BIOLOGICAL SURVEY OF

BARLEE RANGE NATURE RESERVE

Project (N92/5)

Progress Report 9

Prepared by: *Stephen van Leeuwen*

Date: *September 1995*

TITLE OF PROJECT:

Biological survey of the Barlee Range Nature Reserve (A ↑26808)

AGENCY:

Western Australian Department of Conservation and Land Management (CALM) (undertaken jointly by the Science and Information Division and the Pilbara Regional office).

PROJECT SUPERVISOR:

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SCOPE OF PROPOSAL:

a. Select sites that represent the array of communities typical of the Barlee Range.

b. At all sites establish and sample permanent quadrats recording landform unit, species composition, habitat type and the vegetation associations present. Permanent quadrats will enable, through long-term monitoring, the documentation of change over time and after environmental perturbations.

c. Analyse data sets for each biotic group sampled (flora, mammals, birds, reptiles, amphibians and invertebrates (ants)) discussing patterns of community structure, species richness and distribution. Prepare descriptions of vegetation associations and landform units present and map their distribution within the reserve.

d. Publish results of the survey and subsequent analyses. Discuss implications of these results with reference to the representativeness of the nature reserve and it's nature conservation values. Make recommendations for management where appropriate.

WORK COMPLETED

Since the submission of the last progress report three flora sampling trips have been made to the nature reserve. These trips, cumulatively totalling 20 days, were planned to sample the annual and ephemeral flora recruited after the exceptional rainfall associated with the passage of Cyclone Bobby through the upper Ashburton Region in February. These trips were also planned to encompasses the flowering season of

most species present in the reserve. Bird records were also obtained during these flora sampling trips. Systematic and random opportunistic sampling of both flora and avifauna was undertaken during these visits to the reserve. Numerous flora specimens were collected including many specimens which apparently represent new records for the reserve. Preliminary identification indicates that some specimens may also represent novel taxa. Many flowering specimens of the ubiquitous species within the reserve were also collected thereby enabling confirmation of determinations for some species.

Laboratory and curatorial work concentrating on the identification and processing of flora and fauna specimens has continued, along with the incorporation of specimens into the appropriate repositories. Work has also continued on the development of the GIS database for the reserve. This database, which uses MapInfo® software, includes relief, drainage, geological and vegetation community themes. Map interrogation, digitising and data capture for land system, cadastral and anthropomorphic themes is in progress. It is envisaged that the GIS system will facilitate the production of quality maps for the reserve, based on the quantifiable data collected during this project. The GIS database will also facilitate the development and implementation of management actions when and where necessary.

A fauna sampling trip, employing both systematic and random opportunistic collecting, is currently under way and should be completed by late October.

Progress on this project, with reference to each of the biotic groups being examined, is outlined in the following sections.

Flora

Work is progressing on the identification of 320 plus plant taxa recorded within the reserve. During the recent field trips a total of 267 plant specimens were collected. Approximately half of these specimens are thought to represent new taxa, previously not recorded or collected within the reserve. Many of these taxa exhibit an annual or ephemeral life class habit and have not been collected during previous trips due to the prevalence of drought conditions in the area. Some noteworthy collections include:

- The identification of a large (10 000+) population of the novel, Barlee Range endemic, Nancy Lily (*Wurmbea* sp.).

- The collection of several specimens of *Drosera indica* from numerous populations in damp seepages along the main escarpment. These populations represent the most westerly record for this trans-Australian species.

- The collection of two *Stylidium* species. Previously, only one species, *S. alsinoides,* had been recorded in the reserve. Herbarium investigations are required to confirm the identification of the two newly collected specimens and verify their affinity to *S. alsinoides*.

- The collection of the environmental weed Ruby Dock, *Rumex vesicarius*. This species was identified at two disjunct sites within the reserve where it

was represented by individual plants. Control measures were instigated to prevent the plants from fruiting and thus restrict the further spread of this weed species.

