Royal Albatross Centre Education

Seabird Behaviour

A Biology Programme for
Secondary Students
at the **Royal Albatross Centre**

Programme Booklet for Teachers
2020

Programme Overview

Objective: To view seabirds breeding at Taiaroa Head, investigate seabird behaviour in response to their external environment, discuss breeding behaviour (courtship and pair bonding) and migration.

Programme Description: Investigate behaviour of shags and albatross in response to their external environment. Courtship and parental care are some of the behaviours which the programme focuses on. Discussion follows on the use of behavioural studies in management.

Time:	2 hours
Age Focus:	Year 13
Curriculum Area:	**Biology 3.3, AS 91603**
Cost:	$4/person

Spend the day on Otago Peninsula

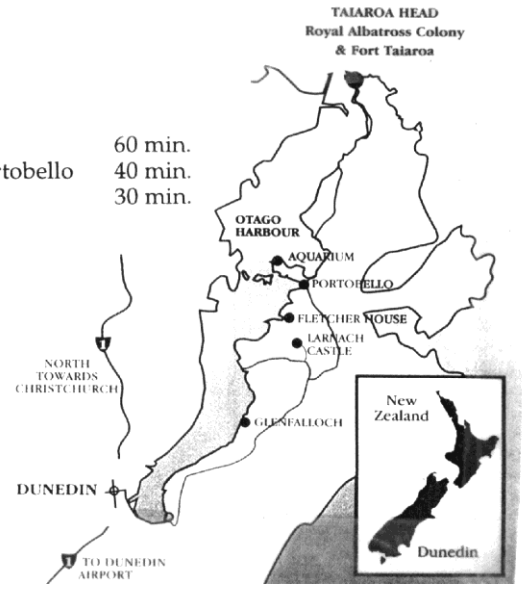
New Zealand Marine Studies Centre:

There are a number of connecting programmes available at the NZ Marine Studies Centre and Aquarium. For programme details and bookings check out www.marine.ac.nz

Location

Travel Times (one way):

Dunedin to the Royal Albatross Centre, Taiaroa Head	60 min.
Dunedin to NZ Marine Studies Centre (Aquarium), Portobello	40 min.
Royal Albatross Centre to NZ Marine Studies Centre	30 min.



Standard Programme Plan:

Time	Activity
	Arrive, meet guide at reception - *please arrive 10 minutes early*
0 min	**Education Rm** (30 min) - *Features of an Albatross* - *Overview of breeding cycles& behaviours* - *Programme objectives*
30 min	**Observatory** (30 min) - *Albatross viewing* - *Otago shag viewing* - *Recording of observations* - *Comparative behaviours*
1 hour	**Cliff Area & Displays** (30 min) - *Viewing of Spotted Shags* - *Recording observations* - *Comparative behaviours*
1.5 hr	**Education Rm** (30 min) - *Albatross Behaviour Video* - *Discussion and wrap-up* - *Hands-on-Head game*
2 hours	**Depart**

Curriculum Links and Planning Guide

Biology 3.3, AS 91603

Demonstrate the understanding of the responses of plants and animals to their external environment.

Specific information for individual external achievement standards.

Students are introduced to the following terms and are able to observe many of the following behaviours during the programme:
Cooperative breeding
Courtship
Home range
Biological clock

Students are introduced to graphical and tabulated data.

Tour Guidelines

1. Supervisors

- Role of supervisors is to:
    - ensure that the students act in a responsible manner.
    - assist the students with the activities.
    - keep the noise level down and the group together.

2. Dress warmly

- It is always windy and cold at Taiaroa Head.

3. Arrive 10 Minutes Early

- If you are late, the time of your visit may be cut short as the observatory time is fixed and other tours are scheduled immediately after yours.
- Please allow time for a toilet break before the programme begins.

4. Group Size

- Please note only 25 people are allowed in the observatory at once.
- Please organise your students and supervisors into groups of 25 or less before arrival.

5. Programme Length

- The programme is 2 hours long (includes 15-30 minutes in the Richdale Observatory).
- Please plan to have morning or afternoon tea before or after the programme (not during).

6. Lunch Areas

- Areas suitable for lunch include:
- Pilots Beach platform
- Grassy area to the east of the Royal Albatross Centre.
- Education Room maybe available if the weather is wet (please check availability with Royal Albatross Centre staff in advance).

Shop and Cafeteria

- Please keep students out of these areas unless they are planning to make a purchase.

No Smoking

- To reduce the fire risk to the colony, smoking is not permitted.

Pre-trip Preparation

In order to ensure that students get the most out of the programme we suggest that some pre- and post-trip work is done in the classroom prior to the visit to the Royal Albatross Centre.

