SCIENTIFIC

EXPEDITION

GROUP

FOREWORD

For its Bicentennial expedition SEG put much extra effort and planning into Expedition COONGIE. This continued the philosophy of providing young people with a combination of adventure and scientific investigation, with the difference that this time members of more mature years were also enrolled - a most rewarding experiment.

The demanding conditions expected were intensified before the expedition set out when a minor flood completely transformed this part of the Cooper's Creek complex, but - as usual - all obstacles were overcome.

Chief Leader Dick Woods and his team are to be congratulated on a successful expedition, a valuable contribution to the knowledge and future protection of this unique inland oasis and an excellent report.

C. Warren Bonython

PRESIDENT

EXPEDITION COONGIE

JUNE 1988

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The logo for the EXPEDITION shows a Coolibah (Eucalyptus microtheca) in the shallows of Coongie Lake. The only other Eucalypt in the area is Red Gum (E. camaldulensis) which is confined to the permanent waterholes of Cooper Creek.

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ACKNOWLEDGMENTS

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Brendan Martin

1.0 INTRODUCTION

1.1 PERSONAL PERSPECTIVE — Julian Reid

Coongie is a beautiful environment. Its beauty changes with the time of day, the shifting weather patterns, and the passing of seasons, and depends on the absence of distracting human activities for full appreciation. Without being prompted, several visitors were heard to say last year, it was the most beautiful place they had ever been to.

The case for preservation of areas of exceptional natural beauty deserves to be argued as forcefully as does the case for conservation of both species and areas of outstanding biological significance. Coongie's peaceful beauty is being shattered more and more frequently by the roar of outboard motors and chainsaws, and is being steadily eroded by the loss of trees and by the other tell-tale signs of an escalating visitor presence. Its beauty would also be violated by the installation of power lines, pipelines, marker posts, signs, formed roads, borrow pits, well-heads and other built structures, which are all part and parcel of the gas and oil extraction process (along with the hum of human activity and increased noise and dust levels).

While the frequently encountered rabbit is reminder enough of the changes that have been wrought upon this environment since European settlement and raises questions like how many species have already been lost from the system, the Coongie Lakes District is still undoubtedly a biological "treasure trove", having many features of the highest conservation significance.

These features include not only items, such as rare species or diverse communities, but also dynamic (i.e. changing) processes, which operate within the framework of many, varied time scales.

Within the region, the Cooper Creek system comprises the main channels, associated secondary channels (anabranches), tributaries, distributaries, inter-lake channels (major and minor), floodouts, swamps, floodplains, the main lakes, peripheral lakes and deltas. It is a marvellously complex and variable hydrological, physiochemical and biological system with myriad processes at work, involving the input, transfer and output of water, energy, nutrients, sediments and whole organisms. In turn, the water bodies exert a pronounced influence on the meteorology of the adjacent terrestrial environment.

The "interconnectedness" of different processes and different components (physical and biological) of the environment is a difficult concept for the mind to come to terms with, but is an all-important concept to embrace as a basis for the sound management of the complex river and wetland system that is the Cooper Creek. Consequently, it needs to be widely appreciated, that the entire Cooper Creek catchment requires adequate protection, if the jewel of the system, the Coongie Lakes complex, is to be effectively conserved in the long term - protection from hydrocarbon pollution, overgrazing, intensive agriculture, uncontrolled tourist activity, regulation/alteration of flow, dam/irrigation schemes, the entry of industrial or town effluents etc.

A very large dose of co-ordinated state and federal effort, backed by a strong political will, would be required to achieve adequate catchment protection necessary for the lakes. More immediately, and on a smaller scale, a considerable sum of money has to be mustered to enable the

placement of a strong ranger presence and adequate levels of information/interpretation/education within the region.

Briefly the conservation values of the area are outlined:

- the Cooper Creek is a natural, unregulated, unpolluted, very fresh, major, intermittent river, with a highly variable hydrology - a rare commodity in Australia and increasingly in the world.

- The Coongie Lakes Complex is the terminus for most flows along the Cooper, via North-West Branch. The lakes although of similar morphology, and inundated for different periods of time and a salinity gradient exists across the system. The lakes fill sequentially, thus adding to the spatial and temporal diversity of habitat.

- It is a unique channel - floodplain - swamp - lake system.

- The district supports an abundance of rare, threatened or little known species of plants, frogs, reptiles, mammals and birds.

- There is a suite of species-rich plant and animal communities such as the river red gum riparian woodland, small mammal community, the largest assemblage of frogs known in central Australia, and the largest assemblage of birds in central Australia.

- A number of unconserved or inadequately conserved plant and animal communities are represented in the district.

- The intricate juxtaposition of floodplain and truly arid, dunefield environments results in a highly significant species and habitat richness at the district scale.

As well as the area's undisputed natural and semi-wilderness qualities, the district is also exceedingly rich archaeologically, but these values are being eroded rapidly in the absence of controls over visitor numbers, access and behaviour.

* Reproduced with permission from XANTHOPUS, Newsletter No. 120 of the Nature Conservation Society of South Australia.

1.2 EXPEDITION BACKGROUND

Dick Woods, Chief Leader

COONGIE LAKES are in the news. The largest unpolluted system of fresh water lakes in arid Australia in the far north east of the State is attracting considerable attention from biologists and the touring public. Concerned that the data base was still incomplete and that there was then no control of the increasing tourist visitors, Dick Smith in late 1986 persuaded his AUSTRALIAN GEOGRAPHIC ORGANISATION to donate $55,000 for further studies of the system. This followed a visit in 1986 by Dick Smith and a party of specialists in the natural sciences, reported in the AUSTRALIAN GEOGRAPHIC No. 5 - 1987.

The recipient body in South Australia was the National Parks Foundation of South Australia which, through the Department of Environment and Planning hired a senior consultant Julian Reid to carry out a comprehensive study of the Lakes. Julian and his team presented their Report in early 1988. Concurrently legislation was being prepared to declare the region a new type of Park; a REGIONAL PARK within the National Parks system.

The Scientific Exploration Group, having successfully completed three expeditions in South Australia for young people in 1985, 1986 and 1987, decided that Coongie was worthy of a visit in the Bicentenary year. Thus EXPEDITION COONGIE 1988 was launched with the aim of attracting people within the age group 17-25. The aim of the expedition was to continue some aspects of the ecological studies of the Julian Reid consultancy and to give some expedition experience in canoeing and walking. Some new studies were also initiated.

The team of leaders was selected in late 1987 and the members and their responsibilities were:-

Julian Reid	Continuing the 1987 studies in small animal ecology, vegetation and bird studies.
Jim Puckridge	Continuing the1987 ecological studies of the fish population.
David Kemp	Equipment and leading the canoeing expedition and navigation exercises.
Sally Wace	Catering and liaison with SANTOS. Also lake sediment studies and seismic line revegetation studies.
Brian Brock	New studies in bird banding for the CSIRO and lake and river invertebrate life.
Rachel Barley	New studies of the revegetation of the seismic lines.
Brendan Atkins	Limnology/aquatic zoology studies.
Marilyn Drewien	Entomological studies

I regret that we had no archaeological input as the Lakes were rich sources of food for the Aboriginal population. The numerous middens and stone artefacts on the dunes are a mute testimony to the Aboriginal past.

In late March by courtesy of SANTOS, six leaders and Fiona Nicholls from SANTOS, flew to Moomba for a quick reconnaissance of the Lakes and to choose the base camp area. The weather was warm and dry and the mosquitoes hungry. Meanwhile the recruitment posters at the two

Universities were not attracting many applicants until we found, to our horror, that exam dates and vacation times had been changed from earlier notified dates. Thus we had to open up the age limit and "expose" the expedition to the community at large. I did this on ABC and 5DN radio together with a notice in the Sunday Mail. The response was immediate, including a number from the country. Finally the 39 member Expedition consisted of 6 leaders, 3 associate leaders, 28 expeditioners and two invited members, viz: Richard and Gwen Willing. Richard is Chairman of S.E.G. In addition, Warren Bonython, President of S.E.G., visited us in the last few days. Thus we achieved our aim in numbers but with a much wider age range than envisaged, viz: 17 to 67. We were also fortunate to have three overseas visitors in our team.

Further problems developed in the week before we started because the whole region enjoyed(?) very heavy rains at Easter plus follow up rains which inundated the country and closed most of the access roads. SANTOS kindly did a quick helicopter reconnaissance and told us that we would not get to the proposed base campsite.. In fact we had to be satisfied with an alternative base camp 20 km short of the goal.

This Report is the story of how these problems were overcome and how the Scientific Programme was completed on schedule, despite the fact it started 5 days later than planned due to the difficult access.

Despite (or perhaps because of?) the "mixed bag" of ages, personalities and backgrounds, everybody agreed that EXPEDITION COONGIE 1988 was a great and unique experience. Everybody worked hard with good co-operation, harmony and humour. I specially thank Richard Willing and the group leaders for their support and all other members for their contributions to the EXPEDITION. Graeme Oats did a good job leading the walking expedition. We should also express our thanks to the S.E.G. committee for their original concept of COONGIE and their organising (particularly Rob Hogan) long before we became involved.

Our sponsors are acknowledged elsewhere in this Report but I should like to emphasise that without the strong support from SANTOS and their staff especially Mr. Oleg Morozow we would have had a more difficult and expensive EXPEDITION. We trust that this Report will add to the background knowledge of a beautiful part of South Australia and thus assist in future management plans for the INNAMINCKA REGIONAL PARK (of which the Coongie Lakes are a part).

We will always remember EXPEDITION COONGIE 1988.

Leaders at the Orphanage prior to departure on 29th May - (L.to R.) Warren Bonython, Rachel Barley, Dick Woods, Julian Reid, Sally Wace, David Kemp, Brian Brock

1.3 THE GEOGRAPHICAL BACKGROUND

Dick Woods

Abridged Extract from Reid and Gillen (1988)

The Coongie Lakes are located in the Far North East of South Australia, some 900 km north of Adelaide and 85 km north-west of Innamincka. Five or six lakes fill regularly as a result of flows along the North-West Branch of the Cooper Creek, and they are Coongie, Marroocoolcannie, Marroocutchanie, Toontoowaranie and Goyder (or Coolgangirie, with Marradibbadibba immediately to its east). Browne Creek links Coongie and Toontoowaranie to the north, while further north, Ellar Creek links Goyder with Toontoowaranie. A number of other lakes and channels within the district receive water occasionally in times of big or prolonged flows (i.e. floods) along the Cooper, and together with the main lakes and channels, comprise the Coongie Lakes system. Figure 1.1 shows the location of

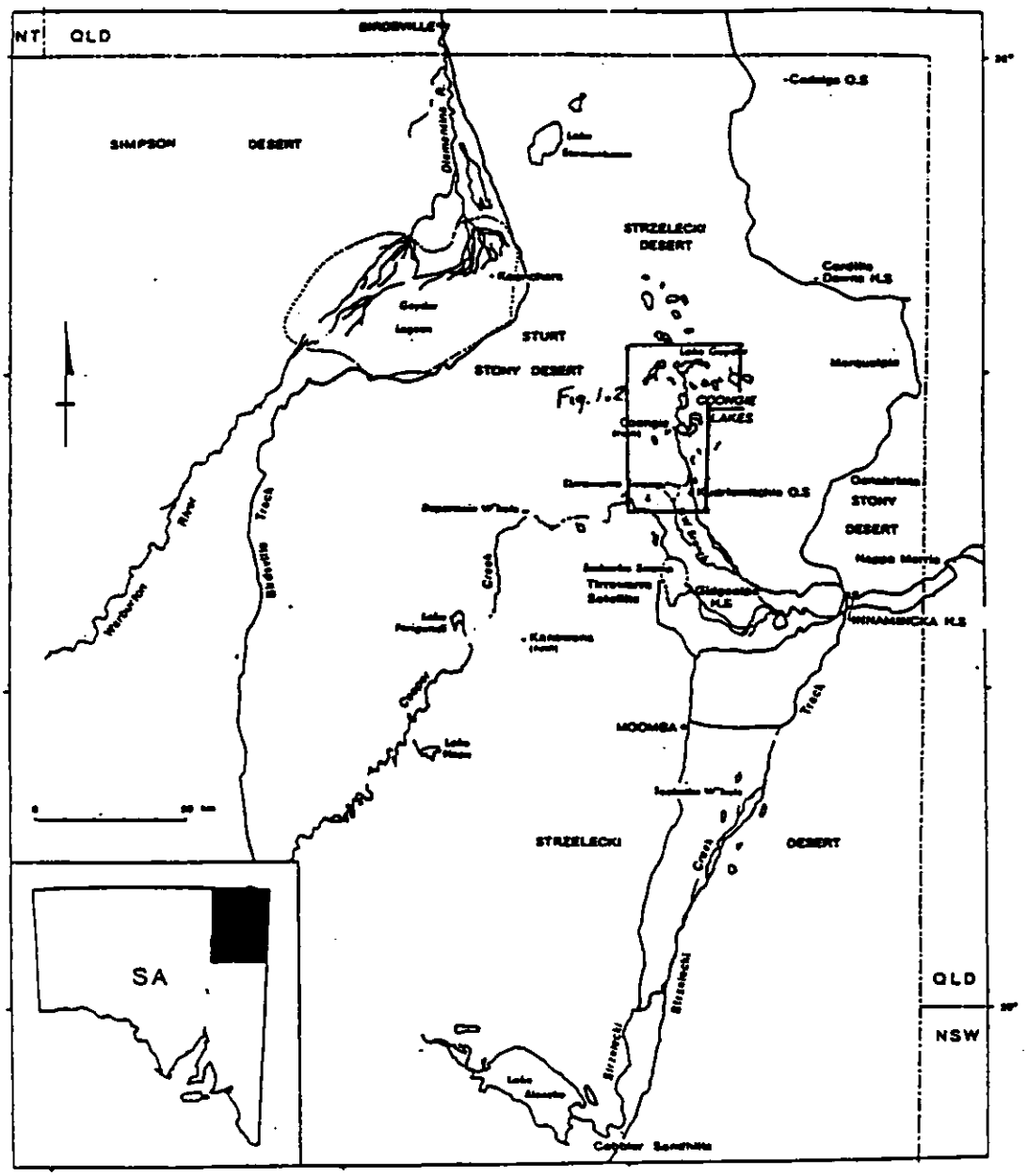

Figure 1.1 THE FAR NORTH EAST OF SOUTH AUSTRALIA

COONGIE LAKES DISTRICT

SOUTH AUSTRALIA

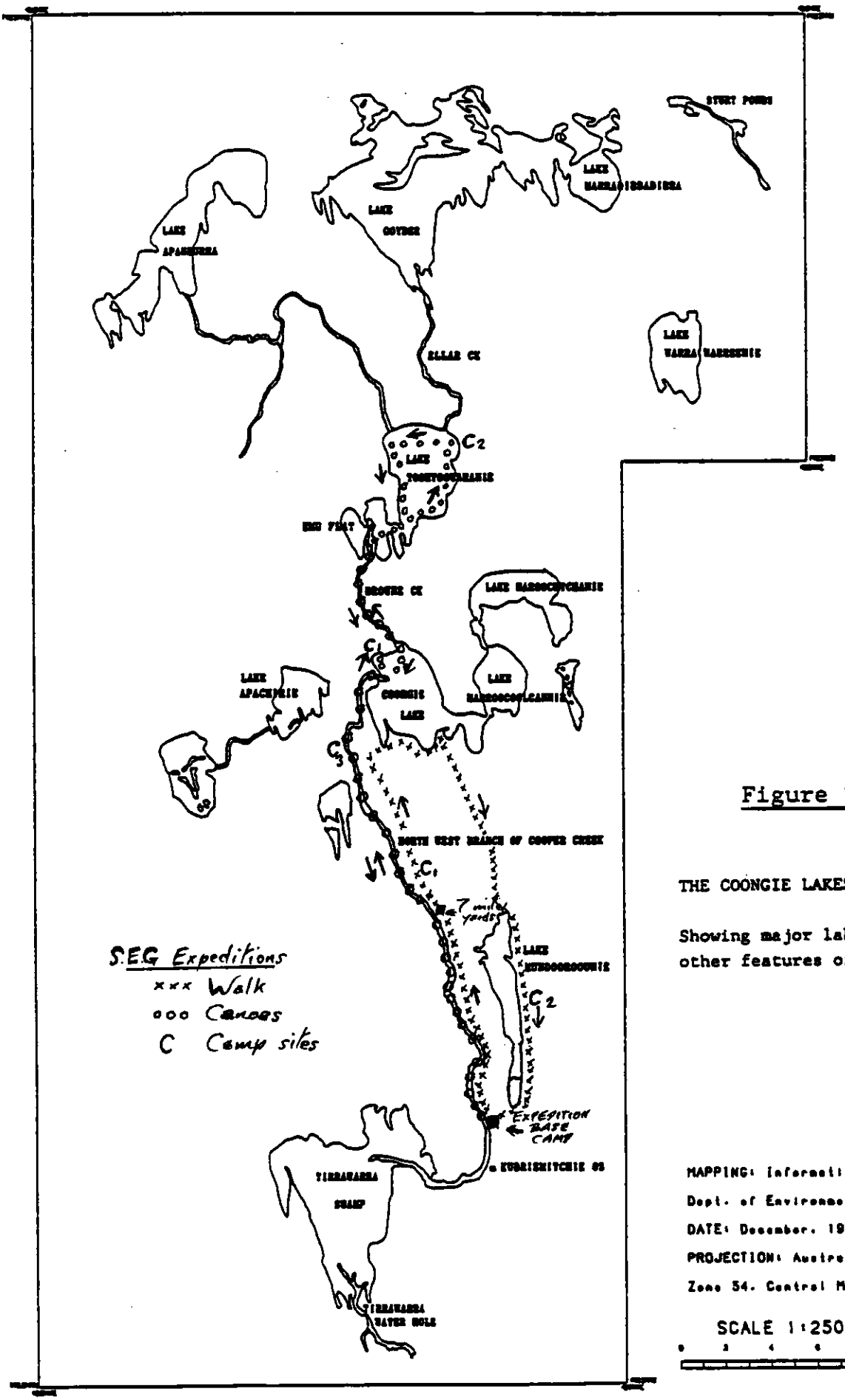

Figure 1.2

THE COONGIE LAKES DISTRICT

Showing major lakes, channels and other features of the district.

MAPPING: Information Systems Branch.
Dept. of Environment & Planning.
DATE: December. 1987.
PROJECTION: Australian Map Grid.
Zone 54. Central Meridian 141 degrees E.

SCALE 1:250 000

the Coongie Lakes District within the wider Cooper Creek and Far North East regions. Figure 1.2 illustrates some of the complexity of the lake and channel system within the Coongie Lakes District, and depicts the features referred to above.

The Cooper Creek country in the vicinity of Innamincka and Coongie was occupied by members of the Jauraworka (to the north) and Jandruwanta tribes for at least several thousand years (Dr. E. Williams pers. comm), and seemingly in excess of thirteen thousand years. European contact was made with these people and the region in 1845 when Captain Charles Sturt's expedition passed through the Cooper Country. Sturt traversed the lakes district, and while in the vicinity of Lake Goyder, one of his party, John McDouall Stuart, earned the distinction of collecting the first specimen of the enigmatic Night Parrot, an endangered species about which very little is known to this day.

The most notable and ill-fated pioneering expedition to the Cooper was that of Burke and Wills in 1860-1861. Three members of the expedition eventually died along the Cooper, having successfully returned from the north Australian coastline.

Cattle were removed from the region in the early 1980s, as part of the Australia wide campaign to rid the nation's herds of brucellosis and bovine tuberculosis. The Coongie Paddock of Innamincka Station has remained free of stock, while most of the country in the wider region was quickly restocked with disease-free herds.

The feral rabbit naturally colonized the region from the south and the east in about 1890 and its numbers quickly grew to pest proportions, with a dramatic lowering of the land's stock carrying capacity. It has remained a major pest in the region, despite myxomatosis having exerted some control since its introduction in the 1950s, and numbers in the Coongie district in particular has historically been very high (although fluctuating widely).

Gas and oil exploration began in the 1950s, and activity was intensified in the following decade, with production beginning in the late 1960s. Most production has been concentrated around Moomba (north to Embarka Swamp) although signs of exploration are evident over virtually all the extensive Cooper Basin. The production of gas and oil from the Basin is considered vital (by the authorities) for South Australia's economy and for the State's energy requirements. In the Coongie Lakes District, exploration has spanned 15 years, with the most recent seismic work carried out in 1985 (SADME pers. comm.). A grid-like network of tracks through the district is the legacy of these activities.

