

Distribution, habitat characteristics and conservation status of the forest wire-grass *Ehrharta juncea* (R. Br.) Sprengel (Poaceae) in Tasmania

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Abstract

Ehrharta juncea (forest wire-grass) has a disjunct distribution across northern and western Tasmania. Key sites for the species are the Crayfish Creek area in north-western Tasmania, the Claytons Rivulet area in the central north, the Dazzler Range in the West Tamar area and the Mt Maurice area in the north-east. It occurs predominantly in wet sclerophyll forest on a range of substrates, mainly in coastal and subcoastal hinterlands, although the occurrence at Mt Maurice is inland at higher altitudes. The species' distribution is strongly associated with disturbance, including fire, logging, and clearing for easements such as roads and pipelines. Most known sites occur on Crown Land or State forest. *Ehrharta juncea* occurs in several reserves including Crayfish Creek Forest Reserve, Mt Maurice Forest Reserve, Little Pegs Beach State Reserve and the Arthur–Pieman Conservation Area. An assessment of the conservation status of the species suggests that its current Rare status may be unwarranted but that the species' response to disturbance should be monitored.

Introduction

Ehrharta is a genus of grasses represented by 10 species in Tasmania, including six native and four introduced species (Buchanan

1999). The genus includes the familiar weeping grass *E. stipoides*, common in native pastures throughout the State. *Ehrharta juncea* (R. Br.) Sprengel, commonly known as forest wire-grass, occurs in Tasmania, Victoria, New South Wales and Queensland (Curtis and Morris 1994; Walsh 1994). In mainland States (and most literature), the species is included in the genus *Tetrarrhena* (as *T. juncea*). In Tasmania, the species' distribution is described as 'apparently uncommon but locally forming extensive colonies scrambling over understorey vegetation in eucalypt forest in coastal areas' (Curtis and Morris 1994).

In Victoria and New South Wales, the species is abundant in a range of forest types, including wet forests, heaths, and woodlands (Willis 1970; Walsh 1994; Lamp *et al.* 2001). Forest research and inventories in mainland States (mainly Victoria) have shown *E. juncea* to be tolerant of major disturbance, including wildfires, prescribed burning and forestry activities (e.g. Rawson and Rees 1981; Loyn *et al.* 1983; Harris 1989; Stuwe and Mueck 1990; Ough and Ross 1992; Murphy and Ough 1997; Ashton and Chinner 1999; Ough and Murphy 1999; Bauhus *et al.* 2001).

Ehrharta juncea is currently listed on Schedule 5 (Rare) of the Tasmanian *Threatened Species Protection Act 1995*, presumably because at the time of the listing it was known only

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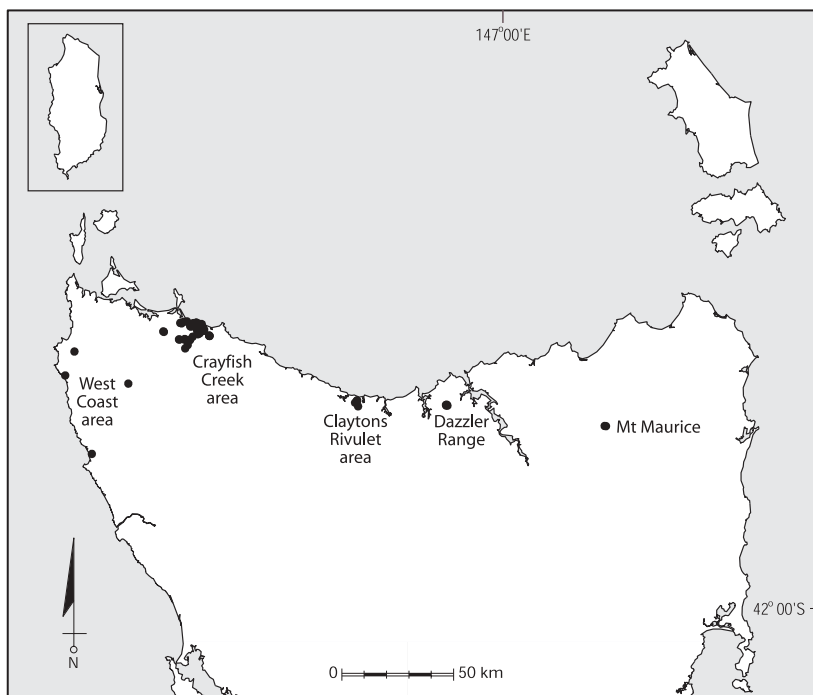


Figure 1. Locations of *Ehrharta juncea* in Tasmania.

from a few scattered localities. The species is now known from several disjunct sites in northern Tasmania: the Crayfish Creek area near Smithton, the Claytons Rivulet area near Ulverstone in the central north, the Dazzler Range in the West Tamar area, the Mt Maurice area in the north-east, and scattered localities in the north-west and on the west coast (Figure 1). *Ehrharta juncea* is not considered threatened in other States and, in Victoria, the species is the subject of actions to control its abundance, mainly for fire management purposes because of the fire risk presented by its elevated fuel (Rawson and Rees 1981; Buckley 1993).

This paper presents information on the known distribution, habitat characteristics and conservation status of *E. juncea* in Tasmania. The distribution and habitat characteristics of the species in State forest in the Crayfish Creek area of north-western Tasmania were reported by Ashlin (2002), and this paper formally presents that information.

Methods

Collation of known records

Records for *E. juncea* were collated from a variety of sources, including database searches (DPIWE's GTSpot database, Forestry Tasmania's Conserve database), Tasmanian herbaria (collections of the Tasmanian Herbarium at Hobart and the Queen Victoria Museum and Art Gallery at Launceston), scientific reports, and personal communications with numerous botanists, naturalists and other field workers. Comments are made on the accuracy of certain records.

