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DUPLICATE

DEPARTMENT OF FISHERIES AND FAUNA
WESTERN AUSTRALIA

REPORT VIII

REPORT ON A VISIT OF INSPECTION TO BARROW ISLAND NOVEMBER, 1969

By A. A. Burbidge and A. R. Main

Published by the Director of Fisheries and Fauna, Perth, under the authority of the Hon. R. Davies, M.L.A., Minister for Fisheries and Fauna

1971

Department of Fisheries and Fauna

Western Australia

REPORT

ON A VISIT

TO

BARROW ISLAND,

By

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1969

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REPORT ON A VISIT OF INSPECTION TO BARROW ISLAND

November, 1969

INTRODUCTION

The aim of the inspection was to examine the effects on the fauna and flora of the oil exploration initiated in mid-1963 by West Australian Petroleum Pty. Ltd. (WAPET) and the construction and development programme which followed in 1966 and which is now nearing completion.

The inspection party was as follows:

a) from the Department of Zoology, Univeristy of Western Australia, Professor A.R. Main (also a member of the Western Australian Wild Life Authority), Professor W.R. Dawson, (Visiting from the University of Michigan at Ann Arbor), Mr. H. Bakker and Mr. P.S. Kennington.

b) from the Department of Fisheries and Fauna, Mr. B.K. Bowen (Director), Dr. A.A. Burbidge and Mr. R.I.T. Prince.

B.K. Bowen flew direct to Barrow Island and the remainder of the party departed Perth on Friday, November 14, in two longwheel-base land-rovers. After waiting one day at Onslow, the party was taken to the island by helicopter on Monday 17th. The vehicles arrived by landing barge the following day (Plate 1). While on the Island, the party was accompanied and assisted by Mr. W.H. Butler (Conservation consultant to WAPET) in a vehicle provided by WAPET.

Messrs. Bowen and Main departed for Perth by air Friday 21st and the remainder of the party departed by landing barge Saturday 22nd.

During the whole of their stay, the party received every assistance from Mr. Butler and the WAPET field Superintendent on the island (Mr. B. Cook).

GENERAL IMPRESSIONS

Approaching the island by helicopter we were impressed by the conspicuous and well formed lens of smog which lay over the island. The lens was continuously fed by smoke and unburnt residues from the eight gas flares burning on the island. The lens of smog was so well formed and constant in dimensions that it must have considerable effect on the radiation received by the island. Enquiry on the island revealed that as from mid-1970 burning of gas will be considerably reduced as gas now burning will be re-circulated to maintain production and so from this time the hazard of smog as an element in changing the environment of the island is likely to be reduced.

Close approach to the island revealed it as a tussock grassland dominated by Triodia (Plate 2) cut by a maze of bulldozed survey lines, pipe lines, tracks and roads over the southern three quarters of the island which is the producing oilfield (Plates 3,4,5 and 6). The net effect was to cut the vegetation into numerous small or relatively small areas and at the same time increase the boundary areas, e.g. road and track verges and other disturbed areas on which early stages in plant regeneration could proceed.

DETAILED EXAMINATION OF THE ISLAND

After the first night when the party was accommodated in the WAPET Camp we were based at a prepared drill site near Cape Malouet on the north west coast.

Examination of the present principal area of activity of WAPET and their associated sub-contractors in the general area from the centre to the south of the island revealed the following stages of activity:

(1) Seismic survey lines and associated tracks and grading. These are extensive but generally narrow and travel for great distances. The activity has ceased and it is only in conjunction with subsequent activities that they assume a significant part of the habitat destruction.

(2) Development Drilling. This takes place on a designated grid and calls for the construction of access tracks and the preparation of well sites. On average an area of 150 x 100 ft. is required for each well site which often has to be built up with gravel dug from adjacent valleys.

(3) Production. Producing wells require to be linked by pipe to crude oil separator stations and a storage tank farm complex. To effect pipeline construction, lengths of pipe are dragged on roads and finally cross country to their point of destination. This causes some additional, though not extensive destruction of vegetation.

EFFECTS ON VEGETATION

The island is a tussock grassland dominated by Triodia and the usefulness of the island as a sanctuary for fauna will depend on the way in which the flora is able to re-establish on the areas disturbed by exploration, drilling and production activities, and then abandoned.

In order to see the way in which vegetation was re-establishing we did two things:

A. examined areas which have been subjected to accidental fires at various times in the past.

B. examined areas which had been disturbed at various times in the past and then left undisturbed. These areas were of two sorts:

(a) areas from which soil had been excavated for the construction of well sites.
(b) an old airfield

A. Regeneration after burn:

Mr. Butler was able to show us a number of localities where small fires had occurred. These, in order of increasing age, were:

i. At the Richter Borden camp, behind (i.e. to the west of) their rubbish tip where a fire had escaped about 5 weeks prior to our visit - i.e. about mid-October 1969. In the burnt area Triodia was already sprouting from the old tussock base while Petalostyles was shooting from the root stock. Also present were occasional plants of Trichodesma. On the other hand, on the graded areas where a fire break had been made with a light scrape, only Petalostyles was shooting.

ii. A burnt area on sand (near Well B14) on the south end of the island there had been a small burn in the first week of August 1969. Since the burn, rain had fallen and this had meant good regeneration. The following were conspicuous:-

Triodia sp.
Acacia sp.
Stylobasium spathulatum Desf.
Adriana tomentosa Gaud.
Corchorus parviflorus Domin.
Heliotropium ovalifolium Forsk.
Trichodesma zeylanicum

All the above appear to be regenerating from root stocks and all the regenerating species are apparent in the unburnt surrounding country. The regenerating Triodia was heavily grazed.

iii. An area, west of the WAPET office block, burnt in April 1965, was searched for signs of the fire:

a) on the ground by Bevan Cook and H. Butler who was there when the fire occurred and could not now locate it on the ground

b) B. Cook and H. Butler searched for the area by helicopter and were again unsuccessful

c) H. Butler and A. Main made a further search on the ground and were unable to identify the burnt area by vegetational differences.

iv. An area of red sand dunes near to the landing site on the east side of island had been burnt in 1962. This area was conspicuous for its bare sandy soil and well developed stand of shrubs and small trees (Plate 7).

