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Stanisław RAKUSA-SUSZCZEWSKI¹ and Kazimierz SIERAKOWSKI²

¹Department of Antarctic Biology
Polish Academy of Sciences
Ustrzycka str., 10
02-141 Warszawa, POLAND

²Department of Vertebrate Ecology
Institute of Ecology
Polish Academy of Sciences
05-092 Łomianki, POLAND

Pinnipeds in Admiralty Bay King George Island, South Shetlands (1988–1992)

ABSTRACT: Pinnipeds were monitored in Admiralty Bay between 1988 and 1992. No particular trends during this period were found, but seasonal changes in each are distinct. It is suggested that the phenology of pinnipeds and that of penguins ensures low competition for food between these groups.

Key words: Antarctic, South Shetlands, Admiralty Bay, Pinnipedia.

Introduction

Pinnipedia censuses have been conducted in the South Shetland Islands during summer by Laws (1953), Aquayo (1970), Krylov and Medvedev (1972), Müller-Schwarze et al. (1978), Vergani, Lewis and Stanganelli (1987), Bengtson et al. (1990) and Vergini and Stanganelli (1990).

Monitoring of pinnipeds in Admiralty Bay commenced after the establishment of "Arctowski" Station in 1977 (Presler 1980, Myrcha and Teliga 1980, Woyciechowski 1980, Krzemiński 1981, Jabłoński, Krzemiński and Zdzitowiecki 1987, Sierakowski 1992, Lesiński 1993). This paper reports the results of a five year census of five pinniped species in Admiralty Bay.

Methods

Pinnipeds on the west coast of Admiralty Bay (SSSI No. 8) (Fig. 1) were counted at least every ten-days between 1988 and 1992. *L. carcinophagus*

