



NOTES ON THE BIOLOGY AND PHYTOGEOGRAPHY
OF THE RESTIONACEAE OF WESTERN AUSTRALIA.

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Abstract:

The Restionaceae of Western Australia comprise 74 species distributed in 16 genera. All are perennial rhizomatous herbs, confined nearly entirely to Southern Western Australia, chiefly in moister habitats. Nearly all species are dioecious, wind pollinated and sexual.

To be quoted as

Keighery G.J. and Marchant N.G (1979) Notes on the Biology and Phytogeography of Western Australian Plants : Part 4 : Restionaceae Kings Park and Botanic Garden, West Perth, Western Australia, 6005. unpublished.

INTRODUCTION:

The family Restionaceae, like the Centrolepidaceae has long been recognised as a major component of the South Western Australian Flora but again like any group with reduced flowers has been poorly collected and there have been few taxonomists prepared to study the group. Fortunately the latter situation has greatly improved, and a radically improved taxonomy of the group is being prepared by Dr. Briggs and Dr. Johnson of the N.S.W. National Herbarium.

It is hoped that these maps and notes will stimulate further interest in collecting data on the biology of the family in Western Australia.

TAXONOMY:

Recently Cutler and Shaw (1965) have divided the Australian Restionaceae into three families; Anarthriaceae, Ecdeiocoleaceae and Restionaceae for reasons given in Table I. This may reflect a more natural arrangement but for convenience, it has not been followed in this treatment until the current monographers have completed their studies. The families Anarthriaceae and Ecdeiocoleaceae are endemic to Southern Western Australia.

Table I : Summary of differences between Anarthriaceae, Ecdeiocoleaceae and Restionaceae.

<u>Anarthriaceae</u>	<u>Ecdeiocoleaceae</u>	<u>Restionaceae</u>
<u>Habit</u> : not Xyris like.	"Xyridaceous"	not Xyris like.
<u>Basal Leaves</u> developed	Basal leaves never developed.	Basal leaves never developed.
<u>Leaves</u> sometimes laterally flattened and equitant		dorsiventrally flattened, never equitant.
<u>Inflorescence</u> as Restionaceae	dense conical or oblong terminal spike, with broad obtuse shiny 'glumes'.	Inflorescence not so: 'glumes' narrow and acute.
<u>Flowers</u> bracteate	Flowers without a subtending basal bract.	Flowers ebracteate except <u>Lepyrodia</u>
<u>Anthers</u> bilocular, free from one another, laterally dehiscent.	bilocular, free, laterally dehiscent	unilocular, rarely bilocular (<u>Lyginia</u>) then comate, introrse.

Phytogeography:

The family is almost entirely confined to the South West Botanical Province and Interzone region (fig. 1). Maps of species diversity for the genera Anarthria, Leptocarpus, Lepyrodia, Loxocarya and Restio (figs 2-6) show greatest diversity of species in the climatically moderate regions, ie. the Jarrah Forest and Southern Coastal. It may be that here, as in South Africa, the Restionaceae prefer swamps or peaty sands (which are most abundant in these areas) and avoid dry sandy soils, which are colonised by the Liliaceae and Cyperaceae. However much more collecting is needed before these trends can be substantiated.

Biology:

The Restionaceae of Western Australia are almost entirely dioecious (see text for exceptions) rhizomatous perennial herbs. None appear to be seed apomictic, but only a handful of species have been studied (Chaetanthus? leptocarpoides (GK 959), Empodisma gracillima, Loxocarya pubescens and Oncysepalum laxiflorum). Vegetative apomixis, can, however, assume major importance as a means of population maintenance and spread in Alexgeorgea. Alexgeorgea arenicola populations in Kings Park have not flowered in five years despite droughts, fires and other environmental perturbations. The rhizomes of this species are actively spreading during Autumn, Winter and Spring, and probably seed is rarely produced. Similarly extensive vegetative reproduction can be found in Empodisma, Harperia, Hypolaena, Loxocarya and Lyginia. However, in all cases flowering and abundant seed production occurs; and vegetative spread is a means of population maintenance, not spread. Although not adequately surveyed similar conditions apply to species of Anarthria, Leptocarpus, Lepyrodia and Restio.

Probably little vegetative spread occurs in Ecdeiocolea and Oncysepalum.

Acknowledgements:

The authors are indebted to Dr. B. Briggs and Dr. L. Johnson without their careful taxonomic studies, no biological studies of this family would be possible.

References:

- Cutler, D.F. and Shaw, H.K. (1965) "Anarthriaceae and Ecdeicoleaceae : two new monocotyledonous families seperated from the Restionaceae" Kew. Bull 19 : 489 - 499.
- Keighery, G.J. and Marchant, N.M. (1979) Notes on the biology and Phytogeography of the genera Dipteranthemum and Ptilotus. Kings Park Research Notes 6 (in press).

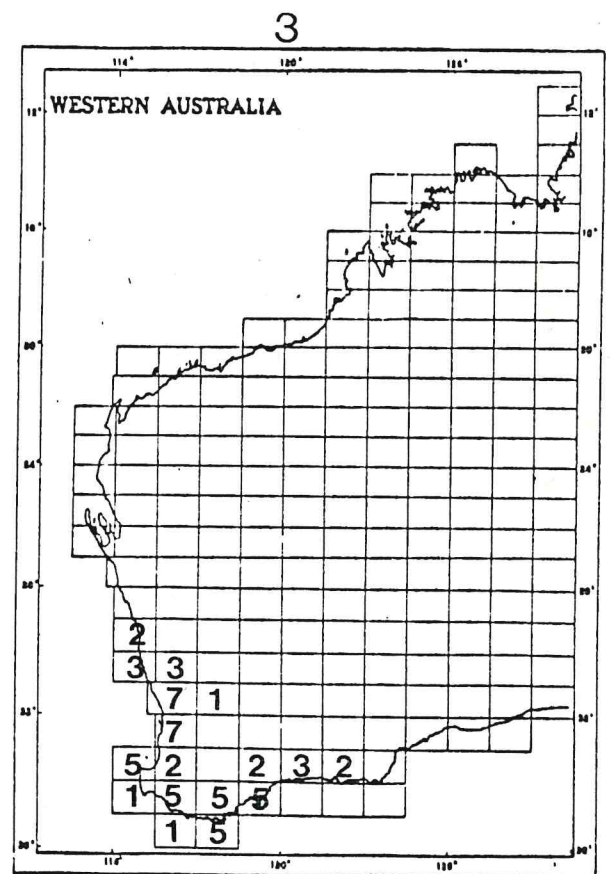
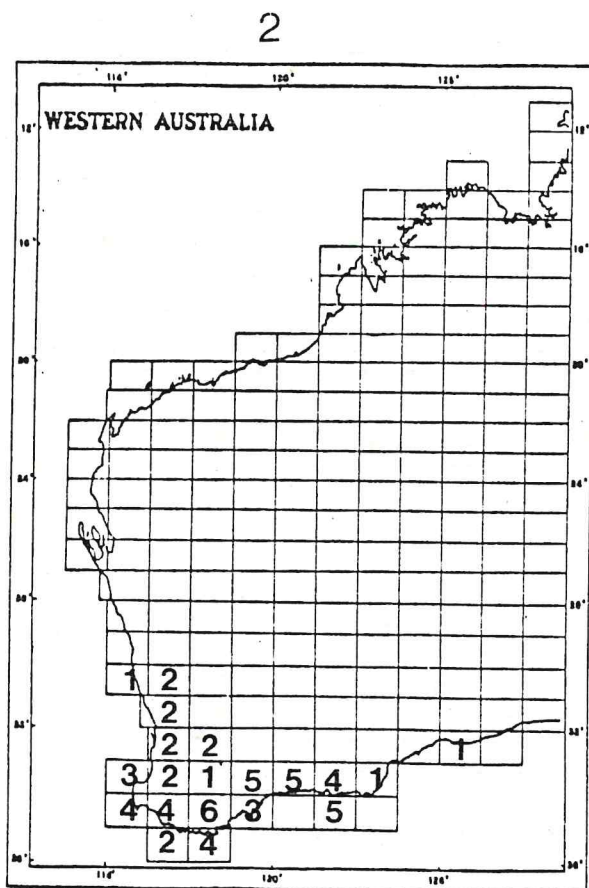
Figure 2 : Species Richness in the genus Anarthria

Figure 3 : Species Richness in the genus Leptocarpus

Figure 4 : Species Richness in the genus Lepyrodia

Figure 5 : Species Richness in the genus Loxocarya

Figure 6 : Species Richness in the genus Restio



Notes on Individual Genera/Species; abbreviations as outlined for Ptilotus by Keighery and Marchant (1979).

ALEXGEORGEA

Genus closely allied to Restio, differing chiefly in possessing subterranean ovaries.

A. arenicola Carlqu. (\equiv Restio nitens; needs new combination).
Tufted rhizomatous herb, culms to 10cm. from spreading underground rhizome, ♂ fls. brown, aerial, ♀ styles aerial, ovary underground; 4-6-(9).
sand.

A. subterranea Carlqu.
Tufted rhizomatous herb, culms to 20 cm; ♂ fls. brown, aerial; ♀ styles aerial, ovary underground; 9-10
sand, lateritic sand.

ANARTHRIA

Genus occasionally given family status, chiefly on anatomical grounds (Cutler and Shaw, 1965), but obviously closely related to Restionaceae s.s. and left in this family by the current Australian monographers, Johnson and Briggs.

* A. gracilis R. Br.
Erect tufted herb, tufts 30cm. x 30cm.
fls brown; 8-11
sand, peaty sands, swamps - often.

A. humilis Nees
Small tufted perennial, culms to 20cm.
fls brown; 8-10

A. laevis R. Br.
Small tufted perennial, culms to 40cm,
fls brown; 11-4
lateritic sands, sand, peaty sandy swamps.

A. prolifera R. Br.
Tangled rhizomatous herb, 30-40cm. x 1m,
fls brown; 8-10
peaty sand, swamps, white sand, coastal dunes, stony humic sand.

- spreads via rhizome, is a major component of early post fire regeneration in the Stirling Ranges.

A. scabra R.Br.

Large tufted herb, culms to 1-5m, fls brown (♂), red (♀); 8-12 swamps, peaty sands, low lying wet sandplain.

CHAETANTHUS

* C. leptocarpoides R.Br.

Tufted perennial herb, 30 x 30 cm, ♀ fls. red, erect ♂ fls. brown pendulous; 10-12 peaty sands or swamps

DIELSIA

D. cygnorum Gilg. (≡ ? Restio stenostachys)
Tufted perennial herb, 30 cm x 40 cm. ?-4-?

ECDEIOCOLEA

Genus given family status by cutler and Shaw (1965) : see introduction.

* E. monostachya F. Muell

Large tufted perennial, up to 1m x 1m, fls cream, bracts brown; yellow sand, peaty sands, sandy clay lateritic sands.

EMPODISMA

* E. gracillimum (F. Muell.) Johnson et Cutler (was Hypolaena gracillima).
Semi-scandent lax herb, tangled, from a rootstock to 1m, fls brown; 7-11 swamps

HARPERIA

H. lateriflora W.V. Fitz.

Tufted rhizomatous herb from a spreading rhizome, culms to 10cm high; colonies up to 2m across; fls brown; summer flowering. saline wet sands, white-grey sand, winter wet sand.

HOPKINSIA

H. anaectocolea (F. Muell.) Cutler
Dense erect clumps, up to 1m high x 1m
across, ♂ fls brown; 9-12
sand, sandy rises in saline regions
(survives fire via rhizome)

H. "ad scendens" m/s
Tufted erect rhizomatous herb, ♂ fls brown;
?-10-?.
sand.

H. calovaginata (Gilg.) Pilger = H. anaectocolea

HYPOLAENA

H. exsulca R. Br.
Rhizomatous herb, with erect culms to 70cm;
♀ fls brown, erect, ♂ pendulous; 6-12
lateritic sand, sand, sand dunes.

H. fasciculata W.V. Fitz.
doubtful record for Western Australia
no data.

H. fastigata R. Br.
Erect tufts from spreading rhizome, culms
tangled to 20cm; ♂ fls pendulous, brown
8-10-(2).
Lateritic sand, sand, peaty sand.

H. ramosissima Gilg.
Erect tufted herb, culms to 50cm ♂ fls
brown, pendulous; ♀ erect, 7-9.
swampy or peaty sands.
(survives fires via rhizome)

LEPIDOBOLUS

* L. chaetocephalus F. Muell.
Erect tufted herb, culms to 50cm; ♂
fls brown, ♀ fls red, 9-11
sand, sandy loam.

L. deserti Gilg.
no data

- * L. priessianus Nees
Erect tufted herb, culms to 40cm; ♂
fls brown, ♀ fls red, 8-11
sand, lateritic sand.
(a "form" or separate species with woolly
bases on the rhizome occurs at Cunderlee)
- * males of L. chaetocephalus and L. priessianus
are horticulturally attractive.

LEPTOCARPUS

- * L. aristatus R.Br.
Erect tufted herb, to 1m; ♂ fls brown,
pendulous; ♀ fls brown, erect, (4)-7-10-(12)
peaty sand, swamps, clay flats.
killed by fire, regenerates from seed.

L. brownii Hook F.
no data

L. canus Lindl. et Nees.
Erect tufted herb, culms to 50cm, ♂ fls erect,
brown, ♀ fls grey, 7-10
clay, swampy sands.

L. co-angustatus Nees.
Erect tufted herb, culms to 1m; ♀ fls brown,
erect; ♂ fls brown, pendulous, 8-11
clay, swampy sands.

L. "crebiculmis" Johnson et Briggs (m/s)
Erect tufted herb, culms to 1m; ♂ fls lax
brown; ♀ fls brown, erect. 9-10
swampy sands.

- * L. diffusus (Spreng.) Johnson et Briggs (m/s)
Erect tufted herb, culms to 1m, ♂ fls
brown; 12-5
swampy

L. erianthus Benth. (? = L. aristatus)
Erect tufted herb; 7-10
swampy sands.

L. humilis Gilg.
Tufted rhizomatous herb from a spreading
rhizome, ♂ fls brown, pendulous; ♀ erect;
8-11 coastal dunes, swampy sand, swampy, saline
sand, clay over sandstone.

(forms large clumps, which may cover entire swamps).

- * L. scariosus R. Br.
Erect tufted herb, culms to 1m, ♂ fls brown;
(5)-10-12.
swamps, streams, swampy silt
(forms large colonies).

- * L. tenax (Labill.) R.Br.
Erect tufted herb, culms to 1m, ♂ fls
brown, ♀ erect, 9-12
swampy sands
(Newbey 4264; notes that colonies may reach
2m across)

L. tenellus (Nees.) F. Muell.
Slender erect herb, culms to 50cm; ♂ fls
pendulous, brown; ♀ fls erect, red-brown;
9-11
swampy sands, yellow sand, lateritic sand.

- * Male plants horticulturally desirable.

LEPYRODIA

some species (L. hermaphrodita and L. monoica)
are monoecious.

L. anaectocolea = Hopkinsia anaectocolea

L. drummondiana Steud.
Tufted rhizomatous herb, culms single to
30cm, ♀, ♂ fls brown, erect; 9-11
sand, swampy sands.

L. "fortunata" m/s
Slender erect tufted herb, to 1m, ♀, ♂ fls
brown, erect; ?-9-?
peaty sand.

- * L. glauca (Nees.) F. Muell.
Robust erect tufts, culms to 1.5m, ♀, ♂
fls brown in dense cluster;
swampy sand, sand, clay.

L. heleocharoides Gilg.
Slender erect tufted herb, to 15cm, fls
inconspicuous; ?-12-?
?

L. hermaphrodita R. Br.

Small tufted perennial herb, to 20cm x 20cm
7-12-(3)
swampy; peaty sands, gravel.

L. macra Lindl. et Nees.

Erect tufted herb, to 30cm x 30cm,
fls brown, small; (9)-1-4.
swamps, sand, gravelly loam over clay.

L. monoica F. Muell.

Erect tufted herb to 30cm; may form very
large clumps; 9-12-(2).
peaty sands, seepage area from granite.

L. muiirii F. Muell.

Tufts of culms to 50cm from a spreading
rhizome (may form large colonies); 8-10.
swampy sands.

* L. stricta R. Br.

Erect tufts of culms to 1m ♂ fls brown,
pendulous; 7-12-(1).
swampy sand.
survives fires via rhizome.

(* Male plants are horticulturally desirable).

LOXOCARYA

L. "asper" (Nees) Johns et Briggs m/s
(based on Calorophus asper Nees.)

Small tufts or tangled culms from a spreading
rhizome, to 15cm; ?
?

L. cinerea R. Br.

Small erect tufts of tangled culms from
spreading rhizome, to 20cm. fls pale brown
8-10
sand, sand over clay, granite.

L. densa (Nees.) Benth.

no data

* L. fasciculata (R. Br.) Benth.

Large erect culms with whorls of "Leaves",
to 50 cms, from spreading rhizome, fls pale
brown; 8 9-11-(12).
sand: white, peaty, yellow or lateritic.

L. flexuosa (R.Br.) Benth.

Lax stems, leafless tangled culms, to 30cms,
from spreading rhizome, fls pale brown,
(7)-8-10.
calcareous sand, sand, stony creek bed.
(forms large colonies).

L. myrioclada Gilg.
no data.

L. pubescens (R. Br.) Benth.

Pubescent erect culms from spreading
rhizome, to 30 cms. fls pale brown;
1-3-(6). sand.

L. vestita Benth.
no data.

L. virgata Benth.
no data.

LYGINIA

L. barbata R. Br.

Erect tufted herb, robust culms to 1m,
generally clumps less than 50 cm diameter,
fls brown; 2-4
saline soil, yellow sand, peaty sand.

