

The Dice Snake in the Czech Republic (3)

We are devoting the third part of our series about the distribution range of the dice snake in the Czech Republic to the occurrence of this critically endangered snake in south Moravia. The situation in north Moravia was described in the last part of our series.

Locality requirements

Within the Czech Republic, the dice snake (*Natrix tessellata*) is already at the limits of its continuous distribution range. This is a major reason why it has very specific requirements regarding habitat, and why its populations only occur in isolated pockets. The dice snake in Moravia is linked to middle-sized and large rivers, and possibly to still water, particularly reservoirs. However, the presence of water is not the only condition for its occurrence. The character of the water environment as well as its surroundings are also important.

The dice snake prefers well warmed, slowly flowing or still waters; reservoirs are also fine, and it even seems that the snake is very happy to occupy such artificial biotopes. The locations where the snake is found have several common features:

- They lie in climatically favourable areas with a high level of sun exposure. The coldest Moravian localities permanently populated with the dice snake are in the Tišnov region in the slightly warm MT7 climatic region. The chance of occurrence is influenced by the overall climate of the area; however, the microclimate of the river valley phenomenon plays an important role.
- Also, shallow shoreline zones with gravel or sandy banks form part of the water environment which dice snakes inhabit. They like flat, sunlit shallow waters with a low water flow. This environment usually occurs in bays, on river islands, or in pits hollowed out by water.
- A rich and varied diet made up of suitable species of fish of appropriate (i.e., small) body size (the presence of fry is important) plays an essential role in the



A juvenile dice snake

maintenance of a permanent population of dice snakes. Suitable biotopes are, for example, near fish spawning grounds.

- In connection with the water environment, the character of the adjoining land plays an important role. There should be slopes which are sunlit for a long time within "slithering" distance. An important element of a habitat is also the complexity of terrain. Dice snakes look for places with a varied shoreline and steep slopes that include rocks and natural stone debris, but also places with diverse artificial biotopes such as stone drifts, railway and road banks, dry stone walls, and the ruins of buildings. (The banks of the rivers Dyje, Oslava, Jihlava, and Svatka offer all of these landscape elements.) It is important that this type of habitat has suitable sun exposure (southern or southwestern orientation is the best) and isn't shaded by trees or bushes, etc. The snakes use such structured locations outside the water environment as locations suitable for warming themselves in safety, with easily accessible hiding places, as well as for hibernation and sometimes for laying eggs.

The prosperity of the population is heavily dependent on the presence of places suitable for egg incubation. These places should maintain a constant temperature. Suitable substrates are, for instance, decaying plant material deposited by water in shoreline zones – humus in clumps of nettles, and the remains of plants and decaying

wood which water has deposited under uprooted or fallen tree trunks. In places where the choice of natural hatching places is not sufficient, dice snakes use compost, dung heaps, or rubbish dumps containing decomposing organic matter or something similar. The incubation of eggs is also possible under warm stones on hillsides or in dry stone walls.

Occurrence of the species in Moravia

There are several locations with significant numbers of dice snakes in Moravia. The majority of important localities can be found in the surroundings of, or directly by, the Dyje River and its tributaries of the first and the second order, roughly from Bítov to Znojmo. In Podyji National Park, the snakes appear in suitable sunlit places near the Dyje River and on its banks from Znojmo up to Vranov and Dyjí. Popular localities include Široká louka, Papírna, Šobes, Lipina, Ostroh, and the area around Hardegg. Dice snakes from Podyji National Park and from neighbouring Thayatal National Park in Austria form a single population. On the Austrian side of border, they occur not only by the River Dyje but also by the River Fugnitz. At present, the largest part of the population in this region can be found outside the national parks, near Vranov Reservoir.

The fact that the flow of the River Dyje is determined in part by reservoirs has an influence on the numbers of the snakes



Dice snakes often use the stones on river banks for basking in the spring

in Podyjí National Park. The population isn't endangered by the existence of the water reservoirs as such, but mainly by the production of electricity at Vranov Reservoir. The allowed maximum of water is released twice a day and then its water discharge drops to the minimum immediately afterwards. Mainly in the upper part of the Podyjí region (in the Vranov–Hardegg section), this has an unfavourable effect on the biota of the river, and particularly on dice snakes. The significant fluctuation of the water level in the river limits the range of food offered and also leads to the absence of flooded habitats suitable for these snakes. With regard to these circumstances, the size of the Dyje Valley population is relatively low. The snakes are present in greater numbers in the area of Vranov Reservoir (which lies outside the national park), where the shallow waters offer a great choice of food and suitable xerothermic biotopes.

