

The
Grasses
of
Central
Australia

M. LAZARIDES

This study is the first specific treatment in Australia of the grasses of a natural region. It gives a taxonomic and ecological account of all known grass species in the arid part of the Northern Territory, an area of about 240,000 square miles.

There is a description in technical and general terms of each of the 132 species, with taxonomic keys to genera and species, and with additional data on geographic and land-type distribution, ecological relationships, and economic value. Photographs, with enlargements of spikelet and floret, illustrate 123 of the species.

The book has been designed to appeal to a wide range of readers with an interest in botany. On the one hand precise botanical descriptions, citations of verified collections, and bibliographic data help the taxonomist to determine circumscription and variation and to relate the affinities of the known taxa to those not yet recognised. On the other hand the macroscopic descriptions, glossary, illustrations, and supporting sections are for the use of the ecologist, pastoralist, and agriculturalist not directly concerned with plant taxonomy.

Though compiled specifically for central Australia, the material of this book has application to all Australian arid and semi-arid areas. Since the flora of the interior includes tropical and temperate elements, there are also similarities with adjacent climatic zones.

In its coverage of the grasses of the low rainfall region, the book contributes to our knowledge of the major component of a flora characteristic of almost three-quarters of the Australian continent, providing a basis for further research and development studies.

This book was published by ANU Press between 1965–1991.
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The Grasses of Central Australia

THE GRASSES OF CENTRAL AUSTRALIA

M. Lazarides

1970

AUSTRALIAN NATIONAL UNIVERSITY PRESS
CANBERRA

First published 1970

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Printed by CATHAY PRESS, 31 Wong Chuk Hang Road, Aberdeen, Hong Kong

SBN 7081 0388 X

Library of Congress Catalog Card no. 69-15737

National Library of Australia reg. no. AUS 68-2527

Foreword

Three-quarters of the Australian continent has a rainfall too low for regular arable farming or extensive pasture improvement. The grazing of cattle and sheep on natural vegetation appears to be the main agricultural purpose for which land will be used in the foreseeable future.

In order that land and the natural vegetation can be managed in a way which will exploit the resources fully and yet maintain them for future generations, it is necessary to know a great deal more about the vegetation and its responses than is known at present.

The first essential is a thorough taxonomic account of the flora itself. The flora of central Australia is an interesting one, containing a high proportion of endemic species, elements from adjacent tropical and temperate zones, and, in special habitats, relics from a previous wetter climate.

Grasses are a prominent component of the flora and provide a major part of the diet of herbivorous animals. In this book Mr Lazarides has brought together for the first time descriptions of all the known species of this group from central Australia. Each is described, and taxonomic keys are provided for genera and species. The taxonomy has been based on existing literature, but the descriptions in many cases have been extended to provide more uniform and complete information.

The book begins with a description of the area and of the distinctive land types of central Australia, based upon extensive field surveys of land resources made by the CSIRO Division of Land Research. For each land type, the author gives a list of dominant, common, scattered, rare, and localised grass species, which provides an ecological guide to identification which will be most helpful to the non-technical user. An additional aid is the inclusion of many photographs of whole plants, which will help considerably in the field recognition of species.

As well as providing a valuable reference work for scientists, the book will be of practical interest and value to pastoralists who have the ultimate responsibility for vegetation management.

C. S. CHRISTIAN

*Member of the Executive
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Acknowledgments

The author acknowledges the ready co-operation of colleagues in the Resources Survey Group of the Division of Land Research, CSIRO, for access to supporting data. In particular, Mr R. A. Perry acted as a critical consultant for the entire work.

In the taxonomic treatment, grateful acknowledgment is made of constructive comments by Dr R. D. Hoogland, Division of Land Research (now Australian National University), Dr N. T. Burbidge, Division of Plant Industry, CSIRO, and Mr G. M. Chippendale, Animal Industry Branch, Northern Territory Administration (now Forest Research Institute, Canberra).

For painstaking editing of the entire text, the author is indebted to Mrs C. Munz, formerly of the National Herbarium, Melbourne.

Mr L. Leslie, Division of Land Research, and Mr R. A. Harwood, Jodrell Laboratory, Kew, contributed much time and effort in the production of the photographs.

The Drawing Section, Division of Land Research, prepared the locality map and, with Mr L. Adams, Division of Land Research, contributed to the line drawings.

Contents

FOREWORD, by C. S. Christian	v
ACKNOWLEDGMENTS	vi
I INTRODUCTION, in collaboration with R. A. Perry	1
Botanical history; general; climate; physical features; soils; vegetation; plant geography; land use; comparison with other arid areas of the world	
II THE LAND TYPES OF CENTRAL AUSTRALIA	10
Spinifex country; woodland country (mulga, witchetty bush, gidgee, sparse low tree country); Mitchell grass country; saltbush and bluebush country; floodplains; fringing country; rugged country; salt lakes	
III THE GRASS PLANT AND ITS PARTS	23
Vegetative parts (roots, culms, leaves); reproductive parts (inflorescence, spikelet)	
IV KEY TO THE GENERA	32
V DESCRIPTION OF THE SPECIES	37
Introduction (common names, occurrence, distribution, abbreviations); descriptions	
VI LITERATURE REFERENCES	251
APPENDIX I	255
Bibliography of Species and Citation of Collections	
APPENDIX II	265
Species Other Than Grasses	
GLOSSARY	267
INDEX	279

Figures and Tables

FIGURES

1	Central Australia and locality map	2
2	Central Australia: basin and range topography	4
3	Vegetative parts of the grass plant	24
4	Reproductive parts of the grass plant	28
5	Botanical terms	277

TABLES

1	Average monthly and seasonal rainfall at selected stations	3
2	Distribution of the plant species in the plant kingdom	7

Plates

1	Spinifex country	11
2	Mulga country	12
3	Witchetty bush country	13
4	Gidgee country	14
5	Sparse low tree country	15
6	Mitchell grass country	17
7	Saltbush and bluebush country	18
8	Floodplains	19
9	Fringing country	20
10	Rugged country	21
11	Salt lakes	22
12a	<i>Amphipogon caricinus</i> (plant and spikelet)	41
12b	<i>Aristida anthoxanthoides</i> (plant and floret)	41
12c	<i>Aristida biglandulosa</i> (plant)	41
13a	<i>Aristida contorta</i> (plant and 2 of floret)	45
13b	<i>Aristida browniana</i> (plant)	45

List of Plates

14a <i>Aristida capillifolia</i> (plant)	47
14b <i>Aristida echinata</i> (plant)	47
15a <i>Aristida inaequiglumis</i> (plant)	51
15b <i>Aristida latifolia</i> (plant and floret)	51
16a <i>Aristida jerichoensis</i> (plant)	53
16b <i>Aristida obscura</i> (plant)	53
17a <i>Aristida nitidula</i> (plant)	55
17b <i>Aristida strigosa</i> (plant and floret)	55
18a <i>Astrebla elymoides</i> (plant)	59
18b <i>Astrebla lappacea</i> (plant and spikelet)	59
18c <i>Astrebla pectinata</i> (plant and spikelet)	59
19a <i>Bothriochloa ewartiana</i> (plant)	65
19b <i>Bothriochloa intermedia</i> (plant)	65
20a <i>Dichanthium fecundum</i> (plant)	67
20b <i>Dichanthium superciliatum</i> (plant and spikelet)	67
21a <i>Dichanthium humilius</i> (plant)	71
21b <i>Dichanthium sericeum</i> (plant)	71
22a <i>Brachiaria gilesii</i> (plant and spikelets)	77
22b <i>Brachiaria holosericea</i> (plant and spikelets)	77
22c <i>Brachiaria notochthona</i> (plant and spikelets)	77
23a <i>Brachiaria miliiformis</i> (plant and spikelets)	79
23b <i>Brachiaria praetervisa</i> (plant)	79
23c <i>Brachiaria piligera</i> (spikelets)	79
24a <i>Chloris acicularis</i> (plant and spikelet)	83
24b <i>Chloris scariosa</i> (plant and florets)	83
25a <i>Chloris pectinata</i> (plant and florets)	85
25b <i>Chloris virgata</i> (plant and florets)	85
26a <i>Chrysopogon fallax</i> (plant and spikelet)	91
26b <i>Sorghum plumosum</i> (plant and spikelets)	91
27a <i>Cymbopogon exaltatus</i> (plant)	95
27b <i>Cymbopogon obtectus</i> (plant)	95
28a and b <i>Dactyloctenium radulans</i> (plant and spikelet)	99
28c <i>Danthonia bipartita</i> (plant and spikelet)	99
29a <i>Digitaria brownii</i> (plant and spikelets)	103
29b <i>Digitaria coenicola</i> (plant)	103
30a <i>Digitaria ctenantha</i> (plant and spikelets)	105
30b <i>Digitaria eriolepis</i> (plant)	105
31a <i>Diplachne fusca</i> (plant and spikelet)	109
31b <i>Diplachne parviflora</i> (plant)	109
32a <i>Echinochloa colonum</i> (plant and spikelets)	111
32b <i>Ectrosia leporina</i> (plant and spikelet)	111
32c <i>Elytrophorus spicatus</i> (plant and spikelet)	111

33a	<i>Enneapogon avenaceus</i> (plant and spikelet)	117
33b	<i>Enneapogon cylindricus</i> (plant)	117
33c	<i>Enneapogon polyphyllus</i> (plant)	117
34a	<i>Enneapogon glaber</i> (plant)	121
34b	<i>Enneapogon pallidus</i> (plant)	121
35a	<i>Enneapogon lindleyanus</i> (plant)	123
35b	<i>Enneapogon oblongus</i> (plant)	123
36a	<i>Eragrostis barrelieri</i> (plant)	131
36b	<i>Eragrostis cilianensis</i> (plant and spikelet)	131
36c	<i>Eragrostis confertiflora</i> (plant)	131
37a	<i>Eragrostis cumingii</i> (plant)	133
37b	<i>Eragrostis elongata</i> (plant)	133
37c	<i>Eragrostis speciosa</i> (plant)	133
38a	<i>Eragrostis dielsii</i> (plant and spikelets)	135
38b	<i>Eragrostis falcata</i> (plant)	135
38c	<i>Eragrostis lacunaria</i> (plant)	135
39	<i>Eragrostis eriopoda</i> (tussocks)	138
40a	<i>Eragrostis japonica</i> (plant)	141
40b	<i>Eragrostis kennedyae</i> (plant)	141
40c	<i>Eragrostis leptocarpa</i> (plant)	141
41a	<i>Eragrostis laniflora</i> (plant and spikelet)	143
41b	<i>Eragrostis setifolia</i> (plant)	143
41c	<i>Eragrostis xerophila</i> (plant)	143
42	<i>Eragrostis speciosa</i> (tussocks in field)	147
43a	<i>Eriachne aristidea</i> (plant)	151
43b	<i>Eriachne armitii</i> (plant and spikelet)	151
44	<i>Eriachne benthamii</i> (tussocks in field)	154
45a	<i>Eriachne helmsii</i> (plant)	155
45b	<i>Eriachne obtusa</i> (plant and spikelets)	155
46a and b	<i>Eriachne mucronata</i> (plant and spikelet)	157
46c	<i>Eriachne pulchella</i> (plant)	157
47a	<i>Eriachne benthamii</i> (plant and spikelet)	159
47b	<i>Eriachne nervosa</i> (plant and spikelet)	159
48	<i>Eriachne scleranthoides</i> (tussocks in field)	163
49a	<i>Eriochloa australiensis</i> (plant and spikelets)	165
49b	<i>Eriochloa pseudoacrotricha</i> (plant)	165
50a	<i>Eulalia fulva</i> (plant and spikelets)	169
50b	<i>Leptochloa digitata</i> (plant and spikelet)	169
51a	<i>Iseilema dolichotrichum</i> (plant)	171
51b	<i>Iseilema macratherum</i> (plant)	171
51c	<i>Iseilema membranaceum</i> (plant)	171
52a	<i>Panicum australiense</i> (plant)	183

List of Plates

52b <i>Panicum decompositum</i> (plant and spikelets)	183
53a <i>Panicum cymbiforme</i> (plant)	185
53b <i>Panicum whitei</i> (plant)	185
54a <i>Paspalidium clementii</i> (plant)	191
54b <i>Paspalidium constrictum</i> (plant)	191
54c <i>Paspalidium rarum</i> (plant)	191
55a <i>Paractaenum novae-hollandiae</i> (plant and spikelets)	193
55b <i>Perotis rara</i> (plant and spikelet)	193
55c <i>Plagiosetum refractum</i> (plant and raceme)	193
56a <i>Phragmites karka</i> (plant)	197
56b <i>Plectrachne schinzii</i> (plant and spikelet)	197
57a <i>Plectrachne pungens</i> (plant)	203
57b <i>Triodia pungens</i> (panicle)	203
58 <i>Plectrachne schinzii</i> (plants in field)	206
59 <i>Triodia basedowii</i> (tussock in field)	208
60a <i>Triodia basedowii</i> (plant and spikelet)	209
60b <i>Triodia clelandii</i> (plant and spikelet)	209
61a <i>Triodia hubbardii</i> (plant)	211
61b <i>Triodia irritans</i> (plant and spikelet)	211
62 <i>Triodia longiceps</i> (tussock in field)	215
63a <i>Triodia longiceps</i> (plant)	217
63b <i>Triodia spicata</i> (plant)	217
64 <i>Triodia pungens</i> (tussocks in field)	218
65 <i>Triodia spicata</i> (tussocks in field)	219
66a <i>Setaria brownii</i> (plant and spikelet)	221
66b <i>Setaria dielsii</i> (plant and spikelets)	221
67a <i>Schizachyrium obliqueberbe</i> (plant)	223
67b <i>Spathia neurosa</i> (plant)	223
67c <i>Stipa scabra</i> (plant)	223
68a <i>Sporobolus actinocladus</i> (plant)	229
68b <i>Sporobolus australasicus</i> (plant and spikelets)	229
68c <i>Sporobolus caroli</i> (plant)	229
68d <i>Sporobolus mitchellii</i> (plant)	229
69a <i>Themeda australis</i> (plant and spikelet)	239
69b <i>Themeda avenacea</i> (plant)	239
70a <i>Tragus australianus</i> (plant and spikelet pair)	241
70b <i>Tripogon loliiiformis</i> (plant and spikelet)	241
70c <i>Triraphis mollis</i> (plant and spikelet)	241
70d <i>Uranthoecium truncatum</i> (plant and spikelet)	241
71 <i>Zygochloa paradoxa</i> (tussocks in field)	248
72 <i>Zygochloa paradoxa</i> (plant)	249

I Introduction

This account aims to provide a basis for subsequent research on the grasses of the Australian arid region. The presentation of the material is planned for use by a broad audience. The work is not intended as a taxonomic monograph or revision of the plant groups concerned. Though taxonomic adjuncts are included, problems in classification are merely noted and the requisites of a precise, taxonomic study are deliberately omitted.

BOTANICAL HISTORY

Until recently, knowledge of the flora of central Australia has been hampered by a serious scarcity of collections and the consequent lack of literature on the subject. Apart from the extensive work on the Australian flora by Bentham (1863–78), the only regional treatment of the area was Ewart and Davies, *Flora of the Northern Territory* (1917). Though probably useful as a basic summary, few would disagree that this work is extremely restricted in application and now quite inadequate. Much of the remaining literature comprises lists or reports compiled from collections made on pioneering explorations. Noteworthy among such contributions are those of Giles (1875), Kempe (1879–80, 1881–2), Tietkens (1891), Warburton (1875), Gosse (1873), and more recently Eardley (1946). New species and records derived from these collections were often described and recorded with those of similar expeditions in adjacent areas, and the resulting systematic work of that time (the nineteenth century) can be attributed largely to Mueller (1858, 1858–82, 1860, 1864, 1877, 1884–5), Mueller and Tate (1889–90, 1896), Tate (1896), and to a lesser extent Brown (1849). More recently, the botanical works of Cleland (Cleland *et al.* 1925) and particularly those of Black (1914, 1948–57) in relation to the flora of South Australia are regarded as a major contribution to the knowledge of central Australian plants, and provide the most reliable guide to their identity to this day.

The advent of a resident plant taxonomist in the area in 1954 has resulted in comprehensive collections and several publications (Chippendale 1958, 1959a, 1959b, 1960, 1961, 1963a, 1963b, 1963c). This work, together with increased activity in recent years by various government departments, has contributed considerably to botanical research in central Australia. Of special significance in this regard are the CSIRO land resource surveys of the Barkly region in 1947–8 (Christian *et al.* 1954) and the Alice Springs area in 1956–7 (Perry *et al.* 1962). It was from these surveys that most of the ecological data on the plants was derived.

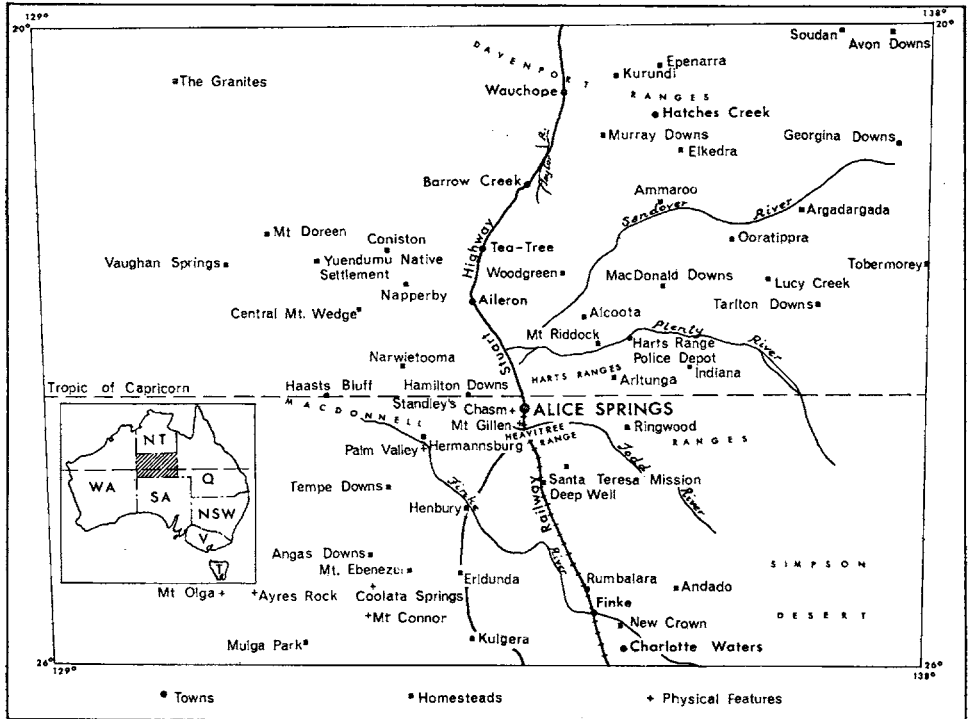


Fig. 1. Central Australia and locality map

GENERAL

Central Australia is the southern part of the Northern Territory. It is an area of 240,000 square miles bounded by latitudes 20°S and 26°S and longitudes 129°E and 138°E (Fig. 1). The Tropic of Capricorn passes through the area slightly south of its centre.

Central Australia is a vast, sparsely populated area, where cattle-grazing on an extensive scale and tourism are the main industries. Alice Springs, which is centrally placed a few miles south of the Tropic, is the only town (European population 6,500 in 1968). A few hundred Europeans reside in the rest of the area, mostly on scattered cattle stations. An Aboriginal population of several thousand live mostly on welfare settlements and cattle stations remote from Alice Springs.

Alice Springs is the terminus of the railway line from Adelaide and of the Stuart Highway which stretches north to Darwin. The cattle stations and other outlying settlements are linked to Alice Springs by a radial system of graded or formed earthen roads and tracks. The town is also the base for two light aircraft charter companies and for the Flying Doctor radio network which covers central Australia.

CLIMATE

Central Australia is arid. Meigs (1953) classifies it as partly Ab 23 and partly Ab 24 (A=arid; b=predominantly summer precipitation; first digit=mean temperature of coldest month, 2 representing between 10°C and 20°C; second digit=mean temperature of hottest month, 3 being between 20°C and 30°C and 4 between 30°C and 40°C). It is within the Eremean zone of Burbidge (1960a).

Mean annual rainfall varies from 5 inches in the southeast to 14 inches in the north with summer predominance increasing northwards (Table 1). Summer maximum temperatures frequently exceed 100°F, but the diurnal range is relatively large and nights are generally cool. Frosts do not occur in the far north, but in the southern half they may be expected between late May and late August.

As well as being low in total amount, rainfall is sporadic in nature and there is no definite growing season. Slatyer (1962) estimates that sufficient rain to initiate plant growth in the summer months can be expected twice a year in the northern half, but only once every two years at Charlotte Waters in the south. In the winter six months it is most likely to occur in the central part (three times every two years), decreasing to once a year at Charlotte Waters and once every two years at Tennant Creek.

Table 1
Average monthly and seasonal rainfall (inches) at selected stations

	<i>Tennant Creek</i>	<i>Alice Springs</i>	<i>Charlotte Waters</i>
January	4.04	1.74	0.74
February	3.54	1.32	0.62
March	2.08	1.09	0.60
April	0.35	0.39	0.43
May	0.21	0.60	0.34
June	0.35	0.52	0.40
July	0.25	0.29	0.18
August	0.06	0.31	0.21
September	0.11	0.28	0.18
October	0.40	0.71	0.32
November	1.07	1.15	0.47
December	1.39	1.53	0.59
Year	13.85	9.93	5.08
October–March	12.52	7.54	3.34
April–September	1.33	2.39	1.74

Source: Commonwealth Meteorological Branch, Book of Normals No. 1, *Rainfall*, Melbourne.

PHYSICAL FEATURES

The overall general impression of the topography of central Australia is one of a vast plain on which are superimposed widely-spaced mountain ranges. In reality it is a broad, flattened basin-and-range topography, with a series of basins separated by ranges of mountains and hills. The basin floors are between 1,000 and 2,000 feet above sea level and the ranges 1,000 to 3,000 feet above them.

Typically, each of the basin-and-range systems has four main components:

1. a rim of mountains or hills;
2. flanking, gently sloping plains with medium textured soils;
3. broad, gently sloping sand plains or dune fields;
4. salt pans in the lowest part of the basins.

The most conspicuous of the ranges is the Macdonnell-Harts system, which trends east-west, roughly through the centre of the area (Fig. 2). The highest point in these ranges is Mt Zeil (4,995 ft). To the southwest the Krichauff, James, and George Gill Ranges separate the Missionary Plains basin from the Amadeus basin, which is bounded on the south by the Musgrave, Mann, Tomkinson, and Petermann Ranges. Lake Amadeus, Lake Neale, and Hopkins Lake are a series of salt pans in the lowest parts (approx. 1,500 ft above sea level) of the Amadeus basin. Ayers

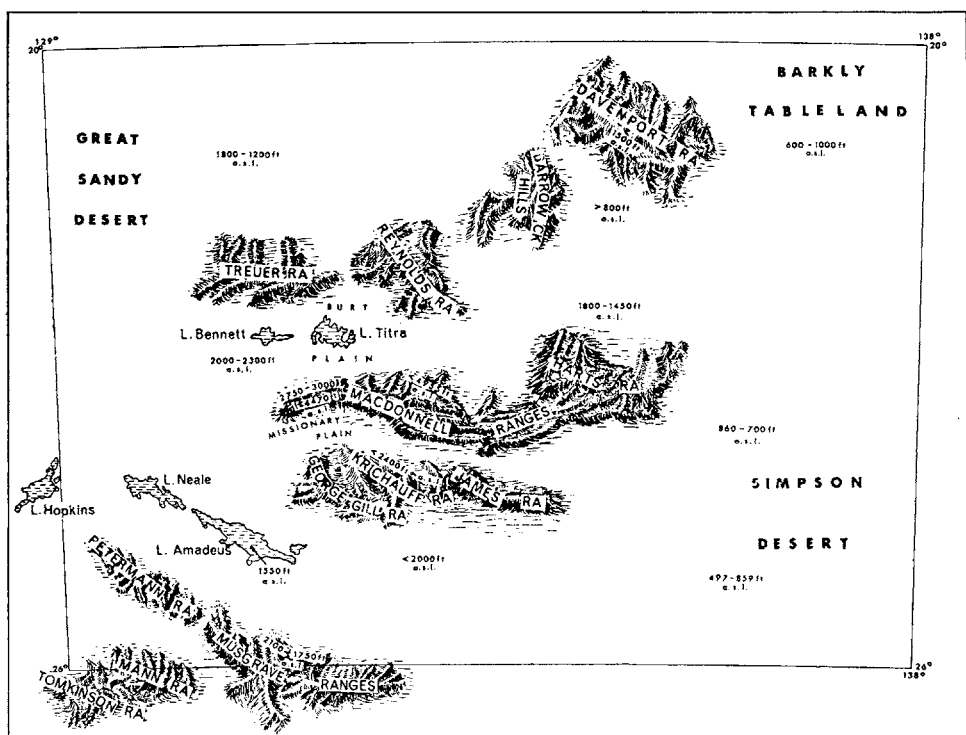


FIG. 2. Central Australia: Basin and Range Topography

Introduction

Rock and Mt Olga are well-known features within the Amadeus basin. Southeast of the Macdonnell Ranges, the Simpson Desert forms the northern flank of the vast Lake Eyre basin.

To the northwest of the central Macdonnell-Harts Range system the Treuer and Reynolds Ranges separate the Burt Plain, within which lie salt pans called Lake Bennett and Lake Titra, from a vast basin (Great Sandy Desert) stretching beyond the area. To the north and northeast of the central ranges, the Barrow Creek hills and the Davenport Ranges demarcate successive basins. The basin to the northeast of the Davenport Ranges is the Barkly Tableland, the central feature of which is a vast area of non-saline cracking clay soils.

Without exception, all creeks and rivers arising in central Australia flow into inland drainage basins and are ephemeral in nature, flowing for only a few days after falls of rain. In most cases the streams flowing from the ranges terminate on the flanks of the basins, and it is exceptional for a defined channel to extend from the ranges to the central salt pans. Only two large streams (the Sandover and Finke Rivers) extend beyond the borders of the area. In both cases the channels continue to Lake Eyre in South Australia, but water from the area very seldom flows that far.

SOILS

In contrast with most arid areas of the world, the most extensive soils of central Australia are strongly weathered and leached, because they are inherited from soils of earlier weathering cycles or are formed on the resorted materials derived from them. By far the most extensive are the red sands of the sand plains and dune fields. On the flanks of the basins, the common soils are medium-textured red earths. Both these groups of soils are highly infertile. Extensive areas of stony soils and shallow skeletal soils are associated with mountains and hills.

Soils of lesser extent include alluvial soils on floodplains and piedmont fans, calcareous earths, solonchic texture-contrast soils, and cracking clay soils.

VEGETATION

The vegetation is characterised by plants of low stature (mostly less than 7.5 m high), forming structurally simple communities in which cover is low. Structural forms include grasslands, grasslands with scattered trees or shrubs, shrublands, and low open woodlands. Unlike the more humid parts of Australia, eucalypts are rare and acacias are the most common trees and shrubs. Spiny plants and succulents, common in other arid parts of the world, are rare in arid Australia.

All the plant species are adapted to withstand long dry periods. On the basis of their means of survival, three groups can be recognised:

1. Perennial drought-resisting plants. This includes all the plants which remain in a vegetative, though generally dormant, state throughout droughts and resume growth with the onset of favourable conditions. Most of the larger plants (i.e. shrubs and trees) fall into this category. The best examples are the *Acacia* spp.,

which have sclerophyllous phyllodes instead of leaves. Also in the group are spinifex (*Triodia* spp. and *Plectrachne* spp.), which are perennial, evergreen grasses forming large tussocks with tough, pungent, sclerophyllous, tightly rolled leaves. The grasses are shrub-like in their adaptation to drought and dominate all the sand plains and dune fields in the area.

Although highly sclerophyllous leaves, phyllodes, or cladodes are the commonest type of adaptation in the perennial drought-resisting plants, a limited number of species exhibit other forms. For example, *Calandrinia* spp. (parakeelya) have succulent leaves and *Atriplex vesicaria* (bladder saltbush) and *Kochia astrotricha* (bluebush) have semi-succulent leaves.

2. Perennial drought-evading plants. This group includes plants whose leaves die during drought periods, but which resume growth from vegetative buds with the onset of favourable conditions. Trees and shrubs in this group are deciduous. *Brachychiton gregorii* (kurrajong) and *Erythrina vesperilio* are among the few which occur in central Australia.

The most important plants in the group are perennial tussock grasses, which have a short growing season. Following rains, new tillers are produced from rhizomes or from basal or axillary buds on old tillers. The new tillers grow rapidly, flower, and produce seeds.

When available soil moisture is exhausted the leaves die. Their life cycle is thus somewhat similar to that of the next group (ephemerals), but regeneration is from vegetative buds rather than from seeds.

Examples include *Eragrostis eriopoda* (woollybutt), *E. xerophila* and *E. setifolia* (neverfail), *Astrelba* spp. (Mitchell grasses), *Aristida inaequiglumis* (threeawn), *Themeda australis* (kangaroo grass), *T. avenacea* (native oat grass), *Chrysopogon fallax* (golden beard grass), *Bothriochloa ewartiana* (desert bluegrass), *Eulalia fulva* (browntop), and *Chloris acicularis* (curly windmill grass).

A number of short grasses such as *Aristida contorta* (kerosene grass) and *Enneapogon* spp. act as short-lived perennials by regenerating from small rootstocks during a succession of favourable periods. However, as seeds are their normal method of reproduction they are classified in the next group.

3. Ephemeral drought-evading plants. The life cycle of this group is such that although they exist in an arid area, they are present vegetatively only under relatively non-arid conditions following rain. During long dry periods they exist only as seeds. In central Australia a large number of short grasses and forbs fall into this group. They include *Aristida contorta* (kerosene grass), *Enneapogon* spp., *Tripogon loliformis*, *Helipterum floribundum* (white daisy), *H. charsleyae* (yellow daisy), *Senecio gregorii* (yellow daisy), *Calotis hispidula* (Bogan flea or bindy-i), *Stenopetalum* spp., *Erodium* spp., *Tribulus* spp., and many others.

This group of plants constitute the short ground cover over almost the whole area, irrespective of habitat or vegetation type. The actual species present vary from

Introduction

season to season, with grasses being predominant after summer rains and various forbs following rains in other seasons.

PLANT GEOGRAPHY

The area is poor floristically, the total number of species of vascular plants being less than 1,200, which represents only about one species per 200 square miles. The distribution of the species throughout the plant kingdom is shown in Table 2.

Table 2
Distribution of the plant species in the plant kingdom

	<i>Families</i>	<i>Genera</i>	<i>Species</i>
Pteridophyta	5	11	18
Gymnosperms	2	2	2
Monocotyledons	14	65	188
Dicotyledons	73	258	<1,000
Total	94	336	<1,200

The Leguminosae and Gramineae are the largest families, being represented by 35 and 41 genera and 171 and 135 species respectively. Other floristically important families are Compositae (100 species), Chenopodiaceae (76), Malvaceae (41), Goodeniaceae (38), Myrtaceae (35), Myoporaceae (33), Amarantaceae (31), Boraginaceae (24), Solanaceae (23), Proteaceae (14), Zygophyllaceae (14), Cruciferae (13), and Portulacaceae (11). These 15 families comprise about 70 per cent of the total flora.

In general the flora is typical of that of arid Australia, 41 per cent of the species being endemic to that part between the ten-inch rainfall isohyet in the south and the fifteen-inch isohyet in the north. Twenty-seven per cent are common to central Australia and higher-rainfall tropical areas, 21 per cent are common to central Australia and higher-rainfall southern Australia, and the remaining 11 per cent are common to central Australia and both northern and southern higher-rainfall areas.

With the grasses the situation is somewhat different: 40 per cent are restricted to arid Australia, 40 per cent are common to arid Australia and higher-rainfall tropical areas, only 3 per cent are common to arid Australia and higher-rainfall southern Australia, and 17 per cent occur in central Australia and both northern and southern higher-rainfall areas.

LAND USE

The main industries of central Australia are tourism and cattle grazing. Until recently the cattle industry was the most important, but the fast-growing tourist industry is beginning to surpass it in economic importance. Mining is of minor

importance, as is the use of ground water for irrigated agriculture, which, however, has a considerable future potential, especially in association with the utilisation of the natural gas resources of the area.

Of these industries tourism, mining, and irrigated agriculture make use of an almost insignificant fraction of the land area. The cattle industry, however, makes use of extensive areas and about half the land area is within pastoral leases. These leases contain all the land at present considered useful for grazing purposes, the remainder being mainly spinifex sand plains and dune fields.

Because of the low, erratic rainfall, cropping and improved (in the sense of fertilising and sowing exotic species) pastures are uneconomic and the cattle industry is therefore entirely based on the harvesting of natural vegetation by grazing animals.

Forage production, and therefore stocking rates, are low. Despite low returns per unit area, the industry is efficient in terms of returns to capital and labour.

Much of the land at present used for grazing was taken up between 1880 and 1910, but the industry did not prosper until the completion of the railway from Adelaide in 1929. A period of further expansion, during which many new properties were established, occurred after World War II. Peak cattle numbers (about 350,000) were reached in 1958, but under the influence of a long drought beginning in 1957, these dropped to 150,000 in 1965.

The effect of the cattle industry on the land and vegetation varies. Most of central Australia consists of stable landscapes on which pasture degeneration and erosion have been slight. On the other hand, extensive areas of the more highly erosive types of country have been degraded and some parts are badly eroded and unproductive. Much of this damage dates back to the early years of settlement, but there is also evidence that high stocking rates in the early part of the 1957-65 drought caused some damage.

Thus, while in general the land and pastures of central Australia are in good condition, some of the highly-erosive types of country have degenerated badly and the early signs of deterioration are widespread. The future of the grazing industry in central Australia, and indeed in all arid Australia, depends on the development of proper management practices for the various types of country. Proper management practices can only be designed from a scientific knowledge of the land-vegetation-animal ecosystem.

The plants grazed by stock vary from season to season. In favourable periods the short grasses and forbs provide most of the forage, but in long dry periods perennial plants, including many shrubs and low trees, comprise a greater part of the diet. At all times grasses, either ephemeral or perennial, comprise most of the diet (Chippendale 1962).

Almost all the grasses are useful forage plants, the main exceptions being some of the *Triodia* spp. Many plants of other families, especially Leguminosae and

Chenopodiaceae, are also valuable for forage. Of the grasses, the seeds of some *Aristida* spp. are harmful to sheep, the seeds of *Perotis rara* have been suspected of causing lesions in the mouths of horses, and *Dactyloctenium radulans* is at times poisonous, especially to hungry travelling animals. None of the other grasses are harmful to stock. The flora contains many species toxic to animals (*Northern Territory Administration Ext. Art.* 1956, 1957, 1959). Of these *Acacia georginae* (gidgee), which causes Georgina poisoning in ruminants, and *Indigofera linnaei* (indigo), which causes Birdsville disease in horses, are by far the most significant economically.

COMPARISON WITH OTHER ARID AREAS OF THE WORLD

Almost all other arid areas of the world are geologically and geomorphically young, i.e. their gross topographical features date back only a few million years to late Tertiary times. Because of this, youthful soils high in carbonate (and often salt) are common. By contrast, central Australia has been stable tectonically since Palaeozoic times and most of the present landscape has endured long periods of erosion and weathering. In consequence, it is a relatively flat, stable landscape with largely infertile soils.

Central Australia lies in the centre of a much larger arid area. It has no high mountain ranges and so no areas of higher rainfall or snow. No permanent rivers cross the area, and thus irrigation schemes based on river waters, such as those of the Indus, Nile, and Colorado, are not possible.

As far as human occupation is concerned, the situation is just the opposite. Most other arid parts of the world have been cropped by man or grazed by man's animals for many centuries. Those in North Africa, the Middle East, and India probably reached their present stage of degradation by 2,000 years ago. Aborigines have lived in central Australia for millenia, but they existed in equilibrium with their environment. They did little or nothing to modify their environment and consequently had very little effect on the natural resources. Civilised man with his herds of cattle has been in central Australia less than a century, but in that time has wrought far greater changes than the Aborigines did over many millenia. In this respect, it must be remembered that the vegetation of central Australia is possibly more susceptible to grazing than that of other arid areas, because significant grazing pressure by either native or domestic animals has not been a factor in its evolutionary selection.

The land ownership and tenure system in central Australia is different from that of any other arid area in the world. All the land is owned by the Commonwealth Government of Australia. Land is occupied by pastoralists on an individual (or company) leasehold basis, the leases generally being for a 30-50 year term. There is no privately owned land and no communally (tribally) owned land. Partly because of this and partly because of the relatively uniform topography, the pastoral industry is all of a sedentary year-long type. The opportunity for seasonal or nomadic grazing systems does not exist in central Australia.

II The Land Types of Central Australia

Central Australia is not a large uniform desert, but is comprised of a number of land types differing in topography, parent material, soils, and vegetation. In a report on the lands of the Alice Springs area (144,000 square miles of the total 240,000 square miles of central Australia), Perry *et al.* (1962) mapped and described 88 distinctive land systems. However, for the purpose of providing an ecological guide to the identification of the grasses, it is adequate to consider central Australia as consisting of eight main land types, one of which is comprised of four subtypes. These eight types are substantially similar to the pasture lands described and mapped by Perry (1960, 1962).

SPINIFEX COUNTRY (Plate 1)

Description. More than half of central Australia consists of slightly uneven sand plains or dune fields with coarse, sandy, permeable, infertile red soils. The sand plains are more extensive north of the Macdonnell Ranges, while the dune fields are best developed in the south, and extend along both eastern and western margins. Both the sand plains and dune fields consist of wind-deposited, or at least wind-resorted, sands which are stabilised by vegetation dominated by various types of spinifex (*Triodia basedowii* in the south, *Plectrachne schinzii* and *Triodia pungens* in the north). Structurally, the vegetation is generally a grassland with scattered shrubs or low trees, the commonest of which are *Acacia* spp., *Cassia eremophila*, *Eucalyptus gamophylla*, *E. pachyphylla*, *E. terminalis*, *Grevillea juncifolia*, and *Codonocarpus cotinifolius*. In some areas in the south taller trees of *Casuarina decaisneana* give the community a woodland aspect, and in the far north *Eucalyptus brevifolia* characterises low woodlands with a spinifex understorey.

Grass flora. 1. Dominant. *Plectrachne schinzii*, *Triodia basedowii*, *T. pungens*, *Zygochloa paradoxa*.

2. Common. *Aristida contorta*, *A. browniana*, *A. inaequiglumis*, *Enneapogon avenaceus*, *E. polyphyllus*, *Eragrostis eriopoda*, *E. laniflora*, *Eriachne aristidea*, *Neurachne mitchelliana*, *Panicum australiense*, *Triraphis mollis*.

3. Scattered. *Amphipogon caricinus*, *Aristida biglandulosa*, *Brachiaria holosericea*, *Cymbopogon obtectus*, *Danthonia bipartita*, *Digitaria brownii*, *Eriachne helmsii*, *Paractaenum novae-hollandiae*, *Plagiosetum refractum*, *Setaria brownii*.

4. Rare. *Dactyloctenium radulans*, *Enneapogon clelandii*, *E. glaber*, *Eragrostis cumingii*, *Eriachne armitii*, *Eulalia fulva*, *Iseilema membranaceum*, *Panicum*

effusum, *Paspalidium constrictum*, *P. rarum*, *Plectrachne pungens*, *Sporobolus australasicus*, *Themeda australis*.

5. Localised. *Perotis rara*, *Schizachyrium obliqueberbe*.



PLATE 1. Spinifex country

WOODLAND COUNTRY

This type comprises low woodlands on gently sloping to undulating land. It mainly flanks the mountain ranges and typically occurs between them and the spinifex country.

The vegetation consists of low woodlands characterised by various acacias over an understorey of short grasses and forbs.

MULGA COUNTRY (Plate 2)

Description. The largest area of this type occurs as a belt 10–50 miles wide extending along the northern flanks of the Macdonnell, Strangways, and Harts Ranges, but it also occurs on the flanks of most other mountains and hills. It occurs on gently sloping to gently undulating plains with coarse to medium-textured, infertile red earth soils of neutral to slightly acid reaction. Where the land surface is erosional in origin (the gently undulating parts), the mulga (*Acacia aneura*) trees grow in dense contour-aligned groves separated by open intergroves, but where the land surface is of old alluvial origin (gently sloping plains) the trees are more evenly distributed.

Short, annual or short-lived perennial grasses and forbs predominate in the understoreys, although several low to medium-height perennial grasses also occur.

The mulga country is mostly an ancient land surface which is comparatively stable as far as wind and water erosion is concerned.

- Grass flora.* 1. Dominant. *Aristida contorta*, *Enneapogon polyphyllus*.
2. Common. *Aristida browniana*, *A. inaequiglumis*, *Chloris acicularis*, *Dactyloctenium radulans*, *Digitaria brownii*, *D. coenicola*, *Enneapogon avenaceus*, *Eriachne helmsii*, *E. pulchella*, *Neurachne mitchelliana*, *Plectrachne schinzii*, *Triodia basedowii*, *T. pungens*, *Tripogon loliiformis*.
3. Scattered. *Aristida biglandulosa*, *A. echinata*, *Brachiaria miliiformis*, *B. piligera*, *Chloris scariosa*, *Chrysopogon fallax*, *C. pallidus*, *Cymbopogon obtectus*, *Danthonia bipartita*, *Dichanthium sericeum*, *Enneapogon cylindricus*, *Eragrostis laniflora*, *E. setifolia*, *E. xerophila*, *Eriachne aristidea*, *E. armitii*, *E. mucronata*, *Neurachne muelleri*, *Panicum decompositum*, *P. whitei*, *Perotis rara*, *Tragus australianus*, *Triraphis mollis*.
4. Rare. *Amphipogon caricinus*, *Aristida jerichoensis*, *Brachyachne ciliaris*, *Dichanthium superciliatum*, *Digitaria ctenantha*, *Diplachne fusca*, *Panicum australiense*, *Paspalidium clementii*, *P. constrictum*, *P. rarum*, *Schizachyrium obliqueberbe*, *Setaria brownii*.
5. Localised. *Aristida obscura*, *Bothriochloa ewartiana*, *Enneapogon pallidus*, *Eragrostis eriopoda*, *Eulalia fulva*, *Themeda australis*, *T. avenacea*.

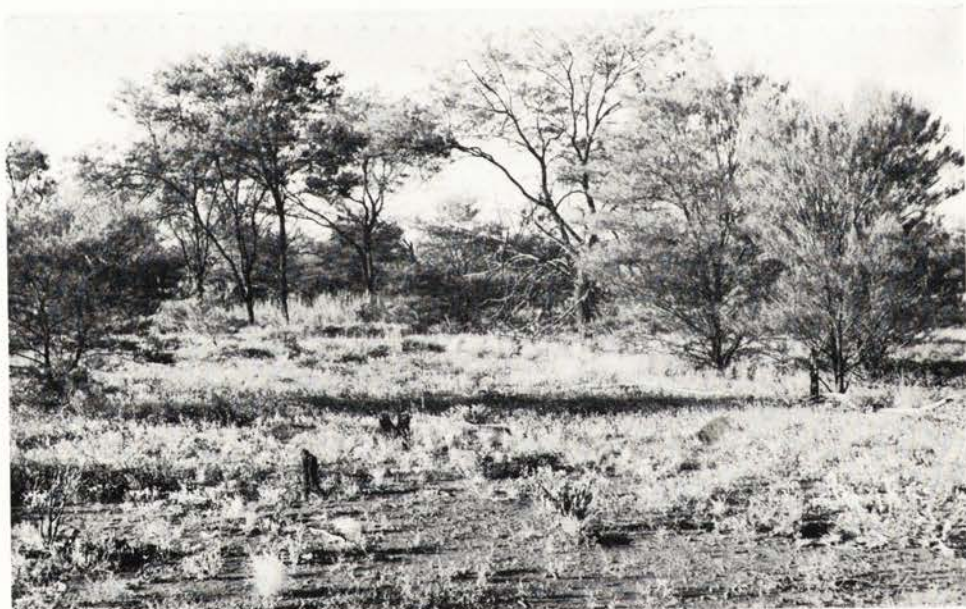


PLATE 2. Mulga country

WITCHETTY BUSH COUNTRY (Plate 3)

Description. This type is widespread and particularly common on limestone country. However, it is not confined to calcareous areas and occurs on acid, stony

skeletal soils and red earths. The soils are relatively shallow and the topography gently undulating. The main areas of concentration are in the central part slightly south of the Macdonnell Ranges and near the southern margin of the area. In association with mulga (*Acacia aneura*) on acid soils, witchetty bush (*Acacia kempeana*) occurs more commonly where the environment is drier. Consequently, it predominates in the southern half of the area where mulga is restricted to better-watered sites such as broad shallow depressions, but north of the Macdonnells it is confined to drier habitats (e.g. low rises) and mulga is more common.

Witchetty bush forms a low to fairly tall shrubland of sparse to medium density containing mainly short grasses and forbs in the understorey.

The landscape is inherently less stable than mulga country and a greater proportion has been degraded.

Grass flora. 1. Dominant. *Enneapogon polyphyllus*, *Aristida contorta*.

2. Common. *Digitaria brownii*, *Enneapogon avenaceus*, *E. cylindricus*, *Eriachne helmsii*, *Neurachne mitchelliana*, *Triodia basedowii*, *T. pungens*, *Tripogon lolii-formis*.

3. Scattered. *Amphipogon caricinus*, *Bothriochloa ewartiana*, *Cymbopogon exaltatus*, *Dactyloctenium radulans*, *Eragrostis eriopoda*, *Eriachne mucronata*, *Neurachne munroi*, *Tragus australianus*.

4. Rare. *Aristida browniana*, *A. nitidula*, *Enneapogon lindleyanus*, *E. oblongus*, *Eragrostis laniflora*, *Eriachne pulchella*, *Eulalia fulva*, *Panicum decompositum*, *Paspalidium constrictum*, *Stipa scabra*, *Triodia longiceps*, *T. spicata*.



PLATE 3. Witchetty bush country

GIDGEE COUNTRY (Plate 4)

Description. This type is mainly restricted to the northeast of the area and is usually associated with limestone. It is common on shallow, calcareous soils and on red earths overlying limestone, but is known to occur also on deep sandy soils without lime, stony hill slopes mainly on limestone though locally on sandstone, and on cracking clay soils. Structurally, the vegetation is a low open woodland or locally a low forest dominated by gidgee (*Acacia georginae*) over an understorey of low, short-lived grasses and forbs.

Under some circumstances gidgee is toxic to ruminants, the toxic principle being sodium fluoro-acetate.

The gidgee country is only moderately stable to erosive forces and parts of it show degeneration and erosion.

- Grass flora.* 1. Dominant. *Enneapogon polyphyllus*, *Aristida contorta*.
2. Common. *Aristida browniana*, *A. latifolia*, *Enneapogon avenaceus*, *E. cylindricus*, *Neurachne mitchelliana*, *Sporobolus caroli*, *Tragus australianus*, *Tripogon loliiformis*, *Triraphis mollis*.
3. Scattered. *Chloris acicularis*, *C. pectinata*, *C. scariosa*, *Chrysopogon fallax*, *Dactyloctenium radulans*, *Dichanthium humilium*, *D. sericeum*, *Digitaria brownii*, *Eragrostis eriopoda*, *E. leptocarpa*, *E. xerophila*, *Eriachne armitii*, *E. benthamii*, *Iseilema macratherum*, *I. membranaceum*, *Neurachne munroi*, *Panicum whitei*, *Sporobolus actinocladus*, *S. mitchellii*, *Triodia longiceps*.

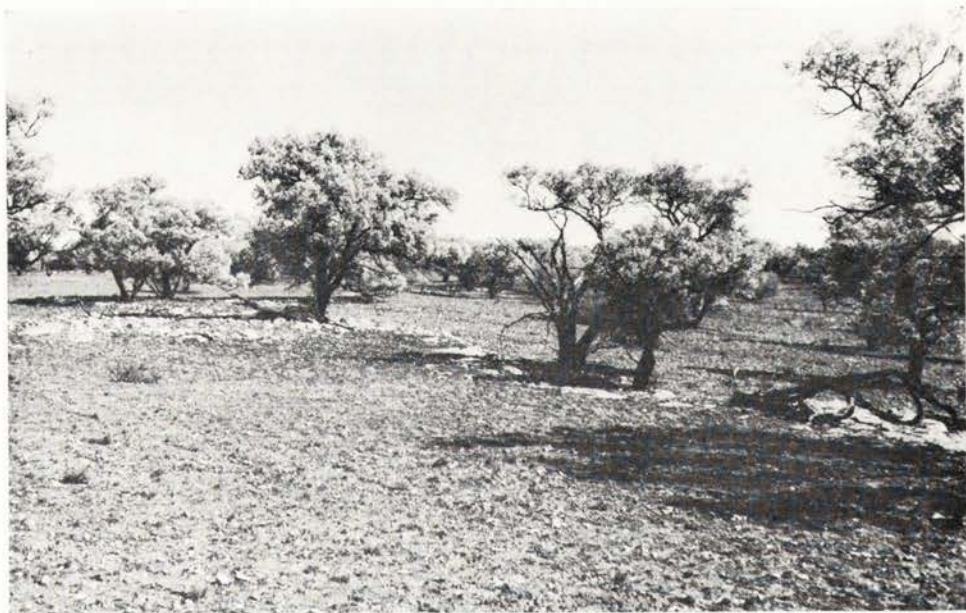


PLATE 4. Gidgee country

4. Rare. *Aristida jerichoensis*, *Astrebula elymoides*, *A. lappacea*, *A. pectinata*, *Digitaria coenicola*, *D. ctenantha*, *Diplachne fusca*, *D. parviflora*, *Echinochloa colonum*, *Elytrophorus spicatus*, *Eragrostis japonica*, *E. laniflora*, *Eriachne nervosa*, *Eriochloa australiensis*, *Panicum decompositum*, *Paspalidium constrictum*, *Uranthoecium truncatum*.
5. Localised. *Eragrostis cumingii*, *E. setifolia*, *Iseilema vaginiflorum*.

SPARSE LOW TREE COUNTRY (Plate 5)

Description. This comprises gently undulating to rolling country developed on granite or metamorphic rocks. The soils are mostly shallow and gritty, and the vegetation is a low open woodland characterised by one or more of *Acacia estrophiolata* (ironwood), *A. aneura* (mulga), *Atalaya hemiglauca* (whitewood), and *Hakea divaricata* (corkwood). The ground vegetation consists of low, short-lived grasses and forbs with patches of scattered perennial grasses.

The country is highly regarded by pastoralists, possibly because the relatively fertile soils produce more nutritious forage than most other types of country.

The undulating topography is moderately susceptible to sheet erosion.

Grass flora. 1. Dominant. *Enneapogon polyphyllus*, *Aristida contorta*.

2. Common. *Aristida strigosa*, *Digitaria brownii*, *Enneapogon oblongus*, *Eriachne mucronata*, *Sporobolus actinocladus*, *Tripogon loliiformis*.

3. Scattered. *Amphipogon caricinus*, *Aristida biglandulosa*, *A. browniana*, *A. echinata*, *A. inaequilumis*, *Bothriochloa ewartiana*, *Chloris acicularis*, *C. scariosa*,



PLATE 5. Sparse low tree country

Cymbopogon bombycinus, *C. exaltatus*, *Dactyloctenium radulans*, *Digitaria coenicola*, *Enneapogon avenaceus*, *E. lindleyanus*, *E. pallidus*, *Eragrostis eriopoda*, *Eriachne pulchella*, *Eulalia fulva*, *Neurachne muelleri*, *N. munroi*, *Setaria brownii*, *Themeda australis*, *Tragus australianus*, *Triodia longiceps*, *Triraphis mollis*.

4. Rare. *Brachiaria gilesii*, *B. miliiformis*, *B. praetervis*, *Cymbopogon obtectus*, *Danthonia bipartita*, *Digitaria ctenantha*, *Enneapogon clelandii*, *Eragrostis leptocarpa*, *Eriachne aristidea*, *E. helmsii*, *E. obtusa*, *Panicum decompositum*, *Paspalidium constrictum*, *P. rarum*, *Schizachyrium obliqueberbe*, *Setaria dielsii*, *Sporobolus australasicus*.

5. Localised. *Enneapogon cylindricus*, *Neurachne mitchelliana*.

MITCHELL GRASS COUNTRY (Plate 6)

Description. Limited in area and commonest in the northern half of central Australia, this type consists of flat or gently sloping plains with brown, grey, or red, poorly drained, cracking clay soils. These plains are mostly treeless and often have a characteristic gilgaied surface. They carry a medium-height perennial tussock grassland of variable density composed mainly of Mitchell grasses (*Astrebla* spp.). In favourable periods, however, a very wide variety of shorter grasses and forbs occupy the interspaces between the tussocks.

Of the three dominant species, barley Mitchell (*Astrebla pectinata*) is widespread and the most common, and hoop and curly Mitchell (*A. elymoides*, *A. lappacea*) are confined to sporadic occurrences in the northern half of the area or to gilgais. Other common perennial grasses include neverfails (*Eragrostis setifolia*, *E. xerophila*) and feathertop threeawn (*Aristida latifolia*). Flooded depressions may be dominated by Queensland bluebush (*Chenopodium auricomum*).

Under excessive grazing the perennial grasses are reduced or eliminated, but the flat landscape with fine-textured soils is not susceptible to either wind or water erosion.

Grass flora. 1. Common. *Aristida latifolia*, *Astrebla pectinata*, *Iseilema vaginiflorum*, *Panicum whitei*.

2. Scattered. *Aristida anthoxanthoides*, *Astrebla elymoides*, *Digitaria coenicola*, *Enneapogon avenaceus*, *E. polyphyllus*, *Eriachne nervosa*, *Eriochloa australiensis*, *Iseilema macratherum*, *I. membranaceum*, *Panicum decompositum*, *Paspalidium rarum*, *Sporobolus actinocladus*, *Tragus australianus*, *Tripogon loliiformis*.

3. Rare. *Astrebla lappacea*, *Dactyloctenium radulans*, *Dichanthium fecundum*, *D. superciliatum*, *Diplachne fusca*, *D. parviflora*, *Echinochloa colonum*, *Elytrophorus spicatus*, *Eragrostis confertiflora*, *E. japonica*, *Spathia neurosa*, *Sporobolus caroli*, *Uranthoecium truncatum*.

4. Localised. *Dichanthium humilium*, *D. sericeum*, *Eragrostis leptocarpa*, *E. setifolia*, *E. xerophila*, *Eriachne benthamii*, *Sporobolus mitchellii*.



PLATE 6. Mitchell grass country

SALTBUSH AND BLUEBUSH COUNTRY (Plate 7)

Description. This type is almost entirely restricted to the southern half of the area, where it occurs on stony tablelands or on undulating to low hilly country developed mainly on calcareous rocks. The soils are either texture-contrast soils, which have a shallow coarse-textured surface over a compact impermeable clay, or calcareous earths. The texture-contrast soils commonly have a surface mantle of stones.

The country is mostly treeless and the vegetation consists of shrublands dominated by a sparse to medium dense cover of either *Atriplex vesicaria* (bladder saltbush) or *Kochia astrotricha* (bluebush). Locally, *Kochia aphylla* (cotton bush) is dominant.

Grasses are relatively sparse, although in favourable periods the interspaces between the shrubs have a cover of short-lived grasses and forbs. Barley Mitchell grass (*Astrelba pectinata*) and knotty-butt neverfail (*Eragrostis xerophila*) occur in gilgais.

This country, and particularly the saltbush parts, has deteriorated more than any other type under the influence of stocking. In many areas the bush cover has been removed completely and the land surface severely eroded. The land surface is inherently unstable and special management practices are needed for it to maintain its productivity.

Grass flora. 1. Dominant. *Tripogon loliformis*.

2. Common. *Chloris scariosa*, *Dactyloctenium radulans*, *Enneapogon avenaceus*, *E. polyphyllus*, *Sporobolus actinocladius*, *S. caroli*, *Tragus australianus*.

3. Scattered. *Aristida contorta*, *A. latifolia*, *Astrebla pectinata*, *Chloris acicularis*, *Dichanthium humilium*, *D. sericeum*, *Digitaria brownii*, *D. coenicola*, *Enneapogon cylindricus*, *Eragrostis dielsii*, *E. falcata*, *Iseilema vaginiflorum*, *Neurachne munroi*.
4. Rare. *Aristida browniana*, *Astrebla elymoides*, *Diplachne fusca*, *Eragrostis leptocarpa*, *Iseilema membranaceum*, *Panicum decompositum*, *Triodia longiceps*.
5. Localised. *Eragrostis setifolia*, *E. xerophila*.



PLATE 7. Saltbush and bluebush country

FLOODPLAINS (Plate 8)

Description. Widely distributed, but comprising only a relatively small proportion of the total area, this type occurs either as the floodplains and levees along drainage systems or as alluvial fans at the foot of mountains and hills. It includes most of the areas which receive run-on and thus have more moisture available for plant growth than is contributed directly from rainfall. The soils are red earths or undifferentiated alluvia and vary from well-drained sands to poorly-drained clays.

The vegetation is commonly an open low woodland in which *Acacia estrophiolata* (ironwood), *Eucalyptus papuana* (ghost gum), *E. terminalis* (bloodwood), and *Hakea divaricata* (corkwood) are the common trees. In favourable seasons the ground cover is of short-lived grasses and forbs, but in unfavourable seasons the ground is almost bare.

While the concentrations of water which flow across this country after rain can produce spectacular growth, they also have an erosive effect. The landscape is naturally unstable and many areas have been severely eroded.

Grass flora. 1. Dominant. *Aristida contorta*, *A. browniana*, *Enneapogon polyphyllus*, *Eriachne benthamii*.

2. Common. *Aristida biglandulosa*, *A. inaequiglumis*, *Chloris acicularis*, *Chrysopogon fallax*, *Dactyloctenium radulans*, *Dichanthium sericeum*, *Digitaria coenicola*, *Enneapogon avenaceus*, *Eragrostis eriopoda*, *E. setifolia*, *E. xerophila*, *Eriachne armitii*, *E. pulchella*, *Iseilema vaginiflorum*, *Panicum whitei*, *Sporobolus caroli*, *Tragus australianus*, *Tripogon loliiformis*, *Triraphis mollis*.

3. Scattered. *Astrebla elymoides*, *A. pectinata*, *Brachiaria gilesii*, *B. miliiformis*, *B. notochthona*, *B. piligera*, *B. praetervisa*, *Chrysopogon pallidus*, *Dichanthium humilium*, *Enneapogon cylindricus*, *Eragrostis dielsii*, *E. falcata*, *E. japonica*, *E. laniflora*, *Eriachne helmsii*, *E. nervosa*, *E. obtusa*, *Iseilema macratherum*, *I. membranaceum*, *Panicum decompositum*, *Paspalidium rarum*, *Setaria brownii*, *Sporobolus mitchellii*, *Themeda australis*, *T. avenacea*, *Zygochloa paradoxa*.

4. Rare. *Aristida anthoxanthoides*, *Chloris virgata*, *Dichanthium fecundum*, *D. superciliatum*, *Diplachne fusca*, *Echinochloa colonum*, *Ectrosia leporina*, *Elytrophorus spicatus*, *Eragrostis cilianensis*, *E. elongata*, *E. kennedyae*, *E. lacunaria*, *E. parviflora*, *Eriochloa australiensis*, *Iseilema dolichotrichum*, *Panicum cymbiforme*, *Schizachyrium obliqueberbe*, *Setaria dielsii*, *Sorghum plumosum*, *Uranthoecium truncatum*.

5. Localised. *Amphipogon caricinus*, *Aristida latifolia*, *Bothriochloa ewartiana*, *Chloris pectinata*, *Digitaria brownii*, *Eragrostis barrelieri*, *E. cumingii*, *E. leptocarpa*, *Eriachne aristidea*, *Eulalia fulva*, *Perotis rara*.



PLATE 8. Floodplains

FRINGING COUNTRY (Plate 9)

Description. Stream channels and depressions comprise a type closely associated with the previous one, but differing in its distinctive vegetation. It occurs as narrow strips fringing channels and depressions. Coolibah (*E. microtheca*) or river red gum (*E. camaldulensis*) are common trees. Depressions in the floodplains or at the ends of channels are subject to brief periods of shallow flooding. They commonly carry stands of Queensland bluebush (*Chenopodium auricomum*) or old-man saltbush (*Atriplex nummularia*).

The ground storey on the banks of the stream lines is predominantly of medium height perennial grasses, but in the depressions grasses are rare.

Grass flora. 1. Dominant. *Aristida biglandulosa*, *A. browniana*, *Chloris acicularis*.
2. Common. *Aristida contorta*, *Brachiaria miliiformis*, *B. piligera*, *B. praetervisa*, *Chrysopogon fallax*, *Dactyloctenium radulans*, *Eragrostis speciosa*, *Eriachne benthamii*, *E. nervosa*, *Eulalia fulva*, *Perotis rara*.
3. Scattered. *Aristida inaequiglumis*, *Bothriochloa ewartiana*, *Brachiaria notochthona*, *Chloris pectinata*, *C. scariosa*, *Chrysopogon pallidus*, *Dichanthium sericeum*, *Digitaria brownii*, *D. coenicola*, *Diplachne fusca*, *Enneapogon avenaceus*, *E. pallidus*, *Eragrostis barrelieri*, *E. cumingii*, *E. dielsii*, *E. eriopoda*, *E. falcata*, *E. laniflora*, *E. leptocarpa*, *E. parviflora*, *E. setifolia*, *E. xerophila*, *Eriachne aristidea*, *E. obtusa*, *Eriochloa australiensis*, *Panicum decompositum*, *P. whitei*, *Paractaenium novae-hollandiae*, *Plagiosetum refractum*, *Setaria brownii*, *S. dielsii*, *Tragus australianus*, *Tripogon loliiformis*, *Triraphis mollis*, *Zygochloa paradoxa*.



PLATE 9. Fringing country

4. Rare. *Bothriochloa intermedia*, *Chloris virgata*, *Cymbopogon oblectus*, *Digitaria ctenantha*, *D. eriolepis*, *Diplachne parviflora*, *Echinochloa colonum*, *Ectrosia leporina*, *Elytrophorus spicatus*, *Enneapogon clelandii*, *Eragrostis confertiflora*, *E. elongata*, *E. japonica*, *E. kennedyae*, *E. lacunaria*, *Eriachne armitii*, *Eriochloa pseudoacrotricha*, *Panicum cymbiforme*, *Paspalidium clementii*, *P. constrictum*, *P. rarum*, *Phragmites karka*, *Sorghum plumosum*, *Sporobolus australasicus*, *Uranthoecium truncatum*.
5. Localised. *Brachiaria gilesii*, *Cymbopogon exaltatus*, *Enneapogon cylindricus*, *E. polyphyllus*, *Leptochloa digitata*, *Schizachyrium obliqueberbe*, *Sporobolus mitchellii*, *Themeda australis*, *T. avenacea*.

RUGGED COUNTRY (Plate 10)

Description. This type includes all the steeply sloping rocky mountains and hills. Where present, the soils are skeletal, shallow, and stony or gritty. A wide range of rock types is represented and this, combined with a wide range of slopes, produces a tremendous range of plant habitats. The vegetation is correspondingly variable. A sparse cover of low trees including *Eucalyptus dichromophloia* (bloodwood), *E. papuana* (ghost gum), *E. gamophylla*, *Ficus platypoda* (fig), *Callitris columellaris* (cypress pine), *Atalaya hemiglauca* (whitewood), and *Hakea lorea*, and of shrubs including *Eremophila freelingii*, *Grevillea wickhamii*, *Acacia* spp. and *Cassia* spp., is common. The ground vegetation is either one of several species of spinifex or consists of scattered tussocks of perennial grasses interspersed with short-lived grasses and forbs in favourable periods.



PLATE 10. Rugged country

- Grass flora.* 1. Dominant. *Eriachne mucronata*, *Triodia clelandii*, *T. longiceps*.
2. Common. *Enneapogon oblongus*.
3. Scattered. *Aristida contorta*, *A. nitidula*, *Cymbopogon exaltatus*, *Enneapogon avenaceus*, *E. pallidus*.
4. Rare. *Aristida browniana*, *A. capillifolia*, *A. strigosa*, *Cymbopogon bombycinus*, *C. obtectus*, *Dactyloctenium radulans*, *Enneapogon lindleyanus*, *Eriachne scleranthoides*, *Paspalidium clementii*, *P. constrictum*, *Triodia hubbardii*, *T. irritans*, *T. spicata*.
5. Localised. *Digitaria brownii*, *Enneapogon polyphyllus*.

SALT LAKES (Plate 11)

Description. Of relatively minor importance in terms of floristic composition and area, this type consists of salt pans with waterlogged clay soils, and is most extensive in the southwestern and central-western parts. Though mainly bare, the fringes of the pans and their tributary channels are usually covered by samphires (*Arthrocnemum* spp.), sometimes under white tea-tree (*Melaleuca glomerata*).

- Grass flora.* 1. Common. *Dactyloctenium radulans*.
2. Scattered. *Eragrostis dielsii*, *E. falcata*, *Sporobolus caroli*, *Tragus australianus*.
3. Rare. *Aristida contorta*, *A. browniana*, *Chloris acicularis*, *Enneapogon polyphyllus*, *Eragrostis xerophila*, *Sporobolus actinocladus*, *Triodia longiceps*, *Tripogon loliiformis*.



PLATE 11. Salt lakes

III The Grass Plant and its Parts

For the sake of accuracy and brevity, the use of technical terms in botanical descriptions can scarcely be avoided. This applies particularly to the family of grasses (Gramineae) characterised as it is by several vegetative and floral structures which have been highly modified during the course of evolution. As it is desirable that this work fall within the scope of others besides plant taxonomists, the terms commonly used in the general text are described below (see also glossary, p. 267).

VEGETATIVE PARTS (Fig. 3)

These parts are concerned with the functions of the individual plant, and consist of the roots, culms, and leaves.

Roots

The root systems of grasses are fibrous and developed from underground nodes of the culms. Some, referred to as *aerial* roots, arise also from nodes situated close above ground level. These, often found on tall annuals, provide extra support for the plant. On the other hand, tussock-forming perennials commonly produce *rhizomes*, which are underground stems functioning as roots but having the structure of culms. These are frequently branched and spread through the soil, sometimes for considerable distances, eventually coming to the surface where a new plant develops.

An important diagnostic feature of grasses is their *duration* or growth habit, according to which they are regarded as annuals or perennials. *Annuals* have a simple rooting system, without rhizomes, from which all culms bear flowers. On maturity, which is attained in a single growing season, the entire plant dies. It is replaced in the successive season by seedlings from the previous crop of seeds, which are usually produced in abundance. Rapidly maturing annuals with a brief life-cycle of only a few weeks are termed *ephemerals*. A common feature of many central Australian grasses, probably related to the low and erratic rainfall of the area, is their behaviour as *short-lived perennials*. These have the characteristic habit of annuals, but persist for longer periods. During this time, they respond to falls of rain regardless of the season and usually produce a few vegetative or sterile, leafy shoots as well as the flowering culms.

Perennials, on the other hand, have coarser, sometimes woody, and often rhizomatous root systems. In addition to the flowering culms, sterile *tillers* (shoots) are produced. These cease growth with the onset of dry conditions, remaining dormant until a favourable period, when they either produce flowering culms or persist

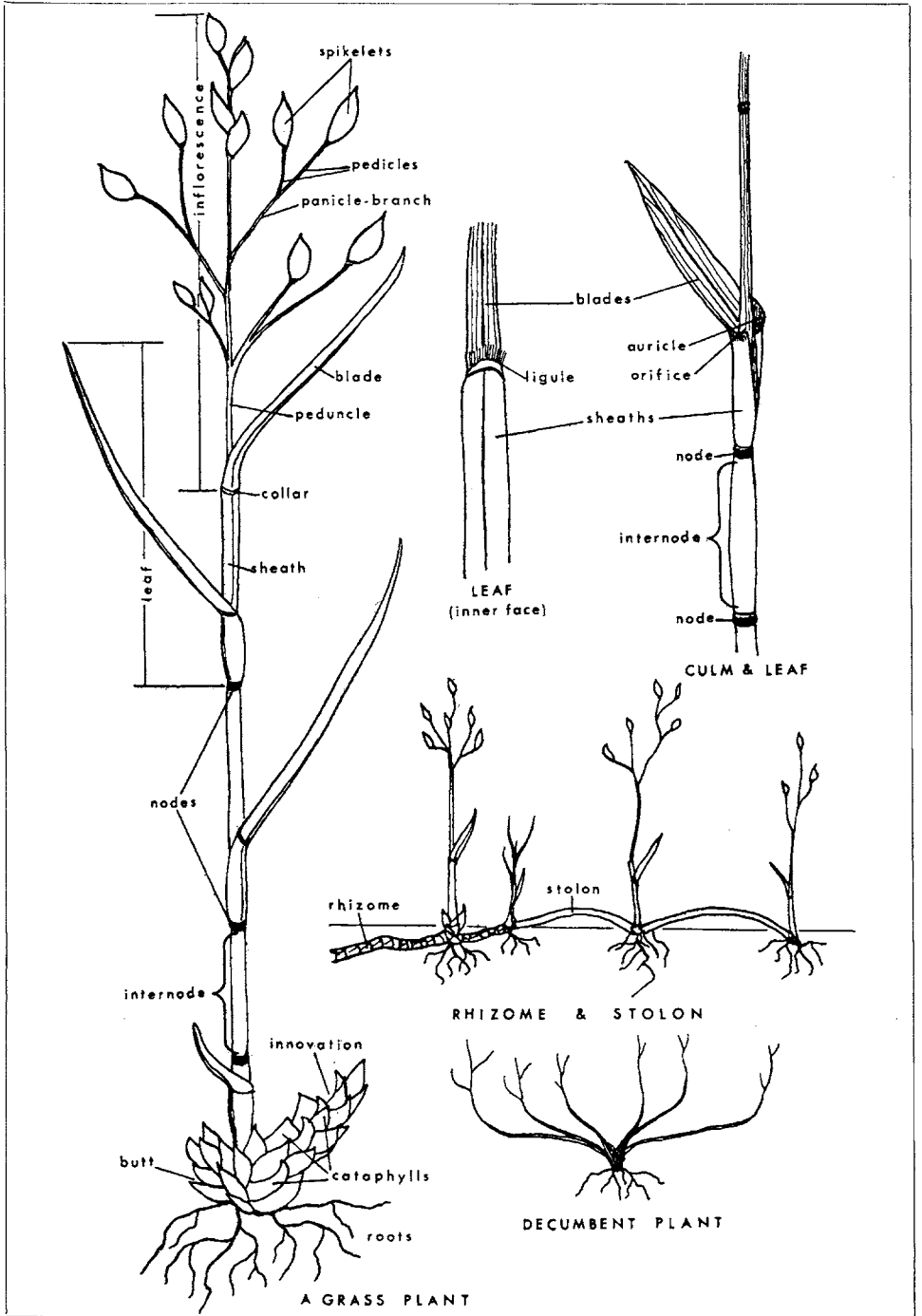


FIG. 3. Vegetative parts of the grass plant

indefinitely as vegetative tillers. Regrowth of some tussock-forming, long-lived perennials takes place at the perimeter of the tussock. The older centre dies out, resulting in the formation of well-defined 'rings', which in some spinifex grasses (*Triodia* and *Plectrachne* spp.) can be several feet in diameter with only a few inches of peripheral growth.

The *butt* or basal internode of perennial grasses is usually thickened by *innovations* or young shoots subtended by newly formed, bladeless sheaths known as *cataphylls*. This branching at the base of the grass plant is generally referred to as *tillering* or *stooling*. The innovations are said to be *intravaginal* when they grow up inside the subtending sheath, or *extravaginal* when the shoot pierces the base of the sheath and growth takes place outside the sheath. The cataphylls are often numerous and closely overlapping due to crowding of the basal nodes. They sometimes provide useful distinguishing characters and can be densely woolly, as in woollybutt wanderrie (*Eriachne helmsii*); hairy, as in many of the fingergrasses (*Digitaria* spp.); *glabrous* (hairless), as in sandhill cane grass (*Zygochloa paradoxa*); or they can be leathery, papery and stiff, shiny, or blunt or pointed. Though generally deciduous, in golden beard grass and ribbon grass (*Chrysopogon* spp.) they persist for long periods and finally disintegrate into fibrous threads.

CULMS

The stems or *culms* of grasses are made up of a number of solid knots or *nodes* separated by usually hollow (sometimes solid) *internodes*. The node is the point of origin of the leaves, shoots, branches, and roots. Occasionally it serves as a joint or *articulation*, a characteristic feature of jointed nineawn (*Enneapogon cylindricus*), in which the culms break cleanly at the nodes into the individual internodes.

The internodes are usually *terete* (rounded) or sometimes *compressed* (flattened), though those of our bluegrasses (*Dichanthium* and *Bothriochloa* spp.) and kangaroo grasses (*Themeda* spp.) are semi-terete and commonly flattened or grooved along one side. The surface is usually smooth and *striate* (nerved).

The culms of grasses are mostly hairless, though hairs do occur on those parts not covered by the sheaths, and particularly close below nodes and inflorescences. A noteworthy exception is Mt Olga wanderrie (*Eriachne scleranthoides*) in which the internodes, though completely covered by the closely fitting leaf sheaths, are densely woolly on the surface.

Grass culms can be *erect*, *ascending* (obliquely spreading and then erect), *decumbent* (spreading along the ground before becoming erect) or *prostrate* (creeping). Creeping culms are termed *stolons* when they produce new plants from their nodes. They differ from *rhizomes* only in that the latter are below ground level, colourless (not green), and by having leaves reduced to scales.

Branching of the culms is a common feature in grasses. Where this occurs on axillary branches, the lowest leaf is reduced to a thin membrane, the *prophyllum*. This supports the developing branch by encircling it with two flaps. With *fastigiate*

culms, several closely clustered branches and several prophylla arise from the same node. Unlike the branching from the basal nodes, the branching from the middle and upper nodes is almost always *intravaginal*.

LEAVES

The foliage or leaves of a grass plant consist of the sheath, the ligule, and the blade.

The *sheath* is the split, tubular portion surrounding the culm. Almost always the two margins or edges are free from one another and overlap, and often the outer one is *ciliate* (fringed with hairs) (diminutive *ciliolate*). The sheaths are usually rounded like the culms or sometimes *compressed* (sharply folded and flattened) and *keeled* like a boat. They can be tightly or loosely fitting on the culms, which they wholly or partly cover, depending on their length in relation to that of the internodes. On the surface they are usually nerved or ridged and *glabrous* (hairless) or variously hairy.

The spreading portion at the top of the sheath is the *lamina* or *blade*. This usually has a prominent midrib and numerous parallel nerves or veins. The blade is flat or folded or has rolled edges, which are frequently thickened and razor sharp due to minute teeth or bristles. Considerable variation occurs in the blade's shape, size, and texture. Its surface varies from smooth to *scabrous* (bristly), and from hairless to variously hairy with slender or stiff or spiny, simple or glandular or tubercle-based hairs. Among the grasses of central Australia, the highly *lignified* (woody) (Burbidge 1945, 1946b), needle-like blades of the spinifex grasses (*Triodia* and *Plectrachne* spp.) are very characteristic.

The junction of blade and sheath, known as the *orifice* (mouth) of the sheath, has several characteristic though less prominent structures. The most important of these is the *ligule*, which extends across the leaf on the upper (inner) surface at the junction of sheath and blade. This is usually a delicate, thin, transparent membrane, often fringed with short hairs. Sometimes the membrane is reduced and the ligule consists merely of a fringe of hairs, while occasionally, as in some species of *Echinochloa*, it is completely absent and represented only by a discoloured zone. Similarly placed on the lower (outer) surface is the *collar*, a line or zone of demarcation between the blade and sheath, and marked in some threeawn grasses (*Aristida* spp.) by a transverse row of hairs. In species with articulate blades, such as spathe grass (*Spathia neurosa*), the collar and ligule represent the point at which the blade and sheath separate.

On either side at the base of the blade of some grasses there are two ear-like projections, the *auricles*. These vary in size and shape.

REPRODUCTIVE PARTS (Fig. 4)

The reproductive parts are responsible for the perpetuation of the species and comprise the inflorescence and the spikelet.

INFLORESCENCE

The *inflorescence* (flowerhead or seedhead) contains the spikelets, or, in broad terms, the flowers and later the seeds. It usually terminates the flowering culm and (if

present) its branches. Such is a *terminal* inflorescence as opposed to an *axillary* one, which arises in the axil of a leaf sheath and is commonly borne on the lower part of the plant. At maturity, terminal inflorescences usually become *exserted*, or protrude from the uppermost sheaths in which they are enclosed during development, but axillary inflorescences often remain partly concealed within their subtending sheaths.

Inflorescences are of various types depending on the degree of branching before attachment of the spikelet. Thus a *spike* has no branches, a *raceme* has a single series of branches or divisions, and a *panicle* has two or more series. The typical spike has *sessile* (stalkless) spikelets attached directly to the central stem, while in a raceme the spikelets are *pedicellate* (stalked). In panicles the stalked spikelets occur on multiple branches arising from the central stem.

However, these three types commonly grade into one another. Thus a raceme or panicle can be spike-like (*spiciform*). In the former case, the spikelets are *subsessile* (very shortly stalked) or, as in our bluegrasses (*Bothriochloa* and *Dichanthium* spp.), they occur in pairs with one of each pair stalkless. In the case of the spike-like panicle (sometimes called a *false spike*), the branches and branchlets are much-reduced, appressed, and concealed by the crowded spikelets. Also, there is the *false panicle* of the Flinders grasses (*Iseilema* spp.) and kangaroo grasses (*Themeda* spp.). Here, the unit of the inflorescence is a cluster of stalked and stalkless spikelets subtended by a spathe, which terminates the branches of a panicle.

There are terms used to distinguish the various divisions or branches within the inflorescence. The *rhachis* is the stem or branch supporting the spikelets. In *simple* (unbranched) inflorescences such as the spike and simple raceme, it refers to the central stem which in *compound* (branched) types is termed the *axis*. On the other hand, a panicle is made up essentially of the axis and primary branches. In *decompound* (much-branched) panicles, found in many of the panic grasses (*Panicum* spp.), the primary branches are subdivided into secondary branches and branchlets. Sometimes at the base of the branches of the inflorescence there is a small swelling, the *pulvinus*, which assists the branches to spread after they emerge from the floral sheath.

The rhachis can be *continuous* (unjointed) or *articulate* (jointed) and then *disarticulating* (breaking) at the joints. Generally this feature is consistent for a group of related species (genus) and sometimes also for related genera. Hence it is of major importance in the classification of grasses. Examples of an articulate rhachis are found in the bluegrasses (*Bothriochloa* and *Dichanthium* spp.), oilgrasses (*Cymbopogon* spp.), and many other genera of the tribe Andropogoneae.

The *pedicel* is the stalk of the individual spikelet, while the stalk of any group of spikelets is termed the *peduncle*. Thus a spike, raceme, or panicle is pedunculate when the lower part of the axis or rhachis is free of spikelets and forms a stalk. The term also refers to the uppermost internode of the flowering culm, i.e. from the uppermost stem-leaf to the first branch of the inflorescence.

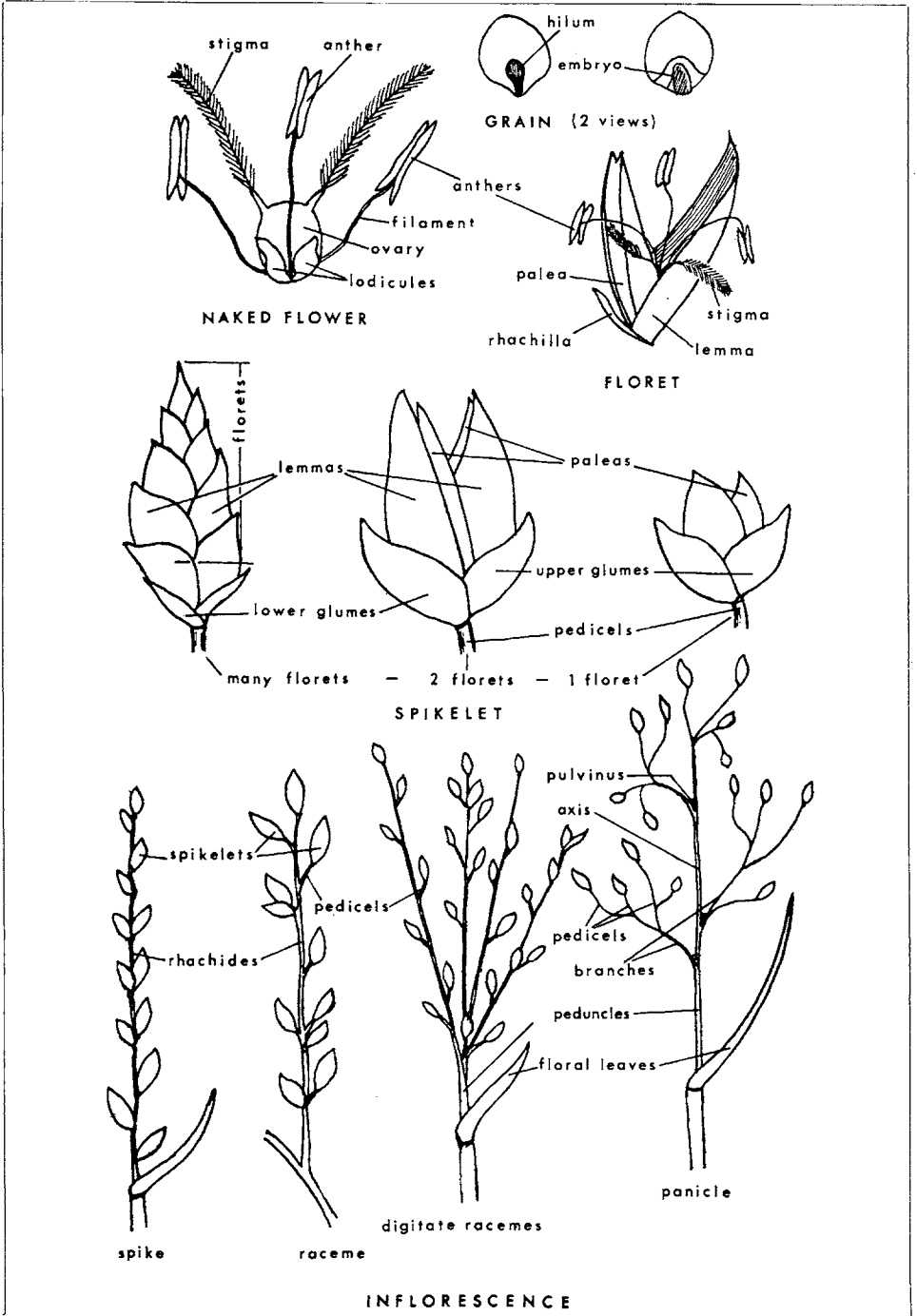


FIG. 4. Reproductive part of the grass plant

The inflorescence also includes the arrangement of the flowering branches on the central stem, a feature often useful in distinguishing species or groups, particularly well-matured specimens shed of spikelets. Needless to say, only compound inflorescences involve branch arrangement. Their component spikes, racemes, or panicle-branches can occur singly, in pairs, or in clusters of few to many and can be *approximate* (close together), *distant* (separated), or *remote* (widely spaced and usually sparse) along the common axis. The spikes of Rhodes grasses (*Chloris* spp.) and button grass (*Dactyloctenium radulans*) are *digitate* since they all arise from the one point at the summit of the peduncle. The basal cluster of racemes in finger panic grass (*Digitaria coenicola*) and the clusters of panicle-branches in ribbon grass (*Chrysopogon pallidus*) are *whorled* or *verticillate* as the members of each cluster completely surround the central stem.

The branches of a racemose inflorescence can be erect and then commonly *appressed* (lying close) to the central stem, *spreading*, or *reflexed* (abruptly bent backward or downward). Those of a panicle can be widely spreading and very loose, giving rise to a *diffuse* or *effuse* panicle, or narrowed and shortened, producing a *contracted* panicle. Dense, narrow inflorescences are termed *continuous* when the spikelets or spikelet-bearing branches completely conceal the central stem, and *interrupted* when spaced along the stem.

SPIKELET

The *spikelet*, or in broad terms the flower or seed, is the unit of the grass inflorescence and consists of a *rhachilla* bearing two glumes and one or more florets. Because of the considerable variation in its structure, the spikelet is of extreme importance for classification purposes. The more significant features include shape in cross section and number of florets present. In shape, the spikelet can be *terete* (rounded and narrowed upwards) or *compressed* (flattened), in the latter case either *laterally* (sidewise) or *dorsally* (on the back). The number of florets can vary from one to twenty or more. With several-flowered spikelets, the first (lowest) floret is attached opposite and slightly above the upper glume, while the remainder are arranged alternately on opposite sides of the rhachilla. As a result, the overlapping glumes and florets form two vertical, often well-defined rows and are referred to as being *2-ranked* or *distichous*. In doing so, they usually conceal the rhachilla.

The *rhachilla* or spikelet-axis is the branchlet on which the glumes and florets are arranged. Comparable with the rachis of the inflorescence, it is also either *continuous* (unjointed) or *articulate* (jointed). When the rhachilla is continuous and *tough* as in some lovegrasses (*Eragrostis* spp.), the mature florets fall from it. Generally, however, the rhachilla is jointed and *disarticulates* (breaks) either above or below the glumes and between the florets. Each floret then falls attached to the rhachilla-internode of the floret above. At its apex, the rhachilla is sometimes produced into a bristle similar to that terminating the rachis of the *Paspalidium* grasses. More often, however, it is terminated either by the uppermost floret as in

the one-flowered spikelet of *Sporobolus*, or by the rudiment of a floret as in the few- and several-flowered spikelet of *Chloris* and *Tripogon* respectively. At the other extreme, the base of the rhachilla-internode is hardened into a *callus*, which can be minute and blunt or long and spear-like. The latter type of callus is usually bearded with hairs or bristles and is a characteristic feature of *Themeda*, *Chrysopogon*, *Aristida*, and *Stipa*.

The two *glumes* are bracts or modified much-reduced leaves attached to the base of the rhachilla on opposite sides. The *lower glume* is inserted slightly below the second or *upper glume*. Both are empty (i.e. without a flower). They vary in texture, indumentum, nervation, shape, and in size relative to each other and to the spikelet itself. Their texture ranges from the *hyaline* (transparent and delicate) glumes of the threeawns (*Aristida* spp.) to the *coriaceous* (leathery) or *crustaceous* (brittle) ones of the bluegrasses (*Bothriochloa* and *Dichanthium* spp.) and their relatives. In indumentum, they can be *glabrous* (hairless) or variously *pubescent* (hairy). The surface can be smooth or wrinkled, pitted, grooved, or otherwise roughened by various protuberances. As well as a wide diversity in outline, the apex can be *obtuse* (blunt) or *acute* (sharply pointed), *acuminate* (tapered to a long point) or *awned* (bristle-like), and *entire* (whole) or variously cut into lobes, teeth, or notches.

The *floret* consists of the flower enclosed within two bracts, the *lemma* or outer (lower) bract, and the *palea* or inner (upper) bract. In shape, texture, size, and nervation, the lemma is subject to modifications similar to those found in the glumes. The palea is almost always 2-nerved, sometimes obscurely so, but in many cases (e.g. in *Panicum* and related genera) otherwise conforms with the lemma, particularly in texture and size.

The flowers of grasses are extremely small, inconspicuous, and naked (i.e. there are no floral envelopes (perianth segments)). Each flower consists of the essential floral organs comprising *pistil* (female organ) and *stamens* (male organs). The pistil is made up of the *ovary* containing a solitary *ovule* and usually two *styles*. These are tube-like stalks arising from the apex of the ovary, each one terminating in a *plumose* (feathery) or *viscid* (sticky) *stigma* to which the pollen grains readily adhere. There are usually 3 *stamens* (sometimes 1, 2, or 6). Each consists of a long, slender *filament* (stalk) terminating in a 2-celled *anther* (pollen sac) which *dehiscens* (opens) usually by 2 longitudinal slits to release the pollen grains.

At the base of the ovary in most grasses, there are 2 (rarely 3) minute scales, the *lodicules*. At *anthesis* (flowering time), these become turgid and force apart the lemma and palea so that stigmas and stamens protrude either *laterally* (i.e. from the side of the floret) or sometimes *terminally* (i.e. from the apex of the floret). Thus pollen grains carried by wind or insects can pollinate the receptive stigmas. Such florets are termed *chasmogamous*, as opposed to the less common *cleistogamous* floret, in which the anthers are located close to the stigmas at the apex of the ovary and self-pollination occurs within the closed floret.

Not all the florets of a spikelet are necessarily *bisexual* or *hermaphrodite* (having both stamens and pistil). The other types are *unisexual*, which can be *pistillate* (ovule-producing) or *staminate* (pollen-producing), and *neuter* (having neither stamens nor pistil). Thus neuter and staminate florets are always *sterile* as opposed to the *fertile* or *perfect* (seed and pollen-producing) florets of the hermaphrodite spikelet. In *Eragrostis* and many other genera, the uppermost florets of the spikelet are sterile and closely resemble the lower, fertile ones. However, in some cases the fertile and sterile florets differ markedly in appearance and their positions on the rachilla are reversed. Generally, pistillate and staminate spikelets are borne on the same plant, a condition known as *monoecious*. But in *Zygochloa paradoxa*, a *dioecious* species, the sexes occur on different plants.

Fertilisation of the ovule in the ovary leads to the production of the *grain* or *caryopsis*. Each grain contains one seed and consists of the mature ovary surrounded by the ovary wall, the *pericarp*. On one side of the grain at the base is a slight depression where lies the *embryo*, from which the seedling plant develops. On the other side is the *hilum*, a scar of variable size and shape representing the point of attachment of the ovule to the ovary wall.

With few exceptions, the ripened grain falls enclosed within its permanent envelopes (the glumes, lemma, and palea), which usually harden with maturity and so provide protection for the caryopsis. In *Panicum* and related genera, the grain tightly enclosed by the lemma and palea disarticulates above the glumes. In *Bothriochloa*, *Dichanthium*, and *Themeda*, the glumes harden with maturity and the entire spikelet falls as the fruit. In contrast, however, the grain of *Eragrostis* and *Sporobolus* is shed naked (i.e. free of the lemma and palea). Furthermore, the delicate pericarp may split on one side and release the naked seed. This is readily seen in *Sporobolus* on moistening the grain, though here the ejected seed remains attached to the ruptured envelope because of the gelatinous nature of the pericarp.

