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ONE HUNDRED YEARS OF NATURAL HISTORY IN TASMANIA

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In 2004 the Tasmanian Field Naturalists Club will celebrate its 100th year. To mark this occasion the Club is publishing a book summarising its activities and achievements over the century. This article sets the scene.

The Club was formed in response to avid interest in natural history and the sciences in general a hundred years ago. Field naturalists groups had already sprung up in Victoria, South Australia and New South Wales, and in Tasmania the Royal Society, formed in 1843, was a respected body with significant achievements to its credit. Under its umbrella the Royal Botanical Gardens and the Tasmanian Museum and Art Gallery were established, geological surveys undertaken and scientific papers published. In terms of fieldwork Australia was a land of opportunity, with so much yet to discover, and so few species named and described.

E.A. Elliot, a young man with a passion for birds and photography, saw the need for a group devoted to study of nature in the field, that was open to amateurs and professionals alike and that encouraged education about, and conservation of, our natural heritage. He enlisted the help of friends and associates, chiefly entomologist Arthur M Lea, to form a field naturalists club in Tasmania. Preliminary meetings were held in September 1904 to gauge interest, frame rules and form a committee, and the inaugural monthly meeting was held in the Royal Society Board Room on Monday 31st October 1904. Medical practitioner Dr Gerard Smith was the first president, followed by educationist Samuel Clemes, founder of Friends School in Hobart. E.A. Elliot, young though he was, set the Club on a good foundation with his administrative skill as secretary and treasurer for the first six years. Clive Lord (who became Director of the Museum) followed in his footsteps as secretary for the next eighteen years. Many other prominent Tasmanians joined the Club, giving it status from its inception. These included Leonard Rodway, a founding member, who was Government botanist, R.M. Johnston, Government Statistician who is best known for his publication of *Geology of Tasmania*; photographer J.W. Beattie and W.L. May of Sandford who compiled an *Illustrated Index of Tasmanian Shells*.

The "Field Nats" provided an opportunity for outings that were productive in a scientific sense as well as being educational and recreational. Easter camp-outs, an

institution of the Club for many years, were a highlight. The first of these was held at Bream Creek (Marion Bay) in 1905. Seven naturalists travelled to Dunalley on the ferry "Nubena", arriving early in the morning. From there they walked to the Bream Creek Beach (now called Marion Beach), where two more naturalists joined them after riding by bicycle from Hobart! Geologists in the party were keen to study a landslip nearby, and the ornithologists tallied fifty species of birds. Elliot, a keen bird observer, wrote "*The Flame-Breasted Robin was to be seen in great numbers, often a dozen or more were visible at the one time*" and one evening "*a couple of Man-faced* [Masked] *owls were heard calling each other in the darkness*" (Elliot, 1905). Plenty of time was left for fishing, although the Bream which once abounded in the river, giving it the name Bream Creek, had been poisoned by poachers and the population had not recovered. Elliot's report was duly published, with photographs, in *The Tasmanian Mail* (Figure 1).

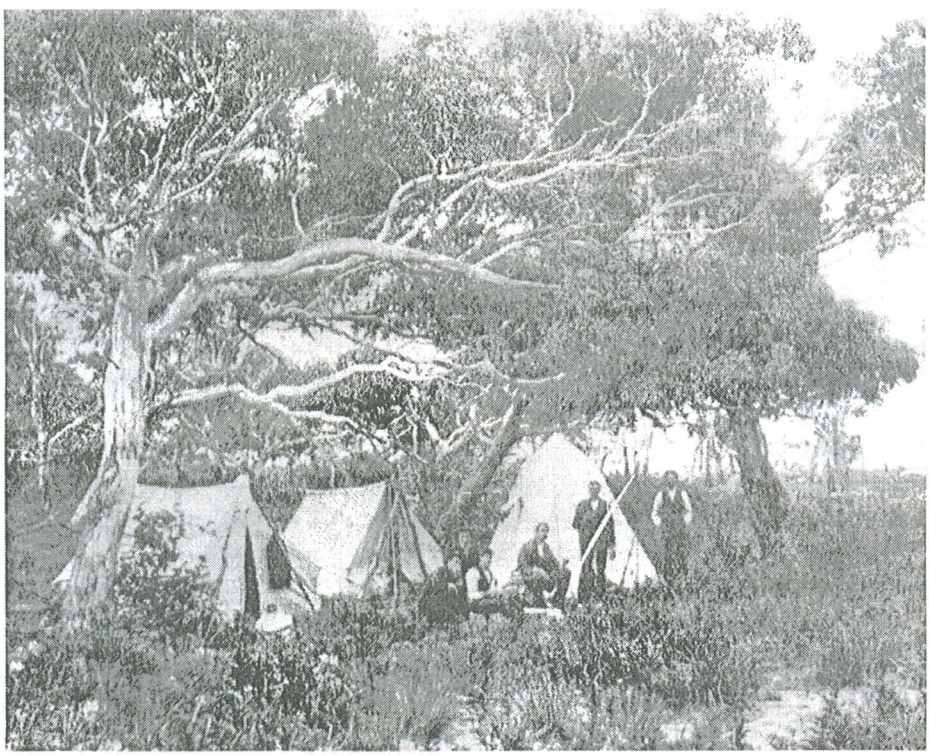

Figure 1. The first Easter Camp of the TFNC at Bream Creek (Marion Bay), 1905. Reproduced from Elliot (1905).

The Club's activities were quite well reported from the start. *The Mercury* published newspaper articles describing meetings and outings, and articles written by members of the club were published in *The Tasmanian Mail*, the illustrated weekly paper. During its first year the Club had four papers published in this way. "*Tasmanian orchids*" by Leonard Rodway and "*The Black-headed Honey-eater*" by A.E. Brent were illustrated. Others were "*The Scrub Tit*" by A.L. Butler and a series "*Tasmanian Ferns*" by Leonard Rodway (TFNC, 1905). For a nominal sum the type was kept and set up in pamphlet form (Elliot, 1991). These pamphlets later gave birth to the Club's journal, *The Tasmanian Naturalist*. The first issue of this journal (priced sixpence) was published in April 1907. The introduction, entitled "*Ourselves*" outlined the purpose envisaged for the journal:

> *The journal is intended to deal with Natural History in its widest sense, particular, but not exclusive, attention being paid to subjects of Tasmanian interest. It is hoped in time that descriptions of new forms of life will appear in its pages, but for some time at least the articles will be of a more or less popular character (TFNC, 1907).*

Articles appearing in that first issue included a discussion of scale insects, "*The Coccidae: A family of Remarkable Insects*" by the eminent Government entomologist Arthur M. Lea; "*The Breeding Habits of Bronzewing Pigeons*" by Mary G Roberts who ran the Beaumaris Zoo; and "*Swan Shooting on the East Coast of Tasmania*" by E.A. Elliot. The Club had already voiced opposition to swan shooting and was lobbying for protection of these birds. Elliot attended (as an observer) the opening day of the swan shooting season on February 1st, cycling through the night from Hobart to "Kelvedon", a property near Swansea, which he reached at dawn! Members of the Cotton family accompanied him in a whaleboat for the next twenty-five mile leg of the journey to Moulting Lagoon (Elliot, 1907).

Readers did not have long to wait for the anticipated "descriptions of new forms" to appear in the journal. In December of the same year the third issue of the journal contained an article by Arthur M. Lea describing not a new species, but a new genus of tiny sightless beetles found in the nests of ants. Lea described five species, all having elytra but no wings, no eyes, and mouthparts concealed. Lea collected them from the nests of "*five kinds of ants (usually under stones)*". The article was entitled "*On a New and Remarkable Genus of Blind Beetles from Australia and Tasmania of the Family Trichopterygidae*". Lea concluded his introduction with the words "*I have very great pleasure in dedicating the genus (certainly the most interesting one known to me from Tasmania) to our chairman, Mr. Leonard Rodway*" (Lea, 1907).

Another bizarre and apparently unidentified creature was informally described by H.M. Nicholls of Garden Island Creek, in the journal's second issue. It was a tiny, legless, wingless parasite found on the proboscis of a march-fly (Figure 2). Nicholls also found these creatures on blowfly probosces (Nicholls, 1907).

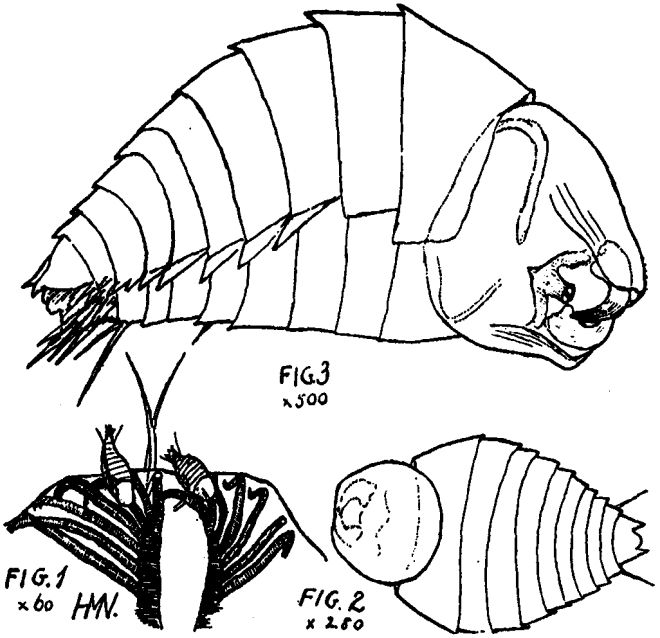

Fig. 1. Two parasites attached to tip of tongue.
Fig. 2. View of parasite from above.
Fig. 3. Side view of parasite.
(All greatly enlarged.)

Figure 2. Illustrations of a parasite on the procoscis of a march-fly, from Nicholls (1907).

New records for existing species soon followed. T. Thompson Flynn (lecturer in biology at the University) announced a record of *Amphioxus* collected at 15 fathoms on the inner side of Schouten Island on a Club dredging trip to the east coast (Flynn, 1910) and W.L. May wrote of a record of a new chiton for Tasmania collected on a Club trip to Bellerive in February 1910 (May, 1910). In the following year May placed on record (May, 1911) the capture of Tasmania's largest gastropod, *Voluta mamilla*:

I wish to place on record the capture of a magnificent specimen of this fine shell. It was taken on the 16th of January last on our beach, immediately South of May Point, by my son. The shell which contained the living animal, was in the edge of the water. I kept it alive for several days, but it did not expand to any extent. The shell which is quite adult, with the thickened and expanded lip, measures eleven and a half inches in length, and weighed, with the animal, five and a half pounds; the shell alone weighs one pound fifteen ounces. This specimen is one of the largest on record. The species must be extremely rare here, as I have never before seen even a dead, or broken one during over thirty years observation, and it is a shell that could not easily be overlooked.

Another fascinating article is an account of an exciting discovery made in the Mowbray Swamp (near Smithton) by a settler while "*engaged upon draining his selection... While working near the bottom of one of his drains...his spade struck some bones, which he at first supposed to be the remains of a bullock, although he was at a loss to understand how they had become embedded so deeply, but a little further examination showed they belonged to some other species of animal*". The curator H.H. Scott from the "Victoria Museum", Launceston, was called upon for an opinion. His conclusion was that the bones were those of an extinct marsupial of the family Nototheriidae, of the genus *Nototherium* established by Professor Owen. Scott proposed the name *Nototherium tasmanicum* (Scott and Harrisson, 1911). (Figure 3).

These organisms have since been reclassified. *Voluta mamilla* is now *Livonia mamilla* (see Margaret Richmond's book *Tasmanian Sea Shells, Vol. 2* (1992), p.10), while *Nototherium tasmanicum* is now *Zygomaturus trilobus* (Chris Tassell, Queen Victoria Museum, pers. comm). However, interpretations such as these represented significant progress in the process of documenting Tasmania's fauna and flora. *The Tasmanian Naturalist* was off to a flying start! Apart from inevitable interruptions caused by two world wars, publication of the journal continued to flourish. Early issues included "handbooks" or educational articles in series as part of the journal, covering insects of Tasmania by A.M. Lea, shells by W.L. May and birds by E.A. Elliot. In later years the club published field guides as separate books. The most recent of these is our book *Jewel Beetles of Tasmania: a Field Naturalist's Guide* by David Cowie, published by the Club in July 2001.

With the book currently in production, summarising the Club's activities and achievements over its first century, the Club is branching out into history. This book will provide a record of a time of rapid social and scientific change within the Tasmanian community. Social changes, changes in attitudes and values; environmental changes and changes in the Tasmanian landscape and land usage are evident in the Club's photographic and written records. The Club's history is well documented with many records and historical photographs already lodged in the Tasmanian State Archives, and some listed on the Australian Historic Records Register. Research for the book has leant heavily

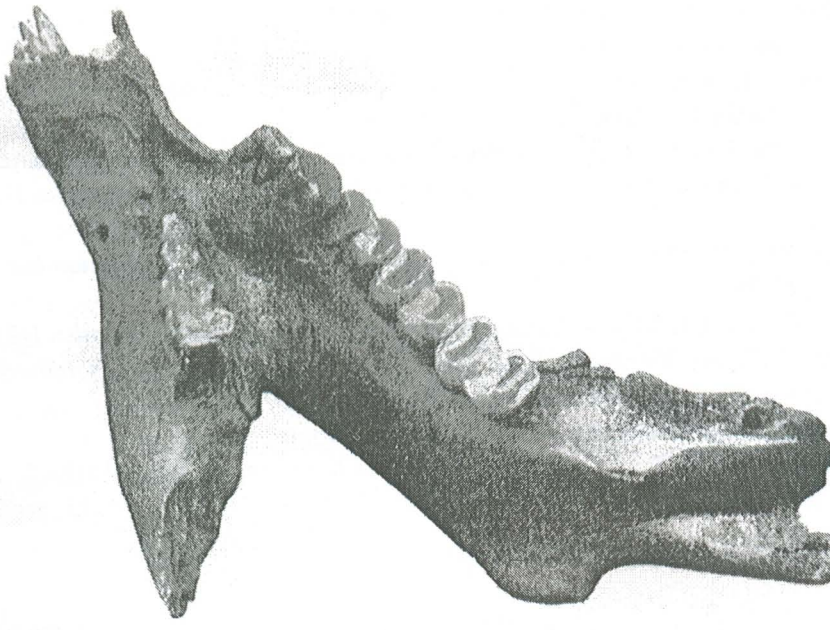

Figure 3. The mandible of an extinct marsupial found in the Mowbray Swamp near Smithton in 1991, and named *Nototherium tasmanicum* in the original publication (Scott and Harrisson, 1911).

on the Club's well-kept minutes, Easter camp reports and of course *The Tasmanian Naturalist*, with background from newspaper reports and biographical sources. Other significant sources of information are oral history interviews with long-standing Club members, providing a sense of immediacy with anecdote and comment. Any additional material such as photographs, information or memorabilia from readers would be most welcome; readers are encouraged to contact the author if they have any material of this nature. The launch of this book, planned to celebrate the founding meetings, will be held in September or October 2004.