L. tenax (Labill.) C.A. Gardn.

acc. to Johnson et Briggs this species
is synomomous with L. barbata R.Br.

MEEBOLDINIA

* M. denmarkica Suess.

Small tufted herb, culms greyish, 30 x 30 cm.
maximum, ♂ fls reddish-brown, often pendulous,
♀ erect;
lateritic sand, sand, peaty sand.

ONYCHOSEPALUM

O. laxiflorum Steud.

Small tufted perennial herb, to 15 cm.
♂ fls brown, ♀ purple-red; 9-10
peaty sands.

RESTIO

R. amblycoleus F. Muell.
Erect tufted herb, culms to 1m, fls brown
(forms large clumps); 9-10
swampy - peaty sands.

* R. appplanatus Spreng.
Erect tufted herb, culms to 1m, fls brown
small (forms large clumps); ?-10-?
(*female plant horticulturally desirable)

R. chaunocoleus F. Muell.
no data.

R. confertospicatus steud.
? synonym?

R. crispatus R.Br.
Erect often tangled herb, culms to 1m.
clump size unknown, fls brown; 8-10
sand.

R. deformis R.Br.
no data

R. dielsii Gilg.
no data

* R. "gigas" Johnson et Briggs (m/s)
Erect robust tufted herb, culms to
2.5m, fls. brown; 9-10
sand.

R. gracilor (F. Muell.) Benth.
Slender erect herb, to 50cm x 50cm,
fls brown; 9-10
peaty sand.

R. luxus R. Br.
Slender erect culms to 50cm, forms large
diffuse clumps from spreading rhizome; 10-12
peaty.

* R. leptocarpoides Benth.
Erect tufted herb, culms to 50cm.
clumps 30 cm diameter, 12-2.
swampy sands.

R. leucoblepharus Gilg.

Erect ? tufted herb, from spreading rhizome, ?
grey sand.

- * R. megalotheca F. Muell. ex Benth.
Erect, often tangled, tufted herb, culms
greyish to 50cm, up to 2m across,
fls brown, 7-10
gravel, gravelly clays or loams
(* male plants attractive)

- * R. "microdon" Johnson et Briggs (m/s)
Erect tufted herb, culms to 50cm ♂ fls.
brown, drooping, ♀ erect, clump size unknown;
?-9-?
sand
(*male plants attractive).

R. nitens ≡ Alexgeorgea arenicola nom. illeg.

R. ornatus Steud.
no data

R. "serialis" Johnson et Briggs (m/s)
Erect tufted herb, culms to 50 cm,
forms large clumps, fls brown; ?-9-?
sand, laterite.

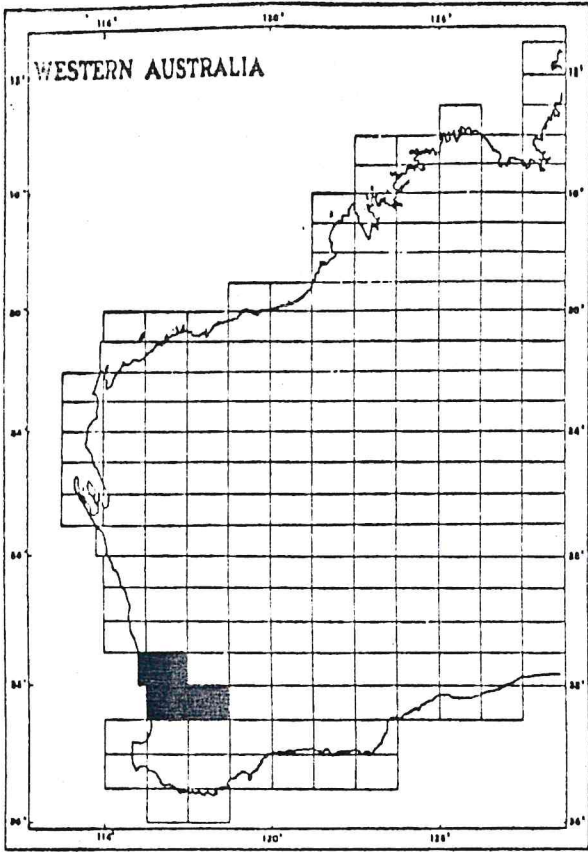
R. sphacelatus R.Br.
Erect tangled culms to 30cm from a spreading
rhizome; ?-9-?
sand, laterite, peaty sands.

R. sphacelatus R.Br. "northern form"
vegetatively as southern form, ?
sand.

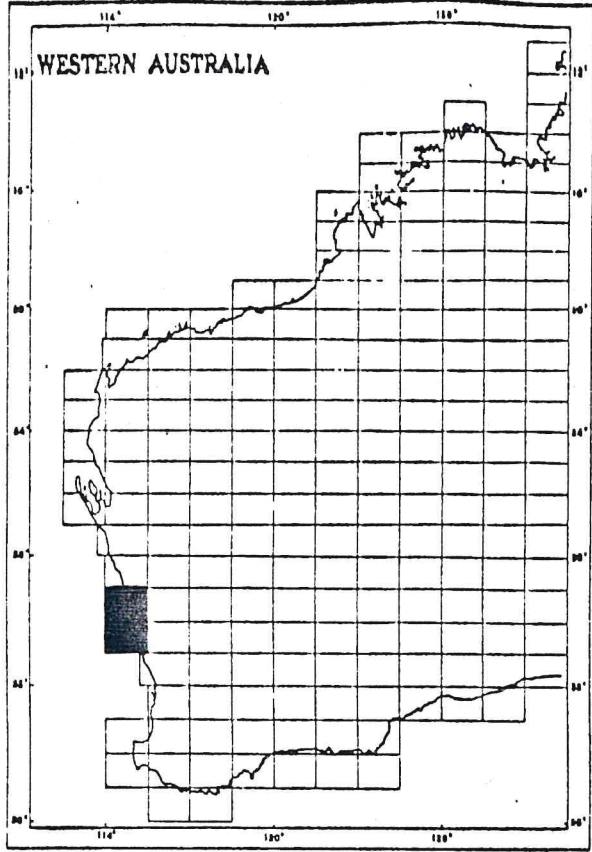
R. stenostachyus W.V. Fitz.
Slender erect culms to 40cm, from a spreading
rhizome forming large diffuse clumps; 9-10-(3)
peaty sands.

- * R. tremulus R. Br.
Erect robust culms to 1.5m, clumps generally
less than 50cm diameter; ?-1-?
peaty sands.
(* male plants attractive)

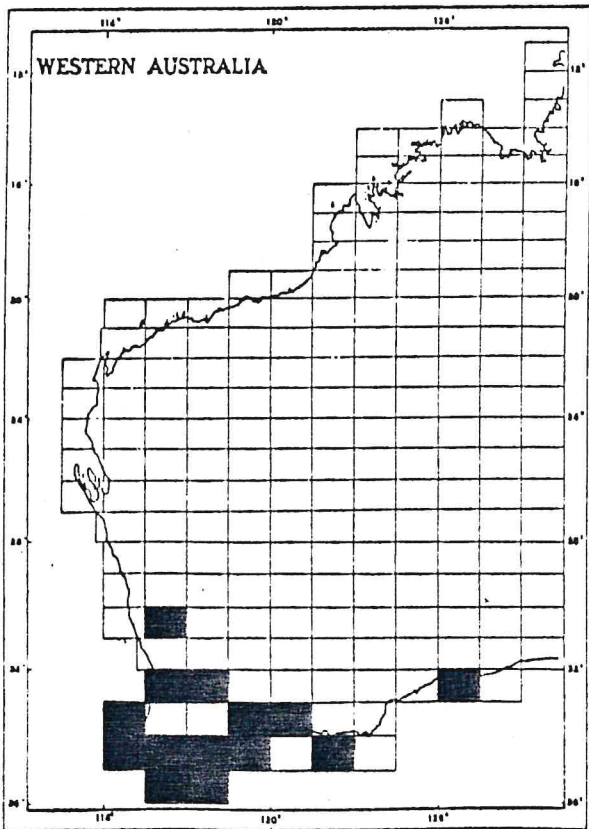
- * R. ustulatus F. Muell. ex Sharman et. Ewart
Erect tufted herb, culms to 1m, may form large
clumps; 9-10 peaty sands.
(*male plants attractive.)



