

## Non-native mammal species in the Czech Republic

In the Czech Republic, there are currently 89 species of mammal. Fifteen of them, representing about 17% (Anděra et Gaisler 2012), can be described as alien (also non-native, introduced, or allochthonous). They were transported from their native (autochthonous) areas into this new environment by humans either intentionally or unintentionally.

The role of humans in the spreading of organisms into areas where they had never lived before is the key to defining native/non-native status; but there are many taxa (species, subspecies, or forms), mainly of some animal and plant species known in our country since early historic times, about whose history of occurrence in our country is marked by a lack of information. However, as regards mammals, we know (or have at least a rough idea) when and from where virtually all non-native forms were imported.

Ten of the fifteen alien mammal species living in the Czech Republic were introduced to our country deliberately – either directly (muskrat, European rabbit, American mink, sika deer, fallow deer, white-tailed deer, Alpine chamois, mouflon), or to neighbouring countries from where the species gradually migrated to us (raccoon dog, raccoon). Typical unintentionally introduced animals are the house mouse (or Western European house mouse), brown rat, and black rat. These synanthropic rodents have spread everywhere that there is human settlement.

Today, the above species are a full-fledged part of our nature, reproducing well here and forming more or less viable populations. They are so-



*The color of the coat of the white variety of the Caspian red deer (maral) is caused by a mutation rather than a lack of skin pigment (albinism). The so-called white deer does not live in the wild in the Czech Republic, but only in four of our game reserves. Maral (which belong to the easternmost subspecies of red deer) originally lived between the Caspian and Black seas.*  
Photo: Petr Podroužek

called established species, with all the positive and negative consequences for local ecosystems. Other non-native taxa have appeared in our country but failed to adapt to the new conditions and gradually disappeared.

The oldest non-native species in the Czech Republic is probably the house mouse (*Mus musculus*), appearing here at the turn of the 1st and 2nd millennium BC. From then until now, there have been 33 non-native mammal species documented in our territory (Mlíkovský et Stýblo 2006).

### Intentional introductions of large herbivores

As for non-native mammals here, ornamental or game animals were imported, along with at least nineteen kinds of non-native ungulates.

Most ungulates were initially introduced only into game reserves for eventual release into the wild. Most of them (ten species), however, were too exotic and difficult to acclimate. These were, for the most part, different deer (*Cervidae*) which had been imported in the late 19th and early 20th centuries, such as chital (*Axis axis*), sambar (*Rusa unicolor*), and reindeer (*Rangifer tarandus*). The only non-native species of deer which is still bred in game reserves (aside from the modern breeding of Père David's deer) is the Caspian red deer (*Cervus elaphus maral*), whose white form was imported to Bohemia in the early 18th century.

Equally short-term occurrences were several representatives of the bovidae family (*Bovidae*). For example, in the 16th century there was an attempted introduction of an Alpine ibex (*Capra ibex*), which was kept then as a game animal in the Křivoklát region, and in the 18th century near Český Krumlov. Also, at the game reserve at Holešov, near Zlín, in the 1920s the West Caucasian tur (*Capra caucasica*) was bred; and in the 19th and 20th centuries, other species of antelope such as blackbuck (*Antilope cervicapra*) or Dorcas gazelle (*Gazella dorcas*) were introduced in game reserves.

The naturalization of the wild goat (*Capra aegagrus*) from Turkey and the Caucasus was considerably more successful. The herd was introduced in 1953 in the Pavlovské vrchy region, and then moved to the Vřísek game reserve near Česká Lipa in 1996 for reasons of nature con-



*The muskrat, which was imported from North America to Europe as a fur animal, belongs among those non-native species that have become part of our nature.*  
Photo: Merrimon Crawford



Chamois were introduced in Jeseníky and near Děčín, where they live in very different habitats from their original alpine homeland. Photo: Martin Viazanko