Field surveys

Intensive surveys were conducted in the Crayfish Creek area of the north-west (see Ashlin 2002; described below). Limited surveys were conducted in the Dazzler Range and Claytons Rivulet area (B. French, M. Wapstra), based around known localities.

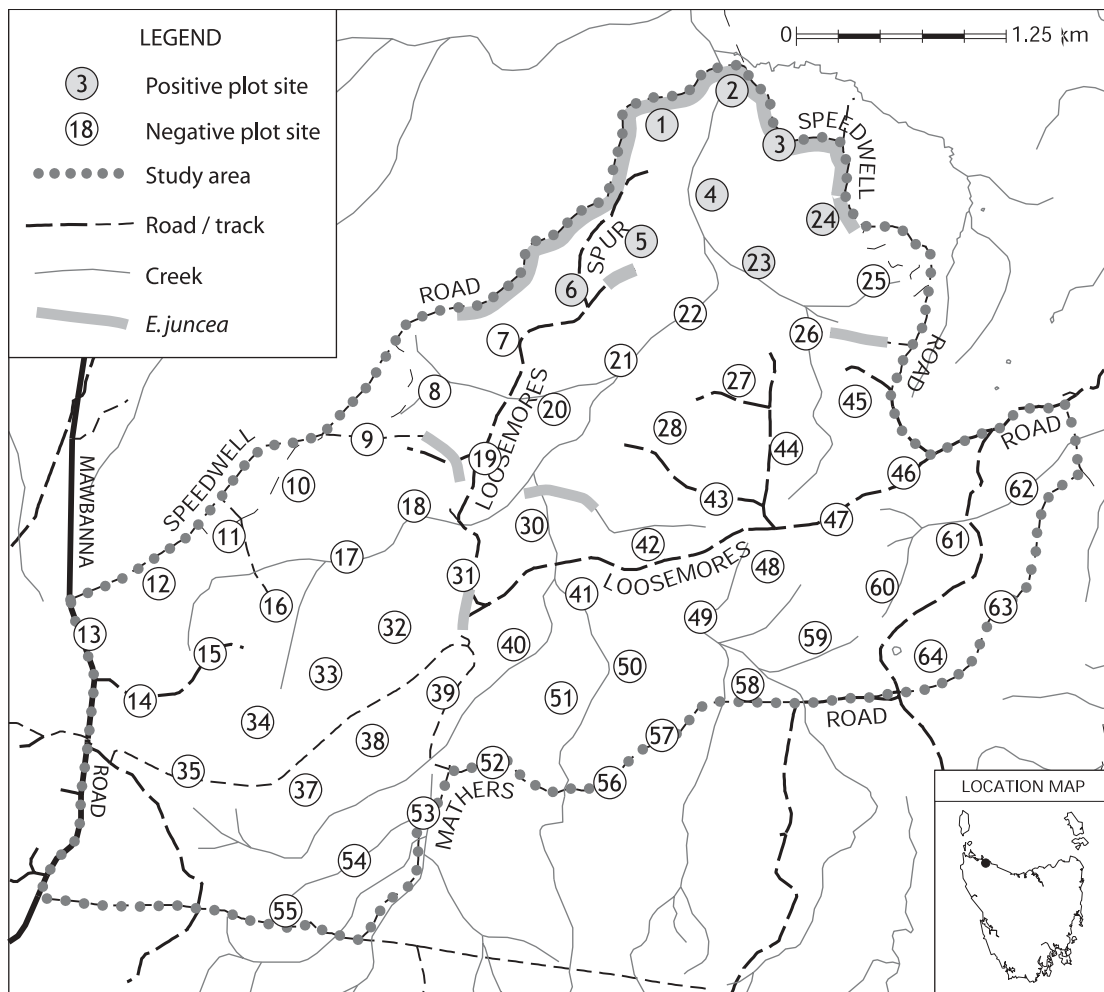


Figure 2. Map showing survey boundary, plot sites and *Ehrharta juncea* locations recorded by Ashlin (2002) in a survey in the Crayfish Creek area in north-western Tasmania.

No additional surveys were conducted in the Mt Maurice or west coast areas.

Field surveys involved visual assessments of the density of *E. juncea* rather than an estimate of absolute numbers in each population. This is mainly because the growth habit of the species makes it very difficult to accurately estimate how many plants are present at a particular site. When only a single 'clump' of grass is present at a site, it is easier to count individual plants, but where the species forms extensive swards (which is the situation at most sites), it is virtually impossible to trace individual culms through the dense undergrowth.

- *Crayfish Creek area (north-western Tasmania)*

The survey area of Ashlin (2002) included State forest encompassed by Mawbanna, Speedwell, Loosemores and Mathers Roads (Figure 2). A combination of the known distribution of *E. juncea* at the time of the survey, logistical constraints (e.g. time, access, tenure) and Forestry Tasmania District priorities were used to define the survey area.

The majority of the survey area supports regrowth wet sclerophyll forest, with creek lines supporting swamp forest or more mature wet sclerophyll forest. Forest in

Table 1. Details of populations of *Ehrharta juncea*.

