

Census of Penguins on Ardley Island of Western Antarctic

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ABSTRACT

Four species of penguins were found on Ardley Island of King George Island during the austral summer of 1993 and 1994. Macaroni Penguin *Eudyptes chrysolophus* is a new record of bird on this Island. The numbers of nests found were 44 1205 and 3678 for Chinstrap Penguin *Pygoscelis antarctica*, Adelie Penguin *P. adeliae* and Gentoo Penguin *P. papua* respectively. Totally about 7430 fledged penguin chicks were produced on Ardley Island in the summer of 1993 and 1994. The decrease of the Island population of Chinstrap Penguins might have resulted from the increasing human disturbance.

Key words: Penguins. Population size. Ardley Island. Antarctic.

Penguins are the symbolized animals of Antarctic and play an important role in the marine ecosystem. They constitute a major class of predators consuming marine resources, especially the krill *Euphausia super* and comprise about 90% of the avian biomass of the Southern Oceans (Croxall 1984; Croxall, et al., 1984; Brown, 1989).

The research activities in Antarctic at present are concentrated on two aspects: the environment monitoring and the potential resource exploitation. Both of them have close relations to the penguin studies.

Since the end of the 1950s, more and more penguin researchers have turned their interests to population studies, and the penguin population monitoring programme has become an important part of seabirds and seal monitoring connected with the implementation of the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR, 1986).

Although many countries have carried out their long-term studies to monitor the dynamics of penguin populations, this is the first study conducted by Chinese biologists. In the austral summer of 1993 and 1994, we had anticipated the 10th Chinese Antarctic Research Expedition. This was the first time for Chinese ornithologists to study penguins and other seabirds in Antarctic. This paper presents the results of a penguin census made on Ardley Island, western Antarctic.

STUDY AREA

This study was conducted on Ardley Island from November 1993 to March 1994. Ardley is a small island located in the Maxwell Bay of King George Island of South Shetland Islands, western Antarctic, i. g. $60^{\circ}13'S$ and $58^{\circ}55'W$ (Fig. 1). The total area of Ardley Island is about 1.18Km^2 with a maximum length of 1800m and a maximum width of 850m. The distance from the study area to the Chinese Research Station (The Great Wall Station) is about 2Km.

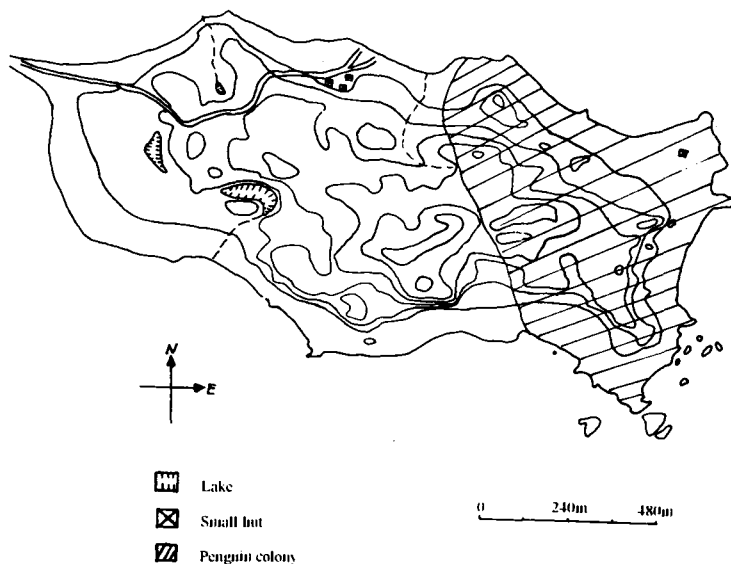


Fig. 1 The map of Ardley Island of Western Antarctic.

The maritime Antarctic climate of Ardley Island is cold, wet and windy. The Island is subject to warm moist wind from the north and west over the Drake Passage and has the greatest frequency of storm depressions in the Antarctic. Overcast skies and fog prevail, and clear days are the exception (Watson, 1975). The mean annual temperature is -2.6°C . The means from December to March are -0.1°C to 1.5°C , but those from April to November range from -1.6°C to -7.8°C . Occasionally the temperature in summer can reach as high as 11.7°C . The annual precipitation in this area is about 635mm (Zhang et al. 1993).

Ardley Island is covered by snow in the winter, but it is usually ice-free in the summer season (from December to March) when seabirds come for breeding.

METHODS

Field investigations were carried out every two weeks. The species of penguins found on the Island, their abundance and activities were recorded, and the locations of the birds were plotted on a 1:5000 scale map.

Census of the breeding populations were made by counting the number of nests built in December

before the chick hatched. The nests which contained eggs (normally 2 eggs in one clutch) of each penguin species were identified by their owners (the incubating birds) and the numbers of nests were counted in groups. If two nests were more than 5 meters apart from each other, they were considered as two groups because the mean distance between two nests in a group was about 1~1.5m. After the chicks came out, they were also counted for each breeding population in a sample of 100~200 nests.

The average annual rate of increase was calculated using the same formula described by Yanez J, et al. (1984). The formula is:

$$I = [(FV/PV)^{1/n} - 1] \times 100$$

where I is the annual increase rate, n is the interval of two censuses, PV is the census result of the population in year A , FV is the census result in year $A+n$.

RESULTS

Four species of penguins were observed on Ardley Island during the austral summer of 1993 and 1994, and three of them were residents on this Island and were common in the study area throughout the summer season, Macaroni Penguin the only non-breeding species on Ardley and it was very rare in this area. On January 31, 1994, we found a young Macaroni Penguin resting in a flock of Chinstrap Penguins in a rocky behind the Germany Observation Station on Ardley Island. This Penguin had stayed there for about three weeks when it molted. The last sighting of this Penguin was on February 21, 1994. It was the first record of Macaroni Penguin on Ardley Island and in its surrounding areas.

