INTERIM RECOVERY PLAN NO. 31

PROSTRATE FLAME FLOWER

(CHORIZEMA HUMILE)

INTERIM RECOVERY PLAN

1999-2002

by

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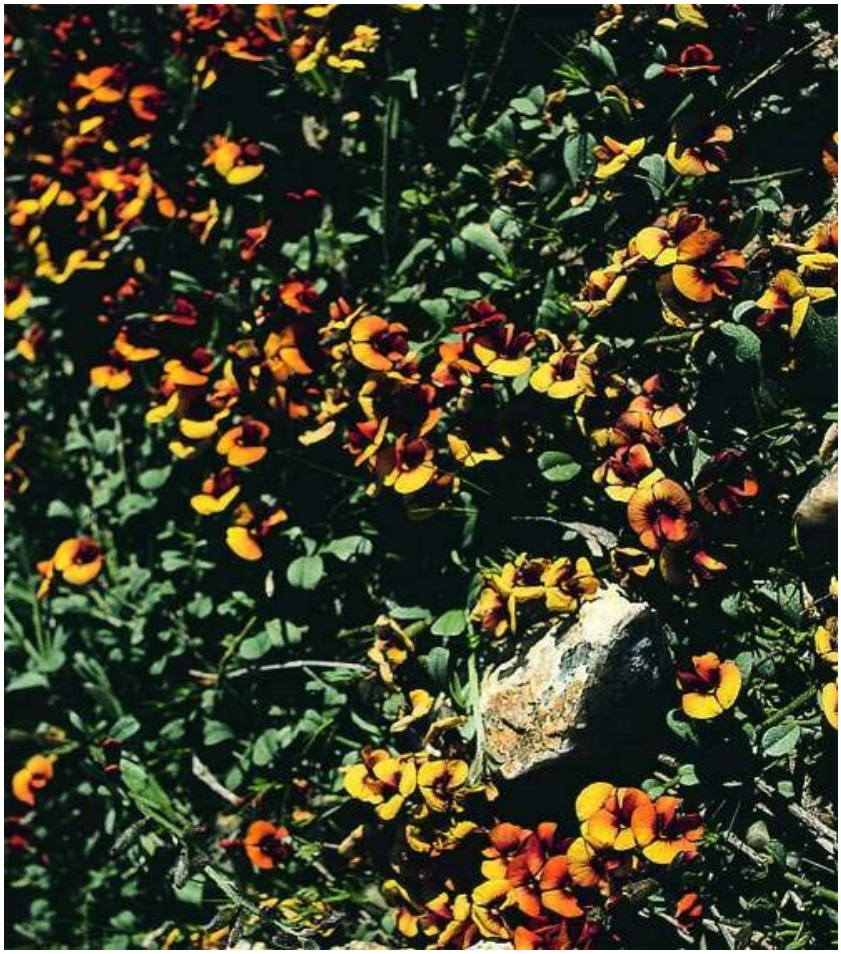

Photograph: Diana Papenfus

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Natural Heritage Trust
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FOREWORD

Interim Recovery Plans (IRPs) are developed within the framework laid down in Department of Conservation and Land Management (CALM) Policy Statements Nos. 44 and 50.

IRPs outline the recovery actions that are required to urgently address those threatening processes most affecting the ongoing survival of threatened taxa or ecological communities, and begin the recovery process.

CALM is committed to ensuring that Critically Endangered taxa are conserved through the preparation and implementation of Recovery Plans or Interim Recovery Plans and by ensuring that conservation action commences as soon as possible and always within one year of endorsement of that rank by the Minister.

This Interim Recovery Plan will operate from May 1999 to April 2002 but will remain in force until withdrawn or replaced. It is intended that, if the taxon is still ranked Critically Endangered, this IRP will be replaced by a full Recovery Plan after three years.

