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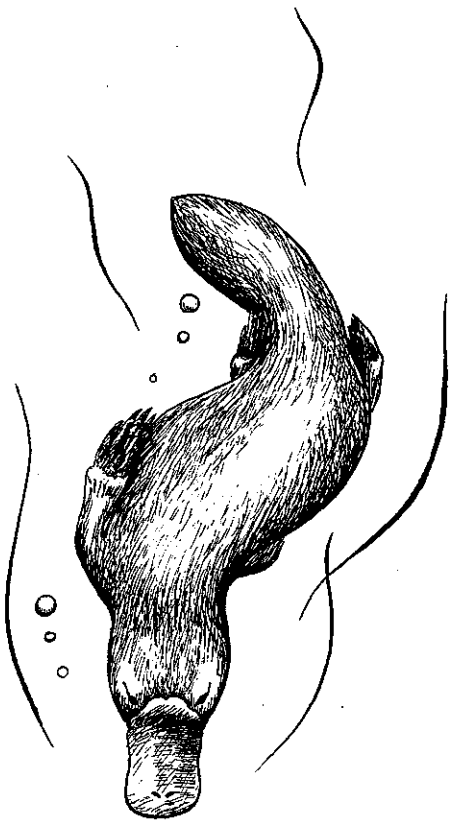

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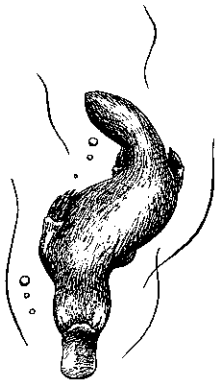

THE TASMANIAN NATURALIST

EDITOR: MARK WAPSTRA

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EDITORIAL NOTE

Mark Wapstra

Editor, *The Tasmanian Naturalist*

During 2010 I continued collating an index to, and scanning in articles from, the previous volumes of *The Tasmanian Naturalist*, later to be made available on the Club's web site. Amidst getting distracted by some very fascinating articles in times gone by, it occurred to me that the *Naturalist* has published articles on a wide diversity of topics.

This volume is certainly as diverse as previous ones. I always worry early in the year when there is a dearth of contributions not covering my desk or flooding my email and I think that I'm going to have to fill the volume myself with plant-related (probably orchid) articles and hope that no-one notices. But usually by the latter half of the year, I end up mildly panicky as the dearth turns to a slightly ovewhelming plentifulness.

I usually aim to have the contents reflect our readership, with scientific peer-reviewed contributions to short contributions (that I like to term "naturalist notes"). And I also try to make sure that the volume includes articles on a wide range of topics from the biological to the non-biological, the vertebrate to invertebrate, the vascular to non-vascular, the plant to animal to other entities! I don't usually get to pick and choose articles for inclusion but I am pleased that this year's volume has managed to end up as diverse as previous years and I thank all contributors wholeheartedly.

Volume 132 contains colour images with many articles. The club has received generous donations to support the higher cost of production from the Forest Practices Authority and Environmental Consulting Options Tasmania. Readers will also note a change in format from one to two columns and a few other changes throughout – I'd be interested to receive comments on what readers prefer (2009 or 2010) – please feel to drop the editor a note!

I wish you happy reading of this year's edition of *The Tasmanian Naturalist* – I hope there is something in here for everyone!

COLLECTION HISTORY OF *SENECIO PSILOCARPUS* (SWAMP FIREWEED) IN TASMANIA

Mark Wapstra

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SUMMARY

The collecting history of *Senecio psilocarpus* in Tasmania is presented. The species has been collected from six disjunct locations: Cressy (site of the first collection in 1943), Forth (1987), Flinders Island (unknown date), King Island (2007), Dukes Marshes (2008) and Mt William (2008).

While the species may meet the criteria for listing (as endangered) on the Tasmanian *Threatened Species Protection Act 1995*, a cautious approach to listing is suggested. As with many other species of recently recognised species of *Senecio*, familiarity is leading to additional collections. Potential habitat for *S. psilocarpus* (natural wetlands, farm dams, marshes) is still relatively common and the species appears to have a widespread distribution so range extensions and infillings are likely. However, the species technically meets the criteria for endangered on the Tasmanian *Threatened Species Protection Act 1995*, and is already listed as Vulnerable on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, and thus a conservative approach to conservation management within Tasmania is advocated.

INTRODUCTION

In recent years it has been difficult keeping abreast of the myriad of taxonomic and nomenclatural changes that have taken place within the southeast Australian (including Tasmanian) species of *Senecio* (e.g. see Thompson 2006 and references therein). There are now thirty-seven native taxa (including infrataxa such as varieties and subspecies) and four exotic taxa recognised in Tasmania (Buchanan 2009), which is significantly more than the eighteen recognised in *The Student's Flora of Tasmania* (Curtis 1963).

During the production of a State-based key to *Senecio* (Wapstra et al. 2008), which included a review of specimens held by the Tasmanian Herbarium, it became apparent that several species were represented by very few formal collections. Some of these are already recognised with a legislated threat status on the Tasmanian *Threatened Species Protection Act 1995* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. Most others have not been formally assessed against conservation status criteria since their recognition in the Tasmanian census. However, familiarity with the revised taxonomy by several field botanists, and re-examination of the collection held at the Tasmanian Herbarium by the author, is leading to a better understanding of the distribution of many species.

This present paper describes the collecting history of *Senecio psilocarpus* in Tasmania to alert field workers to the distribution and habitat of the species (with the hope of securing further collections). The opportunity is also taken to discuss the

reservation and conservation status of the species.

TAXONOMY, NOMENCLATURE AND IDENTIFICATION

Senecio psilocarpus was described by Belcher & Albrecht (1994) from mainland Australian material. The species was recognised as being most similar to *S. squarrosus* (which also occurs in Tasmania) and most earlier collections would have been recorded as that species. *S. psilocarpus* and *S. squarrosus* are readily separated on fruit colour and fruit indumentum, the former having shiny reddish-brown to brown entirely glabrous achenes, the latter having very dark to black puberulant achenes (Belcher & Albrecht 1994).

The species is most widely known as 'swamp fireweed' (Wapstra et al. 2005), a reflection of its habitat, but has also been referred to as 'smoothfruit groundsel' (TSSC 2008), a reference to the smooth glabrous achenes (the terms 'fireweed' and 'groundsel' are applied without too much discretion to species of *Senecio*).

Wapstra et al. (2008) provides a key to Tasmanian species of *Senecio*. Belcher & Albrecht (1994) and Thompson (2004) provide detailed descriptions of *S. psilocarpus*. The species is one of the more easily identified by a combination of habitat (low-lying poorly-drained sites), achene morphology (shiny reddish-brown to brown glabrous and smooth), habit (can develop long underground 'rhizomes' or decumbent stems that root at the nodes with stems arising from these horizontal structures to emerge above the surface of the water), appearance (leaves and stems virtually glabrous) and apparently the smell emanating from bruised leaves (carrot-like in *S. psilocarpus*; tomato-like in *S. squarrosus*).

COLLECTING HISTORY AND DISTRIBUTION IN TASMANIA

Senecio psilocarpus has only been collected six times in Tasmania (Table 1, Figure 1). Three collections pre-date the formal recognition of the species by Belcher & Albrecht (1994).

The first collection of *S. psilocarpus* in Tasmania was in 1943, by J.H. Wilson from a site "swamp" from "near Cressy" (annotation on HO411904), and was initially identified as *S. hispidulus*. No habitat details were provided on the collection but it is presumed to be from a poorly-drained site somewhere between Cressy and Launceston, which now comprises extensive areas of well-developed grazing and cropping ground. Interestingly, the same collector, on the same date, and apparently from the same site, also collected the first specimens of *S. campylocarpus* in Tasmania, a species only collected on one other occasion from the banks of the Elizabeth River in the heart of Campbell Town (Wapstra et al. 2006).

Figure 1. Distribution of *Senecio psilocarpus* within Tasmania (numbers correspond to those in Table 1)

Table 1. Collection details of *Senecio psilocarpus* in Tasmania

Site No.	Location [as per HO label]	Collector	Date	Tenure	Specimen	Extent Abundance
1	"Nook Swamps, **King Island**"	M. Wapstra	19 Nov. 2007	Lavinia State Reserve	HO547588	c. 5 x 5 m <50
2	"**Forth**, near road junction"	D.I. Morris	14 Dec. 1987	Private property?	HO410402	Unknown
3	"Near **Cressy**"	J.H. Wilson	Jan–Feb 1943	Private property?	HO411904	Unknown
4	"**Dukes Marsh[es]**, S edge, 250 m E of bridge"	M. Visoiu	8 Jan. 2008	State forest	HO548138	c. 0.1 ha 5–10
5	"200 m N of N entrance to Forester Kangaroo Drive, **Mt William**"	M. Visoiu	9 Jan. 2008	Mount William National Park	HO548139	c. 0.1 ha c. 5
6	**Pot Boil Lagoon**, Flinders Island	J. Whinray?	?	? Possibly from Logan Lagoon Conservation Area	MEL? [cited in Thompson 2004]	Unknown

The second collection of *S. psilocarpus* in Tasmania was by Dennis Morris in 1987, from "Forth, near road junction" from the "edge of [a] farm dam", and was initially identified as *S. minimus*. Examination of a topographic map suggests that collection was probably made from low-lying grazing/cropping ground, perhaps associated with drains or dams.

The third collection of *S. psilocarpus* was made by the author in November 2007, from the Nook Swamps on King Island. The collection was from a herb-rich poorly-drained grassland in a broad swale between stable sand dunes (burnt c. 2001). Collections were made but a comprehensive survey was not undertaken. Based on cursory field observations, the patch of the species was less than 5 x 5 m and comprised substantially less than 50 mature individuals.

During 2008, Micah Visoiu, during botanical collecting trips as part of the Millennium Seed Bank project, collected *S. psilocarpus* from Mount William National Park, from adjacent to a wetland in native grassland, and Dukes Marshes, from an herbaceous marsh (Plate 1).

The date of collection of *S. psilocarpus* from Pot Boil Lagoon on Flinders Island is not precisely known. The collection was cited in Thompson (2004), based on specimens sighted at the National Herbarium of Victoria (MEL), attributed to John Whinray (Thompson pers. comm.), but not yet formally databased. There is likely to be significant areas of potential habitat in the Furneaux Group, especially the lagoon systems of southern, central and eastern Flinders Island, and the tantalising possibility of several additional populations on the island (most of which would be in reserves) is highlighted to field workers.

RESERVATION STATUS

Senecio psilocarpus is only known from six widely separated locations but is relatively well reserved (Table 1). It occurs with

certainty in the Lavinia State Reserve on King Island, and from Mount William National Park in the northeast. The collection from Dukes Marshes is on State forest from within an area coded as "Protection Informal Reserve" under Forestry Tasmania's Management Decision Classification planning system (Orr & Gerrand 1998), meaning that the site is effectively reserved from wood production (and most other activities). It is difficult to assign tenure to other sites due to the low precision of collection information.

CONSERVATION STATUS

Senecio psilocarpus is listed as Vulnerable on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. At the time of listing, which was a continuation of the listing of the species on the preceding Commonwealth threatened species legislation, the species was only known from Victoria and South Australia. The species is also listed as vulnerable under the South Australian *National Parks and Wildlife Act 1972* and the Victorian *Advisory List for Rare or Threatened Plants of Victoria 2005* (TSSC 2008).

In Tasmania, the most closely related species, *S. squarrosus* ('leafy fireweed'), is presently listed as rare on the Tasmanian *Threatened Species Protection Act 1995*, which by virtue of legislative precedents means that *S. psilocarpus* is listed by default on the same Act. However, *S. squarrosus* is proving to be a widespread, locally common, relatively well-reserved, disturbance-phile such that its status as a threatened species is probably tenuous. As such, the status of *S. psilocarpus* in its own right needs to be considered.

The extent of occurrence of *S. psilocarpus* is c. 40,000 km^2, but this estimate is based on a minimum convex polygon that includes large expanses of Bass Strait. The area of occupancy is less than 5 ha, but this is based on limited surveys. There are likely to be substantial areas of potential habitat close to known sites. On present estimates, the total population of mature individuals is less than 100.

Senecio psilocarpus meets the criteria for listing as endangered, meeting criterion B (extent of occurrence realistically estimated to be less than 500 km^2), specifically, B1 (severely fragmented) and B2c (continuing decline in area, extent and/or quality of habitat); and criterion D (total population extremely small or area of occupancy very restricted), specifically D1 (total population estimated to number fewer than 250 mature individuals).

While the species may meet the criteria for listing on the Tasmanian *Threatened Species Protection Act 1995*, formally listing the species should be approached with caution. As with many other species of recently recognised species of *Senecio*, familiarity is leading to additional collections. Potential habitat for *S. psilocarpus* (natural wetlands, farm dams, marshes) is still relatively common and the species appears to have a widespread distribution so range extensions and infillings are likely. However, the species technically meets the criteria for endangered on the Tasmanian *Threatened Species Protection Act 1995*, and a conservative approach to conservation management is warranted.

DISTRIBUTION, HABITAT AND RESERVATION STATUS ON MAINLAND AUSTRALIA

Senecio psilocarpus occurs in western Victoria and southeastern South Australia (Belcher & Albrecht 1994; Barker et al. 2005; Thompson 2004), where it has a scattered distribution (Figure 2), known from approximately ten sites between

Wallan, about 45 km north of Melbourne, and Honans Scrub in southeastern South Australia (TSSC 2008).

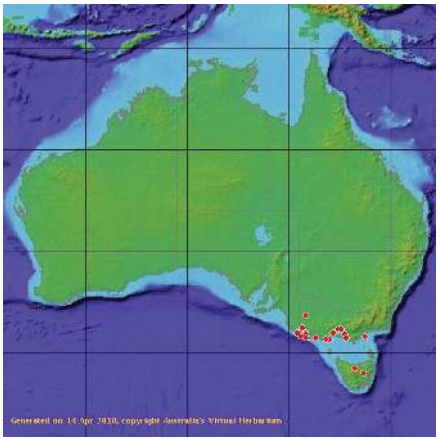

Figure 2. Distribution of *Senecio psilocarpus* within Australia (map generated from the *Australia's Virtual Herbarium*, 14 April 2010, does not show all Tasmanian collections held at HO)

On mainland Australia, *S. psilocarpus* occurs in high-quality herb-rich wetlands on plains. During winter such sites can be inundated with up to 60 cm or more of water, but are almost dry in summer. A tree canopy is absent from most sites, or rarely, *Eucalyptus camaldulensis* (river red gum) is the overstorey species in a woodland formation. The understorey is rich in grasses and sedges and miscellaneous aquatics. The more easterly populations grow in grey to black silty clay soils whereas the westerly populations grow on peatier soils (Belcher & Albrecht 1994; TSSC 2008).

In Victoria, most populations occur in small areas of less than 0.4 ha and only one occurs within a gazetted biological reserve, at Red Gum Swamp in Lower Glenelg National Park, near Drik Drik. Other populations occur within rail reserves, bushland reserves, state forests or uncommitted public land near Lal Lal, Casterton and Koroit. South Australian populations are at Honans Scrub and Piccaninnie Ponds, with the latter appearing to be within Piccaninnie Ponds Conservation Park (Belcher & Albrecht 1994; TSSC 2008).

THREATENING PROCESSES AND MANAGEMENT

On the mainland, the threats to *S. psilocarpus* are not entirely understood, but grazing pressure by both stock and introduced herbivores and weed invasion are considered to be the main threatening processes for this species. Other potential threats to the species include trampling by domestic stock and kangaroos and changed hydrology leading to salinity (TSSC 2008).

In Tasmania, threats to *S. psilocarpus* have historically been extensive land clearing of low-lying ground for the development of pasture and cropping lands, which included substantial modifications to many areas of natural wetlands. Contemporary threats to Tasmanian populations of the species are probably similar to those potentially operating on mainland Australian populations, although most of the known sites are not presently subject to stock grazing.

A warmer climate and longer periods of drought may deleteriously impact on the habitat of *S. psilocarpus*, through effects such as drying out of low-lying areas and competition with weeds.

Lack of knowledge on the distribution of the species is also a concern because many potentially suitable sites are probably subject to ongoing intensive primary production activities. It is likely that minor modifications to agricultural practices would result in a significantly higher level

of security for the species: as with most species of *Senecio*, some level of disturbance is acceptable, if not necessary, for persistence of populations. Small populations separated by long distances supporting unsuitable habitats are also not conducive to genetic exchange and potentially exacerbate the risk of stochastic events eliminating populations of *S. psilocarpus* in Tasmania.

DISCUSSION

Several Tasmanian species of *Senecio* are represented by one or few records including *S. extensus* (single highland record from 1984), *S. longipilus* (three records, only one from 1800s with details suggesting a lowland distribution), *S. georgianus* (single collection from 1800s), *S. campylocarpus* (two historical and one recent record) and *S. macrocarpus* (one historical collection).

Of the thirty-three native taxa (including infrataxa in this total), only one, *S. macrocarpus*, is currently formally listed as Extinct on the Tasmanian *Threatened Species Protection Act 1995*. It is represented by a single old record from northern Tasmania (South Esk River area close to Launceston/Perth). On the mainland, it typically grows in low-lying areas, and has been recorded from basalt-derived clay or clay-loam soils in grassland, sedgeland and woodland (Wapstra et al. 2008).

In the most recent version of *A Census of the Vascular Plants of Tasmania* (Buchanan 2009), only *S. tasmanicus* has been accorded the status of "extinct". This is a Tasmanian endemic but has not been recorded since the mid 1800s. The most likely habitat is lowland plains near swamps. *S. campylocarpus* was another species of low-lying swampy ground represented by only two records (from 1800s and 1943) that has only recently been "re-discovered" from the heart of Campbell Town (Wapstra et al. 2006). *S. longipilus*, represented by only one 1800s collection, is probably also a species of low-lying areas. Buchanan (2009) appears to have been appropriately hesitant in assigning the "presumed extinct" status in the case of *S. campylocarpus*. This may prove to be the case for many other species as previously unexamined or misidentified herbarium specimens are examined and new collections of *Senecio* are made from the State. It is certainly the situation with *S. psilocarpus* in Tasmania, with its geographically and temporarily widely separated collecting history.

Further collections of specimens of *Senecio* from poorly-drained low-lying terrain throughout Tasmania (particularly the northern Midlands, but also coastal hinterlands and Bass Strait islands) are needed to further clarify the status of *S. psilocarpus* and similarly poorly-collected and poorly-understood species of similar habitats. Targeted surveys of potential habitat radiating out from known locations are likely to be a productive method of detecting further sites.

ACKNOWLEDGMENTS

Wendy Potts provided the impetus for this paper by making me aware of the threatened status of *Senecio psilocarpus* on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, a fact that had hitherto escaped my attention. Ian Thompson confirmed the identification of *S. psilocarpus* from King Island. Richard Schahinger provided the logistics of the King Island survey trip. Micah Visoiu provided information on his collections of *S. psilocarpus*. Alex Buchanan (Tasmanian Herbarium) and Ian Thompson provided collection information for other sites. Tim Leaman provided information on the tenure of the Dukes Marshes site. Wendy Potts and

Lorilee Yeates provided useful commentary on an earlier version of the manuscript.

Plate 1. Specimen of *Senecio psilocarpus* from Dukes Marshes – note the multi-stemmed growth habit from the base of the plant

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THE STATUS OF *SENECIO GEORGIANUS* (GREY FIREWEED) IN TASMANIA

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SUMMARY

Senecio georgianus is represented by three formal collections from Tasmania, all prior to 1850. The Tasmanian collections bear scant locality and habitat information. On the basis of no Tasmanian collections for at least 160 years, *Senecio georgianus* qualifies as presumed extinct on the Tasmanian *Threatened Species Protection Act 1995*, and it is recommended that this status be formalised. The species is already listed as Extinct on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, because while apparently once widespread but nowhere common in southeastern Australia (New South Wales, Victoria), it has not been recorded for close to 150 years.

INTRODUCTION

The acceptance of the occurence of *Senecio georgianus* in Tasmania has an apparently confused history, although the reasons for this are unclear.

During the production of a State-based key to *Senecio* (Wapstra et al. 2008), it became apparent that *S. georgianus* should have been long-recognised as having been collected from Tasmania. No specimens collected from Tasmania are held at the Tasmanian Herbarium, which may explain the lack of inclusion of the species in the formal census of vascular plants collated by the Tasmanian Herbarium (Buchanan 2009).

This paper collates the collecting history of *S. georgianus* in Tasmania, describes its inclusion in various State floras, and discusses its conservation status in the light of the now-recognised collecting history.

COLLECTING HISTORY

Senecio georgianus has only been collected three times in Tasmania (Table 1).

Leigh et al. (1984) stated that "although there are no specimens [of *S. georgianus*] in Australia to verify the Tasmanian collections…a recent search by Filson (pers. comm.) has located in the British Museum the specimens of this species from …Tasmania…". Leigh et al. (1984) only cited the Brown and Caley collections, both from near Hobart. Leigh et al. (1984) did not make mention of a collection of *S. georgianus* by Gunn, which post-dates the Brown and Caley collections (Table 1).

The first collection of *S. georgianus* from Tasmania was by Robert Brown on 29 February 1804. Leigh et al. (1984) listed this site as "Derwent River near Risdon Cove", March–April 1804 (specimen held at BM). However, the Australian Virtual Herbarium indicates a Brown collection from 29 February 1804 (held at CANB), which is presumably a duplicate of the BM material.

The second collection of *S. georgianus* from Tasmania was by George Caley in 1805 (precise date unknown). Leigh et al. 1984) cites the location as "Agricultural Settlement, Hobart", which is presumably

Table 1. Collection details of *Senecio georgianus* in Tasmania

Site No.	Location (from herbarium label)	Collector	Date	Specimen Held At	Comments
1	"Derwent River near Risdon Cove"	Robert Brown	29 February 1804	British Museum (BM) Australian National Herbarium (CANB)	Leigh et al. (1984) indicated that there is no date on the collection held at BM (the date is actually shown as Mar – Apr 1804 on the sheet). The Australian Virtual Herbarium database, which also lists a collection of Brown from Tasmania, lists the collection date as 29 February 1804.
2	"Agricultural Settlement, Hobart"	George Caley	1805	British Museum (BM)	Caley was in Hobart at the end of November 1805 (Webb 1995).
3	"Van D.L." [=Van Diemens Land, now Tasmania]	R.C. Gunn	unknown	Royal Botanic Gardens (Kew)	This collection (GUN 701) was used by Joseph Hooker as the type of *Erechtites candicans* (Hooker 1847, and cited in Hooker 1858), which was later synonymised with *Senecio georgianus*.

from a similar area as the collection made by Brown.

The only other collection of *S. georgianus* from Tasmania was by Gunn. The date of the collection is not stated on the herbarium sheet but it must pre-date 1847 (which is when Hooker formally used the specimen to describe *Erechtites candicans* = *S. georgianus*). The location on the collection is simply given as "Van D.L.". This collection was cited by Thompson (2004, 2006) and at the time considered as the only Tasmanian collection of *S. georgianus*. Interestingly, Leigh et al. (1984) did not cite the Gunn collection.

Wapstra et al. (2008) cast some doubt on whether Gunn had collected *S. georgianus* from Tasmania, suggesting the collection may have been from one of his mainland forays. However, the Gunn 701 specimen clearly bears his annotations, including "Van D.L." (Plate 1), confirming the allocation of the collection to Tasmania.

RESERVATION STATUS

Due to the highly imprecise locality details associated with the collections of *S. georgianus* in Tasmania, it is impossible to determine its former reservation status.

TAXONOMY, NOMENCLATURE AND IDENTIFICATION

Senecio georgianus was described by Candolle (1838) from material collected by Alan Cunningham c. 1817 from Lake George in New South Wales. Joseph Hooker described *Erechtites candicans*, synonymous with *S. georgianus*, from material collected by Gunn from Tasmania. The species is most widely known as 'grey fireweed' (Leigh et al. 1984; Wapstra et al. 2005; DEWHA 2010), an allusion to the grey appearance of the plant from a cottony

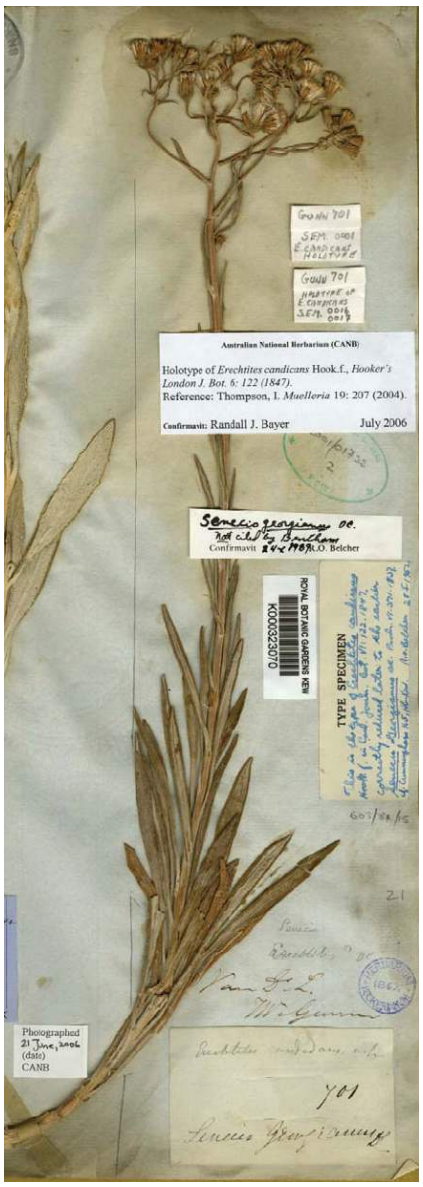

Plate 1. Specimen (Gunn 701) of *Senecio georgianus* collected by Gunn from "Van D.L.", date unknown [extract of image downloaded from Kew Gardens' website]

covering of hairs on the leaves and stem. It is also known as the 'grey groundsel', the terms 'fireweed' and 'groundsel' being applied without too much discretion to species of *Senecio*.

S. georgianus is generally included within the disciform or discoid group of *Senecio*. These species have non-radiate capitula (i.e. lacking ray florets, in which all the florets are bisexual (in disciform species the central florets are bisexual and the outer florets are female).

Based on limited available herbarium material, *S. georgianus* is an erect (30–80 cm tall) perennial herb. The stems are covered with appressed cobwebby hairs. Its linear- to lance-shaped leaves are 6–8 cm long, usually undivided and bases without auricles, the margins more or less entire or slightly toothed. The upper surface of the leaves is more or less glabrous or sparsely appressed-cottony and the lower surface is densely woolly. The capitula (flowerheads) are several per stem, with 6–10 calycular bracteoles (2–3 mm long), the peduncle not or only sparsely cobwebby at anthesis. The involucre is 5–7 mm long and about 2 mm diameter. The 12–14 phyllaries are glabrous and their apices recurved. The 25–40 florets are all bisexual. The achenes are narrow-obloid, 2.5–3.0 mm long, dark brown with papillose hairs in bands. The species appears to flower from late summer into autumn. Vegetatively, *S. georgianus* is probably most similar to the subalpine (and widespread) *S. gunnii*.

INCLUSION IN FLORAS

Hooker (1847) technically recognised the occurrence of the taxon in Tasmania, by describing material collected by Gunn as *Erechtites candicans* (= *Senecio georgianus*). Hooker later included the taxon (as *Senecio georgianus*, recognising de Candolle's nomenclature of 1838) in his *Flora Tasmaniae* (Hooker 1858) noting:

> "I have only one Tasmanian specimen of this very distinct species, but a great number of Australian [he listed the distribution as "south-eastern and south-western Australia: from subtropical New South Wales, Victoria, Adelaide, and Swan River"] ones (collected by Cunningham, Mueller, Drummond, Robertson, and others), from a comparison of which it appears to be a very variable plant, being either perfectly glabrous or more or less covered (even on the involucre) with a hoary tomentum".

Rodway (1903) in *The Tasmanian Flora* did not recognise occurrence of the species in Tasmania. Curtis (1963) in *The Student's Flora of Tasmania* similarly did not recognise the taxon. The exclusion of the species by both of these authors is surprising as in many other cases their floras were quite faithful to the much earlier work of Hooker.

Senecio georgianus was recognised as occurring in Tasmania in the *Flora of Victoria* (Walsh 1999).

The Tasmanian Herbarium's *Census of Vascular Plants* (Buchanan 2009) has never recognised the occurrence of *S. georgianus* in Tasmania.

CONSERVATION STATUS

Senecio georgianus is listed as Presumed Extint on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. The species is also listed as Presumed Extinct under the New South Wales *Threatened Species Conservation Act 1972* (DEWHA 2010) and the Victorian *Advisory List for Rare or Threatened Plants of Victoria 2005*.

In Tasmania, *S. georgianus* is currently not listed on the Tasmanian *Threatened Species Protection Act 1995*. However, on the basis of no formal collections from the wild for over 160 years, the species clearly meets the criterion for presumed extinct (Schedule 3.2), which states "a taxon of native flora or fauna may be listed as endangered because it is presumed to be extinct on the ground that no occurrence of the taxon in the wild can be confirmed during the past 50 years" and "for a taxon to be confirmed to have occurred in the wild during the past 50 years, there must be a verified specimen or a record of a sighting that is considered to be reliable".

The tantalising possibility that *S. georgianus* is extant within Tasmania is highlighted. The revisions to the taxonomy and nomenclature of *Senecio* in Tasmania (e.g. Thompson 2006), and the production of a State-based key to the genus (Wapstra et al. 2008), has already led to a reinvigorated interest and collection of *Senecio* by Tasmanian field botanists. Several hitherto poorly-collected species have already been re-discovered (e.g. *S. campylocarpus* – see Wapstra *et al.* 2006) or their distribution significantly extended by recent collections (e.g. *S. psilocarpus* – see Wapstra 2010, this issue). The persistence of several species of threatened flora in bushland remnants in and around Hobart, for example, gives hope to the possible re-discovery of *S. georgianus* in Tasmania.

DISTRIBUTION, HABITAT AND RESERVATION STATUS ON MAINLAND AUSTRALIA

Senecio georgianus occurs in southeastern Australia (Figure 1), including Tasmania, Victoria, and New South Wales (Thompson 2006).

Sources (e.g. Willis 1972; Leigh et al. 1984; Walsh 1999; DEWHA 2010) that indicate the occurrence of *S. georgianus* from South Australia and Western Australia are out-dated (I. Thompson, pers. comm.). Collections previously allocated to

S. georgianus from South Australia have been re-determined as *S. helichrysoides* and those from Western Australia as *S. barkhausioides* (I. Thompson, pers. comm.; Thompson 2006). Note that both *S. helichrysoides* and *S. barkhausioides*, like *S. georgianus*, appear to have highly localised distributions and have been rarely collected.

In Victoria, *S. georgianus* has been collected from the Clarence River, Macquarie River and Lake George (DEWHA 2010). In New South Wales, *S. georgianus* has been collected from Macalister River, Mitta-Mitta Range and Lake Omeo.

