



TREASURES OF THE KRKONOŠE TUNDRA



SPRÁVA KRKONOŠSKÉHO NÁRODNÍHO PARKU

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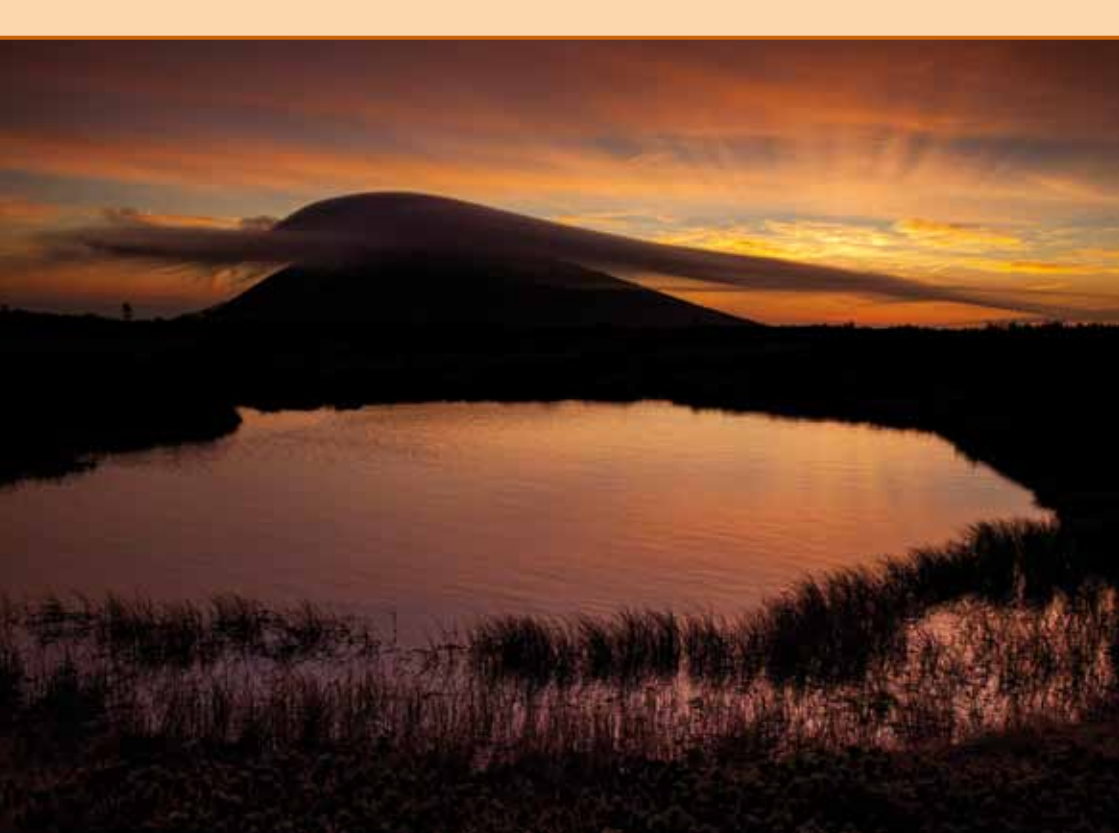


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Terminological Dictionary

endemic species	a plant or animal species which originated and only occurs in a specific, geographically defined area; outside of this area it does not naturally occur
glacial relict	a plant or animal species which has survived in a locality since the ice ages
Hercynides, Hercynian mountain range	a geologically ancient, non-limestone, mountain range in central and western Europe (Massif Central, Vosges, Schwarzwald, Harz, Šumava, Bayerischer Wald, Krušné hory Mountains and the High Sudetes)
megafauna	large animals which lived on Earth at the end of the last ice age (e.g. cave bear, cave lion, woolly rhinoceros, woolly mammoth, spotted hyena); most of these animals died out during the warming in the Holocene
dwarf pine scrub with cloudberry	rare plant community on the subarctic ridge peatbogs in Krkonoše
creeping snow	the individual layers of snow on the slope are moving at different speeds, which causes pressure and on the bodies of plants, especially on the branches and trunks of woody plants, which become deformed; various unusually shaped forms of woody plants occur in this way e.g. on avalanche runs (crooked forests)
semi-parasite	green plant capable of photosynthesis, but extracting water and mineral nutrients from its host plant
Life Corcontica project	supports improved management of the most valuable montane meadows in Krkonoše and selected plant and animal species
matgrass grasslands	low alpine grasslands in the Krkonoše grassy tundra zone, which are dominated by matgrass (<i>Nardus stricta</i>)
Natura 2000 network	a network of protected areas, which are created on their territory by all states of the European Union, according to a standard set of principles; the aim is to ensure the protection of the most valuable, most endangered, rarest or endemic species of plants, animals and selected types of natural habitats
table-like pine scrub	low growth form of pine scrub on the Krkonoše peatbogs; recognizable by the dense crowns, and that the annual shoots are arranged at \pm the same height as the shrub
medium-height mountains	in the classification according to the altitudinal vegetation levels, they are mountain systems with a developed montane (forest) belt



Diverse World of the Krkonoše Plants and Animals

Although the Krkonoše Mountains only cover a small area, they are an important locality if we want to understand the natural processes, which formed our central European landscape. They are the highest of the geologically ancient, non-limestone, central European mountain ranges – the Hercynides.

These mountains formed during the Proterozoic and later experienced several orogenic processes, making them witnesses to the great geological events, which took place in this part of Europe during hundreds of millions of years.

This is reflected in the diversity of the geological structure of Krkonoše, the distinctive layout of its surface and the associated diversity of living nature, which has settled in Krkonoše. Over many centuries the exceptional natural diversity

has caught the attention of human society, from the first colonists of Krkonoše, through conquerors of natural treasures and resources, up to scholars from a wide variety of professions, who were enchanted by this pocket-sized mountain range on the borders of Bohemia, Silesia, Germany and later Poland. Without exaggeration we can say that the Krkonoše is one of the most researched mountain ranges in Europe. This was also thanks to a network of renowned universities and scientific institutions, the researchers from which were extremely close to Krkonoše and the mountains offered them a surprising wealth of biotic and abiotic montane nature, as well as many topics for research, within several hundred metres of elevation.

