

LONG-TERM TRENDS IN THE HOODED PLOVER *Thinornis rubricollis* POPULATION ON KANGAROO ISLAND, SOUTH AUSTRALIA

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ABSTRACT

This study examines trends in Hooded Plover (eastern form) *Thinornis rubricollis rubricollis* numbers, particularly breeding pairs, over a twenty-year period (1985–2004) on Kangaroo Island, a significant national refuge for the species.

We found significant and continuing declines in the number of breeding pairs since 1985 (62) with an overall decline of c. 24% (47), or –1.65 pairs per year, equating to around 50 years before $n = 0$. The greatest decline (44%) was found on the eastern and northern coastline where nearly all beaches were rated as highly disturbed Hooded Plover habitat.

Since the early 1990s Kangaroo Island has experienced unprecedented and ongoing growth in tourism and coastal urbanisation resulting in increased levels of recreation on many of the island's aesthetically attractive sandy beaches. Unless mitigating management strategies are developed and implemented in the near future, the Hooded Plover population on Kangaroo Island will likely decline further and be limited to remote, low-use beaches.

INTRODUCTION

The Hooded Plover *Thinornis rubricollis* is a rare endemic shorebird of southern Australia, distributed primarily over coastal habitats and also on inland saline lakes in the south-west of the continent.

The total population is estimated at around 7,000 adults, consisting of two geographically and morphologically separate subspecies (Garnett and Crowley 2000). The eastern form, *T.r. rubricollis*, found in the south-east of the continent as far west as Fowlers Bay in the Great Australian Bight, has an estimated 3,000 breeding individuals (Marchant and Higgins 1993; Garnett and Crowley 2000) and was classified using IUCN criteria as Vulnerable by Garnett and Crowley (2000). In New South Wales it is classified as Critically Endangered, and in Victoria and South Australia, as Vulnerable (Garnett and Crowley 2000). The western form, *T.r. tregellasi*, is found only in south-west Western Australia and with an estimated 4,000 breeding individuals, was classified using IUCN criteria as Near Threatened (Garnett and Crowley 2000; Raines 2002).

The eastern form of the Hooded Plover is a beach specialist, often nesting in a shallow scrape on the upper beach above the high tide line. The

preferred habitat consists of broad flat sandy ocean-beaches, with a wide wave-wash zone, often with much beach-cast seaweed, and backed by sparsely vegetated sand dunes for shelter and nesting (Marchant and Higgins 1993; Paton, Gates and Pedler 2002).

Throughout its range *T.r. rubricollis* populations are declining as a result of impacts from recreational activities on beaches, introduced predators such as the European Red Fox *Vulpes vulpes* and urbanisation (Dowling and Weston 1999; Paton *et al.* 2002; Baird and Dann 2003).

From Statewide surveys in South Australia, Bransbury (1987) estimated the total Hooded Plover population at around 540 individuals in 1987, and in 1994 Natt and Weston (1995) estimated it at around 470. More than a third of these were found on Kangaroo Island (equivalent to c. 3.5% of the total population) making the island a significant national refuge for the species (Schulz 1995).

Through the 1990s, tourism growth was higher on Kangaroo Island than for other regions in South Australia (Manidis Roberts Consultants 1997). Increasing numbers of people using the island's coastal environments are likely to place additional pressures on sensitive beach-dwelling species such as the Hooded Plover.

To determine trends within the Hooded Plover population on Kangaroo Island we examined the results of seven population surveys conducted over the 20-year period from 1985 to 2004, with the aim of providing:

- (i) an updated estimate of the Hooded Plover population on Kangaroo Island; and
- (ii) an analysis of population trends.

METHODS

Study area

Kangaroo Island is Australia's third largest island situated c. 15 km SW of the Fleurieu Peninsula, South Australia (Figure 1). Lying approximately east–west at Latitude 35°45'S (mid-line), it is c. 150 km long and is c. 55 km north to south. The Island experiences a mild

Mediterranean climate and rainfall regime, with wet winters and dry summers (Schwerdtfeger 2002).

The coastline of Kangaroo Island is c. 509 km long, of which c. 112 km comprises sandy beaches (Schulz 1995). The western and southern coastlines are open to the Southern Ocean and therefore have the strongest wave action and prevailing weather patterns. These are regarded as high-energy coasts, while the northern and eastern aspects are generally more sheltered and consist of moderate to low energy coastlines (Thomas and Edmonds 2002).