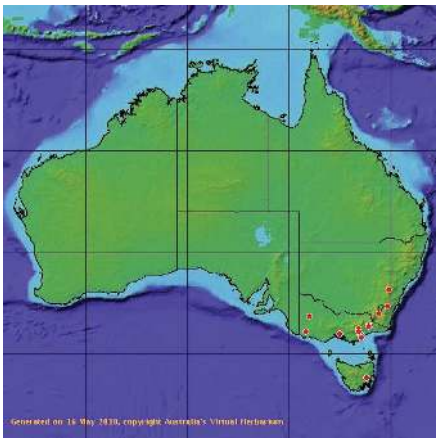

Figure 1. Distribution of *Senecio georgianus* within Australia (map generated from the *Australia's Virtual Herbarium*, 16 May 2010).

DEWHA (2010) states that "all collections are old (prior to 1900) except for Victorian collections which were made in 1972" and "Victorian populations, at the time were described as rare and localised". DEWHA (2010) sourced these statements from Leigh et al. (1984), which cited Willis (1972) as the source of their information. Willis (1972) did not actually make any statements regarding the dates of collection, simply stating the distribution as "rare and localized, on Macalister R. and at Lake Omeo)", suggesting that there have not been any recent collections of the species in Victoria.

On mainland Australia, *S. georgianus* is recorded as occurring in savannah grassland, undulating grassy eucalypt woodland, grassy subalpine ridges, and collections frequently occurred in association with major rivers and lakes (Leigh et al. 1984). The habitat within Tasmania is unknown.

THREATENING PROCESSES AND MANAGEMENT

On the mainland, the threats to *S. georgianus* are not entirely understood, but clearing and domestic stock grazing appear to have caused the local extinctions (DEWHA 2010). The historical collection locations on southeastern mainland Australia were resurveyed and all sites had been converted to pasture (Leigh *et al.* 1984).

In the absence of the precise collection locations of *S. georgianus* in Tasmania, it is difficult to ascertain causes of its presumed extinction. However, clearing of sites for primary production and human occupation are the most probable causes of habitat loss.

DISCUSSION

Senecio georgianus is one of several Tasmanian species of *Senecio* represented by a small number of historical collections. On the basis of existing information, it is suggested that the species qualifies as presumed extinct under the Tasmanian *Threatened Species Protection Act 1995*. The lack of information on potential habitat and likely sites in Tasmania means that the opportunity for re-discovery of extant populations of the species must be considered serendipitous at best.

ACKNOWLEDGMENTS

Wendy Potts provided the impetus for this paper by making me aware of the threatened status of *Senecio georgianus* on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, a fact that had hitherto escaped my attention. Ian Thompson provided information on collections of *S. georgianus* from mainland States. John Hunnex and Honathon Gregson (British Museum) provided images of their Tasmanian collections of *S. georgianus*. Lorilee Yeates and Wendy Potts provided useful commentary on an earlier version of the manuscript.

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THE GREEN-LINED GROUND BEETLE, *CATADROMUS LACORDAIREI*, IN TASMANIA

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SUMMARY

Pterostichines form one of the largest subfamilies of carabid beetles and are richly represented in Australia, particularly in the south and east (Moore 1965). The *Catadromus* genus belongs to this subfamily, and is made up of five species, all of which are widely distributed across the Australian mainland and are distinguishable from other carabids by their large size, (up to 65 mm) and characteristic black elytra outlined by brilliant green or golden metallic detailing.

Catadromus lacordairei Boisduval 1835, is an endemic Australian species occurring across all States and is also present on Kangaroo Island (Giachino 2005a). Regarded as common across its mainland range, in Tasmania, it is the only representative of the genus, with a distribution that is sparse, known only from a few locations. In 2005 the species was listed as rare on the Tasmanian *Threatened Species Protection Act 1995* and in 2008, following a review its status, was upgraded to vulnerable.

DESCRIPTION

Despite being the smallest representative of the genus, with a body length of 28–37 mm, *Catadromus lacordairei* are spectacular beetles. The species displays sexual dimorphism with males being the smaller. Adults are fully winged and the elytra are deeply etched with longitudinal striae, shiny black and outlined with striking metallic golden/green margins, which extend to cover the ventral surface on some specimens (Plate 1). They have filiform antennae consisting of 11 segments, the 4 basal segments being black and glabrous, whilst the 7 distal segments are ferruginous and densely pubescent. The mandibles are characteristically robust, strongly curved and capable of delivering a painful bite, if carelessly handled. Three other carabid beetle species within the size range of *Catadromus lacordairei* occur in Tasmania; however all are pure black (Plate 2) and flightless, have very different habitat requirements and cannot therefore be considered as confusing species.

ECOLOGY

Although *Catadromus lacordairei* is very widespread across the continent, little is known about its life cycle. The larvae are suspected to be edaphic predators, and it is thought that pupation also occurs underground; however, both larvae and pupae remain undescribed.

In Tasmania, adult *Catadromus lacordairei* are known to be opportunistic hunter/scavengers. They are usually located beneath ground debris, including decaying wood and stones, whilst some individuals have been found sheltering beneath sheets of roofing iron. They are also known to inhabit fissures in dry cracking soils. The species is largely nocturnal/crepuscular and actively pursues prey both on the ground

Plate 1. Dorsal (top image) and ventral (lower image) views of *Catadromus lacordairei*

Plate 2. Female Carabidae, from left: *Percosoma carenoides*, *Catadromus lacordairei*, *Percosoma sulcipene* and *Scaraphites rotundipennis*

surface and in confined spaces. Metamorphling frogs are the only vertebrate prey known to be taken. The list of invertebrate prey recorded includes coleopteran (beetle) larvae, oligochaetes (worms), dipteran (fly) larvae and the black field cricket, *Teleogryllus commodus* (Spencer & Fearn, unpublished data).

While no information exists on the larval habits of this species, other carabid larvae are generally known to be predatory, living edaphically or saproxylically, taking whatever small invertebrates, (adults and larvae) occur in their chosen microclimatic conditions. Captive specimens have been observed to feed on adult termites (*Porotermes adamsoni*) and the larvae of lucanid and scarabid beetles, (Spencer & Richards, pers. obs.). Some other exceptional carabid species have been found to live as inquilines inside the colonies of *Iridomyrmex purpureus* and *I. detectus*. However, it is not clear what these larvae eat. At least one related species is known to specialise in the predation of free ranging adult *I. purpureus* (Moore 1964, 1974). Parental care has been recorded in the Tasmanian genus *Rhadbotus*, but uncertainty exists as to the extent of this activity across the genus (Giachino 2005a).

DISTRIBUTION AND HABITAT

Catadromus lacordairei inhabits open grassy woodland at low altitude and is usually associated with wetland areas (Plate 3a); these may be naturally occurring or artificial, permanent or ephemeral. In such habitat, ground debris, especially decaying wood, provides important microclimatic conditions for both sheltering and hunting (Plates 3b & 3c). Sites that have been found to harbour the highest beetle densities support a mosaic of tussocks (*Poa* spp., *Juncus* spp., *Carex* spp. and *Lomandra longifolia*) where the exotic grasses are kept short by the grazing activity of sheep (Plate 3d).

To date, all survey effort for the species has targeted this type of habitat and has consisted of labour-intensive hand searching, involving the careful turning of potential sheltering sites, which are returned to their original position on completion of the inspection. Species of *Catadromus* are known to be attracted to lights at night (Giachino 2005b), they are strong fliers and it is likely that an ultra violet (black) light set up to illuminate a suspended white sheet near suitable habitat may serve as an efficient alternative survey method. Pitfall trapping has also proven to be a successful method of surveying for these animals.

The first specimens of *Catadromus lacordairei* recorded in Tasmania were collected by Augustus Simson (in the early 1900s), who noted the distribution as "Macquarie River" (Sloane 1920). Additional distribution records have been sporadically collected over the decades and the species is now known from a total of 14 sites across the northern and central Midlands of the State.

Owing to the ever changing nature of the landscape and the ability of these beetles to fly to more suitable surrounds, the "snapshot" surveys usually employed may turn up a negative result this year, but a positive result the following year, two of the known site records illustrate this (Figure 1). Adult beetles are active for the warmer months only and consequently all survey effort is confined to the summer and early autumn.

Much of the survey effort has been conducted by interested members of the public, triggered by their need to explore the wonder of nature, and although this is marvellous and must be encouraged, their findings too often do not serve to benefit the species.

Plate 3. Potential habitat of *Catadromus lacordairei*

top: overview showing topography and habitat – note the open woodland in the background, the grazed mixed native/exotic pasture in the foreground and the wetland between

middle left: potential sheltering site (decayed log) amongst tussocks

bottom left: potential sheltering site (large surface rock)

middle right: close-cropped exotic pasture grasses amongst native tussocks

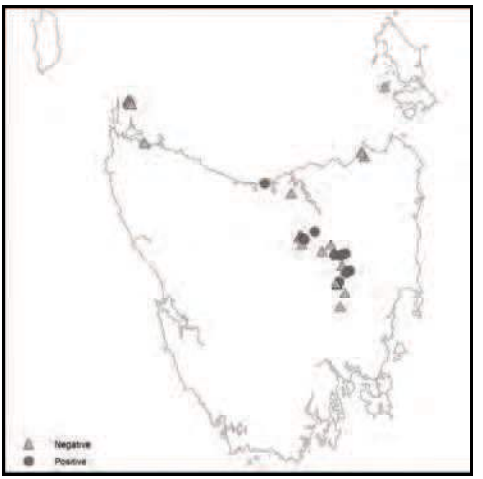

Figure 1. Distribution of *Catadromus lacordairei* within Tasmania (historical sites with limited location information have been omitted)

The importance of recording and publishing of accurate site data can never be too rigorously emphasised. Data from a negative site survey for a target species is never the less important and as with positive site data, it is the information that fuels our knowledge banks and ultimately drives and directs our conservation effort.

The current conservation measures for *Catadromus lacordairei* are severely limited by the lack of information regarding its life history, and until further study is undertaken to provide a better understanding of the beetle's ecological requirements, management outcomes will remain uncertain.

Given the lack of information regarding the life history, it is disturbing to find that Global Insects website (accessed June 2010) offers specimens of either sex of this spectacular species for $14.95 each. These animals obviously have not been captive bred for the market, so we can only conclude that wild mainland populations are being plundered to provide specimens for purchase by uncaring collectors.

We encourage you to be vigilant, record both negative and positive site data, take good quality digital images not specimens, and place the information 'out there' where it may be used to benefit the species.

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OBSERVATIONS OF AVIAN AND BOTANICAL SPECIES ON GOOSE ISLAND, NOVEMBER 2009

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INTRODUCTION

Bill Wakefield, Els Hayward and Bruce Robertson stayed at the research hut on Goose Island from 6–22 November 2009 for the main purpose of assisting Bruce Robertson with his PhD work on the breeding biology of the Pacific Gull, *Larus pacificus*. During this period, daily observations and records were kept of all the species of wildlife identified at species level along with their numbers.

In previous years visits to the island Bruce Robertson had banded a large number of Pacific Gull chicks of known hatching dates and it was hoped that we would be able to determine the age of first breeding of the species, either by reading their band numbers as the birds were in attendance at their nests or by trapping them on the nest.

Unfortunately only one bird carrying a band was found to be present near a nest and not necessarily one of the birds responsible for the nest and its contents. As it was carrying a band on its left leg it did not appear to be a member of the cohort of chicks banded at this location. All the birds that had been banded there, and were as far as we were aware, banded on their right leg. It is just possible that the band had been placed on this birds left leg in error or that it was one of the birds from southern Victoria where birds are banded on their left leg.

As the species has never been recorded moving such a great distance it seems more likely that it was a locally bred bird and that the band was inadvertently placed on the wrong leg. Attempts to read the band on what was to be our last day in the field were unsuccessful so that the origin of the bird remains in doubt.

Over the 16 days of observations 45 species of birds were recorded, four of these over the surrounding seas and the rest on the island itself. There was also a visit by a young male Leopard Seal, *Hydrurga leptonyx*, that hauled out on a small beach on the eastern side of the island. From one to three Australian Fur Seals, *Arctocephalus* [*pusillus*] *doriferus*, were also observed on the surrounding seas on most days.

As far as records go, two botanical and seven avian species observed appear to be new to the island. These were as follows.

FLORA SPECIES NEW TO GOOSE ISLAND

- *Xerochrysum bracteatum* (golden everlasting) [Plate 1]

A group of about 50 plants was located on the southern end of Goose Island on dry granite soil between the ruins of the lighthouse keepers' cottages. This area has been subject to clearing of extensive areas of boxthorn, which may have aided its

recruitment and spread. The disturbance of the soil may have allowed either existing seed stock on the island to sprout or wind-borne seed to take hold. Samples of flowering plants were collected and registered with the Tasmanian Herbarium.

Plate 1. *Xerochrysum bracteatum* growing in the stockyard area on Goose Island

- *Alyxia buxifolia* (seabox)

A solitary small plant was found also in the vicinity of the ruins but closer to the beach. Seabox occurs in front-line coastal areas of the north, northeast, west and northwest of Tasmania as well as on other islands in the Furneaux group although it is absent from the southern half of Tasmania. It also occurs in Western Australia, South Australia and Victoria. This specimen was about 30 cm high and had no flowers.

A search was made in the area of the lighthouse keepers' ruins for more specimens but without success and although we looked out for other specimens on the whole of the island throughout our stay, none were found. Could this one be a new recruit or a possible remnant of a pre-existing population? Further work needs to be done in order to formally register the presence of this plant when and if it flowers.

AVIAN SPECIES NEW TO GOOSE ISLAND

- Lewin's Rail, *Lewinia pectoralis*

A bird was heard calling on most days in the area of the dense boxthorn around the hut and another on three dates in thick *Poa* just to the northwest of the lighthouse.

- Peregrine Falcon, *Falco peregrinus*

A single bird recorded on two days.

- Blue-winged Parrot, *Neophema chrysostoma*

A single bird seen on three different days.

- Australian Shelduck, *Tadorna tadornoides*

A single bird and a party of five flying south on different days.

- Pacific Golden Plover, *Pluvialis fulva*

Calls drew the lone bird's presence to our attention as it flew over heading in the direction of The Franklin Sound.

- Yellow-nosed Albatross, *Thalasarche chlororrhynchos*

A distant bird in the company of Pacific Gulls was observed for some time as they all appeared to be attracted to something in the water. From the bird's size relative to that of the Pacific Gulls and from its under-wing pattern there is no doubt that it was correctly identified.

- Soft Plumaged Petrel, *Pterodroma mollis*

The clear calls of up to three birds of this species were heard on 8 of the 16 nights we were present on the island. Generally at this time of year the night sky is full of Short-tailed Shearwaters whose calls would tend to drown out any other species apart from those of the ever-present Little Penguins, *Eudyptula minor*.

It was the unusual calls of the Soft-Plumaged Petel, a species heard by Nigel

Brothers when lying off Maatsuyker Island at night, which alerted him to the presence of something out of the ordinary. The observation was followed up at a later date by Alan Wiltshire, who managed to find at least six pairs breeding on the island. This was the first confirmed breeding record for Australia, although it is suspected that the species may have a breeding population on Macquarie Island. Perhaps Goose Island may support a further colony.

Without the intermittent presence of observers alert to the calls of unusual species and further follow-up, we will never know what place our offshore islands may have in providing habitat for such species as this (Plate 2).

Plate 2. View south from the campsite in the area where the Soft-plumaged Petrels were heard

In order to confirm this, further expeditions will be required, perhaps commencing at an earlier date than that of our visit. It is reported that the Soft Plumaged Petrel commences its breeding cycle earlier than the Short-tailed Shearwater by its earlier arrival and is therefore able to avoid direct competition for nesting burrows. Once in occupation the species is said to be able to defend the burrow from being taken over by the much larger population of Short-tailed Shearwaters. (Alan Wiltshire, pers. comm.).

Observations on the vegetative cover of the island showed it to be rapidly drying out, exposing larger areas of earth between the tussocks of *Poa* and other plants whose flowering periods were coming to a close. This may well be one of the factors that determine the arrival time of the Short-tailed Shearwaters permitting them easier access to their burrow areas in order to lay their eggs.

OTHER OBSERVATIONS

One very brief visit to the northern end of the island was made in order to asses the breeding population of Pacific Gulls on Little Goose Island as well as the timing of laying and clutch size of the birds in this northern area. As on the southern parts of the island, the birds were also laying later and their clutches contained fewer eggs than in previous years.

Each evening we had noticed parties of Black-faced Cormorants (*Phalacrocorax fufescens*) streaming towards the northern end of the island where they found a sheltered roosting spot on the southern shore of Little Goose Island. In view of the fact that there were at least 870 birds present with small number still arriving as we left the area about an hour before dark, the locality's importance as a roost site is indicated.

In addition to the cormorant roost, Little Goose Island regularly holds approximately 100 breeding pairs of Pacific Gulls. The numbers using the islands would also constitute an additional reason for Goose and Little Goose Islands being declared "Important Bird Areas" or IBAs. In order to be given the status of an IBA it has to be demonstrated that an area regularly holds at least 1% of the population of a species, which in this case applies for both Pacific Gulls and Black-faced Cormorants.

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OBSERVATIONS FROM AN EXPEDITION TO THE SOELA RISE SEA MOUNTS, APRIL 2010

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An expedition to the Soela Rise on the maxi yacht *Blizzard* left Hobart on 7th April 2010, soon after 5 pm to motor down a glassy River Derwent towards the Tasman Sea. On board were Simon Mustoe, the organizer of the voyage, along with 9 others plus the skipper David Pryce and his partner Frederique Olivier. The evening sun set on Tasman Island while a green curry was served in the galley and as the light faded, we all turned in to leave David and Fred to do three hourly watches at the wheel. During the night and for most of the next day, the sea became very rough with up to 40 knot winds and 4 m swells, leaving almost everyone on board very ill and wondering if these conditions were to last for the whole trip. For me the 8th was lost as far as active observing was concerned. Despite the weather, there were plenty of birds.

Fortunately, Friday 9th dawned fine and calm allowing for more comfortable birding. It was amazing to be surrounded by such an expanse of sea where it was often difficult to distinguish the difference between water and sky. The clouds, reflections and light were constantly changing and fascinating to watch. Regular water temperature readings were taken as well as noting the depth and GPS locations. Over the voyage the sea temperatures varied from 14°C rising near the shelf to 20.9°C. The upwelling reduced the sea temperature to 15°C as we approached the sea mounts. A moth hovered around the yacht, sometimes briefly landing on the masts or sails where it was regularly observed using the up-draughts on the sails to soar to the top of the mast. Photographs were taken for its identification later.

Simon kept a running tally and record of the birds and all other observations on his computer so that their distribution and population density along our route could be plotted.

That Friday night, tiny phosphorescence streamed from the bow and larger lights shone back at us from the waves behind the boat. Simon connected a spotlight and shone it into the water. It was teeming with life – various strange organisms yet to be identified; large fish; a large shark; long, segmented snake-like creatures; squid and jellyfish. Above the masts, the stars appeared in the clearing sky more than matching the phosphorescence below.

The following day, Saturday 10th, we reached the Cascades Sea Mount and the wildlife became prolific. Amongst the many cetaceans the most exciting was a pod of Sei Whales (Plate 1) and what appeared to be Pygmy Right Whales that fed alongside, turning side on to scoop up the food in their baleen. Some came in right below the bowsprit with their tail flukes on either side of the bow!

In a pod estimated at around three hundred dolphins, Grant Penryn photographed a Striped Dolphin as it performed a repeated series of backward somersaults!

On one occasion there was an almost solid wall of dolphins and pilot whales packed shoulder to shoulder, pouring down the face

of the swell as they came in right past us. The pod consisted of Common Off-shore Dolphins and Long-finned Pilot Whales. A beautiful sunset finished off an exciting day.

Plate 1. Sei Whale seen from the *Blizzard* at the Cascades Sea Mount

To my knowledge Pygmy Right Whales have been recorded only twice before in Tasmania. A bull was washed up in November 1982 at Stinking Beach in Great Taylor Bay, Bruny Island, and was observed by Bill Wakefield and a couple of American biologists. In 1986 Steve Blaber reported seeing numbers of Pygmy Right Whales over what he described as the Soela Rise, which according to his lat/longs in fact appears to be the Cascades Sea Mount.

The *Blizzard* had not quite reached the Soela Rise by Saturday night but a large low was approaching and it was decided to head back towards Tasmania under full sail in order to arrive before the worst of the weather. Traveling at full speed and heeling over up to 45 degrees made sleeping in the bunks difficult if not impossible for some. The 15 knots wind in the early morning suddenly turned hitting us with a sustained force of 45 knots. Those of us who were passengers thought that we were about to be laid right over at the time when it hit. As I watched from my bunk through the skylight-hatch above me, the horizon appeared over the boat and waves broke onto the hatch! I could hear an air of urgency on deck as those who could help, wrestled with the sails and steering.

Fortunately we had made good progress during the night and with the wind still full in our sails, Tasman Island soon came into view. Then followed a treat of scrambled eggs for breakfast during an exciting run into Storm Bay towards the Derwent. It was great to be in the safety of the Derwent again, which we celebrated with hot chocolates and Tim Tams. Little Penguins could be heard barking on the water. Having coped with the rigours I felt proud of managing my first trip on an ocean going yacht.

This voyage was indeed an expedition of discovery as the information collected now forms a valuable part of the baseline data to be used into the future.

SPECIES RECORDED

Albatross: Buller's, Shy, Yellow-nosed, Black-browed (impavida or Campbell Is race), Wandering, Southern Royal

Shearwaters: Fluttering, Little, Sooty, Short-tailed, Buller's

Prions: Fairy, Broad-billed, Antarctic, Salvins

Petrels: Blue, White-headed, Gould's (over 200), Westland, White-chinned, Providence, Great-winged, Giant, Grey, Common Diving

Storm Petrels: Wilson's, White-faced, Grey-backed, Black-bellied

Skuas: Brown

Terns: White-fronted, Crested

Gannets: Australasian

Cormorants: Black-faced, Great, Little-Pied

Gulls: Silver, Kelp, Pacific

Cetaceans: Sei Whales, Long-finned Pilot Whales, Pygmy Right Whales, Common Off-shore Dolphins, Striped Dolphin, Bottle-nosed Dolphins.

Seals: Australian Fur Seals

Flying Fish: two species yet to be identified

BLOW-INS FROM THE BLUE FLEET

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SOMETHING IN THE WATER

When the First Fleet sailed down the eastern Australian coastline from the Tropic of Capricorn to Botany Bay, progress was no doubt aided by a remarkable ocean feature, the East Australian Current. Thanks to the earth's rotation sloshing the world's oceans onto the eastern flanks of the continents, some thirty million cubic metres of tropical Pacific waters per second are pushed southwards by this current, in a band of water up to 100 km wide and 500 m deep. The Current does more than boost local water temperatures. It also bulk-transports components of a tropical marine ecosystem. It enables coral reefs to survive well south of the Tropic of Capricorn. It brings larvae of coral-dwelling butterflyfish to the New South Wales South Coast. And sometimes, in summer, its swirling, southernmost eddies bring a taste of the tropics all along eastern Tasmania's otherwise very temperate coastline.

This article isn't about the First Fleet, but the Blue Fleet. Captain Cook would not have heard of the term, and you may not have either. It was coined by pioneering oceans biologist Sir Alister Hardy, author of the 1956 classic New Naturalist book *The Open Sea*. The Blue Fleet was his apt descriptor for the assortment of strange creatures that make a living sailing the surface waters of the warmer reaches of the world's oceans, and which are sometimes brought together in vast numbers in eddies and along ocean fronts by the combined effects of wind and current, to be carried polewards, often well beyond their normal range. Scientists call this strange realm, this interface between seawater and air, the pleustal zone. Its inhabitants are neither plankton (which drift beneath the waves) nor nekton (which swim beneath the waves). They are pleuston. And many of them are blue.

BLUE JELLIES

The Blue Fleet is at home out on the open sea, but winds and currents sometimes conspire to bring them ashore. The widespread stranding of one of the most characteristic of these blow-ins, the bluebottle *Physalia utriculus*, is perhaps the best-known harbinger of the Blue Fleet's arrival in Tasmania. Its scientific name means 'little womb bladder', which I suppose is as good a moniker as any, given the physical appearance of the desiccated gas-filled float, which is often all that remains of the hapless bluebottle once cast ashore. Strewn along the tideline, sometimes in their thousands, they are a familiar feature of Tasmania's east-coast beaches; last summer they even turned up in Taroona. But even when we find them freshly stranded, as on Schouten Island last summer (Plate 1), it is difficult for us terrestrials to appreciate the alien life that a bluebottle must lead, out on the ocean waves. So here's a short introduction.

The typical eastern Australian bluebottle has a single retractile fishing tentacle, which, along with its smaller size, distinguishes it from the much-feared Portuguese man-o'war, *Physalia physalis* (the 'bladder bladder'). Thankfully for local beachgoers, a bluebottle's stinging cells

Plate 1. A bluebottle *Physalia utriculus* stranded on Schouten Island, January 2010 (photo: S. Grove)

(nematocysts) are less potent than those of the Portuguese man-o'war – a species now considered to be confined to the Atlantic. Out on the open ocean a bluebottle lives the life of a fisherman, dangling its tentacle into the water to entrap small fish and their larvae. Except, whereas fishermen need to equip themselves with boats and tackle, the bluebottle has all the necessary components for floating, transport, fishing and processing rolled into one living entity. But on the other hand, that entity is not a single organism, so in effect each bluebottle is more like a fishing cooperative, or maybe a factory ship.

In formal taxonomic terms, bluebottles are siphonophores, a group of colonial marine organisms that form part of the class Hydrozoa, itself part of the phylum Cnidaria. They are only distantly related to other cnidarians such as the true jellyfish (Scyphozoa) and the box-jellies (Cubozoa). Most siphonophores live in the ocean's depths, where their colonies can form beaded strings of stinging jelly sometimes tens of metres long – akin to self-replicating, autonomous long-line fishing apparatus. But in bluebottles, individual members of the colony are highly differentiated to serve different functions. One member forms the air-filled float, while the others are specialised for feeding and digestion, or for reproduction, or to form the stinging, fishing tentacle.

A bluebottle may lack a brain, but it is far from being a mere passive drifter. Its float

is not hemispherical, but elongated, with an upper margin that is pinched, rather in the manner of a cornish pasty or apple turnover. Remarkably, it can alter the orientation of its float, the better to catch the wind. What's more, somehow a bluebottle is able to tip itself over onto its side to re-wet its float, first one side and then the other. It may do this every few minutes, depending on ambient conditions of heat and humidity. So is a bluebottle a colony of individual polyps or an individual organism in its own right? It's a question that has been pondered by some of the finest scientific minds for well over a century, yet remains a moot point. In effect, they lie at the boundary between the simple colonial world and that of more complex multicellular animals. This may be worth contemplating the next time you casually 'pop' those 'little womb bladders' as you stroll along the beach.

Bluebottles have some colonial hydrozoan relatives amongst the Blue Fleet, belonging to the anthomedusans rather than the siphonophores. Their vernacular names, by-the-wind sailor and blue-buttons, may charm us more than their equivalent scientific names, *Velella velella* and *Porpita pacifica*, but mean much the same thing ('little sail'; and 'brooch of the Pacific', respectively). Both species are regularly washed ashore in eastern Tasmania amongst the wreckage of bluebottle armadas, but, being much smaller and less robust, they tend to melt into the sand more quickly and are readily overlooked. Still, a freshly stranded by-the-wind sailor is a marvelous sight to behold, as I was fortunate to do last summer on Schouten Island (Plate 2). While bearing a closer resemblance to jellyfish, a by-the-wind sailor has a gas-filled float that keeps it perched upon the sea surface rather than beneath it. The term 'float' underplays its second major function, which is as a sail. Unlike the bluebottle's air-sac, the float is thin, semi-rigid and upright – not unlike a boat's sail, and oriented on a diagonal to the long-axis of the disc. In technical terms, the sail meets the specifications of a 'low-aspect-ratio aerofoil' – a design that favours seaworthiness and stability. This apparently makes it hard to capsize a by-the-wind sailor: it is stable over a range of attack angles from 28 to 87 degrees. Should you find yourself adrift in the East Australian Current, give it a go.

A by-the-wind sailor has only one immovable sail to play with, so is at the mercy of the prevailing winds. But *populations* of by-the-wind sailors do have a bit of control over their destiny, a phenomenon that Hardy referred to as "the evolution of unconscious navigation". Populations can comprise mixtures of both 'right-handed' and 'left-handed' forms, one being the mirror image of the other in respect of the orientation of the sail-axis relative to the long-axis of the disc. This means that one form will tend to be blown towards the northeast in an easterly wind, while the other will be blown towards the southeast; similarly, one will be blown towards the northwest in a westerly, while the other heads towards the southwest. In the centre of the Pacific Ocean, both forms co-occur, but one form tends to predominate over the other elsewhere in the Pacific, depending on the time of year and on the direction of the prevailing winds typical of the season. It would be interesting to see whether both forms occur together in mass strandings in Tasmania; theory would suggest not.

Blue-buttons look rather like by-the-wind sailors with their sails removed (Plate 3). To all intents and purposes they behave like a sail-less by-the-wind sailor would be expected to behave, drifting with the current – they have even appeared at Taroona. Both species lack the bluebottle's fishing tentacle because they feed on microplankton, caught

Plate 2. A by-the-wind sailor *Velella velella* stranded on Schouten Island, Jan. 2010 (photo: S. Grove)

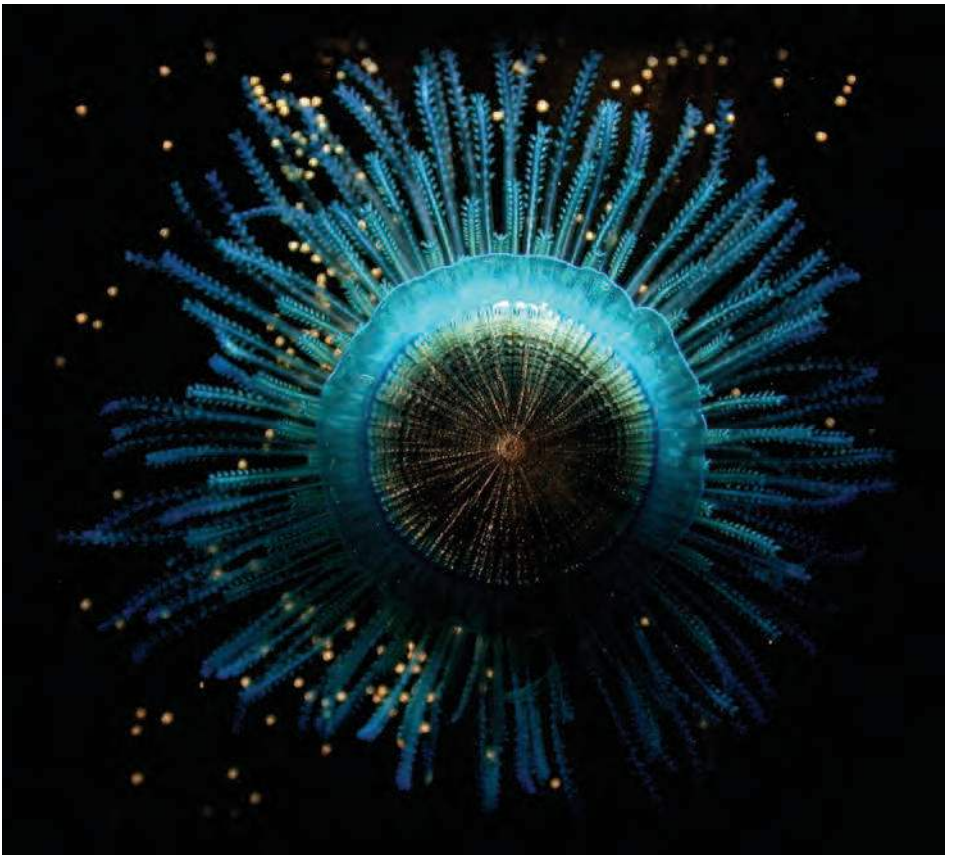


Plate 3. A blue-buttons *Porpita pacifica*, captured live in the waters of Moreton Bay, Queensland (photo: Lisa Gershwin)

by means of smaller tentacles laced with stinging cells. The disc itself is made of keratin and is dead (like our fingernails), acting as a floating substrate for the polyp colony underneath.

