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Recent Trends of the Kelp Gull (*Larus dominicanus*) in South Africa

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Abstract.—South Africa's population of Kelp Gulls (*Larus dominicanus vetula*) numbered about 10,000 pairs during 1976/1977-1980/1981, increased to 21,000 pairs from 2000/2001-2004/2005 and then decreased to 17,500 pairs from 2009/2010-2013/2014. The increase in the late 20th century and the decrease in the early 21st century were mainly attributable to large increases and decreases in numbers breeding at islands off the west coast of South Africa. The increases followed cessation of controls on Kelp Gulls at the islands in the 1970s and were associated with supplementary food provided by fisheries and landfill sites, whereas the decreases were influenced by substantial predation of chicks by Great White Pelicans (*Pelecanus onocrotalus*). The decreases of Kelp Gulls at islands off the west coast of South Africa in the early 21st century were offset to some extent by an increase in numbers breeding on mainland sites, especially around greater Cape Town and along the south coast. The proportion of Kelp Gulls breeding on the south coast increased from 15% in 2000/2001-2004/2005 to 44% in 2009/2010-2013/2014. As there are fewer islands off the south coast than the west coast of South Africa, the proportion of Kelp Gulls breeding at mainland sites as opposed to island localities increased from 12% in 2000 to 31% in 2014. Mainland colonies are more susceptible to disturbance by humans and predation by mainland carnivores, but, in spite of this, the generalist Kelp Gull has performed better in recent years than several specialist, endemic seabirds. At Dyer Island and Bird Island (Algoa Bay), where Kelp Gull numbers increased, predation by Kelp Gulls on eggs and chicks of threatened seabirds is thought to have contributed to decreases in these seabirds, and controls on Kelp Gulls have been reintroduced. Received 1 June 2014, accepted 20 July 2015.

Key words.—distribution change, food, Kelp Gull, *Larus dominicanus*, natural predation, population control, population trend.

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The conservation status of many seabird species has given cause for concern in recent years with 97 (28%) of 346 species listed as globally threatened (Croxall *et al.* 2012). Of the 15 species of seabirds that breed regularly in southern Africa (Cooper *et al.* 1984; Whittington *et al.* 1999; Crawford *et al.* 2014),

nine are included on the South African Red Data list as Threatened and one as Near-threatened (BirdLife South Africa 2014). In contrast, many gull (Laridae) species have increased in numbers (Conover 1983; Blokpoel and Spaans 1991; Hatch 1996; Yorio *et al.* 1998), probably as a result of their abil-

ity to adapt to human-altered environments and take advantage of food sources such as fishery discards and organic waste at landfill sites.

The Kelp Gull (*Larus dominicanus*) is widespread in the Southern Hemisphere, breeding in southern Africa, South America, Antarctica, Australia, southern Madagascar, New Zealand and on subantarctic islands (Jiguet 2002). Its International Union for Conservation of Nature Red List status is Least Concern, with the global population estimated to number 3.3 to 4.3 million individuals and to be increasing, although some populations have unknown trends (BirdLife International 2014). Kelp Gulls breeding in southern Africa are recognized as a distinct subspecies *L. d. vetula* (Brooke and Cooper 1979), representing approximately 2% of the global Kelp Gull population (Wetlands International 2006). Crawford *et al.* (1982) estimated that 8,906 pairs (approximately 80% of the population) of *L. d. vetula* bred at 36 localities in South Africa in 1981. Of the 8,906 pairs, 7,444 (84%) bred on offshore islands. No clear overall trend in numbers was recognized (Crawford *et al.* 1982). Whittington *et al.* (2006) recorded a 71% increase in numbers of Kelp Gulls breeding from Plettenberg Bay eastward along the south coast of South Africa between 1982 and 2004, while Crawford *et al.* (2009a) recorded an increase in numbers on 11 islands in the Western Cape between 1978 and 1999/2000 followed by a subsequent decrease. This study reports trends for the *L. d. vetula* subspecies throughout South Africa and within five regions around the South African coast between the 1976/1977 and 2013/2014 surveys.

METHODS

To investigate a possible change in the distribution of Kelp Gulls breeding around the South African coastline, we split the coastline into the five regions similar to those defined in Crawford *et al.* (2013): Northern Cape, West Coast, Cape Town-Cape Agulhas, South Coast and Eastern Cape (Fig. 1). The West Coast, Cape Town-Cape Agulhas and part of the South Coast regions fall within the provincial boundaries of the Western Cape Province. A distance of approximately 400 km separates

the Kelp Gull colonies of the Northern Cape from those in the West Coast region, and trends in other seabird species have shown differences between the northern and southern parts of the Western Cape (Crawford *et al.* 2014). The provincial boundary of the Eastern Cape falls within the Garden Route National Park, so for the purposes of this study the Eastern Cape is defined as the area between St. Francis Bay and the most easterly breeding site near Hamburg (Fig. 1).

Nest counts were carried out at 74 localities between 1976 and 2014; three in the Northern Cape, 20 in the West Coast region, 14 in the Cape Town-Cape Agulhas region, 23 in the South Coast region and 14 in the Eastern Cape. Breeding sites were located between the Orange River mouth at 38° 37' S, 16° 28' E (Anderson *et al.* 2003), which straddles South Africa's border with Namibia (Fig. 1A), and a location near Hamburg in the Eastern Cape at 33° 21' S, 27° 22' E, where an isolated single breeding attempt occurred (Tree 2006) (Fig. 1E). The total number of Kelp Gulls breeding in South Africa during 1976/1977-1980/1981 was estimated by Crawford *et al.* (1982) by summing the highest counts of numbers of pairs obtained at colonies visited during this period. To examine trends in the numbers of Kelp Gulls breeding in South Africa, we selected two 5-year periods (2000/2001-2004/2005 and 2009/2010-2013/2014) that had reasonably complete census information for the main breeding localities and similarly summed the maximum counts of breeding pairs at each locality visited in a 5-year period. The colonies that were counted in the three different 5-year periods were not always the same. Therefore, for each period we again summed the maximum counts at colonies that were not counted in the period (but omitted colonies that were known to have been formed after the period being considered) to gauge the possible extent of undercounting for the period. We also compared estimates between pairs of periods, which were based on the sums of the maximum counts at colonies that were visited in both periods.

In addition to examining changes between periods in the numbers of Kelp Gulls breeding in each of the five regions, we also examined the proportions breeding at offshore islands (including rocks and stacks surrounded by the ocean) and on the mainland (including islands in salt works and estuaries). Two of the mainland sites were formerly islands: Bird Island adjacent to Lambert's Bay and Marcus Island in Saldanha Bay, which were joined to the mainland in 1959 and 1976, respectively, by causeways to form sheltered harbors (Jarvis and Cram 1971; Shelton *et al.* 1984). Many years of data were available from 11 localities in the Western Cape and at the Swartkops Estuary in the Eastern Cape (Crawford *et al.* 2009a, 2009b). Long-term changes in numbers of Kelp Gulls were investigated using these 12 localities.

