

## Taxonomic appraisal of *Zyzomys* (Rodentia, Muridae) with descriptions of two new species from the Northern Territory, Australia.

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### Abstract

Five species of *Zyzomys* are recognised: *Z. woodwardi* (Thomas), *Z. pedunculatus* (Waite), *Z. argurus* (Thomas), *Z. maini* sp. nov. and *Z. palatalis* sp. nov. Diagnoses and descriptions, assisted by multivariate analyses, are provided for all of these species.

Phenetic analyses indicates that the two new species cluster closely with *Z. woodwardi* and *Z. pedunculatus*. *Z. argurus* is separate.

### Introduction

The five named forms currently placed in the genus *Zyzomys* by most modern workers (e.g. Ellerman 1949, Tate 1951, Watts and Aslin 1981) are *Mus argurus* Thomas, 1889; *Mesembriomys argurus indutus* Thomas, 1909; *Laomys woodwardi* Thomas, 1909; *Conilurus pedunculatus* Waite, 1896 and *Conilurus pedunculatus* [var. *brachyotis*] Waite, 1896.

The status of *Z. argurus indutus* and *Z. pedunculatus* [var. *brachyotis*] has received little further examination; the latter probably because of confusion surrounding the validity of the type specimens (see Aitken 1976).

Begg (1983) relates that the Central Rock-rat, *Z. pedunculatus*, is one of the rarest Australian rodents. It was first collected in central Australia in 1896. Since then it has been collected on only five occasions. The last of these was in 1960 in the western MacDonnell Range. Its distribution is believed to be restricted to rocky ranges surrounding Alice Springs. Watts and Aslin (1981) state that the Common Rock-rat *Z. argurus*, occurs in rocky habitat in the Pilbara and Kimberley regions and some adjacent near-coastal islands off Western Australia, across the northern part of the Northern Territory to Northern Queensland, excluding the top half of Cape York Peninsula. The Large Rock-rat, *Z. woodwardi* (*s.l.*) is restricted to the Kimberley region of Western Australia and the Alligator River region of Northern Territory.

My initial interest in the taxonomy of this group resulted from the observation that the body mass and aspects of maturity of a population of *Zyzomys* '*woodwardi*' at Nourlangie Rock, Northern Territory, reported on by Begg (1981) were markedly different from individuals studied at Mitchell Plateau, Kimberley region (Bradley *et al.* 1987). Comparison between Western Australian *Z. woodwardi* and this Northern Territory form of *Zyzomys* indicated that a number of morphological differences, in

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addition to overall size, existed between individuals from these areas. These differences were such as to warrant description.

This paper reports on the results of a morphological taxonomic appraisal of collections of Western Australian and Northern Territory *Zyzomys* specimens available for study and describes two new species of *Zyzomys*.

## Materials and Methods

### Measurements

Twenty three measurements (in mm) of skull, dentary and dental characters, five of external characters, a count of the number of scale rows in one centimetre of tail length, and weight (in gms) were recorded from adult specimens listed in "Specimens Examined". These measurement points for skull, dentary, dental and foot pad characters are shown in Figure 1.

### Pelage and skin

Colour of pelage when capitalised follows Ridgway (1912). Specimens were regarded as adult if M3 was fully erupted and basicranial sutures were ossified.

### Morphometric analyses

Only adults were included in the statistical appraisal. Means, standard deviations and ranges were computed for skull, dentary, teeth (thereafter referred to as skull characters) and external characters (body measurements and tail scale counts). Sexual dimorphism was examined using a two factor MANOVA of each of the skull and external characters for the factors, species and sex.

Principal component analysis, based on a correlation matrix of the skull characters using varimax rotation, was performed. The first three principal component scores were examined. Canonical variate (discriminant) analysis was performed on skull characters for the recognised species. A dendrogram was produced for both skull and external characters, using UPGMA. All the above analysis were performed using both scaled (Z-values) and unscaled values. All analyses were performed on a COMPAQ computer using SPSS/PC+.

Principal component and discriminant analyses were not presented for external characters because many individuals had missing values for various external characters.

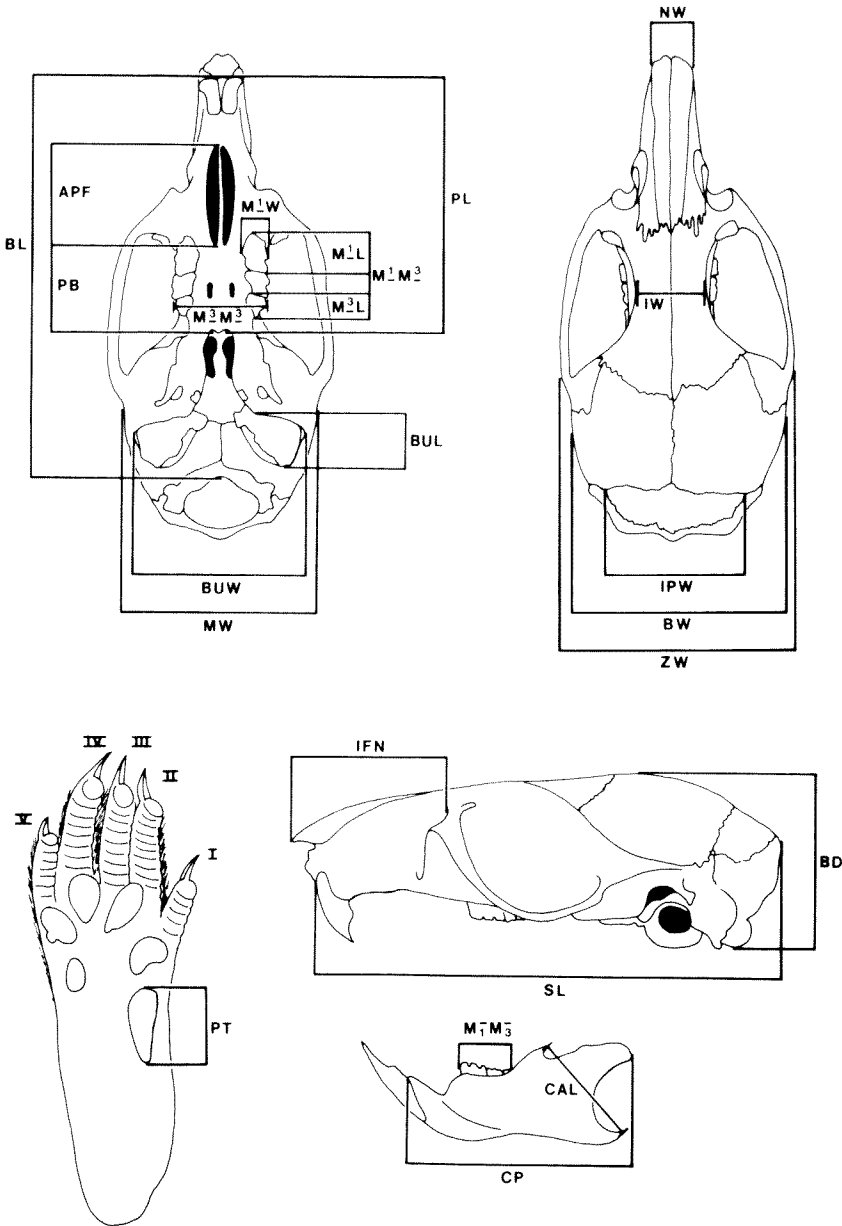
## Systematics

### *Zyzomys* Thomas

*Zyzomys* Thomas, 1909, Ann. Mag. nat. Hist., Ser. 8, 3: 372

*Laomys* Thomas, 1909, Ann. Mag. nat. Hist., Ser. 8, 3: 373

Thomas (1909) placed *Mus argurus* and *Zyzomys argurus indutus* in *Zyzomys* and *Conilurus pedunculatus* and *Laomys woodwardi* in *Laomys*. He distinguished these



**Figure 1.** Measuring points for skull, dental, dentary and pes pads used in this study. See caption of Table I for greater detail.

genera on the basis that the teeth of *Zyzomys* were (like *Mesembriomys*) not especially laminate where as those of *Laomys* were distinctly laminate. Also *Zyzomys* differed in having a well marked re-entrant concavity on the posterior margin of  $M_1$  and  $M_2$  "in which a distinct median supplementary cusp is placed". *Zyzomys* also had a more thinly haired tail which may be incrassated. The tail of *Laomys* was thickened basally. Tate (1951) considered that these characters used by Thomas (1909) were subgeneric.

Tate (1951) rediagnosed the genus *Zyzomys* as follows: molars with external and median cusp of each loph fused while the internal ones were separate and functional; skull moderately arched; lacrimals large; interorbital area smooth, without sharp edges; frontoparietal suture strongly bowed posteriorly; interparietal wide; zygomatic plate unmodified but maxillary zygomatic process broad; palate elongate, extending 1 mm behind  $M^3$ , with strong median spine; incisive (anterior palatine) foramina elongate, extend back to about middle of first loph of  $M^1$ ; mesopterygoid fossa narrow, unroofed and slightly lyrate in form; ectopterygoid fossa shallow; squamosal alisphenoid suture remote from foramen ovale and alisphenoid canal; postsquamosal sinus and bulla unmodified.

Tate (1951) disinclined to merge *Zyzomys* and *Laomys* into one genus as did Ellerman (1949) and retained them as subgenera on the basis of the difference in the structure of the postsquamosal sinus. Tate (1951) states that in *Zyzomys* this sinus is modified such that the tip of the inferior process is broadened to a near rectangular plate which contacts both the mastoid and the occipital closing the mouth of the sinus. The sinus is "very narrow and is pointed at its deepest part, while its lower containing bar is somewhat broader than is the sinus". On the other hand he states that in *Laomys* the squamosal sinus is broad, relatively widely open "and is margined on its lower side by a process, the thickness of which is about one-third of its length". Tate also remarks that *Laomys* differs slightly from *Zyzomys* in that the talonids are further reduced to minute posterior cingula on  $M_1$  and  $M_2$ . Examination of the series of *Zyzomys* available to me indicates that the shape, and indeed existence, of the postorbital sinus varies considerably within species. For example, in *Zyzomys woodwardi* it ranges from absent to long and open. Similarly in *Zyzomys argurus* it may be absent to long and thin but open, to moderately wide and open. Given the variability of this character and the lack of other consistent major characters that are singular to *Zyzomys* or *Laomys*, I have followed Ellerman (1949) and can see no reason for recognising subgenera.

Both *Z. maini* sp. nov. and *Z. palatalis* sp. nov. have only 4 abdominal teats like the other *Zyzomys* spp.

### *Zyzomys woodwardi* (Thomas, 1909)

Table 1, Figs 2-13

*Laomys woodwardi* Thomas, 1909, Ann. Mag. nat. Hist. Ser. 8, 3: 373-374

#### **Holotype**

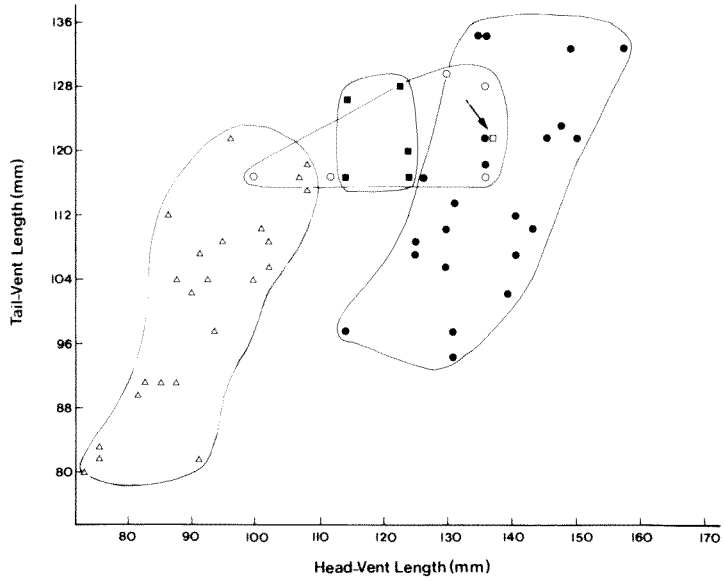
BMNH No. 9.2.16.3, original No. 29, old female.



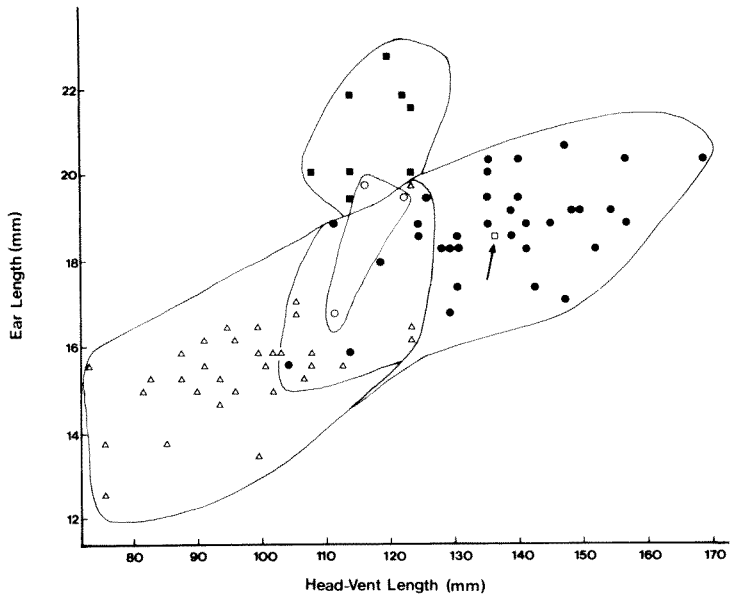
**Table 1** Mean ( $\bar{X}$ ), standard deviation (SD), minimum (Min), maximum (Max) values and sample size (N) for measurements (mm), tail scale row counts and weight (gm) for *Zyzomys* spp. Abbreviations for these measurements, counts and weight are as follows: SL, length of skull from posterior tip of occipital to anterior point of premaxilla; BL, basicranial length; IFN, infraorbital fissure to anterior tip of nasal; BD, braincase depth, lower arm of calipers placed level with pre-and basi-sphenoid, upper arm in contact with apex of skull; IPW, interparietal width; BW, braincase width; ZW, zygomatic width; IW, interorbital width; NW, nasal width; APF, anterior palatine foramen length; MW, mastoid width; BUW, distance outside bullae, caliper points in contact with anterodorsal edge of tympanic ring; BUL, bulla length, excluding eustachian projection; PL, palatal length, excluding length of postpalatal spine; PB, palatal bridge length; M<sup>1</sup>-M<sup>1</sup>, upper molar row crown length; M<sup>1</sup>L, first upper molar crown length; M<sup>1</sup>W, first upper molar crown width; M<sup>3</sup>L, third upper molar crown length; M<sup>3</sup>-M<sup>3</sup>, width outside third upper molar crowns; CP, dentary length from condyle to anterior point of dentary; CAL, tip of coronoid process to posterior edge of angular process; M<sub>1</sub>-M<sub>3</sub>, lower molar crown row length; HV, tip of rhinarium to anus length; TV, distal tip of tail to vent length; E, ear length from base of notch; PES, pes length, excluding claws; TP, thenar pad; SCALES, number of scales per one centimetre of tail length, measured approximately one centimetre from the proximal end of the tail and WT, weight.

