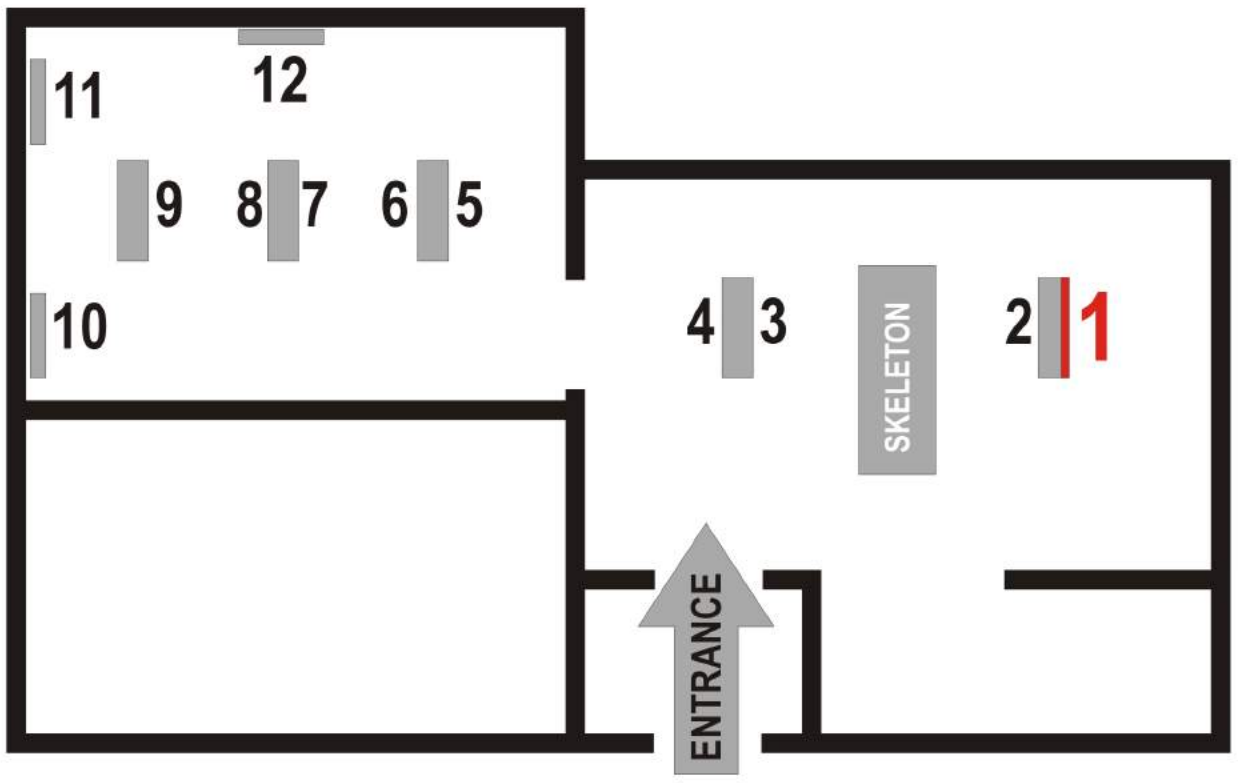


1

Red deer (*Cervus elaphus*)

ZOOLOGICAL CLASSIFICATION
Kingdom: Animals (*Animalia*)
Phylum: Chordates (*Chordata*)
Sub-phylum: Vertebrates (*Vertebrata*)
Class: Mammals (*Mammalia*)
Sub-class: *Theria*
Infraclass: Placentals (*Placentalia*)
Order: Even-toed ungulates (*Artiodactyla*)
Sub-order: Ruminants (*Ruminantia*)
Family: Cervids (*Cervidae*)
Sub-family: *Cervinae*
Genus: *Cervus*
Species: Red deer (*Cervus elaphus*)

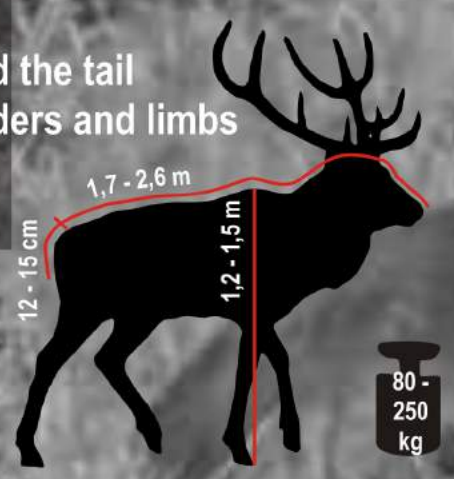
Sub-species:
- Central European red deer (*C. e. hippelaphus*)
- Eastern red deer (*C. e. montanus*)

These two European native subspecies have not been preserved in a genetically pure form in this country due to them crossing mutually as well as with other imported forms (e.g. Asiatic red deer, wapiti deer, and so on).

SIZE
- Robust body
- Short tail
- Males feature antlers that re-grow on an annual basis and weigh 8-13 kg.
- Females (does) are about 1/3 smaller than males.

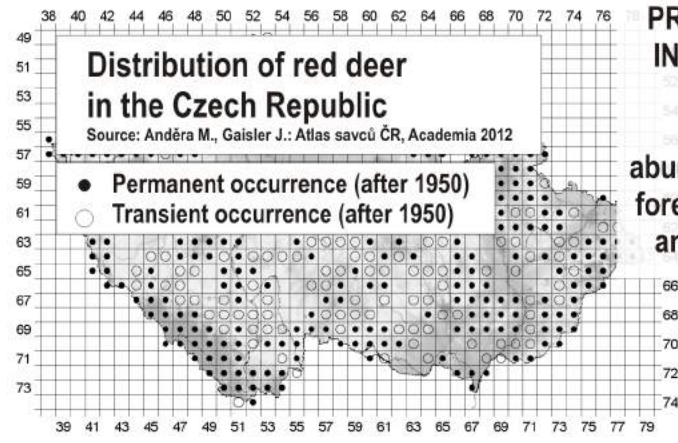
COLOURING
- Reddish-brown summer coat
- Rusty-brown to grey winter coat
- Pale, yellowish patch on the rump around the tail
- Eastern deer have brownish-black shoulders and limbs
- Juveniles under the age of 2-3 months show white speckles.

LIFE SPAN
- The highest possible age in the wild is estimated at 20 years.



MAP OF NATIVE DISTRIBUTION OF RED DEER GLOBALLY

The red deer was artificially introduced in the USA, Argentina, Australia and New Zealand.

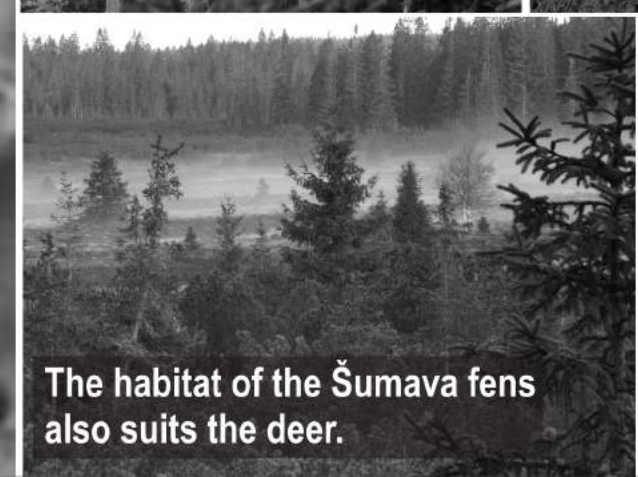


PRESENCE OF RED DEER IN THE CZECH REPUBLIC

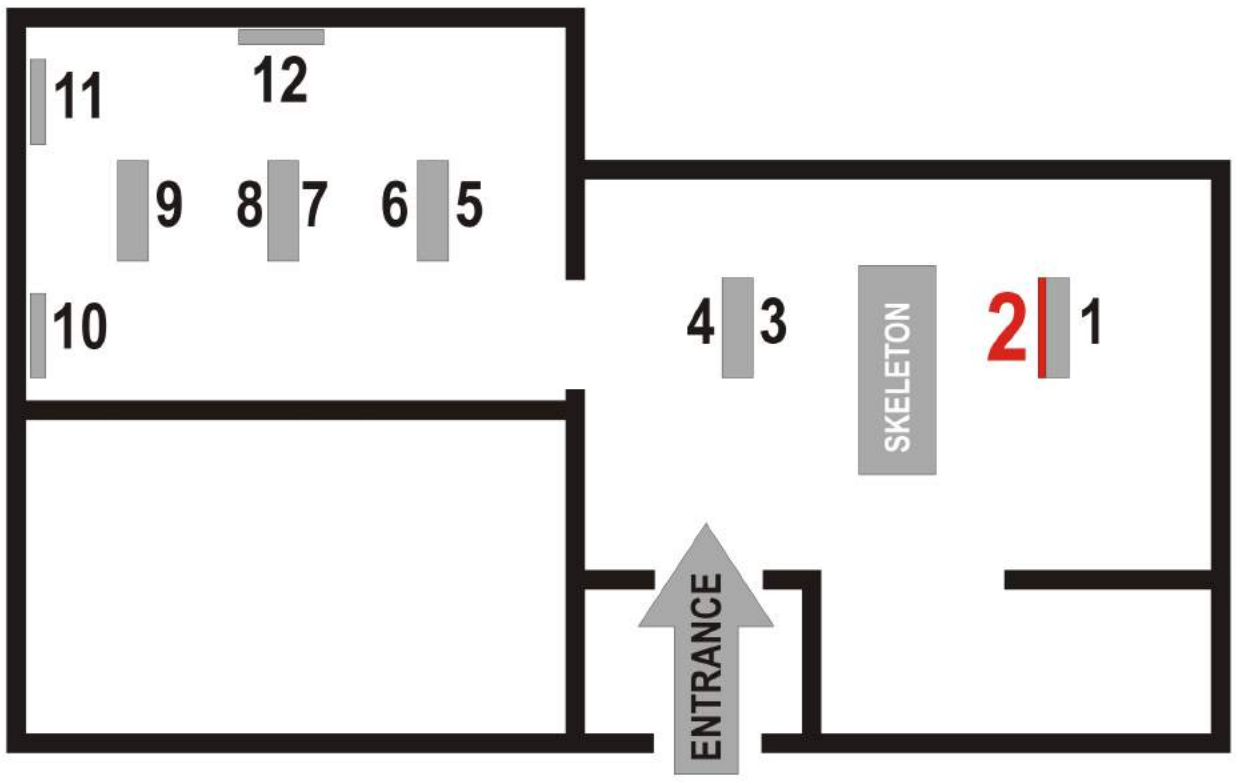
In the wild, the greatest abundance is found in large forested areas of highlands and mountains, as well as in the alluvial forests of southern Moravia. Red deer are also kept in captivity, i.e. game preserves and farms.

Ideal habitats for the red deer are mixed forests with a large amount of available food.

Deer do not avoid even the highest zones of Šumava.



The habitat of the Šumava fens also suits the deer.

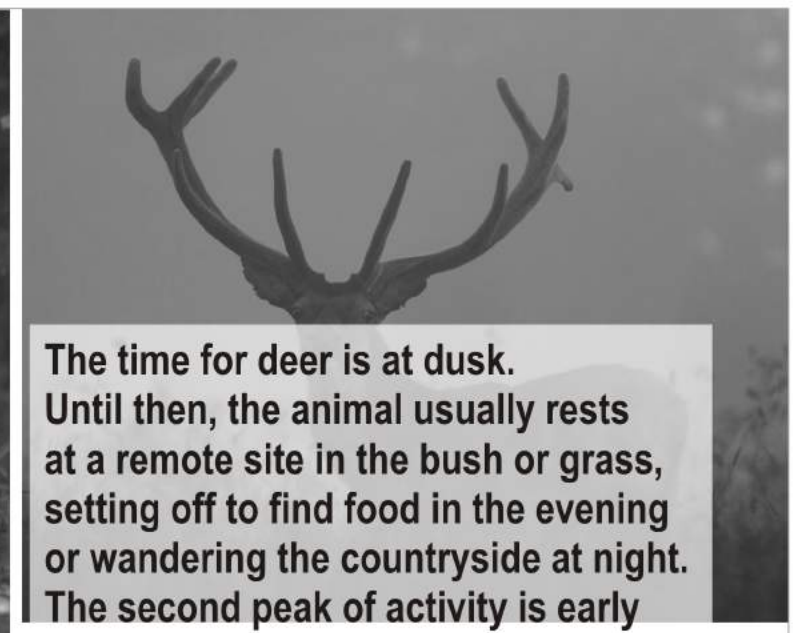


2

Living habits

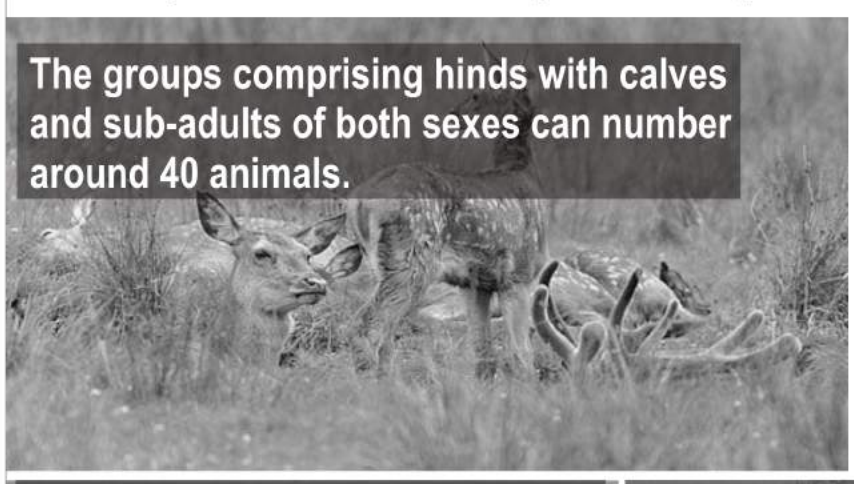
Communication

The deer to the left is showing its superiority. Its auricles are folded and it moved, with a direct gaze, toward the inferior deer to chase it away.
The inferior deer, on the other hand, while looking in a different direction to alleviate the tension, does not want to be intimidated. It may walk aside, but will not run away.



The time for deer is at dusk.
Until then, the animal usually rests at a remote site in the bush or grass, setting off to find food in the evening or wandering the countryside at night.
The second peak of activity is early morning. At sites where they are not disturbed, deer can come out of their hiding places even during the day.
Movement in daylight also applies to wintertime, when food is scarce.

