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Results of the Archbold Expeditions. No. 76 A New Species of Wallaby (Genus *Dorcopsis*) from Goodenough Island, Papua

By Hobart Merritt Van Deusen

INTRODUCTION

The Fourth Archbold Expedition to New Guinea visited Goodenough Island from September 22 through November 2, 1953, for the purpose of making biological collections.

Goodenough is one of the three large islands and many smaller islands comprising the D'Entrecasteaux Group, which lies off the north coast of the Territory of Papua at the extreme east end of New Guinea in latitude 9° 22′ S., longitude 150° 16′ E. The Ward Hunt Strait separates Goodenough Island from the nearest point on the mainland, Cape Vogel, by a distance of about 18 miles (29 kilometers). To the east 3 miles (5 kilometers) across Moresby Strait lies Fergusson, the largest island of the group. For its size, about 22 miles (36 kilometers) from north to south and 15 miles (24 kilometers) from east to west, Goodenough is one of the most mountainous islands in the world. The highest of its five main peaks, all clustered at the north end, rises from the 5000-foot (1540 meters) backbone of the island to an elevation of nearly 8400 feet (2585 meters). This mountain mass is highly dissected, a feature of the landscape being the many razor-backed ridges. Luxuriant forest growth covers the mountains, except on the high peaks and on many of the lower slopes where felling of trees for garden patches has eliminated the pri-

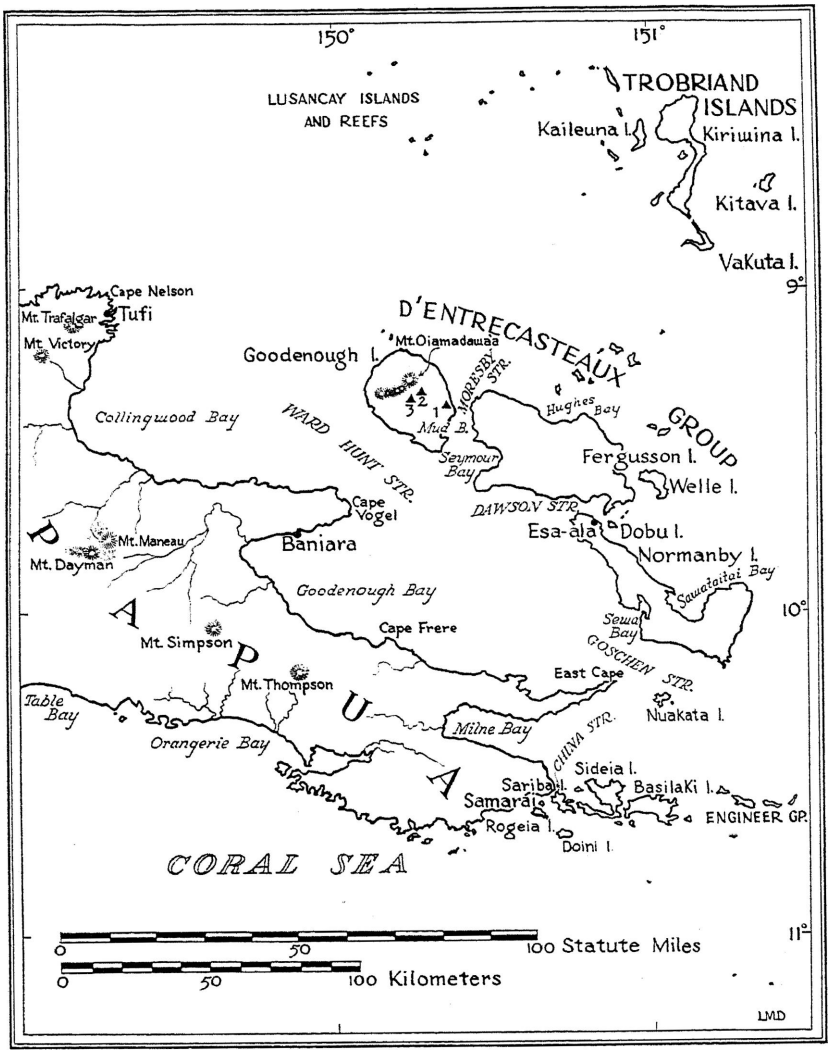

FIG. 1. Map showing the location of Goodenough Island in relation to the mainland of New Guinea and to the other islands of the D'Entrecasteaux Group. On Goodenough Island: 1, Bolu Bolu; 2, No. 2 Camp; 3, Top Camp.

mary forest. Some relict rain forest remains in the lowlands along the stream courses, but rank grasses now cover most of this country and the lower elevations.

The history of mammal collecting on Goodenough Island dates back to the late 1880's when the island first came under British rule. Casual specimens may have been sent home by earlier explorers, but I have seen no reference to them. Basil H. Thomson collected the skull of a bat (*Nyctimene major*) in 1888. Several bird collectors visited Goodenough in subsequent years, but they seem to have paid little attention to mammals. Lamberto Loria, Amadeo Giulianetti, Albert S. Meek, Albert and George Eichhorn, and William E. Armit are among those who made brief trips to the island. Thomas (1895) reported on 12 species of mammals taken by Meek in 1894 on Fergusson, but no specimens were obtained from Goodenough. Hannibal Hamlin, a member of the Whitney South Sea Expedition of the American Museum of Natural History, was on Goodenough collecting birds from November 16 to 23, 1928. Hamlin camped at 1900 feet (585 meters) and hunted up to 4000 feet (1230 meters); his activity was confined to the south end of the island in the neighborhood of Mud Bay. Hamlin obtained six species (10 specimens) of mammals during his stay; these will be discussed in later papers. The 1953 Archbold Expedition collected the following material: 112 study skins with matching skulls; 17 specimens in alcohol; six skulls without skins and 196 mandibles bought from native hunters.

The present paper is the first in a series of reports on this collection and the far larger collections made on the Papuan mainland. In these accounts we plan to discuss not only the special problems of taxonomy but also the distribution of the mammals in relation to habitat. Any excellence found in this latter phase of the treatment is due solely to Leonard J. Brass, botanist to all six Archbold expeditions and organizer and leader of the 1948, 1953, and 1956 expeditions. No one has contributed more to our knowledge of the flora of the New Guinea region, and his analyses of plant communities rest soundly on more than 30 years of field experience. The summary of the Fourth Archbold Expedition to New Guinea (1953) by Brass (1956) should be read in conjunction with this and later accounts of the mammals of eastern Papua. The summary gives a full description of the region, expedition itinerary, and collecting stations. The final report on the mammal collection will consist of an annotated list, and my general conclusions on the ecology and distribution of the mammals of eastern Papua, the D'Entrecasteaux Group, and the Louisiade Archipelago.

I should like to extend my most grateful thanks to Richard Archbold, who made it possible for me to participate in the 1953 expedition and

in the Cape York, Australia, reconnaissance of 1948. His interest in exploration has contributed in large part to our present biological knowledge of New Guinea.

METHODS

WEIGHT: See tables 1 and 4. All weights were recorded in pounds and ounces (equivalent weights in grams are also given), and were taken on receipt of the specimens in camp. Collecting conditions in the mountains of New Guinea impose severe limitations on the weight and size of equipment carried. Therefore, simple spring scales with an accuracy within limits of possibly $\pm$ 2 per cent of the recorded weight were used. No deduction was made for contents of the digestive tract. The weight of A.M.N.H. No. 157277 is low because of loss of blood; A.M.N.H. No. 157278 is low because of the loss of a foreleg during the hunt. These weights are of interest only as a rough approximation for the species.

