



Female of the Kamchatka bear at the Brno Zoo

Brown Bears in Kamchatka

The Kamchatka peninsula in the Russian Far East is one of the last places in the earth where stable wild population of brown bears still prospers. More and more tourists are attracted to Kamchatka from around the world to watch these robust beasts of prey in their natural habitat because of the relatively high number of bears there. The sparsely settled volcanic peninsula, where only about four hundred thousand people live on 472,300 m² (which is approximately five times the area of the Czech Republic), is also famous for its breathtaking countryside, with active volcanoes and untouched nature. A new entrance to Beringia, an arctic animal exposition complex opened for the public in the Brno Zoo on 9 October 2010, intends to simulate and describe this environment to visitors.

The biggest land beast of prey

The brown bear [*Ursus arctos* (Linnaeus, 1755)] is the biggest land beast of prey. It belongs among the Ursidae family. As



Fight of the males

Photo by Igor Shpilenok

a species, it was formed in Eurasia in the Middle Pleistocene (approx. 1.5 million years ago) and, during the fourth (Wisconsin) glacial period, it came through Beringia to North America. The original area was contiguous and covered almost the entirety of Eurasia (except Iceland, Ireland, and some smaller islands in Europe), North Africa, and North America. This area started to become smaller in the Holocene Era (approx. 10,000 years ago). The shrinkage of the area has continued until the present and, particularly since the 18th century, it is connected with the damage to the natural environment and intentional hunting, which are accompanying features of the development of human society. The current European territory is of a mosaic character. Most European bears live in Northern Russia, Scandinavia, and the Carpathians. We can find isolated populations in central

and south Europe, Scandinavia, the Baltic States, the Balkans, and the Caucasus. The brown bear irregularly occurs in Asia over a wide area bordered in the north by the arctic tundra or the coast of the Arctic Ocean, and in the south by northern Kazakhstan, the Tien-Shan Mountains, Mongolian steppes, and the Japanese island of Hokkaido. Their territory still includes most parts of North America.

As they settle over wide regions with various biotopes, brown bears prove to be a species with a high ecological adaptability. The unique adaptation enables them to live in unbelievably different geographic conditions: They occur both in the Gobi desert, and in European, Indian, and Nepalese leafy forests, as well as in the Siberian taiga. They make their home also in mountain ridges in eastern Turkey or Tibet, in the Caucasus and the Tien-Shan mountains,



Bear family, volcano Ilinskaya at the back

Photo by Igor Shpilenok

and they live in the tundra in Chukotka and Alaska and the volcanic landscape of Kamchatka.

Experts estimate the current world population of brown bears to be 150–210 thousand, of which 100–130 thousand live in Russia, 30–40 thousand in North America, and 5–6 thousand in eastern Europe. The species occurrence area has been decreasing throughout the world and individual populations are adversely influenced by this fragmentation. Groups of several dozen individuals live, e.g., in the Alps, the Apennines, the Pyrenees, in northern Kazakhstan, and Tien-Shan. Probably viable populations with growing numbers of individuals only remain in the Carpathians, Siberia, northeast Russia, and Alaska.

Brown bears living in such a vast territory and under such varied conditions differ in their appearance, size and behaviour. Females from different parts of the world, for example, take care of their young and teach them survival techniques for from one to two or four years in some places, and even for as many as five years in others. We recognize twelve sub-species today and several other, already extinct ones.

The largest subspecies is the Kodiak bear living on the island Kodiak in Alaska, where it reaches a weight of up to 800 kg. When it stands up on its back legs, it can be more than three meters high. Its nearest

relative is the Kamchatka brown bear, the second biggest subspecies, weighing up to 750 kg. (For most of the Pleistocene period, Kamchatka was connected with Alaska by a sufficiently wide land bridge.) Grizzly bears live in the western and central part of North America. They are smaller than Kodiaks but bigger than European bears. In Europe, there is only a nominate subspecies [*U. a. arctos*], the area of which spreads up to Siberia. The smallest subspecies, the Syrian bear, weighs not more than 190 kg.