Deer spend most of the year in separate groups:

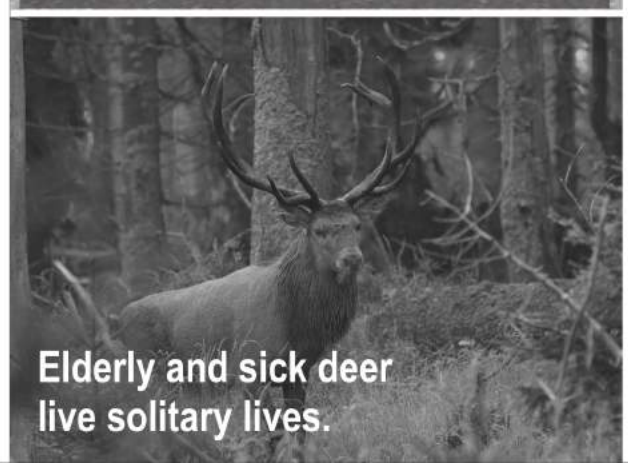


The groups comprising hinds with calves and sub-adults of both sexes can number around 40 animals.

Adult males congregate in small groups or are solitary (especially older animals).

A herd of deer during the rutting period; a stag with a number of does

The herd is guided by an experienced doe, mature in years. It tends to be accompanied by a calf born in that year or, sometimes, one from the previous year.
Usually, other does will voluntarily show sub-ordinance to the leading female.

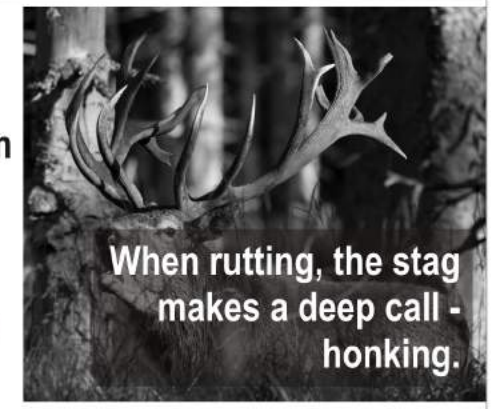


Elderly and sick deer live solitary lives.

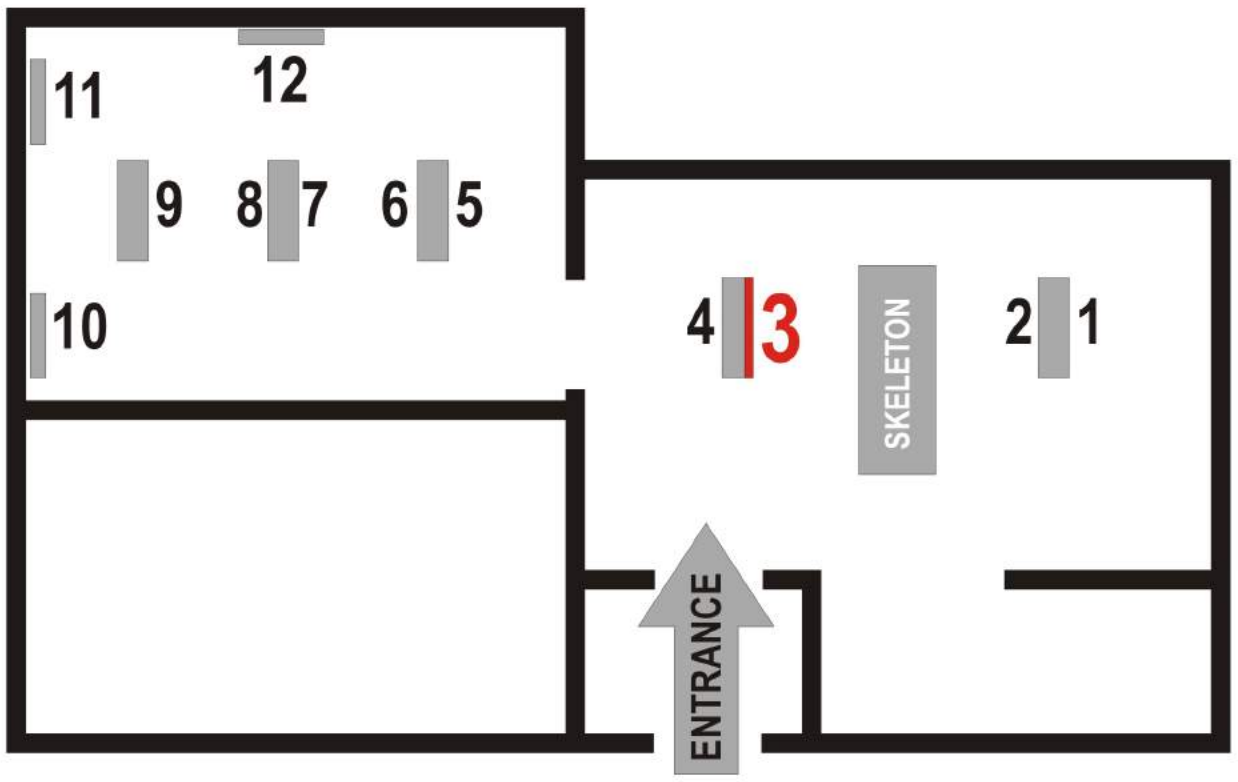
In the groups of stags, constant competition takes place for position. To communicate, they use different gestures and stances, from a direct gaze through to menacing folded ears, teeth grinding, the act of chasing another away, biting and kicking.
Once deer antlers, initially soft and vulnerable, become mature, the animal does not hesitate to use them to fight for position.

Rutting

The mating season runs from mid-September to late October. Does rearing fawns determine the place of rutting;
an important factor for them is that they have enough food. Males receive hardly any food during the period. The strong stags observe their groups of does, running around them and grouping them together. Inferior stags are chased away. If another strong deer arrives, the two animals measure their strength and if there is no leeway, a duel occurs.

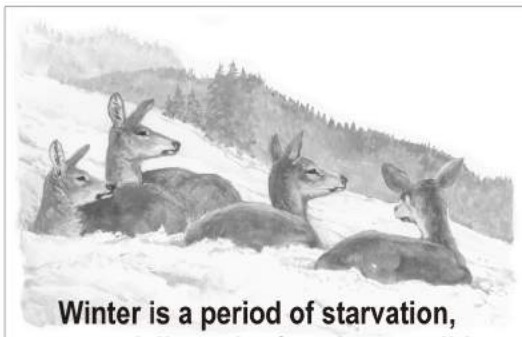


When rutting, the stag makes a deep call - honking.



3

A YEAR IN THE LIFE OF A DEER



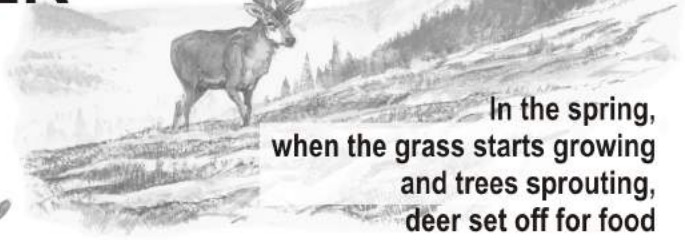
Winter is a period of starvation, especially under freezing conditions with a large amount of snow, which is not only true for deer. Mother Nature effectively examines the health and fitness of specimens, and any particularly weak, sick or injured animals may perish.

A freshly shed antler

Early March: a stag shortly after shedding its antlers.

Late March can already see new antlers growing.

Antlers in mid-April



In the spring, when the grass starts growing and trees sprouting, deer set off for food even to high zones.

In the spring, deer like to nibble budding twigs of trees and shrubs.

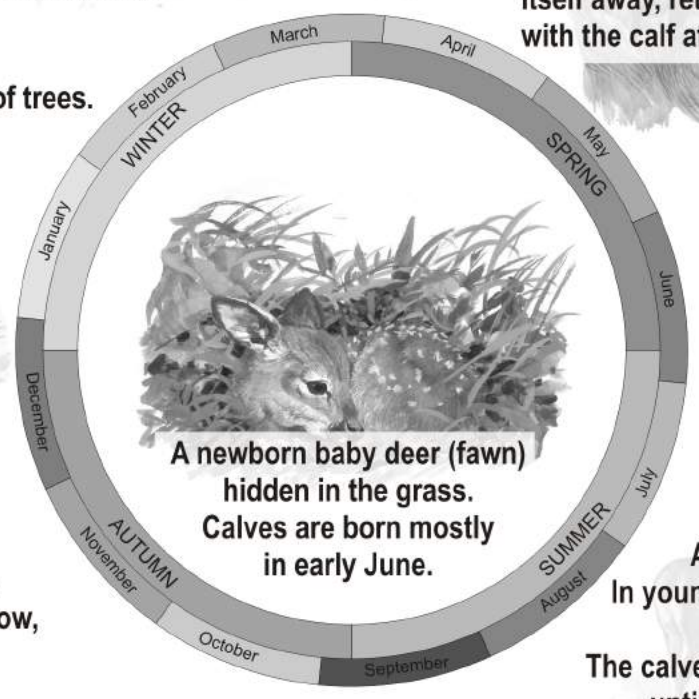
Antlers in May

The oldest and strongest stags shed their antlers first - as early as February, while the others do the same mostly during March to April. Sick and weak deer shed their antlers late and irregularly.

Deer often gnaw the bark of trees.

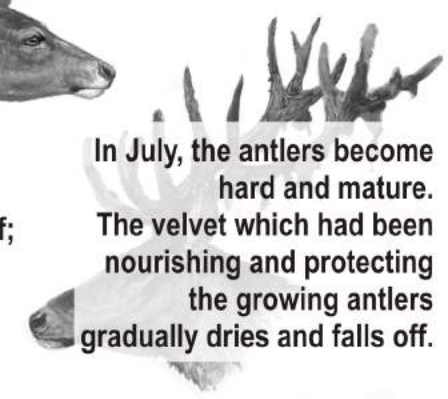
Sometimes there is a noticeably large amount of snow even in low zones. Moving in deep snow is strenuous and exhausting for the animal.

A stag looking for food - removing snow from the grass.



A newborn baby deer (fawn) hidden in the grass. Calves are born mostly in early June.

A doe is pregnant for eight months. It has tends to give birth to a single calf; twins are rare. The doe secludes itself away, returning to the herd with the calf after 7-10 days.



In July, the antlers become hard and mature. The velvet which had been nourishing and protecting the growing antlers gradually dries and falls off.

A separate group of adult stags. By June, their antlers are nearly fully developed but still covered in velvet.

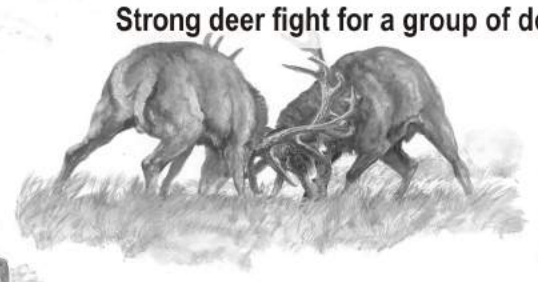
With the forthcoming winter, deer set off for lower elevations where conditions are milder. This usually occurs during the first major instance of permanent cooling and snow, mostly during November.

A doe nursing a fawn. In young deer nursing takes about four months. The calves are speckled white until about 3 months old, then the white spots gradually disappear from the darkening coat.

Stags with mature antlers remove the velvet covering by scraping them against trees and shrubs. The behaviour is called rubbing.

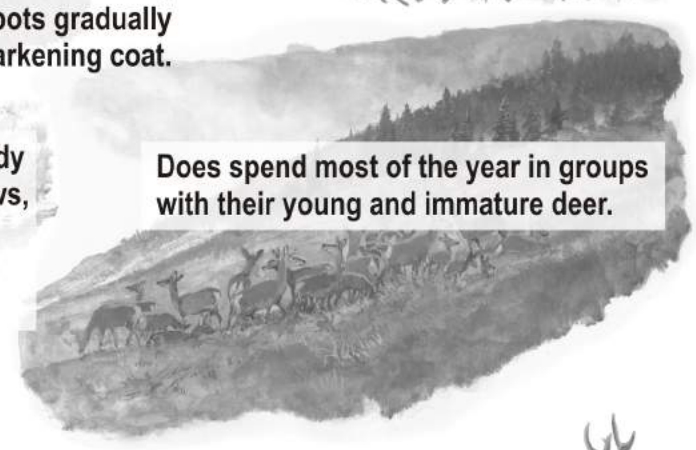
Mating is the culmination of deer rutting.

A stag chasing a doe during a rut.



Strong deer fight for a group of does.

Deer like to cool down in muddy puddles. Referred to as wallows, they serve the animal rolling in the mud by eliminating flies and other external parasites.

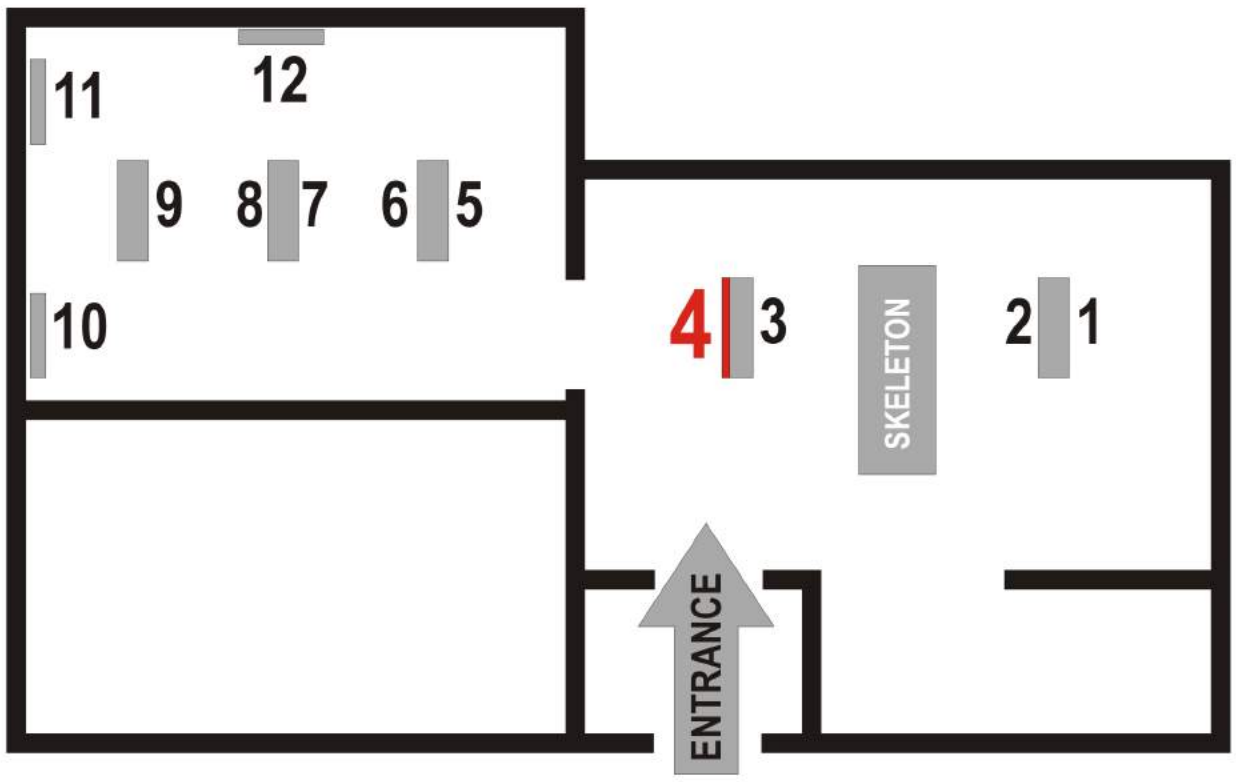


Does spend most of the year in groups with their young and immature deer.

