

Annex 16: Development of hatching places and follow-up care

Care of existing composts and manure heaps

With regard to the fact that Aesculapin Snakes (in particular in Poohří) live in environs of outhouses, they may use composts, manure heaps, sawdust, bark, leaves, wooden chip piles to lay eggs. Where snakes use such composts and manure heaps, manure and composts should be relocated or distributed out of the period of the egg incubation. What should be kept in mind in connection with hatching places is that sometime the population makes use of such places for wintering (from October to April as a rule). The regime of relocation and distribution of composts and manure heaps should be adjusted to such a fact which means that such activities should be carried **from April 15 to June 10**. The most adequate way is to make the substrate once a year, doing so less frequently than once in two years is usually insufficient.

Newly created artificial hatching places

A proper hatching place should comply with several following parameters.

Choice of locality

- The hatching place locality should be exposed to sunshine providing for sufficient warming of the substrate.
- Artificial hatching places replace the lack of natural opportunities and, therefore, they should be located at the distance of 1 km off a known hatching place, both natural, and artificial. According to data from Podyjí, 22% of females and 35% of males can overcome such a distance. It is a sufficient part of the population that may provide for the interconnection of individual habitats. Given the limited home range of the species in Poohří, we recommend to shorten the distances between hatching places (approx. 500 – 800 m).
- An ideal hatching place should be located not far from suitable wintering place (wall stones, stone heaps, ruins of buildings). This will provide young snakes with a better change to find a suitable wintering place immediately after hatching.
- Should the interconnection of localities require the hatching place to be developed as place where no suitable shelters are available, a combination of hatching and wintering place may be designed.
- Suitable shelters are important not only for the wintering but also for successful survival of young snakes in the period when they leave the hatching place. Therefore, it is vital to install such suitable shelter in the environs of the hatching place, if necessary (for instance stonewalls, wood and brushwood piles, etc.).

Hatching place design

- **Organic material dump** – a thick layer (pile) of organic material may be used as a suitable hatching place including compost, leaves, mouldering mowed grass, horse manure, wood shavings, piles of gradually decomposing branches with layers of leaves, etc. A proper method is to add such organic materials to already existing heaps at natural wind falls. Egg clutches and snakes may be partly protected by covering such heaps by thicker branches, wooden boards, etc. However, such organic material heaps are easily accessible for predators even after such coverage (wild pigs, pheasants, hedgehogs, rodents, etc.).
- **Hatching place protected by a structure** – predators represent a significant risk for egg clutches and possibly for wintering snakes. Within the territory of Podyjí and Poohří, the most

relevant predators are wild pigs that can completely rip the substrate and devour the snakes. They may eat adult snakes, young snake and egg clutches. The best protection of hatching places is the development of a fence around the entire hatching place. Such a fence may be made of round poles with small gap. In the corners of such wooden fence, there should be mortices provided so that some space could be created between the logs (profiles). The corners may be reinforced by ground embedded poles fixed with wire. Plastic-coated wire mesh should be fixed on the external perimeter of the wooden structure, mesh size being 50 mm (it is not inevitable). The upper side of the hatching place should be covered by a removable frame filled with wire mesh to protect the hatching place against gallineaceous birds (pheasants, hens) and small carnivorous animals. It may prevent rats and small rodents who may threaten snakes during their lowered activity period (biting).

Size

The hatching place should be large enough to avoid drying, to maintain its micro-climate and could serve the reproduction. The proposed optimal size of the hatching place protected by a structure is 3 x 3 m. A proper height of the protective barrier of an artificial hatching place is at least 100 cm taking into account protection against wild pigs.

Stability

A suitable substrate may be for instance manure (particularly horse manure), wood shavings, compost, unsorted garden waste or its mixture (leaves, mowed grass, branches, soil, mouldering wood). A comparison of various substrates will be studied in next phases of the research. The substrate should be made up or renewed on regular basis to maintain its warming function. The optimal substrate make interval is once a year, less than once in two years is usually not enough. The substrate should be made up in the period when there is no risk of damaging the clutches, wintering snakes or disturbing pregnant females. That means that the optimal period for the make up of the substrate is the spring following the wintering (approx. **from April 15 to June 10**).

Shelters

Foils, metallic sheets or other inert material snakes like to use is a proper supplement to the hatching places. Such objects help to find the snakes and improve the chance of successful monitoring of interventions. Newly born snakes (as the confirmation of the success of the reproduction) can hardly be found without such shelters. Portable material, for instance wooden boards will be preferred in the Podyjí National Park . With regard to the fact that Podyjí is a busy tourist area, some hatching places are likely to be checked by tourists. Therefore, all areas of newly developed hatching places will be provided with information boards.