Today we have thousands of scientific papers from many fields available to us

and we are able to perceive the flora and fauna composition of our highest mountains and their habitats, and to understand why Krkonoše rightfully became our first national park more than 50 years ago.

The area of approximately 700 km² is covered by a varied mosaic of montane environments, from meadows and stream floodplains, through montane forests and meadows, up to the unique environment of the Krkonoše arctic-alpine tundra on the mountain ridges.

This is a distinctive world of fungi, plants and animals, as shown by the number of groups which have been studied in great detail. The fate of several selected celebrities of the Krkonoše flora and fauna are described on the pages of this publication.



Fungi

of the *Macromycetes* order are large fungi, with fruiting bodies visible to the human eye. In Krkonoše they are represented by up to 2,000 confirmed species or predicted species, which have not been recorded yet:

Gasteroid fungi	gill-less fungi	Agaricales	Discomycetes	Polypores (bracket fungi)
16	63	400	80	50

Plants

In Krkonoše more than 2,600 species and subspecies from this taxonomic group occur:

Algae, blue-green algae & red algae	lichens	mosses	ferns	vascular plants
over 300	cca 600	cca 500	cca 50	over 1 200

Animals

We can estimate or predict the occurrence of tens of thousands of species, of which certain invertebrate groups, for which we know the approximate number of species, represent around 5,000 species and the vertebrates up to 400 species. Occurrence from selected taxonomic groups of invertebrates in Krkonoše confirmed:

Invertebrates						
molluscs	crustaceans	mites	spiders	harvestmen	mayflies	Megaloptera
85	cca 25	cca 70	428	15	45	2

dragonflies	stoneflies	earwigs	grasshoppers	cockroaches	true bugs
20	65	2	22	2	cca 120

plant bugs	book & bark lice	beetles	bees, ant & wasps	net-winged insects
cca 40	13	1 300	cca 35	16

true flies, mosquitoes & gnats	scorpionflies	caddisflies	butterflies
cca 770	3	95	1 000

Vertebrates					
cyclostomes	fish	amphibians	reptiles	birds	mammals
1	5	11	6	over 270	80

Apollo Butterfly



History of the Origins of the Krkonoše Flora and Fauna

The contemporary flora and fauna of Krkonoše are relatively young, as they only started to form during the ice ages, interglacials and especially in the postglacial period.

This is called the Holocene, has lasted for around 10,000 years and we live in it now. However, this does not mean that we do not have evidence of how the living world looked in the wider surroundings of Krkonoše in the ancient past. For example, fossilized plants and animals from the Permian period of the Palaeozoic are quite common in the Podkrkonoší Foothills. On the other

hand, we have no evidence of living nature from the Mesozoic, so the first predicted witnesses are certain invertebrates from the Tertiary, including the harvestman *Ischyropsalis hellwigi* and maybe the currently extinct Apollo butterfly already lived in Krkonoše.

As the Tertiary passed into the Quaternary the Northern Hemisphere

Himalayan Balsam





Monk's Rhubarb

became colder and we are reminded of the effects of the events of the ice ages on the living nature in Krkonoše by dozens of plant and animal species. This is because many eyewitnesses travelled here from various parts of Europe in advance of the continental ice sheet and its tundra nature, including for example, the giant springtail and other springtail species, many bats and rodents. Well-known living witnesses to the relatively recent history include the glacial relicts, which found their sanctuary especially on the mountain ridges in the Krkonoše tundra; certain vascular plants, and animals including many spiders, mayflies, dragonflies, beetles, birds or mammals. Insight into the ancient times is also provided by the finds of skeletal remains of the megafauna, which lived in the central European tundra around 20,000 years ago (e.g. the skeletal remains of a cave bear from the Medvědí jeskyně Cave near Svoboda nad Úpou). Although most of the eyewitnesses to the ice ages are critically endangered representatives

of the Krkonoše nature, some of them have adapted so well that they now belong to the harmful species. This is the story of the small rodent – the field vole – which now causes a lot of problems and damage to newly planted forest stands in Krkonoše. However, this also concerns us humans, as we have been influencing the living nature in Krkonoše for many centuries. For example, hundreds of plant and animal species, many of which are not always welcomed as guests, have followed in our footsteps from the foothills to the mountain ridges.

Nevertheless, Krkonoše has been an isolated montane island amid the lowlands and forests of central Europe. This has permitted the formation of another group of species, which are another famous part of the legendary natural wealth of Krkonoše – the Krkonoše endemics. We cannot encounter these anywhere in the World except for here, so they deserve our full attention just as much as the glacial relicts.

Sudetic Lousewort



Cult Plant of Krkonoše **Willow Gentian – *Gentiana asclepiadea***

The great majority of more than 300 gentian species, which inhabit various corners of our planet, grow in the mountains. Many of them colonised the Himalayas, where they have one of their development centres, numerous species grow in the Alps, while even the central European Krkonoše Mountains are famous for their gentians.



Among other species, this mainly concerns the willow gentian, a magnificent montane plant, which will please the eye of every late summer visitor to our highest mountain range (even though its clusters of flowers herald the irrevocable end of the holidays). However, visitors also know them from the coat of arms of the first Czech national park. This is because more than 50 years ago its stylised flower was chosen as the emblem or logo of Krkonoše National Park.

The roots of gentians contain chemical compounds with bizarre names like gentiopicroside or gentisin, which are used to prepare various bitter herbal liqueurs. The fresh roots of perennial gentians have been used in the Alps for many centuries to make gentian liqueurs. The roots of our willow gentian were also added to local bitter herbal liqueurs and Jan David Honců, a farmer from Hoření Štěpanice, once gained a licence to

produce alcohol from potatoes and the right to serve alcohol. His “liqueur factory” and pub was made famous by the well-known and popular gentian liqueur known as “honcouka”.

We could continue to tell the story of the useful properties and fate of gentians. Several years ago it was decided which of the Krkonoše plants could become the joint logo of the Czech and Polish national parks in Krkonoše. In the end

a compromise solution in the form of the stylised flowers of the willow gentian (CZ) and the Bohemian bellflower (PL) was accepted by the conservationists on both sides of the mountains. Thus, both national parks have had the same logo for several years, which is probably the first joint logo for two transboundary national parks in the world.

