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EXPEDITIONS. NO. 60

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(MARSUPIALIA)

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ANATOMICAL AND PHYLOGENETIC NOTES

BECAUSE OF THEIR GREAT RARITY, many of the forms of bandicoots are not represented in the collection of this museum. In order to work out our collection of Peramelidae from New Guinea and Australia effectively, it was necessary to borrow the Australian material from other museums. Even so, it will be seen that numbers of races and species, and particularly the genus *Chaeropus*, are unrepresented in America.

I wish to acknowledge my indebtedness to Dr. Remington Kellogg of the United States National Museum, Miss Barbara Lawrence of the Museum of Comparative Zoölogy, and Mr. C. C. Sanborn of the Chicago Natural History Museum for the use of their peramelid material.

Miss Lawrence has kindly permitted me to describe an *Echymipera*, and Dr. P. G. Darlington has aided me in finding certain Australian localities.

The American Museum of Natural History material consists chiefly of the large and well-prepared collections assembled by the several Archbold expeditions. But, in addition, the H. C. Raven material from Queensland, New South Wales, and Tasmania, and random specimens from various sources have been studied.

The genus *Echymipera* (represented by a new race) is recorded for the first time in Australia.

The Peramelidae are polyprotodont, syndactylous marsupials. All other polyprotodonts are non-syndactylous (Jones, 1923-1925, p. 82, termed them "didactylous"). Also, all remaining syndactylous marsupials are polyprotodonts. The Peramelidae thus occupy an intermediate position in respect of these two characteristics. Differing from many other authors, Jones considered the syndactylous foot character to be of an order higher than the dental character and consequently associated the bandicoots primarily with the phalangiers and kangaroos. I myself associate the bandicoots with the Dasyuridae and so incline to the view that syndactyly has occurred twice in the Marsupialia. This belief is not difficult to entertain when one reflects upon the number of times gliding

membranes have been independently developed by mammals.

Probably the most generalized group of bandicoot genera comprises *Peroryctes*, *Perameles*, *Microperoryctes*, *Rhynchomeles*, and *Echymipera*. In these bandicoots the molars are basically formed on the trituberculate pattern, as in the Didelphidae and the Dasyuridae, although indications of modification in the direction of a quadrituberculate pattern, found in *Echymipera doreyana* (but not in *E. rufescens*), forecast the extensive changes present in the more specialized genera *Isoodon*, *Chaeropus*, and *Macrotis*.

INCISORS

In the Didelphidae five upper and four lower incisors are retained. The incisor pattern in the Peramelidae, however, conforms rather closely to the incisor pattern of the Dasyuridae, four upper and three lower; but basically it is less reduced, since the upper series has lost i^5 in only two of the eight genera. In the Dasyuridae i^5 is no longer found.

The morphological differences between i^1 and i^{2-4} , usually so conspicuous in the Didelphidae, Caenolestidae, and Dasyuridae, may still be discerned in the Peramelidae through the usually narrower shape of i^1 . The late eruption of this tooth, usual in so many Dasyuridae (Tate, 1947, p. 103), is apparently not duplicated in any other family.

The fifth incisor, when present, tends also to be differentiated from i^{2-4} . In the Didelphidae it is often (but not always) slightly larger. In *Caenolestes*, in which but four upper incisors are present, it is believed to be the missing tooth. In the Dasyuridae, as stated above, it is absent. In the Peramelidae it is usually widely separated from i^4 and has become caniniform; or it may also be lacking, as in *Echymipera*.

The bifid character of the crown of the last lower incisor, universal in the Peramelidae, is not found in other related families.

PREMOLARS

The primitive permanent premolars are compressed, triangular, blade-like structures, and p^4 is larger than p^3 or p^1 (as in the

Didelphidae, the primitive Dasyuridae, and even the Caenolestidae). This holds for *Microperoryctes*, *Peroryctes longicauda*, *Echymipera rufescens*, and to some extent for the otherwise much modified *Chaeropus* and *Macrotis*. In *Perameles*, *Echymipera doreyana*, and *Peroryctes raffrayanus* the initial stages of broadening of p^4 have begun; an interoposterior ledge is developed. In *Echymipera clara* and *Rhynchomeles* p^4 is greatly enlarged in proportion to the other premolar teeth.

The phalangerid premolars, on the contrary, have tended to become thickened, crushing teeth, except in the *Distoechurus-Acrobates-Petaurus* group, and in the last named, p^4 is incipiently a crushing tooth. Only *Acrobates* is to be regarded as having unmodified premolars, since p^4 in *Distoechurus* is obsolete.

The permanent fourth premolar is distinguished in the above-mentioned carnivorous and insectivorous families by the fact that it succeeds a deciduous tooth of markedly different type (a molariform tooth). This fact stands in marked contrast to what typically occurs in the Phalangeridae (the replaced tooth being essentially identical in shape to its successor, as in *Phalanger*).

The deciduous fourth premolar in the Didelphidae is a strongly molariform tooth virtually unreduced in size and fully functional as a crushing tooth, while p^3 acts as the primary secator. In the Dasyuridae this tooth is reduced in size to a marked degree, or may be lost (Tate, 1947). It is unknown to me in *Caenolestes*. Osgood (1921) also failed to find it because he lacked juvenile material. In the Macropodidae the tooth, little reduced in size, participates in the prevailing bilophodontism of the true molars. In the Peramelidae dp^4 have followed the same course as in the Dasyuridae and definitely tends towards obsolescence. It has lost its premolar structure in all those peramelid genera known to me except *Isoodon* (the species *obesulus*). However, I do not know the form of this tooth in either *Chaeropus* or *Macrotis*, two of the "specialized" bandicoots, or in *Rhynchomeles* of the less progressive group. I have also seen dp^4 in *Perameles*, *Peroryctes*, and *Echymipera*. Starting from the tiny, faintly molariform structure of *Isoodon obe-*

sulus, dp^4 in *Isoodon macrourus* has become compressed and chisel shaped, the anterior end of the blade being slightly deeper than the posterior end. In *Peroryctes raffrayanus* (A.M.N.H. No. 108546) dp^4 is compressed and pointed. In *Echymipera* it is reduced to a minute peg.

The deciduous p^4 of the Phalangeridae is formed in *Phalanger* essentially like p^4 . In *Dactylopsila* and *Petaurus* it is vestigial. I do not know the character of dp^4 of *Acrobates*, although, since the permanent tooth retains the blade-like character of the polyprotodont p^4 , this point is especially important. Should it be a molariform structure it would suggest preserved ancient relationships.

MOLARS

The primitive (?) trituberculate molar pattern of the Didelphidae, found also in a virtually unmodified state in most Dasyuridae, reappears in the unmodified genera of the Peramelidae; the molar teeth of peramelid *Peroryctes* are almost identical to those of didelphid *Marmosa*. As shown beyond, however, this statement no longer holds for such specialized genera as *Isoodon* and *Macrotis*. A strong tendency, already visible in *Echymipera doreyana*, for the hypocone region of the molars to enlarge, is already well advanced in *Isoodon* and reaches fruition in *Macrotis*. Bensley (1903, p. 110) based his two subfamilies, the Peramelinae and the Thylacomyinae, upon divergences in molar structure, but made his separation not on the presence or absence of the hypocone but on the displacement of the metacone and enlargement of the external styles.

I regard as more specialized those genera in which quadrituberculate molars, or greatly enlarged bullae, or both together have developed. In none of these, however, is i^5 obsolete.

It may be pointed out parenthetically here that the molars of *Caenolestes* are much more like those of the phalangerid *Acrobates* than those of any didelphid. I cannot agree with Osgood (1921) that they conform closely to the peramelid molars—at least, not with the molars of those genera which appear to be the least specialized.

SKULL

Lengthening of the rostrum, a basic family character, reaches optimum in *Rhynchomeles*, in *Echymipera clara*, and in the very different *Macrotis*. Minimal development of this feature is seen in *Isoodon* and *Chaeropus*.

The characteristically elongate peramelid muzzle and the arrangement and pronounced development of the lambdoidal ridges at the back of the skull may both be related to the bandicoots' pig-like habits of rooting in the soil and vegetation. These same two features in modified form can be seen in the monotreme *Tachyglossus*, which also roots with its snout.

The palate varies in two distinct ways: the relationship of the anterior to the posterior width, and the degree of fenestration. The differences in width between the anterior and posterior parts of the palate tend to become extreme in forms exhibiting extremely elongate rostra. In *Isoodon* and in the young of most of the genera, the palate tapers and the toothrows converge rather uniformly from back to front. In *Rhynchomeles* and *Macrotis*, which present extreme attenuation of the rostrum, the anterior part of the palate may be only half or less as wide as the intramolar part.

Fenestration is prone to occur almost at random in any family and any genus. Usually a character of relatively slight value in classification, it is commonly pronounced in the bandicoots. In the more primitive species in each of the genera *Isoodon* and *Perameles* (respectively, *obesulus* and *gunnii*) the palate contains supplementary inter-premolar openings. This may, however, merely represent coincidence. In the case of *Echymipera clara* the moderately large fenestrae of the young animals become smaller and almost disappear as the animals become fully grown.

The auditory bullae, formed by the alisphenoids in marsupials, are quite small in the dentally less specialized genera. They may be considered exceptionally small in *Rhynchomeles*, *Echymipera*, and *Peroryctes*, in which they only partly cover the tympanic ring. In *Perameles* and *Chaeropus* they are almost complete and slightly larger. A change resulting in great enlargement of the bullae

is found in *Isoodon* and *Macrotis*, in both of which they become pear shaped.

EXTERNAL CHARACTERS

The ear in the less specialized genera betrays little variability. It is small but never greatly reduced in *Perameles*, *Peroryctes*, and *Echymipera*. It tends to be slightly larger and subtriangular in *Isoodon*. In *Chaeropus* it becomes very much enlarged (though the bullae remain small). The maximum of enlargement is found in *Macrotis*, the "rabbit-eared" bandicoot.

The fore limb has normally five digits, of which the third is the longest, the second slightly shorter, and the fourth a little shorter than the second. The first and fifth are very much shorter than the fourth, being little better than rudiments. Here belong all genera except *Chaeropus*, the "pig-footed" bandicoot. In that genus (Jones, 1923-1925, fig. 125) the second digit remains virtually equal in size and shape to the third, and the two function jointly somewhat as does the artiodactyl foot. The fourth digit is reduced to a remnant, and d^1 and d^5 are lost. Thus *Chaeropus* departs widely from all other bandicoots in regard to the structure and function of the fore foot.

In the normal hind foot, syndactylous in all genera, the fourth digit is dominant. The next largest is the fifth, but this is considerably shorter than the large fourth digit. The syndactylous d^{2-3} are shorter than d^5 . The first digit, standing far posterior to d^{2-3} , is short, thick, and nailless. Modifications from the above are found.

The first digit, though never large, remains best preserved in *Echymipera*. In *Perameles*, *Peroryctes*, and *Isoodon* it is smaller. It is absent in *Chaeropus* and *Macrotis*.

The fifth digit, still functional and moderately large in most genera, is reduced to a rudiment in *Chaeropus*.

The soles of all genera are granular; there are no striations. The granulations extend down the under side of the dominant toes in *Peroryctes*, particularly in *P. longicauda*. *Echymipera clara* is noteworthy for the hyper-development of the tarsal pad behind d^{4-5} .

Saltation is indicated by the great degree

of attenuation of the hind foot in *Macrotis* and *Chaeropus*, and it was pointed out earlier (Tate and Archbold, 1937, p. 352) that *Peroryctes raffrayanus* also shows tarsal attenuation, though to a lesser degree.

The tail in primitive bandicoots was doubtless unshortened, unless the long tail in *Macrotis* is considered a secondary feature. In some dentally unspecialized Papuan genera the tail has become extremely short. In that respect *Echymipera* is much specialized. The tail is only moderately short in *Rhynchomeles*, *Perameles nasuta*, *Isoodon macrourus*, and *Peroryctes ornatus*. It is clearly in course of reduction in *P. gunnii*, *Isoodon obesulus*, and *Peroryctes raffrayanus*. In *Chaeropus* some shortening has taken place. In *Macrotis* the tail is scarcely shortened. A terminal "spur" is developed in the last-named genus. This may be homologous to the bare prehensile area near the tip of the tail in some phalangerids.

The pouch invariably opens backward. In this respect it agrees with the dasyures and differs from those didelphids that possess pouches (the pouch is absent in many didelphid genera and in *Caenolestes*). The number of pairs of nipples, although not known to me in every species, is indicated below:

They are equally remote from each other.

Of the six genera remaining, *Isoodon* is set well apart from the other five by its nearly quadrilateral molars (traces of this character can be seen in *Echymipera doreyana*), its very large pyriform bullae, and its shortened rostrum.

On a lower plane of differentiation I consider *Perameles*, *Peroryctes*, and *Microperoryctes* to form a group of genera diverging from the *Rhynchomeles-Echymipera* group of genera. The presence or absence of i^5 is a critical but perhaps not extremely important difference. The tendency in the latter group for p_4^4 to become enlarged may be more significant, even though this feature is not noticeable in all *Echymipera*.

The externally different facies of *Microperoryctes* would seem to set it off strongly from *Peroryctes*, yet this distinction is not supported by important cranial and dental divergences.

