LATE PLEISTOCENE MAMMALS FROM THE “KEILOR CRANİUM SITE”, SOUTHERN VICTORIA, AUSTRALIA

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Abstract

Two late Pleistocene mammal faunas have been recorded from the “Keilor Cranium Site”, southern Victoria, Australia. The older late Pleistocene Dry Creek Local Fauna from the “D Clay” includes Sarcophilus haniarius, Thylacinus cynocephalus, Perameles nasuta, Vombatus urisinus, Thylacoleo carnifex, Protemnodon anak, P. brentus, Macropus rufogriseus, M. agilis, M. titan, M. cf. ferragus, and Zygomaturus trilobus. Disconformably overlying the “D Clay” is the slightly younger Doutta Galla Silt with a basal age of 18,000 yr B.P. The Maribyrnong Local Fauna of the Doutta Galla Silt is represented by Vombatus urisinus, Megaleia rufa, Macropus giganteus, Mastacomys fuscus, Pseudomys cf. australis and Pseudomys cf. gracilicaudatus. Late-Pleistocene dwarfing is demonstrated in four species in the Dry Creek Local Fauna and two species in the Maribyrnong Local Fauna, with one species common to both. Late Pleistocene extinctions and late-Pleistocene dwarfing were probably caused by a common factor. The term megafauna is defined to include (1) species now extinct, and (2) species which have undergone late-Pleistocene dwarfing.

Introduction

For nearly two decades fossil mammals have been known from the Doutta Galla Silt in southern Victoria, Australia; these include Rattus cf. assimilis, and species of kangaroos, wallabies, wombats and native cats similar to those living today (Gill 1955a,b). A C14 date of 18,000 ± 500 yr B.P. (NZ-207), obtained on a charcoal sample from the base of the Doutta Galla Silt, indicates that the fauna is of latest Pleistocene age (10,000 yr B.P. is accepted here as the Pleistocene-Holocene boundary).

Disconformably underlying the Doutta Galla Silt at the Keilor Cranium Site is an unnamed dark unit referred to by Gallus (1971) as the “D Clay”, from which are recorded species of Diprotodon and Thylacoleo (Gill 1967).

Over the past eight years Dr. A. Gallus and a team of workers from the Archaeological Society of Victoria have made a large collection of fossil mammals from the Keilor Cranium Site, both from the Doutta Galla Silt and “D Clay”. These faunas are described here as the Maribyrnong Local Fauna and Dry Creek Local Fauna respectively.

Locality

“1940 Cranium Site” of Bowler (1970, p. 17, fig. 1). One mile N. of Keilor at confluence of Dry Creek and Maribyrnong River, S. Vict., Australia. Grid ref. 881495 on Sunbury Military Map.

Methodology

Linear tooth dimensions were measured with a pair of vernier calipers to the nearest 0.1 mm when possible. All measurements are in millimetres unless indicated otherwise.

The following abbreviations are used:
a—approximate measurement
AW—anterior width (protoloph and protolophid width)
DB—distal breadth
DD—distal depth
DP—deciduous premolar
L—length
M—molar
MW—maximum width
P—premolar
PB—proximal breadth
PD—proximal depth
PW—posterior width (metaloph and hypolophid width)

The specimens described here were deposited in the fossil collections of the National Museum of Victoria (NMV), Melbourne, Australia. The roman numerals following the
specimen numbers in the tables refer to the level from where that specimen was collected. A complete list of the identifiable specimens from each level of the “D Clay” is given in Appendix 1. The specimens from the Doutta Gallia Silt are listed in Appendix 2. The higher taxonomic categories are of Ride (1964).

1. “D Clay” (Dry Creek Local Fauna)

Because there are no detailed studies of the complex stratigraphy at the Keilor Cranium Site, I will restrict my comments to the general relationships between the fossil bearing units.

Three basic mapable units are recognizable at the Keilor Cranium Site: (1) the Arundel Formation, (2) an unnamed intermediate unit, and (3) the Doutta Gallia Silt, from oldest to youngest (formational names follow Gill 1962). All three of these units are separated by disconformities. The relationship of the Arundel Formation and Doutta Gallia Silt are discussed by Bowler (1970). The intermediate unnamed unit has been referred to as the “D Clay” by Gallus (1971), although it has not been formally named. The age of the “D Clay” has yet to be established, although it is certainly late Pleistocene in age and probably in the order of 25,000-40,000 yr B.P. (J. M. Bowler, pers. comm.). The material described here as the Dry Creek Local Fauna was collected from the “D Clay”.

During initial excavation of the fossil materials from the Doutta Gallia Silt, Gallus organized his collections on the basis of their relationship to one another (local concentrations) and on superpositional relationships where this was clearly defined. Differences in the lithology of the sediment were also taken into account. For the most part the collection is organized into specific collection sites (layers or levels as sometimes used by Gallus) and the relationships of the sites to each other have not been firmly established. In the interest of convenience and clarity I have given “level” numbers to each of Gallus’s collection sites (Appendix 1). These levels (I-XI) are roughly organized such that level I probably represents the oldest and level XI probably represents the youngest, although this is only an approximation and needs further clarification. Until the stratigraphic and time relationships of these levels are worked out in detail it is not possible to discuss differences in faunal composition within the different levels in any meaningful context.

The Fauna

The Dry Creek Local Fauna consists of 12 species of marsupials representing three orders and seven families. Two of these families, Diprotodontidae and Thylacoleonidae, are now extinct; the other five families, Thylacinidae, Dasyuridae, Peramelidae, Vombatidae, and Macropodidae, are represented by extant species. Table 1 lists the minimum number of individuals of each species necessary to account for all of the specimens recovered from each level (based on both dental and post-cranial remains).

Macropods are the dominant group, comprising 76% of the total minimum number of individuals and are represented by at least three species: (Protemnodon anak, P. brehus, Macropus rufogriseus, M. agilis, M. titan, M. cf. ferragus). Macropus titan is the most abundant species in most of the levels, followed by M. rufogriseus and M. agilis which appear in about equal numbers. The other species appear rather sporadically throughout and are not abundant in any particular level. The ratio of carnivores (Sarcophilus laniarius, Thylacinus cynocephalus, Thylacoleo carnifex) to herbivores (all other species) is approximately 1:10.

The species in the fauna can be placed into three basic groups: (1) species represented by living forms indistinguishable from specimens in the fauna (Perameles nasuta, Vombatus ursinus, Macropus rufogriseus); (2) the larger Pleistocene forms of living species (Sarcophilus laniarius, Thylacinus cynocephalus, Macropus agilis, M. titan), and (3) species now extinct (Thylacoleo carnifex, Protemnodon anak, P. brehus, Macropus cf. ferragus, and Zygomaturus trilobus).
TABLE 1

Under "levels" I-XI from the "D Clay" are listed the minimum number of individuals necessary to account for the specimens recovered from each "level" based on both dentitions and postcranial remains. The minimum number of individuals of each species in the total fauna based solely on dentitions is given in the right-hand column.

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</table>
Dry Creek Local Fauna

Class Mammalia

Infra-class Metatheria

Superorder Marsupialia

Order Marsupicarnivora

Family Dasyuridae

*Sarcophilus laniarius*

Family Thylacinidae

*Thylacinus cynocephalus*

Order Peramelina

Family Peramelidae

*Perameles nasuta*

Order Diprotodonta

Family Vombatidae

*Vombatus ursinus*

Family Thylacoleonidae

*Thylacoleo carnifex*

Family Macropodidae

*Protemnodon anak*

*Protemnodon brehus*

*Macropus rufogriseus*

*Macropus agilis*

*Macropus titan (as M. giganteus)*

*Macropus cf. ferragus*

Family Diprotodontidae

*Zygomaturus trilobus*

Palaeoecology

The probable habitat preferences of the species in the Dry Creek Local Fauna (Table 2) are based on those of extant populations. It is assumed that the larger late Pleistocene forms (*Sarcophilus laniarius, Macropus titan*) had habitat requirements similar to their living descendants (*S. harrisii* and *M. giganteus* respectively). These data show that the region in the Dry Creek area in late Pleistocene time was most probably covered by sclerophyll forest. It is possible that mesophytes lined the river valleys which dissected the open rolling bushlands and grasslands much as occurs in the area today.