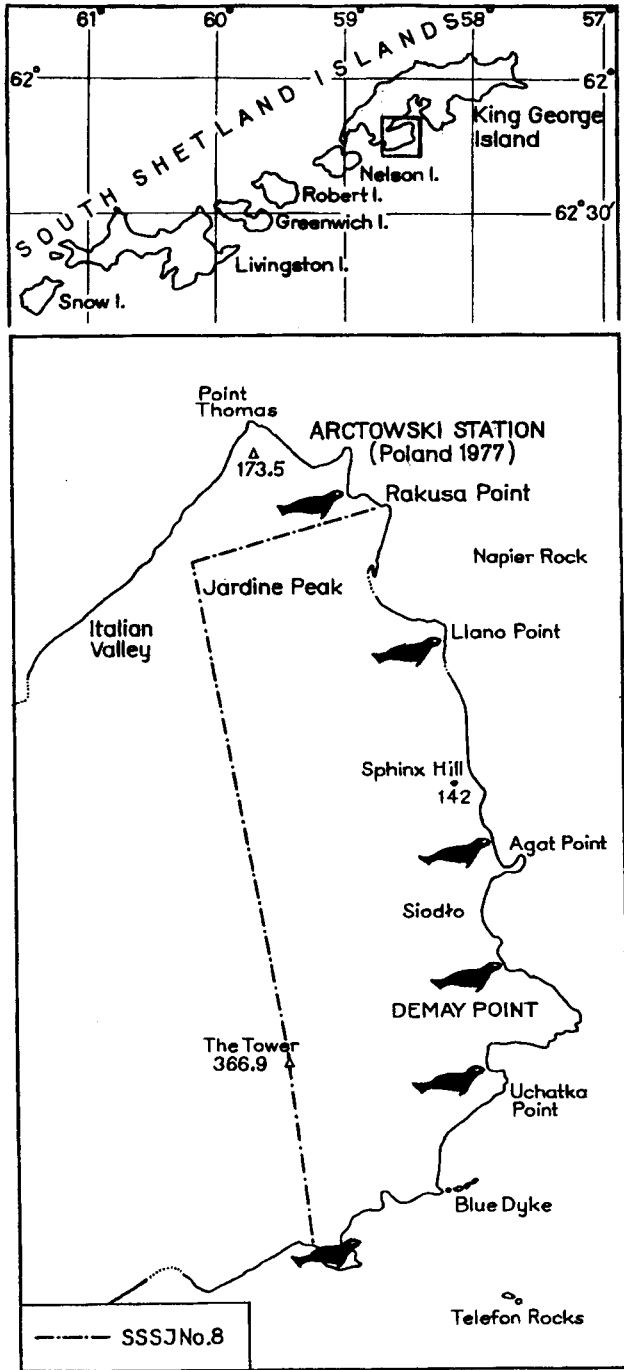


Fig. 1. The study area (SSSI No. 8) on western shores of Admiralty Bay.

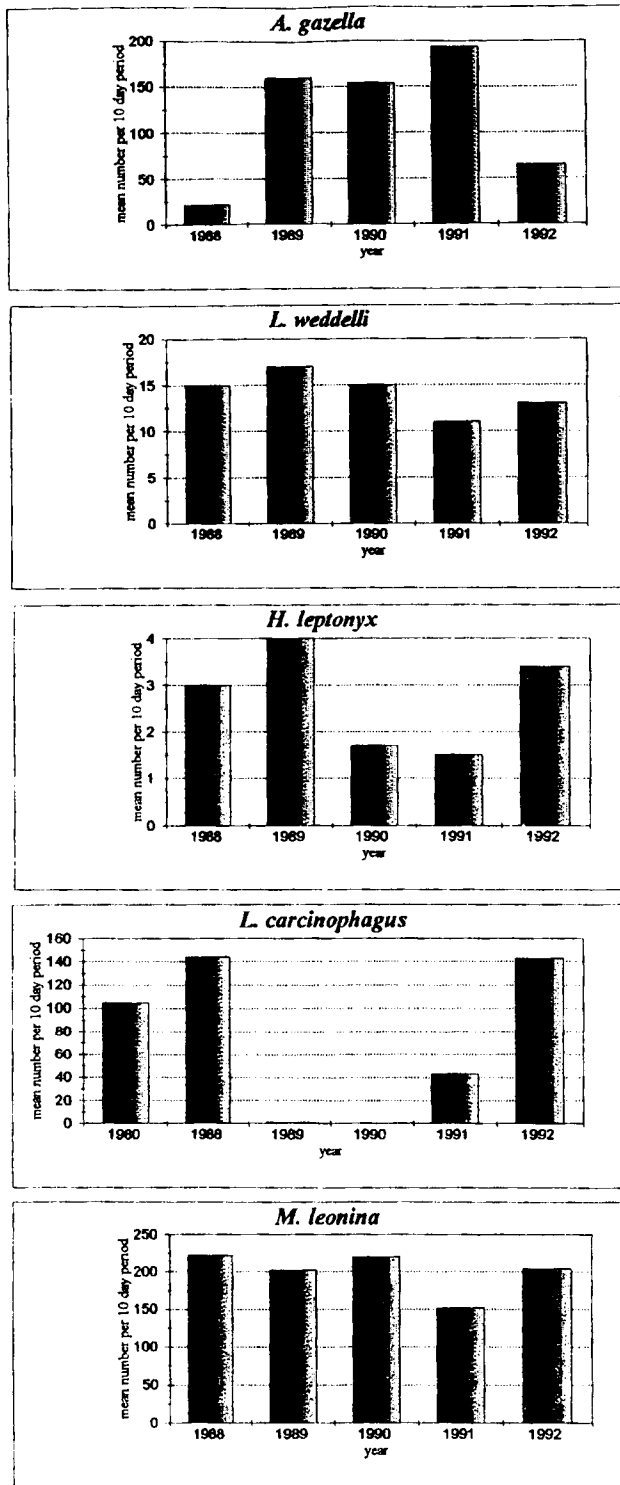


Fig. 2. Mean numbers of pinnipeds in Admiralty Bay at ten day intervals over a year. Data for *L. carcinophagus* include 1980.

numbers from 1980 were provided by Wasilewski (unpubl.). Where counting was more frequent, the arithmetic mean for that period is given. The number of Crabeater seals on ice in the bay was determined through binoculars and/or from a boat. To obtain the total number of seals during the breeding period(s), the number of juveniles should be added to the number of adult specimens in the tables. Sex was not determined. The mean number of pinnipeds in the investigated area during 1988–1992 period was calculated by dividing the number of all specimens noted in a given month by the number of observations (n). In the case of *L. carcinophagus*, data from 1980 were also included. The total number of specimens observed during the year is the sum of the numbers from each ten-day period.

