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Bossiaea heterophylla

variable bossia

TASMANIAN THREATENED SPECIES LISTING STATEMENT

Scientific name: ***Bossiaea heterophylla*** Vent., *Descr. Pl. Nouv.* 1: 7, pl.7 (1800)
Common name: variable bossia
Group: vascular plant, dicotyledon, family **Fabaceae**

Status: *Threatened Species Protection Act 1995*: **endangered**
Environment Protection and Biodiversity Conservation Act 1999: **Not listed**

Distribution: Biogeographic origin: **not endemic to Tasmania**
Tasmanian Natural Resource Management regions: **North**
Tasmanian IBRA Bioregions (V6): **Flinders**

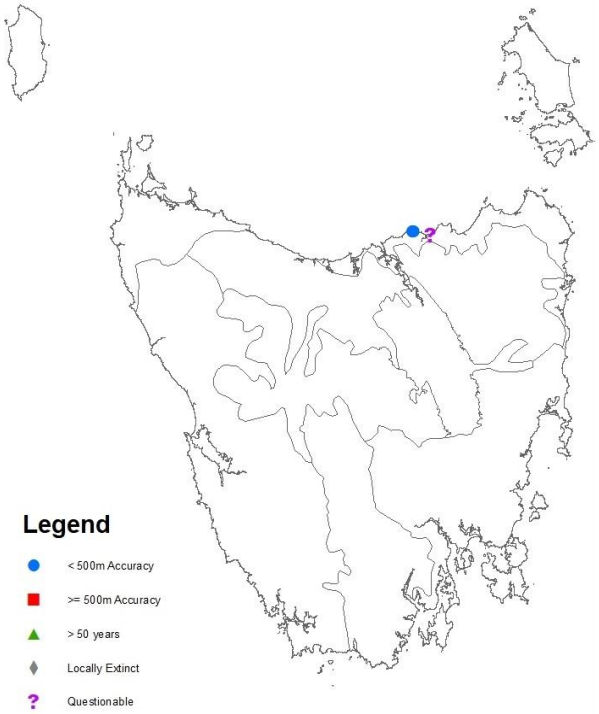

Figure 1. Distribution of *Bossiaea heterophylla* in Tasmania, showing IBRA bioregions (V6)

Plate 1. *Bossiaea heterophylla*

SUMMARY: *Bossiaea heterophylla* (variable bossia) is a shrub in the pea family that occurs on sandy soils in coastal heathland. The Tasmanian occurrence, being the southernmost in Australia, was only discovered in 2011, with one subpopulation confirmed and another reported on the northern coast. Available information suggests the total population is small and localised, with numbers in the low hundreds in less than 0.1 ha confirmed to date, putting the species at risk from chance events. It is also at risk from *Phytophthora cinnamomi*, the root rot pathogen, either directly and/or indirectly due to a decline in the quality of its habitat which is highly susceptible to the pathogen. The species is at risk from the impacts of climate change through an increased fire frequency, higher summer temperatures sufficient to break dormancy, and drying of recruitment niches, possibly leading to a depletion of its soil-stored seed bank thus compromising persistence. Further survey of suitable habitat is needed, particularly in autumn and winter when the species is in flower and most easily detected.

IDENTIFICATION AND ECOLOGY

Bossiaea heterophylla is a semi-prostrate to erect shrub up to about 2 m in height. Plants tend not to resprout when damaged with persistence at a site reliant on recruitment from soil-stored seed following fire. However, the temperature threshold for the breaking of seed dormancy in this species does not preclude recruitment in response to other factors such as extreme summer temperatures or physical disturbance (Ooi et al. 2014). The species is known or suspected to be highly or moderately susceptible to the root rot pathogen *Phytophthora cinnamomi* (Keith et al. 2012).

There are currently 87 taxa in the family Fabaceae native to Tasmania, with *Bossiaea heterophylla* being one of seven *Bossiaea* taxa (de Salas & Baker 2019) and one of two listed on Schedules of the Tasmanian *Threatened Species Protection Act 1995*.

Survey techniques

Surveys are best conducted when *Bossiaea heterophylla* is in flower, enabling identification and easy detection. Flowering occurs mostly in autumn and winter (Thompson 2012). The Tasmanian observations were made in mid-March.

Description

The inflorescences of *Bossiaea heterophylla* are typically borne on longer branchlets rather than shorter side branches. The new growth has 1 to 3 mm wide flattened stems. The leaves are alternate, often variable on the same plant, ranging from narrow oblong-elliptic to sometimes more or less linear because of rolling and are 4 to 25 mm long and 1.5 to 6 mm wide though juvenile leaves can be much wider. They are glabrous at least on the upper surface. The leaf apices tend to be rounded and are often recurved. The pea-like flowers are borne on short stalks with scales. The glabrous calyx is 3 to 6 mm long with the tube mostly slightly longer than the lobes. The standard is yellow with a red flare, flushed pink on the back, and up to about 15 mm long. The wings are yellow but can be flushed pink and are 2 to 3 mm shorter than the 3 to 4 mm wide keel which is pink grading to red (Plate 1). The fruit is a glabrous narrow oblong pod, 30 to 45 mm long and 6 to 10 mm wide.

