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 essential component in any conservation or reserve management programme—but an informed, educated public is needed to ensure its continuing success.

This publication is designed as a medium by which the various 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.

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Acting Editor:
Kevin Carhart

Assistant Editor:
Julie Walsh

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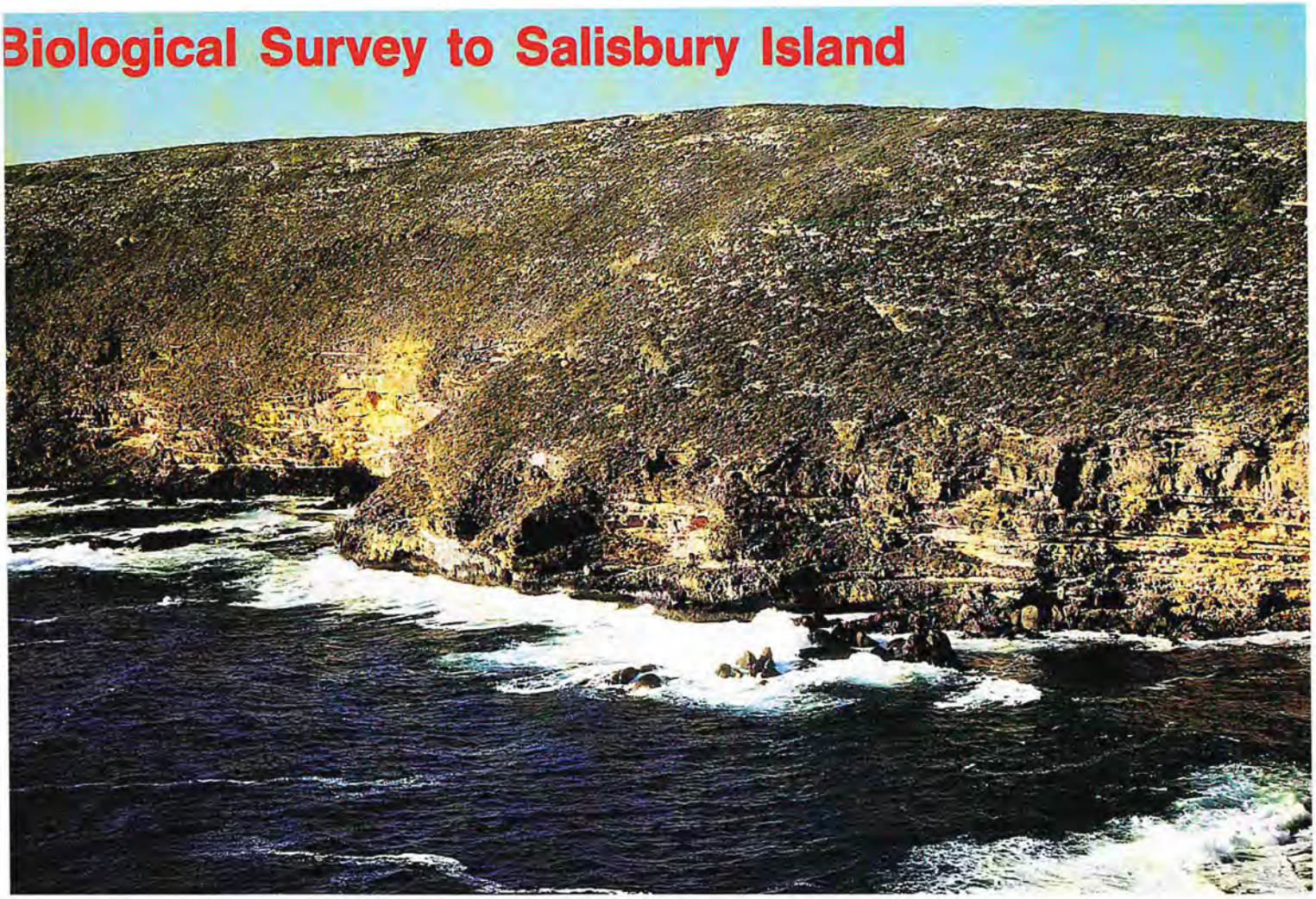
WILLIAM C. BROWN, Government Printer, Western Australia

COVER PHOTO

A Fat-tailed Dunnart *(Sminthopsis crassicaudata crassicaudata)*. Stories on the rearing and biology of this animal appear on pages 8 to 11 of this issue.
(Photo—Copyright A. G. Wells)

Biological Survey to Salisbury Island



▲ Limestone cliffs on the west side of Salisbury Island. (Photo A. A. Burbidge.)

The Recherche Archipelago, a group of over 100 islands off the south coast of Western Australia, has long been recognised as an area of extremely high nature conservation value. Many of the islands hold particular importance because of the presence of small populations of terrestrial mammals, including species or sub-species now rare or extinct on mainland Australia and the presence of significant seabird and seal breeding colonies.

For this reason, the whole of the Recherche Archipelago is included in a Class A reserve, the Recherche Archipelago Nature Reserve, vested in the Western Australian Wildlife Authority in May, 1979. However, because of the large number of islands involved and their difficulty of access, many of the islands have not been adequately surveyed. One such island was Salisbury Island.

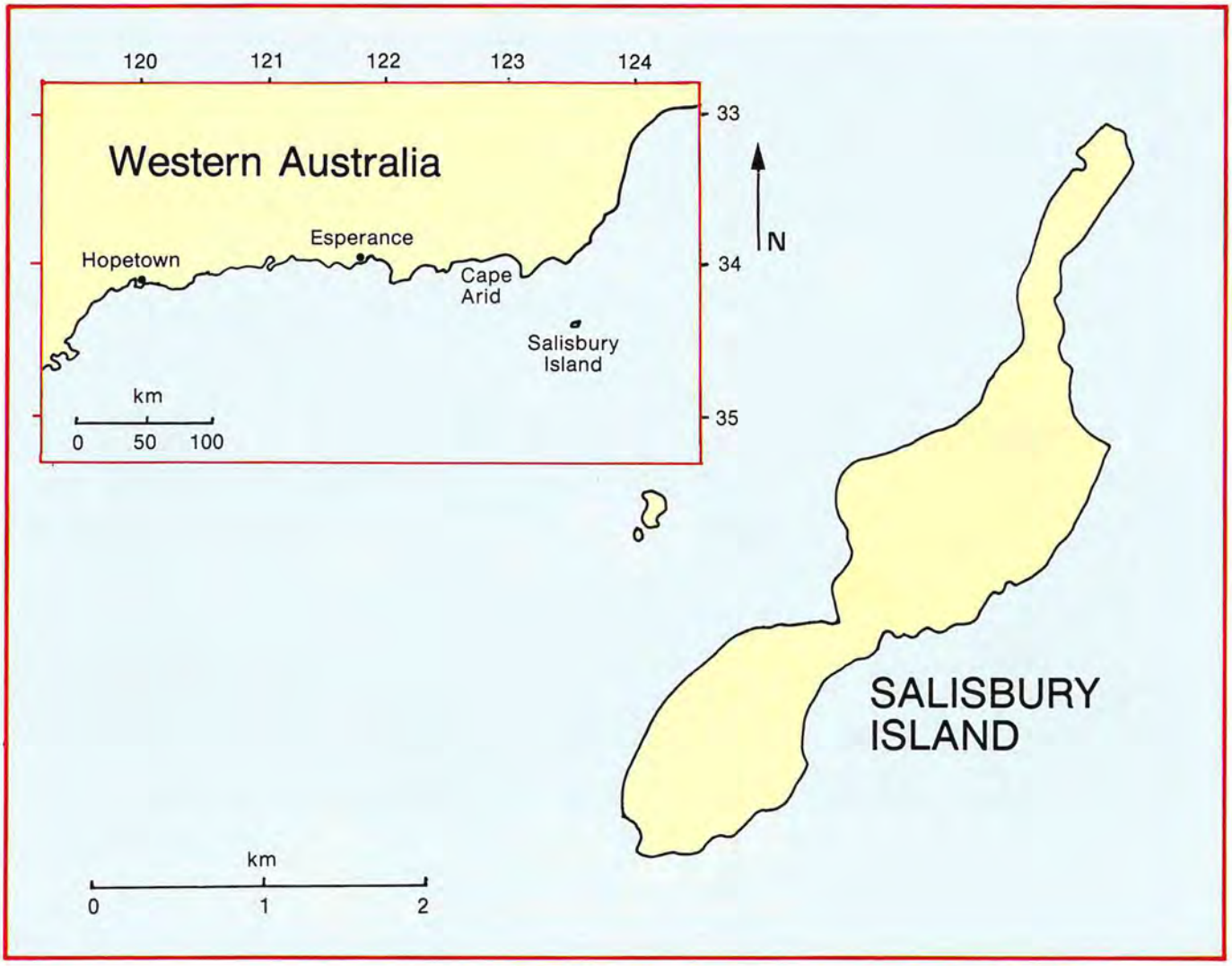
Salisbury Island, having an area of about 320 hectares, is the third largest island in the Archipalego. Despite its size, until the beginning of this year there were only two recorded visits to the island by biologists. The first was during the Australian Geographical Society expedition to the Recherche in 1950 and the second by Dr. I. Abbott and Dr G. Maynes in 1977. Both visits were for only a few hours duration and were confined to the northern end of the island.

This state of affairs changed this year in response to two mineral claims covering Salisbury Island which were lodged under the Mining Act in late 1980. These claims were for guano, phosphate and limestone rock. On their receipt, the Western Australian Wildlife Authority and the Conservator for Wildlife lodged objections to the claims with the Wardens Court and arranged for the Department of Fisheries and Wildlife to examine the island's plants and animals and assess possible impact if mining were to proceed.

Accordingly, in late March this year, a party from the Western Australia Wildlife Research Centre attempted to land on Salisbury Island from the sea. However, after one attempt which was unsuccessful due to stong winds and rough seas, and after talks with local professional fishermen experienced in the waters around the Archipelago, it was decided that although a landing could be made on the island in calm weather, it would be difficult to land and retrieve a large party of scientists and their equipment to any schedule. In other words, attempts to reach the island by sea were abandoned.

The journey across to the island was finally made by helicopter from the mainland at Cape Arid, 40 kilometres away. The party, consisting of Dr Andrew Burbidge, Dr Jack Kinnear, Mr Norm McKenzie and Mr Phil Fuller, set up camp on the crest of the island on April 15th and departed four days later on April 19th.