Key to the Genera

12. Spikelet with a minute, cup-like, purplish or dark ring at its base. 84-5. *Eriochloa*
12. Spikelet lacking a basal ring.
 13. Inflorescence of 3 or more digitate spikes, usually spreading. 30-3. *Chloris*
 13. Inflorescence narrow or spiciform, not digitate.
 14. Inflorescence spiciform, usually dense; spikelets usually numerous and crowded.
 15. Spikelets reflexed on the rachis, thin, needle-like; each one with 2 long awns. 104. *Perotis*
 15. Spikelets erect, not needle-like; each one with bristle-like points or several awns.
 16. Inflorescence somewhat plumose, with soft hairs or awns, often purple-black.
 17. Lemmas softly and densely hairy. 130. *Triraphis*
 17. Lemmas smooth or with minute bristles, but hairless. 48. *Ectrosia*
 16. Inflorescence with stiff hairs, bristles, or awns; not plumose; usually green or leaden-grey.
 18. Inflorescence a spike or spiciform panicle, solitary, cylindrical.
 19. Spikelets 10-14 mm long, long-pointed. Panicle continuous. Perennial, coarse, usually > 30 cm high. 93. *Neurachne*
(in part)
 19. Spikelets < 5 mm long, shortly pointed. Spike usually interrupted in the lower part. Annual, slender, often < 15 cm high. 49. *Elytrophorus*
 18. Inflorescence a spike or spiciform raceme, solitary or paired, secund. 14-6. *Astrebla*
 14. Inflorescence contracted, but open; usually spikelets relatively few and loose.
 20. Spikelet 2-flowered. Lemma entire, long-acuminate or aristate. 75-7, 80. *Eriachne*
(in part)
 20. Spikelet 3-8-flowered. Lemma deeply 2-lobed, aristulate from the sinus. 40. *Danthonia*
 6. Awns sharply bent about the middle, spirally twisted below the bend.
 21. Inflorescence of spiciform racemes, usually leafy; racemes partly enclosed by leaf-like spathes or spatheoles.
 22. Blade not articulate with sheath. Brown hairs on spikelet, if present, short.
 23. Perennials, tussock-forming, mostly > 45 cm high.

Key to the Genera

33. Perennial, 1.2–1.7 m high, cane-like, with hairless rhizomes; inflorescence of subdigitate racemes. 91. *Leptochloa*
33. Annual or perennial, usually < 1 m high, not cane-like; rhizomes absent or if present hairy; inflorescence not as above.
34. Spikelet with few to several florets; florets biseriate, imbricate.
35. Lemma notched at the apex, with a short bristle in the sinus.
36. Lemma ciliate on the margins in the lower part. Perennial, at least 22 cm high. 45–6. *Diplachne*
36. Lemma hairless. Annual, rarely > 15 cm high. 129. *Tripogon*
35. Lemma entire, muticous. 58–74. *Eragrostis*
34. Spikelet with 1 or 2 adjacent florets.
37. Spikelet covered by short hooked spines, burr-like. 128. *Tragus*
37. Spikelet hairy or hairless, smooth or bristly, but not spiny or burr-like.
38. Spikelet with 2 fertile florets. 78–9, 81–3. *Eriachne*
(in part)
38. Spikelet with 1 fertile floret, sometimes also with 1 sterile usually reduced floret.
39. Plant prostrate or decumbent and rooted at lower nodes; erect culms < 60 cm high.
40. Inflorescence of 2 (rarely 3) digitate spikes or spiciform racemes.
41. Plant 5–7.5 cm high. 29. *Brachyachne*
41. Plant 22–45 cm high. 43–4. *Digitaria*
(in part)
40. Inflorescence spiciform or open, not digitate.
42. Perennial, prostrate, mat-like.
..... 124. *Sporobolus*
(in part)
42. Annual or biennial, decumbent and rooted at lower nodes.
43. Blades flaccid. Spikelet bristly but hairless. Rhachides approximate on the axis, usually appressed.
..... 47. *Echinochloa*
43. Blades stiff. Spikelet silky-hairy or if hairless, then rhachides distant on the axis and widely spreading.
..... 23–8. *Brachiaria*
39. Plant usually erect or if rooted at lower nodes, then erect culms 90–120 cm high.
44. Inflorescence loose, exceeded by the upper blades, leafy. 95. *Panicum*
(in part)
44. Inflorescence spiciform or spreading, distinctly exceeding the blades, not leafy.

The Grasses of Central Australia

- 45. Panicle spiciform, with extremely short branches.....
..... 92, 94. *Neurachne*
(in part)
- 45. Panicle open or if contracted, the branches long.
- 46. Spikelet villous with silky hairs.
..... 41-2. *Digitaria*
(in part)
- 46. Spikelet hairless or bristly, but not silky-hairy.
- 47. Spikelet minute, with 1 fertile floret.....
..... 121-3. *Sporobolus*
(in part)
- 47. Spikelet rather large, with 1 fertile floret and a
sterile, reduced one. 96-9. *Panicum*
(in part)

V Description of the Species

INTRODUCTION

Basically, the treatment of each species comprises a description in general terms of the vegetative and major floral characters, and a technical description of the inflorescence and its components. Where more than one species of a single genus exists, also an introductory summary of the characteristics of the genus, a generic description and a key to the species are provided.

With two exceptions, the species are arranged in alphabetical order of their scientific names. The exceptions are *Dichanthium* and *Triodia*, which are grouped with *Bothriochloa* and *Plectrachne* respectively because of the close affinities with these genera.

In compiling the technical descriptions, reference to a greater or lesser degree was made to the following literature: Black (1948); Blake (1938a, 1941, 1943, 1944, 1948, 1952); Burbidge (1941, 1946a, 1953, 1960b); Everist (1935, 1937); Gardner (1952); Hartley (1942); Hubbard (1928, 1935, 1936, 1937); Hughes (1923); Lazarides (1959); Vickery (1950a, 1950b, 1956, 1961).

COMMON NAMES

Whenever possible, the common names were taken from *Standardized Plant Names* (CSIRO 1953). Sometimes well-established local names were adopted, but for the majority of species the common names had to be compiled. In these cases the assigned name is derived from a literal translation of the scientific name or it denotes a characteristic feature of the species. Generally the same name is used for all members of a genus, and a qualifying adjective for the individual species.

OCCURRENCE

This part indicates the distribution of the species in terms of ecological relationships. Associated plants are recorded only by common names, their corresponding scientific names being provided in Appendix II.

DISTRIBUTION

The Australian distribution of the species is shown and non-endemic species are indicated where applicable. Those species recorded for the Northern Territory occur north of the twentieth parallel as well as in central Australia.

Included among the sources from which distribution data were extracted are the following references:

Burbidge (1963); Cross and Vickery (1950); Gray (1961); Hubbard (1938); Lazarides (1961); Specht (1958); Vickery (1953); Willis (1962).

ABBREVIATIONS

C.A.	endemic to central Australia
E-A.	extra-Australian
M.	all mainland states
N.T.	Northern Territory
N.S.W.	New South Wales
Q.	Queensland
S.A.	South Australia
T.	Tasmania
V.	Victoria
W.A.	Western Australia
±	more or less

Descriptions

1. Grey-beard Grass

Amphipogon caricinus

Plate 12a

GENERAL DESCRIPTION

HABIT: Erect rigid perennial, forming dense tufts 22.5–61 cm high, sometimes developing a short rhizome which, like the butt, may be covered by short soft hairs.

STEMS: Numerous, wiry, thickened at the butt by stiff, tightly overlapping cataphylls.

LEAVES: Narrow with inrolled edges, stiffly pointed, somewhat rough, usually hairless though at times densely hairy.

SEEDHEAD: Up to 6.5 cm long, spiciform, cylindrical, with the spikelets densely clustered on very short stalks on short branches. The single floret of the spikelet has 5 awns, which have a distinctive cover of long, greyish, plumose hairs to which the common name refers. In colour the spikelets are first purple, later pale yellow or golden, and the glumes, which remain attached to the plant after the florets have fallen, finally turn straw-coloured.

OCCURRENCE: Widespread but not common; occurring sporadically on deep or shallow sandy soils on dunes, plains, river levees, and rocky hill slopes in association with spinifex (gummy, feathertop, and lobed), snappy gum, 4-toothed mallee, and witchetty bush, and to a lesser extent on medium-textured red earths under mulga on creek floodouts.

DISTRIBUTION: M.

VALUE: Harsh, unpalatable.

BOTANIC DESCRIPTION

Panicle at length exserted, spiciform, narrow-cylindrical, 2–4 (rarely –6.5) cm long, <1.25 cm wide (incl. awns); rhachis and branches smooth and glabrous or scabrous to scabrous-pubescent, the latter short; pedicels 0.5–2 mm long. *Spikelets* 1-flowered, 9–10 mm long (incl. the short callus and the awned lobes). *Glumes* persistent, chartaceous, faintly 3-nerved, acute, ± mucronate, scabrid, ciliolate on the margins towards the apex; lower 4.5–5.5 mm long, upper 6–7 mm long. *Lemma* as long as the spikelet, membranous, deeply 3-lobed, with hyaline margins separating early into 2 broad delicate ephemeral lobes; the body 2.5–3 mm long, 3-nerved, with 2 dorsal vertical rows of appressed silky hairs, otherwise glabrous and smooth; the lobes at least twice as long as the body of the lemma, thickened and densely long-ciliate on the margins, narrowed into bristles; the bristles plumose, at length spreading or ± recurved. *Palea* membranous, almost as long as the lemma, 2-lobed, smooth; the lobes rather narrow, ciliate like those of the lemma, with hyaline margins separating early into 2 narrow lobes. *Caryopsis* enclosed in the somewhat indurated lemma and palea.

2–13. Threawn Grasses

Aristida spp.

This group, also referred to as wire or kerosene grasses, is represented in central Australia by 12 widely distributed species. As a group they are readily recognised

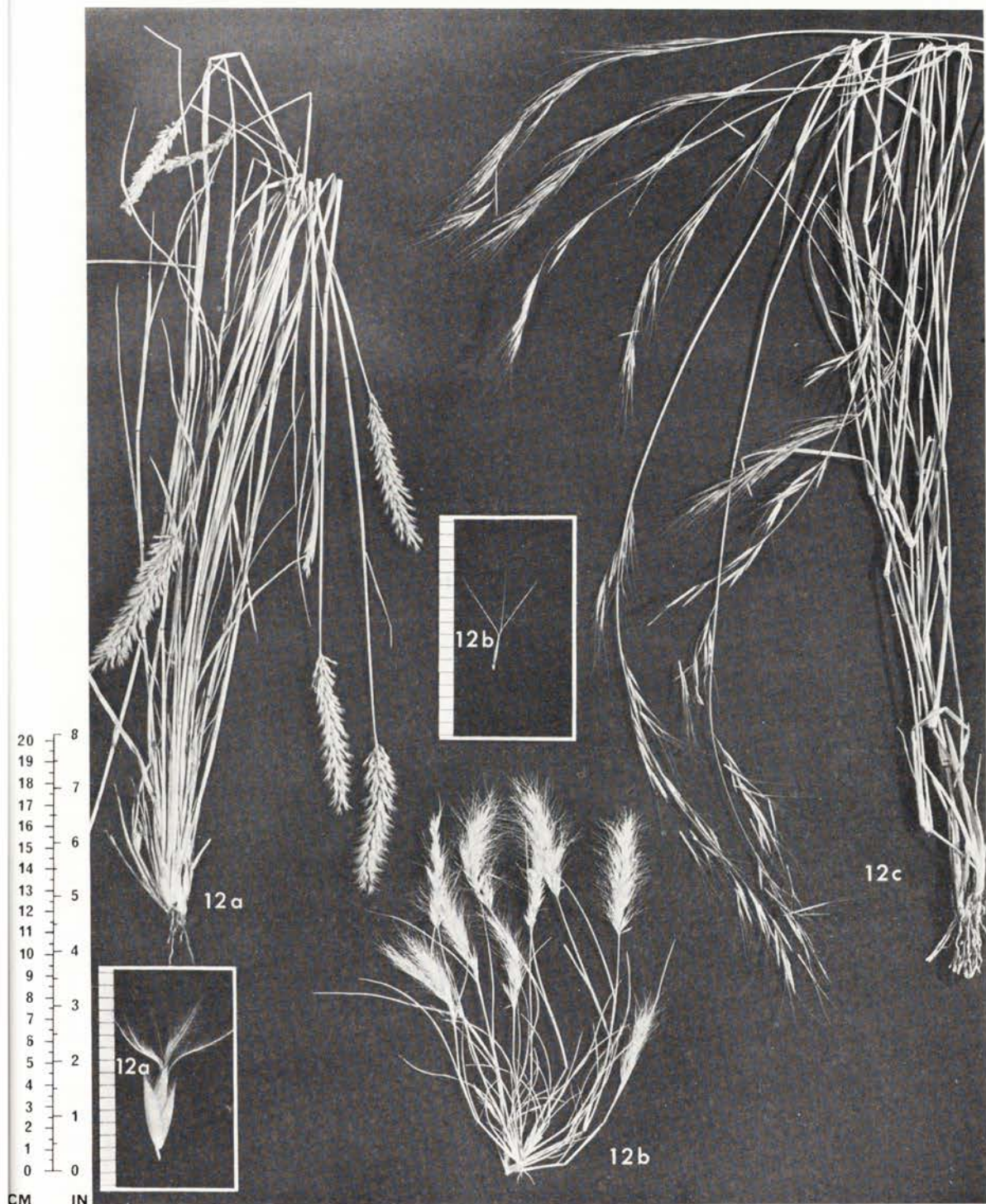


PLATE 12. (a) *Amphipogon caricinus*; (b) *Aristida anthoxanthoides*; (c) *Aristida biglandulosa*

by their characteristic spear-like seeds, which have a hairy, pointed base and terminate in 3 spreading awns. The kerosene grasses (Nos. 4, 6) are further distinguished by the presence of a column (formed by the spirally twisted bases of the awns) supporting the awns, and a joint (articulation) below the column at which the seed separates from the column and awns.

Generally the plants are long-lived perennials with wiry stems and narrow blades. As pasture they are among the least useful in the area, though the short-lived bunched kerosene grass (No. 6) is highly valued in most parts. They are essentially summer-growing, but with suitable rainfall the annual species persist for the greater part of the year.

GENERIC CHARACTERS

Spikelets pedicellate, 1-flowered; rhachilla disarticulate above the glumes. *Glumes* persistent or the lower deciduous, keeled, narrow, 1 (rarely 5)-nerved, subequal or unequal, sometimes inverse. *Lemma* terete, with convolute or involute margins, becoming indurated and rigid at maturity, with a bearded basal callus, terminated by a usually trifid awn with or without a spirally twisted column; the column continuous or articulate with the lemma. *Palea* very small, narrowly oblong, nerveless or sometimes 2-nerved. *Caryopsis* terete or cylindrical, tightly embraced by the lemma and palea. *Inflorescence* a terminal panicle, contracted or open.

KEY TO THE SPECIES

- A. Awns borne on a well-developed spirally twisted column.
 - B. Lemma not articulate with the column; column up to 6.5 mm long. 10. *A. latifolia*
 - B. Lemma articulate below the column; column 11–35 mm long.
 - C. Lemma 7.5–9.5 mm long (incl. callus of 2–2.5 mm). Spikelets usually pale. Culms and panicles stiffly erect. 4. *A. browniana*
 - C. Lemma 6–7 mm long (incl. callus of 2 mm). Spikelets usually purplish-black or brown. Culms ascending and panicles drooping. 6. *A. contorta*
- A. Awns continuous with the lemma, without a column.
 - D. Lemma with involute margins forming a furrow on the ventral surface.
 - E. Glumes inverse, i.e. the lower one either distinctly or slightly longer than the upper. 8. *A. inaequiglumis*
 - E. Glumes equal or subequal or the lower one shorter than the upper.
 - F. Lemmas 10–12 mm long. Glumes 12–16 mm long, at least the lower sub-3-nerved. Robust plant 90–135 cm high or more. 3. *A. biglandulosa*
 - F. Lemmas 4.75–7 mm long. Glumes 5–7 mm long, 1-nerved. Plant < 90 cm high.
 - G. Lemma 4.75–5.25 mm long (incl. callus), rather smooth. Panicle contracted (but not spiciform), 15–20 cm long; branches 4–10 cm long. 9. *A. jerichoensis*
 - G. Lemma 6–7 mm long (incl. callus), scabrous from the middle upwards. Panicle spiciform, 3–8.5 cm long; branches very short. 2. *A. anthoxanthoides*
 - D. Lemma tubulous, with convolute margins, not furrowed.
 - H. Panicle contracted but loose, broadly ovate in outline, 7–9 cm long and wide (incl. awns). 12. *A. obscura*

Description of the Species

- H. Panicle spiciform, linear, 13–30 cm long, 1.75–3.5 cm wide (incl. awns).
- I. Glumes scabrous or scaberulous all over. 7. *A. echinata*
- I. Glumes scabrous or scaberulous on the midnerve, otherwise smooth or almost so.
 - J. Panicle dense, 15–25 cm long and 2–3 cm wide (incl. awns). 13. *A. strigosa*
 - J. Panicle sparse, 6–19 cm long and 0.75–1.75 cm wide (incl. awns).
 - K. Culms simple or sparsely branched. Lemma stout, densely scabrous with spiny hairs from near the base upwards. Awns flat and broad.
..... 11. *A. nitidula*
 - K. Culms strongly branched. Lemma very slender, scabrous with small slender hairs towards the apex. Awns somewhat flattened only near the base, very slender. 5. *A. capillifolia*

2. Yellow Threeawn

Aristida anthoxanthoides

Plate 12b

GENERAL DESCRIPTION

HABIT: Slender, tufted, often bluish-green perennial, sometimes short-lived, 15–38 cm high.

STEMS: Erect or sharply bent at the lower nodes, simple or branched, hairless, almost smooth.

LEAVES: Strongly nerved. Sheaths shorter than their internodes. Blades 3.5–9 cm long, usually rolled and narrow, stiffly erect, tapered to a firm sharp point, usually hairless but bristly.

SEEDHEAD: Dense, spiciform, 3–8.5 cm long and up to 2.5 cm wide (incl. awns), mostly concealed by the numerous awns. With the falling of the florets, which ripen from the top of the panicle downwards, the head (consisting of the empty glumes) becomes much narrower (less than 1.5 cm wide). The common name refers to the pale yellow or straw colour that plants (particularly the glumes) attain at maturity.

OCCURRENCE: Confined to cracking clay soils and distributed mainly in the northern half of the area, where it occurs on Mitchell grass plains and floodplains; not common.

DISTRIBUTION: W.A., S.A., Q., N.S.W.

VALUE: More palatable than many threeawns and readily grazed when green.

BOTANIC DESCRIPTION

Panicle spiciform, linear or narrowly oblong, dense, 3–8.5 cm long, up to 2.5 cm wide (incl. awns), sometimes interrupted towards the base, with a scabrous axis; branches densely clustered, extremely short. *Spikelets* linear-lanceolate, crowded, subsessile. *Glumes* membranous, glabrous, slightly unequal, 1-nerved, the midnerve excurrent as a mucro; the lower one about 5 mm long, acute; upper about 7 mm long, obtuse. *Lemma*

furrowed by the involute margins, 6–7 mm long (incl. callus of 1 mm), scabrous from about the middle upwards. *Awns* equal, flattened but very narrow, slender, scaberulous, 10–14 mm long, at length divergent.

3. Two-gland Threeawn

Aristida biglandulosa

Plate 12c

GENERAL DESCRIPTION

HABIT: Coarse, long-lived perennial, usually 90–137 cm high but sometimes attaining 183 cm, forming stemmy tussocks; the butt thickened by numerous cataphylls.

STEMS: Stout, cane-like, \pm woody, smooth, much branched, distinctly bluish and powdery on the surface when young, often bent at the lower nodes. The lowest 1 or 2 internodes are deeply channelled and flattened or angled. The nodes are prominently thickened, often black or purple, and usually occur in pairs, particularly on the lower part of the plant.

LEAVES: Blades flat or rolled. With age the sheaths become hard, smooth, shiny, and loose.

SEEDHEAD: The hard, 3-awned, purple or mottled, spear-like florets are 10–12 mm long, with awns 25–35 mm long, and are borne in open panicles 15–30 cm long and 1–3 cm wide. The panicles have few spikelets and few, erect or slightly spreading branches widely spaced along the axis. The presence of 2 purple glands in the axils of the panicle-branches is characteristic.

OCCURRENCE: Two-gland threeawn is found mainly in the central part of the area, occurring most commonly on sandy soils on sand plains, river levees, drainage lines, and washaways, and sporadically on red earths under mulga. A common plant of disturbed areas, it is abundant along the Todd River and Stuart Highway.

DISTRIBUTION: Q.

VALUE: Probably grazed when young or under adverse conditions, but like many of the threeawns it is virtually worthless because of its wiry stems, unpalatable foliage, hard spear-like seeds, and general coarseness.

BOTANIC DESCRIPTION

Panicle 15–30 cm long, < 3 cm wide, rather sparse, sometimes interrupted in the lower part; branches erect, distant, flattened or triquetrous, scabrous on the angles, 3–8 cm long, usually with 2 often dark pulvini in the axils; pedicels unequal. *Glumes* membranous, subequal, 12–16 mm long, glabrous, smooth, acuminate, with a scaberulous midnerve produced into a mucro; the lower or both glumes in the lower part with 2 (rarely more) faint lateral nerves closely approximated to the midnerve. *Lemma* 10–12 mm long (incl. callus of 1.5 mm), with involute margins and a deep ventral furrow, glabrous, scaberulous, sometimes scabrous in the furrow, often mottled purple and grey. *Awns* without a column, \pm flat, densely scabrous on the midnerve and margins, erect or spreading but not widely so; median 30–35 mm long; laterals 25–30 mm long.

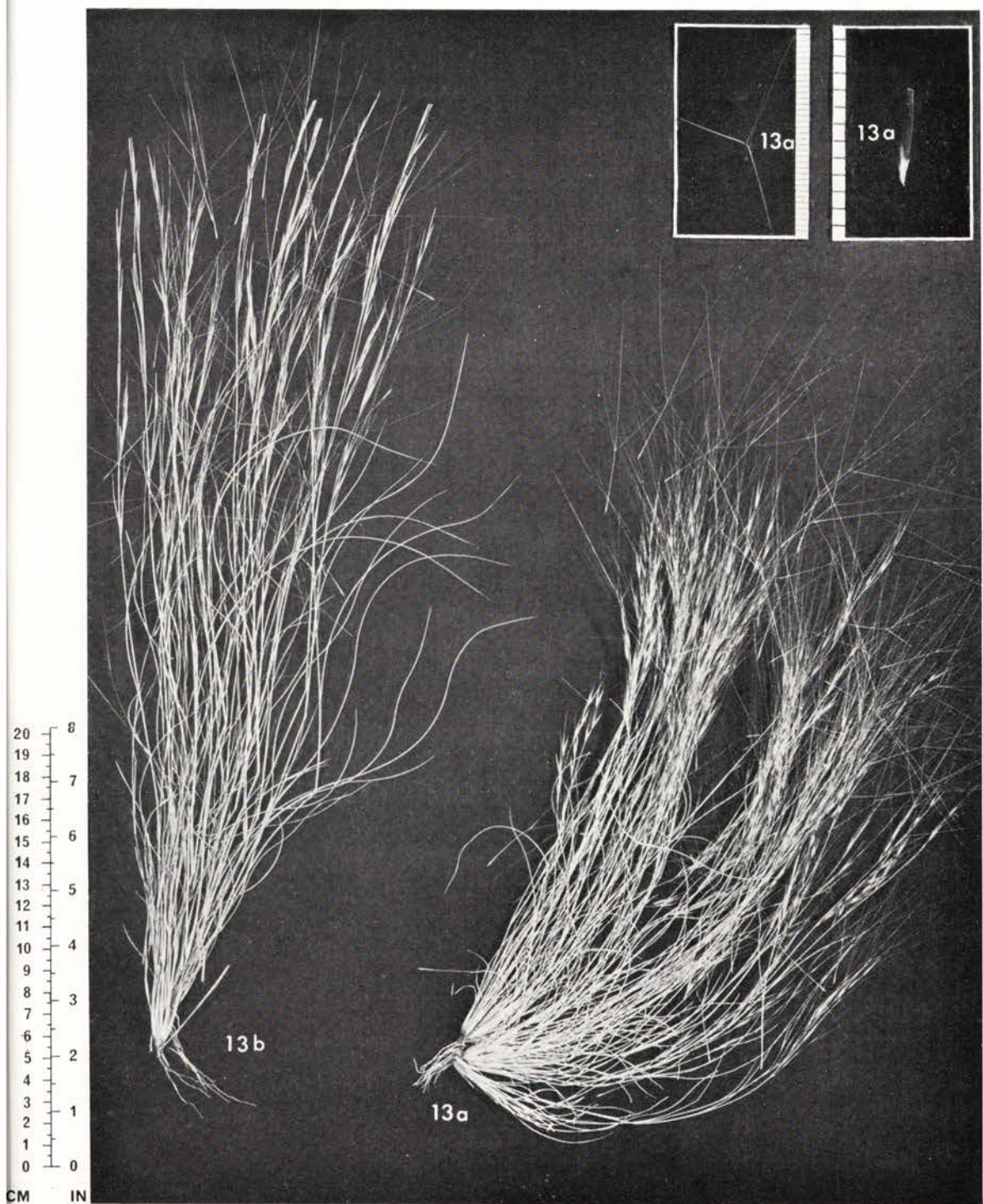


PLATE 13. (a) *Aristida contorta*; (b) *Aristida browniana*

4. Erect Kerosene Grass
(white grass)

Aristida browniana
Plate 13b

GENERAL DESCRIPTION

This species closely resembles bunched kerosene grass (No. 6), but differs in habit. It is usually taller (30–60 cm high), with stiffly erect (not drooping) stems and panicles, and a loosely tufted spreading (not compact) habit. Also (as the local name infers), the panicles are straw-coloured (not purplish) and the florets are pale with slightly darker, mottled or striped markings, unlike those of bunched kerosene grass which are purplish-black at first, and ripen brown.

OCCURRENCE: Equally as widespread as bunched kerosene grass and generally growing with it, but less common. White grass attains only local dominance or is sometimes predominant over fairly large areas of coarse sandy soils on river banks, frontages, floodouts, and sand dunes.

DISTRIBUTION: M. (excl. V.).

VALUE: This species appears to lack the forage value of bunched kerosene grass, although so closely related. Except when young, it is normally neglected by stock.

BOTANIC DESCRIPTION

Close affinities with *Aristida contorta*, but differing in its erect loosely tufted habit, paler spikelets, and longer lemmas, which are 7.5–9.5 mm long (incl. callus of 2–2.5 mm).

5. Needle-leaved Threeawn

Aristida capillifolia
Plate 14a

GENERAL DESCRIPTION

HABIT: Slender semi-erect perennial, forming dense stemmy tussocks 45–76 cm high, often producing long runners bearing erect flowering culms from the nodes.

STEMS: Very thin and wiry, bent and strongly branched at most nodes, flattened particularly in the lower part of the plant; the runners often curved.

LEAVES: Blades tightly rolled, narrowly terete and needle-like, stiffly erect or slightly curved, more slender than the stems. Sheaths narrow, tightly enclosing the internodes.

SEEDHEAD: Panicle 6–13.5 cm long, up to 12 mm wide, with few short branches and few spikelets. The florets are 7–10 mm long, very slender, with fine often curved awns somewhat longer than the floret itself.

OCCURRENCE: On mountains and hills; confined to rocky rather favoured sites such as drainage gullies and rock-pools. The species is known from only a few localities.

DISTRIBUTION: W.A., N.T., S.A.

VALUE: Because of its low palatability and sparse, erratic occurrence in sites largely inaccessible to stock, this grass is virtually worthless as fodder.

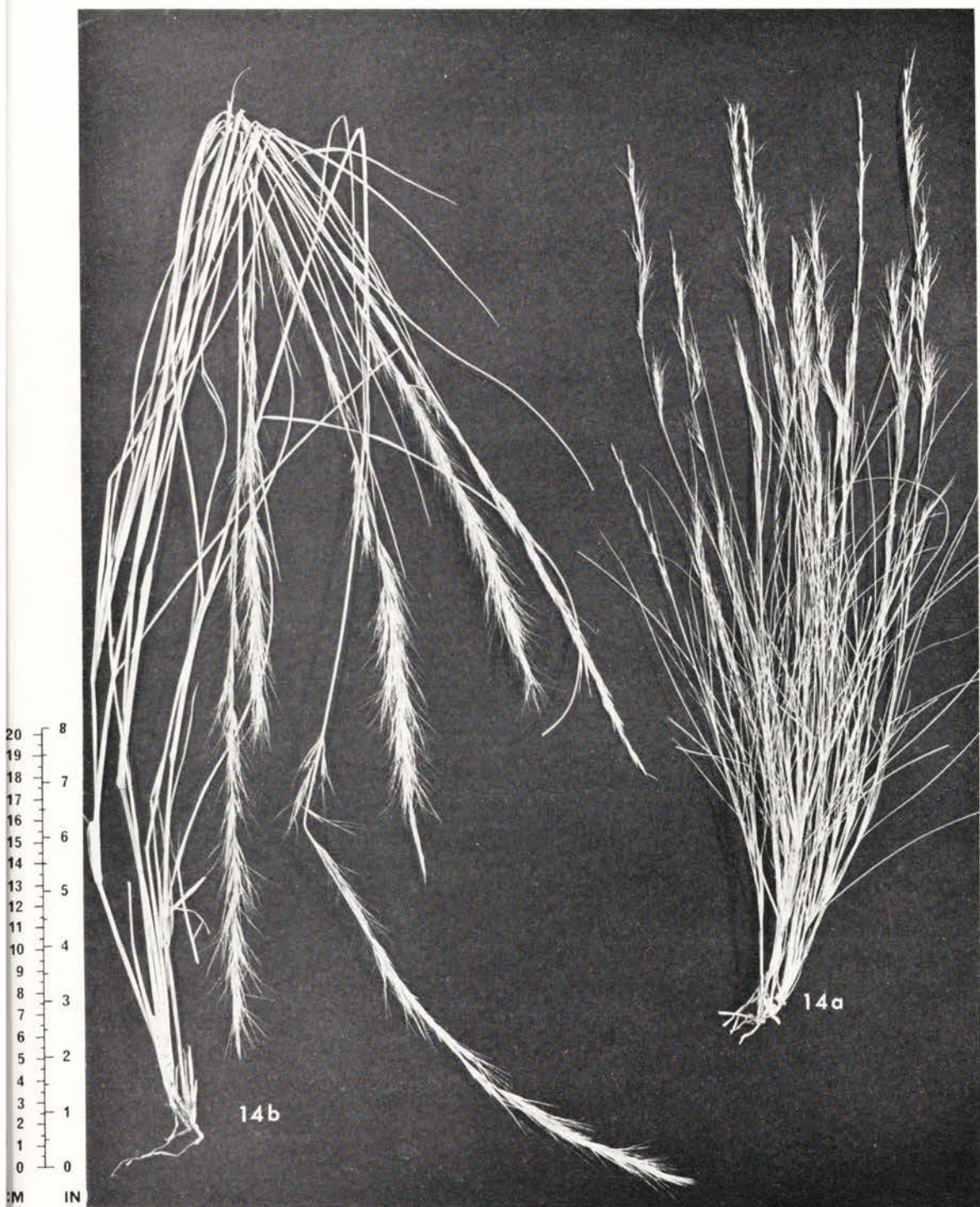


PLATE 14. (a) *Aristida capillifolia*; (b) *Aristida echinata*

BOTANIC DESCRIPTION

Panicle 6–10 (rarely –13.5) cm long, 0.75 cm wide, linear, sparse, prominently exserted, sometimes interrupted in the lower part; branches < 1.5 cm long. *Glumes* subequal or slightly inverse, thinly membranous, 1-nerved, scabrous on the nerve, smooth on the surface; lower 7.5–11.5 mm long, long-acuminate or mucronate; upper 7–9 mm long, mucronate. *Lemma* 7–10 mm long (incl. callus of 0.75 mm), tubulous with convolute margins, very narrow, with short slender hairs towards the apex. *Awns* very slender, scabrous, erect or recurved; median 8.5–15 mm long; laterals slightly shorter.

6. Bunched Kerosene Grass

(wind grass)

Aristida contorta

Plate 13a

GENERAL DESCRIPTION

HABIT: Semi-erect drooping annual or short-lived perennial, forming compact rounded tufts, up to 30 cm high but usually much shorter.

STEMS: Numerous, weak, branched, often curved to the ground.

LEAVES: Blades narrowly rolled, tending to curl on drying.

SEEDHEAD: Plants in flower have a characteristic drooping appearance from the production of numerous, purplish panicles on the upper half of the plant. The spear-like florets are purplish-black to dark brown, with 3 slender awns 3.5–7 cm long. The 3 awns are supported by a prominent, twisted column, which is 11–35 mm long and jointed at its base to the top of the seed. With handling the seed readily breaks at the joint, separating from the column and awns, and is then particularly difficult to remove from clothing, hair, or wool. On ripening the seeds with their awns readily fall from the plant and often collect on the ground in tangled masses.

The species is sometimes called wind grass, due to its characteristic behaviour of swaying or waving in the breeze.

OCCURRENCE: A characteristic grass of the drier parts of Australia, common and widespread in central Australia; though predominant on alluvial, red earth, and sandy soils, it is tolerant to a wide range of environments and absent from only cracking clay soils. In association with leafy nineawn, it dominates grasslands and parklands comprising other low, short-lived grasses and forbs. These communities are particularly extensive on floodplains, river frontages, and sand plains. Associated trees and shrubs include mulga, ironwood, corkwood, witchetty bush, gidgee, and coolibah.

DISTRIBUTION: M.

VALUE: Generally regarded as useful pasture at all stages of growth. It is most valuable when young, and in some areas pastures dominated by bunched kerosene grass are sufficiently nutritious for fattening stock for short periods. On ripening the spear-like florets, which are produced in abundance, harden and can under certain conditions be harmful to grazing animals. However, they are also known to be grazed after having fallen to the ground.

BOTANIC DESCRIPTION

Panicle erect or drooping, short, narrow, with few branches. *Glumes* membranous, 1-nerved, smooth or scaberulous, purplish, drying straw-coloured, very unequal; lower 10–13 mm long, acuminate or mucronate; upper 22–27 mm long, usually mucronate, convolute towards the apex. *Lemma* 6–7 mm long (incl. curved callus of 2 mm), convolute, articulate with its column, scaberulous near the articulation; column well-developed, twisted, scaberulous, 11–35 mm long. *Awns* subequal, slender, scabrous, $3\frac{1}{2}$ –7 cm long, stiff, spreading or at length divaricate.

7. Prickly Threeawn

Aristida echinata

Plate 14b

GENERAL DESCRIPTION

HABIT: Coarse long-lived perennial, forming dense tussocks, 61–106 cm high. Young plants can be bluish-green and rough from a dense cover of short, bristly hairs, which tend to wear off with age.

STEMS: Numerous, thick, hard, branched, mostly covered by the sheaths, usually bent at the lower nodes; nodes thick, prominent, the lower ones usually in pairs.

LEAVES: Blades up to 30 cm long, broad, flat or rolled. Sheaths long, papery.

SEEDHEAD: Panicle commonly 30 cm long, spiciform, dense, coarse, continuous or sometimes the lower 2 or 3 panicle-branches short and widely spaced on the axis. Spikelet covered by bristly hairs; the floret 10–11.5 mm long, with flat, erect or spreading awns 16–18.5 mm long.

OCCURRENCE: Prickly threeawn is a hardy, vigorous plant known to colonise disturbed areas and abundant along parts of the Stuart Highway. It occurs mainly on red earth soils under mulga, or on shallow, skeletal soils of slopes and low hills with leafy nineawn and other short grasses under sparse shrubs and low trees. Its known distribution in central Australia extends from Hermannsburg northeast to the Queensland border.

DISTRIBUTION: Q., N.S.W.

VALUE: Neglected by stock and potentially a troublesome grass of degraded pasture.

BOTANIC DESCRIPTION

Panicle linear, dense, sometimes interrupted towards the base, 14–30 cm long, 2–3.5 cm wide (incl. awns); axis glabrous, scabrous, stout, cylindrical, becoming compressed upwards; branches and pedicels glabrous but scabrous, the branches short. *Glumes* firmly membranous, 1-nerved, glabrous, scabrous or scaberulous all over, slightly unequal, subobtuse or emarginate, shortly aristate; lower 5.5–9.25 mm long, linear-lanceolate; upper 9–11 mm long, narrower. *Lemma* 9.75–11.5 mm long (incl. callus), 0.5–0.75 mm wide, tubulous, narrowed upwards, prickly upwards with spiny hairs; callus 1.25 mm long, densely bearded with long white hairs. *Awns* subequal, 16–18.5 mm long, scabrous, flat, erect or spreading, without a column.

8. Unequal Threeawn

Aristida inaequiglumis

Plate 15a

GENERAL DESCRIPTION

HABIT: Robust long-lived perennial, 45–90 cm high, forming dense leafy tussocks.

STEMS: Erect, hairless, smooth, thick and hard, rounded, simple or slightly branched, 4–5-noded; nodes sometimes swollen and prominent.

LEAVES: Usually shiny green. Sheaths smooth, longer than the internodes, becoming loose. Blades long, prominently nerved, rough with sharp edges, often narrowly rolled when green, becoming flat and curly or twisted with age.

SEEDHEAD: Panicle up to 60 cm long, narrow, terminating a long peduncle and prominent, either rather dense and continuous or loose and interrupted; panicle-branches up to 14 cm long, slender, scattered on the axis and often widely spaced in the lower part of the panicle, either erect and appressed to the axis or spreading and drooping. The floret is 5–8 mm long, with the characteristic spear-like base and 3 terminal awns of the group. Unlike the kerosene grasses (Nos. 4, 6), there is not a spirally twisted column or joint at which the seed and awns separate. The common name refers to the 2 outer glumes of the spikelet, which are distinctly unequal in length.

OCCURRENCE: Distributed mainly in the northern half of the area, extending south to Angas Downs, but becoming less common south of the Macdonnell Ranges. It is most often associated with short annual grasses and forbs on alluvial soils, with mulga on red earths, and with hard spinifex on sandy soils. It occurs also under coolibah and corkwood on floodplains, under ghost gum and bloodwood on river frontages and levees, and with snappy gum and gummy spinifex on gentle slopes. It is known to be a particularly vigorous plant, likely to invade disturbed or degraded communities.

DISTRIBUTION: W.A., N.T., Q.

VALUE: This grass is among the least useful in the area. Though ample foliage is produced, it is almost completely ignored by stock.

BOTANIC DESCRIPTION

Panicle prominently exerted, < 60 cm long, contracted, loose or rather dense, continuous or interrupted in the lower part; axis terete and smooth or angular and scaberulous upwards; branches slender, scaberulous, usually binate, distant, erect and loosely appressed or slightly spreading, sessile or naked towards the base, the lower ones < 14 cm long. *Glumes* thinly membranous, acute, shortly awned, 1-nerved; lower smooth or scaberulous on the keel upwards, 15–16 mm long; upper smooth, 8–10 mm long or sometimes slightly longer. *Lemma* glabrous, punctulate, deeply furrowed by the involute margins, with spiny hairs in the furrow, scarcely narrowed upwards, 5–8 mm long; callus about 1 mm long, acute, densely bearded. *Awns* erect or slightly divergent, 35–40 mm long or the median < 50 mm.

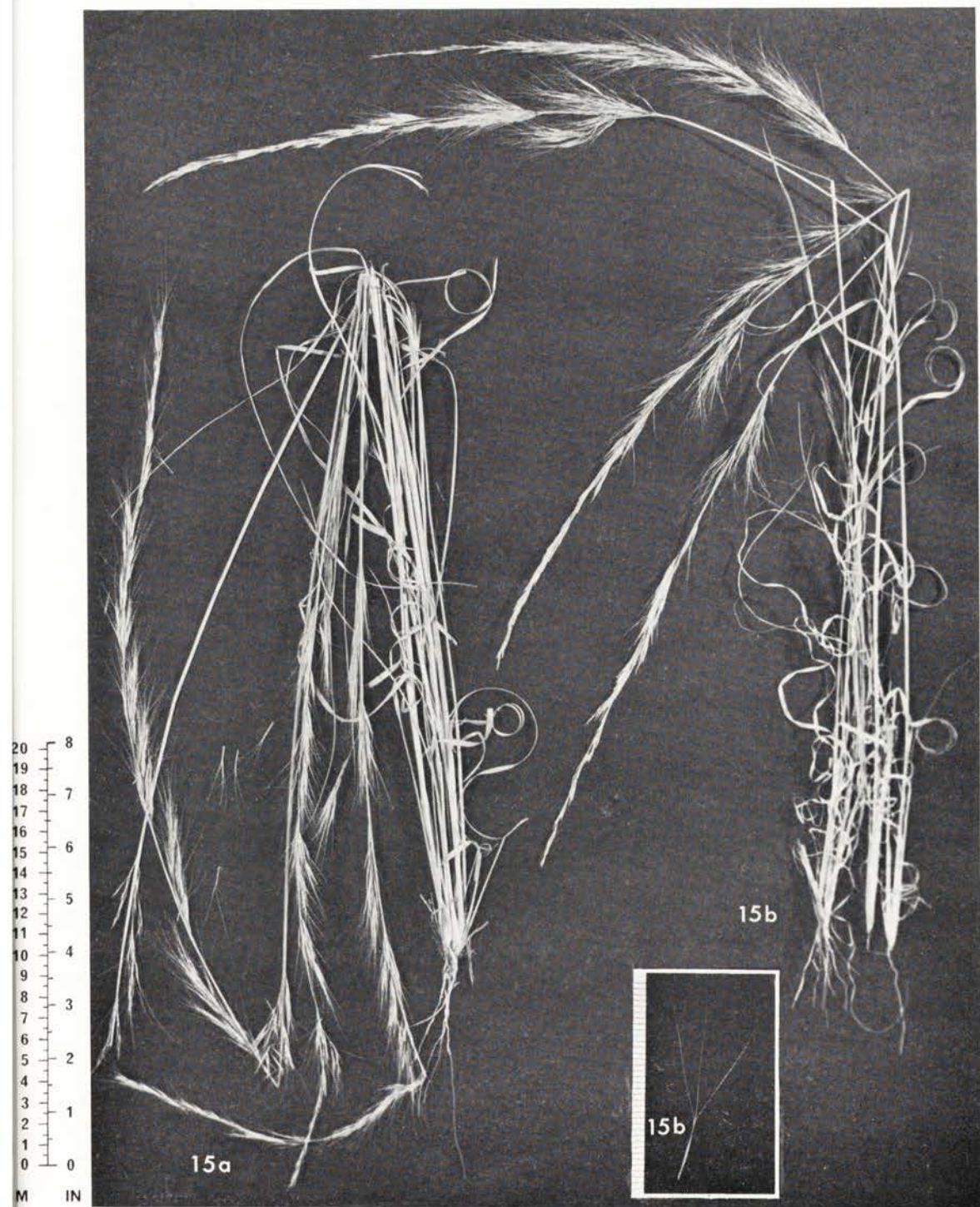


PLATE 15. (a) *Aristida inaequiglumis*; (b) *Aristida latifolia*

9. Jericho Threeawn

Aristida jerichoensis
Plate 16a

GENERAL DESCRIPTION

HABIT: Densely tufted slender often bluish-green perennial, 60–90 cm high, leafy near the base.

STEMS: Erect, simple or sometimes branched from the lower nodes, hairless, \pm smooth, terete, few-noded, many-nerved, sometimes powdery on the surface, often thin and spindly.

LEAVES: Sheaths shorter than the internodes, tight, faintly nerved, pilose at the mouth, otherwise hairless. Blades 10–25 cm long, rolled or sometimes flattened near the sheath, gradually tapered to a long hair-like point, strongly nerved, bristly on the upper surface, \pm hairless on the lower surface, becoming curly and twisted with age.

SEEDHEAD: Panicle 15–20 cm long, narrow, rather dense, overtopping the uppermost leaves; panicle-branches solitary or in pairs, erect and appressed to the axis, up to 10 cm long in the lower part of the panicle, reducing to about 4 cm in the upper part. Borne on thin stalks on the panicle-branches are the crowded, yellowish or purple-brown spikelets, each one containing one floret. The floret is about 5 mm long, with a short, densely hairy, basal spear and 3 spreading, terminal awns 11–16 mm long.

OCCURRENCE: Known from only isolated occurrences in the northern half of the area on shallow, calcareous soils and sandy red earths in association with mulga and gidgee.

DISTRIBUTION: N.T., Q., N.S.W.

VALUE: Moderately palatable.

BOTANIC DESCRIPTION

Panicle exerted, contracted, fairly dense, continuous or \pm interrupted in the lower part, 15–20 cm long; axis glabrous and compressed or terete in the lower part, angular and scaberulous upwards; branches paired or solitary, erect and appressed, mostly 4–6 (–10) cm long. *Spikelets* densely crowded, shortly pedicellate; pedicels scaberulous, widened at the apex. *Glumes* slightly unequal, 1-nerved, acuminate and shortly awned; lower 6–6.5 mm long, scabrous on the keel; upper 6–8 mm long, smooth. *Lemma* 4.75–5.25 mm long (incl. densely long-bearded callus of 1 mm), sub-3-nerved, \pm keeled on the back, \pm smooth, furrowed by the involute margins. *Awns* flat at the base, capillary upwards, scabrid, erect or slightly spreading, subequal, 11–16 mm long. *Palea* minute.

10. Feathertop Wire Grass

Aristida latifolia
Plate 15b

GENERAL DESCRIPTION

HABIT: Tussock-forming perennial, variable in habit, but usually slender, erect, and about 60 cm high.

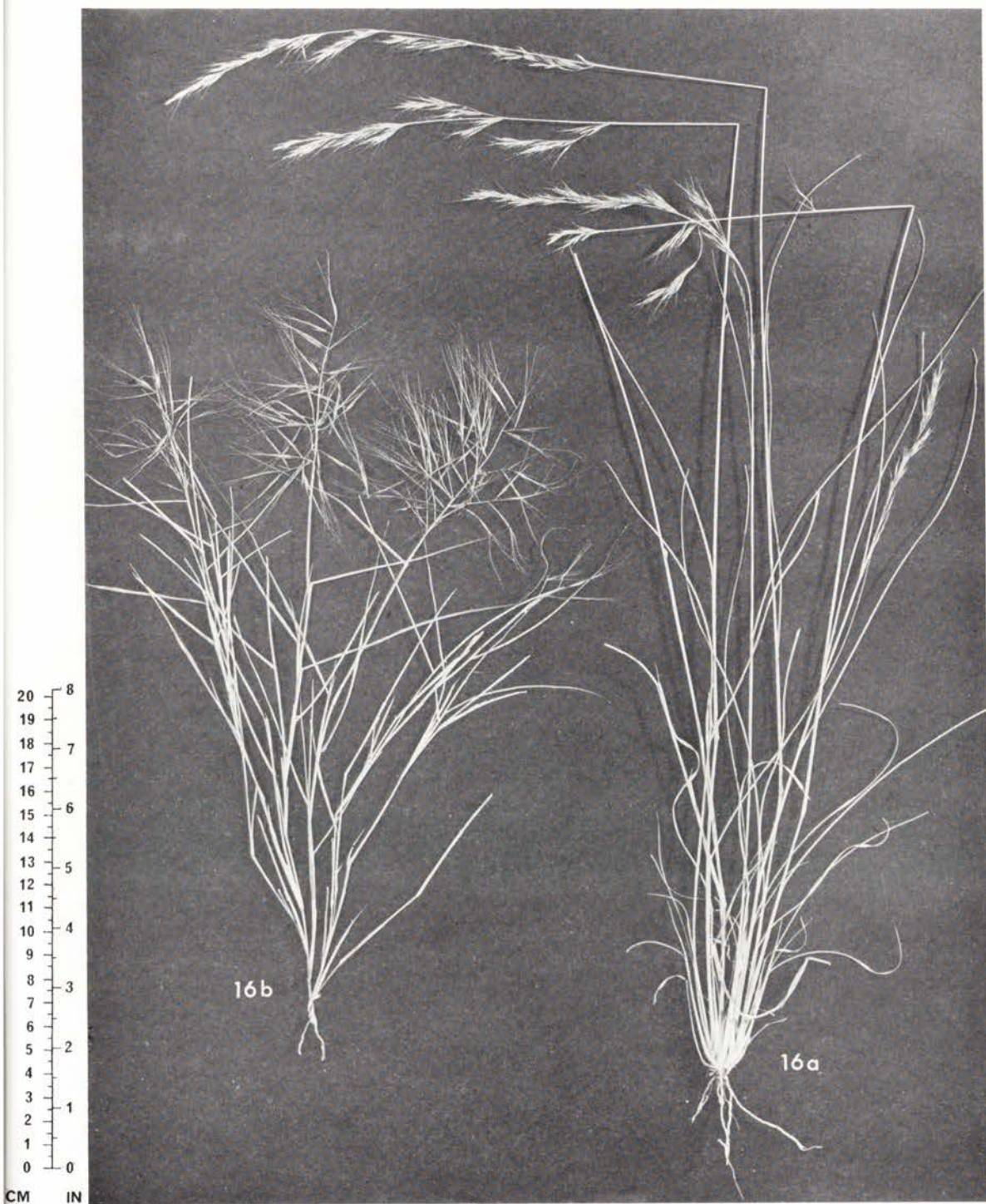


PLATE 16. (a) *Aristida jerichoensis*; (b) *Aristida obscura*

STEMS: Mostly unbranched, almost wholly covered by tight sheaths.

LEAVES: Old leaves flat, curly or twisted, forming entangled masses. Sheaths and blades deeply nerved, largely hairless, slightly rough.

SEEDHEAD: Panicle up to 45 cm long and 3.5 cm wide (incl. awns), dense, feathery from numerous fine awns, ripening from the apex downwards; the lower panicle-branches 2.5–6 cm long, distant, slightly spreading; the upper ones shorter, closer, more erect. The seed is about 6 mm long, the awns 15–35 mm, and the (spirally twisted) column rarely longer than 6 mm though variable. Unlike the kerosene grasses (Nos. 4, 6), there is not a joint below the column at which the awns separate from the seed.

OCCURRENCE: Unlike the majority of threeawns, feathertop occurs on, and is largely confined to, cracking clay soils. It is almost always associated with barley Mitchell and neverfail grasslands or gidgee. Less commonly it occurs in saltbush-bluebush country (mainly in gilgais) and on river floodplains on alluvial soils with short grasses and forbs.

DISTRIBUTION: M. (excl. V.).

VALUE: Though usually less coarse than many perennial threeawns, feathertop is generally ignored in favour of more palatable grasses with which it is commonly associated.

BOTANIC DESCRIPTION

Panicle narrow, < 45 cm long, sometimes interrupted towards the base; axis, branches, and pedicels scabrous; branches usually 4 cm long, becoming shorter upwards, erect or the lower ones slightly spreading. *Glumes* subequal, thinly membranous, prominently 1-nerved, glabrous, scaberulous, acuminate, shortly aristate; lower scabrous on the nerve, 10–11 mm long; upper slightly longer. *Lemma* narrowly tubulous with convolute margins, scabrous towards the apex, 5.5–7 mm long (incl. callus), continuous with the spirally-twisted column and awns; callus about 1 mm long, silky-villous; column scabrous, varying from 1 or 2 weak twists to many, < 6.5 mm long. *Awns* subequal, scabrous, usually slender, flat, 15–35 mm long, finally divaricate.

11. Flat-awned Threeawn

Aristida nitidula

Plate 17a

GENERAL DESCRIPTION

HABIT: Slender leafy sometimes bluish-green perennial, forming compact tufts up to 45 cm high.

STEMS: Rigidly erect, mostly unbranched, hairless, thin, covered by tight sheaths, 3–6-noded.

LEAVES: Hairless, sometimes rough from numerous minute bristles. Ligule of short silky hairs. Blades 7.5–12.5 cm long, stiff, needle-like.

SEEDHEAD: Panicle 13–22 cm long and 6–17.5 mm wide (incl. awns), spiciform, terminal on the culms and prominent, with slender simple short branches appressed

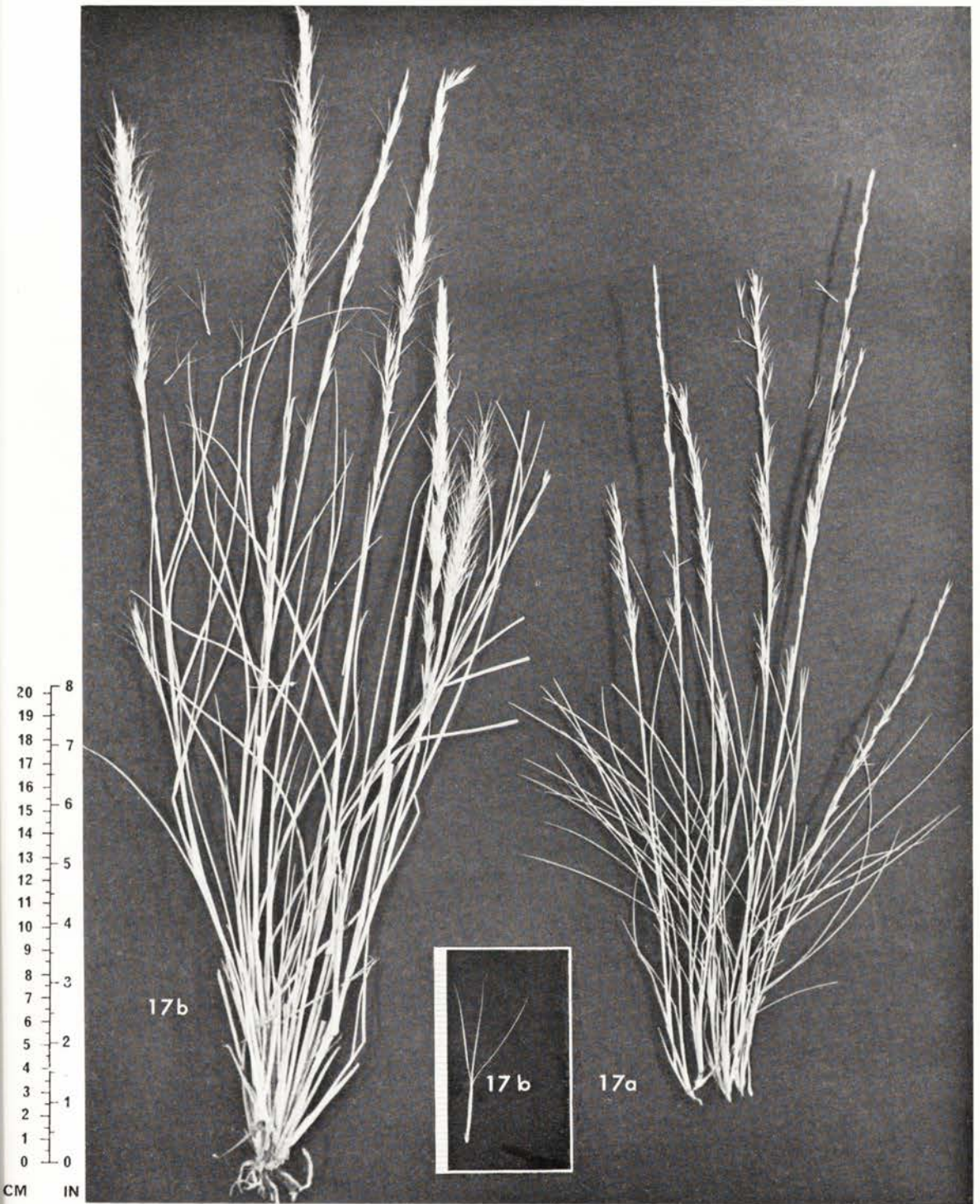


PLATE 17. (a) *Aristida nitidula*; (b) *Aristida strigosa*

to the axis. Floret 6 mm long or somewhat more (incl. the hairy basal spear), narrow, covered by short spiny hairs, with flat broad awns as long as the floret itself or up to twice as long. There is not a joint or spirally twisted column between the awns and floret.

OCCURRENCE: A plant of rough country, distributed throughout the area, and occurring sporadically in isolated tussocks or small patches on steep rocky hillslopes, often in crevices. It can be associated with witchetty bush and other shrubs or low trees, or with mountain wanderrie, spinifex, and short grasses and forbs.

DISTRIBUTION: W.A., S.A., Q.

VALUE: Not palatable and usually growing in sites inaccessible to stock.

BOTANIC DESCRIPTION

Panicle linear, sparse, prominently exerted, 13–22 cm long, 6–17.5 mm wide (incl. awns); axis, branches, and pedicels glabrous, scabrous, angled or flattened; branches < 2.5 cm long, usually simple. *Glumes* thinly membranous, 1-nerved, glabrous, subequal, mucronate, scaberulous on the nerve, otherwise smooth; lower acute, linear-lanceolate, 7–10 mm long; upper linear, subobtuse, usually slightly longer. *Lemma* stout, narrowly linear, keeled on the back, scarcely or not narrowed upwards, tubulous with convolute margins, 3-nerved, densely scabrous from below the middle upwards with thick conical white or hyaline spiny hairs, 6–9 mm long (incl. callus), continuous with the awns; callus about 1 mm long. *Awns* subequal, flat and broad, scabrous, stiff, 9–17 mm long, erect to slightly recurved.

12. Brush Threeawn

Aristida obscura

Plate 16b

GENERAL DESCRIPTION

HABIT: Tussock-forming perennial, usually less than 30 cm high; tussocks semi-erect or sprawling, narrow near the base and spreading upwards.

STEMS: Erect or often bent, wiry, sometimes flattened, densely hairy, strongly branched; nodes prominently thickened and ring-like.

LEAVES: Usually with short bristles on the surface and a dense tuft of long fine soft silvery hairs near the mouth of the sheath. Blades rolled or sometimes flattened, stiffly pointed, with thickened edges. Sheaths tight, slightly shorter than the internodes.

SEEDHEAD: Panicle mostly 7–9 cm long and almost as wide, open, brush-like, usually purplish when young, shortly exceeding the uppermost leaves or sometimes shorter. The relatively few widely scattered spikelets are borne on long stalks on the panicle-branches. The floret is 11.5–14.5 mm long, thin, bristly, with 3 slender awns about 3 cm long, which are first erect and clustered, but opened at maturity.

OCCURRENCE: Brush threeawn occurs occasionally in the northern half of the area in fairly dense stands under mulga on red earth soils.

DISTRIBUTION: W.A., Q., N.S.W.

VALUE: Known to be well grazed, but sparse.

BOTANIC DESCRIPTION

Panicle 7-9 cm long and wide (incl. awns), contracted but loose, broadly ovate, shortly exserted; peduncle strongly flattened; common axis and branches compressed or angled, densely scabrous; branches divaricate, bi-tri-partite, with gland-like pulvini in the axils. *Spikelets* few, distant, prominently and unequally pedicellate; pedicels 1.5-5.5 mm long, compressed or angled, scabrous. *Glumes* thinly membranous, 1-nerved, acute, aristulate, unequal; lower 8.5-10 mm long, scabrous on the nerve, scaberulous on the surface; upper 13.5-16.5 mm long, rather smooth. *Lemma* 11.5-14.5 mm long (incl. callus), 0.25-0.5 mm wide, tubulous with convolute margins, linear-oblong, densely scabrous; callus 1.5-1.75 mm long, densely bearded. *Awns* 2.9-3.9 cm long, subequal, scabrous, without a column.

13. Rough Threeawn

Aristida strigosa

Plate 17b

GENERAL DESCRIPTION

HABIT: Fairly coarse perennial, 45-90 cm high, forming rather straggly tussocks.

STEMS: Usually branched and bent at the thickened nodes, particularly in the lower part of the plant.

LEAVES: Blades up to 20 cm long, flattened with inrolled edges. Sheaths fairly loose, slightly shorter than the internodes.

SEEDHEAD: Panicle spiciform, dense, up to 3 cm wide (incl. awns), shortly overtopping the uppermost leaves.

This plant resembles flat-awned threeawn (No. 11), but differs by its taller straggly tussocks, coarser branched, bent, partly uncovered stems, and longer flattened blades. Also the panicles are broader, denser, and only shortly exserted, and the florets and awns are slightly longer and narrower.

OCCURRENCE: Similar in distribution to flat-awned threeawn, but usually more common on low rocky hills and plateaux rather than rugged country. The plant grows on shallow soils, often in erosion gullies and similar habitats, sometimes densely enough to be locally dominant.

DISTRIBUTION: W.A., S.A., Q.

VALUE: Not grazed.

BOTANIC DESCRIPTION

Panicle linear, exserted, dense, 15-25 cm long, 2-3 cm wide (incl. awns); axis, branches, and pedicels glabrous, scabrous. *Glumes* firmly membranous, glabrous, mostly smooth, 1-nerved, lanceolate, mucronate to aristulate, 6-8.5 mm long, subequal but the upper < 1.5 mm longer. *Lemma* tubulous with convolute margins, linear-lanceolate, 7-11 mm long (incl. callus), 0.5-0.6 mm wide, hispid on the upper part with appressed tubercle-based hairs; callus 1-1.25 mm long. *Awns* scabrous, slender, obliquely spreading, flattened towards the base, subequal, 12.5-15 mm long, without a column.

14-16. Mitchell Grasses

Astrebla spp.

Three species of this widely known group occur in central Australia. They are rather coarse, tussock-forming, long-lived perennials of medium height, highly valued for their high fodder production, persistence under adverse conditions such as drought and heavy stocking, and rapid response to adequate rainfall. The genus as a whole characterises extensive areas of cracking clay plains in tropical and subtropical parts of Australia, but the central Australian representatives are restricted to small areas of fine-textured soils mainly in the northern half of the area.

Mitchell grasses are best recognised by their distinctive inflorescence of a spiciform usually solitary raceme terminating the culms. The raceme may be short and dense as in barley Mitchell or elongated with few spikelets. The spikelets are flattened or somewhat terete, sessile, and arranged in two rows along one side of the rhachis. Each spikelet consists of two outer glumes partly enclosing a number of closely overlapping florets, of which only the lemmas are readily visible. These are distinctive. The lower part of the lemma is densely hairy and the apex is divided into three lobes, which may terminate in a long, stiff bristle. On ripening, the florets of each spikelet fall as a group, while the glumes usually remain attached to the rhachis.

GENERIC CHARACTERS

Spikelets laterally compressed to almost terete, sessile or subsessile, alternately biseriate and secund, generally loosely to densely imbricate on the continuous tough triquetrous rhachis of solitary or paired terminal spikes or spiciform racemes; rhachilla disarticulate above the glumes, not between the lemmas. *Florets* 2-9, the lower 2-4 perfect, the upper sterile and reduced. *Glumes* slightly unequal, keeled, subpersistent, glabrous, firmly membranous to chartaceous; lower 2-9-nerved; upper 7-13-nerved. *Lemmas* usually deeply 3-lobed, coriaceous, dorsally rounded, silky-villous at the base; middle lobe tapered from a broad base into a tough bristle; lateral lobes similar to the middle lobe or wider and flattened, 1-5-nerved. *Paleas* acuminate, dorsally compressed, 2-keeled, firmly membranous to chartaceous, the keels ciliate. *Caryopsis* dorsally compressed, loosely enclosed in the hardened lemma and palea.

KEY TO THE SPECIES

- A. Spike-like racemes slender, often curved, 12-38 cm or more long, 2-3 mm wide. Spikelets 2-3 mm wide, 2-4-flowered, \pm terete, distant in the lower part of the raceme, the upper ones loosely imbricate by up to half their length; internodes of the rhachilla 2-4 mm long. 14. *A. elymoides*
- A. Spike-like racemes rather stout, erect, 4-30 cm long, 8-20 mm wide. Spikelets 3-8 mm wide (excl. bristles), 3-9-flowered, laterally compressed, densely imbricate or sometimes distant in the lower part of the raceme. Internodes of the rhachilla < 1 mm long.
- B. Racemes 4-13 cm long, 1-2 cm wide. Spikelets densely imbricate. Lower glume 5-9-nerved. Lateral lobes of lemmas prominent, chartaceous with broad scarious margins. 16. *A. pectinata*



PLATE 18. (a) *Astrebla elymoides*; (b) *Astrebla lappacea*; (c) *Astrebla pectinata*

- B. Racemes 5–30 cm long, 0.5–1 cm wide. Spikelets loosely to rather densely imbricate or the lower ones distant. Lower glume usually 1–3-nerved. Lateral lobes of lemmas firmly chartaceous to coriaceous. 15. *A. lappacea*

14. Hoop Mitchell Grass

Astrebula elymoides

(weeping Mitchell)

Plate 18a

(slender Mitchell)

GENERAL DESCRIPTION

HABIT: Tussocks 60–90 cm high, erect, with thickened hairless butt. The flowering stems are usually much longer and characteristically recurve or droop to the ground. They may grow to several feet in length and sometimes accumulate in masses about the plant.

STEMS: Erect or somewhat bent at the lower nodes, usually branched, bluish-green, mostly hairless, often flattened, with up to 5 hairless nodes; flowering culms slender, weak, smooth.

LEAVES: Sheaths rather long, tight, hairless, smooth, deeply nerved, bluish-green; the basal ones somewhat flattened. Blades up to 25 cm long, rather narrow, flat, hairless, erect or spreading, tapered to a long fine point, usually bristly and rough on the edges and upper surface, but smooth on the lower surface, on drying sometimes becoming rolled and very narrow.

SEEDHEAD: Raceme usually 12–38 cm long, extremely narrow, spiciform, slender, straight or curved, at maturity extended far beyond the uppermost leaf; spikelets solitary, on extremely short thick stalks, tightly appressed to the rachis, widely spaced in the lower part of the raceme, in the upper part usually overlapping by about half their length. Each spikelet is 11–18 mm long, very slender, \pm terete, hairless, smooth, with 1–2 fertile florets and 1–3 sterile ones.

OCCURRENCE: In central Australia, hoop Mitchell occurs north of the Macdonnell Ranges on cracking clay soils and on some fine-textured, alluvial soils. It grows with barley Mitchell, neverfail, and to a lesser extent with gidgee.

DISTRIBUTION: W.A., N.T., Q., N.S.W.

VALUE: Plants produce leafy tussocks that are moderately palatable when young. On maturity the foliage becomes rather coarse and the long flowering culms, which are produced in abundance, are not normally grazed. In general the species is considered less valuable than barley Mitchell grass.

BOTANIC DESCRIPTION

Racemes very slender, becoming long exserted, 12–38 cm long, 3 mm wide; pedicels very stout, < 1 mm long. *Spikelets* terete, 11–18 mm long, 2–3 mm wide, distant in the lower part of the raceme, becoming loosely imbricate upwards. *Glumes* often deciduous; lower 5.5–7 mm long, 1-nerved, linear-lanceolate; upper 13–15 mm long, 7–11-nerved, oblong-

lanceolate. *Florets* 2-4, the lower 1-2 perfect. *Lowest lemma* 10-13 mm long (incl. lobes); the body 6-7 mm long, 2-3 mm wide, shortly villous at the base; lateral lobes linear, rigid, 2-4 mm long, 0.5 mm wide; middle lobe tapered into a slender rigid bristle 4-6 mm long.

15. Curly Mitchell Grass
(wheat Mitchell)

Astrebula lappacea
Plate 18b

GENERAL DESCRIPTION

HABIT: Densely tufted perennial, 30-90 cm high, with a stout rhizome; butt thickened by numerous thin, papery, hairless cataphylls.

STEMS: Erect or somewhat bent at the nodes, usually branched, hairless, smooth, rigid, many-noded.

LEAVES: Sheaths about as long as the internodes, first tight, becoming loose, smooth and hairless or the upper ones sprinkled with bristly hairs or hard tubercles. Blades 7.5-30 cm long, narrow, flat, stiff, bluish-green, deeply nerved, hairless or sprinkled (particularly on the edges) with hairs based on wart-like tubercles, curly when dry, with rough sharp edges.

SEEDHEAD: 5-30 cm long, up to 13 mm wide, consisting of 1 (rarely 2) spiciform, rigid, straight or sometimes curved raceme. The rachis of the raceme is somewhat flattened, narrow or rather broad, strongly nerved on the back, rough from minute bristles, often wavy, and on one side bears the spikelets in two regular rows. Usually the spikelets are densely crowded and closely overlapping, but can be widely spaced in the lower part of the raceme. The spikelet is 7-13 mm long, with 4-6 florets, each terminating in 3 long, stiff, straight or curved, bristle-like points.

OCCURRENCE: Only localised, disjunct colonies of curly Mitchell occur in central Australia, mainly in gilgais and depressions on cracking clay soils with barley Mitchell grasslands and gidgee.

DISTRIBUTION: M. (excl. V.).

VALUE: Though undoubtedly grazed, curly Mitchell grass is not an important pasture constituent in central Australia.

BOTANIC DESCRIPTION

Racemes solitary or paired, straight or curved, 5-30 cm long, 5-13 mm wide; pedicels < 0.8 mm long. *Spikelets* loosely to densely imbricate or distant in the lower part of the raceme, oblong-cuneate, 7-13 mm long (excl. awns), 2.5-5 mm wide. *Glumes* acuminate-mucronate, thinly chartaceous with scarious margins; lower linear-lanceolate, 4.5-10 mm long, usually 1-5-nerved; upper ovate-elliptic, 7-13 mm long, 7-13-nerved. *Florets* 4-6, the uppermost much reduced. *Lowest lemma* oblong, 8-13 mm long, 3-5-nerved; the body shortly and densely villous, 2.5-4 mm long, 3-4 mm wide, firmly coriaceous; lateral lobes lanceolate to ovate, acuminate, 4-9.5 mm long, 1-1.75 mm wide, firmly membranous, glabrous; middle lobe tapered into a rigid bristle 4-14 mm long.

16. Barley Mitchell Grass

Astrebala pectinata
Plate 18c

GENERAL DESCRIPTION

HABIT: Slender or coarse perennial forming neatly compact tussocks, 30–120 cm high though commonly less than 60 cm, with a short rhizome; rhizome and butt hairless, often knotty, covered by short, firm, sometimes shiny cataphylls.

STEMS: Erect, hairless, smooth, usually much-branched, 6–9-noded; the lower internodes often flattened.

LEAVES: Sheaths tight, smooth, rather long, hairless or pilose at the mouth; ligule fringed with dense, short hairs. Blades 7.5–25 cm long, up to 6 mm wide, flat, bluish-green, finely pointed, stiff, hairless or hairy (often densely so on new shoots) with long very fine hairs based on wart-like tubercles, rather rough and sharp on the edges, often becoming curly or twisted with age.

SEEDHEAD: 4–13 cm long, 1–2 cm wide, terminal on the culms, when young partly enclosed by the uppermost sheath, consisting of 1 (rarely 2) spiciform green or straw-coloured softly bristly raceme. The rachis of the raceme is somewhat flattened (from the back view), rather broad, wavy, strongly nerved, covered by minute bristles, and on one side bears the densely crowded, closely overlapping spikelets in two regular rows. The spikelet is 10–17 mm long and contains 4 or more densely hairy florets, each terminating in 3 long, soft, bristle-like points. The two glumes of the spikelet are hairless, many-nerved, papery, somewhat cymbiform, and partly enclose the florets.

OCCURRENCE: Though barley Mitchell is the most common species of the group in central Australia occurrences are few, mostly restricted to fine-textured soils, and more frequent in the northern half of the area. South of the Macdonnell Ranges, its distribution is sporadic and confined to gilgais and depressions of stony tablelands with texture-contrast soils. Generally there is not an associated tree storey, but in small parts of the northeastern quarter of the area it occurs under gidgee. For long periods during the dry season the only associated plants are neverfails, feathertop wire grass, and a few other perennial grasses, but in good seasons there is a dense growth of low, short-lived grasses and forbs. Among these, Flinders grasses are common in the north, yellow daisy and white daisy in the centre, and *Bassia* in the south.

DISTRIBUTION: M. (excl. V.).

VALUE: Though only moderately palatable when green and less so when dry, barley Mitchell is a vigorous perennial that persists under adverse conditions such as heavy stocking and drought. Pastures dominated by the species produce an abundance of fodder and thus are capable of maintaining large numbers of stock for long periods. They are particularly valuable in good seasons when associated short-lived grasses and forbs are prolific.

BOTANIC DESCRIPTION

Racemes 4–13 cm long, 1–2 cm wide; pedicels 0.5–2 mm long. *Spikelets* 10–17 mm long, 4–8 mm wide, laterally compressed, oblong-cuneate. *Glumes* 6.5–13 mm long, ovate-lanceolate, acute or mucronate, chartaceous with scarious margins; lower 5–9-nerved; upper 7–16-nerved. *Florets* 4–7; the upper ones reduced. *Lowest lemma* 12–17 mm long (incl. lobes), oblong; the body 3–5 mm long, 3–4 mm wide, coriaceous, densely villous all over; lateral lobes lanceolate, acute, glabrous, 7–12 mm long, 1–1.75 mm wide, chartaceous, with broad scarious margins; middle lobe tapered into a slender bristle < 12 mm long.

17–22. Bluegrasses

Bothriochloa and *Dichanthium* spp.

The bluegrasses of central Australia comprise six species belonging to two closely related genera. With one exception (dwarf bluegrass), the plants are long-lived, tussock-forming, medium-height to tall perennials. All species have narrow, terminal panicles comprising one or more fragile racemes, which are scattered along the axis or grouped in a terminal cluster. The spikelets are hairy and crowded in pairs along the several-jointed rhachis of the raceme. One of each pair is sessile, fertile, and awned. The other is shortly stalked, sterile, awnless, and similar to the fertile one in size and shape or smaller. At maturity, the rhachis breaks at the joints and each spikelet falls entire, though in species of *Dichanthium* the lowest one or two pairs remain attached to the plant.

Generally the group are well-developed in tropical and subtropical parts of Australia and regarded as excellent fodder grasses. In central Australia, where distribution is sporadic and restricted, they are of little economic value.

GENERIC CHARACTERS

BOTHRIOCHLOA: *Spikelets* small, in pairs, one sessile, the other pedicellate, similar in size and shape or the pedicellate reduced and smaller, dissimilar in sex, on the fragile rhachis of many-jointed shortly pedunculate subdigitate or paniculate racemes; each spikelet deciduous, the sessile with the adjacent joint and pedicel, or the pedicellate subpersistent; joints and pedicels subequal, linear-filiform, ciliate, longitudinally grooved and \pm hyaline in the groove, with a horizontal articulation. *Florets*, 2 in the sessile spikelet (the lower reduced to an empty lemma, the upper bisexual) and 2 or 1 in the pedicellate spikelet (the lower male or neuter, the upper neuter and often much reduced). *Sessile spikelet* dorsally compressed, awned, with a small obtuse bearded callus. *Glumes* equal, thinly chartaceous to membranous; lower 2-keeled, with narrow sharply incurved margins, rigidly ciliate on the keels in the upper part; upper acutely keeled, 3-nerved, cymbiform. *Lower lemma* hyaline, nerveless. *Upper lemma* reduced to a linear hyaline stipe, firmer upwards and passing into a slender bent awn, rarely bifid and awned from the sinus. *Palea* small or absent. *Caryopsis* obtuse, \pm turgid. *Pedicellate spikelet* awnless. *Glumes* similar to those of the sessile spikelet in form and texture. *Lemmas* (if present) hyaline, nerveless.

DICHANTHIUM: Closely allied to *Bothriochloa* and identical in several characters, but differing in the following ones: *Spikelets* usually rather large; the lowest 1 or 2 pairs of each raceme homogamous, persistent, awnless, with one male or neuter and often suppressed floret. *Racemes* usually subdigitate, subsessile or frequently sessile. *Pedicels* and *joints* solid (without the longitudinal hyaline groove), with a somewhat oblique articulation.

KEY TO THE SPECIES

- A. Lower glume of sessile spikelet with a distinct transverse subapical fringe of long tubercle-based hairs.
 - B. Racemes 2-7 (usually 3-5), densely villous, erect or spreading. Slender perennial 45-60 cm high. 21. *D. sericeum*
 - B. Racemes 10-20 (rarely fewer), hairy, usually closely appressed. Stout perennial, usually >60 cm high, sometimes <30 cm. 22. *D. superciliatum*
- A. Lower glume of sessile spikelet variously hairy, but without a definite subapical fringe.
 - C. Slender annual, usually <30 cm high. Racemes usually 1-2 cm long (excl. awns). 20. *D. humilius*
 - C. Coarse tussocky perennials usually not less than 60 cm high. Racemes usually 3-5 cm long.
 - D. Racemes numerous, approximate along a long axis; axis 4-14 cm long, 5-15-noded, distinctly longer than the racemes. 18. *B. intermedia*
 - D. Racemes 1-12, digitate or approximate along a short axis; axis <2.25 cm long, 1-4-noded, distinctly shorter than the racemes.
 - E. Racemes 1-6, with the basal spikelets persistent. Sessile spikelet 4-5.5 mm long. 19. *D. fecundum*
 - E. Racemes 4-12, with all the spikelets deciduous. Sessile spikelet 3.5-4 mm long. 17. *B. ewartiana*

17. Desert Bluegrass

Bothriochloa ewartiana
Plate 19a

GENERAL DESCRIPTION

HABIT: Stout leafy long-lived perennial, forming shrubby tussocks 60-90 cm high and up to 30 cm wide; butt thickened by rigid shoots and numerous papery cataphylls.

STEMS: Many-noded, smooth, usually much-branched, powdery or shiny; the lower nodes sometimes hairy; internodes mostly covered by the sheaths, grooved on one side.

LEAVES: Bluish-green when young, becoming reddish. Blades up to 22 cm long, 3-6 mm wide, usually flat, gradually tapered to a long fine point. Sheaths broad, rather loose. The foliage is hairless except for a sprinkling of long, fine hairs at the mouth of the sheath, which sometimes extend along the edges of the blade.



PLATE 19. (a) *Bothriochloa ewartiana*; (b) *Bothriochloa intermedia*

SEEDHEAD: Panicle consisting of 4–12 racemes 3.5–5 cm long terminal and subdigitate on the culms; the racemes first clustered and partly enclosed by the uppermost sheath, but exerted and spreading at maturity. On the rhachis of the raceme, the small, silvery-hairy densely clustered spikelets are borne in pairs. The stalked spikelet of the pair is sterile; the fertile one is stalkless, with an awn 12–18 mm long and quite often a small, circular pit near its apex.

OCCURRENCE: In central Australia, desert bluegrass occurs sporadically mainly in the north and northwest, generally in less arid situations such as stream banks, drainage floors, and valley slopes receiving run-off from nearby hills. It occurs on medium-textured red earths in association with mulga, coolibah, or short annual grasses and forbs, and also on shallow soils on low stony hills with witchetty bush or sparse low trees and shrubs.

DISTRIBUTION: M. (excl. V.).

VALUE: The desert form of central Australia appears to lack the fodder value attributed to this species and other bluegrasses in higher rainfall parts of Australia. Its utilisation is normally restricted to short periods during early growth when the foliage is moderately palatable.

BOTANIC DESCRIPTION

Inflorescence of racemes subdigitate on a common axis; axis 1–2.25 cm long, mostly 3–4-noded, with glabrous channelled internodes; branches (peduncles) 2.5–7 mm long, glabrous, usually pulvinate and bearded in the axils. *Racemes* 4–12, mostly 3.5–5 cm long, distinctly longer than the common axis; pedicels and joints about 2 mm long, densely ciliate with long silky hairs. *Sessile spikelet* oblong, subacute, mostly 3.5–4 mm long; callus minute, densely bearded. *Glumes* membranous, as long as the spikelet; lower several-nerved, acute to subobtuse, densely long-hairy towards the base, sometimes with a circular pit near the apex; upper acute, glabrous, scaberulous on the keel towards the apex, ciliate on the margins. *Lower lemma* oblong, ciliate at the apex, almost as long as the glumes. *Upper lemma* stipitiform; awn 17–25 mm long (incl. lemma). *Pedicellate spikelet* usually neuter, acute, 3.5–4.5 mm long, narrow-lanceolate, subequal in length to the sessile spikelet. *Lower glume* 9–11-nerved, ciliate on the margins, scabrous-ciliate on the keels. *Upper glume* subequal or smaller. *Lower lemma* linear, up to three-quarters as long as the spikelet or rudimentary.

18. Forest Bluegrass

Bothriochloa intermedia
Plate 19b

GENERAL DESCRIPTION

HABIT: Robust tussocky perennial, 105–135 cm high or more, dense and leafy near the base.

STEMS: Erect or bent at the lower nodes, hairless, smooth, often shiny, simple or sometimes branched, 5–many-noded; nodes hairless or bearded; internodes terete or deeply grooved on one side.

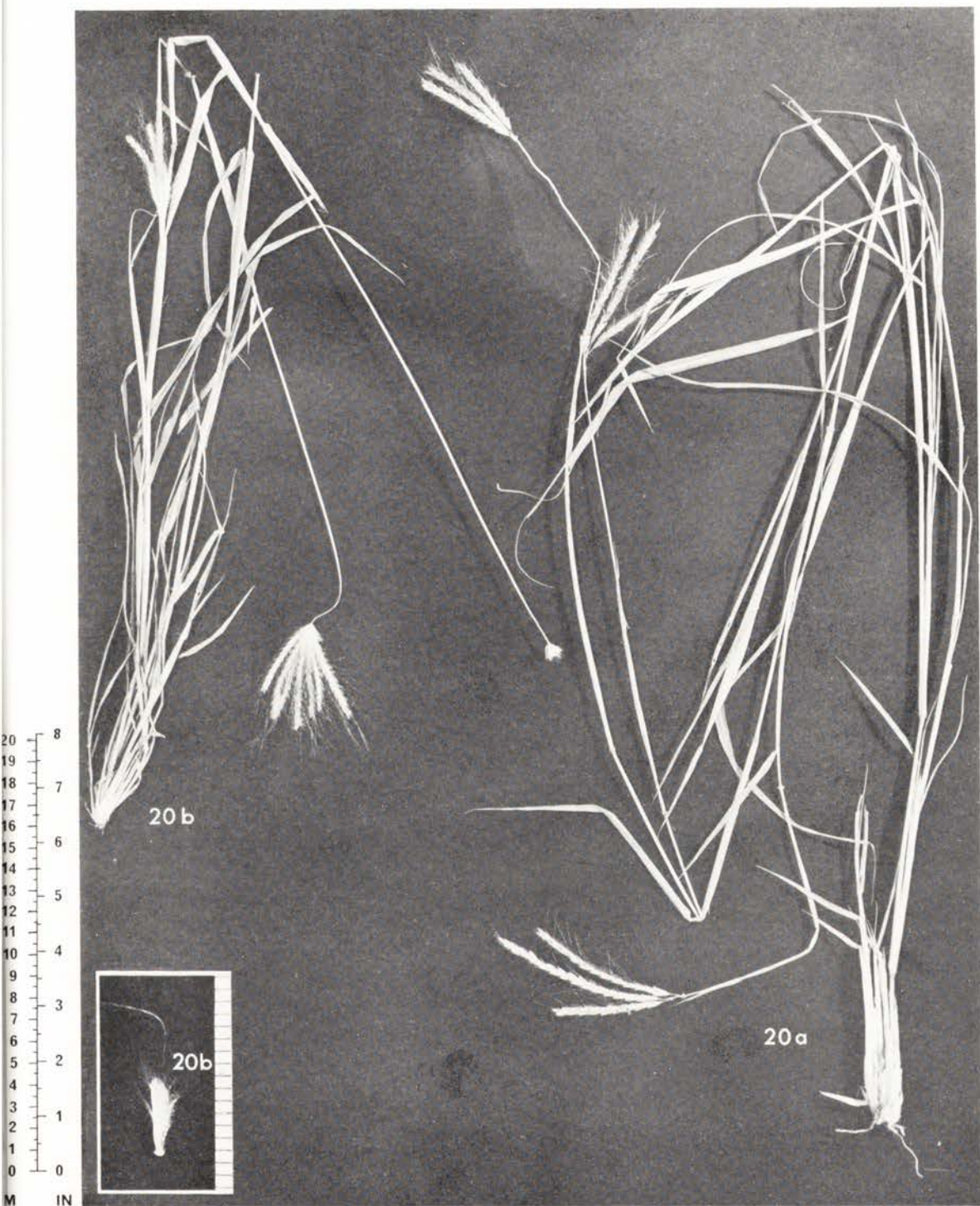


PLATE 20. (a) *Dichanthium fecundum*; (b) *Dichanthium superciliatum*

LEAVES: At first green or bluish-green, maturing purplish-red. Sheaths generally almost as long as the internodes, rather tight, often purplish, prominently nerved, hairless or sparsely bearded at the mouth. Blades flat or loosely folded, up to 30 cm long, 6–8 mm wide, gradually tapered to an extremely long fine point, hairless but usually with minute bristles, with several prominent nerves and thickened rough sharp edges.

SEEDHEAD: Panicle up to 12 cm long and 2.5–4 cm wide (though sometimes much larger), greenish or purplish, consisting of numerous spreading racemes scattered on the axis. The racemes are mostly 3–5 cm long and occur singly, in pairs, or in the lower part of the panicle in clusters of 3 or 4. The spikelet is similar to that of desert bluegrass (No. 17).

This species resembles the previous one (No. 17) in appearance, but plants are taller, with mostly simple culms, and the panicles are larger, with widely spaced racemes, not clustered as in desert bluegrass.

OCCURRENCE: Widespread, but rare; known from few localities usually in the vicinity of major streams.

DISTRIBUTION: M. (excl. V.), E-A.

VALUE: Widely regarded as an excellent fodder grass, but not common enough in central Australia to be important.

BOTANIC DESCRIPTION

Inflorescence of paniculate racemes, usually dense, 7–16 (mostly –12) cm long; common axis 3–14 (mostly 4–10) cm long, 5–15-noded, glabrous, distinctly longer (rarely subequal to or shorter) than the lower racemes; branches (peduncles) 4.5–8 mm long, solitary or paired or clustered, sometimes glandular, often pulvinate and bearded in the axils but otherwise glabrous, simple or shortly branched. *Racemes* numerous, erect or slightly spreading, sometimes branched, 1.8–7 (mostly 3–5) cm long; joints and pedicels densely ciliate. *Sessile spikelet* 3–4 mm long; callus shortly bearded. *Glumes* membranous; lower obtuse, 5–7-nerved between the keels, hairy towards the base, depressed along the middle, with or without a circular apical pit; upper slightly narrower, almost glabrous. *Lower lemma* glabrous, narrow, almost as long as the glumes. *Upper lemma* stipe-like; awn perfect, 10–17.5 (mostly –13.5) mm long (incl. lemma of 1–1.75 mm), the bristle and column subequal in length. *Pedicelled spikelet* about as long as the sessile spikelet, very narrow. *Lower glume* 7–11-nerved, smooth, glabrous but ciliate on the keels. *Upper glume* somewhat shorter, 3–4-nerved, or reduced. *Lower lemma* similar to that of the sessile spikelet or absent.

19. Curly Bluegrass (bundle bundle)

Dichanthium fecundum
Plate 20a

GENERAL DESCRIPTION

HABIT: Tussocky leafy perennial, usually 60–105 cm high; butt thickened by numerous loosely imbricate shiny whitish cataphylls.

Description of the Species

STEMS: Erect or somewhat bent at the nodes, often slender, usually branched, hairless, smooth, powdery or shiny, usually flattened or grooved on one side, with 7-9 hairy nodes.

LEAVES: Sheaths shorter than the internodes, tight though usually becoming loose with age, bearded at the mouth and at times with long stiff tubercle-based hairs on the upper edge, otherwise hairless and smooth. Blades up to 22 cm long or more (though usually much shorter), flat or loosely rolled, stiff, finely pointed, with very short or long tubercle-based sparse hairs, usually somewhat rough, with thickened white sharp edges, often bluish-green at first and maturing brownish-red.

SEEDHEAD: A pale green or purplish racemose panicle terminating the culms, containing 1-3 (sometimes up to 6) slender erect racemes 4-6 cm long. When more than one in number, the racemes are closely spaced along a short axis. The spikelets are hairy, shortly awned, and crowded in pairs in an overlapping fashion on the several-jointed, fragile rhachis of the raceme. At maturity, the rhachis breaks at the joints (i.e. between the spikelet pairs), only the lowest pair of sterile ones remaining attached to the plant.

OCCURRENCE: This species is widespread and dominant over extensive areas in tropical parts of Queensland, the Northern Territory, and Western Australia, but occurs in central Australia only occasionally near the northern margin in less arid habitats.

DISTRIBUTION: W.A., N.T., Q.

VALUE: Regarded as an excellent fodder grass over most of its distribution range, but insignificant in central Australian pastures.

BOTANIC DESCRIPTION

Inflorescence of 1-3 (rarely -6) racemes, terminal; axis erect, slender, terete, glabrous, smooth, up to 15 mm long, with 1-4 nodes. *Racemes* 4-6 cm long, spiciform, pedunculate; peduncles < 7 mm long; rhachis internodes 1.5-2 mm long. *Sessile spikelet* 4-5.5 mm long, narrowly oblong, obtuse. *Lower glume* truncate, ciliate on the keels with tubercle-based hairs, glabrous and shiny on the surface or with sparse hairs and an irregular transverse subapical fringe. *Upper glume* acute, scaberulous near the apex, ciliolate on the margins in the upper part. *Lower lemma* 2-3 mm long, oblong, glabrous, with a lacerated apex. *Upper lemma* stipitate, 1-nerved, membranous in the lower part; awn perfect, 15-28 mm long (incl. lemma), scabrous, with a brown column and a tawny bristle. *Caryopsis* 1.9-2.5 mm long, 0.7-0.9 mm wide, elliptic or obovate, obtuse, somewhat plano-convex. *Pedicellate spikelet* 5.5-6.5 mm long, male or more often bisexual, narrow-elliptic or linear, subobtusate or acute, often deciduous; callus minute, pubescent. *Lower glume* oblong-elliptic, truncate, somewhat involute, with 7-9 intracarinal nerves and a percurrent mid-nerve, glabrous or hirsute on the back and keels with spreading tubercle-based hairs. *Upper glume* as long as the lower, obtuse, usually 5-nerved, ciliate or ciliolate-scaberulous near the margins. *Lower lemma* 3.5-4.7 mm long, linear to lanceolate, glabrous, subacute. *Upper lemma* narrow-linear, membranous or hyaline, bristle-like or produced into an awn < 14 mm long; awn perfect or imperfect. *Caryopsis* 1.8 mm long, 0.8 mm wide, elliptic.

