# **Coastal Bird Monitoring Strategy** for the Great Barrier Reef World Heritage Area



# **Malcolm Turner**

May 2002



Australian Government Great Barrier Reef Marine Park Authority





Malcolm Turner Principal Conservation Officer, Day-to-Day Management Coordination Unit.

> Support and contributions by Paul O'Neill (EPA) and Tony Stokes (GBRMPA)

© Commonwealth of Australia 2008

Published by the Great Barrier Reef Marine Park Authority

ISBN 978 1 876945 75 6 (pdf)

This work is copyright. Apart from any use as permitted under the *Copyright Act 1968*, no part may be reproduced by any process without the prior written permission of the Great Barrier Reef Marine Park Authority.

#### DISCLAIMER

The views and opinions expressed in this publication are those of the authors and do not necessarily reflect those of the Australian Government. While reasonable effort has been made to ensure that the contents of this publication are factually correct, the Commonwealth does not accept responsibility for the accuracy or completeness of the contents, and shall not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on, the contents of this publication.



Comments and inquiries on this document are welcome and should be addressed to:

Director, Day-to-Day Management Coordination Unit info@gbrmpa.gov.au

www.gbrmpa.gov.au

# **Contents**

Introduction Definitions	2 2
Aims, objectives and the value of monitoring	3
Outcomes aims and objectives	3
Why monitor coastal hirds	3
Legislative and international obligations	3 4
Value of coastal birds in the GBRWHA	- 
Threatened species	5
Threatening processes	5
Issues identified by monitoring coastal birds	6
Management actions taken using monitoring data	6
Wanagement detions taken using monitoring data	0
Coordination of coastal bird monitoring	7
The role of management agencies	7
Oueensland Coastal Bird Atlas	7
	,
Monitoring methodology	8
Measures for monitoring	8
Key sites	8
Minimum monitoring priorities	8
Additional observations	8
Data recording methods and sheets	9
Ŭ	
Table 1 Monitoring indicator pecter at key sites	10
Table 2 Key breeding sites in tified a supportant regionally	11
Table 3 Monitoring and information needs for threatened species	12
Table 4 Monitoring and regarch for management issues	13
Table 5 Summary of reasons for monitoring particular sites	14
Table 6 Summary of minimum level of monitoring required	16
Implementing the Strategy	18
Coordination and imprementation	18
Reporting	18
Research	18
Updating the strategy	18
Appendix 1- 1999 Seabird Workshop participants	19

# **Introduction**

The coastal bird monitoring strategy for the Great Barrier Reef World Heritage Area (GBRWHA) outlines the value of coastal bird monitoring and sets out the minimum monitoring required. It is intended to assist managers to plan and program, as well as assist staff monitoring the birds to conduct their responsibilities.

For a quick summary see Table 6 Summary of Minimum Level of Monitoring Required.

Management of coastal birds in the GBRWHA is primarily the responsibility of the Environmental Protection Agency (EPA) and the Great Barrier Reef Marine Park Authority (GBRMPA). Monitoring is part of the Day-to-Day Management (DDM) Program for the GBRWHA.

The Great Barrier Reef/Coral Sea Seabird Workshop in June 1999 in Cairns endorsed the priorities in this monitoring strategy to ensure monitoring of coast a balls in the GBRWHA is effective and efficient.

# Definitions

Monitoring in the Great Barrier Reef DDM Program is defined

"A structured program of data collection and analy is over a period of time designed to measure and report changes in the condition and status of natural values and to evaluate the effectiveness of management" Strate Group minutes for meeting 25 February 1999)

**<u>Research</u>** is a structured study looking at carses and effects.

<u>Coastal birds</u> for this strategy include firds with populations totally dependent on the sea, which breed in the GBRWH, or migrate seasonally to the area. They include:

- Seabirds such as percels, she waters, pelicans, bobbies, frigatebirds, tropicbirds, cormorants, gulls and rms
- Breeding shore irds
- Coastal captor
- Coasta herons
- Signific at migrating shorebirds.

# Aims, objectives and the value of monitoring

# Outcome of coastal bird management

To conserve coastal bird populations in the GBRWHA, whilst maintaining sustainable multiple use.

# Aim of monitoring coastal birds

To detect, interpret and report changes to the temporal and spatial distribution and abundance of coastal birds to guide management actions and determine effectiveness of management.