The following plants were collected :-

Triodia pungens R. Br.
Condonocarpus continifolius (Desf.) F. Muell.
Acacia bivenosa D.C.
Acacia coriacea D.C.
Acacia gregorii F. Muell.
Stylobasium spathulatum Desf.
Petalostyles labichioides R. Br.
Diplopeltis eriocarpa (Benth.) Hemsl.
Corchorus parviflorus Domin.
Triumfetta appendiculata F. Muell.
Hannafordia quadrivalvis F. Muell.
? Keraudrenia sp.
Cyanchum floribundum R. Br.
Clerodendrum tomentosum R. Br.
Heliotropium ovalifolium Forsk.
Scaevola globulifera Labill.
? Scaevola spinescens R. Br.
Olearia axillaris F. Muell.
Pterocaulon sphacelatum (Labill) Benther Book

B. Regeneration After Disturbance

(a)i. A disused gravel pit in a water course 500 yards north of well P.16 which was last used for material for well site preparation in February 1966. Whereas the undisturbed areas were dominated by Triodia angusta the disturbed area had few very small Triodia tussocks, 4-7 inches in diameter, but numerous examples of the following :-

Acacia gregorii F. Muell.
Acacia pyrifolia D.C.
Stylobasium spathulatum Dest.
Petalostyles labichioides R. Br.

Indigofera monophylla D.C.
Tephrosea rosea F. Muell. ex Benth.
Adriana tomentosa Gaud.
Corchorus parviflorus Domin.
? Heliotropium sp.
Trichodesma zeylanicum (L.) R. Br. (Most plants already dead)
Solanum diversiflorum F. Muell.
Solanum lasiophyllum Dun.
Pterocaulon sphacelatum (Labill.) Benth. et Hook
? Pterigeron adscendens Benth.
Pterigeron macrocephalus (F. Muell.) Benth.
Moonia trichodesmoides (F.Muell.) Benth.

ii. The area which had been prepared for Well No. 52 near Cape Dupuy (Plate 8). There were coastal dunes to the north but the soil around the well was firmly packed and although the well was abandoned 18 May 1966, only the following were present:

Corchorus parviflorus Domin.
Abutilon exonemum F. Muell.
Heliotropium ovalifolium Forsk.

iii. The G.S.I. area cleared on east side of North Road October 1964 (Plate 9), had the following regenerating:

Cassia notabilis F. Muell.
Adriana tomentosa Gaud.
Moonia trichodesmoides (F. Muell.) Benth.

(b) Bell Bros. old airfield (Plate 10); this air strip had ceased to be used in November 1963. In general appearance the strip looked like most other disturbed areas. The dominant shrubs were:

Acacia sp.
Stylobasium spathulatum Desf.
Tephrosia rosea F. Muell. ex Benth.
Heliotropium ovalifolium Forsk.
Trichosdesma zeylanicum (L.) R. Br.
Solanum sp.

Since this was apparently the oldest regeneration of a disturbed area available for study we decided to quantify the regeneration of tussock grasses. All of these were heavily grazed and none was greater than 2 feet in diameter. The density of tussocks was quantified by taking 10, 10 yard strips across the width of the old airstrip (100 ft. wide). All the tussocks present in each 10 yard strip were counted. One strip had no Triodia tussocks while one had 6. The mean per sample plot (10 x 33 yard) was 2.7 ± 1.4 tussocks. The adjacent undisturbed area had very few tussocks as small as the largest on the old strip and in most of the area tussocks were contiguous.

CONCLUSIONS

It seems clear from the foregoing (see Table 1) that the vegetation on the island is a fire climax and recovers readily after fire. On the other hand it is poorly adapted to re-invading disturbed areas and the regeneration of cover is a much slower process than recovery after fire.

ANIMALS

The fauna of Barrow Island is well known and no trapping was done. However, the roads and tracks of the island were traversed by landrover on the nights of 17th and 18th and the species seen were recorded in 0.1 mile intervals. Two traverses were done as follows : H. Butler driving, A. Main recording: Vehicle speed 20 - 25 m.p.h.

November 17. Commenced 2000 hrs. return to camp 2350 hrs.

The night was clear and windless, air 26°C., moon in first quarter. The tracks traversed were; up the east coast to storage tanks then north and west to valley of giants, then to landing site then back to cross the road to storage tanks, then to WAPET camp. In all a total of 46 miles was covered.

November 18.

