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CONSERVATION OF AN INCREASING POPULATION OF GREAT WHITE PELICANS *PELECANUS ONOCROTALUS* IN SOUTH AFRICA'S WESTERN CAPE

R. J. M. CRAWFORD, J. COOPER† and B. M. DYER**

Unlike many pelican populations, that of the great white pelican *Pelecanus onocrotalus* in the Western Cape, South Africa, has increased in size, from 20–30 pairs in the first half of the century to over 500 in 1993. The population increase in the past 10 years was too fast to be explained solely by breeding production; immigration also may have been involved. Increased number of coastal water bodies, some stocked with introduced fish, availability of agricultural offal, and lack of disturbance at the breeding site on Dassen Island likely contributed to the population increase. Dassen Island and a number of the coastal water bodies where pelicans roost and forage in the Western Cape are now proclaimed nature reserves. It is suggested that the few important water bodies not yet afforded legal protection should also be proclaimed. Research is needed on the role of offal in the diet and to show whether there has been immigration of pelicans from areas outside the Western Cape.

Anders as vele pelikaanbevolkings het dié van die groot wit pelikaan *Pelecanus onocrotalus* in die Wes-Kaap, Suid-Afrika, vermeerder, van 20–30 pare in die eerste helfte van die eeu tot meer as 500 in 1993. Die bevolkingstoename oor die afgelope 10 jaar was te snel om net deur aanteelproduksie verklaar te word; immigrasie kon dus ook plaasgevind het. Na mening het vermeerdering in die aantal watermassas aan die kus, in sommige waarvan vis geplaas is, beskikbaarheid van landbouafval en afwesigheid van versteuring by die broeiplek op Dasseneiland moontlik tot die bevolkingstoename bygedra. Dasseneiland en 'n aantal kuswatermassas in die Wes-Kaap waar pelikane oornag en jag is nou verklaarde natuurreservate. Daar word aan die hand gedoen dat die paar belangrike watermassas wat nog nie wetlike beskerming geniet nie, ook as reservate verklaar word. Navorsing is nodig oor die rol van afval in die dieet en om te bepaal of immigrasie van pelikane van gebiede buite die Wes-Kaap geskied.

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Pelicans are among the most threatened of the world's waterbirds, being affected by human disturbance, loss of foraging and breeding habitats and pollution (Schreiber 1980, Crivelli and Vizi 1981, Crivelli and Schreiber 1984). Two species, the Dalmatian pelican *Pelecanus crispus* and the spot-billed pelican *P. philippensis*, have estimated global populations of 3 200–4 300 and <1 200 pairs respectively, and they have been considered in danger of extinction (Crivelli and Schreiber 1984, Crivelli *et al.* 1994). Unlike the Dalmatian and spot-billed pelicans, the great white pelican *Pelecanus onocrotalus* still occurs in relatively large numbers (90 000–95 000 pairs, Crivelli and Schreiber 1984) and is widespread, breeding in Europe, Asia and Africa (Cramp and Simmons 1977, Brown *et al.* 1982). However, populations have decreased and breeding sites have been lost throughout the species' range (Crivelli and Schreiber 1984, Crivelli *et al.* 1994). The total African breeding population of the species is an estimated 75 000 pairs (Crivelli and Schreiber 1984). The species has been studied in detail in eastern Africa (Brown and Urban 1969, Din and Eltringham 1974) and in South Africa (Guillet and Crowe 1981, 1983, Guillet and Furness 1985).

The great white pelican currently breeds at only two localities in South Africa: Dassen Island, Western Cape, and Lake St Lucia, Kwazulu/Natal (Berruti 1980, Cooper 1980). The species has been listed as "rare" in the South African Red Data Book for birds, with an estimated national population of c. 2 000 pairs (Brooke 1984). Unlike many pelican populations elsewhere, that in the Western Cape has increased in size this century (Brooke 1984). In this paper the increase in population size is documented and the reasons why one of the world's pelican populations is thriving while so many are not are speculated upon.