DEFINITIONS OF CRANIAL MEASUREMENTS (TABLE 2): Condylobasal length, basal length, palatal length, zygomatic breadth, interorbital breadth, and mastoid breadth follow Hall (1946). Nasals (length by breadth), palatal foramina, and postorbital breadth follow Cockrum (1955).

Skull, greatest length, is the length, in the midline of the skull, measured from a line connecting the anteriormost tips of the premaxillary bones to a line connecting the posteriormost projections of the skull. The plane of this measurement forms an acute angle of about 15 degrees with the plane of the premolar-molar tooth rows.

Occipitobasal length is the length, in the midline of the skull, measured from a line connecting the anteriormost tips of the premaxillary bones to the posteriormost superior border of the occipital foramen.

Rostrum breadth is the breadth across the lateral surfaces of the maxillary bones, measured at a plane midway between the premolar alveolus and the canine alveolus.

Rostrum height is the least distance from the palatal suture of the maxillary bones to the suture between the nasals, measured at the same point given above under breadth of rostrum.

Intertemporal breadth is the least breadth across the skull between the superior borders of the squamous temporal bones, measured at a right angle to the long axis of the skull.

Braincase breadth is the breadth across the braincase, measured (on the ventral aspect of the skull) from the suture of the alisphenoid with

the anteromedian border of the base of the zygomatic process of the left squamosal bone to the corresponding point on the right side of the skull.

DESCRIPTION

Dorcopsis atrata, new species

HOLOTYPE: A.M.N.H. No. 157276, field number AE 13390 (Archbold Collection), adult male, flat skin with skull, collected by Hobart M. Van Deusen near "Top Camp," east slopes of Goodenough Island, D'Entrecasteaux Group, Territory of Papua, at an elevation of about 1600 meters, on October 13, 1953.

PARATYPES: (Field numbers in parentheses). Five males, flat skins with skulls, A.M.N.H. Nos. 157273 (AE 13309), 157274 (AE 13355), 157277 (AE 13494), 157278 (AE 13495), 157279 (AE 13513); one female, flat skin with skull, A.M.N.H. No. 157275 (AE 13356). In addition: three skulls, A.M.N.H. Nos. 158300, 158342, 158356; also 76 mandibles, A.M.N.H. Nos. 158301–158341, 158343–158355, 158357–158378. All specimens in the Archbold Collection.

RANGE: Known only from the high mountain forests of Goodenough Island. The upper and lower limits of its altitudinal range are not known; a strip of forest extends virtually to the summit of the highest peak, and in certain areas the forest also reaches sea level.

DIAGNOSIS: Size: medium (see tables 1 and 3); tail short (averaging about 65% of length of head and body; hind foot short; ears very short (averaging about 26% of length of hind foot). Color: upper parts black or blackish brown, roots of hairs white; under parts blackish brown, hairs in a broad midventral band tipped with light brown, roots of hairs grayish white; tail black, uniformly colored, roots of hairs black, terminal 80 mm. very sparsely haired except in middorsal line, tip coarsely scaled and unpigmented; pelage long, thick, and soft. Skull: nasals parallel-sided, with little or no lateral expansion posteriorly; rostrum lightly built; postorbital process of frontal distinctly pointed; lacrimal considerably expanded into posterior margin of maxillary. (See figs. 2 and 3B.)

COMPARISONS: Differs from *Dorcopsis hageni* as follows: Size: smaller in all external measurements and ratios (see table 3). Color: lacks whitish, middorsal stripe; black or blackish brown, not light brown; pelage long and thick, not short and sparse. Skull: smaller; nasals narrower, shorter, parallel-sided, without posterior flare; p_4^4–m_4^4 relatively long; rostrum more lightly built; canines smaller. (See fig. 3A, B.)

Differs from *D. veterum* as follows: Size: larger in head and body, and

tail vertebrae measurements; slightly smaller hind foot; claws of manus and pes longer and narrower; and much smaller ear. (See table 3.) Color: black, rather than dull blackish brown broadly tipped with light buff, giving a finely grizzled appearance; pelage longer and thicker. Skull: of about the same size, but more delicately proportioned; nasals narrower, parallel sided, without posterior expansion; rostrum more lightly built; supraorbital rim of frontal developed posteriorly into a pointed postorbital process, not broadly rounded and shelf-like; anterior palatine foramina longer; frontals not inflated. (See fig. 3B, C.)

DESCRIPTION OF TYPE SPECIMEN: Dorsal pelage of head, neck, back, and tail black; sides like back but ventrally becoming dull blackish brown; hairs in broad midventral band, upper arms, inner side of thighs, and anal region blackish brown tipped with Light Ochraceous-Buff (Ridgway, 1912); basal half of dorsal hairs white, becoming grayish white basally on flanks and ventrally; hairs grade from a broad black tip through a narrow intermediate zone of dull blackish brown to a white or grayish base; tail hairs black based; hairs of the scapular region in the dorsal divergent center number two (Dd2) bilaterally developed into two whorls (Boardman, 1950); left whorl clockwise, right whorl counterclockwise; hairs in front of whorls run cranially; hairs behind whorls run caudally; hairs between whorls form a short middorsal crest; skin at tip of chin unpigmented; pelage of chin and throat blackish brown, hairs gray based tipped with grayish brown, giving a silvered effect; inside of ears black pigmented, a few grayish brown hairs present; tail heavily furred except for terminal 80 mm. which is coarsely scaled, a few short, light-colored hairs present dorsally almost to tip; distal 30 to 40 mm. of tail appears whitish in life, majority of tail scales without black pigment; hairs of forefoot and hind foot dark brown. Length of pelage: back, middorsal line behind shoulder whorls, 30 to 35 mm., in front of shoulders, 15 to 20 mm.; tail, middorsal line one-third of distance to tip, 20 to 25 mm.; abdominal region, anterior to scrotum, 40 to 50 mm. Claws: digits 2, 3, and 4 of forefeet long, slender, tapering, slightly decurved, ratio of length to basal width about 2.5 to 1, light horn color; of hind feet, claw of digit 4 as above, of digit 5 the length to width ratio is about 2 to 1, light brown; the claws of the female are more delicately built and the length to width ratio may be as high as 3 or 4 to 1.