Population	Locality	No. of sites (minimum)	No. of individuals (minimum)	Area occupied (minimum)
North-west				
1	Mawbanna Road	1	~20	0.01 ha
2	Little Hell Gully	5	1000s	< 10 ha
3	Crayfish Creek area*	70+	10 000s	10s ha
4	Pipeline Road	1	?	?
5	Dip Road	1	1000s	0.4 ha
6	Pine Corner Road East	2	250–1000	0.075 ha
7	Pine Corner Road West	2	> 250	0.065 ha
8	Black River South	2	< 100	< 1 ha
9	Black River North	3	?	?
10	Detention River	4	1000s	~ 2 ha
11	Lake Mikany	2	?	?
Claytons Rivulet (central north near Ulverstone)				
12	Stubbs Road	4	1000s	1 ha+
13	Lasts Road	1	dense	~15 m ²
Dazzler Range (West Tamar area)				
14	Dazzler Range	4	1000s	
Mt Maurice (north-east)				
15	Mt Maurice FR	2	< 100	
West coast				
16	Wild Wave River	1	?	< 1 ha
18	Temma Road	1	?	?
19	Linnanes Road	1	?	?
20	Ekberg Creek	1	?	?

* The Crayfish Creek area is treated as a single population because there are few records that are greater than 1 km apart.

the Crayfish Creek area has been subject to several wildfires during the 1900s, the most notable being an intense fire of large extent in the summer of 1938/39. Most of the area has a long history of forestry activities. Early selective logging used bullocks. More recent activities have included more extensive road construction, native forest operations using clearfell, burn and sow techniques, and some conversion of native forest to hardwood plantations.

Within the survey area, sixty-two 25 m radius plots were located systematically using a 25 ha square grid (i.e. the plot points

are 500 m apart). The grid size was chosen because it sampled the typical variation in topography and forest type in a standard coupe of 50–100 ha. Information collected included grid reference, altitude, slope, aspect, landform, geology (from *Land Systems of Tasmania Region 3* map), PI-type (from Forestry Tasmania's MDC mapping system; Stone 1998), rock cover, drainage, ground litter cover, and bare ground cover. Vascular plant species in each plot were recorded and notes made on the structure of the vegetation. Notes were also made on the disturbance history of the site, including fire and logging history. The presence/absence

of *E. juncea* was recorded, along with notes on its density and habit.

Because of the species' apparent preference for disturbed sites, accessible roads and tracks within the survey area were driven at about 20 km/h (the efficacy of this speed was tested at known sites) to check for the species. Discrete sections of roads/tracks supporting the species were identified and measured and a grid reference allocated to the approximate centre of the site. A total of 32 km of road was surveyed.

Additional sites in the Crayfish Creek area and the broader north-west were collated from database records and from more recent surveys (including those conducted by the authors, and those of North and Mallick (2001).

- *Claytons Rivulet (near Ulverstone)*

Three database records indicated the species' presence on private property in a remnant forest area south of Ulverstone. The area comprises mainly undeveloped private titles interspersed with small farmlets, gravel roads and power easements within the catchment of Little Claytons Rivulet. Areas accessible by public roads in the vicinity of the known sites were driven slowly and the extent of the species mapped on *Tasmap 1: 25 000* scale maps. The survey was extended to include potential *E. juncea* habitat in the Forth and Leven River catchments and the Dial Range area. About 30 sections of road (representing about 80 km) bounded by potentially suitable remnant forest were surveyed between the Dial Range to the west, the Bass Highway to the north, Spellmans Bridge to the south, and Wilmot Road to the east.

- *Dazzler Range (West Tamar area)*

Two records indicated the species' presence along Asbestos Road and Kerrisons Road in State forest in the Dazzler Range. The area consists of dry sclerophyll forest on ridges and more insolated slopes, and wet sclerophyll forest in creek lines and less exposed lower slopes. The general area has

a network of forestry tracks and roads, with a long history of logging and recreational activities. An initial survey of the known sites showed the species was abundant along several hundred metres of gravelled road but did not extend many metres into surrounding vegetation. A 'windscreen' survey was considered the most practical and efficient means of mapping the extent of the species in this area. Most driveable roads within about 5 km of the original known site were surveyed. Some impassable roads and tracks were walked.

Reservation and conservation status

The assessment of the reservation and conservation status of *E. juncea* used the criteria of the Tasmanian *Threatened Species Protection Act 1995* (DPIWE 2002).

Results

Collation of records

Ehrharta juncea is known from five broad areas in northern Tasmania: the Crayfish Creek area near Smithton; the Claytons Rivulet area near Ulverstone in the central north; the Dazzler Range in the West Tamar area; the Mt Maurice area in the north-east; and scattered localities on the west coast (Figure 1). It is now known from the West Coast, North West, Midlands and Ben Lomond floristic regions described by Orchard (1988). A list of site records for *E. juncea*, with details of the date, accuracy and source of the record and some broad habitat details, is available from the corresponding author. More specific details of populations are provided in Table 1. For the conservation assessment (see Discussion), a population is treated as a group of records less than 1 km apart, and separated from other such groups of records by more than 1 km and unsuitable habitat (e.g. pasture).

Discounted records

Databases indicate several incorrect records. The record attributed to K. Williams from

Table 2. Details of positive sites from plot-based surveys (Ashlin 2002).

Plot	Coupe	Easting/ Northing	Geology	Forest type ¹	PI-type
1	CF003B	364220mE 5473980mN	Precambrian mudstone/siltstone	WET-0B0111 Tall <i>Eucalyptus obliqua</i> forest	E2b.S.ER.
2	CF004A	364640mE 5474180mN	Precambrian mudstone/siltstone	WET-0B0111 Tall <i>E. obliqua</i> forest	E-3d.S.
3	CF004A	364920mE 5473860mN	Precambrian mudstone/siltstone	WET-0B0111 Tall <i>E. obliqua</i> forest	E+3b.S.
4	CF004A	364520mE 5473570mN	Precambrian mudstone/siltstone	WET-BR2 <i>E. brookeriana</i> wet forest	E2c.ER4d.S.
5	CF003A	364100mE 5473290mN	Precambrian mudstone/siltstone	WET-0B0111 Tall <i>E. obliqua</i> forest	E2d.ER4D.S.
6	CF003A	363690mE 5473000mN	Precambrian mudstone/siltstone	WET-0B0111 Tall <i>E. obliqua</i> forest	E2c.ER3d.S.
23	CF004A	364800mE 5473160mN	Precambrian mudstone/siltstone	WET-BR2 <i>E. brookeriana</i> wet forest	ER3c/2.S.
24	CF004A	365800mE 5473160mN	Precambrian mudstone/siltstone	WET-OB2 Tall <i>E. obliqua</i> forest	E2c.ER4d.S.