METHODS

Data have been collected from three main sources: breeding censuses conducted at Dassen Island; synoptic counts of pelicans at coastal water bodies in the Western Cape; and a review of published and unpublished sources of information, e.g. egg collections, nest

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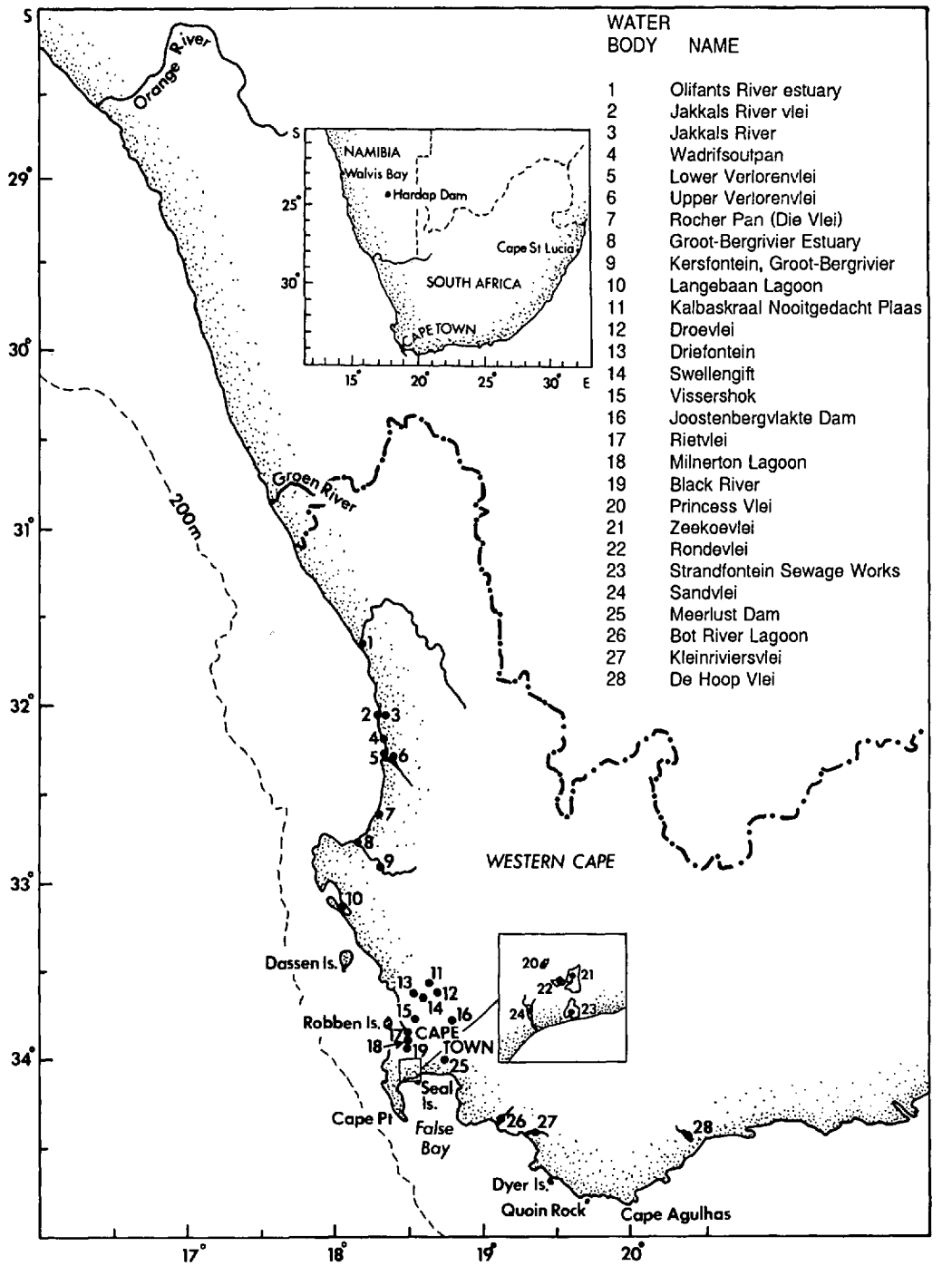

Fig. 1: Location of the 28 water bodies where great white pelicans were counted between 1976 and 1985, and of some other places mentioned in the text

Table I: Breeding records and counts of great white pelicans in South Africa's Western Cape, 1604–1994

