

SWANS

Wildlife Journal
Vol. 12 No. 3
1982





SWANS

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*The State Wildlife
Authority News
Service (SWANS)*
is

*issued by direction of the
Hon. R. C. Old, M.L.A.
Minister for Fisheries
and Wildlife.*

*Director of Fisheries and Wildlife
B. K. Bowen, B.Sc.*

*The support of the public is an
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organisations, individuals, and
wildlife management
personnel may be kept
informed of the work being
carried out by this department,
of departmental policies and
directions: and for promoting
a better understanding and
appreciation of Western
Australian wildlife and the
role it plays in maintaining a
suitable environment in which
man can live.*

*SWANS is published
three times a year by:*

**Extension and Publicity
Office,
Department of Fisheries
and Wildlife,
108 Adelaide Terrace,
Perth, Western
Australia 6000**

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ISSN 0155-9397

WILLIAM C. BROWN, Government Printer, Western Australia

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COVER PHOTO

'Queen of Sheba' Orchid *Thelymitra variegata*.

Flowering from June to September this colourful but uncommon Sun Orchid is widespread throughout the coastal plain from Dongara to Israelite Bay.

(Photo Copyright A.G.Wells)

Orchid Conservation in W.A.

Text by S.Hopper

Photos by S.Hopper and A.Brown

Western Australia is well endowed with terrestrial native orchids. Some 130 species, 30 varieties in 28 genera and approximately 30 unnamed taxa were listed for the State in 1971. Studies since then suggest that at least 30 additional unnamed orchid taxa occur in the south-west.

The majority of W.A.'s species are found nowhere else, so the orchid flora is highly individual. The largest south-western groups include the spider orchids (*Caladenia*, 40 named species), sun orchids (*Thelymitra*, 21 species), leek orchids (*Prasophyllum*, 17 species) and green hoods (*Pterostylis*, 14 species). Among the smaller genera are several bizarre forms including the Underground Orchid *Rhizanthella gardneri*, now famous following its recent rediscovery.

While many W.A. orchids are widespread and abundant, the State also has an unusually large number of uncommon and elusive species, some so rare that they have been seen only once or twice in recent decades. This adds interest to the field work of the orchid enthusiast because there is always the possibility of turning up something rare or completely new. It also represents a significant problem to conservation authorities. No matter how good the intention, you cannot conserve a rare orchid population until it has been located by someone who recognises it and the relevant information is then passed on to the appropriate Government Department and the landowner. Fortunately, in Western Australia, this is often now happening due to the close liaison and cooperation of all parties concerned.

In this article I wish to give an outline of developments in orchid conservation in the State. Conservation of Western Australian wildflowers has been the growing concern of many individuals and organizations from both the private and Government sectors of the community. However, until recently, efforts aimed specifically at conserving orchids were made almost entirely by private landowners and by members of interested groups such as the W.A. Native Orchid Study and

Conservation Group. A recent example followed the rediscovery in 1977 of the Crested Spider Orchid *Caladenia cristata* by Mr Don Voigt of Esperance. This species hadn't been collected for 54 years, and was located by Mr Voigt on 5 ha of uncleared bush on the farm of Mr Norm Scheer. After the identity of the species had been confirmed by Mr Alex George of the W.A.

Herbarium, the W.A. Native Orchid Study and Conservation Group wrote a successful application to the Australian Orchid Foundation for \$150 to pay for fencing of the population of *Caladenia cristata*. Four months after the rediscovery, the fence was erected by Mr Scheer and members of the Orchid Study and Conservation Group, and the *Caladenia* was protected from grazing by stock.

Similarly, many farmers throughout W.A. have left patches of bush uncleared on their properties because they enjoy their wildflowers and wildlife. In so doing, these farmers have made important contributions to the conservation of native orchids in the wild.

The Government, too, has ensured the conservation of many orchids through its policy of creating Nature Reserves and National Parks throughout the State. At present, 14 300 000 ha (6% of W.A.) is set aside for conservation of flora and fauna in some 1 070 Nature Reserves and 50 National Parks. These days, any vacant Crown land opened up for agriculture has a certain percentage set aside as a Nature Reserve. Reserves set aside for other purposes, particularly road reserves, water catchment reserves and State Forest, often retain large tracts of uncleared bush which are also important for orchid conservation. Indeed, in many heavily cleared wheatbelt areas, road verges contain the only remaining vestiges of native flora.

Acquisition of Nature Reserves and National Parks by the State Government has been aimed largely at ensuring that major ecosystems throughout the State are adequately conserved. To this end, the W.A. conservation reserve system has been reviewed twice in the past two decades by expert committees. Significant additions to ecosystem reservation in Nature Reserves and

▼ Zebra Orchid *Caladenia cairnsiana*



GAZETTED RARE W.A. ORCHIDS



▲ The eleven orchids currently gazetted as 'rare flora' under the Western Australian Wildlife Conservation Act (shown at approximately 50% of natural size):

A. Salmon Sun Orchid *Thelymitra macmillanii*; B. Star Orchid *Thelymitra fuscolutea* var. *stellata*; C. Dwarf Spider Orchid *Caladenia bryceana*; D. Sandplain Sun Orchid *Thelymitra psammophila*; E. Brown Leek Orchid *Prasophyllum lanceolatum*; F. Dark Leek Orchid *Prasophyllum triangulare*; G. Underground Orchid *Rhizanthella gardneri*; H. Purdie's Donkey Orchid *Diuris purdii*; I. Lavender Spider Orchid *Caladenia lavandulacea*; J. Shy Spider Orchid *Caladenia triangularis*; K. Yellow China Orchid *Caladenia gemmata* forma *lutea*.

Drawings by S.J.Patrick with the exception of G and I, which are by L.F.S. Braganca and B.L.Rye.

National Parks have resulted. The more recent review, undertaken in the early 1970s by the Conservation Through Reserves Committee of the Environmental Protection Authority, was advised by a technical subcommittee which included the noted orchid taxonomist Mr Alex George. Hence many of the reserve proposals were made with the best available orchid knowledge in hand. Even so, it is apparent now (as it was then to the Committee) that many orchids remain to be discovered and named in the State, and most have poorly known distributions because so few interested botanists are available to search for them. Hence it is not surprising that a number of orchids, particularly the rare ones, are not as yet known to occur in nature reserves or national parks.

While progress can and is being made to rectify this situation, effective conservation of all our native orchids will depend on more than the existence of Nature Reserves and National Parks. Successful conservation must also rest upon the good will and conscious endeavours of farmers, conservation groups and Government instrumentalities, such as Shire Councils, the Main Roads Department, the Bush Fires Board and the Forests Department.

In my experience, most such persons and organisations are willing to assist with conservation when a particular problem is brought to their attention. For example, at considerable expense, the Main Roads Department relocated the site of a new bridge on the Frankland River after Mr Alex George informed its officers that approaches to the old bridge were flanked by an outstanding array of native orchids including several rare hybrids. The essential ingredients in such a success story include: (i) enthusiasts searching for, locating, and correctly identifying orchids in the bush, (ii) the relevant information being written down and passed on to the owners of the land occupied by the orchids, and (iii) the owners planning use of their land in such a way as to ensure the conservation of the



▲ Cowslip Orchid *Caladenia flava*

▼ Shy Spider Orchid *Caladenia triangularis*





▲ Bronze Sun Orchid *Thelymitra fuscolutea* var. *stellata*

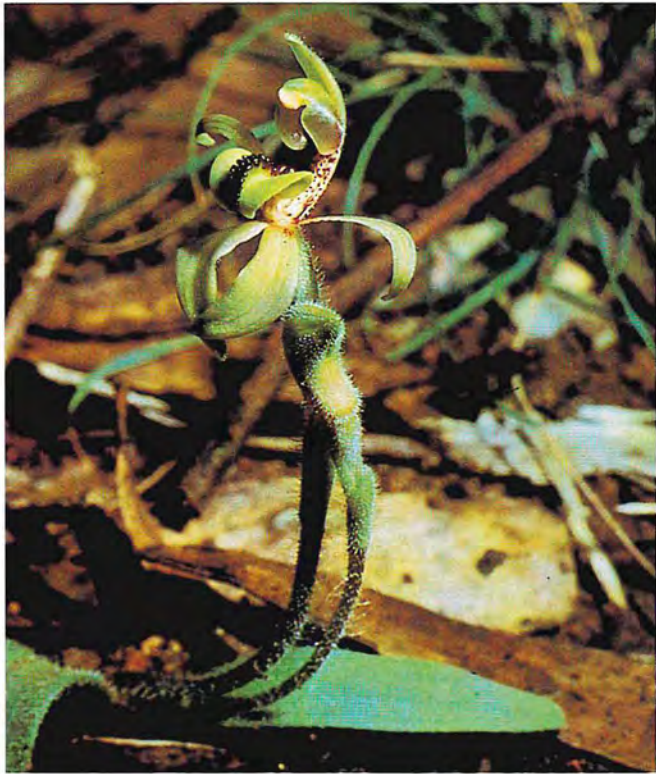
◀ White Spider Orchid *Caladenia patersonii* var. *longicauda*

▼ Wispy Spider Orchid *Caladenia filamentosa* and Blue Fairy Orchid *Caladenia deformis*





▲ Blue Fairy Orchid *Caladenia deformis*



▼ Rabbit Orchid *Caladenia menziesii*



▲ Zebra Orchid *Caladenia cairnsiana*

◀ Dwarf Spider Orchid *Caladenia bryceana*

▼ Custard Orchid *Thelymitra villosa*



orchids. In Western Australia a number of exciting developments aimed at facilitating this process are now underway.

Firstly, the State Government enacted new flora legislation in 1980 that, in many respects, is the most advanced of its kind in Australia. The Wildlife Conservation Act protects all native flora nominated by the Minister for Fisheries and Wildlife throughout the State. To date, the Minister has declared as "protected flora" all ferns and fern allies, all gymnosperms and all flowering plants (including all orchids). Protected flora cannot be taken or destroyed without a license on all Crown lands and the legislation binds the Crown. Hence enthusiasts interested in taking orchids from Crown land for private study and enjoyment must hold a license issued by the Department of Fisheries and Wildlife. In addition, whenever the Crown land has been reserved for a special purpose (e.g. Nature Reserve, National Park, water reserve, State forest, road reserve), a license holder wanting to take orchids must also obtain the written permission of the managing authority in whom the land is vested. No license is required where an orchid enthusiast takes material from private property, but the owner's permission must be obtained prior to doing so.

