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SUMMARY OF THE RESULTS AND MAIN ASPECTS OF INVESTIGATIONS OF SEALS OF PHOCIDAE FAMILY AND WALRUS OF THE NORTHERN PACIFIC OCEAN

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This report summarizes some of the results of investigations carried on between 1930 and 1975 and provides a description of possible future studies of walrus and seals planned by our laboratory for the coming years. In the light of these plans, proposals for future joint programs of research of Bering and Chuckchee Seas pinnipeds by the USSR and U.S. scientists are put forward.

WALRUS

Walrus is the most important prey for the aboriginal hunters of Cukotka and Alaska. It is well known that eskimoes and land inhabitants of Chukotka lived primarily on these animals from times immemorial.

The problem of conservation of walrus stocks and management of their resource is therefore exceedingly important, and calls for conducting large-scale regular investigations.

SYSTEMATICS AND MORPHOLOGICAL CHARACTERISTICS

As is testified by earlier papers by Allen(1880), Smirnov (1908), Ognev(1935), Chapski(1936), Dogerböl and Frauchan(1935) and others, the Pacific walrus differs from the Atlantic walrus by larger body and skull dimensions. However, no comprehensive morphological comparison has been made until now between the Atlantic, Pacific and particularly Laptev populations. There is little knowledge of the fluctuations of systematic characteristics by age and sex.

Attention has been given in recent years to the study of a

number of morphological and physiological parameters of walrus in connection with its adaptation to the life in water (Fay and F Fay,I968;Grill and Quiring,I940;Fedoseev and others,I974;Sokolov and others,I966).These papers show that the distribution of walruses is in many respects interconnected with the character of thermal regulation.However,the adaptive morphological and physiological characteristics of walruses as a whole have not been studied well.Many aspects of behaviour,and particularly of segregation in distribution of walrus during separate seasons of the year remain unclear.

This causes great interest to obtaining data on the gas exchange,energy equillibrium,biochemical properties of fat, physiology of blood,or the time the animal can spend under water.

DISTRIBUTION AND MIGRATIONS

Numerous papers by both Soviet and American researchers provide a sufficiently clear general picture of the distribution and migrations of walrus.

At present the principal task is to clarify the space structure of the population,i.e. we need to know (I)what age and sex groups of walruses inhabit some definite areas by year seasons, (2)what proportion of the stock inhabit in summer time the western and eastern Chuckchee Sea,and the Alaskan and Chukotka peninsula are in the Bering Sea,and (3)how the ice condition affects the distribution and segregation of the population in separate seasons of the year.

The study of these problems will help improve aerial surveys and determine the impact of fisheries on the structure of population.

BIOLOGICAL ASPECTS OF BREEDING AND REPRODUCTION

This was the subject of special studies by Soviet and American scientists (Chapski,I936;Freiman,I940;Nikulin,I940;Belopolsky I939;Popov,I960;Brooks,I954;Fay,I955;Mansfield,I959;Krylov,I962, I966,I967;Burns,I967 and others).

However, several aspects of the biology of breeding and reproduction rates remain to be debatable and unclear. In particular, scientists are not unanimous on the time of mating, or on the development of corpora lutea in the ovaries. This brings about various assessments of the reproduction rates of walrus. It is not entirely clear whether walrus is a monogamous or polygamous animal.

The results of research conducted by our laboratory during recent years indicate great similarity between our and U.S. assessments of the reproduction rythm of females (one pup per 2,I years versus one pup per 2,3 years - Burns, I965 or per 2,4 years - Marbo, I96I).

Nevertheless, additional materials are required to study the biology of breeding of walrus. These materials have to be obtained during the breeding season or shortly after its termination (April--May). Our research program envisages studies of walrus during the reproduction season of I976-I977, once a vessel is allocated to the researchers.

Several scientists believe that walrus is a polygamous animal (Freiman, I940; Brooks, I954; Vinogradov, I949; and others). Not all scientists, however, share this opinion (Krylov, I967).

The problem of whether walrus is a polygamous or monogamous animal is very important to be resolved, moreover that they are shot selectively. Statistical hunting data indicate that there are more males among the animals killed. Therefore, an increased shooting of males may have adverse effect on the reproduction rate of the population. Mating of walrus can also be studied well only during the reproduction season (April-May).