As a rule only slight adaptations and morphological changes of importance can be found in the generic groups living in the tropical latitudes, while major specializations occur principally in southern Australia. The tendencies to shorten the tail and lose the fifth incisor are common in the former

	NUMBER	AUTHORITY
<i>Perameles gunnii</i> (<i>fasciata</i> , <i>myosura</i> , <i>eremiana</i> Spencer)	4	Jones; Troughton
<i>Perameles nasuta</i>		?
<i>Echymipera doreyana</i>	3	Miklouho-Maclay; Tate
<i>Echymipera rufescens</i>	4	<i>myoides</i> , Tate, 2 examples
<i>Echymipera clara</i>		?
<i>Peroryctes raffrayanus</i>		?
<i>Peroryctes ornatus</i>		?
<i>Microperoryctes murina</i>		?
<i>Rhynchomeles prattorum</i>		?
<i>Isoodon obesulus</i>	4	Jones
<i>Isoodon macrourus</i>	4	<i>moresbyensis</i> , Tate
<i>Chaeropus ecaudatus</i>	4	Jones
<i>Macrotis lagotis</i>	4 (5)	Jones; Troughton
<i>Macrotis minor</i>	4 (3)	Jones; <i>miseliae</i> , Finlayson
<i>Macrotis leucura</i>	3	Troughton

INTERRELATIONSHIPS OF GENERA

My concept of the phylogeny of the Peramelidae is set forth by the diagram (fig. 1). The two highly modified genera *Macrotis* and *Chaeropus* are far removed from the relatively unprogressive remaining six genera.

Extensive modifications of the feet, ears, and molars are prevalent in the latter. Even when the Papuan groups adapt themselves to living high in the mountains they undergo only small changes: reduction in size (*Peroryctes*, *Microperoryctes*) or increase in inten-

sity of the color pattern (*Peroryctes* but not *Rhynchomeles*), and sometimes increased density of pelage (*Microperoryctes*, *Rhynchomeles*; not *Peroryctes*).

Perameles and *Isoodon* have each developed a smaller southern and larger northern species. In the case of *Isoodon* the northern species has crossed the Torres Strait and invaded the open grasslands of southern New Guinea. A reverse invasion is seen in the Papuan genus *Echymipera*, of which the species *rufescens* has entered the Cape York Peninsula from southern New Guinea.

In table 1 it can be seen that of the 14 completely distinct species groups of Peramelidae, no fewer than seven are indigenous to New Guinea (with Ceram). This distributional pattern, so very different from that of the Macropodidae (Tate, 1948), suggests that New Guinea has been an evolutionary center for the bandicoots for a very long period of time. At the same time, the comparatively small degree of differentiation among the New Guinea genera indicates that factors inducing marked evolutionary changes have been rather inactive. In north, central, and south continental Australia, containing respectively two, one, and four indigenous species groups, only the central and southern portions have produced profoundly altered organisms. Yet these last are markedly peculiar, including the "pig-footed" *Chaeropus* and the "rabbit-eared" *Macrotis*. It may be argued from this evidence (numerically inadequate) that greater environmental changes have taken place in the south than in the north during Tertiary time.

In most instances island forms are most closely related to the mainland adjoining. *Rhynchomeles* of Ceram betrays affinities with *Echymipera*, particularly with *Echymipera clara* of north New Guinea. *Echymipera rufescens* of Kei and Aru is conspecific, perhaps really consubspecific with the common *Echymipera* of southwest New Guinea.

The *Echymipera* of the Bismarcks is a derivative of *Echymipera doreyana*, found all along the north coast of New Guinea. The bandicoots of Tasmania find their nearest relatives in Victoria and South Australia.

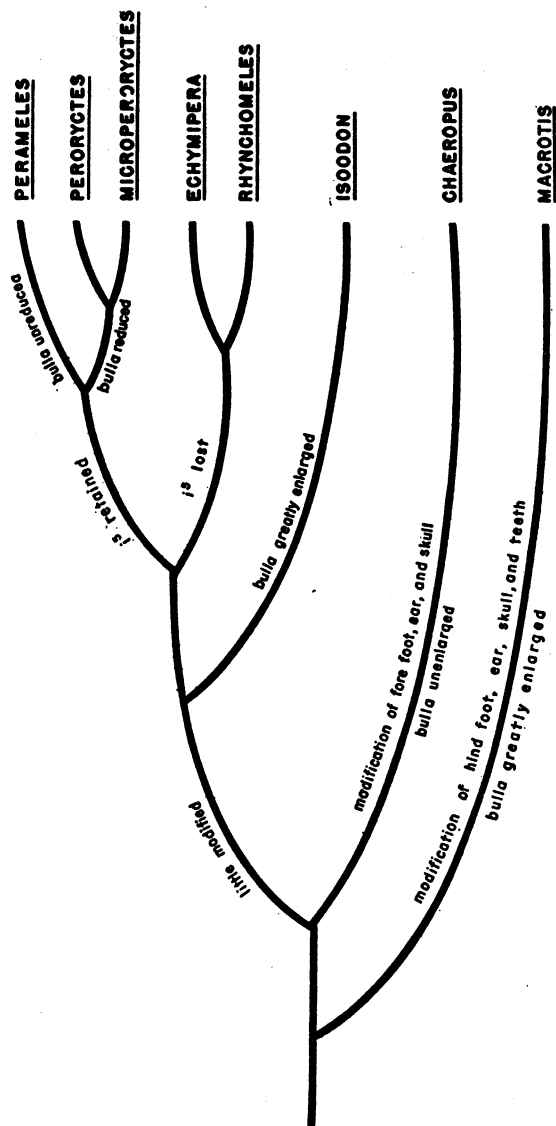


FIG. 1. Suggested phylogeny of the Peramelidae.

TABLE 1
GEOGRAPHICAL DISTRIBUTION OF THE PERAMELIDAE

Species and Species Groups	Ceram	New Guinea Mountains	New Guinea Lowlands	South New Guinea	Northeast Australia	Northwest Australia	East Australia	Central and South Central Australia	Southeast Australia	South Australia	Tasmania	Southwest Australia
<i>Perameles nasuta</i>					X		X		X			
<i>Perameles bougainvillei</i> group									X	X	X	X
<i>Peroryctes longicauda</i>		X										
<i>Peroryctes raffrayanus</i>			X									
<i>Microperoryctes murina</i>		X										
<i>Echymipera rufescens</i>			X	X	X							
<i>Echymipera doreyana</i>			X	X								
<i>Echymipera clara</i>			X									
<i>Rhynchomeles prattorum</i>	X											
<i>Isoodon obesulus</i> group						X			X	X	X	X
<i>Isoodon macrourus</i>				X	X	X						
<i>Chaeropus ecaudatus</i>								X		X		X
<i>Macrotis leucura</i> group								X				
<i>Macrotis lagotis</i>								X	X	X		X
Regional totals	1	2	4	3	3	2	1	3	4	4	2	4
Indigenous species			7			2		1			4	

TABLE 2
DIMENSIONS OF INCISORS AND PREMOLARS IN *Perameles*

	<i>bougainvillei</i> U.S.N.M. No. 218461	<i>notina</i> Type, Old Male	<i>fasciata</i> Type, Juvenal	<i>gunnii</i> Type (?)	U.S.N.M. No. 38808 Tasmania	M.C.Z. No. 29749 Tasmania	<i>nasuta nasuta</i> U.S.N.M. No. 221208, Sydney	<i>pallascens</i> Type
i ¹	1.0	—	1.1	1.4	1.5	1.5	1.4	1.1
i ²	1.2	1.2	1.4	1.6	1.6	1.7	1.8	1.5
i ³	1.2	1.5	1.3	1.8	1.9	1.8	1.9	1.7
i ⁴	1.1	1.2	1.3	1.6	1.6	1.5	1.7	1.5
i ⁵	1.1	1.0	1.2	1.5	1.5	1.4	1.4	1.2
p ¹	2.3	2.5	2.4	2.7	2.7	2.5	2.8	2.8
p ³	2.5	2.5	2.4	2.8	2.8	2.7	3.0	2.9
p ⁴	2.3	2.6	—	3.2	2.8	2.9	3.5	3.6

TAXONOMIC TREATMENT

PERAMELES GEOFFROY

Perameles GEOFFROY, 1803, Bull. Sci. Soc. Philom., Paris, no. 80, p. 150; 1804, Ann. Mus. d'Hist. Nat., Paris, vol. 4, p. 56, pl. 44.

Thylacis ILLIGER, 1811, Prodrum systematis mammalium et avium, p. 76.

TYPE: Of *Perameles*, *P. nasuta*.

In most respects *Perameles* can be considered the least modified of the Peramelinae. It retains i^4 ; the rostrum is not secondarily (?) shortened as in *Isoodon*, and the interocular area remains narrow as in *Peroryctes*, *Rhynchomeles*, and *Echymipera*. The bullae show neither the extreme degree of reduction found in *Peroryctes* nor the enlargement present in *Isoodon* and *Macrotis*.

Changes somewhat analogous to those seen in *Isoodon* (p. 335) have taken place in the

palate and teeth. In the *Perameles nasuta* group, which corresponds broadly to the *Isoodon macrourus* group, the palate is almost entire; in the *bougainvillei-gunnii* group (the banded bandicoots) a high degree of palatal fenestration has taken place.

Variability of m^4 is also pronounced: in m^4 of *P. nasuta* a moderately developed metacone remains, but the protocone and its accompanying commissures are almost obsolete. In *P. gunnii* both the protocone and the metacone remain strongly developed, while in *bougainvillei* the protocone remains prominent and the metacone is reduced, as in *Isoodon obesulus*, to a quite small process. This last change in *bougainvillei* greatly shortens m^4 in the tooththrow.

The fifth incisor, set off from i^4 in all species

TABLE 3
DIMENSIONS OF SKULL AND MOLARS IN *Perameles*

	<i>bougainvillei</i> U.S.N.M. No. 218461	<i>notina</i> Type, Old Male	<i>fasciata</i> Type, Juvenal	<i>gunnii</i> Type (?)	U.S.N.M. No. 38808 Tasmania	M.C.Z. No. 29749 Tasmania	<i>nasuta nasuta</i> U.S.N.M. No. 221208 Sydney	<i>pallascens</i> Type
Condylobasal length	54.2	66.0	—	—	—	69.0	73.0	84.6
Zygomatic breadth	24.2	27.0	—	33.0	30.5	30.0	30.0	32.0
Intertemporal breadth	12.0	14.4	14.0	16.3	15.7	14.2	14.0	14.1
Mastoid breadth	17.0	18.5	—	24.5	21.5	20.5	22.0	23.6
Nasals, length	23.0	28.8	24.0	36.0	34.5	32.0	35.7	39.2
Nasals, greatest breadth	5.0	5.1	5.1	6.1	6.1	6.3	4.9	5.1
Palatal length	33.0	—	—	—	48.0	44.5	47.6	53.4
Length, bulla	5.8	7.9	—	7.2	5.9	6.2	5.9	5.6
p^4-m^4	12.5	14.1	—	18.3	17.0	17.7	18.7	17.5
p^4 , l. \times br.	2.3 \times 1.5	2.7 \times 1.7	—	3.2 \times 2.0	2.8 \times 2.1	3.3 \times 2.2	3.7 \times 2.3	3.6 \times 2.0
m^1 , l. \times br.	3.1 \times 2.3	3.3 \times 2.6	3.7 \times 2.8	4.3 \times 2.9	4.8 \times 3.1	4.7 \times 3.4	4.4 \times 3.8	3.8 \times 3.0
m^2 , l. \times br.	2.8 \times 2.9	3.1 \times 2.9	3.7 \times 3.0	4.0 \times 3.2	4.1 \times 3.4	4.2 \times 3.5	4.1 \times 3.8	3.8 \times 3.3
m^3 , l. \times br.	2.6 \times 3.0	3.0 \times 3.5	3.5 \times 3.3	3.9 \times 3.8	3.9 \times 3.9	3.9 \times 4.0	4.2 \times 3.7	4.2 \times 3.9
m^4 , l. \times br.	1.3 \times 3.0	2.3 \times 3.1	3.1 \times 3.0	3.2 \times 3.8	2.2 \times 4.0	2.4 \times 4.1	2.7 \times 4.2	3.4 \times 4.0
dp^4 , length	—	—	—	—	—	—	—	—

examined by me by a large diastema, is in *P. nasuta* simply caniniform. In both *gunnii* and *bougainvillei* it is strongly double rooted.

The fourth premolar is provided with a moderate-sized postero-internal ledge in *nasuta*. In *gunnii* the said ledge becomes so greatly enlarged that the entire tooth is broadened. In *bougainvillei* the ledge is almost obsolete.

The facial exposure of the lacrimal may be considered moderate in *nasuta* and *bougainvillei*. In *gunnii* it shows a substantial increase, particularly at the level of the frontomaxillary suture. The rostral process of the premaxilla in *nasuta* extends two-thirds of the distance along the nasal suture; in *gunnii* and *bougainvillei* it reaches only about one-half of that distance.

Unfortunately I have only my notes and photographs of the types of *Perameles fasciata* and *P. myosura notina* with which to make the comparisons shown above. Of *eremiana* and true *myosura* I have no material at all. It seems likely that *myosura* was at best a race of *bougainvillei*. Apparently all these bandicoots have fenestrated palates. The metacone of m^4 in *fasciata* appears from the photograph to be well developed, which probably places it with *gunnii*. That of *notina* is reduced almost exactly as in *bougainvillei*. In my photograph of *notina* I can perceive that i^5 is double rooted.