While these provisions are not unlike those applying in other States, the W.A. Wildlife Conservation Act is exceptional in its treatment of rare plants. Under section 23F, the Minister may, by notice published in the Government Gazette, declare plants as likely to become extinct, rare, or otherwise in need of special protection throughout the whole of the State. Once a species is listed in a schedule of gazetted rare plants, no person may take, damage or destroy it or cause the same to occur (e.g. by allowing stock to graze on it) without the special written consent of the Minister. This applies equally to private individuals and to Government officers, and to gazetted rare flora on private land as well as on Crown land. A breach of this provision may result, on prosecution,

in a fine of up to \$1 000. The Act allows for compensation to be paid to private landowners who have been refused permission to take gazetted rare flora by the Minister.

In deciding on plants for gazettal as rare, the Minister is advised by the Flora Committee of the Western Australian Wildlife Authority, which has representatives from the Departments of Fisheries and Wildlife, Agriculture (i.e. the W.A. Herbarium), Main Roads and Forests, as well as botanists from Kings Park, the University of Western Australia and non-



▲ Sandplain Sun Orchid
Thelymitra psammophila

government organisations. The Flora Committee decided that to qualify for gazettal as rare, a plant must have been named by botanists in the correct way, it must have been searched for in the wild reasonably thoroughly, and it must have less than a few thousand known wild adult plants. On these criteria, two orchids were listed in the first schedule of rare flora published in the Government Gazette of November 14, 1980 - the Underground Orchid *Rhizanthella gardneri* and the Lavender Spider Orchid *Caladenia lavandulacea*.

Only these two were included in the first list because representatives of the Wildlife Authority's Flora Committee had not discussed other possible candidates for gazettal with members of the W.A. Native Orchid Study and Conservation Group. Discussions along this line, particularly with Mr Andrew Brown, led to the inclusion of a further 9 orchids in the revised schedule of rare flora published in the Government Gazette of 12 March, 1982 - the Dwarf Spider Orchid *Caladenia bryceana*, Yellow China Orchid *C. gemmata* forma *lutea*, Shy Spider Orchid *C. triangularis*, Purdies's Donkey Orchid *Diuris purdiei*, Brown Leek Orchid *Prasopphyllum lanceolatum*, Dark Leek Orchid *P. triangulare*, Star Orchid *Thelymitra fuscolutea* var. *stellata*, Salmon *T. Macmillanii* and Sandplain Sun Orchid *T. psammophila*. All of these orchids are illustrated and described in reports available from the Extension and Publicity Office, Department of Fisheries and Wildlife, 108 Adelaide Terrace, Perth. A colour leaflet on the Underground Orchid is also available. It is expected that more orchids will be gazetted as rare as knowledge of their distribution improves.

Although the rare flora legislation is potentially a powerful mechanism for conservation, it requires in the first instance a knowledge of the precise locations of rare plants and of the ownership of the lands they occupy. To this end, field surveys of the distribution of gazetted rare orchids have been initiated by myself, by the W.A. Native Orchid Study and Conservation Group, and, specifically for the Underground Orchid, by Dr Kingsley Dixon.

Dr Dixon was appointed for 18 months to search for the underground orchid on a grant of \$29 000 awarded to Dr P.R. Wycherley and Professor J.S. Pate by the World Wildlife Fund Australia. Dr Dixon, assisted by members of the Orchid Study and Conservation Group, has been spectacularly successful in locating some 150 plants of one of the State's most elusive orchids. The majority of

these plants occur on a townsite reserve in the central wheatbelt, but two smaller populations occur on Nature Reserves one of which has been upgraded to Class A status following the discovery of Underground Orchids on it.

To facilitate the rapid communication of survey results such as these to landowners, a number of Orchid Group members are now contributing to a computerized "Atlas of the W.A. Flora" pilot project run by the Department of Fisheries and Wildlife. Only just getting off the ground at the time of writing, this project promises to be particularly rewarding and effective in getting known locations of native orchids written down in a manner that is most useful for conservation initiatives. One of the first Atlas studies that should be published in 1983 is a survey of orchids on National Parks and Nature Reserves in the Perth Metropolitan Region.

In addition to field surveys, management of orchids on Nature Reserves, National Parks and private wildflower reserves is a subject that will require considerable research in the future. Data on the response of orchids to fire are essential in a State where fire is used as a key management tool. A knowledge of flowering seasons, pollinators, fruit maturation and mycorrhizal associations will also assist management planners in some instances.

While the main emphasis of this article has been on conservation of orchids in the wild, there are clearly many instances where this is not possible. In some cases, cultivation of orchids is the only option available to prevent their extinction. Fortunately, this has not yet been the case for any known W.A. orchid. However, the experience gained by growers of native orchids will no doubt prove invaluable for future conservation problems. Moreover, the work of members of the Native Orchid Study and Conservation Group in transplanting orchids from the pathway of bulldozers to a reserve made available by the



▲ Underground Orchid *Rhizanthella gardneri*

Nedlands City Council is commendable.

If there is one lesson that the history of orchid conservation in W.A. can teach, it is that close liaison between private orchid enthusiasts, land owners, research scientists and Government

Departments is the surest way to make effective conservation a reality. Ultimately, each of us must decide if we are prepared to make an effort now in this direction so that future generations may enjoy the pleasure and inspiration for which our native orchids are an unceasing source.

Corella Studies by Graeme Smith C.S.I.R.O.

There are two forms of corella in the south-west of Western Australia; the Long-billed Corella (*Cacatua pastinator pastinator*) and the Little Corella (*Cacatua pastinator gymnopsis*).

The two forms of sub-species were formerly thought to be separate species, but recent work by the CSIRO Division of Wildlife Research has shown they belong to the same species. In the past they probably formed one continuous population ranging from the south-west corner of the state to the Pilbara. The size of the birds, especially the length of the bill, decreased from south to north. The population was subsequently divided, the present evidence suggests that the Little Corellas found south of the

Pilbara are descended from birds that moved south from that region.

There are two populations of the Long-billed Corella, one in the Lake Muir-Boyup Brook area which has a population of about 1000 birds. The other population which has about 5000 birds is in the area bounded by Geraldton, Morawa, Mukinbudin, Northam and Jurien.

In the last century the Little Corella was not found south of the Murchison River, but by the 1950s it was found to be moving south and

today its range overlaps that of the Long-billed Corella, the southern limits are Coorow, Burakin and Goodlands.

Corellas are noisy, sociable birds, forming flocks of 20 to 100 birds which are widely dispersed because of the patchy distribution of suitable habitat in most parts of their range. In summer flocks from a number of areas join together in a traditional area to form flocks of up to 2000 birds. For example, the flock at Dalwallinu may have up to 800 birds

▼ A flock of Little Corellas take flight. (Photo copyright A.G.Wells.)





▲ A research officer records technical data of a young Long-billed Corella. (Photo P.Roberts.)

C.S.I.R.O. officers Les Moore ► and C.P.de Riberia inspect a Long-billed Corella nest hollow in a large Salmon Gum in the Wheatbelt. (Photo P.Roberts.)

which come from areas as far apart as Goodlands, Burakin and Booralaming. At the end of summer the birds begin to move back to their breeding areas, leaving a mobile flock of immature birds. Here, the birds feed in a flock, with the breeding birds making short visits to their nest hollow. By the start of egg laying the breeding birds are spending all their time in the vicinity of the nest tree, while the immature birds move around the area as a single flock.

The one to four eggs (av. 3) are laid in a hollow branch of a tree in August and September and the chicks are hatched 23 to 26 days later. Both parents share in incubating the eggs and feeding the chicks. Pairs usually feed within a kilometre of their nest, usually with neighbouring pairs. They eat a





▲ Long-billed Corella. (Aviary photograph copyright A.G.Wells.)

variety of seeds, bulbs and insects which they glean from the surface or dig up with their long bills. Wheat (in the wheatbelt) is the main item in their diet, but weeds such as double gee (*Emex australis*), Guilford grass (*Romulea rosea*), and *Erodium* spp are also important items. The young birds leave the nest at about 60 days old - they are competent fliers but their first flight usually ends with

them crash landing into the canopy of a tree. It is some months before they have perfected the art of landing. For the first week after leaving the nest the young birds sit quietly in a tree being fed by their parents. After this period they spend an increasing amount of time with their parents, learning to feed. At this stage all the adults and their young, plus the immature birds

congregate in one area for two to three weeks prior to leaving for the summer feeding area. During the summer the adults and their young continue to stay together while the parents gradually wean their young. This process is completed when the adults and young go their separate ways at the end of summer.

Young birds stay with the immature flock until they start breeding at three to five years. Pairs usually stay together, but divorce is not uncommon and some pairs may swap partners.

The biology of the Little Corella has not been studied in detail, however it would appear to be similar to that of the Long-billed Corella.

In early days of the colony the Long-billed Corella was a serious pest to farmers and was poisoned in large numbers. The population was reduced to a small flock near Lake Muir and a population between the coast and a line from Mullewa to Moora. The development of large scale farming, with the provision of permanent water and abundant food has allowed the Long-billed Corella to expand its distributin, although the increase in the population has been limited by the large-scale felling of the nest trees such as the Salmon gum and Wandoo.

At the present there is little or no regeneration of Salmon gums or other trees that provide suitable nest sites in the wheatbelt. This fact, together with the apparent increasing mortality of trees in the wheatbelt, presents a serious threat to the corella and all animals that use hollows in trees for shelter and breeding.

Note: The C.S.I.R.O. Corella studies in the wheatbelt have been aided on many occasions by the Wongan Hills District Wildlife Officer, Phil Roberts. W.O. Roberts has liased with the researchers in the field and has assisted in bird observation, counting and tagging. In return, the Department of Fisheries and Wildlife has gained valuable information regarding Corella populations and new research techniques.