Fights often result in injury to stags. Injuries by sharp-pointed antlers can be fatal. It seldom happens that antlers of competing stags snag together so the animals cannot part.

Male honking is heard during the rutting period, during which the stag almost entirely goes without food.
Strong stags watch groups of does to prevent access by other males.

A strong stag chasing away a weaker individual. Inferior stags experience various slights, not only during the rutting season.



4

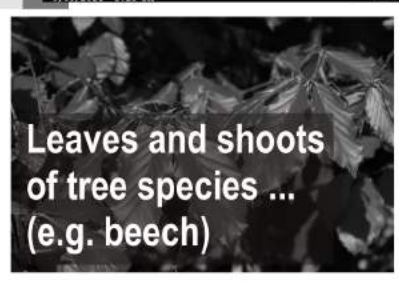
Red deer graze normally in the evening and early morning. At night, they can walk several kilometres. During the day, they usually hide away in forest thickets where they rest, chew and sleep.

What do red deer like to eat?

Red deer like grasses, herbs, leaves, needles, buds and young shoots of trees and shrubs, as well as berries and bark. They graze on bilberry, blackberry and raspberry plants, plus they feed on ferns, mosses and lichens. The proportion of dietary components changes with the season, and varies according to supply in the areas where the deer resides. Grasses and broadleaved woody species form the most common foods.


A deer searching for food; an evening image from a camera trap.


Grasses ...


Leaves and shoots of tree species ... (e.g. beech)

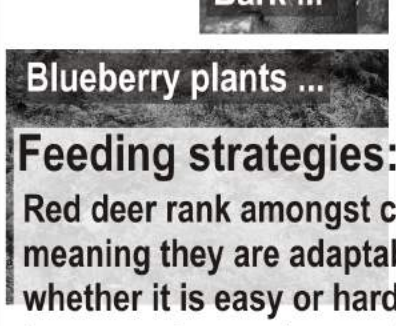

Needles ... (e.g. fir)

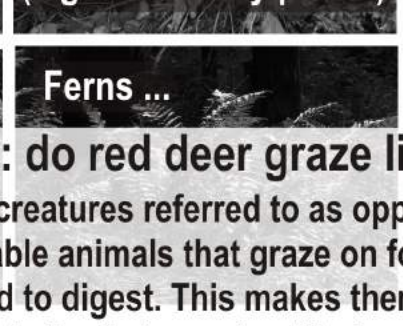

Bark ...

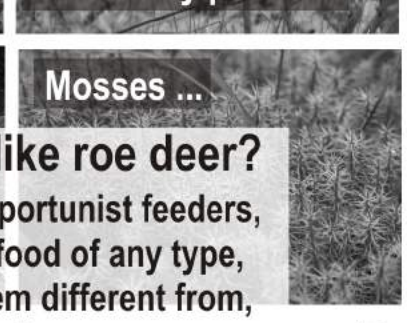

Herbs ... (e.g. strawberry plants)

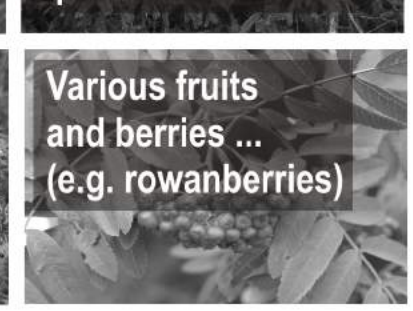

Blackberry plants ...


Buds of coniferous and deciduous tree species ...


Blueberry plants ...

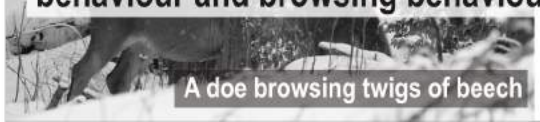

Ferns ...


Mosses ...

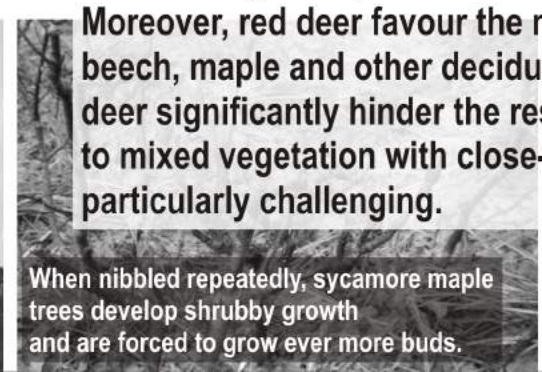

Various fruits and berries ... (e.g. rowanberries)

Feeding strategies: do red deer graze like roe deer?

Red deer rank amongst creatures referred to as opportunist feeders, meaning they are adaptable animals that graze on food of any type, whether it is easy or hard to digest. This makes them different from, for example, roe deer and elks that are classified as browsers. Browsing animals have to choose easily digestible food like young leaves and shoots or herbs. Browsers are not adept at digesting food rich in fibre - e.g. grasses. As a result, roe deer consume low amounts of grass, usually occurring in the spring when grass is more palatable. Finally, the last type of European ruminant to mention comprises grazers. With their digestive tract capable of handling even less-digestible food with large amounts of cellulose very effectively, they mainly feed on grasses. No species of the deer family is ranked as a grazer; indeed, mouflon or cattle are the prime examples.
The digestive tract of ruminants undergoes something of a 'seasonal shift' - it must adjust to food available in a particular season. Opportunist feeders constitute the very group in which this is particularly seen, hence why red deer sometimes display grazing behaviour and browsing behaviour.


A doe browsing twigs of beech

When feeding, roe deer chose easy-to-digest food that quickly passes through the digestive tract. As a result, they must graze more often than red deer.

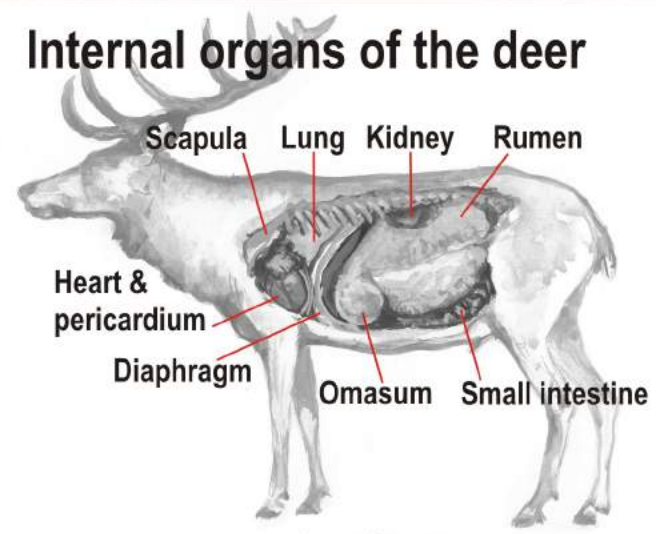

When nibbled repeatedly, sycamore maple trees develop shrubby growth and are forced to grow ever more buds.

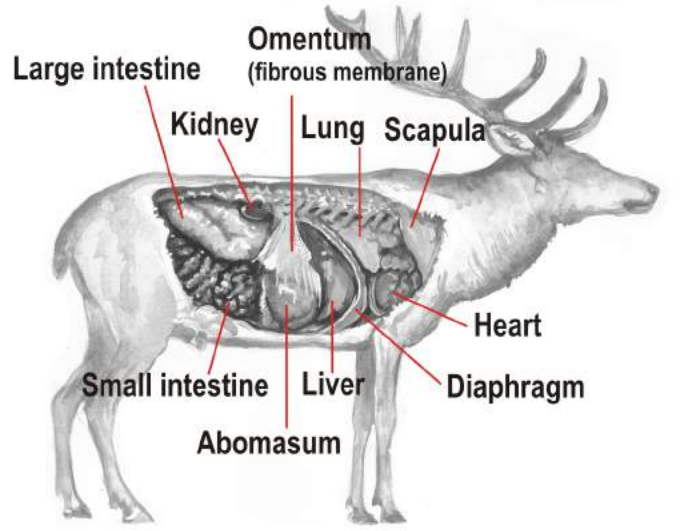
Red deer belong in this country's natural systems and a certain level of browsing is normal. Why are deer considered harmful to woodland? Large-scale management has mostly transformed forests in the Czech Republic into stands of simple structure with a small diversity of species. Since such woods cannot sustain large quantities of animals, red deer cause substantial damage to forests when abundant. Even where red deer are fewer, any frequent disturbance makes the animals retreat to places where they can enjoy much needed rest. Browsed young trees are reduced in growth, their health weakens and they may even die. Moreover, red deer favour the most valuable tree species such as fir, beech, maple and other deciduous trees. This way high numbers of red deer significantly hinder the restoration of forests, and make any return to mixed vegetation with close-to-nature composition of species particularly challenging.

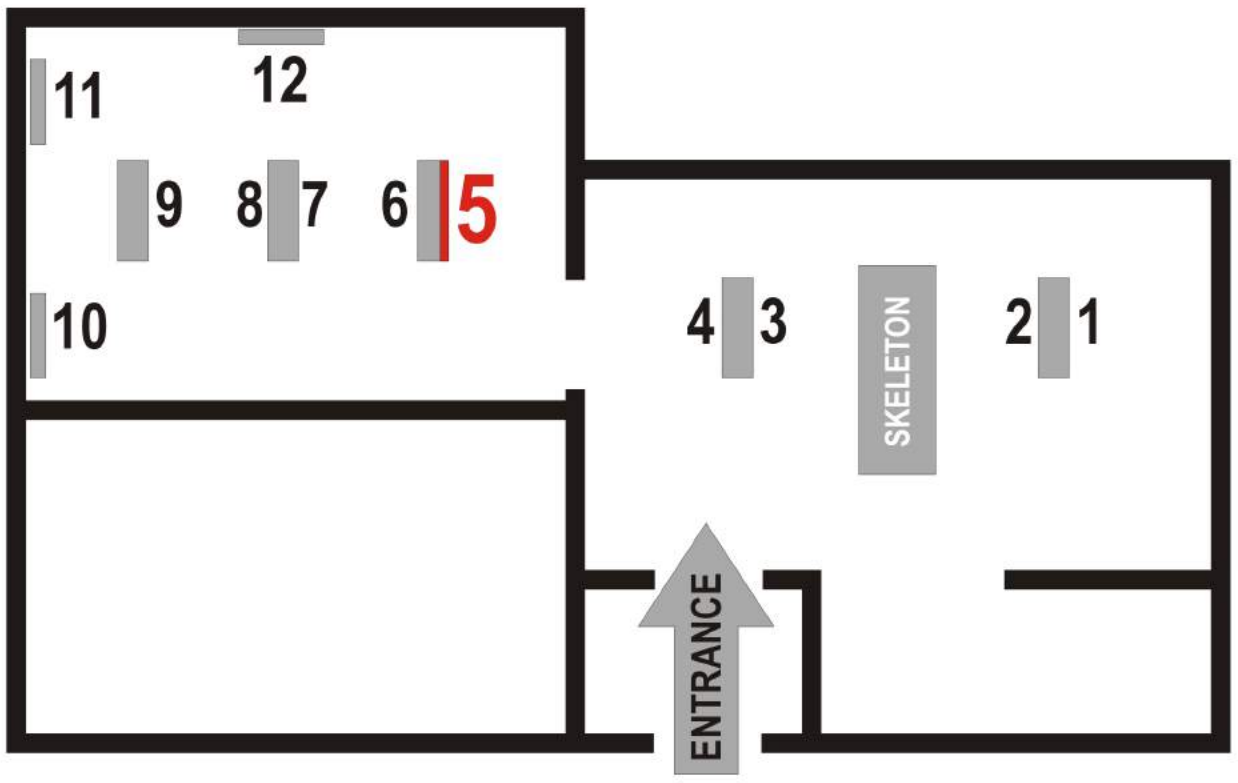
Inside the stomach of a deer

Digestion
Deer are ruminant herbivores with multi-chambered stomachs. The food grazed upon is stored in the rumen, where it is partly digested with the assistance of microorganisms. After some time, the food moves back into the mouth via the oesophagus; the deer chew and swallow it again once it is crushed sufficiently. The food then passes through the rumen and to other parts of the stomach - the reticulum, the omasum and the abomasum.

Internal organs of the deer







5

Red deer in Šumava National Park

Achieving balance

The principles for managing some species of animals in national parks are regulated by directives from the Ministry for the Environment and management plans for each protected area. This applies to red deer as well.
The basic objective is to achieve balance in ecosystems. Natural balance is disrupted in Šumava through the lack of wolves as major predators of deer.
Only lynxes affect the red deer population to some extent, although roe deer make up lynxes' main diet, hence regulating the abundance of red deer is primarily the role of humans.
The aim is to keep the red deer population at an ecologically acceptable level to prevent damage to ecosystems and to meet the interests and needs of nature conservation.

Controlling the number of red deer is not enough.

In the past, a large proportion of Šumava's forest was exploited at an intense level, resulting in stands that were simple in structure with a limited range of species of trees.
Such forests sustain far fewer animals and are susceptible to greater damage. In Šumava National Park, the long-standing goal is to bring about richly structured forests with a natural representation of tree species. Natural laws are used to assist the development of forests, and some portion of the woodland is left without human interference.