Faunal Correlation

Lake Colongulac (= Lake Timboon)

The Dry Creek Local Fauna compares well with the late Pleistocene fauna from Lake Colongulac, N. of Camperdown, S. Victoria. The following species are represented in the Lake Colongulac Local Fauna:

Class Mammalia

Superorder Marsupialia

Order Marsupicarnivora

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### TABLE 2

Basic habitat preferences of species in the Dry Creek Local Fauna based on living populations of these species (x indicates preferred habitat).

<table>
<thead>
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<th>Species</th>
<th>Rain-forest</th>
<th>Sclerophyll forest</th>
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<td>(as <em>M. giganteus</em>)</td>
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<td><em>Macropus agilis</em></td>
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<tr>
<td><em>Macropus rufogriseus</em></td>
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</table>

* from Marlow (1958)  + from Ride (1970)
Family Dasyuridae
*Sarcophilus lanarius* (P30218)

Family Thylacinidae
*Thylacinus rostralis* (see DeVis 1899)

Order Diprotodonta
Family Vombatidae
*Lasiorhinus* sp.? *Vombatus ursinus* (P30785)

Family Thylacoileonidae
*Thylacoileus carinifex* (P24000) (Type locality)

Family Macropodidae

Family Diprotodontidae
*Procotodon optatum* (P15902)

A large collection of fossil mammals from Lake Colongulac and the surrounding lake region (generally referred to as the Campbourn District) is in the National Museum of Victoria; but unfortunately this important fauna has not been adequately described. The diversity of this fauna is considerably greater than previously recognized as is seen in comparing the faunal list given by Gill (1953b, p. 35) with the revised and expanded list given above. The fauna from Lake Colongulac and that from Dry Creek are similar in age and share a close geographical proximity; differences between these faunas are probably due to sampling.

*Murray River Basin*

Late Pleistocene local faunas from the Lower Murray River Basin have been recovered from Lake Menindee (Tedsford 1967), Lake Tandou (Merrilees 1973), and Lake Victoria (Marshall 1973). These faunas are typified by an abundance of grazers (*Macropus ferragus, M. titan*) and browser-grazers (*Sthenurus tindalei, S. andersoni, S. atlas, Pretemnodon brehus, P. anak, Osphranter cooperi*) and dominated by the large browsing macropod *Procotodon goliath*.

The Lake Victoria Local Fauna (which is typical of the Murray River Basin faunas) is considerably different from that of the Dry Creek Local Fauna. Five of the twelve species in the Dry Creek Local Fauna (*Perameles nasuta, Vombatus ursinus, Macropus agilis, M. rufogriseus, and Zygomaturus trilobus*) are absent from the Lake Victoria Local Fauna whereas *Perameles gunnii, Lasiorhinus Kregtii, Lagorchestes leporides, Onychogalea fraenata* and *Diprotodon optatum* occur in the Lake Victoria Local Fauna and not in the Dry Creek Local Fauna. These faunal differences are probably the result of the presence of an open woodland-savannah-grassland in the Murray River Basin during late Pleistocene time.

**The Collection**

The major part of the fossil materials were collected *in situ* as isolated specimens. A few associated left and right rami were obtained, although these finds are certainly exceptions. Most of the postcranial material was broken except for podial and metapodial bones. Because of the dearth of associations it is difficult to assign postcranial elements to respective dentitions with complete certainty. In the case of *Pretemnodon*, all podial elements are referred to *Pretemnodon* sp. as there were no feet of *P. anak* or *P. brehus* available for comparison. All of the postcranial elements of a large species of *Macropus* are referred to *M. titan*. Although associated rami (P30716) are referred to *M. cf. ferragus*, the presence of this species in the fauna cannot be established with complete certainty (see below). The postcranial remains of smaller species of *Macropus* are potentially referable to *M. agilis* or *M. rufogriseus* and some may even be referable to females? of *M. titan*; these are all listed collectively under the heading macropodid. The postcranial remains of a diprotodontid are probably referable to *Zygomaturus trilobus*. Except for basing the identification of *Thylacinus cynocephalus* on a humerus, the identifications of all other species in the fauna are based on teeth. Nearly one third of the total bone sample consists of postcranials which are
too fragmented to permit reasonably accurate identification. These specimens are not discussed in this study although their presence is recorded for completion.

**Systematics Review**

Class Mammalia  
Infraclass Metatheria  
Superorder Marsupialia  
Order Marsupicarnivora  
Family Dasyuridae

*Sarcophilus laniarius* (Owen, 1838)

Specimens of *Sarcophilus laniarius* were collected from levels IV, V, and VI. As there is no duplication in the elements represented they may in theory be attributed to a single individual (Table 3).

The relationship of L M² and MW M² of P29587 from Dry Creek is compared in Fig. 1 with an extant sample of *Sarcophilus harrisii* from Tasmania and a sample of *S. laniarius* from late Pleistocene deposits in Strathdownie Cave, Victoria (Merrilees 1965). The Dry Creek specimen falls well within the range of the *S. laniarius* sample.

No morphological differences were observed in the dentitions of the *S. laniarius* or *S. harrisii* samples studied, and except for the superior size of the former (approximately 15% based on tooth measurements) separation of the dentitions of these species was difficult. *S. laniarius* is typically found in deposits of late Pleistocene age in direct association with extinct megafaunal species of *Procoptodon*, *Protemnodon*, *Sthenurus*, and *Zygomaturus*, to name just a few. *S. harrisii*, on the other hand, occurs in slightly younger deposits always in association with a typically modern fauna (for example see Thorne 1972). Although the association of specimens of *S. harrisii* with extinct megafaunal species are reported (Owen 1877) the contemporaneity of these species is highly questionable (Frank 1971). The direct association and temporal overlap of these species have not been substantiated. This evidence suggests that *S. laniarius* represents a larger, ancestral, late Pleistocene form of *S. harrisii*; a relationship first recognized by Lydekker (1887).

**TABLE 3**

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<th>MW</th>
<th>L</th>
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</table>

**Family Thylacinidae**

*Thylacinus cynocephalus* (Harris, 1808)

A single left humerus (P29588) collected from level VI is the only element referable to this species.

Ride (1964) reviewed the status of the five proposed species of *Thylacinus* (*T. major* Owen 1877, *T. breviceps* Krefft 1871, *T. spelaeus* Owen 1845, *T. cynocephalus* Harris 1808, and *T. rostralis* DeVis 1894). Ride’s study of dental and cranial characters of a living sample of *Thylacinus* from Tasmania, and fossil samples from cave deposits in W. and E. Australia “do not support separation [of these samples] even at a subspecific level at the present time”. Ride recognized that these
samples represent a single variable species, *T. cynocephalus*, which includes *T. breviceps* and *T. spelaeus* as junior synonyms (see footnote of Ride 1964, p. 105 concerning the identity of *T. major*). Ride further noted, "although recognition by name is not justified there is no doubt that in the Pleistocene of W. Australia there existed a population of *Thylacinus cynocephalus* which on an average contained smaller individuals than the modern form (and by inference its eastern Pleistocene representative)". *T. rostralis* from the late Pleistocene fluvialite deposits of the E. Darling Downs, SE. Queensland was shown to be larger than the specimens referred to *T. cynocephalus* by Ride. Ride recommended that *T. rostralis* retain its specific identity, at least for the time being.

The Dry Creek specimen agrees well in morphology with the living specimens of *T. cynocephalus* from Tasmania (NMV C5742, C5746, C5753) with which it was compared, although the Tasmanian specimens are slightly smaller. No specimens of postcrania material referable to *T. rostralis* were available for study and it may be that the Dry Creek specimen is referable to this species. DeVis (1899) reported *T. rostralis* from Lake Colongulac in S. Victoria. I was unable to relocate the specimen(s) upon which this identification was based.