[description based on Thompson 2012]

Confusing species

Bossiaea heterophylla can be distinguished from other Tasmanian *Bossiaea* species by a combination of its flattened branches and regularly placed leaves.

DISTRIBUTION AND HABITAT

On mainland Australia, *Bossiaea heterophylla* is known from coastal areas in Victoria (where it is listed as near threatened), NSW and southern Queensland (Figure 2). In Tasmania, the species occurs at Fothers Hill near Lulworth and has been recorded near Bellingham on the north coast (Figure 1).

Table 1. Population summary for *Bossiaea heterophylla* in Tasmania

	Subpopulation	Tenure	NRM region	1:25000 mapsheet	Year last (first) seen	Area occupied (ha)	Number of individuals
1	Fothers Hill, 2 km NW of Lulworth	Commonwealth land (Department of Defence)	North	Tam O'Shanter	2013 (2011)	0.04-0.06 [1]	>269 [1]
2	Gees Marsh near Bellingham[2]	private land with conservation covenant	North	Weymouth	2001	unknown	unknown

[1] species noted as occurring beyond the 400 m² quadrat in which the count was made
[2] this site requires confirmation

In Tasmania *Bossiaea heterophylla* is found in coastal heath on sand at the margin of dry and wet heath (Plate 2), with plants growing larger in the wetter areas. Associated species include *Acacia suaveolens, Acacia verticillata, Allocasuarina paludosa, Astroloma humifusum, Banksia marginata, Bossiaea cinerea, Dillwynia glaberrima, Epacris impressa, Gompholobium huegelii, Hibbertia* sp., *Hypolaena fastigiata, Lepidosperma concavum, Leucopogon virgatus, Pimelea linifolia, Platylobium triangulare* and *Xanthorrhoea arenaria*.

Figure 2. Distribution of *Bossiaea heterophylla* (*Atlas of Living Australia*, downloaded 26/9/2018)

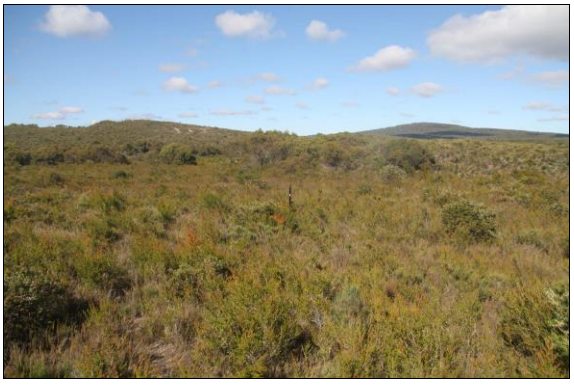

Plate 2. Habitat of *Bossiaea heterophylla*

POPULATION PARAMETERS

Estimates of relevant parameters used for the application of extinction risk criteria for *Bossiaea heterophylla* in Tasmania are shown below followed by justification of the estimates:

Number of subpopulations: <5 (1 confirmed)
Number of locations: < 5 (1 confirmed)
Extent of occurrence: ~ 0.6 km²
(0.005 km² confirmed)
Linear extent: 11.5 km (0.5 km confirmed)
Area of occupancy: < 1 ha
(0.04 to 0.06 ha confirmed)
Area of occupancy (as per IUCN criteria): 8 km²
Number of mature individuals: < 1000

Bossiaea heterophylla was first detected in Tasmania in 2011 (North Barker Ecosystem Services 2011). A count of 269 plants was made in a 400 m² area but it was noted that the species occurred beyond the quadrat (Table 1), and it has been recorded approximately 500 m away. The size of the patch of the coastal heathland vegetation in which the species was found was 29.4 ha (0.29 km²). An anecdotal report of *Bossiaea heterophylla* was made in 2001 in the Bellingham area (11.5 km away) (Micah Visoiu pers. comm.). Targeted surveys by Wildcare's Threatened Plants Tasmania group in nearby areas in October 2015 failed to locate the species. The general botanical community was promptly informed of the find though the species has not yet been found elsewhere to date.

Although the species can be identified without flowers, it has perhaps been overlooked as most surveys are conducted in spring when the species is difficult to detect due to a lack of

flowers, with flowering mostly in autumn and winter. Current information suggests that in Tasmania there are fewer than 1,000 mature individuals and that the species occupies less than 1 ha and extends less than 1 km^2.

With *Bossiaea heterophylla* known to be moderately to highly susceptible to *Phytophthora cinnamomi,* with a high incidence of symptoms in the habitat, a continuing decline is inferred, observed and projected in the quality of habitat.

RESERVATION STATUS

An anecdotal report of *Bossiaea heterophylla* from land that is now protected by a Conservation Covenant under the *Nature Conservation Act 2002* requires confirmation (Table 1).

