

RESEARCH PAPER

Biological and socio-economic function of brown bear (*Ursus arctos syriacus*) in the form of ecological silviculture concepts in Hyrcanian forest

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Highlights

- The ecological and socioeconomic characteristics of the brown bear in the forest stands of northern Iran, studied using archival documents and unstructured interviews with qualitative content analysis.
- According to the results, the most important biological activities of brown bears were controlling populations, facilitating the decomposition, and accelerating the natural regeneration of trees.
- From a socioeconomic point of view, it harms some human activities such as animal husbandry, creating misconceptions about itself.

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Abstract

The study of the ecological parts of animals is always a gap in forest science and ecological studies. The present study aims to investigate the ecological and socioeconomic characteristics of brown bear (*Ursus arctos syriacus*) in the forest stands of northern Iran. The study relies on archival documents, including books on forestry, wildlife, history, anthropology, environmental sociology, natural resource law, and biography, as well as research reviews and sources, including relevant articles and reports, exploring and searching the Internet for relevant evidence, and conducting unstructured interviews. Unstructured qualitative content analysis interviews were conducted with experts and local people who have conflicts with brown bears, such as gardeners, beekeepers, and ranchers. The documents studied show that from a biological perspective, brown bears control populations of insects, invertebrates, and small vertebrates; facilitate decomposition and decay of dead wood in the forest; perform natural pruning; accelerate natural regeneration of forest trees; perform a carnivore burning function; and reduce the risk of wildfires. In socioeconomic terms, it also harms livelihood activities such as beekeeping, horticulture, and animal husbandry, leading to a certain belief in the animal. Understanding the ecological functions of forest animals such as brown bears in tree seed dispersal and establishment, soil fertility, and natural habitat leads to knowledge and awareness among decision makers and locals of the importance of wildlife conservation.



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1. Introduction

Carnivorous mammals, specifically those at the top of food chains, networks, and pyramids, are the key and standard of health and species richness of ecosystems and play a key function in biodiversity. From the carnivore's order, 8 families and 31 species have been identified in Iran so far and two species of them have become extinct, including the Persian lion (*Panthera Leo Leo*) and Mazandaran tiger (*Panthra Tigris virgata*). Iranian carnivores include bears, dogs, cats, mink, otters, and hyenas (Brodeur et al., 2008).

The bear family is a suborder of carnivorous dogs. The brown bear is the most important member of this suborder. Today, some zoologists consider the family of mink, dogs, and jaws to be the closest living relatives of bears. Bears and dogs have common ancestors that separated in the Eurasian region about 40 million years ago. Their common ancestor (i.e., Mysid) was about the same as a raccoon size, and the separation of bears from Mysid changed their appearance and some of their behaviors over time. Most bears evolve, and their tails gradually become smaller. Their carnivorous (fleshy) teeth additionally became smoother and shorter for chopping plant material. Bears transformed into multiple forms and evolved creatures that were remarkably different from mysids, however despite all these distinctions and changes, they inherited the capability to climb trees from mysids, and have maintained this skill to current. Bears are the heaviest carnivores in the universe and the weight of some of them, including Kodiak and polar bears, reaches up to 800 kg. Male and female bears are quite comparable in appearance and differ exclusively in size. Male bears are usually nearly twice as large as females. Male bears reach their maximum growth at 10-years of age and female bears after 5-years of age.

The bear family consists of five genera and eight species. The Tremarctos genus includes the spectacled bear or the Andean bear. The Ailuropoda genus consists of the giant panda bear (*Ailuropoda melanoleuca*). The Ursus genus contains the American Black Bear (*Ursus americanus*), the Brown Bear (*Ursus arctos*), the Polar Bear (*Ursus maritimus*), and the Asian Black Bear (*Ursus thibetanus*). The Melursus genus comprises the Lazy Bear. The Helarctos genus takes in the Sun bear (*Helarctos malayanus*). Bears are versatile faunas, and each has adapted best to the climatic conditions of its habitat. They live in extensive areas of the northern hemisphere; and are found on Europe, Asia, North America, and South America continents. The polar bear survives in the cold Arctic, the American black bear exists in the American jungles, and others, like the panda, live in the forests and reeds of Asia. Living in various climates has caused differences in size, color, and body covering. However, members of this family also have many characteristics in common with each other. A bulky and solid body, immense skull, snout, small and closed eyes, wide and huge claws, small and round ears, coarse and thick hair, and significantly short tail are the main usual features in the bear family.