ACKNOWLEDGEMENTS

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THE FUNGAL GENUS *LENTINELLUS* IN TASMANIA

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INTRODUCTION

The authors' recently published keys to the gilled fungi of Tasmania (Ratkowsky and Gates 2002a) included the genus *Lentinellus*, but no species of this genus were listed in their preliminary census of the Mount Wellington agarics (Ratkowsky and Gates 2002b). This was not due to a perceived absence of the genus from "the Mountain", but rather to uncertainties about the identification of the species present. We now believe that we can correctly identify the three species present there, which also occur in wet forests throughout Tasmania.

Lentinellus is a genus of gilled fungi characterised by a fruit body that is long-lived, leathery, with or without a stipe, with conspicuously serrate or eroded lamellar margins, amyloid spores with verrucose ornamentation, and occurring on wood or soil. In Tasmania, the species with a stipe, which we believe is *Lentinellus omphalodes* (Fr.) Karst., is usually found on soil, or less commonly at the base of trees. The two sessile or laterally stipitate species are always found on wood. Reid (1956) dealt with one of these, *Lentinus hepatotrichus* Berk., transferring the species to *Lentinellus*, but Segedin (1996) pointed out that the material studied by Reid (1956) had larger spores than those of the type of *L. hepatotrichus* and that he was really confusing it with a different species, *Lentinus pulvinulus* Berk. In his study of Australian agarics deposited in the herbarium at Kew, England, Pegler (1965) dealt with both *L. hepatotrichus* and *L. pulvinulus*, noting that the larger spore size of the latter species separated it from the former.

DESCRIPTIONS OF THE TASMANIAN SPECIES

A brief description follows for each of the three *Lentinellus* species present in Tasmanian wet, native forests.

Lentinellus omphalodes (Fr.) Karst.

Pileus to 4 cm diameter, dark brown, purplish chestnut, rusty tawny, dark brick or purplish date, dry, velvety-fibrillose, some fruit bodies appearing to have concentric bands. Lamellae white or whitish, becoming pallid brown and later a darker brown, adnate or notched, margin markedly jagged, serrate or eroded. Stipe well developed, central or

slightly eccentric, concolorous with pileus, thickly covered throughout with fine or coarse, fibrillose scales. Spores elliptical to oblong or tear-drop shaped in profile, 5-6 x 4 µm, walls very finely ornamented.

Lentinellus hepatotrichus (Berk.) D.A.Reid

Pileus laterally attached to the woody substrate, dark brown, to 5 cm x 3-4 cm, densely hairy with tufts of shaggy squamules over almost the whole pileal surface, becoming less hairy approaching the margin, but never or rarely completely glabrous at the pileus edge. Lamellae radiating outwards from the region of attachment, pale brown becoming a darker brown, margin jagged or eroded, lamellulae in several tiers of differing lengths. Spores elliptical in profile, 3-5 x 3-4 µm, walls very finely ornamented.

Lentinellus pulvinulus (Berk.) Pegler

Pileus laterally attached to the woody substrate, some shade of brown, cinnamon, pale buff or tan, mostly to 3 cm long, surface velvety, gelatinised, whitish pubescent near the attachment but glabrous or almost so near the margin. Lamellae white or off-white or pallid brown, margin serrate or eroded, lamellulae in several tiers. Spores elliptical in profile, (5)6-6.5(7) x 4-5(6) µm, walls very finely ornamented.

DISCUSSION

Macroscopically, the presence of a well-developed stipe separates *L. omphalodes* from *L. hepatotrichus* and *L. pulvinulus*, these latter two species being differentiated on spore size, as the spore dimensions do not overlap. Spore size is a more reliable character than the degree of hairiness of the pileal surface for separating the latter two species.

The relationship of these three species to other *Lentinellus* species of the world has been the subject of much discussion. *L. omphalodes* is, in fact, widespread in the Northern Hemisphere, where it was first described. In Tasmania, we have found it mostly on soil but in Europe and North America it is often found on wood, both conifer and hardwood, on woody debris or on soil (Miller and Stewart, 1971). A distinctive feature, according to Miller and Stewart (1971), is its central or nearly central reddish brown stipe. Breitenbach and Kränzlin (1991) described and illustrated *L. omphalodes* from Switzerland, but commented on its polymorphism and the difficulty of forming a clear concept of its characteristics. They stated that their collections contained fruit bodies with completely central stipes as well as those with eccentric to lateral stipes. The pileus and stipe of collections in the Northern Hemisphere are generally lighter in colour than those from Tasmania, where darker colouration is typical and the stipe is usually central.

L. hepatotrichus has been generally accepted as being closely related to *L. ursinus* (Fr.:Fr.) Kühner, which is an extremely variable species with a worldwide distribution.

Miller and Stewart (1971) stopped short of synonymising *L. hepatotrichus* with *L. ursinus*, although all macroscopic and microscopic characters that they examined fitted *L. ursinus* very closely, because the type specimens of *L. hepatotrichus* were not whole, preventing the cuticle near the margin from being adequately studied. Nevertheless, Segedin (1996) accepted *L. hepatotrichus* as a synonym of *L. ursinus* because New Zealand material attributed to *L. hepatotrichus* not only possessed all the characters described for the type specimen collected by W. Archer from Tasmania, but also closely matched the characteristics of *L. ursinus*. However, the pileus of *L. ursinus* is described as having a glabrous or woolly-hairy margin, whereas our Tasmanian collections have dense, shaggy hairs over the whole of the pileal surface. For the moment, we prefer to retain the name *L. hepatotrichus* for the Tasmanian wet forest species but recognise that future work with DNA testing and mating studies might prove that the two species are conspecific. *L. hepatotrichus* in Australia is illustrated by McCann (2003), p. 48.

The closeness of *L. pulvinulus* to *L. flabelliformis* (Bolton: Fr.) Ito, distributed worldwide, has been generally recognised. Miller and Stewart (1971) hesitated to synonymise them because Berkeley (1859) described *L. pulvinulus* as having an entire lamella edge and illustrated it with an entire edge, a feature that, if true, would cast doubt that the species was a *Lentinellus*. Segedin (1996), however, carefully re-examined the type and found one very small portion of one lamella with a distinctly dentate to lacerate edge. She recognised that although *L. pulvinulus* appeared to be very close to *L. flabelliformis*, published descriptions of the pileipellis of *L. flabelliformis* indicated a different structure from that of *L. pulvinulus*. However, she then pointed out that the apparent disparity could be a matter of interpretation of the surface structures. Nevertheless, she felt it was probably best to treat the two species as distinct until more collections have been examined from other countries. We agree with that decision, recognising that future work, including the use of DNA testing and mating studies, might settle the issue of the closeness of the relationship. Fuhrer and Robinson (1992) illustrated a single species of *Lentinellus* in their Tasmanian rainforest book, naming it only to genus level and providing no information on spore size. However, the lateral stipe and light-coloured, glabrous pileus strongly suggest *L. pulvinulus*. McCann (2003), p. 49 (top) illustrates a *Lentinellus* species that appears to be *L. pulvinulus*. Young (2000), Plate 18, illustrates what appears to be the same species, naming it *L. flabelliformis*.

A short key to the three Tasmanian species follows.

KEY

1.a)	Stipe well developed, central or slightly eccentric	*L. omphalodes*
1.b)	Stipe absent or if present, short and lateral	2

2.a) Pileus generally dark brown and densely hairy, with tufts of shaggy hairs over the whole upper surface; spores small, 3-4.5(5) x 3-4 µm

L. hepatotrichus or *L. ursinus*

2.b) Pileus light-coloured and usually glabrous, except near the attachment, the hairs rarely extending to the margin; spores larger than the above, 5-7 x 4-6 µm *L. pulvinulus* or *L. flabelliformis*

TAXONOMIC POSITION OF *LENTINELLUS*

The taxonomic position of *Lentinellus*, with respect to the order and family in which it should be placed, has been a subject of much debate and disagreement amongst mycologists. Conventional taxonomists, including Pegler (1965), Largent and Baroni (1988) and the present authors (Ratkowsky and Gates, 2002a), have placed it in the order Agaricales, due to the presence of lamellae. Maas Geesteranus (1963) deduced that *Lentinellus* had taxonomic affinities with the hydnaceous genus *Auriscalpium*, which bears its basidia on spines rather than lamellae. He proposed a new family Auriscalpiaceae to incorporate *Auriscalpium* and *Lentinellus*. Jülich (1981) erected a new order, Hericiales, to accommodate fungi having amyloid spores, monomitic or dimitic hyphal systems and conspicuous oil-bearing hyphae; *Lentinellus* fits here comfortably.

Courtecuisse and Duhem (1995) placed the genus in the family Pleurotaceae, tribe Lentinelleae, related to the Hericiales by the ornamented amyloid spores and hyphae with oily contents. As yet, DNA studies have not helped to resolve the issue, as no species of *Lentinellus* were included in the most comprehensive DNA study to date (Moncalvo *et al.*, 2002). We are now looking with new eyes at specimens (to our knowledge unnamed) of a stalked, centrally depressed, hydnoid fungus with oily contents and verrucose amyloid spores, often found in an unlogged coupe at the Warra LTER site, which we survey. Viewed from above, this fungus reminds one of *L. omphalodes*. Our new awareness of the taxonomic affinities of *Lentinellus* may help assign this new species to an appropriate genus.

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WHY WOULD A NATURALIST WORK IN THE TASMANIAN FORESTRY INDUSTRY?

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"*I am a naturalist, a conservation biologist and I work for the Tasmanian forestry industry*". It could almost be an introduction at a naturalists' equivalent of an Alcoholics Anonymous meeting. After all, admitting there's a problem is the first step towards resolving it. But there's a difference: I don't admit to a problem, and in this essay I'd like to explore why. Some readers might feel that putting the words 'conservation' and 'forestry' in the same sentence would constitute an oxymoron. From the look on peoples' faces sometimes when I introduce myself, these readers would not be alone. What about clearfelling? What about the loss of old-growth forests? What about all those poisoned possums? The Blue Carrot State? So, have I sold my soul to the Devil, or is real life not quite so black and white for the modern naturalist?

Consider this scenario, and try and conjure up the scene. '*I am standing by a road near Geeveston. Logging trucks whoosh past me every few minutes, laden with logs bound for the processing yard. Before me, as far as my eyes can see, is a scene of devastation. The occasional charred tree stump and dead standing tree reminds me that this was once old-growth forest, but now the entire landscape is covered with non-native vegetation. Even the hollows in the stags are home only to European starlings. The watercourses are choked with sediment from the eroded slopes, and poisoned from frequent applications of fertilisers and herbicides and the all-too-frequent corpses of 1080-poisoned pademelons. As a naturalist, there's nothing for me here. I turn and head down the road to the turnoff where a sign reads 'Welcome to the Southern Forests'. I feel a sense of relief. At last, some native trees! OK, so it's just a forestry coupe six years post clearfelling, but as a naturalist, it feels good to get out of that intensive farmland and into something approaching a natural ecosystem. At least it's full of life – native life. Tasmanian endemic dusky robins, thornbills and scrubwrens call from eucalypt saplings emerging from a dense undergrowth of native herbs and shrubs, native bees buzz around the leatherwood flowers in the retained strip of tall riparian forest, and trails and scats tell of healthy numbers of possums, wallabies and pademelons.*'

So what's my point in telling this story? The main one is that, while we are easily swayed by provocative language and imagery, native forestry should not be confused with land-clearing; clearfelling doesn't create ecological deserts, and is much better for nature than is conversion to agriculture. We know that forests at the Warra Long Term

Ecological Research (LTER) site like those I described above contain hundreds of different native species, and very few exotics (see http://www.warra.com). A naturalist could explore them for years and still only be scratching the surface in terms of understanding the complexity of life associated with these forests as they mature. I must, of course, add a qualification: native forestry will never be as good for nature as leaving the forest alone. Naturalists – being sensitive souls – will usually prefer their forests to be as free of human impact as possible – and in Tasmania, almost uniquely in the developed world, there are plenty of places like this to choose from. But in those forests where nature is but one of several legitimate values, naturalists can still press for forestry that better suits nature, just as others in society with other priorities continue to press for forestry that better addresses socio-economic values. In effect, accepting a role for forestry means accepting a trade-off between the natural values of the forest and their socio-economic values. If one can get over that particular philosophical hurdle, it's much easier to push for trade-offs that are not sell-outs.