AGE STRUCTURE OF THE POPULATION

The introduction of the method of precise age determination by dentine and cement layers in the teeth allowed us to undertake a study of the age structure of walrus population (Krylov, I963; Krylov, Fedoseev, Shustov, I964; Burns, I965; Fedoseev, Goltsev, I969 and others). The data obtained show that walrus has a long life period of over 40 years. The annual mortality of adult males aged I3 to 27 years as assessed by U.S. researchers was II to I5%, or I3% on the average (Burns, I969). If the mortality rate is assessed by the age

limit in samples according to F.I.Baranov's method(I9I8) as modified by P.V.Tjurin (I963) it does not exceed 8-I0% (Fedoseev,Goltsev,I969).

The contemporary data on the age composition of the kill,and the time of maturation collected by both Soviet and U.S. scientists show that the recruitment of maturing animals into the breeding part of the population does not exceed 9-I0%.Hence,if the mortality and recruitment data are collated the walrus population could become smaller under mortality rate of I3%,or would be in equillibrium under 8 to I0% mortality.Indeed,all scientists point out an increase in the abundance of walrus stocks in recent years.The examples given show that the present day idea of the population structure,of mortality and growth rates have to be improved.In particular,the following questions have to be answered: I)what is the selectivity of hunting;2)how much representative are the samples obtained from commerciald drives,in other words whether they do reflect composition of the population;3)-- a scientific pilot shooting of walrus is needed on the breeding grounds so that its results could be compared with the commercial kills,and the natural structure of the population could be seen more exactly.

FOOD HABITS

N.G.Nikulin(I94I),V.I.Krylov(I97I),Brooks(I954),Yu.A.Bukhtiyarov(I974) are the authors who have provided more ample data on feeding in their papers.Besides,there is a number of papers in whi which food habits of walrus are depicted indirectly.

In most cases feeding of walruses was studied between May and September.

In future it would be essential to obtain data on the feeding of walrus in their winter areas and breeding grounds,as well as some information on the amount of food consumed.

MONITORING THE STATUS OF STOCKS AND ABUNDANCE

At present there are no data which would permit to make an exact assessment of the possible increase in the abundance of walruses.Dr.Fay(I957) believes that in the I9th century the abundance of walruses could not be less than 200 th. animals. In the period between I955 and I960 walruses were assessed by

both Soviet and American scientists as being 50 th. animals(Fay, I957;Fedoseev,I962).

On the other hand other scientists,such as Kenyon(I960), Marbo(I96I),Burns(I965) suggested 70-90th. or 78-II3th. animals as the population size.The data from the areal survey carried on by our laboratory in I970 indicate that the abundance of walrus stocks was I03th. animals (Goltsev,I972).These data show that the stock assessments by various scientists in I960 might differ by two times and more (50 and II3th).This again indicates that the methods of assessments are far from being perfect.

The analyses of hunting statistics presented by many authors allows us to make a very important finding that the abundance of walrus stocks has always declined when the kill exceeded I0-I5th. heads.The data presented by Burns in I965 that II700 walruses were taken between I960 and I965,and that there was considerable growth of population are erroneous since his assumption figures of the Soviet kill of walruses were overestimated by 2,5-3 times.In I960-I964 the kill of walruses did not exceed 2-3th. heads,including 40% of lost animals (Krylov,I963); in the later years it was I-I,5 th. heads.If we take into account that the average annual U.S. catch is 2th. walruses or 2,8 with the 40% loss,the total kill of walruses between I960-I964 was 5,5-6,5th. heads,and after I965 - 3,5-4th. heads,loss inclusive. Apparently this level of harvesting does not result in a decline in the abundance.However,we still know little about the natural fluctuations of the abundance,irrespective of the human activities.The possibility of having a period in the life of the population when it would decline under the kill of 3,5-4th animals cannot be ruled out.

In future it will be very important to obtain exact data on the number of walruses killed,and make a simultaneous analysis of the age and sex composition of the kill.This latter circumstance is extremely important since in selective fisheries the adverse human effect is not solely in the exemption of a certain part of animals but also in the violation of the natural structure of the population,which can bring down its natural reproductive capacity.

The methods of counting the number of animals also have to be improved.

RINGED SEAL

Despite the fact that systematic records of ringed seals at Chukotka and Alaska were taken long ago (Allen,I902;Naumov,Smirnov,I935;Andersen,I942) theis biology has not been studied for long.

Comparatively detailed data on the biology of this seal were obtained rather recently(Fedoseev,I965,I967;Johnson and others,I966; and others).