The body of most bears, except the Sun bear, which has a short coat, is covered with long, compact, coarse hair. Their body color is usually black, dark brown, light cream, or white. There are also distinct white spots on the face and chest of some bear species. Bears, unlike other members of the carnivorous family, are bottom-dwelling mammals, and they spread their weight on their hind legs, making them heavy and slow to walk. Bears are able to walk a short distance on two legs. The members of this family have large and wide claws. Each claw consists of five fingers with long, curved nails at the end (Fig. 1). The nails are always protruding and, unlike feline nails, cannot curl into the claw sheath. Robust hands and long and curved nails allow bears to climb trees if necessary to escape danger or to eat fruit.



Fig. 1. Bear footprint (right: footprint and left: hand footprint).

Bears are classified as carnivorous mammals. However, except for polar bears, which mostly feed on meat, and panda bears, which often feed on bamboo, other members of the family are omnivorous and use a variety of food sources. The diet of bears is directly related to the season and the habitat in which they live. Bear species feed primarily on a variety of fruits, insect larvae, small vertebrates (amphibians and small reptiles), invertebrates, animal carcasses, honey, grasses, leaves, fruits, nuts, seeds, fungi, tubers, fish, and even bird eggs included in their diet. Bears have an extraordinary interest in honey, identify forest honey beehives by smell, and do anything to access the honey. The bear's body is resistant to bee stings and only the tip of the snout and around the lips are vulnerable to bee stings; because in other parts of the bear's body, the hair covering the body is very thick, and it is practically impossible for the bee to bite. It tends to eat mushrooms, tree fruits, and freshly grown grass covered in the forest in spring and summer. To access the fruit, it climbs trees and, with the aid of its heavyweight, breaks the branches and returns to the ground, and consumes the fruit.

The behavior of bears also changes with the onset of autumn in cold regions. They seek food day and night and feed on whatever food source is available to them in these surroundings. They store more lipids in their body, and sometimes their weight increases up to about twice by accomplishing this. As winter approaches and the weather cools, bears' access to food sources becomes considerably restricted. They reduce their activity to survive and adapt to severe conditions, such as mammals that have hibernated and take refuge in a cave or shelter that has already prepared for a long rest. These bears stay in their shelter until the end of winter, do not eat or drink, and use only their stored suet. Unlike other hibernating mammals, bears do not lose much of their body temperature during hibernation. As a result, zoologists believe that this behavior of bears is more like a long rest than a real hibernation. However, some researchers consider this a true hibernation because the bear's heart rate drops dramatically to about half normal. Bears only become immobile during the winter, whereas physiologically their body temperature, heart rate, and alertness do not change, and they can attack or escape if they feel threatened.

The bear's immobility reason in winter is the lack of food. As a result, the body's energy needs are met by burning stored fat under the skin during the winter. Therefore, they may have lost up to 25% of their body weight by spring. It is worth noting that when bears are in their winter shelter, their bodies remain inactive to consume less energy. In addition, waste disposal is not performed during this period because the intestines are completely closed because of the deposition of plant material. The bears give birth during hibernation (polar bears do not hibernate) around January and February. The offspring are mature enough to be able to move with their mother by spring. Newborns are between 2 and 4 infants. Unlike oversized bear bodies, offspring weigh a maximum of 500 grams at birth. Infants are breastfed during hibernation and usually remain with the mother for one to two years. Then they survive independently. Each male bear mates with several female bears at the mating time, while male bears do not have a harem.

There are two species of bears in Iran. Brown bear (*Ursus arctos*) whose habitat is in Hyrcanian and Arasbaran forest areas, Alborz and Zagros mountain ranges, mountain meadows, and forest margins. Furthermore, the Asian bear (*Ursus thibetanus*) whose habitat is in mountainous areas of Baluchestan, Kerman, Bashagard, and Rudan mountains on the east of Minab in Hormozgan province. The big brown bear is the largest carnivore (i.e., among the bear species, the largest species, after the polar bear, is the brown bear) in Iran, which has a relatively vast distribution in the northern and western half of the country, as a result of the presence of Alborz and Zagros mountains. The brown bear has the highest distribution among bear species (Madadi et al., 2020). The brown bear is the most widely distributed mammal after the gray wolf. It has suffered more damage than other regions of the world, and its population has significantly decreased in Asia, which researchers have attributed to human activities and habitat fragmentation (Madadi et al., 2020). Zoologists have differing views on the subdivision of the brown bear subspecies. According to recent studies on the DNA of this animal, brown bears in different parts of the globe are genetically very similar, despite the distinctions in size and body color. Some zoologists believe that Iranian brown bears are a subspecies of the Syrian brown bear (*Ursus arctos syriacus*). This bear is the smallest subspecies of the brown bear and has a light color and more or

less short nails. Generally, subspecies of brown bear include the Syrian brown bear (*Ursus arctos syriacus*), the natural bear (*Ursus arctos pruinosus*), the grizzly bear (*Ursus arctos horribilis*), the Ursus brown bear (*Ursus arctos*), the eastern bear (*Ursus arctos collaris*), Eurasian brown bear (*Ursus arctos arctos*), Kodiak bear (*Ursus arctos middendorffi*), Kamchatka brown bear (*Ursus arctos beringianus*), Himalayan brown bear (*Ursus arctos isabellin*).