Bizarrely (from a human perspective), these creatures engage in alternation of generations. The asexual stage is the one I have just described. The sexual stage that follows it is a planktonic medusa that may be either male or female, and which drifts through the sun-lit surface waters, enlisting the services of algal cells (zooxanthellae) to capture energy from sunlight.

BLUE SLUGS

Despite their predatory existence, the three blue 'jellies' are themselves the source of sustenance for further members of the Blue Fleet – the Pirates of the Pleuston, if you like. Like the jellies, they too may end up stranded on Tasmanian beaches, sometimes, but not always, in each other's company. The first of these is the blue ocean-slug *Glaucus atlanticus*. Its name means 'the Atlantic bluish-green one', because it was first described from specimens collected in that ocean, but it occurs worldwide in warmer seas. It made the headlines (okay,

the inside pages of the local papers) in January 2007 when it put in its first, and so far only, known Tasmanian beach appearance, at the Bay of Fires. It's a stunning beast, in more ways than one. For a start, it's bright blue with a dash of silver when seen from above, while from below it's predominantly silvery-white (Plate 4).

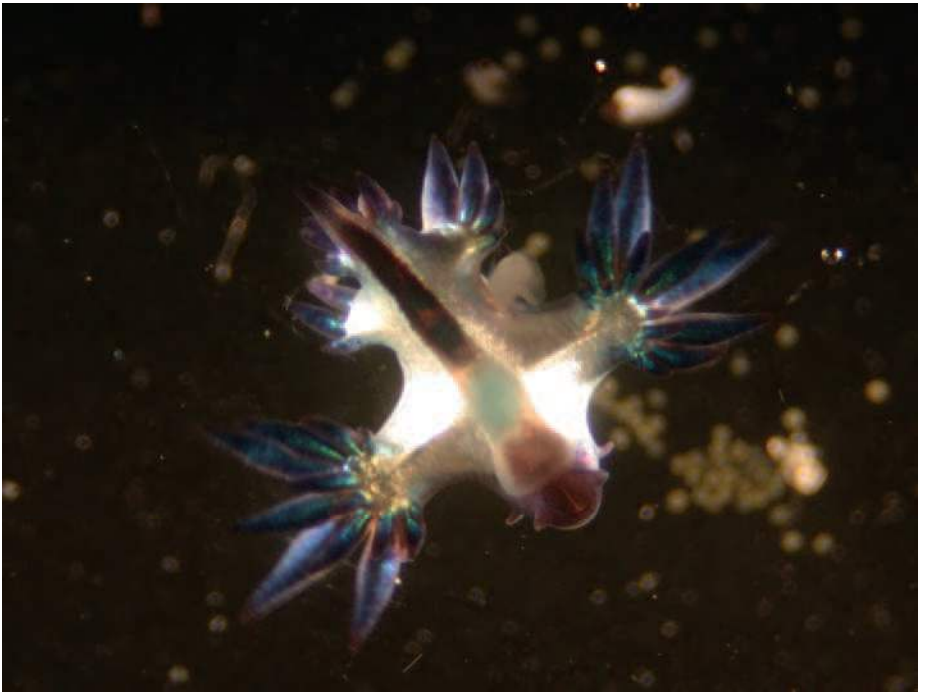


Plate 4. A blue ocean-slug *Glaucus atlanticus*, captured live in the waters of Moreton Bay, Queensland (photo: Lisa Gershwin)

Although it's a sort of sea-slug (an aeolidian nudibranch in technical terms), it is often called a 'sea-lizard', because it seems to have long pointy-fingered fore-limbs and shorter similarly endowed rear-limbs. The 'fingers' on these lobes are technically known as cerata, and they are the second reason for calling this creature stunning. The tips of the cerata are laced with stinging cells, aggregated into cnidosacs that can deliver a formidable sting if touched.

A clue as to whence the blue ocean-slug gets its sting comes from its diet – it's a specialist predator of bluebottles and Portuguese men-o'war, though it will also eat by-the-wind sailors, blue-buttons and other members of its own species if it happens to encounter them. A blue ocean-slug has a gas-filled float in its stomach, allowing it enough buoyancy to almost cling to the sea-surface from beneath – an ideal vantage-point for scouting for bluebottles, though the ploy leaves it at the mercy of the currents and winds. When a blue ocean-slug eats one of these creatures, its stinging-cells pass intact through the gut wall into the slug's body cavity, from where they are somehow translocated to the cerata. The high concentration of these second-hand cells in the cnidosacs means that it's possible to get a much more painful sting

from a blue ocean-slug than from a bluebottle – so if you see one, look but don't touch. Presumably they help the creature defend itself from predatory fish.

Having eaten its fill, a female blue ocean-slug may inflict a final indignity on the bluebottle by laying its eggs on the carcase. Since it's such a rarity in Tasmania, all records of strandings will increase our knowledge of its distribution (Figure 1a) – so please let me know. It would help to either collect the specimen or take a photo, because there's the possibility of detecting a further species, the margined ocean-slug *Glaucus marginatus*. This species shares the blue ocean-slug's habitat and is very similar in appearance. It has recently turned up in Victoria, so why not Tasmania next?

VIOLET SNAILS

The final members of the Blue Fleet are also predators on the jellies. They are the voracious violet vagrants better known as violet-snails (Plate 5), a group of gastropod molluscs closely related to the benthic anemone- and coral-feeding wentletraps. Although they eat nothing but jellies, their shells can survive at sea and on beaches long after their makers' deaths, so they're not uncommonly found by beachcombers even in the absence of their prey. Globally there are five species of violet-snail, but the standard species washed up in Tasmania is the common violet-snail *Janthina janthina* (meaning simply 'the violet-blue one').

These snails are found worldwide in warmer seas; in Tasmania they are more usually recorded from the East Coast (Figure 1b). Their thin globular shells, delicately tinted in shades of light-to-dark blue or purple, are a delight to behold, and because of their unusual colour they stand out strongly when encountered among beach debris. I eagerly await their addition to the Taroona shell list – it can only be a matter of time.

Plate 5. A common violet-snail *Janthina janthina* complete with bubble-raft stranded on Schouten Island, January 2010 (photo: S. Grove)

A violet-snail keeps itself at the sea-surface by means of a raft made of dozens of bubbles, and are sometimes beached in this condition, as on Schouten Island last summer (Plate 5). To make its raft, bubbles of air are captured and bound in mucus by the mollusc's foot, each 'gulp' taking about ten seconds. But this only explains how a violet-snail stays at the surface. How did it get there to take its first gulp? The partial answer is that the planktonic veliger larval stage produces a long mucus stalk with a ball of gas-filled bubbles at the end. This acts like a drag-line and buoy, raising the larva to the surface, where it metamorphoses into the adult snail. Of course, this raises the as-yet unanswered question as to how the veliger gets gas into its own buoy in the first place.

Most probably, violet-snails of any species will feed on whatever Blue Fleet jellies come their way, since they have no control over where they drift and what they might bump into. They also lack eyes (unlike their wentletrap ancestors), so must do everything by touch or in response to chemical cues. When a violet-snail bumps into a bluebottle, it extends its head, everts its proboscis and bites into the prey with its radula. If the bluebottle is a large one, it may have to abandon its bubble raft and climb aboard to devour it, presumably making sure that it doesn't pop the bluebottle's float before it has made itself a new raft. The violet-snail eats the stinging nematocysts along with the rest, but unlike the blue ocean-slug, does not preserve these for its own defensive use.

There is another species of violet-snail that links eastern Tasmania to the tropics, and it's a real gem – the lesser violet-snail *Janthina exigua*. I was surprised to discover that its scientific name means 'meagre violet-blue one', because to my mind it's anything but meagre. Space doesn't permit me the purple passages I would like to write about this purple passenger. It is indeed small compared to the common violet-snail, but what it lacks in stature it makes up for in the intensity of its violet coloration (Plate 6). It also differs in having a taller, more inflated spire. The two species also differ slightly in their biology. While both are hermaphroditic, the common violet-snail expels its veliger larvae (about a thousand of them) directly into the ocean, whereas the lesser violet-snail attaches its eggs (up to 44,000 of them) to the underside of its bubble-raft. Whether these different strategies translate into global differences in adult abundance is unclear to me, but the lesser violet-snail is certainly a rare beast in Tasmanian waters. Previous records that I'm aware of are all from Flinders Island, but last summer I struck gold (or perhaps amethyst) when I found a single specimen amongst hundreds of common violet-snails freshly beached on Schouten Island (Figure 1c).

WHY IS THE BLUE FLEET BLUE?

So why are members of the Blue Fleet blue (or violet)? One theory has it that the coloration is like sunscreen – built-in protection against the intense ultraviolet light at the tropical sea-surface. But this seems misguided, at least for violet-snails. A recent study of the astaxanthin pigments that make them violet demonstrated that they absorb light most strongly in the wavelength range of 630-660 nm, which corresponds to red light, not ultraviolet. It's also noticeable how the coloration of bluebottles, blue ocean-slugs and common violet-snails is more intense when seen from above than from below. This is a classic countershading strategy. The animals blend into the colour of a dazzling sky when viewed from below, helping to avoid being spotted by predatory fish or turtles; while from above, they blend into

Plate 6. The shell of a lesser violet-snail *Janthina exigua* raft stranded on Schouten Island, January 2010 (photo: S. Grove)

the colour of the deep blue sea, reducing the risk of being snacked upon by overhead birds. The blue ocean-slug takes things a step further by mixing in a splash of silver among the blue of its upper surface, all the more resembling the glistening sea-surface.

AN UPSIDE-DOWN WORLD ATOP THE WAVES

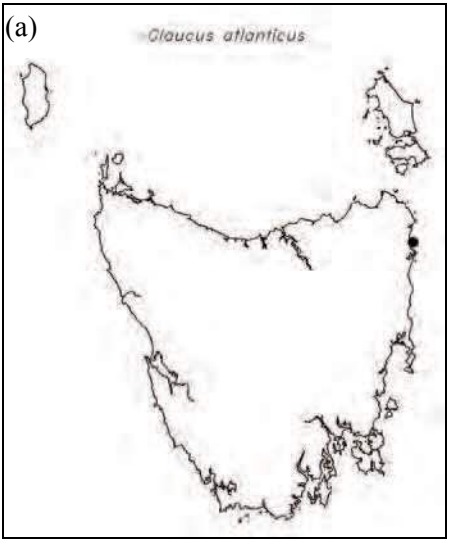
There's one more remarkable attribute that all these creatures share: they all live upside-down, unlike their benthic relatives. It's easy to see why violet-snails would cling upside-down to the undersides of their bubble rafts, but less clear why the blue ocean-slug chooses to cling to the sea-surface in this position; but it does. As for the jellies, their upside-down-ness may be obvious to an evolutionary biologist familiar with the developmental stages of cnidarians, but for the rest of us, it's a matter of trying to imagine how the original medusa or polyp must have had to flip over to suit a lifestyle on top of the waves rather than beneath them. It's as though they capsized in reverse.

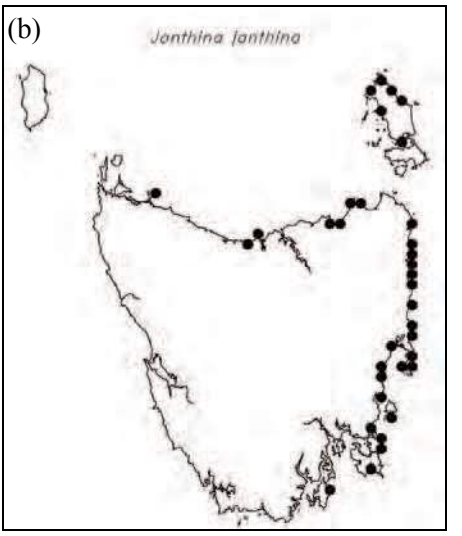
BRING ON THE BLUE FLEET!

It's said that climate change is progressively strengthening the East Australian Current, enabling its fingers to more regularly reach out towards Tasmania and contributing to higher-than-average rates of warming of our East Coast waters. There are very many very special life-forms that will lose out as the waters warm and nutrient levels plunge, and the natural world around us will be the poorer for their loss. But I for one will take some consolation in knowing that blow-ins from the Blue Fleet will increasingly be gracing our Tasmanian shores with their presence.

ACKNOWLEDGEMENT

I am very grateful to Lisa Gershwin, Curator of Natural Sciences at the Queen Victoria Museum and Art Gallery, for commenting on a previous version of this article and for offering me the opportunity to enrich it with her photos of blue-buttons and blue ocean-slug.





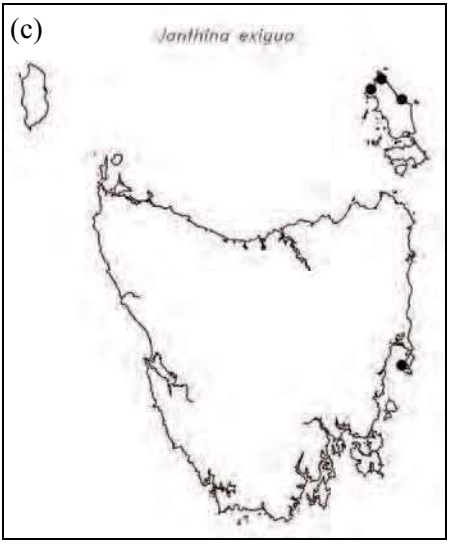


Figure 1. Tasmanian distribution maps (normalised by 10 km square) for the mollusc members of the Blue Fleet, based chiefly on the author's personal records, as well as those of the Tasmanian and Queen Victoria Museums, Margaret Richmond and others (a) blue ocean-slug *Glaucus atlanticus*; (b) common violet-snail *Janthina janthina*; (c) lesser violet-snail *Janthina exigua*

RECENT SIGHTINGS OF FLYING-FOXES IN TASMANIA

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On mother's day evening 2010, I received a call from my colleague Wendy Potts (Botanist, Department of Primary Industries, Parks, Water and Environment, DPIPWE) who had found a dead bat in her garden in Regent Street, Sandy Bay. When Wendy said it was entangled in bird netting covering her fruit trees and was the size of a rat I knew immediately that this animal was likely to be a flying-fox, a rare visitor to Tasmania, especially southern Tasmania.

There had been only nine previous reports of flying-foxes in Tasmania (Table 1) and several of these had an association with fruit trees and bird netting. Seven of the reports were from King and Flinders islands and two were from the south of the State, and all were grey-headed flying-foxes, *Pteropus poliocephalus* (Figure 1). The records from King and Flinders islands spanned a period from 1938 to 2004, whereas the last southern records, reported in Sharland (1962), occurred nearly 60 years ago. One was found dead at Woodbridge (1946) and another was washed up on a beach at Eaglehawk Neck (1951).

Wendy brought the flying-fox into work the next day where we were able to confirm its identity as a young female grey-headed flying-fox (body weight = 355 g; head length = 64 mm, forearm length=144 mm; Plates 1 & 2). Grey-headed flying-foxes can weigh up to1 kg with a wingspan of over 1 m (Churchill 2008).

At the request from the Chief Veterinary Officer, DPIPWE, the flying-fox was sent to Mt Pleasant Laboratories at Prospect to be tested for Hendra virus and Lyssavirus. The result was negative for both diseases.

Previously a flying-fox found on King Island in 2000 had tested positive for Hendra virus antibodies, which means that the animal had been exposed to the virus in the past, but had no signs of infection (Driessen et al. in press).

Table 1. Historical reports (1938 to 2004) of the grey-headed flying-fox in Tasmania

Year	Location	Source
1938	Pegarah, King Island	Green & McGarvie (1971)
1941	Currie, King Island	Morrison (1941)
1946	Woodbridge	Sharland (1962)
1951	Eaglehawk Neck	Sharland (1962)
1955	Babel Island	Sharland (1962); Green (1969)
1958	Big Dog Island	Green (1969)
1994	Flinders Island	Driessen et al. (in press)
2000	Yambacoona, King Island	Driessen et al. (in press)
2004	Whitemark, Flinders Island	Driessen et al. (in press)

Plate 1. Grey-headed flying-fox, *Pteropus poliocephalus*, from Sandy Bay, May 2010 (image: Simon DeSalis, DPIPWE)

Plate 2. Grey-headed flying-fox, *Pteropus poliocephalus*, from Sandy Bay, May 2010 (image: Simon DeSalis, DPIPWE)

I decided to publicise the finding of this flying-fox for two reasons. First, to determine whether this was an isolated occurrence or if other flying-foxes had been observed; and second, to alert the public not to handle flying-foxes if one was found because of their potential to bite. The event was covered in the Hobart *Mercury* and ABC radio on 8 May 2010.

Initially, seven responses were received from the public that I accepted as good observations of flying-foxes based on the experience of the observers and the descriptions they provided (Table 2). They were all from northern Tasmania and islands in Bass Strait from April to mid-May 2010 (Figure 1). For those observations where no photographic evidence or carcass was provided, I have assumed that the flying-foxes were grey-headed flying-foxes.

Two further observations were received from southern Tasmania. However, in both cases it was difficult to be confident of the observation as neither observer was familiar with flying-foxes. In the first case a dark animal was seen in the distance flying and struggling against the wind during the day above Sandown at Sandy Bay on 8 May 2010. The other observation was from

Table 2. Recent reports (April to May 2010) of the grey-headed flying-fox in Tasmania

Date observed	Location	Easting Northing (precision, m datum: GDA94)	Comments
between 3–7 May 2010	The Neck, near Stanley	354098 5483095 (500)	Observed on *Banksia marginata* in backyard; observer was a visitor from Australian mainland
between 3–7 May 2010	Lake Waverley, Launceston	515812 5413437 (1000)	About 5.30pm, after sunset, flying-fox was seen being pursued by a white-faced heron; both animals flew directly overhead and the observer got a clear view of the flying-fox's silhouette for 1–2 seconds; clearly visible was the curve of the webbing between the fingers, small rounded head and little stumpy feet where webbing joined back of body; observer familiar with flying-foxes after living in Darwin for two years; not seen again despite regular walking in the area
late April 2010	Whitemark, Flinders Island	586692 5558526 (500)	Dead specimen found (it had been run over a few times); carcass was disposed of by PWS ranger; ranger noted that they had had some warm northerlies recently
early April 2010	Ranga, Flinders Island	595688 5552936 (500)	Live one seen in a backyard garden near Ranga (photo taken; Plate 3); few days later one found dead next door presumed to be the same one; carcass was partly eaten and disposed of by PWS ranger
6 May 2010	Regent Street, Sandy Bay	526465 5250655 (200)	Found dead in netting over apple tree at 1 pm; lots of fruit trees in garden including several fig trees; carcass submitted to Mt Pleasant Laboratories, DPIPWE for disease tests
30 April 2010	Deal Island	528599 5630229 (1000)	Observed flying overhead at dusk
mid-late April 2010	Riverside, Launceston	508534 5415339 (2000)	Heard and then saw a flying-fox at Riverside; observer used to live in the tropics and is familiar with flying-foxes
18 May 2010	Sorell Street, Devonport	446100 5441800 (500)	Flying-fox seen in a large pear tree in backyard that also had fig trees; observer has lived in Queensland and knows what they look and sound like; flying-fox has been visiting on and off for the past 2 weeks
16 August 2010	Esplanade, Somerset	401415 5456541 (100)	Flying-fox (Plate 4) was electrocuted on power lines and Aurora Energy was called in to remove it from the lines; two large flowering *Banksia marginata* were located under the power lines; photographs supplied; carcass submitted to Mt Pleasant for disease tests

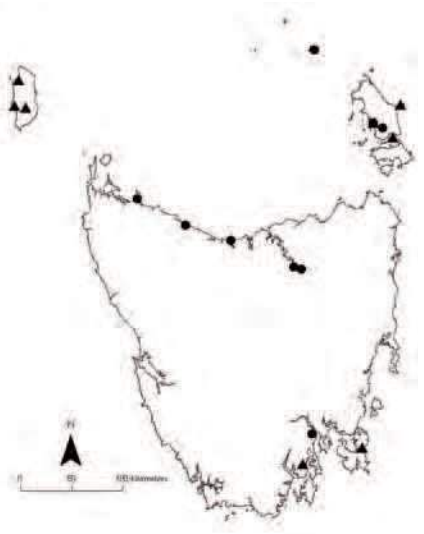

Figure 1. Location of sightings of grey-headed flying-fox in Tasmania: 1938–2004 (triangles); April–May 2010 (circles)

Huonville on dusk and I did not get to speak to the observer. In August 2010, I received another report of a flying-fox from Somerset on the northwest coast. This grey-headed flying-fox was electrocuted on powerlines and it may have been visiting two large flowering *Banksia* trees located underneath. Photographs of the animal were provided confirming its identity (Plate 4). The carcass was sent to Mt Pleasant Laboratories and tests for both Lyssavirus and Hendra virus were negative. It is not known whether this animal arrived in Tasmania recently or during April and May when the other observations occurred.

So how did the flying-fox arrive in Hobart? The most likely answer is that it flew here. There are several flying-fox colonies in southern Victoria. Flying-foxes can forage up to 50 km in a night and adults can disperse up to 750 km away from their summer camps (Churchill 2008). With the assistance of strong northerlies, flying-foxes should be quite capable of flying or island-hopping across Bass Strait resulting in infrequent visits to Tasmania, particularly in the north of the State. Other less likely possibilities for the flying-fox occurring in Hobart could be as a stowaway on a boat or people illegally bringing them into Tasmania as pets.

Plate 3. Grey-headed flying-fox, *Pteropus poliocephalus*, from Ranga area, Flinders Island April 2010 (image: James Luddington)

The breeding range of the grey-headed flying-fox is primarily east of the Great Dividing Range extending from Bundaberg in southern Queensland to Geelong, Victoria with small groups appearing in western Victoria and South Australia (Tidemann et al. 2008). Historically, they had a greater range in Australia and numbers have declined resulting in the grey-headed flying-fox being listed as Vulnerable in 2001 under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (Australian Government 2007). The main threats are loss of foraging and roosting habitats and persecution because of their feeding in orchards.

There is insufficient information to know if flying-fox visits to Tasmania are increasing or not. The recent sightings in Tasmania appear to be associated with sightings of grey-headed flying-foxes in unusual locations in New South Wales, Victoria and

South Australia in March to April 2010 and in much greater numbers than usual in some established camps (Peggy Eby, NSW Department of Environment and Conservation, pers. comm.). These unusual observations in these States may be the result of several cyclones in Queensland between January and March 2010 that may have dispersed flying-fox colonies. All flying-fox observations in Tasmania have been of single individuals with no evidence of camps establishing. Climate may be a factor preventing their establishment in Tasmania but perhaps not because it is too cold for the species – they have established in southern Victoria – but more so its influence on food supply. Flying-foxes eat *Eucalyptus* blossom and a variety of fruits, particularly native figs (Churchill 2008). The absence of a reliable year-round food supply for flying-foxes is probably the main reason they have not established or are unlikely to establish in Tasmania.

Plate 4. Grey-headed flying-fox, *Pteropus poliocephalus*, which was electrocuted on powerlines at Somerset (image: Jill Dunham)

Many flying-fox visits clearly go unreported as the recent sightings in Tasmania were reported only as a result of the media release. If you find a flying-fox in Tasmania, please report it to DPIPWE.

ACKNOWLEDGEMENTS

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OBSERVATION OF A YELLOW-TAILED BLACK COCKATOO ROOST ON THE EDGE OF HARVESTED FOREST, SOUTHEAST TASMANIA

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In Tasmania, yellow-tailed black cockatoos (*Calyptorynchus funereus xanthanotus*) are dependent on large tree hollows for roost and breeding sites (Koch et al. 2008) and considered to only breed in mature forest (Wilsdon 1981). However, there are few records of the type of trees used as roost and breeding sites in Tasmania.

On January 26th 2010, at approximately 8.50pm, a pair of yellow-tailed black cockatoos was observed using a large tree hollow. Initially one bird was observed to fly and perch on the edge of the hollow with another bird observed inside. The bird flew in and out of the hollow for several minutes before entering. Once entered, the bird was seen at the entrance of the hollow and then disappeared within the hollow. The birds were not observed to exit the hollow that night.

The roost was located in a *Eucalyptus viminalis* (white gum) tree in forest regenerating two years after partial harvesting of *Eucalyptus obliqua* dry sclerophyll forest on the Forestier Peninsula (0573085E 5242056N; datum GDA94). The tree was one of few hollow-bearing trees in the area and was located the edge of the harvested area adjacent to mature dry eucalypt forest. The tree was 147.9 cm diameter at breast height (dbh) with a single visible large hollow (entrance > 20 cm) in the trunk on a northwest aspect (Plate 1).

There are very few accounts of the roost and nest requirements of the yellow-tailed black cockatoo in Tasmania. Haseler & Taylor (1993) provided an account of a pair using a mature *Eucalyptus obliqua* (35 m up a 40 m tall, 137 cm dbh tree, estimated hollow entrance size greater than 20 cm) in mature dry sclerophyll forest in northeastern Tasmania prior to harvesting. This tree was not used by the species post-harvest (Haseler & Taylor 1993; Wapstra & Taylor 1998; Koch et al. 2009). Wapstra & Doran (2004) reported on a pair of black cockatoos using a stag (26 m up a 40 m tall, 120 cm dbh tree, hollow entrance 56 cm high and 30 cm wide) in a riparian area of dry sclerophyll forest in northeastern Tasmania: this tree was subsequently lost to the birds through illegal firewood harvesting.

Our present account of the use of a hollow-bearing tree retained in timber production forest two years post-harvest illustrates the importance of retaining habitat for hollow-dependent fauna.

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Plate 1. A roost tree (left) containing a large hollow (right) used by a pair of yellow-tailed black cockatoos on the Forestier Peninsula, Tasmania (images: Lisa Cawthen)

CASSINIA RUGATA DISCOVERED IN TASMANIA: A NATIONALLY THREATENED SPECIES NEW TO THE STATE

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INTRODUCTION

This is a story of two mysteries. One mystery is the challenge to find an "official" identity for a plant that had been previously overlooked or misidentified. The other mystery is very human: how did so many botanists previously overlook or misidentify it? The plant's identity is now known, while we can only speculate about the human mystery (without naming names!).

When Robin Garnett and I took ownership of Rubicon Sanctuary near Port Sorell, it was recognised as an important orchid "hot spot" that needed to be protected by a restrictive covenant. Amateur and professional botanists had visited the site over many years and we inherited an impressive list of native plant species including several threatened species. Living on the property with eyes open in all seasons meant we were able to add to the plant list and re-confirm the property's status as a botanical "hot spot".

One plant species was causing me a niggling concern; a multi-stemmed shrub of up to 1.5 m in height, growing in wetlands. We were unconvinced by the identity offered, being *Cassinia aculeata*. It took three years to find a better name…

BACKGROUND

There are basically two types of "shrubby daisy" in Tasmania. The "daisybushes" in the genus *Olearia* are adorned by traditional daisy flowers. In technical language these flowers have inner disk florets (botanically these florets are the true flowers) and an outer ring of ray florets that combine to provide the impression of "proper" flowers with petals. In contrast, the "everlasting bushes" are adorned with clusters of very small paper daisy flowers. Using technical language again, each "paper daisy flower" is comprised solely of disk florets, but the surrounding bracts are papery and form a small white "frill". Most everlasting bushes are in the genus *Ozothamnus*. There are twenty species of *Ozothamnus* in Tasmania that are not always easy to distinguish and mostly with little horticultural potential (Buchanan 2009). The "dollybushes" in the genus *Cassinia* probably command even less interest. They are distinguished by bracts that are tightly appressed to the florets with no surrounding "frill". *Cassinia aculeata* is a widespread dollybush species that is common in Tasmania and is perhaps best distinguished from similar *Ozothamnus* species by the rounded and densely hairy young branches. *Cassinia trinerva* is the only other dollybush previously known in Tasmania. This is localised in the northeast and previously considered as threatened in Tasmania.

At Rubicon Sanctuary, we have a poor collection of shrubby daisies. *Olearia glandulosa* (swamp daisybush) hides in a shrubby wetland and is declining, presumably through lack of recent disturbance. *Olearia lirata* (forest

daisybush) really prefers wetter forests and is known from two or three brave pioneers. *Olearia ramulosa* (twiggy daisybush) is almost weedy, popping up occasionally especially in disturbed sites mostly along the roadside. It enjoys a vigorous but short life. *Ozothamnus rosmarinifolius* (swamp everlasting bush) is reasonably common in wetland shrubberies, but also declining perhaps also awaiting the next disturbance to its habitat. The often common *Ozothamnus ferrugineus* (tree everlasting-bush) is scarce, and like *Olearia ramulosa* pops up occasionally in disturbed sites. Even *Cassinia aculeata* (dollybush) is known from only two plants growing in well-drained sandy woodland (Plate 1). The most common shrubby daisy is our "mystery" species growing in open wetland sites amongst sedges and grasses (Plates 2 & 3). Botanists who offered an opinion about these specimens said "*Cassinia aculeata*", which we reluctantly accepted.

Plate 1. *Cassinia aculeata* from sandy woodland habitat at Rubicon Sanctuary

MYSTERY 1: WHAT IS THE SHRUBBY DAISY IN THE WETLAND HABITATS?

By February 2010, I was finally motivated to find the identity of the mystery form of "*Cassinia aculeata*". The mystery was compounded by the observation plants were in full flower while the true *Cassinia aculeata* had long finished flowering; in fact the seeds were being shed. On the north coast of Tasmania, a useful starting point to help solve these mysteries is the *Flora of Victoria*. After much head scratching, the closest answer I could find was *Cassinia rugata*, a localised species from the southwest of Victoria that lives in "wet heathland and riparian woodland habitats" (Puttock 1999) with a flowering time from February to April. Those two features sounded a reasonable match, but there were still doubts regarding the arrangement of floral bracts and the leaf shape. Could it even be a new species related to *Cassinia rugata*? But how can this be determined?