Before discussing the results of the party's work, some brief notes on the island's history may be useful. The first European to sight the Archipelago was Pieter Nuyts in 1627. Further visists were made by Vancouver in 1791, D'Entrecasteaux


120
121
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34
35
Western Australia
Esperance
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Arid
Salisbury
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SALISBURY
ISLAND
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2

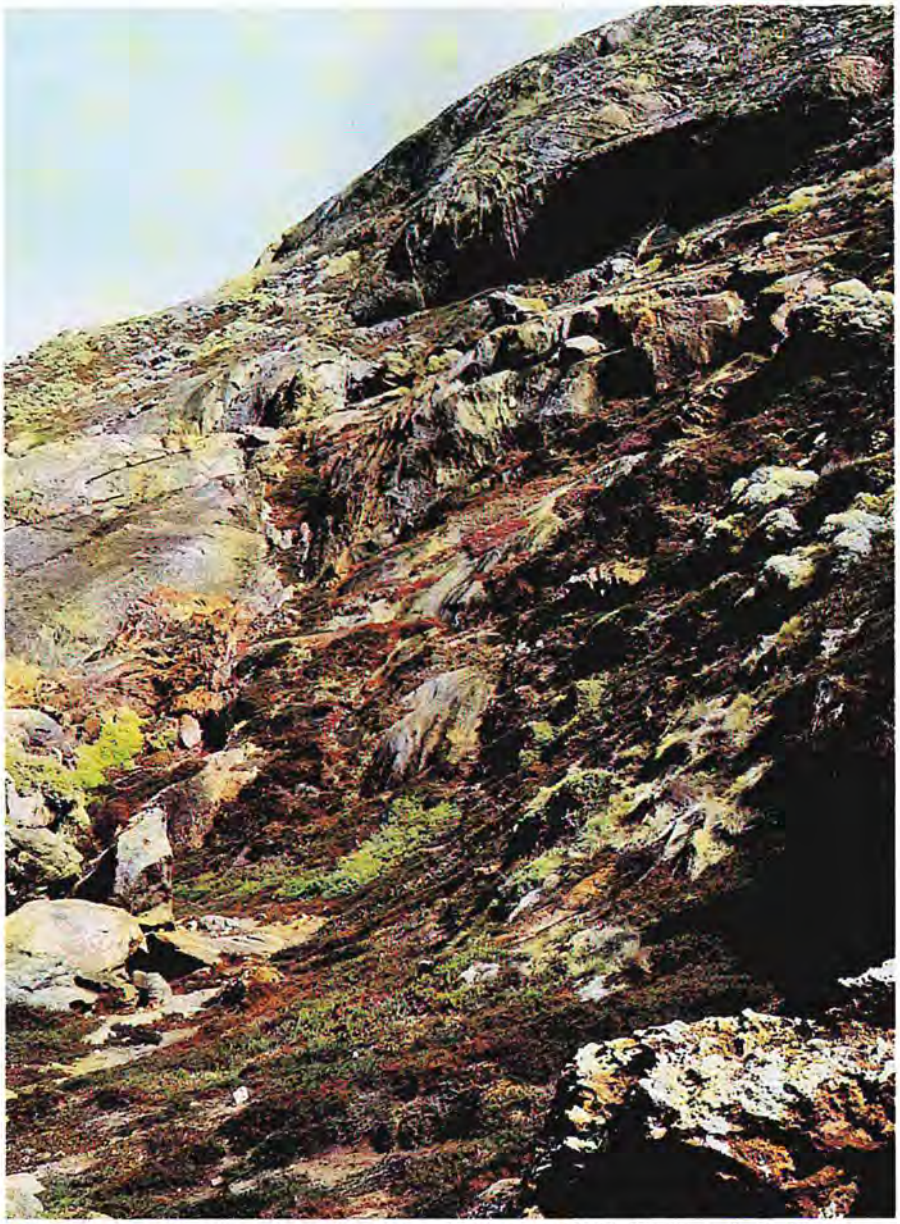
in 1792 and Mathew Flinders in 1802 but during this period there is no record of anyone landing on Salisbury Island. However, by 1825 sealers were operating throughout the islands of the Recherche and this continued until 1892 when seals were legally protected. One further year of sealing was permitted in 1920. Salisbury Island was almost certainly visited by sealers during this period but the lack of a sheltered anchorage, good campsite or fresh water would not have encouraged them to stay. In 1894 the island was the scene of a dramatic rescue after the *Rodondo,* a ship of 1 000 tonnes, struck a nearby reef while bound for Fremantle. The 196 passengers and crew made their way to the island from where they were eventually rescued by the schooner *Grace Darling.*

Salisbury Island was named by Commander J. W. Combe who carried out a hydrographic survey of the Recherche in 1900-1901. However, the origin of the name is unknown.

Salisbury Island is about 5.2km long. It is fairly narrow (see map) being about 1.3km across at the widest point, reducing to 200 metres at the narrow neck and 150 to 300m across the northern peninsula. The long axis is aligned in a north-east south-west direction.

Except for the northern peninsula and the southern peak the island consists of an undulating, high limestone plateau with steep cliffs. It is highest in the centre of the island, north of the narrow neck, where it reaches 120m. The northern peninsula is mostly limestone but it is much lower. The southern peak, which reaches 100m, and its surrounds, consist of a Proterozoic migmatite, composed of granite rocks, metamorphosed basic rocks and minor schists and quartzites. The migmatite extends northwards and is exposed as a fringing platform surrounding most of the island, one to five metres above sea level and up to 40 metres wide.

The recent interest in the island's phosphate reserves is not new as a visit was made to the island during World War II for the same purpose.



▲ Steep migmatite slope at southern end of Salisbury Island. (Photo A. A. Burbidge.)

However, Dulfer, who led the search in 1943, was not impressed with what he found.

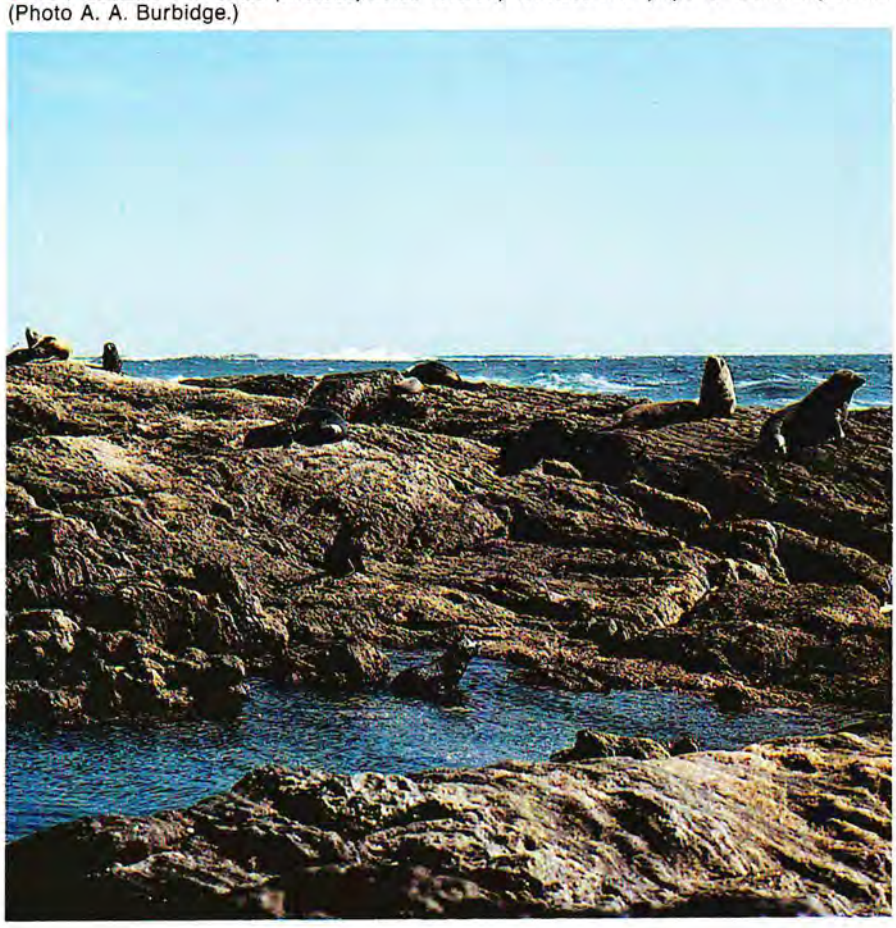
"The narrow beds of low grade phosphate found in the cliff face at Salisbury Island are not encouraging in quality. To determine the quantity available a large amount of tunnelling or drilling would be necessary. If substantial deposits exist, the grade needs to be comparatively high to offset the high cost of underground mining, shipping facilities and probably delays to shipping due to unfavourable seas, of which we had good evidence during our visit to the Archipelago."

Salisbury Island is separated from the mainland coast by a broad channel 45 fathoms (82m) deep. Based on current knowledge and understanding of sea levels, this would indicate that the island was isolated at least 13 000 to 14 000 years ago. Compared with channel depths separating a variety of other large islands within the Archipelago it is evident that Salisbury was separated before any other major island. Thus it could be expected to find greater genetic differences in resident species on Salisbury Island than on other islands in south-west Australia when compared with mainland populations.

Which brings us back to the results and observations of this year's survey party.

▲ Black-flanked rock-wallaby *(Petrogale lateralis)* on Salisbury Island. (Photo A. A. Burbidge.)

▼ New Zealand Fur Seals *(Arctocephalus forsteri)* females and pups on Salisbury Island. (Photo A. A. Burbidge.)



The vegetation on the island varied between dense heath, open grass and sedges and "meadows" of dwarf scrub and succulent mat plants. Prior to this year's visit, 28 species of plants were known to occur on the island. This was increased to 39 species and doubtless collecting in a more favourable season, especially spring, would yield more species. So far, all the work on the island has been carried out in summer or autumn.

However, the most important find on the island was the extent of its mammal population.

Although the first record of Black-flanked Rock-wallabies *(Petrogale lateralis)* on Salisbury Island resulted from 1894 when survivors from the *Rodondo* caught the animals for food, this record was overlooked by scientists until the species was rediscovered by the 1950 Australian Geographical Society expedition, and even then, little was known of the population. The 1982 survey made counts of the rock-wallabies on the island both by day and, with the aid of a spotlight, at night. Daytime counts consistently produced higher numbers and these were used to calculate the size of the population. After counting in the migmatite area as well as the limestone area, the survey estimated the population of the whole island to be 249 animals. An accurate count proved difficult as visibility was a major problem on the island, particularly on the limestone area. There, the vegetation was extremely dense and there were a number of deep caves in the cliffs.

In addition to their numbers, the Salisbury Island rock-wallabies were in excellent condition despite conditions on the island which indicated that little or no rain had fallen during the summer preceding the party's visit.

The status of the Salisbury Island rock-wallaby population may have important implications for the survival of this species throughout Western Australia. The Black-flanked Rock-wallaby is confined to this state, occuring on the mainland in the Cape Range, in the Murchison

River Gorge at Kalbarri, and on granite rocks in the wheatbelt.