20. Dwarf Bluegrass

Dichanthium humilius
Plate 21a

GENERAL DESCRIPTION

HABIT: Slender annual, sometimes long-lived, usually less than 30 cm high, forming small often reddish tufts dense and leafy near the base.

STEMS: Erect or bent at the lower nodes, hairless except for the silky-hairy nodes, smooth.

LEAVES: Blades flat or \pm folded, narrow, with white somewhat thickened midnerve and edges, sparsely hairy or densely covered by minute bristles. Sheaths shorter than the internodes, hairy at the mouth and on the edges or almost hairless and smooth, rather tight or the upper ones loose.

SEEDHEAD: A panicle, terminal on an extremely slender peduncle, frequently bluish or purplish, comprising usually 2 or 3 sparsely hairy racemes 1–4 cm long (excl. awns). Normally, the tuft produces numerous panicles, with several immature ones partly enclosed by floral leaves.

Many characters of Queensland bluegrass (No. 21) apply to this species, which is, however, distinguished by its short slender annual habit, very thin peduncles, and fewer, shorter, much less hairy racemes.

OCCURRENCE: Largely confined to cracking clay soils north of the Macdonnell Ranges in association with gidgee, neverfail, and Mitchell grasses. Also sporadic occurrences are known from the southern half of the area in stony tablelands in gilgais, and in the clayey swales of sandhills in the eastern part. Normally plants are summer-growing and short-lived, though secondary growth and late flowering (August–September) occur with favourable rainfall.

DISTRIBUTION: W.A., S.A., Q., N.S.W.

VALUE: Dwarf bluegrass lacks the bulk desirable for good fodder grasses. Usually it is neglected by stock.

BOTANIC DESCRIPTION

Close affinities with *Dichanthium sericeum*, but recognised by the following characters: *Racemes* mostly 1–2 (rarely –4) cm long (excl. awns), sparsely hairy, few. *Sessile spikelet* < 3.75 mm long. *Lower glume* with 5 intracarinal nerves, with an obscure subapical fringe. *Lower lemma* minute or absent.

21. Queensland Bluegrass

Dichanthium sericeum
Plate 21b

GENERAL DESCRIPTION

HABIT: Tufted, slender perennial, about 60 cm high. Plants are very variable in size, habit, and indumentum, but this description applies to most central Australian forms.



PLATE 21. (a) *Dichanthium humilium*; (b) *Dichanthium sericeum*

STEMS: Erect, hairless, smooth, simple (rarely branched), grooved, with 3-4 bearded nodes.

LEAVES: Blades flat or folded, often bluish-green, with prominent white midrib and edges, either sprinkled with long fine white hairs based on hard tubercles or densely covered by minute bristles or both. Sheaths usually shorter than the internodes, bearded at the mouth, otherwise \pm hairless and smooth.

SEEDHEAD: A racemose panicle, consisting of 2-7 bluish or pale green, clustered, spiciform racemes 2.5-5 cm long digitate on a long, slender peduncle. Often the peduncle is sharply bent close below the panicle, causing the racemes to spread \pm horizontally to the plant. Densely crowded in pairs on the rhachis of the raceme, the spikelets are almost completely concealed by long, silvery-silky hairs and golden-brown, spirally twisted, bent awns. The rhachis is many-jointed and becomes very fragile with age, finally breaking at the joints (i.e. between the spikelet pairs).

OCCURRENCE: This species is common in parts of Australia with higher rainfall, but restricted to favoured sites in the northern half of central Australia. It is associated with floodouts, drainage floors, and similar habitats; with soils of medium or fine texture, such as red and yellow earths, texture contrast, and cracking clays; with grassland plains of neverfail and Mitchell grasses; trees of coolibah, river red gum, ghost gum, mulga, and gidgee; and with forbs like yellow daisy and *Bassia*. Usually the best developed stands are localised in gilgais and small depressions. Flowering takes place soon after summer rains, and can extend from late February to May.

DISTRIBUTION: M., E-A.

VALUE: This grass is one of many in the area which collectively provide grazing for short periods, but individually possess no marked value in natural pastures. With the onset of flowering, it appears to be largely ignored by stock.

BOTANIC DESCRIPTION

Racemes, up to 7, 2.5-5 cm long, fasciculate; pedicels and joints about 2 mm long, densely ciliate with hairs almost as long. *Sessile spikelet* 3.75-4.25 mm long, 1-1.25 mm wide, oblong, truncate; callus almost 1 mm long, shortly and densely bearded. *Lower glume* determining the size and shape of the spikelet, flattened or slightly rounded on the back, membranous to thinly indurate, with a hyaline ciliolate apex, many-nerved, shortly pilose on the back towards the base, ciliate on the keels in the upper part with silvery-silky tubercle-based hairs 3-6 mm long; the hairs continuing across the apex on fused tubercles, forming a raised transverse subapical curved fringe. *Upper glume* slightly shorter than the lower, thinly membranous, glabrous. *Lower lemma* about half as long as the lower glume. *Upper lemma* stipitate; the awn perfect, 23-28 mm long, scaberulous. *Pedicelled spikelet* neuter, as long as the sessile spikelet or slightly shorter, narrower, oblanceolate, reduced usually to the glumes. *Lower glume* determining the shape and size of the spikelet, firmly membranous to indurate, long-ciliate on the margins (sometimes from the base) and with a transverse subapical fringe. *Upper glume* about half as long as the lower, narrower, thinly membranous. *Lemmas* usually absent.

22. Tassel Bluegrass

Dichanthium superciliatum

Plate 20b

GENERAL DESCRIPTION

HABIT: Tussocky perennial, usually 60–120 cm high, but ranging from < 30 to >180 cm.

STEMS: Erect or slightly bent at the lower nodes, hairless, smooth and shiny, often purplish, usually grooved or flattened on one side or the basal ones compressed, simple or sparsely branched from the upper nodes, usually many-noded; nodes densely hairy.

LEAVES: Sheaths smooth, prominently nerved, hairless on the surface, densely hairy at the mouth and on the outer edge; the lower ones usually longer than the internodes and rather tight; the upper ones shorter than the internodes, broad, loose. Blades up to 30 cm long or more and 6 mm wide, flat or sometimes loosely rolled, stiff, fine-pointed, hairless but rough from minute bristles, with many prominent nerves and thickened white sharp edges, usually first bluish-green and maturing purplish-red.

SEEDHEAD: Panicle racemose, bluish-green, hairy, tassel-like, consisting of 10–20 (rarely fewer) racemes 4–5 cm long densely clustered and digitate on the culms. The immature panicle is partly enclosed by a broad, cymbiform floral leaf, but with age the panicle becomes exerted and finally extends prominently above the leaves. Commonly, the peduncle curves sharply below the panicle, so that the racemes spread horizontally to the plant. The spikelets are densely hairy, awned, and closely crowded in an overlapping fashion on the rhachis. Characteristically, each one has a dense, subapical fringe of long, stiff, silvery hairs near the apex. The rhachis is several-jointed, fragile, and at maturity breaks at the joints dispersing all the spikelets except the basal, sterile pair, which all together form a small cluster at the apex of the peduncle.

OCCURRENCE: Rare in the far northern part of the area; restricted to cracking clay grassland plains, and to floodplains with medium-textured red earths or fine alluvial soils.

DISTRIBUTION: W.A., N.T., Q., E-A.

VALUE: Readily grazed.

BOTANIC DESCRIPTION

Racemes, 10–20 (rarely fewer), 4–5 cm long, subdigitate, clustered but spreading with age, hairy, bluish-green, subtended by a broad inflated sheath, finally exerted and prominent; common peduncle glabrous, smooth, shiny, striolate, often sharply bent close below the inflorescence; pedicels and joints 1.5 mm long. *Sessile spikelet* 4 mm long, oblong-obovate. *Lower glume* determining the shape and size of the spikelet, thinly membranous, thickened on the keels, 5–7-nerved between the keels, with a transverse subapical arch of fused tubercles bearing stiff erect silvery-white hairs up to 4 mm long, and with shorter sparse hairs on the surface near the base and on the keels; the apex hyaline, entire, obtuse, ciliate. *Upper glume* about as long as the lower, narrowly elliptic-oblong, acute, thinly membranous or hyaline, smooth, shiny, ciliate on the keel upwards, otherwise glabrous, with narrow incurved margins. *Lower lemma* about half as long as the lower glume, narrow-

lanceolate, acuminate, flat, glabrous, smooth. *Upper lemma* stipitiform; awn 2.5–3 cm long, scabrous, often twice geniculate, with the column somewhat longer than the bristle. *Pedicellate spikelet* broadly obovate (flattened), about as long as the sessile spikelet, reduced to the glumes. *Lower glume* 7–9-nerved between the keels, stiffly hairy or ciliate on the keels, glabrous on the back, scaberulous on the inner surface. *Upper glume* narrow, about three-quarters as long as the lower glume, scaberulous on the incurved margins and inner surface.

23–28. Armgrasses

Brachiaria spp.

In central Australia this group comprises six slender, short-lived, summer-growing grasses occurring mainly in the northern half. Many have broad, flat blades and a semi-prostrate or spreading habit. Though normally not common, in certain seasons some species grow abundantly over small areas. The majority are palatable to stock, and in dense stands they provide valuable fodder for short periods soon after rains.

The common name refers to the arm-like racemes, which occur singly, sometimes at extremely wide intervals, either lying appressed to the axis or widely spreading. The rhachis of the racemes is 3-angled or flat and ribbon-like, and bears the loosely or densely crowded spikelets usually in one or two regular rows on extremely short, cup-like stalks. The spikelets are awnless, often plump, and hairless or sometimes densely hairy. On ripening each one breaks from its stalk, leaving the empty rhachides attached to the plant.

GENERIC CHARACTERS

Spikelets solitary or paired, shortly pedicellate or subsessile, awnless, usually \pm dorsally compressed, plano-convex, falling entire at maturity, appressed and usually imbricate, secund and adaxial on the triquetrous or flattened rhachis of spiciform racemes. Florets, 2; lower male or neuter, often with a palea; upper bisexual. *Glumes* membranous, dissimilar; upper longer than the lower, similar to the lower lemma in size, shape, and texture, with 5–7 (rarely –9) evenly distributed nerves. *Lower lemma* 3–5 (rarely –7) -nerved, the lateral nerves distant from the midnerve. *Palea* somewhat shorter than the lemma, with incurved margins at least up to the middle, or reduced or absent. *Upper lemma* obtuse, apiculate, crustaceous or coriaceous, faintly 5-nerved, with firm narrow involute margins. *Palea* subequal to the lemma and similar in texture, 2-keeled, the keels embraced by the involute margins of the lemma for their full length. *Caryopsis* dorsally compressed, tightly enclosed by the indurated lemma and palea, \pm flattened. *Racemes* usually subsessile and solitary on a common axis, rarely paniculate; rhachis with a prominent flexuose midrib; pedicels unequal when more than one, biseriate and alternate on the midrib.

KEY TO THE SPECIES

- A. Spikelet pubescent or ciliate.
- B. Spikelet pubescent, the hairs longer towards the apex. Racemes distant.
- C. Inflorescence spicate, \pm continuous. Racemes erect, distant, loosely appressed or somewhat spreading. Spikelet with a subapical transverse fringe of silky hairs. Lower lemma with a palea. 24. *B. holosericea*

Description of the Species

- C. Inflorescence open, interrupted. Racemes remote, widely spreading. Spikelet long-hairy at the apex, but without a distinct fringe. Lower lemma without a palea. 27. *B. piligera*
- B. Spikelet ciliate on the edges of the lower lemma, \pm glabrous towards the apex. Racemes subdigitate. 23. *B. gilesii*
- A. Spikelet glabrous or almost so.
 - D. Racemes approximate. Lower lemma with a large palea. Fertile floret mucronate.
 - E. Racemes usually 3, simple. Spikelets closely and regularly biseriate; pedicels glabrous. Lower glume up to one-sixth as long as the spikelet. 26. *B. notochthona*
 - E. Racemes, 5–10, sometimes branched. Spikelets loosely and irregularly arranged; pedicels usually with one or more long stiff hairs. Lower glume one-third to half as long as the spikelet. 28. *B. praetervisa*
 - D. Racemes remote. Lower lemma without a palea. Fertile floret subacute. 25. *B. miliiformis*

23. Hairy-edged Armgrass

Brachiaria gilesii
Plate 22a

GENERAL DESCRIPTION

HABIT: Weak annual, usually 15–45 cm high, sometimes flowering when only 7.5 cm.

STEMS: Erect or bent, branched, angular, grooved, sometimes spreading horizontally from the base and rooting from the lower nodes before becoming erect.

LEAVES: Blades flat, mostly less than 5 cm long, 6–12 mm wide, with prominent bristly hairs along the edges near the sheath. Sheaths broad, loose, sometimes smooth and hairless, but more often covered by long fine stiff hairs arising from hard wart-like tubercles, the hairs often particularly dense along the edges.

SEEDHEAD: Consisting of usually 3 spiciform racemes, with 2 close together and the third below, often partly enclosed by the floral leaf, terminal on (sometimes very short) culms, numerous and scattered throughout the plant. On one side of the rhachis of the raceme the small, hairy, closely overlapping spikelets are arranged alternately in two regular rows. As well as the short hairs on the surface, the edges of the spikelet have a prominent fringe of long, silky hairs which with age spread horizontally.

OCCURRENCE: A short-lived grass, generally found in favoured sites soon after summer rains and usually from early March to May. Normally it is not particularly common or widespread, but in some seasons the plants are abundant over fairly large areas.

DISTRIBUTION: W.A., S.A., Q., N.S.W.

VALUE: It is one of a number of rapid-growing grasses which collectively constitute short, palatable, nutritious pastures for brief periods after rains.

BOTANIC DESCRIPTION

Inflorescence at length exerted, terminal on the flowering culms and branches, the latter sometimes very short; common axis flattened, glabrous, sometimes elongated. *Racemes*, 3, sometimes 2, 1.5–3 cm long, alternate and distant; rhachis 0.5–0.75 mm wide, scabrous, flexuose; pedicels distinctly dilated at the apex. *Spikelets* 4.5–5 mm long, ovate-lanceolate, acute, closely imbricate. *Lower glume* almost 0.5 mm long, acute, concealed by a basal ring of long hairs. *Upper glume* as long as the spikelet, ovate-lanceolate, acute, 7–9-nerved, glabrous or pubescent. *Lower lemma* slightly shorter and narrower than the upper glume, acute or mucronate, 5-nerved, pubescent, ± hyaline and flattened or depressed between the midnerve and the lateral nerves, villous-ciliate on the margins up to slightly above the middle; the hairs very long, white, erect, later horizontally spreading. *Palea* hyaline, glabrous. *Upper lemma* 1.75–2.5 mm long, indurate, broadly elliptic, transversely rugose, subobtuse, mucronate; mucro 0.75 mm long. *Palea* narrower, obtuse, rugose between the keels, smooth and shiny on the margins. *Caryopsis* 1.75 mm long, obtuse, smooth, elliptic-orbicular.

24. Silky-top Armgrass

Brachiaria holosericea
Plate 22b

GENERAL DESCRIPTION

HABIT: Slender annual, usually 15–22.5 cm high (sometimes over 30 cm), softly hairy on most parts including the butt. The small tufts have a characteristic appearance, with the foliage mostly basal and the elongated flowering stems comprising often over half the plant.

STEMS: Erect or bent, simple or branched (sometimes strongly so), mostly covered by the sheaths.

LEAVES: Blades distinctive, up to 4 cm long (though usually less than 2.5 cm) and 6 mm wide, flat or folded and cymbiform, firmly pointed, stiffly erect or widely spreading, with thickened, often wavy edges sometimes fringed with rough bristly hairs.

SEEDHEAD: Spiciform, narrow, terminal on a long peduncle, consisting of 4–6 racemes 1–2.25 cm long scattered on a common axis. Usually the head is continuous with appressed racemes, but it can be interrupted with spreading or very short racemes. The species is readily recognised by its distinctive spikelet, which has a circle of long, silky hairs close below the apex. On young plants the hairs join to form a pointed fringe concealing the upper part of the spikelet, but with age the hairs spread horizontally, revealing the pointed apex.

OCCURRENCE: Silky-top grows with summer rainfall, flowering mainly from late February to early April. Though normally ephemeral in duration, it can persist for a number of seasons with favourable rainfall conditions. In central Australia it occurs in the northern half on coarse, sandy soils with spinifex and mallees. However, it is probably not as confined or uncommon as records indicate, for plants are easily overlooked because of their rapid growth and inconspicuous habit.

DISTRIBUTION: W.A., N.T., Q.

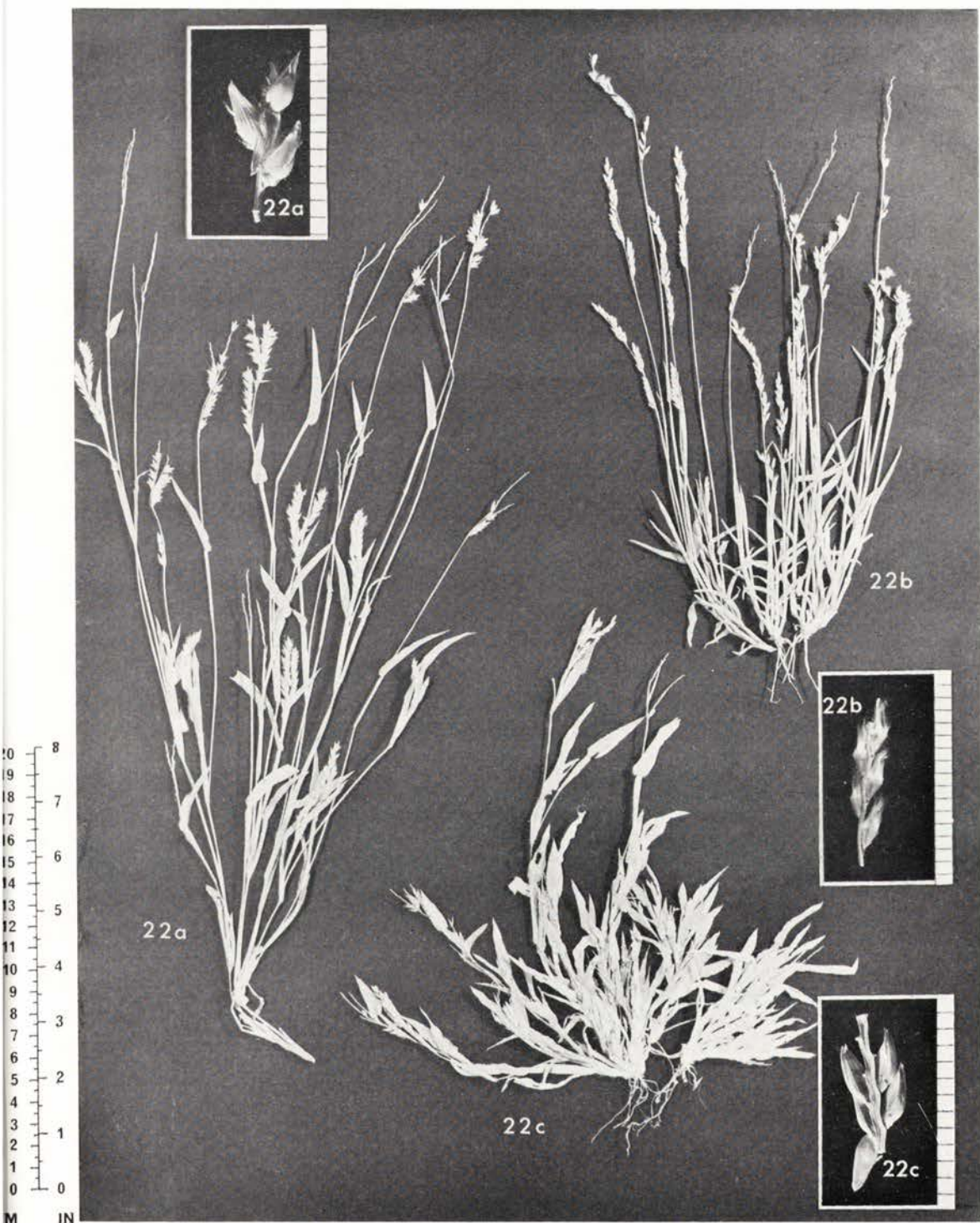


PLATE 22. (a) *Brachiaria gilesii*; (b) *Brachiaria holosericea*; (c) *Brachiaria notochthona*

VALUE: Probably grazed, but contributes little to pastures because of its small size.

BOTANIC DESCRIPTION

Inflorescence spiciform, usually continuous, at length long-exserted; peduncle cylindrical, pubescent, often elongated; common axis compressed, pubescent, scabrous. *Racemes*, 4-6, 1-2.25 cm long, distant, appressed or rarely spreading, bare at the base for 3-4 mm; rhachis flexuose, compressed or angular, scabrous, pilose; pedicels about 1 mm long, scabrous, pilose, dilated at the apex. *Spikelets* about 5 mm long (incl. hairs), few. *Lower glume* 1.5-2 mm long, narrow, acuminate, pubescent. *Upper glume* 2.5-3 mm long and as long as the spikelet, acuminate, 5-nerved, broadly elliptic, densely pubescent on the surface and with a subapical transverse fringe of long silvery-silky hairs, glabrous towards the apex; the hairs of the fringe first erect, finally spreading and exposing the apex of the spikelet. *Lower lemma* 3-nerved, with the pubescence of the upper glume, aristulate; awn 2-2.5 mm long. *Lower palea* narrow, thinly membranous. *Fertile floret* about 2 mm long, broadly elliptic-obovate, cuspidate-mucronate. *Upper lemma* indurate, rugulose. *Palea* flat, rugulose, with thin smooth shiny margins. *Caryopsis* 1.25-1.5 mm long, orbicular-obovate, obtuse, smooth.

25. Armgrass Millet
(green summer grass)

Brachiaria miliiformis
Plate 23a

GENERAL DESCRIPTION

HABIT: Semi-erect rather stout annual, 22.5-37 cm high, mostly hairless and smooth, sometimes rooting at the lower nodes.

STEMS: Flattened or angular, smooth, bent and branched at many nodes.

LEAVES: Hairless except for a sprinkling of long fine hairs on blades and sheaths near their junction, seldom densely hairy. Ligule short, densely ciliate. Blades 7.5-12.5 cm long, 6-8 mm wide, flat, with thickened, white, often wavy edges. Sheaths shorter than the internodes, becoming loose.

SEEDHEAD: Of 3 or 4 (rarely 2) spiciform racemes 2-4 cm long, widely spaced on a common axis. The racemes can be erect or horizontal or reflexed. The spikelets, arranged in 1 row or 2 on one side of the rhachis of the raceme, are small, plump, hairless, smooth, and green.

OCCURRENCE: Armgrass millet appears to favour habitats free of competitive perennials and occurs as a weed of cultivation, in protected sites, and generally on disturbed ground. Under natural conditions it is found in well-watered sandy situations, but probably occurs elsewhere. It grows from December to June.

DISTRIBUTION: M. (excl. V.), E-A.

VALUE: Palatable to stock and of moderate value for short periods.

BOTANIC DESCRIPTION

Inflorescence of 2-4 racemes, terminal on branched culms, at length exserted; peduncle and common axis slender, compressed, glabrous, \pm smooth, the latter sometimes elongated.

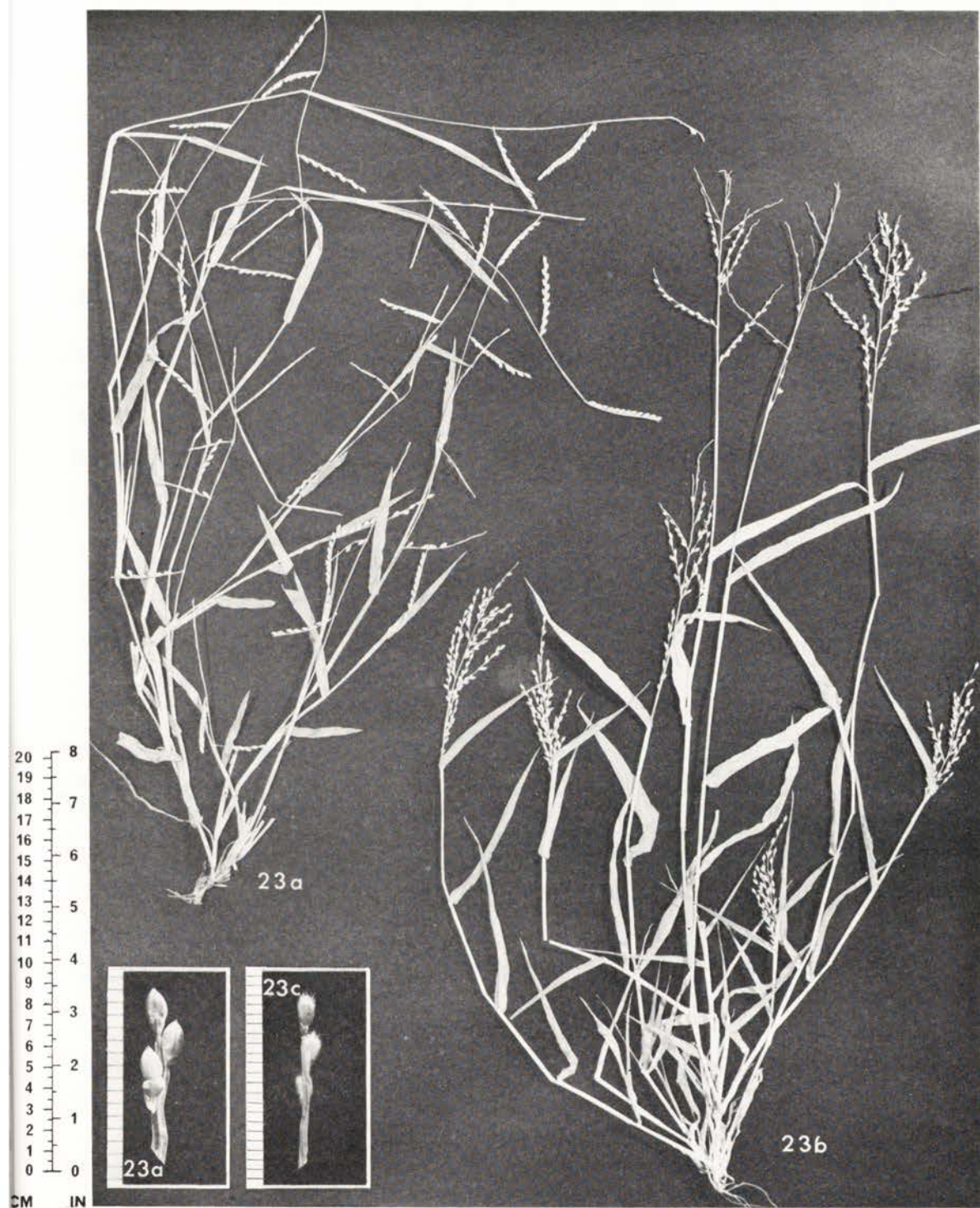


PLATE 23. (a) *Brachiaria miliiformis*; (b) *Brachiaria praetervisa*; (c) *Brachiaria piligera*

Racemes remote on the axis, 2-4 (rarely -6.25) cm long, erect or horizontally spreading or reflexed, spikelet-bearing to the base; rhachis glabrous, \pm smooth, flexuose, flat and ribbon-like, 1-1.5 mm wide, prominently ribbed; pedicels stout, <0.5 mm long, dilated and convex at the apex. *Spikelets* 4-5 mm long, glabrous, smooth, obovate-elliptic, acute or obtuse or apiculate. *Glumes* and *lower lemma* thinly membranous, glabrous, smooth. *Lower glume* slightly less than half as long as the spikelet, acute or obtuse, broad, enclosing the base of the spikelet. *Upper glume* as long as the spikelet, 7-nerved. *Lower lemma* 5-nerved, without a palea. *Fertile floret* 3 mm long, elliptic-obovate, \pm obtuse, rugulose. *Caryopsis* 2-2.5 mm long, elliptic, obtuse.

26. Naked Armgrass

Brachiaria notochthona
Plate 22c

GENERAL DESCRIPTION

In several characters this species is identical with hairy-edged armgrass (No. 23). However, the spikelets of *Brachiaria notochthona* are entirely hairless and slightly smaller.

OCCURRENCE: The two species often grow together and are similar in distribution.

DISTRIBUTION: S.A., Q., N.S.W.

VALUE: Readily grazed.

BOTANIC DESCRIPTION

Inflorescence of 3 or more racemes, usually 2 close together and the remainder lower down, terminating the flowering culms and (sometimes very short) branches, partly enclosed by the floral leaf or shortly exserted. *Racemes* mostly 1.5-2 cm long, erect, usually appressed; rhachis flattened on the back, prominently ribbed, flexuose, scabrous on the edges; pedicels <0.5 mm long, scaberulous, compressed, prominently dilated at the apex. *Spikelets* 3.75-4.5 mm long, glabrous, lanceolate, acute. *Glumes* firmly membranous, glabrous, smooth; lower 0.5 mm long or less, 1-3-nerved, subacute or truncate, broad, enclosing the base of the spikelet; upper as long as the spikelet, lanceolate, acute to cuspidate, 7-9-nerved. *Lower lemma* 5 or sub-7-nerved, thinly membranous and flat or depressed between the midnerve and the lateral nerves, with incurved margins. *Lower palea* glabrous, smooth, hyaline. *Fertile floret* broadly elliptic, obtuse, yellowish, 2-2.25 mm long, 1-1.25 mm wide, mucronate; mucro 0.5-0.75 mm long. *Upper lemma* rugose; palea with smooth shiny thin incurved margins. *Caryopsis* 1.75-2 mm long, smooth, almost orbicular.

27. Hairy Armgrass

Brachiaria piligera
Plate 23c

GENERAL DESCRIPTION

In many respects this species is similar to armgrass millet (No. 25), but differs essentially in its hairy spikelets. Superficially the plants are very close, though hairy armgrass is larger (30-45 cm high), strongly branched, and less erect, with a

Description of the Species

pronounced tendency towards a decumbent habit. The creeping forms in particular tend to behave as short-lived perennials rather than as annuals.

In relation to occurrence and pasture value, the two species can be regarded as identical.

DISTRIBUTION: W.A., N.T., Q., N.S.W.

BOTANIC DESCRIPTION

Close affinities with *Brachiaria miliiformis*, from which it differs in the pubescent (not glabrous) upper glume and lower lemma of its spikelets. Characteristically the hairs are denser and longer upwards and form an indefinite, apical fringe slightly overtopping the spikelet.

28. Large Armgrass

Brachiaria praetervisa
Plate 23b

GENERAL DESCRIPTION

HABIT: Semi-erect annual, 30–60 cm high, sometimes rooting at the lower nodes.

STEMS: Smooth, branched, flattened or angular, grooved on one side, with 3–4 hairy nodes.

LEAVES: Blades thin, flat, 3–11 cm long, 6–12 mm wide, usually hairless, long-pointed, with a prominent white midrib and thickened, often wavy edges roughened by short bristly hairs. Sheaths loose, smooth, shiny, strongly nerved, shorter than their internodes, hairy at the mouth and usually along the edges.

SEEDHEAD: Often partly enclosed by the floral leaf; when mature and fully exserted the heads are 7–11.5 cm long, 2.5–5 cm wide, and consist of 5–10 erect or slightly spreading racemes scattered along the axis. The lower racemes are 2.5–6.5 cm long, the upper somewhat shorter. The green, hairless, shortly stalked spikelets are irregularly arranged on the rhachis of the raceme in singles or in pairs. A distinctive feature is the presence sometimes of 1, 2, or 3 long, fine hairs below each spikelet.

OCCURRENCE: Sporadic and associated with better-watered places such as the beds, banks, frontages, and floodplains of streams. It is most common in March, but persists until May and early June with particularly favourable conditions.

DISTRIBUTION: S.A., Q., N.S.W.

VALUE: The herbaceous stems and thin, soft foliage are palatable; the species being among the more valuable pasture annuals.

BOTANIC DESCRIPTION

Inflorescence of 5–10 racemes, open, 7–11.5 cm long when fully exserted; peduncle compressed, glabrous; axis strongly angular, scabrous-pubescent. *Racemes* solitary, distant, usually simple, erect or slightly spreading, spikelet-bearing almost to the base, the lower ones 2.5–6.5 cm long, the upper much shorter; rhachis strongly angular, scabrous-pubes-

cent; pedicels 0.5–2.75 mm long, angular, scabrous on the angles, thickened upwards, the apex oblique, dilated, convex, sometimes with 1, 2, or 3 long fine white hairs. *Spikelets* elliptic, acute, 2.75–3.5 mm long, usually glabrous, solitary or paired, loosely and irregularly arranged. *Lower glume* about one-third as long as the spikelet, thinly membranous, prominently 3-nerved, acute, enclosing the base of the spikelet. *Upper glume* as long as the spikelet, thinly membranous, glabrous, prominently 7-nerved, convex on the back. *Lower lemma* glabrous, flat, prominently 5-nerved, with a flat hyaline palea. *Fertile floret* slightly shorter than the spikelet, oblong-elliptic, obtuse, mucronate, rugulose; palea with incurved, shiny, smooth, hyaline margins. *Caryopsis* 1.5–2 mm long, broadly elliptic, obtuse.

29. Hairy Native Couch

Brachyachne ciliaris

GENERAL DESCRIPTION

HABIT: Small annual or short-lived perennial, creeping or decumbent, with erect flowering stems 5–7.5 cm high.

LEAVES: Sheaths with long fine spreading hairs along the edges. Blades short, with spreading hairs based on hard, wart-like tubercles.

SEEDHEAD: Consisting of 2 rather stiff spikes 3–4 cm long terminating the culms; one side of the rhachis of the spike densely crowded with small, stalkless spikelets arranged in two rows. The spikelet has one small floret wholly enclosed by two outer glumes. A distinctive feature of the species is the presence of a ring of long, spreading hairs forming a crown at the apex of the floret.

OCCURRENCE: In central Australia, hairy couch is known from only one locality (Charlotte Waters).

DISTRIBUTION: S.A., Q., N.S.W.

VALUE: Not significant in pastures.

BOTANIC DESCRIPTION

Spikes, 2, digitate, 3–4 cm long. *Spikelets* 1-flowered, sessile, imbricate, biseriate and secund on a flattened rhachis; rhachilla disarticulate above the glumes, not produced beyond the floret. *Glumes* 3–4 mm long, longer than the floret, 1-nerved, keeled, membranous. *Lemma* 2–2.5 mm long, cymbiform, 3-nerved, ciliate on the nerves and bearded near the apex, the hairs forming a transverse subapical fringe exceeding the apex. *Palea* 2-keeled, ciliate and bearded like the lemma. *Caryopsis* 1.5 mm long, obovoid, shiny.

30–33. Rhodes Grasses

Chloris spp.

(*Chloris* grasses)

The four species of this group are readily distinguished by their inflorescence, which consists of many erect or spreading spikes digitate on the culms. On one side of the rhachis of the spike, the closely overlapping spikelets are arranged in two



PLATE 24. (a) *Chloris acicularis*; (b) *Chloris scariosa*

rows. The spikelet consists of an outer pair of thin glumes and two or more awned florets, of which only the lowest is fertile. At maturity all the florets fall, leaving the glumes attached to the plant.

Being a genus of high rainfall, tropical and subtropical regions, the group is not well-developed in arid central Australia. All representatives are restricted to better-watered places and the majority are short-lived. As a result, they are relatively unimportant as pasture grasses.

GENERIC CHARACTERS

Spikelets solitary, laterally compressed, sessile or shortly pedicellate, erect and usually closely imbricate, secund, biseriate and alternate on the continuous triquetrous rhachis of digitate spikes or spike-like racemes; rhachilla disarticulate above the glumes, continuous between the florets, terminated by or sometimes produced beyond the terminal floret. *Florets*, 2 or sometimes more, the lowest bisexual, the remainder male or neuter. *Glumes* unequal, narrow, hyaline or thinly membranous, 1-nerved, keeled, scabrous or scaberulous on the keel, otherwise glabrous and smooth. *Lowest lemma* firmly membranous or indurate, 3-nerved with the lateral nerves submarginal, keeled, acutely 2-lobed at the apex and awned from the sinus; callus short, obtuse, bearded with white hairs. *Palea* about as long as the entire portion of the lemma, hyaline or membranous, mostly glabrous and smooth, entire, 2-keeled, with incurved margins. *Caryopsis* enclosed in the lemma and palea, trigonus. *Upper lemma* (or lemmas) usually similar to the lowest but smaller, without paleas.

KEY TO THE SPECIES

- A. Spikelet 4-7-flowered. Lemmas of imperfect florets scarious, expanded, 5-7-nerved. Callus elongated, pungent. 32. *C. scariosa*
- A. Spikelet usually 2-flowered. Lemmas membranous or cartilaginous, not expanded, 3-nerved. Callus small or minute, obtuse or subacute.
 - B. Lemma of lower (fertile) floret bearded on the upper margins. Imperfect floret inflated, obtuse or truncate. 33. *C. virgata*
 - B. Lemmas glabrous or puberulous on the margins, but not bearded. Imperfect floret not inflated, acute or acuminate.
 - C. Lower floret laterally compressed; lemma 3-3.75 mm long, keeled. Upper lemma subequal to the lower one, deeply 2-lobed. Plant usually 20-30 cm high and annual. 31. *C. pectinata*
 - C. Lower floret dorsally compressed; lemma 6-7 mm long, ridged on the midnerve. Upper lemma much-reduced and dissimilar to the lower one, obscurely lobed or entire. Plant perennial, 45-105 cm high. 30. *C. acicularis*

30. Curly Windmill Chloris

Chloris acicularis
Plate 24a

GENERAL DESCRIPTION

HABIT: Erect or sprawling long-lived perennial, 45-105 cm high, sometimes rooting from the lower nodes, forming compact tussocks up to 30 cm wide, with slightly thickened butt.

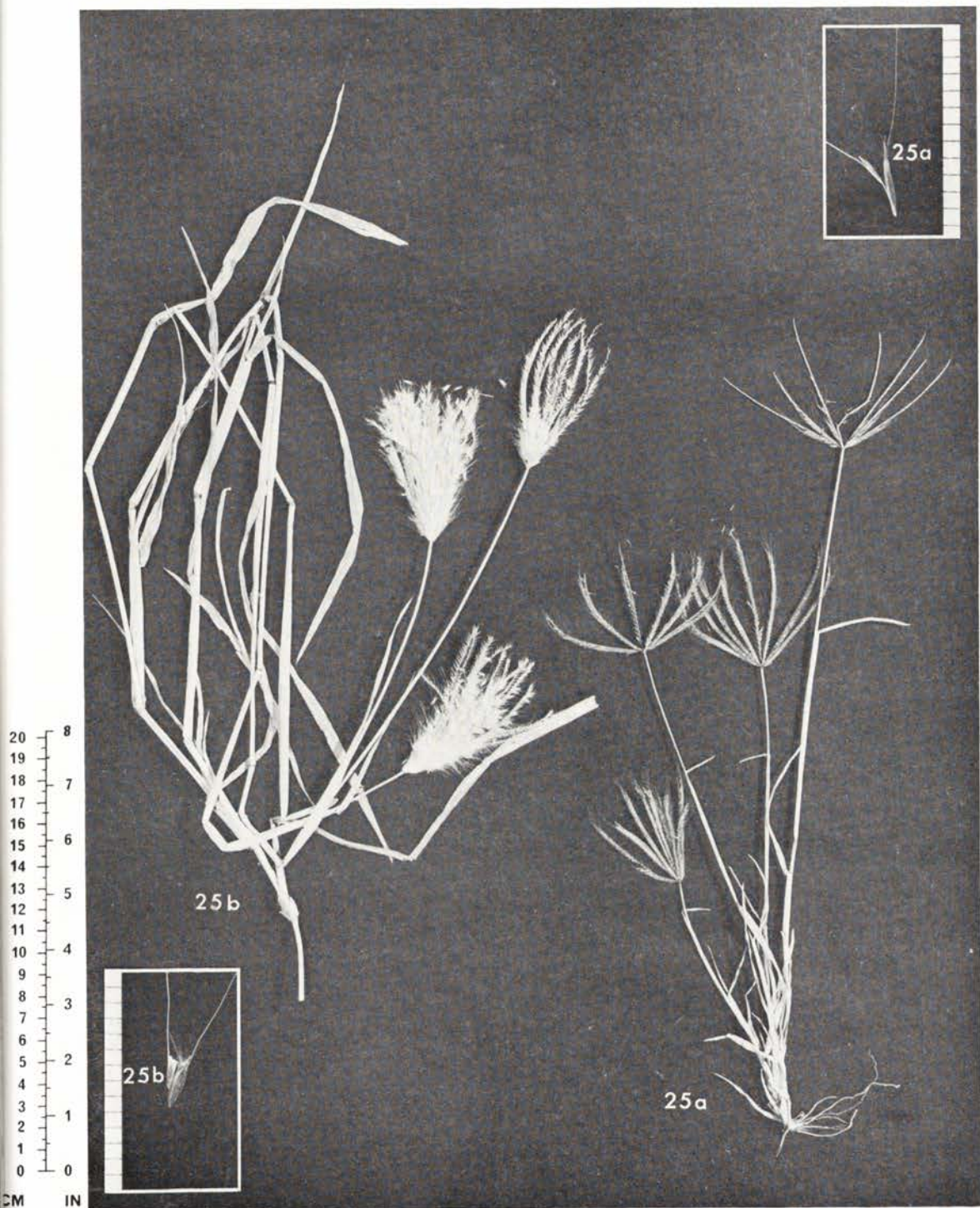


PLATE 25. (a) *Chloris pectinata*; (b) *Chloris virgata*

STEMS: Numerous, wiry, much-branched, densely clustered at the rather thick hairless nodes.

LEAVES: Often bluish-green, hairy or hairless. Blades erect or drooping, up to 20 cm long and 6 mm wide, fairly coarse, flat and characteristically curly when dry. Sheaths loose, shorter than the internodes, slightly rough from scattered bristly hairs or small hard tubercles.

SEEDHEAD: Consisting of 3–12 spikes digitate on the culms and stiffly spreading windmill-like in several different planes. The spikes are up to 17 cm long, swollen and hairy at the axils, with the 2-flowered spikelets in 2 regular rows on one side of the rhachis. The florets are awned, somewhat rough, densely hairy and blunt at the base, first dark purple, but ripening brown; the upper sterile one much narrower than the lower fertile floret.

OCCURRENCE: Though widely dispersed in the area this grass is predominant in the northern half, commonly forming prominent stands on the fringe of stream channels and drainage lines. Less densely, it occurs on river floodplains and alluvial fans. Also there are minor occurrences on calcareous soils under gidgee, on shallow soils on hill slopes, and particularly in the central part on saline soils with saltbush and bluebush and on the margins of clay pans. It is found more often on medium-fine-textured than coarse soils, and is most commonly associated with mulga, ironwood, coolibah, and short grasses and forbs.

DISTRIBUTION: M.

VALUE: Like many perennial grasses in the area curly windmill is moderately palatable when young, but becomes coarse and unpalatable with age. At its most valuable stage of growth, it is largely neglected in favour of more palatable, short-lived plants which become available with the onset of favourable conditions. However, it is utilised by stock when pasture productivity is low.

BOTANIC DESCRIPTION

Spikes, 3–12, rigidly divergent, < 17 cm long, swollen and pubescent in the axils; rhachis angular, scabrid. *Spikelets* 2-flowered. *Glumes* linear-lanceolate, acuminate with a bristle-like point, strongly keeled, scabrous or scaberulous; lower 2.5–4 mm long; upper 5–8 mm long. *Lower lemma* 6–8 mm long (incl. callus), glabrous, scabrous, dorsally compressed, sometimes broadly grooved on each side of the midnerve, with 2 minute teeth at the apex; awn 10–15 mm long, scabrous, stiff, erect or somewhat recurved; callus 0.5–1 mm long. *Palea* scabrous-pubescent and membranous or indurate between the keels, smooth and thin on the margins. *Caryopsis* narrow-oblong, brown, 4–5 mm long. *Upper lemma* extremely narrow, scabrous-pubescent, 2.5–3.25 mm long, with a fine scabrous awn 8–12 mm long, terminating a slender glabrous smooth rhachilla-internode about 2 mm long.

31. Comb Chloris

Chloris pectinata

Plate 25a

GENERAL DESCRIPTION

HABIT: Erect shallow-rooted annual, sometimes long-lived, forming small tufts, up to 30 cm high but usually less than 22 cm.

STEMS: Mostly simple, sometimes branching near the base, hairless, smooth.

LEAVES: Hairless, mostly basal. Blades flat, long, narrow. Sheaths loose.

SEEDHEAD: Consisting of 5-7 slender, spreading, sometimes reflexed, often slightly curved, feathery, often purplish spikes 3.5-8 cm long on a long peduncle. Spikelets 2-flowered, closely crowded along one side of the rachis like the teeth of a comb; each spikelet with two long hair-like awns, pale brown when ripe.

OCCURRENCE: Associated with shallow waterholes, gilgais, depressions, or any low site subject to flooding, usually growing on heavy soil, often with curly windmill *Chloris*. Usually seasonal in occurrence, it grows mainly from March to May, sometimes abundantly.

DISTRIBUTION: W.A., S.A., Q., N.S.W.

VALUE: Moderately palatable; in pasture its shallow-rooting, rapid-maturing habits are unfavourable features.

BOTANIC DESCRIPTION

Racemes, 5-7, 3.5-8 cm long, erect or reflexed, sessile, rigid, straight or somewhat curved, pubescent in the axils; rachis densely scabrid; pedicels about 0.25 mm long, scabrid, thick, rigid, thickened at the apex. *Spikelets* 2-flowered. *Lower glume* 1.75-2 mm long, lanceolate-oblong, long-acuminate and bristle-like at the apex. *Upper glume* 3-3.25 mm long, linear-lanceolate, acuminate. *Lower lemma* 4.5-5 mm long (incl. callus), narrowly linear or linear-oblong, thickened along the nerves, scabrous on the apical lobes and sometimes also on the back near the midnerve, ciliate on the upper margins, otherwise glabrous; awn filiform but stiff, scabrous, 12-23 mm long. *Palea* linear-oblong, acuminate, ciliate on the upper margins. *Upper lemma* almost 2 mm long, divided almost to the middle into 2 acuminate scabrous lobes, glabrous; awn scabrous, 8-10 mm long; rachilla-internode very slender, scabrous or scaberulous, 1.5 mm long.

32. Winged Chloris

Chloris scariosa

Plate 24b

GENERAL DESCRIPTION

HABIT: Densely tufted annual or short-lived perennial, 22-30 cm high, rarely to 45 cm.

STEMS: Erect or bent at the nodes, simple or branched, hairless, smooth, sometimes woody, bluish when young; basal internodes covered by the sheaths.

LEAVES: Bluish-green, mostly hairless, rather thick and stiff; blades flat or with incurved edges, gradually tapered to a long fine point; sheaths tight, becoming loose with age, the upper ones shorter than their internodes.

SEEDHEAD: Consisting of 3–5 (usually 4) stiffly erect spikes 2–3.5 cm long, terminal and somewhat crowded on the culms, first partly enclosed by the broad loose floral leaves, becoming exerted and shortly overtopping the uppermost leaves. The spikelets are purplish or greenish-yellow, awned, usually 5-flowered, densely clustered, with broad transparent particularly distinctive wings on the upper florets. As a result the spike in flower is 2–3 cm wide, but less than 12 mm wide when the florets mature and fall.

OCCURRENCE: In central Australia winged *Chloris* often occurs in saline areas, mainly on texture-contrast soils with *Bassia* and saltbush. However, there are occurrences also on red earth soils under mulga, on low rocky hills, on creek banks, and on heavy soils under gidgee. It is found from February to late July.

DISTRIBUTION: M. (excl. V.).

VALUE: Plants appear not to be grazed to any extent.

BOTANIC DESCRIPTION

Spikes, 3–5 (usually 4), 2–3.5 cm long, erect and closely clustered, shortly pedunculate, villous on the peduncle; rachis straight, scabrous, pilose, slender but rigid. *Spikelets* 4–9 (usually 5) -flowered. *Glumes* prominent; lower 4–4.5 mm long, subobtuse, linear-oblong; upper 6–6.75 mm long, deeply notched at the apex into 2 acuminate lobes, linear-elliptic. *Lowest lemma* 2.5–3.25 mm long, broadly elliptic or \pm orbicular (flattened), hyaline or membranous on the margins and apical lobes, with prominently thickened nerves, bearded near the apex on the lateral nerves and sometimes also on the back in the lower part near the midnerve with dense white hairs, otherwise glabrous, smooth and \pm shiny, borne on a rigid stipitiform densely pubescent callus-like rachilla-internode 2.5–3 mm long; awn 5–7.5 mm long, scaberulous, arising dorsally from the sinus. *Palea* obovate (flattened), curved, ciliate on the keels, acute. *Caryopsis* 1.25–2 mm long, glabrous, brown, obovate, sharply convex on the back, concave on the face. *Lemmas of imperfect florets* scarious, 5–7-nerved, glabrous and smooth, borne on a glabrous rachilla-internode up to 1.25 mm long; the first and second broadly orbicular-ovate, 4 mm long and almost as wide; the remainder much smaller, gradually reduced in size upwards.

33. Feathertop Rhodes

Chloris virgata
Plate 25b

GENERAL DESCRIPTION

HABIT: Slender or robust annual, often decumbent, usually about 90 cm high, but < 120 cm and sometimes only 15–30 cm.

STEMS: Thin or thick, but hollow and soft, hairless, smooth, much-branched, sharply bent at the nodes, with several prominent nodes; lower internodes often grooved along one side, angular or somewhat flattened.

LEAVES: Usually hairless and \pm smooth, green or becoming straw-coloured with age. Sheaths shorter than the internodes, sometimes with long fine hairs at the mouth; the lower ones tight, flattened, keeled like a boat; the upper loose, broad,

Description of the Species

and rounded. Blades usually about 15 cm long and 6 mm wide, but sometimes much larger, tapered to a fine point, flattened or folded and keeled like the lower sheaths, often weakly spreading and flaccid, smooth or somewhat rough, with sharp edges, broad in the lower part and abruptly narrowed to the sheath.

SEEDHEAD: Dense, pale green, feathery, consisting of 7–17 erect, closely clustered spikes or racemes 3.5–7.5 cm long on a long usually stout peduncle. Immature spikes are partly enclosed by the (often broad) uppermost leafsheath, but with maturity they become exerted and prominent above the leaves. The spikelets are pale green and densely crowded in two rows along one side of the slender rhachis. Each one contains two awned florets above the two outer glumes; the lower fertile floret with a dense, distinctive fringe of long, white, stiff hairs near the apex. At maturity the florets fall, leaving the narrow, very thin and delicate, long-pointed, silvery glumes attached to the plant.

OCCURRENCE: Rare in central Australia; occurring near streams on floodouts and levees; probably also as a weed of cultivation and disturbed ground generally.

DISTRIBUTION: M. (excl. V.), E-A.

VALUE: Apparently of low to moderate fodder value in Queensland where it occurs more commonly, but not significant in pastures of central Australia.

BOTANIC DESCRIPTION

Racemes, usually 12 (7–17), 3.5–7.5 cm long, subsessile, erect, closely clustered, exerted at maturity; rhachis slender but stiff, usually straight, scabrous, pilose, villous or pubescent at the base; pedicels about 0.25 mm long, pilose, slender, widened at the apex. *Spikelet* 2-flowered. *Lower glume* 2–2.25 mm long, acute, linear-lanceolate. *Upper glume* 3.5 mm long, narrowly oblong, bifid and awned from the sinus; awn 1.5–1.75 mm long. *Lower lemma* 4 mm long (incl. callus), elliptic (flattened), with a longitudinal groove between the midnerve and lateral nerves, ciliate on the margins in the lower half to two-thirds, bearded near the apex on the lateral nerves with stiff white hairs up to 3 mm long, glabrous and smooth on the surface; apical lobes minute, hyaline, acute; awn 11–12 mm long, filiform but stiff, scabrous, straight. *Palea* hyaline, narrowly oblong-elliptic, acute, scaberulous on the keels. *Caryopsis* 1.5 mm long, narrowly elliptic, \pm terete, smooth, brown. *Upper lemma* 3–3.5 mm long (incl. rhachilla-internode of 0.75 mm), cuneate (flattened), obliquely truncate in profile, ciliolate at the apex, glabrous and smooth on the surface; awn 10–11 mm long.

34-35. Beard Grasses

Chrysopogon spp.

Two closely related species of this largely tropical genus occur in central Australia north of the Macdonnell Ranges. Both are tufted perennial plants with prominent panicles terminating long culms and consisting of whorls of long, fine branches scattered along the axis. Each panicle-branch is terminated by usually a triplet of spikelets comprising one fertile, stalkless spikelet between and below two stalked, sterile spikelets. The fertile spikelet is readily recognised by its hairy, basal spear,

its spirally twisted, sharply bent terminal awn, and its rough, bristly, tubercled edges, whereas the sterile spikelets lack the pointed base and have shorter, straight, slender, untwisted, bristle-like awns. At maturity the triad of spikelets falls as a whole, leaving hairy, oblique scars on the tips of the panicle-branches.

The common name refers to the dense tuft of hairs immediately below the triplet of spikelets.

GENERIC CHARACTERS

Spikelets usually in threes at the ends of the branches of terminal panicles, one sessile, the other two pedicellate; the trio (raceme) falling entire from the thickened, bearded, oblique tips of the panicle-branches. *Florets*, 2; lower reduced to an empty lemma; upper bisexual in the sessile spikelet and male or neuter in the pedicellate spikelet. *Sessile spikelet* usually compressed laterally, awned, with a bearded, usually acute callus. *Glumes* subequal; lower cartilaginous or chartaceous, 2-keeled in the upper part, muricate on the keels; upper cymbiform, \pm keeled. *Lower lemma* hyaline, usually 2-nerved, slightly shorter than the lower glume, ciliate. *Upper lemma* hyaline, linear, entire or 2-dentate, subequal to the lower glume, usually with a perfect awn (sometimes imperfect or absent) arising from the sinus. *Palea* about half as long as the lemma, hyaline, nerveless or 2-nerved. *Caryopsis* linear or narrowly elliptic, laterally compressed. *Pedicellate spikelets* dorsally compressed, awned or awnless. *Lower glume* 2-keeled, membranous; upper usually subequal (sometimes much shorter), 3-nerved, with hyaline ciliate margins. *Lemmas* mostly hyaline, the upper shorter than the lower, rarely the upper or both wanting. *Palea* linear to oblong, obtuse, hyaline, nerveless, or sometimes absent. *Panicles* exserted; branches mostly whorled, usually simple; pedicels linear, filiform, not longitudinally grooved, truncate at the tips.

KEY TO THE SPECIES

- A. Disarticulation scar at apex of panicle-branch broad, ovate. Callus 1.5–3.5 mm long. Awn usually 20–40 (rarely –45) mm long; column 8–15 mm long, usually not overtopping the pedicellate spikelets. 34. *C. fallax*
- A. Disarticulation scar at apex of panicle-branch narrow, very oblique. Callus 4–6 mm long. Awn 42–70 mm long; column 16–31 mm long, usually distinctly overtopping the pedicellate spikelets. 35. *C. pallidus*

34. Golden Beard Grass

Chrysopogon fallax

Plate 26a

GENERAL DESCRIPTION

HABIT: Tussock-forming long-lived rather stout perennial, commonly 90–135 cm (sometimes 1.5–1.8 m) high; tussock 7.5–15 cm wide, deep-rooted, with a distinctive fibrous butt densely covered by soft silky hairs.

In general, plants are mostly hairless and smooth, while stems and sheaths are often bluish-green and powdery. In the field the tussock has a distinctive stemmy appearance, due to its numerous, elongated flowering culms and dense, basal tuft of long leaves curving to the ground.



PLATE 26. (a) *Chrysopogon fallax*; (b) *Sorghum plumosum*

STEMS: Erect, 3–5-noded, grooved, simple or branched from the upper nodes.

LEAVES: Blades long, narrow, flat or folded, dense near the base, but sparse above. Sheaths tight, hairy at the mouth; the upper ones shorter than the internodes; the basal ones usually hairy.

SEEDHEAD: Panicle purplish or golden-brown, usually 17–20 cm long and up to 5 cm wide; branches up to 16 in each cluster, 2.5–6 cm long. The fertile spikelet is 9–11 mm long, with a tuft of golden-brown hairs around the spear-like base, and a terminal awn. This is 2–4.5 cm long and consists of a brown, twisted, bristly, hairy column and a paler, straight bristle.

OCCURRENCE: Golden beard grass is restricted to the northern half of the area and occurs on flat or gently undulating country mainly on medium- or fine-textured soils. It is a characteristic plant of floodplains, creek banks, river levees and flood-outs, depressions, and gentle alluvial slopes receiving run-off from adjacent hills. It is commonly associated with short annual grasses and forbs, scattered low trees and shrubs, with coolibah, river red gum, mulga, ghost gum, and to a lesser extent with bloodwood, snappy gum, and gidgee.

Golden beard grass makes rapid growth with the onset of summer rains and matures earlier than many perennial grasses in the area. If not grazed the flowering stems persist for long periods, but the foliage dies quite readily. For most of the dry season, little of the plant remains except the deeply rooted, fibrous butts (often only barely visible above the ground), which are reputed to be grazed by kangaroos and other native fauna.

DISTRIBUTION: M. (excl. V.).

VALUE: Plants are palatable for short periods during the growing season (Arndt and Norman 1959). Because of its deep, vigorous root-system, golden beard grass is drought-resisting and able to withstand heavy grazing. Its rapid response to rain is a further desirable feature as pasture, though in some parts it is neglected in favour of more palatable, short-lived plants available at the same time.

BOTANIC DESCRIPTION

Panicle linear-lanceolate, contracted but rather lax, 7–23 cm long, 2.5–7 cm wide; axis mostly glabrous and smooth, with pilose or pubescent nodes; branches up to 16 in each whorl, capillary, unequal, up to 6 cm long, slightly spreading, glabrous or pilose-scabrous, hispid on the tips, the scar 0.6–2.1 mm long. *Racemes* mostly 1-jointed; pedicels subequal, mostly 3.5–7 mm long, compressed, mostly glabrous and smooth, widened at the apex. *Sessile spikelet* narrowly lanceolate, acute, 9–11 mm long (incl. callus); callus narrowly conical, sometimes slightly curved, 1.7–3 (rarely –3.5) mm long, bearded with golden-brown hairs up to 2 mm long. *Lower glume* cartilaginous to indurated, convex on the back, 2-keeled in the upper third, 5–7-nerved with 3 intracarinial nerves, narrowly truncate or bifid (sometimes awned), tubercled or spinulose-tubercled on the lateral nerves, smooth on the surface in the lower part and scabrous-punctate towards the apex. *Upper glume* 3–5-nerved, scabrous to scabrous-punctate or smooth in the lower part; keel terminating

Description of the Species

in a slender scabrous bristle-like awn 5.5–10 (rarely –18) mm long. *Lower lemma* oblong or oblanceolate, obtuse, 2–3-nerved, 5–7.5 mm long. *Upper lemma* 5.5–7 mm long, linear-oblong, shortly bifid, membranous, with hyaline ciliate margins; awn scabrous, stout, geniculate, 20–40 (rarely –45) mm long, with scabrous brown column (usually barely exceeding the pedicellate spikelets) and a straight paler bristle. *Palea* 3.2–4.2 mm long, linear-oblong, obtuse, nerveless or 2-nerved, mostly glabrous. *Pedicellate spikelets* male (rarely neuter), linear-lanceolate, acute, usually awned, 9–12 mm long, with a minute callus. *Lower glume* lanceolate, acuminate, usually awned, 5–9-nerved, spinulose to scabrous on the keels, scaberulous to scabrous on the surface; awn bristle-like, scaberulous, oblique, usually 2–7 (rarely –15) mm long. *Upper glume* narrowly lanceolate, acuminate, mucous or shortly awned.

35. Ribbon Grass

Chrysopogon pallidus

GENERAL DESCRIPTION

Ribbon grass is closely related to the former species (No. 34) and in most cases both plants are superficially identical. The typical form of ribbon grass differs mainly in its robust coarse habit, and in the longer basal spear (up to 5.5 mm) and larger awn (42–70 mm long) of its fertile spikelet. The common name comes from the basal leaf sheaths, which disintegrate with age into long fibres.

OCCURRENCE: In central Australia ribbon grass tends to inhabit deep, light-textured soils with good water relations. It does not appear to be as common as golden beard grass.

DISTRIBUTION: W.A., N.T., Q.

VALUE: Comparable with golden beard grass.

BOTANIC DESCRIPTION

Closely allied to *Chrysopogon fallax* and perhaps only an extreme form, differing in the following characters: *Panicle* 18–30 cm long. *Sessile spikelet*: scar 2.2–4.7 mm long; callus pungent, 4–5.5 mm long; awn of upper lemma stout, sharply geniculate, 42–70 mm long; column 16–31 mm long, dark brown to black, distinctly overtopping the pedicelled spikelets.

36–38. Oilgrasses

Cymbopogon spp.

(citronella grass)

The three representatives of this genus are leafy, tussock-forming, long-lived plants; all rather similar in appearance, usually highly coloured, and strongly aromatic. In particular the blades and butt are distinctly citronella-scented. In central Australia the species are widespread, but sporadic in distribution and relatively unimportant in pasture.

A distinctive feature of the group is the densely hairy panicle with the spikelets almost entirely concealed by long, soft, silky, silvery or white hairs. Several panicles are produced on each culm, each one arising from an upper node and partly enclosed

by a spathe often longer than the panicle itself. The panicle is made up of several pairs of racemes, each pair similarly enclosed by a spatheole which is cymbiform, hairless, often red, and rather conspicuous. The rhachis of the raceme is several-jointed, very fragile, and crowded with several pairs of long-hairy, awned spikelets. At maturity, the rhachis breaks at the joints and the spikelets fall separately, leaving the spatheoles attached to the plant.

GENERIC CHARACTERS

Spikelets in pairs, one sessile, the other pedicellate, on the articulate fragile rhachis of many-jointed paired racemes, those of each pair of spikelets differing in sex and \pm in shape (except the lowest pair, which are homogamous and both male or neuter). *Florets*, 2, the lower reduced to an empty lemma, the upper hermaphrodite in the sessile spikelet, male or rarely neuter in the pedicellate spikelet. *Sessile* (fertile) *spikelet* of heterogamous pair dorsally or at times laterally compressed, falling with the adjacent internode of the rhachis and the accompanying pedicel; callus short, obtuse, shortly bearded. *Glumes* equal or subequal, \pm chartaceous; lower flat or slightly depressed or narrowly grooved on the back, 2-keeled, with sharply inflexed margins at least above the middle; upper \pm cymbiform, keeled upwards, usually 1-nerved. *Lemmas* ciliate or ciliate; lower entire, hyaline, usually 2-nerved; upper hyaline, bifid or 2-lobed, awned, rarely firmer and stipitate below the insertion of the awn. *Caryopsis* oblong. *Pedicellate spikelet* not depressed or grooved on the back. *Glumes* muticous; lower \pm chartaceous; upper thinner. *Lower lemma* hyaline, 2-nerved. *Inflorescence* of paired racemes, each pair subtended by a spatheole, grouped into contracted spatheate often decompound panicles.

KEY TO THE SPECIES

- A. Racemes divaricate or reflexed, densely hairy. Awn 6–8 mm long, inconspicuous among the silky hairs. 38. *C. obtectus*
- A. Racemes erect or divergent. Awn 12–15 mm long, prominent.
 - B. Coarse plant 3–5 ft high. Butt sometimes densely woolly. Leaves broad, flat, strap-like, curly and twisted with age. Lower glume of sessile spikelet with 2 intracarinial nerves. 36. *C. bombycinus*
 - B. Somewhat slender plant 1–3 ft high. Butt hairless or sparsely hairy. Leaves narrow and slender, not strap-like, at times curly. Lower glume of sessile spikelet with 3–5 intracarinial nerves. 37. *C. exaltatus*

36. Silky Oilgrass

Cymbopogon bombycinus

GENERAL DESCRIPTION

HABIT: Coarse tussock-forming perennial, 90–150 cm high, particularly aromatic on the thickened butt.

STEMS: Erect, stout, unbranched, with swollen hairy nodes.

LEAVES: Usually purplish-red, acquiring a deep reddish hue with age. Sheaths becoming loose and flat; the basal ones numerous, densely clustered, sometimes cover-



PLATE 27. (a) *Cymbopogon exaltatus*; (b) *Cymbopogon obtectus*

ed by curly and twisted woolly hairs. Blades 6–8 mm wide, flat, long-pointed. With age the flat, rather thick sheaths and blades become curly and twisted, characteristically hanging strap-like from the stems or collecting in tangled masses about the plant.

SEEDHEAD: The panicles are essentially those of silky-heads (No. 38), but the racemes remain \pm erect, not becoming reflexed as in that species.

OCCURRENCE: Rare in central Australia and apparently confined to the far northern part; occurring on, though probably not restricted to, shallow and skeletal soils of stony slopes and hills.

DISTRIBUTION: W.A., N.T., Q.

VALUE: A coarse unpalatable plant, less valuable than other oilgrasses in the area.

BOTANIC DESCRIPTION

Close affinities with *Cymbopogon obtectus*, but differs in the 2-nerved (not 3–5-nerved) lower glume of the sessile spikelet and in the erect or slightly divergent (not reflexed) racemes.

37. Scented Oilgrass (scent grass)

Cymbopogon exaltatus
Plate 27a

GENERAL DESCRIPTION

HABIT: Long-lived perennial, 30–90 cm high, forming leafy tussocks, variable in form. In the fresh state, leaves and butt are strongly citronella-scented.

STEMS: Erect, unbranched, hairless, smooth, shiny, with 2–3 hairless or pilose nodes.

LEAVES: Usually bluish-green when young, becoming reddish. Blades 22–45 cm long, folded and narrow, often slender though variable, tapered to a long fine point, curled and twisted with age. Sheaths \pm smooth, prominently nerved, mostly up to half as long as the internodes, becoming loose with age; the lower ones sometimes pilose.

SEEDHEAD: Panicle up to 35 cm long, 2–3 cm wide, densely or sparsely silky-hairy; spatheole 25–40 mm long, narrow, long-pointed; racemes 12–25 mm long, erect or slightly spreading. The awns are well-developed, 12–18 mm long, and distinctly visible among the hairs of the spikelet.

OCCURRENCE: Scent grass occurs on shallow and skeletal soils in hilly parts of the area associated with witchetty bush, gummy spinifex, white cypress, and sparse low trees and shrubs. Also, it occurs in streams (e.g. Todd River), sometimes growing densely enough to dominate small areas.

Various forms exist, a distinctive one being a slender-leaved plant which inhabits rugged places such as the rocky slopes of Standleys Chasm and sandy crevices of Ayers Rock.

DISTRIBUTION: M. (excl. V.).

VALUE: Reputed to be unattractive to stock because of its aromatic foliage. Plants rarely bear evidence of grazing and in any case occur only sporadically.

BOTANIC DESCRIPTION

Close affinities with *Cymbopogon obtectus*, but differing mainly in the following characters: *Panicle* linear, sparse to rather dense, sometimes interrupted, 8–35 cm long, 2–3 cm wide, 4–6-noded, variable in indumentum; common axis and branches sometimes long-ciliate below the nodes; primary branches usually much shorter than the internodes of the panicle. *Spatheoles* linear or linear-lanceolate, long-acuminate, 25–40 mm long. *Racemes* erect or slightly divergent. *Sessile spikelet* 5.75–7.5 mm long; callus densely bearded with hairs up to 1.5 mm long. *Lower glume* narrowly winged on the keels towards the apex. *Upper lemma* with a perfect awn 12–18 mm long, the column slightly shorter than the bristle.

38. Silky-heads

Cymbopogon obtectus
Plate 27b

GENERAL DESCRIPTION

HABIT: Perennial, tussock-forming, strongly aromatic, 30–90 cm high.

STEMS: Smooth, hairless, shiny, unbranched; nodes, 2–3, usually silky-hairy; internodes long, mostly uncovered by the sheaths.

LEAVES: Blades up to 30 cm long or somewhat more, mostly hairless, narrow, flat or folded, tapered to a long fine point, with rough sharp edges and a prominent midnerve. Sheaths mostly up to half as long as the internodes, strongly nerved, often red, \pm smooth, becoming loose with age; the basal ones numerous, persistent, usually with dense silky hairs.

SEEDHEAD: Panicle up to 25 cm long (though usually shorter), 3–5 cm wide, terminal on branched culms, densely hairy, irregular in outline. It comprises several cymbiform, stiffly pointed, hairless, strongly nerved spatheoles 20–32 mm long, each one subtending a pair of racemes. The racemes are 15–25 mm long, first erect, but spreading with age finally to a horizontal or reflexed position, a distinctive feature of the species. The spikelets are almost completely concealed by long, dense, silky-white hairs, to which the common name refers.

OCCURRENCE: A widespread species from several environments, though not common to any; occurring less infrequently on sandy red earths and clayey sands with mulga and spinifex.

DISTRIBUTION: M.

VALUE: This grass is ignored by stock at most times.

BOTANIC DESCRIPTION

Panicle 7–25 cm long, 3–5 cm wide, densely villous, branched, 3–5-noded, the lower internodes up to 15 cm long; primary branches solitary or fasciculate, erect, 1–3-noded, as long as the panicle internodes or shorter; branchlets 5–30 mm long, filiform. *Spatheoles* 20–32 mm long, narrow; peduncle 5–10 mm long, thickened upwards into a cupuliform denticulate long-bearded apex. *Raceme* 15–25 mm long, densely villous with white silky hairs, sessile, erect or divergent or reflexed; joints and pedicels subequal, 2.75–3.5 mm

long, concave and glabrous on one side, the back and margins densely villous with long white hairs 4.5–7 mm long, the apex dentate-cupuliform. *Sessile spikelet* lanceolate, acute, 5.2–6.4 mm long; callus densely bearded with hairs 3.5–5 mm long. *Lower glume* glabrous, with 2–5 intracarpal nerves and marginate keels, distinctly furrowed on the back below the middle. *Upper glume* 5–7-nerved, acute, hyaline and finely ciliate on the upper margins, otherwise glabrous. *Lower lemma* lanceolate-oblong, acute, 2–3-nerved, 3.7–4.5 mm long, finely ciliate on the margins. *Upper lemma* linear or oblanceolate, 3.6–4.5 mm long, 1–3-nerved at the base, sometimes finely ciliate on the margins, otherwise glabrous, bilobed for one-third to one-sixth of its length; lobes lanceolate, acute; awn arising between the lobes, perfect or imperfect, 6–8 mm long, the column smooth, glabrous, and up to 2 mm long or absent, the bristle scaberulous. *Caryopsis* 2.75–3 mm long, about 1 mm wide, elliptic. *Pedicellate spikelet* neuter, lanceolate, acute, 3.5–5 mm long, much finer than the sessile spikelet, ± concealed by the hairs on the joints and pedicels; callus bearded with hairs 1–1.5 mm long. *Lower glume* 11–13-nerved (with 7–9 intracarpal nerves). *Upper glume* 3–4 mm long, 3–5-nerved, or absent. *Lemma* oblong, hyaline, up to 2 mm long or absent.

39. Button Grass

Dactyloctenium radulans

Plates 28a, 28b

GENERAL DESCRIPTION

HABIT: Semi-erect ephemeral, 15–30 cm high, forming leafy tufts.

STEMS: Numerous, simple or strongly branched, often bent at the nodes.

LEAVES: Blades flat, sometimes with hairs or tubercles; margins fringed with long tubercle-based hairs, often wrinkled. Sheaths loose, similar to the blades in indumentum.

SEEDHEAD: 3–10 digitate spikes up to 12.5 mm long, forming compact, globular or semi-globular heads terminating strongly branched culms and distributed throughout the plant. The rhachis bears the crowded, bristly spikelets arranged in two regular rows along one side, and terminates in a firm point exceeding the spikelets. On maturity the spikes fall with the spikelets attached, leaving a small, hairy swelling at the apex of the peduncle.

OCCURRENCE: Distributed throughout the area in flat to gently undulating country on saline, calcareous, and alluvial soils of medium to fine texture, and to a lesser extent on coarse sands and cracking clays. Associated plants include mulga, coolibah, saltbush, ironwood, short grasses and forbs, sparse low trees and shrubs, and less commonly gidgee and tea-tree.

Button grass is a rapidly maturing plant lasting only a few weeks, though seasonally abundant in most parts. It grows mainly in March, but occurs from February to September with suitable rainfall.

DISTRIBUTION: M., E-A.

VALUE: Highly palatable, nutritious, and one of the more valuable pasture annuals of the area. It commonly increases under heavy stocking and sometimes indicates overgrazing or disturbance. On occasions it is known to be toxic to cattle in poor condition (Chippendale and Murray 1957).

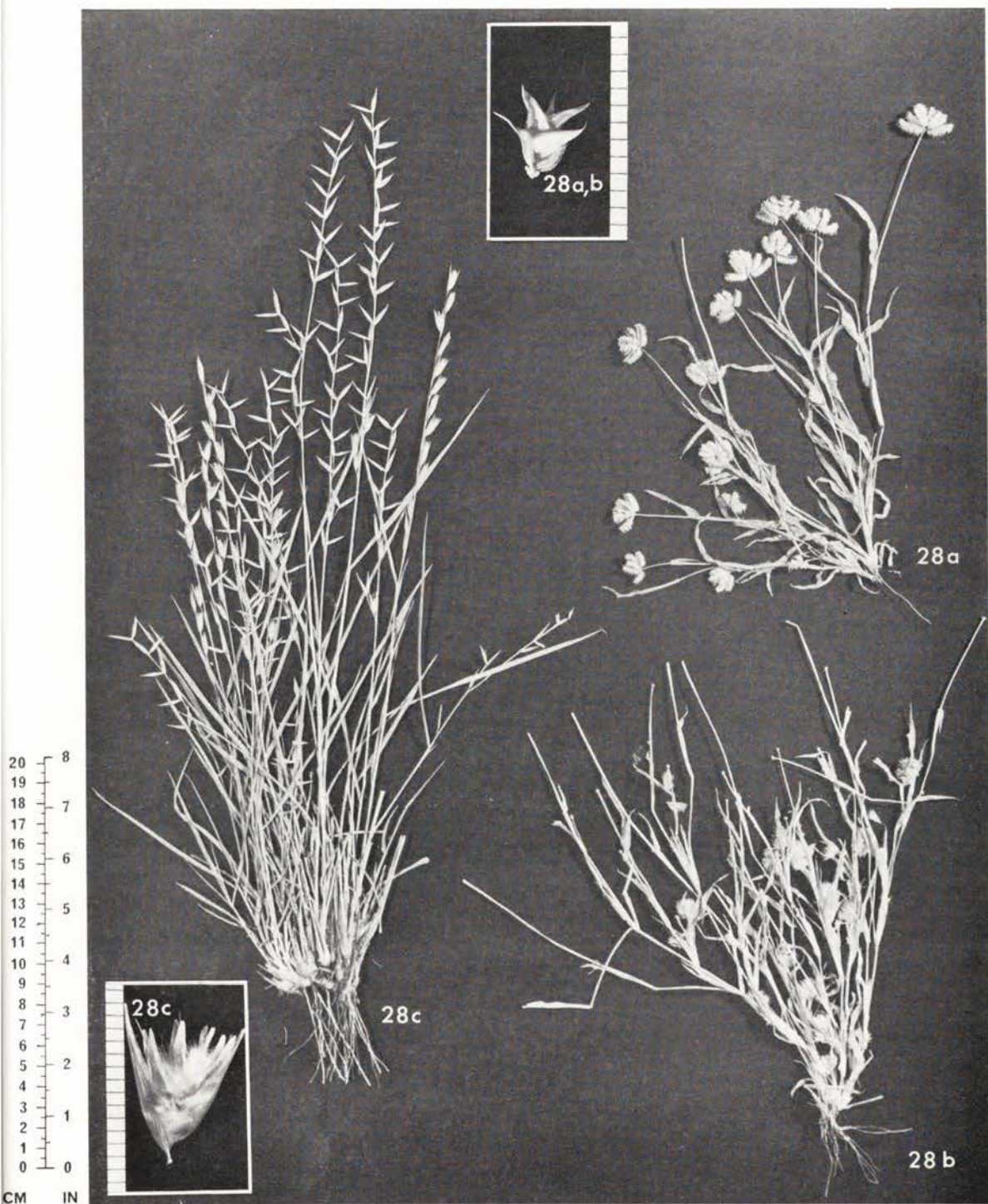


PLATE 28. (a) and (b) *Dactyloctenium radulans*; (c) *Danthonia bipartita*

BOTANIC DESCRIPTION

Inflorescence a compact \pm globular cluster of 3–10 (usually 4–7) digitate spikes terminal on culms and branches, at length exerted. *Spikes* 5–12.5 mm long; rhachis rather broad, rigid, triquetrous, thickened and scabrous on the angles, produced beyond the uppermost spikelet into an acute point, deciduous with the spikelets attached, ribbed on the face, pilose at the base, otherwise glabrous. *Spikelets* solitary, sessile, laterally compressed, 4–5 mm long, closely imbricate, secund and regularly biseriate on the midrib of the rhachis, with 3 bisexual florets; rhachilla disarticulate above the glumes, tough between the florets, glabrous, the internodes almost 1 mm long. *Glumes* strongly keeled, 1-nerved; lower persistent, scarious, complicate, narrow-ovate, acute, green and scabrous on the keel, glabrous and smooth on the surface, about 2 mm long; upper tardily deciduous, thinly membranous, broadly elliptic-oblong, greenish, about 2 mm long, glabrous, smooth, broadly obtuse, the keel produced into a rigid scabrous mucro about 1.25 mm long. *Lemmas* prominently keeled, thinly membranous, complicate, broadly ovate-orbicular, \pm acuminate or mucronate owing to the curved excurrent keel, scabrous on the keel, otherwise glabrous and smooth, 3 mm long, 3-nerved, with faint submarginal lateral nerves. *Palea* similar in texture to the lemma and almost as long, acute, 2-keeled, scabrous and green on the keels. *Caryopsis* about 1 mm long, somewhat laterally compressed, coarsely rugose, obtusely triquetrous.

40. **Bandicoot Grass**

Danthonia bipartita

Plate 28c

GENERAL DESCRIPTION

HABIT: Leafy perennial, perhaps short-lived, forming dense tufts 30–60 cm high \times 7–15 cm wide from a short stocky rhizome; butt usually woolly, thickened by numerous stiff shoots and papery cataphylls.

STEMS: Numerous, wiry, usually unbranched, mostly covered by the sheaths.

LEAVES: Blades up to 13 cm long, stiffly erect, firmly pointed, with rough sharp edges, either flat and up to 6 mm wide or narrower with incurved edges. Sheaths tight.

SEEDHEAD: Panicle open, usually 5–15 cm \times 6.5–12.5 mm, with relatively few solitary distant stalked spikelets on short erect branches or directly on the axis. The spikelet is 8–17 mm long and consists of two large, hairless, smooth, pointed, many-nerved, cymbiform glumes containing 3–8 silvery-hairy florets. At maturity the brownish-black florets separate individually, leaving the glumes attached to the stalks on the plant. The glumes are always conspicuous by their size and high colour, which is bright green at first and straw-yellow at maturity.

OCCURRENCE: Though extending north to Tea Tree, bandicoot grass is predominant in the southern half of the area. It is most common on sandy red earths and clayey sands, usually as a minor element with mulga, naked woollybutt, and hard or feathertop spinifex. It appears to be tolerant to a wide climatic range as plants flower from January to September.

DISTRIBUTION: W.A., S.A., Q., N.S.W.

Description of the Species

VALUE: Readily grazed; in dense stands it is most valued for providing a green shoot after winter rains, when only low quality herbage or moderately palatable top-feed is available to stock.

BOTANIC DESCRIPTION

Panicle mostly 5–15 cm long and 6.5–12.5 mm wide, usually exerted, terminal, loose, linear, often racemose; rhachis, branches, and pedicels compressed or triquetrous, scabrous; the branches few, short, erect. *Spikelets* 8–17 (usually 11–14) mm long, few, distant, erect. *Florets*, 3–8 (mostly 5–6), bisexual, crowded, smaller and often reduced upwards; rhachilla disarticulate above the glumes and between the florets. *Glumes* subequal or the lower slightly longer, as long as the spikelet or sometimes slightly shorter, broad, glabrous, smooth or scaberulous, broadly lanceolate, acuminate, many-nerved, rounded on the back, chartaceous, with narrow scarious margins. *Lemma* deeply 2-lobed, awned from the sinus; the body firmly membranous or indurate, obliquely turbinate, 2–2.5 mm long (incl. the minute subacute callus) and almost as wide, with dense soft silvery-white hairs towards the base and a transverse subapical fringe of longer hairs, otherwise shining and smooth or rugulose; the apical lobes about 6–7 mm long, linear-oblong, acute or sometimes obtuse, awnless, 3–5-nerved, chartaceous, with very narrow scarious margins, scaberulous on the nerves upwards and on the edges, otherwise \pm smooth; awn fine, scaberulous, weakly twisted at the base, shorter than, or at times scarcely exceeding, the apical lobes. *Palea* shortly exceeding the body of the lemma, 2-keeled, obovate or (flattened) broadly ovate, truncate or obtuse, thinly membranous, with hyaline incurved margins distinctly widened downwards, becoming coriaceous with age, prominently thickened on the keels, ciliolate upwards, otherwise glabrous. *Caryopsis* almost 2 mm long, ovate-orbicular, pale brown, with a broad shallow groove on one side, closely embraced by the palea.

41–44. Fingergrasses

Digitaria spp.

The fingergrasses of central Australia comprise four slender, tufted, summer-growing, erect or sometimes creeping annuals or perennials with thickened or shortly rhizomatous base, often soft flaccid leaves, and a dense cover of distinctive velvety hairs on butt and foliage. Like several species in the genus, comb fingergrass behaves at times as a weed or coloniser of cultivated or disturbed areas. Some of the perennials are useful fodder grasses, but in central Australia they generally occur too sparsely to be of any value.

The spikelets are often densely hairy and arranged in pairs or threes on one side of spiciform racemes. These are either digitate or scattered on the axis. On ripening the entire spikelet falls, leaving the usually short, unequal stalks attached to the rhachis of the raceme.

GENERIC CHARACTERS

Spikelets dorsally compressed, pedicellate, flat or \pm concave in front, convex on the back, falling entire from the pedicels, variously hairy or sometimes glabrous, solitary or more often 2–3 (rarely 4–6)-nate, secund and closely appressed to the triquetrous or flattened

rhachis of slender spiciform racemes. *Florets*, 2; lower reduced to the lemma and sometimes a minute rudimentary palea; upper bisexual. *Glumes* dissimilar; lower a minute membranous scale or a delicate hyaline membrane or sometimes absent; upper membranous, usually as long as (and appressed to) the back of the upper lemma, or shorter to very short, or sometimes absent. *Lower lemma* sometimes resembling the upper glume, but often larger and determining the size and shape of the spikelet, rarely reduced to a small scale. *Upper lemma* usually equal or subequal to the lower in size, chartaceous or sometimes indurate, faintly 3-nerved, with thin hyaline margins embracing the palea. *Palea* equal or subequal to the lemma and \pm similar in texture, finely 2-nerved. *Caryopsis* tightly enclosed by the lemma and palea, oblong, plano-convex with rounded sides. *Racemes* sessile or pedunculate, usually simple, digitate or \pm distant on a common axis; rhachis often winged on the lateral angles and with a prominent midrib; pedicels of the pairs or trios of spikelets unequal.

KEY TO THE SPECIES

- A. Racemes, 2 (rarely 3), digitate.
 - B. Spikelets ternate, all covered by soft white hairs. 44. *D. eriolepis*
 - B. Spikelets in pairs, one of each pair with rigid spreading bristles, the other silky-hairy. 43. *D. ctenantha*
- A. Racemes few to numerous, not digitate.
 - C. Racemes few, 4-5 cm long, distant, erect or the lower ones divergent. 41. *D. brownii*
 - C. Racemes numerous, mostly 9-24 cm long; the lowest ones whorled, finally divaricate or horizontal. 42. *D. coenicola*

41. Cotton Panic Grass
(cotton grass)

Digitaria brownii
Plate 29a

GENERAL DESCRIPTION

HABIT: Perennial, 30-45 cm high (rarely up to 75 cm), slender, leafy, tussock-forming, at times developing a short, scaly, hairy rhizome; butt somewhat thickened, hairy, knotty.

STEMS: Numerous, branched, smooth, at times grooved, usually hairy near the base, often extremely thin, erect or bent at the nodes, with many usually thickened nodes, and short internodes less than 2.5 cm long.

LEAVES: Hairless or sprinkled with long, fine, white, spreading and reflexed hairs based on hard tubercles. Blades 5-9 cm long, up to 4 mm wide, flat, thin, long-pointed, somewhat rough, with thickened white often wavy edges, becoming curly and twisted on drying. Sheaths tight at first, at length loose and open.

SEEDHEAD: Panicle 6-11 cm long, usually spiciform, consisting of 2-4 erect or (sometimes in the lower part of the panicle) spreading racemes. The spikelets, enveloped in long, fine, silky, silvery or purplish hairs, are borne often in pairs on very short stalks. On ripening the entire spikelet falls from its stalk, exposing the distinctly wavy rhachis.

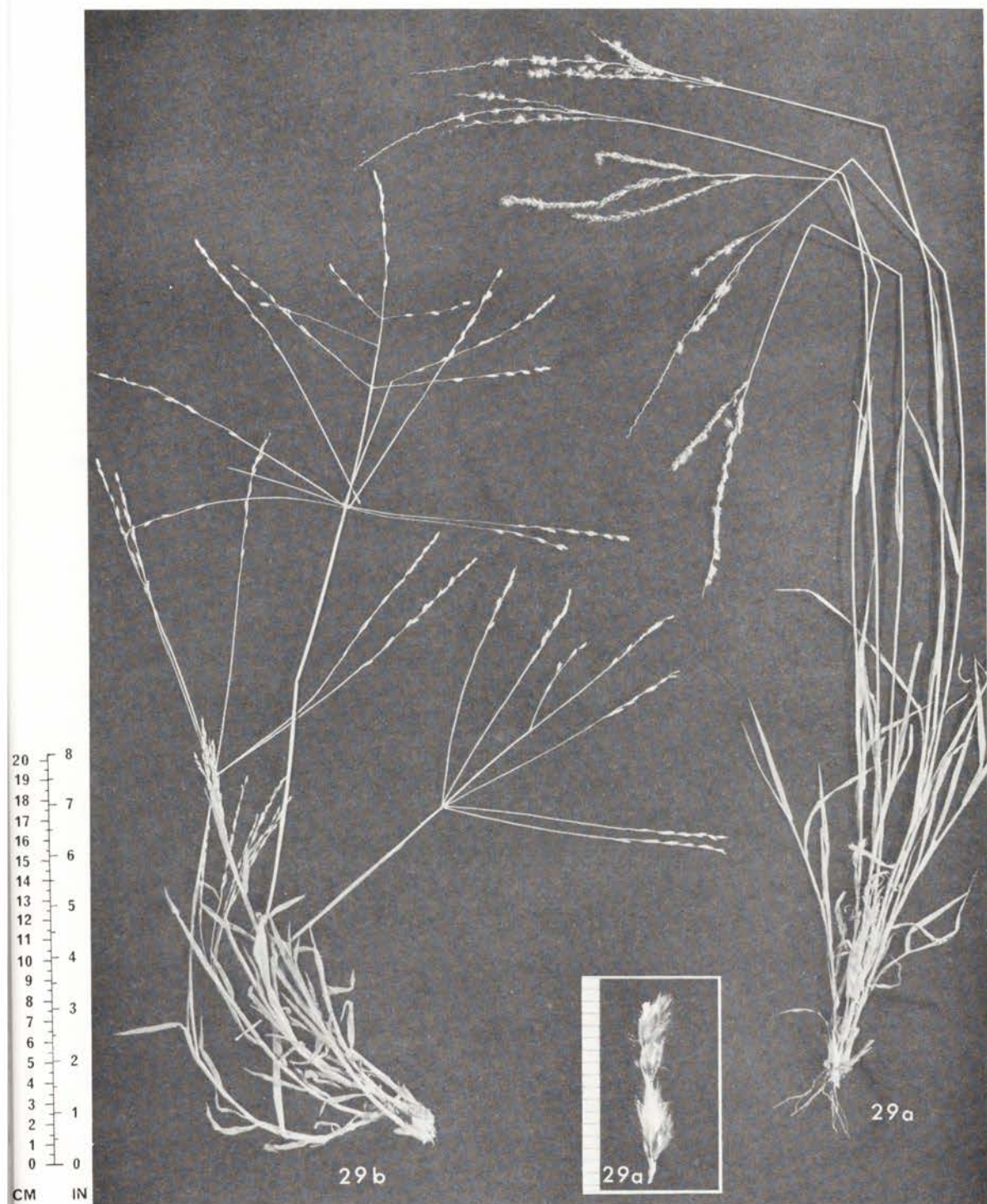


PLATE 29. (a) *Digitaria broenii*; (b) *Digitaria coenicola*

OCCURRENCE: This is a widespread and adaptable species, often locally dominant, equally as common in upland and lowland areas, but apparently absent from highly saline and cracking clay soils. Usually in association with mulga, sparse low trees and shrubs, and short grasses and forbs, it occurs on medium-textured red earths and shallow soils, less frequently on coarse sandy soils and sandy red earths.

DISTRIBUTION: M.

VALUE: One of the more valuable pasture perennials of the area, since the relatively soft foliage and slender stems are highly palatable to stock.