The remaining plants collected during recent sampling trips represent taxa which generally have a ubiquitous distribution throughout the reserve. Flowering and/or fruiting material was required for many of these species to confirm and verify determinations previously made using sterile specimens. Flowering and/or fruiting material will also permit the identification for those species where taxonomic uncertainty exists. For example, the specimens of *Acacia coolgardiensis* collected previously from the reserve have been tentatively identified, by Bruce Maslin, WA Herbarium, as belonging to the undescribed subspecies "*effusa*", however, confirmation of this identification requires the citing of fruiting material. Fruit material of this taxon was collected during the recent sampling trip. Similarly, the common wattle on sandstone ridges and outcrops throughout the range has tentatively been identified as *Acacia* sp. nov. "barlee range 1" as an absence of flowering or fruiting material has precluded an accurate determination of this taxon. Flower and fruiting material of this taxon was collected during recent sampling trips and forwarded to Bruce Maslin for identification.

Over the past few months work has continued on the identification, mounting and incorporation of plant specimens. This work has involved forwarding many specimens to specialist taxonomists for identification as comprehensive taxonomic keys and curated voucher specimens are not readily available for many of these arid zone species. This work has also involved the preparation of a taxonomic description for the undescribed Nancy Lily (*Wurmbea "saccata"* ms) which appears to be endemic to the nature reserve. This taxonomic treatment, duly acknowledging the Heritage Council for their assistance with this biological survey, has been submitted to Western Australia botanical journal, ***Nuytsia,*** for publication (Appendix One).

Mammals

Work is continued on the identification of the many specimens collected within the reserve. In collaboration with colleagues from Macquarie University attempts are currently being made to obtain ear biopsy material from the rock wallabies at Barlee Range to confirm their taxonomic status. The wallaby present in the reserve could either be the Black-footed rock wallaby (*Petrogale laterallis*) or Rothschild's rock wallaby (*P. rothchildi*).

Sorting and identification of subfossil cave deposit material collected from Kookhabinna Gorge has continued in collaboration with the WA Museum's Department of Earth and Planetary Sciences. Recent material forwarded to the museum has returned identifications for the following mammals:

Notomys alexis
Notomys longicaudatus
Pseudomys chapmani
Pseudomys hermannburgensis
Pseudomys nanus

Rattus tunneyi
Zyzomys argurus
Zyzomys pedunculatus

In addition to the mammal work currently under way, four species of fish have been identified in the freshwater pools located in Kookhabinna Gorge. The species recorded include:

Catfish (*Neosilurus hyrtlii*)
Spangled perch (*Leiopotherapon unicolor*)
Rainbow fish (*Melanotaenia splendida australis*)
Hairback herring (*Nematolosa erebi*).

Birds

The bird list current includes 110 species. Additional species observed during the most recent field trips include the Grey falcon (*Falco hypoleucos*), Black-shouldered Kite (*Elanus notatus*), Dollar Bird (*Eurystomus orientalis*), White-faced Heron (*Ardea novaehollandiae*) and the Great Egret (*Egretta alba*). The most interesting new record is that obtained for the Dollar Bird as this record appears to be the most southerly for this species in Western Australian. This species is primarily confined to the Kimberley region, although occasional observations have been made in the western Pilbara.

During the most recent trips to the nature reserve a total of 93 species of bird were recorded. This number was complemented by the observation that 54 species were at some stage of breeding.

Reptiles and Amphibians

Identification and processing of the reptile and amphibian material collected from the reserve has continued. Most specimens collected on previous trips have now been forwarded to the WA Museum for incorporation and confirmation of identification.

Invertebrates

Sorting of invertebrate samples is progressing. Many of the invertebrate groups identified have been prepared for dispatch to the WA Museum for identification by colleagues in the Department of Terrestrial Invertebrates.

No more field trips are planned to the nature reserve. The currently running fauna sampling trip, which will be concluded by mid-October, will also be the last fauna sampling session. In the coming months, work will progress with the identification of flora and fauna specimens and the continued sorting of invertebrate samples. Progress will continue on the identification, databasing and incorporation of specimens collected from the reserve. Work will also continue on the development of the GIS database and inclusion of biological data collected during this survey into this database. Upon completion of the specimen processing and identification, data analysis and report preparation will commence. At present it anticipated that a draft report for this project will be available in late June.

