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The occurrence of *Pinnipedia* in region of Mirnyj and Le- ningradskaja Stations (East An- tarctic) in summer of 1978-1979 *)

ABSTRACT: Distribution and numbers of *Lobodon carcinophagus* and *Leptonychotes weddelli* were evaluated. *Lobodon carcinophagus* dominated on ice floes in offshore zone of Mirnyj Station and in regions of open pack ice close to the northern edge of ice fields. *Leptonychotes weddelli* dominated only on the shore-ice close to Leningradskaja Station in March 1979. A thesis of the lowered daily activity of *Leptonychotes weddelli* was confirmed by observations.

Key words: Antarctic, *Pinnipedia*, distribution

1. Introduction

There is a lack of data on lasting several days observations of *Pinnipedia* in offshore part of Davies Sea and south from Balleny Islands (East Antarctic). Russian papers (Korotkevič 1958, Syroječkovskij 1966, Krylov and Medvedev 1972) contain only fragmentary data on the presence of various species of *Pinnipedia* and on their distribution in the offshore zone and on the shore-ice. American, French and Australian data (Ingham 1960, Müller-Schwarze 1965, Erickson et al. 1971, Tireney 1977) concern detailed and multidirectional investigations from regions of following stations: Mc Murdo, Hallet, Dumont'd'Urville and Davies in East Antarctic. However, these stations are hundreds sea miles from both Russian stations.

Present paper aims at analysis of species composition and an evaluation of the distribution, numbers and density of *Pinnipedia* in region of shore-ice and ice fields in regions of Mirnyj and Leningradskaja Stations.

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2. Study area and methods

The observations were carried out on the selected part of the ocean among the islands of Haswell Archipelago (lat. S 66°32', long. E 93°00'). These 17 small islands (surface area 0.05—0.81 km²) are located some several hundreds to few thousands meters from each other and from continental ice barrier in neighbourhood of Mirnyj Stations. Numerous icebergs are also a part of local landscape, with length not larger than 1.5 km, drifting or grounded on the sea bottom in the east part of the Archipelago. The mean temperature in January is -1.9°C, east and south-east winds dominate in this month (data of meteorologists from Mirnyj Station). The selected area of study equaled 7.05 km², and was located among the Islands: Haswell, Stroitelej and Tokareva, its south boundary was the continent shore, and east one — grounded icebergs. The permanent observation point was on a hill Sopka Komsomolskaja, about 40 m above sea level. The farthest spots of the studied area were about 3 km from the observation point. Part of the observations was done from the top of Haswell Island (93 m above sea level) and from its shore. Observations were carried out with the help of Zeiss telescope 20—40×80 on the tripod and PZO binoculars 7×45. For species determinations of *Pinnipedia* the following papers were used: King (1964), Ray (1970), Ivašin, Popov and Capko (1972), Arsenev, Zemskij and Studeneckaja (1973). In doubts, seals were frequently photographed and their pictures analysed. The counts were made about the local noon time — when the majority of seals was on the ice floes and ice fields (Müller-Schwarze 1965, Smith 1965, Erickson et al. 1971). In the paper only the observations done during good visibility are described. A total of 11 counts was done in January 1979 in 2—3 days interval.

While cruising through the zone of drifting ice fields in neighbourhood of Mirnyj Station (region of Drygalski Island) observations were also done from the bearing decks of m/s "Zawichost" and r/v "Michail Somov" (from about 15 m above sea level). The seals noted on both ship's sides in 1 km distance were counted.

