



Australian Government

Great Barrier Reef
Marine Park Authority



RESTORATION OF REEF ISLANDS PROJECT

RAPID SURVEY FOR PISONIA GRANDIS

Bajigal and Bimi (Stephens and Sisters islands)

Supplementary island threat assessment report

April 2025



We acknowledge the Mandubarra Traditional Owners who are the custodians of Bajigal and Bimi and recognise their continuing connection to lands, waters and community.

We pay our respects to their Elders past, present and emerging.



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Version control

Version	Title	Prepared by	Reviewed by	Date prepared
v0.1	Rapid survey for <i>Pisonia grandis</i> - Bajigal and Bimi (Stephens and Sisters islands) (Supplementary island threat assessment report)	Dr Anthony Rice, David Fell, Andrew Palmer-Brodie	Naomi Maxwell	9/01/2025
v0.2	Rapid survey for <i>Pisonia grandis</i> - Bajigal and Bimi (Stephens and Sisters islands) (Supplementary island threat assessment report)	Aestra David Fell	Sam Gibbs (Reef Authority) Naomi Maxwell	31/03/2025
v0.3	Rapid survey for <i>Pisonia grandis</i> - Bajigal and Bimi (Stephens and Sisters islands) (Supplementary island threat assessment report)	Aestra	MALSI	03/04/2025
v1.0	Rapid survey for <i>Pisonia grandis</i> - Bajigal and Bimi (Stephens and Sisters islands) (Supplementary island threat assessment report)	Aestra	Naomi Maxwell	10/04/2025

Citation: Aestra, 2025, Rapid survey for *Pisonia grandis* - Bajigal and Bimi (Stephens and Sisters islands) (supplementary island threat assessment report), prepared for the Reef Joint Field Management Program on behalf of the Great Barrier Reef Marine Park Authority, Commonwealth of Australia.

Acknowledgements

We would like to acknowledge Mandubarra Aboriginal Land and Sea Inc Rangers and give special thanks to James Epong; Naomi Epong; Sean Kyle; Sharon Casey; Larrence O'Donnell; Dylan Daugherty; Jahrone Johnson; Caylin Epong; Melissa Ball; and Rohann Sultana for providing support, guidance and cultural oversight of the field surveys.

We would also like to acknowledge the support and advice from:

- the field team for their expertise
 - David Fell, Principal Botanist, David Fell Environmental
 - Dr Anthony Rice, Entomologist, Granite Belt IPM
- Kurrimine Beach Hire for their safe and professional transportation.

1 Introduction

This report is a study completed as part of the Restoration of Reef Islands Project (the Project) which aims to facilitate the rehabilitation or enhancement of habitat values for selected islands in the Great Barrier Reef World Heritage Area. The Project has been delivered using funding supplied by the Reef Trust administered by the Commonwealth Department of Climate Change, Energy, the Environment and Water.

The Project includes two components, Component 1 which focusses on islands with known threats (such as weeds and pests) and Component 2 which focusses on understanding potential threats to islands with *Pisonia grandis* (*Pisonia*) particularly as a result of soft scale.

The Component 1 assessments for Bajigal is reported in the *Ecological Assessment for Bajigal (Stephens Island)* (Fell *et al.*, 2024). The Component 1 assessment for Bimi is comprised of three supplementary island threat assessment reports which should be read in conjunction with the Ecological Assessment for Bajigal. The relevant supplementary reports are:

- Rapid survey for *Pisonia grandis* – Bajigal and Bimi (Stephens and Sisters islands) (this report)
- Bimi vegetation assessment (Fell, 2025)
- Bridled tern survey report – Bajigal and Bimi (Stephens and Sisters islands) (Aestra, 2025)

This report relates to rapid ecological assessments undertaken on Bajigal and Bimi to locate and assess populations of *Pisonia*.

1.1 Aims and objectives

This report is intended to rapidly quantify the biodiversity values and threats present on target islands supporting *Pisonia* in the northern Great Barrier Reef World Heritage Area. The report provides a snapshot of ecological threats which may be affecting *Pisonia* and an overview of island condition which can be used to inform and support management for the islands.

The rapid assessment was not intended to provide a comprehensive assessment of the vegetation, flora, fauna or invertebrate diversity of the islands visited.

The field surveys utilised a rapid survey approach to quickly assess the islands for threats and values (refer to [Attachment A for further detail on field methods](#)). A particular focus of the field surveys was the identification of the presence of soft scale (*Pulvinaria urbicola*) which has caused substantial impacts to *Pisonia* forests in the southern parts of the Great Barrier Reef. The rapid assessment is intended to provide information complimentary to the work of Queensland Parks and Wildlife Service (QPWS) and Traditional Owner groups.

The assessment also included sampling of *Pisonia* leaves to support future genetic research. While samples were collected during the field surveys, no processing or analysis of these surveys is presented in this report. Samples collected are stored with James Cook University for future processing and are not discussed further in this report.

