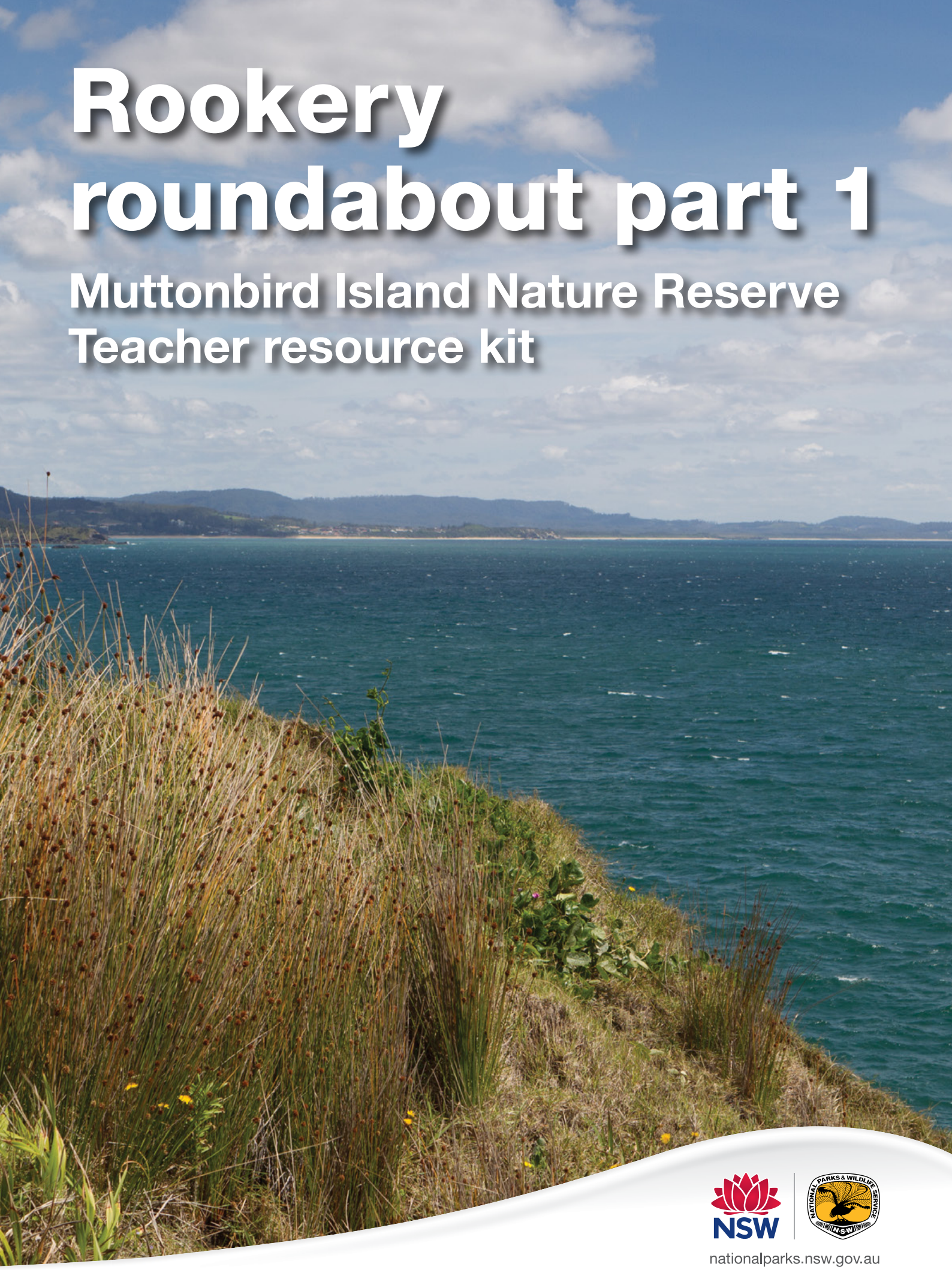
Rookery roundabout part 1

Muttonbird Island Nature Reserve
Teacher resource kit



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Rookery Roundabout, Muttonbird Island Nature Reserve Teacher Resource Kit

For further information contact:
Ranger, Coffs Coast Area
32 Marina Drive, Coffs Harbour 2450

For general inquiries:
Phone: 1300 361 967
www.npws.nsw.gov.au

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National Parks and Wildlife Service, Office of Environment and Heritage
59 Goulburn Street, Sydney NSW 2000
PO Box A290, Sydney South NSW 1232
Phone: 13000 PARKS (13000 72757)
Fax: (02) 9585 6831

Email: parks.info@environment.nsw.gov.au
www.nationalparks.nsw.gov.au
www.facebook.com/NSWNationalParks

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FOREWORD

Muttonbird Island Nature Reserve is a special place. It is a sacred site of the Gumbaynggirr people, who call it Giidany Miirlarl, (pronounced Ghee-dayn Meeral), meaning ‘moon sacred place’. It is the only wedge-tailed shearwater rookery site in New South Wales that is connected to the mainland. It provides a unique opportunity for the public to observe a working seabird colony up close, with more than 100,000 people visiting the island each year.

Rookery roundabout has been developed by the NSW National Parks and Wildlife Service (NPWS) to provide a quality re-source material for teachers, primary and secondary students with the aim to assist them to better understand both the natural and cultural significance of the reserve and the ongoing issues it faces.

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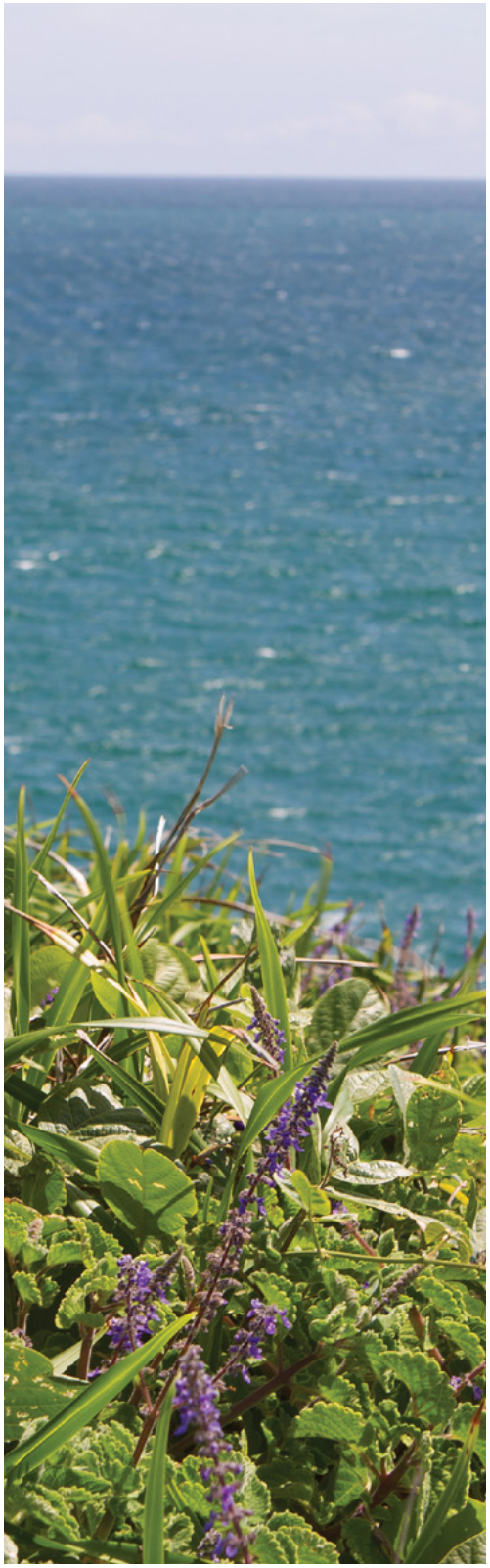


Photo: R.Cleary/Seen Australia

ABOUT THIS RESOURCE

Rookery Roundabout offers:

Part One - A teacher resource booklet (PDF), in three sections, each including information and associated worksheets for printing:

- The island
- The island inhabitants

The Island, the future;

Part Two - Rookery Roundabout flip cards (PDF File) which simply and beautifully depict the annual Wedge-tailed Shearwater life-cycle which occurs on Muttonbird Island Nature Reserve;

Part Three - Syllabus links and lesson plans for stages 1-3.

Resources:

- Giidany Miirlarl – Special site Discovery excursion program outline (4-page PDF)
- Ten-minute segment on Muttonbird Island Nature Reserve that was aired on Totally Wild (courtesy of Channel Ten Brisbane).
- Vegetation maps of weed distribution on the island (PDFs)
- Aerial photo of Muttonbird Island Nature Reserve on: www.google.com.au/maps/place/Muttonbird+Island+Nature+Reserve
- Map of Muttonbird Island Nature Reserve from Plan of Management (PDF)

In addition, a 15 minute educational film that describes the Gumbaynggirr connection and significance of Giidany Miirlarl and Boonyoon Miirral is available on DVD from the NPWS Coffs Coast Area office (ph. 02 6652 0900). The stories are as told by the Coffs Harbour Elders.

ACKNOWLEDGEMENTS

Project Manager: Ann Walton, Ranger Coffs Coast Area

Researched and compiled: Anne Gibbs, Discovery Ranger

Editing: Kerry Cooper, Ann Walton

Technical advice: Janet Cavanaugh, David Page, Maxine Walker, Ann Walton, Narelle Swanson

Historical information: Coffs Harbour Advocate, Coffs Harbour Historical Society

Illustrations: Helen Clark, Lyn Skillings, Janelle Marshall, Kerry Cooper

Photographs: Geoff Biddle, Coffs Harbour Advocate, Coffs Harbour Historical Society

Brett Leis, Helen Clark, Neil Vaughan,

Vegetation Maps prepared by Ruth Armstrong and Holly North

Maps: Kerry Cooper, Karen Gallagher, Holly North,

Video worksheet: Lucy Cooper

Layout and design: Kerry Cooper

Muttonbird Island footage courtesy Channel Ten (Brisbane)

Many thanks to the teachers who took time to answer the questionnaire, the results of which assisted in the development of this teacher resource kit.

THE ISLAND

Photo: R.Cleary/Seen Australia

WHERE IS MUTTONBIRD ISLAND?

Muttonbird Island lies east of the city of Coffs Harbour and forms part of the northern entrance to the Harbour. Muttonbird Island also marks the southern boundary of the Solitary Islands Marine Park. It covers an area of 9 hectares or about the size of 16 football fields.

Muttonbird Island Nature Reserve is managed by the National Parks and Wildlife Service, a section of the Office of Environment and Heritage, for the purpose of wildlife conservation and study.

Why is it called Muttonbird Island?

The common name of Muttonbird refers to the migratory seabirds that live on the Island. They dig burrows in the damp shallow dirt to lay eggs and shelter growing chicks. The early European settlers, like the local Gumbaynggirr people, hunted and ate them, comparing the dark flesh to the flavour and texture of mutton. Today these birds are known as shearwaters, and the wedge-tailed shearwater is the most commonly found on the Island.

Where the land meets the sea

nationalparks.nsw.gov.au

ACTIVITY SHEET 1

1. Describe an island

2. Muttonbird Island is joined to the mainland by a break wall.
Do you think it is still an island?

3. A rookery is where birds gather for breeding.
What type of birds gather on Muttonbird Island to breed?

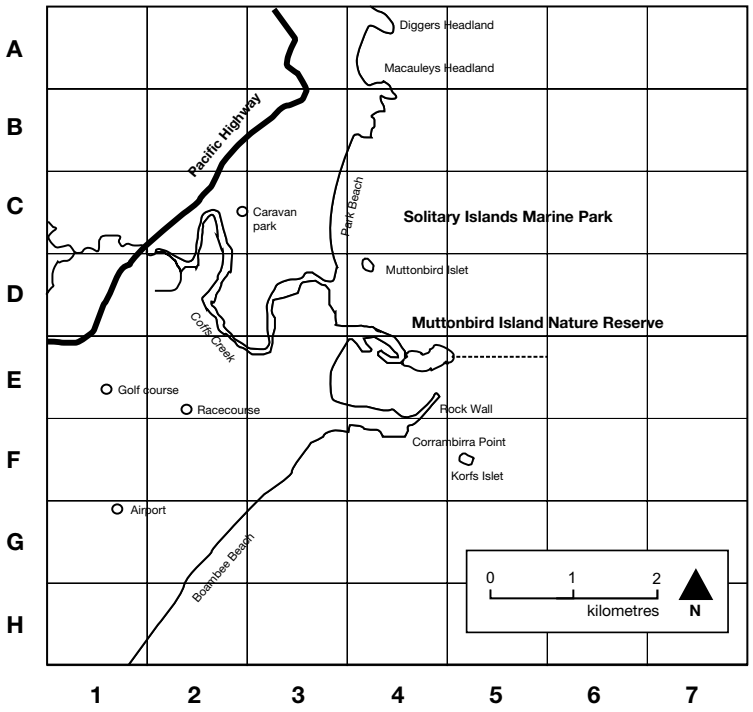
4. Where do the birds find food?