The Dry Creek specimen agrees well in size and morphology with a nearly complete skeleton of *T. cynocephalus* (P26573) from late Pleistocene deposits at Lake Victoria, N.S.W. The cranial dimensions of P26573 fall well within the range of males of *T. cynocephalus* studied by Ride (1964).

**Order Peramelina**

**Family Peramelidae**

*Perameles nasuta* Geoffroy, 1804

A right ramus fragment with P1-M3 and an associated fragment of a left maxillary with M2-3 (P29634) of this species were found in level III (Table 4).

The upper molars of species of *Isoodon* possess a well developed hypocone which is subequal in size to the protocone. In species of *Perameles* a hypocone is absent or only incipiently developed. The Dry Creek specimen has only an incipiently developed hypocone and is readily referred to a species of *Perameles*. The dentitions of *Macrotis*, *Chaeropus* and *Echmiiptera* are sufficiently distinct from *Perameles* and *Isoodon* to dispense with a detailed comparison with the Dry Creek specimen.

The L M2 and AW M3 of living samples of *Perameles bougainville* (including *P. fasciata, P. nyosura, P. arenaria*; see Tate 1948, pp. 324-325), *P. gunnii*, and *P. nasuta* are compared with the Dry Creek specimen in Fig. 2. Values of the dental parameters of *P. bougainville* are significantly smaller than those of the other two species. Freedman (1967) reported that the teeth of *P. gunnii* and *P. nasuta* "are of approximately similar size" although those of *P. gunnii* were shown to be slightly smaller. He noted that the dentitions of these species could be separated by differences in the morphology of the upper incisors and canine. Unfortunately, these teeth are not represented in the collection from Dry Creek. I was unable to find morphological differences in the molar teeth of these species which would allow them

<table>
<thead>
<tr>
<th>Specimen</th>
<th>P1</th>
<th></th>
<th></th>
<th>M1</th>
<th></th>
<th>M2</th>
<th></th>
<th>M3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L</td>
<td>MW</td>
<td>L</td>
<td>MW</td>
<td>L</td>
<td>AW/MW</td>
<td>PW</td>
<td>L</td>
</tr>
<tr>
<td>Upper</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P29634 (III)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4.0</td>
<td>4.0</td>
<td>-</td>
</tr>
<tr>
<td>Lower</td>
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<td>2.2</td>
<td>2.6</td>
<td>4.1</td>
</tr>
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</table>

**TABLE 4**

Dimensions of the cheek teeth of *Perameles nasuta*
to be distinguished. As seen in Fig. 2, *P. gunnii* is slightly smaller than *P. nasuta*. The Dry Creek specimen falls within the range of the *P. nasuta* sample and outside of the *P. gunnii* sample. The Dry Creek specimen is tentatively referred to *P. nasuta* based on this (admittedly minor) size difference.

At the present time one late Pleistocene species, *T. carnifex*, is recognized and is virtually pan-Australian in distribution. Merrilees (1968) reports *Thylacoleo* sp. not *T. carnifex* from Mammoth Cave in SW. W. Aust. This specimen(s) has not been described and I do not know how it differs from *T. carnifex*.

_Mylodon australis_ Krell 1870, _Thylacoleo oweni_ McCoy 1876, and _Thylacopardus australis_ Owen 1888 are presently recognized as junior synonyms of *T. carnifex* (Anderson 1929). A concise description of the cranium and dentition of this species is given by Woods (1956) and the species distribution is outlined by Gill (1954).

Fig. 2—Scatter diagram showing relationship of *L. M3* and AW *M3* for living samples of *Perameles bougainville*, *P. gunnii*, and *P. nasuta*, and a fossil specimen of *Perameles* from the Dry Creek Local Fauna.

Order Diprotodontia
Family Vombatidae

_Vombatus ursinus_ (Shaw, 1800)

A minimum of two individuals of _Vombatus ursinus_ are represented by two rami (P23026, P29519) and a fragment of a left ilium (P29548), collected from levels III and IV respectively. Remains of this species are commonly found in late Pleistocene deposits throughout Victoria, E. New South Wales and S. Queensland.

The molars of _V. ursinus_ typically have W-shaped lobes and sharp interlobe valleys as opposed to the more U-shaped or rounded lobes and more open interlobe valleys of _Lasiorhinus_ (Merrilees 1967, p. 407).

Family Thylacoleonidae

_Thylacoleo carnifex_ Owen, 1858

A single fragment from level XI of a right maxillary (P29545) with the lower edge of the orbit and the anterior root of _P₂₃_ is all that is known of this species.

Fig. 3—_Protemnodon anak_, right _M₃_, NMV P29555, level V; a, lingual; b, occlusal; and c, labial views; all x 13.

Family Macropodidae

_Protemnodon anak_ Owen, 1873

Dentitions of _Protemnodon anak_ were found in levels V (P29554, P29555) and XI (P29604), representing a minimum of two individuals (Table 5). Postcranial remains from levels III, VI, IX and X may be referable to this species (Table 9). These specimens
agree in all respects with the holotype (BMNH M1895) figured by Stirton (1963, p. 136, fig. 13a,b) (Fig. 3).

**TABLE 5**

Dimensions of the cheek teeth of *Protemnodon anak* and *P. brellus*

<table>
<thead>
<tr>
<th>Specimen</th>
<th>P3</th>
<th>M3</th>
<th>M4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PW</td>
<td>L</td>
<td>AW</td>
</tr>
<tr>
<td><em>P. brellus</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Lower</td>
<td>-</td>
<td>-</td>
<td>16.5</td>
</tr>
</tbody>
</table>

| *P. anak* | P29604 (XI) (left) | -  | 13.7 | -  | 15.6 | -  | 9.8 |
|           | P29604 (XI) (right) | 15.0 | 5.5 | 13.5a | -  | 15.7 | -  | 10.0 |

*Protemnodon brellus* (Owen, 1874)

Dentitions of this species were found in levels III (P29522) and IX (P29628). An isolated right lower incisor (P29586) from level VI is probably referable to this species. These specimens represent the first record of *P. brellus* in Victoria.

P29522 agrees in all respects with the holotype (BMNH 43303a) figured by Stirton (1963, p. 140, fig. 15b). The lower molars of *P. brellus*, as represented by P29628, differ from those of *P. anak* (P29601) in being larger and relatively broader (Table 5). Both species have weakly developed cingula on the lower molars.

*Macropus rufoariseus* (Desmarest, 1817)

Dentitions of this species were found in levels IV-VII and XI, and represent a minimum of three individuals (Table 6). Some of the postcaninials from levels II-VI, VIII-XI listed under macropodid may be referable to this species.

In Fig. 4 the Dry Creek specimens are compared with specimens of *M. rufoariseus* from an extant population. There is complete overlap in the range of the two samples. *M. rufoariseus* is found as a living species in the Dry Creek area; the living furirs are indistinguishable in size and tooth morphology from the specimens in the Dry Creek Local Fauna.

![Fig. 4—Scatter diagram showing relationship of L, M1, and AW M1 of a living sample of *Macropus agilis* (squares) and *M. rufoariseus* (circle) and specimens referable to *M. agilis* (triangles) and *M. rufoariseus* (x) from the Dry Creek Local Fauna.](image)

*Macropus agilis* (Gould, 1842)

*Macropus agilis* is the second most abundant species in the fauna and is represented by a minimum of live individuals (Table 7, Figs. 5, 6). *M. agilis*, like *M. rufoariseus*, is repre-

**TABLE 6**

Dimensions of the cheek teeth of *Macropus rufoariseus*

<table>
<thead>
<tr>
<th>Specimen</th>
<th>DP3</th>
<th>P3</th>
<th>M1</th>
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<td>L</td>
<td>AW</td>
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<td>L</td>
<td>AW</td>
</tr>
<tr>
<td>Upper</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Lower</td>
<td>-</td>
<td>4.3</td>
<td>-</td>
<td>7.1</td>
<td>5.0</td>
<td>-</td>
</tr>
<tr>
<td>P29577</td>
<td>-</td>
<td>4.1</td>
<td>1.6</td>
<td>1.8</td>
<td>6.7</td>
<td>5.0</td>
</tr>
<tr>
<td>P29574</td>
<td>-</td>
<td>4.2</td>
<td>-</td>
<td>7.0</td>
<td>4.3</td>
<td>4.7</td>
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<td>P30725</td>
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<td>4.2</td>
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<td>4.0</td>
<td>-</td>
</tr>
</tbody>
</table>
sented by dental remains in levels IV-VII, although is not present in level XI. Some of the postcranials from levels II-VI, VIII-XI may well prove to be referable to this species.