BOTANIC DESCRIPTION

Racemes usually 2-4 on a short axis, 3.5-11 cm long, rather distant, erect and loosely appressed or the lower ones spreading, usually simple and spikelet-bearing to the base; rhachis glabrous, scaberulous, angular, flexuose; pedicels angular, scabrous on the angles, dilated and concave at the apex, 1-4 mm long. *Spikelets* 3-4 mm long (incl. hairs), mostly in pairs, the lower ones rather remote, the upper approximate, all enveloped in long fine silky, silvery or purplish, appressed or spreading hairs. *Lower glume* minute, firm, narrow-triangular, glabrous. *Upper glume* and *lower lemma* subequal and as long as the spikelet, acute or acuminate, densely clothed in, and exceeded by, the hairs of the spikelet. *Upper glume* lanceolate-ovate, 3-nerved. *Lower lemma* broadly ovate, 5-nerved, with a prominent midnerve. *Fertile floret* about 2 mm long, broadly elliptic, apiculate, turgid, punctulate or smooth, shiny, golden brown.

42. Finger Panic Grass

Digitaria coenicola

Plate 29b

GENERAL DESCRIPTION

HABIT: Tussocky leafy perennial, 30-45 cm high, with distinctive velvety hairs on foliage and thickened butt.

STEMS: Usually branched, several-noded, thickened near the base; internodes very short, entirely covered by the leaf sheaths.

LEAVES: Densely covered by short soft appressed hairs; blades mostly 2.5-7.5 cm long, 4-6 mm wide, flat, rather thick, with white often wavy edges.

SEEDHEAD: A large spreading panicle, consisting of a basal whorl of 6-8 racemes 9-24 cm long, and a number of shorter, solitary or paired racemes scattered along the axis. On young plants the racemes are erect, closely clustered, and partly enclosed by the floral leaf. When mature the panicle on a very long peduncle extends prominently above the uppermost leaves, while the racemes spread umbrella-like, becoming almost horizontal to the axis. The spikelets are silky-hairy, few in distant pairs on short stalks of unequal length, and borne only on the outer part of the racemes, which can be bare of spikelets for over half their length. At maturity the panicle and peduncle break at the uppermost node of the culm, and also each raceme of the panicle separates from the axis.

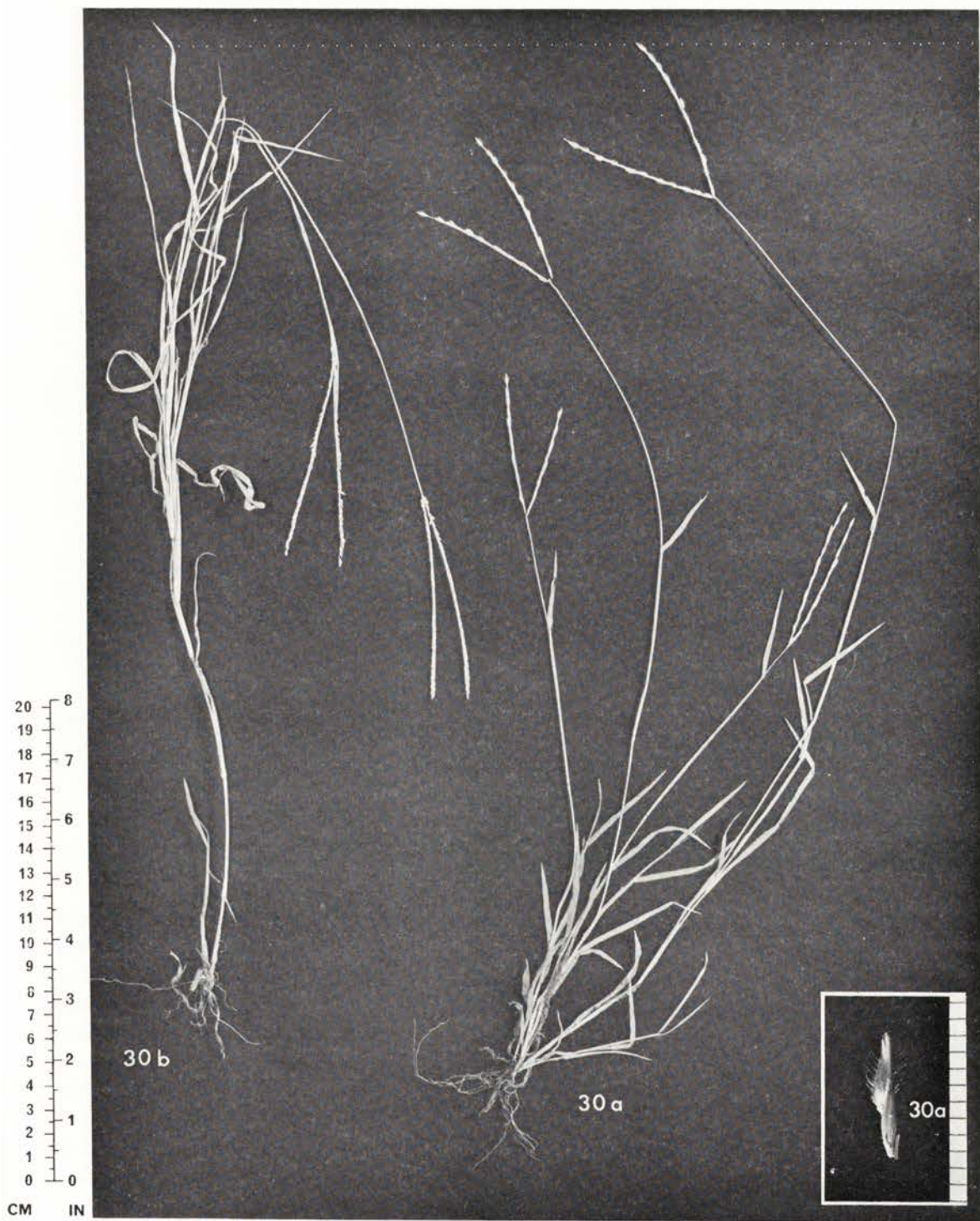


PLATE 30. (a) *Digitaria ctenantha*; (b) *Digitaria eriolepis*

OCURRENCE: Finger panic grass occurs sporadically throughout the area in various environments. These include sandy and medium-textured red earths with mulga and short grasses and forbs, alluvial soils carrying coolibah and ironwood, shallow soils with sparse low trees and shrubs, calcareous and saline soils with gidgee, saltbush, and bluebush, and cracking clay soils with Mitchell and neverfail grasses.

DISTRIBUTION: S.A., Q.

VALUE: A highly palatable plant, grazed in preference to many perennial grasses.

BOTANIC DESCRIPTION

Panicle first contracted, finally exerted open and prominent; peduncle glabrous, smooth, prominently striate, articulate at the uppermost node; axis strongly angled, usually glabrous, smooth. *Racemes* several, first erect, widely spreading at maturity, angled, scaberulous, swollen and pubescent in the axils, articulate, spikelet-bearing outwards, naked of spikelets for over half their length; the lowest racemes in a whorl of 6-8, 9-24 cm long; the remainder solitary or in pairs, remote, becoming shorter upwards; pedicels angular, scaberulous, about 1 mm long and 3-4.5 mm long. *Spikelets* 3.5-4 mm long (incl. hairs), erect, remote, usually in pairs (sometimes the lower ones solitary), villous with white fine silky hairs which are first appressed, but later spreading and partly concealing the spikelet. *Lower glume* 0.5-1.25 mm long, glabrous, obscurely nerved, subobtuse, narrowly ovate, membranous. *Upper glume* and *lower lemma* subequal, as long as the spikelet, villous on the margins and between the nerves with dense long white silky hairs. *Fertile floret* about 2 mm long, elliptic, apiculate, punctulate. *Upper lemma* indurate, with obtusely incurved margins.

43. Comb Fingergrass

Digitaria ctenantha

Plate 30a

GENERAL DESCRIPTION

HABIT: Semi-erect or decumbent annual 22-45 cm high.

STEMS: Smooth, branched, \pm angular, usually bent in the lower part, 3-4-noded; nodes hairless, constricted.

LEAVES: Rough, hairless or with stiff dense white hairs based on tubercles, bearded at the orifice. Blades 4-6 cm long, flat, narrow, many-nerved, with white wavy thickened edges. Sheaths many-nerved, shorter than the internodes.

SEEDHEAD: The flowering culm produces 2 (rarely 3) digitate racemes 3.5-8.5 cm long on a long slender peduncle. The spikelets, appressed to the rachis of the raceme, are borne in pairs on stalks of unequal length. Characteristically, the lower spikelet of each pair is silky-hairy, while the second has a row of prominent, stiff, brown, horizontally spreading bristles along each edge, resembling the teeth of a comb. At maturity the racemes break from the peduncle, and the spikelets from their stalks.

OCURRENCE: Comb fingergrass is an uncommon plant known in the northern half of the area from disturbed sites, creek banks, and from shallow, calcareous and red earth soils.

Description of the Species

DISTRIBUTION: W.A., N.T., Q.

VALUE: Of little or no pastoral value.

BOTANIC DESCRIPTION

Racemes, 2 (rarely 3), 3.5–8.5 cm long, digitate, sessile, divergent, articulate; peduncle elongated, slender, striate, glabrous, scaberulous or \pm smooth, pubescent and somewhat thickened at the apex; rhachis flattened, scabrous, winged on the margins and thick flexuose midnerve; pedicels triquetrous, winged and scabrous on the angles, dilated and concave at the apex, 0.5–1 mm long and 3–4 mm long. *Spikelets* in pairs, alternate on the midrib, contiguous, those of each pair dissimilar. *Lower spikelet* 4–4.5 mm long, linear-lanceolate, shortly pedicellate. *Lower glume* minute, glabrous. *Upper glume* about 3 mm long, narrower and shorter than the spikelet, thin, 3-nerved, acute-acuminate, with dense silky appressed hairs. *Lower lemma* as long as the spikelet, indurate, acuminate, with many thick prominent nerves, ciliate on the margins with dense silky appressed hairs, glabrous and smooth on the surface. *Upper lemma* subequal to the spikelet and similar in shape, firmly membranous, glabrous, smooth, obscurely nerved, convex on the back, with incurved hyaline margins. *Palea* subequal to the lemma and similar in texture, narrow-oblong, obtuse, obtusely 2-keeled, with incurved margins. *Caryopsis* 2.5 mm long, elliptic-oblong, smooth. *Upper spikelet* 4.5–5 mm long, lanceolate-ovate, long-pedicellate. *Lower glume* minute, broadly triangular, nerveless, ciliate upwards or glabrous. *Upper glume* 3–3.5 mm long, shorter and narrower than the spikelet, 3-nerved, thinly membranous, pubescent with dense white silky appressed hairs. *Lower lemma* subequal to the spikelet and similar in shape, firmly membranous, acute, prominently 3-nerved, with a submarginal ridge of fused tubercles bearing a row of stout brown spiny \pm horizontal bristles about 1 mm long along three-quarters of its length, the margins incurved and ciliate with dense white silky appressed hairs. *Fertile floret* similar to that of the lower spikelet.

44. Woolly-seed Fingergrass

Digitaria eriolepis

Plate 30b

GENERAL DESCRIPTION

HABIT: Slender annual or short-lived perennial, 30–45 cm high, erect or sprawling and rooting from the lower nodes.

STEMS: Branched, smooth, hairless except for a sprinkling of long fine tubercle-based hairs close below the seedhead, usually 6–13-noded; nodes constricted.

LEAVES: Mostly smooth and hairless, though the basal sheaths and young shoots may be densely and softly hairy. Blades 6–15 cm long, flat, at times with scattered fine hairs. Sheaths thin, papery, covering the entire internode, becoming loose with age.

SEEDHEAD: This comprises usually two digitate, slender, spiciform racemes 6–11.5 cm long, which bear the very small densely clustered spikelets covered by short, soft, white, woolly hairs. At first both racemes are erect, straight, appressed, and partly enclosed by the uppermost leaf, but with age they spread, often curving downwards, and become shortly exserted.

OCCURRENCE: In central Australia, known from one locality on the bank of a small creek near Hatches Creek; it probably occurs elsewhere in the northern half of the area, since it is mainly tropical in distribution.

DISTRIBUTION: W.A., Q.

VALUE: Probably palatable.

BOTANIC DESCRIPTION

Racemes, 2 (rarely 3), 6–11.5 cm long, digitate, sessile, persistent on the peduncle, first subtended by the uppermost sheath and erect, becoming shortly exerted and slightly divergent; peduncle filiform, ± smooth, striate, glabrous or sometimes pilose with very long, extremely fine, tubercle-based hairs, puberulous at the apex; rhachis flattened, with winged margins, about 1 mm wide, straight, glabrous, ± smooth, with a prominent midrib; pedicels terete, slender, often curved, glabrous, smooth, dilated and concave at the apex, the shortest one about 0.5 mm long, the second 1.5 mm long, the third 2.5–2.75 mm long. *Spikelets* 1.75–2.25 mm long (incl. hairs), ternate, alternate on the midrib, crowded, covered by dense woolly hairs; the hairs verrucose under high magnification ($\times 80$), first appressed, later spreading. *Lower glume* absent. *Upper glume* and *lower lemma* subequal, as long as the spikelet, thinly membranous, covered by the dense hairs of the spikelet. *Fertile floret* 1.5 mm long, glabrous, smooth, acuminate, plano-convex.

45–46. Beetle Grasses

Diplachne spp.

In central Australia these semi-aquatic grasses are minor components of communities fringing permanent surface waters or regularly flooded areas. Occurrences are extremely sporadic, often comprising an isolated tussock. Commonly the site, or the water in which the plants often grow, is saline. Both species are compact, leafy, softly herbaceous perennials with well-developed, fibrous root systems.

The spikelet, containing few to several overlapping florets above the two outer glumes, closely resembles that of the lovegrasses. However, the lemma of the floret of beetle grasses is shortly 2-toothed or notched at the apex, and has a short awn from the sinus. Also the lower edges of the lemma are fringed with soft, silky hairs, and often the spikelets are coloured olive green. The inflorescence consists of a contracted, racemose panicle terminating the culms and often shorter than the uppermost leaves, in which the solitary spikelets are borne in loose, spiciform racemes scattered along the axis.

GENERIC CHARACTERS

Spikelets solitary, dorsally compressed, shortly pedicellate or subsessile, racemose on the branches of a contracted panicle; rhachilla disarticulate above the glumes and between the lemmas, glabrous or sometimes scaberulous, the internodes widened and oblique at the apex. *Florets* few to several, bisexual or the upper neuter, erect and closely imbricate or oblique and loose. *Glumes* persistent, unequal or subequal, membranous, glabrous, 1-nerved, keeled. *Lemmas* membranous with very narrow incurved hyaline margins,



PLATE 31. (a) *Diplachne fusca*; (b) *Diplachne parviflora*

rounded or flattened on the back, prominently 3-nerved with the lateral nerves submarginal and percurrent or excurrent, usually distinctly notched and mucronate from the sinus, ciliate on the margins in the lower part with silky-white erect appressed hairs, usually also with a small tuft of similar hairs on the midnerve below the middle. *Palea* 2-keeled, with broad incurved hyaline margins, flattened or depressed between the keels, entire, subequal to the lemma; keels ciliate in the lower part and scabrous-ciliolate above. *Caryopsis* flattened. *Panicle* terminal, rather loose; racemes (branches) spiciform, distant, solitary or binate or ternate, usually simple, sessile.

KEY TO THE SPECIES

- A. Panicle 10–15 cm long, usually 1–2.5 cm wide; branches relatively few, simple, up to 8 cm long. Spikelets subsessile, 10–15 mm long, 10–12-flowered.45. *D. fusca*
- A. Panicle 20–30 cm long, usually about 4 cm wide; branches rather numerous, sometimes divided, up to 13 cm long. Spikelets distinctly pedicellate, 7–9 mm long, 5–9-flowered. 46. *D. parviflora*

45. Brown Beetle Grass

Diplachne fusca

Plate 31a

GENERAL DESCRIPTION

HABIT: Densely tufted leafy perennial, usually 22–30 cm high, with strongly developed fibrous roots.

STEMS: Numerous, hairless, smooth, simple or branched, erect or bent at the nodes, thick though hollow and soft, often flattened or angular, 1–3-noded; nodes hairless, often purple-black.

LEAVES: Purplish or deep green. Sheaths broad and loose, hairless, usually much longer than the internodes, becoming smooth and shiny; the basal ones numerous, dense, extremely thin and papery, strongly nerved, first purple and finally white. Ligule long, thin, transparent, prominent. Blades up to 22 cm long or more, rather narrow, flat or loosely folded, hairless though rough from minute bristles, gradually narrowed to an extremely long slender point, prominently and many-nerved.

SEEDHEAD: Panicle 10–15 cm long and mostly 1–2.5 cm wide, rather dense, terminating branched culms and usually much shorter than the uppermost leaves; panicle-branches mostly up to 4 cm long in the lower part of the panicle (much shorter in the upper part), erect or slightly spreading, solitary or in small clusters, widely spaced on the axis. The axis and branches of the panicle are angular, covered by short bristles, and sometimes wavy. Rather densely crowded on the branches, the spikelets are 10–15 mm long and olive green or partly purple (pale when old). Each contains several closely overlapping florets, densely fringed along the edges of the lemmas with short, soft, silvery hairs which can be conspicuous in the mature spikelet.



PLATE 32. (a) *Echinochloa colonum*; (b) *Ectrosia leporina*; (c) *Elytrophorus spicatus*

OCCURRENCE: Widespread but sporadic; almost always in or near water or in seasonally flooded depressions on sandy or cracking clay soils. Occasionally it is associated with mulga on drainage floors with medium-textured red earths, but more commonly occurs on the fringe of waterholes and streams, and in the gilgais of Mitchell grass and saltbush plains. Sites are commonly saline. At Coolata Springs and other bores in the area, it inhabits the salt-encrusted overflow areas of the bore tanks. Plants flower mainly from March to May, but also in September and October.

DISTRIBUTION: M., E-A.

VALUE: A softly herbaceous, highly palatable grass, often preferentially grazed, but of only minor importance in natural pastures.

BOTANIC DESCRIPTION

Panicle 10–15 cm long, usually 1–2.5 cm wide, first contracted, finally loose and shortly exerted; axis and branches angular, scabrous on the angles, somewhat flexuose; lower branches up to 4 (rarely to 8) cm long. *Spikelets* 10–15 mm long, 10–12-flowered, erect or sometimes divaricate, usually loosely imbricate. *Glumes* thinly membranous, smooth or scabrous on the keel; lower 3–4 mm long, lanceolate, acute; upper 4–4.5 mm long, broadly elliptic, notched at the apex. *Lemmas* oblong-elliptic, membranous or scarious upwards, smooth on the surface, usually with percurrent lateral nerves and a short apical mucro distinctly shorter than the lobes; lower lemmas 3.5–4 mm long; rhachilla-internode 0.75 mm long. *Palea* sometimes slightly longer than the lemma, narrowly oblong, obtuse or acute, with the texture of its lemma, glabrous and smooth between the keels. *Caryopsis* about 1.5 mm long, elliptic, subobtuse, smooth.

46. Small-flowered Beetle Grass

Diplachne parviflora
Plate 31b

GENERAL DESCRIPTION

HABIT: Densely tufted perennial, 60–120 cm high or more, with numerous coarse fibrous roots, sometimes developing a short thick rhizome.

STEMS: Erect, hairless, smooth and often shiny, thick though hollow and soft, simple (rarely branched), sometimes shallowly grooved on one side, often powdery, usually 4–6-noded; nodes hairless, prominent; lower internodes often extremely long.

LEAVES: Sheaths broad and loose, thin and papery, hairless, smooth, strongly nerved, about as long as the internodes or much longer; basal sheaths dense, purplish when young, becoming white and often shiny with age. Ligule up to 12 mm long, thin, papery, transparent, prominent. Blades up to 30 cm long or more, loosely rolled and narrow, pale green, hairless, with a long fine point, minutely bristly.

SEEDHEAD: Panicle 20–30 cm long, 3–4 cm wide, dense to rather loose, prominent, terminal on the culms and shortly exceeding the uppermost leaves; branches

Description of the Species

numerous, slender, up to 13 cm long, erect or slightly spreading, simple or the lower ones divided, like the axis angular and shortly bristly, solitary or in small clusters and scattered on the axis. Spikelets solitary on short thin stalks on the branches and branchlets, numerous, 7–9 mm long, usually olive green or with age becoming pale or straw-coloured, 5–9-flowered, with a distinctive fringe of dense, short, soft, silky-white hairs on the margins of the lemmas.

OCCURRENCE: This species is known from few localities in the northern half of the area, always near or in water on deep loose sand, or in deeper gilgais and depressions on cracking clay soils. It flowers from March to May.

DISTRIBUTION: W.A., N.T., Q.

VALUE: A softly herbaceous grass palatable to stock, but of only minor importance.

BOTANIC DESCRIPTION

Panicle 20–30 cm long, 3–4 cm wide, rather slender, at length shortly exerted; axis, branches, and pedicels angular, striate, scaberulous; branches up to 13 cm long, numerous, thin, divaricate at maturity, the lower ones sometimes divided; pedicels 0.5–2 mm long. *Spikelets* 7–9 mm long, 5–9-flowered, numerous, erect and loosely appressed, contiguous or rather distant. *Glumes* thinly membranous, scabrous on the keel and ciliate on the upper margins, otherwise glabrous and smooth; lower 1.75–2 mm long, narrowly ovate, acuminate, entire; upper 2.25–2.5 mm long, broadly obovate-elliptic, abruptly narrowed to an obtuse, entire or emarginate apex; rhachilla-internode 0.75–1.25 mm long. *Lemmas* 2.5–3 mm long, narrowly oblong-elliptic, scaberulous and ciliate upwards on the mid-nerve and margins respectively, usually with excurrent lateral nerves and a prominent apical mucro. *Palea* scarious, narrow-elliptic, glabrous and smooth on the surface.

47. Awnless Barnyard Grass

Echinochloa colonum
Plate 32a

GENERAL DESCRIPTION

HABIT: Prostrate or semi-erect annual, 15–60 cm high, rooting at the lower nodes.

STEMS: Soft and hollow, branched, hairless, smooth, often purplish, sharply bent at the lower nodes; nodes often thickened and prominent.

LEAVES: Hairless, \pm smooth, many-nerved. Sheaths usually longer than the internodes, broad, loose, often purplish. Blades 4–15 cm long, 4–8 mm wide, flat, rather flaccid, finely pointed, sometimes bluish, with a prominent midnerve and thickened \pm smooth edges. Ligule hairless.

SEEDHEAD: Usually 4–6 cm long and 6–8 mm wide, contracted or spiciform, terminating branched culms, consisting of erect or slightly spreading racemes up to 15 mm long loosely spaced on a common axis. On one side of the rhachis of the raceme, the plump, green or pale, shortly pointed spikelets are borne on very short stalks and densely crowded in 3 or 4 irregular rows.

OCCURRENCE: Awnless barnyard grass occurs near the northern margin of the area on creek banks and levees and in gilgais and waterholes, usually on cracking clay soils.

DISTRIBUTION: M. (excl. S.A.), E-A.

VALUE: Softly herbaceous and readily grazed by stock.

BOTANIC DESCRIPTION

Panicle racemose, terminal, finally exerted, spiciform or contracted, usually continuous, 2–8 cm long, 0.5–1.5 cm wide; rhachis stout, sharply angular or triquetrous, smooth or scabrous upwards. *Racemes* few, 7–15 mm long, approximate or distant in the lower part, obliquely spreading or erect and loosely appressed; rhachis stout, triquetrous, prominently ribbed on the face, scabrous on the angles, flexuose; pedicels up to 0.5 mm long, thick, dilated and broad at the apex, alternate on the midrib, solitary or paired. *Spikelets* crowded, 2–2.5 mm long, turgid, broadly elliptic, plano-convex in profile, cuspidate. *Glumes* and *lower lemma* thinly membranous, scabrous on the surface, scabrous-hispid on the nerves upwards; the apex constricted, firmer, cuspidate. *Lower glume* 1–1.5 mm long, broadly ovate, 3- or sub-5-nerved, enclosing the base of the spikelet. *Upper glume* subequal to the spikelet, broadly elliptic, 5- or sub-7-nerved, strongly convex on the back. *Lower lemma* as long as the spikelet, ovate-elliptic, 5- or sub-7-nerved, flattened or depressed on the back, with incurved margins, subtending a male floret. *Lower palea* as long as its lemma, acute, elliptic-oblong, hyaline, glabrous. *Fertile floret* slightly shorter than the spikelet and similar in shape, cartilaginous or indurated, striolate, smooth and glossy; the apex of the lemma cuspidate and \pm incurved.

48. Hare's-foot Grass

Ectrosia leporina
Plate 32b

GENERAL DESCRIPTION

HABIT: Slender perennial, 30–45 cm high, dense and leafy near the base, with well-developed fibrous roots.

STEMS: Erect or slightly bent at the nodes, thin, mostly unbranched, hairless, smooth, 2–4-noded.

LEAVES: Sheaths often purplish, rather loose, usually shorter than the internodes, smooth, sometimes with long fine hairs at the mouth and along the edges; the upper ones narrow, the lower rather broad. Blades very narrow, flat or loosely rolled, tapered to a long fine point, mostly 5–15 cm long (sometimes much longer), stiffly erect, hairless or sparsely hairy, usually smooth.

SEEDHEAD: Panicle 3.5–18 cm long, usually 1.5 cm wide, dense, spiciform, feathery, pale green or purplish or purple-black, terminal on long slender culms, with very short branches sometimes widely spaced on the axis in the lower part of the panicle. Spikelets numerous, densely crowded, containing several florets; each floret with a slender terminal awn or bristle. On ripening the spikelet breaks above the two outer glumes, which remain on the plant while the florets fall as a group.

Description of the Species

OCCURRENCE: A rare species in central Australia, occurring near streams with river red gum and silky browntop near the northern margin of the area.

DISTRIBUTION: W.A., N.T., Q., N.S.W., E-A.

VALUE: Not significant in pastures.

BOTANIC DESCRIPTION

Panicle linear-oblong or oblong or lanceolate, erect, dense, spiciform, 3.5–18 cm long, usually 1.5 cm wide, prominently exerted, terminal and sometimes axillary, continuous or interrupted in the lower part; rhachis scaberulous or smooth, glabrous or pilose; branches very slender, erect or slightly spreading, glabrous or pilose, the lower ones up to 4 cm long; pedicels 0.2–1 mm long, glabrous or pilose. *Spikelets* crowded, linear- or lanceolate-oblong, 3–5 mm long, 0.7–1 mm wide, laterally compressed. *Glumes* lanceolate or lanceolate-oblong or ovate-oblong, flattened, acute or obtuse, membranous, 1-nerved, scaberulous on the keel; lower 1–2 mm long; upper 1.5–2.5 mm long. *Florets*, 4–9, loose; lower 1–2 (rarely 3) bisexual; the rest sterile and reduced to the lemma or to the awns; rhachilla disarticulate above the glumes but continuous between the lemmas, glabrous, the lower internodes about 1 mm long, the upper ones gradually shorter. *Fertile lemmas* membranous, 3-nerved or the upper 1-nerved, glabrous, straight on the back, scaberulous on the keel; the first (lowest) one linear-oblong or oblong or lanceolate-oblong (flattened), usually emarginate or minutely 2-lobed, 1.5–2.5 mm long, mucronate or aristate with an awn 0.8–2 mm long; second and third lemmas lanceolate (flattened), acute or acuminate, 1.5–2.5 mm long, with a very thin awn 3–10 mm long. *Sterile lemmas* gradually narrower and shorter than the fertile ones, the uppermost reduced to an awn up to 9 mm long. *Palea* 1.5–2 mm long, 2-keeled, rigidly ciliolate on the keels, narrow. *Caryopsis* 0.8–1 mm long.

49. Spike Grass

Elytrophorus spicatus

Plate 32c

GENERAL DESCRIPTION

HABIT: Slender annual, up to 30 cm high but often less than 15 cm; the tuft sometimes comprising only 1 or 2 stems.

STEMS: Mostly 2-noded, often purplish, densely covered by minute bristly hairs.

LEAVES: Mostly basal, deep green, hairless or sprinkled with long fine hairs. Blades flat, narrow or rather broad, at times almost as long as the culms, rough on the upper surface but smooth underneath. Sheaths loose.

SEEDHEAD: Consisting of a spike up to 19 cm long and 5–9 mm wide, comprising usually over half the plant, with the spikelets crowded in softly bristly, globular clusters. On the rhachis of the spike, the clusters are either widely spaced or in the upper part close so that the spike is continuous and cylindrical.

OCCURRENCE: A fairly rare, short-lived grass, found near permanent waters or in favoured sites such as gilgais and waterholes.

DISTRIBUTION: M., E-A.

VALUE: Of little value in pasture because of its small size.

BOTANIC DESCRIPTION

Inflorescence a compound spike, the spikelets in dense globular or oblong sessile clusters along a simple or sometimes branched rhachis. *Spike* up to 19 cm long and 5–9 mm wide, terminal, often occupying over half the length of the plant, usually stiffly erect, interrupted or continuous and \pm cylindrical towards the apex; lower fascicles distant or remote, \pm secund; peduncle and rhachis stout, terete, shortly hispid. *Spikelets* laterally compressed, sessile; rhachilla disarticulate above the glumes and between the florets. *Florets*, 3–6; lower bisexual, upper 1 or 2 male or neuter and reduced. *Glumes* subequal, keeled, strongly 1-nerved, acuminate or shortly awned, entire, 3–3.5 mm long, hyaline and sparsely hispid-ciliate on the margins, scabrous on the keel and awn. *Lemmas* 3.25 mm long, strongly 3-nerved, acuminate-aristate, thinly membranous to hyaline, granular, scabrous-ciliate on the margins and awn. *Paleas* 2 mm long, glabrous, smooth, faintly nerved, with 2 broad hyaline obtuse wings, ciliate and denticulate on the margins. *Caryopsis* 0.75–1 mm long, brown, narrowly ovate, not compressed.

50-57. Nineawn Grasses (nigger-heads)

Enneapogon spp.

Generally these are slender, tufted, often glandular-hairy plants. In central Australia they are rather erratic in duration and may behave as annuals, biennials, or perennials, a feature probably accounted for by the variable and irregular rainfall of the area. Of the eight representatives, three species (leafy nineawn, bottle-washers, and jointed nineawn) are extremely common over a wide range of country and highly valued as pasture. The remainder are sporadically distributed in hilly country and much less valuable.

The spikelets are small and densely crowded in usually compact, narrow, spicate or globular panicles terminating the culms. Sometimes the spikelets are borne also in the axils of the leaf sheaths. Their most distinctive feature is the apical fringe of nine short, soft, plumose awns on the lemma of each floret. In all species, each spikelet has at least one fertile floret and one or more sterile florets above, all similarly awned. At maturity, the florets fall as a group, while the two thin glumes remain attached to the usually short panicle branches.

GENERIC CHARACTERS

Spikelets shortly pedicellate, not flattened; rhachilla disarticulate above the glumes. *Florets*, 3–6; lower 1–3 bisexual; the remainder sterile. *Glumes* persistent or almost so, thinly membranous, subequal, glabrous or pubescent with simple and/or glandular hairs. *Lowest lemma* shorter than or as long as the glumes, usually indurated, smooth or prominently 9-ribbed, 9-awned from the apex, with a tuft of long silky hairs from the base or lower part, glabrous or shortly hairy above, usually also with a transverse row of sparse short hairs inside close below the awns; awns plumose, each with the continuation

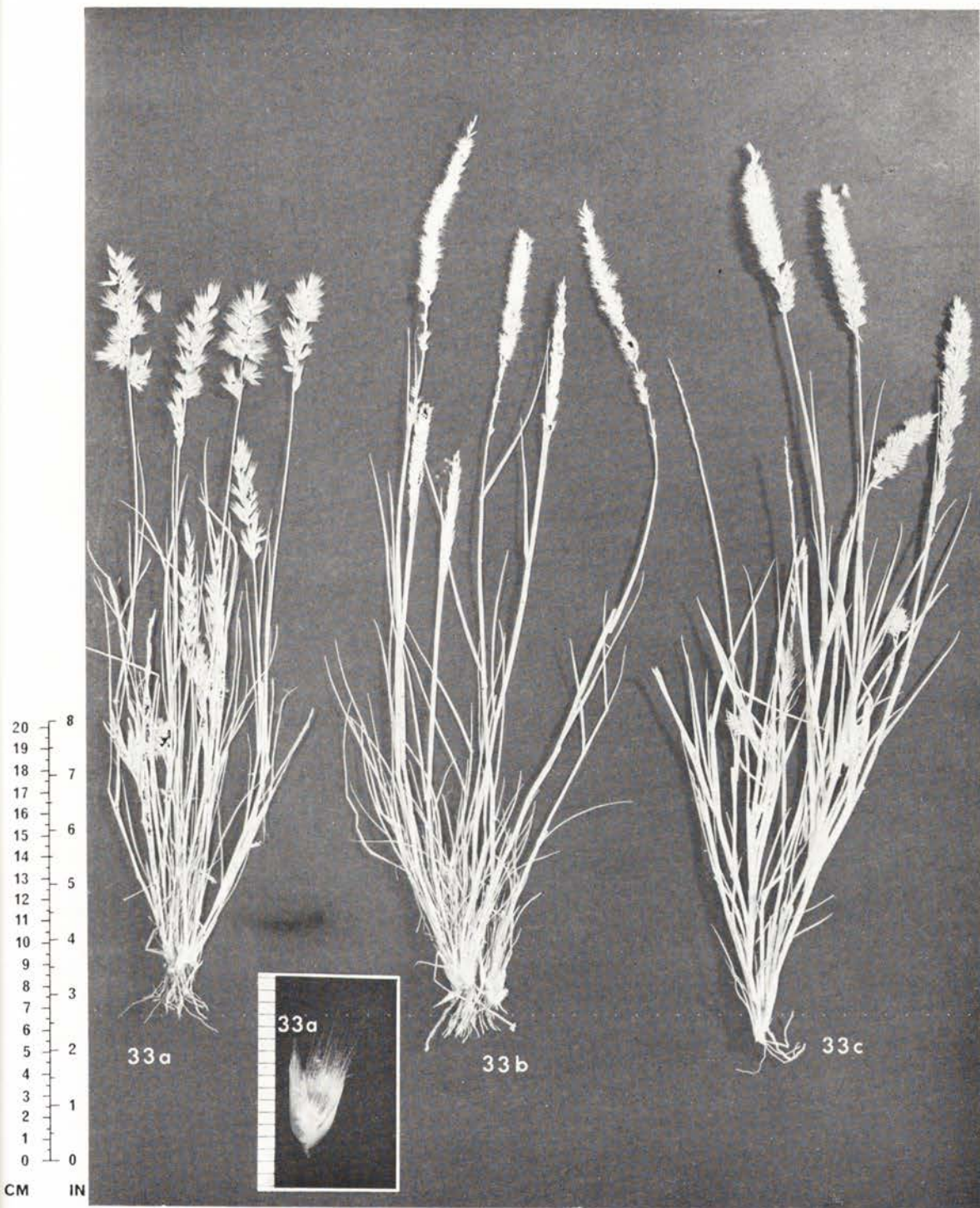


PLATE 33. (a) *Enneapogon avenaceus*; (b) *Enneapogon cylindricus*; (c) *Enneapogon polyphyllus*

of a nerve. *Lemma(s) of the upper fertile florets* (if present) similar to the lowest lemma, but glabrous on the back and smaller. *Palea* usually slightly longer than the body of the lemma, 2-keeled, thinly membranous, glabrous or minutely pubescent; keels usually ciliate. *Callus* short, obtuse. *Lemmas of sterile florets* smaller than those of the fertile florets, the lowest one with a palea, the rest reduced to the awns. *Caryopsis* oblong or obovate, slightly compressed. *Inflorescence* a contracted panicle, spiciform or \pm globular; sometimes also axillary cleistogamous spikelets present.

KEY TO THE SPECIES

- A. Glumes 13–21-nerved. Fertile florets, 2–3. Lowest lemma 9–12.5 mm long (incl. awns), as long as or shorter than broad. Panicles loose. 50. *E. avenaceus*
- A. Glumes up to 11-nerved. Fertile florets usually 1 (rarely 2). Lowest lemma up to 10 mm long (incl. awns), longer than broad. Panicles usually dense or compact (rarely somewhat loose).
 - B. Lowest lemma smooth, evenly indurated at maturity or the nerves slightly prominent immediately below the origin of the awns.
 - C. Leaves pubescent with simple and glandular hairs. 57. *E. polyphyllus*
 - C. Leaves glabrous or the blades sparsely pubescent with simple hairs. 53. *E. glaber*
 - B. Lowest lemma prominently nerved and ribbed on the body.
 - D. Culms disarticulate. Inflorescences terminal and axillary; terminal panicles linear, several times longer than broad. Cleistogamous spikelets present in the lower axils. 52. *E. cylindricus*
 - D. Culms not jointed. Inflorescences all terminal, ovate or elliptic or lanceolate. Cleistogamous spikelets absent.
 - E. Palea pubescent except for a glabrous patch at the apex between the nerves. Fertile florets, 1 or 2. Lowest lemma 5–6 mm long (incl. awns). 55. *E. oblongus*
 - E. Palea evenly pubescent or glabrescent or glabrous. Fertile floret, 1.
 - F. Glumes minutely pubescent with glandular hairs, 5–7-nerved, 3–4 mm long. Lowest lemma 6 mm long (incl. awns). Panicle ovate or oblong-lanceolate, 2–4 cm long, 1–1.5 cm wide, compact. 51. *E. clelandii*
 - F. Glumes glabrous or sparsely pubescent with simple and glandular hairs, 3–5-nerved, 1.5–2 mm long. Lowest lemma 3–4 mm long (incl. awns). Panicle elliptic or ovate or almost globular, 1–1.5 (rarely –3) cm long, 0.5–0.75 cm wide, compact. 54. *E. lindleyanus*
 - F. Glumes usually pubescent with simple and glandular hairs, 5–7-nerved, 2.5–3 mm long. Lowest lemma 5 mm long (incl. awns). Panicle linear-ovate, 2.5–5.5 cm long, 0.75–1.5 cm wide, compact; sometimes broadly lanceolate, \pm loose, up to 9.5 cm long and 3.75 cm wide. 56. *E. pallidus*

50. Bottle-washers
(oat nineawn)

Enneapogon avenaceus
Plate 33a

GENERAL DESCRIPTION

HABIT: This grass possesses many characters of leafy nineawn (No. 57), but differs in habit, spikelet size, and in the form of its panicle.

Description of the Species

Plants are 15–22 (rarely –30) cm high, loosely tufted, with simple or sparsely branched stems. There are simple and glandular hairs on culms and leaves, and a dense cover of long, silvery hairs on the butt, which appears woolly.

SEEDHEAD: Panicles mostly up to 5 cm long × 3 cm wide, open, oat-like in appearance. The few spikelets are large, with long hairy awns, and prominent many-nerved papery cymbiform glumes.

OCCURRENCE: Widespread, but best developed on calcareous and alluvial soils in the form of grasslands or in association with gidgee, witchetty bush, ironwood, coolibah, bluebush, and saltbush. Nevertheless there are numerous less extensive and localised occurrences in a wide range of environments.

DISTRIBUTION: M.

VALUE: Comparable with leafy nineawn.

BOTANIC DESCRIPTION

Close affinities with *Enneapogon polyphyllus*, but readily recognised by the following combination of characters:

Panicle rather loose, mostly up to 5 cm long and 1.25–3 cm wide, lanceolate-ovate or lanceolate-oblong. *Spikelets* rather few, on short lateral branches. *Glumes* acute, 13–21-nerved, with broad hyaline margins; lower broadly ovate, 5–8 mm long; upper broadly lanceolate, 8–10.5 mm long. *Spikelet* with 2 or 3 fertile florets. *Lowest lemma* 9–12.5 mm long (incl. awns); the body ± globular, 2–3 mm long and wide, hard, smooth, and shiny; awns 7–9.5 mm long.

51. Cleland's Nineawn

Enneapogon clelandii

GENERAL DESCRIPTION

HABIT: Loosely tufted or spreading perennial, 30–60 cm high; butt hairy, knotty, or thickened.

STEMS: Erect, rigid, strongly branched, many-noded, terete; internodes mostly covered by the sheaths, densely hairy close below the nodes, but hairless and smooth downwards.

LEAVES: Bluish-green, hairless or sometimes with minute glandular hairs. Blades 7–15 cm long, up to 4 mm wide, tapered to a long fine point, flat or rolled, rough on the upper surface, with numerous prominent nerves and rough sharp edges. Sheaths about as long as the internodes, tight, many-nerved, somewhat rough, sometimes bearded at the mouth, the basal ones densely hairy.

SEEDHEAD: Panicle 2–4 cm long, 1–1.5 cm wide, spiciform, dense and compact, sometimes cone-shaped, terminal and prominent on an extremely long peduncle densely hairy or bristly close below the panicle. The spikelets are small, crowded, and largely concealed by numerous, short, purplish or olive green, plumose awns. On ripening the florets fall as a group, and the olive green or blackish, thin, bristly or hairy glumes persist on the plant or finally also fall.

OCCURRENCE: Cleland's nineawn occurs sporadically throughout the area on sandy soils near creeks and in gullies on rocky hills.

DISTRIBUTION: S.A.

VALUE: Moderately palatable; seldom common enough to be significant in pasture.

BOTANIC DESCRIPTION

Panicle 2–4 cm long, 1–1.5 cm wide, compact, erect, ovate or oblong-lanceolate, prominently exerted, with elongated peduncle. *Spikelet* with 1 fertile floret. *Glumes* 3–4 mm long, 1.5 mm wide, 5–7-nerved, oblong or oblong-lanceolate, obtuse or mucronulate, minutely pubescent with glandular hairs, scabrous on the nerves towards the apex. *Lowest lemma* 6 mm long (incl. awns), oblong; the body 2 mm long, ribbed, villous in the lower third, glabrous above; awns plumose in the lower two-thirds. *Palea* 3 mm long, ciliate on the nerves. *Caryopsis* 1.5 mm long, oblong.

52. Jointed Nineawn

Enneapogon cylindricus
Plate 33b

GENERAL DESCRIPTION

HABIT: Perennial, 15–22 cm high, forming characteristic annual-like tufts with slender elongated flowering culms and a leafy, densely hairy butt thickened by numerous cataphylls.

STEMS: Hairy, sometimes purplish, 2–4-noded, characteristically jointed at each node. The fragile culms are an outstanding feature of the species. With handling, they readily break at the nodes (joints) and each internode separates individually.

LEAVES: Hairy; blades 7–15 cm long, first flat, finally narrow with inrolled edges, with extremely long, fine, thread-like points.

SEEDHEAD: Panicle usually 4–10 cm long and 5–10 mm wide, dense, spiciform, cylindrical, terminal on the culms, and prominent. Besides the terminal panicles, shorter panicles in the upper axils of the leaf sheaths and single spikelets in the basal or lower axils are usually produced. The axillary inflorescences are wholly or partly enclosed by the leaf sheaths. The spikelets are small, shortly awned, and densely crowded.

OCCURRENCE: Jointed nineawn is commonly associated with, though not confined to, calcareous rocks and soils. The species is distributed throughout the area, occurring sparsely or as a local dominant usually on shallow soils in gently undulating or low hilly country. Associated plants include short grasses and forbs, sparse low trees and shrubs, gidgee, and witchetty bush. It flowers mainly from March to May.

DISTRIBUTION: W.A., S.A., Q., N.S.W.

VALUE: Plants are highly palatable and nutritious.

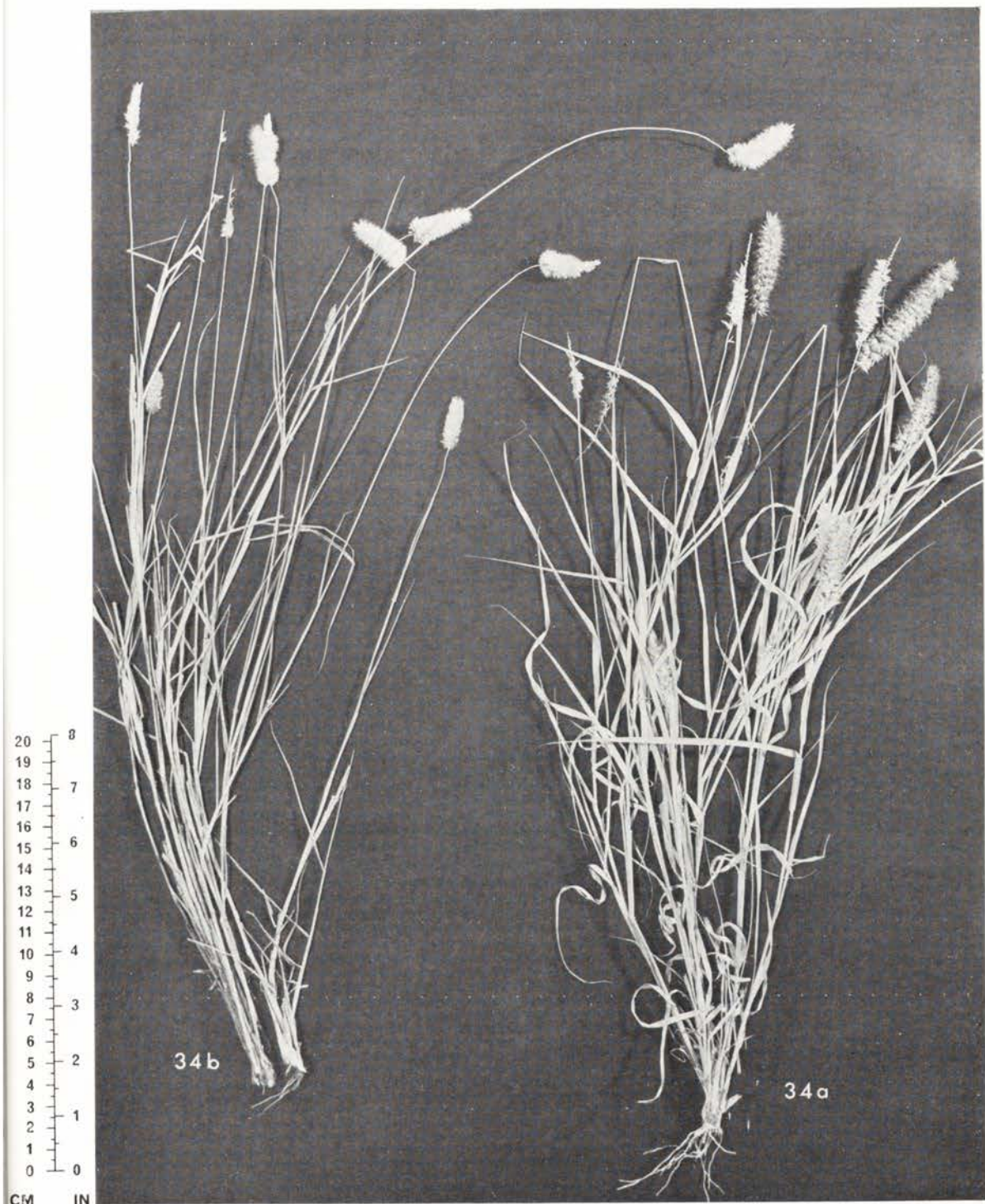


PLATE 34. (a) *Enneapogon glaber*; (b) *Enneapogon pallidus*

BOTANIC DESCRIPTION

Panicles terminal and axillary. *Terminal panicles* at length exerted, dense, spiciform, mostly 4–10 cm long and 5–10 mm wide, cylindrical, usually interrupted towards the base. *Axillary panicles* shorter, wholly or partly enclosed within the sheaths, sometimes reduced in the basal axils to solitary cleistogamous spikelets. *Spikelets* in the terminal and upper axillary panicles similar, chasmogamous, few-flowered; lowest floret fertile; the upper ones neuter, reduced upwards to the awns. *Glumes* 2.75–4 mm long, obtuse or ragged or mucronulate at the apex, 5–7-nerved, narrow-lanceolate to lanceolate-elliptic, glandular pubescent, scaberulous on the nerves. *Lowest lemma* 5–6 mm long (incl. awns); the body 1.5–2 mm long, oblong, prominently ribbed by the nerves, dorsally convex, villous in the lower half with silky hairs as long as the body; awns 3–4 mm long, plumose in the lower half. *Palea* as long as the body of the lemma, pubescent, oblong, with ciliolate keels. *Cleistogamous spikelets*: glumes narrower and longer (6–7 mm), acute or acuminate, villous. *Lowest lemma* ovate, gibbous, indurated, 2–4.5 mm long, not prominently ribbed, glabrous towards the apex, otherwise villous; awns 1–2 mm long, ciliolate. *Palea* pubescent, 2.5–3 mm long, rather broad, with ciliolate keels and broad margins.

53. Hairless Nineawn

Enneapogon glaber

Plate 34a

GENERAL DESCRIPTION

HABIT: Tufted leafy annual or short-lived perennial, 22–45 cm high, generally hairless except for the butt.

STEMS: Erect or somewhat bent, simple or branched, 3–5-noded, terete, slender, wiry, mostly smooth, densely and softly hairy about the nodes, all but the uppermost internode largely covered by the leaf sheaths.

LEAVES: Blades up to 19 cm long, bright green, usually flat, often somewhat rough, many-nerved, tapered to a very long hair-like point, with sharp edges, sometimes with fine thread-like hairs on the upper or both surfaces, at first stiffly erect, characteristically curly and twisted with age. Sheaths tight, slightly shorter than the internode, strongly nerved, smooth or somewhat rough, usually bearded at the mouth with long fine hairs.

SEEDHEAD: Panicle mostly 1–5 cm long \times 8–10 mm wide, usually spiciform and dense, at maturity prominent on a long rigid peduncle; peduncle densely hairy close below the panicle, otherwise hairless and smooth; panicle-branches extremely short, hairy. The florets and awns of immature panicles are usually purplish-black. At maturity the florets fall as a group, leaving the pale or straw-yellow glumes attached to the plant.

OCCURRENCE: Known from only the extreme northwest of the area, this grass occurs sparsely on spinifex sand plains.

DISTRIBUTION: W.A., N.T.

VALUE: Of little value in pasture.

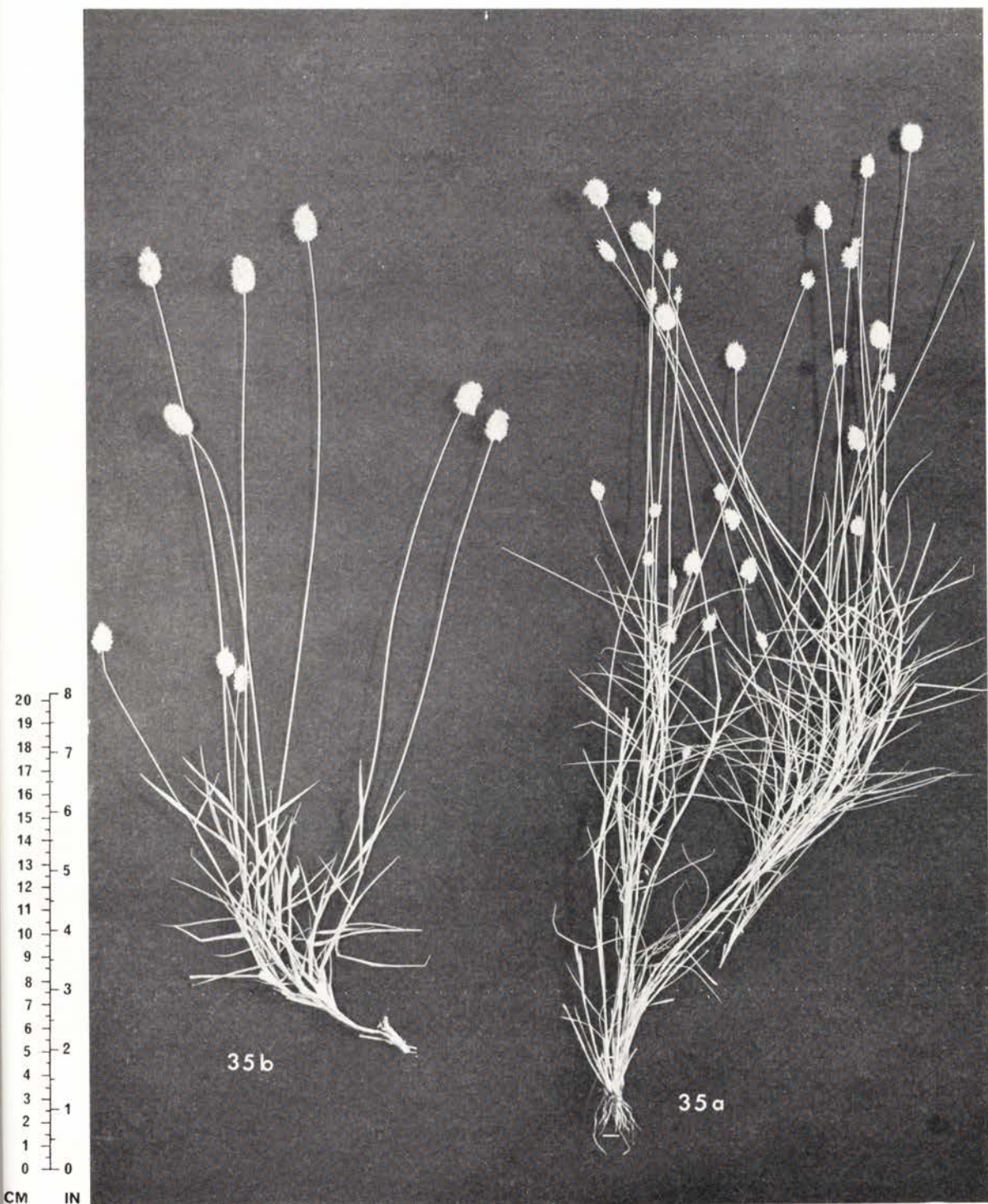


PLATE 35. (a) *Enneapogon lindleyanus*; (b) *Enneapogon oblongus*

BOTANIC DESCRIPTION

Panicle prominently exserted at maturity, 1.5–8 cm long, 8–12 mm wide (incl. awns), linear or linear-lanceolate, rather loose or dense, usually continuous. *Spikelets* with 1 fertile floret. *Glumes* ovate or ovate-lanceolate, acute or obtuse, 7–9-nerved, pubescent with simple and glandular hairs; lower 4–4.5 mm long; upper 5–6 mm long. *Lowest lemma* elliptic-oblong or narrowly ovate, 7.5–9.5 mm long (incl. awns); the body 2.5 mm long, indurated, smooth, with obscure nerves, glabrous except for the basal tuft and thin inner row of hairs; awns plumose in the lower two-thirds. *Palea* 3 mm long, with ciliate keels, pubescent between the keels, pilose near the edges. *Caryopsis* broadly oblong, 1 mm long.

54. **Wiry Nineawn**

Enneapogon lindleyanus

Plate 35a

GENERAL DESCRIPTION

HABIT: Slender perennial, 22–45 cm high.

STEMS: Thin or rather stout, wiry, with slightly thickened hairy nodes, otherwise ± hairless, becoming smooth and shiny, characteristically much-branched and densely clustered at the upper nodes.

LEAVES: ± hairless and smooth; blades tightly rolled (rarely flat) and stiffly spreading.

SEEDHEAD: Panicle 6–30 mm long and almost as wide, compact, often purplish, ± globular, prominent on a long thin peduncle; spikelets small, shortly awned.

OCCURRENCE: Wiry nineawn occurs sporadically on rocky slopes on shallow or skeletal, calcareous soils.

DISTRIBUTION: W.A., N.T., S.A., Q.

VALUE: Probably grazed, but unimportant in pasture.

BOTANIC DESCRIPTION

Panicle distinctly exserted, dense, compact, elliptic or ovate or almost globular, mostly 1–1.5 cm long and 0.5–0.75 cm wide; peduncle slender, elongated, striate, terete, pubescent or glabrous. *Spikelet* with 1 fertile floret. *Glumes* 3–5-nerved, oblong-lanceolate, obtuse, mucronulate or ragged at the apex, glabrous or sparsely pubescent with simple and glandular hairs; lower 1.5 mm long; upper 2 mm long. *Lowest lemma* 3–4 mm long (incl. awns); the body 1.5–2 mm long, prominently ribbed, concealed by the basal tuft of hairs; awns stiffly spreading, as long as the body of the lemma, plumose for at least the lower two-thirds. *Palea* 2 mm long, elliptic, pubescent or glabrous, not enclosed by the lemma. *Caryopsis* 1–1.25 mm long, cuneate-obovate, smooth and shiny.

55. **Purple-head Nineawn**

Enneapogon oblongus

Plate 35b

GENERAL DESCRIPTION

HABIT: Tufted perennial, 30–60 cm high, often bluish-green.

Description of the Species

STEMS: Erect or somewhat bent at the nodes, stiff, wiry, hairless, branched, with 6–8 hairy nodes.

LEAVES: Usually hairy. Blades flattened or loosely inrolled, gradually tapered to a long fine point.

SEEDHEAD: Panicle 1–3 cm long × 8–12 mm wide, usually oblong in outline, compact, often purplish, prominent on a long, rather stout peduncle; spikelets small, densely crowded.

Close to wiry nineawn (No. 54), but purple-head is a coarser plant branching from the lower nodes as well as the upper ones, with wider leaf blades, slightly larger spikelets, and broader, oblong rather than globular panicles.

OCCURRENCE: A plant of the uplands; occurring most commonly on shallow and skeletal soils over limestone; growing vigorously in stony gullies and drainage lines.

DISTRIBUTION: W.A., S.A., Q.

VALUE: Of moderate value where accessible to stock.

BOTANIC DESCRIPTION

Panicle distinctly exerted, densely compact, ovate to oblong, 1–3 cm long, 8–12 mm wide, often purplish; peduncle elongated, usually stout, striate, terete, glabrous or pubescent. *Spikelet* with 1 or 2 fertile florets. *Glumes* oblong or lanceolate, pubescent with simple and glandular hairs, broadly obtuse and often ragged at the apex, 5–9-nerved, 3–4 mm long. *Lowest lemma* 5–6 mm long (incl. awns); the body 2.5–3 mm long, prominently ribbed, concealed by the basal tuft of hairs; awns about 3 mm long (the central one longer), plumose for at least the lower two-thirds. *Palea* free from the lemma, obovate, as long as the body of the lemma, pubescent except for a glabrous apical patch between the nerves. *Caryopsis* obovate, obtuse, 1.5 mm long.

56. Cone-top Nineawn

Enneapogon pallidus
Plate 34b

GENERAL DESCRIPTION

HABIT: Tussocky perennial, 30–60 cm high, with hairy butt.

STEMS: Wiry, branched, erect or sometimes bent at the nodes, with dense hairs particularly near the base, mostly covered by the leaf sheaths, with 4–6 bearded nodes.

LEAVES: Mostly hairless, but rough from minute reflexed bristles; blades 7–15 cm long, flat or rolled, green or bluish.

SEEDHEAD: Panicle 25–55 mm long, 7–15 mm wide near the base, distinctly conical, usually compact, green or pale-coloured. Sometimes the panicle is rather loose, with long, spreading branches in the lower part, and is then over 2.5 cm wide and almost 10 cm long. The pale green spikelets are densely crowded and largely concealed by numerous, short, feathery awns. On ripening the florets fall readily,

leaving the thin, papery, pale or straw-coloured glumes clustered on the panicle-branches.

OCCURRENCE: Mainly tropical in distribution, in central Australia this grass is known to occur sparsely north of the Macdonnell Ranges in flat country on deep, medium-textured red earths under relatively dense mulga groves and on stony, skeletal hillslopes.

DISTRIBUTION: W.A., N.T., Q., N.S.W.

VALUE: Not valuable in pasture.

BOTANIC DESCRIPTION

Panicle exserted; usually compact, linear-ovate, and 2.5–5.5 cm long × 0.75–1.5 cm wide; sometimes branched, ± loose, broadly lanceolate, and up to 9.5 cm long and 3.75 cm wide; peduncle stout, terete, usually glabrous, sometimes flexuose just below the panicle, retrorse-ly scabrous or scaberulous, becoming smooth. *Spikelets* densely crowded, with 1 fertile floret. *Glumes* 2.5–3 mm long, 5–7-nerved, thinly membranous or hyaline, oblong-elliptic, obtuse, scabrous, usually pubescent with simple and glandular hairs. *Lowest lemma* 5 mm long (incl. awns); the body 1.75–2.25 mm long, prominently ribbed, the basal tuft of hairs shorter than the body of the lemma; awns subequal, about 3 mm long, plumose in the lower two-thirds. *Palea* 2–2.5 mm long, pubescent, oblong-elliptic or oblanceolate, acute. *Caryopsis* smooth, 0.75–1 mm long, cuneate, obtuse. Lemma of lowest sterile floret glabrous.

57. Leafy Nineawn

Enneapogon polyphyllus
Plate 33c

GENERAL DESCRIPTION

HABIT: Annual or short-lived perennial, 22–45 cm high, forming dense tufts up to 15 cm wide. A characteristic feature is the dense cover of soft, fine hairs on most parts of the plant. Many of the hairs are glandular; thus plants are somewhat viscid to the touch.

STEMS: Numerous, strongly branched, almost completely covered by the sheaths.

LEAVES: Blades flat or folded, gradually tapered to a long fine point.

SEEDHEAD: Panicle usually 5–9 cm long, 5–15 mm wide, dense, spiciform, often purplish, terminal on the culms, with short branches crowded with spikelets. The panicles are produced in abundance; often shorter, immature ones partly enclosed by the floral leaves are present. The spikelets are partly concealed by numerous, hairy awns. As the panicle ripens from the apex downwards, the florets fall readily, leaving the thin, straw-coloured glumes attached to the plant.

OCCURRENCE: This species is one of the most common and widespread in the area, growing abundantly over large areas in flat or hilly country on deep or shallow, sandy or clayey soils. It is best developed on alluvial soils on river floodplains and similarly favoured areas, where, in association with bunched kerosene grass, it

dominates extensive areas of low, short-lived grasslands. However, it occurs also in an extremely wide range of environments with mulga, gidgee, coolibah, snappy gum, bloodwood, corkwood, desert oak, ironwood, witchetty bush, saltbush, bluebush, spinifex, and Mitchell grasses.

Summer is the main growth period, but plants persist if not destroyed by grazing. It responds rapidly to rainfall, relatively small falls being sufficient to promote growth in four to five days. Furthermore, successive regeneration throughout the year occurs if favourable conditions prevail.

Adaptable and vigorous in habit, leafy nineawn often behaves as a pioneer plant. In this respect, it is one of the first species to invade and temporarily colonise spinifex areas following burning, quite often in association with naked woollybutt or bunched kerosene grass.

DISTRIBUTION: M. (excl. V.).

VALUE: Readily grazed at all stages of growth and highly regarded in the area as valuable fodder. In the early stages nineawn-dominant pastures are sufficiently nutritious to fatten stock, but are relatively short-lived. A particularly valuable feature of the species is its all-year regeneration to adequate rainfall.

BOTANIC DESCRIPTION

Panicle dense, linear-lanceolate, mostly 5–9 cm long and 0.5–1.5 cm wide, spiciform, continuous (rarely interrupted towards the base due to short, slightly divergent branches), at length shortly exerted; peduncle usually elongated, terete, striate, firmly erect, pubescent with simple and glandular hairs or scaberulous or both; rhachis and branchlets similarly pubescent. *Spikelet* with one fertile floret. *Glumes* thinly membranous to hyaline, pubescent, acuminate, strongly nerved; lower lanceolate-ovate, 5–6 mm long, 9–11-nerved; upper lanceolate, slightly longer, 5-nerved. *Lowest lemma* 7–10 mm long (incl. awns); the body 2–3 mm long, smooth, obscurely nerved, the basal tuft of hairs longer than the body, otherwise glabrous on the back; awns 5–7 mm long, plumose in the lower two-thirds. *Palea* 2.75–3.25 mm long, pubescent, hyaline or thinly membranous.

58–74. Lovegrasses

Eragrostis spp.

Largest of the grass genera in central Australia, *Eragrostis* comprises seventeen species, many of them very distinct in appearance, but readily distinguished as a group by the characteristic spikelets. These are usually quite flattened and contain few to numerous florets, of which only the small, thin, papery, cymbiform lemmas are seen superficially. The lemmas are attached on opposite sides of a small rhachilla in an overlapping fashion forming two regular rows. Attached in a similar manner at the base of the spikelet are two glumes, which are usually smaller than the lemmas, but similar in shape and texture. At maturity, usually the glumes and sometimes the paleas remain attached to the rhachilla, but the lemmas fall with the seeds.

The lovegrasses vary in habit from short, slender annuals to coarse, tussock-forming perennials. A few species (particularly the woollybutt and neverfail grasses)

are widespread, common, and moderately valuable fodder plants. However, many are restricted to better-watered habitats and virtually worthless as pasture because of their sporadic distribution and low palatability.

GENERIC CHARACTERS

Spikelets strongly compressed laterally or sometimes terete, pedicellate or rarely sessile, usually not falling entire from the pedicels; rhachilla disarticulate above the glumes and between the lemmas or continuous and persistent. *Florets* few to many, bisexual or the upper sterile and reduced. *Glumes* persistent or deciduous, equal or unequal, usually membranous, keeled, usually shorter than the lowest lemma. *Lemmas* membranous to chartaceous, \pm imbricate, 3-nerved with the lateral nerves not percurrent, glabrous. *Paleas* equal to or shorter than the lemmas, membranous or hyaline, 2-keeled, deciduous or persistent on the rhachilla. *Caryopsis* usually falling with the deciduous lemma or sometimes falling enclosed by the lemma and palea. *Inflorescence* an effuse or spiciform panicle, or modified into simple or compound spikes.

KEY TO THE SPECIES

- A. Plant with a glandular ring below the nodes of the culm, usually also with depressed glands on the foliage.
 - B. Spikelet 2.5–3 mm wide. Panicles all terminal. Leaf sheaths glabrous on the margins. 59. *E. cilianensis*
 - B. Spikelet 1–1.5 mm wide. Panicles terminal and axillary, the latter wholly or partly enclosed in the leaf sheaths. Leaf sheaths often with long, tubercle-based hairs along the outer margin. 58. *E. barrelieri*
- A. Plant not glandular.
 - C. Palea up to half as long as the lemma. 73. *E. speciosa*
 - C. Palea distinctly more than half as long as the lemma.
 - D. Perennials with rhizomes or conspicuously swollen butts.
 - E. Rhizome and butt densely woolly.
 - F. Spikelet glabrous. 64. *E. eriopoda*
 - F. Spikelet woolly-pubescent along the central furrow. 69. *E. laniflora*
 - E. Rhizome or butt glabrous or sparsely pubescent.
 - G. Rhizome well-developed and knotty. Culms 6–20-noded, the internodes usually shorter than their sheaths. Blades up to 2.5 cm long, 1.5–3 mm wide, flat and usually recurved. Panicle 6–10 mm wide. 74. *E. xerophila*
 - G. Rhizome (when developed) short, thickened but not knotty. Culms 3–6-noded, the internodes usually longer than their sheaths. Blades mostly 3–12 cm long, up to 1.5 mm wide, usually inrolled and stiffly erect. Panicle 1–2.5 cm wide. 72. *E. setifolia*
 - D. Annuals or slender perennials with fibrous roots and scarcely thickened butts.
 - H. Spikelet 1–3 mm long, up to 1 mm wide, 3–9-flowered. Panicle up to 5 (rarely –10) cm wide.
 - I. Spikelet 1 mm long, 3–5-flowered. Florets \pm globular. Slender perennial. 67. *E. kennedyae*

Description of the Species

- I. Spikelet 2–3 mm long, 4–9-flowered. Florets \pm laterally compressed. Slender annuals.
- J. Panicle spiciform, up to 1 cm wide. Spikelets crowded. 60. *E. confertiflora*
- J. Panicle loose, 1.5–10 cm wide. Spikelets rather distant. 66. *E. japonica*
- H. Spikelet longer than 3 mm and with numerous florets, or if 3–6 mm long and 4–10-flowered, then the spikelet 1.5 mm wide or the panicle at least 10 cm wide.
- K. Panicles at length effuse, 15–32.5 cm long, 10–20 cm wide, with much-divided branches; lowest branches whorled.
- L. Spikelet 6–10 mm long, closely 8–18-flowered. Glumes subequal. Lemmas smooth, faintly nerved. Grain about 0.5 mm long. Pedicels 2–8 mm long. 71. *E. parviflora*
- L. Spikelet 4–6 mm long, loosely 4–10-flowered. Glumes distinctly unequal. Lemmas scabrous, prominently nerved. Grain 0.75–1.25 mm long. Pedicels 1–3.25 mm long. 70. *E. leptocarpa*
- K. Panicles spiciform or contracted, usually < 16 cm long and 10 cm wide; panicle-branches mostly simple, solitary or clustered, but not whorled.
- M. Spikelets terete or biconvex, up to 1.5 mm wide.
- N. Lemma with the lateral nerves closer to the margin than to the midnerve, ovate (flattened). Grain laterally compressed, furrowed along one edge. Inflorescence comprising about half the plant. 68. *E. lacunaria*
- N. Lemma with the lateral nerves midway or closer to the midnerve, broadly elliptic (flattened). Grain dorsally compressed. Inflorescence comprising one-quarter to one-third of the plant.
- O. Panicle contracted and rather dense, mostly 1–1.5 cm wide, sometimes reduced to a spike or spiciform raceme. Spikelets 1–1.5 mm wide, (the lateral ones at least) sessile to subsessile, usually fascicled. Pedicels up to 0.5 mm long. Grain \pm elliptic, thin. Lemmas closely imbricate. 62. *E. dielsii*
- O. Panicle rather open and loose, 2–8 cm wide. Spikelets usually up to 1 mm wide, distinctly pedicellate, distant. Pedicels 0.5 mm long or more. Grain narrow-ovate. Lemmas rather loose. 65. *E. falcata*
- M. Spikelets laterally compressed, at least 1.5 mm wide.
- P. Annual. Inflorescence comprising usually > half the plant. 61. *E. cumingii*
- P. Perennials. Inflorescence comprising < half the plant.
- Q. Spikelets 3–6 mm long, 6–15-flowered, densely clustered. Panicle 8–16 cm long, interrupted, often spiciform. Lemmas closely imbricate. Palea scabrous-ciliate on the keels. 63. *E. elongata*
- Q. Spikelets 10–20 mm long, mostly 25–30-flowered, rather loose. Panicle up to 10 cm long, usually continuous, narrow but loose. Lemmas loosely imbricate. Palea ciliolate on the keels. 72. *E. setifolia*

58. Pitted Lovegrass

Eragrostis barrelieri

Plate 36a

GENERAL DESCRIPTION

HABIT: Tufted annual or short-lived perennial, 22–45 cm high, dense and leafy near the base.

STEMS: Unbranched, 4–5-noded, faintly purplish, usually bent at the nodes, largely covered by the sheaths, hairless or sparsely hairy, with a characteristic yellowish ring of glands below each node.

LEAVES: Pale or bluish-green, glandular; the glands seen as minute pits mainly on the sheaths, but also on the blades, and causing young plants to appear faintly spotted. Blades rigid, flat or slightly rolled, firmly pointed, rather short, usually hairless. Sheaths mostly more than half as long as the internodes, with a prominent tuft of long fine hairs at the mouth and often a dense row of similar hairs based on hard, wart-like tubercles along one edge, sparsely hairy on the surface or more often hairless.

SEEDHEAD: The inflorescence has two forms: an open panicle, 4–8.5 cm long \times 2.5–5 cm wide, terminal on the culms; and a contracted axillary panicle wholly or partly enclosed in a sheath. The numerous spikelets are 6–16 mm long, many-flowered, green or leaden grey, and solitary on short stalks on the panicle-branches.

OCCURRENCE: A somewhat uncommon plant, occurring on sandy soils in disturbed or well-watered habitats, sometimes developing dense local stands. Usually it flowers from February to early May, but can persist for longer periods with favourable rains.

DISTRIBUTION: S.A., N.S.W., E-A.

VALUE: Readily grazed.

BOTANIC DESCRIPTION

Panicles terminal and axillary; the former ones at length shortly exerted, oblong or elliptic-ovate in outline, loose, 4–8.5 cm long \times 2.5–5 cm wide; the latter ones smaller, denser, wholly or partly enclosed in the leaf sheaths; rhachis and branches angular, scaberulous, glabrous, sparsely glandular; branches obliquely spreading, becoming shorter upwards, glandular in the axils. *Spikelets* numerous but loose, solitary, prominently pedicellate, flattened, obliquely spreading, 8–25-flowered, linear-oblong, 6–16 mm long, 1–1.5 mm wide; pedicels terete or angular, scaberulous, usually with ring-like glands, laterals 1–1.75 mm long, terminals 3–4 mm long; rhachilla persistent, flexuose, internodes almost 0.5 mm long. *Glumes* thinly membranous or scarious, ovate, subacute, 1-nerved, keeled, scabrous on the keel, scaberulous on the surface; lower 1 mm long, upper 1.25 mm long. *Lemma* 1.75–2 mm long, broadly elliptic (flattened), obtuse, emarginate, scaberulous towards the apex, scabrous on the midnerve, with prominent submarginal nerves. *Palea* slightly shorter than the lemma, scabrous-ciliate on the keels.



PLATE 36. (a) *Eragrostis barrelieri*; (b) *Eragrostis cilianensis*; (c) *Eragrostis confertiflora*

59. Stink Grass

Eragrostis cilianensis

Plate 36b

GENERAL DESCRIPTION

HABIT: Annual, 12-22 cm high or more, often coloured olive green, foetid when fresh.

STEMS: Erect or sharply bent at the nodes, slender, simple or branched from the lower nodes, hairless and smooth, prominently nerved or ridged, 1-4-noded, usually with a distinctive yellowish glandular ring close below each node.

LEAVES: Prominently nerved, smooth, mostly hairless, glandular with minute pits mainly on the margins and midnerve. Blades mostly 2.5-12 cm long, flat and rather broad or loosely rolled, thin and papery, tapered to a fine point, often with tubercle-like glands along the edges. Sheaths about half to almost as long as the internodes, usually loose, bearded at the mouth with long fine hairs, sometimes with numerous glands on the surface.

SEEDHEAD: Panicle up to 18 cm long and 7.5 cm wide though often smaller, narrowed to the apex, contracted, terminating peduncles much longer than the lower internodes, with divergent, often short branches scattered on the axis. The spikelets are up to 18 mm long, flattened, usually olive green or purplish, solitary, and shortly stalked on the panicle-branches.

OCCURRENCE: In central Australia stink grass is known only from a bore site on Hamilton Downs. A native of the Mediterranean region, it is naturalised in many parts of Australia and most likely occurs in other disturbed sites.

DISTRIBUTION: M., T., E-A.

VALUE: Of little or no value as a fodder grass.

BOTANIC DESCRIPTION

Panicle terminal, exserted, contracted, ovate or elliptic or oblong, 4-18 cm long, 1.5-7.5 cm wide, with terete or angular, strongly striate, glabrous, scaberulous, sometimes glandular axis, branches, and pedicels; branches slender, up to 5.5 cm long, oblique, simple or shortly divided, mostly solitary, distant, pulvinate in the axils; pedicels stiffly erect or oblique, the lateral ones about 1 mm, the terminal ones 2-2.5 mm long. *Spikelets* distinctly pedicellate, solitary, usually remote, strongly flattened, ovate or lanceolate-oblong, 7-18 mm long, 2.5-3 mm wide, 12-32-flowered; rhachilla persistent, glabrous, internodes about 0.5 mm long. *Glumes* 2.25 mm long, firmly membranous, glabrous, smooth, glandular-tubercled on the keels; lower 1-nerved, narrow-ovate, acute; upper slightly longer, 3-nerved, broadly ovate, subacute. *Lemma* closely imbricate, firmly membranous, broadly ovate-elliptic (flattened), obtuse, 2-2.25 mm long, strongly nerved, with the lateral nerves closer to the margins than to the midnerve, scaberulous mainly in the upper part and towards the margins, the keel scabrous towards the apex and sparsely glandular-tubercled. *Palea* persistent, subequal to the lemma, scarious, narrowly elliptic-obovate, acute, the keels scabrous-ciliate and strongly curved. *Caryopsis* ± globular, 0.5 mm long and wide, faintly reticulate on the surface, dull brown.



PLATE 37. (a) *Eragrostis cumingii*; (b) *Eragrostis elongata*; (c) *Eragrostis speciosa*

60. Spike Lovegrass

Eragrostis confertiflora
Plate 36c

GENERAL DESCRIPTION

HABIT: Slender tufted annual, 22–30 cm high.

STEMS: Erect, with 1 or 2 nodes.

LEAVES: Blades flat.

SEEDHEAD: Panicles are up to 17 cm long, usually < 7 mm wide, dense, spiciform, often purplish, and produced in abundance. Usually they comprise most of the plant and are very distinctive in colour, size, and form.

OCCURRENCE: Mainly northern in distribution and somewhat rare, this grass is known from sandy watercourses (e.g. Plenty River) and the gilgais of cracking clay plains.

DISTRIBUTION: S.A., Q.

VALUE: This plant is extremely short-lived and produces little fodder.

BOTANIC DESCRIPTION

Panicle 6–17 cm long, up to 1 cm wide, erect, spiciform, often interrupted towards the base; branches 5–25 cm long, appressed in dense clusters on the axis, entirely clothed with spikelets. *Spikelets* 2–3 mm long, 1 mm wide, 5–8-flowered, narrowly oblong, flattened, subsessile or shortly pedicellate, crowded. *Lemmas* thinly membranous, loosely imbricate. *Rhachilla* readily disarticulating between the lemmas, with rather long internodes.

61. Cuming's Lovegrass

Eragrostis cumingii
Plate 37a

GENERAL DESCRIPTION

HABIT: Erect or spreading slender annual, 22–37 cm high.

STEMS: Mostly unbranched, sparsely or densely hairy, with few nodes (often only one).

LEAVES: Sparsely or densely hairy on the surface with fine tubercle-based hairs, almost always bearded at the mouth. Blades flat or sometimes inrolled.

SEEDHEAD: Panicle variable in form, on long or very short culms, with usually very short branches up to 2 cm long bearing clusters of pale green and purplish spikelets. The panicle-branches can be erect, horizontal, or reflexed on the axis, while the clusters of spikelets can be continuous on a terminal axis or scattered throughout the plant and often borne near ground level. Each spikelet is 5–16.5 mm long, narrow, flattened, several-flowered, and tapered to a pointed apex.

OCCURRENCE: Apparently rare in central Australia, this grass occurs in better-watered habitats or disturbed places and is normally short-lived.

DISTRIBUTION: W.A., N.T., Q., E-A.

VALUE: Grazed in association with other plants, but not markedly valuable.



PLATE 38. (a) *Eragrostis dielsii*; (b) *Eragrostis falcata*; (c) *Eragrostis lacunaria*

BOTANIC DESCRIPTION

Panicles mostly terminal, narrow, variable in form, either elongated and interrupted or short and \pm continuous; branches up to 2 cm long, erect or horizontally spreading or reflexed, glabrous or pubescent, angular, scabrous on the angles. *Spikelets* solitary and distant or crowded in dense remote clusters, usually becoming approximate towards the apex of the panicle, subsessile or shortly pedicellate, 5–16.5 mm long, 1.75–3.75 mm wide, flattened, 13–36-flowered, linear-lanceolate to linear-oblong, acute; pedicels up to 3 mm long, but usually shorter; rachilla stout, \pm flexuose, internodes about 0.25 mm long. *Lemmas* closely imbricate, 2.5 mm long, broadly elliptic (flattened), obtuse, notched, glabrous, granular or \pm smooth, scabrous on the midnerve towards the apex, lateral nerves prominent and slightly closer to the margins than to the midnerve. *Palea* 1.75–2 mm long, prominently scabrous-ciliate on the keels.

62. Mallee Lovegrass

Eragrostis dielsii

Plate 38a

GENERAL DESCRIPTION

HABIT: Slender grass, annual-like in appearance and often flowering when only 7–15 cm high, but usually behaving as a short-lived perennial and forming small dense tufts up to 30 cm high.

STEMS: Erect or spreading on the ground to form low tufts up to 22 cm wide.

LEAVES: Very rough from a dense cover of minute bristles.

SEEDHEAD: Panicle 2–10 cm long, usually narrow, dense and spiciform; spikelets mostly 12 mm long though variable, purple or brown, usually clustered on short branches scattered on the axis.

The species is distinct in its cylindrical (rather than flattened) spikelets, often all curved to one side of the axis.

OCCURRENCE: Mallee lovegrass occurs throughout the area, but not commonly, on the margins of salt lakes and in other saline habitats in association with samphire and saltbush; also on river levees on sandy and fine-textured alluvial soils with ironwood, corkwood, and short grasses and forbs.

DISTRIBUTION: M.

VALUE: Evidently well-grazed, but contributing little to pastures because of lack of bulk and restricted occurrence.

BOTANIC DESCRIPTION

Panicle contracted, rather dense, 2–10 cm long, mostly 1–1.5 cm wide, sometimes reduced to a spiciform raceme; branches solitary, distant, up to 3 cm long but usually much shorter. *Spikelets* mostly less than 20 mm long, 1–1.5 mm wide, with numerous florets, terete, straight or curved, sessile or subsessile, usually fascicled. *Lemmas* closely imbricate, broadly ovate, obtuse, 2–2.5 mm long, prominently 3-nerved, glandular, sometimes scabrous towards the apex.

63. Clustered Lovegrass

Eragrostis elongata
Plate 37b

GENERAL DESCRIPTION

HABIT: Erect, rather leafy, densely tufted perennial, 30–60 cm high.

STEMS: Usually unbranched, hairless, 2–4-noded.

LEAVES: Pilose at the mouth, otherwise hairless. Blades flat or rolled, up to 20 cm long, narrow, gradually tapered to a long slender point.

SEEDHEAD: Panicle narrow, usually with several clusters of purplish-green spikelets scattered along the axis. In the lower part of the panicle, the spikelets arise on spreading, distant branches up to 3.75 cm long, which become shorter upwards. In the upper part the clusters of spikelets are closer, forming a compact, continuous, spiciform head.

OCURRENCE: Widely distributed, though not common; occurring in sandy creek-beds and similar sites.

DISTRIBUTION: M., E-A.

VALUE: Negligible.

BOTANIC DESCRIPTION

Panicle 8–16 cm long, narrow, interrupted, often spiciform towards the apex; rhachis and branches scabrous; lower branches up to 3.75 cm long, distant. *Spikelets* 3–6 mm long, 1.5–2 mm wide, 6–15-flowered, ovate-lanceolate, laterally compressed, subsessile, densely crowded; rhachilla tough. *Glumes* as long as the lowest lemma or slightly shorter, narrow, with scabrous prominent keels. *Lemmas* 1.5 mm long, broadly ovate, suborbicular (flattened), granular, scabrous on the midnerve, closely imbricate, with the lateral nerves submarginal and prominent. *Palea* as long as the lemma, persistent, with scabrous-ciliate keels.

64. Naked Woollybutt

Eragrostis eriopoda
Plate 39

GENERAL DESCRIPTION

HABIT: Tussock-forming perennial, 30–60 cm high, with coarse hairy roots and densely woolly butt thickened by numerous cataphylls. Usually tussocks are 15–22 cm wide, but old established ones may be larger. These are often ring-like in formation, owing to the dying of the mature centre and the growth of new material on the perimeter.

STEMS: Erect, wiry, unbranched, many-noded, rough with minute bristles.

LEAVES: Blades stiffly spreading, narrow, with inrolled edges and rigid points. Sheaths shorter than the internodes, tight.

SEEDHEAD: Panicle variable in size, density, and form, 11.5–20 cm long, up to 7.5 cm wide near the base and tapered to a narrow apex, with few usually short erect or widely spreading branches scattered on the axis. The straight or curved

spikelets are solitary on short stalks attached to the panicle-branches or in the upper part of the panicle directly to the axis. Each spikelet is 6–22 mm long, 2–3 mm wide, and contains numerous florets.

OCCURRENCE: A characteristic species of the Australian interior, extremely widespread and common in central Australia; occurring most extensively as a local dominant or common constituent of spinifex sand plains and dune fields on red clayey sands. Naked woollybutt also occurs under mulga on coarse to medium-textured red earths; on river floodplains and levees on sandy, alluvial soils with coolibah, bloodwood, ironwood, needlewood, corkwood, and short grasses and forbs; and on limestone slopes and rises on shallow, sandy soils under witchetty bush and gidgee.

Probably because of their deep, vigorous root-system, plants withstand unfavourable conditions and grow rapidly with rainfall. In association with the slow-growing spinifex, they respond more quickly after firing and may dominate the community for short periods.

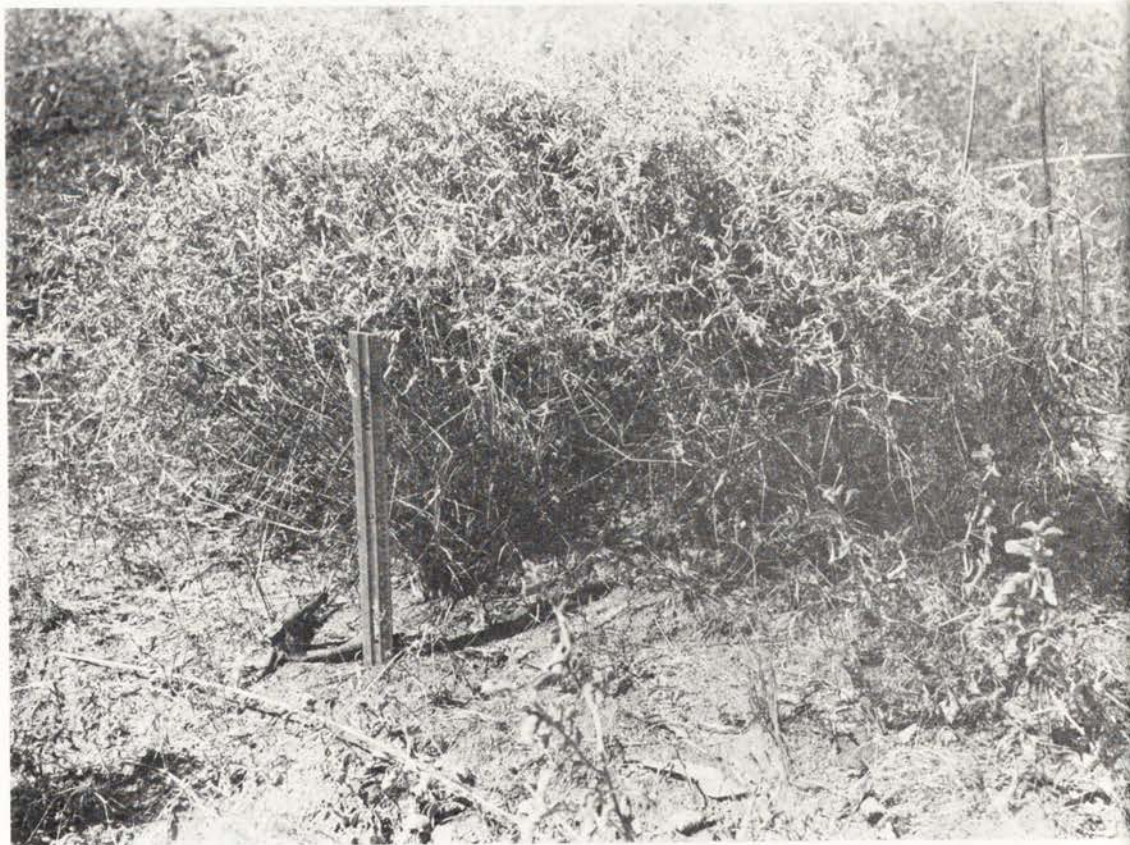


PLATE 39. *Eragrostis eriopoda*

Description of the Species

DISTRIBUTION: M. (excl. V.).

VALUE: Plants are moderately palatable and normally grazing is restricted to new growth. However, naked woollybutt is hardy and vigorous, persisting under drought and other adverse growing conditions. In places of high stock concentration such as stock routes and holding paddocks, it survives consistent stocking and provides some forage after associated, less hardy plants are destroyed.

BOTANIC DESCRIPTION

Panicle prominently exerted, contracted but loose, sometimes spiciform and interrupted, 11.5–20 cm long, up to 7.5 cm wide, narrowed towards the apex, with scabrous angular axis and branches; branches usually few, simple or sometimes divided, solitary, distant or remote, erect or horizontally spreading or reflexed, up to 6.5 cm long but usually much shorter. *Spikelets* subsessile or shortly pedicellate, few, usually solitary and remote, straight or curved, erect or divaricate or reflexed, linear-oblong, flattened, 6–22 mm long, 2–3 mm wide, usually several-flowered (up to 35). *Glumes* subequal, thinly membranous to scarios, ovate, obtuse, 1.75–2 mm long, 3-nerved, scabrous on the keel, granular on the surface. *Lemmas* closely imbricate, ovate (flattened), obtuse, usually emarginate, firmly membranous, with scarios margins, glabrous, smooth or sometimes scaberulous or minutely granular, 2–3 mm long, with thick, sometimes green coloured nerves; lateral nerves midway between midnerve and margins. *Palea* shorter than the lemma, broadly obovate, hyaline; keels thickened, scabrous-ciliolate, sometimes pilose in the lower part. *Caryopsis* ovate, 0.75 mm long.

65. Sickie Lovegrass

Eragrostis falcata
Plate 38b

GENERAL DESCRIPTION

HABIT: Erect tufted perennial, 30–45 cm high; butt usually with sparse silky hairs and somewhat thickened by stiff, pointed cataphylls.

STEMS: Numerous, very slender, wiry.

SEEDHEAD: Panicle 5–12 cm long, 2–8 cm wide, open, with solitary distant spikelets on branches 1.5–5 cm long.

Except for the above characters, this species is identical with mallee lovegrass (No. 62) and is comparable in occurrence and value.

DISTRIBUTION: W.A., S.A.

BOTANIC DESCRIPTION

This species has affinities with *Eragrostis dielsii*, but differs mainly in the open panicle, in the pedicellate, narrower, usually longer spikelets, and in the rather distant lemmas.

Panicle 5–12 cm long, 2–8 cm wide; branches slender, spreading, 1.5–5 cm long. *Spikelets* solitary, distant, shortly but distinctly pedicellate, linear, terete, 8–23 mm long, usually < 1 mm wide, straight or slightly curved; rhachilla with rather long internodes.

66. Delicate Lovegrass

Eragrostis japonica
Plate 40a

GENERAL DESCRIPTION

HABIT: Slender weak-stemmed annual, usually 15 cm high, but up to 60 cm in favourable situations.

STEMS: Hairless, rarely with more than 3 nodes.

LEAVES: Hairless; blades long, flat.