Mouflons are descendants of domestic sheep, which came with people to the islands of Corsica and Sardinia in the early stages of domestication, seven to nine thousand years ago, and later returned to the wild. Photo Reinhold Leitner

they are descendants of feral domestic sheep which had been brought to Corsica and Sardinia by Neolithic farmers seven to nine thousand years ago. From there, much later, mouflon spread to Europe and then to other parts of the world (North America, Argentina, Hawaii). Originally, they were bred in game preserves and, from the early 20th century, were introduced into the wild. They prefer deciduous and mixed forests with rocky subsoil. In recent decades, there has been a significant increase in their population, which causes problems with their over-grazing of herbaceous and woody vegetation.

Alpine chamois (*Rupicapra rupicapra*) from the indigenous population in the Austrian Alps were introduced at the beginning of the last century in Jeseníky, the Děčín Highlands, and the Lusatian Mountains, where they live in significantly different habitats from their alpine one. In northern Bohemia, their new home is on 300-to-600-meter hilly terrain with rock formations and open forests, from where they emerge to feed in meadows and fields. In Jeseníky, they inhabit alpine meadows with stands of dwarf mountain pines above the upper tree line (over 1,400 meters above sea level), and steep mountain slopes with spruce and mixed

servation. Today there are about 30 individuals there, whose breeding has to be strengthened by the importation of new animals.

Some exotic species and subspecies were imported to "enhance" our native trophy game species. The wapiti (*Cervus canadensis*) was introduced from North America. This is such a close relative of our European red deer (*Cervus elaphus*), that both were previously considered to be one species (hence the wapiti's earlier name, *C. elaphus canadensis*). Wapiti were bred in game preserves, where they crossed with European deer; but, after the demise of game reserves, they gradually disappeared. However, the number of trophies in castle collections suggests their former presence. Siberian roe deer (*Capreolus pygargus*) have been introduced into the wild at several places in Bohemia and Moravia in order to strengthen the trophy value of our own roe deer (*Capreolus capreolus*). The Siberian roe deer is bigger and has massive antlers with a rich sparkle. These two species, however, probably did not crossbreed in nature, and hybridization has not been experimentally proven. It seems, therefore, that their importation was not effective in this respect in our country or anywhere else in Europe.

The five species listed below established themselves as an integral part of our nature: Mouflon (*Ovis aries musimon*) were formerly considered one of the ancestors of domestic sheep, and a species of wild sheep. Today, however, we know that



Bezoar ibexes, which are the direct ancestors of the domestic goat, live in Central Asia and Turkey. Individual animals imported from the former Soviet Union were introduced as trophy game to the Pavlovské vrchy region in 1953. However, they threatened the protected veld habitat by browsing, trampling the vegetation, and over-reproducing, so they were moved to the game park near Česká Lípa in 1996.

Photo: Jaroslav Pešat



White-tailed deer, also known as whitetail, have lived in the region of the Czech Republic since 1855. Their original habitat reaches from southern Canada to northern Brazil. Photo: Tom Reichner

forests. As a non-native species, chamois can be in some respects problematic, especially in the sub-alpine ecosystems of the Jeseníky Protected Landscape Area. However, they may help to maintain existing biodiversity there.

White-tailed deer (*Odocoileus virginianus*) came from North and South America. They are bred specifically in game reserves, but are also found in the wild in our country in two local populations - in the Brdy Highlands and the eastern foothills of the Krkonoše Mountains.

Sika deer (*Cervus nippon*) are small, with a distinctive spotted coat in summer. In winter, they are drab or dark grey, and the spots may also be absent. They come from Japan, China, and neighbouring regions in the Far East, with up to 13 subspecies having been described. Sika were originally bred in our country in game reserves; now, they are spreading extensively, and our wild population is the largest in continental Europe. We consider them an undesirable species because of their crossbreeding with our original European deer.

