DISPERSAL, LIFE EXPECTANCY, AND ANNUAL MORTALITY OF WHITEBREASTED CORMORANTS *PHALACROCORAX CARBO* RINGED AS NESTLINGS AT BARBERSPAN

DAVID M. SKEAD

Received 16 May 1980, accepted 2 October 1980

SUMMARY

The Whitebreasted Cormorant *Phalacrocorax carbo* breeds during the austral winter at Barberspan. Ringing of nestlings shows a wide dispersal from the ringing site with a mean recovery distance of 356 km. Seventy-eight percent moved south of Barberspan. Birds recovered elsewhere had a higher life expectancy than those recovered locally. The mean annual mortality rate was 55,4 % and most deaths (73 %) occurred within one year of ringing. Inland bred birds reach the coast suggesting that there may not be two discrete breeding populations.

INTRODUCTION

The Whitebreasted Cormorant *Phalacrocorax carbo* is a common breeding resident at Barberspan (26 33S, 25 36E), Transvaal, South Africa (Shewell 1959, Farkas 1962, 1966, Milstein 1975, Skead & Dean 1977). Barberspan is a large permanent alkaline lake, well stocked with several fish species, and described in detail by Milstein (1975).

The results discussed in this paper are based on nestlings ringed in the years 1955 - 1973 when ringing stopped. Shewell (1959) and Milstein (1975) showed the dispersal from recoveries available to them but did not discuss the results. Their data are included here. The term "local recovery" is used for a bird found dead at Barberspan, while those "recovered elsewhere" were either found dead, shot or captured and released. All recoveries include those up to December 1979.

RESULTS AND DISCUSSION

Breeding at Barberspan is from March to early October with a July/August peak (Farkas 1962), confirmed in Table 1.

Time interval

Seventy-eight percent of the local recoveries were made in the first six months after ringing and 84 % in the first 11 months (Table 2). Mortality of birds ringed as nestlings is high with 57 % dying within the first month after ringing. Sixty-seven

percent of those recovered elsewhere were in the first 11 months. This supports Lack's (1954) view that mortality is high in young and inexperienced birds.

Recovery source

The majority of local recoveries were from birds found dead. Most birds showed no apparent cause of death although some were picked up along the shoreline entangled in discarded nylon fishing line having apparently starved to death. Bunches of discarded nylon are often used as nesting material (Shewell 1959) and nestlings become entangled and die. Some adults nesting in trees are hanged after becoming ensnared in the nylon used for their nests.

Seventy-seven birds were recovered elsewhere which was 3 % of the total ringed; 38 (49 %) were found dead, 29 (38 %) were shot, and 10 (13 %) were caught and released.

Dispersal of young

Fig. 1 shows the wide dispersal of 77 birds recovered elsewhere. The mean distance from Barberspan of 52 birds less than one year old was 354 km (range 14 - 985 km), and for 25 birds one year and older it was 359 km (4 - 1 045 km). The mean recovery distance of all these birds was 356 km. One bird was recovered 672 km from Barberspan 50 days after ringing. Another moved 926 km within four months of ringing, and another was recovered 985 km away after five months.

Table 3 supports the impression of Fig. 1 that most birds moved south. In fact, 78 % were recovered south of Barberspan. Most moved in a southeasterly direction, but those that moved south-west travelled further. Less recoveries could be expected in the northeast because of the arid conditions that prevail. The directions moved are significantly different from random ($X^2_3 = 32,33$; $p < 0,001$).

Jarvis (1970) thought that there were two ecologically separated populations in South Africa; a fresh water population and the other breeding along the coast. The data available to him suggested that most of the fresh water population dispersed along branches of the Orange River and that the one coastal recovery at Alexander Bay was a bird that had moved along the river to the mouth. The data in Table 4 show that other Barberspan ringed birds recovered at or near the coast away from the Orange River system were at the Olifants River estuary, Dwarskersbos, and near Stellenbosch, 24 km from the coast. This applies to two other recoveries in Table 4 where a bird ringed at Bedford, Cape Province (C.P.), was recovered at the Kariega River mouth (Ashton 1954), and another ringed at Fraunstein, South West Africa, was recovered on the coast at Cape Cross, S.W.A. (SAFRING records). These movements suggest that the two breeding populations may not be discrete.

