

Recovery Plan for the Bramble Cay Melomys *Melomys rubicola*

Prepared by Peter Latch



Australian Government



Queensland Government
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Prepared by: Peter Latch

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Executive Summary

Species

Bramble Cay melomys, *Melomys rubicola*, a small rodent of uncertain origins, is morphologically distinct from other Australian melomys. With a population of less than 100 individuals inhabiting a single small sand cay whose existence is threatened by erosion, the Bramble Cay melomys is one of the most threatened mammals in Australia. Speculation exists that the species may also occur in Papua New Guinea (PNG) given the close proximity of the cay to the Fly River region, or on other islands in the Torres Strait. Further survey work on these islands and PNG along with clarification of its taxonomic status in relation to PNG species is required.

Current species status

The small population size and the naturally unstable nature of Bramble Cay has led to the species being listed as 'Endangered' under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and 'Endangered' under the Queensland *Nature Conservation Act 1992* (NCA).

Habitat and distribution summary

Bramble Cay is a small (approximately 5ha), vegetated sand cay surrounded by reef and located in the far northeast of the Torres Strait, about 50km from the mouth of the Fly River in PNG. Vegetation consists of low herbaceous cover to about 40cm in height. It is intermittently broken by bare patches of compacted guano depressions that hold water during the wet season. Bramble Cay melomys appear to primarily inhabit the vegetated portion of the cay, an area of about 2.2ha. Eleven plant species have been recorded however composition varies from year to year. Bramble Cay is also the largest nesting site of green turtles in the Torres Strait and supports the only large seabird colony in the region.

Threats summary

1. Erosion of the cay is the major threat to the species survival. The cay is in a state of flux with its movements strongly influenced by the prevailing weather patterns. While there appears to have been a net loss of the cay in recorded history, recent measurements suggest the cay might be in a depositional phase. Erosion may be compounded by high winds, wave action and storm surges associated with cyclones.
2. The introduction of exotic predators or weeds to the cay could potentially be catastrophic, given the small and vulnerable nature of the melomys population. The cay's isolation, close proximity to PNG and its use as an anchorage by fishing boats means there is a threat of pest and/or disease establishment. Two weed species are already present.
3. Genetic analysis of this species reveals a level of inbreeding which theoretically could lead to inbreeding depression and ultimately extinction.

Recovery objective

The overall objective of this recovery plan is to secure and enhance the status of the Bramble Cay melomys through an integrated program of monitoring, on ground management, searches for other populations and raising public awareness.

Summary of actions

To meet the overall objective for the Bramble Cay melomys recovery program, the following actions are required: establish monitoring programs to assess population trends, habitat condition and cay movement, and to detect and respond to the presence of invasive species; conduct field surveys to locate additional populations; undertake research to clarify Bramble Cay melomys taxonomy and improve knowledge of the species ecology; facilitate community involvement in and encourage support for Bramble Cay melomys recovery by engaging Indigenous groups and promoting the species to the Torres Strait and wider Australian communities; and ensure effective management of the recovery program by facilitating stakeholder involvement in the implementation of the recovery plan and establishing data sharing arrangements between Erubam Le and the EPA.

1. General information

Conservation status

Limpus *et al.* (1983) estimated the population of Bramble Cay melomys at 'several hundred individuals' in 1978 and noted that the cay was eroding away. The small population size and the apparent unstable nature of the cay has led to the species being listed as 'Endangered' under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and 'Endangered' under the Queensland *Nature Conservation Act 1992* (NCA).

International obligations

The Bramble Cay melomys is not listed under any international agreements and this recovery plan is consistent with Australia's international obligations.

Affected interests

Bramble Cay melomys occur only on Bramble Cay, a small sand cay in the Torres Strait. Erub islanders (Erubam Le) are the traditional custodians of Bramble Cay. Native title determination by the Australian High Court in 2004 granted Erubam Le native title rights over Bramble Cay. Their recognised exclusive rights include the right to possess, occupy, use and enjoy the determination area to the exclusion of others. Implementation of the recovery plan will be in accordance with the wishes of Erubam Le and will not affect nor compromise their native title rights. The Australian Maritime Safety Authority (AMSA) is responsible for the management of a small lighthouse on the cay located within a small 400m² area not subject to the native title determination. Other groups that may be involved in or affected by the implementation of this recovery plan include:

- Environmental Protection Agency(EPA)
- Torres Strait Regional Authority (TSRA)
- Island Coordinating Council
- Australian Quarantine and Inspection Service (AQIS)
- Australian Fisheries Management Authority (AFMA)
- Australian Customs Service

Consultation with Indigenous people

Consideration of the role, interests and customary rights of Erubam Le as the traditional owners of Bramble Cay underpins development and implementation of this recovery plan. The board of the Torres Strait Regional Authority on which the traditional owners of Erub are represented gave initial support for development of the plan. Since then Erub community representatives have been involved extensively in the development of the plan and presentations by EPA of draft versions of the plan have been made to the Erub community.

Benefits to other species or communities

Bramble Cay is a significant location for both seabird and turtle breeding in the Torres Strait. It is the largest nesting site for green turtles in the Torres Strait and 27 species of birds have been recorded nesting, roosting or visiting the cay. As such Bramble Cay has high biodiversity and conservation values.

Social and economic impacts

The implementation of this recovery plan is unlikely to cause significant adverse social and economic impacts. Recovery actions are focused on the continued monitoring of population trends and preventing the spread of introduced plants, predators, competitors and disease.

2. Biological information

Species description

First described by Thomas (1924) from a specimen collected by MacGillivray in 1845, the Bramble Cay melomys, *Melomys rubicola* Thomas 1924, is quite distinct from other Australian melomys species and from known Papua New Guinea (PNG) rodents (Dennis and Storch 1998). Larger in size than the three Australian mainland melomys species, it has relatively small ears, a long scaled tail

with a prehensile tip and reddish brown fur with a paler underbelly. As its common name suggests, *M. rubicola* is known only from a small isolated population on Bramble Cay in the northern Torres Strait (Figure 1).