Through the five-year study the means for each ten-day period, including standard deviations for each month and their respective means for each year, were calculated. In the case of *L. carcinophagus* data from 1980 were also included.

Results and discussion

Five pinniped species were noted in the bay throughout the study:

1. *Arctocephalus gazella* Peters, 1875
2. *Leptonychotes weddelli* (Lesson, 1826)
3. *Hydrurga leptonyx* (Blainville, 1820)
4. *Lobodon carcinophagus* (Hombron et Jacquinet, 1842)
5. *Mirounga leonina* (Linnaeus, 1758).

One specimen of *Ommatophoca rossi* (Gray, 1844) was observed on 12th July 1992.

Arctocephalus gazella (Table I)

In March and July, Jabłoński, Krzemiński and Zdzitowiecki (1987) counted 447 and 347 individuals respectively of this species on the west coast of Admiralty Bay (SSSI No. 8). Similarly, in February 1980 and 1981, there were 352 and 662 individuals respectively. During the summer of 1986/87 Bengtson et al. (1990) noted 3644 Fur seals on King George Island, although this number did not include those in Admiralty Bay. *A. gazella* is present in Admiralty Bay all over the year, but its abundance shows considerable seasonal changes (Tab. I). There are two peaks in numbers during the year, first from February to April and second from July to September.

Changes in *A. gazella* numbers in Admiralty Bay over the year during our study were considerable (Fig. 2). A comparison between the number of *A. gazella* at the beginning of the 80's (Jabłoński, Krzemiński and Zdzitowiecki 1987) with the same months in this study, however, does not suggest that the

Table 1

Numbers of *A. gazella* in Admiralty Bay at ten day intervals, over 5 year period.

Month	10-day period	1988	1989	1990	1991	1992	\bar{x} , n, SD.
1	1	5	1	2	7	4	x=30 SD=51 n=12
	2	18	—	—	15	1	
	3	24	—	188	32	66	
2	1	32	107	—	583	613	x=373 SD=288 n=12
	2	47	150	—	604	—	
	3	69	222	890	699	463	
3	1	116	416	932	1147	335	x=632 SD=492 n=15
	2	148	458	1004	1716	415	
	3	107	333	983	1298	69	
4	1	53	403	458	212	103	x=127 SD=139 n=14
	2	41	—	126	198	33	
	3	9	47	51	34	7	
5	1	4	—	24	23	14	x=14 SD=13 n=12
	2	1	—	6	—	44	
	3	2	28	4	11	7	
6	1	5	—	27	2	1	x=13 SD=17 n=11
	2	2	—	36	1	7	
	3	—	—	53	0	11	
7	1	1	—	71	2	5	x=44 SD=100 n=14
	2	3	52	65	0	1	
	3	8	392	2	0	10	
8	1	1	—	1	0	41	x=24 SD=42 n=13
	2	5	—	4	0	2	
	3	14	101	133	0	11	
9	1	2	—	0	0	0	x=19 SD=57 n=13
	2	0	216	0	5	15	
	3	1	—	1	1	1	
10	1	0	—	0	0	1	x=10 SD=29 n=13
	2	0	108	0	0	9	
	3	0	—	5	0	2	
11	1	0	4	1	0	0	x=0.4 SD=1 n=14
	2	0	—	1	0	0	
	3	0	0	0	0	0	
12	1	0	0	0	0	0	x=0.1 SD=0.3 n=13
	2	0	—	0	0	0	
	3	0	0	1	—	0	
Σ		718 x=21 n=35	3038 x=160 n=19	5069 x=154 n=33	6590 x=194 n=34	2291 x=65 n=35	17706

numbers of this species in Admiralty Bay have changed, but it should be noted that *A. gazella* does not breed in Admiralty Bay. Bengtson et al. (1990) concluded that the number of *A. gazella* on the South Shetland Islands has increased.

