

INTERIM RECOVERY PLAN NO. 113

HOOK POINT POISON

(*GASTROLOBIUM HAMULOSUM*)

INTERIM RECOVERY PLAN

2002-2005

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Photograph: Andrew Brown

February 2002

Department of Conservation and Land Management
Western Australian Threatened Species and Communities Unit (WATSCU)
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FOREWORD

Interim Recovery Plans (IRPs) are developed within the framework laid down in Department of Conservation and Land Management (the Department) 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.

The Department 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This Interim Recovery Plan will operate from February 2002 to January 2005 but will remain in force until withdrawn or replaced.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 Acting Director of Nature Conservation on 24 September 2002. The provision of funds identified in this Interim Recovery Plan is dependent on budgetary and other constraints affecting the Department, as well as the need to address other priorities.

Information in this IRP was accurate at February 2002.

SUMMARY

Scientific Name:	<i>Gastrolobium hamulosum</i>	Common Name:	Hook-point Poison
Family:	Papilionaceae	Flowering Period:	August – October
The Department's Regions:	Wheatbelt, Midwest	The Department's Districts:	Merredin, Moora
Shires:	Wongan-Ballidu, Moora, Victoria Plains	Recovery Teams:	Merredin and Moora District Threatened Flora Recovery Teams

Illustrations and/or further information: Rye, B.L. (1980) *Rare and Geographically Restricted Plants of Western Australia No. 4: Wongan Hills Species*. Unpublished Report, Department of Fisheries and Wildlife, W.A.; Sampson, J.F. and Hopper, S.D. (1990). *Endangered Poison Plants of Western Australia*. WWF Project P105. Final Report to World Wide Fund for Nature and Department of Conservation and Land Management; 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: *Gastrolobium hamulosum* was declared to be Rare Flora in June 1990 and ranked in December 1997 as Critically Endangered (CR). It currently meets World Conservation Union (IUCN 2000) Red List Category 'CR' under criteria B1ab(iii)+2ab(iii) and C1. It is known from five populations that contain a total of 197 adult plants and 54 seedlings. The main threats are road, rail, firebreak and drain maintenance activities, weed invasion, inappropriate fire regimes and possibly dieback.

Critical habitat: The critical habitat for *Gastrolobium hamulosum* comprises the area of occupancy of the known populations; areas of similar habitat ie low scrub and heath on gravelly soils on quartzite ridges or on clay flats, within 200 metres of known populations; corridors of remnant vegetation that link populations; and additional occurrences of similar habitat that do not currently contain the species.

Habitat requirements: *Gastrolobium hamulosum* is confined to very restricted areas near Wongan Hills, Calingiri, Bindi Bindi and Watheroo in Western Australia. The species grows on gravelly soils on quartzite ridges or in scrub on clay flats.

Existing Recovery Actions: The following recovery actions have been or are currently being implemented:

1. All relevant land managers have been informed of the species' locations and the associated legal obligations.
2. Declared Rare Flora (DRF) markers have been installed at Populations 1, 2 and 8.
3. Dashboard stickers and posters, that illustrate DRF markers and note their purpose, and a contact telephone number to use if such a marker is encountered, have been produced and distributed.
4. Botanic Garden and Parks Authority (BGPA) currently have 33 plants of *Gastrolobium hamulosum* in cultivation.
5. 2292 seeds have been collected and are being stored in the Department's Threatened Flora Seed Centre at -18°C.
6. Staff from the Department's Moora and Merredin District offices regularly monitor the populations.
7. The Moora and Merredin District Threatened Flora Recovery Teams are overseeing the implementation of this IRP.

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

Recovery criteria

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

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

Recovery actions

1. Coordinate recovery actions.
2. Install DRF markers
3. Undertake weed control.
4. Stimulate and monitor germination.
5. Collect seed and cutting material.
6. Propagate plants for translocation.
7. Undertake and monitor translocation, if required.
8. Conduct further surveys.
9. Monitor populations.
10. Develop and implement a fire management strategy.
11. Promote awareness.
12. Obtain biological and ecological information.
13. Write a full Recovery Plan.

1. BACKGROUND

History

The earliest collection of *Gastrolobium hamulosum* that is housed at the Western Australian Herbarium was made in 1923 by H.L. Wade from near Calingiri. The type collection collected by J. Drummond in 1864 is housed at the British Museum, but locational information is vague. Several additional collections were made from near Watheroo and Calingiri in the 1920s and 1930s by T.P. Duggan, W.E. Blackall and C.A. Gardner. In 1955 R.D. Royce collected a specimen from east of New Norcia, and at Wongan Hills. Additional plants were located at Carani during the 1960s by T.E.H. Aplin, and by J.F. Sampson at Callingiri and Wongan Hills in 1980s. The New Norcia and Carani populations have not been relocated recently and are now only known from herbarium specimens. One additional population has been located near Bindi Bindi. A specimen recorded as *Gastrolobium ?hamulosum* was collected from Jilakin in 1999, but is probably not this taxon as other similar *Gastrolobium* specimens collected from nearby have been identified as a different species.

