Papers and Proceedings of the Royal Society of Tasmania, Volume 116, 1982

(ms. received 23.3.82)

THE VEGETATION OF SCHOUTEN ISLAND, TASMANIA

by S. Harris and J.B. Kirkpatrick
Tasmanian National Parks and Wildlife Service and
Geography Department, University of Tasmania

(with three tables, seven text-figures and ten plates)

ABSTRACT

HARRIS, S. and KIRKPATRICK, J.B., 1982 (31 viii): The vegetation of Schouten Island, Tasmania. *Pap. Proc. R. Soc. Tasm.*, 116: 117-141. https://doi.org/10.26749/rstpp.116.117 ISSN 0080-4703. National Parks and Wildlife Service, and University of Tasmania, Hobart, Tasmania.

Thirty-seven communities defined by structure and dominance are mapped for Schouten Island which lies within the Freycinet National Park on the east coast of Tasmania. The communities dominated by herbs are mainly coastal in occurrence, those dominated by shrubs are mostly confined to the granitic east of the island, and those dominated by trees are most widespread on the dolerite and sandstone of the west. Thirteen floristic communities are recognized as a result of a monothetic divisive classification of species lists from 160 quadrats. The distribution of these communities, like that of the structure-dominance communities, is most closely related to surface geology and exposure to salt-laden winds. However, their structural expression, and to some extent their distribution, is moulded by other influences such as fire incidence and intensity, topography, and disturbances by man and other animals. Over 450 native higher plant species are recorded for the Freycinet National Park.

INTRODUCTION

Schouten Island is situated immediately south of Freycinet Peninsula on Tasmania's eastern coast. It covers an area of 3 439 hectares, and is mountainous and rugged with a predominantly cliffed coastline. The highest peak, Mt Storey, is 400 m high. The island is similar in topography and lithology to Freycinet Peninsula, from which it is separated by a narrow passage about one km in width. Its vegetation contains elements of the dolerite-dominated landscape to the south and the granite-dominated landscape to the north. Schouten Island is part of the Freycinet National Park which with Mt William National Park, Maria Island National Park and Strzelecki National Park contains almost all the reserved natural vegetation in the drier part of the State. Thus, the description of the vegetation of the island given in this paper serves both to make more accurate our knowledge of the plant community composition of the Tasmanian State Reserve system (Specht *et al.* 1974) and to enlarge the published descriptions of the vegetation of "dry" Tasmania (Stephens and Cane 1939; Hogg and Kirkpatrick 1974; Bowden and Kirkpatrick 1974; Kirkpatrick 1973, 1975, 1977, 1981,; Kirkpatrick *et al.* 1980; Brown and Bayly-Stark 1979; Harris and Brown 1980; Wells *et al.* 1977).

There are no climatic data available for Schouten Island but precipitation and temperature conditions are probably approximated by data from the nearest station at Swansea (table 1).

The most striking feature of the geology of the island is the north-south trending fault through the centre of the island. The fault divides the upthrown granite in the east from the downthrown dolerite-capped sedimentary rocks in the west. Sandstone outcrops beneath the dolerite along parts of the western coast. The sandstone beds contain coal measures and form extensive cliffs (plate 1). The sandstone is also exposed in two of the deeper western gullies. Mudstone occurs in a small area next to the granite margin behind Sarah Ann Bay. A sheet of leached sand, probably of aeolian origin, and of variable

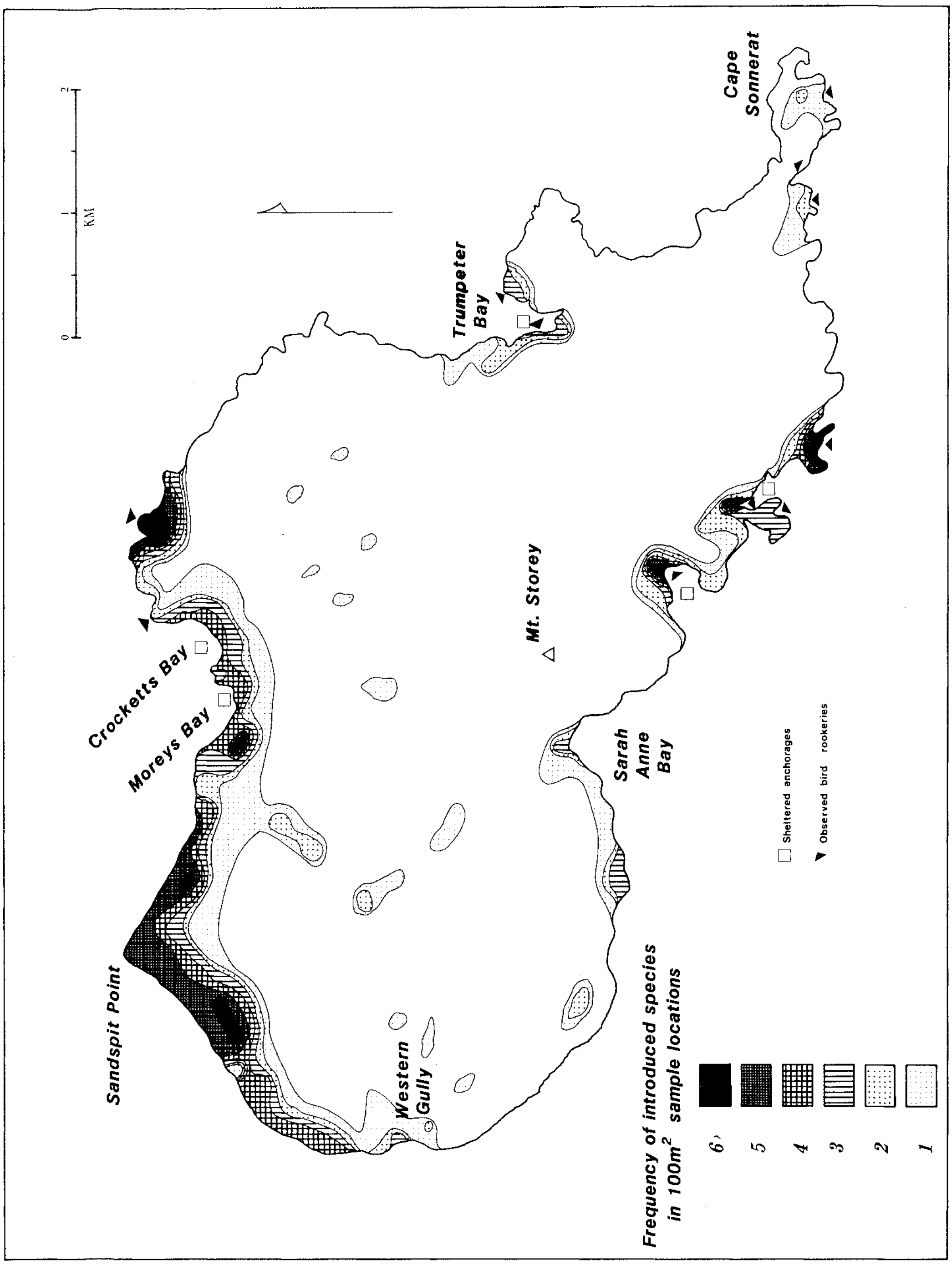

FIG. 1 - The distribution and density of exotic plant species on Schouten Island based on data from 140 quadrats.

TABLE 1

CLIMATIC DATA FOR SWANSEA

A = precipitation (mm); B = no. of raindays (prec. > 2.5 mm);
C = mean daily maximum temperature (°C); D = mean daily minimum temperature (°C).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
A	41	48	63	58	42	64	50	35	38	55	47	62	604
B	9	8	10	11	12	12	12	12	12	13	11	11	131
C	21.6	21.9	20.4	17.7	15.2	12.9	12.6	13.6	15.5	17.4	19.3	20.7	
D	11.2	11.7	10.2	8.1	5.8	4.4	3.8	4.2	5.7	7.2	8.8	10.3	

depth covers part of the dolerite in the west and is probably of Last Glacial Age. Calcareous marine sand is being deposited on Sandspit Pt.

The soils of the island vary from the highly acid (pH = 4.5) podzols on aeolian sand and peats on granite colluvium, to the near neutral and relatively fertile soils formed *in situ* on dolerite and sandstone (fig. 3). Young soils include those formed on alluvium in a few valleys where they often exceed 0.5 m in depth, calcareous undifferentiated coastal sands and lithosols on both granite and dolerite. On the eastern part of the island these lithosols form the extreme of a catena of increasing depth of the coarse weathering products of granite which terminates in the acid peats of the ill-drained slope-base flats. On the western half of the island the lithosols are actually the finer material held between and beneath the dolerite talus of south-east facing slopes (plate 2).

METHODS

Photocommunities were mapped from 1:40 000 black and white aerial photographs. These photocommunities were defined primarily by structural characteristics (Specht 1970) and secondarily by phototexture and tone.

The fieldwork commenced in early January 1977 and continued until the beginning of March 1977 and then proceeded intermittently in June and August 1977. Plant collections were made during these periods and in December 1981. Voucher specimens are held in the Geography Department, University of Tasmania and the Tasmanian Herbarium.

One hundred and sixty square 100 m^2 quadrats were located using the "subjective without preconceived bias" approach (Mueller-Dombois and Ellenberg 1974). Sample sites were selected to include as wide a range of physiognomically different vegetation as possible. Within each quadrat the following data were recorded: a list of all species present, pH of the A_1 soil horizon (measured with a C.S.I.R.O. field testing kit), the structure of the vegetation, whether the vegetation in the quadrat was exposed to salt spray, the extent of drainage or waterlogging of the soil (qualitatively described), the surface geology, aspect and signs of human influence and firing.

General information on current human influence was gained from conversations with local people including Mr R. Maxfield, a local fisherman. Information of European activities on the island, dating from the 1820's, was gleaned from files in the Archives Office of Tasmania.

The monothetic, divisive computer programme, DIVINF, was used to classify the quadrats. The Chi-squared statistic was used to gain an indication of the strengths of the relationships between the environmental variables and the 101 most frequent plant species and between every possible pair of these species.