Date	Breeding details	Source
	Robben Island	
Jul.–Aug. 1604, 1607, 1610	Breeding assumed by Brooke 1983	Raven-Hart 1967
	Dyer Island	
c. 1869	Egg collected	Layard and Sharpe 1884, Brooke 1984
30 Jan. 1898	Egg collected	Brooke 1984
Jan. 1913	Egg collected	Brooke 1984
Jan. 1919	Egg collected	Brooke 1984
	Quoin Rock	
1894–1902	Breeding	Sclater 1906, Rand 1963
15 Feb. 1898	Egg collected	James 1970
	Seal Island, False Bay	
Oct. 1930	Egg collected	James 1970
16 Nov. 1931	22 nests with eggs	Wyndham 1932
30 Sep. 1933	Egg	H. J. Joubert, SAOS NRC*
9 Oct. 1950	c. 30	Rand 1951, SAFRING ringing records
7 Sep. 1951	26 nests with eggs	Rand 1951
4 Feb. 1954	25 nests with eggs and chicks	R. Liversidge, SAOS NRC*
Oct. 1956	43 adults present, no successful breeding	Rand 1963
	Dassen Island	
17 Jan. 1956	25 chicks	R. W. Rand in Rondevlei Bird Sanctuary records
26 Feb. 1971	87 large chicks, Limekiln Bay	JC pers. obs.
9 Dec. 1971	76 chicks, four addled clutches, Boom Point	JC pers. obs.
18 Mar. 1976	33 fledged chicks, Boom Point	JC pers. obs.
17 Jan. 1977	96 fledged chicks, Boom Point	Cooper 1977
Sep. 1977 – Jan. 1978	246 breeding pairs in three "waves" at different localities	Guillet and Crowe 1983
23 Oct. 1978	174 occupied nests, Boom Point	Cooper 1980
2 Dec. 1979	c. 90 nests with eggs in two colonies, Boom Point	JC pers. obs.
15 Mar. 1980	25 fledged chicks	P. D. Shaughnessy, SAOS NRC*
12 Jan. 1983	61 fledged and flying young	R. Prys-Jones, pers. comm. to JC
Nov. 1984 – Jan. 1985	250–500 birds present, some breeding	J. Boonzaier, formerly Dassen Island headman, *in. litt.*
10 Feb. 1985	63 large chicks	G. D. Underhill *in litt.*
26–31 Oct. 1985	185 occupied nests	This study
31 Oct. – 3 Nov. 1988	260 occupied nests	"
27 Oct. – 1 Nov. 1989	265 occupied nests	"
25 Oct. 1990	330 occupied nests and 77 fledged chicks, i.e. 407 breeding pairs	"
1–5 Oct. 1991	434 occupied nests	"
26–31 Oct. 1992	306 occupied nests	"
16–17 Sep. 1993	504 occupied nests	"
25 Oct. 1993	411 occupied nests	"
14–17 Feb. 1994	15–30 fledged chicks	"
21 Sep. 1994	364 occupied nests	"
22 Oct. 1994	400 occupied nests	"

* Southern African Ornithological Society nest record card

record cards of the Southern African Ornithological Society, personal communications.

Dassen Island was visited in the austral spring, when pelicans breed there (Cooper 1980), 10 times between 1985 and 1994 to count the breeding population. Colonies of breeding birds were approached slowly, sometimes by crawling, to avoid loss of eggs and small chicks to kelp gulls *Larus dominicanus*.