Other island populations occur on Depuch and Barrow Islands in the Pilbara. Despite this distribution, the animal is in danger of becoming extremely rare. The Cape Range population has not been studied but both the Kalbarri and wheatbelt populations are declining. In fact, from being a widespread and fairly common animal in the wheatbelt it is now reduced to five small populations totalling between 75-100 animals. These animals lack genetic variability through inbreeding brought about by the low numbers and their only hope of continued survival may be from the introduction of Salisbury Island genes to the mainland in an attempt to produce some hybrid vigour.

A surprise find which had not been previously recorded from the island was a major breeding colony of New Zealand Fur Seals *(Arctocephalus forsteri)*. About 500 animals were counted of which only two were males and about 70 per cent were pups. As fur seals produce only one pup per year, this number of pups would indicate there must have been about 350 females in the colony, many of which were probably in the sea feeding at the time of the count. Based on studies in South Australia, the total size of the Salisbury Island colony may have been in the order of 1 000, consisting of 350 females, 75 to 100 breeding males, 350 pups and perhaps 200 to 250 sub-adult males and females. This would make the colony the largest known breeding colony of fur seals in Western Australia.

In Australia, the New Zealand Fur Seal ranges from Cape Leeuwin in Western Australia to Kangaroo Island and other small islands off the coast of South Australia (see *SWANS* Vol. 12 No. 1 1982).

The New Zealand Fur Seal was heavily exploited by sealers during the nineteenth century and further exploitation was permitted in the Recherche in 1920. Only recently has the species shown any signs of recovery in Western Australia, and it is still an extremely rare animal.

▲ Australian Sea Lions *(Neophoca cinerea)*. (Photo A. A. Burbidge.)

Salisbury Island also provides a breeding place for another of the world's rarer species of seals, the Australian Sea Lion *(Neophoca cinerea)*. Between 30 and 40 were sighted on the island including two pups. The animals, single and in groups, were basking and resting all around the island up to 300m from the sea and 50m above sea level.

Other fauna observed on the island during the survey included a genetically unique population of the Southern Bush Rat *(Rattus fuscipes)* and an undescribed subspecies of lizard. Altogether, nine species of reptiles were collected from the island including two species of geckoes, six of skinks and one species of snake. It is likely that additional work would reveal further species as the survey was hampered in this respect by cool weather, dense vegetation and interference by bush rats during pit trapping for small species.

A total of 14 bird species was also recorded during the survey. Of these, five were land birds, two were breeding seabirds and six were sea and shore birds resting on the island. A Yellow-nosed Albatross was seen flying around the island but this species does not come ashore except to breed. Again, further visits may reveal additional breeding sea and shore birds such as the White-faced Storm Petrel, Caspian Tern, Crested Tern, Cape Barren Goose, Little Shearwater, Pacific Gull, Silver Gull and Sooty Oystercatcher.

Although much work remains to be done on the island, this year's survey highlighted the importance of Salisbury Island in more ways than one. It not only harbours the only insular population of the Black-flanked Rock-wallaby south of the Pilbara and the only one known to have genetic diversity, it also is the site of the largest known breeding colony of the New Zealand Fur Seal in Western Australia. The island is also an important seabird breeding area and, in addition, would provide a valuable scientific laboratory for studies on such subjects as island biogeography, rates of evolution and changes in species diversity following separation from the mainland, as well as broader ecological work.

Development of young Fat-tailed Dunnarts

Story and photographs by B. A. and A. G. Wells. (copyright)

About May, 1972, when the Naturalists' Club was preparing for its Annual Wildlife Show, a farmer from Mingenew offered for display a pair of Fat-tailed Dunnarts, which had been disturbed during plowing and seeding operations on his property. On behalf of the Club, we undertook the care of these animals for the period leading up to the Wildlife Show.

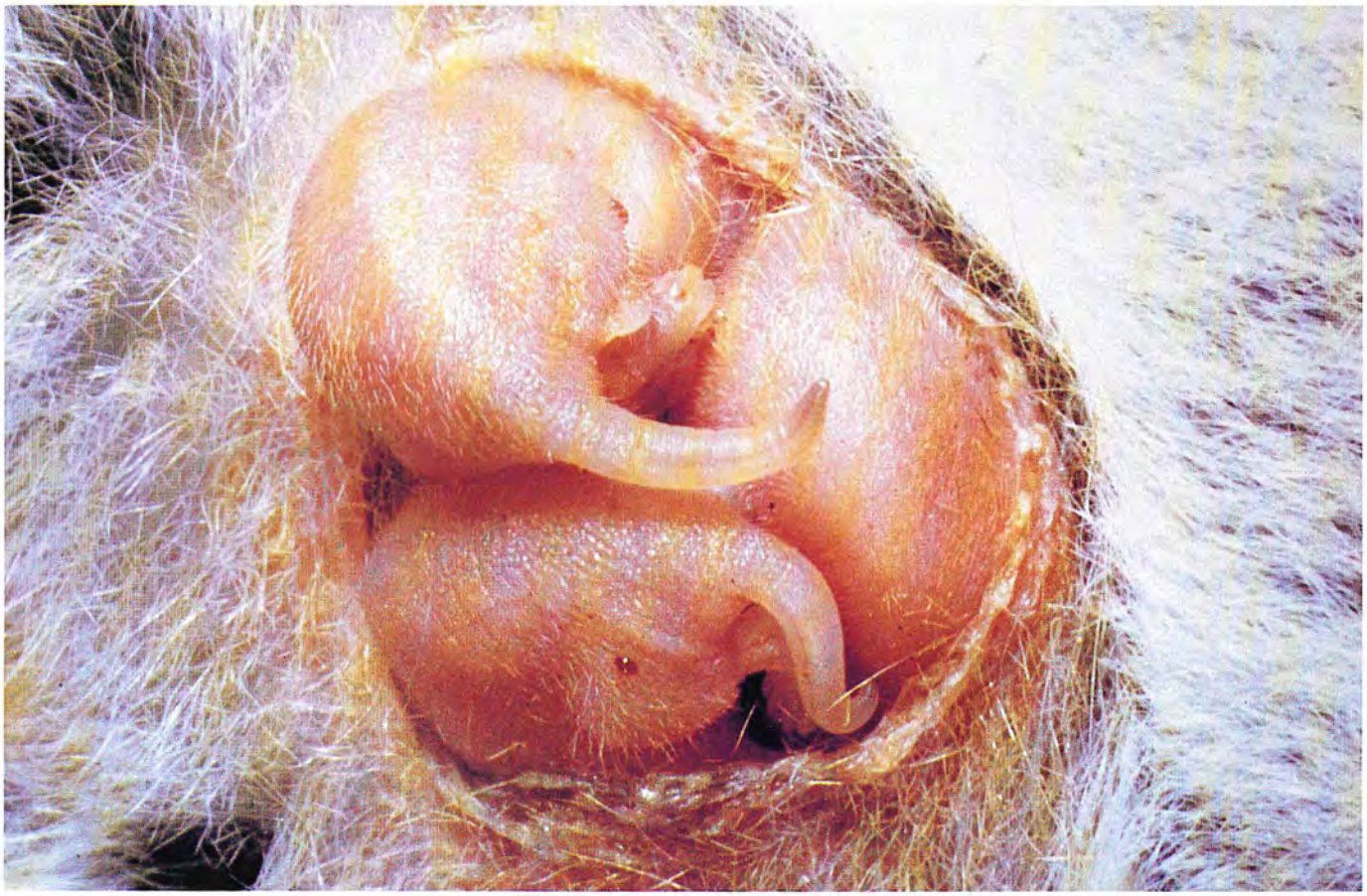
A few days after receiving the animals, we discovered that the female was pouch-gravid and eventually six lively young were revealed. We immediately built a large cage designed to provide adequate space for exercise, material for nesting, and various natural objects (mallee roots etc) to encourage normal activity. As a precautionary measure against the risk of aggression between the two adults, the enclosure was divided in a way which separated the male without entirely restricting interaction.

We procured a copy of *A Preliminary Survey of the Behaviour in Captivity of the Dasyurid Marsupial* (Sminthopsis crassicaudata—Gould) by R. F. Ewer, Dept. of Zoology, University of Adelaide 1967. This thesis was a valuable aid to our management of this pair. Professional advice regarding a suitable balanced artificial diet was also obtained. The diet was frequently supplemented with grasshoppers, moths, other insects, and mealworms. In spite of prodigious effort however, it seemed we were never able to fully satisfy the appetites for natural food.

The development of the six young dunnarts to healthy full adulthood was uneventful. However, about the time they gained independence, the female parent sustained a disease in the tail which failed to respond to veterinary treatment. Although she survived, the tail eventually became detached. The cause was not established.

In those early days of our increasing interest in natural history, regrettably, we did not record information and observations which we now know to be important to such an exercise. At the time, it seemed sufficient satisfaction to have the privilege of photographing the dunnarts' development.

▼ View of the pouch area between the mother's hind legs showing young a few days after birth.



▲ The young grow rapidly to fill the pouch.

▼ They soon outgrow their accommodation.

▲ The young dunnarts are now furred.

▼ Just before weaning the young dunnarts are dragged about as they cling tenaciously to their mother's nipples.

Biology of the Fat-tailed Dunnart

(Sminthopsis crassicaudata crassicaudata)

One of the most common of dunnarts in Australia, the Fat-tailed Dunnart *(Sminthopsis crassicaudata crassicaudata)* is widespread throughout the semi-arid and arid grasslands and shrublands of the southern half of Australia.

Morton (1978) describes its habitat as follows . . . "The habitat of *S.crassicaudata* includes open woodland, stony plain, saltbush steppe and grassland . . . grassy farmland and semi-arid and arid grassland and low shrubland . . . sparsely vegetated sandplain and gibber plain." Morton also suggests that there is considerable evidence that the Fat-tailed Dunnart has expanded its range in south-western Australia." The first collector of *S.crassicaudata* in this area, John Gilbert, noted that it was a very rare local species." Whereas today . . . "as evidenced by the numerous specimens of *S.crassicaudata* donated to the Western Australian Museum within the past 10 years, the species is common throughout the wheatbelt and extends on to the coastal plain north of Perth."

As its name suggests, the Fat-tailed Dunnart usually has a characteristic short, spindle tail although this can vary considerably, depending on available food supplies and whether the animal is breeding or not. Breeding animals store little fat because of the energetic demands of reproduction, and only during autumn when breeding has ceased and food is still relatively abundant, do the fat reserves increase noticeably.

In addition to variable tail 'fatness', *S.crassicaudata* displays considerable geographic variation over its large range, primarily in coat colour, tail length, ear length and foot-pad configuration. Most animals weigh between 10-20g when mature.

The Fat-tailed Dunnart is one of the few dunnarts whose behaviour has been studied in detail. Dr R. F. Ewer has shown that females may start to breed at four months and produce litters continuously at intervals of about 82 days for at least six months. However, field studies indicate that females produce only two litters each season.