Description

Gastrolobium hamulosum is a small, erect, somewhat straggly shrub, to 45 cm tall. The numerous slender branchlets are covered with conspicuous short, white hairs. Bluish-green leaves have conspicuous net veins and the midrib is raised beneath. They are oval, with a wide, blunt tip that has a characteristic hooked point. The leaves are arranged in whorls of 3 up the stems. Golden yellow flowers, streaked with red, are arranged in short clusters at the ends of the branches. The calyx has long silky hairs and deeply divided lobes that taper to long points.

Gastrolobium hamulosum is similar to *G. parvifolium*, that has crowded leaves that are not whorled, and a hairless calyx.

Distribution and habitat

Gastrolobium hamulosum is found in the Wongan Hills, Calingiri, Bindi Bindi, and Watheroo areas. The Calingiri population is one plant on a railway reserve, whereas the Wongan Hills populations consist of one sub-populations on a road verge, and three on a Department of Agriculture reserve. The species has also been recorded in the past from east of New Norcia, and east of Carani, but as mentioned, these populations have not been located recently. Habitat is pale yellowish clay loam with some sand and gravel on clay flats, or white and grey sand or sandy clay, sometimes in disturbed ground with other colonising shrubs, such as *Baeckea crispifolia*, *Gastrolobium calycinum* and *Mirbelia spinosa*, or in low heath with *Allocasuarina campestris*, melaleucas, eucalypts and tall sedges. It has also been recorded from quartzite ridges.

Critical habitat

Critical habitat is habitat identified as being critical to the survival of a listed threatened species or listed threatened ecological community. Habitat is defined as the biophysical medium or media occupied (continuously, periodically or occasionally) by an organism or group of organisms or once occupied (continuously, periodically or occasionally) by an organism, or group of organisms, and into which organisms of that kind have the potential to be reintroduced (Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*).

The critical habitat for *Gastrolobium hamulosum* comprises:

- the area of occupancy of the known populations;
- areas of similar habitat ie. gravelly soils on quartzite ridges or on clay flats in open scrub or heath, within 200 metres of known populations (these areas provide potential habitat for natural range extension);
- corridors of remnant vegetation that link populations (these areas are necessary to allow pollinators to move between populations and are usually road or rail verges);
- additional occurrences of similar habitat ie. gravelly soils on quartzite ridges or on clay flats in scrub or heath, that do not currently contain the species (these areas represents possible translocation sites).

Biology and ecology

Gastrolobium hamulosum is a small single stemmed shrub. Sampson and Hopper (1990) note that it is most likely that it would be killed by fire, be a coloniser (disturbance opportunist) and reproduce from seed. Many seedlings were located in the population in 2000 following major soil disturbance of Population 1a in 1999 for drainage works. However, in some populations the plants extend into the adjacent intact bushland. These observations support the belief that the species is a disturbance opportunist and germinates following disturbance, but is also able to exist in bushland that has apparently been free of disturbance for lengthy periods. It may also germinate from soil stored seed following fire.

The plants are capable of producing only two seeds per flower. As the species only produces moderate numbers of flowers and sets few fruits and seeds per plant, there is likely to be a requirement for a particular amount of time between fires to develop sufficient soil stored seed to allow regeneration of populations.

Sampson and Hopper (1990) note that the species is susceptible to weed invasion, and becomes excluded from weed infested road verges.

Initial tests on *Gastrolobium hamulosum* indicate that it is highly susceptible to dieback disease caused by the plant pathogen *Phytophthora cinnamomi* (B. Shearer¹ personal communication).

Species of poison plants are known to require some clay in the soil to produce their toxin, monofluoroacetic acid (Rye 1980). All the known populations of *Gastrolobium hamulosum* are found in heavy soils, including some that occur on clay flats.

Rye (1980) noted that the honey bee was observed on flowers, apparently feeding on nectar. Other animals observed on the flowers include a bug (Family Miridae).

Despite being rare in the wild, *Gastrolobium hamulosum* has been in cultivation since the 1980s at the Botanic Gardens and Parks Authority (BGPA). The species propagates relatively easily from cuttings, with up to a 50% strike rate, although the mortality can be high after potting (A. Shade² personal communication).

