Productivity of African Black Oystercatchers *Haematopus moquini* on Robben Island, South Africa, in the 2001–2002 breeding season

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Calf, K.M. & Underhill, L.G. 2002. Productivity of African Black Oystercatchers *Haematopus moquini* on Robben Island, South Africa, in the 2001–2002 breeding season. *Wader Study Bull.* 99: 45–49.

Breeding productivity of African Black Oystercatchers was monitored during the austral summer of 2001–2002 on Robben Island, South Africa. Counts were conducted at two-week intervals to determine population changes during the breeding season. The number of pairs that actually bred was about the same as the number observed in the first two counts at the start of the breeding season. A subsequent increase in the numbers may be a result of prospecting birds arriving later. Sixty-seven percent of breeding pairs produced at least one fledgling (similar to the productivity of oystercatchers breeding in protected areas elsewhere). Causes of egg and chick loss probably include predation by natural predators and by cats, dogs and rats (which may be aggravated by human disturbance) and a brood reduction strategy arising because adults are incapable or unwilling to provide food for all the chicks of the clutch.

INTRODUCTION

The African Black Oystercatcher *Haematopus moquini* is the only representative of the family Haematopodidae that breeds in Africa, populating the coast of South Africa and Namibia (Martin 1997, Summers & Cooper 1977). With a world population of about 5,000 in the early 1980s (Hockey 1999), it is classified as "near-threatened" both in South Africa and globally (Barnes 2000, BirdLife International 2000). African Black Oystercatchers breed on the open coast and offshore islands at the peak of the summer holiday season, which runs from November to March (Leseberg *et al.* 2000). Although eggs and chicks are lost to natural causes such as storms, windblown sand and depredation by gulls and predatory mammals such as genets and foxes (Leseberg *et al.* 2000), oystercatcher breeding attempts are also vulnerable to the direct and indirect effects of human disturbance (Jeffery 1987, Hockey 1999, Adams *et al.* 1999, Hockey 2000, Leseberg *et al.* 2000). With ever-increasing human use of the South African coast, the pressure on breeding African Black Oystercatchers is likely to intensify.

Robben Island (33°49'S, 18°22'E) lies in Table Bay, 11 km from the port of Cape Town, and 7 km from the nearest mainland at Bloubergstrand. The shoreline is rocky with various degrees of exposure, dependent on the extent of offshore reefs. Although human disturbance affects limited areas of the shore, the oystercatcher population increased from 40 individuals in 1977 to 130 in 2001. As a result, the island is now an important conservation area for the species (Barnes 1998, Underhill *et al.* 2001).

Adult African Black Oystercatchers are territorial and most stay on the same territory throughout the year. They are long-lived and mate-faithful with a naturally low reproductive rate (≤2 fledglings per pair per year (Hockey 1996)). Some re-nest once a nest has been destroyed, but birds nesting later in the season are less successful than early breeders (Jeffery 1987). Oystercatcher chicks are sub-precocial; they leave the nest soon after hatching but, because they are unable to catch and handle prey, adults provision them until after fledging (Hockey 1984, 1996). Adult workload is thus greatest when feeding chicks because they need to find sufficient food to satisfy their own needs and those of their growing offspring (Hockey 1996, Leseberg *et al.* 2000). Foraging time is limited by access to the intertidal zone during low tide. Therefore food availability, coupled with the effects of sibling rivalry, may mean that chicks face starvation as well as the risk of predation.

Population models indicate that oystercatchers need to fledge an average of 0.33 young per pair per year to maintain stable populations (Hockey 2001). Egg loss and failure of eggs to hatch occur naturally in most areas, but the chick-rearing period has been pinpointed as the bottleneck for population stability or growth (Hockey 2000). Because oystercatchers are long-lived, the effect of elevated reproductive success is evident within 5–6 years but the effect of breeding failure takes much longer to detect (perhaps 15–20 years) (Hockey 2000). Therefore detailed monitoring of breeding success is essential to determine the underlying health of a population. This paper reports the results of the first year of intensive monitoring on Robben Island.

