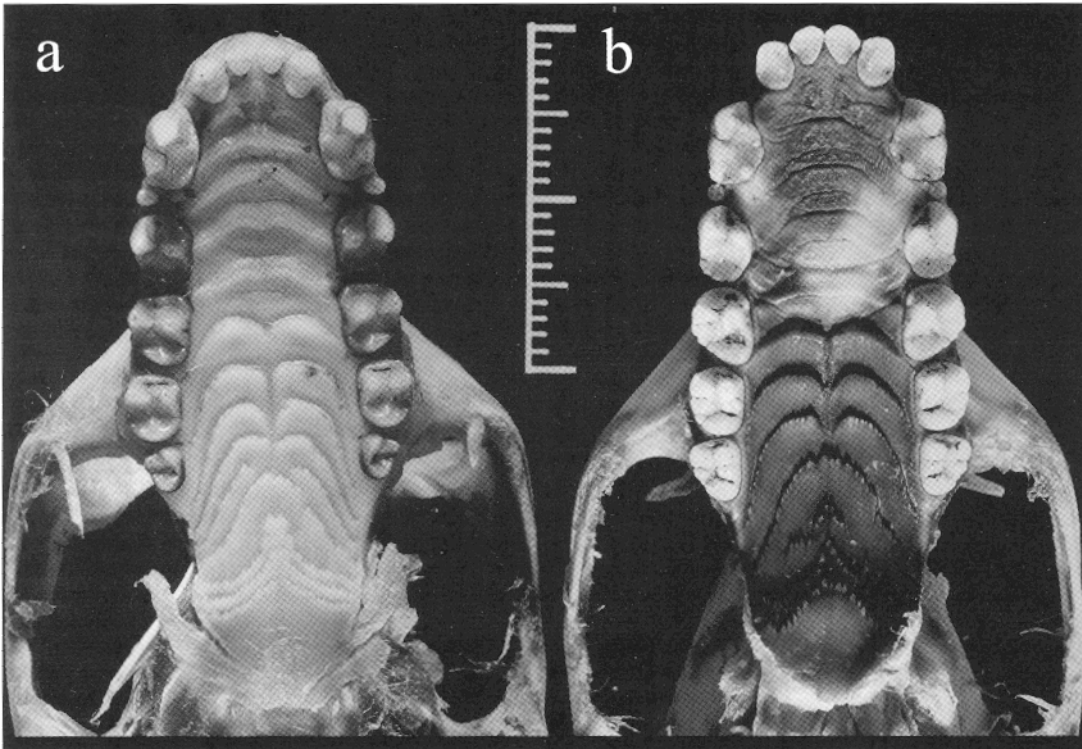
Fig. 6. Palate showing palatal ridges of: **a**, P. *taki* holotype, and **b**, *P. acrodonta* (AM M24579). Smaller scale divisions are mm

Ingleby pers. comm.). However, fixed allelic differences in allopatry provide a 'one way test' of reproductive isolation, in the sense that while a substantial percentage of fixed differences demonstrates reproductive isolation, conspecific status cannot be demonstrated by a failure to detect fixed differences. Differences in dental morphology, skull shape and pelage colour and length justify species status.

Pteralopex atrata **Thomas 1888**
Holotype. BMNH number 88.1.5.9, from Guadalcanal Island, Solomon Islands.

Diagnosis. Larger than all other species of the genus, except P. *anceps,* in external, dental and cranial measurements (Tables 1, 2) e.g., forearm length> 130 mm; greatest skull length > 63 mm; C^1-M^2 > 24 mm; zygomatic breadth> 36 mm; C^I-C^I (outer, cingula) > 15mm. Differs from P. *anceps* in greater forward projection of the nasal tips, which reach a point directly above the middle of the upper outer incisors (I^3), rather than extending forward to the rear margin of that tooth. It further differs from P. *anceps* in smaller average size: e.g., greatest skull length < 70.0 mm, mean = 67.84 mm, (range = 65.8 -69.9, n = 7) compared to mean = 75.79 mm, (range = 70.2 -79.6, n = 11); forearm length mean = 141.68 mm, (range = 138.5 -

Measurements	*P. pulchra*	*P. taki*	*P. taki*				*P. acrodonta*	
Skull and dental	holotype female	holotype female	mean	*sd*	range	*n*	M24030 male	M24031 female
Greatest skull length	55.4	56.8	56.50	0.69	55.1–57.6	9	60.1	57.4
Condylobasal length	53.3	54.1	53.66	0.84	52.1–55.0	9	58.2	55.1
Zygomatic breadth	32.2	32.1	33.34	0.70	32.1–34.6	9	33.9	32.1
Lachrymal breadth	11.0	7.3	7.90	0.58	7.3–8.7	4	-	11.0
Least interorbital breadth	8.1	6.8	7.31	0.48	6.4–7.9	9	9.6	9.2
Post-orbital breadth	6.6	6.0	6.05	0.29	5.6–6.4	8	6.9	8.7
Orbital diameter	11.4	11.3	11.30	0.59	10.4–12.1	8	12.1	12.1
Mastoid breadth	18.8	19.5	20.48	0.60	19.5–21.1	9	20.6	20.5
Braincase breadth	21.2	20.0	21.30	0.72	20.0–21.9	6	21.9	21.0
C^1-C^1 (outer, alveoli)	12.2	12.5	12.86	0.42	12.3–13.7	9	13.7	13.2
C^1-C^1 (outer, cingula)	12.8	13.0	13.44	0.67	12.5–14.7	9	14.1	13.8
C^1-C^1 (inner, cingula)	7.2	6.3	6.92	0.38	6.3–7.7	9	7.4	7.2
PM^4–PM^4 (inner, cingula)	7.9	8.6	8.68	0.17	8.5–9.0	9	9.2	8.7
M^1-M^1 (outer, cingula)	15.6	16.3	16.08	0.59	15.3–17.1	9	16.5	16.3
C^1–M^2 length	19.8	21.4	21.33	0.36	20.6–21.7	9	23.2	22.8
Palatal length	31.5	29.7	-	-	-	-	35.1	-
Mesopterygoid fossa breadth	-	7.3	-	-	-	-	7.4	-
M^2 crown length	2.36	2.56	-	-	-	-	3.65	3.50
M^2 crown breadth	2.06	2.25	-	-	-	-	2.95	2.92
M^3 crown length	2.06	2.22	-	-	-	-	2.84	2.65
M^3 crown breadth	2.05	2.20	-	-	-	-	2.58	2.54
Jaw length (from condyles)	43.2	42.1	-	-	-	-	44.6	43.9
C_1–M_3 length (cingula)	22.2	23.2	22.93	0.31	22.4–23.4	9	25.7	25.4
External body								
Ear length*	16.8	15.8	15.67	0.85	14.3–16.9	16	18.3	18.2
Forearm length	117.9	119		3.09	112.8–122.8	14	127.2	111.2
Digit 3 metacarpal length	85	82	83.50	3.74	78–85	8	-	-
Digit 3 phalanx 1 length	54	52	52.88	1.73	51–56	8	-	-
Digit 3 phalanx 2 length	92	87	87.87	4.12	80–93	8	-	-
Digit 4 metacarpal length	83	83	82.00	1.41	81–83	2	84	74
Digit 4 phalanx 1 length	47	45	45.62	1.26	44–48	10	53	44
Digit 4 phalanx 2 length	58	54	55.43	1.53	53–57	10	53	44
Digit 5 metacarpal length	88	87	88.12	4.32	81–93	8	-	-
Digit 5 phalanx 1 length	37	36	34.75	1.65	33–38	8	-	-
Digit 5 phalanx 2 length	31	30	30.95	1.37	29–32	8	-	-
Hindleg length	56.1	49.7	49.34	2.90	42–53	14	57.2	49.4
Snout – vent length*	162	190	-	-	-	-	200	170
Weight (g)*	280	250			225–351	20	258	222