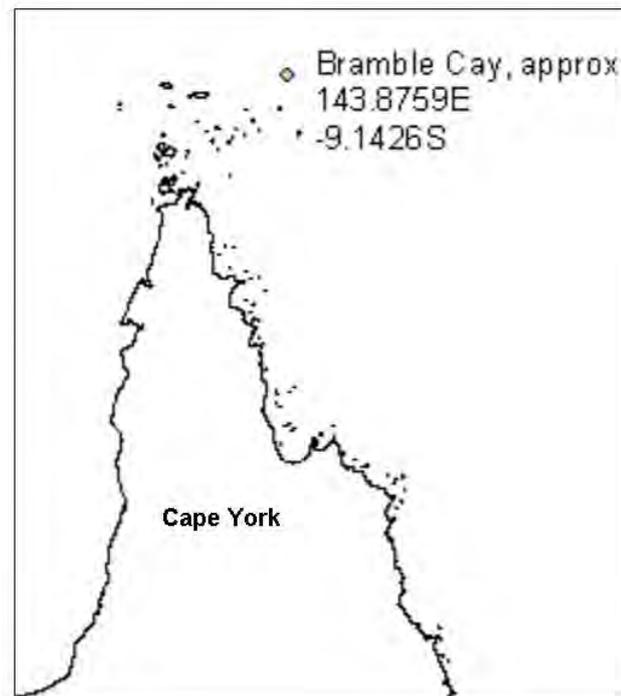


Figure 1: Location of Bramble Cay

Bramble Cay melomys is recognised as a distinct species (Strahan 1995) despite some uncertainty about the designation of species within the *Melomys* genus (Flannery 1995, Dickman *et al.* 2000). Menzies (1996) in his systematic revision of the *Melomys* in PNG did not assess *Melomys rubicola* despite its close proximity to PNG. Dennis and Storch (1998) reassessed its taxonomic status on both morphological and genetic grounds and found that *M. rubicola* is the most morphologically distinct melomys in Australia based on discriminate analysis of a number of features. They also found that *M. rubicola* has a distinct mtDNA gene sequence when compared to other Australian melomys. While the genetic differences between mtDNA sequences cannot prescribe specific status unequivocally, it was concluded that if they do indicate that *M. cervinipes*, *M. capensis* and *M. burtoni* are distinct species, then *M. rubicola* should also be recognised as a distinct species.

The origin of *M. rubicola* is unknown. Being in close proximity to the mouth of the Fly River which regularly deposits large pieces of driftwood onto Bramble Cay (Ellison 1998, Smith 1994), one possible colonisation route is from PNG, either on driftwood or in the canoes of Papua New Guineans who visit the cay (Dennis and Storch 1998). Despite *M. rubicola* showing closer genetic affinities to Australian melomys than the two PNG species examined by Dennis and Storch (1998), this remains a possibility. Additional samples of melomys from the Fly River region in PNG would need to be examined.

On examination of recent sea-level changes in the Torres Strait, Dennis and Storch (1998) suggest that *M. rubicola* could be a relictual species surviving from the time of the Australia–Papua New Guinea land bridge. Assuming that *M. rubicola* is not synonymous with a PNG species, they postulate the explanation which best fits the available evidence is that *M. rubicola* is a relict of the time when Australia and New Guinea were connected, approximately 9000 years ago.

Life history and ecology

Inhabiting only Bramble Cay in the Torres Strait, the Bramble Cay melomys is the most isolated of all Australian mammals and has one of the most restricted distributions. Sharing the cay with numerous

sea birds and nesting marine turtles, it forages at night among the vegetation and occasionally out onto the beach. Little else is known about the biology and ecology of the species.

Various visitors to the cay have provided only sketchy accounts of melomys numbers and behaviour. Sweatman in 1845 described a number of large rats that ran from under dead turtle shells. In 1977 and 1978 Limpus *et al.* (1983) described several hundred rats found foraging in the vegetation at night. The animals were using crab burrows, logs and debris as refuges. The first comprehensive survey to ascertain population numbers was undertaken by Dennis and Storch (1998) for EPA in July 1998. They captured and marked 42 individuals and estimated the population to be approximately 93. A strong female biased sex ratio was also evident.

Subsequent surveys by EPA using the same trapping methodology yielded only 10 trapped individuals in 2002 and 12 in 2004 (QPWS unpub.data). Apart from climatic influences, the variable presence of large numbers of nesting sea birds during the year and nesting sea turtles in the wet monsoonal months may influence population numbers and/or melomys behaviour. In November 2004, more than 20 percent of the vegetated area was severely disturbed by nesting turtles (QPWS unpub. data).

Based on capture rates, Bramble Cay melomys appear to primarily use the vegetated part of the cay although at times they have been observed foraging out on the foreshore (Limpus *et al.* 1983, QPWS unpub. data). Capture success recorded by Dennis and Storch (1998) was highest on the edge of the vegetation or outside areas of high seabird density. This suggests the population is not evenly distributed over the entire vegetated area.

While no dietary studies have been undertaken, it is likely that their diet comprises only plant material (Watts 1995, Limpus *et al.* 1983, Walker 1988, Dickman *et al.* 2000). Melomys have been observed to feed frequently on *Portulaca oleracea* a fleshy herb growing on the Cay (Latch pers. obs.). Despite the abundance of turtle and bird eggs at various times during the year, it is not known whether they are a component of the melomys diet. Ellison (1998) however observed melomys tracks leading into both fresh and uncovered turtle nests and reported an account of rats feeding on turtle eggs.