Wetland habitats in the Coongie Lakes District are recognized as having considerable biological conservation significance. Their significance was not widely appreciated until 1975, when the Nature Conservation Society of South Australia conducted a biological survey of the Far North East and have since expounded the district's natural values and reiterated the need for adequate protection. Coongie's significance has been formally recognized in recent years at the national (National Estate Listing in 1980) and international (RAMSAR Convention on wetlands of international importance for waterfowl; listed in 1987) levels.

Currently the Australian Heritage Commission is preparing a submission proposing an extension to the boundaries of the National Estate Listing, so that all the wetlands associated with the Upper Cooper in South Australia are included. Regrettably such listings confer limited protection.

The district has other values worthy of preservation, apart from its wetlands e.g. terrestrial biota, archeological and historical sites, and natural and aesthetic qualities such as wilderness, beauty and isolation. These same features and its central location (in the Australian context) have made the area very popular with holidaying Australians seeking a "roughing it" bush camping experience. The level of tourism in the Innamincka region has increased dramatically over the last decade, and this trend will only continue or escalate as the area's undoubted natural and historical attractions are even more widely publicised.

In 1987 the Minister for Environment and Planning announced the State Government's intention of securing Innamincka Station as a "regional reserve" to be administered by the National Parks and Wildlife Service. The regional reserve concept embraces the principle of multiple land-uses over the area concerned, such that economic developments (in this case, mainly hydrocarbon production, stock grazing and tourism) can be pursued together with conservation strategies.

GEOLOGY AND LANDFORMS

The surficial geology of the Coongie Lakes District is of Quaternary age (i.e. geologically recent - last two million years), and consists of three units (SADME Geology 1:250,000 map sheets):

- dunefield (Qrs)
- floodplain (Qra)
- claypan and saltlake (Qrl).

In the wider region a broken gibber and boulder duricrust unit (Qrt) of greater antiquity has been recognised as a mappable unit (Mollenmans et al. 1984). This unit is represented by the flat gibber plains to the north-west of Coongie and by the dissected stony tablelands/residuals to the north of Innamincka.

The region's petroleum resources are located in the Cooper and overlying Eromanga Basins (of Permian to Jurassic age) at depths of 1,400 to 3,300 metres. Major coal deposits are also present but they are not economically retrievable, because of their depth. The aquifers of the Great Artesian Basin lie at the top of the hydrocarbon bearing sequences, while shallow aquifers which bear saline (and some fresh) water are also widespread in the region.

Around Coongie, an exploration programme involving relatively intensive geosiesmic testing and the drilling of several wells has been undertaken. It is indicated that the wells were dry, but detailed information from this programme is not publicly available. Certainly intensive production of gas and oil occurs immediately to the south and south-west of the district (centred on Tirrawarra Satellite) while a field to the east of Coongie is currently under development. The life of fields is generally expected to be 30 years or less.

Within the Coongie Lakes District, a vast array of landforms could be recognized, but a basic distinction can be made between floodplain and dunefield features. Moreover many repeating patterns can be detected, and these will be described briefly along with some of the land-forming processes which has biological pertinence.

Floodplains

At times of exceptionally high water levels in the Cooper, all the floodplain features south of the solid line which encloses Lakes Goyder and

Marroopootanie are inundated by floodwaters. Many of the interdune corridors within the district also receive Cooper floodwaters in such an event, and water extends far to the east and west beyond the bounds of the district depicted in Figure 1.2.

Most flow events along the Cooper Creek do not result in the inundation of the entire floodplain, and generally the peripheral lakes, such as Apachirie, Apanburra, Warra Warreenie, Mundooroounie and Talinnie are dry. They then take the form of salt pans (Talinnie) or bare clay pans (Apanburra), but most often as ephemerally vegetated lake beds (Apachirie, Mundooroounie) with heavy, deeply cracking clay soils. The peripheral channels, such as Hamilton Creek, Apanburra Channel, Walkooanie Channel, and the outlet from Apachirie, often contain water in the deeper reaches (from previous flows of the Cooper as well as from local rainstorms) are lined with coolibahs.

The most significant floodplain features environmentally are the more permanent water bodies - the main channels of the Cooper Creek and Lakes Coongie, Marroocoolcannie, Marroocutchanie, Toontoowaranie and Goyder. The most sizeable stands of timber in the district fringe these channels and lakes, and there is significant biological importance of the red gum woodland which lines the Kudriemitchie and Tirrawarra Waterholes. Equally significant is Tirrawarra Swamp - large, densely vegetated, and highly channellised (braided). The waterholes are usually between 1.5 and 4 metres deep (moderate flows), while the lakes fill to the depth of $\leq$ 2.2 metres, before spilling over their margins. None of the features are considered to be strictly permanent, although the deepest reaches of Kudriemitchie and Tirrawarra Waterholes would very rarely dry out completely. These more permanent waters are especially important for wildlife under drought conditions (the norm and not the exception), but the predictably higher productivity of the more ephemeral lakes and pans in the district should not be overlooked.

Dunefields

Dunefields are recognized in the Coongie Lakes District as blocks of (generally) longitudinal dunes. The colour of the dunes ranges from near white to rich orange, although "dull orange" describes the majority of the district's dunes (or orange-brown as described by Wasson 1983, who attributed specific colours and colour codes to various portions of the Strzelecki and Simpson Deserts). It has been suggested that the intensity of the colour of the sand deepens with age, as a consequence of weathering of clay particles in the sand (e.g. oxidation of iron and magnesium). Certainly the palest sand dunes are found closest to their presumed sources of supply the recently deposited alluvia associated with the major floodplain features. As remarked before, these pale alluvial deposits are a distinctive feature of the northern and north-western margins of the lakes in the district, and frequently these deposits take the form of dunes, which may be transverse, irregularly aligned, or longtudinal and aligned with the main dunefield systems.

Dunefields consist basically of dunes and interdunes. The majority of dunes in the Coongie district are longitudinal and are aligned 10-20 west of north, which is the direction of dune travel. Where the dunes are of the well defined, orange form (of early Pleistocene age), the east slope is steeper than the west and the crests are generally unstable; their average height, although less than 10 metres, does not preclude the occasional dune from being much taller than this (to approximately 30m). Dunes are short by Simpson Desert standards, being usually less than 10km long. Forking is relatively frequent (always downwind) as are interconnecting "saddles" of sand between adjacent dunes. Numerous (semi) circular claypans - bare or vegetated - are formed between pairs of such interconnections, while

less well defined depressions are a common feature along the long regular interdune corridors. Interdune flats generally have heavy (predominantly clay) soils, which hold water for several weeks after heavy local storms. The accumulation of sand in some or the presence of a sandy veneer in others ensures a highly variable expression of plant communities within the interdune environment. There are many similarities between these environments and those undifferentiated parts of the floodplain which are not regularly inundated by Cooper Creek floodwaters.

CLIMATE AND HYDROLOGY

Climatology

The climate of the Cooper Creek Environmental Association 8.4.4. has been comprehensively described by and illustrated in Mollenmans et al. (1984). Although no historical data has been gathered specifically in the Coongie district, observations made at Birdsville, Moomba, Innamincka and Cordillo Downs (and as reviewed by Mollenmans et al. (1984) are considered to give a reliable guide, in general, to meteorological conditions experienced at Coongie.

Climatically, the Coongie Lakes region is located in the arid/semi-arid core of the Australian continent. Median annual rainfall is of the order of100-150mm, with rainfall variability being among the highest in Australia (Kotwicki 1986). Such extremes can be seen in both the spatial and temporal nature of recorded rainfall. Patchy rainfall can have striking biological consequences, manifest as localized areas of frantic activity in an otherwise subdued desert landscape. After intense, local rains, invertebrate populations increase in response to rapid plant growth, and then rapid population build-up of vertebrates may occur through immigration and breeding. Many desert animals have evolved nomadic tendencies and rapid breeding cycles to be able to take advantage of such events.

Despite heavy rainfall events and wetter periods in the historical record, high evaporative losses in the region account for the general aridity experienced. Mean annual evaporation from Class A Pan data in North-Eastern South Australia exceeds 3,600mm (Kotwicki 1986) with mean annual evaporation at Moomba being 3,610mm. Seasonally, Moomba evaporation varies from a peak of 510-520mm in summer to a low of 120-125mm in winter. As a result, evaporative losses are at least an order of magnitude larger than rainfall. As an approximation for waterbodies in this region, Kotwicki (1986) indicates that a factor of 0.6-0.7 times the pan evaporation can be used as an estimate of "real" evaporative losses. Thus waterbodies such as those at Coongie could lose as much as 2,166-2,527mm (i.e. $\subseteq$ 2.2-2.5m) of water in one year through evaporation.

Temperatures are extreme in the summer - the mean monthly maximum for December, January and February at Moomba is 38-39°C, with daily maxima frequently exceeding 40°C (e.g. Mollenmans et al. 1984), while the mean minima over summer are 22-24°C. July is usually the coldest month in the region, when Moomba has a mean mimimum of $\subseteq$ 6°C, and sub-zero conditions are occasionally experienced each winter. The July mean monthly maximum for Moomba is $\subseteq$ 19°C.

The prevailing regional winds hail from the south or sou-sou-east (Mollenmans et al. 1984), and the period from September to December in particular, can be extremely windy with desiccating effects of the strong hot northerlies in summer.

Hydrology

Hydrologically, the Coongie Lakes system is situated in the Lake Eyre basin, the largest inland drainage basin in Australia (1,140,000km). This drainage system covers an area one seventh the size of the Australian continent and overlies much of the Great Artesian Basin. A myriad of tributaries feeds the Cooper Creek, Diamantina and Georgina River systems, carrying major flows to the basin terminus at Lake Eyre. The Coongie Lakes are the more regular terminus for Cooper Creek floodwaters. Only in major flooding events do waters extend any distance down the Main Branch to Lake Eyre, with the expansive Embarka Swamp being a major block point to flow along this branch in most years.

The mean annual run off of the Lake Eyre basin is 3.3km^3 or 2.8mm depth over the entire catchment. This is only 5% of the average run off for Australia (57mm) and only 1% of the mean annual run off for the world (Kotwicki, 1986).

AQUATIC BIOLOGY OF COONGIE LAKES

Compared to terrestrial ecology, limnology is a relatively young science, and limnology of arid and semi-arid climates is one of its youngest branches. In hot dry climates, most limnological research is directed towards man-made storage and supply systems. The limnology of natural waterbodies is only beginning to be known and in South Australia, research has concentrated mainly on saline lakes (e.g. Williams 1985) and the small, popularly romantic mound springs (Mitchell 1985).

The ecology of flood-plain rivers in arid Australia is not well known, and with the exception of the River Murray, very little documented. This is especially true of Cooper Creek. Its remoteness and lack of economic significance mean that information on its water quality is limited and somewhat fragmented.

BIRDS

Most recent ornithological research in the Far North East has included observations made at Coongie and other parts of the Upper Cooper. Although birdlife along the Upper Cooper is richer and more abundant than that of the middle and lower reaches, Badman (1988) is to be applauded for having published an exhaustive account of the birds of the Lower and Middle Cooper, regions which had been largely neglected by modern ornithologists. Badman's work shows that significantly, very large concentrations of waterbirds do concentrate on the large lakes of the drier reaches of the Cooper, when the water is available, while the record of the endangered Night Parrot also attest to the Lower Cooper's significance.

The Coongie Lakes wetlands have received greatest prominence in the conservation field, because of the waterbird populations they are known to support. Australia's unique and threatened Freckled Duck regularly inhabits the wetlands, while the diversity of waterbirds recorded and occasionally the numbers of waterfowl have been a feature. Its listing as a wetlands region of international importance under the RAMSAR Treaty highlights the area's significance. The actual Coongie Lakes are the most "permanent" of the regional wetlands (besides the deeper waterholes, which are not strictly regarded as wetlands - see Mollenmans et al. 1984), and this boosts their importance. Nevertheless, other wetlands in the wider region are considered to be as important, but have been little documented or publicised by comparison (Reid in Mollenmans et al. 1984). The known examples are Tirrawarra Swamp, Embarka Swamp and the massive Goyder's Lagoon complex on the Diamantina River to the north-west of Coongie.

These vegetated swamps provide different habitats to those found in the lakes, and being typically ephemeral features, are arguably more productive with respect to waterfowl breeding. It is this range of habitats, together with the range of hydrological regimes operating and the overall naturalness of the region, which undoubtedly makes these wetlands more important waterbird reserves than the widely acclaimed, but quite altered, wetlands of the State's Murray and South East districts.

The Coongie Lakes District also supports many dryland birds having conservation significance in South Australia (Reid Mollenmans et al. 1984). Being highly mobile, arid zone birds can undergo dramatic population shifts (geographically) in response to seasonal conditions, and this capacity for nomadism is the most distinctive behavioural trait of desert birds. It will require further systematic, long-term studies, before a sound understanding of the region's birdlife, in terms of habitat preferences, seasonality and breeding patterns, can be assembled and presented.

TOURISM AND RECREATION

The impact of increased visitation to the Coongie Lakes District is being expressed in several forms. The most obvious effect is the loss of ground layer species and leaf litter in the immediate vicinity of Coongie Lake and the river channel. Increased camping pressure combined with the effects of off-road vehicles has led to the creation of large scalded areas free of vegetation and leaf litter.

Any impact which reduces the naturally occuring erosion resistant cover of arid soils, for example, mechanical disturbance, fire or grazing, will promote accelerated erosion of that landscape, and erosion is a self reinforcing process - erosion causes a loss or redistribution of water and nutrients which results in reduced plant production and cover - which further predisposes that surface to further erosion and so the cycle is perpetuated. If it is not broken the ultimate ecosystem end point is a bare eroded landscape.

The above effects will only be compounded if equivalent pressures are maintained especially in the situation of a future poor season being followed immediately by another or several poor seasons.

One need only visit the Innamincka town environs to observe the effects of longer term visitation and camping pressure along the Cooper's banks to extrapolate such a situation to Coongie in the future. It is precisely the uniqueness of a luxuriant fringe of channel and lake woodland, incongruously imposed on an otherwise arid dunefield ecosystem, that draws visitors to this area. However, the compaction of soils of these areas and the removal of plant litter could threaten the vegetation both aesthetically and environmentally. For example, the fragile topsoil provides conditions favourable for seedling establishment, e.g. ease of root penetration, and in undisturbed soils the overlying plant litter provides a useful protective layer that:

- protects soil from direct raindrop impact
- reduces surface run-off
- provides habitat for micro fauna and burrowing fauna
- returns nutrients and organic matter to soil.

The removal of the overlying plant litter occurs as a result of various land uses, e.g. grazing (including feral animals), mining and recreation and also through the natural agents of fire and heavy rainfall.

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2.0 EXPEDITION DIARY

Sally Wace

DAY 1 - SUNDAY 29th MAY

On a cold Sunday morning about 30 expeditioners and leaders gathered together with family and friends at Goodwood Orphanage, Adelaide. After organising gear into vehicles and trailers, our intrepid leader Dick Woods and S.E.G. President, Warren Bonython gave us an encouraging welcome and send-off talk.

The convoy of 3 4WD vehicles, a Combi and a minibus left at 9 am, but was then delayed by vehicle troubles. We finally left Adelaide about 10 am. - the vehicles humming with conversation as expeditioners started getting to know each other.

After lunch and fuel stops at Crystal Brook and Port Augusta respectively, we spent a pleasant afternoon en route to Leigh Creek. The ETSA canteen provided a welcome 3-course meal to a clean, orderly bunch of well mannered people. (This was in stark contrast to a similar scene 3 weeks later when the very same bunch, this time dirty, high spirited and very noisy, visited Leigh Creek on the return journey.) Camp that night was made by moonlight next to Mundy Creek north of Lyndhurst.

DAY 2 - MONDAY 30th MAY

Departed Mundy Creek camp after a cold clear night. The Flinders Ranges stretched out to the east as we headed northwards. The country was green and lush following good autumn rains. We lunched beside the track after a brief look around and leg stretch at Monte Collina bore. Arrived at Moomba mid-afternoon leaving all but vehicles and drivers to inspect a certain sand dune for several hours. In Moomba we collected fuel, food and some of the scientific equipment, courtesy of SANTOS who were major expedition sponsors. Richard and Gwen Willing joined us there too. We made camp in the dark again beside Strezlecki Creek to the north east of Moomba. There we feasted on snags etc. - YUM YUM.

DAY 3 - TUESDAY 31st MAY

The track from Moomba to Innamincka and Cullyamurra Waterhole was badly rutted, making for exciting driving and a bumpy ride. Numerous shallow lagoons and swamps by the track were full after recent rains, and teemed with a variety of birdlife.

Cullyamurra is a 7 km long waterhole approximately 10 km east of the settlement of Innamincka. It is a heavily used area by visitors to the region, providing good camping and a host of aquatic and birdlife as well as being a site of historical interest due to the ill-fated Burke and Wills expedition.

Anticipating that this would be the closest site to Coongie Lake at which we could establish a base we set about organising gear into a functional camp. Several vehicles returned to Moomba to collect additional scientific and expedition equipment.

Brian and others spent several hours looking and listening to birds along the waterhole and familiarising themselves with the flora.

DAY 4 - WEDNESDAY 1st JUNE

A three vehicle reconnaisance party set off for the eastern side of the Coongie Lake to investigate the feasability of relocating base camp closer to the site of our intended scientific programme. Heavy rains at Easter and

more several weeks prior to the expedition led to large flood outs of Cooper Creek NW Branch. This rendered tracks difficult to negotiate with long detours around soft wet claypans through the sand dunes. The trip proved successful. They found that it was possible to get 2WD vehicles to Lake Mundooroounie, approximately 20 km south of Coongie Lake. It was also estabished that there was access to at least Kudriemitchie Waterhole on the eastern side of Cooper NW Branch.

Meanwhile, back at Kings Marker near Innamincka, Dick Woods and a team of expeditioners had been very busy planting 50 Eucalyptus camaldulensis seedlings. This work will be described later.

At Cullyamurra, Jim and others spent the day conducting fish survey work. The netting of a catfish was the highlight of the day, the species being unrecorded in this environment. Brian put some "rafts" in the waterhole and nearby ephemeral isolated billabongs.

At camp, David and an established team of long drop diggers, worked hard all morning setting up equipment. They then spent a pleasant relaxed afternoon canoeing on the waterhole.

This evening marked the start of a horrendous tradition of what was to become a nightly ritual - the leaders' meeting. We decided to relocate base camp to Kudriemitchie Waterhole further along the Cooper NW Branch. Spirits were high and excitement mounted at the prospect of being close enough to Coongie to pursue the original scientific and exploration objectives of the expedition.

Fiona Nicholls and Steve Tunstill from SANTOS Environmental Section joined the camp just after dusk. An interesting and enjoyable discussion about the SANTOS operations and associated environmental concerns in the Cooper Basin followed.

DAY 5 - THURSDAY 2nd JUNE

It took remarkably little time to dismantle the hard work done the previous day. Base camp was dismantled and packed up by 10.00 am. Eight vehicles headed off in convoy toward Kudriemitchie. Apart from a flat tyre and a few sticky sand patches, the five hour, 60 km trip was uneventful. Sally enjoyed making everyone in the bus get out and push her through some long soft sand stretches. Much carrying on! Apparently there was no record kept of the number of times passengers on the rear seat of the bus became airborne, but there was general relief when the new base campsite was finally reached. Several dozen tents were soon pitched and the site soon looked "homely". It was a scenic little spot on the eastern side of Cooper NW Branch, about 2 km north of the abandoned Kudriemitchie outstation on Innamincka cattle station. The creek was about 30 m wide and up to 2 m deep and lined with large River Red Gums and lignum. The water had a reasonable flow and was a muddy brown colour, but okay to drink.

DAY 6 - FRIDAY 3rd JUNE

This morning marked the inaugural dawn run of the exclusive Kudriemitchie runners association which was to become a regular feature of camp life. It was all "go" today! David took 7 eager canoeists paddling downstream. By all accounts, it was a pleasant day, though of course it was by no means compulsory to go in a straight line. Apparently all canoeists on this and following trips discovered that many good arguments and jokes were to be had by those sharing canoes.

Brian set up rafts and did some netting in the Cooper as well as scouting out shallow flood out lakes for further studies.

Donald Woods set his heart on making our exclusive river frontage home complete by supplying all "mod cons". He and brother Dick scavenged all manner of weird contraptions, odds and ends, etc. from the nearby abandoned outstation. Over the next few days we gained a hot water

service, shower, kitchen sink, tables, shelves, stove shields, rubbish bins and pits etc. etc. Jetties for boat operations and a river "fridge" also enhanced the site.