METHODS

This study was conducted during the 2001–2002 breeding season on Robben Island, which has a coastline of about 10 km and is more fully described by Underhill *et al.* (2001). Oystercatchers were counted at two-week intervals from 5 November 2001 to 4 May 2002 along the entire coastline in the following categories: adults, pairs, scrapes, nests, chicks and fledglings. Pairs were defined as birds that roosted and fed close to each other, but not necessarily breeding. Nests were searched for regularly and, once found, were monitored at 4–7 day intervals until hatching. Chicks were similarly monitored until fledging. Although young oystercatchers remain with their parents for several months, fledging was taken as the day from which chicks are able to fly well. This

occurs around the age of five weeks, when the chicks are about two-thirds of adult body mass.

Each chick was ringed on the right leg with a metal ring and a blue plastic ring and on the left leg with a numbered engraved blue and white plastic ring. Thirty-five adult oystercatchers had already been ringed with a metal ring on the right leg and a unique combination of colour rings on the left leg. During counts, some breeding adults were identified by their ring combinations, others by the ring combinations of their chicks or their location in a territory.

Because of their behaviour, it was easy to miss chicks and fledglings during counts. Therefore any seen within two days before or after a count were included in the total. If chicks or fledglings were not seen, but parents showed defensive behaviour, a pair was counted as possibly having chicks or fledglings. Chicks were differentiated from fledglings on the basis of hatching date and young were counted as fledglings if they were over five weeks of age.

RESULTS

Number of birds

Over the breeding season, the number of adult oystercatchers increased from 123 individuals, including 61 pairs, in early November to 193, 96 pairs, in mid-March (Table 1). In late April, there were still 193 birds, 85 pairs. The median count was 176 birds. The maximum number of fledglings counted was 51 in early April, decreasing to 26 in early May (Table 1).

Nests and nest losses

Altogether, 68 nests were located around the coast of Robben Island during the 2001–2002 breeding season (Table 2). Although the first eggs were found in mid-November, the peak of the incubation period was not until mid-January, when there was a maximum count of 25 nests with eggs (Table 1). Chick-rearing peaked the following month with a total of 53 pairs with chicks on 13 February (Table 1). Of the 68 nests, the eggs disappeared from 14 and 11 pairs lost their chicks (Table 2, Fig. 1). All the chicks that disappeared did so within two weeks of hatching. Twelve pairs re-laid after their first clutch or chicks were lost and five of these re-lays were lost (Table 2). Sixty percent of the eggs and chicks that disappeared were from nests in that part of the south coast defined as Area 1 in Table 3 and shown in Fig. 1 and 12% were from nests in Area 2 in the north where Kelp Gulls *Larus dominicanus* bred in 2001–2002 (Calf *et al.* in press). The other nests from which eggs or chicks disappeared were scattered around the remaining coast. When egg and chick losses are related to coast length, the number of losses in Area 1 is significantly greater than that expected though this is not the case for Area 2 (Table 3).

The total number of breeding pairs was 63. The nests of 57 pairs were found and the chicks of six pairs were found after hatching (Table 2). The chicks of the second nest of a pair were found after hatching and these data have been included in "broods found after hatching in the table. Of the pairs with chicks found after hatching, four pairs produced one fledgling and three produced two (Table 2).

There were five one-egg clutches, 57 two-egg clutches and six three-egg clutches. Three of the one-egg clutches successfully produced fledglings. Of the 57 two-egg clutches, six pairs raised two chicks to fledging, five deserted the remaining egg after one had hatched and, of the 32 pairs which had two chicks hatch, 20 pairs fledged a single chick.

DISCUSSION

Population trends

The earliest counts of African Black Oystercatchers on Robben Island known to us are of 40 in 1977 and 89 in 1980. The median of five irregular counts made between December 1998 and August 2001 was 135, and the median of 13 two-weekly counts in summer 2001–2002 was 177 birds (Table 4). At the time of the early counts, the island was used as a prison, and a substantial proportion of the prison officials were recreational fisherman, who probably caused substantial disturbance along the shoreline, both through bait collection and angling (LGU pers. obs.). Because of the nature of running a prison, there would always be staff off-duty, and it is likely that there was a near-continuous presence of people on the coast throughout the day. This disturbance may have resulted in oystercatchers leaving their eggs to be exposed to the elements and to predators (Jeffery 1987). In 2001–2002, the resident human population of the island was

Table 1. Counts of African Black Oystercatchers on Robben Island, South Africa between 5 November 2001 and 4 May 2002.