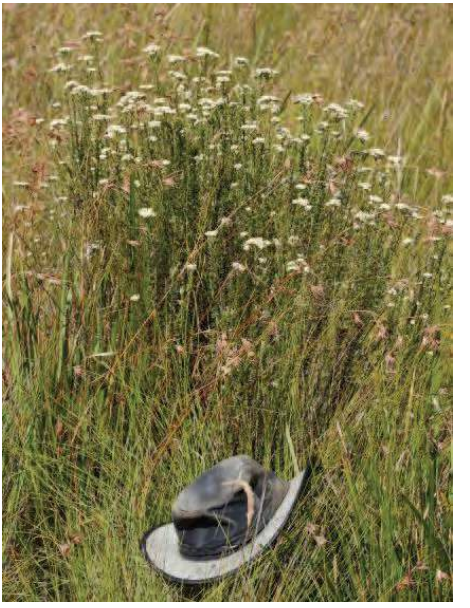

Plate 2. *Cassinia rugata* flowering in a sedgy/grassy wetland habitat at Rubicon Sanctuary (hat is included for scale)

If in doubt, search on Google for "Cassinia", which I did. On this occasion it seemed that luck was on my side. Dr Tony Orchard, the former curator of the Tasmanian Herbarium, had recently completed a revision of *Cassinia* in six parts. Tony had provided comprehensive

keys in his publications, with Part 2 (Orchard 2004) being a definitive source for identification of the mystery species. This exercise re-confirmed what we had gleaned from the *Flora of Victoria*, but the revision had clearly not been informed by the population growing in Tasmania at Rubicon Sanctuary or elsewhere.

Plate 3. Flowering stem of *Cassinia rugata* (note leafs are curved upwards)

Having been as thorough as possible, the next step was to contact Tony Orchard for an opinion. I had come to know Tony quite well in the 1980s while I was providing specimens to the Tasmanian Herbarium. I sent hime a scanned image (Plate 4) with a description of habitat. Tony was most helpful, confirming that the specimen was most unlikely to be *Cassinia aculeata*, but he wanted flowering and fruiting material to provide a more definitive opinion. Over the following four weeks, I collected and pressed four specimens from different plants and sent these to Tony.

Plate 4. Scanned image of *Cassinia rugata* that was sent to Dr Tony Orchard to obtain a preliminary identification

Tony's opinion is that "the best solution is to include the specimens in a slightly expanded concept of *Cassinia rugata*. Some, but not all, have narrower leaves (others match the Vic material well in this

regard), and some lack the slightly spreading tips to the involucral bracts, and not all have the bracts arranged in more-or-less vertical rows. The hairs on the upper leaf surface vary from coarse (as in my illustrations) to quite fine. However, I think these kinds of variation can be accommodated in a slightly broader *C. rugata*" (A. Orchard, pers. comm. 9 April 2010).

I also had assistance from John Davies in Tasmania who sent the scanned image (Plate 4) to his colleague Neville Walsh at the Royal Melbourne Botanic Gardens. Neville's response to John was unexpected: "Yes, I know *C. rugata* (I described it [Walsh 1990]) - and I agree that your plant looks very like it … It's still very rare in Vic - maybe Tas was its stronghold all along" (N. Walsh, pers. comm. 25 March 2010). So the identity of the mystery population was solved. I was very fortunate that the revision of *Cassinia* had been recently completed and that Tony Orchard was so willing to assist. And I was fortunate to have indirect access to Neville Walsh who had described the species.

Given it's rarity in Victoria, I wondered about the status of *Cassinia rugata*. A review of the list of species listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* revealed that *Cassinia rugata* is listed as Vulnerable nationally. According to the "*National Recovery Plan for the Wrinkled Cassinia* Cassinia rugata" (Carter & Walsh 2006) there are only 42 known plants in Victoria, and numbers have been declining. The Recovery Plan includes actions that are costed at $464,000 over five years. We have an estimated 280 plants on Rubicon Sanctuary and we have subsequently found a few more plants along roadsides in the local area (Figure 1). We burnt about half of the Rubicon Sanctuary population in 2007 (not specifically targeting this species) under the terms of the *Nature Conservation Plan for Rubicon Sanctuary*. These plants have re-sprouted from their rootstock, and are apparently thriving just like the unburnt plants. We would be very happy to take the $464,000 and promise to look after the Tasmanian population at Rubicon Sanctuary!

Both Walsh (1990) and Orchard (2004) comment on a possible hybrid origin for *Cassinia rugata*, based partly on its then known restricted distribution. However, the presumed parent species (Orchard 2004) do not occur in Tasmania. We have collected seed for ourselves and for the Tasmanian Seed Safe project set up under the Millennium Seed Bank project being conducted under the auspices of the Royal Botanic Gardens Kew (joint partners in Tasmania include DPIPWE, the Royal Tasmanian Botanical Gardens and the Tasmanian Herbarium); if these germinate it will be interesting to see whether there is any evidence of hybrid status in the progeny. We have never knowingly seen seedlings growing naturally. In contrast, we do see seedlings of *Ozothamnus rosmarinifolius* in burnt wetland sites, but mature plants of this species are killed by fire.

MYSTERY 2: WHY WAS *CASSINIA RUGATA* OVERLOOKED BY LOCAL BOTANISTS?

Unlike the first mystery, the second mystery has no definitive answer. I include some possible explanations, which simply serve to illustrate that taxonomy and plant identification will always have its challenges.

From personal experience as an amateur botanist and gardener, I'm inclined to wander around naming plants. However, you can get a very different perspective

when viewing a collection of specimens from a single species in a herbarium. What can seem like a well-defined species each time it is seen in the bush suddenly becomes a diverse group with a variety of sizes and other variations. Nature is not that tidy and human pattern matching is wonderfully flexible.

Does that explain why *Cassinia rugata* was misidentified or overlooked by several botanists at Rubicon Sanctuary? I don't think so. The primary clue for me was the habitat; I don't associate *Cassinia aculeata* with wetland. When *Hibbertia rufa* was recently re-discovered (after 116 years lost to science) in wet heathlands north of St Helens, similar speculation occurred because that species turned out to be relatively widespread, locally abundant, easily detected and easily accessed on public land only metres from public roads (ECO*tas* 2009).

Rubicon Sanctuary had been regularly burnt by the previous owner, and it is possible that *Cassinia rugata* plants were not prominent when botanists were creating their list of plants on the property. Given it missed out on being "discovered" at this time, it may have failed to demand critical inquiry later.

I earlier described everlasting bushes and dolly bushes as commanding little interest for their horticultural potential and as being in-part a group of similar looking species. It would be understandable if *Cassinia rugata* had been thought to be an *Ozothamnus* by previous botanists. Maybe they placed it in *Ozothamnus rosmarinifolius*, which would at least account for the correct habitat. The hypothesis of a hybrid origin for *Cassinia rugata* adds weight to this possibility.

Finally, I have been told but not verified, that one of the authors of the *Cassinia rugata* Recovery Plan had previously visited Rubicon Sanctuary. No doubt he/she did not expect to see this species in Tasmania, given its rarity in Victoria. A prior expectation about possible identifications can affect the answer you are likely to get.

WHAT ARE THE IMPLICATIONS OF THIS STORY?

Firstly, we need more eyes out for *Cassinia rugata*. Is it just restricted to open wetland habitats south of Port Sorell, or is it lurking in other similar habitats near the north coast?

Secondly, we should always keep an open mind for native plants that are unfamiliar. But … it may not be easy to confirm the identity of something that is unfamiliar or out of its known range.

Thirdly, this is what makes botanising ever fascinating.

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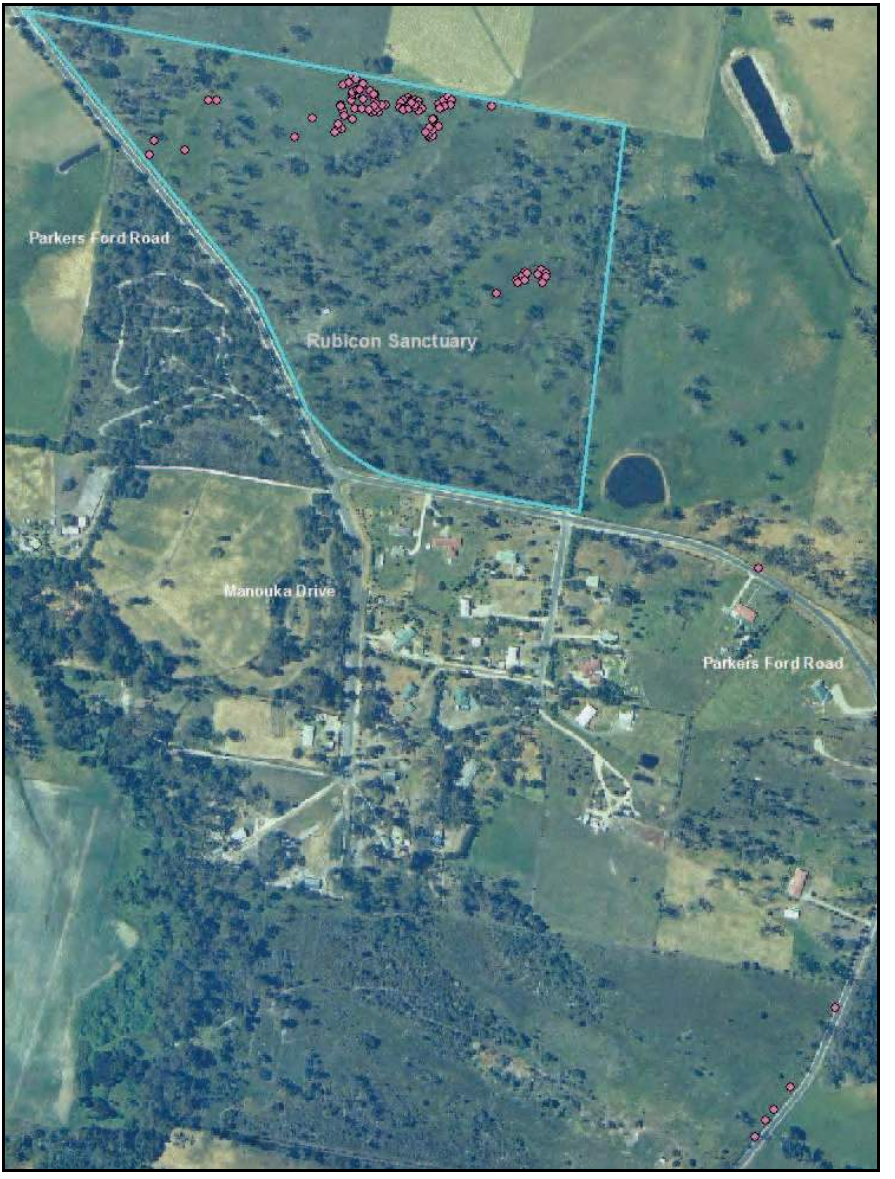

Figure 1. Distribution of *Cassinia rugata* in the Rubicon Sanctuary area (base data: TheList; base image: Tasmap)

ORNITHOLOGICAL OBSERVATIONS FROM THE 2009/2010 SEASON OF THE *MARIA ISLAND WALKS*

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INTRODUCTION – *MARIA ISLAND WALKS*

One of the aims of the owner of the *Maria Island Walks* company, Ian Johnstone, is to improve the knowledge and understanding of the island's wildlife in order that it may be better conserved into the future. As a part of this, it has been the privilege of the authors to take part in educating the guides in the identification of the island's birds and plants and to advise on its protection from disturbance.

Over the past season between 7 October 2009 and 26 April 2010, sixty-one groups of up to eight tourists per group and their two guides recorded the bird life seen on each of their four-day visits. Where possible the numbers of each species were noted daily, with particular attention to the numbers and locations of the shore birds along the beaches. White-bellied Sea-Eagles and the distribution of the Forty Spotted Pardalote sightings are also marked on maps or each trip's recording sheets. At the end of the season the sheets are vetted and then passed on to Birds Australia. With the aid of this information plus some of our own observations we have been able to produce the following report.

SUMMARY OF OBSERVATIONS

Some 1,695 observations were made of 85 species, at least five of which would be new to the island if the observations could be confirmed.

One of them, the Osprey, unfortunately can be rejected at this point unless photographic proof is available. There are no authenticated records for this species in Tasmania. Even a recently claimed sighting from another area of the State by an experienced bird watcher has not yet been accepted as there have been no adequate field notes or photographs submitted to back up the claim. Ospreys are easily confused with immature White-breasted Sea-Eagles, which are resident on Maria Island and frequently sighted. Another species the Rufous Fantail is one where proof of identity is needed if future researchers are to be able to regard sightings as being authentic.

Details of the sightings of rarely recorded species along with field notes and photographs are submitted to the Birds Australia Rarities Committee (BARC) for their vetting and acceptance as to their reliability.

At this stage a little further research is needed with the people who were involved in order to confirm or reject the sightings of the Hardhead, Wood Duck and Little Wattlebird, all of which are species found on the nearby mainland of Tasmania.

ANNOTATED LIST OF SPECIES' OBSERVATIONS

The following is a list of birds observed during the previous tourist season with some comments on their history and status. The species names and their order are those currently used in *Systematics and Taxonomy of Australian Birds* (Christidis & Boles 2008).

Brown Quail (*Coturnix ypsilophora*)

A species that has become scarce on the mainland of Tasmania and is still being shot on the Bass Strait islands. Recorded on two occasions with 5 seen between 26-Feb-10 and 1-Mar-10 and 2 between 2-Apr-10 and 5-Apr-10.

Musk Duck (*Biziura lobata*)

Described in the past as a resident that probably breeds on the lagoons at Point Lesueur. Absent for a number of years due to the drying up of the wetlands and has now returned to its previous location following the filling of the lagoons, where a maximum of 6 were recorded on 2-Mar-10.

Cape Barren Goose (*Cereopsis novaehollandiae*) [Plate 1]

Following the introduction of 45 birds between Sep-68 and Jun-71, this species has become well established. Over the period of the observations used in this report the numbers were estimated to vary from 40 to 100. Only 62 were counted in the first week of Mar-10 when an effort was made to determine the population more accurately. By this time of year many birds could well have left the island for greener pastures and a lot of the young birds would have perished.

Plate 1. The Cape Barren Goose population on the island will not be producing any of these stripy youngsters if the Tasmanian Devil is introduced (image: B. Wakefield & E. Hayward)

This tends to indicate that since the time of its introduction the population has remained stable. At least one pair now breeds on Lachlan Island in Mercury Passage and another pair is generally present on Isle du Nord off the northern end of Maria Island. Other birds are often to be seen in small numbers in the Rheban area and around Triabunna on mainland Tasmania, almost certainly having flown away from Maria Island.

Black Swan (*Cygnus atratus*)

18 were recorded on the 21-Oct-10 rising to 36 at the beginning of Mar-10 when breeding was noted on a lagoon at Bloodstone Point.

Australian Wood Duck (*Chenonetta jubata*)

According to records, these observations appear to be a first for the island with birds recorded on 19-Nov-09 and again in mid March-10. These are not unexpected sightings as the species is now widespread in Tasmania and it seemed only to be a matter of time before they turned up on Maria Island (observations awaiting confirmation).

Pacific Black Duck (*Anas superciliosa*)

Often seen in Bernacchis Creek and on the creek's reservoir in addition to the mouths of the other creeks and the lagoons on the island but never in large numbers. Birds of this species were recorded by seven of the parties between 30-Jan-10 and 2-Feb-10, with 30 as the largest number seen by any one of the tour groups.

Hardhead (*Aythya australis*)

A species that had become widespread in Tasmania in the 50s (M. Sharland) and then became infrequently reported, has once again increased in the frequency of sightings and numbers from the year 2000. Its numbers in Tasmania began to increase

in the middle of the present decade with the onset of the drought on mainland Australia. Observations have begun to decline again. The Hardhead was another first for the island when 2 were sighted on 12-Jan-10 by a couple of the guests, Ruth & Jackie, who were described by the guides as "keen birdies". Further details are still required for confirmation of the record.

Australasian Grebe (*Tachybaptus novaehollandiae*) [Plate 2]

A species that has benefited greatly from the increase in the number of small dams put in by farmers and others over the past 40 years across mainland Tasmania. The Australasian Grebe is another first for Maria Island with 3 birds on the lagoon just to the west of Bloodstone Point on 2-Mar-10. This was almost certainly the species referred to as a "small grebe" in December but with no other details available from the observers.

Plate 2. Australasian Grebe – a species recorded for the first time on one of the islands evanescent lagoons (image: B. Wakefield & E. Hayward)

Rock Dove (*Columba livia*)

Birds of Maria Island (Rounsevell et al. 1977) noted that a pigeon loft was built in 1887 but there are no notes on the period over which it was occupied by the species. A report that a pigeon, otherwise known as the Domestic Pigeon, was seen between 21-Dec-09 and 24-Dec-09 requires clarification to determine whether it refers to this species and or to one of the native Bronzewings.

Common Bronzewing (*Phaps chalcoptera*)

The call of this species is a repeated "oom" closely resembling that of the Brush Bronzewing. We find the easiest way to distinguish between the two is that the Common Bronzewing's call is repeated about once every three seconds in comparison to that of the Brush, which calls at the rate of 45 to 50 times per minute. That is, around twice to two and a half times as fast as the Common Bronzewing. However, observers should take care not to confuse the calls of these two species with those of the female Painted Button-Quail and the Tawny Frogmouth. The Common Bronzewing is present on the Tasmanian mainland just across Mercury Passage where it is not uncommon. Described as being "of uncertain status" in *Birds of Maria Island* (Rounsevell et al. 1977) and probably "a vagrant". One was reported as having been heard in mid Jan-10 by the "two keen birders", Jackie and Ruth.

Brush Bronzewing (*Phaps elegans*)

Formerly reported as a common resident in wet gullies and dense forest. Up to 2 were recorded on some visits between mid Jan-10 to the first week of Mar-10.

Tawny Frogmouth (*Podargus strigoides*)

Recorded on 3 occasions: mid Dec-09, early Feb-10 and in the first week of Apr-10.

Black-browed Albatross (*Thalassarche melanophris*)

2 were reported on the trip from 10-Mar-10 to 14-Mar-10 (details of the observation are requested for confirmation of the record). A group of pelagic seabird watchers saw a single adult bird sitting just off shore at the southern tip of the island near The Boy In A Boat on 25-Apr-10. It was identified as being of the "melanophris" race from photographs that clearly showed it to have a dark iris unlike the "impavida" or Campbell

Island Albatross that have a pale honey-coloured iris. That same day two other Campbell Island Albatross were seen along the edge of the continental shelf drop-off to the east of the northern end of Maria Island.

Yellow-nosed Albatross (*Thalassarche chlororrhynchos*)

The 3 on 5-Feb-10 in Haunted Cove were the only birds of this species recorded by *Maria Island Walks* although 11 were present on the sea just inshore from The Boy In A Boat, which is at the island's southern tip. On the same date that those birds were seen at the southern end of the island (i.e. 25-Apr-10) several others were seen off the east coast of Maria Island. This species is not mentioned in *Birds of Maria Island* (Rounsevell et al. 1977), although it is regularly seen in Mercury Passage and down the east coast of the island, mainly over the shelf waters close to shore.

Bullers Albatross (*Thalassarche bulleri*)

Again another species not mentioned in *Birds of Maria Island* (Rounsevell et al. 1977), although common down the east coast of the State over inshore shelf waters. Single birds were present within a kilometre of the shore down the island's east coast on 25-Apr-10.

Short-tailed Shearwater (*Ardenna tenuirostris*)

Beach-washed birds noted from 11-Nov-09 with 40+ recorded by the tour group present between 23-Nov-09 and 26-Nov-09. Records of live birds noted from mid Feb-10 onwards with literally hundreds seen streaming southwards off the east coast of the island on 2-Mar-10 and 3-Mar-10. They appear like swarms of midges along the horizon, rising and falling as they move between their breeding colonies and their feeding grounds. This is a species almost certain to be seen if searched for with binoculars by looking out to sea from the isthmus in late November to early April.

Common Diving Petrel (*Pelecanoides urinatrix*)

Not formally reported by *Maria Island Walks* parties, although one of the guests described seeing them from the boat when returning from Maria Island on 24-Apr-10. The seabird party also saw a couple of birds rising from the water as they approached the northern end of the island from Triabunna on 25-Apr-10.

This is a species that should be looked out for particularly when crossing from Triabunna to Darlington and back. They often rise from the sea close to the boat and appear as tiny black birds with very rapid wing beats flying only just above the water (often described as "flying potatoes"). They are usually quite common in these waters and could breed on the eastern side of the island where there appears to be large areas of suitable habitat.

A search of these areas for evidence of a breeding presence of this species and also for Fairy Prions (*Pachyptila turtur*) would be worthwhile as they do form a considerable proportion of the prey of the introduced domestic Cat (*Felis catus*) on other islands where they are all present. Their wings and feathers are littered around such breeding areas. Cats are said to be present and common on Maria Island.

Little Penguin (*Eudyptula minor*)

The colonies at the Fossil Cliffs and Haunted Bay remain active and were reported throughout the period covered by this report with a maximum of 13 birds recorded at the end of Dec-10.

This number does not truly reflect the numbers of this species breeding on the island as there are well established colonies at several locations around the coastline and even a casual search by an experienced observer can demonstrate larger numbers present at any of these locations.

Australasian Gannet (*Morus serator*)

Seen all around the island over the whole tourism period. Large parties often rest on the sea at the northern end of Mercury Passage where there were 250+ on 4-Mar-10 and 200 in mid Mar-10.

Little Pied Cormorant (*Microcarbo melanoleucos*)

This species breeds in very low numbers in Tasmania with only the occasional bird being seen away from breeding colony areas until they begin to disperse. This was reflected by the fact that there were only two tour groups reporting the species until 23-Nov-09 when 6 were reported and none again until 24-Dec-09 with the number observed rising to more than 20 in the first week of Mar-10. Following completion of the breeding season, numbers here are augmented by others of this species coming across the Bass Strait from mainland Australia.

Great Cormorant (*Phalacrocorax carbo*)

Seen in 1s and 2s from 14-Oct-09 through to the third week of Mar-10 with a maximum of 3 in the first week of that month. A species more common in the summer months and not recorded in any numbers on the island.

Little Black Cormorant (*Phalacrocorax sulcirostris*)

Not reported in *Birds of Maria Island* (Rounsevell et al. 1977) and as a result records should be viewed with caution.

This species may be confused with other cormorants when viewed from a distance and particularly when the birds are facing away from the observer. Only two reports in the last three months of the year and then from the end of the second week of Jan-10 reports appeared commencing with a single bird and rising to 40 around 21-Apr-10 to 24-Apr-10.

Black-faced Cormorant (*Phalacrocorax fufescens*)

Recorded on every trip with 30 as the largest number in mid Apr-10. Only recorded in relatively low numbers considering the fact that the roost on Lachlan Island normally holds over 200 birds.

Australian Pelican (*Pelecanus conspicillatus*)

Despite being reported as only an occasional visitor in *Birds of Maria Island* (Rounsevell et al. 1977), the species was present over the whole of the tour season with 1 and up to 6 birds recorded.

White-faced Heron (*Egretta novaehollandiae*)

Resident on the island with numbers augmented by birds possibly from the mainland of Australia coming in from late February onwards as illustrated by the increase in observed numbers, which then rose to more than 10 on at least two occasions.

White-bellied Sea Eagle (*Haliaeetus leucogaster*)

The most reliable area to see this species was Haunted Cove. One or two birds were seen on most visits to 9-Apr-10 at the northeast end of Haunted Bay and Barren Head. Other favoured areas for the species were Point Lesueur, Bloodstone Beach, Fossil Bay and Return Point. Bloodstone Beach to Return Point seems to constitute one pair's territory. Another is that from Hopground Beach to Fossil Bay. There is another probable territory running from Shoal Bay to the Whalers Cove and Bunker Bay area. In summary we suspect that there are possibly four pairs of this species breeding on the island with an eyrie on Skipping Ridge at the northern end and a second in the Counsel Creek or Four Mile Creek area. A third may be out around

Whalers Cove where a nest was found in July 1977. The fourth should lie somewhere in the Haunted Bay area. The regular observations and the notes on the locations where the birds were seen have greatly increased the knowledge of the status of this species on the island.

Brown Goshawk (*Accipiter fasciatus*)

Neither this nor the following species appear to have ever been recorded on the island and should be looked out for as there would seem to be an adequate area of habitat available for one or both species.

Collared Sparrowhawk (*Accipiter cirrocephalus*)

See the above species note.

Swamp Harrier (*Circus approximans*)

Recorded breeding on Isle du Nord in the past and would be expected to be found around the isthmus and the lagoon areas further north. Only single birds reported on a couple of occasions, 1 in the fourth week of Dec-09 and the other in the second week of Jan-10. Most of our Tasmanian birds are beginning to head northwards by mid January explaining the lack of sightings after this time.

Wedge-tailed Eagle (*Aquila audax*)

According to *Birds of Maria Island* (Rounsevell et al. 1977) Wedge-tailed Eagles were described as "an occasional visitor that had not bred on the island in recent times". Observed on most visits over the whole of the recording period with a maximum of 4 in the second week of Nov-09 and again on 26-Feb-10 and 25-Apr-10. On this later date there were 2 adults that circled over Whalers Cove just above tree top level causing consternation to the 2 adult White-breasted Sea-eagles sitting in the trees beneath them. A further 2 subadult birds were seen that same day between Cape Peron and Green Bluff in the island's south.

Brown Falcon (*Falco berigora*)

Another raptor not reported this season although Bill Wakefield recorded them breeding on the island in the 1980s. In addition *Birds of Maria Island* (Rounsevell et al. 1977) stated "several pairs probably breed on the island in open forest and woodland".

Tasmanian Native Hen (*Tribonyx mortierii*)

Three birds were reported as having been released on 7-Oct-77 at Darlington. By Jan-77 the species had spread to Chinamans Bay and Counsel Creek. The highest number noted over the present period of data collection was of 20+ in Feb-10. None of the colour-banded birds from previous studies on the island were reported so it would seem that all of those birds have died out. It would be interesting to know whether there was any further addition to the gene pool of this species as only three forebears for the present stock is quite a genetic bottleneck.

Australian Pied Oystercatcher (*Haematopus longirostris*)

A permanent resident recorded on all of the island's sandy beaches with at least 3 pairs seen, each with two young on 17-Dec-10. These pairs were in Riedle, Shoal and Bloodstone bays. By 22-Dec-10 only a single chick was seen with the Shoal Bay pair. The pairs in Riedle and Bloodstone bays were still present with young on 30-Dec-10 but unfortunately there is no record to positively indicate that their young fledged. Numbers on the island rose to 30 between 13-Jan-10 and 16-Jan-10, although this high figure perhaps involved some birds that had moved from one beach to another causing them to be double counted.

Sooty Oystercatcher (*Haematopus fuliginosus*)

This species has not been recorded as breeding on the island although up to 3 pairs breed on nearby Lachlan Island and another pair are often present on Isle du Nord. From 1 to 5 were seen on Maria Island on 24 of the 61 visits for which records were kept.

Red-capped Plover (*Charadrius ruficapillus*)

Interesting in its absence from the records as one would expect to have come across one or two at the creek mouth area in Chinamans Bay where we have recorded it in the past.

Hooded Plover (*Thinornis rubricollis*)

A resident species recorded on all the island's sandy beaches (Plate 3) with the total numbers varying between 1 and 20+. 3 juveniles accompanied by 2 adults were seen on Riedle Bay beach on 15-Mar-10 but it is not known whether they were reared on the island or were birds from elsewhere.

Plate 3. Hooded Plover, a ground-nesting species along our shore lines, are suffering from loss of habitat and safe breeding areas (image: B. Wakefield & E. Hayward)

Masked Lapwing (*Vanellus miles*)

In the past, this species was only present in very low numbers, occurring on the beaches, lagoon margins and open pasture areas. Although recorded over the tourist period, the only occasion when a number was listed on the data sheets was of 2 birds at the end of Jan-10.

Brown Skua (*Stercorarius antarcticus*)

Known to be recorded over the shelf waters and the continental shelf drop-off, both to the south and north of the island and occasionally sighted from shore along other parts of our coastline. Not reported in the survey sheets or in historical records for the island, although there were two observations made on 25-Apr-10. These were several kilometres off the northeast of the island.

Fairy Tern (*Sternula nereis*)

Recorded on 6 dates between the 9-Nov-09 and 2-Mar-10 with a maximum of 5 on 2-Mar-10. This is a species that has never been recorded breeding on Maria Island and whose population is currently threatened due to disturbance of its breeding habitats around mainland Tasmania. Unfortunately the island does not appear to offer any obviously suitable breeding habitat other than the area around the mouth of the creek at the north end of Chinamans Bay. The area around the mouth of Bernacchis Creek is now too small and disturbed by human activity to attract the species. If Devils are released on the island then the possibility that Fairy Terns or any other species of tern would be able to raise their chicks becomes more improbable.

Caspian Tern (*Hydroprogne caspia*)

Previously considered only a rare visitor to Maria Island. Up to 2 birds were seen between 9-Nov-09 and the end of Apr-10. Between 9-Nov-09 and 12-Nov-09 the species was recorded as breeding but with nothing on the sheet to indicate the evidence for this. Whether it was due to the birds' behavior or the presence of one or more eggs is important to know. The dates

are too early for young to have been present. From 1 to 5 pairs breed on nearby Lachlan Island and prior to 1977 the species used to breed on the western shore of Mercury Passage at Sandspit River at a spot that is now favoured as a beach fishing location and picnic area.

Crested Tern (*Thalasseus bergii*)

Common throughout the year around Tasmania's coastline and can be present in larger numbers at favoured roosting spots such as Darlington Jetty and low tide loafing areas on sandy beaches that are sheltered from the wind such as those in Shoal Bay and Chinamans Bay. Very few were reported between Oct-09 and the first week of Dec-09 with no more than 4+ appearing on the record sheets. Thereafter the maximum number of 70+ was recorded in the second week of Jan-10 when some birds would have left their breeding colonies further along the coast.

Pacific Gull (*Larus pacificus*)

Present year round and recorded on 43 of the visits reaching a maximum of 30+ on 5-Mar-10. It was not until mid Feb-10 that numbers of more than 20+ were noted. At this time birds are leaving their breeding colonies with the young fledging once they have reached 7 weeks of age. The added pressure on the species from the large number of the more aggressive Kelp Gulls will no doubt have encouraged them to move to a more peaceful area, away from Lachlan Island, where they both breed.

Kelp Gull (*Larus dominicanus*)

The first record of the species in Tasmania was 26-Dec-1955. Since then the population has increased dramatically with nearby Lachlan Island hosting one of the larger colonies. It is surprising that this species was only recorded by 23 of the 61 parties who took records of the island's bird species as Lachlan Island, only 2.5 km west of Point Lesueur, holds a large breeding colony.