So, this is the concise history of the willow gentian in Krkonoše.



The World's Treasure Chest **Alpine Hawkweed – *Hieracium alpinum***

*Some of the slopes of the highest Krkonoše peaks turn yellow in July – when hundreds of thousands of small, hairy plants for which Krkonoše is rightly famous, all flower at once. These are hawkweeds, the most abundant of which is the alpine hawkweed (*Hieracium alpinum*).*



The first botanists, who wandered along the ridges of Krkonoše two centuries ago, were surprised by the exceptional diversity of species they found here. From the foothills to the summit of Mt. Sněžka in Krkonoše, the occurrence of many species, microspecies and sub-species are described in botanical works; species which grow nowhere else except in Krkonoše, often only occurring at a few sites. These are endemic plants and Krkonoše had many prerequisites for the development of such a rich species collection. Almost 30 montane and high-mountain hawkweed species have the ability to breed and create cells without pollenisation (a phenomenon called apomixis or apogamy) to thank for their genetic diversity. The second

prerequisite is the long-term spatial isolation of Krkonoše (High Sudetes) from other European high mountains. This has lasted since the last glaciation, i.e. for hundreds of thousands of years during alternating periods of ice ages and interglacials. Over the following millennia the notable isolation of the populations of many hawkweed species led to the founding of new and separate species and sub-species. Many of them are named after their discoverers, e.g. Čelakovský, Wimmer, Schneider, Rohlena, Engler, Purkyně, Schustler or Zlatník.

From the perspective of biodiversity the hawkweeds are irreplaceable, still vigorous and continuing to develop as one of the jewels of the Krkonoše nature.



Will it survive the adversities of fate? **Alpine Saxifrage – *Saxifraga nivalis***

The weathered basalt rocks in the Mały Śnieżny Kocioł (Malá Sněžná jáma) Cirque on the northern side of western Krkonoše play host to remarkable relict flora of the last ice age – the alpine saxifrage. It was clearly discovered here in 1815 by Kašpar Maria, Count of Šternberk and his entry on the list of unique plants in Krkonoše somewhat sealed the future fate of this floral jewel.



Not surprisingly, many people wanted to meet this tiny plant, which only occurs in the European interior at this single site: lovers of montane flora, ardent collectors of curiosities, rockery plant growers, as well as botanists from renowned institutions all wanted to see it. Thank god that this glacial relict chose such an inaccessible location for its life, but even so, or perhaps just because of the locality, it became an irresistible challenge for many.

And so the number of tiny rosettes of alpine saxifrage clinging onto cracks in

the rocks declined. The famous princess of the Krkonoše botanists Josefína Kablíková was a frequent visitor to this single central European locality and herbarium entries with her name and the locality named as *Kleine Schneeegrube im Riesengebirge* became a rare entry in the collections of many European herbaria.

Even at the beginning of the 20th century botanical works described a relatively abundant occurrence, but by the mid-20th century there were only

a few plants left. Their survival was not helped by industrial air pollution, frequent landslides of the weathered surface of the cliffs, or even indiscipline by illegal collectors of natural rarities. Therefore, the alpine saxifrage was placed on the list of critically endangered plants in Krkonoše. Luckily, this kickstarted the activities of scientists and conservationists, who started to try out possible ways to save this botanical jewel of the Krkonoše nature. The

years of active conservation work have clearly been successful. Botanists have not only understood the life strategy and behaviour of this tiny saxifrage in detail, but also managed to collect sufficient amounts of its seeds and learnt how to grow them and return them to the original site of its occurrence high up in the Krkonoše Mountains. So, let's hope it survives and will continue to decorate the mountain nature into the future.



The Cloudberry's Journey to the Ridges of Krkonoše

Cloudberry – *Rubus chamaemorus*

In late summer the peatbogs in distant Scandinavia are full of local people, who, equipped with suitable containers and rubber boots, or even protection against biting mosquitoes and flies, collect the fruits of the arctic tundra – the yellow berries of the cloudberry.



So many of these cloudberrys ripen every year that the inhabitants of the Scandinavian states spend much time collecting them. Whereas collectors of bilberries also use effective combs to harvest large amounts, to collect the beautiful fruits of the north it is necessary to know your locality well, and to be patient in your harvesting, as the bunches of berries grow separately and are often far from each other. The most avid cloudberry collectors are the Finns, who harvest hundreds of tons

every year. The fruit of the cloudberry is an important source of vitamin C and the Scandinavians have many uses for them: Marmelade, juice, liqueurs, and even to flavour beer. They are also used to make popular cosmetic products. The cloudberry is even the main symbol on the reverse of the Finnish two euro coin.

You could only collect a few cups full of these berries in the whole of Krkonoše, and they are also the subject of strict protection. The presence of the

cloudberry in Krkonoše is an extremely rare piece of evidence of ancient natural processes, which took place in the northern hemisphere during the last ice ages, hundreds of thousands of years ago. At that time the vast continental ice sheet pushed the tundra and its inhabitants far to the south, coming to a halt against the northern foot of the Krkonoše Mountains. This is clearly how the cloudberry, a tiny shrub, which, unlike the other *Rubus* species, does not have spines, arrived on the

mountain ridges. It was discovered on the ridges of Krkonoše by Kašpar Maria, Count of Šternberk in 1815 during his botanical expedition to the Pančavské rašeliniště Peatbog. On the Krkonoše peatbogs the cloudberry (southernmost occurrence) and dwarf pine scrub (northernmost occurrence) grow together, which led to the description of this unique plant community as dwarf pine scrub with cloudberry. Nowhere in the world, other than Krkonoše, can you find this community.



Age-old Disputes between Experts **Matgrass – *Nardus stricta***

The extensive plateau areas around the Luční and Labská louka Meadow are covered by seemingly botanically poor grasslands, dominated by clumps of matgrass. This is a very hardy plant, the fate of which in Krkonoše has been the cause of years of arguments between scientists from various fields – botanists, foresters, historians or hydrologists.