During the cruise of r/v "Michail Somov" to Leningradskaja Station the observations of seals were also done in the area of pack ice. The climate in this area is more harsh than in area of Mirnyj Station, thus the shore-ice stays there during the whole year, and the zone of drifting ice fields is much wider. The observations covered a total of 80 sea miles of the vessel course among the pack ice of different density and in various distance from the shore-ice edge. The period of single observation covering relatively large area (more than 1 km²) depended on the speed of vessel, but it was never shorter than 1 h. Seals in the distance of 2 km from both ship's sides were counted. This distance was estimated by placing a horizontal line on binocular lenses. If the observer kept binoculars in such a way that the upper edge of the field of view was at the horizon line, the fixed line determined the boundary of the field of view up to 2 km from the vessel (acc. to Siniff et al. 1970). The course, position and speed of the vessel was noted every hour of observation from the

navigatory computer utilizing the satellite system "Transit". The weather and ice conditions were also noted each time.

Numbers and daily activity of seals on shore-ice in area of Leningradskaja Station was studied by counting the individuals on a fixed course from helicopter Mi-8 (speed 100—140 km/h, height of flight 250 m). Observations were repeated every 50 min from 6 to 20 h of the zonal time. The seals about 750 m to both sides of the flight course were counted. The distance was estimated by the same method like on the research vessel. Area of 67.5 km² was covered by observations. The flight course led from the edge of the shore-ice to the continental ice barrier, making possible an analysis of the distribution of seals on the shore-ice. Correctness of species determination was checked after landing on the shore-ice close to large groupings of seals and comparing the direct observations with ones from the helicopter flight.

3. Results

A total of 97 seals was observed in area of Mirnyj Station during all observations, 61 of them was determined to the species. The crabeater seals — *Lobodon carcinophagus* Hombron et Jacquinot made up 67.2% of the total of identified seals, weddell seals — *Leptonychotes weddelli* (Lesson) — 32.8%. With the help of χ^2 test for $p = 0.05$ the results of counts of both species and of all observed seals in the first and second half of January were compared (Table I, observations 1—6 and 7—11). A statistically increase of the average number of *Lobodon carcinophagus* observed during a single

Table I.

Numbers of observed seals on selected area of 1.05 km² in region of Mirnyj Station in January 1979

Date	Hour	DI	Number of seals			
			L.c.	L.w.	US	Σ
2*)	12.40	2	1	1	5	7
6*)	12.20	2	4	1	2	7
8*)	12.00	3—4	3	2	4	9
10*)	14.10	3	3	1	1	5
12*)	14.00	2—3	0	2	2	4
14*)	12.00	2—3	1	4	1	6
16*)	14.20	2—3	5	2	3	10
20*)	13.00	2	8	3	5	16
21**)	13.20	2—3	8	4	6	18
23**)	12.10	2	5	0	6	11
30*)	14.10	1	3	0	1	4

DI — density of drifting ice in degrees, L.c. — *Lobodon carcinophagus*, L.w. — *Leptonychotes weddelli*, US — unidentified seals.

*) observation from the hill Sopka Komsomolskaja.

***) observation from the top of Haswell Island.

count and of the average number of all observed seals was found. The difference between average numbers of *Leptonychotes weddelli* from single observation was not significant for both compared periods. Seals were found usually on average and large ice floes (up to 200 m diameter). They lay usually in the middle of the ice floe. The days when maximum numbers of seals was observed, i.e. 16, 20, 21 and 23 January were ones with strong insolation and weak winds. The weddell seals occurred nearly always as single specimens. Crabeater seals were observed as single ones or as groupings of 2—4 individuals. The groupings consisted usually of the so called mated pairs — pairs without young (Siniff et al. 1970). The maximum density of seals noted was 2.55 individuals/km².

Numbers and density of seals in the studied area can be evaluated on the basis of the identified weddell and crabeater seals and the total number observed, assuming that only these two species occurred on the ice floes. This assumption is justified by the fact that during all observations not other species of seals was noted. Only once a leopard seal *Hydrurga leptonyx* Blainville was noticed north from Haswell Island close to the point where *Pygoscelis adeliae* entered land from water. Remains of one of these birds were found on the shore there — probably of a victim of this predatory seal. Similar remains were noticed floating on the water surface. The presence of 2 females and average size male of elephant seals (*Mirounga leonina* L.) was noticed on the flat rocks permanently splashed by water on the northern shore of the island on 22 January. The animals were in their moulting period.