Table 1. Summary statistics and measurements of *P. pulchra*, *P. taki* and Australian Museum specimens of *P. acrodonta*. *measurements taken in the field.

146.6, n = 10) compared with mean = 161.64 mm, (range = 144.7 - 171.0, n = 12). Differs from *P. anceps* in smaller absolute size for mastoid breadth and M^1 breadth: mastoid breadth < 24.0 mm: mean = 22.44 mm, (range = 21.5 - 23.7, n = 7) compared to *P. anceps* mean = 25.23 mm, (range = 24.5 - 26.0, n = 6); M^1 breadth < 4.0 mm: mean = 3.78 mm, (range = 3.5 - 3.9, n = 6) compared to *P. anceps* mean = 4.33 mm, (range = 4.0 - 4.6, n = 7). It further differs from *P. acrodonta* in very dark or black dorsal and ventral pelage rather than predominantly brown pelage; phalanx 2 of wing digit 4 is clearly longer than phalanx 1, rather than being subequal (Fig. 5); both upper and lower premolars and molars less cuspidate; relatively smaller last upper (M^2) and lower molars (M_3) (Figs 7, 13); orbital process fused with zygomatic arch,

and relatively narrower interorbital region (Fig. 4).

Description. Andersen (1909, 1912) and Hill and Beckon (1978) provide detailed descriptions of this species.

Specimens examined. A total of seven - Guadalcanal Island, Solomon Islands: Lavors, AM M3373-75, AM M4218-19, Poha River Valley, AM M19219-20.

Other specimens. Six specimens in the British Museum (Andersen 1912; Hill and Beckon 1978).
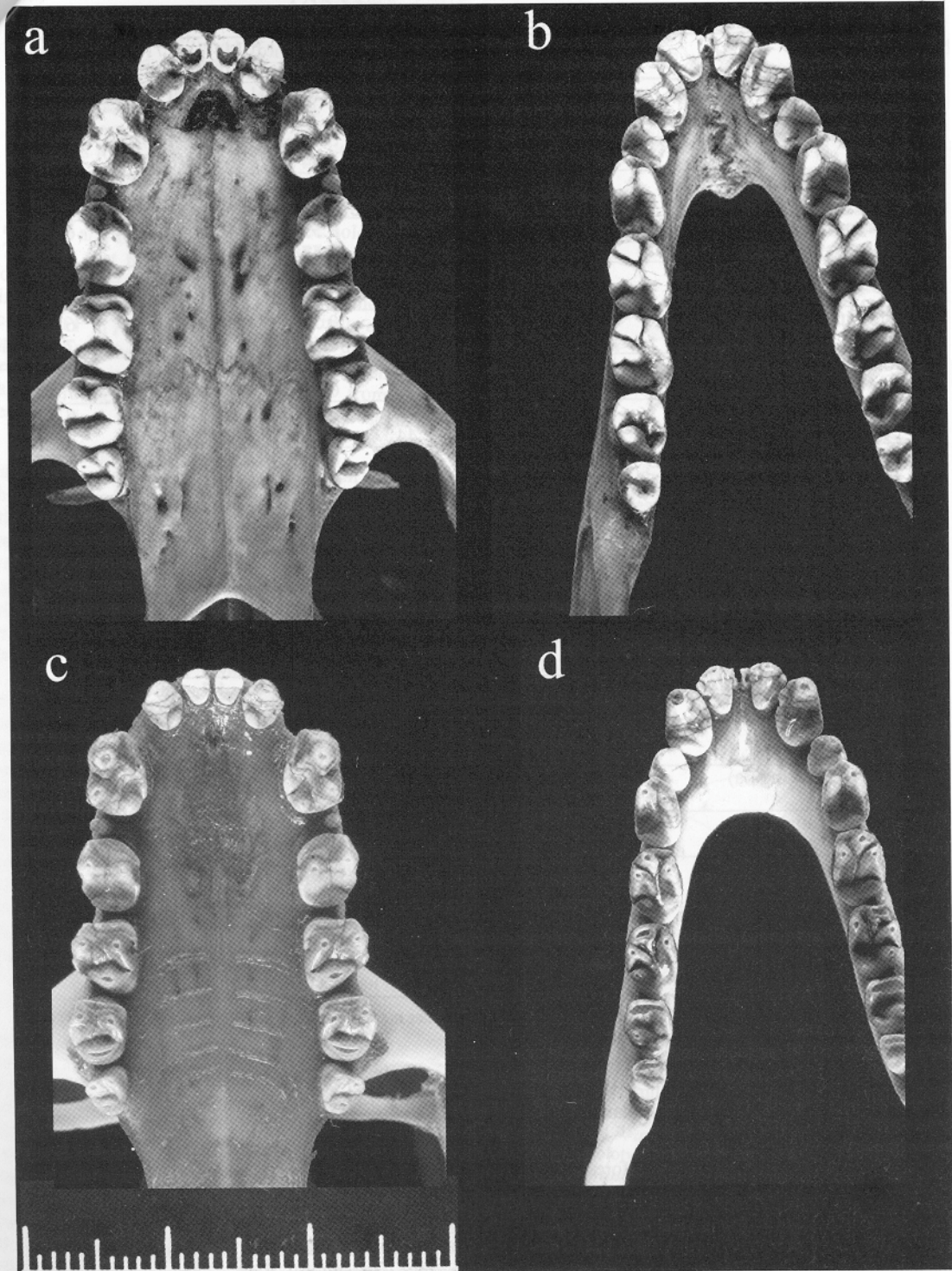
Distribution: Known only from Guadalcanal Island,

Fig. 7. Dentition of: **a** and **b**, *P. anceps* (AM M6498); **c** and **d**, *P. atrata* (AM M3373). Scale divisions are mm.