Although the skulls of *Perameles* and *Isoodon* are so readily distinguished from each other by the form of the bullae and the arrangement of the teeth, such is not always the case with the skins. Careful comparison reveals that the ear in *Perameles nasuta* is distinctly longer than that of *Isoodon macrourus*: 40 mm. compared with 30 mm. (field measurements) made by the same collector on animals of approximately equal size. The fourth anterior digit (the fifth is rudimentary in both) is shorter in proportion to the second and third in *Perameles* than in *Isoodon*, while the fifth posterior digit is distinctly longer in *Perameles* than in *Isoodon*. The limbs, hands, and feet in *Perameles* appear generally slimmer than those of *Isoodon*.

Although I have not adequate material with which to settle the matter, I would like to offer the suggestion that the small bandicoots *P. bougainvillei*, *fasciata*, *notina*, and

eremiana may be local races of a single widespread southern species, or, if this is not so, that they may be members of a single species-group, as opposed to the larger northeastern *Perameles nasuta*. To this species group I would add the much larger *gunnii* as a full species.

Perameles bougainvillei Quoy and Gaimard

Perameles bougainvillei QUOY AND GAIMARD, 1824, Voyage autour du monde . . . sur les Uranie et . . . Physicienne, Zoologie, 1817-1820, p. 56, pl. 5 (mounted skin and poorly drawn skull).

Perameles myosura WAGNER, 1841, Archiv. f. Naturgesch., vol. 7, pt. 1, p. 293; in Schreber, 1855, Die Säugethiere, Supplement, vol. 5, p. 215.

Perameles arenaria GOULD, 1844, Proc. Zool. Soc. London, p. 104.

TYPES: Of *bougainvillei*, possibly at the Paris Museum, from Peron Peninsula, Shark Bay, Western Australia. Of *myosura*, from Swan River (Wagner, in Schreber, 1855, p. 217). Of *arenaria*, not seen by me.

A specimen of *bougainvillei* (U.S.N.M. No. 218461) from Dorre Island, Shark Bay, is remarkable for the high degree of palatal fenestration and for the extreme degree of shortening of m^4 , expressed in part by obsolescence of the metacone tubercle.

Wagner (1841, p. 295) described the complex palatal vacuities of the skull of *myosura* in considerable detail. Of the last molar he wrote (p. 296), "The last cheek tooth is very narrow, still narrower than in *P. obesula* and *nasuta*, while in *P. lagotis* it is rounded." This description appears to fit our specimen of *bougainvillei* quite closely.

Wagner's published dimensions of his type included: head and body, 11 inches (279 mm.); tail, 3 inches (76 mm.); length of skull, 2 inches 6 lines (63.5 mm.); palate, 1 inch $5\frac{1}{2}$ lines (37.0 mm.). The interior of the ear was stated to be golden colored.

Perameles bougainvillei notina Thomas

Perameles myosura notina THOMAS, 1922, Ann. Mag. Nat. Hist., ser. 9, vol. 10, p. 144.

TYPE: B.M. No. 43.8.12.21, adult male, collected by Sir George Gray from the "plains near the head of the St. Vincent Gulf," South Australia.

The skull of the type measured (Thomas); length, 68 mm.; m^{1-3} , 9.8. Now, m^{1-3} in our

bougainvillei is 9.5 mm.; in *fasciata*, m^{1-3} measure 10.6; and in our *gunnii* this measurement amounts to 12.2 mm. The length of m^4 (in the tooththrow) of our *bougainvillei* is only 1.3 mm. In the type of *fasciata* it is 3.1 and in that of *gunnii*, 3.2. In our *gunnii*, it is 2.5 mm. In the type of *notina* it measures 2.3 mm. I am therefore disposed to treat *notina* as a relative of the eastern banded bandicoots, not the western.

Perameles eremiana Spencer

Perameles eremiana SPENCER, 1897, Proc. Roy. Soc. Victoria, new ser., vol. 9, p. 9.

TYPE: In Melbourne Museum, from Burt Plain, north of Alice Springs and 40 miles northeast of Charlotte Waters.

Spencer did not describe the skull of *eremiana* though he published a number of measurements, among which were: basal length of skull, 55.5 mm.; greatest breadth, 24; point of canine to back of m^4 , 24. Glauert (1934) records the species from west of the Warburton ranges, in the Central District of Western Australia. I have found no description of the skull in the literature and in consequence have been unable to form an opinion on its relationships—whether it is closer to *bougainvillei* or to *gunnii* and its relatives.

Perameles fasciata Gray

Perameles fasciata GRAY, in Grey, 1841, Journals of two expeditions . . . in . . . Australia, vol. 2, app., p. 407.

TYPE: B.M. No. 41.1178 (850b), juvenal, from Liverpool Plains, New South Wales.

The total original description of this animal reads, "Grey brown, rump with three black bands; tail white, with a black streak along the upper side. Inhabits Liverpool Plains and South Australia; smaller than *P. gunnii*."

The type skull, which is broken, affords no good measurements, but the teeth are intact: m^{1-3} , 10.6 mm.; length (in tooththrow) of m^4 , 3.1 mm.

Waterhouse (1846b, p. 380), comparing a skull in the British Museum with that of *gunnii*, wrote, "agrees very closely in size and general proportion . . . it is, however, narrower, and the teeth are smaller—the

canine is very small: the second pair of palatine openings are rather larger and the principal opening in the palate is smaller." Dimensions of that specimen were given as: length, 2 inches 6 lines (63 mm.); width, 1 inch (25.4 mm.); length of palate, 1 inch 6 lines (38 mm.); length of four true molars together, $5\frac{1}{2}$ lines (11.3 mm.).

Perameles gunnii Gray

Perameles gunnii GRAY, 1838, Ann. Nat. Hist., vol. 1, p. 107.

TYPE: Not surely seen (B.M. No. 295C may be it); from Tasmania.

The original description deals with the skin only. In B.M. No. 295C, young adult female, the following dimensions were taken: total length of skull, 80.4 mm.; zygomatic breadth, 33; p^4-m^4 , 18.3; m^{1-3} , 12.0; length of m^4 (in tooththrow), 3.2 mm.

This Tasmanian banded bandicoot is distinguished from the Australian banded bandicoots by its larger size and larger teeth. From *nasuta* and *pallescens* it is separable by the fact that in it i^1 is scarcely at all smaller than i^{2-3} and by the relatively small size of p^4 (2.8–3.2 mm.).

Perameles nasuta Geoffroy

Two races of this species have been given recognition: a northern *pallescens* and a southern true *nasuta*. There appears to be no structural difference between the two, and in all probability they intergrade in central Queensland. It is questionable whether they should be maintained.

Methods of distinguishing *Perameles nasuta* from *Isodon macrourus* have already been indicated.

Perameles nasuta nasuta Geoffroy

Perameles nasuta GEOFFROY, 1804, Ann. Mus. d'Hist. Nat., Paris, vol. 4, p. 62.

TYPE: Paris (no number). A skin, adult male, mounted on a plaque, marked "Ce. Baudin (Exp. Cap. Baudin) an 11" (1803). The extracted skull was not found by me in 1937.

From Peron's work (1816) we learn that Baudin was captain of the "Naturaliste," and died in Ile de France, September 16, 1803 (p. xxv). The ship returned to Lorient,

France, March 25, 1804. For the most part she had cruised in Tasmanian waters and along the south and west coasts of Australia. She had called a few times at Botany Bay (Sydney), where presumably the type of *nasuta* was obtained. The type locality has been restricted to Sydney (Iredale and Troughton, 1934, p. 18).

At the United States National Museum there is a virtual topotype (No. 221208) collected by C. M. Hoy 3 miles northeast of Sydney. Other material from New South Wales includes one from Blue Mountains, 50 miles west of Sydney (U.S.N.M. No. 277375, D. H. Johnson); one, Milton (U.S.N.M. No. 236774, Hoy); four, Gloucester (U.S.N.M. Nos. 221210, 221486, 221211, 221209, Hoy); one, Cascade, Dorriggo (M.C.Z. No. 29210, Darlington); from southern Queensland: one, Bunya Mountains (M.C.Z. No. 29655, Schervill); one, Lochaber Station (A.M.N.H. No. 65639, Raven).

***Perameles nasuta pallescens* Thomas**

Perameles nasuta pallescens THOMAS, 1923, Ann. Mag. Nat. Hist., ser. 9, vol. 11, p. 173.

TYPE: B.M. No. 22.12.18.40, old male, collected at Vine Creek, Ravenshoe, north Queensland, by T. V. Sherrin, June 14, 1922.

A number of specimens from nearby localities are contained in American collections: five from Atherton (A.M.N.H. Nos. 65654, 65655, 65656, 65657, 65659, H. C. Raven) and two more (U.S.N.M. Nos. 238439, 238440, C. M. Hoy); three from Lake Barrine, 2400 feet (A.M.N.H. Nos. 107233, 107234, 107235, G. Neuhäuser), and one more (M.C.Z. No. 29329, Darlington); four from Babina Creek (A.M.N.H. Nos. 65641, 65642, 65647, 65649, Raven); two from Evelyn (A.M.N.H. Nos. 65665, 65666, Raven); one from Millaa Millaa (M.C.Z. No. 29209, Darlington); one from Mt. Spurgeon (A.M.N.H. No. 107236, Neuhäuser) and a second (M.C.Z. No. 29211, Darlington); and two from the McIlwraith Range (M.C.Z. Nos. 29212, 29213, Darlington).

This bandicoot was distinguished by its describer for its "beautiful écru-drab color, much paler than is found in the southern form."

PERORYCTES THOMAS

Peroryctes THOMAS, 1906, Proc. Zool. Soc. London, vol. 2, p. 476.

Ornoryctes TATE AND ARCHBOLD, 1937, Bull. Amer. Mus. Nat. Hist., vol. 73, p. 352 (subgenus).

TYPES: Of *Peroryctes*, *Perameles raffrayana*. Of *Ornoryctes*, *Perameles ornata*.

This genus is mainly differentiated from *Perameles* of Australia by its small, incomplete audital bullae. As in *Perameles*, considerable to great reduction of the tail from the primitively long-tailed state has been reached. This differs in different species. Increasingly distinct color pattern shows in the mountain-inhabiting species *longicauda*, compared with the rather uniformly colored and larger *raffrayanus* of the foothills and lowlands.

The two species of *Peroryctes*, *raffrayanus* and *longicauda*, differ from each other by precisely those characters that I set forth (Tate and Archbold, 1937, p. 352) for the subgenera *Peroryctes* and *Ornoryctes*, of which they are, respectively, typical.

***Peroryctes raffrayanus* (Milne Edwards)**

This species is in many ways so different from the mountain-dwelling *Peroryctes longicauda* and allies that I separated the latter subgenerically (Tate and Archbold, 1937, p. 352) as *Ornoryctes*. The distinguishing characters were tabulated at that time. Nothing is gained by maintaining two monotypic subgenera, but *raffrayanus* and *longicauda* remain two very distinct species.

The two previously taxonomically unlocated *mainois* and *rothschildi* were correctly placed in the species *raffrayanus* by Stein (1933), although I have now recognized *rothschildi* (= *mainois*) as a weakly separable local race of the Huon region.

The small pouch young of *raffrayanus* are sharply different in color and pelage from the adults. The pelage is very short and crisply spinous, not merely coarse haired as in old specimens. Its dorsal color is light tan, with dark bases, on the sides self-colored tan; ventrally the color is yellowish white. The sides of the face and the circumocular areas are black. The ears terminally are black, as is the tail. The feet and hands are pale brown or whitish. This pelage grows into, or is

replaced by, the dark brownish gray of adulthood. I have before me one such very small juvenal of true *raffrayanus* from Lake Sentani, and one of *broadbenti* from Sogeri, near Port Moresby. They are virtually indistinguishable. Their measurements are: head and body, 122 and 130 mm.; tail, 39, 40; hind foot (s.u.) 28, 32; ear from crown, 12, 13. A somewhat older specimen of *broadbenti* from the pouch of A.M.N.H. No. 108547 has still the same colors as those just described. Its hair is a little longer and softer. It is considerably larger: head and body 216 mm.; tail, 114; foot (s.u.), 57; ear, 23.

In the skulls of the two youngest specimens i^{1-4} are in place and the canine shows, but i^5 is undeveloped. In the slightly older specimen i^5 is already in position.

In the two smaller juvenals the minute spicule-like dp_4^4 (0.6 mm. in diameter) stand between p_3^3 and m_1^1 . These minute teeth have already been shed in the slightly older pouch specimen.

Peroryctes raffrayanus raffrayanus
(Milne Edwards)

Perameles raffrayana MILNE EDWARDS, 1878, Ann. Sci. Nat., Paris, ser. 6, vol. 7, art. 11, pp. 1-2, pl. 8.

TYPE: Paris No. 2028, adult female, from Amberbaki, Vogelkop, Netherlands New Guinea, collected by Raffray in 1877. Specimen mounted; skull extracted, cleaned, in good condition.

There are three other specimens: Paris No. 2026, female; No. 2027, male; No. 2029, juvenal, unsexed; all with skulls, taken by Raffray at Dorei.

A fine series of this race was taken in the Idenburg Valley by the Archbold expedition of 1939, at altitudes up to 2150 meters: 75 meters, one; 850 meters, 18; 1200 meters, nine; 1800 meters, one; and 2150 meters, two. A female pouch young (A.M.N.H. No. 109833) was taken also at Sentani Lake. The very wide altitudinal range of *raffrayanus* is also apparent in the race *broadbenti*, which extends as high as 2860 meters.

I find no distinct change in the quality of the pelage when comparing highlands with lowland specimens. The short-haired individual from the Weyland Mountains (A.M.N.H. No. 103254) formerly referred

to *broadbenti* is probably better considered as true *raffrayanus*.