DeVis (1895) erected *M. siva* on the basis of a partial ramus collected from the late Pleistocene fluvialite deposits of the E. Darling Downs in SE. Queensland (see Bartholomai 1966, pp. 118-119). Specimens referable to *M. siva* have subsequently been recorded from late Pleistocene deposits in Mount Hamilton Cave, Victoria (Wakefield 1963, p. 326; as *M. cf. M. siva*), the Frenchman’s Creek Local Fauna in SW. New South Wales, and Wellington Caves, N.S.W. (Marshall 1973).

Specimens recognized as *M. siva* are typically larger than *M. agilis*, but except for this small size difference the dentitions of these species are indistinguishable. *M. siva* is reported only from deposits of late Pleistocene age. The most logical explanation regarding the relationship of these two species is that *M. siva* probably represents a slightly larger late Pleistocene form of *M. agilis*. No large samples of *M. siva* have been described and what materials have been referred to this species consist either of isolated specimens or small samples. Thus the precise size difference between populations of *M. siva* and *M. agilis* has yet to be established; I would estimate it to be in the order of 10-15%. A detailed study may show these species to be conspecific.

In Fig. 4 the dimensions of the Dry Creek specimens are compared with three specimens of *M. agilis* from a living population and show that the late Pleistocene Dry Creek specimens are larger. The sample sizes are admittedly small and for this reason it is unwise to place too much emphasis on these differences. The dimensions of the Dry Creek specimens do, however, fall within the range of the large sample of *M. agilis* from Queensland described by Bartholomai (1971, p. 11). For this reason I refer the Dry Creek specimens to the living species *M. agilis*.

The relative abundance of *M. agilis* in the Dry Creek Local Fauna indicates that a large population of this species was present in

### TABLE 7

Dimensions of the cheek teeth of *Macropus agilis*

<table>
<thead>
<tr>
<th>Specimen</th>
<th>P2</th>
<th>DP3</th>
<th>P3</th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
<th>M4</th>
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<tr>
<td>Upper</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P29579 (VI)</td>
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<td></td>
<td>9.8</td>
<td>4.0</td>
<td>5.0</td>
<td>9.8</td>
<td>7.7</td>
</tr>
<tr>
<td>Lower</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P29549 (IV)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>9.7</td>
<td>6.2</td>
</tr>
<tr>
<td>P29550 (IV)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6.6</td>
<td>10.6</td>
</tr>
<tr>
<td>(left)</td>
<td></td>
<td></td>
<td>7.8</td>
<td>2.5</td>
<td>3.4</td>
<td>5.6</td>
<td>6.0</td>
</tr>
<tr>
<td>P29550 (IV)</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>(right)</td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>P29575 (V)</td>
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<td>P29576 (V)</td>
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</tr>
<tr>
<td>P29603 (VII)</td>
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<td>5.4</td>
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</table>

Fig. 5—*Macropus agilis*, left M3-4 of NMV P29550a, level IV; a, labial; b, occlusal; and c, lingual views; all x 2.
southern Victoria in late Pleistocene time. The absence of this species in Victoria today presents a problem because other macropods in the Dry Creek Local Fauna which are represented by living forms (M. rufogriseus and M. titan) are the dominant macropods in the Dry Creek area today. The factor(s) responsible for the post-Pleistocene change in distribution of M. agilis is presently unknown.

Macropus titan Owen, 1838

Macropus titan, the most abundant species in the fauna, is represented by a minimum of 13 individuals, accounting for 40% of the individuals in the fauna (Table 8). Dentitions of this species were recovered at all levels except level I (Fig. 7).

In Fig. 9 Dry Creek specimens are compared with a sample of M. titan from Lake Colongulac, Vict., showing that there is nearly complete overlap in the range of the two samples. In linear dimensions of M3, M. titan is intermediate in size between the smaller living species M. giganteus and the larger extinct late Pleistocene species M. ferragus.

Of the four complete metatarsal IVs listed in Table 9, two (P29534, P29535) are similar in size and are significantly smaller than the other two (P29556, P29589). I attribute these differences to sexual dimorphism with the smaller specimens representing females and the larger the males (Fig. 8).

Macropus faunus DeVis 1895 and Macropus magister DeVis 1895 are recognized as junior synonyms of M. titan (Tedford 1967). The specimen figured by Tedford (1967, Fig. 27a) and referred to Macropus birdselli is also referable to M. titan.

M. titan is the most widely distributed of the late Pleistocene macropod species and occurs in almost every late Pleistocene deposit studied. It is typically the most abundant species in late Pleistocene deposits in Vict. (Lake Colongulac), E. N.S.W. (Wellington Caves), and SE. Qd. (E. Darling Downs). At Lake Victoria in SW. N.S.W., however, M. titan is less abundant than the larger grazing macropod M. ferragus (Marshall 1973). M. titan was
<table>
<thead>
<tr>
<th>Specimen</th>
<th>Upper P3</th>
<th>Lower P4</th>
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<th>M4</th>
<th>Lower P5</th>
<th>Lower M1</th>
<th>Lower AW</th>
<th>Lower PW</th>
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<td>17.0</td>
<td>18.9</td>
<td>18.7</td>
</tr>
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<td>9.0</td>
<td>14.5</td>
<td>14.0</td>
<td>9.0</td>
<td>14.5</td>
<td>16.0</td>
<td>18.0</td>
<td>17.0</td>
</tr>
<tr>
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<td>14.1</td>
<td>14.6</td>
<td>9.6</td>
<td>14.1</td>
<td>16.1</td>
<td>18.1</td>
<td>17.1</td>
</tr>
<tr>
<td>P29611 (VIII)</td>
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<td>14.2</td>
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<td>16.2</td>
<td>18.2</td>
<td>17.2</td>
</tr>
<tr>
<td>P29624 (IX)</td>
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<td>10.3</td>
<td>14.3</td>
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<td>16.3</td>
<td>18.3</td>
<td>17.3</td>
</tr>
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</table>

**TABLE 8**
Dimensions of cheek teeth of *Macropus titan*
probably a woodland-savannah species and occupied a niche which was probably identical to that of *M. giganteus* today (see below).

*M. titan* appears to represent a 30% larger late Pleistocene form of *M. giganteus*. The only consistent difference between these species is in the superior size of the former. *M. titan* occurs in deposits of late Pleistocene age and older, typically in association with extinct megafaunal species of *Thylacoleo, Diprotodon, Sthenurus, Procoptodon*, and *Protemnodon*, to name just a few. *M. giganteus* is found in younger late Pleistocene deposits (<20,000 yr B.P.) and never occurs in direct association with extinct megafaunal species or with *M. titan*. There is also no evidence of temporal overlap in the occurrence of these species. It thus appears most logical to regard *M. titan* as the larger late Pleistocene ancestor of *M. giganteus*. This lineage represents the fourth example of late-Pleistocene dwarfing in the fauna (see Discussion).

A large number of postcranials belonging to a large species of *Macropus* are represented in the Dry Creek collection. Except for the single questionable specimen referred to *M. cf. ferragus* from level III (P30716) (see below) there is no other evidence that this species is present in the fauna. For this reason the post-

---

**Fig. 8**—*Macropus titan*, a, left metatarsal IV (male?), NMV P29556, level V, dorsal view; b, left metatarsal IV (female?), NMV P29534, level IV, dorsal view.

---

**Fig. 9**—Scatter diagram showing relationship of L M₃ and PW M₃ of a living sample of *Macropus giganteus* from Victoria, a fossil sample of *M. titan* from Lake Colongulac, Vic., a fossil sample of *M. ferragus* from Lake Victoria, N.S.W., and specimens referable to *M. titan* and *M. cf. ferragus* from Dry Creek.