Threats

Gastrolobium hamulosum was declared to be Rare Flora in June 1990 and ranked in December 1997 as Critically Endangered (CR). It currently meets World Conservation Union (IUCN 2000) Red List Category 'CR' under criteria B1ab(iii)+2ab(iii) and C1 as it is only known from five populations that contain a total of 197 adult plants and 54 seedlings, with continuing decline in the condition of the habitat. Historical threats are likely to have been clearing for grazing and wheat farming, followed by poison plant eradication programs. The main threats are now road, rail and drain maintenance activities, weed invasion, inappropriate fire regimes and possibly dieback disease.

- **Road, rail, firebreak or drain maintenance activities** threaten all populations. Threats include actions such as grading of rail reserves and access tracks, spraying of chemicals, constructing drainage channels and mowing or completely removing the vegetation to improve visibility. These disturbance events also often encourage weed invasion into adjacent habitat, as well as causing damage to actual plants. Relevant land managers have been informed of the locations to help prevent possible damage to the populations.
- **Weed invasion** is a threat to most populations, but to Population 1 in particular. Weeds suppress early plant growth by competing for soil moisture, nutrients and light. They also exacerbate grazing pressure and increase the fire hazard due to the easy ignition of high fuel loads, which are produced annually by many grass weed species.
- **Inappropriate fire regimes** may affect the viability of populations. The fire response of *Gastrolobium hamulosum* is not known, but fire is assumed to aid germination. Too frequent fire may result in the depletion of the soil seed bank if fires recur before regenerating or juvenile plants reach maturity and replenish the soil seed bank. Occasional fires may, however, be required for the species to propagate from soil-stored seed.
 - **Dieback disease** may be a threat to the species, as initial tests indicate it is highly susceptible. The actual disease risk in the areas where the populations occur is not known. The site conditions, for example the occurrence of populations in or near water gaining sites such as drains, may increase the likelihood of dieback infection regardless of local climatic conditions (B. Shearer personal communication). Dieback has not specifically been recorded in populations of the species in the wild, however, there have been reports of unexplained deaths of plants in Population 1a.

Summary of population information and threats

¹ Dr Bryan Shearer; Principal Research Scientist, Department of Conservation and Land Management

² Amanda Shade; Propagator, BGPA

Pop. No. & Location	Land Status	Year/No. plants	Condition	Threats
1a. South of Wongan Hills	Shire road reserve	09/1982 6 10/1990 5 09/1991 33 11/1996 5 05/1998 2 09/2000 35 (73) 08/2001 36 (50)	Healthy	Road/drain maintenance, weed invasion, inappropriate fire regimes, ?dieback
1b. South of Wongan Hills	Agriculture WA reserve	10/1990 9 (1) 09/1991 11 09/2000 2	Poor	Firebreak maintenance, weed invasion, inappropriate fire regimes, ?dieback
1c. South of Wongan Hills	Agriculture WA reserve	10/1990 3 (1) 09/1991 6 09/2000 2 08/2001 3	Healthy	Firebreak maintenance, weed invasion, inappropriate fire regimes, ?dieback
1d. South of Wongan Hills	Agriculture WA reserve	09/1991 8 09/2000 27 (4)	Poor	Firebreak/road maintenance, weed invasion inappropriate fire regimes, ?dieback
2. Rail line Calingiri	Rail reserve	10/1990 1 09/1991 1 09/1994 1 08/2001 0	Good	Rail maintenance, weed invasion inappropriate fire regimes, ?dieback
3. Midlands Rd, north of Watheroo	Main Roads WA reserve	11/1996 50	Good	Road maintenance, weed invasion inappropriate fire regimes, ?dieback
4. Midlands Rd, north of Watheroo	Shire road reserve	10/1991 48 08/2001 79	Fair	Road maintenance, weed invasion, ?dieback
8. South of Bindi Bindi	Rail reserve	10/1996 1 08/2001 0	Good	Rail maintenance, inappropriate fire regimes, ?dieback

Numbers in brackets = number of seedlings.

Populations 5, 6 and 7 were previously recorded as populations of *Gastrolobium hamulosum* but have either not been located in recent times, or were found to be duplicate locations for other populations.

Guide for decision-makers

Section 1 provides details of current and possible future threats. Developments in the immediate vicinity of any of the populations or within the defined critical habitat of *Gastrolobium hamulosum* require assessment. No developments should be approved unless the proponents can demonstrate that they will have no significant impact on the species, or its habitat or potential habitat.