1. Risk Assessment

Review guidelines on the web site and review with trip supervisors.
(http://www.albatross.org.nz/education/educational-resources/)

2. Pre-trip Activities

Use the activities on the web site and the resources listed to introduce the students to albatross and the Taiaroa headland.

3. Background Information

Review the information provided in this booklet. Further information about albatross and the Taiaroa Headland site can be found on the web site and in the reference list

4. Work Sheets

Programme worksheets are attached and available on web site. Please make copies for your students as they will be used during the programme. Answer sheets are also attached to help with follow-up in the classroom.

5. Tour Guidelines

Please review the Tour Guidelines with your students and supervisors prior to the trip to the Royal Albatross Centre.

6. Teacher led activities at Taiaroa Head

Extend your visit to Taiaroa Head by exploring the headland. Identification guides will help you find other species of birds and mammals that use the headland.

7. New Zealand Marine Studies Centre

Combine at the Royal Albatross Centre programme with a visit to the NZ Marine Studies Centre and Aquarium. Spend the morning at the Aquarium and the afternoon with the Albatross or vice versa. The programmes are complementary and together create a unique learning experience for your class.

Resources

Royal Albatross Centre Activity Sheets

(download from http://www.albatross.org.nz/education/educational-resources/)

SECONDARY

Seabird Behaviour Worksheets

These worksheets follow the programme objectives and look at behaviours of Royal Albatross, Otago Shags and Spotted Shags.

ALL LEVELS

Seabird Solutions Facts Sheets and Lesson Plans

Information about seabirds and conservation issues.

Human Impact Trail

A self guided walk to look at human impact on the sight.

Wildlife Viewing Guide

Wildlife viewing activity guide for teachers.

Wildlife Information Guide

Species to look for at Taiaroa Head and information.

Environmental Action Planner - "Tracking our Trash"

This action planner for Teachers gives an example of how students can make the vision to reduce the amount of rubbish going into the sea a reality.

Marine Rubbish Activity - "Tracking our Trash"

This activity takes students a few steps beyond just picking up trash from the local beach. By identifying the type of rubbish they can look at the source, harm rating on wildlife and find out how long it will take to break down in the ocean.

Problem with Plastic

Information on how our plastic rubbish is affecting wildlife in dramatic ways.

Relevant Web Sites

www.albatross.org.nz/education/educational-resources/ The education part of the Royal Albatross Centre website. Lots of activities and information to download.

www.albatross.org.nz

The Royal Albatross Centre site with background information on the colony and history of Fort Taiaroa.

www.doc.govt.nz/get-involved/conservationeducation/resources/seabirds/

Southern Seabird Solutions fact sheets and lesson plans
Excellent resources

www.savethealbatross.net

Save the Albatross campaign by RSPB and Birdlife International.

www.forestandbird.org.nz/saving-our-environment/marine-and-coastal/save-our-seabirds

Facts about the threatened albatross species and information on the campaign to prevent albatross deaths in the fishing industry.

www.wwf.org.nz/what_we_do/species/seabirds/

World Wide Fund for Nature site with information on conservation issues surrounding albatross.

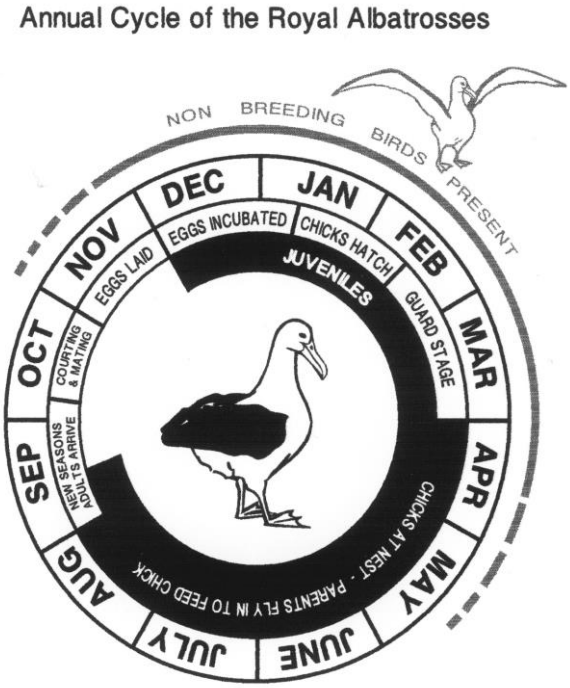
www.albatrossencounter.co.nz/albatross/great_albatross/

A tourism operation in Kaikoura. Has a conservation section and information on what birds (including albatross) can be seen.

