

The flora and fauna of Dirk Hartog Island, Western Australia

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Abstract

Dirk Hartog Island (62 000 ha), which lies off Shark Bay, Western Australia, between 25°30'S and 26°15'S, has been visited and studied by a succession of visitors since 1616. It consists of Quaternary Tamala Eolianite which forms rugged cliffs along much of the coast. The rainfall averages 313 mm, falling mostly in winter, while average temperatures range from 11-21°C (winter) to 22-32°C (summer).

There are five vegetation types: tall open-heath; low closed/open-heath with hummock grasses; low very open-heath; hummock grassland; and low open-shrubland. The known indigenous flora totals 258 species in 167 genera of 67 families. Of the named species, 77 are South Western, 61 Eremean and 102 common to both. The island is floristically transitional between the South West and Eremean Botanical Provinces but with a leaning to the South West. Thirty six species, mostly of European origin, have become naturalised.

Two species of macropod marsupials, *Lagostrophus fasciatus* and *Bettongia lesueur*, once occurred on Dirk Hartog but are now extinct. Two species of rodents, *Pseudomys albocinereus* and *P. hermannsburgensis* are present although not previously reported. Cats, goats and the House Mouse have become feral. Some 84 species of birds have been recorded by a number of visitors over the years. Most have wide-ranging distributions but a few southern species occur here at or near the northern limit of their range. Of especial interest is the Black-and-white Wren (*Malurus leucopterus*) which is restricted to Dirk Hartog and Barrow Islands. Twenty-seven species of terrestrial reptiles have been collected. Most are typical of the warmer and drier parts of southern-Western Australia.

Introduction

Dirk Hartog Island, the westernmost part of Australia, is a large island of about 62 000 ha which encloses the western side of Shark Bay, Western Australia (Fig. 1).

The first recorded landing by a European in Australia is that of the Dutchman Dirk Hartog at Cape Inscription, the northern tip of the island, in 1616 (Flinders 1814). Other early visitors were Vlaming in 1697 (Flinders 1814), William Dampier in 1699 (Dampier 1729), the Baudin expedition in 1801 (Péron 1807, Baudin 1974), Freycinet in 1818 (Quoy and Gaimard 1824), King and Cunningham in 1821 (King 1827) and Grey in 1839 (Grey 1841).

More recent visitors who have reported on aspects of the biology of the island include T. Carter in 1916 (Carter 1917) and 1922 (Carter 1923), F. Lawson Whitlock in 1918 and 1920 (Whitlock 1921), E. Ashby in 1927 (Ashby 1929), a group of students from Wesley College in 1967

(Sedgwick 1967, 1968), B. A. and A. G. Wells in 1973 (Wells and Wells 1974) and J. S. Beard in 1974 (Beard 1976). Most of the recent reports concentrate on birds and give only brief reference to other animals or plants. An exception is the description and map of the vegetation by Beard (Beard 1976).

Since 1899 Dirk Hartog Island has been held under pastoral lease as a sheep station. The whole island is leased except for 81 ha of freehold land and three small reserves at the northern tip containing the lighthouse and inscription posts (Reserve Nos. A12715, 14918 and 11634).

In 1972, the present lessee, Sir Thomas Wardle, invited the authors to visit the island and make an inspection.

The first visit took place from 2 to 8 September 1972. Personnel were A. S. George (Western Australian Herbarium) T. Evans and A. A. Burbidge (Western Australian Wildlife Research

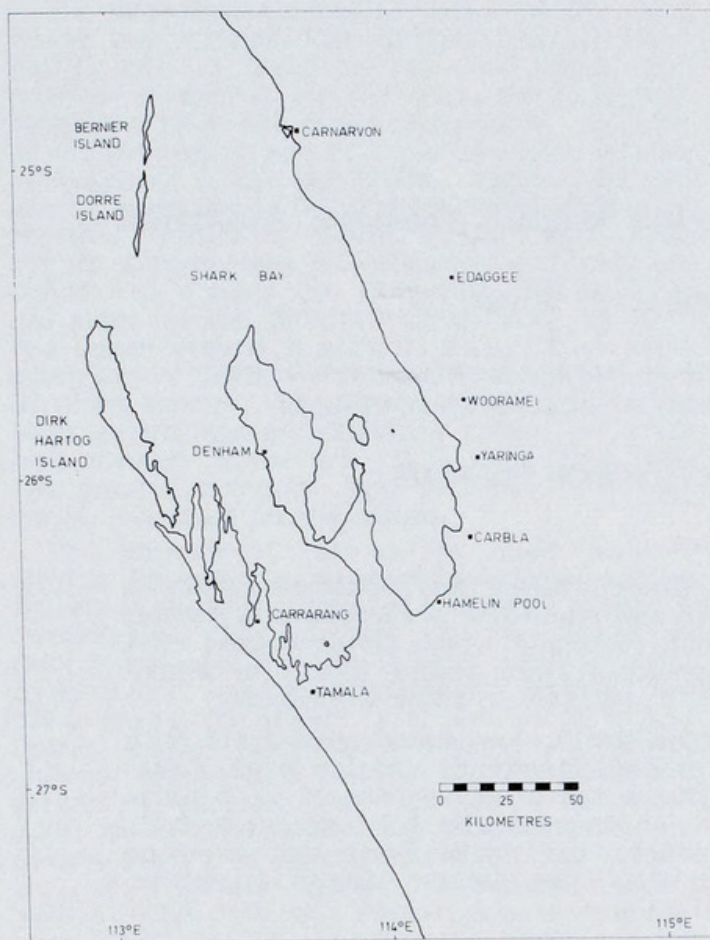


Figure 1.—Map of the Shark Bay area.

Centre). During this visit as much of the island as possible was traversed, using station tracks. In the daytime plants and animals were collected and observations were made on birds. Much time was spent searching for evidence of native mammals, such as tracks, droppings and skeletal remains. At dusk and after dark, spotlight traverses were carried out by vehicle and on foot. Traps were set for small mammals at various localities. The traps used were Elliott live traps (32 cm x 10 cm x 8 cm) and metal break-back traps.

Further visits which have been made to the island by staff of the Wildlife Research Centre have resulted in additional information. In April 1974 further small-mammal trapping and general collecting was carried out by W. K. Youngson.

Physical description

Dirk Hartog Island is about 79 km long and a maximum of 11 km wide with the long axis aligned 340°. The southern end (Cape Ransonnet) is separated from the mainland by South Passage which at its narrowest is about 2 km wide (Fig. 2).

Geologically the island is made up of Quaternary (probably Pleistocene) Tamala Eolianite (Logan *et al.* 1970). The geology of Bernier and

Dorre Islands and the Edel Peninsula is similar but Quaternary sandstone occurs on Peron Peninsula.

The western side of the island is bounded by steep cliffs which range in height from 2 or 3 m to about 80 m near Herald Heights. The eastern side has a few comparatively low cliffs with extensive sandy and rocky beaches in between. Sand dunes lie behind the beaches in places.

The western side of the island is the higher, rising to 185 m at Herald Heights and to 155 m and 132 m further north. The middle parts consist mainly of well-vegetated stable sand dunes of reddish or whitish calcareous soil although in the area between Herald Heights and Tetrodon Loop there are a number of mobile white dunes, one of which touches the sea at Tetrodon Loop. Near the cliffs the soil is shallow and the limestone frequently crops out. A number of low-lying areas contain clay pans.

Climatological data are given in Table 1. It can be seen that most rain falls during the winter but that occasional summer cyclones or thunderstorms also bring rain. The rainfall on Dirk Hartog is higher than that on the adjacent mainland; only Carrarang and Tamala Stations to the south approach the figure for Dirk Hartog. This is possibly an orographic effect since Herald Heights and the other hills along the west side of Dirk Hartog Island are the highest land for some distance.

There is no standing fresh water on the island except in clay pans for a short time following heavy rain. Water has been provided for the sheep from wells. At Herald Heights there is a seepage in a small cave just below the clifftop. Stalactites and associated features have formed, indicating that the water supply, though small, must be fairly constant. It was dripping freely at the time of our visit in 1972.

Vegetation and flora

Shark Bay is the site of the first authenticated botanical collections by Europeans in Australia. William Dampier, on his second visit there between 6 and 12 August 1699, collected at least 18 species which are now in the Sherardian Herbarium at Oxford University (George 1971). Although he landed on Dirk Hartog Island, we do not know which of his plants were collected there. Dampier's name is commemorated in the genus *Dampiera* and the species *Beaufortia dampieri*. Several other names commemorating him have unfortunately been reduced to synonymy, e.g. *Clianthus dampieri* (now *C. formosus*) and *Eurybia dampieri* (*Olearia axillaris*).

Later visitors who collected around Shark Bay included Leschenault, Riedle, Péron and Guichenot with Baudin in 1801 and 1803 (Baudin 1974), Gaudichaud, Quoy and Gaimard with Freycinet in 1818 (Gaudichaud 1826), Cunningham with King in 1822 (King 1827), Grey in 1839 (Grey 1841), Milne with Denham in 1858 and Mueller in 1877 (Mueller 1883). Not all landed on Dirk Hartog Island. Since

Table 1

Climatic data for Dirk Hartog Island and nearby locations, from information supplied by the Bureau of Meteorology.

Rainfall (in mm)

Station	Mean	Median	Range
Dirk Hartog Homestead (1893-1948)			
January	6	0	0-89
February	12	4	0-135
March	13	2	0-130
April	16	7	0-74
May	56	47	0-299
June	88	88	7-222
July	62	50	17-202
August	35	29	4-122
September	14	8	0-61
October	7	5	0-40
November	2	0	0-11
December	2	0	0-34
Annual	313	290	120-681
Other Stations.			
Carrarang (1894-1973)	280	268	71-532
Tamala (1900-1975)	300	285	122-490
Denham (1893-1975)	236	223	78-522
Hamelin Pool (1885-1975)	213	194	45-409
Carbla (1913-1975)	216	190	63-446
Yaringa (1923-1975)	210	185	56-438
Wooramel (1898-1975)	201	184	60-472
Edaggee (1915-1975)	192	175	61-447
Carnarvon (1883-1950)	229	205	68-619

Evaporation (in mm)

Station	Annual average
Denham	2 032
Hamelin Pool	2 108
Carnarvon	2 465

Temperature (in °C).

	Carnarvon (29 years)		Hamelin Pool (17 years)	
	Max.	Min.	Max.	Min.
January	30.8	22.6	37.2	21.0
February	32.0	23.1	37.1	21.8
March	30.1	21.9	35.0	20.1
April	28.1	18.7	30.0	16.9
May	25.9	14.9	25.5	13.4
June	23.1	13.0	21.8	11.4
July	21.9	11.0	20.9	9.5
August	22.4	11.3	22.3	9.5
September	23.8	13.8	25.5	11.2
October	25.6	16.4	29.0	13.6
November	27.0	18.7	32.2	16.0
December	28.9	20.8	34.9	18.8
Annual	26.7	17.2	29.3	15.3

many of their specimens were described as new species, the area contains a number of type localities. Some of their names also are commemorated in genera and species such as *Lechenaultia*, *Guichenotia*, *Eucalyptus baudiniana*, *Angianthus cunninghamii*, *Angianthus milnei* and *Rhagodia gaudichaudiana*.

