NOTES ON SOME SKINKS FROM THE NORTHERN TERRITORY OF AUSTRALIA

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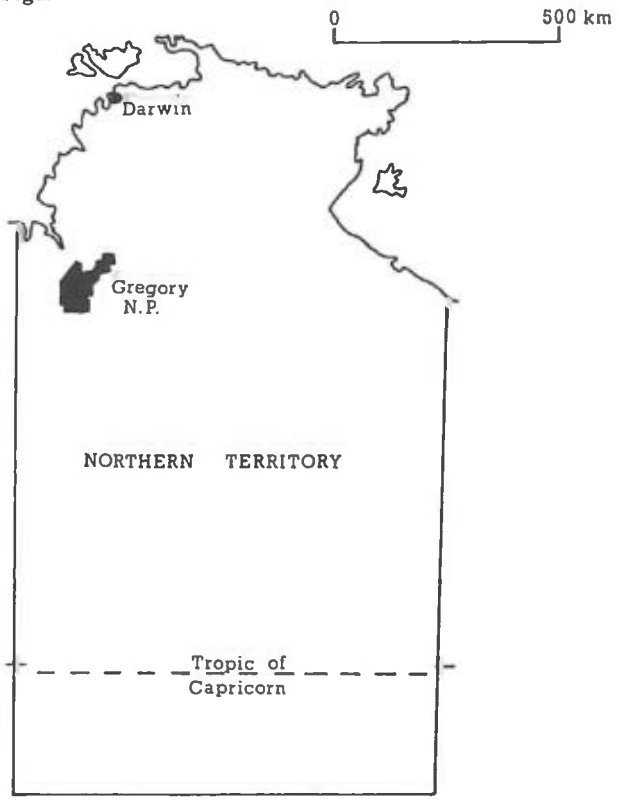
INTRODUCTION

Skinks have an almost world wide distribution but reach their greatest diversity in Australia, where 22 genera and over 250 species occur. The Scincidae is the largest Australian reptile family and the 95 species known to occur in the Northern Territory comprise more than 50% of its described lizard species (Horner 1985). The author had the good fortune to observe a few of these species at first hand, while participating as herpetologist in a fauna survey of the newly created Gregory National Park (Figure 1). This 10,000 sq.km. Park is situated in a transition zone between the tropical forests of the north and the arid interior of Australia and encompasses a wide range of habitats, described in general terms by Edgar (in press) and in far more detail by the Conservation Commission of the Northern Territory (1986). Flat-topped sandstone hills, or mesas, are characteristic of the area and are separated by extensive floodplains covered with savannah vegetation, typical of the monsoonal climate (Plate 1).

Figure 1.



The work was carried out jointly by the Conservation Commission of the Northern Territory (C.C.N.T.) and Venturers of an Operation Raleigh expedition to the region, from May-July 1986. Habitats were sampled for herpetofauna by searching 500 x 20m quadrats for active species. Each quadrat was searched in the morning, late afternoon and just after sunset and this

method was combined with general sorties in promising areas, rock and log rolling and pitfall trapping. The mammalogist working on the survey also turned up several skinks and other lizards in his live traps. A full analysis of the survey data will eventually be published as a major C.C.N.T. scientific report, examining the relationships of the faunal groups to vegetation communities and physiographic features. Because of the importance of the Scincidae in Australia and the paucity of herpetological knowledge about the tropical north of the country it was felt that a few general notes on this family may be of interest.

DIVERSITY AND ABUNDANCE OF SKINKS

The herpetological survey produced 12 amphibians and 60 reptiles species, the first checklist for this area. Of the 40 lizard species recorded, 18 (45%) were skinks. The diversity of skinks in the main habitat types (Table 1) is affected by numerous features, and sampling errors were probably significant. In general, though, the more structurally complex habitats display the greatest species diversity (MacArthur, 1972; Pianka, 1967, 1971). In Gregory National Park these habitats occur where water is most available in the dry season and include narrow riverine forests and savannah woodlands. The stony hills and well-drained limestone floodplains produce more open, less complex habitats with fewer resources and fewer lizard species. Obviously the situation is not this simple and the comparatively low number of skink species in riverine forests, the most structurally complex habitat in the Park, is just one exception. Pianka (1971) noted an inverse relationship between precipitation and species density for Kalahari Desert Lizards and hypothesized that this is due to the more open vegetational structure of the low rainfall areas, affording the lizards more open space for basking and foraging. It may be that the shaded riverine forest is similarly unattractive to certain sun-loving skinks, particularly in the dry season when early morning temperatures can be quite low. On the other hand the difference in taxonomic diversity between the riverine and floodplain habitats may simply be due to the difficulty of seeing reptiles in the former. A reliable method of quantifying the structural complexity of habitats has yet to be devised, which leaves such comparisons open to many variable and produces very broad confidence intervals.