Damage to beech trees by gnawing bark


Damage to fir trees by gnawing bark


Damage to fir trees by nibbling buds


Damage to fir trees by repeatedly nibbling buds - the tree shows shrubby growth


Damage to fir trees by rubbing off antler velvet

Protection of fir trees from the nibbling of buds - repellent coating PHOTO


Damage to pine trees by rubbing off antler velvet

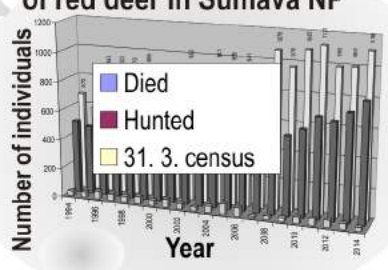
Individual protection of spruce trees from gnawing and debarking; protecting trunks utilises things such as mesh or coatings PHOTO

Over-wintering areas for deer

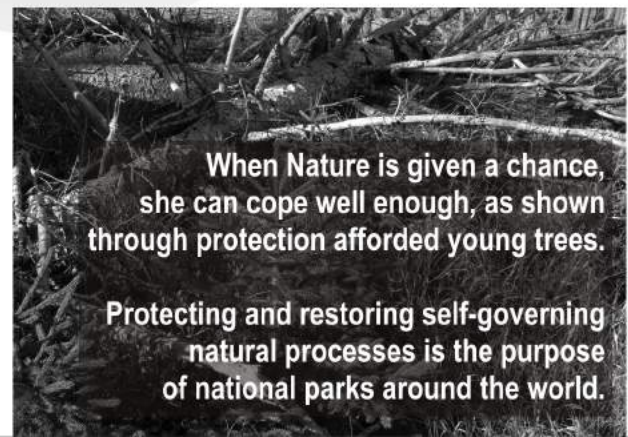
Over-wintering areas were designed in Šumava National Park to reduce winter damage caused by red deer. The time they are closed is dependent on the weather - usually in November or December. They are opened when there is sufficient grass, usually in late April.
Such over-wintering areas facilitate identification of the numbers of red deer with some accuracy. The option of surviving the winter in the territory is made use of by about half the deer population.
Several over-wintering grounds for deer feature cabins built for visitors to watch the animals.

Deer over-wintering areas and view points in Šumava National Park

Course over time of quantity of red deer in Šumava NP

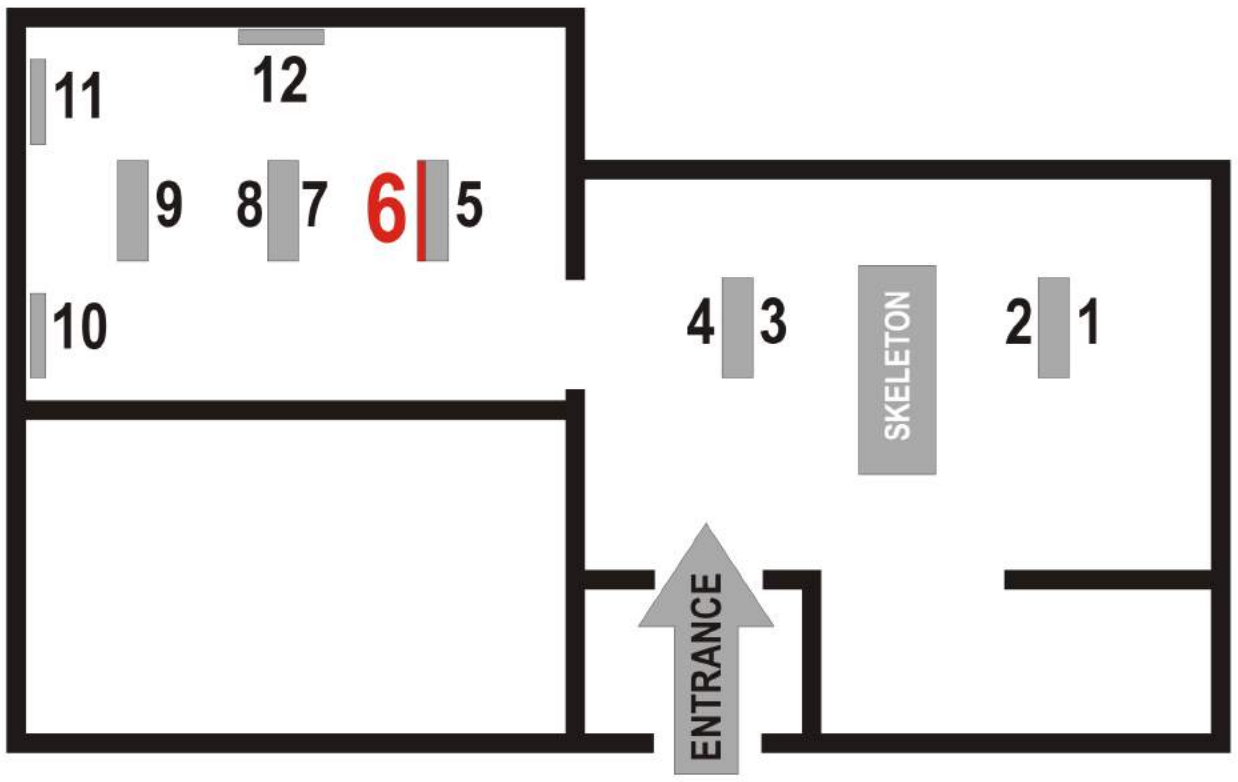


Despite taking various measures, the numbers of red deer remain too high in Šumava National Park due to the condition of the forests, making it necessary to carry out procedures to protect forest systems.
Man can never fully replace the role of natural predators.
Only carnivores can keep populations of their prey in balance - their hunting methods allow them to pick off weak and sick individuals.
As a result, the red deer population is much healthier and the degree of damage to the forest they cause is reduced when ranging in a habitat containing wolves.
Might wolves potentially come back to Šumava one day?


When Nature is given a chance, she can cope well enough, as shown through protection afforded young trees.

Protecting and restoring self-governing natural processes is the purpose of national parks around the world.


Protecting trees by fencing



6

Research

What? Why? How?

Research helps us to better understand the life and habits of animals, as well as their requirements for habitat and space, or specific bonds that exist between individual species and ecosystems. Based on findings from research, measures can be optimised to protect species, ecosystems and the world of nature as a whole.

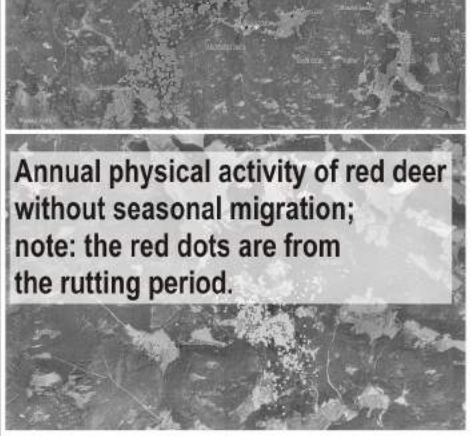
Telemetry

- Enables remote identification of the location and condition of animals fitted with a transmitter
- Provides accurate information particularly on:
  - the size of the territory ranged over by the tracked animal
  - the movement of the animal in the countryside
  - the daily activity of the animal

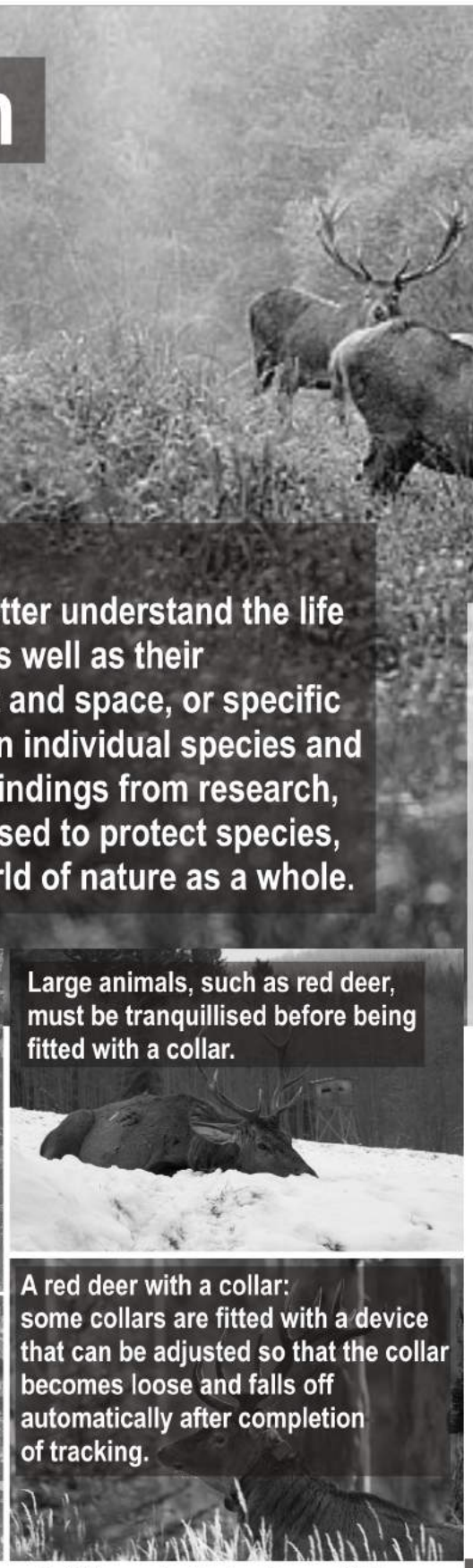
How telemetry works

Collars were fitted to Šumava's red deer to enable localisation using a GPS satellite system. The transmitter in the collar attempts to contact at least three satellites, at specified periods of time. This enables determination of the animal's position with great accuracy (to a tolerance of 15 metres).
The information on the animal is transferred from the collar via a transmitter of a mobile telecommunications operator as a text message to a mobile phone and an email to a computer.
Research utilising the technology of radio telemetry and camera traps in Šumava is also underway across the border in cooperation with Bavarian Forest National Park.
Species that are or have been tracked by radio telemetry in Šumava NP:
red deer, European lynx, roe deer, red fox, Eurasian wild boar, Ural owl, capercaillie.

Annual physical activity of red deer with seasonal migration;
note: the orange dots are from the rutting period.



Annual physical activity of red deer without seasonal migration;
note: the red dots are from the rutting period.

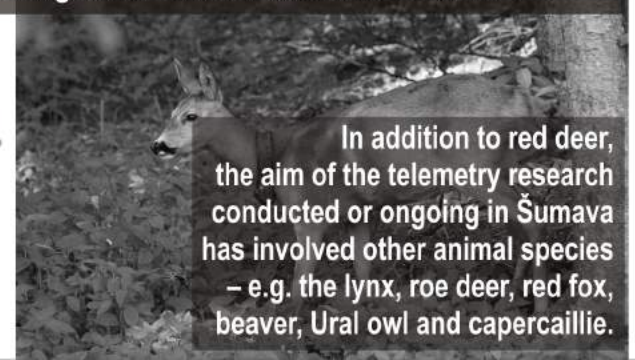


Large animals, such as red deer, must be tranquillised before being fitted with a collar.

A red deer with a collar:
some collars are fitted with a device that can be adjusted so that the collar becomes loose and falls off automatically after completion of tracking.

Red deer telemetry research has revealed the varied behaviour of this species, amongst other things. While some deer stay in the same places throughout the year, others migrate to higher zones in summer, or wander over long distances and return to familiar sites. Quite large movement may also occur during the period of rutting.
Telemetry collars are equipped with a GPS device that locates the animal's position automatically at set periods of time to an accuracy of 15 m. The collar includes an activity sensor that records every 5 minutes what the animal is doing. The sensor differentiates between four main types of behaviour: resting, grazing, slow motion, fast motion.
The peak of activity for red deer occurs in June, relating to grazing, abundant vermin and rearing calves (in the case of does); other increases are seen in September and October, i.e. during the rutting period. In their daily cycle, red deer are most active at dusk and dawn, the time they frequently graze.

How big is the territory required by a red deer?
Referred to the home range, the territory used by red deer during the year is about 60 to 120 km² in seasonally migrating animals; those which do not migrate need less - about 20 to 50 km².

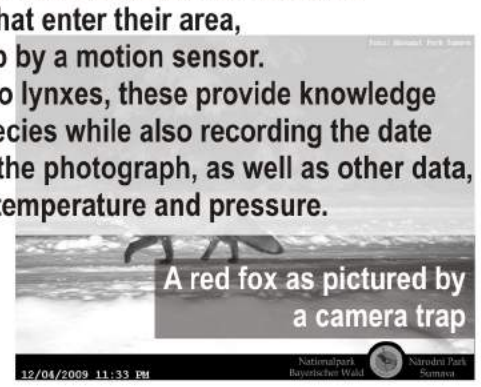


In addition to red deer, the aim of the telemetry research conducted or ongoing in Šumava has involved other animal species – e.g. the lynx, roe deer, red fox, beaver, Ural owl and capercaillie.

Images from camera traps: Šumava NP

Camera traps

Interesting information on Šumava's fauna is sourced from images made on camera traps. In Šumava, research conducted using the devices is primarily concerned with lynxes, although knowledge on other species is also benefited, including the red deer.
Camera traps automatically take pictures of animals that enter their area, as picked up by a motion sensor.
In addition to lynxes, these provide knowledge on other species while also recording the date and time of the photograph, as well as other data, such as air temperature and pressure.

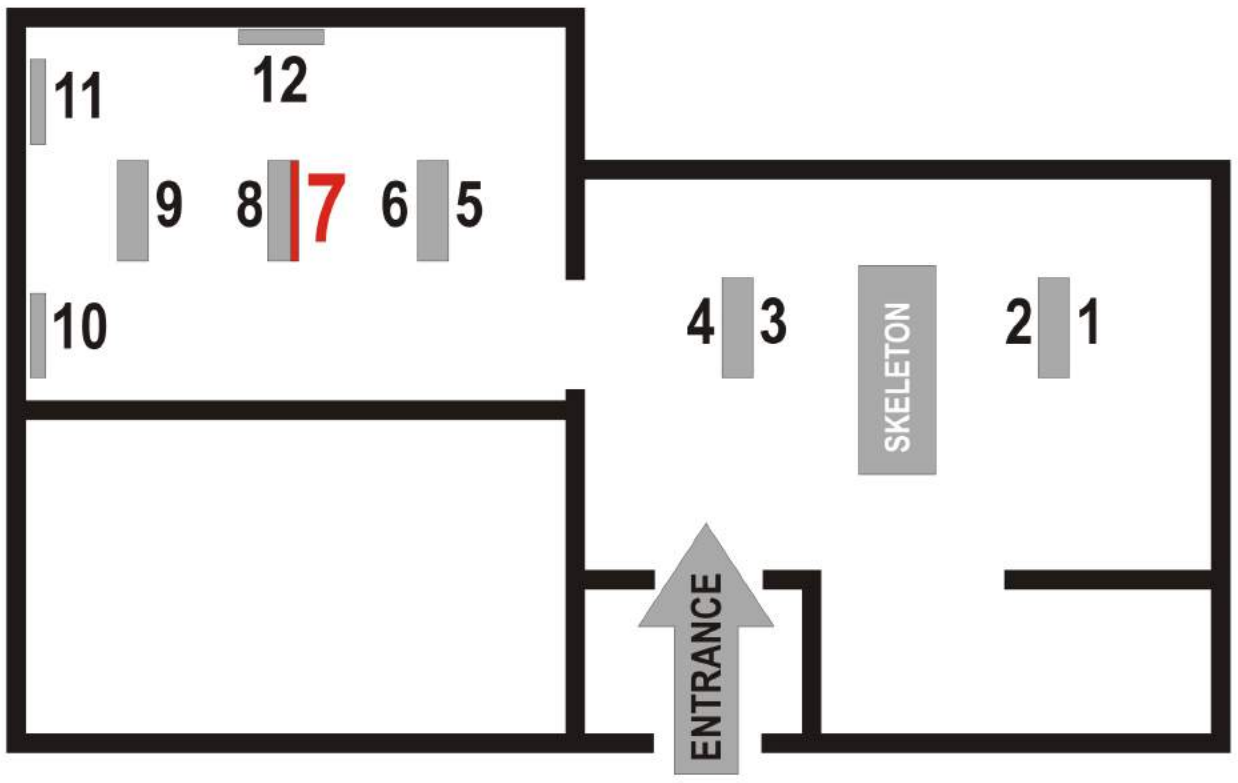


A red fox as pictured by a camera trap

The proportions of transmitters vary according to the size of the species being monitored. A well-built deer can easily carry a relatively heavy collar (750-900 g) with a large battery, which could last for 2 years.