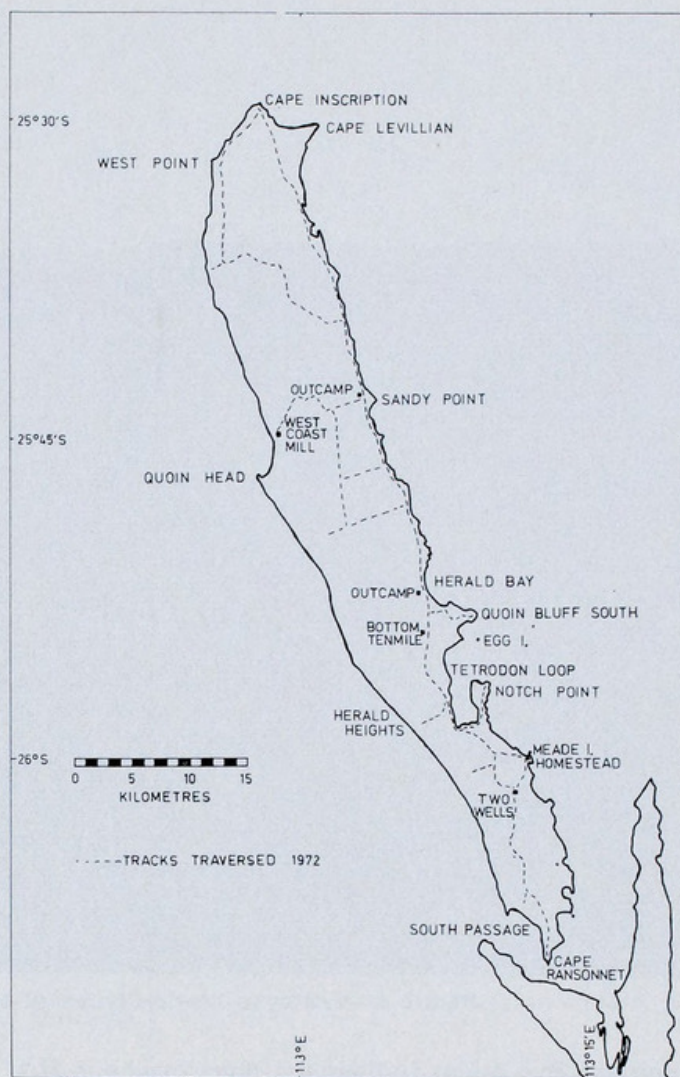


Figure 2.—Map of Dirk Hartog Island.

Mueller (1883) recorded 60 species based on early collections from Dirk Hartog Island, though many of the names he used are not in current use. They have been included under their current names in the flora list below excepting several species whose determination is doubtful and which are mentioned separately.

Although intermittent collecting continued on the mainland, after 1858 few plants were collected from the island until 1967 when a group of students from Wesley College, South Perth, visited it. In 1973, B. A. and A. G. Wells recorded 13 species, and in 1974 J. S. Beard made a small collection.

Our expedition of 1972 had the advantage of an excellent season, about 500 mm of rain having fallen between 1 January and 31 August 1972. Over 250 species were collected in flower or fruit. With flowering at its peak, many areas were extremely colourful, prominent species being *Acacia ligulata*, *Brachycome latisquamea*, *B. iberidifolia*, *Dampiera incana*, *Helipterum* spp., *Swainsona* spp. and *Thryptomene baeckea*. Some plants were not in flower, and collections at other seasons would probably



Figure 3.—Tall open-heath dominated by *Acacia ligulata*, 0.8 km W of homestead.

increase the list of indigenous flora to about 300 species. Several indeed have been added by recent visits of officers of the Wildlife Research Centre.

Vegetation

The vegetation has been mapped and described by Beard (1976), who recognised four communities on the island, designated by his own terminology. This paper describes five communities based on the terminology of Specht *et al.* (1974). They are correlated with Beard's classification as used in his text.

1. *Tall open-heath*.—(Figure 3). (Beard: shrub steppe, a₂₂ Si. x ZHc). This is by far the most extensive community, occupying the deep or shallow sand away from the coast and almost throughout the length of the island. It is usually dominated by *Acacia ligulata*, but several small areas are dominated by *Eucalyptus* of which there are 4 species. Other common tall shrubs are *Acacia coriacea*, *Pittosporum phylliraeoides*, *Diplolaena grandiflora*, *Heterodendrum oleifolium* and *Alyogyne cuneiformis*. Lower shrubs, up to 1 m tall, include *Atriplex bunburyana*, *Thryptomene baeckeacea*, *Beaufortia dampieri*, *Pimela microcephala*, *Ptilotus obovatus* and *Cassia chatelainiana*. The spinifex *Plectrachne*

sp. is common, and the introduced Buffel Grass (*Cenchrus ciliaris*) has spread widely. The perennial scrambler *Brachycome latisquamea* is common.

In a few areas the vegetation is up to 3 m tall and should be termed tall shrubland, while in others it is sparse and becomes low shrubland or low open-shrubland.

2. *Low closed/open-heath with hummock grasses*.—(Figures 4, 5). (included with shrub steppe by Beard.) North of Sandy Point are areas of low heath, vaying from open to closed, with an admixture of spinifex (*Plectrachne* sp. and *Triodia plurinervata*). The myrtles *Thryptomene baeckeacea* and *Melaleuca cardiophylla* are common, and *Acacia ligulata* is still frequent. South Western elements predominate in the other shrubs which include *Calytrix strigosa*, *Cryptandra nudiflora*, *Pityrodia atriplicina*, *Acacia? leptospermoides*, *Geleznovia verrucosa*, *Guichenotia ledifolia*, *Daviesia* aff. *collettioides* and *Keraudrenia hermanniifolia*. Two sedges were recorded—*Lepidobolus preissianus* and *Gahnia? lanigera*. Ephemeral herbs include *Brachycome iberidifolia*, *Swainsona* sp. and *Senecio lautus*, and the perennial *Brachycome latisquamea* is frequent. Occasionally the spinifexes are dominant almost as a hummock grassland.



Figure 4.—Low open-heath with hummock grassland, dominated by *Acacia ligulata* and *Triodia plurinervata*, N of Sandy Point Outcamp.

Formations similar to this or intermediate between it and the tall open-heath occur in other parts of the island, some apparently being the "full heath-spinifex community" described by Beard under mixed heath and spinifex.

3. *Low very-open-heath*.—(Figure 6). (Beard: mixed heath and spinifex, x ZHc. This term is not used by Specht but is used here for low heath (under 1 m tall) with cover less than 30%). The community occurs in shallow sand over limestone above rocky shores such as Quoin Bluff South and along the south-western coast. The shrubs include *Thryptomene baeckeacea*, *Scaevola crassifolia*, *Solanum orbiculatum*, *Frankenia pauciflora*, *Dampiera incana*, *Commersonia gaudichaudii* and *Atriplex* sp. *Plectrachne* sp. is present, and ephemeral herbs include *Lotus cruentus*, *Brachycome iberidifolia* and *Calocephalus francisii*.

A variant of low very-open-heath occurs on sandy flats near the shore at Sandy Point and farther north (Beard: dwarf scrub XZi). The ubiquitous *Thryptomene baeckeacea* is the common shrub, with some *Myoporum* sp. Perennial herbs include *Carpobrotus rossii*, *Conostylis stylidoides*, *Dicrastylis* sp. and *Spinifex longifolius*.

4. *Hummock grassland*.—(Beard: part of mixed heath and spinifex, x ZHc). Small areas tending towards hummock grassland among the low

heath have already been mentioned, but quite extensive areas occur over the hills of Herald Heights. *Triodia plurinervata* is usually dominant, with some *Plectrachne* sp. Shrubs are low and sparse, and include *Pimelea gilgiana*, *Olearia axillaris* and *Thryptomene baeckeacea*.

5. *Low open-shrubland*.—(Figure 7). (Beard: samphire community, K₃ Ci). A number of saline flats occur on the island such as those to the south and west of the homestead on which the old and the new airstrips lie. Samphires dominate them, especially species of *Arthrocnemum* and *Salicornia*. The halophytes *Limonium*, *Atriplex* and *Samolus* are common, and herbs occur such as *Senecio glossanthus*, *Angianthus microcephalus* and *Parietaria debilis*.

The only stand of mangroves on the island is a small population of *Avicennia marina* by a soak on a saline flat at Tetrodon Loop.

Heavily grazed areas around mills and small holding pens have been mostly stripped of indigenous vegetation. Introduced plants have taken over, though most are ephemeral and these areas would be almost bare except after rain. The species include *Lolium loliaceum*, *Hordeum leporinum*, *Koeleria phleoides*, *Melilotus indicus*, *Medicago polymorpha*, *Erodium cicutarium* and *Spergularia rubra*.



Figure 5.—Low open-heath, dominated by *Thryptomene baeckeacea* and *Plectrachne* sp., 5 km N of Cape Ransonnet.

There are extensive blown out sandy areas quite without vegetation, for example near Tetrodon Loop and Mystery Beach. Along the west coast, rocky shores even atop cliffs are kept bare of vegetation by salt spray, sometimes up to 100 m from the sea.

Flora

The known indigenous flora of Dirk Hartog Island is listed in Table 2 and the naturalised flora in Table 3. Both lists are alphabetical. Table 2 cites the species, family, habit and habitat. The distribution on the mainland in the South West (SW) and Ereman (E) Botanical Provinces is shown in the first two columns, while the third (SB) denotes species restricted to the Shark Bay area. Species are included in the South West Province if their only other occurrence outside it (other than Dirk Hartog Island) is Bernier and Dorre Islands.

Representation of the larger families of the indigenous flora is shown in the following list.

Asteraceae	37	Mimosaceae	8
Chenopodiaceae	20	Myoporaceae	7
Poaceae	18	Amaranthaceae	6
Myrtaceae	13	Brassicaceae	6
Papilionaceae	13	Euphorbiaceae	6
Goodeniaceae	9	Sterculiaceae	6
Liliaceae	9	Zygophyllaceae	6
Malvaceae	8	Solanaceae	5

There are 2 families with 4 species, 8 with 3 species, 9 with 2 species and 32 with 1 species. The total number of indigenous families is 67.

The largest genera are *Acacia* (8 species), *Angianthus* (7 species), *Arthrocnemum* and *Ptilotus* (both with 6 species), *Rhagodia* (5 species), *Eucalyptus*, *Helipterum*, *Melaleuca*, *Scaevola*, *Swainsona* and *Zygophyllum* (all with 4 species). The number of genera is 167.

Several species recorded by Mueller should be checked before they can be definitely listed for the island.

They are:

- Acacia spathulata* F. Muell.—probably *A. leptospermoides* Benth.
- Casuarina humilis* Otto et Dietr.—probably *C. helmsii* Ewart & Gordon.
- Convolvulus sepium* L.—? incorrect locality.
- Dicrastylis fulva* Drumm. et Harv.—probably undescribed.
- Frankenia laevis* L.—probably *F. pauciflora* DC.
- Ptilotus striatus* F. Muell.—probably *P. divaricatus* (Gaud.) F. Muell.



Figure 6.—Limestone cliff at Quoin Bluff South with low very open-heath.

Verticordia pennigera Endl.—? incorrect locality.

Melaleuca holosericea Schau.—? incorrect locality.

Excluding these, the known indigenous flora totals 259 species.

The flora of the island is of great interest phytogeographically. Morphologically the island populations, excluding of course several species known only on it, lie within the range of variation shown by those on the mainland. It is the size of the flora and more especially the geographical range of its components which demand attention. With 259 known indigenous species and an estimated total of about 300, the flora is easily the largest of any island off the lower western and southern Western Australian coasts. While this is expected on the much larger island that Dirk Hartog is, it is apparently also a much richer flora than that of the nearby peninsulas—Edel Land and Peron Peninsula. This is probably directly due to the higher rainfall on the island.

The flora is quite evenly divided between South Western and Ereman species, among which the following groups deserve mention.

1. Those apparently endemic to the island: *Gnephosis tenuissima*, *Stipa crinita*, *Trachymene elachocarpa*, *Olearia* sp. inedit., *Arthrocnemum* sp. inedit., *Chrysopogon* sp. inedit., *Scirpus* sp.
2. Those restricted to the Shark Bay area, i.e. the adjacent mainland, some extending along the coast north of Carnarvon. They are shown in the last column of Table 2 and total 18.
3. Those South Western species (54 in all) at their northern limit on the island, marked by an asterisk in Table 2. Some of these also represent the northern limit of the respective families in the South West Botanical Province. They are Casuarinaceae, Centrolepidaceae, Haemodoraceae, Orchidaceae and Restionaceae.
4. Those which are well isolated from their nearest known population on the mainland. These are *Helipterum oppositifolium* (nearest population Bullfinch); *Casuarina helmsii* (Arrino); *Melaleuca lanceolata* (Geraldton); *Neosciadium glochidiatum* (Drummond collection: ? near Perth); *Limosella australis* (Harvey).