	<i>Z. argurus</i>					<i>Z. woodwardi</i>					<i>Z. pedunculatus</i>					<i>Z. maini</i>					<i>Z. palatalis</i>
	$\bar{X}$	SD	Min	Max	N	$\bar{X}$	SD	Min	Max	N	$\bar{X}$	SD	Min	Max	N	$\bar{X}$	SD	Min	Max	N	N=1
SL	29.4	2.04	24.9	35.1	59	38.5	2.03	32.8	41.8	44	36.7	0.90	34.7	37.9	12	35.2	1.78	31.8	38.3	13	35.8
BL	24.6	1.85	21.1	30.3	58	33.0	2.12	26.1	36.3	44	31.0	1.20	28.3	32.3	12	30.9	2.14	27.1	34.2	13	31.1
IFN	8.9	0.84	7.2	11.0	60	12.1	1.01	10.0	14.5	45	11.5	0.63	10.3	12.6	12	11.5	0.65	10.3	12.7	14	12.9
BD	8.8	0.46	7.4	9.6	60	11.1	0.41	10.1	11.9	45	10.5	0.29	10.1	11.0	12	10.1	0.58	9.0	11.1	14	11.0
IPW	8.6	0.55	7.2	9.5	60	9.9	0.60	8.5	11.2	43	9.2	0.45	8.6	9.8	12	9.3	0.79	7.6	10.5	13	9.5
BW	13.3	0.58	11.8	14.7	60	16.2	0.62	14.6	17.5	45	15.4	0.31	14.9	15.9	12	15.1	0.62	13.8	16.2	14	15.9
ZW	14.1	0.85	12.3	16.7	58	18.8	1.03	16.3	20.9	44	17.3	0.40	16.8	18.3	12	17.3	0.93	15.6	18.8	10	16.8
IW	4.5	0.25	3.9	5.0	60	5.4	0.28	4.8	5.9	45	4.9	0.17	4.6	5.2	12	5.2	0.34	4.5	5.6	14	4.9
NW	2.8	0.21	2.4	3.4	60	3.7	0.29	3.0	4.6	45	3.7	0.24	3.3	4.1	12	3.4	0.31	3.0	3.9	14	3.5
APF	5.5	0.45	4.5	7.1	59	7.1	0.59	5.4	8.1	45	7.2	0.37	6.5	7.6	12	6.9	0.72	5.7	8.0	13	7.6
MW	11.4	0.57	10.1	12.8	59	14.0	0.55	12.6	15.5	45	13.6	0.50	12.7	14.4	12	12.7	0.82	11.6	14.2	12	13.1
BUW	12.2	0.58	10.8	13.9	59	15.4	0.74	13.8	17.0	43	14.8	0.30	14.3	15.2	12	14.1	0.81	12.9	15.4	12	14.6
BUL	3.9	0.21	3.5	4.4	59	4.4	0.37	3.8	5.8	44	5.1	0.25	4.8	5.6	12	4.1	0.36	3.5	4.6	13	4.8
PL	15.3	1.04	13.1	18.6	59	20.2	1.28	17.0	22.2	44	19.0	0.66	17.7	20.1	12	19.1	1.08	17.5	20.7	14	19.2
PB	5.8	0.42	4.7	6.9	48	7.4	0.61	5.1	8.1	45	7.1	0.38	6.5	7.7	12	6.8	0.39	6.3	7.6	13	7.1
M <sup>1</sup> M <sup>1</sup>	5.1	0.23	4.6	5.7	59	6.8	0.33	6.1	7.6	45	6.4	0.12	6.2	6.6	12	6.0	0.30	5.4	6.4	14	6.9
M <sup>3</sup> M <sup>3</sup>	5.3	0.32	4.7	5.9	49	7.3	0.41	6.5	8.2	45	6.7	0.26	6.4	7.2	12	6.4	0.52	5.4	7.3	14	6.9
M <sup>1</sup> L	1.1	0.10	0.9	1.3	59	1.4	0.11	1.2	1.7	45	1.5	0.10	1.3	1.7	12	1.4	0.15	1.2	1.6	14	1.5
M <sup>3</sup> L	2.5	0.20	2.1	3.2	60	3.3	0.23	2.6	3.8	45	3.1	0.17	2.8	3.4	12	2.8	0.17	2.6	3.1	14	3.6
M <sup>1</sup> W	1.4	0.07	1.2	1.6	60	2.0	0.13	1.7	2.2	45	2.0	0.05	1.9	2.1	12	1.7	0.09	1.5	1.9	14	2.1
M <sub>1</sub> M <sub>3</sub>	4.7	0.19	4.2	5.1	58	6.4	0.32	5.6	7.2	45	6.3	0.21	6.1	6.8	12	5.5	0.23	5.1	5.8	14	6.4
CP	15.9	1.24	13.5	19.9	59	21.7	1.44	18.5	24.2	45	20.3	0.67	18.6	21.0	12	19.5	1.36	17.3	21.8	14	20.3
CAL	6.5	0.66	5.1	8.2	58	9.5	0.84	6.9	10.9	45	9.5	0.48	8.0	9.7	12	8.3	0.80	6.5	9.8	14	9.0
HV	96.6	12.61	73.0	124.2	39	136.0	13.42	104.0	169.0	40	117.3	5.64	108.0	123.8	8	121.1	13.21	99.0	135.0	7	137.0
TV	100.9	12.58	80.0	121.7	26	114.4	11.90	94.4	135.0	23	121.4	5.55	116.0	127.7	5	121.4	6.99	116.0	130.0	5	121.0
E	15.6	1.18	12.6	19.7	37	18.7	1.21	15.5	20.7	35	21.0	1.21	19.5	22.7	8	18.6	1.68	16.7	19.7	3	18.5
PES	21.0	1.06	18.2	23.9	39	26.5	2.01	22.1	29.7	39	26.5	0.70	25.5	27.8	8	26.7	1.51	24.1	28.6	7	27.7
TP	2.9	0.31	2.2	3.5	39	5.1	0.62	3.4	6.1	39	3.8	0.29	3.3	4.1	8	4.5	0.64	3.9	5.6	7	4.1
SCALES	12.0	2.32	6.0	17.0	38	9.3	1.27	7.0	12.0	36	12.0	1.07	10.0	13.0	8	7.7	1.03	7.0	9.0	6	9
WT	33.4	12.85	14.0	75.0	40	131.7	34.57	68.0	210.0	37	NA	NA	NA	NA	NA	118.0	50.50	63.0	190.0	5	119.0

Taxonomic appraisal of *Zyzomys*



**Figure 2** Relationship between tail to vent length and head to vent length in male and female adult *Zyzomys* spp. ●, *Z. woodwardi*; ■, *Z. pedunculatus*; △, *Z. argurus*; ○, *Z. maini* and □, *Z. palatalis* (also indicated by an arrow).



**Figure 3** Relationship between ear length and head to vent length in male and female adult *Zyzomys* spp. Species codes as for Figure 2.

**Type Locality**

Parrys Creek, near Wyndham, E. Kimberley, Western Australia; c. 15°37'S, 128°17'E; altitude 100' (= 30.5 m). Collected by J.P. Rogers on 9 October 1908 in "rough stony gorge".

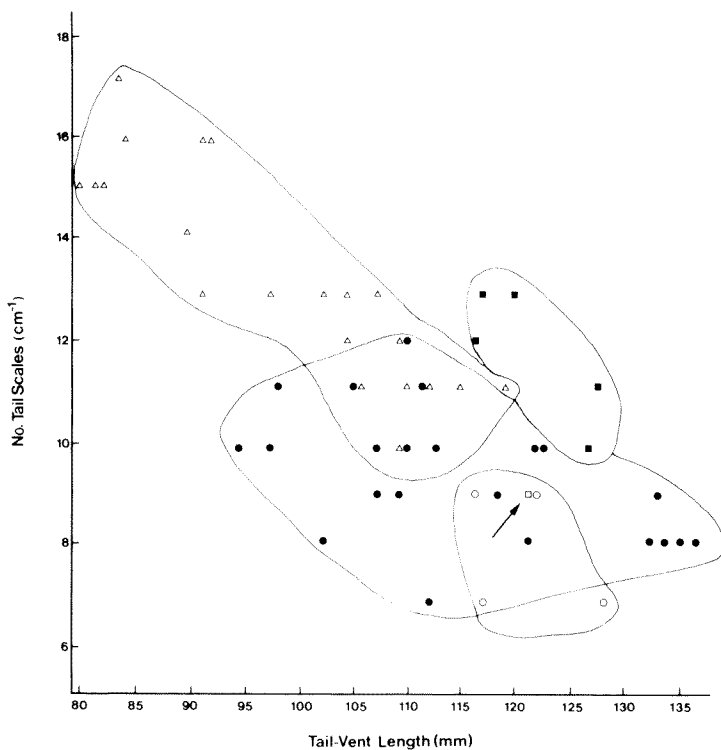
**Specimens Examined**

See later section.

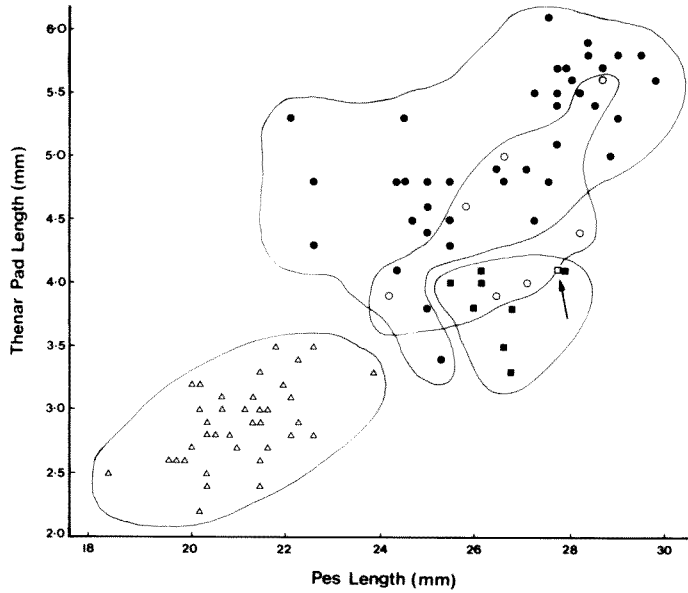
**Diagnosis**

*Zyromys woodwardi* can be distinguished from other *Zyromys* species by a combination of its large overall size (Table 1), 'grey-brown' body fur, tail length shorter than head to vent length and long M<sup>1</sup>-M<sup>3</sup>.

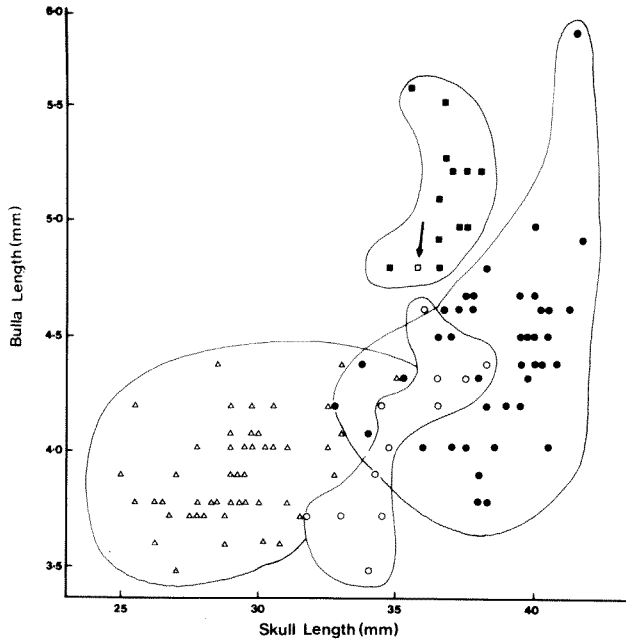
It differs from *Z. pedunculatus* by having the tail relatively shorter than head to vent length (Figure 2); tail lightly furred; pelage 'grey-brown' rather than 'light brown'; thenar pad of pes generally longer relatively to pes length (Figure 5); zygomatic plate wider, anterior edge more or less vertical without marked dorsal projection; bulla shorter relative to skull length (Figure 6), less inflated; molar rows average longer: M<sup>1</sup>-M<sup>3</sup> 6.8 (6.1-7.6) v. 6.4 (6.2-6.6); M<sup>3</sup> anterior and middle lingual cusps not close, posterior cusp mediad, not posterolabial.



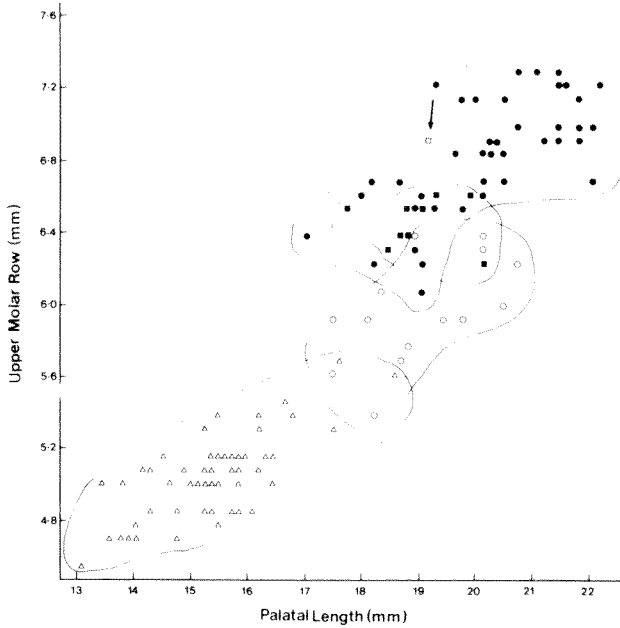
**Figure 4** Relationships between number of scale rows per centimetre of tail length (SCALES) and tail length (TL) in male and female adult *Zyromys* spp. Species codes as for Figure 2.



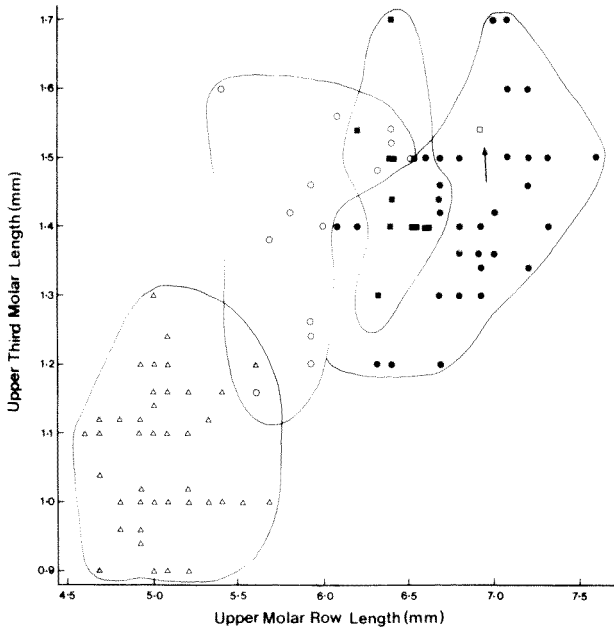
**Figure 5** Relationship between thenar pad length and pes length in male and female adult *Zyzomys* spp. Species codes as for Figure 2.



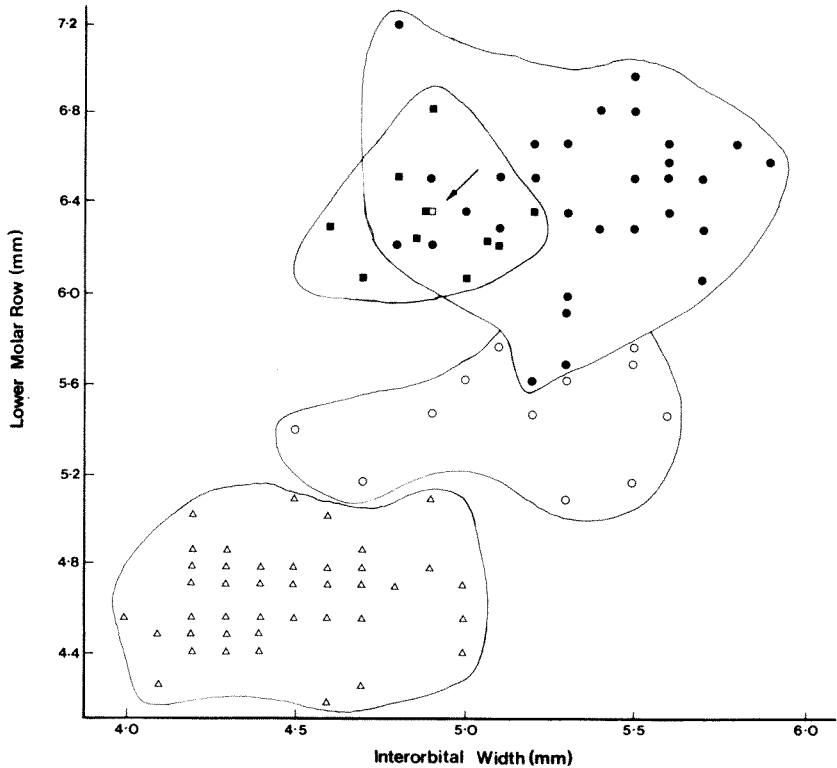
**Figure 6** Relationship between bulla length and skull length in male and female adult *Zyzomys* spp. Species codes as for Figure 2.



**Figure 7** Relationship between upper molar row length ( $M^1$ - $M^3$ ) and palatal length in male and female adult *Zyzomys* spp. Species codes as for Figure 2.



**Figure 8** Relationship between posterior upper molar length and upper molar row length in male and female adult *Zyzomys* spp. Species codes as for Figure 2.

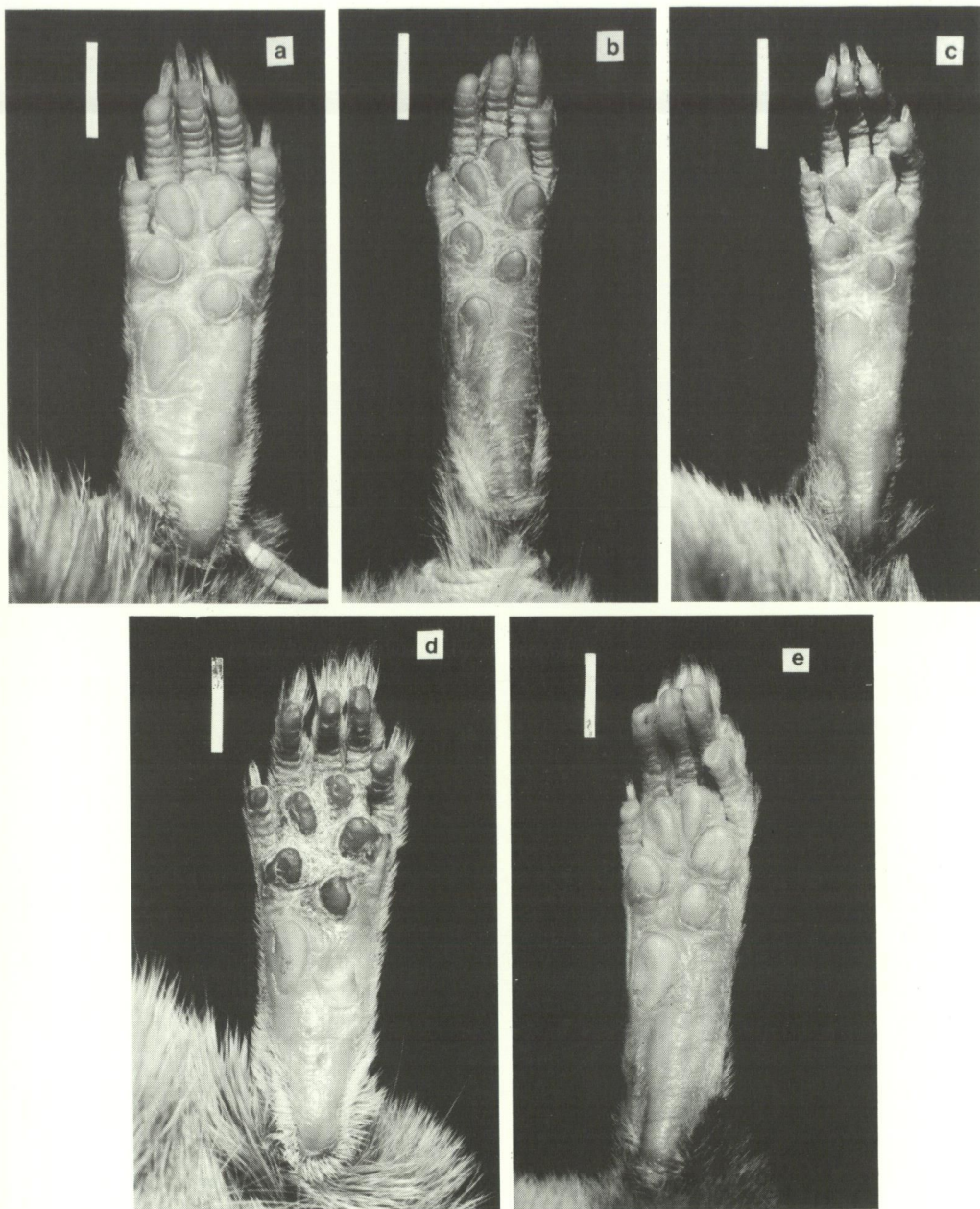


**Figure 9** Relationship between lower molar row length ( $M_1$ - $M_3$ ) and interorbital width in male and female adult *Zyzomys* spp. Species codes as for Figure 2.