1.2 Survey locations

Bajigal (10.6 ha) and Bimi (6.5 ha) are islands situated on the wet tropical coast of north Queensland within the Wet Tropics bioregion. They are located 6.7 km northeast of Kurrimine Beach, which is approximately half-way between Cairns and Townsville. The distance between the two islands is 0.7 km. There is a rocky reef between the islands, which is less than 1 metre deep at low tide (MALSI, pers. comm.)

These two islands lie within the Sea Country of the Mandubarra people. The islands are part of the Barnard Island Group National Park which is managed by QPWS. They are also located within the Marine National Park (Green) Zone (Commonwealth of Australia (GBRMPA) 2016).

Bajigal and Bimi are of great cultural significance to the Mandabarra people and are known to support important nesting and breeding habitat for seabirds, populations of regionally uncommon flora species and littoral rainforest vegetation. The islands have an underlying basaltic geology and have a moderate to high level of disturbance as a result of the impacts of repeat tropical cyclones namely canopy loss and weed invasion.

Access to Bajigal is restricted to private/chartered vessels for camping and recreation. The number of visitors to the island at any one time is capped, and seasonal access restrictions apply to parts of the island to limit impacts to nesting seabirds (QPWS, 2023). Access to Bimi is limited, there are no camping or recreation facilities on the island and vessel access is constrained by surrounding areas of reef.

1.3 Survey overview

This Project utilised a rapid assessment method to provide a snapshot of threats and values on target islands ([Attachment A](#)). The findings of the rapid assessments are summarised for each island in an 'island report card' provided below. Field survey data is consolidated at [Attachment B](#) and additional field photos are provided at [Attachment C](#).

Spatial information on the target islands is provided in the associated geodatabase. The geodatabase includes information on the vegetation, location of survey points and records for flora and fauna species observed during the field surveys.

Field staff were transported to the islands via vessel from Kurrimine Beach. Field surveys were led by Naomi Maxwell (Aestra) with cultural oversight provided by Mandubarra Elders and Rangers and technical specialists David Fell (Botanist) and Dr Anthony Rice (Entomologist). A full list of field survey participants is found in Table 1.

Table 1 Field survey participants

Name	Position
James Epong	MALSI Senior Ranger
Naomi Epong	MALSI Ranger
Sean Kyle	MALSI Ranger
Sharon Casey	MALSI Ranger Trainee
Larrence O'Donnell	MALSI Ranger Trainee
Dylan Daugherty	MALSI Ranger Trainee
Jahrone Johnson	MALSI Ranger Trainee
Caylin Epong	MALSI Junior Ranger
Melissa Ball	MALSI Business Manager
Rohann Sultana	MALSI Program and Logistics Coordinator
David Fell	Botanist
Dr Anthony Rice	Entomologist
Michael Acheson	Boat Skipper

Targeted seabird surveys were completed concurrently. Incidental fauna species recorded during the survey are outlined in that report (refer to Bridled tern survey report – Bajigal and Bimi, Aestra 2025).