Figure 7.—Low open-shrubland dominated by *Arthrocnemum* spp., on (new) airstrip flat.

The indigenous flora of Dirk Hartog Island is over twice that of Bernier and Dorre Islands (Royce in Ride *et al.* 1962), which lie just to the north and, though much smaller, are geologically similar but receive a lower rainfall. Recent collecting by K. F. Kenneally during post-fire regeneration studies on Dorre Island has added 16 species to that island's flora (Kenneally pers. comm.). The total for Dorre of 109 species and for Bernier of 96 species compares with 259 for Dirk Hartog. Discounting the marine *Halophila ovalis*, twenty-six species on Bernier and Dorre have not so far been collected on Dirk Hartog. Almost all are Ereman species, reflecting the lower rainfall on those islands. Of over 150 species on Dirk Hartog not recorded for Bernier and Dorre, the most interesting is the unnamed *Plectrachne*, common on Dirk Hartog but known otherwise only from Edel Land.

At the time of our visit the vegetation was generally in good condition, especially in the northern half of the island where there were no sheep. There was no sign of recent fire, and we understand that for many years fire has not been used in pastoral management on the island. There are few fire-adapted species on the island. Provided that populations of grazing and browsing animals do not build up enough to cause overgrazing, the flora should maintain itself without requiring a great deal of management.

Dirk Hartog Island: South West or Ereman Province?

Beard (1976) determined a precise boundary for the South West Botanical Province in this region (his Fig. 2 p. 13 and Fig. 3 p. 27), leaving most of Edel Land, Peron Peninsula and the islands in the Ereman Province. He concluded that the Dirk Hartog communities "should be placed within the Ereman Province while recognising their intermediate character." In reaching this conclusion he gave "due weight" to "floristics, physiognomy and habitat". However, his visit to the island was made in a dry season and he stated that the "whole impression is one of desolation and aridity". This contrasts with the excellent condition and flowering of the flora during our visit. Since a good proportion (62%) of the species are shrubs or perennial herbs there is always a cover, albeit often open, of vegetation.

Floristically the island is almost equally divided between the provinces but with a leaning to the South West. Of the named species in Table 2, 77 are South Western, 61 are Ereman and 102 are common to both. However a number of species listed as Ereman have taxonomic affinities with the South Western flora, e.g. *Beaufortia dampieri*, *Pileanthus limacis*, *Beyeria cyanescens*, *Dampiera incana*, *Lechenaultia sub-*

Table 2

The known indigenous flora of Dirk Hartog Island, arranged alphabetically with the distribution on the mainland shown in the three columns: SW—South West Botanical Province; E—Ereman Province; SB—Shark Bay area only. Species at their northern limit on Dirk Hartog Island are marked by an asterisk in the SW or E column.

	SW	E	SB		SW	E	SB
<i>Abutilon geranioides</i> (DC.) Benth. Malvaceae		X	X	<i>Angianthus strictus</i> (Steetz) Benth. Asteraceae	X	X	
Scrambling shrub 1·3 m, fls pale yellow.				Ephemeral herb; fls yellow.			
In sand over limestone, among low open-heath.				In loam, in open grazed area near mill.			
<i>Abutilon oxycarpum</i> F. Muell. Malvaceae		X		<i>Angianthus tomentosus</i> Wendl. Asteraceae	X	X	
Slender shrub to 50 cm; fls yellow inside with				Ephemeral herb.			
brown centres, brownish outside.				<i>Angianthus</i> sp. ASG 11362. Asteraceae			
In sand, in tall open-heath.				Ephemeral herb; fls immature.			
<i>Acacia bivenosa</i> DC. Mimosaceae		X		In loam over limestone, in open grazed area.			
<i>Acacia coriacea</i> DC. Mimosaceae		X		<i>Angianthus</i> sp. ASG 11471. Asteraceae			
Spreading shrub to 2·5 m.				Ephemeral herb aromatic; fls yellow.			
On rocky, limestone flat near west coast, in low				In limestone, in low very open-heath.			
open-shrubland, and in sand in open-heath.				<i>Anguillaria monantha</i> Endl. Liliaceae	X*		
<i>Acacia idiomorpha</i> A.Cunn. ex Benth. Mimosaceae	X*			Bulbous herb, in fruit.			
Low, straggling shrub 30 cm.				In sand, in tall open-heath.			
In sand, in low open-heath.				<i>Anthotroche walcottii</i> F.Muell. Solanaceae	X*		
<i>Acacia* leptospermoides</i> Benth. Mimosaceae	X*			Collected by Milne.			
Spreading shrub 40 cm.				<i>Aphanopetalum clematideum</i> (Drumm. et Harv.) C.			
In sand, in tall open-heath.				A. Gardn. Cunoniaceae	X*		
<i>Acacia leptospermoides</i> Benth. Mimosaceae	X*			Climber; fls cream-green.			
Shrub to 3 m; bark smooth, grey.				In sand, in low open-heath.			
In sand, in tall open-heath.				<i>Aristida contorta</i> F.Muell. Poaceae		X	X
<i>Acacia ligulata</i> A.Cunn. ex Benth. Mimosaceae	X	X		Collected by Gaudichaud.			
Spreading shrub to 2·5 m; bark smooth, grey,				<i>Arthrocnemum bidens</i> Nees. Chenopodiaceae	X	X	
becoming fissured when old.				Spreading, succulent shrub, ± dull green.			
Common throughout island, especially in sand,				On saline flat, in low open-shrubland.			
in tall open-heath and low open-heath.				<i>Arthrocnemum halocnemoides</i> Moq. Chenopodiaceae	X	X	
<i>Acacia tetragonophylla</i> F.Muell. Mimosaceae	X	X		Shrub to 70 cm, ± yellow-green.			
Spreading shrub to 1·7 m.				On saline flat, in low open-shrubland.			
In sand, in tall open-heath.				<i>Arthrocnemum pruinatum</i> Paulsen. Chenopodiaceae		X	
<i>Acacia</i> sp. Mimosaceae		X	X	Succulent shrub.			
Shrub 1·5 m, in leaf only.				On saline flat, in low open-shrubland.			
In sand, in tall open-heath. Only 1 population				<i>Arthrocnemum</i> sp. ASG 11609. Chenopodiaceae		X	
seen.				Spreading, succulent perennial herb to 10 cm tall.			
<i>Acanthocarpus preissii</i> Lehm. Liliaceae	X			On saline flat, in low open-shrubland.			
Straggling perennial herb.				<i>Arthrocnemum</i> sp. ASG 11430. Chenopodiaceae		X	
In sand, in tall open-heath.				Succulent shrub, red and green.			
<i>Acanthocarpus</i> sp. Liliaceae		X	X	On saline flat, in low open-shrubland.			
Tough perennial herb to 60 cm, forming clumps.				<i>Arthrocnemum</i> sp. ASG 11454a. Chenopodiaceae		X	X
In sand, in tall open-heath.				Succulent shrub, ± bright green.			
A larger, more robust plant than <i>A. preissii</i> .				On saline flat, in low open-shrubland.			
Also occurs on the coastal plain west of the				<i>Atriplex bunburyana</i> F.Muell. Chenopodiaceae	X	X	
Cape Range.				Shrub to 1 m.			
<i>Alyogyne cuneiformis</i> (DC.) Lewton. Malvaceae	X	X	X	In sand, on coastal dune by beach and in tall			
Shrub to 3 m; fl white with red centre (only 1 fl.				open-heath.			
seen).				<i>Atriplex cinerea</i> Poir. Chenopodiaceae		X	
In sand, in tall open-heath.				Shrub 1 m, dioecious.			
<i>Alyogyne pinonianus</i> (Gaud.) Fryxell. Malvaceae	X	X		In saline mud near soak, with <i>Avicennia marina</i> .			
Shrub 1·3 m; fl mauve (only 1 fl seen).				<i>Atriplex vesicaria</i> Benth. Chenopodiaceae		X	
In sand, in tall open-heath.				<i>Avicennia marina</i> (Forsk.) Vierh. Avicenniaceae	X	X	
<i>Amphibolis antarctica</i> (Labill.) Sond. et Aschers				Mangrove; shrub 3 m with pneumatophores.			
Potamogetonaceae				In saline mud by soak near coast. Only 1 small			
Collected by Gaudichaud.				population seen.			
<i>Amyema linophyllum</i> (Fenzl) Tiegh. Loranaceae	X			<i>Baeckea pentagonantha</i> F. Muell. Myrtaceae	X*		
Collected by Milne.				Collected by Milne.			
<i>Amyema preissii</i> (Miq.) Tiegh. Loranaceae	X	X		<i>Bassia uniflora</i> (R.Br.) F.Muell. Chenopodiaceae	X	X	
Mistletoe on <i>Acacia ligulata</i> .				Spreading shrub 30 cm tall.			
In tall open-heath.				In sand over limestone near coast, in tall open-			
<i>Angianthus cunninghamii</i> (DC.) Benth. Asteraceae	X	X		heath.			
<i>Angianthus microcephalus</i> (F.Muell.) Benth. Aster-	X*	X		<i>Beaufortia dampieri</i> A. Cunn. ex Hook. Myrtaceae	X		
aceae				Spreading shrub to 1·5 m tall; fls pale pink to			
Ephemeral herb.				white.			
On saline flat, in low open-shrubland.				On sand dunes, in tall open-heath.			
<i>Angianthus milnei</i> Benth. Asteraceae		X					
Collected by Milne.							