This duration of this project and submission of the final draft report will take longer than mentioned in previous progress reports as a consequence of the presence of many apparently new flora and fauna records for the reserve. These new records can be attributed to favourable environmental conditions within the Ashburton region as a consequence of the passage of Cyclone Bobby.

EXPENDITURE TO DATE

An expenditure statement from the Administration Assistant in the Pilbara Regional Office is attached as Appendix Two. As of the 29th September a total of $16 924 or 84% of the $20 000 NEGP budget had been consumed. Expenditure over the past eight months has been $2 591, of which $2 052 was attributed to expenditure on materials and $539 to expenditure on plant. A breakdown of budget expenditure between February and the current progress report is provided in Table 1.

To date, 71% of NEGP fund expenditure has been directed towards the purchase of materials and equipment required to undertake the survey. The remainder has been spent on vehicle hire fees and running changes.

A cost overrun in the budget for this project is not anticipated.

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Table 1 Breakdown of expenditure of NEGP funds for the Biological Survey of Barlee Range Nature Reserve project for the period February - September 1995.

Materials, Equipment and Plant

Month	Item	Amount ($)	Account Balance ($)
February 95	Data acquisition (GIS & MapInfo)	500	500
March 95	Data acquisition (GIS & MapInfo)	900	1 400
August 95	Field costs - volunteer	182	1 582
September 95	Plant running & hire charges	179	1 761
September 95	Field equipment	345	2 106
October 95	Travel charges	359	2 465
October 95	Field equipment	126	2 591

TOTAL EXPENDITURE (2/95 - 9/95)

Item	Account Balance ($)
Materials and equipment	2 052
Plant and vehicle running	539
Total	**2 591**

TOTAL PROJECT EXPENDITURE

Item	Account Balance ($)
Materials and equipment	11 991
Plant and vehicle running	4 933
Total	**16 924**

APPENDIX ONE

Taxonomic treatment of *Wurmbea "saccata"* ms

Wurmbea saccata (Colchicaceae), a lepidopteran-pollinated new species from Western Australia

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Abstract

Macfarlane, T.D. and van Leeuwen, S. *Wurmbea saccata* (Colchicaceae), a lepidopteran-pollinated new species from Western Australia. Nuytsia x(x): xx-xx (199x). *Wurmbea saccata* is described as new and illustrated with drawings and photographs. It occurs in an apparently limited area of the remote Barlee Range Nature Reserve, north east of Shark Bay, Western Australia. The tepal nectaries are concealed in pouches formed by the lower part of each tepal and its adjacent staminal filament, a feature unique in the genus. The plants are commonly visited by unidentified day-flying lepidoptera. The new species is closely related to *W. densiflora*.

Introduction

In July 1993 one of us (S. v. L.) made one of the first biological investigations of the Barlee Range Nature Reserve, a region including the steep escarpments known as the Barlee Range.

This remote reserve is located north eastward from Shark Bay, about 275 km from the west coast of Western Australia. The area is transitional between the Gascoyne region to the south and the Pilbara region to the north. A species of *Wurmbea* Thunb. (Colchicaceae) was discovered and collected, in fruit. At a second visit in July 1994 it was found in flower, and a bigger collection and more detailed observations were made, and fresh material sent to the first author.

Wurmbea saccata T. Macfarlane et S.van Leeuwen, sp. nov. (Figures 1 - 3)

[With affinity to *W. densiflora* (Benth.) T. Macfarlane but differing by the longer, 1.6-2 mm long, perianth tube, the nectaries 1 per tepal, concealed in nectar pouches formed by tepal claw and staminal filament, and by the usually free styles.]

