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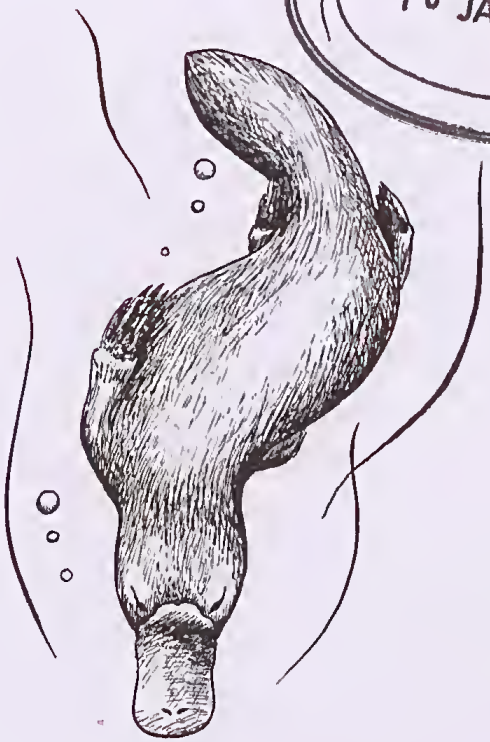

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THE TASMANIAN NATURALIST

EDITOR: MARK WAPSTRA

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(continued....)

Book reviews

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EDITORIAL NOTE

Mark Wapstra

Editor, *The Tasmanian Naturalist*

This is the first volume of *The Tasmanian Naturalist* to appear under my editorial guidance. I wish to express my sincere thanks to the retiring editor Simon Grove who most ably guided several volumes to print and who has helped me settle into my new role.

I have been gratified to have received so many contributions on a diverse range of subjects. I'm pleased to present an edition that I hope will interest the whole membership and the wider naturalist/scientific community. Articles on a range of topics (from the zoological to the botanical, the invertebrate to the vertebrate, the terrestrial to the aquatic, the observational to the scientific) have all found their way to this edition. What is also nice to see is the emphasis of several of the articles on the links between the various facets of the natural and physical world: from mites munching on greenhoods to velvet worms and beetles living in the squelch of mudguts inside logs.

The journal is an ideal forum for writers of all walks of life because we accept formal and informal styles and want to read about observations of natural history on a wide range of topics.

I have tried not to make major changes ("don't fix that which is not broken") but regular readers will note the inclusion of some minor changes from previous volumes. First, some articles in this volume have benefited from the use of higher quality paper. Unfortunately, this increases the cost of production and we have been fortunate to have received sponsorship for this volume. The Defence Department is particularly thanked for their very generous donation that has allowed the inclusion of colour images on higher quality paper. Second, I have made some minor formatting (layout) changes.

I have also managed to reinstate the traditional book review with the inclusion of several reviews. I hope this is a continuing feature because the journal provides a good forum to inform the membership about useful field guides and the like.

And exciting news for the members of the club: the databasing and indexing of the entire set of volumes of *The Tasmanian Naturalist* from the first issue in 1907 to this year's volume is now underway. The intention is to create a detailed index, scan all articles and convert into pdf files, and use a database to make these available (with a search engine) via the club's website.

MUDGUTS

Simon Grove

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The dusty forestry road cuts through a scene of apparent devastation. As Marie Yee and I walk from the car, crow-bars and log-splitters in hand, all around us are the gaunt trunks of fire-blackened trees, testament to the intensity of the midsummer St Marys' - Scamander bushfire that swept through here just five months previously. No bird calls; the only sound is the crunch of dead leaves underfoot as we search for our quarry. We don't have to look far: there are plenty of logs to split around here, but looking at the state of them, is it worth the effort? Surely they are no more than carbonised hulks? One swing of the log-splitter gives us our answer: a gash of glorious orange-red in this otherwise monochrome landscape: we've struck mudguts! A substantial vein too – enough to scoop up in our hands, roll between the fingers and savour its spongy yet clay-like texture, and its earthy, musty aroma.

The no doubt erudite online *urbandictionary.com* defines mudguts as (1) a fat person, especially around the guts; and (2) a particular Western Australian hard rock/heavy metal band. To this we can add a third definition - one that might interest readers of this journal more than readers of the urban dictionary: (3) the red-brown clay-like material found in the heart of rotten trunks, branches and logs of many eucalypt species.

The origin of the term is unknown, but according to Bob Mesibov (pers. comm.) it is likely to have been in common parlance (in Australian forestry circles at least) for more than a hundred years. The classical view of mudguts is as the product of termite excavation of the heartwood of living trees, typically filling a central 'pipe' that may extend from a tree's roots up to its main branches. In a recent review of invertebrates and eucalypts, Majer *et al.* (1997) note that eucalypts are among the most susceptible trees worldwide to termite attack. Termites, of course, chomp through wood, and Greaves (1962) attributes mudgut to the workings of *Coptotermes* termites, describing it as a 'dense mixture of excreta and probably soil'. But other wet-wood termites can also form mudguts: Elliott and Bashford (1984) describe *Porotermes adamsoni* as causing similar formations in a range of Tasmanian eucalypt species, with the level of damage increasing with tree diameter (and hence with age). *Porotermes adamsoni* is a widespread species in Australia, extending from the tropics to Tasmania. It does not form large central colonies, but instead the termites live in many small independent groups or colonies in the heartwood. These colonies do not have a subterranean gallery system and often have no contact with the soil. Thus it is something of a mystery where the 'earthy' component of mudguts actually comes from.

Recently, through the postgraduate deadwoodological studies of Marie Yee, Kate Harrison, Lee Stamm, Anna Hopkins and others in the wet forests at Warra in southern Tasmania, we have begun to question whether termites are the whole story in the formation of mudguts. It now looks as though some of the larger prionine longhorn beetles may do their bit too, often in the absence of termites. Larvae of one species in particular, *Toxeutes arcuatus*, are commonly encountered in the heartwood of mature eucalypts (Figure 1), particularly where this wood already shows some discolouration and softening – a sign of the early stages of fungal decay. They have strong jaws and necessarily prodigious appetites (given the poor nutrient status of heartwood), enabling them to chew their way through large volumes of wood before they eventually pupate near the wood surface, in preparation for life as free-flying adults. In their wake they leave a trail of semi-digested, coarse-fibred, straw-coloured frass, which gradually rots down into a rather spongy form of mudguts. Intermediate stages in this process can be observed in logs years or decades after the larvae have had their fill.

Figure 1. Mature larva of the longhorn beetle *Toxeutes arcuatus* in discoloured heartwood of a *Eucalyptus obliqua* tree. Photo: Simon Grove.

Figure 2. Larva of the prostomid beetle *Prostomis atkinsoni* on a vein of mudguts in a decaying *Eucalyptus obliqua* log. The larva's last meal of mudguts is visible along the length of its gut. Photo: Simon Grove.

Mudguts, whether in living trees or in logs, can host a range of specialised invertebrates, as long as there are cracks or holes providing access from the outside world. These include the curiously flattened beetle *Prostomis atkinsoni*, which is often found (along with its similarly flattened larvae) feeding and tunnelling at the interface between the mudguts and the surrounding more solid wood (Figure 2).

One can scarcely imagine what it might be like to live one's entire life in such a confined, dark, low-oxygen space, and being forced to eat mudguts. At least one would be sheltered from the elements: mudguts must be one of the forest's better buffered environments,

where summer and winter, rain and shine may mean very little to its inhabitants. *Prostomis* shares this home with other beetle larvae, mites, giant springtails (Figure 3) and others. No doubt there are also specialised fungi and other micro-organisms here too. Though they may not initiate the formation of mudguts, these species must contribute to its expansion and, ironically, to its ultimate demise as the inexorable path of decay takes its course and the mudguts is incorporated into the soil humus.

Figure 3. An undescribed uchidanurine springtail commonly found in and around mudguts in logs in wet eucalypt forest, where it apparently feeds on slime moulds. Photo: Simon Grove.

Figure 4. Lee Stamm using a chainsaw to cut 'biscuits' of dead wood from a log at Warra. Mudguts is so much better for invertebrates than for chainsaws. Photo: Simon Grove.

A lexicon of terms has been coined through research at Warra to describe the process of wood decay in our local eucalypts. From discoloured heartwood, the path to mudguts can be direct if *Toxeutes* gets to work on it, producing frass that accumulates and gradually morphs into mudguts. If termites do so instead, then the wood may pass through an intermediate 'discoloured termite wood' stage: the heartwood becomes riddled with termite galleries, which gradually fill up with frass and thence mudguts. Alternatively, the heartwood may be decayed by fungi that appear to remove most of the cellulose but leave much of the lignin, resulting in a rotten wood type which we call 'red-brown blocky-fibrous'. This type readily breaks up into irregular blocks, and appears to be a favoured substrate for many beetles and other invertebrates, particularly where it abuts more solid wood. Through their workings, one can again end up with veins of mudguts, which sometimes coalesce into substantial deposits that resist attack by all but the hardiest of chainsaw operators (Figure 4).

Back to Scamander. Our interest in log-splitting was induced by a concern for the post-fire fate of mudguts and its cast of log-dwellers. In this area, the star attraction is the locally endemic giant velvet worm *Tasmanipatus barretti* (Figure 5).

We need not have worried. Mudguts is proving to be a particularly resilient microhabitat. Not only does it apparently survive for years or decades in the living tree, but for many years it can also continue to occupy the hearts of the logs that arise after the tree (or larger branch) dies and falls to the ground.

Figure 5. A giant velvet worm *Tasmanipatus barretti* emerging onto my finger from the moist mudguts hidden within a charred log near Scamander. Photo: Marie Yee.

In this context, the passage of a bushfire may cause some attrition, but it's not usually terminal. The resilience of mudguts may be due to the exceptional insulation properties of logs in general, and mudguts in particular. Often we would find that, while the outer ten millimetres or so of a log was indeed cooked, inwards from this zone life appears to have gone on as normal. The first giant velvet worm we found was in just such a setting, surrounded by healthy moist mudguts in which could be seen springtails, termites and other animate morsels that count as food for these predatory creatures. As I enticed it onto my finger, it did the onychophoran trick of spitting strands of glue at me from two glands at its front end. A delicate shade of fawn, and velvety in texture as its name suggests, it looked too clean to have just emerged from the mudguts, but their skin must have some peculiar non-stick properties as they always seem to look like this. Coupled with their fifteen pairs of stumpy, flowerpot-like legs, these characteristics gives velvet worms a very unearthly quality, which on this occasion was only enhanced by the incongruity of its moist mudgut habitat amid the stark, charred landscape (Figure 6).

What does the future hold for mudguts and its enigmatic inhabitants in our forests? Termites and wood-boring beetles have few friends, and trees whose heartwood has been converted to mudgut-filled pipes are not highly valued in the timber market. Silviculturists are hopeful that future commercial stands of regenerating native forest will be less

affected than current ones, in part because they will be harvested before the trees get old enough for piping and heart-rot to develop. In the absence of any mitigation measures, this sounds like bad news for mudguts, but there is still much we do not understand about it. Perhaps we need a new discipline, which I shall call chledenterology (it sounds so much more scientific in Ancient Greek than the English 'mudgutology'). Can young, suppressed trees in a regenerating stand succumb to termites, beetles and other mudguts precursors as they are out-competed by more vigorous trees? Can mudguts formation be initiated in logs or does it have to take place in living trees first? Are the typical inhabitants of mudguts, including giant velvet worms, totally dependent on this habitat or might we also find them in other rotten wood types that are more tolerant of our silvicultural practices, if only we looked harder?

Figure 6. Giant velvet worm habitat after the Scamander bushfire. The mad axeman in the background is the author. Photo: Marie Yee.

These are the kinds of issues that we hope to explore in coming years. We may not be able to expect the future forest to be quite as mudguts-friendly as the past and present forest. But let us not contemplate a future forest entirely devoid of the stuff, as there are many of us (well, some at least) who would mourn its passing. Our challenge is therefore to seek

innovative ways of ensuring that it continues to be around for the use of future generations of *Prostomis* and *Tasmanipatus* and the thrill of future generations of chledenterologists.

ACKNOWLEDGEMENTS

With thanks to Marie Yee for sharing deadwoodological ideas and enthusiasm over the years. Giant velvet worm research was conducted under Threatened Species Section permit number TFA07135.

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Note. Some images shown as grey scale tones are also shown as full colour in the central pages of this volume.

WARMING TO THE ICE PLANTS

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INTRODUCING THE ICEPLANTS

The challenges of global warming are yet to be fully appreciated in relation to their potential impacts on our vulnerable indigenous vegetation communities and the habitat they support for our threatened flora and fauna. One predicted response to gradual global warming will be a relentless search for tolerant species, suitable for our future landscape and revegetation sites that will be able to adapt to the harsher environmental realities. Fortunately, members of the ice plant family have a series of rare attributes that will enable them to flourish in these predicted climatic extremes. This article seeks to explore these attributes further as well as highlight some of the fascinating cultural, historic and bush tucker values ascribed to its members.

Known botanically as the Aizoaceae (Latin for "evergreen" or "ever living", the name reflects the ability of members to maintain green coverage of fleshy foliage whilst existing in the harshest and driest environments. There are between 1800 and 2500 (depending on who's treatment of the family one follows) succulent, herbs and shrubs in the family from South Africa, Asia, North and South America, with only 50 indigenous Australian species (four Tasmanian species). Disturbingly, already over 26 naturalised South African invaders thrive in Australia's harsher locations suggesting climate change may exacerbate their invasive potential.

The family is composed of four subfamilies including the following two worthy of note that can be distinguished by the presence or absence of petal-like staminoides (large sterile stamens). The subfamily Ruschoideae has showy daisy-like flowers made of these brightly coloured staminoides typically seen in native pigface *Carpobrotus rossii* (Figure 1), whilst the other subfamily Aizooideae has small insignificant flowers that are brightly coloured on the inside as seen in bower spinach *Tetragonia implexicoma.*

Like many of the Australian species, the Tasmanian representatives act as key framework species in saline wetlands and dry coastal communities. Local examples of this type of habitat include the Pitt Water and Lauderdale saltmarshes as well as the remaining Tasmanian undisturbed, pristine sandy beaches exclusively vegetated by indigenous flora.

From an historic perspective immense significance can be directly attributed to two of the family's indigenous species *Tetragonia implexicoma* and *T. tetragoniodes* (many common names apply such as iceplant, New Zealand spinach, Botany Bay spinach, Warrigal greens and Cook's cabbage). It could be considered that these species had a significant influence in relation to the choice of establishing Australia instead of colonial African nations, as

the preferred penal colony. Undeniably many Tasmanians' ancestries would link to this decision.

Figure 1. *Carpobrotus rossii*, a widespread and common member of the Aizoaceae along Tasmanian coasts. Photo: H. & A. Wapstra.

ADAPTIVE RESPONSES TO THE GLOBAL WARMING CHALLENGE

Climate change's predicted warming, reduction of overland flows and reduced soil moisture will impose severe habitat limitations on our indigenous plants and animals. However certain plants within families such as the iceplants, native grasses (*Poaceae*) and the cactuses (*Cactaceae*) may be competitively advantaged and potentially increase their natural ranges. Consequently they will attract attention due to their tolerance and adaptability. An obvious example will be kangaroo grass (*Themeda triandra*), which benefits from a more efficient photosynthetic process (known as a C_4 pathway) enabling it to flourish in the dry summer periods when most other competitive grasses withdraw into dormancy. Interestingly, recent observations suggest an increased richness of native grasses on disturbed dark-soil grassy woodland due to their exotic competitor grasses, such as yorkshire fog (*Holcus lanatus)* and greater quaking-grass (*Briza maxima*) withering and dying under drought stress (Hovenden & Morris 2002).

Remarkably, iceplants have evolved a separate mechanism, technically Crassulacean acid metabolism (CAM) photosynthesis, giving rise to another of their names "night-time breathers", that will increase the plants' adaptive capacity to cope with climate change. By storing carbon in the form of organic acids produced during night time respiration, they do not need to absorb carbon dioxide by opening their stomatal pores. Hence CAM plants

stop moisture losses through their pores during the heat of the day. This endows them with added xerophytic abilities that enhance their succulency mechanism to accumulate moisture and halophytic characteristics to survive in highly saline areas.

A FAMILY WITH MANY APPEALING COMMON NAMES

The family members are suitably bestowed with intriguing common names, most relating to their striking attributes that enable them to survive low moisture or high salinity conditions. The name of "iceplant" is linked with many family members mostly as a consequence of their leaves being surfaced with salt accumulating bladder-like cells that often sparkle like ice granules to reflect sunlight and reduce transpiration (Figure 2). This name is applied to the fleshy leaved South African iceplants (*Mesembryanthemum* species and *Lampranthus* species) as well as the previously mentioned *T. implexicoma.*

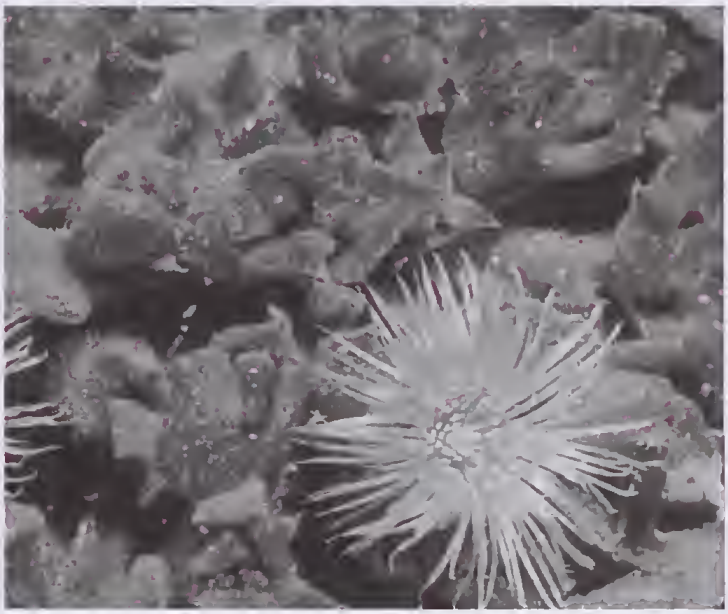

Figure 2. A close-up of *Mesembryanthemum crystallinum* showing the ice-like salt accumulating bladder-like cells on the leaf surface. This species is sparingly naturalised in Tasmania (islands of the Furneaux only). Photo: H. & A. Wapstra.

The aptly named "living stones" or "pebbles" (*Lithops* species) and living stone daisy (*Doroanthemum bellidiformis)* are robustly designed to mimic both the colour patterns and tough surface textures of surrounding stones and pebbles. This ensures survival during arid periods by imparting drought resistance and camouflage from foraging herbivores. During the rainy season when the desert is alive with edible vegetation they transform from their chameleon-like behaviour, into large perfumed, boldly coloured,

daisy–like flowers in an attempt to gain the pollination services of passing insects or butterflies.

The term "noonflower" is another popular descriptive name applied to family members such as the Australian coastal noonflower *Carpobrotus. glaucescens,* the Tasmanian saltmarsh roundleaf noonflower *Disphyma crassifolium* (Figure 3), as well as the many South African species such as wiry noonflower (*Psilocaulon tenue*), due to their habit of opening attractive blooms around noon and closing later in the afternoon.

Figure 3. A carpet of *Disphyma crassifolium*, common in saltmarshes and on rocky shores on much of the Tasmanian coastline. Photo: H. & A. Wapstra.

The resulting carpets of pinks and yellows are irresistible to their insect pollinators, which are at their busiest from noon to the mid afternoon.

The less than attractive common name "snot wort" (*Conicosa pugioniformis*) relates to this succulent's slimy roots, which surprisingly are valued as a South African bush tucker delicacy.

THE TASTY "GREENS" WERE HIGHLY VALUED BY EARLY EXPLORERS

As mentioned in the introduction, iceplants form an important historic connection with our Tasmanian convict ancestry. This arose as a consequence of the 1768 voyage of Captain Cook to observe the transit of Venus. He satisfied his scurvy-stricken crew's desperate need to savour fresh greens by harvesting the pot herb New Zealand spinach, *T. tetragonoides* from the New Zealand shoreline. Following discovery along the Australia coast by Cook and other explorers of large swards of both *T. tetragonoides* and Botany Bay greens *T. implexicoma*, they soon came to rely on these greens as dietary necessities to enhance their spartan rations. It is interesting to note that if the early explorers and colonists had shown a little appreciation for the Aboriginal way of life, they would soon have selected today's popular bush tucker treats but instead limited their choice to only those indigenous plants that reflected the image of English vegetables. Besides the

iceplants these included sea celery (*Apium prostratum*) and grey saltbush (*Atriplex cinerea*).

So impressed was Sir Joseph Banks with these iceplants, he sent their seeds to Kew Gardens from where they rapidly gained favour in high society cuisine as a summer spinach. In 1779 Bank's fondness for this plant's ability to provide reliable quantities of nutritious greens was portrayed exuberantly in the House of Common's inquiry delving into the relative suitability of Australia compared to West Africa as a convict-based colony (Low 1992). He obviously left a strong impression and the rest is now history.

WAS "PIGFACE" TASMANIA'S FIRST BUSH TUCKER?

Tasman's voyage of 1642 was not only historically significant as the arrival of the first explorers to Tasmania, but also for the collection of 'greens' (recorded as a *Mesembryanthemum*) by his crew from the banks of Boomer Creek flowing into Marion Bay. This collection heralded the start of the current bush tucker bonanza. The collection of what is considered to be *Disphyma crassifolium* was reported to be "*...not unlike a certain plant growing at Cabo de Bona Esperance* [Cape of Good Hope]...".

Many diaries of early explorers and settlers not only record positive entries on the edibility of these "greens" but also draw attention to the unique strawberry-fig like flavour of the native pigface's fruits. During the late 18th century a number of explorers referred to the harvesting of iceplants for pot herbage or edible fruits. These included Bligh's 1788 voyage on the *Bounty* and D'Entrecasteaux's 1793 voyage on the *L'Esperance*. During this latter voyage, D'Entrecasteaux noted that "*the fruit proved a delicacy with the New Hollanders (Aborigines) and resembled the Hottentot's Fig of South Africa (Mesembryanthemum edule = Carpobrotus edulis) except that the flowers were not yellow but reddish purple*". Settlers at Collin's first settlement at Risdon Cove collected iceplants for nutritious "greens" (Potts *et al.* 2006), whilst inland explorer Edward John Eyre partook of pigface fruits freely noting the ripe fruit was rich, sweet and refreshing in hot weather.

ROBUST LANDSCAPE PLANTS WITH WEED POTENTIAL

Australia has approximately 25 exotic species recognised as environmental weeds, a number of which derived from naturalising around old settlements, especially near the coast.

The Tasmanian weed representatives including noon flower (*Lampranthus glaucus*), heart leafed ice plant (*Aptenia cordifolia*), common ice plant (*Mesembryanthemum crystallinum*) and the South African hottentot fig or sour fig (*Carpobrotus edulis*) and the Chilean pig face (*C. aequilaterus*). Of these, the later two present major concerns as they are either out-competing native species or are being inadvertently planted by unaware, enthusiastic bush regenerators. Their ability to release 100s of seeds when triggered by rainy spells from the fleshy fruit or establishes from fresh or even significantly dehydrated

cuttings ensures they will remain a persistent threat. Given the recent enthusiasm for planting indigenous pig faces, it is important to positively identify them before planting. Remember, if it has a yellow flower err on the side of caution and check it is not a weedy sour fig!

VALUABLE "PEOPLE'S PLANTS" SUPPLYING FOOD AND MEDICINE

It was apparent that explorers and colonists developed a strong desire for the tasty and nutritious green foliage of *Tetragonia* species. This attraction continued to gain momentum over the next two centuries with these pot herbs being cultivated in European gardens. They have now become an heirloom vegetable, worthy of any menu especially being suited to stir fries, spinach dishes and quiches. Of course, they also prove just as attractive to wildlife; hence protection from browsing is required, during their establishment. Once growing vigorously the wildlife grazing can be used to advantage by acting as marsupial pruning shears, limiting their rampant growth!

It is important for the digestion system to be aware that, like rhubarb and silver beet, it is best not too over indulge in them due to the low levels of oxalates and saponins existing in the succulent leaves and stems. (Pengelly 1997).

In relation to the luscious fruits of *Carpobrotus rossii*, local Aboriginals eagerly awaited their summertime ripening. Aboriginal family bands would often establish camp next to broad expanses of fruiting pigface in order to supplement their fish and seafood diets with otherwise distinctly difficult to find harvestable offerings of summer ripening bush tucker. They not only enjoyed the fruits but also cooked leaves of this native pig face or at times the roundleaf noonflower *Disphyma crassifolium* to accompany their fire pit-roasted possum, kangaroo or echidna.

Beyond their bush tucker attributes, the finger-like leaves and stems when squeezed ooze a gel-like sap that acts as a soothing lotion in much the same way as *Aloe vera* does. As an aside, these bulky sappy leaves have proven problematical for all those plant collectors and students who have attempted to use plant presses to dry and press specimens. They are a botanist's nightmare!

When exploring the worldwide range of extraordinary plant uses attributed to iceplants, it would be remiss not to mention the captivating mind and mood altering qualities of the South African species known locally as "kanna" *Sceletium tortuosum* (van Wyk & Gericke 2003).

This mood-altering plant (attributed to the alkaloid "mesembrine") has been used by hunter-gathers and pastoralists from prehistoric times to elevate mood and decrease anxiety, stress and tension. Amazingly, larger doses have no severe adverse affects, as it induces a euphoric state enabling pastoralists to decrease thirst and hunger or for its application as a local anaesthetic and analgesic for tooth extraction. Traditionally prepared by crushing the succulent plant before sun drying prior to chewing, smoking, inhaling as

snuff or brewing as a tea, it is an important children's sedative and has been effectively used by indigenous healers to withdraw alcoholics from their addiction. Even now the plant may be called *onse droe drank* - "our dry liquor" (van Wyk & Gericke 2003). Although once widely traded in the South African Cape Province and stocked in trading stores, inventories of wild plants have dwindled due to over harvesting and habitat destruction. This has sadly resulted in its replacement by alcohol, tobacco and cannabis. It is pleasing to note that, using only cultivated rather than wild harvested materials, currently phyto-pharmaceuticals from *Sceletium* are being extracted for clinical trials in readiness for the international market.