2. RECOVERY OBJECTIVE AND CRITERIA

Objectives

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

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

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

3. RECOVERY ACTIONS

Existing recovery actions

Relevant land managers have been made aware of the Critically Endangered status of the species and its locations. All relevant landholders have been formally notified of the presence of *Gastrolobium hamulosum* populations on or adjacent to their land. This notification details the Declared Rare status of the taxon and the associated legal responsibilities.

Declared Rare Flora (DRF) markers have been installed at Population 1, 2 and 8. These alert people working in the area to the presence of significant flora, helping to prevent accidental damage during maintenance operations. Awareness of the significance of these markers is being promoted to relevant bodies such as Shires, Westrail, landholders and Agriculture WA. 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.

Three seedlings were established at the Botanic Garden and Parks Authority (BGPA) in 1997 or 1998. Two of these seedlings originated from seed from Populations 1 and one from Population 4. Cuttings were taken from these original plants and the BGPA now has 11 plants derived from Population 1 and 22 from Population 4.

Seed of *Gastrolobium hamulosum* was collected by staff from the Department's Threatened Flora Seed Centre (TFSC) from Population 1 in 1995, 1996, 1997 and 1998 and from Population 4 in 1997. A total of 2292 seeds have been collected and are being stored in the TFSC at -18°C . Initial germination rates of most collections varied from 91 to 97%, however, one small batch collected in 1995 had a rate of only 5%. After one year in storage the germination rate varied from 87 to 100%.

Staff from the Department's Moora and Merredin District office regularly monitor the populations.

The Moora and Merredin District Threatened Flora Recovery Teams (MDTFRTs) are overseeing the implementation of this IRP.

The Moora and Merredin District Threatened Flora Recovery Teams are overseeing the implementation of this IRP and will include information on progress in its annual report to the Department's Corporate Executive and funding bodies.

Future recovery actions

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

1. Coordinate recovery actions

The Moora and Merredin District Recovery Teams will continue to oversee the implementation of recovery actions for *Gastrolobium hamulosum* and will include information on progress in their annual reports to the Department's Corporate Executive and funding bodies.

Action: Coordinate recovery actions

Responsibility: The Department (Moora and Merredin Districts) through the two Recovery Teams

Cost: \$500 per year.

2. Install Declared Rare Flora markers

Declared Rare Flora (DRF) markers are required on all road and rail reserve populations. Their purpose is to alert people operating in the area to the presence of DRF and the need to take care. They will be installed near Populations 3 and 4.

Action: Install DRF markers
Responsibility: The Department (Moora District) through the Recovery Team
Cost: \$500 in first year.

3. Undertake weed control

Weeds are a threat to all populations, but to population 1 in particular. The following actions will be implemented:

1. Selection of appropriate herbicides after determining which weeds are present.
2. Controlling invasive weeds by hand removal or spot spraying around *Gastrolobium hamulosum* plants when weeds first emerge.
3. Scheduling weed control to include spraying at other threatened flora populations within the district.

The tolerance of associated native plant species to herbicides at the site of *Gastrolobium hamulosum* is not known and weed control programs will be undertaken in conjunction with research.

Action: Undertake weed control
Responsibility: The Department (Moora and Merredin Districts) through the two Recovery Teams
Cost: \$600 per year.

4. Stimulate and monitor germination

Burning, smoke water and other disturbance methods may be effective in stimulating seed germination of *Gastrolobium hamulosum* and will be trialed around Population 1, in conjunction with implementation of study of the soil seed bank dynamics under action 12. The time when flowering first occurs, seed is produced and the age at which senescence is reached will continue to be recorded. This will allow determination of the time interval between disturbance events that is most appropriate to maintain populations.

Action: Stimulate and monitor germination
Responsibility: The Department (Merredin District) through the Merredin District Threatened Flora Recovery Team
Cost: \$3,600 in first and second years, \$900 in third year.

5. Collect seed and cutting material

Preservation of germplasm is essential to guard against extinction if wild populations are lost. Seed and cutting collections are also needed to propagate plants for translocations.

Action: Collect seed and cutting material
Responsibility: The Department (Moora and Merredin Districts) through the two Recovery Teams
Cost: \$3,700 in first and second years.

6. Propagate plants for translocation

If recruitment trials prove successful, the necessity for translocation will be re-assessed. Plants will be propagated if translocation is considered necessary. Seed and/or cuttings will be required for germination and propagation at the BGPA to be available for planting in the following year.

Action: Propagate plants for translocation
Responsibility: The Department (Moora and Merredin Districts) and the BGPA through the two Recovery Teams
Cost: \$2,800 in the first and second years.