Clear night, light northerly breeze. Air 26°C. falling to 25°C. by close of traverse. Commenced 2025 hrs. completed 2300 hrs. The tracks traversed were; west from storage tanks then south. Sites passed were as follows: P.17, P.36,

Q.63, Q.52, Biggoda Creek, L 85, F 36, F 44, F 52, G 87, B 16, B 15, B 14, (Burnt ground) B 23, Bandicoot Bay, B 22, G 87, F 52, F 43, E 31, E 32, E 25, then to main camp where traverse finished. In all a total of 35 miles were traversed. Bettongs, Hare Wallabies, the rats Pseudomys and Zyzomys and Bandicoots (Plate 11) were common on the lawns of the main camp and these plus possums, were very abundant about the rubbish tip. Animals seen on the track in the vicinity of these sites were not counted.

Summary of traverses made on Barrow Island

November, 1969

November 17	Bettong	Hare Wallaby	Bandi-coot	Euro	All Murids	Possum	Total
Northern part (undisturbed)	30	51	8	5	6	8	108 + 1 rock wallaby
November 18							
Southern part (disturbed)	16	73	18	2	6	13	128

These figures give the following means per 2 miles of travel

	NORTH	SOUTH
Bettong	1.3	0.9
Hare Wallaby	2.2 ± 2.4	4.0 ± 3.17
Bandicoot	0.35	1.125

From the inspection of the figures it appears that Bettongs are rarer in the south where Hare Wallabies and Bandicoots are more common but the high standard error makes comparison on this basis difficult. The figures can also be compared by taking the numbers of the common species seen in the whole of the southern traverse and the sightings

made during the first 35 miles of the northern traverse. The following table sets out the figures for the common species.

	Bettongia	Hare Wallaby	Bandicoot	Total
North	26	42	8	76
South	16	73	18	107
Totals	42	115	26	183

Statistical comparison of the above shows that:-

i. Bettongs are not significantly different in abundance in the north and south ($p > 0.1$)

ii. Hare Wallabies are significantly more abundant in the south than the north ($p < 0.01 > 0.001$)

iii. Bandicoots are more abundant in the south than the north at the conventional level of $p = 0.05$

iv. The three common species are different in their distribution between north and south ($p < 0.01$). These differences result from Bettongs being more abundant in the north while Hare Wallabies and Bandicoots are more common in the south. Hare Wallabies may be abundant because of high quality grazing provided by regeneration along track verges. Such an interpretation implies that shelter sites are not yet limiting numbers, on the other hand heavy grazing on the verges may be controlling plant regeneration. (See also under diet and general discussion).

The observed abundance of Euros (Plate 12) on Barrow Island poses a grave problem. The density on Barrow Island is as follows :

Northern Traverse 1 euro / 9 miles

Southern Traverse 1 euro /18 miles

As comparison the figures from night travel taken October-December at Woodstock where the country is also a tussock grassland gave a density of 2.08 ± 1.44 euros per mile. Thus the density on Barrow may be from 1/20 to 1/40 of that on the adjacent mainland at Woodstock. The figures for Woodstock have been equated by Ealey to be equivalent to approximately 1 euro per 30 acres.

Ealey's method of search was to count only those animals seen in the headlights whereas the search on Barrow used a spotlight and so searched a greater area but showed fewer animals (see Table). Using the admittedly approximate calculations of Barrow Island Euros at 1/20 the density of Woodstock it appears that the population size is only of the order of 200 animals. Such a small population must be near the lower limit for viability.

THE PREFERRED LIVING PLACE OF HARE WALLABIES

One of the major aims of the inspection was to determine the status of the Hare Wallaby which was regarded as a sensitive species since it had disappeared over most of its former range on the mainland. At the time of our visit W.R. Dawson had already determined a number of the physiological parameters for the Wallaby, especially Temperature Tolerance and Water Loss under heat stress. Briefly these tests had shown that the wallaby was tolerant of high temperatures but wasteful of water in temperature regulation.

Determination of range of country occupied and cover sought during the heat of the day was in charge of W.R. Dawson, A.A. Burbidge and H. Bakker. Radios constructed as collars and with a temperature probe included in the circuit were attached to 3 wallabies (Plate 13) on the night of November 17 and these animals were tracked on each of the succeeding days. The radios were removed from the animals on November 21. The findings from this study were as follows:

i. The animals used different shelter sites on successive days
ii. The distance between shelter sites was remarkably large
iii. The total area included in a home range - as indicated by the distance between shelter sites was 5 - 10 acres.

This figure, obtained by plotting shelter sites connecting them with straight lines and calculating the area within, must be very much below the true figure. This is due to both the short time of the study and the irregular nature of the territory. A more reasonable figure would be at least double the calculated one, that is, about 20 acres.

It is significant that all the animals tracked were females. Knowledge of the home range of other macropods of similar size suggests that the male home range may be considerably larger.

iv. Shelter sites were invariably large well developed tussocks of Triodia angusta (Plates 14 and 15).

v. The preferred shelter sites invariably proved to be well insulated from daily environmental fluctuations and temperatures never rose much above 30°C.

These findings are consistent with the laboratory data which had suggested that the Wallaby would be unable to withstand the full heat stress of the typical small Triodia tussock. The field evidence emphasises the dependance of the species on a well developed stand of Triodia especially Triodia angusta which appears to only occur in the depressions and gullies where soil is deeper and perhaps water more abundant. It should be remembered that these are the sites from which fill is obtained for preparation of well sites and roads and that when disturbed the regeneration is to shrubs and not grasses.

DIET OF HARE WALLABY

In all places where Triodia grassland had been burnt (see earlier) and in those places (e.g. Bell Bros. airfield) where T. pungens was regenerating there was evidence of heavy grazing and in burnt areas particularly many tussocks were closely cropped. It was unclear what was grazing these areas. However, occasional freshly killed hare wallabies were

found on the roads and inspection of the gut contents of these showed that the diet was apparently exclusively T. pungens.