Peroryctes raffrayanus broadbenti (Ramsay)

Perameles broadbenti RAMSAY, 1879, Proc. Linn. Soc. New South Wales, vol. 3, p. 402.

TYPE: Sydney, No. A2328, adult male, mounted, with skull inside, from Goldie River, tributary of Laloki River, Central Division of Papua; collected by Broadbent.

I have obtained a female with one young from Kagi, on the Kokoda road out of Port Moresby, and a pouch young from Sogeri, Astrolabe Range, since writing of this race (Tate and Archbold, 1937). The apparently well-grown female is noticeably smaller than the two old males taken by Archbold at Murray Pass and Mafulu.

Comparison of the skulls with those of the ample series from the Idenburg River taken by the Third Archbold Expedition reveals no dental differences whatever. The nasals in *broadbenti* appear slightly narrower than those of either *raffrayanus* or *rothschildi*. The color of the pelage virtually equals that of *raffrayanus*. The type in Sydney has the measurements: tail, ± 195 mm., hind foot (c.u.), 95 mm.

Peroryctes raffrayanus rothschildi
(Förster)

Perameles rothschildi FÖRSTER, 1913, Zool. Anz., vol. 42, p. 177.

Perameles mainois FÖRSTER, 1913, Zool. Anz., vol. 42, p. 178.

TYPES: Förster's description of *rothschildi* does not agree well with Tring Mus. No. R.M. 4 (I found no other specimen there, however). Of *mainois*, Berlin No. A.45,23 (with metal no. 56), collected by Förster at Sattelberg, field no. 108. Förster stated (p. 178) that a cotype was at Leiden.

The underparts of the Tring specimen of *rothschildi* are brownish yellow instead of "pure white," and the neck from the crown to the withers has a plentiful admixture of white hairs (not mentioned by Förster). There is no skull.

The upper color of *mainois* (Berlin No. A.45,23) is rich umber brown, slightly paler on the neck and buttocks. The underparts are straw buff. The tail is very finely scaled.

The hind foot, slender, measures 70 mm. (s.u.), 75 (c.u.).

Two specimens at the Museum of Comparative Zoölogy (Nos. 22282, 22283) are before me, both with skulls, from the Saruwaged Mountains, respectively 2000 and 3000 meters (*P. rothschildi* was said to be from 4000 meters, *mainois* from 1800 to 2000). These specimens agree with my description of the types of *rothschildi* and *mainois*, in being warmer brown than *raffrayanus* or *broadbenti*, the brown changing to dull golden brown on the sides. They have pectoral and inguinal self-colored patches of straw color, united in one of the two specimens by a narrow median stripe.

Finally, I saw one other skin, Berlin No. VII,65, female, collected by Bürgers at Meanderberg, August 17, 1913.

My general impression is that the form in the Huon area is more rufescent than either *raffrayanus* or *broadbenti*.

The dimensions of the skull of the two specimens at the Museum of Comparative Zoölogy are: condylobasal length, 77.8 mm., —; zygomatic width, 31, 27; mastoid width, 25.4, 24.5; m^{1-3} , 11.6, —; m^1 , 4.2, 4.0 (other molars lost in second specimen); m^2 , 3.8 by 3.1; m^3 , 3.7 by 3.5; m^4 , 1.8 by 3.5. A single skull (Berlin No. 34327) from the Bulong River area, taken by Förster, has the following measurements: m^{1-3} , 11.8 mm.; m^1 , 4.1 by 2.8; m^2 , 4.0 by 3.2; m^3 , 3.6 by 3.4; m^4 , 2.3 by 3.3.

Peroryctes longicauda (Peters and Doria)

In earlier work (Tate and Archbold, 1937, p. 354) I left the relationships of *longicauda* and *ornata* open to doubt. The receipt of the large additional collections listed hereafter seems to make it fairly certain that in the case of *longicauda*, *dorsalis*, and *ornata*, we have a single species, changing progressively from an inornate western race in Vogelkop through a race in central New Guinea bearing a single dorsal stripe, to a strongly patterned eastern race. The result of this conclusion is that the subgenus *Ornoryctes* Tate and Archbold, becoming monotypic, is no longer required, except to illustrate the very wide degree of difference between *longicauda* and *raffrayanus*, also that the type of *Ornoryctes* becomes *Perameles ornata* = *Perameles longicauda*.

Peroryctes longicauda longicauda (Peters and Doria)

Perameles longicauda PETERS AND DORIA, 1876, Ann. Mus. Civ. Genova, ser. 1, vol. 8, p. 333.

TYPE: Genoa No. C.E. 3908 (body in alcohol), with No. C.E. 597 (skull) adult female, collected at Hatam, Arfak, June, 1875, by Beccari.

Present color of type dull reddish gray (affected by alcohol?); no dorsal pattern; three pairs of mammae.

Fifth upper incisor small, caniniform; canine with small anterior and posterior cusps. A small diastema between i^3 and i^4 . The premolars and the canine are all separated by small diastemata.

A series of 10 specimens, taken by Stein at Weyland Mountains in September, 1931, apparently represents this race. The spicule-like dp_4^1 are present still in several of the Stein specimens (Nos. 517, 524, 123).

A single specimen at Tring, taken by Shaw Meyer at the Gebroeders at 6000 feet in 1930, shows traces of a dorsal stripe and may be annectant with the race *dorsalis*, as does also A.M.N.H. No. 101981, a young male taken by the same collector at the same locality. These Gebroeders specimens appear to be transitional between true *longicauda* of Arfak and *dorsalis* of the Mamberano-Idenburg region.

Peroryctes longicauda dorsalis Thomas

Peroryctes dorsalis THOMAS, 1922, Nova Guinea, vol. 13, p. 737.

TYPE: B.M. No. 22.2.2.74, adult female, taken by Van Heurn, October 23, 1920, at Doormanpad Bivak, Mamberano River, 1410 meters.

A very fine series from the near-by Idenburg River and upwards almost to the top of Mt. Wilhelmina was secured by Richardson, the mammalogist of the Third Archbold Expedition, as follows:

Idenburg Valley	
1200 meters	1
1500 meters	1
1800 meters	8
Bele Valley	
2150 meters	2
2200 meters	50
Slopes of Mt. Wilhelmina	
2800 meters (near Lake Habbema)	4
3560 meters	4
3850-3950 meters	4

Virtually no differences in the pelage can be observed in skins from the extremes of this great vertical range.

In almost all examples a well-marked median dorsal stripe is visible. In a few it is weak, reminiscent of true *longicauda*. In still others traces of the paired lateral rump stripes which characterize the eastern *ornatus* appear, suggesting a progressive transition from west to east from the unpatterned *longicauda* to the strongly marked *ornatus* of the Owen Stanley Range.

***Peroryctes longicauda ornatus* (Thomas)**

Perameles ornata THOMAS, 1903, Proc. Zool. Soc. London, vol. 2, p. 201.

TYPE: B.M. No. 3.12.1.23, adult male, collected by A. S. Meek at Avera, Aroa River, near Port Moresby.

Besides the specimens taken by Archbold at Mt. Albert Edward (Tate and Archbold, 1937), I collected three partly grown individuals at Kagi, 5000 feet, on the south slopes of the same mountain. Only p_1^1 and p_3^3 , m_1^1 and m_2^2 are present in the female (and dp_4^4 are still present); the dentition is complete in the two males and dp_4^4 are lost. The strong black markings characteristic of this eastern race of *longicauda* are particularly emphasized in the female. The vertical range of the race is now found to extend at least from 5000 up to 14,000 feet. This is in fair agreement with the vertical range of the race *dorsalis*.

MICROPERORYCTES STEIN

Microperoryctes STEIN, 1932, Zeitschr. f. Säugetierk., vol. 7, p. 256.

TYPE: *Microperoryctes murina*.

The extreme degree of diminution in size added to the soft quality and black color of the pelage confirm the generic distinctness from *Peroryctes* of this remarkable little animal, even though few good anatomical characters to support the separation can be found.

I have now had the opportunity to study all three of the specimens upon which Stein based his work. No new examples have been recorded.

The fifth incisor is retained; c , p^1 , and p^2 have small anterior cusps. The palate is much fenestrated.

***Microperoryctes murina* Stein**

Microperoryctes murina STEIN, 1932, Zeitschr. f. Säugetierk., vol. 7, p. 257.

TYPE: Berlin No. 44229, adult male, from Sumuriberg, Weyland Mountains, Netherlands New Guinea, 2500 meters. There is another paratype: Berlin (field) No. 392, in which p^4 is just appearing. The third specimen is in the Archbold collection.

Some measurements of the type: head and body, 174 mm.; tail, 111; hind foot (s.u.), 30 (c.u.), 34. Skull: condylobasal length, 44.1; zygomatic breadth, 16.2; intertemporal breadth, 11.0; breadth of braincase, 16.4; mastoid breadth, 14.6; length of nasals, 21.0; greatest width of nasals, 3.4; palatal length, 25.9; anterior palatal foramina, 4.0; posterior palatal foramina, 7.0; breadth inside m^{1-1} 5.0; length of bulla, 2.7. Teeth: p^4 - m^4 , 10.0; m^{1-3} , 7.0; p^4 , 1.75 by 0.9; m^1 , 2.3 by 1.7; m^2 , 2.3 by 1.9; m^3 , 2.1 by 1.9; m^4 , 1.7 by 2.0.

The skin is deep smoky fuscous above and below the scrotum gray white; hands and feet with few whitish hairs; tail fuscous above and beneath.

ECHYMIPIPERA LESSON

Echymipera LESSON, 1842, Nouveau tableau du règne animal, p. 192.

Brachymelis MIKLOUHO-MACLAY, 1884, Proc. Linnean Soc. New South Wales, vol. 1, p. 713.

Anuromeles HELLER, 1897, Abhandl. Zool. Mus. Dresden, vol. 6, no. 8, p. 5.

Suillomeles ALLEN AND BARBOUR, 1909, Proc. New England Zool. Club, vol. 4, p. 44.

TYPES: Of *Echymipera*, *Perameles doreyana*. Of *Brachymelis*, *B. garagassi*. Of *Anuromeles*, *A. rufiventris*. Of *Suillomeles*, *S. hispida*. All of these species names refer to the "*doreyana* group" as opposed to the "*clara* group" (see beyond).

Echymipera is set off from *Perameles* and *Peroryctes* by the loss of i^6 and the reduction of the bullae, which, as in *Peroryctes*, only partly cover the tympanic rings. The genus displays considerable morphological variation.

The discovery of a large series of the unusual *Echymipera clara*, previously known only from the type, has served to emphasize both the distinctness of that species and, in contradistinction, the essential group identity within the *doreyana* group of other "species" of *Echymipera*. One other important fact has

also come to light regarding this genus, namely, its presence on Cape York, Queensland.

Apart from the unique *E. clara* group, there are two distinct, though closely similar species that form the *E. doreyana* group. We now have a much larger representation of this group than formerly (Tate and Archbold, 1937). The two species are partly sympatric. Cohn's (1910) work should be consulted. Cohn showed that one morphological group

from Sansapor, both places located a little to the west of Manokwari. There are also triangular-toothed animals in our collections from as far east as the Idenburg River and from Hollandia. Local overlap of the two species, *rufescens* and *doreyana*, certainly occurs, the two species perhaps filling different ecological habitats.

Besides those characters that Cohn employs to distinguish the two species, the following are observable:

	TRIANGULAR-TOOTHED FORMS	TRAPEZOIDAL-TOOTHED FORMS
Incisors	Relatively large size (see table) and approximation of i^1-i^1	Relatively small size, especially of i^1 and i^4 , and space between i^1-i^1
p^4	Lateral compression of tooth and reduction of postero-internal cusp	Lack of compression, non-reduction of postero-internal cusp
Molars	Absence of hypocones to produce triangular outlines of crowns	Presence of hypocones, making outlines of crowns trapezoidal
dp^4	Diminution of this already minute tooth to about half the size in <i>cockerelli</i>	
Incisive foramina	Relatively elongate (short in juvenals)	Relatively short
Pelage	Face without strongly defined horizontal line of demarcation from nostrils to beneath eye	Face with strong line of demarcation, black above, whitish or buffy beneath
Crown of head	In Papuan material, intensely black	Not intensely black
Nipple count	Four pairs	Three pairs

of *Echymipera* has three-cornered molars and another trapezoidal molars. The former tooth shape was accompanied by a slightly broader, shorter skull, the latter by a slightly narrower, longer skull. Cohn identified the first with "*doreyana*," the second with "*cockerelli*." Unfortunately he was mistaken in his actual identification of "*doreyana*," as an inspection of plate 16 (Quoy and Gaimard, 1830, vol. 5 of Atlas) shows unmistakably. The pale-footed bandicoot *doreyana* shown on that plate, its dorsal pelage flecked with red and black and quite lacking the black frontal and crown region of the large-toothed *Echymipera*, represents, however, a very fair delineation of *Echymipera cockerelli*.

I have not been able to prove the presence of the triangular-toothed species (*rufescens*, subspecies) at Dorei (=Manokwari), but *hispida*, a member of the species *cockerelli* and a pure synonym of *doreyana*, came from there. On the other hand I have seen triangular-toothed *Echymipera* from Sorong and

The names of described forms of *Echymipera* can now readily be grouped under the same two specific headings shown above:

TRIANGULAR-TOOTHED FORMS	TRAPEZOIDAL-TOOTHED FORMS
<i>rufescens-keiensis</i>	<i>doreyana</i>
<i>aruensis</i>	<i>myoides</i>
<i>gargantua</i>	<i>rufiventris</i>
<i>rufescens</i> from south New Guinea	<i>oriomo</i>
<i>rufescens</i> , subsp. from Cape York	<i>hispida</i>
	South New Guinea animals

From the foregoing it becomes reasonably certain that the specific name *doreyana* should replace *cockerelli* for the trapezoidal-toothed races, while for the triangular-toothed bandicoots *rufescens* (of the type skull of which I have photographs) is the earliest name available.

