



PROFILE FOR MANAGEMENT OF THE HABITATS AND RELATED ECOLOGICAL AND CULTURAL RESOURCE VALUES OF **ERUB ISLAND**

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Prepared by 3D Environmental for
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EXECUTIVE SUMMARY

Erub (Darnley) Island occupies a total area of 565 ha and is formed on massively bedded basalt, the result of Pleistocene age volcanic activity. The island is part of the Eastern Group of Torres Strait Islands which includes Mer, Ugar (Stephen) and a number of small islands and sand cays.

The vegetation on Erub is controlled largely by variations in soil moisture and fertility coupled with the anthropogenic influences of human occupation. Native grassland forms up to 60% of the islands vegetation with vine forest persisting in fire protected pockets and gully lines. Other vegetation types include mangrove forests and extensive areas of altered forest habitats. A total of nine natural vegetation communities, within four broad vegetation groups (natural only) and four regional ecosystems are recognised on the island, representing approximately 4% of regional ecosystems recorded across the broader Torres Strait Island landscape. Two of the ecosystems recorded are however unique to the Eastern Island Group, in particular Mer and Erub, and have no representation elsewhere in Queensland. There are also a number of highly significant culturally influenced forest types on the island which provide a window into the islands past traditional agricultural practices. Observations suggest that portions of the island have been developed as a permaculture from the time of earliest human settlement.

The total known flora of 281 species comprises 193 native species and represents approximately 21% of the known flora for the Torres Strait Islands. There are 83 families with 200 genera. The 88 introduced species account for 31% of the island flora.

One species of tree, *Alectryon repandodentatus*, is listed as Endangered under federal and state legislation with three species, *Apluda mutica* (a grass), *Neololeba atra* (a bamboo on vine thicket margins), and *Operculina brownii* (a vine) listed as Near-Threatened under the *Queensland Nature Conservation Act* 1999. A further 10 species are considered to have significance at a local and regional level.

As for the majority of Torres Strait Islands there is a considerable lack of systematic survey of fauna habitats on the island. Desktop reporting indicates 112 fauna species have been reported for Erub Island including 1 frog, 20 reptile, 86 bird and 5 mammal species. Of these, 1 reptile, 1 bird and 4 mammal species are introduced, 5 species are considered significant under either state or federal legislation and 1 species of reptile, a skink (*Carlia quinquencarinata*) have their sole Australian representation either on Erub Island or within the broader Eastern Island Group. This can be compared with the 384 terrestrial fauna species that have been reported for the broader Torres Strait Island group which includes 14 frog, 67 reptile, 263 bird and 40 mammal species.

Within the four broad vegetation groups (or management units) identified on the island, a number of issues for future management are identified as necessary for the future biodiversity maintenance and ecological health of the island. These include:

- Control of the exotic weed lantana. Evidence from neighboring Murray Island suggests that with removal of fire as a regulator, this species will rapidly displace native grassland habitats on the island.
- Control of a number of additional invasive weeds which are also threatening biodiversity values on the island.
- Continued collection of floristic information, specifically those plants that are important as a traditional resource.
- Further active fauna survey, both as a means of monitoring for the impacts of exotic species, as well as a means to further define the extent of island scale habitat usage of a number of significant fauna species.
- Further survey and documentation of the complex and diverse cultural landscape on the island.

It is important that any future surveys on Erub be collaborative with the Erubam Rangers and include study of traditional ecological knowledge and ethno-taxonomy. This is also relevant to recommended land management practices which must be implemented in consultation with the island PBC in a culturally acceptable manner.

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Table of Contents

1.0	Introduction	8
1.1	Cultural Setting	8
1.2	Geographic Setting	8
1.3	Geological Context.....	8
2.0	Methods	10
3.0	Aims and Objectives	10
4.0	Legislative and Policy Considerations	10
5.0	Vegetation and Flora	13
5.1	Vegetation Groups and Mapping	14
5.2	Flora Species	17
5.2.1	<i>Flora Species with Biodiversity Significance</i>	17
5.2.2	<i>Introduced Plants</i>	21
5.2.3	<i>Plants with Cultural Significance</i>	25
6.0	Fauna (Animals)	25
6.1	Culturally Important Animal (Fauna) Species	26
6.2	Animal (Fauna) Habitat Values	26
6.3	Animal (Fauna) Species with Conservation Significance	27
6.3.1	<i>Critically Endangered, Endangered, Vulnerable and Near-Threatened Species</i>	28
6.3.2	<i>Profiles of Significant Known from or Possibly Occurring on Erub Island</i>	29
6.3.3	<i>Migratory Animal Species</i>	34
6.3.4	<i>Additional possible Migratory species</i>	35
6.3.5	<i>Species of Regional Significance</i>	36
6.4	Pest Animal (Fauna) Species	36
6.5	Threats to Fauna (Animals) and Habitat.....	38
6.6	Future Priorities.....	38
7.0	The Role of Fire in Savanna Landscapes	39
8.0	Erub Island as a Landscape in Balance	40
9.0	Management Profiles for Erub Island Habitats	43
9.1	Evergreen Vine Thicket.....	43
9.1.1	<i>Status of Ecological Knowledge</i>	43
9.1.2	<i>Ecological / Cultural Considerations</i>	43
9.1.3	<i>Management Implications</i>	43
9.1.4	<i>Summary of Recommended Management Actions</i>	44
9.2	Deciduous / Semi Deciduous Vine Forest and Thicket	45
9.2.1	<i>Status of Ecological Knowledge</i>	45

9.2.2	<i>Ecological / Cultural Considerations</i>	47
9.2.3	<i>Management Implications</i>	48
9.2.4	<i>Summary of Recommended Management Actions</i>	48
9.3	Grassland and Grassland Complexes	50
9.3.1	<i>Status of Ecological Knowledge</i>	50
9.3.2	<i>Ecological / Cultural Considerations</i>	52
9.3.3	<i>Management Implications</i>	52
9.3.4	<i>Summary of Recommended Management Actions</i>	54
9.4	Anthropogenically Altered (secondary) Vine Forest and Thicket.....	55
9.4.1	<i>Status of Ecological Knowledge</i>	55
9.4.2	<i>Ecological / Cultural Considerations</i>	57
9.4.3	<i>Management Implications</i>	57
9.4.4	<i>Summary of Recommended Management Actions</i>	57
9.5	Mangrove Forest , Woodland and Shrubland Complex.....	58
9.5.1	<i>Status of Ecological Knowledge</i>	58
9.5.2	<i>Ecological / Cultural Considerations</i>	59
9.5.3	<i>Management Implications</i>	60
9.5.4	<i>Summary of Recommended Management Actions</i>	60
9.6	Exotic Vegetation and Cleared Areas	61
10.0 References and Bibliography		63
11.0 Glossary		72
Appendices		73
Appendix A. Expert Panel Attendees		73
Appendix B. Queensland Government Vegetation Structural Classification.....		74
Appendix C. Preliminary Flora Species List – Erub Island, Torres Strait, Queensland.		75
Appendix D. Fauna of Erub Island, Torres Strait, Qld.		85
Appendix E. Information on Migratory Fauna Species Potentially occurring on Erub Island and Surrounding Islets		99

List of Figures

Figure 1. Location of Erub Island	9
Figure 2. Diagrammatic illustration of the hierarchy and relationship between components of the vegetation classification system used in the Torres Strait Island vegetation mapping study (Stanton <i>et al.</i> 2009).	14
Figure 3. Distribution of evergreen vine thicket on Erub Island restricted to two minor littoral remnants on the islands north-east coast (place names after Lawrie, 1970).....	43
Figure 4. Distribution of semi-deciduous and deciduous vine forest and thicket on Erub Island (place names after Lawrie, 1970)	48
Figure 5. Location of native grasslands on Erub Island (place names after Lawrie, 1970)	51
Figure 6. The location of anthropogenically altered vine forest communities on Erub Island (place names after Lawrie, 1970).	56
Figure 7. Distribution of mangrove forest habitats (place names after Lawrie 1970).	59
Figure 8. The location of bamboo thickets and other vegetation dominated by exotic species.	62

List of Tables

Table 1. Broad vegetation groups and relative contributions to island vegetation on Erub Island ...	14
Table 2. Descriptions of component vegetation communities and association with regional ecosystems currently recognised on Erub Island (from Stanton <i>et al.</i> 2009).	15
Table 3. Summary of the vascular flora of Erub Island in relation to Torres Strait Islands (Stanton <i>et al.</i> 2009), Cape York Peninsula (Neldner & Clarkson 1995 in Neldner 1998), Great Barrier Reef Continental Islands (Batianoff & Dilleward 1997), and Queensland flora (Bostock & Holland 2010).	17
Table 4. Summary of flora with biodiversity significance on Erub Island.	18
Table 5. Summary of regionally significant flora species, Erub Island.	20
Table 6. Weed threats.	25
Table 7. Endangered, Vulnerable and Near-Threatened fauna species ¹ reported or predicted ² to occur on Erub Island.....	28
Table 8. Migratory ¹ species reported or predicted ² to occur on Erub Island.	34
Table 9. Summary of management actions for evergreen vine Thicket.	45
Table 10. Summary of management actions for semi-deciduous vine forest and thicket.	49
Table 11. Summary of management actions for grassland and grassland complexes.....	54
Table 12. Summary of management actions for anthropogenically altered forest and thicket.	57
Table 13. Summary of management actions for mangrove habitats.....	60

1.0 Introduction

Erub Island, also known by its European name of Darnley, represents one of seven islands within the broader Torres Strait Island group initially selected for the development of an island specific biodiversity management profile. This profile aims to document the biodiversity features, landscape processes, and cultural values (from both a landscape and site specific perspective) that are intrinsic to the island and develop management actions to ensure preservation or enhancement of those features. In the process of developing this plan, those sites and landscape features of specific cultural importance to the Erub Island people (Erubam Le) are recognised and recommendations contained within are pertinent to the management of values of importance in both a traditional and western scientific sense. The specific recommendations detailed within this management profile will be directly incorporated into the developing 'Erub Island Working on Country Plan' for specific action.

1.1 Cultural Setting

The population of Erub at the 2006 census consisted of 283 Indigenous and 31 non-Indigenous people. Land tenure is DOGIT (deed of grant in trust) with Native Title determined on 08/12/2004. The Registered Native Title Body Corporate¹ (RNTBC or PBC in shortened form) is the Erubam Le Traditional Land and Sea Owners (Torres Strait Islanders) Corporation who hold the title of the land on behalf of the traditional owners. The Erubam Le speak Miriam Mir, the dialect of Eastern Torres Strait Island Group.

1.2 Geographic Setting

Erub Island (shown in **Figure 1**), along with Mer (Murray) and Ugar (Stephen) and a number of smaller islands and sand cays including Bramble and Nepean, comprise the Eastern Island Group. Erub is the largest island in this grouping with an area of 565 ha, rising to 150 m AHD at its highest point. The mean annual rainfall of 1 287mm (BOM 2008a) compares to 1 983mm on Badu Island, the wettest recording station in the Torres Strait (BOM 2008b), and Dauan, the driest recording station at 1 082mm (BOM 2008c).

1.3 Geological Context

The Eastern Island Group including the larger islands of Ugar, Mer and Bramble Cay are the result of Pleistocene Age (<1.8Ma) volcanic activity. Unlike Mer where the volcanic cone is well defined, the cone on Erub has eroded and the island is formed on massively bedded, vesicular flow basalt, which forms a pile of up to 150m high (Willmott 1972). Underlying beds of bedded volcanic scoria and ash are exposed under the basalt flow on headlands on the northern side of the island (see **Photograph 1**). The porous nature of the basalt pile imposes an edaphic control which naturally limits vegetation development.

¹ Registered Native Title Body Corporate – the organisation that is recognised as holding native title in trust for the benefit of the native title holders. It contacts native title holders and administers business between them and outsiders, such as government, industry and developers.

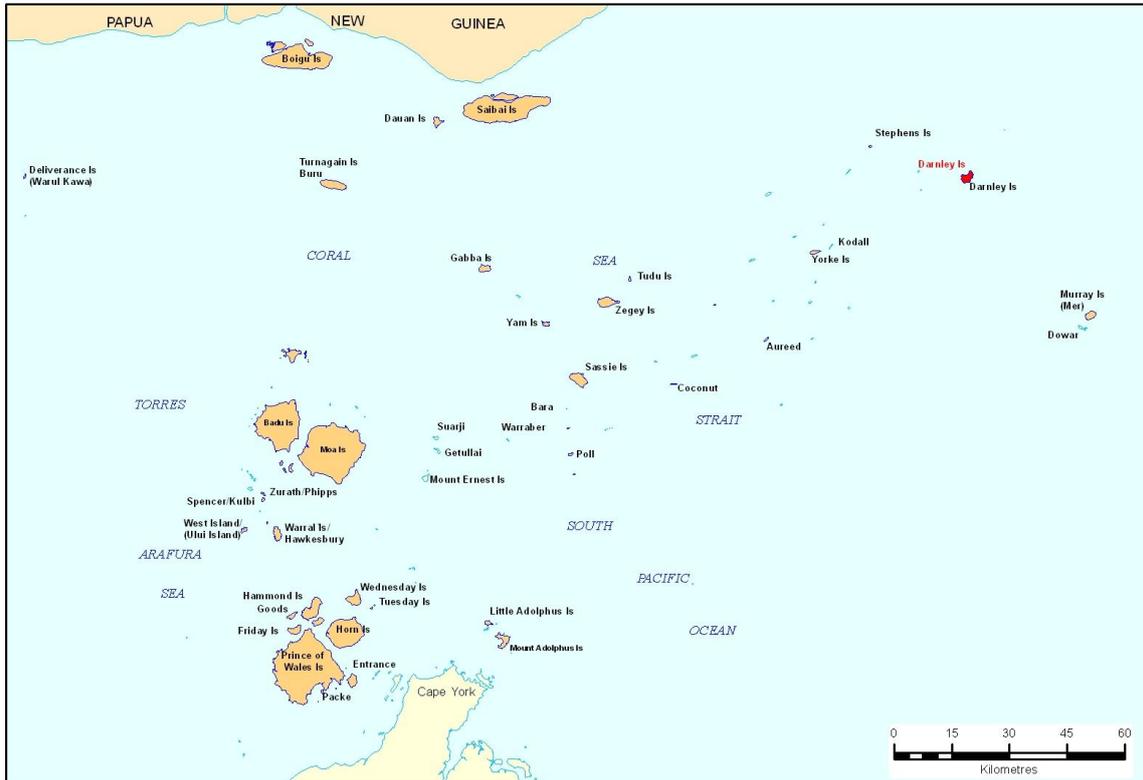


Figure 1. Location of Erub Island



Photograph 1. Consolidated scoria and ash underlying vesicular basalt in the islands north coast

2.0 Methods

This document provides a compendium of information from a range of sources, supplemented with information gathered from consultation with both technical experts and traditional land owners on Erub. In summary, the process undertaken to complete this biodiversity assessment includes:

1. Compilation of desktop resources which includes but is not limited to Stanton, Fell and Gooding (2009), Queensland Herbarium's Herbrecks Database, Queensland Museum fauna record extracts, Birds Australia database extract, WildNet database extracts, Conics Land Use Management Plan for Erub Island (Conics 2009b) and numerous additional technical papers relating to both flora and fauna (see references section).
2. Presentation of this information at a workshop in Cairns, at which biodiversity information was presented to a range of technical experts for discussion and further input. A list of workshop attendees is provided in **Appendix A**.
3. An island based consultation with Land and Sea Rangers and the broader island community was held on Erub Island between 27th and 29th March, 2011.

3.0 Aims and Objectives

The overall aim of this document is to compile and annotate existing information relating to island scale ecological process, introduce cultural interactions with these processes, and establish a framework of actions which can be drawn on by island rangers and managers to effectively manage the islands specific ecological and cultural values.

Owing to the long term occupancy of the islands (> 4 000yrs), the apparent stability of the majority of landscapes, and general lack of detailed ecological information pertaining to these landscapes, it is assumed that maintaining the existing landscape condition and process is the safest management option. Habitat maintenance has therefore been a primary consideration during the compilation of this document although on Erub Island, as on Mer and Ugar Islands, a number of problematic land management issues became apparent. These are documented for further consideration in this report. The specific actions that are ultimately adopted and direction of island scale ecological management will however be ultimately up to the discretion of the island rangers and Traditional Owners.

4.0 Legislative and Policy Considerations

Biodiversity is regulated at state and national levels by a range of legislative mechanisms which classify fauna species, flora species and habitats according to their rarity (at a range of scales), and population size, distribution and threats. The legislative classification is generally used as a surrogate for assigning significance to a particular species or ecological value. Relevant components of the major legislative mechanisms that require consideration are described briefly below.

Nature Conservation Act 1992: The *Nature Conservation Act* (NC Act) is a legislative mechanism of the Queensland Government that is regulated by the Department of Environment and Heritage Protection (EHP). The *Nature Conservation (Wildlife) Regulation 2006* is sub-ordinate to the NC Act and defines seven classes that are:

- Extinct in the Wild.
- Endangered.
- Vulnerable.
- Near-Threatened.
- Least Concern.

These classes collectively relate to native species and are protected wildlife (plants and animals).

Vegetation Management Act: The *Vegetation Management Act 1999* (VMA) is a state regulated planning initiative that underpins the regional management of vegetation in Queensland. Under the VMA, conservation significance to particular vegetation groups termed regional ecosystems (REs) is assigned on a consistent state-wide basis. The classification of regional ecosystems is based on a hierarchical system with a three-part code defining bioregion, followed by land zone, and then vegetation. Thirteen bioregions are classified in Queensland with the Torres Strait Islands being a sub-province of the broader Cape York Peninsula bioregion.

Land zones are geological and geomorphic categories that describe the major geologies and landforms of Queensland. The system is based primarily on geology, with geologic age considered an important determinant. The classification of land zone generally utilises available geological information (Neldner *et al.* 2005) although field inspection is utilised as a supplementary measure where geological mapping is inadequate.

The status of REs is based on their pre-clearing and remnant extent, and is gazetted under the VMA and listed in the Regional Ecosystem Description Database (REDD) maintained by the EHP. The Vegetation Management Status (VMS) of a regional ecosystem is described in line with the following:

Endangered regional ecosystem: a regional ecosystem that is prescribed under a regulation and has either:

- less than 10% of its pre-clearing extent remaining; or
- 10% to 30% of its pre-clearing extent remaining and the remnant vegetation remaining is less than 10 000 hectares (ha).

Of Concern regional ecosystem: means a regional ecosystem that is prescribed under a regulation and has either:

- 10% to 30% of its pre-clearing extent remaining; or
- more than 30% of its pre-clearing extent remaining and the remnant vegetation remaining

is less than 10 000 ha.

Least Concern regional ecosystem: means a regional ecosystem that is prescribed under a regulation and has more than 30% of its pre-clearing extent remaining and the remnant vegetation remaining is more than 10 000 ha.

Hence, the majority of vegetation scheduled under the VMA as 'of concern' on Erub (e.g. vine thicket ecosystems classified under RE3.8.5) is classified as such because on a regional level (Cape York Peninsula) more than 30% of the original habitat extent remains although the total area of the habitat is less than 10 000ha. The regional ecosystem mapping available for Erub provides accurate information on the legislative significance of vegetation on the island offering an information planning resource for the community, the TSIRC and the TSRA. For example, if a radio tower was proposed for a specific area which supported a regional ecosystem (vegetation type) that was 'endangered' or 'of concern', then clearing of this vegetation without authorisation is in breach of the VMA. Liaison with regulators (EHP) should be undertaken to determine the conditions that must be met for clearing to be authorised. EHP also assigns a Biodiversity Status (BS) to REs, a non-statutory indicator of a regional ecosystems susceptibility to elements of degradation.

Land Protection (Pest and Stock Route Management) Act 2002: The *Land Protection (Pest and Stock Route Management) Act 2002* (LP Act) provides a framework and powers for improved management of weeds, pest animals and the stock route network. The act provides for designation of threat classes to exotic species which degrade natural resources, threaten conservation of biodiversity, threaten remnant vegetation, reduce rural production and interfere with human health and recreational activities. Exotic species that pose threat are declared within one of the following three categories:

- Class 1 Pest: a pest that has potential to become a very serious pest in Queensland in the future.
- Class 2 Pest: a pest that has already spread over substantial areas of Queensland, but its impact is considered sufficiently serious to warrant control.
- Class 3 Pest: a pest that is commonly established in parts of Queensland but its control by landholders is not warranted unless the plant is impacting, or has potential to impact on a nearby ecologically sensitive area.

For example, if a Class 2 weed such as Gamba grass (*Andropogon gayanus*) was found on Erub, there is a requirement under the Act for landowners to take reasonable steps to control and manage the weed. In addition, the draft TSRA LMSU Pest Management Plan for Erub forms a policy document to guide field and administrative staff and communities toward cooperative involvement of an integrated and coordinated approach to pest management across the Island. The commonwealth also provides an inaugural list of 'Weeds of National Significance (WONS)' based their perceived threat to a range of environmental, social and cultural values at a national level.

The Back on Track Species Prioritisation Framework: The 'Back on Track (BOT) species prioritisation framework' is a non-legislative Queensland Government initiative that prioritises Queensland's native species as a means to guide their conservation, management and recovery. The assessment method utilises multiple criteria allowing identification of those species that are threatened and facing population declines, and those species that have a high potential for recovery. The BOT methodology classifies five priority levels for action to remediate declining Queensland wildlife being 'Critical Priority (CR)', 'High Priority (H)', 'Medium Priority (M)' and 'Low Priority (L)'. The information within this document will be valuable in future reassessments of BoT in the Torres Strait.

The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act): The EPBC Act, an initiative of the Australian Government, provides recognition of four classes of wildlife and habitat being those which are:

- Extinct in the wild.
- Critically Endangered.
- Endangered.
- Vulnerable.

Plant and animal species and habitats scheduled under these categories are referred to collectively as 'Threatened Wildlife'. The EPBC Act also provides for protection of those species which are considered migratory under international conventions which include:

- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).
- China-Australia Migratory Bird Agreement (CAMBA).
- Japan-Australia Migratory Bird Agreement (JAMBA).
- Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA).

Interference or destruction of plants, animals or areas of habitat for species listed as threatened under the EPBC Act requires specific authorisation from the regulator (Australian Government) who are likely to provide conditions under which the interference can take place. Interference (such as removal of the protected plant species *Alectryon repandodentatus*) without authorisation is in breach of the EPBC Act.

5.0 Vegetation and Flora

As described in the following sections, the classification of vegetation includes both nomenclature of individual species and the classification of groups of plants, the latter often forming unique assemblages that can be consistently recognised across islands (e.g. Erub), island groups (Eastern Island Group), or bioregions (Cape York Peninsula bioregion).

5.1 Vegetation Groups and Mapping

The hierarchy of vegetation classification used in the Torres Strait Islands is described below with relationships illustrated in **Figure 2**. At the highest level, the classification of plant assemblages is based on vegetation structure which considers the dominant life form (tree or grass), height of the tallest strata, and canopy closure. The structural classification used by the Queensland Government is included within **Appendix B**. Vegetation structural groupings (*i.e.* shrubland etc) are used to define **Broad Vegetation Groups** (BVGs) which provide the broadest level of vegetation classification recognised in vegetation mapping produced for the Torres Strait Islands (Stanton *et al.* 2009). BVGs may be an amalgamation of a number of more specific plant groupings known as **Vegetation Communities**. Vegetation communities (VCs) can be described as ‘a unit of vegetation that demonstrates similarities in both structure and floristic composition’. VCs are useful to describe fine scale variation in floristic composition that may occur due to the consistent dominance of a particular plant species or suite of plant species. REs as described in **Section 4** comprise a group of vegetation communities, although unlike BVGs, consider regional distribution and geology within their classification. REs must be considered due to their legislative implications although in this document, BVGs have been used as a principle unit to define habitat management groupings.

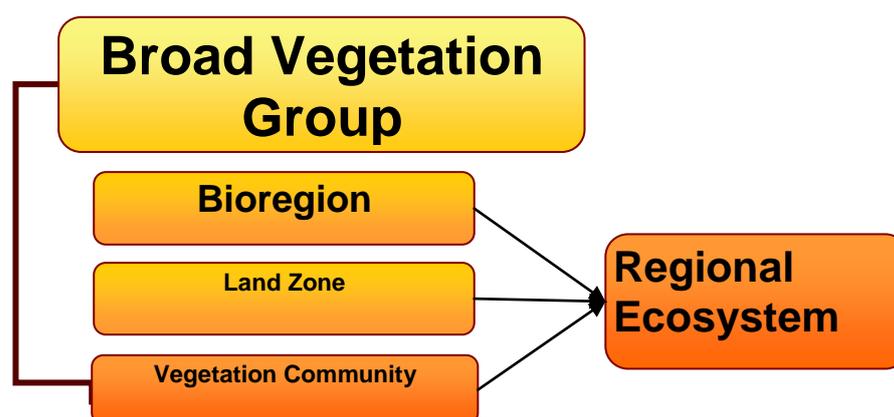


Figure 2. Diagrammatic illustration of the hierarchy and relationship between components of the vegetation classification system used in the Torres Strait Island vegetation mapping study (Stanton *et al.* 2009).

Vegetation Classification on Erub Island: For management purposes, the island’s vegetation is classified into BVGs, herein referred to as habitats as derived from Stanton *et al.* (2009). The spatial extent and relative contribution of these groupings is provided in **Table 1**, with descriptions of component vegetation communities and associated regional ecosystems provided in **Table 2**. Further characterisation of habitat types is provided in the following text.

Table 1. Broad vegetation groups and relative contributions to island vegetation on Erub Island

Broad Vegetation Group/ Habitat**	Component Vegetation Communities**	Area (ha)	Contribution %

Broad Vegetation Group/ Habitat**	Component Vegetation Communities**	Area (ha)	Contribution %
Evergreen vine forest and thicket	1c	0.5	0.1
Deciduous / Semi deciduous vine forest and vine thicket	2i, 2j, 2k, 2l, 2w	101	17.8
Grasslands and grassland complexes	17b, 17be, 17bs	329	57.9
Anthropogenically altered (secondary) vine forest and thicket	22a	6	1
Mangrove forest, woodland and shrubland complexes	24a, 24c	11	1.9
Regrowth	RE	21	3.8
Exotics	Ex, Bamboo	49	8.6
Cleared Areas	CI	47	8.3
Total		565	100

Table 2. Descriptions of component vegetation communities and association with regional ecosystems currently recognised on Erub Island (from Stanton et. al. 2009).

Vegetation Community	Description	Geological Association	Regional Ecosystem	VMS ¹	BDS ²
1c	Evergreen notophyll vine thicket (windsheared) + <i>Manilkara kauki</i> + <i>Celtis philippensis</i> + <i>Terminalia muelleri</i> + <i>Diospyros maritima</i> + <i>Thespesia populneiodes</i> + <i>Drypetes deplanchei</i> .	Basalt platforms with veneer of wind-blown sand.	3.2.2a	LC	OC
2i	Semi deciduous notophyll vine thicket + <i>Berrya javanica</i> + <i>Cupaniopsis anacardioides</i> + <i>Bombax ceiba</i> var. <i>leiocarpum</i> + <i>Diospyros hebecarpa</i> + <i>Mimusops elengi</i> + <i>Melicope peninsularis</i> .	Basalt scree slopes	3.8.5a	OC	OC
2j	Semi-deciduous notophyll vine forest + <i>Bombax ceiba</i> var. <i>leiocarpum</i> + <i>Diospyros hebecarpa</i> +/- <i>Alectryon repandodentatus</i> + <i>Cupaniopsis anacardioides</i> + <i>Alstonia spectabilis</i> +/- <i>Melicope peninsularis</i> .	Basalt scree slopes	3.8.5a	OC	OC
2k	Deciduous vine forest + <i>Gyrocarpus americanus</i> +	Sheltered gullies in basalt	3.8.5b	OC	OC

Vegetation Community	Description	Geological Association	Regional Ecosystem	VMS ¹	BDS ²
	<i>Bombax ceiba</i> var. <i>leiocarpum</i> + <i>Antiaris toxicaria</i> var. <i>macrophylla</i> + <i>Canarium australianum</i> + <i>Cathormion umbellatum</i> subsp. <i>monoliforme</i> + <i>Garuga floribunda</i> var. <i>floribunda</i> +/- <i>Adenanthera pavonina</i> +/- <i>Maranthes corymbosa</i> .				
2l	Semi-deciduous notophyll vine forest + <i>Bombax ceiba</i> var. <i>leiocarpum</i> + <i>Gyrocarpus americanus</i> + <i>Garuga floribunda</i> var. <i>floribunda</i> + <i>Manilkara kauki</i> + <i>Diospyros maritima</i> + <i>Celtis philippensis</i> .	Beach sands	3.2.2b	LC	OC
2w	Deciduous vine thicket + <i>Garuga floribunda</i> var. <i>floribunda</i> + <i>Gyrocarpus americanus</i> + <i>Bombax ceiba</i> var. <i>leiocarpum</i> +/- <i>Antiaris toxicaria</i> var. <i>macrophylla</i> .	Mid and upper slopes along gully lines	3.8.5c	OC	OC
17b	<i>Themeda triandra</i> +/- <i>Imperata cylindrica</i> +/- <i>Mnesithea rottboellioides</i> grassland.	Hillslopes on basalt	3.8.4b	OC	OC
17be	<i>Themeda triandra</i> +/- <i>Imperata cylindrica</i> +/- <i>Mnesithea rottboellioides</i> grassland (infested with <i>Lantana camara</i>)	Hillslopes on basalt	3.8.4b	OC	OC
17bs	<i>Themeda triandra</i> +/- <i>Imperata cylindrica</i> +/- <i>Mnesithea rottboellioides</i> grassland (subject to secondary shrubby thickening).	Hillslopes on basalt	3.8.4b	OC	OC
22a	Tall palm (<i>Cocos nucifera</i>) woodland and open forest with mesophyll/notophyll vine forest sub-canopy of <i>Myristica insipida</i> and <i>Lepidopetalum fructoglabrum</i> .	Flat topped hillslopes on basalt	Non-remnant	Non-remnant	Non-remnant
24a	Mangrove closed and open forest, woodland and shrubland complexes (24d/24c – 80/20).	Estuarine muds (periodically inundated)	3.1.1/ 3.1.2	LC	NCAP/OC
24c	<i>Avicennia marina</i> subsp. <i>eucalyptifolia</i> open to closed forest.	Estuarine muds and sands (periodically inundated)	3.1.2	LC	OC

1. Vegetation Management Status and per the Vegetation Management Act, 1999.

2. Biodiversity Status as designated by EHP.

OC= Of Concern Regional Ecosystem

LC= Least Concern Regional Ecosystem

NCAP = No Concern at Present – Biodiversity Status

5.2 Flora Species

The composition of the Erub flora has been compiled from analysis of Herbarium data (Herbrechts 2011), Smith and Smith (2006), Freebody (2006), Department of Agriculture, Forestry and Fisheries (DAFF) weed lists prepared by Steven McKenna (2011), 3D Environmental survey data (Stanton *et al.* 2009), and field surveys carried out by 3D Environmental with Erubam Rangers in March 2011.