SEEDHEAD: Though variable in size, the delicate, open panicles are usually 8–15 × 1.5–5 cm and characteristically comprise most of the plant. The spreading panicle-branches, often divided into very slender branchlets, are scattered along the axis singly or in clusters. The very small, shortly stalked, often purplish spikelets are solitary on the branches and branchlets, and, though numerous, remain distant.

OCCURRENCE: Widely distributed; like many lovegrasses in the area, this species occurs in favoured habitats such as depressions, gilgais, and creek lines, apparently irrespective of other environmental factors.

DISTRIBUTION: M. (excl. N.S.W.), E-A.

VALUE: Plants consist mainly of seedheads, which are not grazed.

BOTANIC DESCRIPTION

This species is allied to *Eragrostis confertiflora* and *E. kennedyae*, but differs from the former in the loose panicles, and from the latter in the larger spikelets and longer panicles.

Panicle commonly 8–15 cm long and 1.5–5 cm wide (rarely up to 35 cm long and 10 cm wide), loose, with spreading scabrous branches and branchlets; primary branches usually solitary and distant. *Spikelets* 2–3 mm long, up to 1 mm wide, solitary, rather distant, pedicellate, flattened, loosely 4–9-flowered; rhachilla disarticulating readily. *Lemma* thinly membranous, with the lateral nerves close to the margins.

67. Small-flowered Lovegrass

Eragrostis kennedyae
Plate 40b

GENERAL DESCRIPTION

HABIT: Slender perennial, 30–45 cm high, with hairy, slightly thickened butt.

STEMS: Hairless, erect.

LEAVES: Long silky hairs at the mouth of the sheath and extending along the blade, otherwise hairless.

SEEDHEAD: Panicles are very slender with numerous, extremely small, stalked spikelets. When young the panicles are spiciform, but with maturity the lower branches spread slightly. Mature heads are 11–16.5 cm long, 2.5–3.5 cm wide at the base, and gradually narrowed to the apex.

OCCURRENCE: Apparently rare, though probably widely distributed in the area; known from near Alcoota in habitats subjected to flooding.



PLATE 40. (a) *Eragrostis japonica*; (b) *Eragrostis kennedyae*; (c) *Eragrostis leptocarpa*

DISTRIBUTION: W.A., S.A., Q., N.S.W.

VALUE: Apparently not grazed.

BOTANIC DESCRIPTION

Panicle contracted at first, becoming loose, 11–16.5 cm long, 2.5–3.5 cm wide at the base, tapered to a narrow apex; branches capillary, up to 5 cm long and spreading in the lower part, gradually becoming shorter and appressed upwards; secondary branches short, appressed. *Spikelets* numerous, 1 mm long and almost as wide, slightly flattened, unequally pedicellate; rhachilla very fragile. *Florets* almost globular, closely imbricate. *Glumes* and *lemmas* thinly membranous; glumes with a prominent scaberulous keel.

The minute spikelets and globular florets are distinctive features of this species.

68. Purple Lovegrass

Eragrostis lacunaria

Plate 38c

GENERAL DESCRIPTION

HABIT: Slender annual or short-lived perennial, 22–37 cm high.

STEMS: Smooth, hairless, usually unbranched, thin, wiry, 3–5-noded.

LEAVES: Blades 2–7 cm long, narrowly rolled, widening towards the sheath, hairless or sometimes with long fine hairs based on hard tubercles, becoming rigid and bristle-like with age. Sheaths usually much shorter than the internodes, tight, sometimes densely covered by tubercles, sometimes hairy at the mouth and along the margins.

SEEDHEAD: Mature panicle open and usually 11–16 cm long × 6–10 cm wide, with slender, stiff, solitary branches 3–6 cm long, usually widely spaced on the axis. The branches divide into branchlets, bearing relatively few, solitary spikelets on slender stalks. The distant, stiffly spreading spikelets are 6–18 mm long and very slender. Each contains several florets and thus produces several seeds, which ripen to a purple-brown colour and can be seen as dark spots through the paler, golden-brown lemmas.

OCCURRENCE: A plant common to the higher rainfall, eastern states of Australia; fairly rare in central Australia and usually occurring with summer rainfall in February to April in better-watered situations. Near Alice Springs it is found in erosion gullies and washaways, but occurs on river levees and in similar habitats over a wider area.

DISTRIBUTION: Q., N.S.W., V.

VALUE: Relatively unimportant.

BOTANIC DESCRIPTION

Panicle at first contracted and subtended by the uppermost leaf sheath, at length exerted and loose, broadly oblong or ovate, 11–16 cm long, 6–10 cm wide; branches very slender but stiff, spreading or divaricate and sometimes horizontal, distant, mostly solitary, 3–6

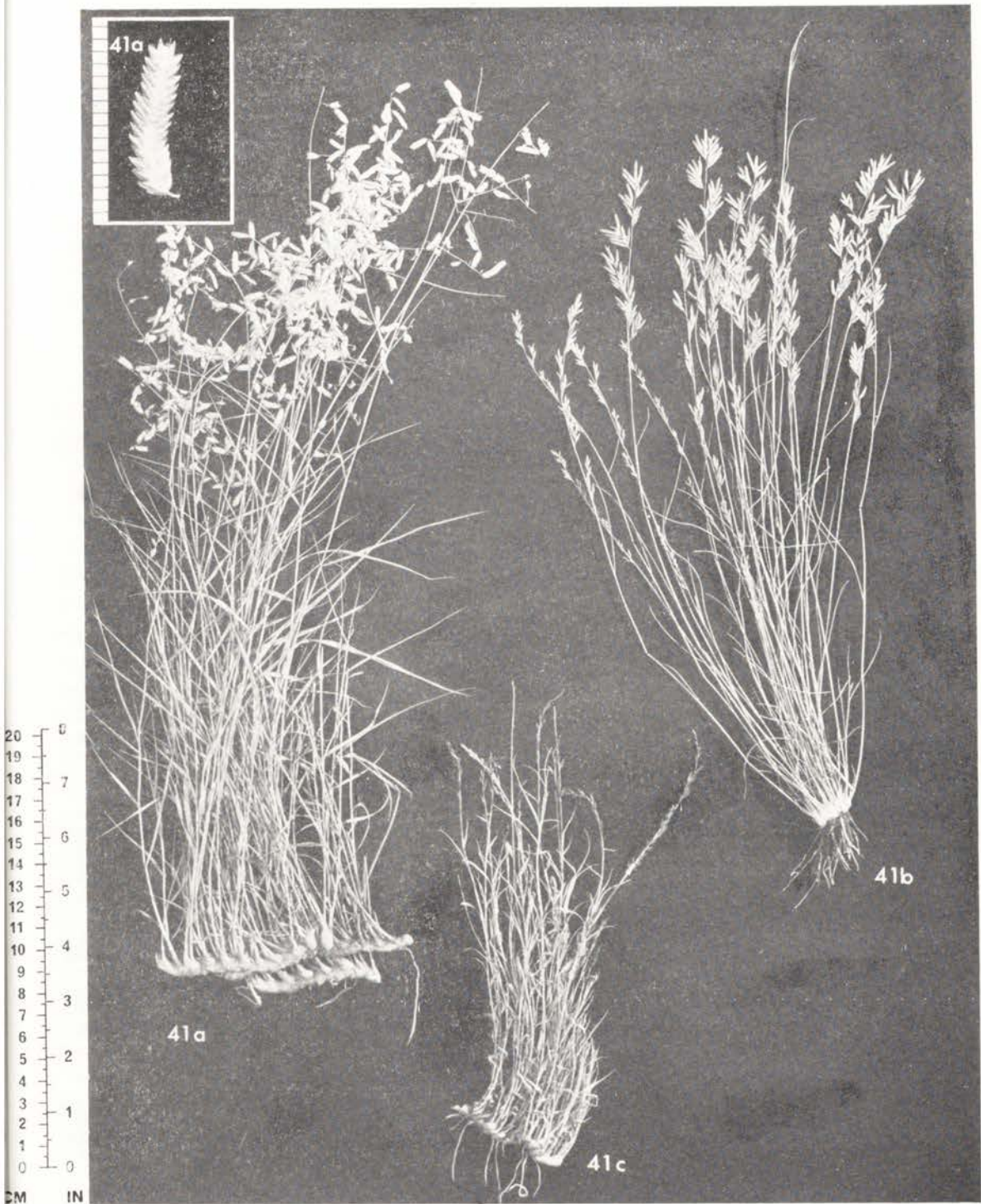


PLATE 41. (a) *Eragrostis laniflora*; (b) *Eragrostis setifolia*; (c) *Eragrostis xerophila*

cm long, divided from a little above the base; branchlets and pedicels angular, scaberulous or becoming smooth, glabrous, divaricate, branchlets mostly up to 2 cm long, lateral pedicels up to 2 mm long, terminal pedicels up to 6 mm long. *Spikelets* prominently pedicellate, solitary, remote, narrow-linear, 6–18 mm long, 0.75–1 mm wide, 11–33-flowered, biconvex; rhachilla tough, distinctly flexuose, internodes 0.5 mm long. *Glumes* unequal, readily deciduous, scarious or firmly membranous, lower 0.5 mm long, upper 0.75–1 mm long. *Lemmas* closely imbricate, 1.5 mm long, ovate (flattened), obtuse, ± smooth, lateral nerves rather faint and slightly closer to the margins than to the midnerve. *Palea* slightly shorter than its lemma, scaberulous on the keels, persistent. *Caryopsis* laterally compressed, furrowed along one edge, less than 0.5 mm long, smooth, shiny.

69. Hairy-flowered Woollybutt

Eragrostis laniflora

Plate 41a

GENERAL DESCRIPTION

This plant is close to naked woollybutt (No. 64), but has a stout, well-developed rhizome, hairy spikelets, and sometimes flat blades. The rhizome is densely woolly, up to 10 cm long or more, often branched, and thickened by numerous stiff, broad, many-nerved, sharply-pointed cataphylls. The long, many-flowered spikelets appear woolly along the central longitudinal groove due to long, soft, usually dense hairs near the base of each floret.

OCCURRENCE: Similar in distribution to naked woollybutt and the two species occasionally grow in close proximity, but hairy-flowered woollybutt is slightly less widespread and far less common. It occurs most commonly on deep sands mainly in the dune fields of the south and southeast.

DISTRIBUTION: S.A., Q., N.S.W.

VALUE: Moderately palatable when young, deteriorating rapidly with maturity, but useful in dry times as alternative forage to associated low-quality spinifex pasture.

BOTANIC DESCRIPTION

Spikelets shortly pedicellate, sometimes curved, 2–3.5 mm wide, with thinly membranous, broadly ovate-elliptic lemmas, otherwise similar to those of *Eragrostis eriopoda*. *Lemma* near the margins and *palea* on the keels densely or sometimes sparsely bearded in the lower part with long, fine, woolly hairs.

70. Drooping Lovegrass

Eragrostis leptocarpa

Plate 40c

GENERAL DESCRIPTION

HABIT: Slender weak-stemmed annual or short-lived biennial, 30–60 cm high.

Description of the Species

STEMS: Thin, smooth, hairless, usually unbranched, 3-4-noded.

LEAVES: Hairless and smooth. Blades sometimes very long, narrow, flat or rolled. Sheaths half to almost as long as the internodes, the basal ones often purple.

SEEDHEAD: Panicle usually 15-23 cm long and 10 cm wide, open, delicate, drooping, with numerous extremely slender spreading branches up to 6 cm long. The lowest panicle-branches are whorled or clustered, while the remainder are solitary or paired and scattered on a long axis. Immature panicles are contracted and partly enclosed by the floral leaves, but fully developed ones can comprise more than half the plant. The numerous, delicate spikelets, borne singly on extremely thin stalks, are pale, few-flowered, and 4-6 mm long.

OCCURRENCE: Distributed throughout the area mainly on cracking clay soils; occurring in the gilgais of Mitchell grass plains and on the fringes of deeper water-holes under coolibah. Plants flower in February-March and die fairly rapidly with the onset of dry conditions.

DISTRIBUTION: W.A., S.A., Q., N.S.W.

VALUE: Not grazed.

BOTANIC DESCRIPTION

Panicle contracted at first, becoming open, usually 15-23 cm long (-30 cm) and 10 cm wide; branches erect or widely spreading or drooping, capillary, strongly divided except near the base, usually 3-6 (-11) cm long, glabrous, scaberulous, angular, distant, prominently pulvinate in the axils, the lowest whorled, the remainder usually solitary or paired. *Spikelets* laterally compressed, loosely 4-10-flowered, prominently pedicellate, 4-6 mm long, 0.75-1 mm wide, narrowly linear; rhachilla tough, flexuose, internodes 0.5-0.75 mm long; pedicels capillary, scaberulous, often pulvinate in the axils, laterals 1-1.5 mm long, terminals < 3.25 mm long. *Glumes* hyaline, deciduous, distinctly unequal; lower readily deciduous, < 0.5 mm long; upper 1-1.25 mm long. *Lemmas* loosely imbricate, scarious, with hyaline margins at least towards the apex, scabrous, 1.75-2 mm long, narrowly elliptic, keeled, readily deciduous, obtuse, notched, lateral nerves prominent and slightly closer to the margins than to the midnerve. *Palea* almost as long as its lemma, hyaline, tardily deciduous, ciliolate on the keels. *Caryopsis* linear-oblong, 0.75-1.25 mm long.

71. Weeping Lovegrass

Eragrostis parviflora

GENERAL DESCRIPTION

Similar to drooping lovegrass (No. 70), but plants are usually 60-90 cm high, sometimes perennial, with branched (rarely simple) stems.

Also the panicle is similar, but larger in all parts. At maturity, it is often 30 cm long or more and 11-20 cm wide, while the spikelets are 6-10 mm long, leaden grey or olive green, with longer stalks and 8-18 florets in each.

OCCURRENCE: Widely distributed, but restricted; occurring near permanent or semi-perennial surface waters (e.g. chasms of Palm Valley) and then usually perennial in duration, or in seasonally-flooded places and then normally short-lived.

DISTRIBUTION: M.

VALUE: Not grazed.

BOTANIC DESCRIPTION

This species has close affinities with *Eragrostis leptocarpa*, but is distinguished by its usually larger panicle, longer, several-flowered spikelets, longer pedicels, subequal glumes, closely imbricate, smooth, faintly nerved lemmas, persistent paleas, and smaller grain.

Panicle at length very loose and spreading, 20–32.5 cm long, 11–20 cm wide; branches commonly 8–11.5 cm long (sometimes < 14.5 cm). *Spikelets* prominently pedicellate, somewhat laterally compressed, 6–10 mm long, 8–18-flowered; lateral pedicels 2–5 mm long, terminals < 8 mm long. *Glumes* subequal, about 1.25 mm long, readily deciduous. *Lemmas* closely imbricate, glabrous, smooth, 1.5 mm long, the lateral nerves faint. *Palea* persistent. *Caryopsis* 0.5 mm long or slightly more, elliptic-ovate or elliptic-oblong.

72. Narrow-leaf Neverfail (plain grass)

Eragrostis setifolia
Plate 41b

GENERAL DESCRIPTION

HABIT: Tufted perennial, 22–45 cm high and < 15 cm wide, growing sometimes from a short rhizome; butt slightly thickened, like the rhizome hairless or sparsely and shortly hairy, covered by stiff, shiny, papery cataphylls.

STEMS: Numerous, slender but wiry, 3–6-noded, hairless, smooth, unbranched.

LEAVES: Sheaths tight, much shorter than the internodes, hairless and smooth. Blades flat or more often narrowly rolled, stiff, erect or slightly spreading, tapered to a firm fine point, strongly nerved, bristly and rough on the upper surface, smooth on the under surface, with sharp, thickened edges, mostly 4–13 cm long.

SEEDHEAD: Panicle spiciform, 7–10 cm long × 12–25 mm wide. Spikelets 10–20 mm long, straight (rarely curved), crowded on short panicle-branches.

OCCURRENCE: This grass is widespread on cracking clay and fine alluvial soils, and to a lesser extent on medium-textured red earths. It is commonly associated with Mitchell grasses, coolibah, lignum, and Queensland bluebush, but also occurs with mulga, gidgee, and cotton-bush. Occurrences are usually sporadic and confined to gilgais and similar depressions.

DISTRIBUTION: M.

VALUE: Only moderately palatable and largely neglected during periods of abundance. However, it tends to remain green for long periods and is grazed in preference to many perennial grasses after more palatable, short-lived plants are gone.

BOTANIC DESCRIPTION

Panicle oblong to linear, loose to rather dense, usually < 10 cm long and 1.5 cm wide; branches mostly 1.5 cm long, the lower ones sometimes up to 3.5 cm. *Spikelets* 10–13.5

Description of the Species

(rarely -20) mm long, 1.5 mm wide, narrow, flattened, mostly 25-30-flowered, usually erect and straight; rhachilla tough. *Lemmas* loosely imbricate, thinly membranous, obtuse, usually 1.25-1.75 mm long. *Palea* persistent.

73. Handsome Lovegrass

Eragrostis speciosa

Plates 37c, 42

GENERAL DESCRIPTION

HABIT: Slender tufted perennial, 30-90 cm high.

STEMS: Erect, smooth, hairless, bluish-green.

LEAVES: Hairless, except for long silky sparse hairs at the mouth of the sheath. Blades long, usually rolled and narrow. Sheaths loose, shiny.

SEEDHEAD: Panicle variable in size and shape, but usually 15-25 cm long, 1-2.5 cm wide, and drooping; branches slender, erect or spreading, scattered on the axis. Spikelets 7-33 mm long, narrow, distinctly flattened, lead grey, usually clustered.



PLATE 42. *Eragrostis speciosa*

OCCURRENCE: Sporadically distributed throughout the area, usually not far from water. In places along the Taylor River (Plate 42), it dominates the sandy bed for long distances.

DISTRIBUTION: M. (excl. V.).

VALUE: Negligible.

BOTANIC DESCRIPTION

Panicle variable in shape, usually contracted, continuous or interrupted; branches capillary, distant, erect, loosely appressed, sometimes the lower ones or all weakly spreading, < 9.5 cm long. *Spikelets* distinctly pedicellate or subsessile, solitary or paired or densely clustered on the branches and branchlets, 7–33 mm long, 1–1.5 mm wide, flattened, linear to narrowly oblong-lanceolate, with numerous florets; rhachilla persistent. *Glumes* deciduous. *Lemmas* usually very closely imbricate, deciduous upwards, lateral nerves submarginal and prominent in the lower half. *Palea* less than half as long as the lemma, persistent, ciliate on the keels.

Eragrostis speciosa is readily recognised by the extremely short, often closely appressed paleas and lead-coloured spikelets.

74. Knotty-butt Neverfail

Eragrostis xerophila
Plate 41c

GENERAL DESCRIPTION

HABIT: Long-lived perennial, forming dense leafy tufts 22 cm high and 15 cm wide, developing a long, stout, scaly, knotty, hairless or woolly rhizome.

STEMS: Erect, with up to 20 nodes and very short internodes, entirely covered by the leaf sheaths.

LEAVES: Blades often less than 2.5 cm long, rigid, broad, flat, recurved at maturity.

SEEDHEAD: Panicle usually up to 10 cm long and 6 mm wide, otherwise similar to that of narrow-leaf neverfail (No. 72).

This species is closely allied to narrow-leaf neverfail, but the flat recurved blades, several-noded sheath-covered culms, extremely short internodes, and knotty rhizome are distinctive features.

OCCURRENCE: Widely dispersed on medium- to fine-textured, commonly calcareous or saline soils; usually sporadic in gilgais, depressions, and similar low situations.

DISTRIBUTION: W.A., N.T., S.A., Q.

VALUE: Moderate in palatability, but a useful grass as the vigorous rhizomes withstand heavy stocking.

BOTANIC DESCRIPTION

Panicle < 10 cm long and 6 mm wide, spiciform though interrupted or sparse, sometimes reduced to a raceme. *Spikelets* 5–12 mm long, 1.5–2 mm wide, erect, flattened, usually clustered; rhachilla usually persistent. *Lemmas* 1.5–2.25 mm long, loosely imbricate, smooth or scaberulous. *Palea* persistent or deciduous after the lemma.

75-83. Wanderrie Grasses

Eriachne spp.

The wanderrie grasses are characteristic plants of the Australian interior, and in central Australia the majority of the nine representatives are widespread and common. In habit they range from slender annuals less than 15 cm high to coarse, tall, tussocky perennials with stout, fibrous roots or rhizomes. The structure of the seedhead and spikelet is relatively simple. Generally, the head is a narrow, loose or rather dense, terminal panicle bearing purple or straw-coloured spikelets on short stalks on branches. The spikelet consists of two outer, cymbiform glumes and two densely hairy, sometimes awned florets adjacent within the glumes. When young the rather large glumes tightly enclose the florets, but these are finally exposed by the widely spreading glumes of the mature spikelet. Where the floret is awned, the awn is straight or sometimes curved, untwisted, and arises from the apex of the lemma. On ripening each floret falls, leaving the glumes attached to the stalks.

As fodder the grasses are moderately palatable when green and low to very low when dry. Generally they provide useful forage in unfavourable periods, though a few are virtually worthless because of their extreme coarseness or inaccessibility to stock.

GENERIC CHARACTERS

Spikelets solitary, pedicellate, \pm laterally compressed, not falling entire from the pedicels; rhachilla disarticulate above the glumes and between the lemmas. *Florets*, 2 (rarely 1), bisexual, similar; callus short, obtuse, villous. *Glumes* persistent, equal or subequal, membranous to scarios, rounded on the back or somewhat keeled, 7-11-nerved, shorter than or as long as the lemmas. *Lemmas* membranous to coriaceous, hairy on the back at least towards the base, awnless or with a terminal untwisted awn, the margins inrolled and tightly embracing the keels of the palea usually for the greater part of their length. *Palea* obtusely 2-keeled, \pm flat between the keels, with incurved margins, coriaceous to scarios, entire or bifid, the apex sometimes elongated and awn-like. *Caryopsis* free from the lemma and palea, sometimes flattened. *Inflorescence* a contracted, loose to rather dense panicle.

KEY TO THE SPECIES

- A. Inflorescence a reduced raceme of 1 or 2 spikelets. Culms entirely covered by the leaf sheaths, woolly on the surface. 83. *E. scleranthoides*
- A. Inflorescence a contracted panicle of few to numerous spikelets; sometimes the spikelets very few in some forms of *E. mucronata*, but then the culms glabrous.
 - B. Coarse perennials 30 cm high or more, or short annuals but then the lemma distinctly awned.
 - C. Lemma with an awn as long as the lemma itself or longer. Slender annuals or biennials.
 - D. Glumes with long dense tubercle-based hairs. Awn of lemma subequal to the lemma itself. 75. *E. aristidea*
 - D. Glumes glabrous. Awn of lemma 20-25 mm long, much longer than the lemma itself. 76. *E. armitii*

- C. Lemma awnless or with an awn much shorter than the lemma itself. Coarse perennials.
 - E. Lemma 7–14 mm long, aristulate or cuspidate, long-acuminate. Floret sometimes with widely divergent or recurved lemma and palea.
 - F. Lemma 11·5–14 mm long. Rhizome present. 80. *E. nervosa*
 - F. Lemma 7–9·5 mm long. Rhizome absent. 77. *E. benthamii*
 - E. Lemma 3–7 mm long, muticous or mucronulate, obtuse or acute. Floret with erect ± appressed lemma and palea.
 - G. Butt bulbous, densely woolly. Culms sometimes decumbent. 78. *E. helmsii*
 - G. Butt somewhat thickened but not bulbous, glabrous or hairy, but not woolly. Culms erect.
 - H. Panicle 2–5 cm long, 1 cm wide, rather loose. Spikelet 5–6 mm long. Lemma abruptly mucronate in profile, villous in the lower part, glabrous above. Glumes glabrous. 79. *E. mucronata*
 - H. Panicle 4–12 cm long, 2–3·5 cm wide, rather dense. Spikelet 3–4·75 mm long. Lemma acute in profile, villous in the lower part and ciliate on the margins above. Glumes glabrous or hairy. 81. *E. obtusa*
- B. Delicate annual 10–15 cm high. Lemma acuminate or cuspidulate, but awnless. 82. *E. pulchella*

75. Three-awned Wanderrie

Eriachne aristidea

Plate 43a

GENERAL DESCRIPTION

HABIT: Densely tufted annual or short-lived perennial, 22–45 cm high; butt thickened by thin papery cataphylls.

STEMS: Mostly simple or strongly branched on perennial plants, sharply bent at the lower nodes, 1–3-noded; nodes bearded with long soft white hairs.

LEAVES: Bearded at the mouth with long soft white hairs, hairless on the surface or more often covered by short bristles based on hard tubercles. Blades flat, up to 14 cm long and 6 mm wide, many-nerved, tapered to a firm, blunt point, with thickened white rough edges, becoming folded or inrolled on drying. Sheaths loose, broad, half to almost as long as the internodes.

SEEDHEAD: Panicle 5–8 cm long, 2·5–4·5 cm wide, open, prominent on a long peduncle, consisting of few spreading branches bearing relatively few solitary spikelets on very short or long stalks. Immature panicles are contracted and partly enclosed by floral leaves. The spikelet, about 8 mm long (excl. awns), comprises 2 bristly, hairy, purplish or pale golden glumes and 2 florets covered by long, soft, silky hairs. Each floret terminates in 1 long awn (about as long as the glumes) and 2 shorter ones. On ripening the 2 florets readily fall, leaving the long glumes attached to the plant.

OCCURRENCE: Widespread; occurring mainly on clayey sands of sand plains and dune fields in association with spinifex grasslands, but also on coarse alluvial



PLATE 43. (a) *Eriachne aristidea*; (b) *Eriachne armitii*

soils and sandy red earths with bloodwood, ironwood, and mulga. Distribution is sparse, though locally dense stands occur in depressions and disturbed sites. Plants flower mainly in the summer months, though with favourable rainfall growth continues until September.

DISTRIBUTION: W.A., S.A., Q., N.S.W.

VALUE: The soft foliage is attractive to stock.

BOTANIC DESCRIPTION

Panicle at first contracted and partly enclosed by the uppermost sheath, becoming long-exserted and open, ovate-oblong, usually 5–8 cm long and 2.5–4.5 cm wide; peduncle finally much longer than the lower internodes, glabrous or pubescent upwards with long tubercle-based hairs; rhachis and branches densely pubescent with long fine spreading tubercle-based hairs, scabrous; branches few, spreading or divaricate. *Spikelets* few, remote, prominently and unequally pedicellate, 1.7–2 cm long (incl. awns); pedicels triquetrous, densely pubescent with the hairs of the branches, distinctly dilated and oblique at the apex, laterals 1 mm long, terminals 6–8 mm long. *Glumes* subequal, 8–10 mm long, 11–13-nerved, lanceolate-ovate, acuminate, with long dense spreading tubercle-based hairs; upper broadly hyaline on the margins. *Lemmas* slightly shorter than the glumes, silky-villous with hairs longer than the lemma, but glabrous upwards, apex tapered into a scabrous awn subequal to the lemma. *Palea* silky-villous in the lower half, glabrous above, bifid, with the keels produced into 2 slender scabrous awns slightly less than half as long as the awn on the lemma. *Caryopsis* 3–3.5 mm long, laterally compressed, plano-convex, cuneate to obovate, acute at the base, obtuse, ± smooth.

76. Long-awned Wanderrie

Eriachne armitii

Plate 43b

GENERAL DESCRIPTION

HABIT: Annual or short-lived perennial, 15–37 cm high.

STEMS: Erect or bent at the nodes, usually unbranched, 2–3-noded, with extremely fine spreading dense hairs close below the seedhead, which become sparser downwards; nodes with long dense soft silvery hairs.

LEAVES: Various hairy, rarely entirely hairless. Blades narrow, loosely rolled, rough from short bristles based on hard tubercles. Sheaths loose, half to almost as long as the internodes, bearded at the mouth and shortly hairy on the outer edge, otherwise largely hairless or bristly like the blades.

SEEDHEAD: Panicle up to 7 cm long and 5 cm wide (incl. awns), dense, long-awned, often purplish, terminal and prominent on long culms. Usually, immature partly enclosed panicles are present on short culms near the base of the plant. The short panicle branches and stalks of the spikelets are densely covered by soft, fine hairs. The spikelet has two silky-hairy florets; each one 3–4 mm long, with a terminal awn 20–25 mm long. The two glumes of the spikelet are smooth and hairless except for a row of stiff, spreading, tubercle-based hairs along each edge.

Description of the Species

OCCURRENCE: Mainly tropical in distribution, in central Australia not known south of Argadargada; occurring mainly on broad, shallow, periodically flooded flats, on medium-textured red and yellow earths, in association with short grasses and forbs, mulga, snappy gum, gummy spinifex, and gidgee. Plants grow in the summer months, sometimes producing dense localised stands, and flower mainly in March.

DISTRIBUTION: N.T., Q.

VALUE: Probably grazed.

BOTANIC DESCRIPTION

Panicle at length distinctly exerted, dense, 3.5–7 cm long, 2.5–5 cm wide (incl. awns), broadly oblong to ovate; peduncle terete, with long, dense, very fine, spreading, simple, and tubercle-based hairs, becoming glabrous downwards; rhachis and branches similarly hairy; branches few, up to 1.25 cm long, stiffly erect. *Spikelets* crowded; pedicels densely hairy, 0.5–3.75 mm long. *Glumes* subequal or the upper one somewhat longer, thinly membranous, 9 or sub-11-nerved, 8.75–11 mm long, with sparse stiff spreading tubercle-based hairs on the margins, otherwise almost glabrous and smooth; lower broadly lanceolate, mucronate; upper lanceolate, aristulate or cuspidate. *Lemmas* 3–4 mm long, enclosed by the glumes, elliptic-obovate, silky-villous with erect hairs longer than the lemma, apex tapered to a straight or curved glabrous scabrous awn 20–25 mm long. *Palea* similar to its lemma in texture and indumentum, elliptic, about 3 mm long, distinctly bifid, with the points awn-like scabrous and 3–4 mm long. *Caryopsis* 1.5–2 mm long, obovate-cuneate, acute at the base, plano-convex.

77. Swamp Wanderrie

Eriachne benthamii

Plates 44, 47a

GENERAL DESCRIPTION

HABIT: Stout often bluish-grey perennial, 45–90 cm high, forming dense stemmy tussocks up to 30 cm wide; butt and basal shoots covered by stiff papery cataphylls and usually with dense hairs.

STEMS: Erect, hairless and smooth, usually unbranched, 3–6-noded, when young often powdery on the surface.

LEAVES: Mostly hairless and smooth. Blades usually about 15 cm long, thick, stiff, leathery, flat or rolled, often hoary on the lower surface, with thickened white edges. Sheaths about half to almost as long as the internodes, tight, sometimes pilose at the mouth.

SEEDHEAD: Panicle 8–13 cm long, 2–3.5 cm wide, irregular in outline, narrow but rather loose, shortly exceeding the uppermost leaves; panicle-branches few, short, divided, widely spaced, erect and loosely appressed to the axis or somewhat spreading. Spikelets 7–9.5 mm long, bluish-green or purplish, rather crowded on the branches. Each floret of the two in the spikelet terminates in two short awns, which characteristically curve downwards with age. The ripened floret falls entire, leaving the pale golden glumes attached to the plant.

OCCURRENCE: Restricted to cracking clay soils; producing dense stands in the vicinity of permanent swamps and lagoons or periodically flooded lowlands. Associated plants include Mitchell grasses and similar perennials, lignum, Queensland bluebush, and less frequently coolibah and gidgee. The species is quite common on the brown and grey soil plains near Argadargada, which appears to be the southern limit of its distribution range.

DISTRIBUTION: W.A., S.A., Q.

VALUE: Plants are rather coarse, with wiry stems, and thick leathery leaves. They are nevertheless grazed, probably because of the green shoot produced for long periods of the dry season owing to the favoured habitats in which they thrive.

BOTANIC DESCRIPTION

Panicle linear at first, becoming \pm lanceolate-oblong or rather irregular in outline, contracted but rather loose, 8-10 (rarely -13) cm long, 2-3.5 cm wide, usually shortly exserted; rhachis and branches mostly glabrous and smooth; branches divided, slightly spreading



PLATE 44. *Eriachne benthamii*

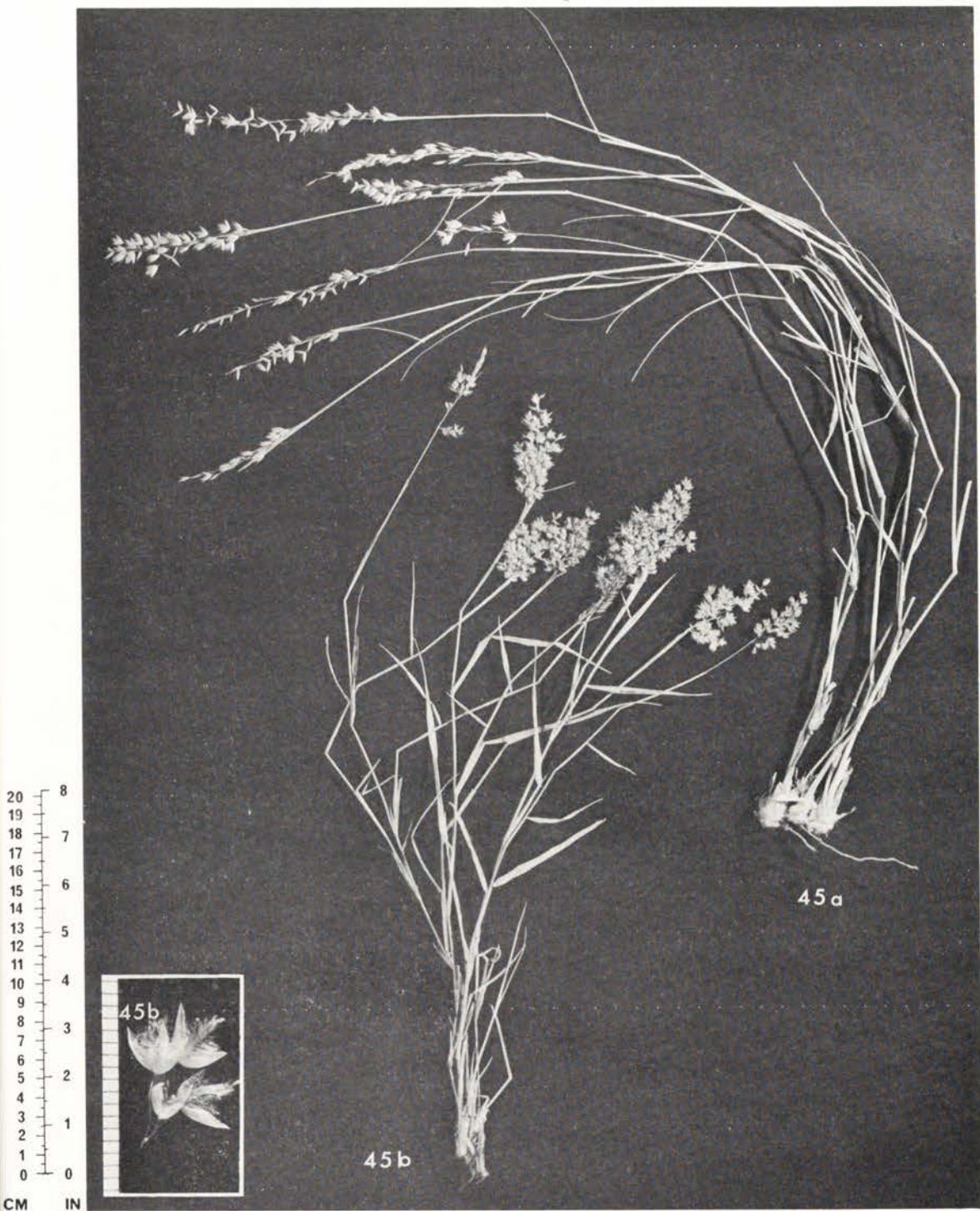


PLATE 45. (a) *Eriachne helmsii*; (b) *Eriachne obtusa*

or loosely appressed, < 4 cm long in the lower part. *Spikelets* somewhat crowded on the branchlets, 7-9.5 mm long, unequally pedicellate; lateral pedicels < 1 mm long, terminals < 3 mm long. *Glumes* equal, 4.5-7.75 mm long, shorter than the spikelet, glabrous, smooth, ovate-oblong (flattened), rounded on the back, 9-11 or sub-13-nerved, with broad scarious margins, obtuse or acute or shortly acuminate. *Lemmas* distinctly exserted above the glumes, narrowly lanceolate, 7-nerved, silky-villous in the lower half, glabrous and smooth or scaberulous above, long-acuminate, aristulate; awn erect at first, becoming widely divergent or recurved. *Palea* slightly shorter than its lemma, similar in shape and indumentum, scaberulous on the keels, bifid; the upper part free from the lemma, at first erect, becoming divergent or slightly recurved. *Caryopsis* 1.5-2.5 mm long, cuneate, reddish-brown, longitudinally grooved on the front, \pm convex on the back.

78. Woollybutt Wanderrie

Eriachne helmsii

Plate 45a

GENERAL DESCRIPTION

HABIT: Coarse perennial, erect or spreading or sometimes decumbent, forming loose straggly tussocks 45-90 cm high and up to 75 cm wide; butt densely woolly, thickened, prominent.

STEMS: Numerous, branched, wiry, bluish-green, often bent at the nodes; basal internodes covered by stiff cataphylls, sometimes with the woolly hairs of the butt; nodes, 6-10, often thickened and knuckle-like, hairless or the upper ones silky-hairy.

LEAVES: Blades 2.5-10 cm long, flat or narrowly rolled, stiffly spreading, firmly pointed, somewhat rough. Sheaths much shorter than the internodes, loose, stiff, straw-yellow, often subtending in the axils (particularly on the lower part of the plant) one or more densely woolly prophylla.

SEEDHEAD: Panicle 5-11 cm long, 1-2 cm wide, loose; spikelets solitary, borne on long thin stalks, awnless, pale or straw-yellow, 5-6 mm long.

OCCURRENCE: Widely distributed; common on shallow, calcareous and lateritic soils with witchetty bush, and coarse-medium-textured red earths with mulga; sporadic on low sandstone hills and clayey sands in association with spinifex or sparse low trees and shrubs.

DISTRIBUTION: W.A., S.A., Q., N.S.W.

VALUE: The wiry, rather woody stems and stiff tough leaves appear unpalatable, but plants often show evidence of heavy grazing.

BOTANIC DESCRIPTION

Panicle shortly exserted, contracted but rather loose, linear or narrowly oblong, 5-11 cm long, 1-2 cm wide; branches few, capillary, angular, glabrous, scabrous, distant, erect, loosely appressed. *Spikelets* few, distant, 5-7 mm long, widely gaping at maturity; pedicels capillary, angular, glabrous, scabrous, 5-15 mm long. *Glumes* subequal, slightly shorter than the spikelet, glabrous, smooth, broadly ovate, 9-11-nerved, acute to subobtuse.

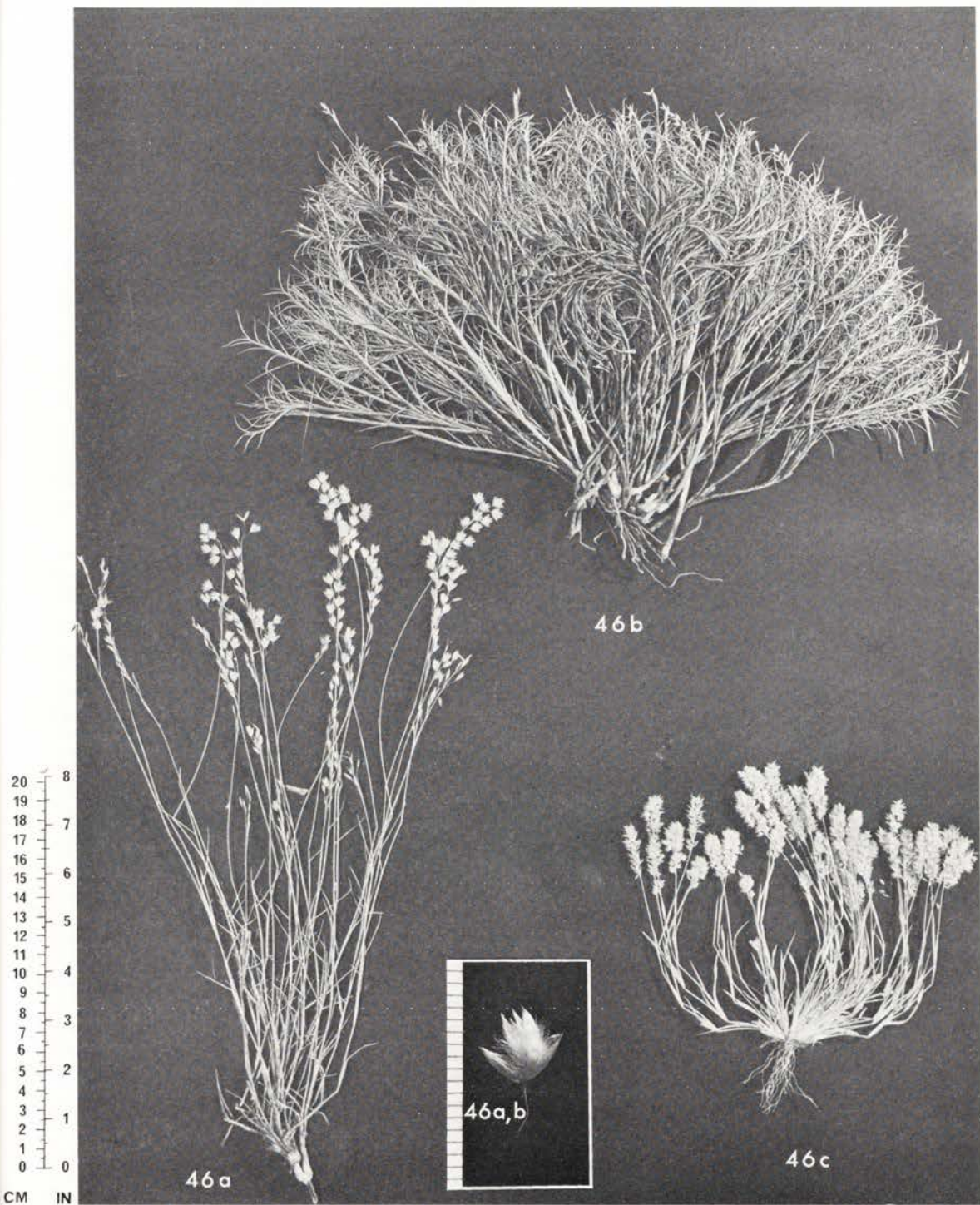


PLATE 46. (a) and (b) *Eriachne mucronata*; (c) *Eriachne pulchella*

Lemmas as long as the spikelet, lanceolate, acuminate, 7-nerved, silky-villous on the margins and in the lower half on the surface with hairs almost as long as the lemma itself, otherwise glabrous, scabrous on the midnerve towards the apex. *Palea* as long as its lemma, narrowly lanceolate, silky-villous in the lower half, pubescent above but glabrous near the apex, scabrous-pubescent on the keels, acuminate. *Caryopsis* almost 3 mm long, narrowly oblong, obtuse, pale brown.

79. Mountain Wanderrie

Eriachne mucronata

Plates 46a, 46b

GENERAL DESCRIPTION

This species is very variable in vegetative characters and two distinct forms are recognised in central Australia. They are:

TYPICAL FORM

HABIT: Loosely tufted perennial, 30–45 cm high; butt hairy, slightly thickened by numerous stiff, tightly overlapping cataphylls.

STEMS: Erect, 4–6-noded, thin but wiry, simple or branched.

LEAVES: Blades stiffly spreading, narrowly folded (rarely flat), firmly and sharply pointed, up to 4 cm long but often less than 2.5 cm. Sheaths short, tight, much shorter than the internodes.

SEEDHEAD: Panicle small, narrow, rather loose, 2–5 cm long, 1 cm wide; spikelets few, hairy, widely gaping at the apex, 5–6 mm long, borne singly on long thin stalks, purplish or purple-black when young, golden or straw-coloured at maturity.

'DESERT' FORM

HABIT: Hard, rough, desert-like plant, forming dense compact tussocks 15–22 cm high and up to 22 cm wide.

STEMS: Rigid, much-branched, with several nodes and very short internodes, entirely covered by the sheaths.

LEAVES: Usually densely covered by short, stiff, bristle-like hairs arising from hard, wart-like tubercles, thus causing plants to be harsh to the touch. Blades straight or curved, spine-like, mostly less than 1.5 cm long. Sheaths numerous, tightly overlapping, 6–8 mm long.

SEEDHEAD: With this form the normally panicked head is reduced to a small raceme, mostly less than 2.5 cm long and containing up to 9 spikelets, which barely exceeds the upper leaves.

OCCURRENCE: A plant of hilly and rugged country growing on shallow and skeletal, sometimes saline, soils irrespective of parent rock. In central Australia the species dominates the slopes of Heavitree Range near Mt Gillen and occurs quite commonly on hills, mesas, mountains, and rocky or gravelly slopes. Often the two



PLATE 47. (a) *Eriachne benthamii*; (b) *Eriachne nervosa*

forms grow in close proximity. They are associated usually with scattered low trees and shrubs, witchetty bush, white cypress, mulga, redbud mallee, snappy gum, and gummy spinifex.

DISTRIBUTION: M. (excl. V.).

VALUE: On a regional basis mountain wanderrie is virtually worthless as pasture, since many forms are unpalatable or inaccessible to stock.

BOTANIC DESCRIPTION

Panicle shortly exerted, contracted, linear or narrowly oblong, mostly 2–5 cm long and about 1 cm wide; branches few, capillary, scabrous, either erect and loosely appressed or slightly spreading. *Spikelets* rather few, prominently pedicellate, 5–6 mm long, remote or somewhat crowded, widely gaping at maturity; pedicels capillary, scabrous, up to 1.5 cm long. *Glumes* subequal, 4–5 mm long, glabrous, membranous, broadly ovate-oblong (flattened), 9–13-nerved, mucronulate, scaberulous on the midnerve. *Lemmas* as long as the spikelet, abruptly mucronate in profile, prominently 5-nerved, densely hairy on the lower half to two-thirds with stiff erect hairs slightly shorter than the lemma itself, glabrous and scaberulous above. *Palea* similar to its lemma in length and indumentum, narrow-lanceolate; apex cuspidate, notched, becoming free from the lemma.

Eriachne mucronata has close affinities with *E. obtusa*, but differs mainly in the lemmas, which are larger, glabrous (not ciliate) on the upper margins, and abruptly mucronate in profile; also in the larger, usually fewer spikelets, in the 9–13-nerved (not 7-nerved) glumes, in the longer pedicels, and in the smaller panicles.

80. Plains Wanderrie

Eriachne nervosa

Plate 47b

GENERAL DESCRIPTION

HABIT: Stout tussock-forming perennial, 60–90 cm high and 15–45 cm wide, growing from a thick hairy rhizome; butt thickened by numerous stiff, papery, smooth, shiny, often purplish cataphylls.

STEMS: Erect, unbranched, hairless, often purplish, 3–5-noded, conspicuously smooth and shiny.

LEAVES: Often bluish, usually quite hairless. Blades up to 17 cm long, flat and broad or with inrolled edges and narrow. Sheaths usually over half as long as the internodes, tight, smooth, and shiny.

SEEDHEAD: Panicle usually 8–12 cm long and 2–3 cm wide, rather dense, terminating tall culms; branches slender, sometimes slightly spreading, divided into branchlets on which the stalked spikelets are loosely crowded. The spikelet is about 12 mm long, sparsely hairy, often purplish, with long terminal awn-like points.

OCCURRENCE: This plant is common on the cracking clay plains of the Barkly Tableland and extends south into the far northern part of central Australia. It

Description of the Species

forms large stands on the fringes of the deeper drainage channels, and generally distribution is similar to that of swamp wanderrie, which it closely resembles in appearance.

DISTRIBUTION: N.T., Q.

VALUE: A coarse plant, but undoubtedly grazed in much the same way as swamp wanderrie.

BOTANIC DESCRIPTION

Panicle long-exserted, contracted, fairly dense, 7.5–15.5 cm long, 1.5–3.5 cm wide; rachis glabrous, smooth, terete; branches slender, glabrous, smooth, divided, distant, pulvinate and pilose in the axils, erect, loosely appressed or sometimes slightly spreading, the lower ones < 5 cm long. *Spikelets* loosely crowded; lateral pedicels < 2 mm long, terminals < 1 cm. *Glumes* subequal, firmly membranous, much shorter than the lemmas, 6–8.5 mm long, glabrous, smooth, broadly ovate, acute or acuminate, closely 13-nerved or more. *Lemmas* 11.5–14 mm long, firmly membranous, narrow-lanceolate, densely hairy in the lower half with stiff erect hairs shorter than the lemma itself, glabrous and scabrous or scaberulous above; the upper part with 2 longitudinal submarginal (sometimes shallow) grooves, 7-nerved (with 3 nerves between the grooves and 2 pairs of close lateral nerves); apex long-acuminate, cuspidate or with a rigid awn < 3 mm long. *Palea* similar to its lemma, with stiff sparse erect hairs near the base, glabrous and smooth above, scabrous or scaberulous on the keels, notched. *Floret* sometimes with widely divergent or recurved lemma and palea.

81. Northern Wanderrie

Eriachne obtusa
Plate 45b

GENERAL DESCRIPTION

HABIT: Tussocky perennial, 30–60 cm high.

LEAVES: Usually hairless, but somewhat rough with minute bristles. Blades up to 10 cm long, gradually tapered to a hard, rather blunt point, with thickened rough edges, flat when green, becoming narrow with inrolled edges and rigidly erect on drying.

SEEDHEAD: Panicle 4–12 cm long, 2–3.5 cm wide, rather dense, with numerous rather small spikelets; otherwise essentially the panicle of mountain wanderrie.

This species is closely allied to the typical forms of mountain wanderrie (No. 79), with similar butt, sheaths, and panicle, and is likewise very variable.

OCCURRENCE: Very common in tropical Australia and extending in central Australia south to Ooratippra; occurring on river levees and valley floors, on deep and shallow sandy soils, in association with ghost gum, river red gum, sparse low trees and shrubs.

DISTRIBUTION: W.A., N.T., Q.

VALUE: Not palatable.

BOTANIC DESCRIPTION

This species has close affinities with *Eriachne mucronata*, but differs by many of the following characters: *Panicle* 4-8 (rarely -12) cm long, 2-3.5 cm wide, ovate, usually rather dense; branches divided, erect or divergent, often long-bearded in the axils, the lower ones up to 2.5 cm long. *Spikelets* 3-4.75 mm long; pedicels 0.5-3.5 mm long. *Glumes* subequal, broadly ovate, 7-nerved, sometimes hairy, acute or mucronulate, as long as the spikelet or slightly shorter. *Lemmas* as long as the spikelet, acute in profile, elliptic-ovate, villous with spreading, often tubercle-based silvery hairs in the lower half to two-thirds and ciliate on the margins, otherwise glabrous. *Palea* acute, closely embraced by the lemma, glabrous except for a basal tuft of hairs. *Caryopsis* 1.75-2 mm long, obovate, plano-convex, dark brown.

82. Pretty Wanderrie

Eriachne pulchella
Plate 46c

GENERAL DESCRIPTION

HABIT: Slender annual, forming small tufts, 10-15 cm high.

STEMS: Thin, simple or branched, with one or two short internodes; nodes often constricted.

LEAVES: Mostly basal, densely covered by stiff bristle-like white hairs based on hard wart-like tubercles. Blades short, flat. Sometimes, the uppermost leaf sheath is reduced and may lack a blade.

SEEDHEAD: Panicle spiciform, 3-5 cm long, 8-10 mm wide, often purplish, prominent on a long peduncle. Spikelets small, awnless, silvery-hairy, with short stalks, densely crowded on short erect branches.

OCCURRENCE: Pretty wanderrie occurs mainly in the northwestern quarter of the area in both flat and hilly country. Commonly, soils are deep or shallow, coarse to medium-textured, red earths and calcareous earths. Associated plants include mulga, gummy spinifex, short grasses and forbs, sparse low trees and shrubs. It grows from March to May.

DISTRIBUTION: W.A., Q.

VALUE: Probably grazed, but not significant in pasture.

BOTANIC DESCRIPTION

Panicle long-exserted, spiciform, dense, 3-5 cm long, 8-10 mm wide; peduncle elongated, glabrous, smooth; branches capillary, very short, much-divided, erect and appressed. *Spikelets* 3-4 mm long, crowded; lateral pedicels 1-1.5 mm long, terminals 2-3 mm long. *Glumes* subequal, about 3 mm long, scarious, 5-7-nerved, glabrous, broadly ovate-oblong to ovate-elliptic, mucronate, smooth. *Lemmas* as long as the spikelet, thinly membranous, prominently 5-nerved or sub-7-nerved, acuminate, muticous or cuspidate, lanceolate, densely silky-villous on the surface in the lower half and on the margins for about two-thirds of their length, otherwise glabrous and smooth. *Palea* as long as its lemma, lanceolate-elliptic, silky-hairy all over or glabrous in the upper half, with silky-ciliate keels. *Caryopsis* 1.5 mm long, laterally compressed, plano-convex, cuneate, reddish-brown.

83. Mt Olga Wanderrie

Eriachne scleranthoides

Plate 48

GENERAL DESCRIPTION

HABIT: Harsh perennial, developing extremely compact tussocks up to 9 cm high and 10 cm wide; butt woolly, somewhat thickened by numerous short, broad, stiff, tightly imbricate cataphylls.

STEMS: Very numerous, strongly branched, thick, woody, rigid, entirely covered by the sheaths, densely woolly (below the sheaths), with numerous internodes 6–12 mm long.

LEAVES: Blades mostly 6–12 mm long, numerous, rigid, spine-like, horizontally spreading, flat or narrowly folded, tapered to a firm sharp point, with thickened edges, sometimes sprinkled on the upper surface with short, bristle-like hairs based on hard tubercles and usually with long similar hairs on the edges. Sheaths short, stiff, tightly imbricate, stiffly bearded at the mouth and sometimes woolly on the edges, otherwise hairless.



PLATE 48. *Eriachne scleranthoides*

SEEDHEAD: A much reduced raceme of 1 or 2 spikelets, terminating numerous short branched culms. The spikelets, on short firm stalks, are 3–5 mm long and purplish when young.

OCCURRENCE: The species is known only from Mt Olga, where plants grow quite densely in rock crevices and chasms.

DISTRIBUTION: C.A.

VALUE: Unimportant.

BOTANIC DESCRIPTION

Inflorescence a reduced raceme of 1 or 2 spikelets, rarely with an additional 1 or 2 reduced spikelets below the fertile ones. *Spikelets* 3–5 mm long, widely gaping at maturity; pedicels 2–4 mm long, angular, scabrous, pubescent or with long fine woolly hairs. *Glumes* glabrous, smooth, slightly unequal; lower broadly ovate-elliptic, 7 or sub-9-nerved, mucronate, 3.25–3.75 mm long; upper broadly ovate-oblong, mucronate, 7-nerved, 3.75–4.25 mm long. *Lemmas* as long as the spikelet, distinctly exerted, narrow-lanceolate, acuminate, mucicous or cuspidate, 5 or faintly 7-nerved, with long dense stiff spreading hairs in the lower half to two-thirds, glabrous and smooth above. *Palea* as long as its lemma and similarly pubescent on the lower half, glabrous above, notched, tightly embraced by the lemma or sometimes free near the apex.

84–85. Cupgrasses (early spring grasses)

Eriochloa spp.

These are among the less prominent constituents of central Australian grasses. Of similar appearance, the two species are soft, loosely tufted, leafy, shallow-rooted plants with contracted or spiciform, green or purplish panicles. These contain a number of widely spaced, shortly hairy racemes, in which the silky-hairy, long-pointed spikelets are densely crowded. A most distinctive feature is the presence of a minute, cup-like ring, usually dark or purplish, situated below each spikelet close above its short stalk. The entire spikelet, excluding the stalk which usually has a few stiff, long hairs near its apex, falls as the ripened seed.

The cupgrasses are palatable and nutritious, being highly regarded in native pastures of New South Wales and Queensland where a number of species occur, growing from early spring to autumn. In central Australia they are less important because of their scarcity.

GENERIC CHARACTERS

Spikelets solitary or paired, somewhat compressed dorsally, pedicellate, falling entire from the pedicels, secund on the triquetrous rachis of \pm spiciform racemes, the lowest internode of the rachilla characteristically calloused and bead-like. *Florets*, 2; lower male or neuter, upper bisexual. *Glumes* unequal; lower reduced to a minute cupular sheath \pm adnate to the thickened rachilla-internode; upper glume membranous, faintly 5-nerved, similar in size and shape to the spikelet, sometimes aristulate. *Lower lemma* similar to the upper glume. *Palea* subequal to the lemma and 2-keeled or reduced. *Upper lemma* chartaceous



PLATE 49. (a) *Eriochloa australiensis*; (b) *Eriochloa pseudoacrotricha*

or crustaceous, glabrous or puberulous at the apex, faintly 5-nerved, with inrolled margins, the apex with a fine barbellate mucro. *Palea* subequal to the lemma, 2-keeled, with thickened keels and rather narrow flaps. *Caryopsis* dorsally compressed, enclosed in the lemma and palea. *Racemes* simple or compound, pedunculate or the upper subsessile, racemously arranged in a narrow panicle.

KEY TO THE SPECIES

- A. Spikelet 6–12 mm long (incl. bristle), long-acuminate. Fertile floret one-third to one-quarter as long as the spikelet. Usually annual and < 60 cm high. Sheaths loose and \pm inflated, much wider than the culms. Blades usually flat, < 11.5 cm long, 4–7 mm wide. 84. *E. australiensis*
- A. Spikelet 4.5–6 mm long (incl. bristle), acuminate. Fertile floret about half as long as the spikelet. Usually perennial and > 60 cm high. Sheaths loose, but narrow. Blades usually involute, commonly > 12.5 cm long, < 4 mm wide. 85. *E. pseudoacrotricha*

84. Australian Cupgrass

Eriochloa australiensis

Plate 49a

GENERAL DESCRIPTION

HABIT: Shallow-rooted tufted annual, sometimes long-lived; tufts dense, leafy, up to 60 (rarely to 90) cm high.

STEMS: Thick though soft and hollow, erect or bent at the nodes, branched, angular, furry like the leaves, 2–3-noded.

LEAVES: When young densely covered by short, soft, fur-like hairs. Blades up to 11.5 cm long and 7 mm wide, usually flat, flaccid, sometimes wavy on the edges. Sheaths broad and inflated, loose, shorter or longer than the internodes.

SEEDHEAD: Panicle usually 10–15 cm long and 8–12 mm wide, dense, spiciform, pale green, racemose; racemes, 5–10, usually 2–4 cm long, widely spaced, and appressed to the axis. Often the panicle is partly enclosed by the floral leaf and at maturity only shortly exceeds the uppermost leaves. The spikelets are 6–12 mm long, long-pointed, silvery-hairy, and crowded in the raceme. Like other cupgrasses, there is a purplish or dark, cup-like ring surrounding the base of each one.

OCCURRENCE: This grass occurs rather sporadically on cracking clay soils in association with Mitchell grasses and gidgee, and under coolibah on alluvial soils fringing watercourses.

DISTRIBUTION: S.A., Q., N.S.W.

VALUE: A valuable pasture grass, often preferentially grazed, as the soft foliage and herbaceous stems are highly palatable.

BOTANIC DESCRIPTION

Panicle at first subtended by the uppermost sheath, becoming shortly exserted, linear,

rather dense, 5–19 cm long, about 1 cm wide; peduncle usually stout, \pm smooth, sometimes with very fine soft hairs; axis broadly channelled and compressed in the lower part, becoming triquetrous or angular upwards, densely pubescent-scabrous or at length almost glabrous. *Racemes*, 5–10, erect, appressed, mostly 2–4 cm long (the lower ones up to 7 cm), usually solitary and distant, but longer than the internodes of the axis and distinctly overlapping, shortly pedunculate (peduncles mostly 2–4 mm long); rachis pubescent-scabrous, straight or slightly flexuose in the upper part, flattened on the back or \pm triquetrous upwards, prominently ribbed on the face; pedicels solitary or more often paired and unequal, alternate on the midrib, 0.5–2.5 mm long, \pm triquetrous, scabrous-pubescent, the apex cupuliform and bearded with a few stiff hairs 1–4 mm long. *Spikelets* imbricate, lanceolate, silky-villous, long-acuminate and aristulate, 6–12 mm long (incl. bristle). *Lower glume* scale-like, glabrous, nerveless, < 0.5 mm long, sometimes purplish. *Upper glume* thinly membranous, aristulate, silky-villous in the lower half, glabrous and scaberulous above. *Lower lemma* without a palea, long-acuminate, scarcely aristulate, otherwise similar to the upper glume. *Fertile floret* (excl. mucro) one-third to one-quarter as long as the spikelet. *Upper lemma* elliptic-oblong, thinly crustaceous, 2–3 mm long (excl. mucro), punctulate-striolate, faintly 3–5-nerved, acute to subobtusate; mucro about 1 mm long. *Palea* narrower than its lemma, obtuse, nerveless.

85. Perennial Cupgrass

Eriochloa pseudoacrotricha

Plate 49b

GENERAL DESCRIPTION

In many respects this species is similar to Australian cupgrass (No. 84), and it is difficult to distinguish superficially. However, the following combination of characters is usually a reliable guide to identity.

HABIT: Perennial or sometimes annual, usually over 60 cm high.

STEMS: Hairless, except for short fine hairs on the nodes.

LEAVES: Hairy on the basal sheaths, otherwise hairless. Blades commonly over 12.5 cm long, narrow, usually rolled or folded. Sheaths loose but narrow.

SEEDHEAD: Panicle up to 17.5 cm long; usually the racemes relatively few and slightly spreading; the spikelets smaller, with shorter points.

OCCURRENCE: Apparently rare in central Australia; known only from near permanent surface waters.

DISTRIBUTION: M. (excl. N.T.).

VALUE: Regarded as a palatable and nutritious pasture plant in the eastern states of Australia, but of little value in central Australia owing to its scarcity.

BOTANIC DESCRIPTION

Close affinities with *Eriochloa australiensis*, differing mainly in the following characters:

Spikelet 4–6 mm long (incl. bristle), acuminate, aristulate. *Fertile floret* (excl. mucro) about half as long as the spikelet.

86. Silky Browntop
(swamp grass, sugar grass)

Eulalia fulva
Plate 50a

GENERAL DESCRIPTION

HABIT: Stout perennial, forming dense tussocks, 60–90 cm (or up to 1.65 m) high and up to 60 cm wide, sometimes growing from a rhizome which, like the butt, is hairless or densely covered by short silvery-white hairs. Usually plants are bluish-green when young and turn purplish-red on maturity.

STEMS: Erect, simple or slightly branched, smooth, hairless except for a dense tuft of long hairs immediately below the seedhead; nodes hairless or sparsely hairy.

LEAVES: Blades flat, 15–22 cm long, up to 6 mm wide, tapered to a long fine point, like the sheaths hairless or sometimes sparsely hairy.

SEEDHEAD: 2–4 (usually 3) brown-hairy racemes 5–11 cm long, clustered or loose at the top of the culm and extended above the uppermost leaves. Densely crowded in the raceme, the spikelets, each one 5–6 mm long and terminated by a slender, twisted, bent, usually brown awn 12–18 mm long, are mostly concealed by long, silky, golden-brown hairs. At maturity the jointed rhachis of the raceme becomes extremely fragile and each spikelet falls separately.

OCCURRENCE: Silky browntop occurs mainly north of the Macdonnell Ranges on medium-textured red earth soils in periodically flooded or favoured sites, such as river floodplains and banks, broad shallow depressions, drainage lines, and valley floors. However, its wide distribution includes a variety of habitats on clayey sands, sandy red earths, calcareous soils, and shallow or skeletal soils. It is associated commonly with mulga, short grasses and forbs, coolibah, bloodwood, and river red gum; less so with snappy gum, lobed spinifex, and sparse low trees and shrubs.

DISTRIBUTION: M., E-A.

VALUE: New growth is grazed readily, but with maturity plants become rather rank and unattractive to stock.

BOTANIC DESCRIPTION

Inflorescence of 2–4 (usually 3) spiciform racemes, terminal, exerted. *Racemes* erect or slightly spreading, sessile, digitate or subdigitate, silky-villous, 5–11 cm long; rhachis articulate. *Spikelets* 5–6 mm long, somewhat compressed dorsally, paired, both alike and fertile, one of the pair sessile, the other pedicellate; pedicels villous. *Glumes* equal, villous with brown silky hairs 1–2 mm long, firmly membranous to coriaceous; lower dorsally flattened or shallowly concave, \pm 2-keeled, with inflexed margins; upper slightly narrower, lanceolate, truncate, faintly 1–3-nerved, with incurved margins. *Lower lemma* very small and hyaline or reduced. *Palea* absent. *Upper lemma* hyaline, very short and narrow, minutely 2-lobed with the lobes terminating in short fine hairs, passing into a slender brown geniculate awn 12–18 mm long, the bristle slightly longer than the twisted column. *Palea* minute or absent.



PLATE 50. (a) *Eulalia fulva*; (b) *Leptochloa digitata*

87-90. Flinders Grasses

Iseilema spp.

(Landsborough, red gulf, or Barcoo grasses)

Though common in adjacent parts of the Barkly Tableland, this group is represented in central Australia by four species generally restricted to small areas of cracking clay soils in the northern half of the area. The plants are tufted, fragile, shallow-rooted annuals, often short-lived. They grow rapidly with summer rainfall and mature usually in a few weeks, but persist for longer periods under favourable conditions.

A distinctive feature of some species is the presence of small, wart-like glands mainly on the foliage though also on the culms, which give rise to the scent possessed by some plants in the fresh state. The scent differs with the species and varies from a sweet, pleasant aroma to a resinous odour resembling that of spinifex.

In the field, Flinders grasses are rather conspicuous because of their deep colour. On young plants the leaf sheaths and stems are often purple, contrasting strongly with the usually green blades. On maturity, plants generally turn deep-red or reddish-brown.

The Flinders grasses are regarded widely as among the more palatable and nutritious components of native pastures. In central Australia this applies mainly to bull, small, and red Flinders, which are grazed often when dry. However, the ephemeral habit and extreme fragility of the group are undesirable features.

The group is recognised by the structure of its inflorescence, which is similar to that of the kangaroo grasses. The culm bears several leafy panicles terminating the upper branches and occupying up to half its length. Each panicle arises from the axil of a spathe and comprises dense clusters of usually several racemes. The raceme consists of a cluster of seven (one fertile and six sterile) spikelets, wholly or partly enclosed in a cymbiform spatheole resembling the spathe. On maturity, usually the group of seven spikelets breaks from the spatheole and falls as the seed. In a few species the raceme, enclosed within its spatheole, in turn partly enclosed within its spathe, forms a leafy seed which falls at maturity.

GENERIC CHARACTERS

Raceme of spikelets, consisting usually of 2 lower pairs of pedicellate homogamous (male or neuter) spikelets approximate in a false tetramerous whorl and forming an involucre around a short rhachis bearing a sessile fertile spikelet and two pedicellate male or neuter spikelets; the raceme articulate with the peduncle and falling as a whole at maturity. *Florets*, 2 (in the sessile spikelet), or 1 (in the involucre and pedicellate spikelets); lower male or neuter, often reduced; upper usually female. *Sessile spikelet* awned, not articulate (or very rarely articulate), without a callus. *Glumes* membranous to coriaceous, usually \pm 2-keeled; lower sometimes flattened; upper with incurved, often hyaline margins. *Lower lemma* shorter than the glumes, hyaline or rarely membranous, nerveless, without a palea. *Upper lemma* stipe-like, passing into a geniculate perfect awn. *Palea* absent. *Caryopsis* commonly oblong. *Involucreal spikelets* fused by their pedicels at the base, dorsally com-



PLATE 51. (a) *Iseilema dolichotrichum*; (b) *Iseilema macratherum*; (c) *Iseilema membranaceum*

pressed, sometimes reduced to the pedicels. *Glumes* subequal, \pm 2-keeled, flattened or slightly convex on the back, usually membranous to coriaceous, with narrowly incurved hyaline or membranous margins. *Lower lemma* hyaline, nerveless, often oblong, usually without a *palea*, sometimes wanting. *Upper lemma* and *palea* usually wanting. *Upper pedicellate spikelets* similar to, or smaller than, the involucrel spikelets. *Racemes* fasciculate, each subtended by a spatheole, terminating the branches of a compound spatheate leafy panicle; spatheoles cymbiform, acute, compressed, many-nerved, with scarious or hyaline margins.

KEY TO THE SPECIES

- A. Plants usually 45–60 cm high. Racemes usually enclosed within the spatheoles, the spatheoles partly or wholly enclosed within the spathes, all falling together at maturity.
 - B. Spathes becoming cartilaginous and indurated, rounded on the back downwards. Involucrel spikelets 3–4 mm long or suppressed. Awn 1.5–2 (rarely –2.3) cm long. Plants entirely eglandular or with scattered glands on the keel of the spathe. 90. *I. vaginiflorum*
 - B. Spathes herbaceous or indurated downwards, keeled. Involucrel spikelets 4–4.5 mm long or suppressed. Awn 2–3 cm long. Plants regularly glandular on the edges and keel of the leaf and on the keel of the spathe. 88. *I. macratherrum*
- A. Plants usually < 30 cm high. Racemes becoming laterally exserted and finally disarticulating from their peduncles.
 - C. Involucrel spikelets abruptly contracted into their pedicels and transversely furrowed at the junction; pedicels bearded at the base with hairs up to 2 mm long. 89. *I. membranaceum*
 - C. Involucrel spikelets attenuate on their pedicels and not or slightly furrowed at the junction; pedicels densely bearded throughout with hairs up to 5 mm long. 87. *I. dolichotrichum*

87. Rough-stemmed Flinders Grass

Iseilema dolichotrichum
Plate 51a

GENERAL DESCRIPTION

HABIT: Small annual or ephemeral, up to 15 cm high, often flowering when only 5 cm, forming dense leafy green or reddish tufts, with a faint resinous odour.

STEMS: Erect or sometimes low and spreading, usually with a cluster of wart-like glands just below the nodes.

SEEDHEAD: Floral leaves and sheaths with numerous, wart-like glands closely spaced along the midnerve (keel). Usually the raceme of seven spikelets becomes exserted from its subtending spatheole, revealing the characteristic basal tuft of erect, dense, long, silvery hairs, which partly conceal the spikelets. The four outer (involucrel) spikelets have long, thin stalks. The awn of the central (fertile) spikelet is bent, brown, and up to 2 cm long. On ripening, the raceme of spikelets falls from its spatheole.

Description of the Species

OCCURRENCE: This is one of the few Flinders grasses not to occur on cracking clay soils. The few known records of its distribution include only one from central Australia (viz. near Undoolya on the floodout of a small creek).

DISTRIBUTION: W.A., Q.

VALUE: Probably grazed.

BOTANIC DESCRIPTION

Panicle dense, 3-4.5 cm long; primary internodes filiform, 1.8 cm long in the lower part, becoming shorter upwards. *Spatheoles* narrowly elliptic or obliquely lanceolate, acutely keeled, 10-12 mm long, herbaceous, thinly nerved, with broad hyaline margins, glabrous, scaberulous, the keels closely glandular. *Racemes* at length laterally exerted, 7-8 mm long; peduncles filiform, < 2 mm long, glandular, minutely tuberculate; rhachis triquetrous, < 2 mm long, long-ciliate. *Involucral spikelets* elliptic-oblong or oblong, obtuse, 3-3.6 mm long; pedicels slender, compressed, 2-2.5 mm long, long-ciliate on the margins, connate and densely bearded at the base with white silky hairs < 5 mm long. *Lower glume* firmly chartaceous, 7-9-nerved, sparsely asperulous on the back, scaberulous on the keels. *Upper glume* oblanceolate-oblong, broadly obtuse (flattened), firmly membranous, 3-nerved, hyaline on the margins and apex, the apex ciliolate. *Lower lemma* narrowly oblong, broadly obtuse, 3-3.3 mm long, glabrous. *Sessile* (fertile) *spikelet* lanceolate, acuminate, 4.5-5 mm long. *Lower glume* narrowly truncate, with incurved margins in the lower part and 2-keeled above, scaberulous on the keels, otherwise smooth, coriaceous, 10-nerved. *Upper glume* lanceolate, acuminate, obtuse, coriaceous, 3-nerved, scaberulous on the midnerve towards the apex, otherwise smooth. *Lower lemma* ovate-oblong or oblong, obtuse, < 3 mm long, glabrous. *Upper lemma* oblong-linear, < 3 mm long, hyaline, 1-nerved, the apex shortly and acutely bilobed; awn brown, < 2 cm long, minutely scaberulous, the column < 8 mm long. *Caryopsis* obovate or elliptic-obovate, 2 mm long. *Pedicellate spikelets* 2.3-3 mm long, narrower than the involucral spikelets; pedicels thinly filiform, 2.5-3 mm long, scabrous-ciliolate. *Lower glume* firmly membranous, 7-nerved. *Upper glume* thinly membranous, 3-nerved. *Lower lemma* narrowly oblong and 2 mm long or absent.

88. Bull Flinders Grass

Iseilema macratherum

Plate 51b

GENERAL DESCRIPTION

This plant resembles red Flinders grass (No. 90), and similarly it varies in habit.

HABIT: Fairly erect densely tufted leafy annual, up to 90 cm high, distinctly scented when green.

STEMS: Thick, strongly branched.

LEAVES: Blades strongly glandular, the wart-like glands closely spaced along the edges.

SEEDHEAD: Head essentially that of red Flinders grass, but strongly glandular on the keel (midnerve) and edges of the spathe, the spathe remaining soft and herbaceous (not becoming hardened and rigid with age), and the awn of the fertile spikelet

usually longer (2–3 cm). Normally the raceme of seven spikelets remains enclosed within its spatheole, and on maturity the spatheole and its subtending spathe fall together. However, sometimes the raceme becomes exserted from its spatheole and falls separately.

OCCURRENCE: Bull Flinders is similar in distribution to red Flinders, but apparently less common and restricted to the far northern part of the area.

DISTRIBUTION: W.A., N.T., Q.

VALUE: Generally regarded in other areas to be less valuable than red Flinders, but apparently not so in central Australia.

BOTANIC DESCRIPTION

This species has close affinities with *Iseilema vaginiflorum*, but differs mainly in the following characters:

Spathe acutely keeled at least in the upper half, herbaceous throughout or becoming hardened only near the base, closely glandular on the keel and sometimes also on the keel and margins of the blade. *Racemes* exserted with maturity, sometimes disarticulate from the spathes and spatheoles. *Involucral spikelets* well-developed, with firmly membranous or cartilaginous 9–11-nerved glumes and a lower lemma. *Awn* 2–3 cm long.

89. Small Flinders Grass

Iseilema membranaceum
Plate 51c

GENERAL DESCRIPTION

HABIT: Annual, usually slender and less than 30 cm high, but occasionally over 60 cm, forming compact or loose spreading tufts. Plants are non-aromatic or faintly scented, with pale green leaves and purple sometimes powdery stems, and mature reddish-brown.

STEMS: Erect, thin, branched, smooth, with few nodes.

LEAVES: Blades usually flat, smooth or somewhat rough, up to 20 cm long. Sheaths loose, smooth, acutely keeled.

SEEDHEAD: Leafy, up to 18 cm long, with the racemes of spikelets in dense clusters scattered along the branches. The spikelets are small, rough, with relatively long, extremely thin stalks and slender, bent or straight awns 12–15 mm long. Glands are few or absent. On maturity, each raceme of 7 spikelets becomes laterally exserted and breaks from its floral leaf and sheath.

OCCURRENCE: Sparsely distributed throughout the area; almost wholly confined to cracking clays and medium-textured red earths in association with short grasses and forbs, Mitchell and neverfail grasses, and gidgee. It is also known to occur on sand dunes and probably in gilgais in saltbush-bluebush country.

DISTRIBUTION: N.T., S.A., Q., N.S.W.

VALUE: Among the more palatable of the Flinders grasses.

BOTANIC DESCRIPTION

Panicle interrupted, clustered, < 18 cm long or more. *Spathe* acutely keeled, herbaceous, smooth or the keel sparsely glandular. *Spatheole* narrowly elliptic or elliptic, 0.8–1.2 cm long, acutely keeled, herbaceous, with hyaline margins, thinly nerved, ± scaberulous and sometimes sparsely glandular on the keel. *Racemes* densely fasciculate, becoming laterally exerted, oblong, 5–7 mm long; peduncles filiform, 1–3 mm long, smooth or scaberulous; rhachis 0.5–1 mm long, with apical hairs < 2 mm long. *Involucral spikelets* oblong or elliptic-oblong, 3–4 mm long; pedicels slender, 1.5–2 mm long, bearded with white hairs < 2 mm long or rarely glabrous. *Lower glume* obtuse or acute, dorsally flattened, usually thinly coriaceous, prominently 9–15-nerved, scabrous or scaberulous on the back and keels. *Upper glume* elliptic (flattened), obtuse, thinly coriaceous, 3-nerved, smooth, the margins hyaline. *Lower lemma* narrowly oblong, < 3.5 mm long. *Sessile* (fertile) *spikelet* lanceolate, acuminate, 5–6 mm long. *Lower glume* coriaceous, 8-nerved, scaberulous on the back, notched or truncate. *Upper glume* lanceolate, acuminate, thinly coriaceous, 3-nerved, scaberulous on the back. *Lower lemma* oblong-ovate, < 3 mm long. *Upper lemma* linear, entire, < 3.5 mm long, 1-nerved, aristate or muticous; awn geniculate or straight, < 1.5 cm long. *Caryopsis* oblong, 2–2.2 mm long. *Pedicellate spikelets* ovate or elliptic, 2–3.5 mm long; pedicels filiform, 2.5–3 mm long, scabrid-ciliolate. *Lower glume* 7–9-nerved, the nerves scaberulous. *Upper glume* 3-nerved.

90. Red Flinders Grass

Iseilema vaginiflorum

GENERAL DESCRIPTION

HABIT: Annual, sometimes long-lived, variable in habit, commonly 45–60 cm high, forming leafy, spreading, rather straggly tufts. Generally plants are rich purple, scentless, and with few or no glands.

STEMS: Branched, smooth and often powdery on the surface, erect or bent at the nodes, hairless, with few nodes.

LEAVES: Generally hairless and smooth. Blades up to 20 cm long, broad, usually flat, finely pointed, with rough edges. Sheaths loose, sharply keeled.

SEEDHEAD: Almost always the raceme of spikelets and subtending spatheole remain completely enclosed within the floral leaf, the whole forming a leafy seed which, on ripening, readily falls from the plant. The brown, bent, twisted awn, which protrudes from within the floral sheath, is 15–23 mm long. Glands are extremely few or absent.

OCCURRENCE: As known, red Flinders grass is confined entirely to cracking clay soils and medium-textured red earths. These are alluvial in origin or developed on calcareous rocks, and usually red-brown or grey. It is commonly localised to drainage lines and other depressions, and occurs with Mitchell grasses, gidgee, coolibah, or saltbush and bluebush. Of the central Australian species, it is the most common and widely distributed.

DISTRIBUTION: M. (excl. V.).

VALUE: Relatively common and thus the most valuable in central Australia, but sometimes coarse and not always as palatable as small Flinders grass and some other allied species.

BOTANIC DESCRIPTION

Panicle < 22 cm long, dense, narrow, erect, finally disarticulate at the nodes. *Spathe* 6–15 mm long, first herbaceous, later cartilaginous or indurate, with scarious margins, rounded on the back downwards, keeled upwards, eglandular or sparsely glandular-punctate on the keels, scaberulous or sometimes smooth. *Spatheole* 9–12 mm long, narrow-elliptic, acutely keeled, herbaceous or later indurate, with hyaline margins; keel scaberulous, with few glands or eglandular. *Raceme* 7–8 mm long, almost wholly enclosed by the spatheole and spathe, articulate, finally falling with the subtending sheaths; peduncle 1–2 mm long, filiform, smooth; rhachis about 1 mm long, glabrous or pilose on the apex. *Involucral spikelets* sterile, narrowly oblong, < 4 mm long or absent; pedicels < 1.5 mm long, slender, glabrous or bearded with white hairs 1–1.5 mm long, attenuate and continuous with the spikelet or with an indistinct transverse furrow. *Lower glume* membranous, obtuse, 5–9-nerved, scaberulous or smooth, or absent. *Upper glume* hyaline, nerveless, minute or rarely < 3 mm long, or absent. *Lemma* < 2 mm long or often wanting. *Sessile (fertile) spikelet* lanceolate or narrow-lanceolate, acuminate, 5.5–7 mm long, glabrous. *Lower glume* coriaceous or membranous, 8–10-nerved, notched, smooth or scaberulous on the keels upwards. *Upper glume* lanceolate, acuminate or acute, smooth, 3-nerved. *Lower lemma* 3.5–4 mm long, narrow-oblong. *Upper lemma* < 5.5 mm long, linear, 1-nerved, entire or notched; awn 15–23 mm long, with a column 6–9 mm long. *Caryopsis* 2.5–3 mm long, oblong. *Pedicellate spikelets* 3–5 mm long, lanceolate or oblong, acute; pedicels 2.5–3 mm long, slender, scaberulous or puberulous. *Lower glume* thinly membranous, 5–7-nerved, scaberulous on the keel. *Upper glume* lanceolate, very thin, 2–3-nerved. *Lemma* 2–4 mm long, oblong or narrow-oblong.

91. Umbrella Cane Grass

Leptochloa digitata
Plate 50b

GENERAL DESCRIPTION

HABIT: Robust perennial, forming coarse stemmy tussocks, 1.2–1.7 m high, growing from a stout, hairless, usually short rhizome, which like the butt is thickened by numerous overlapping cataphylls. These bract-like sheaths are stiff, papery, shiny, many-nerved, and bluntly pointed.

STEMS: Cane-like, rigid, erect, simple or branched, bluish-green, powdery on the surface when young, becoming smooth and shiny with age; nodes thick, prominent.

LEAVES: Blades flat, up to 6 mm wide, usually short (but up to 12.5 cm long). Sheaths broad and loose, much shorter than the internodes, straw-coloured.

SEEDHEAD: Head fan-shaped, consisting of 6–14 spikelet-bearing racemes clustered at the top of the culms and usually prominent; racemes 5–10 cm long, erect

or slightly spreading, usually with one attached slightly below the terminal cluster. The spikelets are small, dark green, shortly stalked, and densely crowded in 2 rows along one side of the rhachis of the raceme. Each spikelet has 5-6 florets, which on ripening fall individually, leaving the minute glumes attached to the rhachis.

OCCURRENCE: Commonly in association with curly windmill grass, umbrella cane grass occurs in the northern half of the area in or near larger watercourses, sometimes forming dense, conspicuous stands.

DISTRIBUTION: M. (excl. V.).

VALUE: The hard, woody stems, sparse foliage, and low palatability are undesirable features in respect to fodder value.

BOTANIC DESCRIPTION

Inflorescence of 4-14 subdigitate spiciform racemes, prominent. *Racemes* 5-10 cm long, usually whorled and with a solitary one close below, erect or slightly spreading, sessile or subsessile, usually pubescent in the axils and on the peduncle; rhachis triquetrous, slender, scabrous, straight or slightly curved. *Spikelets* solitary, laterally compressed, shortly pedicellate, closely imbricate, secund and biseriate, 2.5-4 mm long, with 5-6 bisexual florets; callus minute, obtuse, with sparse short hairs; pedicels about 1 mm long, triquetrous, scabrous; rhachilla disarticulate above the glumes and between the florets, glabrous, the internodes almost 0.5 mm long. *Glumes* persistent, 1-nerved, membranous, acute, \pm keeled, scabrous on the keel, glabrous, usually smooth; lower 1.25 mm long, narrow-ovate; upper 1.5-1.75 mm long, elliptic-ovate. *Lemmas* 1.75-2 mm long, firmly membranous, glabrous, smooth, dorsally convex or obtusely keeled upwards, broadly elliptic-ovate, obtuse, entire or emarginate, sometimes mucronulate, 3-nerved, with faint submarginal lateral nerves. *Palea* almost as long as the lemma, thinly membranous or hyaline, oblong-obovate, obtuse, 2-keeled, ciliolate on the keels upwards, glabrous, smooth. *Caryopsis* about 1 mm long, oblong-elliptic, concave, smooth, pale brown.

92-94. Mulga Grasses

Neurachne spp.

These are characteristic grasses of the dry, Australian interior, and well adapted to their environment. Generally the plants are vigorous, long-lived perennials with tough stems and rather harsh leaves, often developing thick, hairy rhizomes. In palatability they range from moderate when green to low or very low when dry, but are nevertheless quite valuable. Being mainly winter-growing, the more common ones provide useful forage at a time when fodder production is usually low.

Superficially, the spikelets vary considerably from species to species. Window mulga grass is particularly distinctive because of a window-like depression in the lower glume. Generally, however, the spikelets are silky-hairy, shortly or long-pointed, and crowded in dense, spiciform, short, cylindrical panicles terminating the culms. At maturity they ripen from the apex of the panicle downwards and fall separately, exposing the distinctive rhachis. This is stiff, erect, \pm wavy, 3-angled, shortly hairy, and roughened by the extremely short, stump-like stalks of the spikelets.

GENERIC CHARACTERS

Spikelets solitary or rarely in pairs, laterally or slightly dorsally compressed, falling entire, subsessile or shortly pedicellate on the very short branches of a short, dense, spiciform cylindrical panicle with persistent rhachis. *Florets*, 2; lower male or neuter; upper bisexual. *Glumes* equal or the upper slightly shorter, differing in texture, indumentum, and nervation, subequal to the spikelet. *Lower lemma* somewhat similar to the glumes, but usually narrower, shorter, and thinner, with or without a palea. *Upper lemma* hyaline or membranous, 3-nerved, much shorter than the glumes and usually shorter than the lower lemma. *Palea* usually as long as its lemma, 2-nerved and \pm 2-keeled, with inflexed margins. *Caryopsis* oblong, free from the lemma and palea.

KEY TO THE SPECIES

- A. Lower glume membranous or coriaceous, with the same texture throughout. One or both glumes long-acuminate, finally divaricate.
 - B. Rhizome present. Culms erect, not stoloniferous. Spikelet < 10 mm long..... 94. *N. munroi*
 - B. Rhizome absent. Culms erect and often stoloniferous. Spikelet 10–14 mm long. 93. *N. muelleri*
- A. Lower glume membranous or indurate, with a scarious window-like depression in the lower half. Both glumes obtuse, rarely gaping. 92. *N. mitchelliana*

92. Window Mulga Grass

Neurachne mitchelliana

GENERAL DESCRIPTION

HABIT: Harsh, tufted, long-lived perennial, about 30 cm high, growing from a short, thick, scaly, densely woolly rhizome.

STEMS: Numerous, rigidly erect, wiry, simple or branched, 4–6-noded, usually covered by minute dense bristly hairs and also by long soft fine hairs; nodes softly hairy.

LEAVES: Variously hairy; usually sparsely or densely covered by minute and/or long stiff bristle-like hairs with or without hard wart-like tubercles. Blades flat, 2–5.5 cm long, 3–4 mm wide, firmly pointed, rather thick, stiffly spreading (sometimes almost horizontally), with several nerves and thickened edges but without a distinct midrib, sometimes only sparsely hairy along the edges. Sheaths tight, almost as long as the internodes, softly hairy at the mouth.

SEEDHEAD: Panicle terminal, spiciform, 2–9.5 cm long, 5–7 mm wide, usually fairly dense, but sometimes with the lower few spikelets widely separated along the rhachis. The spikelets are silvery-hairy or covered by large, prominent, hard, wart-like tubercles. On maturity the spikelets fall entire, exposing the thick, hairy, wavy rhachis.

OCCURRENCE: A characteristic plant of the arid region of Australia, widespread and fairly common in central Australia, extending north to Wauchope. It occurs

on red earths and clayey sands of the sand plains in association with mulga, hard or feathertop spinifex, and scattered shrubs of *Cassia*, native fuchsia, and wattles. Equally commonly it occurs in the uplands on shallow soils developed mostly on limestone and sandstone rocks under sparse low trees and shrubs, witchetty bush, and gidgee.

Plants grow mainly with winter rainfall and flower from July to October, though some growth is made also in the summer.

DISTRIBUTION: W.A., S.A., Q., N.S.W.

VALUE: A rather coarse, vigorous plant of moderate palatability, grazed mainly when young, but quite valuable since it grows in the winter.

BOTANIC DESCRIPTION

Panicle exerted, rather loose to dense, 2-9.5 (mostly -4) cm long, 0.5-0.7 cm wide, sometimes interrupted in the lower part; peduncle stout, cylindrical, glabrous or pubescent, scaberulous, striate, sometimes bearded at the apex; rhachis pubescent, stout, flexuose, angular, rigidly erect. *Spikelet* solitary, shortly pedicellate, 5-7 mm long, the basal ones sometimes reduced; callus densely and softly bearded; pedicels pubescent, < 1.25 mm long, with a widened oblique and concave apex. *Glumes* cartilaginous or indurate, with incurved margins, obtuse or truncate. *Lower glume* slightly distant from the upper, embracing the base of the spikelet, scaberulous, pubescent, with a scarious \pm oblong window-like depression in the lower half, the depression terminated at the apex by a transverse tubercular protuberance bearing a tuft of few to many coarse, rigid, spreading or \pm reflexed bristles or hairs, sometimes the glume also variously tuberculate particularly around the edges of the depression. *Upper glume* broadly elliptic or elliptic-oblong, convex on the back, tuberculate and often with tubercular callosities bearing tufts of rigid, spreading bristles, pubescent, sometimes villous-ciliate near the margins with spreading, white, simple or tubercle-based hairs or bristles; apex beak-like, glabrous, scaberulous, prominently nerved, 3-toothed. *Lower lemma* as long as the lower glume, 5-nerved, pubescent, membranous, lanceolate-ovate, with a beak-like apex, without a palea. *Upper lemma* elliptic-oblong, 4.5-5 mm long, slightly shorter than the upper glume, convex on the back, glabrous, smooth, membranous, faintly nerved, abruptly narrowed into a beak-like, obtuse apex. *Palea* flat on the back, otherwise similar to its lemma.

93. Northern Mulga Grass

Neurachne muelleri

GENERAL DESCRIPTION

HABIT: Rather coarse perennial, with a hairy butt, forming either dense erect or loose straggly tussocks, 30-45 cm high and 15-22 cm wide; often the stems trailing for several feet and rooting from the nodes.