Silver Gull (*Chroicocephalus novaehollandiae*)

Present year round. Recorded as breeding at Encampment Cove and Return Point by R. Gatenby in 1970, 1971 and 1972, but not since. Between 50 and 100 pairs breed regularly on Lachlan Island. Numbers recorded on Maria Island over this recording period have never been high and have varied from a maximum of 57 on 10-Feb-10 to a low of 4 on 2-Apr-10.

Yellow-tailed Black Cockatoo (*Calyptorhynchus funereus*)

Historically there is only one record of the species having bred on Maria Island and that was in 1976 by R. Gatenby. Recorded by 46 of the 61 touring parties with 10 or more seen on seven of the trips and a maximum of 30 on 13-Jan-10. These records indicate that the area provides important habitat for the species if not as breeding then certainly as a foraging area. Perhaps the extensive logging of nearby areas on mainland Tasmania is pushing birds across in search of feeding and breeding sites.

Green Rosella (*Platycercus caledonicus*)

Prior to mid Mar-10 the reports were of less than 12 birds. After this time 20 or more became a frequent figure as it is around this time of year that the species normally forms flocks, which in some areas of mainland Tasmania may be made up of 50 or more individuals.

Eastern Rosella (*Platycercus eximius*)

Historically 12 birds were introduced to Darlington in Oct-1970 and successfully reared young. The last recorded sighting of either these birds or their progeny was in 1972 although they could have survived longer. 2 were seen on 7-Jul-77 and

15-Jul-77 (Rounsevell et al. 1977). As the species is common nearby at Rheban it is to be expected that birds do visit the island from time to time as evidenced by the sighting of 8 between 10-Feb-10 and 13-Feb-10. More details of this sighting would be desirable to fully authenticate the record.

Swift Parrot (*Lathamus discolor*) [Plate 4]

Maria Island is one of the more important remaining breeding areas for this species with birds recorded from the start of the touring period to the very end. This species was recorded between 14-Oct-09 and mid Apr-10. A roost of at least 70 birds was located between Point Mauge and Stinking Creek on 1-Mar-10. Others have reported the species remaining in similar or slightly larger numbers through to the end of Jun-10.

Plate 4. The Swift Parrot population is in little better shape than the Forty Spotted Pardalote, sharing Maria Island as one of its last strongholds (image: B. Wakefield & E. Hayward)

Horsfields Bronze-Cuckoo (*Chalcites basalis*)

A summer migrant to Tasmania whose status on Maria Island is recorded in *Birds of Maria Island* (Rounsevell et al. 1977) as "a small number probably visit during migration". There was only one previously documented record of a bird seen and heard on 16-Sep-76. The observations of single birds of this species between 13-Jan-10 and 16-Jan-10 and 15-Mar-10 and 18-Mar-10 more than double the number of sightings for this species.

Pallid Cuckoo (*Cacomantis pallidus*)

Recorded as common in dry sclerophyll country by David Milledge when he was on Maria Island as a ranger and only one other record since and that of a bird on 27-Jan-77. *Maria Island Walks* recorded only 2 birds between 9-Nov-09 and 12-Nov-09, which is when the species would be expected to be present on breeding territory.

Fantailed Cuckoo (*Cacomantis flabelliformis*)

A partial migrant to the State with a couple of birds remaining over the winter months in 1976. It was only recorded by five of the visiting groups to the island between the second week of Nov-09 and 8-Mar-10.

Southern Boobook (*Ninox novaeseelandiae*)

This is a species whose numbers and distribution have declined on mainland Tasmania although previously a common resident with some of its population migrating to the mainland in winter. Despite its apparently declining status, most if not all the groups should have recorded this species from its call that can be heard during the hours of darkness. The call gives the species the name of Boobook. Up to 3 birds was the maximum reported by 21 of the tours to the island.

Masked Owl (*Tyto novaehollandiae*)

This is a species that should be looked out for particularly around dusk and dawn. It was suggested that it was probably present as a breeding species in the time of Bernacchi. The last recorded sighting for the island was in 1976 though we have no doubt that as there is plenty of suitable undisturbed habitat, the species should still be present.

Laughing Kookaburra (*Dacelo novaeguineae*)

Introduced to Tasmania in 1906 at Epping Forest and other locations in the north of Tasmania. A previous attempted introduction in 1902 on Waterhouse Island off the north coast of the State failed.

By 1977 birds were recorded at 6 locations on Maria Island. Now a common resident with more than 10 birds seen on several visits and 20+ between 5-Apr-10 and 8-Apr-10. It would be interesting to determine its impact on other species of birds and reptiles on Maria Island.

Tasmanian Scrubwren (*Sericornis humilis*)

A common Tasmanian resident of wet gullies, sub-alpine shrubland and dense undergrowth, often difficult to locate and identify for those unfamiliar with its call and skulking habits. The best way to locate it is to "pish." This sound if rapidly repeated, or the use of a bird squeaker will generally cause the birds to investigate the source and permit better views. As an illustration of the difficulty in sighting and identifying it, the species was recorded by only two of the parties visiting the island.

Yellow-rumped Thornbill (*Acanthiza chrysorrhoa*)

A resident species found mostly in association with prickly box (*Bursaria spinosa*) in the Darlington, Chinamans Bay and McRaes Isthmus areas. Seen on six of the tours when the highest number reported was 12 between 13-Jan-10 and 16-Jan-10.

Tasmanian Thornbill (*Acanthiza ewingii*)

Fortunately Maria Island only has the Tasmanian Thornbill as a resident. It is doubtful but not impossible that the Brown Thornbill ever occured here. Confirmation of the presence of Brown Thornbill would require good photographic evidence in order to convince others. The Tasmanian Thornbill is a common resident, particularly in the wetter gullies. Perhaps the easiest area to see this species is along the Bernacchis Creek track to the reservoir. Owing once again to the fact that this species is one of those damned LBJs (Little Brown Jobs), it was only recorded by four of the groups. [Plate 5]

Plate 5. The Tasmanian Thornbill curiously appears on many of our islands to the exclusion of the very similar Brown Thornbill (image: B. Wakefield & E. Hayward)

Spotted Pardalote (*Pardalotus punctatus*)

A resident species reported to be the least common pardalote on the island in *Birds of Maria Island* (Rounsevell et al. 1977). Despite this, the species was recorded by 13 of the visiting parties between 11-Nov-09 and 14-Apr-10, with up to 4 birds present, indicating that if anything they are more

easily identified, if not more abundant, than the Striated Pardalote.

Forty-spotted Pardalote (*Pardalotus quadragintus*) [Plate 6]

Maria Island and Bruny Island are now the two most important strongholds of the species with only a small number of areas between Hobart and Margate holding a few scattered pairs. Although recorded at the start of the walking season there were none in Dec-09. Noted by 29 of the parties this year but only from 5-Jan-10 to the end of Apr-10. The most frequent area of sightings was between the northern end of Soldiers Beach and the mouth of Four Mile Creek followed by the track leading from the southern end of McRaes Isthmus down to Haunted Bay. A single sighting along the Mount Maria track was the furthest inland record; all the others were along the low lying coastal plains.

Plate 6. The Forty Spotted Pardalote population is now about 1500 birds having suffered a decline of 60% over the last 12 years making its future look bleak (image: B. Wakefield & E. Hayward)

Striated Pardalote (*Pardalotus striatus*)

Recorded in the past as a common breeding summer visitor with practically all leaving the State in winter. Identified by one group of visitors from 1-Mar-10 to 4-Mar-10 by which time most birds of this species had left the State for the mainland of Australia. It will be interesting to see how the species fares on the island over the next few summers as, like the other species of pardalotes, they commonly nest in holes in the ground making them vulnerable to ground predators and to the proposed introduction of the Tasmanian Devil.

Eastern Spinebill (*Acanthorhynchus tenuirostris*)

At the same time as being described as a Tasmanian breeding resident, it is interesting to note that the records of this species available to the writers of in *Birds of Maria Island* (Rounsevell et al. 1977). quoted that the majority of the observations were between 13-20 July and again from the 13-Feb to 30-March indicating that most birds of this species pass through in spring and late summer on migration. This would fit the two following observations of 2 and 5 recorded in the first and third week of March-10, although there were 2+ recorded between 9-Nov-09 and 12-Nov-09 during the breeding season.

Yellow-throated Honeyeater (*Lichenostomus flavicollis*)

This is a truly resident endemic species common in open forest and woodland. No more than 2 recorded by 21 of the visiting parties. The “tonk tonk” of this species would have permitted it to be identified had they been aware of its call as it can be heard along most, if not all, of the tracks taken by the groups.

Little Wattlebird (*Anthochaera chrysoptera*)

Not previously recorded on the island and therefore the record requires more details of the sighting to authenticate its occurrence. This species is not found on any of Tasmania’s other islands, even those less than a kilometre from shore despite the fact that it is common on the nearby mainland.

Yellow Wattlebird (*Anthochaera paradoxa*)

A common resident in wooded grasslands around the island, often forming flocks in autumn and winter. In previous times this species was shot for the oven but is now fully protected. The only group noting the species as common was there between 9-Nov-10 and 12-Nov-10 when 20+ were recorded as present in the area they covered.

White-fronted Chat (*Epthianura albifrons*)

Most frequently encountered in grass and tussock areas such as those out towards Point Lesueur. Up to 5 recorded on eight of the visits distributed over the seven months of the tourist season.

Crescent Honeyeater (*Phylidonyris pyrrhopterus*)

A resident during the summer in the higher forested areas on the northern part of the island, descending to lower ground towards the end of summer. As most of the tour groups spend their time on lower areas this would appear to be born out by the fact that 3 of the 5 records were of birds seen were on or after the 8-Feb-10.

New Holland Honeyeater (*Phylidonyris novaehollandiae*)

A common resident that was most numerous in the first week of Mar-10 when 27 and 20+ were recorded as compared to 12 being the next highest figure towards the end of the second week of Feb-10.

Strong-billed Honeyeater (*Melithreptus validirostris*)

As this species is generally found in wet gullies and forested areas, it is less likely to be recorded by the tour groups than most of the other endemic species. Interestingly there were only four groups that recorded the species and those were between 01-Mar-10 and 15-Mar-10 with 12+ birds as the maximum recorded.

Black-headed Honeyeater (*Melithreptus affinis*)

A common endemic resident reported in the past as the most common of the honeyeaters on the island. Recorded on 46 visits, which is not as frequently as the New Holland Honeyeater, but coming in at third place on 16 visits behind the Yellow-throated Honeyeater, which was reported on 21 visits.

Black-faced Cuckoo-shrike (*Coracina novaehollandiae*)

Records of this species available to the writers of *Birds of Maria Island* (Rounsevell et al. 1977) ranged from 24-Jan to 30-March. Recorded from the 30-Oct-09 onwards, although the majority of recorded sightings were between 5-Feb-10 and 15-Apr-10.

Olive Whistler (*Pachycephala olivacea*)

Found in the thick bush of wet gullies where it's call of "I'll wet you" and a drawn out electronic call may be heard giving its presence away. Uncommon in the areas of the island frequented by the walking groups and recorded on 4 occasions between 27-Nov-09 and 5-Apr-10.

Golden Whistler (*Pachycephala pectoralis*)

A common resident. Up to 10+ recorded on seven of the tours between 9-Nov-09 and 5-Apr-10.

Grey Shrike-thrush (*Colluricincla harmonica*)

Birds of Maria Island (Rounsevell et al. 1977) quotes only one known record of the species for the island and states that there was "no known population of this species on the island". Despite this, single birds were recorded on 8-Jan-10 to 11-Jan-10 and 1-Mar-10 to 4-Mar-10 visits. As the last record was one where both authors identified the bird, we have no doubt as to the accuracy of this later observation.

Dusky Woodswallow (*Artamus cyanopterus*)

10+ in the second week of Nov-09 and then between 10+ and 20+ seen in the first week of March-10, which is at a time of post-breeding dispersal for this species. These were the only sightings reported. Late summer and early autumn is the time of year when this species occurs most frequently on Maria Island.

Australian Magpie (*Cracticus tibicen*)

A common resident breeding species in dry, wooded grassland areas on the northern part of the island. The highest number was estimated as 10 birds by those present between 9-Jan-10 and 16-Jan-10.

Black Currawong (*Strepera fuliginosa*)

A common resident endemic species that we have recorded breeding on the island. 30 estimated as seen between 7-Dec-10 and 10-Dec-10 and 50+ between 1-Mar-10 and 4-Mar-10.

Grey Currawong (*Strepera versicolor*)

Previously reported to be an uncommon species on Maria Island, although there were fourteen reports between 14-Oct-09 and 24-Apr-10 with 20+ birds being recorded by one tour group.

Rufous Fantail (*Rhipidura rufifrons*)

There are no previous records for Maria Island of what is a very rare species in Tasmania. The report of one between 11-Mar-10 and 14-Mar-10 needs a good deal more information in regard to the sighting if it is to be confirmed as accurate and accepted as authentic. Care has to be taken in identifying this species as young Grey Fantails have buff tips to their feathers that can in certain lights and from some angles give the impression that one is looking at or has glimpsed a Rufous Fantail.

Grey Fantail (*Rhipidura albiscapa*)

A common species whose population is partly migratory, moving from Tasmania to mainland Australia. Birds were present throughout the period of observations with 10+ being the highest number recorded and 10 on a couple of occasions in Dec-09. This is perhaps related to the number of young on the wing at that time. Again the frequency of sightings appeared to rise in the first and second weeks of April-10 when the species is moving to lower ground and some are travelling north to cross Bass Strait.

Forest Raven (*Corvus tasmanicus*)

A common resident bird generally recorded in 1s and 2s on the island. 20+ by 2 parties in the first week of March-10, otherwise no more that 10 recorded for the island by the others.

Satin Flycatcher (*Myiagra cyanoleuca*)

The last of Tasmania's summer migrants to arrive and one of the last to leave. Found in gullies such as Bernacchis Creek where a number of pairs breed. A maximum of 10+ birds reported with birds seen over the tour season to the 8-Mar-10.

Scarlet Robin (*Petroica boodang*)

Resident and widespread on the island, more easily seen along the tracks and in open forest areas. Recorded by 39 visiting parties whose stays spanned the whole of the time from the 19-Oct-09 to 26-Apr-10. 6 was the greatest number reported on any one visit.

Flame Robin (*Petroica phoenicea*)

A partially migratory species, with some birds remaining on the island year round, Flame Robins are often seen in loose flocks on open short grasslands in winter and spring, particularly where there are perches within one and a half metres or less above the ground from which to search for

invertebrates. Between 1 and 6 birds recorded on the visits between 7-Oct-09 and 26-Apr-10, with the larger number being seen in the second week of April-10.

Pink Robin (*Petroica rodinogaster*)

A bird of the wet gullies on northern Maria Island perhaps accounting for the fact that only single birds were recorded in late Feb-10 and early Mar-10. The prolonged period of drought over the preceding five years would also have had an effect on the abundance of the species.

Dusky Robin (*Melanodryas vittata*)

One of the Tasmanian endemic species that one would expect to be recorded on almost every visit was only recorded by four of the visiting groups scattered over the season.

Eurasian Skylark (*Alauda arvensis*)

First recorded on the island as recently as 1968. Small flocks have been recorded on open grassy areas in the month of July in the past, a time of year when this species often congregates in loose parties on grasslands, ploughed areas, beaded glasswort (*Sarcocornia quinqueflora*) and lagoon edges. Over the tourist season there were only two reports, one in late Dec-09 and the other in the first week of Mar-10.

Silvereye (*Zosterops lateralis*)

Historically known as a resident and partially migratory species that is common on the island at all times of year, particularly in coastal shrubs and bushes where small and often large flocks are to be found.

Surprisingly only recorded by 6 of the visiting parties and these were between 7-Oct-09 and 10-Oct-09, then with a gap until 8-Jan-10. A further 4 tour groups then reported them up to the 13-Apr-10, indicating that the species may be more abundant on the island in the earlier months of the year.

Welcome Swallow (*Hirundo neoxena*)

A regular visitor to the island that has been recorded breeding there in the past. The majority of the birds of this species leave Tasmania in the autumn with numbers increasing once again from late July onwards. The highest number recorded was in the second week of Dec-09 with 50+. Numbers then fell and rose again to 30+ at the end of the first week of Mar-10. The last sighting was in the first week of Apr-10.

Tree Martin (*Petrochelidon nigricans*)

Recorded by 50 of the visiting parties with 100+ reported between 13-Jan-10 and 16-Jan-10, falling to 61 in the second week of Mar-10 with further decline in numbers to the end of Apr-10.

Bassian Thrush (*Zoothera lunulata*)

A breeding resident in wet gullies, present in very low numbers on the island. This and its tendency to remain motionless make it difficult to observe and account for the fact that it was only observed by two of the visiting parties. They were in the first weeks of March-10 and April-10.

Common Blackbird (*Turdus merula*)

Not reported as present, which is surprising in view of the fact that it had been recorded on the island from 1968 onwards.

Common Starling (*Sturnus vulgaris*)

First recorded on the island between 1887 and 1912. Only 6 were seen between 13-Jan-10 and 16-Jan-10. The relative absence of this species this season was probably due to the severity of the drought denying access to its invertebrate prey.

Beautiful Firetail (*Stagnopleura bella*)

A species not venturing far from cover and more commonly seen in areas of forest understorey such as that along the Bernacchis Creek track to the reservoir and in the prickly box (*Bursaria spinosa*) from

Frenchs Farm to the convict cells near Point Lesueur. 3 sightings of 1 and up to 2 birds between 13-Jan-10 and 12-Mar-10 were the only ones recorded.

House Sparrow (*Passer domesticus*)

First recorded on the island in 1962 forming colonies near old buildings at Darlington and Point Lesueur. It would appear that the species is now absent, although we have no doubt that from time to time it will re-colonise the island.

Australasian Pipit (*Anthus novaeseelandiae*)

A partially migratory species with small returning flocks occurring in July and August on open short grasslands where some birds remain to breed. Most leave Tasmania in the drier summer months. Recorded by 10 of the visiting groups between 13-Jan-10 and 26-Apr-10 with up to 4 birds in Jan-10 and early Feb-10.

CONCLUDING REMARKS

In conclusion we wish to congratulate and thank all those who have contributed to this report through collection of records and observations, in addition to their normal duties as guides. The results provide a most valuable baseline to the knowledge of the status of the birds, which will no doubt undergo marked changes if the proposal to release Tasmanian Devils onto the island goes ahead. This proposal is to carry out a release of up to 70 de-sexed individuals to assess their effects on the biota of the island. Our concerns are that the island already hosts breeding populations of two species of endangered birds that will be impacted to some degree by this introduction. The Forty Spotted Pardalote is already suffering an alarming decline in numbers, which could be accelerated by placing their eggs and young within easy access of this predator. According to the personal experience of one of the authors, five of eleven nests of this species were observed in holes in the ground. Ground breeders of this or any other species are naturally at increased risk of predation.

The population of Devils on Robbins Island is unique in that there is already a physical barrier that operates at least to some degree in reducing or perhaps preventing animals from mixing with those on mainland Tasmania in the form of the tidal waterway. At this location we have observed them on a number of occasions during daylight hours suggesting them to be more diurnal in their habits. If this were to occur on Maria Island then birds frequently entering and leaving nest burrows, or newly fledged young on the ground not yet easily able to fly, could result in them falling prey.

The Cape Barren Goose used to raise 1200 goslings to fledging and leaving Goose Island prior to the introduction of Tasmanian Devils. In the first year post-introduction only seven young geese fledged. Quite an impact! This would spell the demise of the introduced Cape Barren Goose and possibly the Tasmanian Native Hen, which is present in very low numbers and only has a tenuous hold that can easily be shaken loose. The Hooded Plovers along the foreshore would also be likely to disappear. The Fairy Penguin and Short-tailed Shearwater colonies will also feel the impact with the possibility of one or even both species being eliminated.

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DISTRIBUTION AND ECOLOGY OF THREE THREATENED TASMANIAN ENDEMIC SPECIES OF *BORONIA*

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ABSTRACT

A taxonomic review of the *Boronia* genus by Duretto (2003) increased the number of described species in Tasmania from six to fifteen, which included the addition of *Boronia hemichiton* and *B. hippopala* and the reinstallation of *B. gunnii*. These three species are considered a high priority for conservation due to their endemism and apparently restricted distribution and are all listed on the Tasmanian *Threatened Species Protection Act 1995*. Prior to this project, the only formal survey work and conservation assessment for *B. hemichiton*, *B. hippopala* and *B. gunnii* had been undertaken by Schahinger (2004).

In 2005 and 2006 the Forest Practices Authority, with support from Forestry Tasmania, undertook a project to:

- gather information on the size, extent and condition of the known population of these three species;
- conduct extension surveys for each species, and;
- identify sites of significance and develop recommendations for conservation management of the species on State forest.

No new populations of *B. hemichiton*, *B. hippopala* or *B. gunnii* were located during the survey work, which confirmed the distributional gaps previously identified by Schahinger (2004) and supported the threatened conservation status of the three species. Information on population size and extent at significant sites indicated much larger estimated populations than previously reported. However, accurate mapping of area of occupancy was highlighted as a knowledge gap.

For the first time in Tasmania, mature individuals of *B. hemichiton* and *B. hippopala* were aged using growth ring counts and found to be between 13 and 21 years old. It is likely that this corresponds with a disturbance event, as large numbers of seedlings were recorded growing in recently burnt sites. The results of this project have supported the management recommendations by Schahinger (2004) for protection of significant sites combined with fire management, using a fire interval of 12-20 years.

INTRODUCTION

The genus *Boronia* is a member of the Rutaceae family and characterised by small to medium aromatic shrubs that generally occupy heath and woodland communities. There are over 100 species of *Boronia* endemic to Australia (Morely & Toelken 2002), with some species listed on the Commonwealth *Environmental Protection Biodiversity Conservation Act 1999* due to small and fragmented populations (Shapcott et al. 2005).

Tasmania currently has 15 described species of *Boronia* (Duretto 2003). This number was increased from six (Curtis &

Morris 1975) after a taxonomic review of the genus by Duretto (2003) and includes nine endemics and three species listed as threatened on the Tasmanian *Threatened Species Protection Act 1995*.

The threatened species are *B. hemichiton* (endangered), *B. hippopala* (vulnerable) and *B. gunnii* (vulnerable), which are also all listed as Vulnerable on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. *B. hemichiton* (Plates 1 & 9) and *B. hippopala* (Plate 2) were described and *B. gunnii* (Plate 5) was reinstated by Duretto (2003).

These species were often previously identified as *B. pilosa* though they are in fact more closely related to *B. citriodora* (M. Duretto pers. comm.).

Plate 1. *Boronia hemichiton*

B. hemichiton, *B. hippopala* and *B. gunnii* are found in northeastern and eastern Tasmania in disjunct populations.

B. hemichiton is known only from Mount Arthur in the State's northeast. *B. hippopala* and *B. gunnii* are found in the Eastern Tiers in the St Pauls River and Dukes Marshes areas (Schahinger 2004; TSS 2005a; TSS 2005b; TSS 2005c). *B. hemichiton* (Plate 3) and *B. hippopala* (Plate 4) share broadly similar habitat characteristics, occurring in wet heathland or shrubland grading into eucalypt woodland. The associated understorey is dominated by *Leptospermum* species, *Callistemon viridiflorus*, *Melaleuca* species, *Hibbertia* species and *Gahnia grandis* (Schahinger 2004; TSS 2005b; TSS 2005c). *B. gunnii* is a riverine species that occurs in sheltered habitats (Plate 6), such as between boulders, in the flood zone of the St Pauls, South Esk and Apsley river systems (Schahinger 2004; TSS 2005a).

Plate 2. *Boronia hippopala*
insets show flowers and velvety surface of branchlets and leaves

A review of the conservation status of these three *Boronia* species was undertaken by Schahinger (2004) with qualifications for listing on the Tasmanian *Threatened Species Protection Act 1995* due to: a small number of disjunct locations and projected decline in extent and quality of habitat (*B. hemichiton* and *B. hippopala*) and; a small number of populations and individuals (*B. gunnii*). At the time of

Schahinger's works, all locations of *B. hemichiton* and *B. hippopala* were known from State forest and two populations of *B. gunnii* were also from State forest (although not exclusively).

Plate 3. Woodland habitat of *Boronia hemichiton* near Mount Arthur

Plate 4. Wet heathland habitat of *Boronia hippopala* at Flagstaff Marsh

The combination of changes in taxonomy, listing of the three species, locations of the species on State forest and limited survey effort (to date) prompted Forestry Tasmania to commission a project to conducted a more detailed assessment of the distribution of *B. hemichiton*, *B. hippopala* and *B. gunnii*. This project was undertaken by the Forest Practices Authority in 2005 and 2006 and details of the survey work and results were delivered in an unpublished report to Forestry Tasmania (Chuter 2006). This paper summarises the results of that project and outlines recommendations for conservation of the species' and directions for future study.

Plate 5. *Boronia gunnii* growing in crevices of dolerite boulders near Meadstone Falls

Plate 6. Flood-prone boulder-strewn river bed habitat of *Boronia gunnii* near Meadstone Falls

METHODS

Field methods

Study sites were chosen based on known locations and a report by Schahinger (2004), which indentified areas with potential habitat for the three target species. Survey work was undertaken between December 2005 and March 2006, which coincided with the flowering time of the species. The distinctive pink-white four-petalled flowers are an important feature for identification of these three species in areas dominated by thick heath. Known locations were re-visited to assess the extent and condition of the populations and potential habitat sites were targeted for extension survey work. Figures 1 & 2 show the location of all sites surveyed during the project.

At known locations, the target species was relocated using GDA coordinates supplied in Schahinger (2004) and surveys on population size and extent were carried out. At potential habitat sites a widespread search of the area was conducted using maximum person and time allocations.

Where target species were located the population size and extent was assessed by random sampling within a 30 m^2 plot. Within the plot (at random locations), 30 1 x 1 m^2 quadrats were sampled and number of individual plants and life history stage (flowering adult or seedling) was recorded. Number of plots surveyed varied depending on the extent of the area occupied by *Boronia*. A general floristic survey was also undertaken for each 30 m^2 plot.

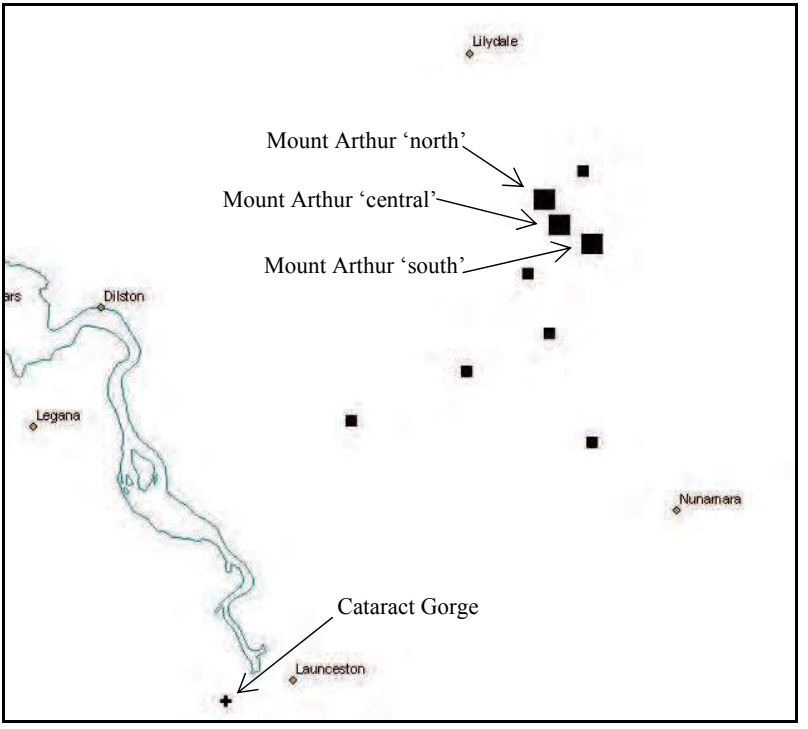

Figure 1. Location of positive (big square) and negative (small square) sites of *Boronia hemichiton*; negative *Boronia gunnii* site (cross) at Cataract Gorge

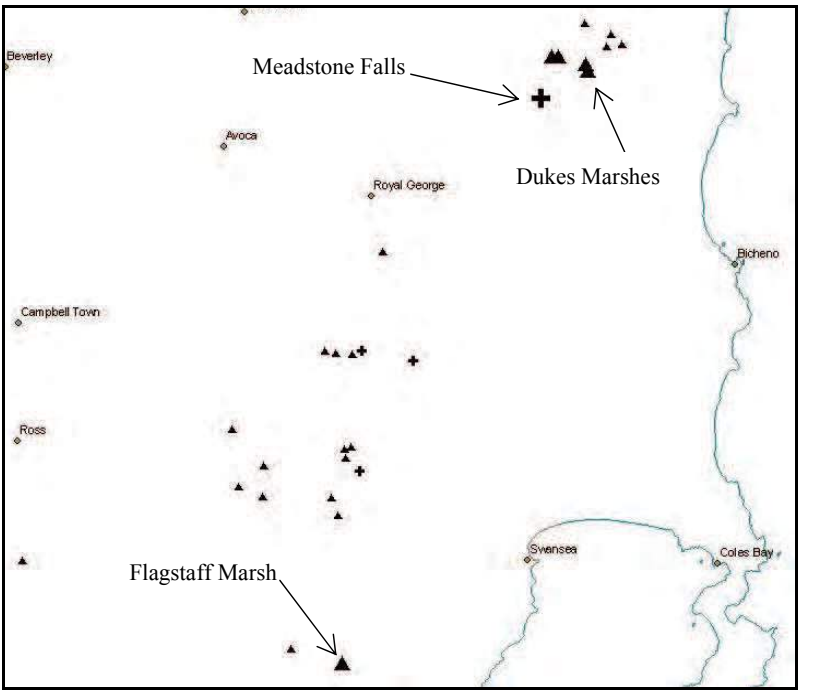

Figure 2. Locations of positive (big triangle) and negative (small triangle) *Boronia hippopala* sites; positive (big cross) and negative (small cross) *Boronia gunnii* sites

Population age

Two sites were chosen for further field work to age the population of *Boronia*; Mount Arthur (*B. hemichiton*) and Flagstaff Marsh (*B. hippopala*). These sites were considered to be significant based on the large size of the populations, the extent of the potential habitat and the range of life stages (both adult plants and seedlings present). At each site (in addition to the population sampling conducted as outlined in previous section) 10 cm samples of the main stem (at base of stem) of eight mature plants of *B. hippopala* and four mature plants of *B. hemichiton* were collected for growth ring analysis. The stem samples were cut into slices approximately 1 cm in width and sanded to produce a smooth surface for growth ring counts (Plate 7).