The total known flora of 281 species comprises 193 native species (see **Appendix D**) and represents approximately 21% of the known flora for the Torres Strait Islands. There are 83 families with 200 genera. The 88 introduced species account for 31% of the island flora. A comparison of the island flora in relation to other Torres Strait Islands and regional floras is provided in **Table 3**. The 24% of the islands vascular flora that is naturalised compares to 15% for Torres Strait Islands (Stanton *et al.* 2009), 7.4% for Cape York Peninsula (Neldner & Clarkson 2005), and 13% for Queensland (Bostock & Holland 2010).

Table 3. Summary of the vascular flora of Erub Island in relation to Torres Strait Islands (Stanton *et al.* 2009), Cape York Peninsula (Neldner & Clarkson 1995 in Neldner 1998), Great Barrier Reef Continental Islands (Batianoff & Dilleward 1997), and Queensland flora (Bostock & Holland 2010).

Islands	Families/Species	Pteridophytes	Gymnosperms	Angiosperms	Total
Erub	Families	1	0	82	83
	Species	1	0	280	281
Mer	Families	3	0	78	82
	Species	7	0	291	299
Iama	Families	2	0	79	81
	Species	2	0	257	259
Boigu	Families	3	0	69	72
	Species	4	0	239	243
Mabuiag	Families	2	1	101	104
	Species	4	1	429	434
Badu	Families	11	2	117	130
	Species	17	2	586	592
Torres Strait Islands (Combined)	Families	15	1	158	174
	Species	39	1	1289	1330
Cape York Peninsula	Families ²	30	5	183	218
	Species	157	6	3173	3338
Great Barrier Reef Continental Islands ³	Families	25	5	165	195
	Species	97	7	2091	2195
Qld Flora	Species	392	68	9246	9706

5.2.1 Flora Species with Biodiversity Significance

An assessment of significant flora species draws from the data sources identified above and seeks to provide details sufficient to document additional flora and habitats that should be considered a priority and focus for management actions. With consideration of the existing Torres Strait Region Back on Track Species Prioritisation program (DERM 2009) and ongoing assessments of the status of Queensland flora by the Queensland Herbarium, additional and complementary species management criteria have been assessed. Species have been broadly categorised into significance categories (i.e. national, state, regional and cultural) based on criteria, which include legislative status, threatened or

² Cape York flora utilises Henderson (2002).

³ Batianoff & Dilleward (1997) identify 552 continental islands along the east coast of Queensland within the Great Barrier Reef Marine Park (GBRMP), a total land area of about 1 627 km².

sensitive, restricted, otherwise noteworthy, or of cultural value. The 14 species identified as having significance at the national, state, and regional level are summarised in **Table 4** below.

Table 4. Summary of flora with biodiversity significance on Erub Island.

Species	National EPBC Act	State NC Act	Regionally Significant	Broad Vegetation Group
<i>Alectryon repandodentatus</i> (Sapindaceae)	E	E	-	Semi-deciduous notophyll vine forest. Successional vine shrubland. Deciduous notophyll vine thicket.
<i>Alpuda mutica</i> (Poaceae)	-	NT	-	Semi deciduous vine thicket margins and grassy headlands.
<i>Neololeba atra</i> (Poaceae)	-	NT	-	Semi-deciduous notophyll vine forest.
<i>Operculina brownii</i>	-	NT		
<i>Atalaya sericopetala</i> (Sapindaceae)	-	-	Disjunct. Northern limit of Australian distribution.	Semi deciduous vine thicket understorey and grassland margins.
<i>Crotalaria sp. (Torres Strait J.R.Clarkson 2044) (Fabaceae)</i>	-	-	Disjunct	Grasslands.
<i>Flacourtia sp. (Shiptons Flat L.W.Jessup 3200) (Flacourtiaceae)</i>	-	-	Cape York Peninsula (CYP) endemic. Disjunct Northern limit of distribution	Semi-deciduous notophyll vine forest, Successional vine shrubland.
<i>Harpullia arborea</i> (Sapindaceae)	-	-	Disjunct. Northern record of Australian distribution. Locally restricted.	Semi-deciduous notophyll vine forest.
<i>Lepidopetalum fructoglabrum</i> (Sapindaceae)	-	-	Disjunct Locally restricted.	Semi-deciduous notophyll vine forest.
<i>Mallotus claoxyloides</i> (Euphorbiaceae)	-	-	Disjunct. Northern limit of Australian distribution.	Semi-deciduous notophyll vine forest. And deciduous vine thicket.
<i>Smilax blumei</i> (Smilacaceae)	-	-	Disjunct	Semi-deciduous notophyll vine forest.
<i>Syzygium bungadinnia</i> (Myrtaceae)	-	-	CYP endemic. Disjunct Northern limit of distribution. Cultural uses.	Semi-deciduous notophyll vine forest.
<i>Uvaria rufa</i> (Annonaceae)	-	-	Disjunct. Locally rare. Cultural uses.	Semi-deciduous notophyll vine forest.
<i>Voacanga grandiflora</i> (Apocynaceae)	-	-	Disjunct. Locally rare with restricted habitat.	Semi-deciduous notophyll vine forest.

National Significance

One species listed under the EPBC Act is known to occur.

***Alectryon repandodentatus* – Endangered (Sapindaceae):** A small to medium tree, with soft hairy pinnate leaves (1-3 pairs of leaflets), rusty, golden-coloured hairs on new growth and branchlets, and reddish new leaf shoots. New foliage is flushed with red. The species is known

from semi-deciduous and deciduous vine forest and thicket on Mer, and Erub, evergreen notophyll vine forest on Dauan, and from semi-deciduous mesophyll vine forest in Lockerbie Scrub near Bamaga, Cape York Peninsula. It also occurs in Papua New Guinea, in the central district near Port Moresby (Fell and Stanton pers. obs.). It is a common species on Erub occurring in and on the margins of vine forest and thicket and disturbed vine forest communities. Its population and ecology requires further investigation to determine management needs although invasion of lantana on forest margins is actively impacting on vine forest margins where the species occurs.



Photographs 2 & 3. *Alectryon repandodentatus*

State Significance

Six species listed on the Amended Regulations of the NC Act are known to occur.

***Alectryon repandodentatus* – Endangered (Sapindaceae):** see above.

Mauritian grass – Near-Threatened (*Apluda mutica*) (Poaceae): A perennial grass known from India through SE Asia to the Torres Strait where it has been recorded from Saibai Island in Pandanus woodlands, and Mer (Clayton *et al.* 2011, Symons 2011). On Erub, the grass has been recorded on rocky outcrops with skeletal soil, just above southern shoreline (Waterhouse specimen notes in HerbreCs 2011). Information on its ecology and population size is currently lacking. Lantana invasion and conversion of grassland into shrubland are identified as threatening processes.

Cape bamboo – Near-Threatened (*Neololeba atra*) (Poaceae): A native bamboo known from Torres Strait, Cape York Peninsula and north eastern Queensland in the understorey of rainforest habitats. The species also occurs in Papua New Guinea, the Moluccas, northern Sulawesi and the Philippines (Hyland *et al.* 2003). On Erub, it is typically associated with the understorey of vine forests. Known also in the Torres Strait from Mua, Badu, Dauan, Iama, Mer and Naghir. Populations on Erub are considered restricted but robust.

***Operculina brownii* – Near-Threatened (Convolvulaceae):** A scrambling or twining annual or perennial climber with white tubular flowers. On Erub, it is known from a single

specimen from vine thicket margins. Additional surveys are required to determine the extent of the population. It has also been recorded from Iama, Dauan, Thursday and Pumpkin Islands (Herbrechts 2011).



Photograph 4. The native bamboo *Neololeba atra*

Regional Significance

The classification of regionally significant species takes into account factors such as disjunct occurrence, endemism (at the bioregional, bioprovince, and island scales), limits of geographic distribution, and local rarity in the landscape. Ten regionally significant species are recognised on Erub.

Table 5. Summary of regionally significant flora species, Erub Island.

Species	Comments
<i>Atalaya australiana</i> (Sapindaceae)	A shrub or small tree to 10m inhabiting vine thicket understorey and margins and grasslands with shrubby thickening (2k, 17b). A Qld endemic known from Iron Range to Chillagoe in vine thickets and open forests. Known elsewhere in Torres Strait from Gebar, Naghir (2t, 2u), Mua (2o, 4a), Muralug (16d) and Friday (16e) Islands. Erub populations are disjunct and representing part of the species northern limits of distribution.
<i>Crotalaria</i> sp. (Torres Strait J.R. Clarkson 2044) (Fabaceae)	A highly disjunct species only known from a few islands in Torres Strait and the northern Barrier Reef continental islands. Populations on Erub are known from a Herbarium specimen with limited details regarding habitat and abundance. The Erub occurrence is disjunct representing the northern limit of distribution.
<i>Flacourtia</i> sp. (Shiptons Flat L.W.Jessup 3200) (Flacourtiaceae)	A small tree endemic to the Cape York Peninsula (CYP) bioregion. Populations on Mer and Erub are disjunct and represent northern limits of distribution. It occurs throughout the understorey of vine thicket on basalt. Populations appear robust.
<i>Harpullia arborea</i> (Sapindaceae)	A tree known from the eastern rainforests of northern and southern CYP. The tree is rare in Torres Strait with the Erub occurrence representing a disjunct population and the northern record of its Australian distribution. It also occurs in Papua New Guinea (PNG) and Pacific Islands. The habitat is restricted.
<i>Lepidopetalum fructoglabrum</i> (Sapindaceae)	Populations of this small rainforest tree are predominately found in the understorey of former garden areas in the forested eastern parts of the island. The species also occurs in CYP and PNG. Occurrences in Torres Strait are disjunct and limited to Mer and Erub. The species has cultural values based on traditional use.
<i>Mallotus claoxyloides</i> (Euphorbiaceae)	A shrub to small tree to 5m found in the understorey and margins of semi deciduous vine forest and thicket (Forster 1999). Rare in Torres Strait with the Erub occurrence part of a number of highly disjunct populations in CYP and Torres Strait, which represent the northern limits of distribution in Australia. Known also from PNG. Can be confused with the equally restricted <i>M. ficifolius</i> and further collections are required.

Species	Comments
<i>Smilax blumei</i> (Smilacaceae)	A slender vine that occurs in vine thickets and forests on Erub. Rare and poorly known in the Torres Strait with the Erub Island occurrence representing a disjunct population. Also known from Malesia.
<i>Syzygium bungadinnia</i> (Myrtaceae)	A tree to 20m found in vine forest on Erub. An endemic to the CYP bioregion occurring from Iron Range in the south to the Torres Strait Islands. The Erub occurrence is part of a number of highly disjunct populations in the Torres Strait, which represent the northern limits of distribution. It is known also from Mabuiag, Mua, Badu, Mer and Dauan. Fruit is edible.
<i>Uvaria rufa</i> (Annonaceae)	A scrambling shrub or liana known from vine forest and thicket habitats between Coen and Thailand. Occurrences on Erub as well as Mer, Badu, Mabuiag, Mua, Prince of Wales and lama are disjunct and restricted. Fruit is edible.
<i>Voacanga grandiflora</i> (Apocynaceae)	A shrub to small tree with large leaves and a copious milky sap. In Torres Strait it is restricted to vine forest habitats on Badu (4a) and Mua (2v, 3d) as well as Erub. Occurs on the north-eastern part of CYP and in PNG and Malesia. Erub record (Freebody 2006) requires field verification. Erub population is disjunct and locally rare with a restricted habitat.

5.2.2 Introduced Plants

Information on weed species has been sourced from Stanton *et al.* (2009), Queensland Herbarium specimen data, field data of Fell (2009, 2010), previous studies of Freebody (2006), Smith & Smith (2006), and lists kindly supplied by Steven McKenna from DAFF.

The use of the land for gardening and as a resource for traditional resources is long standing, and the cultural links with the south pacific region and PNG is likely to have facilitated the movement of plants throughout the region (Haddon 1935, Shukul 2004). Many of these introductions were useful plants of horticulture for example banana (*Musa* spp.), cassava (*Manihot* spp.), taro (*Calocasia* spp.), papaya (*Papaya carica*), and yams (*Dioscorea* spp.), however others such as poinciana (*Delonix regia*) and hibiscus (*Hibiscus* spp.) have been introduced for aesthetic horticultural values.

These early and more recent anthropogenic introductions together with those plants brought to the island by the natural dispersal mechanisms of wind, water and birds, total 87 species which accounts for 31% of the island flora. As for all of the inhabited Torres Strait Islands, the majority of these introductions are associated with disturbed and developed areas within and surrounding the Erub community and fringing disturbed sites such as major roads and tracks, dump, airfield, recreation areas and cemetery. Remnant vegetation on the island is becoming increasingly affected by weeds and a number of species pose serious threats to the islands natural and cultural values.

Declared Weeds

Declared weeds on the LP Act recorded on the island are:

Lantana (*Lantana camara*)

Lantana is a Class 3 Declared Weed and listed as a WONS species. It is currently widespread on Erub, Mer and Ugar and poses a potential threat to deciduous vine thickets and forests, shrublands and grasslands on other Torres Strait Islands. The weed is a climbing shrub and is thought to have been brought to Erub as a garden plant in the early 1900's for its attractive flowers. The fertile and well drained basalt soils are ideal for the plant and over many years it

has slowly but surely established itself over the island via seed dispersal by birds. Lantana now occurs along tracks, on the margins of disturbed areas in parts of the island, and on coastal headlands and cliffs. Dense forested vegetation seems to be currently limiting its infiltration into the forest interior however its invasion into forest gaps probably inevitable. Its proliferation within the grasslands and shrublands is more robust. Large areas are heavily infested and isolated patches are beginning to colonise throughout the grassland ecosystem, although an ongoing burning regime over grasslands is limiting the establishment in grassy habitats. Without urgent management intervention Lantana will continue its inevitable course towards total transformation of the island landscape, and thus critically impact the preservation of the environment and culture.

To achieve the management of habitats currently impacted by lantana there is a requirement for planning, raising community awareness, resourcing, training, and habitat management. An integrated control program using an integration of fire management, and herbicide control methods of splatter gun application of glyphosate and cut stump application are widely accepted best practise methods. Recommendations for the management in habitats are provided in relevant sections of the document.

Singapore daisy (*Sphagneticola trilobata*)

Singapore daisy is a Class 3 declared vigorous creeping ground cover that has become established on Erub in a number of locations in and around the community. The plant will out-compete native species and is a significant threat to a number of habitats across the island. Control of existing populations should be considered a high priority management action.

Sicklepod (*Senna obtusifolia*/*Senna tora*)

Sicklepod (*Senna obtusifolia*) and foetid senna (*Senna tora*) are Class 2 declared weeds that are vigorously growing, annual woody shrubs to 1.5–2.5 m in height. They are thought to originate from America and are considered a weed of pasture and sugar cane along the tropical east coast of Queensland (from Sarina to the tip of Cape York Peninsula) and the Top End of the Northern Territory (Biosecurity Queensland 2007). The species has been recorded on the island by McKenna (2011) however the location and extent of the population is not known. Sicklepods preference for well drained fertile soils, often in coastal areas, renders the grassy ecosystems on Erub particularly vulnerable. Once established it is difficult to control due to the large seed reserves which can remain viable for up to 10 years. Surveys for the presence of this species are required followed by prompt eradication and follow up control.

Chinee apple (*Ziziphus mauritiana*)

Chinee apple weed is a declared Class 2 plant. It is a large shrub or small spreading tree up to 8 m high and 10 m in canopy diameter. Plants are densely branched, and in dense stands can form thorny impenetrable thickets. Mature trees produce large quantities of fruit that are readily

eaten by stock, feral pigs, wallabies and birds, which assists the spread of the seed. Damage to top parts of the plant usually ensures regrowth from lignotubers or cut roots. A single collection of chinee apple has been recorded by Barbara Waterhouse in March 2008 on the hillside behind the Erub Restoration Full Gospel Church. It is not known if the plant has since been destroyed or if any other plants exist in the vicinity. Surveys to detect the plant are a priority with follow up control measures as appropriate.

Yellow bells (*Tecoma stans* var. *stans*) – Class 3

A medium to tall densely branched shrub with attractive yellow flowers, which is common in house gardens throughout inhabited area. It has a papery wind-blown seed, which readily germinates in disturbed areas and native bushland. The species is common within settled areas although has potential to spread significantly through grassland habitats as has occurred on Mer.



Photograph 5. Yellow bells (yellow flowers lower left) on the margins of foreshore coastal shrubland, Poruma.

Environmental Weeds Present

Praxelis (Praxelis clematidea)

Praxelis is a highly invasive, erect, branched, unpleasant-smelling herb thought to have been introduced as a contaminant of building materials or equipment. It is a native of South America and is known to spread rapidly by wind-blown seeds along roadsides. It can spread into native bushland forming dense monospecific stands that exclude other vegetation. Praxelis is known to invade grasslands, woodlands and rock pavements in the Mareeba and Mt Molloy districts and therefore is considered a serious threat to similar habitats on Mer and Erub.

Leucaena (Leucaena leucocephala)

An exotic tall shrub to small tree up to about 6 m tall with fine bipinnate leaflets. The weed is also present on Boigu, Saibai, Mua, Mer, Ugar, Thursday and Horn Islands. The weed is entrenched within the community area with infestations along roadsides and housing areas. The abundance of the plant and its roadside occurrence means there is likelihood that it will be dispersed to other parts of the island by mechanical means such as machinery and associated

soil movement, and vehicles. Grassland habitats are currently free of the weed however future invasion is expected without management intervention. The weed therefore poses a significant threat to cultural and natural values of the island.

Tropical kudzu (*Pueraria montana var. lobata*)

Kudzu is a robust and aggressive tropical legume with large hairy trifoliate leaves and a large edible underground tuber. It is originally from Asia, and is naturalised in Papua New Guinea, other parts of Malesia and the Pacific Islands where it is utilised as a forage crop, a food resource, and for medicinal purposes. It is now naturalised in Cape York Peninsula, north eastern Queensland and southwards as far as north-eastern New South Wales usually growing on disturbed sites and agricultural land, and sometimes on rain forest margins (Hyland *et al.* 2003). On mainland Queensland, the vine is a Class 2 declared weed and is listed as noxious in NSW. The International Union for Conservation of Nature (IUCN) has listed kudzu among the world's 100 worst invasive species (IUCN Global Invasive Species Database 2002) and it is a severe problem in the USA and Japan.

Kudzu has been present in Queensland since at least 1941 (Csurhes 2008). The Torres Strait occurrences are from Dauan, Mua, Hammond, Erub, Mer and Hammond Islands (Herbrechts Data 2011). Torres Strait Islanders consider it to be native and there is some evidence that it has a long history of use and transportation as a source of food, possibly originating in Asia but then taken south through Indonesia and across the Pacific (Csurhes 2008). On Mer the tuber is a traditional food resource known as 'Weskapu'.

The declared status of kudzu does not apply in the Torres Strait. Recent studies (Csurhes 2008) have raised doubts as to the botanical identity of the plant given that Torres Strait Islands populations do not appear to be invasive and appear far less aggressive than kudzu in South East Queensland. However on the evidence of recent field observations (D. Fell pers. obs. March 2011), kudzu was affecting native vegetation by climbing and smothering forest edges, and is therefore considered as a emerging threat to forest ecosystems on Mer and Erub. Further observations are required to monitor the spread of kudzu and its impact on native vegetation.

Weed Threats

This section considers those weeds not recorded on Erub which are capable of causing long-term changes to biodiversity.

Table 6. Weed threats.

Species	Comments	Photograph ⁴
Gamba grass (<i>Andropogon gayanus</i>)	Gamba is a Class 2 Declared Weed that has not yet been recorded in Torres Strait however, it is considered a serious potential threat. Together with annual mission grass it is listed as a Key Threatening Processes under the EPBC Act. It is widespread in the Bamaga district of northern Cape York Peninsula (Fell <i>et al.</i> 2009). The grass is an aggressive colonist which develops a standing biomass of 5-7 times that of native species resulting in extremely intense fires (Rossiter <i>et al.</i> 2003).	 <p data-bbox="991 501 1353 533">Gamba grass near Injinoo (April 09).</p>
Annual mission grass (<i>Cenchrus pedicellatum</i> subsp. <i>unispiculum</i>)	An aggressive robust annual grass capable of inducing habitat change through altering fire behaviour. Known from Mua (St Pauls), Mabuia, Masig, Poruma and Horn. The invasion of annual mission grass is listed as a Key Threatening Processes under the EPBC Act. It threatens biodiversity in northern savannas by competing with native annual grass species and rapidly occupying disturbed areas with the ability to remain green until the late dry season providing fuel for fires which occur later and are hotter than normal seasonal fires (DEWHA 2011).	 <p data-bbox="991 833 1353 909">(source NT Govt.) http://www.nt.gov.au/nreta/natres/weeds/find/missiongrass.html</p>

5.2.3 Plants with Cultural Significance

Information on useful plants of Erub compiled in this study is considered insufficient to prepare any detailed account. A review of available literature such as Haddon (1912a, 1912b), Smith & Smith (2006), Freebody (2006), and notes from specimens lodged with the Queensland Herbarium, provides some preliminary information on plant names. Information on uses is however minimal. Further field work with Erub Rangers and community members is required to develop a foundation for the ongoing recording of Traditional Ecological Knowledge (TEK) as part of the Land and Sea Ranger working on country plans. This will complement existing lists of useful plants, local language names, uses and other values to include information on seasonality, habitat, distribution, abundance, phenology, and the relationships to story and culture.

6.0 Fauna (Animals)

As for the majority of Torres Strait Islands there is a considerable lack of systematic survey of fauna habitats on the island. Avifauna (birds) have been the most comprehensively studied component of Torres Strait's terrestrial fauna. Other records are incidental, or part of broader regional surveys targeted towards particular groups (e.g. Draffan *et al.* 1983, Clarke 2004, Garnet *et al.* 2000, Hall 2008, Helgen 2004). Recent surveys on Erub (Conics 2009b) while limited represent the most comprehensive data available for the island. In addition, there is little available information on the cultural significance of terrestrial fauna species. Some data on this topic can be found in the *Reports of the Cambridge Anthropological Expedition to Torres Straits* (Haddon 1901-1935). Systematic

⁴ All photographs D.Fell & D. Stanton unless otherwise noted.

collecting across the range of habitats is however likely to greatly increase the number of known species and further contribute to the identification and development of management strategies. It is therefore recommended that surveys become an identified ranger work activity, supported by relevant specialists.

The desktop review identified 112 fauna species that have been reported for Erub Island (**Appendix D**). This includes one frog, 20 reptile, 86 bird and five mammal species. Of these, one reptile, one bird and four mammal species are introduced. An additional species has been identified by the Protected Matters Search Tool as possibly occurring.

6.1 Culturally Important Fauna Species

The current available information on useful animals of Erub Island is scant. Whilst insufficient to provide any detailed account, the familiarity of Torres Strait Islanders' with the natural world was noted over 100 years ago by the English anthropologist Alfred Cort Haddon (1912:230):

'[they] are good field naturalists and have names for a large number of plants and animals. A considerable number of plants are utilised in one way or another, more so than we have mentioned in these Reports. Although the land fauna is deficient in forms of economic importance, the natives have names for animals which are not of value to them, and are acquainted with their habits; their knowledge of the natural history of marine animals being very extensive. The uses and properties of most of the plants are known to them.'

The region's birds, mammals and reptiles also have cultural significance for Torres Strait Islanders. Many feature in local myths and legends, and some are clan totems. The calls of some birds are recognised as omens, foretelling events such as weather, the arrival of a ship or the death of a relative (e.g. Haddon 1908:260-261), others are 'calendar species' which alert people to the fact that a particular food resource is now available. Feathers from birds such as herons (*Egretta sacra* and *Ardea* spp.) and the cassowary (*Casuarius casuarius* – obtained from Papua New Guinea traders) continue to be used for traditional head-dresses.

Further fieldwork by the Land and Sea Rangers coupled with review of literature is required, with all information incorporated into an appropriate TEK system. This includes information on uses, habitat, distribution, abundance, and most importantly the relationships to story and culture. The fauna species list provided in **Appendix E** of this report provides a foundation to incorporate language names and habitats.

6.2 Fauna Habitat Values

There has been very limited fauna work conducted on Erub Island with few documented records of even common species (e.g. DERM 2010b) and the faunal values of the island remain poorly known. Conics (2009b) report that much of the northern coastline is in relatively pristine condition, and that the majority of beaches lie within coves protected by high cliff faces. There are small networks of watercourses which flow intermittently, based on season. Some of the watercourses are fed by

groundwater seepage and may be an important resource for fauna. Land erosion, particularly in grasslands on upper slopes, is a major issue on the Island. Habitats on Erub include vine forest, though much of this is disturbed by weed invasion, grasslands, beaches and a limited amount of mangroves (Natural Solutions 2008a). Vine forest and mangroves are the habitat most likely to provide resources for any mammal, reptile or frog species as yet unknown for the island.

Only one frog species, green tree frog *Litoria caerulea* has been recorded on the island. The frog fauna of the Torres Strait is somewhat depauperate based on known records, and the majority of species is confined to larger islands such as Mua and/or islands close to Cape York Peninsula. A few additional species may yet be found on Erub, but these are likely to be common, widespread species.

The reptile assemblage, 20 species, is large in terms of the overall terrestrial vertebrate assemblage of 112 species, and reflects both collecting undertaken for the Australian and Queensland Museums and limited work on mammals. The size and location of Erub Island suggest that few unrecorded species of reptile should be expected to be found, though the mangroves and vine forest are likely habitats for some additional reptile species.

Most of the bird species recorded in the Torres Strait are highly mobile and many are migratory, including many species that are not listed as Migratory under the EPBC Act. It is likely that any additional species reported for Erub Island will be highly mobile species. Thirty-four native mammal species are reported or predicted for the Torres Strait (**Appendix D**), though it is doubtful that some of these species actually occur and the identification of other species is questioned. Regardless, the native mammal fauna of the Strait is dominated by bats, with 20 reported species. Seven rodents are reported, though only one, grassland melomys, is widespread. No dasyurids (quolls) or possums and gliders are reported, and current records of macropods are limited to islands to the south.

At this stage the only native mammal reported from Erub Island is grassland melomys (Natural Solutions 2008a). Other native ground-dwelling mammals are not considered likely to occur. Natural Solutions did not record any species of bat though they were advised by community members that flying-foxes were present on a nearby island. It is likely that both micro-bats and mega-bats will be recorded on Erub Island during future field work.

6.3 Fauna Species with Conservation Significance

In this report fauna of conservation significance include:

- Species listed as Critically Endangered, Endangered or Vulnerable under the EPBC Act.
- Species listed under Endangered, Vulnerable or Near-Threatened under Queensland's NC Act.
- species listed as Migratory under the EPBC Act due to their inclusion under one of more of the following:
 - Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention),

- China-Australia Migratory Bird Agreement (CAMBA)
- Japan-Australia Migratory Bird Agreement (JAMBA)
- Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)
- Species considered of 'Critical' or 'High' priority under the Back on Track framework (DERM 2011).

