Action Plan for the Aesculapian Snake (*Zamenis longissimus*) in the Czech Republic

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2008

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CONTENS

ACTION PLAN EXECUTIVE SUMMARY

Although the Aesculapian Snake (*Zamenis longissimus*) is a snake species that lives in South-West Asia, it may be considered a European reptile species from a more general point of view. As a threatened species, it is listed in the Annex IV to the Guideline No. 92/43/EEC on the Preservation of Natural Biotopes, Wild Animals and Plants.

Moreover, it is listed in the Annex II to the Bern Convention on the Protection of European Wild Life and, within the framework of the said convention, an "Action Plan" was elaborated for it (EDGAR & BIRD 2005).

The implementation Decree No. 395/1992 Coll. to the Act No. 114/1992 Coll. on the Preservation of Nature and Landscape, as amended, included it among critically threatened species. The current Red Book as of 2003 evaluates the population in the North-West Bohemia as critically endangered – threatened (CR), the Moravian population was described as endangered – threatened (EN).

The gradual decline of the number and the regression of the Aesculapian Snake is apparent throughout the distribution range, however, such a regression is most visible in isolated populations above the Northern boundary of its coherent distribution range. Last isolated populations survive in Germany, Poland and in the Czech Republic.

The species lives in the Czech Republic in the North-West Bohemia, in the Northern sector of Doupovské mountains (hereinafter referred to as "Poohří", South Moravia in the Podyjí National Park, in the White Carpathians and in the Southern sector of Beskydy mountains. Meanwhile the Moravian populations are projections of an integral distribution range, the Czech population in Poohří lives in the distance of several hundreds of kilometre away from such a range on approx. 8% of the original area documented by finding dating to 1880-1998. What is alarming is the fact that the shrinkage of the distribution range has reached a breathtaking speed since ten years. Thus, the meta-population has been considerably reduced and disintegrated to several isolated micro-populations that do not communicate with each other and, therefore, one can only hardly speak about a meta-population at all. In Germany, isolated populations survive thanks to care provided by conservationists. Aesculapian Snake is a species that requires a significant diverisified structure of landscape.

The nature of biotopes where the snake lives in three distribution areas in the Czech Republic

varies. Within the territory of Poohří, the snake lives first of all in road and railway embankments, coarse stonewalls, barns, cowsheds, sheds, composts, manure heaps, scrap yards, etc. both inside settlements and in recreational colonies. Its density is quite high. Findings in open landscape or forest are sporadic.On the contrary, in the White Carpathians and the Southern sector of the protected landscape area Beskydy (hereinafter referred to as "Carpathians"), the snake□s occurrence is very dispersed in natural biotopes. However, also in there, a new connection between the occurrence and linkage to human-affected habitats was found. The Podyjí Natural Park as the third home range in the Czech Republic features a kind of transition between Poohří and Carpathians. What is obvious in here is a linkage to human-developed objects (such as vineyards, ruins of buildings), however, such objects are often abandoned which, again, has a connection to the nature of the settlement: practically all population left the area after the WWII and it became a restricted border zone in 1948.

Economic changes after 1948 resulted into an alteration of the landscape mosaic. Luckily, such changes were not that fatal for the Aesculapian Snake in Poohří as the development of summer cottages involved the formation of a landscape mosaic accepted by the Aesculapin Snake. However, after 1989, the landscape mosaic has experienced other changes. Treeless areas that are already subject to farming activities experienced too intensive farming methods and those areas as not used for farming have kept overgrowing even more. Thus, most free landscape consists of two extreme biotopes that are not suitable for the species and the Aesculapian Snake survives only in settlements and summerhouse colonies. It is forced to use ditches along roads or even the roads themselves as migration corridors being threatened by the traffic. Within the territory of Podyjí, it suffers first of all from the overgrowing of the landscape. The combination of climatic changes and the above changes of the landscape very accelerates the regression of snakes.

The key objective of the Action Plan is the preservation of vital populations of Aesculapian Snake in all three known isolated distribution areas in the Czech Republic that means in Poohří, Podyjí and Carpathians. Such an objective will be achieved by means of the following partial objectives:

Within the territory of Poohří:

1) To maintain the micro-populations of the species in the existing localities (2007 condition) and to interconnect them with each other.

2) To bring the Aesculapian Snake back to chosen parts of the original distribution range.

3) To at least double the number of the 2005-2007 population, that means approx. 800 – 1,200 individual snakes.

Within the territory of Podyjí:

1) To achieve a regular occurrence including reproduction in the squares 7,160 and 7,162 for at least five consecutive years.

2) To keep the size of the population in the square 7,161 matching the 2005–2007 condition, i.e. 1,200 – 1,500 individuals.

The objectives for ***Carpathians*** *will be formulated as late as after collection of relevant data as only limited information is available on the condition of the Carpathian population.*

The above referred to objectives should be achieved by the implementation of the following measures:

A suitable biotope will be provided for in Poohří and Podyjí by the preservation of the existing structures where the species currently lives, i.e. habitat shelters, hatching places and wintering grounds. Moreover, disappeared or disappearing structures (for instance stonewalls) should be repaired or renovated in particular where they feature an interconnecting corridor between shelters, hatching places and wintering grounds so that they could serve as stops between migration corridors. Stonewallss will be erected at places of some disappeared ways in Poohří. This will contribute to the development of more structured pattern of the landscape mosaic that will also support small-area farming methods at the same time. Migration corridors will be continuously monitored and maintained.

Within the territory of Carpathians, information on biotopes will be collected at places of the occurrence of Aesculapian Snake. Following an evaluation of collected data, a proper management system will be proposed including the possibility of the adaptation or creation of shelters and the possibility of artificial hatching places.

Moreover, a regular monitoring of all biotopes in Poohří and Podyjí will be implemented including hatching place s and wintering grounds including the monitoring of the population and collection of additional data (for instance phonological data, numbers of eggs in hatching places, monitoring of temperature in wintering grounds, etc.). The research of the reproduction will include the creation of a database of den trees and such trees will be checked for being used for reproduction in individual areas. Such trees will be protected. A continuous educational process focused on residents will be carried out in all three areas using folded leaflets, brochures and information boards. The public information efforts will concentrate on areas of synantropic occurrence of snakes or on distribution areas crossed by hiking trails. Such educational campaign will include a closer cooperation with regional printed media, radio and television. The education will be implemented also in case of any development projects in the distribution range including

the implementation of compensation measures resulting from the law, for instance permanent project supervision at the site of the development of the expressway I13 in Poohří, etc.

The biotope care in Poohří will include the renovation and maintenance of disappearing small ponds. Such amphibian reproduction ponds will be used by Aesculapian Snakes as a source of food for the young snakes who feed on small frogs. What will be implemented in Poohří and Carpathians is an active protection of animals when cleaning and maintaining roads and ditches along roads as the snakes get killed by grass cutters. Appropriate technical measures (barriers, underpasses) will be implemented at appropriate places based on the monitoring of the places where the snakes cross the roads, i.e. at places where higher snake mortality rates were found. Within the territory of Podyjí and Carpathians, a telemetric study will be undertaken to make it possible to better understand the movement of the species in the landscape.

Within the territory of Poohří and Podyjí, species suitable biotopes will be mapped in marginal sectors of isolated ranges and behind their boundaries. Following the preparation of a list of such biotopes in Poohří, suitable biotopes will be repaired and revitalised and monitored for resettlement.

In addition to the above, a verification of historic and non-documented observations will be carried out throughout the country. Basic data on the occurrence and bionomics of Aesculapian Snake will be collected in Carpathians. As well, possible adverse impacts will be identified and used for the specification of further steps in procedure of the species protection in this area.

1. SOURCE INFORMATION

1.1 Taxonomy

The first valid description of Aesculapian Snake was published by Laurenti (1768). It was described as *Natrix longissima* (*Terra typica:* Austria, Terra typica restricta (MERTENS & MÜLLER 1928): Vienna). Many authors of the 19th century assigned it to the genera *Coluber, Zamenis, Callopeltis* or *Elaphis* (GÜNTHER & WAITZMANN 1996). The name *Elaphe longissima* used for the first time by MERTENS (1925) was used until the early 21st century. Nevertheless, this parafyletic taxon has been recently reviewed and based on molecular findings Aesculapian Snake has been again included to the genus *Zamenis* (UTIGER et. al 2002).

According to UTIGER et al. (2002), the genus *Elaphe* sensu lato has been recently divided to several genera. One of them is the West-Palearctic genus *Zamenis* that includes the total number of 5 species, namely *Zamenis lineatus, Zamenis persicus, Zamenis longissimus, Zamenis situla* and *Zamenis hohenackeri.* The original subspecies *Elaphe longissima persica* from Northern Iran and South-East Azerbaijan and *Elaphe longissima romana* from Sicily and Southern and Central Italy

were promoted to genera *Zamenis persicus* and *Zamenis lineatus* (NILSON & ANDRÉN 1984, LENK & WÜRSTER 1999, UTIGER et. al 2002).

Species name in foreign languages: Aesculapian Snake (A), Äskulapnatter (N), Aesculapian Snake (S), Wąż Eskulapa (P).

No subspecies are described in the framework of the genus *Zamenis longissimus*.

The closest relatives include *Zamenis persicus* and *Zamenis lineatus* formerly considered subspecies of *Elaphe longissima*. No hybridisation with the mentioned species has been described despite the distribution ranges of *Zamenis lineatus* and *Zamenis longissimus* are in neighbourhood. Given the considerable geographic distance from the range of distribution of both relative species, there is absolutely no risk of hybridisation for the protection of the species in the Czech Republic.

1.2 Distribution

1.2.1 Overall Range of Distribution

Current Distribution

For the range of distribution of the species see the Annex No. 1 The coherent range of distribution of Aeasculapian Snake spreads from the Northern Spain through the Southern and Central France, Southern and Southern-Western Switzerland, the Northern half of Italy, Austria (from where it slightly overlaps to the Czech Republic in the area of the Podyjí National Park), Slovakia (againt, it overlaps from Slovakia to the Czech Republic in the area of Carpathians), mountains in Hungary, Slovenia and Croatia, Serbia, Monte Negro, Albania, Greece, the Northern-Western Turkey along the Southern coats of Black Sea to Romania, Bulgaria, Moldavia and the Western Ukraine. Moreover, disjunctive occurrence of this species was recorded in the Krasnodar region of Russia, Georgia and adjacent part of Turkey and long the Eastern coat f Black Sea (BÖHME 1993, GÜNTHER & WAITZMANN 1996, SCHULZ 1996).

Isolated populations in the proximity of the disjunctive range are known from the Eastern Georgia, Russia and Turkey (SCHWEIGER 1994, SCHULTZ 1996). In the Southern part of the range, there are isolated population in the Northern-Western Spain and Sardinia (MELLADO et al. 1979, MEIJIDO 1973, CAPOCACCIA 1965). Five recent isolated populations are known to occur above the Northern boundary of the range out of which three are positioned in Germany, one in Poland and Czech Republic. Recently, isolated population in Denmark and Switzerland have disappeared (e.g. REINHARDT 1937, 1938, MERTENS 1948, 1969, ŠOLCOVÁ-DANIHELKOVÁ 1966, SZYNDLAR 1984a, BÖHME 1993, WAITZMANN 1993, GÜNTHER & WAITZMANN 1996, LJUNGAR 1995 and NAJBAR 2000a).

The Czech Republic is situated at the Northern boundary of the coherent distribution range. The boundary runs along the Southern and Eastern boundary of the country. An extraordinary rarity

is the mentioned isolated population in Poohří that is currently the northernmost place of occurrence worldwide.

Fossil Findings

Generally, following the maximum expansion in climatically optimal post-glacial periods, the Central European wild snakes experience a repeated regression (BÖHME 1991a) and the current isolated populations are relicts of former distribution (PETERS 1977a, b; LJUNGAR 1995). Fossil findings of Aesculapian Snake (see Annex 2) are known from a number of localities in the Central and Northern-Western Europe. Such findings prove that the range of the species used to reach far to the North and East in the climatically more favourable periods.

