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A new species of *Dobsonia* Palmer, 1898 (Mammalia, Megachiroptera) from Waigeo, with notes on other members of the genus

W. BERGMANS

ABSTRACT

From a cave near Nja-njef, Waigeo, New Guinea, *Dobsonia beauforti* n.sp. is described. Its position within the genus as well as some aspects of the taxonomy of the genus are discussed.

INTRODUCTION

Checking some old and yet unregistered Megachiroptera samples in the collection of the Zoölogisch Museum, Amsterdam, I encountered a series from Waigeo, identified as "*Dobsonia paliata* E. Geoffroy". The species name "*paliata* Geoffroy" is quite meaningless since it has been in use for some time to accommodate all representatives of the genus *Dobsonia* Palmer, 1898 (see for instance Jentink, 1906), until Andersen (1909) thoroughly revised the genus, disposed of the species name "*paliata* E. Geoffroy" as a *nomen dubium* and, in a later publication, recognized 11 species (Andersen, 1912). Laurie & Hill (1954) recorded altogether 15 forms, nine of which were considered full species. Rabor (1952) described a sixteenth taxon.

The present series did not fit the description of any of these forms and is therefore described here as a new species. The species is named in memory of the collector of the type series, Professor Dr Lieven Ferdinand de Beaufort (1879—1968), director of the Zoölogisch Museum, Amsterdam, from 1922 to 1949.

Dr de Beaufort published a short narrative of his voyage to Waigeo (1913). From the map illustrating this report the position of the type locality has been established (fig. 1).

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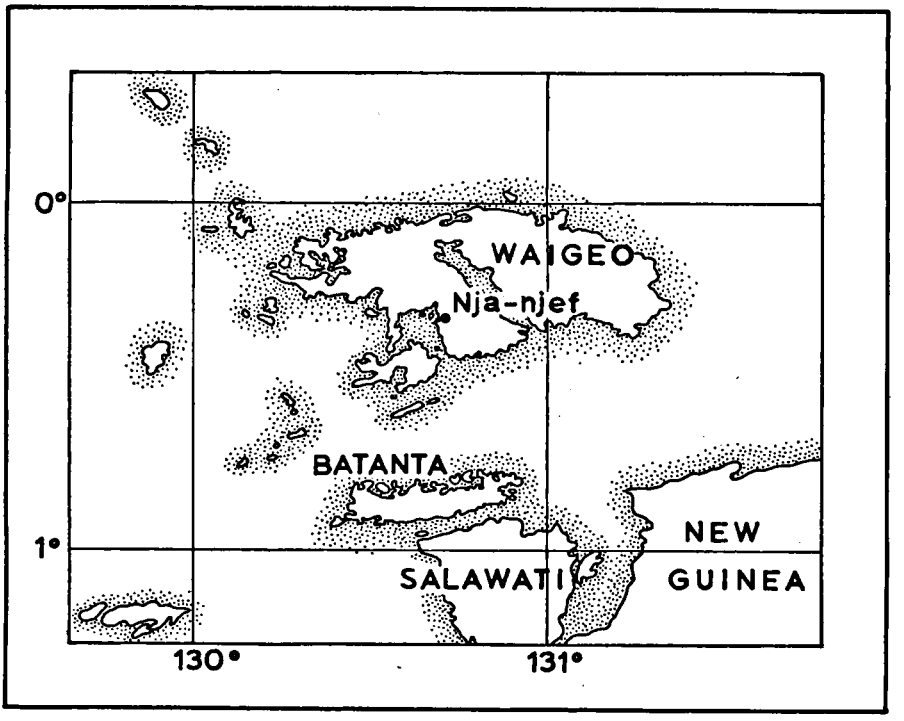


FIG. 1. The position of Nja-njef, type locality of *Dobsonia beauforti* n.sp.

METHODS AND DESCRIPTION

Colour names printed with capital first letters are of colours approximated with the colour plates of Ostwald (1939), translated into Ridgway colour names with the tables of Zimmerman (1952). All measurements are given in mm. The *greatest skull length* represents the distance between prosthion (the intersection of the line that connects the most distal points of both premaxillae with the median plane) and the opisthocranion (the most caudal point of the skull). The *rostrum length* represents the distance between the most distal point of the orbit and the prosthion. The *cranium width* is the greatest width of the actual cranium, situated above the caudal insertions of the zygomatic arches. The teeth rows have been measured over the cingulae. The greatest length and width of the cheek teeth have been measured over the crowns (that, at the caudal side of these teeth, coincide with the cingulae). Unfortunately the specimens, initially preserved in alcohol, had been made into dry skins and skulls before body measurements had been taken by the author. The body measurements in table 2 are those taken from alcohol specimens by the taxidermist, except the forearm lengths which were measured from the dry skins. Collections have been abbreviated as follows:

AMNH — American Museum of Natural History, New York.
AMS — Australian Museum, Sydney.
BMNH — British Museum (Natural History), London.
RMNH — Rijksmuseum van Natuurlijke Historie, Leiden.
ZMA — Zoölogisch Museum, Amsterdam.