Typus: Western Australia: Barlee Range Nature Reserve, 18.2 km SE of Wongida Well, 16.2 km W of Culcra Bore, 17.8 km SW of Wongajerra Well, Barlee Range, 23° 06´ 37" S, 115° 58´ 02" E, 23 June 1994, *S. van Leeuwen* 1846 (holo: PERTH; iso: CANB, K, Karratha, MEL, NY, PRE).

Corm 2 - 2.5 cm long including tunics, compressed spherical to ellipsoidal, 6.5-13.5 cm below ground. *Plant* robust, 10 - 30 cm tall from ground to top of inflorescence. *Cataphyll* well developed, rather fleshy, white except for the pink, slightly exposed, pointed apex. *Leaves* usually 3, occasionally 4. *Lowest leaf* basal, ascending, sometimes curved outwards, narrowly ovate or narrowly elliptical to linear, 6-15 cm long, 3-14 mm wide, concave (appearing flat when dried), not dilated basally. *Second leaf* basal or cauline and separated from the lowest leaf by a usually short internode up to 6 cm long, rarely with an internode up to 11 cm long, resembling the lowest leaf but slightly shorter and narrower, 3-14 mm wide, or when cauline, having a somewhat dilated base and then often wider than the lowest leaf. *Third leaf* well separated from the second leaf, and attached well below the inflorescence, markedly dilated in the lower half, narrow in the upper half and tapering to an acute apex, reaching from 4 cm below the lowest flower to 3 cm above the uppermost flower. *Fourth leaf*, when present, resembling the third or much smaller and narrower. *Inflorescence* dense and compact although

usually the flowers becoming well spaced in fruit, of 5 - 14 bisexual flowers, the uppermost few consisting of a cluster of reduced or vestigial flowers. *Flowers* pale pink, often darker around the base externally, or sometimes all flowers on the plant pure white; sweetly scented. *Perianth* of 6 tepals, 12 - 13 mm long, joined basally by linking tissue to form a tube 1.6-2 mm long; lobes spreading in the distal part, broadly elliptical to obovate, apex rounded to obtuse, the lower part narrow, concave on the inner surface; *nectary pouches* formed by the margins of the concave lower part of each tepal being adnate to the opposite staminal filament, 2.2-2.6 mm long, extending slightly above the top of the perianth tube, in exterior view the tepals in their basal half markedly raised, rounded, separated by deep grooves the base of which consists of the linking tissue of the perianth tube; *nectary* situated at the base of the tepal, consisting of an irregular glandular thickening occupying the bottom of the pouch, concolorous with the remainder of the tepal. *Stamens* 6, 3/4 as long as the tepals, exposed at the top of the flower to almost exserted owing to the spreading of the tepals, erect; filaments tapering gradually, rather thick, inserted at the base of the tepal and partially adnate, each then adnate to the margins of the adjacent tepal for 2-3 mm to form a nectar pouch, concolorous with the perianth; anthers 2-2.5 mm long, obloid, yellow with or without red flecks, or red, versatile, basifixed or dorsifixed up to 1/4 from base of connective, dehiscing latrorsely by longitudinal slits. *Ovary* c. 2 mm long, obloid, pink or green with pink flush, sharply delimited from the styles; ovules 8 -10 per loculus; styles 3, free or connate up to 1/4, exceptionally to 1/3, c. 6.5 mm long, erect, white, with minute terminal stigmas which at anthesis are at anther level. *Capsule* loculicidal, at first opening in the upper 1/5, subsequently opening further. *Seeds* up to 10 per loculus, spheroidal, often with flattened faces from contact with adjacent seeds, c. 1.5 mm diameter, smooth, brown, with the raphe raised as a ridge extending around half the circumference, and a small umbo near the micropylar end.