Description of habitat (Bramble Cay)

Bramble Cay (traditional name Maizab Kaur) is a small vegetated sand cay located in the far northeast of the Torres Strait; 9° 08'32.8"S, 143° 52'37.2"E; Royal Australian Navy Hydrographic Service F349 1996 (Figure 1). The most northern island of the Great Barrier Reef, Bramble Cay is 4km within Australian territorial waters and approximately 53km outside the mouth of the Fly River in PNG. Erub, the nearest inhabited Torres Strait island is 45km to the south-west with the tip of Cape York Peninsula a further 180km in the same direction.

Bramble Cay is surrounded by a relatively small coral reef and is comparatively isolated from other reefs in the Torres Strait. It is situated at the western margin of the reef on which it lies with an outcropping of basalt to its south-east. On this western margin a small portion of the cay is exposed directly to deep, reef front waters. Roughly oval shaped, Bramble Cay is oriented with its long axis running approximately in a northwest–southeast direction (Figure 2). The reef is surrounded by water over 30m in depth and is directly exposed to south-easterly swells originating in the Coral Sea. The cay is composed of foraminiferal sand with some coral and shell fragments with an exposure of phosphate rock on the southeast shore that rises to small cliffs (Jardine 1928). The cay has a maximum elevation of 3m at high tide.

There is no permanent water source on the cay however freshwater collects in pools after rainfall and can remain for several days (B. Saylor pers. comm, Ellison 1998).

The only human structure on the cay is a 17m high automatic lighthouse tower maintained by the Australian Maritime Safety Authority (AMSA) and located east of centre of the cay. The tenure of the cay is Unallocated State Land except for the small (400m²) navigation beacon lease over the tower area. The cement base of the 1958 temporary lighthouse tower, once located near the centre of the cay, now sits towards the south-eastern side of the cay at the high tide mark.

Cay dynamics

Bramble Cay, like many other sand or coral cays on the Great Barrier Reef, is the product of complex physical, geological and biological processes. These cays are geologically temporary features of considerable instability, which may respond dramatically to fluctuations in their environment (Gourlay 1983). This inherent instability is well documented elsewhere, for example Green Island near Cairns has a long history of shoreline construction and erosion (Baxter 1990).

No aerial photographic sequence exists showing changes to the Bramble Cay's shape and size over time, nor has there been any dedicated monitoring program to measure shoreline movements on seasonal and long-term scales. Various authors have documented changes in cay measurements since the first detailed map was produced in 1924 (Jardine 1928). Measurements by Parmenter (1980), Limpus *et al.* (1983), Walker (1988), Dennis and Storch (1998), Ellison (1998), and QPWS unpub. (2002 and 2004) indicate that the cay is in a state of flux with its movements strongly influenced by the prevailing weather patterns. Various descriptions refer to the seasonal trend of erosion on the cay which has sand being eroded from the north-west and deposited on the south east during the north-west monsoon. The reverse occurs when the winds prevail from the south-east. All accounts place the cay on the north-western edge of the reef, presumably with the distance from the reef edge changing as the prevailing winds shift sands from the north-west to south-east and back. Parmenter (1980) reported changes of up to 30 percent of the island eroding at the western end during the northwest monsoon.

Limpus *et al.* (1983), Ellison (1989) and Dennis and Storch (1998) have assessed these changes over time. Limpus *et al.* (1983) concluded that the cay was moving towards the northwest at a rate of 0.44m/year and losing sand over the edge of the reef flat and that in time, the cay will drop off the reef flat into deeper water. Ellison (1998) concluded that the shape of the cay had not substantially changed since the 1970s, with the most significant change being a reduction in the vegetated area. Similarly Dennis and Storch (1998) concluded that while there was net loss up until 1972 there has been little or none since then. Measurements undertaken by EPA in 2002 and 2004 support this, with the cay's area in November 2002 measured at 5.10ha and in November 2004 at 5.50ha (QPWS unpub. data).

The Traditional Owners of Bramble Cay, Erubam Le, who have a long and intimate association with Bramble Cay also report fluctuating changes to the cay's shape and size linked to seasonal weather patterns (B. Saylor pers. comm.).

Impacts associated with climate change

Although no specific assessment of this threat has been undertaken, the likely consequences of climate change, including sea-level rise and increase in the frequency and intensity of tropical storms are unlikely to have any major impact on the survival of the Bramble Cay melomys in the life of this plan. However, the shallow nature of the island and reef environment makes Torres Strait potentially vulnerable to the effects of climate change, including loss of land through sea level rise and subsequent flooding and coastal erosion, and changes to habitat and species composition (Torres Strait NRM Reference Group 2005). Unusual or changing weather patterns in the area resulting in stronger winds, large storm surges and extremely high tides, possibly due to climate change may impact on a number of species (e.g. green turtles, seabirds and the melomys) that inhabit and/or use the island over time.

Vegetation

The vegetation of Bramble Cay consists of a low herbaceous cover, intermittently broken by bare patches of compacted guano depressions that hold water during the wet season. In all 11 plant species (including two weed species) have been recorded however composition varies seasonally and/or from year to year. Recent records have recorded between three to five species at any one time (Ellison 1998, Limpus *et al.* 1983, Walker 1988, Dennis and Storch 1988, QPWS unpub 2002 and in 2004).

Boerhavia albiflora var. *albiflora* is the dominant cover on Bramble Cay. This is the 'spinach' gathered and eaten by early European visitors (MacGillivray 1852). It forms a lush and dense cover up to 35cm in height. Recent surveys undertaken by EPA in 2002 and 2004 recorded the same four species previously recorded by Dennis and Storch (1998) - *Boerhavia albiflora*, *Portulaca oleracea* (a succulent herb), *Cenchrus echinatus* (a grass) and *Amaranthus viridis* (a leafy herb). *Portulaca oleracea* and *B. albiflora* were the most common and widespread species while both weed species, *C. echinatus* and *A. viridis* were restricted in their distribution.

