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THE NORTHERN TERRITORY FIELD NATURALISTS' CLUB - FOUNDED 1977

The objectives of this club are to promote the study of, and interest in, the flora and fauna of the Northern Territory and its conservation. The club provides opportunities for discussion and dissemination of information among its members by regular meetings, publications and fieldwork. It works in close contact with scientific institutions wherever possible, and encourages the publication of scientific and informed popular literature in the various fields of natural history.

All members receive the regular newsletter *Nature Territory* and the *N.T. NATURALIST*. The Club holds monthly meetings and field excursions. Meetings are held in the N.T. Museum of Arts and Sciences theatrette, at 7:45 p.m. on the second Wednesday of each month.

Advice to Contributors

Contributors to the *N.T. Naturalist* need not be members of the N.T.F.N.C., although members are urged to contribute. Manuscripts will be refereed, and should be submitted in duplicate. Contributions may take one of the following forms:

Short Notes

If you have made a significant observation (for example, on the behaviour of a bird or other animal) or have notes on something new or unusual in the field, then this is the place to report your findings. Short notes should be in the order of 200-500 words and provided with a title.

Articles

An article should run to a maximum of about 1500 words (four to five double-spaced typed A4 pages) and deal with a topic in the natural sciences. It should be written in a manner intelligible to readers without a specialist knowledge of the subject. Articles should be appropriately illustrated by clear, black ink graphs, diagrams or photographs.

***Cover*: Carpentarian Grasswren *Amytornis dorotheae*; *Photo*: G. Chapman**

RECOLLECTIONS OF THE FORMATION OF THE N.T. FIELD NATURALISTS' CLUB

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Introduction

Born and raised until I was ten in the Northern Territory, I often dreamt of returning as an adult. The opportunity came in January 1977 when as a raw graduate I obtained a teaching position at Wagaman Primary School in Darwin. Regrettably the stay was short, for in December the same year I secured a position with the Australian Museum in Sydney. However during the time I was back in the Territory I was lucky enough to have had a hand in the formation of the Field Naturalists' Club. With the Club now in its tenth year and the departure of many of the founding members over the years, it may be appropriate to record these notes about its formation.

At the outset I should say that the Club arose from discussion between four, and then quickly, five, six and more individuals. All contributed in similar fashion to its founding and if these notes sound egocentric, it is only because they are based largely upon extracts from a brief diary I wrote that year to send to my parents in lieu of more interesting letters.

An Idea

I was not a particularly satisfied neophyte teacher. My major interest was ornithology and my initial months back in the Territory were spent locating other ornithologists and going bush with them. A principle source of contact was at the CSIRO Division of Wildlife Research in Berrimah. Another was through local members of the Royal Australasian Ornithologists Union and on 26 March 1977 I attended a meeting at Hilary Thompson's home which established the local network of the RAOU Bird Atlas Scheme. Besides Hilary, I was by this stage in touch with people such as John Estbergs, Tony and Mary Hertog, and Pat Rowan, who later became stalwarts of the Club.

I was also bothering CSIRO with a view of possible employment and my diary entry for 7 April carries the first indication of the idea of a Club in the following words -

> "(After school I) went to CSIRO and broached the possibility of starting a Top End Field Naturalists Club - it's incredible, nothing like it has already been formed. Mike Ridpath (the OIC of the CSIRO labs) was helpful but

cautiously worried about its viability with the transient population."

Preliminary Meetings

The Club grew from the informal meetings of four people in the herpetology section of the Northern Territory Museum. The Museum was then housed in derelict buildings (the result of Cyclone Tracy) at its former site in town.

The first mention of meetings at the Museum is recorded in the diary on Friday 13 May when, "I ... went to CSIRO and into town to see (the) N.T. Museum people. Richard Wells and Graham Gow (Curator of Herpetology) took me on a tour of the set-up such as it is". Ten years later, Richard has attracted some notoriety as the proponent of many new taxonomic categories of Australian reptiles, fishes and insects using extremely controversial methods. Then, however, he was employed as Graham's hyper-enthusiastic herpetological assistant.

In June I began working at the museum on one or two nights a week after school. Red-eyed and blinking from formalin, I labelled specimens in the confined brick room with its makeshift wall that was the Museum. On 12 July the diary records for the first time the presence at the Museum of the four prime-movers in forming the Club - Richard Wells, Keith Martin, Stephen Harwood and myself. These work sessions often ran from 4.30 to 11 pm and usually concluded over a cup of coffee or a late meal at the Capri Restaurant.

On 13 July I went

> "... over to the Museum to work till 7pm when I went for a meal. Richard Wells, Steve Harwood, Keith Martin and myself had a preliminary 'meeting' while labelling the fish collection and formed a N.T. Field Naturalists' Club. We will advertise an inaugural meeting in three weeks time and put out a journal. The move is long overdue and I've been holding talks since arriving. Many other people believe it is necessary and I think it will go like a rocket but there are some heavy pessimists. Nevertheless we all have a lot to do in the next few weeks."

Planning the First Meeting

Undoubtedly we each agreed to do specific tasks to get things underway but I don't recall what they were. However the diary entries give some idea of the pace at which things moved. On 18 July, "I went over to see Pat Rowan to get his promise to give a talk to the NTFNA (sic) and write a paper for the journal".

The Darwin Show was on that week and by 21 July we had apparently prepared a brochure advertising the Club because on that date, "... I got another three stalls to hand out the NTFNC brochure. We are getting a lot of support now. I hope everyone comes good with money, subs and attendance though. I still have to find a speaker for the first night".

On 23 July I went "... over to Hilary Thompson's home to get him on our NTFNC committee ...", and on Monday 25 July,

> "... rang around about the NTFNC ... and after school went into a meeting with Lex Silvester, barrister and solicitor, on the legal aspects of setting up the Club. Keith Martin also attended. Afterwards we talked about it some more, went out to Winnellie to order a rubber stamp for the NTFNC and came back at 5.20pm to see Richard and Steve at the Museum".