Dobsonia beauforti n.sp.

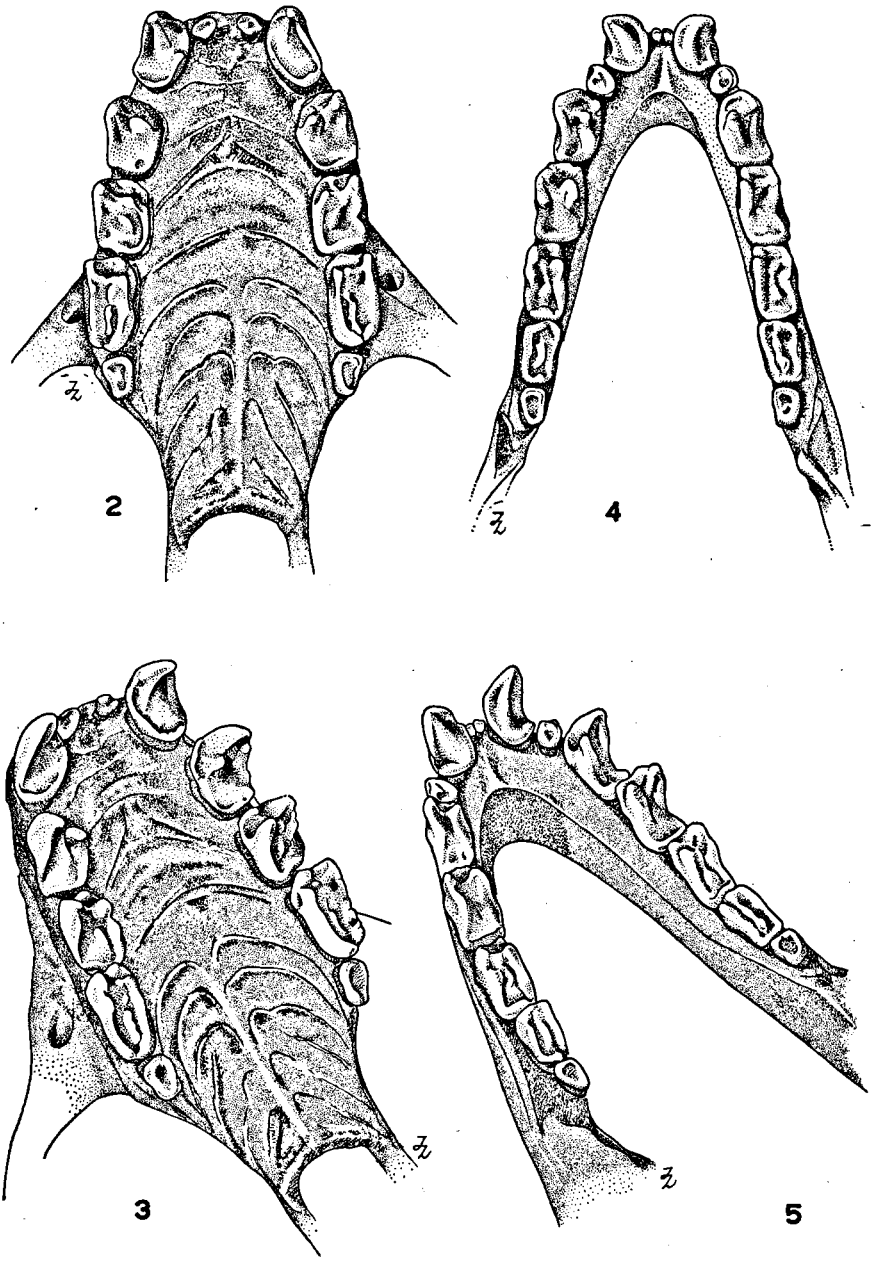
Holotype: An adult female from a cave near Nja-njef, Waigeo, New Guinea, 25 December 1909. Collector Dr L. F. de Beaufort. The specimen (ZMA 16.476; figs. 2—5 and 7—9) consists of skin and skull.