Combination of a hatching and wintering place

In some casing, hatching and wintering places should be properly combined. A hatching place differs from a wintering place by the depth in the ground (approx. 100 cm). The bottom, 20 cm thick layer should be made of coarse materials such as stones, size from 50 cm. Other layers are identical to those of a hatching place.

A newly created hatching place should be checked on regular basis in order to confirm presence of snakes. The most important period in this context is June and the first two decades of July when pregnant females lay eggs and the second half of August to early October when snake hatching takes place. In case pregnant female or newly born snakes are found, the hatching place may be considered operable. In such a case, the hatching place should restructure in the spring or autumn and to find out the exact number of laid eggs and the efficiency of the reproduction. For details on the check of hatching places see the Annex 21.

Annex 17: Care of significant biotope elements and migration corridors

Significant biotope elements include in particular stonewalls, ruins of buildings that provide the snakes with shelters and often reproduction places. Such habitats are often destroyed by improper interventions for instance by repairing or completed removal of stonewalls. Remaining walls and ruins are often overgrown and they do not fulfil their functions as they are shaded. Important migration corridors include in particular watercourse banks and old ways.

Care of significant biotope elements – walls and ruins of buildings

If not maintained on regular basis, wall gets covered with herb and tree/bush vegetation quite fast. They may get covered by some creeper plants or get shaded by vegetation growing in front of or above the wall. Shaded walls do not get warmed and are not suitable for snakes any further as shelters or possible hatching places. Roots of trees may damage the walls and gradually destroy them. To provide suitable sheltering opportunities for reptiles, we have removed the vegetation from the wall itself and its environs on regular basis. Herb should be torn away from the joints between stones and by mowing in front of the wall (possibly on its upper edge).

Trees/bushes may be cut by a saw or gardener's trimmer. Should the wall get damaged (an only missing stone is enough) due to storm water, heavy mechanisms, tree roots, even the smallest damage should be repaired as soon as possible.

The vegetation in front of walls should cut at the height of 15 cm above the ground. Such a height of vegetation makes it possible for the snakes to get exposed to sunshine without being noticed by predators and it seems to be preferred by the snakes. It is also a height that is convenient for other animal species and it prevents the soil from excessive drying. If we keep the height of mowed growth at 15 cm, we can reduce the number of animals (amphibians) killed or damaged by mowing (no English lawn is suitable in this context). A regular mowing will provide for an optimal density of the growth with a dominant representation of grass. In order to ensure availability of shelters, a bush or a creeper plant may be preserved. In general, one quarter to one third of the surface of the wall may be shaded. However, the shade could not be coherent but dispersed.

We recommend to carry out any interventions in the environs of the walls manually in the period of the activity of Aesculapian Snake (April – October) using saw, trimmers, machete and any more invasive interventions using chain saw or brush saw should be executed in the period when the snakes are not active. When repeating the necessary intervention during the vegetation for instance cutting of very resistant vegetation (nettles, naturally regenerating locust), special attention is to be paid and the location of the intervention should be checked prior to the intervention in order to verify whether snakes and other animals are present as they could be killed or injured by the intervention. A hatching place (compost) may be suitably found on a regularly mowed area and cut branches and mowed material may be deposited on it.

Building ruins should be maintained in the same way as walls. Mowed material may be placed inside peripheral walls of the ruin and protected it at least partly against predators. Building ruins are often shaded not only by trees growing from the ruin itself but also by trees and forest as in its environs. In such cases, we recommend to cut other shade casting trees.

When cleaning walls and other structures, naturally regenerating trees and young trees have to be removed including but not limited to locust and ash-trees. What can be preserved are stand-alone fruit trees that turned wild (cherry, pear, crane and apple trees) and over-mature trees including their standing fragments and fallen trunks. The environs of stand-alone trees should be clean, naturally propagating plants and sprout shoots should be removed. For possible treatment of cavities see the Annex 23.

Development of new walls

New walls should be developed at suitable locations with naturally graded morphology exposed to South-East and South-West. The wall should be piled up of broken stones without any mortar. The minimum depth should be 1m. After the completion of construction works, the wall should be covered with soil for the fast natural growth of grass and bushes in order to integrate the wall to the landscape.