Leptonychotes weddelli (Table II)

In Admiralty Bay Weddell seals occur throughout the year, both on the shores in summer in the Fildes Peninsula region at the western end of King George Island; Krylov and Medvedev (1972) counted 59 individuals, with similar densities as in Admiralty Bay.

Abundance of *L. weddelli* shows only small seasonal changes in Admiralty Bay. This species is most numerous from November to January. Breeding (Tab. II) starts at the beginning of September (Myrcha and Teliga 1980, Presler 1980, Sierakowski 1992). Pups constitute about one tenth of these numbers. No trend in *L. weddelli* numbers was evident in this work (Fig. 2).

Hydrurga leptonyx (Table III)

The Leopard seal is the least numerous pinniped species in Admiralty Bay. The highest number (ca. 60 individuals) was observed in this region by Myrcha and Teliga (1980) on the 20th of October 1978; October was also the month when maximum numbers occurred in this study. Changes in *H. leptonyx* from year to year (Fig. 2) were small, and any trend was observed.

Lobodon carcinophagus (Table IV)

In Admiralty Bay Crabeater seals occur on pack- and fast-ice. This species occurs only seasonally from the end of July to the end of December. Peak numbers occur in August, September and October (Tab. IV). Changes in numbers during five years of this study were significant and dependent on the presence of ice in the bay. Assuming 307 specimens as multi-year average for September, this equates to 8 specimens per square nautical mile. This is much higher than average density of this species on pack-ice (1.98 specimens per nM²) in the open ocean zone (Erickson and Hanson 1990).

Mirounga leonina (Table V)

In 1957/58 in the South Shetland Islands, about 7515 Southern elephant seals were reported (Aquaya 1970). Between 28th of January and 20th of February 1968, Krylov and Medvedev (1972) observed 839 elephant seals on the Fildes Peninsula. Summer studies on this species on Stranger Point, King

Table II

Numbers of *L. weddelli* in Admiralty Bay at ten day intervals, over 5 year period.

Month	10-day period	1988	1989	1990	1991	1992	\bar{x} , n, SD.
1	1	24	29	17	19	22	x=22 SD=8 n=12
	2	22	—	—	14	39	
	3	21	—	12	16	34	
2	1	15	7	—	34	16	x=16 SD=5 n=12
	2	17	11	—	18	—	
	3	12	20	9	24	8	
3	1	13	24	17	7	16	x=16 SD=7 n=15
	2	9	20	29	7	14	
	3	12	19	25	10	11	
4	1	5	10	16	12	4	x=10 SD=4 n=14
	2	13	—	14	7	9	
	3	14	6	11	3	15	
5	1	7	—	9	4	5	x=6 SD=3 n=12
	2	12	—	5	—	9	
	3	5	5	3	2	0	
6	1	6	—	7	0	0	x=3 SD=3 n=11
	2	1	—	5	2	0	
	3	—	—	6	2	0	
7	1	3	—	8	1	0	x=8 SD=9 n=14
	2	11	—	7	2	1	
	3	20	28	3	2	3	
8	1	18	21	7	4	1	x=12 SD=8 n=13
	2	21	—	8	8	4	
	3	25	—	24	18	3	
9	1	22 (1)	11	1	9	10	x=14 adult SD=8 n=13
	2	13 (1)	23 (2)	12 (1)	7	7	
	3	16 (1)	—	14 (2)	31	11 (2)	
10	1	14 (6)	—	17 (2)	3	13 (2)	x=16 adult SD=13 n=13
	2	9 (4)	9 (2)	29 (2)	2 (2)	18 (3)	
	3	7 (1)	—	35 (2)	5 (2)	49 (3)	
11	1	12 (1)	22 (1)	23	24	36 (1)	x=22 adult SD=7 n=14
	2	18	—	26	16	36 (2)	
	3	18	24 (1)	18	11 (1)	28	
12	1	22	16	28	13 (1)	18	x=20 adult SD=6 n=13
	2	21	—	15	21 (2)	14	
	3	30	15	32	—	16	

George Island (Vergani and Stanganelli 1990) showed significant changes of its abundance over a multi-year study. The maximum number of Elephant seals in this region was 919 individuals. In Admiralty Bay *M. leonina* occurs year round,

Table III

Numbers of *H. leptonyx* in Admiralty Bay at ten day intervals, over a 5 year period.

