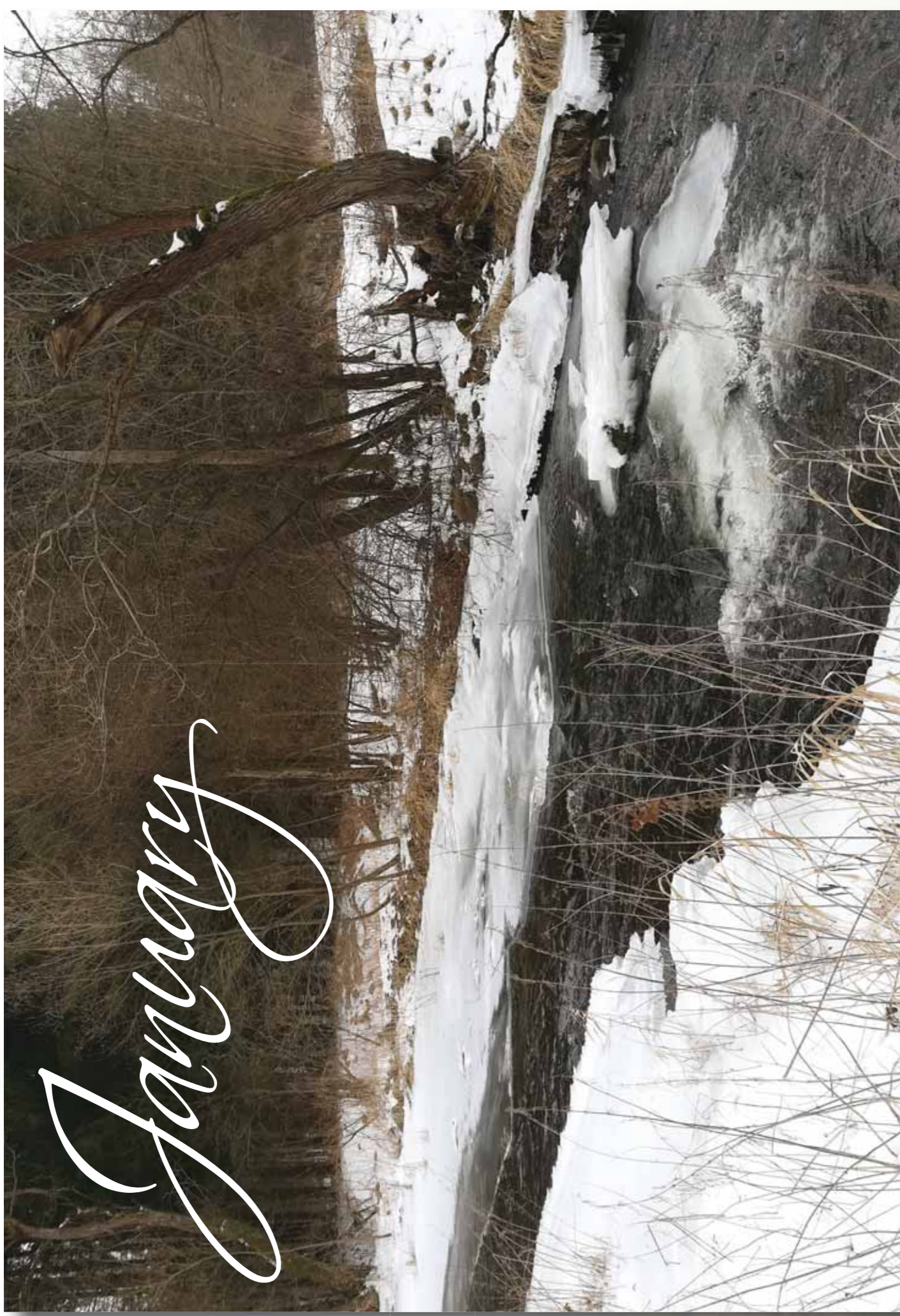


Crayfish 2023...



Tento projekt byl podpořen grantem z Norských fondů.
Supported by grant from the people of Norway.

January



Moise

16 17 18 19 20 21 **22** 23 24 25 26 27 28 29 30 31
1 2 3 4 5 6 7 **8** 9 10 11 12 13 14 **15**



Stone crayfish (*Austropotamobius torrentium*)