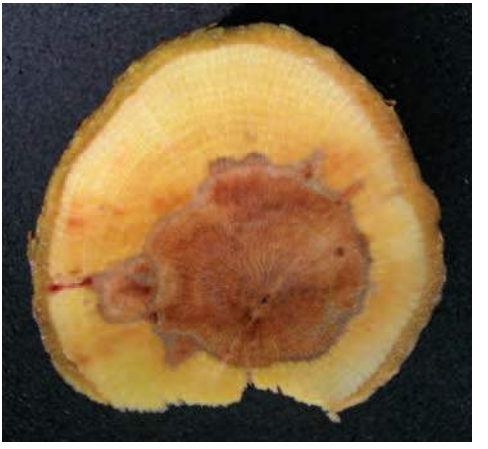

Plate 7. Cut and polished stem of *Boronia hippopala* from Flagstaff Marsh with visible growth rings (x 3.5) (image: Greg Jordan, University of Tasmania)

Data analysis

For sites with positive occurrence of the target *Boronia* species, the results of the floristic survey were analysed for similarity in a Bray-Curtis ordination and a cluster dendogram using PCORD4. Survey plots were used as the basic level of replication for the floristic association data analysis. Population size at positive sites was estimated from the data collected in the quadrat sampling. The number of plants recorded in the quadrats was extrapolated to represent a 100 m^2 area.

RESULTS

Population abundance, extent and distribution

A total of 38 sites were surveyed for *B. hemichiton* (9), *B. hippopala* (24) and *B. gunnii* (5). The target species were successfully relocated at 9 sites, all previously identified by Schahinger (2004), but no new populations were discovered. The location of the positive sites is shown graphically in Figures 1 & 2 and exact locations of all sites surveyed using GDA coordinate are given in Appendix 1.

Boronia hemichiton

Surveys for *B. hemichiton* were concentrated in the Mount Arthur area in northeastern Tasmania. Three known sites were relocated on Mount Arthur. Other suitable habitat in the area was searched but no new populations were found.

Three distinct locations of *B. hemichiton* are found on Mount Arthur, herein named Mount Arthur 'south', 'north' and 'central' (Figure 1). Estimated population size for the Mount Arthur populations is given in Table 1.

The estimated number of adult plants ranged from 56/100 m^2 at Mount Arthur 'central' to 17/100 m^2 at Mount Arthur 'south'. Mount Arthur 'south' has a significantly higher number of seedlings than the other areas, at 320 seedlings per 100 m^2 (Plate 8) compared to 59 seedlings per 100 m^2 at Mount Arthur 'central'. Mount Arthur 'south' was burnt by wildfire in 2003 and *Boronia* seedlings 1-2 years old were observed in high number in the burnt areas and on the road verges. No seedlings were observed at Mount Arthur 'north'; this site had not been recently burnt.

Table 1. Estimated size of populations per 100 m^2 at each positive site sampled

Species	Location	No. of plots / plot numbers	Average pop^n size (per 100m^2)
B. hemichiton	Mt Arthur 'south'	11 (P14 – P24)	320 seedlings; 17 adults
B. hemichiton	Mt Arthur 'north'	1 (P10)	27 adults
B. hemichiton	Mt Arthur 'central'	3 (P11 – 13)	59 seedlings; 56 adults
B. hippopala	Dukes Marshes area	4 (P5 – P8)	17 adults
B. hippopala	Flagstaff Marsh	4 (P1 – P4)	17 seedlings; 91 adults
B. gunnii	Meadstone Falls	1 (P9)	23 seedlings; 57 adults

Plate 8. Prolific growth of seedlings of *B. hemichiton* was recorded at the burnt marsh on the southern side of Mount Arthur: a large number of seedlings estimated to be one year's growth are shown in the foreground of this photo (image: Justine Shaw, DPIPWE)

Boronia hippopala

Known locations of *B. hippopala* were relocated at Flagstaff Marsh, the Dukes Marshes area and the Meadstone Falls area in eastern Tasmania. Extension surveys were conducted throughout the distributional gap in suitable habitat at 19 sites across the Eastern Tiers but no new populations were recorded.

Population abundance surveys were undertaken at Flagstaff and Dukes marshes. The Meadstone Falls area was not assessed for population size as the species was only found scattered along the road edge. An estimated 91 adult plants per 100 m^2 was supported at Flagstaff Marsh at the time of the surveys (see Table 1). This large number of adults was mainly confined to suitable habitat that had not been burnt and did not support seedlings. Some parts of the marsh had been burnt in 2002 and supported the seedling *B. hippopala* population at an estimated 17 seedlings per 100 m^2.

Boronia gunnii

Boronia gunnii was relocated at one site at Meadstone Falls. Four other sites with potential habitat were surveyed, including a historical record in Cataract Gorge, but no new populations were found. The site at Meadstone Falls was from the riparian area associated with the river and estimated to support 57 adult plants and 23 seedlings per 100 m^2.

Mature plant age

Stem samples taken from *B. hemichiton* and *B. hippopala* from Mouth Arthur 'south' and Flagstaff March, respectively, were used to age the populations. Samples were taken from mature plant specimens from unburnt areas. The average growth ring count was 20.75 for *B. hemichiton* and 15 for *B. hippopala*.

Floristic associations

The distribution by ordination of plots according to floristic composition is given in Figure 3. Most *B. hemichiton* plots are clustered and distanced from the plots of *B. hippopala* and *B. gunnii*. This indicates that *B. hemichiton* plots are floristically similar in species composition to each other and different to the *B. hippopala* and *B. gunnii* plots. One exception is plot P10, which appears to be floristically different on the ordination.

However, the cluster analysis, which uses the same floristic data, shows that this plot is closely related to the other plots of *B. hemichiton* (Figure 4). The cluster analysis also supports the result that the *B. hemichiton* plots are more closely related floristically to each other than to *B. hippopala* or *B. gunnii* plots.

The ordination graph shows two distinct groups of plots of *B. hippopala*: plots 1-4 from Flagstaff Marsh appear to be floristically different to plots 5-8 from Dukes Marshes. Plot P9 is an outlier and is the one *B. gunnii* site. The cluster analysis indicates the *B. gunnii* plot to be closely related to the *B. hippopala* plots from

Dukes Marshes. This is expected as the *B. gunnii* plot is from the Dukes Marshes catchment area.

Boronia hemichiton

Floristic composition of all three *B. hemichiton* sites was very similar. *Eucalyptus delegatensis* and *E. amygdalina* were frequent dominant species with *Callistemon viridiflorus*, *Leptospermum lanigerum*, *Micrantheum hexandrum* and *Gahnia sieberiana* as the more common understorey species (Plate 3).

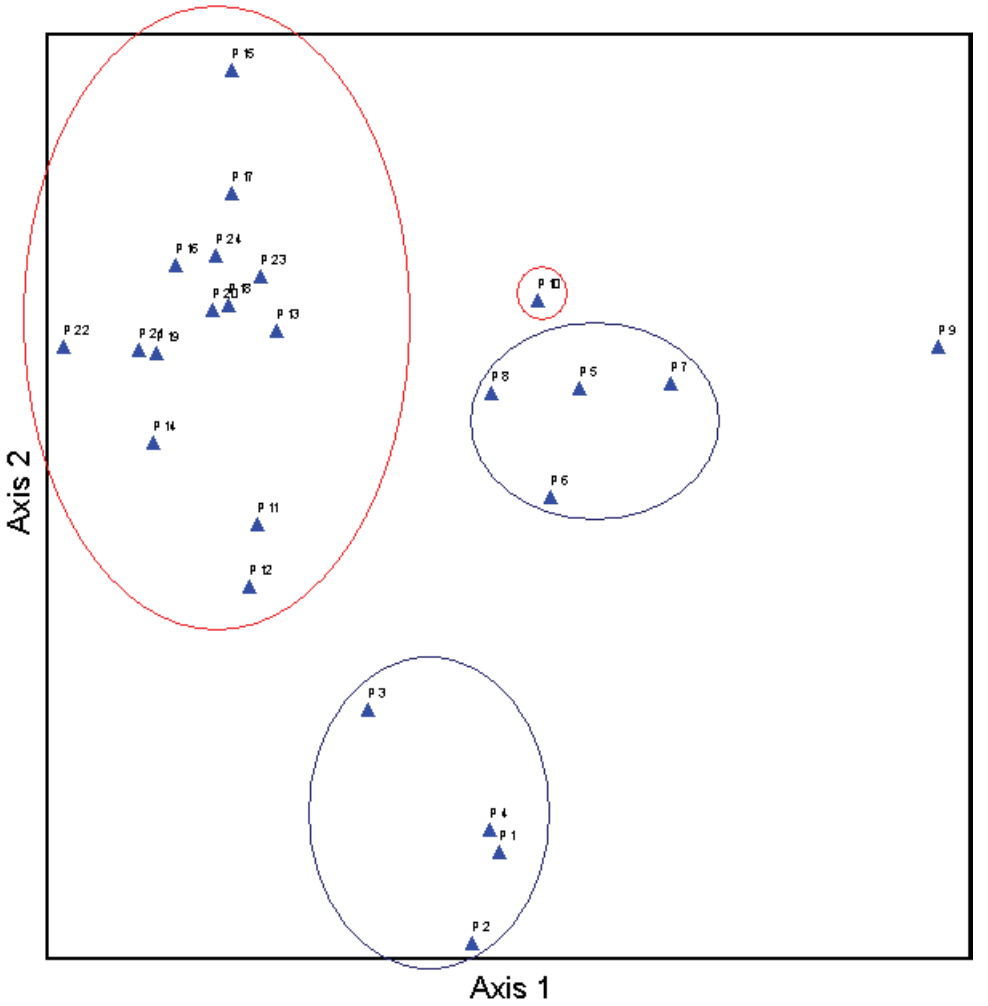

Figure 3. Ordination graph of floristic composition for each plot surveyed with a *Boronia* species present. Plot numbers are marked P1 through to P24 and correspond with the plot numbers given in Table 1. The encircled points on the graph group those plots with the same *Boronia* species present. Red represents *B. hemichiton* and blue represents *B. hippopala* plots. The point not circled represents the *B. gunnii* site.

Boronia hippopala

At Flagstaff Marsh, *B. hippopala* was found growing in wet scrub dominated by *Eucalyptus rodwayi* (Plate 4). The understorey vegetation comprised *Callistemon viridiflorus*, *Epacris gunnii*, *Melaleuca gibbosa* and *M. squamea*. Populations in the Dukes Marshes area were found in the ecotone between wet scrub and eucalypt woodland as described by Schahinger (2004). The flora associated with the populations included *Micrantheum hexandrum*, *Leptospermum scoparium*, *Lomatia tinctoria* and *Banksia marginata*.

Boronia gunnii

B. gunnii was found growing in rock crevices of a river on a dolerite substrate (Plates 5 & 6). The associated vegetation includes *Hakea microcarpa*, *Micrantheum hexandrum*, *Leptospermum lanigerum* and *Lomatia tinctoria*.

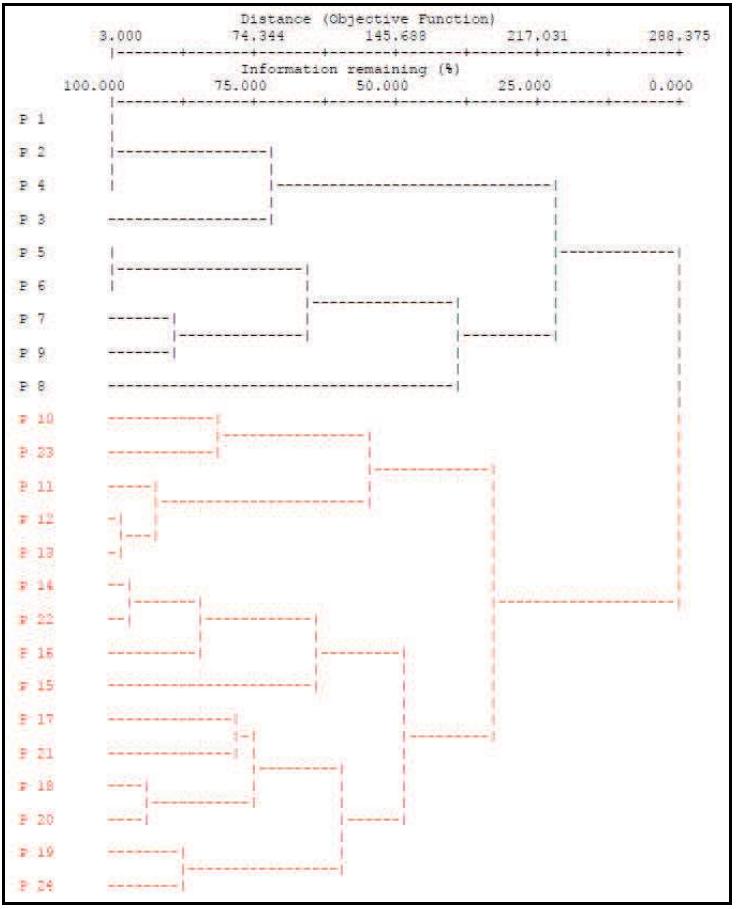

Figure 4. A dendrogram showing the relationship between plots (plots P11-P24 in red = *B. hemichiton* sites, except plot P10 = *B. gunnii* site; plots P1-10 in black = *B. hippopala* sites; linkage method = Ward's method; distance measure = Euclidean (Pythagorean); percent chaining = 2.67

DISCUSSION

Distribution and population dynamics

The focus of this project was on surveying potential habitat within distributional gaps to potentially extend the range of the species. Some data on number of plants in a population or at a site was collected; however, the estimates of population size are only indications. In reality, the actual population numbers are likely to be lower than the estimated numbers due to a scattered distribution and varying densities of populations.

Boronia species were relocated at known sites on Mount Arthur, at Flagstaff Marsh, Dukes Marshes (and surrounds) and Meadstone Falls. All populations of the target species were in good condition, with two sites, Mount Arthur 'south' and Flagstaff Marsh, supporting a large number of seedlings of *B. hemichiton* and *B. hippopala*, respectively. These sites had been recently burnt, indicating a positive response to disturbance, which supports the findings by Schahinger (2004). Mature plants from the same sites were found to be between 13 and 21 years of age, according to growth ring counts. It was observed in the field that these mature plants were showing signs of being suppressed by the surrounding dense vegetation.

Extrapolation of plot count data indicated large population sizes, ranging from 17 plants per 100 m^2 at Dukes Marshes up to 320 seedlings per 100 m^2 at Mount Arthur 'south'. The estimated population size was larger than that reported by Schahinger (2004). However, this is an upper limit estimate. The area of occupancy for each site is still unknown and the patchy distribution of the plants may result in the actual population numbers being lower than reported here.

The response of these species of *Boronia* to the pathogen *Phytophthora cinnamomi* (PC) has not been a focus of this project. However, it is worth mentioning as a discussion point. Schahinger (2004) recommended a conservative approach to the management of PC in areas supporting known population of a threatened species of *Boronia*. Lab-based susceptibility trials indicated that in general these species have a high level of resistance to PC, although *B. hemichiton* does show slight susceptibility and both *B. hemichiton* and *B. gunnii* are hosts of the pathogen (Rudman et al. 2008). Field observations during this project did not report any signs of PC in the sampled populations. Although the results of the lab-based testing indicated only a slight susceptibly in *B. hemichiton*, these species can be associated with other PC-susceptible species and vegetation communities and therefore a conservative approach to PC management in known locations is still recommended, following recommendations in Schahinger (2004).

Floristic associations

Impeded drainage associated with wet heathland characterised the floristic similarities between sites supporting populations of *B. hemichiton* and *B. hippopala*. Taller shrubs, such as species of *Leptospermum* and *Melaleuca*, *Callistemon viridiflorus* and *Hakea lissosperma* dominated sites that had not been recently disturbed and contained mostly mature *Boronia* plants. Those sites that had been recently disturbed by fire had a higher occurrence of heath species, graminoids and herbaceous species as well as a high occurrence of *Boronia* seedlings.

Floristic differences between sites supporting populations of *B. hemichiton* and *B. hippopala* sites are mostly confined to the overstorey. *B. hemichiton* sites are typically dominated by *Eucalyptus delegatensis* and *E. amygdalina* with an understorey of dense *Callistemon viridiflorus*, *Leptospermum* species and

Gahnia species. *B. hippopala* sites had a similar overstorey dominated by *E. rodwayi*, *E. pauciflora* and *E. viminalis*. *Banksia marginata* commonly occurred with *Boronia hippopala*, as did *Bauera rubioides* and a number of epacrids and herbaceous species. The floristic associations recorded during this project can be used to identify areas of potential habitat for these threatened species. This will be useful for future survey work.

Response to disturbance

Results from this study indicate that *B. hemichiton* and *B. hippopala* respond positively to disturbance from fire, in terms of seedling regeneration. Species of *Boronia* species are known to come back readily after fire from soil-stored seed (M. Duretto, pers. comm.). No mature plants were observed to be re-sprouting after fire, indicating that the plants were killed by the fire. Abundant seedling regeneration after fire was recorded for *B. hemichiton* at Mount Arthur and *B. hippopala* at Flagstaff Marsh (Figure 6). Seedling regeneration was prolific with approximately 320 seedlings per 100 m^2 at Mount Arthur and 17 seedlings per 100 m^2 at Flagstaff Marsh. The number of seedlings is expected to decrease over time (particularly for *B. hemichiton* seedling number at Mount Arthur) as competition with associated vegetation increases. *Boronia* species are poor competitors with tall heath species (M. Duretto pers. comm.).

Other studies have also shown a negative correlation between *Boronia* seedling number and time since disturbance (Shapcott et al. 2005). The growth ring counts indicated that the mature plants were one age cohort, which suggests a single reproductive event, most likely associated with a disturbance. Species of *Boronia* react positively to disturbance from fire and cuttings and quarries (Schahinger 2004). Schahinger (2004) proposed a fire regime of between 12 and 20 years for populations of *B. hemichiton* and *B. hippopala*. This dependence on disturbance to regenerate may be responsible for the rarity of the species. Schapcott et al. (2005) identified a positive relationship between fire response and rarity in two species of *Boronia* in Queensland. Both species are killed by fire and depend on soil-stored seed for regeneration.

CONSERVATION MANAGEMENT

Conservation of biodiversity in Tasmania is currently achieved through a range of processes, including protection through reservation as well as species-specific management. The recommendations for conservation delivered through this paper are limited to protection of known locations, fire management (*B. hemichiton* and *B. hippopala*) and limiting hydrological disturbance (*B. gunnii*). They closely follow the recommendations delivered by Schahinger (2004).

B. hemichiton, *B. hippopala* and *B. gunnii* are currently listed on the Tasmanian *Threatened Species Protection Act 1995* due to small and disjunct populations. The results of this project have shown that the species should retain their threatened status due to the small number of known locations combined with disjunct populations, although the number of individuals may be higher than previously estimated.

Suitable habitat for these species, based on floristic composition and structure at known sites, ranges from open woodlands with a dense shrubby understorey to marshes (*B. hemichiton* and *B. hippopala*) and riparian areas (*B. gunnii*). Known sites have low density of eucalypt cover and may not be of high wood production value, and therefore protection through reservation of key sites is a realistic goal. Some known

sites are already in reserve, such as Flagstaff Marsh, which is part of the Tooms Lake Forest Reserve. However, protection without management for *B. hemichiton* and *B. hippopala* may not be suitable, as results from this and other studies indicate that the species rely on disturbance for regeneration.

Schahinger (2004) recommended fire management for *B. hemichiton* and *B. hippopala*, through implementation of a burn interval of 12-20 years. This burn interval is supported by the results of this project, which recorded large numbers of seedlings areas burnt 3-4 years prior to survey, and aged mature plants between 13 and 21 years. Field observation indicates that the mature plants, from where the stem samples were sourced, were beginning to be suppressed by surrounding vegetation (such as species of *Leptospermum* and *Melaleuca*). Schahinger (2004) recommended strategic burning of three sites: Mount Arthur, Dukes Marshes and Horseshoe Marsh. It is recommended that Flagstaff Marsh be included in this strategic recommendation.

Fire is important in the conservation management of many flora and fauna species in Tasmania, as well as the regeneration of many vegetation communities. A local example of fire being used as a tool for conservation management is the management of the grasslands at Surrey Hills in northwest Tasmania. The 2,000 ha estate of high conservation value grassland is subject to low intensity burns of discrete area units to maintain and enhance the floristic diversity of the grassland and provide habitat for threatened species (e.g. ptunarra brown butterfly) associated with the area (Davey & Duncan 2006). Flagstaff Marsh is also a known location of the ptunarra brown butterfly as well as *B. hippopala*, and tactical burning of this marsh at the recommended burn interval will mostly likely have conservation benefits for both species.

Implementing habitat protection for *B. gunnii* in wood productions areas is relatively simple under current policy and legislation. The species occupies the riparian area around Meadstone Falls, and under the *Forest Practices Code 2000* (FPB 2000) this is a class 1 "stream" and must have a minimum 40 m streamside reserve applied. Schahinger (2004) indicated that *B. gunnii* may be at risk from hydrological disturbance upstream of known locations. The upper reaches of the St Pauls, Dukes and Apsley rivers are on State forest and consideration should be given to downstream populations of *B. gunnii* during forest practices planning.

FUTURE WORK

Two future research areas have been identified through this project: (1) accurate mapping of area occupied, and (2) reassessment of populations following disturbance by fire.

This project and the work undertaken by Schahinger (2004) attempted to quantify key populations of the three target *Boronia* species. Number of individuals and area of occupancy for Flagstaff Marsh has been based on estimates, extrapolation of small plots and broad-scale vegetation mapping. More population data, including area occupancy polygons and intensive individual plant counts, will provide an accurate picture of the conservation status of the species. In addition to this work, reassessment of the 'significant sites' that were burnt in 2002 (*B. hippopala* at Flagstaff Marsh) and 2003 (*B. hemichiton* at Mount Arthur) will provide additional information on the population dynamics approximately ten years after disturbance. One aspect of interest would be the expected decrease in *Boronia* numbers in

burnt areas where seedling counts were high during 2005-2006. Understanding the role that fire plays in the ecology and distribution of these threatened species is important in the development of conservation management objectives.

ACKNOWLEDGEMENTS

Thanks to Fred Duncan (Forest Practices Authority), Richard Schahinger (*Threatened Species Section, DPIPWE*) and Marco Duretto (Tasmanian Herbarium of the Tasmanian Museum & Art Gallery) for providing specialist advice and assistance with project design, field work and comments on the unpublished report. Thanks to Justine Shaw (DPIPWE), Tim Leaman and Marie Yee (Forestry Tasmania), Adam Pennington (FPA) and Simon Davies (FPA) for field assistance; and to Greg Jordan (School of Plant Science, University of Tasmania) for laboratory assistance. This project was made possible though the funding from Forestry Tasmania and in-kind support from the Forest Practices Authority.

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APPENDIX. Sites surveyed during this project.

[Sites where the target *Boronia* species were detected have been highlighted in bold.;GPS coordinates are in the GDA94 datum; mapsheets used are from the Tasmap 1:25 000 series]

Target species	Site	Mapsheet	Easting	Northing
Boronia hippopala	**Flagstaff Marsh**	**Tooms**	**571 311**	**5326 119**
Boronia hippopala	Alfred Creek	Tooms	566 500	5327 400
Boronia hippopala	Long Marsh	Colonels	541 200	5335 650
Boronia hippopala	Crayfish Swamp	Colonels	570 846	5339 914
Boronia hippopala	Wingys Tier	Leake	570 250	5341 500
Boronia hippopala	Crossins Road	Leake	571 650	5345 250
Boronia hippopala	Shaws Bog	Leake	571 550	5346 000
Boronia hippopala	Big Peppermint Hill	Leake	572 100	5346 200
Boronia hippopala	Old Flagstaff Marsh	Leake	561 550	5342 500
Boronia hippopala	Long Marsh Road	Leake	563 800	5341 600
Boronia hippopala	Wet Gun Swamp	Leake	563 950	5344 450
Boronia hippopala	Ladies Mile Marsh	Leake	560 950	5347 900
Boronia hippopala	Duckhole Flats	Snow	569 700	5355 200
Boronia hippopala	Meetus Falls Forest Reserve	Snow	572 250	5354 900
Boronia hippopala	Ferrars Tier	Snow	570 650	5354 950
Boronia hippopala	White Marsh	Roys	575 100	5364 400
Boronia hippopala	**Dukes Marshes**	**Fingal**	**594 456**	**5381 339**
Boronia hippopala	**Horseshoe Marsh**	**Fingal**	**591 656**	**5382 605**
Boronia hippopala	**Alberts Marsh**	**Fingal**	**590 998**	**5382 647**
Boronia hippopala	**Meadstone Falls Road**	**Fingal**	**594 422**	**5381 293**
Boronia hippopala	Black Marsh	Fingal	596 150	5383 500
Boronia hippopala	Timmine Gully	Fingal	597 600	5383 750
Boronia hippopala	Sandy Marsh	Fingal	596 600	5384 650
Boronia hippopala	Fingal Tier	Fingal	594 100	5385 650
Boronia hemichiton	**Mount Arthur 'north'**	**Patersonia**	**520 650**	**5428 300**
Boronia hemichiton	**Mount Arthur 'south'**	**Patersonia**	**522 250**	**5425 800**
Boronia hemichiton	**Mount Arthur 'central'**	**Patersonia**	**521 150**	**5427 450**
Boronia hemichiton	Eaglehawk Road	Patersonia	520 100	5425 850
Boronia hemichiton	Excalibur Road	Patersonia	520 800	5423 850
Boronia hemichiton	Prossers Forest Road	Patersonia	522 250	5420 200
Boronia hemichiton	Blyths Spur	Patersonia	521 950	5429 300
Boronia hemichiton	Boomer Hills	Dilston	514 100	5420 900

Target species	Site	Mapsheet	Easting	Northing
Boronia hemichiton	Butchers Creek	Dilston	518 000	5422 550
Boronia gunnii	Lost Falls	Leake	572 900	5343 950
Boronia gunnii	Meetus Falls Forest Reserve	Snow	573 200	5355 200
Boronia gunnii	Cygnet River	Snow	578 000	5354 300
Boronia gunnii	**Meadstone Falls**	**Fingal**	**590 044**	**5378 683**
Boronia gunnii	Cataract Gorge	Launceston	**509 850**	**5411 500**

Plate 9. *Boronia hemichiton*

INITIAL OBSERVATIONS OF SEED AND FRUIT DEVELOPMENT IN *THISMIA RODWAYI* (FAIRY LANTERNS)

James Wood

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Thismia rodwayi (Thismiaceae) is a small, chlorophyll devoid, herb that spends most of its life hidden below the leaf litter (Plate 1). Given this habit little has been known about this plant since its discovery in 1890. But in the last ten years our understanding of this plant's distribution has seen a massive leap. Chance discoveries within Tasmania in 2002 followed by methodical searches (Roberts et al. 2003) have revealed this cryptic herb to be potentially widespread within the State's wet sclerophyll forests (Wapstra et al. 2005).

'SeedSafe' is a plant conservation program aiming to safeguard the Tasmanian flora by holding seeds in long-term storage. The program is a collaboration of the Royal Tasmanian Botanical Gardens (RTBG), the Tasmanian Herbarium; the Resource Management and Conservation Division of the Department of Primary Industries, Parks, Water & Environment (DPIPWE), and the Seed Conservation Department of the Royal Botanic Gardens, Kew (United Kingdom). The project conducts work across the State from Flinders Island to Macquarie Island, but is housed at the Tasmanian Seed Conservation Centre (TSSC), a seed bank facility located at the Royal Tasmanian Botanical Gardens, Hobart. 'SeedSafe' was founded as part of the global conservation program known as the Millennium Seed Bank Project, a landmark project that successfully collected and banked seeds of over 24, 200 wild plant species.

Collecting seed of Thismia rodwayi

With the recent increase in the understanding of the distribution and ecology of *Thismia rodwayi*, the Tasmanian SeedSafe program decided that an attempt should be made to secure seeds in long term storage. The collection of threatened flora is a high priority for the SeedSafe program and work is carried out under the appropriate permits from DPIPWE. Seed collector Micah Visoiu sought information from other field workers and in October of 2009 located a population of *Thismia rodwayi* in the Arve River valley previously identified by Mark Wapstra.

Plate 1. *Thismia rodwayi* flower *in situ*, some leaf litter removed (image: Mark Wapstra)

At this stage the population was in flower and return visits in November and December seemed to show little change. Upon the last visit it was decided to bring the plants into the TSCC laboratory here at the RTBG and hopefully let the fruits mature under observation.

So on the 14th of December the seedbank took possession of a 31 cm x 22 cm Tupperware box containing five small rootballs of flowering plants of *Thismia rodwayi*. The rootballs were placed on a bed of sphagnum moss within the Tupperware box, were watered sparingly, had a piece of geotextile placed over them and then the box was slipped into a large polythene ziplock bag. The plants were then held at 15°C by placing the sealed bag under a bench in the seedbank drying room. After initial checking that the box was not susceptible to the dessicating effect of the room, about once a month the box was brought back into the lab and opened up to inspect the developing fruits and water if necessary.

Fruit development

On arrival at the TSCC laboratory the flowers had begun to fade to dull orange and over the next month began to wither away. By February it was clear that fruits had begun to develop on three of the flowers and the perianth was dropped from the fruits (Plate 2).

Plate 2. Fruits and seeds of *Thismia rodwayi*; fruit approximately 3–4 mm long when dried (image: James Wood)

By the middle of March the ivory white fruits appeared to be fully developed and approximately 1 cm across (Plate 2). The capsule is sunk into the hypanthium, giving the fruit a gumnut-like appearance. The style is persistent. With no information on whether the fruits were dehiscent or not, we waited to see whether the fruits would split. From this very small trial it would seem that the fruits are not dehiscent. Given that the fruits develop beneath the leaf litter, this would seem to suggest that either seed dispersal is not attempted or that the fruits are consumed by animals foraging in the leaf litter (endozoochory).

By the end of May the fruits eventually began to go brown and whither at which point they were harvested and placed into the TSCC drying room. We yielded approximately 1170 seeds (Plate 3) from three fruits (an average of 390 seeds per fruit). The seeds are ellipsoid in shape and approximately 0.5 mm long by 0.25 mm wide. The seed coat is reticulate and a sandy brown in colour. 700 seeds weighed 0.0072 grams.

With hindsight it seems likely that the fruits could probably have been harvested at least a month prior to picking. However it is difficult to be certain on when the seeds achieve peak maturity. More exposure to fruiting plants would be useful.

