

## BODY TEMPERATURES OF ANTARCTIC BIRDS

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BODY-TEMPERATURE studies of Antarctic birds were conducted by the author while employed as ornithologist at the East Base, on the United States Antarctic Expedition, from November, 1939 to May, 1941.

The East Base was one of two bases established on the Antarctic Continent by the United States Antarctic Expedition, under the direction of Rear Admiral Richard E. Byrd. It was located on a small island, approximately 1,000 miles south of Cape Horn, in Marguerite Bay off the Bellinghausen Sea, adjacent to the west coast of the Palmer Peninsula, in Latitude 68° 11' S., Longitude 67° 12' W.

Rather limited bird-temperature records from the Antarctic Continent have thus far been obtained, and this work was an attempt to add slightly to the present knowledge. During the study a total of 78 records covering observations on six species of Antarctic birds were made. All were taken within a fifteen-mile radius of the base. Birds included in the study were the Adélie Penguin (*Pygoscelis adeliae*), South-Polar Skua (*Catharacta skua maccormicki*), Kelp Gull or Southern Black-backed Gull (*Larus dominicanus*), Snow Petrel (*Pagodroma nivea*), Antarctic Tern (*Sterna vittata*), and the Giant Fulmar (*Macronectes giganteus*). Nesting records of the first four species were also obtained during the work.

Previous records on Antarctic birds have been made by Andersson, Clarke, Gain, and Vallette.

## METHOD USED

A 4-inch Asepto rectal maximum-minimum thermometer was used, with recordings made to within a tenth of a degree. The thermometer was inserted at least three inches into the intestine, and was kept there three minutes. In each case the time of day was noted as well as the air temperature, if possible.

Whenever possible, recordings were taken on uninjured birds. All penguin, snow petrel, and most skua records were taken on birds not injured. Penguins were readily caught with a hand net on land, skuas were easily snared with a string, and Snow Petrels were captured after they had momentarily stunned themselves by flying against a building during the winter night. Temperatures were taken from wounded birds immediately after capture, and then only on specimens which were but slightly wounded. The one disadvantage of taking recordings from birds which were not wounded was that sex

was not determined, in many cases, because some of these birds were afterward released.

The following table gives the family, species, number of records, and maximum, minimum, and mean temperatures. All were rectal recordings:

TABLE 1  
SUMMARY OF BODY TEMPERATURE RECORDS

Family and Species	Temperatures (F)			Number of records
	Maximum	Minimum	Mean	
Spheniscidae <i>Pygoscelis adeliae</i>	106.4 (juv.) 105.3 (ad.)	100.3	103.8	23
Laridae <i>Larus dominicanus</i>	107.4	104.2	105.77	16
<i>Sterna vittata</i>	106.2	105.2	105.63	3
Stercorariidae <i>Catharacta skua maccormicki</i>	108.4	103.4	106.14	30
Procellariidae <i>Pagodroma nivea</i>	104.1	102.1	103.3	3
<i>Macronectes giganteus</i>	105.8	104.3	105.03	3
			Total	78

Previous Adélie Penguin records taken by Andersson, ornithologist of Nordenskjöld's Swedish Expedition, near the Antarctic Circle at the northern tip of the Palmer Peninsula, found temperatures ranging from 100.2° F. to 104.9° F. Clarke, biologist for the "Scotia" Antarctic Expedition, found temperatures of this same species as high as 106° F. Vallette, an Argentine meteorological observer in the South Orkney Islands, recorded a South-Polar Skua temperature at 105.9° F., a Kelp Gull at 105.2° F., a Snow Petrel at 99.8° F., and a Giant Fulmar at 104.5° F. This same observer recorded an Antarctic Tern temperature of 107.9° F., while Gain, biologist on Dr. Charcot's French Antarctic Expedition, found a temperature for this same species of 102.9° F.

#### DIURNAL RISE AND FALL

Detailed investigations of the diurnal rise and fall of bird temperatures have been carried out by Wetmore, and Simpson and Galbraith.