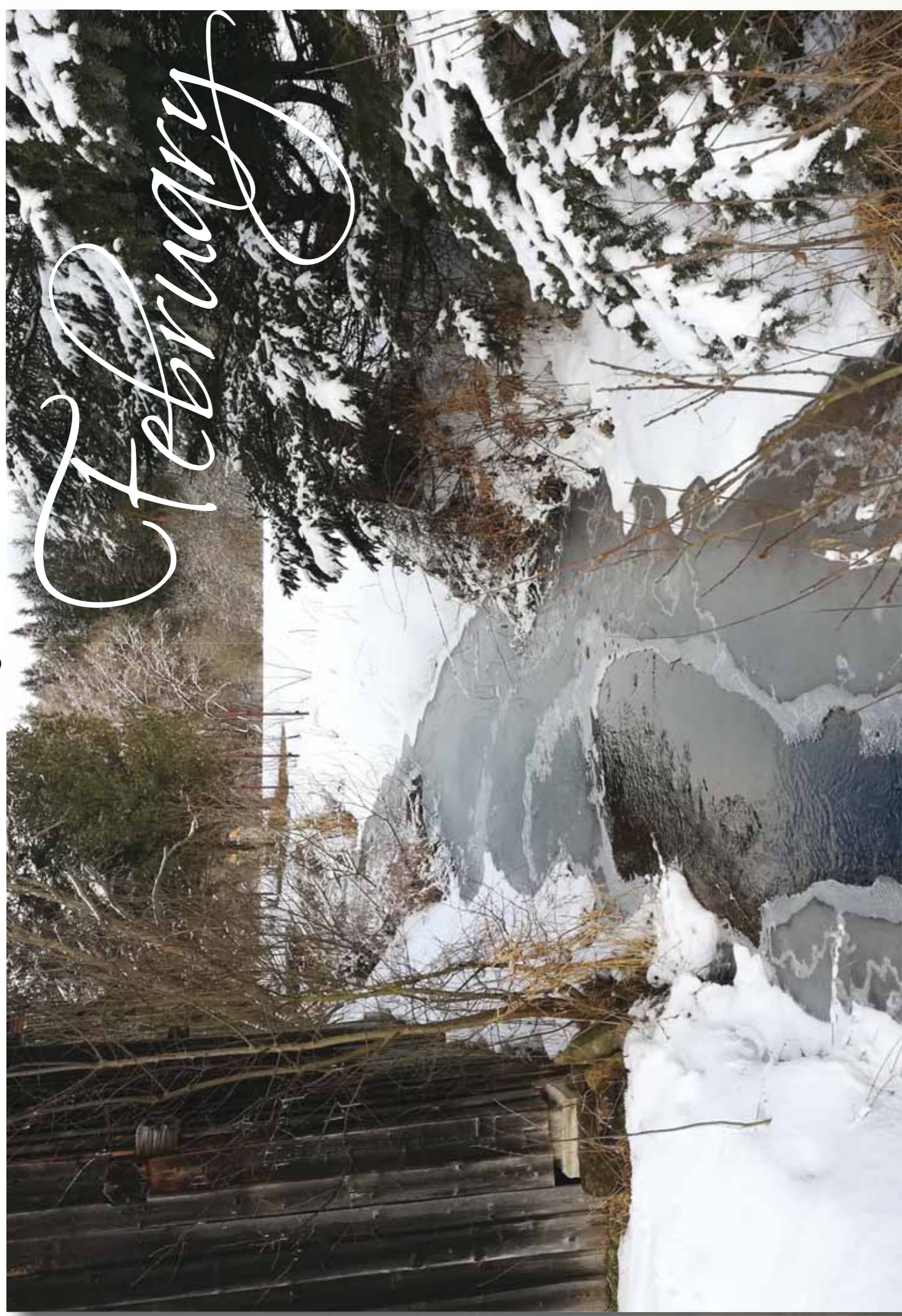
The occurrence and spread of non-native crayfish species is one of the many threats to biodiversity and the aquatic ecosystem as a whole. Threats take many forms, including severe impacts on native species and the structure and function of ecosystems due to habitat alteration, predation, competition, disease transmission, and the displacement of native species over large areas. To prevent this threat, a combination of several measures must be proposed to at least control invasive crayfish and prevent their spread to new sites, with priority given



Noble crayfish (*Astacus astacus*)

Introduction

to sites where specially protected animals are found. From the point of view of the spread of invasive crayfish species, the stone crayfish and noble crayfish are the most threatened, both by predation by non-native crayfish and by crayfish plague (caused by *Aphanomyces astaci*). However, other fauna and flora are also threatened by predation (invasive crayfish are responsible, for example, for the loss of freshwater pearl mussel in Germany).



Maíse

1 2 3 4 **5** 6 7 8
 20 21 22 23 24 25 **26** 27 28

9 10 11 **12** 13 14 15 16 17 18 **19**



Signal crayfish (*Pacifastacus leniusculus*)

Currently, in the wild in Czech Republic, we can demonstrably encounter a total of three species of non-native crayfish: signal crayfish, spiny-cheek crayfish and marbled crayfish. Under normal circumstances, invasive crayfish species are significantly more successful in competition with our species. This success is due to a wider ecological adaptability, higher reproductive potential, greater migration ability, and aggressiveness. In comparison to those native to Europe, invasive crayfish belong to the so-called r-strategists (short-lived animals,



Spiny-cheek crayfish (*Faxonius limosus*)

with the exception of signal crayfish, which reproduce quickly and have a large number of offspring), which are more resistant to pollution and disturbance of their habitat. Because it entered the Czech Republic via the river Labe, the spiny-cheek crayfish is primarily found in large watercourses and their tributaries; the signal crayfish was primarily introduced in stagnant waters. However, thanks to their wide ecological valence, both species have spread to medium and small streams, including relatively polluted locations.

March



Noble crayfish (*Astacus astacus*)

1 2 3 4 **5** 6 7 8 9 10 11 **12** 13 14 15 16 17 18 **19**
20 21 22 23 24 25 **26** 27 28 29 30 31



Besének



Signal crayfish (*Pacifastacus leniusculus*)

Besének

Until 2009, there was a large population of noble crayfish in Besének. But then crayfish plague broke out here and almost the entire population of the native, critically endangered crayfish became extinct. In 2015, the occurrence of invasive signal crayfish was confirmed in the Besének tributary, which was probably released here as a replacement for noble crayfish. Later,

a residual noble crayfish population was found in the upper section of Besének. The question is, how long the noble crayfish will survive there. The non-native aggressive signal crayfish is slowly but surely approaching our crayfish.



