Summer distribution, stocks, prospects for commercial utilization, and certain features of the biology of sea lions inhabiting the Kurile Islands

By A. N. Belkin[*]

Extract from the *Isvestiya* [*News*][†] *of the Pacific Scientific-Research Institute of Fisheries and Oceanography (TINRO)*, Volume LVIII, 1966, Vladivostok (offprint)

The sea lion is common and at the same time is one of least-studied species of seal. The explanation of this are the great remoteness of the main sea lion rookeries from contemporary areas of seal hunting in the Far East, and the fact that the sea lion is not an object of State hunting.

The growing interests of industry and also the fulfillment of international obligations concerning the study of fur-seal biology prompted the Pacific Scientific-Research Institute of Fisheries and Oceanography (TINRO) to mount several expeditions during

---

[*] Original citation: Belkin, A. N. 1966. Letnee raspredelenie, zapasy, perspektivy promysla I nekotorye cherty biologii sivucha, obitayushchego na Kuril'skikh ostrovakh. *Izvestiya Tikhookeanskogo N. I. Instituta Rybnogo Khozyaistva I Okeanografii (TINRO)* 58:69-95. Translated by Translation Bureau (G.P.) Foreign Languages Division Department of the Secretary of State of Canada, Fisheries Research Board of Canada Biological Station, Nanaimo, B.C., 1966. Fisheries Research Board of Canada Translation Series, No. 720. Transferred to electronic format and edited by Mark Uhen and Michell Kwon, Smithsonian Institution, 2007.

[†] Squared brackets contain translator's parentheses.

the period 1962–1964 to the Kurile Islands for the purpose of studying the contemporary state of rookeries and to determine the numerical strength of fur seals and sea lions.

The first visit to the Kurile Islands took place in June, 1962. During the period 19 May to 20 August 1963, a scientific group from the expedition ship "Krylatka" covered a distance of about 1500 [nautical] miles in a small motor-driven seal-boat and investigated the coasts of all the Kurile Islands. At this same time the topography of the sea lion rookeries in the summer period was elucidated and their numerical strength was determined on each rookery and for the Kurile herd as a whole. From 15 May to 15 August 1964, the main sea lion rookeries were again visited. Moreover, more detailed observations were made of the behavior of the animals during the harem period of life, the dates of mating and whelping were refined, the numerical strength of the pup yield was determined for the first time, newborn sea lions were tagged and other work was done.[1]

The method of counting the numerical strength of the sea lions was as follows: the scientific group, trying to be unnoticed, landed on the island and from the most convenient positions counted the number of sea lions on the rookery, the area of which was arbitrarily subdivided into separate regions. The counting operations were performed by several observers. The accuracy of the count of animals on the rookery was sufficiently high: discrepancies in the estimate of their total number usually did not exceed 5–15 head.

[1] The count of the numerical strength of sea lions in 1963 was done by the author together with A. G. Velizhanin and V. D. Kostin. Great help was rendered in the operations of 1964 by N. I. Grigorenk. Author.

The presence of sexual dimorphism in sea lions facilitates the separate census of females and males on the rookery. With enough practice it is possible to distinguish the males according to age directly under field conditions, especially those in the 1–6 year age group. We took cognizance of the following features: overall dimensions of the animal, tint of the hair covering, character of the head profile (the presence of the eminence on the forehead), et cetera.

Information concerning the sex and age groupings of sea lions on individual rookeries and on the entire Kurile Chain is virtually not to he found in the literature, and the same may he said of the behavior of sea lions during the breeding period. It is therefore necessary to dwell on a review of these questions in more detail.

THE POSITION OF THE ROOKERIES AND THE NUMERICAL STRENGTH OF SEA LIONS

The position of 18 sea lion rookeries on the Kurile Islands was described for the first time by Snow (1902). Almost nothing was known in the last century concerning the numerical strength of sea lions except Snow's remark, which refers to the eighties, to the effect that about 100,000 sea lions swim to the islands in summer. However, this same author indicates that the annual take of sea lions on the Chain constitutes 100,000 head (page 105, evidently a typographical error). S. K. Klumov (1957), having inspected most of the

rookeries through binoculars from a ship in 1955, approximately determined the numerical strength of the Kurile sea lion herd as 15,000–17,000 head.

In contrast to fur seals and sea otter, herds of which toward the end of the 19th century were almost completely destroyed here, the development or the sea lion population on the Kurile Islands has proceeded without human intervention up until the present time. As far as we know, no operations capable of affecting the numerical strength of the sea lion herd have been performed during the current century. On the contrary, it may be surmised that the destruction in the past of fur seals on rookeries occupied jointly by fur seals and sea lions has led to some increase in the numerical strength of sea lions on the islands Lovushki, Sredneva, and Raikoke.

It is presumed that the commercial hunting of sea lions on the Kurile Islands will be organized in the very near future. This prompts us to dwell on the question of their distribution in more detail and to give a commercial hunting characteristic to each rookery individually. Information concerning the numerical strength of sea lions is given in Table 1.

Lesser Kurile Chain. It should be noted that S. K. Klumov (1957) unfoundedly denies the presence of sea lions on the Lesser Kurile Chain, where they in fact live all year round.

Shikotan Island is the largest island in the region under description; however there are no permanent sea lion rookeries on it. Our observations of sea lions on this island refer to

March–June, 1959, 1960, and 1963. In 1964, investigation of the island was done in April, May, and August. It became apparent that in winter–spring time a sub-rookery[2] of sea lions forms to eastward of Cape Shikotan with a numerical strength of up to l00–l50 head. In spring time groups of feeding animals with 5–20 or more head in each were constantly noted by us at the southern coast of the island, where they are taken by local hunters.

On 4–5 April 1963, solitary specimens and groups of sea lions were observed on ice floes southward of the island and in Shpanberga Strait. Up to 300 head were counted here. A pregnant female sea lion was taken on an ice floe 14 April. The entire coast of the island was investigated during the period 19–30 May 1963, but no more sea lions were sighted. This is fully in accord with the observations of other years: in the first half of May the sea lions quit the island.

A large permanent rookery exists on Peshchernaya Rock, which is 26 meters high and is situated 2.5 miles south of Polonskogo Island. The rock is divided into two parts by a small strait; the summit of the larger of them, where about 50 sea lions usually lie, is in the form of an arch 26 meters high [see Figure 1]. Around the rock there are smaller stones and reefs which, however, do not go far out to sea.

There were approximately 1000 sea lions on the rock on 31 May l963, and also on 15 August 1964. In winter and early springtime the numerical strength of the sea lions

[2] Throughout this translation the Russian words *lëzhbishche* and *zelezhka* are rendered as "rookery" and "sub-rookery" respectively. Translator.

increases. Thus, on 8 April 1964, 1900–2000 head were counted here. The surface of the rock is uneven and is not very suitable for the whelping of seals; a considerable part of it is flooded during southerly storms (Figure 1). On 15 August 1964 two sea lion pups were registered on the rookery.

There is a sea lion sub-rookery on the Shishki Islands, which are located 1.3 miles southward from Peshchernaya Rock. More than 200 sea lions were counted here on 31 May 1963.

On the shores of the other eight islands of the Lesser Kurile Chain, sea lions were recorded extremely rarely in winter and spring time. According to local inhabitants, sea lions are most widespread in autumn, when they form temporary accumulations on the islands of Shikotan, Zelënyi, and Yurii. Increase in the numerical strength of seals in autumn-winter time takes place at the expense of partial migration of them from the summer rookeries located on the Great Kurile Chain. On the average, 1000 sea lions inhabit the southern islands during the summer period.

Greater Kurile Chain. No coastal sea lion rookeries were found on Kunashir Island. Groups of 3–20 head were encountered afloat in direct proximity to the shores. At the southern shallow littoral part of the island, sea lions were absent. On the ocean side they were sighted to the north of Cape Mysovoi; and on the Sea-of-Okhotsk side, to the north of Cape Prasolova. According to questionnaire data, a non-permanent sub-rookery of them forms on Piko Islet; and in wintertime, a sub-rookery of 100 head and more on

Cape Prasolova. Sea lions swim from the rookeries situated on Iturup Island to the coast of Kunashir Island, where great accumulations of fish (greenling, navaga, and others) are observed in summer.