http://science.howstuffworks.com/great-pacific-garbage-patch.htm

How stuff works articles on the problem the Pacific Ocean is facing with plastics and how we can 'potentially' clean it up

Seabird Behaviour – Activity Answers



Northern Royal Albatross - Toroa
Diomedea epomophora sanfordi

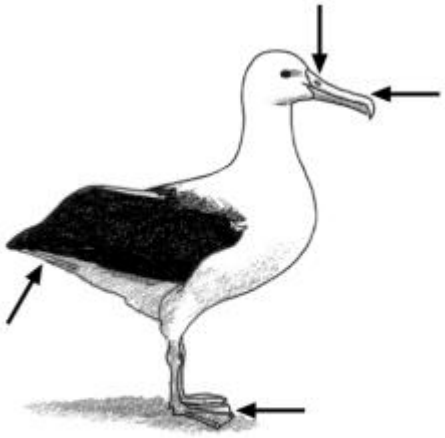
- white body, black on backs of wings
- feeds on squid, octopus and shoaling fish.
- male and female equal share in rearing 1 chick every 2nd year
- mature at 8 years - live about 25 years
- Mate in October, 1 egg laid in November
- incubation 79 days
- Chick guarded for the first 6 weeks,
- young depart late September

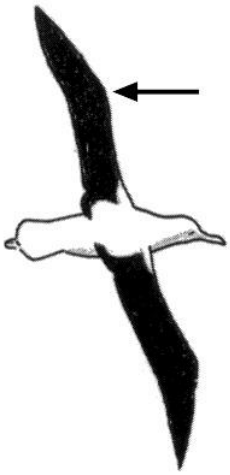
Annual Cycle of the Spotted Shag

Annual Cycle of the Otago Shag

FEATURES OF AN ALBATROSS

1. Describe how an Albatross is adapted to spend 80% of its life at sea.





2. Why do albatross come to land? *To nest / breed*

REVIEW ANNUAL CYCLE OF ALBATROSS

3. Based on the weather (abiotic conditions) and the time of year (annual cycle) – what behaviours would you expect to observe today for the Albatross?
Refer to life cycle wheel for current activity

REVIEW TRACKING DATA

4. Royal Albatross can travel from their nesting site at *Taiaroa Head* to their feeding site at *Chile*

Fledged chicks do not return to the nesting site for *5* years.
Adolescents return to the nesting site *Every* year.
Breeding adults return to the nesting site every *Second* year.

Is this a migration? *Yes, it is a regular seasonal return journey.*

5. Adolescent Male (88071) was tagged in early January and he spent the first month venturing up to 150-300 km from Taiaroa Head, returning every 1-2 days. What term would you used to describe this behaviour? *homing*

What additional information is the tracking project providing and why is this important?
Along with the routes used by the Northern Royal Albatross, a pattern of use will also hopefully be established. This will enable organisations to work together when it comes to the protection of albatrosses. E.g. reducing seabird by catch from fishing activities.

Each of the birds had lightweight satellite transmitters attached to their back feathers and GPS locations were given every 6 hours and the data was plotted onto Google Earth Maps for visitors to our web-site to view. These birds were tracked for approximately one year.

All four albatrosses are currently no longer transmitting. We may never know the reason for this but speculations include detachment of the transmitter (due to natural wear and tear of moulting of the feathers), malfunction, or mortality of the albatross. However, if these albatrosses return to the colony as expected in the years to come, it maybe possible to ascertain the reason.

