PROGRESS REPORT
THE DELLA AND MARQUALPIE LANDSYSTEM'S FAUNAL MONITORING PROGRAMME
FOR
SANTOS LTD

J.S. Gillen & J.R.W. Reid
Environmental Consultants
February, 1990

entered
Nick Neagle

EXECUTIVE SUMMARY
OF
PROGRESS REPORT ON THE DELLA AND MARQUALPIE LAND SYSTEMS FAUNAL MONITORING PROGRAMME

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EXECUTIVE SUMMARY

1. PRIMARY RESEARCH AIMS

1.1 To investigate the possible impacts of gas and oil production and related operations, on the terrestrial fauna within the Della Land System. Within this system the study area includes the satellite installations of the Burke-Dullangari and Toolachee production fields.

1.2 To conduct faunal surveys in the Wider Cooper Basin to assist Santos Ltd. in minimizing their environmental impact by:

- identification of biologically significant species, communities habitats and geographical areas; and

- provision of base-line environmental data for impact assessment, the education of personnel and contribution to environmental management and rehabilitation.

1.3 To recommend appropriate management practices for the amelioration of environmental impacts upon the biota of the region, arising from Santos Ltd's operations within the Cooper Basin.

2. WORK COMPLETED TO DATE

2.1 Establishment Phase

70 sites, each containing a total of one hundred pitfall traps (refer Gillen & Reid, 1988) have been permanently located in the following areas for the purpose of capturing small mammals and reptiles:

- the Burke-Dullingari field	(20 sites);	100 traps
- the Toolachee field	(20 sites);	100 traps
- an intervening non-productive area between the above fields	(20 sites);	100 traps
- the Marqualpie Land System, 40km south-east Cordillo Downs Homestead	(10 sites).	100 traps
	Total: 70 sites	400 traps

2.2 Survey Periods

The 60 Della Land System study sites (Burke-Dullingari, Toolachee and nonproductive area) were trapped in June 1988, January 1989 and January 1990. The ten Marqualpie study sites were assessed in January 1988 and January 1990.

Over 40 species (some yet to be positively identified by South Australian Museum) of reptile and amphibian and 7 species of mammal have been encountered during these surveys. To determine habitat requirements of these animals the botanical component of the study has resulted in the identification of several hundred species of plants.

2.3 Analyses and Reporting

A brief progress report was presented in August 1988 after reconnaissance and subsequent establishment of 60 sites in the Burke-Dullingari, Toolachee region. Animal trapping during this period resulted in the detection of five species of small mammal and six species of reptile, reflecting the decreased biological activity associated with the colder winter months.

Since the presentation of that report, the first summer sampling has been conducted, encountering increased biological activity resulting in the captures of many more species of reptile and two additional mammal species.

The June 1988 and January 1989 data have been pooled, coded and entered into the South Australian National Parks and Wildlife Service's biological survey computer data base. Sophisticated numerical analyses have been performed using the CSIRO PATN package and their results interpreted and presented in the accompanying report.

3. MAJOR FINDINGS

3.1 Significant Findings

Two species of reptile not previously known from South Australia were trapped - *Delma haroldi,* a legless lizard, collected in the Della Land System, and *Ctenotis ariadne,* a striped skink, in the Marqualpie Land System (see plates 4 to 6). Also an un-described species of *Ctenotus,* a skink, only the second specimen collected in South Australia, was trapped at Marqualpie.

Major range extensions of several reptiles (from both land systems) were also revealed and substantiated by the South Australian Museum. The two land systems support rich and highly significant reptile faunas, their predominance being associated with spinifex *Triodia basedowii* hummock grasslands. These grasslands are identified as being a singularly important habitat type for the reptile fauna in both study areas.

Within the Della Land System, the more densely vegetated areas of never-fail and love grasses (*Eragrostis* species) occurring on the heavier loams in some interdune swales are identified as providing important habitat for the sparsely distributed Forrest's mouse *Leggadina forresti.*

Additionally, the ephemeral swamps in the Della Land System constitute important breeding habitats for waterbirds after heavy rains, and warrant sensitive management.

3.2 Impact of Production on Fauna : Interpretation of Analyses

The Marqualpie environment is shown to be distinctly different from that of the Della Land System both floristically and zoologically.

From the Della Land System data set, one major conclusion may be extrapolated, namely the generally clear-cut distinction between the floral and faunal communities of dunes versus interdune sites.

The results, provisional at this stage, do not reveal any major distinction between the composition or overall abundance of mammals and reptiles at sites located adjacent to gas wells and those encountered at sites located 1.5-2km away from these same wells.

Before conducting the January 1990 re-assessment there was an interesting anomaly in that lower capture rates of animals (abundance and number of species) were recorded in the non-productive control area than those of the Toolachee and Burke-Dullingari production fields. It was suspected that this anomaly was due to different weather conditions prevailing during the trapping period in the control area compared with those encountered in the production areas. Subsequent trapping in January 1990 revealed that this suspicion was justified.

So far the data collected from well sites on the periphery of production fields and the resulting analyses have not revealed any significant obvious impact on the fauna. However, the preliminary nature of these findings must be stressed and it is recommended that three to four reassessments take place before reliable inferences can be made.

4. CONCLUSIONS

4.1 The results, albeit preliminary, do not suggest that peripheral gas wells (those located on the outer edge of production fields), have a significant impact on the small mammal and reptile fauna away from the cleared aprons surrounding the wells which are the obvious sites of disturbance.

Should further research confirm these initial impressions, it could be demonstrated that production, in terms of these established peripheral wells only is having a negligible impact on the abundance and diversity of small mammals and reptiles in this vicinity. It

may then be prudent to undertake closer examination within the production fields to determine the impact of the processing stations and related infrastructure on the areas' fauna.

Overall, the results obtained thus far, in revealing the faunal components of ecosystems in the area will contribute greatly to understanding habitat requirements and composition in future rehabilitation projects.

4.2 The Della and Marqualpie Land Systems each possess distinctive reptile assemblages not represented elsewhere in the north-east of South Australia. Their bird and small mammal assemblages are likewise, but more subtly, distinctive.

The research is providing to be of immense scientific as well as management value. Both the South Australian Museum and the State Herbarium have validated the collection of animal and plant species previously unrecorded from this State and this region.

Both study areas are located on the recently proclaimed, Innamincka Regional Reserve, and so the information gained from this research will have immediate value in the co-operative management and protection of the Reserve's natural resources. The process of co-operative management between Santos Ltd and the State Government in this regard has been facilitated during this research project by the role of the National Parks and Wildlife Service Research Section in performing the sophisticated analyses utilizing their main frame computer.

5. RECOMMENDATIONS

5.1 Because of its relatively small area and very high biological and biogeographic significance, extreme sensitivity should be exercised in the Marqualpie District with respect to hydrocarbon, exploration and possible production activities.

5.2 Disturbance to the following habitats, wherever encountered, should be minimized whenever possible:

- spinifex hummock grassland;
- the densely vegetated neverfail/love grass tussock grasslands of the heavier soils of interdune swales and flats;
- emphemeral wetlands/claypans/swamps, scattered throughout the region.

5.3 To minimize the loss of, and impact on, animal habitat in the region, the area of vegetation cover removed in the cause of exploration and production activities should be minimal. Careful consideration should be given to:

- the area of the cleared aprons around the well-heads. Apron edges and slopes should be contoured to minimize the effects of erosion and silting, creeping into adjacent swales as is presently evident;

- minimizing the number of vehicle tracks and roads wherever possible, again controlling the effects of erosion to prevent silting of interdune habitats;

- assuring vehicles keep to designated tracks and roads and do not venture off or damage the edges of cleared aprons at well heads; and

- minimizing of disturbance, removal and transport of soils within the production fields.

5.4 Because of the preliminary nature of the data-set, and the significance of new species collections with every survey period thus far, conclusions from the study must be provisional. It is recommended that the programme of research be continued seeking the support of the South Australian National Parks and Wildlife Service for the analysis of data.

This programme, in the Della and Marqualpie Land System, combined with the results of a recent survey of the Coongie Lakes area of the Cooper Land System has served to substantially increase knowledge concerning the biota of the north-east of South Australia. It is recommended that Santos Ltd continue the objective established by this programme in identifying and examining other ecological land systems within their area of operations. A proposal is outlined below.

6. PROPOSAL FOR FUTURE SAMPLING PROGRAMME

September 1990 : Della and Marqualpie sites to be reassessed.

April 1991 : Della sites to be reassessed. Establishment of sites in the Merninie Land System.

December 1991 : Della and Merninie sites to be reassessed. This should finalize the impact assessment phase in the Della Land System.

Other Proposals : Intensification of research <u>within</u> production areas. Recent research has revealed the significance of the use of ants as bio-indicators of disturbance.

: Establishment of sites in other distinctive land systems associated with Santos Ltd. operations.

: Production of flora and fauna handbooks outlining the biota associated with each of the land systems encountered by the research project.

: Identification and collection of those plant species both annual and perennial shown to be more resistant to foraging rabbits with the aim of increasing the effectiveness of rehabilitation programmes.

ACKNOWLEDGEMENTS

The Consultants would like to express their appreciation for the support of the personnel of Santos Ltd. In particular we would like to thank those on the Moomba staff in Field Services, Vehicle Maintenance, Communications and Administration, for their logistical help and personal support. The programme could not have run smoothly without the invaluable assistance and tolerance of the personnel of the Burke-Dullingari Satellite Station. The initiation of the programme would not have been possible without the vision and enthusiasm of Oleg Morozow and support of Fiona Nicholls and Steve Tunstill, of the Risk Management Section of Santos Ltd.

Our time in the field could not have been as enjoyable, or our work conducted as efficiently, without the companionship and technical assistance of Leonie Heard, Peter Tregenza and Graham Armstrong.

We are extremely grateful for the advice and help provided by Keith Casperson of the South Australian National Parks and Wildlife Service, Research Section, in the analysis of data.

Extenuating circumstances in the field during January 1990 resulted in Mike Steel and Andrew Gassner extending their typical and very much appreciated hospitality to one rather dehydrated consultant for which he is eternally grateful.

For typing and word processing we are indebted to Fay Brooks of SEA Pty. Ltd.

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1. INTRODUCTION

In early 1988, the Risk Management Section of Santos Ltd., initiated this faunal monitoring programme to achieve the following objectives:

- To ascertain the possible effects of the activities of the company upon the fauna in the Cooper Basin area.

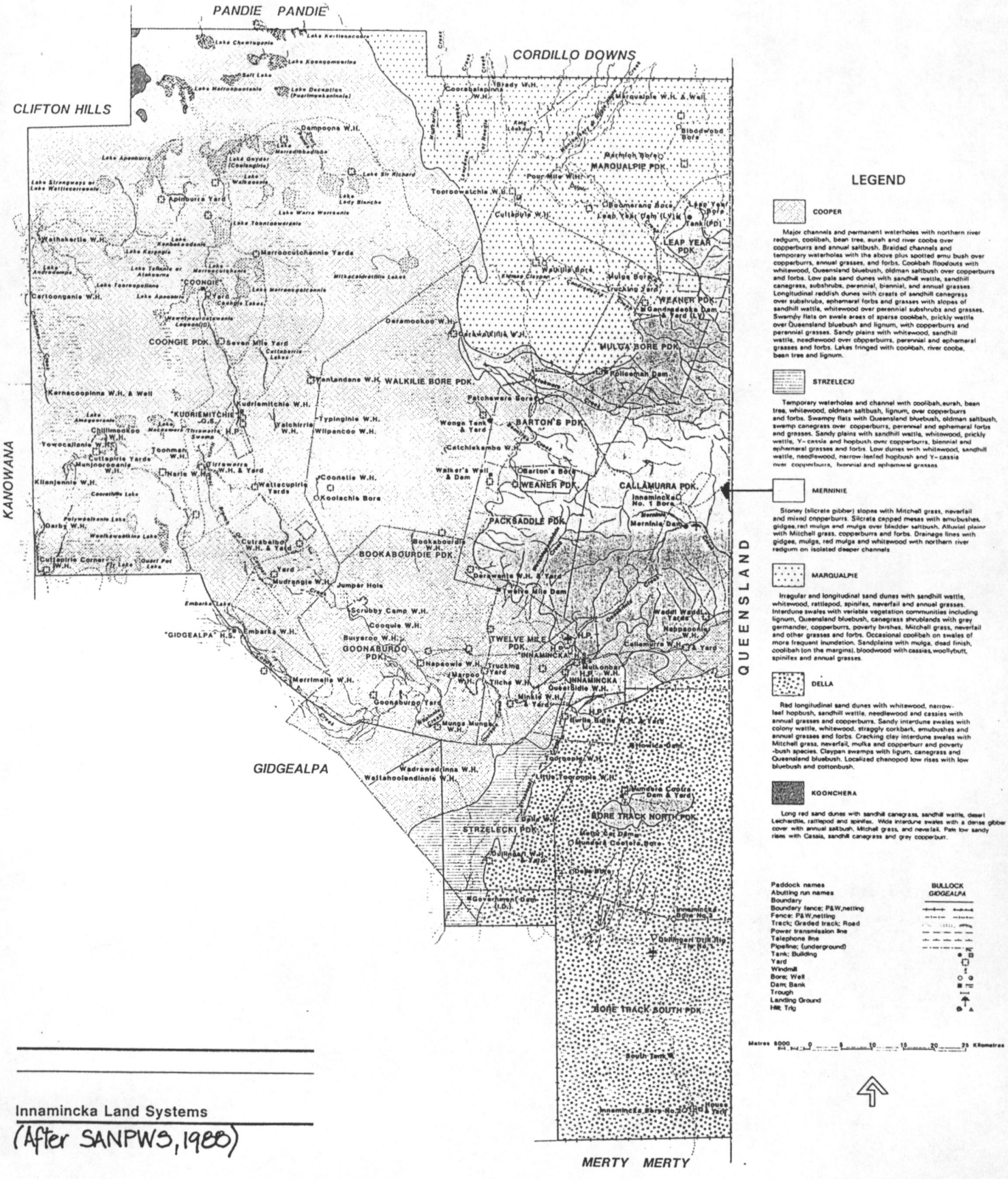
- To obtain baseline biological data for ecologically significant areas for which there is currently little information.

This initiative was consistent with a set of environmental objectives outlined in the Cooper Basin Environmental Review (Santos Ltd., 1983). The proposed programme was to contribute directly to "a better understanding of the existing natural environment within the Cooper Basin" (*ibid* p.11). The programme was to also contribute to the achievement of other "future objectives" contained within the review, namely:

- To identify and delineate boundaries of areas of special environmental significance.

- Extend the existing network of monitoring points.

The programme required the consultants to design and implement faunal assessment and monitoring in selected areas in order to comply with the above objectives. For the reasons outlined in the design and methodology section, a reconnaissance of the Della land system (see Figures 1 & 2) resulted in the selection of 60 permanent sites. These were subsequently established in July 1988 during the cooler winter period and an initial assessment was conducted. A subsequent assessment during January 1989 initiated the monitoring phase of the programme, deliberately coinciding with the higher biological activity associated with the warmer summer months. During this period, in order to achieve the second programme objective, 10 permanent sites were established and assessed in the ecologically significant Marqualpie Land System (see Figures 1 & 2, also plate 1A). Briefly, a land system is an area of similar geomorphology having discrete patterns of land units (e.g. dunes, interdunes), each of which will have similar vegetation, soils and geology.



LEGEND

COOPER

Major channels and permanent waterholes with northern river redgum, coolibah, bean tree, eurah and river cooba over copperburrs and annual saltbush. Braided channels and temporary waterholes with the above plus spotted emu bush over copperburrs, annual grasses, and forbs. Cooklbah floodouts with whitewood, Queensland bluebush, oldman saltbush over copperburrs and forbs. Low pale sand dunes with sandhill wattle, sandhill canegress, subshrubs, perennial, biennial, and annual grasses Longitudinal reddish dunes with crests of sandhill canegress over subshrubs, ephemeral forbs and grasses with slopes of sandhill wattle, whitewood over perennial subshrubs and grasses. Swampy flats on swale areas of sparse cooklbah, prickly wattle over Queensland bluebush and lignum, with copperburrs and perennial grasses. Sandy plains with whitewood, sandhill wattle, needlewood over cbpperburrs, perennial and ephemeral grasses and forbs. Lakes fringed with coolibah, river cooba, bean tree and lignum.

STRZELECKI

Temporary waterholes and channel with coolibah,eurah, bean tree, whitewood, oldman saltbush, lignum, over copperburrs and forbs. Swampy flats with Queensland bluebush, oldman saltbush, swamp canegrass over copperburrs, perennial and ephemeral forbs and grasses. Sandy plains with sandhill wattle, whitewood, prickly wattle, Y-cassia and hopbush over copperburrs, biennial and ephemeral grasses and forbs. Low dunes with whitewood, sandhill wattle, needlewood, narrow-leafed hopbush and Y-cassia over copperburrs, biennial and ephemeral grasses

MERNINIE

Stoney (silcrete gibber) slopes with Mitchell grass, neverfail and mixed cnpperburrs. Silcrete capped mesas with amubushes, gidgee, red mulga and mulga over bladder saltbush. Alluvial plains with Mitchell grass, copperburrs and forbs. Drainage lines with gidgee, mulga, red mulga and whitewood with northern river redgum on isolated deeper channels

MARQUALPIE

Irregular and longitudinal sand dunes with sandhill wattle, whitewood, rattlepod, spinifex, neverfail and annual grasses. Interdune swales with variable vegetation communities including lignum, Queensland bluebush, canegrass shrublands with grey germander, copperburrs, poverty bnshes, Mitchell grass, neverfail and other grasses and forbs. Occasional coolibah on swales of more frequent inundation. Sandplains with mulga, dead finish, coolibah (on the margins), bloodwood with cassias, woollybutt, spinifex and annual grasses.

DELLA

Red longitudinal sand dunes with whitewood, narrow-leaf hopbush, sandhill wattle, needlewood and cassias with annual grasses and copperburrs. Sandy interdune swales with colony wattle, whitewood, straggly corkbark, emubushes and annual grasses and forbs. Cracking clay interdune swales with Mitchell grass, neverfail, mulka and copperburr and poverty-bush species. Claypan swamps with ligum, canegrass and Queensland bluebush. Localized chenopod low rises with low bluebush and cottonbush.

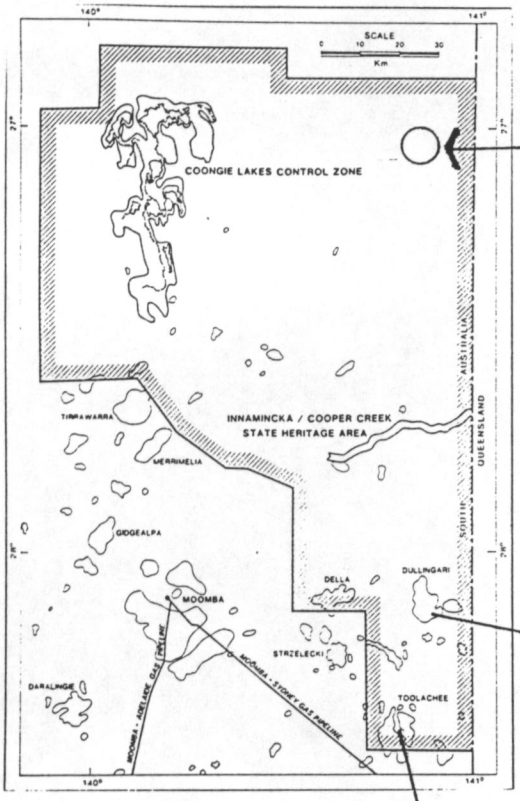
KOONCHERA

Long red sand dunes with sandhil canegrass, sandhill wattle, desert Leichardtia, rattlepod and spinifex. Wide interdune swales with a dense gibber cover with annual saltbush, Mitchell grass, and neverfail. Pale low sandy rises with Cassia, sandhill canegrass and grey copperburr.

	BULLOCK GIDGEALPA
Paddock names	
Abutting run names	
Boundary	
Boundary fence; P&W,netting	
Fence: P&W,netting	
Track; Graded track; Road	
Power transmission line	
Telephone line	
Pipeline; (underground)	
Tank; Building	
Yard	
Windmill	
Bore; Well	
Dam; Bank	
Trough	
Landing Ground	
Hill; Trig	

Metres 5000 0 5 10 15 20 25 Kilometres

FIGURE 1



MARQUALPIE STUDY AREA (Approx.)

NORTH

Nth 3

33, Nth 2

15

18 17

BURKE-DULLINGARI
OIL & GAS FIELD
(10 Sites)

AE Burke-Dullingari Control

A
(5 Sites)

B
(5 Sites)

CONTROL AREA
(10 Sites)

BE Toolachee Control

9

35

28

3

20

TOOLACHEE
OIL & GAS FIELD
(10 Sites)

KEY	
BURKE-DULLINGARI AREA	
Site #	Well #
D1	18
D2	17
D3	15
D4	33, Nth2
D5	3
TOOLACHIE AREA	
T1	9
T2	35
T3	20
T4	3
T5	28

FIGURE 2

In January 1990, all sites within the Della and Marqualpie Land Systems were re-assessed.

This report elucidates the design rationale for the programme and subsequent findings.

These findings include the complete raw data set for all taxonomic groups studied, namely plants, small ground mammals, reptiles and amphibians encountered over all the periods of assessment conducted to date. At this stage, numerical classification analyses have been conducted on the pooled data set collected in July 1988 and January 1989. The January 1990 and subsequent re-assessments needed to provide the necessary additional data will be pooled with the current data and the resulting data set re-analysed. In addition a recent statistical package compatible with the Pattern analysis (PATN) used for this report will enable the progression of analysis from that of a descriptive nature to one of statistical inference.

2. DESIGN RATIONALE AND METHODOLOGY

2.1 DESIGN RATIONALE

The rationale adopted for the programme was determined by a number of factors that decided the nature and final outcome of the design. Foremost, the budget allocated to the programme dictated that efficiency in time and labour was of highest priority. Based on prior biological field work experience in the Cooper Basin (Reid & Gillen, 1988), it was clear to the consultants that with limited time and labour, it was essential to choose a study area of relatively simple geography with ready available access.

An additional deciding factor was that, "The assessment of the relative ecological worth or uniqueness of areas of the arid lands requires a great deal of additional information in more detail than is available to us at present. We also have doubts that the information even exists" (Graetz & Foran, p.1, unpublished). In other words, there is a dearth of biological information for many of the arid areas of Australia. This is certainly the prevailing situation in the north-east of South Australia, particularly the Strzelecki Desert. So quite clearly, although it was possible to establish permanent monitoring points in the study areas, it would be several seasons before adequate knowledge of the various ecosystem components and their patterns of association could be obtained before even contemplating determining possible impacts of production activities upon the biota. This need for several seasons of data collection is emphasized by the following statement:

> "Desert ecosystems with their "pulse-response" character, and their extreme spatial and temporal heterogeneity, are necessarily poorly understood given the relatively short duration of European presence in arid Australia." (Pech & Graetz, p.2, 1982).

Even within the study area that was finally selected, the "pulses" referred to in the above statement, may occur to a different degree in areas that are relatively close due to the localised nature of summer rainfall.

Reinforcing this point, "a single survey will reveal only a static situation frozen in time", (Clarke, p.2, 1986), and only continued re-assessment over time, taking into account stochastic events like localised rainfall, will produce a more adequate understanding of the patterns and processes of ecosystems. Quite simply, ecological monitoring (such as this programme) **begins** with a survey of the habitats involved and **only** continuous monitoring over time will reveal changes which occur in ecosystems as a result of human or natural perturbations.

2.2 METHODOLOGY

2.2.1 Study Area Selection

2.2.1.1 THE DELLA LAND SYSTEM

The Della Land System (Figures 1 & 2) was finally selected as an area possessing characteristics fulfilling the programme requirements and consultants rationale. This system can be simply described as a distinct area of longitudinal red sand dunes, basically comprised of the two obvious land units of dune and interdune each possessing characteristic vegetation associations. Based on these land units in order to facilitate the monitoring aspect of the programme, a stratified sampling procedure was adopted effectively sub-dividing the Della Land System into dune and interdune habitats and locating the permanent monitoring sites accordingly.

The interdune land units can further be subtly sub-divided by soil type, as the subsequent plant analyses revealed, into sandy interdune swales grading into heavier cracking clay swales.

Located within the Della Land System are the Toolachee and Burke-Dullingari oil and gas production fields. The close proximity of these fields enabled their convenient inclusion in the programme. Rather than concentrate on one field alone, including both provided an investigative form of side-by-side replication, enabling comparison between fields in the same land system possible. This also helped to maximise the information obtained about ecosystems in the area in return for the effort and time invested.

A control area was required in order to compare the biota assessed in the production areas with the biota of an undisturbed, natural area. A non-productive area, in terms of oil and gas extraction, located between the two fields was chosen as the control (Figures 1 & 2).

2.2.1.2 THE MARQUALPIE LAND SYSTEM

The Marqualpie Land System was selected for study to fulfill the second objective of the programme, being an ecologically significant area "for which there is currently little information".

This land system, located in the north-eastern region of Innamincka Station (Figures 1 & 2), consists of irregular and longitudinal red sand dunes, with varying swales based on differing soil type and includes broad areas of sandplain. With its distinct biogeography the Marqualpie Land System is unique in South Australia being somewhat of an extrusion into this State of such systems found into south-western Queensland.

The undisturbed nature of this area, with respect to oil and gas production, also serves to provide another form of control area. Data collected for this area will help clarify how undisturbed ecosystems function in the north-east region. The establishment of sites in this area will also serve as a "bench-mark" for future reference should oil or gas be extracted from within this land system.

2.2.2 Permanent Site Locations

2.2.2.1 THE DELLA LAND SYSTEM

In both the Toolachee and Burke-Dullingari fields, 5 functioning oil or gas wells located on the periphery of each field (plate 1B) were chosen for the establishment and replication of permanent sites related to production areas (Figure 2). This was done with the intention of establishing what effect, if any, the production areas are having upon the biota of the wider area **before** focusing within the production fields for possible "internal" impacts. Each of these well sites has associated with it an offwell site acting as a production area control site for comparison, in a relatively undisturbed area nominally 1-1.5km from the well (Figure 3). Each field then, consists of 5 well sites and their 5 related offwell sites, a total of 10 sites in each of the two production areas. The control area, midway between the fields also has a total of 10 sites, 5 in the north associated with the Dullingari field, and 5 in the south with the Toolachee field (Figure 2). In all, a total of 30 permanent sites have been established in the Della Land System study area. At each site are two trapping lines of 5 pots; one trapping line occurs in a dune habitat and the other trapping line is located in an interdune habitat, 10 pots per site. This situation is repeated for all well, off-well and control sites. Thus a total of 300 pots have been established in the study area. Full details of the design and components of these pitfall lines are contained within a prior report (Gillen and Reid, 1988) (plates 2A & B, in this report).

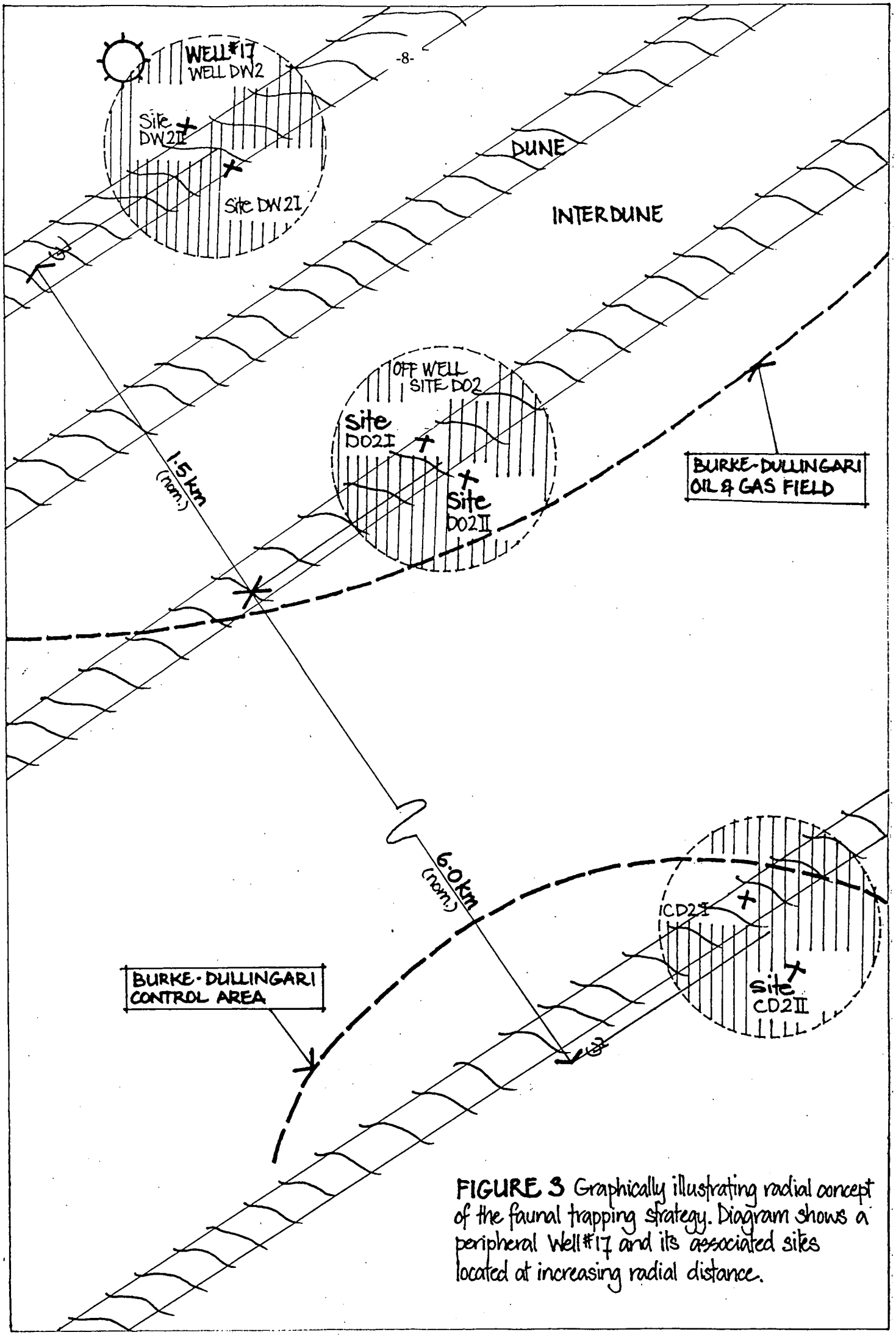


FIGURE 3 Graphically illustrating radial concept of the faunal trapping strategy. Diagram shows a peripheral Well #17 and its associated sites located at increasing radial distance.

All sites have been labelled in a systematic manner (Appendix 1.1), each site eventually receiving a unique code for the purposes of data entry for subsequent numerical classification analysis.

2.2.2.2 THE MARQUALPIE LAND SYSTEM

As for the Della Land System sites, the 10 sites established in the Marqualpie Land System are located within the main land units identified, whose vegetation associations revealed dune, interdune swales and sandplain habitats. However, unlike the Della Land System sites, each of the 10 permanent Marqualpie sites, composed of 2 pitfall lines, each of 5 pots, are located within one habitat type (see Appendix 1.2 for site habitat descriptions). Thus each site has 10 pots giving a total of 100 permanent pots established in the Marqualpie study area.

2.2.3 Elliott Trapping

Following discussion with the Risk Management Section in February 1989, it was decided to combine Elliott trapping (plate 3A) with the pitfalling regime. Low capture rates for small ground mammals for pitfalls had been recorded up to that time and it was envisaged that the use of Elliotts could help provide additional captures to boost numbers for the purpose of analyses.

Accordingly, during the re-assessment in January 1990, 10 Elliott traps were laid out parallel with each pitfall line during each period of trapping. Thus in the Della Land System a total of 200 Elliott traps were used for each of the three areas assessed. However, an extremely low return for the effort involved was experienced and their continued inclusion in the programme is regarded as unwarranted.

2.2.4 Assessment Procedures

2.2.4.1 VEGETATION

Vegetation associations, enabling definition of habitat types (Appendix 1.2) at each site, were identified during the initial survey period. With each subsequent re-assessment the sites are surveyed botanically. All species present, annual and perennial, found within 30-40 metres either side of the pitfall line, were recorded using standard pro-forma (Appendix 6.1). Details noted included their relative abundance, life cycle stage and a subjective estimate of bare earth at the site. All plant species recorded at each site

were then coded for subsequent numerical classification analysis. At the outset of the programme it was intended to obtain more quantitative plant data by the establishment of permanent transects. Time restraints however, did not permit this, although it is recommended that future work incorporate transect establishment to enable a more quantitative measure of habitat change.

However, a visual indication of habitat change has been made possible by the establishment of permanent photopoints associated with the 60 Della and 10 Marqualpie Land System sites. These photographs, from the three assessment periods conducted to date, are included with this report as a separate Appendix. Inspection of these photographs clearly illustrates the point made earlier in the report that, "arid ecosystems cannot thus be sensibly described by one vegetation survey at one particular time" (Pech & Graetz, p.11, 1982).

2.2.4.2 FAUNA

2.2.4.2.1 The Della Land system

Ideally, all study areas in the Della Land System, that is the Burke-Dullingari, Toolachee and control areas, should be assessed contemporaneously to enable assessment under the same weather conditions. However, lack of personnel to achieve this meant that each area had to be assessed separately and sequentially. During the January 1989 and January 1990 assessment periods, the pitfall lines were open for 3 consecutive nights and inspected on each of the following mornings. During the establishment phase of July 1988, assessment was restricted to 2 nights. Standard pro-forma were used to record all captures, (reptile and mammal), and relevant details, (Appendix 6.2) and these data were subsequently coded for numerical classification analyses.

In most instances, the first specimen of each small mammal and reptile species captured was preserved as a specimen for verification of identity by the South Australian Museum. During the more recent assessment of January 1990, samples of liver tissue were taken from most specimens collected and stored in liquid nitrogen. This nitrogen storage allows the later utilization of the technique of alloenzyme electrophoresis to help identify specimens belonging to "difficult" groups.

2.2.4.2.2 The Marqualpie Land System

The same procedure was adhered to in the faunal assessment of the Marqualpie Land System.

2.2.5 Pattern Analysis

What follows is a simplified explanation of the analyses conducted for this report. The main aim of these analyses was to help elucidate the patterning of the biota examined across the study area using objective methods. Before any assessment of impact upon the ecosystem can be made the various components of the system must be identified and patterns of assemblages of the components must be clarified. More simply stated, it is a case of determining "what is where" before progressing to the point of asking "what is being affected".

The programme to date, with each subsequent assessment, has continued to reveal additional species of flora and fauna indicating the need for further assessment to enable a more reliable picture to evolve. Subjecting the data collected for each of the taxonomic groups examined, to a pattern analysis is a means of exploring a large amount of data in an objective manner, in order to reduce them to a form that enables greater comprehension of the information they contain. Usually this process helps to reveal possible patterns and to investigate possible processes that influence these patterns. For example, from the outset it was expected that the dune and interdune sites would each possess distinct assemblages, the subsequent analyses clearly show this distinction, particularly with respect to the plant analysis, but goes further in revealing subtle sub-groups determined by parameters such as soil type and geographic gradients.

For the analytical purposes of this study, and additionally because the study areas lie within the recently declared Innamincka Regional Reserve, all data have been coded and entered into the South Australian National Parks and Wildlife Service's Biological data base and analysed utilizing the CSIRO's PATN software package.

The basis of most pattern analyses is the creation of an association matrix based on data from all sites. This is done for each of the taxonomic groups, plant, mammal and reptile. For example all vegetation data, for all sites are compared with each other based on the presence or absence of species and association values determined indicating which sites are most similar or dissimilar in their floristics. PATN uses a dissimilarity measure, where zero (0) implies absolute equality (i.e. one site identical

to another in species composition) and the value one (1) implies maximum dissimilarity. Utilizing the resulting matrices two major complementary approaches are then used to diagrammatically represent relationships generated. These approaches, called classification and ordination, produce Dendrograms and Scattergrams respectively.

The Dendrogram reveals assemblages or communities, based on species composition, expressed as groups or classes. These identified groups are then ordinated as a means to show the validity of groups recognised from the Dendrogram and to help reveal gradational patterns that may be related to gradients in biophysical parameters. For example, referring once again to the vegetation analysis, sites showing the most similar plant species composition are clustered together in groups in the Dendrogram. Ordination of these groups shows their displacement along one axis, related to soil type, as plant species composition changes from those sites on sand to those on the heavier clay interdune soils.

In summary, it must be stressed that pattern analysis techniques are not designed to test hypotheses in a statistical sense. They are tools to enable the manipulation of a complex data set to generate ideas about what processes may be operating to create or influence certain patterns. The recent availability of a statistical package compatible with PATN, will enable the future statistical analysis of the increasing data pool from re-assessment phases.

3. FINDINGS

3.1 INTRODUCTION

Within this report are the findings of the three assessment phases conducted thus far, namely July 1988, January 1989 and January 1990. The data collected during July 1988 and January 1989 have been pooled and the various taxonomic groups subjected to PATN analysis. The most recent data set from the January 1990 assessment has not yet been pooled and analysed with the previous assessments. However, the findings during this period will be discussed briefly in this report, when ever relevant, and all trapping results and observational data have been included with those of previous assessments in Appendix 5.0.

3.2 PLANTS

3.2.1 General

Appendix 2.1 contains a complete list of all 256 plant species encountered over all the permanent sites examined in the Della and Marqualpie Land Systems in July 1988 and January 1987. Their incidence over all sites is shown in Appendix 2.5. This Appendix also reveals the ubiquitous nature of some species in contrast to others which show a greater degree of restriction to dune or interdune land units. Vegetation associations were described using the classification approach shown in Appendix 6.4, thus producing habitat descriptions for all permanent sites (Appendix 1.2). It should be noted that the table (Appendix 2.4) listing sites in order of increasing species diversity contains only summer data for the Marqualpie sites. Thus their relatively lower species richness in comparison to the Della sites which have included winter and summer annuals from the two assessment periods conducted. A winter assessment of the Marqualpie sites should be conducted to contribute to a more realistic floristic picture relating to each of the two land systems. Nine of the 256 species referred to earlier, are not recorded in the "Flora of South Australia" (1986) as occurring in the Lake Eyre (LE) Botanical region. These particular species are indicated in Appendix 2.3.

As mentioned in the design methodology section, opportunistic collections were undertaken and an additional 41 species were identified. Appendix 2.2 lists these plants indicating that three are not recorded as occurring in the region and *Keraudrinia nephrosperma,*

collected in the Marqualpie area, as not being recorded before in South Australia (*ibid*). The table also contains plants collected from the Merninie Land System (Figure 1) of various gibber landforms, immediately north of Innamicka. Species collected from this land system have included plants not collected from the area since the last century and other plants collected earlier (Reid & Gillen, 1988) which are "first" records for this botanical region (LE). These collections indicate both the ecological significance of the area and exemplify that it has been virtually unexamined biologically for over a century. These points warrant the future inclusion of the Merninie Land System within the monitoring programme.

The collection of 13 species not recorded as occurring in the region ("Flora of South Australia", 1986) serves to emphasize the seasonal approach of this programme in enabling significant additions to the knowledge and significance of the botany of the north-east.

Few specimens were collected during the January 1990 assessment, and any additions to the floristic list will be subject to verification by the South Australian State Herbarium.

Recent heavy rains in the Della Land System did not appear to have elicited much botanical response, although a large rabbit population is having a major impact suppressing any new growth, whether seedling or regrowth.

Reference to the photopoint photographs will reveal how large rabbit numbers have resulted in the heavy grazing of many of the sandhill perennial species, particularly *Dodonaea viscosa* (plate 3B). An interesting and potentially useful observation was that particular species, annual and perennial, were less susceptible to rabbit grazing. This observation possibly warrants further investigation into the use of such species as stabilizing plants in future rehabilitation projects.

3.2.2 PATN Analysis

3.2.2.1 INTRODUCTION

For the purpose of the analysis all data collected from all sites assessed during the July 1988 and January 1989 phases were pooled. This meant the inclusion of summer and winter ephemerals for all the Della Land System as well as perennials. As mentioned previously only summer annuals have been included with the perennials from the Marqualpie sites.

In all, 256 positively identified species occurring at sites, were included in the analysis (Appendix 2.1). Those plants that could not be identified to the species level in the field or even subsequently by the State Herbarium, due to a lack of reproductive plants, were excluded from the analysis (e.g. seedlings or plants in vegetative phase). Plants that were collected opportunistically, that is not encountered at sites but in the wider region, where also excluded.

The main impressions gained from the plant analysis were that:

- the stratified approach adopted for selection of sites in dune and interdune land units appeared to be vindicated by the groups produced by the analysis;

- within groups, for example those groups defined by dune or interdune assemblages, there was a good mix of sites from all three study areas in the Della Land System, supporting the selection of a homogeneous area for study;

- the Marqualpie and Della Land System each possessed a distinctive flora.

3.2.2.2 DENDROGRAM

The Dendrogram generated from the PATN package identifies four groups or assemblages of plant species at the dissimilarity level shown in Figure 4. The most significant plants contributing to the characteristic identity of each group are shown in Appendix 2.7.

As expected the Dendrogram reveals an obvious distinction between dune and interdune sites in the Della Land System.

Group I, contains all dune sites and Group II all interdune sites. The separation between Groups II and III is due to differences in soil types. Group II is comprised of sites located in sandier interdunes whilst Group III sites are found in the heavier clay soils of some of the interdune swales. (Verified by reference to the physical site sheets initially completed for each of the sites. An example is shown in Appendix 6.5). This present situation would be carried to a greater resolution by the collection and inclusion of site soil data in the analysis.

Group IV shows the clear geographic separation between the Della and Marqualpie sites.