Some of them claim that matgrass spread to the ridges of Krkonoše in connection with the mountain chalet farming and gradually overgrew the places where dwarf pine scrub had been removed, while other experts claim that matgrass had grown here long before pine scrub arrived on the mountain ridges. Hydrologists do not

like matgrass meadows and claim that they reduce the water retention capacity of the soil and accelerate the water runoff from the mountains. Hundreds of detailed studies by experts from different fields describing matgrass, its lifestyle and characteristics in detail, have been published in scientific journals. So it was not surprising that in the

second half of the 20th century fierce disputes broke out over who was right.

Matgrass is the only world-wide representative of the *Nardus* genus and can be found throughout the northern hemisphere. However, the matgrass growths in the Alps or the Tatras are quite different to the matgrass growths on the ridges of Krkonoše. Modern geobotanical analyses have shown that the fate of the Krkonoše growths

of matgrass are much more closely connected with the northern Europe than with the Carpathians or the Alps – their species composition, natural conditions and the history of their origin. Therefore, modern science and nature conservation now approach the matgrass and dwarf pine scrub in Krkonoše as the two key organisms of the Krkonoše tundra. They allow us to understand the history of the formation of the Krkonoše nature.



The Time of Krakonoš's Beard **Hare's-tail cottongrass – *Eriophorum vaginatum***

This happens every year on warm sunny days at the turn of July and August. Visitors who cross over the Úpské or Pančavské rašeliněšě Peatbogs at this time are amazed by the flood of shiny white tassels, which wave all around them even in a gentle breeze.



And when a stronger wind starts to blow, everything is covered in the white fluff, which is released from the plant called cottongrass. This grows on the ridges of Krkonoše in two varieties. Hare's-tail cottongrass (*Eriophorum vaginatum*) forms dense tussocks and only has one erect tassel at the top of each stem. The second one spreads by way of rhizomes, covering the shallow peatbog pools and has several hanging tassels. This

is how we recognise **tall cottongrass** (*Eriophorum angustifolium*). The shiny white on the end of the stems are spikelets of white fluffy achenes, which are known as Krakonoš's Beard. It has several folk names, such as gypsy feathers, Jesus's beard, God's hair or fluff.

But be careful! Krakonoš's Beard is a nickname, as this has been used since time immemorial for old man's beard

lichens (*Usnea* order), which used to hang down from the trunks and branches of mountain trees. A hundred years ago the mountain folk used long bunches of it to make the beards on figurines of the giant Krakonoš. And not the woolly fluff of the cottongrasses. But later the air quality began to worsen, the old man's beard lichens disappeared from the mountains and the beards had to be made, and are still made, from technical

oakum. You will find this out when you leave Krkonoše and take a wooden figurine of Krakonoš home with you as a souvenir. However, the good news is that the air purity of the mountain climate has improved so much that old man's beard lichens are returning to the montane forests. So now we can look forward both to the fluff of the cottongrasses and the rare old man's beard lichens.



Relict or Endemic Species?

The Sudetic Lousewort – *Pedicularis sudetica* subsp. *sudetica*

The story of this tiny, semi-parasitic plant from the Krkonoše ridges began in ancient times. During the ice ages the huge continental ice sheet reached as far as the northern foot of Krkonoše several times.



Many hardy tundra species were pushed from the north of Eurasia before the ice sheet, including this tiny, pink-flowering lousewort. When the continent began to warm up around 10-15,000 years ago, the vast lowlands to the north of Krkonoše were covered by thick forests, which cut off the escape route for these arctic organisms. Who had legs or wings could disappear, but the lousewort could not do this. Either it had to find sanctuary on the ridges of Krkonoše, which were never glaciated, or die out. So it made itself at home here and still belongs to the eye-witnesses to the

nature of the long gone ice ages as one of the family of glacial relicts, as experts call these ancient emissaries of the arctic tundra.

Although the Sudetic lousewort primarily grows in the arctic belt of North America and in Siberia, it was discovered for the scientific world in the year 1800 by the German botanist Willdenow right here in Krkonoše. It was a quite paradoxical discovery, as Krkonoše is only a tiny speck on the map of the distribution of this plant in the northern hemisphere. Thus he gave

it the name Sudetic and not Alaskan or Siberian. In contemporary botanical literature it is included under its newer (and more appropriate) name as Sudetic lousewort.

However, detailed research into the Sudetic lousewort in its arctic homeland has confirmed that there are in fact around ten micro-species, which differ in their characteristics and their places

of occurrence. Comparisons with plants from Krkonoše confirmed that here is also a separate sub-species, differing from the arctic plants. It is not surprising when this tiny population in the middle of Europe has developed for many thousands of years in complete isolation. This makes our true **Sudetic lousewort** twice as interesting, because it is not only a glacial relict, but also a Krkonoše endemic species.



Battle for Primacy

Bohemian Bellflower – *Campanula bohemica*

Syn: *Campanula corcontica*

Anybody who has followed the work of botanists in Krkonoše for a long time knows that the endemic bellflower of these mountains was known as the Krkonoše bellflower. And now it is suddenly the Bohemian bellflower.



How in hell should we know! But the natural scientists are clear in this respect. The name chosen by the person who describes an organism for the first time and in the correct manner is valid. This is what happened in the case of the beautiful bellflower, which decorates the summer aspect of the herb-rich montane meadows in Krkonoše. The famous Krkonoše botanist Colonel Josef Šourek published his work on this plant in 1953, in which he clearly described its characteristic features, which differ from other species of the large family of bellflowers. And because he was

indeed a Krkonoše patriot, he tried to promote the Krkonoše Mountains by publicizing the fact that this bellflower is a Krkonoše endemic species and does not grow anywhere else in the surrounding areas of Europe, he called it the Krkonoše bellflower. Under this name, this bellflower became one of the 1,200 species of vascular plants growing in Krkonoše included in Šourek's well-known botanical monography *Květena Krkonoš (Flora of Krkonoše)*.

This effort was certainly commendable, and for many years there was talk purely

and simply of the Krkonoše bellflower (*Campanula corcontica*). Only later it turned out that the Brno botanist Hrubý had the primacy in the description, from as early as 1930. And so there was no choice but to honour the rules for creating scientific nomenclature and start to call this beautiful bellflower the Bohemian bellflower. Which is a paradox, because it only grows on the Krkonoše meadows.