Data source

The number of Hooded Plovers and the number of breeding pairs within the population on Kangaroo Island have been determined by several systematic surveys since 1985. Of these we present data from:

- (i) 1985; unpublished survey data collected during the summer of 1984–85 (and earlier for some remote sites) by A. Lashmar (deceased), T. Dennis and C. Baxter.
- (ii) 1987; unpublished data forming the basis for the report to the Department of Environment and Planning, South Australia (Bransbury 1987).
- (iii) 1994; a traverse of the entire Kangaroo Island coastline by Schulz (1995).
- (iv) 2000, 2002, 2003 and 2004; volunteer

observers and us who contributed to the biennial Birds Australia National Hooded Plover surveys.

We scrutinised all survey records to determine the number and location of pairs and where required sought clarification from the data source or survey contributor. In the case of the 2002, 2003 and 2004 surveys, we conducted additional ground-truthing when data were ambiguous or incomplete.

Survey timing and method

On Kangaroo Island the Hooded Plover breeding season extends from late August to the following March, with some pairs bonding for consecutive seasons and returning to the same beaches to breed (Bransbury 1991; T. Dennis unpubl. data). During this time the pairs are sedentary and show territory defence behaviours. In comparison, non-paired birds are mobile, moving between foraging areas (Bransbury 1991; Marchant and Higgins 1993). This predictable seasonal behaviour greatly increases the confidence and accuracy of mid-summer population surveys reported here.

Survey methods were similar to those described by Schulz (1995), where:

- (i) the observer walked the full length of a beach at slow pace in the storm-tide zone, continually scanning ahead across the width of the beach and dune face;

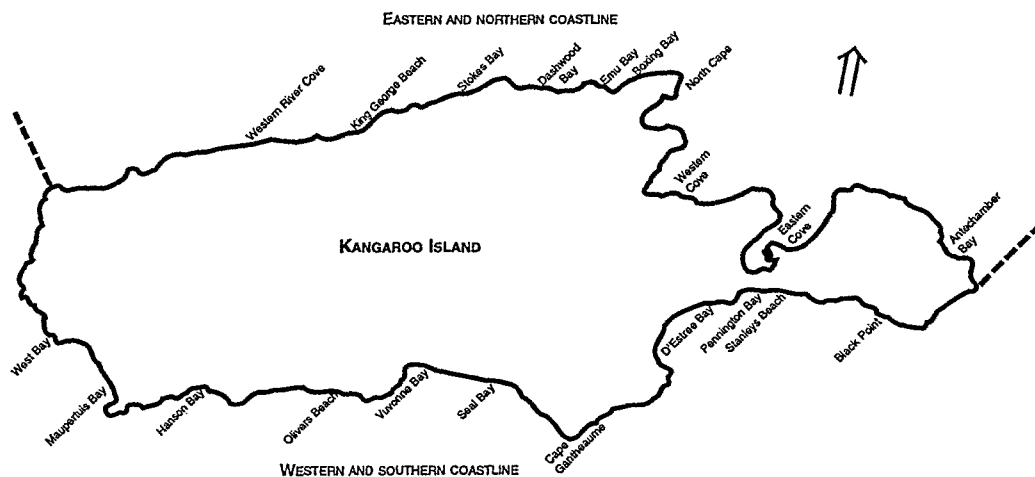


Figure 1. An outline map of Kangaroo Island showing the localities used in Table 1 (see p. 268 for the location of Kangaroo Island in South Australia).

- (ii) the search extended to rocky platforms, banks of weed and pebbled areas at the extremities of typical beach habitat because these are known roosting, feeding and retreat refuges;
- (iii) river estuaries were searched inland until any sandy verge disappeared into flooded vegetation;
- (iv) on some shorter beaches (<150 m long), observations were made over their entire length from a vantage point with binoculars or telescope; and
- (v) care was taken to minimise disturbance and individuals were only counted when passed.

