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TASMANIA: ITS VEGETATION AND LICHENS

Introduction

Tasmania's international reputation is perhaps most closely associated with the infamy of its bleak and at times violent early European colonial history, its unique mammals such as the Tasmanian Devil or the extinct Thylacine, or its ancient conifers. However, the island also has much more to offer the biologist. It is only sparsely populated, and about one quarter of its 68 000 square kilometre land mass lies within National Parks and other formal conservation areas, which have been gazetted primarily for their wilderness, natural or aesthetic values.

Tasmania is situated between latitudes 41° and 43°S, 240 km south of the south-eastern tip of the Australian mainland, and is roughly equivalent in area to Ireland or Sri Lanka. Together with New Zealand and the southern part of South America, it is one of three major southern land masses which lie in the path of the prevailing westerly winds, known as the Roaring Forties. The island is renowned for its ruggedness, with most mountains concentrated in the western half and in the north-east. Nevertheless, the highest peak, Mt Ossa, is a mere 1617 m high. The west of the island comprises intensely folded Precambrian and Cambrian sediments whilst the east and centre consist mainly of faulted Permian and Triassic sediments. capped with Jurassic dolerite. The combination of mountainous terrain inthe west, and westerly winds produce a marked east-west variation in climate. Thus western Tasmania receives an annual rainfall of 1200-3600 mm, whilst parts of the east receive as little as 500 mm. This zonation in climate and geology underlies many of the vegetation patterns, especially at the level of communities and species.

Vegetation

At least five major vegetation formations can be discerned in Tasmania:

Sclerophyll forest

This is dominated mainly by *Eucalyptus*, with an understorey dominated either by small trees and tall shrubs, such as *Banksia*, *Acacia* or members of the Asteraceae (wet sclerophyll forest), or by low, heath-like members of families such as the Epacridaceae or Fabaceae (dry sclerophyll forest). Eucalypts are among the tallest flowering plants in the world, and some individuals in Tasmania exceed 90 metres in height.

Cool temperate rainforest

This is dominated mainly by Nothofagus, or by Eucryphia, Atherosperma, or the conifers Lagarostrobos, Athrotaxis, Phyllocladus or Diselma. Rainforest is considered an ancient vegetation, resembling parts of an early

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flora which occurred in Gondwana prior to its breakup. Important rainforest flowering plant families include the Epacridaceae (Fig 1), Proteaceae and Cunoniaceae. All the species are evergreen with the exception of *Nothofagus gunnii*, a fire-sensitive shrub or small tree from high altitudes. Today related forests occur in south-eastern Australia, New Zealand and southern South America.

Buttongrass moorland

This comprises vegetation associated with the sedge *Gymnoschoenus* sphaerocephalus. It can be divided into two basic types, the most extensive of which occurs on shallow peat across hilly terrain, and is analogous to the blanket bogs of the Northern Hemisphere (Fig 2). Buttongrass moorland usually consists of a complex mosaic of sedgeland, heathland and scrub, rich in species of Cyperaceae, Epacridaceae, Myrtaceae, Proteaceae and Restionaceae. They are very inflammable and have a long history of accidental and deliberate burning.

Alpine vegetation

This includes mosaics of heathland, sedgeland, bolster moor, herbfield, grassland and coniferous woodland (Figs 3 & 4). These communities are typically very rich in Tasmanian endemics and taxa of Gondwanic origin. Most alpine communities are very fire sensitive and many Tasmanian mountain systems have been extensively damaged, especially in this century. The conifers are particularly susceptible.

Coastal vegetation

This comprises a mosaic of heathland, woodland (often dominated by *Allocasuarina*), halophytic, succulent communities and tussock grasslands. Perhaps more than any other formation, coastal communities have been cleared or modified for farming or settlement.

History of lichenology

The study of Tasmanian lichens began in the late 18th century (Kantvilas, 1983). From the first collections by JJ de la Billardière in 1792, specimens were sent to European specialists, first by the early explorers and later by resident naturalists and plant collectors. Thus most of the initial study and description of Tasmanian lichens was undertaken by botanists such as C Babington, J D Hooker, A Jatta, A Krempelhuber, J Müller-Argoviensis, J Stirton and T Taylor, of whom none but Hooker ever visited the region personally. Towards the end of the 19th century, significant contributions on Tasmanian lichens were also published by the resident Australian lichenologists, J Shirley and F R M Wilson.

After a lapse of over half a century, general interest in lichenology, in



Fig. 1 Cool temperate rainforest with the tall rosette shrub, *Richea pandanifolia* (Epacridaceae) very abundant. Other rainforest communities may have a very open and park-like structure.