Representative dental measurements of the two species of the *doreyana* group have been shown.

TABLE 4

MEASUREMENTS OF INCISORS AND P⁴ OF *Echymipera doreyana* GROUP OF SOUTH NEW GUINEA AND QUEENSLAND

	Age and Sex	Anterior Palatal Foramina	i ¹	i ²	i ³	i ⁴	p ⁴		Remarks
							Length	Posterior Width	
<i>doreyana</i> A.M.N.H. No.									
104573	Y.ad. ♂	5.2	1.0	1.3	1.3	1.1	2.8	1.9	Uncompressed; type of <i>oriomo</i>
104572	Ad. ♂	5.3	—	1.2	1.3	1.1	2.9	1.9	
144493	Y. ♀	4.1	1.0	1.2	1.3	1.1	— ^a	—	
105910	Juv. ♀	5.3	1.0	1.4	1.4	1.3	— ^b	—	Sturt Is. Camp; dp ⁴ , 0.8
105909	O.ad. ♀	4.6	—	1.1 ^c	1.4	1.2	2.9	1.9	Sturt Is. Camp
105912	Juv. ♂	4.9	1.0	1.3	1.5	1.3	— ^a	—	dp ⁴ , 0.8; Oroville, upper Fly R.
105911	Ad. ♂	4.9	1.0	1.3	1.4	1.4	3.2	2.2	Oroville, upper Fly R.
105038	Juv. ♀	4.2	1.0	1.3	1.5	1.3	— ^b	—	Black R., Fly R.
104070	Ad. ♀	6.0	1.1 ^c	1.3 ^c	1.5 ^c	1.2 ^c	2.8	2.1	Mafulu, near Port Moresby
104069	Ad. ♀	6.5	0.8 ^c	1.1 ^c	1.5 ^c	1.2 ^c	3.1	2.2	Mafulu, near Port Moresby
108549	Juv. ♀	5.2	1.1 ^d	1.4 ^d	1.5 ^d	1.3 ^d	— ^b	—	Javereri, near Port Moresby; dp ⁴ , 0.7
108551	Juv. ♂	4.6	1.0 ^d	1.6 ^d	1.7 ^d	1.4 ^d	— ^b	—	Sogeri, near Port Moresby; dp ⁴ , 0.9
<i>rufescens</i> 108550	Juv. ♂	6.5	1.6	1.8	1.8	1.7	— ^b	—	Javereri, near Port Moresby; dp ⁴ , 0.4
105208	Ad. ♂	9.9	1.1 ^c	1.6 ^c	1.7 ^c	1.6	3.7	1.9	
105905	O. ♂	9.7	1.4 ^c	1.7	1.8	1.7	3.6	1.8	Sturt Is. Camp, Fly R.
105907	Juv. ♂	4.7	1.6	1.8	1.7	1.5	— ^b	—	Sturt Is. Camp, Fly R.
105906	Y. ♂	7.0	1.6	1.7	1.7	1.7	— ^c	—	Sturt Is. Camp, Fly R.
105908	Ad. ♀	7.9	1.3 ^c	1.6 ^c	1.7	1.5	2.8	1.6	Sturt Is. Camp, Fly R.
105039	Juv. ♀	4.1	1.8 ^d	2.0 ^d	2.0 ^d	1.8	— ^b	—	Mabaduane, south New Guinea; dp ⁴ , 0.3
M.C.Z. No. 29214	Ad. ♂	9.5	1.2 ^c	1.7	2.0	1.7	3.7	2.1	Cape York, Australia

^a Visible.^b Not visible.^c Worn.^d Unworn.^e Not quite measurable.

The geographical ranges of the two species of the *doreyana* group appear to be only partly separate. The range of *rufescens* extends from the Hollandia area west of Vogelkop and offshore islands, and along the south side of the central mountain chain of New Guinea as far east as the Astrolabe Range at Port Moresby. It extends also out to the Kei and Aru Islands, covers south New Guinea, and crosses into the Cape York region of Australia. The range of *doreyana* is mainly north and

east Papua: it occurs at Dorei (*hispida*, type), at Weyland Mountains, the islands of Geelvinck Bay, all of north New Guinea (under assorted names), including New Britain and New Ireland. It also occurs in south New Guinea and is common in the Port Moresby area and in the Western Division of Papua (the race *oriomo*). I have no proof that it extends west of the Digul River. It is not yet known in Australia.

Echymipera clara GROUP*Echymipera clara* Stein

Echymipera clara STEIN, 1932, Zeitschr. f. Säugetierk., vol. 7, p. 256.

TYPE: Berlin No. 44230, young adult male, from Japan Island, Geelvinck Bay, Netherlands New Guinea.

The Third Archbold Expedition to New Guinea procured no fewer than 13 (two of them skulls only) specimens of this unusual

snouted echymipera," and the small size of the posterior palatal foramina which become almost closed in old adults.

Distinctive measurements taken from our series are given in table 5.

Echymipera doreyana GROUP*Echymipera doreyana*

Compared with *E. rufescens*, the present species averages slightly smaller and redder

TABLE 5
GROWTH CHARACTERS IN *Echymipera clara*

A.M.N.H. No.	Age and Sex ^a	Condylobasal Length	Zygomatic Breadth	Crown Lengths in Toothrow			
				c	p ²	p ⁴	m ¹
151900	Ad. ♂	—	45	4.3	3.5	5.8	3.3
151902	O. ♂	96	47	5.5	3.5	6.0	3.5
151880	Y. ad. ♂	89	40	4.5	3.1	5.8	3.5
152480	Y. ad. ♂	84	40	4.5	3.0	5.7	3.5
151901	Y. ad. ♂	80	37	2.7	3.0	5.4	3.6
151908	Y. ♂	74	31.5	2.6	2.8	4.7	3.6
151876	Y. ♂	72.5	31	2.4	2.4	5.0	3.8
151912	Juv. ♂	—	—	—	—	—	—
151902	Ad. ♀	62	26	2.3	2.3	Visible	3.8
151909	Y. ad. ♀	77	31.5	3.0	2.8	3.9	3.4
151911	Y. ad. ♀	68	28	2.2	2.2	2.8	3.5
151904	Y. ad. ♀	69	29	2.2	2.2	2.8	3.5
152474	Juv. ?	60	25	2.1	1.9	Visible	3.6

^a Juvenal, with dp⁴ recently lost; p⁴ visible but not erupted. Young adult, with p⁴ recently in place; c still slender and curved. Adult and old adults have the curved, enamel-bearing tip of the canine worn away, and its dentine root lengthened and thickened to form the tusk-like structure found in very old specimens. The exceptional degree of widening of the zygomata in males is well demonstrated. It is not certain that the zygomata of females become correspondingly widened.

marsupial from the south bank of the middle Idenburg River: 10 from Bernhardt Camp, 75 meters and three from 4 miles away, at 850 meters. The series includes old and young (but not pouch young) of both sexes. So far as I am aware, these are the only examples known, apart from the type.

Adults of *Echymipera clara* are peculiarly distinguished by their enlarged p⁴, their tusk-like canines, and widened zygomata.

The specialized pad on the hind foot mentioned by Stein is prominent in all our specimens, in contrast to the normal pad of typical *Echymipera*. Further characters, not mentioned by Stein, include the white upper and lower lips (both hair and skin), which may serve to justify the common name, "white-

(except the new Australian race of *rufescens*). Its structural distinctions have already been indicated. Only two races are clearly recognizable: the large-toothed true *doreyana* of north New Guinea and the Port Moresby region, and the small-toothed *oriomo* of the Fly River region and extreme south of New Guinea.

Echymipera doreyana doreyana
(Quoy and Gaimard)

Perameles doreyana QUOY AND GAIMARD, 1830, Voyage de la corvette l'Astrolabe, Zool., vol. 1, p. 100; pl. 16, vol. 5, of Atlas.

Perameles cockerelli RAMSAY, 1877, Proc. Linn. Soc. New South Wales, vol. 1, pp. 310, 378.

Perameles myoides GUNTHER, 1883, Ann. Mag. Nat. Hist., ser. 5, vol. 11, p. 247.

Brachymelis garagassi MIKLOUHO-MACLAY, 1884, Proc. Linnean Soc. New South Wales, vol. 9, p. 713.

Anuromeles rufiventris HELLER, 1897, Abhandl. Zool. Mus. Dresden, vol. 6, art. 8, p. 5.

Suillomeles hispida ALLEN AND BARBOUR, 1909, Proc. New England Zool. Club, vol. 4, p. 44.

Perameles doreyana alticeps and *breviceps* COHN, 1910, Zool. Anz., vol. 35, p. 724.

TYPES: Of *doreyana*, not seen (in Paris?). Of *cockerelli*, in the Australian Museum, Sydney, No. 471, young adult male, from New Ireland. Of *myoides*, B.M. No. 82.10.27-10, young female (m_4^4 not through), from Kleinschmidt, Godeffroy Museum, Dresden. Of *garagassi*, not seen but probably in Sydney. Of *rufiventris*, Dresden No. B.3281 (2482), old female, collected by Wahnes, 1896, at Bongu, Astrolabe Bay (lent for study by Dr. Meise). Of *hispida*, in the Museum of Comparative Zoölogy, juvenal, probably pouch young. Of *alticeps*, probably Berlin No. A6008, collected by Hoffmann on the Kempf Coast north of Fr. Wilhelm Hafen.

B.M. No. 77.7.18.21, young male, from Duke of York Island is a near topotype of *cockerelli*.

American Museum material includes the following: Hollandia, Sentani Lake, and Cyclops Mountains, 28; Idenburg River at 50 to 75 meters, 36; Gebroeders, Weyland Mountains, one; Japen Island, Geelvinck Bay, one. The United States National Museum has three from Hollandia and one from Sansapor, northwest Vogelkop. The collection of the Chicago Natural History Museum contains four skins with skulls and five skulls without skins from Hollandia, and one skull only from Finschhafen. No. 56368 has the minute dp_4^4 still present (its crown length, 1.6 mm.).

A young female, Genoa No. C.E. 3911 (with skull No. C.E. 598) with mammary formula three pairs, collected by Loria, extends the range of *doreyana* = *cockerelli* to Misori Island. Another, also with three pairs of mammae, taken by Loria in British New Guinea, confirms the presence of *doreyana* = *cockerelli* there. From the Port Moresby area the American Museum of Natural History has five specimens: Mafulu, two; Javereri, one; Sogeri, one; Kagi, one.

The weights of two male Chicago Natural History Museum specimens were recorded by

Stanley G. Jewett, Jr., as 1860 and 1257 grams. A small female had two young in the pouch.

Echymipera doreyana oriomo Tate and Archbold
Echymipera oriomo TATE AND ARCHBOLD, 1936, Amer. Mus. Novitates, no. 823, p. 1.

TYPE: A.M.N.H. No. 104573, male, from Dogwa, Oriomo River, Western Division, Papua.

Additional specimens of this race confirm the uniformly small size of the teeth in animals of western Papua, as compared with those of the Port Moresby area and of north New Guinea. New material from the Fly River region is as follows: Gaima, lower Fly River, one; Sturt Island Camp, one; Oroville Camp, two; Black River, one.

Echymipera rufescens

This species, recognized by its greatly narrowed skull, comparatively large incisors, and compressed fourth premolars, is here divided into two geographical races. Although some of the black-haired material found in south New Guinea may eventually be separable from true *rufescens*, I have not been able so far to differentiate it satisfactorily. The forest-dwelling *rufescens* of south New Guinea seems to be much rarer than *E. doreyana oriomo* of the open country. The second race of *rufescens*, which is new, is from Cape York, Australia.

Echymipera rufescens rufescens (Peters and Doria)

Perameles rufescens PETERS AND DORIA, 1875, Ann. Mus. Civ. Genova, vol. 7, p. 541; 1881, *ibid.*, vol. 16, p. 671.

Perameles aruensis PETERS AND DORIA, 1875, Ann. Mus. Civ. Genova, vol. 7, p. 542 (foot-note); 1881, *ibid.*, vol. 16, p. 671.

Echymipera gargantua THOMAS, 1914, Ann. Mag. Nat. Hist., ser. 8, vol. 13, p. 443.

TYPES: Of *rufescens*, Genoa No. C.E. 3909 from Kei Islands, old male, skin in alcohol, skull cleaned. Of *aruensis*, Genoa No. C.E. 3973, female, collected by Beccari in 1873. Of *gargantua*, B.M. No. 11.11.11.97, young adult male, from Wahatuna, Mimika River, at sea level, collected by G. C. Shortridge.

Material in the Archbold collections from north New Guinea includes the following: Sentani Lake, one; Cyclops Mountains, one;

Idenburg River at 75 meters, three; Western Division of Papua: Black River, 300 feet, upper Fly River, one; Sturt Island Camp, lower Fly River, four; Mabaduane, one; Mt. Mabion, 2500 feet, two; Mt. Karik, 2500 feet, one. Central Division, Papua: Javereri, Musgrave River, upper Kemp Welch River, 1500 feet, one.