Other specimens examined: WESTERN AUSTRALIA: all Barlee Range Nature Reserve, Barlee Range: 23° 06′ 36" S, 115° 57′ 55" E, 17 Aug. 1993, *S. van Leeuwen* 1674 (CANB, MEL, NSW, PERTH (2 sheets and spirit), PRE, S); 23° 07′ 46" S, 115° 58′ 51" E, 18 June 1994, *S. van Leeuwen* 1765 (PERTH); 23° 07′ 38" S, 115° 59′ 31" E, 20 June 1994, *S. van Leeuwen* 1785 (PERTH); 23° 07′ 46" S, 115° 59′ 06" E, 20 June 1994, *S. van Leeuwen* 1786 (PERTH); 23° 07′

46" S, 115° 58´ 51" E, 20 June 1994, *S. van Leeuwen* 1787 (PERTH including spirit, S); 23° 08´ 05" S, 115° 57´ 57" E, 20 June 1994, *S. van Leeuwen* 1788 (PERTH); 23° 08´ 12" S, 115° 58´ 30" E, 20 June 1994, *S. van Leeuwen* 1789 (PERTH).

Distribution. Current knowledge of this species indicates that it is very restricted in distribution, being known only form an area about 3 km across in the isolated Barlee Range. The plants occur in creek lines, and has been found in three such creeks, two of which are joined. Other creeks occur in the area which lack W. saccata. Several populations are known, ranging from a few hundred plants to an estimated several hundred thousand plants.

Habitat. Growing in a range of sandstone hills in the arid zone, confined to the beds and nearby lower slopes of ephemeral creeks and margins of rock pools, in red gritty or silty soil, sometimes with pebble or rock content, or occasionally in black to dark grey soil with high organic matter content. The vegetation is an open to dense shrub layer of *Acacia* or *Melaleuca* species with occasional trees of several *Eucalyptus* species, lower shrubs of *Dodonaea, Plectranthus* or *Stemodia*, and a herb layer or open tall herbaceous layer of *Cyperus vaginatus*. The *Wurmbea* occurs in either open or sheltered places.

Flowering and fruiting periods. Winter flowering, probably responsive to the irregular rain falls. Flowering has been observed 18-23 June. Fruiting has been observed on 17 August.

Discussion. Wurmbea saccata is unique in the genus in having nectar pouches, which have been observed full of nectar. In most species of the genus, the nectaries are exposed on the perianth lobes, the nectar being exposed as a drop on the nectary. This occurs even when the species has a pronounced perianth tube, as in *W. tubulosa* Benth., *W. drummondii* Benth., *W. odorata* T. Macfarlane and several African species (Nordenstam 1986).The nectary is often morphologically elaborated, the function of which may be to help hold the nectar drop, or it may be a thickening in consequence of the development of glandular tissue. The nectary itself (in Australian species) or part of the tepal adjacent to it (in some African species) is often differentially coloured,

presumably as a pollinator attractant. In *W. saccata,* however, the nectaries are concealed at the bases of the pouches, are poorly differentiated morphologically, and are concolorous with the perianth. The copious nectar production is contained by the pouch, but remains hidden. In one other species, the Western Australian *W. densiflora*, the nectaries are somewhat hidden near the base of the lobes but there is no development of a pouch. Nordenstam (1986) describes the perianth of three African taxa as shortly spurred or subcalcarate at the base, but this appears to be a different phenomenon which does not involve the nectaries. In *W. saccata* the perianth is not spurred, there being no extension of the perianth below the point of insertion on the axis, although the pouches are manifest externally by being markedly raised and rounded.

Wurmbea saccata is most closely related to *W. densiflora*. They are similar in overall appearance, with dense inflorescences of pink flowers (sometimes white in *W. saccata*) of a similar shape, the tepals of both species are relatively broad, the nectaries are basal on the tepals, inconspicuous in colouring, and either partly or fully concealed, the anthers are more exposed than in most species, almost exserted, comparatively large and predominantly yellow, and the lower leaves are comparatively broad. They both occur in relatively arid areas but their ranges are well separated, *W. densiflora* being more southerly. *Wurmbea saccata* differs from *W. densiflora* in having nectary pouches, a single nectary rather than two separate ones, and a longer perianth tube and usually free styles (although they are sometimes partially connate as in *W. densiflora*).