Fig. 2 Rugged, folded Precambrian metamorphic landscape, The Thumbs, southwestern Tasmania. The vegetation is buttongrass moorland over a blanket peat. Australia as elsewhere, was rekindled in the 1960s. This period featured the relearning of the knowledge of the early lichenologists, most of which had fallen into disuse, and its reappraisal in terms of modern taxonomic principles and techniques. Although the greatest emphasis of lichenology has been taxonomic and floristic, considerable progress has also been made in phytosociology and ecology, particularly as regards rainforest lichens.

Composition of the lichen flora

The most recent checklist of Tasmanian lichens (Kantvilas, 1994) lists more than 760 taxa in 210 genera, although significant additions continue to be made as research on the flora progresses. The crustose lichens in particular are poorly known, and their taxonomy at or above generic level is still unstable.

The largest genera in the Tasmanian lichen flora include Bunodophoron (11 taxa), Cladonia (45), Collema (19), Hypogymnia (14), Leptogium (11), Menegazzia (23), Pertusaria (17), Porina (14), Pseudocyphellaria (16), Psoroma (c. 20), Ramalina (11), Rinodina (14), Usnea (19) and Xanthoparmelia (49). Other genera which are significant in the flora, especially with respect to biomass in particular vegetation types or habitats, are Cladia, Micarea and Siphula.

Biogeographical affinities

The Tasmanian lichen flora can be considered in terms of several broadly overlapping biogeographical groupings, analogous to those found on other land masses with similar geographical features, climate and geological origin. The major elements present are the austral cool temperate, the Australian or austral warm temperate, the subantarctic, the cosmopolitan, the pantemperate, the bipolar, the tropical and the endemic elements. The closest floristic similarities are with nearby New Zealand and southeastern Australia (see Galloway, 1979; 1990; Jørgensen, 1983) but affinities are also apparent with southern South America and, to a lesser extent, with southern Africa and India (Rogers & Stevens, 1981). These relationships are today attributed mainly to the common origin of these land masses in the supercontinent of Gondwana, with ancestral distribution patterns having since been modified by climatic changes, evolution and longdistance dispersal.

Austral cool temperate element

The austral cool temperate element is particularly prominent in the Tasmanian lichen flora, especially in cool moist habitats. It predominates in rainforest (Kantvilas et al, 1985) where it includes species from genera such as Austroblastenia, Bunodophoron, Degelia, Fuscoderma, Menegazzia, Metus, Pseudocyphellaria, Psoroma, Psoromidium, Roccellinastrum and



Fig. 3 Alpine heathland and coniferous forest dominated by *Athrotaxis cupressoides*, Lake Ophion, Central Highlands.



Fig. 4 Extensively faulted dolerite plateaux at the Walls of Jerusalem, typical of much of Tasmania's Central Highlands. The vegetation is a mosaic of mostly heathy and grassy alpine communities.

Sagenidium (Fig 5). This element is also well represented in treeless vegetation such as buttongrass moorland (Kantvilas & Jarman, 1988) and alpine communities (Kantvilas, 1995). Its closest geographical affinities are with New Zealand, southern South America and south-eastern Australia, and it is common to find the same or at least closely related lichens occupying the same ecological niches in these regions (Galloway, 1987;1988). Most Tasmanian endemic lichens have their closest relatives in the austral cool temperate element.

Australian or austral warm temperate element

Species from this element occur mostly in sclerophyll forests, coastal heathlands and, to a lesser extent, buttongrass moorland. Many species occur on rocks and soil whilst others are epiphytic on *Eucalyptus, Acacia* and other trees, or are confined to charred wood. Prominent lichens include those from the genera *Xanthoparmelia, Cladia, Heterodea, Thysanothecium* and *Neophyllis*. This element displays closest relationships with mainland Australia, although some affinities can also be found with southern Africa and India. Compared with its occurrence on mainland Australia, the Australian element is relatively poorly represented in Tasmania where in the main only the most common and widespread species are found.

Subantarctic element

In Tasmania, this element is well-developed in alpine vegetation, where it is characterised by species of *Placopsis*, *Siphulastrum*, *Siphula* and *Neuropogon*, and in buttongrass moorland where characteristic lichens include *Knightiella splachnirima*, *Lithographa subantarctica*, *Fuscidea absolodes*, *Micarea austroternaria*, *M. isabellina* and *Stephanocyclos henssenianus*. The subantarctic element is also represented by the lichens *Turgidosculum complicatulum* and *Caloplaca cribrosa* on maritime rocks along Tasmania's southern coastline. The subantarctic element displays strongest geographical affinities with the cold, treeless high altitude areas of New Zealand, southern South America and subantarctic islands.