Kamchatka subspecies occurrence, and migration

The total number of Kamchatka brown bears [*Ursus arctos beringianus* (Middendorff, 1853)] is estimated at 15.5–16.5 thousand, which is approximately 5% of the species' world population and 12–15% of the population living in the territory of the Russian Federation. About 10,000 live in the entire Kamchatka peninsula, with about 5.5–6.5 as well in two land districts of the Koryak Autonomous Okrug. (According to the previous administrative division of Russia in 2007 the Kamchatka Region was formed by merging the Kamchatka area in the south of the peninsula and the Koryak Autonomous Okrug, which is situated in the north of the peninsula and the adjacent land.)

Bears occur almost everywhere in Kamchatka. They only avoid high mountains and very wet locations. Their territory includes more than 460,000 km², which is approximately 95% of the Kamchatka Region. The border between their territory and the territory of much smaller bears living in the Koryak Mountains at the border of the Koryak Autonomous Okrug and the Chukotka Autonomous Region has not been fully investigated yet.

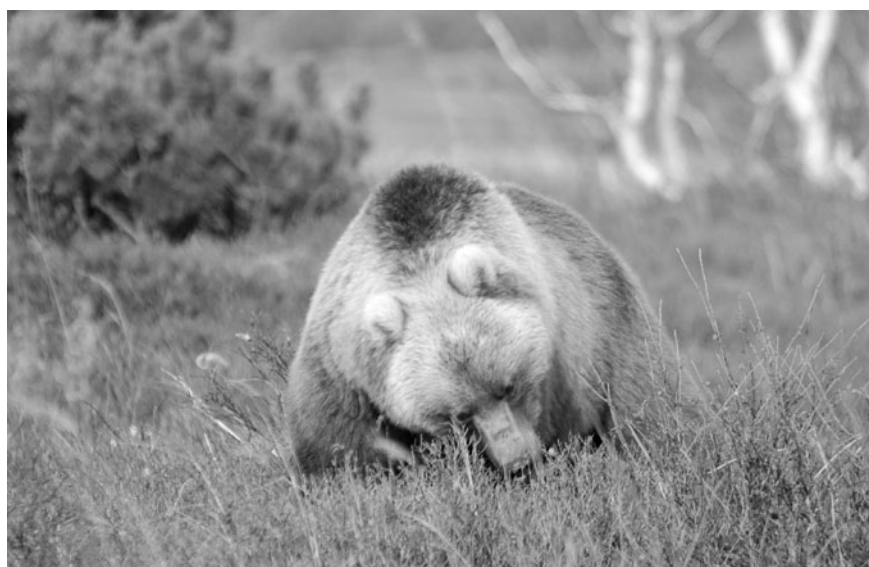
The quite low demand of brown bears for suitable living conditions is reflected in the fact that their territory of occurrence in Kamchatka is continuous and the population space structure is integrated even at the places where anthropogenic pressures start having effect on it, e.g., the cutting down of forests, road construction, etc. The widespread bushy Siberian dwarf pine [*Pinus pumila*], similar to the European dwarf pine, dwarf alder-trees [*Alnus kamtschatica* and *A. fruticosa*], and the forests of "stone" birch-trees, particularly the Erman's birch [*Betula ermani*] and the Middendorff's birch [*Betula middendorffii*], provide Kamchatka bears with an ideal environment. These forests (in Russian called: kamennoberezovye lesa, in English: stone-birch forests) are a specific form of taiga which only occurs in the Kuril Islands, Kamchatka and the adjacent part of Asia. Coniferous forests and flooded

lowland forests also provide very good living conditions for Kamchatka bears. All of these biotopes spread over 46.9% of the Kamchatka bear's territory. These bears find other satisfactory areas in open forests, mountainous or plain tundra and in lowlands at the sea coast.

The main criterion for the bears for the selection of a place suitable for living is the availability of food, which is extended by the possibility of a place suitable for building a den during the autumn. How the biotope is protected by terrain configuration or plant growth is of secondary importance. Kamchatka bears are not afraid of living at an unprotected location, in open landscape, and find suitable living conditions in almost all landscape types.