The maximum evaluated density of *Lobodon carcinophagus* on the selected area was in January 1979 1.49 individuals/km², and of *Leptonychotes weddelli* — 0.92 individuals/km².

Weddell seals emerging for air, were observed sporadically in the offshore waters during the stay on Haswell Island in period 20—24 January. They were observed more frequently early morning and late evening than during the day.

Nine crabeaters, one weddell seal and five unidentified seals were observed on 26 and 27 December 1978 east from Drygalski Island over the distance of about 20 sea miles among drifting ice fields — 6—8 degrees (60—80% of ice cover on the sea). In the same region on the 1 February 1979 12 crabeaters, 1 weddell seal and 2 unidentified seals were noted over the distance of 5 sea miles among small density of ice fields — 3—4 degrees (30—40% of ice cover).

Clear dominance of *Lobodon carcinophagus* was found during all observations in the zone of drifting ice in region of Leningradskaja Station. The observations on 2 March (Table II) were carried out in 20 sea miles wide zone of closed pack ice of small and average size ice fields directly adjacent to the shore-ice. High density of ice fields and neighbourhood of the shore-ice seems to explain the rarity of *Leptonychotes weddelli* in this area. This species at the end of antarctic summer tends to stay rather close to the continental shore (Ivašin, Popov and Capko 1972). This thesis is also confirmed by found during this study sporadic occurrence of *Leptonychotes weddelli* in regions some tens of the sea miles from the edge

Table II.

Counts of seals in the area of pack ice and on the shore-ice in region of Leningradskaja Station in March 1979

Date	Time of observation	Area (km ²)	DI	DE	Number of seals				DS (ind./km ²)	
					L.c.	L.w.	US	Σ	L.c.	Σ
2	8 ²⁰ —17 ⁴⁰	153.3	6—9	40	14	5	7	26	0.12	0.17
7	15 ³⁵ —16 ¹⁰	67.5	10*)	10	5	35	6	46	0.09	0.68
13	13 ²⁰ —19 ³⁰	37.0	8—10	5	3	0	5	8	0.08	0.22
14	9 ¹⁰ —10 ¹⁰	23.2	5—7	55	3	0	2	5	0.13	0.22
15	7 ⁰⁰ —10 ³⁰	82.2	3—6	250	115	2	37	154	1.84	1.87
15	14 ⁰⁰ —14 ²⁵	37.0	2—4	330	23	0	0	23	0.62	0.62

DI—density of drifting ice in degrees, DE—average distance from the edge of the shore-ice, L.c.—*Lobodon carcinophagus*, L.w.—*Leptonychotes weddelli*, US—unidentified seals, DS—estimative density of seals on studies area,

*) shore-ice

of the shore-ice (only two weddell seals were observed associated with a large grouping of crabeater seals during observations on 14 March—Table II).

The highest number of weddell seals was observed on the shore-ice near Leningradskaja Station. The maximum density, evaluated by above described method, was 0.68 individuals/km² on 7 March in afternoon. A reverse tendency of changes was found for crabeaters in this region. Their maximum density was 0.09 individuals/km², the largest groupings were observed on the most northern areas of pack ice near areas free of ice (Table II, both observations from 15 March). About 70% of observed crabeater seals occurred in groups of 2—3 individuals, sometime with young. Near the edge of the shore-ice and on its surface only single and not numerous individuals were observed. A significant increase of crabeaters numbers and density was observed when the vessel after covering some 100 sea miles on free water entered again into the area of fairly loose ice fields with stretches of water covered by just few centimeters thick layer of clear ice (Table II, both observations from 15 March).