Localities in South Poland include fossil findings dating back to various periods of Medium and Upper Pleistocene as well as Holocene (SZYNDLAR 1984b). Similarly, remnants of Aesculapian Snake from three various inter-glacial periods were found in Gamsengerb, Germany (BÖHME 2000). It is evidence that the species repeatedly settled the Central Europe during climatically favourable periods. What is of most importance from the point of view of the relation to the current range are the Holocene findings, dating back to the last post-glacial period. The northernmost findings of fossil remnants of Aesculapian Snake come from the Danish region of Lystrup Enge from the Atlantic Holocene period, that means 6,200 – 6,000 years ago (LJUNGAR 1995). Also the Holocene fossil remnants of Aesculapian Snake from the Northern Germany (PETERS 1977 a,b) illustrate the notion of the recent range of this species. What is interesting from our point of view are recently found fossil remnants of Aesculapian Snake found in several Moravian localities dating back to lower and medium Pleistocene. Such localities include Stránská rock (Brno), Mladečské cave (Olomouc region), quarry Malá Dohoda (Moravian Karst) and the cave “Za hájovnou” (Javoříčský Karst) (IVANOV 1995, 1996, 2005, 2006).

Situation in Neighbouring Countries

For the distribution of the species in neighbouring countries see the Annex 3.

According to NAJBAR (2000a), there are 6 occurrence localities known in Poland. Meanwhile the localities Złoty creek and Zamojszczyna have been abandoned, other localities (Zarzecze, Powroznik, Biesczcady, Magurski national park) still host Aesculapian Snake. The boundary of the coherent distribution runs through the Southern-Eastern Poland and the occurrence at Bieszczady with the only numerous population of this species was a marginal locality of the coherent distribution range of the species according to SZYNDLAR (1984a). Nevertheless, according to NAJBAR (2000a), this population is likely to have lost its contact with the coherent

range of distribution and became an isolated population. Information on the occurrence of Aesculapian Snake from other localities Zarzecze (155 km away from Bieszczady) and Powroznik (115 km away from Bieszczady) date back to the 70s of the 20th century, nevertheless such findings are not numerous and their origin is not sure. Some individuals were even proven by means of their marking executed at Bieszczady to come from there. The same unsure situation is that of the Magurský national park (115 km away from Bieszczady) – reports on the occurrence in there have come as late as in recent years.

The perspectives of the only numerous population of Aesculapian Snake in Poland in the environs of Bieszczady are not optimistic. According to research executed by NAJBAR (2000a), the range of this isolated population has got reduced since 50 years and the population got divided to three sub-populations that do not communicate with each other. Also the numbers of individual snakes experienced a dropping trend. The estimated total number in 2000 was 75 snakes and the most numerous sub-population included thirty snakes. In 1995, Poland adopted strict measures protecting Aesculapian Snake including the prohibition of any disturbing activities (grading works, development projects, etc.) in the proximity of the key localities. Unfortunately, the measures were implemented too late. The critical condition of the population at Bieszczady is already irreversible. NAJBAR (l.c.) see the cause of the extinction in intensive tourism, changes of biotopes, direct chase, illegal capture and, first of all, always deeper isolation of individual micro-localities.

In Germany, there are three isolated populations known located in the environs of Schlangenbad (Walluf creek valley, district of Rheingau-Taunus; Hesse), in the environs of Hirschhorn (Odenwald, Neckar river valley; in the border area between Hesse and Baden – Würtemberg) and in the environs of Burghausen in the valley of the lower part of the Salzach river (South-East Bavaria). The last, in literature often referred to population is located in the valley of Danube in the environs of Passau. It is not considered isolated as it is in contact with the coherent species distribution range in the neighbouring Austria.

The populations in the environs of Hirschhorn and Schlangenbad show similar features from the point of view the total area of the distribution range and the nature of their distribution. They consists of a number of small interconnected micro-populations with the total area up to 100 km^2 and are situated in river valleys with vertical distribution from the level of rivers (Rhein, Neckar) to the altitude of 500 m above sea level. The distribution area includes the entire valley including climatically less favourable adjacent valleys (HEIMES & WAITZMANN 1993, WAITZMANN 1993, GOMILLE 2002).

The total number and first of all the dynamics of individual populations can be described only with difficulties given the lack of any older data. An estimated total number of the population

amounting to 1,100 snakes was made for the locality nearby Passau (DROBNY 1989). The only available data on the number of the members of the isolated population in the environs of Hirschorn was the capture of 190 snakes in 1988 and 1989 (WAITZMANN 1989) and 113 snakes in 1998 (GOMILLE 2002). In the locality of other population (environs of Schlangenbad), even 215 animals were captured in 1988 (HEIMES 1989). The condition of all German population is relatively favourable thanks to timely detailed research of the species ecology, numbers of populations and follow up sophisticated management.

In Slovakia, Aesculapian Snake´s distribution range includes first of all the Small Carpathians and White Carpathians, Považský Inovec, environs of Trenčín, Prievidza, Strážovské hills, Tribeč mountains, Vtáčnik, Štiavnické hills, Javorie mountains nearby Zvolen, Krupinská highland, Poľana, in the environs of v okolí Lučenec, Rimavská Sobota, Muránská plain and in the Slovakian Karst, Slanské mountains, Šarišská highland, Vihorlat, Nastaz and Bukovské hills (VOGEL 1952, HALEŠ 1960, VARGA 1962, LÁC 1968a,b, 1970, 1972, LÁC & LECHOVIČ 1964, 1971, VOŽENÍLEK 1970, 1971, LABANC 1972, VOSKÁR 1972, MOŠANSKÝ 1976, GREGOR 1984). Isolated findings come from Kováčovské hills, Gabčíkovo and Rusovce at the right-hand side of the Danube river opposite to Bratislava. In Slovakia, the species occurrence was found from 120 m above sea level (Rusovce) to 900 m above sea level (Považský Inovec, Muránský castle) (LÁC 1970). The range of distribution of the species overlaps from Slovakia to the territory of our country only in the area of White Carpathians namely in a narrow strip in the environment of Vlárský pass (VARGA 1962, LÁC 1970). In particular the localities of Hornie Srnie (VARGA 1962) and Sietne (Mikátová, own finding) are very close to localities in the Czech Republic as a round the Vlárský pass and they are practically adjacent. The populations are also likely to get in contact in the environs of Červený Kameň (Sk) – Nedašova Lhota (Cz). In 1987, Aesculapian Snake was observed at two places in the environs of Červený Kameň (some 3 km West and approx. 4 km North-West off the municipality, Mikátová, own findings). The occurrence in the environs of Nedašova Lhota was found by Šapovaliv in 1999 (in lit.).

In Austria, Aesculapian Snake lives in the following states: Burgenland, Carinthia, Upper and Lower Austria, Salzburg, Steiermark, Tyrolia, and Vienna (summarised by CABELA et al. 2001). Findings in the proximity of the Czech border are extraordinarily important. No data is available on the numbers and dynamics of the population.

1.2.2. Distribution in the Czech Republic

Reliable occurrence data by 2001 were known from 18 squares, that means 2.6% of the map network of the country. What have been registered is data from other 16 squares that are not fully reliable (MIKÁTOVÁ & ZAVADIL 2001). It may involve found or alleged introduction, migrating individuals or, as the case may be, wrong determination.

Some of such data cannot be objectively evaluated at the time being as it is historic. For a database of findings from three current occurrence localities (Poohří, Podyjí and Carpathians) see the Annex No. 4.

1.2.2.1. Historic Distribution

Poohří

The oldest credible data from Bohemia dates back to 1880 when this snake was documented in Krondorf (at present Korunní) – (BAYER 1894). The snake caught in Korunní was donated in 1880 to the National Museum by the local teacher Stýbal (ZÁLESKÝ 1922, ŠTĚPÁNEK 1949, VOGEL 1952). Approximately twenty years later, Aesculapian Snake was killed at Welchau (currently Velichov) REINHARDT (1938).

After the WWII, there was a time interval supported by the opinion of VOGEL(a) (1952) that no one has seen the species in Poohří since 1880. A photograph was obtained from local residents from Korunní dating to 1953. In 1959 Mikšovský captured an Aesculapian Snake at the boundary of the settlement Horní Hrad (Haleš in verb.), however, the findings remained unpublished. The first documented finding after the WWII was published by ŠOLCOVÁ-DANIHELKOVÁ (1966).

The square 5644 where the locality of the first finding in the Northern-Western Bohemia is situated (Korunní) is still the centre of the home range of Aesculapian Snake in Poohří. For a survey of findings of Aesculapian Snakes in this area starting from 1880 and broken down to squares and based on the level of credibility see the tables in the Annex 4.

A number of ungrounded hypotheses of introduction to Poohří circulates among local residents. These were thoroughly evaluated and summarised by MIKÁTOVÁ & ZAVADIL (2001). The isolated population in Poohří is most likely a residuum of a climatically more favourable period as indicated by a number of fossil finings localised far in North.

Podyjí

The oldest credible record of the occurrence in the territory of this country comes from the German herpetologist Müller (MÜLLER in HEINRICH 1856) who captured an Aesculapian Snake at the foot of Pavlovské hills and donated it to a museum in Vienna. The occurrence in Podyjí was known among local residents starting from the 30s of the 20th century (Doubek in verb.). The first published information on the occurrence in the region of Znojmo was recorded by Radkofsky of

Chvaletice nearby Vranov nad Dyjí (in ADOLPH 1922, 1929). A finding from the environs of Mašovice was published by AMBROŽ (1931). Two findings are known of the 50s of the 20th century. One of them is a documented finding of Aesculapian Snake from the square 7,162 (Konice 20. 6. 1952 1 ex. coll. Faculty of Natural Science of the Charles University in Prague No. 206, leg. Hanák). The other observation was not documented, however, it is quite credible. It refers to the square 7,262 (Šatov, 1958, leg. Šťastný – in 1985 said to Šapovaliv). Historic data not only from Podyjí but also from other regions of Moravia (Pohořelice, Čejč, Lednice, environs of Brna), are summarised in detail and commented by MIKÁTOVÁ & ZAVADIL (2001).

Carpathians

The population on the Czech side of the White Carpathians has been known since 1984 (VLAŠÍN 1984b, MIKÁTOVÁ et al. 1989). Thus, it was discovered quite recently and, therefore, it is not evaluated in this chapter.

Other Findings in the Czech Republic

Other findings from Bohemia are sporadic and not very credible.

North Bohemia

The sporadic foundation in the square 5450 was evaluated in a paper of MIKÁTOVÁ & ZAVADIL (2001). The occurrence of a population nearby Ústí nad Labem is not very likely.

South Bohemia

Historic data from South Bohemia are very scattered in time and space and inconsistent: 1900 – square 7,051, 1906 – square 7,050, the 60s of the 20th century – squares 7,253, 1998 – square 6,750 (KAMMERER 1909, ŠTĚPÁNEK 1949, Ševčík in lit., Mikátová, own data). All South Bohemian findings have to be evaluated with care because of the above as, by the way, already indicated by CHADRABA (1932/1933) and ŠTĚPÁNEK (1949, 1956). The finding from the region of Písek dating to 1998 is the only recent documented finding in the South Bohemia. The snake was found dead at the right-hand edge of the road Ražice – Heřmaň on the level of the railway station Ražice. It is interesting that in addition to the finding of the dead snake, there is some information from that region confirming the observation of a long brown snake climbing to trees (Pecl in lit.). Thereafter, the locality of the railway station Ražice was subjected to a very careful examination (in particular the timber yard and other likely shelters) and a lot of attention was paid to other localities where a long brown snake was seen (surroundings of the Řežabinec and Kočkov ponds). However, no other

Aesculapian Snakes were found. The distance of both localities from the place of documented finding is approx. 1.0 – 1.5 km. With regard to the fact that the reports on the observation of a long brown snake date back to approximately the same period as the finding of the dead snake (the exact dates of observations could not be found out), we believe that the same snake was observed. Such a snake is likely to be snake purposefully released to nature or a snake that escaped from capture.

The distribution of the individual snakes in time and space rather indicates that such findings were errors, intentional fakes or findings of animals that escaped from capture. Thus, the known South Bohemian findings cannot be considered to have any connection to the Austrian localities as in case of Podyjí, however, we have to add that the occurrence in Austria looses coherency towards the Czech border and gets broken down to a mosaic (CABELA et al. 2001) and it could theoretically reach to the Czech territory, too. Details of the findings in South Bohemia are described by MIKÁTOVÁ & ZAVADIL (2001). Despite all reservations concerning the up to now South Bohemian findings, the occurrence in the Southern Bohemia cannot be fully excluded. The potential occurrence in the South bohemia is to be seen in the light of the recent findings in Austria (CABELA et al. 2001). Attention should be paid to areas close to the localities known on the Austrian side of the border. These are regions that have not been subjected to zoological survey (for instance the environs of Nové Bystřice, Soběnov).