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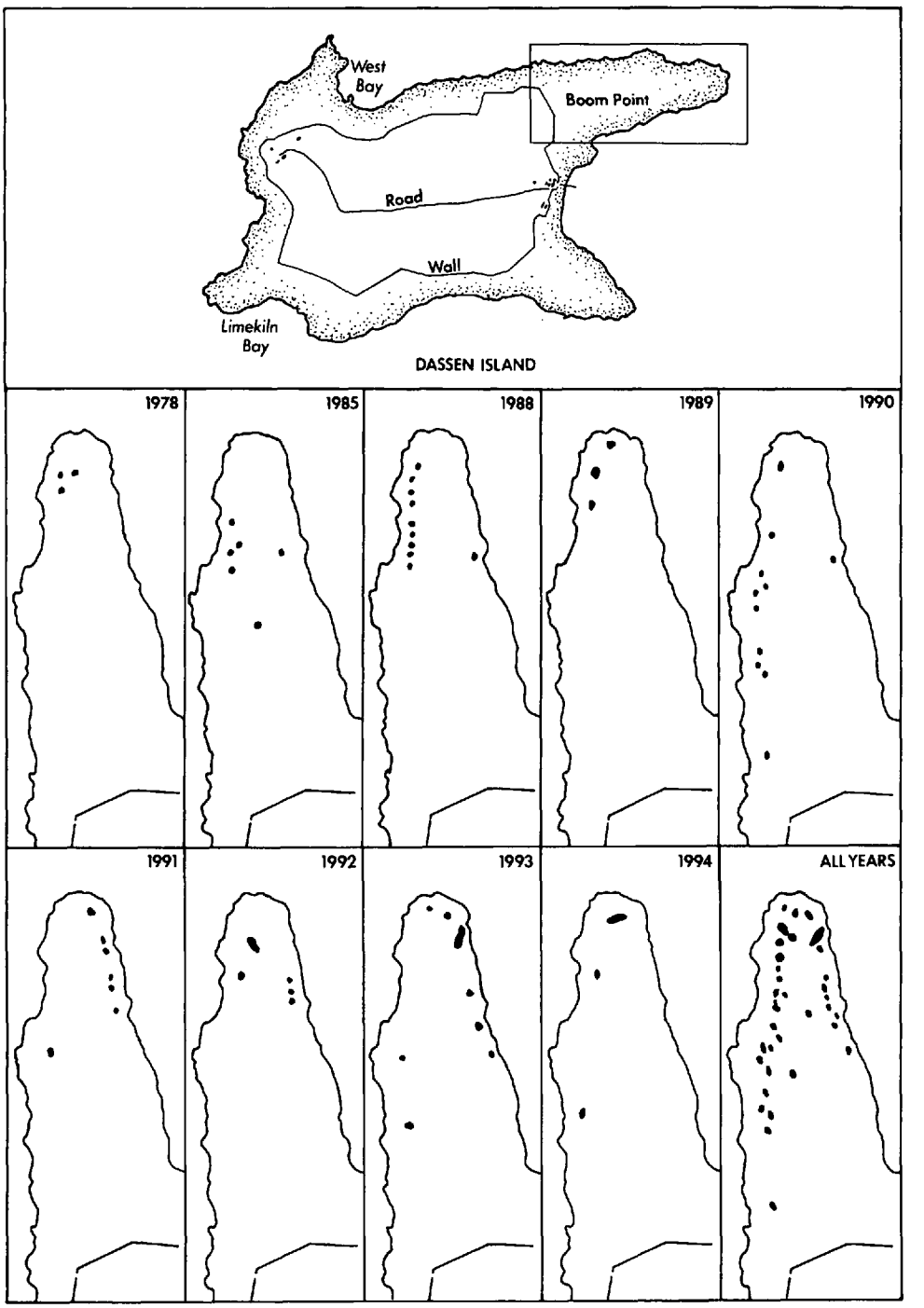

Fig. 2: Dassen Island, showing the location of breeding colonies of great white pelicans on Boom Point in 1978, 1985, 1988–1994 and in summary for all of these years

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Table II: Synoptic counts of great white pelicans at coastal water bodies, Western Cape, South Africa, 1976–1985

Date	Juveniles	Adults	Not aged	Total	% Juveniles
28 March 1976	79	477	15	571	14,2
16 April 1977	21	463	0	484	4,3
9 April 1978	78	574	0	652	12,0
8 April 1979	74	450	0	524	14,1
11 May 1980	25	416	5	446	5,7
2 May 1981	41	446	0	487	8,4
9 May 1982	22	529	0	551	4,0
24 April 1983	22	323	7	352	6,4
15 April 1984	14	397	0	411	3,4
9 June 1985	67	373	0	440	15,2
Mean ± *SD*	44 ± 27	445 ± 73		492 ± 87	9,0

Counts of incubating and brooding adults and of chicks in creches were made from a distance of c. 20 m with binoculars. Each incubating or brooding adult was assumed to represent one breeding pair, as were chicks in creches, because fatal sibling aggression reduces broods to one soon after hatching (Cooper 1980). When only creches of chicks were encountered they sometimes wandered from their nest sites, making it possible to count them. Counts of clearly defined nest sites were preferred to counts of chicks, because the former were considered to be more accurate and also allowed for the inclusion of failed breeding attempts. The locations of breeding colonies were mapped, and the number of breeding pairs in each colony was recorded. During some breeding censuses, regurgitations by large chicks were collected and the food items identified and weighed.