PARATYPES: Subadult specimens do not show the intense blackish coloration of the adults. The pelage of the back, flanks, and legs is tipped with Ochraceous-Buff, giving a finely grizzled appearance and resembling *Dorcopsis veterum* in this respect; the hair bases are grayish rather

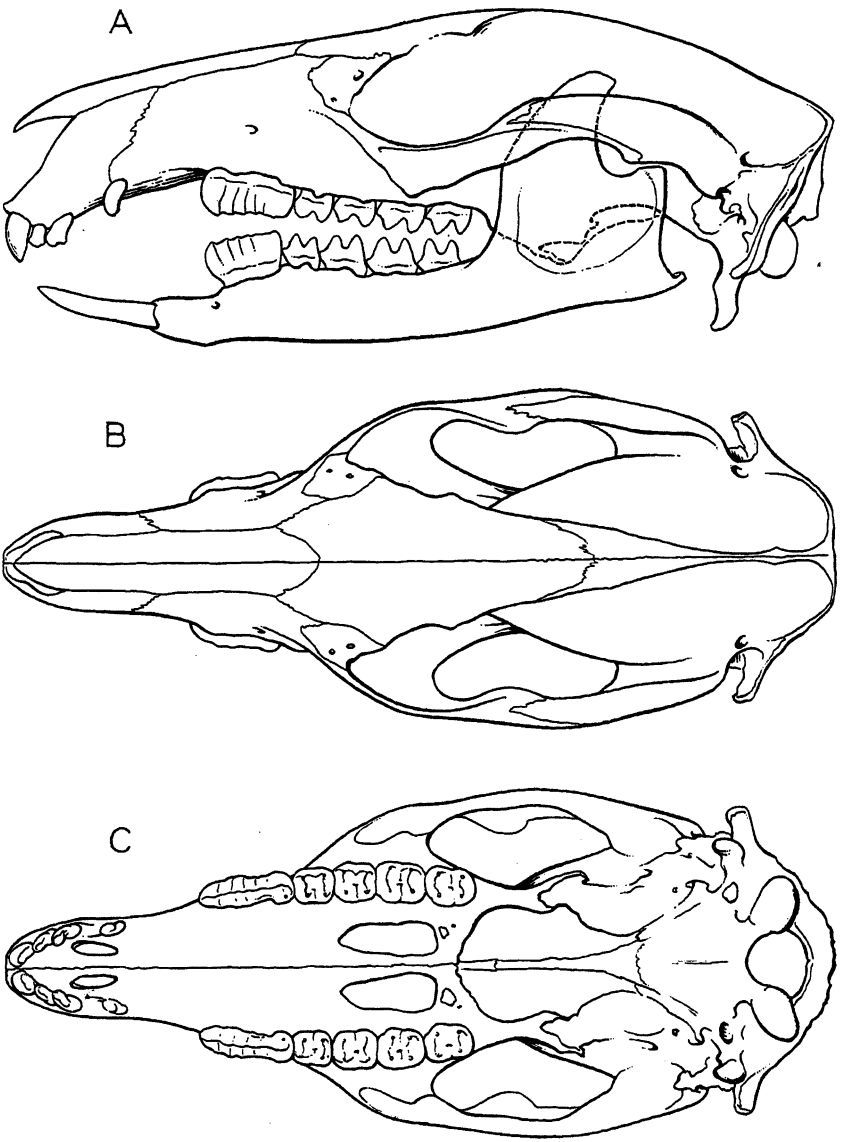

FIG. 2. Skull of *Dorcopsis atrata* Van Deusen, new species, holotype, A.M. N.H. No. 157276. A. Lateral view. B. Dorsal view. C. Ventral view. Slightly smaller than natural size.

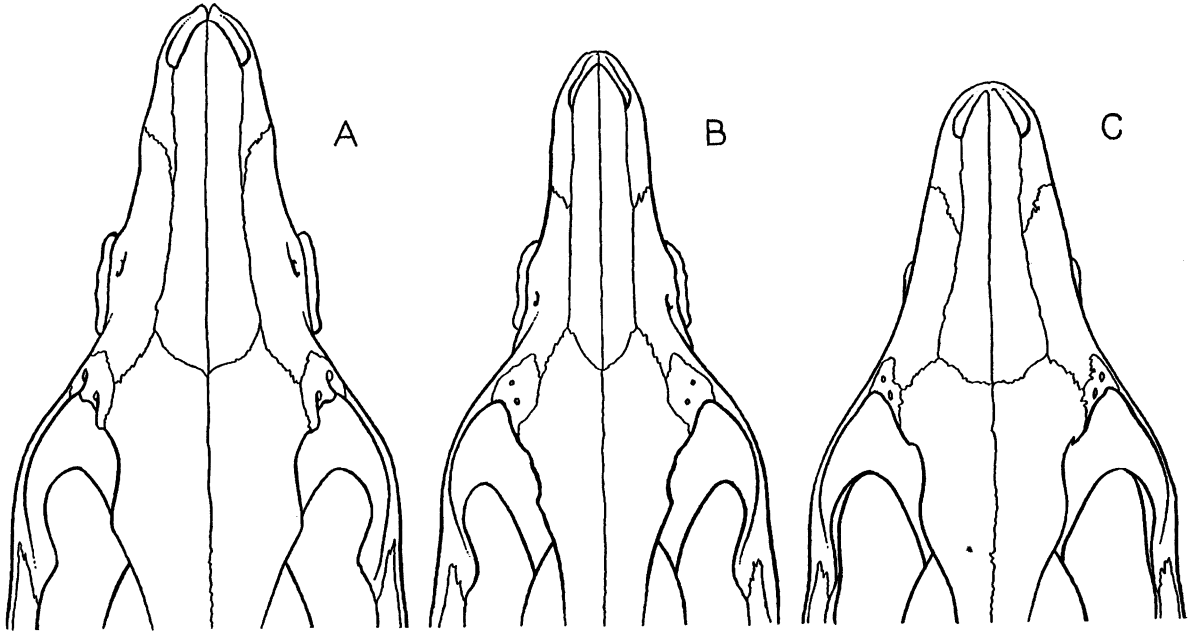

FIG. 3. Dorsal view of anterior two-thirds of skulls. A. *Dorcopsis hageni*, A.M.N.H. No. 151821. B. *Dorcopsis atrata* Van Deusen, new species, holotype, A.M.N.H. No. 157276. C. *Dorcopsis veterum*, A.M.N.H. No. 105979. Slightly smaller than natural size.

TABLE 1

SEX, AGE GROUP, GROSS BODY WEIGHT (IN POUNDS AND OUNCES), AND EXTERNAL BODY MEASUREMENTS (IN MILLIMETERS) OF THE HOLOTYPE AND SIX PARATYPES OF *Dorcopsis atrata*, NEW SPECIES

	A.M.N.H. No. 157279	A.M.N.H. No. 157278	A.M.N.H. No. 157274	A.M.N.H. No. 157273	A.M.N.H. No. 157275	A.M.N.H. No. 157276 (Holotype)	A.M.N.H. No. 157277
Sex	♂	♂	♂	♂	♀	♂	♂
Age group	2	2	3	3	5	5	5
Weight	—	3 lbs. 12 oz. (1701 grams)	6 lbs. 2.5 oz. (2793 grams)	—	8 lbs. 11 oz. (3941 grams)	14 lbs. 8 oz. (6577 grams)	11 lbs. 4 oz. (5103 grams)
Total length	747	—	733	—	823	965	995
Head and body length	446	—	448	—	494	583	618
Tail vertebrae length	301	283	285	—	329	382	377
Hind foot length (with claw)	110	110	115	—	115	131	123
Hind foot length (without claw)	101	100	104	—	102	117	114
Ear length (from crown)	28	29	34	—	27	29	30
Ear length (from notch)	35	37	36	—	33	38	38