6.3.1 Critically Endangered, Endangered, Vulnerable and Near-Threatened Species

The following section provides an overview of those species that are known to occur, or potentially occur on Erub Island. Twenty-five of the 384 species reported or predicted for the Torres Strait are listed as Critically Endangered, Endangered, Vulnerable or Near-Threatened under the EPBC Act and/or NC Act. Fifty-eight species are listed as Migratory under the EPBC Act (see **Appendix D**). Of these, five species of conservation significance are reported from or predicted to occur on Erub Island including one reptile, three birds and one mammal as identified in **Table 7**. Given that there are no confirmed records of spectacled flying fox in the Torres Strait Islands, this species is considered unlikely to occur despite its predicted occurrence by the EPBC protected matters search tool. The record of Jardine River turtle is also suspect due to a lack of suitable habitat and if it is present on the island, is likely to have been translocated. Islands of the Torres Strait have been inadequately surveyed for fauna so records and predictions from throughout the Strait are included to aid in the identification of additional species likely to be present on Erub Island.

Table 7. Endangered, Vulnerable and Near-Threatened fauna species¹ reported or predicted² to occur on Erub Island.

Scientific Name ³	Common Name	Status ⁴			Comments ⁶
		EPBC Act	NC Act	BoT ⁵	
SPECIES REPORTED					
<i>Emydura subglobosa</i>	Jardine River turtle	-	NT	-	Queensland Museum record.
<i>Esacus magnirostris</i>	Beach stone-curlew	-	V	High	Database & published records
<i>Numenius madagascariensis</i>	Eastern curlew	M	NT	-	Database & published records.
<i>Sternula albifrons</i> ⁷	Little tern	M	E	High	Published & unpublished records.
SPECIES PREDICTED					
<i>Pteropus conspicillatus</i>	Spectacled flying-fox	V	LC	High	Predicted by the EPBC Protected Matters Search Tool – occurrence considered unlikely.

1. Listed as Endangered, Vulnerable, Near-Threatened or Migratory under the EPBC Act 1999 and/or the NC Act 1992 or of critical or high priority under the Back on Track prioritisation framework (DERM 2011).
2. Predicted by the EPBC Protected Matters Search Tool maintained by DSEWPC (2011g). Only noted if not recorded from another source.
3. Nomenclature follows the Australian Faunal Directory (DSEWPC 2011d).
4. Status: V = Vulnerable, NT = Near-Threatened, M = Migratory, LC = Least Concern (Common).
5. BoT = Back on Track priority species.
6. Known from Museum records, published literature (eg Storr 1973; Draffan *et al.* 1983), WildNet database and/or reports and other grey literature (eg Smith & Smith 2006; Natural Solutions 2008a). These sources are not necessarily mutually exclusive.
7. Listed under the EPBC Act as *Sterna albifrons* (Bonn Convention, CAMBA, JAMBA, ROKAMBA).

Additional possible EVNT species

Natural Solutions (2008a) reports that some areas of mangroves, coastal water bodies and salt pans on Erub Island are inhabited by salt-water crocodiles, and a small crocodile was observed during field survey associated with this survey, although the species is not listed as a survey record and no other mention is made of the species despite its status under the EPBC Act and NC Act.

It is also possible that slender chained gecko, littoral whiptail-skink, emerald monitor and coastal sheath tail bat will occur on Erub Island. Spectacled flying-fox is predicted to occur by the EPBC Protected Matters Search Tool but a lack of actual database or published records in Torres Strait for such a readily identifiable species makes its occurrence unlikely, particularly given Erub's size and comparative isolation. There is no record of a flying-fox for the island. Species profiles for those EVNT species known or expected to occur are provided in **Section 6.3.2**, excluding spectacled flying fox and Jardine River turtle.

6.3.2 Profiles of Significant Known from or Possibly Occurring on Erub Island

Eastern curlew (*Numenius madagascariensis*)

EPBC Act: Migratory (Bonn Convention, CAMBA, JAMBA, ROKAMBA);

NC Act: Near-Threatened

The eastern curlew is mostly confined to coastal habitats, particularly estuaries, harbours and coastal lagoons. They mainly forage on open intertidal mudflats, sandflats and saltmarsh, often near mangroves, and occasionally on ocean beaches. Roosting occurs on sandy spits and islets, in mangroves and saltmarsh, and along high water mark on beaches (Pringle 1987; Higgins & Davies 1996). The species usually feeds individually or in small groups (Pringle 1987), though large numbers may congregate at high tide roosts (Lane 1987).

Eastern curlews breed in eastern Siberia during the northern hemisphere summer and arrive in north-eastern Australia as early as late July, but most individuals arrive in eastern Australia by late August and September (Ueta *et al.* 2002). Birds begin to depart to return to breeding grounds around March and April (Lane 1987). However, a significant percentage of the Australian population remains through the Australian winter, particularly in northern Australia (Pringle 1987; Driscoll & Ueta 2002). In Australia eastern curlews occur in suitable habitat on all coasts (Higgins & Davies 1996). In the Torres Strait Draffan *et al.* (1983) reported them from 18 islands, including Badu, Mua, Mer, Erub and Boigu, and there is a single WildNet record from Mabuiag (DERM 2010e) and an unpublished record from lama (Conics 2009c). The species is likely to occur, at least on passage, on any island that has suitable foraging habitat.

Eastern curlews are easily disturbed by people at foraging and roosting sites (Higgins & Davies 1996; Taylor & Bester 1999) and are often the first species in a high-tide roost to take to flight if disturbed, relocating to alternative roosts often some considerable distance away (Lane 1987). Eastern curlews

will take off when humans approach to within 30-100 m (Taylor & Bester 1999) and sometimes are disturbed within 250 m of approach (Higgins & Davies 1996). Pollution may have also reduced food availability (Higgins & Davies 1996).

Little tern (*Sternula albifrons*)

EPBC Act: Migratory (Listed under the EPBC Act as *Sterna albifrons* (Bonn Convention, CAMBA, JAMBA, ROKAMBA).

NC Act: Endangered

The little tern is also considered of 'high' priority under the back on track species prioritisation framework (DERM 2011a).

The little tern is found along a variety of coastal areas, including open beaches, lagoons, estuaries, river mouths, lakes, bays, harbours and inlets, especially those with exposed sandbanks. They feed primarily on small fish, crustaceans and other invertebrates and nest on open sandy beaches. Nesting occurs mainly from September to January but in northern Australia nesting also occurs from April to July. Little terns breed in small colonies (Pringle 1987; Higgins & Davies 1996).

The species occurs in Europe, Asia and Australasia and in Australia occurs along the coastal regions of eastern Australia, south to Tasmania, and across northern Australia, west to northern parts of Western Australia (Higgins & Davies 1996). The little tern is mainly a summer visitor to northern Australia, including Torres Strait, though there is a winter-breeding population in the Gulf of Carpentaria (Blakers *et al.* 1984). Draffan *et al.* (1983) reports the species from 13 islands, and describes it as an uncommon summer visitor throughout the Torres Strait.

The little tern in Australia is both increasing in abundance and expanding its distribution. The species has a naturally high rate of breeding failure, with ground-nesting making it vulnerable to natural events that contribute to low success, such as loss of eggs and chicks through native predators, flooding of nesting sites (including high tides), and adverse weather conditions (Garnett & Crowley 2000). Little terns are also threatened by human disturbance at nesting colonies, encroachment of vegetation in colonies (Blakers *et al.* 1984), nest predation by rats, gulls and feral pigs, and by degradation of estuaries, pesticide residues in fish, and oil-fouling of both birds and beaches (Garnett & Crowley 2000). On Erub Island it is likely to be threatened only if breeding occurs in any location.

Beach stone-curlew (*Esacus magnirostris*)

NC Act: Vulnerable

Beach stone-curlew is also considered of 'Critical' priority under the Back on Track species prioritisation framework (DERM 2011a). Formerly known as beach thick-knee and as *Burhinus neglectus*.

The beach stone-curlew generally occurs singularly or in pairs, and occasionally in small groups of up to six birds. The species is exclusively coastal, occurring on all types of beaches, especially near river mouths, on mudflats, near mangroves, and occasionally on coastal lagoons. It is typically more common on islands than the mainland (Lane 1987; Marchant & Higgins 1993). The species is mainly nocturnal or crepuscular and adult birds appear to be sedentary. The species feeds predominately on crabs and other marine invertebrates in the intertidal zone and a single egg is laid in a scrape in the sand, often in the same area year after year (Clancy 1986; Marchant & Higgins 1993).

Beach stone-curlews are found around eastern and northern Australia from Nambucca Heads in New South Wales (and occasionally south to Victoria) to Port Cloates in Western Australia and extend into New Guinea, the Solomon Islands and Indonesia (Marchant & Higgins 1993). Draffan *et al.* (1983) report the species from 33 Torres Strait Islands in total, in every area except the north-west. The species occurs on Mabuia Island (Conics 2009b; Watson 2009, Watson & Hitchcock in press).

This species is still found in locations where human activity is high but the lack of young birds in such areas indicates that reproduction is being affected by human disturbance (Freeman 2003). Breeding success may also be significantly reduced from predation by cats, dogs and feral pigs. Much of the species' habitat in Australia, particularly on islands, is secure. However, because beach stone-curlews occur at low densities and occupy linear habitats, the potential for local extinctions to become regional ones is increased (Garnett & Crowley 2000). On Erub Island the species may be threatened by feral species particularly dogs, and disturbance by humans, particularly when nesting.

Emerald monitor (*Varanus prasinus*)

NC Act: Near-Threatened

The emerald monitor is an arboreal species, living in the upper canopy of rainforest and monsoon forest (Wilson 2005), in palm forest, mangroves (Greene 1986; Cogger 2000), cocoa plantations (Greene 1986), vine thickets (Schaffer 2010) and around lagoons (Cogger 2000). The species uses its prehensile tail to forage among slender branches and outer foliage (Wilson & Swan 2010) and eats mainly katydids and other small arthropods and occasionally rodents (Greene 1986). Emerald monitors lay eggs in termite mounds in trees (Greene 1986; Ehmann 1992).

The emerald monitor is widespread in New Guinea. In Australia it is restricted to several islands in the Torres Strait, south to Mua Island, where it is known as Wyniss (Wilson & Swan 2010). The species is known from Boigu (Clarke 2004a; Schaffer 2010, Stanton & Fell pers. obs. 2010); Mua (Whittier & Moeller 1993; Wilson 2005; Ingram 2008; DERM 2010f), Badu (Borsboom 2007 in Conics 2009a) and Murray Islands (DERM 2010d; OZCAM 2011).

The emerald monitor is one of the most poorly known monitors (Greene 1986) and threats to the species in Australia are unknown. However, in Papua New Guinea the species is targeted by the pet trade, though the threat is considered low (Allison 2006). The emerald monitor is highly desired by reptile keepers and illegal collecting could become a threat in the Torres Strait. The species would be

threatened by habitat clearance. Given its known diet the emerald monitor does not appear susceptible to mortality through attempted ingestion of cane toads *Rhinella marina* as per many other species of varanid (e.g. Shine 2010). On Erub Island, if the species is found in future survey effort, it is probably most at threat from loss and degradation of vine thicket habitat.

Slender chained gecko (*Lepidodactylus pumilus*)

NC Act: Near-Threatened

The slender chained gecko is found in southern New Guinea, the Torres Strait and the tip of Cape York (Covacevich *et al.* 1982; Ehmann 1992). In the Torres Strait there is a WildNet database record from Mer Island (DERM 2010d), and a Queensland Museum specimen (reported in Conics 2008b) and a record by Ingram (2008) from Mua Island. There are also Australian Museum specimens from Mer, Saibai, Masig, Hammond and Prince of Wales Islands (OZCAM 2011) and it is likely the species occurs more widely through the region than is yet documented.

The species is arboreal and occurs in open and closed forests and coastal habitats (Ehmann 1992; Wilson & Swan 2010) and in human dwellings (Wilson 2005). The female lays two eggs per clutch under bark or within closed-in vegetation. Nesting is often communal and takes place during the warmer wet months (Ehmann 1992).

Threats to the species are unknown. Ehmann (1992) states the species is common and secure. However, the species is not known from any national park or other reserve affording protection (Covacevich *et al.* 1982). The slender chained gecko may be threatened by loss of habitat due to clearing and/or rising sea levels and storm surges as a result of climate change and by competition with house gecko *Hemidactylus frenatus*, in both natural habitats and on buildings (Case *et al.* 1994; Buden 2007; Hoskin 2010). House gecko is present on Erub Island but is unlikely to pose a threat to any possible population of slender chained gecko unless it spreads into natural habitats.

Littoral whiptail-skink (*Emoia atrocostata*)

NC Act: Near-Threatened

The littoral whiptail-skink is found on rocky shores and in foreshore vegetation, including mangrove forests. It shelters in rock recesses and crevices, in tree root crevices and in logs. It readily swims in tidal pools and can remain submerged for short periods (Heatwole 1975; Ehmann 1992). Cogger (2000) states that the species also occurs in lowland forests, coastal scrubs and grasslands near beaches but Hediger (1933-34 in Heatwole 1975) states that it is never found more than 100 m from the sea.

The littoral whiptail-skink is widespread from Japan, through south-east Asia and into the south-west Pacific. It is found on the tip of Cape York Peninsula and islands of the Torres Strait (Ehmann 1992; Wilson 2005). Cogger (2000) considers its distribution poorly known and despite references to its

occurrence on Torres Strait Islands there is no available record for any island except Boigu Island (Wilson 2005; Schaffer 2010). Ingram (2008) refers to a WildNet record from Mua but the species was not returned by a search of the database in 2010 (DERM 2010f) and the validity of the record is uncertain. *Emoia* species are efficient rafters and colonise islands on floating debris (Wilson 2005) and it is likely to occur on Torres Strait Islands in addition to Boigu.

Ehmann (1992) states the littoral whiptail-skink is abundant and secure. It is a common mangrove species in some areas and is especially abundant on rocky foreshores (Cogger 2000). Threats are unknown, however small reptiles, including littoral whiptail-skink, are eaten by cats (*Felis catus*) on Christmas Island. However, the species made up a very small percentage of known prey (Tidemann *et al.* 1994), possibly due to cats spending little time foraging in foreshore habitats. On Erub Island the littoral whiptail-skink would be threatened by cats, and loss of mangroves due to clearing, or storm damage.

Salt-water crocodile (*Crocodylus porosus*)

EPBC Act: Migratory (Bonn Convention)

NC Act: Vulnerable

Listed as estuarine crocodile under the Queensland *Nature Conservation (Wildlife) Regulation* 2006.

The salt-water crocodile occurs in tidal rivers, coastal floodplains and swamps, extending hundreds of kilometres inland along major drainage systems, but is also seen regularly in the open ocean (Webb *et al.* 1983; Read *et al.* 2004; Wilson & Swan 2010). The species is found from India through south-east Asia to the western Pacific and northern Australia (Wilson & Swan 2010). In Australia the species is most common in large areas of productive wetlands and estuaries (Fukuda *et al.* 2007). In Queensland, salt-water crocodiles are mainly found in coastal areas north of the Fitzroy River, with only infrequent sightings to the south (QPWS 2007). The highest densities in Queensland are found in north-west Cape York Peninsula (Read *et al.* 2004; EPA 2007). Salt-water crocodile is known from Mabuiag (Watson 2009), Saibai, Thursday (OZCAM 2011), Boigu (Schaffer 2010) and Mua Islands (Terry Reis *pers. obs.*). The species is likely to occur throughout the Torres Strait, including Erub Island.

The salt-water crocodile is still threatened by drowning in fishing nets (Ehmann 1992) with juveniles more likely to become entangled. This does not appear to pose a major threat to the species (EPA 2007). A lack of suitable nesting habitat appears to be the most significant limiting factor for the recovery of the species in Queensland (Read *et al.* 2004). On Erub, the salt-water crocodile may be threatened by entanglement in fishing nets and by direct human persecution but currently such threats are likely to be minor.

Coastal sheathtail bat (*Taphozous australis*)

NC Act: Vulnerable

The coastal sheath-tail bat is also considered of 'High' priority under the Back on Track species prioritisation framework (DERM 2011). It is seldom found more than a few kilometres from the ocean, where it roosts in sea caves, rock fissures, boulder piles and, occasionally, in buildings (Churchill 2008; Richards 2008). Colonies are usually of two to 25 individuals, though up to 100 have been recorded. The species is often found on islands and will forage on nearby mainland (Churchill 2008). Foraging occurs in a wide range of habitats, including open eucalypt forest, coastal heathlands, grasslands, sand dune scrub, monsoon forests and mangroves (Duncan *et al.* 1999; Churchill 2008). Little is known of its breeding biology but most births probably occur from September to November (Churchill 2008; Richards 2008).

The coastal sheath-tail bat occurs from Shoalwater Bay on the central Queensland coast north to Torres Strait and extra-territorially in Papua New Guinea (Duncan *et al.* 1999; Churchill 2008). In the Torres Strait there are 15 Australian Museum specimens from Possession Island (OZCAM 2011), two WildNet records (DERM 2010f) and a Queensland Museum specimen (reported in Conics 2008b) from Mua Island, and observations and Anabat recordings from Pulu (Watson 2009). Conics (2009d) recorded no micro-bats of any species during their survey of Erub Island but the presence of sea cliffs suggests likely roost sites and the species is predicted to occur.

Major threats to the species probably include loss of foraging habitat from coastal development and roost disturbance, particularly in the southern part of their range (Duncan *et al.* 1999). On Erub Island, the coastal sheath-tail bat would be threatened by disturbance to any roosts and maternity sites and by loss of foraging habitat.

6.3.3 Migratory Animal Species

Fifty-seven bird species listed as Migratory under the EPBC Act are known to occur in Torres Strait (**Appendix D**). The Vulnerable (NC Act) salt-water crocodile is also listed as Migratory under the EPBC Act and is known to occur on Erub Island. A number of other species also migrate into or through the Torres Strait but are not listed under the EPBC Act. Unless otherwise stated it should be assumed that reference to Migratory species in this report refers only to those species listed as such under the EPBC Act. Further discussion of these species within groups based on behavioural traits, habitat use and threats is provided in **Appendix E**. A list of migratory species known or expected to occur on Erub Island is provided in **Table 8**.

Table 8. Migratory¹ species reported or predicted² to occur on Erub Island.

Scientific Name ²	Common Name	Comments ³
SPECIES REPORTED		
<i>Hirundapus caudacutus</i> ⁴	White-throated needletail	Published & unpublished records.
<i>Apus pacificus</i>	Fork-tailed swift	Published & unpublished records.
<i>Ardea modesta</i> ⁵	Eastern great egret	Unpublished record.
<i>Egretta sacra</i>	Eastern reef egret	Database, published & unpublished records.
<i>Pandion cristatus</i> ⁶	Eastern osprey	Database record.
<i>Haliaeetus leucogaster</i>	White-bellied sea-eagle	Unpublished record.
<i>Pluvialis fulva</i>	Pacific golden plover	Database, published & unpublished records.
<i>Pluvialis squatarola</i>	Grey plover	Unpublished record.

Scientific Name ²	Common Name	Comments ³
<i>Charadrius mongolus</i>	Lesser sand plover	Database, published & unpublished records.
<i>Charadrius leschenaultii</i>	Greater sand plover	Database, published & unpublished records.
<i>Limosa lapponica</i>	Bar-tailed godwit	Published & unpublished records.
<i>Numenius phaeopus</i>	Whimbrel	Database, published & unpublished records.
<i>Numenius madagascariensis</i> ⁷	Eastern curlew	Database & published records.
<i>Xenus cinereus</i>	Terek sandpiper	Database & unpublished records.
<i>Actitis hypoleucos</i> ⁸	Common sandpiper	Database, published & unpublished records.
<i>Tringa brevipes</i> ⁹	Grey-tailed tattler	Database, published & unpublished records.
<i>Tringa incana</i> ¹⁰	Wandering tattler	Database, published & unpublished records.
<i>Tringa nebularia</i>	Common greenshank	Database & unpublished records.
<i>Arenaria interpres</i>	Ruddy turnstone	Database, published & unpublished records.
<i>Calidris tenuirostris</i>	Great knot	Unpublished record.
<i>Calidris ruficollis</i>	Red-necked Stint	Database, published & unpublished records.
<i>Calidris acuminata</i>	Sharp-tailed sandpiper	Database & unpublished records.
<i>Calidris ferruginea</i>	Curlew sandpiper	Unpublished record.
<i>Anous stolidus</i>	Common noddy	Database & unpublished records.
<i>Onychoprion anaethetus</i> ¹¹	Bridled tern	Database record.
<i>Sternula albifrons</i> ¹²	Little tern	Published & unpublished records.
<i>Chlidonias leucopterus</i>	White-winged black tern	Unpublished record.
<i>Sterna dougallii</i>	Roseate tern	Unpublished record.
<i>Sterna sumatrana</i>	Black-naped tern	Database, published & unpublished records.
<i>Sterna hirundo</i>	Common tern	Database, published & unpublished records.
<i>Thalasseus bengalensis</i> ¹³	Lesser crested tern	Database, published & unpublished records.
<i>Cuculus optatus</i> ¹⁴	Oriental cuckoo	Published record.
<i>Merops ornatus</i>	Rainbow bee-eater	Database & unpublished records.
<i>Monarcha melanopsis</i>	Black-faced monarch	Unpublished record.
<i>Symposiarchus trivirgatus</i> ¹⁵	Spectacled monarch	Database & published records.

1. Listed as Migratory under the EPBC Act 1999.
2. Nomenclature follows the Australian Faunal Directory (DSEWPC 2011d).
3. Known from Museum records, published literature (eg Storr 1973; Draffan *et al.* 1983; Wilson 2005), WildNet database and/or reports and other grey literature (eg Smith & Smith 2006; Natural Solutions 2008a). These sources are not necessarily mutually exclusive. No additional species was predicted by the EPBC Protected Matters Search Tool maintained by DSEWPC (2011g).
4. Also listed under the EPBC Act (ROKAMBA) as *Chaetura caudacuta*.
5. Listed under the EPBC Act (CAMBA, JAMBA) as Great Egret *Ardea alba*. Australian birds elevated to full species level as *A. modesta* (Kushlan & Hancock 2005; Christidis & Boles 2008).
6. Listed under the Bonn Convention as Osprey *Pandion haliaetus*. Australian birds have been elevated to species level as *P. cristatus* (Wink *et al.* 2004; Christidis & Boles 2008).
7. Listed as Near-Threatened under the NC Act.
8. Also listed under CAMBA and ROKAMBA as *Tringa hypoleucos*.
9. Also listed under the Bonn Convention and JAMBA as *Heteroscelus brevipes*.
10. Also listed under the Bonn Convention and JAMBA as *Heteroscelus incanus*.
11. Listed under the EPBC Act as *Sterna anaethetus* (CAMBA, JAMBA).
12. Listed under the EPBC Act (Bonn Convention, CAMBA, JAMBA, ROKAMBA) as *Sterna albifrons*. Listed under the NC Act as Endangered.
13. Listed under the EPBC Act (CAMBA) as *Sterna bengalensis*.
14. Listed under the EPBC Act (CAMBA, JAMBA, ROKAMBA) as *Cuculus saturatus*. Australian birds elevated to full species level as *A. optatus* (Christidis & Boles 2008).
15. Listed under the EPBC Act (Bonn Convention) as *Monarcha trivirgatus*.

6.3.4 Additional possible Migratory species

Of the other 22 species of Migratory bird known from the Torres Strait (**Appendix D**), black-tailed godwit *Limosa limosa*, marsh sandpiper *Tringa stagnatilis*, caspian tern *Hydroprogne caspia* and

rufous fantail *Rhipidura rufifrons* are expected to occur on Erub Island on a regular basis. The remaining 18 species are all possible as sporadic (not annual) visitors except for double-banded plover *Charadrius bicinctus*, which is considered very unlikely based on known movements, and glossy ibis *Plegadis falcinellus*, for which there is no suitable habitat.

6.3.5 Species of Regional Significance

Carlia quinquecarinata is a recently described skink which is possibly restricted to Erub Island, though the species probably occurs on Mer and possibly in Papua New Guinea (Donnellan *et al.* 2009). Until its distribution is clarified the species should be considered regionally significant.

Natural Solutions (2008a) report a survey record of amethyst python *M. amethystina* and a Queensland Museum record of scrub python *Morelia kinghorni*. These species were formerly considered conspecific and are still recognised as such by the *Australian Faunal Directory* (DSEWPC 2011d). Harvey *et al.* (2000) described *M. kinghorni* as a full species, a taxonomy that has since been accepted by others (eg Freeman & Freeman 2009; Wilson & Swan 2010). Wilson and Swan (2010) no longer include *M. amethystina* as a species occurring in Australian territory and such apparent discrepancies in distribution may be due to a delay in recognition of the changed taxonomy. The exact identify of any *Morelia* species on Erub Island should be ascertained whenever possible in order to resolve the distributional limits of the two species. However, differentiation of the two species may be difficult in the field and specimens or precise descriptions and/or photographs may be required.



Photograph 6. Photograph of *Carlia quinquecarinata* taken on Erub Island in notophyll vine forest (photo D. Stanton).

6.4 Pest Animal (Fauna) Species

Exotic (introduced) fauna species reported for Erub Island are house gecko, house sparrow *Passer domesticus*, house mouse *Mus musculus*, dog, cat and pig.

Natural Solutions (2008a) state that house gecko seemed almost entirely reliant on humans on Erub Island. The species is considered a threat to native geckos through competition in both natural habitats and on buildings (Case *et al.* 1994; Hoskin 2010). There are records of native arboreal geckoes on Erub Island, *Gehyra baliola*, and slender chained gecko may also occur. House gecko is

unlikely to prove a threat to native species unless it moves into natural habitats. Any future reptile survey work should include assessments of habitat use by the species.

House sparrow was reported from all habitat types (Natural Solutions 2008a). However, house sparrow is unlikely to pose any threat to native species on Erub Island and no action is required for the species.

Natural Solutions (2008a) considered that dogs, cats and pigs were having limited impact of native wildlife, though domestic dogs and cats do roam the island and may sometimes affect wildlife populations. Pig numbers are controlled as they are periodically hunted and supplies of fresh water are limited. House mouse was captured by Natural Solutions (2008a) in vine forest, otherwise introduced mammal species were recorded only from disturbed habitats.

Nonetheless, dogs are a threat to ground nesting birds such as beach stone-curlew and are a disturbance factor for waders and terns. Cats are significant predators of native animals and have been implicated in the extinction of native species both on islands (Bloomer and Bester 1992) and on mainland Australia (Dickman *et al.* 1993). It is not just feral cats that kill native animals. Although house cats in Australian suburbs have been shown to kill mainly introduced rats and mice, native wildlife are also killed, including mammals, birds, reptiles and frogs. Cat predatory behaviour appears largely opportunistic, though small mammals are preferred. Therefore, should house cats have access to relatively undisturbed habitats it is likely that they would have a substantial impact on native fauna, particularly mammals (Barratt 1997). Natural Solutions (2008a) reported the native rodent grassland melomys (*Melomys burtonii*) as being common in vine forest and adjacent grasslands. If cat numbers are not controlled there could be significant future impacts on melomys and other native fauna.

Pigs present a threat directly to frogs, reptiles and birds through predation. Ground-dwelling birds are particularly vulnerable. They also have indirect impacts through habitat destruction and degradation. The foraging activities of pigs degrade habitat through surface soil destruction and the up-rooting of plants which facilitates erosion. Most damage occurs in areas where the soil is soft such as in and around wetlands and watercourses, or in low-lying areas after rain. Regeneration of forest and woodland plants is reduced and the invasion by both native and introduced weed species is facilitated (Alexiou 1983; Statham and Middleton 1987; Hone 1995). Foraging around wetlands by pigs means that frogs are a common prey item and pigs, through either direct predation or habitat degradation, may have contributed to the declines in some populations of Australian frogs (Richards *et al.* 1993).

In northern Australia the house mouse lives mostly in houses and other buildings storing food. However, the species does move into areas of natural vegetation, especially after fire when native rodent numbers may be low. In dry and temperate Australia, house mouse numbers typically fall as numbers of native species increase with increasing time since fire (Singleton 2008). Numbers on Erub Island are likely to be tied to disturbance regimes. Recent rodent survey work on Mer (Diete 2010) revealed robust populations of the grassland melomys in grassland habitat which could possibly be a factor restricting the distribution of exotic rodents through competition.

6.5 Threats to Fauna and Habitat

The major threats to fauna in any location are loss, degradation and fragmentation of habitat. These processes may be due to deliberate clearing or may be the result of inappropriate fire regimes, damage by feral and domestic herbivores, storm damage and weed invasion. Weed invasion may not simply alter the plant species assemblage but can also choke out ground cover, reducing suitability for ground-dwelling species, and increase fire frequency and intensity, thus altering plant species composition and physical structure even further. Weeds, particularly lantana may be a substantial long-term threat to the fauna of Erub Island.

Exotic predators, such as dogs and cats, pose a threat to native fauna, either directly through predation or by disturbance. At this stage the most significant potential threats to native fauna on Erub Island are the possible introduction of the exotic cane toad and rats (*Rattus* species). Cane toads would have dramatic impacts on the varanid (goanna) and snake fauna and, given the small size of the island, could lead to local extinctions. Pacific and black rats are an even greater potential threat given their agility and generalist diet. Should exotic rats be found to be present an extermination, or control project is recommended.

Hunting may pose a threat to some species. Species likely to be targeted include varanids, pythons, pigeons and flying-foxes. Hunting should be regulated so as to be sustainable.