MORE RESEARCH AND COLLABORATION PROJECTS

Zoological research projects in Šumava are underway in collaboration with external investigators, in addition to those involving the neighbouring, German-based Bavarian Forest National Park, including bodies such as the Institute of Vertebrate Biology at the Academy of Sciences and the Czech University of Life Sciences.



7

Healthy or sick?

What affects health?

Physical fitness
Nutrition (quality and quantity of diet available)
Genetic predisposition
Animal numbers and site concentration
Presence of predators
Condition of habitat


Wolves are specialists in hunting red deer.


A lynx will often catch a red deer fawn or a doe.

Carnivores choose prey that is easy to get when hunting.
This way they eliminate mainly sick and weak individuals, thereby reducing the risk of transmitting disease.

A healthy environment as a basic requirement

Air pollution, emissions, acid rain and the subsequent poor condition of forests and other ecosystems, poor water quality, high concentrations of heavy metals and other pollutants in the natural world and, consequently, in the bodies of animals - all of these bring about increased disease, reduced resistance and restrict the ability to reproduce, including the possibility of less vital offspring.

In Šumava, the quality of the environment is still pretty good.
It is up to humans whether it remains so or not, but even here the situation could worsen through the pursuit of short-term gain.


Dead deer


The capacity of any landscape for various activities is limited.

Disturbance by man

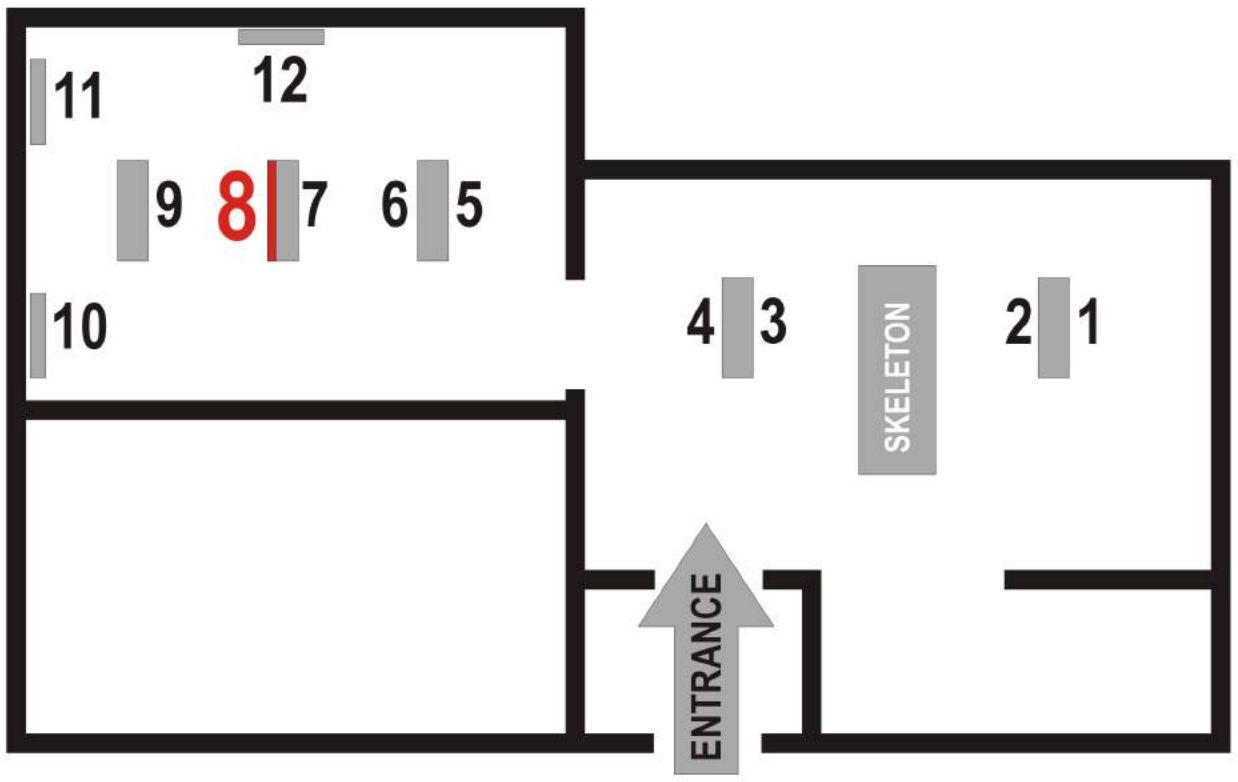
Excessive, repeated disturbance gives rise to stress and threatens all wildlife.
Red deer need to stay calm while ruminating and processing food.
If disturbed, the food is not sufficiently processed and the deer actually starve, irrespective of the sufficiency of food, or are forced into remote places where they may damage forest.

Not only red deer

Increasing pressure on the landscape in the form of new buildings, developing sport facilities, greater tourism and the business of sport, and the associated large number of people moving in the territory, all this means loss of quiet settings and there is a greater degree of disturbance to wildlife. Winter starvation is the riskiest period for wild creatures. Where a skier glides with ease, or a walker in snowshoes is equipped with warm clothes, animals are forced to wade through deep snow, thus losing valuable energy in the freezing winter. Sometimes it even costs them their lives.

Please be considerate when exploring the countryside.

Ensuring quiet places for wild animals is one of the reasons for restricting access to certain parts of protected areas, including Šumava National Park.



8

Deer misery

Developmental stages of trematodes can exist in water and on surrounding plants.
Contaminated water can be a source of more infectious diseases.

Vermin cause much suffering to animals.

THE MAIN DISEASES OF RED DEER *(see next page)*

Onemocnění	Původce	Příznaky a průběh	Přenos	Nakažlivost pro jiná zvířata a člověka
Virová				
		• u šelem 3 fáze: 1. apatie, požírání nelýpkých předmětů; 2. ztráta plachosti, agrese, slinění; 3. ochrnutí a úhyn • nebezpečná nákaza - povinnost hlásit veterinární službě		přenosná na člověka
Bakteriální				
Tuberkulóza	*Mycobacterium bovis* *M. tuberculosis* *M. avis*	• nakažlivé onemocnění, chronický průběh • příznaky se liší podle zasažených orgánů • nejčastěji kašel, postupné chátrání a ztráta hmotnosti, úhyn • při napadení mozku nervové příznaky • při napadení střev průjmy a zvětšení břicha • nebezpečná nákaza - povinnost hlásit veterinární službě	přímým kontaktem, kontaminovanými předměty vč. krmiva, produkty z nemocných zvířat	domácí i volně žijící zvířata přenosná na člověka
Pseudotuberkulóza (Yersinióza)	*Yersinia pseudotuberculosis*	• chronický průběh • hubnutí, průjmy, malátnost, zvětšené dýchání, úhyn • zvětšené mízní uzliny, krevní výrony na plicích, srdci, střevech • nekrotické uzlíky v játrech, slezině, střevech	přímým kontaktem, kontaminovanými předměty, půdou	hlodavci, zajíci, domácí zvířata
Salmonelóza	*Salmonella typhi murium* *S. enteritidis* a další druhy	• průjmy, slabost, ztráta hmotnosti, úhyn • zvířata, která nemoc přežijí, dále šíří bakterie • u sudokopytníků je toto onemocnění vzácnější	konzumací kontaminované potravy, trusem nakažených zvířat	všechny druhy zvířat přenosná na člověka
Aktinomykóza	bakterie rodu *Actinomyces*	• napříč časté onemocnění sudokopytníků, především srnce • tvorba tuhých zduřenin čelistních kostí nebo vnitřních orgánů (plíc, mléčné žlázy)	kontaminovanou potravou prostřednictvím poraněné kůže	přežvýkavci, prasata přenosná na člověka
Parazitární – střevní (endoparazitózy)				
Kokcidióza	prvoci rodu *Eimeria* *isospora*	• kokcidie parazitují ve střevech, kde způsobují zánět • průjmy, oslabení organismu, hubnutí • nebezpečná hlavně pro mláďata, která mohou uhynout • u dospělých zvířat se příznaky vůbec nemusí projevit	potravou kontaminovanou trusem nemocných zvířat	všechny druhy savců (kokcidie jsou druhově specifické)
Toxoplazmóza	prvok *Toxoplasma gondii*	• poruchy centrální nervové soustavy • poruchy zraku, lymfatické a endokrinní soustavy • potraty nebo porody nevyspělých i defektních mláďat • příznaky se liší u různých druhů zvířat • onemocnění je nejčastěji chronické s nevýraznými příznaky, ale při napadení plic, srdce, mozku nebo jater je průběh akutní	kontaminovanou potravou, vodou, půdou apod.	volně žijící i domácí zvířata hostitel: kočkovité šelmy přenosná na člověka
Hlístice dýchacího ústrojí "plicní červivost"	Hlístice rodů *Dictyocaulus*, *Varestrongylus* a další	• zánět plic, ucpání průdušek – ztížené dýchání, kašel • hubnutí, úhyn vyčerpaných jedinců – hlavně mláďat • závažné jsou především infekce hlísticemi rodu *Dictyocaulus* • příznaky napadení ostatními hlísticemi nemusí být příliš zjevné – oslabení, zpomalení vývoje mláďat, méně často úhyn	potravou kontaminovanou infekčními larvami	volně žijící i domácí zvířata
Hlístice trávicího traktu "střevní červivost"	např. hlístice rodů *Haemonchus*, *Trichostrongylus*, *Ostertagia*, *Chabertia*, *Capellania* a další	• příznaky nejsou specifické, závisí mj. na intenzitě napadení parazity • napadení často vyvolá zánět střeva • nejvíce ohrožená jsou mláďata – špatná kondice omezuje jejich růst a vývoj	potravou kontaminovanou infekčními larvami	volně žijící i domácí přežvýkavci
Motolice	různé druhy, zejm. motolice jaterní (*Fasciola hepatica*) motolice velká (*Fascioloides magna*) motolice kopinatá (*Dicrocoelium lanceolatum*) motolice jelení (*Paramphistomum cervi*)	• motolice mají složitý vývojový cyklus, některá stadia využívají hostitele, jiná mezihostitele • jednotlivé druhy motolic napadají různé orgány – játra, žaludek, žlučovody • příznaky mohou být nevýrazné – poruchy při výměně látek, ztráta hmotnosti • poruchy funkce jater, poruchy trávení, průjmy, vyčerpání, otoky • při silné invazi i úhyn (zejména mladá zvířata)	potravou nebo vodou kontaminovanou vývojovými stadii motolic ve fázi metacerkárií	sudokopytníci, výjimečně zajíc, králík přenosná na člověka
Echinokokóza - tasemnice	tasemnice, zejm. rod *Echinococcus*	• tasemnice mají složitý vývojový cyklus, některá stadia využívají hostitele, jiná mezihostitele • horší průběh má infekce u mezihostitele než u hostitele • příznaky a průběh se liší podle napadených orgánů • napadení životně důležitých orgánů (játra, plíce, ledviny aj.) může vést k úhynu	potravou kontaminovanou vývojovými stadii	savci přenosná na člověka
Střečkovitost	larvy střečků, např. *Hypoderma diana* (podkožní střečkovitost) *Cephenemyia stimulator* *Pharyngomyia picta* (nosní střečkovitost)	• střečci jsou hmyz, který klade vajíčka na živá zvířata • vylíhlé larvy se zavrtávají pod kůži (podkožní střečci) nebo zalézají do nosní dutiny i nosohltanu (nosní střečci), kde se dále vyvíjejí • napadená zvířata jsou neklidná, hubnou • při nosní střečkovitosti kašel, hrkání, výtok hlenu z nosu • při silném napadení i úhyn	samička střečka naklade vajíčka na tělo hostitele	sudokopytníci
Parazitární - vnější (ektop				
	roztoči, klíšťata, blechy, vši, všenky, klouti, komáři, ovádi, mouchy	celá řada různých čeledí a druhů bezobratlých	jen ve výjimečných případech působí vnější paraziti závažné problémy (např. přenášení komárů po zoplašcích) • někteří paraziti mohou přenášet různé choroby • znekklidnění zvířat bodáním, sáním krve, vniknáním do očí, uší, nosu apod.	většina ektoparazitů je běžnou součástí živočišného prostředí např. blechy, vši se přenáší nejčastěji kontaktem s napadeným jedincem	napadena mohou být všechna zvířata i člověk

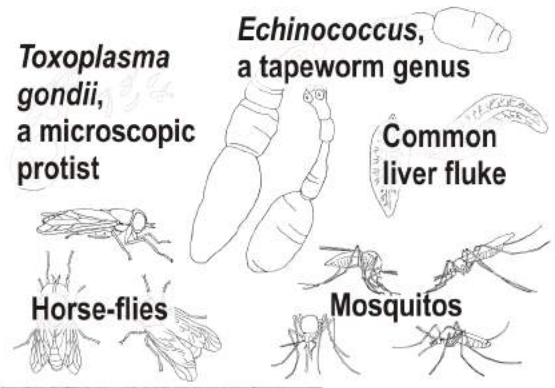
Transmission of infectious diseases and, in particular, parasitic infestation, spreads faster and easier wherever there is high concentration of animals caused artificially, even if seasonal - e.g. in game preserves.

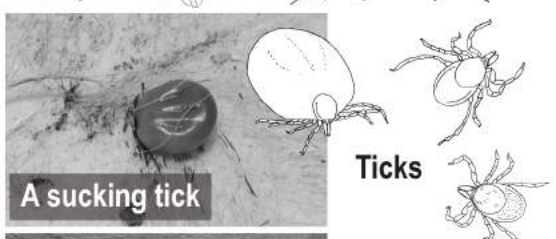
Other diseases can occur as a result of poor nutrition, e.g. enteritis - a diarrhoeal disease, poisoning, developmental and growth disorders, deformity of bones, and the like.
There are also genetically transmitted diseases.
Motor vehicle transportation additionally takes its toll and causes change to the landscape.