Counts were made either from vantage points using 10x magnification binoculars after breeding Kelp Gulls had settled at nests, or by walking tightly spaced grids and marking nests (see Crawford *et al.* 1982, 2009a; Martin and Randall 1987; Whittington *et al.* 2006

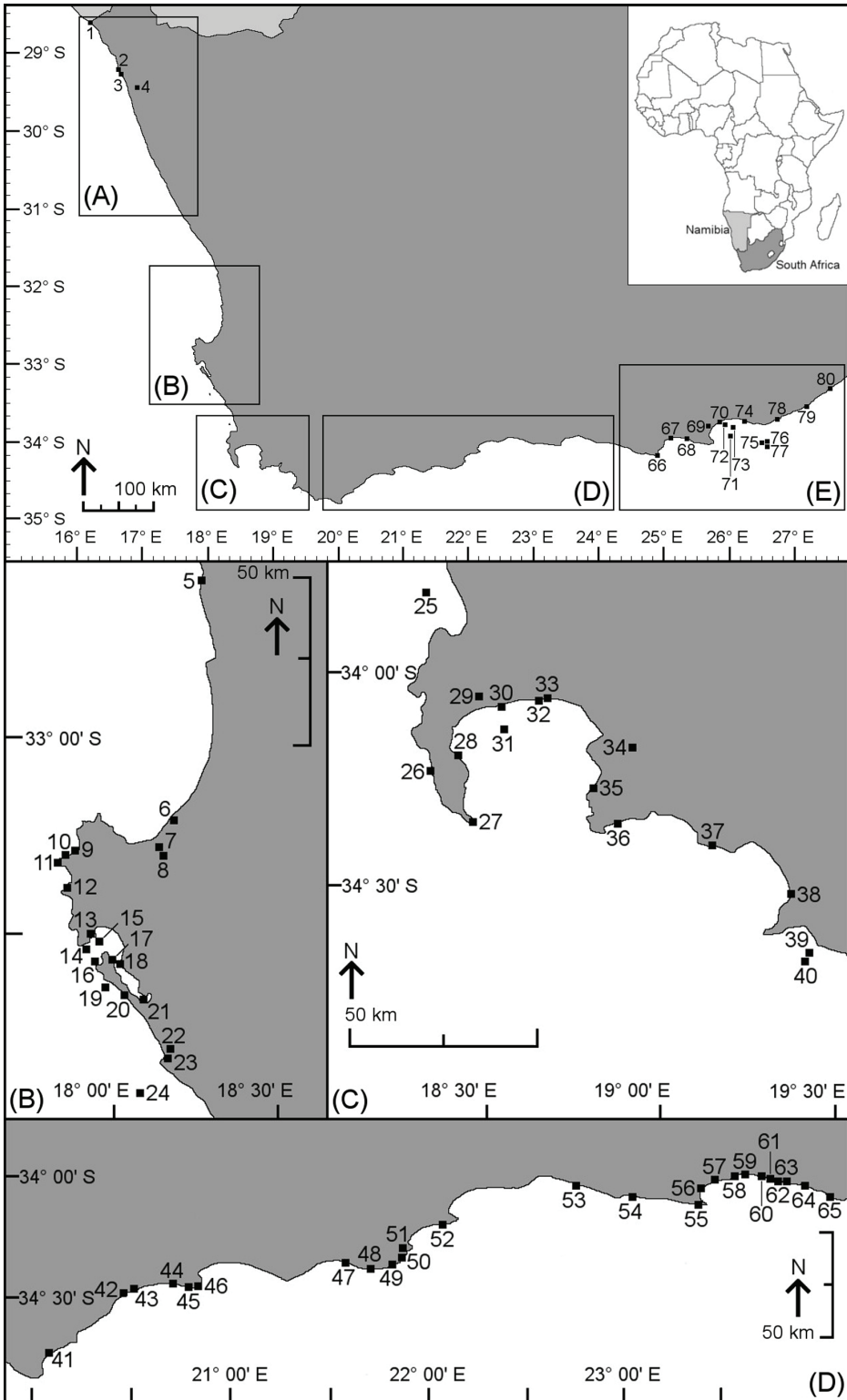


Figure 1. Locations of breeding colonies of Kelp Gulls in South Africa. Numbers refer to those given to each colony in Table 1. A refers to colonies in the Northern Cape, B to the West Coast, C to Cape Town-Cape Agulhas, D to the South Coast and E to the Eastern Cape.

for details). Counts took place from late October-early November, when birds at most nests were incubating eggs (Crawford *et al.* 1982). It was not always possible to visit all colonies before chicks had hatched, which may have resulted in some undercounting, because chicks are able to leave nests shortly after hatching, and their cryptic plumage and behavior make them easy to overlook (Crawford *et al.* 1982). Some gull species are able to change their breeding locations (Cramp *et al.* 1974), and the formation of new colonies of Kelp Gulls in South Africa has been recorded (Calf *et al.* 2003; Whittington *et al.* 2006; Crawford *et al.* 2009a; Ryan and Dyer 2014). If Kelp Gulls changed their breeding location within a 5-year period, it is possible that this method overestimated the population because the same birds may then have been counted at more than one breeding locality within that 5-year period.

RESULTS

At four sites that each had less than five pairs at some stage prior to 1976, no subsequent breeding was recorded. Six sites, each with a single pair, were counted between the 1976/1977 and 2013/2014 surveys but not in one of the 5-year periods, and a single pair was discovered at a new site in 2014. Another new site containing 16 nests was discovered during a survey of the Northern Cape in November 2014 (Table 1). Numbers of counts per breeding site ranged from 1-36 and averaged 7 (median of 3), while at 27 well-established colonies the number of counts ranged from 3-36 and averaged 16 (median of 9). A maximum count of over 1,000 nests was recorded from seven colonies, four of which were in the West Coast, two in the Cape Town-Cape Agulhas region and one in the South Coast (Table 1). The bulk of the Kelp Gull breeding population was situated in the West Coast region with numbers getting progressively smaller to the south and east (Fig. 2).

National Population Changes

Between 1976/1977-1980/1981 and 2000/2001-2004/2005, the South African population of Kelp Gulls was estimated to have doubled to over 21,000 pairs (Table 1), and the proportion breeding in the West Coast region rose from 70% (Fig. 3A) to 85% (Fig. 3B). Restricting the comparison

to the 24 colonies with at least one count in both of these 5-year periods suggests that the increase was of the order of 141%. Of these 24 colonies, eight were in the West Coast region, three in the Cape Town-Cape Agulhas region, four in the South Coast region and nine in the Eastern Cape. Unfortunately, no data were available for the Northern Cape during the period 2000/2001-2004/2005. Although numbers increased at colonies in the Cape Town-Cape Agulhas and South Coast regions, their proportion of the total population decreased, as did the proportion of birds breeding in the Eastern Cape (Fig. 3B). During 2009/2010-2013/2014, numbers of Kelp Gulls breeding in South Africa decreased by approximately 3,500 pairs (17%) from their peak in the late 1990s and early 2000s (Table 1). Restricting the comparison to the 26 colonies with at least one count in each of the periods 2000/2001-2004/2005 and 2009/2010-2013/2014, there was a decrease of 24%. Of these 26 colonies, nine were in the West Coast region, four in the Cape Town-Cape Agulhas region, five in the South Coast region and eight in the Eastern Cape. No Kelp Gulls were recorded breeding at the Orange River mouth in 2011/2012 (or in 2014/2015), previously the largest colony in the Northern Cape, and only eight nests were found at the other two known breeding localities in the Northern Cape during 2009/2010-2013/2014. Numbers breeding in the Cape Town-Cape Agulhas and South Coast regions and in the Eastern Cape increased during the 2009/2010-2013/2014 period. The West Coast region bore the brunt of the decline, only accounting for 56% of the breeding population in 2009/2010-2013/2014, the lowest proportion during this study (Fig. 3C). A direct comparison between 31 colonies with at least one count in the periods 1976/1977-1980/1981 and 2009/2010-2013/2014 indicated an increase of 6,653 pairs or 67%. Of these 31 colonies, one was in the Northern Cape, 10 in the West Coast region, five in the Cape Town-Cape Agulhas region, nine in the South Coast region and six in the Eastern Cape.