Sixteen helicopter flights were made along the fixed course over the shore-ice near Leningradskaja Station on 7 March 1979. It was calculated that *Leptonychotes weddelli* made 87.5% of all seals identified during the flights. The crabeater seals accounted for remaining 12.5%. The other seal species were not found. Of all observed seals, 40.1% were in groups of 2—8 individuals consisting of one or both species. The rest, mainly weddell seals, were single individuals.

All seals occurred in direct neighbourhood of breathing holes. It is worth pointing that the majority of these holes was located near icebergs, by the edge of permanent crevices developed in places of contact between walls of icebergs and shore-ice surface. Only one of the 23 found breathing holes was located in a considerable distance from icebergs and crevices in the shore-ice. One weddell seal was using this hole on the day of observations.

The majority of holes was located half way from ice barrier to the edge of shore-ice or closer to the barrier (Fig. 1).

The number of seals lying on the ice was small in the morning hours. A statistically significant increase of their number after 12 h of the zonal time was found. The number stayed on even high level since 13 h. The number of seals present of the shore-ice or on drifting ice fields is in revers proportion to their activity, as often pointed out in the literature (Müller-Schwarze 1965, Smith 1965). The presented course of daily activity (Fig. 2) is in fact the one of weddell seal, as this species dominated on the shorce-ice.

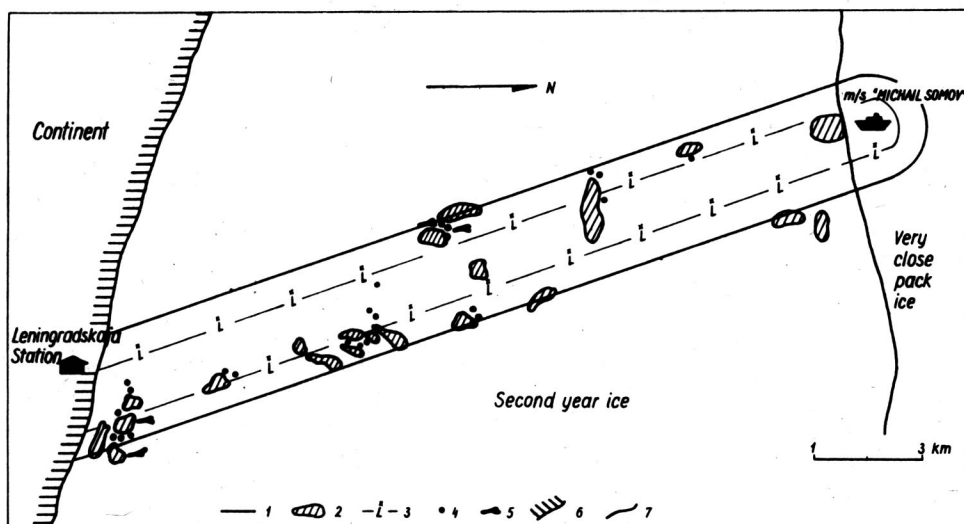


Fig. 1. Terrain of seals observations on the shore-ice close to Leningradskaja Station on 7 March 1979

1 — upper boundary of the observed area, 2 — icebergs, 3 — courses of helicopter, 4 — breathing holes, 5 — groupings of seals, 6 — continental ice barrier, 7 — edge of the shore-ice

4. Discussion

The error resulting from the ice drift should be estimated while evaluating the results of several observations made on permanently established area of the pack ice. *Leptonychotes weddelli*, *Lobodon carcinophagus* and other seal species can stay on the same ice floe even for same days (SCAR/SCOR 1977). A strong drift in the observed area could cause that changes of seals numbers within certain time could be in reality the result of speed and direction of ice movements, but not of the changes of local seals population. The region of Haswell Archipelago was sheltered from the east side by closed barrier of grounded icebergs, which stoped effitiently the drift, protected from strong winds and blocked the passage for pack ice.