It differs from *Z. argurus* by being generally larger in all measurements (Table 1); tail to vent length shorter than head to vent length (Figure 2); fewer scale rows per cm of tail length relative to tail length (Figure 4); thenar pad of pes longer relative to pes length (Figure 5); lacking a pronounced concavity in the posterior margin of  $M_1$  and  $M_2$ ;  $M_3$  posterior cusp closer to labial cusp; occipital condyles almost in line rather than noticeably anterior to posterior tip of skull.

It differs from *Z. maini* in generally averaging larger in all measurements (Table 1);  $M^1$ - $M^3$  longer relative to palatal length (Figure 7);  $M_1$ - $M_3$  longer relative to interorbital width (Figure 9); thenar pad generally longer relative to pes length (Figure 5);  $M^2$  anterior lingual cusp further from its adjacent lingual cusp.

It differs from *Z. palatalis* in having anterior palatal foramen shorter relative to palatal length 0.349 (0.313-0.377) v. 0.396; anterior palatine foramen narrower, not edged at external margins by a sharp low palatal ridge;  $M^2$  lingual cusps subequal in size rather than decreasing in size posteriorly; bulla shorter relative to skull length (Figure 6).



**Figure 10** Plantar surface of right pes of male and female adult *Zyzomys* spp. (a) *Z. woodwardi*; (b) *Z. pedunculatus*; (c) *Z. argurus*; (d) *Z. maini*; (e) *Z. palatalis*. Scale line 5 mm.



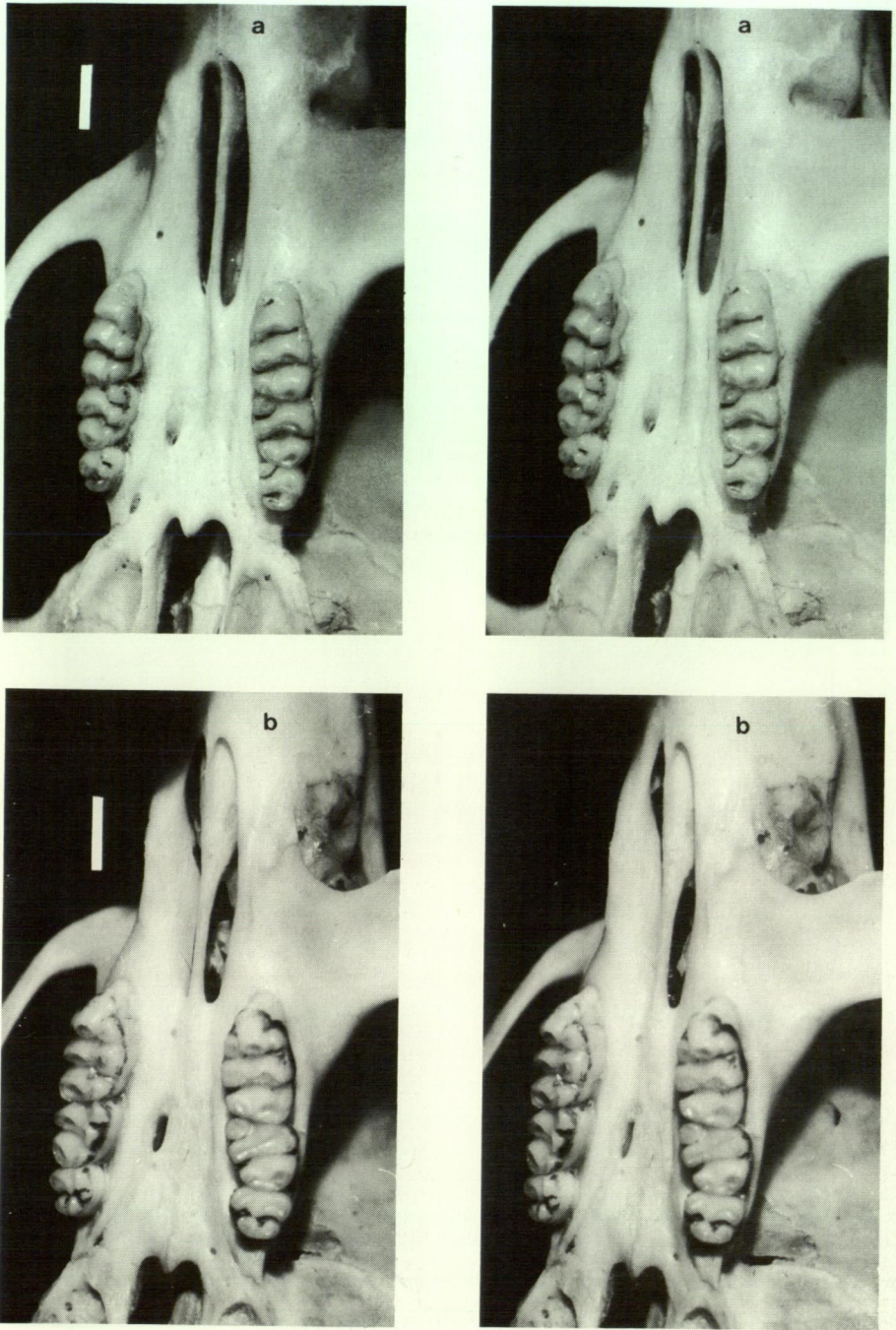


Figure 11



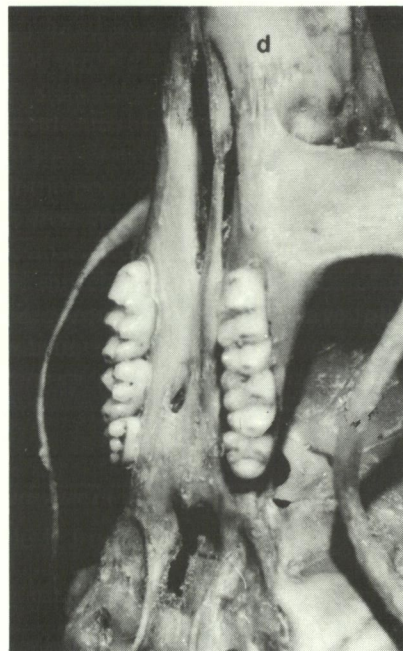
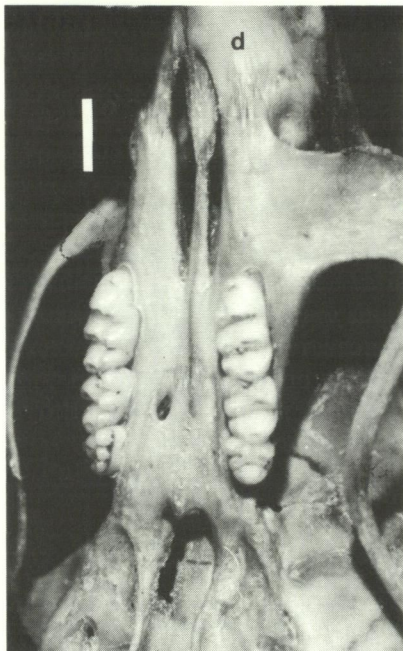
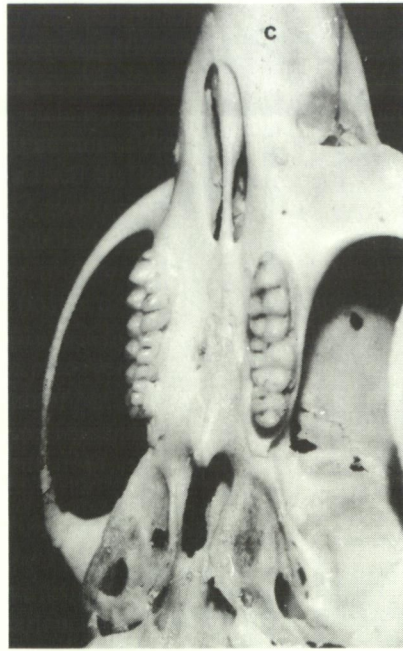
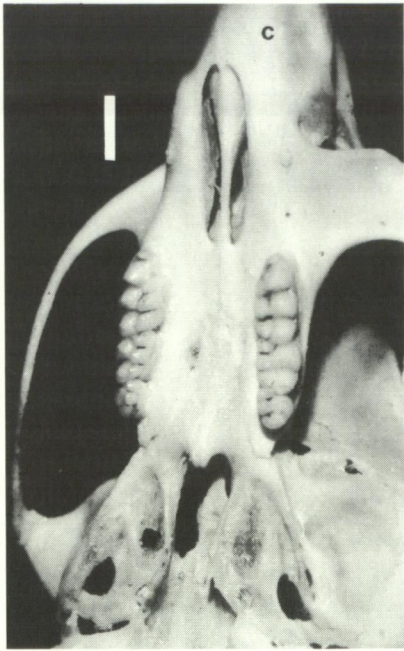
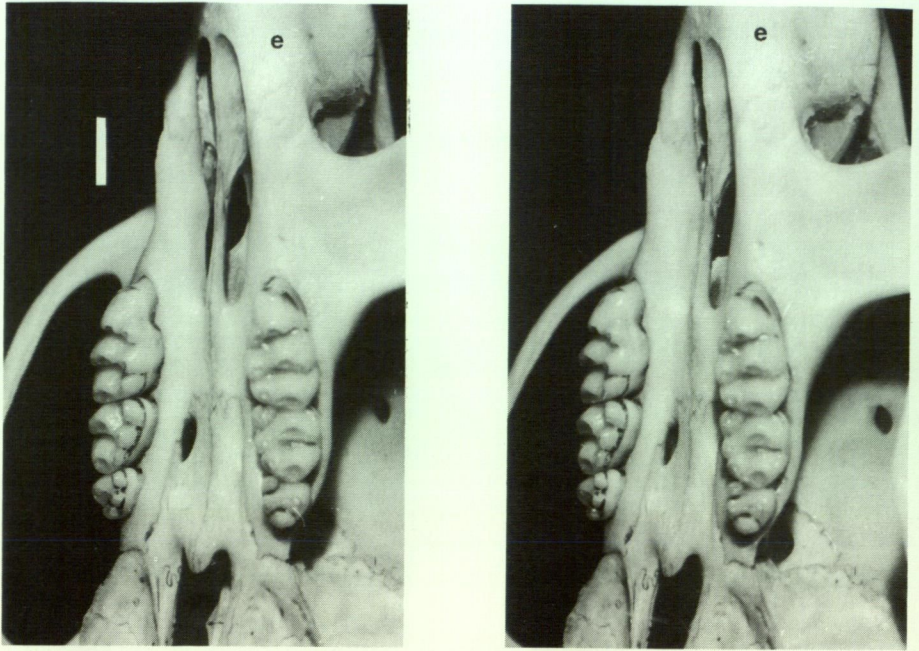


Figure 11 (continued)



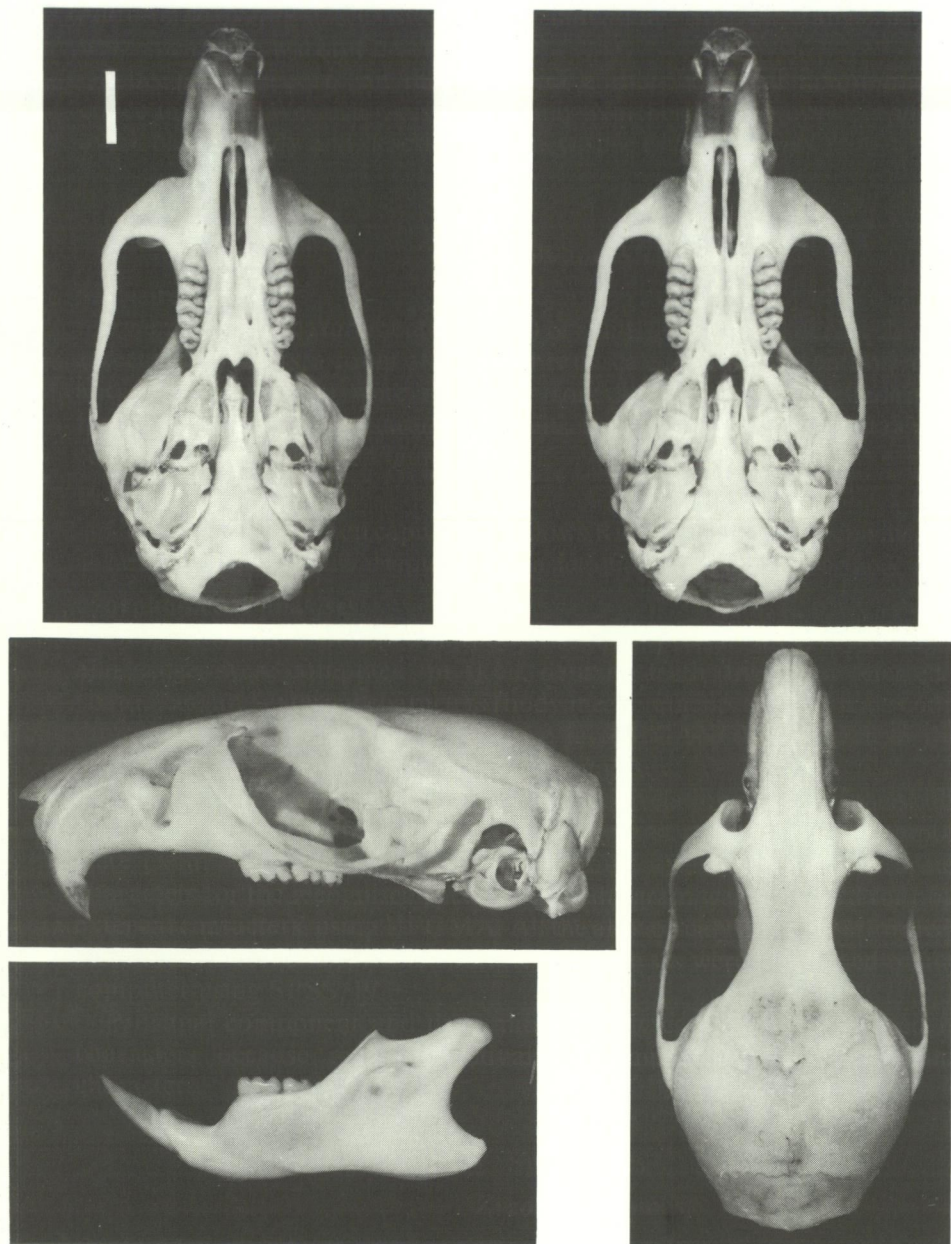
**Figure 11** Palate and molar rows of male and female adult *Zyzomys* spp. as stereopairs (a) *Z. woodwardi*; (b) *Z. pedunculatus*; (c) *Z. argurus*; (d) *Z. maini*; (e) *Z. palatalis*. Scale line 2 mm.

## Description

### *Skull and Teeth* (mean, mm) (Figures 11, 12)

Skull length 38.5; dorsal profile moderately curved; rostrum short, infraorbital fissure to tip of nasal length 12.1; nasal extends anterior to premaxilla up to 0.3; lacrimals large, inflected upwards; braincase depth moderate; braincase little inflated; anterior frontal with slight to moderate depression; anterior palatine foramen moderately wide, narrower posteriorly; premaxilla-maxilla suture sited at anterior one-third of foramen length; anterior palatine foramen projects posteriorly level with front or mid-point of anterior loph of  $M^1$ ; palate external to anterior palatine foramen generally smooth and flat, only occasionally raised to a very low smooth ridge; postpalatal spine short, broadly triangular; bulla short, slightly inflated; postsquamosal sinus absent, short or long, open or closed posteriorly, when present, superior and inferior arms of squamosal that border the sinus of approximately similar width; incisors moderately opisthodont; zygomatic plate wide, generally anterior margin gently convex, not close to rostrum (infraorbital fissure moderately wide); distance between upper molar rows narrowing slightly anteriorly; upper molars with very small labial cusps on  $M^1$ - $M^2$  lochs;  $M^1$ - $M^3$  lingual cusps distinct and functional;  $M^1$  anterior loph moderately elongate anteriorly with small anterior or anterolingual cusplet frequently present;  $M^2$  lingual cusps subequal in size;  $M^2$  anterior and middle cusp moderately separated;  $M^3$  posterior cusp mediad;  $M_1$  and  $M_2$  posterior loph slightly concave;  $M_1$  anterior loph bifurcate.





**Figure 12** Skull and dentary of *Z. woodwardi*: ventral view of skull as stereopairs. Scale line 5 mm.

## EXTERNALS

*Pelage and Skin Colour* (described from 'puppet' skins).

