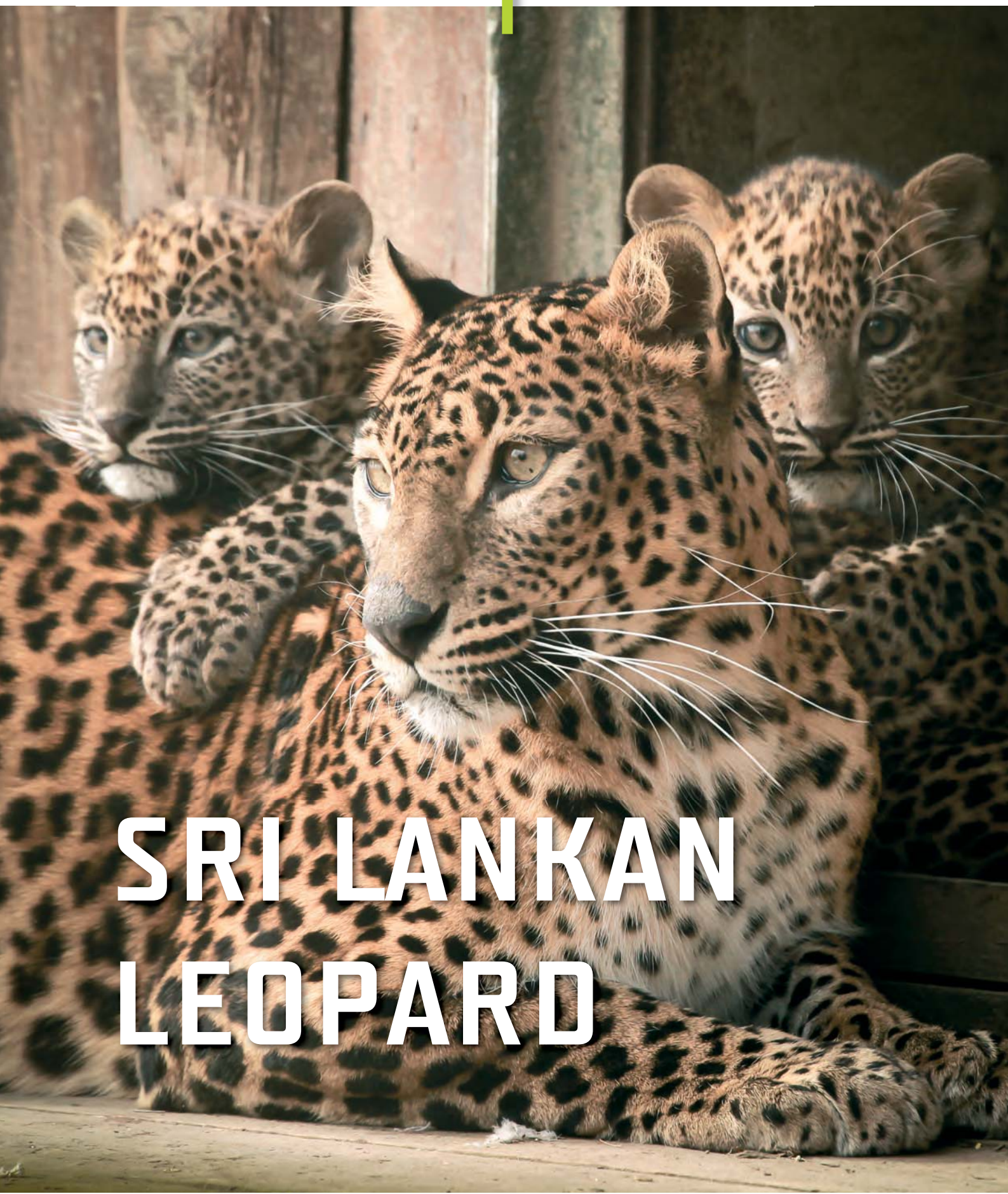
the magazine for friends of the Brno Zoo

Zooreport

No. 1
january 2018



SRI LANKAN LEOPARD

Content

the magazin for friends of the Brno Zoo

Zooreport

january 2018
No. 1/18, volume XX
publisher four times per year
MK ČR E 17723

Editor:
Brno Zoo and Environmental Education Centre, semi-budgetary organization
U Zoologické zahrady 46, 635 00 Brno, Czech Republic
IČ: 00101451
tel.: +420 546 432 311
fax: +420 546 210 000
e-mail: zoo@zoobrno.cz

Publisher:
Moravian Museum
Zelný trh 6, 659 37 Brno
Czech Republic
IČO: 00094862

Editor's office addres
Zoo Brno a stanice zájmových činností, p. o.
redakce Zooreportu
U Zoologické zahrady 46, 635 00 Brno, Czech Republic
tel.: +420 546 432 370
fax: +420 546 210 000
e-mail: stuchlik@zoobrno.cz

Editorial board:
Ing. et Mgr. Lenka Blažejovská, Mgr. Jana Galová (children's supplement), Bc. Jana Hadová, MVDr. Martin Hovorka, Ph.D. (chairman of editorial board), doc. MVDr. Jiří Klimeš, CSc., RNDr. Bohumil Král, CSc. (specialist reader), Ing. Miroslava Piškulová, Bc. Eduard Stuchlík (editor manager), doc. Ing. Josef Suchomel, Ph.D., Mgr. Michal Vaňáč.

