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OBSERVATION OF A SUBADULT MALE, AN ADULT FEMALE AND TWO CUBS OF THE ASIATIC BLACK BEAR (*URSUS THIBETANUS*) HIBERNATING JOINTLY

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Despite examples in the literature of low sociality among species of the Ursidae family compared to other groups of carnivores (Gittleman, 1989), some observations of intraspecific interactions between bears suggest revising or expanding this established understanding may be appropriate. Friendly associations have been described for the brown bear *Ursus arctos* (Bledsoe, 1975; Zhiryakov, Grachev, 1993; Kudaktin, Chestin, 1993; Naves et al., 2014) and the sloth bear *Melursus ursinus* (Laurie, Seidensticker, 1977; Joshi et al., 1999). Cases of different individuals sharing dens have been described for the brown bear (Boby, 1985) and the American black bear *Ursus americanus* (Goodrich, Stiver, 1989; Schwartz et al., 1987). Females adopting unrelated cubs, absent human intervention, has been observed in brown bears (Hornocker, 1962; Erickson, Miller, 1963; Bledsoe, 1975; Barnes, Smith, 1993; Maksimov, Lepskaya, 2009), American black bears (Benson, Chamberlain, 2006) and polar bears *Ursus maritimus* (Atkinson et al., 1996; Derocher, Wiig, 1999; Lunn et al., 2000), as well as observations of family groups of brown bear, including cubs from multiple litters (Erickson, 1964; Dean et al., 1992; Swenson, Haroldson, 2008).

Temporal associations of typically solitary Asiatic black bears (*Ursus thibetanus ussuricus*) of different sexes and ages were first described during periods when an abundance of food resources enabled an increase in social tolerance. The formation of a complex family group has been observed for rehabilitated cubs subsequently released into the wild. Such was the case for a 3.5-year-old orphaned female that, two years after her release, independently approached and accompanied the man who raised her along with three orphaned cubs in the forest (Kolchin, 2015). Sysoev (1966) reported about the meeting of a group including a subadult male, an adult female and two cubs in

late autumn. Reunion of a subadult bear from a previous litter with its mother and her new offspring is a rare event that has previously been disputed for the Asiatic black bear (Bromlei, 1965).

In this communication, we describe the first record of joint hibernation of a mixed group of Asiatic black bears, consisting of a subadult male, an adult female and two cubs.

Observations were made in 2014/15 on the western macro slope of Central Sikhote-Alin (Russian Far East) in the upper reaches of the Gorbun River (basin of the Bira River, 47°04', 134°35'). In September 2014, a camera trap (Bushnell Trophy Cam 119736C) was set near the den of an Asiatic black bear, located in the hollow trunk of the Korean pine *Pinus koraiensis*. The denning tree grew within a stand of old-growth Korean pine-broadleaved forest on a slope of north-western exposure, at an altitude of 240 m above sea level. The outer hollow, which is the entrance to the den, was formed at the site of a branch breaking off the trunk at a height of 10 m from the ground. The internal hollow occupied by animals had a diameter of 130 cm and was located above the roots of the tree. There was a plentiful crop of Korean pine nuts and Mongolian oak acorns *Quercus mongolica*, the main autumn food sources for the Asiatic black bear, when observations were made.

During two periods of camera trapping (September 5 – November 30, 2014 and March 16 – May 10, 2015) individuals of this group were detected 103 times: 76 and 27 detections, respectively.

On September 6 and 13, 2014, a subadult (2–3+ years old) bear and a cub accompanying him were observed near the den. On September 30, these individuals visited the den at the same time with an old female (she had a distinctive, torn right ear) and another cub



Fig. 1. Mixed family of Asiatic black bear at the denning tree. The subadult male is pictured in the center of the photo. 5.11.2014, Gorbun River Basin (Russian Far East).

(the cubs were not individually identifiable). After spending 15 min at the denning tree, all four bears left in the same direction. On November 5, after a first, mild snowfall, all four individuals appeared at the tree together and climbed into the hollow (Fig. 1). In two days, the cubs and the subadult bear began leaving the den daily to eat Korean pine nuts nearby. The adult female left the den only twice, briefly on November 10 and 12. On the evening of November 12, before a heavy snowfall, all four animals climbed into the hollow, where they remained until spring.