Paratypes: 13 specimens from the type locality, 25 December 1909: 3 adult ♂♂ (ZMA 16.473, 16.478, 16.479), 1 juvenile ♂ (ZMA 16.482), 6 adult ♀♀ (ZMA 16.472, 16.474, 16.475, 16.480, 16.481, 16.483) all with embryos (preserved in alcohol: ZMA 16.547—16.552) and 1 juvenile ♀ (ZMA 16.477)*). All ZMA types consist of skull and skin. 1 specimen, adult, sex unknown, from Waigeo, 25 March 1863, collected by H. A. Bernstein (RMNH 23894). This specimen consists of a skull and a mounted skin and is mentioned by Jentink (1888) under *Cephalotes peronii* as specimen *ll.*

Diagnosis: A rather small, typical *Dobsonia*, by its dental characters a member of the *viridis* group (*sensu* Andersen, 1912: 459). In size much like the geographically widely separated *Dobsonia inermis* Andersen, 1909, but differing in form of frontal region, having relatively wider interorbital breadth, relatively bigger width over M^2 — M^2, narrower incisors and averaging smaller cheek teeth. Morphologically allied to *Dobsonia viridis* (Heude, 1896) but appreciably smaller in skull and forearm measurements.

Description: Ears, patagium and naked dorsal skin Blackish Brown. Fur on top and sides of head between Bone Brown and Olive Brown. Nape, upper side of shoulders and furred upper part of back with Olive Brown hairs, somewhat darker in occipital region and where bordering naked part of back; a narrow line of these hairs along spinal tract. Chin sparsely furred Blackish Brown, throat region with Drab hairs, except on the almost naked central region where a lightly coloured skin is exposed. Fur on underparts of upperarms, shoulders and flanks Drab, with a median patch of Sudan Brown on breast and belly. This patch either quite small, rather dark and quite distinctly set off against surrounding Drab or, more often, as in the holotype, rather light and ill defined. Undersides of propatagium and plagiopatagium with light Sudan Brown hairs near forearm and between upperarm and body. Claws very lightly yellowish brown, somewhat darker in the thicker basal part.

*) The original jar containing the ZMA type series also contained the note, that in 1923 two specimens had been sent to Dr F. Spillman at Marbach. Old correspondence learned that this was Marbach in Austria, and that Dr Spillman had been working in Vienna. However, I have not been able yet to locate the two specimens, probably also *Dobsonia beauforti.*



FIGS. 2—5. *Dobsonia beauforti* n.sp., holotype, ♀ (ZMA 16.476): upper teeth and palatal ridge pattern (figs. 2, 3) and lower teeth (figs. 4, 5). J. Zaagman (ZMA) fecit.

Teeth (figs 2—5) with well-marked antero-internal ledges in P^4, M^1, P_3 and P_4, that in M^1 and, more weakly, those in P^4 and P_4 tending to a pointed, cusp-like form. M_1 with a distinct antero-internal cusp. P^3, P^4, P_3, P_4 and M_1 with posterior basal ledges. Median surfacial ridges in P^4, M^1, M_1 and M_2. Surfacial ridge in P^4 not always present, sometimes very weak or very short. When present, it runs into the direction of the tip of the big antero-external cusp. The surfacial ridge in M^1 is often restricted to the rear half of the molar but may run into the direction of the second antero-internal cusp tip. The surfacial ridge in M_1 is quite often represented only by a nodule. Such a nodule and occasionally even a very small ridge may also be found on the surface of M_3.

TABLE I. Measurements of *Dobsonia beauforti* n.sp. Body measurements, except forearm length, taken from alcohol specimens.

	Holotype ♀	n	Holotype and adult paratypes ♀♀	n	♂♂
Greatest skull length	42.5	6	41.9— 43.1	2	44.6— 45.3
Condylobasal length	40.5	7	39.5— 41.7	2	41.9— 42.9
Rostrum length	13.2	7	12.9— 13.8	3	13.8— 14.1
Palatal length		4	20.9— 21.9	3	21.8— 22.3
Mandible length	33.1	7	32.1— 33.3	3	34.0— 34.8
Cranium width	16.5	7	16.2— 17.3	2	16.6— 17.5
Interorbital width	8.8	7	7.9— 8.8	3	8.1— 8.6
Postorbital width	7.1	7	6.5— 7.1	3	6.5— 7.4
Zygomatic width	26.4	6	25.4— 26.7	1	28.0
C^1—M^2	16.5	7	16.1— 16.8	3	16.7— 16.9
M^1—M^1	12.8	7	12.3— 13.2	3	12.6— 13.2
C_1—M_3	17.5	7	16.9— 18.1	3	17.9— 18.0
Total length		5	147 —171		
Tail		5	24 — 29		
Ear		5	19 — 22		
Foot (with claw)		5	18 — 24		
Forearm length		7	99.6—107.6	3	106.3—111.4

TABLE II. Teeth measurements of *Dobsonia beauforti* n.sp.: length × width.