During the winter months and for the duration of prolonged storm events, most Hooded Plovers on Kangaroo Island leave their coastal habitat and gather in flocks on sheltered inland lagoons and ephemeral hyper-saline lakes, particularly those where the mollusc *Coxiella striata* is present (Marchant and Higgins 1993; Baxter 1995). These wetlands were not included in the summer surveys reported here, because breeding has not been recorded in these habitats on Kangaroo Island.

Data analysis

For this study we present data on the total number of Hooded Plovers seen as well as the estimated number of breeding pairs at each beach surveyed, the latter being considered the best measure of habitat quality and stability (Schulz 1996; Dennis 2001).

Due to the differences in the physical characteristics and dynamics of beaches on the northern and eastern coastline compared to the southern and western coast, data from these two areas were analysed separately. In addition, human activities or the presence of grazing animals were recorded for each location. These are likely to disturb Hooded Plovers during the breeding season or impact their habitat. Disturbances included:

- (i) beach recreation activities, including exercising domestic animals;
- (ii) residential or campground developments within 1 km;
- (iii) regular vehicle access and use, including motor cycles and horses; and
- (iv) domestic and feral grazing animals.

Beaches with none of these likely disturbance factors were classified as Low disturbance; with

one of them as Medium; with more than one as High. Each beach habitat was allocated to one of these categories, or more than one where disturbance was confined to part of the habitat on longer beaches (Table 1).

The mean annual rate of change was calculated using two regression equations: the natural logarithm of the numbers of breeding pairs on year (Caughley and Sinclair 1994); and the actual number of breeding pairs on year.

RESULTS

Habitat quality and extent

On Kangaroo Island some of the smaller sandy beaches on exposed coasts were found to erode away completely during winter storms, naturally rebuilding irregularly in spring and summer, thereby varying the amount of available Hooded Plover habitat in some seasons. In addition, much of the 112 km of 'sandy beach' habitat identified by Schulz (1995), includes the shallow tidal bays on the north coast, where there are narrow, mainly shell substrate beaches and wide intertidal zones with broad mud-flats exposed at mid- to low tide (Womersley and Edmonds 2002). These are rarely used by Hooded Plovers (Dennis 2001) and, although important to many migratory shorebird species, did not support breeding Hooded Plovers during the surveys reported here.

Hooded Plovers occupied only *c.* 50 km of sandy beach coastline on Kangaroo Island during 1985–2004 and comparative population data for most (45.6 km) of this habitat are presented in Table 1. Of those beaches regularly surveyed, nearly 50% were regarded as short beaches being <500 m in length, and 20% were >1 km long. The total length of beach habitat was roughly the same for the north and south coasts.

Data were collected from other remote habitats in most surveys but were excluded from the trend analysis because records from these sites were incomplete for some years. However, data from these beaches were used to estimate the overall total population for Kangaroo Island. Information on beach lengths and disturbance levels are presented in Table 1.

Total population estimate and trend

During the 2004 survey, 110 Hooded Plovers were recorded on habitats for which survey data were consistently available, which included 47

Table 1. Data from seven Hooded Plover surveys conducted on Kangaroo Island from 1985 to 2004 showing: the total number of plovers recorded (N), the number of territorial pairs among them (NTP), the habitat extent, and the level of disturbance determined for each location. Habitat disturbance categories: L = Low disturbance, M-H = Medium to High disturbance.