A total of 10 annual ground censuses was conducted at coastal water bodies between March and June, after the conclusion of breeding, from 1976 to 1985. Counts of roosting and foraging birds were made at 28 water bodies known to be visited by pelicans. These were undertaken by a number of observers on the same day before mid morning and before thermals formed and birds took to the air. The coastal water bodies visited extended from the Olifants River estuary to De Hoop Vlei (Fig. 1). Localities surveyed are listed by Cooper (1976, 1977, 1978, 1979) and Guillet and Crowe (1981). Juvenile, i.e. first-year, birds were recognized by their brown plumage (Cramp and Simmons 1977) and were usually counted separately from adults. The 1985 census was supplemented by an aerial search, using a Cessna 172 Skyhawk II, for pelicans at small inland water bodies not normally surveyed from the ground. In some years counts were also made at the mouth of the Orange River on the border between South Africa and Namibia.

RESULTS

Great white pelicans were first recorded in the Western Cape in 1604, prior to the establishment of a European settlement (Raven-Hart 1967), suggesting

Table III: Counts of great white pelicans at the Orange River mouth, Northern Cape, South Africa, 1942–1987

Date	Juveniles	Adults	Not aged	Total	Source
June 1942*				c. 40	Plowes 1943
5 January 1976		4		4	S. Pringle pers. comm.
11 December 1976				44	Frost & Johnson 1977
26 April 1978	2	75		77	Manry 1978
13 January 1980				247	Ryan & Cooper 1985
26 January 1980				162	A. Rudolf *in litt.*
11 May 1980*		80		80	A. Rudolf *in litt.*
10 May 1981	≥3		c. 170	173	A. Rudolf *in litt.*
14 May 1981†				176	A. Rudolf *in litt.*
10 May 1982	7	163		170	A. Rudolf *in litt.*
March 1983	≥30	49		79	A. Rudolf *in litt.*
April 1984	5	68		73	A. Rudolf *in litt.*
14 March 1985	c. 40	c. 200		c. 240	P. D. Morant *in litt.*
12 May 1985	c. 50	c. 190		c. 240	A. Rudolf *in litt.*
16 December 1985				24	Williams 1986
2–13 April 1986				115	Williams 1986
24–28 August 1987				≥115	P. D. Morant *in litt.*

* Identified as pinkbacked pelicans *Pelecanus rufescens*
† Aerial census, all others ground counts

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that the species occurred prehistorically in the region. The first definite record of breeding was not until about 1869, when an egg was collected at Dyer Island (Table I and Layard and Sharpe 1884). Records of breeding were sporadic until the mid 1970s; since then breeding has been recorded in most years.

The history of pelicans breeding in the Western Cape was summarized by Brooke (1984). Pelicans may have bred on Robben Island in the early 1600s (Raven-Hart 1967, Brooke 1983). In the 19th and early 20th centuries they bred in unknown numbers at Dyer Island and Quoin Rock (Table I). Persecution by guano collectors on Dyer Island and displacement by a growing population of Cape fur seals *Arctocephalus pusillus pusillus* on Quoin Rock resulted in pelicans ceasing to breed at these two localities some time after 1919 (Layard and Sharpe 1884, Symons 1924, Rand 1963, Brooke 1984). Pelicans were first recorded on Seal Island, False Bay, in the late 1920s (Shaughnessy 1984). Between 1931 and 1954 they bred there (an estimated 20–30 pairs, Table I), but disturbance by fur seals and humans, including sealers, and guano collectors until 1949, caused the birds to vacate the island (Rand 1963, Brooke 1984, Shaughnessy 1984, Crawford and Payne 1989). An unpublished note by R. W. Rand (Rondevlei Bird Sanctuary files) states that the pelicans finally left Seal Island in 1955, although non-breeding pelicans were recorded there in 1956 (Rand 1963, Table I), after their nests on hut roofs were destroyed to allow painting. Up to 1950, pelicans at Seal Island bred on shingle at ground level (Wyndham 1932, Rand 1951, 1963). The rapidly growing population of fur seals from the 1940s to 1955 (Shaughnessy 1984) presumably had forced the birds to use rooftops for breeding.