# Aim of monitoring strategy

To provide a context to and identify the minimum requirements or monopring coastal birds breeding, feeding and roosting in the GBRWHA and identify the oformation required to ensure management of coastal birds is effective.

# **Objectives of monitoring strategy**

- Identify an effective program for monitoring coastal bird populations breeding in the GBRWHA that minimises the costs to the DEM Program
- Assist programming of DDM activities
- Assist the EPA and the GBRMP in seving priorities for funding
- Identify priorities for coastal but research to be conducted by other organisations that will assist the DDM Program.

# Why monitor coastan jirds

- Coastal birds are a gnificant part of the marine and island ecosystems
- Monitoring coast bit is necessary to determine the success of government actions in neeting teaty and legislative obligations to manage coastal birds
- Coastal bins are good indicators of the health of the environment as they are amongst the highest order predators in the food chain
- Coastal birds are relatively easy to monitor compared to other indicator animals due to their visibility and concentration at breeding and roosting sites
- Considerable biological information is available for coastal birds so it is possible to interpret monitoring data
- Coastal birds are high profile animals and visible to visitors
- Coastal birds are the subject of several international agreements.

# Legislative and international obligations

The Australian and Queensland Governments are required to protect the values of the GBRWHA in general, and birds and threatened species specifically under a variety of legislation and international treaties. These include:

#### Legislation:

- Nature Conservation Act 1992 (Qld)
- *Great Barrier Reef Marine Park Act 1975 (Commonwealth)*
- Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth).

#### **International Conventions and Agreements:**

- World Heritage Convention
- Convention of Biological Diversity
- China Australia Migratory Bird Agreement (CAMBA)
- Japan Australia Migratory Bird Agreement (JAMBA)
- Ramsar (Wetland) Convention
- Convention on the Conservation of Migratory Species of Wild Unimots (Bonn Convention).

Since the 1980s EPA and GBRMPA have worked wether to produce and support coastal bird management. Workshops in 1995, 1996, 1997, and 1999 coordinated with Environment Australia helped develop national approaches to seabird monitoring and research.

# Value of coastal birds in the Greet Barrier Reef World Heritage Area

#### Seabirds

- 22 species of seabird nest on the Great parrier Reef islands
- 55 islands are significant breeding islands
- 1.4 to 1.7 million seability breed in the Great Barrier Reef
- Over two million eabirds ion-breeding migrant seabirds use the GBRWHA.

#### Shorebirds

For a site to be listed upder the Ramsar Convention the area must support greater than 20 000 shorebine, or more than one per cent of a population.

- Shoalwater Bay and Bowling Green Bay are listed Ramsar Sites
- Other sites have been identified as meeting the shorebird criteria but have not been added to the Convention yet.

## **Threatened species**

EPA places a high priority on threatened species listed under the Queensland *Nature Conservation Act 1992* (NCA). GBRMPA is also concerned about assessing and maintaining Great Barrier Reef coastal bird biodiversity and World Heritage values including threatened species. Species in the World Heritage Area listed under regulations of the NCA Act are:

Herald Petrel
Red-tailed Tropicbird
Little Tern
Sooty Oystercatcher (northern spp)
Beach Stone-curlew
Vulnerable
Vulnerable

Garnett ST and Crawley GM *The Action Plan for Australian Birds* (2000) classified bird status nationally. Classified birds breeding or visiting beyond vagrant status in the GBRWHA are:

- Herald Petrel
- Masked Booby
- Red-tailed Tropicbird
- Little Tern
- Beach Stone-curlew
- Sooty Oystercatcher (northern spp)

Critically endange ed Vulnerable Near threatened Least Crucen Least concern Least Concern

The International Union for the Conservation of Islame classifies fauna by their threatened species status. Listed internationally is

• Roseate Tern

#### **Threatening processes**

Tropical coastal birds are suffering aglobal and Pacific-wide decline. This primarily appears due to disturbance to their breeding sites and impacts on their food sources. Threatening process are those processes that are known to, or suspected of, impacting on the coastal birds. They may cause the direct death of birds, cause secondary mortality, for example prough starvation, or cause long-term decline to populations by lowering reproductive puccess. Anthropogenic threatening process for coastal birds include:

- Disturbance to nesting, roosting and feeding sites by humans on foot, boat or vehicle
- Feral animals, for example rats and foxes
- Habitat loss, for example to coastal development
- Weeds taking over habitat
- Increased predation by silver gulls, for example on the Swains Reefs, Yeppoon
- By-catch of birds, for example by long line fishery
- Depletion of fish stocks which are prey items
- Climate change, for example changing food distribution or availability
- Water quality decreases and pollution, which deplete food availability

Natural impacts on coastal birds include:

- Adverse weather
- Parasites and disease (these can be introduced by humans)
- Variations in food availability
- Habitat loss, for example island erosion.