Central Bohemia

No findings are known in the Central Bohemia that would indicate autochthonous occurrence. All published findings (the respective animal was sent to the Senckensberg museum in Frankfurt am Main) were analysed and declared introduction and fakes – MIKÁTOVÁ & ZAVADIL (2001).

N**orth Moravia and Silesia**

The historic and recent data from the Northern Moravia and Silesia was summarised by HUDEČEK & ŠUHAJ (1992) and MIKÁTOVÁ & ZAVADIL (2001). The data from that region is considered unlikely or at least not very reliable. The approach to such data from the region was taken by BÖHME (1993). What has not been verified is the unpublished observation by Otáhal (in verb.) from the region of Nový Jičín, although it would be chronologically more likely.

1.2.2.2. Recent Distribution

At the time being, there is reliable information on permanent occurrence of reproducing populations just in three areas in the Czech Republic: Poohří, Podyjí and Carpathians. Unverified (and as the case may be also documented) observations from other localities are sporadic and they

do not prove the occurrence of a population. Still, it is theoretically possible that another isolated population may live in the territory of the country (let´s recall that one of the three isolated populations in Germany was discovered as late as after the WW II and the Czech population in the White Carpathians was discovered as later as in 1984).

Poohří

Poohří has very complex ladnscape morphology. Enormous altitude differences are experienced within a relatively small area. At the distance of less than 9 km, the altitude of 1,243 m at the top of Klínovec mountain drops to 310 m at the level of the Ohře river below the municipality of Boč. Such altitude differences are behind enormous temperature fluctuations. The higher positions belong to the cold climatic areas (CH6, CH7) meanwhile in the proximity of the river Ohře, there are moderately warm areas MT7 (QUITT 1971). When considering the climate in Poohří, we have to take into account not only the overall climatic region but also microclimate of individual localities. It may be affected by the slope angle, exposure and geological substrate. For instance, the basalt bedrock creates a heating substrate that may affect the locality micro-climate.

The results of the survey executed in 2005-2007 and thus the current distribution of Aesculapian Snake in Poohří are given in the detailed map attached as the Annex 5. The overall size of the population is estimated to 400 – 600 snakes (MUSILOVÁ & ZAVADIL 2007). All findings come from the square 5,644 in the cadastres of eight municipalities: Boč, Damice, Korunní, Krásný Les, Osvinov, Peklo, Stráž nad Ohří and military exercise area (MEA) Hradiště. A number of localities in the environs were visited in the framework of the search for historic findings as well as in the squares 5,643, 5,645 and 5,744, however, without any result (Annex 6). The only results are relatively credible information from local residents and a photograph of the species from Okounov from approx. 2000.

The concerned species is primary bound to the valley of the river Ohře and low cuts of its tributaries. The range is typical of often detritus fields (block seas) that are not practically present in other parts of the Doupovské mountains. The detritus fields are likely to be formed as a consequence of the complex morphology of the landscape, very steep slopes that cannot be found in any other part of the Doupovské mountains, either. Scree woodlands have been preserved in there that are less dense as forest husbandry in such forest is considerably difficult and no machines can be used. Aesculapian Snakes made use of stonewalls erected (and still being erected and disappearing) in the framework of the forest husbandry. Recently, they have been observed more often in anthropogenic formations such as walls, embankments, navigation and roads and not frequently used buildings such as sheds, cowsheds, house, wood-sheds, garages, etc.) rather than in natural biotopes (detritus fields and forests).

Podyjí

The basic climatic characteristics in the national park change from West to East depending first of all on the dropping altitude above the sea level. Temperature keeps growing and precipitation quantity keeps dropping in this direction. According to the climatic division to regions (QUITT 1971), four climatic regions are found in the region of Podyjí: The Western sector of the region (up to the valley of Klaperův creek) is a moderately warm region MT 9. The Central part is a moderately warm region MT 11. The next part is the warm region T 2 (to the boundaries of Dyje valley between Znojmo and the state border) and the warm region T 4 reaches to the Eastern most edge of the national park.

Also the micro-climate of the respective biotope is important for snakes. The locality showing the highest number of population is the vineyard Šobes that is unique from the point of view micro-climatic conditions. The estimated number of Aesculapian Snakes in here is 600 (the total population in Podyjí includes approximately 1,200 – 1,500 snakes). The vineyard Šobes spreads from the side of a rocky shore in the meander of the Dyje river on a sun-exposed Southern slope protected against North-West and North-East winds. The Dyje river plays a special role in this locality. It runs around the vineyard with favourable effects in warm days and colder nights, fog, etc.

The average annual temperature in the Western sector of the national park depends on the elevation and is about 7 °C. In the Eastern sector, in the environs of Znojmo, the average annual temperature is already 8.8 °C. The permanent occurrence of Aesculapian Snake is known also from the Central part of Podyjí, i.e. from the climatic region MT11.

Since 1983, Aesculapian Snakes has been often repeatedly every year found in several locations in the square 7161 (MIKÁTOVÁ et al. 1989, Mikátová, Musilová, Vlašín, Formánek, Čmelík, Slavík, Zavadil own data, Gábriš in verb., Nečas in verb., Modrý in verb., Reiter in verb., Škorpík in lit., Šapovaliv in lit. and other finders). This square is the key Aesculapian Snake occurrence locality in Podyjí. 11 locations were found in the municipality cadastre of Čížov, Lukov, Hnánice, Havraníky and Podmolí where Aesculapian Snake regularly appear. Aesculapian Snake in Podyjí is bound to both human-created biotopes (old buildings and structures) and often managed land (vineyards, terraces, garden borders) and natural biotopes (e.g. Hardecká hillside, a better part of Ostroh and Vraní rock).

The most significant localities are the vineyards Šobes and Nový hrádek. The locality Šobes hosts hundreds, Nový hrádek hosts units of snakes. However, Aesculapian Snake is regularly observed at a number of other micro-localities. They may partly include ruins of old buildings, for

instance Gruberův mill, Judexův (Baštův) mill, Faltýskův mill beneath Nový hrádek, a former paper mill. Such ruins of buildings have had all presumptions for the long-term occurrence of Aesculapian Snake. Findings of Aesculapian Snake at the mill at the Lipinská pedestrian bridge, in water and at the bank of Dyje below Vraní rock and on the Ostroh confirm that the Podyjí National Park at the Czech side and the national park Thayatal at the Austrian side are one integral locality of the occurrence of Aesculapian Snake.

There is a number of similar localities in the national park where the frequency of humans is lower (also prohibited, among other) and Aesculapian Snake may occur in there. However, the number of members of such populations is likely not be that high as found out in the above mentioned locality of Šobes. However, such locations could be significant first of all for the overall stability of the species from the point of view of communication and contact of individual animals from individual occurrence points of this locality.

The regular reproduction has been recorded (findings of juvenile snakes born in the current year) also in the square 7,161. The findings and sub-adult and adult snakes and exuviae are known from other squares (7,162, 7,262, 7,160). Such data is to be evaluated very carefully with regard to considerable migration capability of Aesculapian Snakes (more than 3 km). For instance, snakes from Šobes were observed in the quarter 7,162 and 7,262. This is why the micro-localities in the square 7,161 seem to be centre of the distribution in Podyjí. For maps of the localities see the Annex No. 7

Carpathians

The region of Carpathians includes all three climatic regions: warm, moderately warm (MT5, NMT9, MT11) and cold. Most Carpathians belong to the moderately warm region. The Hlucká upland and the valley of Velička river are located in the warm climatic region. The highest parts of the White Carpathians as around Velká Javořina and Lopeník reaching to approx. 800 m above sea level belong to the cold climatic region (CH7). Most findings of Aesculapian Snakes in Carpathians come from the climatic region MT5.

The localities on the Czech side of the Carpathians (MIKÁTOVÁ & ZAVADIL 2001, BEZDĚČKA 1998) are continuously connected by valleys of the Váh river tributaries to the distribution range in the Trenčín region of Slovakia (VARGA 1962, LÁC1970). The northernmost finding from this region comes from the locality Střelná (square 6874). Thus, the findings are dispersed in squares 6,874, 6,973, 6,974, 7,072, 7,073, 7,172. Most data has been recorded in the square 6,974. This seems to be the area of permanent occurrence of the species including its reproduction. Aesculapian Snake was repeatedly found in the basin of the river Vlára from the Slovak border to Bylnice and from there upstream Brumovka up to Valašské Klobouky and Poteč. The seemingly separate

occurrence in Vyškovec and Žítková is connected to the continuous distribution in Slovakia.

The occurrence in Carpathians differs from that in Podyjí and Poohří. Snakes are found sporadically, there are not any localities where they would be found on regular basis in higher quantities as we know from Podyjí and Poohří. Therefore, it is possible that permanent populations occur in all squares from where individual findings are being reported. Repeated findings of mostly dead snakes were reported only from the road between municipalities Sidonie and Sv. Štěpán.

The biotopes where snakes live are heterogeneous. Unlike in Podyjí and Poohří, this area does not have any significant morphological dominants that would serve as a shelter for a number of snakes and as suitable hatching places (stonewalls, ruins of buildings). Locally, there are cairns that are often covered with vegetation (herbs, shrubs). Snakes often use woodpiles in forest clearances or along ways as their shelter. However, such shelters are temporary and after such structures are removed, snakes have to find other shelters. That means that there is a lack of places where snakes could regularly gather in a specific year season (mating, egg-lying, wintering). Sometimes several snakes used woodsheds or old haylofts. However, the overall character of structurally complex landscape including meadows, refuges, orchards and the like is convenient for snakes. Most findings come from forest steppe locations (abandoned orchards, edges of pastures and forest and the like). However, a significant number of findings come from forest growths where snakes are found at open places such as edges of forest ways, clearing, etc. The species was also recorded immediately in forest growths (beech forest in the natural park Chladný vrch, natural reserve Okrouhlá).

1.2.2.3. Distribution Trends

What is typical of Aesculapian Snake is that since the Atlantic climatic period (5500–2500 B.C.) it has been slowly regressing to the South and it has survived in climatically suitable isolated populations. Five very threatened isolated places of occurrence are currently known above the Northern boundary of the distribution range (Germany – environs of Schlangenbad in the valley of the creek Walluf, Hirschhorn in the valley of the river Neckar and Burghausen in the valley of the river Salzach; Poland – Bieszczady, valley of the river San and the Czech Republic – Stráž nad Ohří, valley of the river Ohře). The most striking is the drop of the number of the population in Poland and Czech Republic. Thanks to good management, the German populations have been successfully maintained on more or less the same level. During the 19th century, snake populations in Denmark disappeared and some hundred years later, the population in the environs of Basel in Switzerland died out and the condition of the already mentioned population in Polish Bieszczady has become critical. The changes of the distribution have been poorly documented with regard to

lack of data.

Czech Republic

Changes of the numbers have not been properly documented in the Czech Republic. Moreover, certain conclusion may be drawn based on unpublished data or popular articles of some observers. However, the changes of the distribution may be derived from historic findings, in particular in Poohří.

Poohří

Changes of the distribution have been reconstructed based on current and historic findings (Annex 4). The Annex 8 includes a map showing three areas – the current area (7.81 km2), area derived from recent 10 years findings (63.09 km2) and an area reconstructed based on findings from the period of 1880 – 1998 (95.65 km2). The map suggests that the range of the distribution of the species in Poohří has showed a significant reduction in size getting consequently broken to micro-populations many out of which do not maintain mutual communication any further. According to calculation, the original distribution range saw a reduction to 8.2% of the original range size. A principal regression has been experienced since last 10 years. However, we have to take into consideration the fact that the centre of the occurrence has always been in the environs of Stráž nad Ohří and Korunní and the snake abundance along the boundaries of the distribution range is believed to be much lower.

Findings from the last ten years from the environs of Petrova, Zvoníčkova, Želinský meander and the marginal zone as attached to the current range, that means in the environs of Jakubov, Krásný Les, Lužný, Okounov, Osvinov, Perštejn, Srní, Smilov, Vojkovice were not verified despite targeted surveys executed in 2005-2007 (including the municipalities themselves but not their cadastre territories). However, important information was found in some localities (credible descriptions provided by local residents, recent photographs) that fully justify further survey works.

Changes of the abundance were pointed out as early as before the WWII in Poohří (REINHARDT 1938). Based on data from local residents, this author claimed that the occurrence of Aesculapian Snake used to be quite common before 1910. The author used to visit the locality of Korunní quite often at the end of the 20s and in the 30s and over the entire period he succeeded to capture only three snakes and found one dead snake. The species, living in an isolated population at the very limit of its environmental possibilities responds in this way to climate oscillations and changes of the way the landscape is used. Anyhow, the 20s of the 20th century are known for being generally very cold (SVOBODA et al. 2003).