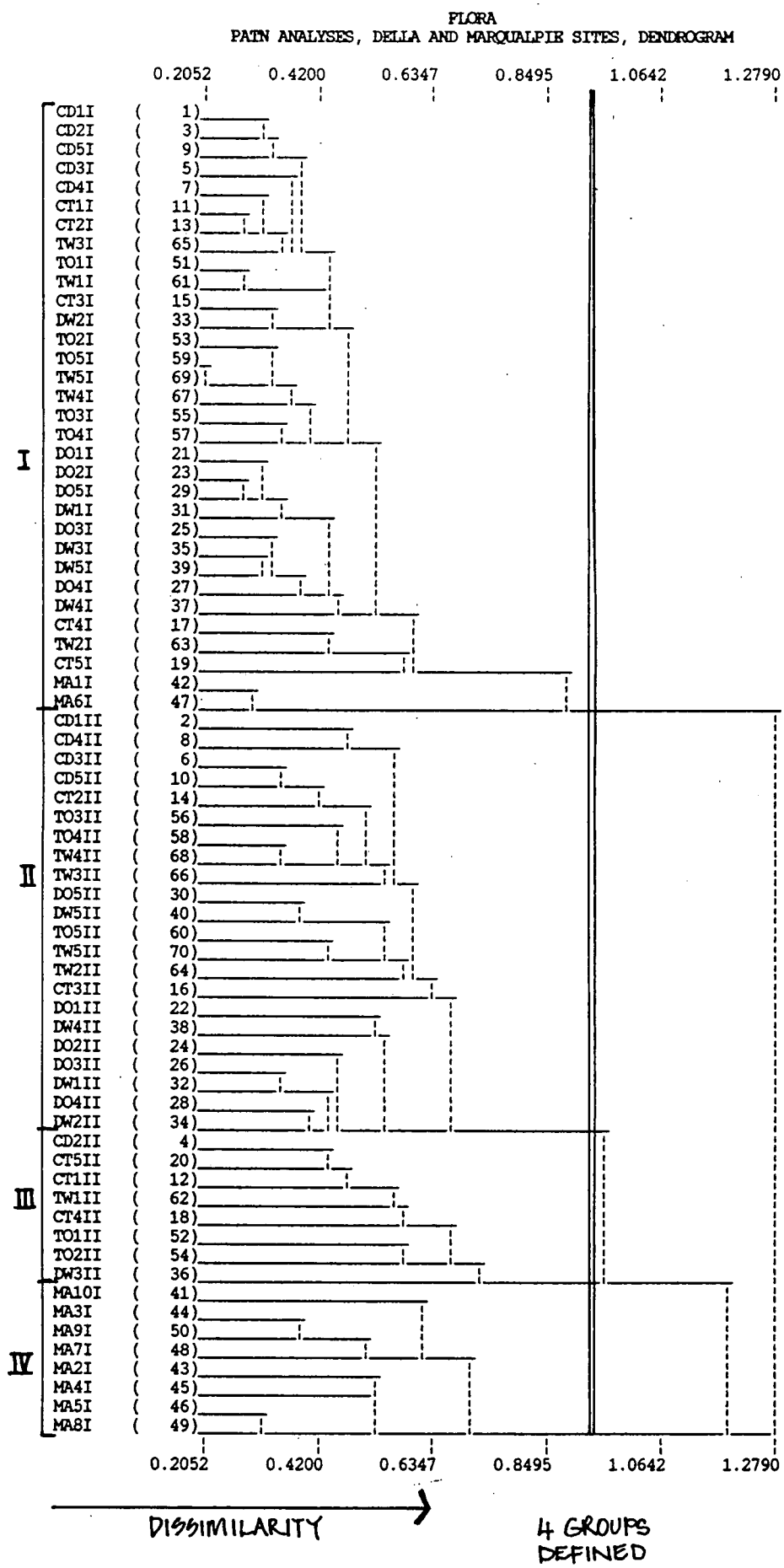

FLORA
PATN ANALYSES, DELTA AND MARQUALPIE SITES, DENDROGRAM
0.2052
0.4200
0.6347
0.8495
1.0642
1.2790
CD1I (1)
CD2I (3)
CD5I (9)
CD3I (5)
CD4I (7)
CT1I (11)
CT2I (13)
TW3I (65)
TO1I (51)
TW1I (61)
CT3I (15)
DW2I (33)
TO2I (53)
TO5I (59)
TW5I (69)
TW4I (67)
TO3I (55)
TO4I (57)
DO1I (21)
DO2I (23)
DO5I (29)
DW1I (31)
DO3I (25)
DW3I (35)
DW5I (39)
DO4I (27)
DW4I (37)
CT4I (17)
TW2I (63)
CT5I (19)
MA1I (42)
MA6I (47)
CD1II (2)
CD4II (8)
CD3II (6)
CD5II (10)
CT2II (14)
TO3II (56)
TO4II (58)
TW4II (68)
TW3II (66)
DO5II (30)
DW5II (40)
TO5II (60)
TW5II (70)
TW2II (64)
CT3II (16)
DO1II (22)
DW4II (38)
DO2II (24)
DO3II (26)
DW1II (32)
DO4II (28)
DW2II (34)
CD2II (4)
CT5II (20)
CT1II (12)
TW1II (62)
CT4II (18)
TO1II (52)
TO2II (54)
DW3II (36)
MA10I (41)
MA3I (44)
MA9I (50)
MA7I (48)
MA2I (43)
MA4I (45)
MA5I (46)
MA8I (49)
I
II
III
IV
0.2052
0.4200
0.6347
0.8495
1.0642
1.2790
DISSIMILARITY
4 GROUPS DEFINED

FIGURE 4

On closer examination of Group I, it is interesting to note that there are clear sub-groups composed of sites within close proximity to each other. Sites in the Control, Toolachee and Dullingari study areas respectively, cluster together. This suggests the presence of a subtle geographic gradient from Toolachee in the south to Dullingari in the north. Whilst this gradient appears evident in the floral analysis, there is no such corresponding pattern in the faunal analysis within the **Della Land System**.

Within groups II and III, comprising the interdune sites, there is a greater degree of mixing of sites, albeit slight, and again there appears to be a separation into sub-groups based on study area.

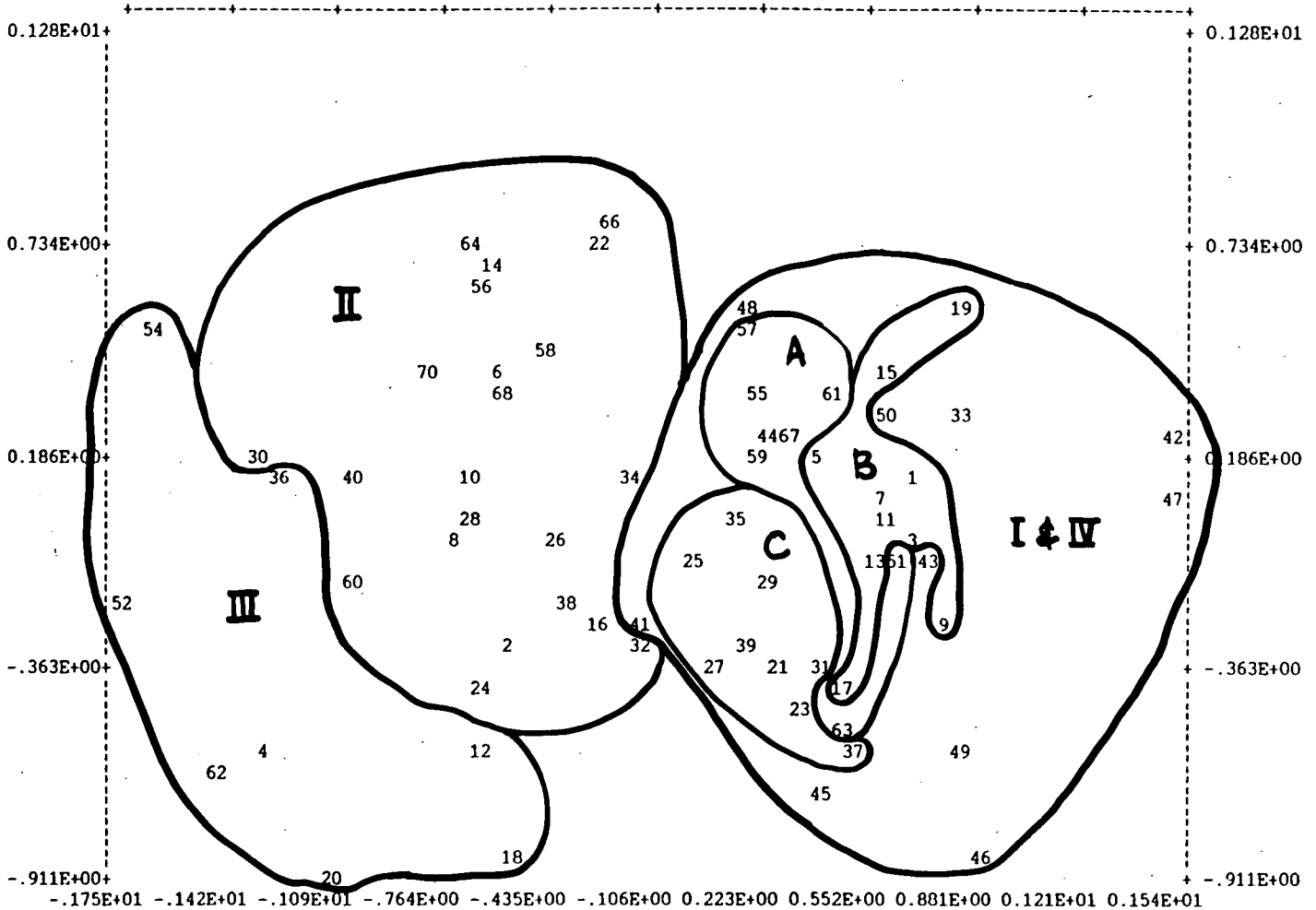
Within Group IV, the group composed solely of Marqualpie sites, at a lower dissimilarity level there is a separation of sites into two main sub-groups that appear to be distinguished by soil type, sites on sandy plain soils separating from those on heavier interdune soils. The two Marqualpie dune sites 1 and 6 are included in Group I revealing the similarity of the dune flora of both Della and Marqualpie Land Systems.

In the reptile analysis discussed later in the report, (conducted only on Della sites), the Group II reptile assemblage corresponds closely with the dune site plants of Group 1 of the floristic analysis. The interdune sites of Group II & III of the floristic analysis correspond with the reptile assemblage of Group II in the reptile analysis.

3.2.2.3 ORDINATION

The Scattergram reveals the ordination of groups (Figure 5) based on the four groups identified from the Dendrogram. The ordination allows the validity of groups defined by the Dendrogram to be assessed in terms of gradational parameters. In this instance the clusters shown in the ordination are by no means discrete. This finding is evidence of a degree of site difference within groups. There is an obvious gradation from the dune vegetation of Group I through the sandy interdune vegetation of Group II, to the vegetation found on the heavier clay interdune soils represented by Group III.

Significantly, Group IV, the Marqualpie sites, have been "superimposed" upon Group I, indicating the similarity of the vegetation of all the Marqualpie sites (on sandy swales, interdunes and dunes) to vegetation of the Della Land System dune sites. A winter assessment of the Marqualpie sites is suggested to help clarify the above situation.



A = Toolachee sites
B = Control sites
C = Dullingari sites

FIGURE 5

Within groups, as shown in Figure 5, the sub-groups referred to in the Dendrogram appear quite clearly as separate clusters. For example, in Group I there is a separation of Dune sites into three sub-groups associated with the Toolachee, Control and Dullingari areas respectively. This separation could reflect the effect of the North, South geographic gradient from Dullingari to Toolachee. However, another possible source is the effect of localised rainfall, resulting in subtle differences in the species composition encountered during survey periods in each of the areas. This effect of localised rain was very evident in the most recent assessment (January 1990). The Toolachee area received a greater amount of rain than the Control and Dullingari areas and this was directly reflected in the greater variety of new growth observed in the Toolachee area. These stochastic events would even out over time given several re-assessments.

3.3 SMALL GROUND MAMMALS

3.3.1 General

Combining the trapping results for July 1988, January 1989 and January 1990, a total of 7 species of small ground mammals were recorded, 6 of these species were collected in the Della Land System, whilst the Marqualpie Land System recorded 4 species, one of which, *Ningaui* sp. aff. *ridei,* was collected from this area only (Appendix 5.1.1). *Pseudomys hermannsburgensis,* the sandy inland mouse, proved to be the most common mammal trapped during all assessments despite the ubiquitous nature of the introduced house mouse, *Mus musculus.* Whilst these two species were found in a relatively broad range of, preferably, sandy habitats, (Appendix 3.3), most of the other mammals were more specific in habitat requirements within the Della Land System more specifically selecting the heavier clay interdune areas with perennial tussocks grasses (*Eragrostis* spp).

These interdune sites also recorded the highest species richness, in particular those in the Toolachee study area (Table A, Appendix 3.2). The pooling of capture data for January 1989 and January 1990, revealed that the sites with the poorest richness and diversity were most likely to be found in the Control area. However, as discussed in more detail later in the report (Section 3.7) this was thought to be an artefact of the sampling procedure where during both assessments cooler temperatures predominated during the trapping periods in these areas.

A number of the native species captured are highly significant and are discussed in more detail below. Overall, poor species diversity was experienced during the programme and hence quantitative data are limited. A complete set of raw data showing all captures for all assessment period is contained in Appendix 5B.

The situation as it relates to small ground mammals encountered during the programme emulates that expressed in the following statement:

> "The hummock grasslands support the world's richest lizard fauna (Pianka 1969). Some lizard species occupying niches that are otherwise filled by mammals in the desert regions of other countries. In contrast they have a low numbers of mammal and bird species" (Pianka, 1979).
>
> An interesting observation is that of the 6 native species captured 4 are insectivorous dasyurids supporting the thesis that ... "insectivorous mammals seem to have radiated in concert with lizards although nowhere near as dramatically" (Morton and James, p.243, 1988).

3.3.2 Significant Species

3.2.2.1 THE DELLA LAND SYSTEM

The narrow nosed planigale, *Planigale tenuirostris,* was captured during January 1989 and January 1990 in the Toolachee area. During the Coongie Lakes Study (Reid and Gillen 1988) the species was found to prefer floodplain, lake shore and channel edge habitats usually with cracking clay soils, and their capture represented the first records in the Cooper Creek region of South Australia. The first individual encountered during this programme was captured, unusually, at a dune site, in reality a transition site between interdune and dune proper. However, the second individual was more characteristically found in hummock grasses (*Eragrostis* spp) on the heavier soils of an interdune site. *Planigale tenuirostris* is considered to be rare in the Cooper Basin region (ERPG 1980) so these captures in the Della Land System represent significant local range extensions.

All captures of Forrest's mouse, *Leggadina forresti* were restricted to interdune trap sites, again with heavier soils and perennial tussock grasses (*Eragrostis species*). This species is also considered rare in the wider region (Mollenmans *et al,* 1984, Reid and Gillen 1988) and is classified as rare in the State (Kemper 1985).

Both *Sminthopsis crassicaudata* and *Sminthopsis macroura* were captured mainly from interdune sites and from all three study areas in the Della Land System.

The sandy inland mouse, *Pseudomys hermannsburgensis,* has a wide distribution over much of the arid and semiarid zones of central, southern and western Australia, found on both sandy and heavier soils (Strahan 1983). As mentioned earlier, it was the most common species recorded during the programme found scattered between dune and interdune sites across all study areas in the Della Land System.

3.3.2.2 THE MARQUALPIE LAND SYSTEM

The most significant capture from this study area was a juvenile *Ningaui* sp. aff. *ridei,* from a dune site with scattered clumps of spinifex. Spinifex communities are recognised as the preferred habitat for this genus. Captures of this species during the Coongie Lakes survey (Reid and Gillen 1988) were the first records from South Australia's north-east region, the species is classified as rare in this State (Kemper 1985).

The other three species from this area *Mus musculus, Sminthopsis macroura* and *Pseudomys hermannsburgensis* were found in very low numbers in January 1989. The only mammal recorded during January 1990 was *Pseudomys hermannsburgensis.* However, unlike the three trapping nights adopted in 1989, due to extenuating circumstances only two nights trapping were conducted in 1990, so additional species may have been recorded.

3.3.3 PATN Analyses

3.3.3.1 INTRODUCTION

As the main objective of the programme was to examine the possible impact of production activities on the fauna, only sites with the Della Land System were included in the faunal analysis. Data from the July 1988 and January 1989 assessments were pooled. Due to the low numbers of individuals and species trapped, the results of the analyses, whilst useful should be viewed with caution. With such a small pool of species multivariate analysis is not conducive to a clear picture. This situation will clarify over time as each subsequent assessment contributes additional numbers to be pooled for analysis. Usually when conducting such analysis it is accepted practice to exclude sites recording only one capture or a single species as their inclusion usually contributes "noise", exaggerating the contribution of these sites to the results of the overall analysis. However, given the poor capture rates of mammals during the programme it was

deemed that the inclusion of these single occurrences was warranted even if only to produce a tentative picture. In the Della Land System, the basic pattern of mammal species richness is one of species poor assemblages over most of the area.

The PATN analysis was run twice on the data. Initially the analysis included the house mouse, *Mus musculus.* The subsequently re-run however excluded this introduced species to concentrate on the patterns of native mammal assemblages in the area.

3.3.3.2 THE DENDROGAM

3.3.3.2.1 Including *Mus musculus*

At the dissimilarity level shown in Figure 6, five groups, or mammal assemblages were revealed. The assemblages contributing to these groups and their most significant species are shown in Appendix 3.5.

Group I, is comprised solely of dune sites containing only the house mouse *Mus musculus.* This ubiquitous species is also a contributing member of the assemblages of Group II and to a lesser extent of Group III. Group II, in which *Sminthopsis crassicaudata,* is the most significant character species was composed mainly of interdune sites across the three study area.

Group III is distinguished by the sandy inland mouse, *Pseudomys hermannsburgensis,* and appears to represent a transition group between dune and interdune habitats.

Group IV, of only four sites, reveals the preference of *Leggadina forresti* for the *Eragrostis* spp., tussock grasslands found on the heavier soils of certain interdune sites.

Group V, again composed of mainly interdune sites, is dominated by *Sminthopsis macroura.*

Within and among those groups identified from the Dendrogram there is a general mixing of sites indicting, albeit at a subjective level, no obvious differences in mammal assemblages of well versus off-well sites.

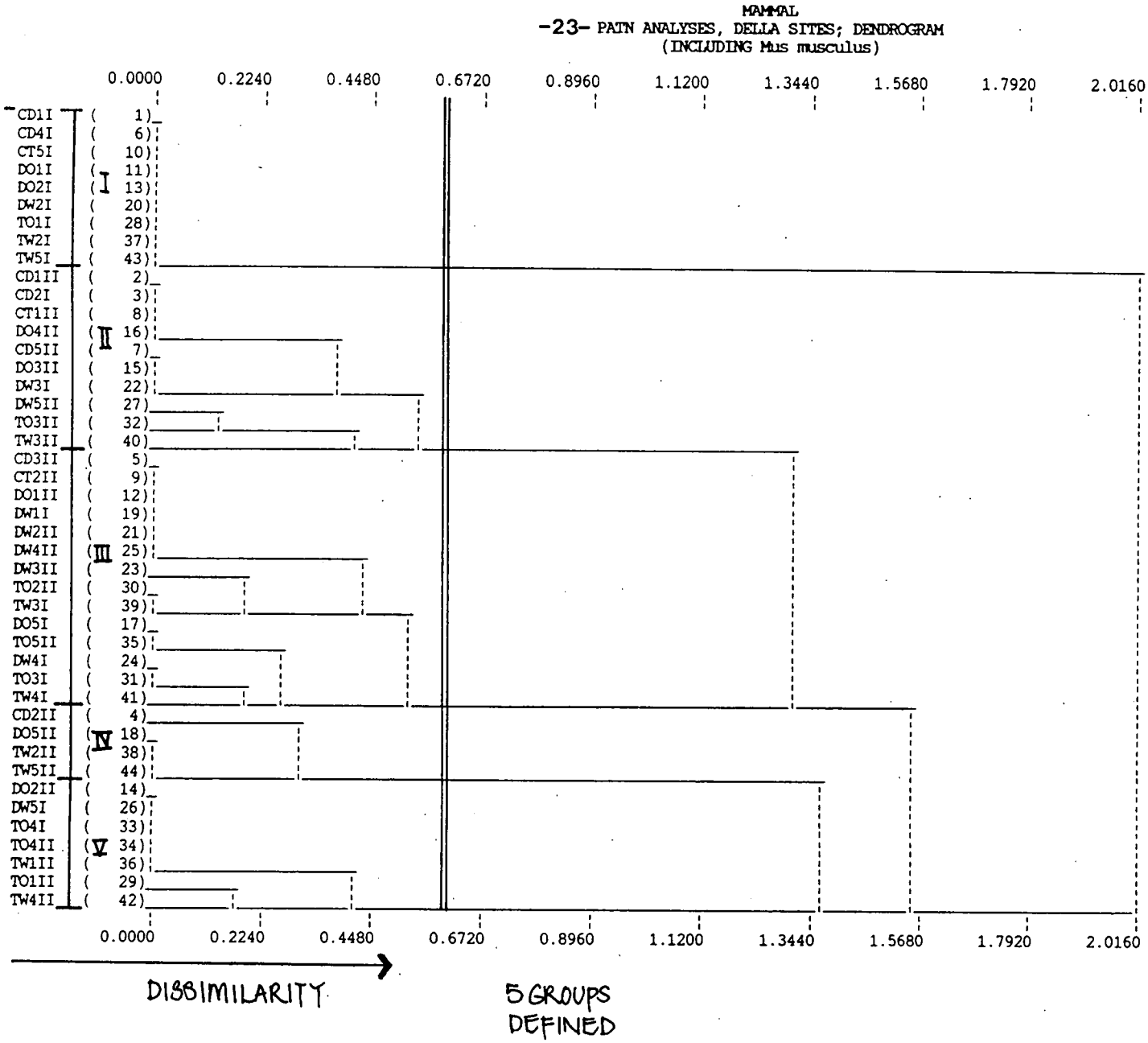

MAMMAL
-23- PATN ANALYSES, DELLA SITES; DENDROGRAM
(INCLUDING Mus musculus)
0.0000
0.2240
0.4480
0.6720
0.8960
1.1200
1.3440
1.5680
1.7920
2.0160
CD1I (1)
CD4I (6)
CT5I (10)
DO1I (11)
DO2I (13)
DW2I (20)
TO1I (28)
TW2I (37)
TW5I (43)
CD1II (2)
CD2I (3)
CT1II (8)
DO4II (16)
CD5II (7)
DO3II (15)
DW3I (22)
DW5II (27)
TO3II (32)
TW3II (40)
CD3II (5)
CT2II (9)
DO1II (12)
DW1I (19)
DW2II (21)
DW4II (25)
DW3II (23)
TO2II (30)
TW3I (39)
DO5I (17)
TO5II (35)
DW4I (24)
TO3I (31)
TW4I (41)
CD2II (4)
DO5II (18)
TW2II (38)
TW5II (44)
DO2II (14)
DW5I (26)
TO4I (33)
TO4II (34)
TW1II (36)
TO1II (29)
TW4II (42)
I
II
III
IV
V
DISSIMILARITY
5 GROUPS DEFINED

FIGURE 6

3.3.3.2.2 Excluding *Mus musculus*

Excluding the house mouse from the analysis, it was envisaged that a more appropriate situation expressive of the native fauna and their assemblages would emerge. Certainly, including the house mouse revealed its dominance at dune sites and overall preference for sandier sites of some interdunes also preferred by some of the native species *(Pseudomys hermannsburgensis* in particular). Significantly, of the 33 sites recording captures of native mammals included in the analysis, 71% of these are interdune habitats. The Dendrogram generated, revealed the four groups at the dissimilarity level shown in Figure 7. The group assemblages and their most significant contributing species are shown in Appendix 3.7. *Pseudomys hermannsburgensis* is shown to contribute in some way to all of the groups, most significantly to Group IV, indicating its relatively widespread abundance across differing habitats and it's preference for the sandier sites. Group II, comprised solely of interdune sites, most with a mix of perennial grasses and forbs, reveals the significance of these habitats for *Leggandina forresti.*

Groups I and III have a mix of both interdune and dune sites, predominantly interdunes, and are characterized by *Sminthopsis crassicaudata* and *Sminthposis macroura* respectively, indicating a possible preference for the habitats which are a transition between dune and interdune (or sandy versus heavier clay soils).

3.3.3.3 THE ORDINATION

3.3.3.3.1 Including *Mus musculus*

Figure 8, reveals the ordination of the 5 groups identified from the Dendrogram (Figure 6). Appendix 3.5, shows the most significant mammal species characterizing each of these groups. The Scattergram can be tentatively interpreted as revealing a gradation from dune sites of Group I through transition Groups II and III which are sites found on more sandy interdune sites to those groups IV and V characterised by those species preferring the interdune areas of heavier cracking clays with mixed tussock grasses and forbs. The inclusion of *Mus musculus* in the analysis shows the preference of this species for sandy habitat clearly revealed by the discrete nature of Group I comprised solely of dune sites at which only *Mus musculus* were captured. However, *Mus musculus* also contributes to the assemblages of Groups II and III, possibly contributing to the lack of clear separation between these groups and also indicating its ubiquitous nature.

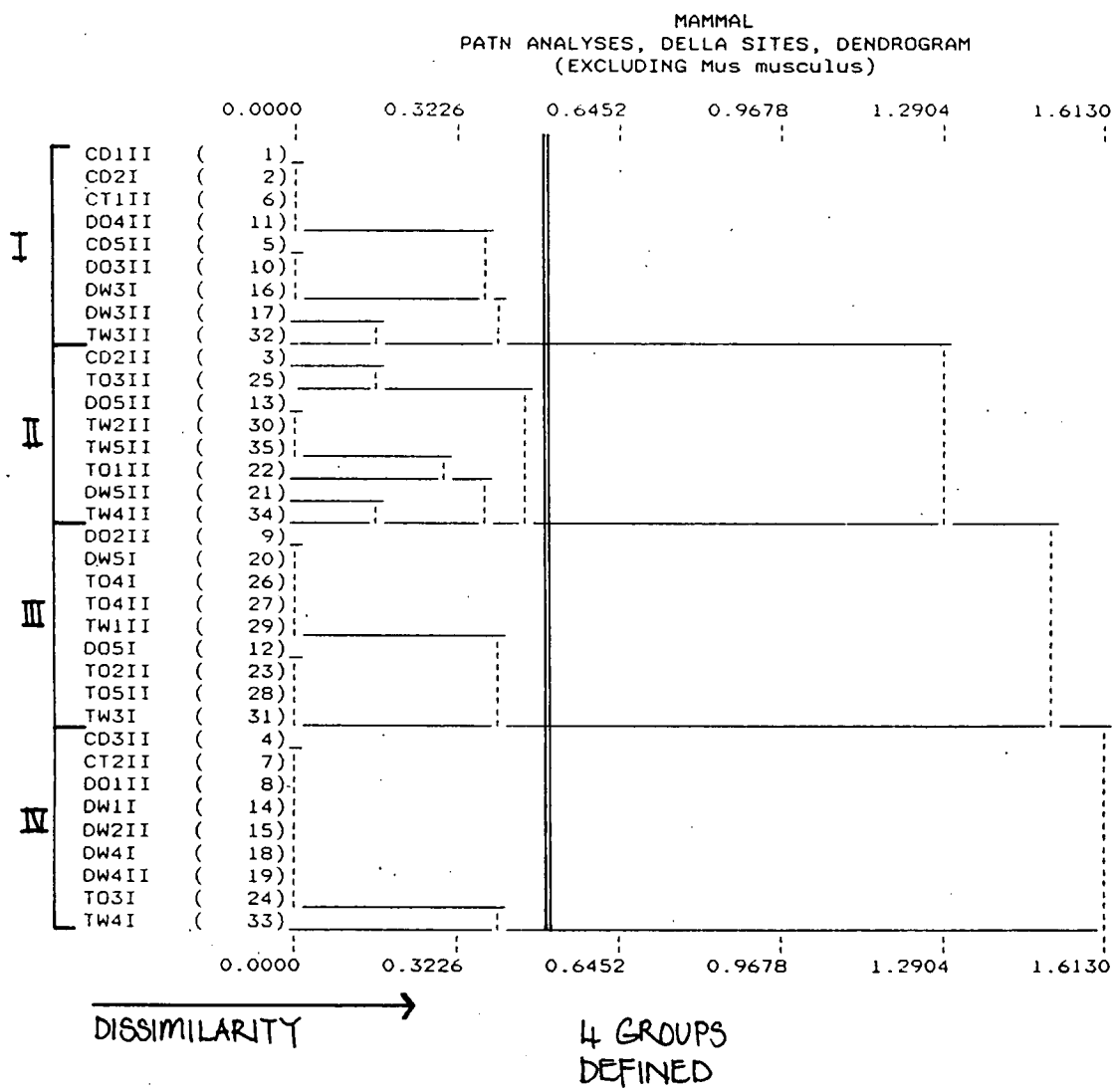

MAMMAL
PATN ANALYSES, DELLA SITES, DENDROGRAM
(EXCLUDING Mus musculus)
0.0000
0.3226
0.6452
0.9678
1.2904
1.6130
CD1II (1)
CD2I (2)
CT1II (6)
DO4II (11)
CD5II (5)
DO3II (10)
DW3I (16)
DW3II (17)
TW3II (32)
CD2II (3)
TO3II (25)
DO5II (13)
TW2II (30)
TW5II (35)
TO1II (22)
DW5II (21)
TW4II (34)
DO2II (9)
DW5I (20)
TO4I (26)
TO4II (27)
TW1II (29)
DO5I (12)
TO2II (23)
TO5II (28)
TW3I (31)
CD3II (4)
CT2II (7)
DO1II (8)
DW1I (14)
DW2II (15)
DW4I (18)
DW4II (19)
TO3I (24)
TW4I (33)
I
II
III
IV
DISSIMILARITY
4 GROUPS DEFINED

FIGURE 7

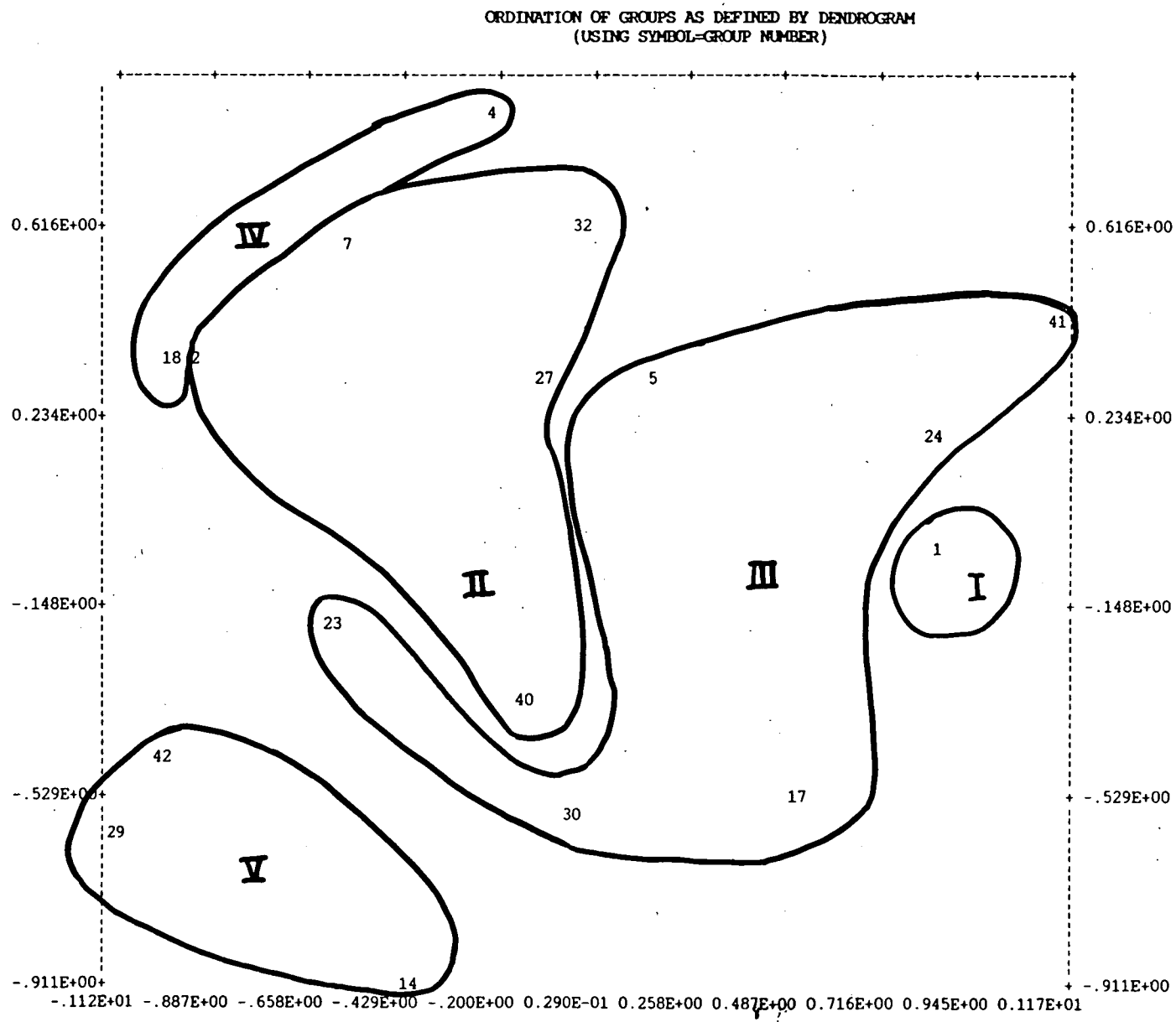

ORDINATION OF GROUPS AS DEFINED BY DENDROGRAM
(USING SYMBOL=GROUP NUMBER)
0.616E+00
0.234E+00
-.148E+00
-.529E+00
-.911E+00
-.112E+01 -.887E+00 -.658E+00 -.429E+00 -.200E+00 0.290E-01 0.258E+00 0.487E+00 0.716E+00 0.945E+00 0.117E+01
I
II
III
IV
V
4
7
32
41
18
2
27
5
24
1
23
40
42
17
30
29
14

FIGURE 8

3.3.3.3.2 Excluding *Mus musculus*

The ordination of the 4 groups identified from the Dendrogram (Figure 7) is shown in the Scattergram of Figure 9. In this instance there is a clear separation between groups although the individual clusters are not particularly discrete. Group II in particular is a good example of this and acts as an indication of the greater species diversity of interdune habitats. Although the most significant contributing species in this group is *Leggadina forresti,* three other species are shown belonging to this assemblage. Whilst *Leggadina forresti,* shows greater preference for the tussock grasslands on heavier interdune soils the other species, whilst occasionally found in these areas are more catholic in habitat preference, quite possibly contributing to the lack of discreteness of Group II on the Scattergram. The Scattergram shows the gradient between the interdune sites of Group II to the sandier dune and interdune sites of Group IV, for which *Pseudomys hermannsburgensis* is the character species. The two other groups, I & II, are more difficult to define, but are, as mentioned previously, most likely to represent those transitional assemblages between those found on heavier soils to those on sandier areas.

As stressed in the introduction the mammal analyses must be viewed with caution. Due to low capture rates and low numbers of species the results are rather distorted and more an artifact of the analyses than a realistic indication of species assemblages. Although mammal captures shall continue to be recorded during subsequent assessments it is proposed that the reptile fauna, due to their greater species diversity, are more amenable to future quantative analyses and are to be utilized as bio-indicators of possible impacts in the production areas.

3.4 REPTILES AND AMPHIBIANS

3.4.1 General

3.4.1.1 THE DELLA LAND SYSTEM

A total of 35 species of reptile and amphibian have been trapped or observed within the three study areas of the Della Land System, combining the data of the July 1988, January 1989 and January 1990 assessments. Most of these reptiles are represented in the photographs accompanying this report (plates 4 to 6). All data collected over the three assessment periods is contained in Appendix 5A. As referred to earlier in the report, the warm summer months and subsequent heightened biological activity facilitates the capture of a wider range of reptile species active in the area. From an initial 7

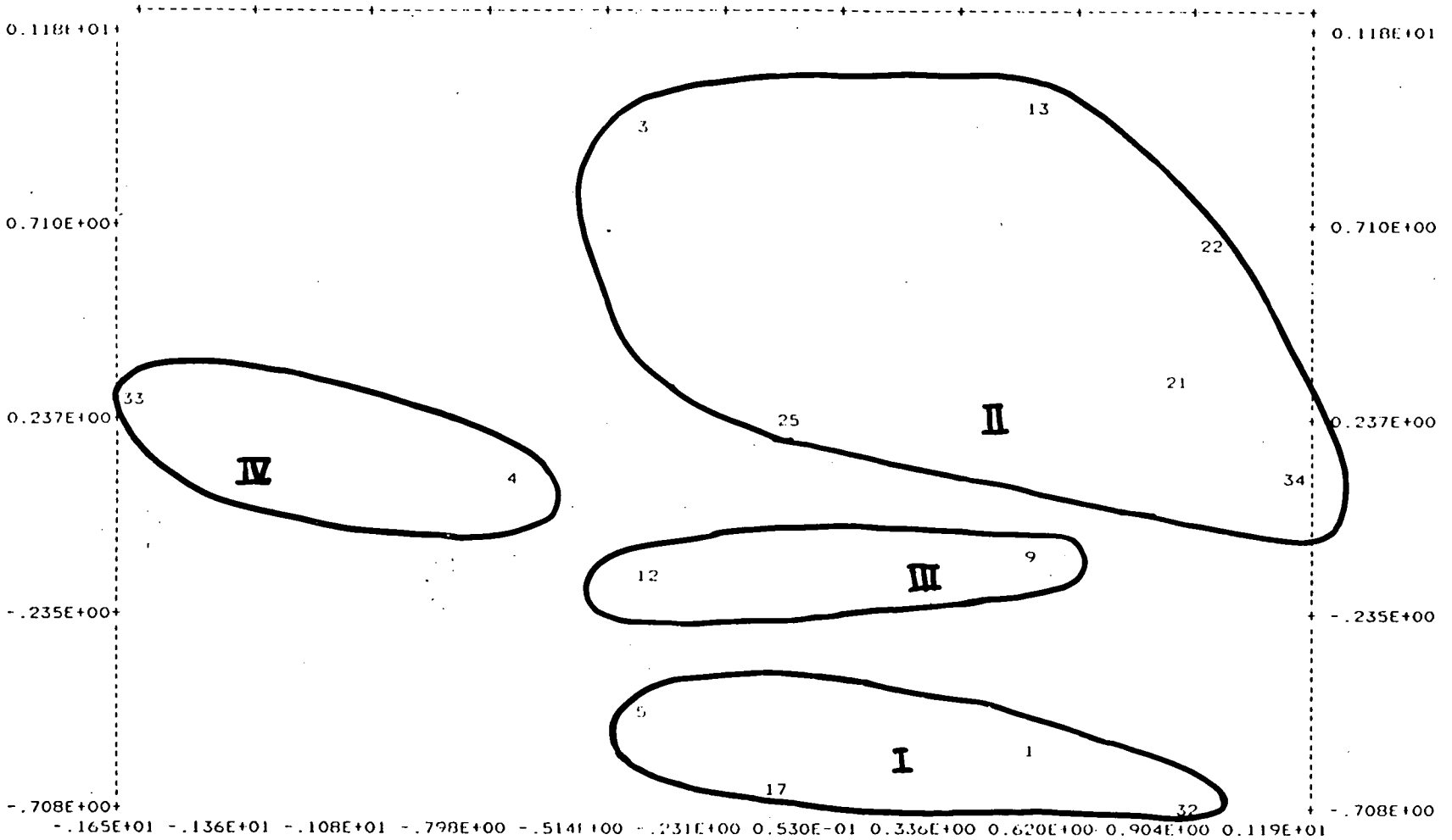

ORDINATION OF GROUPS AS DEFINED BY DENDROGRAM
(USING SEQUENCE NUMBER=SITE)
0.118E+01
0.710E+00
0.237E+00
-.235E+00
-.708E+00
3
13
22
21
25
33
34
4
12
9
5
1
17
32
I
II
III
IV
-.165E+01 -.136E+01 -.108E+01 -.798E+00 -.514E+00 -.231E+00 0.530E-01 0.336E+00 0.620E+00 0.904E+00 0.119E+01

FIGURE 9

species captured during winter 1988, the number of species encountered rose to 32 during the 1989 summer assessment. An additional three species, *Diplodactylus tessellatus, Lialis burtonis* (plate 6) and *Simpselops fasciolatus* (plate 6) were captured during the most recent assessment period.

The nature of this cumulative increase in species richness with continued assessment is presented diagrammatically in Figure 10. This figure represents the species distribution over the three study areas combining the results of the first two assessments. Figure 10B, represents the superimposition of the most recent results of January 1990 over those in Figure 10A. It can be seen from these figures, that the number of species common to all three study areas has risen from 15 to 26, a 73% increase. The figures also show the percentage increase in the species that have been found in the Della Land System to date. So not only are new species continuing to be found with each assessment but also a greater understanding of the distribution of species is evolving. Thus the programme is still basically at the stage of biological description, determining "what is where" and in what numbers (Figure 14). To further emphasize the aforementioned cumulative situation from consecutive assessments, recent faunal surveys at Ulura National Park, Northern Territory and Coongie Lakes, South Australia, have found that it requires at least 4 seasons of consecutive faunal assessments to produce a realistic knowledge of the species present and their distribution.

3.4.1.2 THE MARQUALPIE LAND SYSTEM

The two assessments, 1989 and 1990, have produced a total of 27 species of reptile and 1 amphibian captured or observed in this area. Adopting the same diagrammatic approach as described for the Della Land System, Figures 11 A&B, reflect the similarity and differences in species present in the Della and Marqualpie Land Systems and their cumulative increase with consecutive assessments. The biogeographic distinctiveness of the Marqualpie area is indicated by the collection of 8 reptile species not represented in the Della Land System reptile fauna.