Edgar Ranges — A good case for conservation

A picturesque sandstone scarp with outlying mesas, the Edgar Ranges forms a physical boundary between the Kimberley and Western Australia's inland deserts. It also lies toward the south-eastern end of one of the last extensive areas of uncommitted land in the South-west Kimberley, a district which has been largely (86%) turned over to an intensive pastoral industry.

The South-west Kimberley is a complex array of unique environments and wildlife communities brought about by abrupt geological changes, rapid climatic gradients, dissection by a major river system and the presence of a large peninsula with its coastal environments and accompanying oceanic influences. To date, there are only four conservation reserves in the South-west Kimberley, each of which conserves an array of relatively restricted environments rather than the more widespread landscapes of the district. The

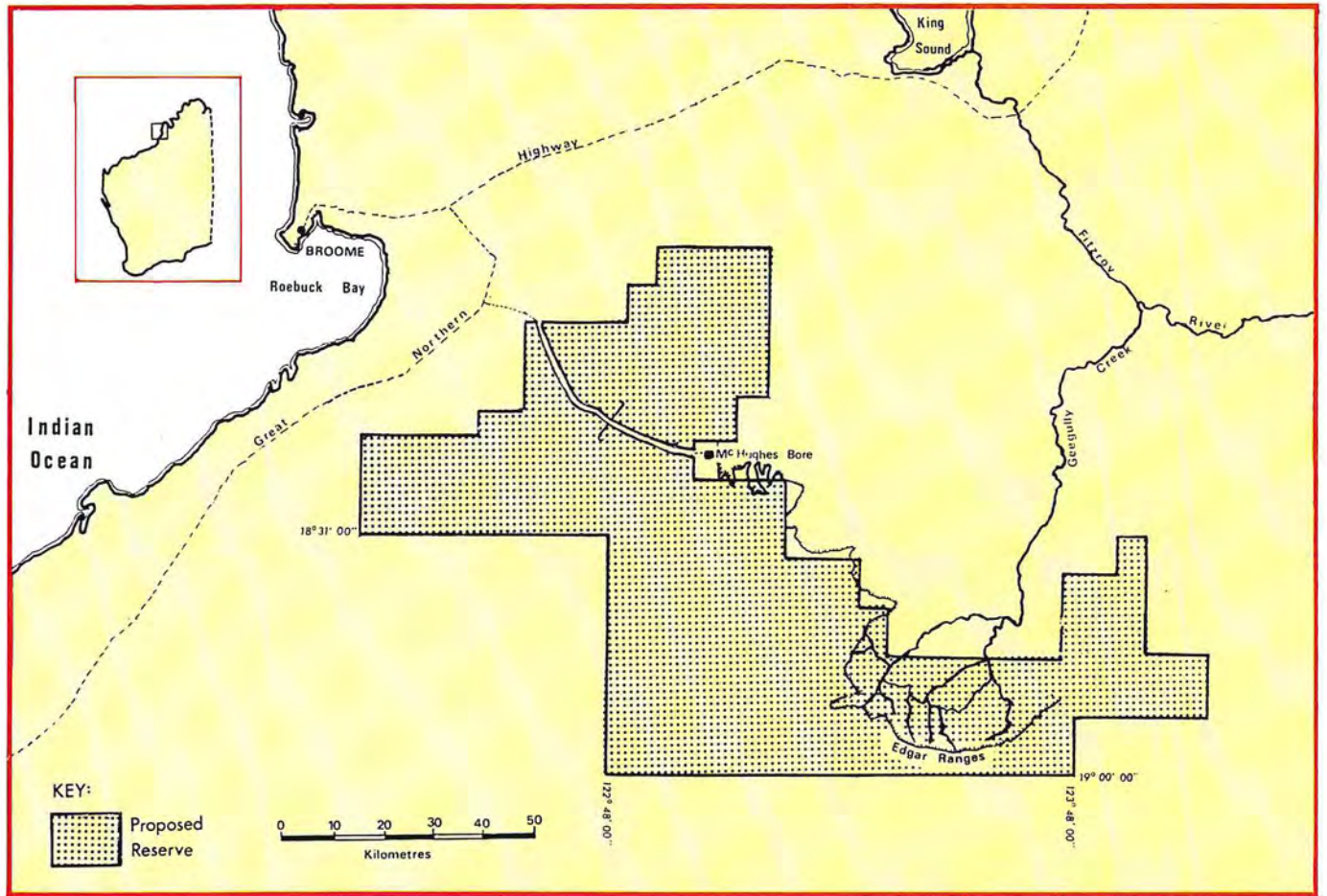
Coulomb Point Nature Reserve comprises coastal environments and certain high rainfall 'pindan' (loosely described as grassland wooded by a sparse upper layer of trees and a dense middle layer of *Acacia* thicket) formations on 'through drained' sandplains of the Dampier Peninsula. The three other reserves are National Parks and are all restricted to scenically attractive sites on the limestone Oscar and Napier Ranges on the northern edge of the district. The combined area of these National Parks, Winjana Gorge, Tunnel Creek and Geikie

Gorge, is less than 5 400 ha.

Consequently, it was felt there was an urgent need to set aside additional reserves to protect a more representative array of the natural environments of the South-west Kimberley district even though many are perhaps not as pristine as they were late in the last century when first visited by biologists. The Edgar Ranges area as shown on the accompanying map was one of several chosen with this purpose in mind and, after being subjected to several rounds of extensive

▼ *Eucalyptus brevifolia* as a dense stand on the alluvial floor of a valley in the Edgar Ranges area. Note the hummocks of *Triodia pungens* on the scree slopes. (Photo N.McKenzie.)





▼ Western Flyeater. (Photo copyright A.G.Wells.)



environmental surveys carried out between 1976 and 1980, an application was submitted to the State Government with the view to setting aside most of the area as a Class A Nature Reserve vested in the Western Australian Wildlife Authority.

The area of vacant land centred on the Edgar Ranges covers a total area of 1 012 600 ha, of which 561 000 ha are composed of sandplain country supporting dry-country versions of the pindan vegetation endemic to the district i.e. low woodlands to low open-woodlands structurally controlled by species of *Acacia*, *Eucalyptus* and *Grevillea* over mixed hummock and tussock grasslands. Sandplains are an important component of the South-west Kimberley, occupying about 25 per cent of its land surface. The pindan vegetation they support varies across the district. Sandplains in the Edgar Ranges area support a vegetation distinct from their better watered equivalents on the Dampier Peninsula and near Derby.

A further 35 per cent of the Edgar Ranges area is occupied by dunes and swale plains typical of the north-western margin of the Great Sandy Desert. This surface supports shrub and grassland communities with occasional low trees. The vegetation found on the swale plains is generally composed of a stunted selection of plants from the pindan community with a greater percentage of desert species such as *Acacia anaticeps*, *A. ancistocarpa*, and *Newcastelia cladotricha*.

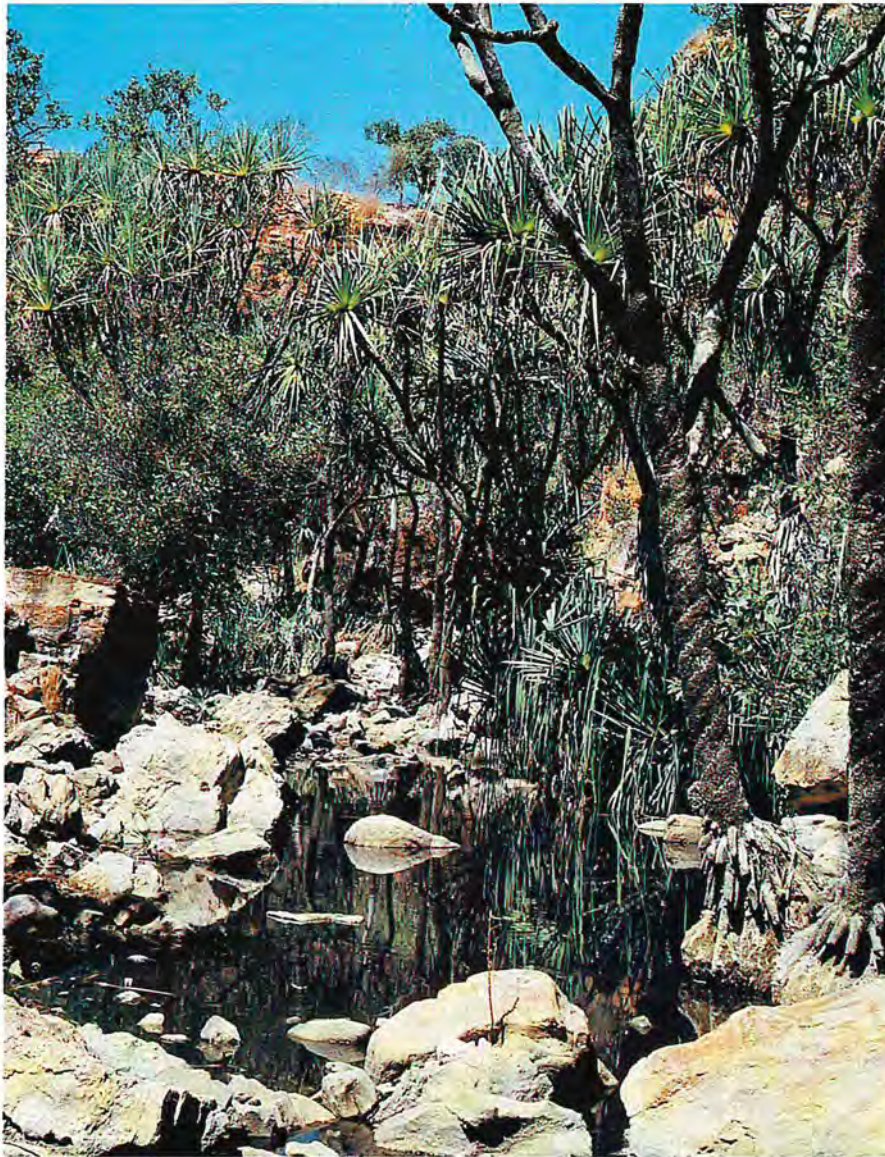
The Edgar Ranges area also includes 78 000 ha (7.7%) of sedimentary ranges. These range surfaces support a variety of fairly sparse plant formations. Open woodlands of River Gums, *Eucalyptus brevifolia* and *E. confertiflora* fringe the watercourses. Hummock grasslands with scattered *Acacia* thickets dominating the gravel and scree slopes. Isolated fig trees cling to the sheer sandstone cliffs but perhaps the most striking find during the surveys was a solitary colony of a new variety of the Screw Pine (*Pandanus spiralis* var. *flammeus*) at Logues Spring.