DISCUSSION

The slow rate of establishment of Triodia-dominated tussock grassland on disturbed areas has already been noted. However it is clear from the counts derived from the traverses on the north and south of the island that the disturbed southern part apparently has Hare Wallabies in higher density than the undisturbed northern part, despite:

i. the preferred daytime cover being large Triodia tussocks which are found on the deeper soil of the valley floors and

ii. the deep soils of the valley floors being used when constructing well sites and

iii. most well sites being on the southern part of the island.

The evidence would suggest that despite the disturbance on the southern part of the island the habitat has not yet deteriorated to the point where the numbers of Hare Wallabies (or Bandicoots) are significantly reduced.

Had all common species been more abundant in the south than the north we might have speculated that the effect was spurious and due entirely to greater accessibility and better vision resulting from the greater number of tracks. The fact that Bettongia are different from the other species would appear to invalidate this interpretation.

The significantly fewer Bettongia seen on the south compared with the north of the island is difficult to account for. The Bettong digs burrows, usually beneath Triodia tussocks. Burrowing is easiest in the deep soils of the valley floors, i.e. in the same situation as the preferred cover of Hare Wallabies is found, and from which fill for well site preparation is taken. It seems inconceivable that if the disturbance to valley floors has not affected the Hare Wallaby it could significantly affect the Bettongia. Two explanations appear possible:

(a) Bettongia never were as abundant in the south as the north of the Island.

(b) They do not persist in the area once it is lit by the flares from burning gas.

This last suggestion was advanced by W.H. Butler to account for the decline which he said he had observed in the abundance of the Euro on the south of the island since gas had been burned.

Very few specimens of Antechinus macdonnellensis have been collected from Barrow but all have come from stands of Acacia coriacea (W.H. Butler pers. comm.). The evidence from our observations (see earlier and Table 1) suggests that this Acacia may regenerate after fire in which case the persistence of Antechinus would depend on fires of sufficient frequency to ensure regeneration of this Acacia scrub (see Plates 7 and 16).

RECOMMENDATIONS

The following are our recommendations:

i. A programme of continuing visits, perhaps at two-yearly intervals, should be instituted so that the status of the vegetation and the fauna can be monitored.

ii. The number of tracks and roads be kept to a minimum. In a number of places the roads have proliferated without any obvious reason. In the event of roads being closed and well sites abandoned they should be ripped so that plants can re-establish.

iii. The procurement of fill for well site preparations or further road construction be reserved to as few sites as possible.

iv. Vehicles should not be permitted to drive across country where there is a track that can be used. Driving across country crushes spinifex tussocks and renders them useless as shelter for the animals.

ACKNOWLEDGEMENTS

Messrs. Bevan Cook and W.H. Butler facilitated the work of the party in many ways and W.H. Butler's familiarity with the Natural History as well as the roads and tracks was invaluable. WAPET provided transport, messing and accommodation for part of our stay. Mr. Alex George of the W.A. Herbarium identified the plants for us.

TABLE 1. BARROW ISLAND: SUMMARY OF DATA ON PLANT REGENERATION

SPECIES	BURN			DISTURBANCE			
	5 wks.	4 mths.	7 yrs.	Road verge	Pit	Air Strip	Well site
Triodia	x	x	x		x	x	
Codonocarpus cotinifolius			x			x	
Acacia sp.		x				x	
Acacia bivenosa			x				
Acacia coriacea			x				
Acacia gregorii			x		x		
Acacia pryifolia					x		
Stylobasium spathulatum		x	x		x	x	
Petalostylis labicheoides	x		x	x	x		
Cassia notabilis				x			
Indigofera monophylla					x		
Tephrosia rosea					x	x	
Adriana tomentosa		x		x	x		
Diplopeltis eriocarpa			x				
Corchorus parviflorus		x	x		x		x
Triumfetta appendiculata			x				
Abutilon exonemum							x
Hannafordia quadrivalvis			x				
?Keraudrenia			x				
Cynanchum floribundum			x				
Clerodendrum tomentosum			x				
Heliotropium ovalifolium		x	x		x	x	x

Continued..

TABLE 1. CONTINUED

SPECIES	BURN			DISTURBANCE			
	5 wks.	4 mths.	7 yrs.	Road verge	Pit	Air Strip	Well site
Trichodesma zeylanicum	x	x			x	x	
Solanum diversiflorum					x	x	
Solanum lasiophyllum					x	x	
Scaevola globulifera			x				
? Scaevola spinescens			x				
Olearis axillaris			x				
Pterocaulon sphacelatum			x		x		
? Pterigeron adscendens					x		
Pterigeron macrocephalus					x		
Moonia trichodesmoides				x	x		


MONTEBELLO ISLANDS
15 MILES
LOEVENTHAL ISLAND 7MILES
INDIAN OCEAN
N
CAPE DUPUY
NAVIGATION LIGHT
SURF POINT
REEF
CAPE MALDUET
ANT POINT
MUSHROOM ISLAND
VALLEY OF GIANTS
WAPET LANDING
PRINCE ISLAND
WITTLOCK COVE
DOUBLE ISLAND
FLACOURT BAY
20°45'
TURTLE BREEDING GROUNDS
CHANNEL ROCK
TANK FARM
DOVE POINT
LATITUDE POINT
PIPE LINE TERMINAL
AIRSTRIP
BIGOTA CREEK
WAPET CAMP
CAPE POIVRE
270'
TOWN POINT
EMERGENCY AIR STRIP
MANGROVE SWAMPS
SHARK POINT
BANDICOOT BAY
BARROW ISLAND
SCALE OF MILES
0 1 2 3 4
SYMBOLS
FORESHORE SAND
FATHOM LINE
CREEKS FLOW IN SOME MONTHS
CONTOUR INTERVAL 50 FEET
PASCO ISLAND
ONSLOW 65 MILES

Plate 1. Transportation of vehicles by landing barge.