Table 1. Maximum count of Kelp Gull nests at each colony in South Africa in three 5-year periods. The maximum count from all records, including those outside the selected periods going back to 1755, is also shown. Blank cells indicate that no count was carried out in that 5-year period. M = mainland colony, I = maritime island. Sources: Crawford (1983), Crawford *et al.* (1982, 2009a, 2009b), Kriel *et al.* (1980), Steele and Hockey (1990), Whittington *et al.* (2006) and unpublished records of authors. * indicates sites combined as one locality on Figure 1.

| Map # | Colony | Coordinates | Maximum Count | | | | |
|-------|-------------------------------------|----------------------|---------------------|---------------------|---------------------|-------------|--|
| | | | 1976/1977-1980/1981 | 2000/2001-2004/2005 | 2009/2010-2013/2014 | All Records | |
| 1 | Orange River mouth (M) | 28° 35' S, 16° 27' E | 300 | | 0 | 300 | |
| 2 | Owen Island (I) | 29° 16' S, 16° 52' E | | | 1 | 1 | |
| 3 | Mathew Rocks (I) | 29° 17' S, 16° 52' E | | | 7 | 7 | |
| 4 | Kleinsee north pan (M) | 29° 29' S, 17° 02' E | | | | 16 | |
| | Total for Northern Cape region | | 300 | | 8 | | |
| 5 | Lambert's Bay (M) | 32° 05' S, 18° 18' E | 14 | 110 | 154 | 154 | |
| 6 | Dwarskorsbos salt works (M) | 32° 43' S, 18° 12' E | | | 698 | 698 | |
| 7 | Berg River salt works (Cerebos) (M) | 32° 48' S, 18° 10' E | | | 82 | 82 | |
| 8 | Flaminkvlei (M) | 32° 48' S, 18° 09' E | | | 2 | 2 | |
| 9 | Klein Paternoster Rocks (I) | 32° 48' S, 17° 52' E | | | 1 | 1 | |
| 10 | Abdolsbaai (M) | 32° 49' S, 17° 52' E | | | | 1 | |
| 11 | Cape Columbine Rocks (I) | 32° 49' S, 17° 50' E | 2 | | 1 | 2 | |
| 12 | Voelleiland, Noordwesbaai (I) | 32° 53' S, 17° 52' E | | | 1 | 1 | |
| 13 | Hoedjies Point, Saldanha (M) | 33° 01' S, 17° 54' E | 6 | | | 6 | |
| 14 | Malgas Island (I) | 33° 03' S, 17° 55' E | 26 | 125 | 213 | 213 | |
| 15 | Marcus Island and causeway (M) | 33° 03' S, 17° 58' E | 80 | 0 | 0 | 80 | |
| 16 | Jutten Island (I) | 33° 05' S, 17° 57' E | 714 | 2,582 | 1,714 | 2,582 | |
| 17 | Meeuw Island (I) | 33° 05' S, 18° 00' E | 185 | 2,215 | 825 | 2,215 | |
| 18 | Schaapen Island (I) | 33° 06' S, 18° 01' E | 3,000 | 6,225 | 3,303 | 6,225 | |
| 19 | Vondeling Island (I) | 33° 09' S, 17° 59' E | 145 | 377 | 178 | 377 | |
| 20 | 16-mile Beach (M) | 33° 10' S, 18° 02' E | | | | 1 | |
| 21 | Caspian Island (M) | 33° 12' S, 18° 06' E | | 171 | 83 | 171 | |
| 22 | Rooipan (M) | 33° 19' S, 18° 10' E | | | | 1 | |
| 23 | Die Skeiding, Yzerfontein (M) | 33° 20' S, 18° 10' E | 3 | | 68 | 118 | |
| 24 | Dassen Island (I) | 33° 25' S, 18° 05' E | 2,892 | 6,179 | 2,278 | 6,406 | |
| | Total for West Coast region | | 7,067 | 17,984 | 9,601 | | |
| 25 | Robben Island (I) | 33° 48' S, 18° 22' E | 0 | 80 | 2,509 | 2,509 | |
| 26 | Olifantsbos (M) | 34° 14' S, 18° 22' E | | | 10 | 10 | |
| 27 | Cape Point (M) | 34° 21' S, 18° 29' E | | | 5 | 5 | |

Table 1. (Continued) Maximum count of Kelp Gull nests at each colony in South Africa in three 5-year periods. The maximum count from all records, including those outside the selected periods going back to 1755, is also shown. Blank cells indicate that no count was carried out in that 5-year period. M = mainland colony, I = maritime island. Sources: Crawford (1983), Crawford *et al.* (1982, 2009a, 2009b), Kriel *et al.* (1980), Steele and Hockey (1990), Whittington *et al.* (2006) and unpublished records of authors. * indicates sites combined as one locality on Figure 1.

| Map # | Colony | Coordinates | Maximum Count | | | | |
|-------|---|----------------------|---------------------|---------------------|---------------------|-------------|--|
| | | | 1976/1977-1980/1981 | 2000/2001-2004/2005 | 2009/2010-2013/2014 | All Records | |
| 28 | Simonstown harbour (M) | 34° 11' S, 18° 26' E | | | | 1 | |
| 29 | Rondevlei (M) | 34° 04' S, 18° 30' E | 2 | | | 2 | |
| 30 | Strandfontein Sewage Works (M) | 34° 05' S, 18° 34' E | 59 | 200 | 1,250 | 1,250 | |
| 31 | Seal Island, False Bay (I) | 34° 08' S, 18° 35' E | | 1 | | 10 | |
| 32 | Wolfgat Nature Reserve (M) | 34° 05' S, 18° 39' E | 249 | | | 249 | |
| 33 | Monwabesi (M) | 34° 04' S, 18° 41' E | | | | 50 | |
| 34 | Steenbras Dam (M) | 34° 10' S, 18° 54' E | | | 175 | 400 | |
| 35 | Rooiels (M) | 34° 17' S, 18° 50' E | | | | 1 | |
| 36 | Stony Point (M) | 34° 22' S, 18° 53' E | | 1 | | 1 | |
| 37 | Vermont Saltpan (M) | 34° 25' S, 19° 09' E | | | | 1 | |
| 38 | De Plaat, Walker Bay (M) | 34° 31' S, 19° 22' E | | | | 1 | |
| 39 | Dyer Island (I) | 34° 41' S, 19° 25' E | 88 | 320 | 610 | 610 | |
| 40 | Geyser Island (I) | 34° 42' S, 19° 25' E | 2 | | | 5 | |
| | Total for Cape Town-Cape Agulhas region | | 400 | 601 | 4,625 | | |
| 41 | De Mond Nature Reserve (M) | 34° 42' S, 20° 07' E | 800 | | 101 | 800 | |
| 42 | De Hoop Vlei (M) | 34° 29' S, 20° 28' E | 2 | | 27 | 27 | |
| 43 | Koppie Alleen (M) | 34° 28' S, 20° 30' E | | | 7 | 7 | |
| 44 | Noetsie (M) | 34° 27' S, 20° 43' E | | | 0 | 2 | |
| 45 | Sterkfontein (M) | 34° 28' S, 20° 48' E | | | 6 | 6 | |
| 46 | Wuklippunt (M) | 34° 28' S, 20° 51' E | | | 1 | 12 | |
| 47 | Paalneskop (M) | 34° 22' S, 21° 35' E | | | 12 | 12 | |
| 48 | Meester se Baai (M) | 34° 22' S, 21° 48' E | 1 | | 0 | 1 | |
| 49 | 5 km west of Gouritz River (M) | 34° 22' S, 21° 51' E | 2 | | | 2 | |
| 50 | Gouritz River (M) | 34° 20' S, 21° 52' E | 1 | | | 1 | |
| 51 | Fransmanhoek (M) | 34° 18' S, 21° 53' E | 49 | | | 49 | |
| 52 | Pinnacle Point (M) | 34° 12' S, 22° 05' E | | | | 4 | |
| 53 | Sedgefield (M) | 34° 02' S, 22° 48' E | 1 | < 10 | | 6 | |
| 54 | Knysna (M) | 34° 05' S, 23° 03' E | 8 | | | 1 | |
| 55 | Robberg (Die Eiland, Cape Seal) (M) | 34° 06' S, 23° 24' E | 18 | 65 | 39 | 65 | |

Table 1. (Continued) Maximum count of Kelp Gull nests at each colony in South Africa in three 5-year periods. The maximum count from all records, including those outside the selected periods going back to 1755, is also shown. Blank cells indicate that no count was carried out in that 5-year period. M = mainland colony, I = maritime island. Sources: Crawford (1983), Crawford *et al.* (1982, 2009a, 2009b), Kriel *et al.* (1980), Steele and Hockey (1990), Whittington *et al.* (2006) and unpublished records of authors. * indicates sites combined as one locality on Figure 1.