▲ The rare Princess Parrot has been recorded in the Edgar Ranges area. (Aviary photo copyright A.G.Wells.)

Another important aspect of the Edgar Ranges area is that it includes a few of the alluvial sand, earth, clay and loam surfaces associated with the drainage valleys of the Fitzroy and Lennard Rivers. Elsewhere in

the South-west Kimberley, these surfaces are almost totally committed to viable pastoral leases and would not be available for conservation purposes in the foreseeable future unless a pastoral



▲ Pool in the gully below Logues Spring showing *Pandanus spiralis* var. *flammeus*. (Photo N.McKenzie.)

▼ View from the rim of the scarp overlooking the plains country of Dampier Downs station. (Photo N.McKenzie.)



lease was purchased specifically for that purpose

In all, a total of 213 species of plants were recorded from the Edgar Ranges area. They were a mixture of Torresian (sub-humid Kimberley) and desert species, many of which were near either the southern or northern limits of their known ranges in Western Australia. The coverage of the South-west Kimberley and the Great Sandy Desert by conservation reserves is so poor (0.39% and 2.7% respectively) that many of these plant species, and all but a few of the communities they form, do not occur on reserves elsewhere in this state.

Fauna

The fauna of the Edgar Ranges area is a mixture of Torresian and desert species. During the recent surveys of the area, a total of 24 species of mammals was recorded which represents nearly half of the known mammal richness of the district. Of particular significance is the presence of an outlying population of the Brush-tailed Rock Wallaby (*Petrogale penicillata*) as the next nearest known population is in the Pilbara on the other side of the Great Sandy Desert. Other mammals of particular importance recorded in the area include the Bilby (*Macrotis lagotis*), Forrest's Mouse (*Pseudomys forresti*) and the bat, (*Tadarida* cf. *beccarii*.) These animals have not been recorded from any other conservation reserves in Western Australia and at least one of them, the Bilby is in urgent need of protection and study as its range throughout Australia has undergone a massive decline since the advent of European man.

One hundred and twenty one species of birds have been recorded in the Edgar Ranges area including three of special significance to conservation, the Princess Parrot, Peregrine Falcon and the Major Mitchell's Cockatoo. Although resident populations of the latter two species were recorded in the area during the 1976 to 1980 surveys, the rare and vagrant Princess Parrot is thought to be only an intermittent visitor.

Among the Torresian bird species were the Red-collared and Varied

Lorikeets, Rufous-throated Honeyeater and Pictorella Finch. A larger component of arid zone bird species has been recorded including the Princess Parrot, White-fronted Honeyeater and Western Flyeater; many of those recorded are on the north-western limit of their known ranges.

Many bats are known from the area including at least one species, the Hoary Bat (*Chalinolobus nigrogriseus*), which is generally confined to wetter parts of the state such as the North Kimberley. The presence of this and some other species so far into the semi-arid zone is probably due to Geegully Creek. The headwaters and upper reaches of the main bed of Geegully Creek are mostly contained within the Edgar Ranges area. This creek is one of the major tributaries of the Fitzroy River which arises in the North Kimberley; the fringing formations of River Gums and paperbark trees that line these water courses probably act as corridors connecting the two districts.

Five species of amphibians and 40 species of reptiles were also recorded in the Edgar Ranges area and, again, the fauna is a mixture of Kimberley and desert species although, the latter are more numerous because of the relatively dry climate.

The insect collection from this area contained 949 species with a further 31 species from Logues Spring, most of which would almost certainly occur at pools elsewhere in the Edgar Ranges. Of the species collected, the order Lepidoptera (moths and butterflies) predominated and represented 514 of the species caught. Considering how poorly the Kimberley insect fauna is known, it is not surprising that many of these records have extended the known range of species. It should also be noted that the insect collection was made at the driest time of the year and no doubt fails to include fauna which are active at other times of the year particularly during and after the rainy season.

As a result of the survey, it was considered by wildlife researchers that reservation of 807 000 ha of the Edgar Ranges area as a Nature



▲ Major Mitchell's Cockatoo. (Photo copyright A.G.Wells.)

Reserve would substantially improve the coverage of both the Kimberley and desert systems of conservation reserves. So much land remains dedicated to purposes incompatible with conservation in the South-west Kimberley that even if the above proposal is given the go ahead, only eight of the 28 distinct surfaces (land systems as mapped by the C.S.I.R.O. Division of Land Research) in the district would be

represented on reserves.

The above story was adapted for SWANS by Clifford Young from Wildlife Research Bulletin Number 10, Wildlife of the Edgar Ranges Area, South-West Kimberley, Western Australia, edited by N.L.McKenzie 1981. The Bulletin is available from the Extension and Publicity Office of the Department of Fisheries and Wildlife, 108 Adelaide Tce, Perth.

Grey Butcherbird (*Cracticus torquatus*)



(Photo copyright A.G.Wells)

The Grey Butcherbird is common in wooded country throughout the southern half of Australia and its loud and musical calls are frequently heard in Perth. These calls are often sung as a duet between pairs of adult birds, the birds singing alternately while bobbing up and down in turn.

The common name of this bird relates to its habit of wedging food, such as insects, lizards, mice or sometimes smaller birds, in a fork of a tree or impaling it on a twig or thorn before pulling it apart with its hooked bill. This action is necessary as the Butcherbird's feet are too small to enable it to hold down prey and tear it up in the manner of a hawk.

Between July and November are the main breeding months with the female Grey Butcherbird usually laying a clutch of 3-4 eggs in a shallow nest made of small twigs and grass in the vertical fork of a tree. The eggs are pale brown with small reddish-brown blotches at one end. Grey Butcherbirds tend to live in permanent territories and have been reported nesting in much the same place year after year.

Young birds are rather brown in appearance and may still be with their parents up to 12 months after leaving the nest. They do not attain full adult plumage until their second year.

Western Silvereye (*Zosterops gouldi*)



(Photo copyright A.G.Wells)

This distinctively coloured little bird is, perhaps, the commonest small bird in the Perth area and over much of the South-west. The role it plays in the city and suburbs has been compared to the Sparrow in the eastern States, visiting gardens and shrubberies in noisy foraging flocks, particularly in early summer after the nesting season.

Silvereyes feed low down in trees and bushes, on insects, nectar, seeds and fruit. Their liking for the latter often makes them unpopular in orchards and vineyards although they do provide a useful service by eating grubs and aphids.

The adult bird is easy to recognise as its entire upper parts are a bright olive-green. The throat and under-tail coverts are yellow-green and the rest of the under parts are grey. Its common name relates to the distinctive circlet of white feathers around its eye.

It breeds from August to January, laying an average of 2-3 pale-blue eggs in a suspended cup-shaped nest of grasses and cobwebs lined with finer grasses, wool or hair. A breeding pair of Silvereyes frequently has up to three broods in a season.

Studies on the bird have revealed that they sometimes live to remarkable ages. At least one Silvereye banded in the eastern States has been recaptured after 10 years. Some ornithologists combine the Western Silvereye with its eastern Australian ally *lateralis*, however, the eastern birds are characterised by having a grey back and a pre-nuptial moult.



▲ Numbat *Myrmecobius fasciatus*. Drawing by Martin Thompson, courtesy Western Australian Museum.

The Numbat in Central Australia

by J.A. Friend, P.J. Fuller and J.A. Davis

Few people realise that the numbat, a distinctively-striped mammal of the State's South-west, was once found in many localities across southern Australia. In 1866, Gerard Krefft wrote that this termite-eating marsupial occurred near the junction of the Murray and Darling Rivers in western New South Wales, while in 1895, a specimen which is now in the National Museum of Victoria was collected on the New South Wales-South Australia border. Several specimens now in the South Australian Museum were collected in South Australia over fifty years ago, mostly from the northwest corner of that State. The numbats which occurred in eastern Western Australia, South Australia and western New South Wales were redder in colour than those of south Western Australia, and have been described at different times either as a different species or subspecies, *rufus*, and dubbed the rusty numbat.

The lack of recent specimens and recorded sightings of numbats outside Western Australia's South-west has caused zoologists to fear that the desert form of the numbat has become extinct.

The most recent proven record of the rusty numbat was from Warburton around 1950, when a skin from that area was donated to the Western Australian Museum. In 1977, Andrew Burbidge and Phil Fuller of the Western Australian Wildlife Research Centre interviewed Aboriginal people in the Warburton and Giles regions about the status of a number of mammal species. They were told that the *walputi*, as the numbat was known, used to exist there, but was "finished" in those areas (Burbidge and Fuller, 1979).

In July 1982 our party left Perth on a 19 day expedition through central Australia. Our purpose was to investigate the status of the desert numbat and to gather as much information as possible about its habitat and biology, to enable comparison with the numbat of the South-west. Of most interest, naturally, was the possibility that populations of the rusty numbat might still exist in some remote areas.

We hoped that interviews with Aboriginal people of the desert tribal groups would cast light upon some of these questions. The route proposed therefore took in as many Aboriginal communities as possible.

The planned itinerary was to travel first from Perth to Warburton, where the largest numbers of Ngaanyatjarra people are based.