# Issues identified by monitoring coastal birds

In the GBRWHA monitoring by the DDM Program has identified several significant coastal bird issues including:

- Discovery in 2002 that Roseate Terns breeding in Japan and China migrate to the Swains Reefs (perhaps the entire East Asian breeding population)
- An 80 per cent decline in breeding populations of Black Noddy in the Capricorn and Bunker Groups
- A 50 per cent decline in Sooty Tern and Common Noddy breeding populations on Michalmas Cay
- A 30 per cent decline in the breeding numbers of Brown Boobies in the Swains Reefs
- A change in predatory behaviour of Silver Gulls in the Swains Reefs, with a subsequent threat to the breeding success of other seabirds
- The loss of breeding populations of ground nesting terns on Green, Heron and North West islands
- A significant decrease in the population of breeding Caspian Terms ear Yeppoon, probably due to an increase in the Silver Gull population
- The loss of a pelican breeding population from Pelican Flands, the hitsundays
- The precarious status of mainland populations of Little Terr and Leach Stone-curlews, due to increasing visitation to beaches.

Work by other observers has identified other coastal by lissues including:

- The decimation of Wedge-tailed Shearwares on North Stradbroke Island (outside GBRWHA) but showing the threat of fox s to those island breeding birds
- The recent discovery of small breeding populations of Little Terns at obscure sites in south-east and central Queensland.

# Management actions taken using pronitoring data

Monitoring coastal bird populations cas enabled GBRWHA management agencies to make informed decisions. Examples of DDM coastal bird monitoring data that has assisted management include:

- Monthly nonitoring at Michaelmas Cay has enabled the assessment and adjustment of management actions aimed at minimising visitor impacts on grounding nesting terms
- Monitoring data at Lady Musgrave Island has enabled planners undertaking site planning to accommodate the needs of both nesting seabirds and island campers
- Accurate locations of seabirds and shorebirds enabled planners for the Whitsundays to reduce proposals for large closures to protect birds to the minimal areas required
- Monitoring data assisted separation of breeding birds and visitors at Lady Elliot Island
- Monitoring data on seabirds on Sandbank Number 8 has lead to management agencies applying conditions on a permit for a tourist operation to the site
- Published reports of monitoring in the Swains Reefs forms the basis for management of visitation to the Swains, including closures of islands
- Pelican monitoring data at Akens Island precluded the granting of a permit for oyster farming
- Nomination of Shoalwater Bay as a Ramsar site.

# **Coordination of coastal bird monitoring**

#### The role of management agencies

Since the 1980s EPA and GBRMPA have worked together to encourage coastal bird management. Workshops in 1995, 1996, 1997, and 1999 coordinated with Environment Australia helped develop national approaches to seabird monitoring and research.

EPA has supported coastal bird monitoring by setting up a central database (Coastal bird Atlas) to collate and store coastal bird data. EPA has employed specialist coastal bird biologists in the past (till 1991) to undertake seabird monitoring and study. EPA is responsible for coastal bird monitoring throughout Queensland and provides resources for management of the Atlas. GBRMPA has supported coastal bird monitoring and management work. It developed and published 'Guidelines for the Visitation to Seabird Islands'.

The DDM Program undertakes a range of management actions, including monitoring, for GBRMPA and EPA. The Strategy Group for DDM decides who monitoring is possible within the DDM Program. Marine Parks staff within the DDM Program conduct most monitoring of coastal birds, with support from EPA and uBRMPA are sometimes with the assistance of other organisations. Much of the monitoring of coastal birds, with few patrols dedicated to coastal bird monitoring alone.

Research into coastal birds has been conducted by EPA, universities, the CRC Reef Research Centre and specialists contracted by bou CBRMPA and EPA. Critical management focused information requirements for coastal bird research need to be identified by GBRMPA and EPA. Faternar binding is essential for this research, but the DDM Program may provide in-kind support of the research has a management outcome.