It was shown that the Bering strait and the bays of the Anadyr gulf are inhabited by the seals which breed on the land floe.At the same time there are seals in the Chuckchee Sea which breed on drifting ice.It is proposed therefore to distinguish between two morpho-ecological types of populations which inhabit (I) the land floe in bays and gulfs and (2) drifting ice.Both types of populations can be easily differentiated by a whole set of morphological characteristics,and by the way of life (ecology).

In future it would be worthwhile to make a comparison of these animals off Chukotka peninsula and Alaska since it may happen that there may be uniform populations,especially in the area of the Bering strait.

Ringed seal is a commercially important animal.The demand for there skins is high because they are valuable fur goods at domestic and foreign market.

Several aspects of the biology of this seal,such as the structure and locality of populations,reproductive capacity,abundance, status of stocks,biocenosis relationships,adaptive capacities,etc. still have to be studied in detail.

The most ample data on ringed seal have been obtained from the Sea of Okhotsk and Canadian Arctic region (McLaren,I958;Fedoseev I967).However,it would not be correct to apply the biological data from these areas to the populations of ringed seals of the Bering and Chuckchee Seas.

Genus PHOCA VITULINA

There were several trials to change the taxonomic structure of seals Phoca vitulina, even new specious were added.
Presently the most acceptable point of view is that there are two types of seals Phoca genus, dwelling in the North Pacific: Phoca vitulina larga and Phoca vitulina richardii or its synonim Phoca vitulina insularis.

Dr. K.K. Chapsky (I966) was the first one to prove this statement, analysing craniological material. Later on two more scientists came to this conclusion (Mohr, I966 and McLaren, I966).

The main biological piculiarity of the island form of seals genus Phoca is that there are a number of populations, not numerous though. Those populations are isolated from one another because they breed on separate islands. This leads to differentiation of specious, and it is very likely that on the modern stage of the evolution in the system of the main island forms of the seals Phoca genus a number of races and sub-specious were formed, morphplogy and ecology of which needs to be studied in details.

In this connection the wish of Soviet and American mammalogists to continue further study of island populations of the seals Phoca genus on the North Pacific islands should be supported in every way possible.
Later on the Pacific forms may be compared with the Atlantic forms. The development of work on island forms of the seals Phoca genus is especially necessary because inspite of numerous articles devoted to systematics, ecology of the majority of the populations is hardly studied.

Phoca vitulina larga is studied more in detail than island forms of the seals nearest to it.
Dr. K.K. Chapsky (I967) had studied morphological characteristics of Larga, basing on materials of the Bering Sea and distinguished it as an individual specious. Extensive researches carried out by our laboratory give every reason to think that there are three independent local populations of this seal in the Bering

Sea: Karaghinsky, West-Anadyr, Alaskan.

The first two populations were studied more in detailed in morpho-ecological aspect, including such questions as characteristics of craniological peculiarities, exterior, peculiarities of distribution of pups and molting grounds, age and sexual structure, rate of reproduction, parasite fauna, state of the stock and quantity.

Further development of Phoca vitulina largha researches requires more detailed studies of its population structure in the Bering Sea and wide morpho-ecological comparison of the animals from Bay of Anadyr and Alaska coastal waters.

It can be achieved only in case of Soviet-American collaboration in mutual study of island forms of Pinnipeds.

The ribbon seal.

The morphology and ecology of this specious have been studied by our scientists in the Bering and Okhotsk Seas. Many of the papers were published (Krylov, Fedoseev, Shustov, I964, Shustov, I965, I967, I969, I970, Fedoseev, I973 and others).

Shortly the biological peculiarities of the ribbon seal are as follows:

I). This is a quick-growing animal, the females of the ribbon seal are able to bear a pup at the age of 2, but in mass at the age of 3.

2). Ribbon seal is the most specific specious among Pacific seals, it is well adapted to the marine way of life and lost any connection with the land..

3). The reproductive area of this specious is rather limited in both Bering and Okhotsk Seas. That is why the number of animals in the populations is rather limited. Presently in the Bering Sea it is not more than 73,000 animals and has tendency to increase due to the limitations in hunting.

4). According to morpho-physiological indices this animal is well adapted to the long submersion and in prospect may serve a good model for physiological researches to

determine the mechanism, providing adaptation to marine way of life and deep-water submersion.

The piculiarities mentioned above show that the ribbon seal is a unique specious among Pinnipeds of the North Pacific and should be controlled carefully.

From I968 harvest of the ribbon seal was limited. Presently the specialists of our institute are studing intraspecious structure of ribbon seal population.