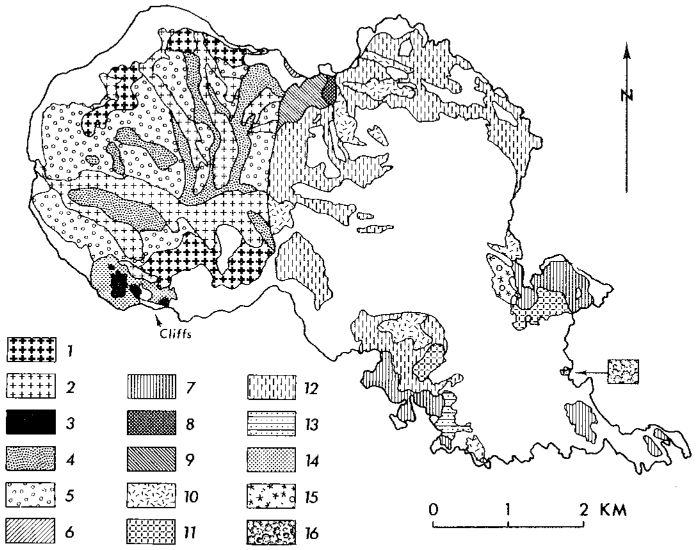

FIG. 2 - Distributions of plant communities dominated by trees. 1 - *Eucalyptus globulus* tall open-forest; 2 - *E. globulus* open-forest; 3 - *Bedfordia salicina-Notelaea ligustrina* low closed-forest; 4 - *E. amygdalina-E. pulchella* open-forest; 5 - *E. amygdalina-E. viminalis* open-forest; 6 - *Casuarina stricta* low open-forest; 7 - *C. stricta* low closed-forest; 8 - *E. amygdalina-C. littoralis* low open-woodland; 9 - *E. amygdalina-C. littoralis-B. marginata* low open-forest; 10 - *E. tenuiramis-E. obliqua-E. ovata* open-forest; 11 - *E. tenuiramis-E. amygdalina* open-forest; 12 - *E. tenuiramis-Callitris rhomboidea* low open-forest; 13 - *Casuarina stricta* low woodland; 14 - *C. stricta* low open-woodland; 15 - *E. amygdalina* low open-woodland; 16 - *E. amygdalina-Callitris rhomboidea* low closed-forest.

RESULTS

The Human Influence

Charcoal is common in aboriginal middens in the north, west and south of the island indicating a long history of firing of the island by aboriginals gaining access by canoe from the Freycinet Peninsula (an early painting shows such access). With the replacement of aboriginal activities by those of Europeans from about 1810, fire frequency was at least maintained, if not increased. Fires were mainly associated with grazing and mining.

As well as firing, Europeans cleared some land and caused exotic species to be introduced. These effects on the vegetation began quietly enough with whalers putting to shore while sheltering from storms. In the 1820's a small whaling station was constructed at Crocketts Bay.

Pasturing of sheep began in the northwestern corner of the island in the early 1840's and continued sporadically until the 1920's. From this time sheep were run more or less continuously until April 1978. Milligan (1848, p.2) mentioned "that from 200 to 300 sheep have at one time run and improved in condition upon the island". The maximum number of sheep on the island was probably 650, in 1960 and 1961, when they occupied part of a lease covering the whole island.

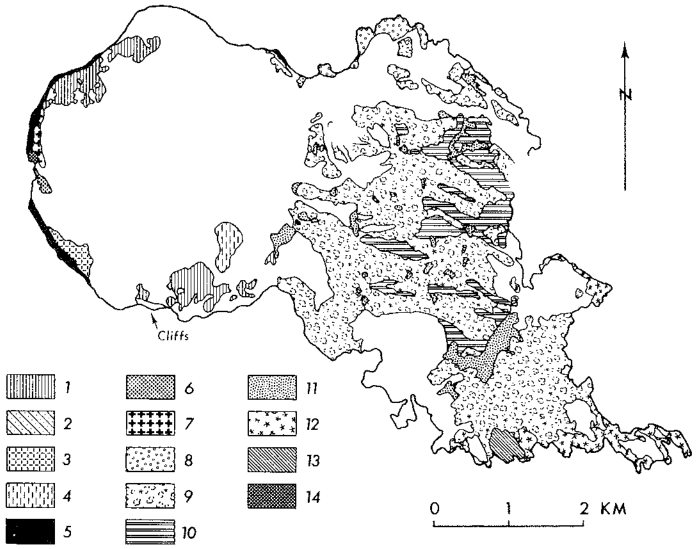

FIG. 3 - Distributions of plant communities dominated by shrubs, ferns and sedges. 1 - *Pteridium esculentum-Lomandra longifolia* closed fernland; 2 - *Ulex europaeus* closed-heath; 3 - *Helichrysum costatifructum-Gahnia radula* open-heath; 4 - *Acacia verticillata-A. melanoxylon-Olearia viscosa-Bursaria spinosa* closed-scrub; 5 - *Alyxia buxifolia-Calocephalus brownii* low open-shrubland; 6 - *Lomandra longifolia-Gahnia radula* closed-sedgeland; 7 - *Casuarina stricta-Banksia marginata* open-heath; 8 - *Acacia mucronata-Eucalyptus amygdalina* closed-scrub; 9 - *E. amygdalina-Banksia marginata-Leptospermum* tall open-shrubland; 10 - *Leptospermum* spp.-*Hakea* spp.-*E. amygdalina* open-scrub; 11 - closed-heath and closed tussock sedgeland; 12 - *Alyxia buxifolia-Helichrysum reticulatum* low open-shrubland; 13 - *Goodenia ovata* closed-heath; 14 - *Bedfordia salicina-Notelaea ligustrina* closed-scrub.

Pasture species as well as weeds were introduced with sheep. Some of these exotic species have become well established on the island. *Ulex europaeus* was certainly introduced with sheep as it is a common "vegetable fault" in wool (Hyde-Wyatt and Morris 1975). It has invaded parts of the eucalypt open-forest on the dolerite, aided by the sheep, which previously ran freely on the western portion of the island.

Coal mining probably began in the 1840's. A jetty was constructed at Crocketts Bay and a railway line built along the coast connected the jetty with the mine near Sandspit Point. Some very high concentrations of exotic species occur along this route (fig. 1). Trees were undoubtedly felled for construction purposes, and accidental and deliberate fires probably occurred. Coal mining was a short-lived industry. In the 1880's a few Chinese worked alluvial tin sluices on the upper reaches of the creek named after them, but this also was a short-lived activity. Repeated, brief attempts at mining occurred from time to time until about 1925.

Figure 1 gives an indication of introduced species concentrations but the pattern does not faithfully reflect areas of human disturbance as bird rookeries determine the location of exotic species infestations over much of the island.

The highest counts of exotic species were in areas disturbed by man or his domestic animals. For example, fourteen exotic species were recorded for quadrat 20 on the closed-

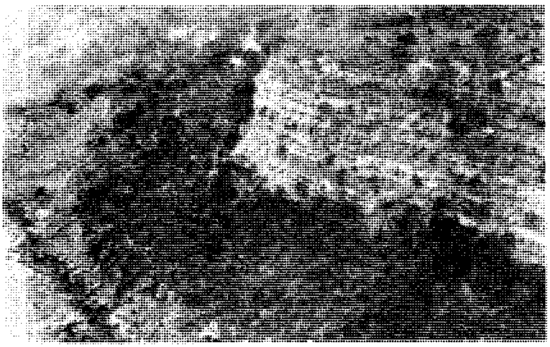

PLATE 1

Sandstone cliffs on the west coast of the island. *Stipa stipoides* dominates a narrow zone near the coast. *Casuarina stricta* is mostly dominant elsewhere. A small group of *Callitris rhomboidea* trees is visible at the base of the cliff in the right foreground.

PLATE 2

Bedfordia salicina-Notelaea ligustrina low closed-forest among dolerite talus.

PLATE 3

The granitic eastern part of the island looking towards Cape Sonnerat. *Casuarina stricta* forms a low closed-forest in the left middleground.

PLATE 4

Eucalyptus amygdalina-E. pulchella open-forest with the grassy understorey typical of much of the drier slopes on dolerite.

grassland, and five species were recorded for quadrat 1, also on closed-grassland. The heavily burned and grazed areas had large numbers of exotics. Such areas on the coast at Sarah Ann Bay had fewer, perhaps because of the distance from the node of animal and plant introduction, considered to be in the Moreys Bay area.

Many bays and inlets, some of which are convenient for boat anchorages, also have high weed concentrations. A small amount of exotic species introduction may have been accomplished by landing parties from fishing and pleasure craft. In such cases plants might become established from seeds that were lodged in boots or clothing. Exotic species are also concentrated on the phosphorus-enriched bird rookeries (fig. 1). At least 44 exotic plant species are found on the island.

Despite the many changes wrought accidentally and deliberately by European man the vegetation of the island looks basically the same today as when described by Milligan (1848, p.8):

> "The remaining third of the surface of the Island consists of greenstone eminences; lofty and barren enough for the most part, but still more undulating and rounded in their outline, and more prolific of vegetation and timber trees, than the granite section, which, except in deep ravines, and around the base of the hills, supports, only, and at long intervals, a scanty show of scrubby and stunted plants.
>
> On the more gentle slopes of the greenstone hills, and their varied undulations, there is besides a forest of gum trees, many stately specimens of Oyster Bay pine with a good deal of grass and other herbage fit for sheep and cattle."

Floristics

The species list (Appendix) includes almost 500 taxa of which 450 species are native to the Freycinet National Park. Of the native species 104 have been recorded from Schouten but not the Freycinet Peninsula and 111 have been recorded for the Freycinet Peninsula but not from Schouten Island. Thus 235 native species are held in common, Freycinet being richer in nanophanerophytes and orchids than Schouten and Schouten being richer in grasses and forbs than Freycinet. Endemism is relatively low with 32 of the 450 native species being Tasmanian endemics, 20 being found on the Freycinet Peninsula and 23 on Schouten Island. The slightly higher proportion of Tasmanian endemic species on Schouten Island may be accounted for by the large area of dolerite on Schouten (Kirkpatrick 1981).

Of the 436 native species recorded from Maria Island to the south (Brown and Bayly-Stark 1979) 287 are also recorded for the Freycinet National Park. The distinct granitic environment of most of the Freycinet Park may partially account for the differences between the two adjacent parks. Some of the species found on the granite of the Freycinet National Park have highly disjunct distributions, with a marked gap between the peninsula and either the Furneaux Group or the mainland (e.g. *Thryptomene micrantha, Pseudanthus ovalifolius, Gahnia microstachya*).