Skull and dental measurements	Species	Mean	sd	range	n
Forearm length	P. anceps	161.64	6.72	144.7 – 171.0	12
	P. atrata	141.68	2.91	138.5 – 146.6	10
Greatest skull length	P. anceps	75.79	3.14	70.2 – 79.6	11
	P. atrata	67.84	1.58	65.8 – 69.9	7
Condylobasal length	P. anceps	72.39	3.03	67.3 – 75.7	11
	P. atrata	64.59	1.54	63.0 – 66.7	7
Zygomatic breadth	P. anceps	42.54	1.63	39.3 – 45.4	11
	P. atrata	38.66	1.02	36.9 – 39.9	7
Lachrymal breadth	P. anceps	14.32	0.55	13.4 – 15.0	6
	P. atrata	12.81	0.57	11.7 – 13.3	7
Least interorbital breadth	P. anceps	10.08	0.46	9.5 – 10.7	6
	P. atrata	8.93	0.38	8.4 – 9.6	7
Postorbital breadth	P. anceps	7.30	0.56	6.4 – 8.0	6
	P. atrata	6.63	0.64	5.4 – 7.2	7
Orbital diameter	P. anceps	13.87	0.25	13.6 – 14.3	6
	P. atrata	12.83	0.58	11.8 – 13.4	7
Mastoid breadth	P. anceps	25.23	0.52	24.5 – 26.0	6
	P. atrata	22.44	0.76	21.5 – 23.7	7
Braincase breadth	P. anceps	25.12	0.83	24.0 – 26.3	6
	P. atrata	22.86	0.71	21.7 – 23.9	7
C^1-C^1 (outer, cingula)	P. anceps	18.52	1.10	17.1 – 21.1	11
	P. atrata	16.86	0.19	15.9 – 17.4	7
C^1-C^1 (outer, alveoli)	P. anceps	16.38	0.69	15.3 – 17.2	6
	P. atrata	15.44	0.55	14.4 – 16.0	7
C^1-C^1 (inner, cingula)	P. anceps	9.05	0.81	8.1 – 10.4	6
	P. atrata	8.86	0.44	8.1 – 9.5	7
PM^4-PM^4 (inner, cingula)	P. anceps	11.15	0.62	10.3 – 12.1	6
	P. atrata	10.74	0.44	10.1 – 11.3	7
M^1 crown length	P. anceps	5.07	0.22	4.7 – 5.3	7
	P. atrata	4.33	0.23	4.0 – 4.6	6
M^1 crown breadth	P. anceps	4.33	0.21	4.0 – 4.6	7
	P. atrata	3.78	0.16	3.5 – 3.9	6
M^1-M^1 (outer, cingula)	P. anceps	22.81	0.45	20.4 – 25.3	10
	P. atrata	20.67	0.21	20.0 – 21.6	7
C^1–M^2 (cingula)	P. anceps	28.46	1.20	26.0 – 29.8	11
	P. atrata	25.94	0.88	25.2 – 27.7	7
Palatal length	P. anceps	40.40	2.32	37.3 – 43.1	6
	P. atrata	36.40	1.22	34.7 – 38.5	7
Mesopterygoid fossa breadth	P. anceps	10.13	0.37	9.6 – 10.6	6
	P. atrata	8.91	0.54	8.1 - 9.8	7
C_1–M_3 (cingula)	P. anceps	31.70	1.22	29.2 – 32.8	9
	P. atrata	27.81	0.47	27.3 – 28.5	7

Table 2. Summary statistics (mm) for *P. atrata* and *P. anceps*. Incorporates measurements from Thomas (1889), Phillips (1968) and Hill and Beckon (1978).

Solomon Islands.

Conservation status. 'Critically Endangered' and declining (Hilton-Taylor 2000).

Remarks. Hill and Beckon (1978) cite forearm length as being diagnostic for this species, with a maximum of 144 mm for *P. atrata* and a minimum of 160 mm for *P. anceps*. Forearm lengths for additional material examined in this study are clearly smaller than all *P. anceps* reported from Bougainville and Choiseul: e.g., the maximum forearm length of 146.6 mm recorded for *P. atrata* is considerably less than 157 mm, the

smallest *P. anceps* from the latter Islands. Forearm length of 144.7 mm for the somewhat aberrant individual from Buka Island (AM MI9822), to the north of Bougainville, overlaps with *P. atrata*. Further material is required from Buka to determine whether this specimen is aberrant, or represents a distinct form.

Pteralopex anceps Andersen 1909

Holotype. BMNH number 8.11.16.7, immature female, skin and skull. Collected from Bougainville, April 1904 (Andersen 1909).

Diagnosis. Distinguished from *P. atrata* by larger average size, larger absolute size of mastoid breadth and M^1 breadth, and in the less anterior projection of the nasals as detailed in the diagnosis for that species. Differs from all other species as detailed in the diagnosis for *P. atrata*..

Description. Detailed descriptions are given by Andersen (1912) who also figures the holotype skull, and Hill and Beckon (1978). Hill and Beckon (1978: 72) note that the nasals project forward to a point directly above the rear of the upper outer incisors (I^3) in the holotype of *P. anceps,* but terminate above the centre of I^3 in *P. atrata.* This difference is upheld in the specimens in the Australian Museum collection, but is less evident in the aberrant *P. anceps* from Buka Island, in which the nasals project forward closer to the rear of I^3.