Since the half of 80s of the last century, we have experience a striking warming. Therefore, there is a presumption that snakes have survived the changing structure of the landscape, perhaps thanks to the fast warming since last twenty years. Apparently, the warming itself is not enough for the species to survive. Aesculapian Snake seems to reach a high level of abundance some 30 years ago in Poohří (although the then climate was significantly colder). Since that time, the number of the population has continuously declined and at the time being a very rough estimate envisages that one tenth of the original number of animals of the 70s of the last century now lives (Haleš, Janoušek, Zavadil, own data).

Podyjí

Although the occurrence of Aesculapian Snake in Podyjí has been known since the first half of the 20th century (ANBROŽ 1931) and local residents used to know the snake very well (Doubek in verb), no data on the distribution are available relating to that period. After the WWII a bigger part of Podyjí became a closed border area and, therefore, the occurrence of Aesculpian Snake could not be monitored for several decades. Only two records from the 50s (squares 7,162, 7,262) document the permanent occurrence. Only the finding dating to 1983 (VLAŠÍN 1984a,b) reconfirmed the occurrence of Aeaculapian Snake. In the second half of the 80s, the occurrence of snake was found several times in the square 7,161. After the opening of Podyjí to public in 1989, snakes were repeatedly seen in particular in Nový Hrádek and Šobes). At some places at Nový Hrádek, the snakes used to appear so regularly that they became a tourist attraction and the castle guides included the information on the snakes to their guided tours. However, the repeated findings at several localities after 1989 were not enough to make any conclusion on the distribution of Aesculapian Snake in Podyjí and its abundance. A survey of the distribution and abundance has been under way in Podyjí only since 2002. Therefore, data is missing for a comparison of the current and past abundance and no conclusion may be drawn as to any significant changes of the abundance. Only the fact that sporadic findings from the 50s come from other squares than 7,161 could indicate that the Podyjí range could be larger compared to the current size.

Carpathians

Since 1984, when Aesculapian Snake was documented by Kux(VLAŠÍN 1984a,b) in Carpathians, there have been only random findings that cannot be used to make any conclusion concerning the condition of the population. A bigger part of the findings come from natural biotopes as in other locations of the Carpathian system, for instance in Slovakia. The use of anthropogenic habitats was confirmed only in sporadic cases. The way Aesculapian Snake

lives in Carpathians seems to differ from that in Podyjí and Poohří. There is no data available on the change of the abundance of the snakes in this area.

1.3. Biology and Ecology of the Species

1.3.1. Requirements to Environment

According to GOMILLE (2002), this is a species that requires warm and moderately wet climate and hates too dry habitats. It explicitly prefers wetter environment and is often bound to river valley phenomenon. The requirements to environment are perfectly obvious looking at the map of the coherent range of distribution of the species (Annex 1). The Southern and Eastern boundary of the distribution correlates with the occurrence of deciduous tree forests that are dependent on a specific amount of precipitation. Where such a type of growth was replaced by evergreen Mediterranean vegetation, that means in areas exposed to low sum of precipitation and high temperatures (an overwhelming part of the Pyrenean peninsula and approximately the Southern half of the Apennine peninsula, etc.), Aesculapian Snake is missing. The Western boundary runs along the Atlatnic coast and the Northern boundary of the distribution of the species is determined by the temperature and apparently by the morphology of the ground which is again related to temperature and humidity (micro-climate). In the Northern sector of the range and in isolated parts of the distribution range, the species occurs in forest valleys of watercourses and it seems to be bound to detritus forests. There re not such biotopes North off this country.

In the framework of its distribution range, Aesculapian Snake inhabits a number of various biotopes at varying altitudes. It occurs from the sea level to 1,500 m above sea level in the South of the distribution range (BÖHME 1993), however, most localities are found at medium altitude between approx. 200 – 600 m above sea level (CABELA et al. 2001). The snake prefers landscape composed of small farming plots creating a variable mosaic of various biotopes with abundant bushes, refuges, pastures, stone piles and cairns always at the edge or in proximity of light broad-leaved tree forests. It often inhabits ruins of houses and edges of ways. It also lives in anthropogenic biotopes below roofs, sheets or in straw or haymows (NAULLEAU 1978, BÖHME 1993, SCHULTZ 1996, LÁC 1970). In rarely populated landscapes (practically deserted mountains of Vihorlat), in inhabits also wet shady forests without any undergrowth (naked beech forests) where it gets exposed to sunshine in tree crowns (being chased by short-toed eagle – Circaetus galicus).

Aesculapian Snake skilfully climbs and can make use of small uneven points of the surface of trees, rocks and building thanks ventro-lateral edges. It is a good swimmer being able to overcome watercourse but does not enter water often.

In the Czech Republic, Aesculapian Snake prefers forest-steppe biotopes however with

occurrence of wet places. It inhabits mainly stony slopes covered with bushes, abandoned vineyards and orchards, edges of pastures, forests and forest clearances. It avoids open landscape. The highest concentrations of snakes are usually found at places offering abundance of shelters, food and hatching places including rocky areas, walls, ruins of buildings, woodsheds, scrap years or wood piles. It does not keep away from humans, all the way round, it often approaches limits of villages and outbuildings and it depends on the tolerance of residents whether it stays. Except for climatically suitable slopes exposed to South-West and South-East, snakes inhabit in Poohří also North, North-East and North-West exposed slopes and wet inversion valleys (REHÁK 1989, 1992, MIKÁTOVÁ & ZAVADIL 2001, Mikátová, Musilová, Zavadil, own data).

Similarly to German populations, the isolated population in Poohří is typical of particularly strong links to humans and its economic activities. WAITZMANN (1993) explains this strong synantropism by the fact that natural biotopes of the thermophillic reptiles such as rocky slopes and dry grasslands become always less abundant in the current cultural landscape and their environmental functions have been taken over by anthropogenic biotopes such as dry walls and quarries. In isolated populations above the Northern boundary of the distribution range and at the boundary of the possible existence from the point of view of climatic conditions, such a link to humans becomes remarkable. What can be an example is the egg incubation. All known hatching places in Germany and Poohří were found in purely anthropogenic structures.

What is of principal importance for Aesculapian Snake is the structural diversity of the landscape offering a wide range of biotopes. The landscape homogenisation either by means of integration of land due to the intensification of farming or by the gradual overgrowing of the landscape makes it fully improper for Aesculapian Snake. What represent a particular risk is the invasion of nitrophilous bushes and herbs including neophytes.

1.3.2. Reproduction and Life Strategy

The season activity of Aesculapian Snake depends on geographical latitude and prevailing climatic and weather conditions. The snake is believed to start to be active in late April to early May and to stop activity in late October to early November (BÖHME 1993). Within the territory of Poohří, first snakes are usually observed starting from the mid April and the last ones in the second half of October. Active snakes were seen in Podyjí as early as in late March (Mikátová, own data).

Aesculapian Snake is active in the day, nevertheless, in hot summer days it may be active also during twilight (BÖHME 1993, MIKÁTOVÁ & ZAVADIL 2001, own observation in Poohří). The snake is active in particular in days that are neither too cold nor too hot, that means within the approximate temperature range of 16 – 25 °C in shadow. Should the temperature

exceed 27 °C, the snakes hide themselves in colder and shady shelters. They like to get exposed to sunshine after prolonged periods of bad weather. They also prefer almost cloudy skies and high air humidity (GÜNTHER & WAITZMANN 1996). Similar preferred weather conditions for the optimal activity in Poohří were confirmed by MIKÁTOVÁ & ZAVADIL (2001), too.

The mating period is affected by climatic, geographic and annual weather conditions and it is usually described to take place from later April /early May to June (REHÁK 1989, 1992, BÖHME 1993, HEIMES & WAITZMANN 1993, GÜNTHER & WAITZMANN 1996). The first mating was observed in Podyjí as early as in late April (Mikátová, own data), in Poohří, it was the first half of May (Musilová, Zavadil, own data).

The behaviour during the mating in a terrarium was described in detail by LOTZE (1975). In natural conditions, this behaviour was observed by DROBNY (1989), HEIMES (1994b), KAMMEL (1999) or NAJBAR (1999a). According to these authors, the male touches the female, pursues her and often bites the front part of her body in order to stop her which are elements typical of the family of Colubridae. The duration of the copulation is 10-45 minutes. Females get mated with several males and males also try to get mated with more females. The males meet in ritual duels twining each other trying to push the head of the rival to the ground. A detailed description of such duels was provided by DROBNY (1993).

The sex ratio is usually claimed to be higher in favour of males, it is 1.23 to 1.98:1 (BEŠKOV 1975, ŠČERBAK & ŠČERBAŇ 1980, NAULLEAU 1992, BÖHME 1993, HEIMES & WAITZMANN 1993, NAJBAR 2000b). HEIMES 1989 (ex BÖHME 1993) found a specific shift in the sex ratio in relation to age when the sex ratio of snakes up to 100 cm was more balanced (1.13:1) compared to adult snakes (1.76:1). BÖHME (l.c.) believes that the number of males rising with heir age may be conditioned by a higher mortality of females. It also may be caused by more noticeable behaviour of males resulting into their easier capture as mentioned by HEIMES & WAITZMANN (1993).

Males are able of reproduction every year and their spermatogenesis was confirmed throughout the year. Most females (77%) have also an annual reproduction cycle and their ovulation starts approximately in the second half of June. Unlike in mammals, the reproduction cycle of females depends on their physical condition, respective content of fat in their bodies. Nevertheless, energy necessary for the eggs to evolve is gained mostly from food and, therefore, the dependency on the bodily fat is lower than that in Vipera aspis, for instance (NAULLEAU 1992, BONNET & NAULLEAU 1994, NAULLEAU & BONNET 1995).

Clutches are laid below moss, rotten leaves, in hollow rotten trees and stumps, sawmill, compost, manure, cavities in rocks and walls (REHÁK 1989, 1992, BÖHME 1993, GÜNTHER & WAITZMANN 1996). Clutched in hollow trees were found in Slovakia by VOGEL (1952,

1968), in Bulgaria by BEŠKOV (1975). Laid eggs were found in a sand alluvium by PILLET & GARD (1979 ex BÖHME 1993). Most surveys of hatching places were executed in isolated populations above the Northern boundary of the coherent distribution range as the sufficient quantity of hatching places in there with regard to climatic conditions is a limiting factor (WAITZMANN 1993). Eggs are often laid to substrates heating heat in the reach of human activities, i.e. compost, manure or leaves, etc. These places are not rare to be used by several females a time including other species most often being shared with ring snakes (Natrix natrix). A collective hatching place was found in the isolated German population in the environs of Schlangenbadu in manure inside cow house with the following numbers of eggs: 114 (1987), 149 (1988) and 154 (1989), other collective hatching place was found in compost containing 354 eggs (HEIMES 1991, 1994b, HEIMES & WAITZMANN 1993). In the German isolated population in the environs of Hirschhorn (Odenwald), a hatching place of Aesculapian Snake was found for the first time by GOMILLE (2002) as late as in 1998. It was one collective hatching place with 136 eggs and the other place was a clutch of 5 eggs. Both hatching places were found in composts of private gardens. A hatching place of exclusively anthropogenic origin was described by KAMMEL (1999) in Austria. Out of the total number of eight clutches, five were laid in composts (vegetable material or manure and litter), two in a vegetable bed covered by a foil and one in a heap of sawdust. NAJBAR (1999a) describes in Polish Bieszczady the total number of 37 clutches all of them being positioned apart. Most often, the clutches were laid to saw dust (27%), cavities of fallen trees (18.9%), below rocks (16.2%), in composts (10.8%) and in hollow trees (8.1%). In sporadic cases, the clutch was laid between boards in the proximity of an abandoned farm, in a heap of rotten rags and in a rock fissure. As well, Mikátová documents exclusively individual clutches found in Podyjí. For a survey of them see the Table 1. The clutches in Podyjí were not subject to a targeted survey, they were found by randomly. On the other hand, in Poohří, a collective hatching place was found in garden compost with the total number of eggs amounting to 181 (MUSILOVÁ & ZAVADIL 2006). That means that females lay eggs to various habitats and, depending on the nature of the biotope, they lay the eggs either collectively or individually. The species seems to tend to collective clutches. However, the clutches are laid collectively only where good opportunities exist.

Tab 1.: Survey of findings of clutches in Podyjí (Mikátová, not published).

