Die Vogelwarte 40, 2000 315–318

Five years of monitoring African Penguins *(Spheniscus demersus)* after the "Apollo Sea" oil spill: a success story identified by flipper bands

By Les G. Underhill[1], Philip A. Whittington[1], Robert J.M. Crawford[2] and Anton C. Wolfaardt[1, 3]

Abstract: UNDERHILL, L. G., P. A. WHITTINGTON., R. J. M. CRAWFORD & A. C. WOLFAARDT (2000): Five years of monitoring African Penguins *(Spheniscus demersus)* after the "Apollo Sea" oil spill: a success story identified by flipper bands. Vogelwarte 40: 315–318.

The world population of the African Penguin *(Spheniscus demersus),* a vulnerable species confined to South Africa and Namibia, is estimated to be 180 000 birds; 10 000 were oiled in the "Apollo Sea" spill in June 1994. Of the 5000 penguins that survived to be cleaned and released, 4076 were fitted with flipper bands. Over the following five years, the resightings database of these birds grew to 40 000 records, relating to 2961 invidivuals, 73% of the number banded. Using an average survival rate for African Penguins of 85%, it was estimated that about half the birds remaining alive at the start of each of five successive years were resighted within it. The results indicate that the cleaning techniques for oiled African Penguins are successful, and that the survival rates of these birds do not differ from those of normal penguins.

Key words: African Penguin *(Spheniscus demersus),* marine oil pollution, "Apollo Sea" oil spill, cleaning techniques for oiled penguins.

Adresses: [1] Avian Demography Unit, Department of Statistical Sciences, University of Cape Town, Rondebosch, 7701 South Africa; [2] Marine and Coastal Management, Department of Environmental Affairs and Tourism, Private Bag X2, Roggebaai, 8012 South Africa; [3] Western Cape Nature Conservation Board, Private Bag X9088, Cape Town, 8000 South Africa.

Introduction

The African Penguin *(Spheniscus demersus)* is a vulnerable species, occurring along the southwestern coast of Africa, breeding between Hollamsbird Island, Namibia, and Bird Island, Algoa Bay, South Africa. The total population size during the early 1990s was estimated to be 180 000 penguins, and to be decreasing at a rate of 2% per year (CRAWFORD & WHITTINGTON 1997, CRAWFORD 2000). One of the major current threats is marine oil pollution, at both chronic and crisis levels. Small-scale oiling events occur near-continuously, and are caused mainly by illegal bilge pumping and pipeline leaks; these involve 1000–1500 penguins per year, on average, about 0.7% of the total population (CHENEY 1999). Occasional crisis events impact thousands of penguins over short periods. The worst of these crises took place in June 1994, when the bulk-ore carrier "Apollo Sea" broke and sank close to Dassen Island; an estimated 10 000 penguins were oiled (6% of the total population). It is this event which is the focus of this paper (ERASMUS 1995, UNDERHILL et al. 1999).

Methods

Of the 10 000 "Apollo Sea" penguins, approximately half survived to be cleaned and released, of which 4076 were fitted with flipper bands; 1527 were released on 26 July 1994, and the remainder were released in small batches until 11 September (UNDERHILL et al. 1999). For this paper, we take 1 August as the anniversary date of release. From banding undertaken prior to the incident, it is known that penguins from throughout the breeding range were involved, but it is not possible to indicate the relative proportions (UNDERHILL et al. 1999).

The numbers on the bands are c. 6 mm tall and can be read with a pair of binoculars at a distance of 10 m; even under poor light conditions they can be read with a telescope at 30 m (LGU pers. obs; WHITTINGTON 1999). A resighting programme for these penguins started within a month of release, and was greatly intensified after about six months. Most of the follow-up studies took place on Robben and Dassen Islands, which are readily accessible from Cape Town. On Robben Island, week-long searches for banded African Penguins were made

regularly, with a less intensive pattern of quarterly searches being adopted in the fourth and fifth years after the incident. Dassen Island was systematically covered on a monthly cycle, with occasional gaps. In addition, resightings were made during routine penguin research on these islands, for example during fortnightly counts of moulting birds (UNDERHILL & CRAWFORD 1999). Elsewhere, resightings are made opportunistically; the intensity of fieldwork at colonies remote from Cape Town peaked in 1995 and 1996. UNDERHILL et al. (1997, 1999) reported the results after two and three years. In this paper, we report the results after five years, using the same approach as in the earlier papers.

Acknowledgements: Financial and logistic support for this project has been provided by the Avian Demography Unit of the University of Cape Town, Western Cape Nature Conservation Board, Marine and Coastal Management of the Department of Environmental Affairs and Tourism, Southern African National Foundation for the Conservation of Coastal Birds, International Fund for Animal Welfare, BP Southern Africa, WWF South Africa, National Research Foundation, South African National Parks, South African Bird Ringing Unit, Robben Island Museum and a Jagger Scholarship of the University of Cape Town. We thank all of them for their support. We are also grateful to the large number of people who have been involved in this project in many ways over five years.