Finally it is worth reflecting on another South African pigface look alike known as "khadi root" *Khadia acutipetala.* Its fleshy rootstock provides an alternative yeast source to act as the key fermentation agent in brewing a distinctively flavoured, yet extremely prized beer known as Khadi.

CONCLUSION

As alluded to earlier, the iceplant family primarily consists of hardy and environmentally resilient plants. Their tolerance is a consequence of their efficient methods of seed dispersal, ease of propagation from cuttings or off sets, their succulence, pest and disease resistance, fire resistance, xerophytic and halophytic abilities all supported by their CAM metabolism. In light of the potential global warming impacts, it is predicted that their recent popularity as landscape, erosion control, bush tucker and revegetation species will increase.

Disappointingly these competitive advantages will probably also result in the prevalence of many more exotic members menacing indigenous vegetation communities as invasive weeds.

To offset this dilemma, many exotics and native members add a rare three dimensional element to landscapes. This is a consequence of their thick, succulent leaves symbolising shapes of limbs and fingers. They can provide an inspiring contrast with the two-dimensional, flat leaves of the most other plants in the landscape (Low 1992).

ACKNOWLEDGEMENT

I would like to recognise the significant editorial support provided by Matthew Baker from the Tasmanian Herbarium.

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EDITORS NOTE: A slightly different version of this article has appeared on the internet: http://www.apstas.com/iceplants.html.

Note. All images shown as grey scale tones are also shown as full colour in the central pages of this volume.

OBSERVATIONS OF A NEW THREAT TO ONE OF TASMANIA'S THREATENED ORCHIDS: THE STORY OF THE MITE VERSUS THE GREENHOOD

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Towards the end of May 2007 I travelled to the Pontville Small Arms Range Complex (the Range) at Pontville at the urging of Alister Clark who is the Senior Environmental Officer for the Department of Defence. My task was to enhance the department's knowledge of the species of *Pterostylis* (greenhood orchids) that grow in the Southern Temperate Lowland Grassland at the Range. Defence has a willingness (and some legal obligations) to manage threatened species that occur on its Tasmanian properties and has gone to great lengths to achieve this.

The Tasmanian *Threatened Orchid Recovery Plan 2004-2008* (TSS 2006) lists the property as having two *Pterostylis* species of interest: *P. wapstrarum* (fleshy greenhood) and *P. ziegeleri* (grassland greenhood). This latter species has undergone a taxonomic change and now includes what we used to call *P. cycnocephala*, a species now regarded as absent from Tasmania.

P. wapstrarum (Figure 1) is currently listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) as Critically Endangered and TSS (2006) suggests that it occurs at only one site with a population of around 120 individual plants (it has since been found in low numbers at Gunners Quoin and a site in the northern Midlands). *P. wapstrarum* is also listed in the recovery plan as one of fourteen Tasmanian orchids that are facing imminent extinction in the wild. *P. ziegeleri* (Figure 2) is listed as Endangered (EPBCA) and it was thought that there are around 140 individual plants at this site.

So on a brisk morning I found myself wandering back and forth, back and forth looking for the elusive greenhoods. Even though I had been to the site the previous two years, my task was not easy as there were many other prostrate herbs growing. Eventually I began to stumble across some orchids and pulled out my GPS to start recording locations. It wasn't long, however, before I started to notice something very odd about the rosettes. They seemed to have a lighter area on the leaf surface and a closer inspection with a hand lens revealed something very disturbing: there was evidence of some sort of herbivory in progress with as many as twenty minute creatures seemingly dining on the leaf surface (Figure 3). The plants were under attack.

I observed the small creatures for a while. When disturbed, they would scurry off only to reappear at the very edge of the damaged area moments later to continue the devastation. I

had never seen this before and so took some photographs before contacting Hans Wapstra, one of Tasmania's recognised orchid specialists.

Figure 1. *Pterostylis wapstrarum* (fleshy greenhood).

Figure 2. *Pterostylis ziegeleri* (grassland greenhood).

Figure 3. Mite damage to rosettes of *P. wapstrarum*.

Within a day or thereabouts Hans advised that he had forwarded the images to David Jones (who is one of Australia's leading orchid taxonomists and also an expert horticulturist) and reported that neither he nor David had seen this before. I then contacted the Orchid Project Officer, Matt Larcombe, from the Threatened Species Section (DPIW) and provided images for his information. All parties (Defence, Hans and Matt) were very concerned. It was decided that more information was needed and so I contacted Dr John Ireson from the Tasmanian Institute of Agricultural Research to see if he could identify the invertebrate from my images.

John was most willing and did not hesitate to view the images. He asked if I could catch some, and from these he identified the creatures as the introduced pest *Halotydeus destructor*, the redlegged earth-mite (Figure 4). Unfortunately it seems that *H. destructor* is aptly named as it is a serious threat and John advised that there was probably little we could do to stop the damage.

Next stop was the University Of Tasmania. I had contacted Jasmine Janes (Jasmine has studied greenhoods and is in the process of writing a thesis) to see if she could identify some of the rosettes taken using DNA sequencing to see whether it was *P. wapstrarum* or *P. ziegeleri* being grazed. Jasmine stopped what she was doing immediately when I walked into her work area, such is her commitment to the welfare of endangered plants. Unfortunately the process takes some time and at this stage the results are not through.

Figure 4. Close-up of *Halotydeus destructor* (redlegged earth-mite) on leaves of *P. wapstrarum*.

Where does this leave us? The redlegged earth-mite is an opportunistie feeder, basically wandering around sampling everything until it eomes across something that it likes. Does this mean that *P. ziegeleri,* which forms denser colonies than *P. wapstrarum,* is more at risk? Have these orchids always faced this herbivory? Will *H. destructor* continue to graze on plants until they die before moving on to the next feast?

How mueh does an earth mite eat? Are we past the worst of the seasonal grazing pressure that the earth mite exerts, or are we yet to see the full potential of this invader? Will *Pterostylis wapstrarum* or *P. ziegeleri* become extinct in the wild at this site?

There are so many unknowns. The only positive is that we now know what is happening and all parties are extremely coneerned. Matt Larcombe is trying to interest students at the University of Tasmania, and Defenee is planning further monitoring and data gathering. Hopefully, this herbivory that has only just been noticed has aetually been oeeurring for many years and the orehid ean eope with this pressure.

I do not wish to see the magnifieent fleshy greenhood disappear from the wild.

SOME NOTES ON *HALOTYDEUS DESTRUCTOR*

The following notes are compiled from Ridsdill-Smith & Annells (1997) "Seasonal oceurrenee and abundanee of redlegged earth mite *Halotydeus destructor* (Aeari: Penthaleidae) in annual pastures of southwestern Australia" (*Bulletin of Entomological Research* 87: 413-423).

- *Halotydeus destructor* (Tucker) (Aeari;Penthaleidae), was aceidentally introduced to Australia from South Afriea in 1917, and was eonsidered a serious pasture pest throughout southern agricultural regions by 1934 and it remains so.
- *H. destructor* oceurs mainly in regions with a cool wet winter where the winter rainfall, between May and October, is greater than 204 mm, and a warm dry summer where the summer rainfall, between December and April, is less than 104 mm.
- Based on a Western Australian study, *H. destructor* is active during the cooler wetter period of the year from May to October. In spring, the female mites retain eggs in their bodies, die on the soil surfaee, and summer is passed as diapausing eggs. Diapause is broken by high temperatures, requiring an equivalent of a month with soil temperatures over 50°C. In autumn, the eggs hatch with adequate soil moisture, when the mean daily temperature falls below 20.5°C for 10 days. Survival of diapause eggs during summer is reduced by moisture (summer rainfall).
- *H. destructor* appears to thrive at sites with well-drained sandy soil (Norris 1938).
- In a study of *H. destructor* abundance near Perth, Western Australia, it was suggested that there are three generations a year, with peaks in autumn and/or spring, but the limiting faetors were not detected.

- Nutritional quality of the plant species strongly influences *H. destructor* rate of multiplication, and could be affecting mite abundance at the pasture sites.
- Each *H. destructor* generation in pastures took seven to eight weeks, using the peak numbers of mites plus eggs, or active mites, or eggs, as markers. In the laboratory at 11-18°C (temperature range similar to that at the pasture sites), *H. destructor* completed a generation every five weeks continuously, with no evidence of diapause.
- *H. destructor* abundance was significantly reduced when the quantity of pasture available was reduced by increased grazing intensity of sheep.

ACKNOWLEDGEMENTS

The Department of Defence has continued to be proactive in the management of threatened plants on its properties and I wish to especially thank Alister Clark (Senior Environmental Officer) for his interest. I also wish to extend my thanks to Hans Wapstra for his interest in the management of orchids at the Pontville Army grounds, for his enthusiastic response to the observation presented in this article and for commenting on a draft of the article; Jasmine Janes (University of Tasmania) for her enthusiasm for the management of these orchids and agreeing to undertake some DNA identifications of rosettes; Dr. John Ireson (Tasmanian Institute of Agricultural Research) for identifying the mites and providing commentary and information; Matthew Larcombe (Project Officer, Threatened Orchids, Threatened Species Section, DPIW) for interest and support in the management of the site; and Mark Wapstra for assisting with massaging a draft of this article into the present format.

Note. All images shown as grey scale tones are also shown as full colour in the central pages of this volume.

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Threatened Species Section (TSS) (2006). *Flora Recovery Plan: Tasmanian Threatened Orchids 2006–2010.* Department of Primary Industries, Water and Environment, Hobart.

ADDENDUM

This article was written and presented for review in August 2007. I have continued with the observations of the site, including mapping the distribution of the orchids (Figure 5), and have started some long-term monitoring of the impacts of the mite on the greenhoods by using quadrats placed amongst known colonies of the species. The mite appears to be grazing on both species of threatened *Pterostylis* and some other native species such as *Wurmbea dioica* (Figure 6). The mite seems to be attracted to the pollen masses in the

orchid flower but seems just as happy grazing on the leaves and outer floral parts (Figures 7 and 8).

Since the writing of the initial article, several additional field visits have been made to the site by members of the Threatened Species Section, the Threatened Orchid Recovery Team and Hans and Annie Wapstra. Collectively, we are all highly concerned about the possible impact of the mite on the threatened orchids and we are urging further research and monitoring as a matter of urgency.

Note. All images shown as grey scale tones are also shown as full colour in the central pages of this volume.

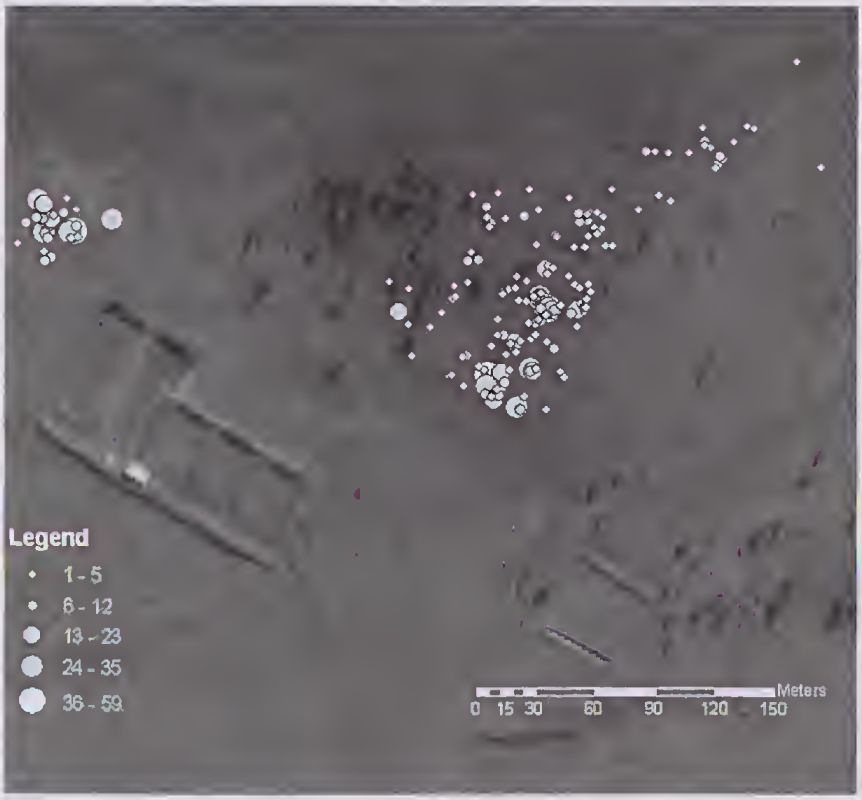

Figure 5. Distribution of threatened species of *Pterostylis* at the Pontville site. Mapping is a continuing project.

Figure 6. *Halotydeus destructor* on stigmas of the native annual lily *Wurmbea dioica.*

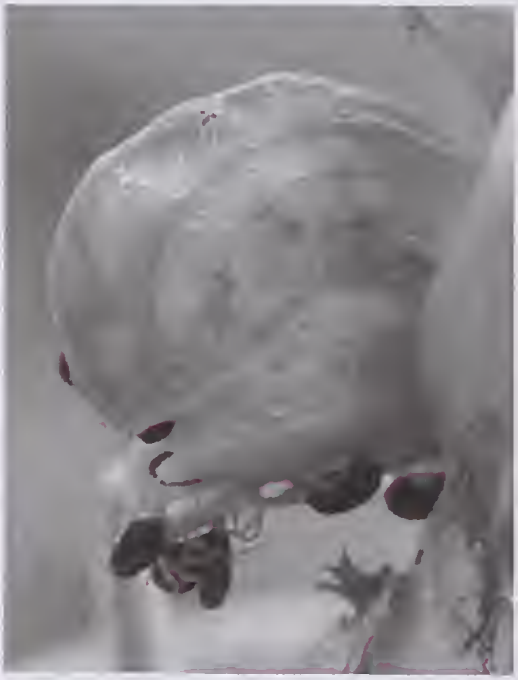

Figure 7. *Halotydeus destructor* on and in the flower of a *Pterostylis*. Note the large numbers of mites.

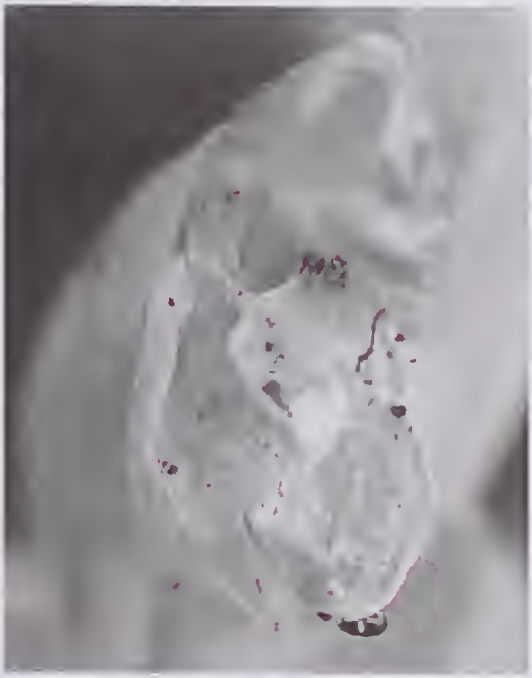

Figure 8. Damage to flowers of *Pterostylis*. Note the "destruction" of the flower structure.

ROBLINELLA ROBLINI (PETTERD, 1879), A RARE TASMANIAN CHAROPID LAND SNAIL

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ABSTRACT

This paper discusses the taxonomic history, identification, known distribution, ecology and conservation of *Roblinella roblini* (Petterd, 1879), the type species of the genus *Roblinella* Iredale, 1937. The protoconch is figured, demonstrating the species' distinctness from the common *R. gadensis* (Petterd, 1879). *R. roblini* has been rediscovered at two localities after having not been collected for over one hundred years but appears to be scarce and requires further research.

TAXONOMIC HISTORY

Roblinella Iredale 1937

Type species *R. roblini* (Petterd, 1879)

DIAGNOSIS: As the genus as originally defined is clearly polyphyletic (see below), *Roblinella* is here confined to minute to small charopids (typically 1.5-4 mm wide) with relatively loosely coiled shells, a flat to slightly elevated spire, low primary adult riblets that are not strongly curved, and a protoconch of discrete bladelike spiral ridges with interstieal, approximately radial, riblets.

Roblinella roblini (Petterd, 1879)

Helix roblini Petterd, 1879: p. 38

Flammulina roblini Petterd and Hedley, 1909: p.300, figs 20-22

Roblinella roblini Iredale 1937: p. 332; May 1958: p. 47, fig 43:25; Hyman and Stanisic 2005: p. 256

Type data: "status and whereabouts unknown, presumed lost" (Smith, 1992:203)

Material examined: TMAG E1214 "Launceston Tas", one sub-adult shell, presumed collected by Petterd before 1879; TMAG E1119 "Distillery Creek Tas", one adult shell, presumed collected by Petterd before 1879; author's collection Distillery Creek 515450 5413500 K. Bonham 11 Mar 2005, three adult shells plus one damaged shell; author's collection Distillery Creek 515450 5413500 K. Bonham 16 April 2006, two adult shells; author's collection Valentine Creek 533250 5437500 M.Yee/K. Bonham/ S. Blake 27 Sep 2006, one live-collected subadult (preserved in 75% ethanol).

Petterd described *Roblinella roblini* in 1879 and gave the type locality as "Distillery Creek, Launceston". Subsequently, Petterd & Hedley (1909) figured "an authentic specimen in the Tasmanian Museum". Two specimens exist in the Tasmanian Museum and Art Gallery (TMAG) collections (E1119 and E1214, both most likely collected by Petterd). Petterd's original description, however, indicates a much greater shell width (2.75 mm) compared to either of these, hence at least three specimens were collected. The whereabouts of any specimens collected by Petterd other than the two TMAG specimens are unknown. Old specimen labels (which refer to the figure in Petterd and Hedley, although not explicitly stating that this particular specimen was figured) and the actual dimensions of the specimen are entirely consistent with E1119 having been the specimen Petterd and Hedley illustrated. The only discrepancies between the illustration and the actual specimen are that the number of whorls shown on the protoconch is greater by about 0.4 of a whorl, and also the diagram does not appear to illustrate all primary ribbing on the dorsal surface. These are probably just illustration errors, perhaps as a result of insufficient magnification.

A third, much larger, charopid shell was found in a vial inside the box that held TMAG E1119. This specimen is not *R. roblini* and is actually an undescribed charopid from the Waratah region, of which Petterd collected several specimens. Evidently the larger charopid specimen has become misplaced within the collections.

Iredale (1937) made *R. roblini* the type species of his genus *Roblinella*, which he created for "flattened species with wide umbilicus, radial sculpture and the protoconch spirally striate or lirate, sometimes of large size as in the type species". However, one of the species Iredale allocated to this genus, *R. agnewi* (Legrand 1871), actually has a smooth protoconch. Furthermore, the genus as created by Iredale contains "species with dramatically different apical spiral lirae indicating that it is polyphyletic" (Hyman & Stanisic 2005). Indeed, no described Tasmanian species apart from *R. roblini* belongs in the genus, but reallocation of the other Tasmanian species to new genera is outside the scope of this paper.

With no further specimens being found following Petterd's collections, the species was poorly known throughout the twentieth century. Curiously, another species, *R. gadensis* (Petterd 1879) was also very poorly represented in collections until very recently, although it is now known to be common and widespread (Bonham 2003). Although all previous authors had considered *R. roblini* valid, Smith & Kershaw (1979) considered the species to be a synonym of *R. gadensis* without stated reasons, an assessment that is disregarded for the reasons noted below. During the late 1990s, the name *Roblinella roblini* was sometimes used in informal literature, including by the author and principally for a widespread fairly common western and southern Tasmanian species with a protoconch similar to that of *R. roblini* as described by Petterd. However, study of the two TMAG specimens showed that they were distinct from this species, which remains undescribed (Bonham 2003). Finally, Hyman & Stanisic (2005) discussed some features of *R. roblini* (which they treated as a valid species without comment on Smith &

Kershaw's synonymy) in order to justify the creation of their new genus *Macrophallikaropa.*

IDENTIFICATION

R. roblini is a small white charopid (measured adults of 4.15 to 4.5 whorls are of 2-2.45 mm diameter, but Petterd records a 2.75 mm specimen with 4.5 whorls). The spire is flat to slightly raised and the ratio of shell height to diameter varies substantially for a small sample (.33<H/D<.48). The umbilicus is of moderate width with a ratio of shell width to umbilicus width (D/U) between 3.7 and 4.9. The protoconch is between 0.53 and 0.67 mm wide and is of 2.0 to 2.4 whorls. The aperture of adult specimens is typically slightly wider than high and there are 140-150 primary ribs on the body whorl, although the slightly subadult specimen from Valentine Creek has 165 ribs on its last whorl. Figures 1-3 illustrate TMAG E1119, which is also believed to be the specimen drawn in Petterd & Hedley (1909). Nothing is known yet of the anatomy of the animal, which is a slaty bluish-grey colour.

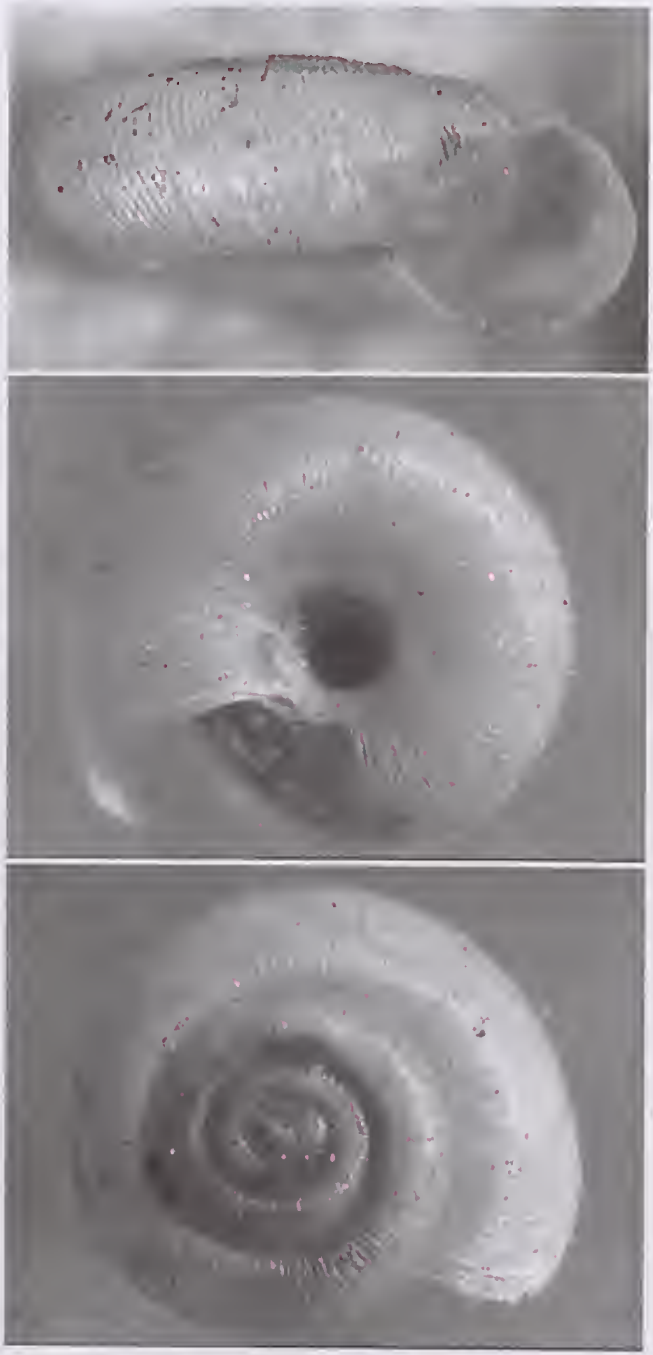
The most significant feature of *R. roblini*, and the feature that distinguishes it reliably from *R. gadensis* and a range of other small Tasmanian charopids, is the protoconch sculpture. The protoconch sculptures of *R. roblini* and a specimen of *R. gadensis* collected close to that species' type locality can be seen in figures 4-5 and 6-7 respectively. The key qualitative differences between the two species are:

1. The protoconch of *R. roblini* has very numerous small discrete interstical riblets, which are not quite perpendicular to the primary spirals. This feature is completely absent on *R. gadensis*, on which the interstices are weakly and irregularly corrugated.

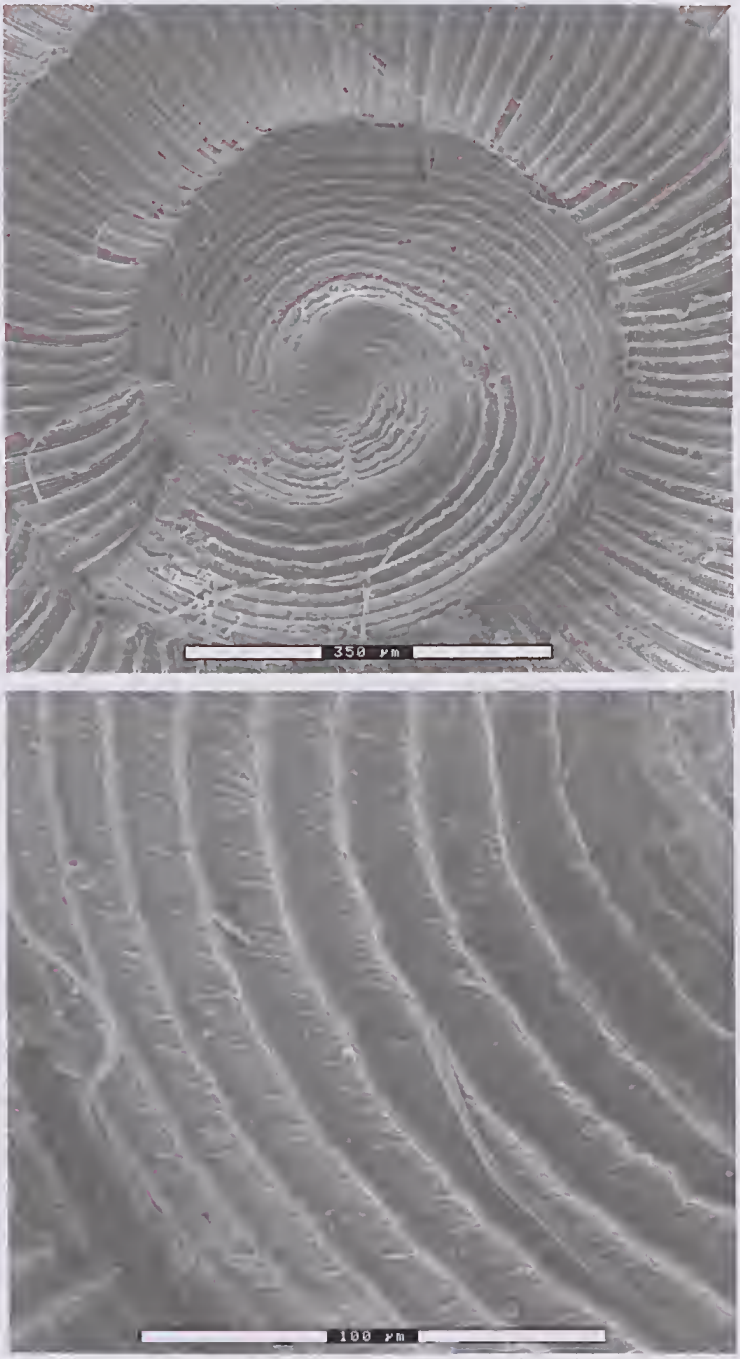
2. The spiral ridges on the protoconch of *R. roblini* are high, discrete and blade-like. Those on *R. gadensis* are lower, relatively broad, and sometimes indistinct.