Another important area of occurrence in Moravia is the River Jihlava and its tributaries, the Oslava and the Rokytná. On the Oslava River, dice snakes appear in sections from around Náměšť nad Oslavou to Ivančice. On the Rokytná, sightings are not very numerous; however, the species has been there on a long-term basis from Moravský Krumlov up to Budkovice. On the River Jihlava, the area of occurrence is the section from the Mohelno Valley Reservoir up to Dolní Kounice, although it isn't continuous, as the snakes dwell only

in the parts of the watercourses that are suitable for them. There have been other occasional sightings from other sections of these rivers or their tributaries: Dice snakes have been found, for instance, along the Smrčenský Brook in Staré Hory and on a volleyball court in Jihlava. However, due to the uniqueness of these sightings and the character of the locations, it can be assumed that these are mainly migrating individuals or ones which have arrived there accidentally. The named localities lie within the MT4 climatic region, which is less suitable for the living requirements of dice snakes.

In several other locations in this part of Moravia, the dice snake has been spotted near ponds which had sufficiently suitable

areas of dry land in the vicinity, for example by Týnský Pond (near Moravský Krumlov), which has a dam that is oriented to the south and has good sun exposure. This location, which is near still water, is more suitable for dice snakes than the biotopes of the nearby River Rokytná, which flows in a north-south direction and has banks which do not provide biotopes with sufficient sun exposure due to the presence of heavy overgrowth. There is a similar case near Moravské Bránice, where dice snakes were observed near a small pond with banks offering good sun exposure and a good food source, as it contained fish of a suitable size. However, both water bodies are located in close proximity to a stream where the species are known to occur.



Dry stone walls are used by dice snakes as a hiding place as well as a place for the incubation of eggs.

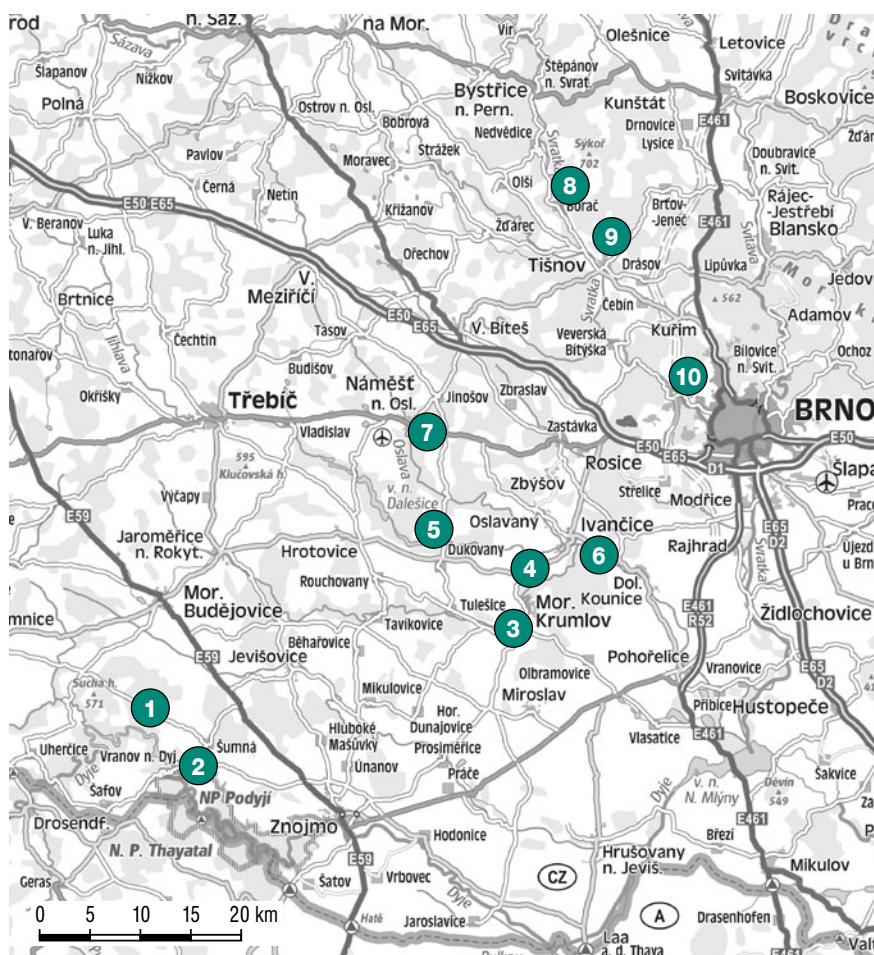
Another river with several places where the dice snake lives is the River Svatka. We know of three populations living by it: near the village of Prudká, in Tišnov; at Brno Reservoir; and also by the river below Brno Reservoir. The population near Brno Reservoir is large: Several tens of individuals can be observed in a single day during the spring period when the snakes assemble for mating after their hibernation.

