We had seven teams and 29 volunteers in the 2007 Earthwatch “South African Penguin” project on Robben Island. So, thank you to Nita Losoponkul, Molly Fulton, Anja Bradley, Dan Goudey, Gillian Atkinson, Wendy Spall, Ann Schwendener, Megan Stauble, Tami Augustyn, Paul Thibodeau, Howard Krieger, Thomas Ruetti, Brenda Hotham, Tom Leiden, Kathy Leiden, Mary Elizabeth Smith, Natalie Westreich, Gil Westreich, Frona Hall, Thalia Goo, Gwendolyn Shipley, Rebecca Carmichael, Maureen Cross, Yukari Kato, Berry Wong, Angelique Schindler, Terri Oba, Dale Anania and Anthony Brown!

We hope you enjoyed your brief stay with us and learnt a little (or a lot?) about the feisty African Penguin. We monitored 181 penguin nests in all and had 225 penguin chicks fledging: a total of 1.24 chicks per nest. Over the full breeding season, 33 nests were classified as breeding in little or no shade; 78 pairs nested under some sort of vegetation, 25 pairs made use of the buildings or other old man-made structures; 16 pairs excavated natural burrows; and 29 pairs made their homes in custom built artificial nests (boxes or burrows). The highest success rate (in terms of chicks per pair) was obtained by the birds nesting in buildings or other man-made structures (1.60 chicks/pair) and the lowest was seen in the natural burrows (1.06 chicks/pair). Why this might be, and whether this pattern will be confirmed in later years, remains to be seen.

Thanks to all who got bitten, scratched, pounded by flippers or covered in guano in the process of nest-checking and banding birds! Thank you for the help in digging-in and/or sponsoring the new artificial burrows; at the last count 76 new homes for penguins had been placed on Robben Island. Of these four were occupied at one point this season and two produced two chicks each. Thanks also for all your help in catching the oiled or injured birds that were sent to SANCCOB from Robben Island this year. Many of them have now been treated and returned to the island.

All the nest monitoring, re-traps, moult counts, nest counts (area U), penguin road crossing counts, wader counts, game counts and BIRP forms that you worked so hard to complete contribute to ongoing data that will help with conservation and management decisions on Robben Island, as well as population studies of the African Penguin and several other species in the Western Cape.

Some teams braved “rough sea crossings” on the ferry, the somewhat erratic baggage retrieval system at O. Tambo airport, days when rain stopped play, unpredictable trips in the leaky bakkie and penguin diet sampling! These experiences are part of what make this project unique, but I hope it is more the delights of the close encounters with wildlife, South African wine, braais, prison tours, Robben’s sunsets, shooting stars, the unique mix of wildlife and birds on the Island and the knowledge that you made a difference that you will never forget.

On behalf of Sue, Mario, Les, Pete, Rob and all the other researchers who shared time with you on Robben, I wish you every success for the future. If you are off on an Earthwatch project this year, we hope you enjoy it!

Project Title: South African Penguins

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Research Site:

Robben Island, Western Cape, South Africa (33°47'S, 18°21'E)

Local Management Status of the Research Site:

World Heritage Site/ South African Department of Arts and Culture

Scientific names of the primary species being studied:

African Penguin *Spheniscus demersus*
Bank Cormorant *Phalacrocorax neglectus*

Key Research Objectives:

1. Monitor African penguin breeding season on Robben Island
2. Monitor the effects of nest type on breeding success of the penguins
3. Re-sighting penguins previously banded in oil spills - data are added to the SAFRING (South African Bird Ringing Unit) database to evaluate movements and survival of penguins
4. Monitor the efficacy of rubber bands as a method to identify individual penguins over the medium to long term.
5. Evaluate breeding productivity of the Bank Cormorant
6. African penguin population monitoring
7. Help with long-term conservation planning and management on Robben Island

Date report completed:

November 2007

1. Data Collection and Results

1.1 Data collected during past field season

- 181 penguin nests were monitored (33 in scrapes with little or no shade; 78 in nests under vegetation; 25 in buildings or under other man-made structures; 29 in custom built artificial nests; and 16 in natural burrows.)
- 1270 re-sightings of previously banded penguins, representing 741 individuals.
- 121 Bank cormorant nests were monitored
- 8 moult counts, 7 nest counts, 6 wader bird count, 12 game counts, and 11 beach cleanups were done

1.2 Progress made towards achieving original objectives

All the data collected contributes to a long-term database that influences conservation planning on Robben Island and in the Western Cape. Several papers summarizing the results of the study on the effects of band type, oiling and food availability on breeding productivity are now published or in press. The rubber band design has been fine-tuned to be a workable alternative and this year the first mass-banding of chicks with the new design was undertaken.