¹ The top line shows the community classification from Kirkpatrick *et al.* (1988); the bottom line shows the equivalent RFA community classification.

the Hardings Falls area is probably the result of inaccurate data entry and is likely to represent another species of *Ehrharta* (F. Duncan, pers. comm.). The record attributed to F. Duncan from King Island is very likely to represent etiolated or scrambly *Ehrharta distichophylla* growing in wet sclerophyll forest: similar material was found in 2002 in shaded forest in the south of King Island (F. Duncan, pers. comm.). King Island has been quite well surveyed over recent years (Barnes *et al.* 2002) and it is unlikely the species is present. The records that fall within Bass Strait near Brickmakers Bay and Ulverstone are likely to represent inaccurate data entry (F. Duncan and P. Barker, pers. comm.).

Record corrections

The record by D. Morris from the Stubbs Road area has been corrected to be located

close to other sites recorded during the more recent surveys presented herein (D. Morris, pers. comm.) as it was inaccurately placed due to manipulations of the original latitude/longitude data. A record attributed to A. North from the Crayfish Creek area (361500mE 5476100mN) was recorded on 23.06.1995 and not 23.06.1996 as shown on some databases.

Distribution and habitat characteristics

- Crayfish Creek area (north-western Tasmania)

Most records of *E. juncea*, including the first collection by R.C. Gunn in 1837 from near Brickmakers Bay, are from the north-west of the State, centred on the heavily forested Crayfish Creek catchment. Most sites are from wet to damp sclerophyll forest (but there are a few records from drier forest types) from below 100 m altitude. *Ehrharta juncea* is also

Table 3. Details of positive sites from the road-line survey (Ashlin 2002).

Site name	Easting/ Northing	Type of road	Length of road ¹
Speedwell Road	364000mE 5474000mN	old track; unsealed	3.4 km (1.3 km on one side of the road does not support the species)
Loosemores Spur 4	364100mE 5473140mN	class 3, all weather	200 m
Big Bend Track off Speedwell Road	365400mE 5472720mN	overgrown track; unsealed	150 m
Lissanthe Link off Loosemores Spur 4	362880mE 5472060mN	old track; unsealed	10 m
Lissanthe Link off Loosemores Spur 4	362900mE 5471970mN	old track; unsealed	50 m
Part of Big Bend between CF006A and CF009A	363500mE 5471760mN	old track; unsealed	100 m
Part of Big Bend in CF006A	363870mE 5471660mN	old track; unsealed	100 m
Part of Big Bend at Loosemores 4 junction	363060mE 5471130mN	old track; unsealed	120 m

¹ *Ehrharta juncea* on both sides of road except where indicated.

prevalent on heavily disturbed ground, such as roads and pipelines, associated with the Port Latta industrial site (North and Mallick 2001). *Ehrharta juncea* has also been found west of Mawbanna Road in the Black River and Dip River catchments, at Lake Mikany (south of Smithton), coastal sites between Little Peggs Beach and Crayfish Creek, and along the Detention River near Yanns Road (usually associated with road systems).

Of the 62 plots surveyed by Ashlin (2002), eight supported *E. juncea* (Table 2). The species was most commonly associated with wet sclerophyll forest dominated by *Eucalyptus obliqua* or *E. brookeriana* (the two most common forest types within the survey area). Forest quality tended to be high (e.g. mature eucalypt canopy greater than 34 m, i.e. E2, E+3, ER3 PI-types) but canopy density was typically low (e.g. crown cover less than 20%, i.e. ER4d, ER3d PI-types).

Drainage on all positive sites was moderate to poor. The absence of *E. juncea* from similar forest elsewhere in the Crayfish Creek survey area suggests that factors other than geology, such as fire and/or disturbance, may be important in explaining the distribution of *E. juncea*.

Eight positive sites were recorded during the road survey (Ashlin 2002), totalling approximately 4.1 km of road edge (Table 3; Figure 2). The association of the species with the network of old roads through the northern section of the study area is clear.

- *Claytons Rivulet (near Ulverstone)*

Ehrharta juncea occurs in *Eucalyptus obliqua* dominated dry to wet sclerophyll forests in the Claytons Rivulet catchment where it is located from 10 to approximately 100 m a.s.l. on Tertiary basalt and basalt