STEMS: Erect or bent at the nodes, thin but wiry, strongly branched; nodes thick, prominent, hairy; internodes almost entirely hairless, but rough from minute bristly hairs.

LEAVES: \pm hairless, but densely covered by minute bristles. Blades stiff, usually flat, fairly broad, many-nerved, sometimes bluish, up to 15 cm long, gradually tapered to a long point. Sheaths tight or loose, firm, usually less than half as long as the internodes.

SEEDHEAD: Panicle dense, spiciform, narrow, about 3 cm long, terminal on the culms, only slightly exceeding the uppermost leaves. The relatively few but crowded spikelets are 10–14 mm long and partly concealed by long, fine, silvery hairs. The 2 outer glumes of the spikelet are firm, smooth, sometimes purplish, with a prominent fringe of hairs on each edge. Each glume tapers to a very long, bristle-like point, which remains erect or curves downwards with age.

OCCURRENCE: This mulga grass occurs sporadically north of the Macdonnell Ranges in gently undulating or flat country on shallow, often gritty or gravelly soils, in association with scattered low trees and shrubs (snappy gum, bloodwood, mallees, native fuchsia); also on red and yellow earths of medium texture under mulga. Unlike other mulga grasses, it is mainly tropical in distribution, summer-growing, and in central Australia flowers from February to late May.

DISTRIBUTION: W.A., N.T., Q.

VALUE: Not a particularly valuable grass, but young plants are moderately palatable.

BOTANIC DESCRIPTION

Panicle shortly exserted, rather loose to dense, 2.5–3.25 cm long, about 1 cm wide, narrow-oblong; peduncle stout, rigid, glabrous, striate, scaberulous, scarcely narrowed upwards, the rachis similar but angular. *Spikelets* solitary, sessile, few but rather crowded, 10–14 mm long; callus densely bearded with fine silvery hairs; pedicels up to 0.5 mm long, stout, scaberulous, with widened oblique and concave apex. *Glumes* membranous to cartilaginous, becoming indurated, with incurved hyaline ciliolate margins which broaden downwards, long-acuminate and tapered into a long, firm, scabrous, bristle-like, erect or recurved point. *Lower glume* linear-lanceolate, prominently 5-nerved, channelled or depressed between the midnerve and the closely approximated lateral nerves, sparsely ciliate on the lateral nerves in the middle third with stiff erect tubercle-based hairs, otherwise glabrous and scaberulous. *Upper glume* faintly 7–9-nerved, broadly ovate, villous-ciliate near the margins for almost their full length with silvery, fine, stiff, widely spreading hairs 5–6.5 mm long arising from an oblique ridge of fused tubercles, otherwise pubescent or scaberulous but becoming glabrous \pm smooth and shiny. *Lower lemma* 7–8.5 mm long, membranous to cartilaginous, lanceolate, glabrous or scabrous-pubescent, scaberulous, with broad hyaline margins, 7-nerved, with the 3 central nerves thickened towards the base, channelled in the lower part between the midnerve and adjacent nerves, long-acuminate and tapered to a bristle-like point. *Palea* about 2 mm long, hyaline, broadly ovate, long-acuminate, notched, subtending a male floret. *Upper lemma* 7–8.5 mm long, glabrous, \pm smooth, lanceolate to lanceolate-ovate, acuminate, 5-nerved, with incurved margins. *Palea* subequal to its lemma.

94. Dwarf Mulga Grass

Neurachne munroi

GENERAL DESCRIPTION

HABIT: Coarse low perennial with a thick knotty or scaly rhizome; butt leafy, compact, thickened, and, like the rhizome, covered by dense long white hairs.

STEMS: Numerous, thick, rigid, branched, with short internodes entirely covered by the sheaths. Flowering culms rather slender, 15–30 cm high, erect, with white-hairy nodes, otherwise glabrous.

LEAVES: Mainly basal, sometimes bluish-green, with dense, long, stiffly spreading, tubercle-based hairs at the orifice; sometimes the hairs present on the surface and edges of the blades. Blades thick, rigid, flat or folded, erect or recurved, rough, firmly and sharply pointed, up to 9 cm long, but often less than 2.5 cm or reduced to short points. Sheaths numerous, tightly overlapping.

SEEDHEAD: Panicle 2–5.5 cm long, 6.5–10 mm wide, prominent, spiciform, terminating culms of variable height. Spikelets crowded and closely overlapping, pointed, partly concealed by long silvery hairs.

OCCURRENCE: In central Australia this grass is restricted mostly to the undulating limestone country of the northeast and to the stony tablelands of the south. It occurs sporadically on low limestone rises under witchetty bush, with gidgee on low hills and gentle slopes with shallow calcareous soils, and on texture-contrast soils in association with *Bassia* and saltbush.

Plants respond to both summer and winter rainfall, flowering from February to April or from September to October.

DISTRIBUTION: S.A., Q., N.S.W.

VALUE: A rather harsh grass, moderate in palatability when young, though producing little fodder.

BOTANIC DESCRIPTION

Panicle distinctly exserted, 2.25–5.5 cm long, 6.5–10 mm wide; peduncle stout, striate, glabrous or scabrous-pubescent, scarcely narrowed upwards; rhachis rigidly erect, angular, scabrous-pubescent. *Spikelets* crowded, sessile, 5–6 mm long, solitary; callus long-bearded; pedicels broad and concave at the apex, stout. *Glumes* membranous or cartilaginous, at length divergent, with incurved thinly membranous or hyaline margins. *Lower glume* 4.5–5 mm long, glabrous, scaberulous, linear or lanceolate-obovate, prominently 3-nerved or sub-5–7-nerved, channelled between the midnerve and adjacent nerves, with notched narrow truncate or obtuse apex. *Upper glume* membranous, lanceolate, acuminate, aristulate, 5–7-nerved, villous-ciliate near the base on the margins with silvery hairs which extend upwards to about the middle in an oblique submarginal series, glabrous or sometimes pubescent on the surface in the lower half, scabrous or scaberulous. *Lower lemma* lanceolate, hyaline, glabrous, 3–5-nerved, with incurved margins, sometimes subtending a narrow palea less than half as long and a male floret. *Upper lemma* narrow-lanceolate, hyaline, glabrous, faintly nerved. *Palea* slightly but distinctly longer, linear-lanceolate, acuminate, glabrous. *Caryopsis* 2 mm long, oblong-elliptic.

95-99. Panic Grasses

Panicum spp.

Only five species of this extremely large genus occur in central Australia, four as minor constituents on cracking clay plains and the fifth (bunch panic) in sandy desert parts. They comprise a somewhat variable group differing in habit, duration, and indumentum, but with a common feature in the structure of the panicle. Usually this is large and open, with extremely long, slender much-divided branches and branchlets on which the small, awnless, long-stalked spikelets arise singly or in pairs. Bunch panic is a noteworthy exception, with reduced panicles of few branches and few spikelets. Characteristically the ripened spikelet falls entire (i.e. with the seed tightly enclosed by the hardened lemma and palea and these in turn by the thin outer glumes).

Generally panic grasses are regarded as valuable fodder, but the central Australian plants are too sparsely distributed to be significant.

GENERIC CHARACTERS

Spikelets solitary or in pairs, usually falling entire, pedicellate in an open, often decompound or contracted panicle; pedicels often elongated, unequal when in pairs. *Florets*, 2; lower male or neuter; upper bisexual. *Glumes* ± herbaceous-membranous; lower often much shorter than (rarely equal to) the upper; upper subequal to the spikelet, rounded on the back, 5-9-nerved. *Lower lemma* similar to the upper glume. *Palea* thinly membranous, subequal to the lemma or ± reduced or sometimes suppressed. *Upper lemma* coriaceous, with firm margins, usually faintly nerved. *Palea* subequal to the lemma and similar in texture, tightly embraced by the ± incurved margins of the lemma. *Caryopsis* tightly enclosed by the indurated lemma and palea, dorsally compressed, biconvex or ± plano-convex.

KEY TO THE SPECIES

- A. Perennials or coarse annuals 23->30 cm high. Panicle open, large, usually decompound.
 - B. Spikelets 2-3.5 mm long, relatively few, pedicellate on the ends of the branches.
 - C. Lower glume ± truncate, less than half as long as the spikelet. Lower lemma with a palea more than half as long.
 - D. Panicle < 23 cm long, with slender drooping branches, the lower ones mostly solitary. Spikelets 2-2.5 mm long, rather crowded. Slender plant. 99. *P. whitei*
 - D. Panicle < 45 cm long, with stiff spreading branches, the lower ones mostly whorled. Spikelets 3-3.5 mm long, rather remote. Coarse plant. 97. *P. decompositum*
 - C. Lower glume acute, half as long as the spikelet. Lower lemma with a palea half as long. Panicle < 25 cm long, with usually stiff spreading branches, the lower ones mostly clustered. Spikelets 2-2.5 mm long, paired, remote. 98. *P. effusum*
 - B. Spikelets 3-3.5 mm long, numerous, subsessile, crowded on short secondary branches loosely appressed to the primary branches. Panicle < 45 cm long. 96. *P. cymbiforme*
- A. Small annual, 7-15 (rarely -25) cm long. Panicle 2-3.5 cm long, short and contracted or reduced to a raceme, of few branches and few spikelets. 95. *P. australiense*

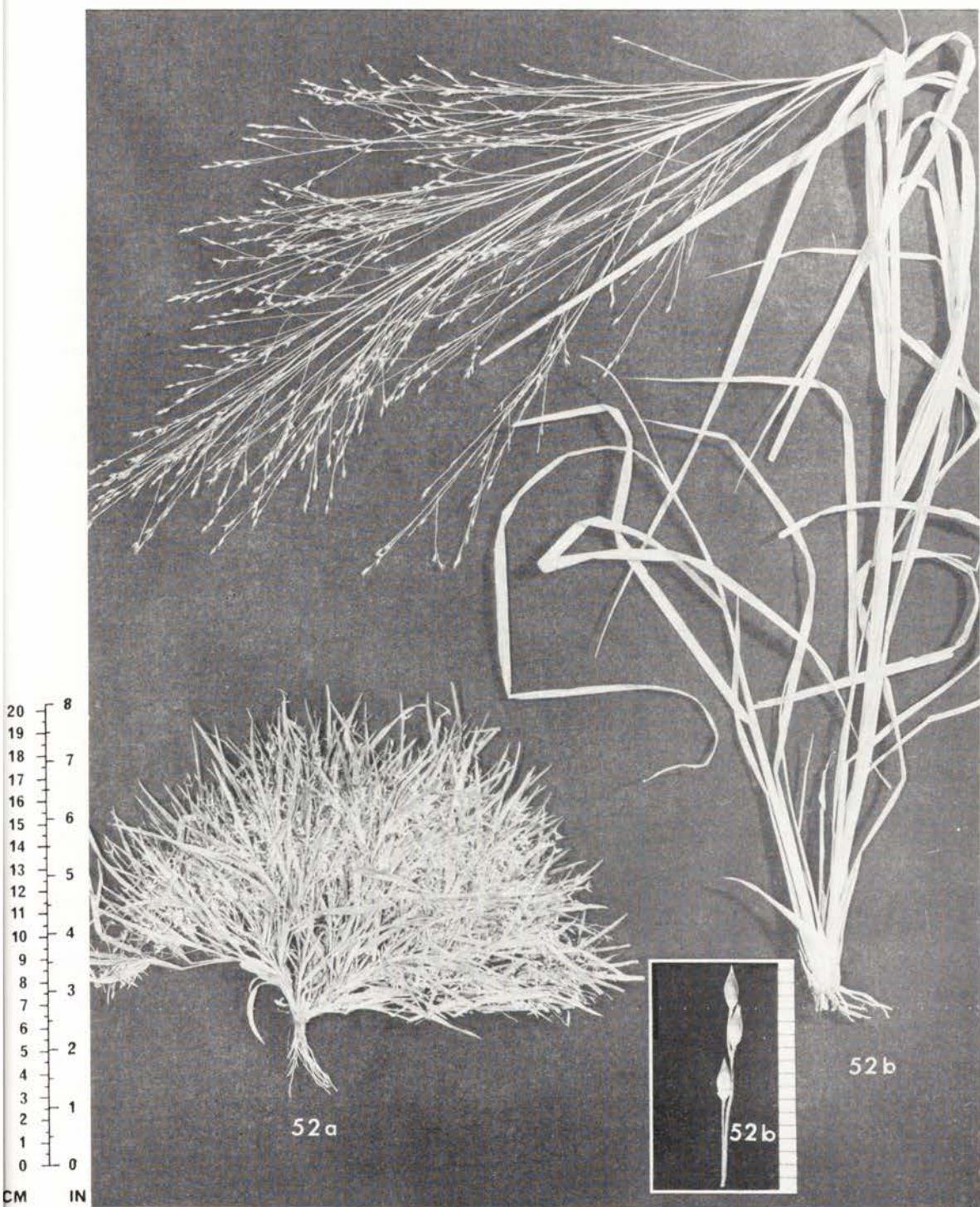


PLATE 52. (a) *Panicum australiense*; (b) *Panicum decompositum*

95. **Bunch Panic**

Panicum australiense

Plate 52a

GENERAL DESCRIPTION

HABIT: Low leafy annual, forming extremely compact tufts 5–15 (rarely –25) cm high, often reddish or purplish.

STEMS: Numerous, erect or more often bent at the nodes, branched, particularly dense at the upper nodes, hairless or with tubercle-based bristles, with 2–4 usually hairy nodes.

LEAVES: Blades 3.5–6.5 cm long, flat, long-pointed, hairy on the thickened edges, with spreading whitish tubercle-based bristles on the surface. Sheaths mostly shorter than the internodes, loose, thin and papery, strongly nerved, hairy, rough with tubercle-based bristles.

SEEDHEAD: Panicle 2–3 cm long, 8–10 mm wide, with 2–3 short branches and few spikelets. The panicles, terminating branched culms and produced in abundance throughout the plant, usually are partly enclosed by, and shorter than, the floral leaves.

OCCURRENCE: A characteristic plant of the sandy interior of Australia; widespread and fairly common in central Australia, chiefly on spinifex sand plains and dune fields with clayey sands. In the northwestern quarter of the area, bunch panic occurs also with snappy gum, gummy spinifex, needlewood, and mallee. It flowers mainly from March to May.

DISTRIBUTION: W.A., N.T., Q.

VALUE: Probably grazed, but of little value.

BOTANIC DESCRIPTION

Panicles 2–3 cm long, up to 1 cm wide, numerous, contracted, distinctly shorter than the subtending leaves. *Spikelet* 3–4 mm long, 1.25 mm wide. *Lower glume* about half as long as the spikelet, 3–5-nerved. *Lower palea* 0.5 mm long. *Fertile floret* 1.5–2 mm long, smooth, glossy, indistinctly nerved, with a stipe 1 mm long.

96. **Boat Panic**

Panicum cymbiforme

Plate 53a

GENERAL DESCRIPTION

HABIT: Robust annual, 90–120 cm high or more, usually rooting from the lower nodes, forming tall narrow tufts.

STEMS: Thick but hollow, purplish when young, branched, hairless, smooth, often sharply bent at the lower nodes and erect above, mostly 4–6-noded; nodes prominent and usually hairless; lower internodes often flattened or angular, usually grooved on one side.

LEAVES: Sheaths broad and loose, hairless (sometimes shortly hairy at the mouth), strongly nerved, fairly smooth, becoming straw-coloured with age; lower sheaths



PLATE 53. (a) *Panicum cymbiforme*; (b) *Panicum whitei*

usually longer, and the upper ones usually shorter, than their internodes. Blades flat or sometimes loosely folded, tapered to a fine point, up to 25 cm long and 6 mm wide, deep-green, with several prominent nerves and thickened margins, hairless but usually rough from minute bristles on the nerves and edges.

SEEDHEAD: Panicle loose, usually narrow, terminating the culms, prominent, 30–45 cm long and < 12.5 cm wide, with numerous slender erect or (sometimes widely) spreading branches. The branches occur singly or in small clusters, and are scattered (often at extremely wide intervals) along a stout axis. They are mostly 7–10 cm long, though the lower ones can be up to 15 cm. Each one divides into several short appressed or slightly spreading branchlets densely crowded with shortly stalked spikelets. These are green, hairless, smooth, and shortly pointed.

OCCURRENCE: A rare species in central Australia known from only the far northern part, growing on creek banks or in similar habitats, and sometimes also in disturbed places.

DISTRIBUTION: W.A., N.T.

VALUE: A leafy, softly herbaceous, highly palatable plant, but insignificant in native pasture.

BOTANIC DESCRIPTION

Panicle prominently exserted, contracted but loose, 30–45 cm long, 3–5 (rarely –12.5) cm wide; axis stout, terete and smooth in the lower part, angular and scaberulous (at least on the angles) upwards; branches obliquely or widely spreading, sometimes drooping, sparsely divided, solitary or clustered, distant to remote, angular, scabrous, usually 7–10 cm long, shorter upwards, the lower ones up to 15 cm long; secondary branches up to 3.5 cm long, slender, appressed to the primary branches, angular, scabrous, sometimes terminating in a filiform bristle up to 1 cm long; pedicels usually < 1 mm long, scabrous, widened at the apex. *Spikelets* 3–3.5 mm long, glabrous, mostly smooth, soon gaping, obliquely appressed and rather crowded on the branchlets. *Lower glume* 1–1.5 mm long, broadly ovate, enclosing the base of the spikelet, acute, mucicous or mucronulate, ± incurved at the apex, strongly 3 or sub-5-nerved, rounded on the back and cymbiform. *Upper glume* slightly shorter than the spikelet, prominently 5–7-nerved, elliptic-ovate, acute or shortly acuminate, becoming constricted and firmer towards the apex. *Lower lemma* as long as the spikelet, elliptic, obtuse (flattened), flattened or longitudinally grooved, 5–7-nerved, with incurved margins, usually subtending a male floret. *Lower palea* as long as its lemma, narrow-elliptic, acute, hyaline, 2-keeled, with inflexed margins. *Fertile floret* plano-convex in profile, 2–2.2 mm long, elliptic, acute, striolate, smooth and glossy.

97. Native Millet
(papa grass)

Panicum decompositum
Plate 52b

GENERAL DESCRIPTION

HABIT: Stout tussock-forming perennial, sometimes short-lived, usually 45–105 cm high though variable in size, with hairless or sparsely hairy butt somewhat

thickened by several broad, loose, papery, shiny cataphylls. Generally plants are entirely hairless, smooth, and bluish in colour.

STEMS: Thick though hollow and soft, erect, simple or branched, mostly covered by the sheaths, with 3 or 4 prominent nodes.

LEAVES: Blades up to 12 mm wide, flat, stiffly erect, long and gradually tapered to a firm fine point, with rough sharp edges and a usually prominent midrib. Sheaths loose, often shiny, with several prominent nerves.

SEEDHEAD: Panicle terminal on the culms, open, up to 40 cm long and almost as wide, comprising up to half the plant, decomposed; branches and branchlets slender, stiffly spreading, angular or flattened, straight or somewhat wavy. The axis of the panicle is deeply grooved or 4-angled and, like the branches and branchlets, hairless though rough from minute bristles. The relatively few spikelets are small, purplish or pale-green, pointed, hairless, and borne usually in pairs on long, thin stalks terminating the branchlets.

OCCURRENCE: Widespread, but sporadic; occurring most commonly on the banks and floodouts of streams and in valley floors with alluvial soils, but also in the uplands in a wide range of habitats. Associated plants include short grasses and forbs, mulga, coolibah, river red gum, gidgee, and witchetty bush. Normally plants flower shortly after summer rains in February and March.

DISTRIBUTION: M.

VALUE: The herbaceous stems and abundant foliage provide palatable fodder. Because of preferential grazing, plants rarely survive in areas of high stock concentrations.

BOTANIC DESCRIPTION

Panicle decomposed, < 40 cm long and almost as wide, first enclosed by the uppermost sheath, later distinctly exerted; branches and branchlets stiffly spreading, strongly angular, scabrous, the lowest ones usually whorled. *Spikelets* 2.75–3.75 mm long, unequally pedicellate, distant, terminating filiform branchlets. Lower glume < one-third as long as the spikelet, 0.5–0.75 mm long, broad, ± truncate, with a prominent midnerve. *Upper glume* and *lower lemma* subequal, as long as the spikelet; the latter with a palea two-thirds to three-quarters as long. *Fertile floret* 1.75–2.25 mm long, distinctly nerved, smooth, glossy.

98. Hairy Panic

Panicum effusum

GENERAL DESCRIPTION

HABIT: Tufted perennial, sometimes short-lived, 22–60 cm high; butt slightly thickened, sparsely hairy. A characteristic feature is the extremely dense cover of stiff, usually long, white, spreading hairs arising from hard, wart-like tubercles on sheaths, blades, and to a lesser extent on the stems.

STEMS: Erect or bent at the lower nodes, simple or branched, densely hairy or sometimes almost hairless, 1–3-noded; nodes usually with long soft dense hairs.

LEAVES: Densely hairy, the hairs of the blades sometimes lying flat on the surface. Blades usually flat, long, rather broad, gradually tapered to a long fine point, with numerous nerves and thickened rough sharp edges. Sheaths loose, usually as long as the internodes, numerous at the base of the plant.

SEEDHEAD: Panicle similar to that of native millet (No. 97), but usually smaller, with branches and branchlets more slender and less rigid. The spikelets are small, purplish or pale-coloured, rather plump, and are borne in pairs (sometimes in threes) on long, extremely thin stalks terminating slender branchlets.

OCCURRENCE: Apparently rare; known from only spinifex sand plains.

DISTRIBUTION: M.

VALUE: Little is known of fodder value, but probably palatable like native millet, which is allied.

BOTANIC DESCRIPTION

Panicle decomposed, comprising almost half the plant; branches and branchlets stiffly spreading. *Spikelets* 2-3 mm long, unequally pedicellate, distant, terminating filiform sometimes long branchlets. *Lower glume* broad, acute, usually about half as long as the spikelet, with 3 prominent nerves and other indistinct ones. *Lower palea* half as long as its lemma. *Fertile floret* 1.75-2 mm long, smooth, glossy, indistinctly nerved.

The chief features of this species are the stiff panicle, the 3-nerved lower glume which is half as long as the spikelet, the presence of simple or tubercle-based hairs on culms and foliage, and the long-bearded nodes.

It has affinities with *Panicum decompositum*, but can be recognised by its smaller spikelets, longer and acute (not \pm truncate) lower glume, shorter palea of the lower lemma, \pm nerveless upper lemma, and its hairy foliage.

99. Pepper Grass

(pigeon grass)

Panicum whitei

Plate 53b

GENERAL DESCRIPTION

HABIT: Annual or short-lived perennial, 30-75 cm high; perennial plants are dense and leafy near the base, with a sparsely hairy butt somewhat thickened by several thin, strongly nerved, papery cataphylls. Usually plants are almost entirely hairless and smooth, but occasionally the leaf sheaths and culms are densely covered by long, extremely fine, spreading, whitish or silvery hairs based on hard tubercles.

STEMS: Erect or bent at the nodes, usually slender, shiny, branched, 3-5-noded; internodes often angular and shallowly grooved.

LEAVES: Blades up to 23 cm long and 6 mm wide, usually flat, shortly or finely pointed, bright green, strongly nerved, usually with thickened sharp edges and a wide prominent midrib. Sheaths loose, shiny, strongly nerved, shorter than the internodes.

SEEDHEAD: Panicle open, slender, usually shortly exceeding the uppermost leaves, variable in size and up to 30 \times 25 cm, decomposed; branches and branchlets

Description of the Species

extremely slender, spreading or drooping, widely spaced. Immature panicles are up to 2.5 cm wide, contracted, with erect stiff clustered branches and branchlets. The spikelets are extremely small, hairless, pale green or purplish, and borne in fairly dense clusters of few to many on short, thin stalks on the outer part of the branchlets.

OCCURRENCE: Pepper grass is mostly confined to cracking clay soils, medium-textured red earths, and fine alluvial soils, commonly in association with Mitchell grasses, short grasses and forbs, coolibah, and less frequently with mulga and gidgee. It is best developed on open plains, river floodplains, and drainage floors.

DISTRIBUTION: M. (excl. V.).

VALUE: Palatable and nutritious, though subject to preferential grazing and readily destroyed.

BOTANIC DESCRIPTION

Panicle decomposed (sometimes almost simple), < 30 cm long and 25 cm wide, but usually smaller; branches filiform, rather lax, angular, the lowest 1 or 2 often solitary. *Spikelets* 2-2.5 mm long, usually in pairs and crowded on the outer part of the branches and branchlets, unequally pedicellate. *Lower glume* < one-third as long as the spikelet, broad, \pm truncate, with a prominent midnerve. *Upper glume* and *lower lemma* subequal, as long as the spikelet; the latter subtending a palea three-quarters as long. *Fertile floret* 1.5-1.75 mm long, smooth, glossy, distinctly nerved.

In relation to the morphology of the lower glume, this species shows affinities with *Panicum decompositum*, but differs in its slender habit, smaller spikelets, and lax usually smaller panicle.

100. Reverse Grass

Paractaenium novae-hollandiae

Plate 55a

GENERAL DESCRIPTION

HABIT: Slender sprawling annual or short-lived perennial, 30-45 cm high, forming straggly tufts. Plants are entirely hairless.

STEMS: Numerous, weak, smooth, several-noded, bent and usually clustered at the nodes, strongly branched.

LEAVES: Blades bright green, usually flat, up to 10 cm long, rather broad, thin, stiff or flaccid, gradually tapered to a long fine point, strongly nerved, with a prominent white midnerve and thickened edges. Sheaths loose, thin, prominently nerved, usually shorter than the internodes.

SEEDHEAD: The small, pale green or purplish, hairless, bluntly pointed spikelets are borne on spiciform racemes 2-6.5 cm long, which are widely spaced on the culm. In the upper part of the seedhead, the racemes are sometimes extremely short or the spikelets are attached directly to the axis. The racemes are unbranched or sometimes divided in their lower part into short spikelet-bearing branchlets. The rachis of each raceme is flattened or angular, wavy, and terminates in a firm bristle

usually as long as the terminal spikelet. Generally there is a similar bristle below the basal spikelet of each raceme and occasionally below some of the other spikelets. At first the racemes are erect on the culms, gradually spreading downwards with age, finally to a reflexed position. On maturity the entire raceme with its spikelets breaks at its point of attachment.

OCCURRENCE: Reverse grass occurs sporadically in the extensive areas of dunes and sand hills in association with hard and feathertop spinifexes. It also occurs in places such as Palm Valley on deep sands near waterholes and seepages.

DISTRIBUTION: W.A., S.A., Q., N.S.W.

VALUE: Evidently not grazed.

BOTANIC DESCRIPTION

Inflorescence an open racemose panicle, terminal on the culms and branches, at length prominently exerted, irregular in outline, usually narrow; axis slender, mostly flattened, strongly striate, scabrous. *Racemes* spiciform, solitary, alternate, distant or remote, erect but soon spreading and finally reflexed, deciduous, simple or sometimes branched in the lower part, 2–6.5 cm long, often becoming shorter upwards, bearing spikelets or very short articulate secondary racemes almost to the base; rhachis flattened and ribbon-like, flexuose, with a prominent acute midrib on the face, scabrous-ciliate on the midrib and thickened margins, continued beyond the uppermost spikelet as a rigid bristle < twice as long as the spikelet itself or somewhat more. *Spikelets* solitary, < 9 in the raceme, lanceolate, somewhat compressed dorsally, \pm plano-convex in profile, 4–5 mm long, subsessile, secund and biseriate on the midrib, closely appressed, approximate or shortly contiguous, falling with the raceme, the lowest or lower subtended by a bristle similar to the terminal one. *Glumes* chartaceous-membranous, with scarious margins, ciliolate at the apex or glabrous, smooth; lower 3–4 mm long, lanceolate-ovate, obtuse or \pm truncate, prominently 3–5-nerved, enclosing the base of the spikelet; upper as long as the spikelet, about 13-nerved, lanceolate, acute, constricted at the tip, rounded on the back, with incurved margins. *Lower lemma* 7 or sub-9-nerved, \pm flattened, otherwise similar to the upper glume. *Lower palea* delicate, hyaline, narrowly lanceolate-triangular, acuminate, glabrous, smooth, nerveless, flat, almost 2 mm long. *Upper lemma* 3.75–4 mm long, firmly cartilaginous, elliptic, apiculate, glabrous, faintly 5-nerved, punctate, somewhat rounded or \pm flattened on the back, with inrolled margins which embrace the keels of the palea. *Palea* thinly 2-keeled, with incurved broad smooth shiny scarious margins, flattened between the keels, otherwise similar to its lemma. *Caryopsis* almost 2 mm long, flattened, elliptic.

101–103. *Paspalidium* Grasses

Paspalidium spp.

This is a fairly large genus, well developed in other parts of Australia, but represented in central Australia by only three rather rare species. These are characteristic grasses of rugged places or favoured sites, but occur in a number of other habitats as well. They are annuals or perennials, usually compact and leafy, with extremely narrow but rather loose panicles terminal on culms of variable height. Generally the panicles

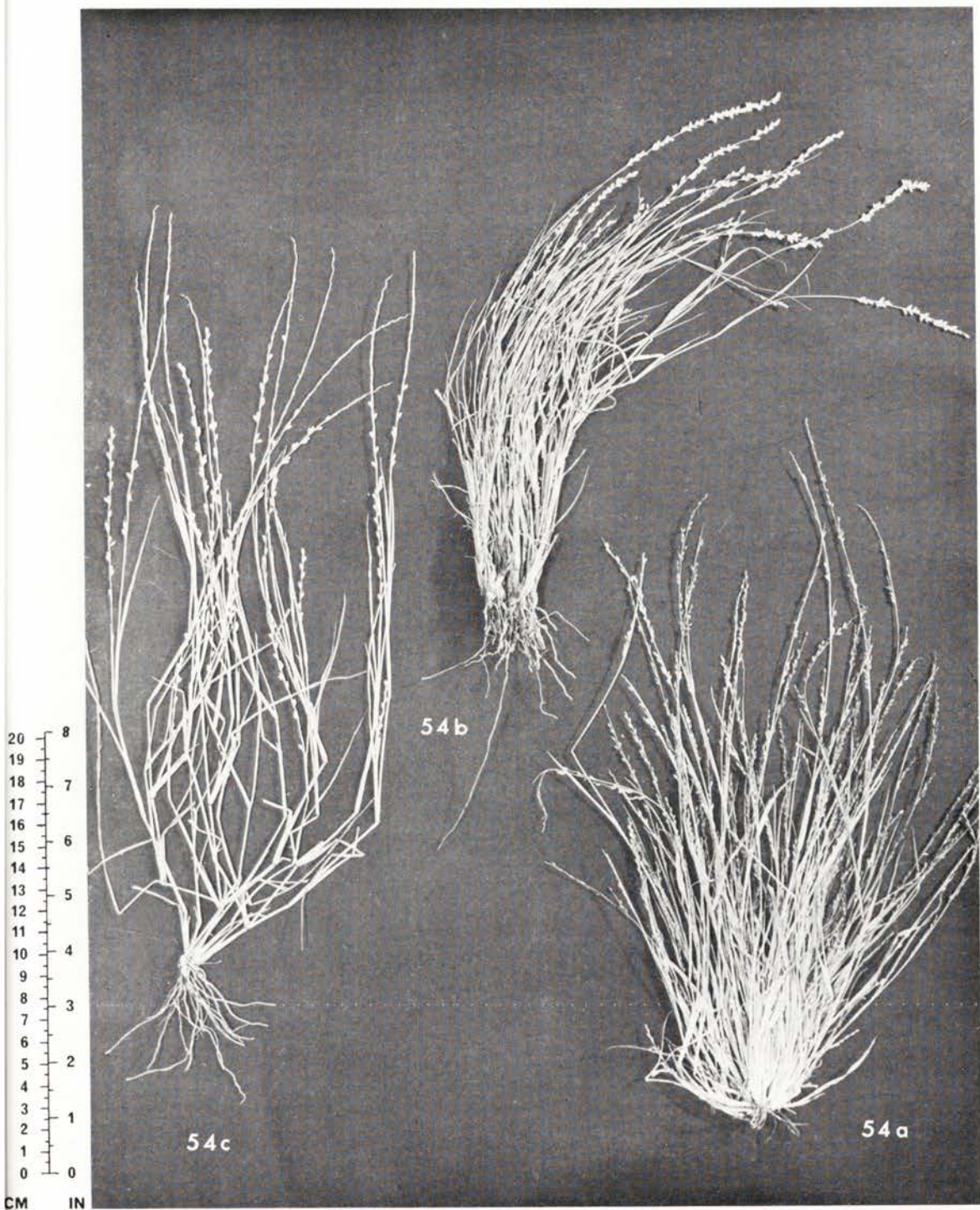


PLATE 54. (a) *Paspalidium clementii*; (b) *Paspalidium constrictum*; (c) *Paspalidium rarum*

are abundant and distributed throughout the plant. The spikelets are small, plump, awnless, and often hairless. Almost always they are borne on short, erect, slender racemes widely spaced along the axis. Within the raceme, the spikelets are densely or rather loosely arranged on one side of the rhachis in 2 rows or sometimes irregularly. The rhachis of each raceme terminates in a stiff, slender bristle, a feature which readily distinguishes this group from closely related ones.

GENERIC CHARACTERS

Spikelets solitary or rarely in pairs, pedicellate, awnless, often glabrous, turgid or somewhat dorsally compressed, flattened or slightly depressed on the front and convex (often strongly so) on the back, falling entire from the pedicels, secund and mostly biseriate on the triquetrous rhachis of sessile or subsessile spiciform racemes. *Florets*, 2; lower male or reduced; upper bisexual, plano-convex in profile, glabrous. *Glumes* usually membranous and dissimilar; lower minute or up to (rarely over) half as long as the upper one, enclosing the base of the spikelet; upper usually equalling the spikelet or almost so, rounded on the back. *Lower lemma* similar to the upper glume, but \pm flat or depressed on the back. *Palea* absent (in the central Australian species) or thinly membranous, subequal to the lemma, with inflexed flaps. *Upper lemma* coriaceous to crustaceous, faintly nerved. *Palea* similar in texture and subequal to the lemma, 2-keeled; keels tightly embraced for their full length by the firm involute margins of the lemma. *Caryopsis* tightly enclosed by the indurated lemma and palea. *Inflorescence* of racemosely arranged, simple or rarely branched racemes; these distant and usually loosely appressed on a common axis, forming a narrow continuous or interrupted panicle; the panicle sometimes reduced to an elongated, simple raceme of solitary and paired spikelets; rhachis terminating in a firm, usually scabrous bristle of variable length; pedicels widened and concave at the apex.

KEY TO THE SPECIES

- A. Inflorescence a panicle of racemosely arranged racemes.
 - B. Annual or biennial. Lower racemes 2-3.5 cm long. Lower glume 3-nerved. Culms glabrous. 101. *P. clementii*
 - B. Perennial. Lower racemes 0.5-1.7 cm long. Lower glume 5-nerved. Culms pubescent. 102. *P. constrictum*
- A. Inflorescence a simple, elongated raceme of distant, solitary or paired spikelets, rarely paniculate in the lower part. 103. *P. rarum*

101. Clement's Paspalidium

Paspalidium clementii
Plate 54a

GENERAL DESCRIPTION

HABIT: Slender annual or short-lived perennial, 15-30 cm high, in dense leafy tufts.

STEMS: Erect or bent at the nodes and spreading from the base, hairless, 2-6-noded, branched, thin.

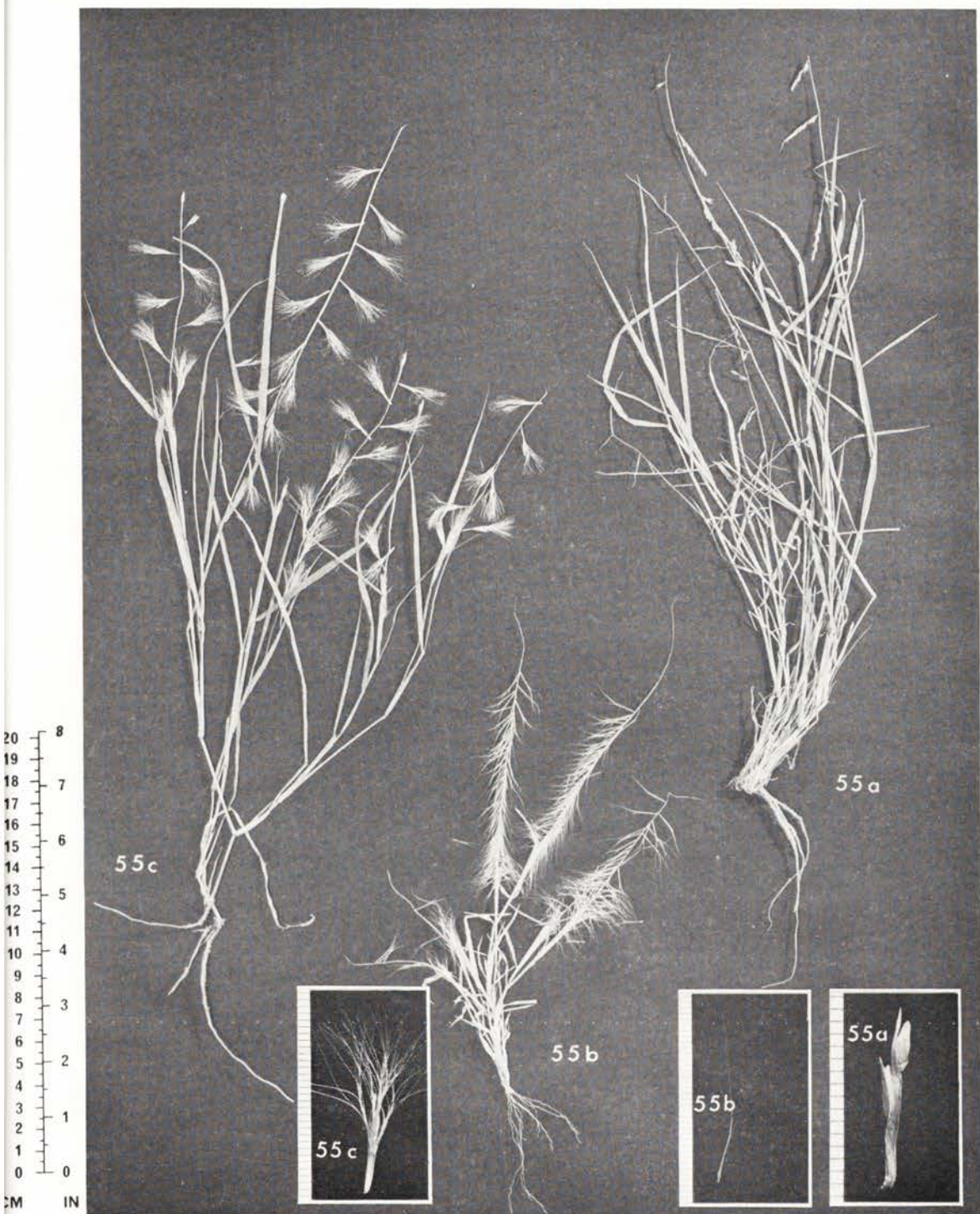


PLATE 55. (a) *Paractaenum novae-hollandiae*; (b) *Perotis rara*; (c) *Plagiosetum refractum*

LEAVES: Almost entirely hairless, many-nerved. Blades up to 15 cm long, usually flat, soft, thin, flaccid, gradually tapered to a long fine weak point, thickened and rough on the edges, sometimes sprinkled with tubercle-based hairs, when young usually rough from short bristles. Sheaths loose, thin, covering half to the entire internode.

SEEDHEAD: The tuft produces numerous extremely narrow terminal panicles up to 15 cm long, which are often exceeded by, or partly enclosed in, the uppermost leaves. The panicle consists of simple or sometimes divided racemes up to 3.5 cm long, which are appressed to the axis and usually widely spaced in the lower part, but contiguous above. On the raceme the small, blunt, hairless, often purplish spikelets are loosely arranged, usually in a single row.

OCCURRENCE: A rarely collected plant known only from the northern half of the area, occurring in isolated tufts often in shady sites. In Heavitree Gap and Palm Valley it grows near waterholes and in crevices. There are also some records from sandy red earths under mulga. Though mainly summer-growing, under certain conditions plants may flower as late as September.

DISTRIBUTION: W.A., Q.

VALUE: The soft foliage is palatable to stock, but the grass is not important in pasture as distribution is sporadic and restricted.

BOTANIC DESCRIPTION

Panicle terminal, shortly exserted, linear, rather loose, usually interrupted in the lower part, < 15 (usually 6–10) cm long; axis glabrous, scaberulous, terete or grooved on one side in the lower part, becoming compressed-angular upwards. *Racemes* 2–3.5 cm long, shorter upwards, erect, the lower ones sometimes branched and subsessile; rhachis scabrous, the terminal bristle sometimes curved, much shorter to slightly longer than the terminal spikelet; peduncles (when present) slender, angular, scabrous, appressed. *Spikelets* solitary, sometimes subtended by a bristle, loose to rather crowded, oblong-elliptic, ± obtuse, 2–2.75 mm long, subsessile to shortly pedicellate; pedicels 0.25–0.75 mm long, scabrous. *Glumes* thinly membranous, unequal, glabrous, smooth; lower prominently 3-nerved, acute, broadly ovate, about half as long as the spikelet; upper acute to subobtuse, 7-nerved, broadly elliptic-oblong to elliptic-ovate. *Fertile floret* subequal to the spikelet, ± shiny, oblong-elliptic. *Upper lemma* obtuse to subacute, rugose or rugulose, rounded on the back, shiny. *Palea* flattened, acute, with smooth shiny margins.

102. Knotty-butt Paspalidium

Paspalidium constrictum
Plate 54b

GENERAL DESCRIPTION

HABIT: Erect or spreading perennial, 22–45 cm high, forming compact tussocks from a thickened, knotty, hairy butt.

STEMS: Particularly numerous, wiry, much branched, terete or angular, often

bent at the lower nodes, densely covered by minute bristly reflexed hairs; nodes several, hairy, thick, prominent.

LEAVES: Sheaths and usually the blades rough upwards with minute, bristly, reflexed hairs. Blades up to 15 cm long, flat or folded, with thickened edges, many-nerved (the midnerve prominent), sometimes sprinkled with long fine hairs arising from hard wart-like tubercles. Sheaths loose, usually with dense hairs at the mouth, the edges thin and transparent.

SEEDHEAD: Panicle up to 11.5 cm long (but mostly 6–8.5 cm) and 5 mm wide, terminal on the culms and often barely exceeding the upper leaves. The small, green, hairless, rather plump spikelets are loosely crowded in two or more irregular rows on racemes 5–17 mm long and scattered along the axis of the panicle. As with other members of the genus, the rachis of the raceme terminates in a stiff bristle and in this species a similar bristle can be present close below each spikelet.

OCCURRENCE: Similar in distribution to Clement's *Paspalidium* but more widespread and occurring also in spinifex dune fields on clayey sands, on shallow, sandy, calcareous soils under gidgee, and in shallow drainage channels under coolibah. The growth habit is also similar, plants flowering throughout the year if rainfall is adequate.

DISTRIBUTION: Q., N.S.W.

VALUE: A soft-leaved, probably palatable plant, but thriving mainly in protected or inaccessible sites.

BOTANIC DESCRIPTION

Panicle terminal, shortly exerted, 6–11.5 (mostly –8.5) cm long and <0.5 cm wide, usually interrupted in the lower part; axis and peduncle striate, terete or angular upwards, densely scabrous-pubescent. *Racemes* erect, mostly 5–10 (rarely –17) mm long, much shorter upwards, rarely branched, usually with a few reduced spikelets at the base. *Spikelets* 2.5–2.75 mm long, turgid, glabrous, ± acute, mostly solitary, rather irregularly crowded, shortly pedicellate to sessile, often subtended by a short stiff scabrous bristle; pedicels scabrous-pubescent, unequal, terminals <1.5 mm long, laterals about 0.25 mm long. *Lower glume* distant from the upper glume, 5-nerved, shortly acuminate, glabrous, smooth, broadly ovate, slightly more than half as long as the spikelet. *Upper glume* glabrous, smooth, 7–9-nerved, acute to subobtusate, broadly elliptic. *Lower lemma* as long as the spikelet, 5 or sub-7-nerved, glabrous, smooth, broadly elliptic-ovate, acute. *Fertile floret* subequal to the spikelet, broadly elliptic, acute to subobtusate, constricted and bent at the tip, rugose, shiny. *Palea* acute, rugulose, with smooth shiny margins.

103. Rare *Paspalidium*

Paspalidium rarum

Plate 54c

GENERAL DESCRIPTION

HABIT: Loosely tufted annual, sometimes long-lived, usually 15–22 cm high but occasionally 30–37 cm. Characteristically the stems spread from the base and

sometimes root from the lower nodes before gradually becoming erect.

STEMS: Branched, 3–5-noded, bent and often clustered at the nodes, sometimes shiny, \pm hairless and smooth.

LEAVES: Mostly hairless, but slightly rough with minute bristles. Blades flat or folded, short, narrow, long-pointed, occasionally sprinkled with tubercle-based hairs. Sheaths loose and thin.

SEEDHEAD: Unlike the panicle of the two previous species, the head is with few exceptions a narrow, spiciform raceme up to 14 cm long, with the numerous minutely stalked spikelets attached directly to the rhachis. This is flat, minutely bristly, and wavy, with the pale green plump spikelets closely appressed. The spikelets occur singly or in pairs and are closely, though irregularly, spaced. At the base of each spikelet (or pair of spikelets) there is a short, stiff, flat bristle. On ripening the spikelet falls as a whole, leaving only the bristle and minute stalk on the rhachis. The seedheads are produced in abundance throughout the plant. Usually those near the base are partly enclosed by the floral leaves, while the terminal ones when mature slightly exceed the uppermost leaves.

OCCURRENCE: Sporadic and not known south of Argadargada, though perhaps more widespread than records indicate. It occurs on clayey red earth and alluvial soils of medium to fine texture, in association with short grasses and forbs, mulga, coolibah, and Mitchell grasses; also on shallow or skeletal soils with gummy spinifex under a sparse cover of low trees and shrubs. It is a rapid-growing summer grass normally flowering in February and early March, though persisting for longer periods with suitable rainfall.

DISTRIBUTION: W.A., N.T., Q., N.S.W.

VALUE: A softly herbaceous plant highly palatable to stock, but sporadic and usually early-maturing and consequently of only limited value.

BOTANIC DESCRIPTION

Inflorescence an elongated raceme of solitary and paired spikelets, sometimes branched in the lower part forming a simple panicle; the lower racemes (when present) with up to 4 spikelets, erect, distant; inflorescence linear, mostly 5–10 cm long and 3–4 mm wide, at length exserted; common rhachis stout, compressed, glabrous, scabrous, terminating in a flat stiff bristle. *Spikelets* 3–3.5 mm long, turgid, acute or \pm obtuse, glabrous, approximate or rather distant, generally subtended by a bristle, shortly pedicellate; pedicels stout, scabrous, 0.25–1.5 mm long. *Lower glume* glabrous, smooth, 5–7-nerved, broadly ovate, somewhat distant from the upper glume, slightly over half as long as the spikelet, acute-apiculate. *Upper glume* 7–9-nerved, broadly elliptic, acute, glabrous, smooth. *Lower lemma* as long as the spikelet, 5–7-nerved, glabrous, smooth, broadly elliptic, acute, with a constricted indurate tip. *Fertile floret* subequal to the spikelet, indurate. *Lemma* elliptic, shiny, coarsely rugose, with a curved apiculate tip. *Palea* elliptic, \pm flat on the back, coarsely rugose, with shiny smooth incurved margins, acute, minutely apiculate, with a prominent basal globular-obovate callosity.



PLATE 56. (a) *Phragmites karka*; (b) *Plectrachne schinzii*

104. Comet Grass

Perotis rara
Plate 55b

GENERAL DESCRIPTION

HABIT: Slender tufted annual or short-lived perennial, 15–30 cm high; characteristically the tufts spread from the base and are \pm equal throughout in width.

STEMS: Erect or bent at the lower nodes, numerous, simple or branched near the base, hairless, smooth, with several nodes.

LEAVES: Blades 1.5–4 cm long, flat and broad or folded, shortly pointed, with spine-like tubercle-based hairs on the lower edges, otherwise usually hairless. Sheaths tight or loose, mostly hairless, covering half to almost the entire internode, with thin transparent edges; the mouth bearded with coarse, stiff hairs, which sometimes extend along the lower edge of the blades.

SEEDHEAD: Spiciform, 10–28 cm long, up to 5 cm wide, terminal on the culms and comprising over half the plant; spikelets numerous, crowded on the axis, first erect but later spreading and finally reflexed, giving a distinctive comet-like appearance. The spikelet is 2–3.5 cm long (incl. awns), extremely narrow, rough with minute bristles, with a spear-like shortly hairy base and 2 long slender terminal awns. On ripening of the head from the top downwards, the spikelets fall entire from their minute, curved stalks, exposing the axis which is deeply grooved or angular, bristly, and tapered to a long, fine point.

OCCURRENCE: The species occurs throughout the area on sandy and alluvial soils on river levees, sand plains, and dune fields, often forming dense, locally dominant colonies. Normally it behaves as an annual and flowers soon after summer rains.

DISTRIBUTION: W.A., N.T., Q., N.S.W., E-A.

VALUE: When young, comet grass is considered nutritious and valuable. On maturity the hardened, spear-like seeds are known to cause injury to horses (Chippendale and Murray 1957).

BOTANIC DESCRIPTION

Inflorescence spiciform, terminal, at length prominently exerted, 10–28 cm long, 2.5–5 cm wide; rhachis angular, scabrous, gradually tapered and capillary upwards. *Spikelets* numerous, solitary, sessile, subulate, 2–3.5 cm long (incl. awns), falling entire from the minute, erect or reflexed pedicels; callus laterally compressed, acute, about 1 mm long, with short stiff hairs on the angles. *Glumes* 1-nerved, keeled, scabrous-ciliate on the keel, narrowly linear-lanceolate (flattened), each attenuate into a capillary scabrous awn at least as long as the glume itself; lower glume firmly membranous to cartilaginous, scabrous on the surface, scabrous-ciliate on the keel and in the upper part on the margins, 7–10 mm long (excl. awn); upper glume narrower and slightly shorter, membranous, hardened on the thickened keel, glabrous, smooth, tightly embraced by the lower. *Lemma* hyaline, 1-nerved, narrowly keeled, glabrous, smooth, ovate-triangular (flattened), acute, 1.25–1.5 mm long. *Palea* delicate, hyaline, flattened, narrowly oblong, nerveless, subequal to the

lemma. *Caryopsis* linear-subulate, smooth, about 4 mm long, pale pink, with a broad, shallow, longitudinal groove, free from the lemma and palea, tightly embraced by the upper glume.

105. Tropical Reed
(bamboo)

Phragmites karka
Plate 56a

GENERAL DESCRIPTION

HABIT: Robust bamboo-like perennial, usually 1.8–2.1 m high but sometimes up to 3.6 m, growing from a long branching rhizome, forming compact tussocks up to 90 cm wide or large dense groves of single-stemmed plants.

STEMS: Cane-like, many-noded, up to 12 mm wide, hairless, smooth, shiny, unbranched, mostly covered by the sheaths, often bluish and powdery below the nodes.

LEAVES: Blades up to 30 cm long and 2 cm wide, flat, almost entirely hairless, gradually tapered to an extremely long fine point, bluish-green when young, with several prominent nerves and numerous fainter ones; midnerve white and prominent on the under-surface; edges thickened, sharp, rough; surface roughened by minute bristles and tubercles. Sheaths broad, tight at first, becoming rather loose, strongly nerved, with thin smooth edges.

SEEDHEAD: Panicle usually 19–30 cm long and 10–15 cm wide, open, silky-hairy, plume-like, purplish-brown, terminating long culms, with spreading, extremely slender, much-divided branches in clusters scattered along the axis. The spikelets are borne on long, thin stalks terminating slender branchlets and are partly concealed by extremely fine, silky-silvery hairs 6–12 mm long. The spikelet has a number of florets, each one terminating in a long, awn-like bristle.

OCCURRENCE: Tropical reed occurs in Palm Valley, forming dense stands on the fringe of perennial waterholes. Though apparently rare, it probably occurs in similar sites elsewhere.

DISTRIBUTION: W.A., N.T., Q., E-A.

VALUE: Too coarse to be of fodder value.

BOTANIC DESCRIPTION

Panicle 19–30 cm long or more, mostly < 15 cm wide, scarcely exceeding or shorter than the uppermost leaf, plumose, decompound, diffuse but rather dense; axis glabrous, scabrous, stout and terete in the lower part, angular and filiform upwards; branches angular, scabrous, filiform, clustered or the upper solitary, distant, usually pubescent in the axils; branchlets and pedicels filiform, scaberulous, the latter 1.75–3 mm long. *Spikelets* solitary, widely gaping at maturity, \pm cuneate in outline, 1.3–1.9 cm long; rhachilla disarticulate above the glumes and between the florets or usually continuous between the upper glume and lowest floret, slender, glabrous, the internodes about 0.25 mm long. *Florets* usually 3–6; the lowest one male or neuter, the remainder bisexual or the uppermost usually reduced. *Glumes* thinly membranous or scarious, acuminate, cuspidate, \pm rounded on the

back, glabrous, smooth, 3 or sub-5-nerved; lower 3.5–5 mm long, lanceolate or lanceolate-ovate, enclosing the base of the spikelet, separated from the upper one; upper about twice as long, narrowly lanceolate. *Lemmas* thinly membranous, glabrous, smooth, \pm rounded on the back, loose; the lowest one 10–18 mm long, linear-lanceolate, acuminate, cuspidate, 3 or sub-5–7-nerved, with the lateral nerves submarginal; upper lemmas narrowly linear-lanceolate, long-acuminate, 1–3-nerved, 10–15 mm long but becoming shorter upwards, tapered to a long slender bristle-like point; callus slender, obtuse, about 1 mm long, bearded with extremely fine silky hairs 6–12 mm long, which partly conceal the spikelet. *Palea* 3.5–5 mm long, narrowly linear-oblong, acute-acuminate, glabrous, smooth, 2-keeled, scabrous on the keels, subhyaline, with hyaline narrow obtusely incurved margins. *Caryopsis* subterete, oblong, loosely enclosed by the lemma and palea.

106. Bristle-brush Grass

Plagiosetum refractum
Plate 55c

GENERAL DESCRIPTION

HABIT: Tufted leafy annual or sometimes short-lived perennial, 22–37 cm high, spreading or sometimes decumbent. Plants are almost entirely hairless.

STEMS: Erect or more often bent, particularly at the lower nodes, branched (usually strongly so near the base), often angular and grooved, smooth or rather rough, 3–5-noded; lower nodes usually thickened and prominent.

LEAVES: Blades up to 19 cm long, rather broad, thin, flat or loosely folded, tapered to a long fine point, strongly nerved, with sharp rough edges, sometimes sprinkled on the upper surface with short tubercle-based hairs or bristles. Sheaths thin, loose, strongly nerved, rather rough, about as long as the internodes, densely bearded with erect hairs at the mouth.

SEEDHEAD: Panicle racemose, up to 13 cm long (though often much shorter), 2.5–4 cm wide, usually shorter than the uppermost leaf, very distinctive, consisting of few solitary spikelets in widely spaced racemes 2–2.5 cm long. Each raceme bears usually 1 spikelet or sometimes 2, rarely 3. The rhachis of the raceme and axis of the panicle are flat and ribbon-like, and characteristically the rhachis terminates in a dense tuft of pale or purplish, slender, hair-like bristles as long as the rhachis itself. The racemes are first erect on the axis, but spread with age finally to a reflexed position. At maturity the entire raceme bearing the spikelet or spikelets falls from the axis.

OCCURRENCE: A plant of sporadic occurrence on deep, sandy soils, known from creek banks and near water generally, but particularly characteristic of sandhill communities, commonly in association with reverse grass, sandhill cane grass, and beetle grasses. Plants flower from May to early September, but probably grow also in the summer months.

DISTRIBUTION: W.A., S.A., Q., N.S.W.

VALUE: Evidently not grazed.

BOTANIC DESCRIPTION

Inflorescence an open racemose panicle, terminal on culms and branches, usually exceeded by the uppermost leaf, < 13 cm long (but often much shorter), 2.5–4 cm wide, linear-oblong in outline; axis and branches flattened and ribbon-like, < 0.75 mm wide, strongly nerved, scabrous on the nerves and thickened edges. *Racemes* (panicle-branches) solitary, remote or distant, erect but soon spreading and finally reflexed, deciduous; each one (primary branch) bearing usually 1 spikelet (sometimes 2 or rarely 3), divided into 3–6 (usually 4) sterile secondary branches which terminate in bristle-like branchlets, 2–2.5 cm long (incl. bristles); the bristles (branchlets) unilateral, slender but stiff, spreading, scabrous-ciliate, 10–13 mm long, much exceeding the spikelet(s). *Spikelets* 7 mm long, few, sessile or subsessile, falling with the raceme, lanceolate, acuminate, somewhat dorsally compressed, \pm plano-convex in profile. *Glumes* thinly coriaceous, with narrow scarious margins, acuminate, scaberulous upwards or smooth, glabrous; lower 4–4.25 mm long, lanceolate-ovate, 5 or sub-7-nerved, enclosing the base of the spikelet; upper as long as the spikelet, lanceolate, 15–17-nerved, somewhat rounded on the back, with incurved margins. *Lower lemma* without a palea, flattened, otherwise similar to the upper glume. *Upper lemma* 4.5–4.75 mm long, firmly cartilaginous, oblong-elliptic, apiculate, faintly 3-nerved, punctate, ciliate upwards or glabrous, somewhat rounded or \pm flattened on the back, with involute margins which embrace the keels of the palea. *Palea* thinly 2-keeled, with incurved smooth scarious \pm shiny margins, flattened between the keels, otherwise similar to the lemma.

107–115. Spinifex Grasses

Plectrachne and *Triodia* spp.

In central Australia, as in most other arid parts of Australia, the spinifex grasses are well represented and nine species characterise about two-thirds of the total area. The major part of this country comprises firstly, extensive areas of sand plains, dune fields, and plains chiefly on the margins of the region and secondly, a well-developed central mountain system with branches to the northeast and north. Though much the larger of the two types in area, the lowlands carry only two major species (lobed spinifex, and in the northern part feathertop). The remaining species occur for the most part on the uplands or associated areas. Of these the majority are localised, and only weeping, soft, and to a lesser extent spike-flowered spinifex in the centre, north, and northwest respectively are of noteworthy occurrence.

The spinifex group consists of two closely related genera: *Triodia* and *Plectrachne*, which can be recognised by a number of characteristic features. Probably the most outstanding is the evergreen blades, which are tightly rolled, hard, and taper to rigid, needle-like points. In some species (gummy, curly, feathertop, and long-leaved) the sheaths of the blades are resinous on the surface and often particularly viscid or gummy when green. All members of the group are long-lived, evergreen, tussock-forming perennials. The tussocks sometimes develop into gradually enlarging rings with open centres, produced by death of the mature central tillers and the

production of new growth on the margins. This ring-forming habit is found commonly in lobed spinifex, less so in gummy and spike-flowered, and occasionally in curly spinifex.

In structure the spikelet consists of two glumes containing a number of florets. The florets are attached on opposite sides of a short rhachilla and overlap to form two vertical rows. Their most distinctive feature is the presence of 3 lobes or teeth at the apex of each lemma. Within the genus *Triodia*, these lobes are generally small and teeth-like, but can be large and conspicuous (as in lobed spinifex) or in spike-flowered spinifex entirely absent.

Thus in structure the spikelet resembles that of bandicoot grass (No. 40), where in contrast the central lobe of the lemma is represented by a twisted awn. To a lesser extent, the many-flowered spikelet of *Triodia* resembles that of some love-grasses (*Eragrostis*), which, however, lack the lobing of the lemmas. On the other hand, there is a marked relationship between *Triodia* and *Plectrachne*, which differs chiefly in its long, awn-like lemma lobes and relatively longer glumes.

The spinifex grasses are all sclerophyllous, drought-resisting, strongly lignified (Burbidge 1945, 1946b) plants low in palatability and nutritive value. The more palatable species (feathertop and gummy) provide subsistence fodder for stock, but the majority are virtually worthless. In general, spinifex country is largely undeveloped for grazing, but in some parts areas are utilised as drought reserves.

GENERIC CHARACTERS

TRIODIA: *Spikelets* solitary, pedicellate or sessile, laterally compressed, not falling entire; rhachilla disarticulate above the glumes and below each floret. *Florets* few to many, bisexual or the upper male or neuter. *Glumes* subequal, persistent, scarios or indurate, mostly 1-7 (rarely -13)-nerved, sometimes keeled, glabrous. *Lemmas* distinctly 3-lobed or merely tridentate and then with the midlobe sometimes consisting of a short mucro, scarios or indurate, usually the entire part hairy and 3-nerved, and the lobes \pm glabrous and each with 1 or 3 nerves; callus minute. *Palea* usually as long as the body of the lemma, 2-keeled, the keels usually ciliolate and sometimes winged. *Inflorescence* an open or contracted panicle or rarely a spike.

PLECTRACHNE: Close affinities with the above genus and identical in many characters. However, *Plectrachne* differs by its relatively longer glumes and well-developed, awn-like lobes of the lemmas, which are several times longer than the entire part.

KEY TO THE SPECIES

- A. Spikelets sessile on the main rhachis, forming a linear spike. Lemma entire. 115. *T. spicata*
- A. Spikelets pedicellate on the branches of narrow or open panicles. Lemma tridentate or 3-awned or 3-lobed.
 - B. Lemma prominently 3-lobed, awnless, the lobes distinctly longer than the entire part. Leaf sheaths woolly-tomentose, particularly at the orifice (except perhaps when old). 109. *T. basedowii*

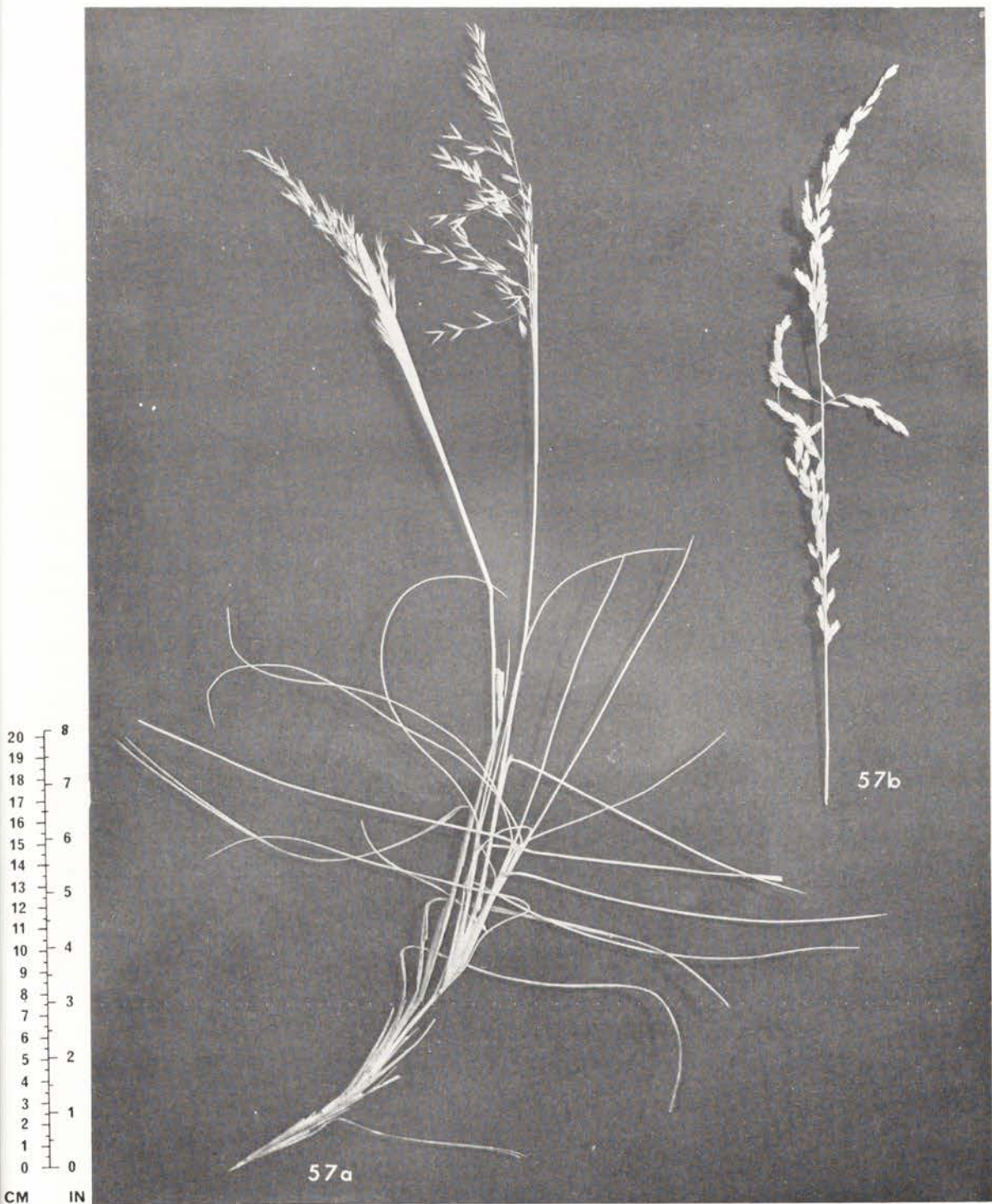


PLATE 57. (a) *Plectrachne pungens*; (b) *Triodia pungens*

- B. Lemma tridentate or 3-awned, or if 3-lobed the lobes much shorter than the entire part. Leaf sheaths glabrous or pubescent, but not woolly.
- C. Glumes 8–20 mm long, as long as or longer than the spikelets (excl. awns).
 - D. Lobes of the lemma awn-like and several times longer than the entire part. Plant resinous on the sheaths or blades. Spikelet oblong-obovate or linear-lanceolate.
 - E. Spikelet oblong or obovate-oblong, 1.5–2 cm long (incl. awns). Body of lemma 2–3 mm long. Glumes 8–12 mm long, 3–5-nerved. 107. *P. pungens*
 - E. Spikelet linear-lanceolate, 2–2.5 cm long (incl. awns). Body of lemma 3 mm long. Glumes 15–20 mm long, 7–11-nerved. 108. *P. schinzii*
 - D. Lobes of the lemma not awn-like, < 1 mm long or the midlobe reduced to an awn < 3 mm long. Plant not resinous. Spikelet cuneate in outline. 112. *T. irritans*
- C. Glumes < 7 mm long, distinctly and usually much shorter than the spikelets at maturity.
 - F. Plant highly resinous on the leaf sheaths.
 - G. Spikelet linear. Lemmas loose, divaricate, narrow, shortly lobed. Palea almost as long as its lemma. Callus laterally bearded. 111. *T. hubbardii*
 - G. Spikelet linear to linear-lanceolate or ovate. Lemmas closely imbricate, erect, broad, deeply lobed. Palea much shorter than its lemma, about as long as or slightly longer than the entire part. Callus evenly bearded. 114. *T. pungens*
 - F. Plant not resinous.
 - H. Leaf sheaths glabrous or almost so. Panicle 20–50 cm long, 1–1.25 cm wide, spiciform, stiffly erect. Spikelet narrowly linear, glabrous or almost so. 113. *T. longiceps*
 - H. Leaf sheaths pubescent at the orifice; the hairs flaccid, < 4 mm long, and extending up the base of the lamina. Panicle 9–15 cm long, 1.8–3.7 cm wide, often drooping, oblong-elliptic in outline. Spikelet ovate or linear-oblong, densely hairy up the middle. 110. *T. clelandii*

107. Curly Spinifex
(soft spinifex)

Plectrachne pungens
Plate 57a

GENERAL DESCRIPTION

HABIT: Tussocks straggly and irregular, 30 cm high and up to 1.2 m wide though often much smaller, rarely forming rings; flowering stems usually 60–90 cm high.

STEMS: Erect, hairless, smooth, simple or branched, 2–4-noded, commonly creeping and rooting from the nodes, often reddish-brown and shiny near the base.

LEAVES: Usually viscid near the junction of blade and sheath, sometimes extremely so all over. Sheaths much shorter than the internodes to slightly longer, usually tight, smooth, hairless or with long soft hairs on the edges and erect shiny hairs about 6 mm long at the mouth; basal sheaths thick and rigid, often brown and shiny, tightly overlapping, sometimes somewhat flattened. Blades 10–25 cm long,

Description of the Species

very narrow, sharply pointed and needle-like, smooth or minutely hairy, widely spreading, green, characteristically curly with age.

SEEDHEAD: Panicle 14–25 cm long, narrow, loose or rather dense; branches erect, thin, undivided, solitary, hairy in the axils; spikelets 15–20 mm long (excl. awns), pale or straw-coloured, usually not crowded, on stalks up to 16 mm long.

OCCURRENCE: This spinifex is known only from the northern part of the area, where on rocky hills with shallow or skeletal soils it occurs as a co-dominant with gummy spinifex under sparse low trees and shrubs such as snappy gum, *Cassia*, and native fuchsia. Near the southern margin of its distribution range (central Mt Wedge), there are also sporadic and minor occurrences on low sand dunes on clayey sands in association with desert oak, wattles, and other spinifex (lobed, feathertop, and gummy).

DISTRIBUTION: W.A., N.T., Q.

VALUE: Regarded as a soft spinifex and more useful than many of its allies, but scarce.

BOTANIC DESCRIPTION

Panicle lanceolate or narrowly oblong, contracted or rather loose, 14–25 cm long; axis channelled, scaberulous or smooth in the lower part; branches solitary, simple, ascending, flexuose, scaberulous, slender, pubescent at the base; pedicels capillary, scaberulous, laterals < 10 mm long, terminals < 1.6 cm long. *Spikelets* oblong or obovate-oblong, 1.5–2 cm long (incl. awns). *Glumes* lanceolate-oblong (flattened), acute or obtuse, sometimes mucronate or aristulate-acuminate, keeled above the middle, thinly chartaceous or scarious, asperulous towards the apex and margins or almost smooth; lower 9–12 mm long, 5-nerved; upper 8–11 mm long, 3 (rarely 5)-nerved. *Florets*, several, the lower 2–4 fertile, the remainder sterile and reduced often to the awns; rhachilla internodes 1.5–2 mm long, glabrous or minutely pubescent; callus acute or subobtuse, < 0.5 mm long, very shortly bearded. *Fertile lemmas* very broad when flattened, rounded on the back, coriaceous, obscurely 3-nerved, 2–3 mm long (excl. awns), pubescent with appressed hairs, with a prominent transverse line or articulation below the awn-like lobes; awns erect or recurved, dilated and narrowly winged at the base, < 1 mm wide, 3-nerved, scaberulous on the margins, laterals < 12 mm long, median < 16 mm long. *Paleas* oblanceolate-oblong or narrowly oblong, obtuse or truncate, 3–3.5 mm long, 2-keeled, glabrous, smooth or scaberulous on the keels above the middle, coriaceous in the lower half to two-thirds, abruptly and thinly hyaline above, the upper part at length splitting from the apex downwards.

108. Feathertop Spinifex
(silvery spinifex)

Plectrachne schinzii
Plates 56b, 58

GENERAL DESCRIPTION

HABIT: Tussocks dense, about 30 cm high and up to 90 cm wide; flowering culms usually numerous, rigidly erect, and 1.2–1.5 m high. The tussocks seldom form rings.

STEMS: Hairless, smooth, strongly branched at the lower nodes, often pale purple or bluish, 2-6-noded; nodes hairless; basal internodes short and wholly covered by the sheaths.

LEAVES: Sheaths tight, hairless, smooth, resinous, with a dense tuft of long silky hairs at the mouth; the upper ones much shorter than their internodes. Blades up to 25 cm long, hairless, smooth, often shiny, needle-like, firmly and sharply pointed, gummy near the sheath and also with scattered droplets of resin on the surface.

SEEDHEAD: Panicle 10-15 cm long, 2.5-3 cm wide, usually dense, exceeding or partly enclosed by the floral leaf, with erect, rough, usually solitary branches; lower panicle-branches up to 6.5 cm long, bearing up to 4 spikelets; the upper ones shorter, with 1 or 2 spikelets. The spikelet is 2-2.5 cm long (incl. awns), shortly stalked, purple or straw-coloured, and has 2-4 fertile florets. Its most distinctive feature is the large glumes, which are 1.5-2 cm long. These remain on the plant after the matured florets have fallen and display a glistening silvery appearance to which the common name refers.



PLATE 58. *Plectrachne schinzii*

Description of the Species

OCCURRENCE: This spinifex is best developed on the sand plains in the northern half of the area, occurring as a dominant or co-dominant with lobed spinifex over extensive areas of open or shrubby grasslands. Though distribution extends to Ayers Rock, it becomes sporadic and localised south of the Macdonnell Ranges. Soils are clayey sands and sandy red earths, with rare occurrences on medium-textured red and yellow earths. Though generally forming grasslands, the species is commonly associated with open woodlands of mulga.

DISTRIBUTION: W.A., N.T.

VALUE: This species is among the more palatable spinifex grasses. The foliage and apparently the large, feathery seedheads are attractive to stock. Nevertheless it provides only subsistence fodder and is utilised mainly as drought reserve.

BOTANIC DESCRIPTION

Panicle exserted or partly enclosed by the uppermost sheath, usually contracted and dense, oblong-lanceolate, 10–15 cm long, 2.5–3 cm wide; axis angular, scaberulous; branches solitary or rarely paired, scabrid, erect, the lower ones < 6.5 cm long and bearing < 4 spikelets, the upper ones shorter and often with 1 or 2 spikelets; pedicels subterete, scabrid, laterals about 2 mm long, terminals much longer. *Spikelets* linear-lanceolate, 2–2.5 cm long (incl. awns), 4–5 mm wide, at length gaping. *Florets*, 4–7, tightly imbricate, the lower 2–4 fertile, the upper sterile and reduced; rachilla-internodes slender, sparsely pubescent, about 2 mm long; callus acute, about 1 mm long, shortly bearded. *Glumes* equal, linear-lanceolate, long-acuminate, 1.5–2 cm long, firmly membranous, keeled or rounded on the back in the lower half, 7–11-nerved, glabrous. *Fertile lemmas* with a transverse line or articulation near the base of the awn-like lobes; the entire part densely pubescent, coriaceous to indurate, about 3 mm long; awns glabrous, scaberulous on the margins, firmly membranous, dilated at the base, the laterals 12–20 mm and the median 20–25 mm long. *Palea* narrowly lanceolate to linear-oblong, 2-keeled, with inflexed margins, obtuse, entire or emarginate, ciliolate on the keels, otherwise glabrous, as long as the entire part of the lemma, firmly membranous or coriaceous in the lower two-thirds, abruptly hyaline above.

109. Lobed Spinifex
(hard spinifex)

Triodia basedowii
Plates 59, 60a

GENERAL DESCRIPTION

HABIT: Tussocks compact or straggly and irregular, 22–37 cm high and up to 75 cm wide; flowering stems 60–120 cm high. Plants are non-resinous and commonly form rings (with open centres) generally 0.9–2.4 m wide, but occasionally up to 7.5 m.

STEMS: Erect or somewhat bent at the nodes, hairless, smooth, branched at the upper nodes, with short internodes; flowering stems often slender, 1–3-noded, with long internodes.

LEAVES: Sheaths with dense woolly hairs particularly near the mouth and on the edges, at times becoming almost hairless and smooth with age, tight, prominently

nerved; those on the flowering stems much shorter than the internodes. Blades 5–25 cm long, narrow, sharply pointed and needle-like, somewhat smooth, rigid, erect or spreading, hairless except for woolly hairs near the sheath.

SEEDHEAD: Panicle usually 6–13 cm long, 1–2.5 cm wide, loose to rather dense, purple when young, at maturity distinctly exceeding the uppermost leaves, with the spikelets solitary on short or long, thin stalks on slender, erect branches, which in the lower part of the panicle are up to 4 cm long. The spikelet is 8–9 mm long, rather broad, blunt at the apex, sparsely hairy, and has 3–6 fertile florets. A characteristic feature of the floret is the 3 broad, sharply pointed, often purplish lobes at the apex of the lemma, which are conspicuous in the spikelet by their relative size.

OCCURRENCE: Undoubtedly this is the most common grass in central Australia and characterises more than half the area. Chiefly it occurs on sand plains and dune fields as the major component of a predominantly grassland community, in which associated plants include low trees and shrubs. The tree and shrub cover varies in density from very sparse to medium-dense and comprises numerous species



PLATE 59. *Triodia basedowii*

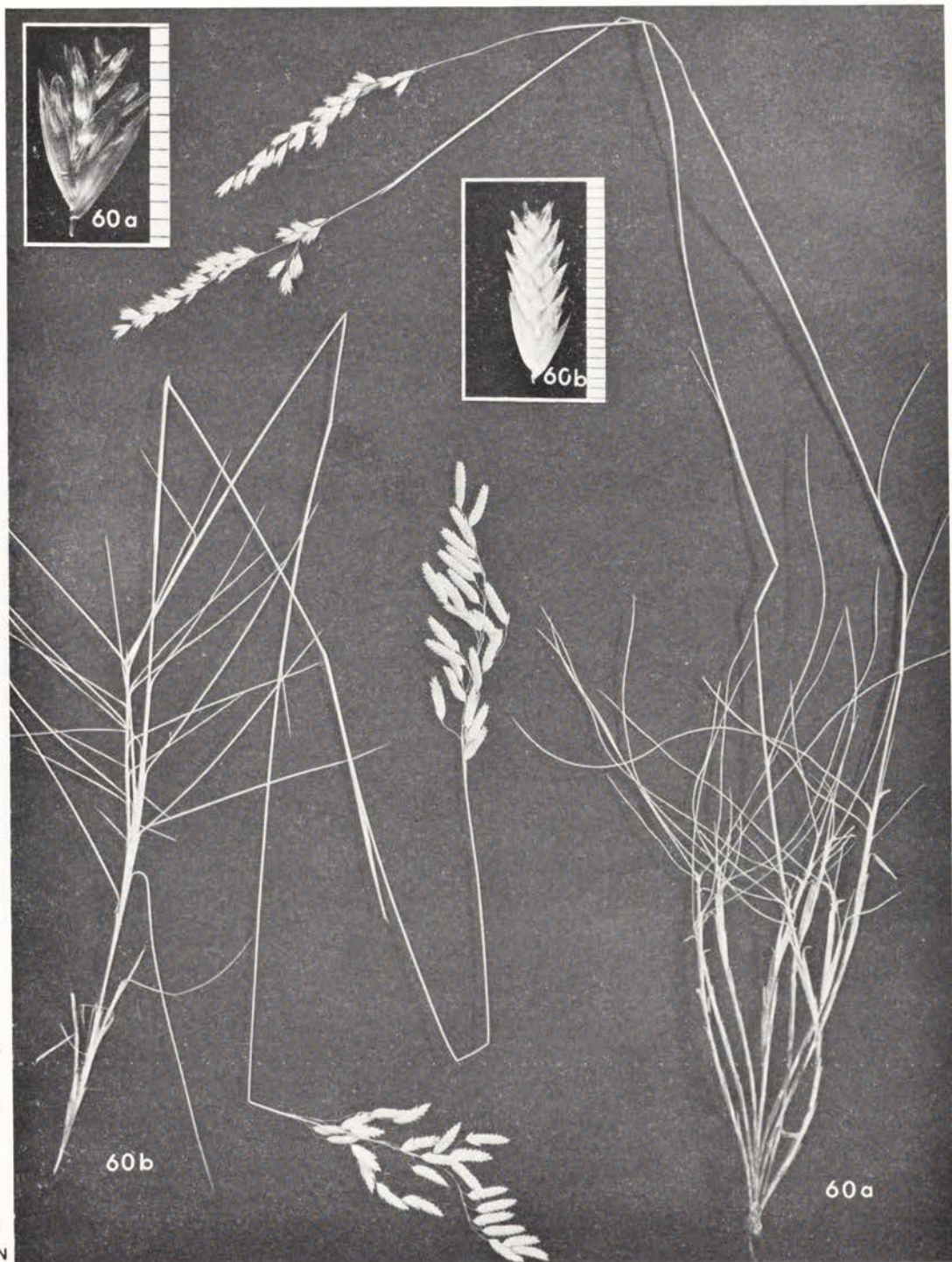


PLATE 60. (a) *Triodia basedowii*; (b) *Triodia clelandii*

represented by wattles, native fuchsia, bloodwood, bottlebrush, hopbush, blue mallee, and desert poplar. In small areas lobed spinifex grows under a well-developed tree cover of desert oak or mulga. Over the entire range of its distribution, soils are red clayey sands or sandy red earths.

DISTRIBUTION: W.A., Q., N.S.W.

VALUE: Lobed spinifex is a coarse, hard plant of low palatability and low nutritive value. It is almost entirely ignored by stock even under extremely adverse conditions.

BOTANIC DESCRIPTION

Panicle 6–13 cm long (rarely longer), 1–2.5 cm wide, loose to rather dense, distinctly exerted; branches erect, slender, < 4 cm long in the lower part, becoming shorter upwards. *Spikelets* 8–9 mm long, 3–8-flowered, cuneate, truncate, about 5 mm wide at the apex, pedicellate. *Glumes* many-nerved, rounded on the back, broad-lanceolate to oblong, obtuse or acute, 6–8 mm long, 2–4 mm wide. *Lemma* with a horny-indurate and pubescent base shorter than the lobes; lobes stiffly scarious, ciliate (rarely with sparse hairs), prominently 3–5 (rarely –7)-nerved; the midlobe acuminate, the laterals obtuse or acute. *Paleas* oblong or obovate, minutely pubescent, scabrid on the nerves, membranous but thinner upwards, ragged, curved over the floral organs.

110. Weeping Spinifex

Triodia clelandii

Plate 60b

GENERAL DESCRIPTION

HABIT: Tussocks compact, 30–60 cm high, 90–120 cm wide, not ring-forming, non-resinous; flowering stems about 90 cm high.

STEMS: Erect, rigid, smooth, hairless; flowering stems strongly nerved, with 2–3 nodes, and long internodes mostly uncovered by the sheaths.

LEAVES: With prominent soft tangled woolly hairs at the mouth and sometimes on the lower part of the blade, otherwise almost entirely hairless and smooth. Sheaths tight, strongly nerved; those on the flowering stems less than half as long as the internodes. Blades 5–14 cm long, needle-like, rigid, dark green when young, with slender though firm sharp points.

SEEDHEAD: Panicle 10–15 cm long, 2–4 cm wide, drooping or nodding to one side, terminal on the culms and prominent above the uppermost leaves. Spikelet usually 12–22 mm long, sparsely hairy, much flattened, purplish or pale golden, often shiny, with 7–15 florets, borne on stalks on the panicle-branches, both of which are extremely slender and covered by minute bristles.

OCCURRENCE: This endemic is common to the central mountain system of the Macdonnell Ranges. It occurs on rocky slopes and terraces in association with sparse low trees and shrubs represented by white cypress, spearwood, mulga, mallees, native fuchsia, and hopbush.

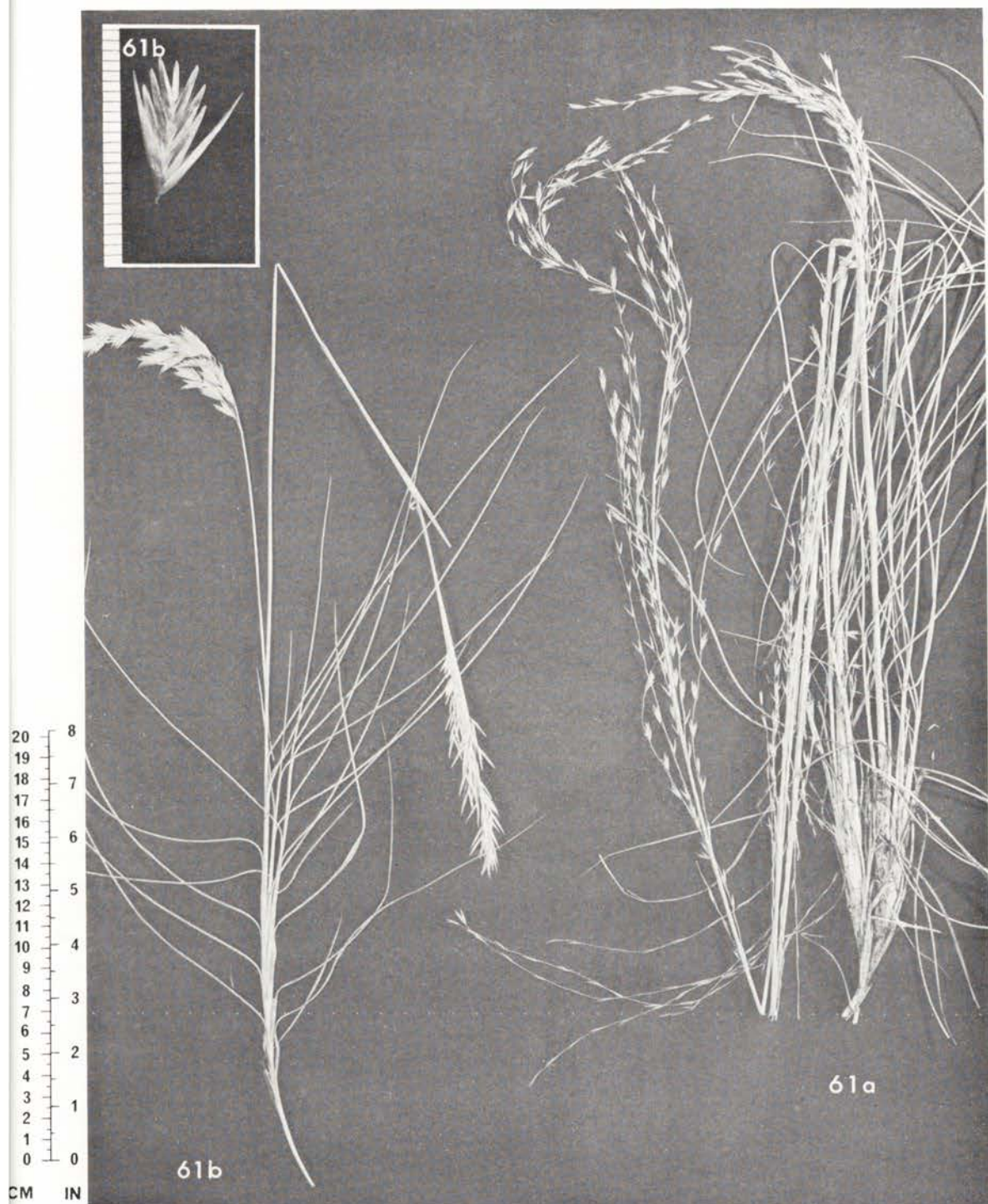


PLATE 61. (a) *Triodia hubbardii*; (b) *Triodia irritans*

DISTRIBUTION: C.A.

VALUE: This is regarded as a hard spinifex of little use as fodder. Furthermore, it occurs usually on rough or inaccessible sites.

BOTANIC DESCRIPTION

Panicle terminal, long-exserted, drooping or nodding to one side, 10–15 cm long, with the spikelets pedicellate on filiform pedicels, which like the branches are minutely scabrid. *Spikelets* ovate to linear-oblong, strongly compressed, 12–22 mm long, 7–15-flowered. *Glumes* lanceolate, acuminate-cuspidate, chartaceous, 7–9 mm long, 3-nerved or sub-4–5-nerved, the midnerve prominent in the upper half. *Lemmas* broadly lanceolate or ovate, densely hairy up the median line on the back and with longer submarginal hairs in the lower third; the 3 lobes less than one-quarter as long as the entire part; lateral lobes usually somewhat shorter than the central lobe, triangular, with acute or acuminate-subulate apices, ciliate on the margins; central lobe linear or almost subulate, with the margins incurved and with sparse minute hairs on the inner face; callus short, densely bearded. Lowest lemma 7–10 mm long. *Palea* elliptic or lanceolate, glabrous or with long hairs on the basal quarter or lower part of the nerves, narrowly winged on the nerves; the wings above the middle ciliate or ciliate; the apex with a very narrow membranous prolongation which, in a folded position, fits into the groove of the central lobe of the lemma.

111. Hubbard's Spinifex

Triodia hubbardii

Plate 61a

GENERAL DESCRIPTION

HABIT: Tussocks up to 90 cm high and several feet wide, the flowering stems 1.2–1.5 m long. Plants are extremely viscid and strongly resinous-scented.

STEMS: Thick, rigid, strongly ridged or grooved, covered by minute hairs when young, becoming hairless or almost so; flowering stems erect, 2–3-noded; nodes hairless or densely woolly hairy.

LEAVES: Sheaths tight, strongly nerved, becoming smooth or almost so, abruptly narrowed and with long, soft, erect or tangled hairs at the mouth, which sometimes extend along the edges; characteristically the basal sheaths closely overlapping and flattened. Blades softer than most spinifex grasses, up to 45 cm long, curved to the ground, at first flat, becoming narrowly rolled, sharply pointed but not needle-like, hairless or sparsely hairy on the surface, smooth or covered by minute bristly hairs.

SEEDHEAD: Panicle 30–60 cm long, rather narrow, slender, loose, prominent above the plant; axis strongly angular, bristly hairy on the ridges. The spikelets are borne singly on long, thin stalks on the panicle-branches. These are erect, wavy or straight, slender, angular, bristly hairy, and in the lower part of the panicle up to 15 cm long or more. The spikelets are 8–14 mm long, narrow, with 5–11 florets borne loosely one above the other. On immature spikelets the florets are wholly enclosed within the purplish glumes.

Description of the Species

OCCURRENCE: Hubbard's spinifex is known only from isolated localities mainly to the west and northwest of Alice Springs. It occurs on steep, rocky slopes, often near gullies and drainage channels, in association with sparse low trees and shrubs.

DISTRIBUTION: C.A.

VALUE: Comparable to gummy spinifex, but usually inaccessible to stock and of minor importance.