The breeding period is generally between July and February. According to Morton (1978) the Fat-tailed Dunnart usually nests solitarily in the breeding season, but up to 70 per cent of individuals share nests in groups of from two to eight during the non-breeding period (March-June). These nest sharing groups are impermanent and appear to be random aggregations of individuals.

The Fat-tailed Dunnart is nocturnal and its diet has been seen to include grasshoppers, beetles, moths and even earthworms. Spiders seem to be a particularly important year-round food source. Some splintered remnants of vertebrate bones have, on occasion, been found in faecal material, and it seems likely that they were from frogs or small reptiles. However, vertebrate remains are very rare and it seems clear that *S.crassicaudata* is almost completely insectivorous.

—Compiled by N. McKenzie and C. Young

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Hand Pollination of Rare Triggerplant Successful

Stephen Hopper, Research Officer, W.A. Wildlife Research Centre.

The Wongan Triggerplant *Stylidium coroniforme* is one of Western Australia's rarest wildflowers. Only two plants are known to exist and these occur in a small fenced enclosure on the edge of a sheep paddock near Wongan Hills, a sheep and wheat farming district 150 km north-east of Perth.

The triggerplant was named in 1966 by Dr Rica Erickson and Mr Jim Willis from specimens collected in 1963 at the same locality where it is found today. At that time the species was reported to be abundant. It has declined to just two plants presumably because of a combination of grazing and trampling by sheep, erosion of topsoil and several successive years of drought.

Attention to the plight of the species was drawn in 1979 by two publications on rare plants. The need for more information on its conservation status was then recognised by the Department of Fisheries and Wildlife, and money was made available for a consultant botanist to search the Wongan Hills for this and other rare plants. Dr Barbara Rye undertook the job in August-October 1980. She failed to locate Wongan Triggerplants anywhere else but at the original place where Dr Erickson and Mr Willis made their collection. Moreover, only one plant was present when Dr Rye searched the area.

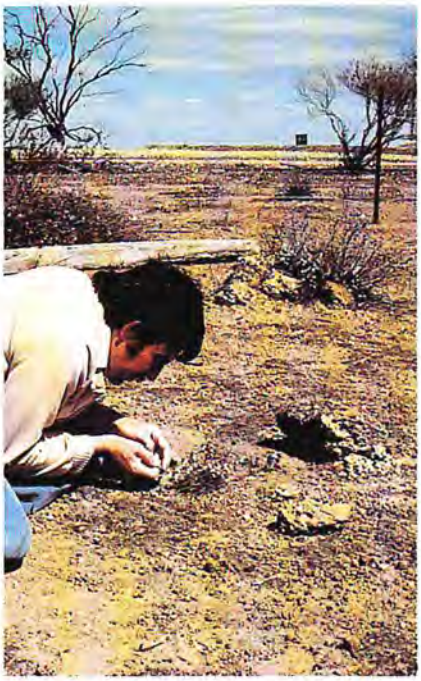
▲ Pollen held in forceps is rubbed on the stigma of the Triggerplant's flowers. (Photo P. Roberts.)

Although this plant produced a good crop of flowers, it failed to set any seed in 1980. Like many other triggerplants *Stylidium coroniforme* appears to require cross-pollination between separate plants to set seed.

Following an inspection of the triggerplant site in November, 1980 by Dr Rye, Chief Research Officer Dr Andrew Burbidge, Technical Officer Mr Phil Fuller and myself, a fence was erected in April, 1981 to exclude sheep and allow any seed that germinated a chance to grow undisturbed to maturity.

On September 16, 1981 the Wongan Hills District Wildlife Officer Phil Roberts discovered a second plant of *Stylidium coroniforme* within the enclosure. It had produced three rosettes of leaves from an old woody groundstock that presumably was dormant during the 1980 season. No seedlings were observed within the enclosure.

Hence it was decided to hand-pollinate flowers on the two existing plants in the hope of obtaining seeds and germinating the species in cultivation. Advice on the best procedure was sought from Dr Sid James of the Botany Department, University of Western Australia, as he and his students had made detailed studies on the reproductive biology and evolution of triggerplants.



▲ Wildlife Officer Phil Roberts performs the operation. Note the fence erected to exclude sheep and the poor soil in which the plants were found. (Photo S. D. Hopper.)

Armed with preliminary information from Dr James, I accompanied Wildlife Officer Roberts to the site on September 22 and the first cross-pollinations were made. Wildlife Officer Roberts undertook all the subsequent work on the project. The following is extracted from his report on the successful production of seed.

"I commenced pollination on September 22 and completed it on September 27. The flowers showed dramatic signs of withering up within two days after pollination had taken place. A total of 17 flowers were pollinated on each of the two plants. Pollen was extracted from anthers by using very fine forceps. Small quantities of pollen were then placed on the female stigma. Numerous new yellow flowers were tagged to determine when petal colour changed from creamy yellow to white. The flowers remained yellow for 2 days, then changed through to white. This colour change process appeared to coincide with the splitting of the bright red anthers.

"New flowers were also tagged with cotton to determine how long unpollinated flowers remained out before they withered up. It was found that each flower remained open for 14 days.

"Again through a tagging system I was able to determine that the flower's anthers (stamens) remained male for up to 5 days. After this period a small protrusion of the stigma could be seen to develop. From this stage it took the stigma 7 days to fully develop.

"On October 14 a plague of caterpillars was found feeding on both plants. All flowers and numerous expanded fruits were eaten by the caterpillars (also at this time one rosette on plant No. 2 had died). On October 15 I erected a small 2" high galvanised fence around both plants. The perimeter was then dusted with common garden dust. This had the desired effect. Numerous dead caterpillars were found on October 16. Also on this date caterpillar eggs and a cocoon were found on plant No. 2. The cocoon, the eggs and caterpillars were sent to Wildlife Research for identification. Other associated plants that the caterpillars were feeding on were *Dampiera eriocephala, Baeckea crispiflora* and *Gastrolobium spinosum.*

"On November 17 the last three flowers on Plant No. 1 had withered up. On November 12 nine fruits from plant No. 1 and three fruits from plant No. 2 were picked.

"Details of seeds per pod (fruit) are as follows:

Plant No. 1-19, 17, 9, 18, 10, 5, 0, 1, 0.

Plant No. 2-5, 9, 2.

"As can be seen by the above figures, fruits of plant No. 2 were not as productive per head as those of plant No. 1. The fruits from plant No. 1 were much larger (2 x) than plant No. 2. More seeds would have been produced from both plants if the fruits weren't eaten by caterpillars. Both plants were watered on numerous occasions.

"Fauna activity was restricted to ants and midgies browsing over both plants. One small unidentified beetle species was seen to activate a trigger of a flower on September 15 on plant No. 1. Unfortunately the specimen couldn't be collected."

The small quantity of seed of *Stylidium coroniforme* obtained from hand pollination provides an opportunity to establish the species in cultivation. Unfortunately, little is known about the horticulture of triggerplants, so the results of attempts to germinate the seeds are unpredictable. Until further plants are found in the wild, cultivation seems to be the only way to prevent the extinction of this attractive plant.

Brown Honeyeater
(Lichmera indistincta)

(Photo copyright A. G. Wells)

A small modestly plumaged bird, the Brown Honeyeater is a familiar sight in many street trees and gardens in Perth's better-wooded suburbs.

The Brown Honeyeater is found all over the state, coastal and inland, in open woodlands and scrub. In the thicker Jarrah forest belt of the the south-west, the bird tends to frequent the more open areas such as where settlement has been established, and in the more arid parts of the country, it is restricted to the dense shrubbery around granite outcrops and to towns where there are street trees and gardens.

The adult birds vary in length between 110-160mm. They breed between June and January, laying up to three matt white eggs in small cup-shaped nests made of bark strips, grasses and sometimes spiderwebs, lined with softer material such as down or hair.

The Brown Honeyeater has a loud spirited song which, in the nesting season, has been likened to that of the Reed-warbler. The Reed-warbler's song is, however, more melodious and uttered with greater vigour.

As its name implies, the Brown Honeyeater feeds mainly on the nectar of flowers for which purpose its beak and tongue are adapted. The beak is lengthened and curved for probing into flowers and the tip of the tongue is frayed out into a brush, while the sides of the tongue curl upwards to form a more or less closed tube. During their visits to flowers, the birds also capture insects which form a substantial part of their diet.

Common Birds of Perth Number 3

Red Wattlebird
(Anthochaera carunculata)

(Photo copyright A. G. Wells)

In Perth, the Red Wattlebird is one of the most common honeyeaters and is often seen probing flowering street trees for insects and nectar and its raucous notes are considered a feature of King's Park which overlooks the city. The bird is also found through the south-west of the state, as far east as Eucla and north to the mulga-eucalypt line. However, in the outer parts of its range the bird seems to be only a winter visitor, withdrawing to Perth and the south-western corner in the summer after breeding.

This migratory passage can be clearly observed in Perth as from about April to June small flocks of up to 15, or sometimes 30, may be seen working their way north. The birds usually start returning south between August and November.

The Red Wattlebird builds a saucer-shaped nest of twigs in trees anywhere between two and twenty metres above the ground. A typical nest measures about 150-200mm in diameter and the clutch consists of two to three pinkish-buff coloured eggs, spotted with reddish-brown or purple, particularly at the larger end.

Adult birds are between 320 and 350mm in length. Their upper parts are dark brown, boldly streaked with white. Its bill is black, its legs are pink-brown and it has a small red fleshy wattle or pendant behind the eye.

The Red Wattlebird breeds between July and December but there is probably some nesting in May.

Common Birds of Perth Number 4

Leathery turtle sightings increase

One of the world's most endangered turtle species, the Leathery turtle, has been sighted on several occasions recently in waters off the south-west of Western Australia.

Although the Leathery turtle is a noted long-distance sea voyager and has been recorded in most Australian waters the species appears to favour the warmer waters of the temperate zone and the tropics where it also breeds. However, between November 1981 and January 1982 there were four sightings of the turtle between Fremantle and Cape Naturaliste.

Two of the sightings were in November, one in December and another one in January. Unfortunately, two of the turtles were dead. The first was found entangled in a trawl net about one kilometre north of Bunkers Bay near Cape Naturaliste by a professional fisherman. The carcase was subsequently offered to a local museum for display and a fibreglass replica was to be made of the turtle for this purpose.

About the same time, a report was received from another professional fisherman saying he had freed a Leathery turtle from a tangle of rope and floats belonging to his rock lobster pots which were then set off Fremantle. The fisherman said the turtle was quite large and, when released, swam away without displaying any obvious injury.

In December, research officers from the Department of Fisheries and Wildlife were called to examine the carcase of a large turtle which was found washed up on the beach just north of Fremantle. Although badly decomposed, the turtle was readily identified as a Leathery turtle of about 1.8m in length.