3.4.1.3 SIGNIFICANT RECORDS

The biological significance of the Marqualpie area is emphasised by the following collections: (p.32)

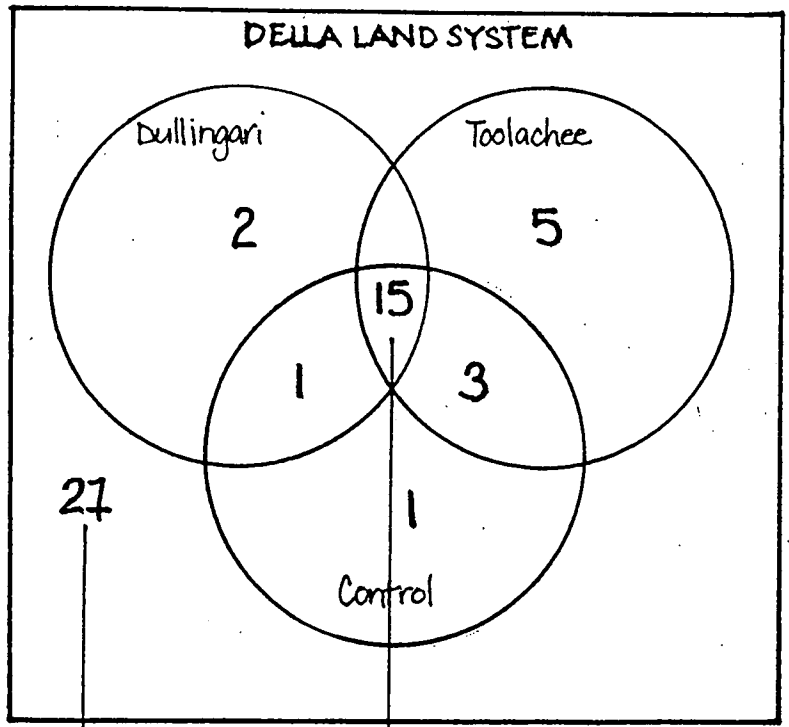


FIGURE A
1980+1989

+5 = 19% inc. in species found in Della Landsystem

+11spp = 73% inc. in species common to all study areas.

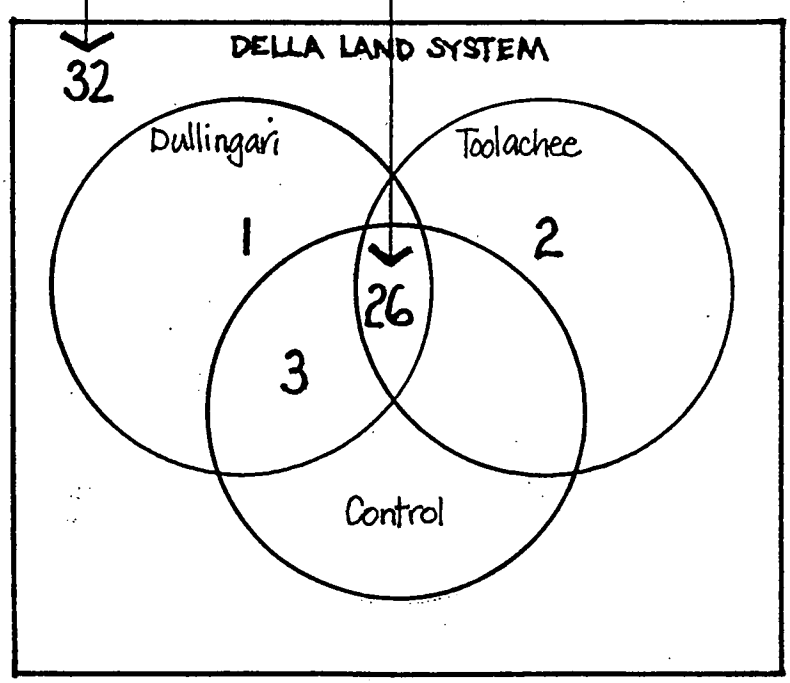


FIGURE B
1980+1989
+1990

FIGURE REPTILE SPECIES RICHNESS ACROSS STUDY AREAS IN DELLA LANDSYSTEM (Includes Captures and Observations)

FIGURE 10

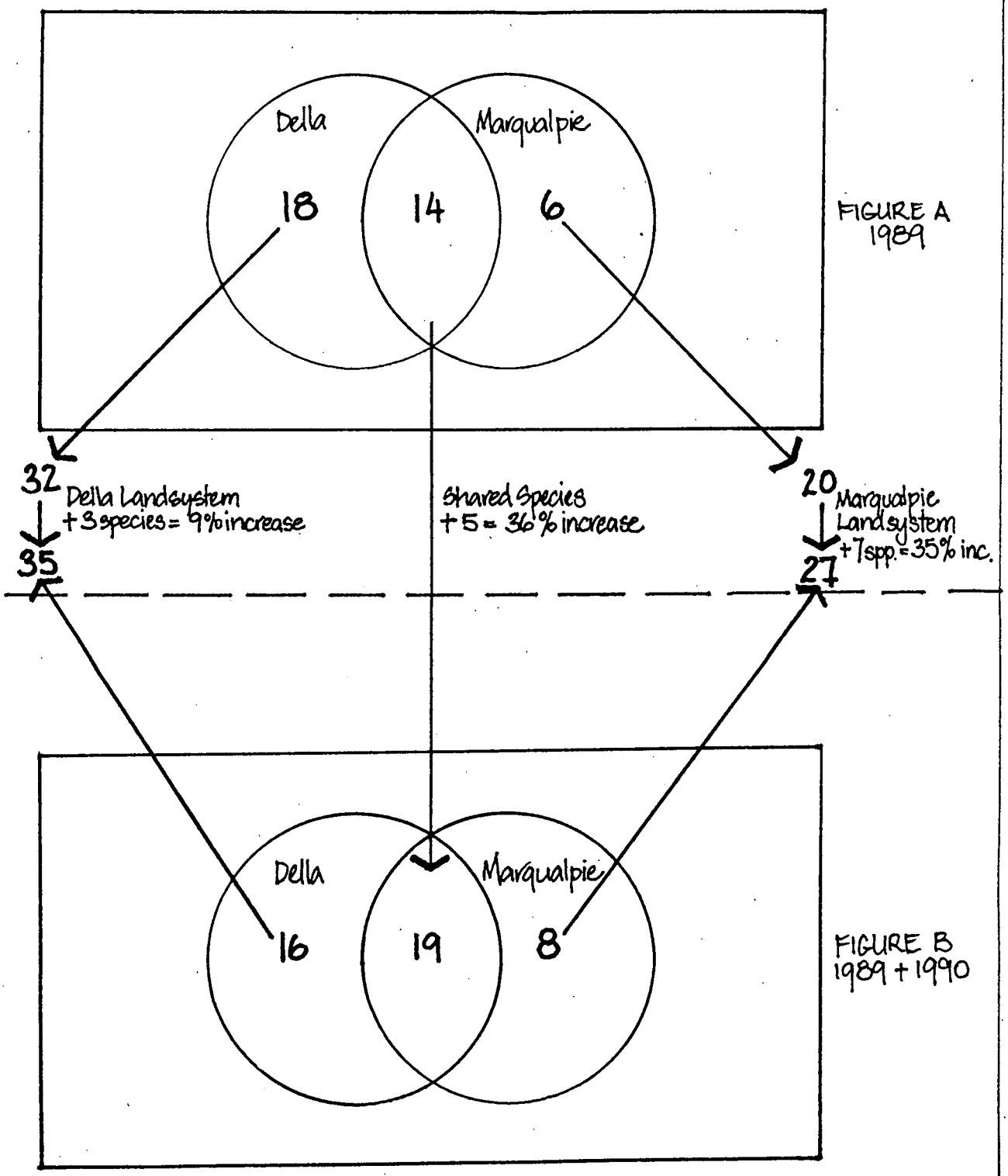


FIGURE REPTILE SPECIES RICHNESS
ACROSS DELLA AND MARQUALPIE LANDSYSTEMS
(Includes Captures and Observations)

FIGURE 11

1. *Ctenotus ariadne,* a new State record (plate 4).

2. *Ctenotus* aff. *robustus,* an un-described member of the *Ctenotus laseurii* group, *inornatus* sub-group.

3. *Varanus eremius,* a significant eastern range extension for the South Australian Museum Records (plate 6).

4. *Diplodactylus elderi,* a significant northern range extension (Northern Flinders Ranges) for the Museum records.

5. *Pygopus nigriceps,* significant collection for this area for Museum records (plate 6).

Among the more significant collections for the Della Land System are the following:

1. *Ctenophorous fordi,* significant northern extension for the Museum records (plate 5). This species was incorrectly identified as *Ctenophorous isolepis* in the 1988 report. *Ctenophorous isolepis* was found in the Marqualpie area (plate 5).

2. *Lialis burtonis,* last collected from this area in 1916 at Innamincka (plate 6).

3. *Ctenotus brachyonyx,* a significant northern range extension (plate 4).

4. *Ctenotus leonhardii,* a range extension for South Australia Museum records (plate 4).

5. *Delma haroldi,* a significant range extension and record for the Museum (plate 6).

During the July 1988 assessment and in the subsequent progress report mention was made of a *Ctenotus, "red strauchii".* Since then, the species has been positively identified and all previous reference to *Ctenotus "red strauchii",* (in Gillen & Reid 1988), need to be altered to *Ctenotus schomburgkii.*

3.4.2 PATN Analysis

3.4.2.1 INTRODUCTION

The analysis for the reptile fauna was performed excluding the Marqualpie data, examining only data collected from three study areas in the Della Land System. This was with the intention of determining whether PATN would possibly differentiate between assemblages recorded at well sites compared to those at offwell sites. The overall pattern to emerge however, was a clear separation of most of the 53 sites included in the analysis, into dune (14 sites) or interdune (15 sites) assemblages. Within each of these groups was a mixing of well and off-well sites suggesting little difference between the two based on the presence or absence of species used for the analysis. The remaining four groups identified from the analysis present a more complicated situation. However, the separation, or more realistic presentation, of assemblages should become clearer with the inclusion of the 1990 data, in a quantitative form, rather than this initial analysis based on presence or absence of species.

3.4.2.2. DENDROGRAM

At the dissimilarity level shows on Figure 12, six groups were identified, each group based on the similarity of species composition possessed by sites. Each group then, includes a number of sites for which an assemblage of reptiles has been identified. The most significant species contributing to these assemblages for each group are shown in Appendix 4.5.

The site composition of Groups II and V is quite distinctive. Group II is comprised of 14 dune sites, from across all three study areas possessing a distinctive assemblage of species most commonly encountered in dune habitats. Group V is comprised solely of interdune sites, possessing an assemblage of species with representatives such as, *Ctenophorus nuchalis* and *Diplodactylus byrnei,* typically found in interdune habitats.

Group II and V, include 29 of the 53 sites, or 55% of the sites included in the analysis, and are most likely to represent the typical dune and interdune assemblages found in the Della Land System. The other groups in the Dendrogram are more difficult to explain and groups like IV and VI with few members or sites, are more likely to be artefacts of the analysis, than realistic natural assemblages of species. Groups I and III both contain a mix of dune and interdune sites and their assemblages reflect this situation. Examining

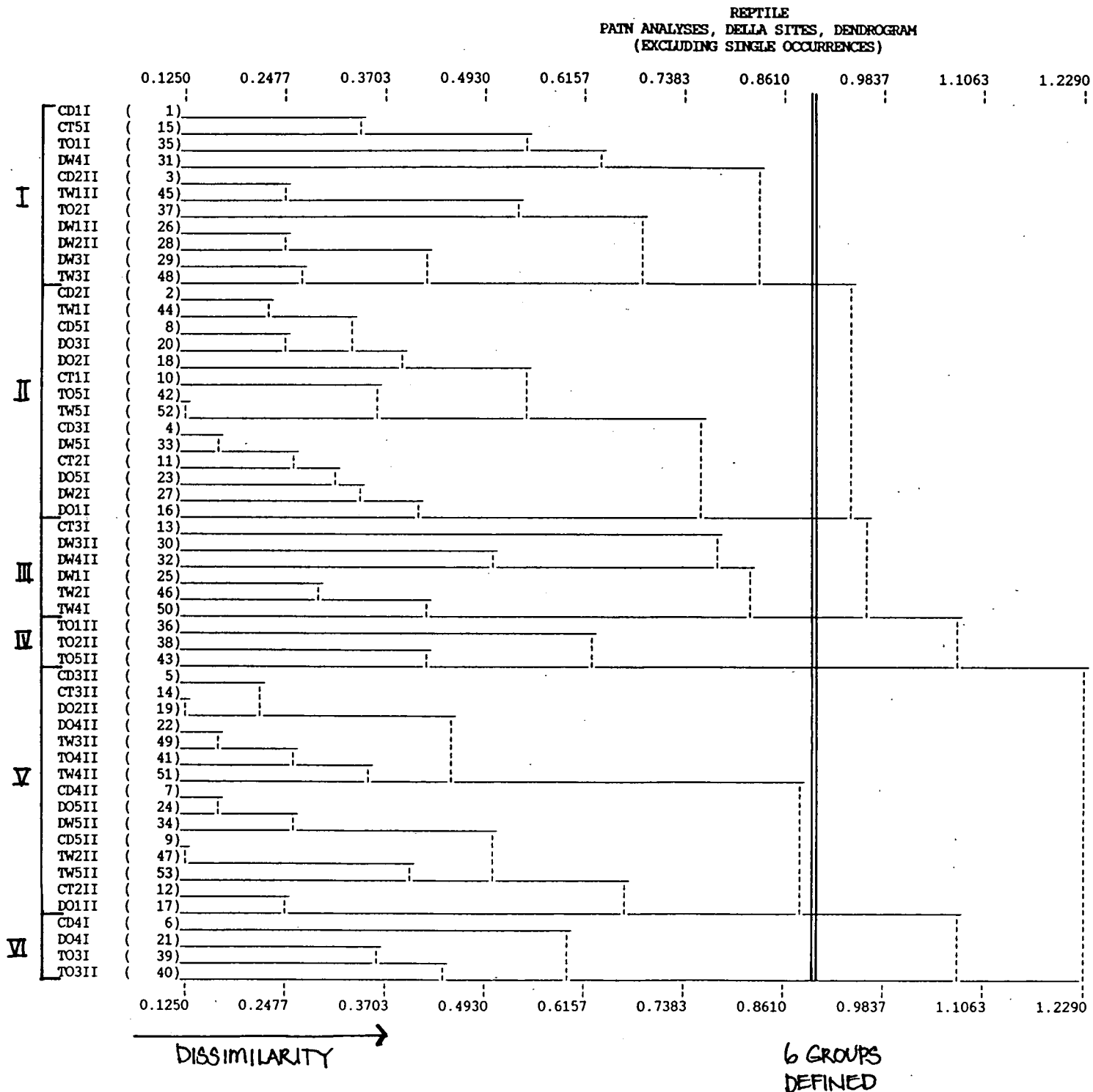

REPTILE
PATN ANALYSES, DELLA SITES, DENDROGRAM
(EXCLUDING SINGLE OCCURRENCES)
0.1250 0.2477 0.3703 0.4930 0.6157 0.7383 0.8610 0.9837 1.1063 1.2290
I
CD1I (1)
CT5I (15)
TO1I (35)
DW4I (31)
CD2II (3)
TW1II (45)
TO2I (37)
DW1II (26)
DW2II (28)
DW3I (29)
TW3I (48)
II
CD2I (2)
TW1I (44)
CD5I (8)
DO3I (20)
DO2I (18)
CT1I (10)
TO5I (42)
TW5I (52)
CD3I (4)
DW5I (33)
CT2I (11)
DO5I (23)
DW2I (27)
DO1I (16)
III
CT3I (13)
DW3II (30)
DW4II (32)
DW1I (25)
TW2I (46)
TW4I (50)
IV
TO1II (36)
TO2II (38)
TO5II (43)
V
CD3II (5)
CT3II (14)
DO2II (19)
DO4II (22)
TW3II (49)
TO4II (41)
TW4II (51)
CD4II (7)
DO5II (24)
DW5II (34)
CD5II (9)
TW2II (47)
TW5II (53)
CT2II (12)
DO1II (17)
VI
CD4I (6)
DO4I (21)
TO3I (39)
TO3II (40)
0.1250 0.2477 0.3703 0.4930 0.6157 0.7383 0.8610 0.9837 1.1063 1.2290
DISSIMILARITY
6 GROUPS DEFINED

FIGURE 12

the species composition of each of these groups it appears that Group I may reflect the transition between the more typical dune and interdune assemblages (of Groups II & V) whilst Group III contains species more likely to be found in the heavier clay soil interdune sites.

3.4.2.3 ORDINATION

The Scattergram (Figure 13), showing the ordination of the 6 groups identified from the Dendrogram (Figure 12), whilst complex, does show the two main Groups II & V as being relatively separate from each other. The fact that none of the Groups in the Scattergram are particularly discrete indicates the presence of a gradient operating to cause such spread. The Scattergram does reveal the gradient referred to in the previous section, from the interdune assemblage of Group V through the transition Group I to the dune assemblage of Group II. The overall impression of the analysis is the lack of clarity of degree of resolution of groups or assemblages as indicated by the contorted nature of the ordination. This indicates an inadequate data set at this stage which will be rectified by the inclusion of the data for January 1990 and subsequent assessments. The more reliable the knowledge of distribution and abundance of species the greater the clarity that will be revealed in the analysis.

3.5 COMPARISON OF WELL AND OFFWELL RESULTS

The greater numbers and species of reptiles captured during the programme make them the logical taxonomic group for quantitative analysis in examining the possible effects of oil/gas wells on the immediate fauna. Recently a statistical package has been developed which is compatible with the PATN analyses undertaken for this report. It is proposed that all data be pooled and investigated statistically to enable differences to be elucidated and to reveal whether these differences between well and offwell assemblages are statistically significant.

An examination of the data as it is summarised, in tabular form, in Appendix 7, does not appear to reveal major differences in the species, individuals and trapping success rates for reptile and mammal data recorded at well versus offwell sites. However, utilizing a measure of community similarity, treating well sites as one community and offwell sites as another, a simple technique called proportional similarity (Brower and Zar, p.161, 1984) provides a very basic indication of the possible extent of difference. Using the most recent data set for January 1990 and 1989, and taking into account the relative abundance of all reptile species captured at well and offwell sites the following table was produced (page 37).

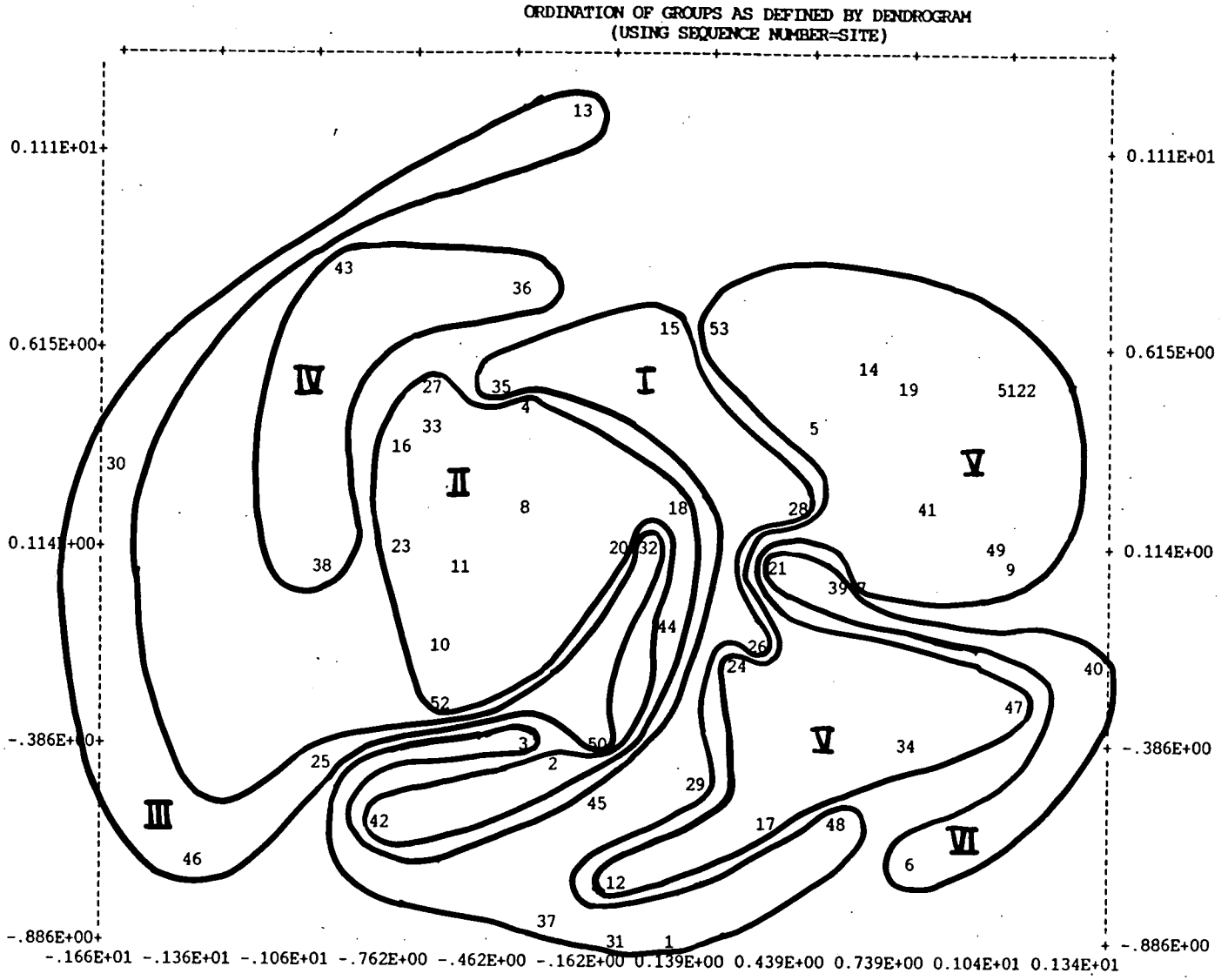

ORDINATION OF GROUPS AS DEFINED BY DENDROGRAM
(USING SEQUENCE NUMBER=SITE)
0.111E+01
0.615E+00
0.114E+00
-.386E+00
-.886E+00
-.166E+01 -.136E+01 -.106E+01 -.762E+00 -.462E+00 -.162E+00 0.139E+00 0.439E+00 0.739E+00 0.104E+01 0.134E+01
I
II
III
IV
V
VI

FIGURE 13

Proportional similarity between all well and offwell sites in the production areas examined

	1989	1990
Dullingari	69%	67%
Toolachee	57%	62%

Whilst supplying a simplified indication of subtle differences between the data set for all well sites versus all offwell sites for Toolachee and Dullingari, the approach does not enable any inference to be made concerning the degree of significance of these differences. Pooling all data collected to date and utilizing both PATN and its accompanying statistical package will clarify the present situation. The future inferences concerning well and offwell differences will become more reliable as future assessments provide both additional quantative data and a clear indication of species distributions and species assemblages.

3.6 TRAPPING SUCCESS

3.6.1 Pitfalling

The 1989 and 1990 trapping success rates are compared within Appendix 7.1, which also provides a summary of captures from all three study areas and habitat types. The July 1988 trapping success rates are contained within a prior report (Gillen and Reid, 1988).

Pitfalling effect is quantified as the number of pot nights, in other words the sum of all pots open over all nights trapped. Within the Della Land System, during 1989 and 1990, at all permanent sites, the pots remained open for three nights. As each area contained a total of 100 pots this represented a pitfalling effort of 300 pot nights in the Toolachee, Burke-Dullingari and Control areas. This represents a total of 900 pot nights in the Della Land System for 1989 and 1990. The winter establishment phase of 1988 allowed only two nights trapping and from a total of 600 pot night yielded 21 reptiles and 52 mammals, a 4% and 9% success rate respectively. This can be contrasted with the summer results to emphasize the heightened activity of reptiles during this

period. Combining the results for both summer assessments reveals that for a total of 1800 pot nights (900 from each year) 679 reptiles and 94 mammals were caught representing success rates of 37% and 5% respectively. During these summer assessments (Appendix 7.1), the success rates for reptiles, for each year, were higher in dune sites and for mammals were higher in the interdune sites.

The trapping success for the Marqualpie Land System is shown in Appendix 7.2. Once again the biological significance of the area is expressed, this time, in the form of higher success rates for reptiles than those achieved in the Della Land System. Combining the results of the two assessments conducted in this area reveals that for a total of 497 pot nights a success rate of 50% was obtained, emphasizing the species richness of this area.

The greater success rates achieved for the reptile fauna again indicates their obvious choice as future bio-indicators of disturbance in production fields.

3.6.2 Elliotts

During the most recent assessment phase of 1990, Elliott trapping was conducted contemporaneously with the pitfalling regime. Introducing additional traps of a different form, it was hoped, would contribute additional quantitative mammal data (supplementing the poor success rate from pitfalling) and possibly the collection of additional species not likely to be captured in pitfalls (for example, *Notomys* species). However, as shown in Appendices 7.1 & 7.2, the results obtained in both land systems do not warrant the continued inclusion of this form of trapping due to the extremely low return for the time and effort involved.

3.7 WEATHER EFFECTS

The effect of weather on the activity of small ground mammals and subsequent trapping success has been the subject of recent research in Australia. Read (1988) has found that his "Results indicate that weather has a strong influence on the trap success of small mammal studies in arid Australia" (p.139).

He also states that "Trapping periods of 4-5 days only may coincide with just one part of the weather cycle and consequently bias estimates of population size" (*ibid.* p.146).

Certainly, the effect of weather and trapping period stated above were observed during the programme. In both July 1988 and January 1989, different weather conditions prevailing during the assessment of the Control area sites, principally a drop in temperature (Appendix 7.3), resulted in lower capture rates for both mammals and reptiles. Toolachee and Dullingari study areas, on the other hand, were both assessed during similar weather conditions and similar results were obtained.

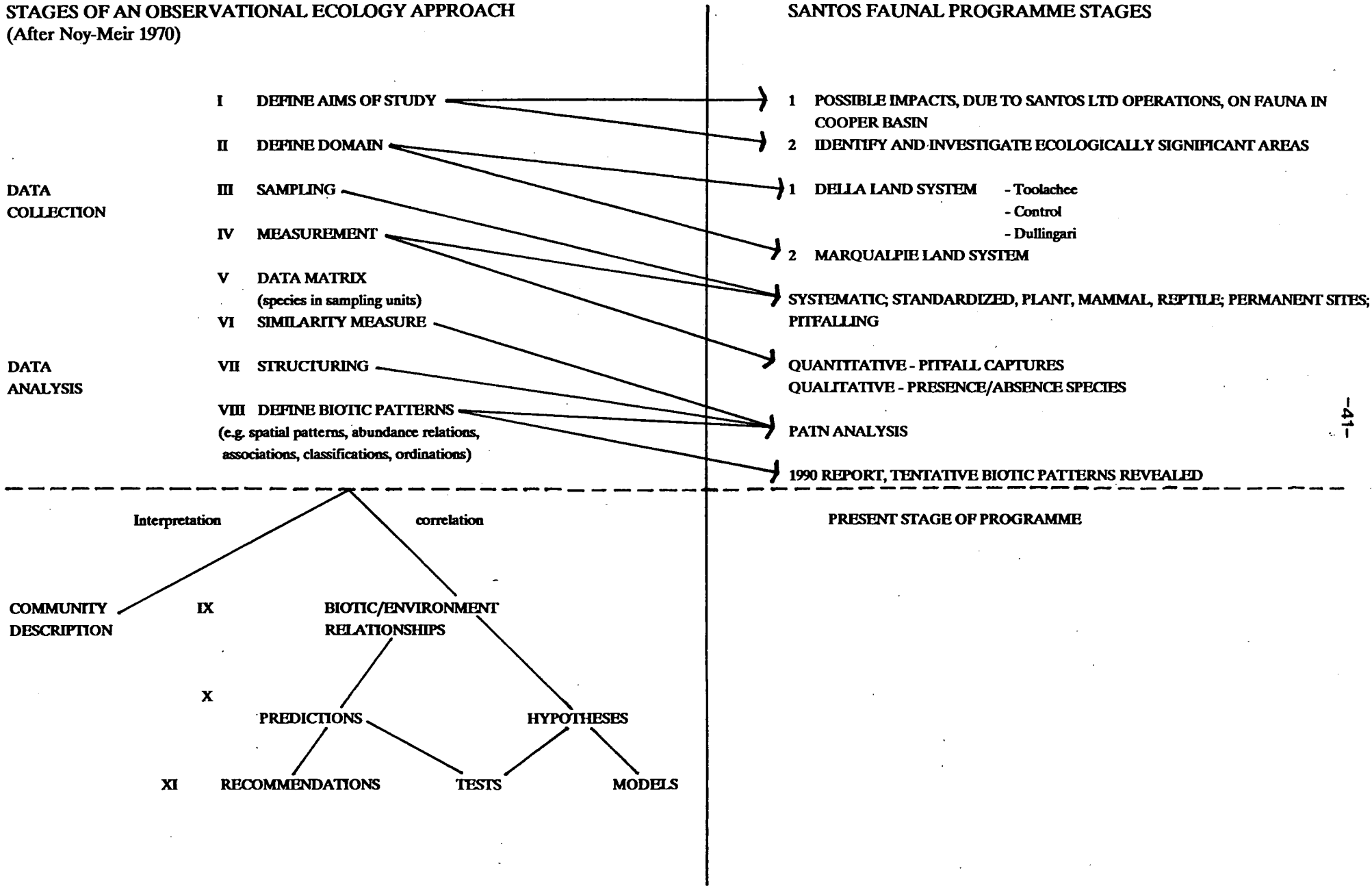
However, during the most recent assessment phase, even though again all three study areas were assessed separately, they all experienced very similar weather conditions. The results obtained for the Control area were on par with those recorded for the Toolachee and Dullingari areas.

Nights during which a higher relative humidity was recorded were seen to result in the heightened activity (and capture) of nocturnal species of reptile. These observations emphasize the need for contemporaneous sampling of the three study areas in the Della Land System. With contemporaneous trapping similar weather conditions would prevail across all sites and would reduce the element of "noise" related to weather conditions which currently complicates the understanding and comparison of faunal activity across the area.

4.0. CONCLUSIONS

The approach adopted for this programme has been similar to that represented in Figure 14, which diagrammatically reveals the steps of an observational ecological survey (Ludwig and Reynolds, p.5, 19). Juxtaposed with this model are the series of equivalent steps taken during the monitoring programme of this report. As indicated, the aims of the programme have been elucidated, the study areas defined, both qualitative and quantitative data collected and subsequently pooled and analysed for each of the taxonomic groups examined over the two assessment periods of July 1988 and January 1989. The results of this initial analysis, using numerical classification techniques, whilst generating realistic assemblages for the flora has produced rather confused and distorted details of the faunal assemblages. This indicates clearly, that the Della and Marqualpie Land System Faunal Monitoring Programme has yet to progress beyond the stage indicated in Figure 14. The programme is still at the stage of defining biotic patterns and until these are clearly understood it would be premature to examine too closely the differences in assemblages between well and offwell sites. The most recent data collected during January 1990, will, when pooled and analysed with the existing data set, contribute to a clearer indication of biotic patterns. Based on recent research, at least four seasons of assessment are necessary for a reliable understanding of the biota of arid areas. This need has been clearly indicated in Section 3.4.1.1. of this report, which shows the number of species now found to occur across all three study areas in the Della Land System to have risen form 15 to 26 species, a 73% increase in distribution with the most recent assessment. Even at the level of each individual site, the most recent data shows that knowledge of the species composition has been increased by an average of 59% at each site.

At least two additional assessments need to be conducted to even out the effects of stochastic events such as localised rainfall, temperature and relative humidity and individual site characteristics. However, as recommended later in this report, these effects would be minimized if future assessments were carried out contemporaneously at all study areas in the Della Land System.


STAGES OF AN OBSERVATIONAL ECOLOGY APPROACH
(After Noy-Meir 1970)
SANTOS FAUNAL PROGRAMME STAGES
I DEFINE AIMS OF STUDY
II DEFINE DOMAIN
DATA COLLECTION
III SAMPLING
IV MEASUREMENT
V DATA MATRIX
(species in sampling units)
VI SIMILARITY MEASURE
DATA ANALYSIS
VII STRUCTURING
VIII DEFINE BIOTIC PATTERNS
(e.g. spatial patterns, abundance relations, associations, classifications, ordinations)
1 POSSIBLE IMPACTS, DUE TO SANTOS LTD OPERATIONS, ON FAUNA IN COOPER BASIN
2 IDENTIFY AND INVESTIGATE ECOLOGICALLY SIGNIFICANT AREAS
1 DELLA LAND SYSTEM - Toolachee
- Control
- Dullingari
2 MARQUALPIE LAND SYSTEM
SYSTEMATIC; STANDARDIZED, PLANT, MAMMAL, REPTILE; PERMANENT SITES; PITFALLING
QUANITITATIVE - PITFALL CAPTURES
QUALITATIVE - PRESENCE/ABSENCE SPECIES
PATN ANALYSIS
1990 REPORT, TENTATIVE BIOTIC PATTERNS REVEALED
Interpretation
correlation
PRESENT STAGE OF PROGRAMME
COMMUNITY DESCRIPTION
IX
BIOTIC/ENVIRONMENT RELATIONSHIPS
X
PREDICTIONS
HYPOTHESES
XI
RECOMMENDATIONS
TESTS
MODELS

The analyses conducted to date have been based on the presence or absence of species at sites. Future assessments providing additional quantitative data will contribute to a future quantitative approach to analyses. Considering the greater species diversity of reptiles in the study area, this taxon is the more logical choice for the eventual quantitative investigation of possible differences between well and offwell sites.

At this stage in the programme it cannot be stated with any certainty that no difference exists between assemblages found at well and offwell sites. A subjective examination of the capture summary (Appendix 7.1), seems to imply little difference. Yet, as discussed in Section 3.5, using a simple measure of proportionality does reveal a degree of difference. In order to further clarify and compliment the future PATN analyses, all well and offwell data, within sites, between sites in the same production fields should be subject to statistical investigation to determine the significance of any differences, subtle or otherwise.

The significance of the scientific contribution that this programme has provided in increasing the biological knowledge of the north-east of South Australia cannot be overemphasized. The work conducted thus far has revealed significant range extensions for certain species of both flora and fauna. The discovery of an undescribed species of *Ctenotus,* along with distinctive reptile assemblages, has served to dramatically emphasize the biogeographical uniqueness of the Marqualpie Land System.

Viewing the programme in its entirety, very few such biological monitoring programmes conducted over several seasons have been established elsewhere in arid Australia. There is no doubt that the quantitative results being achieved are of international significance in contributing to an understanding of the patterns and processes of arid ecosystems of the world.

5.0 RECOMMENDATIONS

5.1 ANALYSIS REQUIREMENTS

5.1.1 Pattern Analysis

A major priority should be given to the inclusion of the January 1990 data into the existing data set and the subsequent re-analysis incorporating all three assessment phases conducted thus far. Rather than using presence or absence it is proposed that the analysis be quantitative concentrating on the greater species diversity of the reptile taxon. All data has been entered into the National Parks and Wildlife Research Section data base, analysis procedures have been established and any subsequent analysis could be conducted efficiently.

5.1.2 Statistical Analysis

It is proposed that all pooled data from all assessments, current and future, pertaining to the well and offwell sites in production areas, be subject to statistical investigation. This could be achieved in conjunction with the recommendation above, as a statistical package that is compatible with the PATN analysis is currently available.

5.2 FUTURE ASSESSMENT PROPOSALS

5.2.1 Short Term

Recommendations:

- that all existing permanent sites have their soils sampled and assessed and this data included in any future analysis enabling a clearer indication of gradients affecting the biota;

- that all existing permanent sites have permanent vegetation transects established to provide quantitative data in assessing habitat change over time;

- that at least two to three additional assessments of all Della and Marqualpie Land System sites be conducted. As stated in the report it has been shown that a minimum of four assessments are required in the arid zone for a reliable indication of a study area's biota;

- that permanent monitoring points be established within the ecologically significant Merninie Land System (Figure 1) of gibber landforms; and

- to achieve the above the following programme is proposed:

September 1990:	Della and Marqualpie Land System sites to be reassessed.
April 1991:	Della sites to be reassessed. Merninie sites to be established.
December 1991:	Della and Merninie sites to be reassessed. This should finalize the impact assessment phase in the Della Land System.

The creation of the Innamincka Regional Reserve has resulted in the recent drafting of a Management Plan. It should be stressed that this Santos initiated monitoring programme and the recommendations above dovetail neatly into some of the stated objectives in the above Draft Management Plan. Some of these objectives should be mentioned as they serve to reinforce the significance of the current programme. Extracts from Section 5.1.2 of the plan include the following:

> "Systematic reviews and descriptions need to be undertaken of the region's flora and fauna. While initial data has been acquired for portions of the Reserve and include a recent detailed study of the Coongie Management Zone, further biological surveys and research programmes should continue and expand to include the remainder of the Reserve and the region's systems".

> "Due to the inherent long-term fluctuations within arid zone environments, base studies should be designed to operate for extended periods and monitoring sites should be assessed during different seasons. For this reason, programmes such as those recently initiated in the Coongie zone should be continued for a minimum of three years" (SANPWS 1988, p.47).

5.2.2 Long-term

Recommendations:

- to further the second stated aim of the programme by identifying other ecologically significant land systems within the regions in which Santos Ltd has interests and once identified subsequently establishing permanent monitoring sites within those systems;

- the possible intensification of future research within production fields. The programme to date has focussed on the periphery of production fields. Future work could incorporate the use of ants as bio-indicators of disturbance.

5.2.3 Refinement of Assessment Techniques

Recommendations:

- enhancing future data collection within the Della Land System segment of the programme by the contemporaneous trapping of all three study areas, reducing stochastic effects due to weather;

- extending existing pitfall lines and including pots of larger diameter thereby enhancing the collection of quantitative data; and

- increasing the trapping session to 4 nights, especially if contemporaneous trapping is instigated, thereby enabling greater returns for time and effort invested in the field.

5.3 MANAGEMENT CONSIDERATIONS

5.3.1 Recommendations Minimizing Habitat Disturbance

Because of its relatively small area and very high biological and biogeographic significance, extreme sensitivity should be exercised in the Marqualpie District with respect to hydrocarbon, exploration and possible production activities.

Disturbance to the following habitats should be minimized whenever possible:

- spinifex hummock grassland;
- the densely vegetated neverfail/love grass tussock grasslands of the heavier soils of interdune swales and flats;
- ephemeral wetlands/claypans/swamps scattered throughout the region.

To minimize the loss of and impact on animal habitat in the region, the area of vegetation cover removed in the case of exploration and production activities should be minimal. Careful consideration should be given to the following:

- contouring beyond the area of the cleared aprons around the well-heads, on the apron edges and slopes, to minimize the effects of erosion and silting creeping into adjacent swales as is presently evident;
- minimizing the number of vehicle tracks and roads wherever possible, again controlling the effects of erosion to prevent silting of interdune habitats;
- assuring vehicles keep to designated tracks and roads and do not venture off or damage the edges of cleared aprons at well heads; and
- minimizing disturbance, removal and transport of soils within the production fields.

5.3.2 Rehabilitation Research

Recommendations:

- observation during the programme has revealed several perennial and annual plant species that appear to be relatively resistant to grazing by rabbits. It is recommended that these plants and others with similar resistance be identified and documented with the aim of their possible incorporation into, and increasing the effectiveness of, rehabilitation programmes;
- the creation of rabbit exclosures within chosen habitats would enable the examination of the effect of the removal of rabbit grazing on the rehabilitation of the habitats biota.

5.3.3 Promotion of Biological Information

This programme has collected valuable biological information relating to the Della and Marqualpie Land Systems. To enable the promotion of biological information to allow more informed environmental management it is proposed that the concept of "land systems handbooks" be considered.

These handbooks would contain information concerning the flora and fauna most likely to be found within the various land units of the system, and the relative sensitivity of various habitats to disturbance.

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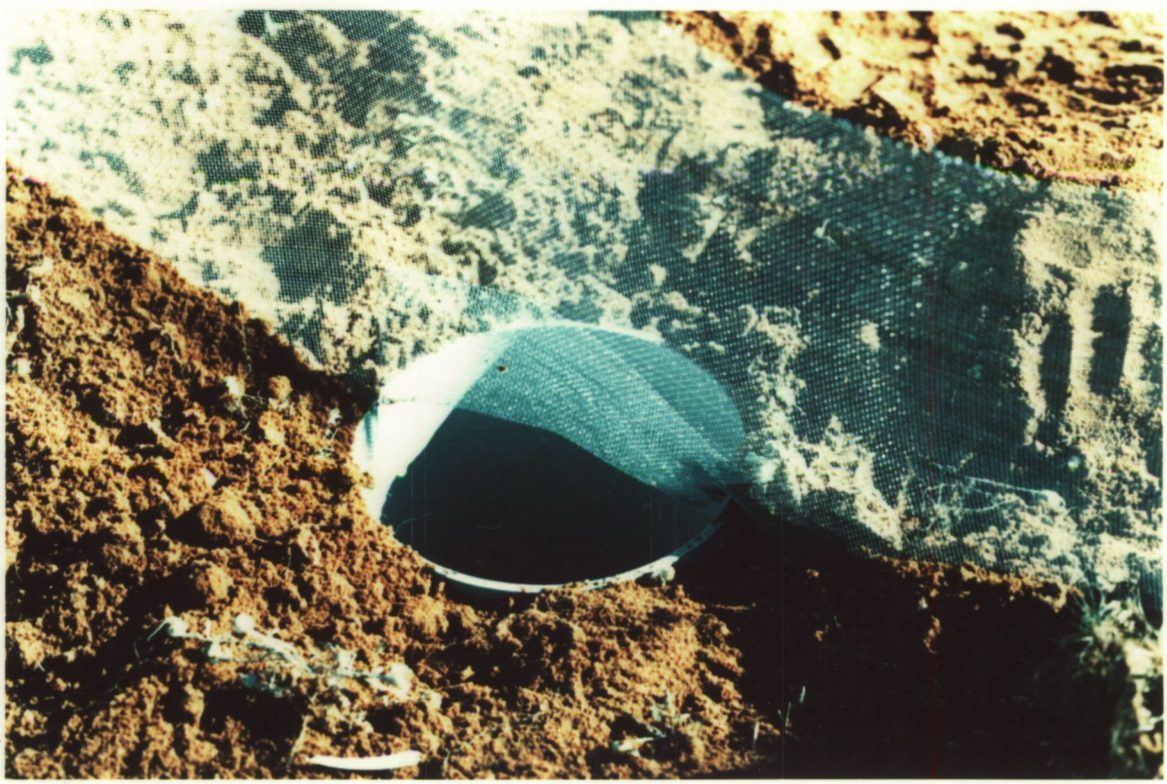
PLATES

A Marqualpie land system (see Figure 1)
Composed of irregular and longitudinal sand dunes
10 permanent sites established in this area.