Locality	Finding place	No. of eggs in the clutch	Clutch condition
Šobes	Below some small sprays at the edge of the vineyard	6	Prior to hatching
Šobes	Among stones in a ruin of wall	5	After hatching
Šobes	In gravel in a depression at the place of a tree on a pathway	7	After hatching
Ostroh	Leaves bank in rock recess on a rock step	6	After hatching
Hradecká vyhlídka	Rotten trunk	6	After hatching
Ostroh	Mouldering wood in a beech exposed to sunshine	8	After hatching
Nad Šobesem	Broken disintegrated trunk (wild pigs?)	1	After hatching

The egg laying time is usually said to be the period from the end of June/beginning of July to beginning of August (REHÁK 1989, 1992, BÖHME 1993). That means approximately 4 – 6 weeks after the copulation meanwhile last 15 – 30 days prior to laying eggs the females do not receive any food (GOLDER 1972 ex GÜNTHER & WAITZMANN 1996). Most authors claim that the main egg laying period is the first to second decade of July (BEŠKOV 1975, HEIMES & WAITZMANN 1993, NAJBAR 1999a). However, all phenological data depends on weather conditions in the given year. DROBNY (1993) found out in the Bavarian population in the environs of Passau a time shift of all phenological phases (start of activity, mating, egg laying, hatching and end of activity) by approximately 1 to 3 weeks in variably favourable years 1987 and 1988. Results of a survey executed in Poohří confirm such a fact. Females laid eggs in the second decade of July in the seasons 2005 and 2006. In the season 2007 typical of unusually weather conditions, eggs were laid some 14 days earlier at the end of June and beginning of July. Pregnant females were seen in Podyjí from approximately beginning of June to 20 of July (Mikátová, own data).

The number of eggs varies from 3 to 30, clutches higher than 20 eggs are exceptional. The usual number is 5 – 12 (REHÁK 1989, 1992, BÖHME 1993, HEIMES & WAITZMANN 1993). The number of eggs has a positive correlation with the size of the female which was proven for instance by DROBNY (1993) or NAULLEAU & BONNET (1995).

The eggs are of white matted colour of elongated form in a parchment coat. Their size at the time of laying is 35–70 x 15–25 mm (REHÁK 1989, 1992, BÖHME 1993). If laid to a warm and wet substrate, eggs absorb 33 – 52% of water and in the course of several days their weigh rises,

however, their size remains almost the same (NAJBAR 1999a).

As a rule, the egg incubation lasts 60 days (REHÁK 1989, 1992, BÖHME 1993) and it considerably depends on temperature. The hatching starts from the mid August and lasts until the mid October (HEIMES & WAITZMANN 1993, DROBNY 1993, HEIMES 1994b, NAJBAR 1999a, CABELA et al. 2001, MIKÁTOVÁ & ZAVADIL 2001) depending on the egg laying time, climatic conditions and weather in the given year. First young snakes are usually found in Podyjí in late August in exceptional cases in early August all, on the contrary, in early September (Mikátová, own data). The findings of first young snakes in Poohří coincide with the first half of September (Musilová, Zavadil, own data). Examples of varying hatching times in various years in the same locality are specified by HEIMES & WAITZMANN (1993) in the environs of Schlangenbadu. For a synoptic survey of hatching dates see the below table 2.

Tab 2.: Hatching dates in the environs of Schlangenbad in individual years (HEIMES & WAITZMANN 1993)

Year	Hatching date
1986	late August – mid September
1987	September 20 – October 15
1988	August 15 – October 5
1989	August 15 – September 6

The success of the reproduction considerably varies. HEIMES (1994b) observed an extreme case when only two young snakes hatched from 122 eggs by October, others gradually addled. There are other cases documenting that by far not 100% cases of hatching are successful. For instance GOMILLE (2002) claims the success rate of eggs from a collective hatching place in the environs Hirschhorn (n = 136) to be just 35%. In the environs of Schlangenbad, the rate of success in one hatching place was recorded to reach 57.6% (n = 354) (HEIMES1994b), in another hatching place it reached 77.8% (n = 149) (HEIMES & WAITZMANN 1993). The 100% success rate from the same locality was documented by GOLDER (1985). DROBNY (1993) recorded in the environs of Passau quite a high rate of success of the reproduction being 98% (n = 99). In a collective hatching place in Poohří in the season 2005, relatively low reproduction success rate was recorded – just 34% (MUSILOVÁ, ZAVADIL 2006). Thus, it is obvious that the success of the reproduction may be one of the key limiting factors for the isolated populations living above the Northern boundary of the coherent distribution range. The size of newly born snakes considerably varies. The total length of the body of the newly born snake ranges from 200 to 387 mm and their weight ranges

from 5.6 to 12.7 g. According to HEIMES & WAITZMANN (1993), juvenile snakes after a wet and cold summer 1987 showed a lower weight and length compared to the warm and dry summer of the following year.

HEIMES & WAITZMANN (1993) claim that the total length of young snakes after one year of life is approx. 400 mm whereby the snakes still carry the typical juvenile animal appearance patterns. After two years, their length is 500 – 600 mm and the visual pattern of the young snakes is preserved only on the head and after three years of life, their length is 700 mm and the pattern on the head is hardly visible and uneasy to be distinguished from adult snakes. The annual growth of juvenile and sub-adult snakes is in average 132 mm. The sexual ripeness is achieved as late as in 4th – 6th year of life at the length of 85 – 100 cm being heavily dependent on genetic presumptions, climatic conditions and food supply (BEŠKOV 1975, HEIMES & WAITZMANN 1993, KAMMEL 1999, NAJBAR 2000b).

Aesculapian Snake hibernates depending on climatic conditions approximately from mid October to mid April (BÖHME 1993). There is not enough information on the wintering places. Snakes may winter in hollow trees, rock fissures, old cellar premises, sawdust piles, etc. (REHÁK 1992). Within the territory of Poohří, there is a number of small walls they may serve this purpose. According to early spring or late autumn findings, eight such walls were identified (MUSILOVÁ & ZAVADIL 2007). Also abundant detritus fields may be the wintering place as HEIMES (1994) found out using telemetric monitoring methods in the German isolated population in the environs of Schlangenbad that the wintering places of Aesculapian Snakes may be positioned also inside forests close to summer biotopes.

There is quite limited data on the wintering mortality. The newly born snakes are obviously the most sensitive group. On one hand, they do not have any wintering experience and, on the other hand, they often get hatched as late as in early October when they often have not time enough to find a proper wintering place. According to HEIMES & WAITZMANN (1993), snakes shorter than 27 cm do not have any chance to survive the first wintering. Results from Poohří include interesting information in this context. In the season 2007 preceded by an unusually moderate winter, 29 young snakes were captured after the first wintering meanwhile after the previous seasons this number ranged from 2 – 3 snakes (MUSILOVÁ& ZAVADIL 2007).

1.3.3. Food Ecology

The food of Aesculapian Snake consists of small warm-blooded vertebrates and occasionally bird eggs and in rare cases of amphibians. The snakes do not reject a carcass. They search for the pray both on the ground an in the burrows of rodents rarely in branches on trees (REHÁK 1989, 1992). The food of young snakes includes in particular lizards, small frogs and invertebrate animals

(ARNOLD & BURTON 1979, REHÁK 1989, WAITZMANN 1993, BÖHME 1993, GÜNTHER & WAITZMANN 1996, NAJBAR 1999b).

The range of food of Aesculapian Snake is very broad whereby the prevailing component of the adult snake food are small rodents. The food composition heavily depends on the current supply in the given season and the species shows quite euryphag behaviour (BEŠKOV 1976, WAITZMANN 1993). ANGELICI & LUISELLI (1998) studied the ornitophagy of snakes in Italy and found out that birds are not a primary source of food for Aesculapian Snake but an occasional pray. They eat birds mainly in the springtime during the nesting time (March – May) and they eat most often young birds, less often eggs and adult birds.

Given the wide spectre and season adaptability, WAITZMANN (1993) believes that the food is not a limiting factor for the existence of Aesculapian Snake. This is confirmed by results from Poohří, too. The local snakes´ condition is very good and even places with a high concentration of snakes do not show any symptoms of lack of food. In the proximity of villages, farms and roads, there is an abundance of small mammals. In the food vomited incidentally during handling, we found small mammals without any exception (including fat dormous and brown rat).

However, the situation of young snakes differs as their food spectre differs, too. They eat young lizards, small frogs, newly born small mammals or beetles (REHÁK 1989, BÖHME 1993, NAJBAR 1999b). The supply of such food has got considerably reduced in Poohří including but not limited to the populations of amphibians and lizards that have declined considerably. The receipt of the first food is the key turning point for young snake from the point of view of their further life. If they overcome the limit size for the swallowing of small mammals, the young snakes appear in a more favourable situation in terms of food.

1.3.4. Movement, Migration and Demographic Parameters

HEIMES (1994b) divides the activity period to four phases – post-hibernation, spring (by mid May), reproduction (mid May – end of June), summer (July, August) and pre-hibernation (starting from early September). He also found out that Aesculapian Snake in the environs of Schlangenbad prefers somewhat different biotopes in every of the above phases. What the snake prefers in the post-hibernation early spring phase are forest biotopes. During the following reproduction period, snakes reside in open areas such as meadows and ruderal places. In the next summer phase, they prefer first of all forest boundaries and at the end of their activity period they withdraw back to forests again where they winter. Such principal changes of the use of biotopes were not found in Poohří nevertheless, without a telemetric survey they may be hardly excluded. Shorter distance (up to 500 m) migrations were observed in the environs of the road between

Stráž nad Ohří and Boč. In there, the snakes migrate on regular basis between their wintering places, small walls in spring and their summer biotope at the river and back to the wintering place, again. All localities in Poohří are likely to be subject to similar migration, nevertheless, they cannot be confirmed based on captures with regard to the ground configuration.

Aesculapian Snake is described as a species that habits a relatively small area and uses the same shelter for years. Its mobility considerably increases during the reproduction period (REHÁK 1989, 1992). NAULLEAU (1989) found out in France the average size of the home range of 1.245 ± 1.73 ha for males and 0.798 ± 0.69 ha for females. The variability of the migration of various snakes and between various seasons was considerable. HEIMES (1994b) found out by a telemetric survey of several Aesculapian Snakes in the German Taunus mountains quite a high migration activity in particular in the reproduction period. The longest daily migration distance was 610 m and a male snake migrated to the distance of 2 km in 14 days. This author claims the size of the home range of the only one monitored female to be 4 ha and 7.2, 9.5, 9.6 and even 61.6 ha for males out of which the one was extraordinarily active in terms of migration.

What can be concluded based on data collected by now from Poohří is that snakes move around the locality in a manner that they stay several days at one single habitat and then they move on. This snake migration theory was supported by results of other surveys focused on other snakes. DEMERS & WEATHERHEAD (2002) recorded the migration of 82 *Elaphe obsoleta* snakes by telemetry. Their results prove the manner of the migration when snakes stay at a single place for several days and only then they move on. After some time, the snake returns to such once visited locality using exactly the same opening in a tree or the same place for sun exposure. The range of such migration of individual snakes was found considerably variable. Some snakes used to migrate within the range of 1 ha meanwhile some very mobile animals (mainly males) migrated to the distance of 4 km. A similar survey involving a higher number of snakes (MACARTNEY et al. 1988 ex DEMERS & WEATHERHEAD 2002) brought very detailed data on the migration of snakes and, therefore, this model of the migration is likely to be applicable to Aesculapian Snake. The longest migration distances as found out in Poohří range from 500 to 1,000 m for both sexes. For the mutual links between localities and the most significant migrations see the Annex 9. Within the territory of Podyjí, the longest migration distance was recoded between localities Šobes and natural park Skalky: 2,700 m. In general, the most risky period for male snakes is the springtime when they search for females. The most risky period for females is the egg laying period when they migrate to hatching places. The most critical period for young snakes is the time immediately following the hatching (BONNET et al. 1999). The animals get killed most often on roads by cars in this period of elevated activity and

migration as proven by a survey executed in Poohří.