Meanwhile, others busied themselves by setting up and organising the store and scientific tents as well as erecting those funny tall tents with a hole in the floor. The boats we all readied for action and indeed shuttled a scout party to the western side. These guys located and marked the track for the incoming vehicles from Cullyamurra via Moomba. Two new scientists (Brendan Atkins and Marilyn Drewien) arrived with the crew.

DAY 7 - SATURDAY 4th JUNE

The scientific phase of the expedition began in earnest today.

Julian explored the western track north to the lake and recovered his mammal trapping equipment.

David and a party of avid novice canoeists spent the day paddling upstream to Tirrawarra Swamp. Battling lignum, a reasonable current and mudbogs, they seemed to enjoy themselves. One of the party found a nardoo grinding stone at Tirrawarra. Apparently the birdlife was prolific and easily viewed as one paddles tranquilly along the creek.

Jim and Sally filled a couple of boats with gear and headed for Coongie to start the fish surveys and sediment sampling programme. They overnighted beside Cooper Creek near the lake.

Rachel and a team of crack navigators set off to locate the seismic lines to begin the re-vegetation survey on the western side of the creek.

Brendan and Marilyn with a small crew of keen expeditioners investigated the shrimp (Macrobrachium) populations of the Cooper in a series of netting, recording and marking experiments. Seine netting produced yabbies, dragonfly larvae, fish, snails, beetles and a variety of invertebrate species. Salinity, temperature and conductivity of the water were routinely measured. Sweep netting produced several colourful types of dragon fly, small shield shrimps, beetle larvae and other aquatic invertebrates were also sampled from a ephemeral flood out lake.

Brian spent a fun filled day with a group of curious expeditioners. Their curiousity led to a range of discoveries ranging from botanical findings to ornithological sightings, scat analysis, netting of colonial rotifors and other invertebrates, and microscopic inspection of algae and various interesting "small wriggly things".

Around the campfire that evening, Graeme entertained us with tales of bushwalking adventures in remote parts of wet mountainous terrain, far from Cooper Creek. In honour of Mark's birthday, a rock solid custard was produced for dessert.

DAY 8 - SUNDAY 5th JUNE

Fish survey and sediment sampling work continued in and around Coongie Lake. "Necessity being the mother of invention" as they say, Sally's crew succeeded in extracting 3 cores of the highly prized smelly black mud from the lake bottom using a variety of unconventional techniques. If there had been any onlookers they would have been amused at the boat rocking, hammering and core pulling routine.

Jim's crew seine netted ephermeral flood out lakes near Coongie, which were slowly drying out as water levels receded after the effects of recent rains decreased.

Julian led a large group of expeditioners in 4 vehicles up shot lines on the eastern side of the Cooper to reach Coongie Lake. Enroute they set three lines of pitfall traps at previously sampled sites in claypans and dunes. This large "tourist" contingent met up with the workers at Coongie for lunch and a few billies of tea on the south-eastern lake shore. For many of the expeditioners this was the first siting of the lakes they had come so far north to see. What an impressive site Coongie is, surrounded as it is by dunes and coolibahs and lignum swamps.

The bird life around Coongie and the Cooper was impressive. That day the party sighted brolgas, bustards, ibis, terns, and the usual parrots and budgies. On the return journey the remaining pitfalls were dug and set up. Exciting times were had negotiating dunes and boggy areas.

Meanwhile Brian, Brendan and Marilyn spent a productive day continuing their aquatic and insect sampling programs in the Cooper and Tirrawarra swamp.

DAY 9 - MONDAY 6th JUNE

After a cold night and an early start the pitfall traps were cleared this morning. Six native and common house mice were revived after spending the cold night in the pitfalls. Everyone had a mouse down their shirt somewhere trying to warm them up again before weighing, measuring and marking them and setting them free. Fleas were also recovered from the mice. Of a total 8 traps set on Sunday, 18 animals were caught: 3 skinks, 10 sandy inland mice, 4 common house mice and 1 fat tailed dunnart.

Following checks on all traps, another 2½ traps were dug before enjoying lunch and a swim at Coongie. More trap setting was completed before returning to base camp in the afternoon. Enroute a wedge tailed eagle's nest with three eggs in it was discovered.

Up at the lake, Jim continued fish surveys with a new crew of workers as Sally and the others returned to base camp.

Sally and Rachel took vehicles and navigators into Moomba to collect food supplies for the remaining expedition period. A successful trip was completed in the dark, returning to the welcome site of the first campfire of the expedition.

David and seven expeditioners spent a pleasant day canoeing downstream from base camp. Brian set up mist nets at several sites and initiated the banding and recording program in conjunction with a large CSIRO survey program.

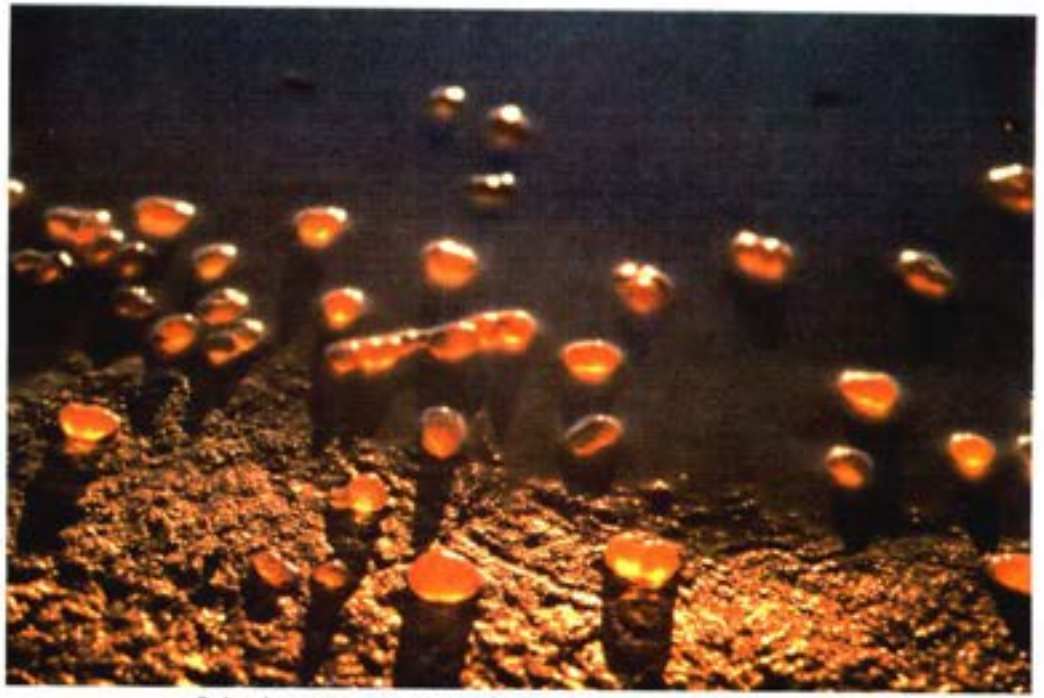
Steve, Christian, Julian, Ulla, recording pitfall results.

Dick, Claire, Frances, Jim at base camp.

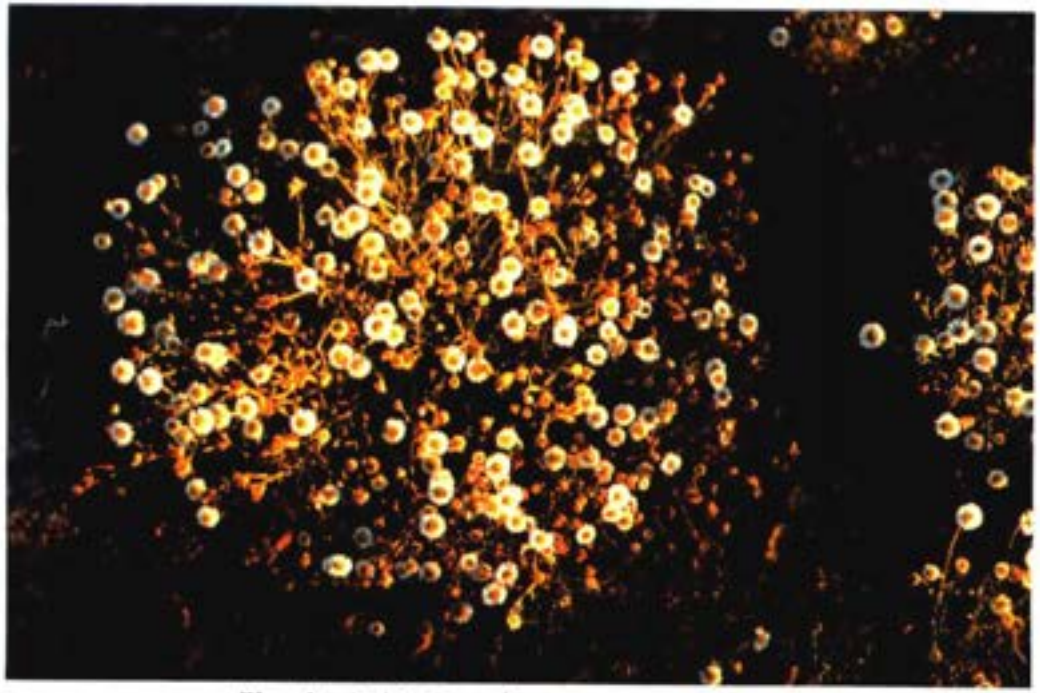
David and Wendy on Cooper Creek.

Rachel, Warren, Steven, Sally, Lesley, Francis.

Red gum on Cooper Creek near 7 mile yards.



Colonies of colonial rotifers on Lake Mundooroounie.



Minuria denticulata (Compositaea) on mud flat.

Painted dragon on John's hand-pitfall studies.

DAY 10 - TUESDAY 7th JUNE

David and an intrepid party paddled upstream to Tirrawarra swamp (and back). They had a lot of fun negotiating narrow fast flowing channels and avoiding lignum, trees etc. and refound the nardoo grinding stone which was discovered on Saturday's trip. No bruises were revealed on return to camp.

The seismic line revegetation work began today. All sites are located between Kudriemitchie and Tirrawarra Oil Field on the western side of Cooper Creek. The lines investigated represented a range of habitats, ages and construction techniques. The field herbarium and Blacks Flora were extensively used as people familiarised themselves with Latin taxonomic names. Identification continued on returning to camp.

That afternoon we were joined by Neil and Marcia prior to them starting a 10-day walk from the Cooper to the Birdsville Track. Four blokes from Flinders University also visited camp this evening as part of a reconnaisance for an International Geographer's Conference excursion to the area later in the year.

In an errand of mercy, Garry drove to the Innamincka pub for supplies of brown and red beer to assist in making merry at tonight's party around the campfire. A pleasant evening was had by all despite the predictable and drawn out leaders' meeting. As happened on most evenings, everyone gathered for half an hour or so after dinner to discuss the day's activities and plan groups and logistics for the following day.

Jim and crew spent another day sampling at Coongie and another quiet starlit night around a quieter campfire than that of the large group.

DAY 11 - WEDNESDAY 8th JUNE

Julian completed sampling the pitfall traps on the eastern side of the Cooper and returned with gear to camp. The shotlining crew, by now more fluent in botanical Latin and over equipped with sample bags and a variety of non-native fruit for lunch, spent another profitable day. Now proficient at pacing sectors of survey lines whilst looking at their feet and mumbling incoherent names which were avidly recorded. The crew were also treated to demonstrations of soil texture classing and description, causing many to question Wace's sanity and intellectual capabilities.

Meanwhile at Coongie, Jim and his intrepid crew in their two boats began the search for Brown Creek leading north to Toontoowaranie. Armed with equipment, aerial photos, maps, compasses etc. they explored the northern fringes of Coongie and did battle with the lignum. Unable to find the creek entrance after their day's search, they made camp beside the lake.

DAY 12 - THURSDAY 9th JUNE

Monitoring of vegetation around pitfalls continued today with Leslie showing a particular flair for botanical Latin. The lesser spotted Barley and others spent the day surveying shotlines in and around Tirrawarra swamp.

David and canoeists paddled towards Tirrawarra, but found that water levels had dropped significantly and that it was more difficult to manoevre in and around the trees and lignum.

Richard drove a 4WD from the eastern side of Cooper Creek to the western side. A net distance of <100m direct, but requiring a 200km hike via Innamincka and Moomba to cross the creek. Most remaining scientific work is on the western side.

A surprise for those in base camp this afternoon was the return (by boat) of Jim and his exhausted crew from Coongie. They had spent yet another day carrying, rowing, pulling, pushing and cruising around the top end of Coongie trying to find the elusive Brown Creek. Lignum, strong currents, tree snags all added to the drama. Brendan and Marilyn managed some successful sampling in the area, but Jim's netting captured only 6 fish. Leaving scientific gear and one boat at Coongie they negotiated slow flows and snags coming upstream on the Cooper to get "home".

The highlight of the day was the arrival of the SANTOS crew with Harry Butler (a consultant to SANTOS). In true style they arrived with an Esky full of cold beer and bickies and cheese. Fiona, Ollie and Steve of SANTOS Environmental branch had been involved in co-ordinating logistical support for the SEG expedition for many months previously. It was good to have them enjoy an evening in camp with us. After tea and our exchange of the day's happenings around the campfire, Harry Butler blacked out the camp and quietened us down. He spoke at some length about the place of man in the natural environment, especially in these sensitive, remote, arid ecosystems. In true story telling fashion, he drew on his own vast personal experience and knowledge of the Australian bush. He raised many questions and ideas on appropriate means of communication and education in areas of conflict over competing land uses. A discussion time followed which summed up an informal and enjoyable evening.

DAY 13 - FRIDAY 10th JUNE

An early morning farewell to the SANTOS crew heralded a busy day for one and all.

Jim and a new crew drove to Coongie to load boats onto vehicles and negotiate the track to Lake Toontoowaranie. They then lost no time in getting into the work of netting etc. Brendan and Marilyn also continued their plankton and insect collecting.

Claire and Frances led an enthusiastic group of birdos on a walk from base camp, adding to the already extensive bird list.

Rachel and the shot liners were overwhelmed with unidentified samples and thus spent a day in camp with the floras and herbarium putting names on specimens and tidying up record sheets of study sites.

Richard Willing kept us all entertained this evening with stories of his time in the Antarctic (many years previous). The very same man also holds the record for best impersonator of the courting ritual of a musk duck!

DAY 14 - SATURDAY 11th JUNE

The 4-day canoeing expedition set off this morning down the Cooper towards Coongie and further lakes. (See report of trip following) Richard and Gwen Willing also departed today headed for N.S.W.

Brian and Gary and others spent a day in the vicinity of Kudriemitchie netting, banding and photographing birds. Of particular note was Gary's witnessing and photographing of a family of Eyerian Grass Wrens.

Three vehicles full of people headed off towards Toontoowaranie on the western side of the Cooper. Sally, Jo, Jeff and Graeme spent a pleasant day sediment coring on the lake using successful though unconventional methods of core extraction as before. Sally showed lack of dedication to the pursuit of science and whimpishness when she refused to dive in after a sample tube lost overboard (but we won't talk about that - will we!).

Julian and a large team dug out and set up several lines of pitfall traps in the vicinity of Toontoowaranie and Browne Creek. Most of the group returned to base camp that evening apart from Julian and three expeditioners who remained around Toontoowaranie to sample traps and do vegetation surveys.

Sally and Co. ran out of daylight on their trip back to base camp and had difficulty locating the track (such as it was) at a vital dune crossing. After an hour of trying to locate the track in darkness, they made camp on the Cooper at what was to have been the original base camp site. As there was no gear they spent a cold night huddled together around small fires, joked about food, made merry and waited for daylight. The elusive shot line track was easily located in the morning, as was the nearby canoeists' camp.

DAY 15 - SUNDAY 12th JUNE

At base camp the bushwalkers packed up and were duly farewelled with much carrying on and taking of pictures. (See following account of their 3-day walk).

Around camp the birdos and Brian's amateur limnologists spent a quiet day with microscopes etc., with some more sampling of the lake and mist netted and recorded birds.

Further north, Jim and Co. continued the fish sampling on Toontoowaranie and Goyder Lakes and Ellar Creek. Julian and his recruits checked and recorded the pitfall lines, where, amongst other animals, a Forests mouse had been captured.

Brendan, Marilyn and others were privileged to watch an absolutely breathtaking sunset over Lake Tillinee.

We were visited by Flinders University canoeists who had come from Innamincka, through Tirrawarra, up to Coongie and now back to Kudriemitchie prior to driving back to civilisation.

A quiet evening was spent at the base camp with very depleted numbers. Brian intrigued his keen listeners with poetry and readings from the journals of Burke and Wills. The "wide mouth frog" and other frivolous, ficticious characters made an appearance around the campfire in the early hours.

DAY 16 - MONDAY 13th JUNE

"Mondayitis" seems irrelevant in this country and everyone was busy this morning. A group of 6 keen botanists set off on a two day trip to complete the southern-most shot line surveys. By now the team was reasonably proficient and tackled the sand dune and swamp vegetation with ease. They camped overnight at Narie Waterhole on the main branch of Cooper Creek.

Sally, Steve, Frances, Brendan and Marilyn ventured into Moomba via some sampling points on Embarka swamp. Brendan, Marilyn and Frances flew out for Adelaide late that afternoon.

Warren Bonython, President of S.E.G., joined the expedition at Moomba. After collecting supplies, fuel etc., Sally, Steve and Warren returned to the shot line survey camp at Narie Waterhole. Julian and Jim joined the camp briefly for a gourmet dinner, all under the watchful eye of a very attentive Tawny frogmouth.

Further north, the sampling at Lake Goyder was completed and Julian's crew continued the small mammal and vegetation surveys.

With four groups in separate locations a record minimum number of expeditioners spent a quiet night at the Kudriemitchie base camp. Brockie again came good with entertainment.

Bushwalkers camped at Brockie's Lake, and the canoeists on Cooper Creek at Coongie entrance.

DAY 17 - TUESDAY 14th JUNE

Julian and Jim completed sampling and survey programs and visited Lake Appenborough before returning to base camp late in the day.

The bushwalkers and canoeists returned during the afternoon. Both expeditions were thoroughly enjoyable and a good time was had by all.

The shot line botanists returned to camp with sample bags full of plants belonging to that large taxonomic family called the problem-aceae for later identification. Sally, Brian and Warren ventured up the eastern track to snatch a look at Coongie Lake itself. They returned to a most spectacular sunset over Brockie's Lake.

Base camp at Kudriemitchie was absolutely buzzing with activity and accounts of the last few days adventures, and plans for the following days. A hilarious evening was spent around the campfire - much music and good humour!

DAY 18 - WEDNESDAY 15th JUNE

The excitement of the day was the capture of an Eyrian Grass Wren in the mist nets. This was a much photographed occasion providing an unusual opportunity to see this rare species at close range.

After dismantling and packing up most of the base camp in the morning, most people spent the afternoon relaxing or walking. The evening proved to be a fun one, with all the musical instruments out and expeditioners in good voice. Gary and Steve delighted our palates with pavlova and vanilla slice for dessert (all from the humble bush kitchen!).

DAY 19 - THURSDAY 16th JUNE

With gear packed onto vehicles and people ready to depart, there remained only two tasks to perform - a commemorative tree planting at our base camp site and the group photo. Julian and his able assistant completed some last minute vegetation surveys before the two convoys, on either side of the creek, began to roll southwards.

After lunching on the track and a brief stop at Innamincka and inspection of the tree site, we farewelled John and Joan as they headed north to Queensland from Innamincka. All vehicles negotiated the track and its many detours without a hassle in much less time than the inward journey (and with no sandbogs!) The two convoys met up at Moomba and the final supply dropoffs and refuelings took place before making camp behind a dune to the south of the gas town.

This camp was another memorable one, not least because of Brockie's and Tim's damper making efforts, with everyone in high spirits.

DAY 20 - FRIDAY 17th JUNE

After Gary's departure the straggly camp packed up and moved on yet again for the drive south. We lunched at Blanchwater ruins on McDonnell Creek, and then in the late afternoon most of us climbed the dizzy heights of Mt. Lyndhurst. Julian and others had more important pursuits at the Lyndhurst pub.

A little after 6 o'clock on a relatively normal Friday night in Leigh Creek, 30 S.E.G. expeditioners decended on the town. It might have been the noise and boisterousness or it could have been our not so delicate bush aroma - but we cleared out the canteen and then the pub in no time flat! Vast quantities of food and drink were consumed as the evening progressed. Previously undiscovered dancing talents were revealed that night in the Leigh Creek hotel as we bopped away to a variety of rock and soppy music. Much silliness and a brilliant evening of self-styled humour/entertainment was enjoyed by all. A fitting celebration for the last night of the expedition. A very rough camp was made near the creek just south of town.