Diurnal species, which are normally active during daylight hours, showed a constant rhythm indicated by a gradual temperature rise toward the latter part of the afternoon, and a corresponding decrease toward early morning. Nocturnal species showed a reverse temperature curve with the high reading late at night and the low during the day. Increased temperatures were definitely correlated with activity.

Peculiarities of Antarctic Continent weather present factors which are not normal to temperate zones. In addition to extreme, cold temperatures and a reverse in seasons of that of the northern hemisphere, there is a period during the summer in which there is continual daylight, and sight of the sun is never lost. Consequently an experiment was carried on, under these natural conditions, which might throw still further light on diurnal rhythm.

TABLE 2  
HOURLY TEMPERATURE RECORDS OF *Catharacta skua maccormicki*

<i>Time of Day</i>	<i>Air Temperature</i>	<i>Body Temperature No. 1 Specimen</i>	<i>Body Temperature No. 2 Specimen</i>
3 P. M.	+33° F.	107.1° F.	107.9° F.
4 P. M.	+33	106.6	108.4
5 P. M.	+33	107.6	107.5
6 P. M.	+32	104.9	106.9
7 P. M.	+32	104.3	106.0
8 P. M.	+32	104.5	104.6
9 P. M.	+32	104.0	103.8
10 P. M.	+32	103.8	104.0
11 P. M.	+32	103.9	103.5
12 Midnight	+32	104.0	104.0
1 A. M.	+32	104.4	104.0
2 A. M.	+32	104.1	104.1
3 A. M.	+32	104.0	104.3
4 A. M.	+32	104.5	104.4
5 A. M.	+32	104.3	104.4
6 A. M.	+32	104.3	104.7
7 A. M.	+33	104.2	104.4
8 A. M.	+33	104.3	104.8
9 A. M.	+33	104.7	105.5
10 A. M.	+33	103.9	105.5
11 A. M.	+34	104.4	106.0
12 Noon	+34	104.9	105.5
1 P. M.	+34	105.4	105.7
2 P. M.	+34	105.2	105.5
3 P. M.	+34	105.7	105.2

Mean Average 104.76° F. 105.12° F.

During a period of continual daylight, in March, two adult South-Polar Skuas, the most southerly bird in the world according to present records, were taken alive. At these times this bird is more or less active for 24-hour periods, and they could always be observed eating and fighting among themselves over seal-meat scraps near the husky sledge-dog kennels. Simultaneous hourly temperature recordings were taken on both captured skuas for a period of 25 hours. One bird showed a high reading of 107.1° F. and a low of 103.8° F., or an average of 104.76° F., while the second had a high of 108.4° F. and a low of 103.5° F., or a mean of 105.12° F. Highest temperatures were reached around 3 P. M. after which there was a gradual decline to midnight. For the next three or four hours the temperatures remained somewhat constant, after which there was a gradual rise up to the middle of the afternoon.

Hourly air temperatures were also kept, but when compared to the bird temperatures no correlation could be found. Light westerly winds, with a foggy and overcast sky caused temperatures to remain steady, and the highest recording within this 25-hour period was + 34° F., with the lowest at + 32° F.

#### TEMPERATURE DIFFERENCE OF SEXES

Correlations on temperature differences between sexes were not worked out in detail, because many birds were released after recordings were taken, and sex was undetermined due to plumage similarity.

Most temperature work on this phase seems to indicate that the female has the higher temperature, although there are exceptions to this, especially in cases where the male helps with nesting and is otherwise more active than the female. In this work only recordings of the South-polar Skua and the Kelp Gull were of sufficient number even to indicate any differences. These recordings were made at the end of the nesting season.

TABLE 3  
TEMPERATURE DIFFERENCE BETWEEN SEXES

Species	Number of Records		Mean Temperature	
	Male	Female	Male	Female
<i>Catharacta skua macconnicki</i>	4	9	106.1	106.5° F.
<i>Larus dominicanus</i>	4	4	105.5	105.8

The author wishes to acknowledge his appreciation to Mr. Herwil M. Bryant, East Base Biologist, and other members of the base for their aid in carrying on these studies.

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