1.3.5. Role in the Ecosystem

In the ecosystem, Aesculapian Snake plays the role of a predator devouring small mammals, occasionally birds and their eggs. It does not change the biotope where it lives. Its most dangerous natural predators include carnivorous animals and birds of pray (BÖHME 1993). Also wild pigs (Sus scrofa) have to be mentioned as snake´s predators. Young snakes may become the pray of smooth snake (Coronella austriaca). Another anticipated predator is raven (Corvus corax), your snakes are believed to be devoured by thrushes and smaller raven species. What seems to be excluded in Poohří is the predation by the specialised snake predator – short-toed eagle (Circaetus galicus) although it was observed in rare cases in there and ZAVADIL et al. (2006) describes the South-West and North-East slopes of the Ore Mountains as a migration corridor of this predator. Among introduced species, the most risky is American mink (*Mustela vison*) the introduction of which to the mountains is theoretically probable, as well racoon dog (*Nyctereutes procyonoides*) and racoon (*Procyon lotor*) who have already been observed in there (Anděra, Musilová, Zavadil, own data). As to domestic animals, Aesculapian Snake is threatened by cats, dogs and poultry (unearthing of clutches and predation of juveniles snakes).

1.4. Causes of Threatening

The table 3 includes individual threatening factors including but not limited to factors recorded and active in the period 2005-2007. The data includes only the regions of Podyjí and Poohří as any information on this species from Carpathians is missing and it is subject to a scheduled survey. For the photo documentation see the Annex 10. The threatening factors may get changed in time including the priority of their significance.

1 – low significance factor
2 – medium significance factor
3 – high significance factor
4 – critical significance factor

Tab. 3: ***Survey of the most significant threatening factors***

Threatening factor	Poohří	Podyjí
Changed management and landscape use methods – biotope loss	**4**	**2-3**
Removal, overgrowing or reinforcement of dray stonewalls	**4**	**4**
Integration of fields and elimination of hedgerows	**4**	**3**
Modernisation or demolition of older buildings	**4**	**2**
Succession of unmanaged land	**4**	**3**
Extinction of old ways (shadowing, overgrowing)	**3**	**2**
Elimination of small compost and manure heaps	**4**	**1**
Elimination of mouldering wood in forests	**2**	**3**
Use of heavy mechanisms	**3**	**2**
Removal of hollow trees	**2**	**2**
River/creek bank overgrowing	**2**	**2**
Extinction of small ponds and pools	**1**	**1**
Creek canalisation	**1**	**1**
Dense forest cultivation	**2**	**3**
Isolation of the population in Poohří	**4**	**-**
Adverse anthropogenic effects	**3**	**2**
Road traffic	**4**	**2**
Construction projects	**4**	**2**
Biking and development of biking trails	**2**	**4**
Vandalism	**3**	**2**
Illegal capture	**2**	**1**
Adverse – positive interventions (only the adverse part of the effect evaluated)	**3**	**1**
Cleaning of ditches along roads	**4**	**1**
Cutting clearances for electrical lines	**2**	**2**
Summerhouses and cottages	**2**	**1**
Extermination of neophytes	**3**	**3**
Cut wood handling	**3**	**3**
Garden or public area mowing	**3**	**1**
Predators and diseases	**2**	**2**
Predators	**3**	**3**
Diseases	**2**	**1**

1.4.1. Change of Management and Landscape Use Methods, Loss of Biotopes

Aesculapian Snake thrives in a structurally complex landscape (involving a rich supply of various morphological structures) with farming on small plots separated by hedgerows, game refuges and stonewalls. Meanwhile some original localities keep overgrowing preserving no value for the snakes, other plots are subject to too extensive farming/forest husbandry using heavy mechanisms. The below points enumerate the most significant specific changes in the landscape that result into the loss of suitable biotopes.

- **Removal, overgrowing or reinforcement of dry stonewalls** that are centres of activities (male duels, mating, etc.) and serves as irreplaceable shelters and wintering places
- **Integration of plots and elimination of hedgerows** resulting into the reduction of the morphological diversity of the landscape converting the landscape in space that is not attractive for the snakes as they do not like to enter it and can overcome it only with difficulties
- **Modernisation or demolition of older buildings** including old hay house, cow sheds, barns, etc. Aesculapian Snake likes thanks to its climbing skills
- **Succession of unmanaged land** that get covered by vegetation in several years (nettle or impervious bushes), the environment become homogeneous and inconvenient for the snakes
- **Extinction of old ways** destroys migration corridors and deepens the insulation of individual micro-populations
- **Elimination of small composts and manure heaps** in connection with the implementation of intensive farming methods reduces the supply of suitable hatching places
- **Elimination of mouldering wood in forests** – where not enough mouldering wood is left in forest, or where fallen trees are broken by wild pigs, snake have only limited possibilities of proper shelters or suitable places for the incubation of clutches
- **Use of heavy mechanisms** including but limited to meadow mulching leads to the direct physical killing of snakes
- **Removal of hollow trees** leads to the loss of suitable natural matching places and shelters
- **Overgrowing of river/creek banks** mainly by neophytes destructs good biotopes
- **Extinction of small pools and ponds** (including their shading) leads to a reduction of the diversity of the landscape and, last but not least, impairs the supply of food for young snakes (small frogs). For instance, 30 years ago in Podyjí, in the current home range of Aesculapian Snake, there use to be about 100 small pools and ponds. In 2007, the number dropped to 25, only.
- **Creek canalisation** impairs the structural diversity of the landscape and it may affect the natural migration corridors. It also eliminates the mating places of common frog and other amphibians (as the basic food for young snakes)
- **Cultivation of dense forest** limits the permeability of forest for the migration of snakes,,

afforestation of clearances limits the possibility of the occurrence in the forest

Poohří

The change of the method of the farming/forest husbandry and use of landscape is synoptically documented by aerial photographs from various periods (See Annex 10). What is apparent is a gradual decline of small-field farming, farming on integrated plots and overgrowing of unmanaged areas.

After the WWII, the population was non-systematically monitored as late as since the 70s (HALEŠ 1975, 1984, 1987, JANOUŠEK 1979, ŠAPOVALIV & ZAVADIL 1990, ZAVADIL & ŠAPOVALIV 1990). According to HALEŠ (1984, 1987) the 80s of the last century experienced a significant decline in the number of snakes in connection with the integration of plots using heavy mechanic means including removal of dry stonewalls and other suitable shelters and modernisation of older buildings. In the Southern part of the home range in Doupovské mountains, in the military exercise area Hradiště (since 1953), people were evacuated from villages and these were demolished and the deforested landscape and demolished village area exposed to uncontrolled overgrowing. The elimination of older buildings in the military exercise area Hradiště Aesculapian Snake likes to use goes on by now.

The maximum diversity of the configuration of the ground in the proximity of human settlements offering a number of various shelters, refuges and reproduction places as well as wintering places naturally results into an increased synathropisation of Aesculapian Snake as such structures are missing in open nature.

Podyjí

The forestation in the proximity of castles and villages and conversion of deforested land to fields and vineyards is associated with the middle age colonisation. A strip of light acidophilous oak woods spreading to South-West away from Znojmo was converted to pastures in those times. After the vineyards were abandoned some 200 years ago, the afforestation started again. In 30s to 60s of the previous century, some enclaves were afforested. After the WWII, forest naturally and by means of targeted afforestation projects extended to other large areas including but not limited to the South-East part of the area.

The settlement patterns of the current Podyjí National Park were different in the first half of the 20th century. There use to be several flour mills on Dyje river, some of them were made of stone. In their proximity, there use to be other stone buildings (outhouses, retention walls, etc.). The environs of such buildings were deforested.

The current shape of the Podyjí National Park is determined in particular by developments

in the previous fifty years. In early 50s, the area of the current Podyjí National Park became a part of a restricted border zone that was closed down for everybody except for border police members. The restricted access regime was lifted as late as after 1989. This fact brought a number of significant changes, for instance the already mentioned increase of the afforested area. Mills and buildings related to them were abandoned and their ruins get slowly overgrown by trees and bushes. Although the snakes are present in such ruins at present, the expanding shading makes the ruins always less suitable for snakes.

Long-term permanent neglecting of meadow growths resulted in the current condition when several tens of hectares of meadows has been changed by succession processes to young forest. The current overgrowing of the Havranické heath land (in particular by wild rose and pine trees) is convenient for Aesculapian Snake (the opinion of experts in botany is different) as it creates a diverse mosaic of biotopes. Further overgrowing that would result into an integrated growth, would not be convenient.

Intensive farming methods in the protective zone and partly in the national park (Čížkovsko) brought the destruction of landscape structures (networks of ways, anti-erosion measures, mosaic-like patterns of cultures, dispersed verdure). Some original heath lands were replaced by intensively husbanded orchards in the late 70s (u Havraníků) that are subject to frequent application of farming chemicals including but not limited to biocides.

The current biological method of farming implemented for instance on the Šobes vineyard (Znovín Znojmo) is doubtlessly beneficial for Aesculapian Snake and other reptile species.

Carpathians

Aesculapian Snake has not been systematically monitored in this area, therefore, data on the life of the population and causes of its threatening is missing. The up to now findings used to come from biotopes not included to human settlements. The snake occurs at complex ground biotopes, on pastures and meadows with dispersed trees and bushes, on forest ways, forest clearances, forest boundaries and the like. In 2008, the snake´s occurrence was recorded in the proximity of an outhouse. Tens of dead snakes were recorded on the road between Svatý Štěpán and Vlárský pass. The mortality on the roads may be a significant decimation factor of the local population.

1.4.2. Isolation of the Population in Poohří

The isolated population in Poohří requires a special approach in the framework of the management with regard to its certain specific features. The danger results from a very limited area of home range, low number of the population (approx. 400 – 600 snakes) and from the very

substance of such isolation when any loss of any snakes due any adverse factors (see the Table 3) cannot be compensated by migration of animals from elsewhere. From the point of view of natural conditions of Poohří, the species is located above the Northern boundary of the coherent distribution range and at the very limit of its existence possibilities. Thus, all adverse factors affect the population much more intensively. The most serious factor threatening the population is the extinction of biotopes and hatching places and the subsequent growing isolation of individual micro-localities.

1.4.3. Adverse Anthropogenic Effects

Aesculapian Snake is seriously threatened by always growing anthropogenic pressure. For a survey of the most relevant adverse effects see the below items.

Road traffic

The relevant adverse effects include the growing road traffic. In this context, the population in Poohří is more exposed due to a denser network of roads and mainly threatened by heavy traffic on the road I/13 Karlovy Vary-Chomutov. However, the roads do not necessarily need to be a principal risk for adult snakes if they permanently live in its proximity. A survey executed in 2005-2007 in Poohří found out that Aesculapian Snakes are able to overcome the road body in some way (repeated and numerous snakes captured at both sides of the road). Given the intensive traffic on the road I/13, snakes would be exposed to an enormous risk and they would be often found killed on the road if they crossed the road. However, snakes are likely to know the ground very well and they remember migration ways and if they want to cross the road they make use of road culverts for periodical watercourses. Such use was confirmed by a monitoring project executed by VIA servis s.r.o. for the Road and Motorway Administration of the Czech Republic (hereinafter "ŘSD"). What plays an important role is the position, dimensions and the design of the culverts below the point of the road. The situation is significantly different for juvenile and sub-adult snakes. Such animals still make them familiar with the locality and they often die below wheel of cars. Adult snakes die in this way much seldom.

Such a danger resulting from road traffic has been recently identified in Carpathians on the road between the village of Svatý Štěpán and Vlárský pass. According to information of local residents, snakes are found dead mainly in the period from the end of April to the beginning of June. Up to tens of snakes may be killed in this way every year.

Development projects

What involves adverse effects, are any ground works and construction activities in general (occupation and destruction of biotopes). What is an extreme effect is the development of roads that features a migration barrier. The road I/13 Ostrov- Chomutovv will be relocated to the area of Poohří in future. The alignment of the relocated road has not be exactly defined, yet, however, it is sure to cross the centre of home range, anyhow. Given the location of the home range in a national park in Podyjí, such a risk for the species is minimised.

Cycling and development of cycling trails

In the Podyjí National Park, there is a number of very busy cycling trails. Young snakes get often killed on the cycling rails that have flat asphalt surface. On the contrary, the mortality of young snakes is significantly lower on cycling trails the surface of which not that finished (holes in asphalt, stony ways and the like) as the snakes are likely to get hidden to any such natural shelters in the road in case of risk. Adult snakes are well visible on the trail, therefore they are get not practically killed by bikers. The cycling tourism has not become too popular in Poohří for the time being, however, these adverse effects should be taken into account when planning any future cycling trails.

Vandalism

Intensive tourism involves the risk of vandalism and intentional chasing of snakes because of people being scarred and ignorant. This adverse effect is significantly eliminated in the Podyjí National Park by the installation of information boards at places of the most frequent occurrence of snakes (for instance the vineyard Šobes) or people are provided information from guides (Nový Hrádek). The Poohří region is not an important tourist destination and most local residents honour the tradition of the occurrence of the “Aesculaps” and they take pride in them and try to protect them. Nevertheless, we still encounter vandalism and intentional chasing of snakes.