TABLE 2

CRANIAL MEASUREMENTS (IN MILLIMETERS) OF THE HOLOTYPE AND SIX PARATYPES OF *Dorcopsis atrata*, NEW SPECIES

	A.M.N.H. No. 157279	A.M.N.H. No. 157278	A.M.N.H. No. 157274	A.M.N.H. No. 157273	A.M.N.H. No. 157275	A.M.N.H. No. 157276	A.M.N.H. No. 157277
Skull, greatest length	92.9	92.2	97.5	97.9	104.0	117.9	112.9
Condylobasal length	86.9	86.8	91.4	92.8	98.3	111.9	109.3
Occipitobasal length	89.5	89.3	94.4	95.8	100.8	114.2	111.4
Basal length	80.8	81.5	85.0	87.2	92.9	105.1	103.8
Palatal length	49.8	51.2	53.1	54.1	57.7	65.2	64.7
Nasals, length × breadth	35.1 × 7.1	32.8 × 7.5	37.9 × 8.1	38.9 × 9.1	40.7 × 10.2	45.2 × 10.2	42.5 × 11.1
Anterior palatal foramina, length	4.8	7.0	6.1	5.1	6.7	7.2	6.0
Posterior palatal foramina, length	10.1	11.2	11.8	13.5	16.3	14.8	17.0
Rostrum, breadth	15.6	16.0	16.2	16.6	17.1	16.8	18.8
Rostrum, height	14.1	13.4	14.5	14.3	15.2	18.1	17.8
Zygomatic breadth	44.7	45.9	46.8	48.3	50.4	51.0	53.6
Interorbital breadth	15.8	17.2	17.1	16.7	18.4	19.1	19.7
Postorbital breadth	16.2	17.4	15.7	16.4	16.0	15.5	14.8
Intertemporal breadth	22.2	21.7	20.0	—	20.6	19.5	20.2
Braincase, breadth	31.0	31.9	31.9	31.1	33.4	33.0	34.0
Mastoid breadth	34.9	34.1	36.0	36.8	—	44.7	46.0
Width across m^3–m^3	—	—	25.4	25.9	28.3	30.0	30.6
i^1–m^4, alveolar length	—	—	—	—	60.5	66.5	64.0
i^1–i^3, alveolar length	9.1	9.2	9.8	9.1	8.9	10.3	11.2
p^4–m^4, crown length	—	—	—	—	36.1	39.0	38.5
m^1–m^4, crown length	—	—	—	—	24.4	26.0	25.4

TABLE 2—(*Continued*)

	A.M.N.H. No. 157279	A.M.N.H. No. 157278	A.M.N.H. No. 157274	A.M.N.H. No. 157273	A.M.N.H. No. 157275	A.M.N.H. No. 157276	A.M.N.H. No. 157277
p^3, length × breadth	7.7 × 3.8	8.1 × 3.7	8.6 × 4.1	7.6 × 3.7	—	—	—
dp^4, length × breadth	6.1 × 4.4	6.3 × 4.5	6.0 × 4.6	5.6 × 4.3	—	—	—
p^4, length × breadth	—	—	—	—	12.1 × 4.6	13.3 × 4.9	13.8 × 4.8
m^1, length × breadth	5.8 × 5.3	5.7 × 5.2	5.6 × 5.4	5.5 × 5.0	5.6 × 5.1	5.9 × 5.6	5.7 × 5.1
m^2, length × breadth	6.3 × 5.4	6.3 × 5.7	6.3 × 5.7	6.2 × 5.2	6.0 × 5.5	6.5 × 5.8	6.3 × 5.4
m^3, length × breadth	—	—	7.1 × 5.7	6.4 × 5.4	6.8 × 5.7	7.1 × 5.9	6.9 × 5.5
m^4, length × breadth	—	—	—	—	6.8 × 5.3	7.1 × 5.8	7.1 × 5.5

TABLE 3

OBSERVED SAMPLE RANGE AND MEAN OF BODY MEASUREMENTS (IN MILLIMETERS) AND BODY MEASUREMENT RATIOS (IN PERCENTAGES) OF ADULT *Dorcopsis hageni*, *Dorcopsis atrata*, NEW SPECIES, AND *Dorcopsis veterum*

	Dorcopsis hageni		*Dorcopsis atrata*		*Dorcopsis veterum*	
Sex	♂	♀	♂	♀	♂	♀
Number of specimens	8	6	2	1	10	6
Total length	1111 (1065–1160)	906 (870–935)	980 (965–995)	823	903 (780–1060)	781 (740–825)
Head and body length	648 (612–671)	531 (515–543)	601 (583–618)	494	545 (465–678)	462 (425–495)
Tail vertebrae length	463 (435–489)	375 (352–400)	380 (377–382)	329	358 (315–422)	319 (305–335)
Hind foot (without claw)	142 (104–152)	123 (120–125)	116 (114–117)	102	118 (108–132)	105 (100–110)
Ear (from crown)	49 (44–53)	48 (47–50)	30 (29–30)	27	53 (47–61)	52 (47–62)
Ratio of tail vertebrae length to head and body length	71.5	70.6	63.3	66.9	65.7	69.0
Ratio of ear length to hind foot length	34.5	39.0	26.0	26.5	45.0	49.0

than white, and the distal half of the hairs is more blackish brown. However, the general effect is still much darker than that of *veterum*. An old adult male (A.M.N.H. No. 157277) shows this same type of coloration except in the region of the back anterior to the shoulder whorls. There is a marked difference in size between the sexes; the head and body length, for example, of the male is almost 20 per cent greater than that of the female. This is also true of *hageni* and *veterum*. The female has two pairs of teats. In A.M.N.H. No. 157275 the right anterior teat appeared to be functional (distended and elongated), but no pouch young was present when the specimen was brought to camp.

AGE GROUPS: A convenient method of sorting specimens into age groups is provided by the stage of eruption of the molars and permanent fourth premolars (as seen on the cleaned skulls). As defined here:

STAGE P: (Pouch young, large, fully haired, possibly on threshold of leaving pouch for the first time) p_3^3 and dp_4^4 in place; m_1^1 just beginning to erupt; m_2^2 still encapsulated in bone; m_3^3 and m_4^4 undeveloped.

STAGE 1: m_1^1 erupted (partially or completely); m_2^2 still encapsulated or just beginning to erupt; m_3^3 encapsulated; m_4^4 undeveloped.

STAGE 2: m_1^1 fully erupted; m_2^2 almost fully erupted; m_3^3 still encapsulated or just beginning to erupt; m_4^4 encapsulated.

STAGE 3: m_1^1 and m_2^2 fully erupted; m_3^3 almost fully erupted; m_4^4 encapsulated or just beginning to erupt; p_3^3 and dp_4^4 still in place (not yet forced out by p_4^4).

STAGE 4: m_1^1, m_2^2, and m_3^3 in place; m_4^4 partially erupted; p_4^4 in place (p_3^3 and dp_4^4 have been replaced by p_4^4).

STAGE 5: p_4^4, m_1^1, m_2^2, m_3^3, and m_4^4 all in place.

Our *Dorcopsis atrata* material from Goodenough Island includes specimens of all the above groups except stage P and stage 1. The definition of stage P is based on a large pouch young (A.M.N.H. No. 108002, male; young of A.M.N.H. No. 108001) of the allied species, *Dorcopsis veterum*. In *Dorcopsis atrata* the p_4^4 are well in place before the m_4^4 are fully erupted; this is also true of *Dorcopsis hageni* and *Dorcopsis veterum*. The fourth premolars in *Dorcopsis atrata* retain their functional importance throughout life. I have seen no specimen where this tooth has been pushed forward out of the tooth row, not even in old individuals in which the molars show considerable wear and forward progression.