DAY 21 - SATURDAY 18th JUNE

Many sleepy eyes and sore heads climbed from tents and swags this morning. After a lazy breakfast, Warren Bonython gave us a send-off speech and wrapped up the formal part of the expedition. He and Graeme departed for some walking in the Flinders Ranges. Our depleted convoy travelled steadily south to a lunch stop at Hawker.

The journey from Hawker and Adelaide was made interesting by Julian taking us through fords and rutted back roads.

In the early evening the laden dirty vehicles rolled into Goodwood to a waiting crowd of friends and family. In contrast the expeditioners seemed very dirty to these city folk. Hurried farewells to good friends and finally each headed home.

And so, another S.E.G. expedition is concluded. After months of planning and preparation and three action-packed weeks Expedition Coongie had been a huge success and a rewarding, enriching experience for each of those who took part.

CANOE TRIP — Vanessa Morley

The party, consisting of David (leader), Jeannie, Vanessa, Con, Tim, Brad, Jo and John, departed camp at 8.45 and headed downstream to Coongie Lake. As always, the correllas made their presence felt. After a lunch stop 3km short of the lake, we met up with a Flinders University canoeing expedition, so we stopped for a yarn. Arriving at Coongie mid-afternoon we were greeted by a fabulous sight. After paddling around the side of the glassy smooth lake, we made camp on the north-west shore. A surprise visit was made from Sally, Graeme, Jo and Geoff on their return from further north.

After a hard night's sleep and breakfast, Sally and Co. dropped in again having spent an unintentional night camped at Coongie. This was the day of attempting to conquer Browne Creek. A canoe can get into a lot of places that an outboard dingy can't, and we found the entrance with no trouble at all. Making our way through the lignum we marked the trail for the return journey and renamed it "Browne Lignum Creek". This brought us out to Lake Toontoowaranie where we had lunch and a swim. We paddled across to the north east bay, spotting pelicans, ducks, swans and water rats enroute. We made camp at the base of a sandhill and later that evening we got torch signals from Jim's camp across the lake.

After a fabulous sunrise we paddled over to the other camp but found it deserted. We found and negotiated Browne Creek with no difficulty, and had a leisurely lunch on returning to Coongie Lake. After many water fights we paddled through a green bed of azolla to reach our camp site near the Cooper NW Branch entrance point to the lake. This was the earlier proposed base camp site of the expedition.

The long paddle upstream to base camp was assisted by the wind behind us, making it easier going. Soon after lunch the familiar yellow base camp dingy was sighted and we were "home".

Thanks to David Kemp for a fantastic trip and his constant encouragement and quiet humour. We had a great time!

3.0 SCIENTIFIC PROGRAMME

3.1 PITFALLING & VEGETATION STUDIES

Julian Reid

Introduction

Thirty permanent sites were established in the Coongie Lakes District in November, 1986, at the onset of a year long study of the Lakes Region instigated by Dick Smith's AUSTRALIAN GEOGRAPHIC. The sites were chosen to encompass the range of landforms and habitats represented in the district's terrestrial environment, and all were located within 15 km of "Coongie Ruins" to facilitate ready travel between sites.

As can be seen from the accompanying Fig. 3.1, the sites are divided between the eastern (1E...15E) and western (1W...15W) sites of the North West Branch - Coongie Lakes system.

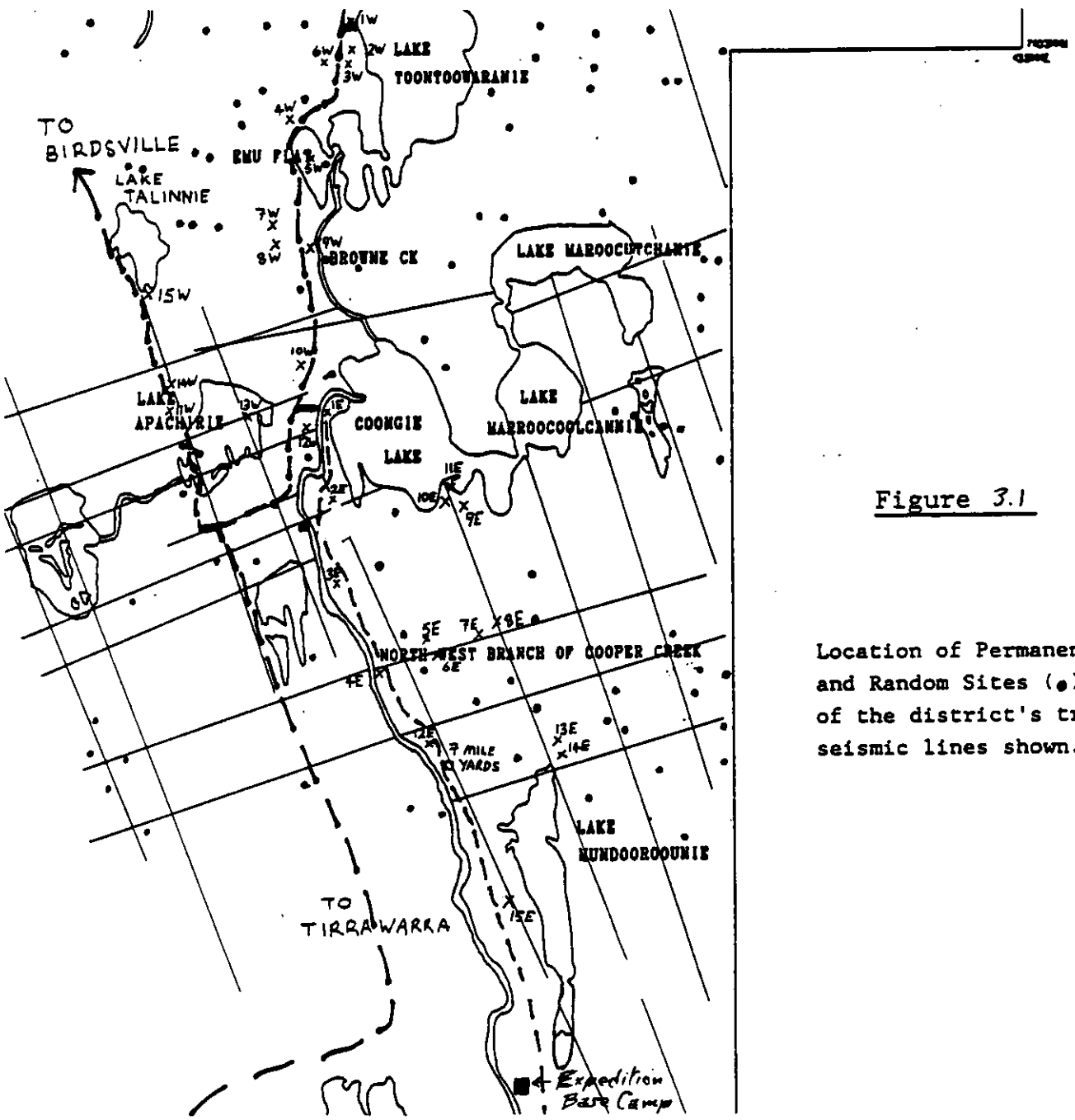


Figure 3.1

Location of Permanent Sites (X) and Random Sites (●) with some of the district's tracks and seismic lines shown.

The sites were established to:

- systematically sample the terrestrial vertebrate fauna (principally frogs, reptiles, rodents and desyurid marsupials;
- record the birds occurring in particular habitats;
- assess the vegetation in particular habits;
- accrue a photographic record of the obvious changes happening to the landscape over time.

This temporal factor, alluded to in the fourth goal, is an important component of desert ecosystems, and was a major focus of the study initiated in late 1986 and continuing still. The information being gained at these sites (which have been sampled nine times to date over a 21 month period), is allowing a comprehensive description of the shifting biological patterns at play across the Coongie landscape to be amassed.

A sound knowledge of the spatial and temporal variability of the different plant and animal communities is fundamental to the appropriate management of the Coongie Lakes, especially as it appears that this area will be subject to increased pressure.

The remainder of this account is broken into two main sections - pitfall sampling for reptiles and mammals is discussed first, and then the vegetation studies are described. Photopoints were not taken on the expedition, although they were subsequently photographed in August, 1988.

An account of the birds recorded during the expedition has been prepared by F. Taylor and C. Gifford. They have presented a complete list of birds identified and detailed several interesting behavioural observations, while B. Brock has reported on his mist-netting and banding studies. Therefore birds are dealt with only briefly in this account.

Regrettably, time constraints precluded the waterbird counting programme from being conducted, although it is observed that on account of the exceptional rains which the region received over Easter prior to the expedition and the ensuing flooding along the Cooper, the level of water in the lakes-system would have prevented satisfactory counts from being made.

"Science is nothing but trained and organized common sense" T.H.Huxley 1825-1895

Pitfalling Studies

A number of the permanent sites were partially or totally under water due to the high water levels referred to above. For this reason, only 10 of the 15 western sites could be trapped, while one eastern site (15E) and one of the two pitfall lines at both 9E and 11E were also under water (in addition sites 1E and 3E are no longer trapped). This situation exemplifies the changeability, frequently dramatic as in this case, of the landscapes at Coongie, where terrestrial environments can be rapidly transformed into temporary aquatic environments, with the ground-dwelling inhabitants either perishing or forced to seek refuge on higher ground.

The pitfalling technique was described in the Expedition Handbook, and so only a brief methodology is recounted here. At each site (where possible), two lines of five pitfall traps were erected. In each line, the pots are spaced c 8m apart, and the pots were opened and joined by a length of flywire (25 cm high) which was dug into the ground passing over the midline of each pot. The pots were open for three nights (two occasionally).

Results

The number of captures of each species of mammal and reptile is presented in the following tables.

Mammals	WEST	EAST	TOTAL
Sminthopsis macroura	4	2	6
S.crassicaudata	3	3	6
Mus musculus	11	10	21
Pseudomys hermannsburgensis	17	16	33
Leggadina forresti	1		1
Ningaui sp.aff.ridei	1		1
TOTAL	37	31	68
No. Spp	6	4	6
* % Success	12.3	10.7	11.5

* Percent Capture Rate Success is derived from the total number of captures (68) divided by the total number of pot-nights (591), and expressed as a percentage.

Reptiles	WEST	EAST	TOTAL
Ctenophorus pictus	5	8	13
Ctenotus brooksi	4	2	6
C. regius	3	3	6
Diporiphora winneckei		1	1
Lerista labialis		1	1
Morethia adelaidensis	3	3	6
M. boulengeri		5	5
Menetia greyi	2	1	3
Pogona vitticeps		1	1
Cryptoblepharus plagiocephalus		1	1
Tympanocryptis lineata		1	1
TOTAL	17	27	44
No. ssp	5	11	11
% Success	5.7	9.3	7.7

Eleven species of reptile and six species of small mammal were encountered, and the overall capture rate of mammals (11.5%) is indicative of an abundant fauna. Reptile numbers were low as a consequence of trapping in winter, when many species are very inactive or actually "hibernating" below ground in burrows. For instance the complete absence of geckos reveals that this group of nocturnal reptiles (at least seven species occur in the district) is inactive over winter thus confirming the results gained in 1987. In fact while erecting a pitfall line at Site 14W, a dazed Nephrurus levis (knob-tailed gecko) was dug up.

Another interesting result was the greater activity of reptiles at the eastern sites (11 species trapped compared with five at the western sites). The discrepancy can be attributed to the prevailing weather conditions, in part, with the humid, milder nights and warmer days encouraging a greater level of activity. Five of the eight painted dragons (Ctenophorus pictus) captured were juvenile-progeny of the previous spring-summer breeding season. A total of 30 reptile species are known from the Coongie district, including the common tortoise, an endemic species of Emydura, as yet undescribed.

Ten small species of mammal have been trapped previously at Coongie, and six were encountered on this expedition. Most common were the native sandy inland mouse (Pseudomys hermannsburgensis) and the introduced house mouse (Mus musculus), which occurs in all habitats; the former species is largely restricted to sand dunes within the district. A small proportion

(approximately 20%) of both species were in breeding conditon (males) or actually breeding (females).

One female fat-tailed dunnart (Sminthopsis crassicaudata) had tiny pouched young, confirming the previous year's findings that this species begins breeding early in winter. This species and its larger congener, the stripe-faced dunnart (S. macroura) occupy the floodplains in the district, and are both quite common. Numbers trapped on this occasion are lower than usual largely because a lot of their favoured sites were under water.

Two rare mammals were trapped - a pregnant Forrest's Mouse (Leggadina forresti) and a female ningaui (Ningaui sp. aff. ridei). Whereas the ningaui is confined to spinifex clad sand dunes, the Forrest's Mouse mainly occupies floodplains habitats.

Vegetation Sampling

Vegetation was assessed at 25 of the 30 permanent sites; the remaining sites were covered by water.

Quantitative data collected consist of frequency scores for each "ground layer" species recorded along a 50m by 0.5m transect. The transect is divided into 100 0.5m by 0.5m quadrats, and the presence of all species in each quadrat recorded. The sum of the number of "hits" is the frequency of occurrence of that species along the transect (and varies from 1 to a 100).

This study (conducted over 21 months to date) has revealed that much of the flora is highly seasonal - that some species germinate in response to summer rains while others respond to winter rains. The subtleties of this temporal partitioning of the environment will only become apparent over several years of resampling at these sites. However, the data gathered on this expedition have certainly confirmed the presence of a distinctive suite of species which proliferate after heavy winter rains. This group is dominated by members of the daisy family (COMPOSITAE), while the "crucifers" (BRASSICACEAE) are also well represented.

Most of the grasses were observed to be in decline, after an extended growing season, because of the unusually warm, humid autumn experienced in 1988.

With some 350 species known to occur in the Coongie district, repeating plant associations are a feature of the landscape.

In base-level habitats (floodplain, claypans), Calotis hispidula - a very prickly tiny daisy - was prominent, while on slightly higher ground with a little sand present, the daisies Gnephosis eriocarpa and Callocephalus platycephalus flourished. Higher, on dune slopes proper, the groundsel Senecio gregorii and poached egg daisy Myriocephalus stuartii were flowering in gay profusion. These daisies were observed to sport rings on the right hand side of their sepals.

Other annuals common in the dunes were the wild parsnip Trachymene glaucifolia, native tobacco Nicotiana velutina and sand spurge Phyllanthus lacunarius. The Cooper Clover Trigonella suarissima, pop saltbush Atriplex holocarpa and variable groundsel Senecio lautus were a feature of sites subject to inundation, with nardoo Marsilea drummondii actually growing in the water.

Birds

Many bird observations of interest were made. Records of birds breeding in winter in Australia are scarce, and so the breeding response observed during the expedition was of particular significance.

Also a much larger number of winter migrants were observed in 1988 than in 1987, and again this is testimony to the different scales of temporal variation witnessed in the arid zone - the numbers of Striated Pardalote, Rufous Whistler, Red-capped Robin and Grey Fantail are pertinent in this respect.

3.2 THE BIRD OBSERVERS REPORT

Claire Gifford &
Frances Taylor

Although no official bird counts were done on Expedition Coongie, the amateur ornithologists recorded a moderate number of observations, many of which were personal first sightings.

However, due to the rather random and unorganised nature of the observations, records tended to be general rather than personal. The list of sightings which follows therefore contains a fairly sketchy estimate of the localities and relative abundance of the species.
We are indebted to Julian Reid whose list covers everyone else's put together, and more. Without his assistance and the relevant data he has provided, this report would not be what it is. Bill Scutchins and Jeff Whittaker also were of considerable help.

A total of 134 species was recorded, at least 71 of which were seen in the vicinity of Kudriemitchie Waterhole and Outstation and across the Lake Mundooroounie. There was a number of breeding records, and some interesting behaviour observed, which follows the bird list.

Further Observations

1. While crossing the sand dunes from Lake Mundooroounie, I watched a pair of little eagles dashing about to the ground with much noise and flapping. They would then retire to the top of a small bush, one nearby and the other further afield. After a pause they repeated these same performance, the further away bird, often flying back over the site of the scramble. Nearby on another bush, a solitary brown falcon watched these performances - unmoving. After about 10 minutes I moved away, and as I did so, noticed in the open, between the bushes and the perched birds, a sand coloured rabbit, sitting frozen. It occured to me that perhaps raptors are like cats, in that they can see only moving prey.

2. My return was further delayed by the delightful sight of some white wing fairy wrens, all female which poured in a steady stream into the Acacia ligulata by which I stood. There must have been 9-12 birds. They busily hopped about the branches, and every now and then, two or three would bunch up together, shuffling along to get as close as possible. They would then give each other a few quick pecks around the neck feathers, then off they'd hop to another branch, and so on...

3. We were following Julian's vehicle back to base, after a day on the pitfall traps. There were a couple of emus on the flat to our left. Julian stopped when level with the birds and got out beside his door. We were fascinated to see him waving his arm above the roof of the car. Overcome with curiosity, the younger emu came running up to within a few metres of the two cars - until it was too close for its comfort, when it ran back to father.

Little Corellas above Kudriemitchie W.H.

Eyrean grass wrens on sandhill near base.

Spoonbill above Kudriemitchie W.H.

Sunrise - Coolibah on Lake Mundooroounie.

FIELD LIST OF BIRDS - S.E.G. EXPEDITION COONGIE

Nomenclature and systematic order based on R.A.O.U. recommendations (EMU-77)

Key to abbreviations:

REGIONS 1. North - Base Camp to Coongie Lakes - Including Kudriemitchie Outstation and Lake Mundooroounie

2. East - Base Camp to Cullyamurra Waterhole - including Innamincka and part of Cooper Creek

3. South - Base Camp to Moomba - Including Tirrawarra Swamp. Part of Strzelecki Creek.

4. Far South - Moomba to Montecollina Bore - Including dunefields, Cobbler, casual water bodies.

Scale of abundance

F = Few
U = Uncommon
MC = Moderately Common
C = Common

Other

W/S = Widespread
Sc = Scattered
MN = Moderate numbers
Br = Breeding record

REGIONS	1 NORTH	2 EAST	3 SOUTH	4 FAR S.	OTHER OBSERVATIONS
Emu	1	2	3	4	W/S all habitats but U. Some juveniles
Hoary Headed Grebe	1				Few
Aust. Pelican	1	2			Few
Darter	1				Few
Great Cormorant	1				F. Small flocks
Pied Cormorant	1	2			F. Small flocks
Pacific Heron	1		3		M.N. Sc. permanent & casual waters
White Faced Heron	1				As above - Br. Ellar Creek
Great Egret	1				F. Sc.
Rufous Night Heron	1	2			F. on waterholes incl. immatures
Sacred Ibis	1				One only on L. Toontoowaranie
Straw Necked Ibis	1			4	F. Small flocks up to 50
Royal Spoon Bill	1				F. Sc.
Yellow Billed Spoon Bill	1				MC. Br. nestlings. Kudrie-mitchie W.H.
Plumed Whistling Duck	1				350+ on Coongie. Small groups most lakes. 13 on Mundooroounie.

REGIONS	1 NORTH	2 EAST	3 SOUTH	4 FAR S.	OTHER OBSERVATIONS
Black Swan	1	2		4	F. W/S.
Freckled Duck	1				2 Pairs (Coongie & Mundooroounie, Males in Br. plumage)
Aust. Shelduck	1			4	F. Sc. U.
Pacific Black Duck	1				F. Sc. U.
Grey Teal	1				MC. Br. (nest with eggs)
Pink Eared Duck	1				MC. Br.
Hard Head	1				F. Sc.
Maned Duck	1				F. Sc.
Musk Duck	1				F. Sc. Male displaying to Female on Coongie
Letter Wing Kite				4	U. 3 seen - 10km N. Monte-collina Bore
Black Kite	1	2	3	4	C. W/S.
Black Breasted Kite (Buzzard)	1				U. 2 or 3 birds seen between Kudriemitchie & Coongie
Whistling Kite	1	2			C. Br. along N.W. Branch of Cooper.
Brown Goshawk	1				One near Kudriemitchie.
Wedge Tailed Eagle	1				F. W/S. Br. 3 nests with eggs.
Little Eagle	1				MC. along N.W. Branch.
Spotted Harrier	1	2		4	F. one in each region
Black Falcon	1				F. Sc.
Aust. Hobby	1				F. Sc.
Grey Falcon	1				One only
Brown Falcon	1	2	3	4	C.W/S. Br. 1 nest in use. One bird observed eating a rabbit.
Aust. Kestrel	1		3	4	MC. W/S.
Stubble Quail	1				2 or 3 on grassy floodplains.
Little Button Quail	1		3		Heard at Coongie & Strzelecki Creek Camp.
Blacktail Native Hen	1			4	MC. Br. on Mundooroounie. Downy chicks & immatures.