Habitat information		Year of survey													
		1985		1987		1994		2000		2002		2003		2004	
Location	Disturbance category	N	NTP	N	NTP	N	NTP	N	NTP	N	NTP	N	NTP	N	NTP
Eastern and northern coastline (east-west)															
Antechamber Bay	M-H	7	3	6	3	7	3	9	3	4	2	4	2	9	3
Eastern Cove	M-H	23	9	16	8	17	7	17	6	8	4	10	4	10	4
Pelican Lagoon	L	4	2	2	1	2	1	0	0	2	1	2	1	0	0
Western Cove	M-H	6	3	6	3	10	2	4	2	6	2	3	1	2	1
Boxing Bay to Emu Bay	M-H	8	4	8	4	5	3	7	3	2	1	7	2	6	3
Dashwood Bay to King George Beach	M-H	8	4	8	4	8	4	10	4	6	3	11	3	6	2
Snellings Beach to Western River Cove	M-H	4	2	4	2	2	1	2	1	2	1	3	1	5	2
<i>Sub-totals</i>		60	27	50	25	51	21	49	19	30	14	40	14	38	15
Western and southern coastline (west-east)															
Ravine des Casoars to Rocky River	M-H	6	3	12	3	6	3	4	2	4	2	6	3	0	0
Maupertuis Bay	L	4	2	6	2	8	2	5	2	9	3	3	2	4	2
Hanson Bay	M-H	9	4	7	3	8	4	7	3	6	3	3	2	6	3
Olivers Beach to Vivonne Bay	M-H	10	5	13	5	15	5	11	4	20	5	13	6	14	6
Seal Bay to Bales Bay (west)	M-H	8	4	9	3	11	4	14	3	7	2	4	2	4	2
Bales Bay (mid) to Cape Gantheaume	L	11	4	10	5	6	3	11	4	13	5	6	3	6	3
D'Estree Bay	M-H	14	4	12	5	19	3	12	4	24	4	14	4	18	6
Flourcask Bay	L	7	2	4	2	3	2	7	2	0	0	4	2	2	1
Pennington Bay to Sandhurst Beach	M-H	4	2	4	2	5	2	8	3	8	2	4	1	6	3
Mouth Flat to Black Point	L	11	5	16	5	19	5	14	5	9	4	13	6	12	6
<i>Sub-totals</i>		84	35	93	35	100	33	93	32	100	30	70	31	72	32
Totals		144	62	143	60	151	54	142	51	130	44	110	45	110	47

territorial pairs (Table 1). In addition to these: a further six pairs were recorded on 12 minor (or ephemeral) habitat sites for which there are incomplete data; an estimated further five pairs are likely to occur on known remote sites not visited; and a small number of nomadic individuals frequent saline wetland habitats. This provides an estimate of the total breeding population for the whole of Kangaroo Island in 2004 of *c.* 60 pairs.

The total number of Hooded Plovers recorded on beaches for which data are consistently available fell by 24% between 1985 (144) and 2004 (110). More significantly, the number of breeding pairs declined from 62 in 1985 to 47 in 2004, showing an overall decline of 24%. Decline was most evident at habitats on the eastern and northern coastline where the number of pairs fell by 44% from 27 in 1985 to 15 in 2004 (Figure 2). This compares with an 8.5% decline on western and southern coasts (35 pairs in 1985 and 32 in 2004).

Both the logarithmic and linear rate of change showed a significant decline ($Y = -0.0167X + 4.1478$, $r^2 = 0.92$ and $Y = -0.883X + 62.8$, $r^2 = 0.94$, respectively). Using the linear equation for the number of breeding pairs, extinction on Kangaroo Island is predicted to occur in around

50 years, and in around 20 years for the eastern and northern coastline habitats if the present rate of decline continues.

Population density over suitable habitat

In the late 1980s, Bransbury (1991) found Hooded Plover nests to be separated by an average *c.* 800 m on long continuous beach habitats in South Australia. Similarly, on Kangaroo Island in 1985, 11 pairs were found over 8.7 km of beach habitat with Low disturbance levels, providing a density estimate of one pair per 790 m. On these beaches in 2004 there were 12 pairs, which increases the density estimate slightly to one pair per 725 m. A comparison with 1985 data (51 pairs) from 36.95 km of beach habitats now rated as having Medium or High disturbance levels revealed a similar density of one pair per 724 m. In 2004 there were 35 pairs over the same habitat, reducing the density estimate by 31.4% to one pair per 1056 m.

DISCUSSION

The importance of beaches as places for human recreation is universally recognised and is culturally embedded in the Australian lifestyle. However, beaches in Australia are rarely