A qualitative assessment of the habitats sampled leaves one with the impression that skinks exhibit greater taxonomic diversity and abundance in areas of well lit, open woodland with numerous *Acacia* shrubs, grass clumps, logs and rocks, areas of thick leaf litter and a significant soil layer (which is frequently almost absent in this region). Mesa tops lack many of these desirable features but may have a surprisingly thick soil, particularly under large flat rocks, due no doubt to the virtual absence of run-off of the wet season rains, which gradually percolate through the flat sandstone plateau instead. The number of skink species found on these plateaux equals that of riverine habitats, possibly because of this one important aspect. Table 2 gives an indication of the abundance of the Scincidae, compared to other reptile and amphibian families, recorded during quadrat searches. Quadrat searches in riverine habitats are examined separately to remove the influence of amphibians from the rest of the quadrat results. The remaining quadrats are combined, to give an overall impression of the relative abundance of the families, because of the above mentioned difficulty in comparing habitats directly. After doubling the figures for nocturnal quadrats (since diurnal searches were twice as frequent) the number of skinks recorded in all habitats, by day and night, is still 37.5% of the total. With the riverine quadrats removed, skinks comprise 54.2% of all reptiles recorded, with the figures for nocturnal quadrats again doubled. These simple observations illustrate the fantastic abundance of skinks in this part of Australia in terms of both species and individual lizards, even when the frogs and geckos, numerous in their own right, are included. The relative abundance of several species are mentioned in the following notes. An estimation of their densities (per hectare) has not been attempted from the limited data.

SPECIES NOTES

The nomenclature used here follows that of Cogger *et al* (1983) and the maximum snout-vent lengths (max. S.V.L.), given for each species, are taken from Horner (1985). Most individuals are obviously much smaller than this, but the figures provide a useful guide to relative sizes. Sample specimens of each species are lodged in the N.T. Museum of Arts and Sciences in Darwin.

Genus *Carlia* Gray, 1845

A genus of small, terrestrial, diurnal skinks with about 25 species occurring in Australia (6 in the N.T.), New Guinea, the Moluccas and Timor (Storr *et al,* 1981). Sexually active males develop attractive breeding colours. The 3 species recorded were all observed actively foraging in leaf litter, occasionally pausing to bask in patches of sunlight for short period, usually less than 30 seconds. The tail is thrashed slowly with a sinuous motion when hunting. Horner (1985) considers all 3 species to be common in the N.T.

Carlia amax Storr, 1974. Max. S.V.L. 40mm. This species was only recorded in riverine forest quadrats and around the first expedition camp on the Victoria River. Its apparent scarcity at the second camp on the East Baines River is possibly due to its association with rocky hills and ranges (Cogger, 1983; Horner, 1985), since the latter camp was situated in an area with more extensive floodplains and fewer outcrops. One specimen caught possessed a perfectly forked tail.

Carlia foliorum (De Vis, 1884). Max S.V.L. 44mm. (Plate 2). Recorded from riverine forest plus sandstone and limestone floodplains, but not hilly country. Very common around the camp on the East Baines River, remaining active throughout the day, but retreating to shaded areas during the hottest period. Of all the terrestrial skinks positively identified in quadrats, 49% were *C. foliorum.* On cold mornings this species was occasionally observed basking on tree trunks, at about 30cm, to catch the rays of the rising sun.

Carlia triacantha (Mitchell, 1953). Max. S.V.L. 52mm. Found in dry habitats including the more barren floodplains, hills and outcrops. This species was the only skink recorded from rolling limestone hills, the driest habitat. Often found near dead logs or clumps of spinifex (*Triodia* spp.), characteristic grasses of the desert regions.