On 26 July, "I went into town to get Steve Harwood to get our advertisement into the paper", and on the following day,

> "... after ringing around the various biologists, I went to see some of them in the afternoon ... I have now lined up a speaker per month for the next year and we are putting monthly notices in various shops advertising the Club. The support has been overwhelming. At 7.30pm the three other guys on the Interim Committee met at my place to draw up a draft Constitution, based mainly on the Australian Herpetological Society Constitution. I was selected to chair the Inaugural Meeting at Darwin High School Theatrette on 10-8-77".

On 28 July, "I went to the Community College to deliver some NTFNC publicity posters ... then into town to put two adverts in the paper for next week - cost $30. Saw Lex Silvester, the solicitor, and registered the 'N.T. Naturalist' and 'Nature Territory' names at $14."

During the following two weeks are references to many meetings of the Interim Committee, the draft Constitution and, on the night before the inaugural meeting (9 August), I was at home writing a speech on hawk identification.

Then, on 10 August 1977, this entry -

> "Typed out the Constitution ... and then ran off 100 copies for the meeting ... More preparation of diagrams on my talk of 'How to identify common hawks of Darwin'. Dinner at 6.30 and at 7.20pm drove in to help set up facilities, arrange slide projectors etc. Took the chair at the Inaugural Meeting of the NTFNC at 8.15pm, cracked a few jokes, made a few slips, stated the aims and concepts as the Interim Committee saw them, and fielded a few discussion questions from the floor. 75 people turned up - a good crowd. They were all given a copy of the Constitution, the first newsletter and a membership application form. At 8.35 I began my talk, raised a few laughs and maybe got across some points. Showed some good slides borrowed from John Estbergs, Pat Rowan and Hilary Thompson. Finished at 8.55pm and then Graham White of N.T. Fisheries launched into his talk on a fish study at Gove. That went down very well until 9.40pm when the meeting ended. Many stayed to talk over coffee later and $167 in

subscriptions and donations were received".

Over the following weeks various meetings of the committee are recorded and Keith Martin, as Interim Secretary, reported on 20 August that six more applications for membership had been received.

On Wednesday 14 September I collected Peter Stevens, Steve Harwood and Richard Wells and,

> "... we arrived at Darwin High School at 7.45pm for the second meeting of the NTFNC. I broke an overhead projector rushing around beforehand, but 100 people turned up to hear Dave Lindner talk on crocodile biology and conservation. The Constitution was accepted without amendment and prior-arranged list of six candidates for the Executive Committee (no one nominated from the floor). Consequently I am inaugural President of the Club, Keith Martin is Secretary and Steve Harwood, Treasurer. We have 56 members paid up already and $350 - so it looks like it will really go well. The talk was exceptionally well received, many questions, long (1.5 hours) coffee chat afterwards and packed theatrette".

On the following day the press rang for a small report on the Club. They also wanted a copy of Dave's speech and were referred to him for that. When the newspaper article appeared on 16 September I noted that it was "... not too bad as publicity but a little inaccurate", presumably because it was mistakenly labelled as the first meeting.

During the following week various people were approached with a view to designing a Club motif, and I convened the first meeting of the Executive on 22 September at which "... we decided to put out a magazine in March and September, and made other resolutions concerning circulars, duties, monies, letterhead etc".

On Sunday 25 September, "... I met 10 NTFNC members for the first outing of the Club (and) took them to Holmes Jungle to look at the spectacular waterbirds and then around to Buffalo Creek to walk through the steaming mangroves. By 10.30, sweat dripping from them, they'd had it and I came home".

The following months passed quickly with a motif accepted (designed I believe by Peter Stevens), newsletters written and an editor of the Club journal appointed (Rob McConchie, a high school science teacher). When the first issue appeared in 1978, it carried the names of the various officer-bearers at that time. Two which stand out in my memory and haven't already been mentioned are Alan Wade and Stephen Swanson. Alan was a driving force in the drafting of the Constitution and the organisation of field-trips, and, I recall, assisted Stephen with preparation of the journal. Stephen later became its Editor.

At the October meeting of the Club, 45 people turned up to hear John Estbergs talk about 'The Birds of the Top End' and 52 people attended the November

meeting. Also, by November we had advised other natural history societies around Australia of our existence and the first of many pre-Christmas parties for the Club was hosted at Johnny Estbergs prior to the school holidays.

Concluding Remarks

Diaries of the type upon which this account is based are inevitably dry and boring (except on occasion to parents). Yet as I read the entries I still sense the energy and commitment of early members to the concept of the Club as it mushroomed into an entity. Their drive was generated by an interest in the Territory's unique wildlife and a desire to share their enthusiasm for it. Since those heady days I have remained a constant though distant member, and have followed its fortunes with interest. As it begins its second decade the reasons for its existence are still apparent and, with the Territory's development, the need may be greater than when it was first mooted. I wish all current members the same drive and enthusiasm we had at its creation.

SOME OBSERVATIONS ON THE PIG-NOSED TURTLE (*CARETTOCHELYS INSCULPTA*) IN NORTHERN AUSTRALIA

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The Pig-nosed Turtle or Warradjan *Carettochelys insculpta* is a large freshwater turtle that inhabits permanent water, both lentic and lotic, in northern Australia and southern New Guinea (Groombridge 1982; Cogger 1986). As the sole surviving member of a once widespread group, the species has generated considerable scientific interest (Pritchard 1979; Groombridge 1982; Frair 1985; Webb *et al.* 1986).