6.6 Future Priorities

It is important that the faunal values of Erub Island be more comprehensively identified so that the most important conservation elements are managed appropriately. In addition to general systematic survey methods for the compilation of the fauna species assemblage for the island, the following actions are recommended.

High Priority

- Extensive ecological monitoring and assessment is required to assess the presence and populations of exotic rodents and to develop the appropriate strategies for eradication from Erub Island (see Dietsch 2010).

Medium Priority

- Verification of the presence of Jardine River turtle.
- Micro-bat surveys.
- Mega-bat surveys.
- Population estimate for beach stone-curlew to allow monitoring of breeding success.
- Identification of any breeding areas for terns.
- Identification of the most important foraging and high roost sites for waders.

- Reptile survey, with particular emphasis on littoral whiptail-skink and slender chained gecko.

7.0 The Role of Fire in Savanna Landscapes

Most Cape York Peninsula, and hence Torres Strait Island plant communities will burn if enough fuel is present. The exceptions are rainforest communities, communities of rocky areas and some wetland areas such as mangroves and the deeper permanent swamps. We know from the historical record and anthropological studies that the landscape of Cape York Peninsula when Europeans arrived was the product of traditional burning practices and land use that had changed little over many thousands of years and had led to stability in the nature of the plant communities and the way they were distributed across the landscape.

The loss of traditional burning practices in recent times has led to a loss of that stability as vegetation types that had evolved under particular fire regimes were subjected to new regimes⁵. In many areas this destabilisation has led to widespread loss of plant communities and inevitably will be found to have led to serious loss of the species of plants and animals that depend upon them.

In the history of the indigenous occupation of Cape York Peninsula and Torres Strait Islands, there were dramatic changes in plant communities as the climate shifted under a rapid succession of global ice ages, but these changes happened over thousands of years. It is clear from the nature of recent changes however that they have been greater in a period of as little as fifty years than occurred in those in those millennia prior to European arrival. It is not the change itself that is the problem but its rapidity. Species cannot evolve rapidly enough to accommodate it and the inevitable result will be the loss of species.

The reasons that the indigenous people of northern Australia used fire have been well documented (Russell Smith *et al.* 2009). They included managing to favour various species of food plants, to protect sacred places, to attract game or drive them towards the spears of hunters and to create open landscapes that made travel easy and ambush by enemies difficult. Above all however, they burnt for their own safety. As people who used fire in their daily lives they had to burn to manage the fuel around them, thus avoiding situations where a stray spark landing in heavy fuel could threaten their lives.

In Torres Strait, the ongoing use of fire is evident on the majority of islands and there is no doubt that it has been fundamental in shaping and modifying vegetation cover and influencing habitat diversity across the islands. McNiven (2008) notes the ethnographic record of Haddon (1935) where fire use formed an integral part of garden preparation and land cleaning in the late 1800's, and evidence of fire is also in the pollen and phytolith record (Rowe 2006, Parr & Carter 2003).

⁵ Fire regimes are defined by the frequency of fires and their season of occurrence, both of which have relationship to their relative severity

The fire dependence of the non-rainforest communities is related largely to the regeneration strategies of the species within them. Some have woody fruits which have to be cracked by heat to release the seed and most require bare ground and sunlight for those seeds to germinate and grow. Many perennial grasses begin to decline and die after several years without fire. Some species will only generate from seed and others are capable of resprouting after fire. Of those species that will germinate and grow through heavy litter, all still require sunlight to survive and most will not persist under a wildfire regime of infrequent hot fires.

In post - European northern Australia, altered fire regimes have led to massive loss of open forest and woodland habitats in the high rainfall areas, particularly the north east coast of Cape York Peninsula. In that area fire has disappeared completely because of the complexity of the landscape, with numerous streams and rainforest areas which have made it impossible for individual fires to spread very far. The result has been widespread development of a dense understory of shrubs and trees which is preventing the regeneration of the canopy. The end result will be the replacement of open forest areas with rainforest related vegetation. In areas of shallow soils dominated by shrubs, there has been a progressive loss of species as they reach the end of their life cycle and die without replacement.

The land management imperatives that now arise as a result of the influences discussed above are to maintain fire in those plant communities that will still support it in order to stabilise them against further change, and to ensure that the prevailing fire regime is one of numerous small cool fires rather than widespread late dry season fires.

8.0 Erub Island as a Landscape in Balance

The volcanic islands of Erub, Mer, Dowar and Waier and Ugar are unique in an Australian context. These are the only tropical islands in Australian territory known to be formed from basaltic lava. Whilst the basaltic soils made the islands particularly amenable to cropping and agriculture, as evidenced by the extensive nature of garden areas throughout the islands interior, it also introduces a number of pressing land management problems. The most problematic of these is the islands capacity for weed invasion and this tendency will be constantly referred to in the habitat management profiles presented in following sections.

Large areas of the island have essentially been managed as a permaculture since the advent of human occupation 4 000 yrs ago. Whilst intensive farming concentrated on those areas of more favourable soil, resulting in relatively broad scale anthropogenic alteration of vine forest habits, seemingly less productive habitats such as grasslands were also managed for cultural purposes. Such cultural purpose may have been as simple as maintaining ease of access, or to manage a material resource. As an example, harvested fresh leaves of blady grass were used as a primary roofing material (Bully Sailor, March 2011 - pers. comm.) on Erub. Throughout traditional occupation, the only feasible means of maintaining these grassland areas would have been fire. A long term and seasonally consistent approach to fire management would have maintained an equilibrium between

grassland and vine forest habitat, holding grassland areas in a metastable state. Irregular hot fire events push back vine forest margins to all but the most topographically protected and sheltered locations favouring the expansion of grassland habits. In turn, a reduction in fire frequency and intensity will generally result in encroachment of grassland areas by rainforest shrubs and trees. It should be stressed that neither vine forest nor grassland habitat should be considered superior in terms of habitat value or landscape function. Both habitats host their own unique array of fauna and flora and there is likely to be co-dependence of a number of specialist vine forest and grassland fauna species. This equilibrium between grasslands, vine forest and woodland habitats is an intrinsic feature of continental island ecosystems along Queensland's entire coastline, particularly apparent in the Palm and Whitsunday Island groups and on Hinchinbrook Island in the Wet Tropics Bioregion, although perhaps to a lesser extent in the latter example.

A number of specific interest groups regularly question the role of fire as a modern landscape management tool. It is however beyond doubt that wholesale removal of fire from the island landscape will alter island scale biodiversity values. A simple example is the importance of grassland habitats to the native rodent burtons melomys (*Melomys burtonii*). Loss of grassland habitat will decrease the population of this species, also affecting those species such as the scrub python and reptiles of the *Varanus* genus (goanna) which rely on the melomys as a source of food.

With the recent advent of exotic weeds, particularly lantana (*Lantana camara*) which was introduced to the Eastern Island Group in the mid 1900's, the removal of fire has perhaps more catastrophic consequences. On Mer for example there has been an observed massive expansion of lantana on the grassy slopes of Gelam between 2007 (an earlier visit by the authors) and 2011. The pertinence of this observation is that grassland firing was banned as a practice from the island ten years prior due to cultural concerns. The expansion of lantana on Erub is not as dramatic as has occurred on Mer, solely because Erub is still subject to regular firing. Lantana is however thickening dramatically in those areas not burnt as regularly such as grassy areas downslope on the road from the township to the airstrip, and on coastal headlands. In the absence of fire and other means of control, it is feasible that within several decades, very few areas of natural grassland would remain in the island landscape and the island will be covered in dense, impenetrable thickets of lantana.

This rapid expansion of lantana is considered the most critical ecological process affecting the island at present, although other weeds such as praxelis also pose a considerable threat. Without intervention, these grassland habitats, which have great significance as a cultural landscape as well as habitat importance will rapidly be lost to a sprawling exotic weed. Notes and recommendations concerning the management of these grasslands, in respect to lantana encroachment in particular are made in the following habitat profiles.



Photograph 7 (left) and **Photograph 8**. Regularly burnt hillslopes on 2007 (left) and 2011 showing limited expansion of lantana. This can be compared with photographs of Gelam on Mer taken at a similar time interval in **Photographs 9** and **Photograph 10** (right) below from where fire has been excluded.



Photograph 8 (left). Lantana thickets in a light green wash in November 2007 below the inner rim of Gelam, and **Photograph 9**. Lantana thickets as a bright green flush in March 2011 with photograph taken looking toward the same location.

9.0 Management Profiles for Erub Island Habitats

9.1 Evergreen Vine Thicket

9.1.1 Status of Ecological Knowledge

Evergreen vine thicket is limited in extent, restricted to exposed south-east facing basalt platforms, which have an overlying veneer of wind-blown sand. The thicket forms a dense, even canopy at 6 -8m height composed entirely of *Manilkara kauki* which has been constantly pruned by salt laden trade winds. There are likely to be additional small copses of this vegetation type in foredune and littoral environments around the island.

9.1.2 Ecological / Cultural Considerations

Habitat Condition: This habitat has been largely unaffected by the impacts of weed invasion and other aspects of human occupation. Being on the upper limits of tidal inundation, it suffers from accumulation of rubbish on its margins.

Fauna: This may provide habitat for the Near-Threatened beach stone-curlew. It also provides a seasonal resource for frugiverous birds and ground dwelling reptiles

Flora: The habitat is simple floristically, dominated by a single species (*Manilkara kauki*). No conservation significant species are known to occur within this habitat.

Cultural Perspectives: The habitat provides an important seasonal resource for wongai.



Photograph 11. Windswept evergreen vine thicket on exposed south facing beach dunes.

9.1.3 Management Implications

This habitat is currently self-maintaining and relatively robust. The exposed location and dense low canopy prevents any significant incursion of weeds into the habitat. Major management issues involve collection of accumulated rubbish and monitoring habitat usage by the beach stone-curlew.

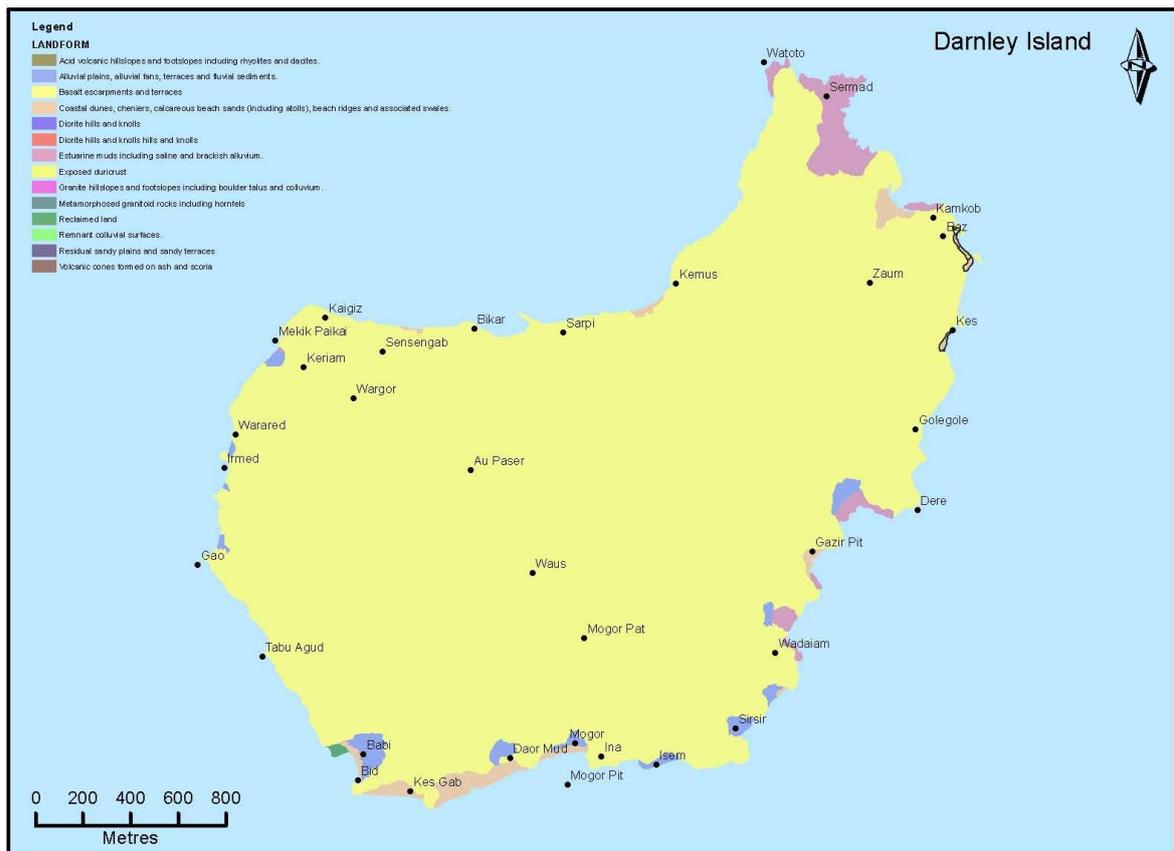


Figure 3. Distribution of evergreen vine thicket on Erub Island restricted to two minor littoral remnants on the islands north-east coast (place names after Lawrie, 1970).

9.1.4 Summary of Recommended Management Actions

The information provided in **Table 9** below aims to summarise the key issues, actions and priorities so as to aid the transfer of information into the Erub Island Working on Country Plan. Priority categories are adapted from the Draft Plan of Management for Pulu Indigenous Protected Area (Hitchcock *et al.* 2009) as follows:

Immediate Priority Actions – Actions required for management issues which have potential to significantly alter or damage the islands natural or cultural values in the short term (0-5years).

High Priority Actions – Actions required for management issues which have potential to result in significant damage of the islands natural or cultural values within the medium term (5-15 years) or where lack of knowledge significantly hampers the ability to manage a habitat effectively.

Moderate Priority Actions – Actions required for management issues which have potential to result in significant damage of the islands natural or cultural values within the long term (>15 years) or where there is a knowledge gap that does not detract significantly from the ability to manage a habitat effectively.

Table 9. Summary of management actions for evergreen vine thicket.

Management Category	Context/Issue	Actions	Priority
Fauna Surveys	Fauna composition within this habitat is poorly documented.	This habitat is limited in extent and does not warrant a specific targeted fauna survey program. Informal records of the fauna utilisation within this habitat should be undertaken in conjunction with general ranger duties.	Moderate
Plant Surveys	Flora composition is limited in diversity.	Additional flora field surveys are not required within this habitat.	Not required
Traditional Ecological Knowledge	TEK of flora within this habitat requires further documentation.	Collect and collate TEK pertaining to traditional habitat usage throughout the course of general ranger duties and interviews with knowledgeable members of the local community.	Moderate
Fire Management	This habitat is not subject to or threatened by fire incursion.	No action required	Not required
Threatened Species Management	<u>Flora</u> : No threatened flora species are known to occur within this habitat.	<u>Flora</u> : No action required	Not required
	<u>Fauna</u> : The usage of this habitat by threatened fauna species is unknown.	<u>Fauna</u> : Further survey information is required in regard to habitat usage by threatened species, in particular the beach stone- curlew.	Moderate
Invasive Species Management	<u>Flora</u> : This habitat is not likely to be subject to invasion by exotic species although it requires informal monitoring for new infestations.	<u>Flora</u> : No specific action is required. Undertake ongoing informal observation and monitoring of this habitat for newly arrived exotic species infestation.	Moderate
	<u>Fauna</u> : The composition of invasive fauna within this habitat requires further study. There is considerable potential for impacts on fauna by feral cats and dogs.	<u>Fauna</u> : Further survey into the usage of this habitat by feral (and domestic) cats is required. This will be informed by results of observation and any further fauna survey. Management protocols can be devised when more baseline information is acquired.	High
Monitoring	No specific aspects of this habitat require structured monitoring at this stage.	Undertake regular informal monitoring and observation within this habitat, particularly for usage by threatened fauna species. Adjust the requirement for monitoring if the habitat is found to be critical habitat for a particular significant species (e.g. beach stone-curlew).	Moderate

9.2 Deciduous / Semi -Deciduous Vine Forest and Thicket

9.2.1 Status of Ecological Knowledge

A structurally and compositionally variable habitat that is confined to sheltered gully lines, protected pockets and basalt scree slopes throughout the island. Structural forms range from deciduous thicket to tall deciduous vine forest, and these variations form a discontinuous mosaic with grassland habitats that typically occupy ridgelines.

Vegetation community 2k represents the maximum development of vine forest observed on all of the basaltic islands. The deciduous forest formation occupies sheltered pockets, in the vicinity of the airstrip. In the dry season the canopy, which typically ranges from 25m to 35m, has an open feel due to the deciduous canopy although measured crown cover is typically > 80%. The dominant canopy species (in order of decreasing dominance) are *Gyrocarpus americanus* subsp. *americanus*, *Cathormion umbellatum* subsp. *monoliforme*, *Garuga floribunda* var. *floribunda*, *Antiaris toxicaria* var. *macrophylla*, *Mimusops elengi*, *Wrightia laevis*, *Diospyros hebecarpa* and *Bombax ceiba* var. *leiocarpum*. The sub-canopy is relatively open with 30 – 50% cover.

Well-developed and well preserved deciduous vine forest is also located on a broad degraded sand dune on the north-eastern side of the island. The canopy in this community ranges from 12-25m, with dominants including *Bombax ceiba* var. *leiocarpum* and *Garuga floribunda* var. *floribunda* with *Gyrocarpus americanus* subsp. *americanus* and *Diospyros maritima*.



Photograph 12 (left). A large emergent specimen of *Gyrocarpus americanus* in VC2K near Erub Airport, and **Photograph 13.** Totally deciduous vine thicket (VC2I) on dune sands near Erub airport.

A gradual reduction in canopy structure occurs from VC 2j through community 2i with vegetation community 2w representing the most depauperate expression of vine thicket habitat on the island. VC 2j is the dominant vine forest habitat on the island although well preserved examples are difficult to find. The typical canopy structure of this VC is highly broken, often with significant canopy gaps extending to near ground level. The uneven nature of this canopy can only be attributed to disturbance in some form, possibly with extreme wind as a major contributing factor. Dominant canopy species comprise *Bombax ceiba* var. *leiocarpum*, *Diospyros hebecarpa*, *Alectryon repandodentatus* (Endangered), *Adenantha pavonina*, *Wrightia pubescens* subsp. *penicillata*, and *Antiaris toxicaria* var. *macrophylla*. *Bombax ceiba* var. *leiocarpum* always forms the emergent layer. *Cupaniopsis anacardioides* forms a dominant to co-dominant canopy species with *Diospyros hebecarpa*.

On steeper basalt escarpments (wind exposed slopes and ridgelines) the vegetation structure reduces to thicket with representative communities being VC2i and VC2w. The distinction between vine forest and thicket communities is an ecological one, with thicket occurring on drier sites such as steep exposed escarpments or as narrow attenuations upslope along gully lines within broader grassland communities. Canopy species in VC2w species include *Antiaris toxicaria* var. *macrophylla*,

Garuga floribunda var. *floribunda*, *Gyrocarpus americanus*, *Terminalia subacroptera* and scattered *Bombax ceiba* var. *leiocarpum*. Ground cover comprises abundant slender vines and low shrubs forming sparse cover over a substrate typically composed of basalt talus. Vegetation community 2i is characterised by *Berrya javanica* with emergent trees of *Bombax ceiba* var. *leicoarpum* a prominent canopy feature.



Photograph 14. Well-developed vine thicket (VC2w) on basalt rubble.

9.2.2 Ecological / Cultural Considerations

Habitat Condition: Large areas of vine thicket have been altered both naturally and through anthropogenic disturbance. Copses of bamboo (*Bambusa vulgaris*) are scattered throughout the habitat and other non-native species including poinciana (*Delonix regia*) and mango (*Mangifera indica*) dominate the canopy in some places, although these areas have been mapped as separate entities wherever possible. Large areas of vine forest regrowth occur on the island whose regeneration is being compromised by the smothering affects of thick copses of lantana.

Fauna: The fauna known to utilise this habitat most extensively are ground dwelling reptiles as well as frugivorous birds. Vine forest provides habitat for the endemic skink species, *Carlia quinquecarinata* which is known to occur in this habitat. It provides the most likely habitat for the Near-Threatened species slender-chained gecko and emerald monitor.

Flora: The habitat is known to support populations of *Alectryon repandodentatus* (Endangered EPBC, NC Act), and the native bamboo (*Noeloleba atra*) (Near-Threatened NC Act). The vine *Operculina brownii* may also occur on the margins of the habitat. Regionally significant species are *Atalaya australiana*, *Harpullia arborea*, *Flacourtia* sp. (Shiptons Flat), *Mallotus claoxyloides*, *Smilax blumei*, and *Uvaria rufa*.

Cultural Perspectives: The habitat, including highly disturbed and altered occurrences, hosts numerous plant resources. The full extent of resource utilisation within this habitat requires further consideration and study.

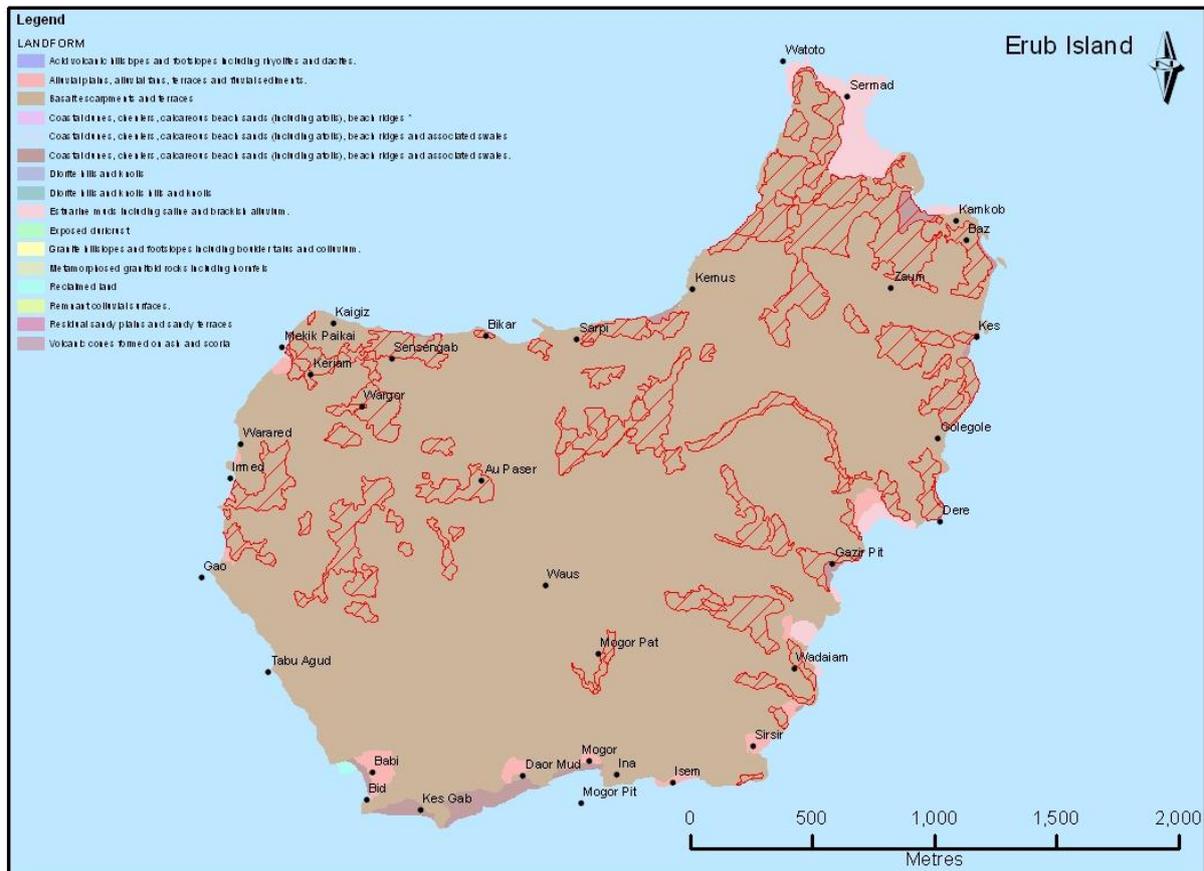


Figure 4. Distribution of semi-deciduous and deciduous vine forest and thicket on Erub Island (place names after Lawrie, 1970).

9.2.3 Management Implications

This habitat is currently self-maintaining although it is threatened by continued attrition, due both to clearing for development and invasion by exotic weeds. Although hot fire regularly interacts with this habitat, it has largely retreated to the most sheltered gully heads where the impact of fire is observed to be minimal. Areas of vine forest regeneration are also compromised by recruitment of exotic species, in particular poinciana (*Delonix regia*) and dense thickets of lantana forming in canopy gaps. Whilst the invasion of exotic species in vine forest habitats is at a scale that is beyond any short term and readily achievable solution, maintenance of the better preserved examples of this habitat should be undertaken on a regular basis. Selected areas of vine thicket regrowth should also be earmarked for maintenance, particularly control of lantana where these species are limiting the recruitment and development of native colonising species.

9.2.4 Summary of Recommended Management Actions

The information provided in **Table 10** below aims to summarise the key issues, actions and priorities so as to aid the transfer of information into the Erub Island Working on Country Plan.

Table 10. Summary of management actions for semi-deciduous vine forest and thicket.

Management Category	Context/Issue	Actions	Priority
Fauna Surveys	Fauna composition within this habitat is poorly documented.	Design and implement a structured fauna survey and trapping program based on priority recommendations contained in Section 6.6 . Particular focus should be given to identifying potentially occurring species including microbats. Maintain focus on ethnotaxonomy to feed into TEK.	Moderate
Plant Surveys	Flora composition is poorly documented and limited to rapid surveys.	Carry out additional flora field surveys with focus on significant species, new records for the island and important cultural resource species. Collect leaf specimens and/or photograph plants with known uses/values and that may have been used in the past, and catalogue.	Moderate
Traditional Ecological Knowledge	TEK of flora within this habitat is poorly known and/ or documented. Plant and animal lists provided in the Appendices provide a good foundation for increasing TEK and ethnotaxonomy.	Collect and collate TEK knowledge within this habitat gained through fauna and flora survey actions on an ongoing basis.	High
Fire Management	This habitat may be subject to edge incursion and continued attrition during hot wildfires, further promoted by lantana infestation on the margins.	Follow fire management guidelines detailed in Section 9.3.3 for grassland habitats.	High
Threatened Species Management	<u>Flora:</u> The habitat may suffer continued degradation through edge effects associated with hot fire, lantana infestation and expansion of bamboo copses. <u>Fauna:</u> Composition of fauna within this habitat is poorly documented.	<u>Flora:</u> The endangered small tree <i>Alectryon repandodentatus</i> has a robust population on the island, together with native bamboo and a host of regionally threatened species. The long term impacts of lantana infestation and expansion of bamboo copses is a possible threat to the species. Control of weeds in selected high quality populations will aid long term preservation of the species. Other significant species potentially impacted are native bamboo and <i>Operculina brownii</i> . <u>Fauna:</u> Further baseline survey information is required in regard to habitat usage by threatened species, particularly 'possibly occurring' species including the emerald monitor, slender-chained gecko and coastal sheathtail bat.	Moderate Moderate
Invasive Species Management	<u>Flora:</u> Lantana, poinciana and a range of smothering vines and herbs are all impacting recruitment of native vine forest species in areas of vine thicket regeneration.	<u>Flora:</u> A critical habitat management requirement is to control and eradicate lantana copses occurring in areas of vine forest regeneration. This should be undertaken within a pilot study area designated for the purpose of rehabilitation. Selective cutting and poisoning of poinciana groves	High

Management Category	Context/Issue	Actions	Priority
	<p><u>Fauna</u>: The composition of invasive fauna within this habitat requires further study. There is considerable potential for impacts on fauna by feral cats, dogs and possibly pigs.</p>	<p>should also be considered as a management action in selected areas if culturally allowable.</p> <p><u>Fauna</u>: Further survey into the usage of this habitat by feral (and domestic) cats is required. This will be informed by results of fauna survey. Management protocols can be devised when more baseline information is acquired.</p>	High
Monitoring	<p>The success of any weed control efforts in promoting natural species recruitment and regeneration requires documentation.</p>	<p>This success of eliminating lantana copses within regrowth vine forest vegetation requires demonstration. Selected monitoring points should be placed within regrowth thicket subject to management within a lantana eradication pilot area. Permanent photographic monitoring sites should be erected supplemented by notes in regard to the observed response in canopy recruitment.</p>	High

9.3 Grassland and Grassland Complexes

9.3.1 Status of Ecological Knowledge

Grassland communities occur across the larger portion of Erub, contributing to up to 60% of the island's native vegetation. The habitat envelopes vine forest which is restricted largely to sheltered or protected pockets. There is some variation in regard to floristic composition within this habitat. Those areas that are apparently subject to repetitive hot burning regimes and the steeper hillslopes are frequently dominated by blady grass (*Imperata cylindrica*). Kangaroo grass (*Themeda triandra*) tends to be abundant in those areas that are less frequently burnt, such as observed on a number of isolated coastal headlands. Areas of this habitat that are subject to shrubby thickening are typically colonised by *Micromelum minutum*, *Litsea glutinosa*, *Cupaniopsis anacardioides*, *Wrightia pubescens* subsp. *penicillata*, and *Melicope peninsulariis*.