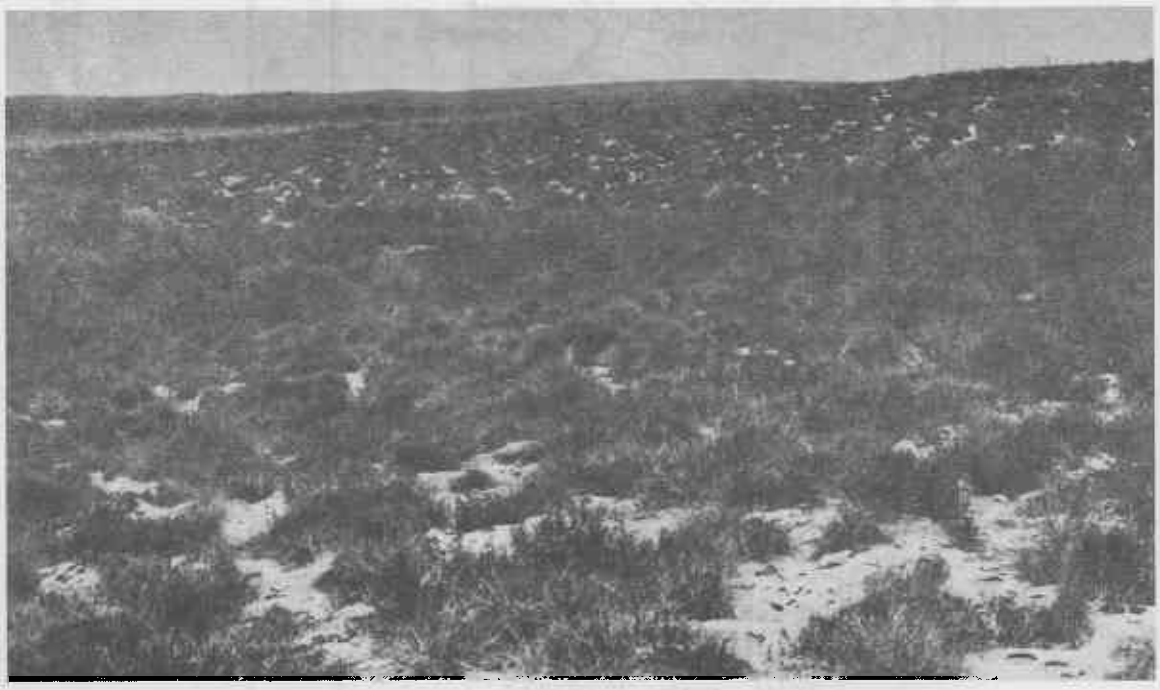

Plate 2. Typical undisturbed area, grassland dominated by *Triodia pungens* with occasional clumps of fig.

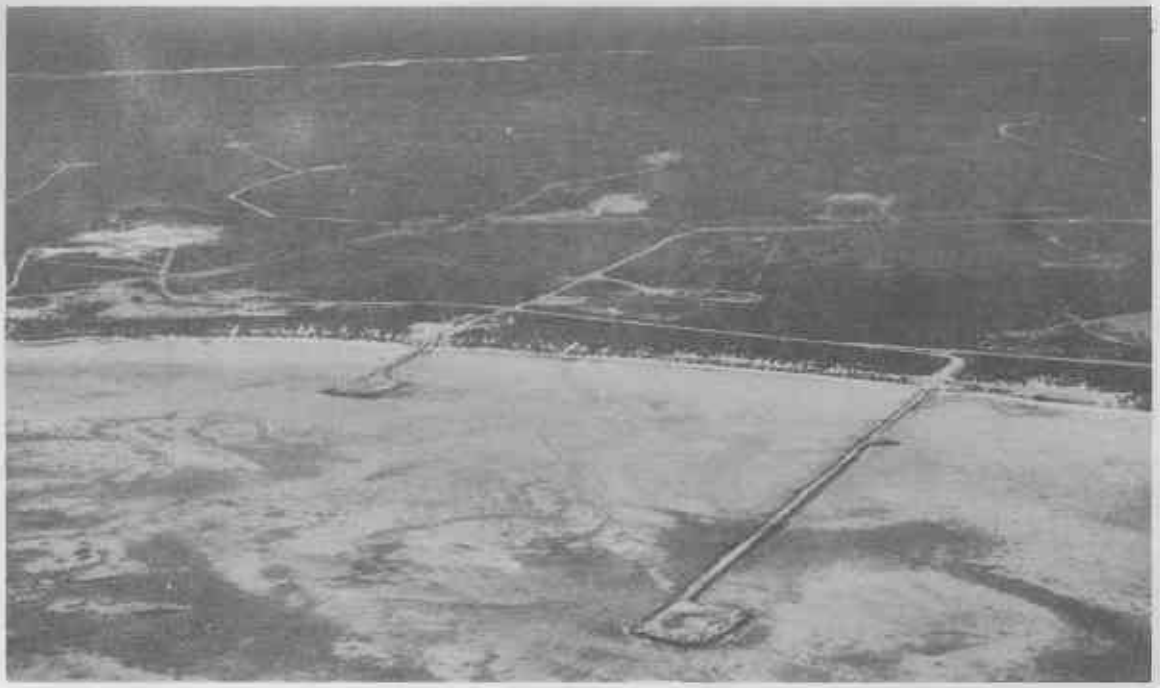

Plate 3. Aerial view of Barrow Island from south looking across Bandicoot Bay.