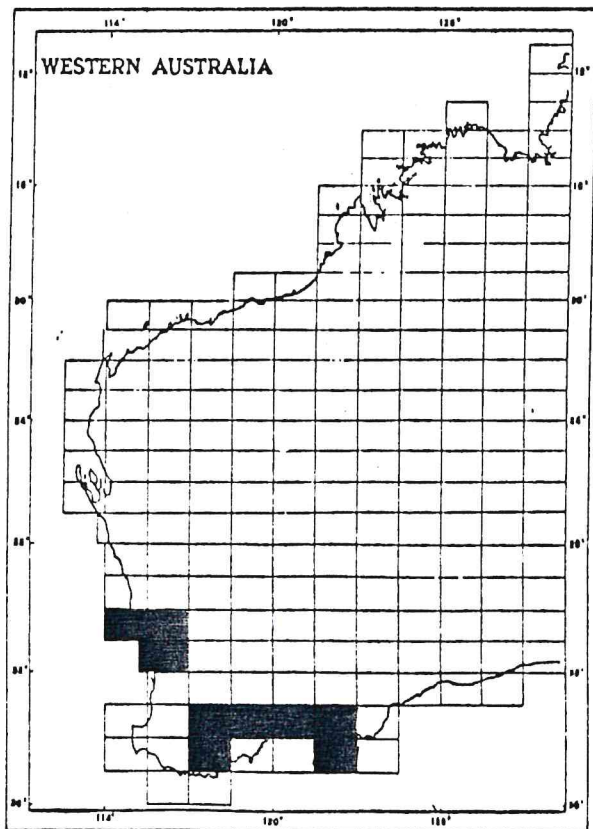
Alexgeorgia arenicola



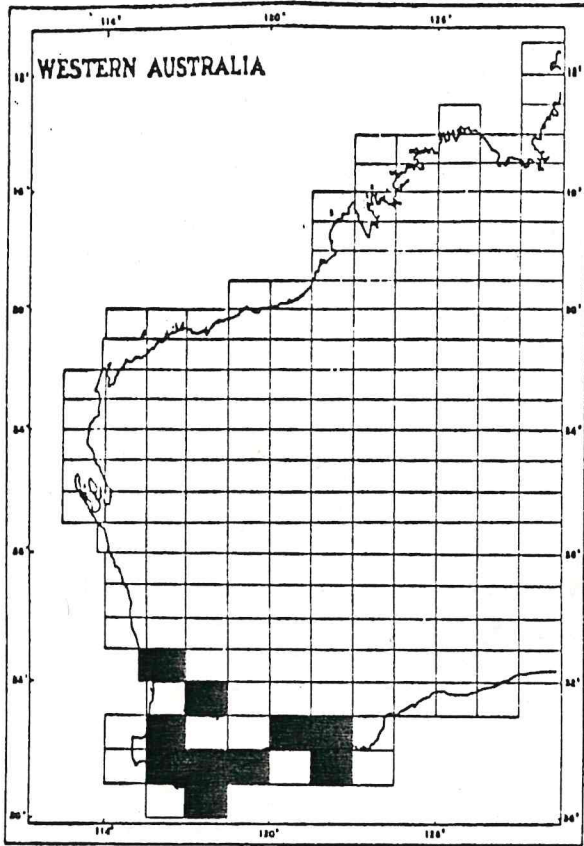
Alexgeorgia subterranea



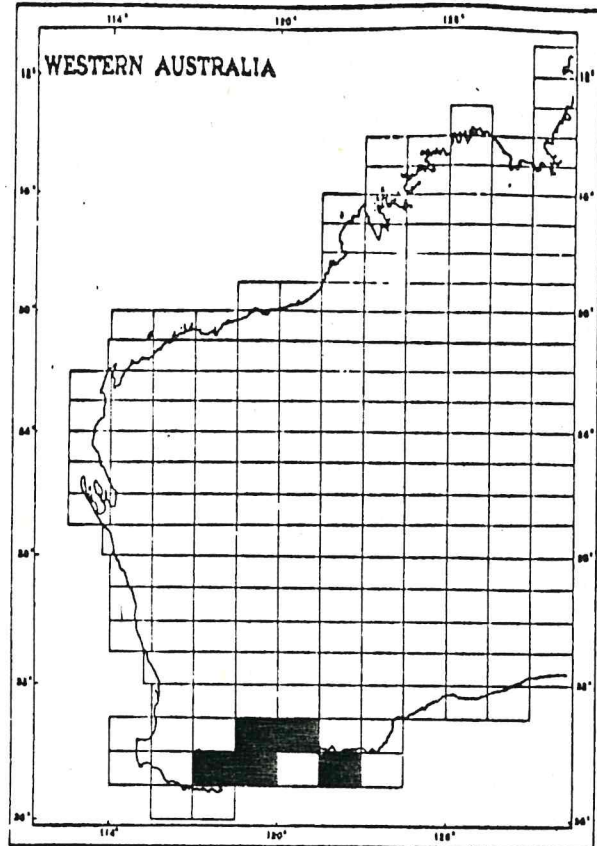
Anarthria gracilis



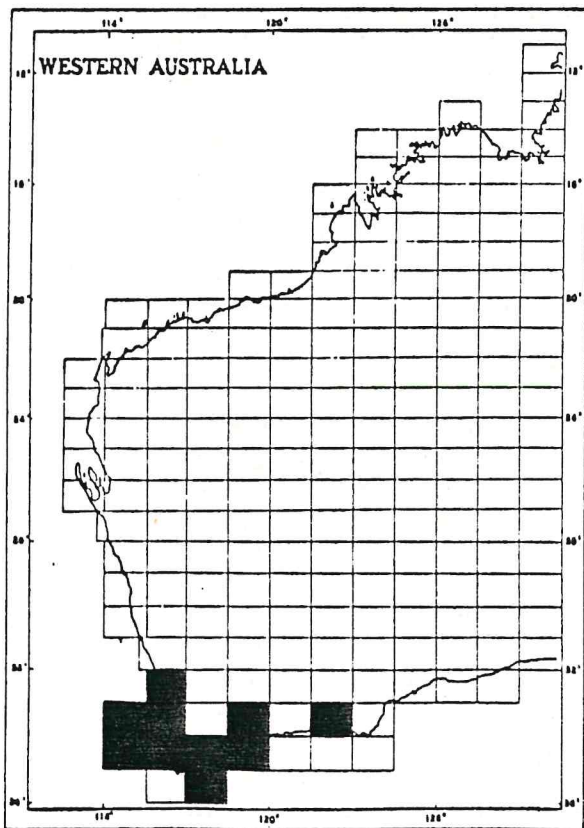
Anarthria humilis



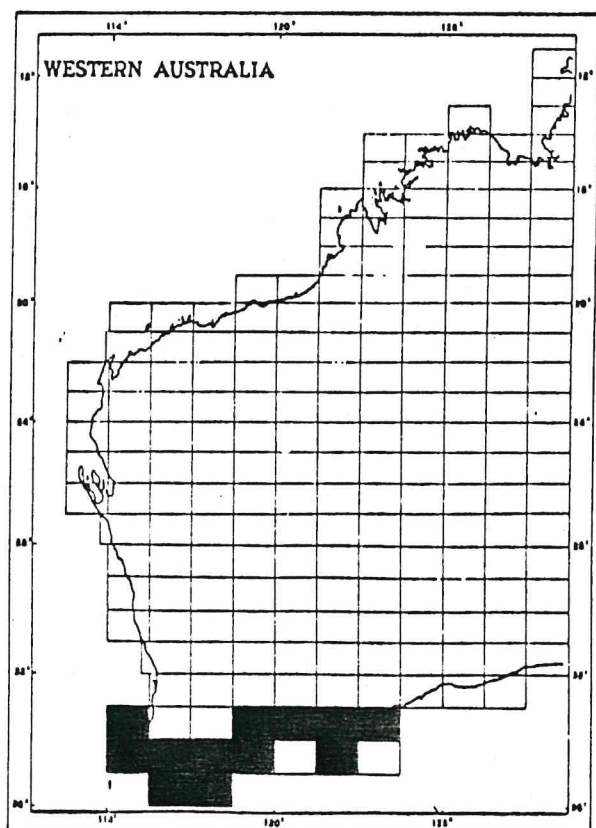
Anarthria laevis



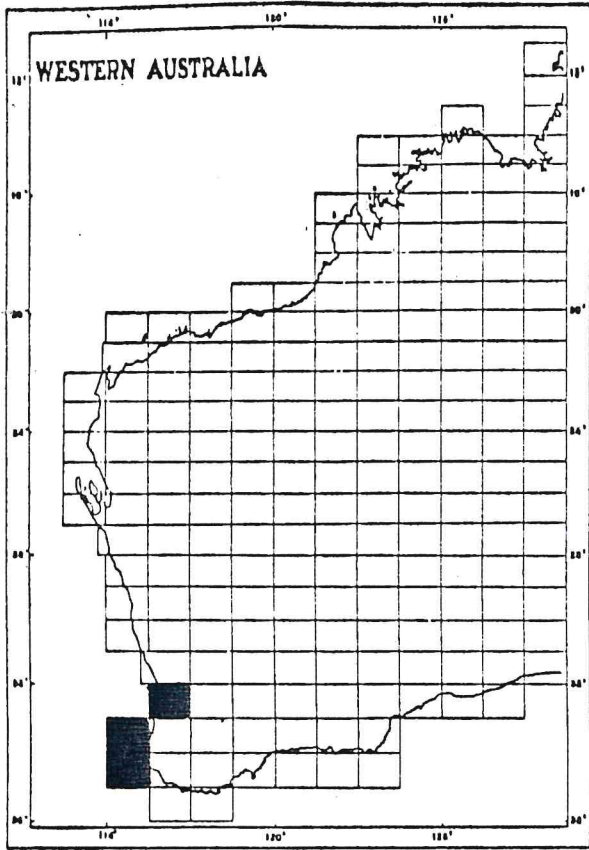
Anarthria polyphylla



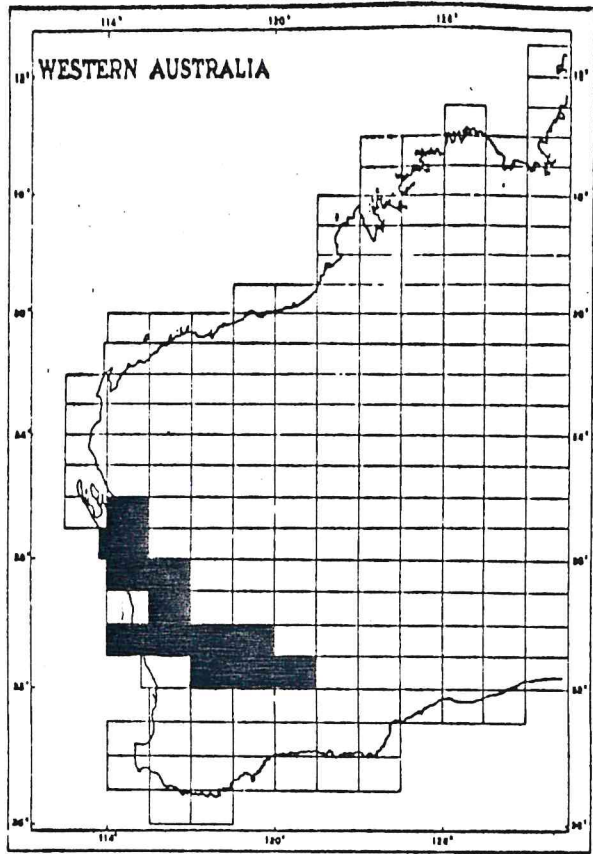
Anarthria prolifera



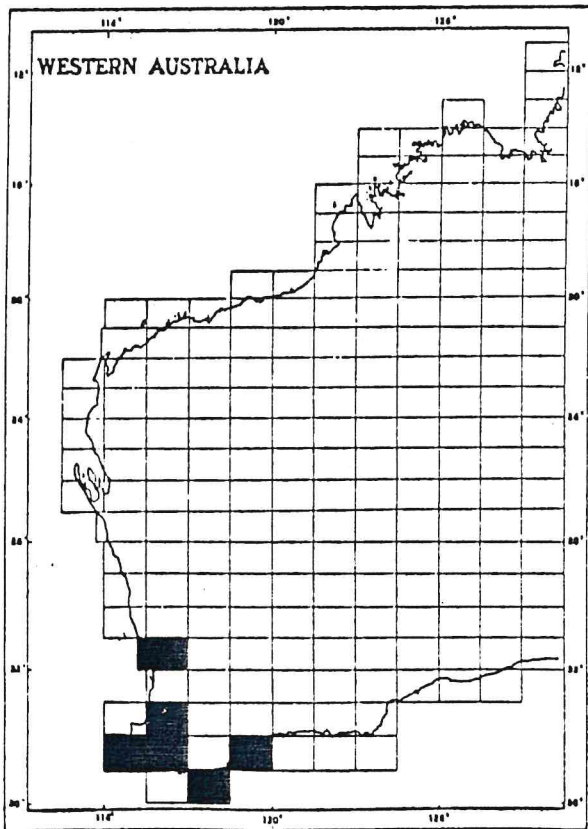
Anarthria scabra



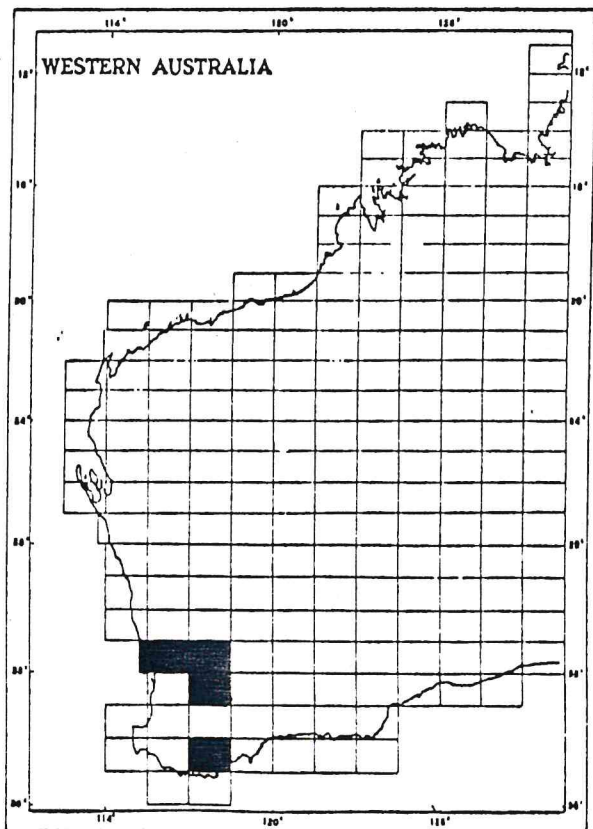
Chaetanthus leptocarpoides



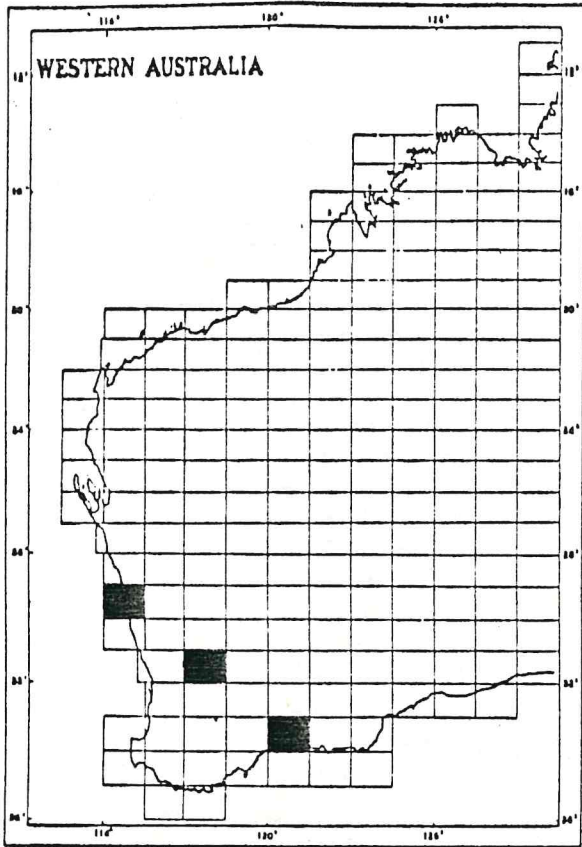
Ectocarpus monostachya



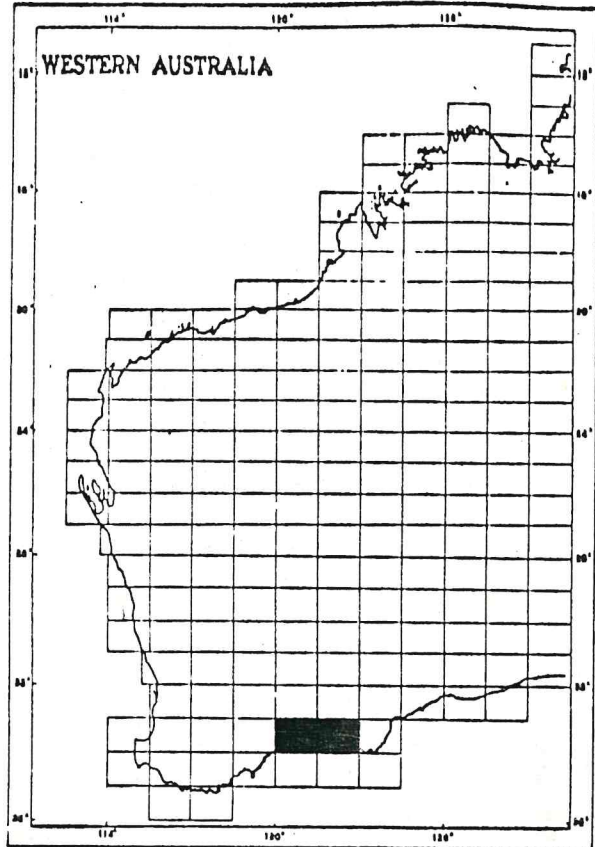
Empodisma gracillima



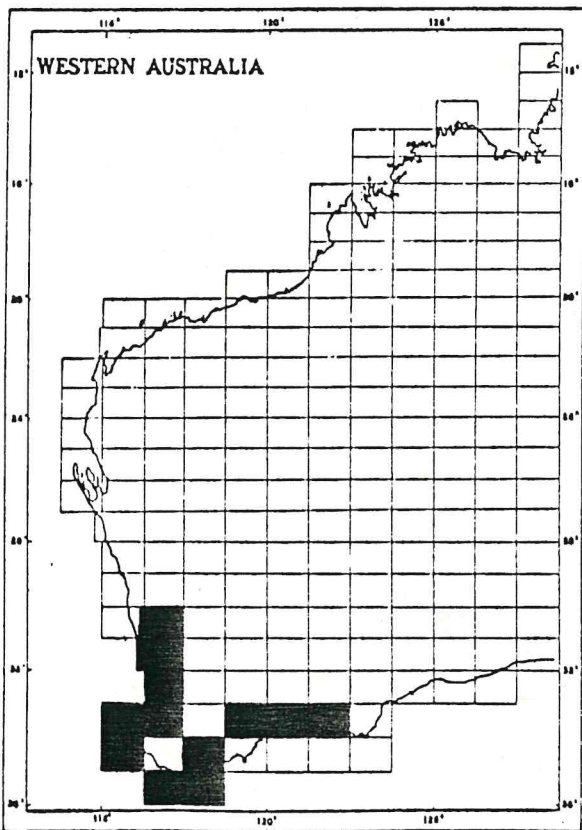