The sea lion rookeries on Iturup Island are situated on its southern extremity, which faces toward the deep-water Ekateriny Strait. Here they are disposed on two neighboring capes: Alësha Popovich and Rikorda. The shores of the island in this part are steep and high, with stony terraces which drop to the sea. On Cape Rikorda, large stone slabs which have a negligible incline toward the sea, and which are heavily flooded during southerly storms, serve as a hauling-out place for seal in summer, as do smooth boulders which are situated at a higher level. On Cape Alësha Popovich, the sea lions lay on large stones, which are inconvenient for whelping, directly adjacent to the precipitous shore. The rookery here is very drawn-out, extending 250–300 meters along the shore. About 1500 sea lions live on the southern rookeries of Iturup Island during the summer period. Another accumulation of sea lions, which could have commercial-hunting significance, is located on two small rocks separated by a narrow strip their of water from Cape Neukrotimyi. Elsewhere on the island, including its northern and western sides, sea lions were sighted individually or in groups of 2–4 specimens.

Characteristic of the littoral zone of Urup Island, especially it oceanic side, is the presence of shallow waters densely overgrown with seaweed, extending far out to sea. Sea lions are nowhere numerous. A few sub-rookeries of them, numbering up to 40 head,

were registered at the northern and southern extremities of the island. Elsewhere solitary individuals were sighted, as a rule.

The sea lion rookery on Brat Chirpoev Island is one of the most convenient for hauling out. It is located on the western side of the island (Figure 2). The rookery is situated on large stone slabs which are delimited from the island by a high, precipitous wall up which, however, large males can climb to a height of more than 20 meters. On top of the wall they lie on soily ground. The hauling-out sites are readily noticed, as the plant cover here is disappearing.

On Broutona Island there is one sea lion rookery, situated on Cape Sivuchii. It occupies a small stony platform[3] which borders the cape from the sea side.

In summer, sea lions on Simushir Island keep to its southern extremity. To the south coast of Cape Aront on a large isolated flattened stone, and also nearby on the shore, an accumulation of sea lions numbering about 250 head was discovered. Individual specimens and groups of 2–4 head were also sighted on the Sea-of-Okhotsk and oceanic sides of this island.

On Ketoy Island a sea lion rookery was registered on Cape Lëzhbishchnyi and in the vicinity of Ostrokonechnaya Rock. About 150 sea lions lay on Cape Lezhbishchnyi.

[3] In retrospect, the Russian word *ploshchadka*, which has been rendered throughout this translation as "platform", is thought to be better [missing part of article] (literally "small area"). Translator.

About 250 sea lions were counted on a large stone slab on the shore at Ostrokonechnaya Rock.

At the coasts of the Ushishir Islands, groups of sea lions containing 2–15 head are noted constantly in summer. Sea lions come here from the neighboring Sredneva Islands to feed.

The sea lion rookery on the Sredneva Islands is one of the largest on the Kurile Islands. In summer up to 3000–3500 sea lions concentrate here. Many of the animals go out onto Khitraya Rock, which is about 3.6 meters high.

A permanent sea lion rookery exists on Cape Severnyi (Rasshun Island), which constitutes a littoral rock. 150–200 meters east of the cape there is a sea lion sub-rookery of 100 head, which forms only in calm weather. About 50 sea lions were registered afloat at Cape Yuzhnyi.

The sea lion rookery on the shore of Lake Matua is situated at Cape Lisii. The hauling-out ground consists. of stone slabs which drop to the sea in steps. The height of the hauling-out ground apparently does not exceed 1.5–2 meters above sea level; about 400 head were counted here.

A permanent bachelor sub-rookery exists on Toporkovyi Island, the shore of which is covered with large flat stones.

On Raikoke Island the sea lion rookery is situated on its western side. This is one of the most convenient rookeries with a negligible incline toward the sea, where about 1000 adult sea lions were counted.

The sea lion sub-rookery on Chirinkotan Island had not formerly been recorded by anyone. It was observed by us on 14 June 1962, and on 16 June 1963. A large number of sea lions lie on the shore of the island at Bol'shaya Rock. Smooth littoral stones usually serve as the site of the rookery. The presence of places which are suitable for hauling-out on Cape Krasnyi, which bounds Shikotan Island from the northeast, attracts hither in summertime a considerable number of sea lions. However, their rookery here is very inconstant, was at high tide and especially during northerly storms it is heavily flooded with water. For this reason the numerical strength of sea lions here fluctuates from tens to several hundreds of head. The Lovushki Islands, which are located in the central part of the Chain, consist of four rocks. There are permanent sea lion rookeries on two of them: Dolgaya Rock and Kotikovaya Rock. Sea lions haul out on Vysokaya Rock, on the large reefs surrounding it and on Nizkaya Rock only in calm weather, quitting them during storms.

On Onekotan Island, sea lions concentrate at its northeastern extremity. About 50 large sea lions were counted at Cape Ivan Malyi and about 350 on the stone Yasnoi Pogody. The rookery here is very convenient, being located high above sea level (3–3.5 meters). Sea lions were not encountered on the western side of the island.

The sea lion rookery on Antsiferova Island was investigated by us for the first time jointly with G. M. Kosygin on 8 July 1962. It is located on the southwestern shore of the island and on Vydar' Rock, which stands off 200 meters from the western shore. 1200 head were counted here.

The shores of Paramushir Island consist of coarse shingle and not infrequently of sandy beaches. They are low-lying and gently sloping, and the littoral part of the island is shallow. There are no sea lion rookeries on Paramushir Island. In winter a small sea lion sub-rookery, having a numerical strength up to 350–400 head, forms on Khmyr' (Perëleshina) Rock. In summer 5–10 male sea lions, which come from Antsiferova Island to feed, are usually observed here.

A sea lion rookery on Alaid (Atlasova) Island was discovered on Cape Kudryavtseva, where they haul out on the shore and on the small separately standing rocks. Here about 1000 head were counted, but the numerical strength of sea lions at this rookery is subject to fluctuations.

On the Vladimira Rocks, which are situated at the north-eastern extremity of Paramushir Island, about 700 sea lions were registered.

To westward from the southern shore of Makanrushi Island there are five small rocks known by the name Avos' Rock. 100 sea lions were counted here.

What general regularities are there in the distribution of sea lions and in the position of their rookeries of the Kurile Islands?

Sea lions are distinguished by their insistence on hauling-out places of a definite type (Klumov, 1957). The obligatory conditions for the existence of a rookery are the presence of smoothed, level, stone platforms and isolated littoral rocks and stones or projections, convenient for lying, on a precipitous coastal strip; the presence of great depths at the very rookery; the proximity of feeding grounds. All sea lion rookeries on the Kurile Islands meet these conditions.

At the present time in the summer period there are 25 sea lion rookeries on the Kurile Islands: 5 are situated on the northern side of the islands, 3[4] on the Sea-of-Okhotsk side, and 7 on the southern side. There are no sea lion rookeries on the oceanic side of the islands with the exception of a few temporary sub-rookeries on Chirinkotan Island, which is protected from the east by Ekarma and Shiashkotan Islands. Besides, there exist small sub-rookeries sea lions on rocks at Cape Neukrotimyi and Toporkovyi Island, which are located on the eastern side of Iturup and Matua Islands. The numerical strength of sea lions here depends strongly on the state of the weather. Thus, the majority of rookeries face toward the Sea of Okhotsk or straits. The obstacle to their formation on the oceanic side is the continual strong after-tossing surge. Evidently this is the reason why there is

[4] In view of the context, this is presumably a typographical error and should read "13". Translator.

no sea lion sub-rookery on Cape Sukhina (Simushir Island), which is not inferior to the best rookeries in its other characteristics.

Of the 19 sea lion rookeries on the coasts of them large islands, 9 are situated on capes, 7 on littoral rocks, and only 3 directly on the shores of the islands. The other 6 rookeries are situated on isolated rocks located in straits between the large islands or at great remoteness from them (for example, Avos Rock and Vladimir Rock).