Results and Discussion

By 1 August 1999, c. 40 000 resightings of 4076 penguins released with bands had been made. These related to 2961 different individuals, 73% of the number banded (Table). If no monitoring had been undertaken in the first year after release (i.e. discarding resightings made prior to 1 August 1995), 2569 (63%) of the banded birds would have been resighted (second row of the Table). This means that 13% (392 out of 2961) were resighted in the first year but were not seen subsequently, a proportion corresponding closely with normal average annual mortality. This points to the first-year-after-release survival rate of cleaned birds which remained within the main study area being essentially identical to the survival rate of normal penguins.

If the average survival rate of African Penguins is taken at 85% (UNDERHILL et al. 1999), an estimated 2128 of the 4076 banded penguins would have been alive on 1 August 1998, four years after release. 1126 penguins were seen between 1 August 1998 and 31 July 1999 (Table), so that an

Table: Results of the five years of follow up of 4076 African Penguins banded after the "Apollo Sea" oil spill in 1994. Section A gives numbers of birds resighted from the date in the left-hand column until 31 July of the year in the headings of subsequent columns, and Section B expresses these numbers as percentages of 4076.

Tab.: Sichtungen beringter Brillenpinguine innerhalb eines 5-järigen Zeitraumes nach der "Apollo Sea"-Ölkatastrophe 1994. Teil „A" zeigt die Zahlen gesichteter Vögel vom angegebenen Datum bis jeweils zum 31. Juli der folgenden Jahre. Teil „B" gibt diese Zahlen jeweils als Prozentsatz von der Gesamtzahl der mit Flügelmarken gekennzeichneten Pinguine wider (n = 4076).

	Year				
A. Numbers resighted	1995	1996	1997	1998	1999
Since 1 August 1994	1827	2623	2812	2924	2961
Since 1 August 1995		2025	2353	2499	2569
Since 1 August 1996			1691	1961	2089
Since 1 August 1997				1144	1484
Since 1 August 1998					1126
B. Percentages resighted					
Since 1 August 1994	45	64	69	72	73
Since 1 August 1995		50	58	61	63
Since 1 August 1996			41	48	51
Since 1 August 1997				28	36
Since 1 August 1998					28

In the columns, 1995 refers to the period up to 31 July 1995, etc.

estimated 53% of birds alive at the start of the fifth year of monitoring were seen within it. The analogous percentages for the first four years of monitoring were comparable (45%, 58%, 57%, 45%) and these fluctuations closely follow our subjective estimate of the overall intensity of monitoring in each year.

Of the 1126 banded penguins resighted between 1 August 1998 and 31 July 1999, 37 had not been seen in previous years (Table). The numbers of first-time resightings in the previous four years were 1827, 796, 189 and 112 respectively (obtained from successive differences between values in the first row of Table). These numbers are decreasing rapidly. It is unlikely that many more "Apollo Sea" penguins will be resighted for the first time, unless extensive searches are initiated in remote colonies; birds from the entire range were impacted by the oiling (UNDERHILL et al. 1999).

First-time resightings in recent years could be of birds established at colonies which were not intensively searched over the five year period, and which were visitors to Robben and Dassen Islands. Alternatively, some "Apollo Sea" survivors may not have bred for several years after the incident, and therefore gone unrecorded. Birds that were juveniles from Robben and Dassen Islands at the time of the oiling in 1994 should have attempted breeding on these islands within two to three years.

From all perspectives, the results indicate that the Southern African National Foundation for the Conservation of Coastal Seabirds (SANCCOB), based in Cape Town, has unparalleled success in restoring oiled penguins to their natural populations. The survival rates of cleaned birds do not differ from those of normal penguins. The results are in stark contrast to those of SHARP (1996) and WERNHAM et al. (1997), who found that the overall median survival period after release was about six days for cleaned seabirds in North America and in Europe. Explanations for the differences are not yet fully understood. However, it is clear that these are not due to differences in treatment methods at the various rescue centres, because the cleaning of the "Apollo Sea" penguins was assisted by personnel from a variety of these centres. The simplest and most likely explanation is that the success relates primarily to the relative robustness of the African Penguin. Long-term physiological studies of the biochemical and hormonal response to oiling in the African Penguin have not yet been performed; this represents a unexploited research opportunity.

It is self-evident, but important to note, that our knowledge of the successes at SANCCOB (and the failures elsewhere) is attributable to our ability to follow the fortunes of individual birds through ringing. However, given the uncertainties of the impact of the standard design of flipper band on penguin survival (FRASER & TRIVELPIECE 1994), there is a need for ongoing efforts to improve our marking techniques for penguins. The South African Bird Ringing Unit is therefore committed to field-testing the new design of plastic flipper band described by BARHAM (1999). Such studies are greatly facilitated by the unique accessibility of the penguin colonies near Cape Town and the presence of a research team capable of undertaking intensive follow-up studies of marked penguins.