Illegal capture

The illegal capture use to be a problem mainly in past (in particular in Poohří). This species is attractive for breeders and terrarists and use to be subject-matter of illegal business (Haleš, Koždoň in verb.). At present, this adverse factor has almost disappeared, nevertheless, a certain level of risk still exists.

1.4.4. Adverse – Positive Interventions

The Aesculapian Snake population survives in Poohří thanks to some activities that help to maintain or create suitable biotopes (see the Table 3) that, however, may kill the snakes if

performed improperly. Such activities have been and will be executed and it would be counter-productive and conflictful to try to restrict such activities. However, the adverse effects of such activities may be influenced or even eliminated. Such interventions include the following:

- **cleaning of ditches along roads** (+ maintenance of small walls to prevent overgrowing) – killing of snakes
- **cutting out clearances below electrical lines** (+ maintenance of the biotope and the corridor) – killing of snakes
- **"summerhouses and cottages"** (+ as a rule, a rich spectre of biotopes offering a number of shelters and morphological structures, people often present only during weekends) – killing of snakes in the course of grass mowing for instance, sometime improper maintenance of land – sterile environment – areas coverage by fine grain gravel, swimming pools, English lawn offering no possibility of shelters
- **extermination of neophytes** (+maintenance of banks) – killing of snakes
- **cut wood handling** (+ creation of suitable Biotope and hatching place) – lack of stability of the Biotope – killing of snakes by the handling operations
- **mowing of vegetation on gardens of public areas** (+ maintenance of the Biotope) – killing of snakes in particular when mechanical means are used

Given the various nature of the biotope and management /husbandry methods, such adverse-positive interventions do not pose a principal risk for Aesculapian snake in Podyjí.

1.4.5. Predators and Diseases

Natural predators are carnivorous animals and birds of pray (for details see the chapter 1.3.5 – Role in the Ecosystem). Within the territory of Poohří and Podyjí, some significant losses may be occasionally caused by wild pigs (*Sus scrofa*). A potential serious risk is Allochthonous predators. Perhaps the most serious risk is American mink (*Mustela vison*) that is likely to get introduced to Poohří after some time – for the time being, its occurrence has been recorded in the square 5,545 (ANDĚRA & HANZAL 1996). Within the territory of Podyjí, the occurrence of the American mink was recorded in the square 7,161 (ANDĚRA & HANZAL1996, Anděra 2008). This species is known for its predation pressure on dice snake in the region of Beroun (RED et al. 2004) and was observed in predation of this snake in the Vltava river basin, too (KAPLER1994). Its impacts upon the isolated population of Aesculapian Snake are difficult to be predicted. As to other predators, we should mention racoon dog (Nyctereutes procyonoides) and racoon (Procyon lotor). Racoon dog has been already recorded in the square 5,644 (ANDĚRA & HANZAL1996), it was found even earlier in surrounding squares

(NESVADBOVÁ 1984). Racoon was recently found killed by car immediately in the epicentre of the home range (Musilová, own finding, det. Anděra). In 2007, nearby the river Ohře, an Aesculapian Snake was found with its head bitten away, however, it was not possible to say whether it was predation of an autochthonous or allochthonous predator.

Given the considerable density of snakes in some localities, diseases and parasites may threaten the population up to a certain extent. A skin disease was described in the past in Poohří (it has not been diagnosed by now) (Haleš 1987), at the time being, the diseases is present but in a limited extent (Haleš, Janoušek, Musilová, Zavadil, own data).

1.5. Protection Status

1.5.1. Protection Status on the International Level

Aesculapian Snake is specified in the Annex IV to the Direction 92/43/EEC on the conservation of natural habitats and of wild fauna and flora. Thus, Aesculapian Snake belongs to species the strict protection of which is the interest of the Community.

Moreover, this species is named in the Annex II to the Bern Convention on the Conservation of European Wildlife and Natural Habitats and it was subject to the elaboration of an "Action Plan" (EDGAR & BIRD 2005). The 26th Meeting of the Standing Committee of the Bern Convention adopted the recommendation 119/2006 on the Conservation of Some Threatened Species of Amphibians and Reptiles in Europe including Aesculapian Snake. Among other, this recommendation binds the parties to the convention to adopt measures to conserve such species and elaboration of so called Action Plans for them.

1.5.2. Protection Status of the Species in the Czech Republic

Legal Protection: specially protected animal named in the implementation Decree No. 395/1992 Coll. to the Act No. 114/1992 Coll. on Nature and Landscape Protection, as amended, as the critically threatened species.

Threatening category subject to the Red List: the population in the North-West Bohemia CR (Critically Endangered – Threatened), Moravian population E (Endangered – Threatened) (ZAVADIL & MORAVEC 2003). The Red List of the former Czechoslovakia included Aesculapian Snake to the category of a vulnerable species (KRÁL 1989).

1.5.3. Protection Status in Neighbouring Countries Where the Species Occurs

The situation in the Czech Republic is comparable to that in Poland and Germany where Aesculapian Snake lives in isolated populations. The species in such countries belong to

critically threatened species. As the coherent distribution range passes through Austria and Slovakia, the level of threatening is somewhat lower, nevertheless, the species is specially protected, too in such countries.

Poland

Aesculapian Snake has been protected in Poland by the law since 1952. The Polish Red Book has included the snake since 1992, being first included to the group E (SZYNDLAR & ZEMANEK 1992) and with regard to the serious condition of the population, it was moved to the category CR in 2001.
(http://www.przyroda.katowice.pl/czerwona_ksiega_kregowcow.html).

Germany

The Red List includes the species in the group of the most threatened species -1 (danger of dying out, vom Aussterben bedroht). It is included to the same category in all three federal states where is occur (Baden-Wuerttemberg, Hesse and Bavaria) (GÜNTHER & WAITZMANN 1996, www.amphibienschutz.de).

Slovakia

Aesculapian Snake is protected in Slovakia by the Decree No. 93/1999 Coll. on Protected Plants and Protected Animals and on the Social Evaluation of Protected Plants, Protected Animals and Trees of the Act No. 543/2002 Coll. on the Nature and Landscape Conservation , as amended as very threatened species (category b) with the social value being SKK 15,000.
In the Red List, it is assigned to category LR (Lower Risk) in the sub-category D (Conservation Dependent) (URBAN et al. 1998). The status of the species has not changed in the updated Red List (KAUTMAN et al. 2001).

Austria

In Austria, the species is included in all federal states of its occurrence (Burgendland, Carinthia, Upper and Lower Austria, Salzburg, Steiermark, Tyrolia and Vienna) to the highest category 1, namely a species that requires the full general and special protection (voll geschütz (pauschal/namentlich) (RIENESL 2001).

In the Austrian Red List, it is included to the category 3 (threatened, gefährdet). It is included to the same category in all federal states except for Carinthia where it is assigned to category 2 (strongly threatened, stark gefährdet) (www.amphibienschutz.de).

1.6. Measures to Protect the Species Adopted by Now

1.6.1 Non-specific Protection

1.6.1.1 Non-specific Protection of the Species Abroad

Germany

In Germany, in the area of Schlangenbad and Hirschhorn, some biotopes of Aesculapian Snake were declared protected areas in the categories Naturschutzgebiet and Landschaftschutzgebiet. These mostly include extensively used land, not very dense orchards with ways flanked with dry stonewalls. The protection of areas may be evaluated as a very efficient tool of the protection of Aesculapian Snake and other reptile species.

Poland

In Poland, places of the occurrence of Aesculapian Snake are declared protected areas including San valley, Cisniansko-Wetlinská protected area and national park Bieszczady. All of them are above-national biosphere reserves. Since 1995, key biotopes are subject Protection with a very strict Protection regime. In the period from February 1 to August 31, trees and bushes must not be cut down, any construction and works that could involve any adverse effects upon the protected species are inadmissible (NAJBAR 2000b). We evaluate such a strict protection of the core localities as unambiguously positive, however introduced somewhat late for the Polish populations.

1.6.1.2. Non-specific Protection of the Species in the Czech Republic

Poohří

Protected areas

The natural park Stráž covers a considerable area of the home range in Poohří. As well, there is a small protected area – the natural park of Basalt vein - Boč and a temporarily protected area where Western marsh orchid occurs. Practically entire area belongs to the specially protected area Doupovské mountains and SCI Doupovské mountains. However, Aesculapian Snake is not subject-matter to protection of any of these areas at present.

Korunní Kyselka

Quite an extensive site of mineral water filling plant is enclosed in fence. This is an ideal area for Aesculapian Snake protected against the key predators for instance wild pigs.

Military exercise area Hradiště

What is an advantage of the military exercise area is the limited presence of people. A disadvantage is the lack of flexibility when negotiating on the implementation of measures within the military exercise area although such localities include plots that are not any further than max. 1 km away from the boundary of the military exercise area. Another adverse factor for the snakes is the order to demolish all older buildings in the military exercise area Hradiště the snakes like to inhabit.

Podyjí

Protected areas

Most biotopes of Aesculapian Snake in the region of Znojmo are located in the Podyjí National Park that features an extraordinarily significant area of the occurrence of Aesculapian Snake. Its biotopes are not significantly threatened in there. Aesculapian Snake occurs being dispersed almost throughout the area. Most localities belong to the protection zone I and II out of human populated areas. As a rule, the localities are quite well isolated from adverse anthropogenic effects except for the already mentioned cycling trail. Moreover, Aesculapian Snake also regularly occurs in the national park Fládnitzské heath land and national park Skalky. A sporadic finding was recorded in the natural park Horáčkův hill. The snakes found in the national park Skalky were snakes from Šobes.

Carpathians

Given sporadic findings in the national park and national reserve in the protected landscape area of the White Carpathians and the only finding in the protected landscape area Beskydy, the positive impacts of the protected landscape area and small protected areas upon the occurrence of the species cannot be evaluated. The concerned species is not subject-matter to special protection in any of the protected landscape areas.

1.6.2 Specific Protection

1.6.2.1 Measures Implemented in Neighbouring Countries

What is available, only, is detailed data on the biotope care in Germany where the following measures are being implemented (for photo-documentation see the Annex 12):

Burghausen:

1. Stonewalls maintenance, mowed grass left at the wall for the creation of compost after some time
2. Large amounts of alluvia material left in the Salzach river lowland in order to feature an ideal hatching environment

Schlangenbad:

1. Stonewalls maintenance, mowed grass left next to the wall – creation of compost.
2. 3 m wide strip of vegetation along the peripheral wall of the Klosterbach monastery plus adjacent English lawn. This strip features a safe refuge and it is mowed as late as in

October.

3. Biological waste from the Klosterbach garden is collected at a Central depository monitored by a camera system (monitoring a.o. the presence and movement of snakes). Such a Central composting site serves as a hatching place.
4. In the area of Wiesbaden – Frauenstein, there are stonewalls along which so-called snake pathway is running (including information boards providing information to local residents and tourists – a kind of Czech nature trails). Close to the front of the walls, there is a strip of higher vegetation left (some 30 cm) that is mowed as late as in October.

Hirschhorn:

1. Owners and users of land collect wood in heaps in the landscape that is covered with boards and foils – a preferred biotope of Aesculapian Snake.
2. The areas of extensively managed meadows and orchards with number of heaps of wood are declared a protected area in two categories: Naturschutzgebiet and Landschaftschutzgebiet.
3. Biological waste from the town of Hirschhorn (trees and bush sprays, leaves, bark, sawdust) is collected at a Central depository in a forest clearance that serves as the hatching place for Aesculapian Snake and other reptiles.

Evaluation:

The highest priority is given in Germany to the creation and maintenance of hatching places, wall maintenance and education. As to problems, the most serious one seems to be the administrative restriction that prohibits the farmers to keep manure on the land not more than several months. This is why the snakes cannot use manure heaps as hatching places, respectively their clutches get destroyed. We got in touch with the local conservationists and agreed on further cooperation and mutual consultations. None of the three isolated populations is Germany is threatened by road traffic.

1.6.2.2. Measures Implemented in the Czech Republic

Poohří

Since the 70s, the protection of the species in Poohří is the job of the Basic Organisation 01/68 of the Czech Union of Nature Conservationists “Protection of Herpetofauna”. Recently, also the “Ekologické centrum Meluzína RCAB” has participated and since 2005, the civil association Zamenis has dealt with the protection of Aesculapian Snake. In the boundary area of the home

range Horní Hrad, there is land union Oharka functions. Each of the above institutions has been working by now based on their won ideas in their localities it is quite difficult to obtain specific information from them on any intervention as implemented by them. It would be very desirable to unify and coordinate all such activities under the auspices of the Action Plan. For photo-documentation and maps see the Annex 11.