7. Undertake and monitor translocation, if required

Although translocations are generally undertaken under full Recovery Plans, a translocation may be required within the time frame of this IRP. Information on the translocation of threatened animals and plants in the wild is provided in the Department's Policy Statement No. 29 *Translocation of Threatened Flora and Fauna*. All translocation proposals require endorsement by the Director of Nature Conservation.

Monitoring of the translocation is essential and if a translocation is required, will be undertaken according to the timetable that will be developed for the Translocation Proposal.

Action: Undertake and monitor translocation, if required
Responsibility: The Department (Moora and Merredin Districts, Science Division) through the two Recovery Teams
Cost: \$13,300 in first year and \$6,200 in subsequent years.

8. Conduct further surveys

Community-based groups and individuals will be encouraged to be involved in further surveys supervised by the Department's staff during the species' flowering period (August-October).

Action: Conduct further surveys
Responsibility: The Department (Moora and Merredin Districts) through the two Recovery Teams
Cost: \$4,200 per year.

9. Monitor populations

Annual monitoring of factors such as dieback disease, habitat degradation, population stability (expansion or decline), weed invasion, pollinator activity, seed production, recruitment, longevity and predation is essential.

Action: Monitor populations
Responsibility: The Department (Moora and Merredin Districts) through the two Recovery Teams
Cost: \$2,700 per year.

10. Develop and implement a fire management strategy

The fire response of *Gastrolobium hamulosum* is not known but occasional disturbances such as fire may be required to stimulate germination. Too frequent fire, however, may prevent the accumulation of sufficient soil stored seed to allow regeneration of the populations. A fire management strategy will be developed to determine fire control measures and appropriate timing and frequency of fire.

Action: Develop and implement a fire management strategy
Responsibility: The Department (Moora and Merredin Districts) through the two Recovery Teams
Cost: \$2,500 in first year and \$1,000 in subsequent years.

11. Promote awareness

The importance of biodiversity conservation and significance of the conservation of the Critically Endangered *Gastrolobium hamulosum* will be promoted to the public. Awareness will be encouraged in the community by a publicity campaign through the local print and electronic media and poster displays. Formal links with local naturalist groups and interested individuals will also be encouraged. An information sheet, which includes a description of the plant, its habitat type, threats, management actions and photos will be produced.

Action:	Promote awareness
Responsibility:	The Department (Merredin and Moora Districts, Strategic Development and Corporate Affairs) through the two Recovery Teams
Cost:	\$1600 in first year and \$900 in subsequent years.

12. Obtain biological and ecological information

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

1. Study of the soil seed bank dynamics and the role of various factors including disturbance (such as fire), competition, rainfall and 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.

Action:	Obtain biological and ecological information
Responsibility:	The Department (Science Division, Moora and Merredin Districts) through the two Recovery Teams
Cost:	\$18,800 per year.

13. Review and update Recovery Plan

At the end of the second-year of implementation of this IRP, the status of the species will be assessed. If *Gastrolobium hamulosum* is still ranked Critically Endangered at that time recovery actions will be reviewed, and this IRP expanded or a full recovery plan developed, if necessary for the long-term recovery of the species.

Action:	Write a full Recovery Plan
Responsibility:	The Department (WATSCU, Moora and Merredin Districts) through the two Recovery Teams
Cost:	\$20,700 once in the final year.

4. TERM OF PLAN

This Interim Recovery Plan will operate from February 2002 to January 2005 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 rewritten or if necessary 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, the Department's Threatened Flora Seed Centre
Bryan Shearer	Principal Research Scientist, the Department
Amanda Shade	Horticulturist, Botanic Garden and Parks Authority

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

6. REFERENCES

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7. TAXONOMIC DESCRIPTION

From: Bentham, G. (1864). *G. hamulosum*, Meissn. In Pl. Preiss. ii. 218. In: *Flora Australiensis: a description of the plants of the Australian Territory. Vol. 2. Leguminosae to Combretaceae*. L. Reeve. London.

Gastrolobium hamulosum

Branches numerous, rather slender, hoary-tomentose. Leaves mostly verticillate in threes, obtuse, with a small often recurved point, about 3 or 4 lines long, rigid, glabrous when full-grown, strongly reticulate, the midrib scarcely prominent. Racemes terminal, short, consisting of 2 or 3 pairs of flowers or whorls of 3 each. Bracts lanceolate. Pedicels very short. Calyx villous with spreading hairs, about 3 lines long, the lobes acuminate, the 2 upper ones shortly united. Standard not twice as long as the calyx, the lower petals not much shorter; keel deeply coloured. Ovary very shortly stipitate; style rather thick.