BOTANIC DESCRIPTION

Panicle 30–60 cm long, slender, loose, the spikelets pedicellate in lateral racemes; axis angular, scabrous especially on the angles. *Spikelet* 8–14 mm long, 3–4.5 mm wide, 5–11-flowered, linear, with divaricate loose lemmas, when young partly or wholly enclosed in purplish glumes. *Glumes* lanceolate, acuminate-cuspidate, scabrous in the upper half and on the nerves, prominently 3-nerved or sub-7-nerved; lower 7 mm long, obtuse or somewhat ragged, mucronate; upper 5.5 mm long, shortly lobed or \pm trilobate. *Lemmas* indurate on the entire portion, with a double series of short hairs along the median line in the lower half of the back and with similar hairs on the margins; the margins incurved, with a narrow wing extending to the lobes; lobes about one-quarter as long as the entire portion, scaberulous, ciliolate, the lateral ones flat and acuminate, the central one slightly longer and concave-subulate; callus oblique, curved, with a median ridge on the abaxial surface, bearded laterally, the hairs continuous with those of the lemma margins. *Lowest lemma* 5 mm long (incl. callus of 0.5 mm), the 9 nerves \pm evenly spaced in the entire part. *Palea* narrow-elliptic, semi-indurate in the lower two-thirds, thin and scaberulous above, with narrowly winged nerves, the wings ciliolate upwards.

112. Porcupine Grass

Triodia irritans

Plate 61b

GENERAL DESCRIPTION

HABIT: Tussocks compact, non-resinous, up to 60 cm high and 90–120 cm wide, but often much smaller; flowering stems up to 90 cm high, but often less than 30 cm.

STEMS: Strongly branched at the upper nodes; lower internodes covered by the sheaths. Flowering stems slender, erect, mostly uncovered, 1–2-noded, hairless, smooth.

LEAVES: Sheaths smooth, hairless or with few long, extremely fine hairs at the mouth; sheaths on the flowering stems becoming loose and flat with age, thinner and usually with shorter blades than the basal ones. Ligule fringed with dense short hairs. Blades usually slender but rigid, needle-like, with fine but firm sharp points, 7–22 cm long, narrow, greyish or bluish-green, hairless and smooth.

SEEDHEAD: Panicle 10–20 cm long, 1–2.5 cm wide, maturing golden brown or straw yellow, often partly enclosed by the uppermost sheath; branches up to 6 cm long, erect, slender, bristly, bearing the solitary spikelets on thin stalks 5–15 mm long. The spikelet is 15–20 mm long, 6–8 mm wide at the apex, flattened, hairy, with

5–10 florets, and two distinctive glumes. These are as long as the spikelet itself or longer, tapered to a long fine point, and divaricate, thus giving the spikelet a wedge-shaped outline.

OCCURRENCE: Porcupine grass is the common spinifex of southern Australia and known in central Australia from only few, disjunct localities in the southern half. It occurs on sandstone and quartzite rocks, generally in rugged places such as Mt Olga, Mt Connor, and Gosse Range. The sparse shrubs and low trees usually in association include wattles, fig, and native fuchsia.

DISTRIBUTION: M. (excl. N.T.).

VALUE: Of no fodder value in central Australia.

BOTANIC DESCRIPTION

Panicle 10–20 cm long. *Spikelet* 1.5–2 cm long, 5–10-flowered, pedicellate, ± cuneate in outline; pedicels 5–15 mm long, slender, spreading. *Glumes* subequal to the spikelet, longer than the lowest lemma, lanceolate, acuminate, ± keeled, 3 or sub-5-nerved. *Lemmas* lanceolate, scaberulous, silky hairy on the base and median line, the lateral nerves in the 3 groups on the entire portion short and poorly developed, the midnerve continued as a short awn as long as the lateral lobes or < 2 mm longer, the lateral lobes < 1 mm long, acute or obtuse, enervate; callus and joints of the rhachilla silky hairy. *Lowest lemma* 6–12 mm long. *Palea* 3.5–6 mm long, linear or elliptic, glabrous on the back, the 2 nerves thickened towards the base and ciliate upwards.

113. Giant Grey Spinifex (porcupine grass)

Triodia longiceps
Plates 62, 63a

GENERAL DESCRIPTION

HABIT: Tussocks up to 2.4 m high and 6 m wide, but more commonly 0.6–0.9 m high and 1.2–1.8 m wide, not ring-forming, non-resinous.

STEMS: Hairless, smooth, strongly branched from the lower nodes, purple when young, thick, rigid; flowering stems usually 2–3-noded, often with short sheaths and blades.

LEAVES: Sheaths hairless except for short hairs at the mouth, smooth, tight, grey-green, firm, noticeably narrowed at the mouth. Blades thick, extremely rigid, with hard, sharp, needle-like, pale brown points, bluish-green, hairless, smooth, 10–25 cm long or more.

SEEDHEAD: Panicle 20–50 cm long and 1–1.5 cm wide, spiciform, interrupted or rather dense and continuous, usually slender, terminal and prominent on the culms; panicle-branches mostly 4–7.5 cm long (though shorter in the upper part), slender, undivided, sometimes few and widely spaced, stiffly erect and usually appressed to the axis. Spikelets 8–20 mm long, narrow, hairless or almost so, purplish or greenish-golden, solitary or rarely in pairs, on short slender stalks on the panicle-branches; each one with 6–21 rather loose or closely overlapping florets.

Description of the Species

OCCURRENCE: This spinifex is found mainly north of the Macdonnell Ranges, but extends further south in the eastern part of the area. Localised stands of minor extent occur generally in calcareous areas on rocky hills or gentle slopes liable to flooding from adjacent hills. Soils, developed commonly on basic rocks, are skeletal or shallow, sandy red earths and gritty clayey sands, and, to a lesser extent, deeper texture contrast soils. Associated plants include gidgee, snappy gum, mallees, witchetty bush, turkey bush, and in saline areas old-man saltbush, *Bassia*, and bluebush.

DISTRIBUTION: W.A., N.T., S.A., Q.

VALUE: This is probably the largest and coarsest spinifex and is rarely, if ever, grazed.

BOTANIC DESCRIPTION

Panicle 20–50 cm long, slender, the spikelets racemose on slender lateral branches. *Spikelet* linear, 6–21-flowered, 8–20 mm long, 2–3 mm wide. *Glumes* lanceolate to ovate, 1-nerved and keeled, 3.5–4 mm long, acute or acuminate. *Lemmas* lanceolate, indurate,



PLATE 62. *Triodia longiceps*

glabrous or with a basal tuft of short hairs associated with the minute callus, sometimes puberulous and ciliolate on the margin, 4–4.5 mm long, with 3 groups of 2 or 3 obscure nerves in the lower part, the central nerve of each group extending into the corresponding small acute or obtuse lobe at the apex; the midlobe sometimes mucronate. *Paleas* subequal to their lemmas, glabrous, oblong or lanceolate, with winged nerves, the wings visible in the spikelet; the apex ragged or with a narrow point fitting into the midlobe of the lemma.

114. Gummy Spinifex
(soft spinifex)

Triodia pungens
Plates 57b, 64

GENERAL DESCRIPTION

HABIT: Tussocks straggly and irregular, 23–90 cm high and 15–150 cm wide; flowering stems usually 60–90 cm high. Ring formation occurs, but is not common. Invariably the leaf sheaths are coated with a resinous gummy secretion which is often plentiful on new growth, but may wear off on old plants. A common feature is the production of lengthy stolons or runners from which new plants develop.

STEMS: Hairless, smooth, erect or slightly bent at the nodes, non-resinous; flowering stems 2–4-noded, mostly uncovered by the sheaths.

LEAVES: Sheaths usually hairless except for long hairs (usually matted with resin) at the mouth, tight at first but becoming loose with age, smooth and often shiny; the basal ones numerous, tightly overlapping and characteristically flattened. Blades open and \pm flat when young, but soon becoming rolled and needle-like, relatively slender with sharp but not hard points, spreading, hairless and smooth, resinous near the sheath, 30 cm long or more but variable, often becoming flat and curly or twisted on drying.

SEEDHEAD: Panicle 10–30 (mostly 15–25) cm long, usually narrow, loose to rather dense; axis angular, bristly hairy, often wavy; branches slender, erect or sometimes spreading, angular or flattened, minutely bristly like the axis, up to 5 cm long in the lower part of the panicle. The spikelets are sometimes few or numerous, purplish or straw-coloured, mostly 8–12 mm long, flattened and fairly broad, almost hairless, and solitary on stalks of variable length on the panicle-branches.

OCCURRENCE: In central Australia gummy spinifex is best developed in the northern part of the area, occurring on plains and rocky hills, often intermixed with other spinifex. Though distribution extends south to Ayers Rock, the small, sporadic areas in the southern half are often confined to somewhat favoured sites.

Soils are commonly shallow or skeletal, but include deep, clayey sands and red earths of coarse or medium texture. Associated plants include a variety of low trees and shrubs represented by snappy gum, witchetty bush, mulga, mallees, coolibah, bloodwood, wattles, turkey bush, and native fuchsia.

DISTRIBUTION: W.A., N.T., Q.

VALUE: Gummy spinifex is softer and generally more palatable than many spinifexes. An evergreen plant, it does not deteriorate to the same extent during

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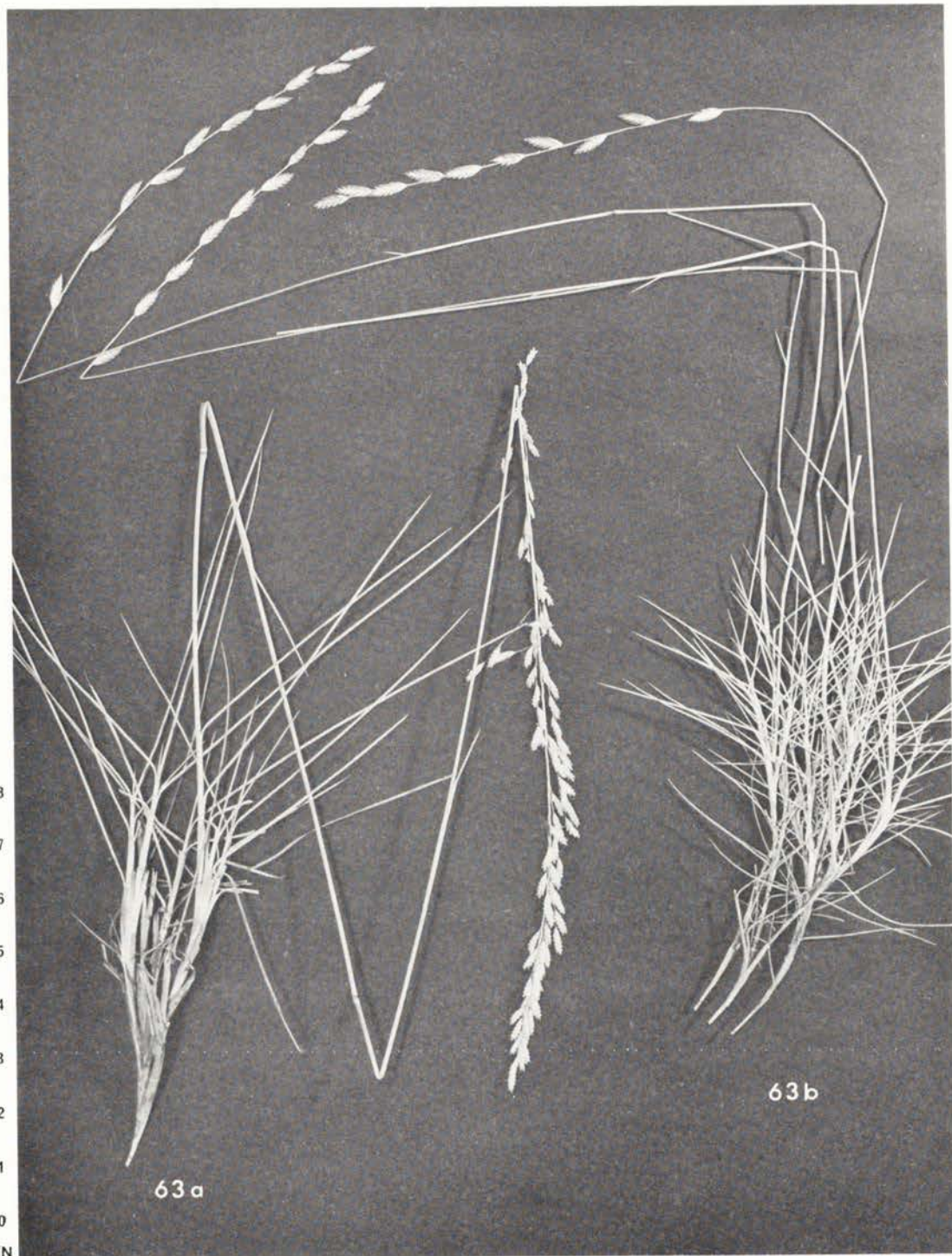


PLATE 63. (a) *Triodia longiceps*; (b) *Triodia spicata*

unfavourable periods as many normally better grasses. Consequently it is commonly utilised as a drought reserve.

BOTANIC DESCRIPTION

Panicle loosely pyramidal, 10–30 cm long; the spikelets \pm pedicellate on the lateral branches, sometimes racemously arranged; pulvini present in the axils of the branches. *Spikelets* linear or linear-lanceolate, sometimes ovate. *Glumes* stiffly subscarios or indurate, 5–7-nerved, cymbiform or oblong to lanceolate; the apex usually acute, but varying from obtuse to long-acute. *Lemmas* deeply 3-lobed, broad; the lateral lobes broad at the base, subulate at the tips, with a thinner flap on either side extending down the upper part of the margin of the entire portion; the body of the lemma hardened or yellowish-indurate and horny; the nerves conspicuous on the lobes, but obscure on the entire portion; the lemma almost glabrous, except for short silky hairs at the base near the short callus or with a line of hairs extending up about half of the median line, as well as hairs along the lower part of the margin, ciliolate on the lobes. *Lowest lemma* 5–8 mm long. *Palea* almost as long as, or slightly longer than, the entire portion of its lemma, incurved over the floral organs, ciliolate at the apex, the nerves narrowly winged.



PLATE 64. *Triodia pungens*

115. Spike-flowered Spinifex

Triodia spicata
Plates 63b, 65

GENERAL DESCRIPTION

HABIT: Tussocks up to 60 cm high and 90–120 cm wide, but commonly 15 cm high and 22 cm wide, neatly compact, pale green. Plants are non-resinous, with slender, spindly, flowering culms 45 cm high or more, and sometimes form perfect rings 90–120 cm wide with a vegetative circumference of about 22 cm.

STEMS: Erect, branched from the upper nodes; flowering culms 1–3-noded, slender, hairless, smooth, mostly uncovered by the sheaths.

LEAVES: Sheaths tight, smooth, with long, extremely fine, silvery hairs at the mouth and on the edges, otherwise hairless. Blades 6–12 cm long, slender though rigid, widely spreading, smooth, with fine firm sharp points, hairless except for sparse hairs near the sheath.

SEEDHEAD: Spikelets few, solitary, stalkless, widely spaced on the axis of a



PLATE 65. *Triodia spicata*

distinctive spike up to 17.5 cm long and 1.3 cm wide. The spikelet is 10–12.5 mm long or somewhat more, 5–6 mm wide at its broadest point at the middle, almost hairless, strongly flattened, pointed at the apex, purple or straw-yellow, and has 10 florets or more.

OCCURRENCE: Spike-flowered spinifex is restricted to rocky hills and slopes in the northwestern quarter of the area. In some parts it intermixes with gummy spinifex and weeping spinifex, but more commonly it is associated with a sparse cover of low trees and shrubs represented by mulga, mallees, wattles, witchetty bush, and whitewood.

DISTRIBUTION: N.T.

VALUE: Plants are smaller and less coarse than many spinifex grasses, but little is known of their fodder value.

BOTANIC DESCRIPTION

Panicle a narrow spike, with biseriate sessile spikelets. *Spikelet* lanceolate or elliptic, sometimes somewhat falcate. *Glumes* indurate, broadly lanceolate or ovate, 5–7-nerved (lateral nerves often obscure), acute or obtuse but usually ragged at the apex. *Lemmas* similar in texture to the glumes, acuminate and usually torn, not lobed, glabrous except for few short hairs on the lower part of the midnerve, 3-nerved and each nerve with faint subsidiaries; midnerve prominent and forming a slight keel; lateral nerves submarginal. *Palea* linear or elliptic, glabrous, obtuse, with narrowly winged nerves.

116. Small Redleaf

Schizachyrium obliqueberbe
Plate 67a

GENERAL DESCRIPTION

HABIT: Slender tufted annual or short-lived perennial, up to 75 cm high, commonly flowering when only 10 cm.

STEMS: Erect, very thin, often purplish, smooth, usually angular (sometimes ± rounded or flattened), glabrous or sparsely hairy along the angles, branched from the upper nodes.

LEAVES: Thin, many-nerved, purplish to reddish-brown, often deeply coloured when old. Sheaths loose, folded and keeled, glabrous or sometimes sparsely hairy at the mouth, smooth or minutely bristly, half as long as the internodes to slightly longer. Ligule short, truncate, ciliolate. Blades flat or folded, with a prominent midnerve, up to 10 cm long but often much shorter, usually hairless but covered by minute bristles, particularly along the thickened edges, usually shortly and bluntly pointed.

SEEDHEAD: Leafy, racemose; racemes solitary, on long slender stalks arising from the upper nodes of branched culms, sometimes more than one raceme produced from the same node. Each raceme is subtended by a spathe terminating the stalk of the raceme. The spathes are 2.5–6.5 cm long, thin and papery, hairless, often

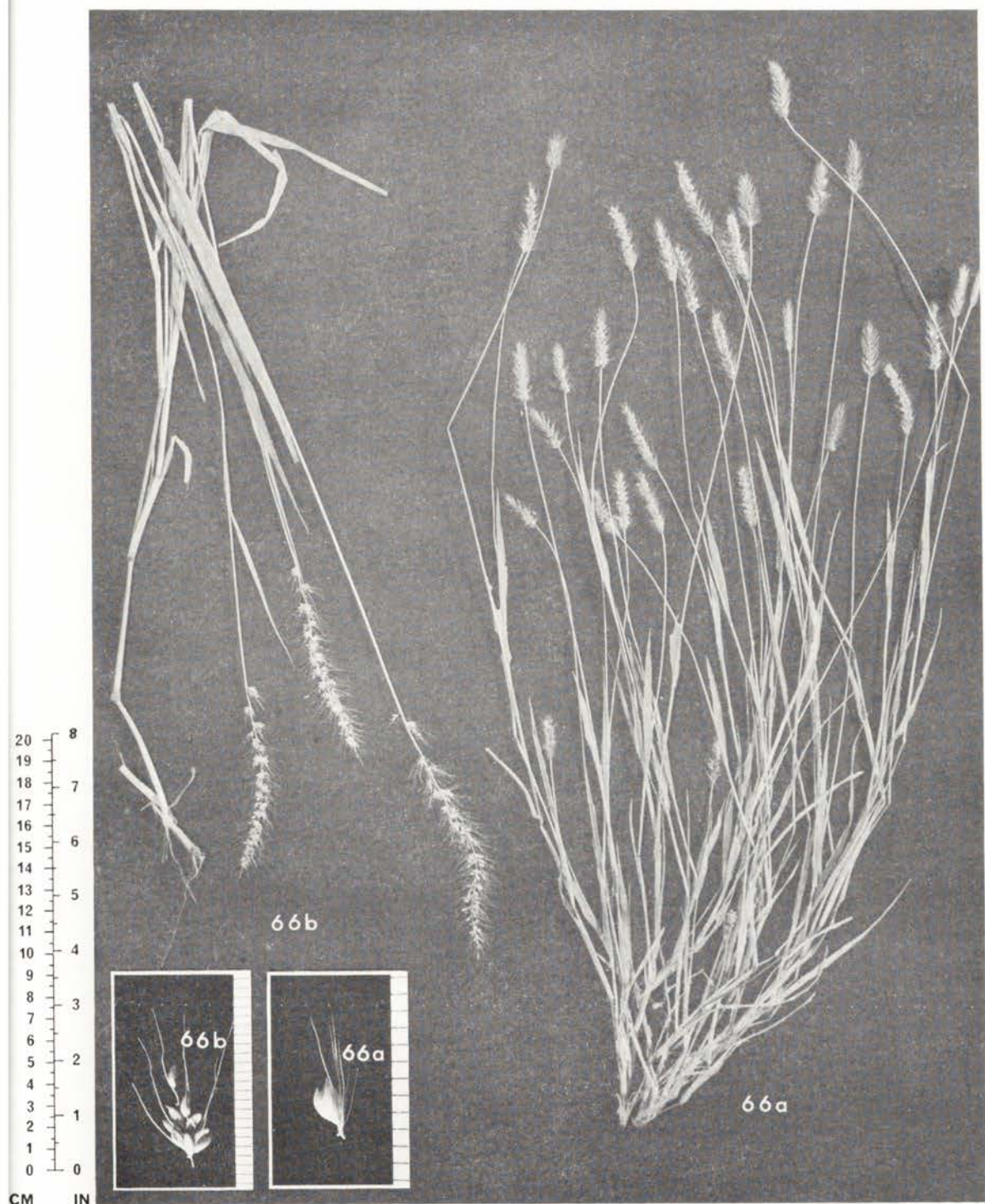


PLATE 66. (a) *Setaria brownii*; (b) *Setaria dielsii*

coloured deep red, with long fine points, first tight around the raceme, but flat and open with age. The spikelets, borne on the extremely fragile many-jointed rhachis of the raceme, have a short, slender, bent, brown awn and are covered by dense, long, white, silky hairs. At maturity the spikelets are dispersed by the breaking of the rhachis at the joints, while the spathes remain attached to the plant.

OCCURRENCE: Rather rare in central Australia and not known south of Tea Tree; occurring on river levees, floodouts, and valley floors on coarse or medium-textured red earths and clayey sands, in association with mulga, bloodwood, and feathertop or gummy spinifex. It grows mainly from March to May, sometimes in dense but low, inconspicuous stands.

DISTRIBUTION: W.A., N.T., Q., N.S.W., E-A.

VALUE: Of little or no fodder value.

BOTANIC DESCRIPTION

Inflorescence leafy, of spatheate racemes; racemes solitary, terminal on culms and branches, frequently gathered into sparse and loose or densely fascicled false panicles. *Spathe* 2.5–6.5 cm long, narrowly elliptic, chartaceous, glabrous. *Raceme* about 3.5 cm long, slender, fragile, shortly pedunculate, borne on a long filiform stalk arising in the axil of a leaf; the apex of the peduncle and of each joint expanded and deeply cupular; the joints and pedicels compressed, bearded along one margin and towards the apex of the other margin with long white hairs. *Sessile spikelet* 6–7 mm long, linear-lanceolate; callus shortly bearded. *Lower glume* chartaceous, shortly 2-toothed, very narrowly winged on the keels in the upper part, villous on the back in the lower half, otherwise glabrous. *Upper glume* subequal, cymbiform, acute, membranous-chartaceous, very narrowly winged on the keel, 1–3-nerved, with membranous, ciliolate margins. *Lower lemma* about three-quarters as long as the glumes, acuminate, hyaline, ciliolate, 2-nerved. *Upper lemma* slightly shorter, hyaline, cleft almost to the base into 2 subacute lobes; the geniculate awn from the sinus about 1 cm long, with the twisted column about half as long. *Caryopsis* linear-terete. *Pedicellate spikelet* reduced to a subulate-lanceolate glume, 1–2 mm long, produced into a bristle 3–4 mm long.

117–118. Pigeon Grasses (bristle grasses)

Setaria spp.

Among the minor components of central Australian grasses are two slender, short-lived species of pigeon grasses. The common name refers to the characteristic bristly panicle, in which each spikelet has one to several long stiff bristles arising from its short stalk. The panicles prominently terminate the culms, and are either spiciform and cylindrical or narrow and rather loose. The spikelets are small, plump, awnless, and usually crowded on extremely short branches. On ripening the entire spikelet falls, but the bristles remain on the plant.

GENERIC CHARACTERS

Spikelets solitary or clustered, subsessile, flattened or slightly depressed in front, convex



PLATE 67. (a) *Schizachyrium obliqueberbe*; (b) *Spathia neurosa*; (c) *Stipa scabra*

on the back, falling entire from the pedicels, subtended by one to many bristles (modified branchlets), gathered into cylindrical panicles. *Florets*, 2; lower male or neuter and sometimes reduced, upper bisexual. *Glumes* membranous, unequal; lower ovate, generally much shorter than the spikelet and \pm enclosing its base, usually 3–5-nerved; upper longer than the lower and sometimes as long as the spikelet. *Lower lemma* membranous, flat or depressed, resembling the upper glume, but always as long as the spikelet. *Palea* as long as the lemma or reduced or absent. *Upper lemma* usually as long as the spikelet or slightly shorter, coriaceous, convex on the back or cymbiform, \pm apiculate, finely pitted or more often rugose or rugulose. *Palea* subequal to the lemma and similar in texture, 2-keeled, the keels embraced for their full length by the incurved margins of the lemma. *Caryopsis* tightly enclosed by the indurated lemma and palea. *Panicle* either dense and spiciform with the spikelets on extremely short branches, or the spikelets rather distant on elongated branches and forming contracted but \pm loose panicles; branches \pm produced into persistent bristles beyond the spikelets or divided into a one-sided involucre of bristles; the bristles sometimes absent from some spikelets.

KEY TO THE SPECIES

- A. Panicle compact, continuous, mostly 1.8–3.2 cm long, 6 mm wide (excl. bristles); branches extremely short, simple, solitary, closely approximate. Bristles usually 4–6 below each spikelet. 117. *S. brownii*
- A. Panicle rather loose to dense, sometimes interrupted, 5–11.5 cm long, 10–12 mm wide (excl. bristles); branches < 15 mm long, divided, usually in rather distant whorls or clusters. Bristles usually 1 below each spikelet. 118. *S. dielsii*

117. Brown's Pigeon Grass

Setaria brownii

Plate 66a

GENERAL DESCRIPTION

HABIT: Slender annual, sometimes long-lived, 22–37 cm high, spreading or decumbent.

STEMS: Thin, soft, hairless, smooth, often angular or flattened, weakly erect or often sharply bent at the lower nodes, branched and densely clustered at the nodes; lower internodes short, often purple; nodes hairless, prominent, often constricted and dark.

LEAVES: Sheaths thin, papery, strongly nerved, hairless, first tight though becoming loose and almost flat, minutely bristly or becoming smooth with age, either (near the base) slightly longer than the internodes or (in the upper part) much shorter. Ligule fringed with dense short hairs. Blades 6–11 cm long, up to 4 mm wide, thin, flat or loosely folded, abruptly pointed, minutely bristly or later smooth, hairless or the upper surface sprinkled with long, extremely fine hairs, faintly nerved, bright green or the upper surface paler, with thick, often rough and sharp edges.

SEEDHEAD: Panicle usually 18–32 mm long, about 6 mm wide (excl. bristles), spiciform, cylindrical, bristly, purple when young, on a long slender minutely bristly

Description of the Species

peduncle. The panicles are produced in abundance and extend prominently above the uppermost leaves. The small, plump, hairless, shortly pointed, green or purple spikelets are densely crowded on very short panicle-branches. At its base the spikelet has a tuft of slender, stiff, rough bristles about 6 mm long. On ripening the spikelets fall individually, leaving the bristles (which mature pale yellow or straw-coloured) attached to the plant.

OCCURRENCE: Apparently rather rare in central Australia, though perhaps common for brief periods in season. The species occurs in the northern half of the area commonly on sandy creek banks, but also on low hills and gently sloping valley floors with shallow or skeletal soils. It can be associated with river red gum, lobed spinifex, gummy spinifex, or scattered low trees and shrubs such as white cypress, bloodwood, and mallees. It flowers mainly from March to May.

DISTRIBUTION: W.A., N.T., Q.

VALUE: Plants appear palatable, but little is known of their fodder value.

BOTANIC DESCRIPTION

Panicle spiciform, compact, mostly 18–32 mm long and 6 mm wide (excl. bristles), terminal, soon becoming prominently exerted, shortly hispid on the stout rigid axis and branches; branches solitary, simple, closely approximate, each one about 0.5 mm long and bearing one spikelet and several (usually 4–6) stiff scabrous suberect bristles 5.5–7 mm long; pedicels minute, stout, much widened at the apex. *Spikelets* almost 3 mm long, broadly obovate-elliptic, acute, glabrous, smooth. *Lower glume* about half as long as the spikelet, broadly ovate, prominently 3-nerved, shortly acuminate, muticous or mucronate. *Upper glume* broadly elliptic, prominently 5-nerved, apiculate, three-quarters as long as the spikelet or slightly more. *Lower lemma* with obtusely incurved margins. *Lower palea* hyaline, narrow-elliptic, acute, glabrous, smooth, slightly shorter than its lemma, 2-keeled, with sharply inflexed margins, nerveless between the keels. *Fertile floret* strongly plano-convex in profile, prominently rugose; lemma thinly nerved; palea smooth on the thin, broad, incurved margins. *Caryopsis* almost 1.5 mm long, broadly elliptic, subacute, smooth, somewhat laterally compressed.

118. Diel's Pigeon Grass

Setaria dielsii

Plate 66b

GENERAL DESCRIPTION

HABIT: Slender, weak-stemmed, leafy annual, 22–60 cm high, sometimes spreading or decumbent and up to 30 cm wide.

STEMS: Erect or sharply bent at the lower nodes, branched, hairless, smooth, angular or flattened, strongly nerved, sometimes thick though hollow and soft, 4–6-noded; the lower nodes swollen and prominent.

LEAVES: Blades 6–17.5 cm long, up to 8 mm wide, flat, thin, bright green, tapered to a long fine point, with some prominent nerves and numerous finer ones,

hairless, minutely bristly on the upper surface and smooth on the lower one, abruptly narrowed at the junction with the sheath; the edges thickened, sharp, rough, sometimes wavy. Sheaths variable in length, loose, thin and papery, hairless and smooth, strongly nerved, often keeled, usually with scarious edges.

SEEDHEAD: Panicle 5–11.5 cm long, 10–12 mm wide (excl. bristles), spiciform, bristly, purplish or pale green, terminal on the culms and at maturity shortly exceeding the uppermost leaves; branches up to 12 mm long. Spikelets are small, narrow, hairless, smooth, blunt, pale green or (when young) purplish, and borne in dense clusters which are widely spaced in the lower part of the panicle, but closer and continuous in the upper part. Below each spikelet there are 1–3 slender, stiff, spreading, rough bristles up to 12 mm long, which remain attached after the ripened spikelet has fallen.

OCCURRENCE: This is a common plant of waste places and disturbed ground, often growing as a weed in Alice Springs and in homestead gardens. Under natural conditions it occurs with kerosene grasses under river red gum on sandy creek banks. It flowers from March to May and with favourable rains, also in August–September.

DISTRIBUTION: W.A., S.A.

VALUE: The softly herbaceous plants appear palatable, but little is known of fodder value.

BOTANIC DESCRIPTION

Panicle terminal, at length exerted, spiciform, continuous or interrupted at least in the lower part, 5–11.5 cm long, 10–12 mm wide (excl. bristles); axis rather stout, erect, straight or curved, terete but strongly angular upwards, scabrous on the angles; branches solitary or more often clustered or whorled, much divided, scabrous, suberect or spreading; bristles mostly 10–12 mm long, stiff, erect but finally spreading, scabrous, usually one below each spikelet (rarely 2 or 3 or absent); pedicels minute, stout, scabrous, much widened at the apex. *Spikelet* 2.5 mm long, glabrous, smooth, narrowly elliptic, constricted and \pm apiculate at the tip. *Glumes* and *lower lemma* thinly membranous, with prominent nerves and hyaline margins. *Lower glume* about half as long as the spikelet, broadly ovate, acute or acuminate, mucicous or cuspidate, 3-nerved. *Upper glume* as long as the spikelet, narrow-elliptic, acute, 7 or sub-9-nerved, rounded on the back. *Lower lemma* depressed on the back, 5 or sub-7-nerved, with incurved margins. *Lower palea* about half as long as its lemma, delicate, hyaline, glabrous, smooth, narrowly oblong-elliptic, notched. *Fertile floret* as long as the spikelet, elliptic, apiculate; lemma faintly nerved, rugose; palea punctulate, smooth and shiny on the broad incurved margins.

119. Plume Sorghum

Sorghum plumosum

Plate 26b

GENERAL DESCRIPTION

HABIT: Robust leafy tussocky perennial, 90–150 cm high or more, with stout roots and sometimes fibrous-woolly rhizomes; the hairy butt thickened by numerous, loosely overlapping cataphylls.

STEMS: Erect, thick and woody, hairless, smooth, unbranched, often powdery though becoming shiny, terete, 4–5-noded; nodes with long fine dense hairs.

LEAVES: Bluish-green when young. Sheaths first tight though becoming loose with age, hairless and smooth or with long fine dense hairs sometimes based on slender tubercles, usually long-bearded at the mouth, sometimes powdery, terete or keeled upwards; the lower ones usually longer than the internodes, the upper much shorter. Blades up to 30 cm long and 6 mm wide or more, rather stiff, flat or loosely folded, usually hairless, rough with short bristles, sharp and rough on the edges, gradually tapered to a long fine point, with a thick white midrib and prominent nerves.

SEEDHEAD: Panicle usually 12.5–23 cm long, rather narrow, loose, prominent, terminal on the culms, with long slender erect or drooping branches borne singly or more often in clusters along the axis. On the outer part of the panicle-branch are pairs of large, brown, hairy, awned, spear-like spikelets. One spikelet of each pair is fertile, stalkless, with a long densely hairy basal spear, and a sharply bent spirally twisted brown terminal awn up to 6.5 cm long. The other spikelet is infertile, awnless, stalked, and blunt at the base. On ripening the spikelets fall as a pair or separately, leaving an oblique, cup-like scar on the tip of the panicle-branch.

OCCURRENCE: In central Australia plume *Sorghum* is known from only one locality near Ooratippra, where it occurs on the sandy levee of the Sandover River under coolibah with ribbon grass, several other perennials, and forbs. Chiefly tropical in distribution, it probably occurs more commonly near the northern margin of the area.

DISTRIBUTION: W.A., N.T., Q.

VALUE: In more northern parts of the Northern Territory where it is common, plume *Sorghum* remains green for much of the dry season and is grazed by cattle throughout the year (Arndt and Norman 1959). In central Australia it is not abundant enough to be of any significance.

BOTANIC DESCRIPTION

Panicle contracted but loose, terminal, prominently exserted, 12.5–23 cm long; axis terete or compressed upwards, glabrous, smooth, striolate; branches 1–4-nate, 1–4.5 cm long, distant, usually erect, slender, simple, compressed-triquetrous, scabrous-hispid on the angles, pilose in the axils, very oblique at the tips. *Racemes* 2.5–3.5 cm long, mostly 4–6-jointed, very fragile; internodes compressed, villous-ciliate on the edges, 4–5 mm long. *Spikelets* dorsally compressed, in pairs (or the terminal group in triplets), one of each pair sessile and hermaphrodite, the other(s) pedicellate and male or neuter. *Sessile spikelet* usually 6 mm long (excl. callus), linear-oblong, dark brown, falling with the adjacent internode and the accompanying pedicellate spikelet or its pedicel; callus about 3 mm long, slightly curved, pungent, bearded with dense reddish-brown hairs. *Lower glume* as long as the spikelet, oblong-elliptic, coriaceous except for the hyaline narrow-truncate apex, 5–7-nerved, ± rounded on the back, hirsute with pale brown hairs, with incurved margins.

Upper glume subequal to the lower and similar in texture, linear-lanceolate, obtuse, mucronulate, \pm keeled upwards, thinly 5-7-nerved, with sparse whitish hairs in the upper part towards the margins, otherwise glabrous, smooth, and glossy, with incurved narrow margins. *Lower floret* male. *Lower lemma* thinly membranous, with hyaline incurved margins, somewhat shorter than the glumes, linear-lanceolate, acute, 2-keeled, ciliate upwards on the margins. *Palea* small, hyaline, ciliate. *Upper floret* bisexual. *Upper lemma* hyaline, ciliate upwards, 2-lobed, awned from the sinus; awn perfect, geniculate, scabrous-ciliate, 5.5-6.5 cm long, with a dark brown column about 3 cm long and a somewhat shorter paler bristle. *Pedicellate spikelet* 7-8 mm long, narrow-lanceolate or lanceolate-oblong, awnless, with a minute obtuse bearded callus; pedicel 5-6 mm long, compressed, villous-ciliate on the edges with reddish-brown hairs. *Glumes* firmly membranous or chartaceous; upper as long as the spikelet, 7-nerved, lanceolate (flattened), notched, hirsute with pale hairs; lower slightly shorter and narrower, 3-5-nerved, acute, with 2 thickened keels, hyaline on the margins, sparsely ciliate on the nerves and keels. *Floret* neuter. *Lemma* hyaline, as long as the glumes, ciliate on the margins.

120. Spathe Grass

Spathia neurosa
Plate 67b

GENERAL DESCRIPTION

HABIT: Tufted, rather coarse, reddish or straw-coloured annual, up to 75 cm high; butt hairy, somewhat thickened by many shiny, hairless, strongly nerved cataphylls.

STEMS: Erect or somewhat bent at the lower nodes, simple or sparsely branched, flattened and shallowly channelled on one side, hairless, smooth, powdery close below the nodes or shiny, with 2-5 densely hairy nodes.

LEAVES: Sheaths loose, hairless, \pm smooth, strongly nerved; the lower ones much shorter than the internodes; the upper (floral) ones longer than the internodes, broad, inflated, with short blades. Ligule thin, papery, transparent, fringed with minute hairs. Blades up to 16 cm long and 4 mm wide, usually flat, tapered to a long fine point, characteristically jointed and breaking at the junction with the sheath, hairless or sometimes sprinkled with short stiff hairs, minutely bristly, with 7-9 prominent nerves and thickened sharp rough edges.

SEEDHEAD: Of 3 (sometimes 4 or 5) brown-hairy, spiciform racemes up to 7.5 cm long almost wholly enclosed by a broad, prominent spathe up to 12.5 cm long. There can be 1 or up to 3 spathes of racemes on a single culm, each one arising from an upper node or terminating a branch of the culm. Covered by long, soft, brown hairs, the densely crowded spikelets are borne on the rhachis in pairs. One spikelet of each pair is sterile and awnless; the other fertile, with a brown, sharply bent, twisted awn 19-33 mm long.

OCCURRENCE: Spathe grass is known from few collections. In central Australia it occurs near Argadargada on cracking clay plains with Mitchell grasses.



PLATE 68. (a) *Sporobolus actinocladus*; (b) *Sporobolus australasicus*; (c) *Sporobolus caroli*; (d) *Sporobolus mitchellii*

DISTRIBUTION: N.T., Q.

VALUE: Plants are probably grazed, but provide little fodder.

BOTANIC DESCRIPTION

Inflorescence of usually 3 (sometimes 4 or 5) racemes, spatheate, terminating the culm and branches. *Spathe* membranous, broad, < 12.5 cm long. *Racemes* subdigitate, sessile to subsessile, 3–7.5 cm long, villous with brown hairs, each with the basal pair of spikelets homogamous and persistent; joints and pedicels linear-filiform, curved, solid, compressed, densely ciliate on both margins, disarticulating obliquely, shallowly concave at the tips; the joints about two-thirds, and the pedicels about half, as long as the sessile spikelet. *Sessile spikelet* lanceolate, 5.5–6.2 mm long, dorsally compressed; callus very small, with dense fulvous hairs < 4 mm long. *Glumes* subequal, chartaceous-membranous, with narrow, inflexed, hyaline, ciliate or ciliolate margins; lower with 2 excurrent keels, narrowed upwards, 2-toothed, obtuse, with 6–8 intracarinal nerves, densely hairy on the back and with a subapical beard of longer, tubercle-based, rich brown hairs < 6 mm long extending downwards close to the keels; upper glume slightly longer, lanceolate, acute, cymbiform, acutely keeled upwards, 3-nerved, depressed between the nerves, villous on the back in the lower part, ciliate on the keel with long tubercle-based hairs. *Lower lemma* hyaline, nerveless, lanceolate, acute, ciliate upwards, 2.5–2.7 mm long. *Upper lemma* stipe-like, 1.8–2.7 mm long, passing into a geniculate scaberulous awn; awn 19–33 mm long, with a twisted fulvous column bent near the middle and a yellowish weakly twisted bristle. *Caryopsis* oblong to obovate, dorsally compressed, 2–2.8 mm long, 1–1.3 mm wide. *Pedicellate spikelet* awnless, dorsally compressed, reduced to the very unequal glumes, about 5 mm long, oblanceolate-oblong or \pm involute; callus shortly bearded. *Lower glume* oblong-elliptic (flattened), 3-toothed, membranous, with narrowly inflexed hyaline ciliate margins, with 13 intracarinal nerves, pubescent like the sessile spikelet. *Upper glume* much shorter or rudimentary, membranous, 3-nerved, pubescent upwards on the midvein.

121–124. Dropseed Grasses

Sporobolus spp.

These are relatively common in tropical parts of Australia, but rather rare in central Australia, the four representatives occurring mainly in the northern half of the area; absent or sporadic towards the south. They are slender or delicate annuals and short-lived perennials, dissimilar in appearance, and distributed over a wide range of country though commonly in saline and scalded habitats. Generally the perennials, and to a lesser extent the annuals, are palatable but not abundant or persistent enough to be important.

The spikelets are extremely small, 1-flowered, and closely resemble the few-flowered spikelets of certain lovegrasses. They are borne in dense, spiciform or open panicles terminating the culms. On maturity the seed is readily shed from the thin lemma and palea, a characteristic feature to which the common name refers.

GENERIC CHARACTERS

Spikelets solitary, sessile or pedicellate, slightly or not compressed, glabrous; rachilla very short, disarticulate above the glumes. *Floret*, 1, bisexual; callus absent. *Glumes* equal or unequal, persistent or subpersistent, membranous or hyaline, 1-nerved or nerveless, slightly keeled or dorsally convex; the lower one often very small. *Lemma* usually similar to the upper glume, awnless, 1-3-nerved. *Palea* equal or subequal to the lemma and similar in texture, glabrous, smooth, 2-nerved, often caniculate between the nerves, obtuse or truncate, sometimes splitting to the base into 2 equal lobes. *Caryopsis* free in a delicate pericarp, loose in the unchanged lemma and palea; the pericarp either falling with the grain or persistent on the rachilla and rupturing to shed the naked seed, usually dehiscent in water, often mucilaginous. *Inflorescence* an open or contracted panicle; panicle effuse or spiciform or sometimes racemose.

KEY TO THE SPECIES

- A. Erect or often creeping perennial. Panicle spiciform, dense. 124. *S. mitchellii*
- A. Erect annuals or perennials. Panicle effuse or contracted and loose.
 - B. Primary branches of the panicle arranged mostly in whorls of more than 4. Delicate annual. 122. *S. australasicus*
 - B. Lowest primary branches of the panicle arranged in a single whorl, the remainder approximate or distant in groups of fewer than 4. Slender perennials.
 - C. Spikelets all distinctly pedicellate, the pedicels and branchlets spreading. Panicle decompose, \pm effuse. 123. *S. caroli*
 - C. Spikelets sessile or subsessile, crowded and appressed on the ends of the branches in false spikes. Panicle at first spiciform, becoming loose but contracted..... 121. *S. actinocladus*

121. Ray Grass
(katoora)

Sporobolus actinocladus
Plate 68a

GENERAL DESCRIPTION

HABIT: Slender perennial, usually 30-45 cm high, densely tufted and leafy at the base; butt largely hairless, somewhat thickened by numerous thin, papery, flattened, strongly nerved cataphylls.

STEMS: Vegetative culms short, covered by the sheaths; flowering culms much longer, erect, slender, hairless, smooth, with few or many nodes, branched, grooved on one side, mostly covered by the sheaths.

LEAVES: Blades up to 12.5 cm long, rather broad near the sheath, flat, rather thick and stiff, pale green or bluish-green, tapered to a rather blunt point, rough with minute bristles, often curly or twisted when dry, sometimes hairy like the sheaths, but more often hairless; the edges thickened, rough with short spiny hairs. Sheaths first tight, becoming rather loose, with long, fine, stiff, tubercle-based, dense hairs or pilose at the mouth and on the edges, but more often hairless and smooth.

SEEDHEAD: Panicle when mature 5–13 cm long and 2.5–8 cm wide, terminal on the culms, with numerous slender branches up to 4 cm long densely crowded with minute, olive green spikelets. Characteristically the spikelets are borne only at the end of the branches, which can be bare for over half their length. The lowest panicle-branches are whorled on the axis, while the upper ones are scattered either in small clusters or singly. The immature panicle is spiciform and continuous with closely appressed branches, but with age the branches spread almost horizontally resulting in a loose, open panicle with widely spaced branches.

OCCURRENCE: This grass occurs throughout the area on low rocky hills, gentle slopes, and stony saline plains, commonly in depressions, gilgais, and scalds. Associated plants include Mitchell grasses, gidgee, saltbush, bluebush, *Bassia*, giant or spike-flowered spinifex, samphire, *Frankenia*, sparse low trees and shrubs, and short grasses and forbs. Depending on rainfall, plants flower early or late in the year.

DISTRIBUTION: M. (excl. V.).

VALUE: Highly palatable and nutritious, but rarely abundant enough to be important.

BOTANIC DESCRIPTION

Panicle terminal, at length prominently exerted, compound, 5–13 cm long, spiciform and continuous when young, open and pyramidal in outline at maturity and then 2.5–8 cm wide; axis slender but rigid, terete, strongly striate or angular upwards, glabrous or pilose, smooth or resinous and somewhat roughened. *Primary branches* < 4 cm long, slender but stiff, terete, glabrous, smooth or roughened by droplets of resin, pulvinate in the axils, naked of spikelets in the lower part for up to slightly over half their length; the lowest ones collected in a single whorl and soon divergent, becoming horizontal; the remainder clustered or solitary, rather distant, suberect, at length widely spreading. *Secondary branches* and *branchlets* erect, closely appressed, secund, bearing the sessile and subsessile spikelets in false spikes, the branches < 7 mm long. *False spikes* dense, solitary on the primary branches and usually about half as long. *Spikelets* 1.25 mm long, slightly laterally compressed, erect, closely appressed. *Glumes* thinly membranous, with broad hyaline margins, scaberulous, subacute; lower slightly less than half as long as the spikelet, nerveless, narrowly ovate; upper slightly but distinctly shorter than the spikelet, 1-nerved, \pm keeled, ovate-elliptic, scabrous on the keel. *Lemma* as long as the spikelet, acute, cymbiform, otherwise similar to the upper glume. *Palea* slightly shorter than the spikelet and slightly longer than the upper glume, with the texture of the glumes, smooth, readily splitting into 2 narrow subacute lobes. *Caryopsis* 0.75 mm long, flattened but obtusely quadrangular, obliquely oblong-elliptic.

122. Australasian Dropseed

Sporobolus australasicus

Plate 68b

GENERAL DESCRIPTION

HABIT: Slender annual, sometimes long-lived, 22–37 cm high, dense and leafy near the base.

Description of the Species

STEMS: Erect or sharply bent at the lower nodes, hairless, smooth, rounded or flattened, sometimes grooved on one side, branched (often strongly so) from the upper nodes, mostly covered by the sheaths, 3–5-noded; nodes hairless.

LEAVES: Mainly basal. Sheaths broad and loose, thin, strongly nerved, hairless and smooth on the surface; the edges fringed with long, extremely fine hairs based on small, hard, wart-like tubercles. Blades flat, stiff, green, up to 7.5 cm long but often less than 2.5 cm, 4–8 mm wide, broad and rounded at the junction with the sheath, tapered to a short firm point, with numerous nerves, rough and sparsely hairy with long fine tubercle-based hairs; the edges thick, white, often wavy, rough with short, spiny, erect, tubercle-based hairs.

SEEDHEAD: Panicle 5–13 cm long, 2.5–5 cm wide in the lower part and narrowed upwards, open, terminating branched culms; panicle-branches numerous, slender, up to 2.5 cm long, widely spreading, widely spaced on the axis in clusters or more often in whorls. The numerous spikelets are extremely small, globular, hairless, smooth, often shiny, solitary on short, thin stalks and loosely crowded on the panicle-branches.

OCCURRENCE: This species is common in tropical parts of Australia and extends not much south of Wauchope in central Australia. It occurs over a wide range of country, usually as a coloniser of denuded areas.

DISTRIBUTION: W.A., N.T., Q.

VALUE: This plant is less palatable than ray grass and also less important because of its normally short-lived habit and restricted distribution.

BOTANIC DESCRIPTION

Panicle terminal, at length exerted, loose, oblong or oblong-pyramidal in outline, compound, 5–13 cm long, 2.5–5 cm wide, with slender but stiff, suberect or widely divergent, scaberulous branches and pedicels; branches < 2.5 cm long, in distant whorls or sometimes clustered and approximate in the upper part, simple or slightly divided, spikelet-bearing almost to the base, pulvinate in the axils; pedicels mostly 0.5–1.25 mm long, distinctly thickened and convex at the apex; axis rigid, terete, scabrous, striate. *Spikelets* about 1 mm long, ± globular. *Glumes* thinly membranous, with narrow hyaline margins, 1-nerved, subacute, smooth; lower about half as long as the spikelet, narrow-ovate, slightly rounded on the back; upper as long as the spikelet, ovate-elliptic, strongly convex on the back. *Lemma* ovate, otherwise similar to the upper glume. *Palea* thinly membranous, subequal to the spikelet, readily splitting into two narrow-elliptic subacute lobes. *Caryopsis* globular, about 0.75 mm long and wide.

123. Fairy Grass
(yakka grass)

Sporobolus caroli
Plate 68c

GENERAL DESCRIPTION

HABIT: Tufted slender perennial, sometimes short-lived, 30–75 cm high, often dense and leafy near the base.

STEMS: Erect, slender, simple or branched from the upper nodes, hairless, smooth and at times shiny, rounded or flattened, mostly covered by the sheaths, 3-5-noded; nodes hairless.

LEAVES: Purplish to bluish-green. Sheaths first tight, but soon loose, thin, strongly nerved, usually hairless on the surface, shortly hairy along the edges and at the mouth; the basal ones numerous and keeled. Blades flat (rarely loosely folded), rather narrow but widened at the junction with the sheath, up to 20 cm long, hairless or sprinkled with stiff fine hairs based on hard wart-like tubercles, rough with minute bristles, tapered to a long firm point, often curly when dry; the edges thickened, sharp and rough with short bristly hairs.

SEEDHEAD: The delicate, open panicle (to which the common name refers) is 7.5-15 cm long, up to 13 cm wide at the base and narrowed to the apex, prominent on a long, slender, smooth, shiny peduncle, and has spreading, extremely fine, divided branches up to 7.5 cm long. Like ray grass (No. 121), the lowest panicle-branches are whorled, and those above scattered on the axis either in small clusters of 2-4 or more often in singles. The numerous spikelets are very small, lead grey, and loosely crowded on thin, hair-like stalks widely spreading like the branches and branchlets.

OCCURRENCE: Fairy grass occurs sporadically in the northern half of the area on sandy and clayey soils, usually in better watered and saline sites. Commonly it is associated with gidgee on cracking clay soil flats, short grasses and forbs on creek floodouts, *Frankenia* on clay pans, and *Bassia* and saltbush on gentle, gravelly, semi-scalded slopes. It flowers from March to May.

DISTRIBUTION: M.

VALUE: Comparable to ray grass.

BOTANIC DESCRIPTION

Panicle terminal, soon becoming prominently exserted, decomposed, open, broadly pyramidal, 7.5-15 cm long, < 13 cm wide in the lower part; axis rather slender, glabrous, terete or angular upwards, smooth or scaberulous on the angles; branches and pedicels capillary, \pm smooth, pulvinate in the axils; the latter widely spreading, variable in length. *Primary branches* in a single whorl; the remainder solitary or in clusters of 2-4, distant or approximate upwards. *Spikelets* slightly compressed laterally, distinctly pedicellate, remote, about 1 mm long or more. *Glumes* thinly membranous, with narrow hyaline margins, scaberulous; lower about 0.5 mm long, narrowly triangular-ovate, acuminate, nerveless; upper as long as the spikelet, \pm obtusely keeled, ovate or ovate-elliptic (flattened), acute, 1-nerved. *Lemma* \pm smooth, otherwise similar to the upper glume. *Palea* slightly shorter than the spikelet, readily splitting into 2 narrowly oblong-elliptic subacute lobes. *Caryopsis* about 0.5 mm long, flattened but tetraquetrous, obliquely obovate-truncate.

124. Rat's-Tail Couch
(swamp rat-tail grass)

Sporobolus mitchellii
Plate 68d

GENERAL DESCRIPTION

HABIT: Decumbent perennial, 22–45 cm high, often running for several feet; the hairless butt thickened by numerous broad, white, strongly nerved, papery, stiffly pointed, closely overlapping cataphylls.

STEMS: Thin, wiry, erect or bent at the nodes, hairless, smooth, with up to 9 nodes or more, purplish or pale green, mostly unbranched, terete, with sometimes very short internodes.

LEAVES: Pale to bluish-green, often dense near the base. Sheaths tight, hairless except for few short hairs at the mouth and sometimes along the white thin edges, smooth, about half as long as the internodes (rarely almost as long). Blades flat (rarely folded), often bluish, stiff, 2.5–10 cm long, rather broad at the junction with the sheath, tapered to a fine but firm point, hairless, smooth on the lower surface, rough and minutely bristly on the upper surface and thickened edges, many-nerved.

SEEDHEAD: Panicle 6–12.5 cm long, 4–6.5 mm wide, spiciform, continuous or sometimes in the lower part interrupted, terminal on the culms and shortly exceeding the uppermost leaves; panicle-branches up to 5 mm long, erect, closely appressed to the axis, overlapping or the lower ones widely spaced, densely crowded with very small yellowish-green or straw-yellow spikelets.

OCCURRENCE: A characteristic grass of cracking clay soils, commonly forming mat-like stands on the floors of gilgais and shallow depressions, near creeks, and in similar seasonally flooded places. It usually grows with coolibah, Mitchell grasses, and gidgee. It flowers mainly from March to May or June, but continues for the greater part of the year with suitable rains.

DISTRIBUTION: M.

VALUE: A valuable grass where it occurs in quantity, tending to remain green for longer periods than plants growing in less favoured habitats.

BOTANIC DESCRIPTION

Panicle terminal, at length exerted, linear, continuous or sometimes interrupted towards the base, compound, 6–12.5 cm long, 4–6.5 mm wide, scabrous on the rather slender angular axis and divisions. *Primary branches* solitary or binate or ternate, rather distant or approximate, < 5 mm long, erect or slightly oblique, spikelet-bearing almost to the base, with closely appressed branchlets; lateral pedicels < 0.5 mm long, terminals < 1 mm long. *Spikelets* slightly compressed laterally, 1.75–2 mm long, densely crowded. *Glumes* subequal, distinctly shorter than the spikelet, about 1.25 mm long, thinly membranous to scarious, lanceolate-ovate, rounded on the back, 1-nerved, mostly smooth; lower slightly shorter and narrower, scaberulous on the nerve, acuminate; upper acute. *Lemma* as long as the spikelet, thinly membranous, glabrous, smooth, 1-nerved, narrowly lanceolate-oblong, acute. *Palea* as long as its lemma, broadly lanceolate, obtuse, caniculate between the nerves. *Caryopsis* about 1 mm long, slightly compressed laterally, oblong-elliptic.

125. Rough Needlegrass

Stipa scabra
Plate 67c

GENERAL DESCRIPTION

HABIT: Erect annual or short-lived perennial, 30–50 cm high, densely tufted at the base.

STEMS: Slender, rounded, minutely bristly, unbranched, 1–2-noded, ± hairless.

LEAVES: Bristly hairy and rough, strongly nerved. Sheaths tight, usually much shorter than the internodes, finely hairy along the outer margin. Ligule about 0.5 mm long, lacerated and fringed with short hairs. Blades tightly rolled, extremely slender, up to 20 cm long, stiffly erect or becoming twisted and curved with age, finely pointed.

SEEDHEAD: Panicle narrow, fairly dense, feathery, 18–25 cm long and 2–3.5 cm wide (incl. awns), when young partly enclosed by the uppermost leaf sheath; branches short, extremely slender, stiffly erect, in clusters widely spaced on the axis. The brown, hairy, long-awned, needle-like spikelets are borne singly on thin stalks on the branches. Each one is 2–2.5 mm long, with a whitish basal spear about half as long, and a brown sharply bent awn 5–6 cm long. The awn consists of an erect, corkscrew-twisted column 8–10 mm long below the bend and a curved, hair-like, untwisted bristle above. On ripening the seeds readily fall, leaving the thin, silvery glumes attached to the stalks.

OCCURRENCE: The needlegrasses are widespread in temperate regions. The single representative in central Australia is known only from near Ayers Rock in the extreme southwest, though it probably occurs elsewhere near the southern margin of the area. Sporadic occurrences are recorded on low rises and hills with shallow, calcareous soils under witchetty bush and myall. It flowers in August–September.

DISTRIBUTION: Q., N.S.W., S.A., W.A.

VALUE: Like the threeawn grasses, needlegrasses are characterised by spear-like seeds which can cause injury to grazing animals, particularly when hardened by maturity. Though rough needlegrass contributes little to pastures of central Australia because of its scarcity, many species are useful fodder plants, especially in dry periods and the growing stage.

BOTANIC DESCRIPTION

Panicle terminal, finally exserted, contracted, rather dense, linear-oblong, 18–25 cm long, 2–3.5 cm wide (incl. awns); axis terete or angular upwards, scaberulous or almost smooth, striolate, glabrous, rigidly erect; branches mostly erect and loosely appressed, angular, scabrous on the angles, slender but stiff, clustered, distant to remote, divided, mostly longer than the internodes of the axis, 3–5.5 cm long, shorter upwards; pedicels erect or somewhat oblique, angular, scabrous-ciliate on the angles, thickened upwards, laterals 1.75–2.5 mm long, terminals 6–7 mm long. *Spikelets* not gaping, narrowly linear. *Glumes* persistent, hyaline, slightly unequal, inverse, long-acuminate, entire, scaberulous upwards

on the midnerve, glabrous, smooth; lower 9–10 mm long, sub-3-nerved, narrowly linear-oblong; upper 3 or sub-5-nerved, narrowly linear-elliptic, 8–9 mm long. *Lemma* convolute, narrowly fusiform, 4 mm long (incl. callus), with stiff white erect hairs, rugulose, thinly 5-nerved, cartilaginous, but becoming crustaceous, minutely 2-lobed. *Callus* 1.25–1.5 mm long, white-bearded, pungent, distinctly bent near the tip. *Awn* terminal, geniculate; the column strongly twisted, pubescent, 8–10 mm long; the bristle capillary, strongly curved, scabrous, about 5 cm long. *Palea* subequal to the lemma and similar in texture, but with scarious edges, 2-nerved, narrow-oblong, obtuse, rounded on the back. *Caryopsis* 2.25–2.5 mm long, narrowly terete, rugulose or smooth, dull brown.

126–127. Kangaroo Grasses

Themeda spp.

The kangaroo grasses are more typical of higher rainfall regions of Australia, but two species occur in the northern half of central Australia, mainly in favoured localities. Both are rather coarse, tussock-forming perennials, of low to moderate palatability, and unimportant in pastures because of their sporadic occurrence.

Like the Flinders grasses (Nos. 87–90), the fertile spikelet is borne in a raceme together with several sterile spikelets. Similarly, the racemes are subtended by spatheoles on the branches of leafy panicles. However, the fertile spikelet is readily distinguished from that of Flinders grasses by its well-developed awn and spear-like base. Also unlike that group, a number of sterile spikelets of the raceme remain attached to the plant after the fertile one has ripened and fallen.

GENERIC CHARACTERS

Raceme of spikelets consisting of 2 pairs of homogamous (male or neuter) sessile spikelets closely approximate and forming an involucre around a short rhachis bearing one or more pairs or trios of heterogamous spikelets, one of each pair (or trio) of the latter spikelets sessile and fertile, the other(s) pedicellate and male or neuter. *Rhachis* of the raceme terete, readily disarticulate below the fertile spikelet(s), tough or tardily disarticulate between the homogamous pairs; the heterogamous spikelets falling separately, the homogamous pairs usually persistent. *Florets*, 2; lower reduced to an empty lemma; upper male or neuter in the homogamous and the pedicellate spikelets, bisexual in the sessile spikelet. *Fertile spikelet* terete, awned; callus usually acute to pungent, bearded. *Glumes* equal, coriaceous except at the \pm membranous tips; lower tightly involute, obscurely nerved; upper with a deep longitudinal groove on each side and very firm between the grooves, thin along the margins, 3-nerved. *Lower lemma* hyaline, nerveless. *Upper lemma* stipe-like; the base hyaline, 1-nerved, cartilaginous upwards and terminating in a stout geniculate awn. *Palea* hyaline, nerveless, and small or absent. *Caryopsis* linear-obovate, \pm terete, grooved. *Involucral spikelets* dorsally compressed, awnless. *Lower glume* \pm herbaceous, 2-keeled. *Upper glume* membranous, rarely absent. *Florets*, 2 or 1, or both suppressed, lemmas hyaline, upper lemma with or without a palea. *Pedicellate spikelets* of the heterogamous pairs similar to the homogamous spikelets, but narrower. *Racemes* fasciculate, subtended by spatheoles, terminating the culms and their branches in spatheate panicles.

KEY TO THE SPECIES

- A. Plant usually 60–90 cm high, with sparsely hairy, slightly thickened butt, not rhizomatous. Fertile spikelet (incl. callus of 2–3 mm) 7–10 mm long, glabrous except at the apex, glossy; awn 5–7 cm long. 126. *T. australis*
- A. Plant commonly 90–165 cm high, with densely woolly bulbous butt, sometimes rhizomatous. Fertile spikelet (incl. callus of 4–5.5 mm) 13–18 mm long, densely villous with brown hairs; awn 7–10 cm long. 127. *T. avenacea*

126. Kangaroo Grass

(native kangaroo grass)

Themeda australis

Plate 69a

GENERAL DESCRIPTION

HABIT: Densely tufted leafy perennial, usually 60–90 cm high; tussocks up to 22 cm wide; butt almost glabrous or more often with sparse, long, fine, simple, and tubercle-based hairs, thickened by thin, papery, strongly nerved sheaths. Often the plants are highly coloured, from glaucous or pale green during growth to reddish-brown at maturity.

STEMS: Erect, smooth, glabrous, mostly undivided, 2–6-noded, often powdery near the nodes; internodes sometimes elongated, at times the lower ones grooved.

LEAVES: Blades flat or loosely folded, usually hairless and smooth, long, rather broad, acuminate, erect and rather stiff, with rough, sharp edges and prominent midnerve. Sheaths tight, usually smooth and hairless; the upper ones much shorter than the internodes; the basal ones folded, prominently keeled.

SEEDHEAD: The spikelets are in large, dense, leafy, green or reddish clusters terminating the branched culms. The fertile spikelet is brown, hard, smooth, glossy, with a rigid, hairy, spear-like base and a hairy, brown, bent awn 5–7 cm long at its apex. Each one is borne with a number of sterile spikelets, which differ markedly by their thin, papery, and awnless form. The fertile spikelet falls at maturity, leaving the cluster of sterile spikelets on the plant.

OCCURRENCE: Kangaroo grass is restricted chiefly to the northern half of central Australia, but extends south to Ayers Rock and probably occurs sporadically in most parts of the area. It occurs on gently sloping valley floors on medium-textured red earth soils, also quite commonly on low hills and near creeks. Associated plants include mulga, short grasses and forbs, coolibah, river red gum, sparse low trees and shrubs, and (near the north-western margin of the area) gummy and feathertop spinifexes. Though generally sparse, sometimes it is localised and dominant.

DISTRIBUTION: M., T., E-A.

VALUE: Not of marked value in pastures of the area, though undoubtedly palatable to stock during the growing period. Normally, mature plants are neglected.



PLATE 69. (a) *Themeda australis*; (b) *Themeda avenacea*

BOTANIC DESCRIPTION

Panicle variable, usually linear or linear-oblong, interrupted, nodding, < 30 cm long; internodes terete or somewhat compressed; primary branches solitary or paired, slender, erect, usually enclosed within the subtending sheath. *Spathoole* mostly about 4 cm long, linear or linear-lanceolate, acute or long-acuminate, acutely keeled, herbaceous, with narrow scarios margins, striate, glabrous or with sparse tubercle-based hairs; peduncle 1–7 mm long, thickened at the apex. *Involucral spikelets* 8–15 mm long, 1.75 mm wide, narrow-lanceolate, acute or acuminate. *Lower glume* firm, closely striate, several-nerved, acuminate, usually glabrous, often narrowly winged on one or both keels. *Upper glume* scarios, 3-nerved, acuminate, 2-keeled, with finely ciliate membranous margins. *Lower lemma* slightly shorter than the glumes, faintly 1-nerved, ragged or acute. *Upper lemma* minute or absent. *Paleas* absent. *Rhachis* 2–3 mm long, callus-like, covered with dense fulvous hairs < 3.5 mm long. *Sessile* (fertile) *spikelet* 7–10 mm long (incl. callus), narrowly elliptic, turgid. *Lower glume* convex on the back, obtuse, pubescent or puberulous or scabrous upwards, otherwise glabrous, smooth and glossy, with inrolled margins. *Upper glume* obtuse or truncate, mostly glabrous, smooth and glossy. *Lower lemma* much shorter than the glumes, obtuse. *Upper lemma* linear; awn 5–7 cm long, with a pubescent column slightly shorter than the scabrous bristle. *Paleas* absent. *Pedicellate spikelets* 7–9 mm long, linear-lanceolate, acuminate; pedicels about 3 mm long. *Glumes* and *lower lemma* similar to those of the involucral spikelets. *Upper lemma* and *paleas* absent.

127. Native Oat Grass
(tall oat or oat kangaroo grass)

Themeda avenacea
Plate 69b

GENERAL DESCRIPTION

HABIT: Robust tussock-forming perennial, up to 1.65 m high and 45 cm wide. Tussock compact, with a prominent butt thickened by numerous cataphylls and densely covered by soft white silky and woolly hairs, developing stout, hairy, fibrous roots and sometimes a short thick rhizome, hairy like the butt.

STEMS: Erect, few-noded, branched from the upper nodes, hairless, smooth, shiny, up to 4 mm wide, often coloured purplish or bluish and powdery on the surface, sometimes deeply grooved on the lower internodes.

LEAVES: Blades 15–60 cm long or more, narrow, bluish-green, flat or more often folded, mostly hairless, rough with prominent stiff bristles and hard tubercles, twisted with age, with sharp rough edges and a prominent midrib thicker in the lower part of the blade. Sheaths much shorter than the internodes, first tight though loose with age, \pm hairless and smooth, noticeably narrowed and bearded at the mouth; the basal ones with dense woolly hairs, persistent, disintegrating into fibres with age. Ligule papery, thin, jagged, prominent.

SEEDHEAD: Panicle up to 75 cm long or more, branched, leafy; panicle-branches borne at the upper nodes of the culms in clusters and partly enclosed by a spathe. Each branch terminates in a raceme similarly subtended by a spathoole, the raceme comprising 1 fertile black or brown spikelet and many (usually 6) sterile green or

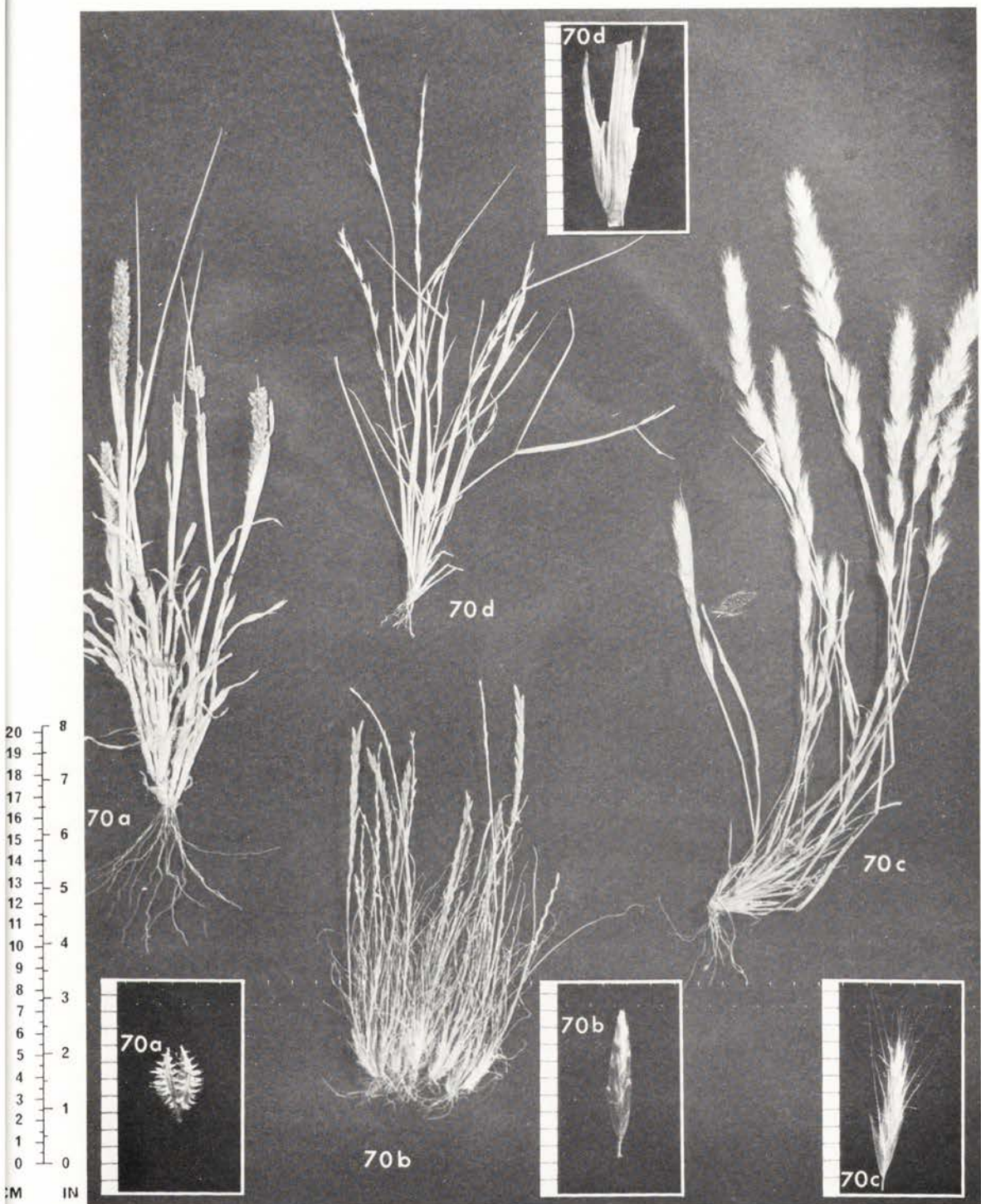


PLATE 70. (a) *Tragus australianus*; (b) *Tripogon loliiformis*; (c) *Triraphis mollis*; (d) *Uranthoecium truncatum*

purplish ones. The fertile spikelet is large, densely hairy, with a basal spear 6–8 mm long and a stout, sharply bent, terminal awn usually 7–10 cm long. The sterile spikelets are 2–2.5 cm long, somewhat flattened, narrow, thin, papery, blunt at the base, and awnless though tapered to a long, fine point.

OCCURRENCE: Similar in distribution to kangaroo grass (i.e. fairly common in the northern half of the area and sporadic south of the Macdonnell Ranges). Generally it forms dense, localised stands on medium-textured red earths and fine-textured clayey sands near creeks, on drainage floors, and in similar better watered places. It grows with coolibah, mulga, river red gum, and short grasses and forbs.

DISTRIBUTION: M. (excl. V.).

VALUE: A coarse, harsh grass apparently unpalatable at most times, but utilised by stock in times of drought.

BOTANIC DESCRIPTION

Panicle < 75 cm long; internodes < 30 cm long, flattened on one side; primary branches erect or loosely spreading, 1–3-nate, their rhachis < 8 cm long; ultimate branchlets 1–6 cm long. *Spatheole* 3–9 cm long; peduncle 1–2 cm long, pubescent upwards, often laterally exerted. *Racemes* 1–2-jointed above the homogamous spikelets, erect or slightly spreading or nodding. *Involucral spikelets* 20–25 mm long, linear-lanceolate, acuminate. *Lower glume* flat or slightly rounded on the back, chartaceous, long-acuminate, many-nerved, finely striate, with thin inrolled margins, the keels variously winged. *Upper glume* three-quarters to four-fifths as long as the lower, thin, 2-keeled, narrow, truncate, 3-nerved, with infolded hyaline ciliate margins. *Lower lemma* subequal to the upper glume but slightly narrower, 1-nerved. *Upper lemma* slightly shorter than the lower lemma, but otherwise similar, without a palea. *Rhachis* 4–5.5 mm long, callus-like, deciduous with the sessile spikelet, villous with dense fulvous hairs. *Sessile (fertile) spikelet* 13–18 mm long (incl. callus), narrowly oblong. *Glumes* 8–10 mm long, cymbiform, obtuse, convex and villous on the back with dense fulvous hairs; lower many-nerved; upper with broad glabrous margins. *Lower lemma* almost as long as the glumes, with inflexed margins. *Palea* hyaline, ciliate at the apex, or much reduced or absent. *Upper lemma* linear, glabrous; awn stout, rigid, 7–10 cm long, with the column usually longer than the bristle, sometimes twice geniculate, shortly villous below and scabrous-pubescent or scabrous upwards. *Palea* absent. *Pedicellate spikelets*, 1 or 2, similar to the involucral spikelets; pedicels < 4.5 mm long.

128. Small Burr Grass

Tragus australianus

Plate 70a

GENERAL DESCRIPTION

HABIT: Small annual, forming dense leafy tufts with few flowering culms, usually 22–30 cm high; foliage mainly basal.

STEMS: Usually erect and unbranched (occasionally bent, branched, and rooting at the lower 1 or 2 nodes), mostly smooth and hairless, 2–4-noded.

LEAVES: Blades flat or \pm folded and twisted, stiff, mostly 2.5–6 cm long and up to 6 mm wide, firmly and shortly pointed, broad and rounded at the junction with the sheath, usually hairless on the surface; edges thickened, white, often wrinkled, fringed with prominent, rigid, coarse, curved, spine-like hairs based on hard, wart-like tubercles. Sheaths usually hairless, smooth, broad, inflated and loose, much shorter than the internodes to slightly longer.

SEEDHEAD: Dense, rigidly erect, cylindrical, spiciform, 5.5–7.5 cm long, 7–10 mm wide, slightly exceeding or partly enclosed by the uppermost leaf. Spikelets crowded, awnless, burr-like from the dense cover of short hooked spines, attached in pairs by short bristly stalks to the rhachis. At maturity, the burrs (spikelet-pairs and their stalks) readily fall, exposing the rhachis. This is terete, bristly-hairy, strongly nerved or grooved, and roughened by the numerous remnants of the spikelet-stalks. The head ripens from the apex downwards.

OCCURRENCE: A widespread and seasonally common grass, occurring mainly on alluvial soils with short grasses and forbs and on texture-contrast soils on stony tablelands with saltbush and bluebush. Other associated communities include mulga and witchetty bush on gentle slopes, gidgee on low hilly limestone country, tea-tree on clay pans, and neverfail grasses on cracking clay plains. Plants grow after summer rains and flower during February and March.

DISTRIBUTION: M. (excl. N.T.), E-A.

VALUE: Known to be palatable, though in fruit the burr-like seeds adhere to wool and hair and can be troublesome to grazing animals.

BOTANIC DESCRIPTION

Inflorescence spiciform, exerted or partly enclosed by the uppermost leaf sheath, erect, linear, 5.5–7.5 cm long, 7–10 mm wide; rhachis somewhat flexuose, terete, strongly striate, hispidulous. *Spikelets* paired, subequal, closely contiguous, 3.5–4 mm long, lanceolate, acute-acuminate, slightly incurved, densely covered on the back with stout hooked spines with thickened bulbous bases; the apex free of spines, smooth or scaberulous. *Lower glume* hyaline and < 0.25 mm long, or wanting. *Upper glume* as long as the spikelet, 5–7-nerved, spiny on the nerves, thinly hyaline and glabrous or sparsely hirtellous between the nerves, scaberulous on the margins, glabrous and almost smooth at the apex. *Lemma* oblong, acute, 3-nerved (lateral nerves faint above the middle), mucronate, 2.6–3 mm long, slightly hairy on the back. *Palea* oblong or ovate, acute or subacute, 2.4–2.8 mm long. *Caryopsis* 1.5–2.1 mm long, 0.5–0.75 mm wide, compressed-fusiform.

129. Five-minute Grass (eight-day grass)

Tripogon loliiformis
Plate 70b

GENERAL DESCRIPTION

HABIT: Slender annual, usually long-lived, rarely over 15 cm high, forming compact leafy tufts with dense fibrous butts.

STEMS: Numerous, fine, erect, unbranched, hairless and smooth, mostly covered by the sheaths, 2-3-noded.

LEAVES: Mainly basal. Blades 5-7.5 cm long, flat or loosely folded, narrow and slender, finely pointed, hairless or with long, extremely fine, spreading hairs, twisted or curly on drying. Sheaths about as long as the internodes, tight, thin, strongly nerved, noticeably narrowed and usually bearded at the mouth, hairless or sparsely hairy on the surface, with thin, transparent, smooth edges; the basal sheaths numerous and with age disintegrating into fibres.

SEEDHEAD: Spike 5-8 cm long, up to 5 mm wide, erect, pale or olive green, terminating the culms and usually exceeding the uppermost leaf. Spikelets 6.5-13 mm long, numerous, erect, crowded and usually overlapping, borne on one side of the rhachis in two rows though sometimes appearing irregular; each one with many florets.

OCCURRENCE: Distributed throughout the area and seasonally common, occurring in all types of country with the possible exception of sand plains, dune fields, and rugged mountains. It is most extensive on stony tablelands and in alluvial areas, such as river floodplains, as a predominant constituent of short-lived grasslands comprising short grasses, forbs, *Bassia*, and saltbush. It occurs also under an open cover of low trees and shrubs commonly represented by mulga, coolibah, witchetty bush, gidgee, ironwood, corkwood, fuchsia, and wattles. Soils are mainly medium-fine-textured and deep, but include sandy red earths and shallow soils.

Commonly, five-minute grass behaves as a coloniser of disturbed ground or denuded country. It flowers from February to May, though in the northern part of the area with suitable conditions it grows throughout the year. The common name refers to its early-maturing habit and to the rapid growth made after only small falls of rain.

DISTRIBUTION: M.

VALUE: In association with other low, short-lived grasses, five-minute grass produces palatable and nutritious pastures, which in some parts are highly valued as stock-fattening areas.

BOTANIC DESCRIPTION

Spikes solitary, terminal, exserted, simple, erect, often curved, slender, 5-8 cm long, < 5 mm wide; rhachis compressed, smooth or scaberulous on the edges, glabrous, striate, grooved, somewhat flexuose, prominently ribbed on the face, with the spikelets biseriate and alternate on the midrib. *Spikelets* solitary, somewhat laterally compressed, usually distant or scarcely contiguous in the lower part, closely imbricate and crowded upwards, erect and appressed to the rhachis, 6.5-13 mm long; rhachilla disarticulate above the glumes and tardily so between the florets, glabrous, the internodes about 0.25 mm long. *Florets* several, closely imbricate, bisexual or the uppermost male or neuter. *Glumes* glabrous; lower 1-nerved, hyaline, 2.5-3 mm long, lanceolate-ovate, acuminate, scaberulous on the nerve, smooth; upper 3-3.5 mm long, oblong-lanceolate, 3-5-nerved, smooth, thinly membranous, with broad hyaline margins, narrow-truncate, emarginate. *Lemmas*

glabrous, smooth, 3-nerved, obtusely keeled, (the lowest) 3-3.25 mm long, scarious, with hyaline margins, broadly lanceolate-ovate, with 2 small, usually obtuse lobes at the apex and mucronate or shortly awned from the sinus; awn scaberulous, exceeding the lobes; callus minute, obtuse, white-bearded. *Palea* hyaline and delicate, broadly elliptic-ovate, slightly shorter than the lemma, entire, complicate, ciliolate on the margins, otherwise glabrous and smooth, 2-keeled; keels green, submarginal, narrowly winged in the lower part. *Caryopsis* obtusely triquetrous, narrowly linear-lanceolate, brown, 1.75 mm long.

130. Purple Plume Grass
(needle grass)

Triraphis mollis
Plate 70c

GENERAL DESCRIPTION

HABIT: Tufted slender perennial, perhaps short-lived, 30-45 cm high, hairless and smooth on the foliage.

STEMS: Erect or bent at the lower nodes, unbranched, maturing purplish, with 3-4 often purple-black nodes.

LEAVES: Dense at the base, sparse on the culms, usually maturing with a high colour. Blades 7-17 cm long, tapered to a long fine point, flat and rather broad or inrolled with a channelled upper surface and narrow. Sheaths much shorter than the internodes, tight, strongly nerved; ligule fringed with short hairs.

SEEDHEAD: Panicle 6-25 cm long, 1-2 cm wide, spiciform, dense or sometimes open or interrupted in the lower part, plumose, pale green or purplish, prominent, terminating the culms and shortly exceeding the uppermost leaf. The flattened spikelets are largely concealed by slender awns and long, fine hairs. Each one contains 6-12 florets, which fall individually at maturity.

OCCURRENCE: Purple plume grass occurs throughout the area in floodout country, on sand plains and dunes, and in gently sloping or low hilly country. Soils include clayey sands, red earths of medium or coarse texture, and coarse alluvial soils. Commonly associated plants are short grasses and forbs, gidgee, lobed spinifex, and less frequently mulga, ironwood, and coolibah.

DISTRIBUTION: M.

VALUE: Purple plume grass is undoubtedly grazed, but appears to be less valuable than many similar, short-lived pasture grasses.

BOTANIC DESCRIPTION

Panicle spiciform, cylindrical, continuous or sometimes interrupted in the lower part, 6-25 cm long, 1-2 cm wide, at length prominently exerted; peduncle and rhachis erect, terete, striate, glabrous, scabrous or scaberulous; branches much divided, angular, scabrous, filiform, clustered, distant or approximate upwards, < 6 cm long but usually much shorter, the lower ones sometimes slightly spreading; pedicels very short but variable, scabrous, slender, angular. *Spikelets* erect, crowded, solitary, laterally compressed, < 1.3 cm long (incl. awns); rhachilla disarticulate above the glumes and between the florets,

slender, glabrous, the internodes 0.5 mm long, very oblique at the apex. *Florets*, 6-12, closely imbricate, bisexual or the uppermost reduced and neuter. *Glumes* hyaline, 1-nerved, keeled, glabrous, scaberulous on the keel, smooth, linear-lanceolate, 3-5 mm long; lower 2-toothed or mucronate; the apex of the upper narrow-truncate, ciliate, mucronate. *Lemmas* scarious to hyaline, linear-oblong, (the lowest) 4-4.5 mm long, 3-nerved and 3-awned from the nerves, deeply 2-toothed with the central awn arising from the sinus, villous-ciliate on the lateral nerves, glabrous or sparsely ciliate on the midnerve, scabrous on the apical teeth, smooth; awns very fine but stiff, erect, scabrous, 6.5-7.5 mm long; callus obtuse, 0.5 mm long, bearded with white hairs. *Palea* hyaline and delicate, linear-oblong, acuminate, 2.75-3 mm long, glabrous, smooth, 2-keeled; keels narrowly winged, scaberulous on the upper part. *Caryopsis* linear, obtusely triquetrous, 2 mm long, golden brown.

131. Flat-stem Grass

Uranthoecium truncatum

Plate 70d

GENERAL DESCRIPTION

HABIT: Slender tufted annual or short-lived perennial, 22-37 cm high.

STEMS: Erect or bent at the lower nodes, simple or sparsely branched mainly at the upper nodes, hairless, smooth, often purplish, hollow and soft, prominently nerved or ridged, often grooved near the base, flat in the upper part, 1-2-noded; nodes shortly hairy.

LEAVES: Sheaths thin, broad and loose, with numerous prominent nerves, smooth, with a dense tuft of erect hairs at the mouth, otherwise hairless; the basal ones rather numerous and papery. Blades flat or sometimes loosely folded, hairless, covered by minute bristles on the upper surface, prominently nerved and smooth on the lower surface, mostly 6-10 cm long, up to 4 mm wide, tapered to a long fine point, with thick white edges.

SEEDHEAD: Spiciform, up to 10 cm long or more, consisting of spikes terminating branched culms and at first partly enclosed by the uppermost sheath, widely spaced on the axis though closer and almost overlapping on young plants. Distinctively, the axis is flat, smooth and yellowish on the upper surface, green and minutely bristly on the lower one. Each spike contains 2, 3, or 4 spikelets, erect and closely appressed to the rhachis which terminates in a flattened bristle. The spikelet is 8-10 mm long, with short, blunt glumes and long-pointed, bristle-like lemmas. At maturity the axis of the inflorescence readily breaks at a joint close below each spike, which falls entire.

OCCURRENCE: Apparently rare in central Australia; known only from cracking clay soils near Argadargada, where it grows in gilgais, depressions, and similar low-lying sites in association with Mitchell grasses, coolibah, and gidgee. Plants flower from March to May.

DISTRIBUTION: Q., N.S.W.

VALUE: Little is known of its fodder value, but the softly herbaceous plants are probably palatable.

BOTANIC DESCRIPTION

Inflorescence of short secondary spikes on the fragile axis of a primary spike. *Primary spike* < 10 cm long or more, finally prominently exerted; peduncle glabrous, smooth, in the lower part, terete or broadly grooved on one side, strongly compressed upwards; common axis conspicuously flattened, cartilaginous, glabrous, green scaberulous and prominently striate on the under surface, straw-coloured and smooth on the face with narrow green scaberulous margins, disarticulate below the nodes, at first short but becoming elongated with long internodes. *Secondary spikes* few, of 2-4 spikelets, 1-1.5 cm long, approximate or remote, erect and appressed, falling entire with the adjacent internode of the common axis; the rhachis flattened like the axis or more often strongly triquetrous, flexuose, rigid, scabrous on the angles, terminated by a broad bristle. *Spikelets* sessile, 8-10 mm long, lanceolate, plano-convex, glabrous, pale green; callus absent. *Florets*, 2; lower neuter, upper bisexual. *Glumes* chartaceous to firmly membranous, with thin margins, glabrous, smooth or scaberulous, pale with green nerves; lower glume 3 mm long, flattened, broadly oblong, broad-truncate, emarginate or obtusely notched, 3 or sub-5-7-nerved or sometimes several-nerved with the lateral nerves paired, the nerves (or pairs of nerves) distant; upper glume 5 mm long, rounded on the back, narrow-truncate, ovate-oblong, entire or minutely notched, several-nerved with a group of 3 or 4 submarginal lateral nerves, the nerves merging near the apex and forming 2 keels; the central nerves thin, faint, sometimes anastomosing. *Lower lemma* as long as the spikelet, narrowly lanceolate, acuminate-caudate, obtusely 2-keeled, thickened-indurate on the keels, scarious between the keels and on the margins, with faint intracarinial nerves and 1 or 2 submarginal ones, scaberulous on the long, bristle-like, straight or curved apex, otherwise smooth. *Palea* 7-8 mm long, cartilaginous, acutely 2-keeled, with narrow hyaline wings on the keels, bidentate, similar in shape to its lemma, glabrous, smooth or ciliolate-scaberulous upwards. *Fertile floret* cartilaginous to indurated, plano-convex, narrowly elliptic-ovate, obscurely nerved, glabrous, rugulose, somewhat shiny, acuminate, with a firm scaberulous bristle. *Lemma* 6.5-7 mm long (incl. the bristle of 2-2.5 mm), with incurved margins. *Palea* 5 mm long (incl. the bristle of 1.25 mm), 2-keeled, with broad, thin, smooth, incurved margins. *Caryopsis* about 3 mm long, plano-convex, oblong-ovate.

132. Sandhill Cane Grass

Zygochloa paradoxa
Plates 71, 72

GENERAL DESCRIPTION

HABIT: Robust shrubby perennial, 75-150 cm high, with long thick rhizomes and coarse roots, forming dense stemmy tussocks up to 90 cm wide or large spreading clumps.

STEMS: Cane-like and woody, hairless, smooth, green, cylindrical or sometimes angular, channelled on one side, strongly branched, 6-9 mm wide near the base.

LEAVES: Foliage sparse. Sheaths broad, usually much shorter than the internodes, at first tight, but soon becoming very loose, rigid, flattened, with several prominent nerves, hairless or shortly hairy near the mouth and in the lower part, the edges

sometimes thin and transparent. Blades usually 2.5–5 cm long and rather narrow (the basal ones much longer and broader), stiff, flat or loosely folded, with several prominent nerves, broad and rounded in the lower part, but abruptly narrowed at the junction with the sheath, tapered to a short blunt point, with thickened and slightly rough edges, almost hairless, but with minute bristles on the upper surface.

SEEDHEAD: Spikelets in globular heads; the male and female spikelets borne separately on different plants. The male heads are pale green to straw-coloured and 1–2 cm wide. The female heads are mostly 2.5–3.5 cm wide and prickly from the curved, rigid points of several, thin, papery, strongly nerved bracteoles.