Structure and Dominance Patterns

(a) Communities dominated by trees

To the west of the fault line forests cover most of the land, whereas forests cover less than 40% of the granite and granitic colluvium (fig. 2, plate 3). The dominant species are mostly eucalypts, although *Casuarina* spp., *Callitris rhomboidea, Bedfordia salicina* and *Notelaea ligustrina* also dominate some areas (fig. 2, plates 1, 2 and 3).

Eucalyptus globulus tall open-forest and open-forest is restricted to south-facing slopes, deep gullies and limited areas of relatively deep soils on gentle slopes, all on dolerite, in the western half of the island. The understorey consists largely of open-grassland. However, the potential understorey in the mesic environment occupied by this community is probably closed-scrub dominated by a mixture of broad-leaved and sclerophyllous tall shrubs, a type which is most common on the island in the tall open-forest.

E. amygdalina and/or *E. pulchella* and their intermediates dominate open-forest on ridges and steep north-facing slopes on dolerite. The understorey consists of a low open cover of grasses, herbs and chamaephytes (plate 4). Where sands cover the dolerite and on the podzolic soils formed on sandstone *E. amygdalina* is generally codominant with *E. viminalis*, except in flat ill-drained areas where *E. ovata* dominates and on the driest slopes where *E. viminalis* is absent. The understorey is dominated by *Pteridium esculentum* and *Lepidosperma* spp. where fire has been recent and by sclerophyllous shrubs where five or more years have elapsed since the last fire (plate 5).

E. amygdalina is codominant with *Casuarina littoralis* in deep sands over granite in the northern part of the island where they form a low open-forest to low open-woodland with a closed-heath understorey under the eucalypt and virtually no plant cover under the *Casuarina*. In the eastern part of the island tree-form *E. amygdalina* is most widely associated with *E. tenuiramis* and *Callitris rhomboidea* in open-forest and low open-forest in well-drained slopes and gullies (plate 6). The open-forest consists largely of *E. tenuiramis*, especially in the north, *E. amygdalina* and *E. obliqua* being codominants on the southern slopes of Mt Daedalus. The understorey is an open to closed-scrub dominated by a mixture of broad-leaved and sclerophyllous shrubs, among which *Callitris rhomboidea* can be prominent. The low open-forest tends to occur in areas where granite boulders occupy much of the ground, the remaining ground cover being open-heath. The sparse understorey and the protection of the boulders are probably responsible for the survival of the fire-sensitive *Callitris rhomboidea* as a codominant in much of the area of this community. *C. rhomboidea* and *E. amygdalina* codominate a low closed-forest in another fire-protected situation below the eastern cliffs of the island. Communities dominated by trees of *Casuarina stricta* occur close to the coast in three structural forms (fig. 2). *C. stricta* is a highly drought-resistant species (Ashton *et al.* 1975), is highly resistant to the effects of salt spray deposition and characteristically has an extremely sparse herb layer underneath its canopy. The sparse understorey gives some fire protection to dense stands of the species, which is readily killed by fire although recovering well from seed held in serotinous cones, root sprouts and occasionally basal shoots. The *Casuarina stricta* low open-woodland in the eastern part of the island is interspersed by *Poa poiformis* tussock grassland and the *C. stricta* low-woodland in the western half of the island is interspersed by fernland or open-heath dominated mostly by coastal species. The understorey of the low closed-forest is bare except for a thick mat of cladodes and infrequent herbs.

Small areas of low closed-forest dominated by *Bedfordia salicina* and *Notelaea ligustrina* occur in the midst of dolerite talus slope deposits in the southwestern sector of the island (plates 2 and 7). There is a sparse covering of ferns, grasses and small shrubs in the interstices between the boulders and on fallen logs. The community is extremely well-protected from fire, being surrounded by unvegetated talus, and having a completely closed-canopy consisting of non-inflammable species.

(b) Communities dominated by shrubs and sedges (fig. 3)

Scrub, heath and sedgeland communities dominate most of the eastern half of the island. Closed tussock-sedgeland and/or closed-heath dominated by *Gymnoschoenus sphaerocephalus* and/or myrtaceous shrub species have formed peat soils over deep granitic colluvium wherever drainage is impeded or slow, the sedgeland community occupying the areas of worst drainage. The surrounding granite topography presents an enormous variety of well-drained microhabitats. Those with the highest moisture status support the forests and woodlands described previously. These grade into open-scrub dominated by *E. amygdalina*, *Hakea* spp. and *Leptospermum* spp. with an extremely dense and tangled understorey, often dominated by *Gleichenia dicarpa*, in valleys and near the bases of south-facing slopes. This community grades into a tall open-shrubland to open-heath as soils become shallower and insolation more intense. *E. amygdalina*, *Banksia marginata* and *Leptospermum* spp. dominate much of this mapping unit. However, *Calytrix tetragona* dominates some of the more exposed and dry situations where soil is still present, *Crassula sieberana*, a succulent herb, occupies shallow, insolated cracks in the granite and lichens dominate the bare rock.

PLATE 5
Eucalyptus amygdalina dominant on a leached sand sheet with an understorey in which *Banksia marginata* and *Gahnia radula* are prominent.

PLATE 6
Eucalyptus tenuiramis-Eucalyptus amygdalina open-forest with a grove of *Callitris rhomboidea*.

PLATE 7
The interior of the *Bedfordia salicina-Notelaea ligustrina* low closed-forest.

PLATE 8
Acacia mucronata closed-scrub at Crocketts Bay.

The only non-coastal area dominated by shrubs in the western half of the island is surrounded by *E. globulus* tall open-forest. This closed-scrub dominated by *Acacia melanoxylon* and *Bursaria spinosa* shows evidence of being in the recent past a forest community. Large eucalypt logs are found within its area.

The vegetation of the sandstone cliffs in the western half of the island is a low open-shrubland dominated by *Alyxia buxifolia* and *Calocephalus brownii* whereas on many of the granite cliffs the codominant of *A. buxifolia* is *Helichrysum reticulatum*. On the cliff tops to the rear of the *A. buxifolia-C. brownii* low open-shrubland the combination of salt spray deposition and firing has created two communities; an open-heath dominated by *Casuarina stricta* and *Banksia marginata* in the north and an open-heath dominated by *Helichrysum costatifructum* and *Gahnia radula* in the south in which *C. stricta* and

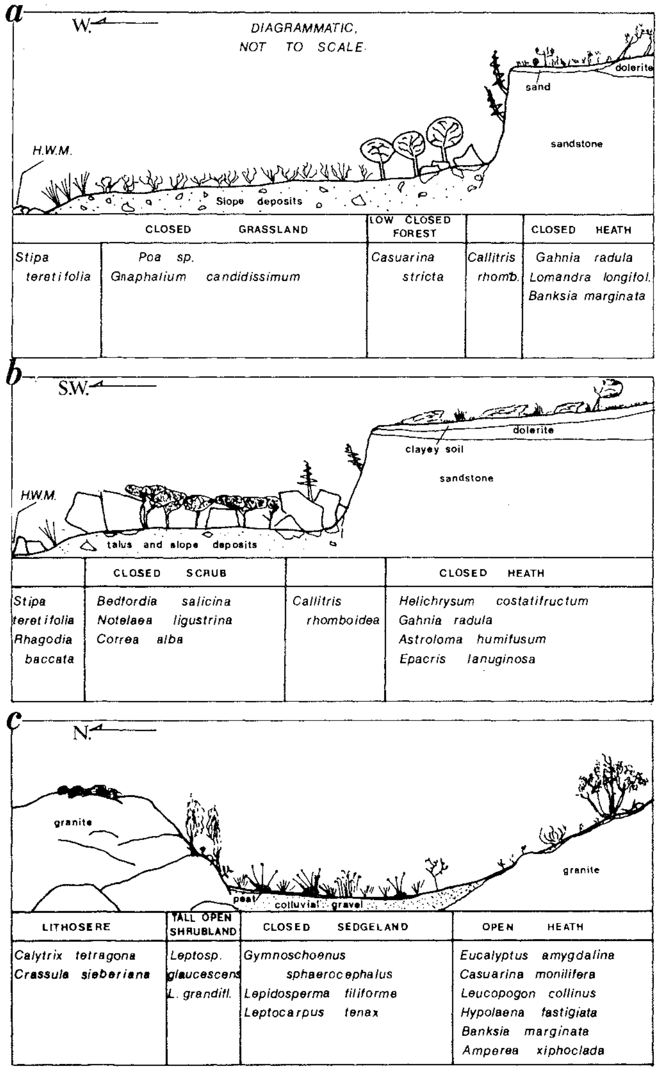

FIG. 4 - Schematic profiles of the coastal and granite vegetation. Note that *Stipa teretifolia* should read *Stipa stipoides*.

B. marginata are present (fig. 4). *Bedfordia salicina* forms a closed-scrub in talus at the base of the same cliffs (fig. 4). On some coastal granite slopes in the southern part of the island firing has probably reduced scrub vegetation to a closed-heath dominated by heavily salt-pruned *Goodenia ovata*. The major coastal community dominated by shrubs in the sheltered north of the island is closed-scrub dominated by *Acacia mucronata* (plate 8). The only mappable community dominated by an exotic is also found in the northern part of the island in the cleared area on dolerite at Moreys Bay where *Ulex europaeus* formed a closed-heath to closed-scrub before control operations in late 1981.

(c) Communities dominated by grasses and herbs (fig. 5)

Communities dominated by grasses or herbs are most widespread in the western part of the island and are mostly near-coastal and/or associated with human disturbance. The most extensive herbaceous communities are *Lomandra longifolia* open tussock-herbland and *Pteridium esculentum-Lomandra longifolia* closed-fernland (plate 9). Both these communities are located in the most intensely disturbed sections of the island where grazing, clearing and frequent firing have destroyed former forest communities which are now re-invading, and both communities have exotic species prominent in the lower strata. The small areas of *Poa poiformis* closed-tussock grassland and *L. longifolia* closed tussock-herbland at the mouth of Western Gully may also owe their origin to a combination of grazing and fire disturbance, and the area of *Themeda australis* closed-tussock grassland in the far northwestern sector of the island has probably resulted from clearing. However, a small near-coastal area of the same community in the southeastern part of the island is probably natural in origin.

