

**PANEL 1: THE ECOLOGY, POPULATION CHARACTERISTICS,
MOVEMENTS AND NATURAL HISTORY OF BEARS**

**Life History of the Brown Bear (*Ursus arctos* L.)
in North-east Siberia**

A. A. KISTCHINSKI

*Central Laboratory on Nature Conservation, Ministry of Agriculture of the
USSR, Moscow.*

SUMMARY

By 'North-East Siberia' we mean the Pacific regions including northern coasts of the Okhotsk sea, Kamtchatka, the Koryak Highlands, the Anadyr drainage, and the Chukotsk Peninsula. The brown bear is abundant here, and in some areas is more numerous than anywhere else in Eurasia. Detailed special ecological studies on the species have not been undertaken in the area and this paper is a summary of our present knowledge, based on the author's own experience as well as on other studies (Portenko 1941, Averin 1948, Portenko *et al.* 1963, Lobatchev 1966, Ostroumov 1966, 1968, Markov 1969, etc.).

DISTRIBUTION AND NUMBERS

Brown bears live throughout the area up to the limits of the arctic tundra (Fig. 1). They inhabit the whole forest zone, the 'beringian' forest-tundra¹ of Koryak lowlands and Anadyr basin, and tundra-like heaths on sea coasts. Brown bears have been observed in the tundra zone, and there are some reasons to believe that there are barren-ground populations, for example, near Chaunskaya Bay (Krivosheyev 1969).

In the greater part of North-East Siberia the brown bear is quite common, and in some regions its numbers are very high. They are perhaps most numerous in Kamtchatka, as well as in some places along the northern coasts of the Okhotsk Sea. Unfortunately, quantitative data on the population density are scanty and are based either on subjective estimations (the number of animals observed by an investigator on a certain territory during a considerable period) or on aerial counts, the interpretation which is very liable to error (Erickson & Siniff 1963); Ostroumov 1968). Thus, the following data may be considered only as approximate.

In mountains bordering the northern coasts of the Okhotsk Sea, we estimated the population density to be close to 1 per 10 sq. km.; in the Upper Kolyma basin the frequency of encounters was 10-20 times lower (Kistchinski 1969). According to aerial counts, the total population density in Kamchatka has been defined 0.6 per 10 sq. km. (Ostroumov 1968). The distribution of bears in different years may change due to the changes in the distribution of seasonal

¹ A specific type of forest-tundra with *Pinus pumila* as the main 'forest' element; a number of animal species of boreal forest type are associated with this habitat.