Conservation status. Although *Wurmbea saccata* appears on current knowledge to be highly geographically restricted, and it is apparently dependent on habitats where there is rainfall runoff, insufficient searching has so far been carried out to determine whether the species occurs elsewhere in other ranges of hills in the region. In view of this, and the fact that it occurs in a Nature Reserve with no obvious threats, and with large numbers of individuals in several populations, we will be recommending to the appropriate committee that it be classified as a species of Conservation Code Priority Three (see end pages of this journal for details of Conservation Codes).

Etymology. The epithet *saccata* is from the Latin *saccatus,* meaning pouched or saccate, in reference to the nectary pouches.

General Discussion

Concealment of nectar in narrow, deep pouches, copious nectar production and exposed sexual organs, are all aspects of a pollination syndrome associated with Lepidoptera (Armstrong 1979). This is consistent with our observation of numerous individuals of two unidentified species of day-flying Lepidoptera visiting the flowers of *Wurmbea saccata.* These were the most common visitors to the flowers. They may have been butterflies or day-flying moths, and further identification must await another expedition to the site. The pollinators of *Wurmbea* species are little known (Nordenstam 1986), but in southern mesic parts of Australia they are believed to be flies (Diptera; Macfarlane 1980). On morphological grounds too, it seems unlikely that other species in either Australia or Africa, with the possible exception of *W. densiflora* (see above), are Lepidopteran-pollinated. *Wurmbea saccata* is therefore an exceptional species, the first in the genus to be reported as pollinated by Lepidoptera.

According to Keighery (1982), pollination by Lepidoptera is rare in the Australian arid zone. Narrow tubular flowers which are often primarily pollinated by Lepidoptera outside the arid zone are often pollinated by bee flies (Bombyliidae) within the zone. Examples cited were *Calytrix* (Myrtaceae), *Pimelea* (Thymelaeaceae) and *Stenopetalum* (Brassicaceae). It is clear that flower-visiting Lepidoptera occur in the Barlee Range, and that they visit *Wurmbea saccata*, and at the time of the observations on that species reported here, the Lepidoptera were the major group of insects visiting its flowers. It is possible that Bombyliid Diptera were among the minor visitors which were seen, and that they may at times be common, or even dominant, visitors (see Armstrong 1979, p. 474). Further observations would be of interest.

The postulated close relationship between *Wurmbea saccata* and *W. densiflora* is of interest because previously the latter species has been regarded as rather isolated taxonomically (Macfarlane 1980). One reason for this was that it was formerly thought to lack nectaries, although it was subsequently (Macfarlane 1987) found from observation of fresh material that they were present but poorly differentiated, concolorous, unusually close to the tepal base and somewhat concealed. These nectary features are shared with *W. saccata*, with the additional development in the latter species of a nectary pouch. It can be speculated that during the evolution of *W. saccata* from an ancestor resembling *W. densiflora*, the tepal margins became adnate to the adjacent staminal filament.

Acknowledgements

Wurmbea saccata was discovered during the biological survey of the Barlee Range Nature Reserve, which was funded by the Heritage Council of Western Australia through the National Estates Grant Program (Project N92/5). Thanks are due to Robert Bromilow, Michael Hughes, Peter Kendrick and Phil Fuller for field assistance and for locating some of the populations of the new species, to Katie Syme for her drawings, and to Paul Wilson for translating the diagnosis into Latin.

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FIGURE CAPTIONS

Figure 1. *Wurmbea saccata.* A - detached flower (x), B - flower opened out, interior view (x), C - flower opened out, exterior view (x), D - gynoecium (x),.E - a tepal, interior view (x), F - a tepal, exterior view, with filament displaced and detached from edge of tepal to show nectary at base of pouch (x), G - transverse section of flower through middle of nectary pouches, diagrammatic. Stippling indicates tissue solely derived from the tepals (x). From *S. van Leeuwen* 1846 (holotype), A-F drawn by K. Syme, G by T.D. Macfarlane.

Figure 2. *Wurmbea saccata.* Habit. Photograph by S. van Leeuwen.

Figure 2 not supplied to me.