---

**Macropus cf. ferragus** Owen, 1874

An associated left and right ramus (P30716) from level III may be referable to this species (Table 10). The Dry Creek specimen is compared in Fig. 9 with a sample of *M. ferragus* from Lake Victoria, N.S.W., *M. titan* from
<table>
<thead>
<tr>
<th>Specimen</th>
<th>L</th>
<th>PB</th>
<th>PD</th>
<th>DB</th>
<th>DD</th>
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<tr>
<td><strong>Metatarsal IV</strong></td>
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</tr>
<tr>
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<td>32.5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>P29534 (IV)</td>
<td>177.0</td>
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<td>26.3</td>
<td>29.5</td>
<td>21.8</td>
</tr>
<tr>
<td>P29535 (IV)</td>
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<td>23.2</td>
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<tr>
<td>P29556 (V)</td>
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<td>32.4</td>
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</tr>
<tr>
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<td>31.3</td>
<td>28.5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>P29589 (VI)</td>
<td>207.0</td>
<td>39.0</td>
<td>28.0</td>
<td>39.6</td>
<td>28.3</td>
</tr>
<tr>
<td>P29591 (VI)</td>
<td>-</td>
<td>31.0a</td>
<td>26.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>P29633 (X)</td>
<td>-</td>
<td>33.0</td>
<td>27.8</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Proximal Phalanx Digit IV</strong></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>P29518 (III)</td>
<td>29.7</td>
<td>29.5</td>
<td>25.2</td>
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</tr>
<tr>
<td>P29560 (V)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>20.1</td>
<td>13.1</td>
</tr>
<tr>
<td><strong>Medial Phalanx Digit IV</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P29520 (III)</td>
<td>42.4</td>
<td>26.4</td>
<td>20.4</td>
<td>21.5a</td>
<td>13.0a</td>
</tr>
<tr>
<td>P29612 (VIII)</td>
<td>41.4</td>
<td>27.6</td>
<td>19.3</td>
<td>-</td>
<td>13.6</td>
</tr>
<tr>
<td><strong>Metatarsal V</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P29557 (V)</td>
<td>156.0</td>
<td>14.8</td>
<td>18.4</td>
<td>18.6</td>
<td>18.7</td>
</tr>
<tr>
<td>P29605 (VIII)</td>
<td>187.0</td>
<td>21.4</td>
<td>29.5</td>
<td>22.5</td>
<td>23.7</td>
</tr>
<tr>
<td>P29633 (X)</td>
<td>-</td>
<td>17.6</td>
<td>20.9</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Proximal Phalanx Digit IV</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P29539 (IV)</td>
<td>38.3</td>
<td>18.4</td>
<td>13.7</td>
<td>14.6</td>
<td>10.3</td>
</tr>
<tr>
<td><strong>Metatarsal IV</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P29618 (VIII)</td>
<td>80.0</td>
<td>13.6</td>
<td>12.0</td>
<td>13.1</td>
<td>10.0</td>
</tr>
<tr>
<td>P30722 (IV)</td>
<td>132.4</td>
<td>22.5</td>
<td>19.2</td>
<td>20.8</td>
<td>14.4</td>
</tr>
<tr>
<td><strong>Metatarsal V</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P29544 (IV)</td>
<td>117.5</td>
<td>11.3</td>
<td>14.0</td>
<td>14.6</td>
<td>13.2</td>
</tr>
<tr>
<td>P29569 (V)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>13.4</td>
<td>13.0</td>
</tr>
<tr>
<td>P29618 (VIII)</td>
<td>71.0</td>
<td>7.6</td>
<td>9.3</td>
<td>9.7</td>
<td>11.0</td>
</tr>
<tr>
<td><strong>Metatarsal IV</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P29527 (III)</td>
<td>136.5</td>
<td>35.8</td>
<td>30.8</td>
<td>40.2</td>
<td>24.0</td>
</tr>
<tr>
<td>P29625 (IX)</td>
<td>118.0</td>
<td>-</td>
<td>31.2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>P29632 (X)</td>
<td>-</td>
<td>37.0</td>
<td>32.5</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Dimensions of macropodid metatarsals and phalanges**

**Macropodid**

**Protemnodon sp.**
Lake Colongulac, Vict., and an extant sample of *M. giganteus* from Victoria. In size of $M_3$, P30716 is closest to the *M. ferragus* sample, falls well outside the range of the *M. titan* sample and is considerably larger than *M. giganteus*. In addition to size, P30716 agrees best with the *M. ferragus* specimens in tooth morphology. As in *M. ferragus* there is a large pit on the posterior face of the hypolophid. The lower molars of specimens referable to *M. titan* typically have a small pit in this same area which is consistently present but never large or developed to the degree found in *M. ferragus*. The possibility of P30716 representing a variant individual of *M. titan* is not dismissed. The problem of assigning P30716 to *M. titan* or *M. ferragus* with certainty reflects the close similarity in molar tooth morphology of these species. P30716 possibly represents the first reported occurrence of *M. ferragus* in Victoria.

**TABLE 10**

Dimensions of the cheek teeth of *Macropus cf. ferragus*

<table>
<thead>
<tr>
<th>Specimen</th>
<th>M3</th>
<th>M4</th>
</tr>
</thead>
<tbody>
<tr>
<td>P30716 (III)</td>
<td>18.8</td>
<td>11.9</td>
</tr>
<tr>
<td>(left)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P30716 (III)</td>
<td>18.6</td>
<td>11.8</td>
</tr>
<tr>
<td>(right)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The type locality of *M. ferragus* is the late Pleistocene fluviatile deposits of the E. Darling Downs, SE. Qd. *Macropus gracilis*, also from the E. Darling Downs, is recognized as a junior synonym of *M. ferragus* (Tedford 1967). As in the Dry Creek Local Fauna *M. titan* is the most abundant macropod in the E. Darling Downs collections whereas *M. ferragus* is uncommon. Remains of *M. ferragus* are abundant at Lake Menindee (Tedford 1967) and Lake Victoria (Marshall 1973) in SW. N.S.W. At Lake Victoria *M. ferragus* is more abundant than *M. titan*. *M. ferragus* was predominately a savannah-grassland species and is the largest grazing species of macropod known.
Family Diprotodontidae

Zygomaturus trilobus Macleay, 1857

A well preserved mandible (P29514) found in level I and an isolated M2 (P29515) from level II, represent a minimum of two individuals (Table 11). Postcranials of a diprotodontid were found in levels VIII and XI (Table 12). There is no duplication among these elements suggesting that they may all have come from a single individual.

The podial elements were compared with those of Diprotodon optatum figured by Stirling and Zietz (1899), and it is evident that they are not referable to that species. They are probably referable to Zygomaturus trilobus, the only diprotodontid so far known with certainty from the fauna. Gill’s (1967) record of Diprotodon remains in this fauna was based on these specimens.

### Table 12

Dimensions of metatarsals of Zygomaturus trilobus

<table>
<thead>
<tr>
<th>Specimen</th>
<th>L</th>
<th>PB</th>
<th>PD</th>
<th>DB</th>
<th>DD</th>
</tr>
</thead>
<tbody>
<tr>
<td>P29619 (VIII)</td>
<td>30.8</td>
<td>32.9</td>
<td>32.9</td>
<td>32.9</td>
<td>32.9</td>
</tr>
<tr>
<td>P29620 (VIII)</td>
<td>30.8</td>
<td>33.6</td>
<td>33.6</td>
<td>33.6</td>
<td>33.6</td>
</tr>
</tbody>
</table>

2. Doutta Galla Silt (Maribyrnong Local Fauna)

**Geology**

Disconformably overlying the “D Clay” containing the Dry Creek Local Fauna at the Keilor Cranium Site is the Doutta Galla Silt. The Doutta Galla Silt consists of “basal gravels three to four feet thick (basalt, sandstone, quartz, and mudstone) passed up through two to three feet of medium to fine quartz sands to 20 feet of yellowish-brown to dark grey, very fine sands and silts which form the main body of the terrace” (Bowler 1970, p. 19). “Gill (1953a, 1957) has equated the sediments of the Braybrook terrace with those of the Keilor Terrace... The sediments of these terraces have been formally defined as the Doutta Galla Silt, for which the type locality is located at the Dry Creek section (Gill 1962)” (Bowler ibid, p. 18). The fauna from the Doutta Galla Silt from the Keilor Cranium Site, Braybrook, and Green Gully is collectively described here as the Maribyrnong Local Fauna (see Appendix 2).