# Queensland Coastal Bird Alas

EPA is responsible for collating and managing coastal bird data. EPA set up a seabird bird database (Seabird etlas) b sed in Brisbane. In the early 1990s EPA (with GBRMPA support) et ployer a consultant to compile all the available seabird census data into a single database (Seabird Atlas). The Seabird Atlas database contained information concepted prior to about 1995.

The Seabird Atlas was upgraded and updated in 2001 incorporating additional data from Marine Park monitoring officers in Townsville, Rockhampton and Cairns. Coastal bird data is also held by a number of researchers from both within EPA and external to the service. While it does remain as a stand-alone database, it is attached to the WildNet system. It has been relaunched as the Queensland Coastal Bird Atlas. EPA officers managing the Atlas are refining the collation, storage, reporting and distribution of coastal bird data.

A policy has been drafted for sharing coastal bird monitoring data between the EPA, GBRMPA and the Biodiversity Group of Environment Australia who are responsible for the management of the Coral Sea Territory.

# **Monitoring methodology**

## **Measures for monitoring**

Monitoring can measure:

- Population size/index especially the size of the breeding population
- Breeding success is a more useful measure but much more expensive to determine
- Spatial and temporal variation in distribution
- Population demographics derived from mark/recapture, modelling etc, for example age classes
- Threatening processes those known or suspected to have negative impacts on the populations, for example disturbance levels, habitat shrinkage.

# Key sites

Priorities for the selection of monitoring sites should focus on:

- The most significant and representative populations
- Significant breeding and roosting sites known to be used threat
- Significant regional sites
- Control sites with little disturbance to compare with importensites.

# Minimum monitoring priorities

Identification of the minimum level of conitor of required for coastal birds in the GBRWHA should be based on a risk assessment approach that looks at values and risks to values. A structured assessment of priorities hust consider:

- **Indicator species:** Systematic ponitoring of the breeding population size of key *indicator* species at a line ited number of important breeding sites during the breeding season (usually orce per year, or twice in Far Northern and Swains colonies).
- **Threatened species:** We notify of *threatened* species with particular attention given to identifying breatening processes.
- **Threatened sites and threatening processes:** Monitoring where threatening processes or priority management issues have been identified (where possible this should be tied to additional research aimed at reducing the impacts of threatening processes).
- **Management actions:** Monitoring effectiveness of management actions should entail before and after monitoring and/or comparisons with control sites. It applies to both small-scale specific DDM actions such as fencing and to large-scale management actions such as the Whitsundays management planning exercise.

# Additional observations

A structured program which minimises the amount of monitoring required does not preclude additional observations of coastal bird numbers at breeding or roosting sites, and observations of feeding birds made as part of patrol reporting.

Some recording of coastal bird data is undertaken by field staff on patrol in addition to structured monitoring programs. These observations could be made more structured and systematic.

### Data recording methods and sheets

Minimum standard monitoring techniques have been developed with the data sheets for the Coastal Bird Atlas. Staff have been trained to observe and fill out the data recording sheet. These techniques include how to determine breeding effort by counting nesting effort. Breeding effort is the best measure for comparing sites and years when only a limited number of counts can be made at each site.

The localities and conditions where coastal birds occur are highly variable and the following considerations are important:

- Specific techniques for counting vary with the site and species
- Techniques for identifying and assessing threatening processes are duermined on a caseby-case basis
- Monitoring techniques are integrated with conservation plans, more gement plans and threat abatement plans
- Techniques are subject to tests of statistical validation.

# Table 1 Monitoring indicator species at key sites

Whilst it may be desirable to monitor all coastal bird species the minimum requirement is to monitor a selection of species that reflect a range of feeding and breeding strategies. These are the indicator species. Selection of these species was also influenced by the historic data available on some species.

Key sites for monitoring indicator species were selected with the following criteria:

- Significance of the size of the population breeding (or roosting) at the site
- Ease of access and counting

- History of monitoring at the site (it is preferable to continue existing monitoring)
- Covering a geographical spread of sites from north to south in the GBRWHA.