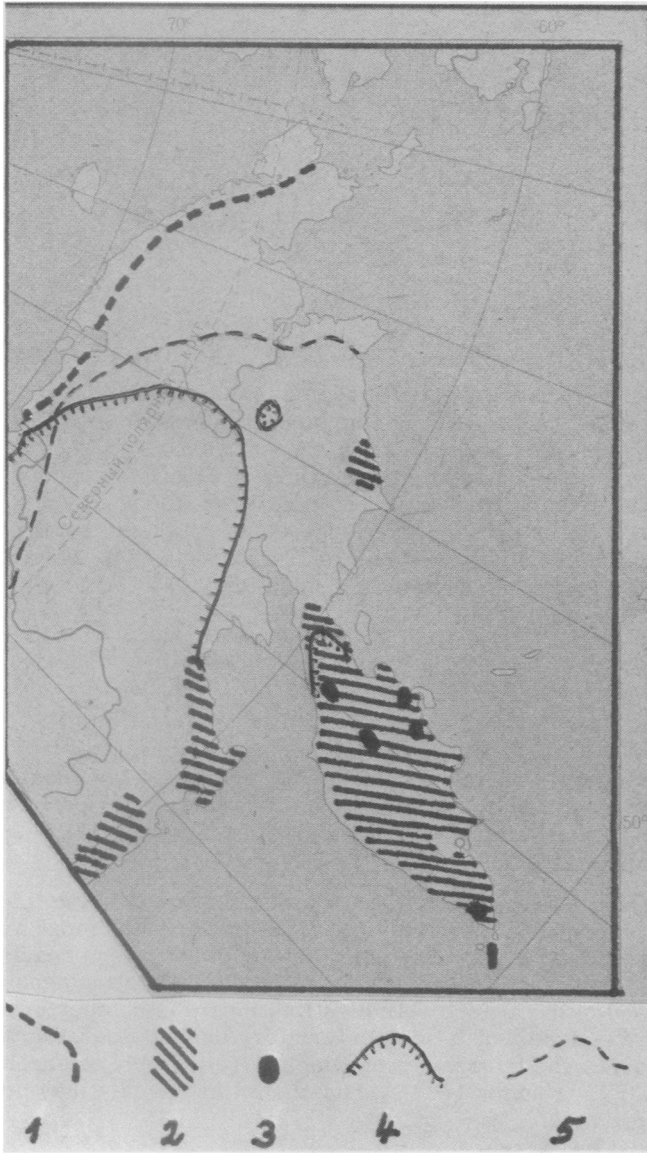


Fig.1 Distribution and abundance of *Ursus arctos* L. in North-East Siberia.

Designations: 1—northern boundary of the area of the species; 2—areas of high numbers (appr. 0.5-1 per 10 sq. km); 3—some areas of especially high numbers (appr. 3-20 per 10 sq. km); 4—north-eastern boundary of the forest zone; 5—northern boundary of the distribution of *Pinus pumila*.

food, e.g. spawning salmon. In some areas of southern and eastern Kamchatka the population density by the end of summer is especially high. According to A. G. Ostroumov (1968), in the basin of the Stolbovoyo Lake it reaches 3 per 10 sq. km, near the Palanskoye Lake 5 per 10 sq. km, and in the basins of lakes Kurilskoye, Azabachye, and along the river Verkhnyaya Dvukhyurtchnaya 10 per 10 sq. km. Still higher (up to 12-20 per 10 sq. km) densities have been estimated for parts of Paramushir Island (Lavov *et al.* 1963). Such high numbers of bears are found only in areas especially rich in fish; population density here may be compared with the best grounds of southern Alaska (Troyer & Hensel 1964).

The number of bears in North-East Siberia, and especially in Kamchatka, has greatly decreased in recent decades, owing to excessive hunting. For instance, in the Kronotsky State Reserve in the 1940's the number of bears was still estimated at several thousand (Averin, 1948); now it does not exceed several hundred (V. I. Markov & Y. M. Chernikin, according to Ostroumov 1968). Approximate calculations give the total numbers of bears in Kamchatka as about 15-20 thousand (Ostroumov 1968), and in the mountains bordering northern coasts of the Okhotsk Sea as not more than 10 thousand.

TAXONOMY AND VARIABILITY

Bears inhabiting the area under consideration are traditionally included in the subspecies *Ursus arctos piscator* Pucheran 1855, which is close to races inhabiting Pacific coasts of North America (*gyas* and *middendorffii*). Apparently, this form is an extreme variant of the cline of East Siberian bears, in the same way as American forms in analogous biogeographical situations (Rausch 1963). To define the place of Pacific populations in the general system of the species' variability, new studies are needed.

It is known that in old times in Kamchatka there were extremely big bears, but in recent decades animals of medium size (250-150 kg and less) predominate; the biggest bear of 40 kills recorded by Averin (1948) weighed 285 kg. In the 1960's neither the author nor other investigators met with animals of greater sizes.¹ This can probably be explained by an overharvesting and selective kill of big specimens.

The colour variability of brown bears in North-East Siberia is great. On the northern coast of the Okhotsk Sea, very dark (black-brown and dark-chocolate) and light-brown (with darker paws) bears predominate, but sometimes also very light (almost sandy-yellow) animals are encountered. Cubs of the same litter may be of very different colour.