	Holotype ZMA 16.476 ♀	Paratype ZMA 16.474 ♀	Paratype ZMA 16.473 ♂	Paratype ZMA 16.479 ♂
I^1	1.2	1.2	1.3	1.4
P^3	3.4 × 2.7	3.3 × 2.5	3.8 × 2.5	3.5 × 2.8
P^4	3.5 × 2.7	3.3 × 2.5	3.8 × 2.7	3.5 × 2.8
M^1	4.3 × 2.5	4.0 × 2.3	4.3 × 2.5	4.0 × 2.5
M^2	2.0 × 1.6	2.0 × 1.4	2.2 × 1.5	2.0 × 1.5
P_1	1.2 × 1.3	1.2 × 1.3	1.2 × 1.4	1.2 × 1.5
P_3	3.1 × 2.1	2.8 × 2.0	3.3 × 2.2	3.0 × 2.2
P_4	3.8 × 2.2	3.3 × 2.0	3.7 × 2.2	3.5 × 2.2
M_1	3.3 × 2.1	3.2 × 1.8	3.5 × 2.2	3.4 × 2.0
M_2	2.8 × 1.9	2.5 × 1.8	2.5 × 2.0	2.5 × 2.0
M_3	1.8 × 1.3	1.7 × 1.3	1.8 × 1.4	1.6 × 1.5

Measurements: tables I, II and IV.

Distribution range: The only exact locality known is Nja-njef, Waigeo (fig. 1). The species is possibly restricted to this island (and possibly some of the very near surrounding islets).

Habitat: According to de Beaufort (1913) Waigeo is covered by forests of the type with little undergrowth. Only in the north of the island there were some grassy slopes with low bushes. The soil consists of limestone, forming low mountains that descend steeply in the sea. Only here and there along the coast a sandy beach or a mangrove forest was found. The cave near the coastal village Nja-njef, where the series was captured, probably was a limestone cave in one of the cliffs.

Discussion

Taxonomically the genus *Dobsonia* Palmer, 1898, is rather difficult to deal with, for the species ascribed to it do not show very striking differences. This has obviously caused some zoologists in the nineteenth century to recognize only one species. In doing so, they had to accept an exceptional size range to exist within that one species. In the case of *Dobsonia moluccensis* (Quoy

Table III. Size ranges in some *Dobsonia* species, compiled from literature (cited in the text) and some own observations. (The exact number of measured individuals of *D. m. moluccensis* is not certain, because Andersen (1912) in his addenda did not mention the number of newly added measurements.)

	greatest skull length		forearm length	
	n	min — max	n	min — max
D. moluccensis moluccensis	2—4	58.5 — 60.5	12 — 14	133.5 — 146
D. moluccensis magna	12	58.2 — 63.8	12	146 — 150.0
D. anderseni	2	50.6 — 54.5	4	119.4 — 125
D. pannietensis	3	46.1 — 48	3	108.7 — 112

& Gaimard, 1830) such a size range within one species (table III) is still accepted by various authors (Laurie & Hill, 1954; Lidicker & Ziegler, 1968) who consider the rather small *Dobsonia pannietensis* De Vis, 1905, and *D. anderseni* Thomas, 1914, as subspecies of *D. moluccensis*. To judge from the published measurements (Andersen, 1912; Thomas, 1914; Lidicker & Ziegler, 1968) and some own observations I find it impossible to share this view.