Vegetation is disturbed and growth appears to be limited through the presence of large colonies of nesting birds throughout the year and nesting turtles from October to March. In particular there appears to be intense disturbance to the periphery of the vegetated area from the nesting turtles. This area of disturbance was calculated to represent 20 percent of the total vegetated area of 2.16ha measured in 2004 (QPWS unpub.).

Records from the literature and historical photographs of the cay also indicate changes in vegetation extent over time. Ellison (1998) concluded that while the shape of the cay had not substantially changed since the 1970s, there was a significant reduction in vegetated area from 1983 to 1995, particularly from the north and south shores. In 2004 the vegetated area of the cay was 2.16ha compared to 2.43ha in 1998 (Dennis and Storch 1998).

Other significant fauna species

Turtles

Bramble Cay is the largest nesting site of green turtles *Chelonia mydas* in the Torres Strait. The nesting population is regarded as an outlying component of the much larger nesting population of the northern genetic stock of green turtles that nest at Raine Island and Moulter Cay (Limpus *et al.* 2001). Torres Strait acts as a corridor through which turtles must migrate from feeding grounds in eastern Indonesia, the Arafura Sea region and the Gulf of Carpentaria en route to the rookeries of eastern Torres Strait and the northern Great Barrier Reef. Erosion of the cay may also impact on the nesting turtle population (Parmenter 1980, Limpus *et al.* 2001). Based on erosion rates of the cay during the 1977/78 and 1978/79 nesting seasons, Parmenter (1980) estimated that more than 100,000 eggs could be lost in an 'average' nesting season.

Birds

Bramble Cay supports the only large seabird colony in the Torres Strait region. In particular it is a significant nesting site for the brown booby *Sula leucogaster*, sooty tern *Sterna fuscata*, bridled tern *Sterna anaethetus*, crested tern *Sterna bergii* and common noddy *Anous stolidus* (Draffan *et al.* 1983, Elvish and Walker 1991, Ellison 1998, Dennis and Storch 1998, QPWS unpub. records). In all 27 species have been recorded on the island (see species list Appendix 2).

Distribution and habitat critical to the survival of the species

Bramble Cay melomys has only been recorded from Bramble Cay. Thomas (1924) suggested the occurrence of this species on another Torres Strait island (Long Island) however despite surveys having been conducted, this has not been substantiated (Limpus *et al.* 1983; Lee 1995). The species has not been identified among the Papuan New Guinean rodent fauna (Flannery 1995; Lee 1995).

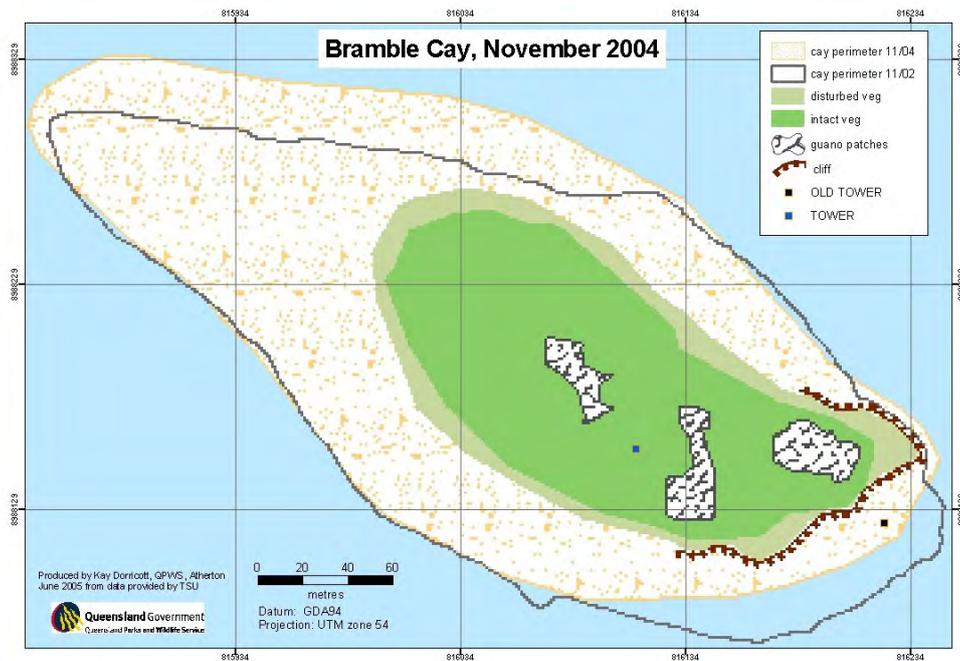


Figure 2: Diagram of Bramble Cay November 2004 with reference to the shape of the cay in November 2002

3. Threats

Biology and ecology relevant to threats

The Bramble Cay melomys is unique in Australia as it is the only listed species where a single naturally occurring process, cay erosion, is threatening its entire habitat and therefore its continuing existence. As a small population restricted to one small isolated sand cay it is particularly vulnerable to an extinction event like a major cyclone. These circumstances have led to some doubts being expressed about its long-term survival (Lee 1995, Watts 1995).

Identification of threats

Erosion of the cay due to natural processes

Cay erosion is identified as the main threatening process to the existence of the Bramble Cay melomys. While small losses and gains to the cay’s sand mass are linked to seasonal weather patterns, significant erosion events may be linked to the high winds, wave action and storm surges associated with cyclones (Dennis and Storch 1998). Parmeneter (1980) reported major losses of sand resulting from big storms, Traditional Owners also tell of major erosion associated with big storm events. In July 2005 waves were reported being thrown up over the cay as a result of gale force winds pounding the cay for several days coupled with very high tides (G. Romano and K. Gutchen pers. comm.).

Introduced exotic plants, predators, competitors and disease

The close proximity of Bramble Cay to PNG presents a challenge, with the threat of pests and diseases in PNG moving across, either on the wind, within traded goods, on animals, soil or on people. The Torres Strait Treaty allows free movement of traditional peoples from the Western Province of PNG in and out of the Torres Strait Protected Zone. Bramble Cay is also used frequently as an anchorage by fishing trawlers. Threats are now also being posed by increasing numbers of illegal fishing boats entering Torres Strait waters (NAQS 2005) as well passing international yachts, who all may stop off illegally on Bramble Cay. All have the potential to inadvertently introduce invasive species or spread diseases.