A consistent size difference is apparent between material from Guadalcanal *(P. atrata)* and that from Choiseul and Bougainville *(P. anceps).* This size difference is evident in larger mean size for all measurements (see Table 2) and is illustrated in bivariate plots of forearm length against greatest skull length (Fig. 8) and mastoid breadth against greatest skull length (Fig. 9). Forearm lengths of adults do not overlap, with the exception of a male (AM M19822) from Buka Island which, with a forearm length of 144.7 mm, falls in the upper range for *P. atrata* (138.5 -146.6; see Table 2, Fig. 8). The skull of this specimen differs however, in being larger than *P. atrata* (e.g., greatest skull length 72.3 mm) and broader for most dimensions (e.g., mastoid breadth (Fig. 9), C^1-C^1 (outer, cingula) is 18.2 mm compared to 15.9 - 17.4 mm for *P. atrata,* see Table 2). Further, the teeth, which show no sign of wear are distinctly larger than the series of *P. atrata*.. For example, M^1 length is 5.3 mm which is well outside the upper range of *P. atrata,* though within the range for *P. anceps* (Fig. 10, Table 2). This specimen is evidently not quite fully mature, as the postorbital processes are not fully ossified but it is not clear whether or not it had attained adult dimensions for forearm length.

Individuals of both taxa are clearly distinguished in a discriminant functions analysis (DFA) based on one external and five cranial measurements (Fig. 11). A restricted number of measurements were selected to enable inclusion of the maximum number of specimens in the analysis, given that a limited number of measurements were available for specimens taken from the literature. Standardised character coefficients from the analysis are: forearm length +1.23; greatest skull length +0.74; condylobasal length -1.24; zygomatic breadth +0.11; C^1-C^1 (outer, cingula) -0.15 and C^1-M^2 +0.58. The pattern of character coefficients suggests that separation of each taxon is influenced by an inverse relationship between forearm length and
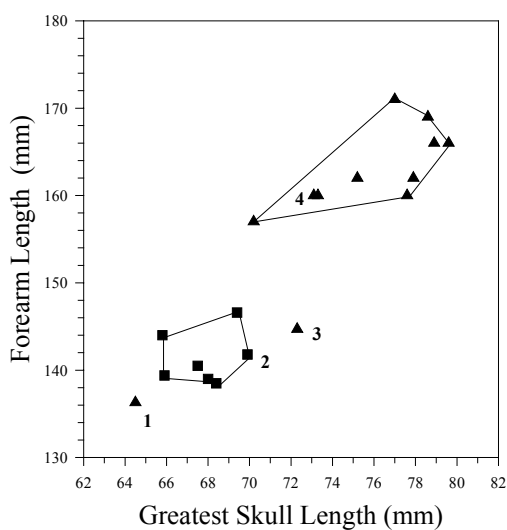

Fig. 8. Forearm length against greatest skull length for *P. atrata* ■ and *P. anceps* ▲ **1,** subadult *P. anceps* holotype; **2,** *P. atrata* holotype; **3,** young adult from Buka Island (AM M19822) and **4,** FMNH31561 from Isabel Is. Includes measurements from Phillips (1968) and Hill and Beckon (1978).
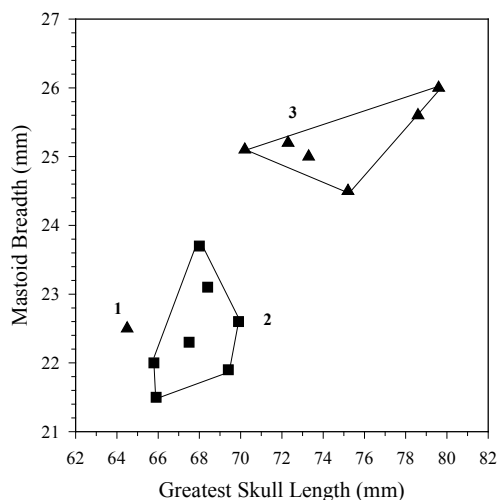

Fig. 9. Bivariate plot of mastoid breadth against greatest skull length for *P. atrata* ■and *P. anceps* ▲ **1,** subadult *P. anceps* holotype; **2,** *P. atrata* holotype; **3,** young adult from Buka Island (AM MI9822). Includes measurements from Hill and Beckon (1978).

condylobasal length, i.e., larger individuals have relatively shorter condylobasal length. All individuals were correctly identified to species using the classification function in the DFA, but a classification function derived from jackknife estimation misclassified two *P. anceps* as *P. atrata.*

A further DFA was run that included the immature

holotype of *P. anceps,* excluding zygomatic breadth, which is not available for the damaged holotype. Results (not illustrated) are similar to the initial analysis, both in terms of the classification of specimens using both types of classification function and the dominant pattern of standardised character coefficients. The holotype of *P. anceps,* which was entered in the analysis without allocation to species, was classified as *P. atrata.*

DFA maximises the differences between groups, and has the potential to separate groups on differences that are merely due to random sampling error. To assess this possibility, variation between 19 individuals was examined using Principle Components Analysis (PCA) of the same characters used in the DFA (excluding zygomatic breadth). The PCA was based on a correlation matrix, in view of the substantial size difference between FA and the smaller skull characters such as C^1-C^1 (outer, cingula). A plot of scores for specimens on the first two Principle Component (PC) axes reveals a clear separation of specimens of the two taxa on the first PC axis (Fig. 12). The first two PC axes account for a significant proportion of the total variation (95.58 %). Standardised character loadings for all characters on PC 1 are very similar to each other (ranging from +0.20 to +0.21), suggesting that separation of specimens on that axis is largely based on size. The location of three specimens is of interest: the holotype of *P. anceps* groups closest to *P. atrata* (Fig. 12); the somewhat aberrant young adult male *P. anceps* from Buka Island falls within *P. anceps,* and an adult and only known specimen from Isabel Island clearly groups with *P. anceps.* Both taxa show extensive overlap of specimen scores on PC 2 and PC 3.

Specimens examined. A total of seven- Buin district, Bougainville, Papua New Guinea: AM M6282-83, M6346-47, M6497-98; Buka Island, Papua New Guinea: Malasang Hamlet, AM19822.

Other specimens: Isabel Island, Solomon Islands: Tunnibuli, FMNH 31561, adult female; Choiseul Island, Solomon Islands: USNM 23682; Bougainville, Papua New Guinea: USNM 276973-74, 276928, 277112 (Phillips 1968). Bonaccorso (1998) lists a further five specimens from Bougainville.