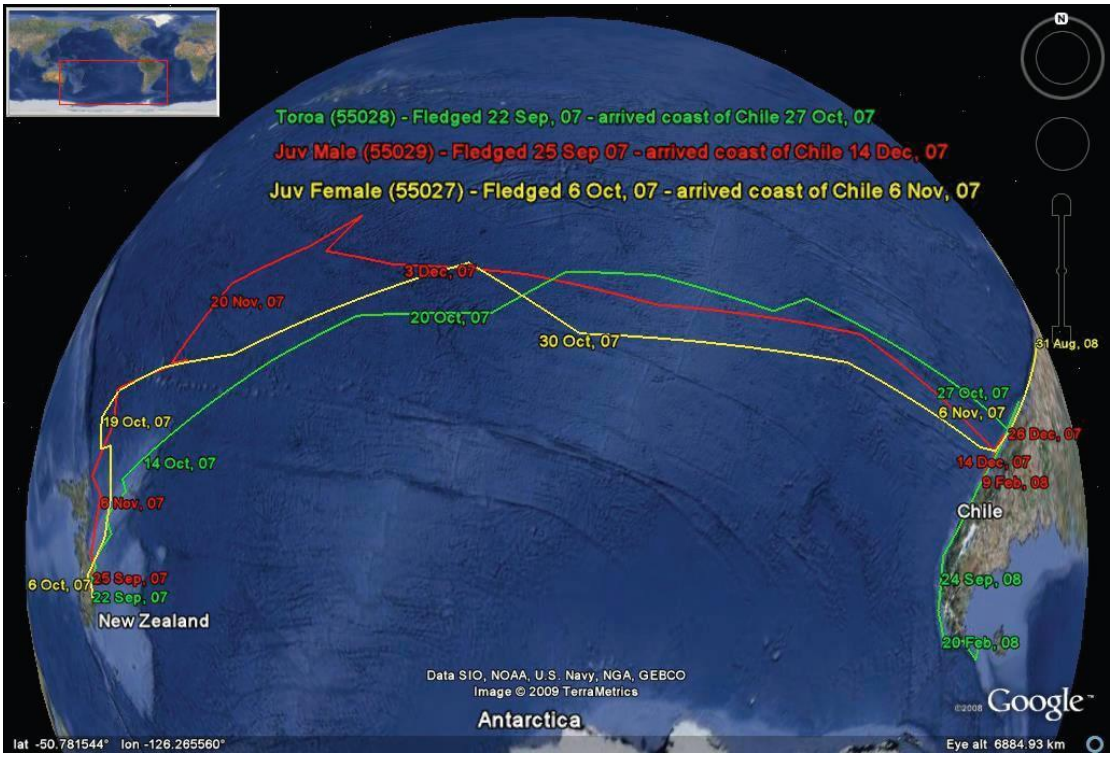
Adolescent Male (88071) – last data received Apr 2009
Toroa (55028) – last data received Sep 2008
Juvenile Female (55027) – last data received Aug 2008
Juvenile Male (55029) – last data received Feb 2008

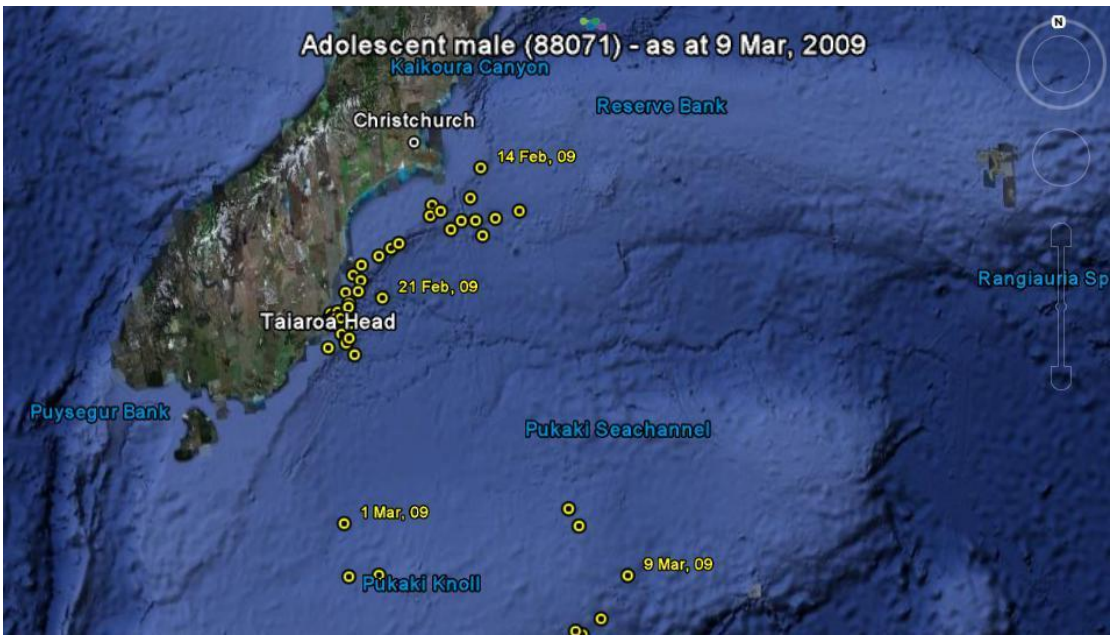
Journey
They appeared to head north from Taiaroa Head up the coast of NZ. From here they travelled across the southern ocean in and almost straight line, taking between 11 and 80 days to reach the coast of Chile from NZ waters.

The speed of the albatrosses ranged between 105 and 110 km/hr and the altitude was approximately 37m above sea level. The average daily minimum distance travelled ranged from 500km to just over 1000km and the total maximum distance travelled during the tracking period was 46,000km.