Beginning March 28, 2015, the bears periodically left the den. On April 24, the subadult bear left the den permanently, while both cubs remained inside with the adult female. The adult female and cubs left the den for long periods of time and fed nearby, but continued to use the hollow daily for rest and sleep. On May 7, the adult female and cubs permanently left the den.

During the observation periods, adult male bears also visited the den: one and four detections were made in autumn 2014 and spring 2015, respectively. On November 9, 2014, an adult male approached the den after the subadult bear hid inside. The adult female and two cubs were also inside the den at the time. The adult male spent the next 10 minutes near the hollow (the camera recorded only the lower part of the

trunk). On April 1, 2015, the adult male bear actively sniffed the trunk of the occupied denning tree, rubbed his back against the trunk, and then climbed up to the hollow. Movements of male bears were also recorded near the den on April 23, May 9 and 10, 2015. Based on individual characteristics of one male (torn ear and the shape of the chest blaze), detections on April 1 and 23 and May 10 were assigned to this particular individual. In two cases, male bears could not be specifically identified.

In the summer of 2015, both 1.5-year-old cubs were separated from the adult female, which corresponds to the typical age at dispersal for the Asiatic black bear at a time when the mother's next breeding cycle begins (June–July).

A camera trap detected a subadult bear and an adult female, separate from each other and any cubs, three times: July 23 (adult female), May 21 (subadult bear) and July 25 (subadult bear). A 1.5-year old cub was detected near the den once on July 20. During autumn of 2015, no individuals of this group were detected near the den.

In April–May 2015, in addition to setting camera traps to identify possible family relationships between bears, scat samples were collected non-invasively near the den ($n = 12$). Samples were stored in airtight containers filled with granular silica gel (KSKG

GOST 3956–76). The integrity of the DNA in the samples was influenced by the duration of exposure to air at temperatures above freezing, storage and transportation. Genetic analysis of samples was carried out in the DNA-laboratory of the Norwegian Institute of Bioeconomy Research Svanhovd (NIBIO), Svanvik, Norway. Nuclear DNA isolation was performed using PSP Spin Stool DNA Plus Kit (Invitek) (system for collection, transportation and storage of stool samples and subsequent DNA purification) according to the manufacturer's instructions. Of the 12 samples, sufficient DNA for genotyping was isolated in only eight. The genotyping process was carried out using a procedure for brown bears, a species the laboratory specializes in. For this reason, the identifications to individual are given conditionally. PCR-amplification was performed according to the protocol used by Andreasen et al. (2012). Of the eight brown bear microsatellite markers used (MU09, MU10, MU23, MU59, Mu05, G10L, MU51, MU50) three were unsuitable for the Asiatic black bear, and one was identical in all individuals. Thus, conditional genotyping was performed using four markers (Mu05, MU09, MU10, MU51). Five individuals were identified – three females and two males. The ML-Relate program was used to analyze family relationships. Results showed a high probability of relatedness for two female individuals (likely the cubs) and a high probability of these individuals being sisters (relation coefficient 0.79). Results for another pair of individuals (a female and male; most likely the adult female and subadult male) showed a high probability of these individuals being mother and son (coefficient 0.50). With the exception of one of the males who was unrelated to the other individuals, it was not possible to assess the degree of relatedness for the remaining individuals using the available data. Before genetic analysis was conducted, a subadult male was previously misidentified as an “adult female” (Kolchin, 2017).

The first mentions of a “pestun” or “babysitter bear” (a young bear from a previous litter that spends time with a female and her new cubs) are found in Russian hunting literature regarding brown bears (Cherkasov, 1867; Shirinsky-Shikhmatov, 1900). Taking an anthropomorphic view, the social role of the pestun was described as assisting the mother in raising younger siblings. In fact, the presence of a subadult bear can have negative consequences for the viability of the new cubs. Yudin (2006) describes observations of a mixed litter of the Asiatic black bear in captivity wherein 2-year-old males hibernated in the same den with their pregnant mother. In January, the female gave birth, but the exact number of cubs was unknown. The young males actively suckled milk, pushing newborns off the nipples. In the spring, only one unusually small cub emerged from the den, showing signs of exhaustion. A similar case of a 2-year-old male associating with his mother and a new cub that died from exhaustion was described for brown bears in Scandinavia

(Swenson, Haroldson, 2008). The authors describe two cases of cubs being separated from their mother in the breeding season during their first and second years of life. After mating, the females reunited with the cubs and hibernated with them in the same den, giving birth to new offspring. The exceptional rarity of observed mixed-aged litters (two out of 406 for radio-collared females) (Swenson, Haroldson, 2008) indicates that a pregnant female reuniting with previous offspring may be maladaptive: with more bears in the den, the likelihood of newborns dying from starvation or unintentional injury by older siblings can be high.