Table 1 introduces the subspecies of brown bears.

Table 1. Subspecies of brown bear.


Row	The name of the brown bear	Latin name	Picture
1	Syrian brown bear	<i>Ursus arctos syriacus</i>	
2	Tabat bear	<i>Ursus arctos pruinosus</i>	
3	Grizzly Bear	<i>Ursus arctos horribilis</i>	
4	Amur brown bear	<i>Ursus arctos lasiotus</i>	
5	East Alaska Brown Bear	<i>Ursus arctos collaris</i>	

Table 1. Continiue.

6	Eurasian brown bear	<i>Ursus arctos arctos</i>	
7	Kodiak bear	<i>Ursus arctos middendorffi</i>	
8	Kamchatka Brown Bear	<i>Ursus arctos beringianus</i>	
9	Himalayan brown bear	<i>Ursus arctos isabellinus</i>	

Many studies have shown the distribution of forest tree seeds by immense mammals living in forest stands. Large mammals living in forest stands are often herbivores or omnivores. The endozoochory, seed transport by attachment of seeds to external organs such as fur or body hairs of large mammals, and intentional seed transport (i.e., Synzoochory) are the main mechanisms of seed dispersal in forest stands (Karimi et al., 2018).

In many studies at home and abroad, brown bears have been studied. For example, studies analyzing the factors affecting the spatial and temporal ecological nests of brown bears, and examining the distribution, population, and abundance of brown bear species, the study of bear physical characteristics, habitat suitability and trend of ecological nest changes, quantification of the effect of environmental factors on the distribution of brown bears (Falahati et al., 2018), study of eating habits and diet (Madadi et al., 2020; Karimi et al., 2018), bear footprints and traces in nature and forest, study of the conflict between bears and humans (Farhadinia et al., 2017; Asadollahi et al., 2020; Madadi et al., 2020; Heemskerk et al., 2020), bear road accidents (Becker, 2011).

The forests of northern Iran (Hyrcani forests) have appeared as a narrow and long strip on the northern slope of the Alborz mountain range. These woodlands are among the vivid regions in the world for flora and fauna. It looks very similar to the mixed broadleaf forests of Central Europe, however it is much better in terms of the number and variety of species. In fact, Hyrcanian forests are among the oldest forests in the world. The study of the ecological functions of animals such as brown bears has always been considered a missing link in

forest science research. The purpose of compiling this review article is to investigate the role of brown bears in forest ecology and socio-economic issues of indigenous communities in the forests of northern Iran.

2. Materials and Methods

2.1. Process of conducting research

The data of the present article have been collected to examine the part of brown bears in forest ecology as well as in socio-economic issues of indigenous communities in the northern forests of Iran. This study is conducted by archive documents that include books on forest and wildlife sciences, anthropology, and biography, as well as a review of research and resources including related articles and reports, cyberspace exploration, and relevant evidence with unstructured interviews using qualitative content analysis. There 20 books (eg., forest ecology, forestry, wildlife science, history, anthropology, environmental sociology, natural resource law, and biography), 30 articles, 1 report, and 8 sites in cyberspace were used. The period for reviewing the relevant documents and conducting unstructured interviews by qualitative content analysis method was performed from October 2021 to March 2021, i.e., for six months.

Unstructured qualitative content analysis interviews were conducted with experts in the field of forest and wildlife ecology as well as related individuals, taking into account their jobs (i.e., ranchers, beekeepers, gardeners, and...) in indigenous communities. The issue can be examined from diverse aspects completely freely without the intervention of the questioner by allowing the informants (i.e., lack of orientation and intellectual bias). Respondents in any way wished to comment on the study of brown bear function in forest ecology also socio-economic issues of indigenous communities in the forests of northern Iran. It should also be noted that the interviews were conducted individually (i.e., in person), and all conversations were recorded and then transcribed with the permission of the informants. It is worth mentioning that many comments were collected from informants in the form of messenger (i.e., E-mail) and text messages in WhatsApp and Telegram Apps. These concepts extracted from the interview with informants were examined as guiding and complementary information in the research process. Many concepts found in the initial revise were also not found in the documents. With further deepening, the concepts driven from the interviews were obtained as novel information from the documents inspection.