The accidental or otherwise introduction of other rodent species, cats or dogs is a potential threat. Anecdotal evidence suggests that rats have escaped from boats and come ashore but none appear to have established and/or threatened the melomys (Dennis and Storch 1998, B. Saylor pers. comm.). Introduction of any exotic animal including insects could also potentially introduce a disease that may

affect the melomys population. Given the small and isolated nature of the population it could potentially be a catastrophic event.

The accidental or otherwise introduction of an exotic plant could lead to its establishment and eventual replacement of native species upon which the melomys depend for food and/or shelter. Two environmental weed species, *A. viridis* and *C. echinatus* are recorded from Bramble Cay although their distribution has been patchy and extremely limited (Dennis and Storch 1998, Ellison 1998, Walker 1998, QPWS 2002, 2004 unpub. data). These weed species are relatively well established across the Torres Strait (B. Waterhouse pers. comm.) but it is not known whether they constitute a threat to the ecology of Bramble Cay. No quantitative data exist on the extent of weed incursions over time nor their impacts on Bramble Cay biodiversity. Despite its isolation and low frequency of human visitation, the risk of new weeds establishing remains high.

Small population size, loss of genetic diversity and inbreeding

Small and isolated populations such as this one are inherently more at risk of extinction due to loss of genetic diversity and inbreeding than larger populations (Frankham *et al.* 2002). Genetic analysis of this species reveals a level of inbreeding which theoretically could lead to inbreeding depression and ultimately extinction (Dennis and Storch 1998). Predicting a time frame within which extinction may occur is very difficult, however work on small island populations of rodents suggests that they will persist for thousands of years under these conditions (M. Elphistone in Dennis and Storch 1998).

It is difficult to evaluate the significance of a small population size as a threat, since most rodent species with small populations in Australia are suspected to be declining due to other extrinsic factors (Dickman *et al.* 2000). These small populations are often considered more at risk from factors such as natural disasters or invasive species (Dickman *et al.* 2000, Dennis and Storch 1998). Inbreeding depression therefore is considered a lower risk to the melomys population than other listed threats.

Areas and population under threat

The major threatening process of cay erosion threatens the very existence of the cay itself. As such the entire population of the Bramble Cay melomys and its habitat is under threat.

Threats summary

All threats occur at the one location, Bramble Cay

Location: Bramble Cay 9° 08'32.8"S, 143° 52'37.2"E

Population size: less than 100 individuals

Tenure: Unallocated State Land, native title resides with traditional owners from Erub

Type of threat	Current actions to reduce/monitor threats	Future actions to reduce threats
Erosion of the cay due to natural processes.	Monitoring and assessment of historical changes to cay.	
Introduced exotic plants, predators, competitors and disease.	Restrictions on visitation to cay. Quarantine restrictions. Flora/fauna surveys to detect presence of invasive species.	Increase restrictions on visitation. Protocols for legitimate visitors. Monitor for presence of invasive species. Eradication of invasive species. Education for visitors and user groups.
Small population size, loss of genetic diversity and inbreeding.	Surveys and assessment of Bramble Cay melomys population. Genetic analyses.	Monitor and assess population size. Determine if Bramble Cay melomys occurs on other islands or in PNG.

4. Recovery objectives, Performance criteria and Actions

Overall objective

To secure and enhance the status of the Bramble Cay melomys through an integrated program of monitoring, on ground management, searches for other populations and public awareness raising.

Specific objective 1: Establish a Bramble Cay melomys monitoring program

Action 1.1 Monitor and assess the Bramble Cay melomys population.

Performance criterion 1.1 An annual population monitoring program is in place.

Given its small population size and vulnerability, it is critical that a robust monitoring program be established to assess what changes to the Bramble Cay melomys population, if any, is occurring over time. Data collected will inform future management actions and together with data collected on habitat variables (Action 1.2) will provide a clearer picture on the extent of threats to the population.

Annual monitoring will involve live trapping sessions and will follow developed trapping protocols. To enable an assessment of the population at different times of the year, monitoring will alternate between May and November each year, to approximately coincide with seasonal changes in weather and any likely seasonal influence from nesting sea birds and turtles. Live trapping of melomys will also monitor health, body condition and reproductive status of individuals. Samples of hair, faeces and any parasites will be taken for subsequent analysis.

Potential contributors: EPA, Erubam Le, TSRA, MTSRF, Australian Customs.

Action 1.2 Monitor and assess Bramble Cay melomys habitat.

Performance criterion 1.2 An annual habitat monitoring program is in place.

In conjunction with monitoring of the melomys population, a number of habitat variables will be monitored including cay physical parameters, vegetation, invertebrate fauna as well as turtle and seabird populations. It is suspected that the presence of birds and turtles at different times of the year influences the melomys population spatially and temporally. Changes in any one of these may signal changes to the melomys population.

Given that floral diversity is not high and area of vegetation small, detailed mapping and assessment of vegetation will occur. The seabird population will be monitored and data provided to the EPA Coastal Seabird atlas program. Turtle monitoring will continue to quantify the regional nesting green turtle population with data provided to the EPA turtle monitoring database. Given that much effort is expended in getting to such a remote location, collection of these data can occur in conjunction with monitoring of the melomys population. Costs of this action are therefore shared with Action 1.1.

Potential contributors: EPA, Erubam Le, TSRA, MTSRF, Australian Customs.

Specific objective 2: Clarify the extent of and manage threats to the Bramble Cay melomys

Action 2.1 Monitor and manage for presence of invasive species and disease.

Performance criterion 2.1 An annual invasive species monitoring and response program is in place.