Genus *Cryptoblepharus* Wiegmann, 1934

A very widespread genus with 6 species found in Australia (4 in the N.T.). One non-Australian species, *C. boutonii,* has a discontinuous distribution from east Africa to Hawaii (Mertens, 1931) although several island races are now recognized as distinct species. The small, diurnal and very active members of this group are usually found on vertical surfaces such as tree trunks and rock faces.

Cryptoblepharus megastictus Storr, 1976. Max. S.V.L. 40mm. A small colony of these saxicoline lizards was discovered on the vertical walls of a sheltered gully, near the top of a large sandstone outcrop. They moved with great agility over the rock although, like the following species, they could easily by tempted to take flies offered to them on grass stalks and approach humans very closely.

Cryptoblepharus plagiocephalus (Cocteau, 1936). Max. S.V.L. 47mm. A very common arboreal species which occurs across most of Australia and often inhabits human dwellings, fences etc. This species was recorded in every habitat surveyed (except limestone hills) and comprised 42.5% of all skinks, arboreal and terrestrial, identified during quadrat searches. This may partly be a reflection of the ease of spotting and identifying this skink scuttling over tree trunks, but it was nonetheless a very abundant and ubiquitous lizard. Several were also seen foraging on the ground and two were caught in pitfall traps. The trees being used by this species that were measured ranged from 5 to 50cm diameter at breast height ($\bar{X} = 22.5 \pm 1.79$cm S.E., $n = 47$). More important, however, was the texture of the bark and species such as the paperbark and corkbark trees, which offer numerous retreats on their trunks, are particularly favoured. Significantly no *C. plagiocephalus* were observed on the smooth barked *Eucalpytus* species despite their abundance in the Park.

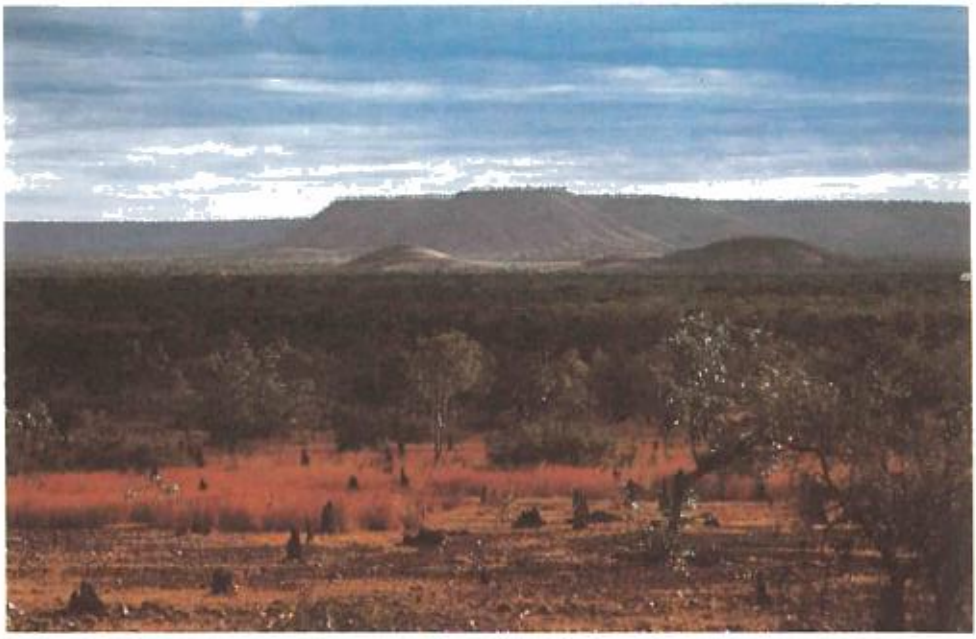


Plate 1. Gregory National Park. Typical view showing arid floodplain and savannah woodland with sandstone mesas in the background.

Plate 2. *Carlia foliorum,* pausing briefly to bask in a sunlit area of leaf litter in riverine forest.

Plate 3. *Ctenotus pantherinus,* photographed on a limestone block, under which it was caught, in a dry floodplain area.