Month	10-day period	1988	1989	1990	1991	1992	\bar{x} , n, SD.
1	1	4	3	0	3	5	$\bar{x}=2.7$ SD=1.4 n=12
	2	3	—	—	3	2	
	3	3	—	0	2	4	
2	1	1	0	—	0	1	$\bar{x}=0.4$ SD=0.6 n=12
	2	2	0	—	0	—	
	3	0	0	0	0	1	
3	1	0	0	1	0	1	$\bar{x}=0.5$ SD=0.7 n=15
	2	0	0	1	0	2	
	3	0	0	1	0	2	
4	1	0	0	1	0	2	$\bar{x}=0.4$ SD=0.6 n=14
	2	0	—	0	0	1	
	3	0	0	0	0	1	
5	1	0	—	0	0	1	$\bar{x}=0.25$ SD=0.6 n=12
	2	0	—	0	—	0	
	3	2	0	0	0	0	
6	1	0	—	0	0	0	$\bar{x}=0.1$ SD=0.3 n=1
	2	1	—	0	0	0	
	3	—	—	0	0	0	
7	1	0	—	0	0	0	$\bar{x}=0.4$ SD=0.6 n=14
	2	1	1	0	0	0	
	3	2	1	0	0	0	
8	1	0	—	0	0	0	$\bar{x}=0.5$ SD=1.1 n=13
	2	1	—	0	0	4	
	3	0	1	0	0	1	
9	1	0	—	0	0	2	$\bar{x}=4.2$ SD=7.2 n=14
	2	0	0	0	2	4	
	3	4	27	2	13	5	
10	1	23	32	5	5	6	$\bar{x}=14.3$ SD=9.4 n=14
	2	31	17	9	9	19	
	3	19	—	16	2	7	
11	1	5	0	3	2	9	$\bar{x}=3.8$ SD=3.1 n=14
	2	3	—	2	1	9	
	3	4	0	3	3	10	
12	1	2	0	2	3	8	$\bar{x}=3.3$ SD=2.5 n=13
	2	3	—	6	2	8	
	3	2	0	3	—	4	

and is one of the most numerous of the breeding pinnipeds in the area. Pups constitute about 10% of the population. Abundance of this species showed no significant trend (Fig. 2) in this five years study.

Table IV

Numbers of *L. carcinophagus* in Admiralty Bay at ten day intervals, over a 6 year period.

Month	10-day period	1980	1988	1989	1990	1991	1992	x, n, SD.
1	1	0	0	0	0	0	0	x=0 SD=0 n=17
	2	0	0	0	—	0	0	
	3	0	0	0	0	0	0	
2	1	0	0	0	—	0	0	x=0 SD=0 n=18
	2	0	0	0	—	0	—	
	3	0	0	0	0	0	0	
3	1	0	0	0	0	0	0	x=0 SD=0 n=18
	2	0	0	0	0	0	0	
	3	0	0	0	0	0	0	
4	1	0	0	0	0	0	0	x=0.06 SD=0.2 n=17
	2	0	0	—	0	1	0	
	3	0	0	0	0	0	0	
5	1	0	0	—	0	0	0	x=0 SD=0 n=15
	2	0	0	—	0	—	0	
	3	0	0	0	0	0	0	
6	1	0	0	—	0	0	0	x=0 SD=0 n=14
	2	0	0	—	0	0	0	
	3	0	—	—	0	0	0	
7	1	0	0	—	0	0	0	x=49 SD=197 n=17
	2	0	0	0	0	0	0	
	3	0	3	1	0	0	836	
8	1	0	92	—	0	0	833	x=268 SD=441 n=16
	2	0	644	—	1	0	1527	
	3	0	829	2	1	0	357	
9	1	31	1305	—	1	103	338	x=307 SD=396 n=17
	2	548	1228	1	1	10	270	
	3	489	441	9	1	121	327	
10	1	1534	120	2	1	795	195	x=278 SD=398 n=17
	2	793	110	6	1	357	128	
	3	400	102	—	1	88	97	
11	1	0	50	0	1	0	41	x=13 SD=18 n=17
	2	0	40	—	1	1	30	
	3	0	30	0	1	0	24	
12	1	0	30	0	1	1	12	x=5 SD=8 n=16
	2	0	15	—	1	0	0	
	3	0	15	0	1	—	0	