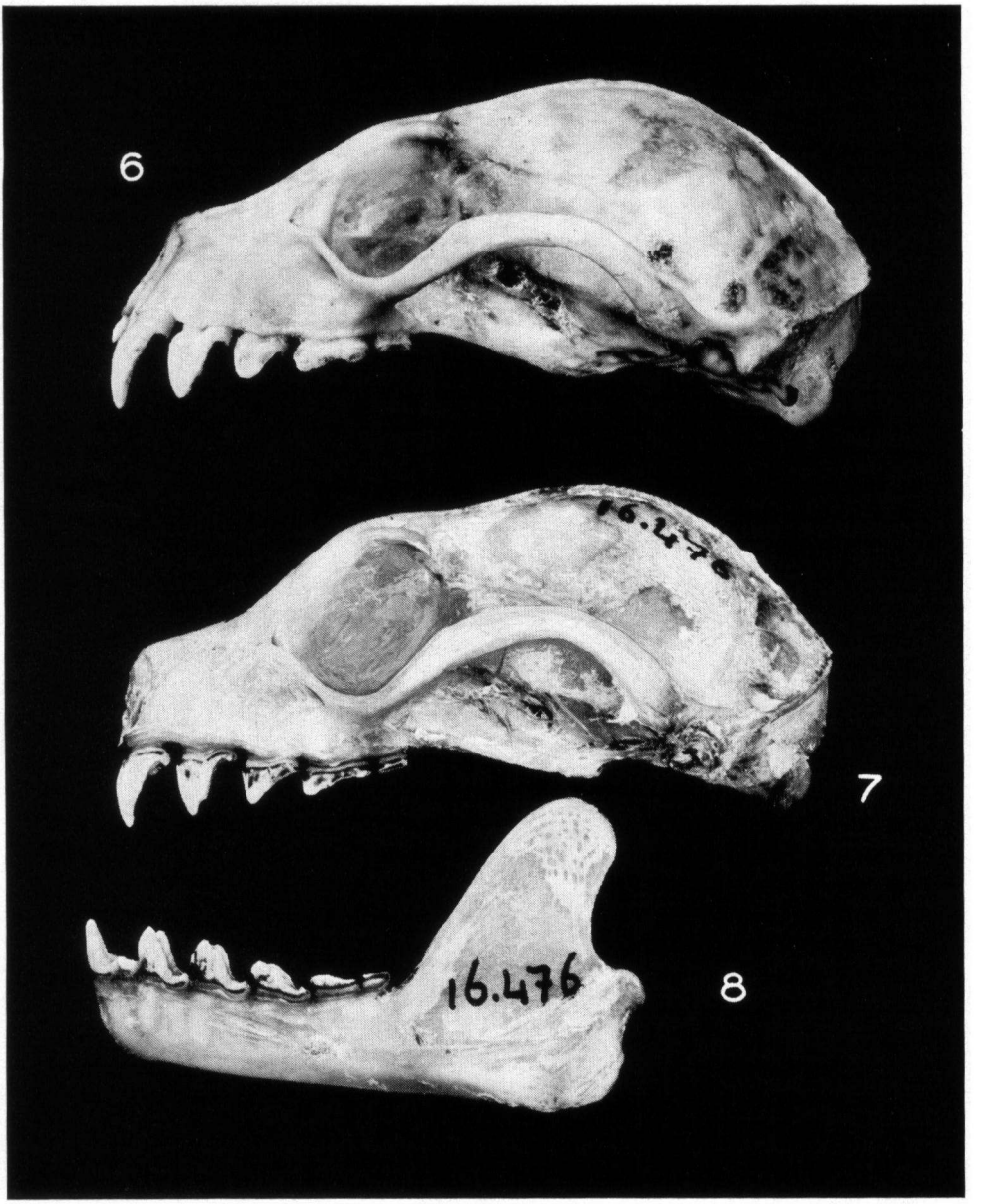
There is some evidence from the series of *Dobsonia beauforti* as well as from a number of measured specimens of *D. viridis* and from a series of *Dobsonia inermis* that in *Dobsonia* males attain larger average skull dimensions than females, while the same may be true for the length of the forearm (table IV). Unfortunately, no measurements of more substantial series of *Dobsonia* species are available. The only rather large series that I know of — 37 specimens of *D. exoleta* Andersen, 1909, and 62 of *D. moluccensis*

TABLE IV. Sexual dimorphism in dimensions of some *Dobsonia* species.

	greatest skull length						forearm length					
	♂♂			♀♀			♂♂			♀♀		
	n	m	min-max	n	m	min-max	n	m	min-max	n	m	min-max
D. viridis	5	47.8	47.2-48.6	8	46.6	45.5-47.5	1		109	1		114.4
D. beauforti	2		44.6-45.3	6	42.5	41.9-43.1	3	108.2	106.3-111.4	7	105.4	99.6-107.6
D. inermis	12	44.8	44.0-46.7	10	43.2	40.7-45.5	4	107.4	105.5-109.5	3	105.6	102.4-109

magna Thomas, 1905 — are only dealt with briefly by Tate (1942), who does not give any information on their size or size variation. To me it seems that if we want to understand the taxonomy of the genus *Dobsonia*, publication of elaborated data on size variation in species and populations is of great importance. It goes without saying that in this information the sexes deserve separate treatment. Too easily, without real arguments, it has been decided by some authors that certain forms, described as distinct species, should be considered only subspecifically related (Pohle, 1952; Rabor, 1952). In fact, such treatment suggests far more insight in the relations between *Dobsonia* populations — scattered over many islands and in the majority of cases very poorly known or not known at all — than the scarcely published information would allow.