5. Draw your own island. Show the things you need to survive on your island.

Mapping around Muttonbird

nationalparks.nsw.gov.au

ACTIVITY SHEET 2



1. Find Muttonbird Island on the map above and colour it green.
2. The break wall and marina area connect Muttonbird Island to the mainland. Colour this area red.
3. The rock wall shown on the map extends out from Corambirra Point. This was once an island, but is now connected to the mainland by land fill. Colour this area brown.
4. A dotted line shown to the east of Muttonbird Island on the map marks the southern boundary of what Marine Park?

_____

5. If you were standing on Muttonbird Island and looking north, what is the first headland you would see?

_____

6. Use the scale on the map to calculate how far Muttonbird Islet is from Muttonbird Island. Locate the Jetty on the map. Write down the map coordinate.

_____

A sacred site

nationalparks.nsw.gov.au

ACTIVITY SHEET 3

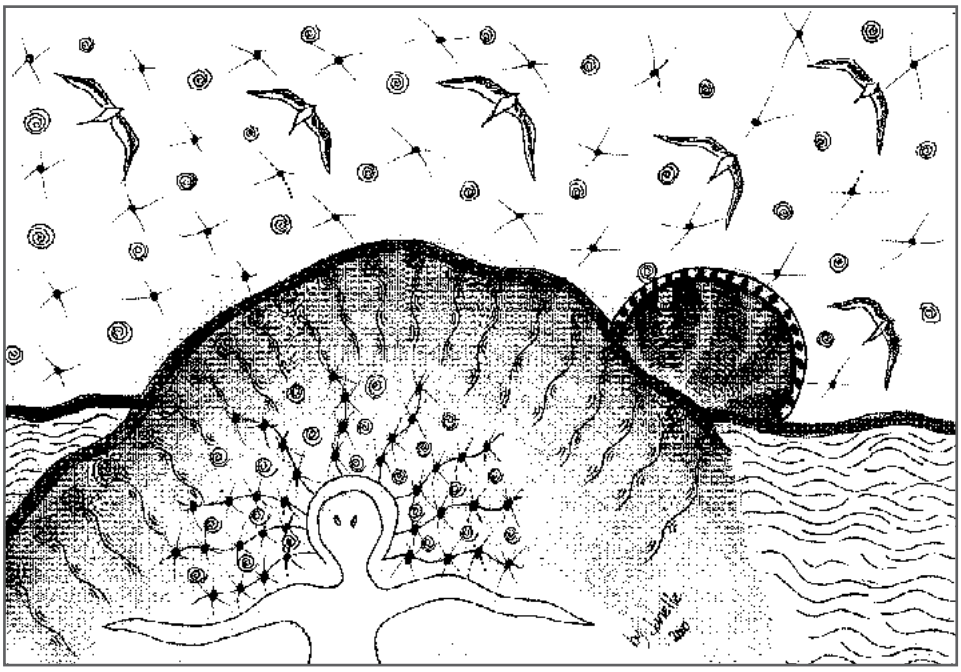
The local Aboriginal people of the past and today in the Coffs Harbour area belong to the Gumbaynggirr Aboriginal nation that represent them as a people. The Gumbaynggirr people have an ongoing connection with the land and water. For them, heritage and nature are inseparable from one another. The Island is significant to the Gumbaynggirr people culturally and forms part of their spirituality and personal identity.

GIIDANY MIIRLARL

The Island is a sacred site of the Gumbaynggirr people, who call it Giidany Miirlarl, which means 'moon sacred place'.

The traditional story tells of the moon, who is the guardian of the island, keeping birds there for the Gumbaynggirr people to hunt for food. The guardian does not allow too many to be hunted so that there would be enough for future generations.

It is said that when the full moon returns each month, it renews life to the plants and animals. The moon uses the tides, riptides and floods against those who do not respect the Aboriginal lore.



The Guardian of Giidany Miirlarl Artist: Janelle Marshall, 2000

The NSW National Parks & Wildlife Service acknowledge, respect and thank the Gumbaynggirr Aboriginal elders of the Gumbaynggirr nation for this interpretation of Muttonbird Island.

The guardian of Giidany Miirlarl

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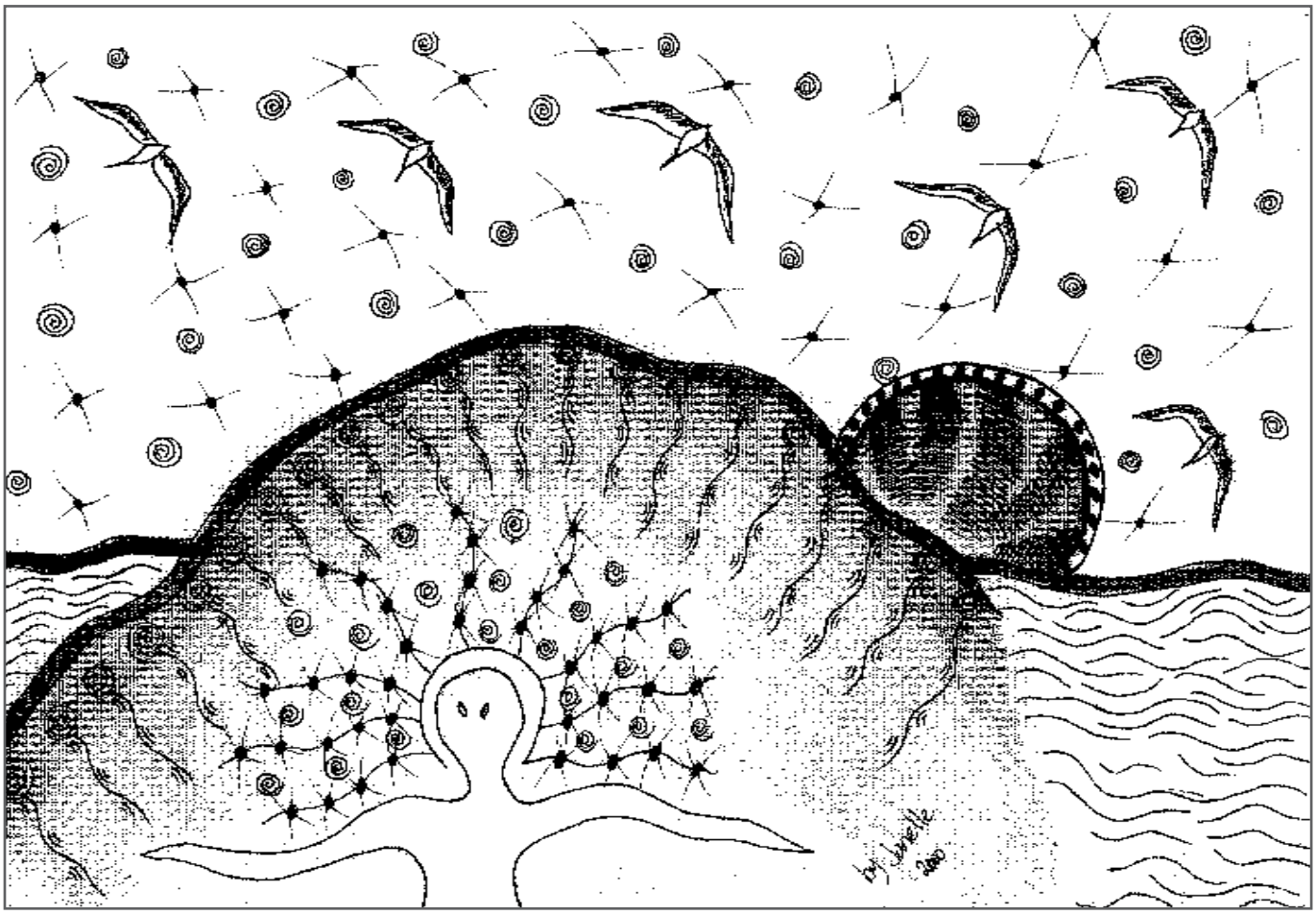
ACTIVITY SHEET 4



1. Recount the story of Giidany Miirlarl in the space below.

THE GRAB FOR GOLD

The history of white invasion in the Coffs Harbour area is a relatively short one. The Solitary Islands were recorded in the log of Captain James Cook during his voyage up the east-coast of Australia in 1770. Over twenty years later, in 1791, runaway convicts William and Mary Bryant were reported to have sailed up the coast from the Colony (Sydney) and landed for repairs and water in the shelter of the bay. Then, in 1847, Captain John Korff, after whom Coffs Harbour was named, sought refuge for his ship Brothers in the shelter of Muttonbird Island. It was apparent to the captain and his crew that the surrounding area held many treasures and the news of this returned to the colony.

As 'gold fever' grew in the colony, the word spread quickly about fortunes to be had in the north. The seemingly endless resources were seen by many as an opportunity to a prosperous life. At this time, many recent arrivals to Australia travelled to the Coffs Harbour area in search of 'gold'.

Prospectors fossicked for the mineral gold in the Orara River. Red cedar was referred to as 'red gold' due to the high prices fetched for the timber. Cedar-getters worked hard in difficult terrain. They risked their lives to fell the forest giants and haul them to the harbour to load on waiting ships.

'In 1865, an early cedar-getter, Walter Harvie, established a campsite and 'tilting ground' on the bank of Coffs Creek. Cedar logs were tilted into the creek to be floated out to sea and loaded onto waiting ships.'

Coffs Harbour Historical Society

Timber getting was a hazardous operation but a huge export for the region. To reduce the number of logs ramming ships, or ruined by salt or lost out to sea, a jetty was proposed. The original Coffs Harbour jetty was built for loading timber and was completed in stages between 1889 and 1953.

The ancient forests were soon exhausted. The Gumbaynggirr people had lived in harmony with the land for thousands of years, however, in less than a century of change the balance and much of their traditional resource base was lost.

A view of Muttonbird Island before the breakwall was constructed.
Taken By Percy Crook in the period 1907-14.
(Courtesy of Coffs Harbour Museum)

LINKING WITH THE LAND

Boarding the S.S. Fitzroy at Coffs Harbour jetty. Note Muttonbird Island on the left.
(Courtesy of Picture Coffs Harbour)

Construction of the breakwall, thought to have been taken in the late 1920's.
(Courtesy of Coffs Habour Museum)

After completing the early stages of Coffs Harbour Jetty, it was realised that more was needed. Storms and heavy seas were taking their toll on the Jetty and the trading ships that docked there. A more sheltered harbour was desired to reduce the loss to the local industries.

An ambitious project to create a northern breakwall that joined Muttonbird Island to the mainland began in 1915 and was officially opened in 1924. The rock used for the breakwall was quarried from nearby Corambirra Point, which was originally an island. The eastern break wall was not complete until 1939.

Huge blocks of stone, up to 40 tons in weight, were reinforced with concrete capping. However, fierce storms and heavy seas continue to destroy parts of the wall, requiring maintenance and further reinforcement.

FERAL FOLK

Threats to the survival of island inhabitants, such as shearwaters, have been many and varied. Since the completion of the breakwall in 1924, direct land access to the Island has exposed it to greater environmental threats than ever before. Black rats, mice and feral cats, often stowaways from visiting ships docked nearby, would escape to the island in search of food. There was also a dramatic increase in the number of people visiting, with sightseers climbing to the top of the Island to take in the spectacular views, or others capturing a bird or gathering eggs to take home for their supper.

During the great depression in the 1930's, the population of shearwaters on the island was severely reduced due to the collection of eggs to feed hungry families. The eggs were easy to collect. The shearwaters instinctively lived as they had when they were protected by the isolation of the island and had little defence to the constant threats that people brought.

The year 1970 was a tragic one for the shearwater population. Many chicks were buried alive in their burrows when people swarmed over the island to try to view the Queen whilst the Royal yacht *Britannia* was visiting Coffs Harbour. Three months later, a deliberately lit fire destroyed the vegetation of the Island and set back research efforts considerably. Even ten years after the fire, the number of Muttonbird burrows was still significantly lower in the burnt area, when compared with the unburnt area. (Floyd and Swanson, 1981).

In 1996 studies found that numbers of shearwaters were dropping significantly and several factors were blamed: bright lights at the jetty keeping adult birds away from the island, heavy spring rains causing burrows to flood, and reduction in pilchard numbers all along the east coast. It was also noted that threats were posed by feral predators and increased visitor numbers. In 2007 a fox attack caused the death of nearly 40 birds.

Photo: R.Cleary/Seen Australia

Muttonbird Island became a nature reserve, managed by the NSW National Parks and Wildlife Service (NPWS) in October 1971.

A nature reserve has its main focus on conservation.To protect and conserve the island, additions have included signage, the construction of a fence in 1973, a paved walkway across the island built in 1988 and a lookout platform, two bench seats and a raised steel mesh section of track erected in 1996.