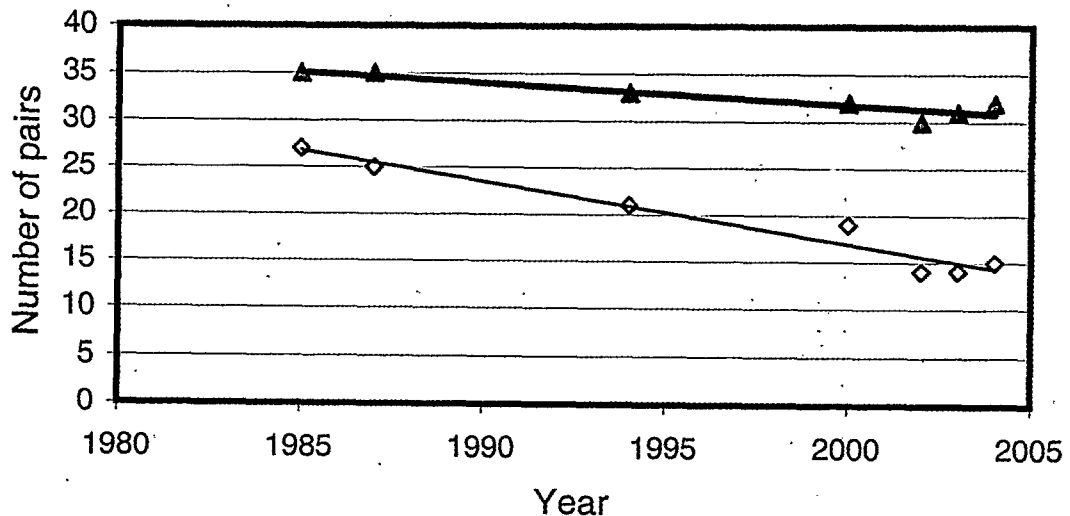


Figure 2: Trends in the number of Hooded Plover pairs on Kangaroo Island from 1985 to 2004, comparing the more disturbed eastern and northern beaches (open diamonds) with the exposed and remote western and southern beaches (solid triangles).

recognised as wildlife habitats with intrinsic ecological values. Consequently, ecologically unacceptable changes to the natural environment of beaches are occurring due to poor planning and management, degradation from waste and stormwater disposal, over-engineering for public access, invasion by exotic flora, urbanisation and over-development in the coastal precinct (James 2000). Kangaroo Island is no exception to these trends with expanding residential development on coastal subdivisions, an increasing population and a growing tourist industry.

Kangaroo Island is a popular destination for both national and international visitors to South Australia. In response to sustained destination marketing by tourism operators and the South Australian Tourism Commission, growth in visitor numbers reached or exceeded 10% per annum between 1992 and 1997 (Manidis Roberts Consultants 1997). There were an estimated 160,000 visitors to Kangaroo Island in 2000–2001, with the majority arriving during the spring–summer breeding season of the Hooded Plover. These trends are likely to continue with increasing pressure to improve access to remote beaches.

Population decline

Over the 46.65 km of habitat reported in Table 1, the overall population density was 3.08 birds/km in 1985. This was down to 2.35 birds/km in 2003 and 2004, an overall decline of 23.7%. However, the density on the more disturbed eastern and northern coastline beaches (22.85 km of habitat) declined even more markedly from 2.62 birds/km in 1985 to 1.66 birds/km in 2004, a decline of 36.6%.

The population has also declined markedly in Tasmania, which has long been regarded as the main stronghold of the *T.r. rubricollis* population (Newman 1983). There were significant population declines of 4.6%/year and some local extinctions were recorded for beaches with high levels of recreational use between 1988 and 1996 (Woehler and Park 1997). Surveys over c. 390 km of coastline in 1988 determined a population density of 2.33 birds/km. By 1996 this had dropped to 1.87 birds/km (Woehler and Park 1997). While these data are difficult to compare with the study on Kangaroo Island where the focus has been on the number of pairs using known breeding habitat, clearly, similar declines have occurred.

Across southern Australia, beach-dwelling bird species such as the Hooded Plover, are declining as a direct result of growing coastal urbanisation and the subsequent increased use of beaches for recreation activities (Hanisch 1998; Dowling and Weston 1999). Although the Hooded Plover has maintained a widespread distribution on Kangaroo Island, this study found significant declines in the number of territorial pairs, particularly on disturbed beaches. This apparent ongoing trend represents substantially reduced breeding effort and moreover is likely to reflect a wider population decline in South Australia.