The differences in the protoconch sculpture of the two species are so great that they strongly suggest the species are not closely related and are only superficially similar. Specimens of *R. gadensis* from 72 localities representing that species' entire known range (which covers most of mainland Tasmania) were examined and although substantial variation in the prominence of the protoconch spirals was apparent, interstical riblets were not present on the protoconch of any specimen. The examined material of *R. gadensis* included specimens from localities near the known range of *R. roblini,* such as Mt Maurice (GR 5462 4263, K. Bonham 9 Jan 1996) and Simons Road (GR 5435 4212, P. Greenslade/J. Diggle 5 June 1989).

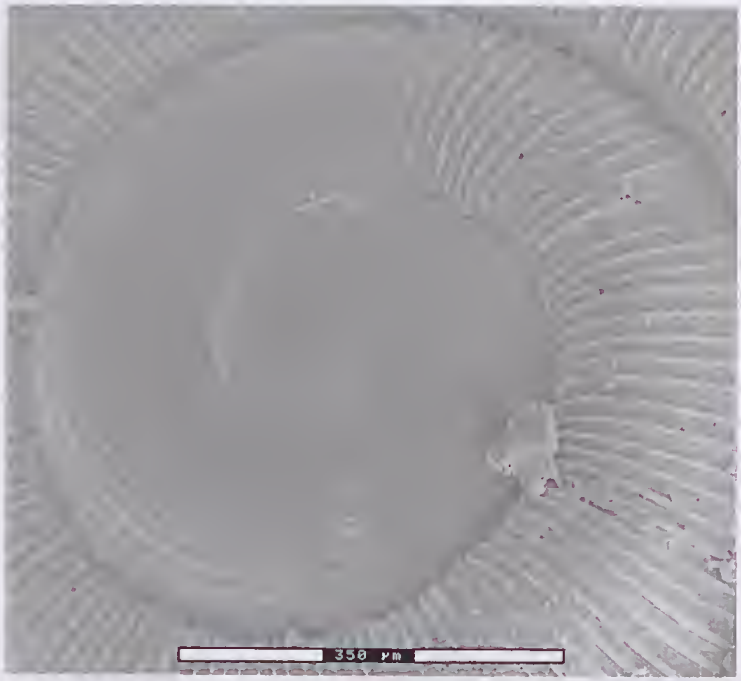
It is possible that the nearest relatives of *R. roblini* (based on protoconch similarities) are undescribed. The widespread western/southern Tasmanian species that has sometimes been mistaken for *R. roblini* is much smaller (adults 1.4-1.9 mm at 3.6-4.0 whorls), with a.

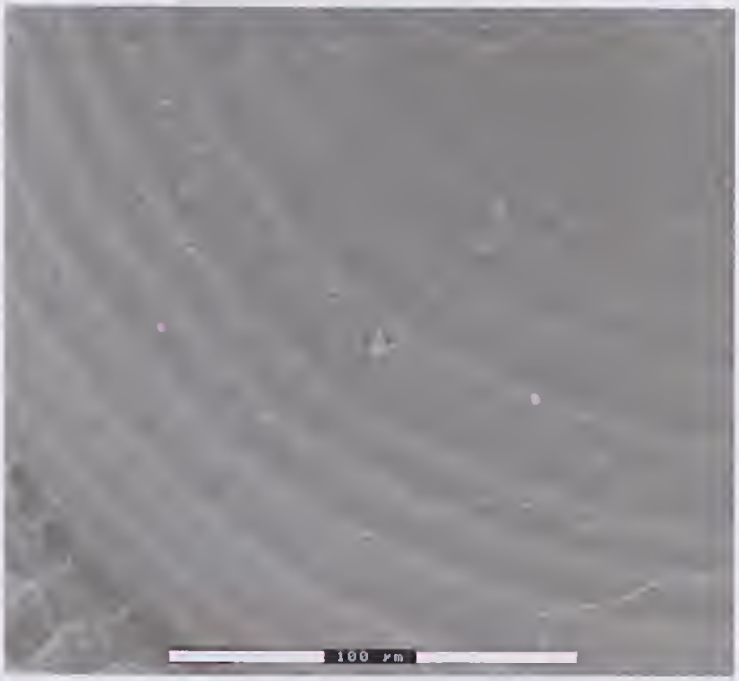


Figures 1-3. *R. roblini* (TMAG E1119). Shell diameter 2.2 mm.



Figures 4-5. *R. roblini* SEM photographs showing protoconch sculpture. From a damaged shell collected at Distillery Creek 11 Mar 2005.





Figures 6-7. *R. gadensis* SEM photographs showing protoconch sculpture. Winterbrook Falls GR 414300 5410600 K. Bonham 25 Mar 96 (author's collection).

slightly narrower umbilicus and much lower and denser, almost reticulated adult sculpture. An undescribed species that is much larger than *R. roblini* (adults to 3.7 mm wide) is known only from long-dead shells collected inside limestone caves at Victoria Pass in western Tasmania: whether this species is extant or extinct is unknown as there has been no surface collecting for it. Finally, the Museum Victoria collections contain many specimens of a Victorian species that looks like a slightly larger (2.8-3.0 mm) and much shinier *R. roblini*, with bolder adult radial ribbing and much stronger adult spiral sculpture

NATURAL HISTORY AND CONSERVATION

R. roblini was discovered by Petterd during the 1870s. Petterd (1879) noted that it was "of very rare occurrence, attached to the under surface of stones in moist places", however elsewhere he suggested the species was one of three occurring "generally in rather dry situations" (p. 37). Petterd & Hedley (1909) later noted *R. roblini* was "extremely difficult to find". The type locality was Distillery Creek and there is no evidence that the species was collected anywhere else prior to 2006; a record from Mt Farrell by May (1958) was probably a misidentification of the undescribed western/southern species mentioned above.

The author collected four dead shells in two hours of hand-searching at the type locality on 11 March 2005, and found one live and three dead shells in ninety minutes at the same locality on 16 April 2006. For conservation reasons the live specimen was briefly observed and then released; one of the latter three dead shells disintegrated. The remaining suitable habitat at Distillery Creek consists of about 14 ha of wet eucalypt scrub and low forest along both sides of the creek between the Waverley Woollen Mills and Farady Street, and surrounded by paddocks and housing. It is likely that this is where Petterd originally collected the specimens, as Petterd's other comments regarding Distillery Creek mention the Woollen Mills and are consistent with the habitat of this bush remnant. The author's first two searches in the area in 2000 and 2004 had concentrated on the densest *Pomaderris* scrub close to the creek, without success. The population actually occurs in short mid-slope scrub comprised mainly of *Beyeria viscosa, Notelaea ligustrina, Bursaria spinosa* and *Pomaderris apetala* with occasional emergent eucalypts, mostly around 4-5 m tall. Six specimens have been found under dolerite rocks, one in leaf litter and one in litter and moss on top of a dolerite rock. With the exception of a single specimen found about 100 metres upstream, all specimens have been found within about twenty metres of each other. The area where specimens have been found is easily accessed from the adjacent Magnet Street Reserve, but is itself unreserved private land; the snail has not yet been recorded in the mostly drier and generally more degraded habitat in the reserve.

A second locality for *R. roblini* was found unexpectedly during failed searches by Marie Yee, Kevin Bonham and Sean Blake for another land snail species at a coupe near Valentine Creek just west of the The Sideling range, about 30 km northeast from the type

locality, on 27 Sep 2006. Yee found a single live specimen under a fern log near the base of a deep creek in wet eucalypt forest with a dense understorey of *Olearia argophylla*, *Pomaderris apetala* and *Dicksonia antarctica*. In the field, this specimen was assumed to be *R. gadensis* and it was only identified correctly upon return to Hobart. Following this find, a further search of 3 hours 30 minutes duration was conducted by Marie Yee, Kevin Bonham, Anne Chuter and Sean Blake on 7 November 2006, but no further specimens were found. While the gully environment itself, on metamorphosed sedimentary rock, contained a diverse native land snail population (14 species recorded), habitats surrounding the gully were found to have few shelters suitable for specialised native snail species, and to have been degraded by past intense fires and, in some areas, cattle. The area is State forest, but much of the coupe through which the creek runs was scheduled for logging at the time of the survey.

The discovery of a second locality so far from the first was not expected, given that lengthy searches for native land snails at several localities between Launceston and the The Sideling range have not produced any records of the species. Figure 8 shows the two successful sites and the distribution of localities where searches for snails have not resulted in finds of this species. Examples of such localities include wet forest behind Rocherlea, Prossers Forest, Hollybank, Skemps, Patersonia Rivulet, native forest sites around the Lisle plantations and many sites around Mount Arthur (especially near Whites Mill Road on the western side). The species has also not been recorded at any other localities around Launceston, despite a great amount of searching by various collectors in and around Cataract Gorge in particular. It is difficult to predict where other populations might occur on the basis of two populations in rather different habitats, separated by such a distance. However, intact areas further upstream on Distillery Creek, as well as around the The Sideling range, should be targeted. Pine plantations in the Lisle block should also be searched, as many charopid species may occur in them. Whether targeted surveying is a practical method of efficiently finding new localities for *R. roblini*, or whether it occurs so unreliably that new finds will most likely be serendipitous, like that of the Valentine Creek specimen, remains to be seen.

Given that *R. roblini* has been found in only two localities in one of the best-sampled areas in the State (for land snails generally), this species appears to be very scarce. Its survival is not secure at either known locality. The remnant bush area at Distillery Creek is too small in area to guarantee the species' long-term viability and its ecology is subject to edge effects from the surrounding urban and farmland areas. Small bushland remnants often have very high populations of introduced invertebrates and small charopids are often reduced in diversity in, or absent from, such remnants (author's data). Whether introduced invertebrates are directly or indirectly responsible for land snail species loss from small remnants, remains unknown. Some small native snail species that were recorded by Petterd from Distillery Creek (*Pasmaditta jungermanniae* (Petterd 1879) and *Prolesophanta dyeri* (Petterd 1879)) have not been re-recorded there and may be locally

extinct. However, as the latter is naturally scarce in most localities, much more searching would be required to confirm this.

At the Valentine Creek locality, the species would not be secure irrespective of the management of the surrounding State forest, as the gully the population may be confined to is very narrow and surrounded by habitat that appears to be unsuitable. Degradation by cattle from cleared farmland immediately below the State forest is also a management issue for the population. The author has recommended that the streamside reserve surrounding the gully be widened to reduce the risk of adjacent timber harvesting affecting the microclimate of the gully.

Given that the species is evidently scarce, likely to be confined to a small portion of the state, apparently absent from many suitable sites within this area and under threat at the only two known localities, it is recommended that the species be listed on the schedules of the Tasmanian *Threatened Species Protection Act 1995*. Even if several more localities were found over subsequent years, it is very unlikely the species would cease to qualify for at least Rare status at any time in the foreseeable future.

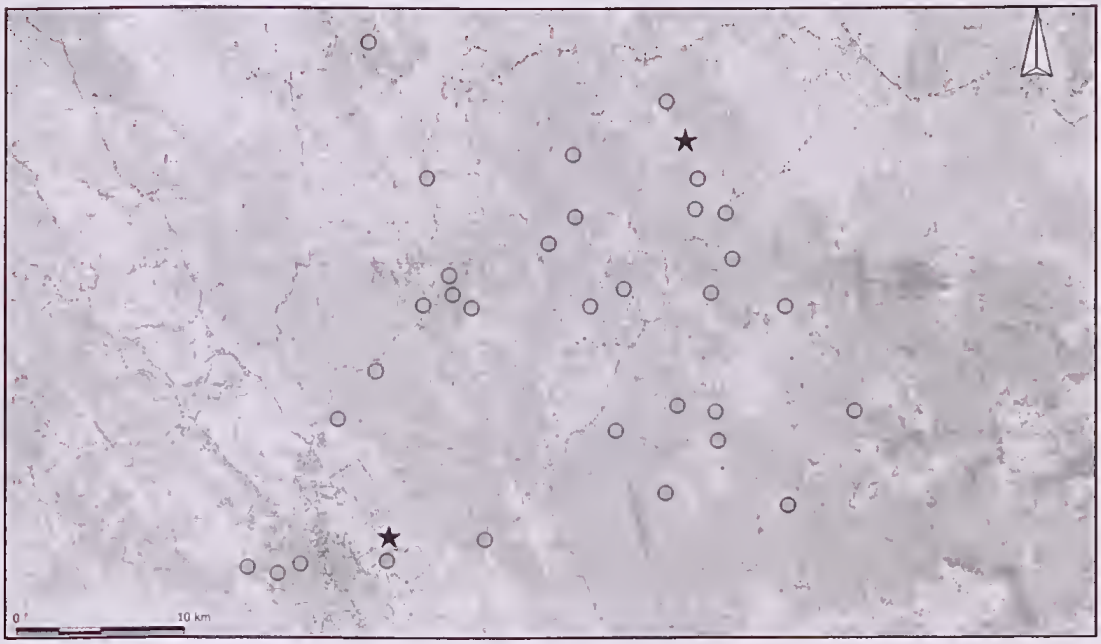


Figure 8. Known range of *R. roblini* showing the two known localities (black stars) and areas where the species has not been found (grey circles) despite searches of at least one hour's duration using methods likely to yield small snails in damp or wet forest habitat. Additional searches very close to other unsuccessful searches have not been included.

ACKNOWLEDGEMENTS

Liz Turner (TMAG) provided assistance with TMAG specimens and photography, Peter Lyle (Geography and Environmental Studies, University of Tasmania) performed file conversions, Marie Yee, Anne Chuter and Sean Blake (FT) assisted with transport, surveying and information for the Valentine Creek site, and Forestry Tasmania funded both surveys of that site. I also thank John Stanisic for discussions of *Roblinella* taxonomy, Paul Throssell (snr) for transport to Distillery Creek on one trip there, and two referees for many useful comments on the wording and content of this paper.

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Note. Some images shown as grey scale tones are also shown as full colour in the central pages of this volume.

A FERN OUT OF PLACE

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The native fern growing lushly in a drain in the heart of Hobart caught me by surprise. In a concrete box drain in the alleyway (I think the lower section is called Mathers Lane) between Liverpool Street and Bathurst Street, near the rear entrance of the State Library, is a small population of *Microsorum pustulatum* clinging tenaciously to its civic existence.

Microsorum pustulatum (or to those who follow the confused world of botanical taxonomy and nomenclature it has been known as *Microsorum diversifolium* and *Phymatosorus pustulatum*, or combinations thereof) is usually an epiphyte or lithophyte, growing most commonly on the trunks of rainforest and wet forest trees (such as blackwoods and myrtles) or on rock faces in many forest situations. The species has a very wide ecological tolerance growing from near sea-level in the salt spray zone to at least 850 m elevation on exposed mountain summits, occupying a wide range of vegetation types from rainforest, scrub, wet sclerophyll and dry sclerophyll forest (Garrett 1996).

The species' penchant for less than native situations is highlighted in Garrett (1996), who reports on occurrences of the species as an epiphyte on introduced willows and as a "lithophyte" on the stone facade of buildings in Zeehan. The present observations add to the list of unusual habitats occupied by this native fern.

I note that in my last stroll past this drain in October 2007 that the fern is being overcome by the introduced *Cymbalaria muralis* (ivyleaf toadflax: Scrophulariaceae), and I wonder which will be the most tenacious species.

After making the city centre observation described above, I noted a clump of *M. pustulatum* growing on the brick wall of a building in central Mount Stuart. The building is circa 1970 (currently used as a dance school and community hall) but whether the plant is an ornamental or a natural lithophyte is unknown to me.

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VICARIANCE, DISPERSAL AND THE STRANGE CASE OF THE TASMANIAN BLACK NERITES

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I know them as black nerites. Others call them crows. These solid snails, jet-black on the outside and porcelain white on the inside, will be familiar to many who delight in exploring Tasmania's rocky shores. Nerites form a large group of mostly intertidal gastropod molluscs. Tropical shores may host a dozen species in a range of colours, sizes, shapes and textures, but up to now, we poor souls in the Far South have had it easy, with only a single, sombre-coloured species recognised.

Reeve described *Nerita atramentosa* from Western Australia's Swan River in 1855, while E.A. Smith formalised the name *N. melanotragus* for New Zealand specimens in 1884. Ever since, taxonomists have vacillated between calling the southern Australian nerites *N. atramentosa* and *N. melanotragus*: I opted for the latter in a recent Tasmanian checklist (Grove *et al.* 2006).

Now, it seems, taxonomists can have it both ways. It transpires that there are actually two black nerite species in the region, and both occur in Tasmania. *Nerita atramentosa* could be dubbed the western black nerite (or, with an eye to research sponsorship, the Adelaide crow?). It's the species Reeve described from Western Australia, and on the south coast of mainland Australia dominates as far east as Wilsons Promontory in Victoria. Then there's *N. melanotragus*, the eastern black nerite. It's the only species present in New Zealand and on Lord Howe and Norfolk Islands, and is the dominant species of black nerite in southeastern Australia, from southern Queensland to Wilsons Promontory. How this situation arose makes a fascinating detective story, one that stretches back many thousands of years. It highlights the impermanence of the island entity that we call Tasmania, and gives us a glimpse into the processes of speciation happening on our own doorsteps. The story was recently recounted in a seminar at the University of Tasmania given by Dr Jon Waters, a Tasmanian marine biologist now working in New Zealand.

Without going into the detail, during the last Ice Age, sea levels were much lower than they are today. Bass Strait dwindled to a gulf, connected to the Great Australian Bight to the west but disconnected from the Tasman Sea to the east by a land bridge, the Bassian Isthmus, between what is now north-eastern Tasmania and eastern Victoria. It looks as though an ancestral black nerite once occupied the entire region (with the same or related forms elsewhere in the Pacific as far east as Easter Island), but its southern Australian populations became separated for many thousands of years by the Bassian Isthmus. Nerite larvae are planktonic and can be dispersed long distances by currents during this phase of their life. However, during the Ice Age, water temperatures around southern Tasmania would have been a few degree cooler than today, and apparently presented an insurmountable barrier for nerite dispersal. This allowed the two populations to drift apart

genetically. They may have done this several times as the glacial cycles waxed and waned in succession, but we have no easy means of knowing this. What we do know is the end result: two separate species, arisen through what biogeographers call vicariance. In other words, the nerite populations were responding passively to changes in the landscapes and seascapes around them. (The alternative process that can give rise to speciation, 'boldly going where no nerite has gone before', may account for the distribution and nature of other black nerites in the South Pacific).

But this is not the end of the story. The current interglacial has seen sea levels rise, reconnecting eastern and western Bass Strait. Wilsons Promontory is the last bastion of the Bassian Isthmus, and, formidable though it may be as an obstacle to human mariners, it's hardly going to stop a determined nerite. Furthermore, warmer waters now put the whole of Tasmania's coastline within the habitable range of nerites (though I know of no records from the far southwest, and nerites are rare west of the Tasman Peninsula). As a result, it appears there has been some 'spillover' of each species into the others' domain. The details are described elsewhere (Waters *et al.* 2005), but essentially, while the broad-scale pre-interglacial pattern remains intact, there is an overlap zone centred on Victoria and Tasmania where both species occur. In Victoria, Wilsons Promontory remains the dividing line, either side of which one or other species dominates. Populations of nerites on shores east and west of here are predominantly one species or the other. But the presence of occasional adults of the 'wrong' species suggests the boundary may not be stable in the longer term if dispersing nerite larvae ever get to establish self-sustaining populations beyond their current respective ranges. Whether they do so or not may also depend on the extent to which the two species compete for the same resources. For instance, where they occur together, do they graze the same sorts of algae and prefer the same sorts of rocky microhabitats, or do they find a way of dividing these up, allowing co-existence?

What does this mean for naturalists in Tasmania? It means we can't just call our nerites black, and there's work to be done in understanding the Tasmanian distribution of eastern and western blacks. In principle, either could be found anywhere around our coast, but one would suspect that *N. atramentosa* might dominate along the Bass Strait coast (and west coast?) while *N. melanotragus* might dominate along the east and south coast. Only time and further study will tell.

This all begs the question, how can the two species be told apart? All is made clear in a recent paper (Spencer *et al.* 2007) – at least if you're looking at live nerites. The colour of the snail's operculum or 'front door' - the horny plate attached to its foot - is diagnostic (Figure 1). In *N. melanotragus* it is 'orangey-tan', while in *N. atramentosa* it is black. There are further distinguishing characters on the shells, but these are more subtle and can be obscured in worn specimens. It also helps to have named examples of both species in front of you as some of these characters are 'relative'. For instance, the outer lip of undamaged specimens shows crenulation in *N. atramentosa*, a feature not normally present in *N. melanotragus*. The teeth on the columella and the tooth at the apical end of

the outer lip are all more prominent in *N. atramentosa* than in *N. melanotragus*. More conclusive is the body-whorl sculpture: in *N. atramentosa* it consists of at least 30 spiral cords, whereas these number 15 to 22 in *N. melanotragus*. Finally *N. atramentosa* is, on average, larger and heavier than *N. melanotragus*.

I am interested in collating records of both species as part of a longer-term initiative aimed at producing an atlas of Tasmanian marine molluscs. I would also be happy to look at well-documented nerite material collected anywhere in Tasmania.

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Figure 1. Comparative appearance of *Nerita* species. The image shows two live specimens from Piccaninny Point, north of Bicheno.
N. melanotragus is on the left (the dominant species at Piccaninny Point) and *N. atramentosa* is on the right. Note the different colours of the opercula (shown in this figure as shades of grey but see colour plate in centre of volume). Photo: Simon Grove.

RESULTS OF A SURVEY TO GATHER INFORMATION ON THE USE OF TREE HOLLOWS BY BIRDS IN TASMANIA

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INTRODUCTION

Australia has a high number of species that use tree hollows for nesting or roosting (Gibbons & Lindenmayer 2002), but there are no primary excavators such as woodpeckers present, as is the case in the northern hemisphere. This means that all hollows are produced by slow processes generally involving fire, fungi and termites, although some species are known to modify the size of cavities to an extent e.g. cockatoos, brushtail possums (Ambrose 1982; Saunders *et al.* 1982). Consequently, many years are required to form hollows, especially large hollows. There is a general decrease in hollow-bearing trees across Australia due to land clearing for urbanization and agriculture, forestry activities and the death of hollow-bearing trees retained in paddocks and urban areas (Gibbons & Lindenmayer 2002). This has resulted in concern for the conservation of hollow-using fauna across Australia (Lindenmayer *et al.* 1993; Gibbons & Lindenmayer 1997; Whitford & Williams 2002; Wormington *et al.* 2002).In Tasmania, hollow-dependent fauna are a management priority under the Tasmanian *Regional Forest Agreement* (CofA & SofT 1997). Forest management agencies in most states of Australia, including Tasmania, have developed management prescriptions for the conservation of habitat for hollow-using fauna (Wayne *et al.* 2006). Yet the tree hollow requirements and the degree to which fauna are dependent on hollows vary greatly among species. Consequently, an essential element of any retention strategy is knowledge of the fauna that use hollows in the region and their known or likely hollow requirements (Recher 1991). There are large differences in the amount of literature available for Tasmanian fauna species, birds in particular, with more information generally available for threatened species. This paper presents the results of a survey distributed to members of Birds Tasmania, intended to gather anecdotal information to assist in assessing the degree to which Tasmania's bird fauna are dependent on tree hollows. The information collected can also be used to help assess the conservation status and threatening process for these species.

METHODS

A survey was distributed to all recipients (approximately 320) of the Birds Tasmania newsletter. The survey asked four questions regarding 38 bird species found in Tasmania. The questions posed and the potential responses are outlined in Table 1. These questions included one which referred to the degree of knowledge the respondent had of the species in question. It should therefore be noted that people referred to as 'experts' in this text are

self-assessed as being such. The remaining questions in the survey aimed to gather the opinions of the participants on (a) the degree to which the species uses tree hollows, (b) the population status of the species and (c) the processes threatening populations of the species. The species considered in the questionnaire were those where mention was found in the literature that they use tree hollows (e.g. Sharland 1958; Munks *et al.*, in press). Additional comments on the status, population size and distribution, use of tree hollows and preferred habitat of the species included in the survey were also invited.

Table 1. Questions asked for each bird species included in the survey.

Question	Potential Responses
How do you rate your knowledge of this species and its current status?	Expert
	High
	Average
	Low
	None
How do you rate the hollow dependency of this species?	Reliant on hollows for roosting and breeding
	Reliant on hollows for breeding but not roosting
	Use hollows for roosting and/or breeding but can use other sites
	Do not use hollows
How do you rate the status of populations of this species?	Increasing
	Stable at high numbers
	Stable at low numbers
	Declining
Of the following issues, circle any you believe to be of concern to this species	Forestry activities
	Land clearing for agriculture
	Competition for nest sites with bees or introduced birds
	Over predation by endemic or introduced species
	Road-kill
	Hunting
	There are no concerns

RESULTS AND DISCUSSION

Hollow use

Although some variability in the survey responses was found for certain species, generally the respondents agreed on the hollow-using status of the bird species considered. The results of the survey largely confirmed the results of scientific studies where literature was available for the species in Tasmania.