The selection of a place suitable for living greatly depends on the season of the year. Seasonal migrations which some populations undertake (to a distance of hundreds of kilometres) are characteristic for Kamchatka bears. Bears use traditional trails that have been formed over many years during long journeys for food or to a potential den. They can be easily recognized, especially if they lead along rivers where salmon migrate or in the open landscape.

Brown bears are omnivores; plants sometimes prevail in their food. In Kamchatka, the biggest "feast" is offered by rivers and lakes during the mass migration and spawning of salmon. Dwarf pine, the seeds of which they eat, and birch forests offering various forest fruit – blueberries, cranberries, raspberries, strawberries, etc. – are equally important for them. Where there is a paucity



Kamchatka bear eating forest products

Photo Igor Špilenok

or total lack of salmon spawning grounds, as in a part of the Bering Sea coast or at some places in the centre of Kamchatka, we can still find a sufficiently high density of bears which live there thanks to the abundant growth of the dwarf-pine, blueberry shrubs and other berries.

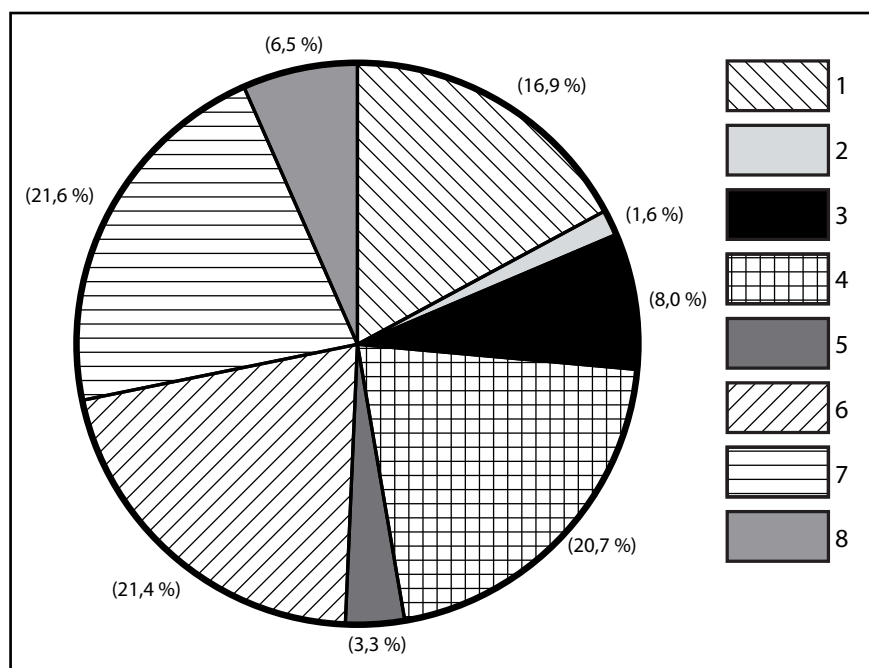
Sometimes, the usual migration of salmon is weaker in part of Kamchatka or there is a failure of the pine cone crop. Bears then set off from their favourite habitats to places with a higher food availability. It remains unknown how the information about places with the abundance of fish is spread among them. Bears pass by one river system after another

with indifference and unmistakably go to a many kilometres' distant fish-populated river basin. Young males which are trying to gain a higher position in the group hierarchy are especially active during these migrations. All of them safely know the way "home". Experiments during which biologists relocated "conflict" individuals to remote places ended by the return of the animals to their original location from a distance of several hundred kilometres. Bears are able to migrate great distances while not losing their error-free spatial orientation.

The role in ecosystem and subspecies protection

Biogenous elements (such as carbon, phosphorus, or potassium, necessary for the existence of organic matter) and organic compounds (such as hydrocarbons, proteins, and lipids playing an important role in the food chain of the majority of peninsula ecosystems) are brought from the sea to the water and land environment of Kamchatka by schools of migrating fish every year. These substances guarantee and support the growth of vegetation, development of invertebrates, and a new generation of salmon and big vertebrates. Bears catching salmon participate in the transfer of biogenous elements to land ecosystems, including those significantly distant from watercourses. Moreover, while eating seeds and fruit, they turn over stems, and they dig up the top soil layer when rooting and searching for insects or rodents. As they build hiding places and dens, bears form plant associations and influence their species' composition.