Thus, the following may be recorded as the main regularities in the topography of sea lion rookeries on the Kurile Islands. 1) the presence of coastal regions possessing a number of specific peculiarities; 2) the disposition of rookeries on the Sea-of-Okhotsk side of the islands and facing straits; 3) the location of sea lion rookeries and small sub-rookeries on isolated rocks, littoral stones and capes of the islands, often in the vicinity of strong currents.

On the majority of islands where sea lions live, there is only one rookery of them, Separate sightings at the island's. shore of one specimen, of a group of sea lions or of their rookery site were reckoned as individual sightings. The number of sightings at one island varied from 1 to 15, and there were 94 sea lion sightings in all, or approximately 1 sighting per 16 miles of seal-boat itinerary. This testifies not only to the frequency with which sea lions are encountered at the shores of each island, but also to the nature of their distribution on the entire Chain. At the present time in the summer period the greater[5]

[5] For want of the accent, *bol'shaya* is ambiguous, and could mean "larg [missing part here]. Translator.

part of the Kurile sea lion population lives north of Kunashir Island. During searches for food and seasonal shifts they visit the shores of all the islands. The seasonal shifts of sea lions along the Chain have the character of temporary migrations. In winter time a part of the herd may evidently migrate into the vicinity of the southern Kurile Islands, returning to the summer rookeries again toward the middle of June.

Unfortunately, observations of sea lions have virtually never been made in winter time. It may be regarded as established that on the Lesser Kurile Chain sea lions lead non-nomadic life, According to local inhabitants, at the southern extremities of Iturup and Urup Islands just as many sea lions are observed in winter as in summer. In the first half of April, with the passage of ice floes, the sea lions eagerly go out onto them. In April small sub-rookeries form on the ice in the vicinity of Dozornyi Bay, where they are noted extremely rarely at any other time of year. V. P. Silin reports the wintering of sea lions on the southern part of Paramushir Island.[6] These observations convincingly testify to the wintering of a significant part of the Kurile herd on the Great Kurile Chain in the vicinity of the summer rookeries and at temporary winter hauling-out grounds.

In the summer period of 1963, sea lions were registered at the shores of 27 islands, but the main mass of them concentrates on the 22 islands enumerated in Table 1. The largest sea lion rookeries are situated on Sredneva, Lovushki, Brat Chirpoev, and Antsiferova Islands. Altogether 7 rookeries were counted with a numerical strength of 1000 or more

[6] A personal communication. Author.

head, 10 rookeries with a numerical strength of more than 200 head, and 8 sub-rookeries with less than 200 head.

However, the whelping of sea lions takes place only on 9 islands of the Kurile Chain. Moreover, on 4 of them the numerical strength of newborn sea lions does not exceed 10 head; or on Antsiferova Island, 100 head. The main restoration of the Kurile sea lion herd is accomplished on four large rookeries situated on Sredneva, Lovushki, Brat Chirpoev, and Raikoke Islands. About 98% of the annual pup yield of the herd is born here. The numerical strength of adult sea lions is set by us at 16,000–16,500 as a minimum; and of pups, at 3700–3800. Consequently, 20,000–20,500 sea lions of all ages live on the shores of the Kurile Islands during the summer period. In spite of the substantial differences between our method of counting seals on the rookeries and that of S. K. Klumov, who worked on the islands almost ten years ago, the total in a census figures for adult sea lions are extremely close. This testifies to the fact that the numerical strength of the Kurile population, which has not been exploited commercially to date, is approximately at the same level and has probably not been subject to sharp fluctuations. Further growth of the herd is hardly possible. The principal obstacle to such growth is the limited number of suitable hauling-out grounds, in regard to which the sea lions are very demanding. As confirmation it will suffice to point out that no changes have taken place in the topography of the main sea lion rookeries during the past eighty years.

TYPES OF SEA LION ROOKERY

Information concerning the rookeries of the sea lion which inhabit the Kurile Islands is very incomplete and usually does not go beyond an indication of their position and approximate numerical strength. The characteristics of the individual rookeries have not been recorded to date.

Our observations have shown that the sea lion rookeries on the Kurile Islands are by no means homogeneous. According to the numerical strength of the animals, these rookeries may be subdivided into two large groups: main and secondary, or rookeries and sub-rookeries.[7] Characteristic of a main rookery[8] is the presence of convenient places for the hauling-out, and the constant presence on it, of a considerable number of sea lions, usually more than 400 head. Accumulations on sub-rookeries are of a less permanent nature. The numerical strength of sea lions on them often depends on such factors as the state of the weather, the seasonal accumulation of food items in the vicinity of the rookery, et cetera. Some of them form in winter and in this case they have a purely seasonal character.

At the basis of the classification of sea lion rookeries we have put not only such features as the numerical strength of the seals and its constancy, but also the sex and age structure of the animals on each rookery [See Figure 3]. As already noted, the whelping of sea lions takes place only on certain islands. On this basis rookeries may be subdivided into unproductive and harem ones. The latter are manifested in clearest form only at the five

[7] See translator's note on page 5.

[8] At the present time the concept "rookery" has two senses: 1) as the substrate or place where seals haul out; and 2) as an accumulation of animals on a limited area. Author.

rookeries where the main whelping takes place. All of the sub-rookeries and 10 of the main rookeries belong in the unproductive category. The numerical strength of sea lions on them is subject to very great fluctuations. It turns out that rookeries of this type are also heterogeneous, as they differ from one another in the sex composition and age composition of the animals which haul out on them. They may conditionally be subdivided into two categories. It was noticed that the unproductive sea lion rookeries on Ketoy, Matua, Shiashkotan and a number of other islands are formed predominantly of males in the 3–4 year age group and older. In the fur-seal economy the concept "bachelor" denotes young males 3–5 years of age. These, mostly sexually mature, males do not participate in breeding and form separate "bachelor areas" on the rookery. It must be said that older males (bulls) are continually going out onto these areas.

*Individual females may whelp on the other rookeries (See Table 1). Author.

By analogy with fur seals, sea lion rookeries and sub-rookeries Consisting of adult males were called bachelor ones.

On the other hand, the main sea lion rookeries on Peshchernaya Rock, Iturup Island and Alaid Island consist predominantly of sexually immature specimens of both sexes in the 1–2 year age group. These are juvenile rookeries.

We shall give a brief description of rookery structure and the differentiation of seals according to sex and age on a few characteristic rookeries of each type.

The harem sea lion rookery on Brat Chirpoev Island is depicted schematically in Figure 4. It consists of 4 regions,[9] 3 of which adjoin the precipitous part of the island's shore. The second region, which is most convenient for hauling out, constitutes the main harem area of the rookery (about 6000–7000 square meters). Here on 16 July 1964, 1204 adult and 700 newborn sea lions were counted. The sea lions which haul out on this region are mainly females. There were 62 males (bulls) maintaining harems. The average number of females in one harem is 17–18.

Whelping in the first region takes place only on a small part of it adjoining the second region. Here there were 232 adult seals and 39 pups. The third region is a rock with a fairly level surface, separated from the island by a narrow strip of water. On this region lay 158 adult and 16 newborn sea lions, which were distributed in 3–4 harems.

The majority of the sea lions in the first and third regions, and also all of the sea lions on the fourth one (170 head), are reserve bachelor males, probably mostly in the 4–6 year age-group, The other young males haul out on the southern side of the island in the vicinity of Uglovaya Bay, where there is a small platform which is apparently completely flooded during storms.

[9] The Russian word *uchastok*; which is rendered throughout this translation by "region", is thought in retrospect to be better construed as "area" or "section". Translator.

Approximately the same principle governs the structure of the sea lion rookery on Raikoke Island, where the birth of pups takes place on two regions of it. The harem area of this rookery is less than on Brat Chirpoev Island.