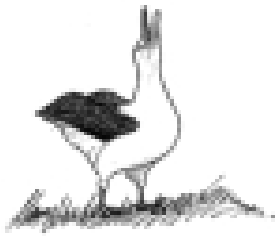
Oceanic and environmental data will be analysed with location data to find possible behavioural patterns as well as travel routes and ocean hotspots used by the Northern Royal Albatross and also the time of the year used.

Understanding where the Albatrosses go at every stage of its life is important in identifying possible reasons for population decline and possible management plans can be developed to aid the growth of the colony.


Toroa (55028) - Fledged 22 Sep, 07 - arrived coast of Chile 27 Oct, 07
Juv Male (55029) - Fledged 25 Sep 07 - arrived coast of Chile 14 Dec, 07
Juv Female (55027) - Fledged 6 Oct, 07 - arrived coast of Chile 6 Nov, 07
3 Dec, 07
20 Nov, 07
20 Oct, 07
30 Oct, 07
31 Aug, 08
27 Oct, 07
6 Nov, 07
26 Dec, 07
14 Dec, 07
9 Feb, 08
19 Oct, 07
14 Oct, 07
8 Nov, 07
Chile
6 Oct, 07
25 Sep, 07
22 Sep, 07
New Zealand
24 Sep, 08
20 Feb, 08
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2009 TerraMetrics
Antarctica
Google
lat -50.781544° lon -126.265560°
Eye alt 6884.93 km


Adolescent male (88071) - as at 9 Mar, 2009
Kaikoura Canyon
Reserve Bank
Christchurch
14 Feb, 09
21 Feb, 09
Taiaroa Head
Rangiauria Sp
Puysegur Bank
Pukaki Seachannel
1 Mar, 09
9 Mar, 09
Pukaki Knoll

Comparative Behaviours - **Use the displays , videos and viewing areas to investigate the behaviours listed and answer the questions.**

Behaviour	Royal Albatross (Adult)	Royal Albatross (chick)	Otago Shag	Spotted Shag
COMMUNICATION Courtship displays (advertising - finding a mate) 	When Albatross return to Taiaroa Head in the spring, they are often seen skycalling with their wings extended and their bill pointing to the sky. In addition to the visual display, what other forms of behaviour are involved with this courtship dance? *Bill Clappering* *Pop (snap) and side preen* *Head sways with wings open (estatic display)* *Sky Calls – screaming through open bill, scream ceases when head is lowered.*	How would this courtship behaviour increase the chance of successful mating to produce viable offspring? *Species recognition, mate recognition, ensures suitable mate selection (mature, fit, healthy)*	***To advertises to potential mates during courtship – the male*** Gargle***s….*** - ***head waves (darts)*** - face colour,plumage crests *exposed* - ***wings frozen in ha lf open position*** - Body held upright It continues for 2-3 months. 	In Spotted Shags, the courtship dance is called a ***wing waving display*** and it continues for 2 weeks to a month**.** How do you think the courtship dance in this species differ to that of the Stewart Island Shag? *Head is stable and the wings wave.* 
COMMUNICATION Pair bonding display (recognition - keeping a mate)	What behaviours, in addition to the sky calling, are observed during the pair bond display? *Bill Clappering* *Mutual preening* *Billing* *Pull out grass and throw over shoulder (nest contribution)*	How do chicks communicate with their parents? *Calling* *Bill tapping*	Did you observe any **mutural head lowering** – a key feature of the Otago Shag pair bond display? *Yes / No* Why not? *May not be the breeding season.*	The pair bond display of the Spotted shag is slightly different with **mutual darting, pointing and bowing.**

Comparative Behaviours - **Use the displays , videos and viewing areas to investigate the behaviours listed and answer the questions.**