Most respondents agreed on the species that use hollows only very occasionally or perhaps not at all in Tasmania. These species are house sparrows (Figure 1-al), Australian kestrels (Figure 1-j) and peregrine falcons (Figure 1-k). Although there was a range of responses for azure kingfishers (Figure 1-a), most respondents, including an expert on the species, stated that they do not use hollows in Tasmania and are only found in very low numbers here. Similarly, although a range of responses was received for grey shrike thrush (Figure 1-p), the majority of recipients suggested they very rarely use hollows. A number of additional species were mentioned by the respondents as being known to use tree hollows very occasionally. These were black currawongs (*Strepera fuliginosa*), brown falcons (*Falco berigora*), scarlet robins (*Petroica multicolour*), spotted pardalotes (*Pardalotus punctatus*), bassian thrushes (*Zoothera lunulate*) and scrubtits (*Acanthornis magnus*). It was also clear that several of the species were vagrants and rarely recorded in Tasmania, including gang gang cockatoos (Figure 1-y) and sacred kingfishers (Figure 1b). Although the rainbow lorikeet (Figure 1-ae) was considered a vagrant by many respondents, recent reports indicate that it is now established in Tasmania (M. Holdsworth pers. comm.; Birds Tasmania, unpubl. data). The conclusion reached from this survey is that 29 of the species selected for this survey use tree hollows more than very occasionally.

Great discrepancy was exhibited on the hollow-using status of the dusky woodswallow (Figure 1-aj), with an expert on the species being the only respondent to state that this species is continuously dependent on hollows, while the majority of respondents stated they were non-dependent or did not use hollows. The literature states that dusky woodswallows can use hollows for breeding but that they also use stumps and roost behind bark (Sharland 1958; Coulson & Coulsen 1981). Reports were also received in this study of nests in the forks of trees (Table 2). Similarly, for the Australian wood duck (Figure 1-h-i) the more 'experienced' respondents stated they were dependent on hollows, largely for breeding, although other responses of non-use were also received. The only Tasmanian report found in the literature for this duck indicated that they can nest in hollows or on the ground (Sharland 1958).

For southern boobooks (Figure 1-l), responses ranged from continuous dependent to non-dependent on hollows. A study by Bell *et al.* (1997) indicated that they use hollows for nesting but are occasionally recorded using nesting boxes and other man-made structures. For roosting, southern boobooks do use tree hollows but will often use dense foliage, rocky clefts, caves or man-made structures (Bell *et al.* 1997). For Australian shelducks (Figure 1i), the majority of respondents indicated the species was either breeding dependent or non-dependent. The literature states that they use tree hollows for breeding but can also use holes in the ground (Sharland 1958). Reports were also received of their using rock crevices and disused rabbit burrows on islands and in treeless areas (C. Spencer pers. comm.). The degree of dependency was also unclear for masked owls (Figure 1-m), with the majority of respondents indicating they were non-dependent, but others stating they were dependent to some degree. From the literature it appears that this

species nests only in tree hollows but can roost in other locations such as cliffs, caves, vegetation and, occasionally, man-made structures (Bell *et al.* 1997). However, one respondent stated that they can also use caves for breeding.

The majority of survey respondents suggested that chestnut teals (Figure 1-f-i) are non-dependent on hollows. The only Tasmanian report found in the literature for this species indicated that they usually nest in tree hollows, although they can also nest elsewhere (Sharland 1958). This report by Sharland (1958) could be interpreted as non-dependency or as being dependent on tree hollows for nesting. For welcome swallows (Figure 1-q), the responses were either that they do not use hollows or they are non-dependent. In the literature it is stated that they do use hollows but no indication of frequency is given (Sharland 1958). For tree martins (Figure 1-r), the majority of responses were that they were non-dependent, but some stated they use them for breeding and roosting or were breeding dependent. In the literature it was stated that they mostly use tree hollows for nesting but can use other sites (Sharland 1958). The majority of respondents for galahs (Figure 1-b) indicated they are dependent on hollows for breeding. In Western Australia, galahs use hollows mainly for breeding (Rowley 1990). For long-billed corellas (Figure 1-x), respondents indicated either a continuous dependency on hollows or that the birds were dependent for breeding. In the literature it was stated that breeding has not been confirmed in Tasmania although it is believed to occur (Brown & Holdsworth 1992). For forty-spotted pardalotes (Figure 1-ag), respondents largely indicated either dependency or non-dependency on hollows for breeding. In the literature it appears that the degree of dependency can vary, as Brown (1986) found most individuals used hollows while Woinarski & Bulman (1985) found alternative sites were more frequently used.

Population status

The information collected in this survey indicated that two of the species considered were rare vagrants. These were the gang gang cockatoo and the sacred kingfisher.

The results of the current survey were generally supported by the literature for those few species where literature was available on the population status of the species in Tasmania. This is the case for the ducks (GMSU 2005), sulphur-crested cockatoos and little corellas (Brown & Holdsworth 1992; Coupland 2000). A mixture of responses was received for galahs (Figure 1-t), ranging from increasing to stable at low numbers. In the literature it was indicated they are likely to be at low numbers but gradually increasing (Brown & Holdsworth 1992; Barrett *et al.* 2003; Birds Tasmania unpubl. data). For blue-winged parrots, respondents indicated they were either stable at low numbers or decreasing (Figure 1-aa). Reports in the literature were conflicting, with some studies indicating they were increasing (Brown 1979; Brown & Wilson 1982) while others suggested they have decreased since European settlement (Green 1983). For eastern rosellas (Figure 1-ac), respondents indicated they were either stable at low numbers or decreasing; Green (1983) suggested they were decreasing. For forty-spotted pardalotes, the majority of respondents indicated they are either stable at low numbers or decreasing in abundance (Figure 1-ag).

It was previously thought that this species was decreasing, but recent work suggests they may always have been found at low numbers (Bryant 1997).

There was, however, one species for which the literature did not support the survey responses. Survey respondents suggested that the masked owl (Figure 1-m) was either stable at low numbers or decreasing in Tasmania. Although this species is listed as endangered at the State level (Schedule 3 of the Tasmanian *Threatened Species Protection Act 1995*), there is no evidence of a decrease in their numbers (Bell *et al.* 1997) although anecdotal reports have been received saying masked owls were more commonly seen in the 1940s and 1950s than at present (Mooney 1997).

Most of the respondents provided similar responses for particular species. For example, there was some variation in responses for long-billed corellas, but the majority of respondents indicated their numbers were increasing. For grey shrike thrushes, the majority of respondents indicated they were stable, with only a couple suggesting they were decreasing. Similarly, the majority of the more experienced respondents indicated that populations of the southern boobook were stable, while a few respondents suggested they were decreasing. Given this response and the fact that southern boobooks are found in a number of reserves across the State (Bell *et al.* 1997), it is suggested that populations of this species are presently stable.

However, there were some species for which the respondents gave very mixed results for population status. The differences in responses obtained in this survey may be due to several reasons. Firstly, it is expected that most respondents will have greater knowledge of their immediate vicinity and less on a broader geographical scale. It is possible that the degree of hollow use, population trends and threatening processes will vary among geographical areas in Tasmania. Secondly, although attempts were made to make the questions and categories of responses clear to the survey participants, there is still likely to be an effect of interpretation of the questions. For example, what constitutes a population at 'high' numbers and one at 'low' numbers may differ among respondents. One sighting of a bird breeding or roosting in an alternate location may be interpreted by some respondents as 'non-dependency' while others will still rate the species as being 'dependent' because the majority of sightings are from tree hollows. The species for which mixed responses were given are briefly discussed below.

For dusky woodswallows (Figure 1-aj) and tree martins (Figure 1-r), some respondents indicated that the population status was stable at high numbers while others indicated that they were decreasing. For sulphur-crested cockatoos (Figure 1-u), responses ranged from increasing to decreasing, although the more experienced respondents tended to indicate either increasing or stable at high numbers. A great discrepancy in responses was received for green rosellas (Figure 1-ab), from increasing to decreasing but with the majority of respondents indicating they are stable at high numbers. For Australian shelducks (Figure 1-i), a great range of responses was received, but again the majority indicating populations of this species are stable. A survey conducted by the Department of Primary Industries,

Water & Environment (now DPIW) confirmed that populations of Australian shelducks are stable (Game Management Services Unit 2005), but no information on population status was found in the literature for the other species.

For yellow-tailed black cockatoos (Figure 1-s), the majority of respondents indicated they were decreasing, while a number of others, including the one expert on the species, indicated they were stable. Only one respondent indicated they were increasing, stating that "*It is against all my expectations to have ticked 'increasing'. In this area (Swan Point) until recent years, a flock of 10-15 would be as many as we would see. For the last three years we have seen up to 80 in a flock. They have learnt to feed on* Pinus radiata *cones as have their white tailed cousins in southwest Western Australia*". Concern for this species has been expressed because their habitat is degraded by forest harvesting as they are dependent on large hollows for breeding (Wilson 1981; Bekessy *et al.* 2004).

Similarly, for musk lorikeets (Figure 1-ad), six of 14 responses to the survey indicated the species is decreasing, while only a single response (from the 'expert') said that the species is increasing. Reports in the literature as to their status are conflicting (Bryant 2002; Barrett *et al.* 2003). The majority of respondents also indicated that flame robins (Figure 1-a-i) are decreasing, while two respondents, including the 'expert', indicated they are stable at high numbers. Comparisons between two major national bird surveys (Barrett *et al.* 2002) suggested a nation-wide decrease in flame robins and anecdotal reports also suggest a decrease in numbers around Hobart (see Newman 2002). It was suggested that changes in rainfall patterns as a result of climate change may be cause for concern for this species (Newman 2002). The suggestion of a decrease in populations of yellow-tailed black cockatoos, musk lorikeets and flame robins, although not from the experts, is of concern and warrants further investigation.

Threatening processes

In terms of threatening processes, the one process considered to be of major concern for most species by the majority of respondents was forestry activities (although for six respondents this included the orange-bellied parrot which nests in southwest Tasmania where forestry practices do not occur, Figure 1-z). Agriculture was also considered to be a major concern. The degree of threat perceived to be due to competition for nesting sites varied among species, being quite high for some such as the orange-bellied parrot and very low for others (although these were largely those species considered to be non-dependent on hollows).

The effect of predation was perceived as being relatively unimportant for most species, although was still considered to be important for species such as rainbow lorikeets (Figure 1-ae). The effect of cars was also variable in their perceived threat, being considered of relative importance to some species such as Australian owlet nightjars (Figure 1-n), but of little concern for the majority of species considered here. The effect of hunting was greatest for the duck species, of which several species can be legally hunted (Game

Management Services Unit 2005). However, hunting was also considered to be of some importance for the owl species and non-hollow-using peregrine falcons. One threatening process which was not provided as an option but was mentioned by several of the respondents was death to birds caused by windfarms.

The species that were universally ranked as having no perceived threat were the introduced the house sparrow (Figure 1-al) and the European starling (Figure 1-ak). However, a number of other species were also considered to have no threats. Occasionally a respondent indicated there were no threats for a species while simultaneously specifying threatening processes. This was interpreted to mean that although the indicated threatening process does kill some individuals, it is not of major concern. Those species with the greatest responses of 'no threat' were sulphur-crested cockatoos (Figure 1-u), pacific black ducks (Figure 1-g), galahs (Figure 1-t), Australian wood ducks (Figure 1-h), grey shrike thrushes (Figure 1-p), laughing kookaburras (Figure 1-c), welcome swallows (Figure 1-q) and rainbow lorikeets (Figure 1-ae).

CONCLUSION

The responses to questions posed in this survey provided support to the fact that 29 bird species commonly found in Tasmania are likely to regularly use tree hollows for either roosting or nesting. The results from this survey indicate, however, that only one species, the Australian owlet nightjar, is considered to be dependent on tree hollows for both nesting and roosting. Nineteen other species are believed to be largely reliant on tree hollows for nesting, while the remaining 10 species use tree hollows to varying degrees. Four hollow-using bird species are currently listed as threatened in Tasmania (swift parrot, orange-bellied parrot, forty-spotted pardalote and masked owl, all on Schedule 3 of the *Tasmanian Threatened Species Protection Act* 1995). Respondents to the survey expressed further concern over the status of yellow-tailed black cockatoos and musk lorikeets. The threatening processes considered to be of greatest concern were associated with land clearing (forestry activities and agriculture).

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MUDGUTS (pp. 2-7)

Simon Grove

Figure 1. Mature larva of the longhorn beetle *Toxeutes arcuatus* in discoloured heartwood of a *Eucalyptus obliqua* tree. Photo: Simon Grove.

Figure 2. Larva of the prostomid beetle *Prostomis atkinsoni* on a vein of mudguts in a decaying *Eucalyptus obliqua* log. The larva's last meal of mudguts is visible along the length of its gut. Photo: Simon Grove.

Figure 3. An undescribed uchidanurine springtail commonly found in and around mudguts in logs in wet eucalypt forest, where it apparently feeds on slime moulds. Photo: Simon Grove.

Figure 5. A giant velvet worm *Tasmanipatus barretti* emerging onto my finger from the moist mudguts hidden within a charred log near Scamander. Photo: Marie Yee.

WARMING TO THE ICE PLANTS (pp. 8-15)

Phil Watson

Figure 1. *Carpobrotus rossii*, a widespread and common member of the Aizoaceae along Tasmanian coasts. Photo: H. & A. Wapstra.

Figure 2. A close-up of *Mesembryanthemum crystallinum* showing the ice-like salt accumulating bladder-like cells on the leaf surface. This species is sparingly naturalised in Tasmania

Figure 3. A carpet of *Disphyma crassifolium*, common in saltmarshes and on rocky shores on much of the Tasmanian coastline. Photo: H. & A. Wapstra.

VICARIANCE, DISPERSAL AND THE STRANGE CASE OF THE TASMANIAN BLACK NERITES (pp. 34-36)

Simon Grove

Figure 1. Comparative appearance of *Nerita* species. The image shows two live specimens from Piceaninny Point, north of Bicheno. *N. melanotragus* is on the left (the dominant species at Piceaninny Point) and *N. atramentosa* is on the right. Note the different colours of the opercula. Photo: Simon Grove.

OBSERVATIONS OF A NEW THREAT TO ONE OF TASMANIA'S THREATENED ORCHIDS: (pp. 16-22)

Peter Norris

Figure 1. *Pterostylis wapstrarum* (fleshy greenhood).

Figure 2. *Pterostylis ziegeleri* (grassland greenhood).

Figure 3. Mite damage to rosettes of *P. wapstrarum*.

Figure 4. Close-up of *Halotydeus destructor* (redlegged earth-mite) on leaves of *P. wapstrarum.*

Figure 6. *Halotydeus destructor* on stigmas of the native annual lily *Wurmbea dioica.*

Figure 7. *Halotydeus destructor* on and in the flower of a *Pterostylis.* Note the large numbers of mites.

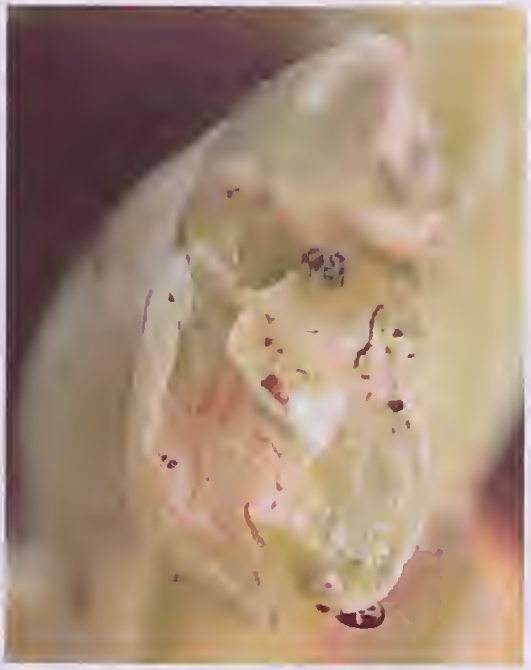
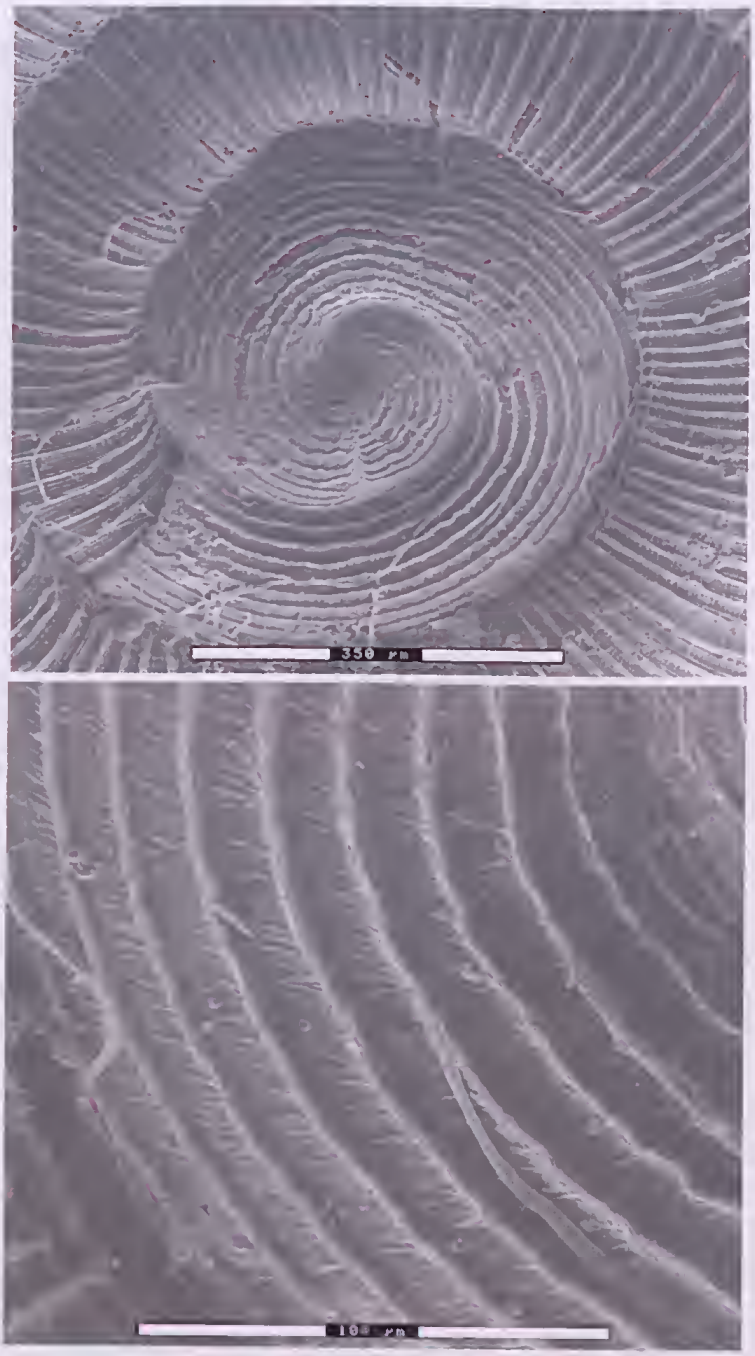


Figure 8. Damage to flowers of *Pterostylis.* Note the "destruction" of the flower structure.

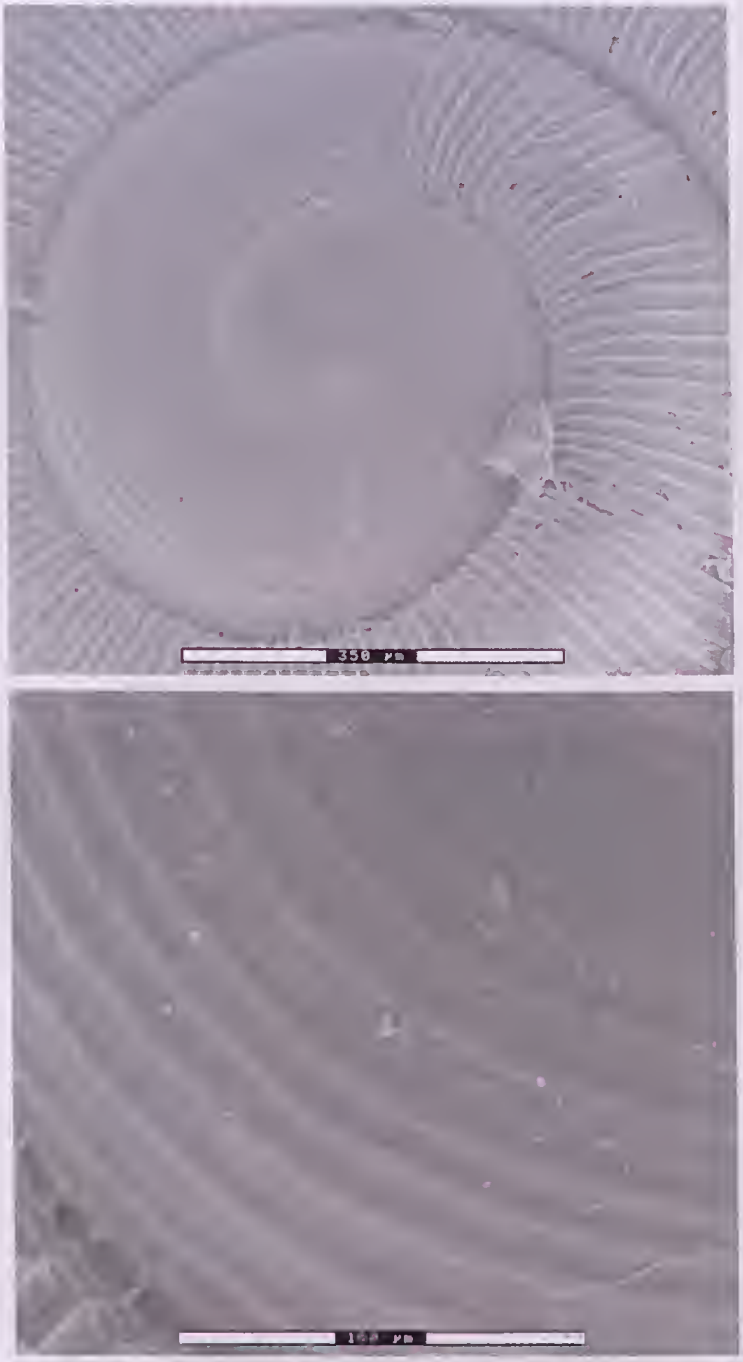
ROBLINELLA ROBLINI (PETTERD, 1879), A RARE TASMANIAN CHAROPID LAND SNAIL (pp. 23-32)

Kevin Bonham

Figures 1-3. *R. roblini* (TMAG E1119). Shell diameter 2.2 mm.



Figures 4-5. *R. roblini* SEM photographs showing protoconch sculpture. From a damaged shell collected at Distillery Creek 11 Mar 2005.



Figures 6-7. *R. gadensis* SEM photographs showing protoconch sculpture. Winterbrook Falls GR 414300 5410600 K. Bonham 25 Mar 96 (author's collection).

DEVILS OF THE ALPINE PROJECT: FIELD MONITORING PROGRAM (pp. 65-81)

Chris Coupland & Wade Anthony

Figure 4. Adult Tasmanian devil with a large DFTD lesion killed by vehicle within study area January 07. Devils@Cradle 2007.

Figure 7. Only digital image showing close contact between devils: the devil on the right is 06-22, the last individual identified in the study area with DFTD facial lesions [17/10/2006 at 2:54 am].

Figure 6. The four individuals recorded by the DOA-FMP with DFTD.

Figure 9. Progression of DFTD in devil 06-18.

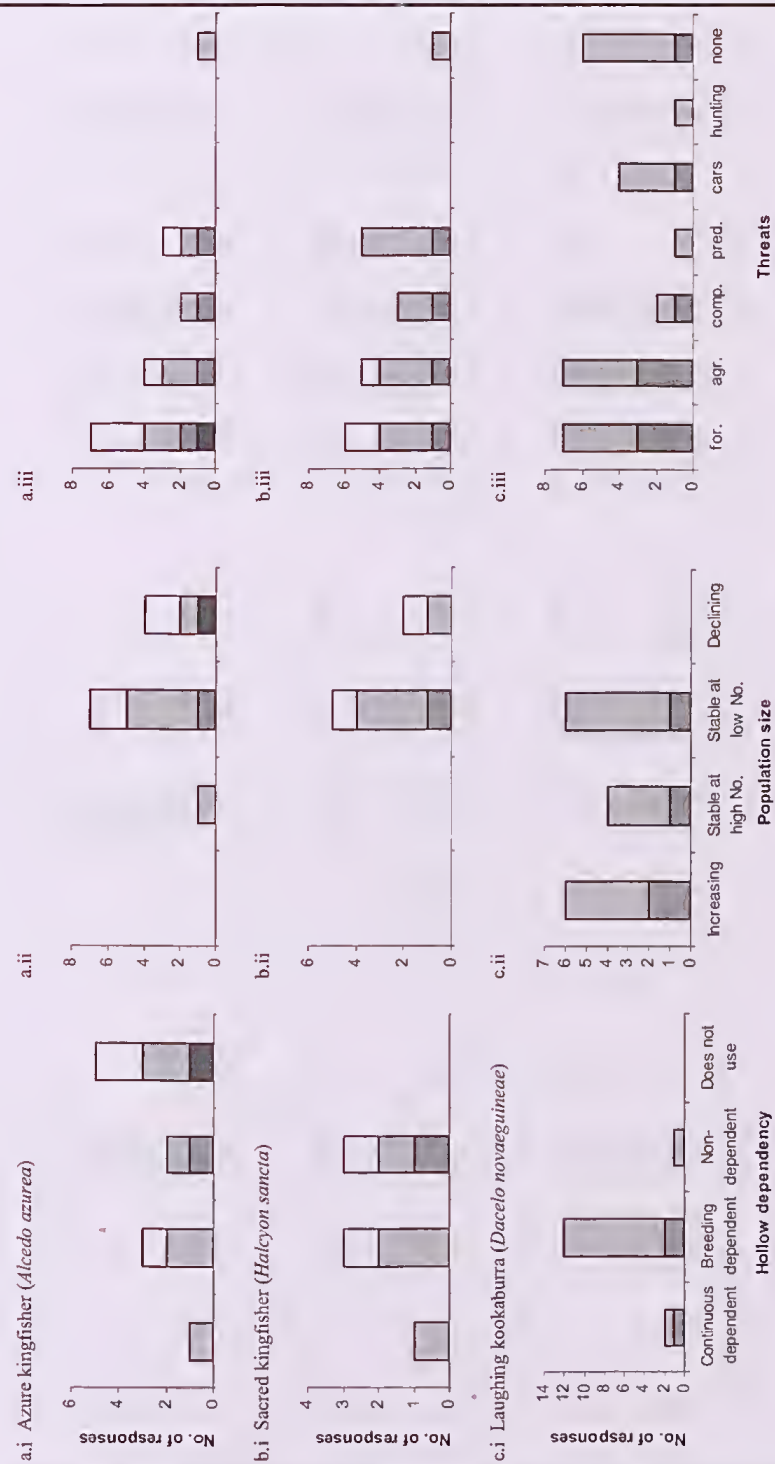


Figure 1 (a – c). The number of responses received for each option of the survey questions. Black indicates the respondent was an expert, dark grey indicates they had high knowledge, light grey indicates they had average knowledge and white indicates they had low knowledge.