The two other large productive rookeries are situated on the hardly accessible Lovushki and Sredneva Islands. On the Lovushki Islands whelping takes place on two rocks. The sea lion rookery on Kotikovaya Rock is shared with the fur seals and occupies the northwestern region of the rock. Bachelors may haul out on any of its regions. On Dolgaya Rock, sea lions whelp on four regions located on different sides of it, and the places between these regions are usually occupied by bachelors. However, the main mass of the latter concentrates on Vysokaya Rock and the reefs surrounding it. One of these unites the two rocks, Dolgaya and Vysokaya.

The seal-lion rookery on the Sredneva Islands is also shared with fur seals. In June the surface of Khitraya Rock is occupied by sea lion harems. A small fraction of the bachelors contents itself with the uncomfortable peripheral regions or lies on the neighboring Chërnye Rocks (200–210 head).

Thus we see that the territory of a productive rookery in the breeding season is subdivided into a harem platform, where breeding takes place, and regions occupied primarily by large males which do not have the opportunity to maintain their own harem. The area of the bachelor region depends on the total territory of the rookery and on its harem platform. For example, several thousand sea lion females whelp annually on

Khitraya Rock; the density of harems here is extraordinarily high, so that young males virtually do not have access to the rock. On the neighboring Chernye Rocks the areas of the regions which are suitable for hauling-out are very limited and cannot accommodate a large number of sea lions. Conversely, the sea lion rookery on the Lovushki Islands is considerably smaller then on the Sredneva Islands, but here there are more reefs and rocks, to which 400–500 bachelors may go.

The breeding of sea lions takes place on the better regions of a harem rookery. Moreover, an obligatory condition for its existence is the presence of regions which are not flooded even in heavy storms.

In Table 4 is shown the distribution of sea lions during the breeding period on rookeries of various types.

We see that more than 60% of the entire population concentrates on productive rookeries (about 12,500 head). The quantitative correlations between the adult specimens and the pup yield are a function of the degree of suitability of the rookery for breeding and its total area. On the largest, presently flourishing sea lion rookeries on the Brat Chirpoev, Sredneva, and Lovushki islands the pup yield accounts for 32–39.5%, whereas on the rookeries, less suitable for whelping, on Broutona and Antsiferova Islands, the pup yield constitutes 1.5–5%. The numerical strength of males on the various productive rookeries is subject to considerably greater fluctuations then that of females.

On the main harem rookeries, females constitute 41–59% of the total number of animals present on the rookery; whereas males, 8–26%. On the whole, for the entire group of productive rookeries, a sex correlation of one male to two females (1:2) is characteristic.

Bachelor rookeries are manifested in clearest form on Onekotan, Shiashkotan, and Rasshua Islands. During our observations in the summer of 1963 they consisted predominantly of adult males.

The largest juvenile rookeries are located on the southern shore of Iturup Island. Of 326 sea lions counted in the investigated region, young specimens in the 1–2 year age group accounted for 302 head, or 92.6%.

The rookery of Cape Rikorda is productive, but whelping here is extremely limited, and most of the seals are juveniles (400 head). Altogether, 1108 juveniles (91.9%) and 90 adult sea lions (8.1%) were counted on the southern shore of the island. Juveniles account for 90% of the total number sea lions inhabiting the southern shore of Iturup Island in summer.

However, such a numerical preponderance of juveniles was not found on all rookeries. Thus, in a sea lion census on Alaid (Atlasova) Island it was elucidated that adult sea lions constitute 20–25% here.

The abundance of yearlings and two-year-olds in the summer period was not confined to the juvenile rookeries. They were encountered on the bachelor rookeries as well. In these cases the type of rookery was determined by the numerical preponderance of one or another age group. The possibility is not excluded that a rookery which was a juvenile rookery in the summer may become a bachelor one, or a rookery of the mixed type (for example, the one on Peshchernaya Rock), in winter. In rare cases individual yearlings and two-year-old sea lions were noted on the bachelor regions of harem rookeries, which they entered by chance during the summer shifts along the Chain.

Thus, in the summer period sea lions form rookeries of the harem, bachelor and juvenile types. Moreover, the principal harem rookeries are located in the middle part of the Chain. It is natural that the majority of bachelor rookeries are also in this vicinity. Conversely, the juvenile rookeries are disposed on the southern and northern islands. Moreover, the most remote of them (Alaid Island and Peshchernaya Rock) stand 600 miles apart. Consequently, sea lion rookeries of the various types occupy different geographical regions of the Kurile Chain. Sexually mature sea lions concentrate in the central part, whereas sexually immature ones of both sexes, and a few sexually mature males who are not participating in breeding, concentrate in the peripheral regions (Figure 5).

THE PERIOD OF HAREM LIFE AND THE BEHAVIOR OF SEA LIONS

The harem period is the time of greatest sexual activity of sea lions, when the breeding instinct takes control of the herd. At this time the sex and age structure of individual rookeries changes, while the overall picture of the distribution of the various groups of seals assumes the form described above. Harem life begins long before parturition: as early as the second half of May the harem structure is well delineated. However, it remains unknown from what time the male begins to hold his territory. When the males establish their harems, there occurs between them a natural process of selection of the strongest, mightiest males which are capable of enduring innumerable fights. These are predominantly males more than 3 meters in length and weighing up to 1000 kilograms and more (Figure 6). The fights between the males are brief, but in some cases they are protracted. Prior to combat the adversaries make jumping movements toward each other, roar and utter a few whistling sounds, breathing out air through the nostrils with force. Bites are made primarily in the region of the neck and chest, and less frequently in the vicinity of the sacrum and hind flippers. Sometimes the males interlock with their lower jaws. Most often, fights occur between harem males when one of them approaches a neighboring harem region or trespasses its boundary. Fights can also occur without any apparent reason: in several cases attacks were made on sleeping males. A bachelor invading a harem platform immediately becomes the object of attack by several males. It is interesting to note that in such cases animosity between erstwhile adversaries (harem males) is, as it were, temporarily forgotten. Upon expulsion of the bachelor they return to their places and renew the fights between each other. On several males, bleeding wounds up to 10–20 centimeters in diameter were observed in the chest area, as well as bits of skin hanging in shreds. Almost throughout the entire harem platform, blood was

noticed on the stones. However, in the majority of cases the consequences of the fights are less serious and consist merely in a breach in the integrity of the skin cover. This may be explained by the fact that the external part of the male sea lion's tusk is comparatively small, and approximately equals the thickness of the skin on the chest, neck and withers.

For the purpose of studying the behavior of individual sea lions and their shifts about the rookery, on 24 June 1964, experimental marking of adult and newborn animals by coloring was done on Dolgaya Rock (Lovushki Island). For want of quick-drying nitro dyes, ordinary white oil paint (whiting) was used.

Marking of the seals was done on the third region of the rock using a mop attached to the end of a bamboo pole about 3.5 meters long. The head and neck areas were painted, i.e., the most noticeable and driest areas of the hair cover. Altogether, 7 harem males, 11 females and about 60 pups were marked.

On the day after the painting, 5 marked males, lying in the former places, and 4 females were found in the region. On 28 June we saw two marked males; and on 1 July, only one. Like fur seal bulls, sea lion harem males leave their harem from time to time and go into the sea to feed. At this time their place is occupied by another male, a rival. It is not known for how long the male sea lions leave the rookery.

The bulls react in different ways to the arrival of a female from the sea. Those animals which are sleeping at the time do not pay any attention whatever to her, whereas

others make an attempt to hold the female. They succeed in doing so in the event that she finds her pup not far away. Males may overtake a female leaving the harem and secure her return, pushing with their head. In rare cases they seize her with their teeth and throw her into the harem.

As is well known, the region of occurrence of the sea lion virtually embraces the littoral belt of almost the entire northern part of the Pacific Ocean. However, notwithstanding the distinctly manifested intermittent nature of the occurrence of individual populations and the presence of a great latitudinal difference between their breeding places, the whelping dates throughout the entire habitat are almost the same. Thus, according to the data of Scheffer (1945), Mathisen (1959), Thorsteinson and Lensink (1962), the whelping of sea lions in the northeastern part of the habitat (Pribylov and Aleutian Islands, Alaska) takes place between 23 May and 27 June (ultimate date, 2 July). In British Columbia sea lions are born during the period from the end of May to the end of June (Pike and Maxwell, 1958). In the middle of the 18th century, Steller (1751) observed the birth of sea lions not long before the beginning of June. Snow (1902) observed the first sea lion pups in May. According to P. Yu. Schmidt (1916), newborn sea lions on the coast of Kamchatka were registered on 29 May (11 June by the new-style calendar). According to M. M. Sleptsov (1950) and, after him, to K. K. Chapskii (1963), the birth of sea lions in the Far East, including the Kurile Islands, begins in May and ends in June.