REGIONS	1 NORTH	2 EAST	3 SOUTH	4 FAR S.	OTHER OBSERVATIONS
Dusky Moor Hen	1				F. N.W. Branch
Purple Swamp Hen	1				F. Northern Lakes
Coot	1				MN on N. Lakes. Few Singles on Mundooroounie.
Brolga	1				F. Sc. around Coongie. 1 pair Mundooroounie.
Aust. Bustard	1	2	3		F. Sc. on vegetated plains
Bush Thick Knee	1				Heard twice near Kudriemitchie.
Masked Lapwing	1	2	3	4	MC. W/S. Br. Toontoowaranie.
Banded Lapwing	1				MN. Sc.
Red Kneed Plover	1				L. Appanburra
Black Fronted Plover	1				MC. W/S.
Red Capped Plover	1				F. L. Appanburra & Toontoowaranie
Black Winged Stilt	1			4	MN & W/S. 100 on L.Appanburra including immatures
Red Necked Avocet	1		3	4	MC. Sc. Several Broods.
Green Shank	1				One - L. Goyder
Marsh Sandpiper	1				One - L. Appanburra
Lesser Yellow Legs	1				One - L. Appanburra. First record for South Aust.
Silver Gull	1				MN on waters of Coongie district one on Mundooroounie.
Gull Billed Tern	1				One - Coongie - 10 Northern Lakes.
Caspian Tern	1				MN. all waters
White Winged Tern	1				4 - L. Appanburra
Peaceful Dove	1	2			MC. in Woodland near the Cooper and Lakes
Diamond Dove	1	2			MC. W/S.
Common Bronzewing		2			One near Scrubby Camp W/H.
Flock Bronzewing	1				MN. Small groups Coongie dist. males displaying at 2-3 localities.

REGIONS	1 NORTH	2 EAST	3 SOUTH	4 FAR S.	OTHER OBSERVATIONS
Crested Pigeon	1	2	?	?	C. W/S
Galah	1	2	3	?	C. W/S. Br. nestlings
Little Corella	1	2	3	?	C. W/S. Br. Feeding on Zygochloa paradoxa
Cockatiel	1	2	3	?	M.N. Sc.
Budgerigar	1	2	3		C. W/S. Br.
Mallee Ring Neck	1	2			U. Confined to Cooper & red gums
Red Rump Parrot	1	2			C. On floodplain of Cooper.
Blue Bonnet	1				M.C. Sc.
Bourke's Parrot		2			Heard Callyamurra Waterhole
Blue Winged Parrot		2	3		Heard near Innamincka & Moomba.
Pallid Cuckoo	1				U. Sc.
Horse Fields Bronze Cuckoo					M.N. Sc.
Barking Owl	1				M.C. in red gums on N.W.Branch.
Barn Owl	1				Heard - several Coongie district
Tawny Frogmouth	1		3		M.N. Heard - corpse at Narie W/H
Aust. Owlet Nightjar	1				M.C. in Woodland
Red Backed Kingfisher	1				M.N.
Rainbow Bee-eater		2			Heard Callyamurra
White Backed Swallow	1			4	M.N. in dunefields
Tree Martin	1	2	3	?	M.C. W/S. near water Br.
Fairy Martin	1	2	3	?	M.C. W/S. near water Br.
Richard's Pipit	1	2	?	4	W/S.
Black Face Cuckoo Shrike	1	2	3	4	M.N. Scattered feeding on Enchylaena Tomentosa
Ground Cuckoo Shrike		2			F. between Scrubby Camp & Innamincka also Cullyamurra
White Winged Triller	?	?	?	?	F. Sc. on passage
Red Capped Robin	1				M.N. around Coongie - 1 or 2 Mundooroounie.

REGIONS	1 NORTH	2 EAST	3 SOUTH	4 FAR S.	OTHER OBSERVATIONS
Jacky Winter		2	3		F. 1 Tirrawarra Swamp - 2 Cullyamurra
Rufous Whistler	1				F. One at Browne Creek 1 pair (banded) Kudriemitchie -O/S all silent
Grey Shrike Thrush	1	2	3		M.C. along Cooper & Lakes
Restless Flycatcher	1		3 (?)		F. 1 or 2 along N.W. Branch - 1 Narie Waterhole
Willie Wagtail	1	2	3	4	M/C W/S.
Grey Fantail	1				F. Sc. Coongie district
Chirruping Wedge Bill	1				M.C. in lignum of floodplain & Mundooroounie
Cinnamon Quail Thrush	1		3		M.C. dunes & outer floodplain
Chestnut Crowned Babbler	1		3		U. shrubby habitat N.W. Branch & Narie Waterhole
Little Grass Bird	1				F. Flooded lignum habitat - Coongie. Heard Mundooroounie
Reed Warbler	1				F. Flooded lignum habitat - Coongie. Heard Mundooroounie
Rufous Song Lark	1	2	3		M.C. Males singing displays in woodlands near water.
Brown Song Lark					U. Sc.
Variegated Fairy Wren	1				M.C. W/S.
White Winged Fairy Wren	1	2	?	4	C. W/S - common in dunes.
Eyrean Grass Wren	1				M.C. & W/S in dunefields with Zygochloa paradoxa. Br. - pair with recently fledged young near Mundooroounie
Calamanthus				4	In stony country between Cobbler desert & Lyndhurst
Thick Billed Grass Wren				4	In stony country between Cobbler desert & Lyndhurst
Gibber Bird				4	In stony country between Cobbler desert & Lyndhurst
Weebill		2	3		One in coolibahs between Scrubby Camp & Innamincka & two at Callyamurra Waterhole

REGION	1 NORTH	2 EAST	3 SOUTH	4 FAR S.	OTHER OBSERVATIONS
Chestnut Rumped Thornbill	1				One in Coongie district.
Southern White Face	1				M.C. & W/S.
Banded White Face					U. but W/S in dunefields.
Brown Tree Creeper	1	2	3		M.C. along Cooper & Lakes. Br. Callyamurra
Spiny Cheeked Honeyeater	1				U. along Cooper - one heard in dunes at Coongie.
Yellow Throated Miner	1	2	3		C. in eucalypts. Scattered contained Euchylaena Tomentosa.
Singing Honeyeater	1				U. W/S.
White Plumed Honeyeater	1	2	3		C. in eucalypts. Br.(eggs) at Cullyamurra & Kudriemitchie.
Golden Backed Honeyeater	1				Two groups near Kudriemitchie & Browne Creek
Black Honeyeater	1		3		U. W/S in dunes near Moomba, Strzelecki Creek floodplain. Sc. Coongie district where Eremophila longifolia were flowering. Mundooroounie.
Crimson Chat					U. Sc.
Orange Chat					U. Sc.
Mistletoe Bird	1	2		4	M.N. W/S. Br. recently fledged young at Kudriemitchie
Red Browed Pardalote	1				M.C. W/S.
Striated Pardalote	1				U. Several Kudriemitchie
Sparrow		2	3		U. Innamincka & Moomba
Zebra Finch	1	2	3	4	C. W/S. Br.
Aust. Magpie Lark	1	2			C. Usually near water. Br. fledged juvenile.
White Breasted W/Swallow	1				M.N. along Cooper & Lakes
Black Faced W/Swallow	1				M.C. W/S.
White Browed W/Swallow					F. few flocks flying
Masked W/Swallow					F. few individuals within flocks of above.

REGION	1 NORTH	2 EAST	3 SOUTH	4 FAR S.	OTHER OBSERVATIONS
Aust. Magpie (Black Backed)	1	2	3	4	C. W/S.
Aust. Raven	1	2			C. W/S.
Little Crow					C. W/S.

Overlooking Lake Mundooroounie
Gary Krohn, Bill Scutchins, Jeff Whittaker, David Kemp

UNUSUAL BEHAVIOUR OF THE EYREAN GRASS WREN

Gary Krohn

In the canegrass clumps near the lake two dunes across from Kudriemitchie Outstation, I spotted a pair of Eyrean Grass Wrens, the juvenile of which I photographed. Following the group until they disappeared into several large clumps of canegrass, I set the camera up near the centre of where I believed they were, having failed to flush the birds into the open. After 10-15 minutes the adult birds appeared and showed a great deal of curiosity in me though not venturing too close. In their rapid hopping transits from one bush to another both birds often stopped in the open to look at me, turning from side to side, then rapidly disappeared into the grass. The birds seemed finally to accept my presence and appeared to behave 'normally'.

Perhaps 20-25 minutes after setting down, the female hopped to one canegrass bush and appeared to "sit" down in the sand, not immediately under the bush, but under its shade. This was in clear sight approximately 7 metres away. The bird began 'rustling' its wings and pushing sand aside to create a shallow depression. This was not a vigorous exercise and in no way appeared to be 'sand-bathing' as no sand was flung into the air. The sand was simply 'pushed' aside. After perhaps 4 seconds of this behaviour the bird sprang up and hopped away. Between 20 to 30 seconds later the same bird approached the depression and again 'sat' down, facing the same way, and again 'pushed' aside the sand for approximately the same period of time. When the bird again 'sprang up' it turned around 180 and briefly 'pecked' at the inner wall of the 'hole' before disappearing around the bush.

Another 20-30 seconds elapsed before the female returned to sight and shortly afterwards was again 'sitting' in the 'hole'. This time the male approached and within a second of the female settling into the hole, the male had joined in, settling in the same depression as the female. Both birds instantly began 'rustling' wings and pushing sand aside for around 4 seconds. Both stopped and the male hopped off, leaving the female to again turn around and 'peck' at the same point as before. There appeared to be no insect or seed in the area. The bird raced off as on previous occasions but was not seen to approach the depression again.

Within the next 5 minutes the female alone had begun another two such depressions, both under the same bush in clear sight of me. Both sites were only started by the female, and never returned to. Though staying in the general area, neither bird appeared to take any further interest in the depressions for the remaining ten minutes in which I stayed.

This began around 5.00pm and with light fading I left the area for the camp. The following morning, I returned and photographed the first and deepest depression. It seemed to have suffered very little overnight.

Comments by Julian Reid.

The observation of the bizarre behaviour shown by the Eyrean Grass Wren as recounted by Gary Krohn in this report are puzzling. Very little is known of this species biology, because of its remote and restricted range and its cryptic behaviour. Prior to the observations made in 1987 and during this expedition, the published literature clearly stated that the species breeds only in spring. Yet our brazen pair, just over the dune from the base camp, had just fledged two young in Mid-June! My interpretation of the puzzling behaviour described by G. Krohn is purely speculative - the two birds he photographed nestling side by side on the sand are juveniles (because of their relatively short tail-length). Young birds of many species will frequently behave like this. I suggest that the

'scoop'-building of the adult female as described, may be an example of displacement behaviour - a repetitive action performed, because of the perceived threat to its defenceless and guileless progeny nearby, as an outlet of its unresolved anxiety; the anxiety as a result of the close human presence. Although grasswrens are normally very retiring, it is well known for them to be quite fearless when humans approach recently fledged young or a nest with advanced young.

3.3 BIRDS, ZOOLOGY and FLORA — Brian J. Brock

My main scientific contributions to the expedition were in the bird, aquatic and plant arenas.

BIRDS

Bird studies included banding birds at Kudriemitchie Outstation, near the S.E.G. Base camp in Riverine Woodland, and in the Dune Cane-grass habitat on the ridge overlooking Lake Mundooroounie (map reference VQ220739 on the Coongie 6943 sheet printed 1987).

A total of 40 birds were banded. For some of these, the beaks were daubed with a cube of sticky jelly to pick up pollen or insect fragments and some birds were also put in a chambered box (the Poo Box) so that scats could be collected before the birds were released.

Daubings and scats were analysed under dissecting and monocular microscopes on site. Some analyses remain to be completed but some worthwhile findings are reported here.

Eyrean Grasswren Male, netted on the S.E.G. Expedition in 1988.

Mist netted in cane-grass on a dune just west of and overlooking Lake Mundooroounie on 15th June, 1988 (near a clump of Eremophila longifolia trees). Map reference VQ220739 on the Coongie 6943 1/100,000 sheet dated 1987.

Not banded (since no size recommended in our list - looks like size 3 would be O.K.)

Some Measurements

Wing 59mm Rooke 30.3mm Weight 17 grams

Bill (dorso-ventral near base) = 6.6mm

Left to right just in front of nares = 4.1mm

Leg, front to back = 2.3mm =)very long
Leg, left to right = 1.5mm =)leg

Tail length from near vent to tip of tail = 88mm

Total length of bird = 163mm

The bird ran fast along the ground when released.

Other Observations on Feeding Ecology of Birds

At different times, Little Corellas were seen feeding on Pop Saltbush, Portulaca, Enchylaena tomentosa, and Paddy Melon. The Little Corellas forage far from their roosting and nesting sites (Red Gums along the Cooper) during the daytime and return at night. Considering the large numbers in the Corella flocks, their contribution to the nutrient and organic matter flux in the Cooper, must be very considerable (as they sit and crap on all night). It ought to be possible to detect diurnal changes in the nutrient content of the water downstream from significant clumps of roosting trees when the Cooper is flowing gently. Another technique might be to collect scats as they fall, much as leaves and other detritus are collected in common forest studies.

Pollen reference slides were made for some of the plants flowering while the expedition was on. The pollen from these slides, is compared with pollen in daubings from the beaks of honeyeaters or flower-eaters to find out what species the birds are visiting.

Reference slides were made for seeds of Nicotiana velutina, and Portulaca. Seeds of Enchylaena tomentosa were also collected, and compared with those passing through Yellow-Throated Miners.

Pollen reference slides were made for the wattles Acacia ligulata, A. salicina and A. stenophylla; Cassia nemophylla; Eremophila longifolia; the Australian Hollyhock Lavatera plebeia; the mistletoes Amyema preissii, Diplatia grandibractea and Loranthus exocarpi; and for the Velvet Tobacco Nicotiana velutina.

Banding, scat and daubing analysis, and the establishment of more complete pollen and seed reference collections, ought to be on-going projects in the Cooper-Coongie region.

AQUATIC STUDIES

Aquatic studies continued on three main fronts in the Kudriemitchie Waterhole - Lake Mundooroounie region:-

I Settlement tile studies of aufwuchs organisms in the Kudriemitchie Waterhole and Lake Mundooroounie. One way to show up differences in water masses is to see what settles on substrates of the same material immersed in similar ways at different sites. Kudriemitchie Waterhole and Lake Mundooroounie provided sites suitable for raft-based settlement experiments.

I prepared and varnished two rafts of marine 7-ply 22 x 30 cms and 12 mm thick and wired twenty four pieces of unvarnished marine 3-ply onto one side of them with nichrome wire. A 1.5 cm hole was drilled through the centre of the raft for an anchor rope. The rope could be tied to an overhanging branch and some kind of anchor, leaving the raft free to float up or down as the water-level changed.

Two sets of two pieces of thin marine ply were removed from each raft every second day while we were based at Kudriemitchie. The ply was examined microscopically while the organisms that settled on it were still alive.

The main differences between tiles from the two sites were:-

TABLE III

Kudriemitchie Waterhole	Lake Mundooroounie
Plenty of filamentous algae; some kind of brown egg case?; plenty of unicellular organisms (plant and animal).	Very little on the tiles.

The Cooper's Creek water (Kudriemitchie Waterhole), although fairly turbid, was much clearer than the very milky (literally as opaque as milk) Lake Mundooroounie water. The lake is fairly shallow (probably nowhere deeper than 1 metre) and I suspect that wave-action is enough to keep the fine clay sediments suspended (as in a large shallow lake I saw in Austria in 1983). The other factors against

settlement of algae etc. on the lake tiles may be firstly the greater wave action, and secondly, the very high numbers of shield shrimps, conchostracans and other crustaceans in the lake water. Cageing experiments might reveal their effect on the tiles (i.e. whether more algae would establish if the large crustaceans were excluded by cages); Coolibah roots in very shallow water near the edge of the lake, were covered with algae (and colonial rotifer colonies).

II The second thrust to the aquatic studies was to see what was happening in the shallow ephemeral pools between the dunes to the east of the S.E.G. base camp.

Here we found plenty of shield shrimps and conchostracans on 3rd June. The pools were of the consistency of pea soup (white clay in suspension). By the time we left, the pools had dried up and the crustaceans were all dead - but no doubt their eggs were "pulsating viable".

We sampled the Kudriemitchie Waterhole plankton on the same day. Ostracods, Water Beetles, Damsel and Mayfly nymphs and Volvox were plentiful. Waterfleas, sundry filamentous algae and Volvox, were abundant in a five minute plankton haul made in the Kudriemitchie Waterhole on 13th June.

III The third aspect of the aquatic studies was to see what was happening to some of the aquatic plants.

Anyone who has read anything about Burke and Wills and King, would know that Nardoo is a very important plant in this region. Nardoo looks like a brown four-leaved clover, growing in or near the water. Seed-like spore-cases may be found on mature plants or washed up around lakes, or in low-lying areas after the plants have died. King fans would also know that you cannot live by Nardoo-bread alone. Lizards, fish, yabbies, mussels etc. are an essential dietary supplement.

A small-leaved Nardoo species was found in a waterhole near the stockyard near Callamurra Waterhole on 1st June. The larger-leaved species was also there, and here at Kudriemitchie. I tried to get the sporocarps ("seeds") of the larger-leaved species to germinate, but did not have any success until I found older sporocarps washed up around Lake Mundooroounie on 12th June. Of ten old sporocarps put in water at sunset on 12th June, five had germinated by next morning. The sori had either all microspores, or a mixture of micro- and megaspores in them.

The other aquatic fern common in Kudriemitchie Waterhole, was the free-floating fern Azolla - important in the nitrogen cycle because of symbiotic nitrogen-fixing algae it contains.

Ferny-leaved seedlings of the River Coobah came up as the Cooper dropped. Water-rat footprints were seen in the soft mud. I did not see any freshwater sponges. Perhaps they were on the deeply submerged snags. I found them growing on mussels in Lake Coongie during our preliminary survey in March, 1988, and on an old tyre pulled out of the lower reaches of the N.W. Branch of the Cooper (near the old Coongie Landing). Unfortunately, preliminary tiles immersed in the Cooper (N.W. Branch) and Coongie, could not be retrieved during our main expedition, because the water levels were at least a metre higher. I would be interested to know whether sponges or freshwater bryozoans settled on them during their long period of immersion.

Colonial rotifers formed spherical or oval blobs of brownish jelly floating freely in Lake Mundooroounie. Small hemispherical jelly blobs attached to Coolibah roots in the lake, also proved to be colonial rotifers. Perhaps that is how they start off.

Exciting Plants of the S.E.G. expedition.

1) Nardoo, because of its historical links, and because it so obligingly germinated before the end of the expedition.

2) Dune Cane-grass, so important as habitat for the Eyrean Grass-wren, and as a food source for other species.

3) Diplatia and the flamboyant Harlequin Mistletoe, firing host plants, and providing nectar, insects and fruits for birds.

4) The Regal Crotalaria, C. cunninghamii - gracing dunes.

5) Nicotiana velutina (one of the Native Tobacco species) and Trichodesma zeylanicum in sandy places. Both were seen previously in the far North West of the state.

6) The Whitewoods and Owenia and flowering Eremophila species.

7) Lysiphyllum gilvum, the butterfly-leaved tree, reminding me of Zambia's Bauhinia species.

8) The wattles, by water or on dunes, feeding moths and birds, and fixing nitrogen.

9) Coolibah and Redgum.

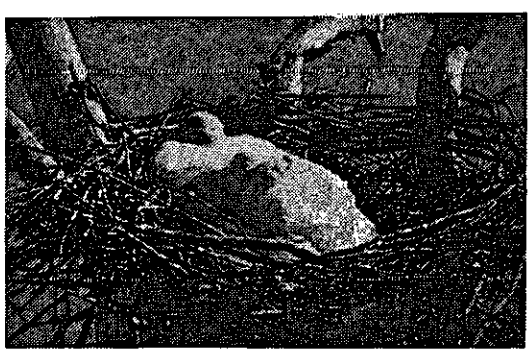
10) The Wrens' and Zebra Finches' lignums.

Finally, a word for the rabbits, perhaps the most important grazers in the system now that the cattle have been removed. Rabbits are almost in plague proportions. Like the Little Corellas, they must play a major part in the nitrogen and carbon (and associated energy) cycles.