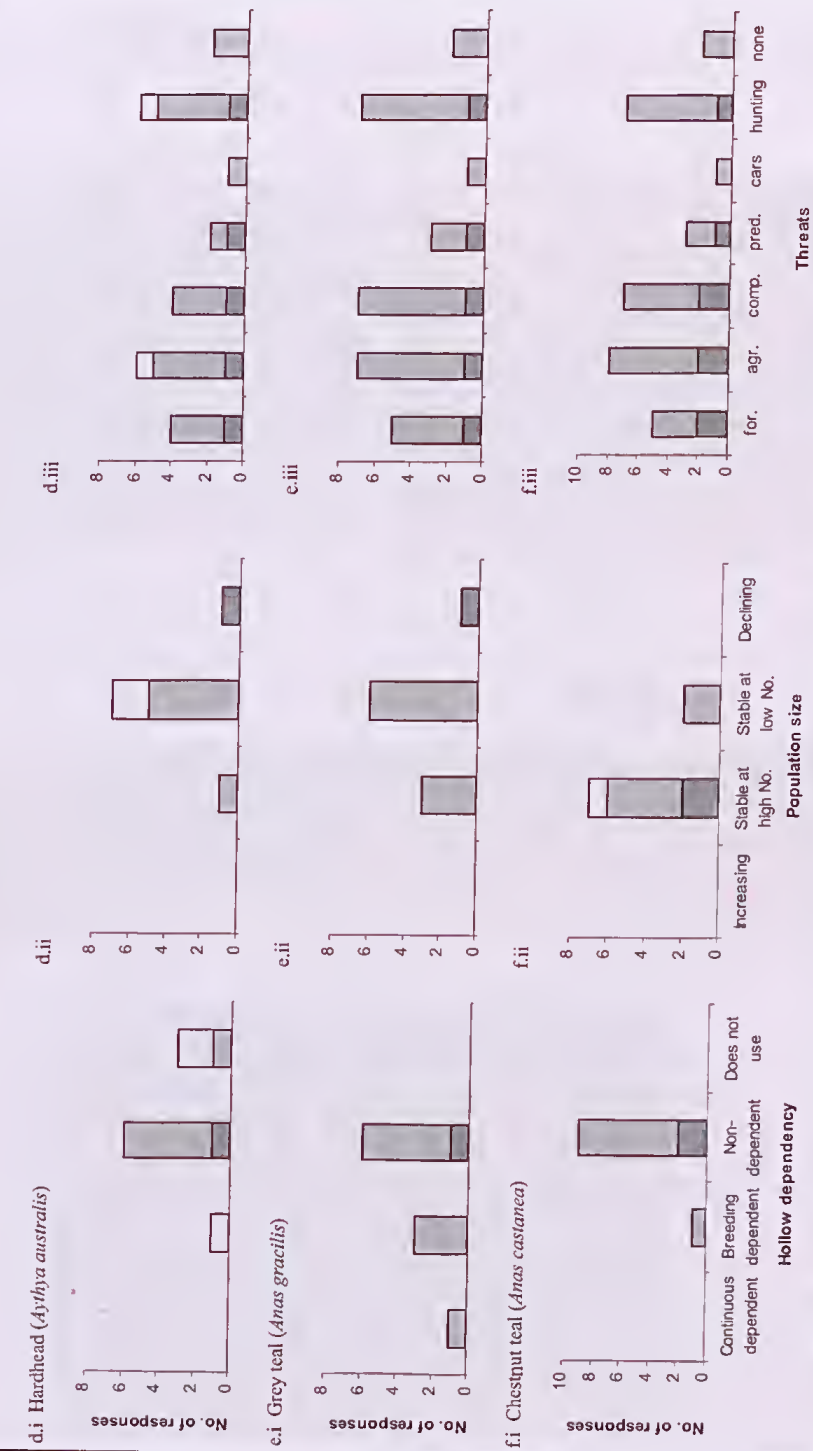


Figure 1 (d – f). The number of responses received for each option of the survey questions. Black indicates the respondent was an expert, dark grey indicates they had high knowledge, light grey indicates they had average knowledge and white indicates they had low knowledge.

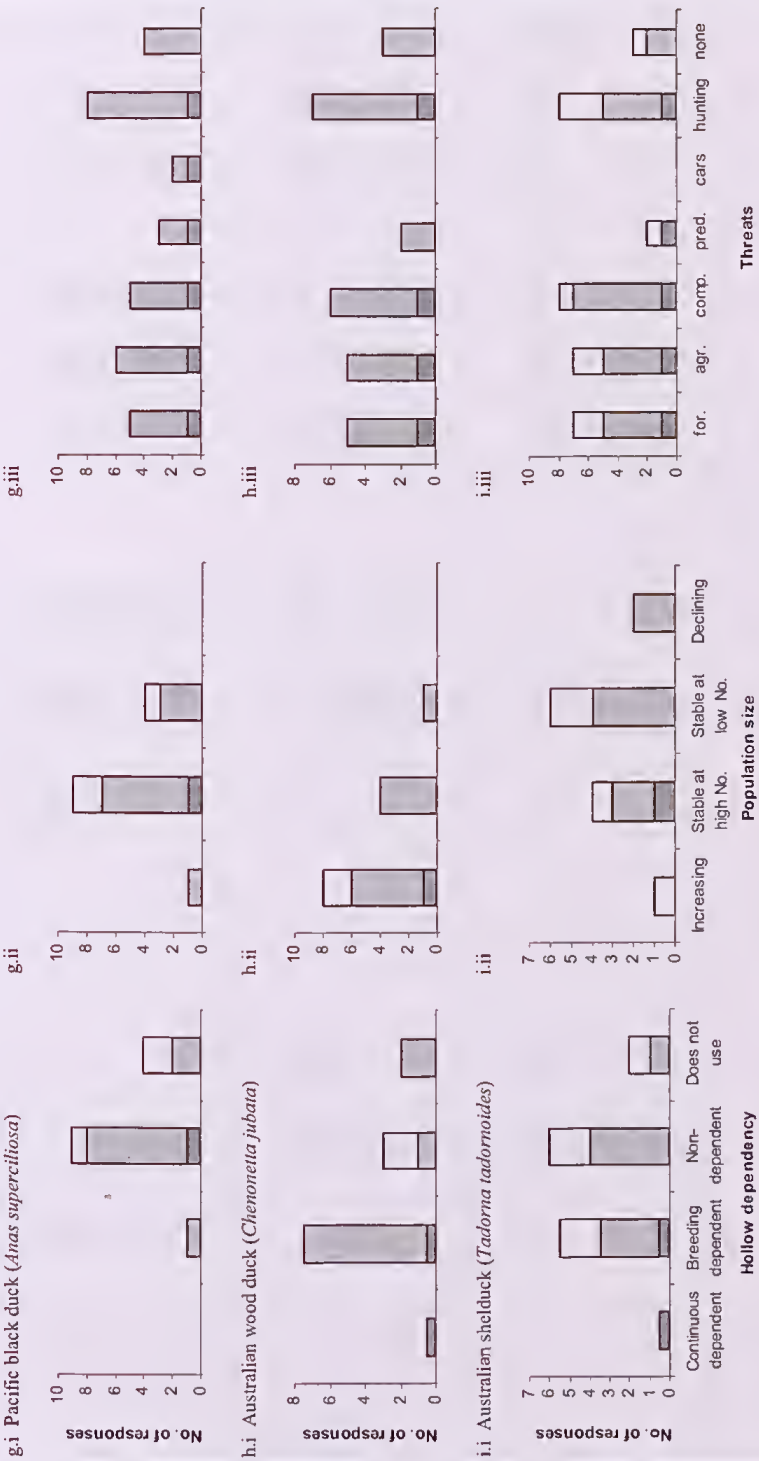


Figure 1 (g – i). The number of responses received for each option of the survey questions. Black indicates the respondent was an expert, dark grey indicates they had high knowledge, light grey indicates they had average knowledge and white indicates they had low knowledge.

Figure 1 (j - l). The number of responses received for each option of the survey questions. Black indicates the respondent was an expert, dark grey indicates they had high knowledge, light grey indicates they had average knowledge and white indicates they had low knowledge.

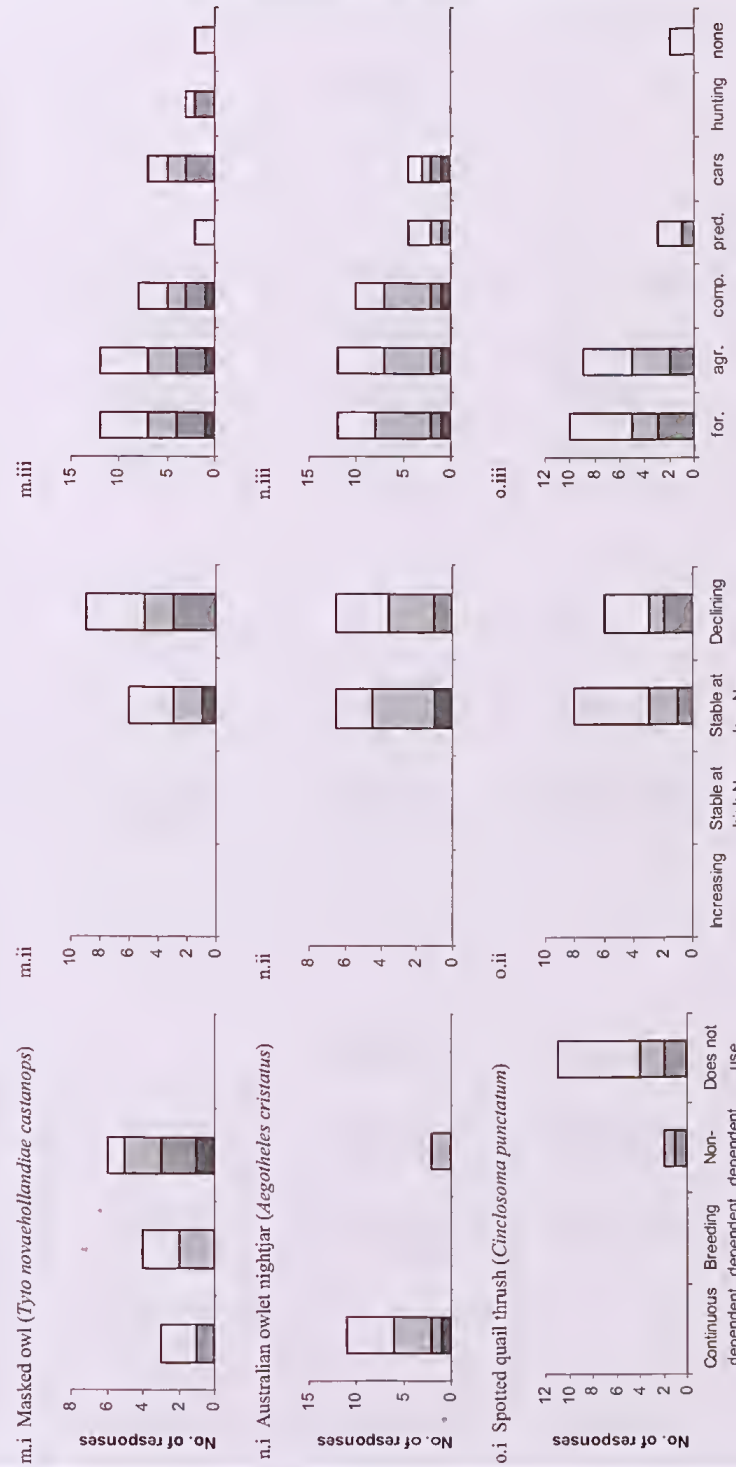


Figure 1 (m – o). The number of responses received for each option of the survey questions. Black indicates the respondent was an expert, dark grey indicates they had high knowledge, light grey indicates they had average knowledge and white indicates they had low knowledge.

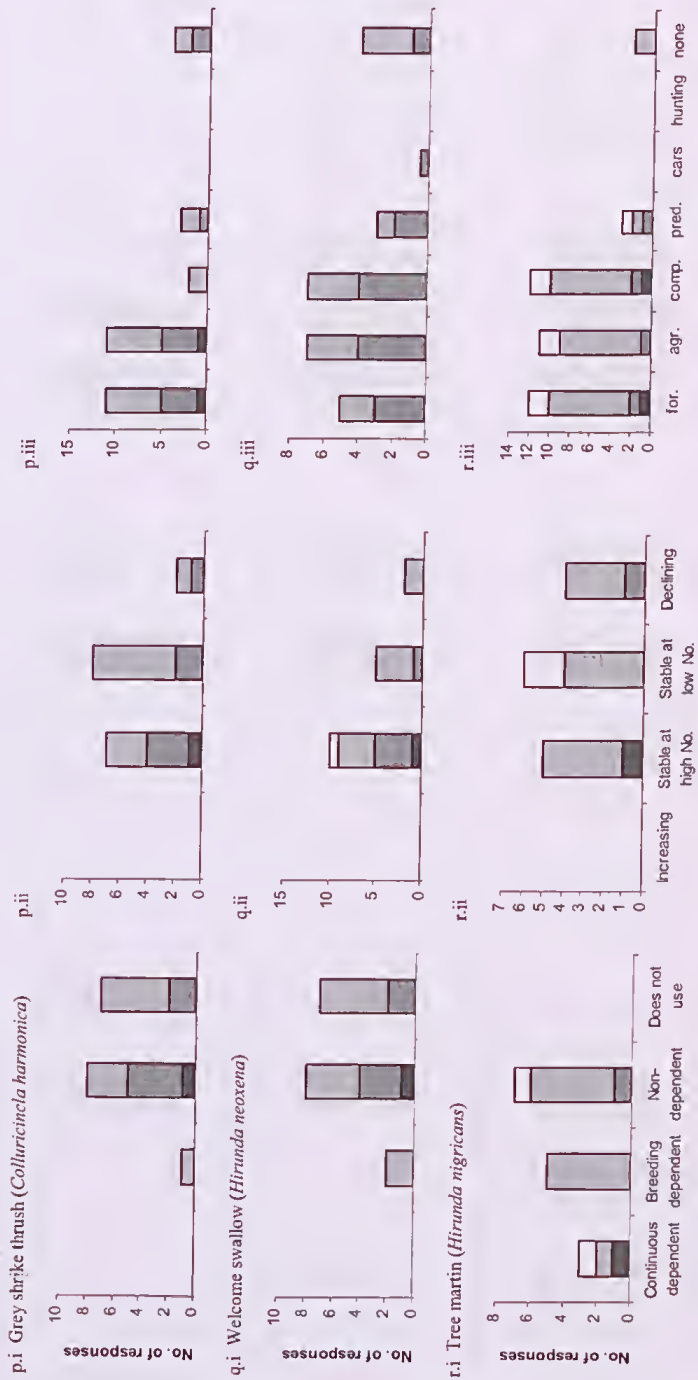


Figure 1 (p – r). The number of responses received for each option of the survey questions. Black indicates the respondent was an expert, dark grey indicates they had high knowledge, light grey indicates they had average knowledge and white indicates they had low knowledge.

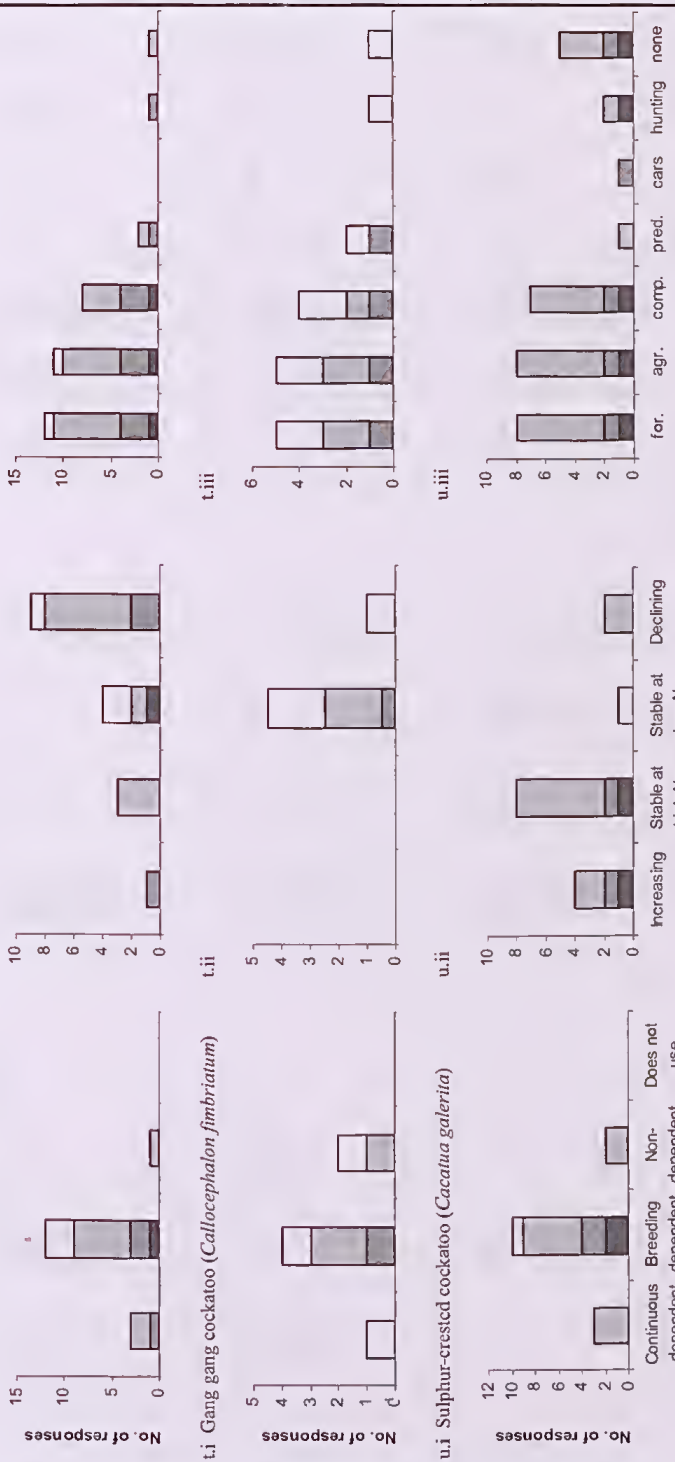


Figure 1 (s – u). The number of responses received for each option of the survey questions. Black indicates the respondent was an expert, dark grey indicates they had high knowledge, light grey indicates they had average knowledge and white indicates they had low knowledge.

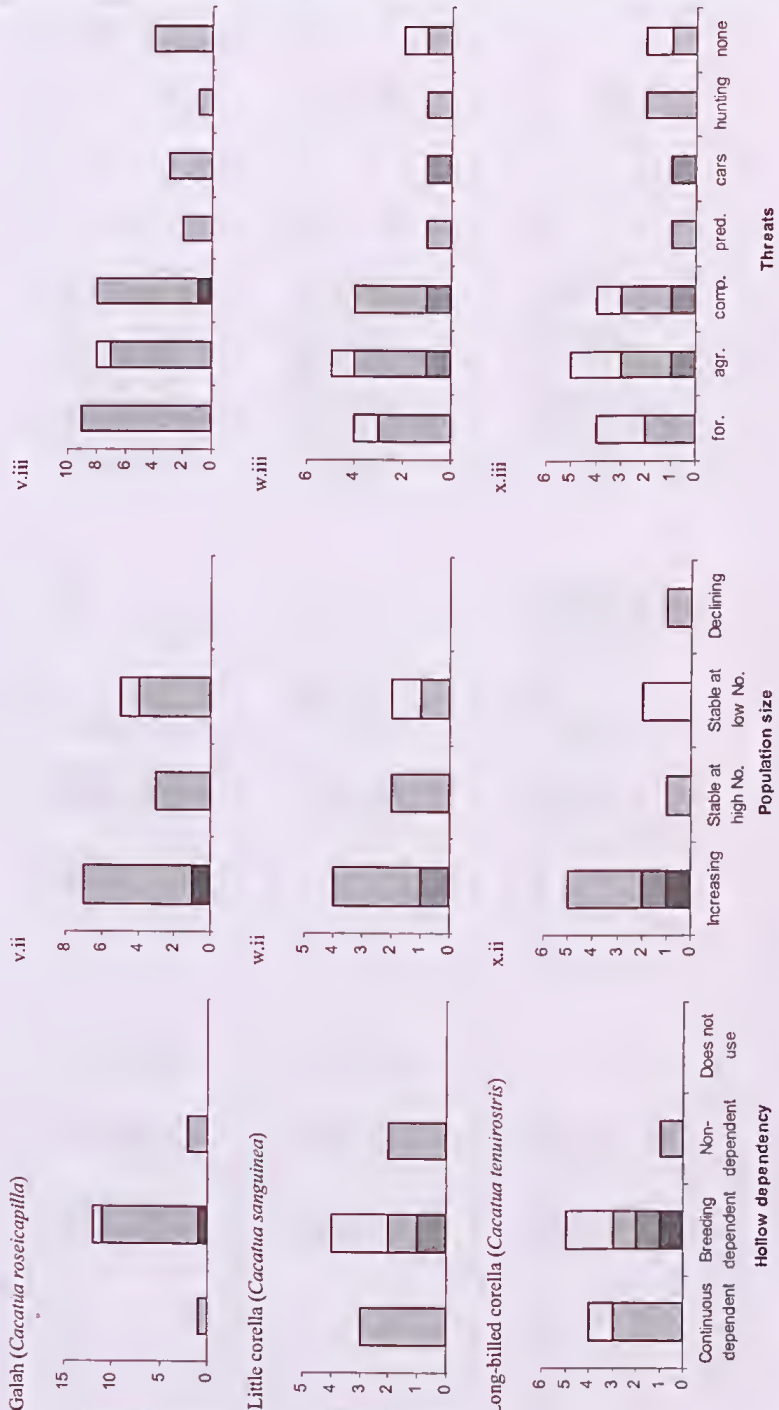


Figure 1 (v – x). The number of responses received for each option of the survey questions. Black indicates the respondent was an expert, dark grey indicates they had high knowledge, light grey indicates they had average knowledge and white indicates they had low knowledge.

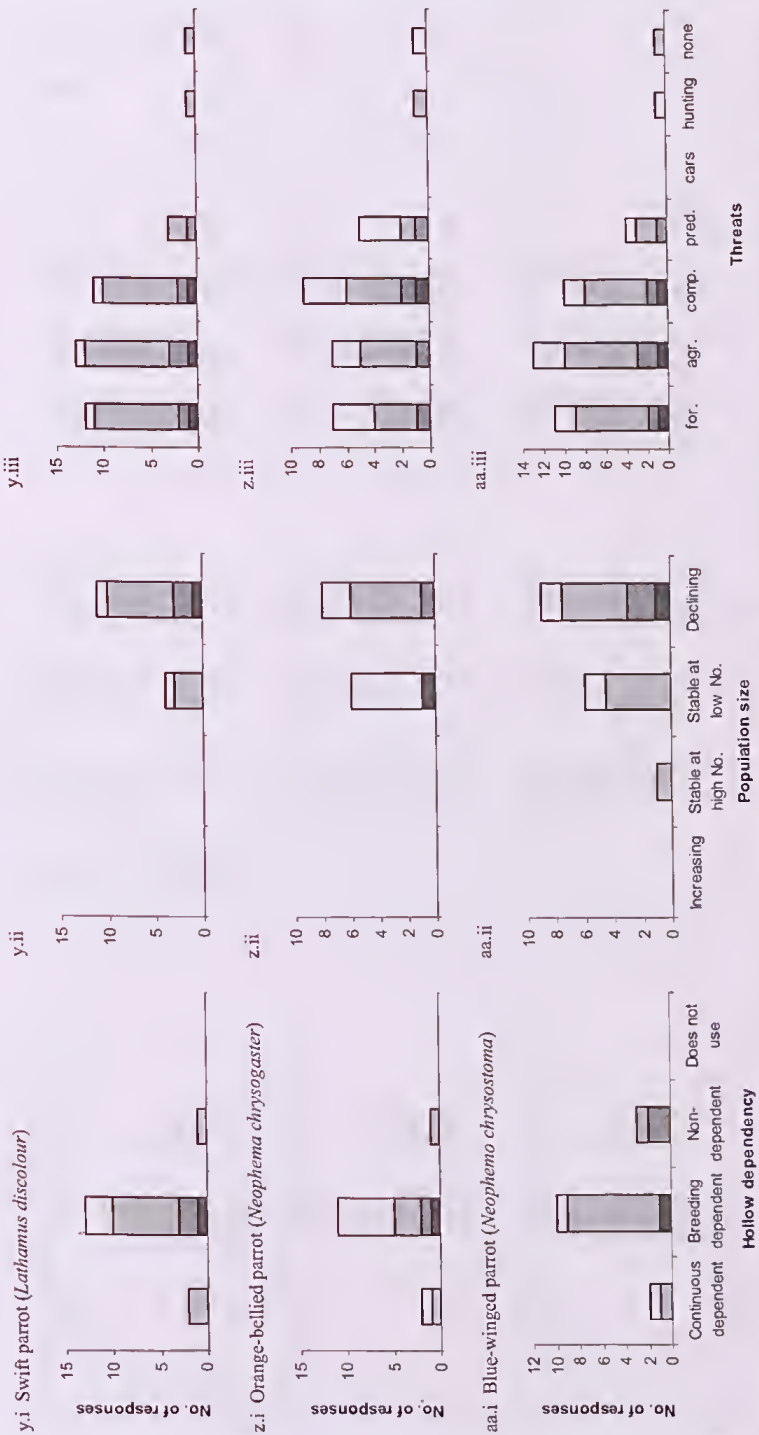


Figure 1 (y – aa). The number of responses received for each option of the survey questions. Black indicates the respondent was an expert, dark grey indicates they had high knowledge, light grey indicates they had average knowledge and white indicates they had low knowledge.