As already stated *Dobsonia beauforti* clearly is a member of the *viridis* group (Andersen, 1912) because of the structure of its cheek teeth. In his description of *Dobsonia viridis chapmani* Rabor, 1952, the author observed that this structure is not as constant as would be desirable for a taxonomic character but Lidicker & Ziegler (1968) in their construction of a key for *Dobsonia* from the New Guinea/Celebes area, based this key largely on Andersen's teeth structure groups. In the *viridis* group Andersen included the species *viridis* (Heude, 1896), and the species *crenulata*, *praedatrix*, *inermis* and *nesea*, all four described by Andersen in 1909. Troughton (1936) argued that *nesea* differed only subspecifically from *inermis*, which view has been generally accepted since (e.g. Hill, 1956). Pohle (1952) thought that *inermis* was probably but a subspecies of *viridis* and he did not doubt that both *crenulata* and *praedatrix* actually were subspecies of *viridis*. However, Pohle failed to give any arguments. Rabor (1952) also considered *crenulata* as a *viridis* subspecies, apparently led to this view because it was well in line with his recognition of the new form *chapmani* from Negros Island, Philippines (Rabor, *loc. cit.*) as a subspecies of *viridis*. The intermediate *crenulata*, inhabiting the Halmahera group, would then be the geographical and intraspecific link between the smaller nominate form (Key Islands, Banda Islands, Amboina Islands) and the somewhat larger *chapmani*. Rabor does not reason his rather comprehensive assumptions and I am inclined to reject them, along with the views of Pohle, mentioned before. Some of the described *Dobsonia* species are no doubt more related to one another than



FIGS. 6—8. Fig. 6: Skull of *Dobsonia inermis* Andersen, ♂, from Buin, Bougainville Island (AMS M5768). Figs. 7—8: Skull of *Dobsonia beauforti* n.sp., holotype, ♀ (ZMA 16.476). L. A. van der Laan (ZMA) fecit.

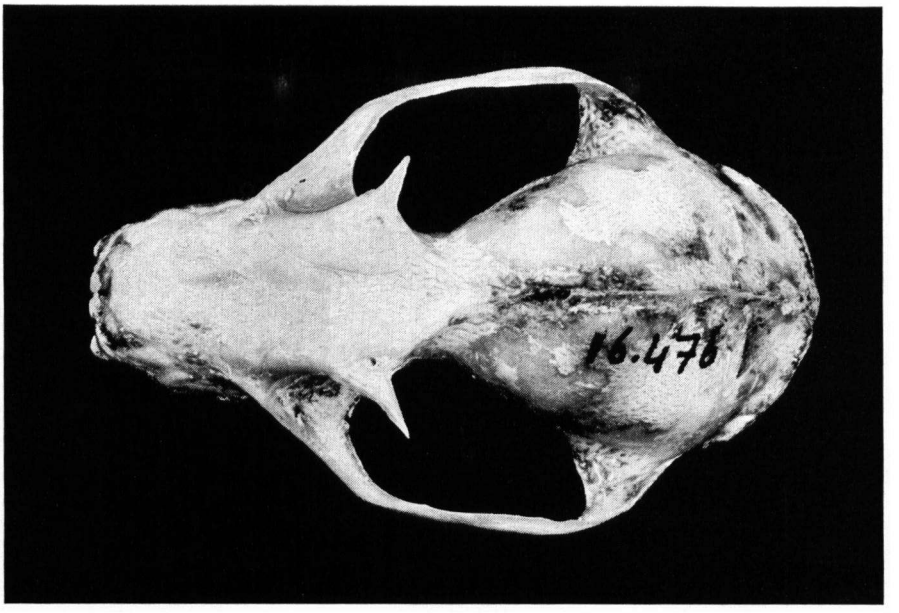


FIG. 9. Skull of *Dobsonia beauforti* n.sp., holotype, ♀ (ZMA 16.476). L. A. van der Laan (ZMA) fecit.

to other species of the genus, possibly partly in accordance with the groups as proposed by Andersen (1912). On the other hand even *Dobsonia* species from different groups do not seem liable to diverge very much in general characters — except, in some cases, in size — and in my opinion more significance should be attached to minor but distinct differences, as tokens of independant evolution over a considerable stretch of time. Rabor (1952) stated that in *chapmani* pollex and foot were appreciably longer than in *crenulata* and *viridis* and in the present paper attention will be paid to small but essential differences in skull form between *beauforti* and *inermis*.

Of the *viridis* group members only *inermis* is about equally large as *beauforti*. There are some slight but clear differences to distinguish *beauforti* from this species from the Solomon Islands and from Rennell Island. In fur colour the two skins of *inermis* that I have seen (AMS M5767 and M5594, from Buin, Bougainville Island) are quite similar to *beauforti*, the only difference being a reddish component in *inermis* in the colours of back skin and head top fur, and in the ventral side Drab. The claws in these two specimens are horn coloured, with medium brown bases.