The brown bear as a species at the top of the food pyramid can be an indicator of the balance of nature of Kamchatka. For exam-



Structure of Brown bear habitats in Kamchatka (from forest taxation in 1974): 1 – stone-birch forests, 2 – flood-plain forest, 3 – creeping alder, 4 – dwarf Siberian pine, 5 – coniferous forests, 6 – plain tundra, 7 – mountain tundra and rocks, 8 – fellings, burnt areas



Daybreak at the Kurile Lake

Photo by Igor Shpilenok

ple, a change in numbers and density of settlement, sometimes accompanied by a shift of seasonal activity, can show strengthening of anthropogenic pressure on the ecosystem. Damming up watercourses, cutting down forests, and poaching result in the reduction of the bear occurrence area, as well as the loss of places through which salmon migrate, or a reduction in the number of spawning fish.

The shooting of up to 500 bears is annually permitted in Kamchatka, and poachers kill another 350–450 individuals a year. The motivation for illegal hunting is obtaining the fur or bear gall valued in Chinese medicine. Salmon hunters also kill bears without this motivation. When setting a legal quota, specialists already count the poachers' "contribution"; therefore they consider the total annual number of 850–950 bears shot reasonable because it corresponds to the dynamics of quantity and the pace of population renewal.

However, the brown bear is not fair game in all of Kamchatka. It enjoys a high degree of protection at some especially protected territories. Its hunting is prohibited in the Kronotsky State Biosphere Reserve, in the Yuzhno-Kamchatsky National Nature Reserve, and some smaller reserves of regional importance making up 14.5% of the Kamchatka area in total. The Kamchatka

subspecies of the brown bear is listed in Annex 2 to CITES, which means it is only possible to export live animals and their body parts, such as fur or souvenirs made of skin, claws, or teeth across the border of Russia on the basis of a special CITES permit issued by the Ministry of the Environment in Moscow.

Biology and morphology

Kamchatka bears differ from other bears in their wide faces with prominent facial bones and, omitting Kodiaks, by the robustness of their bodies. Kamchatka bears have no predator – except for humans and other bears. Rarely is a young or weak adult bear attacked by a pack of wolves. Some bears, especially males, will kill and eat another bear.

Brown bears grow and put on weight all their lives but most intensively up to the age of 10–15. Then the pace of length and weight of the body growth decreases. In nature, they live for 25–35 years; in zoos, up to 40. The age and the weight of an individual are not always in direct correlation: In the spring of 1998, a 34-years-old male weighing only 200 kg was killed in Kamchatka.

Sexual dimorphism is indistinct with Kamchatka bears. Females are usually, but not always, a third smaller and lighter

than males. There are females, called "matukhi" in Russian (матухи), which do not differ much from males in the robustness of their body and which even sometimes take a dominant position in the group. Brown bears in Kamchatka are not only brown. The shade of their fur ranges from very light sandy brown to dark brown; some of them are nearly black. The young usually have a neck ring, white fur on the neck which disappears during the first winter.

Paws on front legs serve as a powerful weapon in defence and attack and as an efficient tool for digging up dens, revealing roots, drawing small rodents from under stones, and turning over fallen stems when searching for invertebrates. Front paw claws can be 12–13 cm long; the back paw claws are much shorter.

Although they seem to be clumsy at first sight, in fact bears are very quick and swift. They are able to attain a speed of 60 km per hour for a short distance, they easily plough through narrow and slippery paths beaten by smaller animals, and they can climb rocks and tree trunks up to their crowns.

Adult individuals are not endangered by cold but they can easily overheat at high temperatures or with strain. Therefore, they like bathing in small icy rivers or lakes where



Bear caught a salmon

Photo by Igor Shpilenok

they feel comfortable, or taking a rest in snowdrifts where they are not disturbed by mosquitoes.

Kamchatka bears are excellent swimmers and can also dive. A bear standing on the bank or in shallow water submerges its head under water when hunting and feels the bottom of the river or lake with its nose. It dives for the kill in deeper waters. When hunting sea mammals (bull seals, fur seals, and otters), it swims far away from the sea-coast. Cases have been known of a bears searching for island fauna which swam over the 10-km-wide First Kuril Strait between the Kamchatka Cape Lopatka and Kuril island Shumshu.