Fallow deer (*Dama dama*) probably come from Turkey and the eastern Mediterranean region. Their original distribution area is not exactly known. In our country, they mostly seek a flat to slightly undulating landscape with thin or discontinuous deciduous and mixed forests. Fallow deer are often



Sika deer, from east Asia, are relatively small. Their summer spotted coat darkens in winter. They often interbreed with red deer. Photo: Eduard Kyslynsky



Fallow deer came from the eastern Mediterranean and adapted without disturbing our country's natural environment. Photo: Giedrius

kept in game preserves. In terms of our nature, it is an acclimatized species with no apparent negative impact on native fauna and the natural environment.

### Intentional introduction of mammals as small game animals

In the past, there have been attempts to enrich not only our species of ungulates, but also so-called small furry fair game.

The repeated introduction of the alpine marmot (*Marmota marmota*) ended unsuccessfully. In the late Middle Ages, it was brought in from the Alps to the Krivoklát region; in the 19th century, in the Krkonoše mountains; and finally, in 1963, in the Jeseníky mountains.

On the contrary, two other species, the European rabbit and the muskrat, successfully established themselves in our nature. The European rabbit (*Oryctolagus cuniculus*) comes from the Iberian Peninsula, first arriving in the Czech Republic during the monastic colonization period in the second half of the 12th and 13th centuries. It was introduced into the wild in the 16th century, and increased vastly three hundred years later. It prefers dry, warm, sunny habitats in forestless

bushy landscape; but you can occasionally see them in cities. By grazing, it helps to maintain its environment; and, with adequate population densities, it supports the existence of many endangered species of heliophilous plants and invertebrates. Until the mid-20th century, it was a common game animal. (Our hunters shot 100,000 to 150,000 rabbits every year.) Now, however, only some tens to hundreds are taken. The sharp decline in population occurred as a result of the recurrent disease myxomatosis. The importation of rabbits naturally resistant to the disease did not stop this decline.

The muskrat (*Ondatra zibethicus*) comes from North America. In our country, it was introduced in 1905 at Dobříš, in Brdy, and near Opočno. From there it spread throughout Europe, introduced as a fur animal into new territories. Muskrats mainly inhabit areas surrounding stagnant water, where they burrow in high banks and build clusters of vegetation 1.5 to 2 meters high in areas with low shores. These structures, however, have almost disappeared in the Czech Republic due to a decrease in the muskrat population density in recent decades.

### Invading carnivores - a threat to nature

There are also three species of non-native predators found in our territory. All can be classified as so-called invasive alien species, which means that they not only spread rapidly, with their numbers still growing, but they also represent a considerable risk to our native animals. Their presence here is therefore highly undesirable and should be suppressed by any means.

The most dangerous of these species is the American mink (*Neovison vison*). Originating from North America, it is smaller than a polecat, and is naturally almost all black with a conspicuous white spot on its lower lip - even though in nature we often see different-colored minks which have escaped from farms (pure black, brown, white, grey-blue, etc). Breeding farms are the foundation

of the population living in the countryside: In addition to minks that have spontaneously escaped from captivity, many were intentionally released from unprofitable farms, mainly in the 1990s (Mlíkovský et Stýblo 2006). Minks dwell along watercourses where, by intensive predation (e.g., of European water vole, crayfish, snakes, and water birds), they significantly affect the natural zoocenosis of wetland ecosystems. The American mink suppresses the occurrence of 47(!) native animal species in Europe (Genovesi et al. 2012); and, among non-native animals, it poses the greatest threat to biodiversity conservation.

The raccoon dog (*Nyctereutes procyonoides*) comes from East Asia (in areas from the Amur River to Vietnam and Japan). It reaches the size of a fox, to which it is similar in its way of life and food preferences; in appearance, though, it is more similar to a badger or raccoon. Originally occurring sporadically, the species is now with us more or less fully extended, and is in the phase of a population boom (Anděra et Gaisler 2012).