Yu. V. Avertin (l948) writes that sea lions are born on the eastern coast of Kamchatka during the period from 10 June to 25 June.

We did not manage to establish an exact date for the beginning of the birth of sea lions on the Kurile Islands. On 12 June 1964, we observed distinctly delineated sea lion harems on the large harem rookery of Brat Chirpoev Island. However, at that time their whelping had not yet begun. On Cape Rikorka (Iturup Island), 3 pups were noticed on 17 June 1963, and 4 on the following day. On 20 June 1964, the birth of sea lions on the Lovushki Islands was in full swing. Consequently, on the basis of the observations at our disposal it may be assumed that the starting date for the birth of sea lions is between 10 June and 17 June; From 20 June to 1 July 1964, we made daily observations on the Lovushki Islands, and isolated instances of the birth of sea lions were still recorded up until 27–28 June. Toward the end of the month whelping stopped. In May and the first days of June in 1963 and 1964, the whelping of sea lions was not observed on the southernmost sea lion rookery (Peshchernaya Rock), although in August 1964, three pups were registered there. The sea lion birth period on the Kurile Islands probably embraces the last two decades of June, with a peak-between the 15th and 23rd of June.

The act of parturition by a sea lion female was observed By us on 20 June 1964, on Kotikovaya Rock. Labor began Approximately 15 minutes prior to the to emergence of the fetus. The behavior of the pregnant female was very agitated. She often curled up and lay on her back. Parturition began at 11 hours, 45 minutes, by local time, and continued for 7 minutes. Just prior to the moment when the fetus began to emerge, the female lay on

her chest, supported herself with her fore flippers and raised the hind part of her body high. Emergency of the pup lasted about 3 minutes, and meanwhile rupture of the fetal membrane did not occur. The female turned rapidly to the newborn pup, tore the placenta with her teeth and then removed the remainder of the amniotic membrane from the newborn pup. At first the pup lay without movement. As parturition took place on a smooth inclined stone slab, the pup began to slide down it, and then the female seized the pup by the back with her teeth and put it down beside her. Then she began to make movements which resembled licking, but in point of fact the female poked the pup cautiously, stroked it with her lower jaw. It is interesting to note that the adult sea lions in the immediate vicinity reacted to the delivery with a brief intensification of their clamor.

When the newborn sea lion moves, the birth membranes (70–80 centimeters long) drag behind it on the umbilical cord. It must be said that gulls fly continually above the sea lion rookery in anticipation of a birth, and white-tailed eagles do so at the southern rookeries. At first the females drive them away, shrieking, not allowing the placenta to be pecked, but in as little as half an hour the females calm down and go to sleep. Further observations showed that only a small number of placentae are eaten by kittiwakes, herring gulls, and eagles, and the remainder decay on the rookery.

The umbilical cord usually breaks during parturition or, more often, a few hours afterward. The time during which the umbilical cord is carried by the newborn sea lions is the same as for other species of seal: 5–7 days.

Newborn sea lions are covered with dark-chestnut-colored, soft fur, weigh 17–20 kilograms, and measure 99–120 centimeters in length along the curves of the body.

A month after birth, the weight of a pup reaches 30–35 kilograms; and toward the middle of August, 40–45 kilograms.

During the first hours after birth the sea lion is helpless, but in as little as 4-5 hours it acquires the ability to move independently and joins in the life of the rookery (Figure 7). The newborn pup stays beside its mother for several days. It was established by marking that during the first two weeks shifts of pups about rookery are very limited: the pups stay close to the place where they were born. In contrast to black fur seals, newborn sea lions are gentle; and during the first 8-10 days after birth, go easily into human hands.

The sea lion rookeries are located in the zone of the Kurile Current, so that even in August the water does not rise above 5ºC. Sea lions are born ill-equipped for life in the water, as their skin cover at this time is undergoing its first post-uterine molt and the pups virtually do not know how to swim (Belkin, 1964). Even at an age or 3 weeks a pup, on being thrown into the water, paddles ineptly with its fore flippers, raising spray, and thrusts its back and hind flippers out of the water. The census of newborn sea lions is organized at this time, but is best done after the termination of mating. Experience shows that when counting the pup yield with the aid of binoculars, the results are markedly understated for the reason that very many pups are not seen due to adult sea lions or are hidden between stones and in crevices. Therefore we recommend that the count of the

pup yield be done in the first half of July, when the pups do not yet go into the water, while the adult sea lions nay relatively easily be driven from the rookery.

As was already noted, the occurrence of females on a rookery is strictly confined to the harem platforms. Not a single instance was registered of females going out onto the bachelor regions, which they avoid. Sometimes bachelors manage to force a female to go out onto a rock, where they pursue her for a long time. However, in this case mating does not, as a rule, take place, as the males fight with each other. The female takes advantage of this and goes into-the sea.

Returning to the rookery, the female usually shakes herself like a dog, shrieks and then, snapping at the other females and running away from the bulls, makes her way between them in searches for her pup, sniffing all pups encountered in the nose or in the region of the anus. It was noticed that in some cases the pups themselves recognize their mother and approach her with a shriek. Having found her pup, the female sniffs it attentively and begins to feed it with milk. In doing so, she not infrequently lies on her back, baring all teats, which the pup sucks sequentially. Nursing lasts 5–15 minutes (Figure 8).

In sunny weather the wet female dries very quickly: in as little as 20–30 minutes she turns from brown to straw yellow. The females sleep during a considerable part of the 24-hour diurnal period. Their movement about the rookery is restricted by the males. If her pup turns out to be on the territory of a neighboring harem, a female nonetheless finds a

way of getting there. When she is feeding in the sea the newborn pup may move about the harem platform. In such a case the female returning from the sea to the rookery orients herself by the position of her pup, so that each time she may turn up in a different harem, which testifies to the great mobility of the harems.

Females fight with each other only over pups. It was noticed that they will not nurse pups other than their own, and not infrequently seize importunate ones with their teeth and fling them aside. It is also interesting to note that, like the female fur seal, the female sea lion calms an assaulting bull with bites in the chest area.

The mating of sea lions begins soon after parturition, probably after 4–6 days. On 20 June 1964, on Kotikovaya and Dolgaya Rocks, about 20 mating pairs were registered in the course of the day. The harem male readily discerns the time of the onset of desire in a female. During the sexual act the male lies with all his mass on the female and fixes her position. He supports himself on the stones with his fore flippers and places his hind flippers widely apart. While mating, a male may snap at and even bite neighboring females who are interfering with the mating. We observed no instance of an attack on a male engaged in mating.

Females always lie on their belly and they shriek almost continually. Their flippers are placed widely apart, especially their hind ones, with which they not infrequently clasp the at extremities of the male. If the female begins to snap at him and make bites in the chest area, the male presses her down with his head, thereby depriving her of movement

completely. We did not observe a single instance when the female did not resist the male. The huge size of the male in comparison with the female (he is 4–5 times larger) has a profound biological meaning: it increases the male's mating possibilities and, consequently, his possibilities for fertilizing a larger number of females.

On conclusion of mating, both individuals manifest a period of inactivity, during which the animals not infrequently go to sleep near one another, on the very spot. Cases of repeated mating were not observed (Figure 9).

It is possible to go right up to mating sea lions. Sometimes they turn out to be half immersed in water, so that, of the female, only the head may be seen on the surface. None-the-less, mating continues. If the female manages to break away, the male pursues her in the water, drives her out onto the shore and mounts again.

