The Ecology of Two Vulnerable Shorebirds (*Haematopus f. fuliginosus* and *H. longirostris*) in Sub-tropical Northern NSW, Australia: Implications for Conservation and Management



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ABSTRACT

Shorebirds around the globe have become increasingly threatened as a result of burgeoning human populations, increased coastal development and habitat loss, recreational activities, predation, and climate change. Australian Pied and Sooty Oystercatchers (*Haematopus longirostris* and *H. fuliginosus* respectively) are two such species, both coastal residents listed as threatened in New South Wales, Australia. Both rely upon the narrow coastal fringe for foraging, roosting and breeding. Both have undergone declines over recent decades, occur in low numbers, have patchy distributions, are specialist foragers, and are thought to exhibit low breeding success. Despite this, there is a paucity of detailed information on their distribution, population size, key habitat attributes, reproductive biology and ecology, or the impact that various threatening processes have upon these species. Previous work in Australia has focused on counts and movements, with banding programs in Victoria, Tasmania and Western Australia where the species is more common. This thesis examines the distribution, habitat use, breeding biology, ecology and impact of threatening processes for both species in northern NSW to provide a basis for effective management of these species.

Population estimates for both species were generated during 2003 to 2005 and compared to past counts and estimates. Australian Pied Oystercatchers had declined dramatically following the late 1990s, and continued to do so, with a net loss of 13% between 2003 and 2005. Adult mortality was estimated at minimum of 10% annually. Declines were evident in all cohorts, and indicated that although breeding adults were being replaced, immature birds were not, and that the rate of adult loss may have been higher than estimated. Sooty Oystercatchers on the other hand, had remained fairly stable over the past decade. However, numbers fluctuate widely between seasons and years. Although almost 70% of the Australian Pied Oystercatcher population were breeding individuals (from a total of 112 individuals), only six Sooty breeding pairs were found (from a total of 45-49 individuals).

Various factors were identified as good predictors of presence for each species, based on generalised linear modelling, and broadly included food supply, habitat structure and human disturbance. The Clarence River represented a divide between the majority of northern Australian Pied Oystercatchers that primarily forage and nest on beaches and the southern birds that use estuaries (39% of birds within the study region). Conversely, Sooty Oystercatchers rarely occurred north of the Clarence. Two primary areas were used by the latter species, one for foraging and one for breeding. Unoccupied suitable nesting habitat was identified for the Sooty, suggesting that the population may be below carrying capacity. However, productivity of the six island nesting Sooty Oystercatcher pairs was high for the years surveyed, ranging from 1.00 to 0.83 fledglings per pair.

Reproductive success of the 41 breeding pairs of Australian Pied Oystercatcher varied between seasons and between habitat types, with an average of 0.90 and 0.31 fledglings per pair annually (over three years) for estuarine and beach nesting pairs respectively. Therefore, although the majority of pairs occurred on beaches, estuarine pairs produced approximately 70% of all fledged birds. Variation in breeding success and the overall population decline were attributed to several limiting factors, primarily risk of predation, food availability and disturbance.

Predation by the Red Fox (*Vulpes vulpes*), was the largest identified source of egg loss (accounting for 34% of lost eggs), and significantly more beach nests were lost to predators than estuarine nests. Beach and estuarine nesting habitat also varied. Estuarine nests were more complex, possibly offering more protection from predators, whereas beach nests were open, surrounded by little vegetation. Conversely, the risk of tidal flooding was higher for estuarine nesters. Continuing fox control is critical to reduce failure of clutches and should commence in July prior to egg-laying.

Abundance of primary prey species also varied between habitats. The density of *Donax deltoides*, the primary prey species on beaches, has undergone a severe long-term decline that continued through to 2005, with a net loss in stock of 75% between 2003 and 2005. Declines in commercial catches also reflect this trend. Estuarine prey on the other hand, are not harvested and remained abundant during the period of survey. The sustainability of removing bivalves (*Donax deltoides*), from NSW beaches should be investigated as stocks appear to be falling rapidly, and this practice has major ramifications for the reproductive potential and survival of Australian Pied Oystercatchers; in the interim this practice should cease.

