

- Alternatives. Eds J.W. Bradbury & M. Anderson. John Wiley & Sons, Chichester.
- Healey, C.J. 1978. Effects of human activity on *Paradisaea minor* in the Jimi Valley, New Guinea. *Emu* 78, 149-155.
- Hundgen, K. & Bruning, D. 1988. Propagation techniques for Birds of Paradise at the New York Zoological Park. AAZPA 1988 Annual Conference Proceedings, 14-20.
- Hundgen, K., Sheppard, C., Bruning, D., Hutchins, M., Worth, W. & Laska, M. 1990. Management and breeding of the Lesser Bird of Paradise *Paradisaea minor* at the New York Zoological Park. AAZPA 1990 Annual Conference Proceedings, 199-207.
- Kwapena, N. 1980. The Ecology and Conservation of Six Species of Birds of Paradise in Papua New Guinea. Progressive Printing Agency, Hong Kong.
- Laska, M.S. 1990. Breeding behavior of captive Lesser Birds of Paradise at the New York Zoological Park. M.S. Thesis. Fordham University, New York.
- LeCroy, M. 1981. The Genus *Paradisaea*: display and evolution. *American Museum Novitates* 2714, 1-52.
- LeCroy, M., Kulupi, A. & Peckover, W.S. 1980. Goldie's Bird of Paradise: display, natural history and traditional relationships of people to the bird. *Wilson Bulletin* 92, 289-301.
- Oring, L.W. 1982. Avian Mating Systems. Pp. 1-92 in *Avian Biology*. Eds D.S. Farner, J.R. King & K.C. Parkes. Academic Press, New York.
- Rubenstein, D.I. 1982. On the evolution of alternative mating strategies. Pp. 65-100 in *Current Problems in Sociobiology*. Eds Kings College Sociobiology Group. Cambridge University Press, Cambridge.
- Zahavi, A. 1975. Mate selection — a selection for a handicap. *Journal of Theoretical Biology* 53, 205-214.

The Status of the Black-browed Albatross *Diomedea melanophrys* at Heard Island

R.J. Kirkwood¹ and P.J. Mitchell²

¹ Department of Parks, Wildlife and Heritage, P.O. Box 44A, Hobart, Tas. 7001

² Regional Veterinary Laboratory, Bairnsdale, Vic. 3875

EMU Vol. 92, 111-114, 1992. Received 10-7-1990, accepted 4-4-1991

The Black-browed Albatross *Diomedea melanophrys* is abundant in the Southern Ocean and has a circum-polar distribution (Tickell 1976). Two subspecies are recognised: *D. m. impavada*, which breeds only on Campbell Island, and *D. m. melanophrys*, which breeds in the Atlantic, west Pacific and Indian sectors of the Southern Ocean (Tickell 1976; Croxall *et al.* 1984). Colonies of *D. m. melanophrys* at Heard Island, south of the Antarctic Convergence in the Indian sector of the Southern Ocean, were first reported in 1947 (Downes *et al.* 1959). Since then, the colonies have been visited irregularly. This paper summarises the information gathered, presents new data collected during the 1987-88 austral summer and discusses parameters affecting the current status of the population on Heard Island.

Breeding biology

Immature Black-browed Albatrosses forage at sea year-

round and start returning to breeding sites as seven-year-olds, but it is several more years until they breed. On maturing, the adults breed annually and raise a maximum of one chick per pair per year (Tickell & Pinder 1967, 1975). Individuals can survive to at least 29 years of age (Copson 1988). During the breeding season, the nest site is occupied for approximately seven months (Tickell & Pinder 1975). For the remaining five months of the year, adults forage at sea, generally over continental-shelf waters (Weimerskirch *et al.* 1985). Although the Black-browed Albatross is considered faithful to its nuptial site, the resighting of an incubating adult at Heard Island which had been banded as a chick on the Kerguelen Islands (360 km to the north-west) (Woehler 1989) indicates that there is some mixing between populations.

