

US-USSR Agreement on Cooperation in the Field of Environmental Protection

Area V. Protection of Nature and the Organization of Preserves

Project 6: Marine Mammals

Trip Report: WALRUS RESEARCH CRUISE OF THE ZRS Zykovo, CHUKCHI SEA, 24 JULY-
22 AUGUST 1983.

Francis H. Fay

Robert R. Nelson

John L. Sease

September 1983

BACKGROUND AND OBJECTIVE

In October 1982, two American scientists (J. J. Burns and F. H. Fay) from Alaska were invited to the Magadan Laboratory of TINRO for work on the pin-niped specimens there and for discussion of past and future joint research. In the course of those discussions, the Americans presented to the Soviets a summary of results from four separate visual surveys of sex/age composition of walruses summering in the eastern Chukchi Sea in 1981 and 1982 and from two surveys in the western Chukchi in 1982 (Table 1). The principal finding in each of those surveys was that the number of young animals in each age class from 0 to 5 years old was much lower than expected, indicating that the productivity of the population has been extremely low in recent years. For example, only about 5% of the adult females had calves of the year in 1981 and only 12 to 15% in 1982, rather than the predicted 35 to 40% each year. Apparently, each of the annual cohorts of young since 1976, at least, was well below that predicted range.

The implication of those findings is that the Pacific walrus population at present must be in a steep decline, for the magnitude of recent harvests appears to have exceeded the recruitment for at least the past 2 or 3 years. The Americans suggested that the Soviets take this into consideration when setting their harvest quotas, which they recently raised from 2,000 to 5,000 per year.

The Soviet biologists expressed disbelief in the American data and stated that they would "see for themselves!" Their disbelief was based on data from samples collected in 1981, which had indicated a normal proportion of pregnancies (about 38%) in the population. They proposed to re-assess the situation by collecting a large sample (3-500) of females in the western Chukchi Sea in the summer of 1983, and they invited the Americans to participate. That invitation was confirmed and accepted at the regular meeting of the Marine Mammal Project in Santa Cruz, in April 1983. Thus, the cruise of the ZRS Zykovo was conceived.

ITINERARY AND PERSONNEL

The Soviet biologists boarded the Zykovo in its home port of Nevel'sk, Sakhalin in mid-July. Only three were able to make the cruise: A. A. Kibal'-chich (Chief Scientist) of the VNIRO Laboratory of Marine Mammal Studies in Moscow, Yu. A. Bukhtiyarov of the TINRO Laboratory in Magadan, and A. G. Somov of Okhotskrybvod in Magadan.

Table 1. Results of visual surveys of sex/age composition of walrus in the Chukchi Sea in 1981 and 1982, showing the percentage of individuals in each age class.

Location and date	No. of animals	Age class (years)							Age uncertain (0 or 1 yr)
		0	1	2	3	4-5	F 6+	M 6+	
East of 170°W									
July 1981	1,691	3.8	2.3	3.3	4.5	9.8	69.3	6.9	0.0
Sept. 1981	434	2.0	1.1	2.3	3.4	5.5	70.6	14.2	0.9
TOTAL	2,125	3.5	2.1	3.1	4.3	8.9	69.7	8.4	0.2
East of 170°W									
July 1982	587	17.0	4.6	1.4	2.2	5.8	66.1	2.9	0.0
Aug. 1982	936	7.5	5.7	1.0	3.1	4.5	78.0	0.0	0.3
TOTAL	1,523	11.2	5.2	1.1	2.8	5.0	73.4	1.1	0.2
West of 170°W									
July 1982	107	5.6	4.7	0.0	1.9	4.7	63.6	17.8	1.9
Aug. 1982	210	10.0	4.8	2.4	1.0	4.8	71.9	5.2	0.0
TOTAL	317	8.5	4.7	1.6	1.3	4.7	69.1	9.5	0.6

¹Sexes combined in 0 to 4-5 year classes.

The ship arrived at Nome in the evening of 24 July, and the American biologists boarded at that time. Shore-to-ship transportation was provided by fish and game law enforcement personnel of the Alaska Department of Public Safety in Nome and by the crew of the Department's fishery patrol vessel, the M/V Wolstadt. The American scientific party consisted of F. H. Fay of the Institute of Marine Science, University of Alaska-Fairbanks, R. R. Nelson of the Alaska Department of Fish and Game, Nome, and J. L. Sease of the Department of Wildlife Management, University of Alaska-Fairbanks. Fay and Sease were sponsored by the U. S. Fish and Wildlife Service's Regional Office in Anchorage; Nelson was sponsored by the Alaska Department of Fish and Game.