Emendation:
Rosalind Miranda

Distribution:
400 pcs in the English version
1,600 pcs in the Czech version

The author of non-attributed texts and photos is: Bc. Eduard Stuchlík

First page: Sri Lankan Leopard

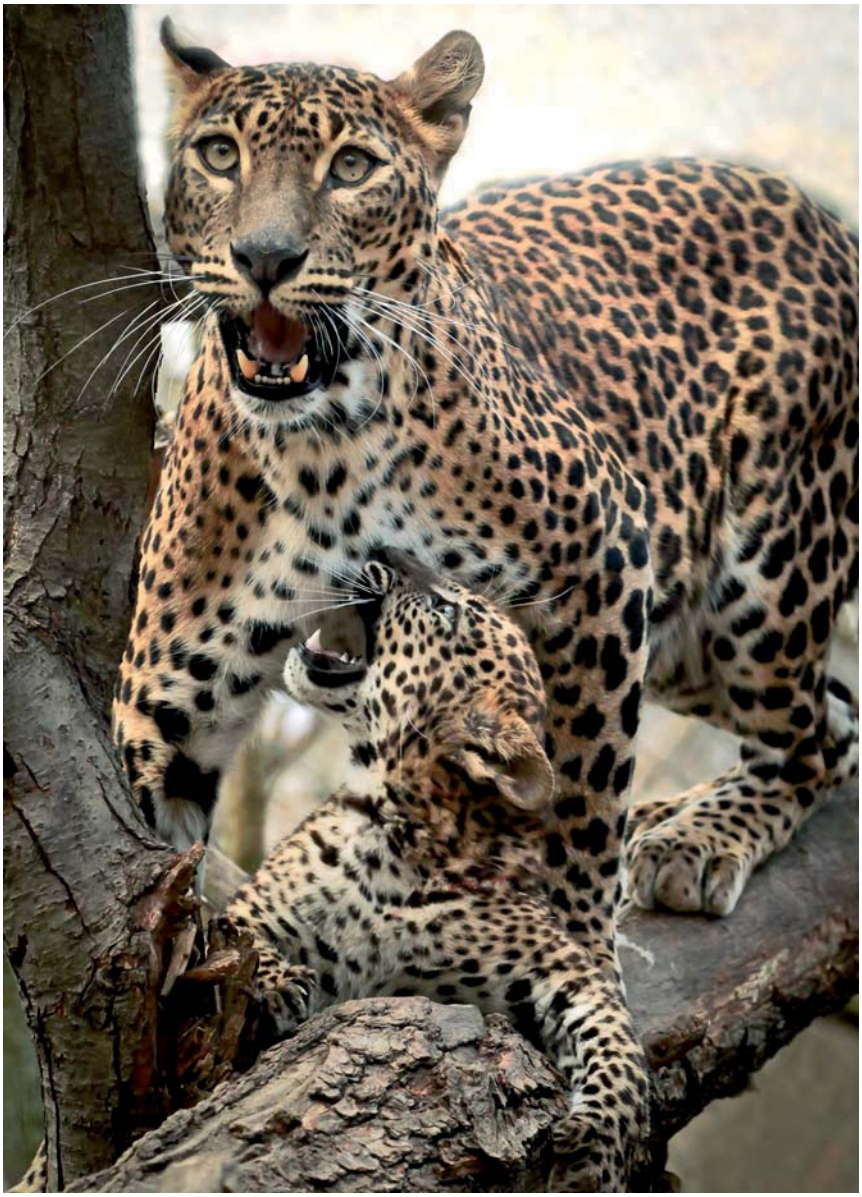
Photo by Eduard Stuchlík

UNSALEABLE

EDITORIAL

Dear Readers,

We are dedicating this issue of ZooReport to Sri Lankan leopards. The birth of leopard twins last year is an important milestone for our zoo because we last bred this subspecies in 2000. Even elsewhere, Sri Lankan leopards are not often bred, as is shown by the fact that only three other zoos that keep Sri Lankan leopards and are also part of the European Rescue Program bred leopard cubs in 2017. In the following pages, we want to share with you the challenges and complications associated with the breeding this beautiful big cat.



Sri Lankan leopardess with her cub.

Another species of big cat, the Katanga lioness, has been nursing cubs who were born at the end of last year in our zoo. The union of this pair of lions went smoothly. The male and female, each brought in from a different zoo, met at our new lion exhibition last summer, and began to mate almost immediately.

Our other successful breeding story, which has also been covered in this issue, concerns a margay, which is a small feline.

Our aquatic family has been enriched by a new species, largescale four-eyed fish. Of course, they have only two eyes, but their visual organ, which has evolved to adapt to life in the interface between marine and terrestrial environments, is so unique that it deserves a special mention and a detailed description.

Our collection of birds is also growing thanks to new additions. Last year, for example, we imported pied imperial pigeons, and Scheepmaker's crowned pigeons, which are amongst the largest pigeons in the world.

Birds are also featured in a contribution from the Environmental Education Centre "Hlídka," whose lecturers organized an educational event on the winter feeding of wild birds. The rich programme content of the Hlídka centre also included the creation of another interest club, which operates only during weekends as a travel club, letting its young members visit eco-farms or other centres of ecological interest, and has them explore natural and cultural sites on trips in and near town.

The Kura Kura rescue and rehabilitation station, which Zoo Brno established last year in Indonesia, reports its first rescue of sea turtles this year – an unmissable account in this year's first issue of ZooReport.

For quite some time now, we have been working in close cooperation with Brno's universities. University students have organised interest clubs in the zoo or have worked on their bachelor or diploma theses here. However, not many people know about our longstanding cooperation with the Faculty of Architecture at the Technical University. An exhibition informing zoo visitors about this collaboration was held at five zoo venues between December 2017 and February 2018. For fourteen years, students of architecture, as part of their bachelor and diploma theses, have been creating designs for our zoological pavilions. In fact, because of the high number of students interested in this specialization, the building of zoo edifices has officially become one of the fields of study at the faculty. On the last page of this issue, we talk about the exhibition of student proposals, and about our planned manatee pavilion.

Bc. Eduard Stuchlík,
Chief Editor of ZooReport

Sri Lankan leopardess with her cubs.

Lions and Leopards Have Youngsters

The birth of two young Sri Lankan leopards (*Panthera pardus kotyia*) at Brno Zoo on 21 November 2017 crowned an important successful breeding. We are also very happy that our other big cats, the Katanga lions (*Panthera leo bleyenberghi*), gave birth to twins on 30 December 2017. The last leopard to be born in Brno Zoo was in 2000, while the last lion was born in 1993.

The six-year-old leopardess Nayana gave birth for the first time, and she immediately started caring for her twins. During their vaccination against common leopard diseases on 5 January, we found out that there is one cub of each sex. The male weighed 2.18 kg, and the female just slightly less (2.1 kg). During vaccination, the twins also received vitamins and preparations against worms, and a chip was embedded in each of them. Two weeks later, they were revaccinated.

Visitors were allowed to see the leopardess and her cubs for the first time on 14 February, when we opened the exit connecting their quarters with the enclosure for a few hours. Visitors were also able to see the father of the cubs, who was housed in the same building as the female but in another enclosure, without access to his offspring. The cubs quickly learned to climb the tree trunks there, but a cold wave interrupted their outings at the end of February.

During the past 17 years, nine Sri Lankan leopards have been kept at Brno Zoo. However, until Nayana and her mate, Daan, came to our zoo in 2013 as young and sexually immature individuals, we did not have a stable and compatible couple. Daan was born on 19 September 2011 at Burgers' Zoo in Arnhem, Netherlands, and was brought to Brno on 25 February 2013. Nayana arrived five days before Daan from Bratislava Zoo, where she was born on 24 June 2011. Typically, the first mating of leopards can be unsuccessful for many reasons: the male might not be ready to mate, the female might not be ready to conceive, or the first oestrus may be weak so that the breeders miscalculate the optimum date of mating. It is therefore quite natural for viable cubs to be born only after four years of cohabitation.

Apart from Brno Zoo, only three other institutions that breed Sri Lankan leopards within the European Rescue Program reported the birth of cubs of this subspecies in 2017. For the programme itself, which covers 69 animals, it was important to include Nayana and Daan among the individuals who are suitable for reproduction. The contribution of this pair has also been acknowledged by the coordinator of the rescue programme.

Young Katanga lions.

Sri Lankan leopards live in the wild only in Sri Lanka, where they are at the top of the food pyramid. According to estimates by the IUCN, there are only between 750 and 900 leopards on the island. The Red List (IUCN Red List) records this subspecies as endangered. Other leopard species live in both Africa and Asia (south of about 45° N). Their fragmented settlement areas were originally larger and more connected, extending into southeast Europe. There are currently nine recognized leopard subspecies, and all of them are threatened by poachers who hunt them as trophies, for religious reasons, or for use in folk medicine. In densely populated southeast Asia, direct conflicts between leopards and human beings are quite common.

The breeding pair of Katanga lions was brought to our zoo at the end of last summer. The female, Kivu, who was born on 12 November 2012 at Lisbon Zoo, arrived at our zoo on 11 August 2017 from the zoo in Ústí nad Labem. The male, Lolek, arrived a week later from Zoo Gdansk, where he was born on 14 July 2015. On arriving in Brno, the lions occupied a brand new natural exposition, suitably large. Soon after being put together, the couple was observed to be mating.