	Islands	Islands	Islands	Islands
Indicator	Cairns/Far	Hinchinbrook	Whitsundays	<b>Gladstone District</b>
species	<b>Northern District</b>	District	Distric	
Black Noddy	Quoin Island		Busk Sislet	North West,
			(Jost)	Masthead, Heron
				Island
Wedge-tailed	Rocky Islet			North West,
Shearwater	Raine Island			Masthead, Heron
				Island
Brown Booby	Sandbank No 8			Swains Reefs
	Raine Island			
Roseate Tern	Wallace Islet	<b>Brook</b> sland		All Cap/Bunkers
Least	Quoin Island			Bell Cay (Swains
Frigatebird				Reefs)
Sooty Tern	Michaelma Cay			
	Stapleton Islan			
Masked Booby	Raine Island			Swains Reefs
	Moulter Ca			
Pelican	Contre Islar I			Akens Island
	Per can Land			

# Table 2 Key breeding sites identified as important regionally

The Great Barrier Reef has a large geographic spread. To monitor coastal birds in the GBRWHA it is important to monitor key sites throughout the area. The most significant coastal bird islands in each region have been based on the numbers of species and numbers of breeding birds on each island. (In 'Guidelines for Managing Visitation to Seabird Breeding Islands' WBM Oceanics Australia).

Cairns and Far	Hinchinbrook	Whitsundays	Gladstone District
Northern District	District	District	
Raine Island		Eshelby Island	Lady Elliot Island
Michaelmas Cay	Cape Bowling Green	Bushy Islet (roost)	North West Island
	Spit		
Moulter Cay	Brook Island		Swains Reefs
Quoin Island			Fan Sax and Hoskyn
			Island
Sandbank No 8			
Wallace Islet			

## Table 3 Monitoring and information needs for threatened species

Many information needs cannot be met as part of the monitoring strategy and must be met by other resources. The monitoring strategy can address the following monitoring needs.

Birds	Monitoring needs	Locations	Information needs
Herald	Monitoring of breeding	Raine Island	Determine population size
Petrel	population		and if it still breeds
Masked	Monitoring breeding	Raine Island, Moulter	Population status
Booby	population size	Cay and Swains Reefs	
Red-tailed	Monitoring of the	Raine Island	Understanding of nest site
Tropicbird	breeding population at	Lady Elliot Island	fidelity and the relationship
	Raine Island and Lady		with Coral Sea populations.
	Elliot Island		Also significance and
			variable breeding success of
			Lady Elliott Island breeding
			po, lations.
Little Tern	Monitoring of size and	C/FN:	The See and location of the
	location of known	Ingram, Lowrie, Scath	Queersland breeding
	breeding populations in	Barnards	pedation, and information
	selected areas. (Little	Hinchinbook:	on the breeding success at
	terns can move nesting	Cape Bowing Gree	various sites subject to
	locations)	Spit	different disturbance
		Dunk Island spic	conditions. Need to acquire
		Coartar sites north of	an understanding of the
		Town vale	interaction with northern
		G. dsinne:	hemisphere and southern
		San y Point at Corio	Australian breeding
		Ba	populations
		Arrubra Island	
Roseate	Monitoring reeding	All Cap/bunkers, Brook	Impacts of disturbance on
Tern	populations and success	Islands, Wallace Islet	breeding.
Beach	Monitology of building	Whitsundays,	Understanding of diet,
Stone-	states an effects of	Brook Islands,	predation levels, importance
curlew	disturbalize. Targeted at	Shoalwater Bay,	of island breeding sites
	nown beeding pairs at	Beaches north of	compared to mainland sites,
	set a sites	Townsville	dispersal patterns, breeding
			success and effects of
			human disturbance.
Sooty	Monitoring of	Important sites to be	Understanding of diet,
Oystercatch	population size and	determined includes:	predation levels, importance
er	breeding success at	North Brook and	of island breeding sites
	selected sites	Whitsundays	compared to mainland sites,
			dispersal patterns, breeding
			success and effects of
			human disturbance.

Additional identification of key sites for monitoring is required for Little Terns, Sooty Oystercatchers and Beach Stone-curlews.

**Table 4 Monitoring and research for management issues**Specific monitoring projects are often required to monitor management actions or assess management issues. More general long term monitoring can assist. This table provides a summary of information required to support coastal bird management.