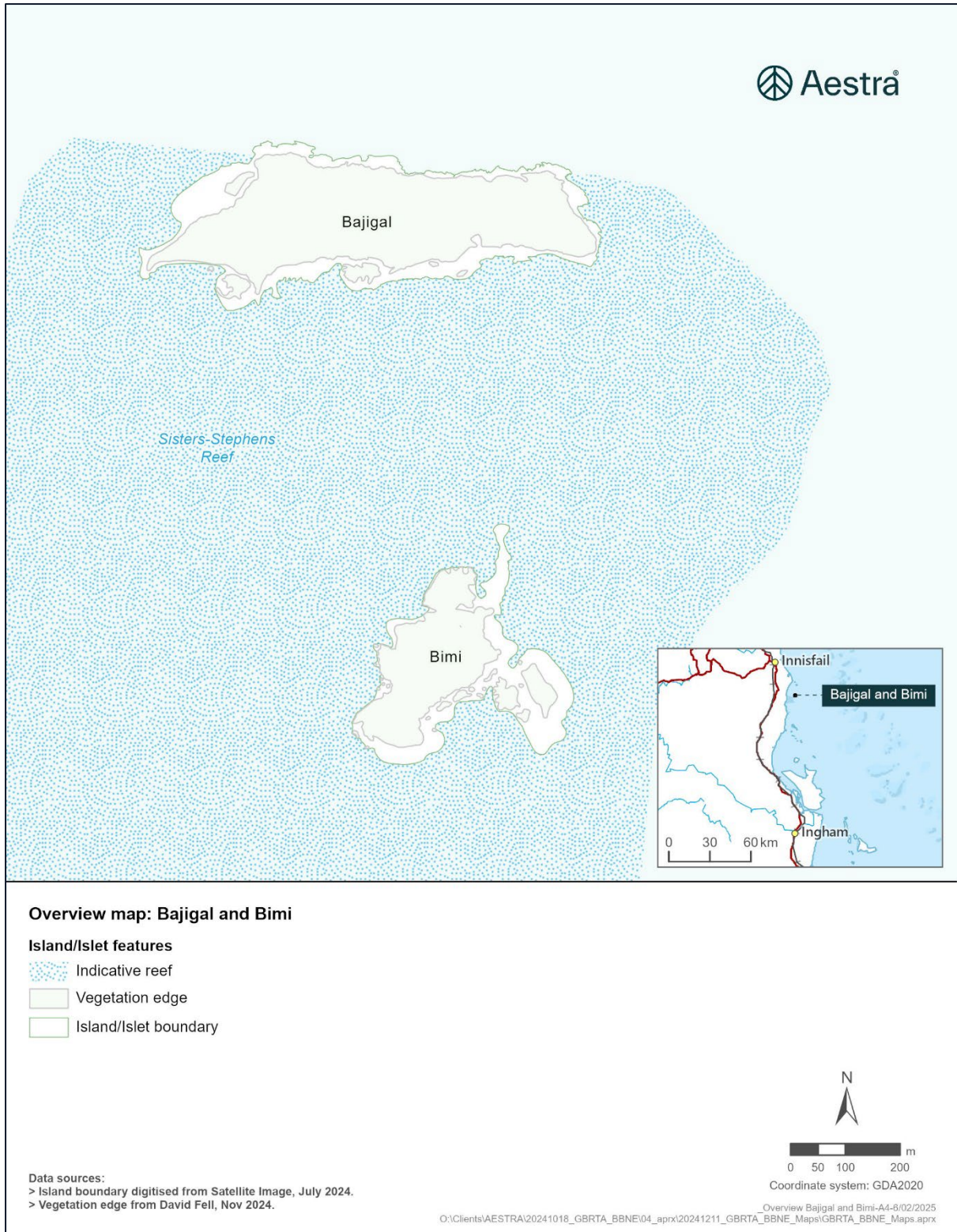


Figure 1: Overview map of Bajigal and Bimi

2 Vegetation and flora

2.1 *Pisonia grandis* (grand-devil's claws)

Pisonia grandis (family Nyctaginaceae) is the target species of this survey (Plate 1). It is a large tree which occurs on islands across the tropical Indo-Pacific region between the latitudes of 24°N and 24°S (Walker, 1991). The species is a semi-deciduous tree which grows to variable heights with large leaves and sticky barbed seeds that become entangled in the feathers of nesting seabirds. The species utilises this mechanism to move seeds between island ecosystems (Walker, 1991).

Across its range, *Pisonia* is declining globally as a result of land clearing associated with phosphate mining, coconut plantations and island development (Walker, 1991). Within the Great Barrier Reef, there are less than 160 ha of *Pisonia* forest spread across approximately 44 islands, with the largest extent of forests in the southern part of the Great Barrier Reef (Walker, 1991).

Pisonia occurs as the dominant or co-dominant element in some vegetation communities on coral cays or as small isolated populations, or individuals on both sandy and rocky substrates (Walker 1991). In Queensland, *Pisonia* forest is of high conservation value with the vegetation community described as '*Pisonia grandis* low closed forest' (Regional Ecosystem (RE) 3.2.29). The community has a biodiversity status (Qld) of 'endangered', while its conservation status under the *Vegetation Management Act 1999* (Qld) is 'of concern'.

Pisonia trees are important for seabird breeding and support important ecological processes particularly on coral cay islands. Species such as wedge-tailed shearwaters (*Puffinus pacificus*) nest in burrows under *Pisonia* roots and mulch, while black noddies (*Anous minutus*), great frigatebirds (*Fregata minor*), and other seabirds are known to nest or roost in or under large *Pisonia* trees.



Plate 1 *Pisonia grandis* flowers (left) and forest (right), Images: David Fell, 2024

Within the Great Barrier Reef, most areas of *Pisonia* forest are protected, however, local declines in the extent of *pisonia* have been associated with wildfire (e.g., Mitirinchi (Quoin) Island), historic phosphate mining (e.g., Lady Elliot Island; in addition to the broader Pacific), and outbreaks of soft scale insect (Freebairn, 2006).

2.2 Target threats to *Pisonia grandis*

Pisonia trees are adapted to environmental stresses such as seasonal drought, periodic seawater inundation and maritime exposure which are typical of coral cay environments. However, the species is known to be susceptible to outbreaks of soft scale and other invertebrates which have caused severe impacts on some island ecosystems (e.g., Smith *et. al.*, 2004).

While threats including climate change, changes in hydrological conditions, beach erosion and storm events are likely to impact this species, the rapid assessments completed for this study focussed on assessing the impacts from soft scale, invertebrates, and weeds

Further studies (which are more detailed in nature) are required to address the knowledge gaps associated with other known threats and the potential for those processes to impact the species and its habitat. Targeted assessment was out of scope of this survey.