Kivu's cubs are also one of each sex, as determined during their vaccination on 12 February 2018. The male weighed somewhat less than 7 kg, and the female was slightly lighter. Kivu probably gave birth a little later than normal, because the cubs were able to see right after being born, and they were larger than is usual at birth. She cared well for her offspring as soon as they were born, even though she was a first-time mother, just like our leopardess. Immediately after vaccination, the lioness led her cubs to the bars behind which Lolek was waiting, to show him that nothing bad had happened to his offspring. But he will have to wait for any direct contact with the cubs. Although we connected the quarters of the lions on 21 February, the careful mother was still on guard, and drove the curious father back to his own room. However, we think that in March, she will probably allow him to establish contact with the young ones, and the parents and their offspring will start walking together to the weaning yard. During spring visits to the zoo, visitors will be able to see the entire family in their large enclosure.

Ing. Dora Gremlicová,
Curator of Mammalian Breeding

Sri Lankan leopardess with her cubs.

A Peek into the History of Our Leopard Breeding

Brno Zoo first bred leopards in the 1960s. Between 1971 and 1973, three cubs appeared. However, they were cared for by zoo staff members instead of by their mother. The first attempt at having its mother rear a leopard only took place in 2000.

The leopards and tigers in the Tiger Rock exposition were separated by a glass partition. On the right is Arnold; on the left, Ruwani.

Originally, Brno Zoo bred a nomino-typical subspecies of leopard (*Panthera pardus*). In the late '80s, we also bred its melanic form. In 1992, the first pair of Sri Lankan leopards (*Panthera pardus kotyia*) were brought into our country. Since then, we have focused our efforts on breeding this subspecies. In 1996, two male Sri Lankan leopard twins were born in our zoo. In May 2000, Daisy was born and raised by her mother at the new Tiger Rock enclosure; and, in November 2007, Daisy left for Singapore Zoo.

As reported in ZooReport No. 1/2005, the arrival here of an unrelated pair of Sri Lankan leopards from a zoo in Colombo (Sri Lanka, formerly Ceylon) marked the success of our continued efforts to acquire individuals who could contribute to the genetic reinforcement of the European breed of this rare feline. The five-year-old female, Ruwani, who, we were told, had given birth to a cub in Sri Lanka, was born in the wild, just like the parents of the two-year-old male, Maga. These leopards were transferred from Colombo to Brno in exchange for a Chapman's zebra from Brno Zoo and a Przewalski's horse from Prague Zoo. The first part of the exchange – transporting the zebra and horse via Frankfurt – was considerably more demanding in terms of logistics.

This unrelated pair of leopards were quarantined directly in their Tiger Rock enclosure, which we had thoroughly insulated and equipped with humidifiers. The temperature and humidity were controlled continuously during the first weeks. Gradual acclimatisation to the European weather took several months.

In the following years, it turned out that Ruwani could not become pregnant with Maga. Tests at the end of 2007 showed that Maga was infertile; so, in 2008, we sent him to be exhibited in Burgers' Zoo in the Dutch town of Arnhem. That same year, we brought an 8-year-old male, Arnold, from Spain's Fuengirola Zoo. However, Ruwani still did not become pregnant; and, on 17 June 2010, Zoo Jihlava accepted Arnold in trade for a new male. His name was Bala, and he had been born in Jihlava Zoo in 2006.

Ruwani and Bala initially lived together without conflicts, but they did not copulate. But, when Ruwani refused to accept Bala, he became aggressive; and, on 16 February 2011, he attacked her. The breeder had to intervene and beat him off her. Afterwards, both animals were separated for a long time, and they had to get used to living by themselves again. Once Ruwani stopped fearing her partner, they began to sleep close to each other, separated only by a grid. Then the breeders decided to try the mating again. However,

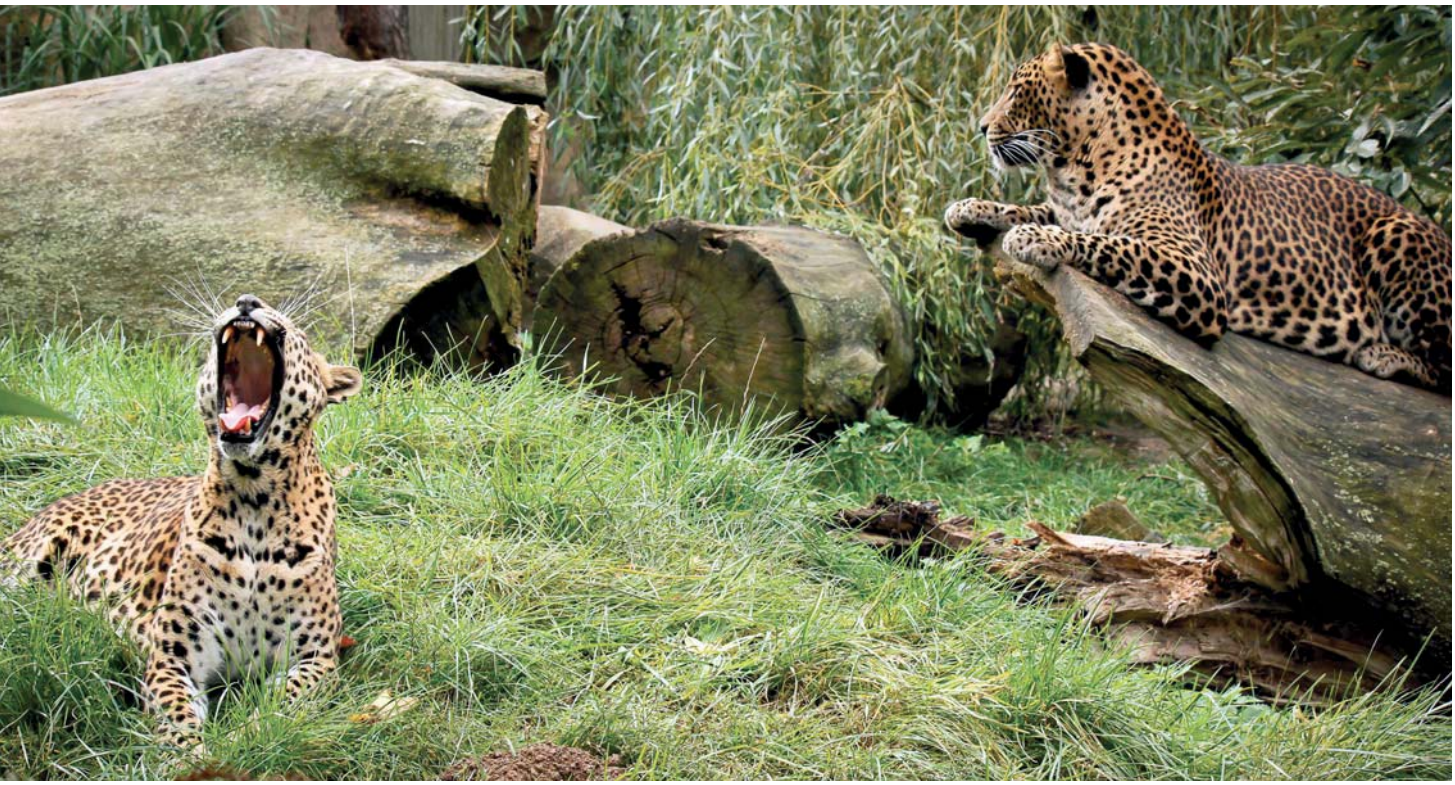
during the second attempt, on 9 May 2011, Bala killed Ruwani. Although the breeders were prepared with hoses, and even a veterinarian with a gun was on alert, Bala was deterred neither by the water nor the warning shots. His deadly lightning strike took only a few seconds. Leopards' sexual acts do sometimes end tragically, both in captivity and in nature.

