From the Editors

As our readers are no doubt well aware, the Editors are fond of pointing out the diversity of subject matter covered in the pages of this Journal. Without overstating the case, we can say that this issue of The Victorian Naturalist contains an offering of almost every category of paper and a wide range of topics. Here we present Contributions on floral communities in Gippsland; and small mammals on the Victorian Volcanic Plain; a Naturalist Note on hibernating skinks; Book Reviews on a range of subject matter; the latest additions to the Flora and Fauna Guarantee Act; and a citation in honour of Ern Perkins, the Australian Natural History Medallionist for 2008. This is diversity of subject and place, indeed.

Looking ahead to the next issue, the June number of the Journal will contain papers from the FNCV Biodiversity Symposium 2008, the subject of which was 'Birds in the urban environment.' This promises to be an interesting collection of papers, and a bonus for those readers who were unable to hear the papers presented last year. Birds are the subject of a number of popular journals today but from the earliest days of The Victorian Naturalist, over many years, papers that focused on avian fauna were a regular feature in this Journal. It is thus fitting that, from time to time, we devote an issue to the subject of birds. We anticipate that the June issue will be a landmark one.

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Front cover: Ern Perkins OAM is congratulated by John Landy AO on being awarded the Australian Natural History Medallion 2008. Photo by Joan Broadberry.

Back cover: Swamp Rat Rattus lutreolus. (See article on page 44.) Photo by the late Tom Sault; from the files of the FNCV.
Defining the floristic community Coastal Moonah Woodland in the Gippsland Plain bioregion

Claire Moxham, David Cheal and Vivienne Turner

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Abstract
The floristic community Coastal Moonah Woodland is listed as a threatened community under the Flora and Fauna Guarantee Act 1988, and remaining stands are often highly degraded. The distribution and composition of this community across its range has been poorly defined, which has proved problematic for land managers and planners. This paper refines the description of Coastal Moonah Woodland in the Gippsland Plain bioregion, provides a workable definition of the community, determines its relationships with similar communities and develops a Key to the community that can be used by land managers, planners and environmental consultants. As well, a Key to the transition states of Coastal Moonah Woodland is provided and these communities are described. (The Victorian Naturalist 126 (2) 2009, 36-43)

Keywords: Coastal Woodlands, Melaleuca lanceolata, Mornington Peninsula, floristic composition, community definition

Introduction
Most of Victoria’s Coastal Moonah Woodland has been cleared for residential, agricultural and other developments (DNRE 2002). Coastal Moonah Woodland is often the subject of planning disputes. Most remnants are small and have become degraded due to ongoing disturbances, such as recreational pressures and weed invasion (Calder 1975; Port Phillip Authority 1982). Most Coastal Moonah Woodland stands have experienced significant changes in species composition, community dynamics and physiognomy, resulting from the location of remnants in the landscape. Furthermore, modifications to disturbance regimes and other ecological processes make defining and classifying this vegetation community a challenge. For example, despite the community’s name, either Moonah, Coast Tea-tree or Coast Beard-heath can dominate or co-dominate the canopy. As well, the community is not necessarily a woodland structure, with some contemporary expressions of the community a closed-shrubland or an open-forest. The sub-canopy structure of this community also varies—open forest remnants may have grassy or shrubby subsidiary strata. Community characteristics prior to European settlement may never be precisely known, although reasonable inferences can be made.

The label used for this vegetation community, ‘Coastal Moonah Woodland’, reflects only one of this community’s condition states prior to European settlement (i.e. stands dominated by Moonah) and may also reflect our sense of loss of this attractive and distinctive version of the community.

There are differing opinions as to what constitutes the floristic community ‘Coastal Moonah Woodland’. The Action Statement (DNRE 2002) identified that the definition offered as part of the original nomination for listing needed to be refined. Unfortunately, the ‘definition’ within the Action Statement does not identify which species or structural features of the community are critical to either the definition or the recognition of Coastal Moonah Woodland. Furthermore, there is scant guidance as to which criteria are critical in deciding whether a vegetation stand belongs in Coastal Moonah Woodland. The description in the Action Statement cannot be used as a practicable definition.

The definition in the current paper is based on a set of rules extracted from the academic literature, and uses the knowledge of various experts in vegetation metrics and with substantial field experience in Coastal Moonah Woodland. Hence, it is based on intimate field knowledge of this community and surround-
ing vegetation, a close inspection of the floristic quadrat data set maintained by the Department of Sustainability and Environment and a practical consideration of workability. The aim of this paper is to offer a definition of Coastal Moonah Woodland that provides a basis for recognising and classifying the community in relation to its species composition, its physiognomy and its dynamic ecological characteristics. This definition also describes the range of soil types on which Coastal Moonah Woodland occurs.

**Definition and description of the floristic community Coastal Moonah Woodland in the Gippsland Plain bioregion**

**Definition:**
Coastal Moonah Woodland is a vegetation community that occurs within alkaline heathlands, on consolidated surfaces and dune systems within 10 kilometres of the coast. The presence of three or more of the following plant taxa, usually within a hectare of the site, is diagnostic of the community - Acacia uncifolia, Pimelea serpyllifolia *subsp.* serpyllifolia, Wurmbea latifolia, Parietaria debilis and/or Melaleuca lanceolata *subsp.* lanceolata. Its canopy is dominated by Melaleuca lanceolata *subsp.* lanceolata and/or Leptospermum laevigatum and/or Leucopogon parviflorus. Structurally, it may occur as a shrubland (open or closed) through to a low forest. (Nomenclature follows Walsh and Stajsic 2007).

**Description:**
Coastal Moonah Woodland occurs within ten kilometres of the Victorian coast and mostly west of Cape Schanck. The community occurs within 500 to 800 mm mean annual rainfall that may fall during any season, although soil moisture is generally heightened in winter. Coastal Moonah Woodland occurs on coastal dune soils that are alkaline at moderate depth and often contain calcarenite. They may be neutral to slightly acidic at the surface. The soil usually consists of a coarse-grained sand, with some minor organic incorporation (grey/brown sands). Calcarenite nodules occur throughout this substrate. The soil may be well-drained but moist throughout winter with soil drying to 2-3 m depth in summer on the ridges and to 300 mm in the swales.

Within the coastal dune system, the community occurs in the swales, slacks and on upper south-facing slopes. Typically it does not occur on high exposed dunes or on headland tops. Similarly, it does not occur on the inland flats of aeolian secondary deposition.

The following native species in combination are faithful to this community in these landscapes: Broad-leafed Early Nancy *Wurmbea latifolia*, Shade Pellitory *Parietaria debilis*, Thyme Rice-flower *Pimelea serpyllifolia subsp. serpyllifolia*, Coast Wirilda *Acacia uncifolia* and Moonah *Melaleuca lanceolata subsp. lanceolata*. Other useful differential species include: Small-leaved Clematis *Clematis microphylla*, Coast Swainson-pea *Swainsona lessertiifolia*, Coast Tea-tree *Leptospermum laevigatum*, Coast Beard-heath *Leucopogon parviflorus*, Rare Bitter-bush *Adriana quadripartita*, Austral Carrot *Daucus glochidiatus* and Kidney-weed *Dictandra repens* (Calder 1975; SAC 1998). In Coastal Moonah Woodland, the canopy is dominated by Moonah and/or Coast Tea-tree and/or Coast Beard-heath or some combination of these with ‘marginal species’ that are frequent in adjoining communities and occasional within Coastal Moonah Woodland, including Sea Box *Alyxia buxifolia*, Cherry Ballart *Exocarpos cupressiformis* and Coast Twin-leaf *Zygophyllum billardierii*.