Great white pelicans commenced breeding at Dassen Island in the 1955/56 breeding season, and all subsequent breeding records for the Western Cape have been from there (Table I). By 1993/94 the breeding population at Dassen Island had increased from <100 pairs to over 500. This trend does not appear to have been a steady one, with population increases interspersed by relatively stable periods, e.g. between 1978/79 and 1985/86, and years with a drop in the breeding population, e.g. 1992/93 and 1994/95 (Table I). The breeding population doubled in size between the 1989/90 and 1993/94 breeding seasons (Table I).

In all seasons between 1985/86 and 1994/95, and in some earlier ones, great white pelicans bred on the north-west point of Dassen Island, termed Boom Point (Fig. 2). Large chicks were seen near Limekiln Bay in 1970/71 and near West Bay in 1990/91, but the extent to which they had wandered from their original nest sites is uncertain. Locations of breeding colonies on Boom Point varied between seasons. In nine seasons, the pelican colonies were located at 35 different sites on Boom Point (Fig. 2).

The maximum number of colonies recorded at Dassen Island in any one breeding season was 12 (including one near West Bay), in 1990/91. Only three colonies were recorded in 1989/90 and 1994/95. Mean colony size was 51 pairs ($n = 53 \pm 65$; range 4–312). Most colonies contained <51 pairs, 11 had 51–100 pairs, and six had >100 pairs.

Counts at coastal water bodies in the Western Cape fluctuated during the period 1976–1985 (Cooper 1976, 1977, 1978, 1979, Table II). The mean number of adult birds (445) roughly matches the two largest breeding censuses at Dassen Island during this period (174 and 246 pairs, Table I). However, 574 adult pelicans were counted in April 1978. Counts at the Orange River mouth have fluctuated considerably, up to a maximum of 247 birds (Table III), but breeding has never been recorded there (A. Rudolf, formerly Consolidated Diamond Mines, Oranjemund, *in litt.*).

The percentage of juveniles at water bodies in the

Table IV: Percentage contribution by mass and number of different items to regurgitations of great white pelicans at Dassen Island, and the number of regurgitations collected, 1990–1994

Prey eaten	By mass				By number			
	1990/91	1992/93	1993/94	Overall	1990/91	1992/93	1993/94	Overall
Jasus lalandii	–	–	13,4	1,2	–	–	33,3	4,2
Cyprinus carpio	–	56,4	–	48,4	–	36,8	–	29,2
Liza richardsonii	–	0,6	–	0,5	–	5,3	–	4,2
Xenopus laevis	–	3,9	–	3,4	–	15,8	–	12,5
Phalacrocorax capensis	–	12,2	–	10,5	–	10,5	–	8,3
Gallus gallus remains	66,8	22,8	86,6	30,9	50,0	26,3	66,7	33,3
Sus scrofa remains	33,2	4,1	–	5,1	50,0	5,3	–	8,3
Number of regurgitations	1	13	3	17	1	13	3	17

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Western Cape varied from 3,4 to 14,1% between years (Table II). Proportionally fewer juveniles were recorded on the Orange River (Table III). There are very few coastal water bodies between the Orange and Olifants rivers, the only perennial one being the mouth of the Groen River (Ryan and Cooper 1985), where five juvenile and 36 adult great white pelicans were counted on 28 August 1987 (P. D. Morant, CSIR Environmental Services, pers. comm.).

In all, 17 regurgitations collected in the 1990s yielded seven prey species (Table IV), including some of freshwater and marine/estuarine origin and scavenged agricultural offal. In terms of mass, the freshwater carp *Cyprinus carpio* dominated. Another freshwater item was the clawed frog *Xenopus laevis*. Marine prey included rock lobster *Jasus lalandii*, southern mullet *Liza richardsonii* and Cape cormorant *Phalacrocorax capensis*. Remains of domestic chicken *Gallus gallus* (the most numerous item) and domestic pig *Sus scrofa* formed the offal. Species identified in 1972 were carp and clawed frog larvae. In September 1993, an adult pelican at a breeding colony on Dassen Island was seen to catch and swallow an adult Cape cormorant. Adult great white pelicans have also been observed catching and eating kelp-gull chicks at Dassen Island in early summer (J. du Preez, Dassen Island headman, pers. comm. to RJMC and BMD). In the latter instance, several pelicans walked in a line through a breeding area of kelp gulls at the north-east end of the island.