CONSERVATION ASSESSMENT

Bossiaea heterophylla was listed as endangered in 2019 on Schedules of the Tasmanian *Threatened Species Protection Act 1995* meeting the following criteria:

B. Extent of occurrence estimated to be less than 500 km^2 or area of occupancy less than 10 ha, and

1. known to exist at no more than 5 locations;
2. (c) a continuing decline inferred, observed or projected in area, extent and or quality of habitat.

D: Total population extremely small or area of occupancy restricted, and

2. total population with an area of occupancy less than 1 ha and typically in five or fewer locations that provide an uncertain future due to the effects of human activities or stochastic events, and thus capable of becoming extinct in a very short time period.

THREATS, LIMITING FACTORS AND MANAGEMENT ISSUES

The Tasmanian distribution of *Bossiaea heterophylla* is an edge-of-range occurrence, being the southernmost in Australia. The main threats to the species in Tasmania are listed below.

Phytophthora cinnamomi: *Bossiaea heterophylla* is at risk of being impacted by the introduced soil-borne root rot pathogen, *Phytophthora cinnamomi,* directly and/or indirectly though declining quality of the habitat. The species itself is known to be moderately to highly susceptible to the pathogen (Keith et al. 2012) as are many members of the pea family. The coastal heathland vegetation community in which *Bossiaea heterophylla* occurs in Tasmania is highly susceptible. A high incidence of symptoms of *Phytophthora cinnamomi* has been reported at the Fothers Hill site, with the vegetation described as significantly disturbed (North Barker Ecosystem Services 2011). The network of tracks in the area may have facilitated spread of the pathogen. *Bossiaea heterophylla* co-occurs with *Xanthorrhoea arenaria*, a highly susceptible species which is listed as threatened.

Stochastic risk: The apparent localised distribution of *Bossiaea heterophylla* makes the species susceptible to losses from chance events. Given its low abundance, the species is possibly unable to sustain even small losses from chance or normal events in its habitat that happen to impact plants e.g. grazing, trampling.

Climate change: *Bossiaea heterophylla* may be susceptible to the impacts of climate change through an increase in fire frequency and a warming and drying out of recruitment niches, particularly if changes to rainfall patterns result in a decreased probability of sufficient rain following fire to allow recruitment. Ooi et al. (2014) have noted that for species such as *Bossiaea heterophylla* that are not wholly dependent on fire to break dormancy, the soil seed store may become depleted with successive hotter summers during which temperatures become sufficiently high to break dormancy but climatic conditions are less conducive to successful recruitment. The locally restricted distribution of the species makes it susceptible to even small changes in climatic conditions.

Inappropriate fire: Given that plants of *Bossiaea heterophylla* tend not to resprout when damaged, persistence at a site is reliant on recruitment from soil-stored seed following fire. However, frequent fires may result in

depletion of the soil-seed store if the interval between fires does not allow sufficient time for plants to establish and produce seed to replenish the store. The risk exacerbated by an increase in the frequency of fire anticipated as consequence of climate change. Fires that are too infrequent may also risk depleting the soil-seed store through attrition should plants become outcompeted as the vegetation thickens and fail to sufficiently replenish the soil-seed store.

Seed predation: Auld (1983) found that 66% of the seed crop of *Bossiaea heterophylla* in the Sydney area was predated by insects with 43% destroyed by one insect (*Plaesiorhinus* sp.). The impact of insect predation on the Tasmanian population is unknown.

MANAGEMENT STRATEGY

Management objectives

The main objectives for the recovery of *Bossiaea heterophylla* are to prevent the loss or degradation of the known subpopulation, and increase the likelihood of locating further subpopulations through targeted survey.

What has been done?

The only confirmed Tasmanian subpopulation of *Bossiaea heterophylla* has been included in a monitoring plan (North Barker Ecosystem Services 2011). The species has been considered in surveys undertaken in suitable habitat in the general area by Wildcare's Threatened Plants Tasmania group.

What is needed?

Agencies, groups or individuals may assist with some or all of the following recovery actions. Coordinated efforts may achieve the best and most efficient results.

- provide information and extension support to relevant Natural Resource Management committees, local councils, government agencies, the local community and development proponents on the locality, significance and management of known subpopulations and potential habitat;
- conduct surveys for the species in autumn or early winter in suitable habitat, radiating out from the confirmed site, and on covenanted land in the Bellingham area;
- determine the size and full extent of the Fothers Hill subpopulation;
- fully implement the *Stony Head Military Training Area Biodiversity Monitoring Plan* (North Barker Ecosystem Services 2011), particularly for sections involving *Bossiaea heterophylla* and *Phytophthora* management;
- undertake demographic monitoring of occurrences to determine the needs of the species and better inform management;
- determine whether insect predation is significantly impacting the Tasmanian occurrence;
- collect seed for long-term conservation storage at the Tasmanian Seed Conservation Centre based at the Royal Tasmanian Botanical Gardens.

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