This IRP was approved by the Director of Nature Conservation on 31 August 1999. The provision of funds identified in this Interim Recovery Plan is dependent on budgetary and other constraints affecting CALM, as well as the need to address other priorities.

Information in this IRP was accurate at May 1999.

SUMMARY

Scientific Name: ***Chorizema humile***
Common Name: Prostrate flame pea
Family: PAPILIONACEAE
Flowering Period: July - September
CALM Region: Midwest
CALM District: Moora
Shires: Coorow, Carnamah, Moora
Recovery Team: Moora District Threatened Flora Recovery Team (MDTFRT)

Illustrations and/or further information: Taylor, J.M. and Crisp, M.D. (1992). A Revision of *Chorizema* (Leguminosae: Mirbelieae). *Australian Systematic Botany* 5(3): 249-335 ; Brown, A., Thomson-Dans, C. and Marchant, N. (eds.). (1998). *Western Australia's Threatened Flora*. Department of Conservation and Land Management, Western Australia.

Current status: *Chorizema humile* was declared as Rare Flora in October 1996, and was ranked as Critically Endangered (CR) in 1998. It currently meets World Conservation Union (IUCN) Red List category 'CR' under criterion B1+2c (IUCN 1994) as the populations are severely fragmented and habitat quality is poor. There are currently 83 plants known from three populations. These populations are vulnerable to a number of threats, including grazing and trampling, road maintenance activities, weed competition and inappropriate fire regimes.

Habitat requirements: *C. humile* is found on red loam or brown sandy clay plains in scrub or open tree mallee. Associated species include *Allocasuarina campestris*, *Hypocalymma angustifolium* and several *Acacia* species. The species was historically collected from Cue to Dowerin, however, all known populations now occur within the Carnamah - Moora area.

Existing Recovery Actions: The following recovery actions have been or are currently being implemented:
1. Surveys for new populations conducted.
2. All relevant land managers notified of presence of *C. humile*.
3. Declared Rare Flora (DRF) markers installed at Populations 2 and 3.
4. Stock-exclusion fence erected at Population 1.
5. Cages installed over individual plants at Populations 1 and 3.
6. Seed collected and stored.
7. Several live plants maintained in cultivation.
8. All populations regularly monitored.

IRP Objective: The objective of this Interim Recovery Plan is to abate identified threats and maintain viable *in situ* populations to ensure the long-term preservation of the species in the wild.

Recovery criteria
Criterion for success: The number of individuals within populations and/or the number of populations have increased.
Criterion for failure: The number of individuals within populations and/or the number of populations have decreased.

Recovery actions
1. Implement weed control.
2. Develop a fire management strategy.
3. Monitor populations.
4. Conduct further survey.
5. Obtain biological and ecological information.
6. Preserve genetic diversity of the taxon.
7. Disseminate information.
8. Start translocation process.
9. Write full Recovery Plan.

1. BACKGROUND

History

The first collection of *Chorizema humile* was made near Cue in 1931 by W.E. Blackall. In August 1995, the taxon received intensive and specific survey work by D. Papenfus in and around the Strawberry, Carnamah and Coorow areas. Although none of the previously recorded populations were relocated, a new population was found. This consisted of 47 plants at last survey, and was located in remnant vegetation on private property. The area has been free from stock since 1975 and rabbits have not been recorded at the site. Surveys conducted in 1996 located two new populations on road verges. When last inspected, Population 2 consisted of 1 plant, and Population 3 comprised 35 plants.

The prostrate habit and delicate foliage of this species makes it particularly vulnerable to trampling and grazing. To prevent this damage, cages have been installed over a number of individual plants at Populations 1 and 3. The cages installed at Population 1 are part of a research project being conducted by staff of CALM's Threatened Flora Seed Centre (TFSC), which is investigating possible causes for the observed low seed set at this population.