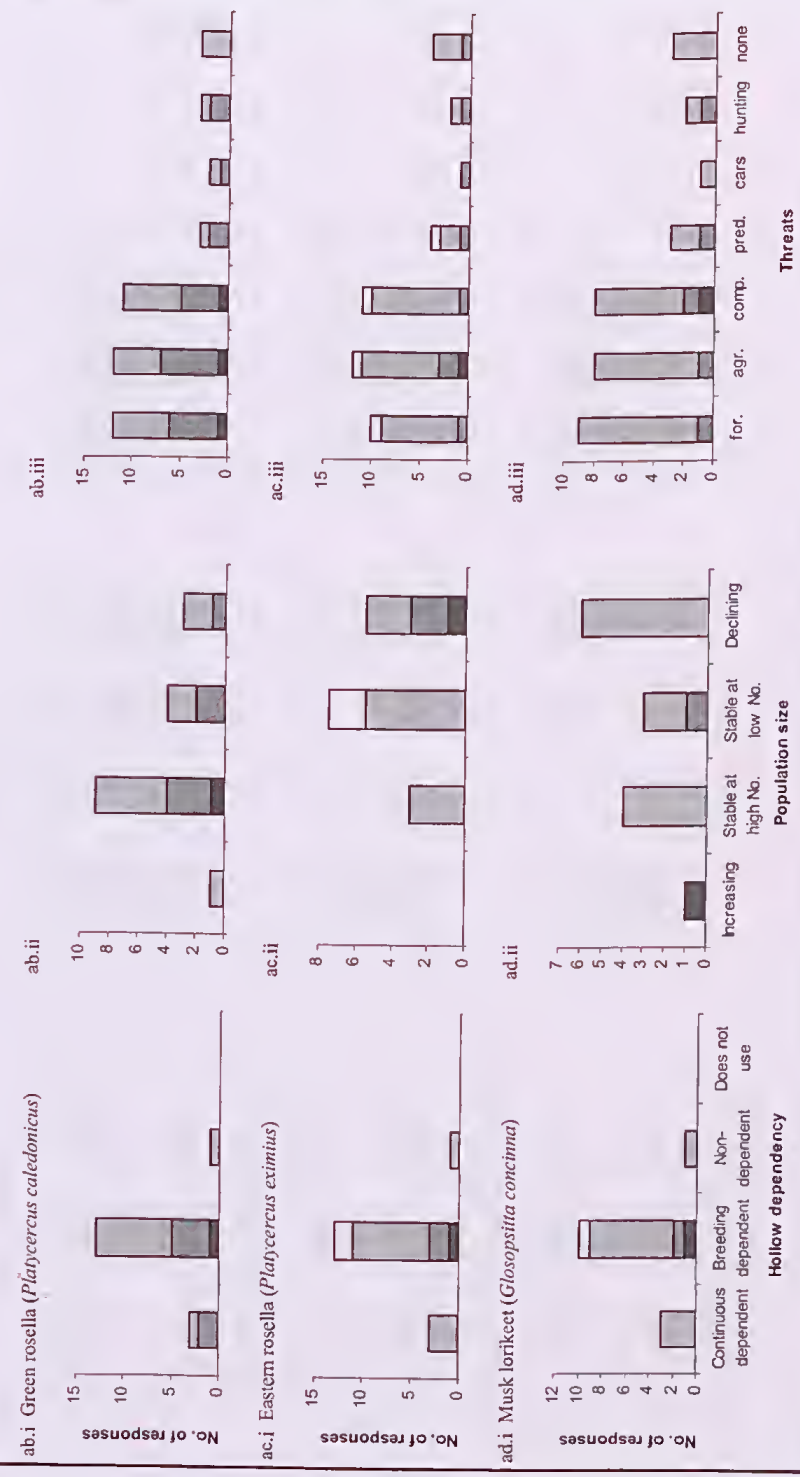


Figure 1 (ab – ad). The number of responses received for each option of the survey questions. Black indicates the respondent was an expert, dark grey indicates they had high knowledge, light grey indicates they had average knowledge and white indicates they had low knowledge.

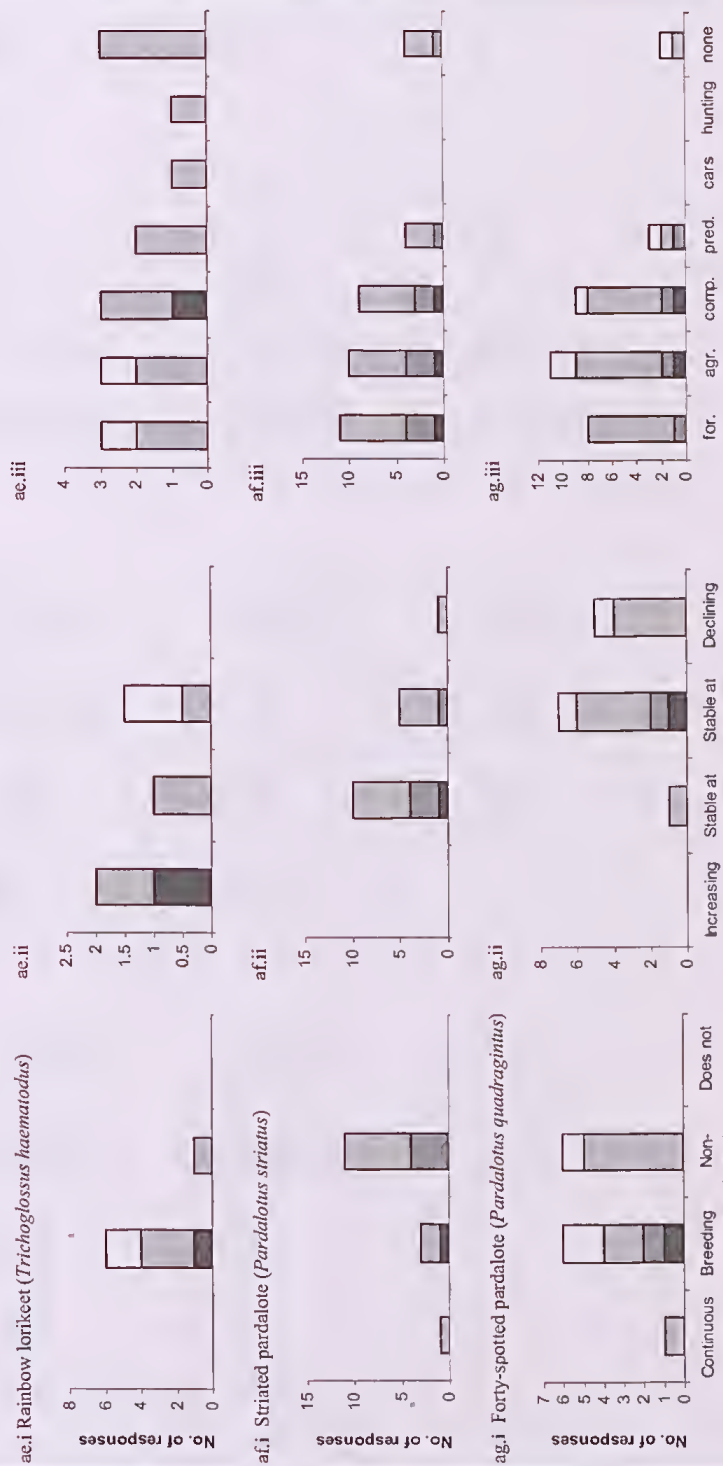


Figure 1 (ae – ag). The number of responses received for each option of the survey questions. Black indicates the respondent was an expert, dark grey indicates they had high knowledge, light grey indicates they had average knowledge and white indicates they had low knowledge.

Figure 1 (ah – aj). The number of responses received for each option of the survey questions. Black indicates the respondent was an expert, dark grey indicates they had high knowledge, light grey indicates they had average knowledge and white indicates they had low knowledge.

Figure 1 (ak-al). The number of responses received for each option of the survey questions. Black indicates the respondent was an expert, dark grey indicates they had high knowledge, light grey indicates they had average knowledge and white indicates they had low knowledge.

Table 2. Additional comments provided by the respondents.

Species name	Comment
Azure kingfisher	Nests in holes in river banks.
	Low records in Tasmania.
	This species does not use hollows in Tasmania.
Sacred kingfisher	Not a Tas. species, a rare vagrant.
Laughing kookaburra	Aggressive feral.
	A pair nested on our property. We have never seen kookaburras attack the small birds and the latter are not afraid of the kookaburras.
	Knew of 2 nests in hollows. Saw a competition with a brushtail possum where the kookaburra won. They are killed by vehicles but some people say a good thing.
Hardhead	Wind farm risk during migration, loss of wetlands and hunting.
	Numbers vary, if drought on mainland see more in Tasmania.
	A rare vagrant.
	Does it breed here in Tasmania?
Grey teal	Risk from windfarms, loss of wetlands and hunting.
	An occasional visitor in low numbers.
Chestnut teal	Risk from windfarms, loss of wetlands and hunting.
	A lot breed in Tasmania, especially when rains maintain over spring into summer.
Pacific black duck	Seems to be a survivor. Risk posed by hybridization with domestic ducks.
Australian wood duck	With Australian mainland drought cycles increasing this and other duck species may visit permanently thus displacing local pops.
	V. rare in Tas in 1910, has increased rapidly during last 20 years.
	Risk from windfarms, loss of wetlands and hunting.
	Becoming a problem for farmers, eating grass etc and fouling up pastures. Nest in trees.
Australian shelduck	Potentially at more risk from windfarms during migration also loss of wetlands and hunting.
	A recent migrant to King Island. Good numbers breed here but do not stay after New Year.
	Persecuted by ill informed persons - hunters and farmers.
Australian kestrel	This species is rare on mainland Tas (>10 pairs) and is not known to use tree hollows (i.e. uses cliff sites). Larger populations on Bass Strait Islands but all nests known from cliffs and corvid nests.
	Likely to be persecuted by ill informed persons.
Peregrine falcon	Land clearing for development.

Species name	Comment
	Human impacts greatest risk. Windfarms may pose a risk.
	Predation by 'pigeon fanciers'.
	Peregrines do not use hollows or other birds nests in Tas - cliffs only.
	Often persecuted by ill informed persons.
Southern boobook	Kookaburras, clearfelling.
	Pesticide usage is of concern for population of this species and illegal trade in bird species.
	Wood collection a problem.
	Occasionally persecuted by ill informed persons.
Masked owl	Also uses caves for breeding.
	Pesticide usage is of concern for this species and illegal trade in bird species.
	Breeds in hollows but roosts often in cliffs and vegetation.
	Occasionally persecuted by ill informed persons.
Australian owlet nightjar	Sometimes nest in fence posts.
	Environmental concern re. use of pesticides etc.
	Distribution of species confirmed in SW Tas through nest box usage.
Spotted quail thrush	Feral cats and maybe foxes are accounting for this bird.
	Nest beside tree stumps.
	Three years ago I observed a nesting female on 2 eggs. The nest was in a curled up piece of bark on the ground.
	This species rarely uses true hollows. Occasionally in the base of tree cavities.
Grey shrike thrush	One pair of grey shrike thrush nested in a manfern over summer in the backyard. The nest was a construction of shredded bark, twigs and fibre between fronds and fern and trunk.
	Over the years have found more nests in the forks of scrubby trees and rarely in hollows.
	Uses stumps for nests.
	Urbanisation increasing threat.
	Feral cat predation impacting on this species.
	Mostly uses open cavities, shelves rather than hollows.
Welcome swallow	Nest yearly under house eaves.
	They seem to have enjoyed our civilisation. Used to nest on rock faces. Now like buildings and under bridges.
	Windfarms may pose a risk during migration.
	Studied swallows in Campania area. Never found any nesting in holes. Man made

Species name	Comment
	structures benefit their nesting. Use caves and cliff shelves. Land clearing helps them on their hawk over paddock trees when insect hatching. But never seen them over forests. Occasional road kill, especially juveniles.
Tree martin	Windfarms may be becoming a risk during migration.
Yellow-tailed black cockatoo	Dependent on mature and rotting rainforest trees (esp. *Nothofagus cunninghamii*) for the fungi and grubs found in there. Often get a small flock of 5-9 feeding in *Banksia marginata*. It is against all my expectations to have ticked 'increasing' in this area. Until recent years, a flock of 10-15 would be as many as we would see. For the last 3 years have seen up to 80 in a flock. They have learnt to feed on *Pinus radiata* cones. Wood cutting removes trees with potential nesting hollows. The increase in sulphur-crested cockatoos, galahs and corellas is a concern for this species.
Gang gang cockatoo	Rarely seen in Tasmania. Land clearing for urban expansion and illegal trade in parrots and other bird species.
Sulphur-crested cockatoo	Have observed being shot/poisoned due to the damage they cause to urban gardens. Illegal poaching of young birds.
Galah	Aggressive competitor for nesting sites.
Little corella	No comments.
Long-billed corella	No comments.
Swift parrot	Window strike kill. Possible competition with the introduced bumblebee? For eucalypt nectar? Noticed a decline in numbers on Maria Island where there are no forestry activities or land clearing. Serious threat from human impacts and introduced ferals. Does not nest here. Migrants passing through (King Island report) Illegal poaching of young birds.
Orange-bellied parrot	Wind turbines are of concern for the migration of this species from Tas. to Victoria and vice versa. Recent breeding successes.
Blue-winged parrot	Ground feeder, cats, habitat loss means a one-way spiral. These were a regular sight during winter. Feeding on seeds in apple orchards in the West Tamar area. Have not been on our property for at least 20 years. Possible increasing threat from wind farms during migration. Vagrants, have been past breeding records (King Island report).

Species name	Comment
	Illegal poaching of young birds.
	Competition with starlings for nest sites, serious for years.
	High numbers but declining?
Green rosella	Often killed by motor vehicles when feed on road sides.
	Often killed as 'vermin' by orchardists and gardeners. Often killed as a result of window collision.
Eastern rosella	Population has declined in N. Tas. more abundant in SE.
	Urban expansion and related habitat destruction is of concern.
	Knew of 3 nests. All hollows in Campania area. 1 was taken over by starlings. Concerned that many are being caught in grape nets. Illegal poaching of young birds.
	Competition with starlings for nest sites.
	Occasionally killed as 'vermin' by orchardists and gardeners. Often killed as a result of window collision.
Rainbow lorikeet	Vagrant to Tasmania.
	Urban expansion and habitat destruction is of concern for this species.
	This species is probably establishing from cage escaped birds and very localised.
Musk lorikeet	Bees and starlings may be of concern, flocks appear to be reducing in winter.
	Have seen an increase in numbers in Launceston this autumn.
	Environmental degradation by human activities and feral species.
	Picked up 3 road kill this summer. Only know of nest in a hole in gum trees. In established suburbs where many mainland flowering gum trees have been planted.
	They seem to be an increasing problem in fruit trees in outer Hobart areas.
	Illegal poaching of young birds.
	Occasionally killed as 'vermin' by orchardists and gardeners, often killed as a result of window collision.
Striated pardalote	Also nests in holes in banks and sometimes in buildings and pipes. Also gravel-soil heaps.
	Over the 70 years of my interest in birds, this species has remained fairly stable. Nesting sites have changed from mostly in hollow trees to mostly in tunnels in drain banks.
	Plenty around Buckland area, have seen nests built in behind stores and on bricks in walls.
	Reduced number of hollows available in urban corridors and bush. Bees and galahs compete for nest sites and kookaburras starlings feral cats and sparrows.
Forty-spotted pardalote	Wildfire is a concern for Flinders island population.

Species name	Comment
	The forty-spotted seems to be appearing in new habitats and doing OK.
Dusky robin	Was quite common 70 years ago. Sometimes nested in the fork of a fruit tree. Never see them here now. Land use changes and environmental degradation may be pushing this bird towards a decline.
Flame robin	Was the most plentiful robin 70 years ago in this area. For many years only see the rare family passing through. Land use changes and environmental degradation in Tasmania and on the mainland seems to me to be responsible for a major decline in a formerly common bird. Windfarms sites may be a further risk during migration. See quite a few spread over wide areas. The vast area netted for orchards plus high density agriculture must reduce a lot of feeding ground.
Dusky woodswallow	These birds used to nest in fruit trees at times. Risk from windfarms during migration. Land use changes and environmental degradation could easily push this bird to decline. Observed three nests. Two in the fork of trees and one against a tree trunk partly protected by a large piece of peeling bark.
European starling	Have witnessed 'gangs' of this bird expelling a nesting pair of swift parrots from an *E. viminalis* at Deloraine and blue winged parrots at Ross (*E. pauciflora*). Estimates in area around 300 (Ulverstone). I have witnessed this species competing for nesting sites locally and harassing parrot species to leave tree hollows. Very opportunist bird. Nests in hollows, top of fence posts, in buildings. Good year for corbi grubs, seen extra large flocks of juveniles in winter flocks. Feral so no concern.
House sparrow	Urban dweller rarely seen in native forest. Pest species. Causes concerns for other species. Congregates around the human that brought it. Mostly located in disturbed environment so less of an environmental impact. Feral. Opportunist. Hollows, rose hip bushes, haystacks, buildings, holes in a bank. Difficult to say status. When the roschips (*Bria bushus)* were removed, v. few birds remained. Sparrow numbers have been increasing greatly until 2004 since then numbers in flocks seem reduced greatly.

DEVILS OF THE ALPINE PROJECT: FIELD MONITORING PROGRAM

Chris Coupland & Wade Anthony

Devils at Cradle – Tasmanian Devil Sanctuary, 3950 Cradle Mountain Road, Cradle Mountain, Tasmania 7306. Email: devilsatcradle@bigpond.com.

INTRODUCTION

Devil Facial Tumour Disease (DFTD) is a debilitating and fatal cancer that affects Tasmanian devils across 59% of the land mass of Tasmania and has caused the death of about 50% of devil individuals in affected areas (DPIW 2007). The disease is characterised by the development of ulcerated tumours around the jaws and head of individual devils. As the tumour grows affected devils become weakened and can become so debilitated that they starve to death within a period of months.

One theory suggests that DFTD started from a chance mutation in one individual ("the rotten apple") in the far northeast of the State in Mount William National Park. The first reported case of DFTD was witnessed by Christo Baars, a wildlife photographer working in the area in 1996. The tumours are believed to be directly transmissible between two individuals through an "allograft" or transplant of tumour cells during challenging or mating behaviour (DPIW 2007; Pearse & Swift 2006). The successful allograft may rely on a lack of genetic diversity in the devil population (Siddle *et al.* 2007). The very low heterozygosity or genetic variability among individuals within populations and variability among populations (http://ec.europa.eu/research/biosociety/library/glossarylist.en.cfm 2007) may be the result of "genetic bottlenecking" or an "island effect".

DFTD can affect all age classes of devils, however, mature age animals show the more serious gross facial and mouth tumours: these age classes having greater opportunity to have face-to-face interactions. As the age structure of affected populations change, younger devils are now showing the disease. The disease has been observed in juvenile devils, younger than two years (DPIW 2007).

Currently DFTD is not found in the western third of the State (Hawkins *et al.* 2006) and Narawntapu (formally Asbestos Ranges) National Park on the central north coast (DPIW 2007). It is believed that these areas are naturally isolated from the spread of disease because of natural vegetation, habitat and topographical boundaries preventing interaction and the spread of disease into these regions. This is further supported by recent evidence from Menna Jones (as cited in Hawkins *et al.* 2006) that the western population is a separate gene pool. The western population may also be free of DFTD due to its very low natural density, which may not facilitate the spread of the disease.

DFTD was first observed in the Cradle Mountain area in November 2004 (W. Anthony pers. comm.). Prior to January 2006, only two individuals with the condition had been

documented by Parks and Wildlife field staff at Cradle Mountain (both observed by W. Anthony). Prior to the commencement of this study, it was postulated that the population in the Cradle region may have declined by 20-30% (N. Mooney pers. comm.). To the west and north of Cradle Mountain lie boundaries of less preferred wet/rain forest. It is believed that the decrease in gene flow may provide enough genetic differentiation to limit the spread of DFTD (Hawkins *et al.* 2006).

The purpose of the *Devils of the Alpine - Field Monitoring Program (DOA-FMP)* study is to monitor the Tasmanian devil population in the Cradle Valley area and to provide a long-term surveillance tool to assess the impact of the arrival of DFTD into this population. The field techniques used are similar to those applied to other carnivore monitoring projects in remote areas of the world.

SIMILAR PROJECTS

Remote sensing cameras have been used throughout the world as a valuable tool in wildlife research and game management. Several long term projects including snow leopards, wolverines, tigers and polar bears utilise similar technology as the DOA-FMP. The equipment is relatively cheap, durable and accurate and is well suited for remote and/or alpine applications.

Remote sensing cameras are an unobtrusive mechanism that can be used to monitor elusive species such as devils. In other studies, the cameras have been used in conjunction with a trapping regime that can make devils either potentially trap shy or increase their confidence. This has potential in giving a pronounced bias to the results over a long term.

By using solely camera traps in the *DOA-FMP*, the devils very quickly become conditioned to their presence providing an accurate picture of the health and dynamics of the Cradle Mountain population.

Whilst similar surveys have been conducted at Cradle Mountain in the past, this continuous long term program is unique in that it will allow daily, ongoing and long-term monitoring supporting the possible release of captive bred animals into the wild.

DPIW and the University of Tasmania have also undertaken various spasmodic devil research programs in the Cradle Mountain Area since Menna Jones' studies in the 1990s.

DEVILS OF THE ALPINE PROJECT

Devils@Cradle, a locally owned devil sanctuary is conducting a devil research and conservation project called 'Devils of the Alpine' (DOA). With the assistance of the Cradle Mountain Parks and Wildlife Service (PWS) and Wildlife Management Branch – Devil Facial Tumour Disease Project team (of the Department of Primary Industries & Water), the field monitoring program (FMP) aims to provide a greater understanding of the current and long term population dynamics and DFTD emergence within the Cradle Mountain area.

The short term objective is to increase the number of field monitoring cameras through sponsorship, grants and donations so that we can continue to expand the scope of the study area. The scope of the study area is intended to cover from Daisy Dell through to the Black Bluff Range including the Vale of Belvoir and Reynolds Falls Conservation Areas, the commercial area of the Cradle Valley and into the Cradle Mountain National Park (approximately 75 square kilometres). We aim to present the results of the DOA-FMP results as a quarterly update on the Devils@Cradle website.

The long term objective of our program is to use the data to inform any decision regarding release of captive bred animals into suitable wild locations. Such areas will be selected on the basis of the presence of DFTD risk in the surrounding wild devil population. Released animals could be monitored through radio tracking devices and assist in the breeding diversity of low density areas in the wild.

METHODS

The Field Monitoring Program (FMP) was conducted using remote sensing, passive infra-red digital cameras. The cameras currently used are Camtrakker™ manufactured in the United States for wildlife and game monitoring purposes and are available online from www.camtrakker.com.

The camera traps were erected strategically in the study area in a zone located by observing and following the natural paths (game trails) that devils have created over many generations. These paths generally converge as the home ranges overlap and are marked by a common latrine site. A slightly open area was selected to try and limit the number of "false records" or digital images taken of moving leaves, branches, etc. A GPS reading was taken to identify the location of the camera trap.

The cameras were mounted on a 900 mm treated pine post driven 300 mm into the ground and fixed to the post using industrial rubber "bungy cords" or "ocky straps". A 600 mm square marine ply "roof" was screwed to the top of each post, providing some protection from rain and frost to the lens window (Figure 1).

To act as an attractant, "bait boxes" (Figure 1) were constructed from 500 mm lengths of 100 mm PVC plumbing pipe enclosed at both ends. A separate screw cap was used at one end and drilled through with air holes to allow the scent to escape. The bait boxes were filled with wallaby offal and dug into the ground leaving only the top exposed. These were positioned 3 m from the camera to record with the best clarity and detail a digital image of devils visiting the camera traps.

A "drag" was conducted with a carcass to scent the game trails in the general vicinity of the camera traps.

Cameras were armed using the "arming" mode on the device that separates the sensor from the camera to any movement at ground level over the bait box; this was determined using the red light installed into the unit. Cameras were set (as per the instructions) using

slide switches mounted within the protective casing of the unit to function only at night and to the most sensitive frequency of operation of one shot every 30 seconds when triggered by movement.

Figure 1. Setting camera trap 1 – Devils@Cradle 2007.
Inset 1 – Camtrakker Digital 6.0 Unit. Inset 2 – Photo taken 21st July 2006 – Devils@Cradle.

Camera traps were checked periodically during which time the memory card was changed and reset. The digital images logged in sequential order on the memory card were checked back at the Devils@Cradle facility where the images were documented and relevant information added to the data set.

During the program cameras were moved frequently between permanently set stations throughout the study area to avoid developing dependence and bias to the results by the local population on the free feeding.

A data base of all animals observed has been kept in both hard copy through a proforma (Figure 2) and electronically (JPEG format). Each individual once identified was given a number e.g. 06-001 (06 determines the year in which the animal was first identified and 001 the individual's identification code). Each digital image was stored in computer files

according to identity codes for easy access. Within each file each digital image was stored in order of date and time, providing a record of activity. The digital images were examined for signs of facial lesions suggestive of or typical of DFTD.