Breeding chronology and breeding success at islands varies depending on location. At islands that lie

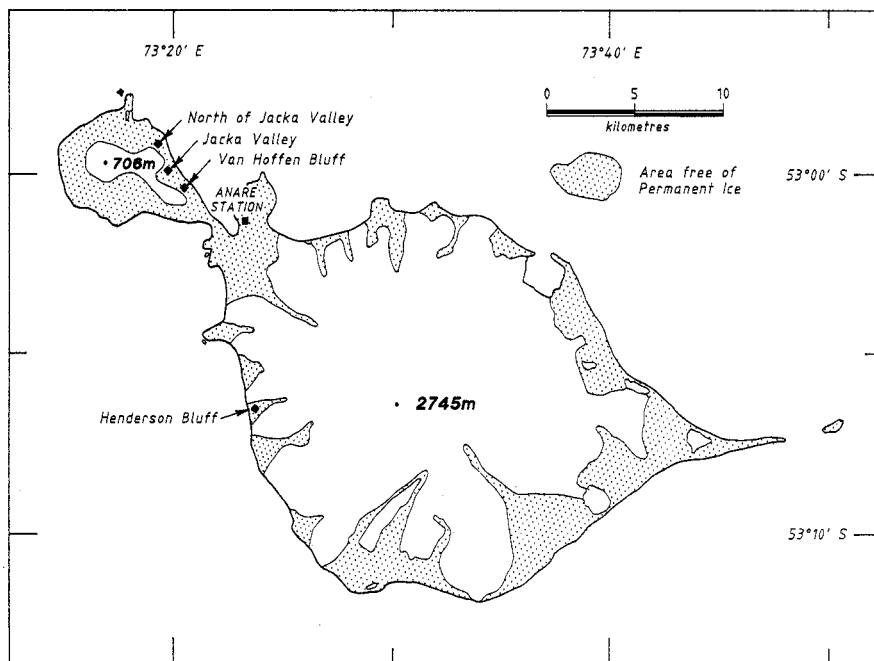


Figure 1 The location of Black-browed Albatross colonies at Heard Island.

south of the Antarctic Convergence, such as Heard Island and Bird Island, South Georgia, the arrival at breeding sites, the commencement of egg-laying and the peak of chick-hatching is delayed approximately two weeks from the timing of these events at breeding sites north of the Antarctic Convergence (data presented in Downes *et al.* 1959; Tickell & Pinder 1975; Copson 1988; Weimerskirch *et al.* 1989).

Breeding success is poorer at colonies south of the Antarctic Convergence. At the Jacka Valley colony, on Heard Island, breeding success (recorded as chicks raised to at least five-weeks of age as a percentage of eggs laid) ranged from 17-68% ($n = 5$ seasons, Table 1). This was similar to the range of actual breeding success (chicks fledged from eggs laid) at Bird Island (0% to 67%, $n = 11$ seasons; Prince 1985; Croxall *et al.* 1988) and lower than at Macquarie Island (48% to 86%, $n = 7$ seasons; Copson 1988), which lies north of the Antarctic Convergence.

Presumably the lower breeding success and the delayed breeding chronology at islands south of the Antarctic Convergence reflects the longer, harsher winter conditions experienced.

Population status and trends

There are four colonies of Black-browed Albatrosses on

Heard Island (Fig. 1). Opportunistic counts of breeding pairs and chicks raised to at least five weeks of age have been conducted at these colonies since 1948 (Table 1). The Jacka Valley colony has been censused most often and, in a total of seven seasons, the number of breeding pairs ranged from 57 in 1950-51 to about 150 in 1987-88 (although the population would have been greater in the 1982-83 season when 153 five-week-old chicks were counted). Overall, the Heard Island population appears to have increased from about 230 breeding pairs in the early 1950s to 600-700 in 1987-88.

This apparent trend should be viewed with caution. Regular monitoring since 1976 at Bird Island found the size of the breeding population of Black-browed Albatrosses to fluctuate annually (Prince 1985; Croxall *et al.* 1988). Further information is needed to clarify whether the present data records an increase in the population at Heard Island or annual fluctuations in the breeding numbers.