Harperia lateriflora



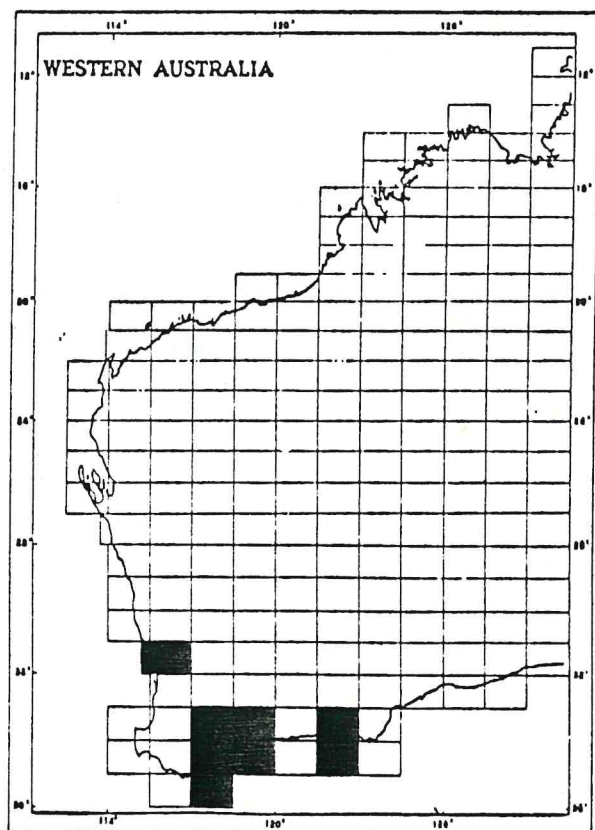
Hopkinsia anaetocolea



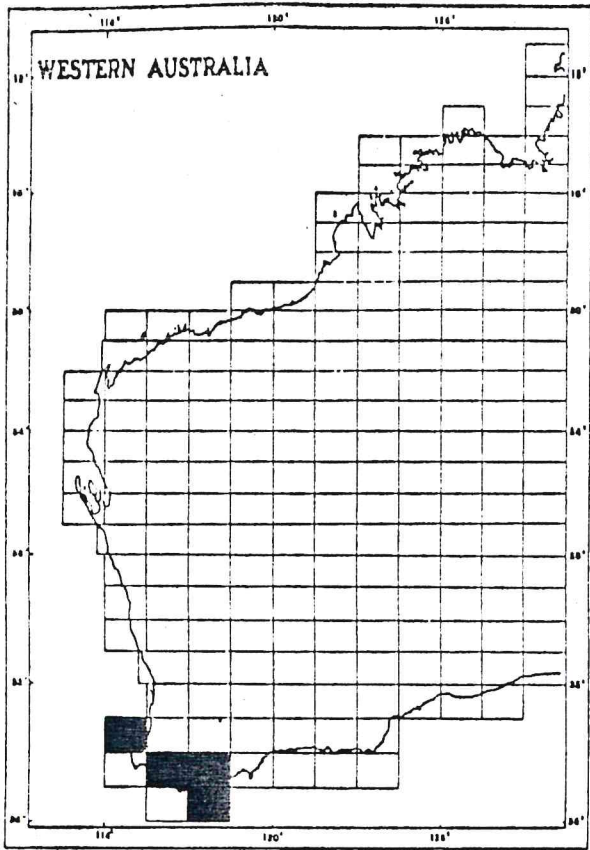
Hopkinsia adscendens



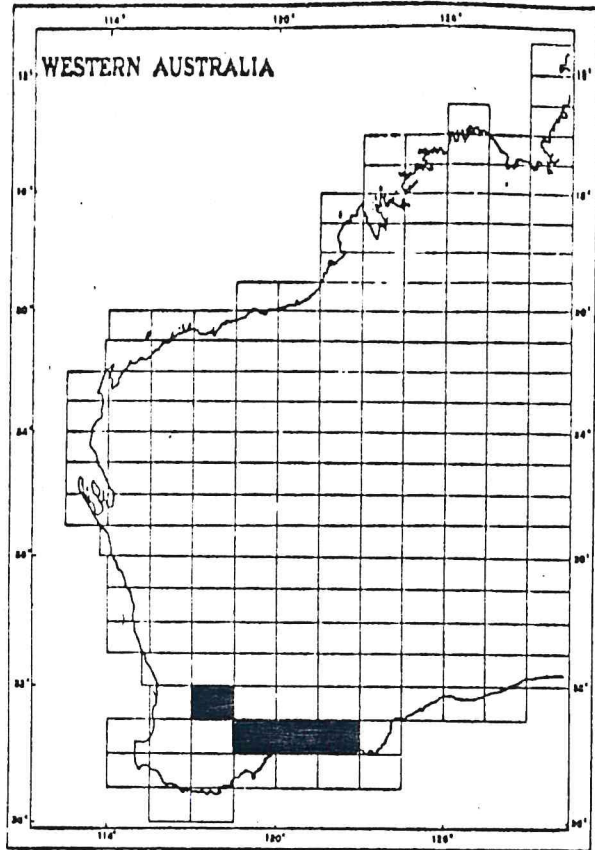
Hypolaena exsulca



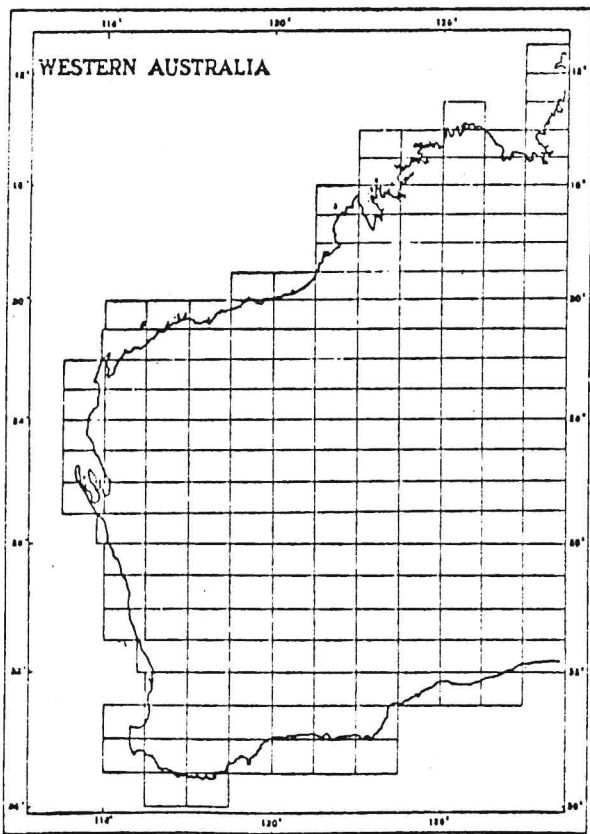
Hypolaena fastigata



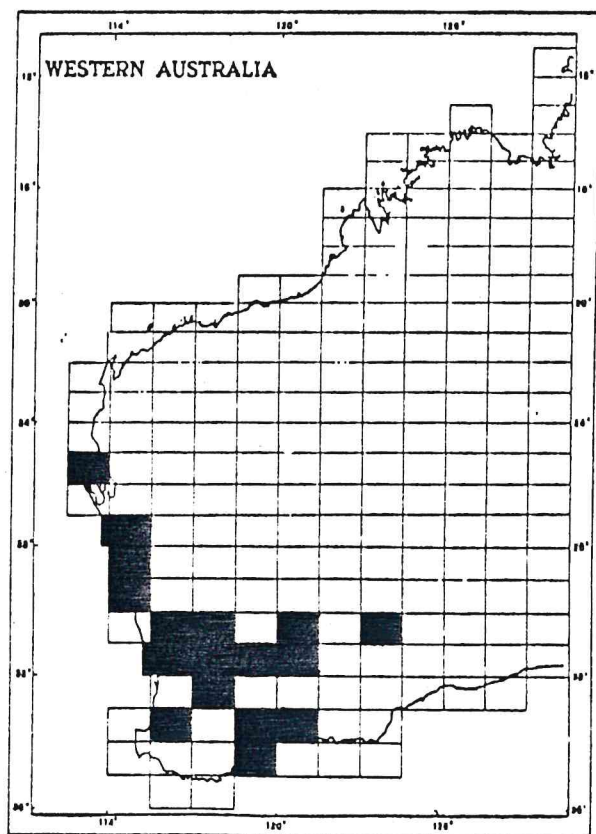
Hypolaena ramosissima



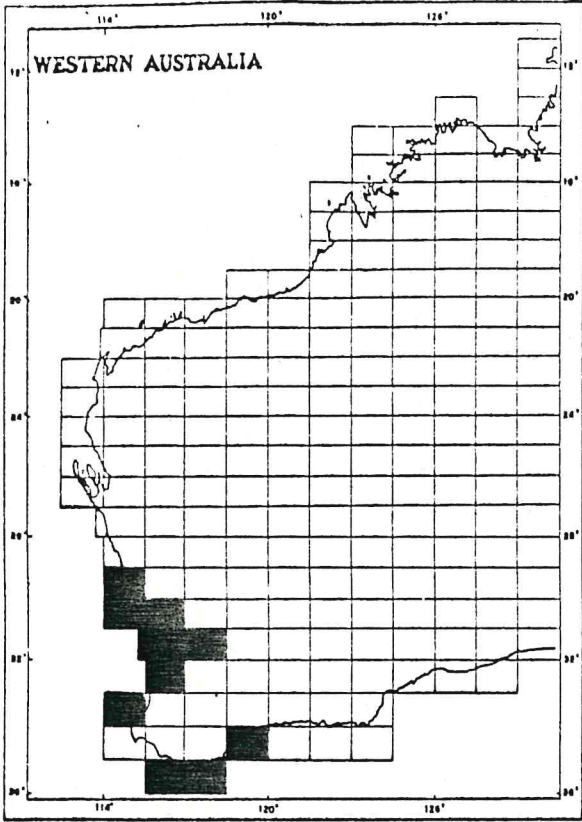
Lepidobolus chaetocephalus



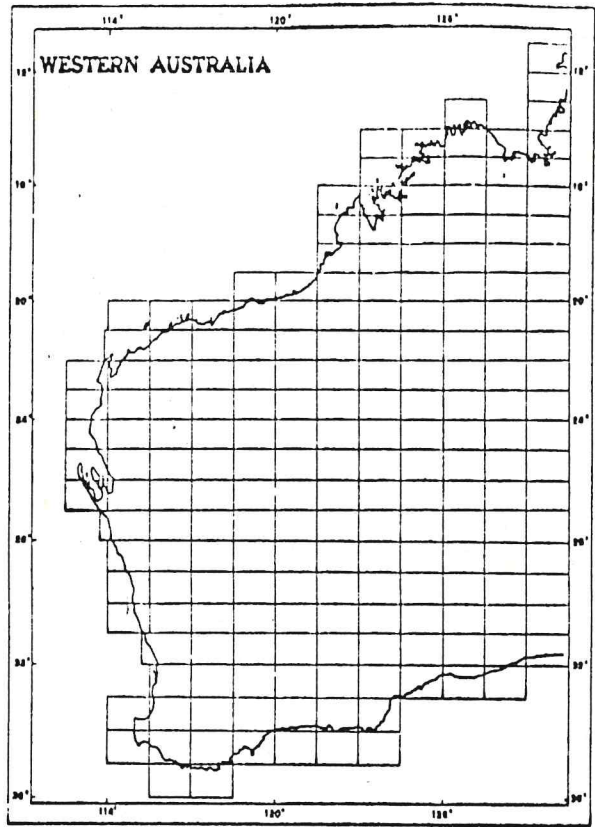
Lepidobolus deserti



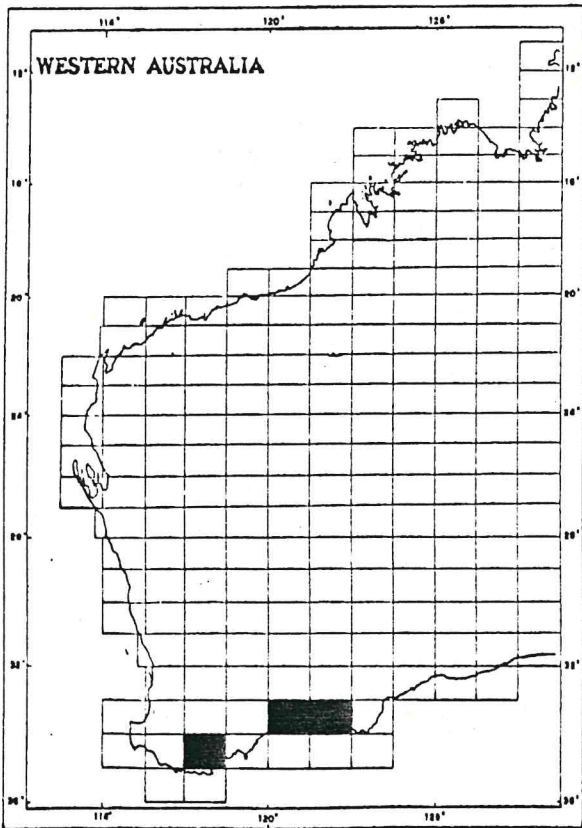
Lepidobolus priessianus



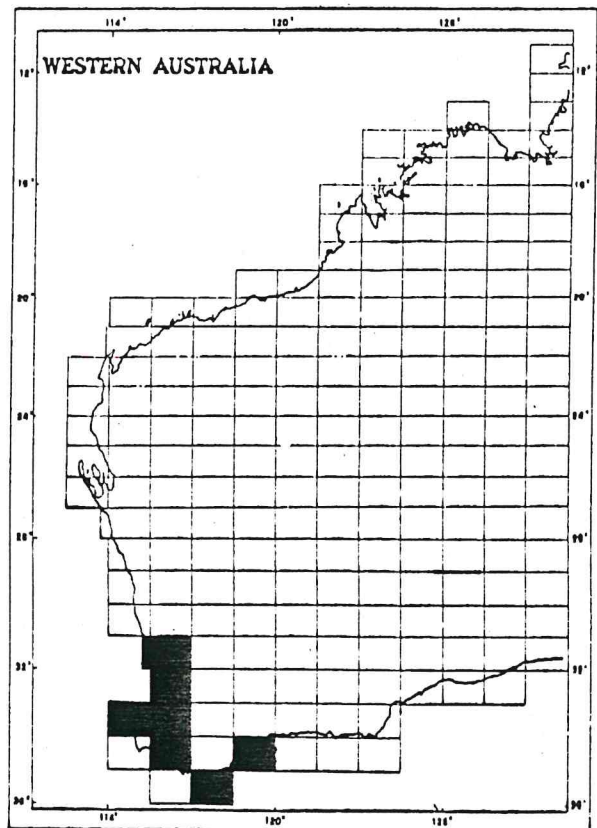
Leptocarpus aristatus



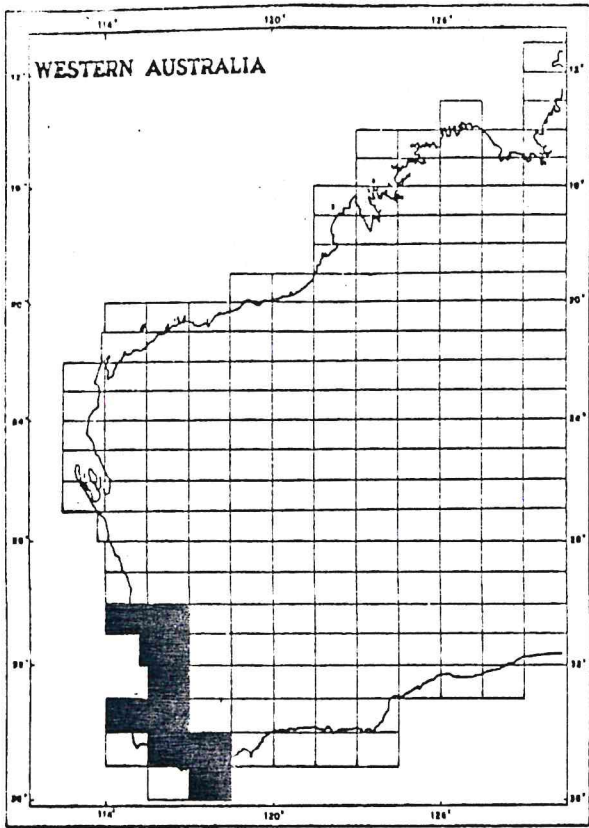
Leptocarpus brownii



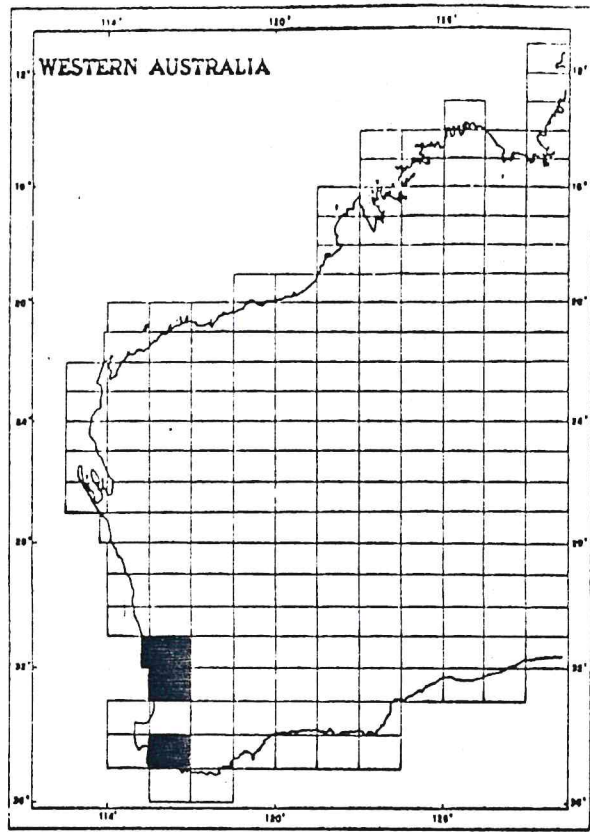
Leptocarpus "crebiculmis"