There are 14 recoveries of birds ringed in coastal populations and all were found on the coast or less than 5 km inland (SAFRING records).

TABLE 1

NUMBER OF WHITEBREASTED CORMORANT *PHALACROCORAX CARBO* NESTLINGS RINGED PER MONTH, 1955-1973

Month	Apr	May	Jun	Jul	Aug	Sep	Oct	Total
n	1	39	731	912	496	120	7	2 306

TABLE 2

DISTRIBUTION OF NESTLING WHITEBREASTED CORMORANT *PHALACROCORAX CARBO* RECOVERIES IN TIME AFTER RINGING

Time	Local recoveries		Recovered elsewhere	
	n	%	n	%
1 month	143	57,2	1	1,3
2 months	21	8,4	12	15,6
3 months	12	4,8	5	6,5
4 months	10	4,0	6	7,7
5 months	4	1,6	8	10,4
6 months	5	2,0	4	5,2
7 months	4	1,6	3	3,9
8 months	4	1,6	5	6,5
9 months	6	2,4	5	6,5
10 months	1	0,4	1	1,3
11 months	1	0,4	2	2,6
1 year	17	6,8	10	13,0
2 years	6	2,4	2	2,6
3 years	7	2,8	1	1,3
4 years	5	2,0	3	3,9
5 years	1	0,4	2	2,6
6 years	1	0,4	2	2,6
7 years	2	0,8	1	1,3
8 years	0	0,0	2	2,6
9 years	0	0,0	0	0,0
10 years	0	0,0	1	1,3
11 years	0	0,0	1	1,3
Totals	250	100,0	77	100,0

TABLE 3

DIRECTION AND DISTANCE MOVED BY WHITEBREASTED CORMORANTS *PHALACROCORAX CARBO* FROM BARBERSPAN

Direction	n	%	Mean distance (km)	Range (km)
Northeast	14	18	256	123 - 657
Southeast	37	48	340	41 - 764
Southwest	23	30	442	14 - 1 045
Northwest	3	4	358	6 - 977

