КРАТКИЕ СООБЩЕНИЯ

UDC 599.742.21(571.65/.66-751.2)

BROWN BEAR (*URSUS ARCTOS*) (CARNIVORA, MAMMALIA) DENS OF THE KRONOTSKY NATURE RESERVE

Ivan V. Seryodkin [1], Vladimir V. Zhakov [2], and John Paczkowski [3]

[1] Pacific Geographical Institute of the Far Eastern Branch, Russian Academy of Sciences
7 Radio Str., Vladivostok 690041, Russia
[2] Kamchatka Branch of Pacific Geographical Institute of the Far Eastern Branch, Russian Academy of Sciences
6 Partizanskaya Str., Petropavlovsk-Kamchatsky 683000, Russia
[3] Alberta Environment and Parks
800 Railway Avenue, Canmore, Suite 201, T1W 1P, Canada
E-mail: *seryodkinivan@inbox.ru*

Received 13 September 2017, accepted 24 November 2017

Seryodkin I. V., Zhakov V. V., Paczkowski J. Brown Bear (*Ursus arctos*) (Carnivora, Mammalia) Dens of the Kronotsky Nature Reserve. *Povolzhskiy Journal of Ecology*, 2018, no. 1, pp. 101–105. DOI: 10.18500/1684-7318-2018-1-101-105.

Seventeen brown bear dens were studied in the Kronotsky Nature Reserve (Russian Far East). The majority of dens were excavated in the ground. The dens were located mainly in the upper part of slopes with southwest aspects in birch forests, dwarf Siberian pine and alder patches. The structure of the dens was typical for brown bear ground dens. There are places in the basin of Shumnaya River in Kamchatka where brown bears prefer to set up their dens.

Key words: brown bear, *Ursus arctos*, den, Kronotsky Nature Reserve.

DOI: 10.18500/1684-7318-2018-1-101-105

Dens areas are critical habitat for brown bears, and the animals select locations for their dens based on both, human activities and presence of suitable natural habitat (Schoen et al., 1987; McLellan, Hovey, 2001).

The studies were carried out in the framework of the research program of the brown bears *Ursus arctos* Linnaeus, 1758 in Kamchatka region at the territory of the Kronotsky Nature Reserve in the Shumnaya River basin in 2005 – 2006. Bear dens were found by searching in the habitat potentially suitable for dens, in places where bears were observed in post-denning period and by visiting the locations of animals with GPS-collars (Paczkowski et al., 2005).

Dens were described and measured, including signs of bear activity inside and outside of the dens. The characteristics of the location of dens were evaluated, such as: elevation, slope aspect, and position at the slope (upper third, middle third or bottom third). The vegetation was described; including vegetative cover, the number of trees and shrubs within 10 meters of the den, crown density above the den and the visibility in four directions from the entrance of the den.

Seventeen brown bear dens were found in the research area. One den located in the volcanic caldera Uzon Caldera, six – in the basin of Geysernaya River (vicinity of the Valley of Geysers), and 10 – on the left bank of the middle reach of Shumnaya River. The last 10 dens were located on a small area of the upper third of the southwestern slope of the Shumnaya River at an area of only 12 km^2. Brown bears have specific requirements for their dens and often select similar areas for many generations. Dens concentrations are typical for different parts of the species' range (Sobansky, 1974; Van Daele et al., 1990; Vaisfeld, Chestin, 1993).

All dens were located on slopes. Most of them (80%) were at the top third of the slope (of which 13.3% were on the ridge), and 20% – at the middle third of the slope. Dens were located on the slopes between 26° and 46° (36.9° on average). The average elevation was 512.8 meters (*SD* = 145.2 m) with a maximum of 863 m and a minimum of 333 m.

Eleven dens were located on south-west aspects; two – on south and west aspects, and the rest were located on different aspects. The preference of southern and western aspects is typical for the north of the Far East, Yakutia, the Volga-Kama region and the Carpathians (Tavrovsky et al., 1971; Slobodyan, 1979; Vaisfeld, Chestin, 1993). The reasons for the preference of these aspects has not been determined yet.

Eleven dens were in the birch forest dominated by Erman's birch *Betula ermanii* Chamisso, 1831, and the remaining were found in patches of shrubs. Alder *Alnus fruticosa* Rupr., 1845 was found near all 17 dens, and dwarf Siberian pine *Pinus pumila* Pallas (Regel), 1859 – next to seven dens. In addition, mountain ash *Sorbus* sp. was found growing near five dens.