How can red deer receive treatment?

Red deer can easily seek relief from undesirable external parasites. They do so by bathing in mud - they like to roll around in muddy puddles, referred to as wallows. They also take a dip in water, which cools them on hot days, protecting them from intrusive insects. It is likely that red deer intentionally look for and feed on a variety of herbs that help improve digestion and treat some diseases.

SOME RED DEER PARASITES

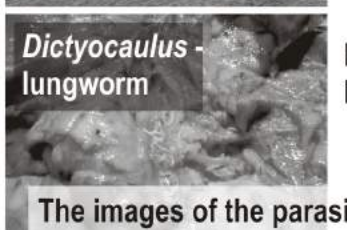




Warble flies - *Hypoderma diana* - cause subcutaneous bots (adult insects and larvae).

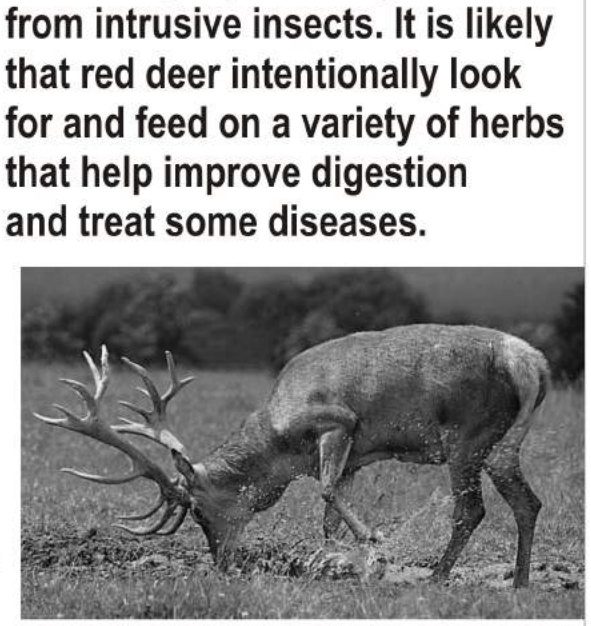
Deer botflies - *Cephenemyia stimulator* - cause nasal bots (adult insects and larvae).

The deer ked has membranous wings that fall off after the insect lands on the host.

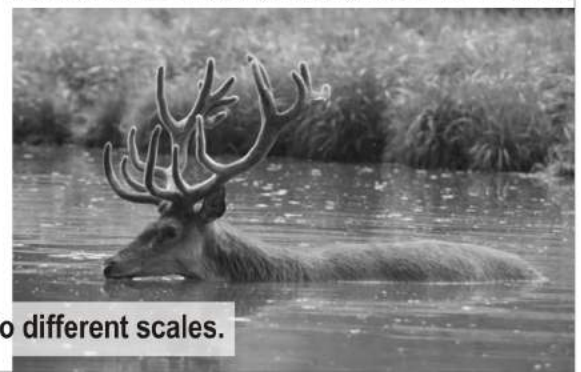


Nematodes - lungworms

The images of the parasites are enlarged to different scales.

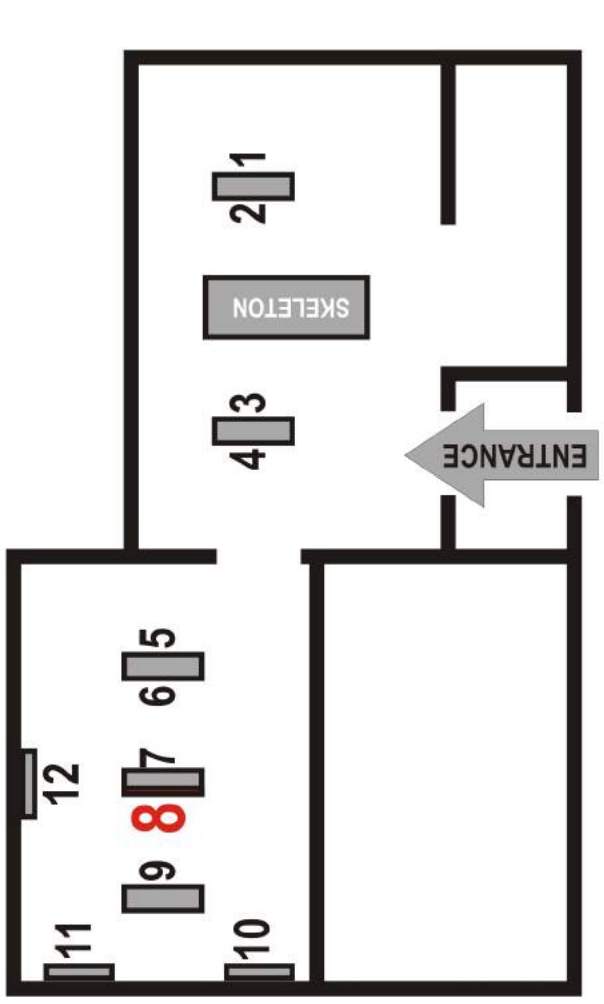


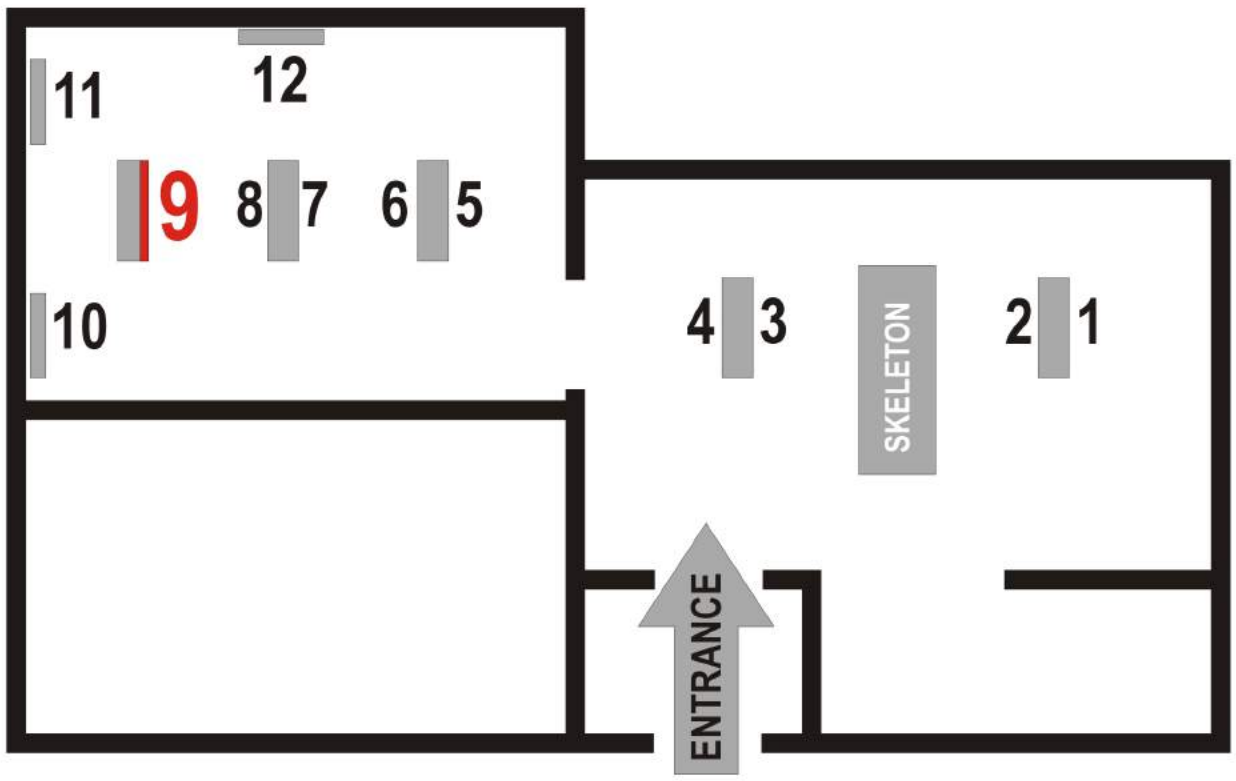
A wallowing place at a waterlogged site in a forest is a good place for the hygiene of deer.
However, if an animal becomes attracted by a small, 'bottomless' peaty lake in the treacherous fens of Šumava, it can cost its life.



Major diseases of the red deer

Disease		Agent	Symptoms and course	Transmission	Transmission to other animals and humans
Viral	**Foot and mouth disease**	*Aphtovirus*	☐ A highly contagious disease, with rapid progression, accompanied by fever ☐ In the mouth, between the hooves and on the rumen there appear vesicles that release blood when they crack. ☐ The animal has a problem ingesting; it limps and loses weight. ☐ Mortalities occur in about 5% of the animals affected. ☐ A highly dangerous infection - the obligation exists to notify the veterinary service	Through direct contact / contaminated objects	Domestic even-toed ungulates (sheep, cows, goats, pigs) Here, the percentage of mortality tends to be higher in offspring.
	Rabies	*Rhabdovirus*	☐ A fatal disease, it affects the central nervous system ☐ A fast course; the incubation period, however, can be up to 1 year. ☐ In even-toed ungulates it is manifest in overall restlessness, paralysis, distension and mortality. ☐ For carnivores, three are 3 phases: 1. apathy; eating unusual objects; 2. loss of usual shyness; aggression; salivation; 3. paralysis and death. ☐ A hazardous disease - the obligation exists to notify the veterinary service.	Biting or other contact with the saliva of an infected animal	Carnivores affected most frequently Transmissible to humans
Bacterial	**Tuberculosis**	*Mycobacterium bovis* *M. tuberculosis* *M. avis*	☐ An infectious disease, chronic in its course. ☐ Symptoms vary based on the organ affected. ☐ Mostly shows as coughing, progressive wasting and loss of weight, mortality. ☐ Symptoms affect nerves if the brain is infested. ☐ Diarrhoea and abdominal enlargement if the intestine is infested. ☐ A hazardous disease - the obligation exists to notify the veterinary service.	Direct contact, contaminated objects incl. foodstuffs, products sourced from sick animals.	Both domestic and wild animals Transmissible to humans
	Pseudotuberculosis (Yersiniosis)	*Yersinia pseudotuberculosis*	☐ Chronic in course. ☐ Weight loss, diarrhoea, dizziness, difficulty in breathing, death. ☐ Enlarged lymph nodes, haematoma in the lungs, heart, and intestines. ☐ Necrotic nodules in the liver, spleen and intestines.	Direct contact, contaminated objects, land	Rodents, rabbits, domestic animals
	Salmonellosis	*Salmonella typhi murium* *S. enteritidis* and other species	☐ Diarrhoea, weakness, loss of weight, death. ☐ Animals that survive the disease continue to spread bacteria. ☐ In even-toed ungulates the disease is rather rare.	Eating contaminated food, faeces of infected animals	All species of animals Transmissible to humans
	Actinomycosis	*Actinomyces* bacteria	☐ An infrequent disease of even-toed ungulates, especially roe deer. ☐ Generates solid swelling of jaw bones/internal organs (lungs, lacteal gland).	Contaminated food, through injured tissues	Ruminants, pigs Transmissible to humans
Parasitic - internal (endoparasites)	**Coccidiosis**	Coccidiosis *Eimeria* and *Isospora* genera of protists	☐ Coccidia are parasites in the intestine, where they cause inflammation. ☐ Diarrhoea, debilitation, loss of weight ☐ Particularly dangerous to juveniles, potentially causing death. ☐ In adults, the symptoms may not occur at all.	Food contaminated with the faeces of sick animals	All species of mammals (Coccidia are species-specific parasites.)
	Toxoplasmosis	Toxoplasmosis *Toxoplasma gondii* (a protist)	☐ Disorders affecting the central nervous system. ☐ Disorders of vision, the lymphatic and the endocrine systems. ☐ Abortions or births of immature/defective offspring. ☐ Symptoms vary in different species of animals. ☐ It is often a chronic disease with featureless symptoms; when the lungs, heart, brain or liver are infested, however, acute progress is discernable.	Contaminated food, water, soil, etc.	Both wild and domestic animals Host animals: felines Transmissible to humans
	Lungworms (Nematods affecting the respiratory system)	*Dictyocaulus*, *Varestrongylus* and other lungworm genera	☐ Pneumonia, blockage of the bronchi - difficulty in breathing, coughing ☐ Loss of weight, the death of exhausted individuals - especially juveniles. ☐ In particular, infections by nematodes of the *Dictyocaulus* genus are serious. ☐ Symptoms of infection by other nematodes' may not be obvious - weakening, slowing the development of the offspring; death is less frequent.	Food contaminated with infective larvae	Both wild and domestic animals
	Digestive tract nematodes (intestine worms)	E.g. nematodes of *Haemonchus*, *Trichostrongylus*, *Ostertagia*, *Chabertia*, *Capillaria* and other genera	☐ Symptoms are not specific; they depend, amongst other things, on the intensity of infestation by the parasites. ☐ Infection often causes inflammation of the intestine. ☐ Juveniles are at biggest threat - poor fitness limits their growth and development.	Food contaminated with infective larvae	Wild and domestic ruminants
	Trematodes	Various species, particularly the common liver fluke (*Fasciola hepatica*) giant liver fluke (*Fascioloides magna*) lancet liver fluke (*Dicrocoelium lanceolatum*) *Paramphistomum cervi*	☐ Trematodes have a complex development cycle; some of the stages use a host, others use an intermediate host. ☐ Individual trematode species affect different organs – the liver, stomach, bile ducts. ☐ Symptoms can be unclear - disorders when shedding coat, weight loss. ☐ Liver disorders, digestion disorders, diarrhoea, fatigue, swelling. ☐ Can lead to death upon severe invasion (especially in young animals).	Food or water contaminated with developmental stages of trematodes in the Metacercaria stage	Even-toed ungulates, exceptionally hares, rabbits Transmissible to humans
	Echinococcosis - tapeworms	Tapeworms, particularly *Echinococcus* genus	☐ Tapeworms have a complex development cycle; some of the stages use a host, others use an intermediate host. ☐ For intermediate hosts, the course of infection exhibits worse progress than in the host. ☐ Symptoms and courses vary according to the organ affected. ☐ Vital organs infested (liver, lungs, kidneys, etc.)	Food contaminated with developmental stages	Mammals Transmissible to humans
	Botflies	Larvae of botflies, e.g. *Hypoderma diana* (subcutaneous bots) *Cephenemyia stimulator* *Pharyngomyia picta* (nasal bots)	☐ A botfly is an insect that lays its eggs on live animals. ☐ Hatched larvae burrow under the skin (subcutaneous bots) or crawl into the nasal cavity and nasopharynx (nasal bots), where they continue their development. ☐ Infested animals are restless, lose weight. ☐ Nasal bots: coughing, snorting, discharge of mucus from the nose. ☐ Mortality occurs upon strong infestation.	Bot females lay eggs on the host's body.	Even-toed ungulates
Parasitic - external (ectoparasites)	**Mites, ticks, fleas, lice, bird lice, keds, mosquitos, horseflies, flies**	A wide range of diverse families & species of invertebrates	☐ Ectoparasites cause serious problems only exceptionally (e.g. over abundance of mosquitoes after flooding). ☐ Some parasites can transmit various diseases. ☐ Causes the animal to be restless through stinging, sucking blood, intrusion into the eyes, ears, nose, etc.	Most ectoparasites are a normal part of the habitat, e.g. fleas/lice are transmitted mostly by contact with infected individuals.	Infestation may occur in any animal, including humans.