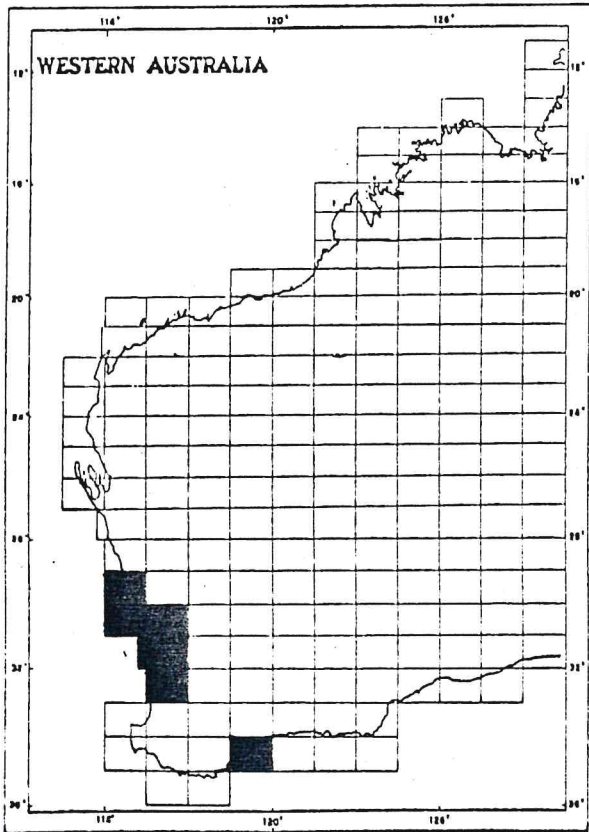
Leptocarpus canus



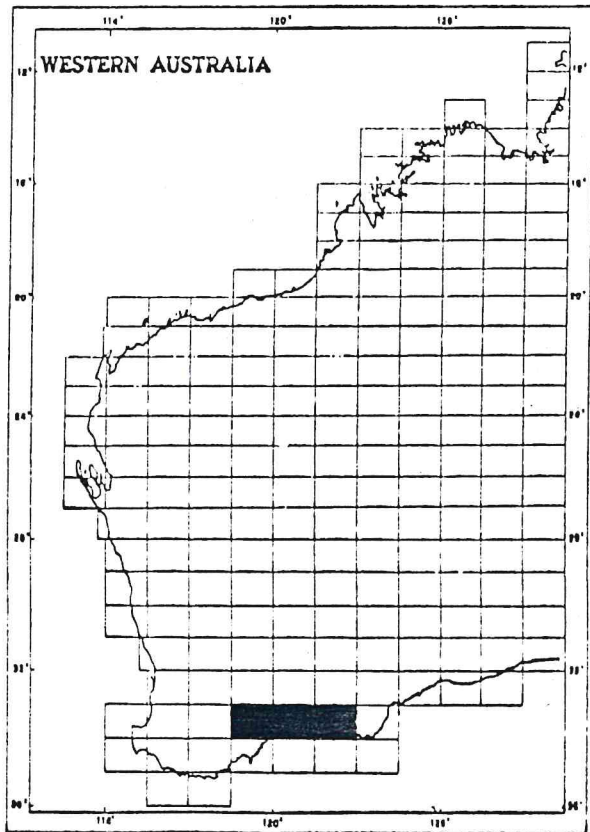
Leptocarpus co-angustatus



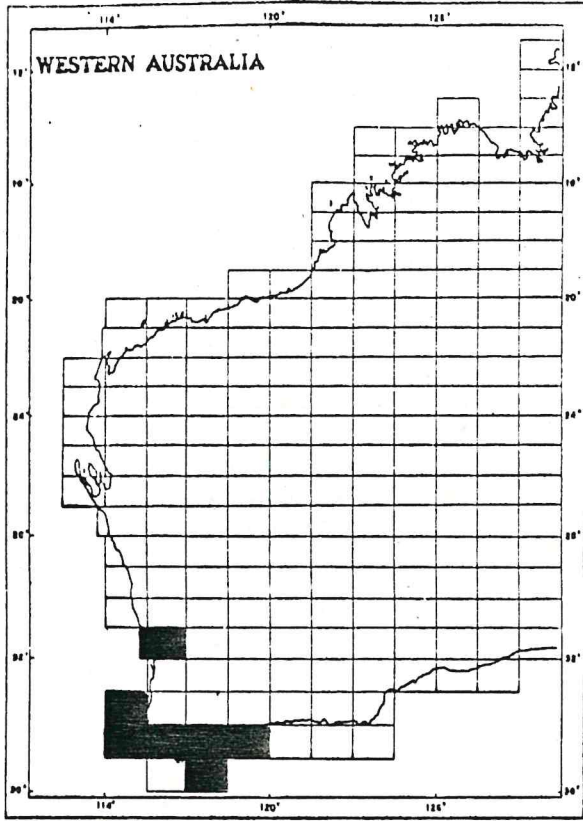
Leptocarpus diffusus



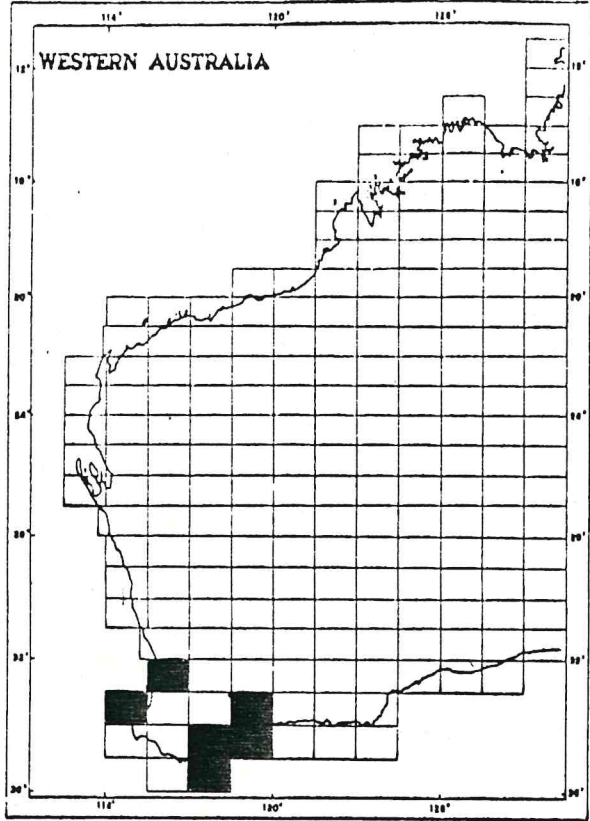
Leptocarpus erianthus



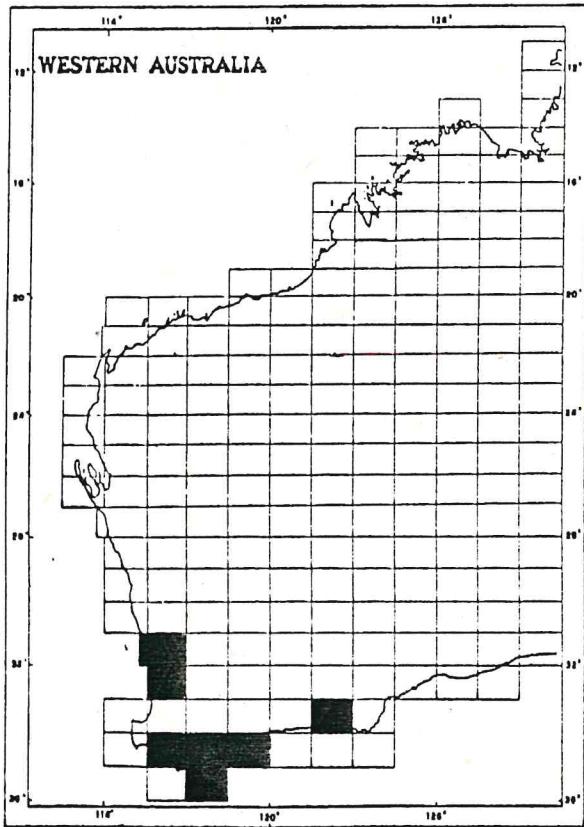
Leptocarpus humilis



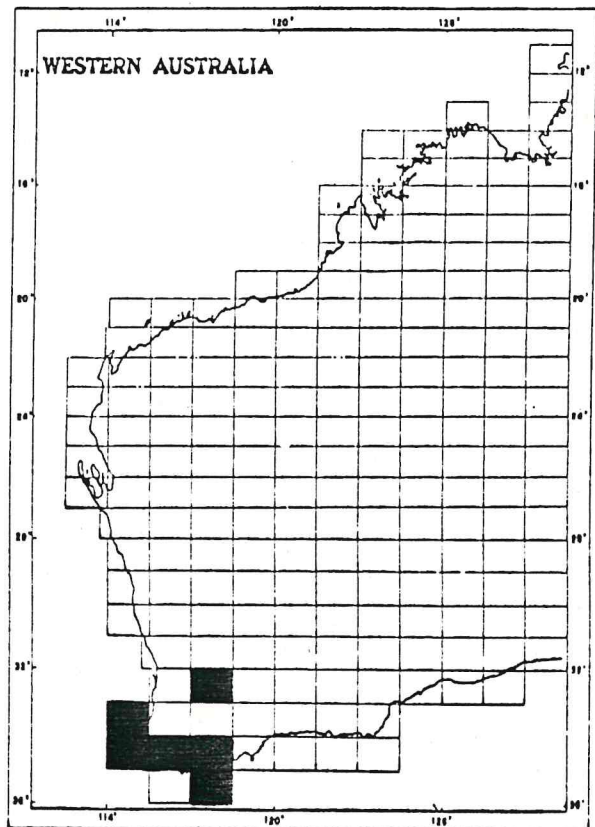
Leptocarpus scariosus



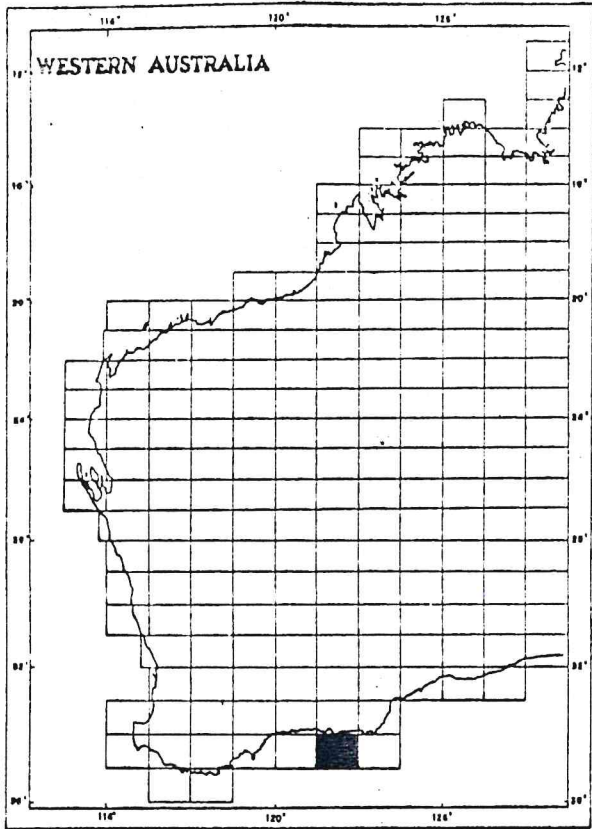
Leptocarpus tenellus



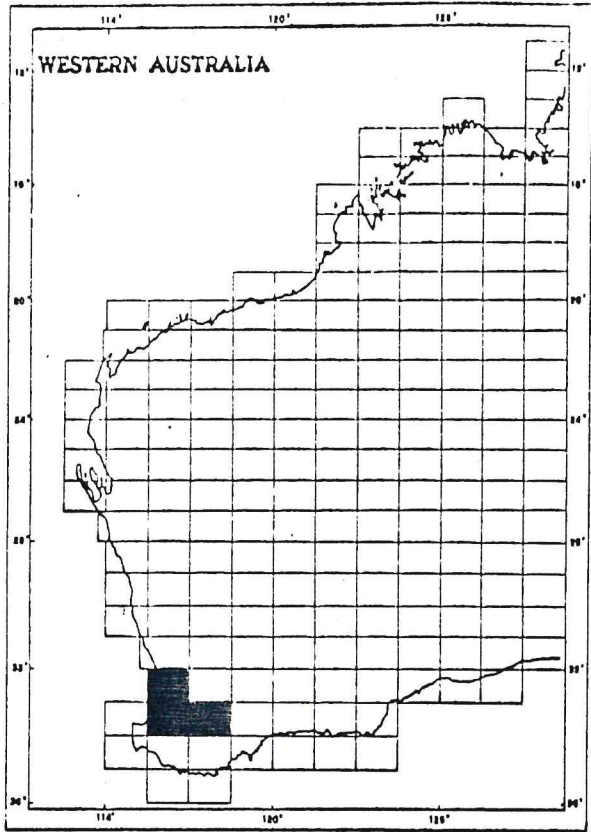
Leptocarpus tenax



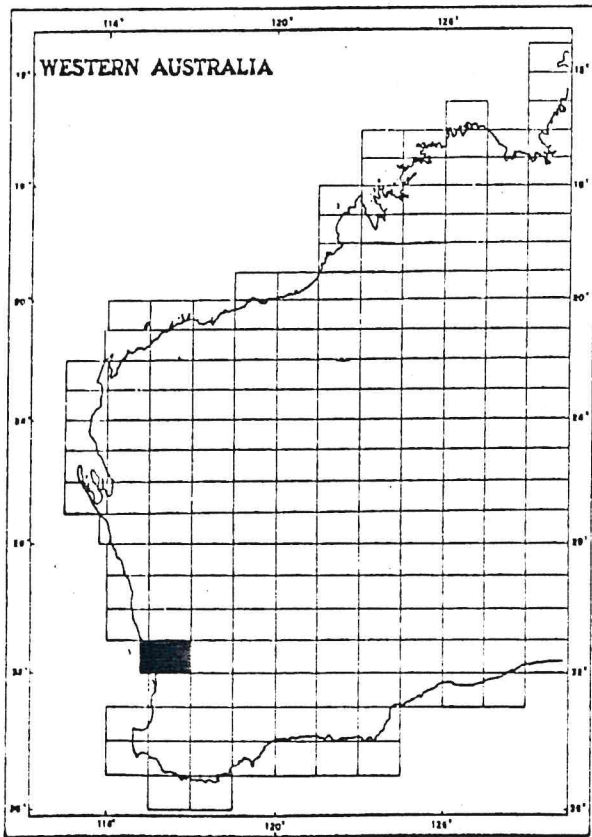
Lepyroidia drummondiana



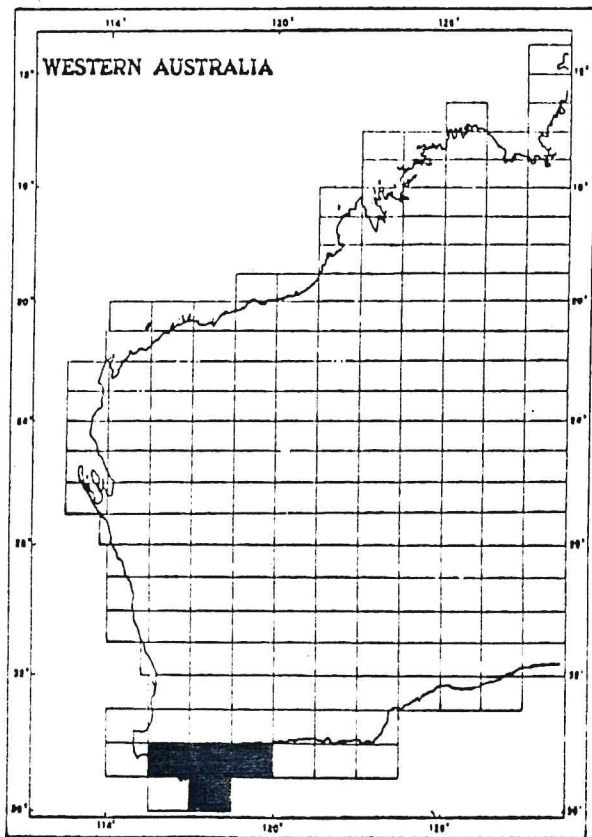
L. "fortunata"