The literature suggests considerable conjecture about the provenance of grasslands on these islands. Draffan *et al.* (1983) in Freebody (2002), and Stocker (1978), refer to the use of fire in vine forest areas (with a closed canopy) on Erub causing habitat alteration and a reduction of the total area of closed forest to fire climax grasslands. Field observations however suggest that the grassland distribution may be influenced by edaphic conditions, including extreme soil drainage, which results in limited soil moisture availability during drier periods. There are a number of volcanic vents and areas of flow basalt on Australia's north-eastern region that naturally support grasslands in much wetter or similar climates (e.g. Seven Sisters near Yungaburra, Mount Fox and Clump Point in Queensland's wettest coastal location). These offer evidence to suggest that the grassland habitats on these islands were not necessarily preceded by vine forest and in a hypothetical island situation free from anthropogenic influence, grasslands may have been a significant component of the natural vegetation mosaic. Whilst there is no doubt that fire controls vine forest distribution to a considerable extent on

Erub, ecotonal changes upslope along gully lines from tall vine forest (VC2k) to vine thicket (VC2w), to grassland (VC17b) observed during the study indicates the considerable role the natural environment plays in the distribution of both grassland and vine forest habitats. It is unlikely that the upper slopes of Erub ever supported luxuriant vine forest due to the relative dryness of the climate and the extreme soil drainage on these upper slope areas. It should thus be stated that whilst removal of fire as a land management tool may not have any marked effect long term effect on vine forest distribution, it will certainly result in considerable degradation of these restricted grassland communities through lantana invasion.



Photograph 15 (left). Grassland habitat dominated by kangaroo grass on a fire protected headland on the north-eastern coastline of the island (photograph taken November 2007), and; **Photograph 16.** Native grassland at the same location in maximum growth season (March 2011).

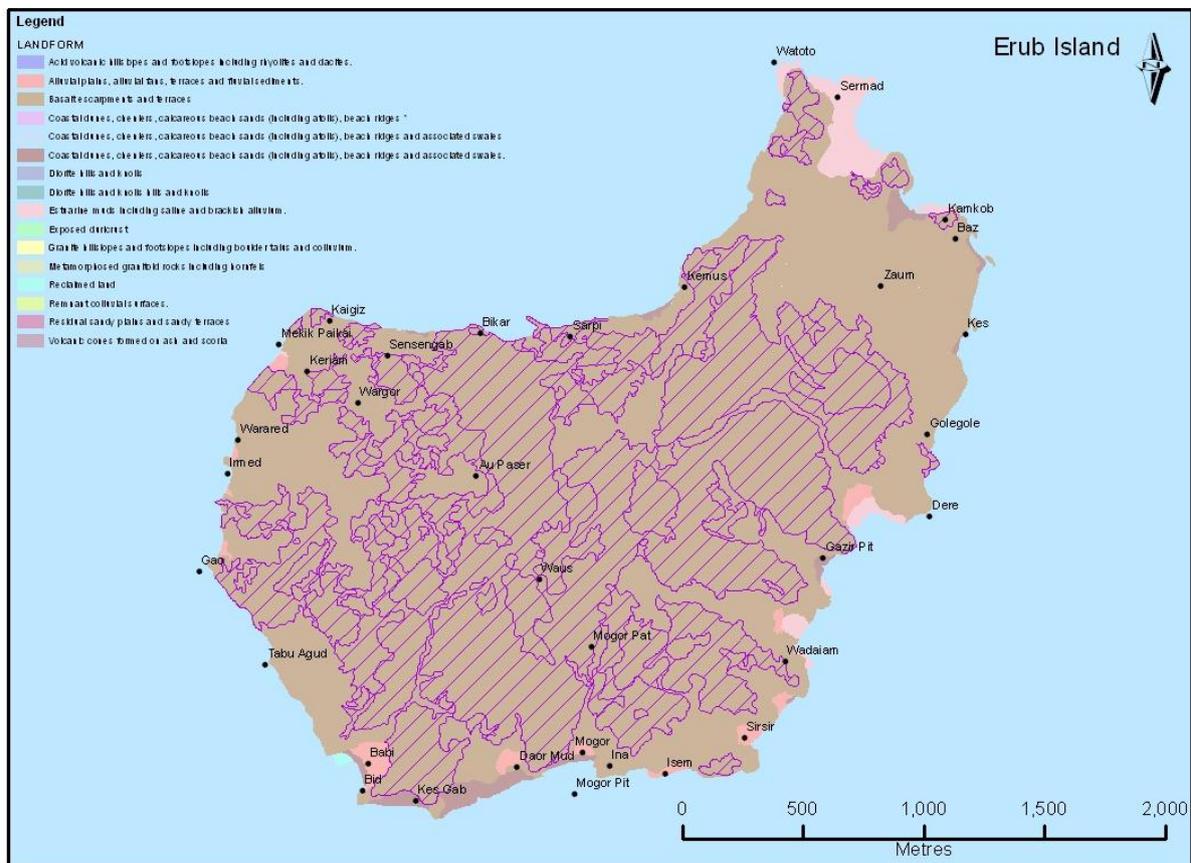


Figure 5. Location of native grasslands on Erub Island (place names after Lawrie, 1970)

9.3.2 Ecological / Cultural Considerations

Current Condition: Grassland condition is variable across much of the island although large areas retain natural condition and are relatively free from exotic species invasion. Lantana typically forms dense thickets on the interface between vine thicket and grassland habitats and copses of lantana may be scattered throughout the community. Pockets where fire has been excluded are almost universally subject to thickening of lantana and other vine thicket shrubs, except in a few notable areas where lantana is yet to gain a strong foothold. Other exotic species including ringworm shrub (*Senna alata*), tropical kudzu (*Pueraria montana var. lobata*), *Sida retusa*, siratro (*Macroptilium atropurpurea*), butterfly pea (*Clitoria ternata*), cupid's flower (*Ipomoea quamoclit*) and bamboo (*Bambusa vulgaris*) are also common in grassland habitats although these are most prominent on roadside margins and in previously disturbed areas. Considerable areas of grassland are also subject to severe topsoil erosion where ground cover has been noticeably reduced.

Fauna: The fauna species within this habitat is likely to be relatively simple. Conics (2009d) report healthy populations of grassland melomys (*Melomys burtonii*).

Flora: The Near-Threatened grass *Apluda mutica* is known to occur within this habitat. Information on population size and habitat preference is currently lacking. This species may be threatened by lantana invasion.

Cultural Perspectives: Whilst it is considered that large areas of this grassland are naturally occurring and stable, anthropogenic burning of the grasslands was undoubtedly undertaken by traditional occupants to maintain ease of access and manage specific cultural resources such as grasses for roofing. Headlands were also used as key observation points. Harvested fresh leaves of blady grass were used as a primary roofing material (Bully Sailor, March 2011 - pers. comm.) on Erub.

9.3.3 Management Implications

A general observation made following the consultative visit on Mer in March 2011 is that within 10-20 years, native grasslands will be extremely rare habitats unless there is some form of strong and consistent management intervention. Fortunately on Erub, unlike Mer, fire is still a factor in the regulation of grassland habitats on the island. Without continued landscape scale burning, supplemented with herbicide intervention, grasslands will inevitably be replaced by dense impenetrable thickets of lantana and shrubs. Whilst this scenario will cause considerable impact on the natural ecological function on the island, the loss of the cultural landscape should also be considered highly significant.

Fire and herbicide application are two fundamental tools that can be utilised to manage lantana infestations within the grasslands. Manual methods such as cutting and swabbing and physical extraction or lantana copses are also useful supplementary management measures in areas of

moderate to low infestation, although this will be most successful when utilised in combination with fire and herbicide application.

Whilst there is understandable concern in regard to the use of chemical herbicides on Erub to control lantana, this concern has not been considered in compilation of these management recommendations which are provided solely for the purpose of presenting lantana control techniques which have been proven to be effective on a large scale in other regions. It is ultimately up to the Erubam people to decide whether these recommendations are acceptable within the community. It should be noted that the recommendations made within are also broadly consistent with recommendations made in the *Draft Strategic Plan for Lantana 2011 – 2016* (NRM CANZ, 2011) and applied by a number of leading resource management agencies in Queensland and New South Wales. The Erub people have an advantage in lantana management in that they have the ability to utilise fire as a management tool in a far more robust capacity than most parts of mainland Australia. Broad recommendations for management are made below although these will require refinement based on field logistics, experience and community desires.

Fire: Whilst fire continues to regulate grassland habitats on Erub, this is largely unstructured and uncontrolled burning. Such burning could be undertaken in a far more effective manner to specifically maintain ecological function of the grasslands, stabilise existing lantana infestation and prevent further spread of lantana into unaffected habitats and protect property from the threat of wildfire. It is recommended that the following actions in respect to fire within grasslands be considered:

- Fire should be re-introduced into the landscape as soon in the season as is feasibly possible.
- Grassland areas should be subject to a mosaic burning regime with numerous small fires that are initiated as soon as grasses will feasibly burn. This will effectively reduce fuel loads in grassland areas.
- Hot fire events can be targeted towards areas of dense lantana thickets late in the dry season without the risk that these hot fires will burn out extensive areas of the island and threaten property.
- This mosaic burning regime should be maintained on an annual basis although it is likely that large areas of grassland will not burn on any given year to due to insufficient fuel loads.

Mosaic burning will also reduce fuel load to the effect that when hot fires burn late in the dry season, these will not place property and infrastructure at risk. It is likely that this mosaic burning pattern will take several years to impact the extent of lantana in the grassland although when conducted effectively it will minimise the further spread of lantana into currently unaffected habitats.

Chemicals: Instructions on the usage of herbicide to target lantana infestation are contained in Stock *et al.* (2009) and it is not intended that detailed instruction on mixing ratios and application methods be provided in this document. The following practices should however be considered:

- Overspray dense thickets or copses of lantana with the aid of a spatter gun and low toxicity herbicide (glyphosate). Do not use this technique where lantana occurs as scattered shrubs in native grassland as this will destroy the native grasses that are to be promoted.
- Follow up spraying should be undertaken on a 3-monthly basis until the infestation is completely eradicated.
- Use concentrated herbicide to swab the cut stems of lantana in low density infestations (particularly in native grassland areas) for effective eradication.

General Recommendations: The following general recommendations are made in regard to lantana control practice:

- Undertake initial stages of lantana control in a small, contained area where the effectiveness of the techniques can readily be observed and assessed. Ensure control of lantana is achieved in the initial pilot area before the effort is extended.
- Attempt to integrate the use of chemicals, landscape burning and physical means of lantana control to the affect that these methods reinforce each other (e.g. use follow up storm burning in areas where chemical control has been implemented to promote the growth of new grass in areas previously occupied by lantana.
- Ensure control and monitoring points, including photographic records are erected in pilot areas to document and demonstrate the success of the eradication effort.

It should be noted that a large number of additional weeds such as praxelis, cupids flower and siratro also threaten grassland habitats on Erub to varying degrees. As a general observation however, these weeds are abundant only in areas of disturbance or extending several metres from roadside margins. The most critical aspect of containing these infestations is to maintain a strong healthy native grass cover and avoid soil disturbance. Mosaic burning will aid maintenance of a healthy grass layer whilst extensive hot wildfire events will often leave large area of bare soil susceptible to weed establishment. With the landscape scale management recommendations contained within this document, particularly in relation to burning regime, it is expected that the current infestations of problematic weeds will remain relatively contained.

9.3.4 Summary of Recommended Management Actions

Recommended management actions are summarised in **Table 11** below.

Table 11. Summary of management actions for grassland and grassland complexes.

Management Category	Context/Issue	Actions	Priority
Fauna Surveys	Fauna composition within this habitat is relatively simple although requires further documentation,	Undertake opportunistic fauna survey in this habitat, record and identify species observed.	Moderate
Plant Surveys	Flora composition is limited to rapid surveys.	Carry out additional flora field surveys with focus on collection of important cultural resource species. Update island species list as new information becomes	Moderate

Management Category	Context/Issue	Actions	Priority
		available.	
Traditional Ecological Knowledge	TEK within this habitat is poorly known or documented.	Obtain and collate traditional knowledge of resource utilisation within this habitat. Information on the historic usage of particular grass species would be useful.	Moderate
Fire Management	Fire management practice needs to be modified to a regime of regular mosaic burning rather than the current regime of hot extensive fires.	Follow recommendations for fire made in Section 9.3.3 .	Immediate
Threatened Species Management	<u>Flora</u> : <i>Alpuda mutica</i> is a rare grass species known from this habitat.	<u>Flora</u> : Undertake targeted surveys to determine the presence and abundance of <i>Alpuda mutica</i> on the island. Use this information to determine management needs.	Moderate
	<u>Fauna</u> : The use of this habitat by significant fauna species is not known although it is not expected to be critical habitat for any known or potentially occurring threatened fauna species.	<u>Fauna</u> : Follow management recommendations made in Section 9.3.3 to maintain native grassland habitats in a sustainable manner and ensure ongoing survival of the habitat in the island landscape.	Moderate
Invasive Species Management	<u>Flora</u> : Extensive infestation of exotic flora (lantana) is observed in this habitat which threatens its biodiversity in the long term. A range of invasive weeds threaten grassland habitats, particularly if there is significant disturbance or broadscale loss of groundcover due to a single hot wildfire event.	<u>Flora</u> : Undertake habitat management protocols detailed in Section 9.3.3 .	Immediate
	<u>Fauna</u> : The invasive fauna utilisation of this habitat requires further study. Particular attention should be paid to usage of this habitat by feral cats.	<u>Fauna</u> : Continued monitoring for use of this habitat by exotic fauna is required.	Moderate
Monitoring	The effectiveness of measures implemented to control lantana requires documentation.	The construction of photographic monitoring points in pilot areas for lantana control is required prior to programme commencement. Photographic monitoring points should be erected in areas of high quality grassland to provide a baseline measure as well as a means to measure weed spread and new weed introductions.	Immediate

9.4 Anthropogenically Altered (secondary) Vine Forest and Thicket

9.4.1 Status of Ecological Knowledge

This habitat has been included for its unique cultural values, and almost identical areas of altered anthropogenically altered vine forest are found on Mer. This closed forest component has a canopy height range of 18 to 23m (with coconut emergents to 30m), comprising a mix of native food trees, typically sorbi (*Syzygium branderhorstii*), and exotic species including coconut (*Cocos nucifera*) and mango (*Mangifera indica*). Where mapped, the majority of these areas are on level topography with a sparse understorey and free of the surface rock that is otherwise abundant on hillslope situations.

Field evidence suggests that these areas were once utilised as traditional garden sites where cultivation of food trees such as *Syzygium branderhorstii*, *Syzygium aqueum* and *Mangifera indica* occurred under coconut groves. In some areas, old rotting coconut stumps can be observed in the understorey. The role Torres Strait Islander people have had in shaping the vegetation communities of the Torres Strait (see Parr & Carter 2003, Carter 2004, McNiven 2007, Rowe 2007, Barham 1999) is evident through the length of continuous occupation +2 500 years BP which relied on land and marine resource exploitation inclusive of extensive garden cultivations.



Photograph 17. Former cultivated area with *Cocos nucifera* mixed with exotic and native food trees.



Figure 6. The location of anthropogenically altered vine forest communities on Erub Island (place names after Lawrie, 1970).

9.4.2 Ecological / Cultural Considerations

Habitat Condition: This habitat is a product of anthropogenic alteration and hence habitat condition cannot readily be discussed in terms of naturalness or similarity with natural habitats. It is however rapidly developing the structure of an intact vine forest habitat and is relatively diverse in terms of its floristic assemblage. It is expected that this habitat will have similar fauna habitat values to intact semi-deciduous vine forest stands.

Fauna: The assemblage of fauna within this habitat will most likely mimic those of intact semi-deciduous vine forest and include ground dwelling reptiles as well as frugivorous birds. It is likely to provide habitat for threatened species potentially occurring on the island including the coastal sheathtail bat, emerald monitor (*Varanus prasinus*) and slender-chained gecko (*Lepidodactylus pumilus*). The endemic skink species, *Carlia quinquecarinata* is known to occur in this habitat.

Flora: The habitat is known to support *Alectryon repandodentatus* (Endangered EPBC, NC Act), and the regionally significant species paperbark satinash (*Syzygium bungadinnia*), and the earring tree (*Lepidopetalum fructoglabrum*).

Cultural Perspectives: This habitat is essentially a long term established permaculture with traditional food trees including sorbi (*Syzygium branderhorstii*), mango, coconut and a number of other traditional plant resources. In this regard, it holds particular cultural significance, providing a record of traditional agricultural practice in the eastern Torres Strait Islands.

9.4.3 Management Implications

This habitat is currently self-maintaining and there are no specific risks identified. Whilst the habitat is classified as non-remnant under the VMA, this by no means degrades its value as a significant habitat worthy of preservation, particularly in respect to its cultural significance. Canopy gaps within this habitat may facilitate invasion of pest plant species including leucaena (*Leucaena leucocephala*), poinciana (*Delonix regia*) and lantana.

9.4.4 Summary of Recommended Management Actions

The information provided in **Table 12** below summarises recommendations pertaining to the management of this habitat.

Table 12. Summary of management actions for anthropogenically altered forest and thicket.

Management Category	Context/Issue	Actions	Priority
Fauna Surveys	Fauna composition within this habitat is poorly documented.	Design and implement a structured fauna survey and trapping program based on priority recommendations contained in Section 6.6 . Maintain focus on ethnotaxonomy to feed into TEK.	Moderate
Plant Surveys	Flora composition is poorly documented and limited to rapid surveys.	Carry out additional flora field surveys with focus on collection of important cultural resource	Moderate

Management Category	Context/Issue	Actions	Priority
		species. Collect leaf specimens and/or photograph plants with known uses/values and that may have been used in the past, and catalogue.	
Traditional Ecological Knowledge	TEK within this habitat is poorly known. Plant and animal lists provided in the Appendices provide a good foundation for increasing TEK and ethnotaxonomy.	Collect and collate TEK knowledge within this habitat gained through fauna and flora survey actions on an ongoing basis. The significance of this habitat as a cultural resource as well as traditional farming practice which shaped the landscape should be documented for future reference.	High
Fire Management	This habitat is not threatened by fire incursion.	No actions required	Not Required
Threatened Species Management	<u>Flora</u> : No significant threats to threatened flora species within this habitat are identified. <u>Fauna</u> : Composition of threatened fauna within this habitat is poorly documented.	<u>Flora</u> : The Endangered small tree <i>Alectryon repandodentatus</i> is known to occur within this habitat although the population is robust and requires little active management or documentation. <u>Fauna</u> : Further baseline survey information is required in regard to habitat usage by threatened species, particularly the emerald monitor and slender-chained gecko.	Moderate Moderate
Invasive Species Management	<u>Flora</u> : Lantana, leucaena and poinciana may also impact this habitat if these species exploit canopy gaps. Tropical kudzu threatens this habitat on Erub Island. <u>Fauna</u> : The composition of invasive fauna within this habitat requires further study. There is considerable potential for impacts on fauna by feral cats and dogs.	<u>Flora</u> : No direct action at this stage as there are a large number of habitats suffering degradation that are in greater need of attention. Continued assessment of this habitat should be undertaken as a component of general ranger duties to identify any problematic weed outbreaks that require attention. <u>Fauna</u> : Further survey into the usage of this habitat by feral (and domestic) cats is required.	Moderate High
Monitoring	The success of any weed control efforts in promoting natural species recruitment and regeneration requires documentation.	Continued informal monitoring of this habitat should be undertaken as a regular component of ranger management duties to identify any potentially problematic weed outbreaks.	High

9.5 Mangrove Forest , Woodland and Shrubland Complex

9.5.1 Status of Ecological Knowledge

Mangrove forests occur within sheltered embayments where tidal water flows periodically over the top of a basalt shelf. Mangroves habitats are zoned with *bruiguiera* and *rhizophora* which are the dominant species on the outer margins where there is regular tidal exchange. The inner margins of

Fauna: Mangrove ecosystems provide habitat and foraging values for a range of avifauna, reptiles and mammals including the saltwater crocodile (*Crocodylus porosus*), and potentially present Near-Threatened species including the emerald monitor and coastal sheathtail bat. A number of the significant migratory bird species listed in **Table 9** are associated with estuarine habitats.

Flora: These habitats have been subject to limited floristic survey. There is a potential for the mangrove trumpet tree (*Dolichandrone spathacea*) (Near-Threatened NC Act) to occur. Further survey is warranted to fully describe the floristic composition and zonation within these habitats. Robust populations of the mangrove (*Xylocarpus rumphii*) are a feature of the interface between vine forested basalt cliffs and mangrove sediments.

Cultural Perspectives: Mangrove communities provide an important cultural resource for hunting grounds and material resources such as timber firewood and construction. Little information was gained on the cultural uses of mangroves and mangrove forests on Erub and this warrants additional investigation.

9.5.3 Management Implications

The extent of impact of feral cats and rats in the habitat is unknown. Recommendations for management and monitoring of mangrove ecosystems are identified in Burrows (2010) who indicates that a thorough knowledge of plants and animals of mangrove ecosystems is essential for understanding and monitoring changes expected with climate change and other human pressures. Further biological surveys are therefore warranted.

9.5.4 Summary of Recommended Management Actions

Table 13. Summary of management actions for mangrove habitats.

Management Category	Context/Issue	Actions	Priority
Fauna Surveys	Not subject to previous fauna survey.	Design and implement a structured fauna survey and trapping program supported by specialists. Maintain focus on culturally significant species and ethnotaxonomy to feed into TEK.	Moderate
Plant Surveys	Information on flora composition is incomplete.	Carry out additional flora field surveys. Collect leaf specimens and photograph plants with known uses/values and that may have been used in the past, and catalogue.	High
Threatened Species Management	<u>Flora:</u> No threatened species are currently known to occur within this habitat.	<u>Flora:</u> Undertake additional floristic survey to fully describe the floristic composition.	Moderate
	<u>Fauna:</u> Numerous migratory birds and a number of potential EVNT fauna species are known to utilise this habitat.	<u>Fauna:</u> Further baseline information required (see fauna surveys) before discrete management actions can be defined.	High
Traditional Ecological Knowledge	TEK within this habitat is poorly known and/ or documented. Plant and animal lists provided in the Appendices provide a good foundation for increasing TEK and	Collect and collate TEK through fauna and flora survey actions, and from interviews with elders on an ongoing basis.	High

Management Category	Context/Issue	Actions	Priority
	ethnotaxonomy.		
Fire Management	No issues evident.	No actions.	No Action Required.
Invasive Species Management	<p><u>Flora</u>: The highly invasive weed pond apple (<i>Annona glabra</i>) has been recorded from Horn island and is considered a low potential threat to habitat margins on Erub.</p> <p><u>Fauna</u>: There is significant potential for impacts on fauna by feral cats and dogs.</p>	<p><u>Flora</u>: Undertake monitoring for invasive species on mangrove margins in conjunction with general ranger (and rubbish clean up) duties.</p> <p><u>Fauna</u>: Composition of invasive fauna to be derived from ongoing fauna survey results. Assess cat and dog activity levels nocturnal spotlighting, and consultation with community members. Implement control where appropriate.</p>	Moderate High
Monitoring	Observations relating to any changes to habitat condition should be documented so that the risk these changes pose to long-term habitat stability can be assessed and appropriate management responses formulated.	No formal monitoring of mangrove habitats is currently required and is considered low priority. General monitoring of habitat condition should be undertaken as a general component of ranger activities.	Moderate
Other	<p>Ghost Nests may occur on the margins of mangrove vegetation.</p> <p>Rubbish accumulation is occurring on the landward margins of mangroves due to tidal action.</p>	<p>Carry out ongoing surveys for Ghost Nets along the coastline of Erub.</p> <p>Undertake routine rubbish collection duties within these habitats.</p>	Immediate

9.6 Exotic Vegetation and Cleared Areas

A significant cultural resource mapped under this classification are the extensive bamboo groves that are prominent over the island. These habitats mosaic with adjacent vine forest communities, either spreading from former traditional garden areas on margins, or as discrete groves within the forest. The spatial distribution of these exotic forest copses is provided in **Figure 8**. The historical record as reviewed by McNiven (2008) reveals the existence of bamboo groves throughout the Torres Strait, more specifically in the eastern islands in 1793, the western islands in 1845, and on Kirriri (Hammond) in 1867, with indications that groves continued to be established in the late nineteenth century. *Bambusa vulgaris* is the most likely bamboo to form the communities mapped in this exercise although a number of species are recorded for the region (see McNiven 2008). The native bamboo (*Neololeba atra* - listed as Near-Threatened under the NC Act) occurs in the Wet Tropics, Iron Range-McIlwraith and Lockerbie areas of north-eastern Queensland and also in Papua New Guinea and New Britain (Hyland *et al.* 2003). It is also known from other islands in Torres Strait such as Mer, Naghir, Ugar and Iama (EPA 2007), and from Badu and Mua Islands (Fell pers. obs.). The species is generally restricted to the understorey and rainforest margins and does not form mappable communities.

Degraded habitats also host a considerable number of exotic weed species which have potential to spread to less disturbed habitats on Erub. The majority of the 84 introduced species on the island occur in degraded areas. The more problematic of these have been previously discussed in **Section**

5.2.2. A structured program of weed management planning, community awareness, and strategic control within the community areas is required to control the spread of these species throughout the island landscape.



Photograph 19. Cultivated *Bambusa vulgaris* on basaltic headland on Erub.

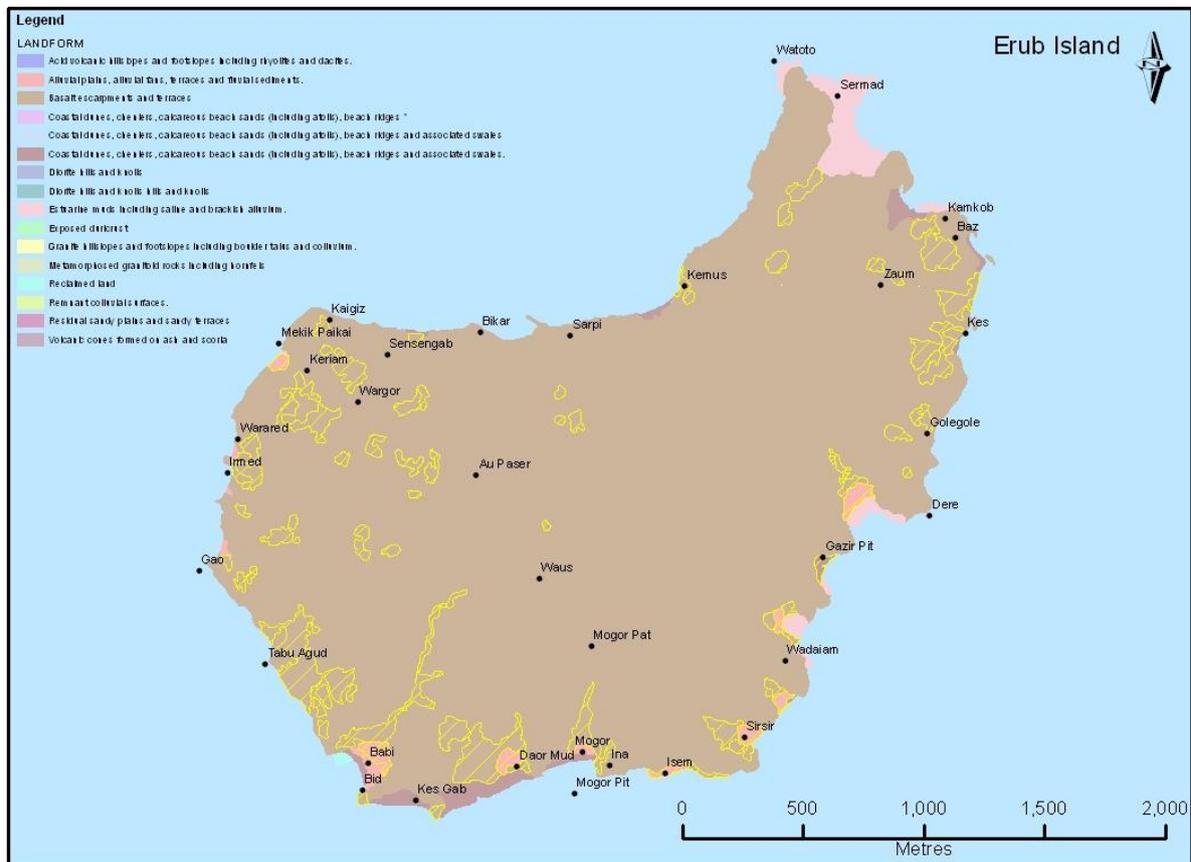


Figure 8. The location of bamboo thickets and other vegetation dominated by exotic species.

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11.0 Glossary

Alluvium/ Alluvial: Sediments deposited by the action of flowing water, generally derived from the action of rivers or from wash of hillslopes.

Bioregion: The bioregion forms the primary level of classification for terrestrial biodiversity values on a state and nationwide basis. Thirteen bioregions are classified in Queensland with the Torres Strait Islands being a sub-province of the broader Cape York Peninsula bioregion.

Broad Vegetation Group: The highest level of classification used to describe plant assemblages in the Torres Strait Islands, typically referring to plant habit and structure.

Deciduous: A tree species that undergoes a seasonal shedding of leaves, typically being leafless in the drier seasonal periods (e.g. Cotton Tree *Bombax ceiba*).

