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The rehabilitation of Swift Terns *Sterna bergii* incapacitated by marine foam on Robben Island, South Africa

Nola J Parsons[1,2*], Kathy M Calf[1§], Les G Underhill[1], Venessa Strauss[2]

[1] *Avian Demography Unit, Department of Statistical Sciences, University of Cape Town, Rondebosch 7701, South Africa*

[2] *SANCCOB, PO Box 11116, Bloubergrandt 7443, South Africa*

** Corresponding author, e-mail: nola@sanccob.co.za*

[§] *Current address: Institute of Integrative and Comparative Biology, University of Leeds, LC Miall Building, Clarendon Way, LS2 9JJ, United Kingdom*

One-hundred-and-three incapacitated Swift Terns *Sterna bergii* were captured on Robben Island on 15 December 2003; 93 (90%) were released between 28 December 2003 and 4 February 2004, having been treated at the Southern African Foundation for the Conservation of Coastal Birds (SANCCOB) facility in Cape Town. The rehabilitation procedure is described. This is the first incident involving the admission of a large group of Swift Terns to SANCCOB and the first time birds have been known to be incapacitated by marine foam, generated by a combination of wave action, kelp mucilage and phytoplankton. Seven had been ringed as chicks; three were from Robben Island, three from other offshore islands of the Western Cape and one from Lüderitz, Namibia, 855km to the north.

Introduction

The Swift Tern *Sterna bergii* (also known as the Greater Crested Tern) occurs on coastlines in the south-east Atlantic Ocean, the Indian Ocean and the western Pacific Ocean (Crawford 1997, Underhill *et al*. 1999b, Crawford *et al*. 2002). The nominate subspecies *Sterna bergii bergii* occurs in southern Africa, having an overall population size of c. 20 000 birds (Cooper *et al.* 1990, du Toit *et al*. 2003). About 80% of this population breeds in the Western Cape in late summer and autumn (Cooper *et al.* 1990, Crawford *et al*. 2002). Juveniles move mainly eastwards with their parents after fledging, and most young birds remain in a 'nursery area' in the Eastern Cape and KwaZulu-Natal until they enter the breeding population from their third year onwards (Underhill *et al*. 1999b).

This paper describes and discusses an incident in which Swift Terns were incapacitated by marine foam. The incident appears to be the first of its type in southern Africa. It also represents the first large admission of Swift Terns to the Southern African Foundation for the Conservation of Coastal Birds (SANCCOB). SANCCOB has rehabilitated seabirds, mainly African Penguins *Spheniscus demersus*, since 1968 (e.g. Nel and Whittington 2003, Parsons and Underhill 2005).

Incident

At 10:00 on 15 December 2003, a group of incapacitated Swift Terns were found on the north-western part of Robben Island (33°47'S 18°21'E). They were not able to fly, due to a greenish-yellow substance which had impregnated the feathers and had dried, so that the feathers had become stiff and inflexible. Most of the birds were standing on the upper shore or had walked a few metres inland. Collection of these birds started at 14:00, and they arrived at SANCCOB at 17:00, having travelled by ferry from the island to Cape Town Harbour and then by road to the SANCCOB facility in Tableview (Cape Town). The birds were packed, 8–10 per box, in ventilated cardboard boxes, designed primarily for the transport of penguins. Admission, stabilisation, evaluation and feeding procedures were completed by 23:00. One bird had died during transport; a total of 102 Swift Terns were admitted. All were in adult plumage. The birds were generally weak and the body condition was poor, with the keel bone prominent. Feather samples were taken and stored in plastic bags, with a view to identifying the contaminant. Seven terns had been ringed as fledglings at their breeding colonies: three at Robben Island, three at other colonies in the Western Cape, and one at Lüderitz, Namibia (Table 1).