The greatest skull length in *beauforti* seems to average slightly less than in *inermis* (table IV). The rostrum in *beauforti* is more heavily built and dorsally more concave than in *inermis* (figs 6, 7). In 8 skulls of *beauforti* I found the width over M^2 — M^2 to be 28.5 to 30.9% of the greatest skull length. In 4 skulls of *inermis* (AMS M5767, M5768, M5770, M5771) this value amounts to 24.5 to 26.3%. In relation to this it is interesting that all

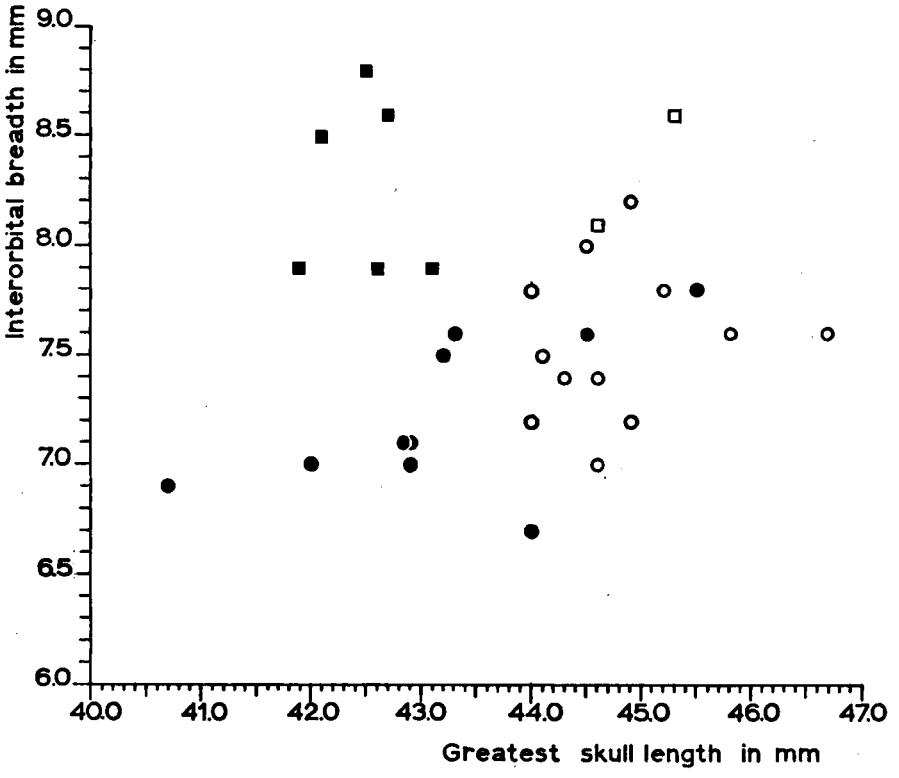


FIG. 10. The relation interorbital breadth/greatest skull length in *Dobsonia beauforti* n.sp. (black squares: females; open squares: males) and *Dobsonia inermis* Andersen (black circles: females; open circles: males).

measured M^2 are absolutely bigger in *inermis* than in *beauforti* (table V). The relatively heavier rostrum in *beauforti* if compared to *inermis* can also be expressed in the relation interorbital breadth/greatest skull length (fig. 10). All teeth measurements in *beauforti* appear to average smaller than in *inermis*. This is most distinct in I^1, M^2 and M_3 (table V).

TABLE V. Minimum and maximum dimensions of I^1, M^2 and M_3 in *Dobsonia beauforti* n.sp. and *Dobsonia inermis*.

	beauforti				*inermis*			
	4 ♂♂		7 ♀♀		2 ♂♂		2 ♀♀	
	length	width	length	width	length	width	length	width
I^1		1.1—1.4		1.1—1.2		1.6—1.6		1.5—1.6
M^2	2.0—2.2	1.4—1.5	1.8—2.2	1.3—1.6	2.4—2.5	1.6—1.8	2.2—2.3	1.6—1.7
M_3	1.6—1.8	1.4—1.5	1.5—1.8	1.2—1.5	2.0—2.0	1.5—1.6	1.8—1.8	1.5—1.5