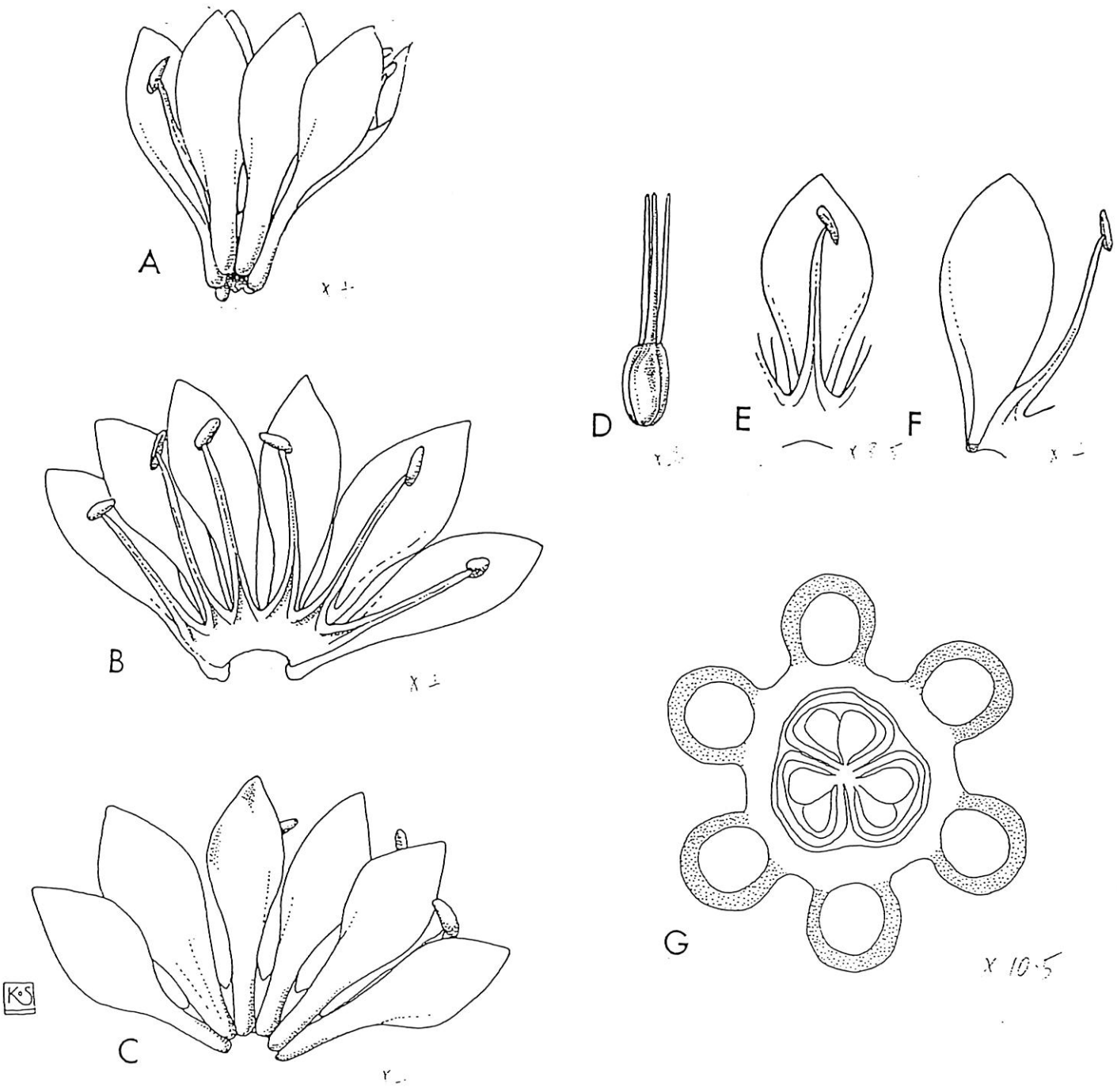

Figure 1

APPENDIX TWO

Budget Statement

NEGP Project N92/5