There are many readers who will not be persuaded that multiple use is the way to go. It smacks of compromise, and there should be some places in the world (other than national parks and World Heritage Areas?) where nature does not have to be compromised. Maybe, but consider this scenario, which I put together having worked with the forestry profession in Indonesia before coming to Australia. 'Jarkarta Times, *27 June 2008. The Minister for Forests today unveiled plans for the establishment of a further 100,000 ha of pulp and timber plantations in the rainforests of East Kalimantan. '*Project Mangium*' is a joint venture between the Indonesian Department of Forestry and a consortium of Australian finance and development agencies. As a measure of the strategic importance attached to the project by the Australian government, it will receive a soft loan from the Australian Development Bank, and technical advice from Forestry Australia International (an Australian government business enterprise promoting forestry overseas to offset looming domestic shortfalls). The project is aimed at supplying the Australian and other western markets with high quality pulp and fibreboard. Initially, the bulk of this will come from rainforest trees, but these will eventually be substituted with plantations of the Australian tree* Acacia mangium. *The Minister has shrugged off protests from international environmental groups about the inevitable destruction of lowland tropical rainforest, and has given assurances that the project will follow world's best practice and will be fully certified according to stewardship standards developed by the Indonesian forestry industry.'* So what's the moral of this admittedly rather fanciful story? It reflects my fears that we could see an unhealthy trade-off between the degree to which we are prepared to source our forest products locally – indeed, export them to the world - and the degree to which we export deforestation instead. For nature, I can't help but feel that losses through destruction of tropical rainforest are vastly greater than any losses that may occur locally through Tasmanian-style forestry.

Of course, as I wrote earlier, most naturalists, myself included, would like to see no losses of nature and wild places at all, whether temperate or tropical. Perhaps the surest way to do this would be to persuade the world to stop using forest products, and to accept that all remaining forests have intrinsic values that place them above exploitation or conversion. Simple! My feeling is that we are unlikely to be able to do so in any meaningful timescale; the most that is achievable in the short term might be a slowing in the rate of increase in consumption, through the three r's: reduce, reuse, recycle. In the mean time, I feel naturalists would make greater gains through working with the forestry industry so that it better caters for the needs of nature (and naturalists), while continuing to sustain the production of forest products that we all use.

Maybe my standards are too low? After all, I grew up in the UK, where forests only thrive in places where humans down the centuries haven't managed to think of any more 'productive' land use. It is too late for the UK to develop a 'comprehensive, adequate and representative' reserve system along the lines of that developed in Tasmania – however imperfectly - through the Regional Forest Agreement (RFA). In the UK, most forest remnants are on infertile, dry or poorly drained soils. Even here, they are not left alone, and nearly all long-established woodlands have been subjected to centuries of use and abuse. As a long-term member of several local Naturalists' Clubs, I would join field trips exploring the natural history of woodlands whose entire extent would fit within a single Tasmanian forestry coupe. What would a British conservation organisation be willing to pay to have even a hectare of Tasmanian old-growth forest on their doorstep! (That was a rhetorical question, but it would certainly be a lot more than current stumpage prices in Tasmania). Needless to say, there is no such thing as old-growth forest in the UK, though the local meaning of the term is now being expanded to apply to areas with old trees. Most British woodlands with conservation value are called 'ancient semi-natural', because, while highly modified from their natural condition, they occur on sites that have not been converted to another land-use in the past few hundred years. This means that they retain the connection through time with the long-gone wildwood (i.e. real old-growth forest). Many of these ancient woodlands have a history of coppicing, a form of management that has affinities with clearfelling but on a ten to thirty year rotation. Interestingly, coppiced woods are especially highly regarded for their nature. Much of it thrives on this traditional management and vanishes if the regular disturbance ceases. Thus British conservation biologists spend a lot of energy promoting coppicing in the name of biodiversity conservation. Mind you, British conservationists are also so concerned at the loss of ruderal species (yes, weeds and associates) from farmland that they have come up with the concept of 'ancient wasteland'. These sites support suites of species that have largely been pushed out of the intensively farmed countryside and hang on in derelict inner-city 'brownfield' sites where irregular disturbance (by trail-bikes, bulldozers etc) enables them to hang on.

I discussed the British situation for two reasons. The first is to remind ourselves of how lucky we are to have such extensive tracts of native forest in Tasmania, including sizeable areas of old-growth in reserves. Even under the most intensive forestry scenario imaginable, we couldn't browbeat Tasmanian nature to the extent that the British have over the past centuries. And let's be grateful that brownfield conservation is still a long way down our list of priorities! So if anything, my UK background has taught me to value naturalness rather than to accept semi-natural mediocrity. The second reason is because of what the British experience teaches us about the resilience of nature and its response to management. It is true that no species naturally depends on forestry (because it is too recent a phenomenon to have led to speciation through natural selection). But it is worth remembering that whatever lives in a managed forest may be doing so as much because of the management as in spite of it, if the management mimics an element of natural disturbance that has otherwise been banished from the landscape. Transferring this thinking to the Tasmanian situation, clearfelling of wet eucalypt forests has at least some similarities with the natural disturbances caused by periodic stand-replacing wildfires (which are currently suppressed in reserves) so we shouldn't expect clearfelled coupes to be ecological deserts, as is often purported. Indeed, in many ways clearfelling is closer to a natural disturbance than would be the careful removal of single trees, because, as research at Warra is showing, the latter approach just doesn't create big enough gaps for the re-establishment of early successional species (including the eucalypts themselves). As I mentioned above, the biological surveys we conduct at Warra reveal hordes of species living quite happily in clearfelled coupes, just responding to the disturbance event as they have evolved to do so. Having said that, I wouldn't want to see the analogy stretched too far; silviculture is not just about the disturbance event but about the entire rotation – its length and the extent of management interventions. Shorter rotations are less 'natural' than longer ones, lacking sufficient time for the development of even a hint of 'oldgrowthness', so they offer fewer opportunities for nature. Stands that are thinned, pruned and fertilised head off on a still less natural successional trajectory. Losses may be scarcely apparent in the first rotation in an otherwise unfragmented landscape, but run the clock forwards two hundred years and it is possible to imagine many species being excluded from the actively managed parts of the forest: almost like conversion to plantation by stealth. Most of these species would still survive in the informal and formal reserve network, but some may not and a naturalist's experience of the forests would be that much the poorer.

Currently, most Tasmanian wet eucalypt forests are not managed as intensively as I have just described. Even so, the forestry industry is not blind to the possibilities of adapting silvicultural systems so that they are more ecologically sensitive while still yielding a sustainable supply of forest products; investigations of some potential alternatives are under way at Warra. The catch is that the yield of forest products could end up lower, or more costly to extract, so society as a whole (and the politicians they

elect) has to want change sufficiently to be prepared to bear this cost. We may be seeing the beginnings of such a situation today.

Here's another scenario, this time one that has more or less eventuated since I first started working in conservation in the UK. From *Proceedings and Transactions of the Federation of British Naturalists,* December 2005. "*The retiring president of the Federation has applauded the contribution that the Forestry Commission has made towards turning around the fortunes of Britain's forest-dependent wildlife. He commented that we sometimes forget just how much the Forestry Commission has changed since the early 1980's, which is really a very short time for an organisation used to decades-long planning horizons. Twenty-five years ago, the Commission was despised by naturalists and conservationists. They were busy converting ancient woodlands to low-value exotic plantations through clearfelling or underplanting; they had only recently given up killing off the native forest overstorey with aerial applications of herbicides, and they were still actively ploughing up ancient grasslands and heathlands for yet more exotic plantations. They were doing very little to encourage more traditional forms of forest management to which our surviving local nature was more attuned and which could have yielded lower volume, higher-value timber products. Worse, they were doing all this with public money. Few Naturalists' Clubs were foolhardy enough to hold excursions on Commission land. Yet today the Commission is spending large sums of public money on pulling out the exotics from those very same ancient woodland relics. They are also reintroducing traditional management, trying to recreate old-growth like conditions wherever there's a clear ecological case to do so, and busy planting up surplus agricultural land with native trees for timber as well as for nature, or encouraging private landholders to do likewise. Of course, they still do intensive production forestry, and do so profitably. But not at the expense of the nature which is so dear to our hearts. Many Federation members will be amongst those who have given of their time and expertise to help the Commission achieve this new vision.*" The moral of this story, which has more or less come to pass, is that organisations can and do change in response to the changing demands of society. In the case of the UK Forestry Commission, perhaps the biggest facilitator of change was the acceptance by government that managing for multiple uses (economic, ecological and social) required a 'social subsidy'. Perhaps there is a lesson here for Tasmania, if a change to the current balance of these uses in forestry is truly what the majority of Tasmanians want (which I'm not yet convinced of). In a system where forestry operates in a framework set by government, the really big changes have to be government-driven. The paradox, for those tempted to embrace economic arguments to criticise forestry, is that if profits or dividends from Tasmanian forestry were to go down, it could be because they were doing a *better* job (ecologically and socially) but one that costs more economically. A healthy triple bottom line optimises, but seldom maximises, all three values.

I would like to discuss one further contentious point: the control of browsing mammals. Naturalists are unlikely to applaud forestry's continuing war on possums and pademelons, but the fact that the industry finds them such a pest is a clear indication of their abundance rather than their imminent extinction. The irony is that it seems likely that many mammalian herbivores are unnaturally common today because humans have provided them with much more abundant and nutritious browse (e.g. agricultural crops and young plantations) while doing away with their natural predators (thylacines). In some ways, we are fortunate that they are not more abundant still. Otherwise, they might begin denuding entire landscapes of their native forests (as, for example, native and half-starved red deer do in Scotland in the absence of wolves and lynx). One reason browsing mammals are less prevalent on the Australian mainland is because foxes and dingos have taken on the role that thylacines once had. Interstate visitors bemoaning the level of roadkill in Tasmania should remember this. Much as I hate to see native animals die, it can be argued that the more dead animals there are on the road, or even on the edge of a baited coupe, the more live ones there are likely to be in the surrounding forest! If a level of unnatural death of browsing mammals is accepted as an inevitable consequence of humans living in post-thylacine and (we hope) fox-free Tasmania, then the issue of how they die becomes one of weighing up ethics and economics rather than conservation. Increasingly, society is demanding a greater role for ethics, which is why so much research effort is being spent by my colleagues in forestry on finding alternatives to the use of poisons. Perhaps one day the same energy will be spent on finding alternatives on agricultural land, where most poison bait is laid.

So, why would a naturalist want to work in the Tasmanian forestry industry? I would not want to have given the impression that I feel everything's rosy in the forestry garden. From my perspective as a naturalist and conservation biologist, there is clearly much to do to nudge forestry in a direction that will see real gains for nature compared to the *status quo*. These include assessing the ecological impacts of alternatives to clearfelling and making changes accordingly, and considering ways of managing for nature and natural processes at the landscape level rather than on a coupe-by-coupe basis. I have only considered the wet forests in this essay, but, taking a long-term perspective, there are many management issues in the dry forests too. There is also the matter of the conversion of native forest to plantation - which ironically may continue longer than anticipated in the RFA as a response to the move out of clearfelling oldgrowth forest. But the longer the public debate on forestry remains polarised, the more opportunities we miss to engage in building a future forest landscape (real and metaphorical) that meets our needs and wants. Nature may be famously red in tooth and claw, but that doesn't mean we humans must be too. Foresters are not ogres (or at least the proportion of ogres is probably no higher than in other segments of society); foresters are real people with hearts and souls too.

So can we not raise the level of debate about forestry in Tasmania a notch or two? Just enough so that we can move towards a future where forestry changes enough for it to be acceptable to a well informed public, and where public perceptions change enough for them to accept a role for forestry in their landscape. Naturalists, as concerned, informed members of the public, can play an active role in helping achieve this.

FROM THE ROARING FORTIES TO PARADISE: A TALE OF TWO ISLANDS

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Many of us dream of life on a remote tropical island with waving palms, white sand and crystal-clear blue water. Usually, opportunities for living out those dreams are few and far between. However, we have found that islands in cooler, more southern climes have much to recommend them. Responding to an advertisement in the local press for volunteers to go to Maatsuyker Island, now part of the South West National Park, we found ourselves part of a select band chosen from hundreds of applicants.

Lying in the Roaring Forties, Maatsuyker Island is pounded by the swells of the Southern Ocean. Gales or strong winds are experienced on about 274 days of each year and rain is recorded, on average, on seven days out of every ten! The inclement weather, we knew, was endemic to this region, but it was with some excitement and eager anticipation that we flew south by helicopter to commence our 3-month posting. From the air we had a bird's-eye-view of the triangular-shaped island, roughly three kilometres long and one and a half wide. The highest point, at 260 metres, was hidden in dense vegetation and on the south-western tip a small settlement consisting of the stark white lighthouse (photo left), three houses and outbuildings was perched above steep cliffs.

The dangers of sailing round the southern coast of Tasmania became apparent to early mariners and requests for a lighthouse in the vicinity came from many ships' masters. Construction of a lighthouse commenced in January 1890 and over the next 18 months an entire settlement was built at a total cost of £15469. The tower was built of rendered red Oyster Cove brick with floors of slate, quarried at Mintaro in South Australia. Chance Brothers of Birmingham were contracted

to provide the prisms, made up of 540 separate pieces of hand-ground glass. They also provided the lens clock mechanism, driven by weights which had to be wound up every 45 minutes, as well as the upper works of the light which in 1890 cost a total of £3672. By 1986 it was valued at $1 million and today is irreplaceable. The Master Warden of the Hobart Marine Board, Captain T.M. Fisher performed the opening ceremony on 1 June 1891 with the tower decked out for the occasion with flags.

Maatsuyker Island is a haven for wildlife. There are no introduced mammals such as rabbits, cats or rats and no snakes. The Australian fur seal ("Sammy", left) is making a comeback on the island after near extinction and below our windows, on Needle Rocks, their barking sometimes made us think that there was someone shouting. On the other side of the island, at Haulage Cove, we were able to watch the seals at close quarters, disporting themselves in the water, or lying somnolently on the rocks or on the remains of the haulage platform. Occasionally one would bark, or give a wheezy cough and there was frequent snarling at each other. The only other mammal on the island, the tiny antechinus or marsupial mouse, is shy and retiring and is rarely seen. The males have a short life. Following mating they usually drop dead from exhaustion!