No definite ages can be assigned to the above groups on the basis of our present knowledge of this genus. Stage-1 young may still use the pouch occasionally. Stage 5 is here considered fully adult. The material in hand, however, is sufficient to give us a preliminary idea of the growth increment of various characters between these stages. These data

TABLE 4

BODY GROWTH, SKULL GROWTH, AND GROSS BODY WEIGHT (IN PERCENTAGES) CORRELATED WITH PREMOLAR AND MOLAR TOOTH ERUPTION IN *Dorcopsis atrata*, NEW SPECIES

	Stage P[a]	Stage 1[b]	Stage 2[c]	Stage 3[d]	Stage 4[e]	Stage 5[f]
Head and body length	39.4	—	74.2	74.5	—	100
Tail vertebrae length	43.3	—	76.8	75.0	—	100
Hind foot (without claw)	61.9	—	87.1	89.7	—	100
Ear length (from notch)	54.7	—	94.7	94.7	—	100
Skull, greatest length	—	—	80.2	84.6	—	100
Basal length	—	—	77.7	82.4	—	100
Nasals, length	41.5	—	77.4	87.5	—	100
Nasals, breadth	—	—	68.2	80.4	—	100
Zygomatic breadth	60.6	—	86.6	91.0	—	100
Interorbital breadth	—	—	84.6	86.7	—	100
Mandible, greatest length	—	—	74.9	86.3	86.2	100
Weight	—	—	29.1	47.8	—	100

[a] Based on *Dorcopsis veterum* (A.M.N.H. No. 108002), male pouch young. The percentages in this column were derived by division of the arithmetic mean of the basic body and skull measurements of 10 stage-5 *Dorcopsis veterum* males (see table 3) into the same basic measurements of the pouch young specimen. These percentages, therefore, are not exactly comparable to those in the other columns. However, I believe that *Dorcopsis atrata* pouch young will be found to give closely approximate figures.

[b] No specimens.

[c] Two males (A.M.N.H. No. 157278; A.M.N.H. No. 157279, no weight for the latter); also six mandibles only.

[d] One male (A.M.N.H. No. 157274) available for body and skull measurements and weight; one male (A.M.N.H. No. 157273) for skull measurements only; eight additional mandibles only.

[e] Two mandibles only, sex unknown (A.M.N.H. Nos. 158333, 158334).

[f] The arithmetic mean of the body weight and of the body and skull measurements of the available specimens (two males: A.M.N.H. Nos. 157276, 157277; 64 mandibles only, sex unknown) in this stage is expressed as 100 per cent. The percentage figures in all other columns are based on this percentage.

are shown in table 4. It will be noticed that the growth curve is very steep between stage P and stage 2; this reflects the rapid growth during the transition between complete dependence on the female for food and shelter and the final adjustment to independent life in the external environment.

MANDIBLE: Within recent years there has been a quickening of interest in the study and search for Tertiary marsupials and monotremes in Australia and New Guinea. Stirton (in press) has reëxamined and described in detail a number of fossil mammal specimens in museums. The ages of these Australian fossil faunas are also undergoing revision on the basis of improved "fluorine index" tests (Gill, 1953). New and more critical studies on the stratigraphy of Australia and New Guinea are being made. Stirton (1955; in press) reports on an important concentration of late Tertiary marsupials found at Lake Palankarinna in South Australia.

New Guinea has received little attention from paleontologists, but this situation is certain to be remedied in the years ahead. Anderson (1937) reported on the first fossil marsupials recorded from New Guinea. These fragmentary remains of mandibles, limb bones, and a vertebra were found near the north coast in the Bulolo River drainage basin west of the Huon Gulf. Geoffrey D. Woodard, working in the Kukukuku country in Papua in 1955, found several macropodid mandibles in beds assumed to be Pliocene in age (Stirton, *in litt.;* Anon., 1955). This discovery together with other fossil material from the same area that had been sent to Australia in previous years will be of the greatest importance to students of marsupial evolution.

In many cases paleontologists have only fragments of teeth and mandibles on which to base their descriptions of extinct mammals. Few writers on the Recent mammals of New Guinea have figured marsupial dentition in detail, and basic measurements of the mandible and its teeth are largely lacking in the literature. In the belief that such information is of considerable reference value, I have had figure 4 drawn. Measurements of the mandible of the holotype of *Dorcopsis atrata* are given in tables 5 and 6, and of six of the paratypes in table 7.

There are 76 mandibles of this wallaby in the collection. These specimens (sex unknown) were all purchased from native hunters for sticks of trade tobacco and sheets of newspaper (for rolling home-made cigarettes). I should like to stress the importance of buying this kind of material in New Guinea wherever possible. Collecting time is limited, and "trophy" skulls often give evidence of the presence in an area of certain mammals that are difficult to obtain with normal trapping methods

TABLE 5

MANDIBULAR MEASUREMENTS (IN MILLIMETERS) OF THE HOLOTYPE OF *Dorcopsis atrata*, NEW SPECIES (A.M.N.H. NO. 157276; MALE)

Length measurements	
Dorsal edge of incisive alveolus to posterior edge of m_4 alveolus	45.3
Anteriormost lingual edge of incisive alveolus	
To posterior tip of angular process	79.0
To posteriormost point of condyle	78.9
Diastema between dorsal edge of incisive alveolus and anterior edge of p_4 alveolus	10.4
Anterior edge of p_4 alveolus to posterior edge of m_4 alveolus	34.7
Height and breadth measurements	
Height of mandible on labial side from tip of bone between roots	
Below p_4	12.2
Below m_1	13.0
Below m_4	10.4
Breadth of mandible	
Below p_4	5.8
Below m_4	6.3
Height of ascending ramus from top of coronoid process to inferior border of mandible	35.4

(e.g., *Zaglossus*). The brain is considered good food, so that in many cases the cranium is broken up and then discarded. However, the mandibles are often saved and hung in the roof smoke holes of native dwellings. Series of such skulls are, of course, invaluable for growth studies, including sequence of tooth eruption. The *Dorcopsis atrata* mandibles have been sorted into the various growth stages defined above in the section on Age Groups. The arithmetic mean of one character, greatest length of the mandible, has been taken for the samples in each stage, and compared with the stage-5 mean measurement on a percentage basis (see table 4).

PARASITES: Ectoparasites were collected, but no identifications have been received to date. Host-parasite studies may provide the taxonomist, who works with imperfectly known groups of mammals, with negative or positive evidence of relationship in varying degree. However, such correlations must be very carefully evaluated and used together with other lines of evidence.