Of the other *viridis* group members, viz. *viridis*, *crenulata*, *praedatrix* and *chapmani* the smallest species, *viridis*, attains significantly bigger skull dimensions than *beauforti* (table IV). The greatest skull lengths in *beauforti* ♂♂ are 44.6 and 45.3 mm and in *beauforti* ♀♀ 45.5, 45.5, 46.5, 46.6, 47.2, 47.3 and 47.5 mm. As for the forearm length of *viridis*, Andersen (1912) gives a range of 111—118 mm in 10 individuals, while two specimens at my disposal have forearms of 109 and 114.4 mm (ZMA 1496 and 16.607). The forearm lengths in *beauforti* ♂♂ are 106.3, 107.0 and 111.4 mm and in *beauforti* ♀♀ 99.6, 105.6, 105.8, 106.1, 106.6, 106.7 and 107.6 mm. The two species are obviously closely related, and especially in cases like this the observed sexual dimorphism in size is a useful character to discriminate between species. From table IV it appears that the range of greatest skull lengths in *beauforti* males approaches that in *viridis* females but is separated from the range in *viridis* males. Similarly, the range of this dimension in *beauforti* females is different from that in *viridis* females. I do not doubt that the series in table IV are too small to establish definite variation ranges, but it seems very unlikely that the conclusions on sexual dimorphism as drawn from these small series will be proved essentially wrong.

All six adult female paratypes of *D. beauforti* bore embryos and the holotype was lactating at the date of capture, the 25th of December, 1909. The embryos had forearm lengths of 19.2, 23.7, 29.3, 32.8, 34.8 and 35.6 mm. A very young, probably newborn animal (paratype ZMA 16.477) has a forearm length of 42.7 mm. This was possibly the young of the lactating holotype female. The data suggest that there might be at least one more or less fixed propagation period in the species and that birth takes place by the end of December and in January, and that newborn animals have a forearm length of about 40 mm. A juvenile male paratype (ZMA 16.482), also taken on 25 December, has a greatest skull length of 39.6 mm and a forearm length of 91.3 mm and might rather well have been about 11 months old.

H. A. Bernstein collected two specimens of *Dobsonia moluccensis magna* on Waigeo which have been preserved in the Leiden Museum (Jentink, 1887: 267—268; specimens *p* and *q*).

A number of specimens of other species have been studied and/or measured. The BMNH specimens have been measured by Dr P. J. H. van Bree, and the majority of *inermis* by Miss L. Gibson of the Australian Museum, Sydney.

Dobsonia viridis: 1 ♀ from Amboina (ZMA 3085); 1 ♀ from Buru (ZMA 16.484); 3 ♀♀ and 2 ♂♂ from Ceram (BMNH 7.1.1.261, 10.3.4.7, 10.3.4.8, 10.3.4.5 and 61.12.11.4); 1 ♀ from Key Islands (ZMA 16.607); 3 ♀♀ and 2 ♂♂ from Tamogil, Key Islands (BMNH 10.3.1.15, 10.3.1.16, 10.3.1.18, 10.3.1.8 and 10.3.1.11); 1 ♂ from Eilat, Key Islands (BMNH 10.3.1.19); 1 ♂ from unknown locality (ZMA 1496).

Dobsonia crenulata: 1 ♂ and 1 ♀ from Batjan (RMNH; Jentink, 1887: 268, specimens *v* and *u*); 1 ♂ and 1 ♀ from Morotai (RMNH; Jentink,

1887: 268, specimens *t* and *s*); 3 ♂♂ from Rau (RMNH; Jentink, 1887: 267, specimens *h*, *i* and *j*).

Dobsonia inermis: 6 ♂♂ and 8 ♀♀ from Bougainville Island (AMS M5592, M5593, M5767, M5768, M5773, M5775, M5594, M5595, M5769-M5772, M5774 and M6651); 5 ♂♂ and 2 ♀♀ from Ysabel Island (BMNH 32.6.162; AMS M3571, M3694, M3937, M3938, M3693, M3940); 1 ♂ and 1 ♀ from Ugi Island (AMS M4805 and BMNH 83.8.18.7); 1 ♂ and 2 immature ♀♀ from Rennell Island (BMNH 54.868, 54.871 and 54.872).

Dobsonia moluccensis magna: 2 ♂♂ from Waigeo, New Guinea (RMNH; Jentink, 1887: 267—268; specimens *p* and *q*); 1 ♂ from Djitmau, Vogelkop, New Guinea (RMNH 12586); 1 ♂ from Tupuselei, Papua (BMNH 69.308); 1 ♀ from Brown River, Papua (BMNH 69.307).

Dobsonia pannietensis: 2 ♀♀ from Liluta, Kiriwina Island (= Trobriand I.) (AMNH 159151, 159152).

Acknowledgements

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W. BERGMANS
Instituut voor Taxonomische Zoölogie (Zoölogisch Museum)
Plantage Middenlaan 53
Amsterdam 1004 — the Netherlands