Gabions are often used at present. They may be convenient for snakes provided certain parameters are adhered to (large irregular stones). Nevertheless, gabions will be preferred for construction works in the place of occurrence (for instance the express way I13 in Poohří) and when designing biotopes specifically for snakes, we recommend preferring standard dry stonewalls although their development is more difficult.

Restoration of migration corridors

Important migration corridors include banks of watercourses and old ways. Banks of watercourses are renovated by the mosaic clearance of bank growths and regular elimination of neophytes (including but not limited to Reynoutria). Old ways are renovated by cutting out naturally propagating plants mainly along the walls. A strip of thorny naturally propagating plants may be cut away as a hiking path. Any moped, quadricycle and bike traffic is not desirable as snakes may get injured or killed and it has to be prevented using all available means (information boards or trunks of trees left across the road). Renovated migration corridors have to be maintained once a year in the initial period and later on (after the elimination of bushes and naturally propagating trees) they should be maintained as necessary. What is ideal for snakes in unpaved surfaces and this is why asphalt should not be used in any case.

Annex 18: Care of other types of biotopes

The creation of simple places attractive for snakes may facilitate the interconnection of the populations. Such types of biotopes are irreplaceable also for the population monitoring. Shelters well proven by practical experience include wood piles covered with suitable materials preserving temperature (foil, metallic sheet or discarded conveyor belt). They may be very variable depending on material available. In principle, they should include an easily removable material below which snakes like to absorb heat. Below, we provide several photographs of suitable biotopes.



Annex 19: Methodology – Protection of individual snakes when maintaining road ditches

Aesculapian Snake in Poohří often inhabits strips along roads and it has accustomed at many places to the everyday road traffic and, therefore, it does not respond to external stimulus. Hazardous interventions include vegetation and bushes cutting along roads, machine cleaning of ditches, etc. Snakes are exposed to maximum risk if they get exposed to sunshine on walls or below walls. In such a case, the application of heavy mechanisms may mean the extermination of all snakes at the given locality. Such a risk exists on all roads of the home range of Aesculapian Snake in Poohří. The most risky is the section of the road of the class I E442(13) from the turning to Horní Hrad to Boč where the vegetation is cut very year on regular basis. Other, although less risky sections, are the section between the turning to Horní Hrad and to Peklo at the left-hand side of the river Ohře and the road from Stráž via Korunní Kyselka, Korunní and Kamenec a the right-hand side of the river Ohře.

With regard to a relatively easy solution of this hazard problem, the protection measure has been implemented since 2005 when the Regional Road and Maintenance Administration at Karlovy Vary was sent a letter calling attention to the occurrence of the rare reptile. A representative of the institution informs us in advance on the date of the planned intervention. A volunteer then slowly walks along the section of the road in front of the machine and captures snakes. After the completion of the cleaning, the snakes are returned to the place where they were captured. The efficiency is considerable, although not 100%. In particular a young snake may be easily missed. Therefore, we recommend at least two volunteers to cooperate in any such case.

Whenever possible, interventions should be executed out of the snake activity period (i.e. from November to March), for instance machine cleaning of ditches. As to the mowing of edges of roads, we recommend the above-described procedure to be implemented. The mowing operation takes place once to twice a year.



Annex 20: Methodology – Monitoring of biotopes of Aesculapian Snake in Poohří and Podyjí

1) The monitoring will be based on direct observing of snakes. Very efficient artificial shelters will be used (metallic sheets, boards, foils). The following data will be collected:

- identification of the biotope (GPS)
- date
- time
- air temperature
- weather conditions (+ conditions in previous days)
- number of observed individual snakes and their sex (if possible, pregnant females, etc.), age (juvenile, sub-adult or adult)
- behaviour (in shelter, sun exposure, other activity)

Note: Should a sheet or other object be lifted and snake found beneath, the observer shall wait until snake moves away or shall removed it out of the reach of such object so that the reinstallation of the object could not injure the animal.

2) A database of monitored biotopes will be worked out that will be continuously updated based on the progress of management works. The following data will be given for every biotope:

- biotope number
- biotope type (wintering place, hatching place, their combination, other habitats)
- description of the biotope (wall, stone heap, compost, manure heap, etc.)
- description of shelters (they may significantly improve the efficiency of the monitoring and they should be included in any monitored biotope)
- survey of interventions including dating
- results of the continuous monitoring

Not: Various configuration of habitats may be considered one single biotope (for instance a cascade of walls together with a compos site) provided the distance of individual habitats does not exceed 100 m.