9

Relatives of the red deer in the Czech Republic

Native and non-native species

In addition to the red deer, only two species of the deer family are native to this country: roe deer and elk.

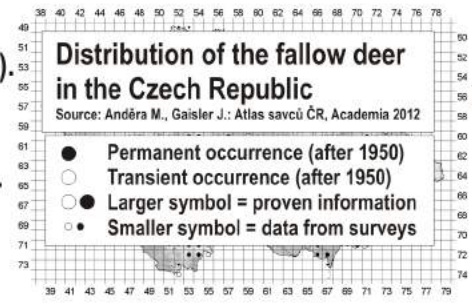
Non-native deer species were introduced locally due to endeavours by man - by escaping from game preserves or via intentional introduction.
In Šumava - mainly due to its natural habitats - the presence of these is not very high.
Non-native species are undesirable in the national park and the goal is complete elimination of these.
What problems can non-native species cause?

- They occupy the space of the native species, becoming competitors regarding occupation of the area and obtaining food.
- They cause damage to forest by browsing woody species and debarking; they can even be harmful to fields.
- For the sika deer, undesirable cross-breeding may take place at the species level with the red deer.

Fallow deer (*Dama dama*)

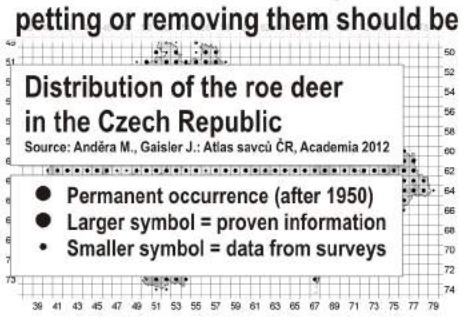
The fallow deer is native to the Mediterranean and South-west Asia.
It was introduced into local game preserves a long time ago - in the 14th/15th century.
Typical traits for fallow deer are the paddle-like antlers of rather mature males.
The coat is spotted (the spots are less pronounced in winter).
The most common occurrence is seen in low zones (up to 500 m) with open deciduous or mixed woods in an agricultural landscape.

Fallow deer in Šumava:
Given that the fallow deer prefers warm, low elevations, Šumava tends to witness individual animals. A permanent population lives in the surroundings of Nýrsko and Klatovy. Sightings have been reported in the regions of Sušice, Hartmanice, Prachatice, and Český Krumlov.



Roe deer (*Capreolus capreolus*)

The smallest of this country's cervids (standing at 90 cm or below, max. weight around 30 kg).
The coat is rusty-brown in summer; in winter, it is greyish-brown, fawns show white spots.
A common species in the wild in this country; frequent in lower elevations.
An adaptable species, it thrives in both intensely used landscapes and uninterrupted forests.
Normally, it is found individually; in winter, it forms groups.
The rutting period runs from mid-July to mid-August.
Fawns are born in late May and June; newborns are usually hidden in the grass - petting or removing them should be avoided at all times!

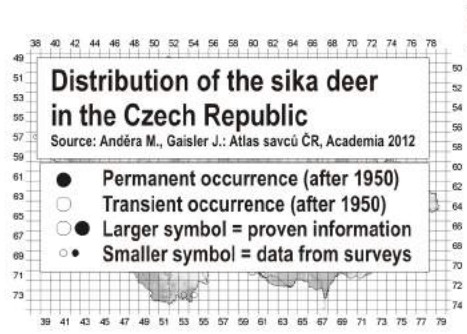


Roe deer in Šumava:
They range throughout the region as far as the highest peaks; the numbers decrease as the elevation rises.
They represent the main prey of the European lynx; the carnivore positively controls the health of roe deer populations by hunting them.

Sika deer (*Cervus nippon*)

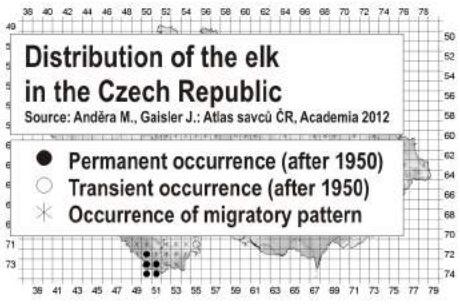
Sika deer are native to East/South-east Asia and Japan. Introduced in the late 19th century into the local game preserves. Resembles the red deer, but stands smaller, with simpler antlers. Even adult animals are speckled (in winter, the spots are less pronounced). Their most preferred landscape alternates between non-forested areas and medium-dense mixed and deciduous woods.

Sika deer in Šumava: The first traces arose in the NW foothills of the region, in the mid-1970s. Since then, there have been dozens of sightings, mostly from the regions of Železná Ruda, Sušice and Strakonice; also seen in the relatively high zones of Hartmanice and Prášily regions.



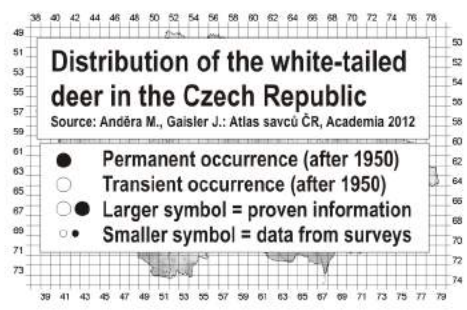
Elk (*Alces alces*)

This country's largest mammal - males may stand up to 230 cm at the shoulders and weigh up to 600 kg.
Elks found in the Czech Republic tend to have simple, perch-like antlers.
The coat has shades of dark brown; the limbs are bright.
Elks prefer wetlands with willows, alders and birches, as well as humid swamp woods.
They lead a solitary life throughout the most of the year; the winter is spent in small groups.
Rutting begins in August and can last until November; the male will mostly mate with a single female.
Preferably during the rutting period, elks set off on travels for hundreds of kilometres.
Elks probably became extinct in the late 14th and 15th centuries or even earlier in some places.
From 1957 onwards, the first elks migrating from Poland started to appear in the Czech Republic.
The elk, as the only hoofed mammal in this country, is a specially protected species (heavily endangered).
The species is the most threatened by increasing traffic (collisions with cars, transport corridors preventing migration etc.) and illegal hunting.



The elk in Šumava:
Elks, probably of Poland origin, have been appearing in the region since the 1980s.
A minimal permanent population (about 10 to 15 animals) ranges in the Lipno region.
Migrating animals can be seen at more places.

A really big animal – an image from a camera trap demonstrates the height of the elk: where a deer would be shown fully, for the elk only the lower body and the limbs are visible.

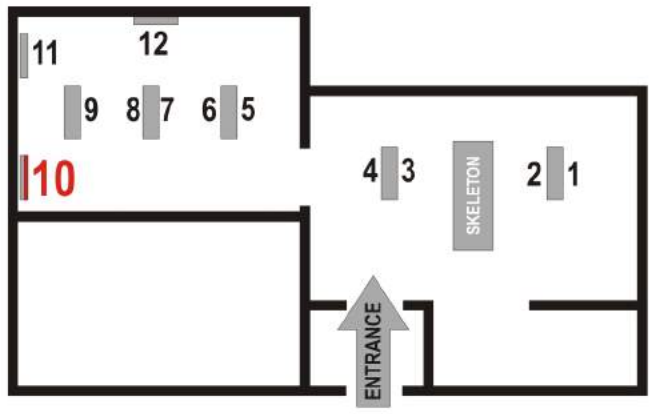


White-tailed deer (*Odocoileus virginianus*)

The white-tailed deer is native to the Americas.
It was introduced in the second half of the 19th century into Czech game preserves.
A long tail is typical of this deer; its white underside is held up when sensing danger and fleeing.
Antlers are arcuated, coiled forwards.
A landscape alternating woods and agricultural crops suits the species best.
This deer species has not yet been recorded in the Šumava region. The nearest sightings thus far have occurred in the Švihov area.

Distinctive features of the deer family - the colour of the patch on the rump and of the tail (partial variations exist in winter and summer colourings; in the roe deer, the rump patch is rusty-brown in summer - no white colour)

elk / red deer / fallow deer / sika deer / white-tailed deer / roe deer



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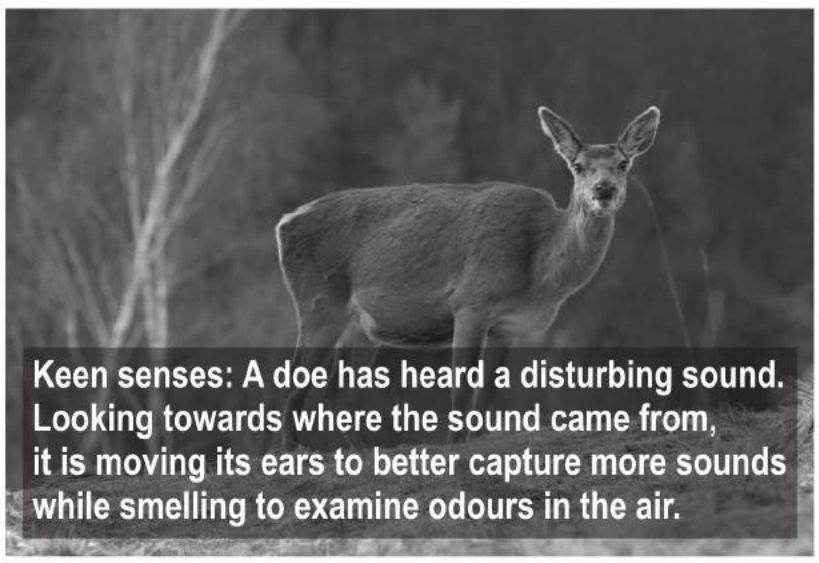
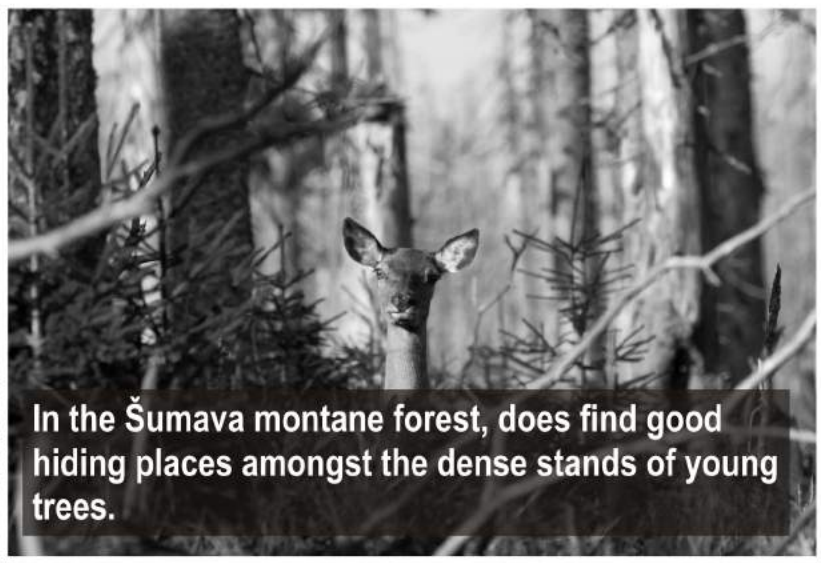

Keen senses: A doe has heard a disturbing sound. Looking towards where the sound came from, it is moving its ears to better capture more sounds while smelling to examine odours in the air.

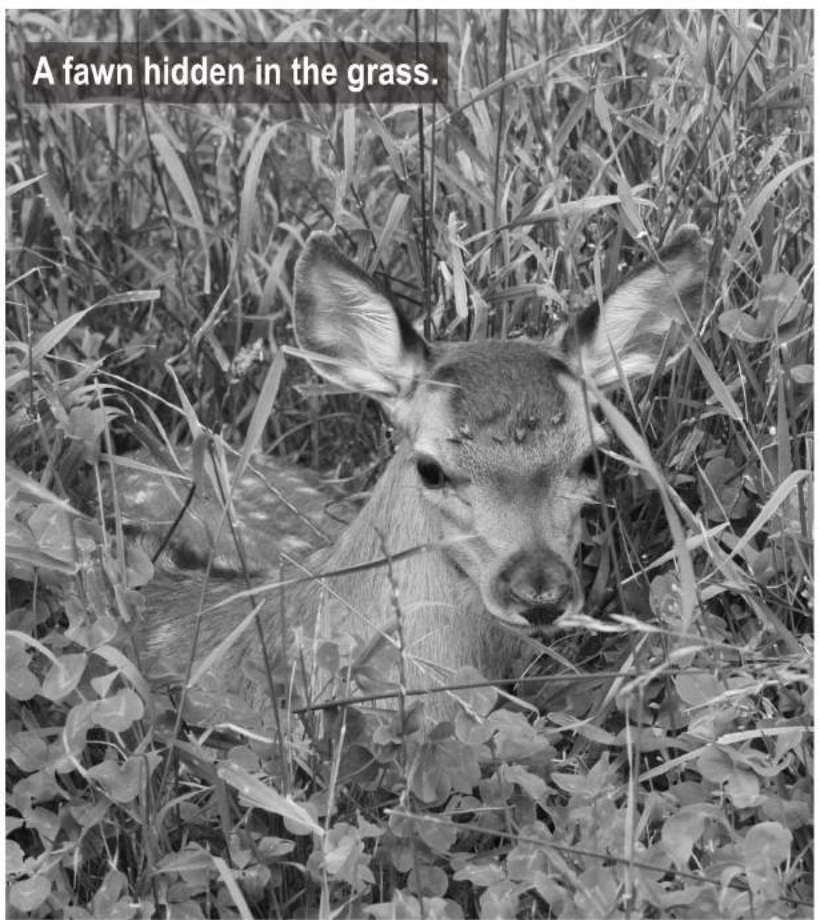

In the Šumava montane forest, does find good hiding places amongst the dense stands of young trees.


Young deer are usually born in early June. This one is only a few weeks old.