Coastal Moonah Woodland has a variable structure according to topographic position, the degree of exposure to coastal influences and the intensity and type of past disturbance (Fig. 1). In its most sheltered occurrences, it may be a low forest, while in exposed areas it may form an open or closed shrubland. Thus, the community ranges structurally from a low forest (open or closed), through low woodland and low open woodland to scrub (open or closed) and tall shrubland (open or closed).

Most former Coastal Moonah Woodland stands have experienced significant changes in species composition and abundances, resulting from modifications in disturbance regimes such as grazing, fire, soil nutrient supply and weed invasion (Calder 1975; JCVRFASC 2000). Disturbance regimes have influenced native plant diversity, community dynamics and the physiognomy of the community (DNRE 2002). Species that commonly increase under these new disturbance regimes include: Coast Tea-tree *Leptospermum laevigatum*, Bower Spinach *Tetragonia implexicoma*, Seaberry Salt-bush *Rhagodia candolleana*, Rare Bitter-bush *Adriana quadripartita* and the exotics Panic...
Fig. 1. Examples of the variation of the structure of Coastal Moonah Woodland. Top left: Coastal Moonah Woodland with a grassy understorey. Top right: Coastal Moonah Woodland with a shrubby understorey. Bottom left: Coastal Moonah Woodland stand (branched habit) with shrubs, grasses and herbs common in the understorey. Bottom right: Coastal Moonah Woodland with Tea-tree dominant in the canopy layer.

**Potential Coastal Moonah Woodland**

Coastal Moonah Woodland once occupied large near-coastal areas of Victoria and is currently limited to small remnants that are usually degraded (Calder 1975; JCVRFASC 2000). Degradation may be attributed to the alteration of disturbance regimes, land clearance and weed invasion (Calder 1975; Port Phillip Authority 1982). This has left some stands of Coastal Moonah Woodland highly degraded, so that they no longer closely resemble the original community.

Such vegetation is variable in species composition and abundance and may be identified by several factors depending on disturbance history. Stands may lack Coast Wirilda, Moonah or Thyme Rice-flower, particularly after a disturbance event. Alternatively, Moonah or Thyme Rice-flower may be present but as very low numbers of individuals. There may be a loss of cover of indigenous species (to less than 5% of the total foliage cover). Exotic species may dominate the overall plant cover, to greater than 75% of the total foliage cover.

Vegetation stands that were once Coastal Moonah Woodland but have since become highly degraded, are no longer reasonably classified as Coastal Moonah Woodland. These remnants may be difficult to identify as former Coastal Moonah Woodland due to the paucity of definitive and characteristic species of Coastal Moonah Woodland and its lack of faithful differential species (Bridgewater 1981; Rieley and Page 1990; Rodwell 2006). Such vegetation stands may be considered ‘Potential Coastal Moonah Woodland’, as the characteristic component species of Coastal Moonah Woodland may be present in the soil seed bank and able to re-establish if the appropriate management regime is implemented.

A guide to potential transition states of Coastal Moonah Woodland is provided below. This information gives an indication of the likelihood of the vegetation regenerating into Coastal Moonah Woodland if the appropriate management regimes were implemented.

**Saline Variant**

A saline-influenced community dominated by Moonah exists in some localities such as Phillip and Churchill Islands. This floristic community is considered neither part of Coastal Moonah Woodland nor of the Ecological Vegetation Class (EVC) Coastal Alkaline Scrub syn. Calcareous Dune Woodland (EVC 858) due to its occurrence on different soil types (Sutter and Downe 2000) and distinctively different species composition. It is distinguished from Coastal Moonah Woodland by the presence of two or more of the following species: Australian Salt-grass *Distichlis distichophylla*, Rounded Noon-flower *Disphyma crassifolium* subsp. *clavellatum*, Beaded Glasswort *Sarcocornia quinqueflora*, Astral Seablite *Suaceda australis*, Marsh Saltbush *Atriplex paludosa* subsp. *paludosa*, Sea Celery *Apium prostratum*, Creeping Brookweed *Samolus repens*, Knobby Club-sedge *Ficinia nodosa* and Salt Couch *Sporobolus virginicus* (Sutter and Downe 2000). Very large individuals of Moonah dominate the sparse canopy of this community type. Coast Wirilda is not present in this community and regeneration of Moonah canopy rarely has been observed. This community is very rare and requires further examination. It may be a result of sea level rise.

It should be noted also that non-coastal stands with some similarities to Coastal Moonah Woodland occur in the Mallee and Wimmera, and also require further examination.

**Key 1: Coastal Moonah Woodland (and related coastal vegetation) in the Gippsland Plain Bioregion**

This key has been developed for woody coastal (i.e. within 10 km of the coast) communities in the Gippsland Plain Bioregion. It is not definitive for Coastal Moonah Woodland in other bioregions (e.g. Otway Plain) although it may assist in recognising Coastal Moonah Woodland in other bioregions.

The key is not intended for application to very small patches of vegetation and should be used within a wider context (i.e. greater than one hectare) of the surrounding vegetation, occurring on similar substrates and in a similar topographic setting.
Contributions

The key is an aid to recognition and thus may not include consideration of all the components of the definition. It is intended for use throughout the year. As such, certain seasonal components of Coastal Moonah Woodland, that are part of its definition, are not used in the key. The key also uses the Ecological Vegetation Class (EVC) classification system, which is the main vegetation unit in the hierarchy for classification used in vegetation management and planning in Victoria, Australia (Woodgate et al. 1996). The EVC is defined by both floristic and structural attributes as well as ecological processes that may be characteristic of that environment (Woodgate et al. 1996). The EVC represents a classification system higher than the floristic community level (Parkes et al. 2003).

1. Vegetation stand occurs on a headland system ................................................. 2
1. Vegetation stand occurs on a dune system ....................................................... 3
1. Vegetation stand occurs elsewhere (i.e. neither on a headland nor a dune system) in the coastal (i.e. within 10 km of the coast) landscape .................. not Coastal Moonah Woodland

2. Vegetation stand occurs on a headland system and consists of a wind-pruned shrubland or (otherwise) low shrubland to 2 m tall ...... Coastal Headland Scrub (EVC 161)
2. Vegetation stand consists of a tussock grassland that may contain an emergent shrub layer ................................................................. Coastal Tussock Grassland (EVC 163)

3. Vegetation occurs on the foredunes/primary dunes of ocean and bay beaches ........... 4
3. Vegetation occurs on the secondary or tertiary dune system .................................. 5

4. Vegetation is a grassland with halophytes present........ Coastal Dune Grassland (EVC 879)
4. Vegetation forms a low shrubland (canopy dominated by shrubs, < 4 m tall) .............................................................. Coastal Dune Scrub (EVC 160)

5. Canopy consists of Coast Banksia Banksia integrifolia subsp. integrifolia over tall shrubs of Coast Tea-tree Leptospermum laeavigatum. Scramblers such as Bower Spinach Tetragonia integrifolia and Seaberry Saltbush Rhagodia candolleana subsp. candolleana are common in the shrub layer ................................................................. Coast Banksia Woodland (EVC 2)
5. Canopy not dominated by Coast Banksia Banksia integrifolia subsp. integrifolia ........... 6