This frequently black-crowned member of the large-toothed *rufescens* appears to be restricted to the forested foothills and lowlands country of western New Guinea both north and south of the mountains. There is a pronounced tendency for all the body hair to become blackish, only the underparts remaining pale. The name *rufescens* is to that extent a misnomer. The facial stripe which distinguished the species *doreyana* (= *cockerelli*) is obsolete in this present form.

The type of *gargantua*, like typical insular *rufescens* of Kei, has considerable red in its pelage. Its large size is incidental; *rufescens* is a species that grows unusually large.

***Echymipera rufescens australis*,**
new subspecies

TYPE: M.C.Z. No. 29214, adult male, from "Rocky Scrub," Rocky River, east slope of the McIlwraith Range, near Coen, Cape York, northern Queensland, collected by P. J. Darlington, June 20, 1932. Original number, 209.

GENERAL CHARACTERS: A large, pale rufescent *Echymipera*, superficially colored more like *E. d. orion* than the dark-hued *E. rufescens* of our collection, to which its skull and teeth indicate that it belongs.

SKIN: Dorsally, a mixture of light tawny and black hairs, the tawny occupying various proportions of the terminal part of the hairs, the black mainly restricted to the bases. The crown and upper part of rostrum mainly fuscous, but the demarcation of this black area from the pale underpart of the head beneath the eye is ill defined. Underparts and hands straw colored. Feet straw colored but the two large digits blackish. Tail black.

SKULL: With the characteristically very narrow zygomata of *rufescens* (in contrast to *doreyana*), long incisive foramina, relatively large incisors, compressed p^4 , and subtriangular molars. I find no racial characters.

MEASUREMENTS OF TYPE: Head and body,¹

¹ Skin measurements made in the flesh.

473 mm.; tail, 101; hind foot (c.u.), 76; ear, 31. Skull: condylobasal length, 81.2; palatal length, 50.6; greatest length of nasals, 39.5; greatest combined width of nasals, 6.0; zygomatic width, 30; mastoid width, 24; length of incisive foramina, 9.1; posterior palatal foramina, 7.0; length of alisphenoid bulla, 5.2; distance apart of bullae, 12.0. Teeth: length in toothrow of crown of i^1 , 1.4; i^2 , 1.8; i^3 , 2.0; i^4 , 1.8. External length by greatest width of p^4 , 3.6 by 2.1; m^1 , 4.1 by 3.0; m^2 , 4.0 by 3.4; m^3 , 4.4 by 4.0. Greatest length by greatest width of m^4 , 2.1 by 4.0.

Only the type specimen is known. This marks the first record of the genus *Echymipera* in Australia proper.

RHYNCHOMELES THOMAS

Rhynchomeles THOMAS, 1920, Ann. Mag. Nat. Hist., ser. 9, vol. 6, p. 430.

TYPE: *Rhynchomeles prattorum*.

This genus from the island of Ceram now appears less isolated morphologically than formerly, if it is compared with the rather newly discovered *Echymipera clara* group of northern New Guinea. The extreme attenuation of the rostrum and the secondary enlargement of p^4 are characters common to both; conversely, the unwidened zygomata of *Rhynchomeles* agree with those of the *Echymipera rufescens* group (especially with the species *E. rufescens*) and disagree with the remarkable secondary widening of the zygomata of old examples of *E. clara*. All three groups have lost i^5 , retained in the otherwise fairly closely related Australian *Perameles* and Papuan *Peroryctes*.

In *Rhynchomeles* the inner lobe (protocone) of m^4 is greatly reduced, in contrast to either *Echymipera* or *Peroryctes raffrayanus*, though only slightly more so than in *P. ornatus*. The bulla is much reduced. The zygomata are slender and the incisive foramina very long and slit-like, as in *Echymipera rufescens*.

***Rhynchomeles prattorum* Thomas**

Rhynchomeles prattorum THOMAS, 1920, Ann. Mag. Nat. Hist., ser. 9, vol. 6, p. 430.

TYPE: B.M. No. 20.7.26.34, adult male, from Mt. Manusela, Ceram, 6000 feet; collected by the Pratt brothers, February, 1920. "In heavy jungle. Formation limestone. Very precipitous country."

This species is still apparently known only

from the four specimens taken by the Pratt brothers (the type, another adult male, and adult and young females). The pelage is deep fuscous brown, glossy, with the guard hairs numerous and wool hairs scanty, shorter, and paler colored. The tail, moderately long (130 mm.), has elliptical scales wider than long, their posterior edges straight, 16 scales per cm., each scale with one hair of three to four scale lengths. The underparts are only slightly paler, except a 20-mm. wide area of self-colored white hairs on chest, about 110 mm. in length. The feet beneath are granular.

The following additional dental measurements of the type are offered: p^4 , 3.7 by 2.2 mm.; m^1 , 3.9 by 2.2; m^2 , 3.3 by 2.6; m^3 , 3.2 by 2.7; m^4 , 2.3 by 2.5. I did not measure the incisors.

ISOODON DESMAREST

Isoodon DESMAREST, 1817, Nouveau dictionnaire d'histoire naturelle, nouv. ed., vol. 16, p. 409.

TYPE: *Didelphis obesula*, by monotypy.

Incipient development of the hypocone re-

Isoodon, particularly in *I. macrourus*. The five incisors and the premolars are unmodified from the primitive condition of *Perameles* and *Rhynchomeles*.

This widespread Australian genus has attained levels of dental and audital (enlarged bulla) specialization which serve to place it wholly apart from *Perameles* and other closely related genera. It is nevertheless derived directly from *Perameles*-like ancestors, the resemblance of its pear-shaped bullae to those of *Macrotis* being explainable as a fortuitous and parallel adaptation.

Study of the members of the genus reveals what I have suspected for some time, namely, that there exist but two thoroughly distinct species groups, *obesulus* and *macrourus*. The distribution of both is wide but dissimilar. A wealth of characters serves to distinguish them. All the described forms, including even the slightly divergent *barrowensis*, appear to approach the one or the other. A number of their distinguishing characters are shown below:

	<i>obesulus</i> GROUP	<i>macrourus</i> GROUP
Adult size (head and body)	Small; ± 300 mm.	Large; 370 to 400 mm.
Length of tail	Shorter; 95 to 130 mm.	Longer; 140 to 160 mm.
Length of hind foot	Smaller; 50 to 58 mm.	Larger; 70 to 85 mm.
Ventral pelage	Gray based	Self colored
Condylbasal length	± 60 mm.	75 to 80 mm.
Length of nasals	± 25 mm.	30 to 35 mm.
Zygomatic breadth	± 26 mm.*	± 35 mm.
Greatest depth of zygoma	2.0 to 2.5 mm.	3.3 to 3.8 mm.
Palate	Much fenestrated	Little fenestrated
Accessory palatal foramina between p^{1-4}	Usually present	Usually absent
Paraoccipital process with exoccipital portion	Little broader than basioccipital portion	Twice as broad as basioccipital portion
Posterior palatal foramina extending from back of m^2 forward to	Front of p^4	Front of m^1
Caniniform i^5	Widely separated from i^4	Slightly separated from i^4
Crown length of i^4	± 1.3 mm.	± 1.5 mm.
Crown dimensions of p^4	$\pm 2.5 \times 2.0$	$\pm 4.0 \times 3.0$
In juvenals, the deciduous dp^4	Relatively molariform	Relatively blade-like
Metacone of m^4	Reduced to a very small cusp	Retained in almost unreduced condition

* Except the especially broad zygomata of *barrowensis* (28 mm.).

gion of the molars has already been noted in *Echymipera doreyana*. This condition has now become a well-developed feature in *Isoodon*, imparting to the first three molars a distinctly quadrilateral outline. The variably developed metacone of m^4 becomes more emphasized in

The *obesulus* group, with the exception of the insular *barrowensis*, is relatively homogeneous. This latter bandicoot appears to differ from the mainland species by a sufficient number of characters to warrant its retention as a full species. In it the zygomata, instead

TABLE 6

INCISIVE AND PREMOLAR DIMENSIONS IN THE *Isodon obesulus* GROUP

	<i>barrowensis</i> Ad. ♂, Type	<i>obesulus fusciventer</i> M.C.Z. No. 28044 Y. ad. ♀, Pemberton	<i>obesulus fusciventer</i> U.S.N.M. No. 237731 Ad. ♂, Busselton	<i>obesulus affinis</i> A.M.N.H. No. 65637 Ad., Tasmania	<i>obesulus affinis</i> A.M.N.H. No. 65638 Old, Hobart	<i>obesulus affinis</i> U.S.N.M. No. 238441 Y. ad. ♂ Perkins Island	<i>nauticus</i> Y. ad. ♂, Type	<i>auratus</i> (?) M.C.Z. No. 29396 Ad., North Territory	<i>peninsulæ</i> Y. ad. ♂, Type
i ¹	0.95	1.0	1.0	1.0	—	1.0	0.75	—	1.0
i ²	1.1	1.4	1.3	1.4	1.4	1.3	1.05	1.0	1.3
i ³	1.2	1.5	1.4	1.5	1.4	1.4	1.0	1.0	1.3
i ⁴	1.15	1.3	1.3	1.4	1.3	1.3	0.95	1.0	1.2
i ⁵	0.8	1.0	1.1	0.8	—	1.0	0.8	0.9	1.0
p ¹	1.9	2.4	2.5	2.1	2.3	2.3	2.0	2.0	2.5
p ²	2.0	2.7	2.7	2.3	2.6	2.5	2.0	2.0	2.7
p ⁴	1.9	—	2.7	1.9	2.8	2.6	1.6	2.1	2.7
dp ⁴	—	1.0	—	—	—	—	—	—	—

TABLE 7

CRANIAL AND MOLAR DIMENSIONS IN THE *Isodon obesulus* GROUP

	<i>barrowensis</i> Adult ♂	<i>obesulus fusciventer</i> M.C.Z. No. 28044 Y. ad. ♀, Pemberton	<i>obesulus fusciventer</i> U.S.N.M. No. 237731 Ad. ♂, Busselton	<i>obesulus affinis</i> A.M.N.H. No. 65637 Ad., Tasmania	<i>obesulus affinis</i> A.M.N.H. No. 65638 Old, Hobart	<i>obesulus affinis</i> U.S.N.M. No. 238441 Y. ad. ♂, Perkins Island	<i>nauticus</i> Y. ad. ♂, Type	<i>auratus</i> (?) M.C.Z. No. 29396 Ad., North Territory	<i>peninsulæ</i> Y. ad. ♂, Type
Condylobasal length	56.3	52.8	—	68.3	72.2	60.0	53.0	54.0	62.2
Zygomatic breadth	26.3	23.5	26.0±	30.2	32.5	26.0	25.1	25.7	28.9
Intertemporal breadth	10.4	11.0	12.5	13.2	13.0	12.5	11.7	10.6	12.3
Mastoid breadth	19.0	8.0	—	29.0	26.0	21.5	20.7	21.0	23.0
Nasals, length	24.3	21.0	26.5	27.3	27.5	25.0	21.4	21.0	25.1
Nasals, greatest breadth	4.3	3.2	4.9	5.6	5.4	5.2	4.9	4.0	4.9
Palatal length	32.0	31.5	37.0	41.0	43.6	36.4	31.0	30.5	36.7
Length bulla	11.1	9.5	11.0	12.4	11.6	10.5	10.2	12.6	12.9
p ¹ -m ⁴	12.7	—	—	—	—	—	12.1	—	14.0
m ¹⁻³	8.9	—	15.6	16.0	16.8	14.8	8.4	12.9	9.8
p ⁴ , l.×br.	1.8×1.2	—	2.7×2.3	2.5×2.3	2.8×2.2	2.4×2.3	1.8×1.2	2.3×1.7	2.2×2.0
m ¹ , l.×br.	2.9×2.5	3.3×2.6	3.7×2.8	3.8×2.9	3.4×3.1*	3.5×3.1	2.6×2.2	3.2×3.0	3.3×3.0
m ² , l.×br.	2.9×2.8	3.1×3.0	3.4×3.0	3.6×3.6	3.7×3.5	3.6×3.4	2.7×2.3	3.0×3.6	3.5×3.5
m ³ , l.×br.	2.8×2.8	3.1×3.3	3.3×3.2	3.6×3.4	3.4×3.7	3.3×3.4	2.8×2.5	2.9×3.6	3.1×3.5
m ⁴ , l.×br.	2.1×2.7	—	2.5×3.2	2.2×3.2	2.6×3.7	2.2×3.1	1.9×2.5	1.9×3.1	2.5×3.8
dp ⁴ , length	—	1.1×0.7	—	—	—	—	—	—	—

* Molars worn.

of being compressed and nearly parallel to the axis of the skull, have the broad flare of the zygomata seen in many Phascogalinae or in the didelphid genus *Marmosa*. Although this condition is probably secondary, it can also be interpreted as a case of retention of an ancient character. The secondary openings of the posterior palate (wholly within the palatal bones and close to their posterior margins) are enlarged and coalesced in *barrowensis*, whereas in *obesulus* they consist merely of a few scattered openings on either side of the median palatal suture. The dentition in *barrowensis* comprises very much smaller elements than in *obesulus*; i^{2-4} measure only 3.1 mm. in *barrowensis*, against 4.0 mm. in *obesulus*; and m^{1-4} , 9.8 mm. against 12.2 mm. Finally, though the condition of the metacone of m^4 equals that of *obesulus*, the size of the shelf on which the protocone stands, measured lengthwise in the toothrow, is substantially less in *barrowensis* (1.6 mm.) than in *obesulus* (2.0 mm.).