Edaphic: Pertaining to characteristics of the soil including moisture, drainage and fertility.

Endemic: A plant or animal that has at least 75% of its known range within a bioregion or which has a total range of 100,000 square km or less (Commonwealth of Australia 1995).

Evergreen: A tree or vegetation community that retains foliage on an annual basis i.e. always has leaves.

Holocene: The current geological epoch, which began approximately 11 thousand years ago. Between five thousand years ago and the present is considered to be 'Late Holocene'.

Igneous Rock: A rock formed by cooling and solidification of molten magma or lava.

Notophyll: A category of leaf size with a leaf blade for 7.5 to 12.5 cm long.

Obligate Seeder: A plant that can only regenerate after fire from a seed or stored seed bank.

Pleistocene: The period of time between 11 thousand and 1.8 million years old.

Pyrophytic: In relation to vegetation, refers to a habitat which benefits or regenerates following a fire event.

Pyrophobic: In relation to vegetation, a vegetation type which is fire intolerant, or is killed or damaged by a fire event.

Quaternary: The period of time between present and 1.8 million years old, which is sub-divided into the Pleistocene and Holocene epochs.

Regional Ecosystem: The primary unit against which Queensland's *Vegetation Management Act* (1999) is regulated and as such, the classification specific legislative significance. The classification of regional ecosystems is based on a hierarchical system with a three part code defining bioregion, followed by land zone, and then vegetation.

Savanna: A habitat typified by grasses where trees do not form a closed canopy.

Semi-evergreen: A tree or forest type whose pattern of leaf loss can be related to specific periods of environmental stress. In semi-evergreen vine forest, only portions of the canopy will be subject to leaf loss at a particular time.

Semi-deciduous: A rainforest or vine thicket type in which a component of the forest canopy trees and canopy emergents are seasonally (obligate) deciduous.

Vine Thicket: A vegetation community that is formed by predominantly soft leaf (rainforest) trees and shrubs, typically with dense layers of wiry lianes (vines) growing from ground level and reaching canopy height. Thicket is in reference to canopy height with the predominant canopy forming at < 9m.

Vine Forest: A vegetation community commonly referred to as rainforest, that is formed by predominantly soft leaf (rainforest) trees and shrubs. Dense cover of lianes (vines) and epiphytes are common at all structural levels. Vine forest is differentiated from vine thicket by height, with predominant vine forest canopy being > 9m.

Appendices

Appendix A. Expert Panel Attendees

Expert	Organisation	Expertise	Inputs
David Stanton	3D Environmental	Vegetation and landscape mapping and assessment.	<ul style="list-style-type: none"> Specialist knowledge of Torres Strait vegetation community distribution, condition and landscape (geology, geomorphology).
David Fell	3D Environmental	Flora survey, species identification, species distribution and significant flora.	<ul style="list-style-type: none"> Specialist knowledge of Torres Strait and Cape York flora and habitats.
David Gooding	3D Environmental	GIS analyst.	<ul style="list-style-type: none"> Development and management of Torres Strait GIS.
Peter Stanton	Private Consultant	Landscape scale ecological and fire management.	<ul style="list-style-type: none"> Specialist regional knowledge of Cape York ecology Practical implementation of ecological management practices i.e. fire, weeds, vegetation change
Dr Jeremy Russell-Smith	Consultant - North Australian Indigenous Land & Sea Management Alliance (NAILSMA)	Sustainable ecological and cultural resource management.	<ul style="list-style-type: none"> PNG and regional northern Australian context Advice on integrated fire and cultural resource management Emissions abatement in tropical savanna fire regimes.
Dr Garrick Hitchcock	Arafura Consulting	Environmental anthropology and cultural resource use and management Torres Strait and PNG.	<ul style="list-style-type: none"> Cultural landscape context Integration of cultural resource values Cultural use of fauna, flora and habitats.
Terry Reis	Biodiversity Assessment and Management	Fauna ecology.	<ul style="list-style-type: none"> Identification and review of fauna values Fauna survey methods Management of habitat for fauna values.
Other engaged parties			
Dr Paul Forster	DERM - Qld Herbarium	Taxonomy and distribution of Qld flora.	<ul style="list-style-type: none"> Threatened flora distribution Conservation and listing context.
Keith Macdonald	DERM Threatened Species Unit	Fauna and flora ecology and distribution.	<ul style="list-style-type: none"> Back on Track methodology. Threatened fauna and flora distribution Conservation and listing context.
Tony O'Keeffe Michael Bradby	TSRA LMSU	Land and Sea Program and Ranger Project.	<ul style="list-style-type: none"> Project background, management and liaison. Protocols and process.

Appendix B. Queensland Government Vegetation Structural Classification

Structural formation classes qualified by height for Non-Rainforest Vegetation: Neldner *et al.* (2005) modified from Specht (1970).

Projective Foliage Cover	70-100%	30-70%	10-30%	<10%
Approximate Crown Cover %	80 - 100%	50 - 80%	20 - 50%	< 20%
Crown separation	closed or dense	mid-dense	sparse	very sparse
Growth Form⁶	Structural Formation Classes (qualified by height)			
Trees > 30m	tall closed-forest (TCF)	tall open-forest (TCF)	tall woodland (TW)	tall open-woodland (TOW)
Trees 10 – 30m	closed-forest (CF)	open-forest (OF)	woodland (W)	open-woodland (OW)
Trees < 10m	low closed-forest (LCF)	low open-forest (LOF)	low woodland (LW)	low open-woodland (LOW)
Shrubs 2 - 8m	closed-scrub (CSC)	open-scrub (OSC)	tall shrubland (TS)	tall open-shrubland (TOS)
Shrubs 1 - 2m	closed-heath (CHT)	open-heath (OHT)	shrubland (S)	open-shrubland (OS)
Shrubs <1m	-	dwarf open-heath (DOHT)	dwarf shrubland (DS)	dwarf open-shrubland (DOS)
Succulent shrub	-	-	succulent shrubland (SS)	dwarf succulent shrubland (DSS)
Hummock grasses	-	-	hummock grassland (HG)	open hummock grassland (OHG)
Tussock grasses	closed-tussock grassland (CTG)	tussock grassland (TG)	open tussock grassland (OTG)	sparse-tussock grassland (STG)
Herbs	closed-herbland (CH)	Herbland (H)	open-herbland (OH)	sparse-herbland (SH)
Forbs	closed-forbland (CFB)	Forbland (FB)	open-forbland (OFB)	sparse-forbland (SFB)
Sedges	closed-sedgeland (CV)	Sedgeland (V)	open-sedgeland (OV I)	-

⁶ Growth form of the predominant layer (the ecologically dominant layer).

Appendix C. Preliminary Flora Species List – Erub Island, Torres Strait, Queensland.

D.G. Fell & D.J. Stanton 3d Environmental_27 May 2011 Version 1

- Nomenclature follows Bostock & Holland (2010) 'Census of the Queensland Flora'.
- Denotes naturalised or doubtfully naturalised taxa according to Bostock & Holland (2010).
- Unnamed taxa are followed by a collection number (i.e. DGF10153) pending formal identification at Qld Herbarium.
- Sources: ATH (Australian Tropical Herbarium), BRI (Queensland Herbarium Herbrecks extract February 2011), Freebody (Freebody 2006), Smith (Smith & Smith 2006), McKenna (DAFF weed lists supplied by Steven McKenna 2011), 3D (3D Environmental survey data, November 2007 and March 2011).

SUMMARY

281 species (1 fern)

194 native (69%)

87 naturalised (31%)

83 families

200 genera

Major families (native)

Fabaceae (15 species)

Apocynaceae (10)

Poaceae (10)

Lamiaceae (10)

Sapindaceae (10)

Euphorbiaceae (8)

Rubiaceae (8)

Convolvulaceae (7)

Moraceae (6)

Phyllanthaceae (5)

Rutaceae (5)

PRELIMINARY FLORA SPECIES LIST – ERUB ISLAND, TORRES STRAIT, QUEENSLAND⁷

D.G. Fell and D.J. Stanton May 2011

Family	Species	Source				
		ATH	BRI	Freebody 2006 / Smith 2006	McKenna (2011)	3D Environmental (Fell & Stanton)
Pteridophytes (Ferns and Fern Allies)						
Schizaeaceae	<i>Lygodium flexuosum</i>		1			1
Angiosperms (Flowering Plants)						
Acanthaceae	<i>Barleria cristata</i> *	1			1	
Acanthaceae	<i>Deeringia arborescens</i>					1
Acanthaceae	<i>Pseuderanthemum variabile</i>		1	1		1
Acanthaceae	<i>Ruellia tuberosa</i> *		1		1	1
Agavaceae	<i>Cordyline sp. (DGF8782+)</i>					1
Aizoaceae	<i>Sesuvium portulacastrum</i>		1	1		1
Amaranthaceae	<i>Achyranthes aspera</i>		1			1
Amaranthaceae	<i>Alternanthera brasiliana</i> *		1		1	1
Amaranthaceae	<i>Alternanthera pungens</i> *		1			1
Amaranthaceae	<i>Amaranthus viridis</i> *		1		1	
Amaranthaceae	<i>Celosia argentea</i> *		1			1
Amaranthaceae	<i>Gomphrena celesioioides</i> *		1		1	1
Amaryllidaceae	<i>Priophys amboinensis</i>					1
Anacardiaceae	<i>Mangifera indica</i> *	1				1
Anacardiaceae	<i>Semecarpus australiensis</i>			1		1
Annonaceae	<i>Uvaria rufa</i>			1		1
Apocynaceae	<i>Alstonia spectabilis subsp. spectabilis</i>			1		1
Apocynaceae	<i>Catharanthus roseus</i> *				1	1
Apocynaceae	<i>Cerbera manghas</i>					1
Apocynaceae	<i>Dischidia sp. (DGF8776+)</i>					1
Apocynaceae	<i>Marsdenia velutina</i>		1			1
Apocynaceae	<i>Tabernaemontana orientalis</i>					1
Apocynaceae	<i>Tabernaemontana pandaqui</i>			1		1
Apocynaceae	<i>Voacanga grandiflora</i>			1		

⁷ Species list valid up to May 2011.

Family	Species	Source				
		ATH	BRI	Freebody 2006 / Smith 2006	McKenna (2011)	3D Environmental (Fell & Stanton)
Apocynaceae	<i>Wrightia laevis</i>					1
Apocynaceae	<i>Wrightia pubescens</i> subsp. <i>penicillata</i>	1		1		1
Araceae	<i>Amorphophallus paeonifolius</i>			1		1
Araceae	<i>Epipremnum pinnatum</i> (DGF8783+)					1
Araceae	<i>Syngonium podophyllum</i> *				1	
Arecaceae	<i>Ptychosperma macarthurii</i>					1
Arecaceae	<i>Metroxylon sagu</i> *					1
Araliaceae	<i>Polyscias macgillivrayi</i>			1		1
Araliaceae	<i>Polyscias</i> sp.			1		
Arecaceae	<i>Cocos nucifera</i> *					1
Asteraceae	<i>Blumea lacera</i>		1			
Asteraceae	<i>Cyanthilleum cinerium</i>					
Asteraceae	<i>Eleutheranthera ruderalis</i> *				1	
Asteraceae	<i>Emilia sonchifolia</i> *				1	1
Asteraceae	<i>Praxelis clematidea</i> *	1	1		1	1
Asteraceae	<i>Sphagneticola trilobata</i> * (Declared Class 2)		1		1	1
Asteraceae	<i>Synedrella nodiflora</i> *		1		1	1
Asteraceae	<i>Tridax procumbens</i> *		1		1	1
Asteraceae	<i>Wollastonia biflora</i>		1	1		1
Avicenniaceae	<i>Avicennia marina</i> subsp. <i>eucalyptifolia</i>			1		1
Bignoniaceae	<i>Tecoma stans</i> var. <i>stans</i> *		1		1	1
Bombacaceae	<i>Bombax ceiba</i> var. <i>leiocarpa</i>			1		1
Boraginaceae	<i>Cordia dichotoma</i>		1	1		1
Boraginaceae	<i>Cordia subcordata</i>			1		1
Burseraceae	<i>Canarium</i> sp. (DGF8684+)					1
Burseraceae	<i>Garuga floribunda</i> var. <i>floribunda</i>		1	1		1
Byttneriaceae	<i>Abroma molle</i>		1			
Caesalpiniaceae	<i>Caesalpinia bonduc</i>	1		1		1
Caesalpiniaceae	<i>Caesalpinia hymenocarpa</i>					1
Caesalpiniaceae	<i>Cassia fistula</i> *				1	1
Caesalpiniaceae	<i>Delonix regia</i> *		1			1
Caesalpiniaceae	<i>Senna alata</i> *		1		1	1
Caesalpiniaceae	<i>Senna occidentalis</i> *		1		1	1
Caesalpiniaceae	<i>Senna obtusifolia/tora</i> * (Declared Class 2)				1	
Capparaceae	<i>Capparis canescens</i>		1			
Capparaceae	<i>Capparis lucida</i>	1	1	1		1

Family	Species	Source				
		ATH	BRI	Freebody 2006 / Smith 2006	McKenna (2011)	3D Environmental (Fell & Stanton)
Capparaceae	<i>Capparis quiniflora</i>	1				1
Capparaceae	<i>Capparis sepiaria</i>	1		1		1
Caricaceae	<i>Carica papaya</i> *					1
Casuarinaceae	<i>Casuarina equisetifolia</i>			1		1
Celastraceae	<i>Salacia discipala</i>			1		1
Clusiaceae	<i>Calophyllum inophyllum</i>			1		1
Colchicaceae	<i>Gloriosa superba</i> *		1		1	1
Combretaceae	<i>Quisqualis indica</i> *				1	
Combretaceae	<i>Terminalia catappa</i>			1		1
Combretaceae	<i>Terminalia muelleri</i>			1		1
Commelinaceae	<i>Commelina ensifolia</i>		1			1
Convolvulaceae	<i>Ipomoea hederifolia</i> *		1		1	1
Convolvulaceae	<i>Ipomoea nil</i> *		1		1	1
Convolvulaceae	<i>Ipomoea pes capre subsp. brasiliensis</i>		1	1		1
Convolvulaceae	<i>Ipomoea quamoclit</i> *		1		1	1
Convolvulaceae	<i>Ipomoea sp. (DGF8778+, 8788+)</i>					1
Convolvulaceae	<i>Jacquemontia paniculata</i>		1	1		1
Convolvulaceae	<i>Merremia umbellata</i>		1			
Convolvulaceae	<i>Merremia umbellata subsp. umbellata</i>		1			
Convolvulaceae	<i>Operculina brownii (Near-threatened)</i>		1			
Convolvulaceae	<i>Operculina turpethum</i>		1			
Cyperaceae	<i>Cyperus rotundus</i> *				1	
Cyperaceae	<i>Cyperus javanicus</i>		1			
Dioscoreaceae	<i>Dioscorea esculenta</i> *					1
Dioscoreaceae	<i>Dioscorea pentaphylla var. papuana</i>		1			
Dracaenaceae	<i>Pleomele angustifolia</i>			1		1
Dracaenaceae	<i>Sanevieria trifasciata</i> *				1	1
Ebenaceae	<i>Diospyros hebecarpa</i>			1		1
Ebenaceae	<i>Diospyros maritima</i>		1	1		1
Euphorbiaceae	<i>Acalypha lanceolata var. lanceolata</i> *		1			
Euphorbiaceae	<i>Chamaesyce bifida</i>		1			
Euphorbiaceae	<i>Chamaesyce hirta</i> *		1		1	
Euphorbiaceae	<i>Claoxylon hillii</i>					1
Euphorbiaceae	<i>Croton arnhemicus</i>		1	1		1
Euphorbiaceae	<i>Euphorbia heterophylla</i> *		1		1	1
Euphorbiaceae	<i>Excoecaria agallocha</i>	1				1

Family	Species	Source				
		ATH	BRI	Freebody 2006 / Smith 2006	McKenna (2011)	3D Environmental (Fell & Stanton)
Euphorbiaceae	<i>Flueggea virosa</i> subsp. <i>melanthesoides</i>	1		1		1
Euphorbiaceae	<i>Macaranga tanarius</i>			1		1
Euphorbiaceae	<i>Mallotus claoxyloides</i>		1	1		1
Euphorbiaceae	<i>Mallotus philippensis</i>			1		1
Euphorbiaceae	<i>Manihot esculenta</i> *		1			1
Euphorbiaceae	<i>Pedilanthus tithymaloides</i> *				1	
Fabaceae	<i>Abrus precatorius</i>	1				1
Fabaceae	<i>Alysicarpus ovalifolius</i> *		1		1	
Fabaceae	<i>Alysicarpus vaginalis</i> *		1			
Fabaceae	<i>Canavalia papuana</i>		1			1
Fabaceae	<i>Canavalia rosea</i>			1		
Fabaceae	<i>Clitoria ternatea</i> *		1		1	1
Fabaceae	<i>Crotalaria goreensis</i> *		1		1	1
Fabaceae	<i>Crotalaria montana</i> var. <i>angustifolia</i>		1			1
Fabaceae	<i>Crotalaria pallida</i> var. <i>obovata</i> *				1	1
Fabaceae	<i>Crotalaria</i> sp. (Torres Strait J.R.Clarkson 2044)		1			
Fabaceae	<i>Dendrolobium arbuscula</i>			1		1
Fabaceae	<i>Desmodium gangeticum</i>		1	1		
Fabaceae	<i>Desmodium scorpiurus</i> *		1		1	
Fabaceae	<i>Desmodium tortuosum</i> *	1	1		1	1
Fabaceae	<i>Entada rheedii</i>	1				1
Fabaceae	<i>Erythrina insularis</i>			1		1
Fabaceae	<i>Erythrina</i> sp.*			1		
Fabaceae	<i>Erythrina variegata</i>	1	1	1		1
Fabaceae	<i>Indigofera tinctoria</i> *				1	
Fabaceae	<i>Macroptilium atropurpureum</i> *		1		1	1
Fabaceae	<i>Milletia pinnata</i>			1		1
Fabaceae	<i>Mucuna gigantea</i>					1
Fabaceae	<i>Mucuna pruriens</i> var. <i>utilis</i> *		1			
Fabaceae	<i>Peltophorum pterocarpum</i> *					1
Fabaceae	<i>Pueraria montana</i> var. <i>lobata</i> * (Declared Class 2) ⁸		1		1	1
Fabaceae	<i>Stylosanthes hamata</i> *		1		1	1

⁸ Not declared in Torres Strait populations.

Family	Species	Source				
		ATH	BRI	Freebody 2006 / Smith 2006	McKenna (2011)	3D Environmental (Fell & Stanton)
Fabaceae	<i>Stylosanthes humilis*</i>				1	1
Fabaceae	<i>Tephrosia purpurea</i>			1		
Fabaceae	<i>Uraria lagopodioides</i>	1				
Flacourtiaceae	<i>Flacourtia</i> sp. (<i>Shtiptions Flat L.W.Jessup+ GJD3200</i>)	1	1	1		1
Flagellariaceae	<i>Flagellaria indica</i>	1		1		1
Goodeniaceae	<i>Scaevola taccada</i>			1		1
Hernandiaceae	<i>Gyrocarpus americanus subsp. americanus</i>			1		1
Lamiaceae	<i>Anisomeles malabarica</i>		1	1		1
Lamiaceae	<i>Callicarpa brevistyla</i>		1			
Lamiaceae	<i>Callicarpa candicans</i>	1		1		1
Lamiaceae	<i>Clerodendrum floribundum</i>		1			1
Lamiaceae	<i>Clerodendrum inerme</i>		1	1		1
Lamiaceae	<i>Gmelina philippensis</i>		1			1
Lamiaceae	<i>Hyptis suaveolens*</i>				1	1
Lamiaceae	<i>Leucas decemdentata</i>		1			
Lamiaceae	<i>Premna acuminata (DGF8880+)</i>					1
Lamiaceae	<i>Premna serratifolia</i>			1		1
Lamiaceae	<i>Vitex trifolia</i>			1		1
Lauraceae	<i>Litsea breviumbellata</i>		1	1		1
Lauraceae	<i>Litsea glutinosa</i>			1		1
Lecythythaceae	<i>Barringtonia acutangula</i>	1		1		1
Lecythythaceae	<i>Barringtonia asiatica</i>	1		1		1
Lecythythaceae	<i>Barringtonia calyptrata</i>	1		1		1
Leeaceae	<i>Leea indica</i>			1		1
Loganiaceae	<i>Mitreola petiolata</i>		1	1		
Lythraceae	<i>Lumnitzera racemosa</i>			1		1
Lythraceae	<i>Pemphis acidula</i>			1		1
Lythraceae	<i>Sonneratia ovata</i>			1		1
Malvaceae	<i>Abelmoschus manihot*</i>				1	
Malvaceae	<i>Abutilon albescens</i>		1			1
Malvaceae	<i>Abutilon indicum</i>		1	1		1
Malvaceae	<i>Gossypium barbadense*</i>		1			1
Malvaceae	<i>Hibiscus tiliaceus</i>	1		1		1
Malvaceae	<i>Malvastrum coromandelianum subsp. coromandelianum*</i>		1		1	

Family	Species	Source				
		ATH	BRI	Freebody 2006 / Smith 2006	McKenna (2011)	3D Environmental (Fell & Stanton)
Malvaceae	<i>Sida acuta</i> *		1		1	1
Malvaceae	<i>Sida cordifolia</i> *				1	
Malvaceae	<i>Thespesia populneoides</i>			1		1
Meliaceae	<i>Aglaia eleagnoidea</i>					1
Meliaceae	<i>Turraea pubescens</i>			1		1
Meliaceae	<i>Xylocarpus moluccensis</i>			1		1
Meliaceae	<i>Xylocarpus rumphii</i>					1
Menispermaceae	<i>Pachygone ovata</i>					1
Mimosaceae	<i>Adenantha pavonina</i>			1		1
Mimosaceae	<i>Archidendron grandiflorum</i>			1		1
Mimosaceae	<i>Delonix regia</i> *				1	1
Mimosaceae	<i>Cathormion umbellatum</i> var. <i>monoliforme</i>			1		1
Mimosaceae	<i>Leucaena leucocephala</i> subsp. <i>leucocephala</i> *				1	1
Mimosaceae	<i>Mimosa pudica</i> var. <i>hispida</i> *				1	
Moraceae	<i>Antiaris toxicarya</i> var. <i>macrophylla</i>					1
Moraceae	<i>Ficus microcarpa</i>					1
Moraceae	<i>Ficus opposita</i>			1		1
Moraceae	<i>Ficus virens</i> var. <i>sublanceolata</i>		1	1		1
Moraceae	<i>Streblus brunonianus</i>					1
Moraceae	<i>Trophis scandens</i> subsp. <i>scandens</i>	1				1
Myristicaceae	<i>Myristica insipida</i> var. <i>cimicifera</i>	1		1		1
Myrsinaceae	<i>Aegiceras corniculatum</i>			1		1
Myrtaceae	<i>Eugenia reinwardtiana</i>			1		1
Myrtaceae	<i>Syzygium aqueum</i> (Near-threatened)			1		1
Myrtaceae	<i>Syzygium branderhorstii</i>			1		1
Myrtaceae	<i>Syzygium bungadinnia</i>		1			1
Musaceae	<i>Musa</i> sp.*					1
Nyctaginaceae	<i>Boerhavia mutabilis</i>		1			
Onagraceae	<i>Ludwigia hyssopifolia</i> *		1			1
Pandanaceae	<i>Pandanus</i> sp.			1		1
Passifloraceae	<i>Passiflora foetida</i> *		1		1	1
Passifloraceae	<i>Passiflora suberosa</i> *		1		1	1
Phyllanthaceae	<i>Breynia cernua</i>		1	1		1
Phyllanthaceae	<i>Breynia oblongifolia</i>		1	1		1
Phyllanthaceae	<i>Bridelia tomentosa</i>	1		1		1
Phyllanthaceae	<i>Cleistanthus peninsularis</i>					1

Family	Species	Source				
		ATH	BRI	Freebody 2006 / Smith 2006	McKenna (2011)	3D Environmental (Fell & Stanton)
Phyllanthaceae	<i>Phyllanthus amarus</i> *		1		1	1
Phytolaccaceae	<i>Rivinia humilis</i> *				1	
Piperaceae	<i>Peperomia pellucida</i> *				1	
Piperaceae	<i>Pilea microphylla</i> *				1	
Poaceae	<i>Apluda mutica (Near-threatened)</i>		1			
Poaceae	<i>Bambusa vulgaris</i> *		1			1
Poaceae	<i>Bothriochloa bladhii subsp. bladhii</i>		1			1
Poaceae	<i>Cenchrus echinatus</i> *		1		1	1
Poaceae	<i>Chloris gayana</i> *		1		1	1
Poaceae	<i>Chloris inflata</i> *		1		1	1
Poaceae	<i>Chrysopogon aciculatus</i> *				1	
Poaceae	<i>Dactyloctenium aegyptium</i> *		1		1	1
Poaceae	<i>Dichanthium annulatum</i> *	1	1			1
Poaceae	<i>Dichanthium aristatum</i> *		1			1
Poaceae	<i>Digitaria ciliaris</i> *		1		1	1
Poaceae	<i>Digitaria setigera</i>		1			
Poaceae	<i>Echinochloa colona</i> *				1	1
Poaceae	<i>Eleusine indica</i> *		1		1	1
Poaceae	<i>Eragrostis amabilis</i> *				1	
Poaceae	<i>Eragrostis tenella</i> *		1			
Poaceae	<i>Heteropogon contortus</i>		1			1
Poaceae	<i>Megathrysus maximus var. maximus</i> *		1		1	1
Poaceae	<i>Melinis repens</i> *		1		1	1
Poaceae	<i>Mnesithea granularis</i>		1			
Poaceae	<i>Mnesithea rottboellioides</i>		1			1
Poaceae	<i>Neololeba atra (Near-threatened)</i>		1			1
Poaceae	<i>Oplismenus burmannii</i>		1			1
Poaceae	<i>Paspalum scrobiculatum</i>	1				
Poaceae	<i>Rottboellia cochinchinensis</i> *		1		1	1
Poaceae	<i>Themeda quadrivalvis</i> *		1			1
Poaceae	<i>Themeda triandra</i>		1			1
Polygonaceae	<i>Antigonun leptopus</i> *				1	
Ptaeroxylaceae	<i>Harrisonia brownii</i>		1	1		1
Putranjivaceae	<i>Drypetes deplanchei</i>		1	1		1
Rhamnaceae	<i>Colubrina asiatica</i>			1		1
Rhamnaceae	<i>Ziziphus mauritiana</i> *	1	1			

Family	Species	Source				
		ATH	BRI	Freebody 2006 / Smith 2006	McKenna (2011)	3D Environmental (Fell & Stanton)
Rhamnaceae	<i>Ziziphus oenopolla</i>			1		1
Rhizophoraceae	<i>Rhizophora apiculata</i>			1		1
Rhizophoraceae	<i>Rhizophora stylosa</i>					
Rubiaceae	<i>Caelospermum paniculatum</i>			1		1
Rubiaceae	<i>Guettarda speciosa</i>	1		1		1
Rubiaceae	<i>Ixora timorensis</i>			1		1
Rubiaceae	<i>Oldenlandia corymbosa</i> var. <i>corymbosa</i> *				1	
Rubiaceae	<i>Morinda citrifolia</i>			1		1
Rubiaceae	<i>Morinda</i> sp. (DGF8787+)					1
Rubiaceae	<i>Psychotria coelospermum</i>	1		1		1
Rubiaceae	<i>Psychotria nesophila</i>		1	1		1
Rubiaceae	<i>Scyphiphora hydrophylacea</i>			1		1
Rutaceae	<i>Glycosmis trifoliata</i>			1		1
Rutaceae	<i>Melicope peninsularis</i>		1	1		1
Rutaceae	<i>Melicope rubra</i>		1	1		
Rutaceae	<i>Micromelum minutum</i>	1	1	1		1
Rutaceae	<i>Murraya paniculata</i>		1	1		1
Sapindaceae	<i>Allophylus cobbe</i>		1	1		1
Sapindaceae	<i>Arytera bifoliolata</i>					1
Sapindaceae	<i>Arytera repandodentatus</i> (Endangered)					1
Sapindaceae	<i>Atalaya sericocarpa</i>					1
Sapindaceae	<i>Cupaniopsis anacardioides</i>					1
Sapindaceae	<i>Cupaniopsis fleckeri</i>	1		1		1
Sapindaceae	<i>Ganophyllum falcatum</i>					1
Sapindaceae	<i>Harpullia arborea</i>			1		1
Sapindaceae	<i>Lepidopetalum fructoglabrum</i>	1	1	1		1
Sapindaceae	<i>Sapindaceae</i> (DGF8785+)					1
Sapindaceae	<i>Toechima daemelianum</i> (DGF8870+)					1
Sapotaceae	<i>Manilkara kauki</i>			1		1
Sapotaceae	<i>Mimusops elengi</i>			1		1
Sapotaceae	<i>Pouteria obovata</i>			1		1
Scrophulariaceae	<i>Angelonia salicariifolia</i> *		1			
Smilacaceae	<i>Smilax australis</i>					1
Smilacaceae	<i>Smilax blumei</i>	1				1
Solanaceae	<i>Capsicum annuum</i> var. <i>glabriusculum</i> *				1	
Solanaceae	<i>Solanum viridiflorum</i>					1

Family	Species	Source				
		ATH	BRI	Freebody 2006 / Smith 2006	McKenna (2011)	3D Environmental (Fell & Stanton)
Sparmaniaceae	<i>Grewia oxyphylla</i>					1
Sparmanniaceae	<i>Berrya javanica</i>					1
Taccaceae	<i>Tacca leontopetaloides</i>			1		1
Thymelaeaceae	<i>Phaleria octandra</i>	1	1	1		1
Ulmaceae	<i>Celtis philippensis</i>			1		1
Urticaceae	<i>Laportea interrupta</i>		1			1
Verbenaceae	<i>Lantana camara*</i> (Declared Class 3)		1		1	1
Verbenaceae	<i>Stachytarpheta jamaicensis*</i>		1		1	1
Vitaceae	<i>Cayratia trifolia</i>		1			1
Vitaceae	<i>Cissus cardiophylla</i>					1
Vitaceae	<i>Cissus maritima</i>					1
Zingiberaceae	<i>Curcuma australasica</i>			1		1
Zygophyllaceae	<i>Tribulus cistoides</i>		1			1

Appendix D. Fauna of Erub Island, Torres Strait, Qld.