DISCUSSION

The discovery of this secretive black *Dorcopsis* in the oak forests on the heights of Goodenough Island came as a complete surprise. Previous to our visit we had read and heard of the presence of a small kangaroo

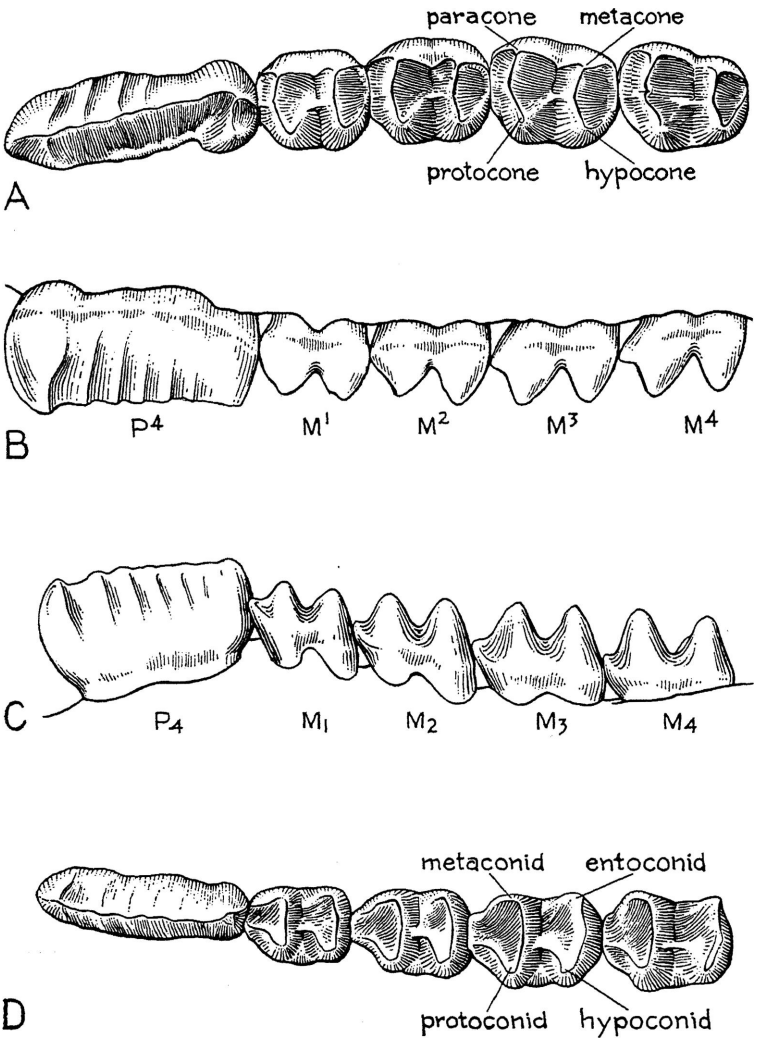

FIG. 4. *Dorcopsis atrata* Van Deusen, new species, holotype, A.M.N.H. No. 157276. Left maxillary tooth row, p^4–m^4. A. Occlusal view. B. Labial view. Left mandibular tooth row, p_4–m_4. C. Labial view. D. Occlusal view. About two and one-half times natural size.

on the island, and we had assumed that this was the sand wallaby (*Protemnodon agilis papuanus*), which has been carried by man to many of the New Guinea islands. We did find *Protemnodon* on the savannas and open grasslands of the northeastern part of Goodenough near the towns

TABLE 6

MEASUREMENTS (IN MILLIMETERS) OF THE MANDIBULAR TEETH OF THE HOLOTYPE OF *Dorcopsis atrata*, NEW SPECIES (A.M.N.H. NO. 157276; MALE)

	p_4–m_4	m_1–m_4	p_4	m_1	m_2	m_3	m_4
Median length, crown	36.4	26.0	—	5.8	6.4	7.1	7.2
Greatest breadth	—	—	3.8	—	—	—	—
Greatest length	—	—	11.3	—	—	—	—
Greatest height from base of enamel	—	—	5.8	—	—	—	—
Breadth across anterior moiety	—	—	—	4.1	4.5	5.0	5.1
Breadth across posterior moiety	—	—	—	3.9	4.4	4.9	4.5
Height from base of enamel							
Of protoconid	—	—	—	3.7	4.1	4.6	4.2
Of hypoconid	—	—	—	3.9	4.7	4.7	4.0
Of metaconid	—	—	—	3.3	3.7	4.0	3.7
Of entoconid	—	—	—	3.1	3.8	3.6	3.5

of Vivigani and Wakonai, but we did not expect a second species of wallaby.

Our seven specimens of *Dorcopsis* were obtained during daylight hours by a native hunter using a dog in the forests between 1200 and 1800 meters in the vicinity of our Top Camp. As far as we could learn from the Goodenough natives, all hunting for this valuable food animal takes place in the high mountain forests (see discussion under Ecology below). I never encountered this wallaby during many hours of night hunting with a "jack light." In contrast to this experience, *Dorcopsulus,* a genus of mountain forest wallabies of the mainland, was commonly found foraging at night on the upper slopes of Mt. Dayman. The dark mid-montane forests of Goodenough provide a logical setting for late afternoon and early morning feeding by this *Dorcopsis*. Extreme wariness and the difficulty of adequately hunting the precipitous cover which *Dorcopsis* inhabits may also help to explain this apparent absence at night.

The two previously known species, *Dorcopsis hageni* and *Dorcopsis veterum,* are both primarily rain-forest animals and appear not to have been collected above an altitude of several hundred meters (400 meters in our records). Their ranges in eastern New Guinea are in question. *Dorcopsis veterum* has been taken at the extreme southeast end of the Papuan mainland opposite Samarai, and a *Dorcopsis,* apparently referable to *veterum,* was collected by our party in rain forest on the north

TABLE 7

MANDIBULAR MEASUREMENTS (IN MILLIMETERS) OF SIX PARATYPES OF *Dorcopsis atrata*, NEW SPECIES

	A.M.N.H. No. 157279	A.M.N.H. No. 157278	A.M.N.H. No. 157274	A.M.N.H. No. 157273	A.M.N.H. No. 157275	A.M.N.H. No. 157277
Mandible, greatest length[a]	59.5	59.8	63.9	65.3	70.9	79.2
Ascending ramus, height[a]	27.2	28.0	29.5	31.4	34.2	39.4
p_3–m_2, crown length	23.8	23.5	—	—	—	—
p_3–m_3, crown length	—	—	29.6	28.3	—	—
p_4–m_4, crown length	—	—	—	—	33.5	35.7
p_3, length × breadth	7.1 × 3.3	7.4 × 3.3	7.3 × 3.4	6.6 × 3.2	—	—
dp_4, length × breadth	6.0 × 3.3	6.1 × 3.3	5.8 × 3.4	5.7 × 3.2	—	—
p_4, length × breadth	—	—	—	—	10.4 × 3.8	11.7 × 4.1

[a] See table 5 for definition of this measurement.

coast a few miles south of Collingwood Bay. *Dorcopsis hageni* is found on the north central coast of New Guinea, but the extent of its range to the east is unknown. Nor do we know how far to the west on the north coast the range of *veterum* extends. A better understanding of these ranges may some day be gained by collecting in the areas of past and present vulcanism on the north coast. It is possible that such zones were and still are effective barriers to the spread of these species.

Dorcopsis atrata is a well-marked insular species, characterized in part by its melanistic pelage, very short ears, and unusual nasal bones. The skull shows an interesting combination of characters found in *Dorcopsis hageni* and *Dorcopsis veterum*. The basic color pattern of *atrata* is much closer to *veterum,* as indicated by the subadult pelage in which the full melanin overlay is not in effect. The distributional evidence also lends support to the belief that *veterum* was the immediate stock from which *atrata* evolved. There is little doubt that both *hageni* and *veterum* come from a common ancestor.