First described in 1886 from a specimen taken in the Fly River of Papua New Guinea (Ramsay 1886; Waite 1905), its existence in Australia was not widely known until recently (Cogger 1970; Peters 1970). At first, it was not certain whether the Australian populations were self-sustaining or whether they merely represented non-breeding outliers of the New Guinea populations (Cogger 1970). However, in 1972 a specimen from the South Alligator River was found to have enlarged oviducts and fresh corpora lutea on the ovary (both indications of egglaying) (Schodde *et al.* 1972), and more recently clutches of eggs have been collected from the Daly River (Webb *et al.* 1986; Georges 1987; Georges and Kennett 1988) and Kakadu National Park (Legler 1982; Georges and Kennett 1989).

Early Breeding Records

It is now apparent that breeding populations of Pig-nosed Turtles have occurred in the Kakadu region since at least early this century. On 3 December 1918, P. Cahill presented 14 eggs of a "large freshwater turtle" to the Museum of Victoria (D40198). The eggs were found buried in sand at a crossing of the East Alligator River, 25.6 km above Oenpelli, and were accompanied by the further observation that the "turtles live in billabongs". Two more eggs (D40199) were presented on the 3 July 1921, but one was broken and has since been discarded. P. Cahill was probably Paddy Cahill, a famous pioneering figure who lived at Oenpelli around 1906-1922 (Mulvaney and Calaby 1985).

The large, spherical, hard-shelled eggs have been positively identified as those of *Carettochelys insculpta* and, together with their accompanying notes, represent

by far the earliest direct evidence of breeding populations of this species in Australia. The East Alligator River above the tidal reaches, but below the escarpment, is considered one of the best places for Pig-nosed Turtles by Aborigines of the Alligator Rivers region (Rosie Hart pers. comm.).

The fourteen eggs from the first clutch lodged with the Museum ranged in diameter from 43.1 mm to 44.8 mm (mean = 43.7) and the remaining egg from the second clutch had a diameter of 42.0 mm. These eggs are somewhat larger than those collected during August - October 1986 at the Daly River, which ranged in diameter from 31.1 mm to 42.1 mm (mean = 38.6 + 0.09 mm, n = 366; Georges and Kennett 1988), but compare well with the size of eggs from Papua New Guinea (range 38-46 mm, mean = 42.9 + 0.2 mm, n = 108; Pernetta and Burgin 1980).

A Turtle Hairball

A hairball was taken from a Pig-nosed Turtle collected by aborigines on 10 May 1986, from the South Alligator River in Stage III of Kakadu National Park. The hairball was a compact ovoid mass of hair mixed with small quantities of plant material and fine sand. It measured 35 x 35 x 12 mm. Together with the hairball, the stomach and intestines of the turtle were crammed with leaves and fruits of the Bush Apple *Syzygium* sp. (probably *S. forte*).

A sample of hairs was prepared as whole mounts and impressions (Brunner and Coman 1974), and examined under a light microscope. When compared to photomicrographs of hair preparations for a wide range of mammalian taxa (Brunner and Coman 1974), the scalation pattern and simple medulla of the unknown hairs eliminated all but two major taxonomic groups: kangaroos and their relatives (superfamily Macropodoidea) and flying foxes (Family Pteropodidae). It was clear that only one species was represented in the hairball.

Unfortunately, the hair guide of Brunner and Coman (1974) includes few species with northern distributions (Strahan 1983), so a reference collection of hairs from local macropod and pteropod species was obtained from the C.S.I.R.O. Wildlife Collection: Black Wallaroo (*Macropus bernardus*), Common Wallaroo (*Macropus robustus*), Antilopine Wallaroo (*Macropus antilopinus*), Agile Wallaby (*Macropus agilis*), Northern Nailtail Wallaby (*Onychogalea unguifera*), Short-eared Rock Wallaby (*Petrogale brachyotis*), Nabarlek (*Peradorcas concinna*), Black Flying Fox (*Pteropus alecto*), and Little Red Flying Fox (*Pteropus scapulatus*).

The unknown hairs differed from all macropod species in length, diameter and cross-sectional shape, and to some extent in scalation. Some macropod species were eliminated on additional differences in hair coloration (e.g. *Macropus agilis*) and structure of the hair medulla (e.g. *Onychogalea*, *Petrogale* and *Peradorcas*). However, the unknown hairs resembled those of the flying foxes in all respects, being most similar to those of the Black Flying Fox, *Pteropus alecto*. Flying foxes

often roost in trees adjacent to water, so the turtle must have come by its meal when a flying fox fell into the water. It was probably eaten as carrion.

Pig-nosed Turtles are opportunist omnivores that eat fruits, flowers, seeds and leaves that fall upon the water, and aquatic vegetation such as ribbon weed (*Vallisneria* spp.) (Cogger 1970; Schodde et al 1972; Legler 1982; Cann pers. comm.). Animal foods eaten include water snails, freshwater mussel, aquatic insect larvae and nymphs, and windblown insects. Mammalian vertebrae have been found among *Carettochelys* faeces in Kakadu National Park (Legler 1982) and the turtles have been observed to feed upon kangaroo carcasses in the Daly River (John Berryman pers. comm.). Carrion is of high quality and is generally plentiful when found, and may therefore be an important component of the diet of *Carettochelys* in Kakadu National Park.

Acknowledgments

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DISTRIBUTION AND STATUS OF THE CARPENTARIAN GRASSWREN *AMYTORNIS DOROTHEAE*

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Summary

The distribution and status of the Carpentarian Grasswren *Amytornis dorotheae* is reviewed following a recent field survey. Three new locality records are given, including the first records for Queensland. One population appears to have declined because of the frequent and extensive burning of its habitat. Factors likely to affect the future status of this bird are briefly outlined.

Introduction

The Carpentarian Grasswren *Amytornis dorotheae* is a small passerine bird of the family Maluridae, inhabiting the spinifex-covered hillsides of the south-western Gulf of Carpentaria region in northern Australia. The species is listed as an endangered vertebrate by Burbidge and Jenkins (1984).