Date	No. of adults	No. of pairs of adults	No. of pairs with scrapes	No. of pairs with eggs	No. of pairs with chicks	No. of pairs with fledglings
5 November 2001	123	61	0	0	0	0
15 November 2001	127	62	1	1	0	0
29 November 2001	158	68	4	13	0	0
18 December 2001	161	80	14	22	11	0
2 January 2002	162	81	8	24	16	0
16 January 2002	179	81	0	25	25	1
1 February 2002	179	82	0	13	45	5
13 February 2002	191	71	0	8	53	9
4 March 2002	191	92	0	3	27	31
14 March 2002	193	96	0	1	16	43
1 April 2002	172	85	0	0	9	51
20 April 2002	193	85	0	0	1	42
4 May 2002	177	43	0	0	0	26
Median	177					

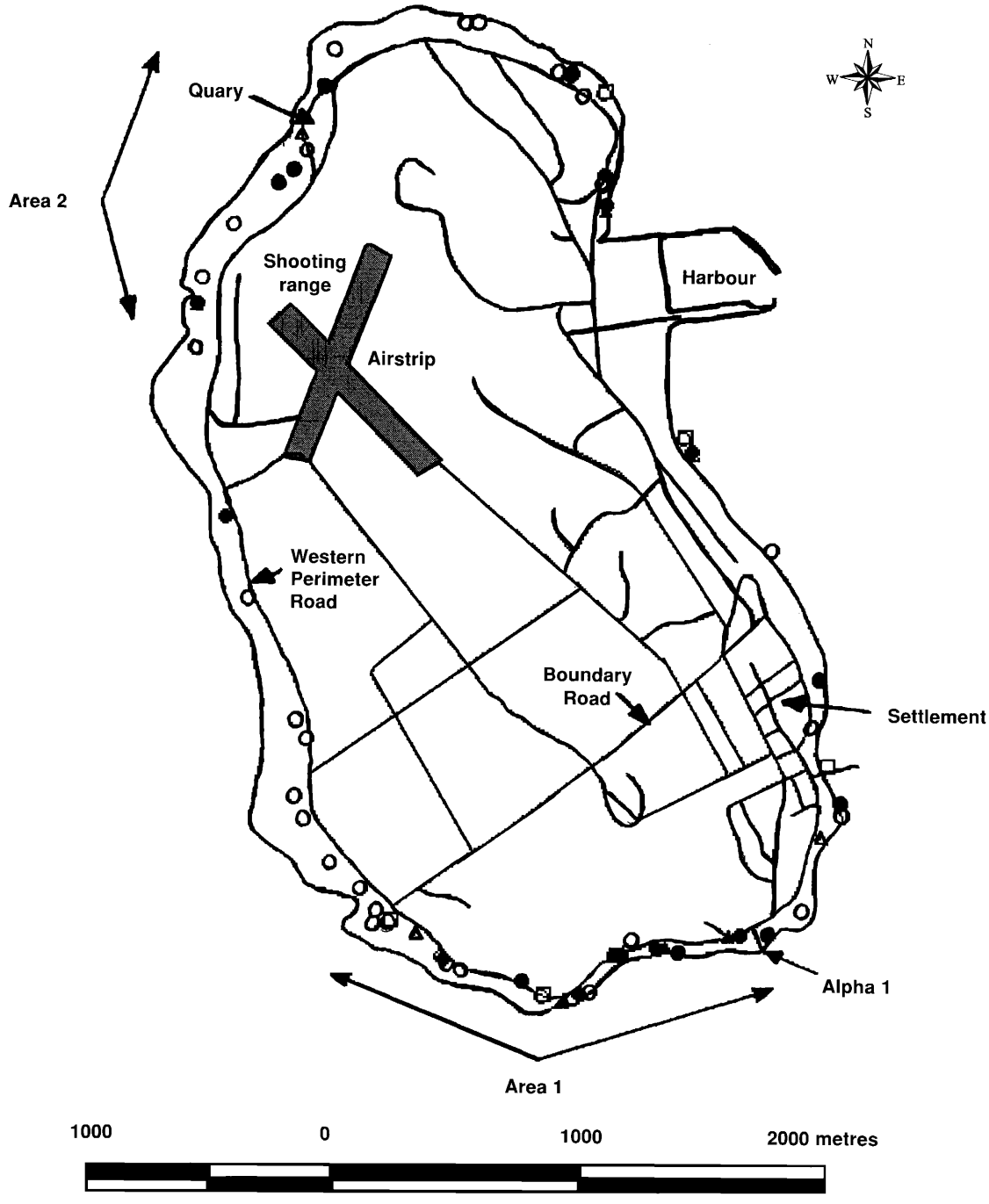

Fig. 1. Location of 68 African Black Oystercatcher nests and six pairs with chicks found after hatching on Robben Island, South Africa, during November 2001 to March 2002. Empty (O) and solid (●) circles indicate the location of nests producing fledglings and nest failures on the first attempt respectively. Empty (△) and solid (▲) triangles indicate the location of second nesting attempts that produced fledglings and that failed respectively. Squares (□) indicate locations where post-hatching chicks were found.

smaller than in prison times, and few of the Robben Island Museum personnel were observed to engage in angling (KMC, LGU pers. obs.). On rocky shores, African Black Oystercatchers feed predominantly on limpets and mussels (Hockey & Underhill 1983). The Palearctic mussel *Mytilus galloprovincialis* has recently invaded the southern African coast where it has outcompeted the indigenous mussel *Aulacomya ater*. An increase in the African Black Oystercatcher population on other offshore islands on the west coast of South Africa has been attributed to the change in oystercatcher diets from indigenous limpets and mussels to the invasive mussel (Hockey & van Erkom Schurink 1992). The colonisation of this mussel may have therefore contributed to the increased numbers of African Black Oystercatchers on Robben Island. Regular monitoring is needed to determine if this upward trend will continue or if the island is already at carrying capacity.

Table 2. Breeding parameters of African Black Oystercatchers on Robben Island, South Africa, during the 2001–2002 breeding season.

	Total nests	Nests in which at least one chick hatched	Total chicks hatched	Chicks hatched per nest	Nests producing at least one fledgling	Total fledlings produced	Fledglings per nest
Initial clutches							
1-egg	5	3	3	0.60	3	3	0.60
2-egg	48	30	51	1.06	30	36	0.75
3-egg	4	2	5	1.25	2	2	0.50
Totals	57	35	59	1.04	35	41	0.72
Second clutches							
1-egg	0	0	0	0	0	0	0
