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Seabird observations in the region of the South Shetland Islands and South Orkney Islands during BIOMASS-SIBEX (December 1983 January 1984)*)

ABSTRACT: The presence of 31 species of birds was observed at sea south of 50°S, out of this number 26 species were present also south of 60°S. The most numerous aggregations of birds were recorded in the regions of: Elephant Island, the South Orkneys and NE part of Bransfield Strait. The average number of birds during 10-minute observation was 74.5. In the areas under observations *Daption capense* predominated quantitatively. The following species were subdominant: *Pygoscelidae*, *Oceanites oceanicus*, *Diomedea melanophris*, *Fulmarus glacialisoides* and *Macronectes giganeus*. In the total number of the birds observed krill-eaters contributed in 80.1%, plankton-eaters — 7.8%, squid-eaters — 6.2%, omnivores — 5.9% and fish-eaters — 0.1%. In comparison with the autumnal observations more than twice as many birds at sea were observed in the same area.

Key words: Antarctic, seabirds, abundance

1. Introduction

One of the objects of the International BIOMASS Programme is widening of the knowledge of the pelagic distribution of seabirds and their role as consumers in the Antarctic marine ecosystem. Such investigations are the basis for quantitative evaluation of the influence of seabirds upon the populations of their prey in the Southern Ocean (Griffiths, Sigfried and Abrams 1982). The aim of this of this study is to present species composition and frequency of occurrence of the avifauna in the western part of the Atlantic Sector of the Southern Ocean at the beginning of the Antarctic summer.

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2. Methods

Observations were conducted in accordance with co-ordinate instructions given to all the SIBEX vessels (BIOMASS Working Party on Bird Ecology 1984). Standardized ten-minute observation cards were used. Counts were made at nearly half-an-hour intervals during the day from the bridge or the upper deck (about 15—17 m above sea level). The 8×30 and 7×45 field glasses were used. For identification of the avian species field guides prepared by Watson (1975) and Harper, Kinsky (1978) were used. Birds flying past or sitting on the water within the 360° sector around the vessel were counted, at the same time the number of the specimens observed in the 90° quadrant to one side of the bow were marked on the observation cards separately. According to the instructions the following data were recorded at each of the 10-min observations: the ship's position, type of the ship activity, meteorological conditions, associations with other phenomena, distance of the birds from the vessel (0—300 m, 300—1000 m), kind of bird activity and an estimated distance from the shores. To avoid eventual effects of fishing activities upon the number of the birds observed (Starck and Wyrzykowski 1982) counts were interrupted throughout the time of trawling and were not resumed sooner than about 30 min after the last hauling of the net.

Further quantitative analyses were based only on the 360° observations made during ship steaming. This made possible a comparison of the present results with the findings from the FIBEX explorations. Data on the main diet and mean body mass of the Antarctic seabirds were taken from the BIOMASS Working Party on Bird Ecology (1982).

3. Results and discussion

Altogether 150 ten-minute observations were made within the area between 50°S and 60°S, whereas 420 observations, including 23 counts at the oceanographic stations, were made south of 60°S. South of 50°S 31 species of seabirds were registered, 26 of them were observed also south of 60°S.

The largest aggregations of seabirds were observed:

- a) west of Elephant Island, on 8th Jan. 1984—about 600 specimens of *Daption capense* and 30 of *Fulmarus glacialisoides*, then, 10 hours later the same flock was noticed in the NE part of Bransfield Strait—within the investigated area only in these regions large and dense krill swarms were recorded on the echogrammes;
- b) 20 nM to the SE of the South Orkney Islands, on 14th Dec. 1983, about 220 specimens of *D. capense* about 150 specimens of *Pygoscelis adeliae* nesting on an iceberg and 16 specimens of *Diomedea melanophris*;

c) on the Weddell Sea about 70 nM to ENE of Joinville Island, on 11th Dec. 1983 — about 200 specimens of *D. capense*.