SEASONAL CHANGES OF HABITAT: FEEDING

In North-East Siberia the brown bear is mainly a mountain animal, visiting various habitats during the year. As a rule, the bears leave their dens from the middle of April to early May, beginning with lean single animals and ending with the females with cubs. The dates of leaving dens depend both on spring weather and the abundance of food the previous autumn. In normal years, animals killed just after leaving dens are well-fed. At this period there are

¹ In recent years, cases of killing very big bears (up to 500-685 kg) are known (Novikov 1969), but extremely rare.

still winter conditions. On emerging from their dens, the bears stay in the mountains and feed on the berries of *Vaccinium vitis-idaea*, *Empetrum nigrum* and *Rosa spp.*, that have lasted through the winter and may be found in sparse thawed patches, and on last year's cones of the dwarf pine *Pinus pumila*. They also eat sprouting green shoots of cereals, *Angelica*, *Heracleum* and *Filipendula kamtschatica*), last year's 'hay' of *Calamagrostis*, and the remains of salmon on river banks. From time to time they manage to catch other fish (*Salvelinus spp.*), susliks *Citellus parryi*, which have emerged after hibernation, or a stray domestic reindeer. In eastern Kamchatka, where snow is very deep in spring, bears go down to the sea coast to search for anything that may have been washed up (mainly dead seal cubs); sometimes they come to human settlements (Averin 1948).

In years of late spring the mountains remain snow-covered for 1-1.5 months after the bears have left their dens. They may then make long migrations in the search for food, often crossing steep mountain passes. It is during this period that they use up the fat accumulated in autumn and by June they have become rather lean.

In June, there is a rapid growth of grass in the valleys and on the coast and the bears descend from the mountains. Later, as the grass begins to grow at higher elevations, they gradually retire to the mountains again. Vegetative parts of plants serve as their main food at the beginning of summer (June-July). In addition, in taiga and the thickets of dwarf pine and dwarf alder (*Alnus kamtschatica*), they eat ants and other insects, birds' eggs, last year's cones of *P. pumila*, foxberries (bearberries *Arctostaphylos*) and crowberries. They readily dig up burrows of ground squirrels and, from time to time, succeed in catching a hare or a willow grouse. By July, they often go up to the alpine belt (1500-1800 m above sea level), where there are no mosquitoes and bighorn sheep and wild reindeer graze with their young.

At the end of summer (varying according to region but usually in the second half of July), the rivers of the Pacific basin begin to swarm with the mass migration of spawning salmon. At this time great numbers of bears gather near the spawning rivers and streams to feed on salmon. Sometimes one can see 15 animals along 1-2 km of a river. In the stomach of one bear (Averin 1948) there may be up to 20 kg of fish. The feeding on salmon continues all August, and to a lesser degree still later, in Kamchatka (Averin 1948) till denning and near the Okhotsk Sea coasts till September.

Fishing bears are very picturesque; they have always attracted much attention both in Asia and America, and many brilliant descriptions have been devoted to this period in the bears' life. But although the salmon forms an important food item, its role should not be exaggerated. Bears feed on salmon only 1.5-3 months a year and intensively for only about 2-4 weeks. Even when salmon are most abundant, not all the bears gather near rivers—some of them stay in the thickets of dwarf pine and dwarf alder, feed on red bilberry bushes in taiga, in the coastal 'tundra', rich in blueberry and crowberry, and on the sea-shore. Thus, in summer on the tide-line, bears eat green algae and laminaria, shrimps, crabs, mollusks and starfish thrown out by the sea. In 1963, on the Okhotsk Sea, the author observed bears eating green algae; this food was digested so quickly that in fresh droppings containing its remnants one could find many amphipods *Gammaridae* still alive. Sometimes seals (*Phoca vitulina* and *Ph. hispida*) which haul out on the shore serve as an additional food item for the bears; they also eat the refuse of sealing operations.

In August-September bears are also finding abundant ripening pine nuts and

berries in the forests, coastal 'tundras' and thickets of dwarf pine, especially blueberries, foxberries, crowberries, berries of *Sorbaria* and also, in Kamchatka, of *Lonicera*, *Padus* and *Crataegus*, and above all the seeds of *Pinus pumila* cones. In autumn, before hibernation, bears can thus build up a layer of fat 5-6cm and sometimes as much as 15cm thick (Lobatchev 1966, Averin 1948).