B Typical peripheral gas well Burke-Dullingari production area. Considered a "well" site for the study.
5 such sites established adjacent to wells in each production area.

PLATE 1A & B

A



B

2A : Typical pitfall line located at permanent sites

2B : Closer detail of one pot in a pitfall line of 5 pots

PLATE 2A&B

A Elliott Trap
10 used per pitfall line

B Dodonaea viscosa
severely grazed and undermined by rabbit activity

PLATE 3A&B

FAMILY SCINCIDAE

Ctenotus ariadne

Ctenotus brachyonyx

Ctenotus brooksi

Ctentous leonhardii

Ctenotus regius

Ctenotus strauchii

Ctenotus pantherinus

Egernia inornata

Eremiascincus fasiolatus

Lerista labialis

Lerista xanthura

Menetia greyii

Tiliqua multifasciata

PLATE 4

FAMILY GEKKONIDAE

Diplodactylus conspicillatus

Diplodactylus byrnei

Lucasium damaeum

Nephrurus levis

Rhynchoedura ornata

FAMILY AGAMIDAE

Ctenophorus fordi

Ctenophorus isolepis

Ctenophorus nuchalis

Diporiphora winneckei

Pogona vitticeps

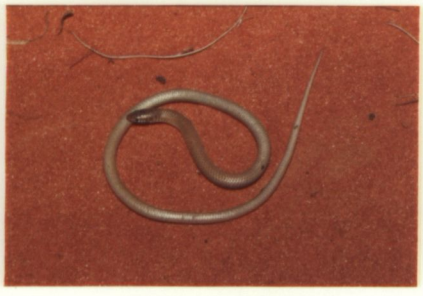
PLATE 5

FAMILY VARANIDAE

Varanus eremius

Varanus gouldii

FAMILY PYGOPODIDAE



Delma haroldi

Lialis burtonis

Pygopus nigriceps

FAMILY ELAPIDAE

Suta suta

Simposelaps fasciolatus

FAMILY BOIDAE

Aspidites ramsayi

FAMILY TYPHLOPIDAE

Ramphotyphlops endoterus

PLATE 6

APPENDICES

APPENDIX 1.0

PERMANENT SITE DESCRIPTION

STUDY AREA	SYMBOL	SITES
1	DWA (I)	Dullingari Well Site - Dune
	DWB (II)	Dullingari Well Site - Interdune
	DOC (I)	Dullingari Off Well Site - Dune
	DOD (II)	Dullingari Off Well Site - Interdune
2	TWA (I)	Toolachee Well Site - Dune
	TWB (II)	Toolachee Well Site - Interdune
	TOC (I)	Toolachee Off Well Site - Dune
	TOD (II)	Toolachee Off Well Site - Interdune
3	CTA (I)	Control Toolachee Site - Dune
	CTB (II)	Control Toolachee Site - Interdune
	CDA (I)	Control Dullingari Site - Dune
	CDB (II)	Control Dullingari Site - Interdune
4	MAI	Marqualpie Sites

STUDY AREA

1 Burke-Dullingari Production Field
2 Toolachee Production Field
3 Control Area, Toolachee (CT) Burke-Dullingari (CD)
4 Marqualpie Area

*ABCD used initially to identify dune and interdune, however, converted to I=Dune II=Interdune for coding purposes for computer data entry.

VEGETATION DESCRIPTIONS FOR PERMANENT SITES

TOOLACHEE AREA

SITES	VEGETATION
T1 A	Very open, tall hummock, *Triodia basedowii* grassland
B	Open, mid-high, *Eragrostis setifolia* grassland
C	Very open, tall mixed hummock; *Triodia basedowii/Zygochloa paradoxa,* grassland
D	Open, mid-high, mixed grassland, *Eragrostis setifolia/Astrebla pectinata*
T2 A	Very open, tall mixed shrubland, *Acacia ligulata/Dodonaea viscosa Grevillea stenobotrya*
B	Very open, low mixed chenopod shrubland, *slerolaena* spp.
C	Very open, tall, hummock *Triodia basedowii* grassland
D	Open, low mixed forb/grassland, *Eragrostis setifolia/Haloragis aspera*
T3 A	Very open, tall *Triodia basedowii hummock grassland*
B	Very open, low, chenopod shrubland, *sclerolaena* spp.
C	Very open, tall, hummock *Triodia basedowii* grassland
D	Very open, mid-high, mixed shrubland, *Maireana astrotricha/ptilotis obovatus*
T4 A	Very open, tall, mixed hummock grassland, *Triodia basedowii, Zygochloa paradoxa*
B	Very open, low, mixed, forb/grassland, *Solanum ellipticum/Sclerolaena* spp */Enneapogon* spp.
C	Very open, tall, hummock *Triodia basedowii* grassland
D	Very open, low, mixed, grassland, *Enneapogon* spp */Aristida contorta*
T5 A	Very open, low, hummock, *Triodia basedowii,* grassland
B	Very open, low, mixed chenopod shrubland, *Sclerolaena* spp, *Atriplex* spp
C	Very open, tall, hummock, *Triodia basedowii,* grassland
D	Very open, low, mixed shrubland, *Sida* spp, *Sclerolaena* spp

VEGETATION DESCRIPTIONS FOR PERMANENT SITES

BURKE - DULLINGARI AREA

VEGETATION

SITES

D1	A	Very open, tall, hummock *Triodia basedowii* grassland
	B	Very open, low, mixed, grassland, *Aristida contorta/Sclerolaena uniflora*
	C	Very open, tall, hummock *Triodia basedowii* grassland
	D	Very open, low, mixed, forb/grassland, *Aristida contorta/Helipterum floribundim*
D2	A	Open, tall, mixed shrubland, *Crotalaria, cunninghamii/C.eremaea/Calotis erinacea*
	B	Very open, low, mixed, grassland, */Aristida* spp */Enneapogon* spp.
	C	Very open, mid-high hummock; *Triodia basedowii* grassland
	D	Very open, low, mixed grassland, *Eragrostis setifolia/Aristida contorta/ Enneapogon nigricans*
D3	A	Very open, tall, hummock *Triodia basedowii* grassland
	B	Sparse, low, chenopod shrubland, *Sclerolaena intricata*
	C	Very open, tall, hummock *Triodia basedowii* grassland
	D	Very open, low, mixed grassland, */Enneapogon* spp */Aristida contorta*
D4	A	Very open, tall hummock, *Triodia basedowii* grassland
	B	Open, low, ephemeral forbland, *Calocephalus platycephalus*
	C	Very open, tall hummock, *Triodia basedowii* grassland
	D	Open, low, ephemeral forbland, *Calocephalus platycephalus*
D5	A	Very open, tall, hummock, *Triodia basedowii* grassland
	B	Very open, low, mixed, grassland, */Aristida contorta* spp */Enneapogon* spp
	C	Very open, low, mixed forb/grassland, *Sida* spp */Enneapogon nigricans*
	D	Open, low, mixed grassland, *Sporobolus actinocladus/Enneapogon* spp

VEGETATION DESCRIPTIONS FOR PERMANENT SITES

CONTROL AREA

VEGETATION

SITES	
CD1A	Very open, tall, hummock, *Triodia basedowii* grassland
1B	Very open, low, ephemeral mixed forbland *Helipterum floribundum, Calocephalus platycephalus*
2A	Very open, tall, hummock, *Triodia basedowii* grassland
2B	Very open, low, bunched grassland, *Eragrostis* spp
3A	Very open, low, mixed grass/forbland, *Aristida* spp */Sida* spp
3B	Very open, low, mixed grassland, *Enneapogon* spp, *Aristida* spp
4A	Very open, tall, hummock *Triodia basedowii* grassland
4B	Very open, low, mixed forbland, *Sclerolaena lanicuspis/Calotis plumulifera*
5A	Very open, tall, hummock, *Triodia basedowii* grassland
5B	Very open, low, mixed forb/grassland, *Scleolaena* spp */Aristida* spp */Enneapogon* spp
CT1A	Very open, tall, hummock, *Triodia basedowii* grassland
1B	Very open, mid-high, bunched grassland, *Eragrostis setifolia*
2A	Very open, tall hummock, *Triodia basedowii* grassland
2B	Very open, low, mixed forb/grassland, *Maireana astrotriche/Scleorlaena* spp *Aristida contorta*
3A	Open, tall, hummock, *Triodia basedowii* grassland
3B	Very open, low, mixed shrubland, *Maireana astrotriche/Ptilotis obovatus*
4A	Very open, tall, shrubland *Dodonaea viscosa/Acacia ligulata*
4B	Very open, low, mixed grassland, *Eragrostis setifolia/Chloris* spp *Aristida* spp
5A	Very open, tall, hummock, *Triodia basedowii* grassland
5B	Very open, low, bunched grassland, *Eragrostis* spp

VEGETATION DESCRIPTIONS FOR PERMANENT SITES

MARQUALPIE AREA

VEGETATION

SITES

MA1I	Very open, very tall, *Grevillea stenobotrya* shrubland
MA2I	Very open, tall mixed shrubland of *Dodonaea viscosa, Cassia oligophylla, Hakea eyreana* and *Acacia ligulata.*
MA3I	Very open, mid-high, *Eucalyptus terminalis* woodland.
MA4I	Open, mid-high, *Triodia basedowii,* hummock grassland.
MA5I	Very open, tall, mixed shrubland, *Acacia ligulata, Grevillea stenobotrya, Dodonaea viscosa, Grevillea juncifolia.*
MA6I	Very open, tall, mixed shrubland, *Acacia ligulata, Grevillea stenobotrya, Atalaya hemiglauca.*
MA7I	Very open, very tall, mixed shrubland, *Atalaya hemiglauca, Acacia ligulata.*
MA8I	Very open, mid-high, *Triodia basedowii* hummock grassland.
MA9I	Very open, mid-high, *Eucalyptus terminalis,* woodland.
MA10I	Open, low, mixed grassland of *Aristida contorta* and *Enneapogon* spp.

APPENDIX 2.0

VEGETATION

(PATN ANALYSIS DATA)

NOTES

Appendix 2.1 260 species are listed; however 4 species as marked in the table, have been inadvertently separated and treated as separate species and should be combined, resulting in 256 species.

Appendix 2.4:

Table A;	Row sum	=	Number of plant species at the site
Table B;	Col label	=	Individual plant species' sequence number in 2.1
	Col sum	=	Number of sites at which that particular species was found

Appendix 2.6:

Seq#	=	Relates to each site included in PATN analyses
Sym	=	Group to which each site was assigned

FLORA
DELLA AND MARQUALPIE SITES

1 Abutilon cryptopetalum
2 Abutilon halophilum
3 Abutilon otocarpum
4 Acacia aneura
5 Acacia coriacea
6 Acacia ligulata
7 Acacia murrayana
8 Acacia oswaldii
9 Acacia ramulosa
10 Acacia tetragonophylla
11 Acacia victoriae ssp. victoriae
12 Actinobole uliginosum
13 Alternanthera denticulata
14 Alternanthera nodiflora
15 Amphipogon caricinus
16 Amyema maidenii ssp. maidenii
17 Amyema preissii
18 Arabidella eremigena
19 Aristida anthoxanthoides
20 Aristida contorta
21 Aristida holathera var. holathera
22 Aristida inaequiglumis
23 Aristida latifolia
24 Astrebla pectinata
25 Atalaya hemiglauca
26 Atriplex angulata
27 Atriplex holocarpa
28 Atriplex limbata
29 Atriplex pseudocampanulata
30 Atriplex spongiosa
31 Atriplex stipitata
32 Atriplex vesicaria ssp. calcicola
33 Bergia trimera
34 Blennodia canescens
35 Blennodia pterosperma
36 Boerhavia dominii
37 Boerhavia hairy dominii
38 Boerhavia schomburgkiana
39 Brachycome ciliaris var. ciliaris
40 Brassica tournefortii
41 Bulbine alata
42 Calandrinia balonensis
43 Calandrinia disperma
44 Calandrinia eremaea
45 Calandrinia ptychosperma
46 Calandrinia pumila
47 Calocephalus platycephalus
48 Calotis erinacea
49 Calotis hispidula
50 Calotis plumulifera

51 Calotis porphyroglossa
52 Cassia artemisioides
53 Cassia desolata var. desolata
54 Cassia helmsii
55 Cassia nemophila var. nemophila
56 Cassia nemophila var. zygophylla
57 Cassia oligophylla
58 Cassia pleurocarpa var. pleurocarpa
59 Cassia sturtii
60 Centaurium spicatum
61 Centipeda minima
62 Centipeda thespidioides
63 Chenopodium auricomum
64 Chenopodium cristatum
65 Chenopodium desertorum ssp. desertorum
66 Chenopodium gaudichaudianum
67 Chloris pectinata
68 Chrysocoryne pusilla
69 Chrysopogon fallax
70 Citrullus lanatus
71 Convolvulus erubescens
72 Crassula colorata var. acuminata
73 Crassula sieberana ssp. tetramera
74 Crotalaria cunninghamii
75 Crotalaria eremaea ssp. eremaea
76 Cymbopogon obtectus
77 Cynanchum floribundum
78 Dactyloctenium radulans
79 Daucus glochidiatus
80 Dentella pulvinata
81 Dichanthium affine
82 Dicrastylis lewellinii
83 Dicratylis lewellinii
84 Digitaria brownii
85 Digitaria coenicola var. coenicola
86 Dissocarpus paradoxus var. paradoxus
87 Dodonaea viscosa ssp. angustissima
88 Einadia nutans ssp. eremaea
89 Enchylaena tomentosa var. tomentosa
90 Enneapogon avenaceus
91 Enneapogon cylindricus
92 Enneapogon nigricans
93 Enneapogon polyphyllus
94 Enteropogon acicularis
95 Eragrostis basedowii
96 Eragrostis dielsii
97 Eragrostis dielsii var. dielsii
98 Eragrostis eriopoda
99 Eragrostis laniflora
100 Eragrostis leptocarpa
101 Eragrostis setifolia
102 Eragrostis tenellula
103 Eragrostis xerophila
104 Eremophila duttonii

105 Eremophila longifolia
106 Eriachne aristidea
107 Eriochloa australiensis
108 Erodium angustilobum
109 Erodium aureum
110 Erodium crinitum
111 Erodium cygnorum ssp. cygnorum
112 Erodium cygnorum ssp. glandulosum
113 Eucalyptus terminalis
114 Euphorbia drummondii
115 Euphorbia parvicaruncula
116 Euphorbia tannensis ssp. eremophila
117 Euphorbia wheeleri
118 Evolvulus alsinoides var. decumbens
119 Fimbristylis dichotoma
120 Fimbristylis velata
121 Gilesia biniflora
122 Glycine canescens
123 Gnephosis arachnoidea
124 Goodenia cycloptera
125 Goodenia fascicularis
126 Goodenia havilandii
127 Grevillea juncifolia
128 Grevillea stenobotrya
129 Grevillea striata
130 Hakea eyreana
131 Hakea leucoptera
132 Halgania cyanea
133 Haloragis aspera
134 Harmsiodoxa blennodioides
135 Harmsiodoxa brevipes var. brevipes
136 Harmsiodoxa puberula
137 Helichrysum apiculatum var. apiculatum
138 Helichrysum eremaeum
139 Helichrysum monochaetum
140 Helichrysum semifertile
141 Heliotropium tenuifolium
142 Helipterum floribundum
143 Helipterum jessenii
144 Helipterum moschatum
145 Helipterum strictum
146 Helipterum uniflorum
147 Hibiscus krichauffianus
148 Indigofera brevidens var. brevidens
149 Indigofera linifolia
150 Indigofera linnaei
151 Iseilema eremaeum
152 Iseilema vaginiflorum
153 Isotropis wheeleri
154 Ixiochlamys nana
155 Ixiolaena leptolepis
156 Keraudrenia integrifolia
157 Lepidium phlebopetalum
158 Lotus cruentus

159 Lysiana exocarpi ssp. exocarpi
160 Maireana aphylla
161 Maireana astrotricha
162 Maireana coronata
163 Maireana georgei
164 Maireana pyramidata
165 Marsilea drummondii
166 Marsilea hirsuta
167 Melhania oblongifolia
168 Millotia greevesii ssp. greevesii var. greevesii
169 Minuria cunninghamii
170 Minuria denticulata
171 Minuria leptophylla
172 Mollugo cerviana
173 Morgania glabra
174 Muehlenbeckia cunninghamii
175 Mukia maderaspatana
176 Myriocephalus stuartii
177 Neurachne munroi
178 Nicotiana velutina
179 Omphalolappula concava
180 Ophioglossum polyphyllum
181 Osteocarpum acropterum var. acropterum
182 Panicum decompositum
183 Panicum schinzii
184 Paractaenum novae-hollandiae
185 Phyllanthus lacunarius
186 Pimelea trichostachya
187 Plagiobothrys plurisepaleus
188 Plagiosetum refractum
189 Plantago drummondii
190 Pluchea tetranthera var. tetranthera
191 Podolepis capillaris
192 Polycarpaea arida
193 Polygala isingii
194 Portulaca intraterranea
195 Portulaca oleracea
196 Psoralea cinerea
197 Psoralea pallida
198 Pterocaulon sphacelatum
199 Ptilotus atriplicifolius var. atriplicifolius
200 Ptilotus obovatus var. obovatus
201 Ptilotus polystachyus
202 Ptilotus polystachyus var. polystachyus
203 Rhagodia spinescens
204 Rulingia loxophylla
205 Rumex crystallinus
206 Salsola kali
207 Sarcostemma australe
208 Sauropus trachyspermus
209 Scaevola depauperata
210 Scaevola parvibarbata
211 Scaevola spinescens
212 Sclerolaena bicornis

213 Sclerolaena convexula
214 Sclerolaena cuneata
215 Sclerolaena decurrens
216 Sclerolaena diacantha
217 Sclerolaena eriacantha
218 Sclerolaena intricata
219 Sclerolaena lanicuspis
220 Sclerolaena parviflora
221 Sclerolaena patenticuspis
222 Sclerolaena uniflora
223 Sclerolaena ventricosa
224 Senecio gregorii
225 Sida ammophila
226 Sida cunninghamii
227 Sida fibulifera
228 Sida intricata
229 Sida trichopoda
230 Solanum ellipticum
231 Solanum esuriale
232 Sporobolus actinocladus
233 Stenopetalum lineare
234 Stenopetalum nutans
235 Streptoglossa adscendens
236 Swainsona microphylla ssp. affinis
237 Swainsona oroboides
238 Swainsona phacoides ssp. phacoides
239 Synaptantha tillaeacea
240 Tephrosia sphaerospora
241 Tephrosia supina
242 Tetragonia tetragonoides
243 Teucrium racemosum
244 Trachymene glaucifolia
245 Tragus australianus
246 Trianthema triquetra
247 Tribulus hystrix
248 Tribulus occidentalis
249 Tribulus terrestris
250 Trichodesma zeylanicum
251 Triglochin calcitrapum
252 Trigonella suavissima
253 Triodia basedowii
254 Tripogon loliiformis
255 Triraphis mollis
256 Wahlenbergia tumidifructu
257 Zygochloa paradoxa
258 Zygophyllum ammophilum
259 Zygophyllum howittii
260 Zygophyllum humillimum

ADDITIONAL PLANT SPECIES COLLECTED OPPORTUNISTICALLY IN WIDER REGION

SPECIES	LOCATION	
Abutilon fraseri	D	
Acacia rhodophloia	Ma	+
Acacia ramulosa	D	
Adriana hookeri	Ma	
Arabidella glaucescens	Me	
Arabidella trisecta	Me	
Aristida strigosa	Me	
Brachychome dichromosomatica var *dichromosomatica*	D	+
Calandrina polyandra	D	
Cassia nemophila var *coriaceae*	Me	
Cassia phyllodinea	D	
Cenchrus ciliaris	Me	
Codonocarpus continifolius	Ma	
Dichromochlamys dentatifolius	Me	
Dissocarpus latifolius	D	
Eriachne mucronata	Me	
Euphorbia tannensis spp *eremophila*	Ma	
Haloragis gossei	D	
Helipterum microglossum	Me	
Helipterum molle	Me	
Helipterum pterochaetum	Me	
Hibiscus brachysiphonius	DMe	
Ipomoea muelleri	Me	
Ipomoea polymorpha	D	
Keraudrinia nephrosperma	Ma	*
Lepidium oxytrichum	Me	
Melaleuca uncinata	D	
Menkia crassa	D	
Polycarpea spirostylis	D	
Portulaca filifolia	Me	
Pseudognaphalium luteo-album	D	
Ptilotis macrocephalus	Me	
Ptilotis nobilis	Me	
Scaevola parvifolia	Ma	+
Senecio glossanthus	Me	
Sida goniocarpa	D	
Sida sp.C.	D	#
Teucrium albicaule	S	
Wahlenbergia queenslandica	D	
Zygophyllum iodocarpum	Me	

KEY

D = Della Land System
Ma = Marqualpie Land System
S = Strzelecki Land System
Me = Merninie Land System

\+ Not recorded in S.A. Flora, LE. Region
* Not recorded as occuring in S.A., in S.A. Flora
\# Second record in the State, not in S.A. Flora

PLANT SPECIES COLLECTED AT PERMANENT SITES,

NOT PREVIOUSLY RECORDED IN LAKE EYRE BOTANICAL REGION*

1. **TOOLACHEE AREA**

Amphipogon caricinus
Ophioglossum polyphyllum
Sclerolaena parviflora

2. **BURKE-DULLINGARI AREA**

Atriplex spongiosa
Chenopodium desertorum ssp *desertorum*
Panicum schinzii (introduced)

3. **CONTROL AREA**

Calandrinia disperma
Fimbristylis velata

4. **MARQUALPIE AREA**

Tephrosia supina

(*With reference to "Flora of South Australia")

FLORA
SPECIES DIVERSITY AT INDIVIDUAL SITES

A

ROW LABEL	SEQUENCE NUMBER	ROW SUM	SUM/ M	SUM/ MAX ROW	NUMBER MISSING-
MA4I	(45)	**17.00**	0.6538E-01	0.3400	0
TW1II	(62)	**17.00**	0.6538E-01	0.3400	0
MA1I	(42)	**18.00**	0.6923E-01	0.3600	0
MA6I	(47)	**19.00**	0.7308E-01	0.3800	0
MA8I	(49)	**19.00**	0.7308E-01	0.3800	0
MA5I	(46)	**19.00**	0.7308E-01	0.3800	0
TO2I	(53)	**21.00**	0.8077E-01	0.4200	0
MA7I	(48)	**21.00**	0.8077E-01	0.4200	0
CD1II	(2)	**21.00**	0.8077E-01	0.4200	0
MA2I	(43)	**22.00**	0.8462E-01	0.4400	0
DW4I	(37)	**22.00**	0.8462E-01	0.4400	0
CT5II	(20)	**23.00**	0.8846E-01	0.4600	0
TW2I	(63)	**23.00**	0.8846E-01	0.4600	0
MA3I	(44)	**23.00**	0.8846E-01	0.4600	0
TO4I	(57)	**23.00**	0.8846E-01	0.4600	0
TO2II	(54)	**23.00**	0.8846E-01	0.4600	0
CT5I	(19)	**25.00**	0.9615E-01	0.5000	0
MA10I	(41)	**25.00**	0.9615E-01	0.5000	0
TW5I	(69)	**25.00**	0.9615E-01	0.5000	0
MA9I	(50)	**26.00**	0.1000	0.5200	0
CD2I	(3)	**26.00**	0.1000	0.5200	0
DO4II	(28)	**28.00**	0.1077	0.5600	0
CD4II	(8)	**29.00**	0.1115	0.5800	0
DW3II	(36)	**29.00**	0.1115	0.5800	0
CD1I	(1)	**29.00**	0.1115	0.5800	0
CD5I	(9)	**29.00**	0.1115	0.5800	0
DW4II	(38)	**31.00**	0.1192	0.6200	0
TO5I	(59)	**31.00**	0.1192	0.6200	0
CT4I	(17)	**32.00**	0.1231	0.6400	0
CD5II	(10)	**33.00**	0.1269	0.6600	0
TW4I	(67)	**33.00**	0.1269	0.6600	0
CD4I	(7)	**34.00**	0.1308	0.6800	0
TW1I	(61)	**34.00**	0.1308	0.6800	0
CD3I	(5)	**34.00**	0.1308	0.6800	0
DO2I	(23)	**35.00**	0.1346	0.7000	0
CT3I	(15)	**36.00**	0.1385	0.7200	0
DW1I	(31)	**36.00**	0.1385	0.7200	0
DW2I	(33)	**36.00**	0.1385	0.7200	0
CT2I	(13)	**36.00**	0.1385	0.7200	0
DO3I	(25)	**36.00**	0.1385	0.7200	0
DO5I	(29)	**36.00**	0.1385	0.7200	0
CD2II	(4)	**37.00**	0.1423	0.7400	0
CT4II	(18)	**37.00**	0.1423	0.7400	0
DO4I	(27)	**37.00**	0.1423	0.7400	0
DO1I	(21)	**37.00**	0.1423	0.7400	0

TO1II	(52)	**38.00**	0.1462	0.7600	0
DW3I	(35)	**38.00**	0.1462	0.7600	0
DW5II	(40)	**39.00**	0.1500	0.7800	0
CT1II	(12)	**39.00**	0.1500	0.7800	0
TO3I	(55)	**39.00**	0.1500	0.7800	0
TO1I	(51)	**39.00**	0.1500	0.7800	0
DO1II	(22)	**40.00**	0.1538	0.8000	0
DW2II	(34)	**40.00**	0.1538	0.8000	0
DW1II	(32)	**40.00**	0.1538	0.8000	0
CT2II	(14)	**40.00**	0.1538	0.8000	0
DO2II	(24)	**40.00**	0.1538	0.8000	0
DW5I	(39)	**40.00**	0.1538	0.8000	0
TW3I	(65)	**41.00**	0.1577	0.8200	0
CD3II	(6)	**42.00**	0.1615	0.8400	0
TO5II	(60)	**42.00**	0.1615	0.8400	0
TW5II	(70)	**42.00**	0.1615	0.8400	0
CT3II	(16)	**43.00**	0.1654	0.8600	0
TW2II	(64)	**43.00**	0.1654	0.8600	0
TO4II	(58)	**44.00**	0.1692	0.8800	0
CT1I	(11)	**44.00**	0.1692	0.8800	0
DO3II	(26)	**45.00**	0.1731	0.9000	0
TW4II	(68)	**45.00**	0.1731	0.9000	0
DO5II	(30)	**48.00**	0.1846	0.9600	0
TO3II	(56)	**49.00**	0.1885	0.9800	0
TW3II	(66)	**50.00**	0.1923	1.000	0

B

COL LABEL	SEQUENCE NUMBER	COL SUM	SUM/ N	SUM/ MAX COL	NUMBER MISSING-
COL	1(1)	**1.000**	0.1429E-01	0.1695E-01	0
COL	66(66)	**1.000**	0.1429E-01	0.1695E-01	0
COL	83(83)	**1.000**	0.1429E-01	0.1695E-01	0
COL	260(260)	**1.000**	0.1429E-01	0.1695E-01	0
COL	5(5)	**1.000**	0.1429E-01	0.1695E-01	0
COL	102(102)	**1.000**	0.1429E-01	0.1695E-01	0
COL	23(23)	**1.000**	0.1429E-01	0.1695E-01	0
COL	8(8)	**1.000**	0.1429E-01	0.1695E-01	0
COL	201(201)	**1.000**	0.1429E-01	0.1695E-01	0
COL	170(170)	**1.000**	0.1429E-01	0.1695E-01	0
COL	139(139)	**1.000**	0.1429E-01	0.1695E-01	0
COL	140(140)	**1.000**	0.1429E-01	0.1695E-01	0
COL	141(141)	**1.000**	0.1429E-01	0.1695E-01	0
COL	14(14)	**1.000**	0.1429E-01	0.1695E-01	0
COL	15(15)	**1.000**	0.1429E-01	0.1695E-01	0
COL	16(16)	**1.000**	0.1429E-01	0.1695E-01	0
COL	177(177)	**1.000**	0.1429E-01	0.1695E-01	0
COL	146(146)	**1.000**	0.1429E-01	0.1695E-01	0
COL	155(155)	**1.000**	0.1429E-01	0.1695E-01	0
COL	148(148)	**1.000**	0.1429E-01	0.1695E-01	0
COL	69(69)	**1.000**	0.1429E-01	0.1695E-01	0
COL	22(22)	**1.000**	0.1429E-01	0.1695E-01	0
COL	183(183)	**1.000**	0.1429E-01	0.1695E-01	0

COL	184(184)	1.000	0.1429E-01	0.1695E-01	0
COL	153(153)	1.000	0.1429E-01	0.1695E-01	0
COL	26(26)	1.000	0.1429E-01	0.1695E-01	0
COL	43(43)	1.000	0.1429E-01	0.1695E-01	0
COL	156(156)	1.000	0.1429E-01	0.1695E-01	0
COL	29(29)	1.000	0.1429E-01	0.1695E-01	0
COL	190(190)	1.000	0.1429E-01	0.1695E-01	0
COL	95(95)	1.000	0.1429E-01	0.1695E-01	0
COL	32(32)	1.000	0.1429E-01	0.1695E-01	0
COL	65(65)	1.000	0.1429E-01	0.1695E-01	0
COL	34(34)	1.000	0.1429E-01	0.1695E-01	0
COL	59(59)	1.000	0.1429E-01	0.1695E-01	0
COL	228(228)	1.000	0.1429E-01	0.1695E-01	0
COL	173(173)	1.000	0.1429E-01	0.1695E-01	0
COL	46(46)	1.000	0.1429E-01	0.1695E-01	0
COL	215(215)	1.000	0.1429E-01	0.1695E-01	0
COL	104(104)	1.000	0.1429E-01	0.1695E-01	0
COL	169(169)	1.000	0.1429E-01	0.1695E-01	0
COL	154(154)	1.000	0.1429E-01	0.1695E-01	0
COL	107(107)	1.000	0.1429E-01	0.1695E-01	0
COL	44(44)	1.000	0.1429E-01	0.1695E-01	0
COL	61(61)	1.000	0.1429E-01	0.1695E-01	0
COL	162(162)	1.000	0.1429E-01	0.1695E-01	0
COL	207(207)	1.000	0.1429E-01	0.1695E-01	0
COL	112(112)	1.000	0.1429E-01	0.1695E-01	0
COL	129(129)	1.000	0.1429E-01	0.1695E-01	0
COL	180(180)	1.000	0.1429E-01	0.1695E-01	0
COL	91(91)	1.000	0.1429E-01	0.1695E-01	0
COL	120(120)	1.000	0.1429E-01	0.1695E-01	0
COL	77(77)	1.000	0.1429E-01	0.1695E-01	0
COL	220(220)	1.000	0.1429E-01	0.1695E-01	0
COL	247(247)	1.000	0.1429E-01	0.1695E-01	0
COL	256(256)	1.000	0.1429E-01	0.1695E-01	0
COL	249(249)	1.000	0.1429E-01	0.1695E-01	0
COL	196(196)	1.000	0.1429E-01	0.1695E-01	0
COL	171(171)	1.000	0.1429E-01	0.1695E-01	0
COL	72(72)	1.000	0.1429E-01	0.1695E-01	0
COL	205(205)	1.000	0.1429E-01	0.1695E-01	0
COL	84(84)	1.000	0.1429E-01	0.1695E-01	0
COL	223(223)	1.000	0.1429E-01	0.1695E-01	0
COL	80(80)	1.000	0.1429E-01	0.1695E-01	0
COL	193(193)	1.000	0.1429E-01	0.1695E-01	0
COL	248(248)	1.000	0.1429E-01	0.1695E-01	0
COL	251(251)	1.000	0.1429E-01	0.1695E-01	0
COL	233(233)	1.000	0.1429E-01	0.1695E-01	0
COL	151(151)	1.000	0.1429E-01	0.1695E-01	0
COL	166(166)	2.000	0.2857E-01	0.3390E-01	0
COL	126(126)	2.000	0.2857E-01	0.3390E-01	0
COL	138(138)	2.000	0.2857E-01	0.3390E-01	0
COL	149(149)	2.000	0.2857E-01	0.3390E-01	0
COL	62(62)	2.000	0.2857E-01	0.3390E-01	0
COL	67(67)	2.000	0.2857E-01	0.3390E-01	0
COL	2(2)	2.000	0.2857E-01	0.3390E-01	0
COL	53(53)	2.000	0.2857E-01	0.3390E-01	0

COL	122(122)	2.000	0.2857E-01	0.3390E-01	0
COL	239(239)	2.000	0.2857E-01	0.3390E-01	0
COL	124(124)	2.000	0.2857E-01	0.3390E-01	0
COL	17(17)	2.000	0.2857E-01	0.3390E-01	0
COL	100(100)	2.000	0.2857E-01	0.3390E-01	0
COL	99(99)	2.000	0.2857E-01	0.3390E-01	0
COL	192(192)	2.000	0.2857E-01	0.3390E-01	0
COL	37(37)	2.000	0.2857E-01	0.3390E-01	0
COL	52(52)	2.000	0.2857E-01	0.3390E-01	0
COL	167(167)	2.000	0.2857E-01	0.3390E-01	0
COL	136(136)	2.000	0.2857E-01	0.3390E-01	0
COL	57(57)	2.000	0.2857E-01	0.3390E-01	0
COL	68(68)	2.000	0.2857E-01	0.3390E-01	0
COL	51(51)	2.000	0.2857E-01	0.3390E-01	0
COL	181(181)	2.000	0.2857E-01	0.3390E-01	0
COL	159(159)	2.000	0.2857E-01	0.3390E-01	0
COL	209(209)	2.000	0.2857E-01	0.3390E-01	0
COL	243(243)	2.000	0.2857E-01	0.3390E-01	0
COL	229(229)	2.000	0.2857E-01	0.3390E-01	0
COL	235(235)	2.000	0.2857E-01	0.3390E-01	0
COL	9(9)	2.000	0.2857E-01	0.3390E-01	0
COL	187(187)	2.000	0.2857E-01	0.3390E-01	0
COL	221(221)	2.000	0.2857E-01	0.3390E-01	0
COL	241(241)	2.000	0.2857E-01	0.3390E-01	0
COL	133(133)	2.000	0.2857E-01	0.3390E-01	0
COL	121(121)	2.000	0.2857E-01	0.3390E-01	0
COL	237(237)	2.000	0.2857E-01	0.3390E-01	0
COL	33(33)	2.000	0.2857E-01	0.3390E-01	0
COL	13(13)	2.000	0.2857E-01	0.3390E-01	0
COL	150(150)	3.000	0.4286E-01	0.5085E-01	0
COL	158(158)	3.000	0.4286E-01	0.5085E-01	0
COL	82(82)	3.000	0.4286E-01	0.5085E-01	0
COL	94(94)	3.000	0.4286E-01	0.5085E-01	0
COL	234(234)	3.000	0.4286E-01	0.5085E-01	0
COL	18(18)	3.000	0.4286E-01	0.5085E-01	0
COL	258(258)	3.000	0.4286E-01	0.5085E-01	0
COL	160(160)	3.000	0.4286E-01	0.5085E-01	0
COL	204(204)	3.000	0.4286E-01	0.5085E-01	0
COL	56(56)	3.000	0.4286E-01	0.5085E-01	0
COL	116(116)	3.000	0.4286E-01	0.5085E-01	0
COL	164(164)	3.000	0.4286E-01	0.5085E-01	0
COL	199(199)	3.000	0.4286E-01	0.5085E-01	0
COL	63(63)	3.000	0.4286E-01	0.5085E-01	0
COL	259(259)	3.000	0.4286E-01	0.5085E-01	0
COL	123(123)	3.000	0.4286E-01	0.5085E-01	0
COL	145(145)	3.000	0.4286E-01	0.5085E-01	0
COL	257(257)	3.000	0.4286E-01	0.5085E-01	0
COL	110(110)	4.000	0.5714E-01	0.6780E-01	0
COL	30(30)	4.000	0.5714E-01	0.6780E-01	0
COL	10(10)	4.000	0.5714E-01	0.6780E-01	0
COL	178(178)	4.000	0.5714E-01	0.6780E-01	0
COL	232(232)	4.000	0.5714E-01	0.6780E-01	0
COL	60(60)	4.000	0.5714E-01	0.6780E-01	0
COL	188(188)	4.000	0.5714E-01	0.6780E-01	0

COL	231(231)	4.000	0.5714E-01	0.6780E-01	0
COL	143(143)	4.000	0.5714E-01	0.6780E-01	0
COL	31(31)	4.000	0.5714E-01	0.6780E-01	0
COL	35(35)	4.000	0.5714E-01	0.6780E-01	0
COL	19(19)	4.000	0.5714E-01	0.6780E-01	0
COL	85(85)	4.000	0.5714E-01	0.6780E-01	0
COL	11(11)	4.000	0.5714E-01	0.6780E-01	0
COL	213(213)	4.000	0.5714E-01	0.6780E-01	0
COL	54(54)	5.000	0.7143E-01	0.8475E-01	0
COL	174(174)	5.000	0.7143E-01	0.8475E-01	0
COL	238(238)	5.000	0.7143E-01	0.8475E-01	0
COL	172(172)	5.000	0.7143E-01	0.8475E-01	0
COL	76(76)	5.000	0.7143E-01	0.8475E-01	0
COL	252(252)	5.000	0.7143E-01	0.8475E-01	0
COL	132(132)	5.000	0.7143E-01	0.8475E-01	0
COL	127(127)	5.000	0.7143E-01	0.8475E-01	0
COL	109(109)	5.000	0.7143E-01	0.8475E-01	0
COL	191(191)	5.000	0.7143E-01	0.8475E-01	0
COL	197(197)	5.000	0.7143E-01	0.8475E-01	0
COL	211(211)	5.000	0.7143E-01	0.8475E-01	0
COL	117(117)	5.000	0.7143E-01	0.8475E-01	0
COL	182(182)	6.000	0.8571E-01	0.1017	0
COL	48(48)	6.000	0.8571E-01	0.1017	0
COL	24(24)	6.000	0.8571E-01	0.1017	0
COL	236(236)	6.000	0.8571E-01	0.1017	0
COL	12(12)	6.000	0.8571E-01	0.1017	0
COL	7(7)	6.000	0.8571E-01	0.1017	0
COL	217(217)	6.000	0.8571E-01	0.1017	0
COL	163(163)	6.000	0.8571E-01	0.1017	0
COL	125(125)	6.000	0.8571E-01	0.1017	0
COL	115(115)	6.000	0.8571E-01	0.1017	0
COL	118(118)	7.000	0.1000	0.1186	0
COL	246(246)	7.000	0.1000	0.1186	0
COL	185(185)	7.000	0.1000	0.1186	0
COL	79(79)	7.000	0.1000	0.1186	0
COL	245(245)	7.000	0.1000	0.1186	0
COL	179(179)	7.000	0.1000	0.1186	0
COL	218(218)	8.000	0.1143	0.1356	0
COL	98(98)	8.000	0.1143	0.1356	0
COL	130(130)	8.000	0.1143	0.1356	0
COL	198(198)	8.000	0.1143	0.1356	0
COL	152(152)	8.000	0.1143	0.1356	0
COL	212(212)	8.000	0.1143	0.1356	0
COL	137(137)	8.000	0.1143	0.1356	0
COL	55(55)	8.000	0.1143	0.1356	0
COL	113(113)	8.000	0.1143	0.1356	0
COL	161(161)	8.000	0.1143	0.1356	0
COL	81(81)	8.000	0.1143	0.1356	0
COL	157(157)	8.000	0.1143	0.1356	0
COL	165(165)	8.000	0.1143	0.1356	0
COL	28(28)	9.000	0.1286	0.1525	0
COL	175(175)	9.000	0.1286	0.1525	0
COL	186(186)	10.00	0.1429	0.1695	0
COL	86(86)	10.00	0.1429	0.1695	0