2.2.1 *Pulvinaria urbicola* (urbicola soft scale)

Pulvinaria urbicola (Cockerell) (Hemiptera: Coccidae) is a soft scale thought to be native the West Indies but which has now spread to over 60 countries across the globe, including Australia (confirmed through discussions with H. Nahrung, M.Gorton, P. Gullen and T.K. Q in *pers comm.*; García Morales *et.al.*, 2016). The species has a large host range and is known to feed on 91 genera and 45 families (García Morales *et.al.*, 2016), however, despite the broad range of hosts, it was not considered a significant pest in Australia until outbreaks in the Great Barrier Reef Marine Park in the early 1990s.

The species (Plate 2) had been recorded on several coral cays in the Great Barrier Reef for several decades (R. Bull, cited in Olds, 2018). However, it wasn't until the mid to late 1990's that *P. urbicola* (Cockerell) came to land managers attention when it caused complete destruction of a 16 ha *Pisonia* forest on Coringa Southwest Islet in the Coringa-Herald National Nature Reserve, and a few years later was threatening *Pisonia* forest on nearby cays (Smith *et.al.*, 2004).



Plate 2 Inside of green tree ant (*Oecophylla smaragdina*) nest showing pulvinaria soft scale (*Pulvinaria urbicola*) on *Pisonia grandis* leaf (left, green ants with immature scale, right, mature scale insects). Images: A Rice, 2024.



Plate 3 *Cryptolaemus larva* feeding on *urbicola* scale on *Pisonia grandis* leaf (left, Image: A Rice, 2024), *Cryptolaemus larva* and scale (right, Image: Naomi Maxwell, 2024).

In a diverse, balanced ecosystem, soft scales are well controlled by a suite of invertebrate natural enemies which comprise predators such as the native ladybird beetle (*Cryptolaemus montrouzieri*) and parasitoids which lay their eggs in the scale (Plate 3). It is only when this controlling guild of natural enemies is disrupted that scale insects can multiply, and the population become eruptive causing significant damage to its host species. Disruption of natural enemy's control of scale can be man-made (e.g., by using pesticides which impact natural enemies) or can occur naturally. Ants attending scale insects in mutualistic relationships can help protect the scale from natural enemy attack and can lead to increased scale infestations. As protein levels in plant sap tend to be low, scale insects must imbibe large quantities of sap to fulfill their dietary requirements. This results in an excess of sugars that the scale insect exudes. This exuded sugar is very attractive to ants and in return for a sugary meal, some ant species will protect and farm the scale, moving them to fresh parts of the plant as populations increase and protecting them from natural enemy attack. This attendant ant behaviour allows scale populations to flourish as the pressure from natural enemies is reduced.

Another compounding factor that enables scales to proliferate at the expense of its host, is moisture stress. While drought can negatively impact many herbivorous insect species, the increased nutrient value of the sap in water stressed trees can benefit those insects that feed on it. Plants that are water stressed, especially during droughts, tend to have higher levels of nitrogen which has been shown to improve the reproductive rate of scale (various authors cited in Frank, 2021). In addition, temperatures tend to be higher at times of drought which can also increase the reproductive rate of scale insects, increase the reproductive rate of attending ants and make their periods of activity longer. This improves the ant's efficacy in protecting and tending the scale insects. In conjunction, parasitoids that don't feed on their reproductive hosts, rely on floral nectaries and pollen from flowers that may not be as abundant during drought conditions. As a result, the populations of nature predators, and as a result their efficacy as regulation agents, may be reduced (Jactel *et al.*, 2019). The cumulative impact of these factors to *Pisonia* is shown in Figure 2.

If, as indicated above, *P. urbicola* has been widespread in *Pisonia* forest in the Great Barrier Reef Marine Park for decades without causing significant damage, it suggests that a suite of natural enemies has also been present and keeping scale in check. Consequently, the outbreaks on Coringa South West Islet, North East Herald and other islands in the 1990's and early 2000's seems to have indicated a collapse of the natural enemy populations of the scale insect. Moreover, because the release of natural enemies and control of exotic ants restored stability back to the island ecosystem, the balance between scale/ant mutualism and natural enemy efficacy appears to be a key driver of the stability of the *Pisonia* forests with the Great Barrier Reef.