The Bohemian bellflower is such an important plant that it has even been included on the European list of significant plant species within the Natura 2000 network, and since 2013 its stylised flower, along with the willow gentian, has been the joint logo of the Krkonoše / Karkonosze National Parks on the Czech and Polish sides of the border. It is clearly the first joint logo of two transboundary national parks in the world.



Parents and their Offspring **The Sudetic Rowan – *Sorbus sudetica***

This story took place on the avalanche slopes of the Krkonoše cirques at the time when the last local glaciers disappeared from them, i. e. around 10,000 years ago. At that time the well-known rowan (mountain ash) already grew in the surrounding mountain forests, as it still does today. However, another two species of rowan grew in the cirques.



The whitebeam, which currently decorates the landscape of the Bohemian or Moravian Karst, and the false medlar, a small shrub we may encounter on our hikes in the Alps or Carpathians. Both species naturally hybridized, which is usual for certain rowan species, and a natural hybrid was the result. During the later climate changes both parents disappeared from Krkonoše, as they chose different places for their further lives, but their offspring has remained here until today and botanists describe it as the Sudetic rowan. The first

description was published in 1834 by the famous Czech botanist I. F. Tausch, from Čertova zahrádka (“Devil’s Back Garden”).

Today we have records from all of Krkonoše of about 130 individuals of this small shrub – the most famous woody plant in the Krkonoše Mountains. It does not grow anywhere else in the world, is a Krkonoše endemic species and rightly belongs to the jewellery box of natural treasures in Krkonoše.

Their offspring inherited characteristics from each parent, such as the pinkish clusters of little flowers (like the false medlar) or the fan-shaped to almost round leaves, but which are not hairy on the back, like those of its second parent, the whitebeam. Simply, the offspring cannot deny its parents and is thriving on the slopes of the Krkonoše cirques, not at all like an orphan, abandoned long ago by its parents. Neither falling avalanches nor creeping snow

bother it, as its prostrate branches and stems easily take root, so that in some places there are many shrubs, which are often connected under the ground. Botanists and conservationists pay the utmost attention to this iconic woody plant of Krkonoše, individual shrubs have been described, their dimensions have been measured and their appearance and state of health documented. This is the necessary care for such a rare jewel of the Krkonoše nature.



The Toughest Woody Plant of All **Dwarf Pine Scrub – *Pinus mugo***

When the first colonists began to reach the ridges of Krkonoše, they had to fight their way through dense growths of a woody plant, which they called “knyholz – knee-high wood” because of its low growth.



This was 200 years before this small woody plant was first described for the world of science by the famous Czech botanist Tadeáš Haenke in 1791. Even today his name is part of several synonyms for dwarf pine scrub (*Pinus pumilio* (Haenke); *Pinus mugo* subsp. *pumilio* (Haenke) (Franco)). This woody plant is extremely resistant and does not only cover the steep mountain slopes, avalanche runs and boulder talus, but has also colonised the arctic peatbogs, where it copes with the extremely unfavourable life conditions by adopting a peculiar growth form, known as table-like scrub.

Dwarf pines reproduce by way of seedlings, but they more often reproduce vegetatively, as the crawling branches easily take root. It takes two years before the winged seeds ripen and drop from tiny, egg-shaped cones. On warm autumn days we can clearly hear the cracks from the opening cones, which then hang empty on the branches for several years.

Dwarf pine scrub gradually spread from the European high mountains (Pyrenees, Alps, and Carpathians) as far as Krkonoše, which is the northernmost

limit of the range of this extremely hardy and long-living woody plant. It commonly lives more than 200 years, while more than 300 annual growth rings were counted on one example which grew on the Kozí hřbety Ridges.

The mountain people used the dwarf pines for various purposes, including distilling the needles to make

medicinal pine oil (*Oleum pini*), carving quality torches for lighting, making snowshoes and under the name of pine scrub goods, they carved all kinds of toys, figurines of the giant Krakonoš or fruit baskets. However, during the period of mountain chalet farming the pine scrub on the ridges was often a hindrance, so the shepherds cut it down and burnt it.



Birth of a New Species

The “Sudetic” Wolf Spider – *Acantholycosa norvegica* ssp. *sudetica*

*An inconspicuous “star” on a rock, which swiftly disappears from view when approached, this is the “Sudetic” wolf spider (*Acantholycosa norvegica*).*



Its body is a dark grey-brown colour, the cephalothorax has whitish fringes and the abdomen carries silver-grey spots and transverse stripes. The distinctive long legs (points of the star) carry dark transverse stripes and pronounced claws. The typical camouflage colours allow the wolf spider to blend in with its background. Males have more contrasting colours than the females. The size is around 10 mm.

From June to the end of July this species inhabits bare rock talus slopes (without soil or vegetation), primarily on boulder fields and talus flows on the ridges and

summits of mountains in the Šumava, Krkonoše (especially at the sub-alpine level), Orlické hory and Jeseníky mountain ranges. They are also sporadically found at lower elevations, such as the periglacial rocky talus on the Čertovy stěny Cliffs, and at around 300 metres above sea level, e.g. in České Středohoří. They live and hunt insects and other invertebrates on the surface of the talus. They enjoy sun-bathing, especially the females who often carry their bluish egg-sacs attached to their spinnerets. The spiders react to any “unnatural” movement in their surroundings by running to hide between the rocks.

The Palaearctic “Sudetic” wolf spider (*Acantholycosa norvegica*) is a relict of the last ice ages with a typical arctic-alpine distribution (from Scandinavia to the Far East and the mountains of central Europe). Since the end of the last ice age (in the postglacial), isolated populations have lived in the mountain ranges in central Europe, where they formed

a separate sub-species (ssp. *sudetica*), found from Krkonoše in the east to the northern Alps, and to the Jura Mountains in Switzerland in the west. Further development in the differentiation between the arctic and central European populations could lead to the creation of a completely new species, which would be derived from a joint ancestor.



Messenger from the North **Azure Hawker – *Aeshna caerulea***

The Azure Hawker belongs to the smaller dragonfly species; the male has a brown thorax, and a dark abdomen with large, azure blue spots. On their brown-black abdomen the females have yellowish to blue-green spots. For his characteristic bright blue colour the male is easily recognisable even in flight.