Vol. LXI No. 2820 WEDNESDAY, JULY 29, 1970

"Deliberate" fire on Coffs wildlife refuge

A fire, started on purpose on Mutton Bird Island last weekend, has wiped out a 12 months study program on the island's bird life.

The fire was started by a group of teenagers on Friday night and was still burning yesterday.

RESEARCH WORK RUINED

It has completely ringed the island.

Mr. Frank Merritt and Miss Narelle Swanson, both of Coffs Harbour, have been carrying out the studies on the mutton-bird (wedge-tailed shearwater) at the suggestion of the CSIRO.

Little is known about the breeding habits and life cycle of the birds.

Miss Swanson and Mr. Merritt have been banding the birds and taping and marking their burrows in an effort to discover more about their habits.

Thousands of mutton-birds arrive at the island about September each year to nest in the burrows which form a honeycomb over the island.

But Mr. Merritt said yesterday that their entire studies had been wiped out by the fire, which could also drive many of the birds away from their nesting places.

A total of 2782 mutton-birds have been banded in NSW this year and more than 1000 of these have been banded on Mutton Bird Island.

Mr. Merritt said Miss Swanson saw three teenagers trying to light a fire on the island on Friday evening and chased them away.

But by 9.30 pm, the undergrowth on the island was ablaze.

The incident was reported to Coffs Harbour police.

"If any heavy rain should fall now, the entire top soil will be washed away and the birds can't burrow into solid rock," Mr. Merritt said.

"The fire has wiped out the natural growth and other grasses will probably cover the burrows, forcing the birds to nest elsewhere.

"As far as we are aware, this is the only mutton-bird nesting area in Australia which can be reached by walking.

"It has a great tourist potential, but is being destroyed."

Mr. Merritt added that fire was not the only threat to the island.

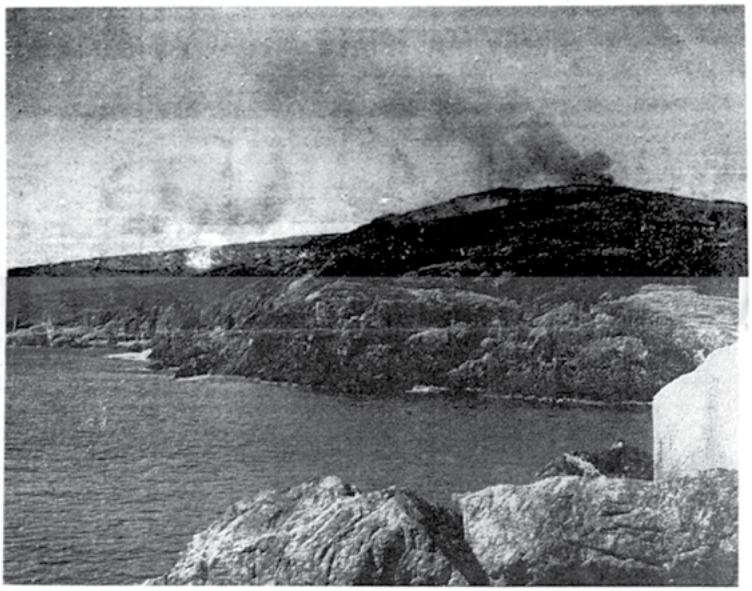
He said the island was designated a wildlife "refuge" and not a "sanctuary" — the difference being that a refuge could be rescinded at any time.

A sign on the island warning that it was a wildlife refuge had disappeared years ago.

The National Parks and Wildlife Service had promised some months ago to send a new sign, but it had not yet arrived.

Mr. Merritt said the service had also promised to ask Coffs Harbour Shire Council to keep sightseers off the nesting areas during the Royal visit in April.

Promised barricades had not been erected and as a result, chicks were buried alive when hundreds of people trampled over the island.



AT TOP, the wedge-tailed shearwater, better known as the mutton-bird and above, Mutton Bird Island, blackened by weekend fires and still burning.

16/3/1996
JETTY TIMES

Bird-banders Bill Lane and Narelle Swanson put a stainless-steel band around the leg of a muttonbird chick on Muttonbird Island. The island has the largest breeding population of wedge-tailed shearwaters in NSW, but the birds are under increasing stress and there are fears that their numbers are falling.

Bright city lights may be dim for muttonbirds

Muttonbird Island is one of the landmark attractions of Coffs Harbour and the wedgetailed shearwaters (Puffinus pacificus), which give the island its name make up the largest breeding population of their kind in NSW.

But the proximity to the city, which makes the island such a tourist asset, is posing increasing problems for the muttonbirds which call the island home.

Ornithologist Bill Lane has been banding muttonbirds on the island for 30 years and he says there are indications that the birds' numbers are dropping significantly.

Narelle Swanson, Bill Lane's first bird-banding pupil, moved to Coffs Harbour in 1969 and has been involved in the research and banding of birds on the island ever since. She is particularly worried about the impact of lights at the Jetty.

Artificial light poses problems for the birds, especially juveniles, who are attracted and disorientated by lights.

Even adult birds prefer dark nights.

In natural light conditions, they land after dark and leave before dawn to avoid their natural predators, the sea eagles.

Bright moonlight or artificial light falling on the island keeps them away unless they are forced to land to feed their chick.

The planned marine science centre could add significantly to the birds' difficulties .

Mrs Swanson said the south-western side of the pear-shaped island, which faces the quarry on Corambirra Point, was the prime nesting site and currently received little night lighting.

But the quarry is the proposed location for the marine science centre so Mrs Swanson said if this development was not to affect the muttonbirds, it would need to have specially-designed and shielded lighting.

Mr Lane said four years of drought had burned off the plant cover and made the light soil so powdery that burrows collapsed.

Last year's spring rains renewed the vegetation but were so long and heavy some burrows flooded, washing out eggs and causing chick deaths from drowning and pneumonia.

A massive fish kill of pilchards all up and down the Australian East Coast last year also seems to have affected many muttonbirds, while the long-term effects of other problems like competition with fishermen for fish, deaths from feral predators and the stress of visitors to the island are unknown.

This year there are very few muttonbirds chicks maturing on the island.

Local researchers are planning a full population study for later this year which will provide hard scientific evidence to establish the current numbers of breeding birds.

The first Muttonbird Island birds were banded exactly 36 years ago, in March 1960.

Mr Lane, who retired to Coffs Harbour first began banding birds on the island in the early 1960s as part of a group of Sydney ornithologists studying sea birds on islands off the NSW coastline.

If you find a banded muttonbird, write down the number on the band, the date and place the bird was found and your name and address. only if the bird is dead, remove the band.

In either case, post the information (and the band) to the address on the band or to the central Banding Office, PO Box 8, Canberra ACT, and in return, the office, run by the Australian Nature Conservation Agency, will send back a report on where and when the bird was banded.

Jetty Village NEWS

● Let's Party!!!!

Come and celebrate on Friday 22 March at 8pm as we host the opening of The Advocate Jetty

believe has met with foul play.

FRIDAY MAY 15 1998

Plucky Mutton Birds head north

Most people dream of a bird's life, to be able to soar high in the sky without a worry in the world.

The sad truth, at least in relation to the Wedgetailed Shearwaters (commonly known as the Mutton Bird) is that these birds begin life in the toughest of circumstances.

Before they can develop enough strength to fly north for the winter with their parents, the fledgling chicks must first overcome the spectre of rat infestation on Muttonbird Island - a problem which emerged after the building of the north breakwall in 1925.

Then there's weeds such as lantana and bitou bush which cover the burrows. And of course, there's the minimal human impact from the many tourists that flock to the island each year.

Yet another problem is rain and windy conditions.

Pet Porpoise Pool senior mammal curator, Mr Greg Pickering, has taken responsibility for rehabilitating injured young, such as the bird pictured.

On Wednesday he released the last of the Mutton Birds from his care. The injured birds had been found as far west as Glenreagh and Bellingen, but the majority perish closer to home at the Jetty.

National Parks and Wildlife Service spokesman, Mr Danny Corcoran, said the birds are attracted by the lights and dead birds are regularly recoverd from roads and properties.

Pet Porpoise Pool senior mammal curator, Greg Pickering, releases the last Mutton Bird atop Muttonbird Island this week.

The COFFS COAST Advocate

Your Voice for 100 YEARS 1907-2007

y April 26 2007 Established 1907 90¢ (incl. GST)

ANZAC DAY 2007

■ Big crowds turn out in tribute

■ Stories and photos: Pages 3, 4, 9

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MASSACRE ON MUTTONBIRD

By ANN-MARIE BEATTIE

IN a sickening act of animal cruelty, a large number of fledgling muttonbirds have been slaughtered.

Early morning walkers made the gruesome discovery on Muttonbird Island yesterday, where blood stains marked the pathway and the birds' lifeless bodies were tossed to the side.

WIRES bird co-ordinator Lynn Gow was first alerted of the attack when she received

■ To Page 5

The dead muttonbirds were discovered by early-morning walkers lining the pathway on Muttonbird Island. Inset: WIRES volunteer Lynn Gow and a NPWS ranger look for any clues that could help investigations.

Photos: CHRIS FIX 07042601A B

The COFFS COAST Advocate

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NOT TOORMINA, IT'S TAORMINA

■ TRAVEL: PAGES 14–15

AUSSIES INTO WORLD CUP FINAL

■ SPORT: PAGE 30

CONTACT US: Coffs Coast Advocate [illegible] Editorial fax [illegible] Advertising fax [illegible] Circulation [illegible] Classifieds [illegible] www.coffscoastadvocate.com.au

For the second day WIRES volunteer Lily-Marie Lusk removed dead muttonbirds from Muttonbird Island. Close to 40 birds have now been killed, with investigations continuing. Photo: [illegible]

Number of dead birds now close close to 40

Muttonbirds under attack

By [illegible]

PUBLIC outrage continued in Coffs Harbour yesterday with the news that seven muttonbirds had been attacked and killed — bringing the number of dead birds close to 40.

A total of 18 fledgling muttonbirds were killed on Muttonbird Island overnight on Tuesday, with that number now doubled following a second attack in the late hours of Wednesday night or early yesterday morning. With the community devastat-

■ To Page 4

LOCAL NEWS www.coffscoastadvocate.com.au localnews - means the world to us

In 10 years, experts say the Muttonbirds may be forced out

IN A FLAP: Neil Vaughan says Muttonbird Island is in poor shape because of swamp rats decimating the vegetation. PHOTO: TREVOR VEALE

Rats pose serious risk to birdlife

By **CRAIG MCTEAR**

COFFS HARBOUR'S iconic Muttonbird Island and its famous inhabitants are under threat from a nasty invader.

The voracious swamp rat is decimating vegetation vital to the integrity of the muttonbird burrows and researchers fear there will be no wedge-tailed shearwaters left on the island in another 10 years if this feeding frenzy continues at its current rate.

A National Parks and Wildlife Service volunteer, Neil Vaughan, said he had noticed a rapid decline in muttonbirds in recent years.

"The population is crashing – in the last two years it's started to really nosedive," Mr Vaughan said.

"The population is nosediving so badly that it has reached its critical level and that's why I'm so worried."

He said burrows were collapsing because swamp rats were eating foliage such as wandering jew which supported the burrows and the rodents were also building their own entrances to the burrows, thereby undermining them.

Mr Vaughan believes swamp rats have been making it onto the island by hitching a ride on vehicles which park at the base of the nature reserve and he says they must be eradicated in order for the island to survive.

"If we don't get rid of them there won't be any burrows left and the muttonbirds won't be able to breed. You might as well call it rat island," he said.

The NPWS has not been baiting the swamp rat, unlike the black rat and mice, because it was considered to be native to Australia.

"It's not native. It was introduced onto Muttonbird Island," Mr Vaughan said.

"The NPWS is trying to prove the swamp rat is not native to the island but in the meantime the rat is doing untold damage.

"The solution is to get rid of all the rodents."

But they are safe for now...

THE NPWS says it is maintaining a swamp rat population on Muttonbird Island until the significance of the species can be determined.

"Initial genetic tests on the swamp rats has indicated they may be significant and distinct from the mainland population and the NPWS is currently in the process of getting more studies done on this native animal to determine their significance, the impacts, if any, on the shearwater population and to learn more about them," said NPWS Coffs Coast manager Glenn Storrie.

"NPWS is committed to protecting the breeding colony of shearwaters on Muttonbird Island and is undertaking a significant program of research, monitoring and rodent control to achieve this."

Mr Storrie said that was why the NPWS had formed a research group to better understand the issues affecting the shearwaters.

The group consists of bird and rodent experts from the University of New England, the Muttonbird Island Banders and NPWS staff with expertise in ecology and pest management.

"The research group has developed and is implementing a plan for research and monitoring on the island to ensure management is effective and supported by good science," Mr Storrie said.