| Map # | Colony | Coordinates | Maximum Count | | | | | All Records |
|-------|--|----------------------|---------------------|---------------------|---------------------|-------|--|-------------|
| | | | 1976/1977-1980/1981 | 2000/2001-2004/2005 | 2009/2010-2013/2014 | | | |
| 56 | Keurbooms Lookout* (M) | 34° 03' S, 23° 22' E | 0 | 0 | 50 | 50 | | |
| 56 | Keurbooms Peninsula* (M) | 34° 02' S, 23° 22' E | 250 | 1,453 | 1,373 | 1,453 | | |
| 57 | Arch Rock, Keurboom Strand (M) | 34° 00' S, 23° 28' E | 2 | 0 | 0 | 2 | | |
| 58 | Tsitsikamma No 12 stacks (I) | 33° 59' S, 23° 35' E | 63 | 17 | 9 | 63 | | |
| 59 | Tsitsikamma Helpmekeer River (I) | 33° 58' S, 23° 36' E | 2 | | | 2 | | |
| 60 | Tsitsikamma Klip River (I) | 33° 58' S, 23° 37' E | 2 | | | 2 | | |
| 61 | Tsitsikamma Geelhoutbos River (I) | 34° 00' S, 23° 46' E | | 2 | | 2 | | |
| 62 | Tsitsikamma Skilderkrans (M) | 34° 01' S, 23° 50' E | 0 | | | 3 | | |
| 63 | Tsitsikamma Storms River mouth (M) | 34° 01' S, 23° 54' E | 1 | | | 1 | | |
| 64 | Tsitsikamma Elands River stack (I) | 34° 02' S, 24° 04' E | 0 | | 11 | 11 | | |
| 65 | 2 km east of Huisklip (M) | 34° 09' S, 24° 27' E | | | | 1 | | |
| | Total for South Coast region | | 1,205 | 1,537 | 1,992 | | | |
| 66 | Cape St Francis (M) | 34° 12' S, 24° 52' E | | | | 1 | | |
| 67 | Gamtoos River (M) | 33° 58' S, 25° 02' E | 25 | 139 | | 139 | | |
| 68 | Maitland River (M) | 33° 54' S, 25° 17' E | 32 | 2 | | 32 | | |
| 69 | Swartkops River (M) | 33° 51' S, 25° 34' E | 102 | 683 | 850 | 850 | | |
| 70 | Coega (M) | 33° 46' S, 25° 40' E | | 34 | 243 | 243 | | |
| 71 | Brenton Rock (I) | 33° 49' S, 25° 45' E | | | 2 | 2 | | |
| 72 | Jahleel Island (I) | 33° 48' S, 25° 42' E | 100 | 12 | 6 | 100 | | |
| 73 | St. Croix Island (I) | 33° 48' S, 25° 46' E | 410 | 0 | 55 | 410 | | |
| 74 | Between Sundays River and Woody Cape (M) | 33° 42' S, 25° 56' E | | 0 | 1 | 1 | | |
| 75 | Seal Island (I) | 33° 50' S, 26° 16' E | 300 | 47 | 140 | 300 | | |
| 76 | Stag Island (I) | 33° 50' S, 26° 17' E | 50 | 27 | 35 | 200 | | |
| 77 | Bird Island (I) | 33° 50' S, 26° 17' E | 20 | 23 | 47 | 473 | | |
| 78 | Kasouga-Kariega Point (M) | 33° 41' S, 26° 42' E | | 1 | | 1 | | |
| 79 | Riet River (M) | 33° 34' S, 27° 01' E | 2 | 0 | | 2 | | |
| 80 | Hamburg (M) | 33° 17' S, 27° 29' E | 1,041 | 968 | | 1,379 | | |
| | Total for Eastern Cape region | | 10,013 | 21,090 | 17,590 | | | |

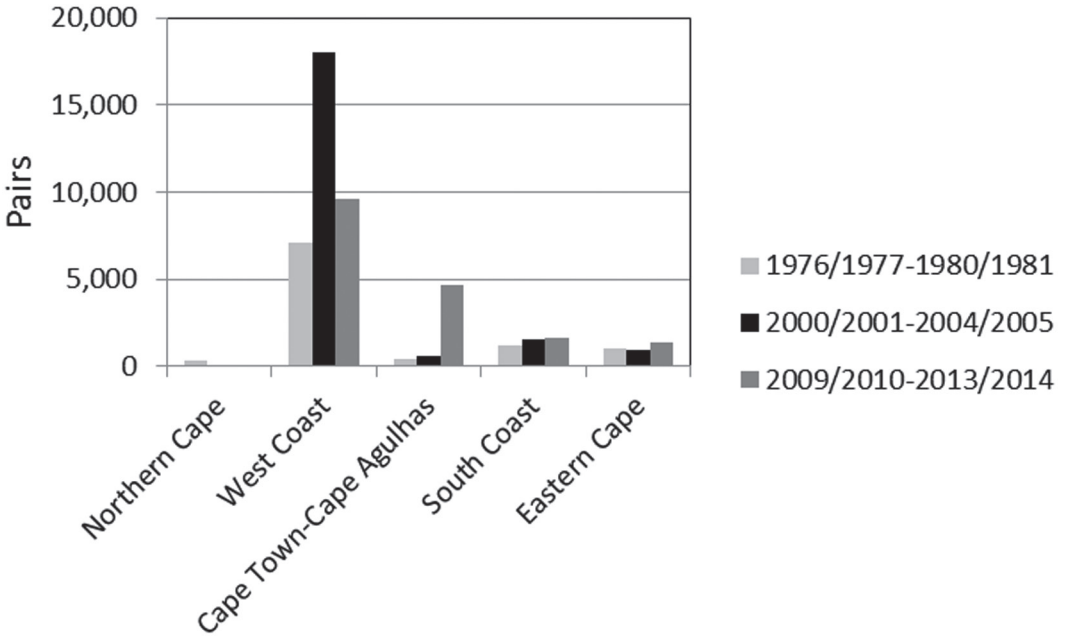


Figure 2. Maximum numbers of pairs of breeding Kelp Gulls recorded in each region in each 5-year period.

Nine colonies thought to have contained breeding birds were not counted in the 1976/1977-1980/1981 period. The sum of the highest counts obtained in other periods for these colonies was 101; therefore, the maximum underestimate of the Kelp Gull population in 1976/1977-1980/1981 was thought to be 101 breeding pairs. The maximum undercount for the period 2000/2001-2004/2005 was estimated to be 2,632 pairs resulting from 19 colonies that were not counted, and for the period 2009/2010-2013/2014 the estimate was 313 from 11 colonies that did not get counted.

Regional Population Changes

The breeding Kelp Gull population in the Northern Cape declined between 1976/1977-1980/1981 and 2009/2010-2013/2014, principally due to the loss of the Orange River mouth as a breeding site. The largest changes occurred in the West Coast region where numbers rose by about 10,000 between 1976/1977-1980/1981 and 2000/2001-2004/2005 and then dropped by about 9,000 pairs in 2009/2010-2013/2014. Although numbers of pairs involved were considerably less than in the West Coast re-

gion, the greatest growth occurred in the Cape Town-Cape Agulhas region where the direct comparison between 1976/1977-1980/1981 and 2009/2010-2013/2014 showed an increase of over 1,000% (Table 2). A more modest but still substantial increase was shown by colonies in the South Coast region and the Eastern Cape (Table 2).