Behaviour	Royal Albatross (Adult)	Royal Albatross (chick)	Otago Shag	Spotted Shag
COMPETITION (Intraspecific) Nest territory and aggression	Are the nests spaced evenly? *Low density, not necessarily* How do they react to another adult near their nest? *Possibly:* *Other breeding birds no interest* *Opposite sex may preen a little* *Clappering at juveniles* *Chase other birds away*	How does the nest territory at the Chatham Islands differ? *High density nests* What do you think they are competing for? *Nesting grounds / nesting materials*	Are the nests spaced evenly? *Yes, just beyond pecking reach (2 dimensional spacing)* How do they react to another adult near their nest? *Peck at approaching bird* *Vocalise their displeasure*	Are the nests spaced evenly along the cliff ledge? *Yes, 1 dimensional spacing* How do they react to another adult near their nest? *Peck at approaching bird* *Vocalise their displeasure*
COMPETITON (interspecific) predators	Do they compete with any other species on the headland for nest site? *No, currently, nesting sites are readily available* What are the predators of the adult albatross? *Introduced: Stoats, ferrets, feral cats, dogs* *Natural: Sharks, orca etc* How do albatross defend themselves? *Vocalise, peck, spit oily substance*	What are the predators of the albatross eggs and chicks? *Introduced: Stoats, ferrets, feral cats, dogs, rat, mice, possum, hedgehog, maggots* *Natural: none* How do albatross chicks defend themselves? *Vocalise, peck, spit oily substance* How does DOC control predators? *Traps, fencing, habitat alteration, use of incubators*	Do they compete with any other species on the headland for nest sites? *Potentially red-billed gulls* What determines the distance between the nests/ *Potential predation threats, strength in numbers, therefore dense nesting* How do shags defend themselves? *Vocalise, peck, spit vomit*	Why is the cliff site such a good nest site? *It makes access to nests difficult for potential land based predators* What about flying predators? *Fly away if not guarding chick or incubating egg.* *Defend by pecking* *Chicks may get stressed and spit vomit* *Gulls are there for food (vomit) not shags*

Comparative Behaviours – (Extras)

Behaviour	Royal Albatross (Adult)	Royal Albatross (chick)	Shags	
FEEDING	The main food of Albatross is squid. How do they get it? *They feed mainly on dead or dying squid that floats to the surface (scavenging)*	Chicks are 100% dependent on the parents for food. What does the chick do to trigger the adult to regurgitate its food? *Tapping its bill to the adults bill* How is the food transferred from parent to chick? *Cross-billed regurgitation*	Unlike Albatross, Shags are able to dive elow the surface to catch their food. What do they eat? *Otago Shags feed on bottom dwelling fish* *Spotted Shags feed on mid-water fish*	Chicks are 100% dependent on the parents for food. The chicks trigger the adults to regurgitate its food by tapping the parents bill and chirping. How is the food transferred from parent to chick? *During food transfer, the chick's head goes down the adult's throat*
THERMO-REGULATION Cooling and Conserving heat	How do Albatross cool off? *Panting* *Standing to expose feet* *Partially opens wings* *Fly away – if not guarding chick or incubating egg*	Why would the chicks be more vulnerable than the parents to high temperatures? *Can't leave* *Less capable to control temperature internally*	Shags also pant to cool off. The wing drying behaviour only seen in Little Shags, can aid cooling.	They can also stand up to increase blood supply to their feet where there is no feathers to aid cooling
MOVEMENT Flying Walking	Describe how Albatross fly. *They're principally gliders* Are they good walkers? *Not particularly, they have big feet and spend little time on land*	How far does a chick wander from their nest? *Several steps initially, but distance increases with age and can be up to 20m*	Describe how shags fly. *Rapid flapping, their wing size is relatively small compared to body size*	The legs of the shags are on the back of their body and they have a long tail. What happens when they walk? *Waddles off balance and tail drags. Position of feet enables efficient propulsion when diving*

Human Effects on Breeding Behaviour

Issue #1: Does tourism affect breeding behaviour?

Managed viewing of the Royal Albatross by the public began in 1972 and although not directly affecting albatross productivity there have been some impacts.

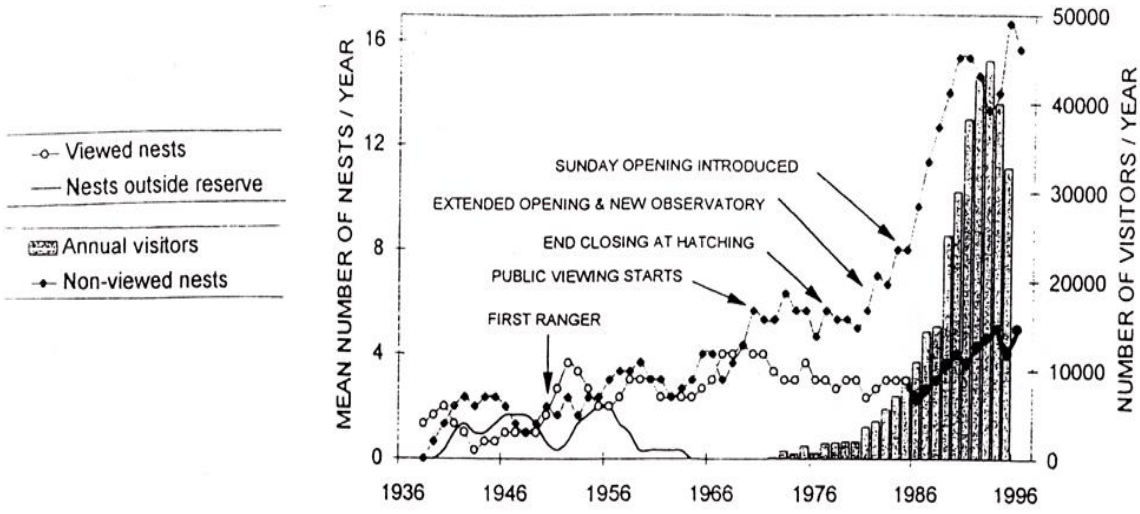


Fig. 1. Location of Royal Albatross nests (3-year running mean) in relation to the public observatory site and visitor numbers at Taiaroa Head Nature Reserve, 1936–1996.