Trees and shrubs grew within a 10 m radius of 64.7% of dens. Five to 10 trees were recorded seven times in this area, up to 5 trees – three times, and in one case 20 trees were recorded. The density of shrubs was average in most cases (52.9%) or high (41.2%) and only once were there isolated shrubs. Visibility from the dens varied from 0 to 1000 m in one direction. In 43% of cases the visibility from a den was up to 15 meters on average. With rare exceptions, the visibility in any direction did not exceed 50 m. No bear dens were found in the open or visible from afar.

All but two dens were excavated in the ground (ground type dens). One den was located in a cave. Another den was a natural niche undercut by water, surrounded from the top and the sides with boulders (the animal has only dug out the entrance to it). Ground type dens are typical for regions with long cold winters and are predominant in the Russian Far East (Batalov, 1982; Chernyavsky et al., 1993; Seryodkin et al., 2003).

The structure was typical for the ground type dens. They consisted of the following components: entrance (covered from all sides entrance into the den), entrance hall (partially covered area outside the entrance or a deepening dug by bear at the entrance),

corridor (underground area between the entrance and the chamber, more narrow than the chamber), and the chamber (the extended underground portion of the den). There were piles of excavated earth next to the dug out dens, and inside each chamber there was a deepening where the animals lay.

The entrance of the majority of dens was perpendicular to the slope on which they were located. Only twice the directions differed by 90°, and in the case of the cave – by 180°. Five times the entrance was concealed in tree roots. The chamber had the largest volume in relation to other parts of the den (Table). The entrance hall was not always present in dens. The bed was usually located in the center of the chamber. In three dens the bears did not use any bedding. The bed was filled with dry grass and leaves in two cases.

Table. The sizes of brown bear dens in the Kronotsky Nature Reserve

Parameter	Number of measurements	Average size, cm	Minimum size, cm	Maximum size, cm
Entrance hall				
length	6	93	50	155
width	5	112.8	64	233
Entrance				
height	9	56.8	37	85
width	11	74.3	40	210
Corridor				
length	6	141.7	70	200
width	6	101.8	79	125
height	6	72.8	60	92
Chamber				
length	7	176.1	55	256
width	7	152.9	87	250
height above the bed	6	112.2	84	145
Bed				
length	6	97.3	85	115
width	6	88.7	51	115
depth	6	22.3	0	38

Ground dens were dug in the ground consisting of clay or clay mixed with sand. When choosing a place for a den the type of soil is very important for bears (Schoen et al., 1987).

In six cases dens were located under trees. Tree roots functioned as a structural framework binding the soil and strengthened the roof of the dens. Nine dens were used by the animals only once, four – repeatedly, and in four cases we failed to determine the number of hibernations. Two ground dens, a cave and a niche in rocks were used repeatedly. The cases of repeated denning in ground type dens are known for other brown bear habitats, for example, Yakutia, Volga-Kama region (Vaisfeld, Chestin, 1993), and Yellowstone National Park (Judd et al., 1986).

Brown bears living in the Kronotsky Nature Reserve prefers to arrange ground type dens on the slopes close to the south-west aspect in the area of birch forests and dwarf trees. The preferences in selecting the sites for dens are not yet sufficiently researched, and further work in this area is important for the conservation study of brown bears.

Brown bears in the region typically select for den sites with similar features and these habitats are critical to grizzly bear conservation. Denning habitat should be granted effective protection measures to reduce anthropogenic impacts. The vicinity of the Valley of Geysers is one of the most attractive habitats for brown bears in Kamchatka during the winter and spring, and this factor should be taken into account in exploitation of the area. Other research of brown bear den site selection indicate that bears select den not only by habitat features but also proximity to spring food sources (Pigeon et al., 2014), like those provided in the Valley of the Geysers. The combination of suitable denning habitat and proximity to geothermally enhanced vegetation should merit further study. We suggest to further research of brown bears denning ecology be conducted to compare denning ecology in the Valley of the Geysers to other denning habitats used by throughout the range of brown bears in Kamchatka.

REFERENCES

Batalov A. S. Features of Ecology of Brown Bears in the Sikhote-Alin in the Fall and Spring. In: *Conservation of Carnivorous Mammals of the Far East*. Vladivostok, 1982, pp. 35–37 (in Russian).

Chernyavsky F. B., Krechmar A. V., Krechmar M. A. The brown bear. The North of the Far East. In: *Bears*: *Brown Bear*, *Polar Bear*, *Asian Black Bear. Distribution*, *Ecology*, *Use and Protection*. Moscow, Nauka Publ., 1993, pp. 318–348 (in Russian).