Breeding Locality Changes

In 1976/1977-1980/1981, about 80% of Kelp Gulls nested on offshore islands, rocks or stacks (Table 3). This proportion increased slightly by 2000/2001-2004/2005, but decreased to 69% in 2009/2010-2013/2014 (Table 3). On a regional basis, most Kelp Gulls in the West Coast region nested on offshore islands, although this proportion decreased in 2009/2010-2013/2014 (Table 3). In the Cape Town-Cape Agulhas region, between 60% and 68% of Kelp Gulls bred on offshore islands, the proportion changing little during the study. In contrast, over 80% of Kelp Gulls in the South Coast region bred at mainland sites, and by 2009/2010-2013/2014 virtually all those recorded were on the mainland. A different pattern

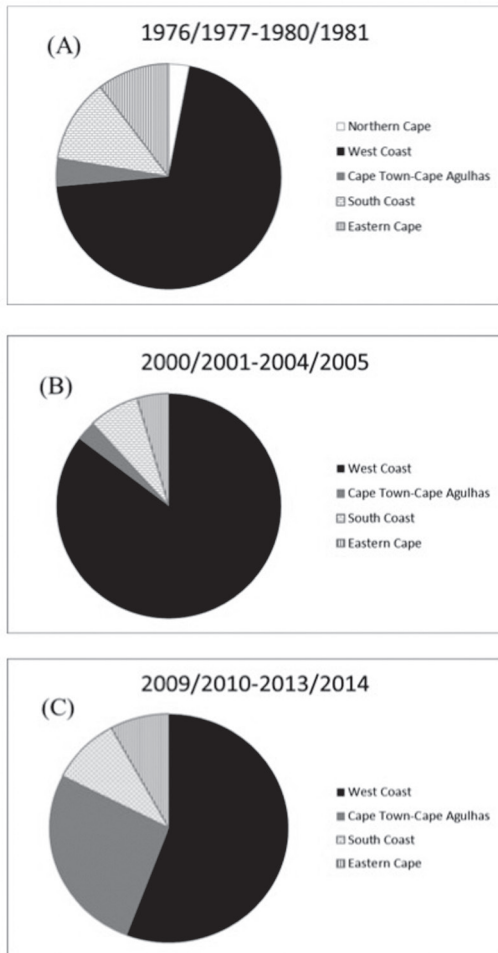


Figure 3. Proportions of breeding Kelp Gulls in each of five regions in three 5-year periods: **A** = 1976/1977-1980/1981, **B** = 2000/2001-2004/2005, **C** = 2009/2010-2013/2014.

emerged in the Eastern Cape, where 85% of Kelp Gulls bred on islands in 1976/1977-1980/1981, but by 2000/2001-2004/2005 89% were nesting on the mainland. Numbers on the Algoa Bay islands recovered a little after their low counts in 2000/2001-2004/2005 such that the proportion of Eastern Cape birds nesting on islands rose to 21% in 2009/2010-2013/2014 (Table 3).

New and Extirpated Colonies

A number of new breeding colonies formed during the study period while others disappeared. Three new colonies were discovered in salt works on the West Coast,

two of them in the last 3 years of the study. Dwarskersbos salt works (Fig. 1B) was developed during the study period, and no suitable habitat for breeding by Kelp Gulls existed at this site in the 1970s. In the Cape Town-Cape Agulhas region, new colonies were found at Monwabesi close to the pre-existing Wolfgat colony in 2012 and at Steenbras Dam, an inland site where the birds nest among montane fynbos vegetation (Ryan and Dyer 2014), in 2013, as well as on an unnamed island covered in dense pine trees in 2014 (Fig. 1C). In the South Coast region, six birds were discovered nesting at Sterkfontein and another small colony was found at Paalneskop in 2012 (Fig. 1D). In the Eastern Cape, a new colony was found at Coega salt works in 2003 and has grown rapidly, most now moving into the nearby Port of Ngqura (Fig. 1E). There were 25 isolated breeding attempts, including five in the West Coast region, three in the Cape Town-Cape Agulhas region, 13 in the South Coast region and four in the Eastern Cape. Most of these breeding attempts related to single pairs, which either did not breed again or were in relatively remote areas that were not subsequently checked. Breeding at one colony in the West Coast region (Marcus Island) and another in the Cape Town-Cape Agulhas region (Rondevlei) ceased in 1993/1994 and 1984/1985, respectively.

Trends in Intensively Monitored Colonies

The 12 most intensively monitored colonies included three mainland sites (Bird Island at Lambert's Bay, Marcus Island and Caspian Island, a low, muddy, estuarine island in Langebaan Lagoon), and six islands (Malgas, Jutten, Meeuw, Schaapen, Vondeling and Dassen) in the West Coast region (Fig. 1B), Robben Island and Dyer Island in the Cape Town-Cape Agulhas region (Fig. 1C) and the Swartkops Estuary in the Eastern Cape (Fig. 1E). Schaapen Island and Dassen Island housed the largest colonies of Kelp Gulls throughout the period until they were overtaken by Robben Island in 2010. All colonies in the West Coast region, with the exception of Marcus Island, showed a

Table 2. Percentage changes between 5-year periods in numbers of pairs of breeding Kelp Gulls in five coastal regions using colonies that were counted in both periods.

| Region | 1976/1977-1980/1981 to 2000/2001-2004/2005 | 2000/2001-2004/2005 to 2009/2010-2013/2014 | 1976/1977-1980/1981 to 2009/2010-2013/2014 |
|------------------------|---|---|---|
| Northern Cape | | | -100 |
| West Coast | 152 | -47 | 35 |
| Cape Town-Cape Agulhas | 308 | 455 | 1,052 |
| South Coast | 361 | -4 | 41 |
| Eastern Cape | -7 | 67 | 40 |

steady increase in numbers followed by a decline, the timing of which varied from about 2001 through to 2011 (Fig. 4). The colony at Marcus Island began a steep decline in 1990, and Kelp Gulls ceased breeding there by 1993 (Fig. 4C). Caspian Island was first colonized in 1993 (Crawford *et al.* 2009a) and grew until 2000, but then decreased steadily beginning in 2006 (Fig. 4H). Robben Island in the Cape Town-Cape Agulhas region has been monitored annually since 1978, but Kelp Gulls were not recorded breeding there until 2000 (Calf *et al.* 2003). Both Robben Island and Dyer Island showed a similar pattern to colonies in the West Coast region, but did not decrease until after 2010 (Figs. 4J and 4K). The Swartkops Estuary population in the Eastern Cape increased steadily from 1978/1979 to 1986/1987 and then more gradually and was still growing in 2013/2014 (Fig. 4L).

DISCUSSION

The Kelp Gull was one of 18 species of gulls with an increasing trend in at least one population at the turn of the 21st century; 10 species or populations were listed as

stable and nine as declining (Wetlands International 2002). Both *L. d. vetula* and the nominate subspecies of Kelp Gull in South America were listed as increasing (Wetlands International 2002). In southern Africa, two main reasons probably account for the increasing numbers of Kelp Gulls. Prior to the 1960s, numbers of Kelp Gulls on offshore islands were controlled to protect the guano and egg producing species (Crawford *et al.* 1982), because Kelp Gulls are predators on the eggs and small chicks of guano-producing seabirds. The virtual cessation of these control measures in the 1960s and 1970s allowed island Kelp Gull populations to recover (Crawford *et al.* 2009a). The other factor promoting population growth has been the provision of additional food from fishing activities and waste disposal. Bycatch and offal discarded by the fishing industry and organic material dumped at landfill sites provide Kelp Gulls with easily available food (Steele 1992; Whittington *et al.* 2006). An increase in inland records of Kelp Gulls, especially at slaughterhouses and landfill sites, was noticed in the 1980s and may be related to the increased Kelp Gull population at this time (Suter and Ryan 1984; Hockey *et al.* 1989). The expanding Cape fur seal (*Arctocephalus*

Table 3. Numbers and percentages of Kelp Gull pairs nesting on maritime islands in each region in each 5-year period.