Our sadness over the loss of Ruwani was at least slightly alleviated by the fact that the other member of the genetically valuable couple, Maga, sired several offspring in Arnhem. Coupling with a rare unrelated member has revived European breeds.

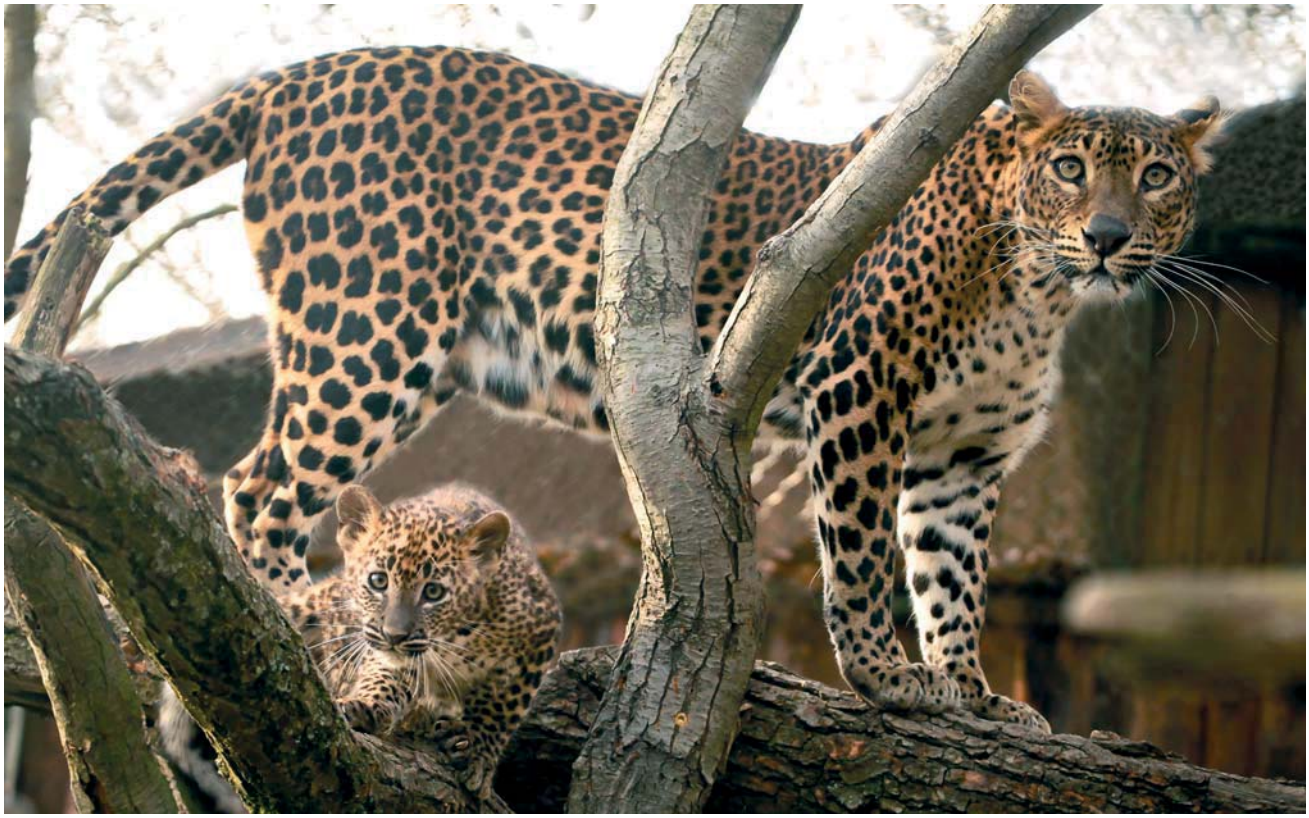
On 18 July 2011, Bala was moved from Tiger Rocks to a newly developed exposition at an administrative building to wait for the arrival of a female from Ostrava Zoo, Macina. She arrived on 20 September 2012, but the planned mating of the pair was not recommended by the coordinator of the European Rescue Program (ERP) of the Sri Lankan Leopard. These potential parents had too many common genes, so would not benefit the ERP population of only 69 individuals. On 23 August 2013, we moved these two leopards to the zoo park in the Russian town of Staryj Oskol. 'Goodbye, lovely couple,' our breeder wrote in the operation diary for that day. Upon arriving in Staryj Oskol, Macina gave birth.

Arnold.

The year 2013 became an important marker in the breeding of Sri Lankan leopards in Brno. In February, a young couple were brought to our zoo: a male named Daan from Burgers' Zoo, and a female named Nayana from Bratislava Zoo. We temporarily housed them in Tiger Rocks, as the exposition behind the administrative building was still occupied. Daan and Nayana mated, and she gave birth to twins, a male and a female, at the end of last year. She continues to carefully rear her offspring.



Ruwani (left) and Bala initially lived together and without conflict, but did not copulate.



Our Fraternising Leopards

Ing. Miloslav Walter is one of the most senior employees of Brno Zoo. He has been working here since 1996. This breeder, who graduated from Mendel University of Agriculture and Forestry in 2007, initially cared for ungulates such as Grévy's zebras, kiangs, and Bactrian camels. About 10 years ago, he moved to the carnivore section, where he now cares for cats. He also cares for some bird species, such as snowy owls. Cubs were born to Sri Lankan leopards in Brno Zoo late last year, a long-awaited event, and these babies continue to do well. Ing. Walter obligingly answered questions about his experience with leopard breeding.

Ing. Miloslav Walter.

The leopard is, like other great cats, a solitary animal. Most of the individuals seen in the wild are females with cubs, and females are usually found near adult males only during mating. How does the zoo try to replicate the natural environment and conditions of leopards?

Creating conditions that are as close as possible to nature is a must for all species of animals, but this is particularly difficult for leopards, which respond to the presence of others of their species in an individual manner. Their behavior can also be unexpected. We have leopards in the enclosure that can co-exist in peace; but there are also so-called killer males, who will simply kill a female at their first mating. In general, we keep the males separately from the females, allowing a couple to interact only when the female is in heat. Therefore, when a pair is to be bred, we use two enclosures that contain several internal enclosures.

Do leopards have any other peculiar needs? For example, what and how often do leopards eat? Is the feed amount adjusted during mating?

For leopard breeding, it is very important to determine the heat interval,

without which the mating time can be missed. Many obstacles have to be dealt with: For example, a leopard can come into heat irregularly or, in case of stress, they can mask being in heat or not be in oestrus at all.