The Zykovo proceeded at once to Bering Strait and into the Chukchi Sea (Fig. 1). For the next 9 days, it worked in the loose ice along the northern coast of Chukotka, from Kolyuchin Island (174°30'W) to about 179°30'E in Long Strait, taking and processing about 120 walruses. It then proceeded to the vicinity of Herald Shoal (70°25'N, 171°30'W) and eastward along the ice edge to about 170°W. Reversing its direction, it then followed the ice edge northward and southward, back to the vicinity of Cape Schmidt, arriving there 8 days later, having collected about 100 more walruses along the way. Because the ice about Wrangel Island remained heavy and impenetrable, the ship continued to work in the vicinity of C. Schmidt to Vankarem for the following 8 days, taking about 175 more walruses and conducting surveys of the sex/age composition of the herds.

On 19 August (Nome calendar), we headed back toward Bering Strait, thence southwestward, stopping briefly for a view of the walrus hauling gound on Arakamchechen Island and on nearby Nunyangan Island. We arrived at Nome in the morning of 22 August.

METHODS AND PROCEDURES

All of the walruses were taken by two professional hunters, operating from a small boat driven by one of the ships crew. The hunters were instructed to take only groups of adult females and, insofar as possible, to take whole groups rather than a few animals from each group. As the animals were killed, they were winched aboard the ship, onto the aft deck. One Soviet (Bukhtiyarov) and two American scientists (Nelson, Sease), after attaching a numbered metal tag to the head of each animal for record-keeping purposes, then proceeded to measure body weight, body length (both "standard" and "zoological" lengths), blubber thickness on the anterior sternum, and tusk length. These measurements are useful for assessment of growth and physical condition.

While recording those measurements, along with the date, sex, and tag number, the third American (Fay) also noted the approximate age, external pathological conditions, state of the molt, and shape and fractures of the tusks. Fecal samples for viral isolation also were collected at this time, whenever feasible.

The carcass was then winched to the butchering area, where it was skinned and eviscerated. In the course of that process, Kibal'chich collected the reproductive tract and a sample of the mammary tissue for histological examination, Fay collected a blood sample for serological analysis, and Nelson and Sease examined the stomach for food remains and collected tissue samples for pollutant analysis. Thereafter, Nelson removed a cross-cut section from the lower jaw, and Somov removed several teeth from the skull, both samples being taken for subsequent determination of age. A number of skulls were saved intact for deposition in museums, and two of the animals (an adult male and female) were prepared for use as whole mounts in a museum display. Following those operations, the carcass was rendered for animal food, rather than discarded.

The collected data and biological samples were prepared further by the scientific group as opportunity permitted during intervals in the collecting, as well as after hours at night and early in the morning. Stomach contents were rinsed in sea water, identified, sorted, counted, and weighed, and voucher samples were preserved for future reference. Reproductive tracts were examined externally and internally; fetuses were weighed and measured, and some were preserved for future study. The ovaries were first fixed in formalin for several days, then serially sectioned for inspection after the fixation had advanced toward completion.

From each blood sample, two 1-ml volumes of serum were pipetted off and stored frozen, to be analyzed later primarily for antibodies to microbiological agents of disease. Tissue samples for pollutant analysis and rectal swabs for viral isolation were appropriately packaged, then also stored frozen.

All data were cross-checked by two or more members of the joint scientific party, and position coordinates for the day's travels and collection sites were transcribed from the ship's log and from the printout of its satellite navigation system.

PRELIMINARY RESULTS

In all, we jointly processed 398 specimens, 329 of which were adult females, 18 were subadult and adult males, and the rest were immature animals of both sexes. From nearly all, we obtained weights, measurements, teeth, and reproductive organs. In addition, we collected sera from 153, jaw sections from 131, rectal swabs from 42, stomach contents from 40, and tissues for pollutant analysis from 23 animals. Although the primary objective of the cruise was to obtain data concerning productivity, a large amount of complimentary information had to be gathered for evaluation.

General Physical Condition

The weights and measurements will not be fully analyzed until the teeth and jaws have been sectioned for age determination. Some highlights, however, are as follows: The largest adult taken was a male about 4 meters long (standard length = 3.9 m; zoological length = 4.2 m), which weighed nearly two tons (1,950 kg). To the best of our knowledge, this is the largest walrus ever recorded. The smallest adult in our sample was an old female that was 2.3 m in standard length (2.5 m zoological) and weighed about 400 kg. This was an exceptionally small animal for the Pacific form.

Blubber thickness on the sternum varied within narrower limits than usual, ranging from 1.0 to 5.9 cm; in more than 80% of the animals it was between 2 and 4 cm. Females tended to be fatter than males, and adults tended to be fatter than the young (Table 2). As a whole, these animals were leaner than in any previous samples on record. Their leanness may be attributable in part to the fact that they were molting. Molting pinnipeds tend to eat less, hence may lose weight during that period.