The purposive sampling method was recruited to select informants in the current study. Initially, a list of people who have the researcher's characteristics such as academic education, research activities, and executive background in the forestry, wildlife ecology and environmental field (i.e., NGOs) was prepared with students, researchers and people from local communities in targeted sampling. Finally, individuals are asked to participate in the research because of the availability of individuals and the desire to participate in the interview (Sharma, 2017). Therefore, originally, was prepared a list of experts and interviews were conducted according to their desire and accessibility. There, 35 experts were interviewed. With the same number of interviews, there was a theoretical saturation (i.e., the informants no longer expressed a new concept). Table 2 shows the characteristics of the participating people in the interviews (i.e., informants).

Table 2. Information of informants.

Row	Informant affiliation	Number
1	Faculty members of universities and research centers	10
2	Executive experts in organizations	5
3	Researchers-Students-Graduates and Non-Governmental Organizations (i.e., NGOs)	8
4	Indigenous-local communities	12
5	Total	35

It is worth mentioning that row 1 includes some faculty members of the Natural Resources Faculty, University of Tehran (i.e., Forestry and Forest Economics and Environment Departments), Faculty of Natural

Resources, the University of Guilan (i.e., Department of Forestry), and several members of the Research Institute of Forests and Rangelands. Row 2 of the retirees of the Natural Resource and Watersheds Organization who were members of the Supreme Council of Forests and Rangelands of the Forests Organization, with the employees of the Environment Organization who are also university lecturers. Row 3 includes individuals from the Shamim Forests of Iran, the Natural Resources and Environment Group of the Chista Young Thinkers Association, and the Environmental Students' Club, as well as many graduates of the Faculty of Natural Resources, University of Tehran. Row 4 was some people who had livestock, beekeeping, horticulture, and forestry project employees in Mazandaran province (Nowshahr, Najardeh, Khairudkenar, and Bandapi villages and Amol, Varazdeh Oyar village, and Chalous). Of the 35, 5 were women, and the rest in all classes (i.e., university, execution, and local communities) were men. The age and grade of class 1 (i.e., academics and research institute) include 60 years and the doctorate. Row 2 (i.e., executive department) is 70 years, and the master. Class three (i.e., activists in non-governmental organizations, Students, and graduates) have 30 years and a master's. Fourth row include indigenous communities, were 50 years old and had a diploma (Sharma, 2017).

3. Results and Discussion

The section first examines the role of brown bears in forest ecology and then examines the socio-economic issues of indigenous-local communities with brown bears.

3.1. *The brown bears in the ecosystem of forest organisms in northern Iran*

A forest is an extensive area covered with trees, shrubs, and other plants that, together with animals, develop an advanced biocoenose between its constituent elements (i.e., flora and fauna). This matrix is able to survive independently under the influence of environmental factors. Such a biological coexistence between animals and plants under the influence of environmental factors (e.g., climate, earth, soil, etc.) forms a general, complex and orderly set called Biogeocoenose. This ecological collection is the same as the ecosystem. Generally, animals contribute to the sustainability of forest ecosystems with perform functions such as assisting in the regeneration and distribution of seeds (Bengtsson et al., 2000), establishing seeds and seedlings, pest control (Leidinger et al., 2019), a scavenger function with carnivores (Stiegler et al., 2020), creating the balance in the forest (food pyramid, population size, network, and food chain), forest soil fertility and forest restoration.

As a result, the brown bear's habitat is in the forest, and the giant mammal and as well as the biggest carnivore in the forests of northern Iran on the top of the food chain and networks as a carnivorous hunter and third-tier consumer. One of the most functions that can be considered for brown bears in these forest habitats is to balance the wildlife population, especially insects, invertebrates and small vertebrates such as amphibians and small reptiles in these forest ecosystems. By attacking forest ranches, eating honey and damaging beekeepers' beehives, and using orchard fruits (such as apples, plums, apricots, etc.) cause a conflict between humans and wildlife and cause extensive livestock losses and economic losses, for some reason, brown bears can't hunt and feed in natural areas (Madadi et al., 2020). In general, the presence of brown bears in the forest ecosystems of northern Iran confirms the following:

3.1.1. *An example of an umbrella species*

Brown bears at the top of food chains, networks, and pyramids in forest ecosystems indicate the stability of the quantitative and qualitative forest stands structure, the function and diversity of forest habitat, the health index (Menge, 1992), and the ecosystem value of Hyrcanian forest (Fig. 2). It can be considered a key indicator of ecosystem health determination (Sergio et al., 2008) (Fig. 2).

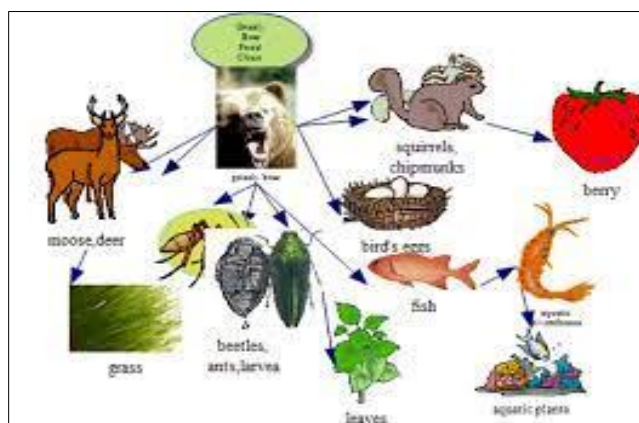


Fig. 2. Brown bear at the top of the food web in forest ecosystems.