In terms of feeding, leopards are more demanding than tigers or lions. They mostly eat young goats, poultry, or rabbits, all parts of which are given, including the fur (feathers) and some of the guts. This is how we try to feed them all year round. They are fed four times a week, fasting on Tuesdays, Thursdays, and Sundays. When the female is in heat and is in direct contact with the male, we separate them at feeding time, as it is impossible to prevent them from biting each other and fighting over the food. We do not modify the feed dose then, but try to put the animals together again after they are fed. With a full stomach, leopards are better prepared to interact well and care for themselves and their partner playfully. After delivery, when the female stays alone with the cubs, we feed her daily. She receives 1.5 kg per day of beef, kid meat, rabbit meat, chicken, or horse meat without bones or intestines, which roughly corresponds to the usual dose. After 6 weeks of the young cubs' life, we slowly start increasing the amount, as the young are growing and need other food in addition to breast milk.

For many years, our zoo has been keeping leopards and tigers in adjacent enclosures. The attractive setting of Tiger Rock now only serves tigers; the leopards were removed in 2011 to a remote place, an adapted older breeding establishment. How is it equipped, how does it work, and how do the leopards feel there?

In terms of user comfort, the leopard enclosure is an outdated facility. In order to be able to serve leopards, we had to build a second, larger enclosure near the original building. This has an area of approximately 300 m^2. The main advantage of the move was that the leopards find it more peaceful, because they no longer live in the same area as their competitors and main enemies – tigers. The adapted building has three interconnected quarters from which the animals can go to both runs. If the leopards are in their quarters, they can see the others through the grate. If they all are in the enclosure, they cannot make eye contact. The female leopard, Nayana, had been used to life in a smaller enclosure. Her somewhat more nervous partner, Daan, likes to hide in the shrubs in the larger enclosure. We believe both leopards are doing well in this breeding establishment, as was confirmed by their recent successful coupling. This does not mean, however, that the exposure needs no further equipping.

The current pair of leopards arrived at Brno Zoo in February 2013 when they were not even two years old. The female came from Bratislava Zoo and the male from Arnhem Zoo, in the Netherlands. What awaited them in their new home?

At the time of their arrival in Brno, the leopards were sexually mature, but were still too young to reproduce. Initially, they lived at Tiger Rock, where they adapted to the new environment near the tigers, although they were perhaps stressed from being separated from their mothers. Fortunately, we were able to move the young couple in August 2013 to the current enclosure, which offers them a more peaceful environment. The leopards, who are still kept separately, were occasionally let out into the unfamiliar enclosure so that they could get acclimatized to the unknown terrain.

Young leopards lurk at the entrance to the quartem.

How does the breeder know that the female is in heat or is pregnant? As you have indicated, symptoms of physiological changes may not be unambiguous.

Among the well-known symptoms of cats in heat, the main one is rubbing her body against various objects. For our female leopard, I can tell she is in heat depending on the sound she makes, which is sometimes called the 'call to the male.' The change in the behaviour of female leopards when they are in heat may not be significant, and the symptoms can easily be confused with other manifestations, leading to false conclusions. It is important to know your animals. The first telling sign of pregnancy is that the female does go into heat the following month. When we see this, we consider her to be pregnant, and do not put her again with the male. In the last third of pregnancy, the stomach of the female bows slightly asymmetrically, more to one side. If the abdomen is symmetrically arched, the animal is usually just overfed. In the last stage of pregnancy, the stomach sags, the back is bent and the overall way the female moves changes.

Oestrus, that is, the period when a female can become pregnant, lasts for 7 days in leopards, and the oestral cycle lasts 47 days. It is probably vital for the breeder to identify the occurrence of oestrus to ensure successful reproduction. Is this time consuming? And when did you first witness mating?

Behavioural changes following the arrival of oestrus can best be observed when the female sees the male and they can get as close as possible to each other. Our leopards, if in their individual enclosures, cannot see each another. Because we had to rely on the female's call alone, it took us a few months before we fixed the interval correctly. When we succeeded in the spring of 2014, the European Rescue Coordinator of Sri Lankan leopards did not recommend that we allow the leopards to reproduce that year, so the first pairing didn't take place until August 2015.

Previously, these cats mated in closed premises under the supervision of both a veterinarian and several breeders who were prepared to intervene by, for example, spraying an aggressive male with water from a fire-hose to get him off the female. Since mating is already a stressful situation, we now practice the technique of "joining," whereby we link all the indoor and outdoor areas of the breeding facility to feed and watch the animals. The first direct interaction between the male and female therefore occurs much more slowly and naturally, both approaching one another slowly, and gradually mating.

After the onset of oestrus in our female leopard, at the beginning of August 2015, we interconnected all inner quarters and opened the exits to the two enclosures. The leopards had already been fed, and we removed the food remnants, which could have been a cause of conflict. The male walked into the large enclosure, hiding in the bushes and not daring to move. Therefore, the female took the initiative: Looking for the male, she approached him gradually, closing in for about an hour. The first direct contact between the couple was completely calm. The animals behaved neutrally, and we decided to keep them together overnight. We did not separate them until a few days later, when the oestrus cycle was complete. During this first oestrus, we did not witness any sexual activity, but it was clear that our leopards were getting along well. At the end of September 2015, we watched, to our great pleasure, the first mating attempts.

Still, it took another two years for the female to get pregnant. During this period, the pair interacted a lot more, and we assessed the mating. We can say with satisfaction that we accurately identified the pregnancy and prepared for it in time, as we now have two beautiful little leopard cubs.

Ishika, a Margay, Gave Birth a Second Time

Margays (*Leopardus wiedii*) made their first appearance in Brno Zoo in late 2016.

The female, Ishika, who arrived in Brno in December 2016, was born in 2012 at Port Lympne Zoo in Great Britain. Because we did not have a suitable mate for her, our colleagues from Jihlava Zoo lent us a male in May 2017 for the duration required to fertilize Ishika. This male, Yoro, had been born in 2009, and had come from Le Parc des Félins Park in Nesles, northern France. We provided our margays with a new home in a building adjacent to the Tropical Kingdom pavilion. From there, they could pass through a wire tunnel into an outdoor enclosure at the front of the building.

The cohabitation of this couple ended with Ishika's pregnancy. At the end of August 2017, when her enlarged stomach signalled the approaching delivery, we moved Yoro out of her enclosure. She bore two cubs on 7 September 2017, but they lived only for three days, because she was unfortunately too inexperienced to take care of them. Because the zoo in Jihlava had not requested an immediate return of Yoro, about a week after the birth we reunited the couple. They stayed together until 11 January 2018, when Yoro returned to his home zoo. We could only confirm that Ishika was pregnant again when she gave birth on 21 February 2018 to a single baby. At the time of printing this edition of ZooReport, we do not know whether this cub is male or female, and we do not have any information about its development.

The margay is a small feline from the *Felinae* subfamily, which is divided into eleven genera. The genus *Leopardus*, to which the margay belongs, has seven species.

Margays live in rainforests and deciduous forests along the watercourses of Mexico, the rest of Central America, and South America as far south as Uruguay. They are very skilled in navigating the treetops, where they hunt squirrels, birds, or spiders, and where they also rest and sleep. They can rotate their hind limbs 180 degrees and thus can climb down head first onto the lower tree trunks which lead to the ground. A margay is also able to hang its hind legs on a branch while it handles its prey with its front paws. However, it hunts not only up in the crowns of trees, but also on the ground, where it can catch larger mammals such as agouti. Margays can make a long jump of up to four meters along the ground, and spring two-and-a-half meters up in the air. This beautiful little cat, weighing less than four kilograms, can live in human care for up to 24 years.