The problem of dating the separation of the D'Entrecasteaux Group from the mainland of New Guinea is complex. The geology of eastern Papua is reasonably well known, but much detail work remains to be done. The tectonic features of the area, however, are but poorly understood. Carey (1938) summarizes our knowledge of this region. An extensive upper Tertiary structure known as the Vogel geosyncline flanks the north coast of Papua for about 300 miles from Morobe to East Cape. This is largely occupied by the sea and is apparently still active. Continuing for another 300 miles from Goodenough Bay in a southeasterly direction there is a long narrow submarine trough, which seems to be an extension of this geosynclinal axis; this is flanked on either side by island festoons. The south side of this trough is comprised of the large majority of the islands of the Louisiade Archipelago; these represent the summits of the drowned New Guinea cordillera. The north side is formed by the D'Entrecasteaux Group, the Bonvouloir Islands, and the Misima Group.

Throughout the littoral of New Guinea there is evidence of great earth movements during the upper Tertiary, commencing probably in late Miocene and reaching a maximum in the Pliocene or early Pleistocene (Stanley, 1924). The comparatively recent date of the climax of these movements is shown by the close relation of the topography of New Guinea to the broad geological structure, and by the fact that the youngest Tertiary strata are involved and have been folded and faulted along with the remainder of the sedimentary rocks (Montgomery, Osborne, and Glaessner, 1944). Cape Vogel Peninsula is an up-arched zone, which

has disclosed an upper Tertiary thickness of over 14,000 feet, in the center of the young Vogel geosyncline. From the evidence it is likely that the definition of the D'Entrecasteaux land mass dates from the late Pliocene or early Pleistocene. It is believed that further localized movements, connected with periods of intense igneous activity, resulted in the later separation of Goodenough, Fergusson, and Normanby Islands.

Dorcopsis, the widespread genus of the lowland rain forest, rather than the mountain *Dorcopsulus,* was isolated on the newly separated D'Entrecasteaux land block. *Dorcopsis,* finding no competition in the oak and beech forests, moved into these unoccupied food niches. Population pressure within its own group may also have played an important role in the populating of these high forests. The coming of man, the clearing of much of the lowland forest, and the hunting pressure of a protein-hungry people probably resulted in the decimation of *Dorcopsis* in the rain forest. We have no evidence that this wallaby is now found in this zone; however, we did not collect in the few remaining areas on the island where the rain forest runs unbroken to the sea.

Of course, it is also possible that *Dorcopsis* is an adventitive addition to the island fauna. If this is the case, I believe that the populating of Goodenough was accomplished early in its history; this assumption is based on the distinctness of the physical characters of this new species. This same reasoning is an even stronger argument against the possibility of introduction of this wallaby to Goodenough from the mainland by the native Papuans. Man, on the geologic time scale, is a very recent addition to the New Guinea fauna, and I cannot picture these characters developing in the relatively few thousands of years since his advent. This entire discussion must be qualified by the statement that we have no reliable data on the rate of evolution in this genus.

I believe that there is a good possibility that this species may also be discovered on the neighboring islands of Fergusson and Normanby. Basil H. Thomson (1889) has an interesting comment in his expedition narrative that bears on this problem: "Normanby Island is the eastern limit of the wallaby, of which we found two varieties." *Protemnodon agilis,* no doubt, is one of these, but it remains for a future expedition to determine the identity of his second "variety."

ECOLOGY

The isolated geographic location of New Guinea, with its attendant factors of high cost and length of time involved in setting up expeditions, has severely restricted programming of ecological studies on the fauna

and flora of this island world. Many of the nineteenth century collecting visits to New Guinea were very limited in scope, often necessarily so because of native hostility. Even the highly organized and efficient field parties of the Archbold Expeditions of recent years have been on a time schedule which allowed little more than a sampling program of the various habitats in relatively limited areas. Because of the pressure of actual collecting and preparation of specimens, the field man has had very little time to gather the facts necessary to an understanding of the interrelationships of the mammals with their environment. To study mammals under natural conditions with any hope of success requires residence in an area extending over many months or even years; this is particularly true in the tropics.

The basic approaches that have been used in these attempts to understand the relations of plants and animals with their environment and with each other are varied. The study of the individual has been productive. Studies of associated groups of organisms in a particular locality have several levels of increasing complexity; population ecology; community ecology; and ecosystem ecology, the whole community and the physical environment considered as a functional unit (Odum, 1953).

Our present knowledge of *Dorcopsis atrata* is limited to a few physical measurements; life history details are almost unknown except by inference. We do, however, have some data on the climatic and physiographic features of the environment (Brass, 1956). We are able to describe rather concisely the plant communities in which this wallaby is found. We can name nearly all the mammals and many of the other associated vertebrates in the community. Some of its ectoparasites have also been collected. All such studies pass through a descriptive phase, but it must be remembered that the treatment of any present-day ecological problem should go far beyond mere listing of the biota and the recording of physical data. The functional viewpoint is all important to a full understanding of these complexes of interacting factors. No ecological system is ever static. Genetic and evolutionary studies give perspective to our problems.

An outline of the plant communities on Goodenough Island follows; in this paper only those in which *Dorcopsis* was found are discussed in any detail. Further reference to the remaining vegetation zones will be made in later reports on the mammals of the island.

1. Lowland, induced savanna and secondary open grassland. This is believed to have been covered originally with mixed rain forest. Some species of lowland grasses now occupy deforested land up to 1600 meters.

2. Mixed rain forest. This is now found in the eastern lowlands of Goodenough chiefly as relict strips along streams; also on all undenuded mountain slopes up to about 900 meters, and in ravines to about 1550 meters. One of the elements of the drier lowland type of this forest, the deciduous tree *Albizzia procera,* is the most abundant tree and often the only one on the savanna. Mangrove and sago palm swamp forests are minor components of this association. It is quite possible that *Dorcopsis* ranges and feeds well below the 900-meter level into this zone of mixed rain forest, but we have no actual evidence of this.

3. Mid-montane forest of oaks and *Castanopsis.* The lower limit corresponds roughly with the bottom level of the cloud bank which is developed almost daily over the long period of southeast trade winds. On Goodenough there is much interdigitation between this and the preceding zone; the lower edge is found between 900 and 1100 meters on the spur ridges. The upper limit blends almost imperceptibly with the next higher forest of mixed beech and other trees at about 1600 meters. The height of the roof of the primary canopy is about 25 meters. A tall sparse sapling story is found under this canopy, becoming thicker in the gullies, where *Pandanus* trees are more common. Massed high on some canopy trees is a climbing *Vacinnium* with beautiful clusters of rose-pink flowers. Vigorous growths of a scrambling bamboo help to screen out the little light which penetrates the dense leafage overhead. The forest floor is a maze of rotting tree trunks and broken ground overlain with thick growths of hepatics, mosses, and lichens. The living trees are heavily "mossed." Ferns are everywhere—from tiny epiphytic species to massive tree-ferns growing to a height of 10 meters. There is relatively little herbaceous growth on the forest floor, but along the courses of the larger streams, where more light penetrates, there are waist-high thickets of *Begonia,* nettle-like *Elatostema,* and large-leaved woody *Medinilla* shrubs 2 to 3 meters in height. When the clouds blanket this jagged upland it is a dark world of swirling mists and dripping leaves. The pervading quiet is broken only by the occasional screech of a parrot or the thrumming wings of a hornbill. This is the world of the black *Dorcopsis.*

4. Beech-other species forest. This is a zone of scattered beeches (*Nothofagus*), *Pandanus,* tree-ferns (one species of *Dicksonia* and several species of *Cyathea*), and rather numerous other species of trees. The canopy is more open, and scrambling bamboo runs rampant together with scrambling fern. The elevated backbone of the island is within this zone, which extends from 1600 to about 1800 meters. Near our Top Camp the beech forest had been somewhat modified by fires set by travel-

ing parties of native hunters. Prostrate masses of bracken (*Pteridium*), overgrown by other ferns and bamboo, made trail-cutting difficult, and at times one walked several feet above the surface of the ground. This level is even more heavily mossed than the oak forest. The ridges are razor-backed and the ravines steep-sided; land slips are of common occurrence. On Goodenough there is no floristically well-defined "mossy forest" such as exists on the New Guinea mainland. Here, as on the mainland, according to Brass, mossiness is a climatic manifestation; it is an overlay of the oak, beech, and subalpine zones induced by the almost continuously present cloud layer. At least two specimens of *Dorcopsis* were taken near the borders of the beech zone, and I believe that this forest is also included in the habitat of the wallaby, even if only as a feeding area.