"It has been monitoring bird breeding success, undertaken rodent surveys, undertaken genetic analysis of the native swamp rats and is monitoring the success of rodent baiting techniques."

Mr Storrie said the NPWS had undertaken rodent control baiting on the island for a numbers of years and this would continue during the current wedge-tailed shearwater breeding season.

"The island, having been attached to the mainland since 1924, provides challenges in managing the nesting shearwater population," he said.

"Pest animals such as black rats and mice have had access to the island since that time.

"Introduced rats and mice have been shown to have devastating impacts on nesting seabirds in many locations around the world and have therefore no doubt also had an impact on Muttonbird Island for some time.

"In addition, research has shown a general trend of reduced populations of seabirds throughout the world due to such issues as increased fishing, reduced habitat, hunting, predation and the potential effects of climate change. As the Coffs Harbour wedge-tailed shearwaters migrate to the oceans around the Philippines and back each year, they are impacted by all of these challenges."

The need for a nature reserve

nationalparks.nsw.gov.au

ACTIVITY SHEET 5

1. Explain why you think Muttonbird Island Nature Reserve is a special place.

2. Explain how you think each of the following help to protect Muttonbird Island Nature Reserve.

a) signs

b) a fence

c) a paved walkway across the island

d) a lookout platform

e) bench seats

f) a raised steel mesh section of track

3. Write three rules for visitors to the island.

THE ISLAND INHABITANTS

Photo: R.Nicolai/OEH

BIRDS ON MUTTONBIRD ISLAND

Bird watching can be very rewarding. Armed with a good pair of binoculars and a user-friendly reference book. The following table provides information about the birds that may be seen, and a page reference number for 'A Field Guide to the Birds of Australia' by Simpson and Day (Penguin Books, 1999).

Photo: Nankeen kestrel - S.Cohen/OEH

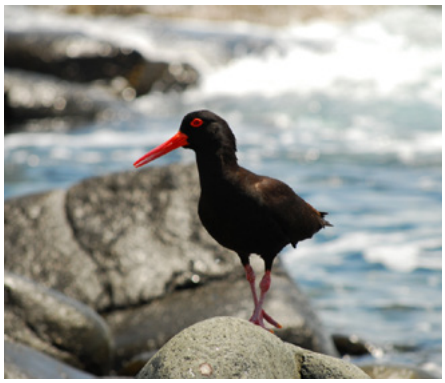
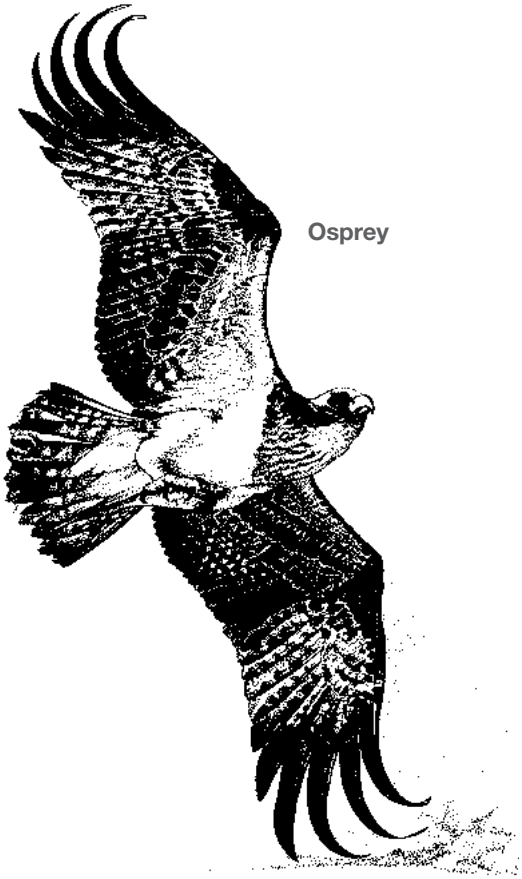


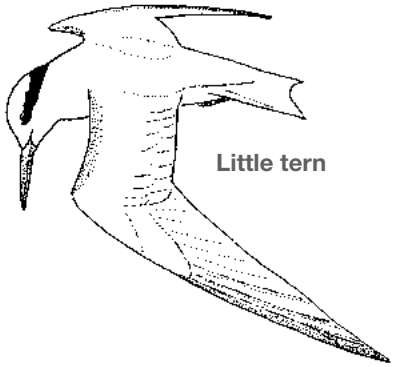
Photo: Sooty oystercatcher - M.Jarman/OEH

Photo: Short-tailed shearwater - B.Whylie/OEH

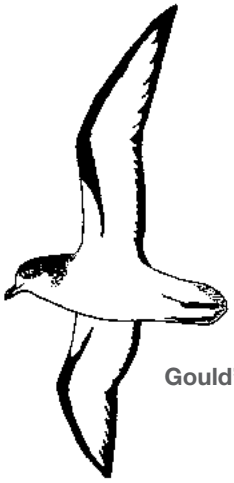
NAME	SCIENTIFIC NAME	DESCRIPTION	PAGE
Barn owl	*Tyto alba*	Rounded heartshaped mask, upper-parts soft grey, under-parts white. Legs protrude beyond tail in flight, can hover before swooping. Eats mice, rats and bandicoots.	152
Black-shouldered kite	*Elanus axillaris*	White body with grey and white wings, prominent black shoulders. Hunts at dusk and dawn, hovers with some wing beats, soars with elevated wings. Often seen.	110
Black-winged petrel	*Pterodama nigripennis*	Pale grey head with black ear patch, underwing white, rest of bird mainly black. Rapid strong flight, wheeling in great arcs.	30
Brahminy kite	*Haliaster indus*	Distinctive chestnut and gleaming white colour. Gliding flight.	288
Crested terns	*Sterna bergii*	Yellow bill, black cap, shaggy crest on nape, upperparts grey.	108
Magpie	*Gymnorhina tibicen*	Glossy black and white. Visits from mainland.	248
Nankeen (Australian) kestrel	*Falco cenchroides*	Grey head, rufous back and wings. Yellow on face, yellow legs. Grey tail with narrow black band. Whitish underparts. Gliding flight, hovers.	120
Osprey	*Pandion haliaetus*	Dark brown upper parts, white head and under parts. Barring on underwing and tail. Soars on long, angled, bowed wings. Threatened species. Nest is a large bulky structure.	110
Richard's pipit	*Anthus novaeseelandiae*	Brown bird with darker brown streaks above. Runs along the ground. Very well camouflaged.	258
Silver gull	*Larus novaehollandiae*	White and grey with red legs and beak. These scavengers will eat exposed shearwater eggs.	100
Short-tailed shearwater	*Puffinus tenuirostris*	Dark grey, smaller than wedge-tailed shearwater. Uncommon, but have been recorded	36
Sooty oystercatcher	*Haematopus fuliginosus*	All black with a red eye, eye-ring and bill. A threatened species. Seen on rock platforms.	90
Sooty shearwater	*Puffinus griseus*	Dark, same size as wedge-tailed shearwater. Have been banded on the island.	36
Wedge-tailed shearwater	*Puffinus pacificus*	Dark grey, 45cm in length with wedge-shaped tail, fleshy white legs. Wingspan 97-104cm. Holds wings well forward, glides over sea. Main species found on Muttonbird Island.	36
Welcome swallow	*Hirundo neoxena*	Reddish throat, blue/black upper parts, deeply forked tail. Often found in large flocks near water.	256
White-breasted sea-eagle	*Haliaeetus leucogaster*	White with grey back, rump and base of tail. Wing-span 190cm, upswept when soaring. Predator of shearwaters.	114
White-faced heron	*Egreta novaeholiandiae*	Grey with white face. Heavy slow flight. Common on farmland and in intertidal areas	153



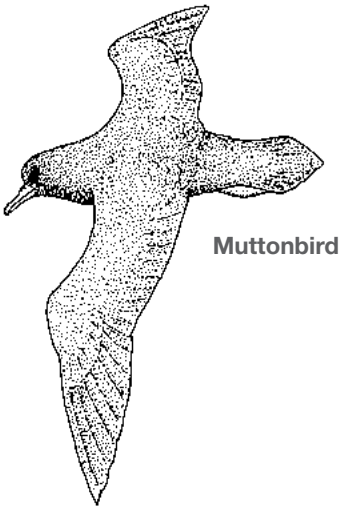
Osprey



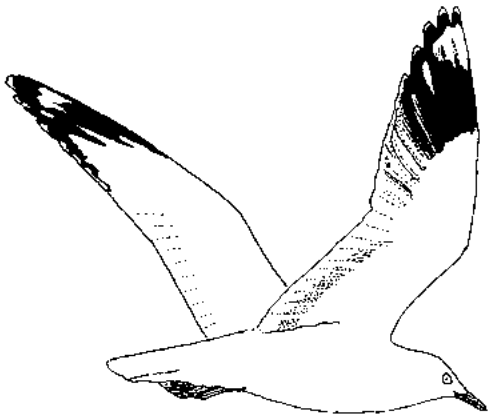
Little tern



Gould's petrel



Muttonbird



Silver gull

Gannet

WHAT IS A SHEARWATER?

Photo: B.Whylie/OEH

Shearwaters, like petrels and albatross, are true seabirds, only returning to land for breeding. The name shearwater is given to a group of birds with the ability to cut or shear the water with their wings as they skim along the ocean surface, diving regularly below the waves in search of food. Shearwaters can also swim underwater seeking fish and krill (tiny shrimps), which they catch with their hooked beak.

All shearwaters have distinctive tube-like nostrils at the base of their beaks, which they use to filter the salt from their ocean-going prey.

Three types of shearwater have been recorded at this location. Although the short-tailed shearwater (*Puffinus tenuirostris* and the sooty shearwater (*Puffinus griseus*) have been recorded on Muttonbird Island, the wedge-tailed shearwater (*Puffinus pacificus*) is the most common that is found on Muttonbird Island.

The wedge-tailed shearwater and the short-tailed shearwater may be confused at first sight. A comparison of wedge-tailed shearwaters and short-tailed shearwaters is given below to assist in identification.

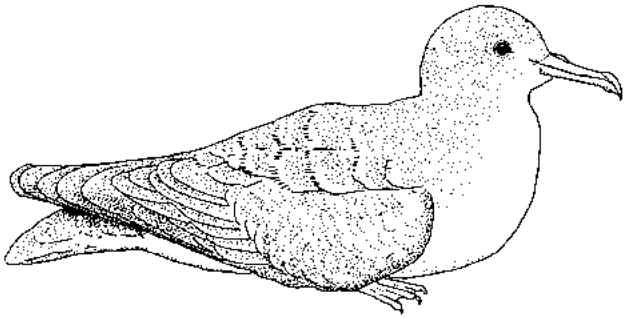
CHARACTERISTIC	WEDGE-TAILED SHEARWATERS	SHORT-TAILED SHEARWATERS
Appearance	Dark grey	Dark grey
	45-47 cm in length	41-43 cm in length
	Wedge-shaped tail	Short rounded tail
	Legs do not extend beyond tail	Feet trail when flying
	When flying	Heavily built, stubby looking
Return to island	Early August	Late September
Begin egg-laying	Late November	Late November
Incubation period	52-54 days	52-55 days
Preferred Australian destination	Northern Australian coastal islands with overlap on boundary	Southern Australian coastal islands with overlap on boundary
Migratory destination	The Philippines	The Bering Strait

A wedge-tailed shearwater

nationalparks.nsw.gov.au

ACTIVITY SHEET 6

1. Label the parts of the wedge-tailed Shearwater: hooked beak, claw-like toe nails, webbed feet, fine soft feathers, nostrils (hint: at the base of the beak).



2. Using a coloured line, connect the name of a body part with a description of how it helps the muttonbird survive.

1. Webbed feet	**a.** for catching fish
2. Hooked beak	**b.** keep bird dry and warm when wet
3. Fat stores in bosy	**c.** used to filter salt
4. Fine, soft feathers	**d.** helps them to swim well
5. Claw-like toenails	**e.** give energy during long flights
6. Tube-like nostrils at base of beak	**f.** for digging burrows

Did you know...

The shearwater uses ocean air currents to glide. The metre wide wingspan of the wedge-tailed shearwater allows it to glide for long distances.

It holds its wings well forward and glides low over the sea, sometimes dipping the tip of its wings into the water to make it turn fast.

WHY MUTTONBIRD ISLAND ROOKERY IS UNIQUE

Photo: Brook Whylie/OEH

A rookery is a place where birds congregate to breed. The wedge-tailed shearwater (*Puffinus pacificus*) congregates on Muttonbird Island Nature Reserve annually to breed. Although these birds are not rare, since they breed on many of the islands off the east and west Australian coast and on islands in the Pacific Ocean, the opportunity to easily watch a seabird rookery in action is unique.

It was once thought that the wedge-tailed shearwaters stayed in the same area throughout their entire life, spending longer periods out at sea, searching the nearby oceans for food during the winter months.