While it is unclear what impact the establishment of any invasive species might have on Bramble Cay melomys or their habitat, monitoring to detect the presence of such species is to be undertaken. An annual monitoring program will allow for early intervention in the event of any invasive species being recorded. As a priority, the eradication of existing weeds (*A. viridis* and *C. echinatus*) on the cay will be undertaken if deemed feasible.

The Northern Australia Quarantine Strategy (NAQS), administered by the Australian Quarantine and Inspection Service (AQIS) addresses quarantine risks such as the potential incursion of weeds, pests and diseases across northern Australia. AQIS conducts surveys for pests, diseases and weeds. A monitoring and management strategy will be developed in consultation with AQIS and a partnership arrangement negotiated; one which will be of mutual benefit for the conservation of Bramble Cay melomys and for detection of any quarantine risks.

Potential contributors: EPA, Erubam Le, TSRA, AQIS.

Action 2.2 Reduce the risk of invasive species establishing on the cay.

Performance criterion 2.2.1 Information on invasive species impacts is disseminated to community and industry groups.

Performance criterion 2.2.2 Protocol to minimise introduction of invasive species to Bramble Cay developed for visitors.

In addition to monitoring for the presence of any invasive species, actions need to be implemented to first reduce their likelihood of establishing on Bramble Cay. This action is largely a community and industry education exercise. Liaison will take place with fishing and boating industry representatives to highlight the issue and establish procedures for communicating information through their industries, both commercial and recreational. In the first instance a small information brochure with accompanying poster will be developed describing risks/consequences of invasive species establishing on Bramble Cay. Dissemination of information materials may be assisted through government agencies like AQIS and AFMA.

A simple protocol for all people visiting Bramble Cay for legitimate reasons will also be developed. This will cover aspects such as seeds attachment to clothing, clean footwear and domestic animal prohibition, and will also ensure that procedures are followed to reduce the likelihood of any invasive species establishing.

Potential contributors: EPA, Erubam Le, TSRA, AQIS, AFMA, AMSA, Qld DPI.

Specific objective 3: Improve understanding of the Bramble Cay melomys taxonomy, biology and ecology

Action 3.1 Clarify taxonomy of Bramble Cay melomys in relation to PNG species.

Performance criterion 3.1.1 Surveys for melomys species undertaken in PNG.

Performance criterion 3.1.2 Examination of Australian and PNG melomys completed and taxonomy clarified.

It is uncertain whether Bramble Cay melomys exist in the PNG rodent fauna given their close proximity to the Fly River region. Further sampling of the PNG rodent fauna from this region is required followed by comprehensive studies of all *Melomys* specimens. This will build on the review undertaken by Menzies (1996) of the PNG *Melomys*.

The following projects are recommended to further clarify the taxonomy of *M. rubicola*:

1. undertake trapping for melomys in the Fly River region to collect genetic and morphological samples from the PNG rodent fauna – undertaken collaboratively with PNG researchers; and
2. review the taxonomy of Australian and PNG melomys drawing on existing and newly collected material lodged in Australian and PNG Museums – undertaken by relevant expert.

Potential contributors: , TSRA, Australian museums, PNG Museum and/or University, international conservation groups operating in PNG such as the Wildlife Conservation Society.

Action 3.2 Undertake surveys on other Torres Strait islands to locate further populations.

Performance criterion 3.2 Surveys for Bramble Cay melomys completed on at least five Torres Strait islands.

While a number of ad hoc fauna surveys have been undertaken on some Torres Strait islands no systematic search for this species has occurred. Anecdotal evidence from Traditional Owners suggest that there are small 'rat-like' animals on some nearby islands that were not formally surveyed (B. Saylor pers. comm.). The justification for this is similar to Action 3.1 and would run in parallel with it.

While it is beyond the life of this recovery plan to undertake comprehensive surveys on all or most islands, this action could be further supported under any future TS NRM plan or strategy if island wide biodiversity surveys are to be undertaken. Based on several potential habitat parameters initiated with a desktop analysis, and in consultation with various Traditional Owner groups, this action will initially

target a selection of islands within the Torres Strait eastern islands section. It is planned that at least five islands will be surveyed in the life of this plan.

Potential contributors: EPA, Erubam Le and other Torres Strait Island traditional owners, TSRA, research institutions.

Action 3.3 Undertake studies on the ecology of the Bramble Cay melomys.

Performance criterion 3.3 Comprehensive ecological studies on Bramble Cay melomys completed and reports produced.

Very little is known about the ecology and behaviour of the Bramble Cay melomys. Autecological studies should be carried out to describe demography, reproduction, habitat requirements and resource use as well as spatial and temporal variance that occur in these parameters. Such studies will help to understand factors that limit their distribution and abundance and guide future management and recovery actions.

Potential contributors: MTSRF, EPA, Erubam Le, TSRA, Australian Customs.

Specific objective 4: Facilitate community participation and education in Bramble Cay melomys recovery

Action 4.1 Engage Erubam Le in all aspects of the recovery process.

Performance criterion 4.1 Erubam Le actively involved in all aspects of the recovery planning process.

As native title holders and traditional custodians of Bramble Cay, it is critical that Erubam Le are actively involved in all aspects of Bramble Cay melomys recovery effort through co-management arrangements, participation in research and monitoring, habitat protection initiatives and their membership on the recovery team. This action will run in parallel with and support all other actions. This action will also emphasise the role and importance of traditional knowledge in the management of the species.

The Erub community will be consulted as a matter of course throughout the recovery process. Once the plan is approved a consultative protocol will be established from which the engagement of Erubam Le in the recovery plan will be directed. This will identify possible co-management arrangements and a range of projects in which Erubam Le wish to initiate, lead and/or participate in.

Potential contributors: Erubam Le, EPA, TSRA.

Action 4.2 Promote Bramble Cay melomys recovery to the Torres Strait community.