From there an easterly course through the range country would be taken, via Jameson, Blackstone and Wingelinna, into South Australia near Kalka and Pipaljatjara (formerly known as Mt Davies Camp). Our plan was then to visit Amata and Ernabella, travelling south to Mimili in the Everard Range, then north on the Stuart Highway to the Ayers Rock turnoff. From here the return trip would be through Docker River back into Western Australia, to Warrakuna (Giles) and back to Warburton after a side trip to the Clutterbuck Hills in the central Gibson Desert. The final leg of the journey was to be west along the Gunbarrel "Highway" and to Wiluna, then back to Perth.

Permission to travel through Aboriginal lands and to speak with the people was granted by the respective councils in Western Australia, South Australia and the Northern Territory.

Our conversations with Aboriginal people were greatly assisted by the fact that we were able to show them the skin of a numbat from the southwest. This always generated great interest, sometimes surprise and usually mirth in the older people, who were nearly all familiar with the animal. In Warburton, our efforts were made very much more fruitful by the willing assistance of Herbert Howell, who has studied the Ngaanyatjarra dialect for many years and translated very ably for us.

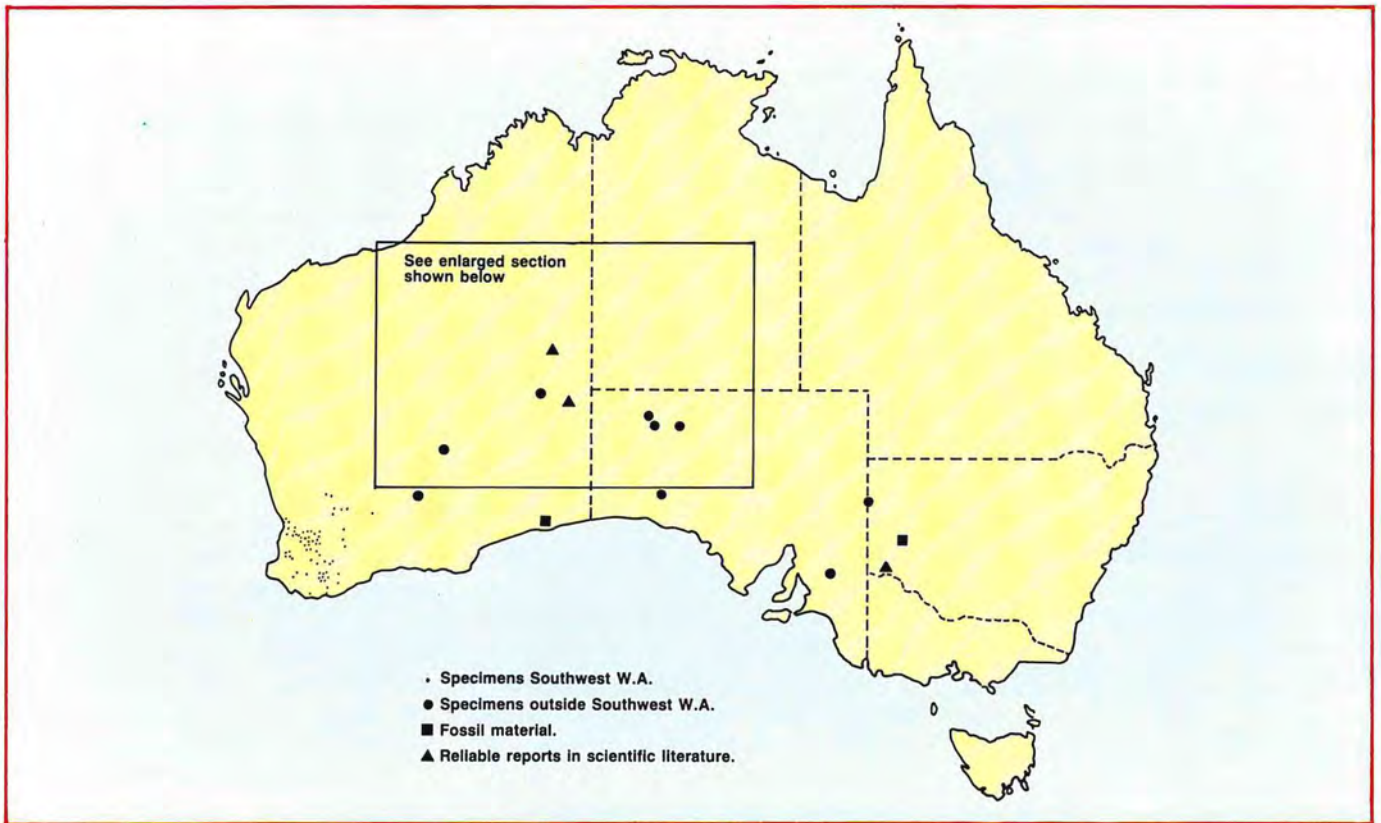
In total, we visited 26 camps and settlements, and interviewed 36 groups of people. They included members of the Ngaanyatjarra, Pitjantjatjarra, Yangkuntjarra,

Pintupi, Putitjarra and Matjiltjarra peoples. The information we collected in this way was remarkably uniform, considering that most events related had happened over thirty years ago. The readiness of the Central Desert people to share their knowledge with us, and their warmth and friendliness made this expedition a most memorable and enlightening experience.

The name used to identify the animal we produced was *walputi* (pronounced "wahl-boor-dee") by people in all settlements we visited besides Wiluna. The name "numbat" is an aboriginal name which was used by the people of the King George Sound (Albany) district.

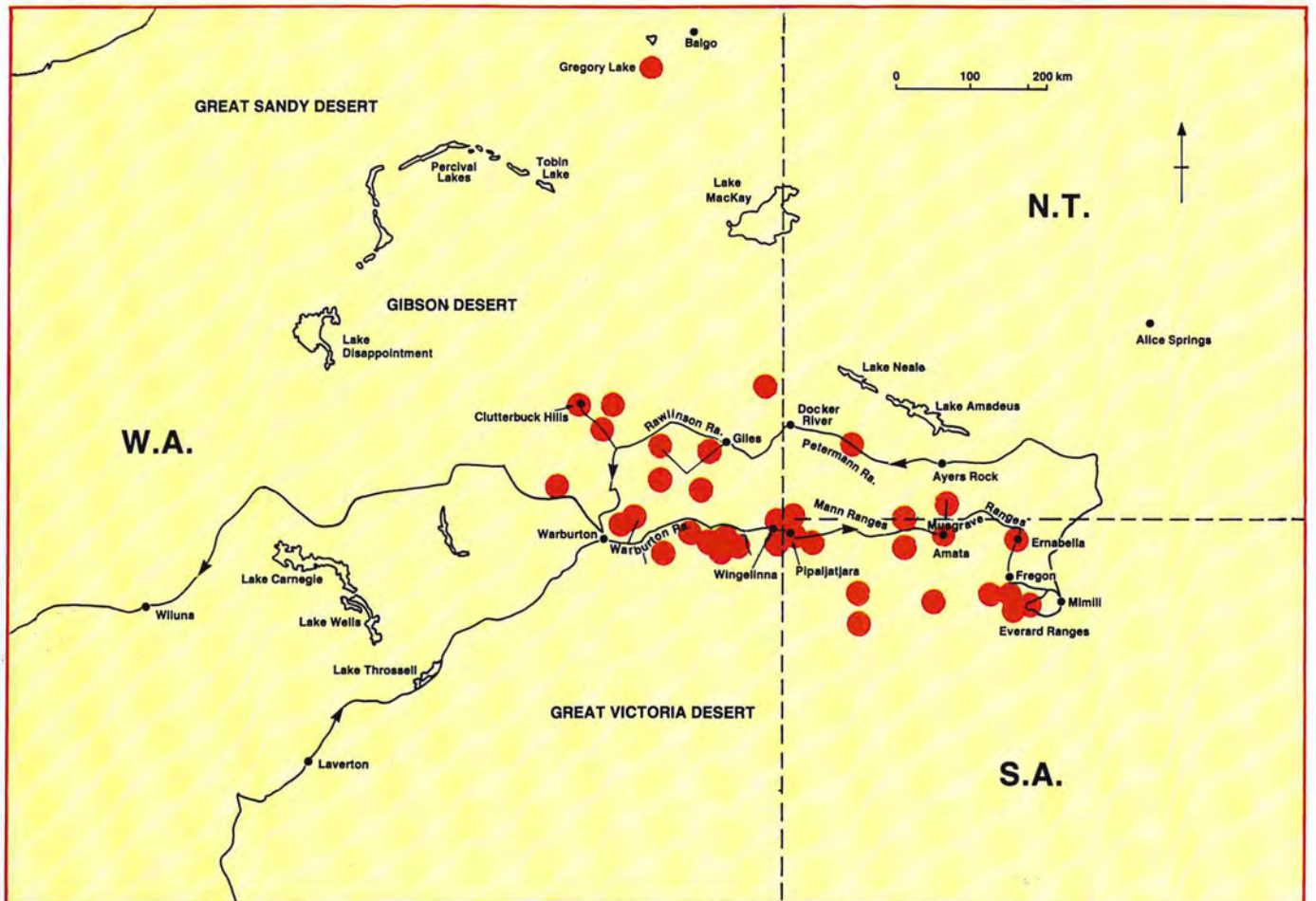
The first comment of most people after they had identified the *walputi* was that it was "good *kuka*" (meat). One old man showed us which cuts should be eaten by each different member of a family, while another pointed out that if the underside of the neck was eaten, it would cause open sores (like ulcers) to break out on the skin of the eater. (This part of the numbat contains both the sternal gland and the greatly enlarged salivary glands. At certain times of the year, the male numbat's sternal gland secretes an oily liquid thought to be used in scent-marking).

Most desert people who knew the *walputi* were at least forty years old. They could generally provide a lot of information about the animals' habits, although some had only seen one or two individuals. This information was usually corroborated by people in different areas. The youngest person interviewed who had seen the



▲ Records of the numbat from museum specimens and scientific literature.

▼ Route followed by expedition through Central Australia. Shaded circles indicate areas where Aboriginal people remembered seeing the numbat.





▲ The habitat of the *walpurti* included spinifex-mulga country similar to this area between the Musgrave and Everard Ranges in South Australia. (Photo A.Friend.)