However, since 1969, the birds' movements have been studied by scientists who placed coded bands on their legs. This research allowed them to estimate how many shearwaters there are, find out more about their migratory patterns, and learn more about their breeding cycle.

In 1980, birds were found in Asia, which were originally banded in the Solitary Islands. This proved conclusively that the birds had migrated 6,000 kilometres to the Philippines during the winter months.

Burrow enttrance (Photo: R.C;eary/OEH)

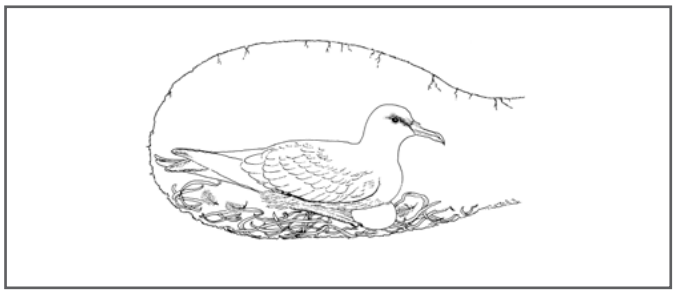
Research by dedicated volunteers suggests that the number of breeding pairs on the island was approximately 9000 in the year to 2001. This research is difficult on the Island, since the eggs and chicks are hidden in burrows, which can easily collapse if trodden on.

Chick in burrow (Photo: R.Nicolai/OEH)

WHAT IS ROOKERY ROUNDABOUT?

The breeding cycle and the annual return of the shearwaters to the Island is fondly referred to as the Rookery Roundabout.

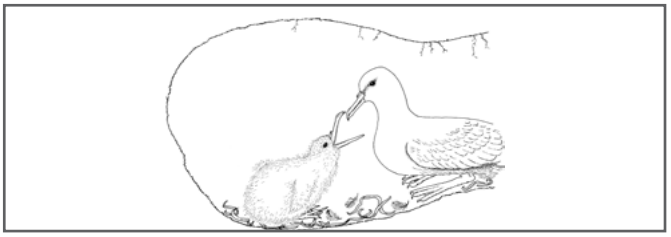
1. Wedge-tailed shearwaters return to Muttonbird Island from south-east Asia in August, when they begin to establish territory, form pairs, renovate old burrows or dig new ones and find a mate. September to November are the best months to visit the island.



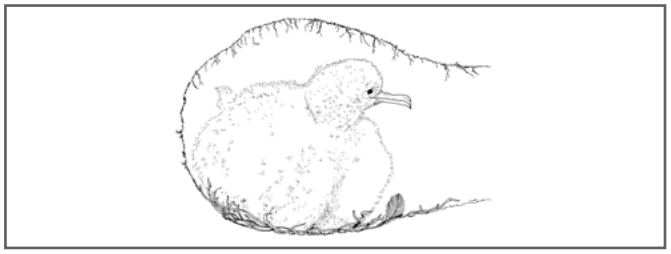
2. At the end of November, egg laying begins, with one white egg the size of a hen's egg laid in each active burrow.

3. The eggs are incubated by the adult birds who take turns to sit on them. The incubation period is around 50 days.

4. The chicks hatch during the middle to the end of January. The chicks weigh around 60 grams.

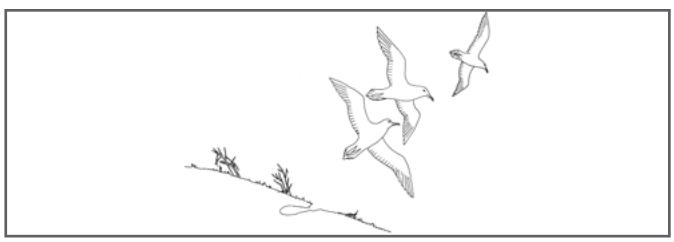


5. During the day, the adult birds leave the chicks in the burrows on their own whilst they forage for food at sea, returning to the island just after dusk. They eat fish, krill, and scraps from ships. The Island comes to life after dark, with chicks and adult birds calling to each other as the adult birds locate their young. The wailing cries of the wedge-tailed shearwaters led to the common name "ghost bird".



6. Throughout March, the chicks are rapidly increasing in size until they are actually larger than the adults. They weigh around 600 grams by the end of March. Their soft downy feathers are gradually replaced by adult feathers. They begin to accumulate fat reserves for the long journey ahead.

7. Most adult birds depart on their long migration flight in late March to early April The chicks are left behind. They begin to emerge from their burrows at night to exercise their wings over a period of two weeks and then start to leave the island, usually departing within a couple of weeks in late April to early May. All the shear waters have left the island by early May.



8. There are no shearwaters on the Island during June and July.

To colour, cut and copy

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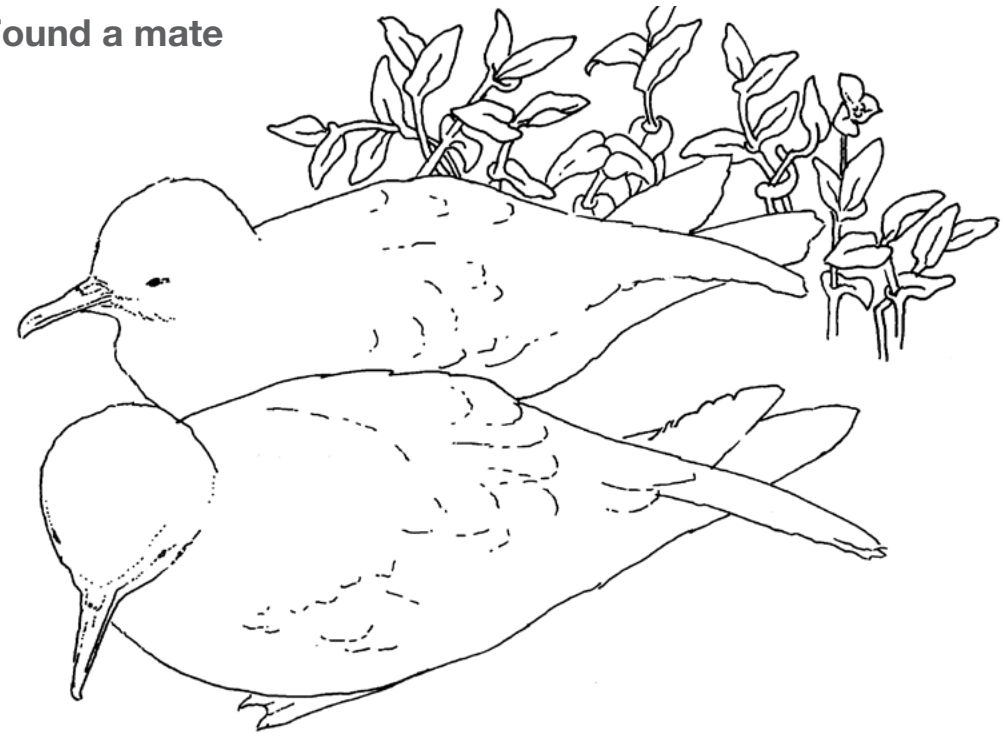
ACTIVITY SHEET 7

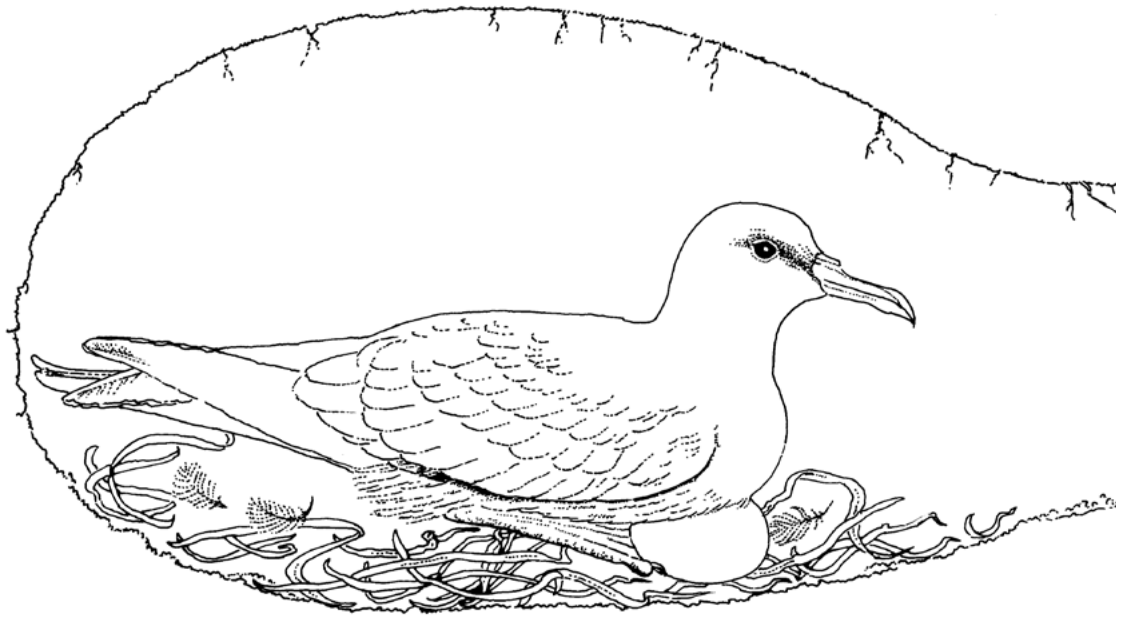
Arrival to the island

Found a mate

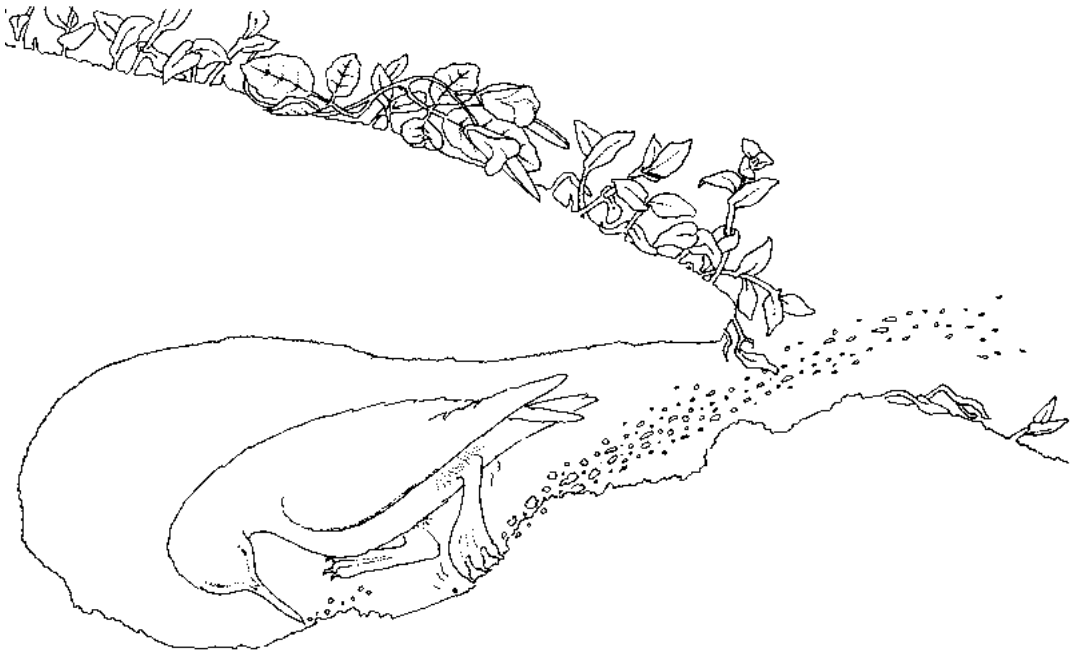


ACTIVITY SHEET 7 (CONTINUED)