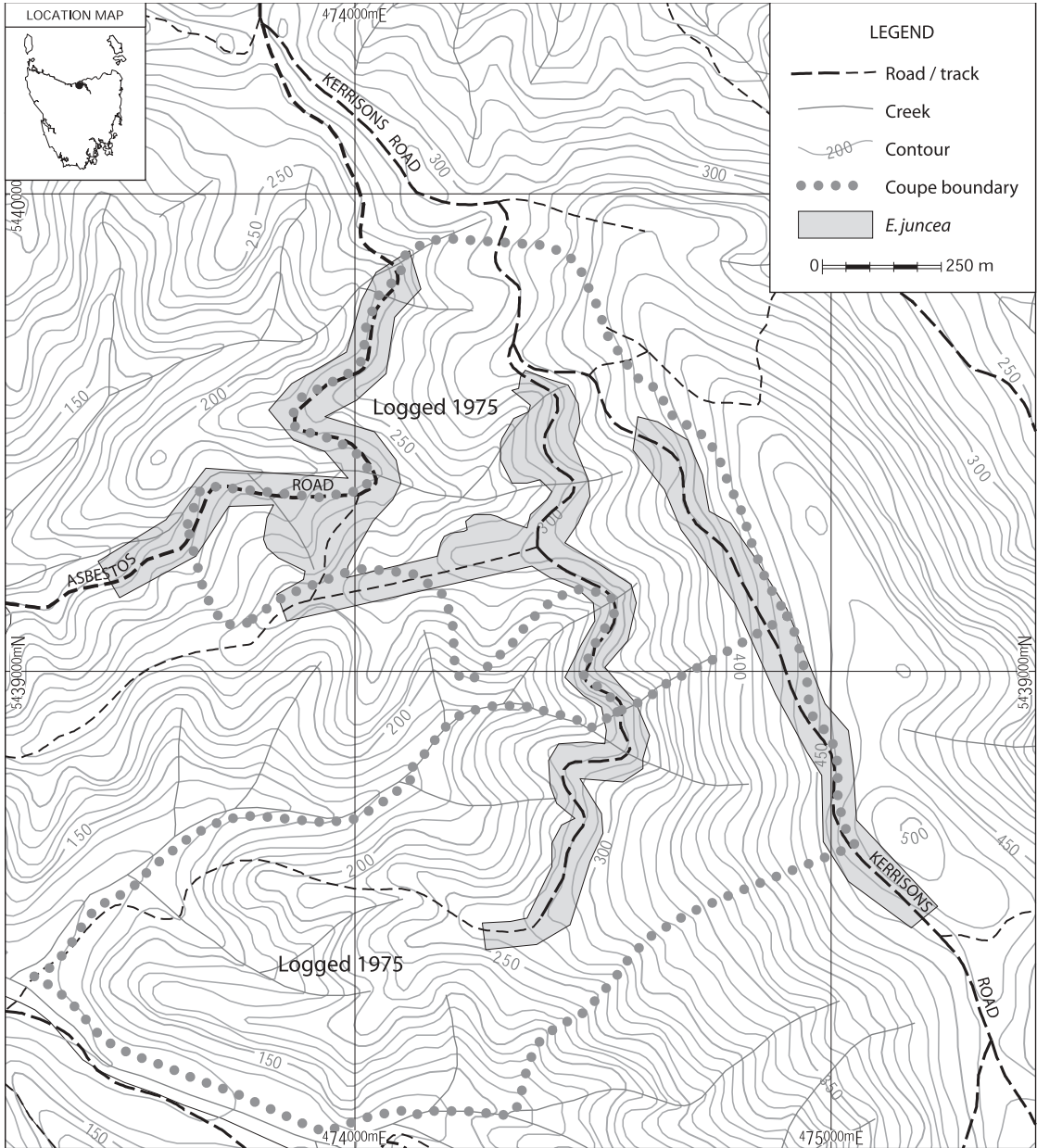


Figure 3. Map showing extent of occurrence of *Ehrharta juncea* in relation to logged coupes in the Dazzler Range.

talus on lower slopes. *Ehrharta juncea* is most strongly associated with sites subject to frequent fire and/or other disturbance (e.g. widespread along roadside banks, and localised under easement clearings). It is unlikely that *E. juncea* was more widespread in the area in the past as there is not much apparently suitable habitat within the search area.

• *Dazzler Range (West Tamar area)*

Ehrharta juncea is mainly confined to a coupe logged in 1975 (BC103A), adjacent to Asbestos Road and Kerrisons Road, on the western side of the Dazzler Range (Figure 3). The coupe ranges in altitude from 200 to 400 m a.s.l. It is native forest regeneration of predominantly *Eucalyptus*

obliqua, with *E. amygdalina* occurring on drier slopes and ridge-lines. *Ehrharta juncea* is most abundant on disturbed roadsides and tracks in the area, but it also extends into regenerating eucalypt forest.

It is unlikely that *E. juncea* is more widespread in the area as previous surveys have not indicated the presence of the species (e.g. Brown and Buckney 1983). It is possible that *E. juncea* was introduced to the area on machinery associated with logging, roading or other activities during the logging operation in 1975. However, it is more likely that logging (and associated roading activities) facilitated the proliferation of the species on disturbed sites from a local native population of *E. juncea*. Coupes in the area were harvested using ground-based logging machinery, with the coupe to the south (BC102A) being harvested first, followed by the more northerly coupe (BC103A). There was no post-harvest regeneration burning due to the success of natural regeneration but a wildfire may have affected part of the upper slope during the mid 1980s (D. Chester and J. Hawkes, pers. comm.).

- *Mt Maurice (north-eastern Tasmania)*

Ehrharta juncea occurs sporadically in *Eucalyptus delegatensis* dominated wet sclerophyll and mixed forest along a ridge-line surrounded by steeper slopes in the Mt Helen area between Mt Maurice and Springfield. Two sites supporting the species are known from Devonian granite between 685 and 750 m a.s.l.

The forest in this area was logged in about the 1950s by the French's logging company who held an Exclusive Forest Permit over the area. (The recorded sites occur adjacent to an old logging track called Frenchs Road.) The area was logged selectively for sawlogs using ground-based equipment. Logging was relatively intense in some areas supporting high quality timber. No regeneration activities were undertaken

and the forest was left to recover naturally. No further forestry activities have occurred since this initial period of logging (S. Blake, pers. comm.).