Information required	Location of	When to	How to monitor
	issue	monitor	
Cause of decline of	Michaelmas	Monthly	An applied research
Michaelmas Cay breeding	Cay and a		project will drive this
seabird species especially	control site		program. Monitoring of
Sooty Tern and Common	(e.g. Stapleton		populations and
Noddy	Island)		disturbance is required.
Critical approach distances by	Visited islands	Breeding	Research project. Support
people on foot and in boats for	and control	seasons	required.
breeding success. Degree of	sites.		
species assimilation to human	Especially in		$\frown$
presence	Whitsundays		
Effectiveness of management	Site of action	Breeding	Wher possible monitoring
actions including habituation	and a series of	seasor 5 when	by ding success or
	control sites	action at in	population size should
	(e.g.	$\boldsymbol{\lambda}$	occur before management
	Michaelmas 🗸		action and certainly after
	Cay, Cap/		
	Bunkers and		
	Whitsundays		
Impacts of disturbance by	Car Bun, rs	Annually at	Monitor population and
visitors to Roseate Terns (and	the patened and	breeding	visitation levels. Support
other breeding seabirds)	cont. 1 sites	times	required.
Location of critical feeding	Swains Leefs	Year round	Research project. Support
areas for tropical seabirds	Cy/Bunkers	especially in	required.
the Great Barrier Reef (e.g.	and Far North	breeding	
Brown Booby and unk own		season	
diets)			
Requirements or protection	State wide	Year round	Research project. Support
and recovery of threater ed			required.
species - Little Teleach			
Stone-curlew, Sooty			
Oystercatcher			
Genetic population structure	Great Barrier	Breeding	Collect and analyse
for species of special concern	Reef and Coral	season	samples from nesting sites.
and units of management to	Sea		Research project. Support
inform monitoring and			required.
management programs (e.g.			
Roseate Terns, Brown			
Boobles)	<b>D</b> 0 11		
Changes in area of coral cays	Reet wide	Every few	Monitoring program
(e.g. Michaelmas Cay)		years	beyond DDM. Support required.

# Table 5 Summary of reasons for monitoring particular sites

There may be more than one reason for monitoring particular locations. A minimum number of sites have been selected that meet the different monitoring needs.

Island	Monitoring	Monitoring	Monitoring	Monitoring
	indicator	key sites	threatened	management
	species		species	issues
Coirns and Far				
Northern				
Raine	X	X	X	
Stapleton	X			X
Moulter	X	X	X	
Ouoin	Х	X		
Sandbank Number 8	Х	X		
Wallace	Х			
Rocky	Х			
Michaelmas	Х	Х		X
Pelican	Х			
Ingram			X	
Lowrie				
Barnards			X	
Hinchinbrook				
Dunk Island Spit	X		Х	
Brook Islands	X	Х	Х	
Cape Bowling Green		X	Х	Х
Beaches north of			Х	
Townsville				
Whitsundays				
Bushy	Х	Х		
Eshelby		Х		
Whitsundays slands			Х	Х
and mainland				
Gladstone				
Swain Reefs	Х	Х	Х	
North West	Х	Х	Х	
Heron	Х		Х	
Masthead	Х		Х	
Fairfax and Hoskyn		Х	Х	
Island				
Lady Musgrave			Х	Х
Other Cap/ Bunker			Х	
Islands				
Lady Elliott		X	X	
Akens Island	X			
Shoalwater Bay			X	
beaches				
Sandy Point Corio			X	

Bay			
Barrubra Island		Х	

# Table 6 Summary of minimum level of monitoring required

**Key** When: S= once/summer W= once/winter

**Species:** all = all species breeding on island, BB = Brown Booby, BN = Black Noddy, BSC = Beach Stone-curlew, HP = Herald Petrel, LF = Least Frigatebird, LT = Little Tern, MB = Masked Booby, P = Pelican, RtTb = Red-tailed Tropicbird, RosT = Roseate Tern, SO= Sooty Oystercatcher, ST = Sooty Tern, WtS = Wedge-tailed Shearwater

Island or	When to	What to monitor-	Monitoring management
mainland site	monitor	minimum required.	issues
Cairns & Far			
<b>Northern District</b>			
Raine	S/W	all, especially RtTb, HP,	
		MB, BB, WtS	
Stapleton	S/W	all especially ST	Michaelmas Cay control site
Moulter	S/W	all, especially MB	
Quoin	S/W	all, especially LF, BN	
Sandbank Number	S/W	all, especially BB	
8			
Wallace Islet	S/W	all, especially Ros	
Rocky Islet	S	WtS	
Michaelmas Cay	monthly	all especiall	Fewer birds at tourism site,
			management actions
Pelican	S/W	Р	<u> </u>
Ingram Island	S	LT	
Lowrie Island	S		
Barnards Island	S	LT	
Hinchinbrook			
District			
Dunk Island Spit	S	LT	Effects of disturbance
Brook Islands	S	all esp LT, BSC, RosT, SO	
Cape Bowling	ponthly in S	all, especially LT, BSC	Effects of disturbance
Green spit			
Beaches north of	n onthly in S	BSC, LT	Effects of disturbance
Townsville			
Whitsunday 🔪			
District			
Bushy	S/W	all esp. BN	
Eshelby	S	all	
Whitsundays	S	BSC, LT, SO	Effects of disturbance,
Islands &			management action
mainland			
<b>Gladstone District</b>			
Swains Reefs	S/W	all, especially MB, BB, LF	
North West	S	all, especially BN, WtS	
Heron	S	BN, WtS	
Masthead	S	BN, RT, WtS	
Fairfax & Hoskyn	S	all, especially RosT	
Lady Musgrave	S	RosT	Management effectiveness
Other Cap/ Bunker	S	RosT	Effects of disturbance RosT