6. Vegetation occurs as a closed shrubland on exposed situations on the upper slopes and crests of secondary dunes and dominated by Coast Wattle Acacia longifolia var. sophorae and Coast Tea-tree Leptospermum laeavigatum ...................................................... Coastal Dune Scrub (EVC 160)
6. Vegetation not as above, occurring on the sheltered upper slopes and/or swales in the dune system .... Coastal Alkaline Scrub syn. Calcareous Swale Community (EVC 858) ...... 7

7. Vegetation occurring in the dune swales, with a predominantly grassy structure and dominated primarily by grasses (mainly Common Tussock-grass Poa labillardieri) ........ Floristic Community: Calcareous Swale Community (undescribed)
7. Not as above ................................................................. 8
8. Less than 75% of the total vegetation cover is provided by weeds. *Pimelea serpyllifolia* or *Acacia unciifolia* present and either Moonah *Melaleuca lanceolata* subsp. *lanceolata*, Coast Tea-tree *Leptospermum laevigatum*, or Coast Beard-heath *Leucopogon parviflorus* dominate the canopy. Usually occurring in dune swales on lower slopes and/or upper south-facing slopes behind the primary dune system.

8. Greater than 75% of the total vegetation cover is provided by weeds

Floristic Community: Coastal Moonah Woodland

Potential and indeterminate Coastal Moonah Woodland

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**Key 2: Transition States of Coastal Moonah Woodland**

This key is a guide to the transition states likely to occur for Coastal Moonah Woodland in the Gippsland Plain Bioregion. The transition states should be used as an indication only. The key is not intended to be applicable to small patches of vegetation and should be utilised within a wider context (one hectare) of the surrounding vegetation occurring on similar substrates and in similar topographic settings.

1. Closed Coast Tea-tree *Leptospermum laevigatum* dominating the canopy .......................... 2
2. Not as above .................................................................................................................. 4

3. Closed Coast Tea-tree *Leptospermum laevigatum*-dominated canopy
   with Panic Veldt-grass *Ehrharta erecta* dominating the field layer .............................. TS1
4. Not as above .................................................................................................................. 3

3. Coast Tea-tree *Leptospermum laevigatum*-dominated canopy,
   abundant mosses present in the field layer, substantially lacking *Ehrharta erecta*  .......... TS2
5. Coast Tea-tree *Leptospermum laevigatum*-dominated canopy, with
   Coast Wirilda *Acacia unciifolia* present ................................................................. TS3

4. Moonah *Melaleuca lanceolata* subsp. *lanceolata* dominating the canopy with
   *Daucus glochidiatus* common in the field layer in the cooler parts of the year,
   frequently with abundant woody weeds, notably
   *Polygala myrtifolia* or *Rhamnus alaternus* ............................................................. TS4
5. Not as above .................................................................................................................. 5

5. Moonah *Melaleuca lanceolata* subsp. *lanceolata* dominating the canopy,
   Common Tussock-grass *Poa labillardierei*, White Elderberry *Sambucus gaudichaudiana*
   and Small-leaf Bramble *Rubus parvifolius* present in the field layer .......................... TS6
6. Moonah *Melaleuca lanceolata* subsp. *lanceolata* dominating the canopy,
   *Austrodanthonia* spp. dominant in the field layer. *Ehrharta erecta* present,
Descriptions of Coastal Moonah Woodland Transition States

The following transition state descriptions are **indications** of the condition and community dynamics of Coastal Moonah Woodland and thus should be used as a **guide only**. The transition states are only applicable to plant communities either identified as previous or current Coastal Moonah Woodland. Thus they consider transition to 'High Quality Coastal Moonah Woodland' and include vegetation that is already Coastal Moonah Woodland, as well as vegetation that may not yet be reasonably classified as Coastal Moonah Woodland but is (re-)nascent Coastal Moonah Woodland. It must be remembered that vegetation is a continuum. An individual stand may show some of the characteristics of Coastal Moonah Woodland at the same time as it also shows some of the characteristics of (degraded) transition states.

Under the correct management regime the majority of the transition states documented here have high regeneration potential due to soil stored seed. Some species may appear absent from the community but may be present in the soil seed bank. Thus it is recommended that communities classified as Potential Coastal Moonah Woodland or degraded/disturbed Coastal Moonah Woodland be subject to soil seed bank studies to determine the true species richness of the community.

Species that are likely to be present in the soil seed bank and that regenerate rapidly include: Coastal Wirilda *Acacia uncifolia*, Thyme Rice-flower *Pimelea serpyllifolia* subsp. *serpyllifolia*, Coast Beard-heath *Leucopogon parviflorus*, Rare Bitter-bush *Adriana quadripartita*, Slender Bush-pea *Pultenaea tenuifolia*, Running Postman *Kennedia prostrata*, Silky Guineaflower *Hibbertia sericea*, Small-fruit Fanflower *Scaevola albida* and a number of **Senecio** species.

**Transition States (TS)**

**TS1** – Panic Veldt-grass *Ehrharta erecta* dominates the field layer; indicating past mowing and grazing. Does not include sites subject to former heavy application of fertilizers. This community state may have a diverse seed bank and may regenerate to higher quality Coastal Moonah Woodland if the appropriate management regime is undertaken.

**TS2** – Mosses abundant in the field layer with little to no Panic Veldt-grass *Ehrharta erecta*. Site likely to have tuberous orchid species. This community state is likely to have a diverse seed bank and is likely to regenerate to high quality Coastal Moonah Woodland if the appropriate management regime is implemented.

**TS3** – Coast Wirilda *Acacia uncifolia* present and scattered individuals of Moonah may be present. This state is likely to be a midden or lime kiln site.

**TS4 to TS6**: Moonah *Melaleuca lanceolata* subsp. *lanceolata*-dominated canopy

**TS4** – Abundant mosses and Austral Carrot *Daucus glocidiatius* present in the field layer (this annual is not apparent in summer) with weedy species such as Myrtle-leaf Milkwort *Polygala myrtifolia* present. This community state is likely to have a diverse seed bank (including *Acacia uncifolia*) and is likely to regenerate to good quality Coastal Moonah Woodland if the appropriate management regime is implemented.

**TS5** – Austrodanthonia species dominating the field layer with *Ehrharta erecta* present. Indicative of past mowing. Likely to regenerate to High Quality Coastal Moonah Woodland if mowing ceases and appropriate management regime applied.

**TS6** – Common Tussock-grass *Poa labillardieri*, White Elderberry *Sambucus gaudichaudiana* and Small-leaf Bramble *Rubus parvifolius* and/or Coastal Sword-sedge *Lepidosperma gladiatum* present in the field layer. Usually occurring on damp south facing low elevation lenses. Can have a high degree of weed cover.
Acknowledgements
This document was initiated at a workshop held at the Arthur Rylah Institute for Environmental Research on 13 September 2004. Workshop participants included: David Cheal, Gija Walker, Imelda Douglas, Dale Tonkinson and Claire Moxham. Further discussions with Alison Oates clarified a number of issues. Michel Kohout and an anonymous reviewer provided valuable comments on the manuscript. This work was funded through the Port Phillip and Western Port Catchment Management Authority, the National Heritage Trust and the Victorian Department of Sustainability and Environment.