A wider distribution for *E. juncea* in the Mt Maurice area is unlikely. There have been several surveys of the area in a range of forest types (e.g. Davies 1988; Kirkpatrick *et al.* 1988; North *et al.* 1998) that have not recorded the species. There are substantial areas of habitat similar to the known site in this area (i.e. *Eucalyptus delegatensis* wet sclerophyll and mixed forest) both within the reserve and in surrounding production forest.

- *West Coast and other sites in the north-west*

Ehrharta juncea has been recorded from the Wild Wave River area (north of Sandy Cape) in *Eucalyptus obliqua* dominated wet sclerophyll forest on mudstone substrate at about 20 m a.s.l. The species was apparently localised (M. Askey-Doran, pers. comm.; Askey-Doran *et al.* 1992). *Ehrharta juncea* has been recorded from Crown Land in the Linnanes Road and the Ekberg Creek area (Neyland 1988), but details of the extent and abundance of the species at these sites is unknown (M. Neyland, pers. comm.). A record found in the Tasmanian Herbarium labelled 'west coast' is most likely from close to the Temma Road between Arthur River and Nelson Bay River (M. Allan, pers. comm.) but details of the site are not available. In addition, its collection from the Rocky Cape area cannot be wholly discounted. Despite several surveys of the vegetation of the west coast (e.g. Macphail *et al.* 1975; Neyland 1988; Askey-Doran *et al.* 1992; North *et al.* 1998), it is likely that *E. juncea* will be recorded from additional areas with more intensive surveys. Significant range extension is not predicted but we note that a specimen lodged at the Tasmanian Herbarium has an annotation from Winifred Curtis that states 'I found a similar plant years ago on a roadside near Queenstown'.

Discussion

Distribution in Tasmania

Ronald C. Gunn made the first collection of *E. juncea* in the Brickmakers Bay area (west of the present-day Port Latta industrial site) in 1837. The species went apparently unrecorded from other areas of the State until the late 1970s when it was collected on the west coast by Mrs Margaret Allan (supporting uncatalogued herbarium material at the Tasmanian Herbarium). Further records through the 1980s extended the range of the species into the Dazzler Range, the Ulverstone area and various locations in the Circular Head area. The record from Mt Maurice in 1995 (North *et al.* 1998) extended its known range to north-eastern Tasmania. That the species went unrecorded for such long periods in easily accessible locations is somewhat surprising because of its distinctive scrambling habit, not shown by other Tasmanian grasses (Lamp *et al.* 2001).

It is unlikely that the current range of the species will be much expanded. This is because of the species' distinctiveness combined with the extent of historical botanical collecting (Buchanan 1988) and botanical surveys across northern Tasmania in recent decades (e.g. Kirkpatrick *et al.* 1988; North *et al.* 1998; and numerous (mainly unpublished) surveys associated with forestry operations, other developments and other vegetation inventories). Minor range extensions in the vicinity of known locations are likely as further surveys are conducted and familiarity with the species increases.

Explanation of current distribution within Tasmania

Given that *E. juncea* was recorded during the very early periods of the settlement of Tasmania (by R.C. Gunn in 1837 from Rocky Cape), and prior to European settlement in Victoria, it is considered highly unlikely that the species is an introduction to Tasmania.

The species' present-day distribution (as disjunct populations across northern Tasmania but widespread on the southern mainland) may be a reflection of a once more widespread distribution across the Bassian Isthmus in times of lower sea levels, with the Tasmanian population representing a now isolated southern limit of its range. The species' absence from the Bass Strait islands is somewhat surprising, particularly given the apparent suitability of the vegetation on King Island (Barnes *et al.* 2002) and its presence in the Otways in south-western Victoria (Harris 1989).

The widely separated Tasmanian occurrences of the species may be related to large-scale clearing of forest for agriculture in the north coast hinterlands since European settlement. Whether the species once occurred in other areas of the State (and in particular, northern Tasmania in areas between the currently known populations) is a matter of speculation. However, northern Tasmania has an extensive history of botanical collecting, particularly in the earlier periods of the settlement of the State (Buchanan 1988). Herbarium records do not indicate any collecting of the species in areas now developed for agriculture. It is more likely that the species has always had a somewhat patchy distribution, which may be expected for a species reaching the limit of its distribution.

The species' prevalence on disturbed sites, particularly roads, suggests that its present distribution can be explained in part by the effects of human-related disturbance such as road construction, forestry activities and placement of power/communication easements, which at a local level may facilitate the dispersal of the species.

Ashlin (2002) argued that the distribution of *E. juncea* in the Crayfish Creek State forest area is largely controlled by the disturbance history of the area. The roads were constructed initially by hand in the 1930s, using labour from the nearby Forestry Training Centre on Mathers Road near

Mawbanna Road. Some of the early logging in the Crayfish Creek Forest Block was carried out using bullock teams. The area is also used extensively for recreation, in particular horse-riding. Vegetative distribution along roads by horses, or machinery carrying out maintenance, is also a possibility, particularly in more recent years. The area has had several recorded wildfires over the last century. Such fires would provide an ideal seedbed and increased light levels, facilitating the spread of *E. juncea*.

It is possible that the species has been introduced to areas such as the Dazzler Range and Mt Maurice. The Mt Maurice site is geographically isolated from the other populations by extensive areas of cleared land, the Tamar River and extensive areas of dense forest. The track on which the species is present dates from the 1950s, and it is unlikely that the logging machinery used at this site came from any areas that currently support the species (S. Blake, pers. comm.). The fact that *E. juncea* does not extend very far beyond disturbed sites (particularly well illustrated in the Dazzler Range and Stubbs Road occurrences) could be considered as further evidence for an anthropogenic source of such populations. However, it is considered more likely that the disturbance has simply facilitated the spread of the species from an existing but sporadic and/or sparse local source.