▼ Wandoo woodland at Dryandra, near Narrogin W.A., where a population of numbats exists today. (Photo A.Friend.)



walpurti was a girl of about 25 years from Patjarr (Clutterbuck Hills) who, with her young brother, saw one when she was a little girl. We assume that this was approximately fifteen years ago, in the late 1960's and constitutes the most recent sighting of the rusty numbat so far reported.

The map shows the areas in which we were told the *walpurti* had lived. The report of its former existence in the Lake Gregory area was given to us by a Mantjiltjarra man now living in Wiluna, with an accurate account of the feeding and other habits of the animal. This reported occurrence is corroborated by information supplied to Andrew Burbidge and Phil Fuller in 1979 by a Kokatja man from Lake Gregory Station.

Thus it appears, from information given to us, that the *walpurti* was widespread in central Australia. It appears also to have been quite common in places. At Angata, west of Amata, we were told that the end of the *walpurti's* tail was used as a decoration by both men and women, the men placing two on each side of the beard, and the women hanging "lots" from their hair, *walpurtis*, therefore, were presumably common enough for the Aborigines to obtain them in quantity. There are accounts of white travellers in central Australia finding the remains of many individual *walpurtis* around Aboriginal campfires. In his book "The Red Centre", the prominent mammalogist, H.H. Finlayson, recounts an incident in the 1930s where at his request, some doggers agreed to obtain specimens of *Myrmecobius* from an area where it still existed.

The species was sufficiently numerous that the men were able to procure ten specimens. Unfortunately they were not familiar with the normal procedures of museum collecting and only kept the scaps!

The questions which we asked generally concerned the biology of the *walpurti* and naturally most of the answers we were given related to experiences in hunting it. We were told that it lived in spinifex and mulga, as well as sandhill country,

but not in the rocky ridge country. It lived in hollow logs and burrows, and the people used to smoke it out or break open the logs, or dig it out from a burrow. Much care had to be taken when digging out *walpurtis*, as they were most adept at escaping and could run extremely fast (faster than a dingo, one man said).

The female placed her young in a burrow which she dug herself. Sometimes the male and female could be found together in a burrow with the young which were present in winter and spring.

Most people agreed that the *walpurti* ate termites and sometimes ants (they had different names for these unrelated groups of insects) which it dug out of the ground. A few people at Warburton said independently that the carcasses of dead animals were the main food of *walpurtis*, but we didn't hear this anywhere else. It is possible that some insects or their larvae might have been taken from decomposing flesh on occasions.

There was also some disagreement on the time of day at which the *walpurti* was usually abroad. The majority said that it fed and ran around during the day, and slept at night. A few told us also that it rested during the very hot weather, coming out in the late afternoon. This corresponds to the behaviour of the numbat in the South-west, which takes refuge in logs between midday and late afternoon on hot summer days. About a quarter of the people interviewed said that the *walpurtis* fed at night and slept during the day, however; it is impossible to say whether they were reporting real observations, or whether their conclusions were based on limited experience. If a resting animal had been dug out during the heat of the day, the hunter may have concluded that it had nocturnal habits.

During conversations, many aspects of the *walpurti's* behaviour were described to us. These accounts left little doubt that the *walpurti* was the same animal as the numbat of the South-west. Several people mentioned its habit of basking in the sun, and standing on

hind legs looking at its hunters before running away. It didn't bite, and generally made no sound, although north of Amata, an old man gave us an accurate rendition of the hissing noise sometimes made by a very angry numbat!

Walpurti burrows were described to us in detail, and on several occasions, men drew diagrams in the sand showing a straight narrow shaft sloping down at a shallow angle, widening out into a chamber at the end. Several also picked up a handful of dead grass and indicated that the chamber was filled or lined with this material, and one told us how the *walpurti* carried it to the burrow in its mouth. The shaft of the burrow was between one and two metres long. In most of these details, the burrow resembles that used by the numbat in wandoo and jarrah forest, although the materials used to line the chamber are different.

Some of the information given to us about *walpurtis* corresponds to aspects of the numbat's life-style only now coming to light from research at Dryandra, in the southwest of the State. One woman described how the female *walpurti* carried the young on her back. Recently, a female numbat has been seen several times carrying her young this way while moving them from one burrow or log to another. The tendency of male and female to share a burrow while the young are still present has also been shown by radio-tracking studies at Dryandra.

Intricately bound up with these accounts of the ways of the *walpurti* were stories showing its cultural significance to the Aborigines. There were a number of "dreaming" stories about the animal, and we were told several times that it was a "big story down Mimili way". The special place of the *walpurti* is at the western end of the Everard Range. We were taken there by the Yangkuntjarra man who is custodian of the story about the *walpurti* and *tjalku*, the bilby (*Macrotis lagotis*). He took us to a waterhole in a small gorge where according to the story the *walpurti* originated. It is interesting to note that the areas near the Everard Musgrave Ranges were among the

last South Australian strongholds of *Myrmecobius*, reported by H.H. Finlayson (1933).

Another story, which we learnt at Kalka, in the North-west corner of South Australia, related how the *walpurti's* colouring originated. The perentie (*Varanus giganteus*, a large goanna) and the *walpurti* made a pact that each would paint the other's body. The *walpurti* painted spots on the perentie, and that met his approval. Then the perentie painted black and white stripes across the *walpurti's* back. The *walpurti* looked over his shoulder, and seeing the stripes, didn't like the pattern, so he picked up red sand and threw it over his back to cover them. This story aptly describes the way in which the red of the *walpurti's* upper back merges with the sharply-defined black and white stripes of the rump.

During our expedition it became apparent that the *walpurti's*

disappearance from the area occurred over relatively few years. It was stated earlier than most people who knew the animal were older than about forty. This leads us to speculate on possible causes of its rapid decline.

In the forty or fifty years since the time when *walpurti's* were common in central Australia, there have been two major changes which might account for the fairly sudden disappearance of this species, and of numerous other small to medium sized mammals which disappeared over the same period.

The first is the build up in numbers of the introduced red fox, (*Vulpes vulpes*) an extremely efficient predator which is able to dig burrowing animals out of their refuges.

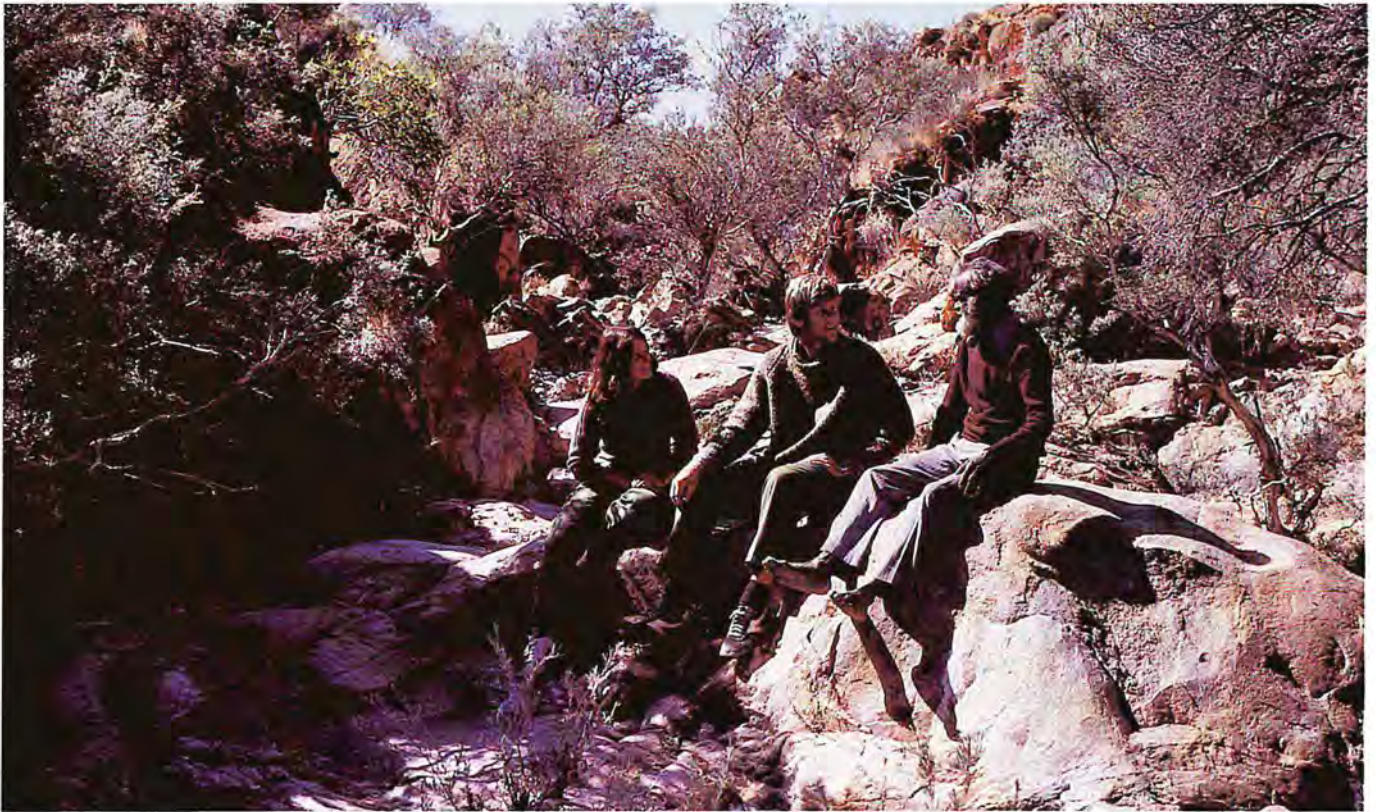
According to Finlayson (1961), the fox was already present in the

Musgrave and Everard in 1932, although still in quite small numbers. By 1956, he reported, it outnumbered the dingo in some areas. The feral cat (*Felis catus*) is another introduced predator which occurs in central Australia, but has been there at least since last century.

The other major change occurring during the same period related to patterns of burning. When the central Australian Aborigines lived their traditional hunting life-styles, they burnt patches of country to force their quarry out of hiding (Finlayson, 1936) and to promote new growth, to provide food for the herbivorous species which they hunted. In addition, small fires were lit as signals, and to regenerate some of the food plants used by the people. These practices resulted in a tight mosaic of vegetation of different fire-ages and probably reduced the occurrence of large summer fires.