1. **Based on the graph above, comment on how the nest numbers have changed over time?**

   Nest numbers increased over time, nesting outside reserve ceased.

2. **How has the proportional distribution of nests in view and nests out of view of the observatory changed?**

   Number of viewed nests remained stagnant while non-viewed nests increased dramatically.

3. **Pair formation (Dec - March), which occurs for 2-4 years before nest site selection, is being increasingly conducted out-of-sight of the observatory. What does this suggest regarding the behaviour of the adolescents?**

   That they do not like disturbance (being watched)

   Windows of the observatory were tinted in 1995 and a wooden fence was installed along the immediate path to the observatory in 2004.

   Adolescent activities have increased POSSIBLY due to these factors.

4. **What other environmental effects (physical and biological) could affect the number and distribution of nests?**

   Areas for nesting in front of the observatory maybe limited compared to areas not in view.

   Wind / exposure / weather / slope / nesting material maybe more appropriate or available in areas not in view.

   Possible competition between albatross and shags for breeding space.

   The existence of tracks, fencing and the location of the signal station (and its aerial), lighthouse, access roads and natural vegetation may have an effect also.

5. **What benefits has tourism provided for the Albatross?**

   Increase in funding (part of the admission fee goes to DoC for management of the colony).

   Increase in public awareness / pressure on environmental issues such as long line fishing.

   Better management (the birds and colony must be looked after because of the commercial component).

Issue #2: When should the public viewing be restricted?

In order to reduce the impact of human interference with the birds' breeding attempts – access to the observatory is restricted during certain times of the year.

Pair bonding and egg laying are most sensitive to human interference.

Based on the annual cycle, when would you recommend that the Observatory be closed for public viewing to avoid the period when the birds are most sensitive to human interference?

September to late November

There is up to a two week variability in egg laying dates from year to year. What environmental conditions might affect the timing of egg laying?

Abiotic – Climate (temperature / wind etc)
Biotic – Changes in food supply, overcrowding / disturbance at nesting site.

What impact would that have on your recommended opening and closing dates for the observatory?

May need to be flexible in opening / closing. This needs to be monitored and changed accordingly. Closing periods will need to be long enough to account for this.

How might the public disturb the birds? Who else might disturb the birds?

Public – movement / noise / camera flash / light reflection from observatory window.
Other – DoC rangers, signal station, boats, water delivery truck.

Background Information: Effect of natural disasters on breeding birds.

The reduction in soil and vegetation cover (up to 80%) at the Chatham Island colonies has resulted in a rocky, desert-like landscape with poor water retention and little soil or vegetation for nest construction. Although the exact causes of the habitat changes are unknown there is evidence that weather events may have been primarily responsible.

The 1994 storm (gusts of 188 km/h) caused loss of eggs (9%) and incubating albatross were blown off nests. The storm in 1985 destroyed the albatross's nesting habitat. Following these storm events egg losses of over 50% have been recorded and the percentage of nests producing fledglings has been as low as 3% in some years.

Higher nesting densities have been recorded in the breeding seasons following storm events.

Issue #3: How does climate affect breeding behaviour?

Since 1970 the climate both at Taiaroa Head and at the Chatham Islands has become warmer and drier, consistent with the warming trend in NZ