| Region | 1976/1977-1980/1981 | | 2000/2001-2004/2005 | | 2009/2010-2013/2014 | |
|------------------------|---------------------|------|---------------------|------|---------------------|-------|
| | Pairs (<i>n</i>) | % | Pairs (<i>n</i>) | % | Pairs (<i>n</i>) | % |
| Northern Cape | — | | — | | 8 | 100.0 |
| West Coast | 6,964 | 98.5 | 17,703 | 98.4 | 8,514 | 88.7 |
| Cape Town-Cape Agulhas | 90 | 59.8 | 401 | 66.7 | 3,121 | 67.5 |
| South Coast | 67 | 19.5 | 19 | 1.1 | 11 | 0.7 |
| Eastern Cape | 880 | 84.5 | 109 | 11.2 | 285 | 20.7 |
| All regions | 8,001 | 79.9 | 18,232 | 86.4 | 11,939 | 69.2 |

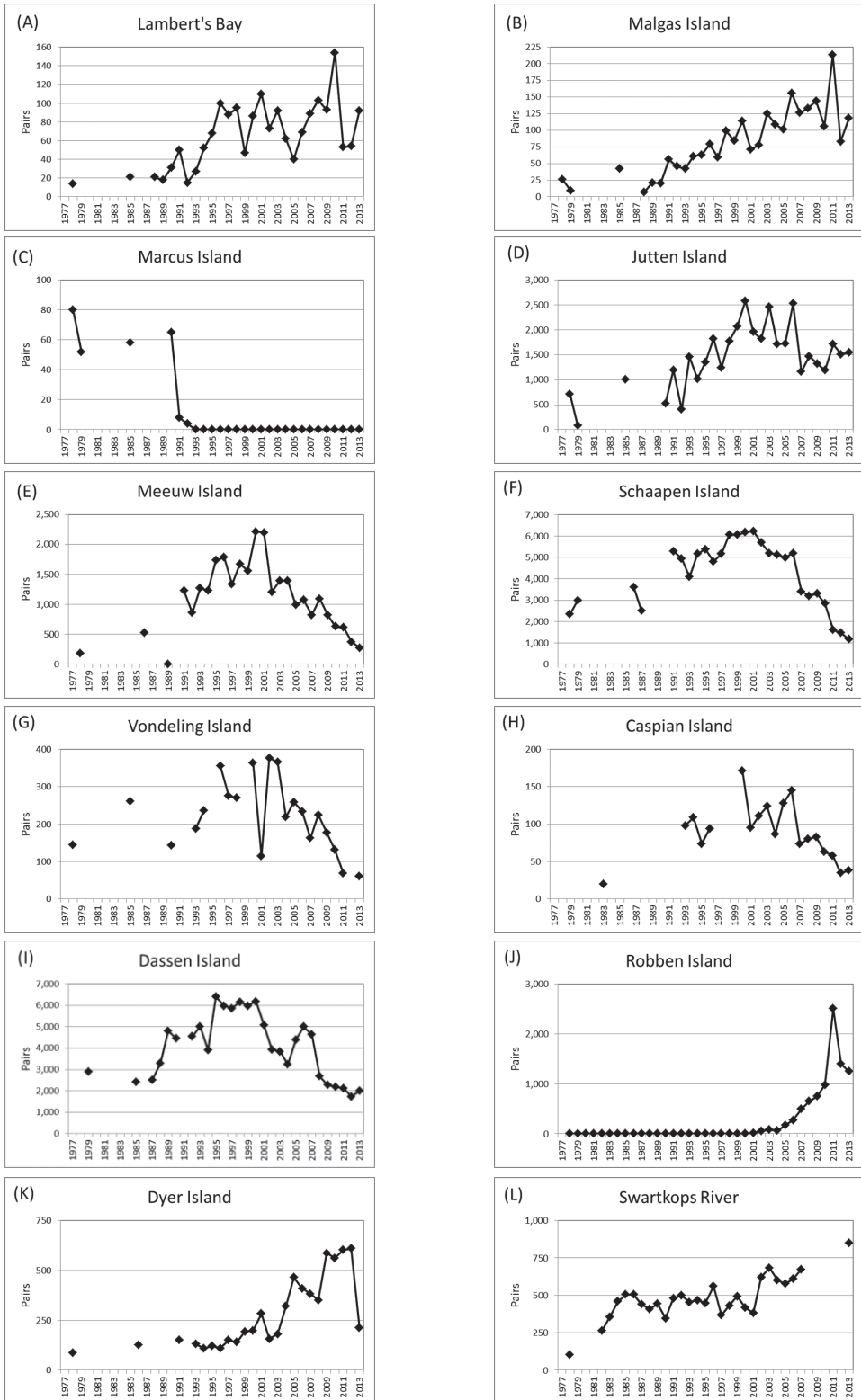


Figure 4. Trends in numbers of Kelp Gulls breeding in the 12 most intensively monitored colonies, 1976/1977-2013/2014.

p. pusillus) population, including individuals that specialize in predation of penguins, gannets and cormorants (Marks *et al.* 1997; Makhado *et al.* 2006, 2013), provides additional feeding opportunities for Kelp Gulls, which often scavenge scraps at seal kills (du Toit 2001). Kelp Gulls on the west coast also feed on the introduced snail (*Theba pisana*; P. G. Ryan, pers. obs.), which is common in agricultural lands in the Western and Eastern Capes (Herbert 2010).

The recent decrease in the South African Kelp Gull population resulted from losses at islands off the West Coast. These were in part due to easterly shifts in the centers of distribution of sardine (*Sardinops sagax*) and rock lobster (*Jasus lalandii*), resulting in lower abundance of these prey species to seabirds breeding on the west coast and a subsequent easterly movement of some breeding seabirds (Crawford *et al.* 2008a, 2008b, 2008c). However, probably the most important factor was predation of Kelp Gull chicks by Great White Pelicans (*Pelecanus onocrotalus*; hereafter pelicans). Numbers of pelicans nesting on Dassen Island in the southern part of the West Coast region increased considerably in the latter part of the 20th century (Crawford *et al.* 1995; du Toit *et al.* 2003; Crawford 2005). Pelicans walk through Kelp Gull colonies feeding on gull chicks (Crawford *et al.* 1995; de Ponte Machado 2007; Mwema *et al.* 2010), resulting in near breeding failure in some years (Mwema *et al.* 2010). Only four Kelp Gull chicks were raised by 4,600 pairs at Dassen Island in December 2007 (Crawford *et al.* 2009a). Predation spread to nearby islands in Saldanha Bay, resulting in complete breeding failure of Kelp Gulls at Jutten Island and Schaapen Island in 2006/2007 (de Ponte Machado 2009). Prior to this time, Schaapen Island housed the largest Kelp Gull colony in South Africa. In spite of this decline in the Western Cape, the Kelp Gull population remained higher than it had been during the period 1976/1977-1980/1981.

The absence of breeding Kelp Gulls on a survey of the Orange River mouth in 2011 may have been due to flooding of the low-lying islands where they had previously bred

(B. M. Dyer, pers. obs.). In the West Coast region, the decline and extirpation of the colony at Marcus Island in Saldanha Bay may have been due to terrestrial predators gaining access to the island after it was connected to the mainland via a causeway in 1976 (Crawford *et al.* 1994), although other mainland colonies have continued to thrive. The increase in Kelp Gull populations east of Cape Town probably owes much to being beyond the range of pelicans (Crawford *et al.* 2009a), although pelicans have been seen in the Kelp Gull colony at Strandfontein, apparently taking chicks, and five were chased off Dyer Island in October 2005 (L. J. Waller, pers. obs.).