Five pinniped species occurring in Admiralty Bay show characteristic changes in numbers at particular periods of the year. Species feeding mainly on krill (Fur seals and Crabeater seals) are present at different time, with the former being most numerous in March, and the latter in September. Although

Table V

Numbers of *M. leonina* in Admiralty Bay at ten day intervals, over a 5 year period.

Month	10-day period	1988	1989	1990	1991	1992	\bar{x} , n, SD.
1	1	592	638	623 (11)	505	618	x=586 SD=89 n=12
	2	624	—	—	484	670	
	3	581	—	455	468	768	
2	1	486	543	—	512	668	x=376 SD=152 n=12
	2	405	344	—	312	—	
	3	340	174	201	145	379	
3	1	251	97	247	112	254	x=194 SD=70 n=15
	2	227	57	273	131	225	
	3	193	103	269	238	232	
4	1	119	187	258	225	148	x=160 SD=46 n=14
	2	152	—	207	126	191	
	3	116	108	173	124	104	
5	1	115	—	161	91	136	x=86 SD=44 n=12
	2	81	—	114	—	80	
	3	96	29	92	1	33	
6	1	75	—	93	0	26	x=39 SD=34 n=11
	2	53	—	82	0	28	
	3	—	—	65	1	2	
7	1	25	—	58	0	0	x=19 SD=21 n=14
	2	47	1	43	0	0	
	3	32	47	11	0	2	
8	1	19	—	1	0	1	x=3 SD=5 n=13
	2	11	—	1	0	0	
	3	2	3	2	0	1	
9	1	5	—	0	0	4	x=11 adult SD=15 n=13
	2	3	10	9	0	9	
	3	24	—	56 (3)	2	20	
10	1	115	—	131 (30)	1	32 (9)	x=139 adult SD=110 n=13
	2	132 (1)	184 (61)	336 (119)	49 (19)	126 (49)	
	3	143 (13)	—	378 (157)	4	181 (140)	
11	1	204 (21)	146 (127)	283 (222)	180 (191)	144 (149)	x=304 adult SD=112 n=14
	2	371 (20)	—	266 (306)	294 (146)	273 (153)	
	3	468 (17)	391 (78)	533 (153)	332 (128)	367 (147)	
12	1	502 (8)	258 (66)	641 (57)	363 (107)	447 (86)	x=500 adult SD=121 n=13
	2	575 (1)	—	760 (11)	466 (61)	431 (75)	
	3	585	519 (25)	433	—	523 (54)	

Elephant seals and Weddell seals reach maximum numbers in the same months, they do not feed predominantly on krill. Leopard seals are most numerous in October, after Crabeaters breed and during hatching of penguins; the latter become the main food of leopard seals at this time (cf. Siniff and Stone 1985).