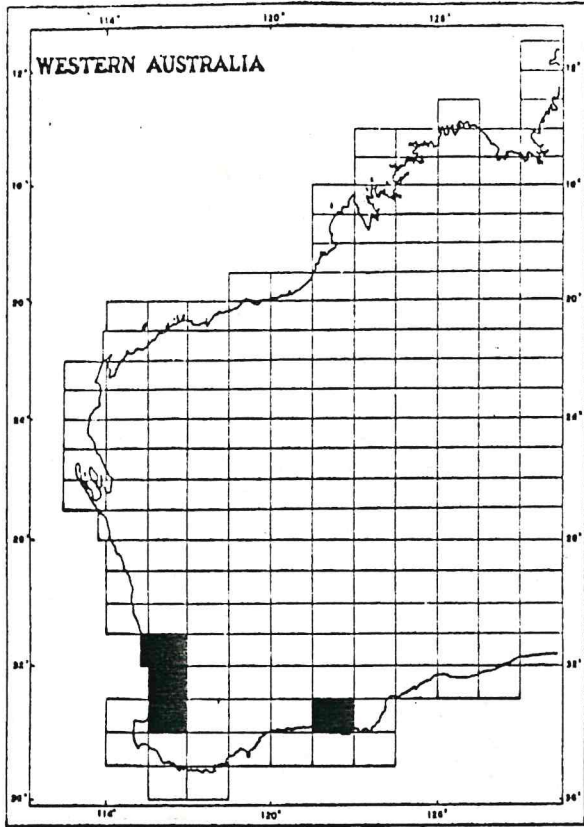
Lepyrodia glauca



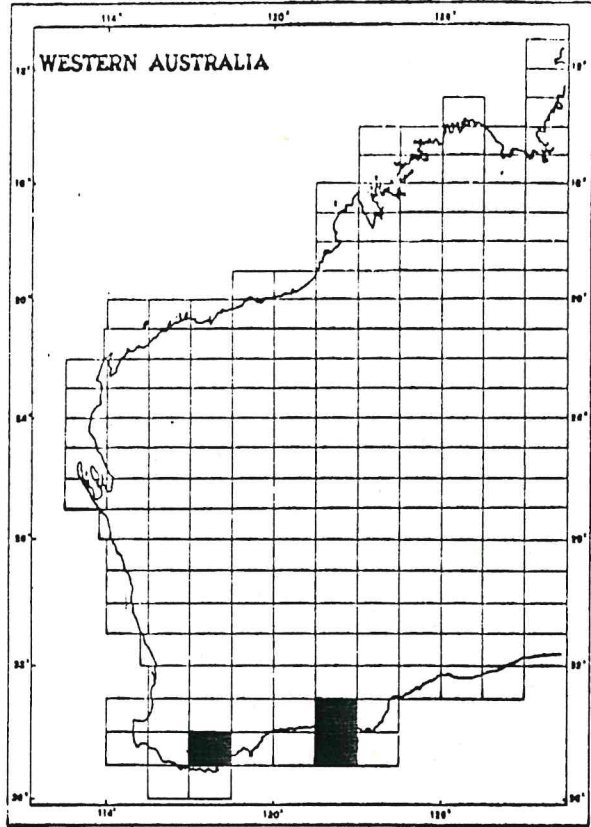
Lepyrodia heleocharoides



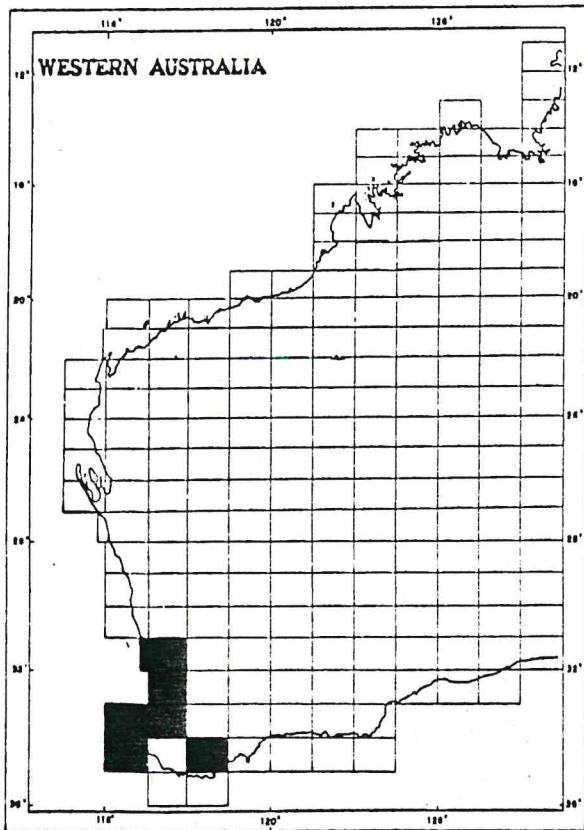
Lepyrodia hermaphrodita



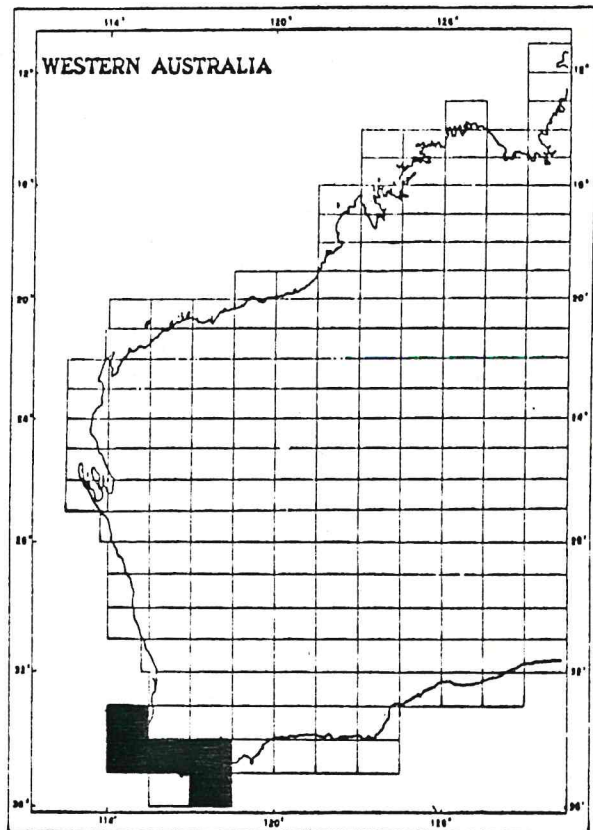
Lepyrodia macra



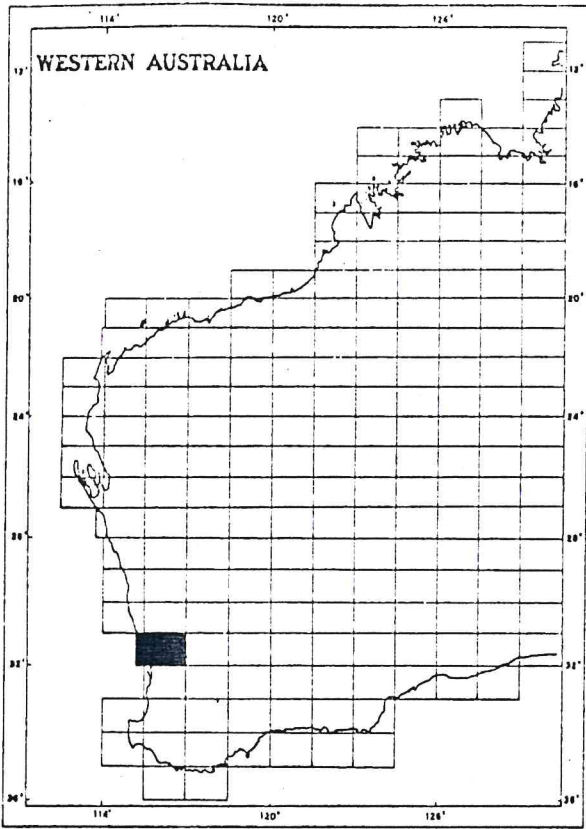
Lepyrodia monoica



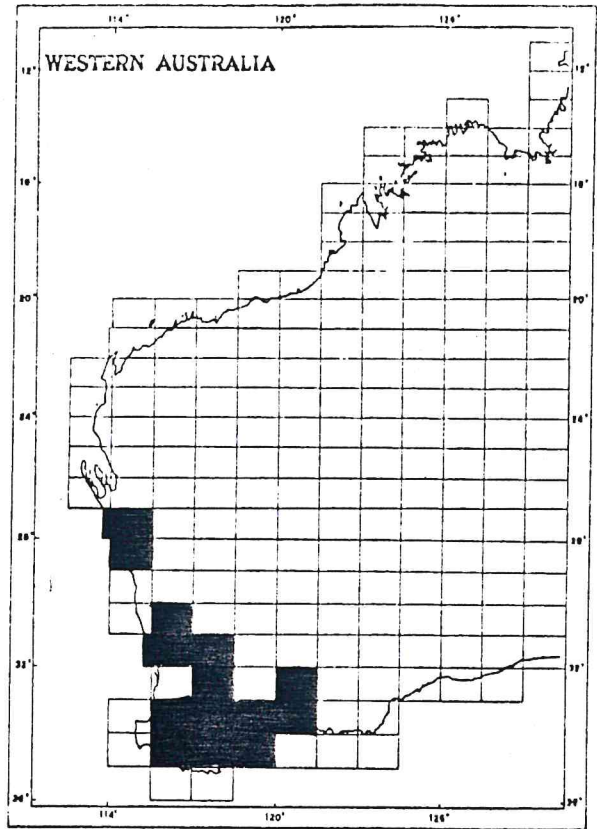
Lepyrodia muirii



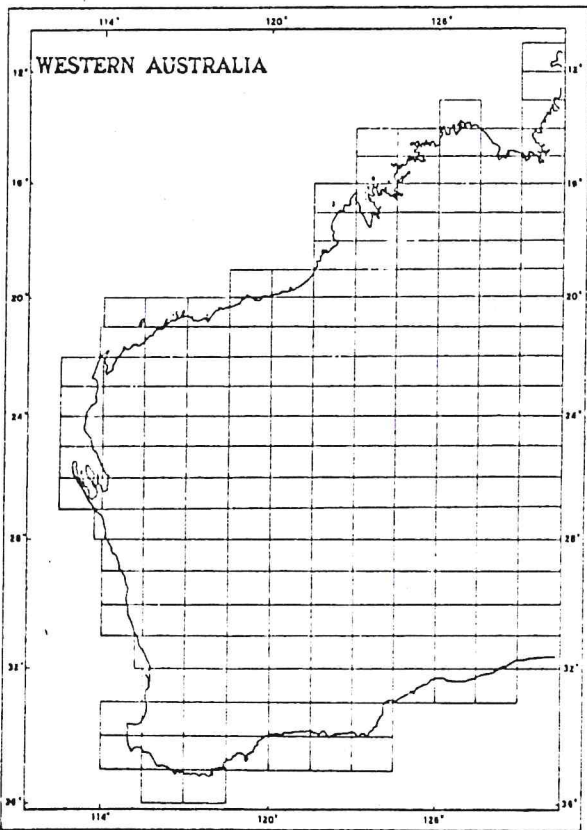
Lepyrodia stricta



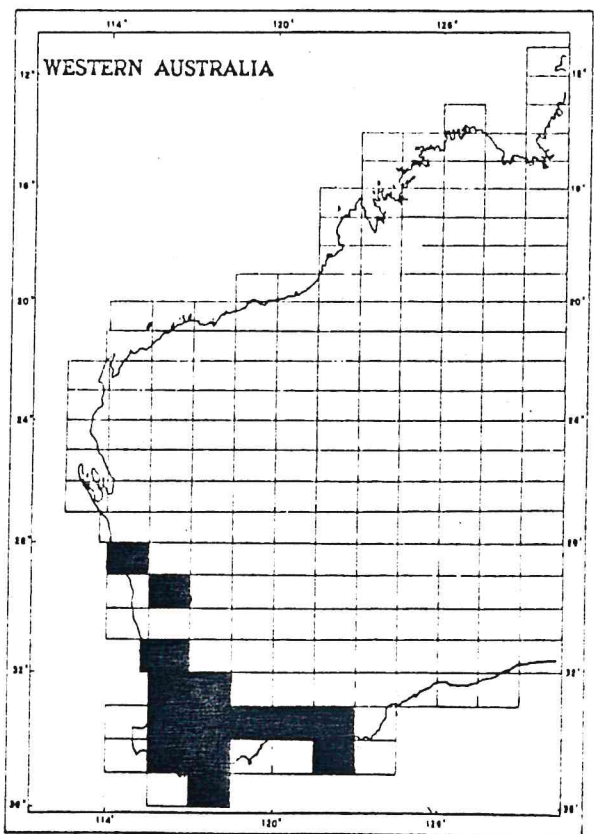
(Calorophus) *Loxocarya asper*



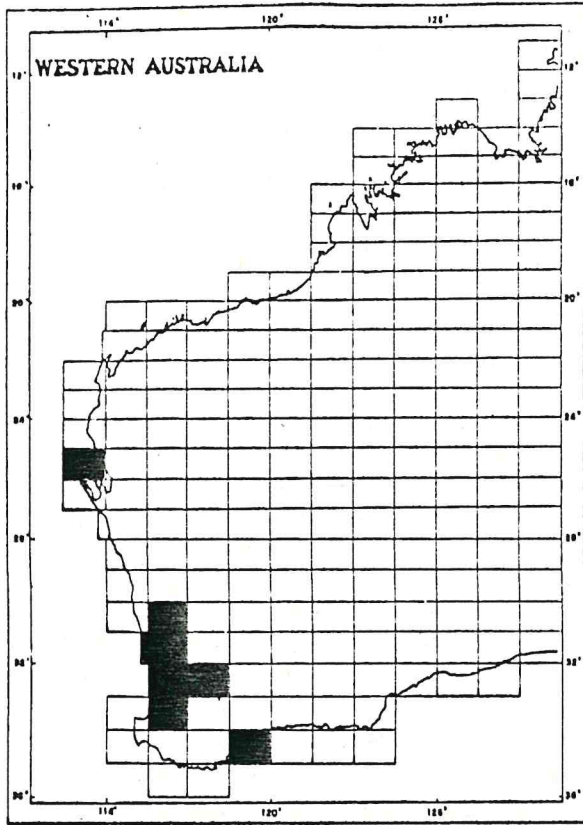
Loxocarya cinerea



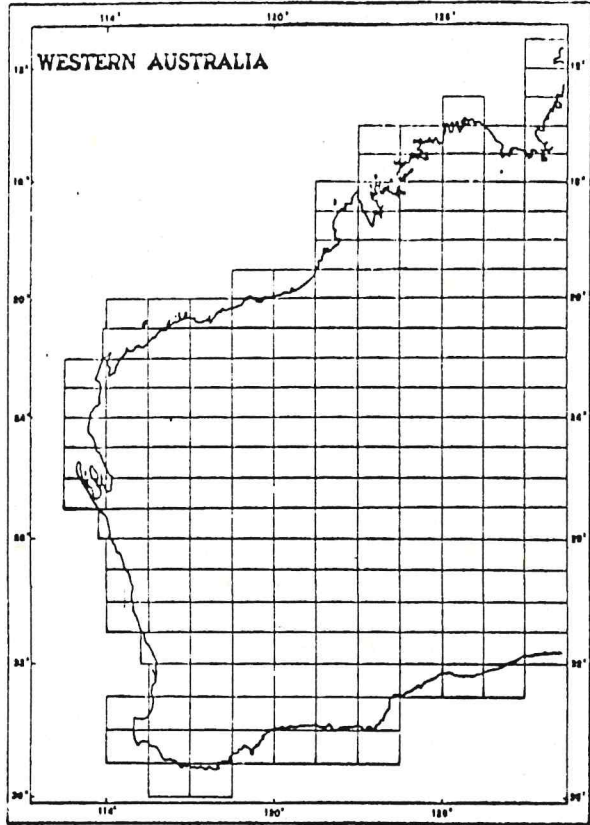
Loxocarya densa



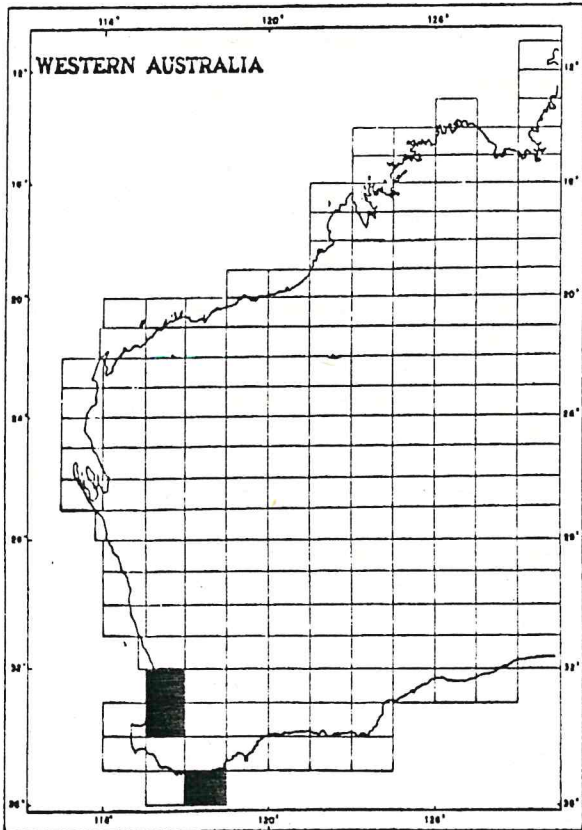
Loxocarya fasciculata



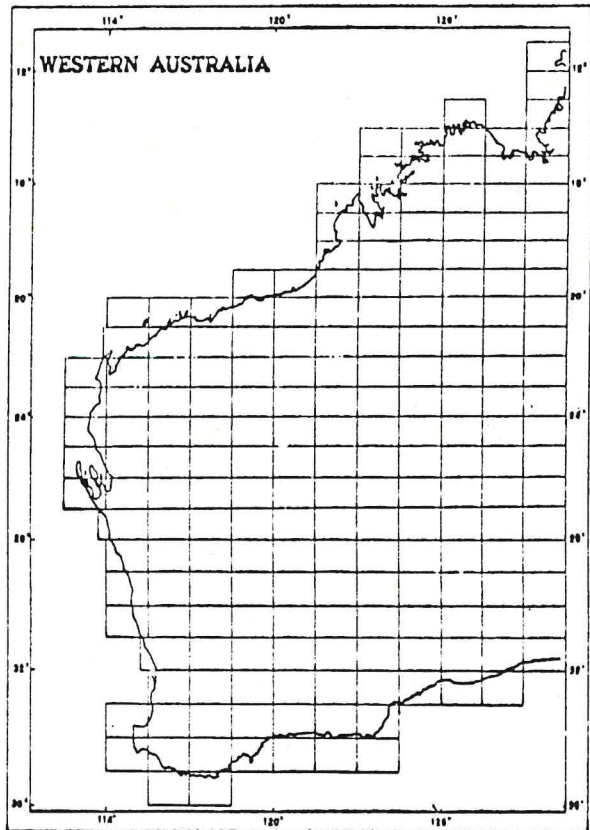
Loxocarya flexuosa



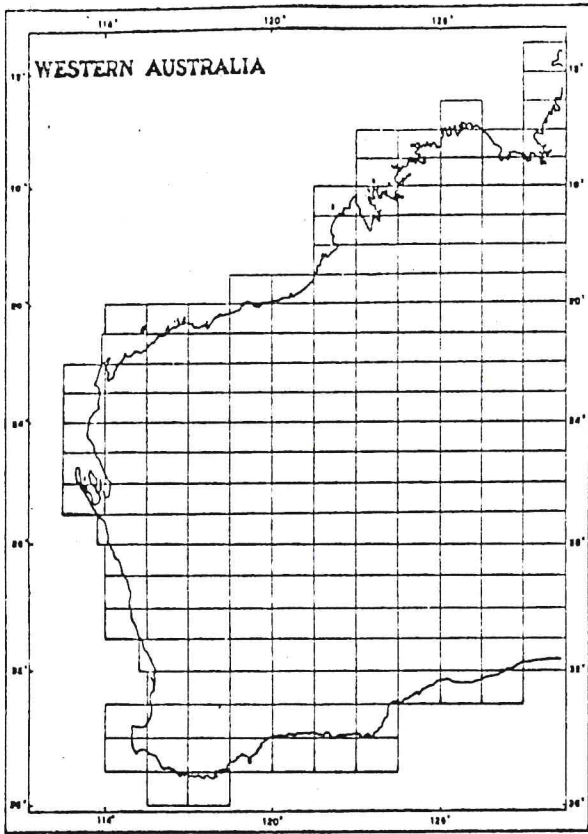
Loxocarya myrioclada



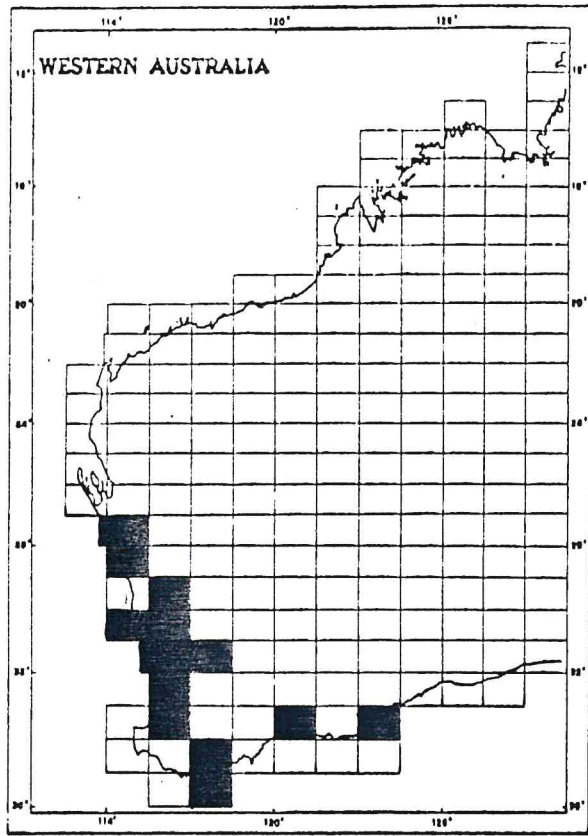