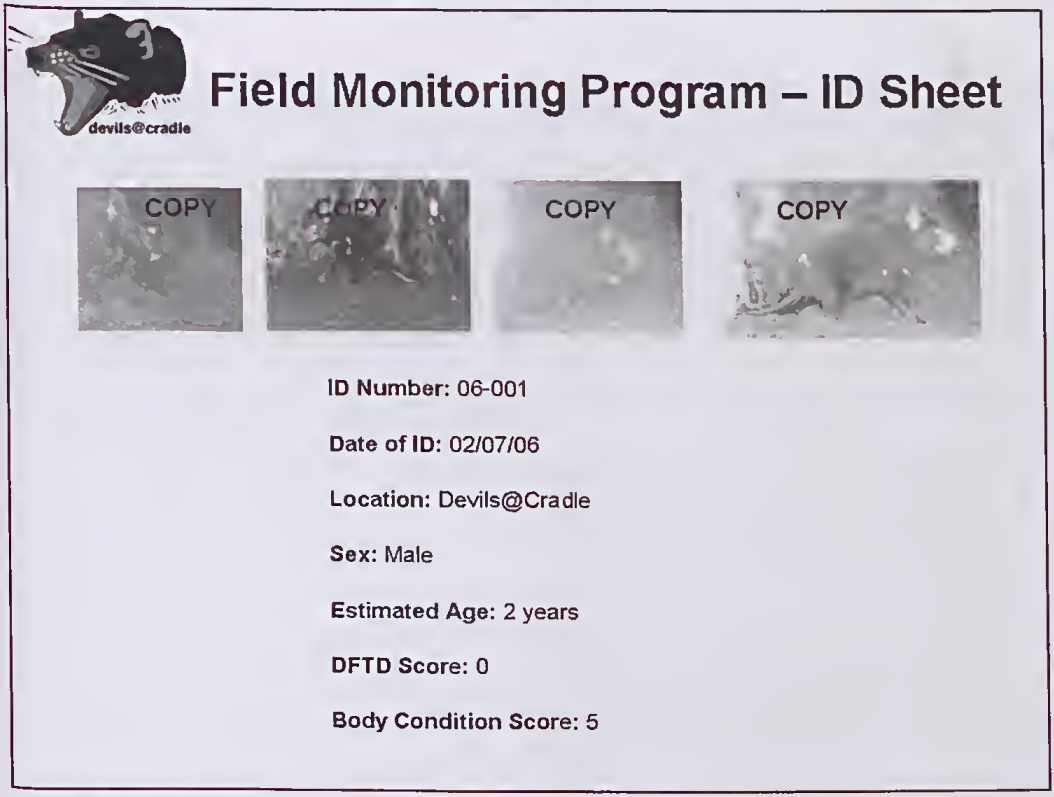


Figure 2. An example of a Completed Identification Proforma. Devils@Cradle 2006.

The documentation for the program occurred in several ways. Data gathered in the study area was formatted and recorded within a spreadsheet data base.

Accumulated totals were produced, displayed and used for interpretation at the Devils@Cradle facility. These accumulative totals for devils, spotted-tailed quolls and eastern quolls are also displayed on the Devils@Cradle website (ww.devilsatcradle.com/devilsofthealpine.htm) and updated quarterly for public viewing. The formatted results are also forwarded onto the DPIW – DFTD Project Team for assessment and feedback.

SCOPE OF THE STUDY AREA

Tasmanian devils are a gregarious species and have already been attracted to the Devils@Cradle facility stimulated by the vocalising of the captive population. It was believed the *"Cradle View"* property offered an excellent opportunity for undertaking this

type of study as it lies near the interface between the eastern and western devil populations. Permission has been gained to utilise a large area of land both Private and Crown for the purpose of this study. Access to the surrounding Conservation areas of the Cradle Mountain National Park, Vale of Belvoir Conservation area and Reynolds Falls Recreation area has been approved by the PWS (Figure 3).

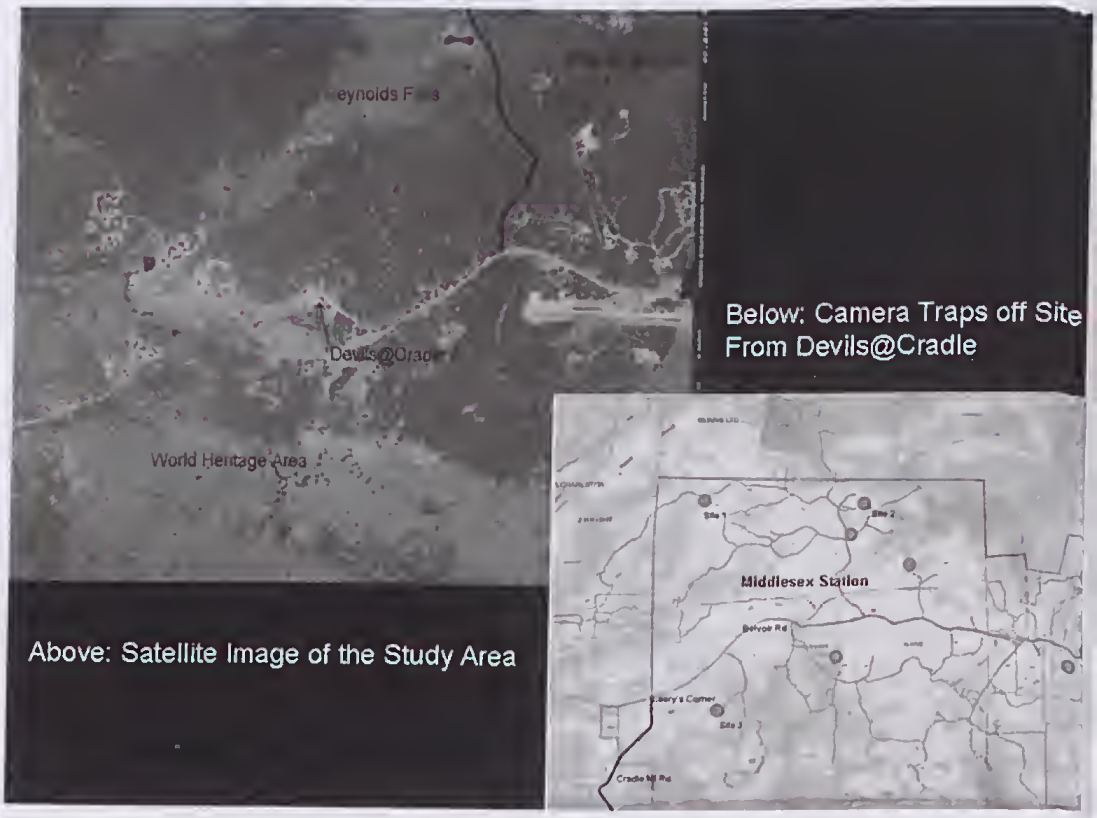


Figure 3. Satellite image of general area surrounding Devils@Cradle and various trap sites on private land on Belvoir Road.

While this report is confined to the immediate area of Cradle Mountain, the scope for this study is quite extensive. This surveillance area will allow for a comprehensive study into current numbers, their movements, habits, range, life spans and the presence of DFTD in the Cradle Mountain region.

RESULTS

Table 1 shows the accumulative results for the first 12 months of the *Devils of the Alpine – Field Monitoring Program (DOA-FMP)*. Results shown are from the 1st July 2006 to the 1st July 2007, with the time period broken into 3-month intervals. By the end of June

2007, a possible 77 individual devils had been identified within the study area; based on distinctive characteristic features, age, body size and coat colouration. There were 35 males, 34 females and 8 juveniles; the juveniles could not be confidently sexed as the sexual dimorphism was not predominant enough to be identified through the photographic method. Over the 12 month period 1758 individual photographs were taken of devils, 4 individuals showed visible facial lesions consistent with DFTD; an occurrence of 6.5% of the observed population. A previously unobserved DFTD positive animal was subsequently killed by a vehicle (Figure 4) on Belvoir Road which transects the Middlesex Station. This animal was identified as 06-028 (Figure 4).

Table 1. Summarised accumulative results for the DOA-FMP.

Devil	**# Indiv**	**# DFTD**	**% DFTD positive**	**M**	**F**	**J**	**# cameras**	**# images**	**Notes**
Jul 06 - Oct 06	26	3	11.5	16	10	0	2	696	
Nov 06 - Jan 07	38	4	10.5	18	14	8	2	1243	1 DFTD road kill
Jan07 - Mar 07	59	4	6.8	27	26	14	4	1606	
Mar 07 - May 07	67	4	6.0	30	30	7	4	1667	
May 06 - Jul 07	77	4	5.2	35	34	8	4	1758	
S-t quoll	**# Indiv**			**M**	**F**	**J**	**# cameras**	**# images**	**Notes**
Jul 06 - Oct 06	1			1	0	0	2	14	
Nov 06 - Jan 07	2			1	1	0	2	24	
Jan07 - Mar 07	5			3	2	0	4	128	
Mar 07 - May 07	6			3	2	1	4	140	1 road kill juvenile
May 06 - Jul 07	7			4	2	1	4	243	
Eastern quoll	**# Indiv**			**M**	**F**	**J**	**# cameras**	**# images**	**Notes**
Jul 06 - Oct 06	?						2	92	
Nov 06 - Jan 07	?						2	101	
Jan07 - Mar 07	?						4	101	
Mar 07 - May 07	c. 10						4	103	
May 06 - Jul 07	c. 10						4	104	

The *DOA-FMP* also produced a substantial data set on the presence of spotted-tailed quoll (*Dasyurus maculatus*) in the study area. By July 1st 2007, 7 individual quolls had been identified within the study area (4 males, 2 females and 1 juvenile) with 243 images taken of the 7 individuals. One individual juvenile was killed by a vehicle also on Cradle Mountain Road within the study area.

Figure 4. Adult Tasmanian devil with a large DFTD lesion killed by vehicle within study area January 07. Devils@Cradle 2007.

Approximately 10 eastern quolls (*Dasyurus viverrinus*) individuals are shown in Table 1. Due to the difficulties in identification, the number of individual eastern quolls in the study area was not accurately determined as for the other large dasyurids. One hundred and four photographs were taken within the 12 month study period: neither the spotted-tailed quolls nor eastern quolls within this study showed any signs of DFTD lesions.

Table 1 shows the number of digital images taken and number of individual devil's identified throughout the study period. The rate of identification of new individuals throughout the study period was most rapid at the start of the study and declined over the second 6 months.

Despite the increase in the number of individual devils identified in the study area, the number observed with DFTD facial lesions did not increase (Figure 5). As a proportion of the devil population attracted to the camera traps, the number of DFTD-affected devils – as assessed by camera images – actually decreased over the 12-month period (Figure 5). Individual devils 06-17, 06-18 and 06-22 (Figure 6) were positively identified on numerous occasions throughout the study period until January 2007. Devil 06-17 was first

identified at 1.00 am on the 3rd August 06 and was last seen at 12:12 am on the 1st of September. Individual 06-18 (Figures 6 and 9) was first observed 13th August 2006 at 1:03 am and last observed 18th November 2006 at 11:40 pm. Individual 06-22 was observed on the 30th August 2006 at 10:26 am for the first time and was last observed 13th November 2006. After January 2007, with the observation of the road kill devil identified through the *DOA-FMP* study (06-028), no new DFTD-affected individuals were recorded within the study area.

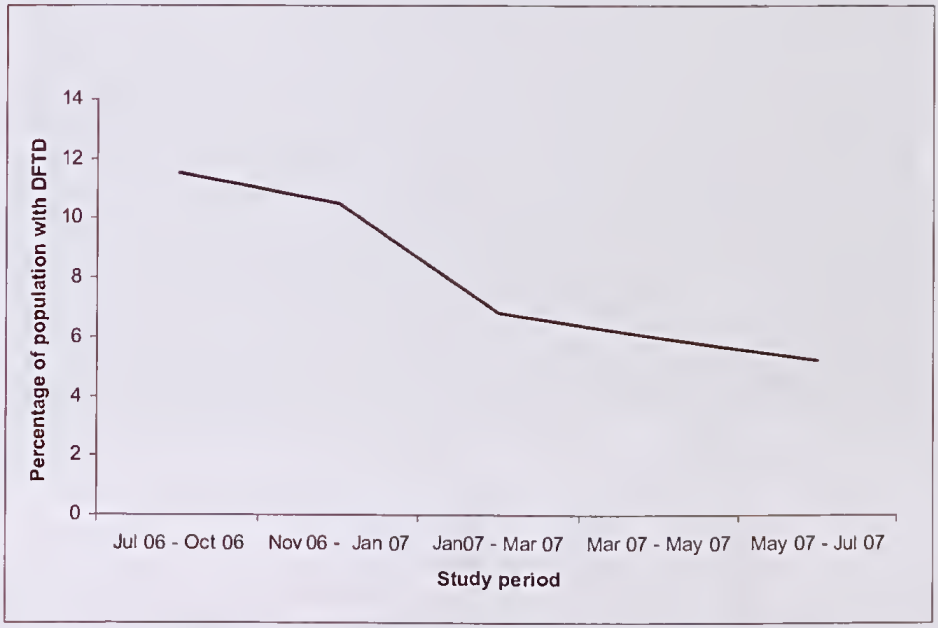


Figure 5. Occurrence of DFTD within the observed population.

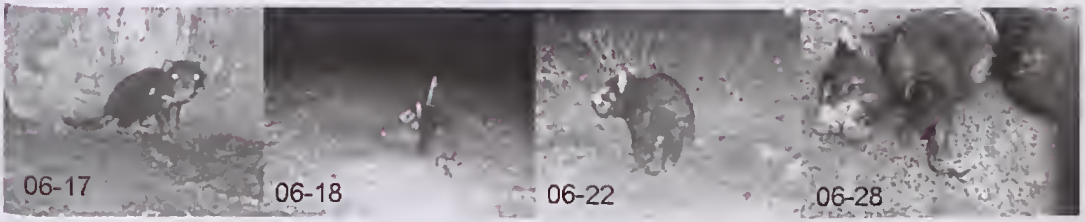


Figure 6. The four individuals recorded by the DOA-FMP with DFTD.

Of the 1758 digital images taken of 77 individual devils; Figure 7 shows the only recorded contact between two devils (06-22 is identified as the individual on the right).

Figure 7. Only digital image showing close contact between devils: the devil on the right is 06-22, the last individual identified in the study area with DFTD facial lesions [17/10/2006 at 2:54 am].

Figure 8 represents the recorded number of males, females and juvenile devils within the study period. No juveniles were observed in the first study interval. An overall sex ratio of 1.03 males for every female was calculated. Figure 8 also shows the ratio of male, female and juvenile spotted-tailed quoll identified in the study area. There were twice the numbers of male quolls identified within the study area as females.

Figure 9 shows devil 06-18 and the progression of DFTD in that individual. One hundred and ninety six digital images have been taken of individual 06-18 on three separate occasions (13th August, 14th August, and 18th November 2006); a male estimated to be 4 years of age. When first observed in August this animal appeared to have a large ulcerated tumour developing on right side of his face (the image alone was not sufficient to definitively diagnose DFTD). When this devil was photographed again on the 18th November 2006 the tumour appeared to have expanded from the cheek and whisker beds of the right hand side of the face across to involve the left and the neck; a massive increase in the observed development of the tumour in 3 months. No further images of 06-18 were taken after 18th November 2006.

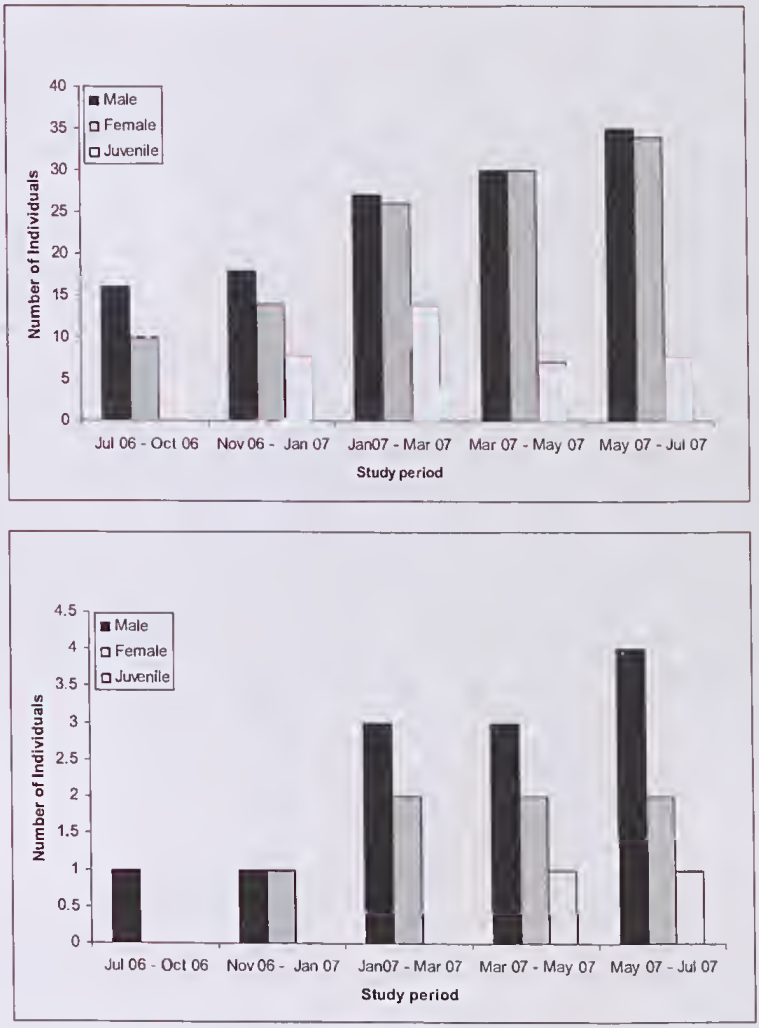


Figure 8. Sex ratio of Tasmanian devils (top) identified within the Cradle Mountain region and the sex ratio of spotted-tailed quolls (bottom) in the Cradle Mountain population.

DISCUSSION

The Department of Primary Industry and Water records indicate that in excess of 2000 devils were trapped from 1964 to 1995 and there is no record of DFTD-like lesions in any animal in that time frame (DPIW 2007). Both of these findings suggest that DFTD has only recently emerged within the Tasmanian devil population. There is currently no recorded evidence of immunity or resistance known to the disease in any of the study sites where the disease is present (Hawkins *et al.* 2006).

Figure 9. Progression of DFTD in devil 06-18.

In 1990 Menna Jones as cited in Hawkins *et al.* (2006) trapped and examined 126 individual devils within the Cradle Mountain area and found no record of DFTD. Furthermore, *The Cradle Mountain Lodge*™ and other commercial operations have been conducting spotlighting tours and wildlife based tours for approximately ten years. Despite the considerable publicity surrounding DFTD, the first case was only observed in the Cradle Mountain area in November 2004 (W. Anthony pers. comm.).

Popular public opinion suggests that DFTD is caused or facilitated by the use of certain chemicals and human induced land management. DFTD appears to be a transmissible disease with diseased devils detected in national parks, the World Heritage Area, agricultural and forestry areas. The known disease-free areas currently appear in the western areas of the State (Hawkins *et al.* 2006).

West of Cradle Mountain, the environment changes rapidly to different ecosystems. Large stretches of wet/rain forest are present, which is the least preferred habitat of the species. It was hoped that this rapid change in habitat type from east to west may prevent gene flow and interaction between eastern and western devils. This is supported by results from

a number of studies cited in Hawkins *et al.* (2006) that there are two distinct genetic groups and if transmission occurs through physical contact this differentiation may act to slow the transmission or make the western population genetically immune to the disease (Hawkins *et al.* 2006).

It is believed by DPIW that DFTD has now been identified 25 km west of Cradle Mountain and its detection in the *DOA-FMP* study site in the Pencil Pine region (W. Anthony pers. comm.) indicates its emergence in a lower density devil population (Figure 10).

Figure 10. Tasmanian devil density prior to Devil Facial Tumour Disease – (DPIW 2005).

Results presented in the current paper support some of those presented in Hawkins *et al.* (2006). DPIW devil field research suggests that DFTD lesions are usually observable in individual devils within six months of the disease being first detected within a population (Hawkins *et al.* 2006). Hamade (2004, cited in Hawkins *et al.* (2006)) postulates "Where tumour growth varies little between individuals if there is a peak in transmission. This could occur if biting is the key transmission route, since it is more common in the mating season. All animals infected the previous year might have died by June, with newly infected animal's not yet manifesting signs".

The *DOA-FMP* has attempted to identify all devils resident in the study area. The apparent absence of any increase in the number of DFTD-affected individuals after the first DFTD affected devil was recorded in the area (November 2004) is particularly

noteworthy. The low number of DFTD affected devils seen in the study site in a 12 month period may indicate a change in the resident devils' capacity to resist this tumour establishing in the Cradle Mountain area. Another explanation for the low number of observed DFTD-affected devils in this population, somewhat borne out by this devil dataset, may be attributed to reduced devil-to-devil contact. Most of our results support those made by Hamede 2004 (as cited in Hawkins *et al.* 2006) that the greatest rate of disease attrition will be by June, our results show that the lowest recorded rate of DFTD observation was in June 2007. Devil 06-18 contradicts other findings in the study (Figure 10; this animal was first observed with DFTD lesions in August and was later observed in November 2006 with obvious progression and expansion of the tumour. With no further observations of this individual, it is likely the animal died well before June 2007. An average rate of decline identified in the DPIW studies as a result of DFTD is 50%. (DPIW 2007; Hawkins *et al.* 2006).

Cradle Mountain was an area where DFTD was late to emerge (Hawkins *et al.* 2006); the first observation of DFTD in the area was made in late 2004 (W. Anthony pers. comm.; Hawkins *et al.* 2006). This study observed a maximum occurrence of obviously affected devils of 13.1%; considerably lower than the 20-30% rate expected. Devils@Cradle plans to continue the *DOA-FMP* long term. Although there are limitations on the ability of camera images to detect all animals with facial tumours, if the current trends reported in this paper continue, then it may be the first indication of some genetic resistance within a local devil population.

It is currently unclear whether the transmission of DFTD is density-dependent. Disease reports are confined to populations considered higher density. In the north-east where the disease is active local devil populations have declined by 75-80% the recorded occurrence of DFTD remains high (Hawkins *et al.* 2006), much greater than the recorded occurrence in the Cradle Mountain region. The Cradle Mountain population appears, from our study (figure 10) to be a medium-density population, which may explain the lower than expected occurrence of DFTD-affected animals.

Hawkins *et al.* (2006) suggests that even a casual observer at a distance of 20 m would be able to detect more than a third of the cases (of DFTD) that a trained researcher would "visually diagnose".

The Camtrakker system provides high resolution images sufficient for the diagnosis of DFTD. Two of the cases of DFTD determined by this study were sent to the DPIW for confirmation. The Camtrakker units are designed for larger mammals such as deer. The passive infra red sensor is designed to detect body heat in motion. Initially we had to experiment with the positioning, height of the camera above the ground to increase sensitivity of the sensor. Despite these adjustments on occasions the cameras were observed not to fire despite and animal in the correct range. Consequently the images obtained may not reflect the full extent of dasyurid activity at the camera trap sites.

One battery unit malfunctioned, and failed to reach and maintain full charge for a period during the study. The result of this malfunction was that the unit still functioned but was far less sensitive than a working unit; a new battery was sent from the US. Having this camera partially inactive may have affected image resolution and interpretation during the period of January to March 2007.

Despite been unobtrusive passive infra-red cameras, there is some evidence that the animals became increasingly trap shy. One expects in all studies to have a greatest rate of detection and identification at the beginning of the study. With eastern quolls we ceased obtaining images quite early in the period of the study. We chose not to utilise carrion frequently as part of this study in order to minimise the development of dependence, risk of spread of DFTD through the devil population at a greater rate than natural, thus biasing the study and putting the population in the region at risk. By simply using a bait box as an attractant it appears that the eastern quolls "learned" that there is little gain to be had and move on quickly. Through the second year of study we will look at using carcasses more frequently, on a random basis to maintain animal activity around the bait stations.

To date there is no evidence of population recovery at any DFTD-affected location and reports of DFTD now cover more than half the extent of the occurrence of the devil's known range. Field studies across the state suggest the disease is spreading westwards and southwards (Hawkins *et al.* 2006).

The *Devils of the Alpine – Field Monitoring Program* has only been in operation for 12 months and provides a baseline for the current population. The program will be in a unique position to monitor the impact of DFTD on the devils in the Cradle Mountain region. If the current trends continue then the *DOA-FMP* will be able to record any differences in the response of a devil population in a region close to the interface between eastern and western devils cohorts. Hopefully the *DOA-FMP* will be in a position to detect any evidence of innate resistance to DFTD present in the population.

As we prepared this paper we collected another 3 months worth of data and have still not observed another DFTD positive animal. If there is a reduction in density of devils within the Cradle Mountain region, it will be important to keep track of the prevalence of introduced predators. Anecdotally (W. Anthony pers. comm.) the presence of feral cats (*Felis catus*) is on the increase within both the private land and areas protected for biodiversity conservation areas (W. Anthony, pers. comm.). Parks and Wildlife is also trying to counteract the presence of at least one dog pack within the general Cradle Mountain /Walls of Jerusalem Area (W. Anthony pers. comm.; *The Advocate*, 16th August 2006, page 3). The presence of the *Devils of the Alpine* passive infra-red camera systems has not yet detected any indication of either introduced species within the study area.

The red fox (*Vulpes vulpes*) is a massive threat to the fauna of Tasmania. Currently there is a co-ordinated effort to eradicate the individuals that are thought to be free living within the State (DPIW 2007). The DPIW has hard evidence to indicate the presence of a small

number of red fox within the State (DPIW 2007). As devils decline one would expect such oppurtunistie species such as fox to expand their range and potentially move into a number of areas that are less densely populated. The *DOA-FMP* has not detected any fox activity within the study area.

Quolls and devils have overlapping ranges. Spotted-tailed quolls are far more territorial than devils and therefore one would expect less overlap of their ranges and therefore fewer individuals identified within the study area. Currently we have identified 7 spotted-tail quoll individuals and approximately 10 eastern quoll individuals within the study area.

No sign of lesions on individuals of either species of quoll have been observed. The current research (reviewed in Hawkins *et al.* 2006) suggests that the actual disease source of DFTD is the tumour cell. Live cells are transferred from an affected devil to another through biting. This has been termed an 'allograft' infection (i.e. a graft between two individuals who are of the same species but have genetic differences www.choa.org/default.aspx 2007), however, it is now apparent that the close genetic relationship between all eastern devils is allowing these tumour cells to be acting more like homografts (i.e. a graft from an genetically identical animal) (Siddle *et al.* 2007). It is unlikely due to the genetic differentiation between the *Sarcophilus* genus, which contains the only the devil and the *Dasyurus* genus, which contains both species of quolls that tumour cells of DFTD will act as a xenograft (i.e. tissues or cells that can successfully transfer from one species to another species (www.convatec.com/en_AU/tips/dictionary/wound_care.htm 2007).