Dramatic population changes have occurred in several vertebrate species at Heard Island (Burton 1986; Gales & Pemberton 1988; Goldsworthy & Shaughnessy 1988; Woehler 1991). These changes may be related to climatic ameliorations at Heard Island which have been

Table 1 Numbers of breeding pairs (bp) and chicks raised to at least five-weeks of age (ch) of Black-browed Albatrosses counted during the breeding season at colonies on Heard Island between the 1948–49 and 1987–88 seasons. Values marked '+' represent minimum numbers; values in brackets are numbers of adult birds recorded at the time of late-incubation or early-chick-hatching.

Breeding season	Colony location						Reference			
	Jacka Valley		Van Hoffen Bluff		North of Jacka Valley			Henderson Bluff		
	bp	ch	bp	ch	bp	ch	bp	ch		
1948–49		28							Downes <i>et al.</i> 1959	
1949–50	70								Downes <i>et al.</i> 1959	
1950–51	57	38+							Downes <i>et al.</i> 1959	
1951–52	69	46+							Downes <i>et al.</i> 1959	
1952–53		44							Downes <i>et al.</i> 1959	
1953–54	87+	33+	22						Downes <i>et al.</i> 1959	
1954–55	102	17					(110)		Downes <i>et al.</i> 1959	
1979–80	98 (Jacka Valley & Van Hoffen Bluff)							112		Johnstone 1982
1982–83		153							Smith 1986	
1985–86	125		20						Woehler 1991	
1986–87			(18)		(40)		(400)		Woehler 1991	
1987–88	147+	100	(44)		(60)				Present study	

emphasised by recent, rapid glacial retreats (Allison & Keage 1986). While being detrimental to some species, conditions at Heard Island may be improving for the Black-browed Albatross. A lessening of the harsh winter conditions could have increased the breeding success of recent generations of this population. At present it is not clear whether these changes represent long-term trends in species abundance, or shorter term fluctuations.

It is interesting to note that although there is evidence of an increase in numbers of Black-browed Albatrosses at Heard Island, colonies at the nearby Kerguelen Islands are declining (Weimerskirch *et al.* 1987, 1989). This decline has been attributed to fishing activities both near to the Islands (Weimerskirch *et al.* 1987, 1989) and throughout the Southern Ocean (Brothers 1991).

Acknowledgements

We acknowledge the field support of Andrew Climie and other members of the 1987–88 A.N.A.R.E. to Heard Island. We are indebted to Graham Robertson, Rosemary Gales, Eric Woehler and W.L.N. Tickell for their comments on drafts of this manuscript. The figure was prepared by John Cox.

References

- Allison, I.F. & Keage, P.L. 1986. Recent changes in the glaciers of Heard Island. *Polar Record* 23, 255–271.
- Brothers, N. 1991. Albatross mortality and associated bait loss in the Japanese long-line fishery in the Southern Ocean. *Biological Conservation* 55, 255–268.
- Burton, H.R. 1986. A substantial decline in numbers of the Southern Elephant Seal at Heard Island. *Tasmanian Naturalist* 86, 4–8.
- Copson, G.R. 1988. The status of the Black-browed and Grey-headed Albatrosses on Macquarie Island. *Papers and Proceedings of the Royal Society of Tasmania* 122, 137–141.
- Croxall, J.P., Prince, P.A., Hunter, I., McInnes, S.J. & Copestake, P.G. 1984. The seabirds of the Antarctic Peninsula, islands of the Scotia Sea and Antarctic Continent between 80°W and 20°W: their status and conservation. Pp. 637–666 in *Status and Conservation of the World's Seabirds*. Eds J.P. Croxall, P.G.H. Evans & R.W. Schreiber. International Council for Bird Preservation Technical Publication 2, Cambridge.
- Croxall, J.P., McCann, T.S., Prince, P.A. & Rothery, P. 1988. Reproductive performance of seabirds and seals at South Georgia and Signy Islands, 1976–1987: Implications for Southern Ocean Monitoring Studies. Pp. 261–285 in *Antarctic Ocean and Resources Variability*. Ed. D. Sahrhag. Springer-Verlag, Berlin.