Not large area of observations among the islands of Haswell Archipelago and small areas covered by observations close to Drygalski Island do not

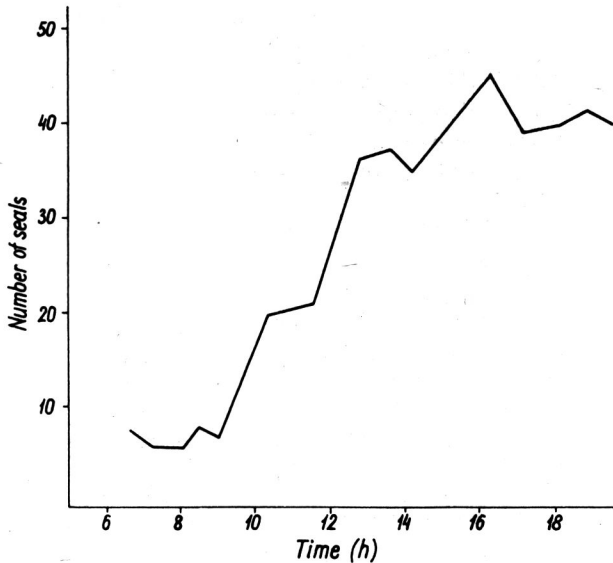


Fig. 2. Numbers of the observed seals on the selected area of the shore-ice (67.5 km²) close to Leningradskaja Station on 7 March 1979

allow do draw sound conclusions on numbers of seals in neighbourhood of Mirnyj Station. However repetition of counts made every few days decreased the risk of accidentalness of the population density evaluation to such an extent, that the gathered data can serve as a base for evaluation of seals density in this area. The number of seals during summer in area of Mirnyj Station seems to be small as compared with regions of other coastal stations in East Antarctic. The dominance of crabeater seals in studied area, distinguishing it from the others, can be explained by the fact, that crabeaters stay most likely in the area of drifting ice, coming closer to the continent shores after destruction of the shore-ice (Siniff et al. 1970). During the studied season the shore-ice floated away about 2 months earlier than usually at Mirnyj Station and this could result in seasonal increase of the number of crabeaters in the area. The already published summer observations of seals in area of Mirnyj Station (Syroječkovskij 1966, Krylov and Medvedev 1972) seem to confirm small number of seals in southern part of Davies Sea. Korotkevič (1958) confirms the occurrence of crabeater seals close to Mirnyj Station already in late spring just after destruction of the shore-ice, and states the occurrence of elephant seals on Haswell Island in summer 1957. The data from other coastal stations in South Antarctic: Mawson (Ingham 1960), Mc Murdo (Ray 1970), Hallet (Müller-Schwarze 1965) confirm the lowering of *Leptonychotes weddelli* density near continental shores since the moment of shore-ice departure through the whole summer. Tirenay (1977) describes numerous groupings of elephant seals near Davies Station.

The lack of any published data about the numbers of seals in regions of Balleny Islands and Leningradskaja Station makes difficult the evaluation

of the obtained results. However, some general regularities are confirmed by literature, Ivašin, Popov and Capko (1972) describe the autumn migrations of crabeaters to the northern edge of drifting ice, where groupings of even up to several thousands of individuals are observed. A SCAR/SCOR (1977) review contains the information that in summer crabeaters most likely stay in areas of loose pack ice with density of ice 30—70%. Korotkevič (1958) and King (1964) describe a decisive dominance of weddell seals on the shore-ice in late autumn and winter. The daily activity pattern of *Leptonychotes weddelli* based on one day observations is in agreement with activity curves of this species in similar conditions (Müller-Schwarze 1965, Smith 1965, Ivašin, Popov and Capko 1972).

The management of the 24 Russian Antarctic Expedition, Russian pilots and captain of r/v "Michail Somov" are acknowledged for their hospitality during stay in Antarctic, making possible observations from the vessel and helicopter and providing the data on navigation and meteorology.