Because of the remote and inhospitable nature of its habitat, coupled with the cryptic nature of the species, there have been few recorded sightings or collections of this bird. Virtually nothing is known of its biology or population size. Consequently, there has been mounting concern in recent years over its status and future survival, particularly in the face of changing land usage and burning practices in the area.

In 1986, the Northern Territory Heritage Grants Program committed funds to the Conservation Commission of the Northern Territory to review the past known distribution, current status, and habitat requirements of the species, including a field survey of the bird's present distribution, extent of suitable habitat and factors affecting the continued survival of the species.

This paper details some of the findings of the field survey, after summarizing the existing knowledge available on the Grasswren's distribution and status.

Historical Background

First recorded sightings of the Carpentarian Grasswren were made by G. F. Hill, ornithologist to the Barclay Expedition (Hill 1913). He reported finding a species of grasswren which he thought may have been the White-throated Grasswren *Amytornis woodwardi* and described it as "fairly numerous in the porcupine-grass and rocks in the ranges near Borroloola" (Hill 1913).

H.L. White, a private collector from Scone, N.S.W., sent H.G. Barnard on a six month long collecting expedition to the Borroloola area in 1913, during which time he managed to collect six specimens (all males) of *A. dorotheae* and two nests (Barnard 1914a,b; White 1914, Appendix A). All except one bird and the two nests were collected near the junction of the Glyde and Macarthur Rivers. The locality of the sixth specimen and the nests is given simply as "Borroloola, Macarthur River, N.T.", and the precise origin of these specimens, and Hill's original observations, are unknown. White sent specimens to G.M. Mathews in England who described them as a new subspecies *dorotheae* of *Amytornis woodwardi* (Mathews 1914). Later Mathews (1917) realized that the differences between dorotheae and woodwardi were so great that the Carpentarian Grasswren should be elevated to a full species.

Nothing further was reported of the bird for nearly 60 years until H. R. Officer, H.B. Gill and K. Gill rediscovered the species in the same general area as Barnard had originally collected it (Officer 1972). The bird has subsequently been seen in this locality by various workers.

In June 1974, T.O. Wolfe and R. Schodde discovered a population of Carpentarian Grasswrens in the southern footslopes of the China Wall, near the Queensland border (Schodde 1982). No further reports of the species in this area have since been made.

Then, in 1981, Carpentarian Grasswrens were discovered by S. Garnett and others on a sandstone escarpment some 40 km west of Borroloola. The birds have been located subsequently in this location many times by J. L. McKean, J. & J. Whitaker and others.

Methods

A field survey in the south-western Gulf of Carpentaria region was completed during May/June 1986. The survey broadly covered the area from the Limmen Bight River, N.T. in the west, to Cliffdale Creek, Qld. in the east, concentrating on the sandstone range country and including the Tawallah Range, Bukalara Range, the Upper Foelsche and Robinson Rivers, the Calvert River and Calvert Hills, the China Wall and range country in the Westmoreland/Cliffdale Creek areas of Queensland.

The sites where the Grasswren had been previously recorded were visited to establish whether the species still persisted there. In addition, nine other accessible areas which appeared to hold suitable habitat were investigated. Advice was also sought from local residents on the occurrence of the bird. Many other areas were also inspected, but were not searched thoroughly as they did not contain suitable habitat. Table 1 gives details on the intensively searched sites. In all areas traversed, the habitat suitability for the Grasswren was evaluated, taking into

account the rock formations, extent of the habitat and the recent fire history.

Once a site had been reached where habitat appeared suitable, it was searched systematically for the presence of Grasswrens. Search techniques involved traversing the area, and occasionally sitting quietly at good vantage points watching and listening intently for the bird, particularly in the vicinity of spinifex-covered rock outcrops. Records of vocalizations were reinforced by sight observations where possible and spinifex clumps were searched for old nests.

Searches were abandoned if the bird could not be located after a thorough search of all, or a large part of the available habitat was made, and the consensus was that further effort in the area was not warranted. Up to 16 man hours of search effort were required to establish the bird's presence at some localities as it is extremely difficult to locate, even under the best conditions.

Table 1. Sites searched for Carpentarian Grasswren *Amytornis dorotheae*.

Location	Dates	Man Hours	Remarks
Bukalara Range (North), Narwinbi Aboriginal Land, N.T. 16° 26'S, 136° 08E	14.3.1986	24	Known site, species still present, at least 5 pairs
Glyde River, Bukalara Range (South), Macarthur River Station, N.T. 16° 55'S, 136° 08'E	23-24.5.1986	7	Known site, species still present at least 1 pair, old nest discovered.
Quaker Yard, Robinson River Station, N.T. 16° 55'S, 135° 40'E	25-26.5.1986	9	Not recorded.
Lagoon Creek Gorge, Westmoreland Station, Q. 17° 32'S, 138° 02'E	27-28.5.1986	14	New locality, first record for Queensland, at least 2 pairs.
Fish River Gorge, China Wall. Nicholson River Aboriginal Land, N.T. 17° 46'S, 137° 48'E	29.5.1986	6	Not recorded.

Table 1 *cont.*

Abandoned Tin Mine, China Wall, Nicholson River Aboriginal Land, N.T. 17° 44'S, 137° 48'E	30.5.1986	8	Known site, species still present, at least 1 pair.
Hells' Gate, Cliffdale Creek Station Q. 17° 33'S, 138° 19'E	31.5.-1.6 1986	16	New locality, at least 3 pairs.
Blackfella Springs, Calvert Hills Station, N.T. 17° 21'S, 137° 05'E	2.6.1986	4	Not recorded.
Bluey Creek, Calvert Hills Station, N.T. 17° 07'S, 137° 16'E	3.6.198	2	Not recorded.
Calvert River Jumpup, Pungalina Station, N.T 16° 30'S, 137° 25'E	4.6.1986	3	Not recorded.
Tawallah Range, Billengarrah Station, N.T. 16° 09'S, 135° 37'E	5.6.1986	6	New locality, at least 1 pair.
Butterfly Springs, Nathan River Station, N.T. 15° 37'S, 135° 27'E	6.6.1986	7	Not recorded.