Mating of sea lions takes place day and night and lasts from 5 to 18 minutes. On the Lovushki Islands the greatest number of mating pairs was registered 20–25 June. The number of them diminished sharply on 27–28 June, and on 1 July only two attempts at mating were noted. Thus, on the Kurile Islands the whelping of sea lions ends on 27–28 June and their mating ends during the first days of July. We see that, in contrast to fur seals, the period of pup-bearing and mating in the case of sea lions is considerably shorter. This is conditioned by such differences in the biology of the two species of eared seals as the absence of protracted migrations in the case of sea lions.

Female sea lions bear only one pup, and only as a rare exception are cases of registration of two or three fetuses recorded. For example, according to a communication of V. A. Nechaev, three fetuses having approximately identical development were found in a killed female sea lion, about 2.5 meters long. which was thrown up by the sea on 10 January 1963, at Alekhino Village (on the west coast of Kunashir Island). When the animal was skinned, milk oozed out of the lacteal glands. The possibility is not excluded that this female, being pregnant, was still nursing her last-year's pup.

In conclusion we note the not-very-precise coincidence of the times of the end of pup-bearing and mating of sea lions on the Kurile Islands and in the American sector of the Pacific Ocean. Therefore the subdivision by N. N. Sleptsov (1950) of the Far-Eastern sea lion herd into two "biological" groups (northern and southern), differing in their breeding dates, must be placed under serious doubt.

The tagging of newborn sea lions was done for the first time on 21 June 1964, on Dolgaya Rock (Lovushki Islands). Ordinary metallic fur-seal tags (series C[10]) were used for tagging, and they were fastened to the left fore flipper. Inasmuch as the tagging of sea lions has not been done previously in the Far East, we consider it necessary to record that the basic difficulties in the tagging of sea lions consisted not so much in the very process of tagging a newborn sea lion (which is 3–4 times larger than a black fur seal) as in the difficulty of driving away the adult sea lions, especially bulls, which do not wish to leave their territory.

[10] It is not possible to tell *a priori* whether this symbol is to be construed as a Latin "C" or as a Cyrillic "S". The former seems more likely. Translator.

After gunshots and the appearance of people on the rookery, only a negligible fraction of the females and non-harem males go off into the water. It turned out to be more effective to use sticks and shingle. Eight workers spent half an hour driving 500 adult sea lions off the rock and one hour tagging 175 pups. The fact that adult sea lions do not become frightened ensures high conservation of the pups, which suffer little as a result of the drive. During the drive the pups remain in their places or, like black fur seals, bunch in groups numbering 30–50 head. They quickly stop paying attention to the people and, having been tagged, even go to sleep in a few minutes.

The female sea lion is greatly attached to her own pup, and defends it desperately. Some of them cannot be driven into the water at all, by any method, and they remain on the shore. Others quickly jump out onto the rookery, seize their cub by the scruff of the neck or by the back, and carry it away in their teeth into the sea, where they not infrequently dive together with the pup. It has been established that female sea lions use their teeth for the following purposes besides eating: when necessary, they tear the fetal membranes, freeing the newborn pup and transferring it to a more convenient place; in the event of a pup falling into a crevice, they retrieve it; in case of danger they carry their pup away into the sea; they fling aside pups other than their own; they defend themselves against males.

In spite of the presence of people, the harem bulls go out onto the rookery and try to penetrate into their own territory. If no abrupt movements are made, they stop paying attention to men here, and may lie down alongside them. However, one wave of the hand

suffices to send the huge animal scurrying off in terror. In this connection we note that vision is much more weakly developed in the sea lion than in the fur seals. This is also pointed out by V. F. Muzhchinkin (1964). The impression is created that in air they are well able to distinguish only silhouettes and moving figures.

It is imperative to continue the tagging of sea lions, and for this purpose tags larger than fur seal ones should be manufactured: 7–8 centimeters long. There has been experience in tagging sea lions with large tags in Canada (Pike, personal communication).

As emerges from the unpublished data of Brooks (1957) (according to Thorsteinson and Lensink, 1962), the sea lion has a two-year breeding cycle. The observations made by us during the breeding period on the Kurile Islands do not confirm this. On 20 June 1964, on the rookery on Dolgaya Rock, several cases were authenticated in which one female nursed two pups of different ages: one several days old and the other a yearling. Similar cases were registered also in July and August on the harem rookeries on Kotikovaya Rock and on Sredneva and Brat Chirpoev islands. As a rule, very large and, apparently, old females had two pups. They protected both pups equally from neighboring females and males. The behavior of the yearling corresponds to the behavior of a newborn pup. On 22 June 1964, we observed from a short distance away how both pups at first sucked the mother (No. 68) from two teats and then from one teat, taking turns. Nursing continued, with pauses, for 24 minutes, the smaller of the teat sucking longer. If the female adopted an inconvenient pose, both pups began to shriek loudly and bite her in the

neck. After nursing the pups fell asleep, lying on the female's back. In one visit to the sea lion rookery on Dolgaya Rock, 5–9 such cases were counted.

According to the date in Table 2, it may be seen that large females, 10 years of age and older, taken in the third decade of June, had newborn pups whose body length was 112.5–118 centimeters, weight 18.5–27.5 kilograms; and yearlings of body length 180–194 centimeters, weight 112–125 kilograms. From 50 to 350 grams of milk were found in their stomachs.

When sea lion pups effect the transition to an independent mode of life is not known exactly, but this evidently takes place at an age of about one year, when the pregnant females go out onto the harem rookeries and the juveniles concentrate on the juvenile rookeries. In the stomach of a yearling sea lion taken afloat off Cape Gnevnyi (Iturup Island) was fish and undigested octopuses. More than a hundred young sea lions were observed feeding at 18 hours,* 13 July 1964, in the seaweeds of the southern shore of Iturup Island.

The period of milk feeding in sea lions is more protracted than was formerly thought. On 8 April 1964, we observed, on Peshchernaya Rock, many females and yearling sea lions, some of which climbed on their mother's backs, thus attracting our attention. Two of them about one year old (more exactly 10–10.5 months) were taken. In male No. 15 in the lower jaw the milk tusks had not yet fallen out. About 1000 grams of milk were found in its stomach.

The observations made testify to the fact that most of the sea lions make the transition to an independent mode of life before they are one year old, but a few may swim to the harem rookery and continue milk feeding more than one year. The feeding of these pupa in the summer period is apparently mixed: in the stomach of a yearling pup (No. 67), which was on the rookery with its mother, two Octopi beaks were found.

Pups that have been fed with milk for a long time (Nos. 67, 69, 72, & 74) grow more quickly and attain larger dimensions than those which have made an early transition to an independent mode of life (Nos. 73, 75, & 76).

It must be especially emphasized that all females observed by us having yearling pups were with newborn pups. A circumstance which attracts attention is the almost complete absence during the breeding period of females on the juvenile rookeries, where the yearlings left by them concentrate not long before this period. All this convincingly refutes the assumption made by Brooks (1957).

The date re the numerical strength of sea lions on the separate regions of the rookery on Dolgaya Rock are given in Table 3. On 20 June 1964, on the 4 harem platforms of the rookery were counted 168 harems, in which there were about 1100 females. Altogether on that day Dolgaya and Vysokaya rocks were counted 630 males, of which only 168, or about a quarter, were harem bulls. The average number of females in one harem varied from 5 to 7, but in individual harems there were as many as 8–10 head. It must be

assumed that the true number of females in the harems is somewhat higher, inasmuch as a few are always absent from the rookery. Thus, for example, on the second region lay 217 females and 268 pups.

The first decade of July is the time of gradual extinction. of harem life for the sea lions, which is expressed in the cessation of mating, in the diminution of the activity of the males, in their more frequent departures from the harems, et cetera. Even the intensity of roaring diminishes noticeably. By the end of the second decade of July the last sea lion harems on the Lovushki Islands break up completely, and the seals go from the central regions of the rookery to the peripheral parts. At this time the sea lions border the shore belt of the rook like a narrow ribbon. The harem platforms become deserted, and there is not one female on them. Here now lie only males, whose membership is almost completely renewed: young reserve males, rivals, have gotten the opportunity to hold regions and pick fights between each other over them.