**Age**

Bowler (1970, p. 43) noted that “deposition of the Keilor Terrace silts [began] at approximately 18,000 yr B.P. This situation is similar to that reported from the excavations of A. Gallus at the cranium site... The independent radiocarbon dates from other sites confirm the validity of the chronological sequence outlined above”. An 18,000 yr B.P. date is accepted here as the basal age of the Doutta Galla Silt.

**The Fauna**

Six species of mammals are represented in the fauna: *Vombatrus ursinus*, *Macropus giganteus*, *Megaleia rufa*, *Mastacomys fuscus*, *Pseudomys cf. gracilicaudatus*, and *Pseudomys cf. australis*, all represented by living populations. The fauna is modern in all respects.

**Systematics Review**

Family Vombatidae

*Vombatrus ursinus* (Shaw, 1800)

*Vombatrus ursinus* is represented by a single mandible (P30724). This species has been discussed above under the Dry Creek Local Fauna.

Family Macropodidae

*Megaleia rufa* (Desmarest, 1822)

This species is represented by a minimum of four individuals and is the most abundant species in the fauna (Table 13). The L M3 and PW M3 of the Dry Creek specimens are compared in Fig. 11 with an extant sample of *Megaleia rufa*, *Osphranter robustus*, and *Macropus giganteus*. In size, the Dry Creek specimen falls well within the range of the *M. rufa* sample.

On lower molars of *M. rufa* the posterior face of the hypolophid is plain and the entoconid is set more posteriorly from the metaconid than the hypoconid is from the protoconid (Fig. 10). In *O. robustus* a faint diagonal
groove is present on the posterior face of the hypolophid, whereas \textit{M. giganteus} typically has a well developed (although usually small) vertical groove on the hypolophid which appears as a well defined pit on the occlusal surface in worn teeth. In both \textit{O. robustus} and \textit{M. giganteus} the hypolophid and protolophid are subparallel (Tedford 1967, pp. 113-114).

Fossil remains of \textit{M. rufa} have been recorded in Victoria from the outlet of Lake Gnapurt to Lake Corangamite. A C\textsubscript{14} date of 4,550 ± 120 (GaK-2518) yr B.P. was obtained from associated \textit{Coxiella} shells (Gill 1971). There is also a specimen of \textit{M. rufa} (P30216) from a bone bed on the E. shore of Lake Werranganuck. Gill (1971, p. 76) reports that a C\textsubscript{14} date of 25,300±1,200 (GaK-986) yr B.P. was obtained on \textit{Coxiella} shells from this bone bed making the \textit{M. rufa} specimen (P30216) late Pleistocene in age and roughly equating this deposit with the "D Clay". P30216 is compared in Fig. 11 with an extant sample of \textit{M. rufa} and specimens referable to \textit{M. rufa} from the Maribyrnong Local Fauna. The larger size of the Lake Werranganuck specimen suggests that larger forms of \textit{M. rufa} lived in late Pleistocene time. This species apparently underwent a late Pleistocene diminution in body size similar to that occurring in the \textit{Macropus titan}-\textit{M. giganteus} lineage. Average individuals in living populations of \textit{M. rufa} are about 25-30\% smaller than individuals in the late Pleistocene, i.e. >20,000 yr B.P.

As a living species \textit{M. rufa} has been recorded in Victoria from Benetook and Ned's Corner in the NW. corner of the State (Wakefield 1966, p. 632).

\textbf{Macropus giganteus} (Shaw, 1790)

Two specimens represent a minimum of one individual of this species (Table 13). The relationship of \textit{M. giganteus} to \textit{M. titan} was discussed under the Dry Creek Local Fauna. The Keilor specimens of \textit{M. giganteus} are indistinguishable in size and tooth morphology from extant specimens.

As a living species \textit{M. giganteus} is abundant in sclerophyll forest, common in woodland and rare in plains habitat (Marlow 1958). That the species is presently found in such diverse habitats reduces its usefulness as an indicator of paleohabitats.

\textbf{Order Rodentia}

\textbf{Family Muridae}

\textit{Mastocomys fusces} Thomas, 1882

This species is represented by a single specimen (P30906) consisting of the greater part
of a skull and associated fragment of the left ramus with \( M_{1-2} \) (Table 14).

Approximately 4% of the specimens of \( M. \) \( fuscus \) studied by Wakefield (1972) had supernumerary cusps on the lingual side of the upper molars. There is no trace of these cusps in P30906. P30906 is the specimen recorded by Gill (1955a,b) as \( Rattus \) \( cf. \) \( assimilis \).

At lower altitudes on the Australian mainland this species lives in “wet sclerophyll forest with dense undergrowth containing ferns, shrubs, and grasses” (Ride 1970, p. 152).

**TABLE 13**

Dimensions of the lower cheek teeth of \( Macropus giganteus \) and \( Megaleia rufa \) from the Doutta Galla Silt

<table>
<thead>
<tr>
<th>Specimen</th>
<th>DP&lt;sub&gt;3&lt;/sub&gt;</th>
<th>M&lt;sub&gt;1&lt;/sub&gt;</th>
<th>M&lt;sub&gt;3&lt;/sub&gt;</th>
<th>M&lt;sub&gt;4&lt;/sub&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L</td>
<td>AW</td>
<td>PW</td>
<td>L</td>
</tr>
<tr>
<td>Macropus giganteus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P30750b</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Megaleia rufa</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P30750a</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P30730</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P30751</td>
<td>9.0</td>
<td>4.7</td>
<td>5.7</td>
<td>11.2</td>
</tr>
</tbody>
</table>

**TABLE 14**

Cheek teeth dimensions of the rodents from the Doutta Galla Silt

<table>
<thead>
<tr>
<th>Specimen</th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
<th>M1-3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L</td>
<td>MW</td>
<td>L</td>
<td>MW</td>
</tr>
<tr>
<td>Upper cheek teeth</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mastacomys fuscus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P30906 (left)</td>
<td>3.8</td>
<td>3.2</td>
<td>2.6</td>
<td>3.1</td>
</tr>
<tr>
<td>P30906 (right)</td>
<td>3.8</td>
<td>3.3</td>
<td>2.6</td>
<td>3.1</td>
</tr>
<tr>
<td>Pseudomys cf. australis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P15773 (left)</td>
<td>2.7</td>
<td>2.0</td>
<td>1.8</td>
<td>1.8</td>
</tr>
<tr>
<td>P15773 (right)</td>
<td>2.7</td>
<td>2.0</td>
<td>1.7</td>
<td>1.8</td>
</tr>
<tr>
<td>Lower cheek teeth</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mastacomys fuscus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P30906 (left)</td>
<td>3.9</td>
<td>2.8</td>
<td>2.6</td>
<td>2.7</td>
</tr>
<tr>
<td>Pseudomys cf. gracilicaudata</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P30907</td>
<td>2.3</td>
<td>1.7</td>
<td>1.8</td>
<td>1.7</td>
</tr>
<tr>
<td>P30908</td>
<td>2.5</td>
<td>1.7</td>
<td>1.9</td>
<td>1.7</td>
</tr>
<tr>
<td>Pseudomys cf. australis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P15773 (left)</td>
<td>2.8</td>
<td>1.7</td>
<td>1.7</td>
<td>1.8</td>
</tr>
</tbody>
</table>
That this animal was considered to be extinct only four decades ago (Wood-Jones 1923-25) indicates that there is still much to be learned about its biology before palaeontologists can use it in palaeoecological considerations.