Flowering in the laboratory

By March 2010 one of the plants had begun to develop a new flowering shoot (Plate 4). This suggested the possibility of getting the plants to flower in the laboratory. To that end, at the start of June the box was moved into the 5°C incubator to vernalise the plants, to mimic the winter period in case this was necessary to induce flowering. Whilst being held in the 5°C incubator two more

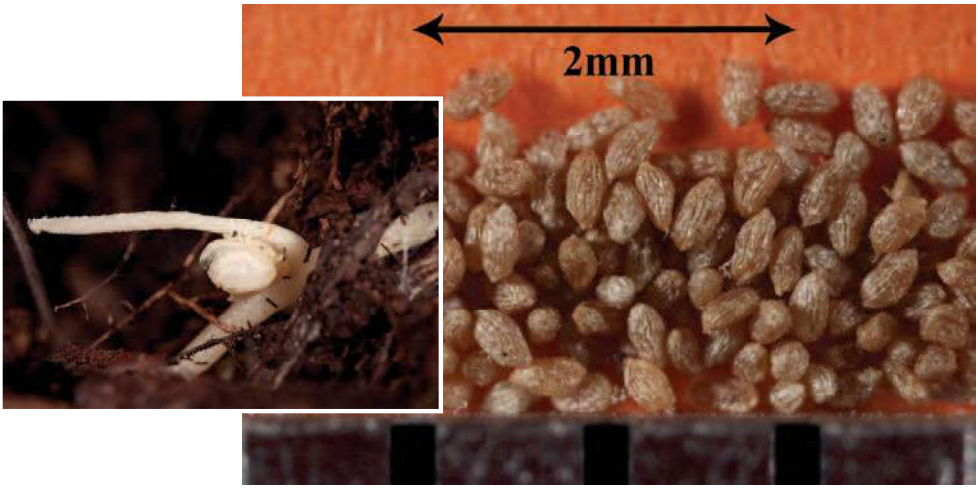

Plate 3. Seeds of *Thismia rodwayi*; seeds are approximately 0.5 mm long and 0.25 mm wide; **Plate 4.** (inset). Developing flowering shoot of *Thismia rodwayi* in the laboratory (images: James Wood)

flowering shoots have developed. We intend to move the box back to the drying room in September and with luck we may have flowering plants by October.

This staggered development in flowering may in part explain the long flowering period reported for *Thismia rodwayi*.

Further work

As part of Micah's collecting work, tissue samples of *Thismia rodwayi* and associated shrubs have been passed on to Vincent Merckx who has been studying the phylogenetics of mycoheterotrophs and also the fungal hosts these plants rely on. The samples supplied so far have revealed interesting results and we hope to collect more material to confirm these findings.

Although we only managed to harvest three fruits, the prodigious seed yield has allowed us to make a small amount of material available for research. Seed will be sent to the Botanic Gardens and Parks Authority in Perth, Western Australia, for a small germination study. Given the information we have gleaned from this initial attempt to collect, it is hoped that a further collection of seed might be made from this species either directly in the field, or perhaps from our laboratory plants.

It will prove interesting to see how long we will be able to grow these peculiar plants in their Tupperware box.

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REMOTE CAMERA OBSERVATIONS OF TASMANIAN DEVILS AND OTHER MAMMALS AT FRANKLIN

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ABSTRACT

Trail cameras were used to remotely capture short videos of Tasmanian Devils and other mammals both during the day and at night. Results show that data collected from these cameras has application to provide short-term census information, as well as information useful for longer-term time series abundance and behaviour studies.

INTRODUCTION

The Tasmanian Devil (*Sarcophilus harrisii*) is the largest living carnivorous marsupial, found only in Tasmania, and is currently listed as endangered on the Tasmanian *Threatened Species Protection Act 1995* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. There has been recent concern for the viability of the species due to the proliferation of Devil Facial Tumour Disease into a large section of the wild population.

Studies have been carried out previously that examined the behaviour of Tasmanian Devils that were enticed to sites where observations could be made by the artificial placement of food (Pemberton & Renouf 2003). Recent advent of trail cameras allows the automatic photographic monitoring of sites where food has been placed, or where wildlife is known to frequent. The present study examined Tasmanian Devil activity at a site with artificial food placement, and general mammal activity at a further site that did not use any artificial attractants.

METHODS

Observations were made using battery-operated trail cameras. Battery operation means that the cameras can be set in remote areas, allowing weeks or months between accesses to retrieve stored videos. The cameras operate during the day, and also at night because they are equipped with an infra-red spotlight and infra-red sensitive charge-coupled device camera. Video recording is triggered by movement in the field of view of the camera, approximately 20 seconds of video is recorded, and the camera then resets for additional recording after one minute. Videos are stored to secure digital flash memory cards, so video retrieval simply requires the swapping of the memory card. Movement is detected using a passive infra-red sensor similar to those used in home security systems. The date and time of the stored video files reflects when they were created.

Study area

Observations were made on private property near Franklin in southern Tasmania in 20 hectares of wet sclerophyll bushland at about 300 m elevation. The vegetation was mostly regrowth eucalypt forest that was selectively logged in about 1960.

Tasmanian Devil observations

A Bushnell "Trail Sentry" camera was set, and road-kill was placed on the ground in front of the camera as bait to attract Tasmanian Devils. The camera was used

intermittently in the period 18 December 2008 to 9 February 2009, with three individual carcasses put out at separate times, and stored videos retrieved 9 times.

Other mammal observations

In the period 14 June to 4 September 2010 a Bushnell "Trophy Cam" trail camera was attached to a tree facing an area where an obvious path created by mammal movements crossed a bush track made by a bulldozer two years previously. No bait attractants were used. Videos were retrieved from the camera at roughly weekly intervals, and the camera remained operational for the entire period.

RESULTS

Tasmanian Devil observations

Although no more than one individual was present at any time, it was possible to identify at least five individuals using animal size and white pelage markings (Plate 1). The images in Plate 1 are still captures from the recorded short videos, so picture quality is fairly low. These images may represent a single family group with joeys (Plate 1, a-c) and adults (Plate 1, d-e). All individuals appeared healthy with no obvious signs of Devil Facial Tumour Disease. There were 15 separate Tasmanian Devil observations made, where several videos recorded in close time sequence of the same individual has been counted as a single observation. Multiple observations were made of some individuals with distinctive markings (e.g. Plate 1, d).

Other mammal observations

The site shows a remarkable variety (8 species) and number of observations (142) of mammals observed for one that did not use any form of attractant (Table 1). The species with the most observations was the Tasmanian Pademelon, *Thylogale billardierii* (79), then the Common Brushtail Possum (26), Eastern Quoll (19), Tasmanian Devil (7), Common Wombat (4), Eastern Barred Bandicoot (4), Spotted-tailed Quoll (2), and Short-beaked Echidna(1) (Table 1). The results show that a considerable number of observations of Tasmanian Devils can be made without the need for artificial enticement.

Observations by time of day were extracted for the top three species in number of observations (Figure 1). The Tasmanian Pademelon shows a strongly bimodal distribution with peak observation numbers at dawn (6-7am) and dusk (5pm). There were a small number of observations of the Tasmanian Pademelon throughout the day. The Common Brushtail Possum and Eastern Quoll showed broadly similar observation patterns, with activity throughout the night, but not at all during the day.

DISCUSSION

There is a delay of a few seconds between the detection of movement and the beginning of recording, so quick movement into and out of the field of view may trigger recording, but no animal is visible in the video. Approximately a third of all recorded videos did not have visible animals, and were deleted after examination. A small proportion of recordings contained animals that were not identifiable – e.g. distant eye shine only, or tails disappearing out of view. These were not counted as valid observations. The majority of videos that contained animals were of animals that could be easily identified. A slight question exists in the mammal observations as to whether the observations for the Spotted-tailed Quoll were actually Eastern Quoll. The animal appeared to be larger than an Eastern Quoll, and spots appeared to be on the tail, but the animal was not entirely in frame (Plate 2g). Spotted-tailed Quolls have been positively identified on the property previously.

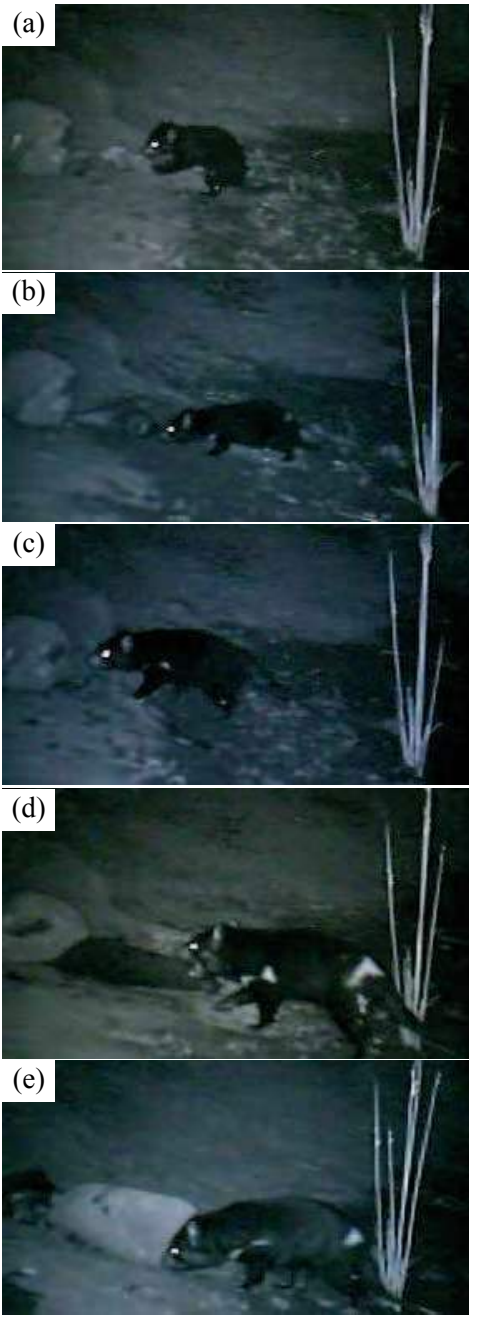

Plate 1. Example Tasmanian Devil observations, 18 December 2008 – 9 February 2009

Movements were only recorded on an often-used animal pathway where the animals were moving from one area to another. This means that records are not of general activity, but specifically of transit activity. For example, the Tasmanian Pademelon observations by time of day show almost no records between 10pm and 5am. Pademelons are known to be generally active from dusk to dawn and travel along communal runways to feeding sites (Cronin 2008), so they were likely to have been feeding during the period of observed low transit activity.

The mammal observations show that these automated video recordings have the potential to provide a useful time series of observations for both abundance and behavioural studies. Monitoring will be continued at the same site with the intention of examining longer-term behavioural aspects of the various species, such as seasonal activity patterns.

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(a) Tasmanian Pademelon

(b) Common Brushtail Possum

(c) Eastern Quoll

(d) Tasmanian Devil

(e) Common Wombat

(f) Eastern Barred Bandicoot

(g) Spotted-tailed Quoll

(h) Short-beaked Echidna

Plate 2. Example mammal observations, 14 June – 4 September 2010

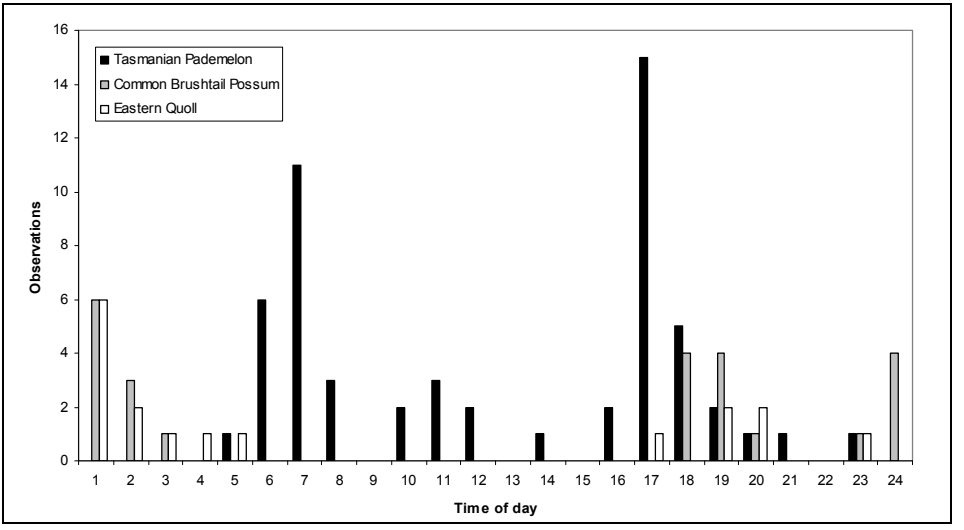

Figure 1. Mammal observations by time of day, 14 June – 4 September 2010

Table 1. Mammal observations 14 June – 4 September 2010

Common name	Scientific name	Observations
Tasmanian Pademelon	*Thylogale billardierii*	79
Common Brushtail Possum	*Trichosurus vulpecula*	26
Eastern Quoll	*Dasyurus viverrinus*	19
Tasmanian Devil	*Sarcophilus harrisii*	7
Common Wombat	*Vombatus ursinus*	4
Eastern Barred Bandicoot	*Perameles gunnii*	4
Spotted-tailed Quoll	*Dasyurus maculatus*	2
Short-beaked Echidna	*Tachyglossus aculeatus*	1

FIRST TASMANIAN RECORD OF THE LAND SNAIL *MISELAOMA SINISTRA* (GABRIEL, 1930) (EUPULMONATA: PUNCTIDAE)

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ABSTRACT

This paper gives details of the first Tasmanian record for *Miselaoma sinistra* (Gabriel, 1930), a minute sinistral land snail that is widespread in Victoria, and differentiates it from the endangered Tasmanian endemic species *Miselaoma weldii* (Tenison-Woods, 1877), which is known from a single locality.

IDENTIFICATION [Plate 1]

The genus *Miselaoma* (Iredale, 1933) comprises at least three very small multi-whorled punctid land snails most readily distinguished by their reversed (sinistral) shells. As one of very few sinistral land snails in southeastern Australia, they cannot be confused for anything else, except perhaps for juveniles of some pupillids.

The Tasmanian (and type) species *Miselaoma weldii* (Tenison-Woods, 1877) and the South Australian species *M. reevesbyi* Cotton 1938 have been accepted by all authors on the genus. However, the snail first described as *Laoma sinistra* Gabriel, 1930 was classified as a synonym of *M. weldii* by Smith & Kershaw (1979), without stated reasons.

A gross difference in shell shape between the two species, alone sufficient to separate them at species level, was clearly evident in the original descriptions. Tenison-Woods (1877) described *M. weldii* as "turbinately discoid" and "1½" mm wide by "1¼" mm high, while Gabriel (1930) stated that *M. sinistra* was "obtusely conical" (see figure) and 1.0 mm wide by 1.2 mm high. Gabriel (1930) also figured *M. sinistra* in what appears to be an early example of microphotography, at x20 magnification, and notes that *M. weldii* is of "much broader proportions". In fact *M. weldii* fairly commonly reaches 1.7 mm wide. (*M. reevesbyi* is also much larger than *M. sinistra*).

Both *M. sinistra* and *M. weldii* are claimed in the original descriptions to have 6.5 whorls. This appears to be incorrect (or to reflect an unusual method of counting the whorls) in both cases. Type material of *M. weldii* is lost but of 50+ mature specimens checked by the author few exceeded 5.5 whorls and none exceeded 5.8 (or 5.0 and 5.3 if the first semicircle is dropped, as several authors do). The holotype of *M. sinistra* (pictured on the Museum Victoria website) has 5.7 whorls.

The conchological differences between the species go beyond just shell width and shape:

- The teleoconch (adult) sculpture of the two species is very different. That of *M. sinistra* consists of distinct low radial riblets (which vary in strength and spacing) and strong regular spirals that can be nearly as prominent as the radials.

By comparison the radial ribbing on *M. weldii* is very blunt and irregular and the spirals are much lower and frequently indistinct.

- The shells of *M. sinistra* are very thin and fragile. Collected dead shells crack very easily. *M. weldii* is more robust.
- Whereas *M. sinistra* tends to be off-white to pale yellow, *M. weldii* is a pale greenish-yellow, often greenish-horn on older specimens. Both are often semi-translucent (*M. weldii* more so when subadult) but *M. weldii* is much shinier.

The first difference is the most important.

In sculpture, size and shape, *M. sinistra* far more closely resembles the dextral *Trocholaoma parvissima* (Legrand, 1871), a species that is common on mainland Tasmania and apparently widespread in eastern Victoria and at least far southern New South Wales, although it has not been reliably recorded from the Bass Strait islands.

Indeed, Smith & Kershaw (1979) placed *T. parvissima* in the genus *Miselaoma*, noting "the only difference between the genera appears to be the direction of coiling of the shell". However, the type species of *Trocholaoma*, *T. spiceri* (Petterd 1879), an uncommon Tasmanian wet forest species, which was also synonymised without stated reason by Smith & Kershaw (1979), is a very distinctive species with a very large and strongly sculpted protoconch and unusually regular adult sculpture. Genetic and anatomical study will be needed to determine how close *T. parvissima* really is to the species of *Miselaoma*.

PREVIOUSLY KNOWN DISTRIBUTION

M. sinistra is very widespread in Victoria. The type locality is "Tarraville, SE Vic". A further thirteen localities supported by specimens held by Museum Victoria (MV) show that the species' range includes practically the whole of southeastern Victoria, defined as everywhere south and/or east of the highway from Melbourne to Albany. A fifteenth MV locality record comes from the Murray-Sunset National Park in the far northwest of the State, but in view of the distance of the record from the remaining Victorian records this record should be reviewed. Details of MV records of the species are available at http://collections.museumvictoria.com.au – records of the species are variously listed as *Laoma sinistra*, *Miselaoma sinistra* and *Miselaoma* cf *sinistra*.

Shells similar to *M. sinistra* and collected by litter sampling in southeastern New South Wales forests are held in the Australian Museum collections, and may be the same species.

MISELAOMA SINISTRA ON KING ISLAND, TASMANIA

M. sinistra was collected incidentally during a survey for a much larger land snail, *Austrochloritis victoriae* (Cox, 1868). The record occurred at Nook Plains in Lavinia State Reserve, northeastern King Island (GR 248820mE 5601502mN ± 20 m, GDA94 datum) on 17 June 2009. Two live and three dead specimens were collected crawling on or attached to thin rolls of eucalypt bark in the litter layer, during an unsuccessful search for *A. victoriae* lasting 25 minutes.

The only other land snails observed at the site were two other small punctid species, one of which was *Paralaoma discors* (Petterd, 1902). The second punctid (a 2 mm wide globular bronze/brown coloured species) is undescribed and previously unrecognised; there is a possible prior specimen collected at Fitzmaurice Bay, King Island in 1990 and held in the

Tasmanian Museum and Art Gallery collections.

The Nook Plains area was subject to severe fires in 2001 and 2007. The site where *M. sinistra* was recorded was a very small area of scrub (<0.1 ha) unburnt in the most recent fire and consisting of eucalypts over young *Melaleuca*. The litter layer was thin with local evidence of fire scarring from the 2001 fire or perhaps an earlier fire. The surrounding area was burnt except for similar scattered small remnants.

DISCUSSION

M. sinistra is the nineteenth native land snail species to be recorded from King Island. The find of another "Victorian species" on King Island further strengthens the already recorded connection (Bonham 1997) between the island's native land snail fauna and Victoria's. Of the nineteen species known to be native to King Island, at least eight have not been recorded from the Tasmanian mainland, and with more taxonomic work on unclear cases, it is likely that this number will increase. Of these eight, all except the undescribed punctid mentioned above are either known to occur in Victoria or else have closer known connections in the Victorian fauna than the Tasmanian fauna. Conversely, there is no clear-cut case of a Tasmanian mainland snail reaching King Island but failing to reach Victoria.

The validity of *M. sinistra* has more than taxonomic implications. While *M. sinistra* is widespread, *M. weldii* is known only from The Nut, Stanley, Tasmania, where its total area of occupancy is estimated at just 4 ha in three subpopulations (Bonham 1999). *M. weldii* is listed as Endangered at Atate level under the Tasmanian *Threatened Species Protection Act 1995*, but the incorrect treatment of *M. sinistra* as a synonym has made it impossible to clearly justify listing *M. weldii* as threatened at species level nationally or internationally. This obstacle is now removed.

Based on what is known of the biogeography of other Victorian/King Island species, it is very unlikely *M. sinistra* will occur anywhere on Tasmanian soil outside King Island, with the possible exception of some of the near-Victorian islands immediately south of Wilsons Promontory. It is possible that *M. sinistra* is rare and localised on King Island and that its Tasmanian population will also be found to qualify for listing as threatened at State level. However, fire-prone scrub habitats like that in which *M. sinistra* was recorded have been seldom surveyed on King Island and the species may turn out to be more frequent there than a single record in the author's five collecting trips to the island suggests.

ACKNOWLEDGEMENTS

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Plate 1. Adult *Miselaoma sinistra* (F106192) collected at Fern Tree Gully, Victoria, 37.87 S 145.28 E, undated but pre-1950. Collector's name not published in accordance with Victorian information privacy requirements. Image: Chris Rowley (MV), 2009. Image is the property of Museum Victoria and may not be used without MV permission.

BIODIVERSITY MONITORING IN THE PETER MURRELL RESERVES BY THE TASMANIAN FIELD NATURALISTS CLUB

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INTRODUCTION

In March 2010, the Tasmanian Field Naturalists Club (TFNC) undertook a fauna and flora survey of the Peter Murrell reserves with the overall objective of: (1) providing the land manager, the Parks and Wildlife Service (PWS), with information that would assist with the management and understanding of the reserves; and (2) to provide club members with the opportunity to participate in a range of monitoring activities. The Peter Murrell reserves were chosen for survey for several reasons: the PWS was planning to undertake management burns in the reserves; they are close to Hobart with easy access; they provide habitat for a number of species that would be adversely impacted should the European red fox (*Vulpes vulpes*) become widely established in Tasmania; and they are also becoming increasing isolated through urban development with unknown impacts on its wildlife. Biodiversity monitoring within the reserves will focus, at least initially, on areas subject to management burns primarily for the purpose of fuel reduction.

Below, we provide background information about the reserves and the basis for the survey design. Detailed methods and initial survey results for mammals and birds are provided in separate reports in this volume. It is anticipated that reports from the invertebrate and vegetation surveys will be provided at a later date.

THE PETER MURRELL RESERVES

The Peter Murrell reserves comprise two reserves proclaimed under the Tasmanian *Nature Conservation Act 2002*. The Peter Murrell State Reserve (133 ha) came into effect on the 14 August 1997. The adjoining Peter Murrell Conservation Area (130.8 ha) became a reserve on the 8 December 1999 and was expanded by 10.9 ha on 10 August 2008. Under the *Nature Conservation Act 2002*, a State Reserve has a higher degree of protection than a Conservation Area. Although the objectives of both reserves aim to protect and maintain biodiversity, geoheritage and cultural heritage, conservation areas provide for the potential use of resources. In addition to protecting biodiversity values, the reserves also provide for a range of recreational activities including dog walking, horse riding and cycling. For the purposes of this report we refer to the two reserves as the Peter Murrell reserves.

An interim management plan (PWS 1997) has been prepared for the Peter Murrell reserves and it identifies a number of further objectives including the following that are particularly relevant to biodiversity monitoring by the TFNC:

- to conserve the large number of orchid species, the heath and buttongrass moorland communities and invertebrate

species through appropriate fire and vegetation management;

- to develop and implement recommendations for fire management in relation to the conservation of flora and fauna;
- to encourage continued active community involvement in the management of the area; and
- to encourage research and scientific studies in the reserves particularly where they assist management, improve the inventory and understanding of the reserves' natural values.

SITE DESCRIPTION

The Peter Murrell reserves are located approximately 12 km south of Hobart. The reserves' aspect is predominantly westerly with an altitude ranging from 30 to 100 m above sea level. The eastern and northern boundaries abut residential areas of Kingston and Blackmans Bay and the southern boundary abuts Howden with lower density housing (Figure 1). Most houses on the northeastern, eastern and southern boundaries back directly on the reserve. The western boundary abuts a light industrial estate, schools, a golf course and paddocks. The reserve is essentially an island of native vegetation with remnant bushland over 2 km to the west across pasture and the Channel Highway. To the southeast of the reserves there is a very limited connection, through residential areas, to native vegetation on the Tinderbox Hills – which itself is isolated.

Geology and soils

The parent materials within the reserves are sandstone, siltstone and mudstone (PWS 2006). Soils are generally sandy and well-drained on the slopes, with small areas of peat in the buttongrass along the east/west creek lines.

Climate

Kingston has an average annual rainfall of about 674 mm based on 64 years of data collected between 1910 and 1977 (BOM 2010). Highest average monthly rainfall occurs in October (68 mm), November (62 mm) and December (65 mm), and lowest in January (46 mm) and February (46 mm). Although no rainfall records have been collected since 1977, the average annual rainfall has probably declined in the order of 10% as has occurred at the nearest comparable weather station at Hobart. Mean annual minimum and maximum temperatures are 6.2° and 17.0°, respectively, based on 10 years of data collected between 1965 and 1976 (BOM 2010).

Vegetation

Botanical surveys of the Peter Murrell reserves have been undertaken by Kirkpatrick (1977, 1999), Pyrke (1990), and Duncan & Duncan (1995). Ziegeler (1994) mapped the distribution of the orchid *Prasophyllum concinnum* (at the time considered to be a rare species). Kirkpatrick (1999) found that the Peter Murrell reserves have varied vegetation, including substantial areas of *Eucalyptus amygdalina* (black peppermint) heathy woodland, heath, buttongrass moorland and *Eucalyptus amygdalina* shrubby forest, with smaller areas of wetland, grassland and *Eucalyptus ovata* shrubby forest. Nine vegetation types were described and mapped. The dominant vegetation type is black peppermint forest and woodland with a heathy understory covering 191 ha (76%) of the reserve. Closed heath covers 28 ha (11%) of the reserve. Over 200 native vascular plant taxa, 26 moss species and 10 liverworts are known from the area and lists of these taxa are included in the appendix of the interim management plan for the reserves (PWS 1997). The area is particularly rich in

Prescribed Burn Program

ID	Block_Name	Area_ha	Scheduled
ECO1	Orchid Trial	9	2006, 2010
ECO2	Spanish Heath	3	not yet scheduled
ECO3	Coffee Creek 3	<1	not yet scheduled
ECO4	Coffee Creek 4	<1	not yet scheduled
FRB1	Pump Station	3	2006
FRB2	Buttongrass	20	2008
FRB3	Scarborough	17	2010
FRB4	Middle West	20	2012
FRB5	Middle East	18	2014
FRB6	Howden	20	2016
FRB7	Gorse Heaps	<1	not yet scheduled
FRB8	Fire Trail Buffer	<1	not yet scheduled
block1	Sandflats	6	post 2016
block2	McVilly	14	post 2016
block3	Bracken	18	post 2016
block4	block4	7	post 2016
block5	Southeast	28	post 2016
block6	Pony Club	20	post 2016

Figure 1. Map of Peter Murrell Reserve showing fire management blocks (modified from a map produced by Hafwen Pearce, PWS 2006)

orchids. Threatened species known to occur in the reserves are the twisting rapier sedge (*Lepidosperma tortuosum*) and gentle rush (*Juncus amabilis*), both listed as rare under the Tasmanian *Threatened Species Protection Act 1995*.

Fauna

The interim management plan for the Peter Murrell reserves provides lists of vertebrate species reported from the reserve (PWS 1997) and is based on reports by Haseler (1994), Kirkpatrick & McQuillan (1996) and observations contributed by the public. The lists contain 13 mammals (including one exotic species), 93 birds (including 10 exotic species), six reptiles, three amphibians and 151 invertebrates.

Two species, both listed as endangered on the Tasmanian *Threatened Species Protection Act 1995*, occur in the reserves: the forty-spotted pardalote (*Pardalotus quadragintus*) and the chaostola skipper, (*Antipodia chaostola*). A third species, the eastern barred bandicoot (*Perameles gunnii*), is listed as Vulnerable on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* but not on State threatened species legislation.

Fire management

The PWS *Interim Management Plan* identifies fire as the greatest threat to the Peter Murrell reserves (PWS 1997). A fire management plan was prepared for the area in 2006 and is intended to be current until 2016 (PWS 2006).

The aims of the fire management plan are to reduce the risk bushfire poses to human life and property, and to manage fire regimes and practices that (a) promote and protect heathland and forest communities, in particular the orchid and invertebrate communities, and (b) enhance the long-term survival of flora and fauna communities and threatened species.

The limited fire history of the reserves is documented in the fire management plan (PWS 2006) and summarised below with the addition of more recent fires. In 1988 most (80-100%) of the Peter Murrell reserves were burnt by an intense fire (PWS 2006). Prior to 1988, little is known about the fire history of the area. The rarity of *Leptospermum glaucescens* tends to suggest that fires have been more frequent than once every ten years (Kirkpatrick 1999). The Parks and Wildlife Service have carried out fuel reduction and species management burns in May 1998 (16 ha), May 2003 (35 ha, Block 5– refer to Figure 1 for location), May 2006 (9 ha, ECO1), April 2009 (19 ha, FRB2), April 2010 (17 ha, FRB3) (PWS 2006; PWS unpublished fire records). Part of FRB3 was illegally burnt in February 2010 (PWS unpublished fire records). A number of small (1-3 ha) weed management and experimental burns are documented in the fire management plan (PWS 2006).

The fire management plan documents areas scheduled for either fuel reduction burns or ecological burns over the 10 year life of the plan. Generally, the objectives for a fuel reduction burn are to reduce fuels by 70% over 70% of the area, with less than 10% total crown scorch. Objectives for ecological burning are more specific and are aimed at enhancement and regeneration of species, communities and habitat. In general, blocks are burnt in a timing mosaic of both autumn and spring. It is proposed to burn 110 ha over the life of the fire management plan.

SURVEY DESIGN

The focus of the TFNC survey is to monitor the response of flora and fauna populations in relation to fuel reduction burns. Two fire management blocks formed the basis of the survey. The first block (FRB3) has an area of 17 ha and was scheduled for a fuel

reduction burn in May 2010. The aim was to undertake pre- and post-burn surveys of the block and an adjacent 20 ha control block (B1-3) that was probably last burnt in 1988 (refer to Figure 1). The second block (FRB2) has an area of 20 ha and it had a fuel reduction burn in 2009. The aim was to survey this with an adjacent 20 ha control block (FRB6) that was probably last burnt in 1988.

The lack of replication limits the interpretation of the results to the management of the reserve. We aimed to survey the flora and fauna at a scale comparable to the management unit – the fire management block. Two transect lines, 450 m long and set 100 m apart were marked out in each block and formed the basis for the surveys. Each transect line had a survey point marked every 50 m.

The predominant vegetation type in all survey blocks was *Eucalyptus amygdalina* heathy coastal forest/woodland as described in Kirkpatrick (1999). The two southern transect lines in blocks FRB2 and FRB6 were in *Eucalyptus amygdalina* heathy forest on sandstone, which is closely similar structurally and floristically to *Eucalyptus amygdalina* heathy coastal forest/woodland (Kirkpatrick 1999). The eastern end of the transect lines in B1-3 graded from *Eucalyptus amygdalina* coastal forest to closed heath. Sedgeland occurred along Buttongrass Creek between the transect lines in FRB2. The vegetation in FRB2 was regenerating from a fuel reduction burn in 2009 and was open and easy to walk through compared to the vegetation in the adjacent unburnt control (FRB6, Plate 1). A comparison of the vegetation of the fire management blocks is still to be completed. Specific details of mammal and bird monitoring undertaken in March 2010 are provided in the following reports (Driessen & Jarman 2010; Hume & Driessen 2010). Invertebrate and vegetation monitoring will be reported at a later date.