The fourth sighting was made at the end of January by two men fishing from a boat anchored in Geographe Bay near Busselton. According to the men the turtle swam up to the boat and touched it before swimming away on the surface. The sea was calm and at the time the men were able to easily identify the turtle as a Leathery turtle about two metres in length.

It would be very difficult to confuse an adult Leathery turtle with any other turtle species, even for an amateur. Besides the distinctive shape of its carapace or shell which, in the Leathery turtle, is tapered toward the tail whereas most other turtles have oval-shaped carapaces, the Leathery turtle also has very characteristic longitudinal ridges along its carapace. These ridges are not found on any other species of adult turtle.

The leathery turtle is also one of the largest turtles in the world, growing to a length of about two metres and a maximum weight up to 550kg. Another readily distinguishing feature about the species is its smooth, relatively scaleless skin which is black, sometimes spotted with white. Its front flippers lack the claws of other sea turtles and are proportionately much larger and more powerful.

The turtle nests on tropical beaches throughout the world although few nests have been recorded in Australia. The few that have been observed have all been located within a single 100km strip of coast near Bundaberg in Queensland.

The Leathery turtle is believed to feed mainly on jellyfish, small crustaceans and algae.

The photograph of the Leathery turtle below was taken by Dr Colin Limpus of the Queensland National Parks and Wildlife Service. Dr Limpus is engaged in studies on marine turtles and he would welcome information on the occurrence of Leathery turtles along the Western Australian coast. Any readers who have information on sightings of the Leathery turtle are asked to contact their local office of the Department of Fisheries and Wildlife so that the necessary information may be recorded and sent to Dr Limpus.

▼ A Leathery turtle laying her eggs on a Queensland beach. (Photo C. Limpus)

North-West Wading Bird Expedition

Although comprehensive counts and surveys of migrant wader birds have been carried out on the shores, bays and estuaries of southern Australia, up until late last year, very little of this work had been extended to the northern coastline. Knowledge of waders in this area, an area which contains immense stretches of potentially suitable habitats for wading birds, had been limited to a few select spots such as near Darwin, Cairns and the Cape York Peninsula.

Accordingly, in August-September last year, a party of 20 ornithologists organised by John Martindale, the co-ordinator of the Australasian Wader Study Group, made an aerial survey of the north-west coast followed by an intensive bird-banding programme spanning eight days within the Broome-Eighty Mile Beach area. Members of this party came from both Western Australia and Victoria and included two members of the Western Australian Wildlife Research Centre, Mr Jim Lane and Mr Grant Pearson.

Organisers of the expedition chose late August-early September because of the higher chance of stable weather conditions during that period. It was recognised that such a date would be before many of the waders would have returned from their Arctic breeding grounds but it was nevertheless considered that population levels should already be high enough to at least indicate relative numbers in the extensive coastal habitats and in particular to highlight the most important areas. Any later in the year and the expedition would be running the risk of severe disruption from the wet season.

The Broome-Eighty Mile Beach area was selected for more intensive study, involving comparisons of aerial and ground counts of waders and also for exploratory banding work, based on previous reports of large numbers of waders in that area and the reported accessibility and suitability of the sandy beaches for wader counting, catching and banding activities.

A report written by Clive Minton and expedition organiser, John Martindale, after the expedition *(Report on Wader Expedition to North West Australia in August/September 1981)* summarised the objectives of the expedition.

"Any case for the conservation and protection of wading birds and their habitats needs to be based on scientific data. It is thus desirable to know the total numbers of wading birds which occur in Australia, their distribution within the continent at definite times of the year, the locations and characteristics of the most important habitats they occupy, the migration routes both within Australia and on their journey to and from their Arctic breeding grounds,

(Photo copyright A. G. Wells.)

▲ Expedition members prepare explosive charges for the cannon net. (Photo copyright A. G. Wells.)

▼ The cannon net is set on the beach. (Photo copyright A. G. Wells.)

▼ Fired. The cannon net is flung over the grouped birds. (Photo copyright A. G. Wells.)

and how they organise their annual life cycle in order to accommodate energy-consuming requirements such as the annual moult and premigratory fat deposition.

"Only when such comprehensive data is available can issues be seen in their full perspective and an optimum course of action on conservation matters be ascertained.

"A general aim of this expedition to northern Australia was to collect data which complement that currently being generated in southern Australia. The specific aims were—

1) to determine the distribution and numbers of waders in selected areas of the northern coastline of Australia;
2) to assess the suitability of aerial survey techniques for accomplishing 1) above by making comparative simultaneous aerial and ground surveys at suitable locations;
3) to catch, band and colour mark as large a sample as possible of the various wader species occurring in the Broome/Eighty Mile Beach area, in order principally to ascertain more about their migrations (including any onward movement within Australia to ultimate "summering" destinations);
4) to record moult, weight and other biometric data relevant to the annual cycle of each species;
5) to take blood and faecal samples for the assay of virus and bacteriological pathogenes which might be carried into Australia or within Australia by migratory waders (e.g. Murray Valley encephalitis and salmonella)."

Although no-one participating in the expedition really knew what results to expect, most hoped that large numbers of waders would be encountered considering the size of the region, but the final results staggered everyone.

To start with, the coast between Darwin and Broome was surprisingly deserted. This stretch looked suitable habitat for much of its length but was almost completely empty of birds although it was thought that numbers may increase in the region later in the year. In contrast, the number of birds encountered just to the south of Broome was described as incredible. In Roebuck Bay alone, more than 45 000 wading birds were counted of which 22 000 were in one flock at high tide. Altogether, 25 species of wading birds were observed in the Roebuck Bay area, the most numerous being Great Knot with an estimated population of 17 000.

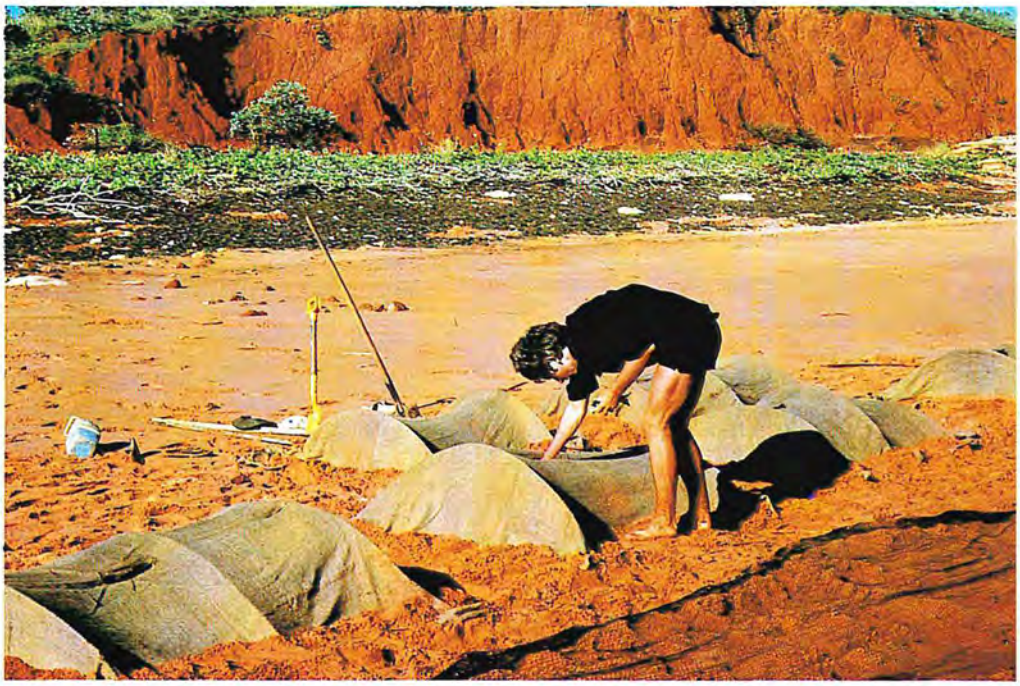
Large numbers of waders were also counted along the full length of Eighty Mile Beach (actually 220km) although the density was never recorded as high as at Roebuck Bay. Nevertheless, the total wader population of Eighty Mile Beach was estimated at more than 102 000. The smaller species of waders were much more numerous than in Roebuck Bay, with 27 600 Rednecked Stints and 22 150 Curlew Sandpipers being estimated. However, there were a further 21 800 Great Knots, giving a grand total for the Broome/Eighty Mile Beach area of 38 800 — *more than previous estimates of the total world population.*

At the end of the expedition, members had recorded a total of nearly a quarter million waders around the northern coastline.

Cannon-netting was carried out several times along the beaches and three were successful, realising a total of 1 189 birds banded from 12 species. Of these, 764 birds were fully processed including a sample swabbed for viral analysis, before the birds were released. However, the large catches made processing difficult and consequently none of the birds were dyed as originally intended. Most of the birds weighed were at or below their 'normal' body weight suggesting that they had just arrived from Northern Hemisphere.

▲ The careful job of disentangling birds caught in the net begins. (Photo copyright A. G. Wells.)

▼ While waiting to be weighed and banded, the birds are kept in holding cages on the beach. (Photo copyright A. G. Wells.)



▼ These two birds, a Mongolian Sand Plover (upper) and a Large Sand Plover, were among the many species trapped and banded during the expedition. (Photo copyright A. G. Wells.)

Following the success of the 1981 expedition, it was decided a return expedition should be made early this year. This was duly carried out between late March and early April by a core of 12 people from the Royal Australasian Ornithologists' Union, the Department of Fisheries and Wildlife, and the Department of Microbiology, University of Western Australia.

The following is extracted from a report compiled after the trip by Grant Pearson, a Technical Officer with the Department of Fisheries and Wildlife.

"From four trapping efforts, 750 birds were ringed and a total of 127 071 waders were counted from Point Gantheaume near Broome south to the Leslie Salt Works at Port Hedland. Counts were also made at sewage works at Hedland and Karratha.