The unsuitable, monotonous character of local watercourses and their surroundings (they are without sloping, rugged banks) is probably the reason why only random sightings of dice snakes occur in southeastern Moravia. However, repeated sightings are known from the River Morava, from Nedakonice, and from Staré Město near Uherské Hradiště. Although sloping and rugged biotopes are missing in this part of the River Morava, their absence is probably compensated for by flood dams.

Lifestyle

The activity of the dice snake in Bohemian and Moravian localities usually starts in mid-April. The earliest sightings have been in the middle of March: An active young snake and one molt were found under a stone in the area around Brno Reservoir as early as on 17.3.2000. After their hibernation, the snakes usually stay near the places where they spent the winter, in dry, sunlit, stony places (on the slopes of river valleys, in dry stone walls, stone debris, etc.) where they warm themselves. These places can be quite distant from water. In the Podyjí region as well as near Brno Reservoir, the snakes were often found at a distance of around 500 meters from water after their hibernation, but they can be even further away. It is after hibernation, when they have yet to move to the water, that dice snakes mate. The males look for females very actively. Group mating is frequent, where males assemble around a female and make balls of several males and one female. About mid-May, dice snakes move towards water. At first, they stay on the bank and do not eat, but only warm themselves. Gradually, as the temperature increases, they spread out and move directly into the water. As soon as the water reaches 14°–15°C, they start hunting (Laňka in Mikátová et al. 2001). Adult individuals have their favourite spots to bask. Stones, fallen tree trunks, or other higher places on the shore or in the water which are exposed to the sun are used by groups of the snakes.

At the end of June and in July, female dice snakes lay eggs in rotting plant remains, under stones, and in spaces in dry stone walls. A place which is suitable for the laying of eggs is often used for several



Important locations where dice snakes occur in Moravia are concentrated in the south-west part, along the valleys of the river Dyje and Jihlava, including their tributaries. Three important localities are also known along the river Svatka. There are only two places with repeated sightings in south-east Moravia, these being near the River Morava in Nedakonice and in Staré Město near Uherské Hradiště. Localities marked on the map: 1 Vranov reservoir 2 section on the river Dyje Vranov–Znojmo 3 Týnský fishpond near Moravský Krumlov 4 section on the river Rokytná Moravský Krumlov–Budkovice 5 section on the river Jihlava, at the valley reservoir of Mohelno–Dolní Kounice 6 fishpond near Moravské Bránice 7 section on the river Oslava Naměšť n. O.–Ivančice 8 the village of Prudká 9 Tišnov 10 Brno reservoir

years and by more than one female simultaneously. After hatching, the young often assemble under heated stones; there can sometimes be several tens of them hiding together (Laňka in Mikátová et al. 2001). Near Brno Reservoir, a hatching place (a heap of rotting material) was discovered where two females were spotted on different occasions and 96 eggs were found. The hatching place was 1.5 km away from the water and, in its vicinity, 10 young dice snakes from that year were discovered under a stone in September. The young usually hatch in August or at the beginning of September. At the locality near Brno Reservoir, the first sightings of new young snakes usually date from the last ten days of August. In the Podyjí region, however, young have sometimes been found as early as in the first ten days of that month. In the autumn, they stay near where they had hatched, they do not go into the water, and

they don't start to eat their first food until as late as the spring of the following year (Laňka in Mikátová et al. 2001).

Adults spend less and less time in water and gradually move towards their hibernation area from about the middle of August, or sometimes even earlier. They can already be found at their wintering grounds by roughly the second half of September or the first third of October. Often, several individuals hibernate together, sometimes sharing the location with grass snakes.

Of all Czech species of snake, the dice snake is the most dependent on water. It feeds mainly on fish, and sometimes also on amphibians in their various developmental stages. It hunts small fish up to a length of 14–17 cm (Laňka 1978). Brück (1969) observed that the dice snakes at Brno Reservoir most often hunt the European perch (*Perca fluviatilis*). However, the range of food consumed might vary over different