Sitting on eggs

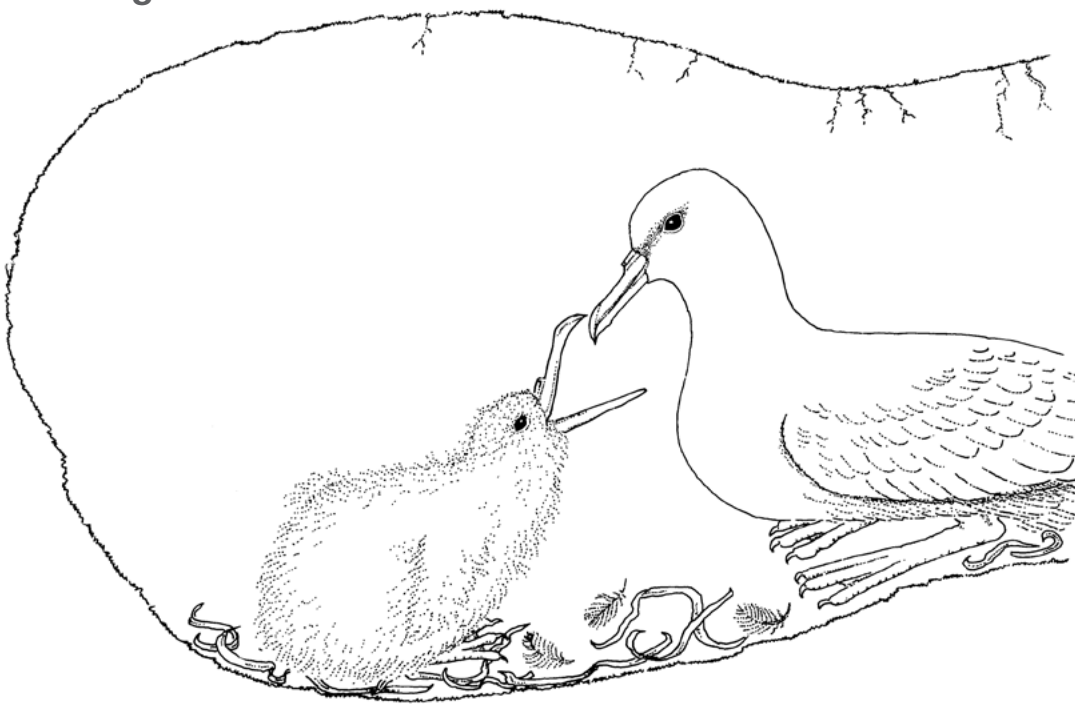


Cleaning the burrow

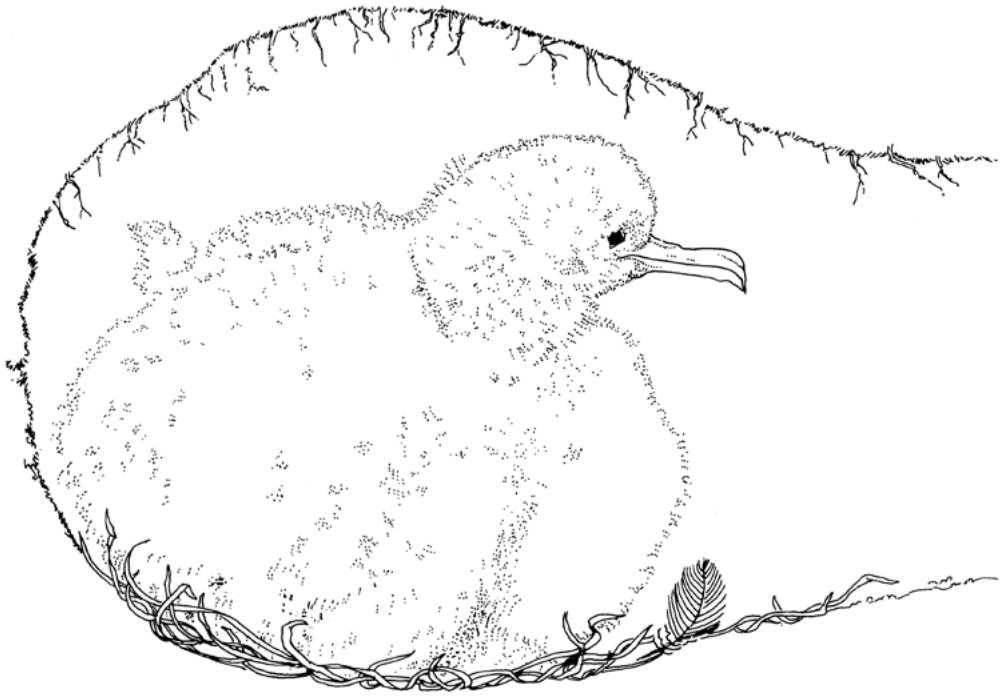


ACTIVITY SHEET (CONTINUED)

Feeding the chick



Fluffy chick



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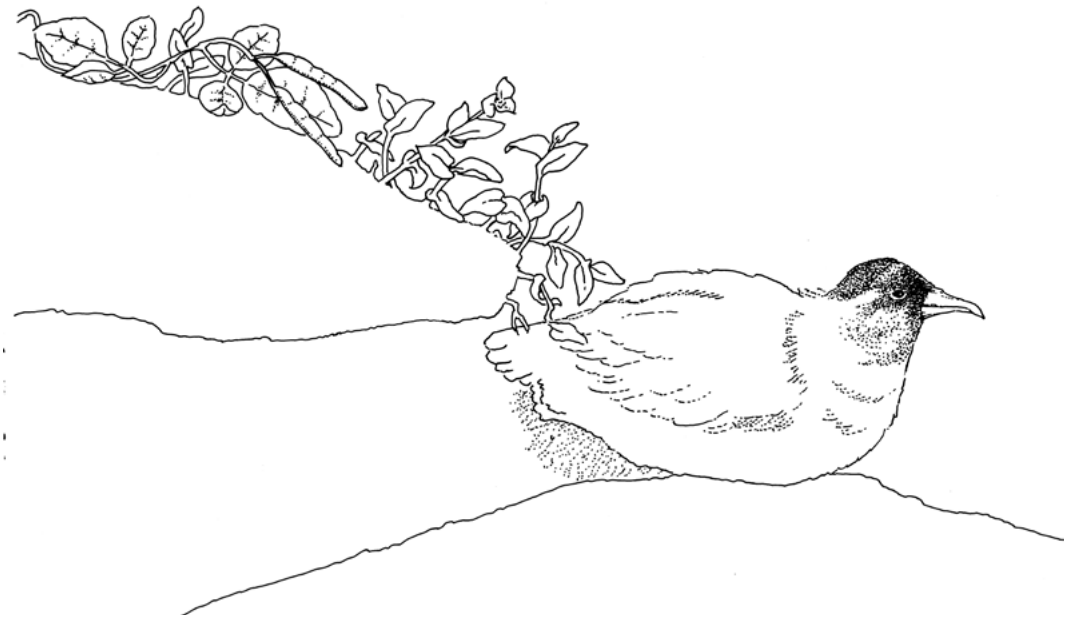
ACTIVITY SHEET 7 (CONTINUED)

Depart the burrow

Grown chick



WHAT IS A BURROW LIKE?

The Wedge-tailed Shearwater burrows have a roof of soil and plants. The fertile, shallow soil on the Island has built up over thousands of years from deposits of salt spray, bird droppings, egg shells and rotting plant material and weathering of the rocks.

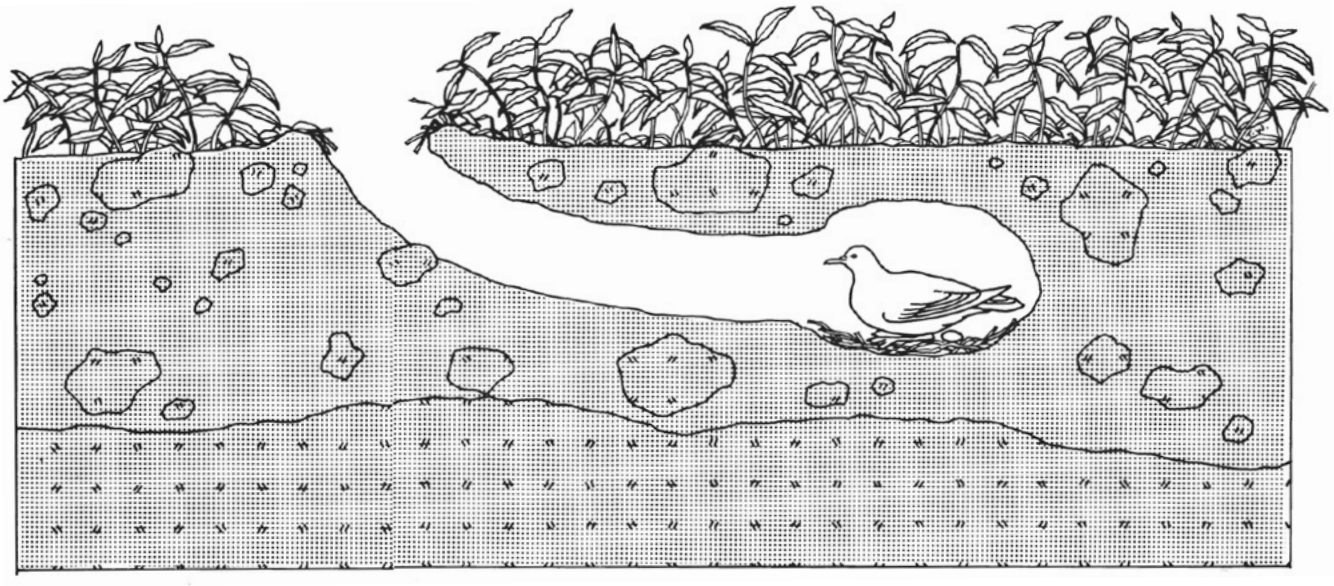


Figure 2: Cross-section of a wedge-tailed shearwater burrow. The Island is covered with burrows, with some areas of the Island having one burrow every square metre. It is thought that female shearwaters return each year to the same burrow for breeding.

The burrows are about a metre or more long with a small space at the end which is often lined with plants and feathers.

The burrows on Muttonbird Island are very fragile. The egg and chicks are very vulnerable to be injured or killed due to:

- human trampling;
- very wet weather conditions which may flood the burrows and cause them to collapse;
- long periods of extremely dry weather causing the soil to crumble;
- predation by rats, mice, feral cats, foxes, silver gulls, blue tongue lizards, crows and white -breasted sea eagles.

A Shearwater shelter

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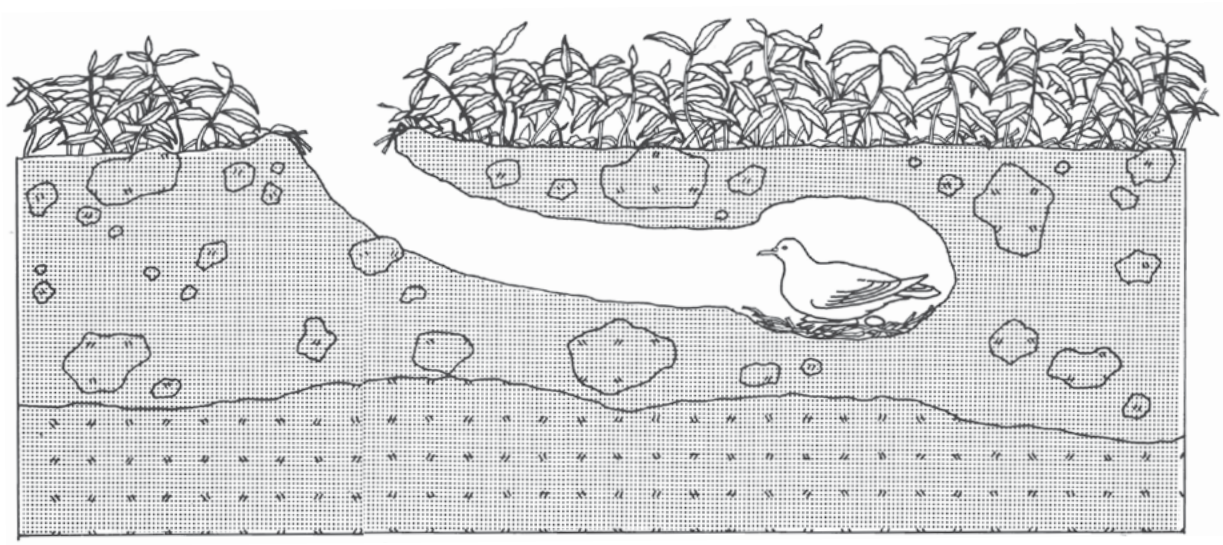
ACTIVITY SHEET 8