Description

Chorizema humile is a small, prostrate shrub to approximately 60 cm in diameter, with many slender stems radiating from a central root that are ridged with scattered hairs. It has obovate leaves that are 4-16 mm long and 2.5-5 mm wide, tapering at the base into a short petiole. The flowers occur at the ends of the stems in racemes up to 18 cm long with up to 30 flowers in each. The petals are yellow with red-brown markings. The standard petal is up to 9 mm long, the wing petals are gently curved to 8 mm long and the keel is almost as long as the wings. *C. humile* shows an affinity to three other species that have small yellow flowers with dull red markings - *C. parviflorum, C. racemosum* and *C. genistoides. C. parviflorum* can be distinguished from *C. humile* by its narrow to linear leaves. *C. racemosum* differs in its spinescent branchlets and linear leaves with revolute margins. *C. genistoides* is superficially similar to *C. humile*, but it differs in having erect or spreading spinescent branchlets, sparse leaves at flowering and keel petals much shorter than the wing petals.

Distribution and habitat

C. humile is endemic to Western Australia and has historically been collected from Cue to Dowerin. It is currently known from three populations, all of which occur in the Carnamah – Moora area. These contained a total of 83 plants at last inspection. While Population 1 occurs in remnant vegetation in good condition, the habitat of Populations 2 and 3 is highly disturbed.

This species is found on red loam or brown sandy clay plains in scrub or open tree mallee. Associated species include *Allocasuarina campestris*, *Hypocalymma angustifolium* and several *Acacia* species.

Biology and ecology

Little is known about the biology and ecology of *C. humile*. It is thought that it may be pollinated by bull ants. The species has been described by the Kings Park and Botanic Garden (KPBG) propagator as easy to propagate from cuttings.

In November 1996 TFSC staff observed that many plants held little or no fruit. As many plants were grazed to their base, the young fruiting shoots may have been eaten. In November 1997 the majority of the fruit were on the ground but unopened. Several plants did not appear to have produced fruit that season. The causes of these variations are unknown.

Threats

The species qualifies as Critically Endangered under criterion B1+2c (IUCN 1994) due to a small area of occupancy, the severe fragmentation of populations and a continuing decline due to the degraded condition of its habitat. The main threats are grazing and trampling, road maintenance activities, weed competition, and inappropriate fire regimes.

- **Grazing and trampling** by kangaroos (*Macropus fuliginosus*) has had a major impact on Population 1 and has contributed to damage at Population 3. A. Cochrane observed in November 1996 that many plants at Population 1 had little or no fruit, although most plants had flowered several months previously. The fruiting shoots had been consumed, with many plants grazed to the base. In addition to the effect on adult *C. humile* plants, grazing is likely to impact on the establishment of *C. humile* seedlings, thus limiting the natural recruitment of the species.

- **Grazing and trampling** of road reserves by sheep being driven along roads is adding to damage done by kangaroos at Population 3a. In addition to damaging the *C. humile* plants, sheep are degrading the surrounding habitat by compacting the soil and their droppings are increasing nutrient levels and introducing weed species. Population 3b has been fenced to exclude stock.

- **Road maintenance activities** such as grading and construction of drainage channels pose a threat to Populations 2 and 3. Mowing of road verge vegetation could also impact on the habitat of this species. These disturbance events can stimulate seed germination, but also generally encourage weed invasion.

- **Weed competition** is a threat to Populations 2 and 3 where dense areas of introduced grasses compete for soil moisture, nutrients and light. Adult plants of *C. humile* are not thriving, and the weeds may smother any germinants. Weeds also exacerbate the risk of fire by increasing the fuel loads, and increase the threat of grazing by providing more green feed palatable to herbivores.

- **Inappropriate fire regimes** would affect the viability of populations, as seeds of *C. humile* probably germinate following fire. The soil seed bank would therefore be rapidly depleted if fires recurred before regenerating or juvenile plants reached maturity and replenished the soil seed bank. However, it is likely that occasional fires are needed for reproduction of this species.