Plate 4. *Lerista borealis,* an elongated skink with reduced limbs, this specimen was discovered under a flat rock on a mesa plateau.

Genus *Ctenotus* Storr, 1964

This group is confined to Australia (apart from 1 species in New Guinea) as is the largest of all the reptile genera found there. There are about 74 species in Australia of which 40 occur in the N.T. (Horner, 1985). The general view has been that these skinks have undergone their main diversification in the more arid regions of Australia (Storr *et al,* 1981; Cogger, 1983), although many of the species are now recognised as specialized tropical forms (Horner & King, 1985). These terrestrial or semi-fossorial lizards are largely diurnal and possess well developed legs and characteristic pointed ear lobules. The generic name is derived from the Greek *cten* (comb) and *ot-* (ear) (Storr *et al,* 1981).

Ctenotus decaneurus Storr, 1970. Max. S.V.L. 50mm. This attractive skink, marked with 10 pale stripes on a dark background, prefers stony hills and ranges (Cogger, 1983; Horner, 1985). Common in suitable habitat, hill slopes covered with small stones and rocks, specimens were also found on dry limestone floodplain by turning rocks in the early morning.

Ctenotus inornatus (Gray, 1845). Max. S.V.L. 95mm. Common in sandstone areas, from floodplains to mesa plateaux. When rubbish and other debris in dry situations near human habitation was turned over this was usually the species found.

Ctenotus pantherinus (Peters, 1866). Max. S.V.L. 114mm. This large handsome lizard (Plate 3) was mainly recorded from dry floodplain areas but small numbers were also observed on a sandstone plateau. Occasionally found under debris or rocks, this species was most often seen as the sun was setting and Horner (1985) also states that they are most active on warm evenings. Four subspecies occur in Australia of which the largest, *C.p.calx* Storr, 1970, was recorded from Gregory National Park.

Ctenotus robustus Storr, 1970. Max. S.V.L. 123mm. A large species, found in a wide variety of habitats, which is the only tropical representative of the genus to also occur on the eastern seaboard and in south Australia (Horner & King, 1985). Although a common skink, only one specimen was recorded, caught in an Elliott trap set in a sandstone floodplain area on the mammal survey. The foraging activity of many species is curtailed in the dry season, making them hard to find, and *C. robustus* also excavates short, shallow burrows under ground debris (Cogger, 1983; Horner, 1985).

Ctenotus saxatilis Storr 1970. Max. S.V.L. 100mm. Very similar to *C. inornatus* apart from the narrow, dark vertebral stripe of the present species. Recorded from the rocky slopes and plateau of the sandstone mesas. Horner (1985) indicates that *C. saxatilis* is common in the N.T. but it was found to be extremely difficult to search the mesa side slopes without causing disturbance, so it was impossible to assess its abundance.

Ctenotus tantillus Storr, 1975. Max. S.V.L. 45mm. Horner (1985) remarks that this species prefers rocky hills and outcrops. During the survey *C. tantillus* was only discovered at one site in a grassy floodplain area, although this was within 500m of a sandstone outcrop.

Genus *Lerista* Bell, 1833

This genus is comprised of 41 species (14 in the N.T.) of nocturnal, terrestrial or fossorial skinks with elongate bodies, which exhibit various degrees of limb and digit reduction. Fossorial species could be uncovered by raking through the soil beneath objects on the ground.

Lerista borealis Storr, 1971. Max. S.V.L. 50mm. A fossorial species displaying a reduced limb condition (Plate 4), with 2 digits on each forelimb and the hindlimbs with 3. Found under a variety of objects such as logs, rocks and fallen termite mounds from floodplains to mesa plateaux, usually on a sandy substrate.

Lerista orientalis (De Vis, 1889). Max. S.V.L. 45mm. An uncommon species in the N.T. which possesses 4 digits on each limb and prefers thick leaf litter (Horner, 1985). Only 2 specimens of an undescribed subspecies were found, both in the same pitfall trap, among a small clump of trees in grassland on sandstone floodplain. Compare the location of Gregory National Park (Figure 1) with the distribution map of this species in Cogger (1983) for an example of the work still needed on the tropical Australian herpetofauna.