Migrating from the Bering Sea, an estimated 800,000 short-tailed shearwaters breed in burrows on the island. The beating of their wings and their cries, like inane laughter, fill the air at dawn and dusk. The single chick from each pair grows fat over the summer months but is eventually abandoned when the adults commence their return north in April. Unable to get food for themselves, the chicks go on a starvation diet. However, they soon get their adult plumage but their attempts at learning to walk and then to fly make them vulnerable to the predations of an increasing number of birds of prey. Those that survive follow their parents north about 6 weeks later. Sharing the same burrows as the short-tailed shearwaters were 6 pairs of soft-plumaged petrels previously thought to breed only on the sub-Antarctic islands off New Zealand.

A dense canopy of small trees, predominantly twisted and gnarled *Leptospermum scoparium* and *Melaleuca squarrosa*, prevents light from reaching the dank rain-forest below. In the dimness, tall tree ferns spread their umbrella-like fronds amid thickets of native laurels while down at ground level a mass of smaller fern species jostle for attention amid swathes of *Dianella tasmanica* with their plump purple berries. Less attractive is the razor-sharp cutting-grass tangled amongst the undergrowth. Near the summit, a stand of *Eucalyptus nitida*, or Smithton peppermint, pushes towards the light with their splayed multiple trunks. One tree has become known as the Keepers' Tree, where successive light-keepers have placed plaques to record their presence on the island. A favourite with the birds is *Pittosporum bicolor* - the freshly-painted white light-tower was soon stained with the dark red juice and seeds from its fruits. The cerise-pink berries of *Cyathodes juniperina* also make a brilliant splash of colour amid the green, with some plants reaching about 3 metres in height. In more open areas there are large clumps of multiple-stemmed orange *Blandfordia* and pink *Stylidium* trigger plants. Pink or white *Epacris* and the papery *Helichrysum* in white and yellow are dotted amid the luxuriant undergrowth. Down toward the cliff-top the wiry wind-pruned coastal scrub hides the insignificant green *Correa* bells and in the few open areas, clumps of native grasses bend their stalks to the prevailing winds.

Sheep and cattle were once kept on the island for food. Even wallabies had been introduced in the hope that they would proliferate and provide a change of diet. However, they mysteriously disappeared, whether through natural means or into a keeper's pot, it is not known! Vegetables, on the other hand, have survived the harsh climate. Maatsuyker's garden still produces the original variety of potato, though it is often a battle with the elements to produce other vegetables. Many of Tasmania's light stations were demanned in the 1980s but a public outcry kept Maatsuyker operating till 1997. The old lighthouse has now been deactivated and a new automatic light operates from a 'tupperware' beacon further up the hill. The island has been a weather observation station since the 1890s with the unique advantage of being able to observe the weather before it reaches the Tasmanian mainland. Six times a day, every three hours from 6am till 9pm, we sent weather reports back to the Bureau of Meteorology in Hobart.

Our life on the island gave us the rare opportunity to observe nature at close quarters. To our south west we could hear the barking of the seals on the Needle Rocks. The cheeky currawongs chortled at us from their vantage point on the eaves while green rosellas shrieked 'tussick tussick', swooping below us. In the thick, entwined branches of the tea-tree and *Melaleuca*, the smaller birds twittered their evening song. The Shearwater rookery had become strangely silent. The adult birds had left, leaving their chicks behind to fend for themselves. As dusk fell, the mountains to our west became sharply etched against the last of the setting sun. Later, a myriad of twinkling stars pierced the velvet sky and the lights of the Aurora Australis often arched pulsating beams across the southern horizon.

On Maatsuyker we felt quite remote from the 'real' world, at one with nature and free from the hustle and bustle of 'civilisation'. We wished that our remote island life-style would go on and on ...

And to our surprise, it did. Only a few months later we found ourselves at the opposite end of Tasmania, on Swan Island! Swan Island is the first in a chain of islands stretching across Bass Strait from Cape Portland on the north east tip of Tasmania to Wilsons Promontory in Victoria. Only three kilometres off-shore, the waters surrounding the island have a dangerous reputation and the chart shows numerous rocks and shoals.

Matthew Flinders, salvaging the wreck of the Sydney Cove on nearby Preservation Island, named Swan Island after a chance comment by one of the survivors. However, on visiting the island with George Bass in the Norfolk on 1 November 1798 he remarked 'we found no indication of its deserving so respectable a name'. His informant probably mistook the native Cape Barren geese for swans.

On Swan Island, too, there is a light station (see photo to left). Governor Sir John Franklin, a nephew of Matthew Flinders, initiated the building of a lighthouse. He was making his final tour of the colony when he and Lady Jane Franklin visited in November 1843 and observed a team of convicts commencing to build the light tower and keeper's quarters. A notice in the Hobart Town Gazette on 2 December 1845 announced that "*a light is now and will continue burning ... on Swan Island*". The light is one of the oldest operating lights still in more or less its original form. Built of local stone, the whole structure is rendered inside and out and an unusual feature is the spiral staircase suspended off the central column, instead of off the tower wall. The settlement expanded when a second

house was built in 1850. This allowed the original house to become accommodation for the assistant keepers who, until that time, had been living in rude shelters or in the base of the tower where the smoke from their fires had been obscuring the lantern. Two more houses were built - a substantial brick dwelling in 1908 and a prefabricated fibro cottage in 1927. The original house was then abandoned and fell into ruins. The island had been continuously occupied by light keepers and their families for 141 years when the light was demanned in October 1986. The light is now powered, automatically, by solar panels which are designed to operate for 14 to 18 months without maintenance.

On Swan Island, too, from where I write this, our daily routine also includes sending weather reports to the Weather Bureau. The climate is milder than much of the Tasmanian mainland with averages in summer from 14°C to 20°C and in winter from 8°C to 13°C. Yearly rainfall is about 620 mm. In light keepers' lingo the island's name was Paradise, but Swan Island is not immune to strong winds and rough seas. Storms can batter the island from all directions and Banks Strait is notorious for its strong tidal currents and steep, breaking seas.

The island's 237 hectares are mainly low, undulating sand hills covered in coastal scrub. One report said that there is only one tree on the island – a macrocarpa pine about 17 m high. However, we regard the predominant species - *Acacia sophorae*, *Leptospermum laevigatum* and *Bursaria spinosa* also as trees. They sometimes grow to over 10 m. Over the spring and summer months wildflowers appear in rotation - yellow wattle, white tea tree, bright pink pigface and creamy *Clematis*. The shrubs are constantly pruned by the wind. The squat cushion or snow bush (*Calocephalus brownii*) with its smoky grey foliage is a stark contrast to the rich green foliage and white aromatic star-like flowers of *Leucopogon parviflorus*. In more open areas are varieties of native tussock grasses and sedges and extensive areas of spinifex and marram grass cover the dunes. The dunes are constantly moving and infiltrating the bush and the bleached remains of once living plants stand gaunt against the sky. In several areas sand-blows have cut a swathe through the island exposing the ancient bones of animals and birds and the calcified stems of once living plants.

On our island paradise, nature is as close as our front door. In spring a soft 'honk' warns us that the Cape Barren goose family is nearby. The gander and his mate are resplendent with their red legs, citrus green beaks and creamy head patch contrasting with the muted grey of their feathers. The gander stands guard, erect and watchful as we walk by while his mate and family of goslings crop the grass around the house. We murmur quietly to them as we pass and he returns to his feeding, content that no danger lies in our direction.

Further down the island little penguins and short-tailed shearwaters share the same rookery. After dusk the beach comes alive as penguins crowd ashore and make their way up through the box thorn and tussock grass on the sand dunes. Above, the air is filled with the silent winging of hundreds of shearwaters. A rush of air fans our cheeks as birds zoom

by, seemingly without direction, trying to locate their home burrow. The noise around us rises to a crescendo. We are reminded of George Augustus Robinson's comments of *"penguins screeching all night"* as we listen to the combined effects of the braying penguins and the maniacal laughing call of the shearwaters as they all settle in for the night. The activities of the welcome swallows, nesting under the eaves, are peaceful in comparison!

Swan Island was included on the Register of the National Estate on 27 March 1984 for its historic and natural significance. The historic interest centres around the lighthouse tower and the remains of some of the earlier buildings. The island itself is of natural significance as it is one of only two islands in Eastern Bass Strait containing substantial tracts of natural vegetation that has not been grazed. It contains a richer variety of plant species than other islands and supports a wide diversity of bird-life. There are also tiger snakes and various species of skinks and lizards. However, the impact of 'civilisation' is apparent. Goats were introduced to the island in the late 1980s and two of the original six are still on the island. Despite the inroads of myxomatosis, rabbits, which were introduced as a food in the early days, still proliferate. Weed species such as *Lycium ferocissimum* (African box thorn) and *Euphorbia paralias* (sea spurge) are also rampant.

The island passed into private hands in 1987 and is now operated as a low-key tourist resort known as Swan Island Retreat with accommodation available in the 1908 keeper's house. Here guests can experience the ambience of an earlier era but with the comforts of the present day. The eight white sandy beaches are interspersed with rocky headlands and over 20 km of 4x4 / walking tracks criss-cross the island. With access by light aircraft from Flinders Island, Launceston or Hobart you can leave the world behind and get away from it all on your own private island in less than an hour!

Erika Johnson, together with husband Alan, is currently Manager of Swan Island Retreat on Swan Island. Contact them on 63572211 for more details of the island's accommodation.

RURAL TREE DECLINE IN TASMANIA: A COMPLEX OF FACTORS

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INTRODUCTION

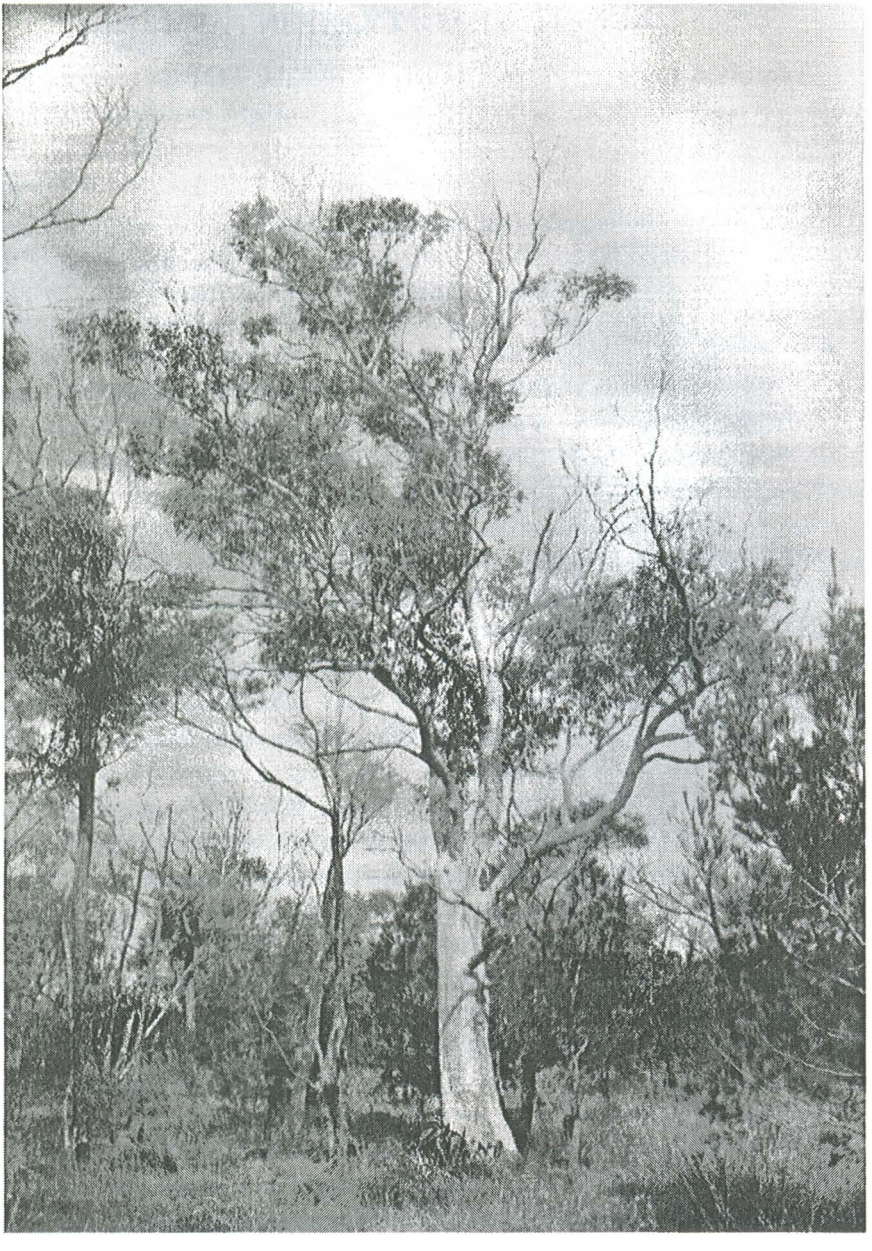
Rural tree decline (RTD) is familiar to anyone that has travelled the Midlands Highway in the last two to three decades. RTD is extensive: 52 000 ha were affected (predominantly in the Southern and Northern Midlands) at the time RTD was last surveyed in 1992 (Grice 1995). RTD was highlighted as an environmental and social issue in 1996 when John Burbury and Ray Norman painted the 'Red Tree' at Woodbury House. The Red Tree was burnt down in late 1996: the letters spelling out 'RED TREE' were erected in 1997, in part to signify that there was no tree left to paint red on the site (R. Norman pers. comm.). Why should RTD be a concern? Trees in agricultural landscapes perform a number of functions: they prevent and ameliorate salinity; alleviate wind and water induced soil erosion; maintain tree species genetic diversity; provide habitat and therefore biodiversity; and provide shelter to crops and livestock.