Distribution. Recorded from Bougainville and Buka Islands, Papua New Guinea; Choiseul Island (Phillips 1968) and Isabel Island, Solomon Islands. Sanborn (1931) reported a specimen from Isabel Island which he considered to be *P. atrata* but gave no description or measurements. However, the specimen falls within the size range for *P. anceps* (compare Tables 2, 3) as illustrated by a plot of Forearm Length against Greatest Skull Length (Fig. 8). This specimen was grouped with *P. anceps* in both DFA and PCA analyses (see above) and represents a southern range extension of *P. anceps.*
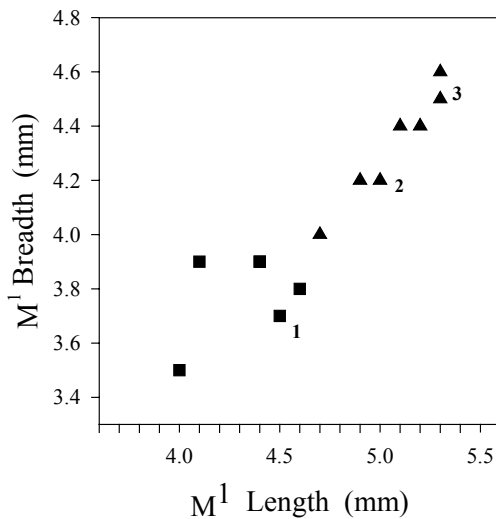

Fig. 10. Bivariate plot of M[1] breadth against M[1] length for *P. atrata* .and *P. anceps* ▲. **1,** *P. atrata* holotype; **2,** subadult *P. anceps* holotype; **3,** young adult from Buka Island (AM MI9822). Includes measurements from Hill and Beckon (1978).
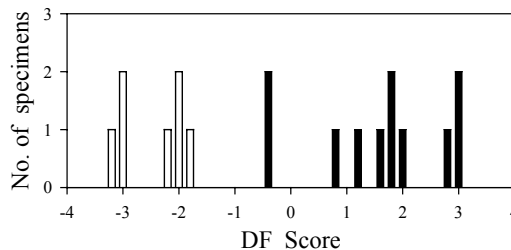

Fig. 11. Histogram of Discriminant Function (DF) scores for 11 specimens of *P. anceps* (shaded) and 7 of *P. atrata* (unshaded) based on a DFA of one external and five skull characters.

Conservation status: 'Critically Endangered' and declining (Hilton-Taylor 2000). The species has evidently not been collected or reported since 1968 (Bonaccorso 1998). In February 1991 the author visited the Hograno District, southern Isabel Island, Solomon Islands, where local land owners were quite familiar with a large form of *Pteralopex,* said to be about the same size as *Pteropus rayneri.* The species was not determined, but is possibly *P. anceps,* which is recorded from Isabel from a single specimen (see above) and is the only member of the genus recorded from Isabel. Local residents said that it was not plentiful in the area and had dramatically decreased in numbers since about the late 1960's. Possible reasons cited by local land owners for this decline are increased hunting pressure as a result of increased settlement of the region; extensive habitat alteration for agriculture or possibly populations have not recovered following a major cyclone which devastated the region some 20

years ago. They remarked that it was much less wary than larger species of *Pteropus* and consequently was much easier to approach. Further, they appeared far less resilient than *Pteropus* and would succumb to relatively minor injury inflicted by hunters, making them much easier to capture than any species of *Pteropus.*

Remarks. Examination of the series of *P. atrata* and *P. anceps* in the Australian Museum collection reveals that many characters exhibit a greater degree of variability than was previously realised and many criteria cited as diagnostic of *P. anceps* are not valid. Andersen (1912) and Hill and Beckon (1978) noted the following dental differences between the holotype of *P. anceps,* the only specimen available to them, and *P. atrata:*

- anterior basal ledges of PM^3, PM^4, and M^1 less developed in *P. anceps;*
- anterior basal ledges of PM^3 and M^1 of *P. anceps* extend much less obviously to inner face of lingual cusp;
- lingual margins of PM$_4$, M$_1$ and M$_2$ of *P. anceps* are more ridge like rather than cusp like;
- labial elevations of PM$_4$, M$_1$ and M$_2$ of *P. anceps* are much less clearly divided into two cusps;
- internal cingulum of I^3 slightly raised, but does not form a cusp as in *P. atrata.*

None of the above differences are upheld in the material examined in this study, as is evident from dental morphology of each taxon in Fig. 7. I have compared Figure 22 of Andersen (1912: 438) and the description of the dentition of the holotype of *P. anceps* given by Hill and Beckon (1978) with three *P. atrata* skulls and six skulls of *P. anceps* from Bougainville and Buka in the Australian Museum. Skull and dental measurements of these specimens are given in Table 3. All but one of the latter conform to descriptions of the dentition of *P. atrata.* A single specimen (AM M6283, adult male) resembles *P. anceps* in the reduced anterior cingula on PM^4 and M$_1$ and in the ridge-like lingual cusp of PM^4 and M$_I$. This was also the only specimen examined which had a fused lingual cusp on PM$_3$. These specimens concur with the view of Phillips (1968), who examined four skulls of *P. anceps* from Bougainville and Choiseul and concluded that dental features conformed with those accredited to *P. atrata* rather than the type of *P. anceps.*

Andersen (1912), and Hill and Beckon (1978) state that the dorsal surface of the metatarsus and tibia are densely furred in *P. anceps* while the distal quarter of the tibia and the metatarsus are naked in *P. atrata.* In six skins and an alcohol specimen of *P. anceps* examined the tibia and metatarsal fur ranges from being very sparse to quite dense and does not appear to

correlated with age or sex. Dorsal tibial fur is stated to be much longer in the holotype of *P. anceps,* i.e., about 20 mm compared with 12 -14 mm in *P. atrata.* In the series of *P. anceps,* the dorsal fur is quite variable in length and overlaps with that of the series of *P. atrata.* The sparse tibial fur of a male from Bougainville (AM M6346) is comparable with that of two female *P. atrata* (AM M4218, M4219) in alcohol. In summary, there is a tendency for fur to be sparser in *P. atrata,* but this character is not diagnostic as it is quite variable in the series from Bougainville.
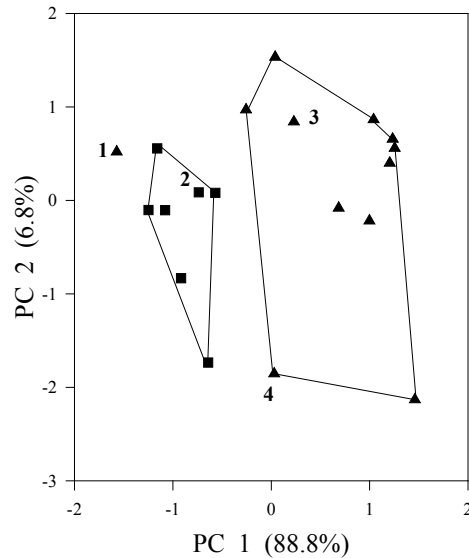

Fig. 12. Bivariate plot of specimen scores on first two Principal Component (PC) axes for *P. atrata* ■ and *P. anceps* ▲ based on one external and four skull characters. **1**, subadult *P. anceps* holotype; **2**, *P. atrata* holotype; **3**, FMNH31561 from Isabel Is; **4**, young adult from Buka Island (AM M19822).