Results and Discussion

Carpentarian Grasswrens were located at six of the twelve sites investigated. Three of these are new locality records and represent range extensions to the west and to the east, including new state records for Queensland. It was particularly disappointing not to be able to locate any birds in the area between Borroloola and the China Wall where the areas visited were either not suitable or had been badly burnt out. However, we believe that the species may still exist in this area as much of it is inaccessible to vehicles.

Based on our surveys at known and new localities the habitat requirements of the Carpentarian Grasswren are large mature stands of spinifex, either *Plectracne pungens* or *Triodia pungens*, growing on dissected sandstone plateaux or slopes.

Scattered trees, particularly *Eucalyptus dichromophloia* and shrubs such as *Acacia* spp. are generally present, but are not essential. Tumbled rocks and surface cracking of the sandstone which provide recesses and clefts in which the bird often shelters, are an essential feature of the habitat.

To date, the species has only been found on rock types of the Palcozoic Adelaidian System (Bukalara Sandstone; Cox Formation) and the Pre-Cambrian Carpentarian System (Tawallah Group). However there are large tracts of these sandstone formations in the Gulf region which do not contain suitable Grasswren habitat.

Most historical and modern records of the Grasswren have come from the Bukalara Ranges. There is an abundance of excellent habitat along the Glyde and Macarthur Rivers but the species so far has only been located at two sites there. Based on the observations of J.L. McKean and J. Whitaker over the past five years the northern site holds at least five pairs and is the largest population known, although other areas have sufficient habitat to hold similar numbers or even more.

At the China Wall, the evidence suggests that the species was far more common in 1974, when they were initially discovered, than they are today. This is apparently due to the intensive burning regime in effect at present (McKean pers. obs.). It is likely that most populations on small, less than ideal sandstone areas have already disappeared because of a lack of refuge areas in which to escape fires.

It is difficult to assess accurately whether or not the species has suffered a serious decline in recent years because even in sites of known populations, the species is frequently difficult to find. Many recent observers have spent days in the Bukalara Range area where there are known territories, without sighting the species. The Harold Hall Expedition of 1968 failed to locate the bird after ten days in the area (Officer 1972) and even Barnard himself searched the Glyde River for two days in 1913 before locating the (now) type specimen.

The status of populations at the three new recorded localities is unknown. The possibility exists that the Grasswren occurs further south and east of the new localities. One prospect is the Lawn Hill National Park where other "Top End" endemics such as the Sandstone Shrike Thrush *Colluricincla woodwardi* and the Rock Ringtail Possum *Pseudocheirus dahli* have been recently discovered. Despite recent searches of suitable habitat by visiting birders and the resident ranger, the Carpentarian Grasswren has not yet been seen in the area. Another promising potential locality is in the sandstone of the upper Foelsche River.

The greatest threat to the continued existence of the Carpentarian Grasswren is the extent and frequency of fires in the sandstone ranges. The best chance for survival of this species is in the areas where there is extensive habitat with natural firebreaks. Such an area would never be totally burnt out, and fires entering the site

would be patchy and leave numerous refuge areas. There are two areas which we feel offer such extensive habitat and natural firebreaks that, under careful management, could maintain viable populations of the species indefinitely. The two areas are the Bukalara Range, N.T. and the Lagoon Creek Gorge/Hells Gate area, Qld.

Apart from fire, there are few management problems facing the Grasswren. Feral cats *Felis catus* may create unnatural predatory pressure on this species although none were seen during the course of the survey. The habitat is usually too inhospitable for most of the large introduced mammals such as cattle, buffalo, donkey and pigs.

There is some mining and exploration activity in the region, particularly in the Macarthur River valley, Calvert Hills and Wollogorang. The region has substantial mineral reserves of silver/lead/zinc, tin, uranium, copper and others. Thus, mining activities have the potential to affect adversely Grasswren populations and need monitoring.

Already many birders visit the region specifically to see the Carpentarian Grasswren. Tourism in the region has increased dramatically in the past few years coinciding with an upgrading of the road conditions and facilities available. At present the sandstone country is rarely visited by tourists even though much of it is scenically spectacular as well having an interesting flora and fauna. In areas where the Grasswren occurs recreational pursuits will need to be controlled.

Acknowledgements

Thanks are due to the various landowners and others in the Gulf region who offered assistance, advice, hospitality and allowed us free access on their land. Special thanks are due to Roy Dixon (Robinson River), Shaun Cootes (Macarthur River), Sue Zlothkowski (Wollogorang), Jack and Fran Gould (Westmoreland), Tommy George (Nicholson River), John Fairfax (Calvert Hills) and Nance Walker (Nathan River). Phil Mitchell and Danny Collins of the Northern Land Council arranged permission to visit aboriginal areas and informed traditional owners of the project.

Richard Schodde and Billie Gill (C.S.I.R.O. Canberra), Mary Lecroy (American Museum of Natural History, New York), Belinda Gillies (Museum of Victoria, Melbourne), and Max King (Northern Territory Museum and Art Gallery, Darwin), provided information on specimens in their care. Julian Reid gave us information on the Grasswrens he saw at Hell's Gate in July 1986.

Funds for the project were supplied by a Northern Territory Heritage Grant to the Conservation Commission of the Northern Territory with supervision provided by Mike Fleming.