3.1.2. Controlling insects, invertebrates and small vertebrates

The larvae of many insects in the forests of the north of the country are considered plant pests that bear feed on them to eliminate and reduce their population (i.e., pest control) from these forest ecosystems. Furthermore, bears disturb the population balance of invertebrates and small vertebrates if the population of invertebrates and small vertebrates is too high (Fig. 3). It will cause the loss of regeneration, feeding on the root system and leaves of seedlings.

3.1.3. Facilitate decomposition and decay of forest dead woods

Unlike felines such as tigers, leopards, lynxes, wildcats, snow leopards, and mountain lions that use standing and fallen dead trees in forest ecosystems to sharpen their claws (Dudley and Vallauri, 2005), bears always try to break downed trees to feed on the insects and larvae in them (Fig. 3). In practice, dead woods are decomposed, and bears feed on the insects in them.

3.1.4. Perform natural pruning

Bears break it by hanging on the branches that attach to the main trunk (i.e., stem). These are possible by using heavy weight and gravity, which practically causes bears to do natural pruning in forest ecosystems (Nolte, 2003) (Fig. 3).

3.1.5. Contribute to the natural regeneration of forest trees

Occasionally, light seeds such as winged hazelnut seeds (i.e., Samar), small hazelnuts, and capsules attach to the fur of the brown bear, and the bear moves by moving the nuts. Therefore, it seems that brown bears have also helped the natural regeneration by moving light seeds such as ash (*Fraxinus excelsior*) and maple (*Acer velotinum*) species (i.e., winged hazelnut), Caucasian Wing – nut (*Pterocarya fraxinifolia*); (i.e., small hazelnut), and boxwood (*Buxus hyrcanus*) (capsule) (Karimi et al., 2018). In addition, as mentioned earlier, the brown bear is omnivorous. That is, in addition to flesh, it feeds on insects, invertebrates and small vertebrates (e.g., amphibians, small mammals, and fish), fresh grasses grown in spring, fruits, fungi, seeds, leaves, and roots of trees. Brown bears facilitate regenerate or revitalize these trees by eating fruits and excreting the kernels or seeds, which are thinned by acid in the digestive tract of brown bears (Karimi et al., 2018). because of the bear's flatness (Fig. 1), as a result of the possibility of the whole bear's sole colliding with the seeds when moving, there is an opportunity of placing the seeds in the soil due to being under heavy force (i.e., bear body weight); (Fig. 3).

The brown bear is very being observed in forest gaps because of the abundance of dead woods (Takahashi and Takahashi, 2013). It often does the disposal of waste in the same place. Therefore, it strives to distribute the undigested seeds of forest trees in its dung. Seeds of tree species and shrubs in forest stands such as hawthorn (*Crataegus* sp.), barberry (*Berberis* sp.), wild cherry (*Cerasus* sp.), and raspberry (*Rubus* sp.) have the highest

percentage in brown bear dung in spring and summer (Karimi et al., 2018) (Fig. 3). The mass and volume of feces are more than other forest animals as a result of the bulk of the brown bear. It causes the fertility of forest soils, practically as a fertilizer.

3.1.6. Perform carnivorous performance in the forest

The bear feeds on carcasses of animals (i.e., carnivores) that have been hunted by animals such as wolves, lynx, and leopards when plant and animal materials such as insects, large and small mammals, and invertebrates are not available (Allen et al., 2014). The carcass of a grown-up domestic cow from which a brown bear was feeding has been observed in the Paloon Gardan area located in Central Alborz. A part of the carcass of a several-day-old baby deer that the bear had eaten was found in Golestan National Park. The carcasses of several dead sheep from which the bear had eaten have been observed in north of Masjed Soleiman. Bears practically contribute to the health of the forest and eliminate the cause of the spread of contaminants originating from animal carcasses (Fig. 3).



Fig. 3. Performing some functions in the forest by a brown bear.

3.1.7. Reduce the risk of forest fires

Generally, herbaceous plants that grow in spring due to immaturity and as a result of high soluble nutrients and low structural cellulose and lignin are the food preferences of bears. However, green vegetation alone is not enough to meet the energy needs of immense brown bears. Therefore, bears are also dependent on meat that can be obtained through carcass eating or hunting. Hunting is difficult for bears because bears do not have the agility to hunt and practically eat carcasses. However, the hunting is often considered opportunistic for them. Consequently, bears feed on green (i.e., herbaceous) vegetation in the spring to establish the seeds of forest trees by eliminating grassy competitors, some of which are aggressive and opportunistic. They also help reduce the probability of fire by covering the grassy plants of the forest floor (Fig. 4).