1. What does a shearwater shelter its baby from?

2. Below is a side on view of a shearwater burrow.
Label the entrance, tunnel and nursery area.



3. What is the nursery area?

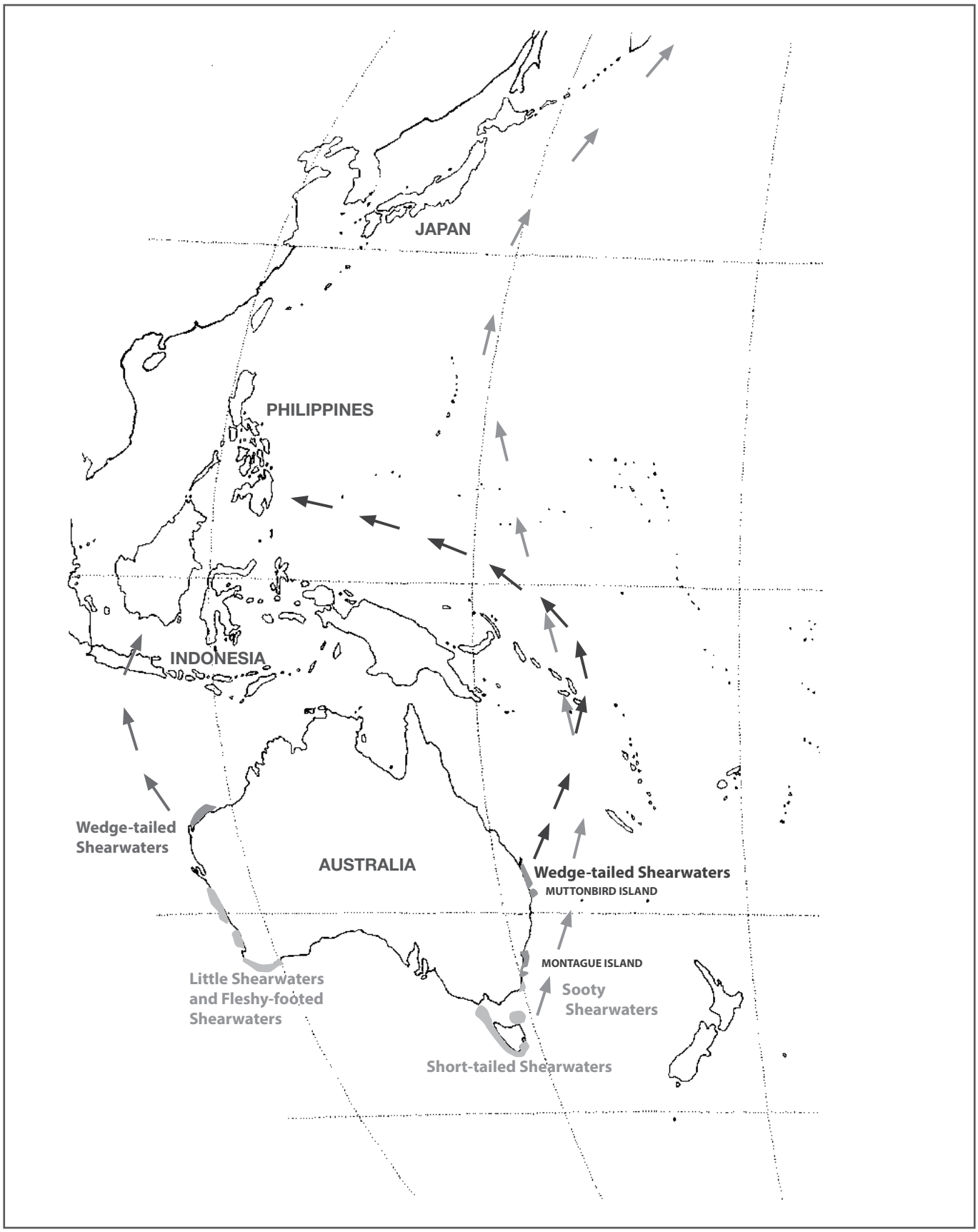
4. What could happen to the chicks if they did not have burrows?

5. Describe what you think it would be like living in a burrow.

6. Why should people stay on the path at Muttonbird Island?

SHEARWATER MIGRATION

Wedge-tailed shearwaters from Muttonbird Island migrate to the Philippines during our winter, so their survival depends not only on our own conservation measures, but also on how they are treated in the Philippines. The most commonly seen Shearwaters of Australian coasts are shown on the map.



ACTIVITY SHEET 9

Watch the film about Muttonbird Island and answer the following questions.
The segment from 'Totally Wild' is provided courtesy of Channel Ten Brisbane.

1. What is special about Muttonbird Island?

2. Why is it called Muttonbird Island?

3. What is a nature reserve?

4. Are muttonbirds usually seen during the day on the island? Why?

5. Why was the special camera used?

6. At what time of year do the eggs hatch?

7. Where do the birds migrate to?

8. Write about something interesting that you learned from the segment?

MAMMALS ON MUTTONBIRD ISLAND

Mammals where once only found on Muttonbird Island in extraordinary or accidental circumstances, such as, if floods had washed them into the sea and they were able to scramble to safe ground. However, the building of the breakwall created a land bridge, connecting the once isolated island to the mainland. Generally the habitat on the island is not inviting for native mammals, with little food or shelter in the harsh and exposed environment.

NATIVE ANIMALS RECORDED ON MUTTONBIRD ISLAND

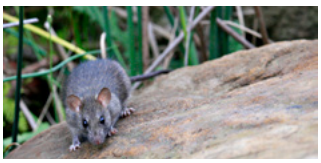
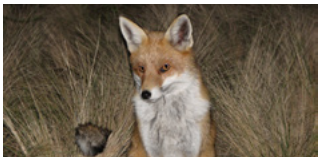
PHOTO	COMMON NAME	SCIENTIFIC NAME	COMMENTS
	Northern brown bandicoot	*Isodon sprom*	These shy creatures would rarely venture onto the Island. Mainly found in grassy areas where they are well hidden. These pose no direct threat to the shearwaters.
	Swamp rat	*Rattus lutreolus*	May eat shearwater eggs and chicks. A native rat which occurs on the mainland in wetland areas.

Photos: TOP: R.Nicolai/OEH, BOTTOM: D.Beckers/OEH

Animals which have been introduced into an area and have escaped and survived in the natural environment are referred to as feral animals. Feral animals are successful in a large range of environments because they are versatile. They are able to vary their sources of food and places of shelter. Many are either scavengers or skillful hunters. Most of the feral animals in the Australian landscape are successful because their are few, if any, predators threatening their survival.

The burrows and crevices in rocks on the Island, as well as nearby boats and buildings make ideal shelters for the feral animals. The shearwaters are ocean going birds, only coming in to isolated islands to breed and feed their young. Their natural predators are white-breasted sea eagles. The construction of the breakwall last century has introduced a serious feral threat to the rookery.

INTRODUCED (FERAL) ANIMALS RECORDED ON MUTTONBIRD ISLAND

PHOTO	COMMON NAME	SCIENTIFIC NAME	COMMENTS
	Black rat	*Rattus rattus*	A destructive predator of eggs and chicks.
	Feral cat	*Felis catus*	Have been seen on the Island since the 1960s. Often from on boats moored at marina. A predator of chicks and adult birds.
	Fox	*Vulpes vulpes*	A predator of eggs, chicks and adult birds. They have been sighted from time to time, with a fox destroyed by a ranger in 1975 after reports of attacking shearwaters.
	House mouse	*Mus musculus*	May eat eggs.

Photos: FIRST: K.Stephnell/OEH, SECOND: P.Meek/OEH, HIRD: R.Nicolai/OEH, FOURTH: J.Dunn/OEH, FIFTH: D.Beckers/OEH

REPTILES ON MUTTONBIRD ISLAND

Very few large reptiles have been recorded on Muttonbird Island.
Recorded sightings include:

- Burton's snake-lizard (*Lialis burtonis*)
- Blue-tongued lizard (*Tiliqua scincoides*)

Carpet Pythons (*Morelia spilota*) are suspected predators, however these have not been recorded.

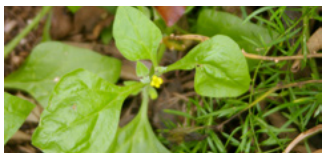
Photo: Blue-tongued Lizard (OEH)

Photo: Burton's Snake-Lizard (OEH)

NATIVE PLANTS ON MUTTONBIRD ISLAND

Most of the plants on Muttonbird Island grow close to the ground due to the harsh conditions, such as, shallow soil, salt spray, harsh winds and occasional long dry periods, especially in early spring.

NATIVE PLANTS RECORDED ON MUTTONBIRD ISLAND

IMAGE	COMMON NAME	BOTANIC NAME	COMMENTS
	Blue wandering jew	*Commelina cyanea*	Groundcover with blue flowers.Common, similar to exotic garden plant, provides ideal conditions for shearwater burrows.
	Cane grass	*Flagellaria indica*	Scrambling tall grass-like plant. Vigorous growth. Mainly on south side of island.
	Dusky coral pea	*Kennedia rubicunda*	Leguminous groundcover with reddish flowers. Common, if too thick may prevent shearwaters burrowing. Pioneer plant after fire.
	New Zealand spinach	*Tetragonia tetragonioides*	Robust perennial with thick triangular leaves. Occurs widely throughout islands of the Pacific, bushfood.
	Pigface	*Carpobrotus glaucescens*	Fleshy succulent. Occurs in exposed areas subject to salt spray.
	Prickly couch	*Zoysia macrantha*	Grass. Areas dominated by prickly couch contain few burrows.
	Rough flax lily	*Dianella caerula*	Small perennial lily up to 0.3m, small blue berries, dark green leaves. Provides ideal cover for shearwater burrows.
	Tuckeroo	*Cupaniopsis anacardioides*	Stunted, wind sheared tree. Only in sheltered gullies on north. side of island.
	Variable groundsel	*Senecio lautus*	Yellow daisy like flowers. Annual which colonises areas of bare soil-often mistaken forexotic weed ‘fireweed’.

Photos: FIRST: R.Nicolai/OEH, SECOND: B.Collier/OEH, THIRD: S.Alton/OEH FOURTH: B.Collier/OEH, FIFITH: R.Nicolai/OEH, SIXTH: T.Rodd, SEVENTH: OEH, EIGHTH: B.Collier/OEH, NINTH: B.Collier/OEH

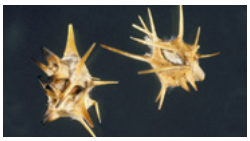
INTRODUCED PLANTS ON MUTTONBIRD ISLAND

Weeds, exotics, plants 'out of place' are all names given to plants which have been introduced into an area. In most cases it is the seeds that have been transported to the Island. For example:

- the berry-like fruits of bitou bush and lantana are eaten by birds and foxes, and the seeds inside them pass through the animal to be deposited with the faeces;
- the sticky seeds of Paspalam, or the spiky seeds of spiny burr grass catch onto clothing, skin or fur and drop off in another area, in this case from the mainland onto the Island; and
- the dry capsule of the coastal morning glory releases small hairy seeds, which could be spread in a strong wind or attach to fur or skin to be carried.

Introduced plants are a problem because they compete with the native plants, and in some cases over take them, if left to do so. This causes problems for the native animals, who rely on the native plants for food and shelter.

TYPE OF RESERVE

IMAGE	COMMON NAME	BOTANIC NAME	COMMENTS
	Bitou bush*	*Chyrsanthemoides monilifera*	Erect perennial shrub with yellow flowers. Competes vigorously with native plants.
	Coastal morning glory	*Ipomea carica*	Perennial twining vine with purple flowers. Tends to entangle and smother other plants, a problem weed.
	Lantana	*Lantana camara*	Prickly scrambling shrub. A very toxic and invasive plant which prevents shearwaters from burrowing. Found in small patches on south side of the island.
	Paspalum	*Paspalum dilatatum*	A perennial grass up to 1m high.
	Spiny burr grass	*Cenchrus caliculatus*	Annual grass up to 1m with pale spiny burrs. Declared noxious weed
	Turkey rhubarb	*Acetosa sagittata*	
	Farmers friend	*Bidens pilosa*	

Photos: FIRST: N.Cubbin/OEH, SECOND: THIRD: B.Collier/OEH, FOURTH: G.Johnson/NSW Govt, FIFITH: Auld and Meld/COURTESY OF INVESTMENT AND TRADE, SIXTH: Auld and Meld/COURTESY OF INVESTMENT AND TRADE.

* There is further information about Bitou Bush on the NPWS website in 'The NSW Bitou Bush Strategy'

Note that a number of other introduced species occur on Muttonbird Island. The table above represents the plants which are currently causing the greatest threat to the Island vegetation, and in turn the rookery.

Food chains of Muttonbird Island

nationalparks.nsw.gov.au

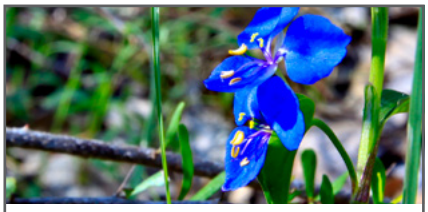
ACTIVITY SHEET 10

Copy this and the next page and cut out each of the cards. Read the information on each, and arrange them to make your own rainforest food web.