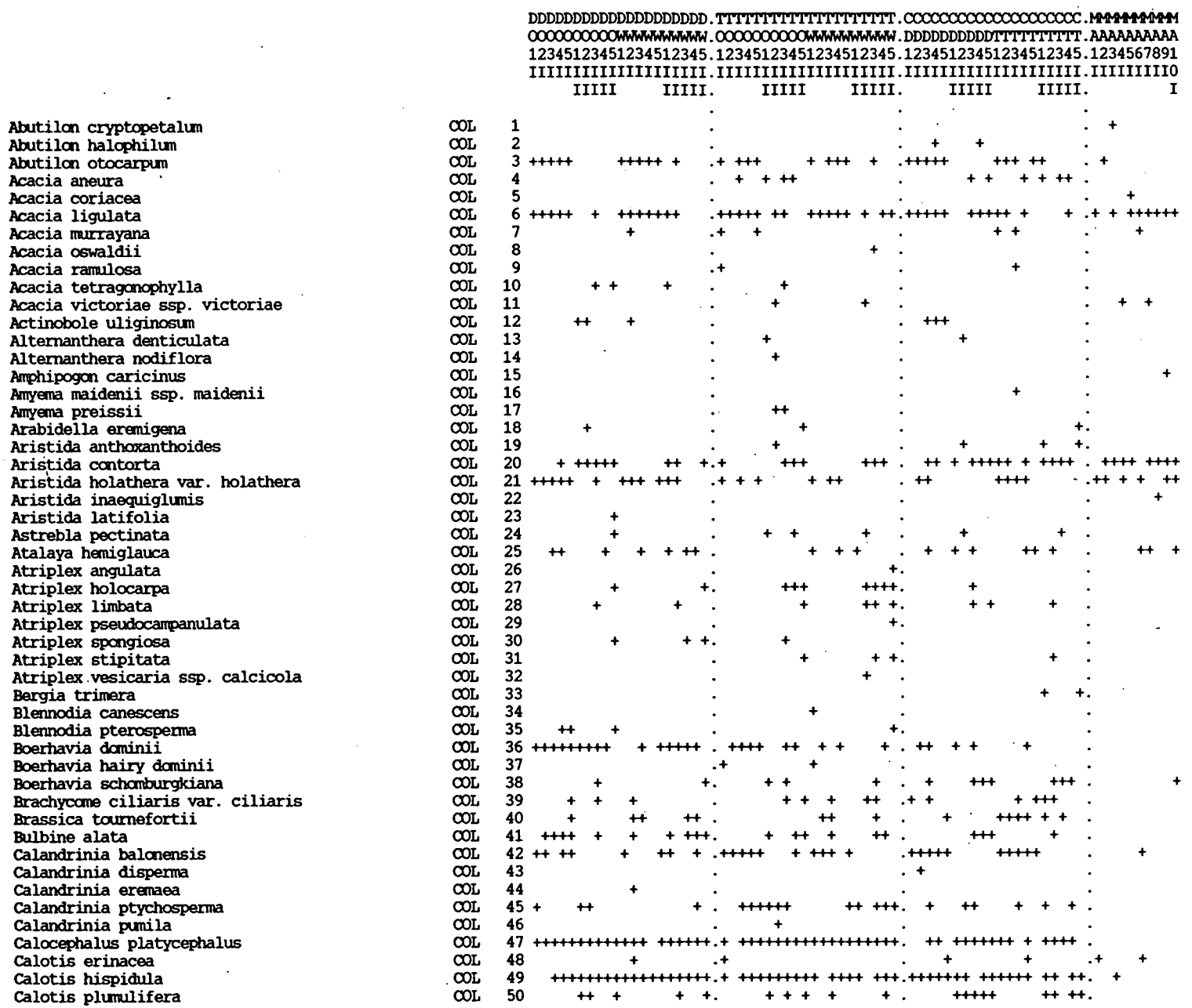
COL	144(144)	10.00	0.1429	0.1695	0
COL	168(168)	10.00	0.1429	0.1695	0
COL	88(88)	10.00	0.1429	0.1695	0
COL	4(4)	10.00	0.1429	0.1695	0
COL	255(255)	10.00	0.1429	0.1695	0
COL	131(131)	10.00	0.1429	0.1695	0
COL	75(75)	10.00	0.1429	0.1695	0
COL	27(27)	10.00	0.1429	0.1695	0
COL	97(97)	10.00	0.1429	0.1695	0
COL	189(189)	10.00	0.1429	0.1695	0
COL	214(214)	11.00	0.1571	0.1864	0
COL	96(96)	11.00	0.1571	0.1864	0
COL	92(92)	11.00	0.1571	0.1864	0
COL	119(119)	11.00	0.1571	0.1864	0
COL	203(203)	11.00	0.1571	0.1864	0
COL	200(200)	12.00	0.1714	0.2034	0
COL	93(93)	12.00	0.1714	0.2034	0
COL	103(103)	12.00	0.1714	0.2034	0
COL	70(70)	13.00	0.1857	0.2203	0
COL	78(78)	13.00	0.1857	0.2203	0
COL	38(38)	13.00	0.1857	0.2203	0
COL	108(108)	13.00	0.1857	0.2203	0
COL	105(105)	14.00	0.2000	0.2373	0
COL	135(135)	14.00	0.2000	0.2373	0
COL	73(73)	14.00	0.2000	0.2373	0
COL	39(39)	14.00	0.2000	0.2373	0
COL	254(254)	15.00	0.2143	0.2542	0
COL	40(40)	15.00	0.2143	0.2542	0
COL	147(147)	15.00	0.2143	0.2542	0
COL	202(202)	16.00	0.2286	0.2712	0
COL	219(219)	16.00	0.2286	0.2712	0
COL	74(74)	17.00	0.2429	0.2881	0
COL	128(128)	17.00	0.2429	0.2881	0
COL	216(216)	17.00	0.2429	0.2881	0
COL	101(101)	17.00	0.2429	0.2881	0
COL	50(50)	19.00	0.2714	0.3220	0
COL	106(106)	19.00	0.2714	0.3220	0
COL	210(210)	19.00	0.2714	0.3220	0
COL	25(25)	19.00	0.2714	0.3220	0
COL	41(41)	20.00	0.2857	0.3390	0
COL	240(240)	21.00	0.3000	0.3559	0
COL	45(45)	21.00	0.3000	0.3559	0
COL	58(58)	22.00	0.3143	0.3729	0
COL	230(230)	23.00	0.3286	0.3898	0
COL	89(89)	23.00	0.3286	0.3898	0
COL	90(90)	24.00	0.3429	0.4068	0
COL	71(71)	24.00	0.3429	0.4068	0
COL	226(226)	25.00	0.3571	0.4237	0
COL	206(206)	25.00	0.3571	0.4237	0
COL	195(195)	26.00	0.3714	0.4407	0
COL	42(42)	29.00	0.4143	0.4915	0
COL	244(244)	29.00	0.4143	0.4915	0
COL	36(36)	29.00	0.4143	0.4915	0
COL	242(242)	30.00	0.4286	0.5085	0

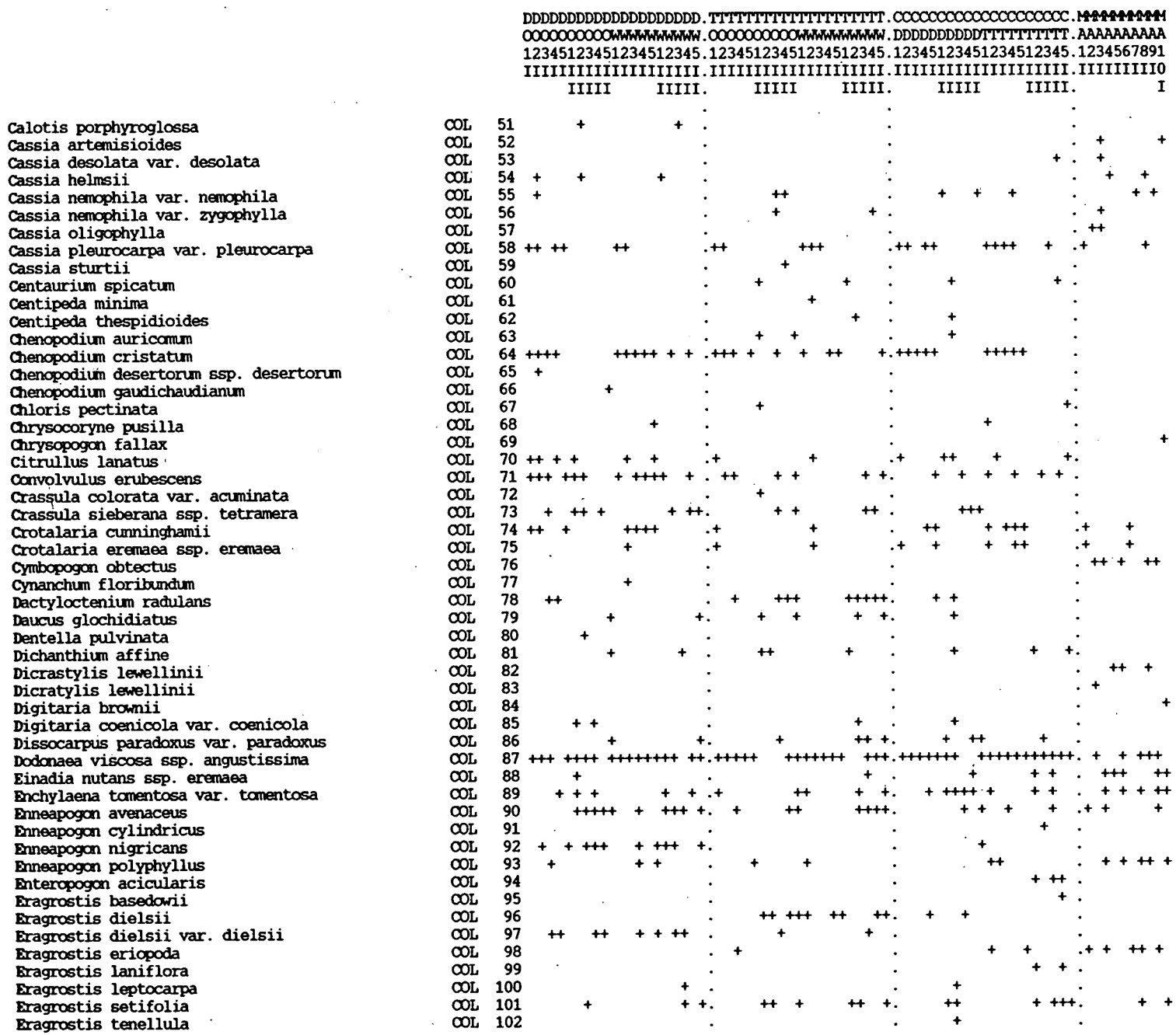
COL	176(176)	**30.00**	0.4286	0.5085	0
COL	64(64)	**30.00**	0.4286	0.5085	0
COL	111(111)	**30.00**	0.4286	0.5085	0
COL	21(21)	**30.00**	0.4286	0.5085	0
COL	222(222)	**31.00**	0.4429	0.5254	0
COL	3(3)	**31.00**	0.4429	0.5254	0
COL	250(250)	**33.00**	0.4714	0.5593	0
COL	134(134)	**35.00**	0.5000	0.5932	0
COL	194(194)	**35.00**	0.5000	0.5932	0
COL	20(20)	**37.00**	0.5286	0.6271	0
COL	225(225)	**41.00**	0.5857	0.6949	0
COL	208(208)	**41.00**	0.5857	0.6949	0
COL	227(227)	**42.00**	0.6000	0.7119	0
COL	253(253)	**45.00**	0.6429	0.7627	0
COL	142(142)	**46.00**	0.6571	0.7797	0
COL	6(6)	**48.00**	0.6857	0.8136	0
COL	47(47)	**52.00**	0.7429	0.8814	0
COL	224(224)	**52.00**	0.7429	0.8814	0
COL	49(49)	**53.00**	0.7571	0.8983	0
COL	87(87)	**55.00**	0.7857	0.9322	0
COL	114(114)	**59.00**	0.8429	1.000	0

SPARSITY RATIO (NUMBER OF NON-ZEROS/(N*M)).....	0.1271
D-RATIO (NUMBER OF D'S(0-0)/ MAX POSSIBLE D'S....	0.7887
WHITTAKERS' BETA DIVERSITY MEASURE.....	6.869
ROUTLEDGES' BETA DIVERSITY MEASURE.....	1.385

TOTAL NUMBER OF MISSING VALUES.....
0

INCIDENCE OF FLORA AT ALL SITES

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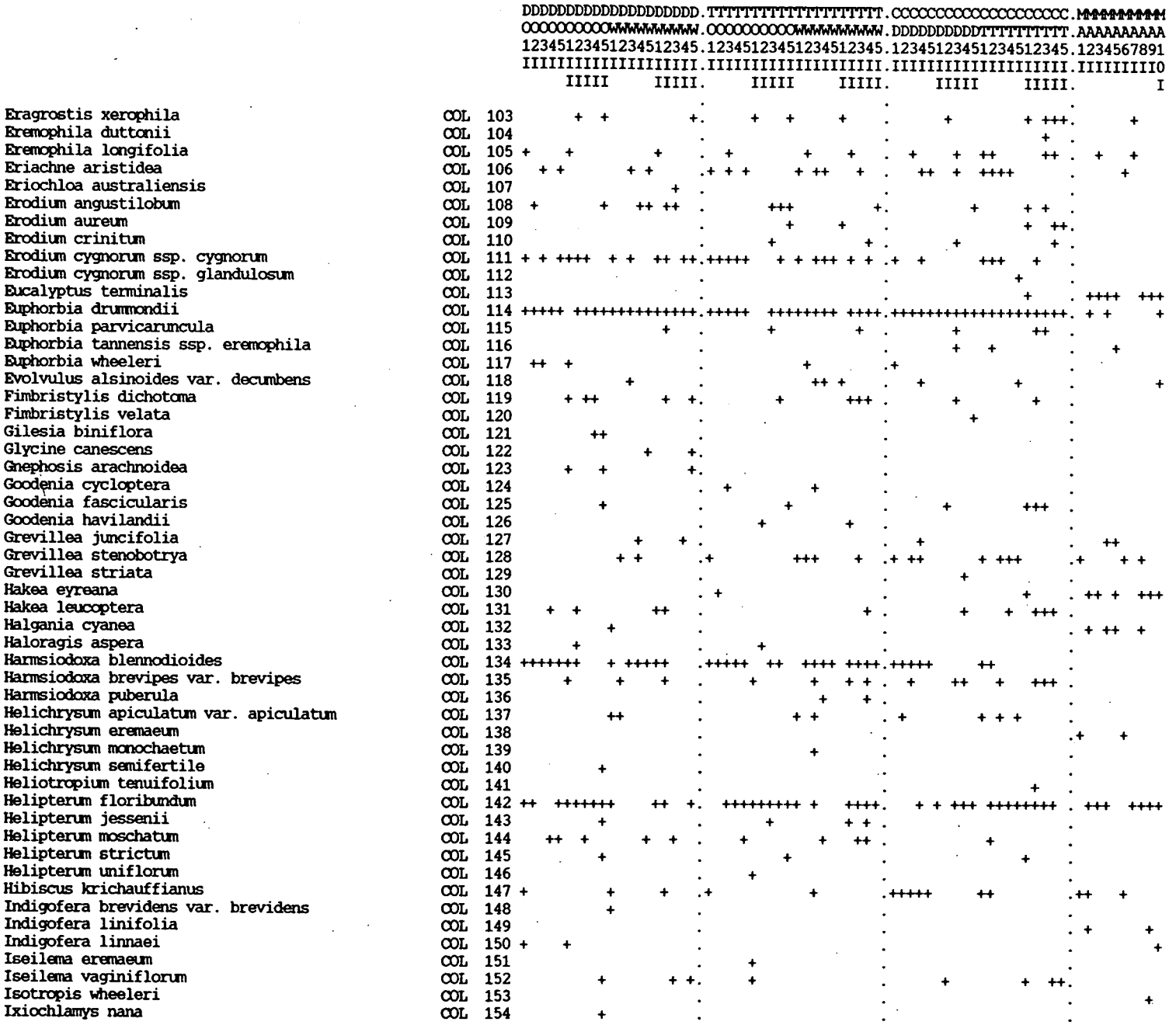
Calotis porphyroglossa COL 51
Cassia artemisioides COL 52
Cassia desolata var. desolata COL 53
Cassia helmsii COL 54
Cassia nemophila var. nemophila COL 55
Cassia nemophila var. zygophylla COL 56
Cassia oligophylla COL 57
Cassia pleurocarpa var. pleurocarpa COL 58
Cassia sturtii COL 59
Centaurium spicatum COL 60
Centipeda minima COL 61
Centipeda thespidioides COL 62
Chenopodium auricomum COL 63
Chenopodium cristatum COL 64
Chenopodium desertorum ssp. desertorum COL 65
Chenopodium gaudichaudianum COL 66
Chloris pectinata COL 67
Chrysocoryne pusilla COL 68
Chrysopogon fallax COL 69
Citrullus lanatus COL 70
Convolvulus erubescens COL 71
Crassula colorata var. acuminata COL 72
Crassula sieberana ssp. tetramera COL 73
Crotalaria cunninghamii COL 74
Crotalaria eremaea ssp. eremaea COL 75
Cymbopogon obtectus COL 76
Cynanchum floribundum COL 77
Dactyloctenium radulans COL 78
Daucus glochidiatus COL 79
Dentella pulvinata COL 80
Dichanthium affine COL 81
Dicrastylis lewellinii COL 82
Dicratylis lewellinii COL 83
Digitaria brownii COL 84
Digitaria coenicola var. coenicola COL 85
Dissocarpus paradoxus var. paradoxus COL 86
Dodonaea viscosa ssp. angustissima COL 87
Einadia nutans ssp. eremaea COL 88
Enchylaena tomentosa var. tomentosa COL 89
Enneapogon avenaceus COL 90
Enneapogon cylindricus COL 91
Enneapogon nigricans COL 92
Enneapogon polyphyllus COL 93
Enteropogon acicularis COL 94
Eragrostis basedowii COL 95
Eragrostis dielsii COL 96
Eragrostis dielsii var. dielsii COL 97
Eragrostis eriopoda COL 98
Eragrostis laniflora COL 99
Eragrostis leptocarpa COL 100
Eragrostis setifolia COL 101
Eragrostis tenellula COL 102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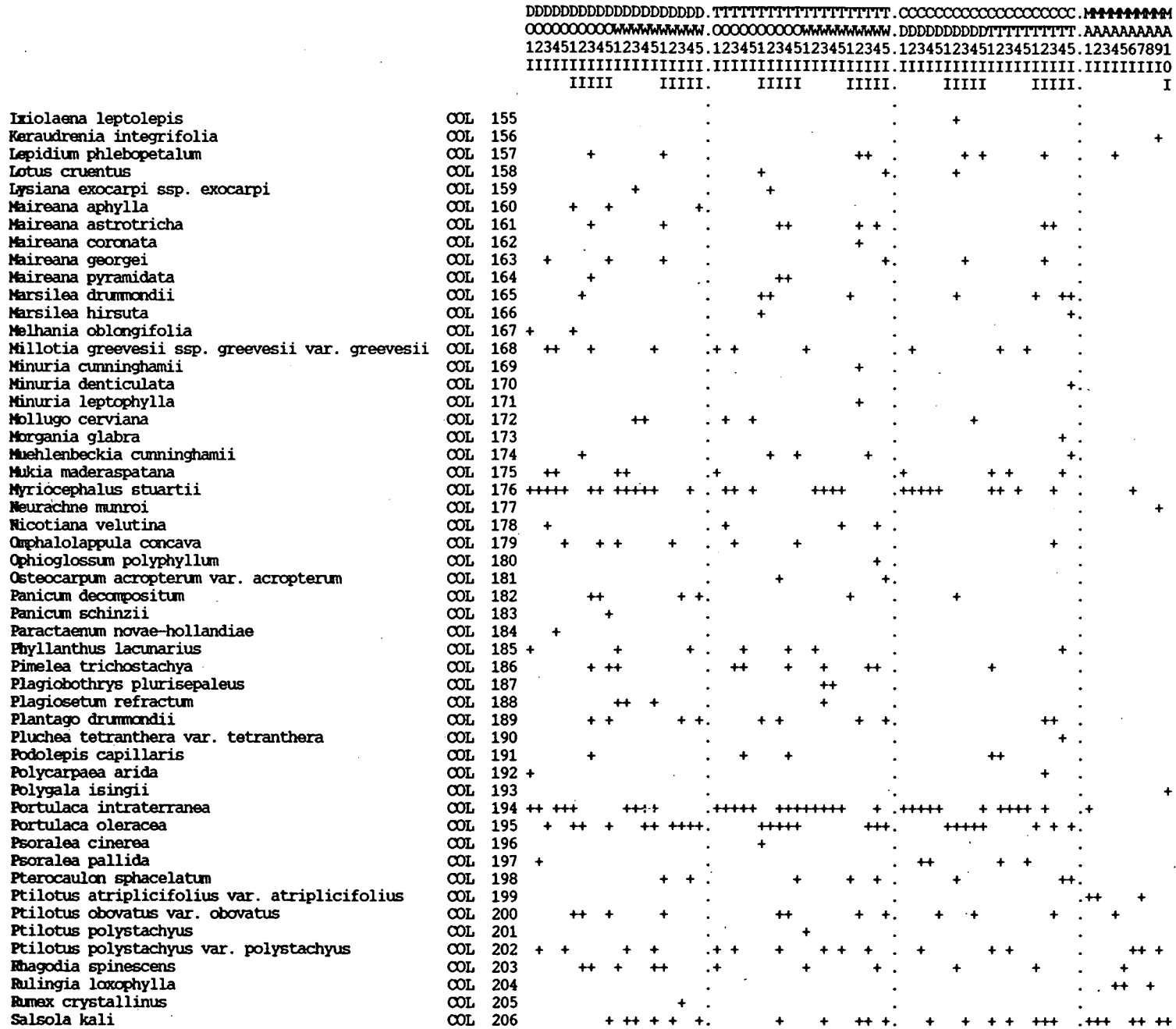
Eragrostis xerophila COL 103
Eremophila duttonii COL 104
Eremophila longifolia COL 105
Eriachne aristidea COL 106
Eriochloa australiensis COL 107
Erodium angustilobum COL 108
Erodium aureum COL 109
Erodium crinitum COL 110
Erodium cygnorum ssp. cygnorum COL 111
Erodium cygnorum ssp. glandulosum COL 112
Eucalyptus terminalis COL 113
Euphorbia drummondii COL 114
Euphorbia parvicaruncula COL 115
Euphorbia tannensis ssp. eremophila COL 116
Euphorbia wheeleri COL 117
Evolvulus alsinoides var. decumbens COL 118
Fimbristylis dichotoma COL 119
Fimbristylis velata COL 120
Gilesia biniflora COL 121
Glycine canescens COL 122
Gnephosis arachnoidea COL 123
Goodenia cycloptera COL 124
Goodenia fascicularis COL 125
Goodenia havilandii COL 126
Grevillea juncifolia COL 127
Grevillea stenobotrya COL 128
Grevillea striata COL 129
Hakea eyreana COL 130
Hakea leucoptera COL 131
Halgania cyanea COL 132
Haloragis aspera COL 133
Harmsiodoxa blennodioides COL 134
Harmsiodoxa brevipes var. brevipes COL 135
Harmsiodoxa puberula COL 136
Helichrysum apiculatum var. apiculatum COL 137
Helichrysum eremaeum COL 138
Helichrysum monochaetum COL 139
Helichrysum semifertile COL 140
Heliotropium tenuifolium COL 141
Helipterum floribundum COL 142
Helipterum jessenii COL 143
Helipterum moschatum COL 144
Helipterum strictum COL 145
Helipterum uniflorum COL 146
Hibiscus krichauffianus COL 147
Indigofera brevidens var. brevidens COL 148
Indigofera linifolia COL 149
Indigofera linnaei COL 150
Iseilema eremaeum COL 151
Iseilema vaginiflorum COL 152
Isotropis wheeleri COL 153
Ixiochlamys nana COL 154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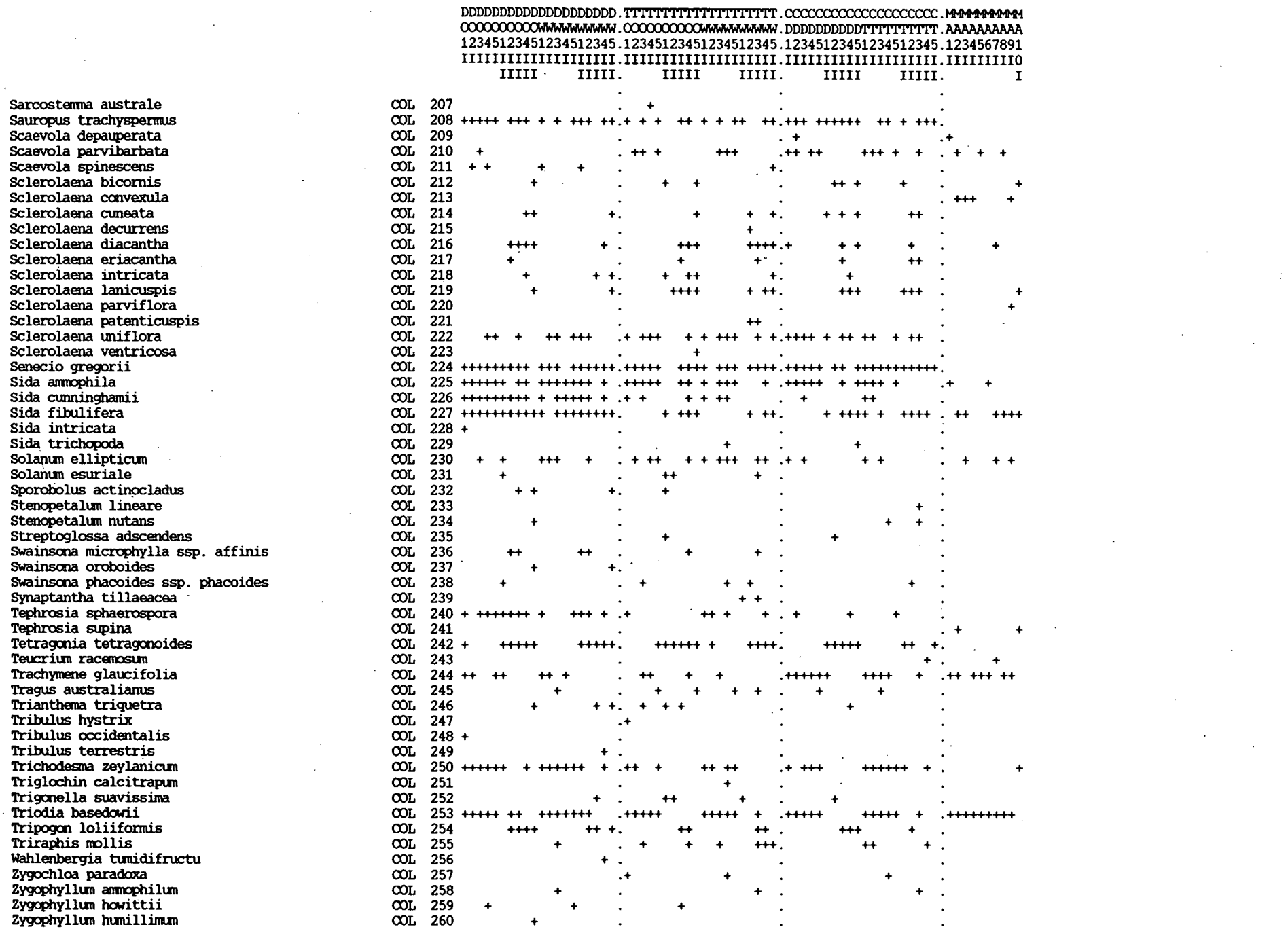
IIIII IIIII. IIIII IIIII. IIIII IIIII. I
Ixiolaena leptolepis COL 155
Keraudrenia integrifolia COL 156
Lepidium phlebopetalum COL 157
Lotus cruentus COL 158
Lysiana exocarpi ssp. exocarpi COL 159
Maireana aphylla COL 160
Maireana astrotricha COL 161
Maireana coronata COL 162
Maireana georgei COL 163
Maireana pyramidata COL 164
Marsilea drummondii COL 165
Marsilea hirsuta COL 166
Melhania oblongifolia COL 167
Millotia greevesii ssp. greevesii var. greevesii COL 168
Minuria cunninghamii COL 169
Minuria denticulata COL 170
Minuria leptophylla COL 171
Mollugo cerviana COL 172
Morgania glabra COL 173
Muehlenbeckia cunninghamii COL 174
Mukia maderaspatana COL 175
Myriocephalus stuartii COL 176
Neurachne munroi COL 177
Nicotiana velutina COL 178
Omphalolappula concava COL 179
Ophioglossum polyphyllum COL 180
Osteocarpum acropterum var. acropterum COL 181
Panicum decompositum COL 182
Panicum schinzii COL 183
Paractaenum novae-hollandiae COL 184
Phyllanthus lacunarius COL 185
Pimelea trichostachya COL 186
Plagiobothrys plurisepaleus COL 187
Plagiosetum refractum COL 188
Plantago drummondii COL 189
Pluchea tetranthera var. tetranthera COL 190
Podolepis capillaris COL 191
Polycarpaea arida COL 192
Polygala isingii COL 193
Portulaca intraterranea COL 194
Portulaca oleracea COL 195
Psoralea cinerea COL 196
Psoralea pallida COL 197
Pterocaulon sphacelatum COL 198
Ptilotus atriplicifolius var. atriplicifolius COL 199
Ptilotus obovatus var. obovatus COL 200
Ptilotus polystachyus COL 201
Ptilotus polystachyus var. polystachyus COL 202
Rhagodia spinescens COL 203
Rulingia loxophylla COL 204
Rumex crystallinus COL 205
Salsola kali COL 206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IIIII IIIII. IIIII IIIII. IIIII IIIII. I
Sarcostemma australe COL 207
Sauropus trachyspermus COL 208
Scaevola depauperata COL 209
Scaevola parvibarbata COL 210
Scaevola spinescens COL 211
Sclerolaena bicornis COL 212
Sclerolaena convexula COL 213
Sclerolaena cuneata COL 214
Sclerolaena decurrens COL 215
Sclerolaena diacantha COL 216
Sclerolaena eriacantha COL 217
Sclerolaena intricata COL 218
Sclerolaena lanicuspis COL 219
Sclerolaena parviflora COL 220
Sclerolaena patenticuspis COL 221
Sclerolaena uniflora COL 222
Sclerolaena ventricosa COL 223
Senecio gregorii COL 224
Sida ammophila COL 225
Sida cunninghamii COL 226
Sida fibulifera COL 227
Sida intricata COL 228
Sida trichopoda COL 229
Solanum ellipticum COL 230
Solanum esuriale COL 231
Sporobolus actinocladus COL 232
Stenopetalum lineare COL 233
Stenopetalum nutans COL 234
Streptoglossa adscendens COL 235
Swainsona microphylla ssp. affinis COL 236
Swainsona oroboides COL 237
Swainsona phacoides ssp. phacoides COL 238
Synaptantha tillaeacea COL 239
Tephrosia sphaerospora COL 240
Tephrosia supina COL 241
Tetragonia tetragonoides COL 242
Teucrium racemosum COL 243
Trachymene glaucifolia COL 244
Tragus australianus COL 245
Trianthema triquetra COL 246
Tribulus hystrix COL 247
Tribulus occidentalis COL 248
Tribulus terrestris COL 249
Trichodesma zeylanicum COL 250
Triglochin calcitrapum COL 251
Trigonella suavissima COL 252
Triodia basedowii COL 253
Tripogon loliiformis COL 254
Triraphis mollis COL 255
Wahlenbergia tumidifructu COL 256
Zygochloa paradoxa COL 257
Zygophyllum ammophilum COL 258
Zygophyllum howittii COL 259
Zygophyllum humillimum COL 260

FLORA
PATN ANALYSES, DELLA AND MARQUALPIE SITES, ORDINATION
REGRESSION AND PLOTS BASED ON 70 SITES

LABEL	SEQ #	X-VALUE	Y-VALUE	XCO	YCO	PLOT STATUS	Z-VALUE	SYM
CD1I	1	0.7290	0.1220	75	19	+ PLOTTED +	1.000	1
CD1II	2	-0.5250	-0.2970	37	11	+ PLOTTED +	2.000	2
CD2I	3	0.7140	-0.5500E-01	75	16	+ PLOTTED +	1.000	1
CD2II	4	-1.293	-0.5990	14	6	+ PLOTTED +	3.000	3
CD3I	5	0.4200	0.1610	66	20	+ PLOTTED +	1.000	1
CD3II	6	-0.5630	0.3860	36	24	+ PLOTTED +	2.000	2
CD4I	7	0.6310	0.9500E-01	72	18	+ PLOTTED +	1.000	1
CD4II	8	-0.7130	-0.4200E-01	32	16	+ PLOTTED +	2.000	2
CD5I	9	0.8290	-0.2420	78	12	+ PLOTTED +	1.000	1
CD5II	10	-0.6280	0.1350	34	19	+ PLOTTED +	2.000	2
CT1I	11	0.6640	0.4100E-01	73	17	+ PLOTTED +	1.000	1
CT1II	12	-0.5870	-0.5940	35	6	+ PLOTTED +	3.000	3
CT2I	13	0.6100	-0.6200E-01	72	15	+ PLOTTED +	1.000	1
CT2II	14	-0.5640	0.6630	36	29	+ PLOTTED +	2.000	2
CT3I	15	0.6380	0.4230	73	24	+ PLOTTED +	1.000	1
CT3II	16	-0.2380	-0.2430	46	12	+ PLOTTED +	2.000	2
CT4I	17	0.5090	-0.3930	69	9	+ PLOTTED +	1.000	1
CT4II	18	-0.5030	-0.8550	38	1	+ PLOTTED +	3.000	3
CT5I	19	0.8920	0.5930	80	27	+ PLOTTED +	1.000	1
CT5II	20	-1.052	-0.9110	21	0	+ PLOTTED +	3.000	3
DO1I	21	0.3290	-0.3780	63	10	+ PLOTTED +	1.000	1
DO1II	22	-0.2470	0.7120	46	30	+ PLOTTED +	2.000	2
DO2I	23	0.3770	-0.4900	65	8	+ PLOTTED +	1.000	1
DO2II	24	-0.6080	-0.4130	35	9	+ PLOTTED +	2.000	2
DO3I	25	0.5400E-01	-0.1060	55	15	+ PLOTTED +	1.000	1
DO3II	26	-0.3710	-0.8000E-02	42	16	+ PLOTTED +	2.000	2
DO4I	27	0.1080	-0.3420	57	10	+ PLOTTED +	1.000	1
DO4II	28	-0.6480	0.4400E-01	34	17	+ PLOTTED +	2.000	2
DO5I	29	0.2900	-0.1180	62	14	+ PLOTTED +	1.000	1
DO5II	30	-1.278	0.2090	14	20	+ PLOTTED +	2.000	2
DW1I	31	0.4490	-0.3390	67	10	+ PLOTTED +	1.000	1
DW1II	32	-0.1000	-0.2960	50	11	+ PLOTTED +	2.000	2
DW2I	33	0.8710	0.3210	80	22	+ PLOTTED +	1.000	1
DW2II	34	-0.1230	0.1560	49	19	+ PLOTTED +	2.000	2
DW3I	35	0.1830	0.4800E-01	59	17	+ PLOTTED +	1.000	1
DW3II	36	-1.234	0.1200	16	19	+ PLOTTED +	3.000	3
DW4I	37	0.5410	-0.6060	70	6	+ PLOTTED +	1.000	1
DW4II	38	-0.3390	-0.1820	43	13	+ PLOTTED +	2.000	2
DW5I	39	0.2220	-0.2880	60	11	+ PLOTTED +	1.000	1
DW5II	40	-1.002	0.1490	23	19	+ PLOTTED +	2.000	2
MA10I	41	-0.9100E-01	-0.2660	50	12	+ PLOTTED +	4.000	4
MA1I	42	1.539	0.2320	100	21	+ PLOTTED +	1.000	1
MA2I	43	0.7950	-0.1150	77	15	+ PLOTTED +	4.000	4
MA3I	44	0.2860	0.2420	62	21	+ PLOTTED +	4.000	4
MA4I	45	0.4390	-0.7160	67	4	+ PLOTTED +	4.000	4
MA5I	46	0.9370	-0.8330	82	1	+ PLOTTED +	4.000	4
MA6I	47	1.536	0.9400E-01	100	18	+ PLOTTED +	1.000	1
MA7I	48	0.2190	0.5540	60	27	+ PLOTTED +	4.000	4
MA8I	49	0.8890	-0.5690	80	6	+ PLOTTED +	4.000	4
MA9I	50	0.6440	0.3110	73	22	+ PLOTTED +	4.000	4
TO1I	51	0.6860	-0.6600E-01	74	15	+ PLOTTED +	1.000	1
TO1II	52	-1.751	-0.2220	0	13	+ PLOTTED +	3.000	3
TO2I	53	0.6550	-0.1080	73	15	+ PLOTTED +	1.000	1
TO2II	54	-1.603	0.5350	4	26	+ PLOTTED +	3.000	3
TO3I	55	0.2650	0.3670	61	23	+ PLOTTED +	1.000	1
TO3II	56	-0.6050	0.6090	35	28	+ PLOTTED +	2.000	2
TO4I	57	0.2350	0.5400	60	26	+ PLOTTED +	1.000	1
TO4II	58	-0.4120	0.4520	41	25	+ PLOTTED +	2.000	2
TO5I	59	0.2560	0.1780	61	20	+ PLOTTED +	1.000	1
TO5II	60	-0.9930	-0.1380	23	14	+ PLOTTED +	2.000	2
TW1I	61	0.4750	0.3400	68	23	+ PLOTTED +	1.000	1
TW1II	62	-1.412	-0.6110	10	5	+ PLOTTED +	3.000	3
TW2I	63	0.5340	-0.5380	69	7	+ PLOTTED +	1.000	1
TW2II	64	-0.6230	0.7500	34	30	+ PLOTTED +	2.000	2
TW3I	65	0.5220	0.3770	69	23	+ PLOTTED +	1.000	1
TW3II	66	-0.2180	0.7930	47	31	+ PLOTTED +	2.000	2
TW4I	67	0.3620	0.2490	64	21	+ PLOTTED +	1.000	1
TW4II	68	-0.5460	0.3740	37	23	+ PLOTTED +	2.000	2
TW5I	69	0.2970	0.2650	62	21	-NOT PLOTTED-	1.000	1
TW5II	70	-0.7610	0.4040	30	24	+ PLOTTED +	2.000	2

PLANT SPECIES COMPOSITION OF IDENTIFIED PATN GROUPS
(SHOWING 20 MOST SIGNIFICANT SPECIES FOR EACH GROUP)
NO. GROUPS = 4

Group 1 32 Members

sp.no	Species	Frequency	Overall Gps	Overall Ind	Group chi squ	Signif. std resid
42	Calandrinia balonensis	0.8125	2	57	1.3951	1.18
176	Myriocephalus stuartii	0.8125	2	56	1.2793	1.13
64	Chenopodium cristatum	0.8125	2	56	1.2793	1.13
74	Crotalaria cunninghamii	0.5313	1	79	1.1954	1.09
194	Portulaca intraterranea	0.8750	2	59	1.1149	1.06
3	Abutilon otocarpum	0.8438	4	27	1.0125	1.01
225	Sida ammophila	0.9375	2	71	0.9300	0.96
58	Cassia pleurocarpa var. pleu	0.6250	3	28	0.9132	0.96
106	Eriachne aristidea	0.5313	2	37	0.9076	0.95
134	Harmsiodoxa blennodioides	0.7813	2	61	0.7222	0.85
75	Crotalaria eremaea ssp. erem	0.3125	1	46	0.7031	0.84
250	Trichodesma zeylanicum	0.8125	4	23	0.6458	0.80
128	Grevillea stenobotrya	0.4688	3	20	0.5974	0.77
137	Helichrysum apiculatum var.	0.2500	1	37	0.5625	0.75
168	Millotia greevesii ssp. gree	0.2813	2	19	0.4878	0.70
147	Hibiscus krichauffianus	0.4063	3	17	0.4765	0.69
21	Aristida holathera var. hola	0.7188	3	36	0.4262	0.65
226	Sida cunninghamii	0.5313	2	44	0.4229	0.65
7	Acacia murrayana	0.1875	1	28	0.4219	0.65
48	Calotis erinacea	0.1875	1	28	0.4219	0.65

SPECIES GROUPS FROM DELLA_MAR_FLOR.GST
No. GROUPS = 4

Group 2 22 Members

sp.no	Species	Frequency	Overall Gps	Overall Ind	Group chi squ	Signif. std resid
73	Crassula sieberana ssp. tetr	0.5909	2	43	1.2186	1.10
214	Sclerolaena cuneata	0.5000	1	75	1.1250	1.06
119	Fimbristylis dichotoma	0.5000	1	75	1.1250	1.06
216	Sclerolaena diacantha	0.6818	3	31	1.0646	1.03
254	Tripogon loliiformis	0.6364	2	44	1.0452	1.02
27	Atriplex holocarpa	0.4545	1	68	1.0226	1.01
86	Dissocarpus paradoxus var. p	0.4545	1	68	1.0226	1.01
28	Atriplex limbata	0.4091	1	61	0.9205	0.96
161	Maireana astrotricha	0.3636	1	54	0.8181	0.90
90	Enneapogon avenaceus	0.7727	4	22	0.6493	0.81
115	Euphorbia parvicaruncula	0.2727	1	40	0.6136	0.78
217	Sclerolaena eriacantha	0.2727	1	40	0.6136	0.78
236	Swainsona microphylla ssp. a	0.2727	1	40	0.6136	0.78
200	Ptilotus obovatus var. obova	0.4545	3	20	0.5966	0.77
242	Tetragonia tetragonoides	0.9545	3	53	0.5671	0.75
219	Sclerolaena lanicuspis	0.5909	3	23	0.5056	0.71
163	Maireana georgei	0.2273	2	16	0.4093	0.64
31	Atriplex stipitata	0.1818	1	27	0.4091	0.64
143	Helipterum jessenii	0.1818	1	27	0.4091	0.64
10	Acacia tetragonophylla	0.1818	1	27	0.4091	0.64