_Pseudomys cf. australis_ Gray, 1832

and

_Pseudomys cf. gracilicaudatus_ (Gould, 1845)

The genus _Pseudomys_ is represented by three specimens, representing two species (Table 14). These have been identified by Mr. J. A. Mahoney as _Pseudomys cf. gracilicaudatus_ (P30907, P30908) and _P. cf. australis_ (P15773).

"Native cats"

Gill (1955a,b) reported the presence of "native cats" in the Doutta Galla Silt, but I have not been able to relocate the specimens upon which this was based. "Native cat" is the colloquial name generally applied to one of the four species of _Dasyurus_ ( _D. hallucatus, D. geoffroyi, D. maculatus, D. viverrinus_ ) which live today on the Australian mainland and Tasmania. _D. maculatus_ and _D. viverrinus_ occur in the Dry Creek area today and are abundant in Holocene and late Pleistocene deposits in S. Victoria. The presence of either or both of these species in the Maribyrnong Local Fauna would not be unexpected.

Discussion

The major reservation which must be immediately recognized in comparing the Dry Creek Local Fauna with the Maribyrnong Local Fauna is that the sample size from the latter is extremely small. For this reason larger sample sizes from the Doutta Galla Silt will surely result in expansion of the present study; the basic theme of late Pleistocene faunal succession as outlined below should, however, remain unchanged.

In the time interval between deposition of the "D Clay" and the Doutta Galla Silt two major faunal changes occurred: (1) many of the megafaunal species became extinct (i.e. _Thylacoleo carnifex, Protemnodon anak, P. brehui, Macropus ferragus_ and _Zygomaturus trilobus_), and (2) some megafaunal species associated with the now extinct megafaunal species underwent a reduction in body size giving rise to smaller living forms. Some of these smaller living forms are presently recognized as distinct species (i.e. _Macropus giganteus_ represents a smaller living form of _M. titan_; _Sarcophilus harrisii_ represents a smaller living form of _S. laniarius_).

It is a well established fact that many living species of both carnivorous and herbivorous mammals are represented in late Pleistocene deposits by populations which are on the whole larger in absolute body size. This reduction in body size has been discussed by various workers under the heading of "post-Pleistocene dwarfing" and has been shown to occur on a world wide scale (Hooijer 1950, Kurten 1959, Wen-Chung 1963). Hooijer (1950) has referred to this dwarfing as "a sort of general evolutionary trend that is going on in the Quaternary". Kurten (1959, 1968 and references) has established the present of post-Pleistocene dwarfing in many European and Asian mammals with many of the lineages showing a 25-30% reduction in body size. As seen in the present study this diminution in body size is not restricted to post-Pleistocene time but occurs also in the late Pleistocene. I have, therefore, used the term "late-Pleistocene dwarfing" throughout the text in reference to this phenomena in the Australian marsupials.

The presence of late-Pleistocene dwarfing has not been well established for Australian marsupials although I have found it to occur in a large number of species. These include the following species or lineages as the case may be (where the late Pleistocene forms are recognized as distinct species they are listed first): _Macropus titan-M. giganteus, Macropus siva-M. agilis_ (probably), _Megaleia rufa, Osphranter cooperi-O. robustus, Wallabia vishnu-W. bicolor, Thylacinus cynocephalus, Sarcophilus laniarius-S. harrisii_, and possibly _Dasyurus maculatus_. _Macropus rufogriseus_ has remained unchanged in size and tooth morphology from the late Pleistocene to the present. _M. rufogriseus_ is also the smallest macropod species in the Dry Creek Local Fauna and it is interesting and probably significant that larger macropod species experi-
enced either a late-Pleistocene dimunition in body size (probably in the lineage M. siva-
M. agilis and definitely in the lineage M. titan-
M. giganteus), while still larger body species
became extinct (i.e. Protemnodon anak, P.
breus, Macropus ferragus). It would thus
appear that the late-Pleistocene fate of a
species was determined to a large extent by its
absolute body size, as reflected in tooth
dimensions.

The immediate problem arising from recog-
nition of late-Pleistocene dwarfing is how to
treat the populations of each species through
time. Are the larger late Pleistocene forms
specifically distinct, sub-specifically distinct, or
taxonomically indistinct from the smaller living
forms? Some of the lineages show size differ-
ences of 5%, others 30%. Can all of these
lineages be treated collectively or is it best to
treat each lineage separately depending upon
the amount of dwarfing involved? An attempt
to answer these questions must be based on
more extensive collections and larger sample
sizes than those constituting the faunas
described here.

Kurten (1959) considered the populations
he studied which showed post-Pleistocene
dwarfing to be distinct at the subspecific level.
These species differed by a magnitude equal to
the differences which occur in the Australian
species. If Kurten’s example is followed then
such late Pleistocene species as Macropus titan
would be regarded as subspecies of the living
M. giganteus (i.e. Macropus giganteus titan).
Such taxonomic changes are not proposed
here although the option is made available for
future studies.

The term megafauna as used in this study
includes those large body sized species of
mammal which occur in late Pleistocene
deposits >20,000 yr B.P. As shown above,
the megafauna is composed of two very dis-

tinct groups: (1) species now extinct, and (2)
species which have undergone a late-Pleisto-
cene dimunition in body size. It is thus
necessary to indicate which of these groups is
being considered when using the term mega-
fauna; if no distinction is made it must be
assumed that both groups are being considered
collectively.

In late Pleistocene faunas >20,000 yr B.P.
and represented by large sample sizes, both
megafaunal groups occur together. There are
no faunas to my knowledge which are com-
posed of only one of these groups. Based on
this evidence it may be induced that where
extinct megafaunal species are found there
will also be found larger forms of living
species; where living species occur which are
of their present size there will be no extinct
megafaunal species found. I know of no excep-
tions to this generalization although it must be
kept in mind that within the time interval
between extinction of part of the megafauna
and dwarfing of part of the megafauna these
groups may not show complete overlap.
Deposits showing this transition are presently
unknown.

At Lake Menindee, N.S.W., a C₁₄ date of
26,300 ± 1,500 yr B.P. was obtained on
charcoal from an Aboriginal oven associated
with the remains of the extinct macropod
Macropus ferragus (Tedford 1967). At Lake
Victoria, N.S.W., an 18,000 yr B.P. date is
tentatively recognized as representing a pos-
sible terminal date for extinction of late
Pleistocene megafaunal species (Marshall
1973). These studies complement the age and
faunal composition of the Dry Creek and
Maribyrnong Local Faunas respectively.

Thorne (1972) described the late Pleisto-
cene fauna from Koonalda Cave, S.A.,
collected from red, water-laid deposits “which
are approximately 20,000 yr B.P. old”. All of
the species present in the fauna are represented
by living forms; no extinct megafaunal species
or larger forms of living species are present.
The fauna is modern in all respects. Thorne’s
study upholds the conclusions reached by
Jones (1968, p. 203) that “where fauna is
found in archaeological sites spanning the last
20,000 yr it is modern”.

On the bases of these data it appears that
extinction of late Pleistocene megafaunal
species and attainment of a fauna of modern
aspect occurred in the time interval between
20,000-25,000 yr B.P. In addition, it is con-
cluded that late Pleistocene extinctions and
late-Pleistocene dwarfing are correlative and
that these phenomena may possibly have been caused by a common, cryptic, factor(s).

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**Appendix 1**

**Dry Creek Local Fauna**

**Level**

**I. Gravel layer 1, D excavation**

(a) Zygomaturus trilobus P29514, mandible.

(b) Macropus taylori P29515, isolated M3.

(b) Macropus taylori P29516, fragment of right ramus of medium-sized macropod, with roots of M2-3; P29517, distal end of humerus of large macropod.

**II. X clay under L gravel**

(a) Zygomaturus trilobus P29515, isolated M3.

(b) Macropus taylori P29544, left ramus; P29531, right ramus with M3-

(c) macropodid P29516, fragment of right ramus of medium-sized macropod, with roots of M2-3; P29517, distal end of humerus of large macropod.