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One Hundred Years Ago
THE DARWIN-WALLACE CELEBRATION

The Linnean Society of London has just issued a most interesting record of the Darwin-Wallace celebration, held on 1st July last. The meeting was arranged for the purpose of celebrating the fiftieth anniversary of the joint communication made by Charles Darwin and Alfred Russel Wallace to the society on 1st July, 1858, entitled—“On the Tendency of Species to form Varieties, and on the Perpetuation of Varieties and Species by Natural Selection”. In addition to the fellows, foreign members, and associates, invitations were issued to certain distinguished naturalists, every university in the United Kingdom, and to societies publishing on subjects of biology, the result being a great attendance of interested persons, including Dr. Wallace and several members of the Darwin family. The president of the Linnean Society, Dr. Dukinfield H. Scott, presided, and briefly outlined the object of the meeting, and then called on Dr. Wallace to receive the first Darwin-Wallace medal, instituted in commemoration of the event, and alluded to the self-sacrificing position Dr. Wallace had always taken in relation to the great theories first made public in the paper of 1858.

Dr. Wallace, who was received with great enthusiasm, replied at some length, and in doing so took the opportunity of detailing the actual relations between Darwin and himself prior to July, 1858, in order to correct the misapprehensions of popular writers as to what his share in Darwin’s work really amounted to. He said he had even been credited with being the first discoverer, whereas the idea had occurred to Darwin in October, 1838, nearly twenty years before it had occurred to him, in February, 1858. Darwin had spent the twenty years in collecting evidence, conducting original observations and experiments, the results of which would be found in his “Origin of Species” and especially in that wonderful storehouse of knowledge his “Animals and Plants under Domestication”. In 1844 Darwin had outlined his views to his friends Sir Charles Lyell and Dr. (now Sir Joseph) Hooker. The former strongly urged him to publish an abstract of his theory, in case some other person should precede him, but he always refused, on the plea that he had not got together all the materials for his great work. Then without any warning Lyell’s prediction came true, for in June, 1858, he (Dr. Wallace) had forwarded to Darwin a letter, asking him to hand an essay enclosed, “On the Tendency of Varieties to Depart Indefinitely from the Original Type”, to Sir Charles Lyell for publication if deemed suitable.

Continued on page 53
Rocks, rats and cats: a survey for small mammals in native grasslands on farms across the Victorian Volcanic Plain

Heidi Zimmer and Vivienne Turner

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Abstract
Mammal surveys were conducted at 16 farms on the Victorian Volcanic Plain, as part of a study on native grassland biodiversity. One hundred and forty-six hair tubes/funnels were laid at the 16 farms. Elliott traps were laid only at one farm, for 27 trap nights, in a small area with active disturbance indicative of the Swamp Rat Rattus lutreolus. No evidence of any small native mammals was discovered using hair tubes, funnels or Elliott traps. The only hair recovered was from a Cat Felis catus. These results are discussed from the perspective of small mammal decline on the Victorian Volcanic Plain and its ecological implications. Improved methods for detection of elusive grassland mammals are suggested. (The Victorian Naturalist 126 (2) 2009, 44-50)

Keywords: Elliott trapping, Faunatech hair funnels, hair-tube sampling, Rattus lutreolus, Western Basalt Plain.

Introduction
The native grassland of the Victorian Volcanic Plain (VVP) bioregion is a critically endangered ecosystem (EPBC 1999). Until recently, the extent and quality of native grassland across the VVP was largely unknown. Although only 0.5% is protected in reserves, recent mapping and research indicates that ecologically significant grasslands occur across the private estate (Barlow and Ross 2001; Williams et al. 2005; Turner and Zimmer 2007; Zimmer et al. 2008). The decline in the distribution of native grasslands has been driven by agricultural expansion (Stuwe 1986) and urban development (Williams et al. 2005). The associated decline in small ground-dwelling mammals on the VVP has been attributed to three main causes: habitat modification, impact of introduced mammals, and direct killing (Bennett 1982).

Habitat preferences of small ground-dwelling mammals are commonly based on vegetation structure (Moro 1991; Dufty 1994; Catling et al. 2000); the greater the structural complexity, the greater the diversity of fauna supported (Michael et al. 2004). Agricultural intensification of landscapes has led to a decline in this ecological complexity (Benton et al. 2003).

Since 2003 the authors have been studying the floristic and structural responses of native grasslands to sheep grazing on the VVP. The ‘long-term ecological grazing project’ has two main elements: (1) a network of 13 ‘Plains-Tender’ farms (private properties) where several grazing-rest treatments are trialled at the paddock-scale and (2) three experimental sites where six grazing-rest treatments are imposed within a system of 15 m x 15 m plots (Fig. 1). In spring 2005, it was noticed that plots undergoing grazing rest periods of ≥ 6 months per year were grossly disturbed at two of the experimental sites, Hamilton in the west and Birregurra in the east (~150 km apart) (Fig. 2). Local experts suggested that the system of tunnels and runways beneath mature Kangaroo Grass Themeda triandra tussocks were created by the native Swamp Rat Rattus lutreolus. The disturbance has persisted only at the Hamilton site. In spring 2007, the authors decided to use the rare opportunity of access to 16 private properties across the VVP to conduct a general survey for small mammals. As well, the authors were determined to discover whether or not plot disturbances were a result of the activities of the Swamp Rat.

Historically, the VVP, previously known as the Western Basalt Plain, was home to a variety of small mammals (Seebeck 1984). The sub-fossil record reflects a diverse mammal fauna of 42 species (Wakefield 1964), but far fewer are extant on the VVP (Taylor et al. 2003). Although a range of native rats and mice were
Fig. 1. Map of Victoria showing locations of study farms • and experimental sites •

once present in all major habitat types of the plain, several species became extinct within the first few years of settlement (150 years ago) (Seebeck 1984), including a species now known to be Long-eared Mouse *Pseudomys auritus* (Medlin 2008) (formerly described as Plains Rat *Pseudomys australis*, Mahoney and Richardson 1988, although see Williams and Menkhorst 1995) and an undescribed large *Pseudomys* (Seebeck 1984). Small native ground-dwelling mammals recorded on the plains in the early 1900s include the monotreme, *Echidna Tachyglossus aculeatus*, several dasyurid marsupials (Spotted-tailed Quoll *Dasyurus maculatus*, Eastern Quoll *Dasyurus viverrinus*, Fat-tailed Dunnart *Sminthopsis crassicaudata*), Eastern Barred Bandicoot *Perameles gunnii* and Swamp Rat *Rattus lutreolus* (Bennett 1982), all of which were reported to have undergone decline or local extinction in the Woolsthorpe area of the plain (Bennett 1982). Today, the Spotted-tailed Quoll has a much reduced range on the VVP, restricted to the Otway Range and the Mt Eccles–Lake Condah area (Fleay 1932, Belcher et al. 2008). The Eastern Quoll, alongside a larger mammal, the Common Wombat *Vombatus ursinus*, became extinct on the plain relatively recently (i.e. 1950s) (Seebeck 1984).

In the mid-1970s, Emison et al. (1975) asserted that the VVP grasslands were inhabited by approximately eight species of mammal, four of which used grassland as primary habitat: Fat-tailed Dunnart, Eastern Barred Bandicoot, the introduced Hare *Lepus capensis* and House Mouse *Mus musculus*. More recently, a study of mammal fauna in native grasslands on farms on the VVP, undertaken in 1995-1996, documented the occurrence of only two native small mammal species, Fat-tailed Dunnart and Common Dunnart *S. murina* (Hadden 2002).