SPECIES GROUPS FROM DELLA_MAR_FLOR.GST
No. GROUPS = 4

Group 3 8 Members

sp.no	Species	Frequency	Overall Gps	Overall Ind	Group chi squ	Signif. std resid
81	Dichanthium affine	0.8750	2	64	1.8073	1.34
165	Marsilea drummondii	0.8750	2	64	1.8073	1.34
252	Trigonella suavissima	0.6250	1	93	1.4063	1.19
152	Iseilema vaginiflorum	0.7500	2	53	1.3859	1.18
60	Centaurium spicatum	0.5000	1	75	1.1250	1.06
19	Aristida anthoxanthoides	0.5000	1	75	1.1250	1.06
109	Erodium aureum	0.5000	2	36	0.9697	0.98
101	Eragrostis setifolia	1.0000	3	40	0.9427	0.97
103	Eragrostis xerophila	0.7500	3	31	0.8168	0.90
198	Pterocaulon sphacelatum	0.5000	2	34	0.6372	0.80
100	Eragrostis leptocarpa	0.2500	1	37	0.5625	0.75
235	Streptoglossa adscendens	0.2500	1	37	0.5625	0.75
33	Bergia trimera	0.2500	1	37	0.5625	0.75
67	Chloris pectinata	0.2500	1	37	0.5625	0.75
166	Marsilea hirsuta	0.2500	1	37	0.5625	0.75
13	Alternanthera denticulata	0.2500	1	37	0.5625	0.75
99	Eragrostis laniflora	0.2500	1	37	0.5625	0.75
45	Calandrinia ptychosperma	0.7500	3	29	0.5218	0.72
182	Panicum decompositum	0.3750	2	25	0.4778	0.69
63	Chenopodium auricomum	0.2500	2	17	0.4200	0.65

SPECIES GROUPS FROM DELLA_MAR_FLOR.GST
No. GROUPS = 4

Group 4 8 Members

sp.no	Species	Frequency	Overall Gps	Overall Ind	Group chi squ	Signif. std resid
113	Eucalyptus terminalis	0.8750	2	62	1.5625	1.25
76	Cymbopogon obtectus	0.6250	1	93	1.4063	1.19
130	Hakea eyreana	0.7500	3	34	1.2093	1.10
213	Sclerolaena convexula	0.5000	1	75	1.1250	1.06
132	Halgania cyanea	0.5000	2	36	1.0152	1.01
204	Rulingia loxophylla	0.3750	1	56	0.8438	0.92
82	Dicrastylis lewellinii	0.3750	1	56	0.8438	0.92
93	Enneapogon polyphyllus	0.6250	2	42	0.8127	0.90
88	Einadia nutans ssp. eremaea	0.6250	3	26	0.6598	0.81
241	Tephrosia supina	0.2500	1	37	0.5625	0.75
57	Cassia oligophylla	0.2500	1	37	0.5625	0.75
52	Cassia artemisioides	0.2500	1	37	0.5625	0.75
149	Indigofera linifolia	0.2500	1	37	0.5625	0.75
49	Calotis hispidula	0.1250	4	28	0.4650	-0.68
199	Ptilotus atriplicifolius var	0.2500	2	17	0.4592	0.68
98	Eragrostis eriopoda	0.3750	2	26	0.4415	0.66
127	Grevillea juncifolia	0.2500	3	10	0.2879	0.54
15	Amphipogon caricinus	0.1250	1	18	0.2813	0.53
220	Sclerolaena parviflora	0.1250	1	18	0.2813	0.53
156	Keraudrenia integrifolia	0.1250	1	18	0.2813	0.53

APPENDIX 3.0

SMALL GROUND MAMMALS

(PATN ANALYSIS DATA)

NOTES

Appendix 3.2:	Table A:	Row sum	=	Number of mammal species at the site
	Table B:	Col label	=	Individual Mammal species sequence number in 3.1
		Sol sum	=	Number of sits at which that particular species was found
Appendices 3.4 & 3.6:		Seq #	=	Relates to each site included in PATN analyses
		Sym	=	Group to which each site was assigned

MAMMALS
DELLA AND MARQUALPIE SITES

1 Leggadina forresti
2 Mus musculus
3 Ningaui ridei
4 Planigale tenuirostris
5 Pseudomys hermannsburgensis
6 Sminthopsis crassicaudata
7 Sminthopsis macroura

MAMMALS
SPECIES DIVERSITY AT INDIVIDUAL SITES

A

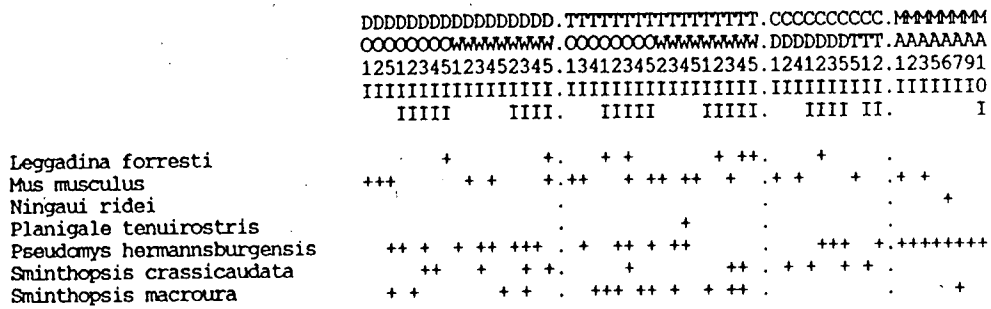
ROW LABEL	SEQUENCE NUMBER	ROW SUM	SUM/ M	SUM/ MAX ROW	NUMBER MISSING-
CD1I	(1)	1.000	0.1429	0.2500	0
CD1II	(2)	1.000	0.1429	0.2500	0
CD2I	(3)	1.000	0.1429	0.2500	0
TO1I	(36)	1.000	0.1429	0.2500	0
CD3II	(5)	1.000	0.1429	0.2500	0
CD4I	(6)	1.000	0.1429	0.2500	0
DO1I	(11)	1.000	0.1429	0.2500	0
CT1II	(8)	1.000	0.1429	0.2500	0
CT2II	(9)	1.000	0.1429	0.2500	0
CT5I	(10)	1.000	0.1429	0.2500	0
DW1I	(19)	1.000	0.1429	0.2500	0
DO1II	(12)	1.000	0.1429	0.2500	0
DO2I	(13)	1.000	0.1429	0.2500	0
DO2II	(14)	1.000	0.1429	0.2500	0
MA9I	(35)	1.000	0.1429	0.2500	0
DO4II	(16)	1.000	0.1429	0.2500	0
DW4II	(25)	1.000	0.1429	0.2500	0
DO5II	(18)	1.000	0.1429	0.2500	0
TW5I	(51)	1.000	0.1429	0.2500	0
DW2I	(20)	1.000	0.1429	0.2500	0
DW2II	(21)	1.000	0.1429	0.2500	0
MA2I	(30)	1.000	0.1429	0.2500	0
TO4I	(41)	1.000	0.1429	0.2500	0
MA5I	(32)	1.000	0.1429	0.2500	0
TW2I	(45)	1.000	0.1429	0.2500	0
DW5I	(26)	1.000	0.1429	0.2500	0
MA10I	(28)	1.000	0.1429	0.2500	0
TW2II	(46)	1.000	0.1429	0.2500	0
TW5II	(52)	1.000	0.1429	0.2500	0
TO4II	(42)	1.000	0.1429	0.2500	0
TW1II	(44)	1.000	0.1429	0.2500	0
CD5II	(7)	2.000	0.2857	0.5000	0
DO3II	(15)	2.000	0.2857	0.5000	0
TO3I	(39)	2.000	0.2857	0.5000	0
MA6I	(33)	2.000	0.2857	0.5000	0
MA3I	(31)	2.000	0.2857	0.5000	0
TO1II	(37)	2.000	0.2857	0.5000	0
DW3I	(22)	2.000	0.2857	0.5000	0
TW3I	(47)	2.000	0.2857	0.5000	0
DW4I	(24)	2.000	0.2857	0.5000	0
MA1I	(29)	2.000	0.2857	0.5000	0
MA7I	(34)	2.000	0.2857	0.5000	0
CD2II	(4)	2.000	0.2857	0.5000	0
TO2II	(38)	2.000	0.2857	0.5000	0
DW5II	(27)	3.000	0.4286	0.7500	0
DO5I	(17)	3.000	0.4286	0.7500	0
DW3II	(23)	3.000	0.4286	0.7500	0
TW3II	(48)	3.000	0.4286	0.7500	0
TW4I	(49)	3.000	0.4286	0.7500	0
TW4II	(50)	3.000	0.4286	0.7500	0
TO5II	(43)	3.000	0.4286	0.7500	0
TO3II	(40)	4.000	0.5714	1.000	0

B

COL LABEL	SEQUENCE NUMBER	COL SUM	SUM/ N	SUM/ MAX COL	NUMBER MISSING-
COL	3(3)	**1.000**	0.1923E-01	0.3704E-01	0
COL	4(4)	**1.000**	0.1923E-01	0.3704E-01	0
COL	1(1)	**8.000**	0.1538	0.2963	0
COL	6(6)	**12.00**	0.2308	0.4444	0
COL	7(7)	**14.00**	0.2692	0.5185	0
COL	2(2)	**19.00**	0.3654	0.7037	0
COL	5(5)	**27.00**	0.5192	1.000	0

SPARSITY RATIO (NUMBER OF NON-ZEROS/(N*M))..... 0.2253
D-RATIO (NUMBER OF D'S(0-0)/ MAX POSSIBLE D'S.... 0.6256
WHITTAKERS' BETA DIVERSITY MEASURE..... 3.439
ROUTLEDGES' BETA DIVERSITY MEASURE..... 1.053
TOTAL NUMBER OF MISSING VALUES.....
0

INCIDENCE OF MAMMALS AT ALL SITES



MAMMALS
PATN ANALYSES, DELLA SITES, ORDINATION
(INCLUDING Mus musculus)

LABEL	SEQ #	X-VALUE	Y-VALUE	XCO	YCO	PLOT STATUS	Z-VALUE	SYM
CD1I	1	0.8820	-0.3500E-01	87	23	+ PLOTTED +	1.000	1
CD1II	2	-0.9040	0.3500	9	33	+ PLOTTED +	2.000	2
CD2I	3	-0.9040	0.3500	9	33	-NOT PLOTTED-	2.000	2
CD2II	4	-0.2060	0.8350	40	46	+ PLOTTED +	4.000	4
CD3II	5	0.1870	0.3170	57	32	+ PLOTTED +	3.000	3
CD4I	6	0.8820	-0.3500E-01	87	23	-NOT PLOTTED-	1.000	1
CD5II	7	-0.5530	0.5960	25	39	+ PLOTTED +	2.000	2
CT1II	8	-0.9040	0.3500	9	33	-NOT PLOTTED-	2.000	2
CT2II	9	0.1870	0.3170	57	32	-NOT PLOTTED-	3.000	3
CT5I	10	0.8820	-0.3500E-01	87	23	-NOT PLOTTED-	1.000	1
DO1I	11	0.8820	-0.3500E-01	87	23	-NOT PLOTTED-	1.000	1
DO1II	12	0.1870	0.3170	57	32	-NOT PLOTTED-	3.000	3
DO2I	13	0.8820	-0.3500E-01	87	23	-NOT PLOTTED-	1.000	1
DO2II	14	-0.3910	-0.9110	32	0	+ PLOTTED +	5.000	5
DO3II	15	-0.5530	0.5960	25	39	-NOT PLOTTED-	2.000	2
DO4II	16	-0.9040	0.3500	9	33	-NOT PLOTTED-	2.000	2
DO5I	17	0.5530	-0.5130	73	10	+ PLOTTED +	3.000	3
DO5II	18	-0.9570	0.3410	7	33	+ PLOTTED +	4.000	4
DW1I	19	0.1870	0.3170	57	32	-NOT PLOTTED-	3.000	3
DW2I	20	0.8820	-0.3500E-01	87	23	-NOT PLOTTED-	1.000	1
DW2II	21	0.1870	0.3170	57	32	-NOT PLOTTED-	3.000	3
DW3I	22	-0.5530	0.5960	25	39	-NOT PLOTTED-	2.000	2
DW3II	23	-0.5620	-0.1830	24	19	+ PLOTTED +	3.000	3
DW4I	24	0.8740	0.1790	87	29	+ PLOTTED +	3.000	3
DW4II	25	0.1870	0.3170	57	32	-NOT PLOTTED-	3.000	3
DW5I	26	-0.3910	-0.9110	32	0	-NOT PLOTTED-	5.000	5
DW5II	27	-0.6200E-01	0.3130	46	32	+ PLOTTED +	2.000	2
TO1I	28	0.8820	-0.3500E-01	87	23	-NOT PLOTTED-	1.000	1
TO1II	29	-1.116	-0.6220	0	8	+ PLOTTED +	5.000	5
TO2II	30	-0.2000E-02	-0.5780	49	9	+ PLOTTED +	3.000	3
TO3I	31	0.8740	0.1790	87	29	-NOT PLOTTED-	3.000	3
TO3II	32	0.3900E-01	0.6120	50	40	+ PLOTTED +	2.000	2
TO4I	33	-0.3910	-0.9110	32	0	-NOT PLOTTED-	5.000	5
TO4II	34	-0.3910	-0.9110	32	0	-NOT PLOTTED-	5.000	5
TO5II	35	0.5530	-0.5130	73	10	-NOT PLOTTED-	3.000	3
TW1II	36	-0.3910	-0.9110	32	0	-NOT PLOTTED-	5.000	5
TW2I	37	0.8820	-0.3500E-01	87	23	-NOT PLOTTED-	1.000	1
TW2II	38	-0.9570	0.3410	7	33	-NOT PLOTTED-	4.000	4
TW3I	39	-0.2000E-02	-0.5780	49	9	-NOT PLOTTED-	3.000	3
TW3II	40	-0.9900E-01	-0.3430	44	15	+ PLOTTED +	2.000	2
TW4I	41	1.174	0.4330	100	35	+ PLOTTED +	3.000	3
TW4II	42	-0.9780	-0.4660	6	12	+ PLOTTED +	5.000	5
TW5I	43	0.8820	-0.3500E-01	87	23	-NOT PLOTTED-	1.000	1
TW5II	44	-0.9570	0.3410	7	33	-NOT PLOTTED-	4.000	4

MAMMAL SPECIES COMPOSITION OF PATN GROUPING
No. GROUPS = 5

Group 1 9 Members

sp.no	Species	Frequency	Overall Gps	Overall Ind	Group chi squ	Signif. std resi
2	Mus musculus	1.0000	3	46	1.3487	1.16

Group 2 10 Members

sp.no	Species	Frequency	Overall Gps	Overall Ind	Group chi squ	Signif. std resi
6	Sminthopsis crassicaudata	1.0000	3	50	2.3604	1.54
7	Sminthopsis macroura	0.1000	3	51	0.1257	-0.35
1	Leggadina forresti	0.2000	3	46	0.0318	-0.18
5	Pseudomys hermannsburgensis	0.4000	3	49	0.0148	0.12
2	Mus musculus	0.3000	3	46	0.0030	-0.05

Group 3 14 Members

sp.no	Species	Frequency	Overall Gps	Overall Ind	Group chi squ	Signif. std resi
5	Pseudomys hermannsburgensis	1.0000	3	49	1.3603	1.17
4	Planigale tenuirostris	0.0714	1	11	0.2286	0.48
6	Sminthopsis crassicaudata	0.0714	3	50	0.1210	-0.35
7	Sminthopsis macroura	0.3571	3	51	0.0148	0.12
2	Mus musculus	0.3571	3	46	0.0020	0.04

Group 4 4 Members

sp.no	Species	Frequency	Overall Gps	Overall Ind	Group chi squ	Signif. std resi
1	Leggadina forresti	1.0000	3	46	1.6626	1.29
5	Pseudomys hermannsburgensis	0.2500	3	49	0.0194	-0.14

Group 5 7 Members

sp.no	Species	Frequency	Overall Gps	Overall Ind	Group chi squ	Signif. std resi
7	Sminthopsis macroura	1.0000	3	51	1.7229	1.31
6	Sminthopsis crassicaudata	0.1429	3	50	0.0411	-0.20
1	Leggadina forresti	0.2857	3	46	0.0004	-0.02

MAMMALS
PATN ANALYSES, DELLA SITES, ORDINATION
(EXCLUDING Mus musculus)

LABEL	SEQ #	X-VALUE	Y-VALUE	XCO	YCO	PLOT STATUS	Z-VALUE	SYM
CD1II	1	0.5330	-0.5640	77	3	+ PLOTTED +	1.000	1
CD2I	2	0.5330	-0.5640	77	3	-NOT PLOTTED-	1.000	1
CD2II	3	-0.3890	0.9570	44	35	+ PLOTTED +	2.000	2
CD3II	4	-0.7240	0.8600E-01	33	17	+ PLOTTED +	4.000	4
CD5II	5	-0.3870	-0.4600	44	5	+ PLOTTED +	1.000	1
CT1II	6	0.5330	-0.5640	77	3	-NOT PLOTTED-	1.000	1
CT2II	7	-0.7240	0.8600E-01	33	17	-NOT PLOTTED-	4.000	4
DO1II	8	-0.7240	0.8600E-01	33	17	-NOT PLOTTED-	4.000	4
DO2II	9	0.5470	-0.1110	77	13	+ PLOTTED +	3.000	3
DO3II	10	-0.3870	-0.4610	44	5	-NOT PLOTTED-	1.000	1
DO4II	11	0.5330	-0.5640	77	3	-NOT PLOTTED-	1.000	1
DO5I	12	-0.3670	-0.1550	45	12	+ PLOTTED +	3.000	3
DO5II	13	0.5580	0.9710	78	36	+ PLOTTED +	2.000	2
DW1I	14	-0.7240	0.8600E-01	33	17	-NOT PLOTTED-	4.000	4
DW2II	15	-0.7240	0.8600E-01	33	17	-NOT PLOTTED-	4.000	4
DW3I	16	-0.3870	-0.4610	44	5	-NOT PLOTTED-	1.000	1
DW3II	17	-0.6200E-01	-0.6640	56	1	+ PLOTTED +	1.000	1
DW4I	18	-0.7240	0.8600E-01	33	17	-NOT PLOTTED-	4.000	4
DW4II	19	-0.7240	0.8600E-01	33	17	-NOT PLOTTED-	4.000	4
DW5I	20	0.5470	-0.1110	77	13	-NOT PLOTTED-	3.000	3
DW5II	21	0.9060	0.3250	90	22	+ PLOTTED +	2.000	2
TO1II	22	0.9990	0.6810	93	29	+ PLOTTED +	2.000	2
TO2II	23	-0.3680	-0.1540	45	12	-NOT PLOTTED-	3.000	3
TO3I	24	-0.7240	0.8600E-01	33	17	-NOT PLOTTED-	4.000	4
TO3II	25	-0.4600E-01	0.2500	57	20	+ PLOTTED +	2.000	2
TO4I	26	0.5470	-0.1110	77	13	-NOT PLOTTED-	3.000	3
TO4II	27	0.5470	-0.1110	77	13	-NOT PLOTTED-	3.000	3
TO5II	28	-0.3700	-0.1540	45	12	-NOT PLOTTED-	3.000	3
TW1II	29	0.5470	-0.1110	77	13	-NOT PLOTTED-	3.000	3
TW2II	30	0.5580	0.9710	78	36	-NOT PLOTTED-	2.000	2
TW3I	31	-0.3640	-0.1560	45	12	-NOT PLOTTED-	3.000	3
TW3II	32	0.9330	-0.7080	91	0	+ PLOTTED +	1.000	1
TW4I	33	-1.648	0.2780	0	21	+ PLOTTED +	4.000	4
TW4II	34	1.187	0.8900E-01	100	17	+ PLOTTED +	2.000	2
TW5II	35	0.5580	0.9710	78	36	-NOT PLOTTED-	2.000	2

MAMMAL SPECIES COMPOSTION OF PATN GROUPING
(minus Mus musculus)
No. GROUPS = 4

Group 1 9 Members

sp.no	Species	Frequency	Overall Gps	Overall Ind	Group Signif. chi squ	Group Signif. std resid
6	Sminthopsis crassicaudata	1.0000	2	68	1.2528	1.12
7	Sminthopsis macroura	0.2222	3	42	0.0578	-0.24
5	Pseudomys hermannsburgensis	0.4444	4	23	0.0152	-0.12

Group 2 8 Members

sp.no	Species	Frequency	Overall Gps	Overall Ind	Group Signif. chi squ	Group Signif. std resid
1	Leggadina forresti	1.0000	1	150	2.2500	1.50
5	Pseudomys hermannsburgensis	0.2500	4	23	0.1516	-0.39
7	Sminthopsis macroura	0.2500	3	42	0.0379	-0.19
6	Sminthopsis crassicaudata	0.3750	2	68	0.0028	0.05

Group 3 9 Members

sp.no	Species	Frequency	Overall Gps	Overall Ind	Group Signif. chi squ	Group Signif. std resid
7	Sminthopsis macroura	1.0000	3	42	1.0851	1.04
5	Pseudomys hermannsburgensis	0.4444	4	23	0.0152	-0.12

Group 4 9 Members

sp.no	Species	Frequency	Overall Gps	Overall Ind	Group Signif. chi squ	Group Signif. std resid
5	Pseudomys hermannsburgensis	1.0000	4	23	0.4049	0.64
4	Planigale tenuirostris	0.1111	1	16	0.2500	0.50

APPENDIX 4.0

REPTILES

(PATN ANALYSIS DATA)

NOTES

Appendix 4.2	Table A:	Row sum	=	Number of reptile species at the site
	Table B:	Col label	=	Individual reptile species sequence number in 4.1
Appendix 4.4		Seq #	=	Relates to each site included in PATN analyses
		Sym	=	Group to which each site was assigned

REPTILES
DELLA AND MARQUALPIE SITES

1 Ctenophorus fordi
2 Ctenophorus isolepis
3 Ctenophorus nuchalis
4 Ctenophorus vitticeps
5 Ctenotus ariadnae
6 Ctenotus brachyonyx
7 Ctenotus brooksi
8 Ctenotus leae
9 Ctenotus leonhardii
10 Ctenotus pantherinus
11 Ctenotus regius
12 Ctenotus schomburgkii
13 Ctenotus sp. aff. inornatus
14 Ctenotus sp. aff. strauchii
15 Ctenotus strauchii
16 Delma sp. aff. borea
17 Diplodactylus byrnei
18 Diplodactylus conspicillatus
19 Diporiphora winneckei
20 Egernia inornata
21 Eremiascincus fasciolatus
22 Gehyra variegata
23 Heteronotia binoei
24 Lerista labialis
25 Lerista xanthura
26 Lucasium damaeum
27 Menetia greyii
28 Neobatrachus centralis
29 Nephrurus levis
30 Pseudonaja modesta
31 Pygopus nigriceps
32 Ramphotyphlops endoterus
33 Rhynchoedura ornata
34 Suta suta
35 Tiliqua multifasciata
36 Varanus eremius
37 Varanus gouldii

REPTILES
SPECIES DIVERSITY AT INDIVIDUAL SITES

A

ROW LABEL	SEQUENCE NUMBER	ROW SUM	SUM/ M	SUM/ MAX ROW	NUMBER MISSING-
CT4I	(17)	**1.000**	0.2703E-01	0.1111	0
CD1II	(2)	**1.000**	0.2703E-01	0.1111	0
CT1II	(12)	**1.000**	0.2703E-01	0.1111	0
CT4II	(18)	**1.000**	0.2703E-01	0.1111	0
TO4I	(56)	**1.000**	0.2703E-01	0.1111	0
CT5I	(19)	**2.000**	0.5405E-01	0.2222	0
CD3I	(5)	**2.000**	0.5405E-01	0.2222	0
TO3II	(55)	**2.000**	0.5405E-01	0.2222	0
DO5II	(29)	**2.000**	0.5405E-01	0.2222	0
CD3II	(6)	**2.000**	0.5405E-01	0.2222	0
DO4II	(27)	**2.000**	0.5405E-01	0.2222	0
CT5II	(20)	**2.000**	0.5405E-01	0.2222	0
TO1II	(51)	**2.000**	0.5405E-01	0.2222	0
TW2I	(62)	**3.000**	0.8108E-01	0.3333	0
CD5I	(9)	**3.000**	0.8108E-01	0.3333	0
CD4II	(8)	**3.000**	0.8108E-01	0.3333	0
DW2II	(33)	**3.000**	0.8108E-01	0.3333	0
DO4I	(26)	**3.000**	0.8108E-01	0.3333	0
TW2II	(63)	**3.000**	0.8108E-01	0.3333	0
DO2II	(24)	**3.000**	0.8108E-01	0.3333	0
TW5II	(69)	**3.000**	0.8108E-01	0.3333	0
DW5I	(38)	**3.000**	0.8108E-01	0.3333	0
CD4I	(7)	**3.000**	0.8108E-01	0.3333	0
TW3II	(65)	**3.000**	0.8108E-01	0.3333	0
TO5II	(59)	**3.000**	0.8108E-01	0.3333	0
DW3II	(35)	**3.000**	0.8108E-01	0.3333	0
CD2II	(4)	**4.000**	0.1081	0.4444	0
CD5II	(10)	**4.000**	0.1081	0.4444	0
DW4I	(36)	**4.000**	0.1081	0.4444	0
CT2II	(14)	**4.000**	0.1081	0.4444	0
TO2II	(53)	**4.000**	0.1081	0.4444	0
CT3II	(16)	**4.000**	0.1081	0.4444	0
CT3I	(15)	**4.000**	0.1081	0.4444	0
TO5I	(58)	**4.000**	0.1081	0.4444	0
CT1I	(11)	**4.000**	0.1081	0.4444	0
TW5I	(68)	**4.000**	0.1081	0.4444	0
TW4II	(67)	**4.000**	0.1081	0.4444	0
DO1II	(22)	**4.000**	0.1081	0.4444	0
TO4II	(57)	**5.000**	0.1351	0.5556	0
DW2I	(32)	**5.000**	0.1351	0.5556	0
CT2I	(13)	**5.000**	0.1351	0.5556	0
DW3I	(34)	**5.000**	0.1351	0.5556	0
MA5I	(45)	**5.000**	0.1351	0.5556	0
DO5I	(28)	**5.000**	0.1351	0.5556	0
TW1II	(61)	**5.000**	0.1351	0.5556	0
MA8I	(48)	**5.000**	0.1351	0.5556	0
DW5II	(39)	**5.000**	0.1351	0.5556	0
MA10I	(40)	**5.000**	0.1351	0.5556	0
DO3I	(25)	**6.000**	0.1622	0.6667	0
MA2I	(42)	**6.000**	0.1622	0.6667	0
DW1II	(31)	**6.000**	0.1622	0.6667	0

TW1I	(60)	6.000	0.1622	0.6667	0
MA9I	(49)	6.000	0.1622	0.6667	0
DO2I	(23)	6.000	0.1622	0.6667	0
CD1I	(1)	6.000	0.1622	0.6667	0
DW4II	(37)	6.000	0.1622	0.6667	0
MA6I	(46)	7.000	0.1892	0.7778	0
TO3I	(54)	7.000	0.1892	0.7778	0
TO1I	(50)	7.000	0.1892	0.7778	0
TO2I	(52)	7.000	0.1892	0.7778	0
MA3I	(43)	7.000	0.1892	0.7778	0
DW1I	(30)	7.000	0.1892	0.7778	0
MA7I	(47)	7.000	0.1892	0.7778	0
TW3I	(64)	7.000	0.1892	0.7778	0
CD2I	(3)	7.000	0.1892	0.7778	0
TW4I	(66)	7.000	0.1892	0.7778	0
DO1I	(21)	8.000	0.2162	0.8889	0
MA4I	(44)	8.000	0.2162	0.8889	0
MA1I	(41)	9.000	0.2432	1.000	0

B

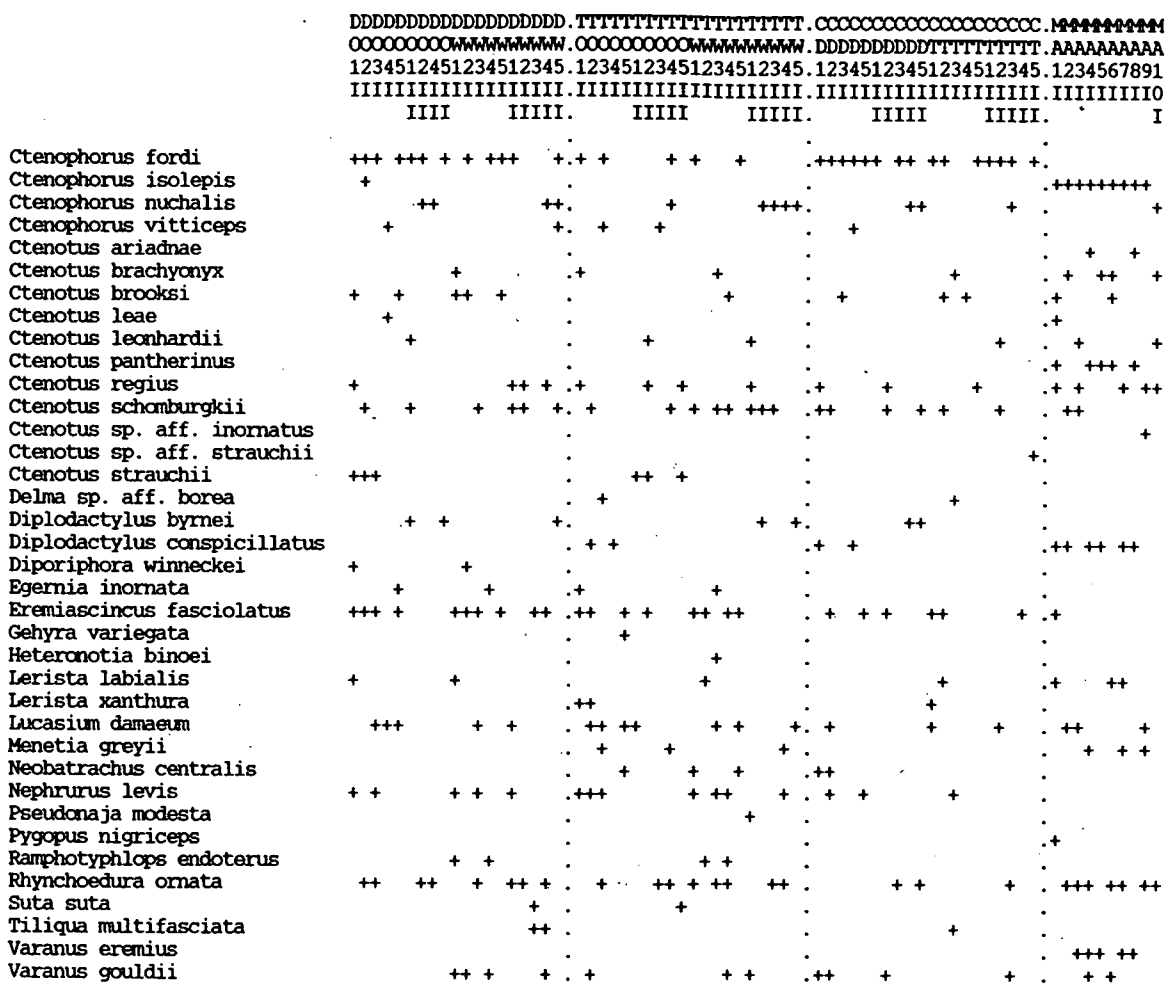
COL LABEL	SEQUENCE NUMBER	COL SUM	SUM/ N	SUM/ MAX COL	NUMBER MISSING-
COL	13(13)	1.000	0.1449E-01	0.3125E-01	0
COL	22(22)	1.000	0.1449E-01	0.3125E-01	0
COL	23(23)	1.000	0.1449E-01	0.3125E-01	0
COL	14(14)	1.000	0.1449E-01	0.3125E-01	0
COL	31(31)	1.000	0.1449E-01	0.3125E-01	0
COL	30(30)	1.000	0.1449E-01	0.3125E-01	0
COL	5(5)	2.000	0.2899E-01	0.6250E-01	0
COL	8(8)	2.000	0.2899E-01	0.6250E-01	0
COL	19(19)	2.000	0.2899E-01	0.6250E-01	0
COL	16(16)	2.000	0.2899E-01	0.6250E-01	0
COL	34(34)	2.000	0.2899E-01	0.6250E-01	0
COL	25(25)	3.000	0.4348E-01	0.9375E-01	0
COL	35(35)	3.000	0.4348E-01	0.9375E-01	0
COL	20(20)	4.000	0.5797E-01	0.1250	0
COL	32(32)	4.000	0.5797E-01	0.1250	0
COL	10(10)	5.000	0.7246E-01	0.1563	0
COL	28(28)	5.000	0.7246E-01	0.1563	0
COL	4(4)	5.000	0.7246E-01	0.1563	0
COL	36(36)	5.000	0.7246E-01	0.1563	0
COL	9(9)	6.000	0.8696E-01	0.1875	0
COL	27(27)	6.000	0.8696E-01	0.1875	0
COL	15(15)	6.000	0.8696E-01	0.1875	0
COL	17(17)	7.000	0.1014	0.2188	0
COL	24(24)	7.000	0.1014	0.2188	0
COL	6(6)	8.000	0.1159	0.2500	0
COL	2(2)	10.00	0.1449	0.3125	0
COL	18(18)	10.00	0.1449	0.3125	0
COL	7(7)	11.00	0.1594	0.3438	0
COL	37(37)	13.00	0.1884	0.4063	0
COL	3(3)	13.00	0.1884	0.4063	0
COL	29(29)	15.00	0.2174	0.4688	0
COL	11(11)	16.00	0.2319	0.5000	0
COL	26(26)	18.00	0.2609	0.5625	0
COL	12(12)	22.00	0.3188	0.6875	0
COL	21(21)	25.00	0.3623	0.7813	0
COL	33(33)	26.00	0.3768	0.8125	0

COL	1(1)	**32.00**	0.4638	1.000	0

SPARSITY RATIO (NUMBER OF NON-ZEROS/(N*M))	0.1179
D-RATIO (NUMBER OF D'S(0-0)/ MAX POSSIBLE D'S	0.7896
WHITTAKERS' BETA DIVERSITY MEASURE	7.482
ROUTLEDGES' BETA DIVERSITY MEASURE	1.623

TOTAL NUMBER OF MISSING VALUES.....
0

INCIDENCE OF REPTILES AT ALL SITES



REPTILES AND AMPHIBIAN
PATN ANALYSES, DELTA SITES, ORDINATION
(EXCLUDING SINGLE OCCURRENCES)
REGRESSIONS AND PLOT BASED ON 53 POINTS

LABEL	SEQ #	X-VALUE	Y-VALUE	XCO	YCO	PLOT STATUS	Z-VALUE	SYM
CD1I	1	0.6300E-01	-0.8820	57	0	+ PLOTTED +	1.000	1
CD2I	2	-0.3260	-0.4500	45	9	+ PLOTTED +	2.000	2
CD2II	3	-0.3980	-0.3720	42	10	+ PLOTTED +	1.000	1
CD3I	4	-0.3900	0.4780	42	27	+ PLOTTED +	2.000	2
CD3II	5	0.4790	0.4290	71	26	+ PLOTTED +	5.000	5
CD4I	6	0.7820	-0.7100	81	4	+ PLOTTED +	6.000	6
CD4II	7	0.6230	0.1300E-01	76	18	+ PLOTTED +	5.000	5
CD5I	8	-0.4130	0.2170	42	22	+ PLOTTED +	2.000	2
CD5II	9	1.069	0.5000E-01	91	19	+ PLOTTED +	5.000	5
CT1I	10	-0.6360	-0.1210	34	15	+ PLOTTED +	2.000	2
CT2I	11	-0.5750	0.5300E-01	36	19	+ PLOTTED +	2.000	2
CT2II	12	-0.9900E-01	-0.7250	52	3	+ PLOTTED +	5.000	5
CT3I	13	-0.2210	1.225	48	42	+ PLOTTED +	3.000	3
CT3II	14	0.6510	0.5580	77	29	+ PLOTTED +	5.000	5
CT5I	15	0.4000E-01	0.6690	57	31	+ PLOTTED +	1.000	1
DO1I	16	-0.7550	0.3820	30	25	+ PLOTTED +	2.000	2
DO1II	17	0.3490	-0.6060	67	6	+ PLOTTED +	5.000	5
DO2I	18	0.7900E-01	0.2350	58	22	+ PLOTTED +	2.000	2
DO2II	19	0.7670	0.4930	81	28	+ PLOTTED +	5.000	5
DO3I	20	-0.9300E-01	0.1200	52	20	+ PLOTTED +	2.000	2
DO4I	21	0.3920	0.4700E-01	68	19	+ PLOTTED +	6.000	6
DO4II	22	1.139	0.5390	93	28	+ PLOTTED +	5.000	5
DO5I	23	-0.7730	0.9600E-01	30	20	+ PLOTTED +	2.000	2
DO5II	24	0.2480	-0.2100	64	14	+ PLOTTED +	5.000	5
DW1I	25	-0.9990	-0.4450	22	9	+ PLOTTED +	3.000	3
DW1II	26	0.3150	-0.1190	66	15	+ PLOTTED +	1.000	1
DW2I	27	-0.6580	0.5150	33	28	+ PLOTTED +	2.000	2
DW2II	28	0.4280	0.2250	70	22	+ PLOTTED +	1.000	1
DW3I	29	0.1260	-0.4610	60	8	+ PLOTTED +	1.000	1
DW3II	30	-1.662	0.3100	0	24	+ PLOTTED +	3.000	3
DW4I	31	-0.1010	-0.8860	52	0	+ PLOTTED +	1.000	1
DW4II	32	0.3000E-02	0.9600E-01	55	20	+ PLOTTED +	3.000	3
DW5I	33	-0.6840	0.3950	33	26	+ PLOTTED +	2.000	2
DW5II	34	0.7790	-0.3720	81	10	+ PLOTTED +	5.000	5
TO1I	35	-0.4470	0.5180	40	28	+ PLOTTED +	1.000	1
TO1II	36	-0.4110	0.7750	42	33	+ PLOTTED +	4.000	4
TO2I	37	-0.3010	-0.8270	45	1	+ PLOTTED +	1.000	1
TO2II	38	-0.9880	0.8500E-01	22	19	+ PLOTTED +	4.000	4
TO3I	39	0.5470	0.3400E-01	74	18	+ PLOTTED +	6.000	6
TO3II	40	1.339	-0.2050	100	14	+ PLOTTED +	6.000	6
TO4II	41	0.8320	0.1930	83	22	+ PLOTTED +	5.000	5
TO5I	42	-0.8190	-0.5610	28	6	+ PLOTTED +	2.000	2
TO5II	43	-0.9490	0.8180	24	34	+ PLOTTED +	4.000	4
TW1I	44	0.6200E-01	-0.6900E-01	57	16	+ PLOTTED +	2.000	2
TW1II	45	-0.1720	-0.5580	50	7	+ PLOTTED +	1.000	1
TW2I	46	-1.405	-0.6610	9	4	+ PLOTTED +	3.000	3
TW2II	47	1.111	-0.2910	92	12	+ PLOTTED +	5.000	5
TW3I	48	0.5620	-0.6040	74	6	+ PLOTTED +	1.000	1
TW3II	49	1.035	0.9300E-01	90	20	+ PLOTTED +	5.000	5
TW4I	50	-0.1630	-0.3970	50	10	+ PLOTTED +	3.000	3
TW4II	51	1.056	0.4930	91	28	+ PLOTTED +	5.000	5
TW5I	52	-0.6380	-0.3040	34	12	+ PLOTTED +	2.000	2
TW5II	53	0.2010	0.6880	62	31	+ PLOTTED +	5.000	5

REPTILE SPECIES COMPOSTION OF PATN GROUPING
No. GROUPS = 6

Group 1 11 Members

sp.no	Species	Frequency	Overall Gps	Overall Ind	Group chi squ	Signif. std resi
20	Egernia inornata	0.2727	2	22	0.8085	0.90
12	Ctenotus schomburgkii	0.7273	4	32	0.7475	0.86
11	Ctenotus regius	0.6364	4	39	0.5608	0.75
25	Lerista xanthura	0.1818	2	16	0.4617	0.68
37	Varanus gouldii	0.4545	4	28	0.3497	0.59
18	Diplodactylus conspicillatus	0.1818	2	28	0.1676	0.41
29	Nephrurus levis	0.4545	5	19	0.1236	0.35
6	Ctenotus brachyonyx	0.1818	2	34	0.1072	0.33
26	Lucasium damaeum	0.3636	5	18	0.0169	0.13
28	Neobatrachus centralis	0.0909	2	25	0.0126	0.11
21	Eremiascincus fasciolatus	0.3636	4	47	0.0052	-0.07
33	Rhynchoedura ornata	0.3636	5	17	0.0048	0.07
1	Ctenophorus fordi	0.4545	4	41	0.0040	0.06
32	Ramphotyphlops endoterus	0.0909	2	40	0.0006	-0.02
9	Ctenotus leonhardii	0.0909	3	18	0.0000	-0.01

Group 2 14 Members

sp.no	Species	Frequency	Overall Gps	Overall Ind	Group chi squ	Signif. std resi
28	Neobatrachus centralis	0.2857	2	25	0.7918	0.89
7	Ctenotus brooksi	0.4286	2	50	0.7164	0.85
21	Eremiascincus fasciolatus	0.9286	4	47	0.6568	0.81
1	Ctenophorus fordi	0.9286	4	41	0.6403	0.80
19	Diporiphora winneckei	0.1429	1	23	0.5954	0.77
11	Ctenotus regius	0.0714	4	39	0.1339	-0.37
26	Lucasium damaeum	0.4286	5	18	0.0626	0.25
24	Lerista labialis	0.1429	2	31	0.0509	0.23
33	Rhynchoedura ornata	0.2143	5	17	0.0372	-0.19
29	Nephrurus levis	0.3571	5	19	0.0271	0.16
25	Lerista xanthura	0.0714	2	16	0.0202	0.14
37	Varanus gouldii	0.1429	4	28	0.0135	-0.12
20	Egernia inornata	0.0714	2	22	0.0035	0.06
15	Ctenotus strauchii	0.2143	2	80	0.0007	0.03
12	Ctenotus schomburgkii	0.2857	4	32	0.0005	0.02

Group 3 6 Members

sp.no	Species	Frequency	Overall Gps	Overall Ind	Group chi squ	Signif. std resi
35	Tiliqua multifasciata	0.5000	1	83	2.0833	1.44
32	Ramphotyphlops endoterus	0.5000	2	40	1.6369	1.28
24	Lerista labialis	0.3333	2	31	0.8125	0.90
6	Ctenotus brachyonyx	0.3333	2	34	0.7132	0.84

37	Varanus gouldii	0.5000	4	28	0.4826	0.69
21	Eremiascincus fasciolatus	0.8333	4	47	0.4377	0.66
7	Ctenotus brooksi	0.3333	2	50	0.3352	0.58
29	Nephrurus levis	0.5000	5	19	0.1926	0.44
16	Delma sp. aff. borea	0.1667	2	27	0.1362	0.37
34	Suta suta	0.1667	2	33	0.0834	0.29
12	Ctenotus schomburgkii	0.1667	4	32	0.0423	-0.21
11	Ctenotus regius	0.1667	4	39	0.0317	-0.18
3	Ctenophorus nuchalis	0.1667	2	59	0.0019	0.04
33	Rhynchoedura ornata	0.3333	5	17	0.0003	0.02

Group 4 3 Members

sp.no	Species	Frequency	Overall Gps	Overall Ind	Group chi squ	Signif. std resi
15	Ctenotus strauchii	1.0000	2	80	3.1435	1.77
34	Suta suta	0.3333	2	33	0.7498	0.87
11	Ctenotus regius	0.6667	4	39	0.6539	0.81
9	Ctenotus leonhardii	0.3333	3	18	0.6219	0.79
21	Eremiascincus fasciolatus	0.3333	4	47	0.0143	-0.12
26	Lucasium damaeum	0.3333	5	18	0.0055	0.07

Group 5 15 Members

sp.no	Species	Frequency	Overall Gps	Overall Ind	Group chi squ	Signif. std resi
3	Ctenophorus nuchalis	0.7333	2	59	2.2683	1.51
17	Diplodactylus byrnei	0.4667	1	77	1.9446	1.39
29	Nephrurus levis	0.0667	5	19	0.1544	-0.39
33	Rhynchoedura ornata	0.5333	5	17	0.1351	0.37
12	Ctenotus schomburgkii	0.4667	4	32	0.1348	0.37
26	Lucasium damaeum	0.1333	5	18	0.0872	-0.30
1	Ctenophorus fordi	0.6000	4	41	0.0837	0.29
37	Varanus gouldii	0.0667	4	28	0.0836	-0.29
27	Menetia greyii	0.1333	2	25	0.0754	0.27
4	Ctenophorus vitticeps	0.0667	2	82	0.0694	-0.26
9	Ctenotus leonhardii	0.1333	3	18	0.0175	0.13

Group 6 4 Members

sp.no	Species	Frequency	Overall Gps	Overall Ind	Group chi squ	Signif. std resi
4	Ctenophorus vitticeps	1.0000	2	82	3.8028	1.95
27	Menetia greyii	0.2500	2	25	0.5422	0.74
16	Delma sp. aff. borea	0.2500	2	27	0.4694	0.69
18	Diplodactylus conspicillatus	0.2500	2	28	0.4404	0.66
26	Lucasium damaeum	0.5000	5	18	0.1460	0.38
33	Rhynchoedura ornata	0.5000	5	17	0.0955	0.31
1	Ctenophorus fordi	0.5000	4	41	0.0179	0.13
29	Nephrurus levis	0.2500	5	19	0.0017	-0.04

APPENDIX 5.0

FAUNAL RAW DATA TABLES 1988, 1989, 1990

A) REPTILES

A-1 Species captured and observed in all study areas

A-2 Della Land System capture data 1988

A-3 Della and Marqualpie Land Systems capture data 1989

A-4 Della and Marqualpie Land Systems capture data 1990

B) MAMMALS

B-1 Species captured and observed in all study areas

B-2 Della Land System capture data 1988

B-3 Della and Marqualpie Land Systems capture data 1989

B-4 Della and Marqualpie Land Systems capture data 1990

C) BIRDS

C-1 Species observed in all study areas

C-2 Species observed at sites in the Della Land System 1988

C-3 Species observed at sites in the Della and Marqualpie Land Systems 1989

NOTE: To enable table interpretation: during the 1988 and 1989 surveys, dune and interdune sites were identified by the letters A and B respectively. This approach was subsequently altered to a numerical differentiation. Currently dune and interdune sites are identified by I and II respectively.