- **A lack of recruitment** has been observed at all populations. There are a number of possible causes including: low seed production; high flower, seed and/or seedling predation; and a lack of disturbance events to stimulate germination.

Summary of population information and threats

Pop. No. & Location	Land Status	Date / No. of Plants	Condition	Threats
1. ESE of Coorow	Private property	08.95 17 08.96 11 08.98 47	Good	Grazing and trampling by kangaroos, inappropriate fire regime, lack of regeneration
2. E of Carnamah	Shire road reserve	08.96 1 09.96 1	Poor	Road maintenance activities, weed invasion, inappropriate fire regime, lack of regeneration
3a. NE of Bindi Bindi	Shire road reserve	08.96 20* 09.96 15 05.98 16 07.98 27 10.98 28	Poor	Road maintenance activities, grazing and trampling by sheep, weed invasion, inappropriate fire regime, lack of regeneration
3b. NE of Bindi Bindi	Private property	08.96 * 10.98 7	Poor	Weed invasion, inappropriate fire regime, lack of regeneration

* Includes both subpopulations

2. RECOVERY OBJECTIVE AND CRITERIA

Objective

The objective of this Interim Recovery Plan is to abate identified threats and maintain viable *in situ* populations to ensure the long-term preservation of the species in the wild.

Criterion for success: The number of individuals within populations and/or the number of populations have increased.
Criterion for failure: The number of individuals within populations and/or the number of populations have decreased.

3. RECOVERY ACTIONS

Existing recovery actions

All appropriate people have been made aware of the existence of this species and its locations. They include the Shires of Carnamah and Moora, the managers of land on which Populations 1 and 3B occur, and managers of land adjacent to Populations 2 and 3A. They were formally notified of the presence of *C. humile* populations, the Declared Rare Flora status of the species, and associated legal responsibilities.

Declared Rare Flora markers were installed at Populations 2 and 3 in September 1996. These markers alert people working in the area to the presence of an area of environmental significance, and help prevent accidental damage during maintenance operations. Awareness of the significance of these markers is being promoted to relevant authorities such as shires, Main Roads Western Australia (MRWA) and Westrail. To this end, dashboard stickers and posters have been produced and distributed. These illustrate DRF markers, inform of their purpose and provide a contact telephone number to use if such a marker is encountered.

Population 1 occurs in remnant vegetation on private property and was fenced from stock in 1975. Kangaroos have continued to have a serious impact on the population through grazing and trampling, drastically reducing plant condition and seed set. In August 1998, to address this problem, small wire cages were constructed over 47 individual plants at this population. This was completed with the aid of a team from the Australian Trust for Conservation Volunteers (ATCV). Seed collection conducted in 1998 suggests that this helped reduce the impact of kangaroos. Seed numbers are still not as high as in Population 3, but it is hoped that they will increase as the condition of the plants improves with continued exclusion of grazing.

Stock movement on the road reserve that contains Population 3a is an ongoing threat. To prevent grazing and trampling damage to the *C. humile* plants, seven steel mesh cages were installed over ten plants at Population 3a in July 1998. A further nine cages were installed in November 1998. A stock-exclusion fence was erected around Population 3b in 1997. Approval was gained from the Shire of Moora to move the firebreak to the outside of that fence. During monitoring in July 1998, it was observed that the subpopulation was still sustaining damage from kangaroos, and in October 1998, wire netting cages were installed over all seven *C. humile* plants at this subpopulation.

Staff from the TFSC collected nearly 100 seeds from 10 plants at Population 1, and almost 3 600 seeds from 10 plants at Population 3 in November 1996. These are now being stored at -18°C in CALM's TFSC. The TFSC tests the viability of the seed initially, after one year in storage, and again after five years. The initial germination rate of this seed was found to vary from 50% to 72%, and after one year in storage, from 71% to 88%. Just over 1 500 seeds were collected from 11 plants at Population 3 in November 1997. This material had an initial germination rate of 84%. Most recently, almost 300 seeds were collected from 19 plants at Population 1 in November 1998. This material is still being processed so the overall germination rate is not yet known, but will be higher than 80%. In February 1998, 1000 seeds of those collected from Population 3 in 1996 were sent to KPBG as a duplicate collection. This strategy is designed to safeguard the resource by maintaining it in two locations.