Overall dorsal fur colour Cinnamon Brown. Dorsal hairs range in length from *c.* 11 mm between ears to 15 mm in middle and posterior regions; basal four-fifth of dorsal hairs Pale Mouse Gray tipped with Cinnamon Buff, Snuff Brown or Sepia to provide 'flecked' appearance. Hairs on flanks similar colour to dorsal hairs, up to 13 mm long; hairs of venter with basal half Pale Neutral Gray tipped with white, up to 6 mm long; hairs on chest and throat White, up to 9 mm long on chest, shorter on throat (3 mm). Hairs on forehead with 'grizzled' appearance, up to 10 mm long, similar colours to dorsum but with more hairs tipped with Black, particularly towards rhinarium. Ears lightly clothed on the external and margins of the internal surfaces with Cinnamon Brown hairs *c.* 1 mm long.

Tail moderately furred, scales usually readily visible; on dorsal surface hairs Tawny Olive frequently tipped with Pale Pinkish Buff, 5 mm long; on ventral surface hairs White, 7 mm long.

Approximately 30 dark, long (up to 62 mm) and 20 White, short (up to 25 mm) mystacial vibrissae on each side; two Black supraorbital vibrissae, up to 38 mm long and two White ulnar carpal vibrissae, up to 12 mm long.

Skin of pes and manus Honey Yellow, proximal part of ears Wood Brown, distal half Dark Olive.

*Pes* (Figure 10)

Interdigital pad at base of digit I oval, slightly smaller than and posterior to other interdigital pads; interdigital pad at base of digit II oval, slightly posterior to interdigital pad between digit III and IV which is subtriangular, with posterior one-third overlapping with interdigital pad of digit V. This latter pad kidney shaped with moderate posteroexternal accessory pad present, subequal in size to interdigital pads of digits III/IV and of digit II. Thenar pad kidney shaped, moderately long, *c.* 2.2 mm posterior of interdigital pad of digit I; hypothenar pad oval, smaller than or subequal to interdigital pad of digit I. All pads smooth.

*Tail* (Figure 13)

Tail to vent length  $114.4 \pm 11.90$  (94.4-135.0) shorter than head to vent length  $136.0 \pm 13.42$  (104.0-169.0), usually with a thickened basal part, although this thickening is dependent on seasonal condition (Begg 1981).

The number of scale rows per cm of tail length (SCALES) is low,  $9 \pm 1.3$  (7-12) and is dependent on tail length (TV) with smaller tails having a higher number of scale rows per cm (Figure 4). The regression equation is  $SCALES = -.048 TV + 14.932$  ( $F_{1,21} = 5.180$ ,  $P < .05$ )

### Distribution

Specimens examined (Figure 22) covers most of the known localities of this species in Western Australia. The species is now known only from Western Australia. Previous records from the Northern Territory are now attributed to *Z. maini*.

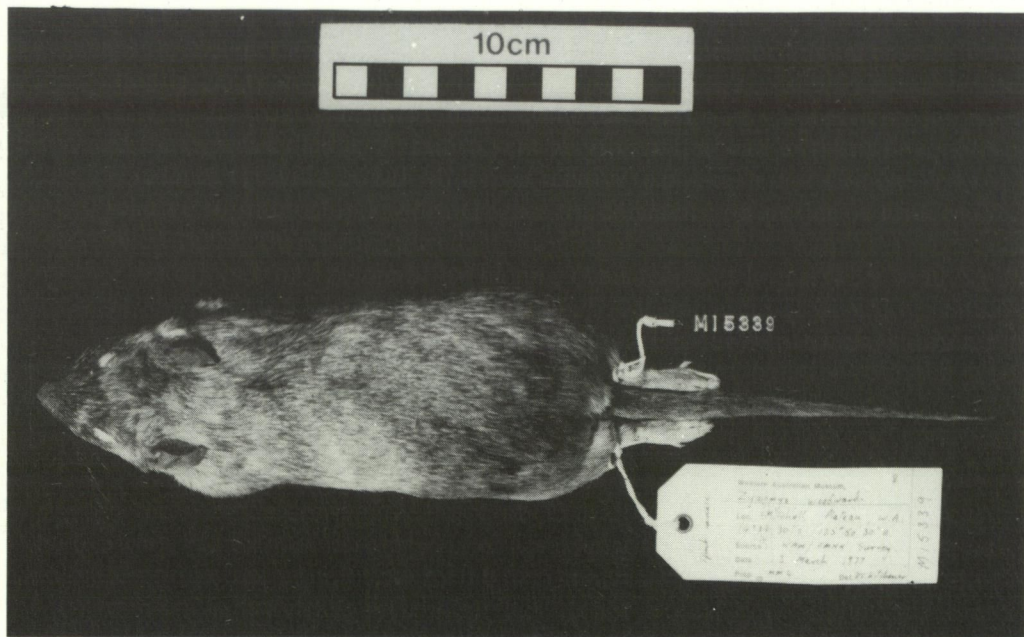


Figure 13 Dorsal view of 'puppet' skin of specimen of *Z. woodwardi*.

***Zyzomys pedunculatus* (Waite, 1896)**

Table 1, Figures 2-11, 14-15

*Conilurus pedunculatus* Waite, 1896, Rept. Horn scientific expedition to central Australia, Part II (Zoology), 395-398

*Conilurus pedunculatus* [var. *brachyotis*] Waite, 1896, Rept. Horn scientific expedition to central Australia, Part II (Zoology), 395-398

**Type Specimens**

Waite (1896) listed four male and one female syntypes labelled A to E. Syntype B is in the South Australian Museum (SAM M2437); the location of syntypes A, C, D and E is said to be uncertain. (Dixon 1970) stated that the Australian Museum probably has specimen A as AM M1064. Other possible syntypes considered by Aitken (1976) to be in the Australian Museum are AM M1158 (skin with skull separate) and AM M1298 (skin with skull *in situ*) and the South Australian Museum SAM M4384 (female in alcohol), M4385-7 (males in alcohol) and SAM M4379 (female in alcohol). However, The Australian Museum catalogue clearly indicates in Waite's own handwriting (fide T. Flannery) that specimen 'A' of this type series was catalogued as AM M1064.

**Lectotype**

Australian Museum No. 1064, male, skin with skull intact, collected by J. Field from Alice Springs, Central Australia.

**Type Locality**

Listed as Alice Springs by Waite (1896). However, W.B. Spencer, who donated the syntypes to Waite, did not collect the specimens himself (Waite 1896: 394) and therefore this locality is suspect.



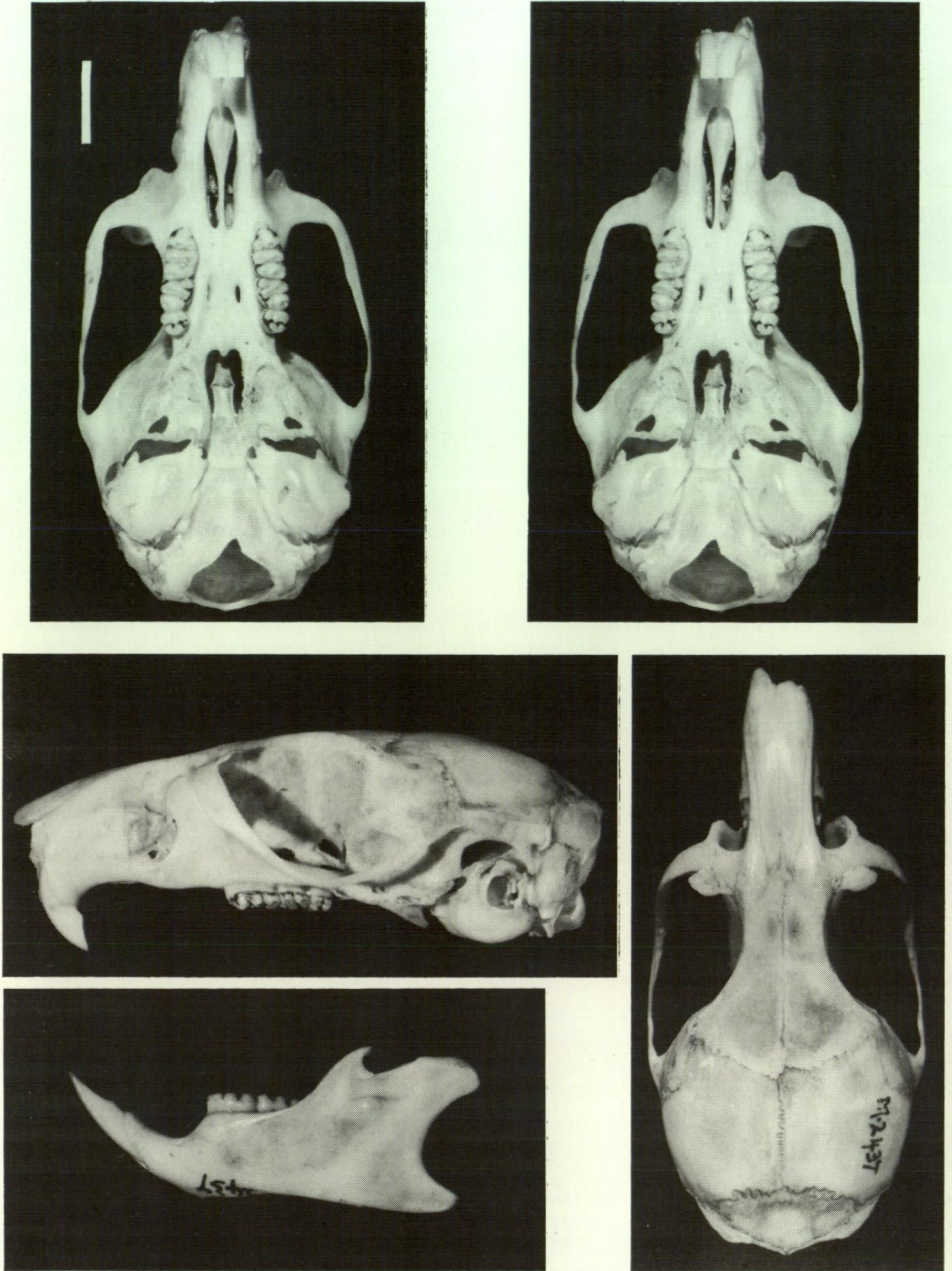


Figure 14 Skull and dentary of *Z. pedunculatus*: ventral view of skull as stereopairs. Scale line 5 mm.

**Specimens Examined**

See later section.

**Diagnosis**

*Zyomys pedunculatus* is distinguished from other species of *Zyomys* by its more heavily furred and terminally tufted tail; larger number of scale rows per cm of tail length relative to tail length (Figure 4); longer ears relative to head to vent length (Figure 3); generally longer (and more inflated) bulla relative to greatest skull length (Figure 6), M<sup>3</sup> posterior cusp more labial in position; zygomatic plate anterodorsal edge projects further forward.

It also differs from *Z. woodwardi* by having the tail to vent length subequal rather than shorter than head to vent length (Figure 2); thenar pad generally shorter relative to pes length (Figure 5); 'light brown' rather than 'grey brown' pelage; zygomatic plate narrower with anterior edge slightly concave with dorsal projection present; molar rows average shorter: M<sup>1</sup>-M<sup>3</sup> 6.4 (6.2-6.6) v. 6.8 (6.1-6.7); M<sup>3</sup> anterior lingual cusp larger rather than smaller than M<sup>2</sup> anterior lingual cusp.

It also differs from *Z. argurus* by averaging larger in all measurements (Table 1); thenar pad shorter relative to pes length (Figure 5). M<sup>1</sup>-M<sup>3</sup> longer relative to palatal length (Figure 7); M<sup>3</sup> anterior lingual cusp larger rather than smaller than M<sup>2</sup> anterior lingual cusp and lacking a pronounced concavity in the posterior margin of M<sub>1</sub> and M<sub>2</sub>.

It also differs from *Z. maini* in having the general pelage colour 'light brown' rather than 'grey brown'; M<sup>1</sup>-M<sup>3</sup> longer relative to palate length (Figure 7); interorbital width generally narrower; 4.9 (4.6-5.2) v. 5.2 (4.5-5.6); M<sub>1</sub>-M<sub>3</sub> length longer relative to interorbital width (Figure 9).

It also differs from *Z. palatalis* in having general pelage colour 'light brown' rather than 'grey brown'; orbit to nasal shorter 11.5 (10.3-12.6) v. 12.9; M<sup>1</sup>-M<sup>3</sup> shorter 6.4 (6.2-6.6) v. 6.9; M<sup>1</sup> shorter 3.1 (2.8-3.4) v. 3.6; anterior palatine foramen generally shorter 7.2 (6.5-7.6) v. 7.6, narrower; palatal ridges at edge of external margins of anterior palatine foramen much lower; M<sup>3</sup> anterior lingual cusp larger rather than smaller than M<sup>2</sup> anterior lingual cusp.

**Description**

*Skull and Teeth* (means, mm) (Figures 11, 14)

Skull moderate length, 36.7; dorsal profile moderately curved; rostrum short, infraorbital fissure to tip of nasal length 11.5; nasal usually extends anterior of premaxilla, occasionally as far as 0.4; lacrimals large, inflected upwards; braincase depth moderate; braincase little inflated; anterior frontal with moderate depression; anterior palatine foramen moderately wide, narrowing anteriorly and posteriorly; premaxilla-maxilla suture situated at anterior one-third to one-half of foramen length; anterior palatine foramen projects posteriorly level with mid point of anterior loph of M<sup>1</sup>; maxillary part of palate anterior to M<sup>1</sup> and external to anterior palatine foramen frequently raised to a low ridge but not as pronounced as in *Z. palatalis*; postpalatal spine moderately long, triangular; bulla long, moderately inflated; postsquamosal sinus varies from short to moderately long, open posteriorly, but sometimes only narrowly,

occipital spur narrow and usually intrudes halfway along superior margin of sinus, inferior arm of squamosal narrow, subequal to width of sinus, incisors moderately opisthodont; zygomatic plate narrow relative to other larger *Zyzomys* spp, anterior margin slightly concave with moderate to pronounced blunt dorsal projection, not close to rostrum (infraorbital fissure moderately wide); distance between upper molar rows narrowing slightly anteriorly; upper molars with very small labial cusps on the anterior lophs of  $M^1$  and  $M^2$  and  $M^1$  middle loph;  $M^1$  anterior labial cusp occasionally larger and quite distinct;  $M^1$ - $M^3$  lingual cusps distinct and functional;  $M^1$  anterior loph shorter relative to other species of *Zyzomys*, usually with a distinct outer lingual cusplet;  $M^2$  lingual cusps subequal in size, anterior two cusps close;  $M^3$  anterior lingual cusp larger than  $M^2$  lingual cusps, much larger than adjacent lingual cusp (from which it is separated by a considerable distance) which is sited posterolingually; the remaining  $M^3$  cusp is sited posterolabially such that the posterior of  $M^3$  appears bifurcated;  $M_1$  and  $M_2$  posterior loph margin slightly to moderately concave;  $M_1$  anterior loph bifurcate.

#### EXTERNALS

*Pelage and Skin Colour* (Described from puppet skins).

Overall dorsal fur colour Tawny-Olive; dorsal hairs range in length from 12 mm between ears to 15 mm in middle of dorsum to 17 mm in posterior regions; basal three quarters of hairs Wood Brown, most tipped with Tawny Olive but some with Buffy Brown. Hairs on flanks 18 mm, similar colour to dorsum but without or with greatly reduced Buffy Brown tipping. Hair on forehead and face similar in colour to that of dorsum. Hair on chest, throat and around mouth Pale Olive Buff, on throat 5.5 mm long and on chest 10 mm long. Venter with hairs up to 8 mm long, basal two-thirds Quaker Drab to Light Mouse Gray tipped with Pale Olive Buff laterally but in mid line areas of hairs all of Pale Olive Buff. Ears moderately furred on external surface with Buffy Brown hairs 1.5 mm long and on margins of internal surface with longer (up to 3 mm) Tawny Olive hairs. Hairs on dorsal surfaces of pes and manus Pale Olive Buff. Tail heavily haired, scales not visible. On dorsal surface of tail, hairs Warm Sepia interspersed with Cinnamon Buff, 7 mm long for basal one-quarter, remainder of tail Warm Sepia up to 20 mm long and forming a tufted end to tail. On ventral surface to tail Pale Olive Buff 6 mm long for basal one-quarter of tail and up to 13 mm at distal part of tail. On each side 16, up to 55 mm long, variously coloured Pale Olive Buff or Buffy Brown mystacial vibrissae, and c. 20 shorter (up to 20 mm) Pale Olive Buff anterior mystacial vibrissae; a single long, up to 30 mm, Pale Olive Buff supraorbital vibrissa; and two Pale Olive Buff ulnar carpal vibrissae, up to 13 mm long.

Skin of pes, manus and ears Benzo Brown.

*Pes* (Figure 10)

Interdigital pad at base of digit I moderately large and kidney shaped with small accessory external pad, subequal in size and posterior to other interdigital pads; interdigital pad at base of digit II oval shaped, slightly posterior to interdigital pad between digits III and IV which is slightly kidney shaped. Interdigital pad of digits III



and IV varies from clearly anterior to interdigital pad of digit V to its posterior margin overlapping slightly with this latter pad; interdigital pad of digit V oval shaped with moderate sized external accessory pad. Thenar pad short,  $3.8 \pm 0.29$  ( $x \pm SD$ ), oval or kidney shaped, c. 2.5 posterior of interdigital pad of digit I; hypothenar pad suboval, smaller than interdigital pad of digit I, overlapping posterior half of this latter pad; all pads smooth.

#### Tail (Figure 15)

Tail to vent length (TV) of  $121.4 \pm 5.55$  (116.0-127.7) subequal to head to vent length  $117.3 \pm 5.64$  (108.0-123.8). Number of scale rows per cm of tail length (SCALES) high  $12 \pm 1.1$  (10-13). Tail frequently considerably incassated, a character considered by Finlayson (1941) to be variable in *Zyzomys*. Shorter tails appear to have more scale rows per cm. However this relationship is not quite significant, probably because the sample size is low. The equation is  $SCALES = -0.193 TV + 35.226$  ( $F_{1,3} = 6.203, 0.05 < P < 0.10$ ).