Spinifex hirsutus open-grassland is confined to the northwestern sandspit where it is a colonizing community. The herbaceous communities of rocky coasts are only of mappable extent in the highly exposed southeastern part of the island. This mapping unit includes several zones, the distribution of which seems strongly related to exposure to saltspray. The zone closest to the sea is dominated by succulents, most notably *Disphyma australe* and *Carpobrotus rossii*. The latter species, as on the granite Bass Strait Islands where exactly the same zonation is apparent (Kirkpatrick *et al*. 1974), tends to occur to the landward of *D. australe*. *Stipa stipoides* tussock-grassland forms the next most landward zone with *Poa poiformis* tussock-grassland further inland.

FIG. 5 - Distributions of the communities dominated by grasses and herbs. 1 - *Stipa stipoides* tussock grassland; 2 - *Poa-Danthonia* closed-grassland; 3 - *Cakile* ephemeral herbland; 4 - *Themeda australis* closed-grassland; 5 - *Poa-Themeda-Pteridium-Lomandra* grassland; 6 - *Ammophila arenaria-Spinifex hirsutus-Festuca littoralis* open grassland; 7 - *Lomandra longifolia* open herbland.

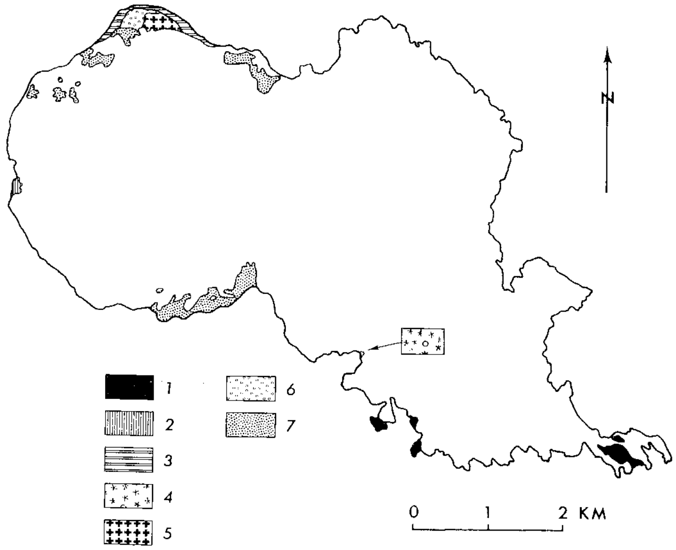

TABLE 2

PERCENTAGE FREQUENCY OF SPECIES BY DIVINF GROUPS.

Species	Group 4 n=8	Group 24 n=6	Group 25 n=12	Group 17 n=17	Group 16 n=10	Group 22 n=7	Group 23 n=13	Group 10 n=14	Group 8 n=18	Group 18 n=13	Group 19 n=18	Group 20 n=6	Group 21 n=18
Gymnoschoenus sphaerocephalus	100	-	-	-	-	-	-	-	-	-	-	-	-
Sprengelia incarnata	88	100	-	12	-	-	-	-	-	-	-	-	-
Selaginella uliginosa	63	17	-	-	-	-	-	-	-	8	-	-	6
Drosera pygmaea	50	50	-	-	-	-	-	7	-	-	11	-	-
Xyris spp.	50	-	8	-	-	-	-	-	-	-	-	-	-
Gleichenia spp.	75	-	17	-	-	-	-	-	-	8	-	-	-
Hakea teretifolia	75	100	100	-	-	-	-	-	-	-	11	-	-
Lepidosperma filiforme	88	100	50	18	10	-	-	-	-	-	-	-	-
Leptospermum scoparium	88	50	8	24	-	-	-	14	-	8	22	-	-
Leptocarpus tenax	75	83	8	12	-	29	-	-	-	-	-	-	-
Melaleuca squamea	50	17	8	6	-	-	-	-	-	-	6	-	-
Cassytha glabella	50	83	42	24	-	14	-	14	-	-	6	-	-
Bauera rubioides	75	83	25	24	10	-	-	-	-	-	6	-	-
Calorophus elongatus	88	17	33	6	-	-	-	-	-	-	6	-	-
Caustis pentandra	-	67	25	12	-	-	-	-	-	-	-	-	-
Gompholobium heugelii	-	50	33	35	-	-	-	-	-	-	-	-	-
Pseudanthus ovalifolius	-	50	42	12	-	-	-	-	-	-	6	-	-
Schoenus tenuissimus	-	50	33	12	-	-	-	-	-	-	-	-	-
Patersonia fragilis	-	50	-	-	-	-	-	-	-	-	-	-	-
Dillwynnia glaberrima	13	33	58	29	-	-	-	-	-	-	6	-	-
Leptospermum glaucescens	-	33	42	18	-	-	-	-	6	-	11	-	-
Tetratheca pilosa	25	17	58	12	-	14	-	7	-	-	-	-	-
Leucopogon collinus	13	100	75	53	10	14	-	21	-	-	6	-	-
Acacia genistifolia	13	67	100	53	30	14	-	14	-	-	11	0	6
Gonocarpus humilis	13	17	67	76	40	29	54	29	-	-	22	-	33
Lindsaya linearis	38	83	17	12	-	14	8	7	-	-	11	-	22
Acacia myrtifolia	38	100	58	71	40	14	23	7	-	-	6	-	-
Amperea xiphoclada	-	67	83	65	30	14	15	-	-	-	6	-	6
Spyridium vexilliferum	-	17	17	6	10	43	8	29	-	-	-	-	6
Xanthosia pilosa	13	33	92	53	10	14	8	-	-	-	-	-	-
Xanthosia tridentata	-	50	58	53	20	14	-	-	-	-	-	-	-
Epacris impressa	-	100	100	100	100	-	-	100	-	-	-	-	-
Eucalyptus amygdalina	13	67	67	53	50	100	100	64	-	-	-	-	-
Hibbertia riparia	13	67	83	59	60	100	-	43	-	-	6	17	-

TABLE 2 (cont.)

Species	Group 4 n=8	Group 24 n=6	Group 25 n=12	Group 17 n=17	Group 16 n=10	Group 22 n=7	Group 23 n=13	Group 10 n=14	Group 8 n=18	Group 18 n=13	Group 19 n=18	Group 20 n=6	Group 21 n=18
Gonocarpus tetragynus	13	-	17	18	40	71	8	43	11	-	6	50	11
Correa reflexa	25	-	8	6	20	43	15	7	-	-	11	-	6
Banksia marginata	50	83	92	82	50	57	54	50	6	-	28	17	6
Stylidium graminifolium	25	100	83	71	70	14	8	36	6	31	22	-	11
Lepidosperma concavum	-	67	92	88	60	43	31	50	6	8	22	-	6
Dampiera stricta	-	33	8	24	10	-	-	7	11	54	17	17	6
Calytrix tetragona	-	67	33	29	10	14	-	-	6	8	11	-	6
Schoenus turbinatus	-	50	8	6	10	-	-	7	-	8	-	-	-
Casuarina monilifera	-	83	33	29	10	-	-	-	-	8	17	-	-
Acacia botrycephala	-	-	67	24	10	14	15	-	-	-	6	21	6
Goodenia ovata	-	-	17	6	20	-	31	7	11	46	33	-	50
Senecio spp.	-	-	8	-	20	-	15	7	33	46	28	17	61
Poa spp.	-	-	17	12	20	14	54	29	61	69	44	100	61
Deyeuxia spp.	-	-	8	12	10	29	8	29	40	-	6	50	11
Pteridium esculentum	-	-	8	18	30	-	62	7	67	-	-	100	100
Casuarina littoralis	-	-	33	71	90	71	38	57	6	-	11	-	-
Astroloma humifusum	-	-	8	29	60	71	38	86	44	-	-	83	6
Helichrysum scorpioides	-	-	8	18	40	-	15	-	-	-	6	17	17
Clematis gentianoides	13	-	-	6	10	57	23	50	-	-	-	-	6
Viola sieberana	-	-	-	18	20	43	-	64	-	-	6	17	-
Bossiaea prostrata	-	-	-	-	30	86	38	86	22	-	-	-	-
Lepidosperma lineare	-	-	-	-	30	43	8	57	6	-	-	-	-
Schoenus apogon	-	-	-	-	-	43	8	100	22	-	11	33	-
Gahnia radula	-	-	-	-	10	57	-	29	17	-	-	17	-
Pultenaea pedunculata	-	-	-	6	-	43	-	21	-	-	-	17	-
Hypericum gramineum	-	-	-	-	-	14	-	57	22	-	-	17	-
Hypochaeris radicata	-	-	8	-	-	-	8	14	100	-	-	-	-
Acaena echinata	-	-	8	-	-	-	15	-	61	-	6	-	-
Gnaphalium spp.	35	-	-	6	40	-	23	36	39	100	-	33	11
Stipa spp.	-	-	-	12	50	43	23	57	33	23	11	17	17
Viola hederacea	-	-	-	6	20	14	62	29	6	8	-	50	22
Danthonia spp.	-	-	-	6	30	71	8	57	39	46	11	100	-
Wahlenbergia spp.	-	-	-	12	20	29	31	50	72	31	11	67	50
Dichondra repens	-	-	-	-	10	-	15	-	56	15	11	67	39
Lomandra longifolia	-	-	-	-	100	86	69	64	67	46	33	67	61
Agrostis spp.	-	-	-	-	10	43	23	57	50	46	11	17	11

TABLE 2 (cont.)