Ishika (pictured above and below), before the departure of Yoro to his home zoo, became pregnant. On 21 February of this year, she gave birth to a cub.

The coat of a margay, which is decorated on the back and sides with attractive spots, is used for commercial purposes. Fifteen animals are required for the production of a single overcoat. The numbers of margays living in the wild are low because of predators, which mainly consist of stronger ocelots (*Leopardus pardalis*) and poachers, who either kill them or catch them alive. At present, their greatest threat is deforestation, especially of the Amazonia. The current threat status of the margay is not high according to the World Conservation Association (IUCN) (NT, Near Threatened), but the current unfavourable population trend suggests that the threat level may soon increase. European zoos, including ours, breed margays as part of the European Rescue Program.

Four-Eyed Fish Have Only Two Eyes!

Brno Zoo is currently the only Czech zoo that breeds largescale four-eyed fish (*Anableps anableps*). A group of these fish from Central and South America was imported by our zoo in November 2017 from the zoo in Stuttgart, Germany. The largescale four-eyed fish aquarium is located in the Exotarium pavilion, in the very first tank (if we enter the building from the Grévy's zebra exposition).

Largescale four-eyed fish live in fresh or brackish waters at the mouth of rivers and in the shallows on the Atlantic coast from southern Mexico to Brazil. Because of the tide, the salinity of the water in which they live constantly changes. These interesting creatures mostly swim with their big eyes almost bulging from the water. They hunt insects on the surface and sometimes even leave the aquatic environment and seek prey on muddy or sandy beaches with mangrove vegetation. They also hunt various small invertebrates, or even small fish, and eat aquatic plants; and can grow to a length of 32 cm (but only up to 24 cm in an aquarium).

The *Anableps* genus includes two other species: *Anableps microlepis* inhabit sites similar to largescale four-eyed fish, and are also very similar to them. The very rare Pacific four-eyed fish (*Anableps dowei*) inhabit only the Pacific coastline from southern Mexico to Nicaragua. The four-eyed fish's evolutionary adaptation to the specific conditions at the interface of the aquatic and terrestrial environments is the unique construction of its eyes. This is indicated by its English name: four-eyed fish.

When seen from the side, the fish's eye is divided into two parts, with a dark horizontal epithelium, so it looks like the fish has four eyes. However, it has only one lens and one retina. The top and bottom of the lens vary in curvature: the upper part is flatter and corresponds to the eye of terrestrial animals, while the bottom part is rounded like a fish's eye. A split lens can remove the difference in image transmission caused by different light fractures in the atmosphere and aquatic environment. The image in the retina is then in the lower part, where the light reaches from places above the surface, and it is as sharp as it is in the upper part, where the light is filtered by the aquatic environment. (Remember that the lens turns the image upside down.)

The retina of four-eyed fish is also unusual. Most of the luminescent cells in

The split eye can best be seen if the four-eyed fish's head is submerged.

◂

its lower part are sensitive to the wavelengths of green light, which are predominant in the atmosphere above the surface; whereas the upper part of its retina primarily perceives yellow light, which spreads in a turbid aquatic environment. The entire retina also contains cells sensitive to other wavelengths of sunlight. The split eye has the characteristics of bifocal glasses, and four-eyed fish can see objects above and below the surface simultaneously and equally well. It is admirable that such a simple brain as the fish's can produce the resulting overall image of the field of view from partial information.

Four-eyed fish are viviparous (fertilization occurs within the female's body) and need to be kept in a larger flock. The male cannot fertilize just any female, and the female cannot mate with just any male. The helper genital organ of the male, by which four-eyed fish (and other viviparous fish) females are fertilized, is an anvil fin converted into the so-called 'gonopodium.' It grows from the body of the male four-eyed fish either to the left or to the right. (The number of 'right' and 'left' males is approximately the same.) The male can fertilize the female only when he approaches her from the side on which this organ is present. The females have a genital outlet either on the right or left side of the body. (The number of 'right' and 'left' females is also approximately the same.) 'Right' males can only mate with 'left' females, and vice versa. The evolutionary advantage that this arrangement offers is not clear.

The four-eyed fish eye is divided by a horizontal divider of the dark epithelium into the upper part, which sees above the surface, and the lower part, which is adapted to monitor the aquatic environment.

Four-eyed fish are passive, so can be placed in the same tank as other species. They require water with mild salinity. Our largescale four-eyed fish tank is also inhabited by marbled swamp eels (*Synbranchus marmoratus*) and banded banjo catfish (*Platystacus cotylephorus*). These latter two species also live in brackish waters of Central and South America, and are only rarely bred.

Four-eyed fish eyes mostly protrude above the surface, while the rest of the body is submerged.

Scheepmaker's crowned pigeon.

Pied Imperial Pigeons and the Scheepmaker's Crowned Pigeon

Thanks to an agreement with the coordinator of the European rescue program of Scheepmaker's crowned pigeons (*Goura sclateri*), our zoo managed to acquire a two-year-old female of this species from Děčín Zoo in July 2017. Scheepmaker's crowned pigeons are very popular because of their unusual appearance, and they are quite common in zoos. However, it is difficult to acquire new individuals because of their slow breeding cycle and the low number of squabs per nest.

The female was placed in the Exotarium Hall. We tried to find a mate for her, but this is a time-consuming task. So that she wouldn't be in the aviary alone, we introduced some roommates in November 2017: two pied imperial pigeons (*Ducula bicolor*). Both these pigeon species live on the island of New Guinea and belong to the family *Columbiformes* (*Columbidae*).

Scheepmaker's crowned pigeons are the world's largest pigeons. They can reach up to 70 cm in length and weigh over 2 kg. They are heavy, short-winged pigeons that mostly fly only between tree branches and do not venture very far, which is slightly atypical for pigeons. During the day, they seek food (fruits and invertebrates) in the undergrowth, and sleep in the trees at night. The female lays one egg in a nest in the branches, and sits on it for almost a month. The parents then feed their squab with a mushy milk that they create in their maw. The milk composition of fruit-eating pigeons differs from that of seed-eating pigeons.

Four species of crowned pigeons have been identified: the western crowned pigeon (*Goura cristata*), the southern crowned pigeon (*G. scheepmakeri*), the Victoria crowned pigeon (*G. victoria*), and the Scheepmaker's crowned pigeon. All crowned pigeons come from New Guinea and its near-by islands, and are very similar, differing mainly in terms of the proportion of the reddish colour on the body and the colour of the 'mirror' in the wings, which may be white or blue-gray. The first two species, according to the Red List of Endangered Species (IUCN Red List), are Vulnerable (VU), and the other two are Near

Threatened (NT). They are not very abundant in their homeland: In addition to the loss of their natural habitat, hunting has posed another danger for these birds, as they are a favourite prey of the natives, especially because of their size. Wild populations are shy, so crowned pigeons are rarely seen in nature. In captivity, they can get used to humans, but individual differences in behaviour can be significant: We encounter timid individuals as well as heroic aggressors. While our female is not disturbed by the visitors she sees through the glass wall of her quarters, she is afraid of the breeders and is therefore difficult to handle.