Table 2—continued

	SW	E	SB		SW	E	SB
<i>Beyeria cyanescens</i> (Muell. Arg.) Benth. Euphorbiaceae Much-branched shrub 35 cm, dioecious. In sand, in tall open-heath.	X	X		<i>Cassytha pubescens</i> R.Br. Lauraceae Parasitic climber. In tall open-heath.		X	X
<i>Bidens bipinnata</i> L. Asteraceae Ephemeral herb; fls yellow. On rocky, limestone flat near west coast, in low open-shrubland.		X		<i>Casuarina helmsii</i> Ewart and Gordon. Casuarinaceae Sprawling shrub 40 cm tall x 2 m broad. Rare, in sand in low closed/open-heath. In East Sandy Paddock, only male seen; in Blowhole Paddock, male and female seen.	X	X	
<i>Boerhavia chinensis</i> (L.) Aschers and Schweinf. Nyctaginaceae Sprawling perennial herb; fls deep pink. On rocky, limestone flat near west coast, in low open-shrubland.		X		<i>Centrolepis humillima</i> F.Muell. ex Benth. Centrolepidaceae On saline flat in low open-shrubland.	X*		
<i>Bossiaea rufa</i> R.Br. var. <i>foliosa</i> Benth. Papilionaceae Spreading shrub 30 cm; fls yellow and red. In sand, in tall open-heath.	X*			<i>Cephalopterum drummondii</i> A. Gray. Asteraceae Ephemeral herb; bracts yellow or white. In loam over limestone, in open grazed area.	X	X	
<i>Brachycome ciliaris</i> (Labill.) Less. Asteraceae Ephemeral herb; rays pale mauve. In sand over limestone, in low open-shrubland.	X	X		<i>Chamaesyce myrtilloides</i> (Boiss.) Hassall. Euphorbiaceae Ephemeral herb.		X	
<i>Brachycome iberidifolia</i> Benth. Asteraceae Ephemeral herb; rays mauve. Common in many areas, in sand or on limestone. In open-heath, low-shrubland.	X	X		<i>Chorizema ericifolium</i> Meisn. Papilionaceae Shrub to 40 cm; fls yellow and red. In sand, in low open-heath/hummock grassland.	X	X	
<i>Brachycome latisquamea</i> F.Muell. Asteraceae Scrambling shrub to 1.5 m; rays mauve, rarely white. In sand, in tall open-heath and low shrubland; fairly common.		X	X	<i>Chrysopogon</i> sp. ASG 11544. Poaceae Perennial grass with underground rhizomes. In sand near seashore.			
<i>Brachysema macrocarpum</i> Benth. Papilionaceae Perennial herb. In sand, in tall open-heath.		X	X	<i>Clematis microphylla</i> DC. Ranunculaceae Climber; fls white. In sand, in tall open-heath.	X		
<i>Cakile maritima</i> L. Brassicaceae Perennial herb; fls pink. In sand above beach by homestead.	X	X		<i>Commersonia gaudichaudii</i> J. Gay. Sterculiaceae Spreading shrub; fls white. In sand, in low very open-heath.	X*	X	
<i>Calandrinia polyandra</i> Benth. Portulacaceae Ephemeral herb with succulent lvs; fls bright pink inside, centres often darker, pale yellow outside. In sand, in open-shrub, and in limestone near sea.	X	X		<i>Conostylis stylidioides</i> F.Muell. Haemodorumaceae Caespitose perennial herb; fls yellow. In sand, in tall open-heath and in low very open-heath.	X*		
<i>Calandrinia</i> sp. Portulacaceae Succulent ephemeral herb, reddish. In sand over limestone, in low open-shrubland.				<i>Corynotheca micrantha</i> (Lindl.) Macbride. Liliaceae Sprawling perennial herb; fls pale pink to white. On coastal dune, in tall open-heath.	X		
<i>Calocephalus francisii</i> (F.Muell.) Benth. Asteraceae Ephemeral herb; fls white or pale yellow. In sand, in low open-heath.	X	X		<i>Cotula cotuloides</i> (Steetz) Druce. Asteraceae Ephemeral herb. In sand, in open grazed area by mill.	X	X	
<i>Calogyne berardiana</i> (Gaud.) F.Muell. Goodeniaceae Ephemeral herb; fls yellow. On sand dune, in low open-heath.	X	X		<i>Crassula colorata</i> (Nees) Ostenf. Crassulaceae Ephemeral herb. In sand, in tall open-heath.	X	X	
<i>Calotis multicaulis</i> (Turcz.) Druce. Asteraceae Ephemeral herb; rays white. In loam over limestone, in open grazed area.		X		<i>Cryptandra nudiflora</i> F.Muell. Rhamnaceae Low shrub. In sand, in low open-heath.	X*		
<i>Calytrix strigosa</i> A. Cunn. Myrtaceae Sprawling shrub 25 cm; fls purple, stamens yellow. In sand, in low open-heath.	X*			<i>Cymbopogon ambiguus</i> A. Camus. Poaceae Perennial grass. On sand dune, in low open-heath.	X	X	
<i>Capparis spinosa</i> L. var. <i>nummularia</i> (DC.) F. M. Bailey. Capparidaceae Shrub ± 1 m. In limestone, in tall open-heath.	X	X		<i>Cyperus bulbosus</i> Vahl. Cyperaceae Rhizomatous sedge; fls brown.		X	
<i>Carpobrotus rossii</i> (Haw.) Schwantes. Aizoaceae Prostrate perennial herb with succulent lvs; fls pale pink to white. In white sand, in low open-heath.	X	X		<i>Dampiera incana</i> R.Br. Goodeniaceae Perennial herb to 50 cm; fls deep blue. In sand, in tall and low open-heath.		X	X
<i>Cassia chatelainiana</i> Gaud. Caesalpiniaceae Shrub to 1 m; fls bright yellow. In sand, in tall open-heath.	X	X		<i>Danthonia racemosa</i> R.Br. Poaceae Collected by Gaudichaud.	X*		
<i>Cassytha nodiflora</i> Meisn. Lauraceae Parasitic climber. In low open-shrubland near cosat.	X			<i>Daucus glochidiatus</i> (Labill.) Fisch. Mey. and Avé-Lall. Apiaceae Ephemeral herb. In sand, in tall open-heath.	X	X	
				<i>Daviesia</i> aff. <i>collettioides</i> Meisn. Papilionaceae Much-branched shrub 40 cm; fls yellow and red. In sand, in tall open-heath.	X		
				<i>Dianella revoluta</i> R.Br. Liliaceae Caespitose perennial herb; fls blue. In sand, in tall open-heath.	X	X	

Table 2—continued

	SW	E	SB		SW	E	SB
<i>Dichopogon strictus</i> (R.Br.) Baker. Liliaceae	X*			<i>Eucalyptus foecunda</i> Schau. Myrtaceae	X		
Herb with tubers; fls mauve.				Dense, sprawling mallee 1-2 m tall; lower bark			
In sand, in tall open-heath.				rough, upper smooth, fls white.			
				In sand, in tall open-heath.			
<i>Dicrastylis</i> sp. Chloanthaceae		X	X	<i>Eucalyptus tamala</i> Carr & Carr. Myrtaceae	X		
Perennial herb, in leaf only.				Sprawling mallee 1.5 m tall; bark rough at base,			
In sand above beach by homestead, and at Sandy				smooth above.			
Point in low shrubland.				In sand, in tall open-heath.			
<i>Diplolaena grandiflora</i> Desf. Rutaceae	X	X		<i>Eulalia fulva</i> (R.Br.) O. Kuntze. Poaceae		X	
Shrub to 2 m; bracts red, fls orange to pale green.				Perennial grass; fls brown.			
Common, especially in sand in tall open-heath.				In limestone, in low very open-heath.			
<i>Diplolaena microcephala</i> Desf. Rutaceae	X*			<i>Euphorbia eremophila</i> A. Cunn. ex Hook. Euphorbiaceae	X	X	
Shrub to 1.7 m; fls red-pink.				Ephemeral herb with latex.			
In sand, in tall open-heath.				In sand, in low open-heath/hummock grassland			
<i>Dodonaea aptera</i> Miq. Sapindaceae	X*			<i>Euphorbia sharkoensis</i> Baill. Euphorbiaceae	X		
Shrub 70 cm.				Ephemeral herb.			
In sand, in tall open-heath.				<i>Exocarpos aphyllus</i> R.Br. Santalaceae	X	X	
<i>Dodonaea inaequifolia</i> Turcz. Sapindaceae	X*	X		Much-branched shrub 2 m; fls greenish-yellow.			
Shrub to 1.3 m; fr red and green, \pm viscid.				In sand, in tall open-heath.			
In sand over limestone cliff top, in tall open-heath.				<i>Frankenia cinerea</i> DC. Frankeniaceae		X	
<i>Dysphania plantaginella</i> F.Muell. Chenopodiaceae		X		Small shrub to 10 cm tall; fls white.			
Ephemeral herb; fls pale green.				On saline flat, in low open-shrubland.			
In sand over limestone, in low open-heath.				<i>Frankenia pauciflora</i> DC. Frankeniaceae	X	X	
<i>Enchylaena tomentosa</i> R.Br. Chenopodiaceae	X	X		<i>Gahnia? lanigera</i> (R.Br.) Benth. Cyperaceae	X*		
Shrub 70 cm; fr orange.				Caespitose perennial sedge.			
In sand, in tall open-heath.				In sand over limestone, in low open-heath.			
<i>Enneapogon caerulescens</i> (Gaud.) N. T. Burbidge. Poaceae		X		<i>Geleznowia verrucosa</i> Turcz. Rutaceae	X*		
Small, caespitose, perennial grass; fls lead-green.				Small shrub to 35 cm; fls yellow.			
In sand over limestone on cliff top, in low open-heath.				In sand, in low closed-heath			
<i>Eragrostis? brownii</i> (Kunth) Nees. Poaceae	X			<i>Glycine tabacina</i> (Labill.) Benth. Papilionaceae	X	X	
Small ephemeral grass.				Slender climber; fls deep pink			
In sand, in tall open-heath.				In sand over limestone, in low open-heath			
<i>Eragrostis dielsii</i> Pilger. Poaceae	X	X		<i>Gnaphalium luteoalbum</i> L. Asteraceae	X	X	
Prostrate ephemeral grass; fls green-purplish.				Ephemeral herb.			
In loam over limestone, in open grazed area by mill.				In sand by homestead.			
<i>Eremophila clarkei</i> F.Muell. Myoporaceae	X	X		<i>Gnaphalodes condensatum</i> A. Gray. Asteraceae	X	X	
Spreading shrub 1 m tall; fls pale to deep pink.				Ephemeral herb; fls cream-green.			
In sand, in tall open-heath.				In sand over limestone, in low open-heath.			
<i>Eremophila glabra</i> (R.Br.) Ostenf. Myoporaceae	X	X		<i>Gnephosis macrocephala</i> Turcz. Asteraceae	X		
Shrub 25-130 cm; fls red (3 variants collected).				Ephemeral herb; fls yellow.			
In sand, in tall and low open-heath.				In sand, in open-heath.			
<i>Eremophila oldfieldii</i> F.Muell. Myoporaceae	X	X		<i>Gnephosis skirrophora</i> (Sond.) Benth. Asteraceae	X	X	
Shrub to 1.5 m; fls dull red.				Collected by Milne.			
In sand over limestone on cliff top, in tall open-heath.				<i>Gnephosis? tenuissima</i> Cass. Asteraceae	X		
<i>Eriachne mucronata</i> R.Br. Poaceae		X		<i>Goodenia</i> sp. ASG 11508. Goodeniaceae			
Caespitose perennial grass.				Herb with underground stolons; fls yellow.			
In sand, in tall open-heath.				In sand, in low open-heath.			
<i>Eriochilus dilatatus</i> Lindl. Orchidaceae	X*			<i>Grevillea stenophylla</i> W. V. Fitzg. Proteaceae	X*		
Orchid with tuber; in old fruit.				Sprawling shrub 40 cm; fls cream on reddish			
On sandy hill, in low open-heath.				pedicels.			
<i>Erodium angustilobum</i> Carolin. Geraniaceae		X		In sand, in closed-heath.			
Ephemeral herb.				<i>Guichenotia ledifolia</i> J. Gay. Sterculiaceae	X*		
<i>Erodium cygnorum</i> Nees subsp. <i>cygnorum</i> . Geraniaceae	X	X		Spreading shrub to 80 cm; fls pale pink.			
Ephemeral herb.				In sand, in tall open-heath.			
<i>Eucalyptus baudiniana</i> Carr & Carr. Myrtaceae	X			<i>Gyrostemon ramulosus</i> Desf. Gyrostemonaceae	X	X	
Sprawling mallee 1.5 m.				Tree 3 m, male; no female seen.			
In sand, in tall open-heath.				In sand, as emergent in tall open-heath.			
<i>Eucalyptus dongarraensis</i> Maiden & Blakely. Myrtaceae	X	X		<i>Halganina littoralis</i> Gaud. Boraginaceae	X		
Mallee 1-2.5 m; bark rough at base, exfoliating				Shrub 40 cm; fls deep blue.			
in broad, \pm smooth strips above.				In sand, in low open-heath/hummock grassland.			
In sand or sand over limestone in tall open-heath.				<i>Haloragis gossei</i> F. Muell. Haloragaceae		X	
				Ephemeral herb.			