At the individual tree scale, the symptoms of RTD are a thinning of the crown beginning at branch ends and progressing towards the trunk. Dead branches then typically protrude from the reduced crown (see photo, next page). Subsequent leaf growth generally arises from epicormic buds, giving a 'woolly' appearance, similar to the appearance of eucalypts regenerating after fire.

At a landscape scale, RTD is a symptom of current land management practices. Despite the efforts of the Tasmanian media at blaming one factor for causing RTD (e.g. "*Phytophthora*", "insect plagues", "possum plagues", "drought" and "desert-like" conditions) it is likely that a number of factors are involved. Agriculture in the Midlands has involved clearing the majority of native vegetation, cultivation of soil and the sowing and fertilisation of introduced pasture species. Thus the present environment is distinctly different from that in which most rural eucalypts currently suffering RTD, or remaining only as a dead 'skeletons', germinated and established. In this paper I will briefly describe some of the potential factors associated with RTD.

FACTORS ASSOCIATED WITH RURAL TREE DECLINE

Climate. Increased wind speed near ground level occurs as a result of vegetation clearing. Trees in natural stands experience less severe winds due to 'self-sheltering'



Eucalyptus viminalis in early stage of rural tree decline. Note dead branches protruding from reduced crown. Photo by Neil Davidson

relative to trees isolated in paddocks. Strong winds dry soils and may cause increased plant water loss through increased evapotranspiration. Winds also decrease the effective temperature through 'wind-chill' effects.

Average annual rainfall in the Midlands has been below the long-term average (552 mm yr^{-1}) in 20 of the last 25 years. During this time the average rainfall has been only 492 mm yr^{-1}. The pattern of rainfall has altered from a more even distribution to a pronounced dry period in late summer-autumn (Kirkpatrick *et al.* 2000) during the 'autumn flush'. Also, mean daily maximum temperature has increased by 1.5 °C between 1945 and 1995 (Kirkpatrick and Gibson 1999).

Ectomycorrhizal fungi. Symbiotic ectomycorrhizal fungal associations are critical for plant nutrient and water acquisition. Loss of understorey and tree cover, and cultivation and fertilisation decrease the diversity of soil ectomycorrhizal fungal communities (Tommerup and Bougher 2000). It has been shown that growth of eucalypt seedlings can be inhibited in soils from old grasslands that do not contain ectomycorrhizal fungi associated with eucalypts. Adding as little as 10% volume of soil from a healthy eucalypt forest resulted in normal eucalypt seedling growth (Ellis and Pennington 1992).

Nutrient input. Nutrient input, via fertilisation, nitrogen fixation from clover-based pastures, or from stock excrement deposited whilst camping under trees, induces increased nutrient uptake by trees. This increases the palatability of eucalypt foliage to possums and speeds up the life-cycles of herbivorous insects, increasing their population size and their ability to defoliate trees (Landsberg *et al.* 1990).

Pest-predator ecology. Removal of the understorey and partial tree removal decrease habitat for natural enemies of pest insects such as parasitic wasps and flies, predatory insects and birds. Possums attain unusually high numbers through feeding on nutritious pastures and crops. When these are not available the pressure on rural trees as a food source is great.

Soil water relations. Cloven-hooved livestock compact agricultural soils, particularly around trees where they shelter. Compacted soils have lower water infiltration rates and water holding capacities. Introduced pastures form a dense root 'mat' and compete vigorously for soil water. This may prevent water infiltrating to deeper parts of the soil profile. This contrasts to the tussocky nature of native grasses, with bare soil between grass tussocks that allows water infiltration.

Tree age. Many eucalypts suffering RTD may be old, having been left as shelter trees by settlers. Trees lose vigour and robustness to stress with increasing age. Natural

recruitment has been prevented through continual grazing by livestock. Thus, trees dying of old age are not being replaced.

Salinity. Soil salinity occurs over much of the region affected by RTD. However, salinity is likely a result of tree clearing, rather than a cause of RTD (in the majority of instances in Tasmania) as salinity is restricted to low-lying areas but RTD is not.

CONCLUSION

RTD is a symptom of a complex of ecological factors. In some instances (but not all) bush remnants, where livestock have been excluded and no further agricultural activity undertaken, have significantly improved in health and RTD has been reversed. This indicates the overarching effects of rural land use and perhaps also that the current climate is not playing a major role in RTD. In instances where 'fencing-off' has not been successful and where the landscape is denuded of trees, revegetation efforts are attempting to put some trees back into agricultural landscapes (Close and Davidson 2003; see photo to left). It is likely that revegetation will be the only way through which tree numbers can be maintained or increased in regions under agricultural land-use given the nature of the grazing enterprises where RTD occurs.

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MAMMAL TRAPPING IN REMNANT NATIVE BUSH AT KINGSTON BEACH, AN AREA USED FOR OFF-LEASH DOG EXERCISE

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INTRODUCTION

The northern end of Kingston Beach in southern Tasmania contains a narrow strip of remnant native vegetation between the beach and a housing suburb, south of Hobart on Tyndall Road. A range of weed species has invaded the native vegetation and the Kingston Beach/Browns River Coast Care group has undertaken a program to remove these weeds and replace them with local native species. At the request of this group I undertook two short trapping sessions early in 2003 to determine the presence of some mammal species in the area. A notable use of the area is that it is a very popular location for off-lead dog exercise.

SITE DESCRIPTION AND METHODS

The survey was undertaken at two locations. The first was located along the track behind the northern end of Kingston Beach. The vegetation in the southern part was dominated *by Eucalyptus globulus* with some *E. viminalis* and occasional *E. obliqua* over a tall (6-10m) understorey of *Acacia melanoxylon*, *A. dealbata*, *Banksia marginata*, *Bursaria spinosa* and occasional *Exocarpus cupressiformis*. There was a second lower (3-6m) sparse understorey of *A. melanoxylon*, *Cassinia aculeata*, *Goodenia ovata* and *E. globulus*. Ground cover was dominated by exotic and native grasses, *Lomandra longifolia*, *Pteridium esculentum*, *Coprosma* sp., *Dianella* sp. and *Carpobrotus rosii*. Grasses, *Lomandra* and *Pteridium* were more common on the dunes close to the beach. Traps were split between two large flat areas beneath the cliffs at this location. The vegetation of the more northern part had a ground cover dominated by *Rubus fruticosus* (blackberry, some recently poisoned), rock scree and *Gahnia grandis* growing in a depression that fills with water after rain. Some wet forest species were also present such as *Pomederris apetala* and *Olearia argophylla*. This location is frequently used for off-lead dog exercise.

The second location was along the northern edge of Browns River between the Christopher Johnson Memorial Park and the Kingston Beach Golf Course. The land sloped steeply down to the river, in parts attaining an angle of 45°. The vegetation was dominated by *E. globulus* with *E. viminalis* and *E. pulchella* over a tall understorey

of *A. melanoxylon, Exocarpus cupressiformis, Allocasuarina stricta, Banksia marginata, Bursaria spinosa, Acacia verticillata, Cassinia aculeata and Goodenia ovata. Allocasuarina* became more common towards the Kingston Beach Golf Course end. The ground layer was very open with exposed earth and rocks. *Lomandra longifolia* and *Pteridium esculentum* were the most common ground cover with native grasses interspersed. The water edge was dominated by *Poa* sp. tussocks, *Juncus* sp. and other wetland species.

Mammals were surveyed using cage traps (200x200x560 mm) baited with peanut butter sandwiches. A line of 12 traps were set for 3 nights (between 12/1/03 and 15/1/03, i.e. 36 trap-nights) in bush either side of the track behind the northern end of Kingston Beach. A line of 12 traps was set for two nights (between 28/1/03 and 30/1/03, i.e. 24 trap-nights) along the northern edge of Browns River between the Christopher Johnson Park and the Kingston Golf Course. All traps were closed each morning and re-opened each night to avoid potential disturbance to trapped animals from humans or dogs. Traps were also well hidden to avoid disturbance. All animals, with the exception of brushtail possums and rabbits, were weighed, and had their hind foot measured. Their sex and reproductive status was also recorded. All animals were released unharmed.

RESULTS AND DISCUSSION

Eighteen individual mammals were captured comprising five native species and two introduced species. The commonest native species was southern brown bandicoot *Isoodon obseulus* (2 at Kingston Beach, 3 at Browns River), followed by long-nosed potoroo *Potorous tridactylus* (3 at KB, 1 a BR). Single specimens of brushtail possum *Trichosurus vulpecula* and Tasmanian bettong *Bettongia gaimardi* were captured at Browns River, while a single velvet-furred rat *Rattus lutreolus* was captured at Kingston Beach. Of the introduced mammal species, black rat *Rattus rattus* was the commoner, with three captured at Kingston Beach (one twice) and two at Browns River. A single European rabbit *Oryctolagus cuniculus* was captured at Kingston Beach.

The number of native species captured was remarkable given the remnant nature of the bush, disturbance from nearby houses, the high level of dog and human activity and the low level of trapping effort. Whether more animals could occur in the area in the absence of this disturbance is unknown. Several female potoroos and bandicoots were trapped with signs that they were breeding or had recently bred indicating that they were resident in the area.

None of the species captured is considered to be rare or threatened in Tasmania. However, the Tasmanian bettong is now endemic to Tasmania, having become extinct on the Australian mainland early last century. Although the bettong is not threatened in Tasmania, it requires monitoring as most of its habitat is on private land. The long-nosed potoroo appears to be relatively common in the Kingston area as I have had high capture rates at Boronia Hill Reserve and at the Peter Murrell Reserve. The

public does not often see this species, as it prefers to forage and live where there is good ground cover, rarely venturing out into the open.

There are few other animals I would expect to trap in the area. I had hoped to trap eastern barred bandicoot, which is known to occur on and near the Kingston Beach Golf Course. Its numbers tend to fluctuate in relation to rainfall (Mallick *et al.* 1997) and it is likely that numbers were low at the time of the survey. Ringtail possums are also likely to occur in the area but are not normally caught in cage traps. I observed one dead on the road in Victoria Street, Kingston Beach in February 2003 and I have observed roadkills of this species on the Channel Highway. Pygmy possums may also occur in the area but specialised techniques are required to confirm their presence. Platypuses may be present in Browns River near the survey area, since they have been recorded further upstream near the Lea. Water rats also may also be present, as they are known to occur throughout the Derwent estuary. It is unlikely (although not impossible) that eastern quolls occur in the area as they are vulnerable to disturbance by dogs and humans and may require a greater area of habitat. No doubt a number of bat species use the area. These could be surveyed if a suitable and secure site could be found to set specialised traps.

Rabbits are very common throughout the area. It is very unusual to trap rabbits as they are very trap shy. Rabbits represent a significant problem for revegetation efforts. It would be impossible to eradicate them. Fencing could be used to protect areas to be revegetated. Black rats typically occur where there is disturbance to native habitat or in areas close to human dwellings. At the Kingston Beach site all rats were trapped in the remaining blackberry stands at the northern end of the trapping location. Removal of blackberries and a return to more native vegetation will significantly reduce their numbers but I expect they will always maintain a presence due to nearby human habitation and other disturbed areas. It is likely that house mice and the larger brown rat could also occur in the area, since both have been recorded in houses nearby.

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GALLS ON TASMANIAN WATTLES CAUSED BY RUST FUNGI - EVIDENCE FOR *FORMAE SPECIALES* OF *UROMYCLADIUM NOTABILE*

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SUMMARY

Rust fungi are host specific plant pathogens. One species of rust fungus may have a number of varieties or *formae speciales* which are specific to a different host plant. This account of the *Uromycladium* rust fungi on the black and silver wattle in Tasmania highlights that simple observations can detect evidence for *formae speciales* and this can explain irregular patterns of infection. This report also provides a general account of this little known group of fungi.

Figure 1. Many galls on an *Acacia mearnsii* tree which is almost dead.

INTRODUCTION

Stems, leaves and pods of *Acacia mearnsii* (black wattle) and *Acacia dealbata* (silver wattle) can become disfigured by large brown galls. In some areas of Tasmania, the galls are in high numbers and can cause death of the trees (Figure 1). Some locals affectionately call them "poo" trees! The chocolate brown colour is caused by fungal spores.

WHAT CAUSES THESE GALLS?

Rust fungi are a group of obligate plant pathogens from the Division Basidiomycota. The rust fungi, numbering some 7000 species in about 130 genera, attack an extremely wide range of hosts, including ferns, Gymnosperms and mono- and dicotyledonous Angiosperms (Moore-Landecker, 1990). The *Uromycladium* rust genus that is associated with gall formation of wattles consists of seven species: *U. tepperianum*, *U. notabile*, *U. alpinum*, *U. simplex*, *U. robinsoni*, *U. bisporum* and *U. maritimum* (McAlpine, 1906). The *Uromycladium* disease produces a variety of symptoms such as leaf and phyllode pustules, and may lead to the eventual death of the plants.

U. tepperianum and *U. notabile* are the only species that induce the formation of large galls on their host plants. These are the two species found on Tasmanian wattles. They can be distinguished only by the pattern of their sexual spores (teliospores) as shown by Environmental Scanning Electron Microscopy (ESEM) in Figure 2. The teliospores of *U. tepperanium* have fine lines on the surface while those of *U. notabile* have warts on the spore surface. These features are apparent under a light microscope, but not as distinctly as by ESEM.

Figure 2. Scanning electron micrograph images of teliospores.
Left: *U. tepperianum* (*A. verticillata*, Port Arthur).
Right: *U. notabile* (*A. mearnsii*, Sandy Bay).

During surveys, *U. notabile* was the only species found on *A. mearnsii* and *A. dealbata* trees in Tasmania and this supports previous studies showing that a number of *U. tepperianum* genotypes could not infect these *Acacia* species (Morris, 1987).