Figure 15 Dorsal view of 'puppet' skin of specimen of *Z. pedunculatus*.

#### Distribution

Locality of specimens examined (Figure 22) represent the localised distribution of this species.

#### Referred specimens

After submission of this paper for publication two specimens (AM M7770-1) from 'Granites Goldfield', NW of Alice Springs ( $20^{\circ}34'S, 130^{\circ}22'E$ ), collected on 29 May 1953

by the Australian Museum Central and North West Expedition, were drawn to the attention of the author. These specimens were entire and in alcohol. Permission was given to the author to remove one of these skulls and to partially clean it (leaving the soft palate intact). Unfortunately this removed skull was considerably damaged at capture. Both these specimens appear to be *Z. pedunculatus*.

### Remarks

Waite (1896) described two specimens (field numbers F and G) from the syntypic series of *Conilurus* (= *Zyromys*) *pedunculatus* as differing from the other five in the series as follows "being slightly smaller, in having the ears proportionally smaller, reaching only to the posterior margin of the eye, and in the tail being shorter than the head and body. The tail is similar to the typical examples, but is less incrassated, and is destitute of yellow hairs, being black above and white below throughout; basally the hairs are scanty and do not hide the scales, but are longer distally. The scales are also much smaller, averaging seventeen to the centimetre". Waite considered specimens 'F' and 'G' represented "a well-marked variety, which may be known as var. *brachyotis*". These were from Illamurta, James Range (c. 20°18'S, 132°41'E); the other was sent from Alice Springs.

Dixon (1970) and Aitken (1976) have dealt with the uncertain provenance of supposed type material in the South Australian Museum and Museum of Victoria collections labelled 'F' and attributed to *C. pedunculatus* var. *brachyotis*. Dixon (1970) concluded that the specimen in the Museum of Victoria (NMV C7806) could not be 'F' because it is an entire male in spirit and 'F' was a male with the skull removed.

I have examined both specimen 'F' from the South Australian Museum (SAM M2412) and NMV C7806. Overall SAM M2412 skull measurements are closer to those presented from specimen 'F' in Waite's description than those of NMV C7806. However, measurements of SAM M2412 also differ somewhat more from Waite's for specimen 'F' than would be expected as a result of variation due to measurements recorded by different people.

I have also examined specimen 'G', AM M1065, from Illamurta, James Ra., a mounted skin with skull intact. This skin has a tail with 17 scale rows per cm and a tail which is shorter than the head to vent length. However, hairs on this tail are not now black above, nor are the ventral tail hairs more noticeably 'scanty' than the possible syntypic *C. pedunculatus* specimen, AM M1158, similarly mounted.

If specimens AM M1065 and SAM M2412 are syntypes of *C. pedunculatus* [var. *brachyotis*] then they do not warrant subspecific distinction from *Z. pedunculatus*. This is because the characters of colour and density of tail pelage of AM M1065 (specimen 'G') appear to fall within the range of the series of *Z. pedunculatus* available to me. Also the combination of shorter tail and high number of tail scale rows may merely reflect a young adult condition, given the general relationship between tail length and scale row number for this genus shown in Figure 4. The generally smaller size and shorter ears reported for var. *brachyotis* would also be consistent with a subadult or young adult animal and Finlayson (1941) considered it to be "definitely young".

Because of the doubtful provenance of some existing specimens attributed to *Z. pedunculatus* (s. s.), paralectotypes are not here nominated.

### ***Zyzomys argurus* (Thomas, 1889)**

#### Table 1 Figures 2-11, 16-17

*Mus argurus* Thomas, 1889, Ann. Mag. nat. Hist., Ser. 6, 3: 433-435

*Mesembriomys argurus indutus* Thomas, 1909, Ann. Mag. nat. Hist., Ser. 8, 3: 151

#### **Holotype**

BMNH No. 86.8.26.6 referred to as "adult male in spirit" by Thomas (1889). However Tate (1951) considered it a young male.

#### **Type Locality**

"South Australia" (Thomas, 1889). Tate (1951) stated that it was from "South Australia", purchased from Gerrard, a dealer. Tate (1951) further explained that at the time of the purchase of the holotype specimen "South Australia" had extended north to the Gulf of Carpentaria and Arnhemland. Only after 1909 did the boundary of South Australia contract below 26°S. It seems reasonable then, that this tropical species came from what is now recognised as the Northern Territory.

#### **Diagnosis**

*Zyzomys argurus* differs from other *Zyzomys* spp. by averaging smaller in all measurements (Table 1);  $M_3$  posterior cusp further from its labial cusp; concavity on posterior loph of  $M_1$  and  $M_2$  more pronounced.

It also differs from *Z. woodwardi* by having tail to vent longer than head to vent length (Figure 2); thenar pad shorter relative to pes length (Figure 5); occipital condyles noticeably anterior to posterior point of occipital, more scale rows per cm of tail length relative to tail length (Figure 4).

It also differs from *Z. pedunculatus* by its shorter ears relative to head to vent length (Figure 3); less heavily furred tail; generally fewer number of scale rows per cm of tail length relative to tail length (Figure 4); shorter (and less inflated) bulla relative to skull length (Figure 6); anterior edge of zygomatic plate without marked dorsal projection;  $M^3$  anterior lingual cusp smaller rather than longer than  $M^2$  anterior lingual cusp;  $M^3$  posterior cusp mediad and not labial.

It also differs from *Z. maini* by having its ears generally shorter relative to head to vent length (Figure 3);  $M^3$  shorter relative to  $M^1$ - $M^3$  length (Figure 8);  $M_1$ - $M_3$  shorter relative to interorbital width (Figure 9).

It also differs from *Z. palatalis* in having tail to vent length longer, rather than subequal, to head to vent length (Figure 2);  $M^1$ - $M^3$  shorter relative to palatal length (Figure 7);  $M_1$ - $M_3$  shorter relative to interorbital width (Figure 9); anterior palatal foramen narrower, not edged at external margin by a sharp low palatal ridge.

#### **Description**

*Skull and teeth* (means, mm) (Figures 11, 16)

Skull short, 29.4; dorsal profile as for other *Zyzomys* spp.; rostrum length moderate as judged by the infraorbital fissure to tip of nasal length of 8.9; nasal generally reaches





Figure 16 Skull and dentary of *Z. argurus*: ventral view of skull as stereopairs. Scale line 5 mm.

slightly anterior of premaxilla; lacrimals moderate size; braincase depth moderate, braincase inflation moderate; anterior frontal with very slight depression; anterior palatine foramen moderately wide, narrowing only slightly posteriorly, premaxilla-maxilla suture situated at approximate anterior one-third of the foramen length, projects posteriorly level with or at the mid point of the anterior loph of M<sup>1</sup>; palate external to anterior palatine foramen smoothly rounded and without a lateral longitudinal ridge; postpalatal spine moderate length, blunt triangular shape; bulla short, moderately inflated; postsquamosal sinus varies greatly in shape from absent to long and narrow and open posteriorly to moderately large and closed posteriorly; incisors moderately opisthodont; zygomatic plate anterior margin almost vertical or slightly concave, moderately close to rostrum (infraorbital fissure not particularly wide); distance between upper molar rows narrowing moderately anteriorly; upper molars with very small labial cusps occasionally on M<sup>1</sup> anterior and middle loph and M<sup>2</sup> anterior loph; M<sup>1</sup>-M<sup>3</sup> lingual cusps distinct and functional, M<sup>1</sup> anterior loph elongate anteriorly and frequently has a tiny anterior cingular cusplet; M<sup>3</sup> posterior cusp mediad; M<sup>2</sup> lingual cusps subequal in size; M<sup>2</sup> anterior and middle cusp close; M<sub>1</sub> loph bifurcate; M<sub>1</sub> and M<sub>2</sub> loph margin posterior with pronounced concavity; M<sub>3</sub> posterior loph turned slightly lingually such that generally further spaced from labial cusp than in other *Zyromys* spp.

#### EXTERNALS

*Pelage and Skin Colour* (Described from 'puppet' skins).

Overall dorsal fur colour varies from Clay Color (topotype *Z. a. indutus*, E. Kimberley WAM M1607, field No 9595 of J.P. Rogers) to Wood Brown (Pilbara, WAM M19906) to Hair Brown (W. Kimberley, WAM M15563) and many shades of colours in between. Dorsal hairs range in length from 7 mm between ears to 9 mm in middle and posterior regions; basal three-quarters of hairs Neutral Gray, most tipped with colours described above but also some with Chaetura Drab. Extent of darker tipping of dorsal hairs appears to vary with geography. It is more pronounced in specimens from the moister northwestern Kimberley, less so from the Pilbara region and even less again from the E. Kimberley. Hairs on flanks up to 9 mm long, similar colour to dorsum but without or with greatly reduced dark tipping to hairs. Hairs on forehead similar in colour to dorsum but basal hairs lighter grey, with WAM M16107 Pale Gull Gray. Hairs on throat and chest short, White in the 'lighter' coloured forms. However, in the 'darker' form from Mitchell Plateau, N.W. Kimberley the basal one-third of all but the central region of the throat and chest are Light Gull Gray. Hairs on the venter of the 'darker' and 'intermediate coloured' forms are light Gull Gray tipped with White, while those of the 'lighter' forms from E. Kimberley are White only. Ears lightly haired on external surface and margins of internal surface with short Vinaceous-Buff to Wood Brown hairs, 1 mm long. Hairs on dorsal surface of pes and manus White. Tail lightly haired, scales clearly visible. On dorsal surface of tail hairs Buffy Brown to Clove Brown; ventrally hairs White. For basal one-third of tail hairs 1.8 mm long, more distally up to 5 mm long. On each side of face 25 long (up to 45 mm) posterodorsal mystacial vibrissae, usually Dark Olive tipped with White, and 20 short (up to 20 mm), White anterior mystacial vibrissae;



two Dark Olive supraorbital vibrissae, up to 20 mm long; and two to three White ulnar carpal vibrissae, up to 6 mm long. Skin of pes and manus Honey Yellow. Skin of ear Olive Brown.

*Pes* (Figure 10)

Interdigital pad at base of digit I of variable shape, usually oval, subequal in size and posterior to other interdigital pads occasionally with small accessory external pad; interdigital pad at base of digit II oval to rectangular shaped, slightly posterior to interdigital pad between digits III and IV, which varies from subrectangular to kidney shaped, interdigital pad of digits III and IV varies from clearly anterior to interdigital pad of digit V, to its posterior one-quarter overlapping with this latter pad; interdigital pad of digit V oval to kidney shaped, usually with moderate sized external accessory pad. Thenar pad elongate but variable in shape from subrectangular to almost kidney shaped, short,  $2.9 \pm 0.31$  ( $x \pm SD$ ),  $c. 2.2$  posterior to interdigital pad of digit I; hypothenar pad suboval, usually slightly smaller than interdigital pad of digit I; overlapping posterior margin or posterior one-third of interdigital pad of digit I; all pads smooth.

*Tail* (Figure 17)

Tail to vent length (TV)  $100.9 \pm 12.58$  (80.0-121.7) subequal to head to vent length  $96.6 \pm 12.61$  (73.0-124.2). Number of scale rows per cm of tail length (SCALES) high  $12 \pm 2.3$  (6-17). Shorter tails have more scale rows per cm. The relationship is  $SCALES = -0.152 TV + 28.122$  ( $F_{1,24} = 104.37$ ,  $P << 0.001$ ). Tail frequently incrassate at base.

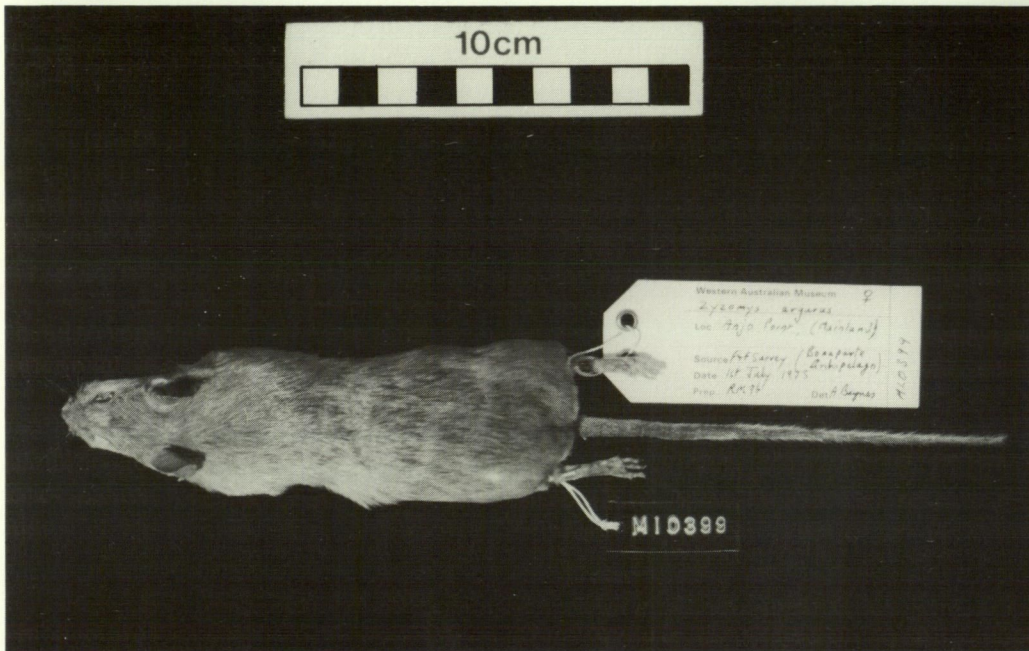


Figure 17 Dorsal view of 'puppet' skin of specimen of *Z. argurus*.

## Distribution

Specimens examined were from Pilbara and Kimberley regions and adjacent offshore islands of Western Australia and northern part of Northern Territory (Figure 22). As noted in the Introduction, the species also occurs in the northern parts of Queensland, excluding the northern half of Cape York Peninsula.

## Remarks

The form *Z. argurus indutus* is not considered subspecifically distinct from *Z. argurus*. Measurements of a *Z. a. indutus* topotype, WAM M16107: field No. 9595, collected by J.P. Rogers during the period he collected the holotype, fall within the range of those for *Z. argurus* and there appear to be no substantial shape differences. Tate (1951) stated that he was not wholly satisfied with the synonymizing of *indutus* with *argurus* principally because of the lack of grey bases in the white hairs of the ventral surface of *indutus*. However, in the series of *Z. argurus* examined by me there are a range of intermediate colour forms ranging from no basal grey on ventral hairs to grey base on abdominal hairs only, to grey base on abdominal, chest and throat hairs.

## *Zyzomys maini* sp. nov.

Table 1, Figures 2-11, 18-19

### Holotype

Northern Territory Museum, NTM (CAWC) M1002. Adult female, body in ethanol, skull separate.

### Type Locality

Djawamba Massif, 1.5 km east of Ja Ja Billabong, Northern Territory, 12°31'S, 132°54'E; altitude c. 150 m. Collected by A. Kerle on 26 August 1979 who's notes record the habitat as "amongst large boulders of creek down edge of large sandstone outlier, no grass, monsoon forest". This locality has been described by Burgman and Thomson (1982) as closed forest restricted to ravines and watercourses of the Kombolgie formations with dominant trees up to 24 m high of *Calophyllum sil.*, *Allosyncarpia ternata* up to 29 m high and *Syzygium rubiginosum* up to 24 m high. Shrub understorey usually absent and with a poorly developed herb and grass layer. *Dianella caerulea*, *Smilax australis* and *Flagellaria indica* usually present.

### Diagnosis

*Zyzomys maini* differs from *Z. woodwardi* in averaging smaller in almost all measurements (Table 1); tail length subequal rather than shorter than head to vent length (Figure 2); thenar pad generally shorter relative to pes length (Figure 5);  $M^1$ - $M^3$  shorter relative to palatal length (Figure 7);  $M_1$ - $M_3$  shorter relative to interorbital width (Figure 9).  $M^2$  anterior lingual cusp closer to its adjacent lingual cusp.

It differs from *Z. pedunculatus* by having the general pelage colour 'grey brown' rather than 'light brown'; thenar pad generally longer relative to pes length (Figure 5);  $M^1$ - $M^3$  generally shorter relative to palate length (Figure 7); interorbital width generally larger 5.2 (4.5-5.6) v. 4.9 (4.6-5.2);  $M_1$ - $M_3$  shorter relative to interorbital width (Figure 9);  $M^3$  anterior lingual cusp smaller rather than larger than  $M^2$  anterior lingual cusp.  $M^3$  posterior cusp mediad and not labial.

It differs from *Z. argurus* by averaging larger in all measurements (Table 1);  $M_3$  posterior cusp closer to its labial cusp; ears generally longer relative to head to vent length (Figure 3);  $M^3$  longer relative to  $M^1$ - $M^3$  length (Figure 8);  $M_1$ - $M_3$  longer relative to interorbital width (Figure 9); concavity on posterior margin of  $M_1$  and  $M_2$  less pronounced.

It differs from *Z. palatalis* by having orbital to nasal length shorter 11.5 (10.3-12.7) v. 12.9;  $M^1$ - $M^3$  shorter 6.0 (5.4-6.4) v. 6.9;  $M^1$  shorter 2.8 (2.6-3.1) v. 3.6;  $M^1$  narrower 1.7 (1.5-1.9) v. 2.1; bulla shorter 4.1 (3.5-4.6) v. 4.8; tail to vent length generally subequal rather than shorter than head to vent length (Figure 2); anterior palatine foramen narrower, not edged externally by sharp low palatal ridge.