Cosmopolitan element

The cosmopolitan element contains species with world-wide distributions and is represented in most Tasmanian vegetation types. Common species include several from the large terricolous genus, *Cladonia*, for example *C. scabriuscula*, *C. chlorophaea* and *C. ramulosa*, and the forest epiphytes *Thelotrema lepadinum* and *Dimerella lutea*. Typically, cosmopolitan species tend to be associated with disturbance. In native vegetation, they occur on freshly exposed soil, e.g. *Stereocaulon ramulosum* and *Trapeliopsis* granulosa, or at the margins or in the canopy of the closed forest, e.g. *Parmotrema chinense* and *Usnea rubicunda*. They are particularly prominent within habitats created or modified by man. Thus *Physcia* adscendens and Punctelia subrudecta are frequently the dominant epiphytic lichens in parks and gardens, Neofuscelia pulla is found on bitumen pathways and Xanthoria parietina occurs on roofing tiles and introduced trees.

Pan-temperate element

This element is also represented in most Tasmanian vegetation formations, although it is particularly common in rainforest. Typical species include the small crustose lichens Arthothelium ilicinum, Chaenotheca brunneola, Cliostomum griffithii, Leproloma membranacea, Lecanactis abietina and Lopadium disciforme, and these are usually best developed on the oldest trees in mature closed forests, mostly on the very dry trunks (Kantvilas, 1988). Examples of pan-temperate macrolichens found in Tasmania include the forest epiphytes Tuckermannopsis chlorophylla and Imshaugia aleurites. All these species are also found in similar ecological niches in the forests of northern Europe and cool temperate North America (James et al, 1977).

Bipolar element

The bipolar element includes species which occur in cold Arctic and Antarctic regions with intervening populations along high mountain chains (Du Rietz, 1940). In Tasmania, the bipolar element is rather depauperate, probably due to the relatively mild climate and low altitude of the mountains (Kantvilas, 1995). Thus bipolar species such as Alectoria nigricans, Arthroraphis spp., Coelocaulon aculeatum, Ochrolechia frigida, Catillaria contristans, Pseudephebe pubescens and species of Umbilicaria are mostly uncommon and restricted to the highest peaks.

Tropical element

Despite its cool climate and southerly location, Tasmania also supports a small number of essentially tropical lichens. For example, *Phaeographis* exaltata and the basidiolichen, *Dictyonema sericeum*, are found in rainforest, whilst *Coenogonium implexum* is abundant in wet sclerophyll forest. In coastal vegetation, *Phaeophyscia endococcinodes* and species of *Relicina* and *Heterodermia* are present and locally abundant.

Endemic element

As indicated above, most Tasmanian lichens have rather wide distributions and occur in other regions of the world. Only about 5 % of the flora is endemic to Tasmania, including such noteworthy species as *Lichina tasmanica*, which occurs semi-submerged in the alpine streams, *Roccellinastrum flavescens* and *R. lagarostrobi*, which are confined to the leaves of some endemic Tasmanian conifers, and *Cladia moniliformis* and *Siphula jamesii*, which characterise the buttongrass moorlands of the

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Fig. 5

- (a) Pseudocyphellaria billardieri, a common lichen in wet forests. (Photo: B Fuhrer)
- (b) Menegazzia weindorferi, a common epiphyte in wet forests, especially in the canopy. (Photo: B Fuhrer)
- (c) Bunodophoron imshaugii, a rainforest lichen. This genus is characteristic of moist mossy tree trunks in the shady rainforest interior. (Photo: B Fuhrer)
- (d) Psoroma euphyllum, an uncommon rainforest lichen. Unlike this taxon, most Tasmanian species of Psoroma have a squamulose thallus. (Photo: B Fuhrer)
- (e) Metus conglomeratus, from the deeply shaded rainforest understorey. (Photo: B Fuhrer)
- (f) Cladia retipora, also known as coral lichen. A very typical Australasian lichen, common in heathland from coastal to alpine environments. (Photo: B Fuhrer)



South-West. There are also several endemic epiphytic species of the genus *Menegazzia*. There is only one described endemic genus, *Siphulella*, which grows mainly in alpine vegetation in the south-west, although *Conotremopsis* and *Wawea*, two monotypic genera also known in New Zealand, clearly attain their maximum development in Tasmania.

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