Besének

17 18 19 20 21 22 **23** 24 25 26 27 28 29 **30** 1 **2** 3 4 5 6 7 8 **9** 10 11 12 13 14 15 **16**



Creating an overhanging overflow edge

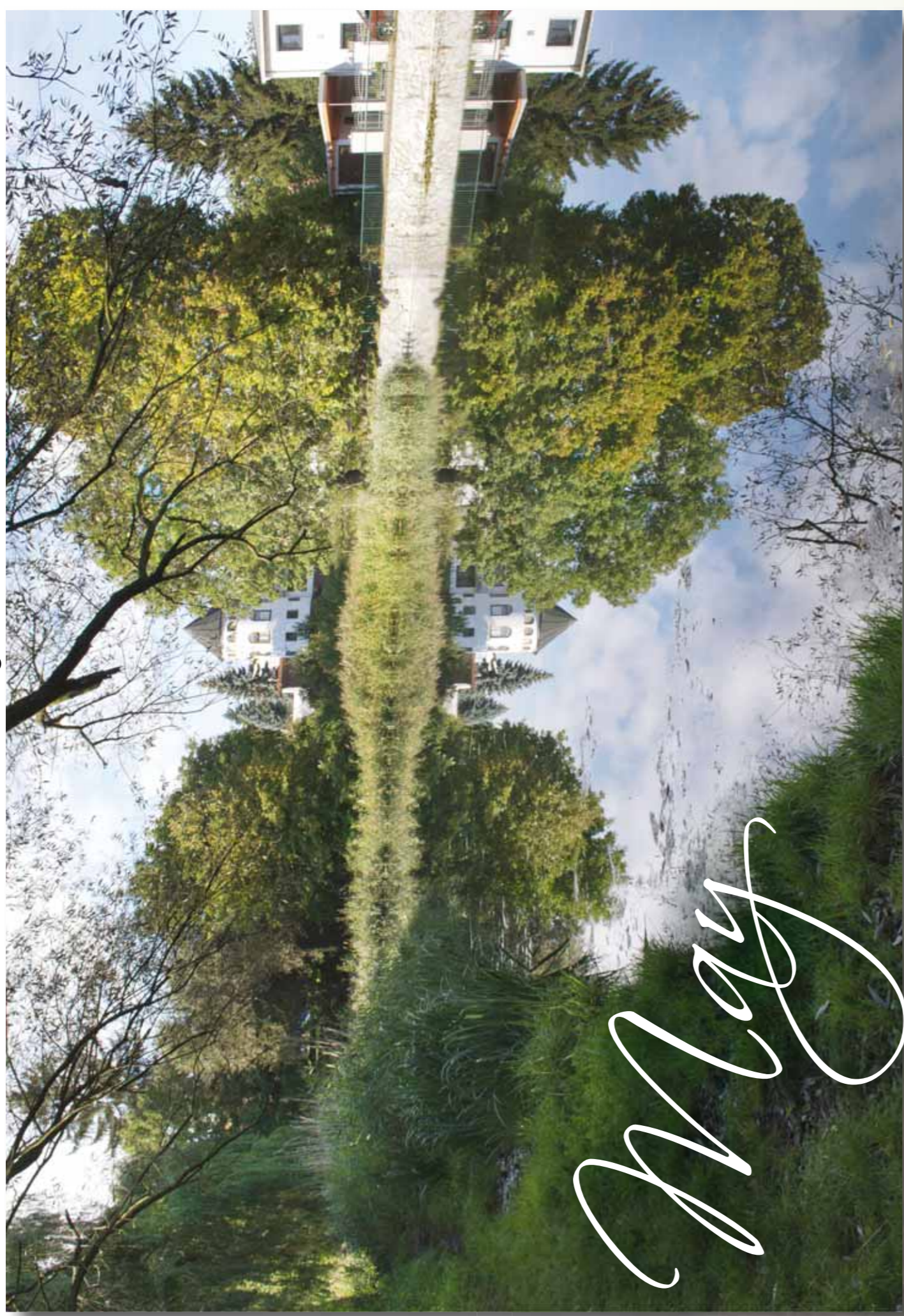


Signal crayfish (*Pacifastacus leniusculus*)

Besének

The danger of the signal crayfish does not lie just in the spread of crayfish plague; the signal crayfish is larger, more aggressive, and has significantly more offspring. Thanks to this, it quickly colonizes new habitats. Such a situation also occurs in Besének, where the signal crayfish moves upstream to the site with the critically endangered noble crayfish. Therefore, we have planned steps to prevent it from doing so. The existing transverse steps were modified to make

them impenetrable for crayfish moving upstream. They were equipped with an overhanging overflow edge and supplemented with barriers preventing the crayfish migration on land. It is also necessary to systematically collect crayfish above the steps and to optimize the fish stock in such a way as to support the elimination of the young crayfish.



Prostřední rybník Dolní Chabry

1 2 3 4 5 6 **7** 8 9 10 11 12 13 14 15 16 17 18 19 20 21
 22 23 24 25 26 27 **28** 29 30 31



Marbled crayfish (*Procambarus virginalis*)

Prostřední rybník (Prostřední pond) is located in Prague, Dolní Chabry on Dražanský potok (Dražanský stream). In August 2020, the occurrence of invasive marbled crayfish was confirmed here. This invasive species, like other non-native crayfish, transmits crayfish plague. It is also very dangerous thanks to the ability of parthenogenetic reproduction – the female can reproduce without the presence of a male, even at three months of age. This crayfish is commonly kept in aquariums and is released into the wild by irresponsible aquarists. They get



Migrant hawkfly (*Aeshna mixta*)

Prostřední rybník Dolní Chabry

rid of overpopulated crayfish that destroy the plants and other animals in their aquariums. Thanks to parthenogenesis, a single released animal is enough to establish a new population in the wild. At the time when marbled crayfish were found in Chabry, the local population numbered hundreds of individuals. Of these, 20% of the females carried a large number of eggs or young, even in the cold winter season. Such a large number of crayfish in the pond ran out of food, so they were attacking the surrounding gardens. This also led to their detection.