Species	Group 4 n=8	Group 24 n=6	Group 25 n=12	Group 17 n=17	Group 16 n=10	Group 22 n=7	Group 23 n=13	Group 10 n=14	Group 8 n=18	Group 18 n=13	Group 19 n=18	Group 20 n=6	Group 21 n=18
Oxalis corniculata	-	-	-	-	20	29	31	50	94	46	22	67	56
Casuarina stricta	-	-	-	-	20	14	8	21	39	46	28	33	33
Lagenophora stipitata	-	-	-	-	40	43	-	79	17	8	6	17	-
Acrotriche serrulata	-	-	-	-	-	-	8	50	6	-	-	17	-
Anagallis arvensis	-	-	-	-	-	-	-	7	11	38	-	17	-
Gahnia graminifolia	-	-	-	-	-	-	-	29	11	-	6	50	-
Juncus spp.	13	-	-	-	-	-	-	7	17	23	-	50	-
Crassula sieberana	13	-	17	-	10	-	-	-	-	38	6	-	17
Leucopogon parviflorus	-	-	-	47	10	-	15	-	22	-	6	-	22
Scirpus nodosus	-	-	-	-	-	-	15	7	39	54	11	50	17
Acaena novae-zelandiae	13	-	-	-	-	-	15	7	11	8	11	83	17
Sonchus asper	-	-	-	-	-	-	-	-	17	54	11	33	11
Rhagodia baccata	-	-	-	-	-	-	-	-	11	54	22	-	22
Carpobrotus rossii	-	-	-	-	-	-	8	-	22	69	17	-	11
Leucopogon australis	-	-	8	-	-	-	8	-	17	31	28	50	17
Plantago coronopus	-	-	-	-	-	-	-	-	22	15	6	67	-

PLATE 9
Lomandra longifolia open-herbland on dolerite near the south coast being invaded by *Casuarina stricta* four years after the removal of stock from the island. Note the fire-killed trees in the background.

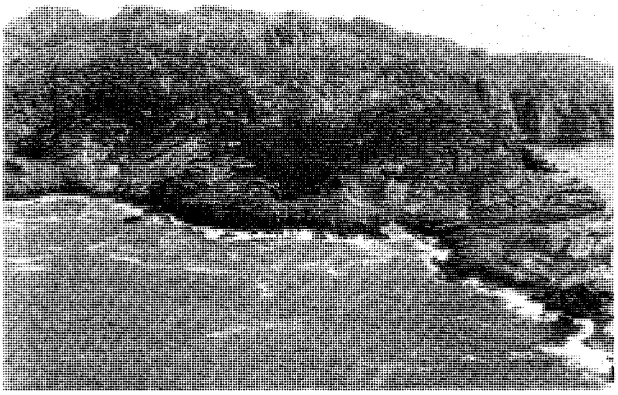

PLATE 10
The high energy granite coast looking west from Cape Sonnerat. Coastal communities dominated by succulents, tussock grasses and *Casuarina stricta* clothe much of the landscape.

Species and Stand Relationships

The species associations shown in the species constellation diagram (fig. 6) largely reflect edaphic variation on the island. The species in the uppermost constellation range from a strong group on the left associated with the peat soils formed on granite colluvium through a group at the top strongly associated with the heaths and scrub on granite to a less strongly defined group on the right which consists of species characteristic of woodland and forest on granite. Some species to the far right occur together over most of the island. The smaller underlying constellation consists of species characteristic of the sandstone and dolerite soils in the western part of the island.

The thirteen major quadrat groupings that resulted from the association analysis form a continuum within which few groups can be recognized by both faithful and constant species (table 2). However the group defined by the absence of all species (19) is the only group which cannot be reasonably defined by the association of two or more constant species. Groups 4, 24, 25 and 17 are almost totally confined to granite and granitic colluvium out of reach of the major influence of saltspray. They form a continuum from the stands in the ill-drained valleys characterized by the presence of *Gymnoschoenus sphaerocephalus* to stands largely in the forests and woodlands of the north characterized by the presence of *Epacris impressa, Banksia marginata* and *Lepidosperma concavum.* Groups 16, 22, 23 and 10 are concentrated in the forests of the west of the island, and the quadrats in the remaining groups are predominantly located in coastal herbland (figure 7). Several floristic regions, most of which include several of the communities defined by both structure and dominance and floristic composition, can be recognized. Group 17 characterizes a large region in the north of the granite part of the island, groups 4, 24 and 25 are intimately mixed in the southern part of the east of the island, groups 10, 16, 22 and 23 characterize the inland dolerite region, groups 19, 20 and 21 dominate the south and east coasts, and group 8 dominates much of the north coast (figure 7).

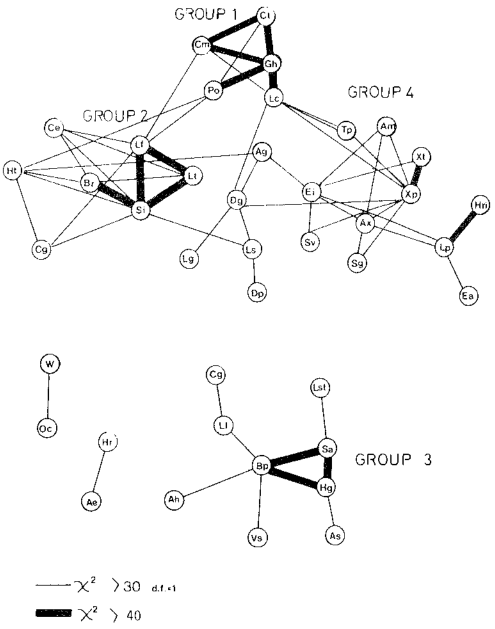

FIG. 6 - Species constellation diagram. Ae - *Acaena echinata;* Ag - *Acacia genistifolia;* Ah - *Astroloma humifusum;* Am - *Acacia myrtifolia;* As - *Acrotriche serrulata;* Ax - *Amperea xiphoclada;* Bp - *Bossiaea prostrata;* Br - *Bauera rubioides;* Ce - *Empodisma minus;* Cg (group 2) - *Cassytha glabella;* Cg (group 3) - *Clematis gentianoides;* Cm - *Casuarina monilifera;* Ct - *Calytrix tetragona;* Dg - *Dillwynia glaberrima;* Dp - *Drosera pygmaea;* Ea - *Eucalyptus amygdalina;* Ei - *Epacris impressa;* Gh - *Gompholobium heugelii;* Hg - *Hypericum gramineum;* Hr - *Hypochaeris radicata;* Hri - *Hibbertia riparia;* Ht - *Hakea teretifolia;* Lc - *Leucopogon collinus;* Lf - *Lepidosperma filiforme;* Lg - *Leptospermum glaucescens;* Ll - *Lepidosperma lineare* var. *inops;* Lp - *Lepidosperma concavum;* Ls = *Leptospermum scoparium;* Lst - *Lagenophora stipitata;* Lt = *Leptocarpus tenax;* Oc - *Oxalis corniculata;* Po - *Pseudanthus ovalifolius;* Sa - *Schoenus apogon;* Sg - *Stylidium graminifolium;* Si - *Sprengelia incarnata;* Sv - *Spyridium vexilliferum;* Tp - *Tetratheca pilosa;* Vs - *Viola sieberana;* W - *Wahlenbergia* spp.; Xp - *Xanthosia pilosa;* Xt - *Xanthosia tridentata.*

TABLE 3

PERCENTAGE FREQUENCY OF THE DIVINF COMMUNITIES
by geology and position related to coast

Community	SUBSTRATE			LOCATION	
	Sandstone and sand	Dolerite	Granite	Coastal	Non-coastal
4	0	0	100	0	100
24	0	0	100	0	100
25	0	0	100	10	90
17	0	6	94	0	100
16	20	40	40	20	80
22	0	86	14	0	100
23	33	50	17	33	67
10	14	86	0	14	86
8	28	55	17	89	11
18	15	8	77	100	0
19	22	33	45	78	22
20	17	83	-	83	17
21	11	22	66	72	28

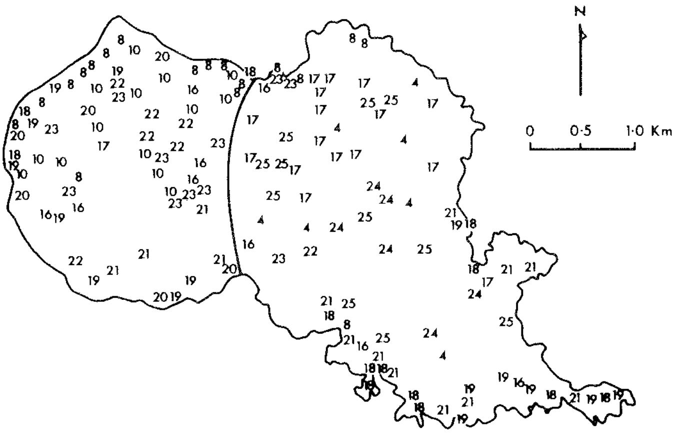

FIG. 7 - The distributions of the communities defined by the DIVINF analysis. See table 2 for the percentage frequency of species within the groups.

Plant-Environmental Relationships

A marked dichotomy exists on Schouten Island between coastal vegetation and inland vegetation. The coastal influence is independent of all other variables, the salt spray communities often transgressing lithological boundaries (table 3). Typical patterns of zonation of the coastal vegetation are shown in figure 4. Zonation is telescoped as exposure to salt-laden winds decreases (plates 1 and 10).

A second dichotomy in the overall vegetation pattern is geological (table 3). The nature of the substrate determines the type and distribution of soil, and nutrient availability and moisture relations differ between soil types.

The major rock types differ markedly. Granite, composed largely of silica and feldspar with a small amount of mica, weathers to form sandy soils which contain fewer of the trace elements, and are therefore, generally less productive than the clayey soils formed from dolerite. Dolerite contains pyroxene and calcic feldspar which, in weathering, release Fe, Mg and Ca ions into the soil (Corbett 1969). Compared with the spatial extent of the two major rock types, sandstone and cover sands are limited in extent and are largely excluded from this discussion.

The constancy of depth of soil on the two major lithologies differs a great deal. The dolerite produces a soil of fairly constant depth and profile, thus giving rise to the fairly uniform covering of vegetation on this substrate. The variation of structural and floristic composition is then accomplished by the influence of other factors, such as firing patterns and variations in moisture availability related to topography. The soil cover on the granite is highly variable in depth from no soil to soils several metres in depth in the poorly-drained colluvium-filled hollows.

Drainage and moisture relations are partly determined by soil type. The dolerite soil has a solid impervious clay base hence runoff on these soils may be fairly rapid. This is borne out by the lack of flowing streams in summer in the west. On the granite, in constrast, moisture is retained in the colluvium-filled hollows and gradual release produces perennial streams. However, moisture availability varies markedly on the granite. On bare rock the runoff is instant. No vascular plants can survive in these situations. At the other extreme the peats formed on the gravels and sands are often water-logged (fig. 4).

Variations in the frequency and intensity of fire may have some considerable effect on the structural variation in the vegetation of the island, and a lesser effect on floristic variation.