Table 1 The species of penguins found on Ardley in the summer of 1993 and 1994.

Species	Arrival	Departure	Status
Adelie Penguin (<i>Pygoscelis adeliae</i>)	early October		late January to early February common
Gentoo Penguin (<i>Pygoscelis papua</i>)	late September to mid-October		early March to late April common
Chinstrap Penguin (<i>Pygoscelis antarctica</i>)	early November		late March to late April common
Macaroni Penguin (<i>Eudyptes chrysolophus</i>)	31st January		22nd February accidental

The results of censusing the breeding population of Penguins on Ardley is shown in Table 2. It indicates that totally 9854 breeding penguins were found on Ardley Island in the summer of 1993 and 1994, and the dominant species was Gentoo Penguin, then Adelie Penguin and Chinstrap was the least in terms of population size.

Table 2 The population size of the three breeding penguin species on Ardley.

Species	No. of groups	No. of nests	No. of breeding birds
Adelie Penguin	17	1205	2410
Gentoo Penguin	226	3678	7356
Chinstrap Penguin	3	44	88
Total	246	4927	9854

In the summer of 1993 and 1994, about 1567, 5775 and 61 fledged chicks were produced on Ardley Island by the breeding populations of Adelie Penguin, Gentoo Penguin and Chinstrap Penguin, respectively (Table 3). Therefore, the total number of the penguins on Ardley Island in the post-breeding period (late January to early February) was 17 257. This number did not include the non-breeding individuals.

Table 3 Number of fledged penguin chicks produced on ardley island in the summer of 1993 and 1994.

	Adelie Penguin	Gentoo Penguin	Chinstrap Penguin
No. of pairs	1205	3678	44
Breeding success (chicks/pair)	1.30 *	1.57 * *	1.39
Chick production (no. of chicks)	1567	5775	61
Date of Census	7th Jan.	14th Jan.	31st Jan.

* Based on a sampling census of 190 nests. * * based on a sampling census of 150 nests.

DISCUSSION

Seven penguin species are resident in the Antarctic and sub-Antarctic regions (Watson, 1975). Four of them were found on Ardley Island in the summer of 1993 and 1994, which accounted for 57.14% of the Antarctic penguin species. Macaroni Penguin which normally breeds on Livingston Island (South Shetland Islands) and Antarctic Peninsula appeared on Ardley in late January to mid-February of 1994. This is the first record of this species of penguins on Ardley Island.

According to our investigations, there were 4827 pairs of penguins bred on Ardley Island in the summer of 1993 and 1994. Comparing our results with the results from the previous censuses (Yanez, et al., 1984), we can find some increase in the Adelie Penguins and Gentoo Penguins while a drastical decrease occurred in the Chinstrap Penguins. The changes of population size and the average annual rates of increases of the different penguin populations are shown in Table 4.

Table 4 The changes of penguin population size at Ardley island.

	Adelie Penguin	Gentoo Penguin	Chinstrap Penguin
No. of breeding pairs			
1973 *	230	1850	18
1983 *	1074	1656	91
1993	1205	3678	44
The average annual rate of increases (I)			
1973~1983	16.6	-1.1	17.6
1983~1993	1.2	8.3	-7.0

* Date from Yanez J, Nunez H, Valencia J et al. (1984)

There are several potential factors that might have affected the population size of Antarctic birds, such as the availability of food supply (Heinmann, et al., 1989; Harrigan, 1992), parasitic disease (Harrigan 1992) and human disturbance (Peter, et al 1986). A study of Adelie Penguins indicated

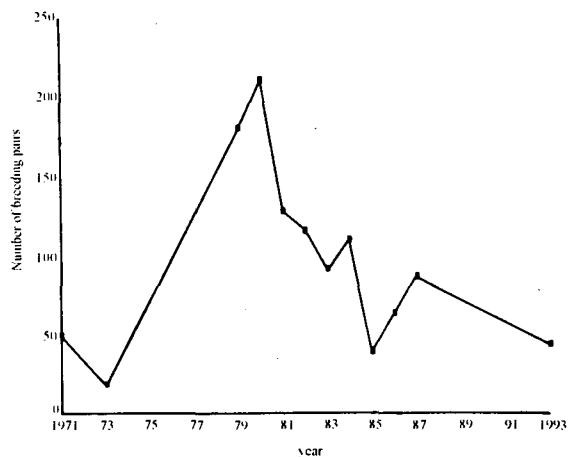


Fig. 2 The population changes of Chinstrap Penguin at Ardley Island since 1971.

that human disturbance (aircraft) could cause bird numbers in the colonies to decrease by 15% and produced an active nest mortality of 8% (Wilson, et al., 1991). Chinstrap Penguins nest in the rockeries close to the sea and they are more sensitive to human disturbance than Adelie Penguins and Gentoo Penguins. Using the data from the present study and some previous studies to examine the annual changes of the Chinstrap Penguin population on Ardley Island, we found that lower numbers were occurred in the early 1970s, 1985 and 1986 as well as 1993 and 1994 (Fig. 2). These decreases were coincided with the increases of the intensity of human activities on Ardley Island and its surrounding areas (The Marsh Airport was built in 1970s, The Great Wall Station and Artigas Station were built in the summer of 1985 and 1986, more visitors and aircrafts went to Ardley in the summer of 1993 and 1994). Therefore, we infer that the increase of human disturbance caused the declines of the population of Chinstrap Penguins on Ardley Island.

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