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Appendix A

***Amytornis dorotheae* specimens currently held in research collections.**

Museum*	Reg. No.	Sex	Date Coll.	Collector	Locality	Remarks
AMNH	598138	M	24/9/13	H. G. Barnard	McArthur Stn McArthur R. N.T.	Holotype (Mathews' collection #18427)
AMNH	598139	M	24/9/13	H. G. Barnard	McArthur Stn McArthur R. N.T.	(Mathews' collection #18428)
NMV	HLW.2739	M	24/9/13	H. G. Barnard	McArthur Stn McArthur R. N.T.	Co-Type Emu 27:32
NMV	HLW.2740	M	24/9/13	H. G. Barnard	"	
NMV	HLW.2741	M	24/9/13	H. G. Barnard	"	
NMV	HLW.2742	M	7/12/14	H. G. Barnard	Borroloola. McArthur R. N.T.	
NWC	17285	M	6/6/74	T. O. Wolfe	China Wall, N.T.	Exchanged. Now in AM
NWC	17389	F	12/6/74	T. O. Wolfe	"	"
NWC	17296	M	7/6/74	T. O. Wolfe	"	
NWC	17316	F	8/6/74	T. O. Wolfe	"	
NWC	17317	F	8/6/74	T. O. Wolfe	"	
NWC	17388	F	12/6/74	T. O. Wolfe	"	
NWC	18341	M?	31/1/76	I. J. Mason	Glyde River, Bukalara Range N.T.	
NWC	18342	F	31/1/76	I. J. Mason	"	

* AMNH, American Museum of Natural History, New York
NMV, National Museum of Victoria, Melbourne
NWC, National Wildlife Collection, Canberra
AM, Australian Museum, Sydney

A FISH KILL ON THE KATHERINE RIVER, NOVEMBER 1987

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Introduction

Although fish kills in the coastal rivers of the Northern Territory appear to be an almost annual occurrence at the beginning of the wet season, few of these events have been properly documented, and the ecological processes involved are still little understood.

Bishop (1980) and Brown *et al* (1983) reported fish kills in the East Alligator River system, while Jeffree and Williams (1975) noted a fish kill in the Finniss River. Recent reports of fish kills have come from the upper reaches of the South Alligator, and Adelaide River systems, and from the Mary River wetlands (G. White, pers. comm.). The following is the first documented occurrence of a fish kill in the Katherine River.

Description of the Event

A storm apparently hit the upper catchment of Maud Creek on the night of 31 October 1987, causing a flush into the Katherine River. Next day, a small fish kill was reported to have occurred at a set of rapids which mark the upstream limits of Donkey Camp billabong. The extent of this fish kill is unknown, although Barramundi and Fork-tailed Catfish were affected. Another storm hit the Maud Creek catchment on the night of November 5, and again the Katherine River was inundated, rising several metres. A few days later, when the level subsided, an estimated 5000+ fishes were observed dead on the northern bank of Donkey Camp, directly opposite the N.T. Power and Water Authority's out-take station for the Katherine water supply. As the putrification of these fishes posed a public health risk, most were cleaned up and removed on November 11.

Methods

An inspection of the site was made on 12 November 1987, and data collected on the remaining fishes. Examination of the entire area by boat and helicopter revealed that the fish kill site was entirely restricted to an area of rapids at the downstream end of Donkey Camp billabong. The majority of the fishes had been beached along a sandy part of the waterhole about 100m long. As these had all been cleaned up, data were collected on an undisturbed stretch of dead fishes which were

seemingly stranded in a rocky offshoot of the main billabong when the water receded. Very few dead fishes were observed floating in the billabong itself. The decomposed state of most specimens made identifications difficult, and autopsy impossible.

Two transects were analyzed. Each constituted a stretch of shoreline 10m long, with a width of 4m, which had the highest concentration of undisturbed fishes. The number of large fishes (Total Length >180mm) of each species occurring on each transect was counted. The presence of small species, and small individuals of the larger species was also noted. However, as these smaller fishes constituted a very minor part of the biomass, and because of the distinct possibility that most had been eaten by birds, these smaller individuals were not examined quantitatively. Data for the two transects were added, and the results compared with similar data from the Magela Creek (Bishop, 1980).

Results

A complete list of species found, along with an estimate of the numbers left after the clean-up is provided in Appendix A. Some of the more isolated pools above the main fish kill site were observed to contain small populations of living fishes. Two species in particular, the Red-finned Rainbowfish and the Barred Grunter were surviving in these pools. One large, and badly damaged specimen of the Blue Catfish was also found in one of these pools.

Species which were observed or netted alive in the Donkey Camp billabong were the Barred Grunter, Red-finned Rainbowfish, Reticulated Perchlet, Bony Bream and Black Catfish. It is not known whether these living fishes actually survived the kill, or migrated into the area afterwards. At the height of the fish kill, a total of thirteen Barramundi were "rescued", and re-released into an aquaculture pond where all were still alive several days later. Of the smaller fishes present in the fish kill, the vast majority were juvenile (TL <50mm) Bony Bream. A number of these juvenile fishes were also observed floating in a near-dead condition in the billabong several days after the main kill.

Along with the fishes, vast numbers of Freshwater Prawns *Macrobrachium rosenbergii* were also killed. Two turtles *Emydura victoriae* and one Agile Wallaby *Macropus agilis* also died in the event. It is possible that these animals died either through drinking the putrid water, or were drowned in the flood conditions. Two Freshwater Crocodiles *Crocodylus johnstoni* were alive and well at the site. No dead birds were seen in the area, although numerous hawks and egrets had gathered to feed on the dead fish.

Discussion

The fish kill seemed to be caused by the flushing of poor quality water from the Maud Creek catchment into the main river channel, in the absence of a similar flush

of clean water from the Katherine River itself, which would have had a dilution effect. As all of the killed fish were located at the downstream end of the billabong, it is likely that they were either swept there by the current, or had travelled down ahead of the slug, only to become trapped at the rapids. Another possibility is that the fishes were already congregating at the downstream outflow at the time of the event. At this time of year, many species habitually descend to the lower reaches of the river system to breed, and mass migrations can occur with the first flush of the season.