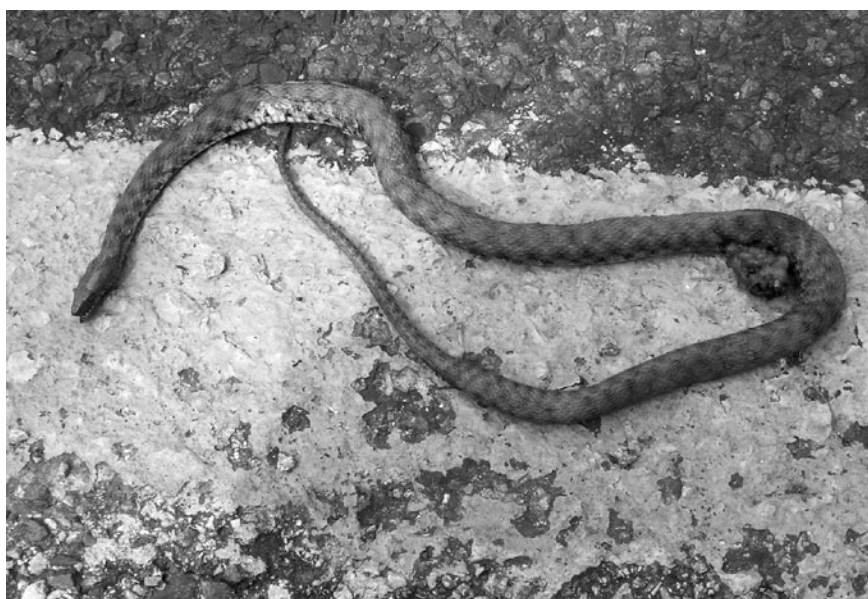
locations, and it seems that the right-size category of food is important for the snakes (Laňka 1978). As Laňka (in Mikátová et al. 2001) found out, the most frequently available food species in the Berounka River is the gudgeon (*Gobio gobio*); while in the River Ohře, three species share first place: the Eurasian ruffe (*Gymnocephalus cenusus*), the pike perch (*Stizostedion lucioperca*), and the roach (*Rutilus rutilus*).

The state of populations and the possibility of their protection

At present, we only have very fragmentary information about the numbers of dice snakes present in Moravian populations. However, it is obvious that there are significant differences between the individual localities. A strong population with hundreds of individuals lives near Vranov Reservoir, with an overlap of less dense occurrence along the River Dyje up to Znojmo. The population at Brno Reservoir is also large: Between 280 and 420 individuals were found in a 900-meter-long section in 1996–1999, counted by marking the snakes. Only one place has been monitored in this way, though; and with regard to other frequent sightings in the surroundings of Brno Reservoir, it can be assumed that hundreds of others live in the Brno population.

At other localities, for instance on the River Rokytná (Reiter 2001), the irregular detection and small number of sightings of dice snakes indicate that the population density is low and that reproduction isn't very successful. The decrease in population may also have been caused by several consecutive years of unfavourable weather (Gruschwitz 1986). If the weather is unbeneficial, the number of newly hatched snakes decreases in the summer or autumn, or the young are weakened and their hibernation isn't successful.

Taking into consideration the fact that the ecological requirements of dice snakes include various kinds of locations on which they are dependant during the year (a suitable watercourse, locations for basking, hatching places, hibernation areas), damage to one part of this 'chain' of locations can have serious consequences for the whole population.



A run-over dice snake on a road

As has already been mentioned above, one type of intervention in the environment with a strongly negative impact on dice snakes is the altering of watercourses and the controlled manipulation of water levels. The operation of the power station on Vranov Reservoir has significantly lessened the population of this snake at Podyjí National Park. The negative influence of water reservoirs is also described by Pecina (1991), who gives the example of the Vltava populations above Prague; they were destroyed by the construction of dams, which caused significant water cooling. Another negative influence is the decline in numbers of small fish, as well as their contamination from polluted water. Gruschwitz (1986) states that the fertility of dice snake females decreases as a result of the concentration of heavy metals in their food.

The occurrence of dice snakes can also be negatively influenced by insensitive alterations to watercourses or their banks. Such a situation was also a threat on the River Svratka under Brno Reservoir. Three years ago, it was necessary to fortify damaged river banks under the dam. The administrator of the river – Povodí Moravy – wanted to use stones embedded in con-

crete. However, with regard to the presence of the snakes, another method was chosen. Stones in wire baskets (gabions) were used to provide fortification. This solution proved to be successful both from the technical and environmental points of view. The snakes use the wire baskets as convenient hiding places, which is proved by sightings of snakes as well as by their molts. If the stones were embedded in the concrete, the hiding places would disappear and part of the local population would vanish with them.

Another danger which dice snakes have to face is that of roads or cycle lanes running along watercourses, particularly those that form a barrier between their water and land habitats. The asphalt surfaces of such roads provide a lot of warmth and snakes often use them for basking. Cars and also cyclists can thus kill tens of individuals at one spot in one season, and this can have a fatal effect on a population which only occurs in isolated pockets.

RNDr. Blanka Mikátová,
Nature Conservation Agency of the
Czech Republic,
Regional Centre in Hradec Králové

All photos by Blanka Mikátová

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