June

Prostřední rybník Dolní Chabry

19 20 21 22 23 24 **25** 26 27 28 29 30
 1 2 3 **4** 5 6 7 8 9 10 **11** 12 13 14 15 16 17 **18**



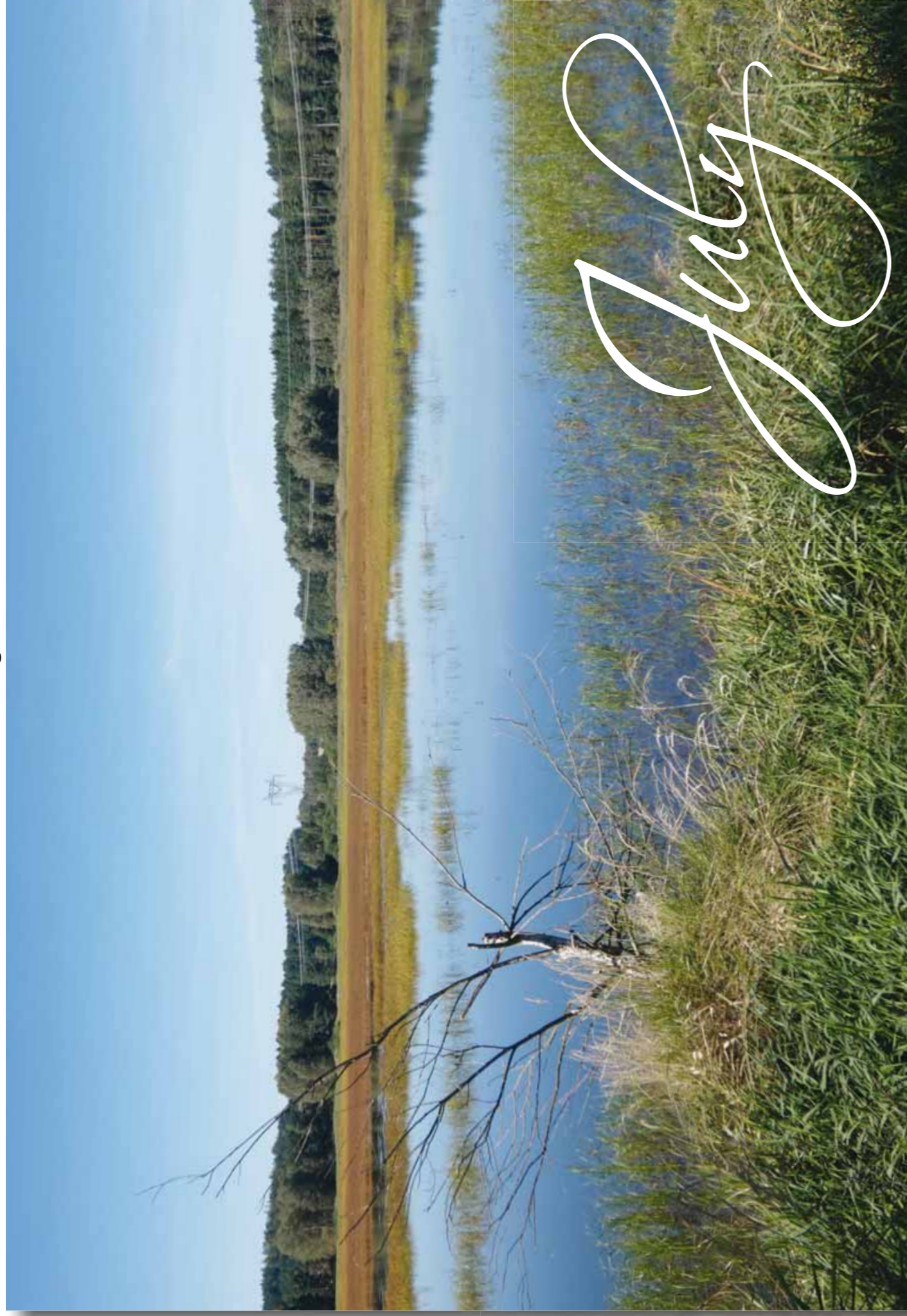
Marbled crayfish (*Procambarus virginalis*)

Prostřední rybník Dolní Chabry

In Prostřední rybník and the adjacent part of Dražanský potok, no more rare species of animals have been recorded; therefore, we were able to take more drastic measures to suppress the marbled crayfish here. This is a non-native, very invasive species that spreads crayfish plague. The pond was thus drained in autumn and limed after the collection of crayfish. The reservoir was then winter-dried. After refilling, perch, which is a reliable predator of crayfish, was introduced into the pond. The following year, although fewer crayfish were caught during draining, 40% were with eggs or young. Marbled crayfish were able to survive the liming and

winter drying of the reservoir in burrows excavated at the bottom of the pond. Therefore, in the following year, we applied milk of lime to the banks and the bottom, which penetrates into the burrows and thus kills the hidden individuals. The pond was also dredged in spring. However, even that did not lead to the complete extermination of unwanted invaders – we again found several young individuals. Perch will be introduced back into the pond and the site will be carefully monitored. At the beginning of this expensive marathon, there could be only one crayfish thrown away by an irresponsible aquarist!