### Description

*Skull and teeth* (means, mm) (Figures 11, 18)

Skull moderate length, 35.2, dorsal profile slightly more convex than other *Zyzomys* spp., sloping downwards slightly more in the region of the interparietal; rostrum length long, infraorbital fissure to tip of nasal length 11.5; nasals extend anterior to premaxilla by as much as 0.5; lacrimals large, inflected upwards; braincase depth moderate, braincase little inflated; anterior frontal with slight depression; anterior palatine foramen wide, narrowing only slightly anteriorly and posteriorly, premaxilla-maxilla suture situated at anterior one-third to one-quarter of foramen length; anterior palatine foramen projects posteriorly level with or at mid point of the anterior loph of  $M^1$ ; palate external to anterior palatine foramen smoothly rounded and without a lateral longitudinal ridge; postpalatal spine small, rounded to sharply triangular; bulla short, slightly inflated; postsquamosal sinus varies from absent to short and open posteriorly; incisors moderately opisthodont; zygomatic plate anterior margin almost vertical or slightly concave, moderately close to rostrum (infraorbital fissure not particularly wide); distance between upper molar rows narrowing slightly anteriorly; upper molars with very small labial cusps occasionally on  $M^1$  anterior and middle loph and  $M^2$  anterior loph;  $M^1$   $M^3$  lingual cusps distinct and functional,  $M^1$  anterior loph elongate anteriorly and frequently has a tiny anterolingual cingular cusplet;  $M^3$  posterior cusp mediad;  $M^2$  and  $M^3$  lingual cusps subequal in size;  $M^2$  anterior and middle cusps close;  $M_1$  and  $M_2$  posterior loph margin slight to moderately concave;  $M_1$  anterior loph bifurcate.

### EXTERNALS

*Pelage and Skin Colour* (Described from 'puppet skins').

Overall dorsal fur colour varies from Hair Brown to Snuff Brown. Dorsal hairs range in length from 8 mm between ears to 10-12 mm in middle and posterior regions, basal three-quarters of hairs Neutral Gray, most tipped with Snuff Brown or Hair Brown, occasional hairs tipped with Clove Brown or Black to produce a slightly speckled appearance. Hairs on flanks up to 12 mm long, basal three-quarters Pale Neutral Gray tipped with Vinaceous-Buff or Avellaneous. Ventral hairs up to 7.5 mm, basal one-quarter to one-half Pale Mouse Gray tipped with White. Hairs on forehead with 'grizzled' appearance, up to 6 mm long, similar colours to dorsum but interspersed with Black hairs, some tipped with White. Hairs on throat White, 1.5 mm long; on cheek



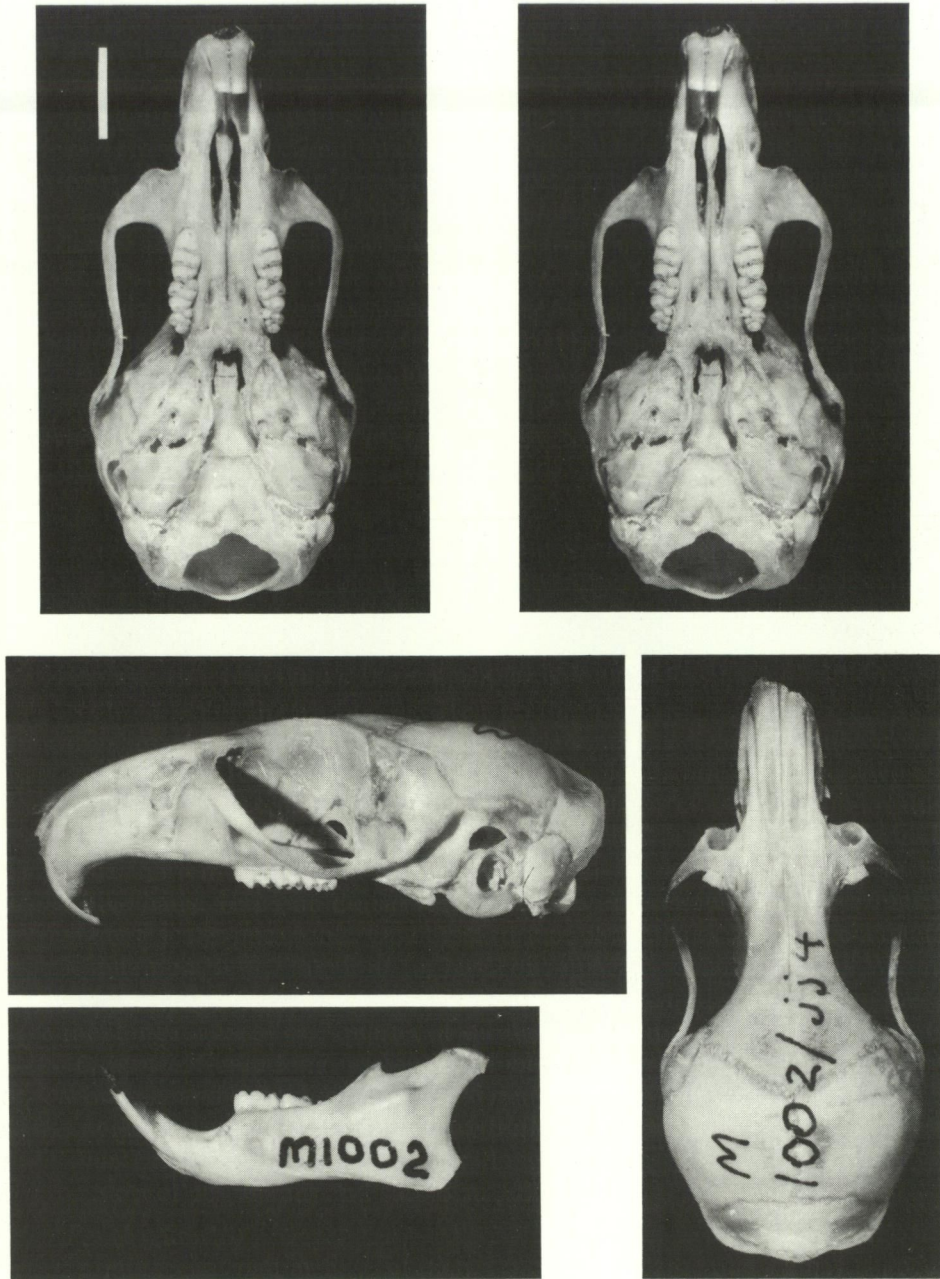
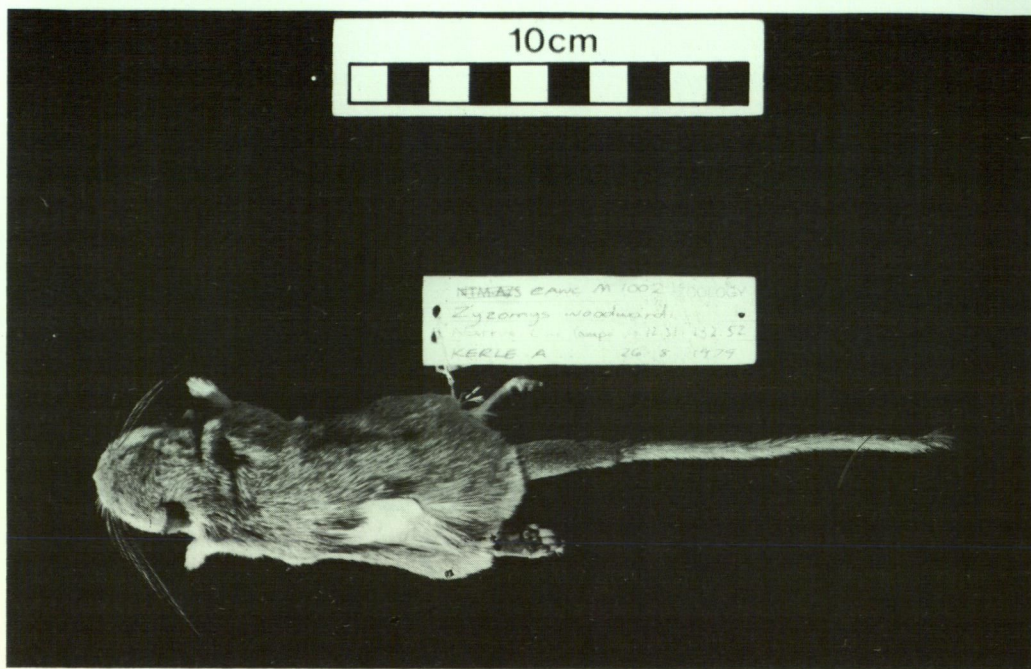


Figure 18 Skull and dentary of *Z. maini* sp. nov., holotype; ventral view of skull as stereopairs. Scale line 5 mm.



**Figure 19** Dorsal view of 'alcoholic' specimen of *Z. maini* sp. nov., holotype.

basal one-half Neutral Gray tipped with Pinkish Buff, 1.2 mm long. Ears lightly haired on external surface and margins of internal surface with short Tawny Olive or White hairs, 1 mm long; hairs on pes and manus White, 2 mm long.

Tail lightly haired, scales clearly visible. On dorsal surface of tail hairs Saccardo Umber or Light Pinkish Cinnamon, tipped with White; ventrally hairs White for basal one-third of tail, 3 mm long, more distally up to 10 mm long. On each side of face approximately 50 mystical vibrissae posterodorsally Black tipped with White, up to 60 mm long, anteroventrally White, up to 25 mm; two Black supraorbital vibrissae, up to 30 mm long; and two White ulnar carpal vibrissae, up to 10 mm. Skin of pes and manus Honey Yellow. Skin of ear Isabella Color.

#### *Pes* (Figure 10)

Interdigital pad at base of digit I oval, slightly smaller than and posterior to other interdigital pads, with two small external accessory pads in holotype; interdigital pad at base of digit II oval with small external accessory pad in holotype; interdigital pad at base of digit III oval shaped, slightly posterior to interdigital pad between digits III and IV which is subtriangular and almost completely anterior to interdigital pad of digit V. This latter pad kidney shaped with small posteroexternal pad in holotype, subequal in size in interdigital pads of digits III and IV and of digit II. Thenar pad, subrectangular, short,  $4.5 \pm 0.64$  ( $x \pm SD$ ),  $c. 2$  posterior of interdigital pad of digit I; hypothenar pad oval,

subequal in size to interdigital pad of digit I, overlapping posterior margin of interdigital pad of digit I. All pads smooth.

#### *Tail* (Figure 19)

Tail to vent length  $121.4 \pm 6.99$  (116.0-130.0) subequal to head to vent length  $121.1 \pm 13.21$  (99.0-135.0). Number of scale rows per cm tail length low  $8 \pm 1.0$  (7-9). Tail swollen and incrassated at base.

#### **Distribution**

Specimens examined are all from the central north of the Northern Territory in the region of the East and South Alligator Rivers (Figure 22). They are all found on outliers of the stony Arnhem Land escarpment. Three specimens from Unbalanja Hill, near Oenpelli, discussed by Johnson (1964), have body measurements a little larger than *Z. maini* but would appear to be attributable to this new species.

#### **Etymology**

Named after Professor A.R. Main, recently retired from the Zoology Department, University of Western Australia, in recognition of his contribution to our understanding of the biology of Australian mammals and their conservation, both through his own studies and those of his students.

### *Zyomys palatalis* sp. nov.

Table 1, Figures 2-11, 20-21

#### **Holotype**

Northern Territory Museum, NTM U1388 adult (pregnant) female, body in ethanol, skull separate.

#### **Type Locality**

Northern Territory, Echo Gorge, Wologorang Station,  $17^{\circ}12'S$ ,  $137^{\circ}41'E$ ; altitude 180 m. Elliott trapped by D.G. Langford on 10 June 1987 in *Eucalyptus dichromophloia* association on sandstone in deep gorge. Also *E. miniata* and ground cover of *Pleirachne pungens* and *Triodia microstachya*. About 100 m distant was a patch of vine thicket elements with *Ficus* sp., *Terminalia carpentariae*, *Owenia vernicosa* and *Buchanania obovata* prominent, including a number of fruiting trees.

#### **Diagnosis**

Some dental measurements for the two juvenile paratypes of *Zyomys palatalis* are presented, (in square brackets).

*Zyomys palatalis* differs from *Z. woodwardi* in having anterior palatine foramen generally longer relative to palatal length: 0.396 v. 0.349 (0.313-0.397); anterior palatine foramen broader, edged at external margins by a sharp low palatal ridge; M<sup>2</sup> lingual cusps large, decrease in size posteriorly rather than subequal in size; bulla longer relative to greatest skull length (Figure 6).

It differs from *Z. pedunculatus* by its less heavily furred tail; fewer scale rows per cm of tail length relative to tail length (Figure 4); general pelage 'grey brown' rather than 'light brown'; shorter ears relative to head to vent length (Figure 3); M<sup>3</sup> posterior cusp medial rather than labial; zygomatic plate anterodorsal edge more or less straight, does not project markedly forward, orbit to nasal longer 12.9 v. 11.5 (10.3-12.6); M<sup>1</sup>-M<sup>3</sup> longer



6.9 [6.5, 6.6] v. 6.4 (6.2-6.6);  $M^1$  longer 3.6 [3.4, 3.5] v. 3.1 (2.8-3.4); anterior palatine foramen generally longer 7.6 v. 7.2 (6.5-7.6);  $M^3$  anterior lingual cusp subequal rather than larger than  $M^2$  anterior lingual cusp.

It differs from *Z. argurus* in exceeding the maximum values for most measurements of that species (Table 1); tail to vent length shorter, rather than subequal, to head to vent length (Figure 2).  $M^1$ - $M^3$  longer relative to palatal length (Figure 7);  $M_1$ - $M_3$  longer relative to interorbital width (Figure 9); concavity on posterior loph of  $M_1$  and  $M_2$  slight rather than pronounced.

It differs from *Z. maini* by having orbit to nasal longer 12.9 v. 11.5 (10.3-12.7);  $M^1$ - $M^3$  longer 6.9 [6.5, 6.6] v. 6.0 (5.4-6.4);  $M^1$  longer 3.6 [3.4, 3.5] v. 2.8 (2.6-3.1);  $M^1$  wider 2.1 v. 1.7 (1.5-1.9); bulla longer 4.8 v. 4.1 (3.5-4.6); tail to vent shorter, rather than subequal to head to vent length (Figure 2), anterior palatine foramen wider, edged externally by sharp low palatal ridge.

### Description

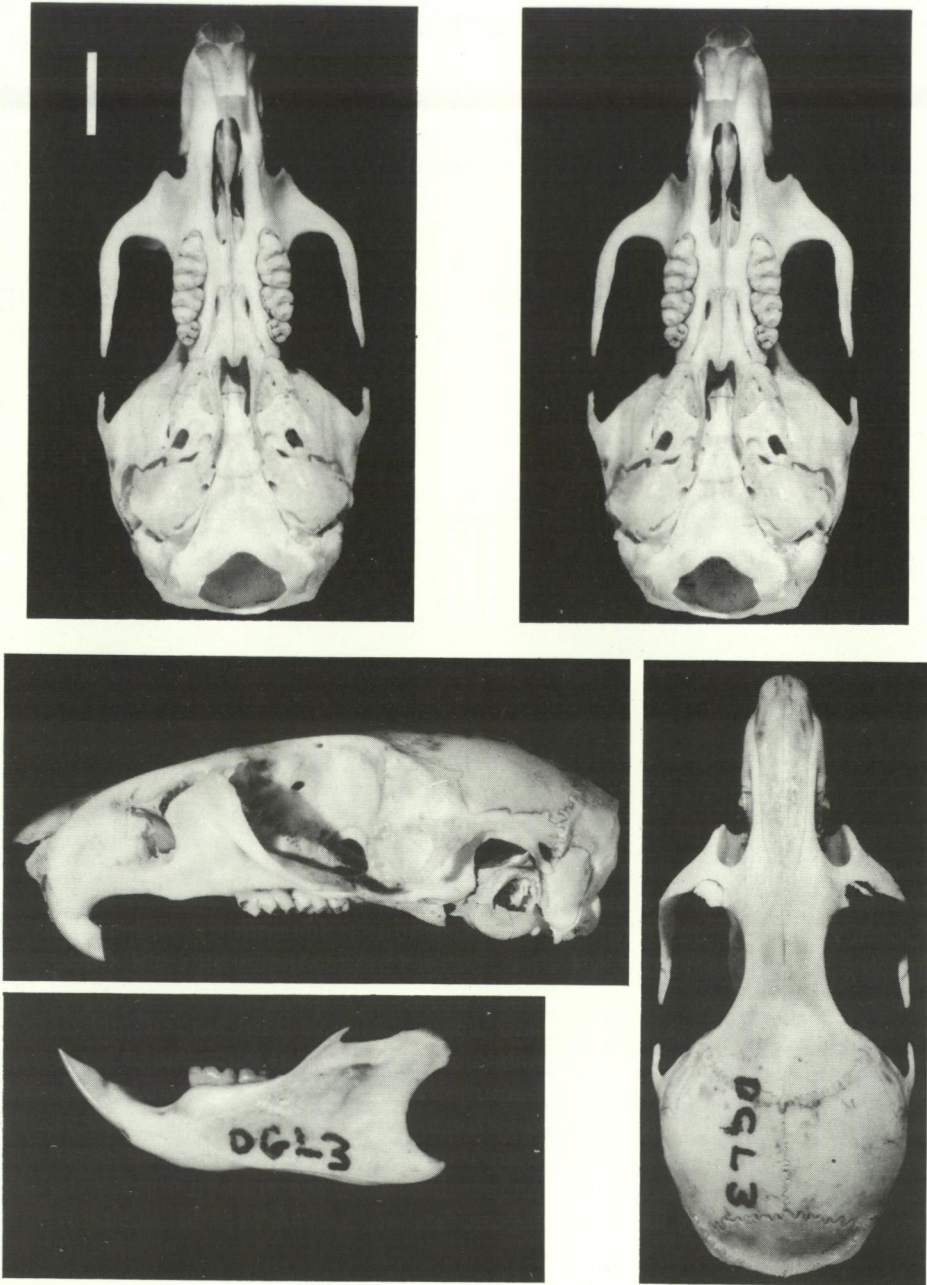
#### *Skull and Teeth* (Figures 11, 20)

Skull moderate length, holotype 35.8; dorsal profile moderately curved; rostrum short, infraorbital fissure to tip of nasal length in holotype 12.9; nasal extends anterior to premaxilla in holotype by 0.6; lacrimals large, inflected upwards; braincase depth moderate, braincase little inflated; anterior frontal with slight depression; anterior palatine foramen wide, narrowing only slightly anteriorly and posteriorly; premaxillamaxilla suture situated at anterior one-third of the foramen length; anterior palatine foramen projects posteriorly level with midpoint of anterior loph of  $M^1$ ; maxillary part of palate anterior to  $M^1$  and external to anterior palatine foramen raised to a low (c. 0.5) ridge that is sharp edged for its anterior half (also very pronounced in the juvenile paratypes); postpalatal spine large, bluntly triangular; bulla moderately long, moderately inflated; postsquamosal sinus of holotype moderately long, 1.3, inferior arm of squamosal edging sinus narrow, subequal to width of sinus, open posteriorly; incisors very opisthodont as a result (and combined with the long anterior palatine foramen) when viewed vertically, the palate visible anterior to this foramen relatively much less than in other *Zyzomys* spp; zygomatic plate of holotype wide, anterior margin slightly concave with slight dorsal blunt projection, not close to rostrum (infraorbital fissure moderately wide); distance between upper molar rows narrowing slightly anteriorly; upper molars with very small labial cusps on  $M^1$  and  $M^2$  lochs;  $M^1$  to  $M^3$  lingual cusps distinct and functional,  $M^1$  anterior loph elongate anteriorly with small anterior cingular shelf;  $M^2$  and  $M^3$  lingual cusps decrease in size posteriorly;  $M^2$  anterior and middle cusps separate;  $M^3$  posterior cusp mediad;  $M_1$  and  $M_2$  posterior loph margin slightly concave;  $M_1$  anterior loph bifurcate.