Potential impacts of disturbance

Fire.—There is strong evidence that fire is not detrimental to *E. juncea* in Tasmania and may be largely responsible for its present-day distribution at two sites. A significant fire in the summer of 1938/39 in the Crayfish Creek area encompassed a large tract of native forest, and there have been numerous other less extensive fires. Most of the current native forest in this area is regrowth wet sclerophyll forest (with areas of mixed forest and swamp forest on poorly drained flats). *Ehrharta juncea* is apparently absent from or very sparse in patches of forest that have escaped fire, such as poorly drained flats

and steeper gullies (C. Gould, pers. comm.). Fires associated with logging activities do not seem to adversely affect the species in the short term, as shown in a coupe that was clearfelled, windrow burnt and planted to *Eucalyptus globulus* (CF006A), where the species is still present along old tracks and seems to be regenerating successfully.

Victorian research in a range of forest types supports the Tasmanian observation of *E. juncea* being tolerant of major disturbance, including fire (Rawson and Rees 1981; Harris 1989; Stuwe and Mueck 1990; McHugh 1991; Ough and Ross 1992; Murphy and Ough 1997; Ashton and Chinner 1999; Ough and Murphy 1999). For instance, Ough and Murphy (1999) found no significant difference between the frequency or abundance of *E. juncea* in wet forests dominated by *Eucalyptus regnans* subject to intense wildfire (Ash Wednesday 1983) and similar forest clearfelled and subject to slash-burning. Stuwe and Mueck (1990) noted that undocumented fires are probably largely responsible for the high frequency of *E. juncea* in a range of forest types in Victoria. Several reports document the significant fire management issue presented by forests with a wire-grass understorey (e.g. Buckley 1993; Fogarty 1993). *Ehrharta juncea* forms a highly flammable elevated web of fibres that becomes entwined with shrubs, which suspends fallen eucalypt litter.

Clearing.—*Ehrharta juncea* is common on cleared sites such as roadsides and power/communication/rail easements. Such sites support predominantly native vegetation that is strongly controlled (e.g. slashed). The species occurs along the cleared communication easement in the Crayfish Creek area: the original survey report indicated that it was common in the area and did not suggest any special management was required for the species (Tasmanian Herbarium 1996). Since the clearing of vegetation, *E. juncea* remained abundant (Ashlin 2002). The species is likely to be eliminated by clearing of native vegetation for agriculture, but it can persist in quite small

remnant forest patches (e.g. the record from disturbed native forest in the Stubbs Road, Forth, area is essentially surrounded by cleared land).

Forestry disturbance.—Observations from several Tasmanian sites indicate that *E. juncea* is extremely tolerant of most forestry activities. Road construction to access native forest appears to be one factor responsible for the species' sporadic occurrence in the north-west (e.g. roads between the Black River and Mawbanna Road). It is particularly abundant along major forestry roads and minor access tracks in the Dazzler Range (e.g. Asbestos Road, Kerrisons Road) and both sites in the Mt Maurice area are along a disused forestry track built in the 1950s.

The species' tolerance of selective logging in Tasmanian forests is shown in the forests of the north-east and north-west. The Crayfish Creek area has a long history of disturbance with selective harvesting dating back to early settlement. The forests supporting the species in the north-east were selectively logged for sawlogs in the 1950s.

Ehrharta juncea is clearly tolerant of clear-felling silvicultural practices (i.e. clearfelling of merchantable timber, burning of slash and debris in a high intensity post-harvest burn with subsequent aerial and/or natural sowing of eucalypts). The extent of the Dazzler Range occurrence of the species coincides almost entirely with the boundary of a coupe clearfelled and regenerated in 1975 (see Figure 3).

At this stage, *E. juncea* is known from only one hardwood plantation site in Tasmania. The site was not subject to specific management actions for the species. *Ehrharta juncea* is present along a section of old logging road that dissects the plantation. Several other forestry coupes in the Crayfish Creek – Black River area are in the process of being converted to hardwood plantations. A range of prescriptions has been implemented for the management of *E. juncea* in several coupes in the north-west, allowing the longer term

response of the species to different forestry practices to be monitored. *Ehrharta juncea* does occur in plantation situations in Victoria (C. Gould, J. Davies, S. Harris, pers. comm.) but there is little formally documented evidence of the abundance or extent of the species in such situations.

Evidence from Victorian research on the impacts of timber harvesting on vascular flora shows that *E. juncea* is a common component of both regrowth and mature forests of different types (Loyn *et al.* 1983; Harris 1989; Griffiths and Muir 1991; Mueck and Peacock 1992; Ough and Ross 1992; Murphy and Ough 1997; Ough and Murphy 1999). Several of these authors have documented the proliferation of *E. juncea* following disturbance associated with timber harvesting and/or fire, often followed by a decrease in abundance as the canopy closes. The species appears to respond to forestry disturbance in a similar manner in New South Wales (D. Binns and R. Peacock, pers. comm.).

Bauhus *et al.* (2001) studied the impacts of commercial thinning and fertilising on the understorey of regrowth *Eucalyptus sieberi* forests in East Gippsland. These authors reported that the foliage nitrogen concentration of *E. juncea* decreased following fertilising. Understorey species diversity was lower in sites that supported a high density of *E. juncea*, but there was little difference in the frequency of *E. juncea* in four treatments (control, thinned, fertilised, thinned and fertilised).