Plate 4. General view of oilfield.

Plate 5. Closer view of oilfield showing seismic survey lines, well sites, gravel pits, roads and tracks.

Plate 6. Activity around drilling rig and oil separator station. Note burning gas flare.

Plate 7. Red dune area, burnt 1962, photographed November 1969. Shrub is *Acacia coriacea.*

Plate 8. Site for Well No. 52 near Cape Dupuy. Abandoned May 18 1966, photographed November 1969.

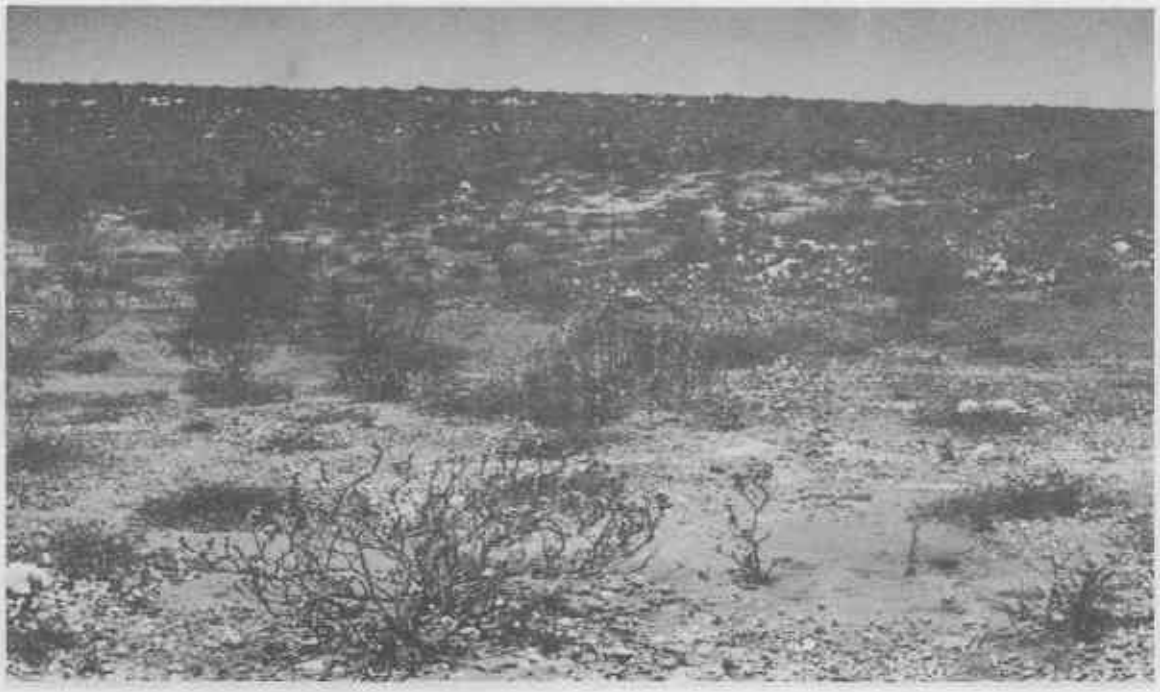

Plate 9. G.S.I. area cleared October 1964, photographed November 1969.