2-egg	9	6	6	0.67	6	7	0.78
3-egg	2	2	3	1.50	1	2	1.00
Totals	11	8	11	1.00	8	9	0.81
Grand total	**68**	**43**	**70**	**1.03**	**43**	**50**	**0.74**
Broods found after hatching	7	?	?	?	7	9	1.29

The 2001–2002 breeding season

The largest counts of oystercatchers, both of 193, were made on 14 March and 20 April 2002, including 96 and 85 pairs, respectively, with the remaining birds occurring as singles or small flocks. Across the breeding season from 5 November 2001 to 20 April 2002, the median number of pairs present was 81. Sixty-three pairs were known to have bred. The number of pairs that bred is almost the same as the number of pairs observed in the first two counts made in November (61 and 62 pairs) (Table 1). We therefore consider that the breeding birds were present in pairs on the island in their territories at the start of the breeding season, before the first nests were found. The increase in the number of pairs during the breeding season may be a result of birds arriving on the island to prospect a breeding territory for the following year. The occurrence of nonbreeding adult oystercatchers in pairs was observed on Marcus Island, South Africa, in January 1976 by Summers & Cooper (1977).

Seventy-six percent of the monitored breeding pairs of African Black Oystercatchers on Robben Island produced at least one fledgling (Table 1). This is similar to the fledging success of 70% found for oystercatchers breeding in areas of the Western Cape that are protected from human disturbance, and far larger than the 25% recorded in unprotected areas (Hockey 2000). At 0.87 fledglings per pair in 2001–2002, the Robben Island oystercatchers comfortably exceeded the threshold of 0.33 young per pair estimated by Hockey (2001) as the fledging success necessary to maintain a stable population.

It seems likely that, though the oystercatchers of Robben Island breed successfully, they operate a brood reduction strategy, preferentially feeding the largest chick or first to hatch (O'Connor 1984) because most pairs only reared one chick to fledging despite 93% of nests containing two or three eggs. Fifty-seven (84%) of all the clutches found consisted of two eggs but only 10 of these raised both chicks (Table 2). Oystercatchers may be unable to provide two or more chicks with sufficient food as a result of poor food availability or the adults may be unwilling to expend their own energy in rearing two chicks, thereby sacrificing their longevity and lifetime reproductive success (Ens *et al.* 1992, Kersten 1997). These factors are currently being investigated.