Hill and Beckon (1978) noted that the ears of *P. atrata* are semi-circularly rounded off above, while those of the holotype of *P. anceps* (a skin) are broadly rounded off but with a distinct trace of a blunt tip. However, I am unable to distinguish such differences as ear tips are of a similar rounded shape in alcohol specimens of both species in the Australian Museum collection.

In both the DFA and PCA, the holotype of *P. anceps* groups with *P. atrata* rather than *P. anceps.* However, although falling within the size range of *P. atrata* for a number of characters, as might be expected for an immature individual, the holotype falls within *P. anceps* for other characters such as the large teeth, illustrated by crown dimensions of M^1 (Fig. 10). Andersen (1909: 268) considered that the holotype was "slightly immature" and "evidently very nearly full-

Measurement	P. atrata			P. anceps						
	AM M3373 male	AM M19219 female	AM M19920 female	AM M6282 male	AM M6283 male	AM M6347 female	AM M6497 male	AM M6498 female	AM M19822 male	FMNH 31561 female
Greatest skull length	68.4	69.4	65.9	79.6	73.3	78.6	70.2	75.2	72.3	73.1
Condylobasal length	64.4	66.7	63.0	75.7	70.0	75.2	68.3	71.6	67.3	70.2
Zygomatic breadth	39.4	38.6	36.9	44.3	41.2	43.7	39.3	42.5	41.5	42.1
Lachrymal breadth	13.0	12.5	11.7	15.0	14.2	14.7	14.2	14.4	13.4	-
Least interorbital breadth	9.6	9.2	8.9	10.5	10.1	10.7	9.7	9.5	10.0	-
Post-orbital breadth	7.0	7.2	7.1	7.4	7.3	7.0	6.4	8 .0	7.7	-
Orbital diameter	13.4	12.3	11.8	13.8	14.3	13.7	14.0	13.8	13.6	-
Mastoid breadth	23.1	21.9	21.5	26.0	25.0	25.6	25.1	24.5	25.2	-
Braincase breadth	23.9	23.0	22.7	25.5	26.3	24.4	25.5	24.0	25.0	-
C^1-C^1 (outer, cingula)	17.4	17.1	16.5	18.4	17.1	18.7	17.5	18.8	18.2	17.2
C^1-C^1 (outer, alveoli)	15.9	15.8	15.5	16.6	15.9	16.9	15.3	16.4	17.2	-
C^1-C^1 (inner, cingula)	9.1	9.5	8.1	9.0	8.8	10.4	8.1	9.5	8.5	-
PM^4-PM^4 (inner, cingula)	10.4	10.6	10.1	11.2	10.3	12.1	10.8	11.5	11.0	-
M^1-M^1 (outer, cingula)	20.9	20.9	20.1	23.0	20.4	24.6	21.6	23.5	22.6	-
C^1–M^2 (cingula)	27.7	26.3	25.2	29.7	26.7	29.3	26.0	28.5	28.8	28.1
Palatal length	36.0	38.5	35.6	43.1	38.9	43.1	37.3	40.2	39.8	-
Mesopterygoid fossa	8.6	9.1	8.6	10.6	10.1	10.1	9.6	10.5	9.9	-
Jaw length	53.4	54.5	52.5	61.6	55.7	61.7	53.9	61.0	58.3	-
C_1–M_3 (cingula)	28.3	28.5	27.3	32.5	29.2	32.3	29.0	31.9	30.3	-
Forearm length	138.5	146.6	139.4	166	160	169	157	162	144.7	160

Table 3. Selected measurements (mm) for three specimens of *P. atrata* and specimens of *P. anceps* in the Australian Museum collection, and FMNS31561.

grown; forearm 137 mm, in four adult *Pt. atrata* 139 - 143.5" (also see Andersen 1912: 441). However, his view was based on the assumption that *P. anceps* approximates the size of *P. atrata,* which is clearly not the case. Hill and Beckon (1978) indicated that the holotype of *P. anceps* was "subadu1t". It would be instructive to determine the extent of ossification of the holotype skull. Although I have not examined the holotype (collected from Bougainville), it is possibly at a much early growth stage than Andersen suspected, given that the range of forearm length of three females from Bougainvi11e is 162 -171 mm. If so, this would discount the possibility that the holotype represents an aberrant northern range extension of *P. atrata,* and thus discount the possibility that the larger animals from Bougainvi11e and Choiseul referred to *P. anceps,* are in fact an unnamed taxon.

In view of the suggestion that *Pteralopex* from Isabel feeds on green coconuts (Sanborn 1931), I closely questioned hunters in the Hograno district of Isabel regarding this behaviour but was assured that the *Pteralopex* in their region did not feed on coconuts, young or old. A number of people reported that the species chewed bark on the trunk of selected trees. The expectorated pulp of *Pteralopex* could evidently be readily recognised from that of *Pteropus sp.* by shape and greater size. Individuals were said to roost solitarily or in pairs, often in the tangled lianas of large rainforest trees. These animals were said to be equally

likely to be encountered in coastal forest as on the higher elevations of the nearby mountains, which reach some 1000 m, the highest mountains on Isabel.

Pteralopex acrodonta Hill and Beckon 1978

Holotype. BMNH 77.3097, adult male skin and skull from Des Voeux Peak, Taveuni Island (16° 50' S, 179° 58' W), Fiji Islands.

Diagnosis. Similar general size to *P. pulchra* and *P. taki* sp. nov. Differs from all other members of the genus in: more cuspidate PM^4 and upper and lower molars; less pronounced reduction in size of last upper and lower molars, their morphology not dissimilar to M^1 and M_2 respectively (Fig. 13); relatively broader interorbital region (Fig. 4); postorbital processes smaller, do not extend to zygomatic arches; second phalanx of wing digit 4 is subequal to the first phalanx rather than being substantially longer (Fig. 5). It further differs from *P. atrata* and *P. anceps* in being smaller, e.g., forearm length < 130 mm; greatest skull length < 63 mm; C^1-M^2 < 24 mm; zygomatic breadth < 36 mm; C^1_C^1 (outer, cingula) < 15 mm.