Table 2—continued

	SW	E	SB		SW	E	SB
<i>Haloragis trigonocarpa</i> F. Muell. Haloragaceae Ephemeral herb. In loam over limestone, in open grazed area.		X		<i>Leptomeria spinosa</i> (Lehm.) DC. Santalaceae Collected by Cunningham.	X		
<i>Hannafordia quadrivalvis</i> F. Muell. Sterculiaceae Shrub 35 cm; fls pale yellow, brown outside. In sand, in tall open-heath.	X	X		<i>Limonium salicorniaceum</i> (F. Muell.) Kuntze. Plum- baginaceae Perennial herb; fls white. On saline flat, forming closed herbland with <i>Samolus</i> , <i>Atriplex</i> , etc. around small soak.		X	
<i>Helipterum condensatum</i> F. Muell. Asteraceae Ephemeral herb; bracts white; fls yellow. On coastal dune, in tall open-heath.	X	X		<i>Limosella australis</i> R. Br. Scrophulariaceae Ephemeral herb; fls white In loam over limestone, in open grazed area by mill.	X*		
<i>Helipterum humboldtianum</i> (Gaud.) DC. Asteraceae Ephemeral herb; fls bright yellow. In sand, in tall open-heath.	X	X		<i>Loania</i> sp. Loganiaceae	X		
<i>Helipterum oppositifolium</i> S. Moore. Asteraceae Ephemeral herb; bracts cream-white and bronze. In sand over limestone, in low open-heath.		X*		<i>Lotus cruentus</i> Court. Papilionaceae Ephemeral herb; fls maroon. In sand, in low open-heath near coast.		X	
<i>Helipterum polycephalum</i> (A. Gray) Benth. Aster- aceae Ephemeral herb; fls cream. In sand over limestone, in shelter of shrubs in tall open-heath.	X			<i>Loxocarya flexuosa</i> (R. Br.) Benth. Restionaceae Caespitose perennial sedge. In sand, in low open-heath.	X*		
<i>Heterodendrum oleifolium</i> Desf. Sapindaceae Shrub to 3 m. In limestone, in tall open-heath.		X		<i>Lysiana murrayi</i> (F. Muell. et Tate) Tiegh. Loranth- aceae Mistletoe on <i>Acacia ligulata</i> .		X	
<i>Hymenolobus procumbens</i> (L.) Nuttall. Brassicaceae Ephemeral herb. In soil pockets on limestone by sea, and on saline flat near airstrip.	X*			<i>Melaleuca cardiophylla</i> F. Muell. Myrtaceae Shrub. In sand, in tall and low open-heath.	X	X	
<i>Indigofera boviparda</i> A. Morrison. Papilionaceae Sprawling perennial herb; fls deep pink. In sand, in low open-heath.		X		<i>Melaleuca aff. heugelii</i> Endl. Myrtaceae Sprawling shrub 1 m tall x 4 m broad; fls pink. In sand or limestone, in low open-heath.	X*		
<i>Jasminum calcareum</i> F. Muell. Oleaceae Small shrub or straggling climber; fls white, sweetly scented. In sand, in tall open-heath.		X		<i>Melaleuca lanceolata</i> Otto. Myrtaceae Spreading shrub or tree to 4 m; bark grey, stringy. In shell grit near saline flat.	X*		
<i>Juncus bufonius</i> L. Juncaceae In sand, in open grazed area by mill.	X			<i>Melaleuca? oldfieldii</i> F. Muell. Myrtaceae	X*		
<i>Kennedia prostrata</i> R. Br. Papilionaceae Collected by Gaudichaud	X*			<i>Millotia myosotidifolia</i> (Benth.) Steetz. Asteraceae Ephemeral herb; fls white. On sand dunes in open-heath near coast.	X	X	
<i>Keraudrenia hermanniifolia</i> J. Gay. Sterculiaceae Shrub to 35 cm; fls purple with yellow stamens. In sand, in tall open-heath.	X			<i>Mirbelia ramulosa</i> (Benth.) C. A. Gardn. Papilion- aceae Sprawling shrub, fls yellow and red. In sand, in low open-heath/hummock grassland.	X	X	
<i>Lasiopetalum angustifolium</i> W. V. Fitzg. Sterculiaceae Spreading shrub to 40 cm tall; fls pale pink. In sand in tall open-heath.	X			<i>Myoporum acuminatum</i> R. Br. Myoporaceae Shrub 1 m; fls white. On coastal dune, in tall open-heath.	X	X	
<i>Lawrenia densiflora</i> (Bak.f.) Melville. Malvaceae In sand, in tall open-heath.		X		<i>Myoporum adscendens</i> R. Br. Myoporaceae	X		
<i>Lawrenia</i> sp. Malvaceae				<i>Myoporum deserti</i> A. Cunn. ex Benth. Myoporaceae Shrub 50 cm. In sand, in open-heath.	X	X	
<i>Lechenaultia linarioides</i> DC. Goodeniaceae Tangled perennial herb 1 m; fls yellow and red. In sand, in low open-heath.	X*			<i>Myoporum tetrandrum</i> (Labill.) Domin. Myoporaceae Collected by Cunningham and Milne.	X*		
<i>Lechenaultia subcymosa</i> Gardn. & George. Goodeni- aceae Perennial herb; fls pale mauve. In sand over limestone, in low open-heath.		X	X	<i>Neosciadium glochidiatum</i> (Benth.) Domin. Apiaceae Ephemeral herb; fls cream. On saline flat, in low open-shrubland.	X*		
<i>Lepidium linifolium</i> (Desv.) Benth. Brassicaceae Straggling ephemeral herb to 1 m tall, fls white. In sand, in tall open-heath.	X	X		<i>Nicotiana occidentalis</i> Wheeler. Solanaceae Ephemeral herb; fls pale cream. In sand, in tall open-heath.	X	X	
<i>Lepidium pseudo-ruderalis</i> Thell. Brassicaceae Slender ephemeral herb. In sand, in mustering yard.	X*			<i>Nitraria schoberi</i> L. Zygophyllaceae Much-branched shrub to 2 m; fls pale greenish- cream. On sand dune by coast, in tall open-heath.	X	X	
<i>Lepidium rotundum</i> DC. Brassicaceae Ephemeral herb. In sand, in tall open-heath.	X	X		<i>Olearia axillaris</i> (DC.) Benth. var. <i>obovata</i> Benth. Asteraceae	X		
<i>Lepidobolus preissianus</i> Nees. Restionaceae Caespitose sedge, dioecious. In sand, in low open-heath.	X*			<i>Olearia pimelioides</i> (DC.) Benth. Asteraceae		X*	
				<i>Olearia</i> sp. ASG 11568. Asteraceae Straggling shrub, rays white. In limestone, in tall open-heath.			

Table 2—continued

	SW	E	SB		SW	E	SB
<i>Opercularia spermacoea</i> Labill. Rubiaceae	X*			<i>Porana sericea</i> (Gaud.) F. Muell. Convolvulaceae	X	X	
Perennial herb to 35 cm.				Climber; fls blue-purple.			
In sand, in low open-heath.				In sand, in tall open-heath.			
<i>Ophioglossum lusitanicum</i> L. subsp. <i>coriaceum</i> (A. Cunn.) Clausen. Ophioglossaceae	X	X		<i>Poranthera microphylla</i> Brongn. Euphorbiaceae	X	X	
In sandy pockets on limestone, in low open-heath.				Ephemeral herb.			
<i>Oxalis corniculata</i> L. Oxalidaceae	X	X		In sand, in tall open-heath.			
Fls yellow.				<i>Ptilotus alexandri</i> Benl. Amaranthaceae		X	X
In shelter of shrubs of sandy depression, in tall open-heath.				Ephemeral herb.			
<i>Paractaneum novae-hollandiae</i> Beauv. Poaceae		X		In sand, in tall open-heath.			
Ephemeral grass; fls purplish.				<i>Ptilotus divaricatus</i> (Gaud.) F. Muell. Amaranthaceae	X	X	
In sand, in mustering yard.				Straggling perennial herb; fls pink.			
<i>Parietaria debilis</i> Forst. f. Urticaceae	X	X		In sand, in low open-heath.			
Ephemeral herb; stems red, fls green.				<i>Ptilotus exaltatus</i> (Nees) Benth. Amaranthaceae	X	X	
On saline flat, in low open-shrubland, and in limestone by sea.				Ephemeral herb; fls pink.			
<i>Paspalidium gracile</i> (R.Br.) Hughes. Poaceae	X	X		In sand, in tall open-heath.			
Perennial grass; fls green.				<i>Ptilotus gaudichaudii</i> (Steud.) J. M. Black var. <i>parviflorus</i> (Benth.) Benl. Amaranthaceae	X	X	
On rocky limestone near coast, in low open-shrubland.				Ephemeral herb; fls yellow.			
<i>Pentatropis linearis</i> Dcne. Asclepiadaceae		X		In sand, in tall open-heath.			
Climber; fls pale brown-green.				<i>Ptilotus obovatus</i> (Gaud.) F. Muell. Amaranthaceae	X	X	
In sand, in tall open-heath.				Shrub to 70 cm; fls pink.			
<i>Phyllanthus? crassifolius</i> Muell. Arg. Euphorbiaceae	X			<i>Ptilotus villosiflorus</i> F. Muell. Amaranthaceae	X	X	
Small shrub.				Ephemeral herb; fls cream-green and pale pink.			
In limestone, in low shrubland.				On sand dune by coast, in open-heath.			
<i>Pileanthus limacis</i> Labill. Myrtaceae		X	X	<i>Rhagodia crassifolia</i> R.Br. var. <i>latifolia</i> Benth. Chenopodiaceae		X	X
Sprawling shrub to 70 cm tall x 3 m broad, fls pale pink.				Collected by Gaudichaud.	X		
In limestone soil, on cliffs by sea.				<i>Rhagodia preissii</i> Moq. Chenopodiaceae	X	X	
<i>Pimelea gilgiana</i> E. Pritzel. Thymelaeaceae	X*			Shrub to 1.3 m; fruit succulent red.			
Shrub to 35 cm, dioecious; fls white, mostly over.				<i>Rhagodia</i> sp. ASG 11503. Chenopodiaceae			
In sand, in hummock grassland and low shrubland.				Sprawling shrub.			
<i>Pimelea microcephala</i> R.Br. Thymelaeaceae	X	X		In sand, in tall open-heath.			
Shrub to 1.5 m, dioecious; male fls cream; fr orange or red.				<i>Rhagodia</i> sp. ASG 11580. Chenopodiaceae			
In sand, in tall and low open-heath and low shrubland.				Shrub 40 cm.			
<i>Pittosporum phylliraeoides</i> DC. Pittosporaceae	X	X		In sand over limestone, in low open-heath.			
Tree to 3 m; fls cream.				<i>Rulingia cygnorum</i> (Steud.) C. A. Gardn. Sterculiaceae	X*		
In sand, as emergent in tall open-heath, and at base of cliff near sea.				Shrub to 40 cm; fls cream.			
<i>Pityrodia atriplicina</i> (F. Muell.) F. Muell. ex Benth. Chloanthaceae	X*			In sand over limestone, in low open-heath.			
Shrub 1 m; fls pink.				<i>Ruppia maritima</i> L. Ruppiaceae	X*	X	
In sand, in low closed-heath/hummock grassland.				Aquatic herb.			
<i>Pityrodia cuneata</i> (Gaud.) Benth. Dicrostylidaceae	X			In pool on saline flat.			
Much-branched shrub to 1 m; fls pale pink, spotted.				<i>Salicornia blackiana</i> Ulbrich. Chenopodiaceae	X		
In sand, in low open-heath.				Shrub, red and green.			
<i>Plantago varia</i> R.Br. Plantaginaceae	X	X		On saline flat, in low open-shrubland.			
In loam over limestone, in open grazed area.				<i>Salsola kali</i> L. subsp. <i>ruthenica</i> (Iljen) Soo. Chenopodiaceae	X	X	
<i>Plectrachne</i> sp. Poaceae	X*	X		On sand dunes by coast.			
Spinifex; fls straw-pale purple.				<i>Samolus repens</i> (Forst.) Pers. Primulaceae	X	X	
Common, especially in sand, in tall or low open-heath and hummock grassland.				In limestone, by coast.			
<i>Podolepis canescens</i> A. Cunn. ex DC. Asteraceae	X	X		<i>Santalum spicatum</i> (R.Br.) D.C. Santalaceae	X	X	
Ephemeral herb; fls yellow.				Shrub.			
<i>Podolepis gardneri</i> G. L. Davis. Asteraceae		X		In sand, in tall open-heath.			
<i>Podotheca angustifolia</i> (Labill.) Less. Asteraceae	X*			<i>Sarcostemma australe</i> R.Br. Asclepiadaceae	X	X	
Ephemeral herb; fls pale yellow.				Shrub to 1.5 m with latex; fls cream.			
In sand, in tall open-heath.				In sand, in tall open-heath.			
<i>Podotheca gnaphalioides</i> Grah. Asteraceae	X*	X		<i>Scaevola crassifolia</i> Labill. Goodeniaceae	X	X	
Ephemeral herb.				Shrub to 1 m; fls white or pale blue.			
In sand, in tall open-heath.				In sand, in low open-heath.			
<i>Podotheca gnaphalioides</i> Grah. Asteraceae	X*	X		<i>Scaevola holosericea</i> De Vr. Goodeniaceae	X	X	
Ephemeral herb.				Perennial herb to 40 cm; fls pale blue.			
In sand, in tall open-heath.				In sand, in tall open-heath.			