What is unique about this species is that during cold and cloudy weather, the blue on the abdomen becomes a darker and less eye-catching brown-grey. Increased light absorption clearly leads to increased body temperature. The larvae are predatory, preying on various aquatic invertebrates and developing in the peatbog pools for 2 to 4 years. The adult dragonflies hatch from mid-June and fly until mid-September.

They fly over the sub-alpine peatbogs, preferring open, sunny areas with dwarf pine scrub. They do not travel far from their birthplace, but will fly into adjacent cirques. They are predatory and hunt various flying insects. Unlike other dragonfly species, they do not behave in a territorial way.

On the territory of the Czech Republic this species was previously thought to

only live in Krkonoše, but at the end of the 20th century it was also recorded in the Šumava Mountains and Jizerské hory Mountains, where it probably forms small local populations.

This dragonfly is considered to be a glacial relict, with its range in the polar regions of Eurasia – Scandinavia, in the Arctic coniferous forests and tundra in a contiguous belt across Siberia,

Scotland, to France (Massif Central, Vosges) in the west, scattered in the mountains of central Europe (Alps above 1,000 m) and to the Caucasus in the east.

Considering its restricted range in this country, even though it is quite common in parts of Krkonoše, it is included in the national Red List of Animals as critically endangered.



Trial Ringlet

Small Mountain Ringlet – *Erebia epiphron*

According to its name this small, dark brown ringlet butterfly (wingspan 30–35 mm) with orange stripes and typical eyes on its wings should not be absent from the Krkonoše Mountains, but it only occurs naturally in the Czech Republic in the Hrubý Jeseník Mountains, where it has formed an endemic sub-species.



Otherwise, it occurs in the European mountain ranges, except for Scandinavia and the British Isles. From early July to mid-August it inhabits the alpine grasslands, and also follows the meadows and trail margins down to lower elevations. The males hatch before the females and fly around in sunny and calm weather looking for females. In the afternoon it feeds on the flowers of bistorts, ragworts and hawkweed. In windy and overcast weather it sits on vegetation, but when disturbed it falls into the grass with jagged movements. The food plants for the caterpillars are tufted fescue, wavy hair-grass and tufted hair-grass. It passes through an annual development,

although in cases of bad weather it can be extended by a year. This made it even more surprising when the finding of this species in eastern Krkonoše was published by the Polish entomologist A. Borkowski in 1966. Considering that this was the Jeseníky subspecies and that this species was highly unsuited for long-distance migration, it was clear that they must have been artificially transported here by humans. We did not have to wait long for the explanation. In 1967 J. Soffner wrote in an entomological journal of his attempts to transfer two species of ringlet butterflies from Jeseníky to Krkonoše. In the years 1932–33 he collected females of the

small mountain ringlet (*Erebia epiphron*) and Sudeten ringlet (*Erebia sudetica*) and sent them by express post to the landlords of the Luční bouda Chalet and the Maxova chata Chalet on Rýchory. According to his instructions the butterflies were released on the montane meadows to the north and north-west of the Luční bouda Chalet and next to the Rýchorská bouda Chalet. Around 100 individuals of each species were introduced during two years (probably 50 individuals near the Luční bouda

Chalet and 50 individuals on Rýchory). Whereas the package delivered to the Luční bouda Chalet produced a large population of small mountain ringlets, inhabiting the whole forest-free area in the sub-alpine and alpine levels of eastern Krkonoše and the nearby meadow enclaves below the upper tree line, in the same conditions, the Sudeten ringlet did not catch hold in Krkonoše. The introduction of both species at Rýchory was also unsuccessful.



“Return” of the Lost Dotterel

Eurasian dotterel – *Charadrius morinellus*

A meeting with this wading bird, of which females are more colourful than males, is certainly unforgettable. The dotterel is also one of a small group of animals which are traditionally linked to Krkonoše.



It nests irregularly or very rarely in Czechia and only in the Krkonoše tundra on boulder fields and alpine grasslands with short-herb vegetation on the highest summits at elevations between 1,500–1,590 metres.

This species is of great interest for its behaviour during nesting and raising chicks. Unlike in most other bird species, the female is larger and more brightly coloured, but the smaller and less colourful male incubates the eggs and cares for the hatched chicks. The female then moves on to another male, who incubates a second clutch of eggs and the cycle can be repeated. The nest is situated on the ground, where the male sits on the clutch of 2-4 eggs for 3 weeks until they hatch. The chicks are not fed and soon leave the nest. The male leads them around for another 4 weeks until they are fully ready to fly. They feed on

small invertebrates – insect larvae and adults, worms, molluscs, etc.

The dotterel (*Charadrius morinellus*) is migratory and is observed in Krkonoše between May (migration to nesting sites in Scandinavia) and August (return from the north to wintering grounds around the Mediterranean Sea, mostly in semi-desert regions of north Africa). Historical records of their abundant population probably only come from the handwritten notes by Frič in his copy of “Vertebrates of the Czech Lands”, where he wrote that Antonín Fierlinger (a pharmacist from Vrchlabí) shot 17 dotterel and collected 30 eggs during one day. Apparently Fierlinger shot dotterels more often; his trophies ended up in the teacher’s offices at schools in Dolní Bousov and Sobotka. On the other hand, further irregular reports (the first was from 1825) only describe singular finds

of adult birds, young birds and eggs. Some of the “search” events in the 19th century focussed on finding the nests of dotterels were also unsuccessful. One of the last recorded nestings, which took place in 1903, is the most quoted, and then nesting was again confirmed by J. Mařan 43 years later in 1946, followed by a long gap of 53 years without confirmed nesting, up to 1999.

These facts have led experts to the premise, that this cannot be regarded as a “Czech” population of this species. The birds probably migrate over Krkonoše every year and can nest here in favourable conditions. After laying a clutch of eggs in Krkonoše the female leaves the nest in the care of her “local” male and flies off to Scandinavia to mate and nest with another partner...