Rehabilitation protocol

Upon admission to SANCCOB, each bird was individually numbered with a temporary waterproof leg tag. Stabilisation and initial treatment consisted of giving 5ml of a charcoal solution and 5–20ml electrolyte solution orally, administering an eye ointment, and spraying with Newcastle Disease vaccine (La Sota strain). Birds were given charcoal orally to adsorb any toxins that may have been ingested. The fluids were given to replace an assumed fluid deficit and to furnish further maintenance needs. Birds were allocated to two treatment groups, based on subjective body condition assessment and behaviour. Weak birds (c. 30) were evaluated as those that were generally not standing, had drooping wings and were struggling to hold their heads up. They were placed in the intensive care unit (ICU) in towel-

Table 1: Ringing details of Swift Terns admitted to SANCCOB on 15 December 2003. All had been ringed as chicks close to fledging

Ring number	Ringing place	Date of ringing	Elapsed time	Distance (km)
575700	Robben Island	21 May 1981	22y 7m	0
572504	Marcus Island, Saldanha Bay	17 April 1982	21y 9m	91
528622	Marcus Island, Saldanha Bay	1 April 1984	19y 9m	93
589392	Robben Island	20 April 1994	8y 9m	0
589794	Robben Island	13 April 1995	8y 8m	0
5H08724	Shark Island, Lüderitz, Namibia	6 April 1999	4y 9m	855
5H02691	Dassen Island	6 April 2000	3y 9m	50

lined crates (three per crate).The stronger birds were placed in outside shade-cloth pens. All birds were force-fed sardine *Sardinops sagax* fillets before being left overnight.

The birds in ICU were evaluated daily and upgraded to the group of stronger birds once they could stand and hold their wings close to their bodies. While in ICU they received 5–10ml fluid (electrolyte solution alternating with water) orally three times daily to maintain body fluid levels. They also received a high-protein pet food concentrate (fish-based) twice daily to maintain body nutritional needs, and were offered sardine fillets twice daily.

The stronger birds remained in the outdoor pens. They were given 10ml electrolyte solution once daily; initially, they were force-fed sardine fillets but they quickly learnt to feed from a plate. These birds were forced to swim twice daily in fresh water; this encouraged drinking and preening. Fluids were not given more frequently, as the birds were maintaining body fluid levels by drinking. Some of the contaminant was removed during swimming and preening. Initially, the birds became waterlogged during swimming, but recovered quickly by standing in the sun. Any weak birds were downgraded to ICU. Because the contaminant was not easily removed by swimming, the decision was taken to wash the birds.

The strongest birds were washed first. Forty-five birds were washed on 18 December 2003, 30 on 19 December, 16 on 21 December and the remaining eight on 24 December. The birds were washed in basins of warm water (temperature c. 40°C) containing Light Duty Concentrate (LDC: Golden Neo-Life Diamite) and Savlon (Savlon Antiseptic Solution, Pharmedica, active ingredient chlorhexidene gluconate 0.3g/100ml). Each tern was placed in the water so that its body was submerged up to shoulder height. Two people were required for both washing and rinsing the birds. The birds were washed by gently massaging the contaminated patches with LDC, brushing with toothbrushes if necessary, systematically working over the whole body. The ventrum of the birds, especially the base of the neck, the base of the wings and between the legs, were the areas most severely impacted with the contaminant. Washing took 20–30min per bird. The birds were rinsed with water under pressure from a spray attachment at c. 40°C for 10–15min per bird; any remaining patches of contaminant were spot-washed. Rinsed birds were wrapped in a towel, given 5–10ml electrolyte solution, administered eye ointment, and left to dry in an enclosed pen heated by an infra-red lamp. On the day of washing, birds did not swim (or drink) and therefore were given fluids for body fluid maintenance. They were provided with sardine fillets and left overnight in this pen. Weak birds were downgraded to ICU. After recovery from the washing process, the terns were moved to an enclosed aviary with a small pool of fresh water and fed twice daily with sardine fillets. Release requirements were that each bird was flying well and that the plumage remained completely dry after a 10min forced swim (birds were also sprayed with water during the forced swim to ensure all feathers were soaked).

Ten birds died in total: one during transit to the SANCCOB centre, two weak birds the day after admission and one six days later; four died within two days of washing and one died 10 days after washing. One bird was euthanased on 8 January 2004; it had a deformed foot upon admission and developed a foot injury because it could not walk properly. No postmortems were done on birds that died and no weight measurements, body condition scores or blood parameters were evaluated on those that were released.