The increase in the proportion of island-nesting Kelp Gulls in the Cape Town-Cape Agulhas region can be attributed to the growth of the colonies at Robben Island and Dyer Island, but there was also growth in the mainland colonies at Strandfontein and Wolfgat and establishment of an inland colony at Steenbras Dam. Kelp Gulls did not begin nesting on Robben Island until 2000/2001 (Calf *et al.* 2003), yet it was the largest colony in the country in 2011/2012. The initial increase at Robben Island was largely driven by immigration (Crawford *et al.* 2009a). Numbers of Kelp Gulls at Dyer Island increased to the point where concern was raised over the negative effects of their predation on the eggs and chicks of other seabird species, notably African Penguins (*Spheniscus demersus*) (Pichegru 2012) and Cape Cormorants (*Phalacrocorax capensis*) (Voorbergen *et al.* 2012), and on adult Leach's Storm-petrels (*Oceanodroma leucorhoa*) (Taylor and Whittington 2015). A culling program began in 2012 and continued in 2013. Subsequently, a 65% drop in the numbers of Kelp Gulls breeding on Dyer Island was recorded (Fig. 4K). The increase in numbers in the South Coast region was largely due to the growth of the mainland colony at the Keurbooms Estuary. This site is in a nature reserve and is within 7 km of the Robberg landfill (Whittington *et al.* 2006). There are few island sites available for Kelp Gulls to nest in this region. The reasons for the change from island to mainland breed-

ing in the Eastern Cape are not fully understood. St. Croix Island and Seal Island housed the largest Kelp Gull colonies in the Eastern Cape in 1976/1977-1980/1981, but the Swartkops Estuary had taken over by 1982. Kelp Gulls from St. Croix Island probably relocated to Redhouse saltpan in the Swartkops Estuary, possibly to be closer to sources of supplementary food at the Port Elizabeth harbor (14 km from the estuary) and at the Arlington landfill site (20 km away). Redhouse saltpan is ~10 km closer to these locations than St. Croix Island. However, St. Croix Island is free of predators and human disturbance, whereas Kelp Gull nests at Redhouse saltpan were frequently robbed by mongooses, as well as by dogs and people from Motherwell (Martin and Randall 1987; Whittington *et al.* 2006). By 2006, most Kelp Gulls from Redhouse saltpan had relocated to the saltmarsh of the estuary proper.

It is likely that new colonies of Kelp Gulls formed on the mainland of the West Coast region in response to the heavy predation of their chicks by pelicans at island colonies. The growth of some mainland colonies, such as at the Swartkops Estuary, and the founding of the colony at Coega saltpans (most of these breeding birds have now moved into the port of Ngqura; A. P. Martin, pers. obs.) in the Eastern Cape may be in part due to immigration of Kelp Gulls from islands in Algoa Bay (Whittington *et al.* 2006). Single pairs nesting between Kariega Point and the Kasouga Estuary in 2003 (Whittington *et al.* 2006) and east of the Ngculura River in 2006 (Tree 2006) represent the most easterly recorded breeding attempts of this species in South Africa.

The Kelp Gull population in South Africa grew following cessation of control methods, aided by fishery discards and poor waste management, as has been noted for gulls elsewhere (Cotter *et al.* 2012). Environmental changes influencing the distributions of Kelp Gull prey (both natural and human-supplemented) have probably encouraged a redistribution of breeding by Kelp Gulls, and their varied diet (Steele 1982) and flexible breeding behavior have allowed them to avoid the marked population decreases exhibited over the last decade by some of the

more specialized seabirds that breed in the region (Crawford *et al.* 2007, 2008a, 2011).

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LITERATURE CITED

- Anderson, M. D., H. Kolberg, P. C. Anderson, J. Dini and A. Abrahams. 2003. Waterbird populations at the Orange River mouth from 1981-2001: a re-assessment of its Ramsar status. *Ostrich* 73: 159-172.
- BirdLife International. 2014. Species factsheet: Kelp Gull *Larus dominicanus*. BirdLife International, Cambridge, U.K. <http://www.birdlife.org/datazone/speciesfactsheet.php?id=3221>, accessed 29 May 2014.
- BirdLife South Africa. 2014. Checklist of birds in South Africa 2014. BirdLife South Africa, Cape Town, South Africa.
- Blokpoel, H. and A. L. Spaans. 1991. Introductory remarks: superabundance in gulls: causes, problems and solutions. Pages 2361-2364 in *Acta XX Congressus Internationalis Ornithologici* (B. D. Bell, Ed.). New Zealand Ornithological Congress Trust Board, Wellington, New Zealand.
- Brooke, R. K. and J. Cooper. 1979. The distinctiveness of southern African *Larus dominicanus* (Aves: Laridae). *Durban Museum Novitates* 12: 27-37.
- Calf, K. M., J. Cooper and L. G. Underhill. 2003. First breeding records of Kelp Gulls *Larus dominicanus vetula* at Robben Island, Western Cape, South Africa. *African Journal of Marine Science* 25: 391-393.
- Conover, M. R. 1983. Recent changes in Ring-billed and California Gull populations in the western United States. *Wilson Bulletin* 95: 362-383.
- Cooper, J., A. J. Williams and P. L. Britton. 1984. Distribution, population sizes and conservation of breeding seabirds in the Afrotropical region. Pages 403-419 in *Status and Conservation of the World's Seabirds* (J. P. Croxall, P. G. H. Evans and R. W. Schreiber, Eds.). Technical Publication 2, International Council for Bird Preservation, Cambridge, U.K.
- Cotter, R. C., J.-F. Rail, A. W. Boyne, G. J. Robertson, D. V. C. Weseloh and K. G. Chaulk. 2012. Population status, distribution, and trends of gulls and kit-