Lady Elliott	S	all, especially RtTb, RosT	
Akens	S/W	Р	
Shoalwater Bay	S	BSC	
Sandy Point	S	LT	
Barrubra Island	S	LT	

# **Implementing the Strategy**

This strategy outlines the minimum requirements for monitoring key coastal bird species at key sites within the GBRWHA.

### Coordination and implementation of monitoring

EPA and GBRMPA are the prime agencies responsible for coastal birds and the health of the ecosystem in the GBRWHA and therefore have responsibility for coastal bird monitoring. Coordination of coastal bird monitoring is provided through an informal working group of EPA and GBRMPA officers. This group tries to ensure the strategy for coastal bird monitoring is implemented, with the DDM Coordination Unit providing support.

Management of the Coastal Bird Atlas by EPA staff will ensure data is consistently collected and stored in a database, that reporting meets agency requirements and that data is available for analysis.

Each year the DDM Program will attempt to undertake the minimum conitoring required for indicator species, threatened species and threatening processes is outlined by this strategy. Table 6 is the key guide for Marine Park conagers is determine their monitoring program. Implementation of the monitoring strategy will be primarily through the annual business planning process that ensures resources of staff and boats are programmed. This is facilitated by the DDM Coordination Unit. GPRN M and EPA will encourage academic and volunteer programs to assist with monitoring.

# Reporting

An annual summary of coastal birl monitoring will be produced for the GBRWHA by EPA staff managing the Coastal Birl Atka. As a minimum it will include population estimates of all key sites and species as identified in Table 6. EPA staff currently undertaking the monitoring will annually reportion specific monitoring projects. Every five years a major collation and presentation of the monitoring program will be undertaken as part of the State of the GBRWHA report.

# Research

Research will be undertaken by appropriate researchers and funded outside the DDM budget. GBRMPA and EPA should continue to encourage academic institutions and volunteers to participate. DDM may support projects related to the research priorities listed here if their expenses are covered by GBRMPA, EPA or external funds, and if the use of staff and boats does not compromise other management priorities.

# Updating the strategy

Appraisal of the monitoring program will be undertaken each year by the Coastal Bird Working Group. The appraisal will take place in February, prior to the budgeting cycle. Each region or district will present a list of the monitoring achieved and a summary of significant results. After review by the group the monitoring strategy will be revised.

## **Appendix 1 The 1999 Seabird Workshop**

The Great Barrier Reef/Coral Sea Seabird Workshop met in June 1999 and endorsed the priorities in this strategy. The participants for the Cairns workshop are listed below:

Tony Stokes, Great Barrier Reef Marine Park Authority (GBRMPA) - organiser Barry Baker, Environment Australia Brad Congdon, James Cook University (Cairns campus) John Cornelius, EPA DDM Cairns Dennis Devine, EPA DDM Cairns Kirstin Dobbs, GBRMPA Pam Dyer, University of the Sunshine Coast Darren Grover, James Cook University Townsville Emma Gyuris, James Cook University (CRC Reef) Mark Hallam, Environment Australia Eddie Hegerl, Australian Marine Conservation Society John Hicks, EPA DDM Townsville Kees Hulsman, Griffith University David James, Australasian Seabird Group/Birds Australia Col Limpus, EPA, Brisbane David Milton, CSIRO Marine Research Frazer Muir, EPA DDM Cairns Paul O'Neill, EPA DDM Rockhampton Mary Power, EPA DDM Cairns Mike Short, EPA DDM Cairns Malcolm Turner, DDM Coordination Unit David Wachenfeld, GBRMPA Margo Warnett, EPA DDM ov sville