**Methods**

*Faunatech* hair funnels were laid in 28 native grassland paddocks (on 13 farms) undergoing grazing-rest treatments. *Faunatech* hair funnels are resistant to damage from stock; they are cone shaped, baited at the tapered end and have a removable sticky surface inside. The hair funnels were placed close to permanent vegetation sampling transects. On average, three funnels were used per paddock. They were laid during October 2007 for approximately two weeks, after which they were collected, and the sticky surfaces removed, analysed for hairs and sent to Barbara Triggs for identification.
Fig. 2. Disturbance attributed to Swamp Rats, Hamilton, August 2006
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Orange Lacewing butterfly. Photo by Dan Carey Photography.
At the three experimental sites, three hair tubes were placed in each of the three plots undergoing continuous rest from grazing. The hair tubes were made from a square of flexible plastic, bordered on two sides with double-sided sticky tape. They are designed so that when folded in a ‘u’ shape the tapes catch hairs of any mammals entering the tube. Bait made from oats, honey and peanut butter was placed in the middle. The tubes were left out for an average of three weeks (between 15 October and 23 November 2007), then collected and the tapes removed and analysed for the presence of hairs.

At the Hamilton site, three Elliott traps were placed in each of the three plots undergoing continuous rest from grazing (i.e. the most disturbed plots, Fig. 2) for three consecutive nights (22-25 October 2007). The three continuously rested plots were between 15 m and 30 m apart. Traps were baited with a ball of oats, honey and peanut butter, and bedding material was provided. Each trap was placed in a plastic bag to protect it from rain. Traps were then placed beside tunnel entrances or on runways and were opened each evening and checked soon after dawn.

Results

Only one of the 146 hair tubes/funnels had hair present, from the Cat Felis catus. No animals were captured in the Elliott traps after 27 trap nights (one trap night equals one trap set for one night). No evidence of tunnelling or burrows was seen at any of the farms other than at Hamilton.

Discussion

The Swamp Rat can make tunnels through dense grass by biting away and eating any obstructing plants (Lunney 2008). It also can be cryptic (Lunney 2008). Further, Swamp Rats are known to construct burrows in ungrazed native grasslands (Seebeck 1995). The failure to trap small native mammals, or indeed their hair, does not prove their absence from these sites. Capture probability can vary due to trap position, time of year/season, micro-habitat and also odours from previous trap occupancy (Cunningham et al. 2005). The effect of these variables changes for different target species. In efforts to capture Swamp Rats at the Hamilton site, traps were placed in areas of relatively dense, structurally diverse vegetation (Lunney 2008) and alongside burrows and on runways. Further, trapping was undertaken during spring, when Swamp Rats are likely to be mobile. Previous trap occupancy is thought to have no influence on capture probability of the Swamp Rat (Monamy 1996). Trap type also can impact capture probability: hair funnels detect a wider range of species than hair tubes, as the tapered shape of hair funnels is designed to allow a wide range of different sized species to make contact with the sticky surface (Lindemayer et al. 1999). However, it is possible that the industrial adhesive used may act as a deterrent to some Rattus species (Meggs in Lindemayer et al. 1999).

Hadden (2002) recorded two species of Dunnart in remnant native grasslands on the VVP by pitfall trapping, systematic searching and opportunistic discovery. Morton (1978) found ‘rock-rolling’ to be the best method of detecting Fat-tail Dunnarts on the VVP. Several landholders also said they had seen dunnarts on their properties. It is possible that Faunatech hair funnels were not the best method for recording the presence of dunnarts (see Garden et al. 2007). Information on the distribution and abundance of small mammals, especially on private property, is scarce (see Hadden 2002). A more intensive small mammal survey effort is necessary on the VVP, including rock-rolling, pitfall trapping and spotlighting, before the absence of species is confirmed.

Rocks typically made up less than 10% cover in the paddocks surveyed and no search under rocks was made. Since the process of ‘cleaning-up’ paddocks, by removing the basalt rocks that litter VVP grasslands in their natural state, is considered a major threatening process to reptiles (Brereton and Backhouse 1993), it is possible that this loss of rock habitat, rather than loss of native grass habitat, from paddocks on farms across the VVP is likely to be leading to a decline in Dunnart populations (Morton 1978).

Little is known about the invertebrate communities of the VVP (Yen et al. 1994, Yen et al. 1995, Gibson and New 2007), nor about their importance as prey for insectivores such as Dunnarts. Although Hadden (2002) found a positive correlation between Fat-tailed Dunnart numbers and native plant richness, no such relationship was found for invertebrates.
However, Horne and Nicholson (2007) found that invertebrate diversity was significantly higher in species-rich native grasslands, compared to degraded native grassland or exotic pasture.

Although there have been no studies on the ecological role of small mammals in the grasslands of the VVP, research elsewhere indicates that they are likely to contribute to ecosystem dynamics in a variety of ways. For example, small mammal herbivory, including seed predation, can impact on representation of plant species and functional groups, recruitment opportunities and thus vegetation composition and succession (Gibson et al. 1990, Huntly 1991, Brown and Stuth 1993, Hulme 1994, Huntly and Reichmann 1994, Olff and Ritchie 1998, Howe et al. 2002). At Hamilton, the gross community disturbance that is attributed to Swamp Rats correlates with greatly reduced species richness, and the dominance of exotic plant species, Ribwort Plantago lanceolata and Sweet Vernal-grass Anthoxanthum odoratum, over the suite of 49 other plant species recorded there. A similar level of community disturbance has been attributed to the burrowing activities of pocket gopher (Geomyidae) in North American fields (Reichmann and Smith 1985). Apart from the massive change in plant community expression, such activities have a considerable effect on the soil structure. When walking about the disturbed plots, the authors had to take care not to sink into the extremely soft soil. Small burrowing mammals are likely to have contributed to the soil of the western basalt plain being described as a ‘bed of sponge’ in the 1800s (Conley and Dennis 1984). The impact of the loss of this soil characteristic on the functioning of the grassland ecosystem can only be speculated upon (Garkaklis 2003).

Conclusion

Discovering more about the small mammal communities of native grasslands on the Victorian Volcanic Plain will require targeted effort. At the very least, opportunistic searching under rocks (Fig. 3) could reveal dunnarts, as well as useful information on lizards and invertebrates. The identity of our mystery plot disturbance may become clearer with spotlighting, more intensive trap effort and the use of infra-red camera technology. More research into the habitat requirements of small mammals on the plain and the threats to their persistence, such as rock removal and predation by Cats, is needed. Investigation of the ecological role formerly played by small mammals could prove very important to our understanding of the Victorian Volcanic Plain.

Acknowledgements

Thanks to the wonderful landholders of the VVP for allowing us to complete these surveys on their farms. Claire Moxham, Judy Downe and Arrn Tolsmena gave invaluable assistance in the field. Luke Woodford, Ryan Chick and Phoebe Macak gave excellent advice on mammal trapping. Sally Dwyer gave very useful assistance with literature research. Thankyou to Barbara Triggs for mammal hair identification, and to Cameron Williams for assistance with the Victorian Fauna Database. Comments by Peter Menkhorst and two anonymous referees greatly improved this manuscript. This project was jointly funded by the Department of Sustainability and Environment and Corangamite Catchment Management Authority.