Pied imperial pigeons are also large and attractive. The family *Ducula* (so-called imperial pigeons) has about 40 species, and these colourful birds are native to Southeast Asia, New Guinea, and the Pacific islands. Pied imperial pigeons mostly inhabit island coasts and do not penetrate the interiors much. These birds grow up to 40 cm long and weigh up to 0.5 kg. They spend considerably less time on the ground compared to crowned pigeons. They usually nest in colonies, and lay two eggs in a nest in the branches. They are monogamous. Their popularity is indicated by the fact that over 300 of them reside in European zoos. Imperial pigeons were imported into Europe for the first time at the end of the 19th century, and they became more widespread in the 1990s.

Pied imperial pigeon.

We often see them in aviaries with other species of birds. Like other species of pigeons, these are usually peaceable, and can live together with many other birds. Two males, aged 9 and 17 years, were sent to Brno Zoo from Zagreb Zoo. They are well adapted to living with the crowned pigeon female. For both these males, we will soon have females.

Brno Zoo has not had many *Columbiformes* in its history. Since the opening of the zoo in 1953, we have only had 13 species, including the African vinaceous dove (*Streptopelia vinacea*) and two North American species: the mourning dove (*Zenaida macroura*) and the common ground dove (*Columbina passerina*). Boosting our *Columbiformes* breeding, we acquired a male common emerald dove (*Chalcophaps indica*) from Prague Zoo in 2013, which was later joined by a female from Ostrava Zoo. This couple were repeatedly successful in producing chicks. This is how the idea of breeding so-called tropical-fruit-eating pigeons, which are more difficult to breed than grain-eating species, came about in Brno Zoo. Most tropical-fruit-eating pigeons require thermally insulated quarters in winter and good quality feed throughout the year, including ripe fruit and special granules.

I firmly believe that more rare and attractive species will be added to Brno Zoo's collection in the future, and that our breeding skills will improve accordingly.

RNDr. Petr Suvorov, Ph.D.,
Bird Breeding Curator

Head of Scheepmaker's crowned pigeon.

On the feeder, the great tit (Parus major) belongs to frequent visitors.

"Nature in Winter" with a Focus on Birds

The Hlídka Ecological Education Centre, where children met with various interest groups and attended educational programs during the winter, also organized a one-day public awareness event. The event was called "Nature in Winter", and focused on birds that do not migrate to warm climes in cold weather. The event took place in both the morning and afternoon of January 19, 2018.

Visitors first learned about the obstacles that birds must overcome in winter, and how humans can help them. We stressed that birds need water, which has to be replaced, especially when it is freezing. What do we feed our birds? Fat is an important ingredient in bird food, so we provide tallow balls. We also mix seeds of different sizes (sunflower, millet, barley, corn, oats, poppy, linseed, rape, walnuts, and groundnuts) and add fruits (such as whole apples or pears). We can also use purchased seed mixtures for birds or a mixture of dried insects.

It is important to use some kind of hanging feeder because, if the food is placed directly on the ground, it can get wet and mouldy. Particular care should be taken when feeding water birds. The shore can be heavily polluted with bird droppings; and if more food is given than the birds need, the remainder will drop to the bottom and can adversely affect the quality of the water.

We acquainted both children and adults with the birds which winter here, and we listened to their songs. The children learned what to feed the birds, and made small feeders from tree cones and PET bottles, sometimes with the help of adults, and then filled them. Cone feeders have an important advantage: It does not matter if they are not cleared away in the spring. To manufacture a cone feeder, we need one pine cone, string, and some food: a mixture of sunflower seeds, poppy seeds, oatmeal, and lard. Additionally, other seeds, as well as nuts or grated carrots, can be included. The mixture should be pushed as far up into the cone as possible, and the string should be connected to the tip of the cone so it can be hung.

An art workshop was also part of the event, as well as a bird puzzle and a quiz. Older children solved complicated rebus puzzles, and these little nature enthusiasts received small rewards when they were successful.

Experts are undecided about whether or not it is advisable to feed wild birds in winter. Endangered species only rarely live near human settlements, and we probably will not see them at feeders. However, if children regularly monitor their feeders, they will learn to understand their responsibility toward wildlife, and can share a closer relationship with it. They are in turn rewarded by the birds, who are fun to watch as they eat. Thus, children can see which bird populations are coming to feed, and the birds can get ready access to food and then quickly fly away. By regularly monitoring life on a feeder and its surroundings, children learn more about each bird species, and come to understand their inter-relationships and interactions.

Mgr. Vladimíra Dolejšová,
Lecturer at the Hlídka
Ecological Education Centre

Grinding cereal into flour in the Experience Park Zeměráj. The park offers more than a hundred games, puzzles, and adventure tasks that teach children about nature and the lives of our ancestors.
Photo by Milan Okrajek

Bare Feet in the Park

One of the interest groups led by lecturers from the Centre for Environmental Education (CEE) Hlídka carries a somewhat unusual name – the Vlaštovka (Swallow) Travel Club. What's special about it is that it is active only on weekends.

The club was founded in September 2017 thanks to extensive cooperation between the Brno City Transport Company and Brno Zoo. (We would like to point out that CEE Hlídka is an integral part of Brno Zoo.) Approximately thirty children aged from 7 to 12 years belong to the club. Once a month, on a Saturday or Sunday, children explore different places in our country as well as in neighbouring Austria, including eco-farms, environmental education centres, national parks, zoos, and other places or institutions that bring together the natural and cultural richness of the visited region.

The first trip taken by Vlaštovka Club, in October 2017, was to the Zeměráj Experience Park, which is located near Kovářov village in Písek. Its biggest attraction is the one-kilometre-long footpath on which people can walk barefoot on grass, cones, sticks, needles, sand, mud, and boulders of various sizes. This can be an extraordinary sensory experience. At the end, when you finally rinse your feet with cold water from the pump, you feel reborn and closer to nature.

We also visited an open-air archaeological museum and the botanical and freshwater exposition "Living Water" in Modrá in Uherské Hradiště. The children saw aquatic animals and plants of the Morava River and its adjacent streams and pools.

The November trip was to the Centre for Environmental Education in Chaloupky in Třebíč and to the ecological farm in nearby Zašovice, where the children made cheese from cows' milk. They could also take samples home. The parents of one girl later told us enthusiastically how their daughter had brought them fresh cheese to taste. And they also listened to a lecture on how food is grown in Zašovice, so a small family event was created. Before Christmas, the Vlaštovka Club visited the zoo in Vienna-Schönbrunn. This year's first trip was a visit to the Moravian Karst, where we saw several bats wintering in the stalactites during a tour of the caves. Other trips are planned, for example to Dvůr Králové Zoo or Prague Zoo.

The Brno City Transport Company provided the Vlaštovka Club with a beautiful new bus and an extremely nice driver who is very kind to the children. We have received positive feedback from the parents of the members of this special club, which offers something that neither the school nor their parents can provide. Employees at CEE Hlídka want the club to continue, enhancing the children's school education as well as the environmental education they get in the zoo.

Mgr. Alena Okrajková,
Head of the Hlídka
Centre of Environmental Education

Members of the Vlaštovka Travel Club walk barefoot on the footpath in the Zeměráj Experience Park near Kovářov village in Písek.
Photo by Milan Okrajek

This year, the first two saved sea turtles

The rehabilitation centre Kura Kura, which helps sea turtles in their natural habitat in Indonesia, rescued its first patients in 2018.