Colour code : Energy -> Producer -> 1st Consumer -> 2nd & 3rd Consumer -> Decomposer

*-> indicates a transfer of energy between trophic levels of photosynthesis and eating

Butterfly
sips nectar



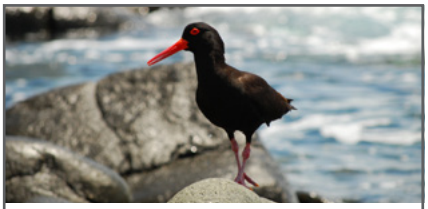
Commelina
leaves are edible

Wedge-tailed shearwater
eats fish

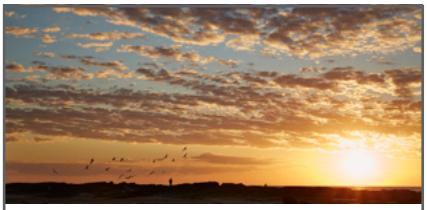
Caterpillar
eats leaves

Barn owls
nocturnal predator of rats, birds and bandicoots

Ants
eat remains of dead animals



Sooty oystercatcher
eats oysters and pipis



Sun, soil and water

Carnivorous fish
eats prawns and fish

Australian pipit
eats seeds and insects

Silver gull
eats eggs and dead animals

Coral pea
has edible flowers and leaves

Food chains of Muttonbird Island

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ACTIVITY SHEET 10 (CONTINUED)

Black rat
eats insects and eggs

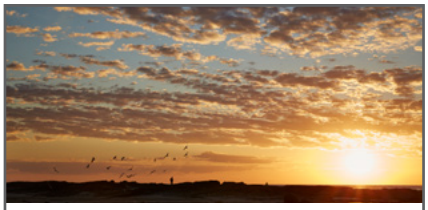
Magpie
eats grasshoppers and worms

Worms
eat dead plant material in soil

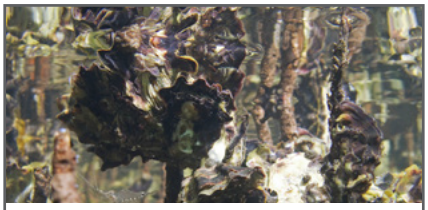
Northern brown bandicoot
eats plant roots and worms

White-breasted sea eagle
preys on fish, birds and mammals

Herbivorous fish
eats marine algae



Sun, soil and water



Oysters
eat microscopic plants

Pigface
has edible flowes, leaves and fruit

Domestic cat
eats birds, small mammals and lizards

Lantana
produces nectar in its flowers

Blue-tongue lizard
eats insects

Page 40 photos: FIRST ROW - LEFT: B.Thompson/OEH, MIDDLE: R.Nicolai/OEH, RIGHT: Brook Wylie/OEH. SECOND ROW - LEFT: A.Andrews/OEH, MIDDLE: OEH, RIGHT: M.Jarman/OEH. THIRD ROW - LEFT: M.Jarman/OEH, MIDDLE: N.Cubbin/OEH, RIGHT: P.Tully\COURTESY OF INVESTMENT AND TRADE. FOURTH ROW - LEFT: R.Nicolai/OEH, MIDDLE: S.Cohen/OEH, RIGHT: S.Alton/OEH.

Page 41 photos: FIRST ROW - LEFT: R.Nicoail/OEH, MIDDLE: J.Turbill/OEH R.Nicoail/OEH, RIGHT: S.Cohen/OEH. SECOND ROW - LEFT: K.Stephnell/OEH, MIDDLE:, RIGHT: R.Nicolai/OEH THIRD ROW - LEFT: N.Cubbin/OEH, MIDDLE: G.Dunnett/OEH, RIGHT: R.Nicolai/OEH. FOURTH ROW - LEFT: P.Meek/OEH, MIDDLE: B.Collier/OEH, RIGHT: R.Nicolai/OEH

THE ISLAND, THE FUTURE

Photo: R.Cleary/Seen Australia

MANAGING THE ISLAND: THREATS TO THE NATIVE PLANTS AND ANIMALS

FERAL CATS AND PET CATS FROM YACHTS	
Impact	Hunt and eat large chicks sitting near burrow entrances.
Management	Some trapping and removal of cats has been undertaken.
Future	Ongoing problems likely due to availability of food scraps around the Jetty and break wall. People must be educated to understand the importance of keeping cats locked up at night.

BLACK RATS, HOUSE MICE AND SWAMP RATS	
Impact	May damage plants/soil, eat eggs and small chicks.
Management	Baiting of rats and mice along breakwall and on the island has assisted in control of numbers. A new vertical tube trap targets introduced rats as they are the only species capable of climbing to reach the elevated bait station.
Future	The native swamp rats may or may not be natural on the island, so DNA tests will help to tell us how to manage this species. Baiting is difficult when trying to target only introduced rats.

LIGHTING IN COFFS HARBOUR AND HALOGEN LIGHTS ON LARGE FISHING BOATS	
Impact	Lighting reflected on the water confuses young birds leaving on their first migration. They often fly inland instead of out to sea.
Management	Discussions have been held with the Coffs Harbour City Council to limit lighting at critical times in April/ May.
Future	Community education needed to increase awareness and gain support of local businesses and the fishing community to act responsibly during this critical time of year.

WEEDS ON ISLAND	
Impact	Introduced grasses and weeds may out-compete native plants which have suitable root systems for burrowing.
Management	Regular weed control programs targeting weeds like spiny burr grass, bitou bush and coastal morning Glory.
Future	Weed infestations tend to be worse near paths. Likely to be an ongoing problem as visitation rates will remain high.

THOUSANDS OF VISITORS EACH YEAR	
Impact	Trampling of burrows, leading to death of shearwater chicks. Rubbish left in burrows.
Management	A paved walkway has been constructed along the island.
Future	Public awareness and continuing visitor education about staying on the path, also limiting the size of groups visiting the island.

FOXES ON THE ISLAND	
Impact	Foxes have attacked and killed many chicks when they get onto the island. The breakwall allows foxes to access Muttonbird Island.
Management	Fox baits are set on the island. When a fox is located on the island, a team is set up to remove the animal. Video monitoring helps to locate foxes before they enter the island.
Future	The video monitoring, baiting, together with community reports will help keep foxes off the island.

Let people know how to help

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ACTIVITY SHEET 11

Muttonbird Island is a special place. Design a poster or write a letter to a local newspaper to let people know about one of the problems that the shearwater rookery faces and how people in the community can help.

First! Plan your campaign

1. Write what your poster or letter will be about.

2. Write the main point that you wish to make.

3. Write what you would like your audience to do.

4. Think of a catchy heading to grab attention.

BIRD BANDING

People who place bands on birds legs are known as ‘bird banders’. All bird banders operate under strict guidelines and are licensed by government authorities.

Since 1960, bands have been carefully placed around the bird’s leg to help identify individual shearwaters on Muttonbird Island. The bands each have an individual identification number.

Unfortunately the original metal bands attached in the 1960’s wore off after about ten years, so unless rebanded the identity of these birds was no longer known. Since 1976, stainless steel bands have been used. These are hoped to be more durable. By the end of April 2002, there were over 25,000 bands attached.

The banding has revealed information about the life of shearwaters. Some of the information gathered includes:

- life expectancy of the shearwaters. Recovery of individual birds by bird banders has shown that they can live up to 23 years.
- proof that the wedge-tailed shearwater migrates to the Philippines, since banded birds have been recovered there;
- the average weight of birds has been calculated each season. This gives an indication of how much food they have eaten in a season, which in turn reflects the availability of food in the ocean;
- individual bird weight assists in predicting how many shearwaters will produce chicks during breeding time. Small underweight birds are less likely to be successful;
- understanding some of the threats faced by shearwaters whilst on the island during breeding season.

KEEPING TRACK

If you find a banded bird it is referred to as a 'band recovery'. Dead or injured birds may be found, or live birds may be temporarily stunned when they hit a window. By reporting a band recovery you will help to increase the knowledge by helping to keep track.

If you encounter a bird wearing a band please record the following details:

- Name of species or common name if possible
- Full number and address written on band
- Date and place where the animal was found
- Your contact details (so you can find out where and when the bird was banded)
- Your assessment of possible cause of death or reason for encountering the animal.

If the bird is alive and healthy please record the above details and release the animal with the band still attached. If the bird is dead, the band should be removed, flattened and returned with the recovery details. Large numbers of dead shearwaters are often recovered on NSW north coast beaches, as they become weak during their long migration.

Contact details for the Australian Bird and Bat Banding Scheme are:

Senior Project Officer,
Australian Bird and Bat Banding Scheme,
Environment Australia,
Fax: +61-2-62742455
Email:david.drynan@ea.gov.au
www.ea.gov.au/biodiversity/science/abbbs

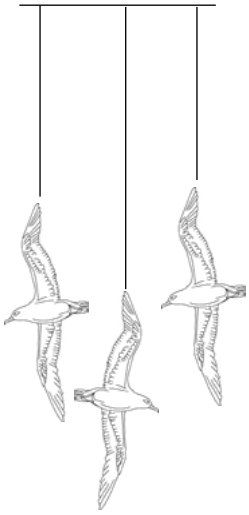
A brochure giving more information about the scheme is included in this kit.

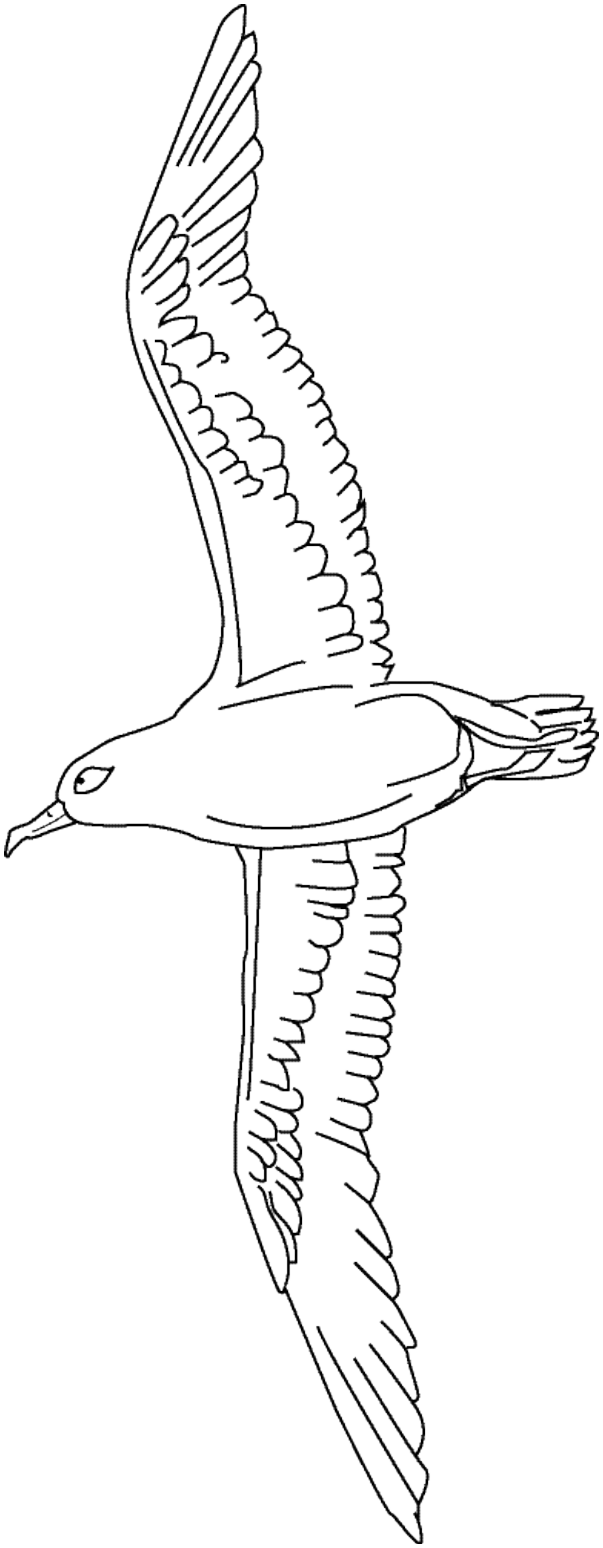
Make a mobile

nationalparks.nsw.gov.au

ACTIVITY SHEET 12

Celebrate the arrival or departure of the wedge-tailed shearwaters with a room festooned with birds.





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Cavanaugh, J. (unpublished assignment), 2001: Does visitor infrastructure on Muttonbird Island, Coffs Harbour, affect the breeding success of wedge-tailed shearwaters?

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Lane, S.G. (ed), 2001: Bird in the Hand, Bird Banders Association of Australia, Sydney.

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Swanson, N.M. and Merritt, F.D., 1973: The Breeding Cycle of the Wedge-tailed shearwater on Mutton Bird Island, NSW, The Australian Bird Bander 12:1 pp.3-9

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Science Department, Toormina High.

Watts, C.H.S & Aslin, A.J., 1981, Rodents of Australia, Angus and Robertson Publishers, Australia.

WEBSITES

Muttonbird Island Nature Reserve
www.environment.nsw.gov.au/NationalParks/parkHome.aspx?id=N0457

Birds Australia
www.birdsaustralia.com.au/

Weeds Australia
www.weeds.org.au

North Coast Weeds Advisory Committee
www.northcoastweeds.org.au

Bird and bat banding
www.ea.gov.au/biodiversity/science/abbbs/

Australian Bird Study Association
www.absa.asn.au

'Special birds get a helping hand...'
www.environment.nsw.gov.au/explore/issue09/

FACT SHEETS

Wedge-tailed Shearwater
members.iinet.net.au/~foconnor/birds/species/wedge_tailed_shearwater.htm