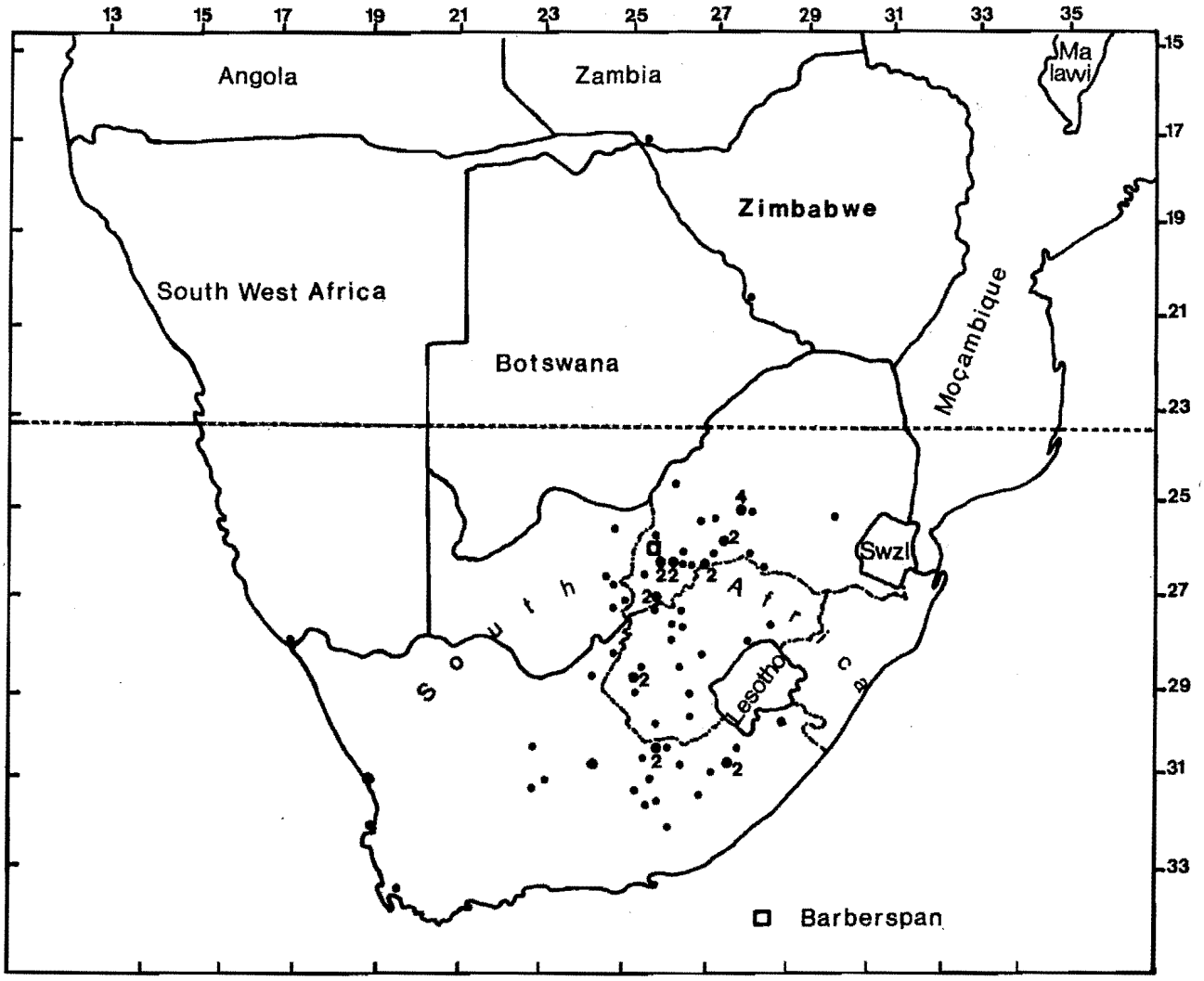

Figure 1

Recovery distribution of Whitebreasted Cormorants *Phalacrocorax carbo* ringed as nestlings at Barberspan

TABLE 4

LIST OF WHITEBREASTED CORMORANTS *PHALACROCORAX CARBO* RINGED INLAND AND RECOVERED ON OR NEAR THE COAST. THE FIRST RECOVERY FROM ASHTON (1954) AND OTHERS SUPPLIED BY SAFRING

Ring No.	Date ringed	Date recovered	Place ringed	Place recovered
B-638	10 Jul 52	Jan 53	near Bedford, C.P. 32 45S, 26 08E	Kariega River mouth, C.P. 33 41S, 26 41E
546-04539	24 Sep 55	18 Jun 57	Barberspan, Tvl. 26 33S, 25 36E	near Stellenbosch, C.P. 33 55S, 18 50E
546-04841	21 May 58	06 Oct 58	Barberspan, Tvl. 26 33S, 25 36E	Alexander Bay, C.P. 28 40S, 16 30E
9-01111	26 Jun 70	08 Feb 79	Barberspan, Tvl. 26 33S, 25 36E	Olifants River estuary, C.P. 31 42S, 18 12E
9-13551	18 Jul 73	30 Dec 73	Barberspan, Tvl. 26 33S, 25 36E	Dwarskersbos, C.P. 32 42S, 18 15E
9-03486	19 May 74	22 Aug 75	Fraunstein, S.W.A. 22 24S, 17 20E	Cape Cross, S.W.A. 21 45S, 13 56E

TABLE 5

LIFE TABLE : WHITEBREASTED CORMORANTS *PHALACROCORAX CARBO* RINGED AS NESTLINGS AND RECOVERED DEAD AT BARBERSPAN

Age class	Recovery in age class	Number alive at start	% still surviving at start	Mean % surviving age i and i + 1	Further life expectancy at start of age, in years
0	124	163	100,0	61,9	1,08
+ 1	17	39	23,9	18,7	1,92
+ 2	6	22	13,5	11,6	2,02
+ 3	7	16	9,8	7,6	1,60
+ 4	5	9	5,5	3,9	1,47
+ 5	1	4	2,4	2,1	1,75
+ 6	1	3	1,8	1,5	1,17
+ 7	2	2	1,2	0,6	0,50
+ 8	0	0	0,0	0,0	0,00