Human activity and that of their pets occurred in both habitats, accounting for egg, chick and adult loss. Recreational disturbance also caused birds to depart from nests for 21.5% of incubation time (survey n = 176 hrs, pairs n = 23). Non-incubating partners foraging on shoreline close to nests were also disturbed and lost 18.4% of foraging time. With limited food availability, the impact of disturbance would be exacerbated, likely resulting in fitness costs. Human recreation, particularly involving dogs, was most threatening to incubating Australian Pied Oystercatchers, resulting in significantly higher frequencies and durations of absences than disturbance by researcher approach, slow moving

vehicles and natural stimuli. Human disturbance should be minimised at beach and estuarine breeding sites. Sign-posted buffers with a radius of 195 m should be enforced surrounding nests, in which recreation and pets are excluded.

Population analysis for the Australian Pied Oystercatcher, using the finite rate of increase equation, supported the observed population decline. To reverse the decline managers must focus not only on productivity, but on survivorship of immature and adults. If the currently managed level of productivity can be maintained, and adult survival maintained at 10%, the goal should be to achieve at least $\geq 35\%$ of female fledglings surviving to breeding age. However, further monitoring and colour-flagging is required to determine the survival of fledglings to breeding age, the dynamics of floater populations and the long-term population trends of the population as a whole.

Management of the Australian Pied Oystercatcher in northern NSW has been guided by many of the recommendations made within this thesis in the development of a Threatened Species (Australian Pied Oystercatcher) Management Strategy, and more recently in the preliminary determination by the NSW Scientific Committee to upgrade the species from Vulnerable to Endangered. Measures for mitigating human disturbance also apply to the Sooty Oystercatcher where near-shore islands are used for nesting. However, most off-shore breeding territories are in marine parks and are less accessible to people.

Key words: shorebirds, disturbance, breeding biology, nest predation, population trends, sustainability, management.

CERTIFICATION of ORIGINALITY

I certify that the substance of this thesis has not already been submitted for any degree and is not currently being submitted for any other degree or qualification.

I certify that any help received in preparing this thesis, and all sources used, have been acknowledged in this thesis.

I certify that all text, maps, figures, tables and images included in this thesis are my original work. Guidance regarding text revision for each of the chapters of this thesis has also been provided by Professor Hugh A. Ford.

8th March 2009

Date

Candidate

STATEMENT of AUTHORS' CONTRIBUTION

Chapter 4 is the only chapter submitted for publication prior to submission of this thesis. The two authors include myself (the candidate), and my Principal supervisor (Professor Hugh A. Ford).

We, the PhD candidate and the candidate's Principal Supervisor, certify that all co-authors have consented to their work being included in the thesis (Chapter 4) and they have accepted the candidate's contribution as indicated in the *Statement of Originality*.

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DEFINITION of TERMS

Anthropogenic Anthropogenic effects, processes, materials or objects derived from human activities, as opposed to those occurring in biophysical environments without human influence. APOC Australian Pied Oystercatcher Austral Austral spring includes the period between September 1 and November spring/summer 30, while summer includes the period between December 1 and February 31. One of three beach state categories, dissipative beaches include those **Dissipative Beach** with a flat beach face compriosed of fine sand particles, fronted by State nearshore sand bars and a wide surf zone. Spilling waves are dissipated as they travel through the shallow water over the bars; this surf zone may be 100 m wide. Floaters Generally immature and/or non-breeding, non-territorial birds that move around locally, tending to occur in small groups in a range of regular locations. Fledgling Oystercatcher chicks that are able to take flight (generally 5-8 weeks of age), but that generally remain with parents, rather than fledging or leaving the nest as for other species. Immature Non-breeding birds, generally less than four years of age. Intermediate One of three beach state catchegories, intermediate beaches include **Beach State** those with a gently sloping gradient and fine sand particles, wide beach face and large surf zone. Pipi Bivalve (Donax deltoides), also known as the Goolwa Cockle or Surf Clam, one of the best known molluscs occurin on ocean beaches of Australia.

- Reflective BeachOne of three beach state categories, reflective beaches include thoseStatewith a steep and often narrow beach face comprised of coarse sediment,
where small (but plunging) waves break. The zone where these high
energy waves break is often < 10 m wide; waves are reflected seaward.</th>
- VulnerableA taxon is Vulnerable when it is neither Critically Endangered nor
Endangered, but is facing a high risk of extinction in the wild in the
medium-term future. Includes those are those that are likely to become
endangered unless the circumstances and factors threatening their
survival or evolutionary development cease to operate.

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