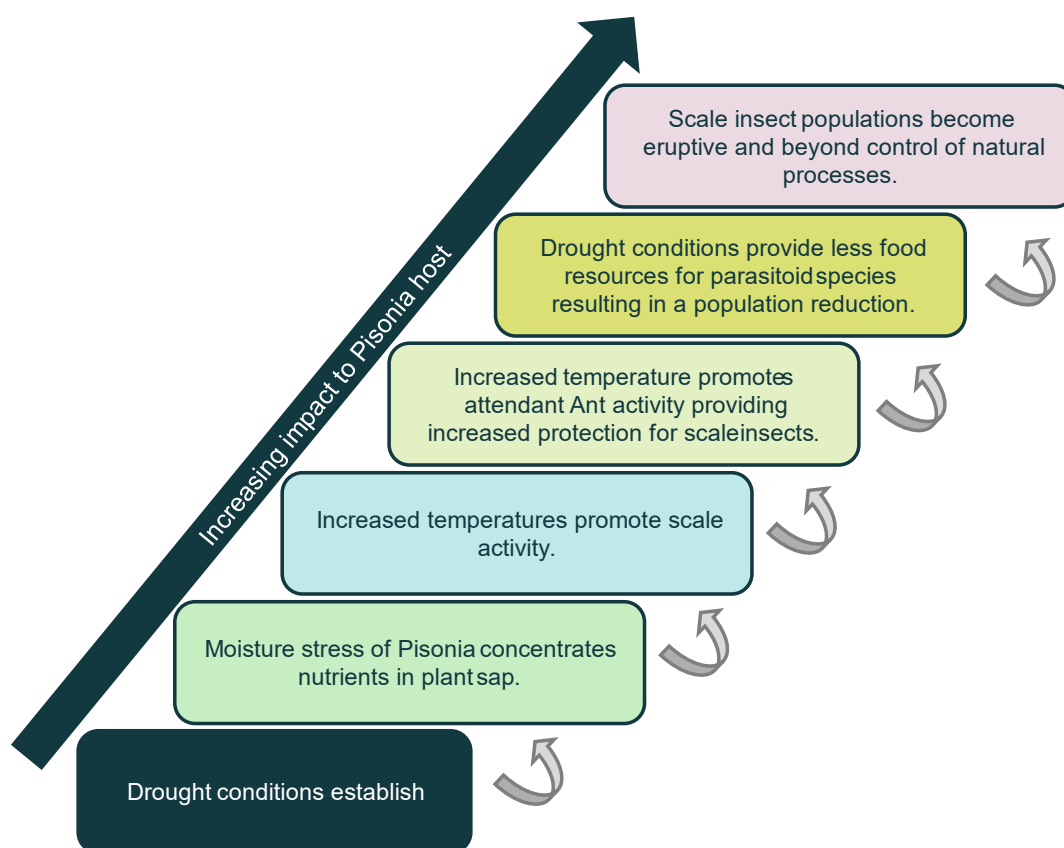


Figure 2: Scale insects have an increased impact to host species such as *Pisonia* under drought conditions.

2.2.2 Other invertebrate threats to *Pisonia* forests

In addition to scale insects, there are other invertebrate herbivores that potentially represent threats to *Pisonia* forest on the coral cays of the Great Barrier Reef. These include native hawkmoth caterpillars *Hippotion spp.*, (Lepidoptera: Sphingidae) and native giant grasshoppers *Valanger irregularis* (Orthoptera: Acrididae) (Olds *et.al.*, 2019).

Outbreaks of hawkmoth in 2001 caused severe defoliation at North East Herald Island and South East Magdelaine Island leading to releases of the native egg parasitoids *Trichogramma pretiosum* and *T. carverae* to control the outbreak (Smith *et.al.*, 2004).

It is unclear what led to these outbreaks but as with the scale outbreaks mentioned above, the efficacy of the natural enemies that normally keep these herbivores in check appears to have been compromised. As this period coincides with the early stages of the millennium drought it may have been environmental factors that impacted the balance of natural predators.

Changes to the climate are likely to exacerbate or compound these issues over the long term. With longer and more frequent droughts predicted and the potential for associated moisture stress to increase the number of defoliator invertebrates, threats to *Pisonia* forest are expected to remain high into the future.

3 Island report cards

3.1 Bajigal



Figure 3: Bajigal snapshot (Image: Mandubarra Aboriginal Land and Sea Incorporated, 2024).

3.1.1 Vegetation and flora

The most widespread vegetation cover is rainforest which occurs on basalt slopes and littoral sands. Three rainforest vegetation communities are recognised.

The vascular flora of Bajigal contains 184 species within 72 families and 149 genera comprising species observed through this project and records identified in the desktop assessment from WildNet. The naturalised flora (exotic species) has 23 species (13%). Further information on the vegetation is available in the Ecological Assessment of Bajigal (Stephens Island) (Fell *et. al.*, 2024).

The presence of *Pisonia* trees on Bajigal was recorded in April 2024 during the ecological assessment. This population was revisited for this assessment and was noted to comprise four mature trees located above the shoreline on the north-western side of the island.

3.1.2 Invertebrate threats to *Pisonia grandis* forest

The small stand of *Pisonia grandis* on Bajigal had recently emerged from a period of senescence at the time of survey. Each branch-end had two to four fully expanded leaves only.