TABLE 6

LIFE TABLE : WHITEBREASTED CORMORANTS *PHALACROCORAX CARBO* RINGED AS NESTLINGS AND RECOVERED ELSEWHERE

Age class	Recovery in age class	Number alive at start	% still surviving at start	Mean % surviving age i and i + 1	Further life expectancy at start of age, in years
0	44	67	100,0	67,2	1,85
+ 1	9	23	34,3	27,7	3,44
+ 2	2	14	21,0	19,5	4,30
+ 3	1	12	18,0	17,2	3,93
+ 4	2	11	16,4	14,9	2,36
+ 5	2	9	13,4	11,9	2,89
+ 6	2	7	10,4	9,0	2,58
+ 7	1	5	7,5	6,8	2,37
+ 8	2	4	6,0	4,5	1,83
+ 9	0	2	3,0	3,0	2,17
+ 10	1	2	3,0	2,5	1,17
+ 11	1	1	2,0	1,0	0,50
+ 12	0	0	0,0	0,0	0,00

TABLE 7

ANNUAL MORTALITY IN WHITEBREASTED CORMORANTS *PHALACROCORAX CARBO* RINGED AS NESTLINGS AFTER HICKEY (1952)

Age interval (years)	No. dead (d'x)	No. dead per 1 000 (dx)	No. survivors per 1 000 (lx)	Mortality rate (qx)
x+0 to x+1	168	730	1 000	730
x+1 to x+2	26	113	270	419
x+2 to x+3	8	35	157	223
x+3 to x+4	8	35	122	287
x+4 to x+5	7	30	87	345
x+5 to x+6	3	13	57	228
x+6 to x+7	3	13	44	295
x+7 to x+8	3	13	31	419
x+8 to x+9	2	10	18	555
x+9 to x+10	0	0	8	0
x+10 to x+11	1	4	8	500
x+11 to x+12	1	4	4	1 000
	230	1 000	1 806	554

Life expectancy

Life expectancy is based on the method used by Franks (1975). The data in Table 5 exclude ringed nestlings found dead in the nest less than one month after ringing because I suspect that this activity leads to increased mortality. The data in Table 6 exclude those birds "captured and released". Birds recovered elsewhere (Table 6) have a greater life expectancy than those recovered at Barberspan (Table 5). This supports the conclusion of Franks (1975) who showed the same phenomenon.

Mortality

Table 7 shows a mean annual mortality of 55,4 % ($\frac{dx}{lx} \times \frac{1\ 000}{1}$) for 226 nestlings. These data exclude those found dead in less than one month as mentioned above.

ACKNOWLEDGEMENTS

My thanks are due to those who helped with the ringing; D.H. Day, T. Farkas, E. Grei, B.L. Grewcock, P. le S. Milstein, P.J.J. Prins and B. Rooiland. J. Cooper and P.D. Morant supplied additional recovery data.

REFERENCES

ASHTON, E.H. 1954. Third progress report : bird ringing 1951-1952. *Ostrich* 25: 2-12.

FARKAS, T. 1962. Contribution to the bird fauna of Barberspan. *Ostrich* suppl. 4: 1-39.

FARKAS, T. 1966. The birds of Barberspan. III. Some structural changes in the avifauna of the Barberspan Nature Reserve. *Ostrich* suppl. 6: 463-491.

FRANKS, E.C. 1975. Bias reduction in bird life expectancy estimates. *Bird-Banding* 46: 241-247.

HICKEY, J.J. 1952. Survival studies of banded birds. *U.S. Fish and Wildl. Serv. Special sci. Rep.* 15: 1-177.

JARVIS, M.J.F. 1970. The White-breasted Cormorant in South Africa. *Ostrich* 41: 118-119.

LACK, D. 1954. The natural regulation of animal numbers. Oxford: Clarendon Press.

MILSTEIN, P. le S. 1975. The biology of Barberspan, with special reference to the avifauna. *Ostrich* suppl. 10: 1-74.

SHEWELL, E.L. 1959. The waterfowl of Barberspan. *Ostrich* suppl. 3: 160-179.

SKEAD, D.M. & DEAN, W.R.J. 1977. Status of the Barberspan avifauna (1971-1975). *Ostrich* suppl. 12: 3-42.

David M. Skead, Transvaal Nature Conservation Division, Barberspan Ornithological Research Station, Barberspan 2765, South Africa.