OCCURRENCE: This grass is a characteristic plant of the sandhills of the Simpson Desert. It occurs on the upper slopes and crests, either in widely spaced tussocks interspersed with unstable areas of bare, windswept sand or for long distances along the crests in dense, continuous stands. It also occurs sporadically throughout the eastern half of the area on deep, loose, sandy soils on low sand dunes or near streams



PLATE 71. *Zygochloa paradoxa*

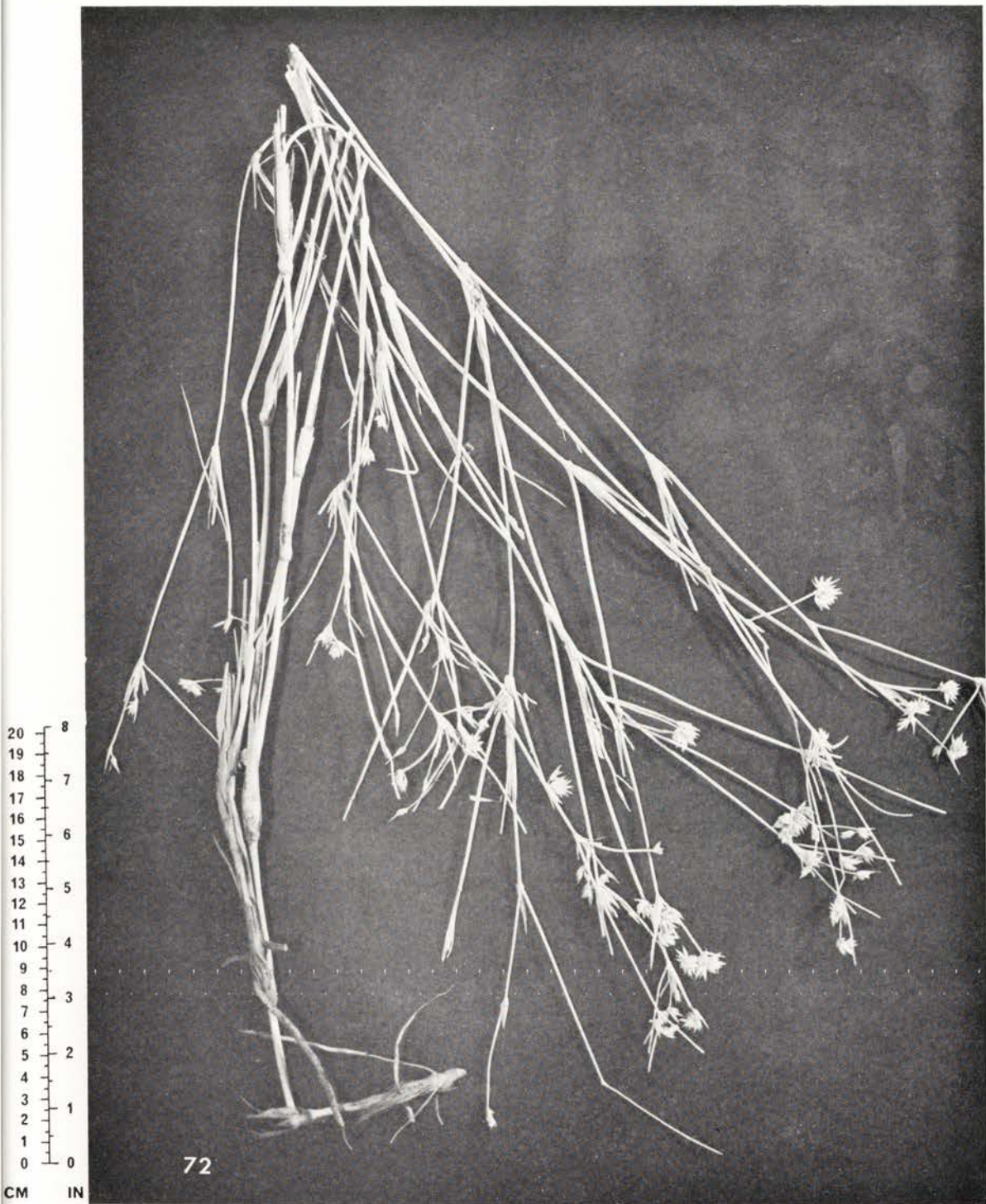


PLATE 72. *Zygochloa paradoxa*

on levees, floodouts, and banks. In sand dune areas, commonly associated plants include parrot-pea and lobed spinifex. In sites associated with streams, coolibah, river red gum, and ironwood are dominant in the upper storey, while kerosene grasses and forbs are common ground-storey constituents.

DISTRIBUTION: S.A., Q., N.S.W.

VALUE: Though foliage is sparse, cattle graze the new shoots and immature inflorescences. The plant is well adapted to its arid environment, for it responds readily to only light falls of rain and has vigorous, rhizomatous roots. Its spreading habit is a useful attribute in maintaining dune stability.

BOTANIC DESCRIPTION

Male heads semi-orbicular to orbicular, 1–2 cm diam.; lowermost bract mostly exceeding the head, usually with a very short lamina, the other bracts gradually shorter, the upper concealed in the head; spiciform partial panicles few in the head, with few to several flowers; axis angular, scaberulous on the margins; branches and pedicels short, scaberulous to finely pilose. *Spikelets* about 7–8 mm long, lanceolate, acute. *Glumes* ovate to elliptic-ovate, acute, rigidly chartaceous, 5–7-nerved, glabrous or almost so; the lower about two-thirds to three-quarters, and the upper about three-quarters to four-fifths, as long as the spikelet. *Florets*, 2, subsimilar. *Lemmas* elliptic-oblong (flattened), usually obtuse, glabrous, rigidly chartaceous with hyaline margins, 5-nerved. *Paleas* mostly glabrous and smooth, obtuse, rigid, almost as long as the lemmas, 2-keeled, winged on the keels in the lower part. *Female heads* hemispherical to globular, 2.5–3.5 mm diam., ± echinate due to the curved points of the bracteoles; bracts shorter than the heads; primary branches within the head very short, shortly and sparsely hairy; peduncles of the partial inflorescences 1–1.5 mm long; bracteoles ± lanceolate when young, becoming enlarged with ± toothed margins, prominently nerved, keeled, the keel produced into a rigid curved point or stout awn. *Spikelets* ellipsoid or narrowly ovoid, acute, turgid, 6–10 mm long. *Glumes* glabrous and smooth, prominently 7–9-nerved, rigidly chartaceous, with hyaline margins, ovate, usually acute to subobtus. *Lower floret* neuter. *Lemma* ovate-acute (flattened), glabrous, prominently 5-nerved, about as long as the spikelet, indurate. *Palea* with very broad overlapping flaps, scaberulous on the keels, glabrous, smooth, oblong and obtuse when flattened. *Upper (fertile) floret* lanceolate, acute, reaching to the top of the spikelet. *Lemma* broadly ovate (flattened), abruptly acuminate, crustaceous, 5-nerved; the margins hyaline and flat in the upper part, thicker, firm, and ± inrolled below. *Palea* included, broadly ovate and abruptly acuminate (flattened), 2-nerved, with hyaline margins.

VI Literature References

- ARNDT, W. and NORMAN, M. J. T. (1959). 'Characteristics of Native Pasture on Tippera Clay Loam at Katherine, N.T.', *C.S.I.R.O. Land Res. Reg. Survey Tech. Pap.* No. 3.
- BENTHAM, G. (1863-78). *Flora Australiensis*, Vols. 1-7, London.
- BLACK, J. M. (1914). 'Scientific Notes on an Expedition into the Interior of Australia', *Trans. R. Soc. S. Aust.*, **38**: 460-71.
- (1948-57). *Flora of South Australia*, Pts. 1-4, 2nd Ed., Govt Printer, Adelaide.
- BLAKE, S. T. (1938a). 'The Genus *Iseilema* in Queensland', *Proc. R. Soc. Qd*, **49** (6): 82-94.
- (1938b). 'The Plant Communities of Western Queensland and their Relationships, with Special Reference to the Grazing Industry', *Proc. R. Soc. Qd*, **49** (16): 156-204.
- (1940). 'The Interrelationships of the Plant Communities of Queensland', *Proc. R. Soc. Qd*, **51** (4): 24-31.
- (1941). 'Studies on Queensland Grasses, II', *Pap. Dep. Biol. Univ. Qd*, **1** (18): 1-22.
- (1943). 'Critical Notes on the Gramineae and Cyperaceae of South Australia with Descriptions of New Species', *Trans. R. Soc. S. Aust.*, **67** (1): 42-61.
- (1944). 'Monographic Studies in the Australian Andropogoneae, Part I', *Pap. Dep. Biol. Univ. Qd*, **2** (3): 1-62.
- (1948). 'Studies in Queensland Grasses, III', *Proc. R. Soc. Qd*, **59** (7): 153-60.
- (1952). 'The Identification and Distribution of some Cyperaceae and Gramineae, Chiefly from Australia', *Proc. R. Soc. Qd*, **62** (10): 83-100.
- BROWN, R. (1849). Appendix to C. Sturt, *Narrative of an Expedition into Central Australia during the years 1844, 5, and 6*, London.
- BURBIDGE, N. T. (1941). 'A Revision of the Australian Species of *Enneapogon* Desv.', *Proc. Linn. Soc. Lond.*, Session 153, Pt 1: 52-91.
- (1945). 'Morphology and Anatomy of the Western Australian species of *Triodia* R. Br. I. General Morphology', *Trans. R. Soc. S. Aust.*, **69**: 303-8.
- (1946a). 'A Revision of the Western Australian Species of *Triodia* R. Br.', *J. Proc. R. Soc. West. Aust.*, **30**: 15-33.
- (1946b). 'Morphology and Anatomy of the Western Australian species of *Triodia* R. Br. II. Internal Anatomy of Leaves', *Trans. R. Soc. S. Aust.*, **70** (2): 221-34.

The Grasses of Central Australia

- (1953). 'The Genus *Triodia* R. Br. (Gramineae)', *Aust. J. Bot.*, **1** (1): 121–84.
- (1960a). 'The Phytogeography of the Australian Region', *Aust. J. Bot.*, **8** (2): 75–212.
- (1960b). 'Further Notes on *Triodia* R. Br. (Gramineae) with Description of five new Species and one Variety', *Aust. J. Bot.*, **8** (3): 381–94.
- (1963). *Dictionary of Australian Plant Genera*, Gymnosperms and Angiosperms, Sydney.
- CHIPPENDALE, G. M. (1958). 'Notes on the Vegetation of a Desert Area in Central Australia', *Trans. R. Soc. S. Aust.*, **81**: 31–41.
- (1959a). 'Plants of Palm Valley, Central Australia', *Victorian Nat.*, **75** (12): 192–9.
- (1959b). 'Check List of Central Australian Plants', *Trans. R. Soc. S. Aust.*, **82**: 321–38.
- (1960). 'Contributions to the Flora of Central Australia, No. 1', *Trans. R. Soc. S. Aust.*, **83**: 199–203.
- (1961). 'Contributions to the Flora of Central Australia, No. 2', *Trans. R. Soc. S. Aust.*, **84**: 99–103.
- (1962). 'Botanical Examination of Kangaroo Stomach Contents and Cattle Rumen Contents', *Aust. J. Sci.*, **25** (1): 21–2.
- (1963a). 'Contributions to the Flora of Central Australia, No. 3', *Trans. R. Soc. S. Aust.*, **86**: 7–9.
- (1963b). 'The Relic Nature of some Central Australian Plants', *Trans. R. Soc. S. Aust.*, **86**: 31–4.
- (1963c). 'Ecological Notes on the "Western Desert" area of the Northern Territory', *Proc. Linn. Soc. N.S.W.*, **88** (1): 54–66.
- (1965). 'Desert Plants and Their Use', *Aust. natn. Clay.*, **15** (4): 115–18.
- and MURRAY, L. (1957). 'Poisonous Plants of the Northern Territory', *N.T.A., A.I.B. Ext. Art.*, **2** (2): 13–16.
- CHRISTIAN, C. S. *et al.* (1954). 'Survey of the Barkly Region, Northern Territory and Queensland, 1947–8', *Land Res. Ser. C.S.I.R.O. Aust.*, No. 3.
- CLELAND, J. B., BLACK, J. M., and REESE, L. (1925). 'The Flora of the North-east Corner of South Australia, North of Cooper's Creek', *Trans. R. Soc. S. Aust.*, **44**: 103–20.
- CROSS, D. O. and VICKERY, J. W. (1950). 'List of the Naturalised Grasses in New South Wales', *Contr. N.S.W. natn. Herb.*, **1** (5): 275–80.
- C.S.I.R.O. (1953). 'Standardized Plant Names', *C.S.I.R.O. Bull.*, No. 272.
- EARDLEY, C. M. (1946). 'Catalogue of Plants of the Simpson Desert Expedition (1939)', *Trans. R. Soc. S. Aust.*, **70**: 145–74.
- EVERIST, S. L. (1935). '*Chloris* Grasses in Queensland. Part I', *Qd agric. J.*, **43**: 474–8.
- (1937). '*Chloris* Grasses in Queensland, Part III', *Qd agric. J.*, **47**: 181–91.

Literature References

- EWART, A. J. and DAVIES, O. B. (1917). *The Flora of the Northern Territory*, Melbourne.
- GARDNER, C. A. (1952). *Flora of Western Australia*, Gramineae, Vol. 1, Pt 1, Govt Printer, Perth.
- GILES, E. (1875). *Geographic Travels in Central Australia from 1872 to 1874*, Melbourne. List of Plants, pp. 211–23.
- GOSSE, W. C. (1873). *W. C. Gosse's Explorations: Report and Diary*, Adelaide.
- GRAY, M. (1961). 'A List of Vascular Plants Occurring in the New England Tablelands, New South Wales, with Notes on Distribution', *Contr. N.S.W. natn. Herb.*, **3** (1): 1–82.
- HARTLEY, W. (1942). 'New Species and Varieties of *Eriachne* R. Br.—Family Gramineae', *J. Linn. Soc. Botany*, **52** (344): 342–8.
- HUBBARD, C. E. (1928). 'The Genus *Astrebla* or Mitchell Grasses', *Kew Bull.*, **1928** (7): 257–66.
- (1935). *Hooker's Icon. Pl.*, tt. 3284–6.
- (1936). *Hooker's Icon. Pl.*, t. 3312.
- (1937). *Hooker's Icon. Pl.*, t. 3336.
- (1938). *Hooker's Icon. Pl.*, tt. 3363, 3364.
- HUGHES, D. K. (1923). 'The Genus *Panicum* of the Flora Australiensis', *Kew Bull.*, **1923** (9): 305–32.
- KEMPE, H. (1879–80). 'Plants Indigenous to the Neighbourhood of Hermannsburg', *Trans. R. Soc. S. Aust.*, **3**: 129–37.
- (1881–2). 'Plants Indigenous to the Neighbourhood of Hermannsburg', *Trans. R. Soc. S. Aust.*, **5**: 19–23.
- LAZARIDES, M. (1959). 'The Australian Species referred to *Ichmanthus* Beauv. (Gramineae)', *Aust. J. Bot.*, **7** (3): 328–46.
- (1961). 'Contributions to the Knowledge of Western Australian Gramineae', *J. Proc. R. Soc. West. Aust.*, **44** (3): 77–83.
- MEIGS, P. (1953). 'World Distribution of Arid and Semi-Arid Homoclimates', *Reviews of Research on Arid Zone Hydrology*, Unesco, Paris, pp. 203–10.
- MUELLER, F. (1858). *Report on the Plants collected during Mr. Babbage's Expedition into the North-Western Interior of South Australia in 1858*, Govt Printer, Melbourne.
- (1858–82). *Fragmenta Phytographiae Australiae*, Vols. 1–12, Melbourne.
- (1864). Appendix to *The Journals of John McDouall Stuart during the Years 1858, 1859, 1860, 1861, 1862*, London.
- (1877). 'List of the Plants obtained during Mr. C. Giles's Travels in Australia in 1875 and 1876', *J. Bot., Lond.*, **15**: 269–81, 300–6, 344–9.
- (1884–5). 'Plants Collected in Central Australia by Charles Winnecke', *Proc. R. Soc. S. Aust.*, **8**: 10–13.

The Grasses of Central Australia

- and TATE, R. (1889–90). ‘List of Plants Collected During Mr. Tietken’s Expedition into Central Australia (1889)’, *Trans. R. Soc. S. Aust.*, **13**: 94–109.
- and—(1896). ‘Botany of the Elder Exploring Expedition (1891–2)’, *Trans. R. Soc. S. Aust.*, **16** (3): 333–83.
- PERRY, R. A. (1960). ‘Pasture Lands of the Northern Territory, Australia’, *Land Res. Ser. C.S.I.R.O. Aust.*, No. 5.
- (1962). ‘Natural Pastures of the Alice Springs Area’, *Land Res. Ser. C.S.I.R.O. Aust.*, No. 6: 240–57.
- et al.* (1962). ‘Lands of the Alice Springs Area, Northern Territory, 1956–7’, *Land Res. Ser. C.S.I.R.O. Aust.*, No. 6.
- SLATYER, R. O. (1962). ‘Climate of the Alice Springs Area’, *Land Res. Ser. C.S.I.R.O. Aust.*, No. 6: 109–28.
- SPECHT, R. L. (1958). *Records of the American–Australian Scientific Expedition to Arnhem Land*, Vol. 3, Botany and Plant Ecology, Melbourne.
- STEARNS, W. T. (1966). *Botanical Latin*, London.
- TATE, R. (1896). *Report of the Horn Expedition to Central Australia (1894)*, Pt 3, Botany, Adelaide, pp. 117–204.
- TIETKENS, W. H. (1891). *Journal of the Central Australian Exploring Expedition, 1889*, Adelaide.
- VICKERY, J. W. (1950a). ‘The Species of *Amphipogon* R. Br.’, *Contr. N.S.W. natn. Herb.*, **1** (5): 281–95.
- (1950b). ‘Contributions to the Taxonomy of Australian Grasses’, *Contr. N.S.W. natn. Herb.*, **1** (6): 322–43.
- (1953). ‘A Census of the Native Gramineae of New South Wales’, *Contr. N.S.W. natn. Herb.*, **2** (1): 67–87.
- (1956). ‘A Revision of the Australian Species of *Danthonia* DC’, *Contr. N.S.W. natn. Herb.*, **2** (3): 249–325.
- (1961). ‘Flora of New South Wales’, *Contr. N.S.W. natn. Herb.*, Flora Series, Gramineae, No. 19, Pt 1: 1–124.
- WARBURTON, P. E. (1875). *Journey across the Western Interior of Australia (1873)*, London.
- WILLIS, J. H. (1962). *A Handbook to Plants in Victoria*, Vol. 1, Ferns, Conifers and Monocotyledons, Melbourne.

Appendix I

BIBLIOGRAPHY OF SPECIES AND CITATION OF COLLECTIONS

The species, with basionyms and bibliographic references, are listed in alphabetical order and numbered to correspond with their description in Part V. The cited collections represent specimens from the area and are located in the herbarium of the CSIRO, Canberra, or in the Northern Territory Herbarium, Alice Springs (cited as NT).

Collectors' names are abbreviated as follows:

N.T. Burbidge:	N.T.B.	M. Lazarides:	M.L.
J.B. Cleland:	J.B.C.	R.A. Perry:	R.A.P.
N. Forde:	N.F.	R.E. Winkworth:	R.E.W.
M. Gray:	M.G.		

1. *Amphipogon caricinus* F. Muell., *Linnaea*, **25**: 445 (1853).
M.L. 5867, 5873, 6169; R.A.P. 910.
2. *Aristida anthoxanthoides* (Domin) Henr., *Meded. Herb. Leid.* No. 54: 10, 29 (1926).
A. adscensionis L. var. *anthoxanthoides* Domin, *Biblioth. Bot.*, **20** (85): 343, pl. 15, f. 9-12 (1915).
R.A.P. 3344.
3. *A. biglandulosa* J. M. Black, *Trans. R. Soc. S. Aust.*, **57**: 146 (1933).
M.L. 5182, 5323; NT 8406, 8941, 8942; R.A.P. 3217, 3346, 3363.
4. *A. browniana* Henr., *Meded. Herb. Leid.* No. 54: 63 (1926).
M.L. 2714; NT 8678; R.A.P. 3214, 3411, 5343; R.E.W. 11, 32.
5. *A. capillifolia* Henr., l.c. No. 58A: 298 (in clavi), pl. 154 (1932); l.c. No. 54C: 710 (latine) (1933).
J.B.C. 23; R.A.P. 5337A.
6. *A. contorta* F. Muell., *Trans. Proc. Vict. Inst.*, **1**: 44 (1855).
M.L. 5179, 6266; NT 8650, 8729, 8759; R.A.P. 3210, 3241.
7. *A. echinata* Henr., *Meded. Herb. Leid.* No. 58A: 285 (in clavi), pl. 139 (1932); l.c. 713 (latine) (1933).
N.T.B. & M.G. 4233, 4249; M.L. 5183.

The Grasses of Central Australia

8. *A. inaequiglumis* Domin, *Biblioth. Bot.*, **20** (85): 347 (1915).
M.L. 5186, 5213, 5230, 5311.
9. *A. jerichoensis* (Domin) Henr., *Meded. Herb. Leid.* No. 54A: 261, 270 (1927).
A. ingrata Domin var. *jerichoensis* Domin, l.c. 346 (1915).
N.F. 97; R.A.P. 882.
10. *A. latifolia* Domin, l.c. 339, pl. 13, figs. 13, 14 (1915).
M.L. 5257; NT 8815; R.A.P. 675, 700, 3306.
11. *A. nitidula* (Henr.) S.T. Blake, *Trans. R. Soc. S. Aust.*, **67** (1): 46 (1943). *A. echinata*
Henr. var. *nitidula* Henr., *Meded. Herb. Leid.* No. 58A: 285 (descr. angl.) (1932);
l.c. No. 54C: 714 (latine) (1933).
M.L. 5310; R.A.P. 3297.
12. *A. obscura* Henr., l.c. No. 54A: 385 (1927).
N.F. 93; M.L. 5187; NT 6646.
13. *A. strigosa* (Henr.) S. T. Blake, *Trans. R. Soc. S. Aust.*, **67** (1): 45 (1943). *A. calycina*
R. Br. var. *strigosa* Henr., l.c. No. 58A: 297 (descr. angl.) (1932); l.c. No. 54C:
708 (latine) (1933).
M.L. 5206, 5227, 5312, 5725, 5984; NT 8667; R.E.W. 30, 793.
14. *Astrebla elymoides* F. Muell. ex F.M. Bail., *Illustr. Monogr. Grasses Qld.* t. 8 (1879).
NT 8688, 8714; R.A.P. 3493.
15. *A. lappacea* (Lindl.) Domin, *Biblioth. Bot.*, **20** (85): 372 (1915). *Danthonia lappacea*
Lindl. in Mitch. *Three Exped. Aust.*, **1**: 309 (1838).
NT 4069.
16. *A. pectinata* (Lindl.) F. Muell. ex Benth., *Flor. Austral.*, **7**: 602 (1878). *Danthonia*
pectinata Lindl., l.c. **2**: 26 (1838).
NT 8713, 8800, 10255; R.A.P. 677, 3308, 3492; R.E.W. 61.
17. *Bothriochloa ewartiana* (Domin) C.E. Hubb., *Kew Bull.*, **1934**: 444 (1934). *Andropo-*
gon ewartianus Domin, *Biblioth. Bot.*, **20** (85): 269 (1915).
M.L. 5180, 6269; NT 8652; R.A.P. 3362.
18. *B. intermedia* (R. Br.) A. Camus, *Ann. Soc. Linn. Lyon* (1930), n.s., **76**: 164 (1931).
Andropogon intermedius R. Br., *Prodr. Flor. Nov. Holl.* 202 (1810).
C.A. Gardner 11621.
23. *Brachiaria gilesii* (Benth.) Chase, *Contr. U.S. natn. Herb.*, **22**: 35 (1920). *Panicum*
gilesii Benth., *Flor. Austral.*, **7**: 477 (1878).
M.L. 5326; NT 8641, 8643, 8674, 8999; R.A.P. 3278, 3288.
24. *B. holosericea* (R. Br.) Hughes, *Kew Bull.* **1923**: 315 (1923). *Panicum holosericeum*
R. Br., *Prodr. Flor. Nov. Holl.* 190 (1810).
R.A.P. 3409.
25. *B. miliiformis* (C. B. Presl) Chase, *Contr. U.S. natn. Herb.*, **22** (1): 35 (1920). *Panicum*
miliiforme J. S. Presl ex C. B. Presl, *Rel. Haenk.*, **1**: 300 (1830).
M.L. 5203; NT 5185, 8647; R.A.P. 3261.

Appendix I

26. *B. notochthona* (Domin) Stapf in Prain, *Flor. trop. Afr.*, **9** (4): 597 (1920). *Panicum notochthonum* Domin in Fedde, *Repert. Spec. nov. Regn. Veg.*, **10**: 60 (1911).
M.L. 5326A; R.A.P. 3317.
27. *B. piligera* (F. Muell. ex Benth.) Hughes, *Kew Bull.*, **1923**: 315 (1923). *Panicum piligerum* F. Muell. ex Benth., *Flor. Austral.*, **7**: 477 (1878).
M.L. 5217.
28. *B. praetervisa* (Domin) C. E. Hubb., *Kew Bull.*, **1934**: 446 (1934). *Panicum praetervisum* Domin, *Biblioth. Bot.*, **20** (85): 309 (1915).
M.L. 5321, 6205; NT 8642, 8663, 8682; R.A.P. 3282, 3290, 3319, 3421.
29. *Brachyachne ciliaris* (Benth.) C. E. Hubb., *Kew Bull.*, **1934**: 448 (1934). *Cynodon ciliaris* Benth., *Flor. Austral.*, **7**: 610 (1878).
30. *Chloris acicularis* Lindl. in Mitch. *J. Exped. trop. Aust.*, **33** (1848).
M.L. 5181, 5225, 6270; NT 8654, 9024; R.A.P. 906, 3233, 5425.
31. *C. pectinata* Benth., *Flor. Austral.*, **7**: 612 (1878).
M.L. 5258; NT 8686; R.A.P. 710, 3314.
32. *C. scariosa* F. Muell., *Fragm. Phyt. Aust.*, **6**: 85 (1867).
M.L. 5280; NT 9017; R.A.P. 3368.
33. *C. virgata* Sw., *Flor. Ind. Occid.*, **1**: 203 (1797).
NT 8664; R.A.P. 3277.
34. *Chrysopogon fallax* S. T. Blake, *Pap. Dep. Biol. Univ. Qd.*, **2** (3): 9 (1944).
M.L. 5205, 5271; NT 8672; R.A.P. 3276.
35. *C. pallidus* (R. Br.) Trin. ex Steud., *Nomencl. Bot.*, Ed. 2, **1**: 360 (1840). *Holcus pallidus* R. Br., *Prodr. Flor. Nov. Holl.* 199 (1810).
NT 10263.
36. *Cymbopogon bombycinus* (R. Br.) Domin, *Biblioth. Bot.*, **20** (85): 274 (1915). *Andropogon bombycinus* R. Br., *Prodr. Flor. Nov. Holl.* 202 (1810).
R.A.P. 911.
37. *C. exaltatus* (R. Br.) Domin, l.c. 273. *Andropogon exaltatus* R. Br., l.c. 202.
M.L. 5228, 5322, 6145; N.F. 71, 945A; R.A.P. 3514, 5373, 5490.
38. *C. obtectus* S. T. Blake, *Pap. Dep. Biol. Univ. Qd.*, **2** (3): 55 (1944).
M.L. 5313; NT 8670; R.A.P. 3215.
39. *Dactyloctenium radulans* (R. Br.) Beauv., *Ess. Agrost.*, 72, (1812). *Eleusine radulans* R. Br., *Prodr. Flor. Nov. Holl.* 186 (1810).
M.L. 5259; R.A.P. 3227, 5346; R.E.W. 146.
40. *Danthonia bipartita* F. Muell., *Fragm. Phyt. Aust.*, **1**: 160 (1859).
M.L. 5314, 6238; R.A.P. 5482.
19. *Dichanthium fecundum* S. T. Blake, *Pap. Dep. Biol. Univ. Qd.*, **2** (3): 51 (1944).
20. *D. humilius* J. M. Black, *Trans. R. Soc. S. Aust.*, **60**: 165 (1936).
M.L. 6069; NT 8604, 8691; R.E.W. 1295.

21. *D. sericeum* (R. Br.) A. Camus, *Bull. Mus. Hist. Nat. Paris*, **27**: 549 (1921). *Andropogon sericeus* R. Br., *Prodr. Flor. Nov. Holl.* 201 (1810).
M.L. 5191; R.A.P. 3275; R.E.W. 47.
22. *D. superciliatum* (Hack.) A. Camus, l.c. 550 (1921). *Andropogon superciliatus* Hack. in Engl., *Bot. Jahrb.*, **6**: 239 (1885).
R.A.P. 715.
41. *Digitaria brownii* (Roem. & Schult.) Hughes, *Kew Bull.*, **1923**: 313 (1923). *Panicum brownii* Roem. & Schult., *Syst. Veg.*, **2**: 462 (1817).
M.L. 5210, 5283; NT 8660, 9025; R.A.P. 3216, 3245; R.E.W. 5, 160.
42. *D. coenicola* (F. Muell.) Hughes, l.c. 313 (1923). *Panicum coenicolum* F. Muell., *Trans. Proc. Vict. Inst.*, **1**: 45 (1855).
M.L. 5178, 5193; NT 1655, 3170, 8665, 9027; R.A.P. 3220, 3324; R.E.W. 48, 164, 283.
43. *D. ctenantha* (F. Muell.) Hughes, l.c. 310 (1923). *Panicum ctenanthum* F. Muell., *Fragm. Phyt. Aust.*, **8**: 153 (1874).
NT 8683; R.A.P. 3254.
44. *D. eriolepis* Henr., Monogr. Genus *Digitaria* 819 (1950).
M.L. 6264.
45. *Diplachne fusca* (L.) P. Beauv., *Ess. Agrost.* 80, 163 (1812), in index sub *Festuca fusca*. *Festuca fusca* L., *Syst. Nat.*, Ed. 10, **2**: 876 (1759).
M.L. 5192, 5329, 6194; NT 2036, 10584; R.A.P. 3340, 5352.
46. *D. parviflora* (R. Br.) Benth., *Flor. Austral.*, **7**: 620 (1878). *Triodia parviflora* R. Br., *Prodr. Flor. Nov. Holl.* 182 (1810).
M.L. 5290; R.A.P. 3501.
47. *Echinochloa colonum* (L.) Link, *Hort. Bot. Berol.*, **2**: 209 (1833). *Panicum colonum* L., *Syst. Nat.*, Ed. 10, **2**: 870 (1759).
R.A.P. 709.
48. *Ectrosia leporina* R. Br., *Prodr. Flor. Nov. Holl.* 186 (1810).
R.E.W. 987.
49. *Elytrophorus spicatus* (Willd.) A. Camus in Lecomte, *Flor. gen. l'Ind.-Chin.*, **7**: 547 (1923). *Dactylis spicata* Willd., *Neue Schrift Ges. Naturf. Freund. Berlin*, **3**: 416 (1801).
NT 1122, 8749.
50. *Enneapogon avenaceus* (Lindl.) C. E. Hubb., *Kew Bull.*, **1934**: 450 (1934). *Pappophorum avenaceum* Lindl. in Mitch., *J. Exped. trop. Aust.* 320 (1848).
M.L. 5174, 5202; R.A.P. 3212, 5427; R.E.W. 42, 135.
51. *E. clelandii* N. T. Burbidge, *Proc. Linn. Soc. Lond.*, Session 153, Pt 1, 81 (1941).
J.B.C. viii. 1951.
52. *E. cylindricus* N. T. Burbidge, l.c. 91, fig. 5 (1941).
M.L. 5173; NT 10588; R.A.P. 3265; R.E.W. 74.

Appendix I

53. *E. glaber* N. T. Burbidge, l.c. 73 (1941).
NT 8772.
54. *E. lindleyanus* (Domin) C. E. Hubb., *Kew Bull.*, **1934**: 450 (1934). *Pappophorum lindleyanum* Domin, *Biblioth. Bot.*, **20** (85): 379 (1915).
R.A.P. 3296.
55. *E. oblongus* N. T. Burbidge, l.c. 86 (1941).
M.L. 5229, 5293; NT 8658; R.A.P. 3280, 3376, 5439.
56. *E. pallidus* (R. Br.) Beauv., *Ess. Agrost.* 82, 162, 171 (1812). *Pappophorum pallidum* R. Br., *Prodr. Flor. Nov. Holl.* 185 (1810).
M.L. 5188, 5281; R.A.P. 3361.
57. *E. polyphyllus* (Domin) N. T. Burbidge, l.c. 69, f. 2 (1941). *Pappophorum nigricans* R. Br. var. *polyphyllum* Domin, *Biblioth. Bot.*, **20** (85): 381 (1915).
M.L. 5320, 6220, 6225, 6237; NT 8601, 8653, 8998; R.A.P. 3211, 3256, 3431, 3478, 5342, 5494; R.E.W. 81.
58. *Eragrostis barrelieri* Daveau in Morot, *J. de Bot.*, **8**: 289 (1894).
M.L. 5171; R.A.P. 3222, 3255, 3315.
59. *E. cilianensis* (All.) Link ex Lut. in *Malpighia*, **18**: 386 (1904). *Poa cilianensis* All., *Flor. Pedem.*, **2**: 246, t. 91, f. 2 (1785).
NT 8692.
60. *E. confertiflora* J. M. Black, *Trans. R. Soc. S. Aust.* **55**: 136, f. 2 (1931).
M.L. 5956.
61. *E. cumingii* Steud., *Syn. Pl. Glum.*, **1**: 266 (1854).
M.L. 5246; NT 8836; R.A.P. 3420.
62. *E. dielsii* Pilger in Engl., *Bot. Jahrb.*, **35**: 76 (1904).
M.L. 5327, 6052; NT 8648; R.A.P. 3253, 5356, 5369.
63. *E. elongata* (Willd.) J. F. Jacq., *Eclog. Gramin. rar.*, t. 3 (1813). *Poa elongata* Willd., *Enum. Plant. Hort. berol.*, **1**: 108 (1809).
64. *E. eriopoda* Benth., *Flor. Austral.*, **7**: 648 (1878).
M.L. 2718, 5189, 5209, 6201, 6203, 6215, 6224, 6226, 6229; R.A.P. 903.
65. *E. falcata* Gaud. in Freyc., *Voy. aut. Monde* (Bot.), 408, t. 25 (1829).
M.L. 5294, 6206; NT 8696, 8698, 8760; R.A.P. 5356A; R.E.W. 108.
66. *E. japonica* (Thunb.) Trin., *Mém. Acad. Sci. St Pétersb.*, Sér. 6, **1**: 405 (1831). *Poa japonica* Thunb., *Flor. japon.* 51 (1784).
NT 8859; R.A.P. 711.
67. *E. kennedyae* F. Turner, *Proc. Linn. Soc. N.S.W.*, Ser. 2, **8**: 535 (1894).
NT 8690; R.A.P. 3384.
68. *E. lacunaria* F. Muell. ex Benth., *Flor. Austral.*, **7**: 649 (1878).
R.A.P. 3218.

69. *E. laniflora* Benth., l.c.: 648 (1878).
J.B.C., L41; M.L. 5317, 6204, 6234, 6235, 6239; NT 8671; R.A.P. 5341; R.E.W. 9, 40.
70. *E. leptocarpa* Benth., l.c.: 644 (1878).
NT 8666, 8679, 8681; R.A.P. 3312, 3398.
71. *E. parviflora* (R. Br.) Trin., *Mém. Acad. Sci. St Pétersb.*, Sér. 6, 1: 411 (1831). *Poa parviflora* R. Br., *Prodr. Flor. Nov. Holl.* 180 (1810).
M.L. 5298.
72. *E. setifolia* Nees in Hook., *Lond. J. Bot.*, 2: 419 (1843).
M.L. 5194, 5943, 6216, 6217, 6222, 6231, 6233; NT 8715, 8765, 8694, 8912, 8913, 9011, 9012; R.A.P. 872, 3345, 3375, 3397, 5351.
73. *E. speciosa* (Roem. & Schult.) Steud., *Syn. Pl. Glum.*, 1: 279 (1854). *Poa speciosa* Roem. & Schult. *Syst. Veg.*, 2: 573 (1817).
74. *E. xerophila* Domin, *J. Linn. Soc.*, 41: 281, pl. 12, f. 18–20 (1912).
M.L. 6267; NT 8689, 8718, 8722; R.A.P. 682, 866, 870.
75. *Eriachne aristidea* F. Muell., *Fragm. Phyt. Aust.*, 5: 205 (1866).
M.L. 5219, 6228; R.A.P. 3401, 3423, 3450, 5347, 5410; R.E.W. 44.
76. *E. armitii* F. Muell. ex Benth., *Flor. Austral.*, 7: 627 (1878).
NT 8837; R.A.P. 3456.
77. *E. benthamii* Hartley, *J. Linn. Soc. (Bot.)*, 52 (344): 345 (1942).
M.L. 5254, 5266, 6221.
78. *E. helmsii* (Domin) Hartley, l.c.: 346 (1942). *E. mucronata* R. Br. var. *helmsii* Domin, *Biblioth. Bot.*, 20 (85): 361 (1915).
M.L. 5185, 5316, 6219, 6236; N.F. 98; NT 8680; R.A.P. 3266.
79. *E. mucronata* R. Br., *Prodr. Flor. Nov. Holl.* 184 (1810).
M.L. 5292, 5332, 5924; NT 8655; R.A.P. 3244, 3354.
80. *E. nervosa* Ewart & Cookson in Ewart & Davies, *Fl. North. Territ.* 44, Pl. IV (1917).
R.A.P. 695, 717, 920.
81. *E. obtusa* R. Br., *Prodr. Flor. Nov. Holl.* 184 (1810).
M.L. 5270; NT 8782.
82. *E. pulchella* Domin in Fedde, *Repert. Spec. nov. Regn. Veg.*, 9: 552 (1911).
M.L. 5222, 5790; NT 8677, 8755; R.A.P. 3339, 3473.
83. *E. scleranthoides* F. Muell., *Fragm. Phyt. Aust.*, 8: 233 (1874).
M.L. 6167.
84. *Eriochloa australiensis* Stapf ex Thell., *Vierteljahrs. Naturf. Ges. Zürich*, 64: 697 (1919).
R.A.P. 3309.
85. *E. pseudoacrotricha* (Stapf ex Thell.) C. E. Hubb. ex S. T. Blake, *Trans. R. Soc. S. Aust.*, 67 (1): 43 (1943). *E. ramosa* O. Kuntze var. *pseudoacrotricha* Stapf ex Thell., l.c. (1919).
M.L. 5296.

Appendix I

86. *Eulalia fulva* (R. Br.) O. Kuntze, *Rev. Gen.* 775 (1891). *Saccharum fulvum* R. Br., *Prodr. Flor. Nov. Holl.* 203 (1810).
M.L. 6268; R.A.P. 679, 3221, 5430; R.E.W. 2, 90.
87. *Iseilema dolichotrichum* C. E. Hubb. in Hook., *Ic. Plant.*, **33**: t. 3285 (1935).
R.A.P. 3281.
88. *I. macratherum* Domin, *Biblioth. Bot.*, **20** (85): 283, T. 12, f. 3, T. 13, f. 3 (1915).
NT 10244; R.A.P. 3307.
89. *I. membranaceum* (Lindl.) Domin, l.c. 280 (1915), *excl. descr. et specim. Anthistiria membranacea* Lindl. in Mitch., *J. Exped. trop. Aust.* 88 (1848).
M.L. 5248, 5249; NT 8779; R.A.P. 702, 3313.
90. *I. vaginiflorum* Domin, l.c. 281, T. 12, f. 2, T. 13, f. 1 (1915).
M.L. 5250, 5256; NT 8712; R.A.P. 676, 3462.
91. *Leptochloa digitata* (R. Br.) Domin, l.c. 379 (1915). *Poa digitata* R. Br., *Prodr. Flor. Nov. Holl.* 182 (1810).
M.L. 5319.
92. *Neurachne mitchelliana* Nees in Hook., *Lond. J. Bot.*, **2**: 410 (1843).
M.L. 5282, 5767, 6150; R.A.P. 3355, 5480.
93. *N. muelleri* Hack., *Oest. Bot. Zeitschr.*, **45**: 329 (1895).
M.L. 5211, 6261; NT 8673; R.A.P. 898, 3335, 3408.
94. *N. munroi* (F. Muell.) F. Muell., *Fragm. Phyt. Aust.*, **8**: 200 (1874). *Panicum munroi* F. Muell., l.c. **5**: 204 (1866).
M.L. 6121, 6186; R.A.P. 912.
95. *Panicum australiense* Domin, *J. Linn. Soc. (Bot.)*, **41**: 271, pl. 10, f. 7, pl. 11, f. 8-12 (1912).
M.L. 5264, 6218; NT 8742; R.A.P. 3402.
96. *P. cymbiforme* Hughes, *Kew Bull.*, **1923**: 323 (1923).
M.L. 6212; NT 3127, 8737, 8780; R.E.W. 951.
97. *P. decompositum* R. Br., *Prodr. Flor. Nov. Holl.* 191 (1810).
NT 8649; R.A.P. 3283; R.E.W. 4, 90.
98. *P. effusum* R. Br., *Prodr. Flor. Nov. Holl.* 191 (1810).
R.E.W. 314.
99. *P. whitei* J. M. Black, *Trans. R. Soc. S. Aust.*, **41**: 632 (1917).
R.A.P. 689, 3461.
100. *Paractaenum novae-hollandiae* Beauv., *Ess. Agrost.* 47, t. 10, f. 6 (1812).
M.L. 5289A, 6227; NT 8914.
101. *Paspalidium clementii* (Domin) C. E. Hubb., *Kew Bull.*, **1934**: 447 (1934). *Panicum clementii* Domin, *J. Linn. Soc. (Bot.)*, **41**: 272 (1912) et in *Biblioth. Bot.*, **20** (85): 303 (1915).
M.L. 5190, 5299, 5900, 6210; N.F. 102; NT 8676, 8687.

102. *P. constrictum* (Domin) C. E. Hubb., l.c. 447 (1934). *Panicum constrictum* Domin, *Biblioth. Bot.*, **20** (85): 302 (1915).
M.L. 5297, 5892; NT 8662, 8684; R.A.P. 5423; R.E.W. 254, 685, 1288.
103. *P. rarum* (R. Br.) Hughes, *Kew Bull.*, **1923**: 318 (1923). *Panicum rarum* R. Br., *Prodr. Flor. Nov. Holl.* 189 (1810).
M.L. 5260; NT 8669, 8840; R.A.P. 3454, 3463A, 3472.
104. *Perotis rara* R. Br., l.c. 172 (1810).
R.A.P. 3258.
105. *Phragmites karka* (Retz.) Trin. ex Steud., *Nom. Bot.*, Ed. 2, **2**: 324 (1841). *Arundo karka* Retz., *Obs. Bot.*, **4**: 21 (1786).
M.L. 5307.
106. *Plagiosetum refractum* (F. Muell.) Benth. in Hook., *Ic. Plant.*, **13**: 33, Plate 1242 (1877). *Setaria refracta* F. Muell., *Fragm. Phyt. Aust.*, **3**: 147 (1863).
M.L. 5289, 5746; R.A.P. 5395, 5408, 5415.
107. *Plectrachne pungens* (R. Br.) C. E. Hubb. in Hook., *Ic. Plant.*, **34**: t. 3385 (1939). *Tiraphis pungens* R. Br., *Prodr. Flor. Nov. Holl.* 185 (1810).
108. *P. schinzii* Henr., *Vierteljahrs. Naturf. Ges. Zürich*, **74**: 134 (1929).
M.L. 5268, 5276, 6202; R.A.P. 3394.
116. *Schizachyrium obliqueberbe* (Hack.) A. Camus, *Ann. Soc. Linn. Lyon* (1923), n.s. **70**: 89 (1924). *Andropogon obliqueberbis* Hack. in *Flora* **68**: 117 (1885).
NT 8639.
117. *Setaria brownii* Herrm., *Beitr. Biol. Pflanzen.*, **10**: 61 (1910).
M.L. 5216, 5265, 5267; NT 8862; R.A.P. 3415.
118. *S. dielsii* Herrm., l.c. 52 (1910).
M.L. 5184, 5967; NT 8661; R.A.P. 3289.
119. *Sorghum plumosum* (R. Br.) P. Beauv., *Ess. Agrost.* 132, 165, 178 (1812). *Holcus plumosus* R. Br., *Prodr. Flor. Nov. Holl.* 200 (1810).
M.L. 5272.
120. *Spathia neurosa* Ewart & Archer in Ewart & Davies, *Flor. North. Territ.* 26, Pl. 1 (1917).
R.A.P. 3460.
121. *Sporobolus actinocladius* (F. Muell.) F. Muell., *Fragm. Phyt. Aust.*, **8**: 140 (1874). *Vilfa actinoclada* F. Muell., l.c. **6**: 84 (1867).
M.L. 5558; R.A.P. 699.
122. *S. australasicus* Domin in Fedde, *Repert. Spec. nov. Regn. Veg.*, **9**: 553 (1911).
NT 840, 8675, 8730.
123. *S. caroli* Mez in Fedde, l.c. **17**: 299 (1921).
R.A.P. 907, 3263, 3293.
124. *S. mitchellii* (Trin.) C. E. Hubb. ex S. T. Blake, *Pap. Dep. Biol. Univ. Qd*, **1** (18): 22 (1941). *Vilfa mitchellii* Trin., *Mém. Acad. Sci. St Pétersb.*, Sér. 6, **6**: 53 (1840).
R.E.W. 841.

Appendix I

125. *Stipa scabra* Lindl. in Mitch., *J. Exped. trop. Aust.* 31 (1848).
M.L. 6152.
126. *Themeda australis* (R. Br.) Stapf in Prain, *Flor. trop. Afr.*, **9**: 420 (1919). *Anthistiria australis* R. Br., *Prodr. Flor. Nov. Holl.* 200 (1810).
M.L. 5269, 5295; NT 7662, 8656, 9026; R.A.P. 3209; R.E.W. 1.
127. *T. avenacea* (F. Muell.) Maid. & Betche, *Census N.S.W. Pl.* 15 (1916). *Anthistiria avenacea* F. Muell., *Fragm. Phyt. Aust.*, **5**: 206 (1866).
M.L. 5226; R.A.P. 3370.
128. *Tragus australianus* S. T. Blake, *Pap. Dep. Biol. Univ. Qd*, **1** (18): 12 (1941).
R.A.P. 3213.
109. *Triodia basedowii* Pritz. in Fedde, *Repert. Spec. nov. Regn. Veg.*, **15**: 356 (1918).
M.L. 2715, 2717, 5212; R.A.P. 900, 901, 3332, 3406, 5339; R.E.W. 73.
110. *T. clelandii* N. T. Burbidge, *Aust. J. Bot.*, **8** (3): 385, fig. 1 (1960).
N.T.B. & M.G. 4152, 4273, 4286; N.F. 840; M.L. 6002; NT 2559; R.A.P. 5388, 5393; R.E.W. 673.
111. *T. hubbardi* N. T. Burbidge, l.c. 381, fig. 2(b) (1960).
N.T.B. & M.G. 4153; M.L. 6038; C.J. Mulhearn 58; R.A.P. 5389; R.E.W. 416.
112. *T. irritans* R. Br., *Prodr. Flor. Nov. Holl.* 182 (1810).
N.F. 145B; M.L. 6156, 6198.
113. *T. longiceps* J. M. Black, *Trans. R. Soc. S. Aust.*, **54**: 59, pl. 4, figs. 5-8 (1930).
M.L. 5810; R.A.P. 865, 3341.
114. *T. pungens* R. Br., *Prodr. Flor. Nov. Holl.* 182 (1810).
R.A.P. 879, 880, 889, 3403.
115. *T. spicata* N. T. Burbidge, *Aust. J. Bot.*, **1** (1): 182 (1953).
J.B.C., 24. viii. 1951; S.L. Everist 4188; M.L. 5780, 5847, 6003; R.E.W. 883, 923.
129. *Tripogon loliiiformis* (F. Muell.) C. E. Hubb., *Kew Bull.*, **1934**: 448 (1934). *Festuca loliiiformis* F. Muell., *Fragm. Phyt. Aust.*, **8**: 128 (1873).
M.L. 5255; NT 8017, 8582; R.A.P. 896, 5363.
130. *Triraphis mollis* R. Br., *Prodr. Flor. Nov. Holl.* 185 (1810).
M.L. 5172; NT 10589; R.A.P. 3257, 3279, 5409; R.E.W. 75.
131. *Uranthoecium truncatum* (Maid. & Betche) Stapf in Hook., *Ic. Plant.*, **31**: t. 3073 (1916). *Rottboellia truncata* Maid. & Betche, *Proc. Linn. Soc. N.S.W.*, **31**: 741, t. 69 (1907).
R.A.P. 712, 3463.
132. *Zygochloa paradoxa* (R. Br.) S. T. Blake, *Pap. Dep. Biol. Univ. Qd*, **1** (19): 8, pl. 3 (1941). *Neurachne paradoxa* R. Br. in Sturt, *Exped. Centr. Aust.* 2, App., 89 (1849).
M.L. 5201; R.A.P. 5411.

Appendix II

SPECIES OTHER THAN GRASSES

Bladder saltbush	<i>Atriplex vesicaria</i> Heward ex Benth.	Mulga	<i>Acacia aneura</i> F. Muell.
Bloodwood	<i>Eucalyptus terminalis</i> F. Muell. <i>E. polycarpa</i> F. Muell.	Myall	<i>A. calcicola</i> Forde & Ising
Bluebush	<i>Kochia</i> spp.	Needlewood	<i>Hakea leucoptera</i> R. Br.
Blue mallee	<i>Eucalyptus gamophylla</i> F. Muell.	Old-man saltbush	<i>Atriplex nummularia</i> Lindl.
Bottlebrush	<i>Grevillea</i> spp.	Parrot-pea	<i>Crotalaria cunninghamii</i> R. Br.
Coolibah	<i>Eucalyptus microtheca</i> F. Muell.	Queensland bluebush	<i>Chenopodium auricomum</i> Lindl.
Corkwood	<i>Hakea divaricata</i> L. John- son	Redbud mallee	<i>Eucalyptus pachyphylla</i> F. Muell.
Cotton bush	<i>Kochia aphylla</i> R. Br.	Red mallee	<i>E. oleosa</i> F. Muell.
Desert oak	<i>Casuarina decasneana</i> F. Muell.	River red gum	<i>E. camaldulensis</i> Dehn.
Desert poplar	<i>Codonocarpus cotinifolius</i> (Desf.) F. Muell.	Saltbush	<i>Atriplex</i> spp.
Fig	<i>Ficus</i> spp.	Samphire	<i>Arthrocnemum</i> spp.
Four-toothed mallee	<i>Eucalyptus odontocarpa</i> F. Muell.	Snappy gum	<i>Eucalyptus brevifolia</i> F. Muell.
Fuchsia	<i>Eremophila</i> spp.	Southern bluebush	<i>Kochia astrotricha</i> L. Johnson
Ghost gum	<i>Eucalyptus papuana</i> F. Muell.	Spearwood	<i>Pandorea pandorana</i> (Andr.) Steenis
Gidgee	<i>Acacia georginae</i> F. M. Bail.	Supplejack	<i>Ventilago viminalis</i> Hook.
Hopbush	<i>Dodonaea</i> spp.	Tea-tree	<i>Melaleuca</i> spp.
Ironwood	<i>Acacia estrophiolata</i> F. Muell.	Umbrella mulga	<i>Acacia brachystachya</i> Benth.
Lignum	<i>Muehlenbeckia cunning- hamii</i> (Meisn.) F. Muell.	Wattle	<i>Acacia</i> spp.
		White cypress	<i>Callitris columellaris</i> F. Muell.
		White daisy	<i>Helipterum floribundum</i> DC.

The Grasses of Central Australia

White tea-tree	<i>Melaleuca glomerata</i> F. Muell.	Witchetty bush	<i>Acacia kempeana</i> F. Muell.
Whitewood	<i>Atalaya hemiglauca</i> (F. Muell.) Benth.	Yellow Daisy	<i>Helipterum charsleyae</i> F. Muell.

Glossary

Terms illustrated in Figures 3, 4, and 5 are indicated by an asterisk (*)

- abaxial*: the disposition of a lateral organ when its side is turned away from the axis, as opposed to adaxial. Spikelets are abaxial when the back of the upper glume faces the branch of attachment (cf. dorsal).
- **acuminate*: applied to an apex with gradually tapered sides and a protracted point.
- **acute*: applied to a distinctly pointed, but not drawn-out apex. Opposed to obtuse.
- adaxial*: the disposition of a lateral organ when its side is turned toward the axis, as opposed to abaxial. Spikelets are adaxial when the back of the lower glume faces the branch of attachment (cf. ventral).
- aerial*: used for plants or those organs living above the surface of the ground or water. Said of roots arising from nodes situated above ground level.
- alternate*: an arrangement of organs placed at different levels on opposite sides of an axis and forming two rows longitudinally.
- anastomosing*: said of veins which form a network or reticulation by their division and union.
- angle*: an edge formed by the meeting of two planes, as in angular stems.
- annual*: within one year. Applied to plants of one season's duration from seed to maturity and death. Opposed to perennial.
- **anther*: the pollen-producing part of the stamen, borne at the top of the filament or stalk.
- anthesis*: flowering, used to designate the period of expansion of a flower when pollination takes place, i.e. in grasses, the time when the lemma and palea are open.
- antrorse*: directed or turned upward or forward, applied especially to hairs or bristles on stems, leaves, and awns. Opposed to retrorse.
- apex* (pl. *apices*): the tip or distal end of an organ.
- **apiculate*: furnished with an apicula, i.e. a short, sharp, but flexible point which may terminate a leaf, glume, or lemma.
- appressed*: closely and flatly pressed against, e.g. the branches of an inflorescence may be appressed to the axis or the hairs on a stem may be appressed to its surface.
- approximate*: closely situated, but not united; intermediate between contiguous and distant. The spikelets of a raceme or spike may be approximate on the rachis or the racemes of an inflorescence may be approximate on the axis.
- aquatic*: living in water.
- **aristate*: awned; provided with an awn or bristle.
- aristulate*: bearing a small awn.
- aromatic*: possessing a distinctive smell or aroma.
- articulate*: jointed; provided with a joint or articulation where separation can take place by a clean scar. Opposed to continuous.

- ascending*: applied to culms that grow obliquely or indirectly upward (cf. decumbent).
- asperulous*: slightly rough with minute points.
- attenuate*: tapered; having a long gradual unbroken taper, applied to apices and bases of organs.
- **auricle*: applied to one of the two ear-shaped parts or appendages at the base of some leaves.
- **awn*: a bristle-like part or appendage. In grasses, the awn is usually a continuation of the midnerve of the lemmas or glumes.
- axil*: the upper angle between the axis and any organ which arises from it. Applied especially to the angle formed by a culm and its leaf, branch, or bract.
- axillary*: arising in an axil.
- **axis*: the main or central line of development of any plant or organ. The axis of an inflorescence is that part of the stem or branch upon which the flowers are borne. Applied especially to the main stem of a panicle.
- barbellate*: furnished with minute, straight, stiff hairs or bristles.
- bearded*: furnished with tufted hairs.
- biconvex*: convex on both sides or surfaces.
- bidentate*: having two teeth.
- biennial*: within two years. Applied to plants of two seasons' duration which may flower more than once before death. Comparable to 'short-lived perennial', which differs only in a longer though limited duration.
- bifid*: divided or cleft into two parts, applied to the apex of glumes, lemmas, and paleas (cf. bilobed).
- **bilobed*: deeply divided into two segments or lobes, applied especially to lemmas (cf. bifid).
- binate*: said of an organ composed of two members.
- bipartite*: divided nearly to the base into two parts. Applied especially to the primary branches of an inflorescence.
- biseriate*: arranged in two rows or series. Applied especially to the arrangement of spikelets on the rhachis of a spike or raceme (cf. distichous).
- bisexual*: of both sexes. Said of flowers or florets having stamens and pistil present and functional. Opposed to unisexual.
- **blade*: the limb or expanded portion of the leaf, as distinct from the leaf sheath.
- bract*: a much reduced leaf or leaf-like structure associated with the inflorescence or its parts or with the upper part of a shoot (cf. scale).
- bracteole*: a secondary bract; a bractlet or small bract.
- bulbous*: swollen or thickened like a bulb or corm. Applied especially (in grasses) to the butt.
- **butt*: the basal internodes of the culms, but no portion of the root system. Commonly applied to tussock-forming grasses.
- caespitose*: tufted or crowded. Applied to grasses with closely tufted stems.
- callus*: in grasses, the hardened, usually hairy base of the fertile floret, often tapered, as in *Aristida*, into a sharp, spear-like point.
- callosity*: a leathery or hard thickening of part of an organ.
- canaliculate*: channelled or grooved lengthwise.
- capillary*: very slender or hair-like.
- cartilaginous*: gristly or like cartilage; hard and tough but flexible.
- **caryopsis*: the grain or fruit of grasses. A dry, indehiscent fruit containing one seed closely fused to the pericarp and formed from a one-celled superior ovary.
- **cataphyll*: the early leaf-forms or reduced leaves at the base of a shoot in grasses.

Glossary

- caudate*: tailed or bearing a tail-like appendage.
- chartaceous*: papery in texture.
- chasmogamous*: applied to florets in which pollination takes place during opening or expansion of the lemma and palea, as opposed to cleistogamous.
- ciliate*: fringed with hairs on the margin, like an eyelash.
- ciliolate*: minutely ciliate or fringed with very short hairs.
- cleistogamous*: applied to self-pollinated florets whereby pollination takes place within the unopened floret. Opposed to chasmogamous.
- **collar*: the area on the lower (outer) surface of a leaf at the junction of sheath and blade, sometimes represented by a joint and sometimes by a row of hairs.
- column*: applied in grasses to the lower undivided or spirally twisted portion of the awn.
- compact*: closely joined or pressed together.
- complicate*: see conduplicate.
- compound*: composed of two or more similar parts aggregated into a common whole. Opposed to simple.
- compressed*: flattened lengthwise. Applied especially to organs flattened laterally.
- concave*: hollowed out, as the inside of a saucer. Opposed to convex.
- **conduplicate (complicate)*: folded together lengthwise with the upper surface within, as the blades of many grasses.
- **conical*: cone-shaped or tapering upwards and circular in cross-section.
- connate*: closely united or joined. Said of like or similar structures joined as one body or organ.
- constricted*: contracted or drawn together. Applied to the narrowing of part of an organ.
- contiguous*: touching without fusion, irrespective of whether the neighbouring parts or organs are like or unlike.
- continuous*: running on or uninterrupted. Opposed to articulate. Said of the rachis and rachilla when unjointed.
- contracted*: narrowed or shortened. Said of inflorescences that spread but slightly.
- convex*: arched or rounded on the surface. Opposed to concave. Said especially of glumes and lemmas that are rounded on the back instead of keeled.
- **convolute*: rolled longitudinally. Said mostly of blades, one edge being inside and the other outside.
- coriaceous*: leathery in texture.
- crustaceous*: brittle in texture.
- **culm*: the stem of grasses, usually hollow except at the nodes.
- cuneate*: wedge-shaped or triangular, with the narrow end at the base.
- cupular (cupuliform)*: cup-shaped, nearly hemispherical.
- cupuliform*: see cupular.
- **cuspidate*: tipped with a cusp or sharp, rigid point which terminates a tapered summit or apex (cf. mucronate).
- **cylindric (cylindrical)*: elongated, with a circular cross-section and parallel sides.
- cymbiform*: boat-shaped.
- deciduous*: falling off at maturity or at the end of life, as the leaves of non-evergreen trees in autumn. Applied in grasses to spikelets and awns which disarticulate. Opposed to organs that persist.
- decompound*: more than once compounded or divided. Applied especially to much-branched inflorescences.
- **decumbent*: reclining or lying on the ground before becoming erect. Said of culms.
- dehiscent*: the spontaneous opening or splitting of a mature organ into definite parts, as that of pods by valves and anthers by pores or slits to release seed and pollen.
- dentate*: toothed on the margin.
- denticulate*: minutely or finely toothed.

- depressed*: sunk down or flattened from above downwards.
- diffuse (effuse)*: widely or loosely spreading. Said of much-branched, open panicles.
- **digitate*: finger-like; compound, with the members arising from one point. Said especially of an inflorescence with several racemes or spikes arising from the summit of the peduncle and spreading upwards or outwards like the fingers of a hand.
- dilated*: widened or expanded. Said of the apex of pedicels.
- dioecious*: producing unisexual (staminate or pistillate) flowers on separate plants. Opposed to monoecious.
- disarticulate*: to separate at a joint; the separating of two articulate parts or organs.
- distant*: widely situated; when similar parts or organs are not closely aggregated (cf. approximate, remote, and contiguous).
- distichous*: two-ranked; disposed in two vertical rows. Applied especially to the arrangement of florets on the rhachilla (cf. biseriata).
- divaricate*: extremely divergent; spreading almost at a right angle to the common axis, as the branches of certain inflorescences.
- divergent*: spreading broadly, but at a lesser angle than divaricate.
- dorsal*: back; the outer face or side of an organ, i.e. the surface turned away from the axis (abaxial). Opposed to ventral.
- echinate*: beset with prickles.
- effuse*: expanded (cf. diffuse).
- ellipsoid*: an elliptic solid. Said of the shape of spikelets, fruit, and other solid organs.
- **elliptic*: shaped like an ellipse, i.e. widest at the middle and tapering evenly to both ends.
- elongate*: lengthened or drawn out in length.
- **emarginate*: shallowly notched at the apex.
- **embryo*: the rudimentary plant within the seed.
- endemic*: confined naturally to a particular and usually restricted area or region.
- entire*: with a continuous or whole margin, not in any way indented such as by toothing, notching, or division.
- ephemeral*: a short-lived annual, i.e. a plant completing its life-cycle in a period of a few weeks or months.
- evergreen*: a plant which bears persistent leaves and thus retains green foliage in its dormant season. Opposed to deciduous.
- excurrent*: extending beyond the margin. Said of nerves which extend beyond the margin of an organ (especially a lemma) as a mucro or an awn. Opposed to percurrent.
- exserted*: protruded beyond, such as the awn beyond the spikelet or the inflorescence beyond the floral leaf.
- extravaginal*: beyond or outside the sheath. Applied to a young shoot which pierces and grows outside the sheath of its subtending leaf. Opposed to intravaginal.
- fascicle*: a close or condensed cluster or bundle. Said of stems, spikelets, the branches of a panicle, and the spikes or racemes on an axis.
- fasciculate (fascicled)*: gathered into a fascicle.
- fastigate*: applied to branches which are erect, clustered, and more or less parallel with the axis.
- fertile*: capable of producing fruit. A fertile floret can be pistillate or perfect. Opposed to sterile.
- fibrous*: having much woody fibre.
- **filament*: the stalk of the stamen, terminated by the anther.

Glossary

- filiform*: thread-like; long and extremely slender.
- flaccid*: limp, not stiff or turgid.
- flexuose*: bent alternately in opposite directions or having a more or less wavy or zigzag form.
- flora*: the plant species occurring within a given area at a particular period of time; a work which contains an enumeration of these and a key for their identification.
- **floret*: a single, usually small flower. Applied in grasses to the naked flower (stamens and pistil) together with its lemma and palea.
- foetid*: smelling strongly and disagreeably.
- forb*: a herbaceous plant other than a grass.
- fulvous*: yellow or tawny, applied especially to hairs or awns.
- furrowed (canaliculate)*: grooved or channelled lengthwise.
- **fusiform*: spindle-shaped. A solid that is thick in the middle and tapers to each end.
- gelatinous*: jelly-like.
- geniculate*: bent abruptly, so as to resemble a bent knee. Said especially of awns.
- genus (pl. genera)*: the smallest natural group containing distinct species.
- glabrous*: without hairs of any kind.
- gland*: a specialised structure, either protruding or depressed, usually minute, which secretes a specific substance.
- glandular*: supplied with glands, e.g. glandular-pubescent: with glands and hairs intermixed or having hairs terminated by glands.
- glaucous*: having a bloom or bluish-green coating that rubs off (cf. pruinose).
- globular*: a solid that is spherical or rounded like a globe or sphere.
- **glume*: one of the two empty bracts at the base of the grass spikelet.
- **grain (caryopsis)*: the fruit of grasses.
- granular*: roughened due to minute grains or tubercles.
- habit*: the general appearance of a plant, i.e. whether erect, prostrate, climbing, etc.
- habitat*: the environment in which a plant exists.
- hemispherical*: shaped like half a sphere.
- herb*: a flowering plant lacking woody structure.
- herbaceous*: having the characters of a herb. Opposed to woody.
- hermaphrodite*: see bisexual.
- heterogamous*: having two or more kinds of flowers or florets in relation to their sex, i.e. male, female, neuter, and bisexual. Opposed to homogamous.
- **hilum*: the scar on a seed where formerly attached to the funicle.
- **hirsute*: with long, straight, rather rough or coarse hairs.
- hirtellous*: minutely hirsute.
- **hispid*: rough with numerous stiff hairs or bristles.
- hispidulous*: minutely hispid.
- homogamous*: having one kind of flower or floret in relation to its sex, i.e. male, female, neuter, or bisexual. Opposed to heterogamous.
- hyaline*: thin, delicate, and translucent or transparent.
- imbricate*: overlapping, as the tiles of a roof.
- **incurved*: curved from without inwards.
- indumentum*: any covering of hairs.
- indurated*: hardened.
- inflated*: blown up or bladdery.
- inflexed*: bent or turned inwards abruptly. Applied especially to the margins of lemma and palea.
- **inflorescence*: the flowering part of a plant, or more correctly the arrangement of the flowers of a plant.

- *innovation*: a newly formed shoot arising from the base of a perennial grass, which carries on the further growth of the plant.
- *internode*: applied to the portion of a culm, usually hollow, between two successive nodes.
- interrupted*: not continuous; broken or separated. Said especially of dense inflorescences when their continuity is broken by gaps.
- intracarinal*: between the keels. Applied especially to the nerves occurring in the area between the two keels of the glumes of certain species.
- intravaginal*: within the sheath. Applied to a young shoot which does not pierce the sheath of its subtending leaf, but grows up inside it. Opposed to extravaginal.
- inverse*: turned about, opposite, or inverted. Said of the two glumes of a spikelet when the upper is shorter than the lower.
- involute*: a whorl or circle of bracts close below a flower or flower cluster. Applied in grasses to a cluster of bristles or sterile spikelets below the fertile spikelet.
- *involute (inrolled)*: rolled inwards, the upper surface within. Said of the edges of the leaf-blades of many grasses.
- keel*: in grasses, a prominent ridge, usually formed by the midnerve, along the middle of a longitudinally folded surface. Applied especially to glumes, lemmas, and paleas, which sometimes may be two-keeled.
- keeled*: ridged like the keel of a boat.
- lacerated*: torn; irregularly cleft or cut, as in some ligules and apices.
- *lamina*: the blade or expanded portion of a leaf.
- *lanceolate*: lance-shaped; when about three times as long as broad, broadest about one-third from the base, and tapered to each end.
- lateral*: on or at the side.
- lax*: loose or open, not congested.
- *leaf*: the principal lateral organ borne by the stem, in grasses consisting of sheaf, blade, and ligule.
- *leaf blade*: see lamina.
- *leaf sheath*: the lower, split portion of a leaf, which more or less envelopes the culm.
- *lemma*: the lower (outer) of two bracts (the other being the palea) enclosing the naked flower in grasses; sometimes referred to as the flowering glume.
- lignified*: woody.
- *ligule*: of grasses, a membranous or hairy outgrowth on the upper (inner) surface of the leaf at the junction of sheath and blade.
- *linear*: long and narrow; at least four or five times as long as broad, and with parallel sides. Applied especially to flat surfaces such as leaf blades.
- lobe*: any part or segment of an organ. Applied in grasses especially to each division of a cleft or divided lemma.
- *lodicule*: one of two or three scales at the base of the ovary of a grass floret and regarded as a reduced perianth segment.
- margin*: edge.
- marginate*: furnished with a broad or prominent margin.
- membrane*: a thin skin or lining.
- membranous*: like a membrane; thin, translucent, not green (cf. scariosus).
- monoecious*: producing unisexual (staminate or pistillate) flowers separately on the same plant. Opposed to dioecious.
- mucilaginous*: viscid or sticky like mucilage.
- micro*: a short, sharp, rigid point.
- *mucronate*: terminated abruptly by a micro (cf. cuspidate).
- mucronulate*: diminutive of mucronate.

muricate: rough due to short, hard, finely pointed or rounded, tubercular excrescences.

muticous: pointless, blunt, awnless.

nervation (venation): veining; the arrangement or disposition of the veins of an organ.

nerve: a simple or unbranched vein or rib, as of a blade, glume, or lemma.

neuter: sexless, as a floret or spikelet which has neither stamens nor pistil.

**node*: applied to the solid transverse part of a stem from which a leaf may arise.

notched: see emarginate.

ob-: as a prefix, means inversely or oppositely.

oblanceolate: inversely lanceolate.

oblique: slanting; unequal-sided.

**oblong*: in shape or outline longer than broad (but not as long as linear), with the sides parallel or almost so for most of their length.

**obovate*: inversely ovate.

obovoid: inversely ovoid.

**obtuse*: blunt or rounded at the apex. Opposed to acute.

orbicular: circular. Said of a flat surface. Corresponding to globular or spherical in a solid.

**orifice*: opening or mouth. Applied in grasses to the summit of the leaf sheath.

**ovary*: the basal, ovule-bearing portion of the pistil, which after fertilisation develops into the fruit.

**ovate*: with the shape of the longitudinal section of an egg; scarcely twice as long as broad, and broadest below the middle. Said of flat surfaces.

ovoid: egg-shaped. Said of solids. Corresponding to ovate in a flat surface.

ovule: the egg-containing body of the ovary,

which after fertilisation develops into the seed.

**palea (palet)*: the upper (inner) of two bracts enclosing the naked flower in grasses, the other bract being the lemma.

**panicle*: an inflorescence with axis and subdivided branches.

pectinate: comb-like. Said of spikelets when narrow, close-set, and parallel on the rhachis like the teeth of a comb.

**pedicel*: in grasses, the stalk of a single spikelet.

pedicellate: borne on a pedicel. Opposed to sessile.

**peduncle*: in grasses, the stalk of a cluster of spikelets or of an inflorescence.

pedunculate (peduncled): borne on a peduncle.

percurrent: extending throughout the entire length of an organ, but not beyond its margin. Opposed to excurrent.

perennial: of permanent duration in relation to time. Said of a plant which does not die after once flowering and fruiting, but normally lives for an indefinite period. Opposed to annual.

perfect: complete. Said of a flower or floret with stamens and pistil present and functional.

pericarp: the wall of a fruit, developed from the wall of an ovary after fertilisation.

persistent: remaining attached after maturity. Said of organs or their parts. Opposed to deciduous.

**pilose*: sparsely hairy with soft, rather long, simple hairs.

pistil: the female organ of a flower, consisting (when complete) of ovary, style, and stigma.

pistillate: female; having pistils but no functional stamens. Applied to flowers, florets, or to inflorescences of pistillate flowers. Opposed to staminate.

- pitted*: having small depressions or pits.
- plano-convex*: flat on one side and convex on the other.
- plumose*: feathery; having very fine soft hairs, usually in two opposite rows. Said chiefly of awns.
- pollen*: the dust-like powder composed of minute grains which is produced by the anther of seed plants and contains the male element.
- pollination*: the transfer of pollen from the mature anther to the receptive stigma.
- primary*: of the first importance. Used of the part first developed.
- prophyllum*: in grasses, the lowest leaf on an axillary branch, reduced to a thin, leaf-like membrane.
- prostrate*: lying flat on the ground and, when applied to culms, usually rooting at intervals.
- pruinose*: having a more pronounced bloom than glaucous.
- puberulous (puberulent)*: slightly or minutely pubescent.
- **pubescent*: covered with hairs. Applied especially when the hairs are short and soft like down.
- **pulvinus*: in grasses, the axillary swelling at the base of the branches of some panicles, which causes them to spread.
- punctate*: with translucent or coloured dots, depressions, or glands.
- punctulate*: finely punctate.
- pungent*: ending in a rigid, sharp point, prickle, or spine, as the leaves of *Triodia*.
- pyramidal*: pyramid-shaped, i.e. tapering upwards from a broad base and more or less triangular in cross-section. Said chiefly of solids, but sometimes also of the outline of inflorescences.
- quadrangular*: four-cornered.
- **raceme*: an inflorescence of pedicellate spikelets borne directly on an undivided axis.
- racemose*: raceme-like. Applied to inflorescences that may or may not be true racemes.
- recurved*: bent or curved downward or backward (cf. reflexed).
- reduced*: said of an organ which, though mature, has not developed completely.
- reflexed*: abruptly bent or curved downward or backward (cf. recurved).
- remote*: widely placed and usually few in number.
- resiniferous*: secreting resin. Said chiefly of certain tissues.
- resinous*: containing or producing resin, as the leaf sheaths of certain *Triodia* which exude a sticky coat of resin.
- reticulate*: netted or like net-work. Said of veins which anastomose.
- retorse*: directed or turned backward or downward. Said especially of hairs or bristles on stems, foliage, and awns. Opposed to antrorse.
- rhachilla*: a small or secondary rhachis. Applied to the axis of a grass spikelet, on which the florets are borne.
- **rhachis (pl. rhachides)*: Applied in grasses to the axis of a spike or raceme.
- rhizomatous*: rhizome-producing or rhizome-like.
- **rhizome*: the rootstock of certain perennial plants; essentially an underground, scale-bearing stem growing more or less horizontally, and producing roots and shoots from its nodes.
- rib*: in a leaf or similar organ, the midvein or any primary vein. Also any prominent nerve, vein, or ridge.
- ribbed*: furnished with a rib.
- rudiment*: an imperfectly developed and nonfunctional organ.
- rugose*: covered with, or thrown into wrinkles. Said especially of the surface of certain lemmas, paleas, and fruit.
- rugulose*: minutely or finely rugose.

Glossary

sac: a bag or pouch.

saline: having the qualities of salt.

scaberulous: slightly or minutely scabrous or scabrid.

scabrid: see scabrous.

**scabrous (scabrid)*: rough to the touch from short stiff hairs or bristles.

scale: any small, usually dry, much-reduced leaf or leaf-like structure at the base of a shoot. Said especially of the rudimentary leaves of a rhizome.

scarious: similar to membranous, but very thin, dry, and parchment-like in texture.

secondary: subordinate; below or less than primary. Said of panicle-branches arising from primary branches.

secund: one-sided. Said of a spike or raceme when the spikelets are borne on, or directed to, only one side of the rachis.

sessile: without a stalk. Opposed to pedicellate.

**sheath*: see leaf sheath.

simple: of one piece or series; not compounded or divided into parts. Opposed to compound.

sinus: the recess between, or the basal angle formed by, two adjacent teeth or lobes.

smooth: not rough to the touch. Refers strictly to surface texture and not to indumentum.

spathe: a bract or leaf, usually large, surrounding or subtending an inflorescence.

spatheate: furnished with a spathe.

spatheole: a secondary spathe.

species: the unit of classification; the largest group of individuals capable of perpetuation by interbreeding; an aggregate of closely related and distinctive individuals distinguished from any other similar group by a discontinuity in character.

spiciform: spike-like or having the form or shape of a spike.

**spike*: an unbranched inflorescence in which (in grasses) the spikelets are sessile on a rachis.

**spikelet*: in grasses, the unit or ultimate cluster of the inflorescence, consisting of two glumes and one or more florets.

spike-like: see spiciform.

spine: a sharp, pointed, woody or hardened body usually arising from the wood of the stem.

spinulose: with small spines.

sporadic: widely dispersed or scattered.

**stamen*: the unit of the androecium; the male or pollen-bearing organ of a flower or floret, consisting of an anther and (usually) a filament.

staminate: male; having stamens but no pistil. Applied to flowers, florets, or to inflorescences of staminate flowers. Opposed to pistillate.

**stem*: the main axis of a plant, leaf-bearing and flower-bearing as distinguished from the root-bearing axis.

sterile: barren or incapable of producing fruit. A sterile floret can be staminate or neuter. Opposed to fertile.

**stigma*: the part of the pistil (or style) adapted for the reception and germination of the pollen grains. In grasses, the upper, feathery part of the style.

stipe (pl. *stipes*): a special, usually minute stalk of an organ. Applied especially to the stalk of the ovary.

stipitate: having a stipe or special stalk.

stipitiform: having the appearance of a stipe.

**stolon*: a runner, sucker, or modified stem, either bending over to the ground or growing horizontally on the surface, which roots and produces a new plant at its tip or at intervals from its nodes.

stoloniferous: bearing stolons or propagating by stolons.

striate: with fine, longitudinal, parallel lines or minute ridges.

striolate: faintly striate.

**style*: the (usually) elongated part of a pistil, which surmounts the ovary and supports the stigma.

- sub*: under or below. As a prefix, implies somewhat, slightly, or rather.
- subtend*: placed immediately below, as the uppermost leaf of a stem subtends the inflorescence arising in its axil.
- subulate*: awl-shaped; rigid, pointed, and tapered from base to apex.
- suppressed*: imperfectly developed to an extreme degree.
- teeth*: small, pointed lobes or divisions in the margins (usually apex) of an organ or part.
- *terete*: circular in cross section, tapered towards the apex and thus imperfectly cylindrical, as the culms of most grasses.
- terminal*: at the tip, the apical or distal end.
- ternate*: in threes, as three organs in a whorl or cluster.
- tetramerous*: of four members.
- tetraquetrous*: with four sharp angles.
- texture*: the structure of the tissue or the composition of an organ.
- tiller*: a shoot or branch from the butt of a grass plant.
- tough*: difficult to break; said of an axis, rhachis, or rhachilla that does not disarticulate readily.
- triad*: a group of three, such as the ultimate raceme of one sessile and two pedicellate spikelets in *Sorghum*.
- *tridentate*: three-toothed or three-pronged at the apex or summit, as the lemma in *Triodia*.
- *trifid*: divided into three parts, as the awn in many *Aristida*.
- tripartite*: divided from near the base into three parts, as the primary branches of the inflorescence of certain *Aristida*.
- *triquetrous*: sharply or prominently three-angled or three-edged in cross section.
- *truncate*: ending abruptly, as if cut off horizontally. Said especially of an apex nearly or quite straight across.
- tubercle*: a small, wart-like protuberance.
- *tuberculate (tubercled)*: furnished or covered with tubercles.
- tubulous*: tube-shaped. Said of the convolute lemma of certain *Aristida*.
- tufted*: growing in small tufts. Applied especially to short-lived grasses.
- turbinate*: shaped like a top; inversely conical.
- turgid*: swollen from fullness.
- tussock*: composed of dense thick tufts. Applied especially to long-lived perennial grasses.
- unisexual*: of one sex. Said of a flower or floret having only the stamens or only the pistil present and functional. Opposed to bisexual.
- unilateral*: one-sided; either originating on, or (more often) all turned to, one side.
- ventral*: front; the inner face or side of an organ, i.e. the surface facing the axis (adaxial). Opposed to dorsal.
- verrucose*: covered with warts or having a warty or nodular surface.
- verticillate*: see whorled.
- *villous*: shaggy; provided with a coating of long, weak, soft hairs.
- viscid*: sticky owing to a tenacious coating or secretion.
- whorl*: an arrangement of similar organs in a circle round an axis.
- whorled (verticillate)*: disposed or arranged in one or more whorls or verticils.
- wiry*: wire-like; tough and flexible as wire. Said of the culms of many grasses.

Glossary

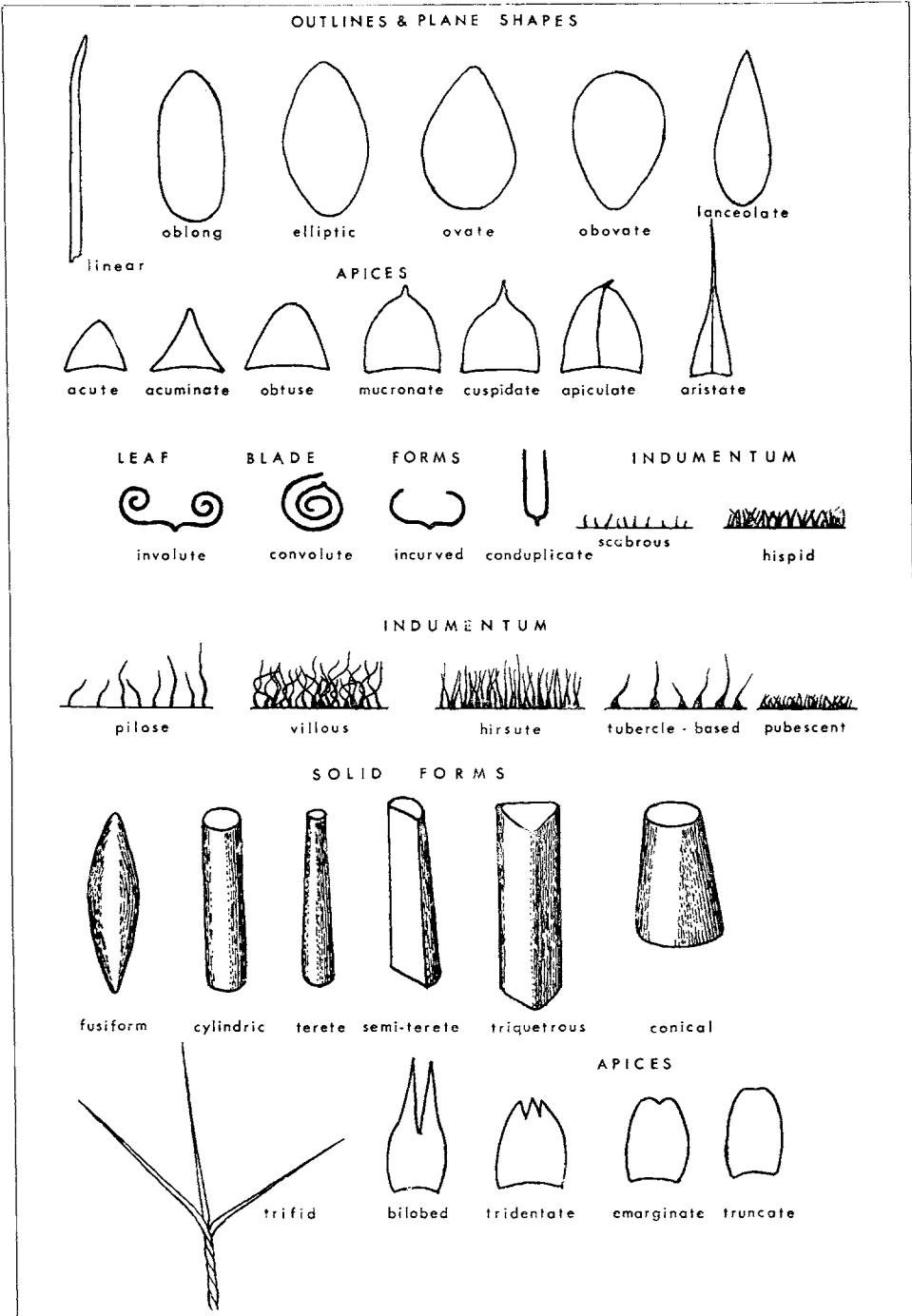


FIG. 5. Botanical terms

Index

Numbers refer to the order in which the taxa are described in Part V.

- Amphipogon caricinus 1
- Aristida 2-13
 - anthoxanthoides 2
 - biglandulosa 3
 - browniana 4
 - capillifolia 5
 - contorta 6
 - echinata 7
 - inaequiglumis 8
 - jerichoensis 9
 - latifolia 10
 - nitidula 11
 - obscura 12
 - strigosa 13
- Armgrasses 23-8
 - hairy 27
 - hairy-edged 23
 - large 28
 - naked 26
 - silky-top 24
- Astrebula 14-16
 - elymoides 14
 - lappacea 15
 - pectinata 16
- Awnless barnyard grass 47
- Bamboo 105
- Bandicoot grass 40
- Barcoo grasses 87-90
- Beard grasses 34-5
 - golden 34
- Beetle grasses 45-6
 - brown 45
 - small-flowered 46
- Bluegrasses 17-22
 - curly 19
 - desert 17
 - dwarf 20
 - forest 18
 - Queensland 21
 - tassel 22
- Bothriochloa 17-18
 - ewartiana 17
 - intermedia 18
- Bottle-washers 50
- Brachiaria 23-8
 - gilesii 23
 - holosericea 24
 - miliiformis 25
 - notochthona 26
 - piligera 27
 - praetervisiva 28
- Brachyachne ciliaris 29
- Bristle-brush grass 106
- Bristle grasses 117-18
- Bundle bundle 19
- Button grass 39
- Cane grass 91, 132
 - sandhill 132
 - umbrella 91
- Chloris 30-3
 - acicularis 30
 - pectinata 31
 - scariosa 32
 - virgata 33
- Chloris grasses 30-3
 - comb 31
 - curly windmill 30
 - winged 32
- Chrysopogon 34-5
 - fallax 34
 - pallidus 35
- Citronella grasses 36-8
- Comet grass 104
- Cotton grass 41
- Couch grass 29, 124
 - hairy native 29
 - rat's-tail 124
- Cupgrasses 84-5
 - Australian 84
 - perennial 85

The Grasses of Central Australia

- Cymbopogon 36-8
 bombycinus 36
 exaltatus 37
 obtectus 38
- Dactyloctenium radulans 39
- Danthonia bipartita 40
- Dichanthium 19-22
 fecundum 19
 humilius 20
 sericeum 21
 superciliatum 22
- Digitaria 41-4
 brownii 41
 coenicola 42
 ctenantha 43
 eriolepis 44
- Diplachne 45-6
 fusca 45
 parviflora 46
- Dropseed grasses 121-4
 Australasian 122
- Early spring grasses 84-5
- Echinochloa colonum 47
- Ectrosia leporina 48
- Eight-day grass 129
- Elytrophorus spicatus 49
- Enneapogon 50-7
 avenaceus 50
 clelandii 51
 cylindricus 52
 glaber 53
 lindleyanus 54
 oblongus 55
 pallidus 56
 polyphyllus 57
- Eragrostis 58-74
 barrelieri 58
 cilianensis 59
 confertiflora 60
 cumingii 61
 dielsii 62
 elongata 63
 eriopoda 64
 falcata 65
 japonica 66
 kennedyae 67
 lacunaria 68
 laniflora 69
 leptocarpa 70
 parviflora 71
 setifolia 72
- speciosa 73
 xerophila 74
- Eriachne 75-83
 aristidea 75
 armitii 76
 benthamii 77
 helmsii 78
 mucronata 79
 nervosa 80
 obtusa 81
 pulchella 82
 scleranthoides 83
- Eriochloa 84-5
 australiensis 84
 pseudoacrotricha 85
- Eulalia fulva 86
- Fairy grass 123
- Feathertop wire grass 10
- Fingergrasses 41-4
 comb 43
 woolly-seed 44
- Five-minute grass 129
- Flat-stem grass 131
- Flinders grasses 87-90
 bull 88
 red 90
 rough-stemmed 87
 small 89
- Green summer grass 25
- Grey-beard grass 1
- Hare's-foot grass 48
- Iseilema 87-90
 dolichotrichum 87
 macratherum 88
 membranaceum 89
 vaginiflorum 90
- Kangaroo grasses 126-7
 native 126
 oat 127
- Katoora 121
- Kerosene grasses 4, 6
 bunched 6
 erect 4
- Landsborough grasses 87-90
- Leptochloa digitata 91

Index

- Lovegrasses 58-74
 clustered 63
 Cuming's 61
 delicate 66
 drooping 70
 handsome 73
 mallee 62
 pitted 58
 purple 68
 sickle 65
 small-flowered 67
 spike 60
 weeping 71
- Millet 25, 97
 armgrass 25
 native 97
- Mitchell grasses 14-16
 barley 16
 curly 15
 hoop 14
 slender 14
 weeping 14
 wheat 15
- Mulga grasses 92-4
 dwarf 94
 northern 93
 window 92
- Native oat grass 127
- Needle grass 125, 130
 rough 125
- Neurachne 92-4
 mitchelliana 92
 muelleri 93
 munroi 94
- Neverfail grasses 72, 74
 knotty-butt 74
 narrow-leaf 72
- Niggerheads 50-7
- Nineawn grasses 50-7
 Cleland's 51
 cone-top 56
 hairless 53
 jointed 52
 leafy 57
 oat 50
 purple-head 55
 wiry 54
- Oilgrasses 36-8
 scented 37
 silky 36
- Panic grasses 41-2, 95-9
 boat 96
 bunch 95
 cotton 41
 finger 42
 hairy 98
- Panicum 95-9
 australiense 95
 cymbiforme 96
 decompositum 97
 effusum 98
 whitei 99
- Papa grass 97
- Paractaenum novae-hollandiae 100
- Paspalidium 101-3
 clementii 101
 constrictum 102
 rarum 103
- Paspalidium grasses 101-3
 Clement's 101
 knotty-butt 102
 rare 103
- Pepper grass 99
- Perotis rara 104
- Phragmites karka 105
- Pigeon grasses 99, 117-18
 Brown's 117
 Diel's 118
- Plagiosetum refractum 106
- Plain grass 72
- Plectrachne 107-8
 pungens 107
 schinzii 108
- Plume sorghum 119
- Porcupine grass 112, 113
- Purple plume grass 130
- Ray grass 121
- Red gulf grasses 87-90
- Reverse grass 100
- Rhodes grasses 30-3
 feathertop 33
- Ribbon grass 35
- Scent grass 37
- Schizachyrium obliqueberbe 116
- Setaria 117-18
 brownii 117
 dielsii 118
- Silky browntop 86
- Silky-heads 38
- Small burr grass 128
- Small redleaf 116

The Grasses of Central Australia

- Sorghum plumosum 119
Spathe grass 120
Spathia neurosa 120
Spike grass 49
Spinifex grasses 107-15
 curly 107
 feathertop 108
 giant grey 113
 gummy 114
 hard 109
 Hubbard's 111
 lobed 109
 silvery 108
 soft 107, 114
 spike-flowered 115
 weeping 110
Sporobolus 121-4
 actinocladus 121
 australasicus 122
 caroli 123
 mitchellii 124
Stink grass 59
Stipa scabra 125
Sugar grass 86
Swamp grass 86
Swamp rat-tail grass 124

Tall oat grass 127
Themeda 126-7
 australis 126
 avenacea 127
Threeawn grasses 2-13
 brush 12
 flat-awned 11
 Jericho 9
 needle-leaved 5
 prickly 7
 rough 13

two-gland 3
unequal 8
yellow 2
Tragus australianus 128
Triodia 109-15
 basedowii 109
 clelandii 110
 hubbardii 111
 irritans 112
 longiceps 113
 pungens 114
 spicata 115
Tripogon loliiformis 129
Triraphis mollis 130
Tropical reed 105

Uranthoecium truncatum 131

Wanderrie grasses 75-83
 long-awned 76
 mountain 79
 Mt Olga 83
 northern 81
 plains 80
 pretty 82
 swamp 77
 three-awned 75
 woollybutt 78
White grass 4
Wind grass 6
Woollybutt grasses 64, 69
 hairy-flowered 69
 naked 64

Yakka grass 123

Zygochloa paradoxa 132



Text set in 11 on 13 pt and 10 on 12 pt Imprint,
and printed on 120 lb Artpaper
by Cathay Press, Hong Kong

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