Hibernation usually begins in the second half of October and in November. Dens in Kamchatka and the Koryak Highlands are in mountainous terrain. They have been found under the roots of fallen birch trees, among piles of boulders, in caves and in rock crevices. Some areas are particularly abundant in dens, for instance, on the Opalinskaya, Karymskaya and other volcanic peaks of Kamchatka (Lobatchev 1966). The floors of dens are covered with branches, leaves, and grass (Y. V. Averin 1948). Pregnant females in general den earlier than the others and prepare their dens more carefully. In winter active animals are very rare. In southern Kamchatka, at the beginning of winter heavy rain sometimes falls, washing away the snow cover from some dens and forcing the occupants to leave until the termination of the thaw (Novikow 1969).

This sums up the characteristic mode of life (with small differences in phenology) of all populations inhabiting the Pacific territories within the limits of the forest zone and dwarf-pine 'beringian' forest-tundra. In the Kolyma basin, bears do not have such an abundance of summer food in the way of salmon and sea animals. During summer they stay in taiga and the subalpine belt of the mountains, feeding on greens, dwarf-pine seeds and berries. Sometimes they attack wild reindeer.

Almost nothing is known about the life of brown bear in tundra proper.

THE USE OF TERRITORY

Due to a large set of seasonal habitats, individual movements of bears during a year must be significant. Special studies on this problem have not been undertaken. According to observations and trackings, a single bear or a family may live on a territory 10-15km wide from a week to a month, after which they move elsewhere (Portenko *et al.* 1963). In eastern Kamchatka such temporary 'home ranges' from 8-12 to 60-100 sq. km can be distinguished in June-July (Markov 1969).

At the end of summer bears gather on salmon rivers in great numbers. By this time in convenient places (along tide-lines, river channels and the lower slopes of mountain or foothill valleys) bear pathways used by many individuals are established. In Kamchatka bears sometimes moved a distance of 50-60 km in one day (Ostroumov 1968). Apparently, the greatest movements take place immediately after bears leave their dens.

Bears do not have a clear daily rhythm. Most often they are met with in the evening, as also happens in Alaska (Erickson & Siniff 1963), but we could see them active (moving or fishing) even at midnight.

BREEDING. POPULATION STRUCTURE

The rut of bears occurs in May-June. The litter size is 1-3 (usually 2); litters of 4 or 5 occur very rarely. In mountains bordering the northern shores of the Okhotsk Sea, in 1963, cubs made up 17% (n-35) of the population; in 1964 only 6% (n-16). The spring of 1963 was very late and the bears killed during the

rutting time were in an exhausted state (Kistchinski 1969). According to Y. V. Averin (1948), in the 1940's in eastern Kamchatka cubs averaged 23% (n-65) of the population; the mean litter size was 2.1. In 1960-1965, in the same area (Kronotsky State Reserve) V. I. Markov (1969) estimated the percentage of adults in the bear population to be 65% with a sex ratio of 1 male to 1.30 female. 8% of the female bears had cubs and 24.6% yearlings. Cubs comprised 22% of the total population and yearlings 13%. Mean litter size was 2.20 (cubs) and 1.56 (yearlings) per female. On territories in the vicinity of thermal areas, this author observed a certain increase of mean litter size.

ENEMIES AND PARASITES

Practically, bears have no enemies except man. In Kamchatka rare instances have been known of wolves attacking bears (Averin 1948)

In Kamchatka almost all the bears are infested with ascarids; one animal had 20-30 of them, but as many as 350 have been recorded. In spring ascarids are absent (Averin 1948). In the Koryak Highlands a case has been recorded of an outbreak of trichinellosis caused by the consumption of brown bear meat (Portenko *et al.* 1963).

THE BROWN BEAR AND MAN

The brown bears in near-Pacific regions are very peaceable and present hardly any danger to man. Apparently, their reflex to attack an animal of their own size is not developed. Only single cases of an 'unprovoked' attack are known (mainly by bears active in winter). During the rutting time in uninhabited areas male bears are very unwary and sometimes come up straight to man or a caravan of pack horses.

There are no reliable data on the harm done by bears to reindeer husbandry. Sometimes bears kill horses and cattle in Kamchatka; when in the 1860's cattle were introduced into the Anadyr valley, some of them were eaten by bears (Gondatti 1897).