Kačležský rybník

17 18 19 20 21 22 **23** 24 25 26 27 28 29 **30** 31

1 **2** 3 4 5 6 7 8 **9** 10 11 12 13 14 15 **16**

Large white-faced darter (*Leucorhinia pectoralis*)Danubian spined loach (*Cobitis elongatoides*)

Kačležský rybník (Kačležský pond) is part of Krvavý and Kačležský rybník National Natural Monument. Until 2015, there was a large population of our native noble crayfish in Kačležský rybník and its tributaries. In 2007, crayfish plague broke out in the nearby Pěněnský potok (Pěněnský stream). At that time, it was not yet possible to determine the source of the infection. It was not until 2014 that an invasive signal crayfish was detected in Dračice, and gradually in other streams and ponds in the wider area. A high percentage of individuals have

Noble crayfish (*Astacus astacus*)

Kačležský rybník

also been confirmed to carry crayfish plague. Kačležský rybník, where we have known about signal crayfish since 2017, is already inhabited by thousands of these animals. They represent a significant threat to the entire unique pond ecosystem here, which is home to, for example, a population of the rare Danubian spined loach, swan mussel, and many species of dragonflies and amphibians.



Kačležský rybník

1 2 3 4 5 **6** 7 8 9 10 11 12 **13** 14 15 16 17 18 19 **20**
 21 22 23 24 25 26 **27** 28 29 30 31



Signal crayfish (*Pacifastacus leniusculus*)

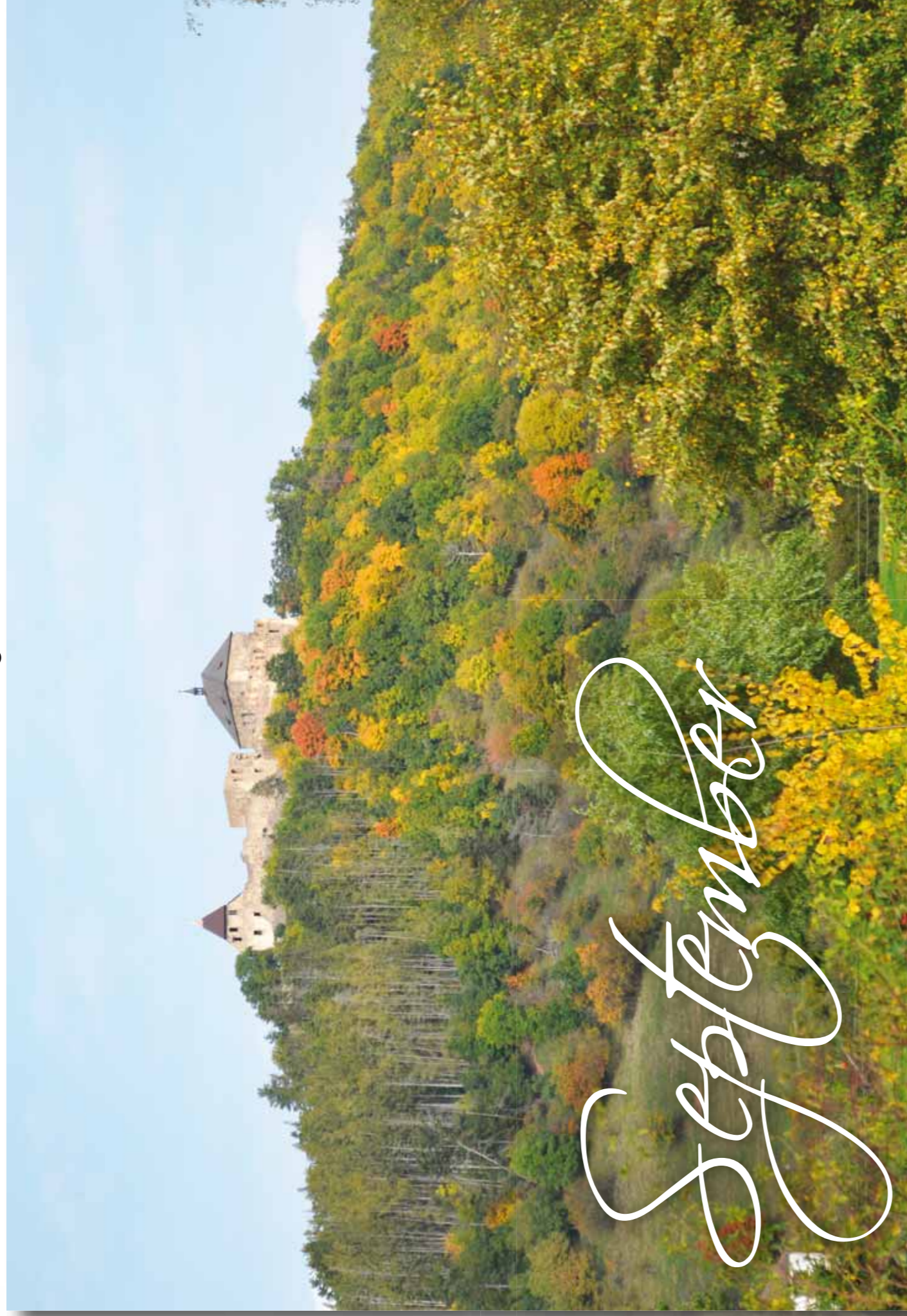
Kačležský rybník

A large population of signal crayfish no longer finds enough shelter or food; therefore, it is intensively spreading into adjacent streams. Exterminating it is no longer realistically possible. Therefore, it is very important to try to reduce its size as much as possible. This can be achieved by combining several approaches. The first is systematic catching in bow-nets and collecting crayfish when fishing the pond, but this way we catch mostly large crayfish. The removal of larger individuals, which also feed on smaller and weaker crayfish, could therefore