Genus *Menetia* Gray, 1845

A group of small, terrestrial, diurnal litter-dwelling skinks with 4 species found in the N.T. and 7 in Australia.

Menetia greyii Gray, 1845. Max. S.V.L. 38mm. A moderately common skink preferring dry habitats (Horner, 1985) which was recorded from riverine forest, sandstone floodplain and the drier limestone floodplain. Sometimes seen on open ground, away from the cover of leaf litter, but easily overlooked because of its small size.

Genus *Morethia* Gray, 1845

Small, terrestrial, diurnal skinks, 8 species occur in Australia (4 in the N.T.). The throat of the breeding males of most species is bright orange-red. (Storr *et al,* 1981).

Morethia ruficauda (Lucas & Frost, 1895). Max. S.V.L. 36mm. A glossy black skink with white dorsolateral and midlateral stripes and a bright red tail and hindlimbs. A small number of the subspecies *M.r. ruficauda* was seen among leaf litter and rocks at the base of a sandstone outcrop.

Genus *Notoscincus* Fuhn, 1969

Two species of these terrestrial, diurnal skinks occur in Australia (1 in the N.T.) and very little is known about their biology.

Notoscincus ornatus (Broom, 1896). Max. S.V.L. 39mm. The subspecies *N.o. wotjulum* (Glauert, 1959) is present in the region of Gregory National Park and was particularly common in the thick leaf litter of the riverine forest near our camp on the East Baines River. Any sizeable object, left on the ground for a few days, would reveal up to half a dozen small skinks when lifted, mostly this species and *Carlia foliorum. N. ornatus* was also recorded in lower densities in floodplain areas usually in the leaf litter associated with *Acacia* bushes and stands of trees.

Genus *Proablepharus* Fuhn, 1969

Very small, diurnal, terrestrial litter-dwellers, all 3 species found in Australia occur in the N.T.

Proablepharus tenuis (Broom, 1896). Max. S.V.L. 32mm. The smallest species of skink recorded on the survey, very hard to spot in the thick leaf litter it inhabits and subsequently difficult to catch. Only 11.3% of the skinks positively identified in quadrats were *P. tenuis* whereas this species represented 42.1% of the skinks caught in pitfall traps. Although many habitats were too rocky for their installation, pitfall traps probably provide a more reliable estimate of the abundance of this tiny lizard than that obtained searching large quadrats. This species was present in riverine forest and the savannah woodland and grassland of the floodplains.

Genus *Tiliqua* Gray, 1825

Large, heavily built lizards, familiar for their blue tongues, with 5 species occurring in Australia (3 in the N.T.) and one, *Tiliqua gigas,* in Papua New Guinea and Indonesia. Three former members of this group have been placed in the genus *Omolepida* (Storr *et al,* 1981).

Tiliqua scincoides (White, 1790). Max. S.V.L. 370mm. A common blue-tongued skink which inhabits a variety of habitats, preferring those with extensive ground debris (Horner, 1985). The northern subspecies, *T.s. intermedia* Mitchell, 1955, was observed during the day, by other zoologists driving through floodplain areas, and caught at night by the author in Darwin, in very warm, humid weather. This species is capable of moving surprisingly fast when disturbed and will try to bite when captured.

DISCUSSION

The estimates of the diversity and abundance of skinks given in this article are extremely coarse for a number of reasons. Reliable sampling techniques are very difficult to devise and are subject to large errors, even when comparing relatively stable (although structurally complex) environments such as rainforests (Inger, 1979). These problems were further compounded in Gregory National Park by the diversity of habitats and differences in their structural complexity and physical features. In addition, relatively small samples of each habitat were obtained during a limited period of the dry season, a time of reduced activity for many species. However, the

survey has succeeded in its aim of providing a data base for the formulation of a Park management plan, and for future work, and useful observations were made on numerous species which are still virtually unknown ecologically. A rough picture of the diversity and relative abundance of several skink species has been obtained and this will become more accurate with future investigations. An enormous amount of work remains to be done and the skinks alone would provide suitable subjects for many research projects. It is hard for European herpetologists, with just 5 skinks occurring in southern Europe (Arnold *et al.* 1978), to appreciate the numbers of the Australian Scincidae and the species mentioned here are but a small example of this stunning variety.