1.3 Summary of results

See Table 1 below for a summary of the data collected on South African penguin nests, their positions and breeding success.

	Little/no shade		Under vegetation		Buildings/Other man-made		Artificial Nests		Natural Burrows	
Nests	33		78		25		29		16	
Abandoned Eggs	6	18 %	15	19 %	4	16 %	6	21 %	5	31 %
Abandoned Chicks	5	15 %	10	13 %	1	4 %	4	14 %	1	6 %
Successful (P3, P4)	22	67 %	53	68 %	20	80 %	19	65 %	10	63 %
Incubating at end	0	0 %	0	0 %	0	0%	0	0 %	0	0 %
Total Chicks (P3, P4)	38		95		40		35		17	
Chicks per pair	1.15		1.22		1.60		1.21		1.06	
		100%		100 %		100 %		100 %		100 %

Table 1. African Penguin Nest summary for 2007 at time of final Earthwatch team.

2. Significance/Benefits of Research

The main objective of this project is to monitor breeding productivity of the African Penguin (*Spheniscus demersus*) which is classified as Vulnerable to Extinction on the IUCN threatened species list. This is done by monitoring individual nests several times per team throughout the breeding season, as well as monitoring some nests over successive years. Nests are monitored in specific areas of the colony so that not all areas are subject to disturbance by the groups. Data are used to estimate demographic parameters of the penguin population as well as performance, behaviour and movements of individual birds. These data can also be used to assist in long-term conservation planning and investigating management related aspects such as the impact of tourism and fishing on the penguin colony.

Long term monitoring of penguin populations is dependent on individual bird identification, which has been done in the past by fixing steel bands to the penguins' flippers. The previous focus of this project was to assess a new silicon rubber flipper band designed for the African Penguin. Field tests over the last six years helped to slightly change and improve the design until this year when they were finalised for more wide scale use in wild penguins. The first mass-banding of chicks from Robben with the new design took place this field season.

There are various other important areas of research carried out by the Earthwatch groups on Robben Island. These are discussed below.

The Bank Cormorant (*Phalacrocorax neglectus*) is listed as Endangered to Extinction on the IUCN threatened species list. A study has been initiated to evaluate breeding productivity and survival of this species on Robben Island. These birds are very sensitive to disturbance by people so this study is carried out by taking digital photos of the breeding area on the old jetty and monitoring individual nest outcome over the whole breeding season.

Long term monitoring of the African Penguin population is dependent on re-sightings of birds with steel flipper bands. Looking for banded birds and recording the band number is one of the main procedures that the Earthwatch groups are involved with. In the last few years Earthwatch teams have recorded over 9 000 individual identifiable penguins. These data are used by SAFRING to evaluate movements, survival and the success of rehabilitating oiled, injured or sick penguins. Re-sightings are recorded at specific sights, such as the hide, near penguin crossing routes, or while walking through the colony monitoring nests.

Earthwatch groups are also involved with helping ongoing population monitoring that is carried out by Marine and Coastal Management staff. They are involved with counting nests (classified in specific categories) in one area of the penguin colony. Done on a monthly basis, this builds up a pattern of how nest counts vary throughout the year. A monthly moult count is also carried out by Earthwatch teams. Counting the number of penguins moulting at frequent intervals (in specific areas) throughout the year is another method of estimating the overall population of a colony.

Various activities are performed by Earthwatch groups which help with long-term conservation planning and management on Robben Island. A game census is performed during each team's visit, providing data on population sizes of these species and any fluctuations that may impact on the island's vegetation. During these counts and at any other time, teams are on the look-out for sightings of cats. Cats are a real threat to any ground-nesting bird and when numbers increased over the last few years there was a severe impact

on birds such as the Swift Tern, African Black Oystercatcher and African Penguin. Thanks to a scheme to control the cat population, the number remaining is now quite low (estimated to be in single digits). However, whilst a few remain there is still the potential for population expansion, so volunteers aid the programme by noting down sighting times and locations along with individual characteristics of the cats. This helps to provide an idea as to the number of cats remaining and to build a behavioural profile of the remaining individuals. Such information has been crucial in getting the numbers down to the present level.