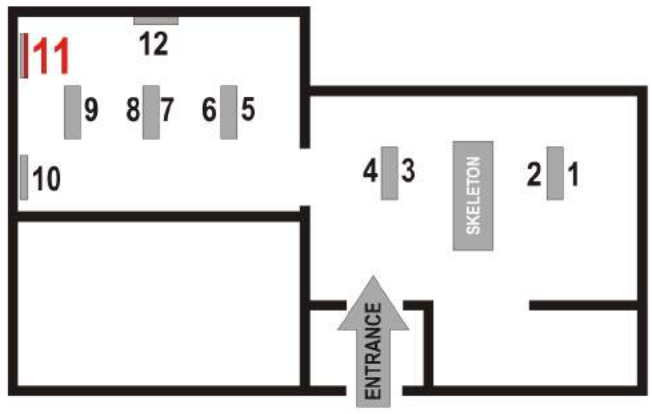

The white spots on the fawn's coat help the animal blend in with its habitat, such as when lying hidden in the grass.


Grasses and herbs form a major part of the diet of red deer in the summer.


Light spots can sometimes even be seen on the coats of adult animals.


A fawn hidden in the grass.


Does nurse their fawns usually for four months.



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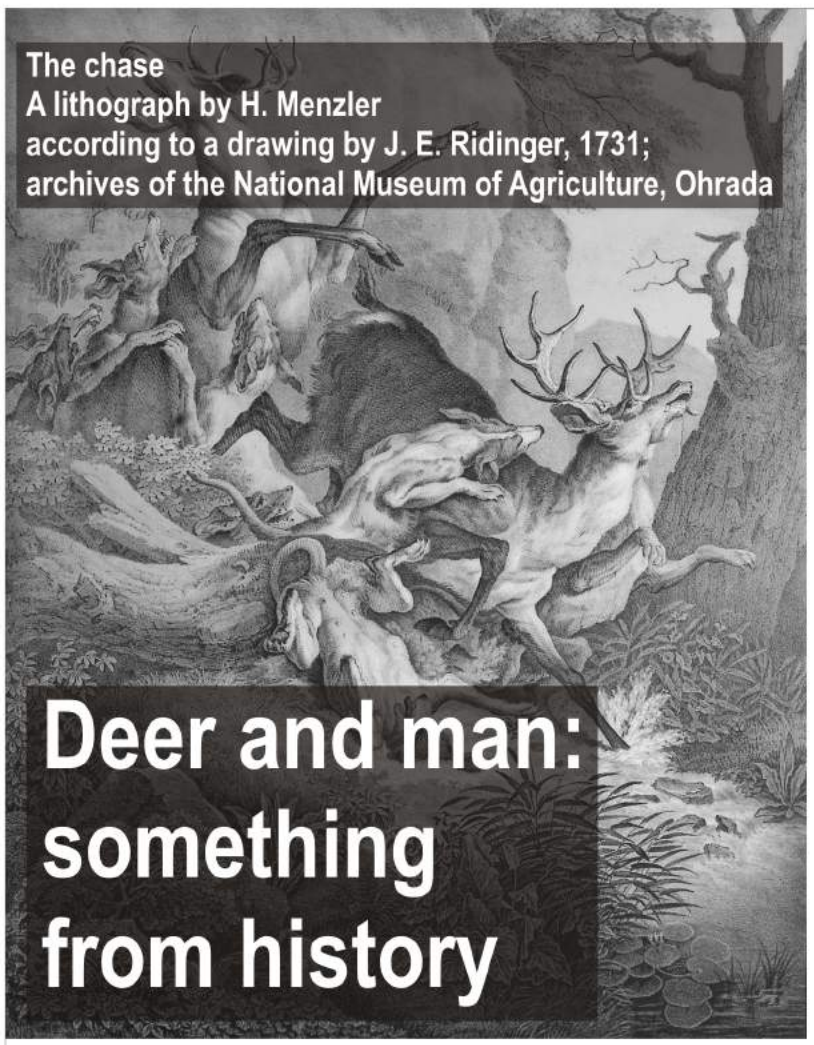


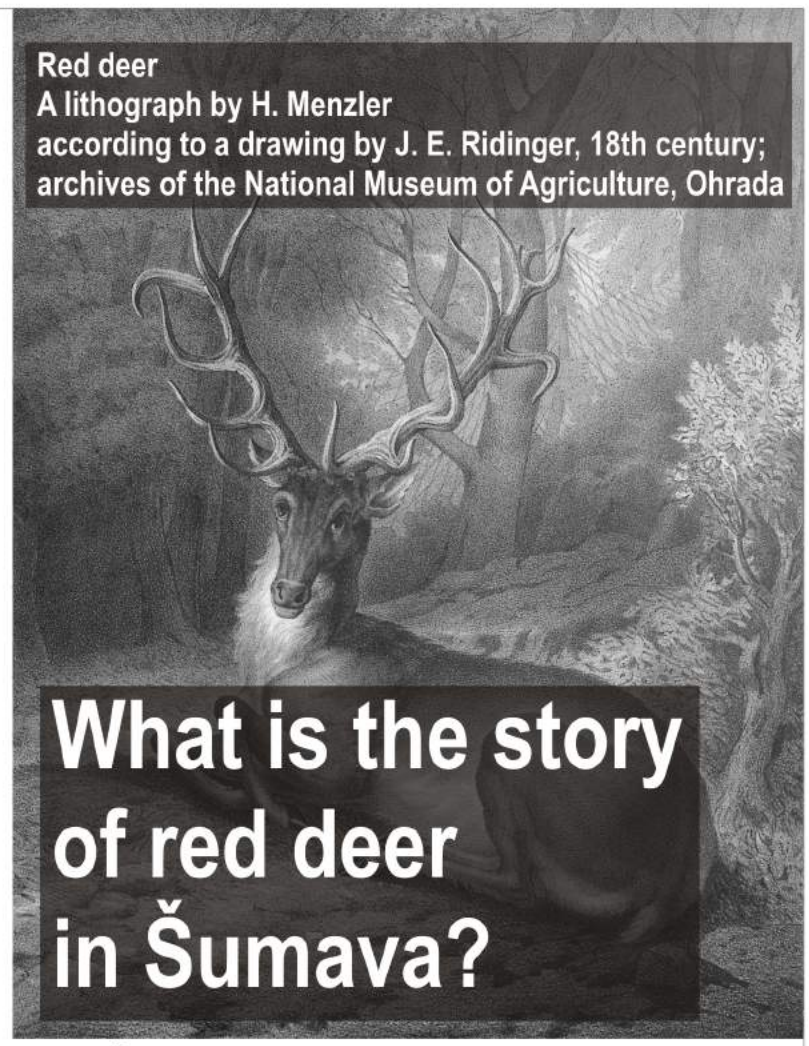
The chase
A lithograph by H. Menzler
according to a drawing by J. E. Ridinger, 1731;
archives of the National Museum of Agriculture, Ohrada

Deer and man: something from history

The perception of wild animals and humans' attitudes to them has changed over the centuries. Historically, the main concern was to source food, but later on hunting became something of a sport. Stocking up the kitchen was no longer enough, the goal was to kill the greatest number of animals possible. Hunting methods also changed and evolved through improvements in weaponry. Well-arranged hunts and chases were held, during which they slaughtered dozens or even hundreds of red deer and other animals during a single day. In particular, the 16th-18th centuries were a cruel period for such creatures.

Yet the numbers of animals were high, causing damage to both forests and fields. The poor condition of the woods was also due to their unrestrained use. Therefore, to protect the forests, Empress Maria Theresa released, in 1754, a document entitled The Imperial and Royal Patent on Forests and Timber in the Czech Kingdom. In 1766, the Empress subsequently issued a patent on the principal duties of addressing the damage caused by game. Likewise, Emperor Joseph II confirmed the duty to deal with such damage, ordering a reduction in the number of red deer.

Since then, numerous changes have happened in humans' attitudes towards different species of animals and natural systems as a whole, from intentional destruction to the current protection of species and entire ecosystems, including the relationships between them. Information and evidence can be sourced from literature on the subject, as well as a number of museums and archives.



Red deer
A lithograph by H. Menzler
according to a drawing by J. E. Ridinger, 18th century;
archives of the National Museum of Agriculture, Ohrada

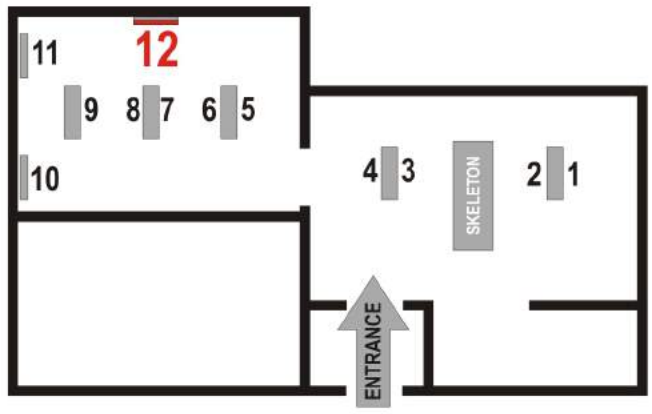
What is the story of red deer in Šumava?

Are Šumava's red deer really native to Šumava?

Red deer have always constituted the most plentiful animal species in Šumava. In the past, the nobility used to reserve hunting rights for themselves. The animals' meat - venison - attracted poachers as well, who desired the meat for personal consumption or offered it for sale, despite the fact that they could face high fines.

Frequent conflicts broke out between poachers and landowners' gamekeepers, which often ended in death. As a result, Prince Schwarzenberg ordered, in 1817, all the red deer be shot. The order was reportedly completed in 1820, meaning the native red deer population of Šumava had been completely wiped out.

A deer reserve was only set up in 1874; founded at the foot of Mount Boubín, this area witnessed a total of 29 deer, which had been farmed locally, released into the wild four years later. Today's red deer population in Šumava consists of the offspring of several subspecies that were gradually introduced in the region.



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How do the antlers of red deer grow?

At the cusp of February and March:
an antler that has been shed. In this period, antlers naturally break off and fall away. This first occurs in the eldest stags.

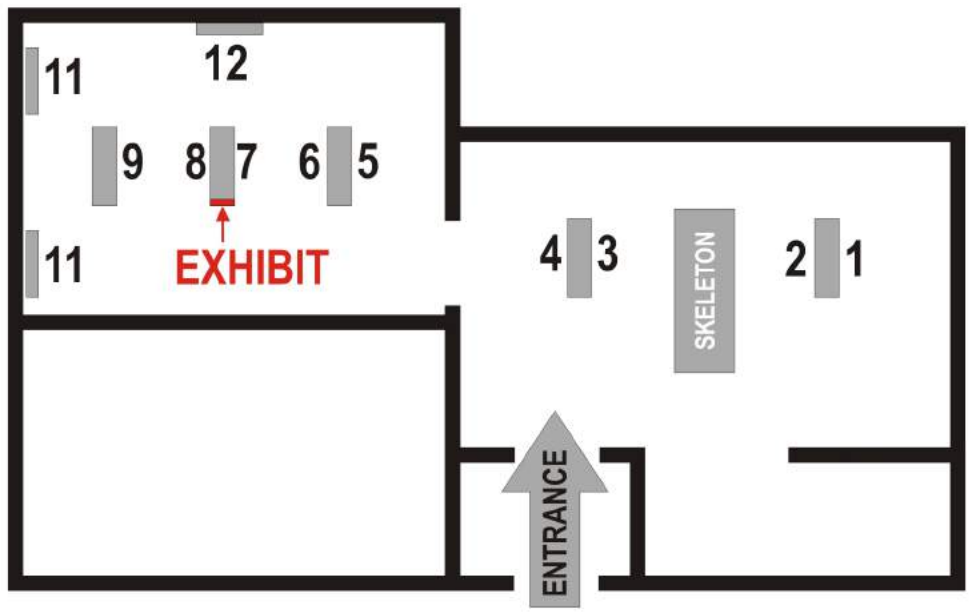
Mid-July: the eldest deer are the first to remove the velvet down

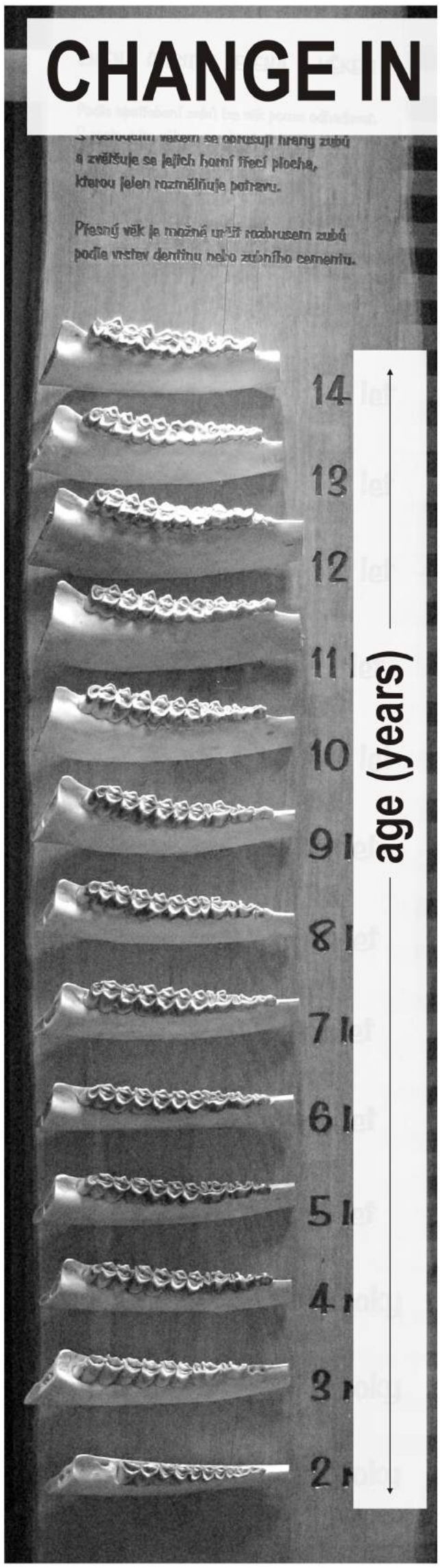
Late March:
a stag that is growing new antlers. The development of antlers is related to the hormonal activity of the male sex organs.

Mid-July: the tissue covering the antler dies off, dries out and peels off; below it is the mature, ossified antler.

Early July:
a stag with antlers still covered in soft, downy tissue (velvet). This tissue contains blood vessels supplying nourishment to the growing antlers. The tissue contains sebaceous and scent glands as well as nerve endings.

September/October:
at this time the deer's antlers, fully mature, are utilised during the rut to compete for does. Antlers are also used in self-defence, e.g. as protection from carnivores. Deer also use antlers to scratch or search for food (removing snow or turf, and so on).





CHANGE IN DENTAL CONDITION OVER THE YEARS

The amount of wear to teeth only allows for estimating the age of the animal.

With each passing year, the edges of the teeth become abraded and increase their upper friction surface, applied by the animal to crush food.

The exact age can be determined by the layers of dentine or dental cement accumulated through grinding the teeth.