Table 2—continued

	SW	E	SB		SW	E	SB
<i>Scaevola spinescens</i> R.Br. Goodeniaceae	X	X		<i>Tetragonia amplexicoma</i> (Miq.) Hook.f. Aizoaceae	X*		
Divaricately-branched shrub to 70 cm; fls white.				Straggling shrub, fls yellow.			
In sand, in tall open-heath.				In sand, in tall open-heath.			
<i>Scaevola tomentosa</i> Gaud. Goodeniaceae	X	X		<i>Tetragonia diptera</i> F. Muell. Aizoaceae		X	X
Much-branched shrub to 1.5 m; fls gold, turning				Ephemeral herb.			
orange, anthers brown.				In sand at base of low cliff.			
In sand, in tall open-heath.				<i>Threlkeldia diffusa</i> R.Br. Chenopodiaceae	X	X	
<i>Scirpus cernuus</i> Vahl. Cyperaceae	X*			Diffuse perennial herb, lvs succulent.			
In limestone, in open grazed area.				In sand by homestead.			
<i>Scirpus</i> sp. ASG 11610. Cyperaceae				<i>Thryptomene baeckeacea</i> F.Muell. Myrtaceae		X	
Small ephemeral sedge.				Sprawling shrub to 50 cm tall x 1 m broad; fls			
On saline flat, in low open-shrubland.				pink.			
<i>Senecio glossanthus</i> (Sond.) Belcher. Asteraceae	X	X		Common, in sand and limestone, in tall and low			
Ephemeral herb.				open-heath.			
On saline flat, in low open-shrubland.				<i>Thysanotus patersonii</i> R.Br. Liliaceae	X	X	
<i>Senecio lautus</i> Willd. Asteraceae	X	X		Twining herb with tubers, fls pale purple.			
Perennial herb; fls yellow.				In sand over limestone, in tall open-heath.			
In sand or limestone, in low open-heath.				<i>Thysanotus speckii</i> Brittan. Liliaceae		X	
<i>Sida calyxhymenia</i> J. Gay. Malvaceae	X	X		In shelter of shrubs, in sand in low very open-			
Shrub 70 cm; fls pale yellow.				heath.			
In sand, in tall open-heath.				<i>Trachymene elachocarpa</i> (F.Muell.) B. L. Burtt.			
<i>Sida corrugata</i> Lindl. Malvaceae		X		Apiaceae	X		
<i>Solanum lasiophyllum</i> Dun. Solanaceae	X	X		Ephemeral herb; fls white.			
<i>Solanum</i> aff. <i>oldfieldii</i> F.Muell. Solanaceae				In sand, in low open-heath.			
Small shrub 5-40 cm, suckering; fls purple.				<i>Trachymene</i> aff. <i>pilosa</i> Sm. Apiaceae			
In sand, in tall open-heath.				Tiny ephemeral herb; fruit ± smooth.			
<i>Solanum orbiculatum</i> Dun. Solanaceae	X	X		In sand, in open-heath.			
Spreading shrub to 50 cm; fls pale purple.				<i>Tribulus occidentalis</i> R.Br. Zygophyllaceae		X	
On sand dune near coast.				Near homestead.			
<i>Spinifex longifolius</i> R.Br. Poaceae	X	X		<i>Trichodesma zeylanicum</i> (L.) R.Br. Boraginaceae		X	
Perennial grass, dioecious.				Collected by Milne.			
On coastal dunes.				<i>Tricoryne elatior</i> R.Br. Liliaceae	X		
<i>Sporobolus virginicus</i> (L.) Kunth. Poaceae	X	X		Collected by Gaudichaud.			
Perennial rhizomatous grass; fls purplish.				<i>Triglochin calcitrapa</i> Hook. var. <i>isingiana</i> Black.			
In sand, in low open-heath near coast.				Juncaginaceae	X	X	
<i>Spyridium complicatum</i> F.Muell. Rhamnaceae	X*			Ephemeral herb.			
Rounded shrub to 40 cm, with old fls.				In sand, in open grazed area by mill.			
In sand, in low open-heath.				<i>Triglochin mucronata</i> R.Br. Juncaginaceae	X*		
<i>Spyridium?</i> <i>divaricatum</i> Benth. Rhamnaceae	X			Ephemeral herb.			
Small, much-branched shrub.				In sand, in open grazed area by mill.			
In sand, in low open-heath.				<i>Triglochin trichophora</i> Nees. Juncaginaceae	X		
<i>Stackhousia viminea</i> Sm. Stackhousiaceae	X	X		Ephemeral herb.			
Ephemeral herb; fls yellow.				In sand, in tall open-heath.			
In sand, in tall open-heath.				<i>Triodia plurinervata</i> N.T. Burbidge. Poaceae		X	
<i>Stenopetalum sphaerocarpum</i> F.Muell. Brassicaceae	X*			Spinifex, in clumps to 40 cm tall x 2 m broad;			
Ephemeral herb; fls pale yellow.				foliage fine, ± bright green.			
In sand over limestone, in low open-heath.				In sand, in low open/closed-heath with hummock			
<i>Stipa crinita</i> Gaud. Poaceae	X*			grassland.			
In sand, in open-heath.				<i>Vittadinia</i> sp. Asteraceae	X	X	
<i>Stipa elegantissima</i> Labill. Poaceae	X	X		Ephemeral herb; rays pale mauve, fls yellow.			
Perennial grass.				In sand over limestone, in tall open-heath.			
<i>Stipa</i> sp. ASG 11394. Poaceae				<i>Wahlenbergia</i> sp. Campanulaceae			
On sand dune by coast, in open-heath and in low				Ephemeral herb; fls pale blue.			
open-shrubland.				In sand over limestone, in low open-heath.			
<i>Stylobasium spathulatum</i> Desf. Stylobasiaceae	X			<i>Waitzia citrina</i> (Benth.) Steetz. Asteraceae	X	X	
Shrub to 1 m.				Ephemeral herb; fls yellow.			
In sand, in open-heath.				In sand, in tall open-heath.			
<i>Swainsona beasleyana</i> F.Muell. subsp. <i>elegantoides</i>		X		<i>Waitzia podolepis</i> (Gaud.) Steetz. Asteraceae		X	X
A.Lee. Papilionaceae				Ephemeral herb.			
Ephemeral herb; fls maroon-pink, turning blue,				In sand, in open-heath.			
eye pale yellow.				<i>Westingia rigida</i> R.Br. Lamiaceae	X		
In sand over limestone, on sea cliffs.				Much-branched shrub to 70 cm; fls white.			
<i>Swainsona kingii</i> F.Muell. subsp. <i>kingii</i> . Papilionaceae		X		In sand, in tall open-heath.			
Prostrate ephemeral herb; fls maroon.				<i>Zygophyllum ammophilum</i> F.Muell. Zygophyllaceae		X	
In limestone, in tall open-heath.				Ephemeral herb.			
<i>Swainsona phacoides</i> F.Muell. subsp. <i>grandiflora</i>		X		In sand, in low open-heath.			
(Benth.) A.Lee. Papilionaceae				<i>Zygophyllum aurantiacum</i> Lindl. Zygophyllaceae	X	X	
Prostrate ephemeral herb, scapes erect; fls				Straggling perennial herb; fls pale yellow.			
maroon, turning blue, eye yellow.				In sand, in open-heath.			
In sand, in low open-heath.				<i>Zygophyllum</i> aff. <i>aurantiacum</i> Lindl. Zygophyllaceae			
<i>Swainsona</i> sp. ASG 11570. Papilionaceae				Much-branched perennial herb; fls white.			
Prostrate ephemeral herb; fls pink.				On sand dune by coast, in open-heath.			
In limestone, in tall open-heath.				<i>Zygophyllum</i> aff. <i>fruticosum</i> DC. Zygophyllaceae			

Table 3

Exotic species naturalised on Dirk Hartog Island.

Species	Family	Place of Origin
<i>Anagallis arvensis</i> L. var. <i>caerulea</i> Gouan	Primulaceae	Europe
<i>Arctotheca calendula</i> (L.) Levyns	Asteraceae	South Africa
<i>Asphodelus fistulosus</i> L.	Liliaceae	Mediterranean region
<i>Avena barbata</i> Brot.	Poaceae	Mediterranean region
<i>Brassica tournefortii</i> Gouan	Brassicaceae	Mediterranean region
<i>Briza minor</i> L.	Poaceae	Mediterranean region
<i>Bromus diandrus</i> Roth	Poaceae	Mediterranean region
<i>Bromus hordeaceus</i> L.	Poaceae	Mediterranean region
<i>Cenchrus ciliaris</i> L.	Poaceae	Africa/N. India
<i>Cenchrus setigerus</i> Vahl	Poaceae	Africa/N. India
<i>Centaurea melitensis</i> L.	Asteraceae	Europe—W. Asia
<i>Cerastium glomeratum</i> Thuill.	Caryophyllaceae	Europe
<i>Chenopodium murale</i> L.	Chenopodiaceae	Europe
<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	South Africa
<i>Diplotaxis muralis</i> (L.) DC.	Brassicaceae	Europe
<i>Ehrharta brevifolia</i> Schrad.	Poaceae	South Africa
<i>Emex australis</i> Steinh.	Polygonaceae	South Africa
<i>Erodium cicutarium</i> (L.) L. Her. ex Ait.	Geraniaceae	Europe—S. Asia
<i>Hordeum leporinum</i> Link.	Poaceae	Mediterranean region
<i>Hypochoeris glabra</i> L.	Asteraceae	Europe—Asia
<i>Koeleria phleoides</i> (Vill.) Pers.	Poaceae	Mediterranean region
<i>Lavatera cretica</i> L.	Malvaceae	Mediterranean region
<i>Lolium lolium</i> (Bory et Chaub.) Hand-Mazz.	Poaceae	Mediterranean region
<i>Medicago polymorpha</i> L. subsp. <i>polymorpha</i>	Papilionaceae	Mediterranean region
<i>Melilotus indicus</i> (L.) All.	Papilionaceae	Europe—W. Asia
<i>Nicotiana glauca</i> R. Graham	Solanaceae	Argentina
<i>Poa annua</i> L.	Poaceae	Europe—W. Asia
<i>Polycarpon tetraphyllum</i> (L.) L.	Caryophyllaceae	Europe
<i>Ricinus communis</i> L.	Euphorbiaceae	India—tropical Africa
<i>Silene gallica</i> L.	Caryophyllaceae	Europe
<i>Sisymbrium irio</i> L.	Brassicaceae	Mediterranean region
<i>Sisymbrium orientale</i> L.	Brassicaceae	Mediterranean region
<i>Solanum nodiflorum</i> Jacq.	Solanaceae	N. & S. America
<i>Sonchus oleraceus</i> L.	Asteraceae	Europe—Asia
<i>Spergularia rubra</i> (L.) J. & C. Presl.	Caryophyllaceae	Europe
<i>Urospermum picroides</i> (L.) Desf.	Asteraceae	Mediterranean region

cymosa and *Brachysema macrocarpum*. Of the three dominant species on the island—*Acacia ligulata*, *Thryptomene baeckeacea* and *Plectrachne* sp.—the *Acacia* and *Thryptomene* extended well into the South West Province while the *Plectrachne*, though of a typical Ereman genus, is restricted to the island and Edel Land and is marginally Ereman. Several major families which characterise the South West Province are lacking (e.g. Epacridaceae, Droseraceae, Dilleniaceae) or poorly represented (e.g. Proteaceae [1 sp.], Orchidaceae [1 sp.], Haemodraceae [1 sp.]).