Data are also collected on numbers of penguins crossing roads on Robben Island that have a high flow of traffic. This information is important to evaluate the movements of penguins on the island (many walk a considerable distance inland to their nests) and the impact that vehicles and tourists may have on these movements.

A monthly wader bird census is also conducted with the help of Earthwatch teams and a weekly presence survey of all bird species is completed. These data contribute to an assessment of the levels of protection offered to different species within southern Africa and help with long-term monitoring of different wader bird species and their movements on a global scale, as many are migratory birds.

3. Dissemination of Results

Three papers have now been published in peer reviewed journals:

1. **Barham PJ, Underhill LG, Crawford RJM & Leshoro TM.** 2007. Differences in breeding success between African Penguins (*Spheniscus demersus*) that were and were not oiled in the MV Treasure oil-spill in 2000. *Emu*, 107 (1): 7-13.

2. **Barham PJ, Crawford RJM, Underhill LG, Wolfaardt AC, Barham BJ, Dyer BM, Leshoro TM, Meyer MA, Navarro RA, Oschadleus D, Upfold L, Whittington PA & Williams AJ.** 2006. Return to Robben Island of African Penguins that were rehabilitated, relocated or reared in captivity following the Treasure oil spill of 2000. *Ostrich*, 77 (3-4): 202-209.

3. **Crawford RJM, Barham PJ, Underhill LG, Shannon LJ, Coetzee JC, Dyer BM, Leshoro TM & Upfold L.** 2006. The influence of food availability on breeding success of African Penguins *Spheniscus demersus* at Robben Island South Africa. *Biological Conservation,* 132 (1): 119-125.

One paper has been contributed to the Final Report of the BCLME (Benguela Current Large Marine Ecosystem) Project on Top Predators as Biological Indicators of Ecosystem Change in the BCLME: title and abstract provided.

> **The efficacy of hand-rearing penguin chicks: evidence from African Penguins (*Spheniscus demersus)* orphaned in the *Treasure* oil spill in 2000.**
> Some 2 000 orphaned chicks of African Penguins *Spheniscus demersus* were hand-reared and released back into the wild on Robben and Dassen Islands following the *Treasure* oil spill in June 2000. Of these chicks, 1 787 were flipper banded. This paper

reports on the subsequent survival rate and breeding success of those individuals seen on Robben Island from 2001–2006. Survival to breeding age of hand-reared chicks was no different from that of naturally-reared chicks, and their breeding success was at least as good as that of naturally-reared chicks. Over a four-year period, pairs where at least one partner was a hand-reared chick produced an average of more than 1.6 chicks per year. Combining the data on survival with that on breeding success indicates that 1 000 hand-reared chicks will produce around 1 220 chicks themselves over their lifetimes, making this a worthwhile conservation intervention.

One further paper is being prepared for publication: title and abstract provided.

Designs of different types of flipper bands and their effect on breeding success of African Penguins at Robben Island.
From 2001-2005, designs of flipper bands made from silicone rubbers were tested on African Penguins *Spheniscus demersus* at Robben Island. Each season the breeding success of three different groups of birds was recorded: birds with no bands, birds with conventional steel bands and birds with the new rubber bands. There was no significant difference in the breeding success of the three groups, suggesting that neither the currently used steel bands, nor any of the new rubber designs were harmful during the seasons investigated. The rubber bands caused less wear of feathers than the steel bands

Information of the influence of food on abstinence from breeding and breeding success of African Penguins will be made available to the Ecosystem Approach to Fisheries Working Group and the Pelagic Scientific Working Group of South Africa's Department of Environmental Affairs and Tourism, which advise on total allowable catches of pelagic fish off South Africa and are drafting a proposal to carry out experimental closures to Purse-Seine fishing of areas around African Penguin breeding colonies.

4. Volunteer Tasks and Accomplishments

4.1 Ideas, skills, expertise, motivations

Each volunteer brings their own set of skills and expertise to the project from recording data, using the GPS, evaluating nest status, handling and banding penguins, re-sighting banded penguins, counting of nests and moulting birds, observing penguins crossing roads, counting game species, being on the look-out for cats, rubbish collecting off the beach, data entry onto the computer, writing the diary, preparing food and contributing to each team's unique "character".