Ninety-three birds (90% of birds captured) were released from a boat close offshore from Robben Island: 38 on 24 December 2003, 28 on 30 December, 19 on 8 January 2004, four on 27 January and the last four on 10 February. The rehabilitation period averaged 17 days (range 9–57 days). Birds were ringed with SAFRING 8mm stainless steel rings prior to release. By September 2005, none had been recovered (HD Oschadleus, SAFRING, pers. comm.).

The feather samples were examined and phytoplankton residues were found, although no species could be identified. Microscopic examination revealed that the fine structure of the feathers had been damaged.

Discussion

Rehabilitation

There are three key principles of bird rehabilitation: (1) to initiate treatment as rapidly as possible, because the condition of the birds deteriorates steadily; (2) to minimise the time in captivity so as to limit the risk of exposure to, and spread of, disease, and to reduce the disruption of the birds' annual cycle; (3) to minimise handling because this is stressful and may lead to injury (directly) or disease (indirectly). The 90% success rate achieved after this incident is attributed to the three principles being met.

The interval between discovery of the incapacitated birds and the completion of stabilisation was 13 hours. During this period the birds were collected, transported, admitted and stabilised.

We had initially hoped to minimise handling and that the contaminant would be removed when we allowed the birds to swim regularly in fresh water. However, the birds became waterlogged during swimming. After two days, the decision was taken that washing, although it involved handling, would minimise the time in captivity. Because washing is a particularly stressful procedure, birds were only washed once they were fully stabilised. Four birds died within two days of being washed and one bird died 10 days after washing. The decision to wash the birds proved to be the correct approach in this case because the contaminant was found to be firmly embedded in the feathers and could not have been removed by the birds themselves.

The terns coped well in captivity. To minimise handling, birds were encouraged to eat on their own as well as drinking while swimming. They started feeding on their own within two days, on sardine fillets from a plate. The only problem encountered was in birds that were kept longer than four weeks in the rehabilitation facility. A few birds began to show symptoms of bumblefoot, in which the feet become inflamed and infected, mainly caused by standing for long periods on hard surfaces. The bumblefoot was not treated but the birds were released as soon as possible.

This is the first time there has been an incident involving the admission of more than a few Swift Terns to SANCCOB. For example, in the two-year period 2001 and 2002, a total of six Swift Terns were admitted, of which two were released (Parsons and Underhill 2005). The treatment of this group of 102 terns is a demonstration that rehabilitation can be undertaken not only of penguins but also of terns, which are generally regarded as delicate flying birds (*contra* Sharp 1996).

SANCCOB has formal release criteria for the commonly admitted seabirds, in terms of haematalogical parameters, body weight and plumage (Parsons and Underhill 2005), but these are not yet in place for Swift Terns. There is thus potential value in collecting objective condition score data, haematological indices and pathological information from healthy birds in order to obtain baseline values on which to formulate release criteria.

The contaminant

When the birds were washed, an overwhelming smell was reported, as previously experienced when washing birds covered in sewage. Phytoplankton residues are subject to anaerobic wet decomposition, producing organic sulphides. These sulphides become embedded in the feathers, and generate a sewage-like odour when released into the air during the washing process.

Large expanses of marine foam are frequently deposited on and immediately above the intertidal area of Robben Island, usually after storms; these areas of foam can be up to 1m deep and 100m wide and persist for several days (KMC, LGU pers. obs.). In the Benguela Upwelling System, this stable marine foam is formed by a three-way interaction between heavy onshore wave action in the surf zone, the presence of mucilage exuded by beds of kelp *Ecklonia maxima* and high concentrations of phytoplankton (Velimirov 1980). The large kelp beds around Robben Island provide ample supplies of mucilage, especially when kelp fronds are pounded by breaking surf. Areas covered by marine foam become unavailable to birds, either for roosting or feeding. The foam gradually desiccates and decomposes; the final stage is a thin slimy residue over the affected areas (KMC, LGU pers. obs.). This marine foam has been seen to affect birds indirectly by making feeding areas and territories unavailable to the African Black Oystercatcher *Haematopus moquini* and the Blacksmith Plover *Vanellus armatus* (KMC pers. obs.). The only other impact of the marine foam previously observed on birds on Robben Island has been when the landing sites of African Penguins were filled with foam. The penguins walk through the foam and emerge covered in it, and it dries to form greenish-yellow patches (which have not been known to cause problems to penguins: LGU, NJP pers. obs.).