Relative abundance of the seabirds at sea (mean number of specimens/10-min count) was 147.3 in the region of Elephant Island (n=44 counts), 110.2 in the region of the South Orkneys (n=33), 118.4 in the NE part of Bransfield Strait (n=47), and 74.9 near Palmer Archipelago (n=19).

The lowest numbers of birds were recorded in the middle part of Drake Passage, western part of Bransfield Strait and to the west of d'Urville Island.

Penguins

The highest abundance of *P. adeliae* was observed on the icebergs near the South Orkneys and Joinville Island. *P. antarctica* were observed most frequently and in greatest numbers on the waters off the northern shores of King George Island. The relative abundance of Pygoscelid penguins was as follows: in average 17.0 birds/10 min count near the South Orkney Islands, 12.4 birds/10-min count off the north coasts of King George Island and Livingston Island and 11.4 birds/10-min count near Joinville Island.

Daption capense

Most numerous in the region of Elephant Island. They appeared also on great numbers near the South Orkneys, in the NW of the Weddell Sea and in the proximity of Palmer Archipelago.

Oceanites oceanicus

Fairly numerous near the South Orkneys, Palmer Archipelago, Elephant Islands and the NE part of Bransfield Strait. The greatest number — 33 birds/10-min count was recorded 20 nM to the west of the South Orkneys.

Diomedea melanophris

Most numerous in the region near Elephant Island, the South Orkneys and along the line between these two Archipelagos.

Fulmarus glacialisoides

Their distribution was similar to that of *D. capense* but nearly fifteen times less numerous. The greatest number of birds /10-min count was recorded in the eastern part of Bransfield Strait.

Macronectes giganteus

This species was observed over nearly the whole area under investigations, but in not too great numbers.

The relative abundance of the remaining seabird species did not exceed on the average 3 birds/10-min count (Table I).

Table I.

Seabirds recorded in the SIBEX research area from the board of the r/v "Profesor Siedlecki" (only ship's steaming counts south of 60° S; n = 396)

Species	Number of observations	Total number of recorded birds	Mean number of birds/10 min	Relative abundance (%)
<i>Daption capense</i>	392	19826	50.07	67.2
<i>Pygoscelis</i> spp.	141	2083	5.26	7.1
<i>Oceanites oceanicus</i>	281	1828	4.62	6.2
<i>Diomedea melanophris</i>	271	1662	4.20	5.6
<i>Flumarus glacialoides</i>	275	1416	3.58	4.8
<i>Macronectes giganteus</i>	324	1380	3.48	4.7
<i>Pachyptila</i> spp.	147	513	1.30	1.7
<i>Fregetta tropica</i>	144	100	0.25	0.5
<i>Larus dominicanus</i>	63	281	0.71	0.9
<i>Procellaria aequinoctialis</i>	61	111	0.28	0.4
<i>Macronectes halli</i>	54	68	0.17	0.2
<i>Pagodroma nivea</i>	14	57	0.14	0.2
<i>Thalassoica antarctica</i>	23	33	0.08	0.11
Skua spp.	16	18	0.05	0.07
<i>Phoebetria palpebrata</i>	18	19	0.05	0.07
<i>Diomedea chrysostoma</i>	15	15	0.04	0.05
<i>Sterna vittata</i>	15	19	0.05	0.05
<i>Halobaena caerulea</i>	6	10	0.03	0.04
Storm petrel spp.	5	13	0.03	0.04
<i>Chionis alba</i>	5	6	0.02	0.03
<i>Diomedea exulans</i>	7	7	0.02	0.03
<i>Phalacrocorax atriceps</i>	4	5	0.01	0.01
<i>Diomedea chlororhynchus</i>	1	1	0.00	0.00
<i>Pelacanoides</i> spp.	1	1	0.00	0.00

Species composition of the seabird communities observed in the investigated area does not differ from the general information given in the literature (Brown et al. 1975, Starck and Wyrzykowski 1982, Torres 1982, Zink 1981). However, considerable difference in the relative abundance of most of the observed species seem to be noteworthy, as compared with the autumnal observations during the FIBEX cruise (Starck and Wyrzykowski 1982).