The injured olive ridley sea turtle, Poppy, on the operating table at Kura Kura Rescue Station.
Photo by Simona Rusu

At the rescue station, the turtles have access to 12 rehabilitation pools and a perfectly equipped surgery centre. A veterinarian is always available to take care of them. Ivy, a female green sea turtle (*Chelonia mydas*), was the station's first patient this year. 'Ivy is a beautiful turtle who got stuck in a fishing net in northwest Bali and injured her carapace. She came to us because of a request for help from the local authorities,' explained veterinarian Simona Rusu.

After rehabilitation and healing, Ivy is back where she belongs. 'She has made great progress in the station, and we have put her back into the ocean. We hope she will successfully reproduce next year and will help increase the population of these majestic marine animals,' added Mrs. Rusu.

The second 'beauty in trouble' was Poppy, an olive ridley sea turtle (*Lepidochelys olivacea*). 'Poppy was found by local residents during the cleaning of the beaches of Toyapakeh. She had probably been tangled in ropes for a very long time, as she was not only injured but also very gaunt and weak,' Mrs. Rusu said. Poppy managed to heal successfully, and, although she is not completely out of danger, the recuse officials believe that she is on the right track.

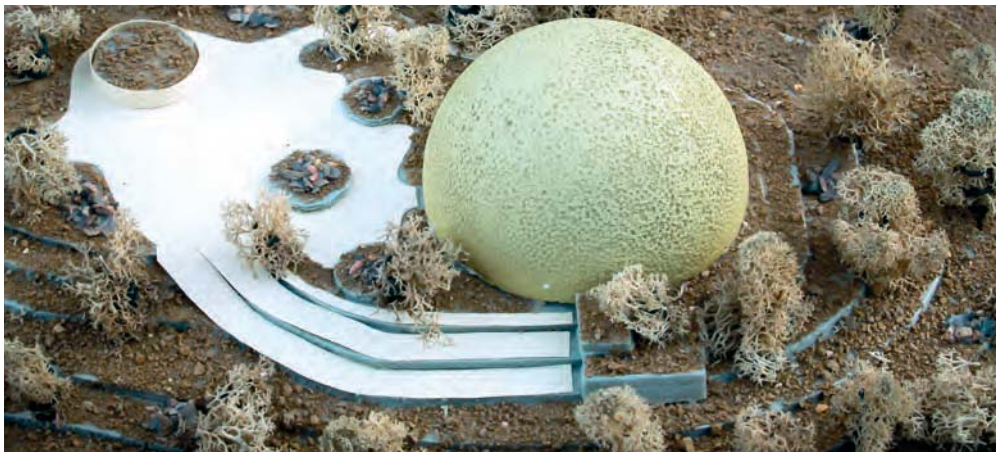
The Kura Kura (Save the Turtles) Rescue Station was established in May 2017 on Nusa Penida Island after ten years of effort and planning. Wounded turtles are brought to the station by BKSDA (Balai Konservasi Sumber Dava Alam). The staff at Nusa Penida also regularly visit 20 turtle rescue stations located in various parts of nearby Bali Island, checking on the health of rescued turtles and transporting the most needy cases, with the consent of BKSDA, to Nusa Penida, where better technical equipment is available.

Kura Kura cares for turtles in their natural environment (*in situ*) to help avert the crisis facing the worldwide turtle population. Rescue stations are trying to rehabilitate wounded and sick turtles, and then return them to their natural life so that they can bring more generations into the world. The turtles that come to Kura Kura Station are mostly in poor health due to human behaviour. Frequent injuries are caused by traps, transports related to illegal trade, or the impact of the environment.

Petra Hokszová

Staff at Kura Kura Station put a green sea turtle in the rehab pool. This female, Ivy, was the first rescued sea turtle this year, and she has been released into the ocean.
Photo by Simona Rusu

Architecture Students Design Zoo Pavilions



Model of the manatee pavilion at Brno Zoo submitted in 2014 by 3rd year Faculty of Architecture student Lukáš Malík.

An exhibition of designs for new zoological expositions, called *Identity Search*, has now been mounted at Brno Zoo in five locations: the Tropical Kingdom Pavilion, the Bear Hunter Farm, the Haida Gwaii Indians' Hut, the Monkey Hall, and the African Village. The exhibited information panels and three-dimensional models were made by students of the Faculty of Architecture at the University of Technology (VUT) in Brno.

The most extraordinary new exhibit will be the construction of a manatee exposition. This is being highlighted with models exhibited in the Tropical Kingdom Pavilion, located in the southern (lower) hilltop of Mniší hora. There, the zoo has built a comprehensive Caribbean exposition. The ground floor of the Tropical Kingdom, established in 1998 by rebuilding the older vivarium, will be preserved, as it still meets current breeding requirements. Close by, there is a high terrarium building with a saddle roof, which is technically unsound. Ever since it was built in 1972, it has faced the problem of heat leakage. This building will be completely removed, and a new tropical pavilion with a manatee pool and accompanying exposures for smaller animals from the Caribbean region will be built in its place. The building will be complemented by outdoor exposures located at the southern tip of the hill.

On the hillside, the new two-storey recessed building will be covered with an arched roof that does not clash with its surroundings, but rather merges with them. In the middle of the pavilion, there will be a large freshwater tank for manatees. A ramp around it will lead visitors into an acrylic tunnel in the basement, where they can imagine themselves in a watery realm.

Manatees are large aquatic mammals, weighing up to 600 kg. They are also called sirenia, sea cows, or sirenians. Their genus, *Trichechus*, which includes three species, belongs to the manatee family. Manatees inhabit the Atlantic coast from the south of the USA to Brazil. They are able to live in the salty sea, or in brackish or sweet water, but they cannot tolerate a water temperature below 15 °C. They eat only aquatic plants. Although they do not have natural enemies, they are a threatened species. Many individuals die after colliding with motor boats, and manatees often swallow parts of fishing nets.

The cooperation between Brno Zoo and the Faculty of Architecture in Brno began in 2004 with the accidental meeting of an employee from each of these institutions at the opening of a new exhibition at Vyškov Zoo. RNDr. Bohumil Král, CSc. (from Brno Zoo) learned that Ing. arch. Ivo Boháč, Ph.D. (at that time, an assistant professor) was encouraging his students to submit designs for zoo buildings. This was a delightful discovery, because no architectural office in the Czech Republic was then dedicated to zoo edifices.

Five students worked on Dr. Král's 2005 assignment for zoo pavilions in Australia and Madagascar. To date, 38 students from the Faculty of Architecture in Brno have been involved in designing zoo buildings. Recently, students of the Faculty of Architecture submitted bachelor's and master's theses about designing zoo structures, and this has officially become one of the fields of study at the architecture college. We hope this faculty gets an opportunity to actually build a zoo enclosure soon, perhaps even in our own zoo.

Model of the manatee pavilion at Brno Zoo submitted in 2013 by 3rd year Faculty of Architecture student Pavla Šebestová.

ANOONA & AKASHINGA

ZOO BRNO

www.zoobrno.cz/en

B | R | N | O

STATUTÁRNÍ MĚSTO BRNO
FINANČNĚ PODPORUJE ZOO BRNO A STANICI ZÁJMOVÝCH ČINNOSTÍ,
PŘÍSPĚVKOVOU ORGANIZACI