The floristic groups on the two main substrata produce distinctive communities which differ in susceptibility to fire intensity and frequency. The heathy nature of much of the vegetation on granite encourages a moderate frequency, moderate intensity fire regime. This is illustrated by the mallee-form of *Eucalyptus amygdalina* growing on the tall open-shrubland complex. Fires are sufficiently frequent to prevent the eucalypt from developing thick enough bark at flame height to avoid crown and stem death. So after each fire the eucalypts are set back to regeneration from buds in lignotubers protected under the ground. Multiple fire boundaries were observed in part of the granite vegetation with as many as four age-height classes in one small area.

The vegetation on the less-insolated slopes on dolerite produces more litter than that on the granite and north-facing slopes on dolerite; and possesses a dense shrub understorey. If fire frequency is low the intensity will be high, resulting in crown death. Such crown fires have occurred immediately east of Crocketts Bay and behind Sarah Ann Bay. In these cases dense shrub regeneration has occurred. These sites are affected by salt spray which might partially explain the death of mature eucalypts. The lack of regeneration may have resulted from a second fire in close succession, followed by grazing and sodium chloride necrosis. On north and northeast facing slopes on dolerite there is a sparse ground cover dominated by graminoids. The relative lack of shrubs may be explained partially by the relative dryness of the insolated slopes combined with the high clay content of the soils, but may also reflect a feedback from dryness to fire frequency and intensity.

Not all Tasmanian vegetation is adapted to fire (Jackson 1968) and even elements in the dry sclerophyll vegetation are susceptible to fire. *Callitris rhomboidea* is one fire susceptible species occurring widely on Schouten Island. *C. rhomboidea* is usually killed by fire, but releases seed that has been held in serotinous cones as a consequence of fire. The species can be thus eliminated by two fires separated by less than the period between seed germination and new seed production, unlike most dry sclerophyll species which recover vegetatively from fire. Some plants that occur with *Callitris* in refuge sites are typical of wet forest areas. The main species in this group are *Pittosporum bicolor*, *Drimys lanceolata* and *Billardiera longiflora*.

Callitris rhomboidea everywhere occupies niches which are obviously protected from fire. A common locality is in gullies both on the granite and to a lesser degree, on the dolerite. One south-facing slope in a steep gully in the west of the island has a pure grove of *Callitris* trees which have a foothold on a nearly vertical cliff. The clear understorey of this stand presents insufficient fuel for fires severe enough to cause the death of mature *Callitris*. On the granite *Callitris* also occurs among massive boulders which have tumbled into gullies. In a particularly steep gully leading down to Trumpeter Bay there are *Callitris* and *Drimys* trees in profusion. These specimens of *Callitris* are the tallest on the island (approx. 20 m).

Not only inherently fire susceptible species occupy these refugia. On the southwestern slopes of Mt Storey, *Eucalyptus tenuiramis* trees fill the gaps between boulders. These boulders are up to 7 m high and would effectively impede the progress of any fire. The ground cover is sparse, the surface being mainly siliceous gravels, and the tree crowns are more or less even in height with the tops of the boulders.

The ubiquitous fire factor has a modifying influence on the other factors. It has forced certain species into topographically protected sites and has determined the structure of many communities. Floristically the different lithologies produce their own communities but it is fire which moulds their structural expression.

REFERENCES

Ashton, D.H., Bond, H. and Morris, G.C., 1975: Drought damage on Mount Towrong, Victoria. *Proc. Linn. Soc. N.S.W.,* 100: 44-69.

Bowden, A.R. and Kirkpatrick, J.B., 1974: The vegetation of Rheban Spit, Tasmania. *Pap. Proc. R. Soc. Tasm.,* 108: 119-210.

Brown, M.J. and Bayly-Stark, J.H., 1979: Vegetation of Maria Island. *Tasmanian National Parks & Wildlife Service, Wildlife Division, Tech. Rept* 79/1: 99 pp.

Corbett, J.R., 1969: THE LIVING SOIL. Martindale, West Como.

Curtis, W.M., 1963: THE STUDENT'S FLORA OF TASMANIA, PART II. Government Printer, Tasmania.

__________, 1967: THE STUDENT'S FLORA OF TASMANIA, PART III. Government Printer, Tasmania.

__________ and Morris, D.I., 1975: THE STUDENT'S FLORA OF TASMANIA, PART I. (2nd Ed.), Government Printer, Tasmania.

Harris, S. and Brown, M.J., 1980: The vegetation of Hellfire Bluff-Cape Bernier, Tasmania. *Tasm. Nat.*, August 1980: 1-16.

Hogg, A. and Kirkpatrick, J.B., 1974: The phytosociology and synecology of some southern Tasmanian eucalypt forests and woodlands. *J. Biogeog.,* 1: 227-245.

Hyde-Wyatt, B.H. and Morris, D., 1975: TASMANIAN WEED HANDBOOK. Government Printer, Tasmania.

Jackson, W.D., 1968: Fire, air, water and earth - an elemental ecology of Tasmania. *Proc. ecol. Soc. Aust.,* 3: 9-16.

Kirkpatrick, J.B., 1973: The vegetation of Sloping Island, Tasmania. *Vict. Nat.,* 90: 313-321.

__________, 1975: Phytosociological analysis of the vegetation at Lagoon Beach, Tasmania. *Pap. Proc. R. Soc. Tasm.,* 109: 53-63.

__________, 1977: THE DISAPPEARING HEATH. Tasmanian Conservation Trust, Hobart.

__________, 1981: A transect study of forests and woodlands on dolerite in the eastern Tiers, Tasmania. *Vegetatio,* 44: 155-163.

__________, Brown, M.J. and Moscal, A., 1980: THREATENED PLANTS OF THE TASMANIAN CENTRAL EAST COAST. Tasmanian Conservation Trust, Hobart.

__________, Massey, J.S. and Parsons, R.F., 1974: Natural history of Curtis Island, Bass Strait. 3 - soils and vegetation with notes on Rodondo Island. *Pap. Proc. R. Soc. Tasm.,* 107: 129-144.

Milligan, J., 1848: Schouten Island. *Pap. Proc. R. Soc. Tasm.,* 1848.

Mueller-Dombois, D. and Ellenberg, H., 1974: AIMS AND METHODS OF VEGETATION ECOLOGY. Wiley, New York.

Specht, R.L., 1970: Vegetation. In Leeper, G.W. (Ed.): THE AUSTRALIAN ENVIRONMENT. 4th Ed., CSIRO and MUP, Melbourne: 44-67.

__________, Roe, E.M. and Boughton, V.H., 1974: Conservation of major plant communities in Australia and Papua-New Guinea. *Aust. J. Bot. Suppl. Ser.,* 7: 1-667.

Stephens, C.G. and Cane, R.F., 1939: The soils and general ecology of the north-east coastal region of Tasmania. *Pap Proc. R. Soc. Tasm.* (1938): 201-208.

Wells, K.F., Gowland, P.N. and Spate, A.P., 1977: Natural resources of the Buckland Training Area, Tasmania. CSIRO Division of Land Use Research Technical Mem. 77/4.

Willis, J.H., 1970: A HANDBOOK TO PLANTS IN VICTORIA, VOLUME I. 2nd Ed., MUP, Melbourne.

Vegetation of Schouten Island, Tasmania

APPENDIX

HIGHER PLANTS OBSERVED IN THE FREYCINET NATIONAL PARK 1975-1982

Nomenclature follows Curtis (1963, 1967), Curtis and Morris (1975) and Willis (1970) except where authorities are given. + = introduced species.

Abbreviations used: Frey = Freycinet Peninsula; Sch = Schouten Island
csl = coastal; for = forest; hth = heath; rk cr = rock crevices; wtld = wetlands

PTERIDOPHYTA

Adiantaceae
Cheilanthes tenuifolia Frey, Sch; for
Pteris tremula Frey; for

Aspidiaceae
Polystichum proliferum Sch; for

Aspleniaceae
Asplenium flabellifolium Frey, Sch; for, hth
A. obtusatum Frey, Sch; csl

Blechnaceae
Blechnum nudum Frey, Sch; for
B. wattsii Tindale Frey, Sch; for
Lastreopsis shepherdii Frey; for

Cyatheaceae
Cyathea australis Frey, Sch; for

Dennstaedtiaceae
Histiopteris incisa Frey, Sch; for, csl
Pteridium esculentum Frey, Sch; hth, for

Dicksoniaceae
Dicksonia antarctica Frey, Sch; for

Gleicheniaceae
Gleichenia dicarpa R.Br. Frey, Sch; hth, for
G. microphylla Frey, Sch; for

Hymenophyllaceae
Hymenophyllum australe Frey; for

Lindsayaceae
Lindsaya linearis Frey; hth, for

Lycopodiaceae
Lycopodium deuterodensum Frey, Sch; hth, for
L. laterale Frey, Sch; hth
L. myrtifolium Forst.f. Frey; rk cr
L. serpentinum Frey; hth

Osmundaceae
Todea barbara Frey; for

Polypodiaceae
Microsorium diversifolium Frey, Sch; for

Schizaeaceae
Schizaea bifida Frey; hth, for
S. fistulosa Frey; hth, for

Selaginellaceae
Selaginella uliginosa Frey, Sch; hth, wtld

SPERMATOPHYTA

GYMNOSPERMAE

Cupressaceae
Callitris rhomboidea Frey, Sch; for

ANGIOSPERMAE

Monocotyledones

Centrolepidaceae
Centrolepis strigosa Frey, Sch; hth, wtld, csl

Cyperaceae
Baumea acuta Frey, Sch; hth, for, wtld
B. arthrophylla (Nees) Boeck. Frey; wtld
B. juncea Frey, Sch; hth, for, wtld
B. tetragona Frey, Sch; wtld
Carex appressa Frey; csl, wtld
C. breviculmis Sch; for
C. iynx Sch; wtld
Caustis pentandra Frey, Sch; hth
Chorizandra cymbarica Frey; wtld
Eleocharis acuta Frey, Sch; wtld
E. sphacelata Frey, Sch; wtld
Gahnia filum Frey; wtld
G. grandis Frey, Sch; for
G. microstachya Frey, Sch; for
G. radula Sch; for, hth
G. trifida Sch; wtld
Gymnoschoenus sphaerocephalus Frey, Sch; hth
Lepidosperma concavum Frey, Sch; hth, for
L. elatius Frey; for
L. filiforme Frey, Sch; hth, for
L. gladiatum Frey, Sch; csl
L. laterale Frey, Sch; for