The relative abundance of various trophic groups of the seabirds had been analysed and the results obtained were compared with the data from the FIBEX Programme 1981. Ornithological observations made from the

board of the r/v "Profesor Siedlecki" were conducted in similar areas (ibid.). During the SIBEX cruise more than twice as great relative abundance of the birds at sea was recorded, e.g. the relative abundance of squid-eaters has increased by 253%, of krill eaters by 124%, of omnivores by 69% (Table II). The percentage of squid-eaters in the aggregations of birds

Table II.

Comparison of relative abundance (number of birds/10 min count) and frequency distribution of various trophic groups of birds observed at sea during the FIBEX and SIBEX cruises (only ship's steaming counts made south of 60°S; n = 396 counts)

Trophic group	Mean number of birds/10 min count		Relative abundance (%)	
	FIBEX	SIBEX	FIBEX	SIBEX
Krill-eaters	26.6	59.7	74.4	80.1
Plankton-eaters	5.1	5.8	14.3	7.8
Squid-eaters	1.3	4.6	3.6	6.2
Omnivores	2.6	4.4	7.3	5.8
Fish-eaters	0.14	0.04	0.4	0.1
Total	35.74	74.54	100.0	100.0

at sea observed in early summer of 1983/1984 was significantly higher than that in the similar area of investigations in autumn 1981. The percentage of plankton-eaters, omnivores and fish-eaters was markedly lower in the early summer 1983/1984.

There is no doubt that Antarctic summer season at the beginning of the phenology of the reproduction of various bird species is one of the factors bringing about an increase in the number of the birds at sea, especially in the proximity of breeding sites. In December and January many of those birds feed their chick, this creates a necessity for provision of greater quantities of food. At that time birds must prey more intensively than in autumn, when most of the nestlings are already self-dependent (Croxall 1984).

An increased relative abundance of seabirds observed in early summer within the investigation area was caused by higher, as compared with the 1981 autumn, relative abundance of the species hatching on the South Shetlands, South Orkneys, and in the region of the Antarctic Peninsula, namely: *D. capense*, *Pygoscelidae*, *D. melanophris*, *F. glacialoides*, *M. giganteus*, *Pachyptila* spp., *L. dominicanus* and *F. tropica* (Watson et al. 1971, Croxall and Kirkwood 1979, Jabłoński 1984). On the other hand, a decrease was noted in the relative abundance of *D. exulans* and *M. halli*, which according to Watson et al. (1971). Watson (1975) and other authors, do not hatch in regions mentioned above.

Considering the causes of the increase of relative abundance of birds

at sea in the investigated area one should take into account the fact that the abundance of Pygoscelid penguins in their breeding colonies at Admiralty Bay on King George Island was in the 1983—84 season distinctly lower than in the 1980—81 season (Jabłoński 1984). This fact allows to presume that the total number of Pygoscelid penguins hatching brood on the South Shetlands in the breeding season 1983—84 was lower than in the 1980—81 season. On the other hand, observations carried out at sea in the early summer 1983—84 show that the average number of *Pygoscelidae* registered on the water during 10-min counts was about four-times higher than in the autumn 1981.

In the 1983—84 summer season concentration of krill swarms in the region of the South Shetlands was markedly lower than in previous years (Kalinowski, Godlewska and Klusek 1985). This means that there is a much less of the availability of the basic food of the Antarctic birds, as compared of that investigated in 1980—81, and this could be the second cause of the increased relative abundance of the birds at sea. Possibly, the scarcity of the food comple the birds to intensify their feeding activity and widening the range of their feeding grounds.