Performance criterion 4.2 Recovery plan promoted through the media and in person to the Torres Strait community.

As this is the first recovery plan developed for a threatened species endemic to the Torres Strait islands it is an opportunity to not only promote Bramble Cay melomys conservation but also raise the profile of threatened species recovery generally. This action will:

1. provide regular updates of progress to the Erub community;
2. identify potential communities and schools in which presentations can be made;
3. publicise the project, its significance and management arrangements to the wider island community; and
4. ensure that information on significant events in the recovery process is provided to local print and radio.

Opportunities exist to disseminate information via community radio stations, public talks and in local newspaper articles. Other avenues to publicise the project will also be explored through the TS NRM planning process. Regular updates to Erub community will be via in-person presentations at least once a year.

Potential contributors: Erubam Le, EPA, TSRA.

Action 4.3 Produce and disseminate recovery information to the wider Australian community.

Performance criterion 4.3 Various publicity materials produced and disseminated during the life of the recovery plan.

The Bramble Cay melomys is one of Australia's most threatened mammals and one of the most unique in terms of its restricted isolated habitat, possible biogeographical affinities with the PNG fauna and threats to its existence. However very little is known about it outside the Torres Strait region. It is important that the profile of this species be raised in the broader Australian community in order to promote understanding of its conservation and increase public support for recovery efforts. Promoting Bramble Cay melomys conservation could also highlight the nature of threats operating on Torres Strait island biodiversity and the challenges in undertaking recovery efforts there.

A communication strategy will be developed which will provide direction on identifying target groups, main messages, modes of communication, responsible parties and timelines.

Potential contributors: Erubam Le, EPA, conservation groups.

Specific objective 5: Manage the recovery program

Action 5.1 Facilitate stakeholder involvement in implementation of the recovery plan.

Performance criterion 5.1 All stakeholders involved in the implementation of the recovery plan on an annual basis.

The ongoing effective management of the recovery process is possible only if all affected stakeholders are directly involved in the recovery process. This involvement will include direct support for on-ground work on Bramble Cay, participation in meetings and contributions to any planning or management decision.

EPA will work cooperatively with the Erub community to facilitate implementation of recovery actions. All affected stakeholders will be informed of recovery progress and regular reports on monitoring and management actions will be provided. It is important that liaison be maintained with the TS NRM planning process.

Potential contributors: EPA, Erubam Le, TSRA, AQIS, Island Coordinating Council, Australian Maritime Safety Authority, Australian Fisheries Management Authority, Australian Customs.

Action 5.2 Establish data sharing arrangements between Erubam Le and EPA.

Performance criterion 5.2 Recovery data successfully stored and managed by Erubam Le and EPA via a data sharing protocol.

All data and information collected through the life of the plan will be jointly shared and managed by EPA and Erubam Le. Data sharing arrangements will be negotiated and formalised in a MoU.

Potential contributors: Erubam Le, EPA, TSRA.

Summary table

Table 1: Summary of relationship between specific objectives, performance criteria and actions

Specific objectives	Performance Criteria	Actions	Potential Contributors	Priority
SO 1: Establish a Bramble Cay melomys monitoring program.	C1.1: An annual population monitoring program is in place.	A1.1: Monitor and assess the Bramble Cay melomys population	EPA Erubam Le, TSRA, MTSRF, Australian Customs.	1
	C1.2: An annual habitat monitoring program is in place.	A1.2: Monitor and assess Bramble Cay melomys habitat	EPA, Erubam Le, TSRA, MTSRF, Australian Customs.	1
SO 2: Clarify the extent of and manage threats to the Bramble Cay melomys.	C2.1: An annual invasive species monitoring and response program is in place.	A2.1: Monitor and manage for presence of invasive species and disease	EPA, Erubam Le, TSRA, AQIS.	1
	C2.2.1: Information on invasive species impacts is disseminated to community and industry groups.	A2.2: Reduce the risk of invasive species establishing on the cay	EPA, Erubam Le, TSRA, AQIS, AFMA, AMSA, Qld DPI.	2
	C2.2.2: Protocol to minimise introduction of invasive species to Bramble Cay developed for visitors.			
SO 3: Improve understanding of the species taxonomy, biology and ecology.	C3.1.1: Surveys for melomys species undertaken in PNG.	A3.1: Clarify taxonomy of Bramble Cay melomys in relation to PNG species	EPA, TSRA, Australian museums, PNG Museum and/or University, international conservation groups operating in PNG such as the Wildlife Conservation Society.	1
	C3.1.2: Examination of Australian and PNG melomys completed and taxonomy clarified.			
	C3.2: Surveys for <i>Melomys rubicola</i> completed on at least five Torres Strait islands.	A3.2: Undertake surveys on other Torres Strait islands to locate further populations	EPA, Erubam Le and other Torres Strait Island traditional owners, TSRA, research institutions.	1
	C3.3: Comprehensive ecological studies on Bramble Cay melomys completed.	A3.3: Undertake studies on the ecology of the Bramble Cay melomys	MTSRF, EPA, Erubam Le, TSRA, Australian Customs.	2
SO 4: Facilitate community participation and education in Bramble Cay melomys recovery.	C4.1: Erubam Le actively involved in all aspects of the recovery planning process.	A4.1: Engage Erubam Le in all aspects of the recovery process	Erubam Le, EPA, TSRA.	1
	C4.2: Recovery plan promoted through the media and in person to the Torres Strait community.	A4.2: Promote Bramble Cay melomys recovery to the Torres Strait community	Erubam Le, EPA, TSRA.	3
	C4.3: Various publicity materials produced and disseminated during the life of the recovery plan.	A4.3: Produce and disseminate recovery information to the wider Australian community	Erubam Le, EPA, conservation groups .	3
SO 5: Manage the recovery program.	C5.1: All stakeholders involved in operation of recovery plan on an annual basis.	A5.1: Facilitate stakeholder involvement in implementation of the recovery plan	EPA, Erubam Le, TSRA, AQIS, Island Coordinating Council, Australian Maritime Safety Authority, Australian Fisheries Management Authority, Australian Customs.	2
	C5.2: Recovery data successfully stored and managed by Erubam Le and EPA via a data sharing protocol	A5.2: Establish data sharing arrangements between Erubam Le and EPA	Erubam Le, EPA.	3