TABLE I HIGHLIGHTS OF SCAT ANALYSIS AND POLLEN DAUBING

SPECIES OF BIRD	SCAT	DAUBING
Willie Wagtail 032 66047 5/6/88	Leg and wing fragments in scat	Moth scales in daubing
White-plumed Honey-eater 749	-	Eremophila bignoniflora pollen in daubing
White-plumed Honey-eater 752 and 753	Insect pieces in scats	-
Black Honeyeater Male	-	Eremophila longifolia & Mistletoe pollen. Insect bits
Yellow Throated Miner 209 and 211	Enchylaena tomentosa seeds in scats. Insect pieces as well in scat of 211	-
Red-browed Pardalote 205	Insect bits in scat	-
Peaceful Dove	Portulaca seeds in scat.	-
Eyrean Grasswren	Insect pieces and vegetable matter in scats	-

Brian Brock with Eyrean Grass Wren



Young spoonbills above Kudriemitchie Waterhole

TABLE II MIST-NETTING AND BANDING RECORDS.

Common Name	Numbers caught and date		
	Kudriemitchie Outstation	Near S.E.G. Base Camp	Dune Canegrass overlooking L. Mundooroounie
Dove - Diamond	1 - 5/6/88	-	-
Dove - Peaceful	-	1 - 9/6/88 1 - 10/6/88	- -
Grasswren Eyrean	-	-	1 - 15/6/88 (not banded)
Honeyeater - Black	-	-	1 Male - 7/6/88
Honeyeater - White Plumed	7 - 5/6/88	4 - 9/6/88 4 + 1 retrap - 10/6/88 3 - 12/6/88	-
Miner Yellow-throated	-	2 - 9/6/88 3 - 10/6/88 1 + 1 retrap - 12/6/88	-
Mistletoe Bird	-	1 - 10/6/88	-
Pardalote - Red-browed	1 - 5/6/88	2 - 12/6/88	-
Pardalote - Striated	1 - 5/6/88	-	-
Treecreeper Brown	-	1 - 9/6/88 1 retrap - 12/6/88	- -
Wagtail Willie	1 - 5/6/88	1 - 10/6/88	-
Whistler Rufous	1 Male - 5/6/88 1 Female - 5/6/88	- -	- -
Wren - White-winged	-	-	1 Female - 15/6/88
Wren - Variegated	-	-	1 Male - 14/6/88

- 40 birds banded
- 3 retrapped
- Eyrian Grasswren caught but not banded.

3.4 THE FISH COMMUNITY OF THE NORTHWEST BRANCH OF COOPER CREEK

Jim Puckridge

INTRODUCTION

The fish community of the Northwest Branch is one of the most significant in the state. It is probably the richest in the Lake Eyre drainage and has only two exotic species. The Cooper is entirely unregulated, so the fish community still lives according to its natural patterns. Understanding such patterns will help us protect native fish communities in many parts of Australia from the impacts of development. It will also help us restore the devastated native fish populations of regulated rivers like the Murray. The May 1988 fish community sampling programme was intended as a continuation of the Coongie Lakes Study. This study aims to describe the Northwest Branch fish community - its species composition, the relative abundance of these species, their preferred environments, and their breeding, feeding, disease and migration cycles. It aims further to relate changes in these community patterns to seasonal and flood cycles and to recommend conservation measures for the aquatic environments of the region.

The May expedition took place at an interesting time. Because fish activity is temperature - dependent, it is usually low in winter. However, flooding creates ample food and new environments, and stimulates fish activity. Although seasonal temperature cycles are well-defined on the Cooper, flood cycles are not. Most flooding occurs when temperatures are high, but this is not always so, and fish communities may be faced with conflicting demands - high temperatures and drought, or as in May 1988, low temperatures and floods. The heavy rains of April produced strong flows and substantial areas of flooding in the Northwest Branch, and although levels were falling at Kudriemitchie in May, they were still rising in the northern lakes. Water temperatures were very low.

METHODS

Because the SEG expedition extended over three weeks instead of the two weeks of previous trips, it was possible, despite delays due to flooding, to extend the range of sites sampled south to Cullyamurra Waterhole and north to Lake Apanburra. This gave a total of 17 sites (Fig. 1). Fish were collected with a set of 5 gillnets, 2m and 20m seines, a 0.5m trawl, and four drumnets. Direction of fish movement and depth in the water were determined in gillnets set across Cullyamurra Waterhole, the Northwest Branch channel, Browne Creek and Ellar Creek. All fish caught in gillnets were measured, and their reproductive state and health recorded. Samples of juveniles caught in seines and larvae caught in trawls were preserved for diet studies. Some seine samples were repeated morning and afternoon to test for daily cycles of fish movement. Seine samples were also taken along gradients from the water's edge into deep water, to test for juvenile fish depth preferences. Samples of selected species were preserved in liquid nitrogen for the South Australian Museum, which will use them in a study of the relationships between central Australian fish. Zooplankton and aquatic invertebrate samples were taken at all fish sampling sites. Water chemistry, physical variables, morphology and vegetation of the water body were measured at each site, and critical features such as depth, temperature and aquatic vegetation cover were measured for each sample.

RESULTS

Highest gillnet catchers per hour of adults and larger juveniles were recorded in the northern (downstream) creeks (Ellar (G2) and Browne (BC1)), lowest in the most southerly (upstream) site, Cullyamurra Waterhole (CA1). Of the lake sites, the highest catches were recorded in Lake Goyder

(G3). Mean seine and trawl catches of small juveniles however were low in the two most downstream lakes (Goyder (G1) and Apanburra (AP1) and highest in Lake Toontoowaranie (T1).

As tested by position in cross-channel gillnets, adult bony bream showed significant downstream movement in both Browne (BC1) and Ellar (G2) Creeks, juveniles only in Ellar Creek (Chi-square, $P<0.001$). There was no significant movement in the Northwest Branch main channel (WH1MC). No other species were caught in sufficient numbers to statistically test movement. No significant correlation (Spearman Rank) of seine catch with distance from shore was found in Coongie Lake (C5), nor was there a significant difference between mean morning and afternoon catches (t-test) at this site.

Number of species caught was highest in the upstream sites, particularly Tirrawarra Waterhole (TW1), upstream of Tirrawarra Swamp (TS1). Catches at most sites were dominated by the bony bream Nematalosa erebi. The Australian smelt Retropinna semoni and western carp gudgeon Hypseleotris klunzingeri were also widespread, and abundant in some habitats. Only smelt and bony bream were found in the most recently flooded habitat, Lake Apanburra, and only in very small numbers. However, numerous shield shrimps Triops australiense and walrus shrimps Branchinella sp. were present.

Mean catches of larvae by 2m seine and trawl were highest in the downstream lakes Toontoowaranie and Goyder. These catches consisted entirely of enormous numbers of bony bream and smelt. A few were also caught in Lake Apanburra. Larvae of the desert rainbowfish Melanotaenia splendida tatei were present upstream at Tirrawarra Waterhole. No adult fish were found in spawning condition.

Incidence of skin disease (saprolegniasis) in adult fish calculated over all capture methods and all sites was 6.3% for adult bony bream, 1.9% for juvenile bony bream, and 22.2% for juvenile central Australian silver tandan Neosilurus argenteus. No other species was affected.

DISCUSSION

Overall, gillnet catches per hour were below those in summer. This was probably because of a drop in fish activity at low temperatures, and because flooding enlarges the area of habitats available to fish, causing fish densities to decline. The northern sites (Lakes Goyder and Apanburra) were the most recently flooded, and in fact water levels there were still rising. Lake Goyder was first flooded in mid-1987, after a period of drought. Initially its fish population was sparse, and consisted entirely of juvenile bony bream. In June, 1988, Goyder had the highest gillnet catch per hour of the lakes, and one-fifth of the bony bream population were adults. Since the majority of this catch were over a year old and so could not have been bred in Lake Goyder, substantial immigration has taken place. Similarly, the higher densities and increasing proportions of juveniles in the downstream than in the upstream creek environments suggest downstream migrations of juveniles have been occurring. In fact juvenile bony bream were moving downstream in significant numbers in the northernmost creek (Ellar) in June. Up to February, 1988 downstream movement of juveniles was also taking place in the other creeks. The cessation of juvenile downstream movement in the upstream creeks may be due to the length of the flood cycle, which in these creeks has been continuing for over 18 months. After some time, flooded habitats are presumably colonized, depleted of resources and no longer attractive.

Until June, no significant downstream movement of adult bony bream had taken place. It is extremely interesting that this began only after Lake

Goyder had been filling for 12 months. Perhaps adults pursue more cautious migration strategies.

A significant decline in juvenile fish catch from the shore into deeper water was recorded in March-April and May-June 1987. At the same time, significantly higher fish catches were recorded in the late afternoon than in the morning. It was suggested that the fringe of the recent flood provided both an enhanced food supply and warmer water. The absence of either a significant gradient in fish catch or a significant difference between morning and afternoon catches in June 1988 may have been due to the lack of a strong temperature gradient, or to the fact that Coongie had now been flooded for some 18 months, and water levels were falling. The question of how long a flooded habitat remains advantageous to fish populations is important from both an ecological and a management viewpoint.

The decline in numbers of species from upstream to downstream in the Northwest Branch is the reverse of the pattern in coastal rivers, and is probably a reflection of a number of upstream to downstream environments in the aquatic environment. In particular, downstream environments are less frequently inundated, carry less diverse aquatic vegetation, and have more severe fluctuations in physical and chemical conditions.

Lake Apanburra was only beginning to fill in June 1988. No aquatic vegetation apart from filamentous algae was present. The shield and walrus shrimps found in abundance are normally present only in rain-filled pools devoid of fish. Their coexistence in Apanburra with a low density of juvenile and larval fish suggests the two faunas had only recently been mingled. The presence of smelt and bony bream in this lake confirms earlier evidence that the juveniles of these two species are strong colonizers.

The presence of high densities of bony bream larvae in the northern lakes is of great interest. Until June, it appeared that bony bream spawned seasonally in early to mid-summer in response to temperature or daylength cues, and responded little or not at all to flooding. In May-June however bony bream spawned strongly quite outside what had appeared to be their spawning season. Further, this occurred only in the northern lakes, where floodwaters were still rising. Evidently bony bream have a flexible spawning strategy, breeding seasonally in the absence of flooding, but retaining a capacity to respond when floods create an exceptional opportunity. This appears also to be the strategy of the desert rainbowfish, for which a seasonal spawning has already been recorded. The June spawning of smelt is at least a month early, and although this may be due to the stimulus of flooding, it may also be within the variability of the spawning cycle of this species.

A relatively high incidence of saprolegniasis in bony bream and juvenile silver tandan was quite unexpected. Incidence was high in December 1986, and the disease lingered through the first half of 1987, but it had disappeared by September 1987. In February 1988 only 0.4% of adult bony bream were infected, and no other species showed sign of infection. It was assumed that the epizootic was initiated by low oxygen conditions, overcrowding and high temperatures in the drought of late 1986. However, in June 1988 dissolved oxygen levels were high, temperatures were low, and floods had provided ample food and habitat. Clearly more work is needed on this problem.

Sampling at Cullyamurra Waterhole provided several specimens of Hyrtl's tandan Neosilurus hyrtlii. This species had not been captured to date in the Coongie Lakes Study, but there was a museum record of a specimen from the vicinity of Innamincka. It was pleasing to confirm this record,

and provide the museum with more specimens. However, the discovery of the species in considerable numbers at Cullyamurra makes its absence from similiar deep channel habitats in the Northwest Branch particularly puzzling. There are many such questions still to be answered about the aquatic ecology of Cooper Creek.

FIG.1: SITES - COONGIE LAKES DISTRICT

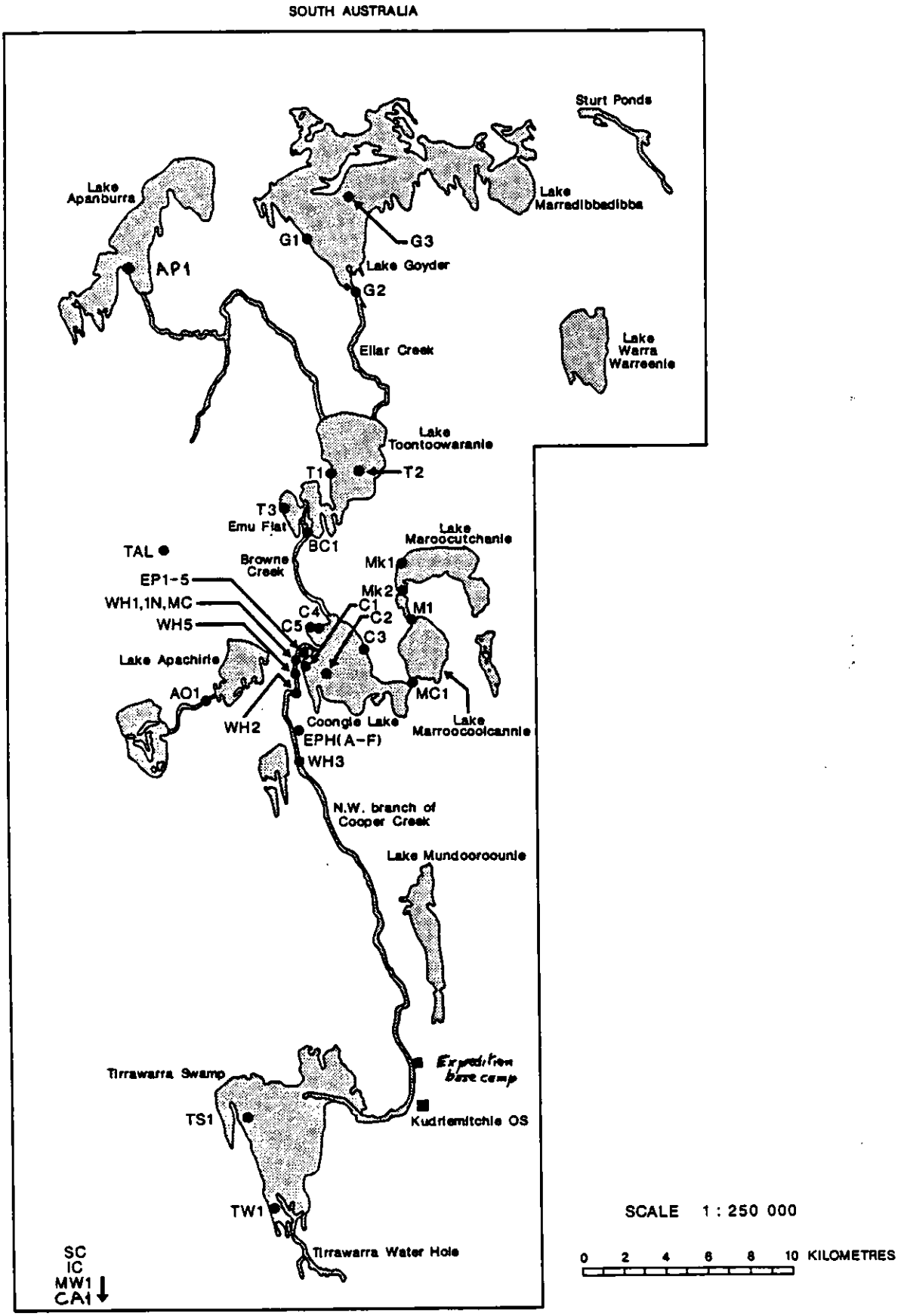
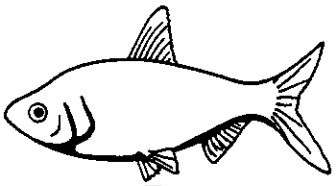


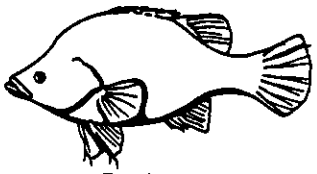
FIG. 2

FISHES OF THE NORTH-WEST BRANCH OF COOPER CREEK

Native



Bony Bream



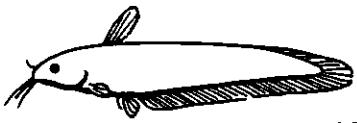
Callop

Smelt

Western Carp Gudgeon

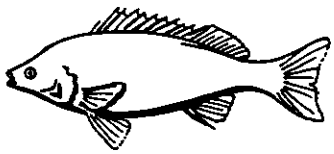
Desert Rainbow Fish

Cooper Ck. Silver Tandan(?)



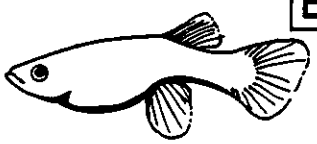
Yellow Fin Tandan(?)

Spangled Perch

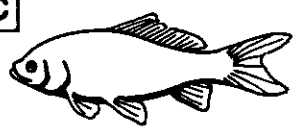


Welch's Grunter

Exotic



Top Minnow



Goldfish

3.5 AQUATIC INVERTEBRATE COMMUNITY STUDIES

Brendan Atkins

INTRODUCTION

Although poorly known taxonomically, the aquatic invertebrates of the Coongie Lakes System provide subjects for experiments in community ecology, in the shorter term, and for population studies over a period encompassing several stages of the unpredictable flood and drought cycles for which the Cooper Creek system is renowned. The experiment described below addresses the question of aquatic invertebrate community structure and distribution.

Sampling began in February 1988. Subsequent field trips in June (with the Scientific Expedition Group) and in August continued the sampling programme, undertaken for the South Australian National Parks & Wildlife Service.

Kick net sampling (see Methods) in June and August was more intensive than in February, and aimed to sample quantitatively the invertebrate communities in micro-habitats defined by riparian and aquatic vegetation. Some 80 kick samples were taken in June. Sorting is continuing.

METHODS

Planktonic invertebrate communities, sampled with a 53 micron mesh net from the surface waters of several wetlands, and sublittoral benthic invertebrate communities (sampled with a kick net, 250 micron diameter mesh) may be compared using an index of community similarity to derive dendograms illustrating groups of communities. Hypotheses concerning observed groupings may then be generated.

Samples were fixed and stored in absolute alcohol at a final concentration of 50% alcohol with the stain Rose Bengal added. Littoral benthic samples are sorted in large white plastic trays or in petri dishes under a dissecting microscope at x10 magnification. Plankton is subsampled and then sorted in maze trays under a dissecting microscope at 40x magnification.

RESULTS

From the February samples alone it appears that diversity is moderate, with approximately fifty species of aquatic invertebrates recognised. The process of identification is continuing, with samples of sorted animals being sent to experts.

This number will no doubt rise as sorting of samples from throughout the year is completed.

FRESHWATER SHRIMP - POPULATION STUDY

INTRODUCTION

This study aimed to estimate the population density of the freshwater shrimp Macrobrachium australiense in the Coopers Creek, to determine the population age structure and to learn about aspects of shrimp behaviour under natural conditions. It was conducted by S.E.G. expeditioners during June 1988 at Kudriemitchie Waterhole, NW Branch of the Coopers Creek.

It is a 'first look' at the shrimp's ecology under field conditions. As such it provides valuable guidelines for further field work and suggests new methodologies and hypotheses.

The shrimp was chosen as a study subject because of its wide range and abundance in the region. It is important fodder for many waterbirds and fish and plays a vital role in the recycling of organic matter.

METHODS

Animals were captured in shrimp traps set from the bank. Ten traps were distributed equally between two sites: 5 were along a vegetated bank (site 1) while 5 were adjacent to a mud flat (site 2).

The traps were baited with soap, gum leaves and meat scraps and checked hourly (approximately) on 3rd June, left overnight, and then checked again early on 4th June. The carapace lengths of captured shrimps were measured from the tip of the rostrum to the rear of the carapace (to the nearest millimetre). They were released after being marked on the dorsal surface of the carapace with either green paint (site 1) or orange paint (site 2).

RESULTS AND DISCUSSION

Population density

During the sampling period, 122 shrimps were captured, measured, marked and released. One specimen only was recaptured, on 4th June, thus preventing any meaningful estimate of population size or density.

Perhaps the assumptions of the method (see notes) were not met: migration downstream is a possible confounding factor (although marked animals from upstream weren't recaptured downstream) and predation could have been quite high. While the density of animals is very high along the creek, accurate estimates are not possible here.

Marking didn't seem to affect the animals adversely. Suggestions for improved marking methods, such as dyeing, may be feasible.

Population age structure

Carapace lengths from animals captured over several days are graphed in a relative frequency histogram (Figure 1). Two size classes of shrimp are evident in the Figure. The larger shrimps have a mean carapace length of 29.86mm, ($s = 1.215$, $n = 7$) while the smaller shrimp carapaces average 14.63mm ($s = 4.374$, $n = 142$).