4. Резюме

Исследования велись в районе на ют от 50° ю.ш. методом 10-минутных пересчетов, которые проводились днем приблизительно каждые полчаса согласно инструкции. Рабочей группы по экологии морских птиц в программе БИОМАСС. Было проведено 150 наблюдений в поясе 50—60° ю.ш., а также 420 наблюдений к югу от 60° ю.ш., в том числе 23 на океанографических станциях, остальные — во время движения судна.

Установлено присутствие 31 вида птиц на ют от 50° ю.ш., а 26 видов — к югу от 60° ю.ш. Самые крупные группировки птиц на море наблюдались в районах: Южных Оркнейских островов и северо-восточной части пролива Брансфилда. В среднем количество птиц, наблюдаемых в течение 10 минут, составляло 74,5. В районе исследований преобладал *Daption capense*, а субдоминантами были *Pygoscelidae* gen. sp., *Oceanites oceanicus*, *Diomedea melanophris*, *Fulmarus glacialisoides*, *Macronectes giganteus* (таблица I). Из числа всех наблюдаемых птиц 80,1% составляли особи, питающиеся крилем, 7,8% планктонофаги, 6,2% особи, питающиеся головоногами, 5,9% всеядные, а 0,1% — птицы, питающиеся рыбами (таблица II).

В сравнении с осенними наблюдениями, проведенными на похожей территории (в 1981 г), теперь наблюдалось двухкратно большее количество птиц на море. Выдвинута гипотеза, что причиной именно такого состояния является более интенсивное ранним летом, чем осенью питание и вылеты на море большинства видов антарктических птиц, что связано с необходимостью прокормления птенцов. Другой причиной повышенной активности в поисках пищи могут быть неожиданно низкие в сезоне 1983/84 ресурсы криля — основного компонента диеты многих антарктических птиц.

5. Streszczenie

Badania prowadzono w obszarze na południe od 50°S metodą 10-min liczeń prowadzonych przeciętnie co pół godziny w porze dziennej, według instrukcji Grupy Roboczej Ekologii

Ptaków Morskich Programu BIOMASS. Wykonano 150 obserwacji w pasie 50°S—60°S oraz 420 obserwacji na południe od 60°S, w tym 23 na stacjach oceanograficznych, a pozostałe podczas ruchu statku.

Stwierdzono występowanie 31 gatunków ptaków na południe od 50°S, a 26 gatunków na południe od 60°S. Największe zgrupowania ptaków na morzu obserwowano w rejonach: Wyspy Elephant, Południowych Orkadów i północno-wschodniej części Cieśniny Bransfielda. Średnia liczba ptaków obserwowanych w ciągu 10-min wyniosła 74,5. Na obszarze badań dominował *Daption capense*, a subdominantami pod względem liczebności były: *Pygoscelidae* gen. sp., *Oceanites oceanicus*, *Diomedea melanophris*, *Flumarus glacialis* i *Macronectes giganteus* (Tabela I). Spośród liczby wszystkich obserwowanych ptaków 80,1% stanowiły osobniki odżywiające się kryłem, 7,8% planktonożercy, 6,2% odżywiające się glononogami, 5,9% ptaki wszystkożerne oraz 0,1% — rybojady (tabela II).

W porównaniu z obserwacjami jesiennymi wykonanymi na podobnym obszarze (w roku 1981) zaobserwowano ponad dwukrotnie więcej ptaków na morzu. Wysłunęto hipotezę, że powodem tego jest intensywniejsze wczesnym latem niż jesienią, żerowanie i wyloty w morze większości gatunków ptaków antarktycznych, co wiąże się z koniecznością dostarczania pokarmu piskletom. Innym powodem zwiększonej aktywności w poszukiwaniu pokarmu mogły być niespodziewanie małe, w sezonie 1983/84, zasoby kryla — podstawowego składnika diety wielu gatunków ptaków antarktycznych.

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