Table 3. Observed and expected losses of African Black Oystercatcher eggs and chicks on Robben Island, South Africa. Expected numbers were calculated assuming that losses were proportional to the length of coastline. Area 1 is the section of coast between Alpha 1 and the intersection of Western Perimeter Road and Boundary Road (Fig. 1). Area 2 is the section of coast between the quarry and the old shooting range. The differences between the observed and expected values are statistically significant ($\chi^2_2 = 12.0$, $P < 0.001$).

	Area 1	Area 2	Remainder of island
Coast length (km)	1.7	1.3	7.7
Observed number of losses of eggs or chicks	15	3	7
Expected number of losses of eggs or chicks	4	3	18

Table 4. African Black Oystercatcher counts on Robben Island, South Africa (data from Underhill *et al.* 2001 and this study).

Observers	Date	Count
G. Arkell, C. Marais	18 Aug. 1977	40
G.D. Underhill, LGU, H.G. Robertson	8 Dec. 1980	89
P.A. Whittington	26 Dec. 1998	149
Avian Demography Unit	30 Nov. 2000	135
Earthwatch Team	3 Mar. 2001	143
LGU, KMC	18 May 2001	110
LGU, KMC	12 Aug. 2001	126
KMC	Median of 13 counts between 5 Nov. 2001 and 4 May 2002	177

During the summer of 2001–2002, virtually all visitors to the Robben Island Museum undertook a bus tour along the south coast from the settlement past Alpha 1 to Boundary Road, an area that held a high density of breeding oystercatchers (Fig. 1). There, the perimeter road is very close to the shoreline (less than 10 m). Because it is near the settlement, it is also an area where residents walk their dogs. This is the section of coast where oystercatchers experienced the most severe loss of eggs and chicks, with 60% of all losses taking place in Area 1 (Table 3, Fig. 1). It is likely that this arises from disturbance resulting in adults being away from their nests or chicks for long periods making them more vulnerable to predation. The impact of cats, dogs and rats from the settlement has not yet been evaluated but it is likely that they take oystercatcher eggs or chicks. In Area 2, between the quarry where Kelp Gulls bred and the old shooting range, the number of losses was not particularly high (Table 3, Fig. 1). Therefore the Kelp Gulls did not apparently have a large impact on the breeding success of the oystercatchers.

RECOMMENDATIONS

Robben Island is protected as a National Historical Monument and has World Heritage Site status based on its historical and cultural heritage. It already qualifies as a Wetland of International Importance in terms of the Ramsar Convention because it supports more than 1% of the global population of the African Black Oystercatcher, and of the nominate race of the Swift Tern *Sterna bergii bergii* (Barnes 1998, Underhill *et al.* 2001). We therefore recommend that South Africa nominate Robben Island as a Ramsar wetland.

Because of its status as a National Historical Monument, the island is a tourist attraction and the number of visitors has increased in recent years. We therefore recommend that, during the oystercatcher breeding-season (November–April), tourists be directed away from the sensitive shoreline areas where African Black Oystercatchers breed. Tourists should not, for example, be permitted to venture on foot beyond the Alpha 1. Moreover residents should be discouraged from walking along the section of road between Alpha 1 and Boundary Road, and should keep their dogs on a lead. The impact of domestic and feral cats on the oystercatcher population should be also be monitored and if necessary controlled.

In 2000, Kelp Gulls bred on Robben Island for the first time, and 15 pairs bred in 2001–2002 (Calf *et al.* in press). The Kelp Gull breeding season coincides with that of the oystercatchers, but in 2001–2002 the area where they bred was not one with poor oystercatcher breeding success (Table 3). However, Kelp Gulls are known predators of African Black Oystercatchers (Summers & Cooper 1977). We therefore recommend that the Kelp Gull breeding population and its impact on the oystercatchers be monitored. If the Kelp Gulls become a problem for the oystercatchers, they should be controlled.

ACKNOWLEDGEMENTS

This research was supported by the National Research Foundation, the Earthwatch Institute, the Darwin Initiative and the Centre for Isotope Research at the University of Groningen. Robben Island Museum and Marine and Coastal Management provided logistical support. All the willing field workers involved in this project are thanked for their assistance.

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