Compiled by Terry Reis (Natural Resource Assessments, Cairns).

Terrestrial vertebrates known¹ or predicted² to occur on the islands of Torres Strait and their occurrence on Erub (Darnley) Island

Family	Scientific Name ³	Common Name	Status ⁴			Erub Island
			EPBC Act	NC Act	BoT	
AMPHIBIANS						
Myobatrachidae	<i>Limnodynastes ornatus</i>	Ornate Burrowing Frog		LC		
Myobatrachidae	<i>Uperoleia lithomoda</i>	Stonemason Toadlet		LC		
Myobatrachidae	<i>Uperoleia mimula</i>	Mimic Toadlet		LC		
Hylidae	<i>Litoria bicolor</i>	Northern Dwarf Tree Frog		LC		
Hylidae	<i>Litoria caerulea</i>	Green Tree Frog		LC		WildNet & published records.
Hylidae	<i>Litoria gracilentia</i>	Dainty Green Tree Frog		LC		
Hylidae	<i>Litoria infrafrenata</i>	White-lipped Tree Frog		LC		
Hylidae	<i>Litoria nasuta</i>	Rocket Frog		LC		
Hylidae	<i>Litoria nigrofrenata</i>	Bridle Frog		LC		
Hylidae	<i>Litoria rubella</i>	Red Tree Frog		LC		
Microhylidae	<i>Austrochaperina gracilipes</i>	Slender Frog		LC		
Microhylidae	<i>Cophixalus</i> sp.					
Ranidae	<i>Rana daemeli</i>	Wood Frog		LC		
Bufonidae	<i>Rhinella marina</i>	Cane Toad		I		
REPTILES						
Crocodylidae	<i>Crocodylus porosus</i>	Salt-water Crocodile	M	V		
Chelidae	<i>Emydura subglobosa</i>	Jardine River Turtle		NT		Queensland Museum record.
Chelidae	<i>Macrochelodina rugosa</i>	Northern Long-necked Turtle		LC		
Gekkonidae	<i>Cyrtodactylus louisianensis</i>	Ring-tailed Gecko		LC		
Gekkonidae	<i>Gehyra baliola</i>	Short-tailed Dtella		LC		Queensland Museum, WildNet, published & unpublished records.

Family	Scientific Name ³	Common Name	Status ⁴			Erub Island
			EPBC Act	NC Act	BoT	
Gekkonidae	<i>Gehyra dubia</i>	Dubious Dtella		LC		
Gekkonidae	<i>Gehyra variegata</i>	Tree Dtella		LC		
Gekkonidae	<i>Hemidactylus frenatus</i>	House Gecko		I		Australian & Queensland Museum & unpublished records.
Gekkonidae	<i>Heteronotia binoei</i>	Bynoe's Gecko		LC		
Gekkonidae	<i>Lepidodactylus lugubris</i>	Mourning Gecko		LC		
Gekkonidae	<i>Lepidodactylus pumilus</i>	Slender Chained Gecko		NT		
Gekkonidae	<i>Nactus eboracensis</i>	no common name		LC		
Gekkonidae	<i>Nactus 'pelagicus'</i>	Pelagic Gecko		LC		
Gekkonidae	<i>Oedura rhombifer</i>	Zigzag Velvet Gecko		LC		
Gekkonidae	<i>Pseudothecadactylus australis</i>	Giant Tree Gecko		LC		
Pygopodidae	<i>Lialis burtonis</i>	Burton's Snake-lizard		LC		
Scincidae	<i>Bellatorias frerei</i>	Major Skink		LC		
Scincidae	<i>Carlia coensis</i>	Coen Rainbow-skink		LC		
Scincidae	<i>Carlia longipes</i>	Closed-litter Rainbow-skink		LC		Australian and Queensland Museum records. Animals from Torres Strait now known as <i>C. sexdentata</i> .
Scincidae	<i>Carlia quinquecarinata</i>	no common name		LC		WildNet & published records.
Scincidae	<i>Carlia sexdentata</i>	no common name		LC		Australian & Queensland Museum, WildNet & unpublished records. Previously included within <i>Carlia longipes</i> .
Scincidae	<i>Carlia storri</i>	Brown Bicarinate Rainbow-skink		LC		WildNet record.
Scincidae	<i>Cryptoblepharus litoralis litoralis</i>	Supralittoral Shinning-skink		LC		Queensland Museum & unpublished records.
Scincidae	<i>Cryptoblepharus virgatus</i>	Cream-striped Shinning-skink		LC		WildNet record.
Scincidae	<i>Ctenotus inornatus</i>	Bar-shouldered Ctenotus		LC		
Scincidae	<i>Ctenotus robustus</i>	Robust Ctenotus		LC		
Scincidae	<i>Ctenotus spaldingi</i>	Straight-browed Ctenotus		LC		
Scincidae	<i>Emoia atrocostata</i>	Littoral Whiptail-skink		NT		
Scincidae	<i>Emoia longicauda</i>	Shrub Whiptail-skink		LC		Australian & Queensland Museum, WildNet & unpublished records.
Scincidae	<i>Eremiascincus pardalis</i>	Lowlands Bar-lipped Skink		LC		WildNet record.
Scincidae	<i>Eugongylus rufescens</i>	Bar-lipped Sheen-skink		LC		Australian & Queensland Museum, WildNet & unpublished records.
Scincidae	<i>Glaphyromorphus</i>	Cape York Mulch-skink		LC		WildNet record.

Family	Scientific Name ³	Common Name	Status ⁴			Erub Island
			EPBC Act	NC Act	BoT	
	<i>crassicaudus</i>					
Scincidae	<i>Glaphyromorphus nigricaudis</i>	Black-tailed Bar-lipped Skink		LC		WildNet record.
Scincidae	<i>Glaphyromorphus pumilus</i>	Dwarf Mulch-skink		LC		
Scincidae	<i>Lygisaurus foliorum</i>	Tree-base Litter-skink		LC		
Scincidae	<i>Lygisaurus macfarlani</i>	Translucent Litter-skink		LC		WildNet record.
Agamidae	<i>Chlamydosaurus kingii</i>	Frilled Lizard		LC		
Agamidae	<i>Diporiphora bilineata</i>	Two-lined Dragon		LC		
Agamidae	<i>Lophognathus temporalis</i>	Swamplands Lashtail		LC		
Varanidae	<i>Varanus gouldii</i>	Gould's Goanna		LC		
Varanidae	<i>Varanus indicus</i>	Mangrove Monitor		LC		Queensland Museum record.
Varanidae	<i>Varanus mertensi</i>	Mertens' Water Monitor		LC		
Varanidae	<i>Varanus panoptes</i>	Yellow-spotted Monitor		LC		
Varanidae	<i>Varanus prasinus</i>	Emerald Monitor		NT		
Varanidae	<i>Varanus scalaris</i>	Spotted Tree Monitor		LC		Unpublished record.
Varanidae	<i>Varanus tristis</i>	Black-tailed Monitor		LC		
Typhlopidae	<i>Ramphotyphlops braminus</i>	Flowerpot Blind Snake		I		
Typhlopidae	<i>Ramphotyphlops leucoproctus</i>	Cape York Blind Snake		LC		Queensland Museum (as <i>R. wiedii</i>) & WildNet records.
Typhlopidae	<i>Ramphotyphlops polygrammicus</i>	North-eastern Blind Snake		LC		
Boidae	<i>Antaresia cf childreni</i>	Children's Python		LC		
Boidae	<i>Antaresia maculosa</i>	Spotted Python		LC		
Boidae	<i>Liasis fuscus</i>	Water Python		LC		
Boidae	<i>Morelia amethystina</i>	Amethyst Python		LC		Unpublished record (likely to be <i>M. kinghorni</i>).
Boidae	<i>Morelia kinghorni</i>	Scrub Python		LC		Queensland Museum record.
Colubridae	<i>Boiga irregularis</i>	Brown Tree Snake		LC		
Colubridae	<i>Cerberus australis</i>	Bockadam		LC		
Colubridae	<i>Dendrelaphis calligastra</i>	Northern Tree Snake		LC		Australian Museum & WildNet records.
Colubridae	<i>Dendrelaphis punctulatus</i>	Common Tree Snake		LC		
Colubridae	<i>Stegonotus cucullatus</i>	Slaty-grey Snake		LC		WildNet record.
Colubridae	<i>Stegonotus parvus</i>	Slate-brown Snake		LC		
Colubridae	<i>Tropidonophis mairii</i>	Freshwater Snake		LC		
Elapidae	<i>Acanthophis praelongus</i>	Northern Death Adder		LC		

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Elapidae	<i>Demansia papuensis</i>	Papuan Whipsnake		LC		
Elapidae	<i>Demansia vestigiata</i>	Black Whipsnake		LC		
Elapidae	<i>Furina tristis</i>	Brown-headed Snake		LC		
Elapidae	<i>Oxyuranus scutellatus</i>	Taipan		LC		
Elapidae	<i>Pseudechis papuanus</i>	Papuan Black Snake		LC		
BIRDS						
Megapodiidae	<i>Alectura lathami</i>	Australian Brush-turkey		LC		
Megapodiidae	<i>Megapodius reinwardt</i>	Orange-Footed Scrubfowl		LC		
Phasianidae	<i>Coturnix ypsilophora</i>	Brown Quail		LC		
Anseranatidae	<i>Anseranas semipalmata</i>	Magpie Goose		LC		
Anatidae	<i>Dendrocygna guttata</i>	Spotted Whistling-Duck		LC		
Anatidae	<i>Dendrocygna eytoni</i>	Plumed Whistling-Duck		LC		
Anatidae	<i>Dendrocygna arcuata</i>	Wandering Whistling-Duck		LC		
Anatidae	<i>Tadorna radjah</i>	Radjah Shelduck		NT		
Anatidae	<i>Chenonetta jubata</i>	Australian Wood Duck		LC		
Anatidae	<i>Nettapus pulchellus</i>	Green Pygmy-goose		LC		
Anatidae	<i>Anas gracilis</i>	Grey Teal		LC		
Anatidae	<i>Anas superciliosa</i>	Pacific Black Duck		LC		
Podicipedidae	<i>Tachybaptus novaehollandiae</i>	Australasian Grebe		LC		
Columbidae	<i>Columba livia</i>	Rock Dove		I		
Columbidae	<i>Geopelia striata papua</i>	Emerald Dove		LC		WildNet, published & unpublished records.
Columbidae	<i>Geopelia striata</i>	Peaceful Dove		LC		
Columbidae	<i>Geopelia humeralis</i>	Bar-shouldered Dove		LC		WildNet, published & unpublished records.
Columbidae	<i>Ptilinopus magnificus</i>	Wompoo Fruit-Dove		LC		
Columbidae	<i>Ptilinopus superbus</i>	Superb Fruit-Dove		LC		WildNet & published records.
Columbidae	<i>Ptilinopus regina</i>	Rose-crowned Fruit-Dove		LC		WildNet, published & unpublished records.
Columbidae	<i>Ptilinopus iozonus</i>	Orange-Bellied Fruit-Dove		LC		
Columbidae	<i>Ducula mullerii</i>	Collared Imperial-Pigeon		LC		
Columbidae	<i>Ducula bicolor</i>	Pied Imperial-Pigeon		LC		WildNet & unpublished records.
Columbidae	<i>Lopholaimus antarcticus</i>	Topknot Pigeon		LC		
Podargidae	<i>Podargus strigoides</i>	Tawny Frogmouth		LC		
Podargidae	<i>Podargus papuensis</i>	Papuan Frogmouth		LC		

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Eurostopodidae	<i>Eurostopodus mystacalis</i>	White-throated Nightjar		LC		
Eurostopodidae	<i>Eurostopodus argus</i>	Spotted Nightjar		LC		
Caprimulgidae	<i>Caprimulgus macrurus</i>	Large-tailed Nightjar		LC		
Apodidae	<i>Collocalia esculenta</i>	Glossy Swiftlet		LC		
Apodidae	<i>Aerodramus terraereginae</i>	Australian Swiftlet		NT		
Apodidae	<i>Aerodramus vanikorensis</i>	Uniform Swiftlet		LC		
Apodidae	<i>Hirundapus caudacutus</i> ⁵	White-throated Needletail	M	LC		Published & unpublished records.
Apodidae	<i>Mearnsia novaeguineae</i>	Papuan Spine-tailed Swift		LC		
Apodidae	<i>Apus pacificus</i>	Fork-tailed Swift	M	LC		Published & unpublished records.
Apodidae	<i>Apus affinis</i>	House Swift		LC		
Anhingidae	<i>Anhinga novaehollandiae</i>	Australasian Darter		LC		WildNet record.
Phalacrocoracidae	<i>Microcarbo melanoleucos</i>	Little Pied Cormorant		LC		
Phalacrocoracidae	<i>Phalacrocorax carbo</i>	Great Cormorant		LC		
Phalacrocoracidae	<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant		LC		WildNet & published records.
Phalacrocoracidae	<i>Phalacrocorax varius</i>	Pied Cormorant		LC		
Pelecanidae	<i>Pelecanus conspicillatus</i>	Australian Pelican		LC		WildNet, published & unpublished records.
Ciconiidae	<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork		NT		
Ardeidae	<i>Ixobrychus dubius</i>	Australian Little Bittern		LC		
Ardeidae	<i>Ixobrychus flavicollis</i>	Black Bittern		LC		
Ardeidae	<i>Ardea pacifica</i>	White-necked Heron		LC		
Ardeidae	<i>Ardea modesta</i> ⁶	Eastern Great Egret	M	LC		Unpublished record.
Ardeidae	<i>Ardea intermedia</i>	Intermediate Egret		LC		
Ardeidae	<i>Ardea sumatrana</i>	Great-billed Heron		LC		
Ardeidae	<i>Ardea ibis</i> ⁷	Cattle Egret	M	LC		
Ardeidae	<i>Butorides striata</i>	Striated Heron		LC		
Ardeidae	<i>Egretta picata</i>	Pied Heron		LC		
Ardeidae	<i>Egretta novaehollandiae</i>	White-faced Heron		LC		
Ardeidae	<i>Egretta garzetta</i>	Little Egret		LC		WildNet record.
Ardeidae	<i>Egretta sacra</i>	Eastern Reef Egret	M	LC		WildNet, published & unpublished records.
Ardeidae	<i>Nycticorax caledonicus</i>	Nankeen Night-Heron		LC		WildNet & published records.
Threskiornithidae	<i>Plegadis falcinellus</i>	Glossy Ibis	M	LC		
Threskiornithidae	<i>Threskiornis molucca</i>	Australian White Ibis		LC		

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Threskiornithidae	<i>Threskiornis spinicollis</i>	Straw-necked Ibis		LC		
Threskiornithidae	<i>Platalea regia</i>	Royal Spoonbill		LC		WildNet record.
Accipitridae	<i>Pandion cristatus</i> ⁸	Eastern Osprey	M	LC		WildNet record.
Accipitridae	<i>Elanus axillaris</i>	Black-shouldered Kite		LC		
Accipitridae	<i>Hamirostra melanosternon</i>	Black-breasted Buzzard		LC		
Accipitridae	<i>Aviceda subcristata</i>	Pacific Baza		LC		WildNet record.
Accipitridae	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	M	LC		Unpublished record.
Accipitridae	<i>Haliastur sphenurus</i>	Whistling Kite		LC		
Accipitridae	<i>Haliastur indus</i>	Brahminy Kite		LC		
Accipitridae	<i>Milvus migrans</i>	Black Kite		LC		
Accipitridae	<i>Accipiter fasciatus</i>	Brown Goshawk		LC		
Accipitridae	<i>Accipiter cirrhocephalus</i>	Collared Sparrowhawk		LC		
Accipitridae	<i>Accipiter novaehollandiae</i>	Grey Goshawk		NT		
Accipitridae	<i>Circus assimilis</i>	Spotted Harrier		LC		
Accipitridae	<i>Circus approximans</i>	Swamp Harrier		LC		
Accipitridae	<i>Erythrotriorchis radiatus</i>	Red Goshawk	V	E	high	
Accipitridae	<i>Aquila gurneyi</i>	Gurney's Eagle		LC		
Falconidae	<i>Falco cenchroides</i>	Nankeen Kestrel		LC		
Falconidae	<i>Falco berigora</i>	Brown Falcon		LC		
Falconidae	<i>Falco longipennis</i>	Australian Hobby		LC		
Falconidae	<i>Falco peregrinus</i>	Peregrine Falcon		LC		
Gruidae	<i>Grus rubicunda</i>	Brolga		LC		
Rallidae	<i>Porphyrio porphyrio</i>	Purple Swamphen		LC		
Rallidae	<i>Eulabeornis castaneoventris</i>	Chestnut Rail		LC		
Rallidae	<i>Rallina tricolor</i>	Red-necked Crake		LC		
Rallidae	<i>Gallirallus philippensis</i>	Buff-banded Rail		LC		
Rallidae	<i>Porzana pusilla</i>	Baillon's Crake		LC		
Rallidae	<i>Porzana fluminea</i>	Australian Spotted Crake		LC		
Rallidae	<i>Porzana tabuensis</i>	Spotless Crake		LC		
Rallidae	<i>Amauornis cinerea</i>	White-browed Crake		LC		
Rallidae	<i>Amauornis moluccana</i>	Pale-vented Bush-hen		LC		
Otididae	<i>Ardeotis australis</i>	Australian Bustard		LC		

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Burhinidae	<i>Burhinus grallarius</i>	Bush Stone-curlew		LC		
Burhinidae	<i>Esacus magnirostris</i>	Beach Stone-curlew		V	high	WildNet & published records.
Haematopodidae	<i>Haematopus longirostris</i>	Australian Pied Oystercatcher		LC		
Haematopodidae	<i>Haematopus fuliginosus</i>	Sooty Oystercatcher		NT		
Recurvirostridae	<i>Himantopus himantopus</i>	Black-winged Stilt		LC		
Charadriidae	<i>Pluvialis fulva</i>	Pacific Golden Plover	M	LC		WildNet, published & unpublished records.
Charadriidae	<i>Pluvialis squatarola</i>	Grey Plover	M	LC		Unpublished record.
Charadriidae	<i>Charadrius ruficapillus</i>	Red-capped Plover		LC		
Charadriidae	<i>Charadrius bicinctus</i>	Double-banded Plover	M	LC		
Charadriidae	<i>Charadrius mongolus</i>	Lesser Sand Plover	M	LC		WildNet, published & unpublished records.
Charadriidae	<i>Charadrius leschenaultii</i>	Greater Sand Plover	M	LC		WildNet, published & unpublished records.
Charadriidae	<i>Erythronyx cinctus</i>	Red-kneed Dotterel		LC		
Charadriidae	<i>Vanellus miles</i>	Masked Lapwing		LC		WildNet & unpublished records.
Scolopacidae	<i>Gallinago hardwickii</i>	Latham's Snipe	M	LC		
Scolopacidae	<i>Gallinago megala</i>	Swinhoe's Snipe	M	LC		
Scolopacidae	<i>Gallinago</i> sp.	snipe species				Unpublished record.
Scolopacidae	<i>Limosa limosa</i>	Black-tailed Godwit	M	LC		
Scolopacidae	<i>Limosa lapponica</i>	Bar-tailed Godwit	M	LC		Published & unpublished records.
Scolopacidae	<i>Numenius minutus</i>	Little Curlew	M	LC		
Scolopacidae	<i>Numenius phaeopus</i>	Whimbrel	M	LC		WildNet, published & unpublished records.
Scolopacidae	<i>Numenius madagascariensis</i>	Eastern Curlew	M	NT		WildNet & published records.
Scolopacidae	<i>Xenus cinereus</i>	Terek Sandpiper	M	LC		WildNet & unpublished records.
Scolopacidae	<i>Actitis hypoleucos</i> ⁹	Common Sandpiper	M	LC		WildNet, published & unpublished records.
Scolopacidae	<i>Tringa brevipes</i> ¹⁰	Grey-tailed Tattler	M	LC		WildNet, published & unpublished records.
Scolopacidae	<i>Tringa incana</i> ¹¹	Wandering Tattler	M	LC		WildNet, published & unpublished records.
Scolopacidae	<i>Tringa nebularia</i>	Common Greenshank	M	LC		WildNet & unpublished records.
Scolopacidae	<i>Tringa stagnatilis</i>	Marsh Sandpiper	M	LC		
Scolopacidae	<i>Tringa glareola</i>	Wood Sandpiper	M	LC		
Scolopacidae	<i>Arenaria interpres</i>	Ruddy Turnstone	M	LC		WildNet, published & unpublished records.
Scolopacidae	<i>Calidris tenuirostris</i>	Great Knot	M	LC		Unpublished record.
Scolopacidae	<i>Calidris canutus</i>	Red Knot	M	LC		
Scolopacidae	<i>Calidris alba</i> ¹²	Sanderling	M	LC		

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Scolopacidae	<i>Calidris ruficollis</i>	Red-necked Stint	M	LC		WildNet, published & unpublished records.
Scolopacidae	<i>Calidris melanotos</i>	Pectoral Sandpiper	M	LC		
Scolopacidae	<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	M	LC		WildNet & unpublished records.
Scolopacidae	<i>Calidris ferruginea</i>	Curlew Sandpiper	M	LC		Unpublished record.
Turnicidae	<i>Turnix maculosus</i>	Red-backed Button-quail		LC		WildNet, published & unpublished records.
Turnicidae	<i>Turnix pyrrhothorax</i>	Red-chested Button-quail		LC		WildNet & published records.
Glareolidae	<i>Glareola maldivarum</i>	Oriental Pratincole	M	LC		
Glareolidae	<i>Stiltia isabella</i>	Australian Pratincole		LC		
Laridae	<i>Anous stolidus</i>	Common Noddy	M	LC		WildNet & unpublished records.
Laridae	<i>Anous minutus</i>	Black Noddy		LC		WildNet, published & unpublished records.
Laridae	<i>Onychoprion anaethetus</i> ¹³	Bridled Tern	M	LC		WildNet record.
Laridae	<i>Onychoprion fuscata</i>	Sooty Tern		LC		Unpublished record.
Laridae	<i>Sternula albifrons</i> ¹⁴	Little Tern	M	E	high	Published & unpublished records.
Laridae	<i>Gelochelidon nilotica</i>	Gull-billed Tern		LC		
Laridae	<i>Hydroprogne caspia</i>	Caspian Tern	M	LC		
Laridae	<i>Chlidonias hybrida</i>	Whiskered Tern		LC		WildNet record.
Laridae	<i>Chlidonias leucopterus</i>	White-winged Black Tern	M	LC		Unpublished record.
Laridae	<i>Sterna dougallii</i>	Roseate Tern	M	LC		Unpublished record.
Laridae	<i>Sterna striata</i>	White-fronted Tern		LC		
Laridae	<i>Sterna sumatrana</i>	Black-naped Tern	M	LC		WildNet, published & unpublished records.
Laridae	<i>Sterna hirundo</i>	Common Tern	M	LC		WildNet, published & unpublished records.
Laridae	<i>Thalasseus bengalensis</i> ¹⁵	Lesser Crested Tern	M	LC		WildNet, published & unpublished records.
Laridae	<i>Thalasseus bergii</i>	Crested Tern		LC		WildNet, published & unpublished records.
Laridae	<i>Chroicocephalus novaehollandiae</i>	Silver Gull		LC		WildNet, published & unpublished records.
Cacatuidae	<i>Probosciger aterrimus</i>	Palm Cockatoo		NT		
Cacatuidae	<i>Eolophus roseicapilla</i>	Galah		LC		
Cacatuidae	<i>Cacatua galerita</i>	Sulphur-crested Cockatoo		LC		
Psittacidae	<i>Trichoglossus haematodus</i>	Rainbow Lorikeet		LC		Published record.
Psittacidae	<i>Cyclopsitta species</i>	fig-parrot species				
Psittacidae	<i>Eclectus roratus polychloros</i>	Eclectus Parrot		LC		
Psittacidae	<i>Geoffroyus geoffroyi</i>	Red-cheeked Parrot		LC		

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Cuculidae	<i>Centropus phasianinus</i>	Pheasant Coucal		LC		Published record.
Cuculidae	<i>Eudynamys orientalis</i>	Eastern Koel		LC		Published & unpublished records.
Cuculidae	<i>Urodynamys taitensis</i>	Long-tailed Cuckoo				
Cuculidae	<i>Scythrops novaehollandiae</i>	Channel-billed Cuckoo		LC		WildNet, published & unpublished records.
Cuculidae	<i>Chalcites basalis</i>	Horsfield's Bronze-Cuckoo		LC		
Cuculidae	<i>Chalcites osculans</i>	Black-eared Cuckoo		LC		
Cuculidae	<i>Chalcites lucidus</i>	Shining Bronze-Cuckoo		LC		
Cuculidae	<i>Chalcites minutillus</i>	Little Bronze-Cuckoo		LC		
Cuculidae	<i>Cacomantis pallidus</i>	Pallid Cuckoo		LC		
Cuculidae	<i>Cacomantis castaneiventris</i>	Chestnut-breasted Cuckoo		LC		
Cuculidae	<i>Cacomantis flabelliformis</i>	Fan-tailed Cuckoo		LC		
Cuculidae	<i>Cacomantis variolosus</i>	Brush Cuckoo		LC		
Cuculidae	<i>Cuculus optatus</i> ¹⁶	Oriental Cuckoo	M	LC		Published record.
Strigidae	<i>Ninox connivens</i>	Barking Owl		LC		
Strigidae	<i>Ninox novaeseelandiae</i>	Southern Boobook		LC		
Tytonidae	<i>Tyto longimembris</i>	Eastern Grass Owl		LC		
Alcedinidae	<i>Ceyx azureus</i>	Azure Kingfisher		LC		
Alcedinidae	<i>Ceyx pusilla</i>	Little Kingfisher		LC		
Halcyonidae	<i>Tanysiptera sylvia</i>	Buff-breasted Paradise-Kingfisher		LC		Published & unpublished records.
Halcyonidae	<i>Tanysiptera galatea</i>	Common Paradise-Kingfisher		LC		Published record.
Halcyonidae	<i>Tanysiptera hydrocharis</i>	Little Paradise-Kingfisher				
Halcyonidae	<i>Dacelo leachii</i>	Blue-winged Kookaburra		LC		
Halcyonidae	<i>Syma torotoro</i>	Yellow-billed Kingfisher		LC		
Halcyonidae	<i>Todiramphus macleayii</i>	Forest Kingfisher		LC		Unpublished record.
Halcyonidae	<i>Todiramphus sanctus</i>	Sacred Kingfisher		LC		WildNet, published & unpublished records.
Halcyonidae	<i>Todiramphus chloris</i>	Collared Kingfisher		LC		WildNet record.
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater	M	LC		WildNet & unpublished records.
Coraciidae	<i>Eurystomus orientalis</i>	Dollarbird		LC		WildNet, published & unpublished records.
Pittidae	<i>Pitta erythrogaster</i>	Red-bellied Pitta		LC		
Pittidae	<i>Pitta versicolor</i>	Noisy Pitta		LC		WildNet & published records.
Ptilonorhynchidae	<i>Ptilonorhynchus nuchalis</i>	Great Bowerbird		LC		