▼ Changes in patterns of burning may have been a factor in the decline of the numbat in Central Australia. (Photo P.Binden.)





▲ The "walpurti's place", Everard Range, South Australia.

Once the missions were established in the 1920s and 1930s, the desert people began to leave their traditional homelands, being encouraged to do so by the authorities during the 1950s and 1960s, until there were very few still living off the land. It has been suggested that the resulting change in fire regime caused the decline of at least one central Australian mammal, the western hare-wallaby, *Lagorchestes hirsutus* (Bolton and Latz, 1978). This formerly-abundant small macropod is now known in mainland Australia only from a small area of the Tanami Desert remaining subject to cool winter fires of limited extent.

Burning in the central desert now largely takes the form of extensive summer wildfires (Burbidge and Fuller, 1979). Although *walpurtis* lived in burrows and may have survived the fire itself, an extensive wildfire would have left them in huge tracts of burnt land with very little cover from predators. The effect of changed burning practices on the availability of termites and ants as food for the *walpurti* is not known.

On the question of the *walpurti*'s persistence in central Australia, our interviews gave little hope that any populations might still exist. However, many desert people are now moving back into their traditional homelands, where in many cases, nobody has lived for twenty to thirty years. Perhaps a remnant population of the *walpurti* may yet be discovered.

ACKNOWLEDGEMENTS

We would like to thank all the Aboriginal people who supplied information about the *walpurti*, and others who assisted our enquiries. At each major settlement, community advisers were of great help, as were Uwe Kiebat of Mimili and Valerie Foster of Wingelinna. Herbert Howell acted as an interpreter in Warburton and he and his family kindly extended their hospitality to us. Andrew Burbidge suggested several important changes to an earlier draft of this article, while Peter Randolph and Peter Bindon, Western Australian Museum provided information on Aboriginal names.

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Editor's Note:

For reasons of economy the number of issues of SWANS has been reduced from 4 to 3 each year. The revised dates for publishing are now May 1st, September 1st, and the last day of each year.

Mobile Cannon Netting for Waders at Eyre Bird Observatory

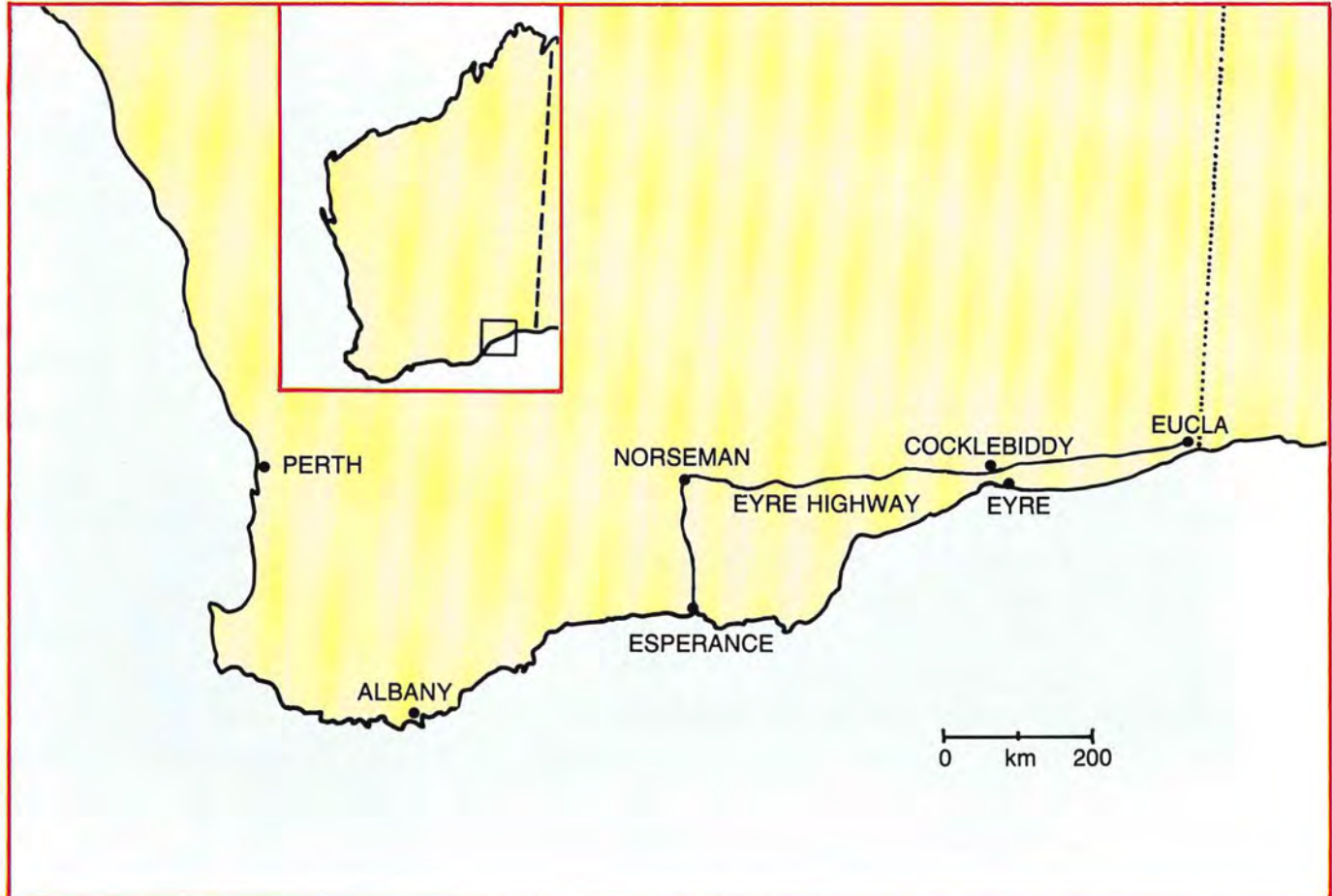
by Grant Pearson

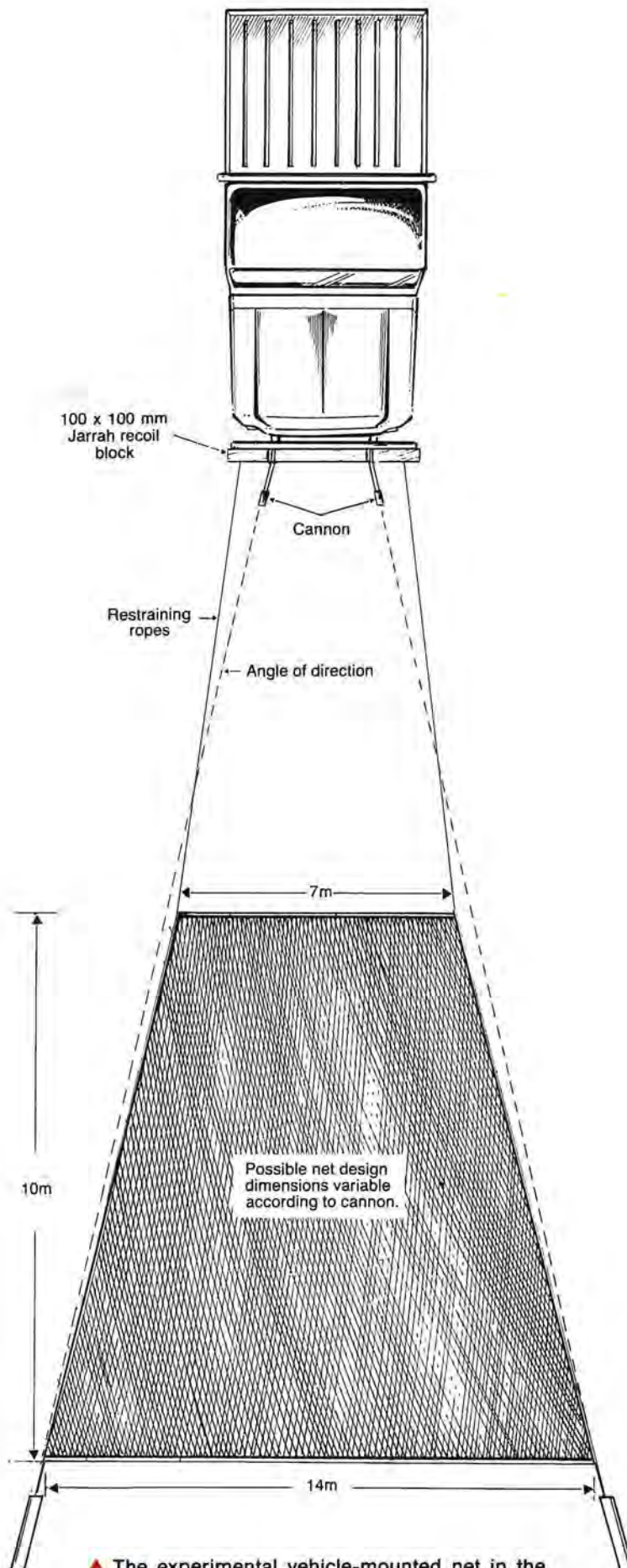
Eyre Bird Observatory lies 32km from Cocklebidy along the Great Australian Bight and only 1km from the sea. Migratory waders make their way along the coast on their annual migration to or from the northern hemisphere and are the subject of a study by the Warden at the Bird Observatory, Mr Peter Congreve.

The wader numbers peak in November with a considerable diversity of species making excellent subjects for a wader identification course held each year by the R.A.O.U. (Royal Australasian Ornithologists Union). In fact 19 species were recorded during the November 1982 course illustrating the unusual, if not unique, nature of the ocean front wader habitat at Eyre. Among the birds sighted were



Grey-tailed Tattler were often sighted in small numbers near the Observatory. (Photo G.Pearson.)





▲ The experimental vehicle-mounted net in the fired position. Opposite page, shows the close up detail of cannon apparatus ready for use.