Yearly changes of mean numbers of pinnipeds and mean numbers of penguins (according to Myrcha 1993) are presented in Fig. 3. Both pinnipeds and penguins, as krill and fish consumers, are potential competitors for these

**MEAN No. OF INDIVIDUALS
per 10 day period (x10)**

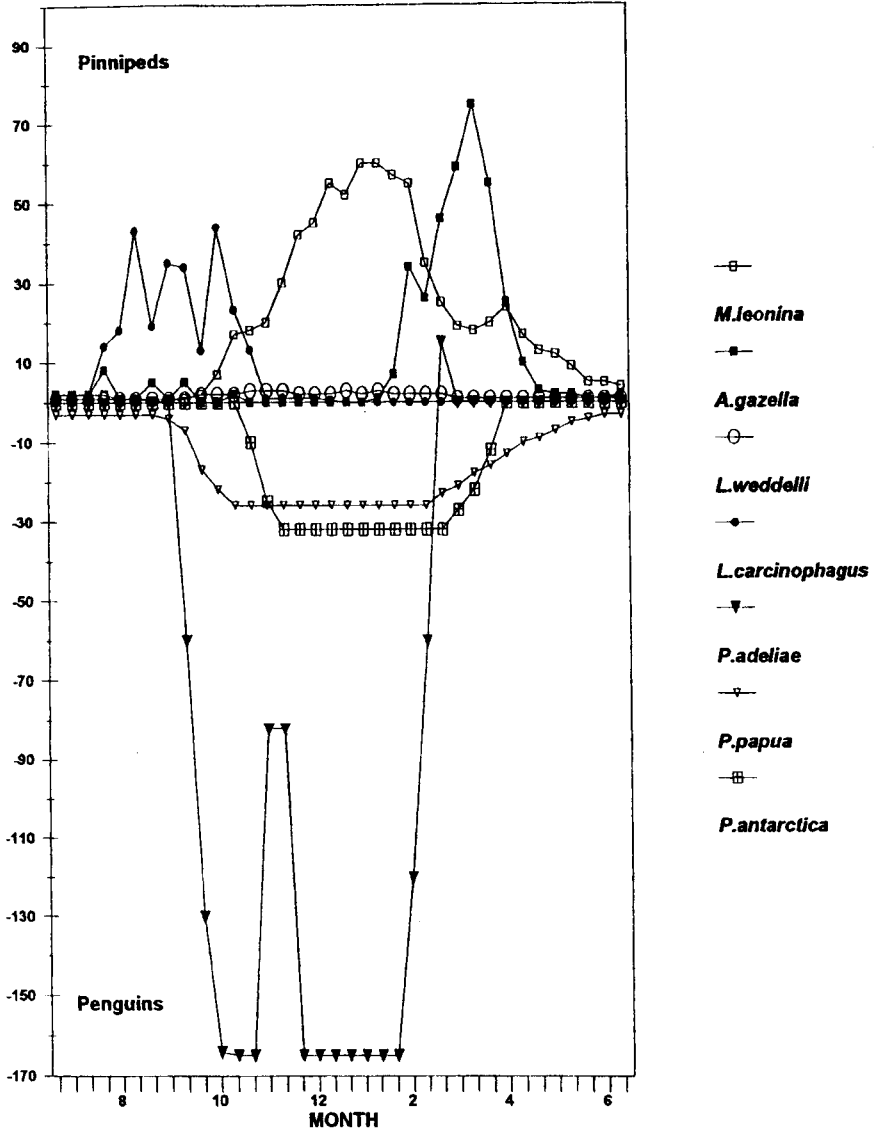


Fig. 3. Changes in the abundance of adult pinnipeds and penguins in Admiralty Bay throughout the year — mean values.

food resources. Different phenology of some of these species, however, ensures that the level of this competition is relatively low.

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Streszczenie

W niniejszej pracy przedstawiono wyniki monitoringu pięciu gatunków płetwonogich (Pinnipedia), obserwowanych regularnie w Zatoce Admiralicji (*Arctocephalus gazella*, *Lobodon carcinophagus*, *Leptonychotes weddelli*, *Mirounga leonina* i *Hydrurga leptonyx*). Nie zauważono żadnych określonych tendencji zmian populacji tych gatunków, a jedynie ich wyraźne wahania sezonowe. Porównanie zmian liczebności płetwonogich i pingwinów w badanym obszarze wydaje się wskazywać na niską konkurencję pokarmową pomiędzy tymi gatunkami zwierząt w cyklu rocznym.