Several Cape Gannets *Morus capensis* have been admitted to SANCCOB from the South African west coast in recent years with a greenish-yellow contaminant. They have been successfully washed and released but no attempt has been made to quantify the event or identify the contaminant (NJP pers. obs.). Du Toit and Bartlett (2001) at Ichaboe Island (26°17'S 14°56'E) in Namibia reported that, over a four-year period, 719 Cape Gannets were polluted with an oily fluid that discoloured the affected feathers to yellow. The feathers became sticky and did not interlock, resulting in the feathers becoming waterlogged. The pollutant in that case was not identified but it was suspected to be fish oil (du Toit and Bartlett 2001).

Diatom growths have been recorded on diving seabirds in California (Croll and Holmes 1982). Carcasses of dead Common Murres *Uria aalge* (collected from a gill-net fishery) showed abundant diatom growth (appearing to be slightly 'oiled'), where the diatoms were attached to each other and to barbs of exposed feathers. No comments were made about any possible toxic effects of the phytoplankton.

From a rehabilitation perspective, SANCCOB should examine birds admitted with their feathers impregnated with greenish-yellow substances more critically in future. Feather samples should be sent off rapidly for examination of the nature of the contaminant and for the identification of phytoplankton, if present. This would help to determine whether or not the incident reported here is unusual, or whether contamination of feathers by marine foam is a regular occurrence.

It is not clear how the Swift Terns came to be so heavily coated with marine foam that they became incapacitated. The high tide on 15 December 2003 was at 07:15, two hours after first light. The birds had been found in and near an area where they often roost at night. It is possible that waves during the incoming tide drove thick foam over the birds whilst they were roosting in the intertidal zone, so that they were caught unawares in the dark.

Ages and movements of ringed terns

These birds constituted a sample of the Swift Terns in Table Bay in midsummer, a few months prior to the start of the breeding season and close to the main breeding sites (Crawford *et al*. 1994). The age of first breeding is mainly between three and six years (Crawford *et al*. 2002) and most young birds do not return from their 'nursery areas' to

the breeding areas until after their third year (Underhill *et al*. 1999b). This is consistent with the youngest of the seven ringed birds (Table 1) being 3.8 years old. Swift Tern breeding colonies shift nomadically between the offshore islands of the Western Cape (Crawford *et al*. 1994); it is therefore anticipated that an incident like this off Robben Island should involve birds that were raised on other islands of the Western Cape. The presence of a 4.8-year old bird from Lüderitz, Namibia, could therefore either be a bird moving between its nursery and breeding areas (possibly to breed for the first time) or be the second example of long-distance breeding nomadism — a Swift Tern which fledged in 1981 on Bird Island (33°51'S 26°17'E), Algoa Bay and bred on Malgas Island, Western Cape, in 1997 (Crawford *et al*. 2002). The sample of seven ringed birds contained a disproportionate number of old birds (Table 1). The SAFRING database contains 14 records of Swift Terns older than 20 years, of which the two oldest birds in Table 1 are the fourth and sixth oldest; the oldest Swift Tern on record is 26.5 years old (SAFRING unpubl. data, April 2005).

Conservation value

The 93 birds cleaned and released represented 0.5% of the estimated global population of this subspecies, c. 20 000 (du Toit *et al*. 2003). Given that a concentration of 1% of a waterbird population is regarded as internationally significant, the successful rehabilitation and release of these birds has conservation value. We do not know whether these birds survived the transition back to living in the wild. However, the fact that none were recovered soon after release indicates that they probably survived; it is likely that dead ringed birds washing up on the shoreline of Robben Island or of Table Bay would be found and reported to SAFRING.

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