If life-form is considered, it can be seen that the woody shrubs are more South Western than Ereman, while the ephemeral herbs are predominantly Ereman. Of the 77 purely South West species on the island, 42 are shrubs or perennial herbs, while of the 61 Ereman only 24 are shrubs or perennial herbs.

Vegetation formation (physiognomy) presents no clearer picture. The widespread open-heath can be considered intermediate, though similar formations but lacking *Triodia* or *Plectrachne* occur near the coast between Tamala and Kalbarri to the south of Shark Bay.

It is clearly difficult to place Dirk Hartog Island in either Province, and it may be best left in a "Transitional zone". However if placed in one or the other the South West Province is preferable because

1. a majority of the species present are either South Western or have strong South Western affinities;
2. the vegetation formations, apart from hummock grassland, are more representative of the South West than the Ereman.

Naturalised flora

Table 3 lists 36 introduced species which are considered naturalised. The country of origin is given after the family. Most have their origin in Europe (especially the Mediterranean region) or South Africa. Several grasses have probably been introduced as pasture species, e.g. *Cenchrus ciliaris*, *C. setigerus* and *Bromus diandrus*. The others have probably come to the island with sheep. All are common weeds of south western Australia except the two *Cenchrus* species. There are 12 Poaceae, 5 Asteraceae, 4 Brassicaceae, 4 Caryophyllaceae, 2 Papilionaceae, 2 Solanaceae and 1 each of seven other families. Thirty are ephemeral herbs, 4 are perennial and 2 are shrubs.

Fauna

Mammals

Lagostrophus fasciatus (Péron). Banded Hare-wallaby.—This species was first described by Péron in 1807. He reported it as being very common on Dirk Hartog as well as on Bernier

and Dorre Islands. It is presumably the wallaby seen by William Dampier in 1699 (Dampier 1729, p. 85).

L. fasciatus is known only from the South west of Western Australia and its northern limit is Bernier Island. To-day there is little doubt that this species is extinct on Dirk Hartog as well as on the mainland. It survives only on Bernier and Dorre Islands. Local knowledge from the Shark Bay area puts the date of extinction of the "wallabies" (possibly including the two species below) in the 1920s. It must have been some time ago since we did not locate any skeletal remains. It is perhaps pertinent that Shortridge (1909, p. 818) stated that "... in the south of Dirk Hartog there is a large sheep station and the wallabies are said to have entirely left that end of the island".

Following our 1972 visit the Western Australian Wildlife Authority and Sir Thomas Wardle agreed on a programme, to be carried out by the Western Australian Wildlife Research Centre, to attempt the re-introduction of the Banded Hare-wallaby to Dirk Hartog Island. In April 1974 11 adult animals (4 male, 7 female, 6 with small pouch young) which had been captured on Dorre Island were placed in two pens on Dirk Hartog. By December, 1976, the breeding colony had increased to 33 adults and 3 dependent young. An attempt to reduce feral cat numbers (see below) is under way, and the first releases of wallabies to the wild took place during May 1977.

Knowledge of the biology of *Lagostrophus* is summarised by Ride and Tyndale-Biscoe (in Ride *et al.* 1962) and Tyndale-Biscoe (1965).

Lagorchestes hirsutus (Gould). Western Hare-wallaby.—This wallaby occurs on Bernier and Dorre Islands but is very rare on the mainland. While some authors have noted that it occurred or probably occurred on Dirk Hartog (e.g. Shortridge 1909; Glauert 1933; Main 1961; Main and Yadav 1971) it appears that no specimen has been collected and some doubt must remain that it ever existed there.

Bettongia lesueur (Quoy & Gaimard). Boodie.—The Boodie was first collected as a skull picked up on Dirk Hartog by Freycinet's Expedition (Quoy and Gaimard 1824). They obtained no entire animals but caught glimpses of an animal that lived in burrows and foraged in the debris on the beaches at night. This description fits that of *B. lesueur*, but not of any of the hare wallabies. No specimen has since been collected on Dirk Hartog.

The Boodie once had a wide distribution in the southern two thirds of Australia. It appears to be extinct on the mainland and is now confined to Barrow, Boodie (a small island south of Barrow), Bernier and Dorre Islands. We saw no sign of it during our visits.

Perameles bougainville (Quoy & Gaimard). Marl.—This bandicoot is common on Bernier and Dorre Islands, but has not been collected on Dirk Hartog. It was first collected on Peron Peninsula by Quoy and Gaimard and the Western Australian Museum has a single specimen

from Onslow which was collected in 1909. The only possible reference to this species on Dirk Hartog is the sighting of a "small opossum" on the island by A. C. Cunningham, the botanist with King's expedition in 1821 (King 1827). This has been interpreted by Alexander (1915, p. 123) as being a reference to *Perameles bougainville*. We saw no evidence of it during our visit.

Pseudomys hermannsburgensis (Waite). Sandy Mouse.—Nine specimens have been taken from the island. Four were from a trapline located 10 km south of the homestead. This area consists of deep white sand with occasional limestone outcrops and the vegetation is an *Acacia* low shrubland mixed with spinifex (*Plectrachne* sp.). One was from an *Acacia* thicket at the base of a dune 13 km south of the homestead. Two came from red sand near Sandy Point outcamp where the vegetation is a tall shrubland of *Acacia ligulata*, *Alyogyne cuneiformis* and *Thryptomene baeckeacea* with spinifex (*Plectrachne* sp.) as a scattered ground cover. One specimen from Sandy Point was taken during September 1972, the remainder in April 1974. A. G. Wells collected two specimens at Herald Bay in September 1973. The species has not previously been recorded from Dirk Hartog. It has a wide distribution in the dry parts of the interior (Ride 1970) and is also known from Rosemary Island (Burbidge and Prince 1972).

Pseudomys albocinereus (Gould). Ashy-grey Mouse.—Two specimens were taken, both in April 1974, at a location 10 km south of Dirk Hartog homestead. The soil and vegetation are described above under *P. hermannsburgensis*. This species was also previously unknown from Dirk Hartog. It occurs on Bernier and Dorre Islands, and on the mainland in various sand-plain habitats in the south-west.

Mus musculus (Linnaeus). House Mouse.—Nine specimens have been collected, two in September 1972 and the remainder in April 1974. This species was present in all habitats which were trapped and occurs commonly around the homestead.

Nyctophilus geoffroyi (Leach). Lesser Long-eared Bat.—In September 1972, one specimen was captured by hand as it was flying out of a cave in the cliffs on the western side of the island near West Coast Mill. The species has a wide distribution.

Eptesicus pumilis (Gray). Little Bat.—Two specimens were taken in April 1974. One was collected at Sandy Point Outcamp and the other in a cave near West Coast Mill. The species has a wide distribution.

Capra hircus (Linnaeus). Goat.—We saw about 140 goats during the 1972 visit. Four flocks were seen; one of 56, one of about 50 and two of 20. At the time station hands estimated that there were about 700 goats on the island. Our observations suggest that this figure may be conservative.

The domestic goat turned feral is now a common animal in many parts of Western Australia and the damage which it is doing to the

vegetation is only beginning to be appreciated by pastoralists and the general public. On Bernier Island goats were introduced in 1899 and extensive damage has been done to the vegetation. Air photographs show that the number and extent of sand dune blowouts have increased greatly over the past 20 years. Following the recommendations of a party of scientists who visited the island in 1959 (Ride *et al.* 1962) the Department of Fisheries and Wildlife carried out a campaign of attack on the goats and by 1972 more than 450 had been shot. We estimate that at the commencement of shooting in 1959 Bernier Island carried about 350 goats, or 1 goat to 12 ha. With a similar density Dirk Hartog could support a population of about 5 000.

However, on Dirk Hartog goat density is affected by two factors not present on Bernier. These are the presence of drinking troughs which may allow an even greater density, and competition for food from sheep. Sheep numbers in the past have been over 10 000 (see below) and this may have kept goat numbers down. However, goats tend to browse shrubs much more than do sheep and would not always be in direct competition for food.

Damage to vegetation by sheep and goats on Dirk Hartog was obvious but it did not appear to be worse than that on Bernier Island except where heavy overgrazing had occurred near drinking troughs.

Following the 1972 visit we voiced our concern about goats to Sir Thomas Wardle and he responded by placing a bounty on them. About 800 were destroyed during the following two years.

Ovis aries (Linnaeus). Sheep.—Dirk Hartog has been used as a sheep station since 1899. The number of sheep on the island has usually been between 10 000 and 11 000. In 1972 the population was only about 4 000 and only the southern two-thirds of the island was stocked.

Equus caballus (Linnaeus). Horse.—During our 1972 visit we were told that there were about 12 horses on the island, all mares.

Camelus dromedarius (Linnaeus). Camel.—Carter (1917) records that during his visit camels were used to take rations to men stationed at outcamps and windmills. There are no camels on the island at present.

Felis catus (Linnaeus). Domestic Cat.—The domestic cat is well established on Dirk Hartog. Although sightings of the animal itself were infrequent, tracks were seen all over the island.

It is not known when the species became established but it seems probable that cats were taken to the island when the sheep station was established. Carter (1917, p. 605) states that "cats . . . are now becoming numerous on the island".

Feral cats are common and widespread on the Australian mainland. They are also known from three other islands off the west coast—Trimouille and Hermite islands in the Monte Bello group and Rottne Island near Perth. On Hermite

they have apparently been responsible for the disappearance of two species of marsupials and two species of birds (Burbidge 1971). These are the Spectacled Hare-wallaby (*Lagorchestes conspicillatus*), Golden Bandicoot (*Isodon auratus*), Black and White Wren (*Malurus leucopterus*) and Spinifex-bird (*Eremiornis carteri*). On Rottne Island the cats have been reduced in number by poisoning programmes.

Two cats shot near the homestead in April 1974 had a variety of materials in their stomachs. In both a large centipede predominated but one had the remains of a Zebra Finch and the gecko *Gehyra variegata* while the other contained remains of a Silver Gull.

Dugong dugon (Lacépède). Dugong.—Shark Bay is considered to be the southern limit of the range of this species on the west coast, although occasional animals have been sighted further south, for example off Geraldton. On 3 September 1972, we saw between 30 and 40 Dugong feeding in shallow water adjacent to Quoin Bluff South. One or two are often seen near the homestead.

Neophoca cinerea (Péron & Lesueur). Australian Sea Lion.—King (1827) records that Cunningham, the botanist accompanying his expedition, saw a Sea Lion on Dirk Hartog Island in 1821. Local knowledge indicates that this species is occasionally found in Shark Bay, although the northern limit of its distribution is usually the Abrolhos Islands.

Mammalian Sub-fossil Material.—Because of the lack of evidence regarding the presence of *Lagorchestes hirsutus* and *Perameles bougainville* we arranged for Dr D. Merrilees and Mr A. Baynes of the Western Australian Museum to visit the island and collect sub-fossil material. During a short visit in April 1974 they excavated cave deposits at Herald Heights and Notch Point with the following results (Merrilees and Baynes, pers. comm.).

Herald Heights

Sminthopsis cf. *murina*
Antechinus apicalis
Dasyurus cristicauda
Perameles bougainville
Bettongia lesueur
Bettongia penicillata
Leporillus conditor
Pseudomys hermannsburgensis
Pseudomys shortridgei
Pseudomys praeconis
Pseudomys sp.

Notch Point

Dasyurus geoffroyi
Perameles bougainville
Bettongia lesueur
 cf. *Pseudomys praeconis*

The *Pseudomys* sp. from Herald Heights is not *P. albocinereus* but is larger and might be *P. desertor*. It can be seen that although *Perameles* did occur on Dirk Hartog at some time the deposits did not yield remains of *Lagorchestes*. This does not prove that *Lagorchestes* did not

occur there. With the exception of the *Bettongia* spp., all the above are comparatively small animals and the deposits may have been accumulated by owls or other similar-sized predators. *Bettongia lesueur* live in burrows and could have made their own way into these caves. There are no *Lagostrophus* in the deposits, and it and the similarly sized *Lagorchestes* may have been too large to be taken by the predator concerned.