Most of the animals were in the process of shedding their old hair and beginning to replace it with new. About 9% had not yet begun to shed; 55% had shed less than half; 32% had shed more than half; and about 4% already had finished shedding and showed new hair in all areas. The shedding showed very little consistency in pattern, except that it seemed to begin usually on the head and neck and to proceed more rapidly on the ventral than on the dorsal side. Last to shed, apparently, were the rump and ankles.

Because of the shedding, the surface of the skin on the body was more visible than at other times, and the presence of fungal infections was more easily detectable. In well haired specimens, mycosis of the skin usually is visible only on the naked flippers, but in this sample it could be seen easily on the body, as well. More than 80% of the infections involved the body surface, as well as the flippers; less than 20% of the infections were found

Table 2. Summary of results from measurement of blubber thickness on the sternum.

Sex	Est. age (yrs)	N	Blubber thickness(mm)	
			Range	Mean
Males	0-5	13	10 - 30	20.1
	6-9	23	17 - 33	24.1
	10+	17	16 - 37	26.7
Females	0-5	10	15 - 30	20.7
	6-9	19	14 - 59	27.8
	10+	295	13 - 55	29.9

to exist on the body surface alone (Table 3). The percentage of animals showing infections on the flippers was about the same as in a sample taken in 1981. Mycosis tended to be more common in females than in males, and more common in old than in young animals.

A "blistering" of the skin also was seen on various parts of the torso in several animals. In adults, the blebs were about 1 cm in diameter; they were about half as large in a calf. The cause of this condition is not yet known; samples preserved for histological and microbiological examination have not yet been analyzed. Possibly, it is associated just with the mechanical loosening of the cornified layer during the molt, or it could be the manifestation of a viral infection, such as the San Miguel sea lion disease, which can cause blistering of the skin. A viral agent similar to the San Miguel sea lion virus (SMSV) recently was isolated from Pacific walruses. SMSV is suspected to cause lower reproductive success in other pinnipeds.

Table 3. Comparative frequency of occurrence of mycotic infections by sex, age, and region of the body in walrus from the western Chukchi Sea, July-August 1983.

Sex	Est. age (yrs)	N	Percent infected	Infected area		
				None	Body and flippers	Body only
Male	1- 5	14	57	6	7	1
	6- 9	20	80	4	14	2
	10-15	16	50	8	6	2
	16+	7	71	2	3	2
Female	1- 5	8	75	2	5	1
	6- 9	20	55	9	9	2
	10-15	71	75	18	47	6
	16-20	93	84	15	66	12
	21-29	101	90	11	80	10
	30+	36	89	4	31	1

Reproduction

Of the 329 adult females, 95 (28.9%) were newly pregnant, carrying fetuses (47 males: 48 females) that were 11 to 21 cm in crown-rump length. This is a considerably lower proportion of pregnancies than was found in previous samples from this region (37 to 43%) in past years, but it is comparable to the proportion (about 30%) found in samples from the Alaskan Eskimos' recent harvests in the Bering Strait region.

Unfortunately, the reproductive organs of most of the females could not be analyzed further during the cruise, because most of the ovaries had not been in the formalin long enough for proper fixation. Toward the end of the cruise, we did examine a few of the ovaries from specimens taken between 28

July and 12 August, even though they were not yet fully fixed. In a sample of 120 of those for which complete data were recorded, the proportion pregnant with a new fetus was 28.3%, indicating that this was a representative "aliquot" of the larger set.

In that aliquot of 120 specimens, 72 (60%) had ovulated in the 1983 breeding season, but only 40 of those had conceived (i.e., implanted a fetus). The other 32 apparently had either not been fertilized, rejected the blastocyst, or failed to implant. At least 6 of the 40 successful implantations already had ended in abortion of the fetus, and one other fetus with an umbilical hernia could not have survived. Thus, more than half of the females that had ovulated in the 1983 breeding season had failed to conceive and retain the fetus.

Reproductive failures apparently had been high also in the 1982 breeding season, for only 25 (21%) of the 120 specimens had conceived in 1982 and carried the fetus to full term. A few others appeared to have conceived in 1982 but aborted their fetus early in gestation. A comparably low birth rate, partly due to a high rate of abortion, has been indicated in recent years also by the Alaskan harvest samples. The low pregnancy and birth rates also are attributable in part to age. About two-thirds of the adult females in this sample were estimated to have been more than 20 years old, and nearly half were in the 25-to about 35-year age classes, which are relatively unproductive under any circumstances.

The final indication of reproductive success (or lack thereof!) was seen in the brief visual surveys of herd composition in the vicinity of Cape Schmidt on 15-16 August. There, in a sample of 430 females and young, only 11% of the adult females were accompanied by calves of the year, 7.4% by 1-year-olds, and 2.4% by 2-year-olds. This sample is small and from only a small part of the distributional area, hence it may not have been representative of the population as a whole. It was, however, very similar in composition to the samples obtained in the previous two years from much broader areas in both the eastern and western Chukchi Sea. It suggests, as did the others, that the survival of young has been extremely low in recent years.