Loxocarya pubescens



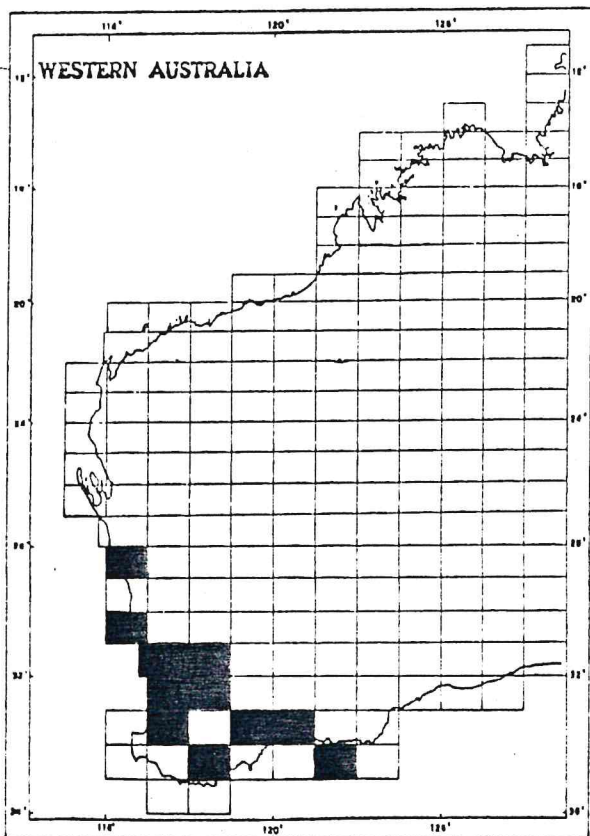
Loxocarya vestita



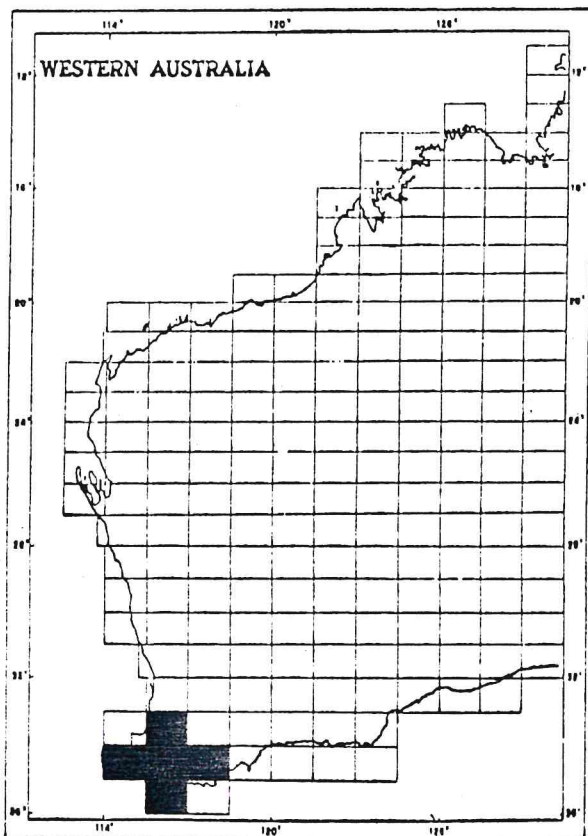
Loxocarya virgata



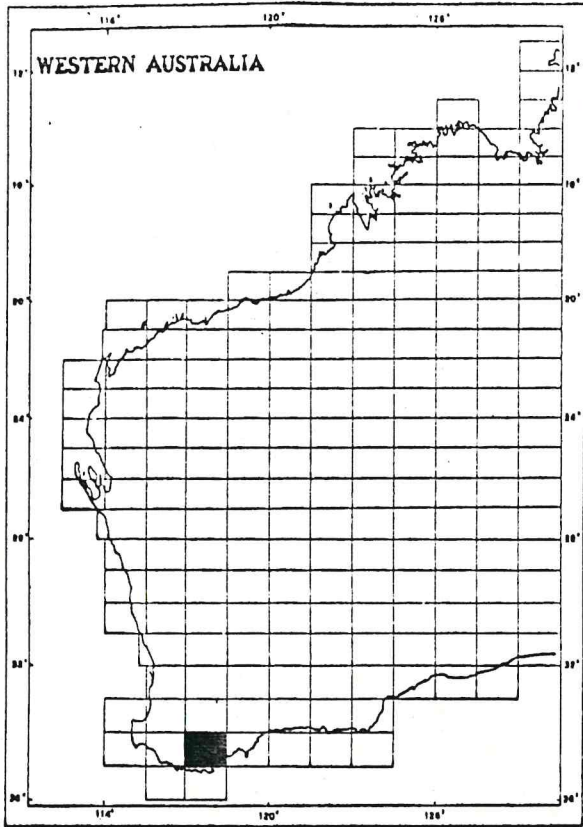
Lyginia barbata



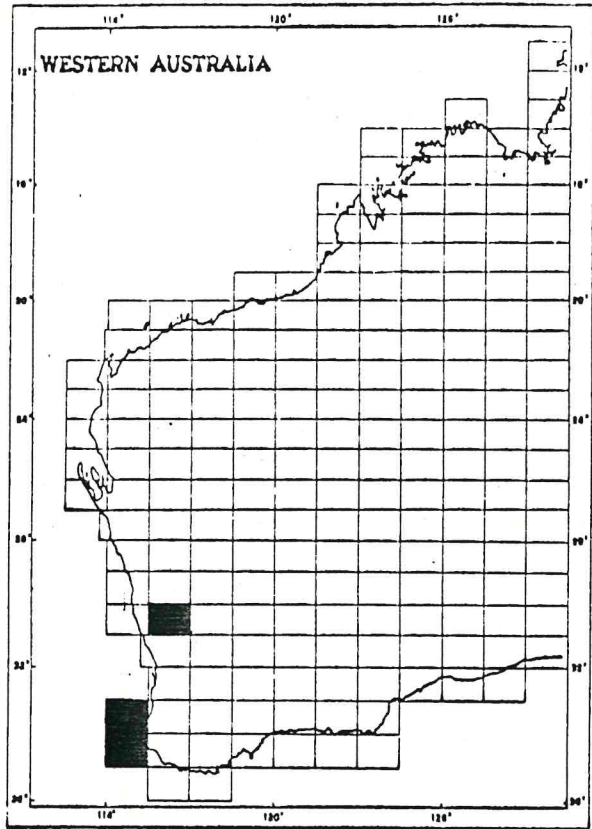
Lyginia tenax



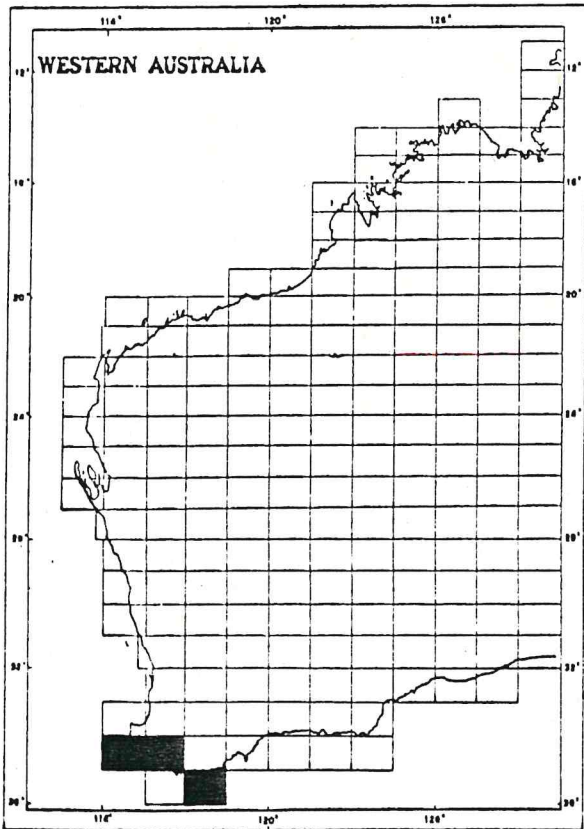
Meeboldinia denmarkica



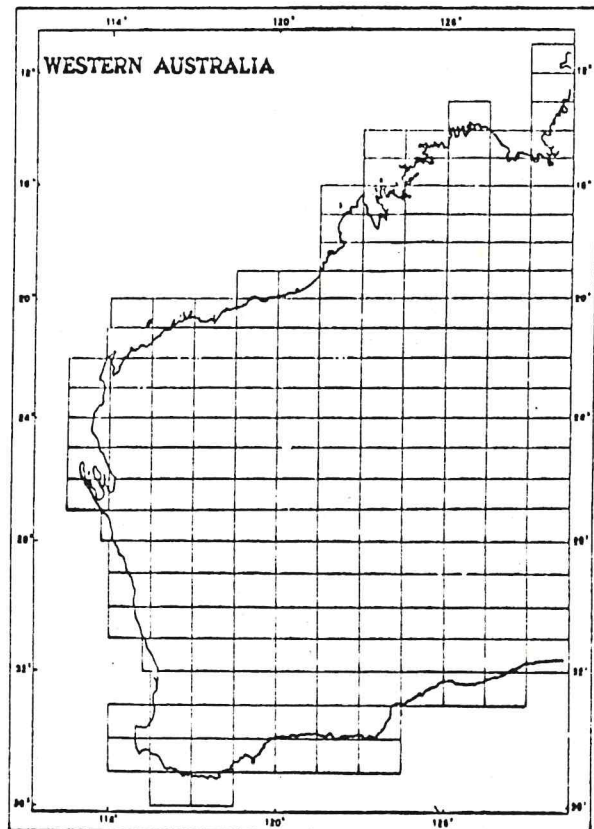
Onychosepalum laxiflorum



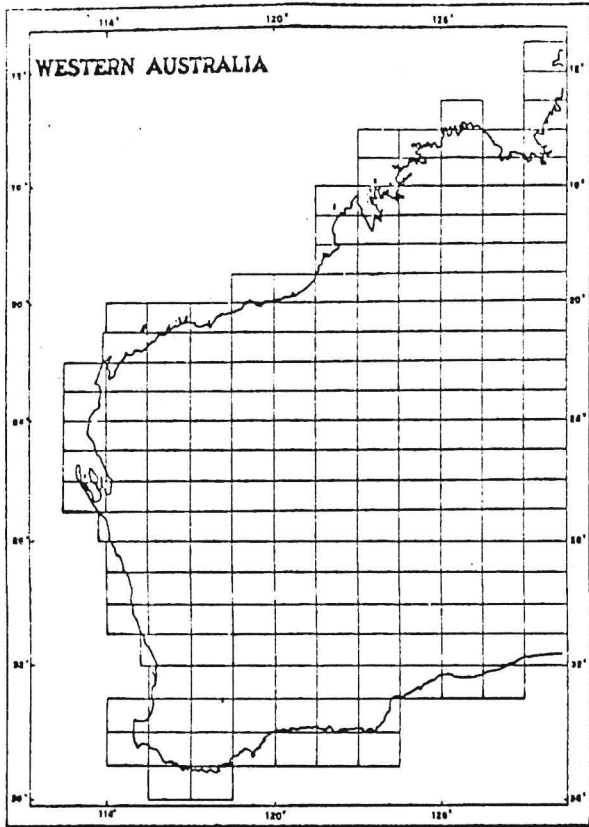
Restio ambylcoleus



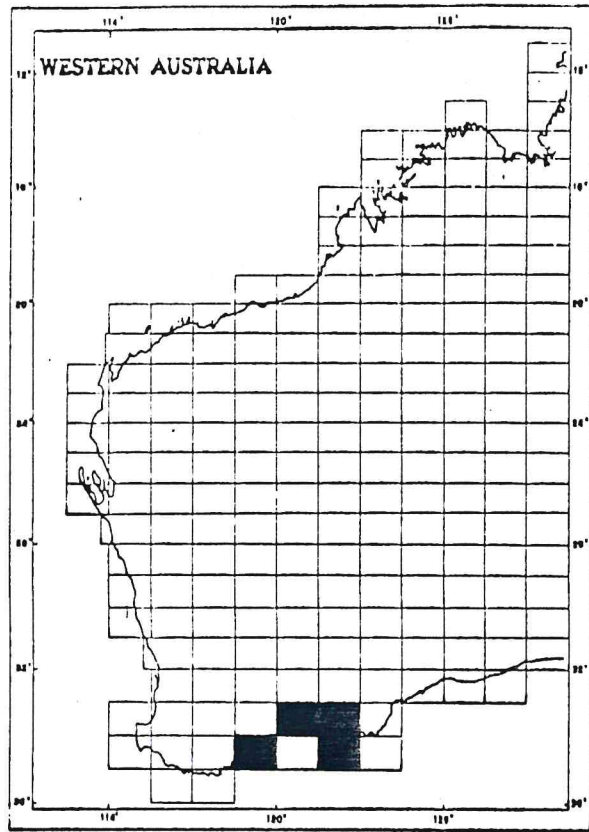
Restio applanatus



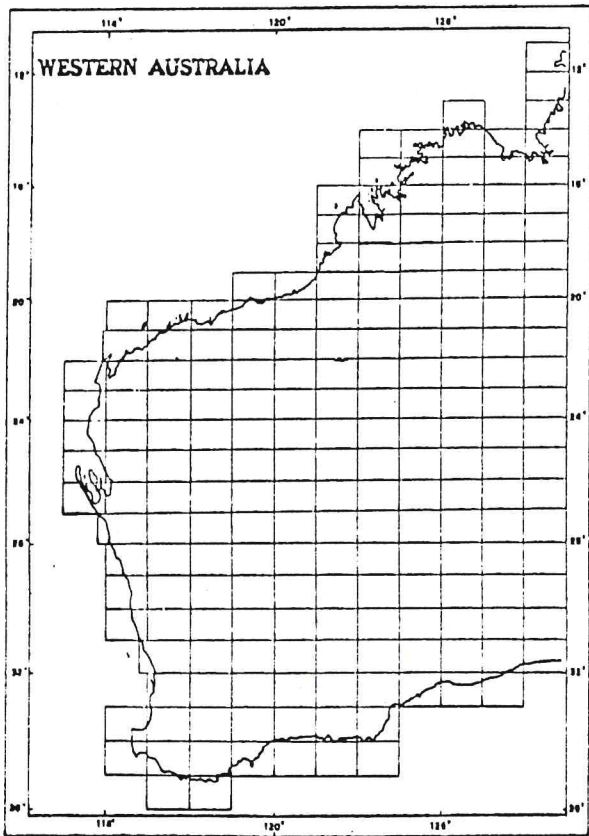
Restio chaunocoleus



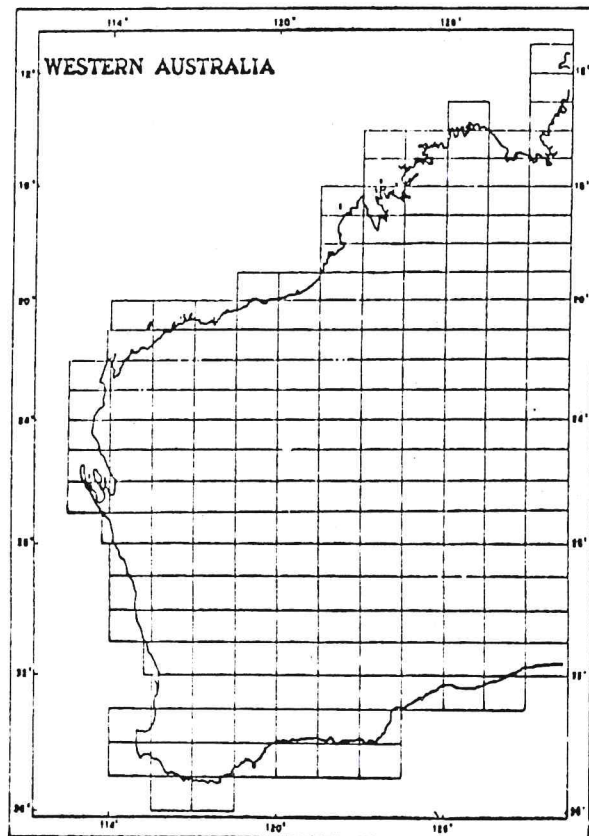
Restio confertispicatus



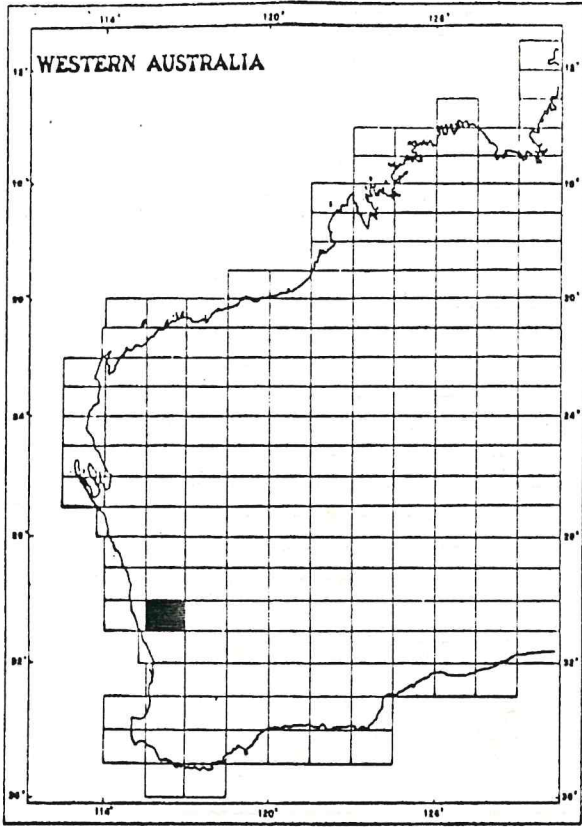
Restio crispatus



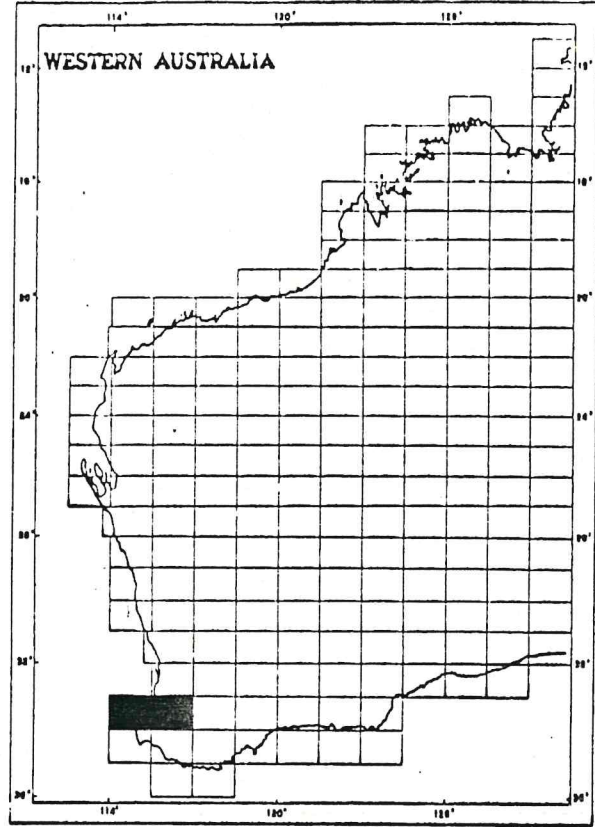
Restio deformis



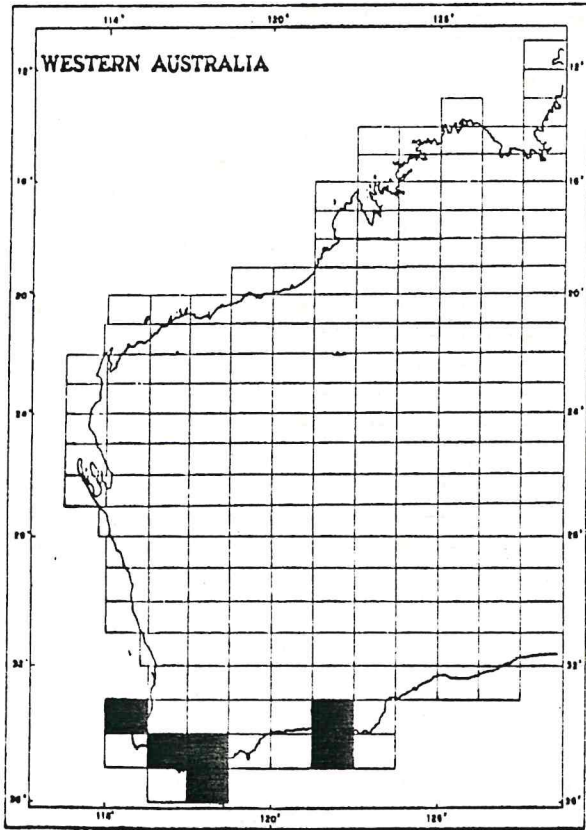
Restio dielsii



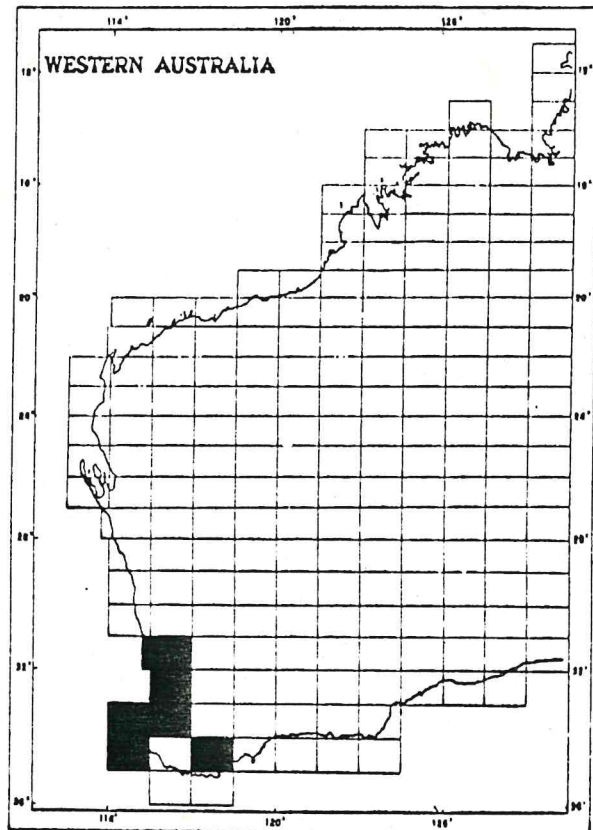
Restio "gigas"