L. lineare R.Br. var. *inops* (F. Muell. ex Rodw.) Frey, Sch; hth, for
L. longitudinale Frey, Sch; hth, wtld
Schoenus apogon Frey, Sch; hth, for
S. maschalinus Frey; hth
S. nitens Frey, Sch; csl, wtld
S. tenuissimus Frey, Sch; hth
S. tesquorum Frey; wtld
S. turbinatus Frey, Sch; hth
Scirpus cernuus Frey; wtld
S. fluitans Frey; wtld
S. inundatus Frey; wtld
S. nodosus Frey, Sch; csl
Tetraria capillaris Frey, Sch; hth, for

Iridaceae
Diplarrena moraea Frey, Sch; for
Patersonia fragilis Frey, Sch; hth

Juncaceae
Juncus gregiflorus Sch; wtld
J. kraussii Frey, Sch; wtld
J. pallidus Sch; wtld
J. planifolius Sch; wtld
J. procerus Sch; wtld

Juncaginaceae
Triglochin procera Frey, Sch; wtld
T. striata Frey; wtld

Liliaceae
Arthropodium milleflorum Sch; for
Dianella revoluta Frey, Sch; hth, for, csl
D. tasmanica Frey, Sch; for
Drymophila cyanocarpa Frey, Sch; for
Laxmannia sessiliflora Frey; hth
Lomandra longifolia Frey, Sch; hth, for, csl
Stypandra caespitosa Sch; hth
Xanthorrhoea australis Frey; hth,for

Orchidaceae
Acianthus caudatus Frey; hth
A. exsertus Frey; hth, for
A. reniformis Frey; hth
Caladenia angustata Sch; for
C. catenata Frey; hth, for
C. caudata Sch; for
C. deformis Sch; for
C. filamentosa Frey, Sch; for
C. latifolia Sch; csl
C. patersonii Sch; for
C. praecox Sch; for
Chiloglottis reflexa Frey; for
Corybas aconiiflorus Frey; for
C. unguiculatus Frey; hth, for
Cryptostylis subulata Frey; hth
Dendrobium striolatum Frey; for
Dipodium punctatum Frey, Sch; hth, for
Diuris maculata Frey, Sch; hth, for
Eriochilus cucullatus Frey, Sch; hth, for
Gastrodia sesamoides Frey, Sch; for
Glossodia major Frey; for
Lyperanthus suaveolens Frey; for
Microtis sp. Sch; for
Orthoceras strictum Frey; hth, for
Prasophyllum archeri Frey; hth, for
P. australe Frey; hth, for
P. buftonianum Frey; hth
P. elatum Frey, Sch; hth, for
P. nigricans Frey; for
Pterostylis concinna Frey; for
P. curta Sch; for
P. grandiflora Frey; for
P. longifolia Frey; for
P. nana Frey, Sch; hth, for
P. nutans Frey; hth, for
P. parviflora Frey; hth, for
P. pedoglossa Frey; for
P. pedunculata Frey; hth, for
P. plumosa Frey; hth, for
Thelymitra flexuosa Frey; for
T. ixioides Frey; hth, for
T. pauciflora Frey; hth, for

Poaceae
+ *Agropyron repens*
A. scabrum Sch; for
Agrostis aemula Frey, Sch; for
A. avenacea Frey, Sch; for, csl
+ *A. tenuis*
A. venusta Sch; for
+ *Aira caryophyllea*
+ *Ammophila arenaria*
Amphibromus recurvatus Frey; wtld
+ *Arrhenatherum elatius*
+ *Briza minor*
+ *Bromus mollis*
+ *B. sterilis*
+ *B. unioloides*
Danthonia caespitosa Frey, Sch; for, hth
D. geniculata Sch; for
D. purpurascens Sch; for
Deyeuxia monticola Sch; hth
D. parviseta Sch; for
D. quadriseta Sch; hth, for
Dichelachne crinita Frey, Sch; csl
D. sciurea Frey, Sch; hth, for
Distichlis distichophylla Frey, Sch; csl, wtld
Festuca littoralis Frey, Sch; csl
F. plebeia R.Br. Sch; for
+ *Holcus lanatus*
+ *Hordeum leporinum*
Imperata cylindrica Sch; csl
+ *Lolium perenne*
Microlaena stipoides Frey, Sch; for
+ *Monerma cylindrica*
+ *Nardus stricta* L.
Phragmites australis (Cav.) Trin. ex Steud. Frey, Sch; wtld
Poa labillardieri Frey, Sch; for, csl, wtld

P. poiformis Frey, Sch; csl
P. rodwayi Vickery Sch; for
P. sieberana Frey; for
P. tenera Sch; for
+ *Setaria viridis*
Spinifex hirsutus Frey, Sch; csl
Stipa aphylla (Rodway) Townrow Sch; for
S. flavescens Labill. Frey, Sch; csl, for
S. mollis Sch; for
S. nervosa Sch; for
S. pubinodis Trin. and Rupr. Sch; for
S. semibarbata Frey, Sch; hth, for
S. stipoides (Hook) Veldkamp Frey, Sch; csl
S. stuposa Hughes Sch; for
Tetrarrhena acuminata Frey, Sch; for
T. distichophylla Frey, Sch; hth
T. juncea Sch; for
Themeda australis Frey, Sch; hth, for
+ *Vulpia bromoides*
+ *V. myuros*

Potamogetonaceae
Potamogeton tricarinatus Sch; wtld

Restionaceae
*Calorophus elongatus** Frey, Sch; for, hth
Empodisma minus (Hook. f.) Johnson & Cutler Frey, Sch; hth
Hypolaena fastigiata Frey, Sch; hth, for
Leptocarpus brownii Frey, Sch; wtld
L. tenax Frey, Sch; hth
Restio complanatus Frey, Sch; hth
R. monocephalus Labill. Frey; hth

Ruppiaceae
Ruppia maritima Frey; wtld

Xyridaceae

Xyris gracilis R.Br. ssp. *tasmanica* D.I. Morris Frey; hth
X. marginata Rendle Frey, Sch; hth
X. operculata Frey, Sch; hth
X. muelleri Malme Frey; hth

Zanichelliaceae
Lepilaena cylindrocarpa Frey; wtld

Dicotyledones

Apiaceae
Apium prostratum Frey, Sch; csl, wtld
Centella cordifolia Frey; hth, wtld
Daucus glochidiatus Sch; for
Eryngium vesiculosum Frey, Sch; wtld
Hydrocotyle javanica Frey, Sch; for
H. muscosa Frey; wtld
H. pterocarpa Sch; wtld
H. sibthorpioides Frey; csl
Lilaeopsis brownii Frey; wtld
Trachymene anisocarpa Frey; hth
Xanthosia dissecta Frey; hth
X. pilosa Frey, Sch; hth, for
X. pusilla Frey, Sch; hth, for
X. tridentata Frey, Sch; hth, for

Apocynaceae
Alyxia buxifolia Sch; csl
+ *Vinca major*

Asteraceae
Bedfordia linearis Frey; for
B. salicina Sch; for
Brachycome stricta Frey, Sch; for
+ *Carduus tenuiflorus*
Cassinia aculeata Frey, Sch; for
+ *Cirsium vulgare*
Cotula coronopifolia Frey; wtld
C. longipes Frey, Sch; csl, wtld
Craspedia glauca Frey; hth
+ *Gnaphalium candidissimum*
G. involucratum Sch; csl
G. japonicum Thunb. Frey; hth
G. purpureum Sch; csl
Helichrysum apiculatum Frey, Sch; hth, for
H. costatifructum Sch; csl
H. dealbatum Sch; for
H. dendroideum Sch; for
H. obcordatum Frey, Sch; for
H. reticulatum Frey, Sch; csl
H. scorpioides Frey, Sch; hth, for
H. scutellifolium Sch; for
H. semipapposum Sch; for
+ *Hypochaeris radicata*
Ixodia angusta Frey; hth
Lagenophora stipitata Sch; for
+ *Leontodon leysseri*
Leptorhynchos linearis Sch; for
L. squamatus Frey, Sch; hth, for
Microseris scapigera Frey, Sch; for
Olearia argophylla Sch; for
O. ciliata Frey, Sch; hth
O. ericoides Sch; for
O. erubescens Sch; for
O. lirata Sch; for
O. phlogopappa Sch; csl, for
O. ramulosa Frey, Sch; csl
O. viscosa Sch; for
Senecio biserratus Sch; csl
S. hispidulus Frey, Sch; csl, for
S. lautus Sch; csl
S. linearifolius Frey; for
S. quadridentatus Sch; for
+ *Sonchus asper*
+ *Sonchus oleraceus*

Baueraceae
Bauera rubioides Frey, Sch; hth, for

Boraginaceae
Cynoglossum australe Sch; for

C. latifolium Sch; for
Mysotis australis Sch; csl, for

Brassicaceae
Lepidium sp. Sch; csl

Campanulaceae
Wahlenbergia gracilenta Frey, Sch; hth, for
W. quadrifida Sch; for
W. tadgellii Sch; for

Caryophyllaceae
Gypsophila australis Sch; csl
+ *Polycarpon tetraphyllum*
+ *Sagina apetala*
Scleranthus biflorus Frey, Sch; csl
+ *Silene gallica*
Spergularia media Sch; csl
Stellaria flaccida Sch; for
+ *S. media*
S. pungens Sch; for

Casuarinaceae
Casuarina littoralis Frey, Sch; for
C. monilifera Frey, Sch; hth, for
C. stricta Frey, Sch; csl, for

Chenopodiaceae
Atriplex billardieri Frey; csl
A. paludosa Frey; csl
Chenopodium glaucum spp. *ambiguum* Frey; wtld
Hemichroa pentandra Frey; wtld
Rhagodia baccata Frey, Sch; csl
Salicornia blackiana Frey; wtld
S. quinqueflora Frey; wtld, csl

Convolvulaceae
Convolvulus erubescens Sch; for
Dichondra repens Frey, Sch; hth, for, csl
Wilsonia backhousei Frey; wtld

Crassulaceae
Crassula sieberana Frey, Sch; for, hth, csl

Dilleniaceae
Hibbertia acicularis Frey; hth
H. empetrifolia Frey; for
H. fasciculata Frey; hth, for
H. hirsuta Frey; for
H. procumbens Frey; hth, for
H. riparia Frey, Sch; hth, for
H. sericea Frey; hth, csl