Pulvinaria urbicola was recorded as present during the surveys but was at very low densities. Samples of the scale were taken and submitted for confirmation of identification. The surveys noted that the scale were being tended by ants that appeared to be *Pheidole megacephala*. The species has previously been recorded on the island and is a known scale mutualist. Sampling undertaken on the island recorded *P. megacephala* as the predominant ant species on the island. Specimens that were actually tending the scale were not collected.

Pheidole megacephala is a highly invasive species that has spread throughout tropical regions of the world and has had significant negative impacts on native invertebrate assemblages where it has become established (Wetterer, 2012). It can out-compete and displace endemic ant species and become the dominant ant species, which can have devastating impacts on local invertebrate diversity (Perkins, 1913; Zimmerman, 1970; Young, 2000 cited in Wetterer, 2012).

3.2 Bimi

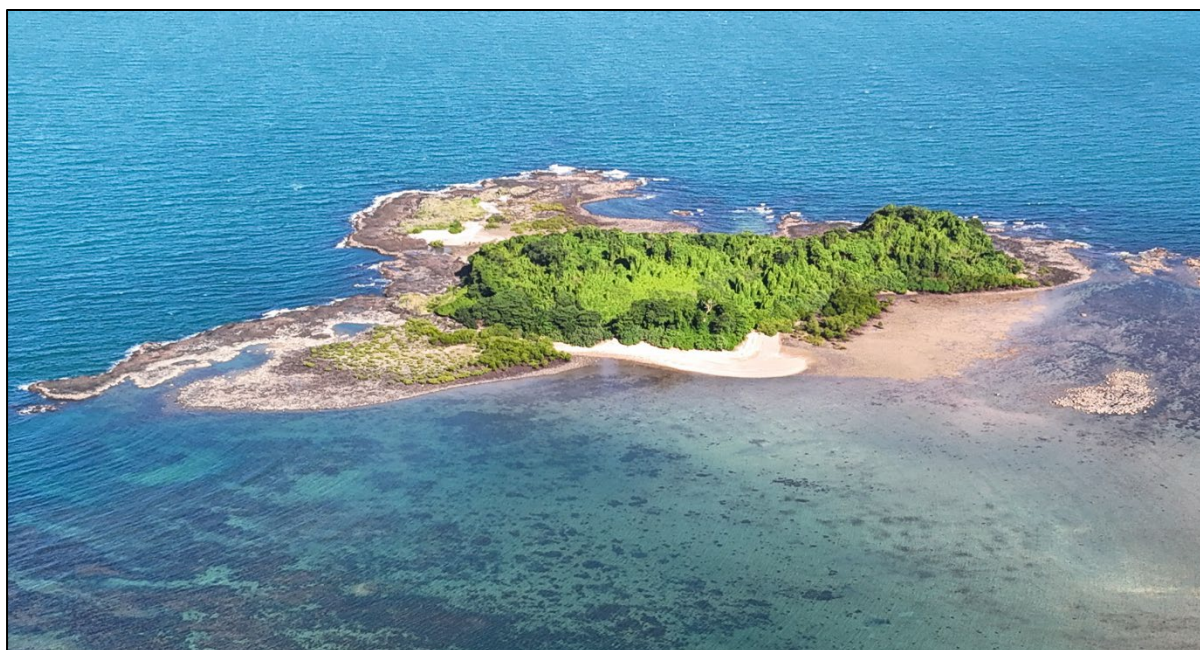


Figure 4: Bimi snapshot (Image: Mandubarra Aboriginal Land and Sea Incorporated, November 2024).

3.2.1 Vegetation and flora

The vegetation of Bimi comprises six vegetation communities within five remnant Regional Ecosystems and one non-remnant Regional Ecosystem. The most widespread vegetation cover is closed forest / rainforest which occurs on basalt slopes and littoral sands. Vegetation condition across the island was variable with some areas in relatively good condition with some weeds present through to vegetation in critical condition. Refer to the supplementary report Bimi Vegetation Assessment (Fell, 2025) for further detail.

3.2.2 Invertebrate threats to *Pisonia grandis* forests

Although most areas of potential *Pisonia* habitat were surveyed, not all parts of Bimi were accessible. As a result, the possibility of encountering *Pisonia* in unsurveyed areas cannot be ruled out. Since no *Pisonia* was recorded on Bimi, threats from scale insects were not further assessed. While scale insects surveys were not undertaken, opportunistic sampling of Ants was completed at five locations across Bimi. Ants were collected using a range of baits including peanut butter, fish and honey. All sample locations recorded the presence of *Pheidole megacephala*.