1) Basic number of visit of biotopes is three subject to the following recommended timing:

Wintering place type:

- 1) Visit – end of April/beginning of May
- 2) Visit – May
- 3) Visit – September/October

Hatching place type:

- 1) Visit – May
- 2) Visit – June/July
- 3) Visit – September

Hatching place/wintering place combination:

- 1) Visit – April/May
- 2) Visit – June/July
- 3) Visit – September

Other habitats:

- 1) Visit – April/May
- 2) Visit – June

Visit – August

3) After the end of the season, data from all monitored biotopes will be summarised as follows:

- Should Aesculapian Snake be recorded at least in two cases of three visits, the monitoring system will be preserved and the biotope will be identified by a green point in the map
- Should Aesculapian Snake be recorded just in one case of three visits, the number of visits in the next years will be increased to 6 (various timing, nevertheless subject to the three basic dates for the given type of biotope) and the biotope will be identified by an orange point in the map
- Should Aesculapian Snake be seen in no case of the three visits (and the locality possesses an occurrence potential), the number of visits in the next year will be increased to 9 (various timing, nevertheless subject to the three basic dates for the given type of biotope) and the biotope will be identified by a red point in the map

At the end of the next year, a summary will be repeatedly compiled subject to the following table:

Original status	Efficiency	Subsequent status
Green point (3 visits)	more than 66% (2/3, 3/3)	Green point (3 visits)
	33 – 66% (1/3)	Orange point (6 visits)
	less than 33% (0/3)	Red point (9 visits)
Orange point (6 visits)	more than 66% (4/6, 5/6, 6/6)	Green point (3 visits)
	33 – 66% (2,6, 3/6)	Orange point (6 visits)
	less than 33% (0/6, 1/6)	Red point (9 visits)
Red point (9 visits)	more than 66% (6/9, 7/9, 8/9, 9/9)	Green point (3 visits)
	33 – 66% (3/9, 4/9, 5/9)	Orange point (6 visits)
	less than 33% (0/9, 1/9, 2/9)	Red point (9 visits)

- Always at the beginning of the monitoring season, the least possible polygon will be constructed for every group that will include all biotopes of the same colour. This method will facilitate monitoring of individual seasons.
- This way, localities will be monitored that show a lower density of population meanwhile snakes will not be unnecessarily disturbed in the numerous core localities. The mapping of biotopes and their division to three colour categories will be executed in the first year of the monitoring based on results of a systematic survey executed in 2005-2007.
- The above-described type of monitoring will make it possible for the comparison of individual seasons and using GIS, it will be possible to express colour changes of biotopes and, thus, of trends of the extension or reduction of the home range. Moreover, the speed of the occupation of newly adapted biotopes will be monitored.

5) The observation itself has to be carried out at temperatures ranging from approx. 16 to 25 °C in shadow and during clear sunny days, monitoring should be executed rather in the lower part of the temperature range. During partly cloudy or cloudy days, the monitoring should be executed rather when the temperatures are close to the upper limit of the range.

Annex 21: Methodology – Monitoring of hatching places

1) Chosen existing and all newly created hatching places will be monitored during the season. The following data will be collected:

- identification of the biotope (GPS)
- date
- time
- air temperature
- weather conditions (+ conditions in previous days)
- number of observed individual snakes and their sex (if possible, pregnant females, etc.), age (juvenile, sub-adult or adult)
- behaviour (in shelter, sun exposure, other activity)

2) A database of monitored hatching places will be prepared containing the following data:

- description hatching place (dimensions, substrate, exposure, etc.)
- survey of interventions affecting the hatching places including date
- results of the monitoring of hatching places (number of eggs, young snakes and percentage of successfully hatched young animals, etc.)

3) Basic number of hatching places is **8** subject to the following recommended timing:

Visits 1 – 2:

Date: Late March in Podyjí and second half of April to early May in Poohří; immediately after the end of wintering.

Activity: The hatching place will be carefully searched and restructured in a way to make it possible to find remnants of eggs laid in deeper layers. Wintering young snake may be present in the hatching place, too. Such found young snakes will be metered and weighed so that their condition could be assessed. All hatching places where clutches of Aesculapian Snake were found in the previous autumn will be restructured in this way. Other hatching places will be handled as may be found fit. Anyhow, they should be restructured at least once in three years for the sake of loosening of substrate.