Bears sexually mature in the fifth or sixth year of their life, with the period of the highest reproductive intensity lasting up to their 12th year. We know of one case when an 18-year-old female with two young was marked with a radio-neck ring in Kamchatka. A female bear delivers 12–15 young during its life, of which less than half live to be sexually mature. The low reproduction rate is one of the reasons for the vulnerability of the species.

Pregnancy lasts from 180 to 250 days, and also contains a “hidden” pregnancy, i.e., a period of latency when the creeping in of the embryo in the womb is suspended. Females give birth during hibernation and

deliver one to three or sometimes four young every three or four years. Russian has the term “segoletok” (сеголеток) for young in the first year of life, “lonchak” (лончак / hogget) for young in the second year of life, and “tret’yak” (третьяк) in the third year of life. About 15% of young die during the first period of winter sleep, and more than 25% of them only live to reach the age of “tret’yak”. The main reason for mortality is cannibalism. A female which loses her young in the spring (usually after they are attacked by a male), ruts in the same year.

Behavioural characteristics causing conflicts

Conflicts between humans and this beast of prey cannot be completely avoided. To eliminate them as much as possible, it is necessary to be aware of some behavioural characteristics of the species. The highest degree of intellectual behaviour among all beasts of prey and other bear species and the ability to solve logical tasks is exhibited by brown bears. They are also highly adaptable to changes in the environment caused by humans. They are inventive and stubborn about obtaining food and they are not afraid of other animals because, as mentioned above, they are at the top of the food

pyramid. They have excellent memories and error-free spatial orientation, suggesting that they might be equipped with an internal compass. Young individuals, in particular, easily get to as-yet unknown territories. They are able to pass on individual experiences of their lives to bright younger bears at seasonal gathering places. Bears are able to learn and teach as well. As with many other wild animals (especially the young ones), bears show an inherent basic curiosity which need not necessarily be connected with the search for food. Young bears at the age of three or four are especially curious. They only begin their independent life, easily making mistakes by, for example, entering human territory. If the entry was caused by the availability of human food, the bear changes into a dangerous moocher. The ability to get used to a wide range of various kinds of food including plant food can be described as unlimitedly omnivorous behaviour of bears. They quickly get used to human food. Some surveys even show that bears having access to garbage, for instance, soon become addicted to human food to an extent which is similar to drug addiction. Garbage cans, especially those with pieces of fish bodies or camping residues, and the feeding of wild animals by good-natured tourists result in the making of a conflict animal.

The yearly life cycle of brown bears is divided into an active stage and an inactive stage of winter sleep. Winter dens built by males maintain a temperature of about 5 °C, female dens of about 10 °C. The winter sleep of brown bears is not real hibernation; the body temperature, reaching 37 °C during the active stage, only loses 3–8 °C. The pulse rate drops from 50 to 10 heart beats per minute and, after a series of 5–10 inhalations, there is a four-minutes pause when the animal does not breathe. Bears sometimes go out in winter to eat something and excrete. (They do not eat and excrete in the den).

Active stage of the yearly life cycle

The active stage starts with the spring period (April, May and the first half of June) when bears leave winter hiding places to seek their first food, and, later, even life partners. Adult males leave dens first. It is usually in April (sometimes even in March or February). Females taking care of 1-year-old young appear last, in May or at the beginning of June. The spring is the period of hunger. Plants have only started sprouting and there are few

opportunities to kill something. Some Kamchatka bears search for the first places at the volcano slopes, where the snow has melted. Those living in lowlands dig up plant roots, catch mice and other rodents, graze blueberry and cranberry shrubs which have fruit, and eat seeds of cones from the previous year. They also set out for the seaside, where they eat cadavers washed ashore, destroy bird colonies, or chase sea mammals. Bears from the central Kamchatka and Korjat region quite successfully hunt pregnant female moose and reindeer, which are less movable, and later they catch their young. They fatten on the carion of moose and reindeer and live members of their family, and collect the residue of the previous year's spawn salmon from the bottom of lakes. The first poor spring pasture has various horse-tail and sedge species.