REPTILES : TABLE A-1

SPECIES	Species # 2	Total List 3		July '88 4				January '89 5					January '90 6			
				Della L.S.				Della L.S.					Della L.S.			
		M	D	D	B-D	C	T	M	D	B-D	C	T	M	D	B-D	C	T
GEKKONIDAE																	
Diplodactylus byrnei	R1		X						X	X	X	X		X	X	X	X
D. conspicillatus	R2	X	X					X	X		X	X	X	X	X	X	X
Gehyra variegata	R3	X	X						X	X	X	X	X	X	X	X	X
Heteronotia binoei	R4		X						X			X		X	X	X	X
Lucasium damaeum	R5	X	X					X	X	X	X	X	X	X	X	X	X
Nephrurus levis	R6	X	X						X	X	X	X	X	X	X	X	X
Rhynchoedura ornata	R7	X	X					X	X	X	X	X	X	X	X	X	X
Diplodactylus elderi	R39	X											X				
Diplodactylus tessellatus	R40		X											X			X
PYGOPODIDAE																	
Delma sp.aff. *haroldi*	R8	X	X						X		X	X	X	X	X	X	
Pygopus nigriceps	R9	X						X									
Lialis burtonis	R41		X											X	X	X	X
AGAMIDAE																	
Ctenophorus fordi	R10		X	X	X		X		X	X	X	X		X	X	X	X
C. isolepis	R11	X						X					X				
C. nuchalis	R12	X	X					X	X	X	X	X		X	X	X	X
Diporiphora winneckei	R13		X						X	X	X			X	X	X	
Pogona vitticeps	R14	X	X	X	X		X	X		X	X	X	X	X	X	X	X
VARANIDAE																	
Varanus eremius	R15	X						X					X				
V. gouldii	R16	X	X					X	X	X	X	X	X	X	X	X	X

Continued

REPTILES : TABLE A-1

SPECIES	Species # 2	Total List 3		July '88 4 Della L.S.				January '89 5 Della L.S.					January '90 6 Della L.S.				
		M	D	D	B-D	C	T	M	D	B-D	C	T	M	D	B-D	C	T
SCINCIDAE																	
Ctenotus ariadne	R17	X						X					X				
C. brachyonyx	R18	X	X					X	X	X	X	X	X	X	X	X	X
C. brooksi	R19	X	X	X	X			X	X	X	X	X	X	X	X	X	X
C. leae	R20	X	X					X	X	X							
C. leonhardii	R21	X	X					X	X	X	X	X	X	X	X	X	
C. pantherinus	R22	X						X					X				
C. sp. aff. *robustus*	R23	X						X									
C. regius	R24	X	X	X	X			X	X	X	X	X	X	X	X	X	X
C. schomburgkii	R25	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
C. strauchii	R26		X	X	X		X		X			X		X	X	X	X
C. "red strauchii"	R27		X	X	X				X		X						
Egernia inornata	R28		X						X	X		X		X	X	X	X
Eremiascincus fasciolatus	R29	X	X					X	X	X	X	X		X	X	X	X
Lerista labialis	R30	X	X					X	X	X	X	X	X	X	X	X	X
L. xanthura	R31		X						X		X	X		X		X	
Menetia greyii	R32	X	X			X		X	X			X	X	X	X	X	X
Tiliqua multifasciata	R33		X						X	X	X			X		X	
TYPHLOPIDAE																	
Rhamphotyphlops endoterus	R34	X	X						X	X		X	X	X	X		
BOIDAE																	
Aspidites ramsayi	R35		X						X	X							

Continued

REPTILES : TABLE A-1

SPECIES	Species #	Total List 3		July '88			4		January '89			5		January '90			6
				Della L.S.					Della L.S.					Della L.S.			
		M	D	D	B-D	C	T	M	D	B-D	C	T	M	D	B-D	C	T
ELAPIDAE																	
Pseudechis australis	R36		X						X		X						
Pseudonaja modesta	R37		X						X			X					
Pseudonaja nuchalis	R42	X											X				
Simoselaps fasciolatus	R43		X											X	X		
Suta suta	R38		X						X	X		X					
ANURA																	
Litoria rubella	A39	X						X									
Neobatrachus centralis	A40		X	X		X	X										

Table A-2a Burke - Dullingari : Reptiles trapped at the Burke - Dullingari sites in July '88

SP #	DW 1A	DW 1B	DO 1A	DO 1B	DW 2A	DW 2B	DO 2A	DO 2B	DW 3A	DW 3B	DO 3A	DO 3B	DW 4A	DW 4B	DO 4A	DO 4B	DW 5A	DW 5B	DO 5A	DO 5B	ALL W/I	ALL O/I	ALL I = dunes	ALL W/II	ALL O/II	ALL II = int. dunes	ALL W = wells	ALL O = off wells	Total	No. sites
R10			2										1						1		1	3	4	-	-	-	1	3	4	3
R19																	1				1	-	1	-	-	-	1	-	1	1
R24						1															-	-	-	1	-	1	1	-	1	1
R26											1									1	-	1	1	-	1	1	-	2	2	2
R27 •	1		1		1		1														2	2	4	-	-	-	2	2	4	4
No Spp	1		2		1	1	1				1		1				1		1	1	3	3	4	1	1	2	4	3	5	
T	1		3		1	1	1				1		1				1		1	1	4	6	10	1	1	2	5	7	12	

• *Pogona vitticeps* observed in district

Table A-2b Toolachee : Reptiles trapped at the Toolachee sites in July '88

SP #	TW 1A	TW 1B	TO 1A	TO 1B	TW 2A	TW 2B	TO 2A	TO 2B	TW 3A	TW 3B	TO 3A	TO 3B	TW 4A	TW 4B	TO 4A	TO 4B	TW 5A	TW 5B	TO 5A	TO 5B	ALL W/I	ALL O/I	ALL I = dunes	ALL W/II	ALL O/II	ALL II = int. dunes	ALL W = wells	ALL O = off wells	Total	No. sites
R25	2						1									1					2	1	3	-	1	1	2	2	4	3
R26 •				1				1												1	-	-	-	-	3	3	-	3	3	3
No. spp	1			1			1	1								1				1	1	1	1	0	2	2	1	2	2	
T	2			1			1	1								1				1	2	1	3	0	4	4	2	5	7	

• *Pogona vitticeps* observed, and *Neobatrachus centralis* trapped

Table A - 2c Control Field : Reptiles trapped at Control sites in July '88

SP #	CD 1A	CD 1B	CD 2A	CD 2B	CD 3A	CD 3B	CD 4A	CD 4B	CD 5A	CD 5B	CT 1A	CT 1B	CT 2A	CT 2B	CT 3A	CT 3B	CT 4A	CT 4B	CT 5A	CT 5B	ALL D/I	ALL T/I	ALL I = dunes	ALL D = II	ALL T = II	ALL II = int. dunes	ALL D	ALL T	Total	N° sites
R10									1												1	-	1	-	-	-	1	-	1	1
R25 •										1											-	-	-	1	-	1	1	-	1	1
No. spp									1	1											1	0	1	1	0	1	2	0	2	
T									1	1											1	0	1	1	0	1	2	0	2	

• *Neobatrachus centralis* trapped, and *Menetia greyii* and *Pogona viticeps* observed

Table A-3a Burke - Dullingari : Reptiles trapped at the Burke - Dullingari sites in January 1989

SP #	DW 1A	DW 1B	DO 1A	DO 1B	DW 2A	DW 2B	DO 2A	DO 2B	DW 3A	DW 3B	DO 3A	DO 3B	DW 4A	DW 4B	DO 4A	DO 4B	DW 5A	DW 5B	DO 5A	DO 5B	ALL W/I	ALL O/I	ALL I = dunes	ALL W/II	ALL O/II	ALL II = int. dunes	ALL W = wells	ALL O = off wells	Total	No. sites
* (*Gehyra variegata* observed)																														
R1				1														2		1	-	-	-	2	2	4	2	2	4	3
R5		1							2		1				1				2		2	4	6	1	-	1	3	4	7	5
R6	1	1	1						2		1										3	2	5	1	-	1	4	2	6	5
R7		1				1	5	6	1		2			3		4					1	7	8	5	10	15	6	17	23	8
R10		1	7		2		2	2			2						3			1	5	11	16	1	3	4	6	14	20	8
R12								3						2		1		4			-	-	-	6	4	10	6	4	10	4
R13			1		1																1	1	2	-	-	-	1	1	2	2
R14															1			1			-	1	1	1	-	1	1	1	2	2
R16	1				1								2	1							4	-	4	1	-	1	5	-	5	4
R18	1																				1	-	1	-	-	-	1	-	1	1
R19	1		1		1														1		2	2	4	-	-	-	2	2	4	4
R20															1						-	1	1	-	-	-	-	1	1	1
R21				1																	-	-	-	-	1	1	-	1	1	1
R24		1	1		1	1								1							1	1	2	2	1	3	3	2	5	5
R25		1		1		1	2		1									1			1	2	3	3	1	4	4	3	7	6
R28													2						1		2	1	3	-	-	-	2	1	3	2
R29	2		6		3		1		3		1			1			2		5		10	13	23	1	-	1	11	13	24	9
R30	1		1																		1	1	2	-	-	-	1	1	2	2
R33										1			1								1	-	1	1	-	1	2	-	2	2
R34	1												1								2	-	2	-	-	-	2	-	2	2
R38										1											-	-	-	1	-	1	1	-	1	1
No Spp	7	6	7	3	6	3	4	3	5	2	5	0	4	5	3	2	2	4	4	2	15	13	17	13	7	14	19	16	21	
T	8	6	18	3	9	3	10	11	9	2	7	0	6	8	3	5	5	8	9	2	37	47	84	26	22	48	63	69	132	

Table A-3b Toolachee : Reptiles trapped at the Toolachee sites in January 1989

SP #	TW 1A	TW 1B	TO 1A	TO 1B	TW 2A	TW 2B	TO 2A	TO 2B	TW 3A	TW 3B	TO 3A	TO 3B	TW 4A	TW 4B	TO 4A	TO 4B	TW 5A	TW 5B	TO 5A	TO 5B	ALL W/I	ALL O/I	ALL I = dunes	ALL W/II	ALL O/II	ALL II = int. dunes	ALL W = wells	ALL O = off wells	Total	No. sites
R1						1												3			-	-	-	4	-	4	4	-	4	2
R2							1								1						-	2	2	-	-	-	-	2	2	2
R3																			1		-	1	1	-	-	-	-	1	1	1
R4									1												1	-	1	-	-	-	1	-	1	1
R5			1				1		3		2						2		1		5	5	10	-	-	-	5	5	10	6
R6	1		2				1		2		1		3								6	4	10	-	-	-	6	4	10	6
R7	1								1	1	1	9	1	1		4					3	1	4	2	13	15	5	14	19	8
R8											1										-	1	1	-	-	-	-	1	1	1
R10	1		1								2				1		4				5	4	9	-	-	-	5	4	9	5
R12						4				1				1		1		2			-	-	-	8	1	9	8	1	9	5
R14											1	1									-	1	1	-	1	1	-	2	2	2
R16	1						1						1								2	1	3	-	-	-	2	1	3	3
R18			1						1												1	1	2	-	-	-	1	1	2	2
R19													1								1	-	1	-	-	-	1	-	1	1
R21		3						2													-	-	-	3	2	5	3	2	5	2
R24		1	1					1												1	-	1	1	1	2	3	1	3	4	4
R25		1				1			1	1			2			1					3	-	3	3	1	4	6	1	7	6
R26				4																	-	-	-	-	4	4	-	4	4	1
R28			1						1												1	1	2	-	-	-	1	1	2	2
R29	2		3		2		2						1				1		1		6	6	12	-	-	-	6	6	12	7
R30					3																3	-	3	-	-	-	3	-	3	1
R31			1				1														-	2	2	-	-	-	-	2	2	2
R32											2			1		1					-	2	2	1	1	2	1	3	4	3
R34					1								1								2	-	2	-	-	-	2	-	2	2
R37		1																			-	-	-	1	-	1	1	-	1	1
R38																				2	-	-	-	-	2	2	-	2	2	1
No. spp	5	4	8	1	3	3	6	2	7	3	7	2	7	3	2	4	3	2	3	2	13	15	20	8	9	11	19	20	26	
T	6	6	11	4	6	6	7	3	10	3	10	10	10	3	2	7	7	5	3	3	39	33	72	23	27	50	62	60	122	

Table B - 3c Control Field : Reptiles trapped at Control sites in January 1989

SP #	CD 1A	CD 1B	CD 2A	CD 2B	CD 3A	CD 3B	CD 4A	CD 4B	CD 5A	CD 5B	CT 1A	CT 1B	CT 2A	CT 2B	CT 3A	CT 3B	CT 4A	CT 4B	CT 5A	CT 5B	ALL D/I	ALL T/I	ALL I = dunes	ALL D = II	ALL T = II	ALL II = int. dunes	ALL D	ALL T	Total	N° sites
*R1								6		2											-	-	-	8	-	8	8	-	8	2
R2	1						1														2	-	2	-	-	-	2	-	2	2
R5			2								1		1								2	2	4	-	-	-	2	2	4	3
R6			1						1						1						2	1	3	-	-	-	2	1	3	3
R7						2				1						1					-	-	-	3	1	4	3	1	4	3
R8															1						-	1	1	-	-	-	-	1	1	1
R10	3		2		3		2		1		2		1	1	1				4		11	8	19	-	1	1	11	9	20	10
R12								2		1						1					-	-	-	3	1	4	3	1	4	3
#R14							1														1	-	1	-	-	-	1	-	1	1
R16	1		1	1												1					2	-	2	1	1	2	3	1	4	4
R18															1						-	1	1	-	-	-	-	1	1	1
R19					1								2				1				1	3	4	-	-	-	1	3	4	3
R21														1							-	-	-	-	1	1	-	1	1	1
R24	1			2															1		1	1	2	2	-	2	3	1	4	3
R25	1		1	1									1	1							2	1	3	1	1	2	3	2	5	5
R27																				1	-	-	-	-	1	1	-	1	1	1
R29			3						1		2		1				1				4	4	8	-	-	-	4	4	8	5
R30													1								-	1	1	-	-	-	-	1	1	1
R31											1										-	1	1	-	-	-	-	1	1	1
R33															1						-	1	1	-	-	-	-	1	1	1
No. spp	5	0	6	3	2	1	3	2	3	3	4	0	6	3	5	3	2	0	2	1	10	12	15	6	7	9	13	17	20	
T	7	0	10	4	4	2	4	8	3	4	6	0	7	3	5	3	2	0	5	1	28	25	53	18	7	25	46	32	78	

* *Gehyra variegata* observed
\# *Diporiphora winneckei* hand caught

Table B - 3d Marqualpie : Reptiles trapped at Marqualpie sites in January 1989

SP #	MA 1A	MA 1B	MA 2A	MA 2B	MA 3A	MA 3B	MA 4A	MA 4B	MA 5A	MA 5B	MA 6A	MA 6B	MA 7A	MA 7B	MA 8A	MA 8B	MA 9A	MA 9B	MA 10A	MA 10B	TOTAL LINE A's	TOTAL LINE B's	TOTAL	N° lines	N° Sites A & B
R2	0	2	1	0			3	1	1	1			0	1	3	1					8	6	14	9	6
R5			3	0	1	1											0	1			4	2	6	4	3
R7			2	2	6	2	1	0			1	0	4	1			1	2	1	0	16	7	23	11	7
R9	0	1																			0	1	1	1	1
R11	0	1	1	1	2	0	0	2	1	0	1	0	0	1	2	2	1	0			8	7	15	11	9
R12																			0	1	0	1	1	1	1
R15					1	0	2	2	1	0			0	1	0	1					4	4	8	6	5
R16							0	1			2	0									2	1	3	2	2
R17							4	0							1	0					5	0	5	2	2
R18			0	1					0	1	1	0							1	0	2	2	4	4	4
R19	1	1									0	1									2	1	3	3	2
R20	1	0																			1	0	1	1	1
R21					1	0													1	0	2	0	2	2	2
R22	0	2					5	0	1	0	1	0			3	0					10	2	12	5	5
R23																	1	0			1	0	1	1	1
R24	0	1			0	3							2	0			1	1	2	2	5	7	12	7	5
R25			4	0	3	0															7	0	7	2	2
R29	0	1																			0	1	1	1	1
R30	11	9									1	2	0	1							12	12	24	5	3
R32							1	0					1	0			1	0			3	0	3	3	3
No. spp	3	8	5	3	6	3	6	4	4	2	6	2	3	5	4	3	5	3	4	2	17	14	20		
T	13	18	11	4	14	6	16	6	4	2	7	3	7	5	9	4	5	4	5	3	91	55	146		

Table A-4a: Reptiles trapped at the Burke - Dullingari sites in January 1990

SP #	DW 1I	DW 1II	DO 1I	DO 1II	DW 2I	DW 2II	DO 2I	DO 2II	DW 3I	DW 3II	DO 3I	DO 3II	DW 4I	DW 4II	DO 4I	DO 4II	DW 5I	DW 5II	DO 5I	DO 5II	ALL W/I	ALL O/I	ALL I = dunes	ALL W/II	ALL O/II	ALL II = int. dunes	ALL W = wells	ALL O = off wells	Total	No. sites
R1				1				2										4		1	-	-	-	4	4	8	4	4	8	4
R2													1								1	-	1	-	-	-	1	-	1	1
R4			1																		-	1	1	-	-	-	-	1	1	1
R5			3													1			2		-	5	5	-	1	1	-	6	6	3
R6			1		2				1		2			1	2						3	5	8	1	-	1	4	5	9	6
R7		7				2		3	1			1				1		1			1	-	1	10	5	15	11	5	16	7
R8	1																				1	-	1	-	-	-	1	-	1	1
R41	1																				1	-	1	-	-	-	1	-	1	1
R10	3		1				3		1				5		2				2		9	8	17	-	-	-	9	8	17	7
R12																		1			-	-	-	1	-	1	1	-	1	1
R13							1														-	1	1	-	-	-	-	1	1	1
R16	1		1								1										1	2	3	-	-	-	1	2	3	3
R18	1														1				1		1	2	3	-	-	-	1	2	3	3
R19					1		1														1	1	2	-	-	-	1	1	2	2
R21							1														-	1	1	-	-	-	-	1	1	1
R24			1				1										1				1	2	3	-	-	-	1	2	3	3
R26																				1	-	-	-	-	1	1	-	1	1	1
R28	1		1										2								3	1	4	-	-	-	3	1	4	3
R29			1		1			1	3					1	5	1	3		2		7	8	15	1	2	3	8	10	18	9
R30	3		4				1						1		1						4	6	10	-	-	-	4	6	10	5
R32				1					1											1	1	-	1	-	2	2	1	2	3	3
R34	1												2								3	-	3	-	-	-	3	-	3	2
R43																	1				1	-	1	-	-	-	1	-	1	1
No Spp	8	1	9	2	3	1	6	3	5	0	2	1	5	2	5	3	3	3	4	3	16	13	20	5	6	8	18	17	23	
T	12	7	14	2	4	2	8	6	7	0	3	1	11	2	11	3	5	6	7	3	39	43	82	17	15	32	56	58	114	

Other species recorded were Gehyra Variegata, Pogona vitticeps and Ctenotus schomburgkii

Table A-4b: Reptiles trapped at the Toolachee sites in January 1990

SP #	TW 1I	TW 1II	TO 1I	TO 1II	TW 2I	TW 2II	TO 2I	TO 2II	TW 3I	TW 3II	TO 3I	TO 3II	TW 4I	TW 4II	TO 4I	TO 4II	TW 5I	TW 5II	TO 5I	TO 5II	ALL W/I	ALL O/I	ALL I = dunes	ALL W/II	ALL O/II	ALL II = int. dunes	ALL W = wells	ALL O = off wells	Total	No. sites
R1						2												3			-	-	-	5	-	5	5	-	5	2
R2							1		1												1	1	2	-	-	-	1	1	2	2
R40				1																	-	-	-	-	1	1	-	1	1	1
R5									2	2									1		2	1	3	2	-	2	4	1	5	3
R6		1	1																1		-	2	2	1	-	1	1	2	3	3
R7	1							2	2	1	1	5		3		3			1		3	2	5	4	10	14	7	12	19	9
R10							1		4		1		3								7	2	9	-	-	-	7	2	9	4
R12										1											-	-	-	1	-	1	1	-	1	1
R14									1												1	-	1	-	-	-	1	-	1	1
R16		1																			-	-	-	1	-	1	1	-	1	1
R18							1														-	1	1	-	-	-	-	1	1	1
R19							1														-	1	1	-	-	-	-	1	1	1
R24													1				1				2	-	2	-	-	-	2	-	2	2
R25	2	1								3				1			1		1		3	1	4	5	-	5	8	1	9	6
R26		1		2														1			-	-	-	2	2	4	2	2	4	3
R28	1		1						1		1										2	2	4	-	-	-	2	2	4	4
R29	2		10		7				1		1		2	1			1		2		13	13	26	1	-	1	14	13	27	9
R30			1		2		1		3		1						1		2		6	5	11	-	-	-	6	5	11	7
R32																1					-	-	-	-	1	1	-	1	1	1
R38				1																	-	-	-	-	1	1	-	1	1	1
No. spp	4	4	4	3	2	1	5	1	8	4	5	1	3	3	0	2	4	2	6	0	10	11	13	9	5	12	15	15	20	
T	6	4	13	4	9	2	5	2	15	7	5	5	6	5	0	4	4	4	8	0	40	31	71	22	15	37	62	46	108	

Also recorded off-site, were Gehyra variegata, Heteronotia binoei and Liatis burtonis

Table A-4c: Reptiles trapped at Control sites in January 1990

SP #	CD 1I	CD 1II	CD 2I	CD 2II	CD 3I	CD 3II	CD 4I	CD 4II	CD 5I	CD 5II	CT 1I	CT 1II	CT 2I	CT 2II	CT 3I	CT 3II	CT 4I	CT 4II	CT 5I	CT 5II	ALL D/I	ALL T/I	ALL I = dunes	ALL D = II	ALL T = II	ALL II = int. dunes	ALL D	ALL T	Total	N° sites
R1								3		1											-	-	-	4	-	4	4	0	4	2
R2							1		1		1										2	1	3	-	-	-	2	1	3	3
R3								1													-	-	-	1	-	1	1	-	1	1
R4				2																	-	-	-	2	-	2	2	-	2	1
R5	1		2		1		3						1		1	1			2		7	4	11	-	1	1	7	5	12	8
R6	1	1		1			1						1				1				2	2	4	2	-	2	4	2	6	6
R7		3	2			2		2		2		1	1	2		1		8			2	1	3	9	12	21	11	13	24	10
R8															1					1	-	1	1	-	1	1	-	2	2	2
R41	1																				1	-	1	-	-	-	1	-	1	1
R10	2		1		5		1	1	2				1		2				1		11	4	15	1	-	1	12	4	16	9
R12										1											-	-	-	1	-	1	1	-	1	1
R13					1				1												2	-	2	-	-	-	2	-	2	2
R16			1								1										1	1	2	-	-	-	1	1	2	2
R18	1								1										1		2	1	3	-	-	-	2	1	3	3
R21														1							-	-	-	-	1	1	-	1	1	1
R24						1															-	-	-	1	-	1	1	-	1	1
R25				1		1															-	-	-	2	-	2	2	-	2	2
R26																				1	-	-	-	-	1	1	-	1	1	1
R28							2		1				3								3	3	6	-	-	-	3	3	6	3
R29			4						2		2		2				3				6	7	13	-	-	-	6	7	13	5
R30	1		5		9		1		2				4				2		1		18	7	25	-	-	-	18	7	25	8
R31	1																				1	-	1	-	-	-	1	-	1	1
R32																			1		-	1	1	-	-	-	-	1	1	1
R38																				1	-	-	-	-	1	1	-	1	1	1
No. spp	7	2	6	3	4	3	6	4	7	3	3	1	7	2	3	2	3	1	5	3	13	12	15	9	6	14	19	15	24	
T	8	4	15	4	16	4	9	7	10	4	4	1	13	3	4	2	6	8	6	3	58	33	91	23	17	40	81	50	131	

Other species recorded were Pogona vitticeps, Ctenotus brooksi and Tiliqua multifasciata

Table A-4d: Reptiles trapped at Marqualpie sites in January 1990

SP #	MA 1A	MA 1B	MA 2A	MA 2B	MA 3A	MA 3B	MA 4A	MA 4B	MA 5A	MA 5B	MA 6A	MA 6B	MA 7A	MA 7B	MA 8A	MA 8B	MA 9A	MA 9B	MA 10A	MA 10B	TOTAL LINE A's	TOTAL LINE B's	TOTAL	N° lines	N° Sites A & B
R2	1	0					1	0	2	1	1	2	0	4	2	2	2	1			9	10	19	11	7
R39	0	1																			0	1	1	1	1
R5			0	1													1	0			1	1	2	2	2
R6	0	1									0	2									0	3	3	2	2
R7			0	1	6	4							4	0			1	0			11	5	16	5	4
R8							1	0			0	1							1	0	2	1	3	3	3
R11											1	3	0	3	1	3	2	0			4	9	13	6	4
R12																			1	0	1	0	1	1	1
R15			1	0			0	1							0	1					1	2	3	3	3
R16											1	0									1	0	1	1	1
R17	2	0													2	1	1	0			5	1	6	4	3
R18																	0	1			0	1	1	1	1
R19	0	1																			0	1	1	1	1
R21																	0	1	1	4	1	5	6	3	2
R22	0	1							0	1			1	0	1	0					2	2	4	4	4
R24			1	1					0	1	1	0	0	1					0	1	2	4	6	6	5
R25			0	1	0	2							1	0							1	3	4	3	3
R30	6	1									1	2	0	1							7	4	11	5	3
R32											0	1	0	1							0	2	2	2	2
R34	1	0																			1		1	1	1
R42	1	0																			1	0	1	1	1
No. spp	5	5	2	4	1	2	2	1	1	3	5	6	3	5	4	4	5	3	3	2	16	17	21*		
T	11	5	2	4	6	6	2	1	2	3	5	11	6	10	6	7	7	3	3	5	50	55	105		

* Also Pogona vitticeps & Gehyra variegata recorded off-site

MAMMALS : TABLE B-1

	SPECIES	Species # 2	Total List 3		July '88 4 Della L.S.				January '89 5 Della L.S.					January '90 6 Della L.S.				
			M	D	D	B-D	C	T	M	D	B-D	C	T	M	D	B-D	C	T
	DASYUROIDEA																	
	Ningaui sp. aff. *ridei*	M1	X						X									
	Sminthopsis crassicaudata	M2		X	X	X	X	X		X	X	X	X		X	X	X	X
	S. macroura	M3	X	X	X	X		X	X	X	X		X		X	X	X	X
	Planigale tenuirostris	M4		X						X			X		X			X
	RODENTIA																	
	Leggadina forrest	M5		X	X	X		X		X		X	X		X			X
	Pseudomys hermannsburgensis	M6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
*	*Mus musculus*	M7	X	X	X	X	X	X	X	X	X	X	X		X	X		X
	MACROPODOIDEA																	
	Macropus rufus	M8		X	X		X											
	ARTIODACTYLA																	
*	*Camelus dromedarius*	M9	X						X									
	PERISSODACTYLA																	
*	*Equus asinus*	M10		X						X		X						
	LAGOMORPHA																	
*	*Oryctolagus cuniculus*	M11		X						X	X	X	X		X	X	X	X
	CARNIVORA																	
*	*Canis familiaris dingo*	M12		X						X	X	X	X					
*	*Vulpes vulpes*	M13		X						X		X						
*	*Felis cattus*	M14		X						X	X	X						

* Introduced species

Table B-2a Burke - Dullingari : Mammals trapped at the Burke - Dullingari sites in July '88

SP #	DW 1A	DW 1B	DO 1A	DO 1B	DW 2A	DW 2B	DO 2A	DO 2B	DW 3A	DW 3B	DO 3A	DO 3B	DW 4A	DW 4B	DO 4A	DO 4B	DW 5A	DW 5B	DO 5A	DO 5B	ALL W/I	ALL O/I	ALL I = dunes	ALL W/II	ALL O/II	ALL II = int. dunes	ALL W = wells	ALL O = off wells	Total	No. sites
M2										1		1									-	-	-	1	1	2	1	1	2	2
M3																	1				1	-	1	-	-	-	1	-	1	1
M5																		1		2	-	-	-	1	2	3	1	2	3	2
M6	1												5	1					1		6	1	7	1	-	1	7	1	8	4
M7					2		2						2								4	2	6	-	-	-	4	2	6	3
No Spp	1				1		1			1		1	2	1			1	1	1	1	3	2	3	3	2	3	5	4	5	
T	1				2		2			1		1	7	1			1	1	1	2	11	3	14	3	3	6	14	6	20	

Table B-2b Toolachee : Mammals trapped at the Toolachee sites in July '88

SP #	TW 1A	TW 1B	TO 1A	TO 1B	TW 2A	TW 2B	TO 2A	TO 2B	TW 3A	TW 3B	TO 3A	TO 3B	TW 4A	TW 4B	TO 4A	TO 4B	TW 5A	TW 5B	TO 5A	TO 5B	ALL W/I	ALL O/I	ALL I = dunes	ALL W/II	ALL O/II	ALL II = int. dunes	ALL W = wells	ALL O = off wells	Total	No. sites
M2										2		1									-	-	-	2	1	3	2	1	3	2
M3		2							2					1	1	1				1	2	1	3	3	2	5	5	3	8	6
M5				1								1		1							-	-	-	1	2	3	1	2	3	3
M6								1	1		1										1	1	2	-	1	1	1	2	3	3
M7			1		1						1		1				1				3	2	5	-	-	-	3	2	5	5
No. spp		1	1	1	1			1	2	1	1	2	1	2	1	1	1			1	3	3	3	3	4	4	5	5	5	
T		2	1	1	1			1	3	1	2	2	1	2	1	1	1			1	6	4	10	6	6	12	12	10	22	

Table B - 2c Control Field : Mammals trapped at Control sites in July '88

SP #	CD 1A	CD 1B	CD 2A	CD 2B	CD 3A	CD 3B	CD 4A	CD 4B	CD 5A	CD 5B	CT 1A	CT 1B	CT 2A	CT 2B	CT 3A	CT 3B	CT 4A	CT 4B	CT 5A	CT 5B	ALL D/I	ALL T/I	ALL I = dunes	ALL D = II	ALL T = II	ALL II = int. dunes	ALL D	ALL T	Total	N° sites
M2										1											-	-	-	1	-	1	1	-	1	1
M6				1			1							1							1	-	1	1	1	2	2	1	3	3
M7	1						1												1		2	1	3	-	-	-	2	1	3	3
No. spp	1			1			2			1				1					1		2	1	2	2	1	2	3	2	3	
T	1			1			2			1				1					1		3	1	4	2	1	3	5	2	7	

Table B-3a Burke - Dullingari : Mammals trapped at the Burke - Dullingari sites in January 1989

SP #	DW 1A	DW 1B	DO 1A	DO 1B	DW 2A	DW 2B	DO 2A	DO 2B	DW 3A	DW 3B	DO 3A	DO 3B	DW 4A	DW 4B	DO 4A	DO 4B	DW 5A	DW 5B	DO 5A	DO 5B	ALL W/I	ALL O/I	ALL I = dunes	ALL W/II	ALL O/II	ALL II = int. dunes	ALL W = wells	ALL O = off wells	Total	No. sites
M2									1							1		1			1	-	1	1	1	2	2	1	3	3
M3								1		1									1		-	1	1	1	1	2	1	2	3	3
M6				2	1	1			5			1							1		6	1	7	1	3	4	7	4	11	6
M7			1		1													1	1		1	2	3	1	-	1	2	2	4	4
No Spp	0	0	1	1	2	1	0	1	2	1	0	1	0	0	0	1	0	2	3	0	3	3	4	4	3	4	4	4	4	
T	0	0	1	2	2	1	0	1	6	1	0	1	0	0	0	1	0	2	3	0	8	4	12	4	5	9	12	9	21	

Table B-3b Toolachee : Mammals trapped at the Toolachee sites in January 1989

SP #	TW 1A	TW 1B	TO 1A	TO 1B	TW 2A	TW 2B	TO 2A	TO 2B	TW 3A	TW 3B	TO 3A	TO 3B	TW 4A	TW 4B	TO 4A	TO 4B	TW 5A	TW 5B	TO 5A	TO 5B	ALL W/I	ALL O/I	ALL I = dunes	ALL W/II	ALL O/II	ALL II = int. dunes	ALL W = wells	ALL O = off wells	Total	No. sites
M2														1							-	-	-	1	-	1	1	-	1	1
M3		4		3				4	1												1	-	1	4	7	11	5	7	12	4
M4													1								1	-	1	-	-	-	1	0	1	1
M5						1												1			-	-	-	2	-	2	2	-	2	2
M6												1	1							1	1	-	1	2	-	2	1	2	3	3
M7					1					1		1							1		1	1	2	1	1	2	2	2	4	4
No. spp	0	1	0	1	1	1	0	1	1	1	0	2	2	1	0	0	0	1	1	1	4	1	4	5	2	5	6	3	6	
T	0	4	0	3	1	1	0	4	1	1	0	2	2	1	0	0	0	1	1	1	4	1	5	10	8	18	12	11	23	

Table B - 3c Control Field : Mammals trapped at Control sites in January 1989

SP #	CD 1A	CD 1B	CD 2A	CD 2B	CD 3A	CD 3B	CD 4A	CD 4B	CD 5A	CD 5B	CT 1A	CT 1B	CT 2A	CT 2B	CT 3A	CT 3B	CT 4A	CT 4B	CT 5A	CT 5B	ALL D/I	ALL T/I	ALL I = dunes	ALL D = II	ALL T = II	ALL II = int. dunes	ALL D	ALL T	Total	N° sites
M2		2	1									5									1	-	1	2	5	7	3	5	8	3
M5				1																	-	-	-	1	-	1	1	-	1	1
M6				1		1			1												1	-	1	2	-	2	3	-	3	3
M7																			1		-	1	1	-	-	-	-	1	1	1
No. spp	0	1	1	2	0	1	0	0	1	0	0	1	0	0	0	0	0	0	1	0	2	1	3	3	1	3	3	2	4	
T	0	2	1	2	0	1	0	0	1	0	0	5	0	0	0	0	0	0	1	0	2	1	3	5	5	10	7	6	13	

Table B - 3d Marqualpie : Mammals trapped at Marqualpie sites in January 1989

SP #	MA 1A	MA 1B	MA 2A	MA 2B	MA 3A	MA 3B	MA 4A	MA 4B	MA 5A	MA 5B	MA 6A	MA 6B	MA 7A	MA 7B	MA 8A	MA 8B	MA 9A	MA 9B	MA 10A	MA 10B	TOTAL LINE A's	TOTAL LINE B's	TOTAL	N° lines	N° Sites A & B
M1											0	1									-	1	1	1	1
M3													0	1							-	1	1	1	1
M6	1	3	0	1	2	0			2	0	1	0	0	1			1	0	2	0	9	5	14	9	8
M7	0	1			1	0															1	1	2	2	2
No. spp	1	2	0	1	2	0	0	0	1	0	1	1	0	2	0	0	1	0	1	0	2	4	4		
T	1	4	0	1	3	0	0	0	2	0	1	1	0	2	0	0	1	0	2	0	10	8	18		

Table B-4a: Mammals trapped at the Burke - Dullingari sites in January 1990

SP #	DW 1I	DW 1II	DO 1I	DO 1II	DW 2I	DW 2II	DO 2I	DO 2II	DW 3I	DW 3II	DO 3I	DO 3II	DW 4I	DW 4II	DO 4I	DO 4II	DW 5I	DW 5II	DO 5I	DO 5II	ALL W/I	ALL O/I	ALL I = dunes	ALL W/II	ALL O/II	ALL II = int. dunes	ALL W = wells	ALL O = off wells	Total	No. sites
M2										1						1		1			-	-	-	2	1	3	2	1	3	3
M3	1							1										1			1	-	1	1	1	2	2	1	3	3
M6	1			1							1	1		1	1						1	3	4	1	2	3	2	5	7	6
M7	1								1*		1		1*				1*				4	1	5	-	-	-	4	1	5	5
No Spp	3			1				1	1	1	2	1	1	1	1	1	1	2			3	2	3	3	3	3	4	4	4	
T	3			1				1	1	1	2	1	1	1	2	1	1	2			6	4	10	4	4	8	10	8	18	

* Captured in Elliott traps (600 Elliott-nights)

Table B-4b: Mammals trapped at the Toolachee sites in January 1990

SP #	TW 1I	TW 1II	TO 1I	TO 1II	TW 2I	TW 2II	TO 2I	TO 2II	TW 3I	TW 3II	TO 3I	TO 3II	TW 4I	TW 4II	TO 4I	TO 4II	TW 5I	TW 5II	TO 5I	TO 5II	ALL W/I	ALL O/I	ALL I = dunes	ALL W/II	ALL O/II	ALL II = int. dunes	ALL W = wells	ALL O = off wells	Total	No. sites
M2												1			1	1				1	-	1	1	-	3	3	-	4	4	4
M3														1							-	-	-	1	-	1	1	-	1	1
M4				1																	-	-	-	-	1	1	-	1	1	1
M5				1																	-	-	-	-	1	1	-	1	1	1
M6		1*							1	1					2						1	2	3	2	-	2	3	2	5	4
M7			1*				1*				1*	1*			5#			1*			-	8	8	1	1	2	1	9	10	6
No. spp		1	1	2			1		1	1	1	2		1	3	1		1		1	1	3	3	3	4	6	3	5	6	
T		1	1	2			1		1	1	1	2		1	8	1		1		1	1	11	12	4	6	10	5	17	22	