Signal crayfish (*Pacifastacus leniusculus*)

paradoxically result in a further increase in the local population, as a greater percentage of the young would survive. So we need more help. It can be provided by some types of fish that would eliminate small crayfish, and at the same time would not destroy the local ecosystem so much. In Kačležský rybník, pikeperch is introduced, which has been bred here for some time now, and which does not exert such pressure, for example, on the larvae of amphibians and insects as other fish predators do.



Točník

1 2 **3** 4 5 6 7 8 9 **10** 11 12 13 14 15 16 **17**
 18 19 20 21 22 23 **24** 25 26 27 28 29 30



Stone crayfish (*Austropotamobius torrentium*)

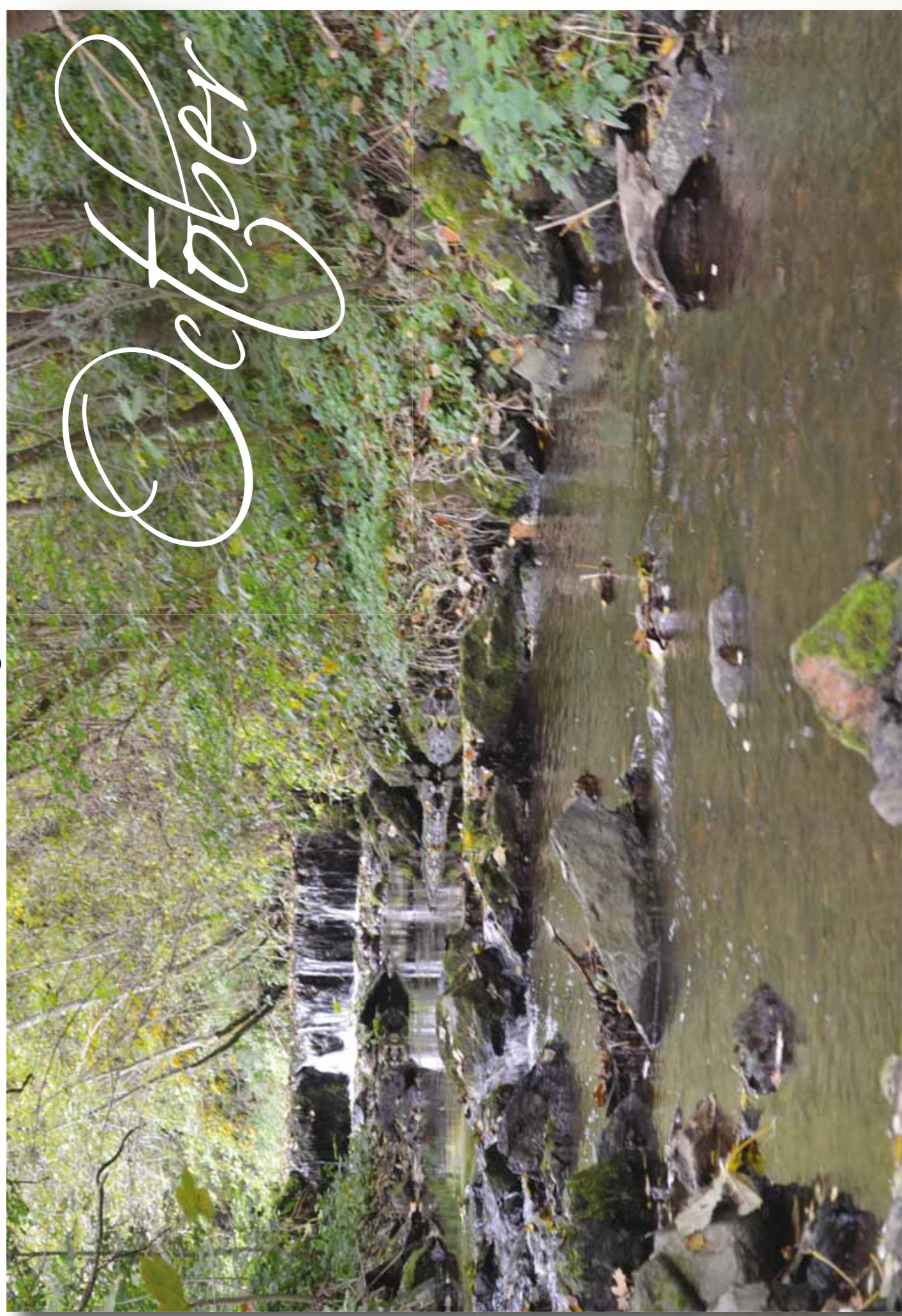
Stroupínský potok (Stroupínský stream) with its two tributaries – Kublovský and Bzovský – was, until relatively recently, one of the most important Special Areas of Conservation for stone crayfish in our country. Unfortunately, between 2018 and 2019, the local population was completely destroyed by crayfish plague. As in many other cases, we do not know the source of the introduction of this disease because the invasive species of crayfish that transmit it have not been found here. However, thanks to genetic analysis of the causative agent



Noble crayfish (*Astacus astacus*)

Stroupínský potok

of the disease, we can deduce it with a high degree of probability. Each of the American species of crayfish carries a specific strain of crayfish plague, and in this case it was found that the cause of the native crayfish extinction in Stroupínský potok was a strain characteristic of red swamp crayfish. Hopefully it does not yet occur in our countryside, but it is often kept in aquariums. All you have to do is pour the water from the aquarium into the stream and the will be a disaster.