Fig. 4. Feeding brown bears from herbaceous plants in forest stands.

3.2. *The brown bears in socio-economic issues of indigenous communities in northern forests*

The function of bears in creating socio-economic problems for indigenous-local communities in the northern forests includes creating conflicts with indigenous-local communities whose occupations are livestock, beekeeping, and horticulture. It seems that the cause of human-bear conflict is agricultural development, bear habitat destruction associated with habitat fragmentation, access to human food resources, reduction of natural food resources, and bear habitat occupation by local communities as a result of human population expansion (Madadi et al., 2020).

The conflict between humans and brown bears than other carnivores (e.g., cats, dogs, and hyenas) has been less studied, especially in Asia (Madadi et al., 2020). What is certain is that the conflict between humans and brown bears causes economic damage to indigenous communities, especially ranchers, beekeepers, and gardeners, which results in a change in the attitude of local people towards bears. In addition, the attitudes and beliefs of indigenous communities towards the presence of brown bears in the northern forests can be influenced by people's opinions. However, possibly the attitude of societies is only the result of the thoughts of their predecessors. There are many studies concerning the deaths of brown bears roads in the forest roads of the northern forests (e.g., the transit road of Golestan National Park).

3.2.1. *Brown bears and beekeepers*

The bear accomplishes everything to obtain honey because of its great desirability. Because bears are active at night, beekeepers usually shoot around the hives several times during the night, for example, once every two or three hours, to keep the bear out of the beehives. If the bear approaches the beehive, it will cause a lot of damage to the hives in the first step that they providing access to the honey. It then kills a large number of bees, often with both hands. As a result, the thickness of the bear's skin overall body (except the areas around the lips and snout that are sensitive to bee stings) does not fall on the body of the bees sting. Therefore, it causes the death of bees (i.e., worker bees). Eventually, he eats honey, which causes countless damage to beekeepers. There is a conflict between beekeepers and brown bears all year round.

3.2.2. *Brown bears and gardeners*

Many ranchers in the northern forests have set up forest huts such as Cowpens. The livestock, settlements, and households analysis changes in the northern forests of the country in the form of an evaluation of the plan to remove livestock from the forest has shown that the number of livestock units living in settlements and forest margins and settlements with more than 20 households in lowland areas has increased. Correspondingly, this project has been effective in reducing the number of livestock units and semi-mobile and mobile livestock units in the middle and upper forest areas. Bear attack on moving cattle from lowland to highland or vice versa or bear attack on livestock on forested areas in the northern forests in addition to causing economic damage to the cottage, such as breaking of logs and collapsing the roof, causing the destruction of equipment inside the cabin, the destruction of products in forest houses such as milk, yogurt, buttermilk, butter, cheese, curd, and cranberry, can cause the loss of livestock and cause widespread economic damage.

Brown bears and ranchers.

3.2.3. *Brown bear in beliefs and thoughts*

Unlike other predators such as lions, tigers, and leopards, bears do not have many functions in Iranian literature however; there are a few cases in which bears have a specific position. In the Shahnameh of the Abolghasem Ferdowsi, the bear is a symbol of bravery, on Rumi's Masnavi (in the story of Aunt Bear's friendship), it is a symbol of an ignorant man who should not be befriended. Some proverbs in different parts of Iran are also dedicated to bears and related instructive adventures. For example, the:

- a) Getting the bear to dance: forcing someone to do something against their will.
- b) Plucking a bear's hair is a booty: from a miser, everything you take is a booty, even if it is small.

- c) The bear was told to go to work and went out to the bathroom: when someone was doing something useless and unwise.
- d) Messi's Bear and Bedouin House: They asked someone for something they could not do.
- e) Does the bear lay eggs or the baby? Someone who can do something complicated.

In some ancient works and texts of Iran, such as the book of *Bandehesh*, it has been mentioned that the emergence of a bear was the result of Jamshid Shah's marriage to a demon. In the people's beliefs in different parts of Iran, brown bears have a strong and distinct presence. Very specifically and extensively in most rural and forested areas of the forests of northern Iran, people believe that a male brown bear steals beautiful girls and hides them in a cave to marry them. For the girl not to run away, she rubs her soles with her rough tongue so that the skin of the girl's soles becomes as thin as onionskin, and it is no longer possible to escape. In most of these stories, the bear treats the girls kindly and provides them with mountain honey, the best fruits, and food, and after a while, the bear and the girl have children. It is worth noting that none of those who quote or retell this story has seen a brown bear steal a girl. They have heard this story from other people. Perhaps telling this story is to scare girls and prevent them from going to the forest alone. Many Iranian nomads, such as the Bakhtiari tribe, consider the bear a symbol of warfare, strength, bravery, and heroism. People who know a lot about bear species, individuals who are afraid of this species, and somebody who has a traditional belief in this species, agree with the presence of bears in nature (Madadi et al., 2020). In addition, the results showed that the knowledge of local communities about bears has been effective in a positive attitude and interest in the presence of bears. Furthermore, fear of bears has not caused a negative attitude and lack of interest in bears. However, as the conflicts increase in recent years in Mazandaran province, economic losses may increase retaliatory actions by local people and endanger the survival of this species.