I have before me material representing all the members of the *obesulus* group except *nauticus*. But *nauticus*, if I may judge by Jones' diagram (1923-1925, fig. 98), representing an overlay of the skull of *nauticus* on that of *obesulus*, is essentially only a small-sized race of the latter. Certainly it shows none of the zygomatic flare of *barrowensis*. However, its m^4 , as shown in my photographs of the type, possesses a somewhat less reduced metacone than is usual in *obesulus*.

Writing of the *obesulus* group, Troughton (1941, pp. 60-63) pointed out the disparity in the size of the sexes in southern races of *obesulus* and the lack of such disparity in its northern races *auratus* and *peninsulae*.

In some respects the northern species *I. macrourus* is somewhat more primitive than *obesulus*. Its less shortened tail, less modified m^4 , and palate suggest this. On the other hand its blade-like deciduous milk premolar is more specialized than the distinctly multicuspoid deciduous milk premolar of *obesulus*.

Isoodon barrowensis (Thomas)

Perameles barrowensis THOMAS, 1901, Novitates Zool., vol. 8, p. 396.

TYPE: B.M. No. 1.5.2.6, young adult male, collected by Tunney, November 6, 1900,

from Barrow Island, northern Western Australia.

Besides my photographs of and notes on the type, I have for study U.S.N.M. No. 218462, male, received many years ago from the Australian Museum and Art Gallery (No. 3288), collected on Barrow Island, December, 1900.

The skull of *barrowensis* with its broad zygomata superficially suggests the skull of one of the small dasyures such as *Phascosorex*. The zygomatic broadening is probably a secondary character, as the other species of *Isoodon* have the zygomata compressed. Compared with the type of *peninsulae* the posterior palatal foramina and the openings between the anterior and posterior palatal foramina are larger. The teeth in the type of *barrowensis*, although narrower, are not so short as those of *I. obesulus nauticus*.

Isoodon obesulus (Shaw and Nodder)

This small-sized bandicoot is distinguished from the large species *I. macrourus* by the development of accessory palatal vacuities between the anterior premolars and by near obsolescence of the posteriorly projecting metacone of m^4 . From the more closely related *I. barrowensis* it is distinguished by the reduced flare of the zygomata, the somewhat larger size of the teeth, and lack of the large, coalescent palatal openings between m^4 - m^4 .

The species is widely distributed in Australia, its principal center of distribution including the southern half of that continent and Tasmania. From the southwest of Australia it extends northward to Derby. On the eastern side a hiatus appears to exist between typical *obesulus* of New South Wales and the tropical race *peninsulae* of the extreme north of Cape York.

The three southern races, *fusciventer*, *obesulus*, and *affinis*, are only doubtfully distinct from one another.

Isoodon obesulus obesulus (Shaw and Nodder)

Didelphis obesula SHAW AND NODDER, 1797, The naturalist's miscellany, vol. 8, pl. 298.

TYPE: None in existence. Iredale and Troughton (1934, p. 17) restrict the type locality to Sydney.

Shaw and Nodder's illustration of the "porcine opossum" is one of their poorest reproductions.

The collection of the United States National Museum includes one juvenal skin without skull from near Sydney and one a pick-up skull with most of the teeth lost, from Milton, southern New South Wales. It is to be hoped that detailed measurements of a series of this race may be published so that a satisfactory comparison may be made between it and *fusciventer* and *affinis*.

***Isoodon obesulus fusciventer* (Gray)**

Perameles fusciventer GRAY, in Grey, 1841, Journals of two expeditions . . . in . . . Australia, vol. 2, app., pp. 401, 407.

TYPE: Not seen; from King George's Sound, south Western Australia.

The Museum of Comparative Zoölogy collection contains one specimen from Pemberton and one from Bride's Cave (a pick-up skull); the United States National Museum, one from Busselton. Measurements of skull and of teeth are given in tables 6 and 7.

***Isoodon obesulus affinis* (Waterhouse)**

Perameles affinis WATERHOUSE, 1846, A natural history of the Mammalia, vol. 1, p. 373.

TYPE: Not seen; from Tasmania.

In the United States National Museum there are one from near Launceston, one male from Perkins Island, and one female without locality. H. C. Raven obtained two from near Hobart for the American Museum of Natural History. Measurements of skulls and teeth have been given (tables 6 and 7).

***Isoodon obesulus nauticus* Thomas**

Isoodon nauticus THOMAS, 1922, Ann. Mag. Nat. Hist., ser. 9, vol. 9, p. 678.

TYPE: B.M. No. 22.4.15.6, young adult male, from Franklin Island, Nuyt's Archipelago, South Australia, collected by F. Wood Jones.

I have studied the type only. This is a very small form; its teeth are only about three-quarters of the size of *peninsulae*. For dimensions of the skull and teeth, see tables 6 and 7.

***Isoodon obesulus auratus* (Ramsay)**

Perameles auratus RAMSAY, 1887, Proc. Linnean Soc. New South Wales, ser. 2, vol. 2, p. 551.

Perameles auratus THOMAS, 1904, Novitates Zool., vol. 11, p. 227; 1922, Ann. Mag. Nat. Hist., ser. 9, vol. 9, p. 679, from Derby, north Western Australia.

Thomas (1922) remarked upon the type, the measurements of which had been sent him by Mr. Waite. All characters indicate its membership with the small-sized group.

At the Museum of Comparative Zoölogy a form of *obesulus* (No. 29396) taken at The Granites, Northern Territory, seems to represent *auratus*. The skin of this animal is very much paler than any of the southern *obesulus*. Moreover, it is washed with sandy yellow and the throat is buffy, which by discoloration may have given rise to Ramsay's "golden" hues. Dental and cranial measurements have been given (tables 6 and 7).

***Isoodon obesulus peninsulae* Thomas**

Isoodon peninsulae THOMAS, 1922, Ann. Mag. Nat. Hist., ser. 9, vol. 9, p. 679.

TYPE: B.M. No. 15.3.5.71, young adult male, from Utingu, near the tip of Cape York, north Queensland, collected by R. Kemp, September 20, 1912. I have seen only the type. The cranial and dental measurements of the type are given in tables 6 and 7.

***Isoodon macrourus* (Gould)**

This, the largest of the few species of *Isoodon*, is characterized by its usually (but not always) entire anterior palate, large m^4 , and long tail. It includes true *macrourus* of Northern Territory, *torosus* of northern New South Wales and Queensland (which should probably be synonymized), and the race *moresbyensis* of south New Guinea.

Although the Papuan and the Australian forms of *macrourus* can be readily recognized by color differences, the former being much the darker, the same cannot be said of the two continental forms, *macrourus* proper of the Northern Territory and *torosus* of the northeast of Australia. I suspect that Ramsay's character based on throat color is not diagnostic; it may even be a food stain. Of the many specimens of *torosus* from Queensland before me, not one shows any conspicuous yellowing of the neck. In other respects *torosus* and *macrourus* appear to be alike.

***Isoodon macrourus macrourus* (Gould)**

Perameles macroura GOULD, 1842, Proc. Zool. Soc. London, p. 41.

TYPE: B.M. No. 42.5.26.11, old male, from Port Essington, Northern Territory.

A fine series of seven specimens from "100

***Isoodon macrourus torosus* (Ramsay)**

Perameles macroura var. *torosus* RAMSAY, 1877, Proc. Linnean Soc. New South Wales, vol. 2, p. 12.

TYPE: Not seen; from Cooktown, north Queensland.

Miss Neuhäuser collected two from Lake

TABLE 8
INCISIVE DIMENSIONS IN THE *Isoodon macrourus* GROUP

	<i>macrourus</i> Type, Old Male	<i>torosus</i> Type, Old Male	<i>moresbyensis</i> A.M.N.H. No. 105864 Fly River, Adult Male
i ¹	1.1	1.0	1.0
i ²	1.5	1.5	1.5
i ³	1.5	1.5	1.6
i ⁴	1.4	1.5	1.5
i ⁵	1.2	1.4	1.4
p ¹	2.6	2.2	2.3
p ³	2.65	3.1	2.5
p ⁴	3.0	3.5	3.2

TABLE 9
CRANIAL AND MOLAR DIMENSIONS IN THE *Isoodon macrourus* GROUP

	<i>macrourus</i> Type, Old Male	<i>torosus</i> Type, Old Male	<i>moresbyensis</i> A.M.N.H. No. 105864, Fly River, Adult Male
Condylbasal length	78.0	84.0	74.4
Zygomatic breadth	36.5	40.0	34.0
Intertemporal breadth	—	12.0	11.0
Mastoid breadth	24.0	29.0	24.0
Nasals, length	30.5	35.7	31.0
Nasals, greatest breadth	5.1	5.4	6.2
Palatal length	46.5	50.5	46.0
Length bulla	12.5	13.5	12.5
p ⁴ -m ⁴	19.7	21.0	18.0
m ¹⁻³	12.5	13.4	11.0
p ⁴ , length by breadth	3.3×2.9	3.8×2.4	3.6×2.5
m ¹ , length by breadth	3.8×3.6	4.3×3.7	3.7×3.3
m ² , length by breadth	3.9×4.3	4.3×4.3	3.6×3.7
m ³ , length by breadth	4.3×4.5	4.5×4.3	3.8×3.7
m ⁴ , length by breadth	4.5×4.6	—×4.3	3.5×3.8

miles south of Port Darwin" represents this race in the United States National Museum. The Museum of Comparative Zoölogy has one female from The Granites, Northern Territory, taken in 1932.

Barrine, two from Evelyn, one from Rocky Scrub, and 11 from Coen for the Archbold collections.

The United States National Museum has three and a "skull only" from Atherton; the

Museum of Comparative Zoölogy has one from Molloy, northern Queensland, procured by P. J. Darlington, and one from the Dawson Valley, southern Queensland. At the American Museum of Natural History are three skulls, one from Ravenshoe, another from Babinda Creek, both places in northern Queensland, the third from Glen Ferneigh, New South Wales. Thomas recorded specimens from Inkerman collected by Stalker.

The largest specimen of *torosus* in our collection is a male from Lake Barrine (A.M.N.H. No. 107237). Its field measurements are: head and body, 488 mm.; tail, 201; hind foot, 74. The skull is badly smashed, but the teeth are intact: m^{1-4} , 18.6 mm.

***Isoodon macrourus moresbyensis* (Ramsay)**

Perameles moresbyensis RAMSAY, 1877, Proc. Linnean Soc. New South Wales, vol. 2, p. 14.

TYPE: Australian Museum, Sydney, No. 2554, adult male, mounted, with skull inside skin (in 1937); a separate label marked "type" accompanied it. Tail length, ± 140 mm.; hind foot (s.u.), 58.

The Archbold collection of the American Museum of Natural History has a very fine series of approximately 67 specimens from the following localities in New Guinea: Central Division: Boroka, Mekeo District, two; Rona Falls, two; Port Moresby, one (A.M.N.H. No. 108553); Rigo, Kemp Welch River, two. Western Division: Dogwa, Oriomo River, eight; Old Mawatta, Oriomo River, one; Middle Fly River, Lake Daviumbu, 30; Mabaduane, one; Wassi Kussa and Mai Kussa, 18; Gaima, Lower Fly River, two.

The majority of the Archbold specimens (*moresbyensis*) are very much darker and somewhat shorter haired than the Queensland specimens (*torosus*) studied. The young are especially dark. Rarely a somewhat paler example is seen—e.g., A.M.N.H. No. 105204, adult female, which I collected at Rona Falls, northeast of Port Moresby, and A.M.N.H. No. 108553, juvenal male, from Port Moresby. Such pallor may be in part due to sun bleach.

In old males from south New Guinea (Western Division) the underparts are often strongly yellowish. This may also be true in Port Moresby specimens, but those latter in

our collections, all of which lack such coloring, are too few and too young to afford proof one way or the other.

CHAEROPUS OGILBY

Chaeropus OGILBY, 1838, Proc. Zool. Soc. London, p. 26.

TYPE: *Chaeropus ecaudatus*.

There appear to be no specimens of this interesting genus in any museum in America. Bensley (1903, p. 197) considered *Chaeropus* to be the most highly specialized of the bandicoots as regards foot structure and believed it derived from *Perameles*, *sensu stricto* (nearest to *P. bougainvillei*). The soft anatomy of a male animal was worked out by Parsons (1903).

The tail is relatively unshortened; its length is still more than 50 per cent of the length of the head and body. The un-reduced complement of nipples in the pouch (four pairs) is retained. The enlarged ear represents merely a parallelism with the rabbit-sized ear of *Macrotis*.

In the skull the interorbital width (see Jones, 1923–1925, fig. 127) is abnormally great, compared with the intertemporal width, so that in consequence the zygomata flare widely in front. The bullae resemble the complete, unenlarged bullae of *Perameles* and are quite unlike those of *Isoodon* or *Macrotis*. The pattern of the molar teeth has departed from the simple triangular plan of *Perameles* and *Peroryctes* and, by development of the hypocone, has reached a rectangular or even incipiently bilophodont condition. The molars most nearly resemble those of *Isoodon macrourus* but are broader in proportion to their lengths in the toothrow.

The premolars are distinctive (except for those of *Macrotis*) from the fact that the last (fourth) premolars are conspicuously smaller than the next to last (third) premolars. This condition, normal in the Dasyurinae (Tate, 1947, p. 104), is exceptional in the Peramelidae. The incisors are generalized and complete in number.

Considering the foregoing peculiarities, together with the well-known "pig-feet" of *Chaeropus*, in combination with its several unspecialized characters, I agree with Jones that its ancestry must converge on that of *Perameles*.