IRREGULAR PATTERNS OF GALL FORMATION BY *U. NOTABILE*

U. notabile is capable of infecting and initiating gall formation on both silver and black wattles, but an irregular pattern of gall distribution on these two *Acacia* species was observed during a survey of eastern Tasmania (where these *Acacia* species are mainly found). Sometimes both species of wattle were found growing closely together but only one of the two species was infected (Figure 3). Only in one case were both

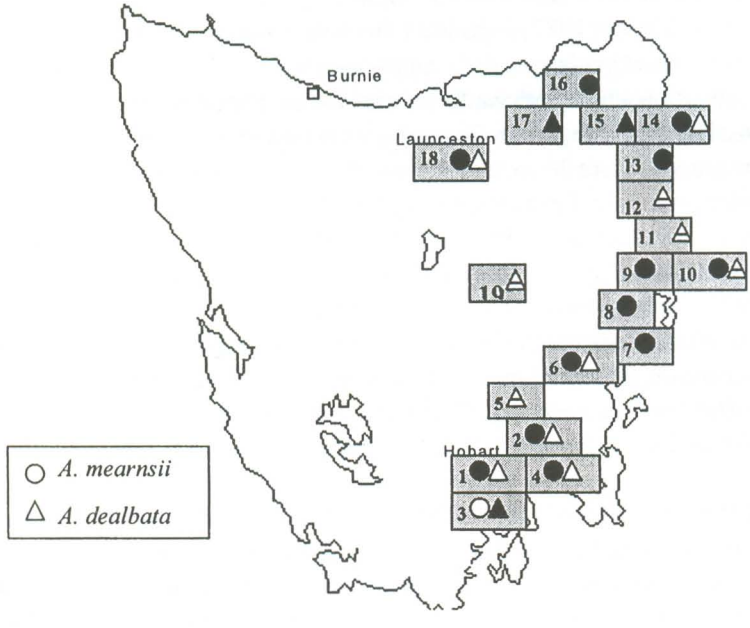

Figure 3. Observations of *U. notabile* infection on *A. mearnsii* and *A. dealbata* in eastern Tasmania. Shaded shapes: galled trees; unshaded shaped: nogalls ; striped shaped: some minor evidence of galling (e.g. less than 5 galls). 1. Sandy Bay, 2. Risdon, 3. Oyster Cove, 4. Clifton Beach, 5. Black Charlies Opening, 6. Buckland, 7. Orford, 8. Little Swanport, 9. Swansea, 10. Freycinet Peninsula, 11. Bicheno, 12/13. near Gray, 14. St .Helens, 15. Goulds Country, 16/17. near Lottah, 18. Launceston, 19. Kempton.

species infected in close proximity (Freycinet Peninsula). As the fungus produces many infectious spores, if a neighbouring tree was susceptible to the fungus, it would surely also become infected.

This irregular distribution pattern is probably explained by host specific "*formae speciales*" of *U. notabile*. Rust species that attack more than one host species are sometimes divided into more specialised categories, designated "varieties" and "specialised forms" by use of the Latin *formae speciales*. Slight morphologic differences, such as variation in spore sizes, have been described for various *formae speciales* but this variation is generally not a good basis for identification. Identification of *formae speciales* is best made by determination of host specificity. *Formae speciales* have been recorded for *U. tepperianum* by Samuel (1924) and Burges (1934) on a variety of hosts. Samuel stated that this suggests that the fungus affecting each host is not cross-inoculable to the other, although the fungi are morphologically identical in every respect. Morris (1987) supported this with cross-inoculation experiments and found three distinct genotypes of *U. tepperianum*.

In the situation where both wattle species were infected in close proximity (Figure 3) it is possible that both *formae speciales* were probably present. Given the concept of *formae speciales* and dispersal patterns of rust fungi, it is strange that this situation was not more common. For example, at sites 14, 15, 16 and 17 one or the other wattle species was infected, but never both. While these sites were reasonably distanced, it reflects a patchy distribution of the *formae speciales*, rather than a localised distribution (as would be the case, for example, if the *forma specialis* that infects *A. mearnsii* was found in southern Tasmania and the one that infects *A. dealbata* in northern Tasmania). Superimposed on the variation in rust via *formae speciales* there is likely to be some element of host resistance (Barry, 1995). This may contribute to the reasonably patchy nature of infection.

OTHER ISSUES IN RESEARCHING *UROMYCLADIUM* SPECIES

Little research has been conducted on these species of *Uromycladium* since they were initially described by McAlpine (1906) and later by Burges (1934). Morris (1987) investigated host specificity so that the fungus could be used as a biological control of weedy *Acacia* species in South Africa. Interestingly, this introduction was later criticised for the disfiguring conditions that resulted on the trees. In New Zealand, the fungus prevented wattles being established as a commercial industry (Ken Old, personal communication). More recently, *U. tepperianum* infections on *Paraserianthes* (a shade tree grown over coffee crops in East Timor, and a close relative of *Acacia*) have become a concern as trees are likely to die from the disease (Cristavo and Old, 2003).

One difficulty of conducting research on rust fungi is that they are extremely difficult to culture *in vitro*. This limits the possibilities for molecular studies which require fungal material free of other contaminant fungi. Research conducted during the

study here attempted to extract fungal DNA from sterile gall tissue, but the high acacia tannin content interfered with the extraction and purification process (Barry, 1995). Interestingly, this researcher is now studying acacia tannins in quite a lot of detail!

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THE BIOGRAPHY BEHIND THE BIRD, NO 21: TASMANIAN THORNBILL *ACANTHIZA EWINGII* GOULD 1844

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INTRODUCTION

This Series deals with reproducing the original publication which announced the scientific naming of a bird, and at the same time, serves to commemorate an individual who has made a contribution to Australian ornithology. Each contains a brief biography of the person so honoured. Approximately 90 species of Australian birds perpetuate the names of our naturalists in this way. *Acanthiza ewingii* is Tasmania's own - one of the State's twelve endemic bird species. It is therefore fitting that this piece, the 21st in the Series, be published in *The Tasmanian Naturalist*.

NAMING THE BIRD: TASMANIAN THORNBILL *ACANTHIZA EWINGII*

Acanthiza a thorn brake G.; *ewingii* after the Reverend Thomas James Ewing (1813? -1882), Church of England clergyman, with an interest in natural history, and a friend of John Gould (1804-1881). *"This species of* Acanthiza *is a native of Van Diemen's Land, and has been named after the Reverend Thomas James Ewing, a gentleman ardently attached to the study of Natural History, and a sincere friend to all who have the advantage of his acquaintance"* (Gould, 1848).

EWING, THOMAS JAMES (1813?-1882)

Thomas James Ewing, was born in Devonshire, England, and in 1831 was a scholar of Corpus Christi College, Cambridge. He arrived in Hobart Town in November 1833 and in 1837 married Louisa (née Were). He was admitted to Holy Orders in 1838, and in the same year became minister of St George's Church, Battery Point. In 1840 he was appointed chaplain of St John's, New Town, and headmaster of the Queen's Orphan Schools. The two separate schools for boys and girls were for orphans and for children of convicts (Hagger, 1966.)

In 1841 he was accused of imprudent behaviour with one of the senior girls. Although he remained chaplain of St John's, and was to act as chaplain of the Queen's Orphan Schools, he was relieved of his position as headmaster (Brown 1972, Datta 1997, Hagger 1966). Despite this slur on his character he apparently gave satisfaction in "*the discharge of his duties*" (Hagger, 1966).

The Reverend Ewing always had a lively interest in natural history, particularly ornithology. By 1834 he had contacted John Gould in England, and the two met for the first time in Hobart in 1838. Ewing taught Gould's son Henry, and the two families "*had*

Thomas James Ewing, 1813?-1882. Reprinted from Brown (1972).

a close and enduring friendship" (Datta, 1997). The two men corresponded for over three decades. Ewing was very useful to Gould in attending to his various Tasmanian business dealings. He also sent him bird skins, eggs and some mammals. Gould reciprocated by sending Ewing books for the public libraries in Van Diemen's Land, and personal items for his household. [This might be the place for a small correction to H.M.

Whittell's *The Literature of Australian Birds*, p.232. At no time did Gould stay with Ewing. After arriving in Hobart Town in September 1838 he lived in temporary lodgings with a Mr Fisher. As he became friendly with Sir John Franklin, the Governor of Tasmania, he moved at first into Franklin's cottage, then later as the friendship progressed, into Government House itself (Datta 1997)].

Between 1842 and 1863 Ewing published a review of Gould's *Birds of Australia*; a note on the occurrence of white-throated needletail *Hirundapus caudacutus* in Tasmania; three separate lists of the birds of Tasmania (Whittell, 1954); and a small amount of non-ornithological material. In addition to the Tasmanian thornbill, Ewing's name also survives in the race *ewingii* of the [non-Tasmanian] rose-crowned pigeon *Ptinilopus regina* and in the brown tree frog *Littoria ewingii*. An earlier name for the alga *Acanthiococcus ewingii* is no longer valid.

In 1846 Ewing was granted leave to visit his mother in England. He remained there with his family until 1848. On his return to Van Diemen's Land he resumed his duties. An outbreak of scarlet fever throughout the area in 1853 tragically led to the deaths of two of Ewing's five children. Ewing was to live in Tasmania for thirty years, finally returning permanently to England in 1863. He remained within the church, receiving the degree of Doctor of Divinity in 1864. He served as chaplain in Tattingstone, Suffolk (1868-70), and Postwick, Norfolk (1876-82) (Hagger 1966). The Reverend Thomas James Ewing died at Plymouth, Devonshire on 4 February 1882, aged 69.

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WEEDY SEADRAGONS AROUND TASMANIA: RESULTS OF THE *DRAGONSEARCH* COMMUNITY MONITORING PROGRAM

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SUMMARY

DragonSearch was started in South Australia in 1995 and subsequently established in Western Australia, Victoria, New South Wales and Tasmania. Volunteer divers, fishers or beachcombers were encouraged to report any seadragon sightings during the course of their normal activities. In Tasmania, a total of 248 records was collected over a 4.5 year period, describing 476 seadragon sightings from all bioregions except Davey. Over 70% of records were by divers in the Bruny bioregion, the most populated area, followed by Freycinet and Flinders. Non-breeding adults were sighted throughout the year, but males incubating eggs were sighted only between September and March. Juveniles were also sighted throughout the year but they appeared to peak between June and November. Most dragons were seen between 4 and 15 m depth, but one was sighted at a wreck site at 37 m. The most popular habitat was reef with macro-algae, particularly along reef edges abutting sand. Netting was perceived to be the most likely threat to seadragon populations. Although these data are from non-quantitative surveys by volunteers, they greatly add to our knowledge of weedy seadragons and the research gaps that need to be filled. In particular, they have identified some breeding populations close to population centres that may need protection.

INTRODUCTION

Seadragons are spectacular fish found only in southern Australian waters. These fish belong to the Family Syngnathidae, along with seahorses, pipehorses and pipefish. The characteristic features of Syngnathids are the bony plates that are fused into a 'tube-snouted' mouth, so that they can only feed on very small animals that they have to suck into their mouths. Of more than 200 species world-wide, over 100 occur in Australia (Keith Martin-Smith, pers. comm.). There are only two species of seadragons, both of which are found in southern Australia: the leafy seadragon (*Phycodurus eques* Gunther) and the weedy or common seadragon (*Phyllopteryx taeniolatus* Lacepede). Both species are slow swimmers that rely on the many leaf-like appendages on their heads and bodies to camouflage them amongst seaweed (Edgar 1997; Connolly *et al.* 2002b).

Weedy seadragons have been recorded from Geraldton in Western Australia, along the southern Australian coastline, around Tasmania, and as far north as Port Stephens in New South Wales. Weedy seadragons grow up to 46 cm in length and adults are orange-red with spectacular, bright purple-blue bars on the neck and white spots and yellow markings on the head and body. There have been some unconfirmed sightings in Tasmania of leafy seadragons. The pattern of white blotches on the head of leafy and spots on weedy seadragons is unique on each fish and can be used to identify each animal (Connolly *et al.* 2002a and G. Collins pers. comm. respectively).

Seahorses, seadragons and pipefish are threatened globally by habitat destruction. An estimated 20 million seahorses are taken each year for traditional Asian medicines and for curios. The international trade in seahorses and pipefish involves more than 76 countries. Fortunately seadragons are not used currently for the medicine trade (Vincent 1996; Keith Martin-Smith pers. comm.). However seadragons are targeted for the aquarium fish trade. Keeping live seadragons is extremely difficult so collectors often target males with eggs, hatching out and selling the young. Removing these brooding animals from the wild populations may impact on local populations of seadragons. To our knowledge, no closed cycle, captive-breeding program has succeeded (i.e. getting a generation of captive-raised seadragons to breed) although seahorses are being bred commercially for both the aquarium and Asian medicine trades (www.seahorseworld.com.au). Seadragons have a specific level of protection under fisheries legislation federally, and in most Australian states where they occur it is illegal to collect or export seadragons without a permit. In Tasmania, it is illegal to collect without a permit or intentionally harm any syngnathid species. The weedy seadragon is listed by the World Conservation Union (IUCN) as 'data deficient' since insufficient data are available to assess its status. Since most research on marine species is on commercial fish species, there is little known about any non-commercial species. However, there has been some work on the breeding processes at seahorse farms (unpublished) and Amanda Vincent has researched pipefish and a NSW seahorse (Vincent *et al.* 1995; Vincent & Sadler 1995) and received world recognition for her efforts to protect Asian populations of seahorses threatened by the Asian seahorse trade (Vincent 1996). Keith Martin-Smith, University of Tasmania, is currently researching the Tasmanian big-bellied seahorse *Hippocampus abdominalis*. The only work we know about on seadragons is that by Connolly and colleagues, who have studied the abundance and movement of leafy seadragons in South Australia (Connolly *et al.* 2002a & 2002b), and two MSc studies on weedy seadragons in Sydney. A further study is in progress in Tasmania by Marlene Davey, supervised by Keith Martin-Smith, investigating life-history parameters of the spiny seahorse and weedy seadragon.