The reason for the fear of brown bears is that they are carnivores, large in stature, standing on two legs, producing loud noises, and hearing the beliefs and traditions of their predecessors. An ancient people in northern Japan on the Hokkaido Island believe that the bear is the god of the mountains and is superior to all gods. In Siberia and Alaska, the bear is seasonal; because it disappears in winter and appears in spring. The Canadian Algonquins called the bear their grandfather. Most Siberian fishermen use titles such as old man, old black man, forest chief, grandfather, grandmother, and grandmother when talking about bears.

The utilization of forests in the north of the country was subject to having a forestry plan from 1959. Therefore extended areas of forest habitats in the Guilan, Mazandaran, and Golestan provinces enclosed by forestry plans. A forestry plan refers to a set of codified activities in which all vital interventions with the conservation, restoration, development aim, and proper operation to have continuous production (i.e., including goods and services) according to the type, amount, time, the place of activity; and expenses and incomes are specified in ten years.

4. Conclusion

Forests and wildlife are not studied in a single complex, either the university or the executive division in Iran. Forest is the habitat of many animals, and those who study forest science do not know much about wildlife. Wildlife training units have no place in the topic of forest science. The same is true for environmentalists concerning forest ecology and forestry. This situation is not the result of a comprehensive and complete knowledge of forest science and wildlife topics, which has led to the non-study of wildlife functions in forest ecosystems. Understanding the ecological functions of forest animals such as moving and settling tree seeds, soil fertility, and natural habitat result in the awareness of indigenous communities about animals. As a result, knowledge and attitudes of local communities towards wildlife can be significantly effective in raising awareness and therefore protecting wildlife (Bertassoni, 2012). Today in Iran, brown bears have a high level of conflict with local communities (i.e., gardeners, beekeepers and ranchers). So far, however, few studies have been conducted on the tension of brown bears with local communities (Madadi et al., 2020). While these few studies have result in awareness and efforts to reduce and moderate conflicts. There are many

superstitions about brown bears compared to other animals in the Northern provinces (i.e., Mazandaran, Guilan, and Golestan). This result in a negative attitude of indigenous communities towards bears, and as a result, conflicts increase. It is important to note that fear of a species does not necessarily mean dislike. In most cases, animal fear is a result of insufficient knowledge of the wildlife behavior. For example, in a study, although locals were afraid of brown bears, they said they should be protected (Madadi et al., 2020).

Undoubtedly, people's knowledge of the brown bear as well as its importance in forest ecology can positively affect the attitude of local communities towards this species. This knowledge does not necessarily have a comprehensive and accurate of the animal. Somewhat, it is enough for local people to know that the presence of bears in nature and forest ecosystems is essential (Madadi et al., 2020). Younger people have a more optimistic perspective towards enhancing their understanding of wildlife as a result of changing thoughts and increasing education, with global awareness and orientation (Bright and Manfred, 1996).

It is hoped that by gaining awareness of the brown bear, improved protection will be brought with the conflicts reduction. Definitely, wildlife conservation contributes to the sustainability of biodiversity and ecosystems.