The species is in cultivation at the National Botanic Gardens, Canberra. They provided cutting material to KPBG in July 1984. The success rate of cuttings taken from this cultivated material has been excellent, with

between 70 and 100% of cuttings developing roots. The KPBG propagator described the species as easy to propagate and maintain. In February 1999, KPBG held four plants in its nursery.

CALM's Moora District staff regularly monitor all populations.

The Moora District Threatened Flora Recovery Team (MDTFRT) is overseeing the implementation of this IRP and will include information on progress in its annual report to CALM's Corporate Executive and funding bodies.

Future recovery actions

Where populations occur on lands other than those managed by CALM, permission has been or will be sought from the appropriate land managers prior to recovery actions being undertaken.

1. Implement weed control

The habitat of Populations 2 and 3 is weed infested. Weed control with the use of herbicides and hand pulling will be conducted in these areas. The tolerance of native plant species to herbicides at *C. humile* sites is unknown, so caution is necessary. A weed control program for these populations will involve the following steps (adapted from Panetta and Hopkins 1991):

1. Accurately mapping the boundaries of the weed populations.
2. Selection of an appropriate herbicide or method of weed control after determining which weeds are present.
3. Controlling invasive weeds internal to the boundary by hand removal or spot spraying around individual *C. humile* plants when weeds first emerge.
4. Scheduling weed spraying to accommodate weed control around other DRF populations in the area.

A weed control program will be developed in consultation with the Shires of Carnamah and Moora and the managers of the private property on which Populations 1 and 3b are located.

Action:	Undertake weed control
Responsibility:	CALM (Moora District) and relevant land managers, through the MDTFRT
Cost:	$600 per year.

2. Develop a fire management strategy

Little is known about the effects of fire on this species. It is likely that the species requires occasional fire for recruitment from soil-stored seed, but frequent fires may be detrimental to its long-term survival. Fire also promotes the introduction and proliferation of weed species.

A fire management strategy will be developed by CALM's Moora District in consultation with relevant land managers (including relevant private property managers, the Shire of Coorow, MRWA) and the MDTFRT.

Action:	Develop a fire management strategy
Responsibility:	CALM (Moora District) through the MDTFRT, relevant land managers
Cost:	$2,300 for year 1, $1,000 for years 2 and 3.

3. Monitor populations

Monitoring factors such as weed densities, habitat degradation, population stability (expansion or decline), pollination activity, seed production, recruitment and longevity is essential. For Populations 2 and 3, the visibility of DRF markers will also be monitored and maintained. The paint may become dull, and weed or other vegetation growth may obscure markers, rendering them ineffective.

Populations will be inspected annually.

Action: Monitor populations
Responsibility: CALM (Moora District) through the MDTFRT
Cost: $600 per year.

4. Conduct further surveys

Further surveys for *C. humile* will be undertaken during its flowering period on a systematic basis in areas of suitable habitat. Appropriate habitat on private lands will be surveyed where possible. Areas considered to be suitable habitat for the species will be noted and considered for translocation. Kojarena, Dowerin, Wongan Hills and Cue are all areas from which collections have been made, and need further survey. Volunteers from the local community, Wildflower Societies, Naturalist Clubs and other community-based groups will be encouraged to be involved in surveys supervised by CALM staff.

Action: Conduct further surveys
Responsibility: CALM (Moora District) through the MDTFRT
Cost: $1,800 per year.