Recreational divers and community recorders represent a large, virtually untapped resource for data collection. Increased awareness and involvement of local communities may encourage protection of both the seadragons and their habitat and help prevent

poaching of seadragons. With this in mind, the *Dragon Search* program was established to collect information about seadragon populations and habitat using community volunteers to record their sightings. *Dragon Search* was started in South Australia in 1995 and subsequently established in Western Australia, Victoria, New South Wales and Tasmania. The Program has provided valuable information on seadragons that may help to identify potential sites for no-take marine reserves. Reports from all states except Victoria are on the *Dragon Search* website. The Tasmanian *Dragon Search* program was run by the Tasmanian Marine Naturalists Association from August 1997. This paper analyses and discusses the seadragon sightings reported in Tasmania between 1998 and 2002.

METHODS

A standard Access reporting form and database were developed by the Tasmanian and the South Australian *Dragon Search* so that the data from all the southern states could be pooled for analysis of the national results (to be carried out by SA *Dragon Search*). The form recorded essential details of numbers of male, female and juvenile (< 20 cm long) seadragons of each species sighted, as well as date, location, dragon activity, method of sighting, sea conditions, depth, habitat type and other fish species sighted. Over four and a half years, *Dragon Search* Tasmania liaised extensively with recreational divers, dive clubs, dive shops and various community activities around the state to encourage community members to report sightings while diving, fishing or beachcombing. The surveys were not systematic over time or space so that the same fish may have been reported by several divers in the same group or at the same location on different occasions. This is a limitation of the data and makes quantitative interpretation difficult. With this in mind, the data have been pooled over all years, summarised using Access reports and queries, then graphed in Excel and the main trends discussed.

RESULTS

A total of 248 records was collected over the 4.5 year period, describing 476 seadragon sightings from around Tasmania in 211 separate sightings. Although two reputable sightings reported leafy seadragons on the north and north-east coast while one unreliable sighting reported a leafy seadragon in the southeast, no confirmation (photo or specimen) of these reports has been obtained. Therefore, these sightings have been combined with the data on weedy seadragons. The most prevalent sighting method was by daytime SCUBA diving (70%), with beach combing providing most of the remainder.

The number of seadragons sighted and sightings were surprisingly uniform throughout the year (Figure 1). At least 20 seadragons were sighted every month except for April. This indicates that the sightings did not seem to be biased towards any particular season.

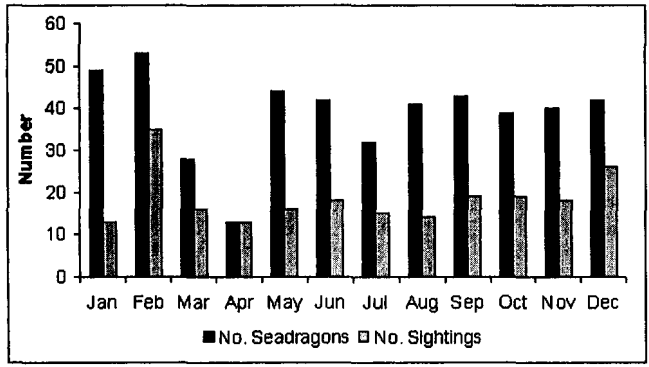

Figure 1. Seasonal occurrence of all seadragon sightings

Distribution. Seadragons were sighted in six of Tasmanian's seven main provisional marine bioregions: Bruny (Southport to Hellfire Bluff), Freycinet (Hellfire Bluff to Great Musselroe Bay), Flinders (Flinders and Cape Barren Island group), Boags (north coast), Otway (King Island group) and Franklin (west coast to Elliott Pt) with the vast majority (72%) sighted in the Bruny region (Table 1). The Flinders sightings were mainly beachcombing reports. The prevalence of sightings in the Bruny bioregion may be biased because a project officer was based in this region for the first two years of the project. This region is also densely populated and a focus of the Tasmanian diving industry.

There were 89 sightings of two or more seadragons (any combination of adults or juveniles). Twenty-one of these sightings were of five or more seadragons in one report (Table 2). The majority of these were in the Bruny bioregion, at just three locations, which may reflect favourite diving sites. However, it is notable that juveniles were also reported at all locations, particularly at the two Derwent Estuary sites. The sighting of 14 seadragons at Whitemark was a combination of beachcombing sightings over a four week period. Two of the sightings at Blackmans Bay included multiple brooding males (four and three). Only three sightings of multiple brooding males were recorded throughout the survey.

Breeding. The sex of the seadragons sighted was only reported for about half the sightings, with the ratio of females to males being 1.34 to 1. The two sexes are difficult to tell apart, especially if seen separately, except in the breeding season. The male

Table 1. Number of seadragon sightings in Tasmanian bioregions

Bioregion	Number of seadragons sighted	% of total seadragons sighted	Number of sightings	% of total sightings
Bruny	344	72	175	71
Freycinet	54	11	35	14
Flinders	48	10	14	5
Boags	23	5	20	8
Otway	3	1	2	1
Franklin	4	1	2	1
Davey	0	0	0	0
Total	**476**	**100**	**248**	**100**

Table 2. Sightings of groups of five or more seadragons

Location	Number of sightings	Number of seadragons sighted (adults/juveniles)
Whitemark	1	14/0
Lady Barron	2	6/0, 0/8
Blackmans Bay	8	13/3, 9/0, 12/0, 7/3, 6/1, 5/0, 4/1, 4/1
Kingston	5	13/6, 10/10, 0/7, 3/2, 0/6
Waterfall Bay	3	9/1, 5/0, 5/0
Bicheno	2	7/1, 3/10

'weedy' has a narrower body depth than the female and, when mature, the ventral portion of his tail becomes deep red and modified for carrying the fertilised eggs while he incubates them (Edgar 1997). It is not known how long the eggs remain incubating on the tail. However, it must be for a reasonable length of time because some egg batches are free of growth while others have noticeable growth of hydroids and seaweed on them (JE pers. obs.). The 24 sightings of brooding males started in September, peaked in December then tapered off, indicating that the breeding season is distinctly seasonal in Tasmania (Figure 2). In NSW and WA brooding males were first recorded in July and in SA in August, with no more seen after January (Dragon Search website). This supports the suggestion that there is only one breeding a year, triggered by increases in water temperature. Water temperature was recorded for 17 sightings in Tasmania, and ranged from 12°C to 19°C, averaging 14.2°C. However the lowest temperature recorded when brooding males were sighted was 13°C, which suggests breeding may not commence in Tasmania until the water temperature has reached 13°C.

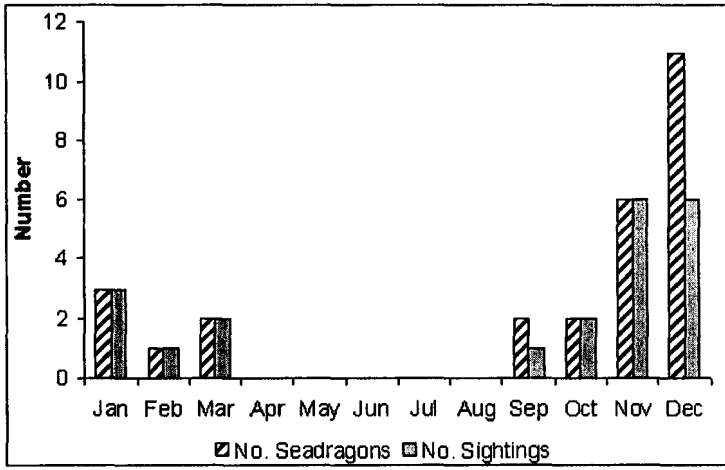

Figure 2. Seasonal occurrence of brooding male seadragons

The definition of 'juvenile' used for Dragon Search was anything smaller than 20cm length, and thus included hatchlings to sub-adult seadragons. There were 82 juvenile

seadragons sighted, of which 18 sightings also included adult seadragons. On two occasions, groups of 6 and 10 very small juveniles were sighted, about 3 cm long (pers. comm. G. Collins). Sightings of juveniles were very irregular but generally peaked between June and November then declined to March (Figure 3). The main peak of brooding males was in December, suggesting that hatchlings take about 6 months to reach a size that can be noticed by divers (about 3 cm). It is also possible, since hatching has never been observed in the wild, that the males swim offshore for the hatching and the hatchlings spend the first 6 months on offshore reefs to reduce chances of predation. This has been recorded for some tropical fish species. Recording the size of juveniles sighted would give more precise information on their times of hatching and development.

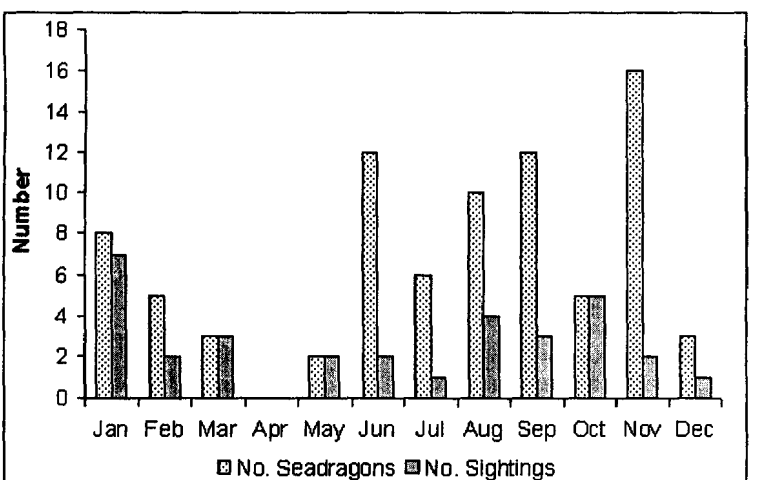

Figure 3. Seasonal occurrence of juvenile seadragons

Habitat. The majority of seadragons (58%) were sighted on reefs or in seaweed, including giant kelp (*Macrocystis pyrifera*) (Figure 4). Many of these occurred on the reef edge where there is a rock shelf bordering sand, or seagrass meadows (JE pers. obs.). The next most frequent habitat (13%) was sand. Other states also found that reefs and macro-algal sites were the most frequent habitats, and noted the low occurrence on seagrass. This analysis of the major habitats was not biased by the frequency or seas-

onality of surveys. However, it could be influenced by the choice of dive sites, since divers most frequently swim over reef habitats. The depth of the most frequent sightings (3 – 6 m) corroborates that reef and seaweed are favoured habitats because most seaweed grows at these depths. Generally *Macrocyctis pyrifera* or *Ecklonia radiata* are the dominant seaweeds in Tasmania that grow at depths of 15 - 20 m, where most of the remaining sightings occurred.

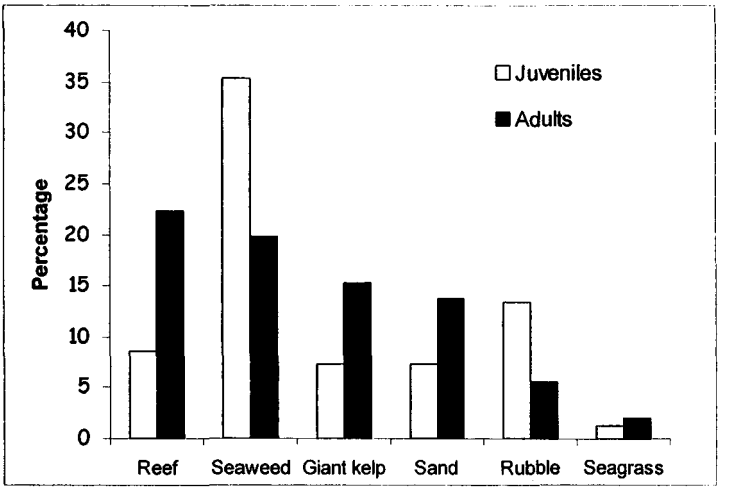

Figure 4. Percentage of different habitats frequented by seadragons

Depth. Sightings decreased more or less steadily from a peak at 4 metres depth with most dragons being recorded in the first 15 metres (Figure 5). The deepest recorded seadragon at 37 metres was on a wreck on the Tasman Peninsula. These data are heavily influenced by the preferred diving depth of most recreational scuba divers.

Threats. The threats identified are summarised in Figure 6. Netting was the most frequent threat identified for most population sites, particularly on the Tasman Peninsula. It may be significant that the largest populations were found in the Derwent estuary where netting is prohibited. A stormwater outlet threatens one important population in the Derwent Estuary. Recreational fishing and collecting by line, snorkel and scuba threaten other populations in the Derwent. The site where the gas pipeline and power

cable cross the north coast of Tasmania near Georgetown may threaten a population there. Illegal collection of seadragons for private aquaria is considered to be a potential threat wherever seadragons are found.