Hunting of brown bears in North-East Siberia is limited and only allowed from September to May inclusive. In the Kamchatka Region killing of females with cubs is prohibited in spring. The number of animals which may be killed in the hunting season is unlimited and not registered. The hunters include local people, personnel of expeditions and weather stations, and sportsmen hunters. The Koryaks and Chukchis hunt mainly in spring, when the animals may be tracked and the meat brought home by dog teams.

The annual kill in the mountains bordering the Okhotsk Sea, the Koryak Highlands and the Anadyr basin may be estimated in hundreds but probably does not exceed a thousand. It is not considered excessive. In Kamchatka the kill is more intensive (according to A. G. Ostroumov, between 1000 and 2000 per year) and is subject to very little control. The present level of kill is probably too high and should be reduced.

REFERENCES

- AVERIN, Y. V. 1948. Land vertebrates of eastern Kamchatka. *Proc. Kronotsky State Reserve, No. 1*, Moscow: 1-222 (in Russian).

- ERICKSON, A. W. & SINIFF, D. B. 1963. A statistical evaluation of factors influencing aerial survey results on brown bears. *Trans. 28th North Amer. Wildlife and Nat. Resources Conf.* 1963, Detroit, Mich. Washington, Wildl. Mgmt. Inst.: 391-409.
- GONDATTI, N. 1897. Settled population of the Anadyr river. *Proc. Priamursk. Div. Russ. Geogr. Soc.*, Khabarovsk, v. III, No. 1: 111-165 (in Russian).
- KISTCHINSKI, A. A. 1969. Brown bear in the Kolyma Highlands. In *Increasing of Productivity of Hunting Grounds*, Moscow: 177-184 (in Russian).
- KRIVOSHEYEV, V. G. 1969. Faunistic discoveries in North-East Asia. In *Mammals: evolution, caryology, faunistics, systematics*. For the 2nd All-Union Mammal. Conf., Novosibirsk: 156 (in Russian).
- LAVOV, M. A., VORONOV, V. G. & YEVDOKIMOV, Y. I. 1963. Fauna of game mammals of the islands Paramushir and Shumshu and possibilities of enriching it. *Proc. Sakhalin Res. Inst., USSR Acad. Sci.*, No. 14: 39-47 (in Russian).
- LOBATCHEV, Y. S. 1966. New ecological data on the Kamchatkan brown bear. In *Problems of Zoology*, Tomsk: 211-212 (in Russian).
- MARKOV, V. I. 1969. Biology of Kamchatkan brown bear (*Ursus arctos beringianus*) and principles of regulating its hunting. IX Int. Congr. Game Biol., Abstr. Symp. Papers, Symposium 'Increasing Productivity in Game Management', Moscow: 88-90.
- NOVIKOV, B. 1969. A giant requires protection. In *Hunting and Game Management*, No. 10: 9 (in Russian).
- OSTROUMOV, A. G. 1966. Summer and autumn in the life of brown bear in Kamchatka. In *Problems of the Geography of Kamchatka*, No. 4, Petropavlovsk-Kamchatsk.: 32-42 (in Russian).
- OSTROUMOV, A. G. 1968. Aerovisual census of brown bears in Kamchatka and some observations on their behavior. *Bull. Mosc. Soc. Natur., Biol. Div.*, v. 73, No. 2: 35-50 (in Russian).
- PORTENKO, L. A. 1941. Fauna of the Anadyr Region. Part III. Mammals. *Proc. Res. Inst. Polar Farming, Animal Husbandry, and Game Management*, ser. 'Game Mgmt.', No. 14: 1-93 (in Russian).
- PORTENKO, L. A., KISTCHINSKI, A. A. & CHERNYAVSKI, F. B. 1963. The Mammals of the Koryak Highlands. Moscow-Leningrad: 1-131 (in Russian).
- RAUSCH, R. L., 1963. Geographic variation in size of North American brown bears, *Ursus arctos* L., as indicated by condylobasal length., *Canad. Journ. Zool.*, v. 41, No. 1: 33-45.
- TROYER, W. A. & HENSEL, R. J., 1964. Structure and distribution of a Kodiak bear population. *J. Wildl. Mgmt.*, v. 28, No. 4: 769-772.