The precise cause of death is difficult to determine. It has been generally assumed that these phenomena are caused by a lowering of the dissolved oxygen content of the waters, brought about by mixing of anoxic bottom waters, or by the oxidation of materials brought in by the first floods. This was the reason attributed to the fish kill on the Magela Creek in 1978 (Bishop, 1980), which has some parallels to the Katherine event. In both cases, most of the affected fishes were large species. Ox-eyed Herring were relatively unaffected by the kill, even though they were known to be common in the area.

This species is known to be able to survive low oxygen conditions (Merrick & Schmida 1984). Also, both fish kills occurred at the downstream end of a large billabong, where the fishes were apparently trapped, and both were preceded by minor fish kills in the same area. The kill density recorded in the Katherine event is about 3 times higher than that recorded by Bishop (1980) on the Magela (Appendix B).

Brown *et al* (1983) have postulated that acid water runoff (pH 2.4) and subsequently high aluminium levels (500 ugL-1) caused another fish kill on the Magela in 1980. Bishop et al (1982) suggested that naturally occurring toxins could cause fish kills. They listed numerous plants which, under certain circumstances, could release toxic saponins into the river systems. Some of these species, such as *Barringtonia acutangula*, *Acacia auriculiformis*, and *Owenia vernicosa* are very common in the Katherine area.

Jeffree and Williams (1975) reported on man-induced fish kills in the Finniss River caused by heavy metal pollution from a uranium mine site which had been flushed in the absence of a strong flow in the main river. The fishes reportedly killed in these events were generally smaller in size than those observed in the Katherine or Magela Creek fish kills (Appendix C).

It is likely that many factors play a role in these fish kills. Low dissolved oxygen levels may be present in most fish kill situations, but may not be the cause. In the Katherine event, the evidence suggests that the larger species were selectively killed, and that even juveniles of the larger species (eg. Bony Bream) were affected more than adults of the small species. Many individuals which survived the initial

kill did recover, suggesting that the adverse conditions were quite temporary, although the putrified water from the already decomposing fishes must have had a multiplier effect.

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Appendix A
Fish species killed in the Katherine River, near Donkey Camp, during November 1987.

Common Name	Scientific Name	No.+
Ox-eye Herring	*Megalops cyprinoides*	*
Bony Bream	*Nematolosa erebi*	***
Blue Catfish	*Arius graeffei*	***
Salmon Catfish	*Arius leptaspis*	**
Eel-tailed Catfish	*Neosilurus hyrtlii*	*
Long Tom	*Strongylura kreffti*	*
Red-finned Rainbowfish	*Melanotaenia splendida australis*	**
Strawman	*Quirichthys stramineus*	**
Sail-fin Perchlet	*Ambassis a. agrammus*	**
Reticulated Perchlet	*Ambassis macleayi*	*
Barramundi	*Lates calcarifer*	**
Barred Grunter	*Amniataba percoides*	*
Black Bream	*Hephaestus fuliginosus*	**
Spangled Grunter	*Leiopotherapon unicolor*	*
Sharp-nosed Grunter	*Syncomistes butleri*	*
Mouth Almighty	*Glossamia aprion*	*
Archer Fish	*Toxotes chatareus*	*
Giant Gudgeon	*Oxyeleotris herwerdenii*	*

+ approximate number observed dead: *<10; **10-50; ***>100.

Appendix B

Numbers of large (TL >18cm) fishes in samples taken at Katherine River, 1987 (present study) and Magela Ck, 1978 (Bishop, 1980).

Fish Genus	No. Recorded (% of total)	
	Katherine R, 1987	Magela Ck, 1978
Nematolosa	185 (59.9)	6 (2.1)
Arius	77 (24.9)	27 (9.5)
Hephaestus	25 (8.1)	-
Lates	19 (6.1)	27 (9.5)
Strongylura	3 (1.0)	2 (0.1)
Liza	-	198 (69.7)
Neosilurus	-	23 (8.1)
Glossamia	-	1 (0.3)
	N=309	N=284
Kill Density (No./m of bank)	**3.86**	**0.12 - 1.35**

Appendix C
Fish genera (ranked in approximate descending order of size) observed in some fish kills in the rivers of the Northern Territory.

Fish Genus	Katherine 1987	Magela 1978	Finniss 1975
Lates	x	x	
Arius	x	x	
Megalops	x		x
Liza		x	
Oxyeleotris	x		x
Hephaestus	x		
Syncomistes	x		
Nematolosa	x	x	
Strongylura	x	x	x
Toxotes	x		
Leiopotherapon	x	x	x
Neosilurus	x	x	x
Amniataba	x		
Glossogobius			x
Glossamia	x	x	x
Ambassis	x	x	x
Melanotaenia	x		x
Quirichthys	x		
Craterocephalus	x		
TOTAL No	**16**	**9**	**10**

SUB-FOSSIL TERMITE MOUNDS IN THE SIMPSON DESERT

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Introduction

Termite fossils of any kind are not abundant, but the recent discovery of excellently preserved whole adults of the family Termopsidae (Ruiz and Delclos 1986) indicate that the order Isoptera was well differentiated by the early Cretaceous. Later fossils consist mainly of wings or fragments of wings (Emerson 1965), although there are some whole insects from Tertiary amber (Carpenter and Hermann 1977, Krishna and Bacchus 1987). Trace fossils (ie. fossilised nests, galleries, etc) are even more scarce. Cloud *et al* (1980) stated that galleries in Precambrian rocks in Africa, first thought to be the earliest metazoan trace fossils, were probably caused by termites and were of much more recent, but unknown, age. Coaton (1981) reported fossil termite nests, probably of a species of *Microhodotermes*, from South Africa which were carbon dated at 32,100 + 720 years B. P.. Fontes (1984) discussed termite galleries in lateritic and bauxitic soils in the Amazon region, to which he attributed an age of 12,000-18,000 years B.P.. This paper records late Pleistocene termite mounds from the sand dunes of the Simpson Desert in Central Australia.