- tiwakes breeding in eastern Canada, 1998-2007. Occasional Paper No. 120, Canadian Wildlife Service, Ottawa, Ontario.
- Cramp, S., W. R. P. Bourne and D. Saunders. 1974. The seabirds of Britain and Ireland. Collins, London, U.K.
- Crawford, R. J. M. 1983. Some observations on seabirds breeding in the Tsitsikamma Coastal National Park. *Koedoe* 26: 145-152
- Crawford, R. J. M. 2005. Great White Pelican. Pages 614-615 in Roberts Birds of Southern Africa, 7th ed. (P. A. R. Hockey, W. R. J. Dean and P. G. Ryan, Eds.). The Trustees of the John Voelcker Bird Book Fund, Cape Town, South Africa.
- Crawford, R. J. M., J. Cooper and P. A. Shelton. 1982. Distribution, population size, breeding and conservation of the Kelp Gull in southern Africa. *Ostrich* 53: 164-177.
- Crawford, R. J. M., B. M. Dyer and R. K. Brooke. 1994. Breeding nomadism in southern African seabirds – constraints, causes and conservation. *Ostrich* 65: 231-246.
- Crawford, R. J. M., J. Cooper and B. M. Dyer. 1995. Conservation of an increasing population of Great White Pelicans *Pelecanus onocrotalus* in South Africa's Western Cape. *South African Journal of Marine Science* 15: 33-42.
- Crawford, R. J. M., B. M. Dyer, J. Kemper, R. E. Simmons and L. Upfold. 2007. Trends in numbers of Cape Cormorants (*Phalacrocorax capensis*) over a 50-year period, 1956-57 to 2006-07. *Emu* 107: 253-261.
- Crawford, R. J. M., A. C. Cockcroft, B. M. Dyer and L. Upfold. 2008a. Divergent trends in bank cormorants *Phalacrocorax neglectus* breeding in South Africa's Western Cape consistent with a distributional shift of rock lobsters *Jasus lalandii*. *African Journal of Marine Science* 30: 161-166.
- Crawford, R. J. M., P. S. Sabarros, T. Fairweather, L. G. Underhill and A. C. Wolfaardt. 2008b. Implications for seabirds off South Africa of a long-term change in the distribution of sardine. *African Journal of Marine Science* 30: 177-184.
- Crawford, R. J. M., A. J. Tree, P. A. Whittington, J. Visagie, L. Upfold, K. J. Roxburg[h], A. P. Martin and B. M. Dyer. 2008c. Recent distributional changes of seabirds in South Africa: is climate having an impact? *African Journal of Marine Science* 30: 189-193.
- Crawford, R. J. M., L. G. Underhill, R. Altwegg, B. M. Dyer and L. Upfold. 2009a. Trends in numbers of Kelp Gulls *Larus dominicanus* off western South Africa, 1978-2007. *Ostrich* 80: 139-143.
- Crawford, R. J. M., P. A. Whittington, A. P. Martin, A. J. Tree and A. B. Makhado. 2009b. Population trends of seabirds breeding in South Africa's Eastern Cape, and the possible influence of anthropogenic and environmental change. *Marine Ornithology* 37: 159-174.
- Crawford, R. J. M., R. Altwegg, B. J. Barham, P. J. Barham, J. M. Durant, B. M. Dyer, D. Geldenhuys, A. B. Makhado, L. Pichegru, P. G. Ryan and others. 2011. Collapse of South Africa's penguins in the early 21st century. *African Journal of Marine Science* 33: 139-156.
- Crawford, R. J. M., R. M. Randall, P. A. Whittington, L. J. Waller, B. M. Dyer, D. G. Allan, C. Fox, A. P. Martin, L. Upfold, J. Visagie and others. 2013. South Africa's coastal-breeding white-breasted cormorants: population trends, breeding season and movements, and diet. *African Journal of Marine Science* 35: 473-490.
- Crawford, R. J. M., A. B. Makhado, L. J. Waller and P. A. Whittington. 2014. Winners and losers – responses to recent environmental change by South African seabirds that compete with fisheries for food. *Ostrich* 85: 111-117.
- Croxall, J. P., S. H. M. Butchart, B. Lascelles, A. J. Stattersfield, B. Sullivan, A. Symes and P. Taylor. 2012. Seabird conservation status, threats and priority actions: a global assessment. *Bird Conservation International* 22: 1-34.
- de Ponte Machado, M. 2007. Is predation on seabirds a new foraging behaviour for Great White Pelicans? History, foraging strategies and prey defensive strategies. Pages 131-142 in Final Report of the BCLME (Benguela Current Large Marine Ecosystem) Project on Top Predators as Biological Indicators of Ecosystem Change in the BCLME (S. P. Kirkman, Ed.). Avian Demography Unit, Cape Town, South Africa.
- de Ponte Machado, M. 2009. Population dynamics of Great White Pelicans in southern Africa. Ph.D. Dissertation, University of Cape Town, South Africa.
- du Toit, M. 2001. Predatory interactions between Cape fur seals and seabirds at Ichaboe Island, Namibia. M.S. Thesis, University of Pretoria, Pretoria, South Africa.
- du Toit, M., G. C. Boere, J. Cooper, M. S. de Villiers, J. Kemper, B. Lenten, S. L. Petersen, R. E. Simmons, L. G. Underhill, P. A. Whittington and O. P. Byers (Eds.). 2003. Conservation assessment and management plan for southern African coastal seabirds. Avian Demography Unit, Cape Town, South Africa, and Conservation Breeding Specialist Group, Apple Valley, Minnesota.
- Hatch, J. H. 1996. Threats to public health from gulls (Laridae). *International Journal of Environmental Health Research* 6: 5-16.
- Herbert, D. G. 2010. The introduced terrestrial Mollusca of South Africa. SANBI Biodiversity Series 15, South African National Biodiversity Institute, Pretoria, South Africa.
- Hockey, P. A. R., L. G. Underhill, M. Neatherway and P. G. Ryan. 1989. Atlas of the birds of the south-western Cape. Cape Bird Club, Cape Town, South Africa.
- Jarvis, M. J. F. and D. L. Cram. 1971. Bird Island, Lamberts Bay, South Africa: an attempt at conservation. *Biological Conservation* 4: 269-272.
- Jiguet, F. 2002. Taxonomy of the Kelp Gull *Larus dominicanus* Lichenstein inferred from biometrics and wing plumage pattern, including two previously undescribed subspecies. *Bulletin of the British Ornithologists' Club* 122: 50-71.
- Kriel, F., R. J. M. Crawford and P. A. Shelton. 1980. Seabirds breeding at Robben Island between 1949 and 1980. *Cormorant* 8: 87-96.

- Makhado, A. B., R. J. M. Crawford and L. G. Underhill. 2006. Impact of predation by Cape fur seals *Arctocephalus pusillus pusillus* on Cape gannets *Morus capensis* at Malgas Island, Western Cape, South Africa. *African Journal of Marine Science* 28: 681-687.
- Makhado, A. B., R. J. M. Crawford, L. J. Waller and L. G. Underhill. 2013. An assessment of the impact of predation by Cape fur seals *Arctocephalus pusillus pusillus* on seabirds at Dyer Island, South Africa. *Ostrich* 84: 191-198.
- Marks, M. A., R. K. Brooke and A. M. Gildenhuys. 1997. Cape fur seal *Arctocephalus pusillus* predation on Cape Cormorants *Phalacrocorax capensis* and other birds at Dyer Island, South Africa. *Marine Ornithology* 25: 9-12.
- Martin, A. P. and R. M. Randall. 1987. Numbers of waterbirds at a commercial saltpan, and suggestions for management. *South African Journal of Wildlife Research* 17: 75-81.
- Mwema, M. M., M. de Ponte Machado and P. G. Ryan. 2010. Breeding seabirds at Dassen Island, South Africa: chances of surviving great white pelican predation. *Endangered Species Research* 9: 125-131.
- Pichegru, L. 2012. Increased breeding success of an endangered penguin: artificial nests or culling predatory gulls? *Bird Conservation International* 23: 296-308.
- Ryan, P. G. and B. M. Dyer. 2014. Kelp Gulls breeding in mountain fynbos. *Ornithological Observations* 5: 128-130.
- Shelton, P. A., R. J. M. Crawford, J. Cooper and R. K. Brooke. 1984. Distribution, population size and conservation of the jackass penguin *Spheniscus demersus*. *South African Journal of Marine Science* 2: 217-257.
- Steele, W. K. 1992. Diet of Hartlaub's Gull *Larus hartlaubii* and the Kelp Gull *L. dominicanus* in the southwestern Cape Province, South Africa. *Ostrich* 63: 68-82.
- Steele, W. K. and P. A. R. Hockey. 1990. Population size, distribution and dispersal of Kelp Gulls in the southwestern Cape, South Africa. *Ostrich* 61: 97-106.
- Suter, W. and P. G. Ryan. 1984. More Kelp Gulls *Larus dominicanus* seen inland in South Africa. *Cormorant* 12: 101-102.
- Taylor, M. R. and P. A. Whittington. 2015. Leach's Storm Petrel *Oceanodroma leucorhoa*. Pages 44-45 in *The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland* (M. R. Taylor, F. Peacock and R. W. Wanless, Eds.). BirdLife South Africa, Johannesburg, South Africa.
- Tree, A. J. 2006. An eastward extension of Kelp Gull breeding activity. *Bee-eater* 57: 58.
- Voorbergen, A., W. F. de Boer and L. G. Underhill. 2012. Natural and human-induced predation on Cape Cormorants at Dyer Island. *Bird Conservation International* 22: 82-93.
- Wetlands International. 2002. Waterbird population estimates, 3rd ed. Wetlands International Global Series No. 12, Wageningen, The Netherlands.
- Wetlands International. 2006. Waterbird population estimates, 4th ed. Wetlands International, Wageningen, The Netherlands.
- Whittington, P. A., A. P. Martin and N. T. W. Klages. 2006. Status, distribution and conservation implications of the Kelp Gull (*Larus dominicanus vetula*) within the Eastern Cape region of South Africa. *Emu* 106: 127-139.
- Whittington, P. A., B. M. Dyer, R. J. M. Crawford and A. J. Williams. 1999. First recorded breeding of Leach's Storm Petrel *Oceanodroma leucorhoa* in the Southern Hemisphere, at Dyer Island, South Africa. *Ibis* 141: 327-330.
- Yorio, P., M. Bertellotti, P. Gandini and E. Frere. 1998. Kelp Gulls *Larus dominicanus* breeding on the Argentine coast: population status and relationship with coastal management and conservation. *Marine Ornithology* 26: 11-18.