- Downes, M.C., Ealey, E.H.M., Gwynn, A.M. & Young, P.S. 1959. The birds of Heard Island. Australian National Antarctic Research Expeditions Report B.1. Zoology.
- Gales, R.P. & Pemberton, D. 1988. Recovery of the King Penguin, *Aptenodytes patagonicus*, population on Heard Island. Australian Wildlife Research 15, 579-585.
- Goldsworthy, S.D. & Shaughnessy, P.D. 1988. Counts of the Antarctic fur seal *Arctocephalus gazella* and location of colonies at Heard Island in the 1987-88 summer. Australian National Antarctic Research Expeditions Research Notes 72.
- Johnstone, G.W. 1982. Zoology. Pp. 33-39 in Expedition to the Australian Territory of Heard Island and McDonald Islands 1980. Eds C. Veenstra, J. Manning *et al.* Division of National Mapping Technical Report 31.
- Prince, P.A. 1985. Population and energetic aspects of the relationship between Black-browed and Grey-headed Albatrosses and the Southern Ocean marine environment. Pp. 473-477 in Antarctic Nutrient Cycles and Food Webs. Eds W.R. Siegfried, P.R. Condy & R.M. Laws. Springer-Verlag, Berlin.
- Smith, J. 1986. Specks in the Southern Ocean. University of New England, New South Wales.
- Tickell, W.L.N. 1976. The distribution of Black-browed and Grey-headed albatrosses. Emu 76, 64-68.
- Tickell, W.L.N. & Pinder, R. 1975. Breeding biology of the Black-browed Albatross *Diomedea melanophris* and Grey-headed Albatross *D. chrysostoma* at Bird Island, South Georgia. Ibis 117, 433-451.
- Tickell, W.L.N. & Pinder, R. 1975. Breeding biology of the Albatrosses *Diomedea melanophris* and *D. chrysostoma*. Nature 213, 315-316.
- Weimerskirch, H., Jouventin, P., Mougou, J.L., Stahl, J.C. & Van Beveren, M. 1985. Banding recoveries and the dispersal of seabirds breeding in French Austral and Antarctic Territories. Emu 85, 22-33.
- Weimerskirch, H., Clobert, J. & Jouventin, P. 1987. Survival in five southern albatrosses and its relationship with their life history. Journal of Animal Ecology 56, 1043-1056.
- Weimerskirch, H., Zotier, R. & Jouventin, P. 1989. The avifauna of the Kerguelen Islands. Emu 89, 15-29.
- Woehler, E.J. 1989. Resights and recoveries of banded seabirds at Heard Island, 1985-1988. Corella 13, 38-40.
- Woehler, E.J. 1991. The status and conservation of seabirds of Heard Island and the McDonald Islands. Pp. 263-277 in Seabird Status and Conservation: Supplement. Ed. J.P. Croxall. International Council for Bird Preservation Technical Publication No. 11, Cambridge.

An Investigation of Blood Smears of Northern Australian Finches

Sonia C. Tidemann, M. Calley and C. Burgoyne

Conservation Commission of the Northern Territory, P.O. Box 496, Palmerston. N.T. 0831

EMU Vol. 92, 114-117, 1992. Received 21-10-1990, accepted 8-4-1991

Haematology can be used to diagnose avian (Hawkey *et al.* 1985; Campbell & Dein 1984; Campbell 1988) and mammalian diseases (Bubenik 1987). It can be used to indicate the presence of intra- or extra-cellular parasites, a high white blood cell count or a low count of mature red blood cells (Campbell & Dein 1984).

The aim of this study was to investigate the possibility that Gouldian Finches *Erythrura gouldiae* were diseased, as far as it was possible to determine from blood smears, by comparing blood smears from them with those of co-occurring finches. The reason for focusing on the Gouldian Finch was that their numbers have declined in the wild (Blakers *et al.* 1984) to the point of

their being endangered (Brouwer & Garnett 1990). If the measures of red and white cells of Gouldian Finches lay outside the ranges of the other finches or intra- or extra-cellular parasites were present in Gouldian Finches but not the others, it could suggest that Gouldian Finches might be affected by disease. More refined methods could then be used to re-examine blood composition and investigate the nature of the disease.

Methods

Blood was taken from eight species of finch, Long-tailed *Poephila acuticauda* ($n = 81$), Masked *P. person-*