Description of Mounds

The sand ridges of the Simpson Desert are parallel longitudinal dunes 12-30m high, which extend unbroken for tens or sometimes hundreds of kilometres (Brown *et al*. 1968). The dunes are relatively stable (Galloway and Kemp 1981) and have been formed by a series of depositions over at least 250,000 years (Gardner *et al* 1987). Disturbance, for example construction of a road or track across or along the edge of a dune, may initiate erosion resulting in one or more of the deposition layers being removed by wind.

In 1986 I examined two sites near the southeast edge of the Simpson Desert at which the relatively soft upper layers of dunes had been eroded away, exposing a firmer, more cohesive surface. On this newly exposed surface were earthy structures, also eroded to varying degrees, which were undoubtedly fossil termite mounds. The mounds ranged in size from 30-60 cm diameter and 15-17 cm in height. Galleries consisting of broad flattened chambers connected by narrow tunnels were clearly visible on the eroded outer parts of the mounds (Fig. 1), but the

inner chambers were completely filled with sand grains so that the gallery structure was not easily seen. However, since grain size of the fill was larger than that of the walls, and grains were not cemented together, overall gallery structure was faintly visible and the sand fill could be removed by gentle brushing. I suggest that sand infiltrating the gallery system as the mounds were buried would have preserved their structure by preventing them from being crushed as the weight of the upper dune layers increased.

At one of the sites examined, near Innamincka, an eroded area approximately 20 m x 40 m contained seven mounds. The second, much smaller, area forming part of a road edge contained one mound. Dr R. Wasson, a scientist with extensive knowledge of the dune formations, has informed me that he has noted mounds in eroded dunes in other parts of the Simpson Desert.

Age of Mounds

The soils comprising the lower layers of the dunes contain carbonate nodules which can be radiocarbon dated to give a minimum age for the soil in which they occur. The mounds also contain carbonate and the degree of development of the nodules in a section of mound taken to CSIRO laboratories in Canberra is consistent with that of a dune layer dated at a minimum age of 13,000 - 25,000 years B.P. (R. Wasson, pers. comm.).

Even if no information were available for the age of the dunes, the high concentrations of carbonate indicate the antiquity of the mounds. This is because the formation of carbonate concretions in mounds is pedological not biological, and would take hundreds or thousands of years (Lee & Wood 1971).

It should also be noted that since nodules have formed both in the clayey fabric of the mound structure and in the sand which fills the galleries, age therefore refers to the age of the layer which buried the mounds, and not that of the surface upon which they were constructed.

Identification of the Mounds

The diameter and shape of the chambers and tunnels which make up the gallery systems of the mounds are very similar to those constructed by species of the genus *Drepanotermes* Silvestri. The Australian National Insect Collection has no record of *Drepanotermes* from the Simpson Desert, but two mound-building species, *D. rubriceps* (Froggatt) and *D. perniger* (Froggatt), are found close to its margins. The gallery structure of the sub-fossil mounds resembles most closely that of *D. perniger* (*cf* Watson and Perry 1981).

Species of *Drepanotermes* are harvesters which forage on the surface, collecting grass and other plant material and storing it within their nest systems. Although a wide range of material is known to be collected, including acacia phyllodes, leaves,

Fig. 1. *Late Pleistocene termite mound. Gallery structure is clearly visible in this recently eroded surface.*

seeds, and twigs, the type of material eaten depends on availability and the preferred food of almost all of the twenty-three known species is grass (Watson and Perry 1981). Given the high density of fossil mounds (up to 125ha-1), it seems reasonable to assume that at the time *D. perniger* or a closely related species inhabited the area, the landscape included substantial areas of grassland comprised of species palatable to *Drepanotermes*.

The present vegetation consists of stunted Acacia and ephemeral herbs, with sparse grasses. The dune vegetation of the Simpson Desert is known to have fluctuated widely during the Pleistocene due to climatic change, and the age of the fossil mounds is consistent with a time of high rainfall conducive to the formation of grassland (Galloway & Kemp 1981).

Acknowledgement

I thank Dr R. Wasson (CSIRO Division of Water Resources, Canberra) for his information on dune structure and age.

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SHORT NOTES

Freshwater Turtles of the Top End

Species diversity tends to be greater in the tropics and this certainly seems to be the case for Australian freshwater turtles. On 19 September 1987 during a turtle catching trip on the Daly River upstream of Policeman's Crossing, we counted five species of turtle in one short stretch of river. Although we have dived and trapped extensively in rivers and lakes in southern Australia, we have never found more than two or three species in the same waterbody. The distribution maps of Australian turtles (Cogger, H. 1985. *Reptiles and Amphibians of Australia.* Reed, Sydney) reflect this increased species diversity in northern Australia.

Operating from a boat with a spotlight at night we encountered several Northern Long-necked Turtles *Chelodina rugosa* resting on submerged logs, their necks curled in preparation for striking at unwary prey. Northern Snappers *Elseya dentata* were common, and shared the deeper water around snags with male-female pairs of Red-faced *Emydura victoriae* and Yellow-faced *Emydura "australis"* short-necked turtles. The Daly River is the only river in Australia where two species of *Emydura* coexist. We were also lucky to see the rare Pig-nosed Turtle *Carettochelys insculpta.*

We caught our target of ten short-necked turtles within the first hour, then spent several more enjoyable hours watching turtles swim around submerged logs and trees and adding to our species count. Our progress along the river was punctuated by loud splashes as startled freshwater crocodiles *Crocodylus johnstoni* made desperate leaps from the high banks. Tropical rivers certainly come alive at night and meandering along a river armed only with a spotlight provides an unforgettable experience.

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