#### EXTERNALS

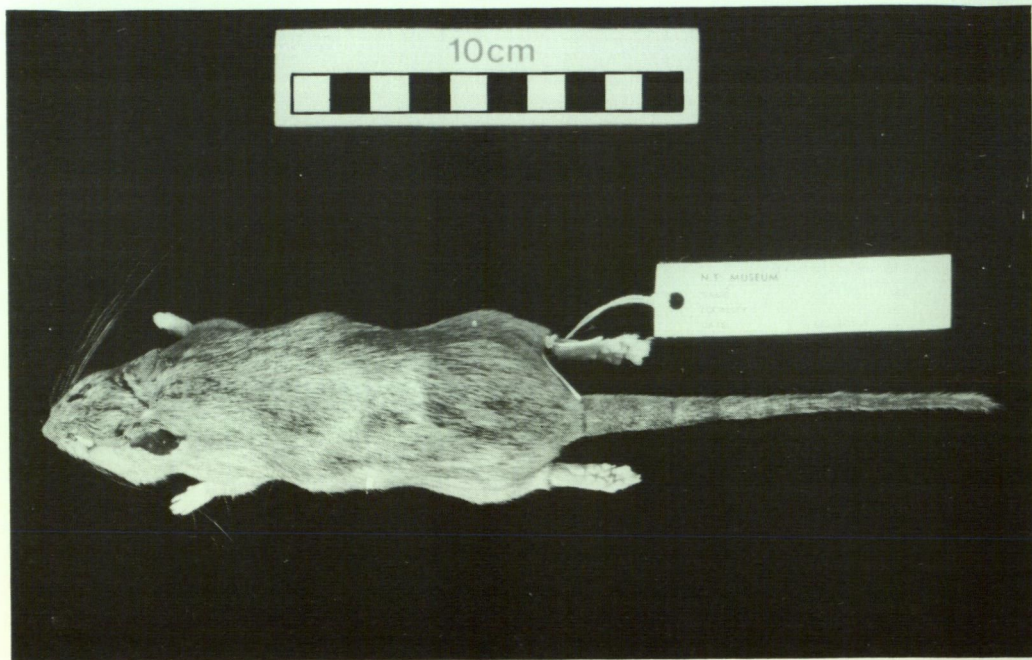
*Pelage and Skin Colour* (Described from carefully dried holotype 'alcoholic' specimen).

Overall dorsal fur colour Buffy Brown; dorsal hairs range in length from 10 mm between ears to 13 mm in middle and posterior regions, basal two-thirds of hairs



**Figure 20** Skull and dentary of *Z. palatalis* sp. nov., holotype; ventral view of skull as stereopairs. Scale line 5 mm.





**Figure 21** Dorsal view of 'alcoholic' specimen of *Z. palatalis* sp. nov., holotype.

Neutral Gray tipped with Cinnamon Buff or Black. Hair on flanks 10 mm long, basal three-quarters Neutral Gray mostly tipped with Avellaneous interspersed with occasional Black tipped hairs. Hairs on forehead similar in colour to dorsum, 8 mm long. Hairs of chest and throat 8 mm long, with large patches of White only, others with basal half Light Violet Gray variously tipped with White or with small patches of Vinaceous-Buff; venter with hairs 6 mm long, basal half Light Violet Gray tipped with Vinaceous-Buff; area around anus and teats short White hairs. Ears lightly furred externally with short (1 mm) Black hairs, margins of internal surface with sparse Avellaneous hairs. Hairs on dorsal surface of pes and manus White with small patches of Tilleul-Buff; thin line of Citrine-Drab hairs on dorsolateral external surface of pes; colouring of dorsum extends to forearm and contrast sharply with White of manus. Tail lightly haired, scales clearly visible. On dorsal surface of tail hairs Olive Brown, basal one-third of tail with hairs 4 mm long, remainder of tail slightly more heavily furred with hairs up to 7 mm long; ventral surface of tail with White hairs. On each side of face c. 20 long (up to 65 mm) posterior mystacial vibrissae Black or White or Black tipped with White and c. 20 short (up to 26 mm), White, anterior mystacial vibrissae; two Clove Brown supraorbital vibrissae, up to 32 mm long; and two White ulnar carpal vibrissae up to 8 mm long.

Skin of pes and manus Dark Olive Buff. Skin of ears Chamois basally and Olive for the distal two-thirds.

**Pes** (Figure 10)

Described from holotype.

Interdigital pad at base of digit I oval shaped with moderately large accessory external pad, located posterior to interdigital pads of digit II and digits III/IV, anterior margin, however, overlaps posterior margin of interdigital pad of digit I, slightly smaller than other interdigital pads interdigital pad of digit II elongate, slightly posterior to interdigital pad of digits II and III which is subtriangular in shape; interdigital pad of digit V kidney shaped with moderately large external accessory pad; thenar pad oval shaped, short (4.1), 2 mm posterior to interdigital pad of digit I; hypothenar pad suboval, slightly smaller than interdigital pad of digit I, overlapping posterior margin of that pad; all pads smooth.

**Tail** (Figure 21)

Tail to vent length considerably shorter than head to vent length 121.0 v. 137.0. Number of scale rows per cm of tail length moderate, 9. Tail swollen and incrassate at base.

**Distribution**

The two Northern Territory localities are in the Gulf Country close to the border with Queensland.

**Etymology**

The species name *palatalis* is Latin for pertaining to the palate. It is a reference to the morphology of the anterior palatine foramen and the adjacent palatal ridges of this species.

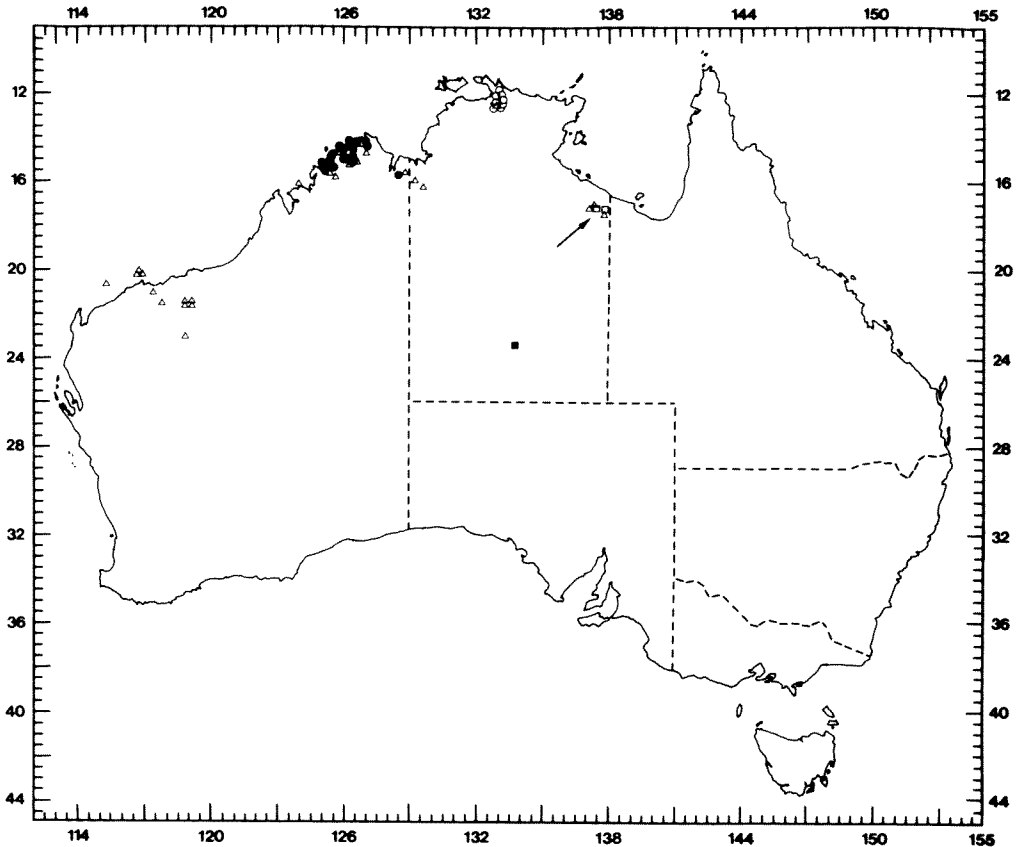
**Additional measurements**

The measurements of the two juvenile male paratypes NTM 1144 and NTM 1148 are as follows: SL 29.7, 29.0; BL —, 24.5; IFN 10.0, —; BD 9.4, 9.5; IPW 8.7, 8.4; BW 14.3, —; ZW 14.5, —; IW 4.9, 4.8; NW 2.8, —; APF 5.6, 5.7; MW 11.8; BUW 12.7, —; BUL 4.4, 4.7; PL 15.8, 15.8; PB 6.6, 6.1; M<sup>1</sup>-M<sup>3</sup> 6.5, 6.6; M<sup>3</sup>-M<sup>3</sup> 6.1, 6.1; M<sup>3</sup>L 1.6, 1.8, M<sup>1</sup>L 3.4, 3.5; M<sup>1</sup>W 2.0, 2.1; M<sub>1</sub>-M<sub>3</sub> 6.5, 6.4; CP 15.8, 16.4; CAL —.

**Statistical analysis: results and discussion****Univariate analysis**

Means, standard deviations and range of the skull and external characters for the five species are shown in Table 1.

The two factor MANOVA resulted in no significant ( $P < 0.05$ ) sexual dimorphism of any of the 23 skull and 6 external characters. Only anterior palatine foramen had a significant interaction between sex and species. Because of the absence of sexual dimorphism in skull characters within species, males and females were combined in the following analyses.

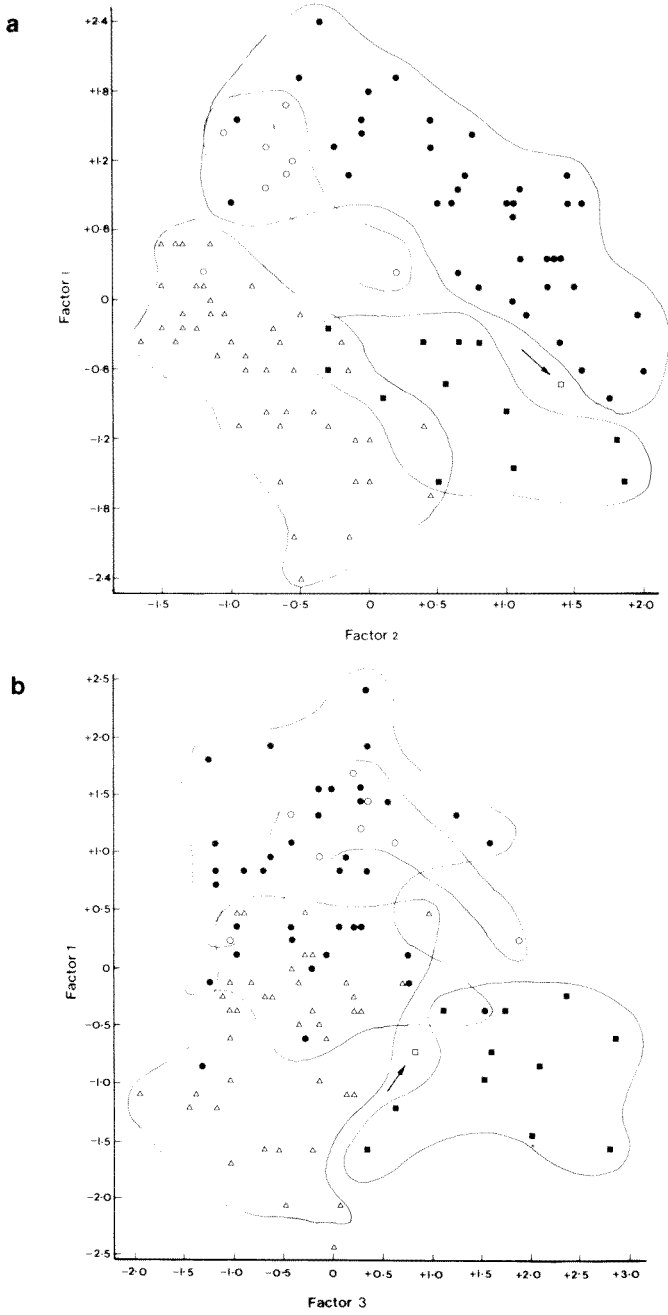


**Figure 22** Distribution of specimens of *Zyzomys* spp used in this study. Species codes as for Figure 2.

### Principal component analysis

This *a priori* analysis was carried out on skull characters of combined male and female adults. Specimens with missing character values were deleted from the analysis. The analysis was run using both scaled (using Z values) and unscaled values. The results were similar so unscaled values only are presented in Figure 23. Factors 1, 2 and 3 explain 91.8 per cent of the observed variation (Table 2). Plots of Factors 1 and 2 (Figure 23a) show *Z. argurus*, *Z. woodwardi*, *Z. pedunculatus* and *Z. maini* form reasonably discrete clusters with little overlap. *Z. maini* separates from *Z. pedunculatus* and *Z. argurus* on Factor 1 which is influenced most by those characters (Table 2) that reflect differences in overall size [skull length (SL), basicranial length (BL), rostrum length (IFN), braincase depth (BD), interparietal width (IPW), braincase width (BW), zygomatic width (ZW), interorbital width (IW), palatal length (PL), dentary length (CP)]. While there is considerable overlap between clusters on Factor 2, *Z. maini* again is mainly separated from *Z. pedunculatus* on this factor which is influenced most by the





**Figure 23** Principal component analysis based on skull measurements of male and female adult *Zyromys* spp. Species code as for Figure 2 (a) Factors 1 and 2, (b) Factors 1 and 3. \*, group means.

variables relating to tooth size ( $M^1-M^3$ ,  $M^3L$ ,  $M^1L$ ,  $M^1W$ ,  $M_1-M_3$ ). *Z. pedunculatus* separates from *Z. woodwardi*, *Z. argurus* and *Z. maini* on Factor 3 (Figure 23b) which is influenced greatly by bulla length.

**Table 2** Principal component factor scores produced by varimax rotation based on skull measurements of adult *Zyromys* spp. The codes for the characters are detailed in caption of Table 1.

Character	Factor 1	Factor 2	Factor 3
SL	.687	.538	.453
BL	.698	.494	.493
IFN	.6894	.419	.540
BD	.675	.609	.342
IPW	.848	.274	.089
BW	.691	.582	.384
ZW	.710	.563	.391
IW	.768	.465	.186
NW	.530	.536	.502
APF	.588	.378	.644
MW	.610	.639	.351
BUW	.661	.580	.446
BUL	.126	.338	.884
PL	.692	.518	.479
PB	.572	.616	.394
$M^1-M^3$	.518	.745	.380
$M^3-M^3$	.666	.628	.314
$M^3L$	.358	.755	.331
$M^1L$	.438	.768	.305
$M^1W$	.417	.767	.401
$M_1-M_3$	.427	.773	.410
CP	.675	.533	.487
CAL	.608	.535	.523
Variation explained (%)	85.9	3.5	2.4

### Canonical variate analysis

This analysis was used to select the combination of skull characters that best discriminate between the five species of *Zyromys*. The analyses were run using both scaled (Z values) and unscaled values. The results were similar so the unscaled results are presented here. Analysis showed that Functions 1, 2 and 3 explain a total of 98 percent of the variance (Table 3). Function 1 separates *Z. argurus* and *Z. maini* from each other and from *Z. woodwardi* and *Z. pedunculatus* (and possibly *Z. palatalis*) (Figure 24a). Characters loading most heavily on Function 1 are skull length (SL), palatal length (PL) and upper molar row length ( $M^1-M^3$ ) which reflect overall size differences. Function 2 separates *Z. pedunculatus* from other *Zyromys* spp. Characters loading most heavily on Function 2 are basicranial length (BL), anterior palatine foramen length (APF), bulla length (BUL), palate length (PL), palatal bridge length

(PB) and coronoid to angular process length (CAL). These characters relate to the shape of the ventral aspects of the skull. Function 3 separates *Z. maini* from other *Zyzomys* spp. (Figure 24b). Characters loading most heavily on Function 3 are interorbital width (IW), anterior palatine foramen (APF), bullae width (BW), palatal length (PL), upper molar row length (M<sup>1</sup>-M<sup>3</sup>) and dentary length (CP). These are a complex of characters that indicate significant shape differences.