References

- Allen, M.L., Elbroch, L.M., Wilmsers, C.C., Wittmer, H.U., 2014. Trophic facilitation or limitation? Comparative effects of pumas and black bears on the scavenger community. *PLoS One*, 9(7), e102257-e102266. <https://doi.org/10.1371/journal.pone.0102257>
- Asadollahi, M., Ahmadzadeh, F., Mahmoudi, H., 2020. The status of farmers' conflict with wildlife in Mazandaran province. *J. Animal Environ.*, 12(4), 153-160. [In Persian] <https://doi.org/10.22034/aej.2020.125334>
- Becker, S., 2011. Spatial and temporal characteristics of moose highway crossings during winter in the Buffalo Fork Valley, Wyoming. *Alces J. Devoted Biol. Manage. Moose*, 47, 69-81.
- Bengtsson, J., Nilsson, S.G., Franc, A., Menozzi, P., 2000. Biodiversity, disturbances, ecosystem function and management of European forests. *For. Ecol. Manage.*, 132(1), 39-50. [https://doi.org/10.1016/S0378-1127\(00\)00378-9](https://doi.org/10.1016/S0378-1127(00)00378-9)
- Bertassoni, A., 2012. Perception and popular reports about giant anteaters (*Myrmecophaga tridactyla* Linnaeus, 1758) by two Brazilian traditional communities. *Edentata*, 13(1), 10-17. <https://doi.org/10.5537/020.013.0113>
- Bright, A.D., Manfred, M.J., 1996. A conceptual model of attitudes toward natural resource issues: a case study of wolf reintroduction. *Hum Dimensions Wildlife*, 1(1), 1-21. <https://doi.org/10.1080/10871209609359048>
- Brodeur, V., Ouellet, J.P., Courtois, R., Fortin, D., 2008. Habitat selection by black bears in an intensively logged boreal forest. *Canad. J. Zoology*, 86(11), 1307-1316. <https://doi.org/10.1139/Z08-118>
- Dudley, N., Vallauri, D., 2005. Restoration of deadwood as a critical microhabitat in forest landscapes. *For. Restor. Landscapes*, 203-207. https://doi.org/10.1007/0-387-29112-1_29
- Falahati, S., Shayesteh, K., Karami, P., 2019. Quantifying the effect of environmental factors on the distribution of brown bears (*Ursus arctos*) in Zagros Oak (*Quercus*) Forests (case study: Ghalajeh protected area). *J. Animal Environ.*, 11(4), 1-8. [In Persian] [20.1001.1.27171388.1398.11.4.1.7](https://doi.org/10.27171/388.1398.11.4.1.7)
- Farhadinia, M.S., Johnson, P.J., Hunter, L.T., Macdonald, D.W., 2017. Wolves can suppress goodwill for leopards: Patterns of human-predator coexistence in northeastern Iran. *Biol. Conserve.*, 213, 210-217. <https://doi.org/10.1016/j.biocon.2017.07.011>
- Heemskerk, S., Johnson, A.C., Hedman, D., Trim, V., Lunn, N.J., McGeachy, D., Derocher, A.E., 2020. Temporal dynamics of human-polar bear conflicts in Churchill, Manitoba. *Global Ecol. Conserv.*, 24, p.e01320. <https://doi.org/10.1016/j.gecco.2020.e01320>
- Karimi, S., Hemami, M.R., Tarkesh Esfahani, M., Baltzinger, C., 2018. The role of brown bear (*Ursus arctos*) in the plant seed dispersal of Golestan National Park. *J. Appl. Ecol.*, 7(2), 29-42. [In Persian] <https://doi.org/10.29252/ijae.7.2.29>

- Leidinger, J., Seibold, S., Weisser, W.W., Lange, M., Schall, P., Türke, M., Gossner, M.M., 2019. [Effects of forest management on herbivorous insects in temperate Europe. *For. Ecol. Manage.*, 437, 232-245. <https://doi.org/10.1016/j.foreco.2019.01.013>](#)
- Madadi, M., Nezami, B., Kaboli, M., Rezaei, H.R., 2020. [Identifying Human-Brown Bear\(*Ursus arctos*\) Conflicts Areas in Mazandaran Province. *Exp. Animal Boil.*, 9\(2\), 83-95. <https://doi.org/10.30473/eab.2020.44841.1688>](#)
- Menge, B.A., 1992. [Community regulation: under what conditions are bottom-up factors important on rocky shores?. *Ecology*, 73\(3\), 755-765. <https://doi.org/10.2307/1940155>](#)
- Nolte, D.L., 2003. [Timber damage by black bears: approaches to control the problem. *USDA For. Serv. Technol. Develop. Program*.](#)
- Sergio, F., Caro, T., Brown, D., Clucas, B., Hunter, J., Ketchum, J., McHugh, K., Hiraldo, F., 2008. [Top predators as conservation tools: ecological rationale, assumptions, and efficacy. *Ann. Rev. Ecol. Evol. System.*, 39, 1-19. <https://doi.org/10.1146/annurev.ecolsys.39.110707.173545>](#)
- Sharma, G., 2017. [Pros and cons of different sampling techniques. *Int. J. Appl. Res.*, 3\(7\), 749-752.](#)
- Stiegler, J., Von Hoermann, C., Müller, J., Benbow, M.E., Heurich, M., 2020. [Carcass provisioning for scavenger conservation in a temperate forest ecosystem. *Ecosphere*, 11\(4\), e03063. <https://doi.org/10.1002/ecs2.3063>](#)
- Takahashi, K., Takahashi, K., 2013. [Spatial distribution and size of small canopy gaps created by Japanese black bears: estimating gap size using dropped branch measurements. *BMC Ecol.*, 13\(1\), 1-12.](#)

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