Judd S. L., Knight R. R., Blanchard B. M. Denning of grizzly bears in the Yellowstone National Park area. *Intern. Conference Bear Ressearch and Management*, 1986, vol. 6, pp. 111–117.

McLellan B. N., Hovey F. W. Habitats selected by grizzly bears in multiple use landscape. *J. of Wildlife Management*, 2001, vol. 65, iss. 1, pp. 92–99.

Paczkowski J., Seryodkin I. V., Zhakov V. V. The importance of the valley of the geysers to the brown bear population of Kamchatka. In: *Conservation of Biodiversity of Kamchatka and Adjacent Seas*. Petropavlovsk-Kamchatsky, Kamchatpress, 2005, pp. 216–219 (in Russian).

Pigeon K. E., Nielson S. E., Stenhouse G. B., Cote S. D. Den Selection by Brown Bears on a Managed Landscape. *J. Mammalogy*, 2014, vol. 95, no. 3, pp. 559–571.

Schoen J. W., Beier L. W., Lentfer J. W., Johnson L. J. Denning ecology of brown bears on Admiralty and Chichagof Islands. *Intern. Conference Bear Ressearch and Management*, 1987, vol. 7, pp. 293–304.

Seryodkin I. V., Kostyria A. V., Goodrich J. M., Miquelle D. G., Smirnov E. N., Kerley L. L., Quigley H. B., Hornocker M. G. Denning Ecology of Brown Bears and Asiatic Black Bears in the Russian Far East. *Ursus*, 2003, vol. 14, no. 2, pp. 153–161.

Slobodyan A. A. On the Ecology of Brown Bear in the Carpathians. In: *Ecological Bases of Conservation and Rational Use of Carnivorous Mammals*. Moscow, Nauka Publ., 1979, pp. 233–235 (in Russian).

Sobansky G. G. Brown Bear in the Altai. *Hunting and Game Management*, 1974, no. 7, pp. 14–17.

Tavrovsky V. A., Egorov O. V., Krivosheev V. G. *Mammals of Yakutia*. Moscow, Nauka Publ., 1971. 660 p. (in Russian).

Vaisfeld M. A., Chestin I. E. *Bears*: *Brown Bear*, *Polar Bear*, *Asian Black Bear. Distribution*, *Ecology*, *Use and Protection*. Moscow, Nauka Publ., 1993. 519 p. (in Russian).

Van Daele L. J., Barnes V. G., Smith R. B. Denning Characteristics of Brown Bears on Kodiak Island, Alaska. *Intern. Conference Bear Ressearch and Management*, 1990, vol. 8, pp. 257–267.

УДК 599.742.21(571.65/.66-751.2)

БЕРЛОГИ БУРОГО МЕДВЕДЯ (*URSUS ARCTOS*) (CARNIVORA, MAMMALIA) В КРОНОЦКОМ ЗАПОВЕДНИКЕ

И. В. Серёдкин [1], В. В. Жаков [2], Д. Пачковский [3]

[1] Тихоокеанский институт географии ДВО РАН
Россия, 690041, Владивосток, Радио, 7
[2] Камчатский филиал Тихоокеанского института географии ДВО РАН
Россия, 683000, Петропавловск-Камчатский, Партизанская, 6
[3] Отделение парков, Окружающая среда и парки Альберты
Канада, Провинция Альберта, Канмор, Железнодорожный просп., 800, офис 201
E-mail: seryodkinivan@inbox.ru

Поступила в редакцию 13.09.2017 г., принята 24.11.2017 г.

Seryodkin I. V., Zhakov V. V., Paczkowski J. Brown Bear (*Ursus arctos*) (Carnivora, Mammalia) Dens of the Kronotsky Nature Reserve // Поволжский экологический журнал. 2018. № 1. С. 101 – 105. DOI: 10.18500/1684-7318-2018-1-101-105.

В Кроноцком заповеднике (Дальний Восток России) описано 17 берлог бурых медведей. Большинство берлог были грунтового типа. Берлоги были расположены в основном в верхней части склонов юго-западной экспозиции в берёзовых лесах, зарослях кедрового и ольхового стлаников. Структура зимних убежищ была типичной для берлог бурых медведей грунтового типа. В бассейне р. Шумная на Камчатке имеются предпочитаемые бурыми медведями места для обустройства берлог.

Ключевые слова: бурый медведь, *Ursus arctos*, берлога, Кроноцкий заповедник.

DOI: 10.18500/1684-7318-2018-1-101-105