Human impacts

On Kangaroo Island the impact of human activities on Hooded Plover reproductivity is exemplified by a study of three individually identifiable (colour-banded) pairs on Emu Bay beach, which has vehicle access over its entire length (c. 3 km) and high levels of broad-spectrum recreational activity year-round. These pairs were monitored over several breeding attempts between September 1989 and March 1992 and a clear gradational pattern emerged for the number of young fledged. The pair closest to residential development and vehicle access, and therefore exposed to the highest levels of disturbance, produced few young over the three summers of monitoring with none surviving to fledge. By comparison, the pair on the eastern end of the beach, furthest from disturbance, fledged young each year (T. Dennis unpubl. data). Although this study did not specifically determine the causal factors of nest failure, the decline in productivity is typical of disturbed habitats (Hanisch 1998; Dowling and Weston 1999). In 2002 only one pair was found holding a territory at Emu Bay, two pairs in 2003 and three pairs were present in 2004. However, no eggs or young were found in these years.

The high number of short beaches (<200 m in length) occupied by Hooded Plover pairs is unique to Kangaroo Island (Schulz 1995). Around one third of pairs were found on these habitats where they are considered particularly vulnerable to disturbance that may lead to nest desertion because of the absence of adequate refuge.

On Kangaroo Island, the beaches where the greatest declines in the number of Hooded Plover breeding pairs have been found are also those

where vehicles have unregulated access. In the Coorong National Park in South Australia, Buick and Paton (1989) found that >85% of nests were likely to be crushed on beaches regularly accessed by vehicles. Additionally, pre-fledged Hooded Plover chicks are particularly vulnerable to being crushed where vehicles follow the wheel-tracks of preceding vehicles, because the chicks take refuge in vehicle wheel-mark depressions high on the beach (Raines 2002).

Legislation in South Australia does not generally prohibit vehicles on beaches although Local Government authorities may control access through by-laws. This was the case on Kangaroo Island where, since 1987, vehicle access has been restricted to Emu Bay and limited access allowed elsewhere for the launching of boats. However, to our knowledge these by-laws were never policed and eventually lapsed. As a result vehicles still use many of the accessible beaches and are likely to be contributing to nest failures and habitat degradation.

Passive human activities such as walking, picnicking and swimming can also impact on the breeding success of beach-dwelling birds if people are unaware of their presence (Dowling and Weston 1999). A study of Hooded Plover reproduction and human disturbance in Tasmania determined that 50 m was the critical approach distance at which incubating birds left the nest (Hanisch 1998). On Kangaroo Island, Bransbury (1991) found that during early incubation birds left the nest when approached at 150–200 m, which reduced to 50–60 m in late incubation. Keeping nesting birds from their nests exposes eggs to scavenging birds and ambient conditions that are adverse to successful incubation (Schulz 1996; Raines 2002).

Domestic animal impacts

Exercising Dogs *Canis familiaris* and in some areas Horses *Equus caballus*, on beaches is a common and widespread activity on Kangaroo Island. Unwittingly, there can be direct impacts for ground-nesting shorebirds, such as the Hooded Plover. Dogs are likely to be attracted to nest sites by olfactory cues or the visual concentration of tracks. They have been observed trampling nest sites and eating young or driving them from cover thus exposing them to secondary predation (Retallick and Bolitho 1993; Weston and Morrow 2000). Dogs are required by Local Government by-law on Kangaroo Island to be

restrained on beaches, but to our knowledge this is rarely, if ever, enforced. Nest destruction by people and pets was found to be the most common cause of nest failure on beaches and in adjacent dunes on Victoria's Mornington Peninsula (Dowling and Weston 1999) and on Tasmania's north coast (Hanisch 1998).

An additional impact on Kangaroo Island is the potential trampling of nests by grazing animals such as Sheep *Ovis aries* and feral Goats *Capra hircus*. Studies on Phillip Island in Victoria have shown that Hooded Plovers abandon territories when trampled by sheep (Baird and Dann 2003). Sheep have unrestricted access to beaches along much of Kangaroo Island's northern coastline and feral Goats are frequently recorded grazing on fore-dune vegetation and on beaches on the western coastline in Flinders Chase National Park.

Nest predation

The Heath Goanna *Varanus rosenbergi* is abundant on Kangaroo Island and although predation on Hooded Plover eggs has been observed (Lashmar 1984; Schulz 1995), and tracks have been recorded at recently failed nests (Bransbury 1991), this type of predation has always been present and there is no evidence to suggest that goanna numbers have increased.