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Fig. 3. High quality grassland with rocks (potential fauna habitat)
Contributions


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Beating the cold: group hibernation in a species of small skink

While group hibernation in small skinks is probably commonplace, there are relatively few reports on it, or reasons suggested for those cases observed.

At 7.45 am on the morning of 22 July 2008, I stopped on the side of the main highway to Shepparton (adjacent to the Melbourne 146 km signpost) and headed to a paddock that was west of the road and beside a watercourse. My purpose was to lift scattered rubbish and debris in search of insects and worms to feed frogs (held under DSE permit for demonstrations). The habitat was typical of the agricultural landscape in the area, with trees generally absent except along the watercourse and periphery.

The search and collection of insects took approximately 15 minutes, and also yielded 17 lizards, including 15 *Lampropholis ronhoseri* under a single piece of wood (Hoser 2009; keyed as *Lampropholis delicata* in Cogger 2000). Two *Morethia boulengeri* were found separately under pieces of metal.

The aggregating lizards rested in a clump, save for a single ‘outlier’ resting about 6 cm away under the same piece of wood. There were lizards of all ages, from last season’s juveniles to adults.

The weather at the time was cold, with a moderately severe frost on the ground and an ambient air temperature of 1°C. In previous days the weather in the area had been cool (maximum temperatures in low ‘teens), with steady rain two days prior. Based on the time of year, it is reasonable to assume that the lizards were hibernating.

Sheets of metal are regarded as good cover for reptiles, but in frosty conditions these are avoided due to the conductivity of the metal. Wood is preferred as cover, especially if of sufficient thickness to afford protection from frosts. The aggregation of skinks was found under a disused wood post between the paddock fence and the road.

No other *L. ronhoseri* was found in the vicinity, even though there were similar bits of wood nearby. This indicates that the aggregation was deliberate on the part of the lizards, and not a chance gathering of lizards seeking shelter. The lizards, while very torpid, were not frozen as they had been insulated from the frost by the wood. That only two *M. boulengeri* were found separately perhaps suggests that this species is less likely to hibernate in aggregations.

Although lizards are regarded as cold-blooded, their limited biological activity does generate some heat, and grouping might offer protection from frosty conditions.

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References
The recipient of the 2008 Australian Natural History Medallion is Ern Perkins, who was nominated by the Field Naturalists’ Club of Ballarat for his work in the research and recording of native flora and fauna. This work has led to his extensive contribution to environmental education in the community. His dedicated investigation, exploration, recording, documenting and advocacy of our natural environment has been of such benefit that he greatly deserves the award.

The Castlemaine Field Naturalists Club supported the nomination and provided an update to the original submission of Ern’s achievements in 2007 and early 2008.

One of the hallmarks of Ern Perkins’ natural history contribution has been his initiation of, involvement in, and leadership of surveys of local flora and fauna. Personal experience includes the Swift Parrot and Regent Honeyeater surveys and ongoing contributions to the New Atlas of Australian Birds. With groups he has coordinated projects on the conservation value of roadside reserves, first in the Shire of Maldon and later on in the Shires of Metcalfe and Newstead and the City of Castlemaine. He recorded plant lists for the Eltham Copper Butterfly colony at Castlemaine Botanic Gardens and conducted plant surveys for the Diggings National Heritage Park on behalf of Parks Victoria. Records of the birds and plants located by the Castlemaine Field Naturalists Club, the natural history along Shire walks and the indigenous plants of Castlemaine District are all maintained by Ern in databases that he has developed.

Ern was a member of the publishing committee, and a contributor for both editions of *Indigenous Plants of Greater Bendigo* published by the Bendigo Native Plant Group (the local Australian Plants Society group) and the City of Greater Bendigo. Most of the leaflets on the natural history of the Castlemaine area, published by its field naturalist club, have been prepared by Ern. Regular updates and reprinting are undertaken. Topics include acacias, eucalypts, mistletoes, native grasses, orchids, ferns, rare plants and weeds. Birds and local geological features are also covered.

Ern has totalled nearly 90 years of membership with field naturalist clubs (FNCV, Benalla, Bendigo, Castlemaine and Ringwood); still current are those with Castlemaine from its inception in 1976, and the FNCV since 1965. Simultaneously, he has spent nearly 80 years in total with the Australian Plants Society and the Bendigo Native Plant Group. The Australian Plants Society (Victoria) elected him as an Honorary Life Member in 2000. With many of these memberships came office bearer positions: president, treasurer, newsletter editor, membership officer and webmaster.

With his fund of local knowledge it is not surprising that Ern has been asked to participate on advisory boards and committees of management, for the Kaweka Wildflower Reserve, the Mt Alexander Shire Walk and Trails Advisory Board and that Shire’s Council Heritage Advisory Board. With his wife Lesley he has taken part in the Botanical Guardians Scheme; activities have included botanical surveys of bushland blocks, the cemeteries of north-central Victoria, and populations of threatened plant species.

Like most well-respected local naturalists, Ern has been called upon often to provide lectures and talks, not only to naturalist, plant and Landcare groups but in other more diverse settings. He has led innumerable walks and excursions for groups and for the Shire, thus helping to spread the conservation message. On a more personal level, he helps individuals with plant identification, particularly for Landcare surveys.

Not only has Ern used his specialist skills of plant identification and selection of plants for regeneration projects with Castlemaine Urban Landcare and the Eltham Copper Butterfly colony in the Castlemaine Botanic Gardens, but he has also removed tens of thousands of weeds over many years.
Ern has been involved closely with two major projects in the Castlemaine area. Since 2005 he has undertaken plant identifications, photography and data collation in an ongoing project in which paired quadrats are used to monitor the effects of control burning. Ern also played a major role in the photography and recording of geo-referenced localities. Castlemaine Historical Society holds this large set of photographs in its archives. The intent is that these photographs will be used to document changes in the flora and landscape of the local district. Future photographs from the same photopoints will be used to assess the effect of prolonged drought on the bushland.

Ern has always worked closely with Lesley, and in 2006 they received a Banksia Environmental Award entitled 'Back from the Brink: Saving Victoria's Threatened Orchids'. As joint research officer with his wife for the Australian Plants Society, he contributes a regular column for its quarterly magazine. In 2000 he was awarded an Order of Australia Medal for services to conservation and the environment and the community of Castlemaine.

In these days of increased specialisation, even by the field naturalist, it is a pleasure to hear of Ern Perkins' diverse range of interests—botany, ecology, geology, ornithology and conservation—and to see them put into practice, encouraging the community to provide the basic data on which future research and management should be based.

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Darwin and Lyell at once saw that the essay, if published, would anticipate the former's work, and, on Dr. Hooker being consulted, it was decided to make an abstract of Darwin's work and his essay as a joint communication to the society. Dr. Wallace alluded to the very different way in which he had dealt with his ideas to that of Darwin. The idea had come to him in a sudden flash of insight, thought out in a few hours, written down with such illustrations and developments as occurred to him at the moment, copied on thin letter-paper and sent off to Darwin, all within one week. He therefore contended that Darwin should ever be recognized as the sole and undisputed discoverer and patient investigator of the great law of "natural selection" in all its far-reaching consequences. Then he went on to consider why, of all the great men who had given attention to the question, he and Darwin had alone hit upon a solution which seemed to be a satisfying one to a large number of able men to-day, and attributed it to the fact that both he and Darwin had been ardent beetle-hunters, and the constant comparison of specimens for new species and varieties had so trained them to observe slight peculiarities of habits, & c., and both being of a speculative turn of mind, they were constantly led to think upon the "why" and the "how" of all the wonderful variety of nature. Finally, he said, when their minds were well stored with the results of personal observation their attention had been directed to theories set forth by Malthus in his "Principles of Population", and though Darwin read the book two years after his return from his celebrated voyage, and he had read it before he went abroad, that influence, combined with their experience as collectors, doubtless led to practically the same conclusion, and he thought that possibly Darwin's precursors in the same line of investigation had failed through lacking that special turn of mind that makes the collector and the species-man. He concluded by saying that he had long since come to see "that no one deserves either praise or blame for the ideas that come to him, but only for the actions resulting therefrom..."