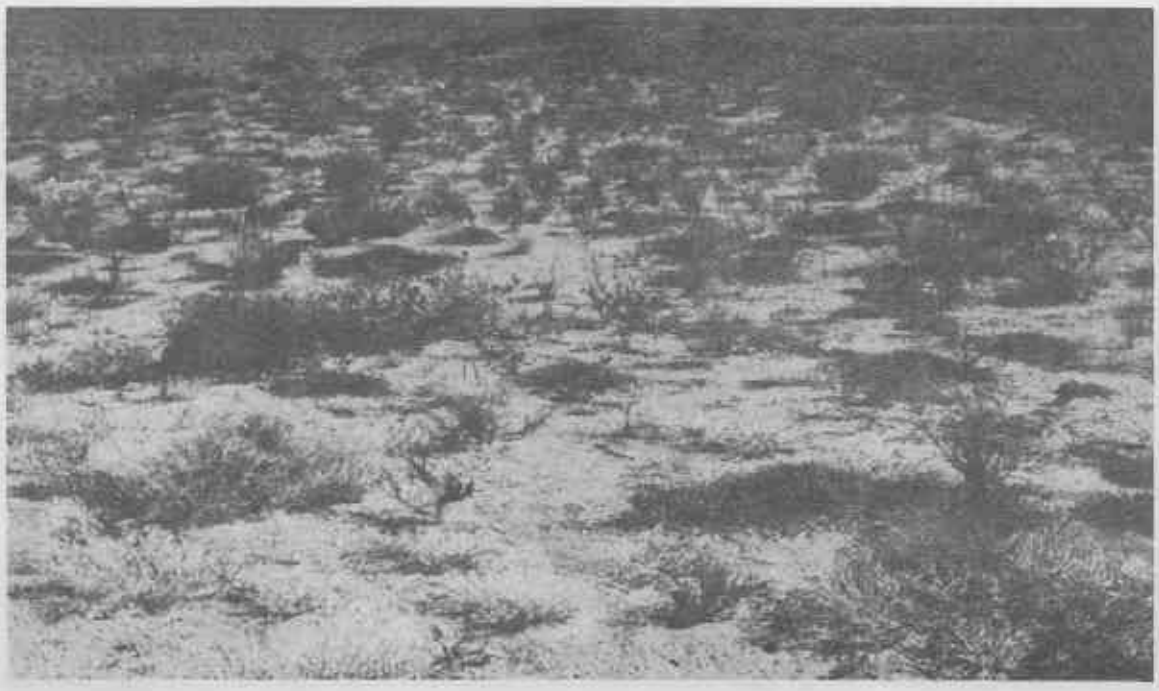

Plate 10. Old airfield; use ceased November 1963, photographed November 1969.