DISCUSSION

Great white pelicans in South Africa's Western Cape have increased in numbers at a time when pelican populations worldwide are threatened (Crivelli and Schreiber 1984). There may be several reasons for this state of affairs.

First, the move of pelicans to the 200-ha Dassen Island in the mid 1970s gave far more space for breeding. At Seal Island, which is just 2 ha, nests were restricted to hut roofs, presumably to avoid fur seals, which no longer occur on Dassen Island. At least from the early 1970s, and probably from earlier (W. van Dyk, formerly Dassen Island headman, pers. comm. to JC), pelicans breeding on Dassen Island were protected from human disturbance. In most years they have bred near Boom Point (Table I, Fig. 1), an area "closed" to all human entry during summer in the 1960s and early 1970s to allow guano-producing Cape cormorants to breed undisturbed. Undisturbed breeding at Dassen Island contrasts with the earlier situation when pelicans were regularly disturbed at Dyer Island, Quoin Rock and Seal Island.

Second, the number of coastal water bodies suitable for pelican foraging in the Western Cape has increased markedly with the building of farm dams and the dredging of seasonal vleis this century (Guillet and Crowe 1981). Third, introduction of fish, especially carp, to water bodies has led to a readily available food supply, which forms an important part of the pelican's diet in the Western Cape (Guillet and Crowe 1981, Guillet and Furness 1985, Table IV). Availability of offal (Table IV), on which pelicans have been seen feeding at a municipal dump near the Berg River estuary (R. K. Brooke, University of Cape Town, pers. comm., JC pers. obs.), may also have been a factor.

Levels of disturbance to breeding birds, and the availability of foraging habitats and food supply have not changed markedly over the past decade, so other factors may be responsible for the most recent increase in pelican numbers. Mean annual breeding production, as measured by counts of juveniles a few months after fledging (44 birds — Table II), is inadequate to explain the increase of 319 breeding pairs (638 individuals) in the eight years between 1985/86 and 1993/94 (Table I). The highest recorded production (79 — Table II) would have been almost sufficient, if sustained. However, there must be further mortality before juveniles commence breeding at three or four years of age (Cramp and Simmons 1977, Grummt 1984). It is known that juvenile pelicans disproportionately frequent small and ephemeral water bodies in the Western Cape (Cooper 1977, Guillet and Crowe 1981). Such water bodies were not all visited during surveys, so juveniles may have been undercounted in some years. It is also possible that not all adults were breeding in 1985/86, or that some stopped breeding prior to the count being made. Not all adult great white pelicans necessarily breed every year (Cramp and Simmons 1977). Indeed, large changes in numbers of birds breeding between 1991/92 and 1994/95 indicate interannual variation in the proportion breeding. The relatively small breeding population counted in 1992/93 may have resulted from failures early in the breeding season, such as observed the following year, when the numbers of breeding pairs decreased by 18,5% between mid September and late October (Table I). The same is less likely to be the case for 1994/95, when a low count was made early in the season.

It is possible that immigration caused some of the population growth. The only other South African colony of breeding great white pelicans, in northern Kwazulu/Natal, is far from the easternmost major feeding locality of the Western Cape at De Hoop Vlei (Underhill *et al.* 1980, Brooke 1984, Ryan *et al.*