The genus *Pheidole* includes nearly 50 native Australian species and subspecies (Shattuck, 1999; Anderson, 2000). However, it also includes the exotic African big-headed ant (*Pheidole megacephala* Fabricius). The African big-headed ant is a highly invasive species that has spread throughout tropical regions of the world and has had significant negative impacts on native invertebrate assemblages where it has become established (Wetterer, 2012). It can out-compete and displace endemic ant species and become the dominant ant species, which can have devastating impacts on local invertebrate diversity (Perkins, 1913; Zimmerman, 1970; Young, 2000 cited in Wetterer, 2012) and poses a substantial conservation threat (Reichel and Andersen, 1996).

The fact that apart from a single specimen of the Australian native black house ant (*Ochatellus glaber* (Mayr), African big-headed ant was the only species found on Bimi suggests that it may already be outcompeting the native ant fauna. This may also be related to the brief time spent on the island producing a snapshot rather than a dedicated study. Using ants as bioindicators of environmental disturbance is a sound principal but requires more evidence than was collected here to draw meaningful conclusions (see Anderson, 1997). The MALSI rangers, in conjunction with the Northern Australia Quarantine Strategy (NAQS), have been collecting data relating to the presence and abundance of ant species and are well placed to conduct further work in this area.

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Attachment A - Methods

The field surveys were carried out between 28th and 29th of November 2024. The surveys aimed to assess values, health and threats to island landscapes supporting *Pisonia* forests. The team which comprised a botanist, and an entomologist was supported by a MALSI Rangers and Aestra project staff. Based out of Kurrimine Beach, a vessel was used to travel to target islands each day.

Flora and vegetation methods

Prior to the commencement of field survey, a brief desktop review of the known ecological values of each island was carried out from the following sources:

- records from the Atlas of Living Australia (ALA, 2024).
- WildNet data (Queensland Government, 2024).
- Records for *P. grandis* from the Australasian Virtual Herbarium are shown where available.
- Published papers of Walker (1991), King (1989) and Turner and Batainoff (2007).
- Regional Ecosystem mapping (Qld Department Environment Science and Innovation).

Field Survey

Survey sites were selected using satellite imagery, with a focus on:

- Detection of the presence of *Pisonia* trees.
- Rapid assessment of *Pisonia* population size, species associations and health.
- QPWS health check.
- Collection of site data to support any future vegetation mapping and inform RE classification.

The field survey collected vegetation structural and floristic data at 24 sites applying quaternary and tertiary site detail (Neldner *et. al.*, 2019) and QNPWS Health Checks (Melzer *et. al.*, 2019). Health checks were carried out on all islets with three sites in *P. grandis* habitat and one in grassland/herbland.

Site locations and traverses were captured using ArcGIS Field Maps application. Images were taken using an Olympus tough digital camera and iPad. Vouchers of botanical specimens were collected for verification of identification and inclusion into the Queensland Herbarium and the Australian Tropical Herbarium ([Attachment B3](#)).

Table 2 Survey timing

Date	Island	Arrive	Depart	Time on islands (hours)
28/11/24	Bimi	8.00 am	11.00 am	3 hrs
29/11/24	Bajjigal	12.00 pm	3.00 pm	3 hrs

Invertebrate methods

A targeted invertebrate assessment was undertaken for species that were likely to have an impact on the resilience of *Pisonia grandis* communities on target islands. The methodology assumed that the main entomological threats to the ecology of the target islands was posed by the urbicola soft scale (*Pulvinaria urbicola*) and the mutualistic relationships that it develops with many species of ants.

The identification of target areas for invertebrate assessment was carried out collaboratively with the field team, and in particular the team botanist. The methodology was implemented flexibly to allow it to be refined as needed to suit conditions on the ground.

Scale density and mutualism assessment

A scale density and mutualism assessment was conducted using the ten branch-end method (Freebairn, 2006, Hempson *et al.* 2019). To sample for the presence of scale, the end of ten branches with approximately ten leaves were opportunistically selected per site. Visual assessments were undertaken to determine abundance scores/infestation categories of soft scale (number of scales per leaf): 0; 1 - 50; 50 - 500; and > 500.

The number of sites per island were dependent on the size of the *Pisonia grandis* stand, and this method was supplemented with additional 'off-site' examination of trees where required, in particular to ascertain the presence of natural enemies. Scale specimens were collected into 5 ml tubes of 70% ethanol for confirmation of identification. Scale samples were submitted for expert identification.

If ants were attending the scale infestation, the number of species and abundance were estimated per leaf. Specimens of each species were collected into 5 ml tubes of 70% ethanol for later identification. The presence of predators was also visually assessed during the ten branch-end inspection and samples of any potential predators were collected for further identification.

Natural enemies

Scale was visually assessed for natural enemies as well as evidence of parasitism and predation. Any scale that were apparently parasitized were collected for rearing out for further identification of parasitoids. The number of samples taken for rearing was determined by logistics and decided in the field. Parasitised scale samples were held on sections of leaf in ventilated field tubes 100mm x 25mm and held at ambient temperature until either death or the emergence of parasitoids occurred. Parasitoids successfully reared from scale samples were submitted to relevant experts for specialist identification.