Priority ratings are: 1 (High) 2 (Medium) 3 (Low)

5. Management practices

Management practices necessary for the maintenance of Bramble Cay melomys habitat are based on current understanding of known threats and the species ecology. As capacity to halt erosion of the cay due to natural processes is limited, emphasis is placed on: continued monitoring of population trends and habitat condition; preventing further spread of existing, and establishment of new, exotic plants, predators, competitors and disease through monitoring programs and on ground action; and public education campaigns (targeting the fishing and boating industry and the Torres Strait community).

All work undertaken in this plan will require support and permission from the Erub islanders (Erubam Le), the traditional custodians of Bramble Cay who have for generations, exercised their native title rights as traditional land and sea managers over Bramble Cay and surrounding sea country. Protocols to be followed when obtaining such support will be developed as part of this recovery program.

The authority to carry out maintenance and other works associated with managing the lighthouse on Bramble cay rests with the Australian Maritime Safety Authority.

6. Costs of recovery

Table 2: Cost of recovery per annum

Action		Year 1	Year 2	Year 3	Year 4	Year 5	Total
1.1	Monitor and assess the Bramble Cay melomys population	6,000	6,000	6,000	6,000	6,000	30,000
1.2	Monitor and assess Bramble Cay melomys habitat	6,000	6,000	6,000	6,000	6,000	30,000
2.1	Monitor and manage for presence of invasive pests and disease	6,000	6,000	6,000	6,000	6,000	30,000
2.2	Reduce the risk of invasive species establishing on the cay	1,000	5,000	5,000	3,000	1,000	15,000
3.1	Clarify taxonomy of Bramble Cay melomys in relation to PNG species	5,000	10,000	10,000	10,000	10,000	45,000
3.2	Undertake surveys on other Torres Strait islands to locate further populations	2,000	7,000	7,000	7,000	1,000	24,000
3.3	Undertake studies on the ecology of the Bramble Cay melomys	7,000	7,000	2,000	2,000	2,000	20,000
4.1	Engage Erubam Le in all aspects of the recovery process	3,000	3,000	3,000	3,000	3,000	15,000
4.2	Promote Bramble Cay melomys recovery to the wider Torres Strait community	2,000	2,000	2,000	2,000	2,000	10,000
4.3	Produce and disseminate recovery information to the wider Australian community	1,000	1,000	5,000	2,000	1,000	10,000
5.1	Facilitate stakeholder involvement in operation of the recovery plan	5,000	3,000	3,000	3,000	3,000	17,000
5.2	Establish data sharing arrangements between Erubam Le and EPA	1,000	5,000	2,000	2,000	2,000	12,000
TOTAL		45,000	61,000	57,000	52,000	43,000	258,000

7. Evaluation of recovery plan

A review of the recovery plan will be undertaken by an external reviewer in consultation with the Recovery Team and Erubam Le within five years of adoption. The review will provide an opportunity to monitor progress of recovery actions and provide direction to any actions that may be necessary in the future.

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The people of Erub have been most welcoming and supportive of this recovery planning process and their time and contribution is gratefully acknowledged. In particular, I thank Bill Saylor for his time, energy and passion for this project and his desire and commitment to see Bramble Cay melomys persist well into the future.

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Appendix 1: Recovery team membership

Recovery team members

As key representatives on a recovery team, EPA and the Traditional Owners of Bramble Cay (Erubam Le) have sought input from a number of stakeholders in the development of this plan. These stakeholders will be formally invited to participate in a recovery team in some capacity when the recovery plan is approved:

Torres Strait Regional Authority (Representing Torres Strait NRM)
Island Coordinating Council
Australian Maritime Safety Authority
Australian Fisheries Management Authority
Australian Quarantine and Inspection Service
Australian Customs and Coastwatch
Marine and Tropical Science Research Facility (MTSRF)

Appendix 2: List of known bird species from Bramble Cay

Common name	Scientific name
brown booby	<i>Sula leucogaster</i>
red-footed booby	<i>Sula sula</i>
great frigatebird	<i>Fregata minor</i>
least frigatebird	<i>Fregata ariel</i>
red-tailed tropicbird	<i>Phaethon rubricauda</i>
white-tailed tropicbird	<i>Phaethon lepturus</i>
common noddy	<i>Anous stolidus</i>
silver gull	<i>Larus novaehollandiae</i>
common tern	<i>Sterna hirundo</i>
roseate tern	<i>Sterna dougallii</i>
black naped tern	<i>Sterna sumatrana</i>
little tern	<i>Sterna albifrons</i>
crested tern	<i>Sterna bergii</i>
sooty tern	<i>Sterna fuscata</i>
bridled tern	<i>Sterna anaethetus</i>
sacred ibis	<i>Threskiornis aethiopica</i>
wandering tattler	<i>Tringa incana</i>
lesser golden plover	<i>Pluvialis dominica</i>
ruddy turnstone	<i>Arenaria interpres</i>
eastern reef egret	<i>Egretta sacra</i>
rufous night heron	<i>Nycticorax caledonicus</i>
Mongolian plover	<i>Charadrius mongolus</i>
superb fruit dove	<i>Ptilinopus superbus</i>
black-faced monarch	<i>Monarcha melanopsis</i>
metallic starling	<i>Aplonis metallica</i>
black-fronted dotterel	<i>Charadrius melanops</i>
sacred kingfisher	<i>Halcyon sancta</i>

Sources: Draffan *et al.* 1983, Ellison 1998, Elvish and Walker 1991, EPA records.