Where does it Disappear in Winter? **Alpine Accentor – *Prunella collaris***

*The nesting of this rare, grey-brown songbird with rusty flanks has been monitored since the 19th century. As early as 1865 A. Homeyer estimated that 5–8 pairs nested in the Śnieżne Kotty (Sněžné jámy) Cirques. The alpine accentor (*Prunella collaris*) regularly nests in Krkonoše on the highest summits, scree slopes and talus fields in the glacial cirques at the highest elevations from 1,280 to 1,600 metres above sea level.*



Here it reaches the northernmost border of its range in Europe. It can also be observed occasionally in the Hrubý Jeseník Mountains. It is most numerous in the Polish Śnieżne Kotty (Sněžné jámy) Cirques and on the summit of Mt. Sněžka. Nests are hidden in hollows in the rocky talus or in cracks in the cliffs.

A brood contains 3–5 eggs, which are incubated for 2 weeks and care for the young lasts another 2 weeks. The whole Krkonoše population seems to be stable in the long term and is estimated at 12–17 “pairs”, but the numbers have fallen by around 20 % in recent years. You may be surprised by the term

“pairs” but during the nesting season the alpine accentor (*Prunella collaris*) lives in small groups of several males and females (polygynandry). Around half the females breed with only one male and the other half breed with multiple males, which ensures their help in feeding the young. Their food consists of a variety of invertebrates and plant seeds. The birds arrive at the breeding site in April and disappear during September and October. Although the members of other European populations stay in the surroundings of

their mountain range all year round, the Krkonoše accentors fly off to an unknown destination for the wintertime. It is possible that our population migrates to suitable sites at lower elevations in the Czech Republic or Poland (recorded in the wintertime in the Dyje canyon, south Moravia), but nobody knows where this overwintering site is. The small isolated Krkonoše population is not directly endangered, but could be negatively influenced by a number of natural (especially climatic) and anthropogenic factors.



Beautiful Arrivals

Red-spotted Bluethroat – *Luscinia svecica* ssp. *svecica*

*In the Czech Republic the very rare bluethroat (*Luscinia svecica* ssp. *svecica*), which only nests regularly in the Krkonoše Mountains, is a smaller but close relative of the thrush. Males are easily spotted thanks to their bright blue throat with a rust-red spot in the middle, while females have a cream-coloured throat.*



The range of the bluethroat is extensive and includes regions from Scandinavia, across Siberia to western Alaska. In the European mountains its populations have spread to the Alps, Krkonoše, High Tatras and to the Carpathians in Ukraine.

Until 1978, when their nesting in Krkonoše was first confirmed by P. Miles, bluethroats were only seen here during their migration. The highest numbers were recorded in 1989 (40 males and 21 females). The size of the population fluctuates, but the long-term trend is negative. The estimated population at the moment is 16–19 pairs.

In Krkonoše they only nest in dwarf pine scrub on the mountain ridge peatbogs and wet alpine meadows at the highest elevations between 1,300 and

1,470 metres above sea level. These are primarily the Pančavské rašeliniště Peatbog and Labská louka Meadow in the west, and Čertova louka Meadow and Úpské rašeliniště Peatbog in the east. The bluethroat's nest is hidden on the ground in the grass and among the dwarf pine scrub. The 5–7 eggs are incubated for 14 days, and the young are cared for in the nest for another 14 days. They especially feed on small insects. They fly into their nesting grounds as the snow melts in early May and return to their wintering grounds around the Mediterranean and in North Africa in August and early September. Thanks to long-term studies using various methods (ringing, videos from slow-filming micro-cameras, blood samples, measuring and weighing, and further methods), especially by V. Pavel

and B. Chutný, an enormous amount of information has been gathered and published since 1988 and this species is one of the most researched Krkonoše vertebrates. For example, the genetic structure of the population is now understood, as is their communication with other (even distant) populations and their fidelity to their Krkonoše nesting sites (48 % of males, 40 % of females and 7.5 % of last years' fledged young return here every year).

For the first time in the Czech Republic the larvae of the blow fly *Tripocalliphora braueri* were found on the young birds. These larvae burrow into the subcutaneous tissue, often in the feather follicles, creating blow fly myiasis.

The infested young are weakened by the blood-sucking and are lighter than healthy birds, but in most cases the parasite infestation is not the direct cause of death.



From a Relict to a Pest **Field Vole – *Microtus agrestis***

*This small, brownish rodent is considered a glacial relict species. Its close relative, the common vole (*M. arvalis*) is common in the foothills; small populations also live on montane meadows, and surprisingly on Mt. Sněžka too.*



Throughout the mountain range the field vole (*Microtus agrestis*) occupies waterlogged localities with a rich herb layer and a flattened layer of old growth, with solitary or groups of woody plants in open countryside of a variety of characters: the banks of fishponds, waterlogged and uncut meadows, damp forest meadows and overgrown emission clear-cuts, glacial cirques, mountain ridge peatbogs, exceptionally also on talus fields.

Until the middle of the 20th century it only lived on mountain ridge peatbogs. As the mountain forests gradually died

off it spread to open forests and emission clear-cuts, where it became the most common rodent.

This was helped by the vole's life strategy. The species is active all year, feeds on vegetable matter, predominantly monocot plants such as rushes, sedges, wood-rushes and cotton-grasses. They also feed on fungi, seeds and small animals. In the wintertime they are also active under the snow and when there is a lack of green plants they gnaw on the stems of young woody plants just above the roots, which decimates them. According to the results of forestry

research the voles do more damage to artificially planted trees than to natural renewal, maybe because the imported saplings are fertilised. Voles breed from May to October, building a round nest, where, after a three-week pregnancy, the female gives birth to 4-5 (max. 11) blind offspring, which are capable of breeding themselves at the age of 4 weeks. The usual number of litters is around 4-5 per

year. The average lifespan of a field vole is 6-8 months, with some individuals living for up to 18 months. The population size fluctuates in 3-5 year cycles with a minimum density of 1 ind/ha and the population maximum of up to 50 ind/ha, which can be seen from the repeated serious damage to plantings of deciduous trees, mainly to beech, especially on the emission clear-cuts.



White armour

Alpine ensign scale – *Arctorthezia cataphracta*

The wingless body of the female is hidden under chalky white plates and columns of wax, which overlap like tiles on a roof. In this species the plates on the sides of the body are almost the same size.