5. Summary

The evaluation was made of the species composition of seals and the distribution and density of *Lobodon carcinophagus* and *Leptonychotes weddelli* in region of Russian Antarctic Stations: Mirnyj in January and Leningradskaja in March 1979. The counting from permanent observation points on selected area near Mirnyj Station showed small dominance of *Lobodon carcinophagus* — its number increased during January (Table I). This results probably from earlier than usually destruction of the shore-ice. Once *Hydrurga leptonyx* and 2 females and 1 male of moulting *Mirounga leonina* were observed on Haswell Island (3 km from Mirnyj Station).

The highest density of seals on the selected area was 2.55 individuals/km². A strong dominance of *Lobodon carcinophagus* was found on drifting ice close to Drygalski Island and Leningradskaja Station. The highest density of this species — 1.84 individuals/km² was observed in area of loose pack ice close to the northern edge of drifting ice, north-west from Balleny Island (Table II). *Leptonychotes weddelli* dominated on the shore-ice close to Leningradskaja Station. The observations carried out in this area confirmed the thesis of lowering of the daily activity of this species in the middle of the day (Fig. 2).

6. Резюме

Проведено оценку видового состава ластоногих а также распределения и плотности *Lobodon carcinophagus* и *Leptonychotes weddelli* в районе Советских Антарктических Станции: Мирный в январе и Ленинградская в марте 1979 г. Подсчитывание с постоянных наблюдательных пунктов на выбранной поверхности при Станции Мирный показало небольшое численное доминирование *Lobodon carcinophagus* — их число увеличилось в течение января (таблица I). Это вероятно результат более раннего чем обычно потрескивания припая. На острове Хасвель (3 км от Станции Мирный) однократно замечено *Hydrurga leptonyx* а также 2 самки и 1 самца линнеющих *Mirounga leonina*.

Самую большую плотность ластоногих на выбранной поверхности составляло 2,55 ос./км². На скоплении дрейфующих льдов вблизи острова Дрыгальского и Станции

Ленинградская обнаружено сильное количественное преобладание *Lobodon carcinophagus*. Самое большое сгущение этого вида 1,84 ос./км² замечено в зоне разрезанного дрейфующего льда, недалеко северного края дрейфующих льдов, на северный запад от острова Баллены (таблица II). На прилипе вблизи Станции Ленинградская констатировано численное доминирование *Leptonychotes weddelli*. Проведённые там наблюдения подтвердили тезис о пониженной активности этого вида в середине дня (рис. 2).

7. Streszczenie

Dokonano oceny składu gatunkowego płetwonogich oraz rozmieszczenia i zagęszczenia *Lobodon carcinophagus* i *Leptonychotes weddelli* w rejonie Radzieckich Stacji Antarktycznych: Mirnyj w styczniu i Leningradskaja w marcu 1979. Liczenia ze stałych punktów obserwacyjnych na obranej powierzchni przy Stacji Mirnyj wykazały niewielką dominację liczebną *Lobodon carcinophagus* — ich liczba zwiększała się w ciągu stycznia (tabela I). Jest to przypuszczalnie wynik wcześniejszego niż zwykle popękania przylepy. Na wyspie Haswell (3 km od stacji Mirnyj) obserwowano jednokrotnie *Hydrurga leptonyx* oraz 2 samice i 1 samca liniejących *Mirounga leonina*.

Największe zagęszczenie płetwonogich na obranej powierzchni wyniosło 2,55 osobnika/km². Na obszarach lodów dryfujących w pobliżu wyspy Drygalskiego i Stacji Leningradskaja stwierdzono silną dominację liczebną *Lobodon carcinophagus*. Największe zagęszczenie tego gatunku — 1,84 os./km² obserwowano w strefie luźnego paku lodowego, blisko północnego skraju lodów dryfujących, na północny zachód od Wysp Balleny (tabela II). Na przylepie w pobliżu Stacji Leningradskaja zanotowano dominację liczebną *Leptonychotes weddelli*. Prowadzone tam obserwacje potwierdziły tezę o zmniejszonej aktywności tego gatunku w środku dnia (rys. 2).

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