* Captured in Elliott traps (600 Elliott-nights)

\# 3 individuals captured in Elliott traps

Table B-4c: Mammals trapped at Control sites in January 1990

SP #	CD 1I	CD 1II	CD 2I	CD 2II	CD 3I	CD 3II	CD 4I	CD 4II	CD 5I	CD 5II	CT 1I	CT 1II	CT 2I	CT 2II	CT 3I	CT 3II	CT 4I	CT 4II	CT 5I	CT 5II	ALL D/I	ALL T/I	ALL I = dunes	ALL D = II	ALL T = II	ALL II = int. dunes	ALL D	ALL T	Total	N° sites
M2				1		2						1									-	-	-	3	1	4	3	1	4	3
M3				1								1								1	-	-	-	1	2	3	1	2	3	3
M6	1					1			1							1					2	-	2	1	1	2	3	1	4	4
No. spp	1			2		2			1			2				1				1	1	0	1	3	3	3	3	3	3	
T	1			2		3			1			2				1				1	2	0	2	5	4	9	7	4	11	

Table B 4d: Mammals trapped at Marqualpie sites in January 1990

SP #	MA 1A	MA 1B	MA 2A	MA 2B	MA 3A	MA 3B	MA 4A	MA 4B	MA 5A	MA 5B	MA 6A	MA 6B	MA 7A	MA 7B	MA 8A	MA 8B	MA 9A	MA 9B	MA 10A	MA 10B	TOTAL LINE A's	TOTAL LINE B's	TOTAL	N° lines	N° Sites A & B
M6	0	1											0	1			4	1	1	0	5	3	8	5	4

BIRDS : TABLE C-1

SPECIES	Species # 2	Total List 3		July '88 4 Della L.S.			January '89 5 Della L.S.		
		M	D	B-D	C	T	B-D	C	T
Emu	B1	X	X						
Pacific Heron	B2		X	X	X				
White-faced Heron	B3		X						
Cattle Egret	B4		X						
Straw-necked Ibis	B5		X						
Yellow-billed Spoonbill	B6		X	X					
Plumed Whistling-Duck	B7		X		X				
Black Swan	B8		X						
Grey Teal	B9		X						
Pink-eared Duck	B10		X		X	X		X	
Maned Duck	B11		X						
Letter-winged Kite	B12		X	X					
Black Kite	B13	X	X	X	X	X	X	X	X
Brown Goshawk	B14	X	X						
Wedge-tailed Eagle	B15	X	X		X		X	X	X
Spotted Harrier	B16	X	X						X
Black Falcon	B17		X				X		X
Brown Falcon	B18	X	X	X	X	X	X	X	X
Australian Kestrel	B19	X	X		X	X	X	X	
Stubble Quail	B20		X	X					
Little Button-quail	B21	X	X						
Black-tailed Native-hen	B22		X	X	X		X		
Australian Bustard	B23	X	X						
Masked Lapwing	B24		X						
Banded Lapwing	B25		X	X	X	X			
Red-kneed Dotterel	R26		X						
Black-fronted Plover	B27		X		X	X			
Black-winged Stilt	B28		X	X					
Red-necked Avocet	B29		X	X	X	X			

Continued

BIRDS : TABLE C-1 (Continued)

SPECIES	Species # 2	Total List 3		July '88 4 Della L.S.			January '89 5 Della L.S.		
		M	D	B-D	C	T	B-D	C	T
Greenshank	B30		X						
Marsh Sandpiper	B31		X						
Sharp-tailed Sandpiper	B32		X						
Silver Gull	B33		X						
Gull-billed Tern	B34		X						
Diamond Dove	B35		X		X	X	X		X
Flock Bronzewing	B36		X				X		
Crested Pigeon	B37	X	X	X	X	X	X	X	X
Galah	B38	X	X	X	X	X	X	X	X
Little Corella	B39	X	X	X		X	X	X	X
Cockatiel	B40	X	X	X	X	X			
Budgerigah	B41	X	X	X	X	X	X	X	X
Bluebonnet	B42		X	X	X	X	X	X	X
Blue-winged Parrot	B43		X			X			
Pallid Cuckoo	B44		X	X					
Horsfield's Bronze-Cuckoo	B45		X	X	X	X			
Southern Boobook	B46		X		X	X			
Tawny Frogmouth	B47		X		X			X	X
Australian Owlet-nightjar	B48	X	X						
Spotted Nightjar	B49	X	X						
Red-backed Kingfisher	B50		X			X	X		
Rainbow Bee-eater	B51	X	X				X	X	
Singing Bushlark	B52		X						
White-backed Swallow	B53	X	X	X	X	X	X	X	X
Welcome Swallow	B54		X	X					
Fairy Martin	B55		X			X			
Richard's Pipit	B56		X	X	X	X	X	X	X
Black-faced Cuckoo-shrike	B57		X	X					
Ground Cuckoo-shrike	B58	X	X		X				
White-winged Triller	B59		X	X	X	X			

Continued

BIRDS : TABLE C-1 (Continued)

SPECIES	Species # 2	Total List 3		July '88 4			January '89 5		
				Della L.S.			Della L.S.		
		M	D	B-D	C	T	B-D	C	T
Red-capped Robin	B60		X						
Willie Wagtail	B61	X	X	X	X	X	X		X
Chirruping Wedgebill	B62		X		X	X	X		X
Cinnamon Quail-thrush	B63		X	X	X				
Chestnut-crowned Babbler	B64	X	X	X	X	X	X	X	X
Rufous Songlark	B65		X	X		X			
Brown Songlark	B66		X	X	X	X	X		X
Variegated Fairy-wren	B67	X	X		X	X	X	X	X
White-winged Fairy-wren	B68	X	X	X	X	X	X	X	X
Eyrean Grasswren	B69		?		?				
Southern Whiteface	B70	X	X	X	X	X		X	X
Banded Whiteface	B71	X	X		X	X		X	X
Yellow-throated Miner	B72	X	X	X	X	X	X	X	X
Singing Honeyeater	B73	X	X	X	X	X	X	X	X
White-plumed Honeyeater	B74		X				X	X	
White-fronted Honeyeater	B75		X						
Black Honeyeater	B76		X		X	X		X	
Pied Honeyeater	B77		X			X		X	
Crimson Chat	B78		X			X	X		X
Orange Chat	B79		X			X	X		
Gibberbird	B80		X						
Mistletoebird	B81		X	X	X	X			
Red-browed Pardalote	B82	X	X	X			X		
House Sparrow	B83		X						
Zebra Finch	B84	X	X	X	X	X	X	X	X
Australian Magpie-lark	B85		X	X	X	X	X		X
White-breasted Woodswallow	B86		X						X
White-browed Woodswallow	B87		X			X			
Black-faced Woodswallow	B88	X	X	X	X	X	X	X	X
Australian Magpie	B89	X	X	X	X	X	X	X	X
Australian Raven	B90		X	X	X				
Little Crow	B91	X	X	X	X	X	X	X	X
Rufous Whistler	B92		X			X			

Table C-2a Burke - Dullingari : Birds observed at the Burke - Dullingari sites in July '88

SP #	DW 1A	DW 1B	DO 1A	DO 1B	DW 2A	DW 2B	DO 2A	DO 2B	DW 3A	DW 3B	DO 3A	DO 3B	DW 4A	DW 4B	DO 4A	DO 4B	DW 5A	DW 5B	DO 5A	DO 5B	ALL W/I	ALL O/I	ALL I = dunes	ALL W/II	ALL O/II	ALL II = int. dunes	ALL W = wells	ALL O = off wells	Total	No. sites	site vicinity No.
B13	2				X	2			1		1	1			2		1				4	3	7	2	1	3	6	4	10	7	1
B18												X						X		2	-	-	-	-	2	2	-	2	2	1	2
B20												X									-	-	-	-	-	-	-	-	0	0	1
B25				3								1									-	-	-	-	4	4	-	4	4	2	0
B37						1			1		X	1	1		1	1	1		X		3	1	4	1	2	3	4	3	7	7	2
B38				X											X						-	-	-	-	-	-	-	-	0	0	2
B39												X			X						-	-	-	-	-	-	-	-	0	0	2
B40	X																			X	-	-	-	-	-	-	-	-	0	0	2
B41	X			X	X		X			X		1	X		1		X		1		-	2	2	-	1	1	-	3	3	3	7
B42					X								X								-	-	-	-	-	-	-	-	0	0	2
B44																	X				-	-	-	-		-	-	-	0	0	1
B45		1									2										-	2	2	1	-	1	1	2	3	2	0
B53					2		1	2					1	1			1			1	4	1	5	1	3	4	5	4	9	7	0
B56				2				1				1				2		1		1	-	-	-	1	7	8	1	7	8	6	0
B57	1														1						1	1	2	-	-	-	1	1	2	2	0
B59										1											-	-	-	1	-	1	1	-	1	1	0
B61	3			1		1	1		X		X		1		1		1				5	2	7	1	1	2	6	3	9	7	2
B63											3	1									-	3	3	-	1	1	-	4	4	2	0
B64	1						3				2	1	1		2						2	7	9	-	1	1	2	8	10	6	0
B65						2			2	1					X						2	-	2	3	-	3	5	-	5	3	1
B66										3		X								2	-	-	-	3	2	5	3	2	5	2	1
B68							3	1			1									1	-	4	4	-	2	2	-	6	6	4	0
B70											1	1									-	1	1	-	1	1	-	2	2	2	0
B72		2			2		1		1								1				4	1	5	2	-	2	6	1	7	5	0
B73	3		1		3		3		3		3		3	1	1		3		3		15	11	26	1	-	1	16	11	27	11	0
B81							1														-	1	1	-	-	-	-	1	1	1	0
B82												X									-	-	-	-	-	-	-	-	0	0	1
B84	1					1	1				1	2			3	1		1	1		1	6	7	2	3	5	3	9	12	9	0
B85		1										X									-	-	-	1	-	1	1	-	1	1	1
B88		2	1	1								2			1	1		1			-	2	2	3	4	7	3	6	9	7	0
B89			1	1		X	X	X		X						X					-	1	1	-	1	1	-	2	2	2	5
B90		2	1	1			1														-	2	2	2	1	3	2	3	5	4	0
B91	1	1		1	X	2	1		1	1	2		1		3		X				3	6	9	4	1	5	7	7	14	10	2
No Spp	7	6	4	7	3	6	10	3	6	4	9	10	6	2	10	4	6	3	3	5	11	19	20	16	18	24	18	23	26		
Add Spp	2	0		2	4	1	2	1	1	2	2	6	2	0	3	1	3	1	1	1											7
																				Total Records	44	57	101	29	38	67	73	95	168		

The numbers refer to the number of days on which a species was recorded on the site - they do not indicate the number of individuals.
X: species not recorded on immediate site, but recorded within the habitat in the vicinity of the site.

Table C-2b Toolachee : Birds observed at the Toolachee sites in July '88

SP #	TW 1A	TW 1B	TO 1A	TO 1B	TW 2A	TW 2B	TO 2A	TO 2B	TW 3A	TW 3B	TO 3A	TO 3B	TW 4A	TW 4B	TO 4A	TO 4B	TW 5A	TW 5B	TO 5A	TO 5B	ALL W/I	ALL O/I	ALL I = dunes	ALL W/II	ALL O/II	ALL II = int. dunes	ALL W = wells	ALL O = off wells	Total	No. sites	site vicinity No.
B13		1				1		X					1						X		1	-	1	2	-	2	3	-	3	3	2
B18		1				1			X	1				X	X		X	X			-	-	-	3	-	3	3	-	3	3	5
B19	1																				1	-	1	-	-	-	1	-	1	1	0
B25										X		1								X	-	-	-	-	1	1	-	1	1	1	2
B27										1											-	-	-	1	-	1	1	-	1	1	0
B35					1	X		1													1	-	1	-	1	1	1	1	2	2	1
B37	1	1		X	1			1	X	2				1							2	-	2	4	1	5	6	1	7	6	2
B38		X								X											-	-	-	-	-	-	-	-	0	0	2
B39			X			1		X													-	-	-	1	-	1	1	-	1	1	2
B40							X														-	-	-	-	-	-	-	-	0	0	1
B41	X		X	X		1		2	X	2	1	X		X	X				X		-	1	1	3	2	5	3	3	6	4	8
B42										2											-	-	-	2	-	2	2	-	2	1	0
B43	X									X											-	-	-	-	-	-	-	-	0	0	2
B45				X		X									X						-	-	-	-	-	-	-	-	0	0	3
B46																		X			-	-	-	-	-	-	-	-	0	0	1
B50								1		1											-	-	-	1	1	2	1	1	2	2	0
B53	1	1		1			1				X		2	2							3	1	4	3	1	4	6	2	8	6	1
B55		2	1		1	2				2				1				2			1	1	2	9	-	9	10	1	11	7	0
B56		X				1		1	X	1				2		2		1			-	-	-	5	3	8	5	3	8	6	2
B59								2			X										-	-	-	-	2	2	-	2	2	1	1
B92																			X		-	-	-	-	-	-	-	-	0	0	1
B61	1	X			X		1	1						X					1		1	2	3	-	1	1	1	3	4	4	3
B62						2	X	2		2											-	-	-	4	2	6	4	2	6	3	1
B64	1		1		1	1	X		1		X				1		1				4	2	6	1	-	1	5	2	7	7	2
B65								1							X					1	-	-	-	-	2	2	-	2	2	2	1
B66						1		X						1						X	-	-	-	2	-	2	2	-	2	2	2
B67			2						1				X	1					X		1	2	3	1	-	1	2	2	4	3	2
B68	2		1			1			2	1		1	2	1	2		1		2	1	7	5	12	3	2	5	10	7	17	12	0
B70	1																			X	1	-	1	-	-	-	1	-	1	1	1
B71															X	1			1	1	-	1	1	-	2	2	-	3	3	3	1
B72			1		1	1	1	X	1	1	1				1				1		2	5	7	2	-	2	4	5	9	9	1
B73	2		2		1	X	2	X	2		2		2		1	X	2		2		9	9	18	-	-	-	9	9	18	10	3
B76	1								1		X				X				1		2	1	3	-	-	-	2	1	3	3	2
B77											X										-	-	-	-	-	-	-	-	0	0	1
B78	X																				-	-	-	-	-	-	-	-	0	0	1
B81	X					1		2			X		X						1		-	1	1	1	2	3	1	3	4	3	3
B84	1	2	2	1	2	2		1	X	1		1	2	1	1	2		2	2	2	5	5	10	8	7	15	13	12	25	16	1
B85				1				X													-	-	-	-	1	1	-	1	1	1	1
B87	X		X																		-	-	-	-	-	-	-	-	0	0	2
B88		1	1	1				1		1						1				1	-	1	1	2	4	6	2	5	7	7	0
B89											1	1	X			X			X	X	-	1	1	-	1	1	-	2	2	2	4
B91	X	X		2	X	1	1	X	X	X	1	X	1		X		X		1	X	1	3	4	1	2	3	2	5	7	6	10
No. spp	10	7	8	5	7	14	5	12	6	13	5	4	6	8	5	4	3	3	9	5	16	16	21	21	19	29	27	25	33		(9)
T	6	4	3	3	2	3	3	7	6	4	6	2	3	3	7	2	2	2	5	5	42	41	83	59	38	97	101	79	180		

Table C - 2c Control Field : Birds Observed at Control sites in July '88

SP #	CD 1A	CD 1B	CD 2A	CD 2B	CD 3A	CD 3B	CD 4A	CD 4B	CD 5A	CD 5B	CT 1A	CT 1B	CT 2A	CT 2B	CT 3A	CT 3B	CT 4A	CT 4B	CT 5A	CT 5B	ALL D/I	ALL T/I	ALL I = dunes	ALL D = II	ALL T = II	ALL II = int. dunes	ALL D	ALL T	Total	N° sites	site vicinity No.
B13			X		2			1				2	1	1	1		1		X		2	3	5	1	3	4	3	6	9	7	2
B15					X								X								-	-	-	-	-	-	-	-	0	0	2
B18	X							1		X		1						X	1		-	1	1	1	1	2	1	2	3	3	3
B19														1						1	-	-	-	-	2	2	-	2	2	2	0
B35								1													-	-	-	1	-	1	1	-	1	1	0
B37					1						2	2			1		1	2			1	4	5	-	4	4	1	8	9	6	0
B38						X						1		X							-	-	-	-	1	1	-	1	1	1	2
B40																		X			-	-	-	-	-	-	-	-	0	0	1
B41		1		X	X			X			1	2	X	X		1		1			-	1	1	1	4	5	1	5	6	5	5
B42												2						1			-	-	-	-	3	3	-	3	3	2	0
B45											X						X				-	-	-	-	-	-	-	-	0	0	2
B53						1													1	1	-	1	1	1	1	2	1	2	3	3	0
B56		1		1		1		1		1		1		1		1					-	-	-	5	3	8	5	3	8	8	0
B58								1													-	-	-	1	-	1	1	-	1	1	0
B59	1		1																		2	-	2	-	-	-	2	-	2	2	0
B61	1			1																	1	-	1	1	-	1	2	-	2	2	0
B62	X																				-	-	-	-	-	-	-	-	0	0	1
B63															X						-	-	-	-	-	-	-	-	0	0	1
B64							2	1													2	1	3	-	-	-	2	1	3	2	0
B66										X	1										-	1	1	-	-	-	-	1	1	1	1
B67																	1		1		-	2	2	-	-	-	-	2	2	2	0
B68	1				3		2		1	2						1	1		2		7	3	10	2	1	3	9	4	13	8	0
B70								1													-	-	-	1	-	1	1	-	1	1	0
B71															X						-	-	-	-	-	-	-	-	0	0	1
B25		1		3										X				X		X	-	-	-	4	-	4	4	-	4	2	3
B72					2						2	3	1	1	1		3	2	3		2	10	12	-	6	6	2	16	18	9	0
B73	2		3		3		3		1		2		2		1		3		2		12	10	22	-	-	-	12	10	22	10	0
B76	1		1				1										3				3	3	6	-	-	-	3	3	6	4	0
B81																	1				-	1	1	-	-	-	-	1	1	1	0
B84	1	1		X		1		1						1			X	X	1		1	1	2	3	1	4	4	2	6	6	3
B85					X																-	-	-	-	-	-	-	-	0	0	1
B88		1	1	1			1	1		1						1					2	-	2	4	1	5	6	1	7	7	0
B89				X										1			X		1	1	-	1	1	-	2	2	-	3	3	3	2
B90					1			X													1	-	1	-	-	-	1	-	1	1	1
B91	1		2	1	1		1	1	1		1	1	1	1	1			X		1	6	3	9	2	3	5	8	6	14	13	1
No. spp	7	5	5	5	7	3	6	10	3	3	6	9	4	7	5	4	8	4	8	4	13	16	20	14	15	20	21	21	28		
Add. spp	2	0	1	3	3	1	0	2	0	2	1	0	2	3	2	0	3	5	1	1											7
																					Total records										

Table C-3a Burke - Dullingari : Birds recorded at the Burke - Dullingari sites in January 1989

SP #	DW 1A	DW 1B	DO 1A	DO 1B	DW 2A	DW 2B	DO 2A	DO 2B	DW 3A	DW 3B	DO 3A	DO 3B	DW 4A	DW 4B	DO 4A	DO 4B	DW 5A	DW 5B	DO 5A	DO 5B	ALL W/I	ALL O/I	ALL I = dunes	ALL W/II	ALL O/II	ALL II = int. dunes	ALL W = wells	ALL O = off wells	Total	No. sites	site vicinity No.
B13			1		X	X				1	X			X	X						-	1	1	1	-	1	1	1	2	2	5
B15					X						X										-	-	-	-	-	-	-	-	0	0	2
B18									X												-	-	-	-	-	-	-	-	0	0	1
B19				X																	-	-	-	-	-	-	-	-	0	0	1
B35									1						1						1	1	2	-	-	-	1	1	2	2	0
B37	X	4	1			1		X			1			1	1	1					-	3	3	6	1	7	6	4	10	7	2
B38		X													2	2					-	2	2	-	2	2	-	4	4	2	1
B39			1	1		1															-	1	1	1	1	2	1	2	3	3	0
B41	X	1				1		X							X						-	-	-	2	-	2	2	-	2	2	3
B42		2			X	1															-	-	-	3	-	3	3	-	3	2	1
B50													X				X				-	-	-	-	-	-	-	-	0	0	2
B51			1			X			1		1										1	2	3	-	-	-	1	2	3	3	1
B53	1				1		1				2				1		X				2	4	6	-	-	-	2	4	6	5	1
B56						1		1								1				X	-	-	-	1	2	3	1	2	3	3	1
B61		1		1				X	1												1	-	1	1	1	2	2	1	3	3	1
B62								1										X			-	-	-	-	1	1	-	1	1	1	1
B64	2		1				1	1							1				1		2	4	6	-	1	1	2	5	7	6	0
B66												2									-	-	-	-	2	2	-	2	2	1	0
B67	1				2		1				1		1		1				1		4	4	8	-	-	-	4	4	8	7	0
B68	1		1		1			1			2		1				1		2		4	5	9	-	1	1	4	6	10	8	0
B72	2	3	3	X	3	X	1		3												8	4	12	3	-	3	11	4	15	6	2
B73	4	2	3		3	1	2		3		3		2		2		3		3		15	13	28	3	-	3	18	13	31	12	0
B74									1												1	-	1	-	-	-	1	-	1	1	0
B78		1							1		1					1					1	1	2	1	1	2	2	2	4	4	0
B82									X												-	-	-	-	-	-	-	-	0	0	1
B84	2	3	2	3	1	1		3	1	X	2	X		X		X	1			1	5	4	9	4	7	11	9	11	20	12	4
B85		1																			-	-	-	1	-	1	1	-	1	1	0
B88		2				1		3				1		X	1	X					-	1	1	3	4	7	3	5	8	5	2
B89		1	X	1		1		X	2		1				X						2	1	3	2	1	3	4	2	6	5	3
B91	1	1	X	X		X	2	2		X	X				X				X		1	2	3	1	2	3	2	4	6	4	7
No. Spp	8	12	9	4	6	9	6	7	9	1	9	2	3	1	8	4	3	0	4	1	14	17	19	15	14	20	22	21	25		
Add. Spp	2	1	2	3	3	4	0	4	2	2	3	1	1	3	4	2	2	1	1	1											5
																		Total records			48	53	101	33	27	60	81	80	161		

Table C-3b Toolachee : Birds recorded at the Toolachee sites in January 1989

SP #	TW 1A	TW 1B	TO 1A	TO 1B	TW 2A	TW 2B	TO 2A	TO 2B	TW 3A	TW 3B	TO 3A	TO 3B	TW 4A	TW 4B	TO 4A	TO 4B	TW 5A	TW 5B	TO 5A	TO 5B	ALL W/I	ALL O/I	ALL I = dunes	ALL W/II	ALL O/II	ALL II = int. dunes	ALL W = wells	ALL O = off wells	Total	No. sites	site vicinity No.
B13		1		1				1								X	1	1			1	-	1	2	2	4	3	2	5	5	1
B15														X							-	-	-	-	-	-	-	-	0	0	1
B16				X																	-	-	-	-	-	-	-	-	0	0	1
B18					1								X					1			1	-	1	1	-	1	2	-	2	2	1
B35								1													-	-	-	-	1	1	-	1	1	1	0
B37		1		1	1	1															1	-	1	2	1	3	3	1	4	4	0
B38					X																-	-	-	-	-	-	-	-	0	0	1
B39		2	2			1															-	2	2	3	-	3	3	2	5	3	0
B41	X	X	X	1		1															-	-	-	1	1	2	1	1	2	2	3
B42	1			1			1	2													1	1	2	-	3	3	1	4	5	4	0
B53	2				1	1						1					1		1		4	1	5	1	1	2	5	2	7	7	0
B56		1		1	1																1	-	1	1	1	2	2	1	3	3	0
B61				2				1													-	-	-	-	3	3	-	3	3	2	0
B62						X		3													-	-	-	-	3	3	-	3	3	1	1
B64	1				1			1											1		2	1	3	-	1	1	2	2	4	4	0
B66																X					-	-	-	-	-	-	-	-	0	0	1
B67	1												1		1		2		1		3	3	6	-	-	-	3	3	6	5	0
B68	1		2	1	1	1		1				2	1			X			1		3	3	6	1	4	5	4	7	11	9	1
B70											1	1									-	1	1	-	1	1	-	2	2	2	0
B71											1					1					-	1	1	-	1	1	-	2	2	2	0
B72	1		1		1		2	3											1		2	4	6	-	3	3	2	7	9	6	0
B73	3		2	1	2	X	1	2			1	1			1		1		X		6	5	11	-	4	4	6	9	15	10	2
B78					1																-	1	1	-	-	-	-	1	1	1	0
B84			1	1		3		1			1	1	2	2		1	1			1	3	2	5	5	5	10	8	7	15	11	0
B85						X															-	-	-	-	-	-	-	-	0	0	1
B88	1	1		1		1		1			1		1			1					2	1	3	2	3	5	4	4	8	8	0
B89													1								1	-	1	-	-	-	1	-	1	1	0
B91	1	X		X	X												1	2			2	-	2	2	-	2	4	-	4	3	3
No. spp	9	5	5	10	8	7	4	11	0	0	5	5	5	1	2	3	6	3	5	1	15	13	19	11	17	20	17	20	23		
Add. Spp	1	2	1	2	2	3	0	0	0	0	0	0	1	1	0	3	0	0	1	0											5
																				Total Records	33	26	59	21	38	59	54	64	118		

Table C - 3c Control Field : Birds recorded at Control sites in January 1989

SP #	CD 1A	CD 1B	CD 2A	CD 2B	CD 3A	CD 3B	CD 4A	CD 4B	CD 5A	CD 5B	CT 1A	CT 1B	CT 2A	CT 2B	CT 3A	CT 3B	CT 4A	CT 4B	CT 5A	CT 5B	ALL D/I	ALL T/I	ALL I = dunes	ALL D = II	ALL T = II	ALL II = int. dunes	ALL D	ALL T	Total	N° sites	site vicinity No.
B13					1	X		X		X				2		1		1		2	1	-	1	-	6	6	1	6	7	5	3
B15								1		X							X		X		-	-	-	1	-	1	1	-	1	1	3
B18		1			1	1									X		1		X		1	1	2	2	-	2	3	1	4	4	2
B19																		1			-	-	-	-	1	1	1	1	1	0
B37	1				1						2	3						1			2	2	4	-	4	4	2	6	8	5	0
B38						1													X		-	-	-	1	-	1	1	-	1	1	1
B39						1					3	2		1		1	1		X		-	4	4	1	4	5	1	8	9	6	1
B41	X						X			1	X	X		X					X		-	-	-	1	-	1	1	-	1	1	6
B42											2	3						2			-	2	2	-	5	5	-	7	7	3	0
B51					X																-	-	-	-	-	-	-	-	0	0	1
B53			1		1						2		1						1		2	4	6	-	-	-	2	4	6	5	0
B56						1			1	2									1		1	1	2	3	-	3	4	1	5	4	0
B64											1							2	1	2	-	2	2	-	4	4	-	6	6	4	0
B67	2				2				1		1								2		5	3	8	-	-	-	5	3	8	5	0
B68	2		2		2	1	3		4		2				1	2			1	1	13	4	17	1	3	4	14	7	21	11	0
B70							2	1													2	-	2	1	-	1	3	-	3	2	0
B71																1					-	-	-	-	1	1	-	1	1	1	0
B72	1		1		2		1			1	1	1	1		1		1	1	2		5	6	11	1	2	3	6	8	14	12	0
B73	2		2	1	3		1		3	1			2	1	1	1	4	3	2		11	9	20	2	5	7	13	14	27	14	0
B76																	1				-	1	1	-	-	-	-	1	1	1	0
B84					2		2	1	1	3	1	1	1	1	2	3			2		5	6	11	4	5	9	9	11	20	12	0
B88	1			1				2			X					1	1	1		2	1	1	2	3	4	7	4	5	9	7	1
B89	1										1	1					1				1	2	3	-	1	1	1	3	4	4	0
B91						X	1	X		X		X		1	X	1	X		1	1	1	3	4	-	1	1	1	4	5	5	6
No. spp	7	1	4	2	9	5	6	4	5	5	10	6	4	5	4	8	7	8	9	5	14	16	18	12	14	20	18	19	23		
Add. spp	1	0	0	0	1	2	1	2	0	3	2	2	0	1	2	0	2	0	5	0											1
																		Total records			51	51	102	21	46	67	72	97	169		

Table C - 3d Marqualpie : Birds recorded at Marqualpie sites in January 1989

SP #	MA 1	MA 2	MA 3	MA 4	MA 5	MA 6	MA 7	MA 8	MA 9	MA 10	No. sites	site vicinity No.
B18			1								1	0
B23			X								0	1
B37		1	1						1		3	0
B40			1								1	0
B41			1		X						1	1
B61			X								0	1
B67	2		2		2	1			1		5	0
B68		1		1			1	1			4	0
B70		1									1	0
B72			X								0	1
B73			X						X	X	0	3
B82			2								1	0
B84	1	2							1	1	4	0
B88	1		1								2	0
B89				X							0	1
B91			2		X	1			1		3	1
No. spp	3	4	8	1	1	2	1	1	4	1	11	
Add. spp	0	0	4	1	2	0	0	0	1	1	5	

Notes

1) X: record of a species off the immediate site, but in the vicinity of the site.

2) the numbers refer to the number of days on which a species was recorded at the site, not the number of individuals recorded.

APPENDIX 6.0

STANDARD PROFORMAS

PERMANENT TRAPSITE VEGETATION DATA.

TRAPSITE: _____ DATE: _____

OBSERVER: _____

DESCRIPTION OF STRUCTURE AND FLORISTICS OF ANNUALS.

E CYCLE STAGES: N = Newgrowth, B = Buds, F = Flowering, S = Fruit/Shedding, Sp = Shed, Sd = Seedl
G = Badly grazed, D = Dead, Do = Dormant. V = Vegetative (in none of above)

Vertebrate Site Sheet

SANTOS MONITORING PROGRAMME

DELLA DUNE SYSTEM

SITE _____ DATE _____ TIME _____ WEATHER _____

SP	POT	NO	N/R	AGE	SEX	WT	SVL	Comments

BIRD NOTES

Date	Within Habitat	Site Vicinity Extras

ELEMENT NUMBER: ____________________

SANTOS SURVEY

REPTILE/AMPHBIAN DATA

Observer: (1) ____________________

Date: (dd/mm/yy: (2)) ______________ CAMPSITE : QUADRAT : PATCH

Code:______ : 1 2 3 4 5 6 : I II III IV V VI

CODE (3)	GENUS	SPECIES (4)	VOUCH. NO. (5)	LINE A/B (7)	TIME (8)	METHOD (a) (9)	STRATA MACRO MICRO (b) (10)	TISSUES H/L/K/B (11)	COMMENTS (12)

(a) 1=pit 2= elliott 3= observed 4= heard 5= captured while foraging 6=mistnet 7 trap 8= other(in comments)
9=nest 10=eggs 11=skeleton/feathers 12=droppings

(b) STRATA:(than or equal to 0.5m=34; >0.5m and < 5.0m=35 ; greater than 5.0m=36 MACROHABITAT: On ground=17; *Tree=33; **Shrub=16 MICROHABITAT: under rocks=1; on rocks=2; around rocks=3; under log=4; on log=5; in log=6; in leaf litter=10; in burrow=11; tree hollow=7; loose bark,life tree=8; loose bark,dead tree=22; on trunk=20; foliage=9; upper branches=14; lower branches=15; over dam/pool=28; on surface of pool=29; overhead=19; other=30(put in comments)

*TREE:-single stemmed woody plant>5m **SHRUB:-multi-stemmed woody plant< or =5m(includes small(<5m) Mallee

HEIGHT CLASSES

HEIGHT(M)	TREES	SHRUBS	GRASSES/FORBS/SEDGES
20-35	VERY TALL	N.A.	N.A.
12-20	TALL	N.A.	N.A
6-12	MID-HIGH	N.A.	N.A
3-6	LOW	VERY TALL	EXTREMELY TALL
1.01-3	DWARF	TALL	VERY TALL
0.51-1.00	N.A.	MID-HIGH	TALL
0.26-0.50	N.A.	LOW	MID-HIGH
≤0.25	N.A.	DWARF	LOW

CROWN COVERAGE (SEPARATIONS)

CLOSED (C)	MODERATELY OPEN (M)	OPEN (O)	VERY OPEN (V)	SPARSE (S)	ISOLATED PLANTS (I)	ISOLATED CLUMPS (IC)
CROWNS	TOUCHING SLIGHTLY	CLEARLY SEPARATED	WELL SEPARATED	VERY GOOD SEPARATION	ISOLATED	ISOLATED
OVERLAP	<1/4 DIAM. SEP.	1/4≤D.S≤1	1<D.S.≤10	10<D.S.≤20	>20 D.S.	>20 D.S.

STRUCTURAL FORMATION CLASSES

	C	M	O	V	S	I(C)
TALL TREE (12-35M)	CLOSED FOREST	OPEN FOREST	WOODLAND	OPEN WOODLAND	SPARSE WOODLAND	ISOLATED TREES (CLUMP)
LOW-MID TREE (3-12M)	LOW CLOSED FOREST	LOW OPEN FOREST	LOW WOODLAND	LOW OPEN WOODLAND	LOW SPARSE WOODLAND	LOW ISOLATED TREES (CLUMPS)
SHRUBS	CLOSED SHRUBLAND	SHRUBLAND	OPEN SHRUBLAND	VERY OPEN SHRUBLAND	SPARSE SHRUBLAND	ISOLATED SHRUBS (C)
CHENOPOD SHRUBS	CLOSED CHENO. SHRUBLAND	CHENOPOD SHRUBLAND	OPEN	VERY OPEN	SPARSE	ISOLATED
HUMMOCK GRASS	CLOSED HUMM GRASSLAND	HUMMOCK GRASSLAND	-	-	-	-
GRASS	CLOSED GRASSLAND	GRASSLAND	-	-	-	-
FORB	CLOSED FORBLAND	FORBLAND	-	-	-	-
SEDGE	CLOSED SEDGELAND	SEDGELAND	-	-	-	-

(EXAMPLE: FORBS 70 CM TALL, D.S. = 8 ⟶ TALL, VERY OPEN FORBLAND (70 CM, D.S. = 8))

LIFE CYCLE STAGES: B = BUDS, D = DEAD, Do = DORMANT, F = FLOWERS, G = BADLY GRAZED, N = NEW GROWTH, S = FRUIT/SHEDDING, Sd = SEEDLING, Sp) = PAST EVENT FRUITING, RE = REGENERATING, OLD STOCK, V = NO NEW GROWTH BUT GREEN.

PLANTS QUALITATIVE ABUNDANCE

t = TRACE ≤ 1% COVER

1 ——— 1-5%

2 ——— 6-25%

3 ——— 26-50%

4 ——— 51-75%

5 ——— 76-100%

— JULIAN REIDS "BUMP UP CLASSES"
BY 1, IF SPECIES COMMON, WIDESPREAD OR PATCHILY, LOCALLY DOMINANT.
BY 2, IF SPECIES VERY COMMON, ABUNDANT OR MONOSPECIFIC OVER LARGE AREAS.
NO BUMPING UP BELOW THIS LINE

D.S.	0.7	1.0	5	10
≙ 6-4 ROUGH	50%	25%	5%	1%

MIN OF DIAM. SEPN TO COVER.

ELEMENT NUMBER: _____

COOPER CREEK SURVEY

(SURVEY AND RESEARCH SECTION SA NPWS AND SA MUSEUM)
OCTOBER 1985

PHYSICAL ENVIRONMENT

CAMPSITE	QUADRAT	PATCH
Code: (1)	: (2) 1 2 3 4 5 6	: (3) I II III IV V VI VII

In Full: _____

Environmental Association (P.R.A): (4) _____

PROPERTY: (5) _____ PADDOCK: (6) _____

OBSERVER: (7) _____ DATE: (8) __/__/__

	AMG Zone	Eastings	Northings
QUADRAT LOCATION:	(9) 53	(10) _____	(11) _____

QUADRAT LATITUDE: (12) _____ LONGITUDE: (13) _____

TITUDE: (14) _____metres

OLUTION: (15) _____ 1=1"/30m 2=10"/300m 3=30"/900m 4=1'/1.8km 5=10'/18km

NEAREST NAMED PLACE: (16) _____ : _____

DISTANCE (17) _____(Kms)

DIRECTION FROM PLACE (18) N NW W SW S SE E NE

LANDFORM: (19) __ 1=hillslope 2=footslope 3=floodplain 4=crest 5=lake 6=dune 7=rise 8=plain 9=hill 10=swamp 11=channel 12=other (write in Item 30 (Comments)

GEOLOGICAL SURFACE CODE: (20) _____

SOIL TEXTURE: (21) ___ 1 = clay 2 = sandy clay loam 3 = loam 4 = san

SURFACE STREW SIZE: (22) _2_ 1 = pebble (4 - 64 mm) 2 = cobble (64-256 m 3 = boulder (>256 m) 4 = none apparent

SURFACE STREW COVER: (23) ___ 1= <10% 2=10-30% 3=30-70% 4 = 70-100%

HORIZONS: - Colour A (24) _____ Colour B _____

- Depth (25): A (____mm) B(____mm)
- Comments: (26) _____

DISTURBANCE: (27) __ 1=none visible 2=sheet eroded 3=gullied 4=scalde

LAND USE: PRESENT: (28) ___ 1=grazing 2=light grazing 3=conservation
PAST: (29) ___ 4=mineral extraction 5=no defined use

COMMENTS: (30)

HEIGHT ABOVE BASE-LEVEL ADJACENT (M) _____

APPENDIX 7.0

TABLES

TABLE 7.1A: DELLA LAND SYSTEM PITFALL CAPTURE SUMMARY TABLE JANUARY 1989, JANUARY 1990, DATA COMPARISON

	DUNE HABITAT								INTERDUNE HABITAT									
	Well		Offwell		Control		Total		Well		Offwell		Control		Total		Grand Total	
	1989	1990	1989	1990	1989	1990	1989	1990	1989	1990	1989	1990	1989	1990	1989	1990	1989	1990
Reptile species	16	19	20	16	15	15	23	23	15	9	11	8	9	14	18	17	30	29
Individuals trapped	76	76	80	74	53	90	209	240	47	39	49	30	25	40	121	109	330	349
Success rate	51%	51%	53%	49%	35%	60%	46%	53%	31%	26%	33%	20%	17%	27%	27%	24%	37%	39%
Mammal species	5	3	3	3	3	1	5	3	5	3	4	5	3	3	5	5	6	5
Individuals trapped	12	4	5	9	3	2	20	15	12	6	13	9	10	9	35	24	55	39
Success rate	8%	3%	3%	6%	2%	1%	4%	3%	8%	4%	9%	6%	7%	6%	8%	5%	6%	4%

TABLE 7.1B: DATA SUMMARY FOR COMPARISON DELLA LAND SYSTEM STUDY AREAS JANUARY 1989, JANUARY 1990

	All Well Sites		All Off-well Sites		All Control Sites		All Dullingari Sites		All Toolachee Sites	
	'89	'90	'89	'90	'89	'90	'89	'90	'89	'90
Reptile Species	23	22	25	21	20	24	21	24	26	20
Individuals captured	123	115	129	104	78	130	130	111	122	108
Success rate	41%	38%	43%	35%	26%	43%	43%	37%	41%	36%
Mammal species	6	4	4	6	4	3	4	4	6	6
Individuals captured	24	10	18	18	13	11	19	15	23	13
Success rate	8%	3%	6%	6%	4%	4%	6%	5%	8%	4%

TABLE 7.1C: ELLIOT TRAP SUCCESS RATE - DELLA LAND SYSTEM JAN '90, 200 TRAPS SET FOR 3 NIGHTS = 600 TRAP NIGHTS

Study Area	Individuals Trapped	Success Rate For 600 Trap Nights
Burke-Dullingari	4	0.6%
Control	0	0.0%
Toolachee	9	1.5%
Total success rate for 1800 nights	0.07%	

Table 7.2A: Marqualpie Land System
Pitfall captures Data Summary Table
January 1989 - January 1990

	Number of Species Captured		Individuals Captured		Success Rate	
Year	January 1989	January 1990	January 1989	January 1990	January[1] 1989	January[2] 1990
Reptiles	20	21	146	105	49%	53%
Mammals	4	1	18	8	6%	4%

1 Based on 3 nights trapping (3 x 100 pots = 300 trap nights)
2 Based on 2 nights trapping (197 trap nights, some pots missing)

Table 7.2 B: Marqualpie Land System
Elliott Captures - January 1990

150 Elliotts for 1 night = 0% success rate

Table 7.3: Minimum Temperature & Relative Humidity Recorded During Trapping Sessions January 1989 - January 1990

	NIGHT 1		NIGHT 2		NIGHT 3		
January 1989	**Min**	**RH**	**Min**	**RH**	**Min**	**RH**	**Reptile Total Trapping Success Rate**
Control	12	47%	13	50%	14	-	26%
Dullingari	18	30%	19	40%	16	38%	43%
Toolachee	22	27%	27	27%	24	77%	41%

	NIGHT 1		NIGHT 2		NIGHT 3		
January 1990	**Min**	**RH**	**Min**	**RH**	**Min**	**RH**	**Reptile Total Trapping Success Rate**
Control	25	28%	25	27%	33	35%	43%
Dullingari	22	45%	28.5	41%	26.5	77%	37%
Toolachee	26.5	35%	26.5	40%	30	34%	36%

Notes:
January 1989 data: Temperature minima taken from weather data Burke-Dullingari satellite

(Refer, Gillen & Reid 1988, report for 1988 Temperatures)