Studies elsewhere report the indirect risk for nests from corvids that are alerted to a nest location by observing distraction or stress behaviours displayed by the incubating bird when frequently disturbed (Buick and Paton 1989). On Kangaroo Island, ravens *Corvus* spp., the Grey Currawong *Strepera versicolor*, Pacific Gull *Larus pacificus* and Silver Gull *Larus novaehollandiae* are common beach and dune scavengers and are potential predators of Hooded Plover eggs and young (Marchant and Higgins 1993; Weston and Morrow 2000). While Kangaroo Island does not have a fox population there are feral and domestic Cats *Felis catus* and the abundant Common Brushtail Possum *Trichosurus vulpecular* is also a beach scavenger and, although largely vegetarian, is a known predator of eggs and nestlings (Inns 2002). On some beaches the introduced Black Rat *Rattus rattus* is sometimes common and is a likely opportunistic predator of small ground-nesting birds.

Population monitoring

The decline in the Hooded Plover population

on Kangaroo Island determined in this study indicates that ongoing monitoring at key locations will be important for effective future management. The data presented in Table 1 provide a baseline against which future surveys can be compared.

In the late 1980s a number of non-paired adult Hooded Plovers aggregated into small mobile flocks (<10), found loosely associated with typical wader foraging habitats on the south coast of Kangaroo Island and on inland saline lagoons during the breeding season (T. Dennis unpubl. data). Similarly, in 1994 Schulz (1995) found around 12% of the Kangaroo Island Hooded Plover population to consist of small non-territorial flocks and individuals. Future monitoring initiatives would need to take into account the presence or absence of these flocks in any assessment of recovery potential for the species on disturbed sites.

Management strategies

Throughout Australia, the typical management response to increasing recreational use of beaches has been to expand beach development and infrastructure, often in a largely *ad hoc* manner with regulation of human use being reactive rather than strategic (James 2000). This is also true of Kangaroo Island, with many residents believing their rights are being threatened when restrictions to beach activities are discussed. Tourism growth and further coastal developments are predicted to continue on Kangaroo Island, increasing the likelihood of habitat disturbance and impact to a number of wildlife species, particularly in coastal habitats (Manidis Roberts Consultants 1997).

Based on the findings of this study there is an urgent need to develop remedial and preemptory management strategies at some beaches to reduce the impact of human activities. These are best developed through a threat abatement and species management planning process with strong local community input and involvement, as recently developed in Western Australia (Raines 2002). Some community involvement is already taking place on Kangaroo Island, including the provision of interpretive signs at some beach access points and through participation in annual population surveys. However, few people recognise the importance of beaches as unique ecosystems that support a variety of specialised species.

Based on the experience of Hooded Plover

recovery programs in other states and in the absence of a specific species management plan in South Australia, the following interim management concepts could be considered for Kangaroo Island (not prioritised):

- (i) encourage research projects that investigate comparative reproductive success between habitat sites and threatening processes;
- (ii) re-establish and enforce by-laws dealing with vehicle access (including Horses) and Dog control measures on beaches under Local Government management;
- (iii) zone key beaches such as Emu Bay to facilitate both appropriate recreation areas and wildlife refuges;
- (iv) establish annual population surveys at key locations and bi-annual surveys of all known Hooded Plover habitat including sub-optimal habitats;
- (v) reduce the number of pedestrian beach access points at key habitat locations such as Eastern Cove;
- (vi) develop an educational '*Living with Wildlife*' program, informing residents and visitors of the significance of Kangaroo Island in the conservation of important wildlife habitat remnants, including beaches;
- (vii) establish a community-based 'beach watch' monitoring scheme to include marking or fencing of nesting sites on highly disturbed beaches (with posts capped to prevent perching by avian scavengers; see Weston 1997); and
- (viii) encourage landowners and public land management authorities to cooperatively seek funding for fencing to exclude domestic and feral grazing animals from coastal dunes and beaches (Baird and Dann 2003).

Results of similar actions on the Mornington Peninsula in Victoria indicate some early success in increasing the number of Hooded Plover young produced, improving rates of survival, and increasing public awareness, acceptance and support for Hooded Plover conservation program objectives and strategies (Dowling and Weston 1999).

Clearly the levels of recent declines reported here are cause for serious concern and, in the short to medium term, strategic management of Hooded Plover habitat appears imperative.

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