***Chaeropus ecaudatus* Ogilby**

Chaeropus ecaudatus OGILBY, 1838, Proc. Zool. Soc. London, p. 25.

Chaeropus castanotis GRAY, 1842, Ann. Mag. Nat. Hist., vol. 9, p. 42.

TYPES: Of *ecaudatus*, from the left bank of the Murray River, collected by T. L. Mitchell. Of *castanotis*, "scrub near the Murray River," collected by Captain Grey.

In London I saw B.M. No. 48.1.27.41 (845a), female, collected by T. L. Mitchell at Muda, New South Wales, and B.M. No. 42.2.1.33, from Murray River, South Australia, collected by G. Grey. Both specimens are labeled *castanotis*, the latter marked "type."

The crown dimensions of the teeth in the Muda specimen are: i^1 , 1.5 mm.; i^2 , 1.5; i^3 , 1.5; i^4 , 1.7; i^5 , 1.2; p^1 , 2.4; p^2 , 2.6; p^4 , 2.7 by 2.1; m^1 , 4.3 by 3.1; m^2 , 3.1 by 3.2; m^3 , 3.0 by 3.1; m^4 , 2.4 by 2.7. The length of m^{1-3} is 10.9.

Kreff (1865, pp. 12-14) wrote an interesting account of his observations on living specimens of *Chaeropus*.

***Chaeropus occidentalis* Gould**

Chaeropus occidentalis GOULD, 1845, The mammals of Australia, pt. 1, vol. 1, text of pl. 6.

TYPE: Not seen; from Western Australia, collected by Gilbert.

This name is founded upon the two front figures in plate 6 of Gould, 1845. The animal may be extinct. Shortridge (1909) implied that it might be found near Broome and Port Hedland, in the north and northwest of Western Australia.

MACROTIS REID

Macrotis REID, 1837, Proc. Zool. Soc. London, for 1836, p. 31.

Thalacomys BLYTH, 1840, Cuvier's animal kingdom, p. 104.

Paragalia GRAY, in Grey, 1841, Journals of two expeditions . . . in . . . Australia, vol. 2, app., p. 401.

TYPE: For all three genera, *Perameles lagotis* Reid.

This genus is without question the most highly specialized of the bandicoots. Such a peculiar genus has naturally attracted much attention. Work on it has been done by Schmidt (1867), Palmer (1899), Jones (1923), Finlayson (1930), and Troughton (1932).

Marked peculiarities appear in the molars and premolars, in the great inflation of the alisphenoid bullae with the additional inflation of the periotic, the enlargement of the tympanic ring, the palatal outline (approached somewhat in old males of *Echymipera clara*), the relatively great longitudinal extent of the lacrimal within the orbit, the presence of an ectoglenoid canal; in the skin, the enlargement of the ears, the spur-like tip of the tail, and the soft pelage.

The molars are highly specialized. It is difficult to find them in unworn condition, owing to lack of sufficient young specimens in our material. Bensley (1903, p. 110) described the molars as "quadrate through displacement inwards of the metacone; external styles greatly enlarged and forming with the protocone and metacone the main cusps of the crown." There is no question that an extreme degree of specialization has been reached in these teeth. The body of each tooth is rounded quadrilateral in outline. Their anterior and posterior portions are well separated by deep internal and external grooves. In fact, m^{1-3} of *Macrotis* present a considerable resemblance to the worn crown patterns of a wombat. The fourth molar, nearly circular in section, has lost almost all identity with m^4 of less altered genera. This tooth does not resemble the m^4 of the wombat, which is divided into anterior and posterior halves much as m^{1-3} . The species *M. leucura* is reported to have slightly less specialized molars.

Jones (1923) admitted four species. Troughton (1932) reduced this number to three, recognizing only *lagotis* (with many races), *minor*, and *leucura*.

I have photographs of the skulls of the types of *M. l. lagotis*, *M. lagotis sagitta*, *M. minor* (topotype), and *M. leucura* only.

My photographs of the types of *leucura*, *minor*, and *lagotis* indicate specific distinctness for each. This view accords with that of Troughton (1932). The first two stand closer to each other than either does to the third. Unfortunately I have no specimens that I can identify as either *minor* or *leucura*, so am compelled to base my opinion upon my photographs and measurements of types of these two and upon the literature.

The type of *leucura* was so young that m^4 was not visible and m_4 was just erupting. I

am not able to state with certainty whether the small premolars immediately in front of m_1^1 are unusually small permanent teeth or unusually large deciduous teeth, though I suspect the former, since in this genus p_4^4 seem invariably to be smaller than p_3^3 and in other peramelid genera dp_4^4 are already exceedingly minute. The cusps retained on the molars, mentioned by Thomas (1888), are readily to

1925, p. 340) was taken from that of Spencer, whose original specimens are believed to be at Melbourne. Those skulls should be re-examined in order to determine whether rounded bullae and paracones are present. It appears to me that the paroccipital processes are exceptionally broad at their contacts with the bullae in *leucura* and in "*minor*," in contrast to the same contact areas in *lagotis*, also

TABLE 10
DIMENSIONS OF TYPE SPECIMENS OF *Macrotis*

	<i>leucura</i> Juvenal Male	<i>minor</i> Topotype Adult Male	<i>miselliae</i> Adult Male	<i>lagotis</i> Old Female	<i>sagitta</i> Adult Male
Hind foot (s.u.)	53	—	70	107	90
Condylobasal length	48	72	66.5	97	80
Zygomatic breadth	23	35.3	30.5	42	37.5
Intertemporal breadth	10.7	9.3	10.7	11.7	12.7
Mastoid breadth	—	28.8	22.1	31.6	28
Nasals, length	—	31.2	29.0	46	39.6
Nasals, greatest breadth	4.3	6.1	5.9	6.7	7.3
Palatal length	28	43	39	61	50.5
Anterior palatal foramina	5.0	7.0	6.0	9.3	9.5
Posterior palatal foramina	4.0	7.5	8.0	18	12.5
Length of bulla	11	15	14	16	13.5
m_1^{1-3}	10.1	9.9	10.0	—	12.6
p_4^4 , length by breadth	1.2×1.2^a	2.6×1.8	$2.5 \times$ —	3.6×1.9	3.3×1.8
dp_4^4 , length by breadth					
m^1 length by breadth	3.6×2.8	3.5×2.6	3.5×2.6	4.2×4.3	4.1×3.8
m^2 length by breadth	3.3×3.2	3.3×3.3	3.3×3.3	4.2×5.3	4.2×4.5
m^3 length by breadth	3.3×3.4	3.2×3.5	3.0×3.3	4.5×4.7	4.2×4.0
m^4 length by breadth	—	2.0×2.8	2.2×2.6	3.6×3.6	3.2×3.4

^a This may instead be dp_4^4 , but, if so, its degree of size reduction is far less advanced than in other genera.

be discerned in my photographs. It appears that in this species the paracone, standing between the protocone and parastyles, is retained, while this same cusp is absent in the case of the more specialized species *lagotis*.

A further character to be noted in the type skull of *leucura* is the nearly spherical form of the bullae, in contrast to the pyriform bullae of *minor* and *lagotis*.

Macrotis minor is known to me only from my photograph of a supposed topotype. This specimen has pyriform bullae as in *lagotis*. Its teeth are too much worn for me to be able to tell whether or not a paracone was present. It could be merely one of the forms of *lagotis*. The figure of "*minor*" shown by Jones (1923—

that m^4 is less terete (see measurements of type).

I have treated *leucura* as the least specialized of the species of *Macrotis* and *lagotis* as the most specialized.

Macrotis leucura (Thomas)

Peragale leucura THOMAS, 1887, Ann. Mag. Nat. Hist., ser. 5, vol. 19, p. 397.

TYPE: B.M. No. 83.10.19.17 (1900a), juvenal male, collected by J. Beazley, without locality. Jones (1923, p. 351) states that Beazley was "at that time employed as taxidermist to the South Australian Museum . . ."

I find no record of any other examples being caught. Jones refers to a fawn-colored

form in Western Australia, but that may not be the same as *leucura*.

The crown lengths of the incisors and premolars are: i^1 , 0.8 mm.; i^2 , 1.0; i^3 , 1.15; i^4 , 1.4; i^5 , 1.3; p^1 , 2.8; p^2 , 2.8. There is a slight space between i^4 and i^5 .

Macrotis minor Spencer

For reasons already explained this species with its two races is kept separate from *leucura*. Additional work may show that it should be merged specifically.

Macrotis minor minor Spencer

Macrotis minor SPENCER, 1897, Proc. Roy. Soc. Victoria, new ser., vol. 9, p. 6.

TYPE: A series of paratypes from 40 miles northeast of Charlotte Waters is at Melbourne (Troughton, 1932, p. 232, footnote). Troughton suggested that *minor* may be sub-specifically allied to *leucura* (p. 234).

B.M. No. 8.11.16.5, adult male, collected by A. B. Meek, is a near topotype from Charlotte Waters.

The first and fifth incisors are both set off from i^{2-4} by small diastemata. The crown lengths of the incisors and premolars are: i^1 , 0.65; i^2 , 1.0; i^3 , 1.1; i^4 , 1.1; i^5 , 1.1; p^1 , 2.85; p^2 , 2.7; p^3 , 2.55.

Macrotis minor miseliae (Finlayson)

Thalacomys minor miseliae FINLAYSON, 1932, Trans. Proc. Roy. Soc. South Australia, vol. 56, p. 168.

TYPE: South Australia Mus. No. M.3465, adult male, from Cooncherie, near Diamantina, east of Lake Eyre, South Australia.

When I visited Melbourne in 1937 Mr. Finlayson kindly allowed me to make a few notes upon the type, but I was unable to make any measurements.

Macrotis lagotis (Reid)

I agree with Troughton (1932) that the various relatives of *lagotis* should be united as races. Six such races, however, are perhaps too many. In all, I have before me eight specimens of *M. lagotis*. The single juvenal (but not very young) male skull is about equal in size to that of one of the adult females. In it the extreme zygomatic flare characteristic of age in either sex is yet undeveloped. Its teeth give the appearance of being small only be-

cause of their taper terminally; as they continue to grow out and wear down, their size in section increases, their alveoli becoming correspondingly larger. Although the molars in *Macrotis* appear to be open rooted, this is not actually so, as can be seen in teeth that have become loosened. The molars $1-3$ have each a single large internal root and two shorter external roots.

Macrotis lagotis lagotis (Reid)

Perameles lagotis REID, 1837, Proc. Zool. Soc. London, for 1836, p. 129.

TYPE: B.M. No. 55.12.24.68 (skin), with B.M. No. 50.11.22.31 (skull), old female from Swan River, Western Australia, collected by A. Gordon (Zool. Soc.).

I have been able to examine two old males from Broome Hill (M.C.Z. No. 17765 and U.S.N.M. No. 154994) and two adult females (A.M.N.H. Nos. 74486 and 74487) from Gingin, also one old male and one young male "zoo" specimen, each without locality.

The crown lengths of the incisors and premolars are: i^1 , 1.0 mm.; i^2 , 1.6; i^3 , 1.8; i^4 , 1.85; i^5 , 1.6; p^1 , 3.9; p^2 , 4.0; p^3 , 3.6. The space between i^5 and i^4 is 0.9.

Macrotis lagotis interjecta Troughton

Macrotis lagotis interjecta TROUGHTON, 1932, Australian Zool., vol. 7, p. 227.

TYPE: Sydney, No. M.4351; (allotype No. M.4639), from Rawlinna, Trans-Australian Railway, Western Australia.

There are no specimens of this form in American museums.

Macrotis lagotis nigripes (Jones)

Thalacomys nigripes JONES, 1923, Rec. South Australian Mus., vol. 2, p. 347.

TYPE: Probably at Adelaide Museum, from Ooldea Soak, Trans-Australian Railway, South Australia. Not seen by me. No example in America.

Macrotis lagotis sagitta (Thomas)

Thalacomys sagitta THOMAS, 1905, Ann. Mag. Nat. Hist., ser. 7, vol. 16, p. 426.

TYPE: B.M. No. 3.5.21.2, adult male, from Killalpanina, east of Lake Eyre, South Australia, collected by H. J. Hillier.

To this race I have referred two specimens,

M.C.Z. No. 31095 from Barrow Creek, north of Alice Springs, and A.M.N.H. No. 153412, adult female from Roseberth, Birdsville area, southwestern Queensland (east of Alice Springs). I am doubtful of the validity of this (and other) races, as the two specimens before me are scarcely distinguishable from females of similar age from Western Australia.

The type of *sagitta* is a younger animal than that of true *lagotis* and its molars, due to youth, present narrower crown surfaces. The crown lengths of the incisors and premolars are: i^1 , 1.1 mm.; i^2 , 1.6; i^3 , 1.7; i^4 , 1.8; i^5 , 1.4; p^1 , 4.0; p^3 , 3.7; p^4 , 3.4.

***Macrotis lagotis grandis* Troughton**

Macrotis lagotis grandis TROUGHTON, 1932, Australian Zool., vol. 7, p. 229.

TYPE: At Adelaide Museum; from Nalpa, Lake Alexandrina, South Australia. Not represented in American museums.

***Macrotis lagotis cambrica* Troughton**

Macrotis lagotis cambrica TROUGHTON, 1932, Australian Zool., vol. 7, p. 230.

TYPE: Sydney Museum, No. M.677, adult male, from Bathurst, 100 miles west of Sydney, New South Wales. We have no examples in American museums.

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