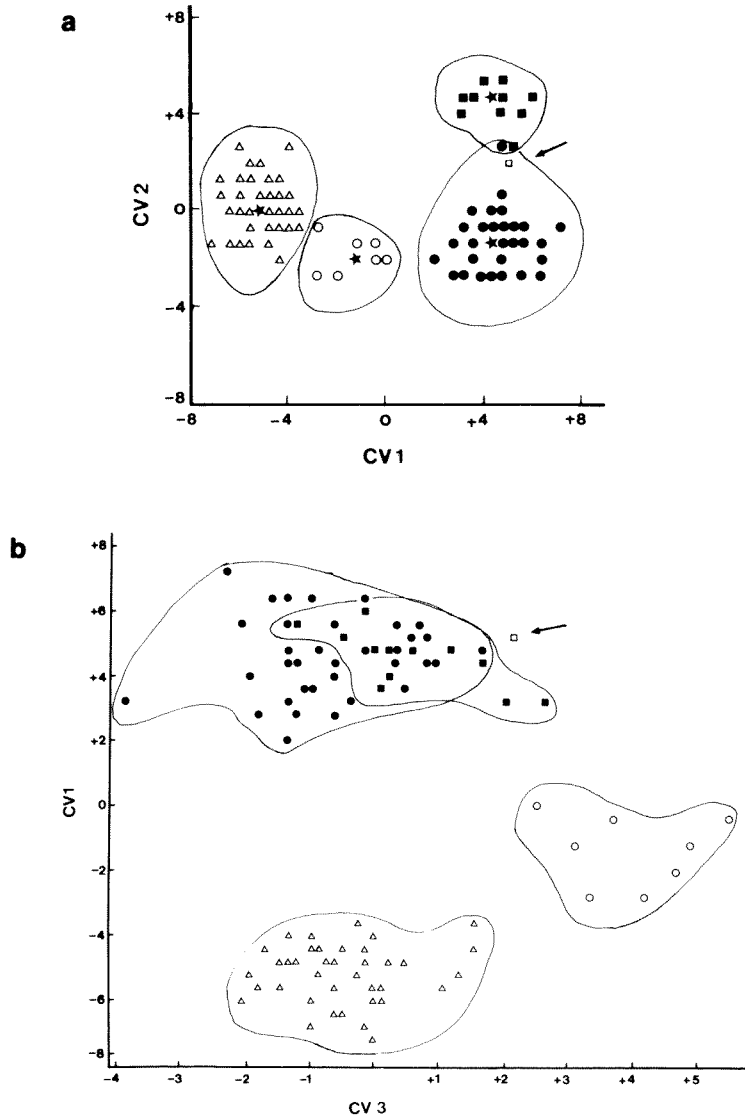
**Table 3** Standardised and unstandardised (in brackets) canonical variates based on skull measurements of adult *Zyzomys* spp. Canonical variate scores are calculated as the summation of the products of the unstandardised canonical variates and the respective length measurements plus the constant. The codes for the characters are detailed in caption of Table 1.

Character	Function 1	Function 2	Function 3
SL	.6592 ( .3277)	.4883 ( .2427)	-.1583 ( -.0708)
BL	.1954 ( .0992)	-.6179 ( -.3137)	.3826 ( .1942)
IFN	.1155 ( .1268)	.1121 ( .1231)	.0921 ( .1011)
BD	.2188 ( .4933)	.0302 ( -.0681)	.2068 ( .4664)
IPW	.0402 ( .0693)	.0989 ( -.1706)	-.0960 ( -.1656)
BW	-.0168 ( -.0297)	-.2956 ( -.5227)	.4726 ( .8358)
ZW	-.2443 ( -.2618)	-.2948 ( -.3160)	-.1015 ( -.1087)
IW	.0272 ( .1074)	-.2102 ( -.8300)	.5196 ( 2.0512)
NW	.0130 ( .0510)	.0635 ( .2495)	.4031 ( 1.5851)
APF	.0610 ( .1122)	.5816 ( 1.0688)	.8479 ( 1.5583)
MW	-.0737 ( -.1240)	.4281 ( .7204)	-.0908 ( -.1528)
BUW	.3377 ( .5144)	.1309 ( .1994)	-.8692 ( -1.3242)
BUL	.1389 ( .4834)	.8833 ( 3.0731)	.0240 ( .0835)
PL	-2.1598 ( -1.8784)	-1.7502 ( -1.5221)	1.4473 ( 1.2587)
PB	.2493 ( .5553)	.5661 ( 1.2610)	.0018 ( .0040)
M <sup>1</sup> -M <sup>3</sup>	.6453 ( 2.3449)	-.3552 ( -1.2907)	-.9340 ( -3.3941)
M <sup>3</sup> -M <sup>3</sup>	.4686 ( 1.3144)	-.0696 ( -.1952)	-.4706 ( -1.3200)
M <sup>3</sup> L	.2941 ( 2.7821)	.1966 ( 1.8601)	.4306 ( 4.0735)
M <sup>1</sup> L	-.3549 ( -1.7352)	-.0300 ( -.1462)	.3623 ( 1.7713)
M <sup>1</sup> W	.1962 ( 2.0583)	.3269 ( 3.4301)	.2611 ( 2.7389)
M <sub>1</sub> -M <sub>3</sub>	.4879 ( 1.9218)	-.0771 ( -.3039)	-.0466 ( -.1834)
CP	.0502 ( .0384)	-.0178 ( -.0136)	-1.2574 ( -.9632)
CAL	.2569 ( .3461)	.7384 ( .9949)	-.2966 ( -.3996)
CONSTANT	-33.8796	-1.5744	-9.6865
Variation explained (%)	81.24	11.28	5.48

### Phenetic relationships

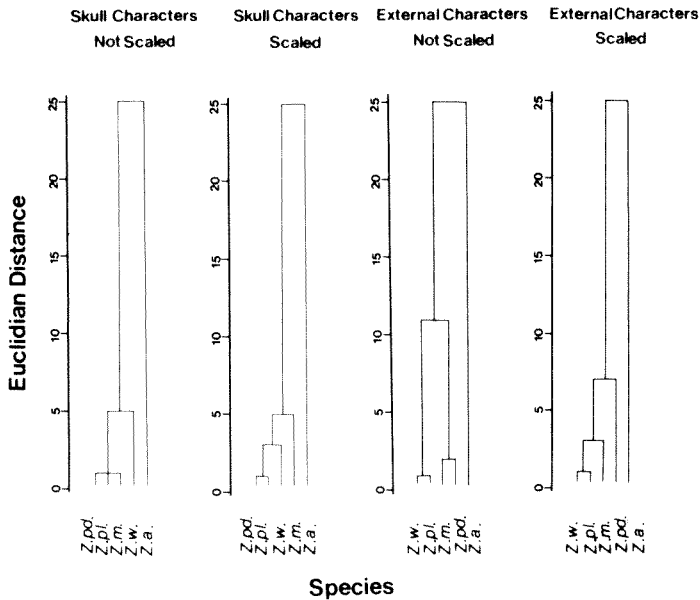
Dendrograms based on skull and external characters, both scaled and unscaled (Figure 25) show that *Zyzomys argurus* is phenetically very distinct from the other species of *Zyzomys*.

On external characters *Z. woodwardi* clusters with *Z. palatalis* but the relationship between *Z. maini* and *Z. pedunculatus* varies slightly depending on scaling of values.



**Figure 24** Canonical variate (discriminant) analysis of male and female adult *Zyzomys* spp. for (a) variates 1 and 2 and (b) variates 1 and 3. Species codes as for Figure 2.

On skull characters, *Z. pedunculatus* clusters with *Z. palatalis*; *Z. maini* is added to this cluster when values are not scaled but when scaled, replaces *Z. maini* as the most distant member of the group excluding *Z. argurus*.



**Figure 25** Dendrograms based on Euclidian distance and produced by UPGMA linkage for male and female adult *Zyzomys* spp. for both non-scaled and scaled values. *Z. w.*, *woodwardi*; *Z. pl.*, *pedunculatus*; *Z. a.*, *argurus*; *Z. m.*, *maini* and *Z. pl.*, *palatalis*.

### Specimens examined

Specimens prefixed with WAM, Western Australian Museum; with AM, Australian Museum; with NMV, Museum of Victoria; with SAM, South Australian Museum and with NTM, Northern Territory Museum (sometimes also with CAWC, Central Australian Wildlife Collection numbers -now part of Northern Territory Museum collections). Specimens as S, skin; C, skull; FA, fixed in 10 percent formalin and preserved in 75% ethanol. Those specimens without preservation method indicated are (C, FA). All specimens are adult unless stated otherwise.

### *Zyzomys woodwardi*

Western Australia. Pauline Ck/Bay, 14°11'00"S, 126°19'00"E, 1 ♂, NMV C26642. Nr Kalumburu: 14°15'20"S, 126°37'20"E, 1 ♂ 1 ♀, WAM M6031A-B; 14°16'12"S, 126°37'54"E, 1 ♂, WAM M19922 (S, C, FA); 14°17'00"S, 126°39'00"E, 1 ♂ 1 ♀, WAM (M4128, M4189); 14°17'40"S, 126°36'20"E, 1 ♂ 1 ♀, WAM M4126-7; Bonaparte Archipelago: SW Osborne I., 14°21'00"S, 125°57'00"E, 2 ♂, WAM (M10410, M10414); Katers I., 14°28'00"S, 125°31'20"E, 1 ♂, 1 ♀, WAM M9331-2; Bigge I., 14°31'40"S, 125°09'20"E, 2 ♂ 2 ♀ WAM (M9294, M9299, M9300, M9302); Boongaree I., 15°06'00"S, 125°12'40"E, 2 ♂ 2 ♀, WAM (M10424-5, M10432-3); Heywood Is (nth), 15°18'00"S, 124°20'00"E, 1 ♂ 1 ♀, WAM (M8492, M8495); Heywood I., 15°19'00"S, 124°22'30"E, 2 ♂, WAM (M9248, M9251); Augustus I., 15°20'00"S, 124°32'00"E, 2 ♂ 1 ♀, WAM (M8490, M9253-4). Mitchell Plateau: 14°33'24"S, 125°50'30"E, 1 ♀, WAM M22064; 14°35'15"S, 125°45'40"E, 1 ♀, WAM M21931; 14°35'50"S, 125°45'55"E, 1 ♀, WAM M22078; 14°37'00"S, 125°52'00"E, 2 ♂, WAM (M21945, M21947); 14°40'20"S, 125°43'40"E, 1 ♀, WAM M15860; 14°49'00"S, 125°50'15"E, 2 ♀, (M21965, M21971); 14°53'25"S, 125°44'35"E, 1 ♂ 1 ♀, WAM (M21845, M21849); 14°53'30"S, 125°45'00"E, 2 ♂, WAM (M21903, M22056). Prince Regent R. Reserve: 15°26'12"S, 125°36'42"E, 1 ♀, WAM M12263; 15°34'21"S, 125°25'03"E, 2 ♂, WAM M12260-1; 15°37'32"S, 125°18'04"E, 1 ♂, WAM M12262. Wyndham, 15°36'20"S, 128°16'40"E, 1 ♀, WAM M16109 (topotype - C, S).

*Zyzomys pedunculatus*

Northern Territory. Alice Springs, 23°42'00"S, 133°52'00"E, 4 ♂ 2 ♀ 3 ?, NMV C509, NMV C7806, C7590, SAM M1298 (C, S) SAM (M2412, M2437) (C only) SAM (M4379, M4385-6). 'Central Australia', 1 ?, SAM M1158 (C, S). Unknown locality. 2 ♀ NMV (C202, C7593).

*Zyzomys argurus*

Western Australia. Nr Kalumburu, 14°16'12"S, 126°37'54"E, 2 ♂ 2 ♀, WAM M11917-M11920 (S, C, FA). Mitchell Plateau: 14°34'00"S, 125°50'00"E, 1 ♀, WAM M22087; 14°34'00"S, 125°50'55"E, 1 ♂, WAM M22032; 14°35'15"S, 125°45'45"E, 1 ♂, WAM M22027; 14°35'50"S, 125°45'55"E, 1 ♂, WAM M22080; 14°36'40"S, 125°52'10"E, 1 ♀, WAM M15613, 14°43'00"S, 125°47'00"E, 1 ?, WAM M18578; 14°47'15"S, 125°51'55"E, 1 ♀, WAM M21929; 14°49'00"S, 125°50'25"E, 1 ♂, WAM M21956; 14°53'25"S, 125°44'35"E, 2 ♂ 1 ♀, WAM (M22048, M22060, M22050); 14°53'30"S, 125°45'00"E, 1 ♀, WAM M21907; 14°53'40"S, 125°45'20"E, 1 ♂, WAM M15616. Drysdale River Nat. Park: 14°40'00"S, 127°00'00"E, 2 ?, WAM M1418-9 (C only); 15°01'00"S, 126°49'00"E, 1 ♂ 1 ♀, WAM M14186-7. Nr Wyndham: 15°36'20"S, 128°16'40"E, 1 ♂, WAM M16107 (topotype - S, C); 15°38'15"S, 128°17'54"E, 1 ?, WAM M19766 (S, P, C). Bonaparte Archipelago: Coronation I., 15°01'55"S, 124°55'55"E, 1 ♀ 1 ?, WAM M9325-6; Augustus I., 15°20'00"S, 124°30'00"E, 1 ♂, WAM M8486. Prince Regent River Res., 15°34'21"S, 125°25'03"E, 1 ♀, WAM M12282. Cave Springs, 15°32'00"S, 128°50'00"E, 1 ♀, WAM M18568, 1 ♀, Koolan I., 16°08'00"S, 123°45'00"E, 1 ♂, WAM M6902. Kildurk Hmsd, 16°26'00"S, 129°37'00"E, 1 ♀, WAM M19105. Barrow I., 20°46'50"S, 115°23'00"E, 1 ♂, WAM M12202. Dampier Archipelago: Legendre Is, 20°23'00"S, 116°52'00"E, 1 ?, WAM M12512 (C only); Dolphin I., 20°29'00"S, 116°50'00"E, 3 ♀, WAM (M23856-7, M22888); West Lewis I., 20°35'00"S, 116°37'00"E, 1 ?, WAM M22900 (C only). Pyramid Hmsd, 21°05'00"S, 117°22'00"E, 1 ♀, WAM 10313. Tambrey, 21°37'00"S, 117°35'20", 1 ♀, WAM M19906 (S, C, FA). Woodstock 21°36'20"S, 118°58'10"E, 1 ?, WAM M4356 (C, P); 21°36'30"S, 118°57'30"E, 1 ♂ 1 ♀, WAM M19901-2 (S, C; S, C, FA); 21°38'00"S, 118°56'00"E, 1 ♂ 1 ♀, WAM (M3294, M3296) (S, C, FA); 21°40'20"S, 119°02'25"E, 1 ♀, WAM M19903 (S, C). Weeli Wollie Spring, 22°54'45"S, 119°12'40"E, 1 ♀, WAM M19907 (S, C, FA). Nr Mt Meharry, 23°11'00"S, 118°48'23"E, 1 ♀, WAM M16826. Northern Territory. Nr Nourlangie Rock, 12°51'00"S, 132°47'00"E, 1 ♂, NMV C25454. Keep River Nat. Park, c. 16°00'00"S, 129°15'00"E, 1 ♂ 2 ♀, NTM (595-7). Calvert R. Crossing, c. 16°40'00"S, 137°24'00"E, 1 ♂ 1 ♀, NTM (U1179, M1186). Woollogorang Stn: Echo Gorge, 17°12'00"S, 137°41'00"E, 3 ♂ 1 ♀, NTM (U1142-3, U1389-90); 17°13'00"S, 137°57'00"E, 1 ♂ 1 ♀, NTM (U1166-7). Calvert Hill Stn., 17°14'00"S, 137°20'00"E, 1 ♀, NTM U1188.

*Zyzomys maini* (holotype and paratypes)

Northern Territory. Mt Borradaile, 12°03'00"S, 132°54'00"E, 1 ♂, NTM (CAWC) 4287. Cannon Hill, 12°23'00"S, 132°56'00"E, 2 ♀, SAM M13136, SAM 9899. Djawamba Massif: 1.5 km E Ja Ja Billabong, 12°31'00"S, 132°54'00"E, 1 ♀, NTM (CAWC) M1002 (holotype); 12°33'00"S, 132°55'30"E, 1 ♂, NTM (CAWC) 1014. Mudginbarry, 12°34'00"S, 132°55'00"E, 1 ♂, NTM (CAWC) 1008. Nr Nourlangie Rock, c. 12°51'00"S, 132°47'00"E, 5 ♂ 1 ♀ 2 ?, NMV C26606 (C only), NMVC25475, NTM 0505-6, SAM 10152-4 (C only), NTM (CAWC) 248 (C only).

**Referred Specimens.**

Nr Nourlangie Rock, c. 12°51'00"S, 132°47'00"E, 2 ♀, NTM 203 (S only), NTM CCH (S only). Mudginbarry Stn, 12°34'00"S, 132°55'00"E, 1 ♀, NTM 1009.

*Zyzomys palatalis* (holotype and paratypes)

Northern Territory. Echo Gorge, Woollogorang Stn, 17°12'00"S, 137°41'00"E, 1 ♀, NTM U1388 (holotype); 2 ♂, NTM (CAWC) M1144, M1148 (juveniles).

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