Visits 3 – 4:

Date: May

Activity: Substrate make up – after the end of wintering, during the period when most young snakes leave for the surroundings (in the course of May) and only few snakes are present in the hatching place, substrate should be added. The hatching places have to be thoroughly checked prior to the make up of substrate in order to avoid killing of animals (including but not limited to young snakes) when restructuring the substrate. The substrate make up must be timed in a way to protect young snakes that may persist in the hatching place after wintering and later pregnant females who like to use the hatching places for egg laying. Thus, it is vital to adjust the timing to weather conditions and vegetation season. Sometimes, it may coincide with the second visit, at other places, it will be necessary to wait until young snakes leave the place and one more visit may be necessary.

Visits 5 – 6:

Date: June – 2nd decade of June

Activity: Observation of the occurrence of adult snakes, including but not limited to pregnant females. Capture and marking of snakes may be source of very valuable data on the use of hatching places by specific individual snakes and on distances from where they come for reproduction. With regard to the risk of adverse impacts of the presence of visitors, we recommend to monitor the places using web cameras. The web camera based monitoring may serve to protect the hatching places against poaching and undesirable predation.

Visit 7 – 8:

Date: August – October/November

Activity: Observation of young snakes –found young snakes will be metered and weighed.

After the hatching of eggs, hatching places will be restructured in order to establish the exact number of laid eggs and efficiency of the incubation. Given the fact that eggs are often laid to the depth to 30 cm from the surface of the hatching place, we recommend to restructure only the first 50 cm layer as it could adversely affect possible wintering young snakes (who, according to literature sources, often winter for the first in the proximity of their hatching place). All hatching places where a pregnant female snake or juvenile snakes were observed during the monitoring will be restructured in this way. Other hatching places will be restructured as considered fit based on specific circumstances and time, technical and material possibilities. The hatching place should be restructured manually and with regard to the possible presence of vulnerable juvenile snakes or other animals.

Annex 22: Care of hollow trees

1) Care of hollow trees in forest

The nature of forest in individual localities of the occurrence of the species determines the extent to which Aesculapian Snake makes use of such biotopes. Most forests in Poohří are quite dense and dark and do not play a significant role for Aesculapian Snake from the point of view of the quality of biotope. The occurrence of the species in the environs of loose growths in the proximity of detritus field has not been documented, yet and it will be subject-matter to further monitoring. On the contrary, in forests in Podyjí, reproduction of Aesculapian Snake has been repeatedly recorded in tree cavities and dead mouldering trunks. At the same time, some forest growths are a type of biotope where snakes like to migrate and some clear places are their permanent habitats. Such forest habitats are structurally diverse. Snakes prefer light forests with densely integrated growth, presence of old trees and mouldering wood. The diversity of the biotope may be improved by the presence of variously configured rock formations. A telemetric study to be executed in Poyjí should identify the extent and methods of the use of forest biotopes.

Several basic recommendations and principles are formulated below for the region of Podyjí: To provide for the natural structures of forest growths, low integration and age-varying growths. Conditions should be included to the forest husbandry plan. What is vital for the creation of preservation suitable forest biotopes is to adhere to the following points that should be included to forest husbandry works including areas as not included to the zone 1 of the national park.

- Achieve a better diversity of space structure of growths by means of education
- Part of mass should be left in forest as a reserve including but not limited to broad-leaved trees with proper cavities on the level of the crown of adult growth and at boundaries of forest
- Fallen dead trees mass should not be removed from forests (approx. 5% of the growth stock).
- To reduce the crop density adhering to the procedure specified by the Act on Forest No. 289/1995 Coll.
- No biocides may be used to protect the forest

These items will be further elaborated for specific cases with regard to integral forest cultivation technology in the form of husbandry guidelines or measures applicable to growth groups.

2) Care of hollow trees in open landscape

Aesculapian Snake may use over-mature trees or hollow trees and fallen trunks in open landscape at sun-exposed boundaries of forest. In particular in Poohří, there are remnants of abandoned orchards and alleys along roads. What is particularly valuable are long-age pear-trees. We propose the following care measures

- Protect over-mature (mainly fruit) trees in alleys, along roads and anywhere they are not in forest. Such principles should be made available to respective nature preservation bodies and husbandry entities.
- If such trees may threaten people or buildings, fragment of trees should be preserved by its centre of gravity being properly lowered by cutting.
- Should any such measure resulting into the creation of an uncovered cavity, it should be roofed in a manner preserving small openings that facilitate migration of snakes or other animals, as the case may be. Rotten wood should not be removed and the cavities should not be burnt.
- Large openings at places exposed to visitors (for instance at the place of broken away branch) should be covered by wooden shingles and the like but should not be fully sealed.