5. Obtain biological and ecological information

Increased knowledge of the biology and ecology of the species will provide a scientific basis for management of *C. humile* in the wild. Investigations will include:

1. Study of the soil seed bank dynamics and the role of various factors (disturbance, competition, rainfall, grazing) in recruitment and seedling survival.
2. Determination of reproductive strategies, phenology and seasonal growth.
3. Investigation of the mating system and pollination biology.
4. Investigation of population genetic structure, levels of genetic diversity and minimum viable population size.
5. Investigation of the impacts of herbicide on habitat.

Action: Obtain biological and ecological information
Responsibility: CALM (CALMScience, Moora District) through the MDTFRT
Cost: $16,900 per year.

6. Preserve genetic diversity of the taxon

It is necessary to store germplasm as a genetic resource, ready for use in translocations and as an *ex situ* genetic 'blueprint' of the taxon. The germplasm stored will include seed and live plants in cultivation. Some seed has been collected from Populations 1 and 3. Further collection is necessary to maintain adequate representation of the remaining genetic diversity of this species. Care needs to be taken, as these processes carry an inherent risk of depletion of seed bank reserves. The first aim of germplasm collection should be the preservation of the species in the wild.

If it is not possible to collect adequate quantities of viable seed, other methods of germplasm storage will be investigated, such as living collections grown from cutting material.

Action: Preserve genetic diversity of the species
Responsibility: CALM (TFSC, Moora District) and KPBG, through the MDTFRT
Cost: $2,600 for year 1; $1,400 for year 3.

7. Disseminate information

The importance of biodiversity conservation and the preservation of critically endangered species generally and *C. humile* in particular will be promoted to the public. Awareness will be encouraged in the community through a publicity campaign using the local print and electronic media and poster displays. Formal links with local naturalist groups and interested individuals will also be encouraged. A poster illustrating all critically

endangered flora taxa in Moora District will be prepared and displayed at Shire Offices and shopping centres. An information sheet for *C. humile* will also be produced. This will include photographs, a description of the plant, its habitat type, threats and management actions. The exact location of this species will remain confidential. The information sheets will be distributed to the public through CALM's Moora District office and at the offices and libraries of the Shires of Coorow, Carnamah and Moora. Copies will also be supplied to the Fire and Rescue Service, Westrail, MRWA and Agriculture Western Australia to raise awareness of the plant and its appearance. Such activities may lead to the discovery of new populations of the species.

Action: Disseminate information
Responsibility: CALM (Moora District, Corporate Relations Division) through the MDTFRT
Cost: $1,000 for year 2, $400 for years 1 and 3.

8. Start translocation process

Translocation is essential for the conservation of this species, as the road verges and private property on which all populations occur are not secure from threats including weeds, fire and physical destruction. Although translocations are generally undertaken under full Recovery Plans, it is possible to develop a translocation proposal and begin propagating plants within the timeframe of an Interim Recovery Plan. This will be coordinated by the MDTFRT. Information on the translocation of threatened animals and plants in the wild is provided in CALM Policy Statement No 29 *Translocation of Threatened Flora and Fauna*. All translocation proposals require approval by the Director of Nature Conservation.

Action: Start translocation process
Responsibility: CALM (Moora District) and KPBG, through the MDTFRT
Cost: $1,700 for year 3.

9. Write full Recovery Plan

At the end of the three-year term of this Interim Recovery Plan, the need for further recovery will be assessed. If the species is still ranked Critically Endangered, a full Recovery Plan will be developed to describe action required for long-term maintenance of the taxon.

Action: Write full Recovery Plan
Responsibility: CALM (Moora District) through the MDTFRT
Cost: $18,800 for year 3.

4. TERM OF PLAN

This Interim Recovery Plan will operate from May 1999 to April 2002 but will remain in force until withdrawn or replaced. It is intended that, if the taxon is still ranked Critically Endangered, this IRP will be replaced by a full Recovery Plan after three years.