At low tide puddles form on the rock and the pups spend whole days in them learning to swim (Figure 10). By the beginning of August they can already cover the distances between the rocks, and appear on the reefs at Vysokaya Rock together with the females.

By the end of the sea lions' breeding period, a reduction in their numerical strength on the rookery takes place. Many of the bachelors swim away from the harem rookeries and the females' absences at sea are prolonged. On 23 July 1964, only 674 adult sea lions were counted on Dolgaya Rock, or half as many as on 20 June.

It is appropriate to remark that to date we do not have at our disposal accurate information concerning the time sexual maturation of the female sea lion. On some harem rookeries 50–96% of the females present were parous. On the whole for the group of productive rookeries the pregnancy of females constitutes about 65%, which is only insignificantly less than the figure (70%) indicated by Pike and Maxwell (1958) for British Columbia.

FEEDING

Our attitude to the sea lion must be built on a correct evaluation, firstly, of its role in the food balance of the sea and, secondly, of its effect on the growth of the fur seal herd. Notwithstanding the fact that individual observations testify to the consumption by the sea lion of commercial species of fish, the information which we have at our disposal on its feeding is too meager to permit a final conclusion regarding its harmfulness. Attachment to definite places of habitation, in other words the territorial conservatism of sea lions, suggests that their feeding has a purely local character and consequently must be determined separately in each case. For example, on the Kurile Islands the feeding of sea lions all year round takes place in the littoral belt of the islands and involves cephalopod molluscs and local forms of species of fish which are of little value or are not caught commercially. The presence of sea lions along with harbor seals[11] in the estuaries of spawning rivers is possibly associated with their feeding on salmon. However, at the

[11] *Phoca vitulina largha*. Translator.

present time we do not know what share in the total diet belongs to fish of the salmon family. Moreover, feeding on them is possible only during part of the year.

On the other hand, as emerges from fishermen's communications (which have become more frequent), in the commercial-fishing regions of the Bering Sea, sea lions feed on commercial species of fish (herring) and crabs, and not infrequently do substantial harm to tackle (nets and trawls). Merrel (1963) wrote about just this. The attitude toward the sea lion in this region must be more firm, and directed toward reduction of its numerical strength.

As far as may be judged from the content of the sea lions' stomachs and visual observations, their feeding is confined to the morning (8–9) and evening (after 17) hours. At this time, in the littoral belt by the islands, often not far from their rookery, groups of sea lions (3–25 head in each) appear afloat, engaged in collective hunting of fish.

Research was done on the stomachs of 20 adult sea lions taken in summer time on the southern and middle Kurile Islands in 1963–1964.[12] Partially digested food was found in 6 of them (30%). In the stomachs were found remains of the following species of fish: *Theragra chalcogramma* [walleye (Alaska) pollock], *Pleurogrammus azonus* [Asiatic greenling], *Ammodytes hexapterus* [Pacific sandlance], *Sebastodes* sp [rockfish]; and the remains of large octopuses.

[12] Analysis of content of the sea lions' stomachs was done by G. K. Panina, a scientist on the staff of TINRO. Author.

It must be remarked that in the stomachs of sea lions taken in summer time off the coasts of British Columbia (Pike, 1958), Alaska and the Aleutian Islands (Mathisen, 1959; Thorsteinson and Lensink, 1962), commercially important species of fish were encountered in negligible quantities.

THE ENEMIES OF SEA LIONS

The main enemy of sea lions on the Kurile Islands is man. To the potential enemy category may be relegated the brown bears which inhabit the islands of Kunashir, Iturup, and Paramushir; and dolphin-like killer whales.[13] However, local hunters have never seen attacks by these predators on seals.

In June and July 1964, several bears were observed by us in the vicinity of the juvenile rookeries on the southern shore of Iturup Island. Individual seals here often haul out on the littoral stones, and it is not especially difficult even for a person to sneak up to them. Here, two large bears, not far from the rookery, were taken for research purposes. Their stomachs turned out to be filled with plant foods.

In August, 1963 and 1964, two groups of killer whales of 3 and 4 specimens were registered in direct proximity to the sea lion and fur-seal rookeries of the Lovushki Islands.

---

[13] According to Dumbleton's Biological Dictionary, the Russian term *buryi medved* may properly be construed as the European brown bear (*Ursus arctos* L.) Translator.

Sometimes the predators approached the rocks to a distance of 23–30 meters, but we saw no attack on the seals. According to a personal communication from V. I. Troinin, an instance of sea lions being attacked and eaten by killer whales was observed by him in the winter of 1961 in the Gulf of Alaska.

RECOMMENDATIONS CONCERNING COMMERCIAL HUNTING AND PROTECTION

It was shown above that the idealized schema for the differentiation of a herd of sea lions during the breeding period is approximately the same as in the case of fur seals. This is the concentration on separate islands of adult individuals which are participating in breeding, and the isolation from them of the pups and some of the bachelors in the 3–6 year age-group. Whereas in the case of fur-seals subdivision of the herd is achieved by allocating separate regions within the confines of one rookery, in the case of sea lions the bachelor rookeries, as a rule, are situated outside the harem ones and occupy definite regions of other remote islands.

In the summer period approximately 50% of the total numerical strength of the Kurile sea lion herd concentrates on productive rookeries, more than 30% on juvenile rookeries and only 15% on bachelor ones. According to the results of our calculations, in summer onto rookeries of the two last types go out more than 7000 sea lions, of which about 40% are bachelors (Table 4). An additional differentiation of sea lions according to age is recorded when males in the 1–2 year age-group, together with sexually immature

females, form separate rookeries. This expands the possibility of conducting commercial hunting on the Kurile Islands, the rational schema for which must the same as for the fur-seal economy. Commercial hunting must be predominantly of males in the 1–6 year age-group. We consider that the industry must aim at appropriation of the bachelor rookeries and, partially, of the juvenile rookeries. It is necessary to take into account that on the northern and southern islands the take will consist mainly of young animals, whose skin may be of greatest interest to the tanning industry; and possibly, with time, will find application as fur raw material.

S. K. Klumov (1957) sets the annual quota for shooting sea lions of the Kurile herd at 500–600 head. He recommends that the take consist primarily of bulls. Unfortunately, however, that author does not stipulate at what time or where they must be shot. It seems to us that the quota calculated by him for the felling of sea lions, which quota, by the way, does not correspond to the proportion indicated by him, namely 6–8% of the total reserves, is heavily understated.

Almost 50 years of experience with the commercial hunting of sea lions in British Columbia shows that shooting 8–9% of the herd does not tell adversely on the state of the population (Pike and Maxwell, 1958). However, the Canadian commercial hunting is based fundamentally on the take of sea lion pups, which can hardly be considered rational. If cognizance be taken of the latter circumstance, then given that sea lions are taken on the Kurile Islands only on bachelor and juvenile rookeries, the number of animals subject to felling annually could probably be increased somewhat (to 10%). In

this case the annual quota for the take of sea lions on the Kurile Islands would constitute 2000 head. Moreover, taking cognizance of the polygamy of the species, the bachelor rookeries must be subjected to the main commercial-hunting pressure. Let us allow commercial hunting also on the islands of Broutona and Antsiferova, as the whelping of sea lions here is very limited (the pup yield is less that 100 head). The Kurile sea lion herd is virtually restored by the four main harem rookeries situated on the Brat Chirpoev, Sredneva, Lovushki, and Raikoke islands, so that commercial hunting here must be prohibited, if, of course, it is not a question of annihilating the sea lion as a species. The experimental shooting of harem males which has been approved by the Americans on a number of productive rookeries on the Aleutian Islands (Thorsteinson and Lensink, 1962) evidently cannot be recommended to our industry because the performing of any commercial hunting operations on harem rookeries during the sea lion breeding season will not be slow to tell adversely on the-state of the entire population. Nor is there any need for this, as only 4 rookeries will be prohibited, while on the remaining 21, where more than 50% of the herd concentrates, commercial hunting is possible (See Table 1).