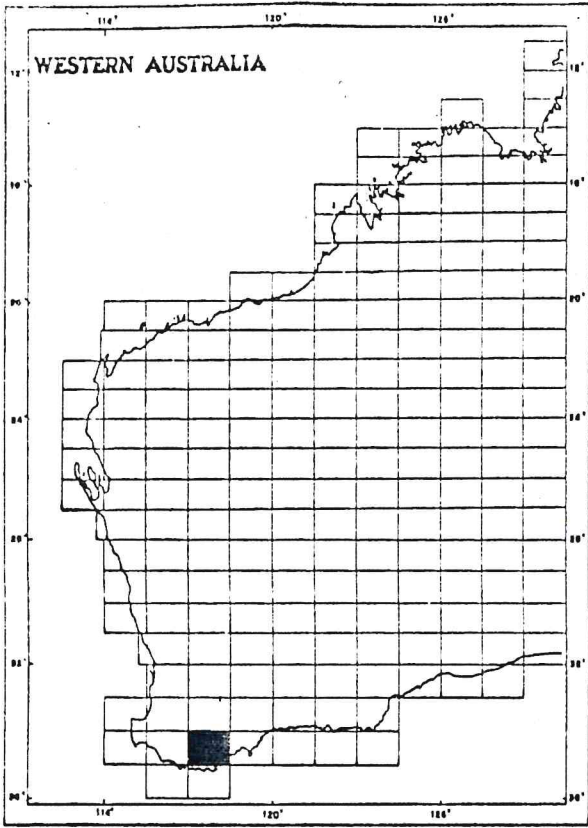
Restio gracilor



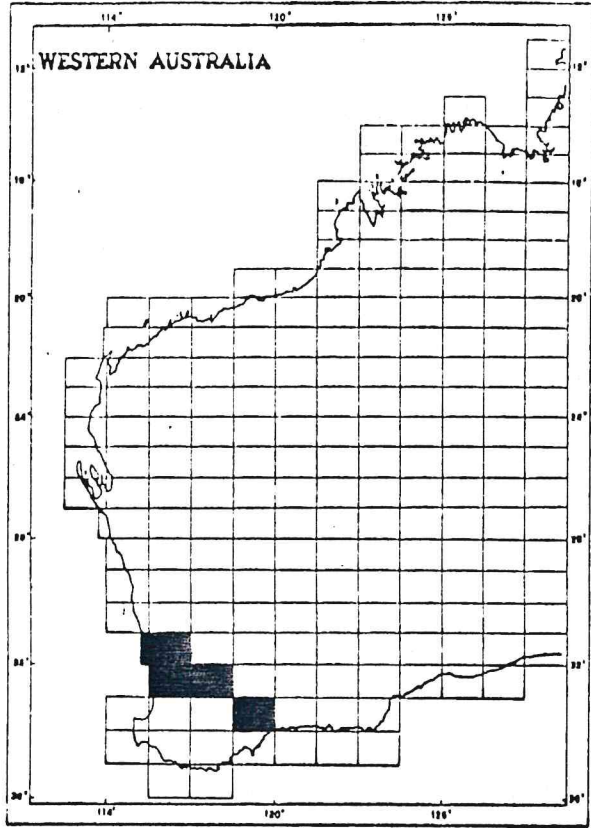
Restio laxus



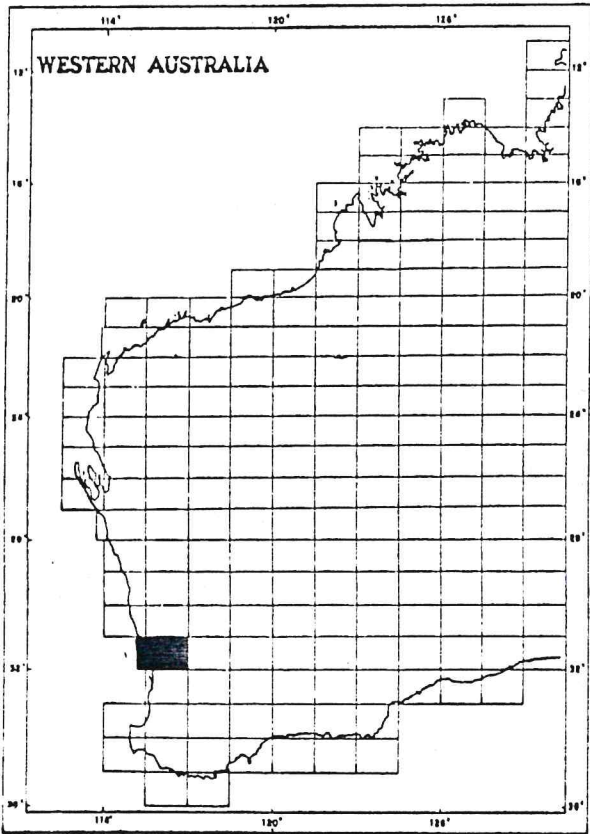
Restio leptocarpoides



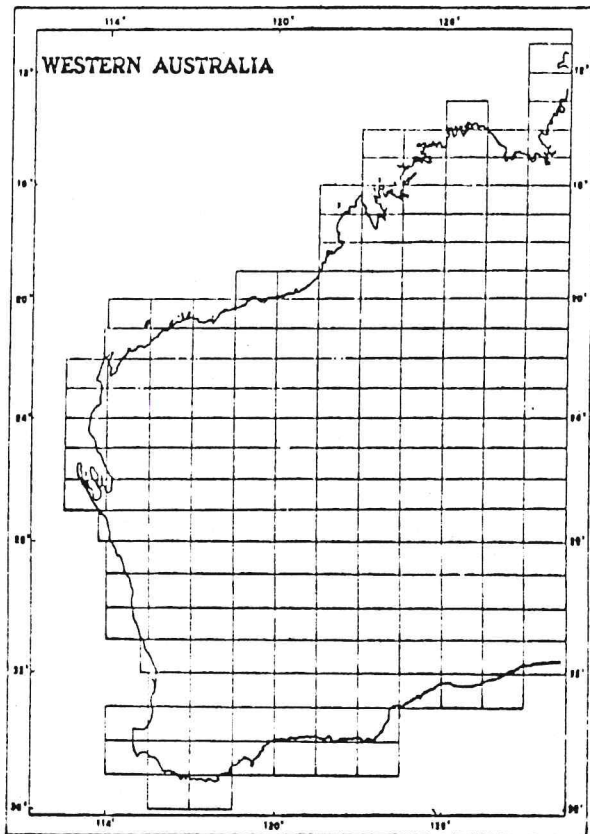
Restio leucoblepharus



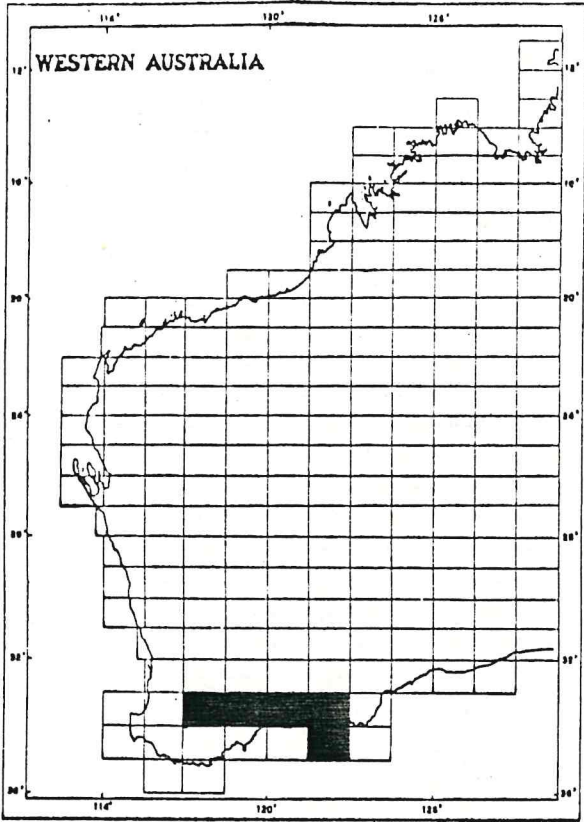
Restio megalotheca



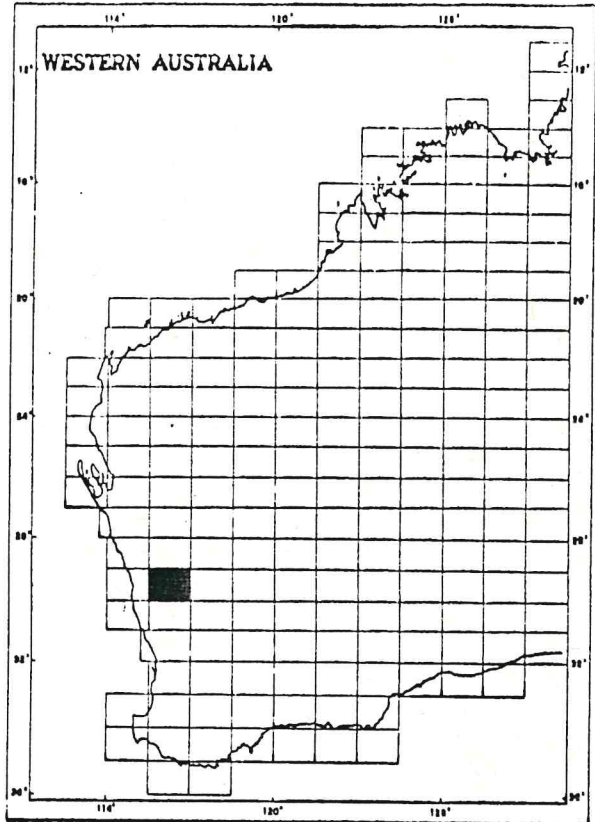
R. "microcodon"



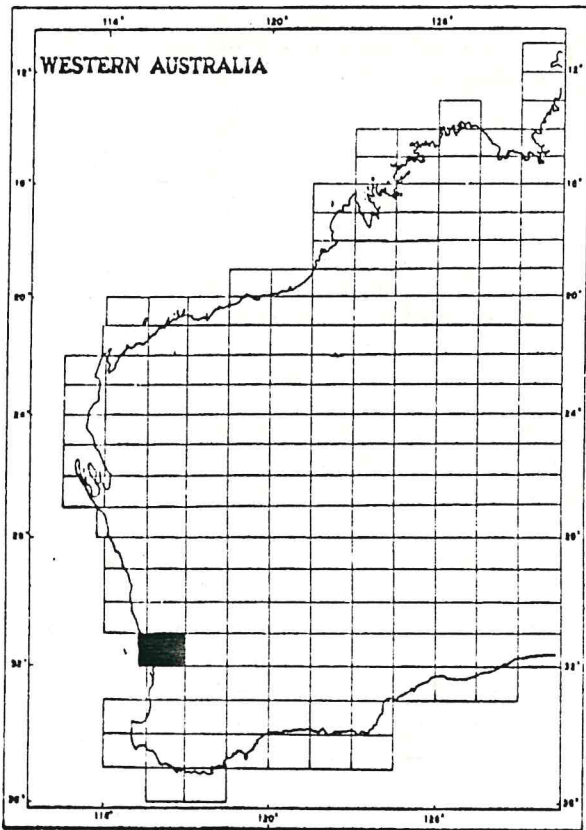
Restio ornatus



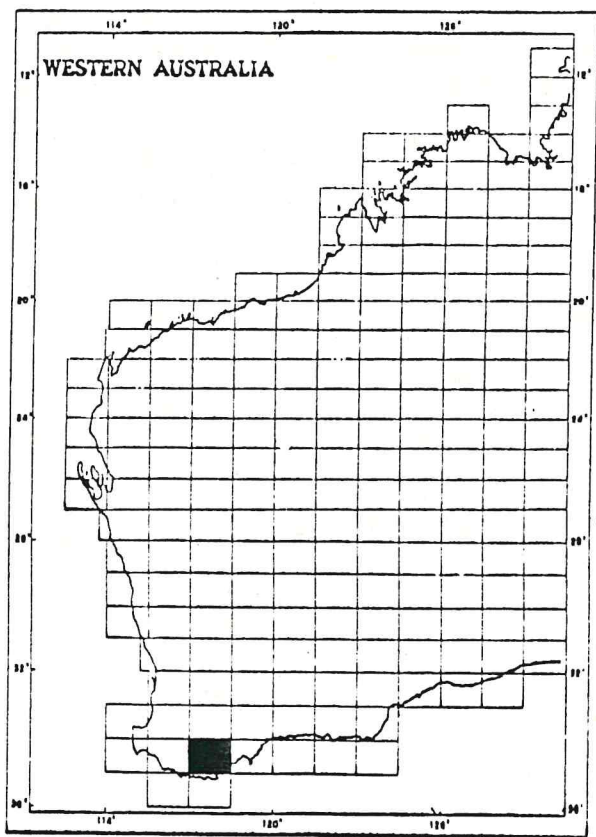
Restio sphacelatus



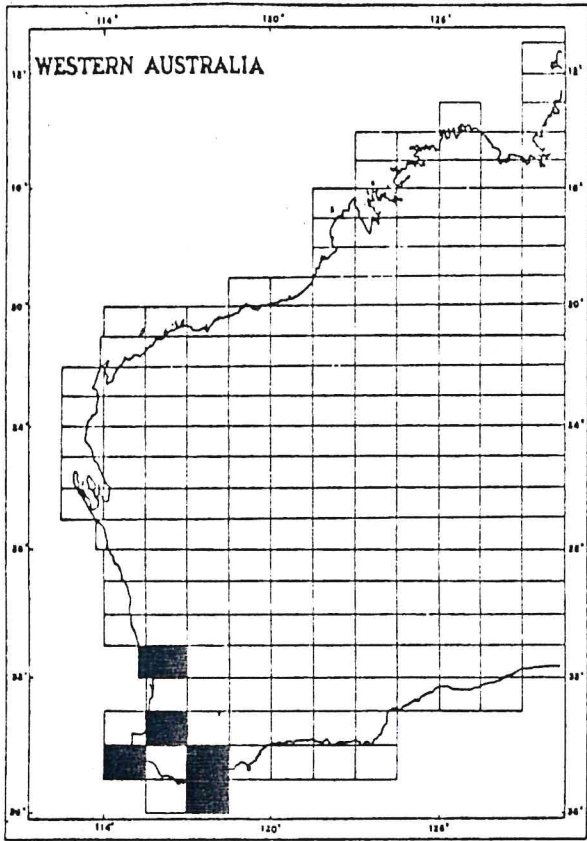
Restio aff sphacelatus



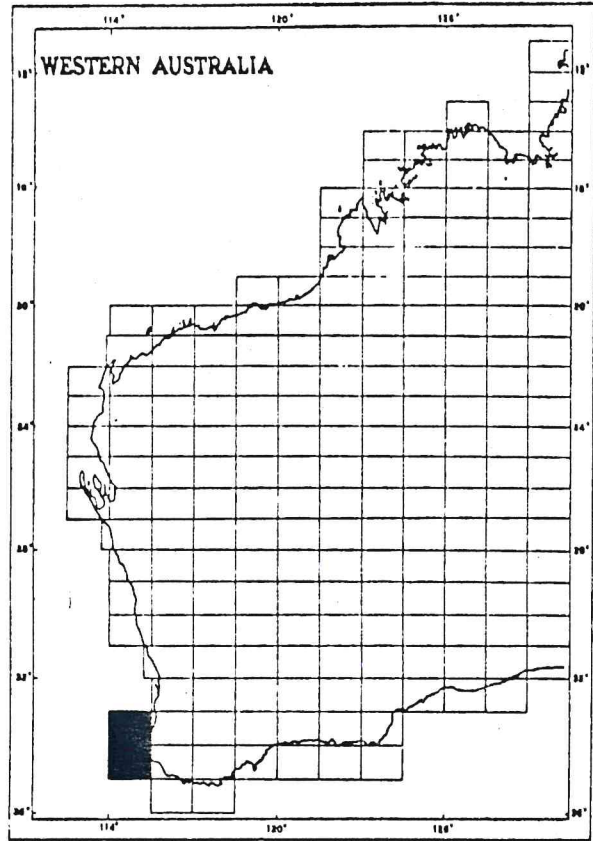
Restio stenostachyus



R. "serialis"



Restio tremulus



Restio ustulatus