In the event that there were large amounts of scale and natural enemies were not obvious, additional time was spent (where possible) undertaking targeted searches for natural enemies on plants affected by scale.

Ant assemblage assessment

The ant assemblage present on each island was investigated and sampled using baited traps to identify the number and diversity of species present.

A series of 5 ml tubes were baited with three baits: peanut butter, honey and fish-based cat food. The baited traps were laid out in groups of three comprising one of each bait type and separated by approx. 0.1m. Between sixteen baiting sites were established per island (depending on size). Baited sites were selected to cover the range of different habitat types present (e.g., *Pisonia* forest, beach margins) and marked with flagging tape for easy retrieval. The location of each set of tubes was recorded using GPS.

After installation, the traps were retrieved prior to leaving the island and sealed for further processing. All traps and flagging tape were collected and removed on completion of the survey. Ants were preserved and identified in-house at Granite Belt IPM QLD. Any suspected species of biosecurity concern were sent off for confirmation of identification by a specialist.

In addition to the baited traps, sampling of the ant fauna was supplemented by opportunistic collections of ants as they were found during island traverses.

Insect herbivory damage assessment

Opportunistic assessments of insect herbivory were completed during broader field surveys. Assessment of herbivory damage targeted *Pisonia* species, however other important island forming species like *Cordia* subcordata were also considered. If evidence of herbivory was identified at a problematic level, a targeted search was undertaken for larvae on the affected individuals. Photographs and samples of larvae found were collected for later identification. Notes on tree health and condition were taken for affected individuals (if isolated) and general observations were captured if evidence of herbivory was more widespread.

Attachment B – Field data

Invertebrate field data

Table 3 Scale density assessment results

Scale density	Scale rating
0	Absent
1-50	Low
50-500	Moderate
500+	High

ID	Date	Location	No. branch ends	Scale density	Ants present	Comments
AR_21a	28/11/2024	Bajigal Island	10	1-50	Y	Two to four fully expanded leaves. One leaf only with scales. Early instars. Collected for ID.
AR_22	28/11/2024	Bajigal Island	10	1-50	Y	Single scale on 10 branch ends. Ant not collected.
AR_23	28/11/2024	Bajigal Island	10	0	N	
AR_25	28/11/2024	Bajigal Island	10	1-50	Y	A single scale. Ant not collected.
AR_25_1	28/11/2024	Bajigal Island	10	0	N	

Table 4 Invertebrate samples collected

Location	Taxon	Collected	ID	Comments	Known scale mutualist?
Bajigal	<i>P. megacephala</i>	28/11/2024	<i>P. megacephala</i>	Ant traps Bajigal	Yes
Bajigal	<i>P. megacephala</i>	28/11/2024	<i>P. megacephala</i>		Yes
Bajigal	<i>P. megacephala</i>	28/11/2024	<i>P. megacephala</i>		Yes
Bajigal	<i>P. megacephala</i> , <i>Polyrachis</i> sp	28/11/2024	<i>P. megacephala</i> , <i>Polyrachis</i> sp		Yes
Bimi	<i>Pheidole megacephala</i> , <i>Ochetellus glaber</i>	27/11/2024	<i>Pheidole megacephala</i> , <i>Ochetellus glaber</i>	Ant traps honey	Yes
Bimi	<i>P. megacephala</i>	28/11/2024	<i>P. megacephala</i>	Ant traps peanut butter	Yes
Bimi	<i>P. megacephala</i>	28/11/2024	<i>P. megacephala</i>	Ant traps fish	Yes
Bimi	<i>P. megacephala</i>	28/11/2024	<i>P. megacephala</i>	Ants opportunistic collections	Yes

Attachment C – Field photos



Plate 4 Opportunistic ant surveys, Bimi (Dr A. Rice, 2024)

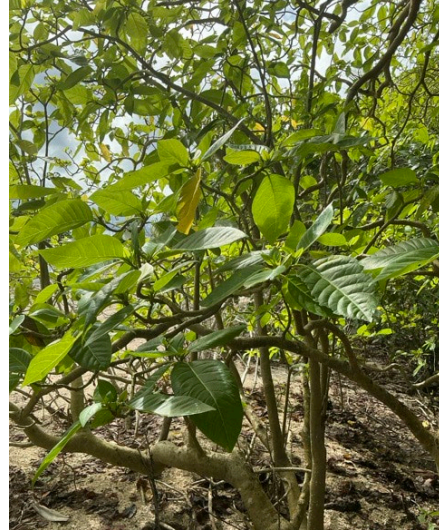


Plate 5 Pisonia grandis surveyed, Bajigal (Dr A. Rice, 2024)



Plate 6 Pisonia grandis surveyed, Bajigal (Dr A. Rice, 2024)