Currently we have noted the presence of what appears to be a healthy population of spotted-tailed quolls and as the study period continued we have identified more individuals. It is unusual that we have identified far more males than females, but it may indicate that we are on the edge of at least four animal's territories. Eastern quolls on the other hand have reduced in the frequency over the observation period. Currently we believe this is due to trap shyness or an indicator of their natural range or congregations in suitable habitat rather than a decline in population. From Wade Anthony's personal experience living and working in the Cradle Mountain region for the last six years, eastern quolls are not generally observed in the winter months and the frequency of observation increases over the summer months. There is currently no concern for the eastern quoll population in the region. An observable increase in spotted-tailed quoll numbers may indicate a decline in devils. If devils do decline it appears from anecdotal evidence that there may be an increase in quoll numbers as they either expand their range or increase in numbers to fill the vacant niche. It is currently arguable, within the observed devil population, a true decline has not been observed. We may have observed the normal dynamics, seasonality and rates of attrition that is natural for the area and species.

ACKNOWLEDGEMENTS

The authors would like to thank the ongoing support of the Parks and Wildlife Service – Cradle Mountain, the Cradle Mountain Tourism Association, Inc. and the DPIW –

Wildlife Management Branch; the numerous and generous public donations received that financially support the Devils of the Alpine – Field Monitoring Program; the staff at Devils@Cradle Tasmanian devil sanctuary for their support and commitment; John Wright for permission to incorporate his private property into the study area; and Dr David Obendorf for his advice, helpful suggestions and his valuable time taken to review this study.

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BOOK REVIEWS

Tasmania: A Natural History *by William E. Davis Jr., Surrey Beatty & Sons, 2007, paperback, 269 pages.*

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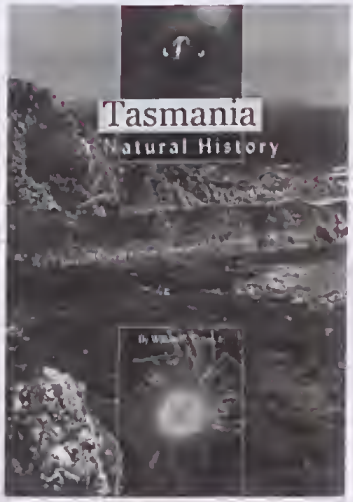


A title like this had me drooling in anticipation of getting my hands on a copy as soon as it was published. At this point in the piece, the standard comment would be 'and I was not disappointed when it arrived'. But the sad thing is that I was – a little, at least. I've been trying to put my finger on exactly why, and think it boils down to one key point: presentation. These days, readers are used to being able to dip into a book of this sort. One expects to be able to use chapter headings and sub-headings to make instant sense of the book's structure, helping one to decide whether to delve into the detail presented in tables and text-boxes or to go for a more superficial impression from browsing high-quality graphics with informative captions.

By contrast, this book reminds me of something I might have read in the 1970s or earlier. The text is dense and unbroken. The photos are sparse and mostly monochrome. They are very poorly reproduced (they look like they started life as embedded graphics in a Word document) and are not well integrated with the text. Their captions are minimalistic. There are no other figures, no tables, no text boxes.

While the chapter headings give little clue as to what lies within, the bulk of this book is a traditional treatise on natural history set out along taxonomic lines – a style largely abandoned by other authors and publishers in recent years in favour of more contemporary habitat-, ecosystem- or ecological process-based approaches. After some scene-setting chapters on the geologic (*sic*) history, climate and arrival of humans, there are separate chapters devoted to the inhabitants of Tasmania's land-base, describing in sequence vegetation, invertebrates, mammals, birds and 'other vertebrates'. A chapter on marine natural history follows, similarly arranged taxonomically. The final chapter is perhaps the one that visitors to the State will appreciate most: a regional guide to some of the best places for experiencing Tasmanian natural history.

As a taster of what to expect from this book, here's the opening sentence to Chapter 1. 'The largely non-biological (abiotic) processes that have shaped the geological and climatic history of Tasmania over the past billion years or so have provided constraints

within which natural selection has worked to shape Tasmania's current flora and fauna (biota).' All true, but a bit, well, uninviting. Not even my word processor liked the sentence construction as I retyped it; it underlined it in green. I don't believe that Surrey Beatty has served Tasmanian naturalists well by apparently taking a 'hands-off' approach to preparing this book for publication.

Despite my disappointment with the presentation of this book, there's no doubting the quality of the material contained within. Almost every paragraph is packed full of information, and the author is clearly very much in tune with Tasmania's nature and with the way naturalists experience it. Almost everything I read struck a chord with me: it was all stuff I either knew or was pleased to learn afresh. The list of local naturalists that the author acknowledges for support along the way is long and venerable; many are members of the Tasmanian Field Naturalists Club and will be reading this review.

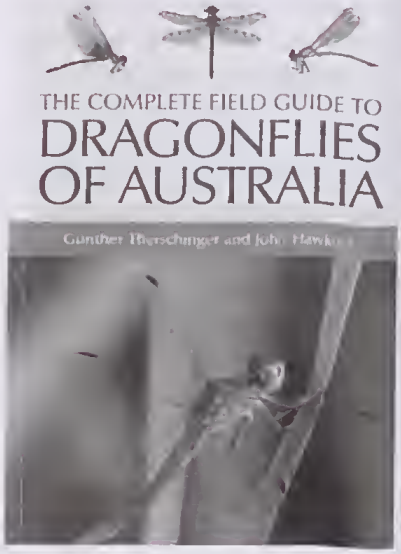
There's one other reason for my disappointment, which may come across as a bit churlish, even xenophobic; but I'll say it anyway. I'm disappointed that the market existed for this book in the first place. The publishers boldly state that 'this is the first book on the general natural history of Tasmania in nearly a century'. Whatever the veracity of this statement, it strikes me as odd that a book with this title hasn't been produced by a home-grown Tasmanian naturalist. William Davis Jr. is a Professor Emeritus at Boston University in the United States, and his book is based on his eight visits to Tasmania since 1990. His overseas perspective may well add something to the book. After all, many of us take our own backyard for granted and sometimes need non-locals to remind us of the wonders that Tasmania has to offer. But his style can also irritate. Do we really need to be told in a book on Tasmanian natural history that, 'for foreign visitors be aware that as in Great Britain, cars drive on the left hand side of the road'? And should a 21st century book on Tasmanian natural history perpetuate the use of feet and inches as the preferred unit of measurement?

The often pedantic nature of naturalists (or at least of me) means some niggling over spelling errors is only to be expected in a book review such as this. So I can report that, while Karen Richards may be happy to get an acknowledgement for her contribution, she may be less so to be referred to as 'Karren'. I also noticed that the marine mollusc *Pleuroploca* was renamed *Leuroploca*. Again, allowing these and others like it to slip through does little credit to the publishers.

As the first sentence of the book's preface says, 'Tasmania is a truly remarkable place for those interested in natural history'. Unfortunately, my feeling is that only Tasmanians (and visitors) who are already truly remarkably interested in natural history will get real value out of this book. This means that I can end on a positive note by recommending the book to the majority of the readership of *The Tasmanian Naturalist*, but I wouldn't necessarily recommend it to those whose interest in natural history extends no further than enjoying an uncomplicated walk in the bush.

The Complete Field Guide to Dragonflies of Australia *by Gunther Theischinger and John Hawking, CSIRO Publishing, 2006, paperback, 366 pages.*

REVIEWED BY: Michael Driessen, Kingston Beach, Tasmania 7050, email: michael.driessen@dpiw.tas.gov.au.



This field guide is a must have for anyone with an interest in identifying Australia's dragonflies. It covers 324 species found in Australia comprising 12 families of damselflies and 18 families of dragonflies. The field guide is divided into three sections. The first section is the introduction, which provides a brief overview of the Australian dragonfly fauna, life-cycle, ecology, habitats and conservation (pp. 1-10). The second and largest section is the species guide (pp. 11-299).

For each species there is a full-colour image of the adult, a distribution map and a species account giving descriptions of adults and larvae, habitat notes and information on extra-limital distribution where appropriate. Line drawings and photos of larvae of many species are also given. The format of the species guide is similar to that of many good field guides with the descriptions and distribution maps provided on the left hand pages and the photographs of the species on the facing pages, with 2-3 species per opening.

The third and final section contains the keys to adults and larvae and an illustrated glossary (pp. 300-342). At the end of the book there are brief notes on studying dragonflies (under the headings of observing, photography, collecting, rearing, preservation and dragonfly societies), a checklist of all species, references and further reading, and indexes to both scientific and common names. All this is packed into a solid yet compact 366 page paperback book in an A5 format.

There is much to like about this book in terms of design and layout with attractive photos often of the animals in natural settings. Even the images of preserved specimens are appealing. Unusually, the keys to identify the species from adults or larvae are placed after the species guide rather than the other way around, which is more traditional. This ordering reflects the guide's primary focus on using the images and accompanying descriptive notes and diagrams to identify the species rather than using the keys. Indeed the authors state that dragonfly identification can be done in the field using the field guide after gaining some experience, allowing the dragonflies to be released. I have not tried this with a live dragonfly and imagine this would be quite challenging. It would have been helpful if instructions were provided on how to handle live dragonflies while observing

their various features without causing damage. I did use the key to identify several curated Tasmanian damselfies and dragonflies and did so without too much difficulty. Like any key on a group of species you need to spend a little time understanding the terminology and diagrams and becoming familiar with the taxa.

One of the helpful features of the keys is the location of diagrams right next to the couplets to help make a decision. The keys allow identification to family level and then you are directed to keys for families that allow identification to genera and some species, from which you must then go to the species guide to complete the identification. The keys would have benefited from having page numbers next to the family, genera or species name to direct you straight to the next appropriate section without having to flip through pages or refer to the contents. Little information on ecology or features of interest is provided for each dragonfly species, which may disappoint some naturalists. However such notes would have greatly increased the size of the book and for most species this basic information remains to be collected – a challenge for all naturalists, now that that this field guide has been published, is to go out and learn more about dragonflies.

In summary my criticisms are minor and I can highly recommend this book. From a Tasmanian perspective it is the only book available to identify the 29 Tasmanian species including five endemic species. A previous black and white field guide *Tasmanian Odonata* written by Piers Allbrook in 1979 is out of print and largely out of date.

Despite our modest number of dragonflies we have several species of considerable scientific interest and in recent years the State has been visited by several international scientists studying the phylogeny of the worlds dragonfly fauna. The Ancient Greenling *Hemiphlebia mirabilas* is as its name indicates an ancient species having characteristics of damselflies recorded from the Permian period. It is a rare species found only in Victoria and recently in northeast Tasmania. The Tasmanian Redspot *Archipetalia auriculata*, the only member of its family, and the Tasmanian Spotwing *Synthemiopsis gomphomacromioidesis*, the only member of its genus (and has the longest scientific name for a dragonfly in Australia), are both Tasmanian endemics and are thought to be relicts of early dragonfly evolution that occurred in Antarctica.

A Systematic List of the Marine Molluscs of Tasmania by Simon J. Grove, Ron C. Kershaw, Brian J. Smith & Elizabeth Turner, Queen Victoria Museum and Art Gallery Occasional Paper No. 8 (2006), 120 pages.

REVIEWED BY: Kevin Bonham, 410 Macquarie Street, South Hobart, Tasmania 7004, email: k_bonham@tassie.net.au.

Surprisingly it has been nearly fifty years since a full listing of Tasmania's marine mollusc fauna was produced, Kershaw's 1955 list and Macpherson's 1958 revision of May's *Illustrated Index of Tasmanian Shells* (1923) being the most recent contributions of

this type. Meanwhile, several dozen new species occurring in Tasmanian waters have been described, others have been newly recorded, and taxonomy above species level has changed dramatically, especially thanks to the advances made possible by genetic studies. Kershaw's 1955 list recorded almost 1200 species as Tasmanian: the new list records 1357 (not counting species from and surrounding Macquarie Island), of which nine are considered introduced and two suspected extinct from the State. The list includes those species sometimes referred to as "marginal marine" or "saltmarsh" species, for example the five recorded species of ellobiid. Uncertain species (whether for taxonomic reasons or because records are unconfirmed) are noted as mysteries that may someday be resolved.

This publication includes an alphabetic index of species, genera and subgenera, a two-page non-exhaustive reference list, and an introduction that discusses the fauna's geographic affinities and the preparation of the list in question, as well as the taxonomic list itself. The authors have been cautious with the placement of some of the more contentious or unclear groups and thus a small number of species, genera and families appear as "unplaced" listings (most notably, several families appear as "order unplaced" at the end of Subclass Eogastropoda).

As a terrestrial malacologist who dabbles selectively in the marine fauna I have learnt quite a deal from perusing this list already. For instance, those disappointed with Tasmania's cone shell fauna (usually quoted as two species, *Conus anemone* and *C. rutilus*, the latter being scarce) will be interested to note not only that the authors record a third species in the genus, *C. clarus*, but also that several genera formerly considered to be turrids have now joined the Family Conidae.

This list has been a work in progress for many years, alas outliving two of its co-authors, to whom it is dedicated (Kershaw passed away in 2003, Smith in 2006). Both would have been very pleased to see this latest step in the documentation of the State's marine fauna finally published.

Weeds of the South-east: An Identification Guide for Australia *by F.J. Richardson, R.G. Richardson & R.C.H. Shepherd, R.G. and F.J. Richardson, 2006, full colour, soft cover, 438 pages.*

REVIEWED BY: Matthew Baker, Curator (Weed Taxonomy), Tasmanian Herbarium, Private Bag 4, Hobart, Tasmania 7001, email: matthew.baker@tmag.tas.gov.au.

With weeds, in particular environmental weeds, becoming more of an issue and as our knowledge increases about the impacts of weeds in many sectors, it is very timely that this book has been produced. Identifying weeds is the first step in managing them. Once identified, further information on the control of the species, its poisonous properties or if in fact it is a weed rather than a native can be sought.

The book claims to be aimed at a wide range of people, from those that deal with weeds on a daily basis through to any one who holds land, including those that only come across weeds in their backyards. I think that this book is a must have for those upon whom weeds have a direct impact, those who have a real interest in them, or for those whom it is crucial in knowing what weed species they are dealing with so they can then be properly managed.

This book gives information on over 2000 weed species. It includes botanic names, common names, brief diagnostic descriptions, habitat information, location by states and it is plastered with stacks of wonderful images (>1600 of them). Many of them are just superb. Most are close up shots of flowers, although there are also many habit shots. It is beautifully designed and has a very appealing layout. I often find myself randomly flicking through it when I need to look something up, more often than not forgetting what I was actually looking for. It seems to draw you in and keeps you turning from page to page.

For the vast amount of information, I think it is reasonably priced a $69.95. A similar publication recently put out by the Weed Society of Western Australia includes 1050 weeds, 625 images and costs $35. There is nothing else out there that is so comprehensive with respect to the number of species included. However, its scope could prove a disadvantage to some users who deal with only a handful of weed species in a particular habitat or region.

As the book says, it is aimed at a wide audience including the general public. I decided to see if it could be easily used as a guide to identifying several common Tasmanian weeds. The 'guinea pig' was my father, not someone with a super keen interest in plants but a keen veggie gardener with a blood-thirty passion for killing boneseed and a general appreciation of the Tasmanian bush.

Ehrharta erecta (panic veldt grass): The flicking through the pages began and the grass was first identified as a *Poa* spp? A 'no' was given and several minutes later a correct identification was made. That was pretty easy. I do wonder if he would have stuck with the first *Poa* identification that he made. I thought to myself that for a true test, I should not offer any assistance with the next two species.

Stellaria media (chickweed): Flicking resumed but this time he started at the dicotyledons. About 12 minutes had passed and we were up to the right family (Caryophyllaceae). He paused over the image of *Cerastium glomeratum* (sticky mouse-ear chickweed) and said 'it looks like this - but it's not sticky'. The search resumed, I thought he would have got it

but he flicked straight on past and continued for another five minutes. I told him he went past it and he went back the page with the *Cerastium* species. After another five or so minutes I got impatient and pointed to the image of *Stellaria media*.

Euphorbia peplus (petty spurge): This took just as long as the chickweed and again he flicked straight past the species. I thought he would get this for sure. Again I got impatient.

About an hour to identify three plants is a long time to spend. And it would have taken longer if I hadn't intervened on all three species. I think it failed this test, and for that matter its supposed usefulness could instead be a cause of great frustration.

I think for the uninitiated, the sheer number of images, whilst nice to look at, are overwhelming. Some of the pages have 12 images to consider and when there are 1600 images to choose from, it is always going to take a while to find the right plant. Not all of the plants are illustrated. If your plant is one of those, then I think you could have a lot of trouble getting the specimen identified. Difficult groups to identify are, as per usual, difficult to distinguish, even using both the images and the descriptions; for example, *Lepidium* species and many of the grasses.

The downfall of this book is that there just isn't any help in narrowing down the search, although I suppose that this will always be a difficult task when dealing with such large numbers of species. A similar type of guide to weeds but one for those in New Zealand (Bruce, R., Popay, I., Champion, P., James, T. & Rahman, A. 2004: *An Illustrated Guide to Common Weeds Of New Zealand*, 2nd Ed. New Zealand Plant Protection Society), whilst not as comprehensive, includes a handy guide to flower colour and size. If you have flowers and know the habit of the plant, then you can at least narrow your search down to, at the worst, 20 out of the 330 species included. However, at the scale of the reviewed book it may not have been as helpful as in some cases it may only narrow down to, say, 100–200 species. Ease of use comes down to being familiar with and being able to recognise the key weedy plant families. This is really the only way to allow for easier identification and navigation through this book. I think for the book to be really useful, you need to form a relationship with it. You need to visit it often. You need to go out of your way to take in all the glorious images. As you spend more time with it, the names of the plants you are seeing will start to fall into place.

The book includes many native species. In the introduction it justifies their inclusion on the basis that some are now weed problems outside of their natural range. Others are included because they are toxic to stock or cause some other negative impact. Then there are those that have been included to illustrate their similarity to introduced weedy species. However, I believe that, in some cases, the information on these native species is so brief that it could mislead the reader. For instance, *Calystegia sepium*, although correctly reported to be native, is also listed as naturalised in Tasmania. The book fails to mention that this species is listed as rare on the Tasmanian *Threatened Species Protection Act*.

Lythrum salicaria is described as a cosmopolitan species but it does not mention that it is listed as vulnerable in Tasmania. But wait, there are more examples: *Centaurium spicatum* is listed as a native of southern Europe and Asia, but it is not mentioned that it is also considered native in Tasmania and rare as well. A couple of threatened species of *Persicaria* are also treated as weeds, and I am sure if I looked hard enough I would find more in this category. Treating these species as weeds in Tasmania and doing to them what is generally done to weeds would be breaking the law! Their inclusion in the book without proper notes on their conservation status could be portrayed as irresponsible.

There is one last negative aspect. I get the feeling that the Tasmanian *Census of Vascular Plants* was not consulted during the production of this book. One big clue to this is that 24 out of the 36 species which are known in Australia as only occurring in Tasmania are omitted.

Calling this book an identification guide and aiming it at the general public may be over ambitious. Perhaps it could have been titled 'an annotated illustrated inventory to the weeds of south-eastern Australia' then I would have no problems. Despite this, I find the book very useful, and there is probably not a day that goes by when I don't pick it up. I also know of others in the weed fraternity that use it almost as often. It has assisted me to make many identifications but I will always refer to a flora before making a final identification.

I would recommend the book anyone interested in weeds but I would always suggest that having identified your plant, you should seek further information if you intend to kill it.

A Complete Guide to Native Orchids of Australia including the Island Territories *by D.L. Jones, Reed New Holland, 2006, full colour, hard cover, 496 pages.*

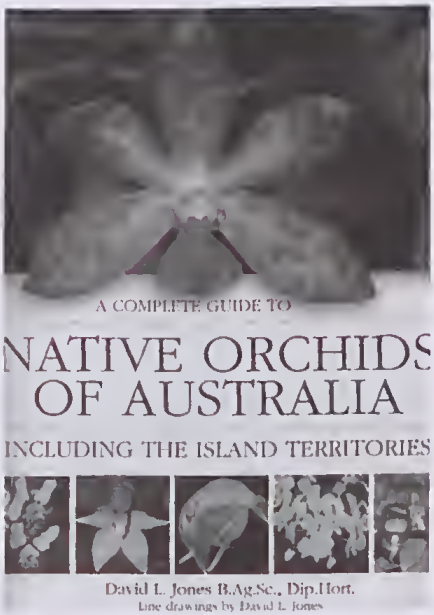
REVIEWED BY: Matthew Larcombe, Project Officer (Threatened Orchid & Euphrasia), Threatened Species Section, Department of Primary Industries & Water, GPO Box 44, Hobart, Tasmania 7001, email: matthew.larcombe@dpiw.tas.gov.au.

This beautiful book is an appropriate culmination of the career of Australia's most prolific orchidologist. Over 45 years of involvement in Australian native orchids, Jones has become Australia's foremost expert on this beautiful and complex group. *A Complete Guide to Native Orchids of Australia including the Island Territories* (NOA) arose from a rewrite of Jones's earlier publication, *Native Orchids of Australia* (1988), and was published just prior to his retirement earlier this year.

Jones aims to present a book that can be used by "casual visitors to the bush as well as orchid enthusiasts, conservation workers, environmental consultants and professional botanists" to identify species, and in general, raise the profile and conservation

significance of Australian native orchids. Layed-out in three parts, Part I gives an excellent introduction to orchids. It details the diagnostic floral structure of orchids, then looks at life history attributes including pollination, hybridisation, seed germination, mycorrhizal fungi and cultivation. Parts II and III describe in detail over 1300 species of terrestrial (part II) and epiphytic (Part III) native Australian orchids. Chapters amalgamate groups of closely related genera, and species are listed alphabetically within each genus. Detailed line drawings of the important floral and vegetative characters accompany each genus, and almost every species has an accompanying colour photograph. Species descriptions are deliberately brief and scientific nomenclature is kept to a minimum. Most species also have notes on distribution, recognition, and conservation status, making NOA the most comprehensive single reference on Australia's orchid flora.

Jones has adopted some taxonomic treatments that are not currently accepted, and in some cases have been rejected by the Council of Heads of Australasian Herbaria (CHAH). For example, his treatment of the greenhoods (*Pterostylis*) was considered but not adopted by CHAH. The use of non-accepted taxonomy makes this taxonomically confusing group more confusing and is the main drawback of the book.



Another notable and deliberate omission from NOA is any type of key to species. With a book of this detail covering such a wide range of species, keys would be difficult to follow, let alone produce, and with descriptions, photos and notes on recognition, most users will be able to identify field specimens to at least a narrow range of species, although professional users will need to revert to the primary literature in many cases to positively identify species. Distribution maps would also be helpful in identifying potential species for the field worker.

Overall the book is wonderfully presented, beautifully illustrated and conveys the diversity and beauty of our native orchid flora more effectively than any other publication I am aware of. This book could be described as an encyclopaedia of Australian native orchids and will be an essential reference for years to come.

ADVICE TO CONTRIBUTORS

The Tasmanian Naturalist publishes articles on all aspects of natural history and the conservation, management and sustainable use of natural resources, with a focus on Tasmania and Tasmanian naturalists. These can be either in a formal or informal style. Articles need not be written in a traditional scientific format unless appropriate for the content. A wide range of types of articles is accepted. For instance, the journal will publish articles that: summarise or review relevant scientific studies, in language that can be appreciated by field naturalists; stimulate interest in, or facilitate in identifying, studying or recording particular taxa or habitats; record interesting observations of behaviour, phenology, natural variation or biogeography; stimulate thinking and discussion on points of interest or contention to naturalists; put the study of natural history today into context through comparisons with past writings, archives, etc.; or review recent publications that are relevant to the study of Tasmanian natural history.

Submission of manuscripts

Manuscripts should be sent to the editor, Mark Wapstra, preferably electronically (email: mark@ecotas.com.au) as Word documents. Alternatively they can be mailed to 28 Sunerest Avenue, Lenah Valley, Tasmania 7008. Graphs, illustrations or maps should also be provided electronically by preference, generally in TIFF or EMF format. Figures, especially photographs, should be supplied in high resolution (ideally 300 dpi) to ensure high quality reproduction.

Formal articles should follow the style of similar articles in recent issues. Informal articles need not fit any particular format (abstract needed only for formal articles). References cited in the text should be listed at the end of the paper in the following format:

Ratkowsky, A.V. & Ratkowsky, D.A. (1976). The birds of the Mt. Wellington Range, Tasmania. *Emu* 77: 19-22.

Watts, D. (1993). *Tasmanian Mammals. A Field Guide*. Peregrine Press, Kettering.

Ponder, W.F. (1993). Endemism in invertebrates in streams and rivers as demonstrated by hydrobiid snails. In: *Tasmanian Wilderness: World Heritage Values*. Eds. S. Smith & M. Banks. Royal Society of Tasmania, Hobart.

Bryant, S.L. (1991). *The Ground Parrot* Pezoporous wallicus *in Tasmania: Distribution, Density and Conservation Status*. Scientific Report 1/91. Department of Parks, Wildlife and Heritage, Hobart.

Formal articles are normally sent to at least one independent referee for comment. This is undertaken to try to ensure accuracy of information and to improve the quality of presentation. It should not be seen by prospective authors as a means for their work to be criticised by rather as a service to help them improve their manuscripts. The editor is willing to assist any prospective authors who have little experience in writing articles.

Tasmanian Field Naturalists Club

G.P.O. Box 68, Hobart, Tas. 7001

Founded 1904

Objectives

The Tasmanian Field Naturalists Club aims to encourage the study of all aspects of natural history and to advocate the conservation of our natural heritage. The club is comprised of both amateurs and professionals who share a common interest in the natural world.

Activities

Members meet on the first Thursday of each month in the Life Sciences Lecture Theatre 1 at the University of Tasmania at Sandy Bay. These meetings include a guest speaker who provides an illustrated talk. An excursion is usually held on the following weekend to a suitable site to allow field observations of the subject of that week's talk. The Club's committee coordinates input from members of the Club into natural area management plans and other issues of interest to members.

The Tasmanian Naturalist

The Club publishes the journal *The Tasmanian Naturalist*. This annual journal provides a forum for the presentation of observations on natural history, and views on the management of natural values, in both formal and informal styles.

Membership

Membership of the Tasmanian Field Naturalists Club is open to any person interested in natural history. Members receive *The Tasmanian Naturalist* annually, plus a quarterly bulletin with information covering forthcoming activities, and the Club's library is available for use. Prospective members should either write to the Secretary at the above address, phone President, Janet Fenton, on (03) 62 396443, or visit our web site at http://www.tasfieldnats.org.au/.

Membership rates		**Subscription rates for *The Tasmanian Naturalist***	
Adults	[redacted]	Individuals	$15
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