Other forms of disturbance.—Grazing pressure by native animals has been implicated in the patchy distribution of *E. juncea* in some areas (Ashwell 1985; Ashton and Chinner 1999) and the species has been shown to increase in abundance following a decline in the wombat population due to the presence of dogs (PLUC 1996). A study established in 1968 in Sherbrooke Forest, Victoria, examined the separate effects of low intensity burning and slashing of understorey vegetation on the

cover of *E. juncea* in tall open forest (Rawson and Rees 1981). *Ehrharta juncea* had been implicated in the declining population of lyrebirds because its extensive cover restricted the ability of lyrebirds to scratch in the ground and obtain food (Ashwell 1985). Slashing proved ineffective in controlling *E. juncea* but low intensity burning reduced its cover and created a more diverse understorey (Rawson and Rees 1981).

Reservation and conservation status

In north-western Tasmania, *E. juncea* is widespread in the Crayfish Creek Forest Reserve in a range of forest types. It is also reserved in several smaller reserves (e.g. Detention River River Reserve and the Little Peggs Beach State Reserve). The species is the subject of special management prescriptions on State and private forest coupes in the Crayfish Creek area. Some occurrences in northern Tasmania are on Crown Land. It is uncommon in disturbed forest in Mt Maurice Forest Reserve. Some sites within the Dazzler Range are contained within formal protection zones on State forest but most occur within production forest. Sites in the Claytons Rivulet area are entirely on private land but the species is patchily abundant along roadsides and other easements. Sites on the west coast all occur within the Arthur–Pieman Conservation Area.

Table 1 provides more detail on the numbers of individuals and extent of occupancy of each population.

Ehrharta juncea is currently listed on Schedule 5 (Rare) of the Tasmanian *Threatened Species Protection Act 1995*. It is not listed on threatened species legislation in other States or on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. The guidelines for a species to be listed as Rare on the Tasmanian *Threatened Species Protection Act 1995* are shown below in italics (DPIWE 2002). Comments relevant to *E. juncea* are given in square brackets.

A taxon of native flora or fauna may be listed as rare if it has a small total population in Tasmania that is not endangered or vulnerable but is at risk. There are two categories of taxa which could meet this requirement as outlined in 'A' and 'B' below.

A. Taxon of limited distribution or numbers, threatened by on-going processes occurring over sufficient of their range to suggest that they would satisfy the indicative criteria for vulnerable unless the threatening process was abated. The indicative distributional ranges are:

r1: extends less than 100 x 100 km

[*Ehrharta juncea* extends from the Wild Wave River area on the west coast to the Circular Head area on the north-west coast (about 60 km), east to the Forth area (about 80 km), further east to the Dazzler Range (about 30 km), and further to the east at Mt Maurice (about 70 km). The straight-line distance between the two most separated populations (west coast to Mt Maurice) is approximately 220 km.]

r2: occupies 20 or less 10 x 10 km Australian Metric Grid squares

[*Ehrharta juncea* is known from c. 100 sites from twelve 10 x 10 km AMG squares and as such qualifies as an r2 species.]

r3: taxa that are not r1 or r2, but have very small or localised populations wherever they occur

[*Ehrharta juncea* does not qualify as an r3 species as it does not have small or localised populations wherever they occur. Populations vary from 10s to many 1000s of individuals, the latter often occupying areas over 1 ha. Although several populations do support a small number of individuals and occur over relatively small areas, most of these are on disturbed sites such as roadsides.]

B. Species subject to stochastic risk of endangerment because of naturally small population size(s):

Extent of occurrence < 2000 sq km

[*Ehrharta juncea* has an extent of occurrence substantially greater than 2000 sq km

(see Figure 1 and comments above under criteria for an r1 species).]

or

Area of occupancy < 50 ha

[It is estimated that *E. juncea* occupies more than 50 ha. Most populations occupy small disturbed areas but populations in the Crayfish Creek area occur over tens of hectares.]

or

Less than 10 000 individuals

[It is estimated that more than 10 000 individuals of *E. juncea* are present in Tasmania. However, its growth habit precludes accurate assessment of population size. It should be noted that the population numbers presented in Table 1 are conservative for this reason.]

or

No population > 1000 individuals

[It is estimated that several populations support more than 1000 individuals (but the note above regarding population estimates is relevant).]

or

Most individuals in < 10 populations

[*Ehrharta juncea* is represented by about 20 discrete populations. Most individuals occur in about six populations, several of which are extensive in area (i.e. Dazzler Range, Stubbs Road, Detention River, Crayfish Creek area (treated as one extensive population), Little Hell Gully and Dip Road.)]

Based on the assessment provided above, *E. juncea* might qualify as Rare (Schedule 5) under the criteria of the Tasmanian *Threatened Species Protection Act 1995*. The main qualifying criteria are that the species occurs in less than twenty 10 km x 10 km grid squares (criterion r2), and most of the total population occurs in less than ten populations (criterion B). The latter

criterion suggests that the species may be subject to stochastic risk, and the former that the species is of limited distribution and may be threatened by on-going processes. It is the authors' opinion, however, that *E. juncea* is not 'at risk' from either stochastic events or on-going processes, and that the present research has shown the species to be much more widespread and robust than previously thought. We have presented a strong case that 'natural' stochastic risks, such as fire, are unlikely to be detrimental to the species. In addition, the definition of population used in the assessment presented above was conservative, and the number of individuals occurring in the Crayfish Creek area (whether regarded as one extensive population, or many smaller populations) is extremely high (and it is unlikely that the majority of the area supporting *E. juncea* will be subject to 'risks' identified as detrimental to the species). Further monitoring, as recommended by Ashlin (2002), of sites subject to different disturbance regimes (mainly forestry related) would be beneficial in identifying the species' response to such activities.

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