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1986, 1988). However, pelicans have bred at several localities in Namibia (Berry *et al.* 1973, Crawford *et al.* 1981, C. J. Clinning, South African Ornithological Society nest record card). With coastal localities such as Sandwich Harbour (Whitelaw *et al.* 1978) and the mouth of the Orange and Groen rivers acting as "staging posts", some pelicans from the breeding colonies in Namibia at Bird Rock Platform, Walvis Bay, or inland Hardap Dam may have joined the Western Cape population (Cooper 1978). Very few pelicans have been banded in southern Africa (T. B. Oatley, SAFRING, pers. comm.) and no recoveries exist to substantiate such speculation. However, the 247 pelicans that frequent the Orange River (Table III), where no breeding has ever been reported, must come from either (or both) the populations of Namibia or the Western Cape. It is thought unlikely that they could be derived from breeding populations at Lake St Lucia or Botswana (Jacka 1972, Jones 1979), given the large distances and lack of intervening records of any but vagrant birds (Brooke 1984). Pelicans are large and are obvious candidates for satellite radio-tracking, which would help resolve this issue.

Although the population of great white pelicans in the Western Cape is flourishing, the birds do face some threats. Some, mainly juveniles, are killed by flying into overhead wires when moving between water bodies. At localities where this occurs regularly, devices such as fibreglass spheres can be attached to wires to make them more visible. Such devices have been placed between the Rondevlei Bird Sanctuary and Zeekoevlei and between the Berg River estuary and adjacent salt pans. At Dassen Island in May 1989, one adult pelican was found dead with a plastic bottle of length 258 mm and diameter 84 mm in its stomach. On 31 January 1991, 53 pelicans died after apparently feeding on dumped offal at chicken farms near Kalbaskraal (*The Argus*, 6 February 1991). Poisoning from fly-control efforts was suspected, but no analyses were conducted owing to the state of decomposition of the carcasses. As offal forms a significant part of the pelican's diet (Table IV), the risks of further poisonings exist. At Dassen Island, two adult pelicans were found dead in October 1991, probably from avian cholera *Pasteurella multocida* that had caused the deaths of other seabirds there as well (Crawford *et al.* 1992). In spite of these observed mortalities, there was a small increase in the breeding population between 1990/91 and 1991/92 (Table I).

What further action is required to enhance the great white pelican population in South Africa's Western Cape? Dassen Island was proclaimed a provincial nature reserve in 1988 (Cooper and Berruti 1989) and is currently manned by an island headman who deters illegal landings. Because pelicans are easily disturbed while breeding (Crivelli and Schreiber 1984, pers. obs.), it is essential that the island continues to be wardened, at least in summer when the pelicans are present. To this effect, the island requires a formal management plan to be produced and implemented (Cooper and Berruti 1989), especially as ecotourism to view the island's bird life is mooted from time to time (Z. Erasmus, Western Cape Nature Conservation, pers. comm.).

In recent years, two coastal water bodies frequented by pelicans in the Western Cape (Cooper 1976, 1977, 1978, 1979, Guillet and Crowe 1981) have been afforded legal protection as a nature reserve (Rietvlei) or a national park (Langebaan Lagoon). Four water bodies have been further protected by registration with the Convention on Wetlands of International Importance, especially as Waterfowl Habitat (the Ramsar Convention). These are De Hoop Vlei, Langebaan Lagoon, the Orange River mouth and Verlorenvlei (Cowan and Müller 1994). The Orange River mouth and Verlorenvlei had been specifically identified by Brooke (1984) for improved conservation status because of their pelican populations. Therefore, there has been a noticeable improvement in the protection of water bodies in the Western Cape in the past two decades (Cooper *et al.* 1976). Based on the 1976–1985 surveys, 45,8% of the pelican population was counted within currently existing reserves, with a range of 12,7–65,5%.

Consideration should now be given to improving the conservation status of the Berg and Olifants River estuaries and Zeekoevlei, because these are the three most important foraging and roosting localities in the Western Cape (Cooper 1976, 1977, 1978, 1979, Guillet and Crowe 1981) not yet afforded any legal protection. Protection of these three localities would boost the pelican population in nature reserves (based on the 1976–1985 surveys) to 72,9% (range 52,5–98,7%). Ramsar Convention status for the Berg River estuary is now under consideration by the South African Ramsar Working Group of the Department of Environmental Affairs and Tourism (G. I. Cowan, Department of Environmental Affairs and Tourism, pers. comm.).

Future studies of great white pelicans in South Africa's Western Cape should continue to monitor population changes by annual censuses at breeding colonies, to ascertain whether immigration is playing a role in the increase and to study the significance of dumped offal to the diet and breeding success.

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