Kublovský potok

October

16 17 18 19 20 21 **22** 23 24 25 26 27 28 **29** 30 31
1 2 3 4 5 6 7 **8** 9 10 11 12 13 14 **15**



Noble crayfish (*Astacus astacus*)

Stroupínský potok was not only a habitat for stone crayfish, but both species of our native crayfish lived here together. It was one of the few localities in our country where we could see both stone crayfish and noble crayfish in the same pool. This idyll was ended by crayfish plague, which completely destroyed the crayfish population here. In addition to crayfish, the stream was inhabited by a large population of fish, among them the specially protected European bullhead and common minnow. Fortunately, the water mould which is the causative



European bullhead (*Cottus gobio*)

Stroupínský potok

agent of crayfish plague does not attack fish, so at least these species can still be observed in Stroupínský potok today. If the population of native crayfish in Stroupínský potok recovers over time, it will still be at risk from the spread of spiny-cheek crayfish from Litavka to the site. This is currently prevented by several steps on Stroupínský potok, and we have to hope that there will be no further transmission of the infection from aquarium crayfish by irresponsible aquarists.

November



Vltava

1 2 3 4 **5** 6 7 8 9 10 11 **12** 13 14 15 16 17 18 **19**
20 21 22 23 24 25 **26** 27 28 29 30



Stone crayfish (*Austropotamobius torrentium*)

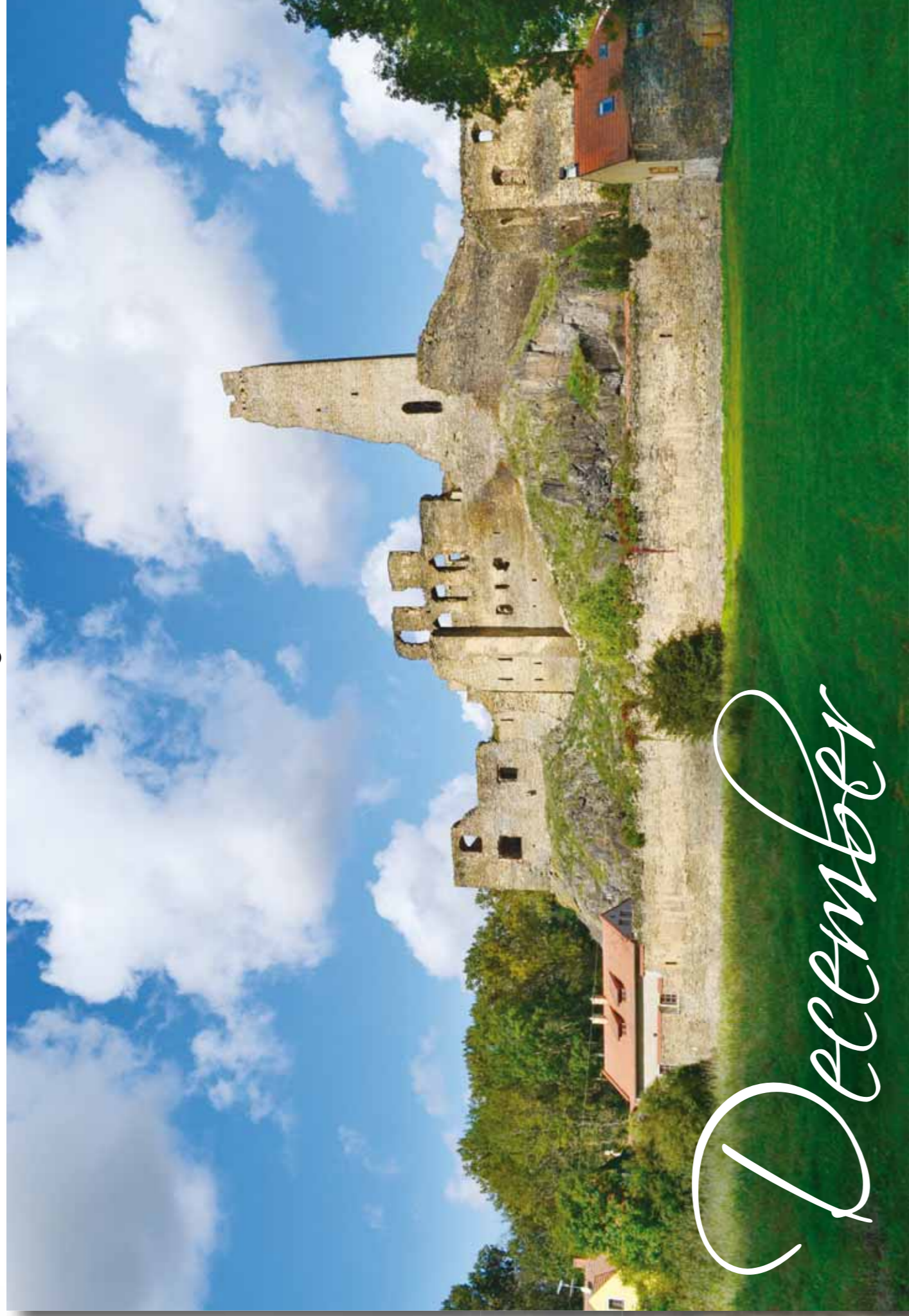
The Special Area of Conservation Zákolanský potok (Zákolanský stream), with the occurrence of critically endangered stone crayfish, is the only known tributary of the Vltava with this native species of crayfish. In the other Vltava tributaries, it probably became extinct due to a combination of excessive pollution and crayfish plague. The Vltava has already been completely occupied by the invasive spiny-cheek crayfish, whose population is greatly affected by this pathogen. This non-native crayfish is very resistant to this disease. Water pollution also