The raccoon (*Procyon lotor*) comes, as does the mink, from North America, also escaping from farms into the wild. In many European countries, it has created a stable and expansive population. It is noticeable by its distinctive black-and-white facemask and dark striped tail. In our country, it is in the early stages of invasion. Its population is growing steadily in Germany and Austria, from where it has spread to the Czech Republic.

### Unintentional introduction of rodents

Escaping from captivity or having a close relationship to humans (synanthropic species) also allowed several exotic species of rodents to become part of Czech nature. In recent years, we have seen a population boom of nutria (*Myocastor coypus*), which come from the southern regions of South America. In our country, they were initially kept on farms for their meat and fur. Some escaped



A South American rodent, the coypu, expanded into the open countryside of every continent except for Antarctica and Australia after escapes from fur farms. It is included in the list of the one hundred most dangerous invasive species in the world. Photo: Sters



The American mink was introduced from North America. Of all the introduced predators in the Czech Republic, it is the most harmful to our native fauna. Photo: Paul Reeves

and established a wild population that is currently spreading rapidly; and, thanks to our warmer winters, they are already reproducing (Anděra et Gaisler 2012). In many areas of their non-native occurrence (Western Europe, North America), they are already considered a dangerous invasive species that is changing the nature of riparian vegetation and is causing significant damage to hydraulic structures by building its burrows. The seriousness of the nutria's threat is evidenced by its inclusion among the hundred worst invasive species of the world (Lowe et al. 2000).

Our other non-native rodents are synanthropic species. The brown rat (*Rattus norvegicus*) has spread to the west from its original area (north-east China, southeast Siberia, and Japan) in the Middle Ages. In Europe, emerging in the early 18th century, today it is present on all continents. A slightly smaller black rat (*Rattus rattus*) originated from southeast Asia from where, with human help, it gradually spread to all tropical, subtropical, and temperate regions of the world. A permanent population exists in the Czech Republic only from northern Bohemia, south to the border of Prague, and up to the region of Mladá Boleslav.

The ubiquitous house mouse (*Mus musculus*) comes from the warmer areas of southern Eurasia (probably from India), where it spread through the entire world with the aid of people. Two subspecies, which are sometimes considered separate species, exist in the Czech Republic: *M. m. musculus* lives throughout most of the area; whereas *M. m. domesticus* (the so-called western European house mouse), which has somewhat darker or black-and-grey colouring and differs in some features of its skull, lives in western Bohemia (Aš and Cheb regions). A 20-km-wide hybrid zone runs through the western boundary of Bohemia, which is being intensively studied by zoologists now.

### Short-term exotic mammal escapes from farms into the wild

The last group of non-native mammals in the Czech Republic are those who are episodic; in other words, are in the wild only in the short term. Often they are runaways from zoos or private farms. Barbary sheep (*Ammotragus lervia*) enriched our wild animal species from 1972 to 2000, a few individuals having escaped from Zoo Plzeň and having begun to reproduce in the surrounding forests. A particular rarity was the Arctic fox (*Alopex lagopus*) which, between 1983 and 1984, bred cubs in a stack of straw in a field near Moravská Nová Ves. A refugee from Zoo Olomouc, a dhole (*Cuon alpinus*), was caught in the Olomouc region in 2000; and, in the first years of the 21st century, a guanaco (*Lama guanicoe*) was recorded in the Lusatian Mountains (Mlíkovský et Stýblo 2006). Heiko, in his time a legendary male gelada (*Theropithecus gelada*), escaped from Brno Zoo twice (2007 and 2009). The number of other undocumented cases is undoubtedly higher. Such events are not uncommon today. Due to the increasing number of private zoos, zoo parks, and small private farms, we can expect that short-term stays of exotic animals in our countryside will become more frequent.

### The arrival of new alien species must be prevented

The adverse effects caused by many of our established non-native mammals are well known. It is important to avoid establishment and stabilization of populations of other non-native species because we can never predict which ones will become causes of new and dangerous biological invasions.

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