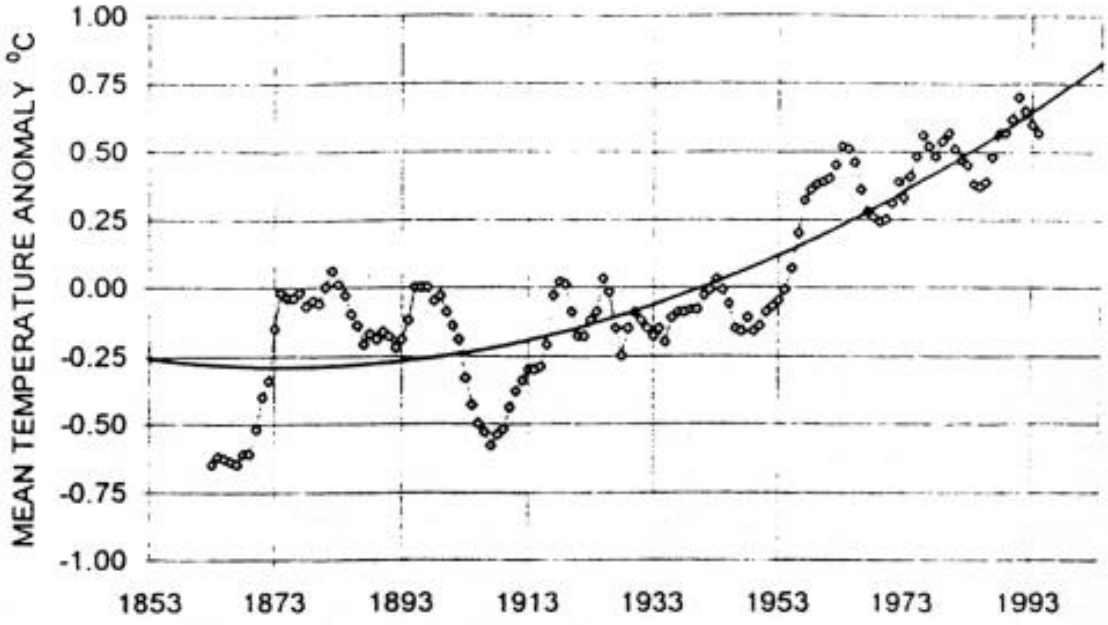


Fig. 3. Mean annual surface temperature anomaly (variation from the mean) and trend for New Zealand, 1853–1995 (10-year running mean). Information supplied by National Institute of Water and Atmospheric Research Ltd.

How do you think an increase in temperature might affect the following:

- **Building of nests (with soft vegetation):**

  Decrease and change in vegetation available.

- **Chick hatching:**

  Increase in chance of fly strike

- **Adults sitting on nest incubating /guarding eggs:**

  Incubating / guarding adult will overheat, may lead to death of both adult and chick.

What might happen to Albatross at Taiaroa Head if temperatures continue to increase?

May need to move to a more suitable nesting area

What is the main vegetation at Taiaroa Head and is it natural?

The headland is dominated by exotic grasses, not what would have originally been here.

What would happen if it was restored to the original vegetation?

Original vegetation was coastal shrubs. The albatrosses will leave as it would not be suitable for nesting.

What could be planted on the headland to help nesting albatross during high temperatures and to reduce moisture loss?

Tussocks – shades the ground and helps moisture retention.

Issue #4: What is causing egg shell thinning at the Chatham Islands?

Egg shell thickness measured at the Chatham Island (1993-95) was 20% less than the same location in the 1970's, No similar change has occurred at Taiaroa Head where the density of nesting birds is much lower.

Albatross are predatory/scavenging birds who feed at the top of the marine food chains and therefore can be expected to accumulate relatively high concentrations of organochlorines. In North Pacific albatrosses, high concentrations of PCB's and PCDDs have been recorded, which have been suggested to be sufficient to cause reproductive impairment. The observation of reproductive deficiencies (including egg shell thinning) in albatrosses at the Chatham Islands, resulted in a study being undertaken examining the levels of organochlorine pollutants in these birds.

Table 3. Comparison of the levels of PCDD/F, PCB and selected organochlorine pesticides in Northern Royal Albatross from Taiaroa Head and Chatham Islands vs. Northern Pacific Albatrosses.

	Northern Royal Taiaroa Head[1] /g wet weight	Northern Royal Chatham Is.[2] /g wet weight	Laysan alb. Midway Is.[3] /g wet weight	Black-footed alb. Midway Is.[3] /g wet weight
PCDD/F I-TEQ	1.12 pg	1.02 pg	19.4 pg	37.4 pg
PCB I-TEQ	7.78 pg	5.03 pg	30.7 pg	86.6 pg
PCBs total	49.5 ng	33.7 ng	198.5 ng	688 ng

How do the levels of PCBs and PCDDs compare between the Taiaroa Head population and the Chatham Islands population?

Higher at Taiaroa Head.

And how do they compare with the levels of PCE's and PCDD's with the North Pacific Albatross?

Much lower.

No egg shell thinning was reported at Taiaroa Head. Do you think organochlorine contaminants are responsible for egg shell thinning in albatross from the Chatham Islands?

Unlikely.

What factors might have caused the egg shell thinning in the Chatham Islands albatross population?
(Think about what has changed at the Chatham Islands since the 1970's)

Nest density has increased. Increased competition for nesting materials and nesting sites.