From *The Victorian Naturalist* XXV, pp. 202-203, April 15, 1909
Dictionary of Australian and New Guinean Mammals

by Ronald Strahan and Pamela Conder

Publisher. CSIRO Publishing, 2007, 200 pages, hardback; illustrations. ISBN 9780643091672. RRP $49.95

This book is the successor to *A Dictionary of Australian Mammal Names* published in 1981. The authors have updated the 1981 dictionary to include New Guinean species in one of the first attempts to provide a unified treatment of Melanesian and Australian mammalian faunas.

The book deals with a number of taxonomic aspects of Australian and New Guinean species, including the current scientific name and pronunciation, derivation and meaning of the name, common name, and the describer and reference for the first published description. These details are infrequently provided in field guides or other reference books.

The introduction provides an overview of the history of discovery and naming of mammals in Australia and Melanesia, and the publications on taxonomic aspects. The dictionary itself is comprehensive and ordered alphabetically by genus and species. An index of common names at the back allows the reader to easily locate the species in the dictionary. There are numerous illustrations of species reprinted from historical accounts. These are interesting by themselves. The authors have done an excellent job of describing concisely how each species was named.

Perhaps the most interesting and often amusing reading in this book is the collection of biographies of 51 workers who have described Australian and New Guinean mammals during the last three centuries. Amongst the biographies are those of Frenchman Etienne Geoffroy Saint-Hilaire (1772-1844) who coined the term Monotremata; John Gould (1804-1881) who began his career as a gardener, but went on (with no formal training) to become a well-known zoologist; and more recently John Calaby (1922-1998) who has around thirty species named after him; and Tim Flannery (1956- ) who authored the books *Mammals of New Guinea* and *Mammals of the South-West Pacific and Moluccan Islands*.

The authors have a reputation for producing quality books. Ronald Strahan is a well-known authority in the field of Australian mammalogy, and Editor of the widely used reference *The Mammals of Australia*. Pamela Conder is a natural history author and artist who previously worked with Strahan to produce *The Incomplete Book of Australian Mammals*, a lighter account of the study of Australian mammals.

This book should not be mistaken for a field guide as it does not provide any accounts of species or their distribution. It is, however, a valuable reference for those interested in the taxonomy and natural history of Australian and New Guinean mammals.

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The Victorian Naturalist
The Nature of Latrobe
A guide to the parks and reserves in the Latrobe Region


The book begins with an informative and detailed introduction to the history and geology of the Latrobe Region; the reader is then inspired to explore further. We can thank various field naturalist clubs, conservationists, friends groups and early visionaries, DSE and Parks Victoria for protecting and restoring what is left of the Latrobe region. The history states many intrusions, e.g. coal mining, timber-getting and power station facilities.

Thirty-five parks and reserves are listed, numbered and described. These are linked to the central map and to VicRoads Directory, making locations easy to find.

The first State Park described is Mt Worth, which suffered logging between 1920s and 1940s. We owe its protection now to the Warragul Field Naturalists Club and Mr Jack Brooks from the Warragul Shire.

Each reserve has a short written history and information on the flora and fauna. This is extremely useful as most parks now do not provide printed material on site.

The facilities, e.g. wheelchair access, toilets available, seats, picnic tables etc., are clearly listed.

Some black and white sketches of flora and fauna add to the charm of the book. There are 20 excellent colour plates, including one of *Caleana major* as an eye-catching front cover, and a magical misty landscape photographed in the Tarra-Bulga National Park on the back cover.

Having visited only eight of the areas listed, I am now totally inspired to explore some of the others.

As many field naturalists and other nature lovers and bird watchers are campers, I would have liked more information on nearby camping facilities, but most of the reserves have telephone numbers provided for further enquiries; and some have provided email addresses. Like all books of the size of this one, the contents have to stop somewhere.

I would like to congratulate the Latrobe Valley Field Naturalists Club for all their hard work and I look forward to exploring this richly diverse habitat in more detail (book in hand) very soon.

I would recommend that all field naturalists clubs in Victoria have a copy of this great book in their libraries, and I would urge people visiting these areas to purchase a copy before their trip.

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Ancient Australian Landscapes

by C R Twidale


This A4 sized, soft-covered volume is the latest in a series of books on Australian landscapes either authored by CR Twidale or jointly authored by him with EM Campbell.

In his preface, Twidale states that 'For the author ... the antiquity of some parts of landscapes has engaged his interest for more than half a century ...' 'Throughout the book Twidale explores this concept of the survival of Australian landscapes of great antiquity with sometimes unconventional views on the evolution and relief of landforms within those landscapes.

The initial chapters develop the concept of Australia as a geologically ancient continent and review its surfaces and the methods used for estimating their ages. South Australian uplands, South Australian cratons and basins, south-west and west Australia, northern Australia, central Australia, and eastern uplands have a chapter each studying and analysing their palaeo landforms. The ensuing chapters examine the reasons for the survival and persistence of remnants of very old surfaces and areas of relief in the Australian landscape. Finally, Twidale takes the reader through a short discussion clarifying the many and varied arguments that he developed throughout the book.

As would be expected from a book that is a detailed study of all aspects of ancient landscapes and their landforms, this volume includes many beautiful photographic images on almost every page, in both colour and black and white, to illustrate the ideas of the author. Many useful maps and diagrams are also included.

To assist the reader with the terminology of landscapes, a five-page glossary of terms is given. Access to the wider literature of Australian landforms and landscapes is provided by 13 pages of references. A comprehensive index enables specific localities and topics to be easily found.

Informative biographical notes on well-known and not so widely-known pioneering Australian geomorphologists and experts in the interpretation of landforms and their evolution are used at the beginning of eight chapters of the book.

If the chart provided in Gradstein, Ogg, and Smith (2004) is accepted, then Twidale's geological time scale chart, Table 1.1, p. 12, is out-of-date in terms of both nomenclature and boundary dates.

The index entry for 'Gondwana' on p. 121 places the existence of the supercontinent in the time span from 1100 to 2000 million years ago. This should read 1100 to 200 million years ago (Twidale and Campbell, 2005).

Who would find interest in this lavishly illustrated book with its comprehensive analysis of
Australia’s unique, ancient geological landscapes? Any person with a curiosity in landscapes and landforms, be they professional geologists, students of geology, or interested amateurs, will find interest in this book. For some, this could be a useful book to take with them on journeys throughout Australia to enable them to gain a better understanding of the geology of the landscapes that they pass through. Others may take a special interest in deciding to agree or disagree with some of the ideas offered by the author. If natural landscapes, their ages and their dynamic evolutionary history are of interest to you, at whatever level, this book is for you.