Mongolian Plover, Grey-tailed Tattler, Red Knot, Great Knot, Sandlering, Sharp-tailed Sandpiper and Pectoral Sandpiper. The Oriental Plover has also been recorded at Eyre.

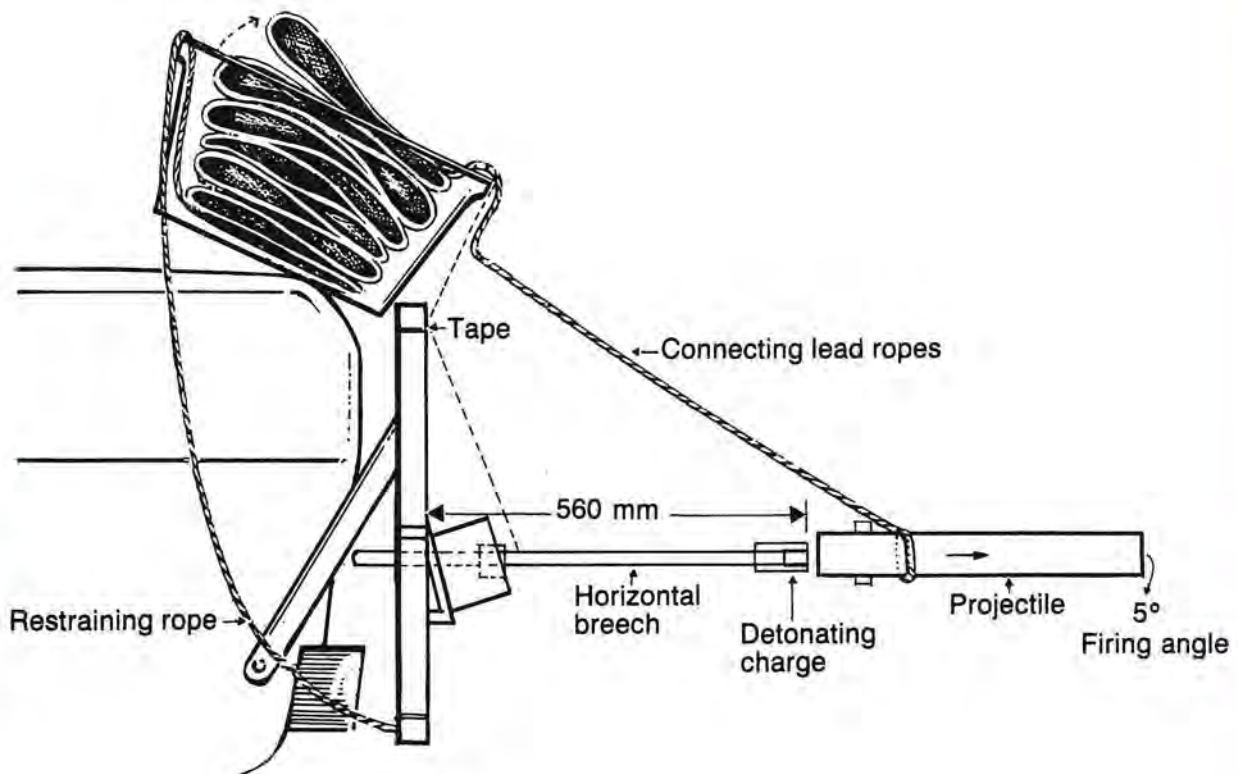
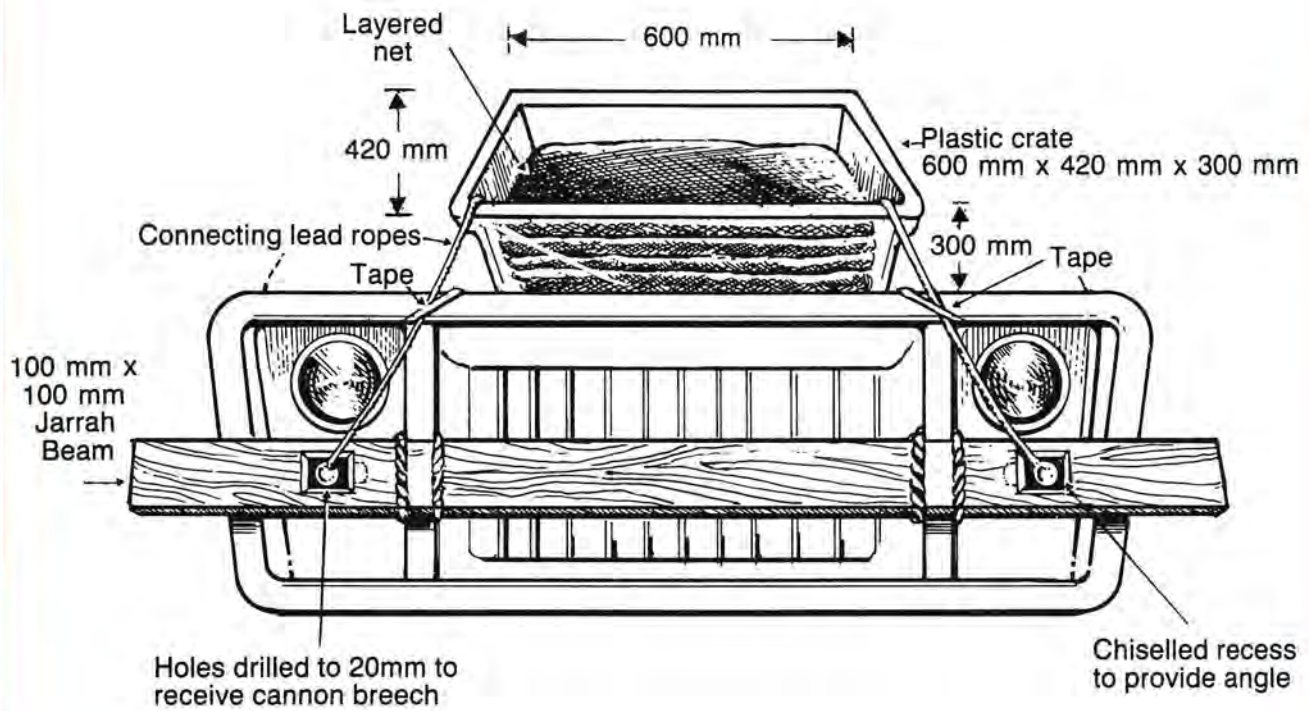
In addition to migratory wader counts carried out by Peter, he is also studying the biology and movements of the Red-capped Plover, a non-migratory species. With this in mind and the need to trap waders during the November 1982 wader identification course I decided to modify the normal cannon net system to take advantage of beach conditions peculiar to those near Twilight Cove about 10km west of the observatory.

On several occasions while driving the Ford F100 4 x 4 survey vehicle along the beach at the water's edge, waders would wait until the vehicle was within 6-8m of them before taking flight. This is the exact range of the standard cannon net employed on netting birds in Perth and in the North-West.

The aim of this article then is to describe the materials and technique used to trap single and small groups of migratory and non-migratory waders at the Eyre Bird Observatory. It will also provide some basic information on the construction and operation of cannon nets as used in the North-West which has attracted considerable publicity in recent years.

Under normal circumstances a wader net is set at a known roost or place where waders can be expected to gather at periods of high tide. However there are several conditions at Eyre which encouraged the development of a small portable (i.e. vehicle mounted) cannon net. Not the least of these factors is the lack of manpower available to the Warden for setting up and firing a large net. By comparison a vehicle mounted net can be carried during surveys and used instantly if the opportunity arises with only one helper or none if necessary - he need only tailor his catch according to the amount of help available.

Secondly if a suitably effective system could be developed it would





▲ Oriental Plover. This bird is one of the less common species recorded at Eyre in recent years. (Photo G.Pearson.)



▲ The cannon net loaded and ready to fire in early prototype. (Photo G.Pearson.)

make the time spent setting cannon and nets more acceptable considering the small catches available even using full size stationary nets.

Single adult Red-capped Plover could also be quickly and simply trapped thus complementing the work done on juvenile non-flying birds which to date are the only waders easily catchable along the beach front.

As the migratory waders rarely linger at Eyre for more than a few days at a time it is difficult to predict

where to set a net. Naturally should there be sufficient helpers to "twinkle birds" and help remove them (i.e. shepherd them into the target area) a large set net will be successful.

The method used to fire a net from a vehicle was rough and simple but effective. Further work is needed to develop a net more suited to the output of two cannons instead of the usual three. It should also be constructed from a close mesh net such as 20mm 6-ply which will not snag easily and will flow evenly from the plastic holding crate when fired.

The cannons used were of the improved Dill-Thornsberry type each taking 6 gram charge of F-grade black powder and fired electrically. They were mounted through a section of 100mm x 100mm pine which, when it shattered, was replaced with jarrah (125mm x 100mm).

The timber was fixed to the bull bar close to the supports for rigidity. Twenty mm holes were drilled through the timber to provide 5° elevation above the horizontal and at such an angle that the projectile would fully extend the net at the maximum length of the recoil ropes. Although the elevation would vary with the terrain the vehicle would usually be facing along the flat sandy beach parallel to the water's edge and relatively horizontal.

The net was contained in a plastic fish box tilted forward and mounted on the vehicle's bonnet. The restraining ropes were tied to the bull bar as low down as possible. The net was loaded into the box starting from the rear and folded in concertina fashion. The lead ropes were taped to the top of the bull bar and attached to the projectile.

Firing was carried out using a 30 shot firer and the wiring was connected in series. A range finder was made from pieces of insulating tape fixed to the windscreen and placed to line up with the lowered sunvisor and the top of the bull bar.

In summary the results of the tests indicate that the system will work. However, it is evident that the following points will affect the success rate of trapping attempts:

- a) The net should be fired with the wind to achieve the optimum spread.
- b) The vehicle used must be quiet and as unobtrusive as possible. Movements in the cab can be enough to alarm the birds.
- c) A completely clean net is essential to allow it to flow evenly from the container when fired.

My thanks go to Warren Low Choy, a course participant, and to Peter Congreve, the Warden, for their help in the design and construction of the assembly.

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