Description. See Hill and Beckon (1978) for a detailed account. Additional material has enabled examination of palatal ridges and the two specimens examined differ both in number (12 versus 14) and structure from other species of *Pteralopex*. The palatal ridges of the
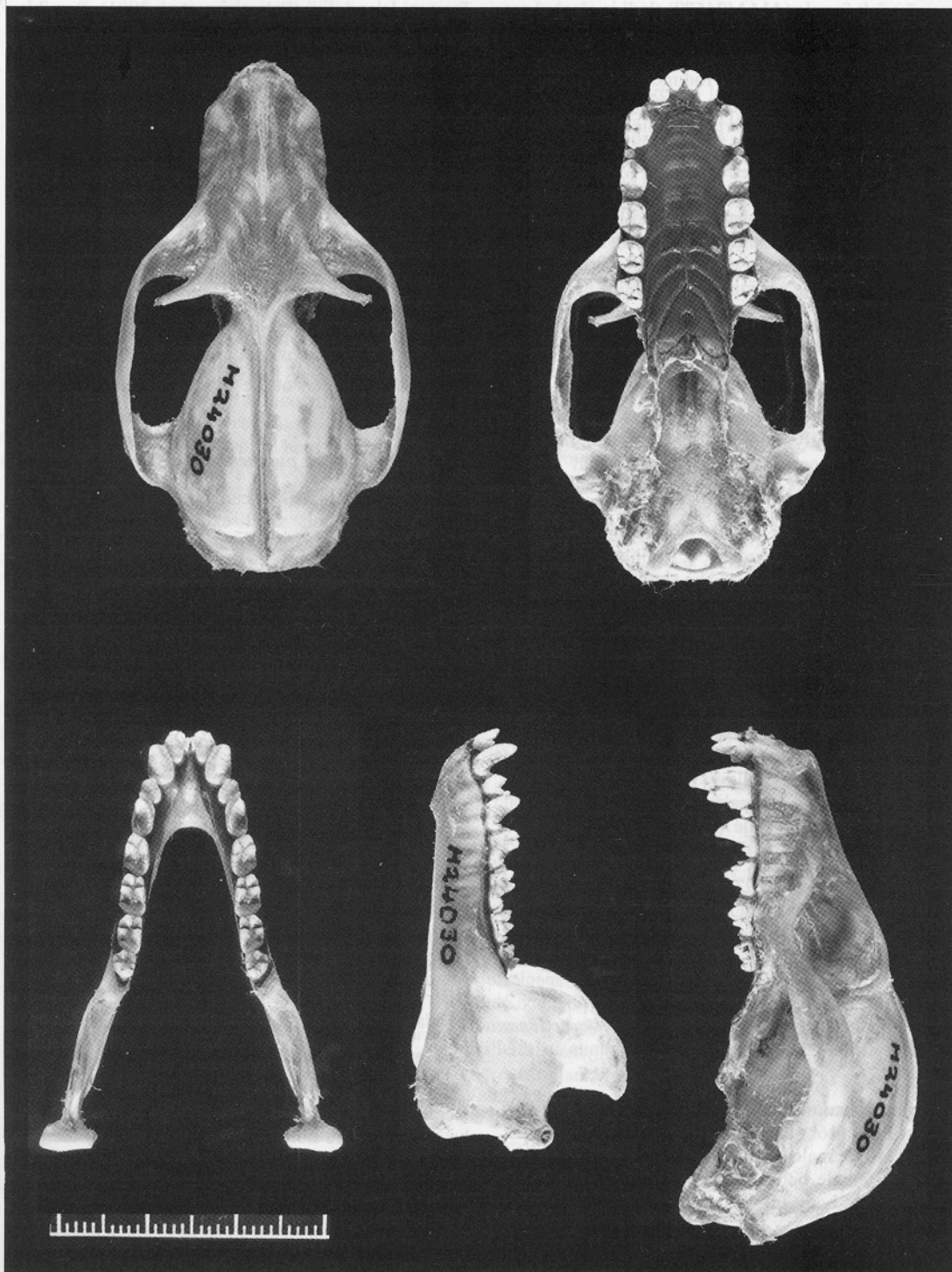
Fig. 13. Skull and jaw of *P. acrodonta* from Taveuni Is., Fiji (AM M24030 male). Scale divisions are in mm.

young adult female (AM M24579) skull in alcohol are shown in Fig. 6b. There are 12 ridges: five anterior, five middle and two posterior. The first four of the five anterior ridges are extremely rudimentary and contrast dramatically with the massive first ridge of the middle ridges, which is level with the middle of PM^4. There appear to be five middle ridges: the first three are divided, the forth is joined medially; what appears to be the fifth ridge is rudimentary. The two most posterior ridges are complete in the mid-line. All ridges posterior to the first of the middle series, are serrated. The male palate is similar except that the forth ridge in the middle series is not joined in the mid-line.

Measurements of an adult female and male obtained by Australian Museum staff from Taveuni in 1990 are given in Table 1. These specimens are of similar dimensions to the holotype and paratype female given by Hill and Beckon (1978). The adult male AM M24030 is slightly larger than the holotype male for several dimensions including greatest skull length, zygomatic breadth, C^1-M^2 and C_1-M_3. The adult female AM M24031 is of similar greatest skull length to the paratype female but is slightly smaller for most length and breadth measurements. It is likely that this specimen is a young adult. The skull lacks a sagittal crest and the basioccipital-basisphenoid joint is in the process of fusion.

Dorsal fur colour of the male specimen (AM M24030) is a uniform light brown, close to Olive-Brown, on the head, shoulders and mantle extending to midway down the back. Fur of the lower back, rump and dorsal surface of the tibia is predominantly a pale yellow, close to Buff-Yellow. Ventral fur is a uniform light brown and slightly paler than the dorsum. Dorsal fur colour of the female skin (AM M24031) is a uniform light brown, with uniform paler ventral fur.

Hill and Beckon (1978) stated that *P. acrodonta* differs from *P. atrata* and *P. anceps* in that the second phalanx of digit 4 is subequal to the first phalanx rather than being substantially longer. This distinction is confirmed by the additional material of this species held at the Australian Museum. A plot of phalanx 2 against phalanx 1 (Fig. 5) illustrates that *P. acrodonta* diverges from other members of the genus in this respect.