References
Twidale CR (1968) Geomorphology with Special Reference to Australia. (Nelson: Sydney)

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Bettongs, potoroos and the Musky Rat-kangaroo

by Andrew Claridge, John Seebeck and Randy Rose


Bettongs and potoroos have not fared well since European settlement in Victoria. The three species of bettongs once present in the state—the Brush-tailed Bettong, the Rufous Bettong and the Tasmanian Bettong—have disappeared. Of Victoria’s remaining rat-kangaroos, the vulnerable Long-nosed Potoroo has a reduced range and the endangered Long-footed Potoroo occurs in few localities. A similar pattern of decline has taken place across much of Australia. However, as this new book shows, it’s not all bad news.

_Bettongs, potoroos and the Musky Rat-kangaroo_ provides a comprehensive account of Australia’s eleven species of modern rat-kangaroos. It covers a wide range of subjects on this intriguing suite of species including: distribution and habitat requirements; taxonomy; biology and behaviour; diet; research methods; and conservation management. The opening chapter focuses on early rat-kangaroo discoveries, and documents the decline of a number of species. Two of the more exciting events discussed are the discovery of the Long-footed Potoroo in east Gippsland in 1967 and the fortuitous rediscovery of Gilbert’s Potoroo in Western Australia in 1994 (it had been presumed extinct for 120 years).
Clear maps of each species' distribution, descriptions of habitat associations and a summary of classification provide a good entry point into the study of rat-kangaroos in Chapters 2 and 3. Rat-kangaroos are cryptic animals and it is rarely possible to observe them in the wild. Chapter 4 outlines the novel field methods used to study them and provides useful summaries of techniques such as direct trapping, radio tracking and the use of hair tubes. Here the authors share a number of useful insights from their extensive experience in the field, including tips on handling individuals and methods of returning the displaced young of captured animals back into the mother's pouch.

Chapters 5 and 6 detail the biology, behaviour and reproductive biology of rat-kangaroos, while Chapter 7 focuses on the diet of rat-kangaroos. Here the interesting relationship with underground fruiting fungi or 'truffles' is explored. The authors explain that the fruiting bodies of many of these truffle species form a beneficial symbiotic relationship with the roots of trees and shrubs (called mycorrhizae). A number of rat-kangaroo species feed on these fungi and aid in the dispersal of their spores by carrying them in their fur or by passing them on in scats. Chapter 8 focuses on the habitat requirements of rat-kangaroos. The discussion of the influence of fire is particularly detailed throughout the final chapters and provides a well-considered summary of the complex role that fire may play in creating rat-kangaroo habitat.

Chapter 9 outlines the conservation and management of rat-kangaroos. The threats to rat-kangaroos and reasons for decline are summarised, and include habitat loss, introduced predators and altered fire regimes (the usual suspects). The book finishes with a summary of conservation and recovery programs recently conducted or currently underway. Some of the best news is from Victoria where results from 'Project Deliverance' indicate populations of Long-nosed Potoroos can increase significantly following fox control. The Southern Ark Project, where fox control has been undertaken to include one million hectares in East Gippsland, also looks very promising.

Overall, the book flows well and is written in a clear and effective style. The authors cover a number of topics very well throughout each of the nine chapters (and 182 pages). A useful reference list of research papers at the end of the book allows subjects of interest to be followed up in detail. My only criticism is that I would like to have seen more discussion of the role that rat-kangaroos play in the functioning of Australian ecosystems, particularly their potential influence on surface soils. However, there is only a small body of literature on this subject and it is not a major detractor.

Recently I was fortunate enough to spend some time at Scotia Sanctuary in western New South Wales. Here the Australian Wildlife Conservancy is reintroducing a number of endangered mammals to large, fenced off areas in the Murray Mallee region. Among them is the Brush-tailed Bettong. These curious marsupials are once again foraging, digging and interacting with mallee landscapes (albeit behind foxproof fences). The conservation and recovery programs underway in several states, coupled with the growing knowledge base of the ecology of rat-kangaroos presented in this book, suggest that the threats facing rat-kangaroos may not be insurmountable. *Bettongs, potoroos and the Musky Rat-kangaroo* will be of interest to naturalists, students, land managers and ecologists.

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The Victorian Naturalist
Additions to the Flora and Fauna Guarantee Act 1988

The Flora and Fauna Guarantee Act 1988 is the main biodiversity legislation in Victoria. The Act enables members of the public to nominate species, ecological communities and potentially threatening processes for listing. Nominations under the Act are considered by an independent Scientific Advisory Committee, which makes recommendations to the Minister.

The Committee has made a number of final and preliminary recommendations. A Recommendation Report has been prepared for each final and preliminary recommendation. Copies of the reports can be obtained from the Head Office (http://www.dse.vic.gov.au) and major country offices of the Department of Sustainability and Environment (DSE). The Flora and Fauna Guarantee Act 1988 and the Flora and Fauna Guarantee Regulations 2001 can be viewed at these offices or on the internet.

Final Recommendations of the Scientific Advisory Committee

**Item supported for listing**

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<th>Species</th>
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<td>797</td>
<td>Pomaderris vaccinifolia</td>
<td>Round-leaf Pomaderris</td>
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**Items not supported for listing**

- 791 Calcarenite Dune Woodland Community
- 798 Cercartetus lepidus Little Pygmy Possum
- 795 Sedimentation of marine ecosystems as a result of dredging activities (potentially threatening process)

Final Recommendations of the Scientific Advisory Committee

**Items supported for listing**

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<tr>
<th>Code</th>
<th>Species</th>
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<td>Port Phillip Bay Entrance Deep Canyon Community</td>
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<td>799</td>
<td>Hairy-leaved Trigger-plant Stylidium pilosifolia var. nov. Riddells Creek</td>
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<td>800</td>
<td>Moss species Dicranoloma diaphanoneuron</td>
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<td>Southern Brown Bandicoot Isoodon obesulus obesulus</td>
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<tr>
<td>803</td>
<td>Black Threadwort Allisoniella nigra</td>
<td>1.2.1</td>
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</tbody>
</table>

**Items not supported for listing**

- 793 Invasion of native grassland by Serrated Tussock (Nassella trichotoma) (potentially threatening process)

**Items added to the list of threatened species and communities under the Flora and Fauna Guarantee Act 1988**

- Caladenia cremna Don's Spider-orchid
- Caladenia clavescens Castlemaine Spider-orchid
- Caladenia douglasiorum Douglas' Spider-orchid
- Caladenia oreophila Monaro Spider-orchid
- Caladenia peisleyi Heath Spider-orchid
- Prasophyllum anticum Pretty Hill Leek-orchid
- Prasophyllum erythrocummm Tan Leek-orchid
- Diuris daltonii Western Purple Diuris
- Prasophyllum maccannii Inland Leek-orchid
- Prasophyllum viretrum Basalt Leek-orchid
- Caladenia ancylosa Genoa Spider-orchid
- Caladenia creticaea Stuart Mill Spider-orchid
- Caladenia grampiana Grampians Spider-orchid
- Caladenia osmera Pungent Spider-orchid
- Diuris protera Northern Golden Moths
- Prasophyllum barnetti Elegant Leek-orchid
- Diuris gregaria Clumping Golden Moths
- Prasophyllum gilgai Gilgai Leek-orchid
- Prasophyllum readii Painted Leek-orchid
- Canis lupus subsp. dingo Dingo

Ref: Victorian Government Gazette G46, 13 November 2008