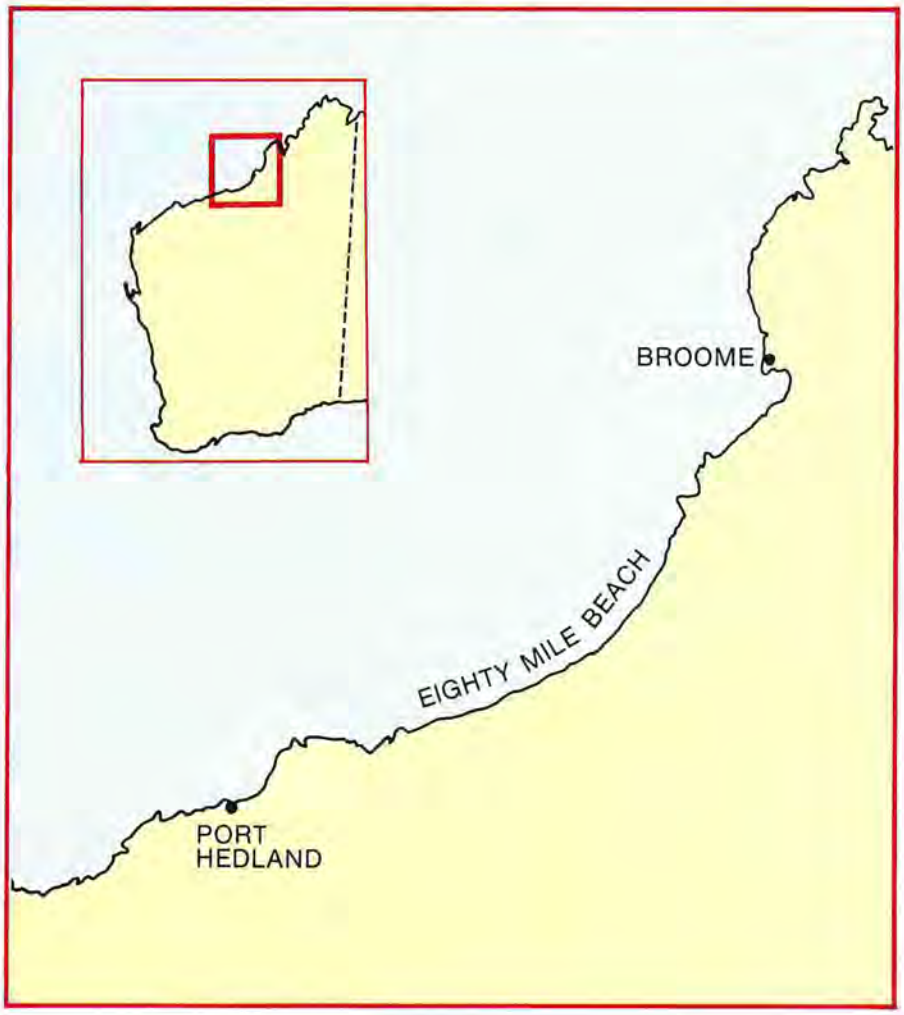
"Thirty-six species of waders were recorded including some previously considered extremely uncommon, and 15 species were ringed including Asiatic Dowitchers and Broad-billed Sandpipers.

"Floodwaters were still high along the coastal plain from Hedland to Broome making access to the Eighty Mile Beach impossible at Mandora and Anna Plains. As a result, the only counts of this stretch of the Eighty Mile Beach were made from the air by co-operation with the Department of Transport Coastal Surveillance Group. Approximately 90 000 birds were counted from Bush Point to the DeGrey River."

It should be pointed out that the numbers of birds recorded on the March/April Expedition did not represent the peak of the wader season. Numbers of birds sighted during the course of the trip steadily declined as time went by and it was thought the bulk of the birds had been in the area earlier in the year, probably in February.

Some of the results from the species recorded and the banding work were of particular interest. These included the capture of two Asiatic Dowitchers, of which there are only two previous sightings recorded in Australia, and the banding of 47 Broad-billed Sandpipers, few of which have been previously sighted in Australia. Also, the number of Ruddy Turnstone and Great Knot caught, 91 and 234 respectively, was the largest number ever caught in this country.

It is now obvious that the coast of Western Australia, particularly the northen half, in one of the richest wader habitats in Australia for migratory species. However, much work still remains to be done to fulfil all the original objectives of the wader study groups. Already there are plans to return to the north-west coast in August/September this year and it is likely the work will continue next year.



Seal Story—Correction

In the story 'Seals of Western Australia and Southern Australia' which appeared in the last edition of *SWANS*, the figure given for the sea lion population of South Australia was incorrectly printed.

The final sentence of the final paragraph on page 7 should read: 'There are probably only 750-1 000 sea lions in Western Australia altogether and 3-4 000 in South Australia.'

Rare Flora Leaflets Released

The range of plant species categorised as 'rare flora' under Western Australia's wildlife conservation legislation covers a wide variety of plant life from the Underground Orchid *(Rhizanthella gardneri)* to eucalypts such as the Caesia *(Eucalyptus caesia)*.

This range is reflected in the first eight in a series of leaflets released by the Department of Fisheries and Wildlife. Each leaflet depicts a rare flora species and includes colour photographs of the plant and its habitat together with notes on its distribution, reproductive biology and conservation status.

In addition to the Underground Orchid and Caesia, the leaflets deal with Green Honeysuckle *(Lambertia rariflora)*, Fitzgerald Eremophila *(Eremophila denticulata)*, Good's Banksia *(Banksia goodii)*, Lesueur Hakea *(Hakea megalosperma)*, Mogumber Bell *(Darwinia carnea)* and Augusta Kennedia *(Kennedia macrophylla)*.

In common with the other 124 species listed as 'rare flora', these eight species are given special protection under the Wildlife Conservation Act. They may not be taken or disturbed without specific approval from the Minister for Fisheries and Wildlife. A fine of up to $1 000 may be imposed for offences involving rare flora species.

The need for special protection is well illustrated by the status of the Fitzgerald Eremophila. Although it is commonly grown in cultivation, especially in the Adelaide area, only two plants of this species were found in the wild during a search conducted in 1980.

The Caesia too is popular in cultivation. Many gardeners will be surprised to find this eucalypt, which is grown in so many suburban gardens, listed as a rare species. However, despite its ability to grow in a wide variety of soils, the Caesia's known wild population numbers only about 2 000 plants in small, widely separated groups.

In the past, flora populations have been inadvertently damaged by land clearing and other activities. By providing concise and accurate species descriptions in laymen's terms, the leaflet series aims to provide the public with a guide to identification so that rare flora populations may be recognised and steps taken to ensure their conservation.

Future additions to the leaflet series will be publicised in *SWANS* as they become available. The present eight leaflets may be obtained from the Extension and Publicity Office of the Department of Fisheries and Wildlife, Perth. Anyone finding populations or rare native plants is urged to contact the Department's Wildlife Research Centre or their local District Wildlife Officer.

Beetalyinna Nature Reserve—a Summer Refuge for Waterbirds

by Clifford Young

The Geraldton region of Western Australia is not renown for its extensive wetland habitats and freshwater river systems. In fact, with few exceptions, the area is almost devoid of any such features. One of the exceptions lies in the middle reaches of the Greenough River. Here, upstream from the estuary, a few small freshwater pools resist the heat of summer and the pressure of surrounding agricultural development sufficiently each year to become a haven for wildlife, particularly birds.

However, until recently, none of these important habitats were protected from outside pressure or the threat of future development and the future for the river and its dependant wildlife looked shaky. With the creation of the Beetalyinna Nature Reserve late last year an important reprieve was gained for at least a section of the river and its fringing vegetation.

◀ A steep laterite cliff overlooks one of the summer pools on the Greenough River in the new nature reserve. (Photo D. Mell.)

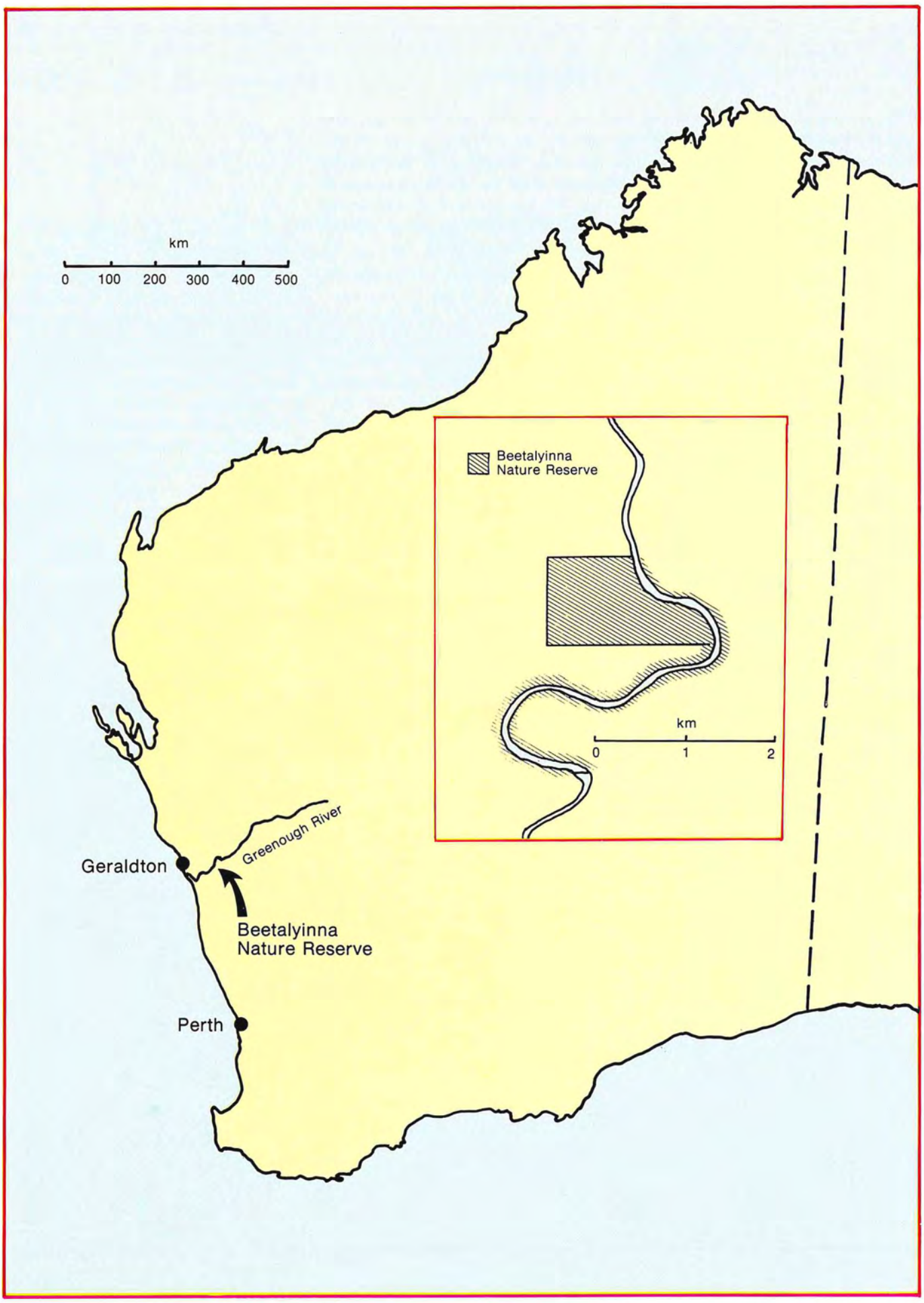
The reserve covers a total area of 206 hectares of which 121 hectares are in a block of uncleared land (Reserve 2069) bounding a section of the river to the north, and the remaining nature reserve stretches south along both banks of the river for about four kilometres downstream.