It is planned to compare the animals of the reproductive groups which have been formed in the Bering Sea: West-Anadyr and East-Bering, grouping round King island.

Besides the materials on population dynamics for the period I96I - I975 will be generalized.

Bearded seal.

The biology of the bearded seal in the Bering Sea was studied by soviet zoologists during I962 - I969.

Presently, morphology and systimatics of the bearded seal are discribed in many works (Kosygin, I968, Potelov, Kosygin I970).

There are also data on reproduction of the bearded seal (Tikhomirov, I966, Burns, I970) and feeding (Kosygin, I966). It was also noted that bearded seal in contrast to the other ice forms of Pinnipeds of the Bering Sea migrate ih Chukchi Sea. (Krylov, Fedoseev, Shustov, I964, Burns, I970).

Inspite of the large number of works the bearded seal biology is not studied well enough, especially the questions of the population characteristics as a whole.

In particular there are no data on age structure of the population, extent of the population differetiation is also studied insufficiently.

Though it is known that males are separated from

females at an early stage, but the area of dwelling of young and adult animals through seasons is not known.

The influence of hunting on the structure and population is not studied.

The bearded seal is used by natives of Chukotka and Alaska. Annual total harvest is not less than 5 - 6 thousand animals, not taking into consideration losses during hunting.

Insufficient knowledge of the Bering Sea bearded seal ecology makes aerial counting difficult. That is why abundancy of these animals in the Bering and Chukchi Seas is estimated very approximately - 250 000 animals (Kenyon, I972).

According to our data, using aerial counting, the abundance of bearded seal was not more than 70-80 thousand animals (GOLTSEV, I974).

The present state of bearded seal stock is studied rather badly. In the USSR hunting was forbiden in I969, this was resulted in the growth of abundance.

Within the next few years mammalogists of our laboratory will study the age structure and sexual structure of the bearded seal populations, the rate of reproduction, seasonal differentiation of the animals, the influence of hunting on structure and abundance and so on.

Main trend in the researches and possible aspects of Soviet-American collaboration in study of the ice forms of Pinnipeds.

From this very brief report on the ice form of pinnipeds in the North Pacific one can draw a conclusion that till recently general questions of biology of some specious were studied, including distribution, migration, systematics; characteristics of craniological, exterior and interior indeces; body colour, periods of maturation,

MATING, birth, age composition, mortality, feeding, parasitofauna, abundance and other questions. But still we do not know the structure of the population well enough, hence biological foundations for population monitoring, hunting and protection are not worked out.

The territories of the Bering and Chukchi Saes are very large, therefore it is very likely that there are many populations, each of which has its peculiarities.

It may be referred first of all to such specious as ringed seal, harbour seal. Each population has very complicated differentiated structure in seasonal and long-term aspects.

Itis necessary to study this structure to know the influence of hunting on natural structure of the population from the point of view of morphological genetic and ecological composition of animal groups comprising it.

Very often we make mistakes estimating the influence of hunting only as decrease in the number of animals. Meanwhile negative influence of hunting reflects first of all in hamparing of natural relationships in populations and biogeocenoses. Course of this processes depends on the influence of hunting on populations in age sexual and spatial aspects.

It also should be noted that harvest depends on the age and sexual groups of the animals used by man.

That is why we think that researches should be concentrated on detailed analysis of population structure of each specious. In this connection our laboratory will carry out investigations on the following aspects of each specious:

1. Spatial age and sexual differentiation of animals.
2. Comparison of individuals from different points of ~~view~~ the area on craniological, exterior and interior signs, parasitofauna and different ecological peculiarities.
3. Study of abundance in different parts of the area

and population dynamics, taking into consideration reproduction rate and natural mortality.

4. Influence of man on structure and population abundance.

5. Morphological and physiological adaptation of Pinnipeds.

Besides we think it is important to study adaptation of pinnipeds to power exchange, deepwater submersion and bioacoustics.

We know that american scientists achieved considerable success. Study of these aspects of Pinnipeds biology will help to explain reasons of animals differentiations in populations, their interrelations and ecology and also general distribution in the North Pacific.

Success in the study of seals and walruses may be achieved only in case of thorough investigation of seals ~~d~~ distribution areas.

It may be fulfilled only on the base of mutual collaboration of soviet and american scientists, because seals and walruses as other marine animales do not recognize state borders and are dwelling in both neutral and territorial waters of the USSR and USA..