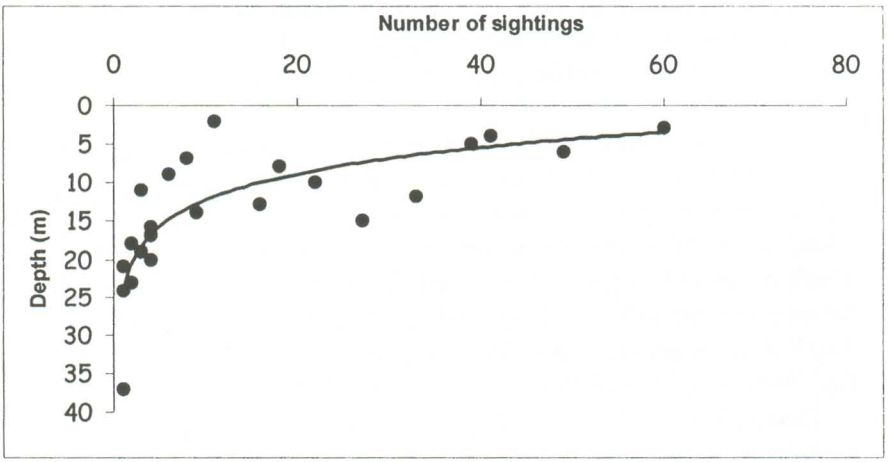

Figure 5. Frequency of seadragons at different depths

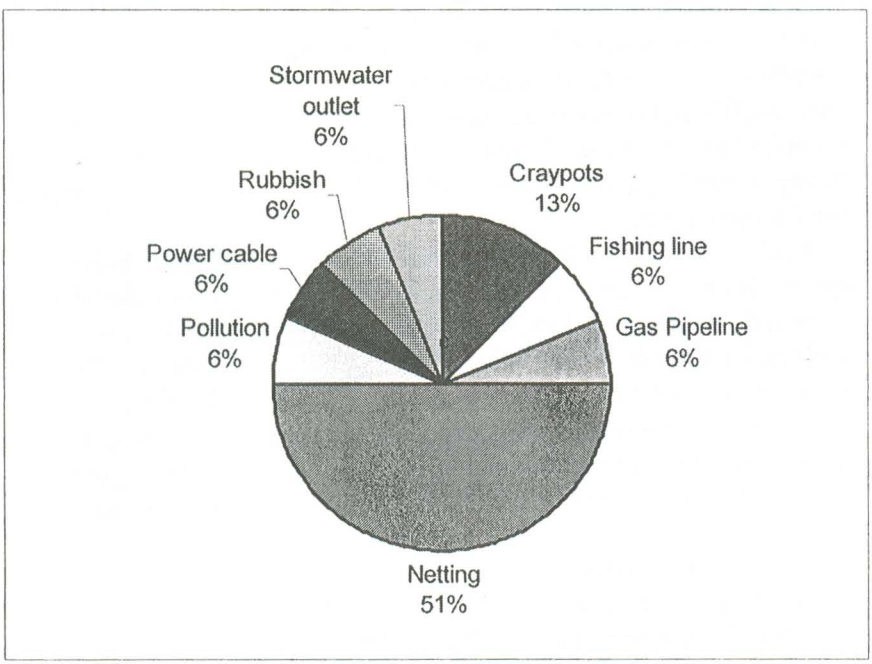

Figure 6. Perceived threats to seadragon populations

DISCUSSION

Data obtained by voluntary surveys, such as Dragon Search, have their limitations. The numbers of surveys are strongly influenced by the frequency of visits to particular areas, so that a few seadragons living near popular dive sights will be reported frequently. Thus, location data need to be interpreted with caution. However, total numbers sighted on any one occasion can give a truer indication of the population at a particular site. Seasonal data can also be biased because more people dive and beachcomb during the warmer months.

The surveys do not include an estimate of area covered so we cannot estimate population densities at those locations. However, the majority of seadragons were sighted singly or in pairs. The exceptions were during mating aggregations or when very young juveniles from the same brood were in clusters. Thus, the multiple sightings have mostly occurred during a dive that passed through a series of seadragon territories along the shoreline, each inhabited by one pair. This is quite possible during an average 60 min dive if weedy seadragon ranges are similar to leafy seadragon territories, which range from 35 to 82 m of shoreline (Connolly *et al.* 2002a).

Dragon Search has significantly increased the amount of information on weedy seadragons in Tasmania. However there are still a lot of gaps in our knowledge. More detailed surveys and observations of the breeding biology need to be done, such as how many batches of eggs per season females lay, and how long eggs and juveniles take to develop. We need to know more about the home range of the dragons and distances they can migrate, to understand the potential for recruitment of depauperate populations. Surveys of the Davey bioregion, including interviewing of commercial fishers, should be conducted to determine whether seadragons are present in this region. Quantitative surveys could be carried out in selected areas of other bioregions to assess local population densities.

Finally, Dragon Search has demonstrated that the weedy seadragon is not a rare species, but it may be a threatened species because of its weak swimming ability and demand for the aquarium trade. Until we know more about their breeding and migration abilities, ways should be explored of protecting the demonstrated breeding populations at the three areas within the Bruny bioregion where multiple sightings of five or more seadragons occurred (Blackmans Bay, Kingston Beach and Waterfall Bay reefs). The best option would be to declare reasonable areas (several home ranges at least) as no-take marine protected areas to prevent fishing and poaching for the aquarium trade.

ACKNOWLEDGEMENTS

Thanks to Christian Bell, MCCN, for bringing Dragon Search to Tasmania. Thanks to the other Dragon Search project officers, Gary Myers and David Bell, to Simon Grove for assisting with the Access analyses, and to Keith Martin-Smith for helpful comments on the manuscript. Most of all, thanks to all the volunteer surveyors who provided the

reports for this study. Funding for Dragon Search in Tasmania was provided by Natural Heritage Trust grants through the Fishcare, Coastcare, Coast and CleanSeas and the Fisheries Action Plan programs.

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The Tasmanian Naturalist (2003) **125**: 54-56

BOOK REVIEW

The New Nature
by Tim Low,
Published by Viking: Camberwell. 378 pp.
ISBN 0 670 88466 9. RRP $29.95.

Reviewed by Bob Mesibov

The publisher's subtitle for this extraordinary book is '*Winners and Losers in Wild Australia*'. It's a misleading tag, on two counts.

Tim Low's earlier book *Feral Future* spelled out how non-urban Australia is being slowly and steadily transformed by exotic plants and animals, many of them deliberately introduced. *New Nature*, in contrast, focuses on cities, suburbs and farms, rather than 'the wild'. The key actors in the new book aren't 'losers', either. In *New Nature* you learn how native 'winners' are taking advantage of what we naively describe as 'environmental loss and degradation'.

Low rejects black-and-white distinctions like 'natural' and 'unnatural', instead asking 'What's actually happening in the Australia landscape?' The answers are unsettling. Some of our least appealing places (sewage plants, quarries) and practices (artificial waterholes, exotic tree plantations) are now critically important habitat and resources for a host of natives. It's not because their pre-European habitats are gone, either. In many cases it's clearly because what we're offering is better, and opportunistic natives couldn't care less about eco-political correctness.

Much of *New Nature* is taken up with nicely documented examples of this opportunism. Low is an experienced writer of popular science (he contributes a regular column to the quarterly magazine *Nature Australia*) and his style is light, but his arguments are backed up with many and interesting cases-in-point. Hundreds of them, all referenced in an appendix. This isn't a book to be read at a single sitting!

Another unsettling lesson is how native plants and animals have become weeds in their own land: noisy miners, koalas, *Pittosporum undulatum* and *Leptospermum laevigatum* come to mind. If you're inclined to explain native weediness with the complaint that 'We've upset the balance of Nature!', Low counters with 'Change prevails'. There never was a balance of nature and never will be. 'Balance' is a romantic myth. The truth is much more interesting: change, change and more change, even before European settlement.

New Nature covers the whole of Australia, and Tasmania isn't forgotten. From the following abridged list of Tasmanian items you can sense one of the book's strong points, irony:

· The rare velvety peppercress (*Lepidium hyssopifolium*) does particularly well in the shade of *Pinus radiata* and Monterey cypress.

· Barred bandicoots now require gorse and blackberry thickets to nest safely in populated areas.

· Lyrebirds, introduced here in 1934 to 'save them from extinction' on the mainland, are spreading through central and western Tasmanian forests, posing a significant conservation threat.

· The rare *Melaleuca pustulata* in eastern Tasmania is a paddock weed.

· The wonderful diversity of herbs in the Tom Gibson reserve at Epping Forest is maintained by sheep grazing.

There are some extraordinary ironies in nature conservation. Did you know that the Tasmanian Government decided in the 1960s to make Maria Island a wildlife sanctuary? That it released 766 birds and mammals on the island, including bandicoots, Bennett's wallabies, bettongs, brushtail possums, cockatoos, ducks, echidnas, emus, grey kangaroos, marsupial mice, pademelons, potoroos, pygmy possums, quolls, ringtail possums, rosellas and wombats? We all know how well the kangaroos have done, to their own detriment, and how unhappy some people become when the word 'cull' is mentioned. 'Maria today remains a mess', says Low. 'Matters might be improved by bringing in Tasmanian devils as predators, but the National Parks service has wisely lost its taste for translocation.'

This year I had a fine experience of *New Nature* irony myself, in a forest plantation near Sheffield. I sampled millipedes in two second-rotation stands of *Pinus radiata*. The pine blocks I sampled were established on abandoned farmland and have been under pine for 60 years, with clearfell-and-burn after the first harvest. Under the needle litter I found 14 millipede species, of which 11 were forest-dwelling natives found in the Sheffield area. Natives made up more than 80% of all the millipedes I collected. Want to conserve millipedes and other native litter invertebrates in a farmed landscape? Plant *Pinus radiata* next to those tiny, degraded bush remnants.

Perhaps the most controversial chapter in *New Nature* is one attacking the notion of wilderness, which Low labels 'an unhelpful idea'. He makes the familiar point that the contemporary understanding of wilderness is at odds with the reality of a landscape fashioned by pre-European Australians, and 'sails too close to the idea of *terra nullius*'. More importantly, he argues that 'most animals now live in humanised landscapes. A typical animal now lives in a paddock or a logged forest, whether it wants to or not.' If we want to experience a vigorous and healthy Nature, we need only enjoy the native flora and fauna that are doing so well around us.

'*The stories in this book*,' says Low, '*make little sense if viewed through wilderness-tinted glasses. Like computers, humans are probably wired to think in opposites – yes and no, good and bad, winners and losers, nature and culture, natural and art-*

ificial. The world isn't divided up like this, but our minds like to see it that way. "Wilderness" is a child of this dichotomous thinking, existing only as the opposite of something – us. We define it by what it is not, then imbue it with values considered wanting in our cities: purity, innocence, goodness. What we really need are concepts that put people and nature in the same picture. We need an ecological framework that acknowledges the central role played by Homo sapiens.'

BOOK REVIEW

Name that Flower - The Identification of Flowering Plants
by Ian Clarke and Helen Lee
Melbourne University Press

reviewed by Anna McEldowney

This useful book has been reprinted ten times and the latest edition is a result of a complete revision. Owners of previous editions had told me what a good book it was and we are grateful to MUP for providing the Club with a review copy.

One of the great stumbling blocks to plant identification can be the language of botanical keys - how many people have been discouraged by a description such as "more or less tomentose"?

The book begins with the basic structure of flowers and terminology of the reproductive structures before a short chapter on classification and nomenclature. Of particular value to the beginner is the chapter on the process of identification which sets out the process of cutting sections of the flower and how to interpret what you see - a great confidence booster!

One criterion for choosing the families for this book was that they include most of the common genera of South East Australia. For each family there is a description followed by the floral structure, spotting characters (easily observed characteristics of a group) and sample routes through commonly used keys. *Name that Flower* is designed to be used in conjunction with a key, although the standard Tasmanian key *The Student's Flora of Tasmania* has not been used in the sample routes.

I was impressed by the clear diagrams which illustrate the parts of flowers for representative genera within each family. These are supplemented by a short section of colour photos with accompanying descriptive details for each species illustrated. The final sections comprise the grasses and the lily, amaryllis, iris and orchid families.

The book concludes with a section on available CD-ROMs and websites. The comprehensive bibliography gives lots of sources of extra information while the glossary will help with all those botanical terms you can't quite remember.

This would be a very useful book for amateur or more experienced botanists, or for those who would like to be able to identify plants and need help with learning the language used in botanical keys.

The Tasmanian Naturalist (2003) **125**: 58-59

BOOK REVIEW

Citizen Labillardière: a naturalist's life in revolution and exploration (1755-1834)
By Edward Duyker
Miegunyah Press, Melbourne 2003

Reviewed by Julia Scott

Sooner or later the Tasmanian naturalist will encounter the name of Jacques-Julien Houtou de Labillardière. The abbreviation "Labill." appears after the names of such well-known plants as *Eucalyptus globulus* and *Epacris impressa*, and the genus to which the climbing blueberry (*Billardiera longiflora*) belongs has been named in his honour. His name is also remembered in the species names of organisms as diverse as the pademelon (*Thylogale billardierii*), the red-legged skink (*Ctenotus labillardieri*), ferns, mosses, native grasses, a lichen and a marine alga.

Labillardière was a naturalist on the d'Entrecasteaux expedition, which left France in September 1791 in search of the lost explorer La Pérouse. The expedition visited Tasmania twice, in April/May 1792, and in January/February of the following year, both times anchoring in Recherche Bay.

Edward Duyker draws on the journals of various members of the expedition to give a detailed account of Labillardière's excursions ashore, and his collecting efforts.

Although Labillardière's main interest was in botany, he also collected birds, and noted observations of mammals, crabs and lizards. His notes on the local inhabitants he encountered are a valuable source of information on the traditional lifestyle of Tasmania's aborigines.

The chapters on the expedition's sojourns in Van Diemen's Land will be of the most interest to the Tasmanian naturalist. However, a reading of the whole book will give a more complete picture of Labillardière the naturalist, from his early expeditions in the Mediterranean and Syria (which established his reputation as a botanist) to his later life in Paris, writing his works on the flora of Syria, New Holland and New Caledonia.

Edward Duyker's thoroughly researched study of Labillardière is both informative and readable. He includes intriguing asides (was the crew member Girardin really a woman?), but also carefully documents Labillardière's botanical work. There are detailed source notes, a comprehensive bibliography, and both botanical and zoological indices, as well as a general index. For the non-specialist, Duyker has provided glossaries of scientific and French terms.

Unfortunately, the page references for the Notes section in the indices are all one or two pages out. Also, the Notes are not indexed as exhaustively as one might have

wished. For example, the reference to Truganini on page 294 is not indexed; neither is the list of the place names sighted by Mourelle (p. 287), or the common names of all the animals and plants that are mentioned in the Notes. These shortcomings have only a minor impact on the overall high quality of the book.

As Tasmania prepares to celebrate the bicentenary of European settlement (in the year that the Tasmanian Field Naturalists' Club celebrates its own centenary), there is a growing interest in our early history, and the events leading up to settlement. The publication of this book is therefore timely, and it will be read with enjoyment by anyone with even a passing interest in Tasmania and its natural history.