Reserve 2069 contains a large proportion of laterite breakaway as do some sections of the riverbank, particularly on the west bank. In fact, where the river flows through the breakaway, it is flanked in places by towering cliffs between 20-30m high.

The south-west corner of the reserve is low ground and is flat to the north where it meets a laterite breakaway approximately 15m high. The north-west corner contains many deep gullies with laterite walls. Apart from a fire about six years ago, there has been little disturbance to the reserve's vegetation. Grazing appears to have been minor and regeneration since the fire has been satisfactory.

The uplands support scrub and heath of *Casuarina, Grevillea* and *Banksia* with emergent mallee and patches of York Gum. Bordering the Greenough River and its pools are

▼ White-faced Heron *(Ardea novaehollandiae.)* One of the many waterbirds recorded from Beetalyinna. (Photo copyright A. G. Wells.)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Beetalyinna
Nature Reserve
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River Gum, York Gum, *Acacia, Melaleuca* and various rushes and sedges. This is in stark contrast to its surroundings as, with the exception of some breakaway country, all the adjoining land to be reserve has been cleared for agriculture.

During a survey of the reserve before it was gazetted last year, Wildlife Officer David Mell recorded 10 species of birds, two species of reptiles and many kangaroos and Euros on Reserve 2069. The birds recorded were the Common Bronzewing, Little Falcon, Pipits, Galahs, Grey Currawong, Crow, Western Shrike Thrush, Willy Wagtail, Splendid Wren and Singing Honeyeater. A further 20 bird species in addition to some of those already mentioned were observed along the river banks of the proposed new reserve. These included Maned Geese, Black Duck, White-eyed Duck, Coots, Little Grebes, Pelicans, Nankeen Night Herons, White-faced Herons, Darters, Little Pied Cormorants, Little Black Cormorants, Black-fronted Dotterels, Reed Warblers, Port Lincoln Parrots, Mudlarks, Mistletoe Birds, Silvereyes, White-plumed Honeyeaters, Weebills and Yellow-tailed Thornbills.

The importance of the permanent water holes and pools along this stretch of river is apparent on looking at the above list, as 12 of the 27 species of birds recorded during the survey are waterbirds.

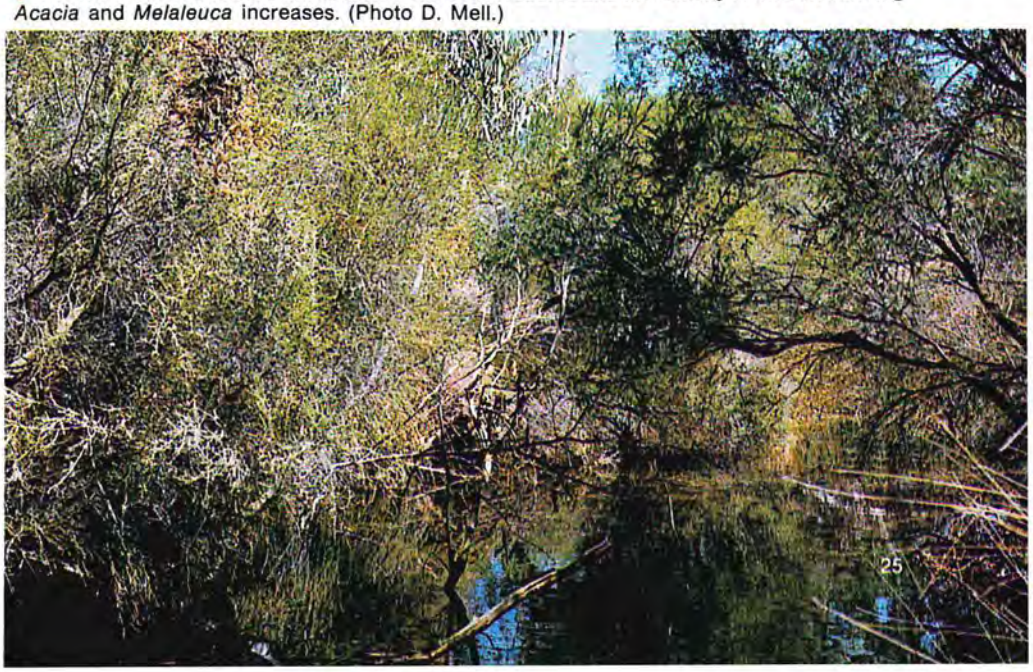
David Mell also made an unexpected find along the riverbank when he reported seeing a large reptile, *Lophognathus longirostris*. Previously, reports of this reptile indicated it was confined to an area north of Kalbarri, making this sighting of considerable interest. This section of the Greenough River is now recognised as containing the southern-most known population of the animal.

An unidentified large green tree frog was also found in considerable numbers throughout the rushes and sedges bordering the river pools.

▲ A view of the scrub and heath vegetation near the southern boundary of the reserve. (Photo D. Mell.)

▲ In places, the pools remain large and deep throughout summer, providing secure havens for many species of wildlife. (Photo D. Mell.)

▼ The river narrows toward the southern end of the reserve and the density of the surrounding *Acacia* and *Melaleuca* increases. (Photo D. Mell.)



▲ *Banksia prionotes* is found throughout the reserve. Although most plants are below 2m in height, there is a small stand of plants near the centre of the reserve which exceed 3m. (Photo D. Mell.)

The pools themselves vary in size from small holes a few metres in diameter to deep pools that extend up to 1200m in length. However, most of the pools are between 100 and 600m in length separated by varying distances of dry river bed. This is, of course, the situation in summer only. During winter the whole river is usually flowing and, after heavy rain, is subject to flooding in some low-lying spaces.

In his recommendation that the area be reserved for wildlife, David Mell noted . . . "On its own merits, this reserve has the value to be set aside for the conservation of flora and fauna. It is basically a laterite breakaway reserve with a specific range of flora, marsupials and reptiles. If this reserve was to be developed, i.e. the sandy areas cleared and the vegetation on the gravel thinned to allow a growth of grasses and herbs to carry stock, there could be extensive problems.

"Apart from this reserve's flora and fauna, there is another important role for it to play. That is in a supportive role to the adjoining section of the Greenough River. Reserve 2069 not only provides an additional environment for some of the fauna living along the river but, simply by continuing to exist in its present natural form, it reduces the possibility of irrevocable damage to the river caused by erosion and increased levels of superphosphate.

"The river at this location contains several large and apparently permanent pools of water and it should be appreciated that in this region during summer, and after four years of drought, it is in the exception rather than the rule when water such as this remains in the water course. Most other rivers and large sections of this river are simply dry river beds (on the surface) during this period.

"In a region where water can be very scarce, this section of the Greenough River should be considered outstanding simply because of the abundant pools. However, in addition to that, these same pools have attracted and can mantain a vast range of waterfowl, other birdlife and fauna including reptiles, frogs and marsupials.."

In response to David Mell's work and support from the Department of Fisheries and Wildlife, Beetalyinna Nature Reserve was subsequently gazetted on September 4th, 1981 and vested in the Western Australian Wildlife Authority.

▲ The reserve harbours the southern-most known population of *Lophognathus longirostris*. (Photo R. E. Johnstone W.A. Museum.)

Rare Flora List Amendments

Thirty-six species of Western Australian plants have recently been added to the list of plants declared as 'rare flora' under the provisions of the Wildlife Conservation Act.

These additions, together with four deletions from the previous list, produce a total of 132 plants which are currently given special legislative protection throughout the State. A copy of the complete list is available from the Department of Fisheries and Wildlife.

The amendments to the list result from continuing research on the status of flora populations. Additions are made on the basis of three criteria adopted by the Flora Committee of the Western Australian Wildlife Authority:

1. The taxon (plant species or variety) must be formally named under internationally accepted conventions.
2. A reasonably thorough search must be made to locate wild populations and count the number of plants.
3. Less than a few thousand reproductively mature plants must be known to exist in the wild.

In the case of the four deletions, recent surveys have established that the known populations of these species exceed the number specified under criterion 3 above. These species are also now known to be well represented on conservation reserves.

Photographs of some of the newly-listed species appear on page 28.

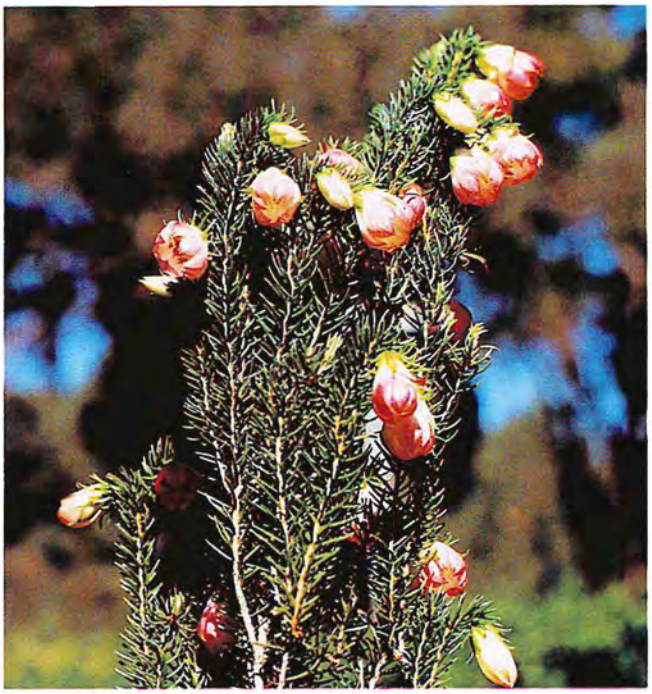
ADDITIONS

Baeckea	
arbuscula	Albany Baeckea
Banksia	
chamaephyton	Fishbone Banksia
cuneata	Quairading Banksia
meisneri var. *ascendens*	Meisner's Scott River Banksia
sphaerocarpa var. *dolichostyla*	Ironcap Banksia
Boronia	
tenuis	Blue Boronia
Caladenia	
bryceana	Dwarf Spider Orchid
gemmata forma *lutea*	Yellow China Orchid
triangularis	Shy Spider Orchid
Conostylis	
pauciflora	Dawesville Conostylis
Darwinia	
oxylepis	Scarlet Mountain Bell
wittwerorum	Wittwer's Mountain Bell
Daviesia	
euphorbioides	Wongan Cactus
Diuris	
purdiei	Purdie's Donkey Orchid
Drummondita	
ericoides	Moresby Range Drummondita
Eremophila	
inflata	Swollen-flowered Eremophila
merrallii	Bruce Rock Eremophila
microtheca	Heath-like Eremophila
resinosa	Resinous Eremophila
serpens	Snake Eremophila
viscida	Varnish Bush
Eucalyptus	
bennettiae	Bennett's Mallee
brachyphylla	Binyarinrinna Mallee
Halosarcia	
bulbosa	Large-articled Samphire
entrichoma	Eyelash Samphire
Myoporum	
salsoloides	Jerramungup Myoporum
Prasophyllum	
lanceolatum	Brown Leek Orchid
triangulare	Dark Leek Orchid
Pultenaea	
skinneri	Skinner's Pea
Sowerbaea	Many-stemmed Lily
multicaulis	
Thelymitra	
fuscolutea var. *stellata*	Star Orchid
macmillanii	Salmon Sun Orchid
psammophila	Sandplain Sun Orchid
Urocarpus	
niveus	Bindoon Starbush
Wurmbea	
humilis	Wongan Dwarf Nancy
tubulosa	Long-flowered Nancy

DELETIONS

Dryandra	
comosa	Wongan Dryandra
pulchella	Sprawling Dryandra
Melaleuca	
baxteri	Albany Paperbark
Pentapeltis	
silvatica	Southern Pentapeltis

▲ *Drummondita ericoides.* (Photo G. J. Keighery.)