ACKNOWLEDGEMENTS

The author is indebted to the following for their encouragement and help in making the work possible:— Dr Bill Freeland and the staff and rangers of the C.C.N.T., Dr Max King of the N.T. Museum of Arts and Sciences, Eibleis Fanning and the Directing Staff, Venturers and Aboriginal tribesmen involved in Operation Raleigh Expedition 6A. Particular thanks are due to Paul Horner of the N.T. Museum for sharing his expert knowledge of skinks, the use of his excellent identification keys, his encouragement in the field and the hospitality he and his wife Judy showed me in Darwin.

Table 1. Taxonomic diversity of the main habitat types (figures derived from all sampling methods).

Habitat type	Amphibian Species	Reptile Species	Skink Species
Riverine	11	25	6
Sandstone Floodplain	—	31	12
Limestone Floodplain	—	15	8
Rolling Sandstone Hills	—	10	3
Rolling Limestone Hills	—	5	1
Mesa Slopes and Escarpments	2	16	4
Mesa Plateaux	—	17	6
Human Habitation	2	7	1

Table 2. Relative abundances of amphibian and reptile families (determined by quadrat sampling) expressed as percentages of the total numbers of individual animals recorded.

	Riverine Forest		Other habitats	
Family	**Diurnal**	**Nocturnal**	**Diurnal**	**Nocturnal**
Myobatrachidae	—	5.7	—	—
Hylidae	17.8	77.0	—	—
Gekkonidae	—	15.8	—	93.3
Pygopodidae	—	—	1.2	—
Agamidae	11.1	—	12.9	—
Varanidae	—	—	1.8	—
Scincidae	68.9	—	83.5	—
Boidae	—	1.5	—	2.2
Colubridae	2.2	—	—	—
Elapidae	—	—	0.6	4.5
Total percentage	100	100	100	100
Number of Quadrat Searches	14	7	62	31

REFERENCES

Arnold, E.N., Burton, J.A. and Ovenden, D.W. (1978). *A Field Guide to the Reptiles and Amphibians of Britain and Europe.* Collins: London, Glasgow.

Cogger, H.G. (1983). *Reptiles and Amphibians of Australia.* 2nd Rev. Edn. A.H. & A.W. Reed: Sydney.

Cogger, H.G., Cameron, E.E. and Cogger, H.M. (1983). *Zoological Catalogue of Australia. I. Amphibia and Reptilia.* Australian Government Publishing Service: Canberra.

Conservation Commission of the Northern Territory (1986). *Bullita/Victoria River Crossing vegetation survey.* Wildlife Research: Darwin.

Edgar, P. (In press). The amphibians and reptiles of Gregory National Park, Northern Territory, Australia. Preliminary report of a dry season herpetological survey. In: *Proceedings of the Joint U.K. Herpetological Societies Symposium, September 1986.* British Herpetological Society: London.

Horner, P. (In press). *Annotated checklist and key to the Scincid lizards of the Northern Territory.* Environmental Biology Report, December 1985, Darwin Institute of Technology.

Horner, P. and King, M. (1985). A new species of *Ctenotus* (Scincidae, Reptilia) from the Northern Territory. *The Beagle, Occasional Papers of the Northern Territory Museum of Arts and Sciences,* **2** (1): 143-148.

Inger, R.F. (1979). Abundances of amphibians and reptiles in tropical forests of Southeast Asia. *University of Hull, Dept. of Geography, Misc. Series* No. 22: 93-110.

MacArthur, R.H. (1972). *Geographical Ecology: Patterns in the Distribution of Species.* Harper and Row: New York.

Mertens, R. (1931). *Ablepharus boutonii* (Desjardin) und seine geographische Variation. *Zool. Jahrb. (Syst.),* **61** (1-2): 1-262.

Pianka, E.R. (1967). On lizard species diversity: North American flatland deserts. *Ecology* **48**: 333-351.

Pianka, E.R. (1971). Lizard species density in the Kalahari Desert. *Ecology* **52:** 1024-1029.

Storr, G.M., Smith, L.A. and Johnstone, R.E. (1981). *Lizards of Western Australia. I. Skinks.* University of Western Australia Press and Western Australian Museum: Perth.