Bears live through the spring especially thanks to the fat they have collected in the autumn. During their winter sleep they do not lose more than 30–40% of fat, which is sufficient to cover moderated physiological processes. During the first two spring months bears significantly lose weight. Some of them even do not live to experience the full surge of vegetation. Females accompanying 1-year-

old young are in the worst situation because these young are reliant on breast milk for the whole spring. In addition, these females must avoid places with a better food availability because they could encounter a dangerous, stronger male there. Some adult males specialize in hunting young bears not only in the spring, when there is a pronounced lack of food. Cannibalism is common as a protein source with many wild animal species, and it is one natural mechanism for regulating the numbers of populations.

Mating occurs in May and June. Males in rut are highly agile and aggressive; when searching females and marking the territory, they travel long distances. Females in rut also actively search for males at this time. Both sexes form couples of "husband and wife" or groups which stay together for several hours or days and then break up. They can also form a "partnership" again with previous partners. The result can be that a female might have young bears from different males in the brood. During the period of mating, families break up. Last year's young and three-year-old young are afraid of adult males and leave their mothers, who do not protect them anymore, to live an independ-



Bear in the volcanic landscape

Photo by Igor Shpilenok



Female with young ones

Photo by Igor Shpilenok

ent life. They can still spend some time in the vicinity of their mothers, and they spend the first winter sleep of their independent existence with her in the same den.

The summer period (June, July, and August) starts with a massive growth of vegetation. Kamchatka bears take huge quantities of the food they find in all landscape types. Their vegetarian menu contains numerous herbal species, including poisonous ones (bears do not get poisoned by them), but also leaves, young shoots, and floral envelopes of birches and sallow willows. Young males often undertake long summer journeys for food, and they can get close to human settlements where they are attracted by garbage cans with food residues, animal food, or domestic animals.

The autumn period (from the half of August to the end of October) is the most important one in the bears' life. In this period animals must collect sufficient stock of subcutaneous fat to be able to survive the long winter sleep and the following hungry spring months. Bears spend most of the autumn time fishing. At that time the mass migration of salmon from the sea to the places of spawning at the upper river courses and lakes occurs. Bears eat the first caught fish almost whole; they only throw the gill away. When they are fed up with fish meat, they only eat the upper part of the head and spawn. Autumn is also the time of ripening blueberries and cones; therefore,

bears alternate between meat and plant food and also intensively graze blueberry shrubs and dwarf pine undergrowths. If the salmon migration is sufficient and the cone and blueberry harvest good, a seasonal concentration of bears occurs when males as well as females of different ages and growth gather at places rich in huge quantities of food. During the air census in 2001, environmentalists

found out that in the autumn it is possible to find areas in Kamchatka showing the highest density of settlement by bears in the world – 8.48 individuals per 10 km² (determined around the Kuril Lake in the territory of the Yuzhno-Kamchatsky Reserve).

The abundance of food means that, during the seasonal concentration, one territory is shared by individuals of various hierarchical po-



Still life with a bear

Photo by Igor Shpilenok



Male Jelizar at the Brno Zoo



Female Kamchatka at the Brno Zoo

sition calmly and peaceably. It can happen that a female and her 1-year-old young are waiting several meters from a robust male catching salmon on the bank of a river for left-overs after the male's feast. No one else can hunt in the territory of a dominant male. The hierarchy also partly manifests when everybody is full and they go to take a rest. A dominant male lies anywhere and the others have to leave. Those at the lowest rank go to places up to 1.5 km distant. In August and September, there are frequent cases in Kamchatka when a person catching fish or picking up blueberries or mushrooms meets a bear.

The end of the period of searching for food and other activities comes during October and November, when the countryside is under a complete blanket of snow. In December some loners, usually old robust males, catch fish or eat cones only. On gloomy days, in a snowstorm which sweeps up their traces and masks winter hiding places, bears equipped with sufficient fat retire to the previously prepared dens.

Eduard Stuchlík

Igor Shpilenok's photos have been taken in the Kronotsky and Juzhno-Kamchatsky reserves.

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