▲ *Darwinia wittwerorum.* (Photo G. J. Keighery.)

Eremophila serpens. (Photo S. D. Hopper.) ▶

▼ *Eremophila viscida.* (Photo S. D. Hopper.)

▼ *Halosarcia bulbosa.* (Photo R. J. Hnatiuk.)

Rock Sheoak

by Tim McDonald

Of the many trees that grace the wheatbelt, the sheoaks are perhaps the ones that least catch the eye. Specialists in difficult sites, sheoaks, trees and shrubs of the genus *Casuarina*, are often perched on top of gravel breakaways or around granite boulders , tucked along the saline margins of creeks or dug in on the freely-draining sands that are so exasperating to crop. Consequently farming operations frequently leave them untouched in their preferred infertile ground. Because they are not worth removing they become, it seems, a forgotten part of the landscape.

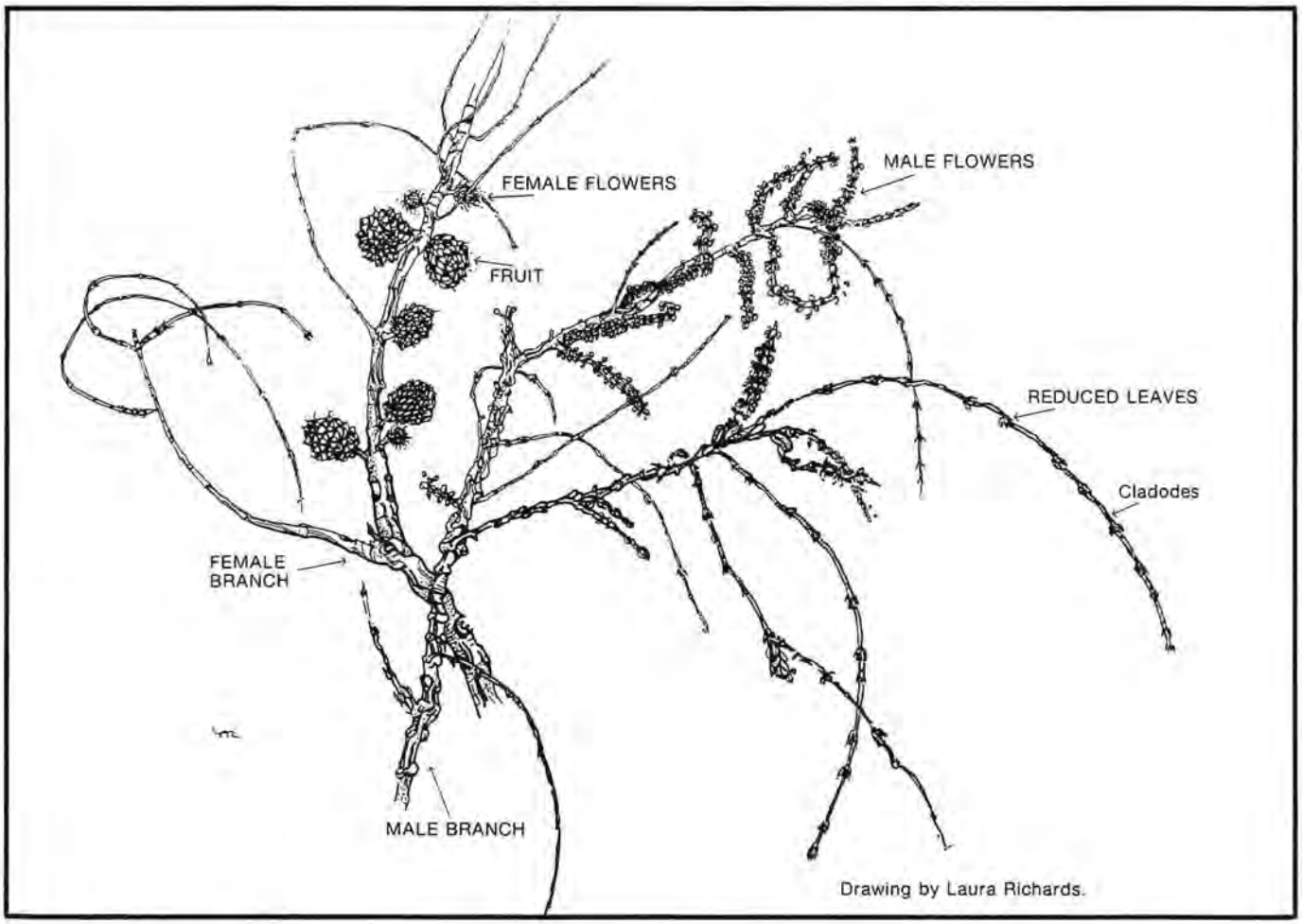
But, despite their sombre colouring, they can be quite attractive plants. This is particularly true of one species native to much of the wheatbelt and the eastern jarrah forest, the rock sheoak *(C. huegeliana)*. It is a slender tree with erect branches and a dark green spray of foliage. The moderately dense crown, carried on the upper two-thirds of the rough-barked trunk, is usually shaped into a compact ovoid or globe, often giving the tree an oddly formal appearance. It can reach twelve metres in height but is normally six to nine metres tall.

An intriguing feature of the tree is the pine-like needles making up the foliage. These are actually flexible branchlets, named cladodes, that have taken over the functions of leaves. the cladodes are cylindrical, grooved and rather lengthy—sometimes more than 40cm. The true leaves are the tiny scales that encircle and seemingly segment them every few centimetres.

The genetic name is derived from this unusual adaptation. The bunched cladodes of the first described species (horsetail sheoak) supposedly resemble the drooping tail feathers of the cassowary, which the Malays call *casuaris*—hence *Casuarina*. *C. huegeliana* itself is named in honour of Baron Von Hugel, an Austrian naturalist who collected plants from parts of W.A. in 1833.

The vernacular name sheoak is one that could not be coined now, in the age of feminism. Australia's early settlers noticed a visual similarity in wood grain between casuarinas and the English oak, but considered the former inferior timber. So they indicated their opinion by calling it 'she' oak.

The rock sheoak almost always grows in shallow sands around the



Drawing by Laura Richards.

granite outcrops that distort many undulating wheatbelt contours. (This habitat explains the tree's full common name.) While often associated with York Gum *(Eucalyptus loxophleba)* and jam wattle *(Acacia acuminata),* it also forms a low woodland unmixed with other trees in which the dense shade, ground-litter of needles and virtual absence of undergrowth is reminiscent of pine groves.

If the closely packed trees are examined it can be seen that they are not of one sex only. All sheoaks have unisexual flowers and most are dioecious—that is, some trees are male and some are female. Thus we have the paradox of a masculine sheoak. On *C. huegeliana* the female flowers are small maroon cones attached to the thicker branchlets and the male ones are numerous russet clusters on the cladodes (see drawing). The abundance of male blossoms is characteristic of wind-pollinated plants; it allows the breeze to blanket the females so heavily with pollen that they cannot avoid being fertilised. After the spring flowering the female cones ripen into woody fruit about the size and thickness of a small olive. These often stay on the branch for several years, releasing the tiny winged seeds on the wind when conditions are favourable.

Rock sheoak woodland can be home to a diverse collection of wildlife. Vincent Serventy succinctly described its role at Dryandra State Forest near Narrogin: when the plant 'first appears above the ground it is food for the Tammar; at 5 to 7 years it becomes a shelter; when between 11 and 15 years it is the home of the Wambengers; and finally, when mature, it is the habitat of the Ringtail Possum'[1]. In addition it provides food to the Red-tailed Black Cockatoo and nesting sites to many birds, including the Scarlet Robin and the Ground Cuckoo-shrike.

Of course this wildlife is not found where rock sheoak is reduced to scattered trees in paddocks and on road verges but where it stands undisturbed and in some quantity—now a rather rare occurrence. Although it grows in places too rocky to crop, it is as open to interference by stock animals and burning-off fires as any other species. Seedlings on farms are grazed or trampled by stock; and I have seen mature trees ringbarked by both sheep and open-ranging pigs. Sheep do it by using isolated trees as rubbing posts and pigs by gnawing the bark. Pigs also kill rock sheoaks by uprooting them in search of underground food. All this could be prevented by a simple—but for pigs, strong—wire fence around what is agriculturally useless land.

A danger the rock sheoak has not been subject to is unwise commercial exploitation. Its wood has never been used much, probably because of the tree's small size and the availability throughout its range of all-purpose timbers such as wandoo, jarrah and jam wattle. However it can be turned on a lathe to produce ornamental pieces and is good firewood. The Forests Department maintains that rock sheoak 'merits greater attention than it has hitherto received for shade planting on poor, shallow sandy soils . . . (and) ornamental planting on difficult sites'[2]. Seeds and

▼ A male sheok (Rock sheok, *Casuarina huegeliana)* in flower. (Photo D. Purton.)

▲ A rock sheok woodland with fringing sheet granite. Flowering male trees are russet-coloured, females dark green. (Photo D. Purton.)

seedlings are available in Perth and in such regional centres as Wongan Hills and Narrogin or through the Forests Department.

There are at least twenty species of casuarina other than rock sheoak that are indigenous to W.A. They range from a 30cm shrub to trees of up to 18m in height, and in habitat from the wet karri forests to the Great Sandy Desert. Many are as attractive and potentially useful as the rock sheoak. Maybe now, as farmers and gardeners increase their interests in planting native species, they will become recognised as members of a genus that ranks only behind *Eucalyptus* and *Acacia* in its importance in the Australian flora.

References

1. Vincent Serventy, 1970, *Dryandra: the story of an Australian forest.* A. H. & A. W. Reed, Sydney: p. 12.

2. Norman Hall, *et al.* 1972. *The use of trees and shrubs in the dry country of Australia.* A.G.P.S., Canberra:p360.

WILDLIFE DISTRICTS IN WESTERN AUSTRALIA