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Plate 1. Comparison of vegetation density between fire management block FRB2 (burnt in 2009) (top) and fire management block FRB6 (burnt in 1988) (bottom)

THE RESPONSE OF MAMMAL POPULATIONS TO FIRE IN THE PETER MURRELL RESERVES: INITIAL SURVEY

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INTRODUCTION

The aim of this study is to monitor the response of mammal populations to fuel reduction burns in the Peter Murrell reserves. We present the results of an initial survey of terrestrial mammal fauna in a fire management block prior to a proposed fuel reduction burn and an adjacent unburnt control. We also surveyed the mammal fauna of a fire management block burnt two years previously and compared this with an adjacent unburnt control.

Although there has been no previous systematic survey or monitoring of mammals in the Peter Murrell reserves, 17 native and two introduced mammal species (excluding domesticated animals) have previously been recorded in or immediately adjacent to the Peter Murrell reserves (Table 1).

Haseler (1994) documented the presence of nine native and two introduced mammal species based on direct observation or inferred from scats, tracks and diggings, and suggested (based on possible scat and digging evidence) that three other species (echidna, swamp antechinus *Antechinus minimus*, and swamp rat; see Table 1 for other binomials) might also occur. In May 2001, five long-nosed potoroos and two southern barred bandicoots were trapped over one night using 20 cage traps (M. Driessen, unpublished data). Five species of bat, Gould's wattled bat, chocolate wattled bat, little forest bat, southern forest bat, and the lesser long-eared bat, have been recorded using harp traps and sound recordings (Hans and Mark Wapstra, unpublished data; Hilliard 2010). The Tasmanian bettong potentially occurs in the reserves based on roadkills observed on Burwood Drive (PWS 2007) and Redwood Road (M. Driessen, unpublished observation) and appropriate diggings within the reserves (P. Jarman, unpublished observations).

Between 2006 and 2010 a number of mammal species were observed by Jarman (unpublished observations) including a dead male sugar glider (Table 1). In addition to the 16 native mammal species recorded in the Peter Murrell reserves, a further seven species have potential to occur in the reserves based on available habitat and their known Tasmanian distributions: the two species of pygmy possums, *Cercartetus nanus* and *C. lepidus*, three species of bats, the water rat *Hydromys chrysogaster*, and the swamp rat.

The remaining ten species of land mammals native to Tasmania are unlikely to occur in the reserve because of unsuitable or limited habitat, its isolation from substantial areas of native habitat, its lying outside the species' known current distribution, and disturbance by humans and domestic animals.

Table 1. List of mammal species previously recorded in the Peter Murrell reserves
Data from Haseler (1994), PWS (2007), and unpublished observations by the authors
D = digging; Dr = Drey; H = heard using ANABAT detector; O = observation; RK = roadkill adjacent to reserves; S = scat; T = track; ? = not specified

Common name	Scientific name	Detection method	Source
Native species			
Platypus	*Ornithorhynchus anatinus*	O	Haseler (1994), PWS (2007), P. Jarman (unpub. obs. 2006-2010)
Echidna	*Tachyglossus aculeatus*	?	PWS (2007)
Eastern quoll	*Dasyurus viverrinus*	T	Haseler (1994), PWS (2007)
Southern brown bandicoot	*Isoodon obesulus*	O, D, S	Haseler (1994), PWS (2007), M. Driessen (unpub. data 2001), P. Jarman (unpub. obs. 2006-2010)
Eastern barred bandicoot	*Perameles gunnii*	O, D, RK, S	Haseler (1994), PWS (2007), P. Jarman (unpub. obs. 2006-2010)
Ringtail possum	*Pseudocheirus peregrinus*	O, Dr, S	Haseler (1994), PWS (2007), Jarman (unpub. obs. 2006-2010), Hilliard (2010)
Sugar glider	*Petaurus breviceps*	O (dead)	Jarman (unpub. obs. 2006-2010)
Brushtail possum	*Trichosurus vulpecula*	S	Haseler (1994), PWS (2007), Hilliard (2010)
Long-nosed potoroo	*Potorous obesulus*	O, D, RK, S, T	Haseler (1994), PWS (2007), M. Driessen (unpub. data 2001), Jarman (unpub. obs. 2006-2010)
Tasmanian bettong	*Bettongia gaimardi*	D, RK	PWS (2007), M. Driessen (unpub. data 2001)
Tasmanian pademelon	*Thylogale billardierii*	O, S, T	Haseler (1994), PWS (2007), Jarman (unpub. obs. 2006-2010)
Bennetts wallaby	*Macropus rufogriseus*	O, S, T	Haseler (1994), PWS (2007), Jarman (unpub. obs. 2006-2010)
Goulds wattled bat	*Chalinolobus gouldii*	H	Hilliard (2010)
Chocolate wattled bat	*Chalinolobus morio*	H	Hilliard (2010)
Lesser long-eared bat	*Nyctophilus geoffroyi*	O	H. and M. Wapstra (unpub. data)
Southern forest bat	*Vespadelus regulus*	H	Hilliard (2010)
Little forest bat	*Vespadelus vulturnus*	O	H. and M. Wapstra (unpub. data)
Introduced species			
Rabbit	*Oryctolagus cuniculus*	O, S, D, Rk	Haseler (1994), PWS (2007), Jarman (unpub. obs. 2006-2010)
Cat	*Felis catus*	S	Haseler (1994), PWS (2007)

METHODS

A description of the survey design and study area is provided in Driessen et al. (2010). Terrestrial mammals were surveyed by live-trap-and-release over three nights, 4-7 March 2010. Two lines of traps stations were set in four management blocks in the reserves (FRB2, FRB3, FRB6, B1-2; refer to Figure 1 in Driessen et al. (2010)). The trap lines in each block were 100 m apart and the trap stations within each line were 50 m apart. An aluminium box trap (11 x 11 x 33 cm made by Elliott Scientific) was placed at each trap station. A wire cage trap (20 x 20 x 56 cm made by Mascot Wireworks) was placed at every second station. Thus 20 box traps and 10 cage traps were set at each block except FRB3 where an extra box trap was set at the end of each line to compensate for a small patch of burnt vegetation near the middle of these lines.

Box traps were baited with peanut butter and rolled oats, provided with Dacron for bedding and placed in sheltered locations. Cage traps were baited with peanut butter sandwiches, provided with Dacron for bedding and covered with hessian sacks. Traps were checked each morning.

All native mammals were weighed, had their head and pes length measured and had their reproductive condition, and sex determined. A small amount of fur was clipped on the rump to mark each capture. All box traps that captured an animal were replaced with a clean trap. In the interests of saving time all introduced rodents were released without recording any details other than their species.

RESULTS AND DISCUSSION

Six mammal species and one reptile were trapped during the survey (Table 2). The most commonly caught animal was the long-nosed potoroo followed by the swamp rat and house mouse.Very few individuals were recaptured, although previous experience with potoroos, swamp rats and barred bandicoots has shown that they regularly re-enter traps. Thus more trapping effort is required to reflect accurately the numbers of individual animals in the areas surveyed. The swamp rat, house mouse, brown rat and White's skink are the first confirmed records of these species for the reserves. The long-nosed potoroo (Figure 1) and house mouse (Figure 2) were caught in all blocks surveyed including the block burnt in 2009.

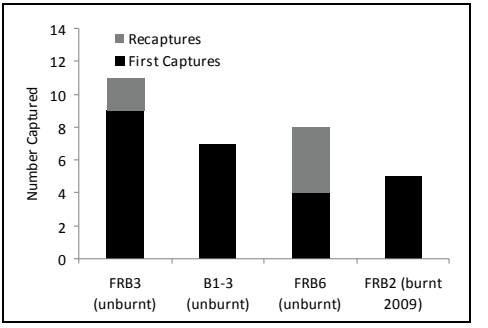

Figure 1. Number of long-nosed potoroos captured in Peter Murrell reserves

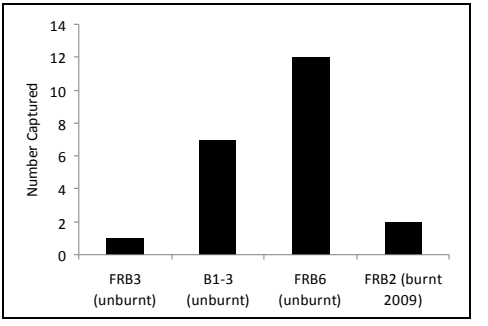

Figure 2. Number of house mice captured in Peter Murrell reserves (recaptures were not recorded for this species)

The swamp rat was caught in all blocks except the block that was burnt in 2009 (Figure 3), consistent with previous research indicating that this species requires

Table 2. Animals caught in the Peter Murrell reserves, March 2010

Common name	Scientific name	First captures	Re-captures	Total captures
Long-nosed Potoroo	*Potorous tridactylus*	25	6	31
Southern brown bandicoot	*Isoodon obesulus*	7	0	7
Eastern barred bandicoot	*Perameles gunnii*	2	0	2
Swamp rat	*Rattus lutreolus*	21	1	22
House mouse*	*Mus musculus*	-	-	22
Brown rat*	*Rattus norvegicus*	1	0	1
White's skink	*Egernia whitii*	1	0	1
Total				**86**

*introduced species

cover close to the ground (Catling & Newsome 1981; Fox 1982; Catling 1986; Wilson et al. 1990).

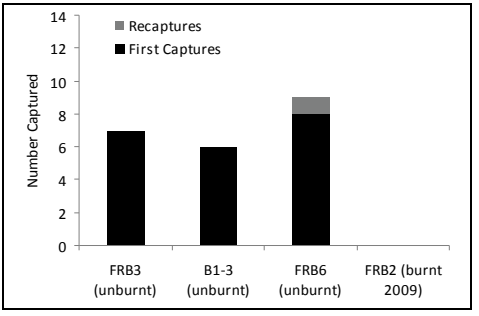

Figure 3. Number of swamp rats captured in Peter Murrell reserves

Four of the seven southern brown bandicoots were caught in the block burnt in 2009 (Figure 4).

The other species were caught in numbers too low for further comment. All but one of the ten female long-nosed potoroos captured were carrying pouch young ranging in development from tiny and unfurred through to large and furred, consistent with their capacity to breed all year round (Johnston 2009). Only one of the four female bandicoots had pouch young, consistent with their breeding ceasing towards the end of summer (Mallick et al. 1998, 2000).

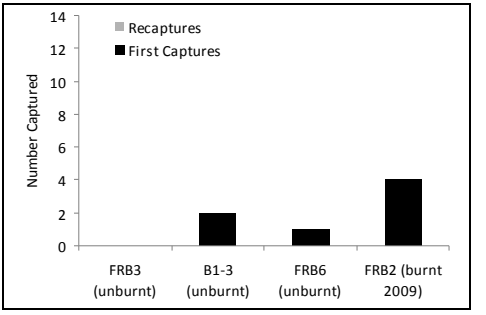

Figure 4. Number of southern brown bandicoots captured in Peter Murrell reserves (note: there were no recaptures)

Several species not trapped during the survey are worth mentioning especially as they are normally readily trapped when present. Probably the most surprising was the absence of brushtail possums, which are widespread in the Kingborough area. It is not clear why this species was not caught; however, it was noted that mature trees with hollows were largely absent from the survey area. The eastern quoll and the Tasmanian bettong are also readily trapped but neither was recorded during the survey. The eastern

quoll has previously been considered to be widespread in the reserves (PWS 1997).

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Research was conducted with approval from the Department of Primary Industry, Parks, Water and Environment's Animal Ethics Committee (AEC No. 39/2006-07).

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[note: images of mammal trapping can be found on the Club's web site]

THE RESPONSE OF BIRD POPULATIONS TO FIRE IN THE PETER MURRELL RESERVES: INITIAL SURVEY

Fiona Hume & Michael Driessen

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INTRODUCTION

The aim of this study is to monitor the response of bird populations to fuel reduction burns in the Peter Murrell reserves. We present the results of an initial survey of four fire management blocks within the Peter Murrell reserves. We are not aware of any previous published survey of the diversity and abundance of birds in the reserves. However, a list of 93 bird species (including 10 exotic species) has been compiled in the interim management plan for the reserves (PWS 1997) based on public observations and a survey of Coffee Creek by Haseler (1994). The reserves have been surveyed for the endangered forty-spotted pardalote, *Pardalotus quadragintus*, where, in 2010, an estimated population of 10 birds occur in 10 ha of habitat (Bryant 2010), which is half of the estimated population recorded in 1994–1997 (TSU 1998).

METHODS

A description of the survey design and study area is provided in Driessen et al. (2010). The presence of bird species was recorded in each fire management block by walking along the established transect lines.

Each fire management block was surveyed twice, once in the morning and once in the afternoon, over two days. Morning surveys were conducted between 9 am and 12 pm, and afternoon surveys were conducted between 12 pm and 3 pm. Only birds seen or heard within approximately 50 m of the transect line were recorded. The time taken to walk a transect line was 30 minutes. All bird observations were made by Fiona Hume.

We performed non-metric multidimensional scaling analysis on the bird data using PCORD to detect differences in bird communities between the fire management blocks. We also performed a two-way ANOVA on the number of bird species recorded per transect with fire management block and time of day (AM and PM) as factors.

RESULTS AND DISCUSSION

Twenty eight bird species were recorded during the survey and all have been previously reported in the reserves (Table 1). The most commonly recorded species were the brown thornbill (recorded on 15 of 16 surveys; 8 transects by 2 times of day), the yellow-throated honeyeater (14), the dusky woodswallow (13), and the superb fairy wren (10). Six species were recorded within all blocks and a further 8 species were recorded within 3 blocks (Table 1).

No useful ordination was found suggesting the data is weakly structured with little meaningful differences between the bird communities recorded for each block. Thus, despite quite clear differences in the vegetation, we were unable to detect a difference in the bird communities recorded between the block that was burnt 11 months earlier (FRB2) and the control block, which

Table 1. Presence of bird species recorded during transect surveys in fire management blocks in the Peter Murrell reserves

		FRB3 A	FRB3 A	FRB3 B	FRB3 B	B1-3 C	B1-3 C	B1-3 D	B1-3 D	FRB6 E	FRB6 E	FRB6 F	FRB6 F	FRB2 G	FRB2 G	FRB2 H	FRB2 H	
		6/03/2010	7/03/2010	6/03/2010	7/03/2010	6/03/2010	7/03/2010	6/03/2010	7/03/2010	7/03/2010	6/03/2010	7/03/2010	6/03/2010	7/03/2010	6/03/2010	7/03/2010	6/03/2010	
		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	Total
Blackheaded Honeyeater	*Melithreptus affinus*	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	**3**
Common Blackbird	*Turdus merula*	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	**3**
Brown Thornbill	*Acanthiza pusilla*	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	**15**
Brown Falcon	*Falco berigora*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	**1**
Dusky Woodswallow	*Artamus cyanopterus*	1	1	0	1	1	0	1	0	1	1	1	1	1	1	1	1	**13**
Dusky Robin	*Melanodryas vittata*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	**1**
Superb Fairy-wren	*Malurus cyaneus*	1	1	1	1	1	1	1	1	0	1	0	1	0	0	0	0	**10**
Goldfinch	*Carduelis carduelis*	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	**1**
Golden Whistler	*Pachycephala pectoralis*	0	1	0	0	0	1	1	0	0	0	0	0	0	0	1	0	**4**
Green Rosella	*Platycercus caledonica*	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	**3**
Grey Currawong	*Strepera versicolor*	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	**3**
Grey Fantail	*Rhipidura fuliginosa*	1	1	1	1	0	0	0	0	0	0	0	0	1	0	1	0	**7**
Grey Shrike-thrush	*Colluricincla harmonica*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	**1**
Grey Butcher Bird	*Cracticus torquatus*	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	**3**
Kookaburra	*Dacelo novaeguineae*	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Little Wattlebird	*Anthochaera lunulata*	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	**2**
New Holland Honeyeater	*Phylidonyris novaehollandiae*	1	1	1	0	0	0	0	1	1	0	0	0	1	0	0	0	**6**
Shining Bronze Cuckoo	*Chrysicoccyx basalis*	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	**1**
Scarlet Robin	*Petroica multicolor*	0	0	0	0	1	0	0	0	1	1	0	1	0	0	1	0	**5**
Silvereye	*Zosterops lateralis*	1	0	1	0	1	0	1	1	1	0	0	0	1	1	0	0	**8**
Spotted Pardalote	*Pardalotus punctatus*	1	1	1	1	0	1	1	0	1	1	1	0	0	0	0	0	**9**
Striated Pardalote	*Pardalotus striatus*	1	0	0	0	1	0	1	1	0	0	1	0	1	1	0	0	**7**
Tasmanian Scrubwren	*Sericornis frontalis*	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	**2**
Yellow-throated Honeyeater	*Lichenostomus flavicollis*	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	**14**
Yellow Wattlebird	*Anthochaera paradoxa*	0	0	1	0	1	0	1	0	1	0	1	0	0	0	0	0	**5**
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	0	0	0	0	0	0	0	1	0	0	0	1	0	1	1	0	**4**
Forest Raven	*Corvus tasmanicus*	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	**3**
		14	**9**	**9**	**8**	**13**	**8**	**12**	**7**	**8**	**6**	**8**	**7**	**11**	**5**	**8**	**3**	**136**

was probably last burnt 22 years ago in 1988. This may reflect the high mobility of bird species but is also likely to reflect some limitations of our survey design to detect differences, such as recording presence of species and not abundance, and the relatively small size of the management blocks.

Significantly fewer species were recorded at blocks FRB2 and FRB6 than at blocks FRB3 and B1-3 (Figure 1, Table 2) and significantly fewer species were recorded during the afternoon surveys than the morning surveys (Figure 2, Table 2).

We do not know why there was a difference in the number of bird species recorded between our two areas of study but it may relate to differences in vegetation between and requires further investigation.

The difference in number of bird species recorded between morning and afternoon surveys is typical of many bird surveys with calling by birds declining from early morning to early afternoon (Welty 1982).

Table 2. Effect of fire management block and time of day on number of bird species recorded using two-way ANOVA

	SS	DF	MS	FR	P
Block	35.50	3	12.17	4.64	0.037
Time of day	56.25	1	56.25	21.43	0.002
Inter-action	10.25	3	3.42	1.30	0.339
Error	21.00	8	2.63		

SS = sum of squares; DF = degrees of freedom; MS = mean square; FR = F-ratio

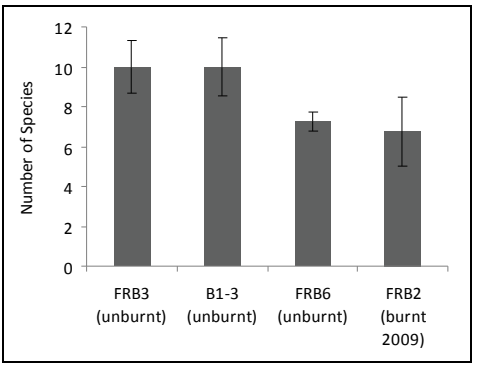

Figure 1. Mean number of bird species recorded per fire management block (number of surveys per block equals two)

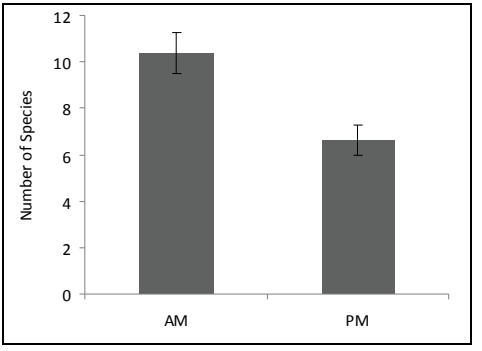

Figure 2. Mean number of bird species recorded during morning (AM) and afternoon (PM) surveys (data pooled over all transects; sample size equals four)

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BOOK REVIEWS

Wattles of Tasmania *by Marion H. Simmons, self-published (2009), spiral-bound, stiff card cover, 64 pages (ISBN 978 0 646 52288 3)*

REVIEWED BY: Mark Wapstra, 28 Suncrest Avenue, Lenah Valley, Tasmania 7008

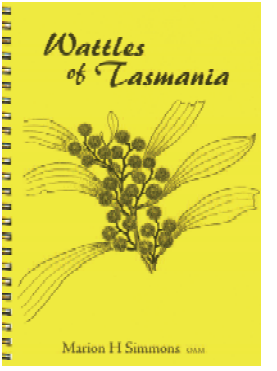
Wattles are an iconic component of the Australian flora, our national floral emblem being *Acacia pycnantha*, the distinctive 'golden wattle' that often defines Australia's sporting colours. While Australia has more than 1000 species, Tasmania only has twenty-two naturally occurring species, four of which are endemic. Tasmanian species of *Acacia* are not particularly difficult to identify but a pocket-sized field guide is a good idea for such a self-contained group.

Wattles of Tasmania is a mix of field guide and cultivation guide. As the latter, I suspect it succeeds admirably. As the former, I have mixed feelings on the success of the book. On the one hand, the simple layout (two opposing pages to a species: on the left a simple description of the species with notes; on the right line drawings) combined with easy-to-read non-technical text is excellent.

On the other, the apparent lack of order to the display of the species is a little hard to understand (to those unfamiliar with the recognised 'groups' within the genus) and makes finding a species a little difficult (there is an index but this assumes a reader already knows the name of the species they are after).

Should *Wattles of Tasmania* have included a key? I ask the question because I'm uncertain. If the introduction had included a discussion of the groups within the genus, with a listing of species under each group (perhaps even with corresponding page numbers), a key would be superfluous in many respects. And there are perfectly adequate keys to Tasmanian wattles available but most are not up-to-date with the latest recognised species (e.g. *A. derwentiana*) and nomenclature. So on this issue I remain somewhat undecided but if a key was included, the book becomes nicely self-contained.

The author has chosen to use black and white line drawings instead of colour images. I think this was a good choice because I have personally found that taking identification-type photographs of some wattles is difficult and that several images are often required to illustrate one species adequately. The drawings are high quality (and presumably by the author, although this is not stated anywhere in the text) and as someone familiar with the species illustrated I can attest to their accuracy and usefulness. The author has made good use of space, each species illustrated on one page, but the pages do not appear cluttered, even when variation in leaf shape, several infrataxa or different parts of the plant are depicted. On this latter point, each composite drawing includes a general view of habit, flowers and pods and sometimes phyllodes, where relevant.



The pedantic editor in me was a little irritated by some format and style issues. For example, the reference list contains several texts that are

incompletely cited (e.g. Alan Gray's description of *Acacia derwentiana* is simply cited as "*Acacia derwentiana*" when the full title of the paper is "*Acacia derwentiana* (Mimosaceae), a new species from southern Tasmania"). The list also contains fairly non-standard reference citation formatting.

I think *Wattles of Tasmania* could be improved with some fairly simple additions. Distribution maps would aid the reader in confirming the identity of a species or recognising a range extension. A note about the conservation status of a species would also be useful (although it is recognised that changes occur to formal lists) in guiding readers about which species should or should not be picked from the wild, or in selecting species for cultivation of particular interest. For the record, four Tasmanian species are listed on the Tasmanian *Threatened Species Protection Act 1995*, and one is listed nationally.

Wattles of Tasmania does not include *A. implexa* ('hickory wattle'), a naturally occurring blackwood-lookalike apparently collected from King Island (widespread on mainland Australia). Within the group of introduced species, the author has chosen just four species. I would have liked to have seen at least four more: *A. retinodes* and *A. provincialis* (especially since the author discusses the species-complex under the naturally-occurring *A. uncifolia*), both of which are widely used as ornamentals and becoming naturalised; *A. pravissima* ('ovens wattle), which is becoming widespread along many main roads; and *A. floribunda* ('gossamer wattle'), which is included in the Tasmanian Herbarium's *Census* with the species becoming locally common in the southeast.

On the whole, the written descriptions of the species are excellent, succinct, easy-to-understand, and well supported by the excellent line drawings. However, the inclusion of a little more discussion on the well-recognised variation in a couple of the species may have been worth including. For example, the massive variation in 'varnish wattle' in Tasmania (note that the authors recognise the new nomenclature of the species, *A. leprosa* var. *graveolens* rather than *A. verniciflua*, the latter now known to be restricted to mainland Tasmania) is not discussed in detail. Within *A. mucronata*, the problems encountered by field workers in assigning a plant to one of the three subspecies because of sometimes continual variation in length and width of phyllodes, often between plants growing side by side and even on the same plant, is worthy of some discussion.

Overall, *Wattles of Tasmania* is a well-presented field and cultivation guide (printed on good quality paper that I suspect is fairly rain- and mud-proof), well-priced (less than $20), and contains excellent line drawings and supporting text. This book will make a good addition to the bookshelves (or backpack) of any field naturalist, gardener, bushwalker, landcarer or student of botany.

Animals of Tasmania: Wildlife of an Incredible Island *by Sally Bryant & Tim Squires, Quintus Publishing, 2009, softback, 80 pages (ISBN 978 0 9775572 7 1)*

REVIEWED BY: Mark Wapstra, 28 Suncrest Avenue, Lenah Valley, Tasmania 7008

This is a delightful book! The text is engaging, the illustrations unique and captivating! I sometimes approach books with illustrations of endangered and extinct animals on their covers with some trepidation, expecting a book of rhetoric about the woes of the world and how we

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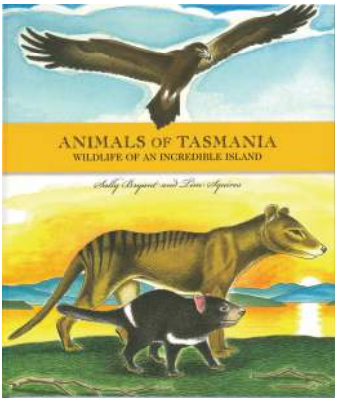
must stop what we're doing else we all go the way of the thylacine. But the text of *Animals of Tasmania: Wildlife of an Incredible Island* is honest, positive, uplifting and a true celebration of Tasmania's unique and interesting fauna.

The authors describe 31 vertebrate species, including 7 mammals, 21 birds, 1 lizard, 1 frog and 1 fish. I'm not sure how they selected the species because I would have not known how to not include others – perhaps the cost of publishing held them back or the tantalising possibility of a sequel?



A clear theme of the book is Tasmania's extinct and threatened species. The tales of the forces of extinction and threat are related to historical events, often with quotes from historical sources that provide the reader with a context to the plight of the animals. As a species, we cannot be proud of the extinction of the thylacine, two species of flightless birds (Tasmanian Emu, King Island Emu) and two other near-flightless birds (Macquarie Island Parakeet and Macquarie Island Rail). The stories of how these species met their fate are disturbing: firstly because, if the beautiful drawings by Tim Squires are anything to go by, we've lost some gorgeous animals; and secondly, because the extinctions occurred quickly and not that long ago. The authors include several species now on the brink of extinction: we could be pessimistic about the future of these species, because the threats are real and somewhat daunting; but the authors have chosen to let the animals tell their stories by their beauty and charm. For example, rather than the authors "picking on" the agricultural, forestry and urban sectors for driving the swift parrot to extinction, they have written: "Swift Parrots are joyous birds with a carefree charm, and their feathers shine iridescent as they race from tree to tree. Sadly, it seems that their forests and population both decline while we continually talk about how to save them". An honest appraisal of the situation for many threatened species: we talk but don't act, but after reading *Animals of Tasmania: Wildlife of an Incredible Island* I think more people will understand the plight of our unique fauna and want to do more to help.

Included in the book are some of Tasmania's most iconic and fasinating species. Eleven of the twelve endemic birds are described, along with a selection of others such as the Royal Penguin, Wandering Albatross, Wedge-tailed Eagle, Masked Owl, Swift Parrot and Orange-bellied Parrot. Arguably the most interesting of our reptile fauna is included, the Pedra Branca skink. Most of us will never get to see it on its remote offshore wave-washed rock in the Southern Ocean but its story is told with a passion that makes the reader want to brave the wild seas.

I hope the author and artist are already working on Part 2 because I for one would like to see some of our weird and wonderful invertebrates described and illustrated. This is a book for anyone (and not just Tasmanians – the moral of the tales are, unfortunately, universal) who loves our wildlife, natural history and art. It is not just another book about animals, it is a cleverly and thoughtfully written work delightfully illustrated that the reader will pull off the shelf again and again.

ADVICE TO CONTRIBUTORS

The Tasmanian Naturalist publishes articles on all aspects of natural history and the conservation, management and sustainable use of natural resources, with a focus on Tasmania and Tasmanian naturalists. These can be either in a formal or informal style. Articles need not be written in a traditional scientific format unless appropriate for the content. A wide range of types of articles is accepted. For instance, the journal will publish articles that:

- summarise or review relevant scientific studies, in language that can be appreciated by field naturalists;
- stimulate interest in, or facilitate in identifying, studying or recording particular taxa or habitats;
- record interesting observations of behaviour, phenology, natural variation or biogeography;
- stimulate thinking and discussion on points of interest or contention to naturalists;
- put the study of natural history today into context through comparisons with past writings, archives, etc.;
- review recent publications that are relevant to the study of Tasmanian natural history.

Book reviews, web site reviews, poetry and prose and other informal natural-history related content are also accepted. If you are thinking of submitting such material, please check with the Editor first (to avoid duplication of items such as book reviews and for appropriateness of content).

Submission of manuscripts

Manuscripts should be sent to the editor, either emailed to nat.editor@tasfieldnats.org.au or mailed to the Club's address. Feel free to contact the editor (see the Club's website for current contact details) prior to submission to discuss the format, style and content, or any particular submission issues (such as provision of large illustrations). Formal articles should follow the style of similar articles in recent issues. Informal articles need not fit any particular format (abstract needed only for formal articles). Please refer to the *Guidelines for Authors*, available on the Club's website.

Submissions should be provided in standard word processing format (i.e. .doc file). Please ensure all pages are numbered. Graphs, illustrations or maps should also be provided electronically by preference, generally in TIFF or JPEG format. Figures, especially photographs, should be supplied in high resolution (ideally 300 dpi) to ensure high quality reproduction. The Editor can assist with scanning of illustrations if originals are provided.

The Tasmanian Naturalist is printed in October and distributed to the Club membership and libraries during November/December. Articles, especially those that may require formal review by an external referee, need to be submitted by the end of July to ensure inclusion in the current year's edition. Please contact the Editor to discuss possible articles and the need for review, which may affect how much time is available.

Tasmanian Field Naturalists Club

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

Founded 1904

OBJECTIVES

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

ACTIVITIES

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

THE TASMANIAN NATURALIST

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

MEMBERSHIP

Membership of the Tasmanian Field Naturalists Club is open to any person interested in natural history. Members receive *The Tasmanian Naturalist* annually, plus a quarterly bulletin with information covering forthcoming activities, and the Club's library is available for use.

Prospective members should either write to the Secretary at the above address, phone our President Michael Driessen on (03) 62 29 6382, or visit our web site at: http://www.tasfieldnats.org.au/.

Membership rates		**Subscription rates for *The Tasmanian Naturalist***	
Adults	$30	Australia	$20
Families	$35	Overseas	$25
Concession	$25		
Junior	$25	[GST is not applicable—ABN 83 082 058 176]	