5. Subalpine forest.
6. Alpine grassland.

The main peaks of the island, rising about 800 meters above the main ridge and lying several miles to the north of Top Camp, were not visited by our party. However, Brass almost certainly identified with field glasses an indicator species of tree (*Podocarpus*) that is known to be subalpine in occurrence. Grasslands, which are very likely alpine, were also observed on the peaks. The total area of the peaks is small, and faunally these two zones are no doubt very poorly developed when compared with the similar zones of the high mountains on the mainland.

REFERENCES

ANDERSON, C.
1937. Palaeontological notes. No. 4. Fossil marsupials from New Guinea. Rec. Australian Mus., vol. 20, no. 2, pp. 73–78.

ANDREWARTHA, H. G., AND L. C. BIRCH
1954. The distribution and abundance of animals. Chicago, the University of Chicago Press, xv+ 782 pp.

ANON.
1955. Find fossil remains of kangaroo-like animal. Sci. News Letter, vol. 68, no. 25, p. 391.

BOARDMAN, W.
1950. The hair tracts in marsupials. Part 7. A system of nomenclature. Proc. Linnean Soc. New South Wales, vol. 75, pp. 273–278.

BRASS, LEONARD J.
1956. Results of the Archbold Expeditions. No. 75. Summary of the Fourth Archbold Expedition to New Guinea (1953). Bull. Amer. Mus. Nat. Hist., vol. 111, pp. 77–152.

CAREY, S. WARREN
1938. The morphology of New Guinea. Australian Geogr., vol. 3, no. 5, pp. 3–31.
CLARKE, GEORGE L.
1954. Elements of ecology. New York and London, John Wiley and Sons, Inc., Chapman and Hall, Ltd., xiv + 534 pp.
COCKRUM, E. LENDELL
1955. Laboratory manual of mammalogy. Minneapolis, Burgess Publishing Co., iii + 160 pp.
COLYER, FRANK
1936. Variations and diseases of the teeth of animals. London, John Bale, Sons and Danielsson, Ltd., viii + 750 pp.
GILL, EDMUND D.
1953. Australian Tertiary marsupials. Australian Jour. Sci., vol. 16, pp. 106–108.
HALL, E. Raymond
1946. Mammals of Nevada. Berkeley and Los Angeles, University of California Press, xi + 710 pp.
HAMLIN, HANNIBAL
[MS.] Journal and notes of Hannibal Hamlin. Whitney South Sea Expedition. November 8, 1928–August 8, 1930.
HUSSON, A. M.
1955. Tabel voor het determineren van de landzoogdieren van Nederlands Nieuw-Guinea. Zool. Bijd., no. 1, pp. 1–35, figs. 1–11.
HUSSON, A. M.
1955. Notes on the mammals collected by the Swedish New Guinea Expedition 1948–1949. Nova Guinea, new ser., vol. 6, pp. 283–306, pls. 25–28.
JONES, FREDERIC WOOD
1923–1925. The mammals of South Australia. Adelaide, R. E. E. Rogers, Government Printer, pts. 1, 2, 3, 458 pp.
LAURIE, ELEANOR M. O., AND J. E. HILL
1954. List of land mammals of New Guinea, Celebes and adjacent islands 1758–1952. London, British Museum (Natural History), 175 pp., pls. 1–3.
MARTIN, PAUL S.
1955. Zonal distribution of vertebrates in a Mexican cloud forest. Amer. Nat., vol. 89, pp. 347–361.
MIKLOUHO-MACLAY, N. DE
1884. On a new species of kangaroo (Dorcopsis chalmersii) from the south-east end of New Guinea. Proc. Linnean Soc. New South Wales, vol. 9, pp. 569–577, 1 pl.
MINISTRY OF NATIONAL DEVELOPMENT, REGIONAL DEVELOPMENT DIVISION [AUSTRALIA]
1950–1951. The resources of the Territory of Papua and New Guinea. Canberra, A.C.T., vol. 1, 150 pp.; vol. 2, 9 maps, vi pp.
MONTGOMERY, J. N., N. OSBORNE, AND M. F. GLAESSNER
1944. Explanatory notes to accompany a geological sketch map of eastern New Guinea. Melbourne, Directorate of Research, L.H.Q., A.M.F.

ODUM, EUGENE P.
1953. Fundamentals of ecology. Philadelphia and London, W. B. Saunders Co., xii + 384 pp.
RAVEN, H. C., AND WILLIAM K. GREGORY
1946. Adaptive branching of the kangaroo family in relation to habitat. Amer. Mus. Novitates, no. 1309.
RIDGWAY, ROBERT
1912. Color standards and color nomenclature. Washington, D. C., published by the author, iv + 44 pp., 53 pls.
STANLEY, EVAN R.
1924. The geology of Papua. Melbourne, Albert J. Mullett, Government Printer, 56 pp., 1 map.
STEENIS, C. G. G. J. VAN (ED.)
1950. Flora Malesiana. Djakarta, Noordhoff-Kolff N. V., ser. 1, vol. 1, clii + 639 pp.
STIRTON, R. A.
1955. Late Tertiary marsupials from South Australia. Rec. South Australian Mus., vol. 11, no. 3, pp. 247–268.
[In press.] A new koala from the Pliocene Palankarinna fauna of South Australia. *Ibid.*
[In press.] Tertiary marsupials from Victoria, Australia. Mem. Natl. Mus. Victoria.
TATE, G. H. H.
1948. Results of the Archbold Expeditions. No. 59. Studies on the anatomy and phylogeny of the Macropodidae (Marsupialia). Bull. Amer. Mus. Nat. Hist., vol. 91, pp. 233–352.
THOMAS, OLDFIELD
1888. Catalogue of the Marsupialia and Monotremata in the collection of the British Museum (Natural History). London, xiii + 401 pp.
1895. On some mammals collected by Mr. Albert Meek on Fergusson Island, D'Entrecasteaux Group. Novitates Zool., vol. 2, pp. 163–166.
1913. On some mammals from Bali and Mysol, collected by Mr. E. Stresemann during the "Freiburger Molukken-Expedition." Ann. Mag. Nat. Hist., ser. 8, vol. 11, pp. 504–507.
THOMSON, BASIL H.
1889. New Guinea: narrative of an exploring expedition to the Louisiade and D'Entrecasteaux Islands. Proc. Roy. Geogr. Soc., vol. 11, pp. 525–540, 1 map.