**III. D excavation, D clay**

(a) Perameles nasuta P29634, associated right ramus fragment with P3-M3, and associated left maxillary fragment with M3-

(b) Vombatus ursinus P29526, mandible; P29519, fragment of right ramus.

(c) Protomnodon brehui P29522, fragment of right maxillary with M3-

(d) Protomnodon sp. P29527, left metatarsal IV with proximal end of metatarsal III, and left tibia.

(e) Macropus taylori P29518, proximal phalanx digit IV; P29520, medial phalanx digit IV; P29521, fragment of right maxillary with M3-4; P29523, right ramus; P29524, left ramus with M34; P29525, right ramus with P3, M34 (associated with P29524); P29526, tip of right lower incisor; P3004, right ramus; P3007, right ramus; P3007, proximal end of right metatarsal IV; P3007, proximal end of right metatarsal IV.

(f) Macropus cf. ferragus P30716, left and right ramus.

(g) macropodid P30718, distal end of metatarsal IV; P30721, proximal end of left metatarsal IV of medium-sized macropod.

IV. A clay, level 4

(a) Sarcophilus lanarius P29547, shaft of left humerus.

(b) Vombatus ursinus P29548, left ilium region of acetabulum.

(c) Macropus taylori P29534, left metatarsal IV; P29535, right metatarsal IV; P29537, left maxillary fragment with M3-4; P29541, right astragalus; P29558, proximal end of right metatarsal III and IV; P30715, left ramus; P30726, calcaneum; P29560, proximal phalanx digit IV.

(d) Macropus agilis P29549, left ramus; P29550, associated left and right rami; P29551, fragment of left ramus.

(e) Macropus rufogriseus P30725, left rami; P29577, right rami.

(f) macropodid P29532, distal end of right humerus; P29536, shaft of right humerus; P29539, proximal phalanx of digit IV; P29542, last thoracic or first lumbar vertebra; P29543, left ilium fragment; P29544, left metatarsal V; P29568, right
metatarsal V; P30722, left metatarsal IV; P29563, fragment of right scapula; P29566, fragment of right humerus; P29598, distal end of right femur.

V. A clay, level 3
(a) Sarcophilus lanarius P29631, right maxillary fragment with M3-M1.
(b) Protemnodon anak P29554, left ramus with Pn; M1; P29555, right M1.
(c) Macropus titan P29552, fragment of right ramus with M1; P29553, left ramus with M1; P29556, left metatarsal IV; P29557, left metatarsal V; P29564, right calcaneum.
(d) Macropus agilis P29575, left ramus; P29576, right ramus.
(e) Macropus rufogriseus P29578, right maxillary fragment with M2-M1.
(f) macropodid P29559, acetabular region of left innominate; P29561, left cuboid; P29562, right scapula fragment; P29567, caudal vertebrae; P29569, distal end of left metatarsal V; P29570, proximal end of right ulna; P29571, distal end of right humerus; P29572, right calcaneum; P29573, left acetabular portion of innominate; P30727, proximal end of left metatarsal IV; P30728, fragment of right innominate.

VI. A clay, level 2
(a) Thylacinus cynocephalus P29588, left humerus.
(b) Sarcophilus lanarius P29587, left maxillary fragment with M3-M1.
(c) Protemnodon sp. (probably P. brehuius) P29586, isolated right lower incisor.
(d) Macropus titan P29580, left ramus; P29581, right and left ramus; P29582, isolated right M3; P29583, left ramus; P29584, right ramus; P29589, right metatarsal IV; P29590, left metatarsal V; P29591, left metatarsal IV.
(e) Macropus agilis P29579, right P4, M3-M2.
(f) Macropus rufogriseus P29585, series of upper incisors.
(g) macropodid P29592, lumbar vertebra; P29593, vertebra; P29594, caudal vertebra; P29595, left acetabular portion of innominate; P29596, portion of right ilium; P29597, portion of right scapula.

VII. A clay, level 1
(a) Macropus titan P29600, left ramus; P29602, left ramus; P29605, left metatarsal V; P29606, right maxillary fragment; P29607, left calcaneum; P29608, associated left calcaneum and astragalus.
(b) Macropus agilis P29603, left ramus with M1.
(c) Macropus rufogriseus P30905, left ramus.

VIII. A clay, level 1a
(a) diprotodontid (probably referable to Zygomaturus trilobus) P29619, right metatarsal V; P29620, right metatarsal IV; P29621, right cuboid; P29622, right ectocuneiform; P29623, right navicular.
(b) Macropus titan P29609, right ramus; P29610, isolated left M1; P29611, associated fragments of upper dentition; P29612, medial phalanx of digit IV; P29613, associated left and right innominate.
(c) macropodid P29614, fragment of right scapula; P29615, fragment of right innominate; P29616, caudal vertebrae; P29617, right innominate; P29618, right metatarsal IV and V (both large and small species of macropod are included in this group).

IX. Excavation Y, various levels
(a) Protemnodon brehuius P29628, right ramus.
(b) Protemnodon sp. P29625, left metatarsal IV.
(c) Macropus titan P29624, right ramus; P29625, right maxillary fragment; P29627, left maxillary fragment; P29629, fragment of right tibia.
(d) In addition to the above there are fragments of a large pelvis, a medium-sized pelvis, a medial phalanx of digit IV, and several vertebrae of macropods. These were not catalogued because of their fragmentary condition.

X. KA Excavation 1963
(a) Protemnodon sp. P29632, right metatarsal IV.
(b) Macropus titan P29633, right metatarsal IV and V.
(c) macropodid (small species) P29630, isolated right lower incisor.

XI. KAA, lowest level
(a) Thylacoleo carnifex P29545, right maxillary fragment with lower edge of orbit, and anterior root of P3.
(b) Macropus titan P29528, right ramus with M1-M2; P29529, left ramus with M1-M2; P29530, left ramus with M1-M2; P29533, proximal end of right metatarsal IV; P29538, left maxillary fragment with M2-M1; P29540, right astragalus.
(c) diprotodontid (probably referable to Zygomaturus trilobus) P30723, right calcaneum.

KAA. middle level
(a) diprotodontid P29599, shaft of left humerus.
(b) Macropus rufogriseus P29574, right ramus.
(c) macropodid P29565, fragment of right humerus.

KAA. highest level
(a) Protemnodon anak P29604, associated left and right ramus.
(b) Macropus titan P29601, left ramus.

Appendix 2
Maribyrnong Local Fauna
(a) Vombatus ursinus P30724, mandible.
(b) Megaleia rufa P30730, left maxillary fragment with M3-M2; P30749, two lower molar fragments. This specimen was collected as float from the soil quarry in Green Gully downstream from St. Albans Road, Keilor, Victoria. P30749 and
other bones were found washed out of a bulldozed slope in the Doutta Galla Silt where it abuts against the hillside at the southern end of the quarry (slope nearest shed). P30750a, upper molar and lower molar series (left) (M2-4), and isolated left lower molar; P30751, associated with C4u date W169, Braybrook.

(c) *Macropus giganteus* P30752, left ramus with broken M2-4; P30750b, isolated lower molar, probably M4.

(d) *Mastacomys fuscus* P30906, partial skull with left and right M1-3, associated left ramus fragment with M1-5. This specimen was collected by Mr. H. E. Wilkinson, *in situ*, in the soil quarry in Green Gully, downstream from Keilor Terrace-St. Albans Road.

(e) *Pseudomys* cf. *P. australis* P15773, associated skull and postcranium fragments representing a single individual. This specimen was collected by Mr. E. D. Gill seven feet from surface and above diastema in east wall of Keilor cranium quarry.

(f) *Pseudomys* cf. *P. gracilicaudatus* P30907, left ramus with incisor, M1-3; P30908, left ramus with incisor, M1-3. These specimens were collected by Mr. H. E. Wilkinson 13 feet below the surface of high level terrace, in soil pit at mouth of Green Gully, Keilor.

Erratum: Fig. 9, . . . solid triangles represent extant sample of *Macropus giganteus* from Victoria, solid circles represent fossil sample of *Macropus titan* from Dry Creek (opposite as appears in the figure).