Feeding Habits

Stomach contents were examined in 40 animals (8males, 32 females); in the rest, the food was already too far advanced in digestion for analysis, or the stomach was empty. Of the 40 animals with assayable stomach contents, 20 were taken well offshore in the Herald Shoal-Wrangell Island area, and 20 were taken near shore in the vicinity of Capes Schmidt and Vankarem (Fig. 2).

The wet weight of total contents (excluding gravel) in each of the 40 stomachs was from 2 to 1624 g; the mean was about 500 g. These are comparatively small amounts, but they may not be unusual for animals that are molting, because of reduced food intake in that period.

Predominant by weight among the foods eaten in the offshore area were polychaetes, followed by snails (Gastropoda) and seals (Pinnipedia) (Table 4). In the nearshore area, seals predominated by weight, followed by, snails, priapulids, polychaetes, clams (Bivalvia), and tunicates (Urochordata). At least 39 different species were represented, 15 of which were mollusks.

As noted earlier by Soviet investigators, most of the invertebrates eaten by the walruses in this region are of small size. That was especially true of the snails and clams in this sample, the average unit weights of which were about 0.9 and 0.2 grams, respectively. The mean size of invertebrates in the offshore sample was about twice that in the nearshore sample, and in both areas the males tended to take somewhat larger invertebrates than did the females.

Of the five animals with remains of seals in their stomach, three were males and two were females. Seal-eating usually is attributed to males, alone. The remains in the stomachs were identifiable as those of ringed seals (Phoca hispida), four of which were pups and the fifth was an adult. Most of the remains were strips and chunks of skin with blubber, but some of the flesh, bones, and viscera also had been eaten from the seals.

Coastal Haulouts

The hauling ground on Arakamchechen Island was inhabited by about 3000 male walruses and at least four females. A series of photos was taken of the entire herd for assessment of sex/age composition.

The Nunyangan hauling ground was occupied by about 1000 males.

Other Observations

Polar bears (Ursus maritimus) were common in the nearshore area and northward to Herald Island.

Ringed seals were sighted occasionally in all areas but were not markedly abundant anywhere. Most of those sighted were very small, young animals; all were in the water.

Table 4. Summary of stomach contents of walrus taken in the western Chukchi Sea, July-August 1983.

Kind of organisms	<u>Schmidt-Vankarem (N=20)</u>		<u>Herald-Wrangell (N=20)</u>	
	Number	Weight (g)	Number	Weight (g)
Polychaeta	486	1246	2038	3138
Echiurida	12	35	4	25
Priapulida	426	1345	25	474
Sipunculida	15	43	143	563
Gastropoda	1674	1489	3246	2776
Bivalvia	6126	1179	215	231
Cephalopoda	2	4	8	172
Amphipoda	86	36	2	1
Cumacea	51	5	0	0
Crangonidae	31	82	50	83
Paguridae	89	51	233	123
Brachyura	57	166	10	154
Holothurea	8	120	0	0
Urochordata	954	1057	112	562
Pinnipedia	2	2344	3	2345
Unidentified	5+	42	4+	661
Totals	9,897	9,196	6,093	11,314

Bearded seals (Erignathus barbatus) were present but scarce in all areas.

Five ribbon seals (Phoca fasciata) were sighted, mainly in the vicinity of Herald Shoal (Fig. 2). Three of these (2 males, 1 female) were on the ice when first seen; the other two (males?) were in the water. All were adults, to judge from their size and coloration. Three other adults were seen in this same region last summer. Since sightings have been extremely rare in other parts of the Chukchi and Bering Seas in summer, the frequent sightings here may indicate that this is an important summering area for the species.

Two male killer whales (Orcinus orca) were seen in Bering Strait, just west of Big Diomede Island on 20 August.

Gray whales (Eschrichtius robustus) were numerous in the nearshore zone along the northern coast of Chukotka, even in the ice as far west as Cape Schmidt. They were abundant in the vicinity of Bering Strait and as far south as Arakamchechen Island, as well.

Bowhead whales (Balaena mysticetus) were not seen in any of the areas visited.

CONCLUDING REMARKS

The cruise was highly successful, thanks to the very competent performance of the crew of the Zykovo and effective handling of the specimens by the scientific party. We sincerely thank Captain Kaitkulov and his congenial crew for their considerable help and hospitality, and we commend our colleagues Kibal'chich, Bukhtiyarov, and Somov for conducting a well organized, highly informative, scientific expedition.

The results from both the specimens collected and the compositional surveys confirmed that the productivity of the walrus summering in the western Chukchi Sea is not markedly different from that of walrus in the eastern Chukchi. For walrus in both regions, reproductive success and survival of young has been very poor for the past several years, and the population at present is made up predominantly of old animals.