Droseraceae
Drosera auriculata Sch; for
D. binata Frey, Sch; hth, wtld
D. gracilis Frey; hth
D. peltata Frey; for
D. pygmaea Frey, Sch; hth, for, wtld
D. planchonii Frey; for
D. spathulata Frey, Sch; hth

Epacridaceae
Acrotriche serrulata Frey, Sch; hth, for
Astroloma humifusum Frey, Sch; hth, for
A. pinifolium Frey; hth, for
Brachyloma ciliatum Frey; hth
B. depressum Frey, Sch; hth, for
Cyathodes divaricata Sch; for
Epacris barbata Frey, Sch; hth
E. impressa Frey, Sch; hth, for
E. lanuginosa Frey, Sch; hth
E. obtusifolia Frey, Sch; hth
E. tasmanica W.M. Curtis Sch; for
Leucopogon australis Sch; hth
L. collinus Frey, Sch; hth, for
L. ericoides Frey, Sch; hth, for
L. parviflorus Frey, Sch; hth, for, csl
L. virgatus Frey; hth
Lissanthe strigosa Sch; for
Monotoca elliptica Frey, Sch; hth, for
M. glauca Frey; for
M. scoparia Frey, Sch; hth, for, csl
M. submutica S.J. Jarman Frey; hth
Pentachondra involucrata Frey, Sch; hth, for
Sprengelia incarnata Frey, Sch; hth, for
Styphelia adscendens Frey, Sch; hth, for

Euphorbiaceae
Amperea xiphoclada Frey, Sch; for, hth
Beyeria viscosa Frey, Sch; for
Phyllanthus australis Sch; hth
Poranthera microphylla Frey, Sch; hth, for
Pseudanthus ovalifolius Frey, Sch; hth

Fabaceae
Aotus ericoides Frey, Sch; hth, for
Bossiaea cinerea Frey, Sch; hth, for
B. prostrata Frey, Sch; hth, for
Daviesia ulicifolia Frey, Sch; for
Dillwynia glaberrima Frey, Sch; hth, for
D. sericea Frey, Sch; hth, for
Glycine clandestina Sch; for
Gompholobium huegelii Frey, Sch; hth, for
Goodia lotifolia Sch; for
Indigofera australis Frey, Sch; for
Kennedia prostrata Frey, Sch; hth, for, csl
+ *Melitotus indica*
Phyllota diffusa Frey; hth, for
Platylobium obtusangulum Sch; for
P. triangulare Frey, Sch; hth, for
Pultenaea daphnoides Frey, Sch; for
P. gunnii Frey, Sch; hth, for
P. juniperina Frey; for
P. pedunculata Sch; for
P. subumbellata Frey, Sch; hth
P. stricta Frey; hth
Sphaerolobium vimineum Frey, Sch; for, hth
+ *Trifolium glomeratum*

+ *Ulex europaeus*
+ *Vicia angustifolia*
+ *V. tetrasperma*

Ficoideae
Carpobrotus rossii Frey, Sch; csl
Disphyma australe Sch; csl
Tetragonia implexicoma Sch; csl

Gentianaceae
Centaurium australe Frey; for
+ *C. pulchellum*
Villarsia reniformis Frey, Sch; wtld

Geraniaceae
Geranium solanderi Sch; for
Pelargonium australe Frey, Sch; csl
P. inodorum Frey, Sch; for, csl

Goodeniaceae
Dampiera stricta Frey, Sch; hth, for
Goodenia humilis Sch; hth
G. lanata Frey, Sch; hth, for
G. ovata Frey, Sch; for, csl
Scaevola hookeri Frey; hth
Selliera radicans Frey, Sch; wtld

Haloragaceae
Gonocarpus humilis Orchard Frey, Sch; hth, for
G. micranthus Thunb. Frey, Sch; hth, wtld
G. tetragynus Labill. Frey, Sch; hth, for
Myriophyllum pedunculatum Frey; wtld

Hypericaceae
Hypericum gramineum Frey, Sch; for

Lamiaceae
+ *Marrubium vulgare*
Prostanthera lasianthos Frey, Sch; for
Westringia angustifolia Frey, Sch; csl

Lauraceae
Cassytha glabella Frey, Sch; hth, for
C. melantha Frey, Sch; for
C. pubescens Frey, Sch; hth, for

Lentibulariaceae
Utricularia dichotoma Frey, Sch; hth, wtld
U. lateriflora Frey, Sch; hth, wtld

Lobeliaceae
Lobelia alata Frey, Sch; csl, wtld
Pratia platycalyx Frey; csl, wtld

Loganiaceae
Mitrasacme pilosa Frey, Sch; hth

Malvaceae
Lawrencia spicata Frey; wtld

Mimosaceae
Acacia botrycephala Frey, Sch; for
A. dealbata Frey, Sch; for
A. genistifolia Frey, Sch; hth, for
A. mearnsii Frey; for
A. melanoxylon Frey, Sch; for
A. mucronata Frey, Sch; for, csl
A. myrtifolia Frey, Sch; hth, for
A. sophorae Frey, Sch; csl
A. suaveolens Frey, Sch; hth, for
A. ulicifolia Frey; for
A. verticillata Frey, Sch; for, csl

Myoporaceae
Myoporum insulare Frey, Sch; csl

Myrtaceae
Baeckea ramosissima Frey, Sch; hth, for
Callistemon pallidus Sch; for
Calytrix tetragona Frey, Sch; hth, for, csl
Eucalyptus amygdalina Frey, Sch; for, hth
E. globulus Frey, Sch; for
E. obliqua Frey, Sch; for
E. ovata Frey, Sch; for
E. pulchella Sch; for
E. tenuiramis Frey, Sch; for
E. viminalis Frey, Sch; for
Kunzea ambigua Frey, Sch; hth, for
Leptospermum glaucescens Frey, Sch; hth, for
L. grandiflorum Frey, Sch; hth, for
L. lanigerum Frey, Sch; hth, for
L. scoparium Frey, Sch; hth, for
Melaleuca gibbosa Frey; hth
M. pustulata Frey; for
M. squamea Frey, Sch; hth
M. squarrosa Sch; hth, for
Thryptomene micrantha Frey; hth, for

Oleaceae
Notelaea ligustrina Sch; for

Onagraceae
Epilobium sp. Frey, Sch; for, wtld

Oxalidaceae
Oxalis corniculata Frey, Sch; for

Pittosporaceae
Billardiera longiflora Frey, Sch; for
B. scandens Sch; for
Bursaria spinosa Frey, Sch; for
Marianthus procumbens Frey, Sch; hth
Pittosporum bicolor Sch; for

Plantaginaceae
+ *Plantago coronopus*
+ *P. lanceolata*

P. varia sensu lato Frey, Sch; for, csl

Polygalaceae

Comesperma calymega Frey, Sch; hth
C. ericinum Frey, Sch; hth
C. retusum Frey; hth
C. volubile Frey, Sch; for

Polygonaceae

Muehlenbeckia adpressa Frey, Sch; csl
\+ *Rumex acetosella*
R. brownii Sch; for
\+ *Polygonum aviculare*

Primulaceae

\+ *Anagallis arvensis*
Samolus repens Frey, Sch; csl, wtld

Proteaceae

Banksia marginata Frey, Sch, hth, for, csl
Conospermum taxifolium Frey, Sch; hth, for
Hakea epiglottis Frey, Sch; hth
H. lissosperma Sch; for
H. nodosa Frey; for
H. rugosa Sch; hth
H. teretifolia Frey, Sch; hth, for
Lomatia tinctoria Frey, Sch; for
Persoonia juniperina Frey, Sch; hth, for

Ranunculaceae

Clematis aristata Sch; for
C. gentianoides Sch; for

Rhamnaceae

Cryptandra amara Frey, Sch; hth
Pomaderris apetala Frey, Sch; for
P. elliptica Frey, Sch; for
P. pilifera Frey, Sch; for
Spyridium eriocephalum Frey; for
S. obovatum Sch; for
S. vexilliferum Frey, Sch; hth, for
Stenanthemum pimeleoides Frey; for

Rosaceae

Acaena echinata Frey, Sch; for
A. novae-zelandiae Frey, Sch; for, csl
\+ *Rubus fruticosus* sp. agg.
R. parvifolius Sch; csl

Rubiaceae

Coprosma quadrifida Sch; for
Galium albescens Frey; for
G. sp. Frey, Sch; for
Opercularia varia Frey, Sch; hth, for

Rutaceae

Boronia anemonifolia Frey, Sch; for, csl
B. nana Frey; hth
B. parviflora Frey, Sch; hth
B. pilosa Frey, Sch; hth, for
Correa alba Frey, Sch; csl
C. reflexa Frey, Sch; for
Eriostemon virgatus Frey; hth, for
Phebalium bilobum Frey, Sch; for, hth
Zieria arborescens Frey; for
Z. cytisoides Frey; csl

Santalaceae

Exocarpos cupressiformis Frey, Sch; for
E. strictus Sch; for
Leptomeria drupacea Frey; for

Sapindaceae

Dodonaea viscosa Frey, Sch; for

Scrophulariaceae

Euphrasia collina Frey, Sch; hth
Veronica gracilis Sch; for

Solanaceae

Anthocercis tasmanica Frey, Sch; for
\+ *Physalis peruviana*
Solanum laciniatum Sch; for
\+ *S. marginatum*
\+ *S. nigrum*

Stackhousiaceae

Stackhousia monogyna Frey, Sch; for

Sterculiaceae

Lasiopetalum dasyphyllum Frey, Sch; for

Stylidiaceae

Stylidium graminifolium Frey, Sch; hth, for, csl

Thymeleaceae

Pimelea curviflora Sch; for
P. drupacea Sch; for
P. humilis Frey, Sch; for
P. lindleyana Sch; hth
P. linifolia Frey, Sch; hth, for

Tremandraceae

Tetratheca glandulosa Sch; for
T. pilosa Frey, Sch; hth, for
T. procumbens Frey; hth

Urticaceae

Urtica incisa Sch; for

Violaceae

Viola hederacea Frey, Sch; hth, for, csl
V. sieberana Sch; hth

Winteraceae

Drimys lanceolata Frey, Sch; for

* Author of name - Labillardière