In April 1974, W. K. Youngson found what appeared to be the sub-fossil remains of an owl pellet deposit in a cave near the ocean adjacent to West Coast Mill. This deposit contained remains from the following species: *Perameles bougainville*, *Dasyurus geoffroyi*, *Dasyercus cristicauda*, *Sminthopsis cf. murina*, *Leporillus conditor*, *Pseudomys hermannsburgensis*, *P. praeconis*, *P. shortridgei* and *Nyctophilus geoffroyi*.

Birds

Observations on the birds of Dirk Hartog Island have been the subject of a number of publications over the years, including Carter (1917, 1923), Whitlock (1921), Ashby (1927),

Sedgwick (1968), Wells and Wells (1974) and Davies and Chapman (1975). The last of these provides a comprehensive summary of the observations of previous authors and lists some 77 species for the island, four of which are seabirds listed as "off Dirk Hartog". To this we can add 7 species—*Anas gibberifrons* (Grey Teal), *Tringa brevipes* (Grey-tailed Tattler) seen in April 1972, *Nymphicus hollandicus* (Cockatiel) seen in April 1974, *Calidris canutus* (Knot), *Sterna dougallii* (Roseate Tern), *S. bengalensis* (Lesser Crested Tern) and *Cheramoeca leucosternum* (White-backed Swallow) seen in December 1976. Tattlers were also plentiful at the time of this visit. We also observed a single Rock Dove or Domestic Pigeon (*Columba livia*) on the island in 1972. This was a stray racing pigeon, carrying a Pigeon Racing Federation band. Wells and Wells (1974) recorded another racing pigeon in 1973. From Davies and Chapman's Appendix 5—Species not seen since 1921—we can remove Large Sand Dotterel (seen in 1972 and 1976), Greenshank (1974 and 1976), Bar-tailed Godwit (1972 and 1976) and Little Wood Swallow (1972).

* <i>Pelecanus conspicillatus</i>	Australian Pelican	* <i>Sterna bergii</i>	Crested Tern
* <i>Phalacrocorax varius</i>	Pied Cormorant	† <i>Sterna bengalensis</i>	Lesser Crested Tern
* <i>Egretta sacra</i>	Reef Heron	<i>Geopelia cuneata</i>	Diamond Dove
† <i>Tadorna tadornoides</i>	Mountain Duck	<i>Phaps chalceptera</i>	Common Bronzewing
* <i>Anas gibberifrons</i>	Grey Teal	<i>Cacatua sanguinea</i>	Little Corella
<i>Accipiter fasciatus</i>	Australian Goshawk	<i>Cacatua roseicapilla</i>	Galah
* <i>Accipiter cirrocephalus</i>	Collared Sparrowhawk	† <i>Nymphicus hollandicus</i>	Cockatiel
* <i>Aquila audax</i>	Wedge-tailed Eagle	<i>Neophema petrophila</i>	Rock Parrot
<i>Hieraaetus morphnoides</i>	Australian Little Eagle	<i>Cuculus pallidus</i>	Pallid Cuckoo
* <i>Haliaeetus leucogaster</i>	White-breasted Sea Eagle	<i>Chrysococcyx basalis</i>	Horsfield Bronze Cuckoo
<i>Circus assimilis</i>	Spotted Harrier	<i>Ninox novaeseelandiae</i>	Boobook Owl
* <i>Pandion haliaetus</i>	Osprey	<i>Eurostopodus guttatus</i>	Spotted Nightjar
* <i>Falco cenchroides</i>	Nankeen Kestrel	† <i>Cheramoeca leucosternum</i>	White-backed Swallow
<i>Falco berigora</i>	Brown Falcon	* <i>Hirunda neoxena</i>	Welcome Swallow
<i>Turnix varia</i>	Painted Quail	<i>Petrochelidon nigricans</i>	Tree Martin
<i>Rallus philippensis</i>	Banded Landrail	* <i>Anthus novaeseelandiae</i>	Australian Pipit
* <i>Eupodotis australis</i>	Australian Bustard	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-Shrike
* <i>Haematopus ostralegus</i>	Pied Oystercatcher	<i>Cincloramphus cruralis</i>	Brown Songlark
* <i>Haematopus fuliginosus</i>	Sooty Oystercatcher	* <i>Malurus leucopterus</i>	Black-and-white Wren
* <i>Vanellus tricolor</i>	Banded Plover	* <i>Malurus lamberti</i>	Variegated Wren
<i>Peltohyas australis</i>	Australian Dotterel	* <i>Stipiturus malachurus</i>	Southern Emu-Wren
* <i>Charadrius alexandrinus</i>	Red-capped Dotterel	* <i>Sericornis maculatus</i>	Spotted Scrub-Wren
* <i>Charadrius leschenaulti</i>	Large Sand Dotterel	* <i>Calamanthus fuliginosus</i>	Field-Wren
† <i>Pluvialis squatarola</i>	Grey Plover	<i>Amytornis textilis</i>	Western Grass-Wren
* <i>Arenaria interpres</i>	Turnstone	* <i>Ephthianura albifrons</i>	White-fronted Chat
† <i>Numenius phaeopus</i>	Whimbrel	<i>Ephthianura tricolor</i>	Crimson Chat
† <i>Numenius madagascariensis</i>	Eastern Curlew	<i>Petroica goodenovii</i>	Red-capped Robin
† <i>Tringa nebularia</i>	Greenshank	<i>Petroica cucullata</i>	Hooded Robin
<i>Tringa hypoleucos</i>	Common Sandpiper	* <i>Rhipidura leucophrys</i>	Willie Wagtail
* <i>Tringa brevipes</i>	Grey-tailed Tattler	<i>Oreoica gutturalis</i>	Crested Bell-Bird
† <i>Calidris canutus</i>	Knot	<i>Dicaeum hirundinaceum</i>	Mistletoe Bird
* <i>Calidris acuminata</i>	Sharp-tailed Sandpiper	* <i>Zosterops gouldi</i>	Western Silvereye
* <i>Calidris ruficollis</i>	Red-necked Stint	<i>Lichmera indistincta</i>	Brown Honeyeater
* <i>Limosa lapponica</i>	Bar-tailed Godwit	* <i>Meliphaga virescens</i>	Singing Honeyeater
* <i>Himantopus himantopus</i>	White-headed Stilt	* <i>Poephila guttata</i>	Zebra Finch
* <i>Burhinus magnirostris</i>	Southern Stone-Curlew	<i>Grallina cyanoleuca</i>	Magpie-Lark
* <i>Larus pacificus</i>	Pacific Gull	* <i>Artamus cinereus</i>	Black-faced Wood-Swallow
* <i>Larus novaehollandiae</i>	Silver Gull	* <i>Artamus minor</i>	Little Wood-Swallow
* <i>Hydroprogne caspia</i>	Caspian Tern	* <i>Cracticus torquatus</i>	Grey Butcher-Bird
† <i>Sterna dougallii</i>	Roseate Tern	* <i>Corvus bennetti</i>	Little Crow
<i>Sterna nereis</i>	Fairy Tern		

A full list of those species known from the island follows. Those birds observed by us in 1972 are marked with an asterisk and additional species seen by us since 1972 with a dagger.

The avifauna of Dirk Hartog Island does not comprise a large number of species but it does show some interesting differences from that of Peron Peninsula, immediately to the east. Wrens are much more common on the island. Indeed Carter (1917, p. 571) suggested that "Dirk Hartog might be called an island of Wrens, as at least ninety of every hundred land-birds seen are Wrens". On the other hand a number of common arid zone species which occur on Peron Peninsula are uncommon or absent on the island, e.g. Crested Pigeon, Wedgebill, Pallid Cuckoo and Crested Bell-Bird. Davies and Chapman (1975) suggest that this could be due to some species having only recently arrived in the area. It could also be due to the difference in soils and vegetation—Peron Peninsula has a vegetation similar to much of the Murchison (Beard 1976) while Dirk Hartog has no Bowgada (*Acacia ramulosa*) and has a less dense shrub layer and more heath-like formations. Dirk Hartog's avifauna will probably prove to be more akin to the mainland south of the island (Edel Land) which has a similar vegetation.

Most species recorded from Dirk Hartog have wide-ranging distributions and many, e.g. the Zebra Finch, Little Crow and Little Wood-Swallow are typical of the arid zone. However, two southern species, the Rock Parrot and the Southern Emu-Wren occur here at the northern end of their range. The Spotted Scrub-Wren extends northward only as far as Bernier and Dorre Islands. Other species close to the northern end of their range are the Western Silvereye and White-fronted Chat. The Black-and-white Wren is of special interest, being restricted to Dirk Hartog and Barrow Islands.

On 3 September 1972 we inspected the nesting colony of Pied Cormorants at Quoin Bluff South. We estimated the number of nests at about 2 500, the same figure reached by Whitlock in 1920. Only about 1% contained eggs; most contained half grown young.

Other birds which were breeding during this visit included Grey Teal (young almost fully fledged), Nankeen Kestrel (eggs), Caspian Tern (one nest with 2 eggs on Cape Ransonnet), Crested Tern (one chick on Meade Island), White-breasted Sea Eagle (a chick in a nest at Quoin Bluff South), Osprey (several nests, both eggs and chicks present), Banded Plover (a nest at Two Wells Mill, one young almost fully fledged near Bottom Ten Mile Mill) and Little Crow (several nests; one we inspected had 6 eggs, another at Cape Inscription had newly hatched chicks).

On 9 December 1976 we found a Roseate Tern colony of between 200 and 300 nests on the northern tip of Meade Island which is adjacent to the Homestead and joined to Dirk Hartog Island at low tide. Most nests had one egg, 2 to 3% had two eggs and in about 5% the eggs

had recently hatched. Over 500 terns were sighted in the vicinity; between 5 and 10% were in juvenile plumage.

Reptiles

The following species have been collected from Dirk Hartog Island and specimens are lodged in the Western Australian Museum.

GEKKONIDAE

Crenadactylus ocellatus horni (Lucas & Frost)
Diplodactylus spinigerus Gray
Diplodactylus vittatus Gray
Gehyra variegata (Duméril & Bibron)
Heteronotia binoei (Gray)
Nephrurus levis occidentalis Storr
Phyllurus mili Bory

PYGOPODIDAE

Delma nasuta Kluge
Lialis burtonis Gray
Pygopus lepidopodus (Lacépède)

AGAMIDAE

Amphibolurus maculatus maculatus Gray
Amphibolurus minor Sternfeld
Amphibolurus parviceps (Storr)
Amphibolurus reticulatus (Gray)

SCINCIDAE

Cryptoblepharus carnabyi Storr
Ctenotus fallens Storr
Ctenotus lesueurii (Duméril & Bibron)
Ctenotus youngsoni Storr
Egernia stokesii badia Storr
Lerista elegans (Gray)
Morethia lineocellata (Duméril & Bibron)
Lerista lineopunctulata (Duméril & Bibron)
Lerista praepedita (Boulenger)
Orolepida branchialis (Günther)
Tiliqua rugosa (Gray)

VARANIDAE

Varanus gouldii (Gray)

ELAPIDAE

Demansia olivacea (Gray)
Demansia reticulata (Gray)
Pseudechis australis (Gray)
Vermicella littoralis Storr

HYDROPHIIDAE

Hydrophis elegans (Gray)
Hydrophis major (Shaw)

Ours were the first extensive collections of reptiles made on Dirk Hartog Island. In general the species present are typical of the warmer and drier parts of south-western Australia. The only northern element is the gecko *Nephrurus levis*, which, however, extends as far south as Geraldton.

The skink *Ctenotus youngsoni* is restricted to the Shark Bay area, being known only from Dirk Hartog and the northern part of Edel Land.

Invertebrates

No systematic collecting of invertebrates was attempted. On 29 April 1974, W. K. Youngson collected a sample of humic soil from near Sandy Point from which five species of land snail were obtained. These were *Westralaoma* sp., *Themapupa* sp., *Australbinula* sp., *Austrosuccinea* sp. and *Bothriembryon* sp. Publications on invertebrates from Dirk Hartog include Ashby (1929), Hale (1929) and Allender (1969).

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