Specimens examined. A total of three: all from Des Voeux Peak (16° 50' S, 179° 58' W), Taveuni Island: AM M24030, male skin and skull, body in spirit; AM M24031 female body in alcohol; and AM M24579 female, skin, body in alcohol, skull extracted and in alcohol.

Other specimens. The holotype and paratype in the British Museum collection (Hill and Beckon 1978).

Distribution. Known only from high elevations on Taveuni Island, Fiji (Palmeirim *et a/.* 2001). Possibly also occurs on the adjacent island Vanua Levu, where Hill and Beckon (1978) record unconfirmed observations thought to be of this species. Reliable observations were also reported from Delaikoro Peak, Vanua Levu (Flannery 1995) by Australian Museum operatives in 1990.

Conservation status. 'Critically Endangered' and declining (Hilton-Taylor 2000).

Remarks. Several surveys of the major islands of Fiji undertaken by staff of the Australian Museum in 1990 and 1991 resulted in three specimens of this species, which appear to be the only specimens reported following its description. The additional specimens confirm the distinctive nature of this species in relation to all other members of the genus, which are from the Solomon Islands.

Pteralopex pulchra Flannery 1991

Holotype. Australian Museum number M21842, adult female in alcohol; skull extracted. Collected on southern slopes of Mt Makarakomburu *(*9° 44' S, 160° 01' E), Guadalcanal Island, Solomon Islands.

Diagnosis. A small member of the genus. It differs from *P. taki* sp. nov. as detailed in the diagnosis of that species. Differs from *P. atrata* and *P. anceps* in smaller size (Tables 1, 2), e.g., forearm length < 130 mm; greatest skull length < 60 mm; C^1-M^2 < 24 mm; ventral fur colour with pale yellowish tips rather than dark or blackish; skin of ear base whitish rather than dark. It differs from *P. acrodonta* in less cuspidate PM^4 and molars; relatively smaller M^2 and M_3 (compare Figs 1, 13); black dorsal fur rather than brown fur, wing digit 4 phalanx 2 longer than phalanx 1, rather than being subequal; postorbital processes fused with zygomatic arch, but does not extend to zygoma in *P. acrodonta;* narrower interorbital region (Fig. 4).

Specimens examined. The holotype and only known specimen.

Distribution. Known only from Mt Makarakomburu, Guadalcanal, Solomon Islands.

Conservation status. 'Critically Endangered' and declining (Hilton-Taylor 2000).

Remarks. The anterolingual cusp of PM_3 is stated to be absent in the holotype of this species (Flannery 1991). However, rather than being absent, it is partially fused with the main cusp and is not distinct. An identical condition is present in only one (AM M6283) of the *P. anceps* examined while this cusp is unfused in the remaining four skulls with unworn dentition of the latter species and a further three skulls of *P. atrata.* The black and white ventral wing mottling of the holotype of *P. pulchra* is stated to be far more

black and white ventral wing mottling of the holotype of *P. pulchra* is stated to be far more pronounced than in *P. atrata*. The extent of wing mottling appears to be quite variable in *P. atrata*. Mottling is evident but less pronounced (as noted by Flannery 1991) in three alcohol specimens of *P. atrata*: AM M3373, AM M4218 and AM M4219, particularly the latter specimen. These specimens (collected in the 1930's) have faded and it is possible that mottling was quite prominent in life. However, two skins of *P. atrata* obtained from Guadalcanal in 1991 show no signs of mottling.

DISCUSSION

Further investigations of the biology and conservation of all members of the genus are urgently required. All appear to be uncommon, have very restricted island distributions and are at risk of extinction primarily from habitat destruction (particularly unrestrained logging operations) and escalating pressure from expanding human populations. These factors provide strong reasons for prioritizing research into the biology of the genus. Suggested priorities for field studies are to determine:

• the identity and status of *Pteralopex* reported from Vanua Levu, and the status of populations on Taveuni, Fiji;

• the distribution and status of *P. pulchra*, known only from a single specimen from Mt Makarakomburu, Guadalcanal;

• the status of populations from Buka Island, Papua New Guinea. The single specimen reported (AM M19822) differs from material from adjacent Bougainville;

• whether the genus occurs on the major islands of Makira and Malita, Solomon Islands;

• past patterns of distribution and abundance from the experience of local people.

Researchers in the Solomon Islands should allow sufficient time to liaise with local land owners. This is essential, both to address the often complex issue of land ownership to gain access to areas, and to establish trust and co-operation from land owners.

Land managers and conservation agencies are urged to instigate as a high priority, management plans and conservation reserves to address the perilous conservation status of all *Pteralopex* species.

Species key to adult *Pteralopex*

1a Size larger, forearm length >130 mm; greatest skull length > 63 mm; C^1-C^1 (outer, cingula) > 15 mm ....……………..………..…**2**

1b Size smaller, forearm length < 130 mm; greatest length of skull < 63 mm; C^1-C^1 (outer, cingula) < 15 mm…..…………………………………..…..**3**

2a Size smaller, forearm length usually < ~ 150 mm; greatest skull length < 70.0 mm; mastoid breadth < 24.0 mm; anterior of nasals terminates above middle of second upper incisor (Guadalcanal)...………...***P. atrata***

2b Size larger, forearm length usually > ~ 150 mm; greatest skull length > 70.0 mm; mastoid breadth > 24.0 mm; anterior of nasals terminates above posterior edge of upper second incisor (Isabel Is., Choiseul Is., Bougainville and Buka Is.)…………..………***P. anceps***

3a Fourth digit phalanx 1 and 2 subequal; postorbital process does not extend to zygomatic arch; M^2 breadth > 2.4 mm; last upper and lower molars only slightly smaller than preceding molar; (Fiji)...…......***P. acrodonta***

3b Fourth digit phalanx 2 clearly longer than phalanx 1; postorbital process fused with zygomatic arch; M^2 breadth < 2.4 mm; last upper and lower molars clearly more reduced than preceding molar ....………….............…..........**4**

4a Dorsal fur dense and long, black, ventral fur dark with yellowish tips; second lower incisors separated from each other by at least half the breadth of each tooth; (Guadalcanal) ....…..………...…......***P. pulchra***

4b Dorsal fur generally sparse, short; overall fur colour light brown; second lower incisors nearly in contact, or separated by less than half the breadth of each tooth; (New Georgia and Vangunu Islands)……........***P. taki***

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