According to the most closely approximating calculations, from 1000 juveniles and the same number of adults annually, it is possible to obtain about 1600 *centners*[14] of skins and more than 2500 *centners* of meat. On the basis of these calculations we estimate that one or two sealing schooners must be engaged in commercial hunting of the sea lion on the Kurile Islands. When taking sea lions during the harem period of life, the main difficulties consist not in felling the animals, but in dragging them from the shore and

[14] One Soviet *centner* equals 100 kilograms or Two German *centners* or approximately 2 cwt. Imperial. Translator. **1 metric ton = 1000 kilograms = 2205 pounds. Translator.

towing them to the ship. For these purposes a sealing schooner must have one towing launch with a pull on the towing end of 1.5 tons.** The shooting of sea lions on shore is done with rifles. On some rookeries it is possible to drive the animals toward the inland parts of the rookery. It is not expedient to take a sea lion afloat, as 80–90% of the animals sink prior to the approach of the motorboat. However, juveniles may successfully be taken afloat if a shotgun is used. As a rule, shock does not set in after a round of buckshot, and the seals remain on the surface at the water. Besides, in the vicinity of the juvenile reservoirs it is possible to catch sea lions with nets.

The period from May to July must be regarded as the most favorable time for the hunting of sea lions, i.e., the time of breeding, when the greater part of the population concentrates on the summer rookeries. Besides, the sea lions' breeding period coincides with the most favorable weather for commercial hunting, although such hunting may continue right up until autumn storms.

Organizational questions concerning the development of the commercial hunting of sea lions in the Far East are closely associated with quests for methods of correct utilization of the produce obtained from them. Unfortunately, little has been done in this regards At the present time the specific gravity of the sea lion in the commercial hunting of animals in the Far East is negligible. For this reason, no technology yet exists for processing and preserving sea lion skins; each of which attains a weight of 100–150 kilograms and more. Sea lion meat is quite edible. It may be used not only for feeding fur-bearing animals, but also for human consumption purposes, for example, in the preparation of special kinds of

sausage. From 2000 sea lions may be obtained up to 400 *centners* of high-quality liver, which may be used as raw material for the medicine industry. The significance of the sea lion is not exhausted merely with its economic value. The sea lion is an extraordinarily convenient object for study; on it may be resolved many complex problems associated with the acquisition of knowledge concerning the phylogeny of pinnipeds, their breeding, embryonic development, et cetera, It must not be forgotten that the sea lion is a genuine adornment of the shores of the Kurile Archipelago, the eastern borderland of our country.

In conclusion we note that the considerations set forth above are based primarily on visual observations of sea lions on rookeries under conditions of the absence of commercial hunting, so that we could not investigate a large number of specimens and, consequently, did not have the opportunity to show an accurate age structure for the sea lion rookeries of the different types. This is a research task for the immediate future.

BIBLIOGRAPHY

1. Averin, Yu. V. Nazemnye pozvonochnye vostochnoi Kamchatki [Terrestrial vertebrates of eastern Kamchatka.] *Trudy Kronotskogo gosudarstvennoga zapovednika [Proceedings of the Kronotskii State Game Preserve]*, vypusk [Issue] 1, pp. 1–223, 1948.

2. Belkin, A. N. Materialy po embrional'nomu razvitiyu koshnogo i volosyanogo pokrova ushastykh tyulenei (Otariidae) [Data on the embrional development of the skin

cover and hair cover in eared seals]. *Izvestiya [News] of TINRO*, Volume 54, pp. 97–130, 1964.

3. Klumov, S. K. Uchët beregovykh lëzhbishch sivuchei (*Eumetopias jubatus*) na Kuril'skikh ostrovakh i orientirovochnoe opredelenie ikh chislennosti. [A census of the littoral sea lion rookeries on the Kurile Islands and on approximate determination of their numerical strength]. *Doklady Akademii Nauk SSSR [Reports of the Academy of Sciences of the USSR]*, Volume CXVII, No. 1, pp. 345– 348, 1957.

4. Muzhchinkin, V. F. Raspredelenie sivuchei na yugo-vostochnom kotikovom lëznbishche ostrova Mednogo. [The distribution of sea lions on the southeastern fur seal rookery of Mednyi Island]. *Izvestiya [News] of TINRO*, Volume 54, pp. 179–186, 1964.

5. Sleptsov, M. M. O biologii dal'nevostochnogo sivucha. [On the biology of the Far Eastern sea lion]. *Izvestiya of TINRO*, Volume 32, pp. 129–133, 1950.

6. Snou [Snow] Kuril'skaya gryada. [The Kurile Chain]. *Zapiski obshchestva izucheniya Amurskogo kraya [Transactions of the Society for the Study of the Amur Krai]*, Vladivostok, 1902.

7. Chapskii, K. K. Otryad Pinnipedia. [The order Pinnipedia]. In *Mlekopitayushchie Fauny SSSR [Mammalian Faunas of the USSR]*, Volume 2, pp. 895–964, published by the Academy of Sciences of the USSR; Moscow and Leningrad, l963.

8. Schmidt, P. Yu. Kamchatskaya ekspeditsiya F.P. Ryabushinskogo. [F.P. Ryabusbinskiifg Kamchatka Expedition]. *Zoologicheskoe otdelenie [Zoological Division]*, Issue 1, pp. 175–199, 1916.

9. Kenyon, K. W. and Rice, D. W. Abundance and distribution of the Steller sea lion. *J. Mammal*., vol, 42 No 2. 1961.

10. Mathisen, O. A. Studies on Steller sea lion (*Eumetopias jubata*) in Alaska. *Publ. Wild. Manag. Institute*, Wire Building, Washington 5, D.C., 1959.

11. Merrel, T. R. Sea lions create havoc. *Pacific Fisherman*, Vol. 61, No. 12, pp. 13–15, 1963.

12. Pike, G. C. Food of the northern sea lion. *Progress reports of Pacific Coast Stations*, No. 112. pp. 18–20, 1958.

13. Pike, G.C. and Maxwell, B.E. The abundance and distribution of the northern sea lion (*Eumetopias jubata*) on the coast of British Columbia. *Journal of the Fisheries Research Board of Canada*, Vol. 15, No. 1, pp. 5–17, 1958.

14. Scheffer, V. B. Growth and behaviour of young see lions. *J. Mammal.*, vol. 26, No. 4, pp. 390–392, 1945.

15. Steller, G. W. De Bestiis Marinis [On Marine Animals]. *Novi Comm. Acad. Sci Petropolitanae [Recent Communications of the St. Petersburg Academy of Sciences]*, vol. 2; (English translation by Walter Miller and Jennie Emerson Miller. In *The Fur Seals and Fur-Seal Islands*.. See Jordan and Clark, 1898–1899), 1751.

16. Thorsteinson, T. V. and S J. Lensink. Biological observations of the Steller sea lion taken during an experimental harvest. *J. Wildl. Managm*., vol, 26, No. 4.

FIGURE CAPTIONS

Figure 1. Sea lion rookery on Peshchernaya [Cave] Rock, 26 meters high.

Figure 2. Sea lion harem rookery on Brat Chirpoev Island, 14 July, 1964.

Figure 3. Classification of sea lion rookeries on the Kurile Islands.

Figure 4. A schematic depiction of the sea lion harem rookery on Brat Chirpoev Island; plan view, as seen from the island. --- Sea lion harems - - - bachelor regions

Figure 5. Distribution of sea lion rookeries on the Kurile Islands during the breeding season of 1963: 1 – harem rookeries, 2 – bachelor rookeries, 3 – juvenile rookeries.

Named islands (from north to south): Paramushir, Onekotan, Lovushki, Rasshua, Simushir, Chërnye, Brat'ya, Urup, Iturup, Peshchernaya Rock.

Figure 6. An adult male sea lion (bull). Dolgaya [Long] Rock (Lovushki Islands). 15 August 1963.

Figure 7. A sea lion a few hours after birth (Iturup Island, 19 June 1963).

Figure 8. A female sea lion nursing a yearling pup. Dolgaya Rook (Lovushki [Trap] Islands), 24 June 1964.

Figure 9. The position of the male and female sea lions during mating. Lovushki Islands, 24 June 1964.

Figure 10. The sea lion harem rookery on Dolgaya Rock (Lovushki Islands). 15 August 1963.