Plate 11. Barrow Island Bandicoot *(Isoodon auratus barrowensis).*

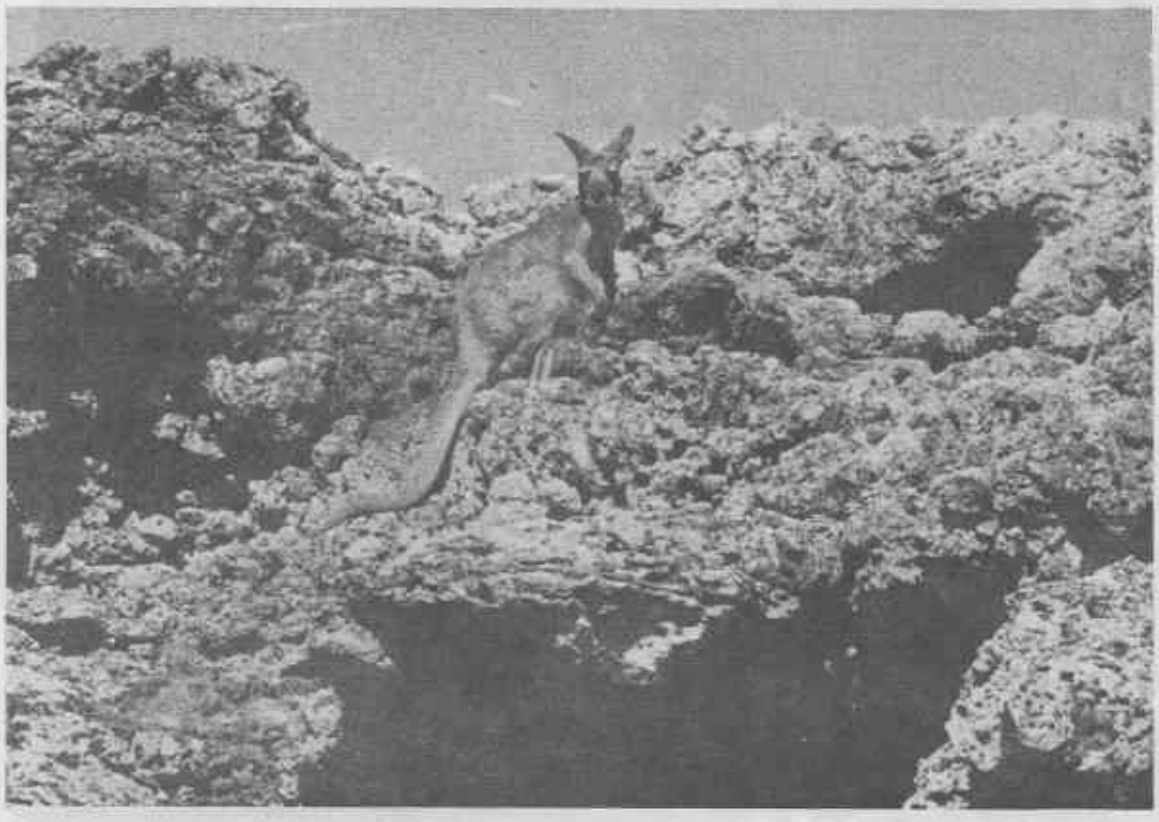

Plate 12. Barrow Island Euro *(Macropus robustus isabellinus).*

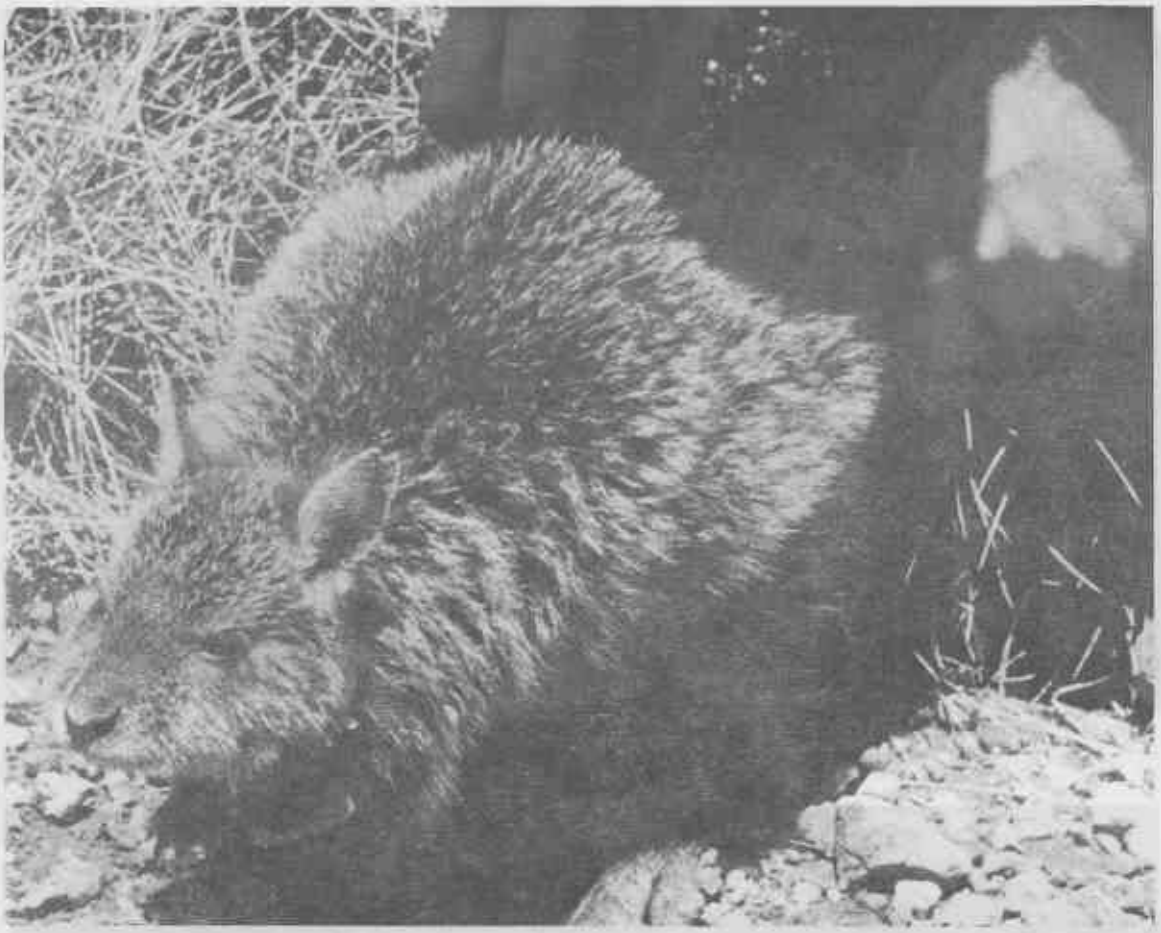

Plate 13. Spectacled Hare Wallaby *(Lagorchestes conspicillatus)* fitted with radio transmitter.

Plate 14. Shelter site (centre dark area) of hare wallaby – located by radio-tracking.

Plate 15. *Trioda angusta* growing in valley.

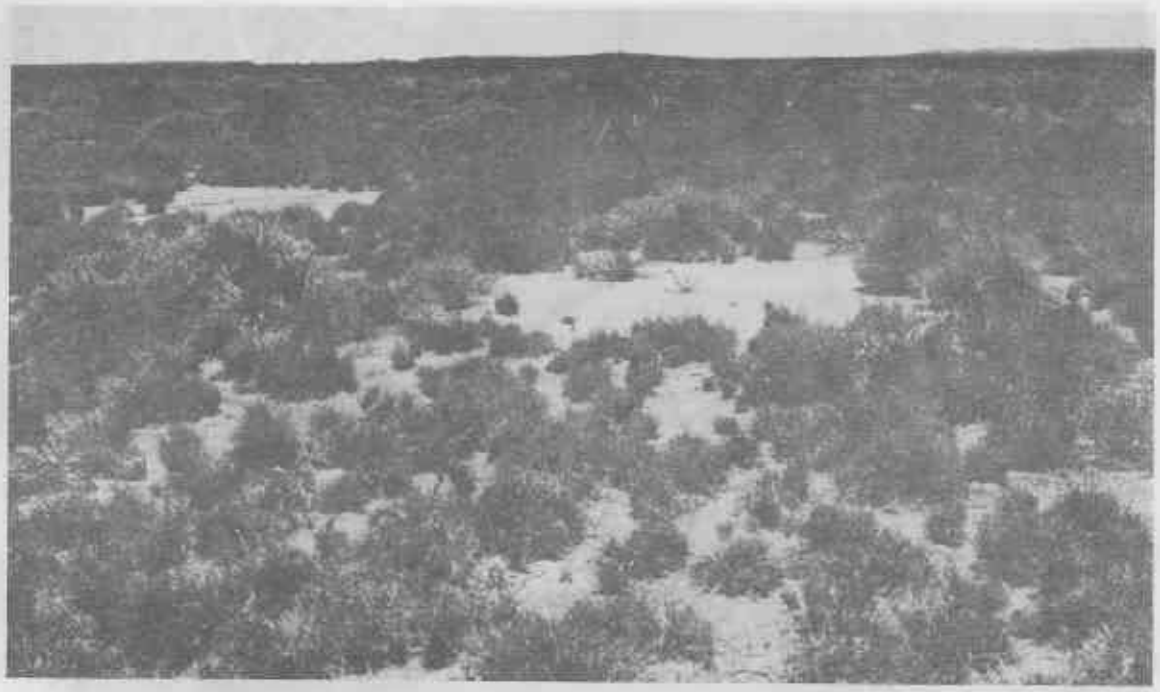

Plate 16. Mud pan with grasses and *Acacia coriacea.*

Plate 17. Rock wallaby *(Petrogale pencillata).*

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