Spiny-cheek crayfish (*Faxonius limosus*)

Zákolanský potok

played an important role in Zákolanský potok. This time, paradoxically, it was a positive role. The pollution that flows through Dřetovický potok (Dřetovický stream) from Kladno has made Zákolanský potok an uninhabitable environment for any crayfish. The stone crayfish inhabits only the upper part of the stream above the confluence with this polluted stream. The water quality is not the best even in the upper section, but the crayfish can still cope with it.



Okor

1 2 **3** 4 5 6 7 8 9 **10** 11 12 13 14 15 16 **17**
 18 19 20 21 22 23 **24** 25 26 27 28 29 30 **31**



Zákolanský potok

In Zákolanský potok, the stone crayfish is paradoxically protected by the barrier of the heavily polluted stream. One day, when there is better sewage treatment, infected crayfish from the Vitava and the local stone crayfish would probably meet. In order to prevent this, two transverse obstacles were selected for the stream, suitable for modifications preventing the migration of crayfish upstream. Both barriers will be supplemented with an overhanging edge and barriers against the migration of crayfish on land. This measure will hopefully prevent



Zákolanský potok

Zákolanský potok

the possible penetration of infected crayfish upstream. It is important that even stone crayfish do not get back through the barrier which could become infected with crayfish plague after contact with the spiny-cheek crayfish and transmit the infection to the population in the upper section of Zákolanský potok. So an important principle applies – do not transfer any crayfish to other locations.



Maïše

2024

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
22	23	24	25	26	27	28	29	30	31											



Signal crayfish (*Pacifastacus leniusculus*)

The occurrence of the non-native invasive signal crayfish was recorded in the Maïše for the first time in 2011. It probably spread there from surrounding ponds, where it was either intentionally released or inadvertently introduced with fish stock. This is a very dangerous species, both in relation to our original crayfish (noble crayfish used to live in the Maïše basin) and to a number of other aquatic animals. Our crayfish are threatened not only by their aggressiveness and



Green snake tail (*Ophiogomphus cecilia*)

Maïše

greater reproductive capacity, but also by crayfish plague, which is carried by up to 80% of individuals. While the signal crayfish is resistant to it, our crayfish will definitely die from it. Signal crayfish can threaten other aquatic animals, for example freshwater pearl mussel, both by direct predation and by degradation of its habitat.



Signal crayfish (*Pacifastacus leniusculus*)

2024

19 20 21 22 23 24 **25** 26 27 28 29
 1 2 3 **4** 5 6 7 8 9 10 **11** 12 13 14 15 16 17 **18**



Freshwater pearl mussel (*Margaritifera margaritifera*)



Malše


Malše




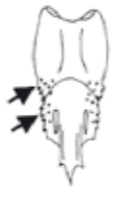


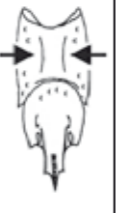

Freshwater pearl mussel use the brown trout to reproduce. Its larvae, so-called glochidia, develop in gill apparatus and thus travel with the fish to other locations in the stream. After the young bivalves leave their host, they burrow into the river bed for about five years. In the oligotrophic Malše, young freshwater pearl mussels can easily fall prey to signal crayfish. Older individuals of this long-lived bivalve (freshwater pearl mussels can live up to 100 years) with stronger shells are too hard for it, but it can seriously threaten younger freshwater pearl mussels with its predation. The spread of crayfish upstream could be helped, for example,

by obstructions in the flow. However, they would also prevent the migration of trout, which is necessary for the spread of freshwater pearl mussels. We can therefore only reduce the number of crayfish by hand collecting or catching them in bow-nets, or support the optimal composition of fish populations with enough predators, capable of at least hunting the young crayfish. It is often complicated to combine the elimination of invasive crayfish with the protection of our native, now critically endangered species.

Key for distinguishing individual species of crayfish found in our countryside

Signs relevant to a given type of crayfish are marked with an X.

Crayfish species	noble	stone	narrowclawed	signal	spiny-cheek	marbled	red swamp
Postorbital ridges	one pair 	X	X	X	X	X	X
	two pairs 	X	X				
Underside of the claws	light 	X	X		X	X	X
	red 	X		X			
	orange 	X				X	
Spot on the claw joint	orange 	X	X				
	light 			X			
	without spot 				X	X	X

Special markings	red cross stripes on the uropod 				X		
	without stripes 	X	X	X		X	X
Carapace	smooth 			X		X	
	with thorns 				X		
	with bumps 		X				X
	with bumps and thorn in the occipital suture 	X					
	open 	X	X	X	X	X	
closed 						X	



Source: "Crayfish in the Czech Republic" mobile app
<https://play.google.com/store/apps/details?id=cz.jp.raci>

Jitka Svobodová, Jiří Píček, VÚV TGM, v. i., 2020





Created within the project:
Use of innovative methods in the eradication of invasive crayfish in the Czech Republic
<https://crayfish2022.vuv.cz>

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Crayfish 2023..



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