The shrimps probably have quite long breeding seasons when conditions are suitable, evidenced by the wide variation in carapace length in the shorter size class. More than one cohort (individuals from one breeding event in the population) may be present in the smaller size class - if so, it is obscured by natural variation in individual growth rates (shrimps grow by moulting their exoskeletons, in stages).

Probably, the results say more about the size selectivity of the shrimp traps used in the study than about the population age structure! Seine netting later in the study period captured many tiny shrimps as well as a few whoppers. Seining may be a far more effective sampling method all round for this animals.

Taken at face value though, the results suggest that we caught lots of juvenile shrimps with just a few of their parents.

Behaviour

The relative abundance at each site differs significantly, as traps in site 1 caught on average twice as many shrimps as those in site 2 (Table 1).

TRAPPING EVENT	SITE 1	SITE 2	n
1000-1100	4	6	10
1101-1200	7	1	8
1201-1300	15	2	17
1301-1400	7	1	8
1401-1500	8	8	16
1501-1630	9	1	10
1631-1800	11	17	28
1801-2000	23	2	25
TOTAL	84	38	122

TABLE 1. Raw scores for each site. Trapping event is the time of capture.

Statistical validation (i.e. replication of vegetated and unvegetated sites) would be necessary to test hypotheses concerning shrimp habitats. Also, replication over several days would be necessary to test hypotheses about activity schedules. Future studies will examine the following untested statements derived from the above results:

1. The freshwater shrimp uses riverside vegetation as habitat without significant variation in activity during the day.

2. The freshwater shrimp uses riverside mudbanks as habitat in the early evening only.

It is significant that no ovigerous (egg-bearing) animals were captured. The shrimps were not breeding at the time of sampling, not only at this site, but at all sites sampled during the study period. My thanks to all expeditioners who took part in the study. Many of your suggestions and lateral thoughts appear in this report.

GENERAL DISCUSSION - KEY ISSUES

The experiments will provide information on wetland processes. Such functional knowledge is known to be extremely useful to management. However, it is not available for many wetland systems and, in particular, unregulated, floodplain rivers in arid zones. A summary of key issues addressed by the study appears below.

1. Monitoring of aquatic invertebrate communities can indicate environmental conditions and detect changes once baselines are established (effects of nutrients, grazing, pollutants, etc.)

2. Diversity is a commonly-accepted determinant of conservation value. Assessment of aquatic invertebrate diversity can be achieved in parallel with biological monitoring of aquatic invertebrate communities.

3. Data collected during biological monitoring can be correlated with other data (waterbird and fish abundances; physico-chemical data) to yield new insights into the biology of many species.

4. Functional knowledge of ecosystems, such as that obtainable from this sampling programme, is essential for effective management and conservation.

3.6 AQUATIC INSECTS OF THE COONGIE LAKES DISTRICT

Marilyn Drewien

Introduction

The June 1988 S.E.G. Coongie Expedition afforded a valuable opportunity to continue and enhance this on-going study of the aquatic insects of the region. The trip offered a chance to extensively sample during the cooler season of the year and to note how the chilly water and night time temperatures affected the activity, variety and abundance of insect species.

Aims

Objectives of the project at this time are to sample and identify the major groups of aquatic insects occurring in the area. Notes of their habitats, seasonal frequency and behaviour are taken for future reference when the objectives will be expanded to include a more ecological approach.

Sites

Sampling sites included the North West Branch of Cooper Creek, the flooded Kudriemitchie Waterhole, Coongie Lake, Lake Toontoowaranie, Lake Goyder, Ellar and Browne Creeks, Tirrawarra Swamp and numerous temporary ponds around these sites.

Methods

When sampling in the water particular attention was paid to vegetated areas, the shore line, substrate and the water surface. These areas were sampled with a dip net or seine. Contents of the nets were emptied into a white dish for sorting. Against the light background the movement of individual animals stood out clearly and they could be picked out with forceps or a fine paint brush.

For those aquatic insects that are terrestrial as adults, a sweep net was used to either catch them in flight or it was swept through shore line vegetation and trees to dislodge the insects resting there.

Many adult aquatics are attracted to lights at night. These were collected as they congregated around the light sources. (When possible, a white sheet placed behind the light aids in the collection of these individuals as they can be easily seen and flicked into collection jars).

Specimens were killed and preserved in either 70% ethyl alcohol or Hood's Solution. Vials were labelled with location, date and collection method. In addition to the label information, daily notes were taken on observations of insect behaviour and habitat.

Collection identification is continuing. Preliminary sorting was carried out separating the insects into orders and families using a binocular microscope and several reference keys. Generic and species determination often requires an extensive literature search. Once this level is reached the individual is compared to a South Australian Museum representative of the species and when possible the identification is confirmed by a specialist.

Results and Discussion

Despite cool water temperatures (16-20°C), the waters still teemed with multitudes of insects and crustaceans. Large percentages of the insects present were at various stages of their immature forms. They were obviously poised to be able to start progressively providing legions of adults once optimum conditions occurred. It was a good illustration of rapid life cycle and reproduction strategies adapted by arid zone animals to enable them to take full advantage of favorable conditions immediately when they occur.

Adult dragonflies of several local species could still be observed flying during the daylight hours hunting, mating and laying eggs. The cooler temperatures did make these adults easier to catch and it was possible to capture representatives of most of the species occurring in the region. This was a significant achievement for the collection.

The number of adults of many common species were down from their summer highs and in some cases, absent.

Data gathered from this trip is being added to that of several other excursions to the area. However, it is expected that it will take several more years to analyze its relevance and significance. To date, the information collected is from very favorable seasonal conditions with the result that drought condition data still needs to be obtained. Such information is necessary to determine the impact and associations of seasonal and hydrological fluctuations on the local aquatic insect populations.

Outlook

Once the arduous task of species identification is worked out, attention will be shifted to the study of the life histories of some of the major groups of insects with the aim of relating them to the ecology of the area. Of particular interest is determining the role that aquatic insects have in the food chains, especially as related to the fish and birds that are dependent on the wetland systems. It is also expected that some species or groups of aquatic insects will prove useful as biological indicators of water quality; information which would be useful in determining management strategies for the area.

The data gathered from this Scientific Expedition Group to the Coongie Lake and Cooper Creek Region will form an appreciated component of the longterm study of the aquatic insects and wetland systems of the area.

3.7 REVEGETATION ON SEISMIC LINES

Rachel Barley

Introduction

Exploration for oil and gas began in northeastern South Australia in 1958, and around Coongie in about 1970.[1] As part of exploration seismic surveys are used to study underground geological structures. Grid lines for the surveys are cleared by superficial blading to a width of 5m. The cleared vegetation and soil are displaced to the verges forming windrows, and after use the lines are left to regenerate.

A network of seismic lines now covers large areas of northeastern South Australia, frequently creating lasting and distinctly visible traces on the landscape[2]. This conflicts with the growing use of the region for wilderness-based tourism. Also, tourists use the lines as roads, exacerbating and prolonging the impacts.

In recent years Delhi/SANTOS have been experimenting with alternative line clearing and rehabilitation methods to minimise environmental impacts[1]. Such methods include decreasing the depth of blading; respreading windrows on the line; and leaving screening vegetation where lines intersect tourist roads.

S.E.A.[2,3] have investigated the visual impact and revegetation of seismic lines in PEL 5 and 6. During the Coongie expedition we extended their study, focusing on the land surrounding Tirrawarra Swamp and Kudramitchie. This area has been increasingly visited by tourists in recent years[4].

Methods

Study sites

Study sites were selected to satisfy the following criteria:

- diversity of landunits (sand dune, floodplain and swamp) within a small area.
- range of ages (1980-1987) and surveying methods
- easily accessible from established tracks.

The location of study sites is shown in Figure 1. Landunit, blading cut depth and windrow height were recorded in the field.

Visual impact and erosion.

Qualitative scores were assigned according to the criteria in Appendix 1 by at least 3 observers. Where there was disagreement over a score, an average was taken; this occurred twice in 16 sites.

Ground Cover

As a measure of revegetation, a step-point technique was used to assess the frequency of different types of groundcover on and off the lines. A 250m section of line at least 50m from the access track was chosen and measured by pacing. A 250m section of ground about 10m from the line was used as a control. A mark was placed at the tip of each boot of one expeditioner, who then walked along the line (or control), calling out to their partner what was immediately adjacent to the mark at each step. Possible scores were as follows:

- bare earth
- perennial tussock
- other perennial
- ephemeral forb
- litter

Samples of at least 250 steps were taken from the line and from the control.

Perennial plants along the line and control were identified to species level where possible.

Results and Discussion

Visual impact

Visual impact ratings are given in Figure 2a. While the sample is too small for statistical analysis, several trends are apparent. Firstly, visual impact increases with age. Lines made by traditional methods (up to 1985) have an average score of 1.8 and lines made in 1986-1987 by the new methods have an average score of 0.75. Secondly, for lines of any given age, visual impact is greatest in sand-dunes.

Several factors could be contributing to the visual impact we observed. The seismic lines themselves change the local landform with a shallow ditch flanked by windrows. Vegetation clearance and soil disturbance may cause lasting alterations to the groundcover. They may also cause erosion, which further alters the landform.

Erosion

Figure 2b. shows similar trends in the erosion ratings. Old lines have greater erosion than new lines, suggesting that either the new methods cause less erosion, or that erosion continues for several years so that it takes time before more severe erosion can be observed.

Tentative support for the former hypothesis comes from Figure 3, showing that erosion increases with increasing cut depth in sand-dunes and floodplains. Shallow cuts are a characteristic of the new methods. However, it was difficult to measure the "cut depth" on severely eroded lines.

Lines in sand-dunes showed the greatest erosion, while virtually none occurred on lines in swamps.

Ground Cover

Ground cover frequencies were analysed by a Chi-squared test for goodness of fit. When sites were grouped before testing, frequencies were first transformed into percentages and summed within ground cover classes. Because of low numbers of perennials, tussocks and other perennials counts were combined.

Lines were significantly different (=0.05) from controls at all sites except Site 12, a sand-dune surveyed in 1982. However, Site 12 showed the change at the species level which was found at all sand-dune sites : Zygochloa paradoxa was very common, and other grasses (mainly Triaphis mollis and Aristida holothera) were common on the control, but absent from the line. Species common on the line but less common on the control were Chenopodium auricommum, Portulaca oleracae and Phyllanthus fuernrohrii.

At swamp sites, Muehlenbeckia cunninghamii, Acacia ligulata and Eucalyptus microcarpa were present on the controls but not on the line. These species were also absent from floodplain lines, but were relatively rare on the floodplain controls also.

Examination of the contribution of each groundcover class to the Chi-squared score (e.g. Appendix 2) shows the following patterns:

- sand-dunes : all sites had an increased frequency of bare earth on the lines relative to the controls. Older lines had a greater decrease in perennial plant cover than did new (1986, 1987) lines.

- floodplains : all sites but one (Site 11) had more bare earth on the lines. However, there was no consistent pattern in the increase or decrease in perennials and ephemerals.

- swamps : the greatest difference between lines and controls was a decrease in perennial plant cover. The frequencies of bare earth and of ephemerals were higher on the lines.

Conclusions

Of the three landunits studied seismic lines cause the greatest visual impact on sand-dunes. This impact is related to relatively high levels of erosion and to the absence of Zygochloa (canegrass) regeneration, but which of these causes the other is not known.

Visual impact of lines in swamps is moderate. There is little or no erosion and the impact is primarily due to the lack of regeneration of Muehlenbeckia (lignum), and also Eucalyptus (coolibah).

Generally low visual impact occurs on lines in floodplains. Erosion is generally also low, and although there is more bare earth on the line the visual impact maybe due to the physical traces of the survey : low windrows, and vehicle tracks on the line.

References

1. SANTOS/Delhi (1983) : Arid Zone field environmental handbook 3rd edn.

2. SEA (1987) : The effect of seismic lines on the environment of PEL's 5 and 6. (unpublished report to SANTOS/Delhi).

3. SEA (1988).: (unpublished report to SANTOS/Delhi).

4. Gillen, J. (1988) : The Coongie Report. NPWS (S.A.), Adelaide.

Appendix 1 - Criteria used in evaluations.

Severity of erosion:	0	None - no erosion, stable
	1	Minor - some evidence of soil movement
	2	Moderate - active erosion small gullies, thin sheeting, scalding
	3	Severe - active erosion with extensive gullying, removal of soil surface, scalds etc.
Visual impact:	0	Low - not noticable without close inspection
	1	Minor - noticable but not intrusive
	2	Moderate - noticable from a distance
	3	Severe - noticable and intrusive from a distance. Major disturbance.

Appendix 2 - Sample analysis of ground cover frequency.

Site 14 - Sand-dune, 1987

Observed frequency = line, expected frequency = control

	Observed	Expected	Chi-square
bare earth	225	165	21.82
perennials	9	17	3.76
ephemerals	17	6	2.67
litter	8	15	3.27

Chi-square = 31.5162 with 3 d.f.
Sig. level = 6.61795 x E^{-7}

Figure 1. Location of seismic lines and study sites.

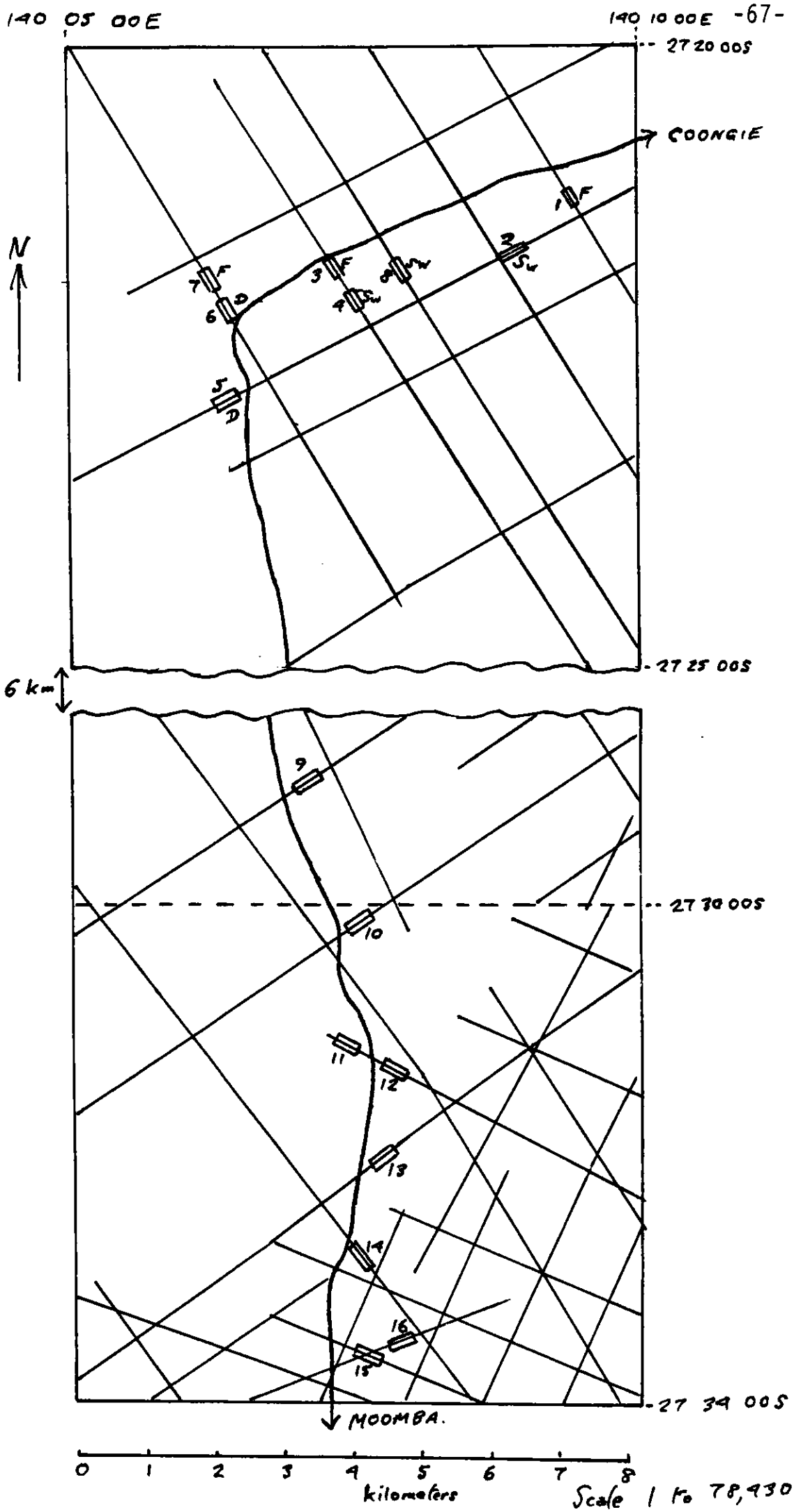


Figure 2. Scores for visual impact and erosion. ○ = swamp, ● = floodplain, △ = sand-dune, ⊘ = none, 1 = minor, 2 = moderate, 3 = severe.

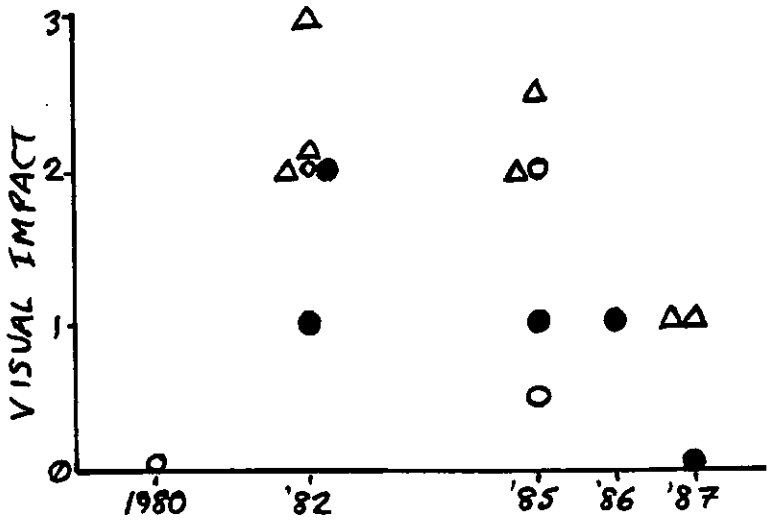


Fig. 2(a)

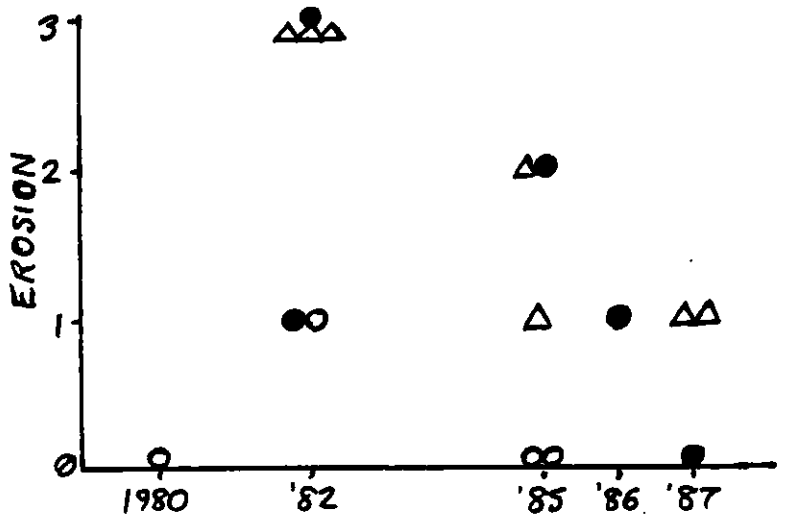


Fig. 2(b)

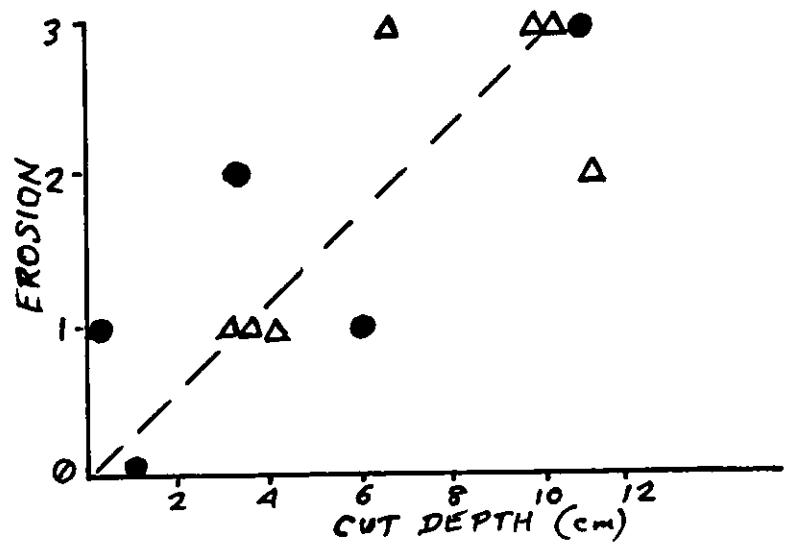


Fig. 3

Figure 3. Erosion as a function of cut depth. Symbols as for figure 2.