5. ACKNOWLEDGMENTS

The following people have provided assistance and advice in the preparation of this Interim Recovery Plan:

Anne Cochrane	Manager, CALM Threatened Flora Seed Centre
Emma Holland	Consultant, previously CALM W.A. Threatened Species and Communities Unit
Sophie Juszkiewicz	Propagator, Kings Park and Botanic Garden
Kim Kershaw	Consultant, previously CALM W.A. Threatened Species and Communities Unit
Diana Papenfus	Botanist, previously CALMScience
Sue Patrick	Senior Research Scientist, CALMScience
Rebecca Carter (nee Wolstenholm)	Previously Conservation Officer, CALM Moora District.

Thanks also to CALMScience staff for providing access to Herbarium databases and specimen information, and the staff of CALM's Wildlife Branch for assistance.

6. REFERENCES

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7. TAXONOMIC DESCRIPTION

(Taylor and Crisp 1992).

Chorizema humile

Small *shrub*; *branches* sprawling, prostrate or decumbent, *c.* 35 cm long, striate or ridged, with scattered, peltate, fusiform hairs. *Leaves* alternate, obovate, obtuse, emarginate or rarely acute at the apex, mucronate, tapered into the petiole, 4-16 x 2.5-5 mm, $\pm$ complicate, with appressed hairs or almost glabrous; margins slightly recurved; venation brochidodromous, midrib raised on the underside; *petioles* 0.5-1.5 mm long; *stipules* subulate, *c.* 1 mm long, persistent. *Racemes* terminal, 7-18 cm long with up to 30 flowers. *Pedicels* 2-2.5 mm long; *bracts* narrow-ovate, 1.5-2 mm long, persistent; *bracteoles* very narrow-ovate, *c.* 0.75 mm long, attached to the pedicel close to the calyx, persistent. *Calyx* tapered at the base, 3.5-4.5 mm long, with peltate, fusiform hairs; upper two lobes united into a truncate, emarginate lip, the tips free *c.* 0.75 mm; lower three lobes a little shorter, acute, *c.* 1.75 mm long. *Corolla* dull yellow with red-brown markings; *standard* depressed ovate, shallowly emarginate, 7-9 x 7-9 mm including 3.5-4 mm long claw; *wings* oblong-obovate, curved, scarcely auriculate, 7-8 x 2-2.5 mm including 2-2.5 mm long claw; *keel* almost as long as the wings, $\pm$ ovate, acuminate or attenuate at the apex, rarely acute, partly inflated, auriculate, 6-7.5 x 1.5-2.5 mm including 2-3 mm claw. *Stamens* with filaments 4-6 mm long; *anthers* versatile, *c.* 0.4 mm long. *Gynoecium* 6-7 mm long including 1-1.5 mm stipe and gently incurved style 1.75-2.5 mm; *stigma* capitate, very small; *ovary* with dense, appressed hairs; *ovules* 14-21. *Pod* and *seed* not seen.

Flowering period. July to September. *Fruiting period.* Unknown.

Distribution. Western Australia: Irwin and Austin Districts. *Chorizema humile* has been collected from a small area which includes Kojarena, E of Geraldton, and Strawberry, Carnamah and Coorow to the south-east. As this species has been collected infrequently, further field work may extend the known distribution.

Habitat. Chorizema humile has been observed growing on sandy clay or red loam. Composites are the only associated flora recorded.

Affinity. Chorizema humile shows an affinity to three other species which have small yellow flowers with dull red markings, viz. *C. parviflorum*, *C. racemosum* and *C. genistoides*. *C. parviflorum* has leaves narrow to linear, and usually elliptic, with recurved margins. *Chorizema racemosum* has branchlets which are usually spinescent and leaves linear with revolute margins. *C. genistoides* although superficially similar to *C. humile* differs in having erect or spreading spinescent branches, leaves sparse at flowering, stipules minute and caducous, bracts caducous, calyx rounded at the base, keel much shorter than the wings, and the style abruptly incurved.