In two cases similar to ours, multi-generational hibernation in the same den have been described for the American black bear (Schwartz et al., 1987). In the first case, a female overwintered with her 1-year-old cub and 4-year-old daughter from a previous litter. In the second case, a female overwintered with her 1-year-old male cub and a 2-year-old female, who was the daughter of another female. A case of an adult female hibernating with two 1-year-old cubs and a subadult individual (not older than 3 years) was described for brown bears in the Caucasus (Boby, 1985). Examples of lactating females adopting cubs are widely known for different bear species (Hornocker, 1962; Atkinson et al., 1996; Benson, Chamberlain, 2006, et al.). It can be assumed that subadult bears associating with a female and cubs is more likely outside the den than subadult bears hibernating with a pregnant female within a den where there is an obvious risk to cubs.

The behavioral mechanisms underlying the reunion a young bear from a previous litter with a female and her new cubs were revealed during experimental work with orphaned Asiatic black bear and brown bear cubs (Kolchin, 2015; Pazhetnov, Kolchin, 2015). An orphaned, female Asiatic black bear was removed from the den at 2.5 months of age, and subsequently imprinted on the appearance, smell and voice of the author, which resulted in an instinctive impulse to follow the author during daily excursions in the forest. In fact, a surrogate family was formed between the female cub and two male cubs being kept in the same forest enclosure, where the author acted as a surrogate mother. Following rehabilitation, the female was released into the wild in a familiar area near the enclosure at an age of 1.5 years. Two years passed with no contact between the female and the author. At this time, the author was working with a new group of orphaned Asiatic black and brown bear cubs. The female, now 3.5 years old, lived in the vicinity of the enclosure, and followed the tracks of the author, but avoided direct contact with him in spring and summer. At the end of September–October, the female found the author and cubs by following their scent and accompanied them on excursions. The female exhibited affiliative behavior with the author and cubs, including play. There was a plentiful crop of acorns at the time which the bears had been feeding on since Au-

gust. With an abundance of food available, the female likely engaged in intensive feeding, allowing her to meet her nutritional needs and facilitate social interactions. When the author carried out work with a new group of Asiatic black bear cubs the following year, the female avoided direct contact with the author all season and, in the case of casual encounters with her and the cubs, she left or hid in trees. The Korean pine nut and acorn crops failed in the autumn, so the bears faced a shortage of food sources.

In times of abundant food a decrease in intraspecific competition for food resources allows for more tolerant relationships between bears. Bears may exhibit friendly behavior or form temporary associations between related or familiar individuals, including between a female with cubs and bears from previous litters. Of the 11 such known associations of Asiatic black bears, 10 were recorded during periods of abundant Korean pine nuts and acorns (Kolchin, 2015). At the same time, failure of autumn mast crops can result in cubs separating from their mother prematurely at an age of 8–9 months. Numerous observations of orphaned cubs were made in the fall of 2015, when Korean pine nuts, acorns and other food sources were absent throughout Asiatic black bear range in Sikhotealin (Kolchin et al., 2017).

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НАБЛЮДЕНИЕ СОВМЕСТНОГО ЗАЛЕГАНИЯ В БЕРЛОГУ МОЛОДОГО САМЦА, ВЗРОСЛОЙ САМКИ И ДВУХ ДЕТЕНЬШЕЙ ГИМАЛАЙСКОГО МЕДВЕДЯ (*URSUS THIBETANUS*)

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Мы сообщаем о первой регистрации залегания в одной берлоге молодого самца, взрослой самки и двух медвежат-сеголеток гималайского медведя. Молодой самец, наиболее вероятно, являлся детенышем самки из предыдущего выводка. Наблюдение сделано во время обильного урожая кедровых орехов и желудей – основных осенних кормов гималайского медведя на Дальнем Востоке России. В условиях трофического комфорта повышение социальной толерантности может сопровождаться временным объединением в группу родственных или знакомых особей.

Ключевые слова: внутривидовые ассоциации, гималайский медведь, Сихотэ-Алинь, смешанные выводки, *Ursus thibetanus*