4.0 OTHER ACTIVITIES

4.1 COONGIE WALK

Graeme Oats
Walk Leader

By the end of the second week on the Coopers Creek the scientific work was nearing completion and the troops were looking forward to a few days either canoeing or walking. Joanne Bested, Maike Kahl, Mark Darter, Wendy Tomlinson, Jeff Whittaker, Don and Dick Woods elected to "give it a go walking".

Due to circumstances out of my control the departure was delayed until 12 noon Sunday 12th. After posing for photographs we departed along a Santos "shotline" in a north-north-west direction following the east bank of the Cooper. There was plenty of enthusiastic chatter as we picked our way around a couple of washouts. The Cooper in flood made these otherwise dry creek beds boggy and slippery.

Around 2.30 p.m. we came to the inlet/outlet creek of Lake Mundooroounie. The stream was narrow and shallow, but the mud banks were very "squelchy". First prize goes to Wendy, who managed to throw one of her shoes into the mud whilst trying a balancing act on the slippery mud. After this "little adventure" we joined the 4WD track to Coongie Lake and around 4.00 p.m. we arrived at Seven Mile Yards for a brief afternoon tea stop. We then pushed on for another 2 kms before finding a campsite near the Cooper.

Monday dawned quietly; there were a few correllas and sundry birds; nothing like the chorus at Kudriemitchie. The previous day we had covered about 13-14 kms; today however, we were to travel about 22 kms, including the ascent of the highest sand dune in the area. With this daunting prospect we left camp about 8.45 a.m., travelling at first along the 4WD track then moving more nor-easterly until around 9.30 a.m. we saw our objective, THE BIG SAND DUNE. Well this had to be discussed: do we tackle it head on or should we approach via the south ridge? We deliberated for a few seconds, then proceeded with the latter. Pushing on and steadily gaining altitude we slowly but surely reached the summit after two or three rest stops to acclimatize. It was 10.00 a.m. - we had made it! Three dunes later we peered down onto the shining waters of Coongie Lake.

The two depressions on the S.E. corner of the lake were flooded. The first was easily rounded, but the second was much larger, stretching some 1.5-2 km to the south. I noticed what appeared to be a causeway on the lake edge. We started across this grassy strip, shaded by the coolibahs, when I discovered a small creek - not deep - well - not very deep, only up to my knees. Wendy and Jeff, being last to cross it, swear I said navel deep ... (the soft bottom had been compressed by the first few walkers). 20 minutes later, dried by the sun, we walked a further 100 metres - another creek, muddier and deeper. Riotous noises came from behind. Not looking back I scampered quickly through boots and all and quickly checked for further creeks. No more, thank goodness - PHEW! Saved a sure mutiny.

Over another red dune and down to the lake, we arrived for lunch at the spot that most of us had enjoyed with Julian on "Pitfall Trap Tour". I collected my sunglasses, left there six days earlier on one such tour. (It is rumoured that this was the reason why eight people spent 3 days walking - its not true). We all ventured into the lake. Jo would have the record of the slowest immersion, Wendy the longest and Jeff recorded a swim with his hat on.

After dozing and sunbaking for an hour we headed south towards Lake Mundooroounie. We checked the Wedge Tail Eagle's nest (the three eggs

were not hatched). A Tawny Frogmouth was suprised to see us. For about two hours we ambled through the broad swales passing one of Julian's trap sites (with rock hard clay) then over a shortline eventually resting under an Acacia ligulata (Sandhill Wattle), near a shallow dune enclosed pool. I was expecting to find a campsite over the dunes a few metres to the south near the lake, but this northern end of the lake is one large swamp. Wanting to be in camp before sunset, I pressed on ahead of the group, eventually finding a suitable site about 2 kms further down the east side of the lake. The last rays of the sun were flashing across the smooth surface of the lake as we erected the flies and tents near a copse of Eremophylla longifolia. The water from the lake had the texture of skimmed milk, but it tasted O.K. We had covered the 22 kms in good time.

On the Tuesday, after a leisurely breakfast and more damper from Don we walked south along the edge of the lake for about an hour before stopping under a coolibah for a scroggin stop and to enjoy the peace and beauty of our surroundings. Feeling very relaxed we pushed further on south, finally rounding the lake over two red dunes pushing their way north into the lake. Another coolibah provided the ideal place for an early lunch. This was particularly welcomed by Dick; his feet were sore and body not agreeing with the exercise. Mark also enjoyed a chance to rest.

Five minutes after leaving the lunch spot we encountered our first humans for more than two days. Jim and Fae Trueman had been out walking near us. The last 50 hours had been a memorable interlude with nature - not long enough but enough to appreciate our natural environment.

Thanks everyone for your company and a great time.

THE START

GRAEME drinks Lake Mundoorocunie dry!

Dick Woods, Mark Darter, Graeme Oats, Joanne Basted,
Maike Kahl, Jeff Whittaker, Wendy Tomlinson, Don Woods

INTERNATIONAL CO-OPERATION!
Don and Mark assisting Wendy (from U.S.A.)

4.2 PLANTING OF RED GUMS AT QUEERBIDIE WATERHOLE

Wednesday 1st June — Dick Woods

The camping ground beside the Queerbidie Waterhole on the Cooper just downstream from Innamincka is heavily used by the touring public. Although there are a number of old Red Gums on the banks no young trees are growing on the camping ground. Over the last 2-3 years, Brendan Martin and students of the Marden High School, Adelaide, have been planting young Red Gums to alleviate this problem.

We decided to augment this good work by planting 48 Red Gum (E. camaldulensis v. obtusa). We planted 24 in one group in a scientific trial and then 24 in another group further to the north. The attached sketch shows the location of the plots and the trial design. The aim was to test the effectiveness of starter fertilising and/or protection by GROW TUBE on speeding the early growth of the trees.

Rapid early growth is desirable on this site for the trees to overcome weed competition and to resist flooding and damage by animals etc. Both fertilising and the use of the GROW TUBE are likely to improve early growth but unless conducted in a scientific trial with a control, there is no measure of how effective they are. This knowledge will be useful for future tree plantings in the area as surely they must be done because soil compaction and loss of organic litter caused by tourist impact prevents any natural regeneration. In addition all trees were protected by a sleeve of rabbit proof netting.

GROW TUBES are transparent durable plastic sleeves about 30 cm in diameter and 1 metre high which are slipped over the netting. The aim is to create a miniature hot house environment to raise the air and soil temperature and so speed early growth. They were "invented" in the U.K. where they have been responsible for tripling the early growth of slow growing deciduous trees. They are now very popular in the A.C.T. and N.S.W. for highway plantings etc. (Julian Reid inspected the trees in late September and tells me that the GROW TUBE trees are already showing better growth).

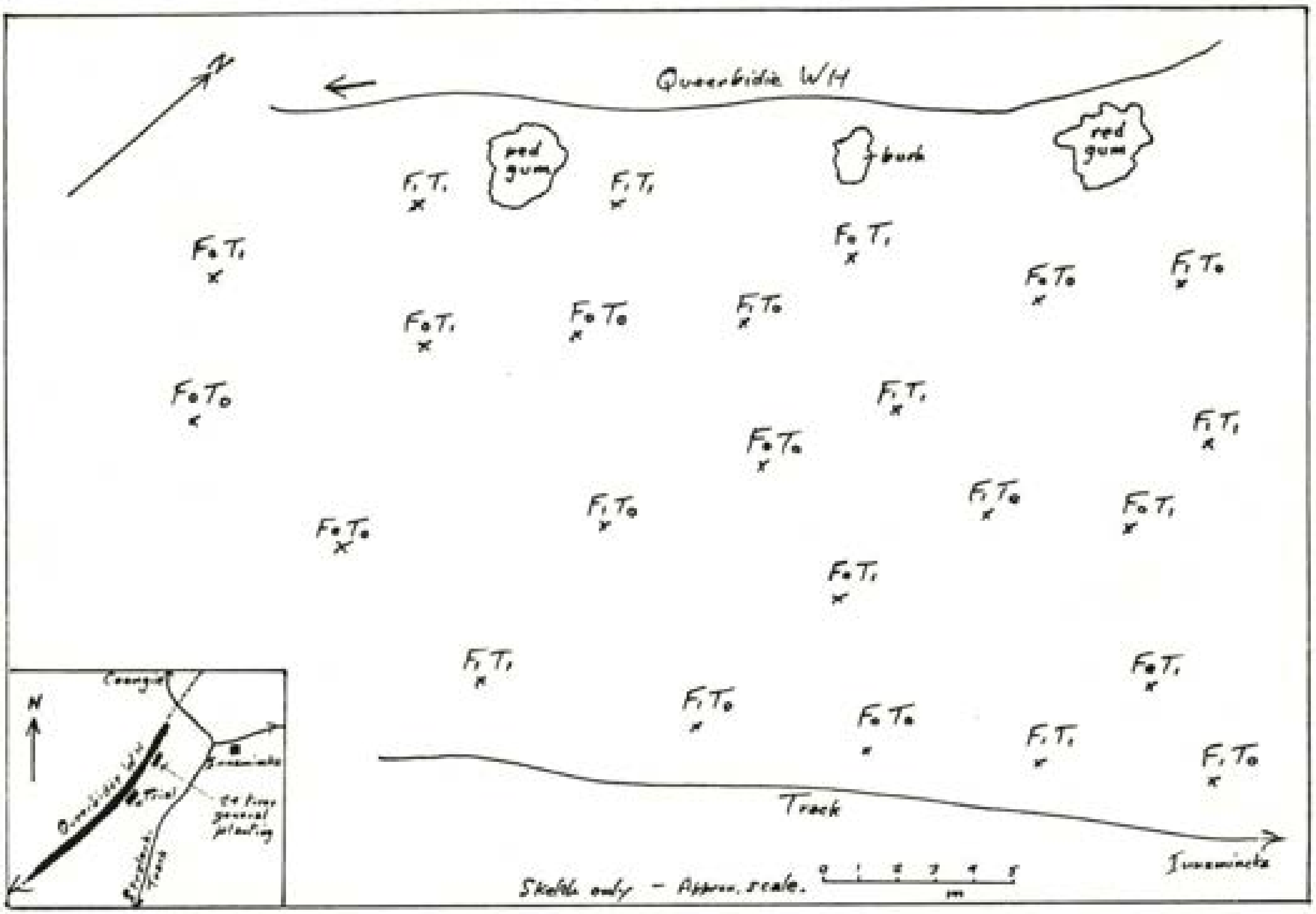
To prevent dehydration in the "hot house" a cuff is turned inwards at soil level to collect natural internal condensation and so maintain the humidity. The fertiliser was a COMPLETE MINERAL MIX with twelve required plant elements in a balanced formula. 50g per tree was applied 5 cm below the tree with a soil barrier between the roots and fertilizer.

A factorial design in the trial resulted in four treatments viz:

FoTo	CONTROL	No fertilizer, no tube
FoT1		No fertilizer with tube
F1To		With fertilizer, no tube
F1T1		With fertilizer with tube

There are six replications = 24 trees which were individually randomised as in the plan.

The team of eight were:- Dick Woods, Gwen Willing, Jeannie Davison, Mark Darter, Bill Scutchins, Wendy Tomlinson, Lesley Dodderidge, Claire Gifford.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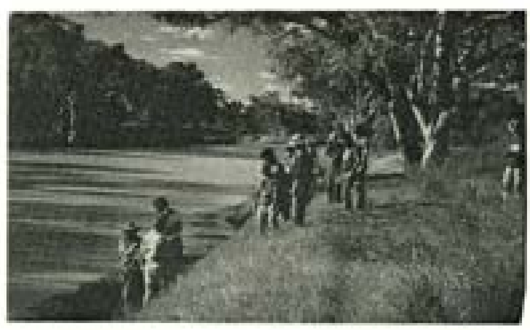

5.0 COONGIE POEM

COONGIE-COOPER SEGSPEDITION 1988

Brian Brock

Bicentennial SEGers would
A wooding go with Woody
He primed us up as best he could
To make the trip a goody.

We left the Orphanage in May
To SEG the distant Cooper
But Thebby looked like where we'd stay
'Til Con controlled the blooper.

With diesel doctor Con on board
And Jo, and Richard Willing
Our hopes for SEG survival soared
We'd bet our bottom shilling.

Sally drove the Mazda well
Where Mazdas seldom go
Brocky was there to give her a spell
While Marion sang "Gung Ho!"

Oats and Barley grew together
While the camp progressed.
Darter Mark of different feather
A yen for birds confessed.

Jeff and Bill know the Eyrian bird
As do Claire and Francis
Gary filmed them so we heard
Doing nuptial dances.

Brad was quite a camera man
Chasing birds of feather
Probably did a camera-pan
Of chequered-hatted Heather.

Oatsey urged his walkers on
To Coongie's flooded shore.
Hale and hearty they had gone
But back with blisters raw.

Plumber Don, and Jim and Fae,
Helped us cope with camping
But even so they got away
To do their share of tramping.

Puckridge plied the Coongie Lakes
By thriving lignums daunted
His intrepid team climbing "stakes"
Their nether-regions flaunted.

Discreetly left in flooded trees
(For land was somewhat lacking)
Lizarding around with shaking knees
While Jim was busy tacking.

Like Sturt, they boated sandy dunes
To find elusive passage.
No wonder rounds of campfire tunes
Were accompanied by massage.

We're pleased they found the Coongie fish
And Brendan dabbing later
Drovin' a fancy plankton dish
That would charm his Alma Mater.

The mammals fell to Julian's crew
Pitting dunes and flats:
Bustards and Dingoes looked askew
As did the Feral Cats.

His pitfall traps now lined with wool
To keep his creatures warmer
Julian and Lesley played it cool
Far from SEG-base trauma.

John and Jo kept camel sched.
Birded and canoed
Checking troops and flies were fed
As tea-towels quietly stewed.

Along the lines our Barley tore
"Avaunt thee feathered Bustard!"
Back to Cooper's North-East shore
To burn the lumpy custard.

From out the trees, canoeist came
Along the flooded Cooper.
The Flinders mob and Kempy's aim
Was "Pioneer there trooper!"

Maike, Ulla and Wendy learnt
The art in planting a tree
Replacing those the SEGers burnt
By year two-o-fifty.

So Julian, we concede the point
That if we must have fire
Plant some trees around the joint
To calm the ranger's ire.

At Innamincka, we joined the club,
Water Woody's trees
Tried the Coopers at the pub
And downed a few with ease.

Tim we call the Damper King
He proved himself at Moomba
Twisting damper snake or ring
Before we danced the Rhumba.

Strzelecki traffic and Moomba's flame
Intruded on the scene;
A good campsite...
but not the same.

The morrow was Lyndhurst day;
We climbed the craggy peak;
Passed by Cathy on the way
I pondered plants I seek.

No dallying for a Lyndhurst beer
(Julian waved us through),
Leigh Creek was drawing near
And tea was overdue.

Canteen tea was fairly quiet
But then the scouts were out.
We rocketed on a different diet
To call of an M.C. stout.

Christian danced, Vanessa too
As Leigh Creek turned us lively
Steve B. ignored the Roughy's cue
To make him just as jively.

Jeannie Wren with smiling eyes
Warmed cold fires.
Think she'd probably "win the prize"
Before the party tires.

A highlight was the CASM band
In reccy hall venue.
Although the "concert" wasn't planned
It nicely capped the menu.

At Emu Creek we camped that night
With spirits still on high.
Warren found us at morning light
Not feeling quite so spry.

He spoke of opera under stars,
Of SEG and many things.
Of breaking down in little cars
With Spinifex in his "Springs".

Julian thought he knew a way
To get us home much faster.
We forded streams and rutted roads
Avoiding all disaster.

But short-cut road was long-way
round
As Kempy sat serenely
Waiting in the Orphanage ground
Not even grinning meanly.

Hitch has buckled up his boo
Back by now to farming
I hope he leaves a tree or two
For Mallee birds are charming.

From Coongie here we seem remote
But cheers to absent friends
Gary's on his Antarctic boat -
And so SEG ballad ends.

6.0 THE LEADERSHIP TEAM

DICK WOODS (Chief Leader)

A Senior Forester with the Woods and Forests Department until retirement in 1983. Now Consulting Forester within Australia and in Madagascar for the World Bank. He has had experience in bushwalking in the Flinders Ranges, the A.C.T. and the Himalayas, and cycling in southern Australia. Other interests are geology, geomorphology and photography.

DAVID KEMP

David is an Engineer in the Highways Department. He has considerable bushwalking experience in Australia and New Zealand and has led several training camps. He is a member of the Adelaide Bushwalkers and is currently Chairman of the Expedition Panel of the Duke of Edinburgh Award Scheme. David has extensive experience in canoeing instruction and water safety. Other interests include gliding, photography and birdwatching.

SALLY WACE

Sally is an Experimental Scientist with the CSIRO Division of Soils. She is an experienced bushwalker, especially in New South Wales where she completed an Outward Bound course. She has specialised in arid zone ecology in the Northern Territory and New South Wales. She has been deeply involved in leading school and church outdoor activity programs for large groups. Other interests include soil conservation, hydrology and geomorphology.

BRIAN BROCK

Brian is a lecturer in Natural Science at the Underdale Campus of the SACAE. He is a specialist in aquatic bryozoans with considerable experience in botany, zoology and ecology, having led tertiary students on those subjects to various parts of the State. He has taught these subjects for 19 years in various sections of SACAE. Other interests include geology, geomorphology and archaeology.

JULIAN REID

Julian is an Environmental Consultant, currently engaged by the Department of Environment and Planning to conduct a study of the Coongie Lakes. He is primarily an ornithologist and has gained considerable experience in Australia's arid zone botany and vertebrate zoology in recent years. He is actively involved with the South Australian Ornithological Association and Nature Conservation Society of S.A., and is strongly committed to biological conservation. He has participated in numerous field trips to all parts of South Australia and has spent 1986 travelling around Australia visiting national parks and other wild places.

RACHEL BARLEY

Rachel is a Scientific Officer in the Department of Environment and Planning, working on the assessment of the potential environmental impacts of proposed developments. She is a zoologist, qualified in environmental physiology, and has a keen interest in bushwalking with experience in the Flinders Ranges, Tasmania and Nepal. She is the Secretary of the Nature Conservation Society, edits their journal and is a "Walks with Nature" leader. Other interests include rockclimbing and canoeing.

ASSOCIATE LEADERS

JIM PUCKRIDGE

Jim took his first degree in English Literature and spent 15 years as a Secondary School teacher. He then returned to the University for a B.Sc. He has done postgraduate studies in aquatic zoology with a particular interest in fish life history and the dynamics of fish communities especially the effects of flooding. He is currently working on a biological survey of Coongie Lakes leading to a Ph.D.

BRENDAN ATKINS

Brendan is a graduate in freshwater ecology. He is self-employed in Independant Environmental Research for conservation bodies. Current research is in wetlands in the South East, Murraylands and the North East of the State. He is also conducting a survey of the River Murray cliffs with respect to natural and cultural values.

MARILYN DREWIEN

Marilyn studied for 2½ years at Humboldt State University including comprehensive courses in Entomology and Aquatic Entomology. She co-authored Water Life in the McGraw Hill "Exploring the Environment Series", 1977. She participated in "The Coongie Lakes Study" 1987 headed by Julian Reid and Jake Gillen.

SCIENTIFIC EXPEDITION GROUP

The Scientific Expedition Group came into being at a public meeting on the 21st August, 1984. Membership is open to any persons, families or organisations interested in the following aims:

* The promotion and running of expeditions of a scientific, cultural and adventurous nature.

* The furthering of knowledge, understanding and appreciation of the natural environment.

* Promotion of the values and philosphy of wilderness.

* Enabling people to learn the skills required for planning and running expeditions, and to develop sound field techniques.

Members will receive regular information on S.E.G. activities and expeditions.

Applications should be addressed to: The Secretary,
Scientific Expedition Group,
P.O., Box 501,
Unley. S.A. 5061