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Acanthizidae	<i>Sericornis beccarii</i>	Tropical Scrubwren		LC		
Acanthizidae	<i>Gerygone levigaster</i>	Mangrove Gerygone		LC		
Acanthizidae	<i>Gerygone magnirostris</i>	Large-billed Gerygone		LC		
Acanthizidae	<i>Gerygone palpebrosa</i>	Fairy Gerygone		LC		
Meliphagidae	<i>Meliphaga notata</i>	Yellow-spotted Honeyeater		LC		WildNet, published & unpublished records.
Meliphagidae	<i>Meliphaga gracilis</i>	Graceful Honeyeater		LC		
Meliphagidae	<i>Lichenostomus versicolor</i>	Varied Honeyeater		LC		
Meliphagidae	<i>Manorina melanocephala</i>	Noisy Miner		LC		
Meliphagidae	<i>Ramsayornis modestus</i>	Brown-backed Honeyeater		LC		
Meliphagidae	<i>Conopophila albogularis</i>	Rufous-banded Honeyeater		LC		
Meliphagidae	<i>Myzomela obscura</i>	Dusky Honeyeater		LC		
Meliphagidae	<i>Myzomela erythrocephala</i>	Red-headed Honeyeater		LC		WildNet, published & unpublished records.
Meliphagidae	<i>Cissomela pectoralis</i>	Banded Honeyeater		LC		
Meliphagidae	<i>Lichmera indistincta</i>	Brown Honeyeater		LC		
Meliphagidae	<i>Philemon buceroides</i>	Helmeted Friarbird		LC		
Meliphagidae	<i>Philemon argenticeps</i>	Silver-crowned Friarbird		LC		
Meliphagidae	<i>Philemon corniculatus</i>	Noisy Friarbird		LC		
Meliphagidae	<i>Philemon citreogularis</i>	Little Friarbird		LC		
Meliphagidae	<i>Xanthotis flaviventer</i>	Tawny-breasted Honeyeater		LC		
Pomatostomidae	<i>Pomatostomus temporalis</i>	Grey-crowned Babbler		LC		
Campephagidae	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike		LC		WildNet, published & unpublished records.
Campephagidae	<i>Coracina papuensis</i>	White-bellied Cuckoo-shrike		LC		WildNet, published & unpublished records.
Campephagidae	<i>Coracina lineata</i>	Barred Cuckoo-shrike		LC		
Campephagidae	<i>Coracina tenuirostris melvillensis</i>	(Melville) Cicadabird	M	LC		
Campephagidae	<i>Lalage tricolor</i>	White-winged Triller		LC		
Campephagidae	<i>Lalage leucomela</i>	Varied Triller		LC		
Pachycephalidae	<i>Pachycephala melanura</i>	Mangrove Golden Whistler		LC		WildNet, published & unpublished records.
Pachycephalidae	<i>Pachycephala rufiventris</i>	Rufous Whistler		LC		WildNet record.
Pachycephalidae	<i>Colluricincla megarrhyncha</i>	Little Shrike-thrush		LC		
Oriolidae	<i>Sphecotheres vieilloti</i>	Australasian Figbird		LC		
Oriolidae	<i>Oriolus flavocinctus</i>	Yellow Oriole		LC		

Family	Scientific Name ³	Common Name	Status ⁴			Erub Island
			EPBC Act	NC Act	BoT	
Oriolidae	<i>Oriolus sagittatus</i>	Olive-backed Oriole		LC		WildNet record.
Artamidae	<i>Artamus leucorhynchus</i>	White-breasted Woodswallow		LC		
Artamidae	<i>Artamus cinereus</i>	Black-faced Woodswallow		LC		
Artamidae	<i>Artamus minor</i>	Little Woodswallow		LC		
Artamidae	<i>Cracticus quoyi</i>	Black Butcherbird		LC		
Dicruridae	<i>Dicrurus bracteatus</i>	Spangled Drongo		LC		Published & unpublished records.
Rhipiduridae	<i>Rhipidura rufifrons</i>	Rufous Fantail	M	LC		
Rhipiduridae	<i>Rhipidura phasiana</i>	Mangrove Grey Fantail		LC		
Rhipiduridae	<i>Rhipidura rufiventris</i>	Northern Fantail		LC		
Rhipiduridae	<i>Rhipidura leucophrys</i>	Willie Wagtail		LC		
Corvidae	<i>Corvus orru</i>	Torresian Crow		LC		
Monarchidae	<i>Myiagra ruficollis</i>	Broad-billed Flycatcher		LC		WildNet record.
Monarchidae	<i>Myiagra rubecula</i>	Leaden Flycatcher		LC		WildNet & published records.
Monarchidae	<i>Myiagra cyanoleuca</i>	Satin Flycatcher	M	LC		
Monarchidae	<i>Myiagra alecto</i>	Shining Flycatcher		LC		
Monarchidae	<i>Myiagra inquieta</i>	Restless Flycatcher		LC		
Monarchidae	<i>Monarcha melanopsis</i>	Black-faced Monarch	M	LC		Unpublished record.
Monarchidae	<i>Monarcha frater</i>	Black-winged Monarch	M	LC		
Monarchidae	<i>Symphoricarthus trivirgatus</i> ¹⁷	Spectacled Monarch	M	LC		WildNet, published & unpublished records.
Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark		LC		
Monarchidae	<i>Arses telescopthalmus</i>	Frilled Monarch		LC		
Paradisaeidae	<i>Phonygamus keraudrenii</i>	Trumpet Manucode		LC		
Paradisaeidae	<i>Ptiloris magnificus</i>	Magnificent Riflebird		LC		
Petroicidae	<i>Microeca flavigaster</i>	Lemon-bellied Flycatcher		LC		Unpublished record.
Petroicidae	<i>Peneoenanthe pulverulenta</i>	Mangrove Robin		LC		
Petroicidae	<i>Drymodes superciliaris</i>	Northern Scrub-robin		LC		
Cisticolidae	<i>Cisticola exilis</i>	Golden-headed Cisticola		LC		WildNet, published & unpublished records.
Acrocephalidae	<i>Acrocephalus australis</i> ¹⁸	Australian Reed-Warbler	M	LC		
Megaluridae	<i>Megalurus timoriensis</i>	Tawny Grassbird		LC		
Megaluridae	<i>Megalurus gramineus</i>	Little Grassbird		LC		
Timaliidae	<i>Zosterops citrinella</i>	Pale White-eye		LC		WildNet, published & unpublished records.
Timaliidae	<i>Zosterops lateralis</i>	Silvereye		LC		

Family	Scientific Name ³	Common Name	Status ⁴			Erub Island
			EPBC Act	NC Act	BoT	
Hirundinidae	<i>Hirundo rustica</i>	Barn Swallow	M	LC		
Hirundinidae	<i>Hirundo neoxena</i>	Welcome Swallow		LC		
Hirundinidae	<i>Petrochelidon ariel</i>	Fairy Martin		LC		
Hirundinidae	<i>Petrochelidon nigricans</i>	Tree Martin		LC		WildNet, published & unpublished records.
Hirundinidae	<i>Cecropis daurica</i> ¹⁹	Red-rumped Swallow	M	LC		
Turdidae	<i>Zoothera</i> sp.	thrush species		LC		
Sturnidae	<i>Aplornis cantoroides</i>	Singing Starling		LC		
Sturnidae	<i>Aplornis metallica</i>	Metallic Starling		LC		Published & unpublished records.
Sturnidae	<i>Sturnus tristis</i>	Common Myna		I		
Nectariniidae	<i>Dicaeum geelvinkianum</i>	Red-capped Flowerpecker		LC		
Nectariniidae	<i>Dicaeum hirundinaceum</i>	Mistletoebird		LC		
Nectariniidae	<i>Nectarinia jugularis</i>	Olive-backed Sunbird		LC		WildNet, published & unpublished records.
Estrildidae	<i>Poephila personata</i>	Masked Finch		LC		
Estrildidae	<i>Lonchura punctulata</i>	Nutmeg Mannikin		I		
Estrildidae	<i>Lonchura castaneothorax</i>	Chestnut-breasted Mannikin		LC		WildNet, published & unpublished records.
Passeridae	<i>Passer domesticus</i>	House Sparrow		I		WildNet & unpublished records.
Motacillidae	<i>Motacilla</i> sp.	Yellow Wagtail species	M	LC		
MAMMALS						
Tachyglossidae	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna		LC		
Peramelidae	<i>Isoodon macrourus</i>	Northern Brown Bandicoot		LC		
Peramelidae	<i>Isoodon obesulus</i>	Southern Brown Bandicoot		LC		
Macropodidae	<i>Macropus agilis</i>	Agile Wallaby		LC		
Pteropodidae	<i>Dobsonia magna</i>	Bare-backed Fruit-bat		NT		
Pteropodidae	<i>Macroglossus minimus</i>	Northern Blossom-bat		LC		
Pteropodidae	<i>Syconycteris australis</i>	Common Blossom-bat		LC		
Pteropodidae	<i>Nyctimene cephalotes</i>	Torresian Tube-nosed Bat		NT		
Pteropodidae	<i>Nyctimene robinsoni</i>	Eastern Tube-nosed Bat		LC		
Pteropodidae	<i>Pteropus alecto</i>	Black Flying-fox		LC		
Pteropodidae	<i>Pteropus conspicillatus</i>	Spectacled Flying-fox	V	LC	high	Predicted by the EPBC Protected Matters Search Tool
Pteropodidae	<i>Pteropus macrotis</i>	Large-eared Flying-fox		LC		
Pteropodidae	<i>Pteropus scapulatus</i>	Little Red Flying-fox		LC		
Rhinolophidae	<i>Rhinolophus philippinensis</i>	Greater Large-eared	E	E	high	

Family	Scientific Name ³	Common Name	Status ⁴			Erub Island
			EPBC Act	NC Act	BoT	
	(large form)	Horseshoe Bat				
Hipposideridae	<i>Hipposideros ater aruensis</i>	(eastern) Dusky Leaf-nosed Bat		LC		
Hipposideridae	<i>Hipposideros cervinus</i>	Fawn Leaf-nosed Bat		V	high	
Hipposideridae	<i>Hipposideros diadema</i>	Diadem Leaf-nosed Bat		LC		
Emballonuridae	<i>Saccolaimus saccolaimus nudicluniatus</i>	Bare-rumped Sheath-tail-bat	CE	E	high	
Emballonuridae	<i>Taphozous australis</i>	Coastal Sheath-tail Bat		V	high	
Molossidae	<i>Chaerephon jobensis</i>	Northern Freetail-bat		LC		
Molossidae	<i>Mormopterus beccarii</i>	Beccari's Freetail-bat		LC		
Vespertilionidae	<i>Chalinolobus nigrogriseus</i>	Hoary Wattled Bat		LC		
Vespertilionidae	<i>Miniopterus australis</i>	Little Bent-wing Bat		LC		
Vespertilionidae	<i>Miniopterus schreibersii</i>	Eastern Bent-wing Bat		LC		
Vespertilionidae	<i>Myotis macropus</i>	Large-footed Myotis		LC		
Vespertilionidae	<i>Nyctophilus bifax</i>	Eastern Long-eared Bat		LC		
Vespertilionidae	<i>Pipistrellus</i> sp.	Pipistrelle species		LC		
Muridae	<i>Conilurus penicillatus</i>	Brush-tailed Tree-rat	V	LC		
Muridae	<i>Hydromys chrysogaster</i>	Water-rat		LC		
Muridae	<i>Melomys burtoni</i>	Grassland Melomys		LC		Unpublished record.
Muridae	<i>Melomys capensis</i>	Cape York Melomys		LC		
Muridae	<i>Melomys rubicola</i>	Bramble Cay Melomys	E	E	high	
Muridae	<i>Mus musculus</i>	House Mouse		I		Unpublished record.
Muridae	<i>Pseudomys delicatulus</i>	Delicate Mouse		LC		
Muridae	<i>Rattus exulans</i>	Pacific Rat		I		
Muridae	<i>Rattus norvegicus</i>	Brown Rat		I		
Muridae	<i>Rattus rattus</i>	Black Rat		I		
Muridae	<i>Xeromys myoides</i>	Water Mouse	V	V	high	
Canidae	<i>Canis lupus</i>	Dingo, Domestic Dog		I		Unpublished record.
Felidae	<i>Felis catus</i>	Cat		I		Unpublished record.
Equidae	<i>Equus caballus</i>	Horse, Brumby		I		
Suidae	<i>Sus scrofa</i>	Pig		I		Unpublished record.

Family	Scientific Name ³	Common Name	Status ⁴			Erub Island
			EPBC Act	NC Act	BoT	
Bovidae	<i>Capra hircus</i>	Goat		I		
Cervidae	<i>Cervus timorensis</i>	Rusa Deer		I		

- Known from Museum records, published literature (eg Tyler 1972; Storr 1973; Draffan *et al.* 1983; Whittier & Moeller 1993; Clarke 2004a, b; 2005, 2006; Wilson 2005; Ingram 2008), WildNet database and/or reports and other grey literature (eg Smith & Smith 2006; Borsboom 2007; Conics 2008a, b, c; 2009a, b; Natural Solutions 2008; Schaffer 2010). These sources are not necessarily mutually exclusive and many records are un-confirmed. Some appear unreliable. WildNet database searches were conducted for Boigu, Saibai, Dauan, Bramble Cay, Darnley (Erub), Mer, Mabuiag, Iama (Yam), Mua, Badu, Possession, Thursday, Wednesday, Friday, Horn, Hammond and Prince of Wales Islands.
- Predicted by the EPBC Protected Matters Search Tool maintained by the Department of Sustainability, Environment, Water, Population and Communities, Canberra (DSEWPC) <http://www.environment.gov.au/erin/ert/epbc/index.html>. Only noted if not recorded from another source.
- Nomenclature follows the Australian Faunal Directory maintained by DSEWPC. <http://www.environment.gov.au/biodiversity/abrs/online-resources/fauna/afd/index.html>
- Status: CE = Critically Endangered, E = Endangered, V = Vulnerable, NT = Near-threatened, M = Migratory, LC = Least Concern (Common), I = Introduced (Exotic) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and/or *Nature Conservation Act 1992* (NC Act). BoT = species listed as critical or high priority under the Back on Track species prioritisation framework. Department of Environment and Resource Management, Brisbane. http://www.derm.qld.gov.au/wildlife-ecosystems/wildlife/back_on_track_species_prioritisation_framework/index.html.
- Also listed under the EPBC Act (ROKAMBA) as *Chaetura caudacuta*.
- Listed under the EPBC Act (CAMBA, JAMBA) as Great Egret *Ardea alba*. Australian birds elevated to full species level as *A. modesta* (Kushlan & Hancock 2005; Christidis & Boles 2008).
- Listed under CAMBA as *Ardeola ibis*, listed under JAMBA as *Bubulcus ibis*.
- Listed under the Bonn Convention as Osprey *Pandion haliaetus*. Australian birds have been elevated to species level as *P. cristatus* (Wink *et al.* 2004; Christidis & Boles 2008).
- Also listed under CAMBA and ROKAMBA as *Tringa hypoleucos*.
- Also listed under the Bonn Convention and JAMBA as *Heteroscelus brevipes*.
- Also listed under the Bonn Convention and JAMBA as *Heteroscelus incanus*.
- Also listed under ROKAMBA as *Crocethia alba*.
- Listed under the EPBC Act (CAMBA, JAMBA) as *Sterna anaethetus*.
- Listed under the EPBC Act (Bonn Convention, CAMBA, JAMBA, ROKAMBA) as *Sterna albifrons*.
- Listed under the EPBC Act (CAMBA) as *Sterna bengalensis*.
- Listed under the EPBC Act (CAMBA, JAMBA, ROKAMBA) as *Cuculus saturatus*. Australian birds elevated to full species level as *A. optatus* (Christidis & Boles 2008).
- Listed under the EPBC Act (Bonn Convention) as *Monarcha trivirgatus*.
- Listed under the EPBC Act (Bonn Convention) as Clamorous Reed-warbler *Acrocephalus stentoreus*. Australian birds elevated to full species level as *A. australis* (Higgins *et al.* 2006b).
- Listed under the EPBC Act (ROKAMBA) as *Hirundo daurica*.

Appendix E. Information on Migratory Fauna Species Potentially occurring on Erub Island and Surrounding Islets

Waders

Life history

Waders listed as Migratory under the EPBC Act that have been recorded in the Torres Strait include plovers, sandpipers and oriental pratincole *Glareola maldivarum*. Sandpipers are known by a number of common names including snipe, godwit, curlew, tattler, knot and stint. The majority of the waders recorded occur in coastal areas, particularly in the intertidal zone, on mudflats, sandflats, beaches, saltmarsh, coastal lagoons and mangroves. Some also forage and/or roost on rocky shores. Many of these species are also found on freshwater and artificial waterbodies such as rivers, streams, swamps, dams and sewage ponds. Two species are unlikely to be found in the intertidal zone, oriental pratincole and wood sandpiper *Tringa glareola*. Oriental pratincole is largely restricted to grasslands and other open areas and wood sandpiper occurs on freshwater waterbodies (Pringle 1987). None of these wader species breed in Australia but individuals of some species, especially large sandpipers such as eastern curlew and bar-tailed godwit, may be present year-round.

Flat tidal shores with extensive muddy intertidal areas support the most species and individuals, though some waders feed in mangroves forests at low tide (Lane 1987). The coastal species have a life cycle driven largely by the tidal cycle, roosting in mixed species flocks above the high water mark at high tide and moving to feeding areas as the tide recedes. Most of these species are gregarious, wary and fly strongly and swiftly (Pringle 1987; Geering *et al.* 2007). Smaller species, such as red-necked stint and curlew sandpiper, feed for longer each tide cycle than do larger species and may continue to feed in non-tidal areas during high tide (Lane 1987).

Other than double-banded plover, which breeds in New Zealand, all the Migratory waders breed in the northern hemisphere during the Australian winter. Migration to Australia after breeding starts in mid-July and finishes by December. Birds begin returning to breeding grounds as early as mid-February, though most birds leave in mid-March (Lane 1987).

Threats

Although none of the species breed in Australia they are susceptible to loss of foraging and roosting habitat and to disturbance, when foraging or roosting, by human activities and feral and domestic animals. Such disturbance may limit their ability to undertake long migration flights through depletion of their energy reserves. Pollution may also affect the intertidal invertebrate species on which so many Migratory waders depend (Lane 1987). On Erub Island, threats to waders appear limited to disturbance on beaches and rocky shores. This will be most relevant prior to return passage in autumn.

Terns

Life history

Terns, with gulls, belong to the family Laridae. The terns include the noddies, a group of largely tropical pelagic species. Eight Migratory tern species have been recorded from Erub Island and the caspian tern is also expected to occur. Many tern species are cosmopolitan, with very large distributions. Most species are coastal, found in a variety of habitats, including open beaches, lagoons, estuaries, river mouths, lakes, bays, harbours and inlets. Some species do also occur on inland freshwater habitats and others are largely restricted to pelagic waters. Fish is the major food item but crustaceans and insects are also taken by some and those species that feed in freshwater may also eat reptiles, frogs and small mammals. Most terns are gregarious when feeding and are colonial nesters, with most of the species that breed in Australia simply laying their eggs in shallow depressions, though noddies will nest in trees (Pringle 1987; Higgins & Davies 1996).

Threats

Ground-nesting makes many species susceptible to loss of eggs and chicks through native and feral predators and adverse weather conditions. Colonies can be threatened by human disturbance and birds are affected by degradation of feeding areas, pesticide residues in fish, and oil-fouling, both of birds and beaches. Birds occasionally are tangled in fishing nets (Blakers *et al.* 1984; Higgins & Davies 1996; Garnett & Crowley 2000). Threats appear to be minimal except for any species that may breed on Erub Island.

Herons and egrets

Life history

The family Ardeidae includes herons, egrets, and bitterns, and all species are characterised by long necks and legs and long sharp bills. Although there is variation, most species forage in shallow water and eat fish, crustaceans, frogs, insects and other small animals (McKilligan 2005). Three species listed as Migratory occur in the Torres Strait; eastern great egret, cattle egret and eastern reef egret.

Eastern great egrets are generally associated with shallow water, both freshwater and saline, but also occur in dry habitats. The species occurs on coastal and inland habitats, including rivers, estuaries, tidal mudflats, swamps, man-made dams and ponds, sewage farms and wet pasture. Eastern great egrets eat mainly fish but also small vertebrates such as frogs and aquatic insects (Pringle 1985; Marchant & Higgins 1990; McKilligan 2005). The cattle egret inhabits grasslands, wetlands and wooded lands, often foraging away from water in grassland, pasture and crops. The species is strongly associated with grazing animals in Australia, but also forages at garbage tips, follows machinery, and feeds independently. Cattle egrets feed on invertebrates, especially grasshoppers, and small vertebrates such as frogs, reptiles and mammals (Pringle 1985; Marchant & Higgins 1990).

eastern reef egret is found on coastlines, foraging on rocky and muddy shores. The species eats mostly fish, but also crustaceans, molluscs, bird chicks and turtle hatchlings (McKilligan 2005).

Eastern great egret is common and widespread in Australia even in some arid areas. The cattle egret occurs in all Australian states and mainland territories. Eastern reef egret occurs along most of the Australian coastline. All three species extend through the Torres Strait into south-east Asia. The cattle egret has a limited distribution in the Torres Strait but has been undergoing a global expansion of range (Pringle 1985; Marchant & Higgins 1990; McKilligan 2005). It may become more widespread and common in the Torres Strait if there are changes to land use which favour the species.

Threats

The eastern great egret is threatened by destruction and modification of freshwater habitats by drainage and groundwater extraction, clearing, livestock, burning, increased salinity and weed invasions (Marchant & Higgins 1990). The most important issue is the allocation of water from regulated rivers in sufficient quantity and with appropriate timing to maintain suitable wetland conditions (Maddock 2000). The cattle egret is also threatened by loss of breeding habitat through drainage of wetlands and river regulation and water harvesting that prevent or limit flooding of temporary wetlands. Nestlings may be susceptible to predation by cats (DSEWPC 2011b). Eastern reef egrets can be disturbed by human activity near nest sites and are threatened by reclamation of tidal areas and deepening of channels. However, the species often tolerates human presence and roosts, and sometimes breeds, on artificial structures (Marchant & Higgins 1990). Eastern great and cattle egrets are not likely to breed on Erub Island and threats appear minor. Eastern reef egret may breed and would be susceptible to disturbance at its nest. The level of threat is likely to be minor.

Swifts

Life history

In Australia the white-throated needletail and fork-tailed swift are almost completely aerial species, possibly even sleeping on the wing. These species are sometimes found roosting in trees and may on rare occasions rest in trees and on the ground during the day. They are found over a wide variety of habitat, including forest, open areas, modified land and the ocean. Foraging for aerial invertebrates occurs at heights from less than one metre up to more than 1000 metres (Higgins 1999).

Both species breed in Asia and arrive in Australia in September/October and leave by April. Some birds may over-winter. White-throated needletail is widespread in eastern and south-eastern Australia and fork-tailed swift is widespread throughout Australia (Higgins 1999). The total population of white-throated needletail is unknown but it is described as abundant in some regions of Australia (Chantler 1999). A comparison of Birds Australia atlas data between 1977–81 and 1998–2002 indicates that the species has undergone a decline in both its area of occupancy and extent of occurrence in Australia (Blakers *et al.* 1984; Barrett *et al.* 2003). Worldwide the fork-tailed swift is thought to have a stable population with no evidence for any declines or substantial threats (BirdLife International 2011).

Threats

Both species are occasionally killed by collision with man-made structures, and fork-tailed swifts are occasionally killed by cats (Higgins 1999), but there is no apparent major threat to either species overall, either in Australia or elsewhere (DSEWPC 2011a, f). A potential threat is a reduction in prey due to loss of habitat (Low 1995; DSEWPC 2011a). Neither species would be subject to any significant level of threat on Erub Island.

Raptors

Life history

The family Accipitridae includes a very large number of species with an enormous variety of body sizes, prey species and habitat use. The two Migratory raptors, eastern osprey and white-bellied sea-eagle are however very similar in much of their life history. Both species occur along the entire Australian coastline and extend far inland, typically along major rivers or on large lakes and reservoirs. Eastern osprey feeds on fish but the white-bellied sea-eagle also eats mammals, birds, reptiles and carrion. Both species will nest on cliffs and in large trees but eastern osprey also nest on artificial structures such as power poles and towers (Debus 1998; NSW NPWS 2002).

Established breeding pairs are mostly sedentary although there is evidence that territorial adults move long distances. Inland territorial birds are probably more dispersive than those on the coast and may move as waters disappear (Debus 1998).

Threats

The eastern osprey population in Australia has decreased since European settlement but has been recovering in recent years (Olsen 1998). They are threatened by loss of existing and suitable replacement breeding trees, disturbance at the nest site, reduction in quality and quantity of fish stocks, collision with or electrocution by power lines, and the use of pesticides (NSW NPWS 2002). The white-bellied sea-eagle is threatened by clearing of forests and the consequent loss of optimal breeding sites (Marchant & Higgins 1993) and disturbance at nest sites (Debus 1998). Neither species is likely to be threatened by current land use practices on Erub Island.

Oriental Cuckoo (*Cuculus optatus*)

The oriental cuckoo breeds in northern Asia with birds spending the non-breeding season in south-east Asia, New Guinea, the Solomons and Australia. The species mostly occurs on the northern and eastern coasts of Australia, between September and April. Most birds do not arrive in Australia until December. Oriental Cuckoos occur in rainforest, vine thicket and open forest and woodland. The species is sometimes found in mangroves and is often recorded in gardens and plantations. It feeds on invertebrates, particularly caterpillars (Blakers *et al.* 1984; Higgins 1999).

Threats

The species is sometimes killed by cats and by collisions with windows and lighthouses (Higgins 1999). Oriental cuckoo is possibly an annual visitor to Erub Island, and could occur in almost any habitat other than grasslands. Threats would be minimal.

Rainbow Bee-eater (*Merops ornatus*)

The rainbow bee-eater occurs in almost any habitat. The species eats insects, preferring bees and wasps, which are mostly caught in the air, and will also take food from the ground or vegetation and occasionally water. It is widespread in Australia, New Guinea, Indonesia and Micronesia. In northern Australia populations are present in coastal or sub-coastal areas where they breed in the riparian areas and move into more open habitat after the breeding season. Breeding may take place individually or in colonies, nesting in burrows in soft sand or soil (Higgins 1999; Boland 2004a).

Threats

The species appears little threatened, although cane toads have been found to prey on the eggs and nestlings (Boland 2004b). Rainbow bee-eater could occur in, or over, all habitats on Erub Island. Cane toads are not reported for the island and threats to rainbow bee-eater would be minimal.

Passerines

Ten species of Migratory passerine are known from the Torres Strait. These species may be split into two broad groups, species that occur mostly in wooded habitats and those that occur mostly in open habitats. Members of these pairings may not be particularly closely related.

Wooded habitat species

Life history

Six of the Migratory passerine species that occur in Torres Strait occur mostly in wooded habitats. All of these birds, (Melville) cicadabird (subspecies *melvillensis*), rufous fantail, satin flycatcher *Myiagra cyanoleuca*, spectacled, black-faced and black-winged monarchs *Monarcha frater*, occur in rainforest, melaleuca woodlands, mangroves and occasionally open forests, except for Satin Flycatcher, which typically avoids closed forest. All the species are insectivorous, though the cicadabird may also eat some fruit and seeds. All breed in Australia and, except for black-winged monarch; all are at least partly resident in Australia. Some individuals of black-winged monarch may also be present year-round (Higgins *et al.* 2006a).

Threats

Threats include the loss and fragmentation of habitat, especially along the migratory routes, and predation of eggs and young by the black rat *Rattus rattus* (Higgins *et al.* 2006a). All six species do or may occur on Erub Island and would use a majority of the wooded habitats present. Breeding by any species would be limited, if any breeding occurs. Black rat is not known to occur on Erub Island. However, these bird species are more threatened by habitat loss should land use practices change and by the spread of cats into natural habitats.

Open habitat species

Life history

Four of the Migratory passerine species that occur in Torres Strait occur mostly in open habitats.

Reed-Warblers in Australia were previously thought to be a subspecies of the migratory clamorous reed-warbler *Acrocephalus stentoreus*. They are now considered a full species, Australian reed-warbler *A. australis*, and all movements are thought to occur within Australia. Australian reed-warblers typically occur in reeds and other dense vegetation in and adjacent to a variety of wetland types. They feed on insects and spiders. The species is not known to breed in the Torres Strait (Higgins *et al.* 2006b).

Barn and red-rumped swallows are both widespread species, particularly in the northern hemisphere, and neither breeds in Australia. Barn swallow is an annual visitor to northern Australia in small numbers but red-rumped swallow may not be present every year. Both species feed in open areas, particularly over wetlands, cane fields and sporting fields and often perch on overhead wires.

Yellow wagtail is listed under the EPBC Act as *Motacilla flava s. lat.* The birds that occur in Australia are now treated as full species, eastern yellow wagtail *M. tschutschensis* and green-headed yellow wagtail *M. taivana* (Christidis & Boles 2008). They were previously regarded as subspecies of *M. flava*, which is no longer considered to occur in Australia. The occurrence of yellow wagtails in the Torres Strait appears unconfirmed but yellow wagtails have been reported for Boigu, Thursday and Horn islands (Baxter 2010) and are likely to occur as irregular visitors on many of the Torres Strait islands, possibly including Erub Island. Yellow wagtails occur in open areas with low vegetation, especially in cultivation and on lawns, sporting fields and air fields. They are often recorded near water. Yellow wagtails are probably regular wet season non-breeding visitors to north Queensland. Diet consists mainly of invertebrates, taken mostly from the ground and occasionally from the air (Higgins *et al.* 2006b).

Threats

The major threat to Australian reed-warbler is loss of habitat due to coastal development in natural habitat areas (Higgins *et al.* 2006b). Barn and red-rumped swallows appear to be increasing in numbers in Australia, though this may be due to an increase in observers. Neither species appears subject to any particular threat in Australia. Threats to yellow wagtail in Australia are unknown.

None of these species are known from Erub Island. Neither species appears subject to any particular threat in Australia. Threats to yellow wagtail in Australia are unknown.