4.2 Contribution to data collection

It would be very difficult and time-consuming for the principle investigators and the team leaders to collect this data without the help of the volunteers. Essentially they do all the data collection and are aided and guided by the team leaders. Mario Leshoro is the co-principle investigator based on Robben Island and is involved with every team and therefore coordinates the data collection.

5. Project Development

5.1 Logistical and scientific challenges

The logistical challenges faced mainly revolved around rough seas and the ferry not travelling to Robben Island. This resulted in four teams having to leave Robben Island earlier than expected (one team on the penultimate day, the others early on the final day), the transport of fresh food to the island being delayed and some days when Mario Leshoro could not get to Robben Island and the team leaders had to continue without his help. Baggage not arriving in Cape Town International was also a problem for some volunteers.

Research challenges faced included the difficulty in finding enough burrows and birds nesting in buildings to act as suitable groups to compare with birds nesting in vegetation. The Bank Cormorant work poses several problems due to the nature of the birds and the unsteady jetty that they are breeding on, but this was overcome to some degree by the use of a ladder and digital camera. Catching of birds was carried out by researchers only.

5.2 Upcoming research development

The long-term monitoring of seabirds at Robben Island has proved most useful in gauging the success of conservation interventions, as were applied during the *Treasure* oil spill in 2000, and in advising fisheries managers on the food requirements of seabirds. It is important that this monitoring be continued into the future so that long-term changes in the Benguela Ecosystem (where the cold waters of the Benguela current move from the western coast of South Africa, Namibia and Angola, in a north/northwest direction to join the warm southern equatorial current) can be explored.

In addition, a new non-invasive automated computer vision monitoring system is being developed on Robben Island and the data collected by the volunteers in this project will be extremely valuable in guiding the trial stages of this work. These data will set the benchmark for the new automated system and will be incorporated into any new monitoring strategies so that future monitoring can make reference to long-term differences.

6. Educational Opportunities

6.1 Involvement of communities, students, career scientists and others

The team leaders consist of MCM (Marine and Coastal Management) staff, ADU (Avian Demographic Unit) staff and students, other University of Cape Town students, SAFRING staff, Robben Island conservation staff and University of Bristol staff and students.

6.2 Promoting understanding and the conservation of a sustainable environment

The MCM staff are involved in collecting data from the different seabird colonies of the Western Cape and therefore have a good understanding of conservation involved on Robben Island. The students involved in the project are exposed to working on an island that is vitally important to seabird conservation but is also a major tourist attraction because of the cultural heritage. It therefore presents management challenges to conserving the sustainable environment on Robben Island.

6.3 Contribution to educational research

Shannon Hampton – University of Cape Town MSc project
Richard Sherley – University of Bristol PhD project
Tilo Burghardt – University of Bristol, Postdoctoral research project

7. Partnerships

7.1 Organisations and their contributions

Marine and Coastal Management, Department Environmental Affairs and Tourism
- staff, equipment, support, student project

Avian Demography Unit, University of Cape Town
- staff, equipment, co-ordinators, support

University of Bristol, H H Wills Physics Laboratory
- staff, database, rubber bands, computer support, student project

Bristol Zoological Gardens
- preliminary rubber band testing

Robben Island Museum
- staff, equipment, support, ferry transport, accommodation, transport of penguins

SAFRING, ADU, University of Cape Town
- staff, database of recaptured birds

SANCCOB (Southern African Foundation for the Conservation of Coastal Birds)
- rehabilitates oiled, weak, injured and orphaned seabirds

7.2 Use of data

Marine and Coastal Management, Department Environmental Affairs and Tourism

- Long term data set for conservation priorities on Robben Island
- Long term data sets on numbers of African Penguins and Swift Terns breeding and breeding success of African Penguins to relate to trends in fish biomass and advise on an ecosystem approach to fisheries (EAF)
- Bank Cormorant breeding evaluation to help with conservation of this endangered species, short term report on breeding success in 2006 as well as long term dataset on breeding and population trends

University of Bristol

- Short term evaluation of the rubber band design used from 2004 to 2006
- Medium term evaluation of how the new rubber band design survives at sea
- Long term evaluation of breeding success of penguins with rubber bands compared to unbanded and metal-banded penguins
- Long term data set on resightings of banded penguins for comparisons with data produced from new monitoring methods.

Robben Island Museum

- Long term dataset for conservation and management priorities on Robben Island

SAFRING, ADU, University of Cape Town

- Long term dataset for monitoring the African Penguin population in terms of movements, survival and the success of rehabilitation