Postscript

On 23 June 2000, the "Treasure", also a bulk-ore carrier, sank less than 20 km from the spot where the "Apollo Sea" sank (CRAWFORD et al. 2000). About 20 000 penguins were oiled; at least 100 of these had also been oiled by the "Apollo Sea" six years previously. Another 20 000 penguins were transported away from their breeding islands to avoid them becoming oiled. About 25 000 of these birds were flipper-banded, providing an unplanned opportunity to repeat and extend the evaluation reported in this paper.

Zusammenfassung

Fünf Jahre Monitoring von Brillenpinguinen *(Spheniscus demersus)* nach der „Apollo Sea"-Ölkatastrophe: eine mit Hilfe individueller Flügelmarken sichtbar gewordene Erfolgsgeschichte.

Die als „gefährdet" eingestufte Weltpopulation des nur in Südafrika und Namibia beheimateten Brillenpinguins *(Spheniscus demersus)* wird auf etwa 180 000 Vögel geschätzt. Davon wurden 10 000 Vögel Opfer der „Apollo-Sea"-Ölkatastrophe im Juni 1994. Von den 5000 überlebenden, die gereinigt und dann wieder freigelassen

wurden, erhielten 4076 Individuen eine Kennzeichnung durch Flügelmarken. In den folgenden 5 Jahren kamen insgesamt 40 000 Meldungen gesichteter Vögel zusammen, die sich auf 2961 Individuen beziehen. Dies entspricht 73% bezogen auf die Gesamtzahl markierter Vögel. Legt man die durchschnittliche Überlebensrate von 85% für Brillenpinguine zugrunde, läßt sich kalkulieren, dass innerhalb der 5 Beobachtungsjahre jeweils etwa die Hälfte der Vögel, die zu Beginn des Jahres noch am Leben waren, gesichtet wurden. Diese Befunde zeigen, dass die Reinigung verölter Pinguine erfolgreich war und sich ihre Überlebensrate nicht von der „normaler" Pinguine unterscheidet.

References

Barham, P. (1999): Design of plastic flipper bands. Penguin Conservation 12(1): 4–7. * Cheney, C. (1999): Seabird rehabilitation in South Africa. Penguin Conservation 12 (2) 20–21. * Crawford, R. J. M. (2000): African Penguin *Spheniscus demersus*. In: The ESKOM Red Data Book of birds of South Africa, Lesotho and Swaziland. Barnes, K. (ed.). Johannesburg: BirdLife South Africa: 56–57. * Crawford, R. J. M., & P. A. W. Whittington (1997): Jackass Penguin *Spheniscus demersus*. In: The atlas of southern African birds. Vol. 1: Non-passerines. Harrison, J. A., Allan, D. G., Underhill, L. G., Herremans, M., Tree, A. J., Parker, V. & Brown, C. J. (eds). Johannesburg: BirdLife South Africa: 2–3. * Crawford, R. J. M., S. A. Davis, R. T. Harding, L. F. Jackson, T. M. Leshoro, M. A. Meyer, R. M. Randall, L. G. Underhill, L. Upfold, A. P. van Dalsen, E. van der Merwe, P. A. Whittington & A. C. Wolfaardt (2000): Initial impact of the Treasure oil spill on seabirds off western South Africa. South African Journal of Marine Science 22: 157–176. * Erasmus, Z. (1995): An overview of the Apollo Sea incident. In: Proceedings Coastal Oil Spills: Effect on Penguin Communities and Rehabilitation Procedures. Barrett, J., Erasmus, Z. & Williams, A. J. (eds) Cape Town: Cape Nature Conservation: 5–7. * Fraser, W. R., & W. Z. Trivelpiece (1994): Report on the Workshop on Researcher-Seabird Interactions, July 15–17, Monticello, Minnesota, USA. Bozeman, Montana: Polar Oceans Research Group, Montana State University. * Sharp, B. E. (1996): Post-release survival of oiled, cleaned seabirds in North America. Ibis 138: 222–228. * Underhill, L. G., P. A. Bartlett, L. Baumann, R. J. M Crawford, B. M. Dyer, A. Gildenhuys, D. C. Nel, T. B. Oatley, M. Thornton, L. Upfold, A. J. Williams, P. A. Whittington & A. C. Wolfaardt (1999): Mortality and survival of African Penguins *Spheniscus demersus* involved in the Apollo Sea oil spill: an evaluation of rehabilitation efforts. Ibis 141: 29–37. * Underhill, L. G., & R. J. M. Crawford (1999): Period of moult of African Penguins at Robben Island, South Africa, and its variation. South African Journal of Marine Science 21: 437–441. * Underhill, L. G., P. A. Whittington, R. J. M. Crawford, & A. J. Williams (1997): Results of monitoring oiled African Penguins *Spheniscus demersus* for three years after the Apollo Sea incident of June 1994. Sula 11: 187–192. * Wernham, C. V., W. J. Peach & S. J. Brown (1997): Survival of rehabilitated guillemots. British Trust for Ornithology Research Report 186: 1–40. Thetford. * Whittington, P. A. (1999): Banding 50,000 penguins: a brief look at numbers and techniques. Penguin Conservation 12 (2): 19.