The female also creates a wax egg sac, as long as her body, on the end of her abdomen. The size, including the egg sac, reaches 3-4 mm. The legs are brown and the eyes are simple. Male Alpine ensign scales have never been found, so it is assumed that this species only breeds in a parthenogenetic manner i.e., without contribution from the male.

During the whole vegetative season the female lays eggs into her egg sac, where

they are protected from enemies and the weather. After hatching the larvae leave the sac and attach themselves to the food plant. They secrete plates and cones of wax from the surface of their bodies.

The Alpine ensign scale (*Arctorthezia cataphracta*) is quite a rare and sporadic find in Krkonoše: on dry, rocky soils on the roots of heather (*Calluna vulgaris*) in the lichen tundra, on purple colt's-foot (*Homogyne alpina*) in the grassy tundra,

but also on *Sphagnum* mosses on peaty soils. Adults and larvae also drink from the mycelia of fungi, e.g. the velvet shank (*Collybia* sp.). This means that they are widely polyphagous, living on mono- and dicotyledonous plants, herbs and woody plants, mosses and fungi.

The range of this species is huge, as we can find it in arctic and sub-arctic zones

all around the northern hemisphere (Palearctic) and in the European mountains. Nevertheless, a male has never been caught.

This could be due to the fact that, as in related species, males have very short lifespans (only hours, maximally several days) or males simply do not exist.



Endemic species, one of three

The Geometrid moth – *Psodos quadrifaria* ssp. *sudetica*

Tento endemický poddruh, popsáný v roce 1918 známým českým badatelem zabývajícím se motýly J. Sterneckem, můžeme nalézt na území naší republiky pouze v Krkonoších a to ještě jen občas, spíše vzácně.



This endemic subspecies, first described in 1918 by the well-known Czech butterfly researcher J. Sterneck, can only be found on the territory of the Czech Republic in Krkonoše, and only occasionally or rarely.

The range of this species is much wider, covering the European high mountain ranges - the Alps, Carpathians, Pyrenees, High Tatras, as well as certain lower mountain ranges, such as the Vosges and Krkonoše. The subspecies, from which this butterfly was described

(ssp. *quadrifaria*), can be found throughout its range, but here in Krkonoše and in the Pyrenees, possibly due to long-term isolation, specific endemic forms (ssp. *sudetica* and ssp. *pyrenaea*) have developed.

This geometrid moth occurs in Krkonoše in the mountain ridge tundra on the alpine meadows above the upper tree line, on the fringes of talus fields and peatbogs. It flies low over vegetation from June to August, sitting on flowers, especially common bistort.

The moth is dark brown, only with wide yellow-orange stripes on the wings. The wingspan is between 22 and 25 mm.

The chubby grey-brown caterpillars have a recurring dark, lanceolate pattern on their back and feed on a variety of short-stemmed montane herbs. Their development lasts from August and after hibernation until June. The species

is included in the Red List of the Czech Republic as vulnerable.

A similar species, but without the yellow stripes, is the closely related Geometrid moth *Glacies alpinata* with a similar range.

In the Czech Republic we can only find it in the high mountain areas of Krkonoše and Jeseníky.



Three in one

Ground beetle – *Nebria rufescens*

In older publications this ground beetle, ranging from 9–12 mm in length, with long legs, black, a heart-shaped thorax and black or rust-coloured elytra, was usually known as Gyllenhal's ground beetle (*Nebria gyllenhali*).



It is a part of the epigeion – fauna living on the surface of the soil. It feeds on various kinds of invertebrates and its larvae are also predatory. Breeding takes place in the autumn, both adults and larvae hibernate, with the new generation hatching in July.

The ground beetle *Nebria rufescens* is classified as a glacial relict, a survivor from the ice ages. It has a wide range

and lives in large parts of Europe, Asia and North America (circumboreal). In the Czech Republic it is mostly found in the border mountain ranges, but also at lower elevations in places with a temperature inversion.

A similar, but larger, species is the ground beetle *Nebria jockischii*, which lives in the same localities and can be recognised by the red-brown pattern in

the middle of the head. Its range is from Krkonoše to the east, in the Eastern Sudetes, Alps and Carpathians.

In Krkonoše the ground beetle *Nebria rufescens* lives everywhere in the forest level in damp places, gravel and boulder alluvia around streams, under rocks, driftwood, etc. This is the abundant form with black elytra and black legs (f. *gylenhalii*) or red (f. *balbii*).

The form with rusty elytra and brown-black legs (f. *rufescens*) only occurs rarely in the Czech Republic at the highest elevations on the Krkonoše summits, making it a typical representative of the fauna of the lichen tundra. In general this species is not endangered, although the rusty form *rufescens* only lives in Krkonoše in a very restricted space, which makes it extremely vulnerable.





Care for the Treasures of Living Nature in Krkonoše

The protection of the living nature in Krkonoše has undergone many changes and faithfully reflects how our opinions have evolved, hand in hand with increased knowledge. From the first idealistic notion, that it is sufficient to protect individual endangered species, via understanding the principles of protecting the wider environment in which the organisms live, up to contemporary methods based on detailed knowledge of the life stories of the protected species or those in need of protection.

Care for the living nature in Krkonoše began with a variety of activities and official decrees in the first third of the 20th century. The first calls for a Krkonoše National Park also date from this time, when the geobotanist František Schustler, an exceptional expert on the local nature, outlined his timeless and modern proposals for protecting the mountains. He formulated these first plans for a national park in 1923, but it took another 40 years before they came to fruition. Krkonoše was declared

a national park in 1963, which began a new chapter in the work of protecting the unique nature in these mountains.

It was necessary to quickly understand the changing forms of endangerment for the montane nature – from picking protected plant species, via the effects of air pollution on the plants and soil in Krkonoše, up to targeted co-operation between all those who care about Krkonoše. From the mountain chalet owners, weekend cottage owners, hikers and lovers of the mountains, representatives of local councils, up to state institutions which are responsible for nature protection. This is indeed a diverse community of people with differing philosophies of perceiving the mountains and their beauty. The seemingly impossible was achieved in 2006, when the document entitled “Vision for Krkonoše in 2050” was formulated. Its motto is “Friendship between Man and Mountains”, which precisely evokes the paths which everybody who really cares about the fate of the Krkonoše nature should follow.

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112



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155




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158



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