BIOTOPE CARE

1) <u>Development and maintenance of refuges – BO 01/68 of the Czech Union of Nature Conservationists "Protection of Herpetofauna"</u>

Duration: 1993-2007

Description: BO 01/68 of the Czech Union of Nature Conservationists "Protection of Herpetofauna" has developed since the beginning of their activities four so called refuges (habitat, hatching and sometimes wintering place) identified in the text by the letters A through D. Such activities used to be initially subsidised by the Ministry of Environment with the 30% participation of the BO 01/68 of the Czech Union of Nature Conservationists, recently from the funds of the Czech Union of Nature Conservationists.

a) **"Temporarily protected gene pool area"** is located in the valley of Pekelský creek at a place of rehabilitated uncontrolled dumpsite. The site is provided with a fence and straw and manure have been imported to the site in order create "wintering places", three approx. 0.8 m deep pits with an access pipe with an entrance opening on the ground. They are filled with pieces of material making it possible to get to the bottom. On the surface, they are covered by a solid slab covered with a heap of insulation hatching substrate. On the heaps of the substrate, there are old metallic sheets, floor covering, chipboards, etc.
b) **A heap of stones nad Hrachovou** – a heap of stones was first covered by a plastic foil covered by a layer of manure. After some time, manure drop down in gaps between stones where it rolled away from the separation foil. The substrate is continuously made up in cooperation with the nearby farm Rájov. Two metallic sheets and black foil are provided on the surface.
c) **A heap of straw and manure** at the Northern boundary of the village of Stráž nad Ohří at the right-hand bank of Pekelský creek.
d) **Packages of old straw and hay** on the meadow North-West of Stráž n. O.

Evaluation: In general, the refuges (habitats, hatching places and sometimes wintering

places) developed according to the design of BO 01/68 of the Czech Union of Nature Conservationists "Protection of Herpetofauna" for Aesculapian Snake are efficient and they may be one of possible forms of the support of the population of the snake. However, certain procedures and quality standards should be adhered to subject to a standardised methodology. For the rating of the refuges using the scale from 1 (the best) to 5 (the worst) see the table 4.

Tab. 4.: ***Evaluation of refuges based on chosen parameters***

Refuge	Choice of locality	Size	Regular make up of substrate	Protection against predators	Shelters	Total
A	2	2	2	1	1	1-2
B	1	1	2	4	1	2
C	1	3	3	3	3	3
D	3	5	5	5	3	4

The evaluation given in the Tab. 4. indicates that the best was the **refuge A**, that the temporarily protected gene pool area. The **refuges B and C** have well fulfilled the basic presumption namely the choice of the locality. Other parameters that have not been complied with for financial reasons, most likely, should be added in the framework of the proposed Action Plan. The **refuge D** was preliminarily found inconvenient.

2) <u>Cleaning of stonewalls, creation of hatching places – Zamenis, o.s., Naturaservis s.r.o.</u>

Duration: 2005-2007

Description: Since 2005, civil association Zamenis has taken care of some of the biotopes. Its activities have focused mainly on the renovation of overgrown stonewalls throughout the home range of Aesculapian Snake in Poohří. The care measures as proposed by Zamenis have been implemented by now by Naturaservis (2006) and the association Zamenis (2006-7). It is funded by the AOPK of the CR and by sponsors.

Evaluation: In 2006-2007, 22 walls were renovated. The success of the intervention is illustrated by the fact that the species was just believed to be present at some locations of the intervention and was found as late as after the completion of the intervention (stonewalls 2, 11, 19, 20). In general, Aesculapian Snake was recorded at 9 of 22 repaired walls. At first sight, it may seem not to be very many, but is a great success as the intervention has been completed recently and the snakes need some time to find and occupy a new biotope. The occupation of more distant walls will naturally take place later and, therefore, it would be desirable to develop a corridor that would facilitate access to renovated walls (for instance renovation of old ways,

etc.). The renovated walls have to be maintained on regular basis.

3) <u>Barrier – Naturaservis s.r.o., Zamenis, o.s.</u>

Duration: 2006-2007

Description: In 2005, the association Zamenis evaluated the very risky section of the road E442 (13) where young snakes used to be killed very often whose hatching place was probably located in the stonewalls closely below the road. Therefore, in August 2006, the company of Naturaservis – Roman Rozínek, developed based on the PPK program a barrier (see the Annex 11) that would guide the snakes to culverts. In 2005, prior to the development of the barrier, nine young snakes killed by cars were found which is a negligible fraction of the actual loss with regard to the small size of the animal and other factors (such a wet surface of the carriageway that facilitates the quick removal of the carcass from the road). Immediately after the completion of the development of the barrier in August 2006, the functionality of the barrier was subjected to a test. In the course of September and October, four killed young Aesculapian Snakes were found (again, just a fraction of the actual loss). After correction of small deficiencies in 2007, no killed young snakes were found there in September and October.

For the sake of the improvement of the reproduction capacity, a hatching place was founded at the opposite side of the road at the distance of approx. 30 m off it. If hatched in this place, the newly born snakes should be able to easily circumvent the road.

Evaluation: The barrier is one of possibilities how to prevent snakes from entering the road at risky sections. The design and installation of a barrier for Aasculapian Snake that is good in climbing is not simple. The collected data indicate that barrier is effective and the number of killed snakes has declined. However, the structure needs to be maintained on regular basis and its functionality has to be checked as even a small crack may destroy it all. An additional solution may be to guide females to another hatching place that should be safer, if possible.

4) <u>Biotope Care – locality v Pekle – EC Meluzína RCAB</u>

Duration: since 2003

Description: A hatching place was created on the grounds of the Land Union Meluzína v Pekle at the place of the occurrence of Aesculapian Snakes by means of formation of a heap of horse manure and straw. The hatching place is supervised by wood ranger S. Kuchta. No detailed information is available on other projects, nevertheless, we can anticipate that stonewalls are newly erected or renovated on the land as in possession of S. Kuchta.

Evaluation: The creation of a hatching place is unambiguously a positive fact. The hatching place is likely to be fully operable.

5) Biotope Care in the Environs of Horní Hrad – EC Oharka

Duration: not known

Description: Information on projects implemented by EC Oharka is very sporadic. It deals with the maintenance of pastures and orchards, repairs of walls and ways and renovation ponds in the environs of Horní Hrad that is located in the marginal sector of the area of potential occurrence however, without any recently documented finding of Aesculapian Snake.

Evaluation: These landscape interventions are praiseworthy and fully in compliance with reptile management including Aesculapian Snake. The possible occurrence of Aesculapian Snake may be recorded thanks to such activities.

Total evaluation: Although the biotope care as executed by all above organisations facilitates positive protection of reptiles and maintains perhaps even strengthens the population in the micro-localities, we have to state that the positive results of such efforts are only local meanwhile Aesulapian snake needs help covering the entire distribution range.

SPECIES CARE

An attempt to introduce Aesculapian Snakes from Poohří to Vráž u Berouna and in the environs of Slapy failed in the 80s of the 20th century. There is not any information available on whether such introduced snakes keep surviving. Such introduction attempts are to be seen rather as a nonsense and dilettante attempt.

ZO 01/68 of the Czech Union of Nature Conservationists "Protection of Herpetofauna"

Description: BO 01/68 of the Czech Union of Nature Conservationists "Protection of Herpetofauna" used to deal in past with a direct species care. During the period of extended occurrence of the skin disease, some heavily infected snakes were captured and cured. As well, snakes were captured prior to the rehabilitation of the uncontrolled dumpsite and kept in captivity and then released to the rehabilitated area. According to information provided by Ing. Haleš (BO 01/68 of the Czech Union of Nature Conservationists "Protection of Herpetofauna") and experience of other breeders, the species is relatively easy to be kept in terrarium and the artificial egg incubation does not pose any problem, either.

Evaluation: The activities of the BO 01/68 of the Czech Union of Nature Conservationists

“Protection of Herpetofauna” brought interesting information at that time although the Action Plan is based mainly on the care focused on the biotope and it does not envisage any breeding or repatriation.

Education

Given the partly synanthrophic style of living, the education is one of basic point of the protection of Aesculapian Snake.

1. BO 01/68 of the Czech Union of Nature Conservationists “Protection of Herpetofauna”

Description: BO 01/68 of the Czech Union of Nature Conservationists “Protection of Herpetofauna” has been dealing with education of local resident since the beginning of its activities in Poohří by means of organising lectures and dissemination of information materials (DVD, drawing of so called poly-functional refuge). As well, it calls attention of local residents to the scheduled development of the road I/13 stressing the possibility to take into consideration the existence and requirements of Aesculapian Snake when designing possible variants of the alignment of the expressway. At the same, it established contacts with local farmers and provides information on the possibility of the creation of hatching places using easily available and suitable substrate (manure, straw) for the sake of the snakes.

Evaluation: This kind of adult education has to overcome the primary lack of trust and defiance of local residents which has been made in many case. The spontaneous tendency of the local residents to protect “their” snakes involves some “cons” residing in the fact that some residents are afraid of people trying to capture snakes for terrarium breeding or sale, they are suspicious and obstruct the execution of surveys that take place in the area. Such distrust in some people is hardly to be overcome.

The drawing of the poly-functional refuge is quite good illustration of the needs of snakes. An optimal refuge should be larger (in particular as far as its depth is concerned, it should be at least 120 cm deep). Its implementation is the climax of the efforts of the conservationists when the owner of the plots not only accepts the fact that its property is populated by Aesculapian Snake but also agrees to help the snake and he/she on his/her own develops a refuge for specially protected animals on his/her own plot based on expert instructions. Some local residents have already prepared such a refuge on their land.

The communication with local farmers functions as a good foundation for the future cooperation. Farmers are the most important group of local residents as they do farming on

larger landscape units and often handle suitable substrate materials (hay, straw, bark, sawdust manure) for the hatching of snake eggs. Thus, the support of farmers to the project of the protection of Aesculapian Snake is principal.

2. Zamenis, o.s.

Description: The civic association Zamenis designed in 2007 by initiative of the vice-mayor of Stráž nad Ohří Mr. Záleský a leaflet informing the local residents on the survey executed and practical measures for the protection of the species that was posted at several points in the municipality. A bulletin board was installed in Stráž nad Ohří that dealt with the issue of Aesculapian Snake, only.

Evaluation: These activities may be seen as positive. Local residents were noticed to show increased awareness and gradual overcoming of the starting lack of belief to the conservationist activities.

Podyjí

No extensive measures to protect Aesculapian Snake have been implemented in Podyjí by now. In 2004-2005, herb vegetation was partly removed from the stonewalls in Šobes as well as a creeper growths of wild vine. In 2006, a more extensive intervention was executed when trees and bushes were cut away from some stonewalls using chain saw. Five line wall structures, approximate collective length of 1,300 m were cleaned. The stonewalls get quickly overgrown in particular by wild vine that has to be removed every year. In 2006, a part of slightly damaged walls was repaired. The cleaning was organised by the BO of the Czech Union of Nature Conservationists. The project was funded from the programme called Protection of Bio-diversity (Czech Union of Nature Conservationists). The same funds were used to fund the installation of the information board at Šobes.

2. OBJECTIVES OF THE ACTION PLAN

Long-term Objectives:

A long-term objective of the Action Plan is the preservation of vital populations of Aesculapian Snake in all three known mutually isolated home rages, namely in Poohří, Podyjí and Carpathians.

Poohří

1) To preserve the micro-populations of the species in the existing localities (2007 condition) and to interconnect them. Such an interconnection will be deemed successful if Aesculapian Snake is found every year on at least 75% of newly formed interconnection biotopes (see Annex 14) for at least 5 years.
2) To bring Aesculapian Snake back to chosen parts of the original distribution range (see Annex 15). Such a repeated occupation of chosen parts of the original distribution range will be deemed successful if at least one Aesculapian Snake is found on at least 75% of newly formed biotopes in the parts of the original range of distribution for at least 5 years.
3) To at least double the number of members of the population in the period 2005-2007 up to approx. 800 – 1,200 snakes.

Podyjí

1) To achieve a regular occurrence including reproduction in the squares 7,160 and 7,162 at least 5 consecutive years.
2) To preserve the number of the population in the square 7,161 at the number found out in 2005-2007, i.e. 1,200 – 1,500 snakes.

Carpathians

To preserve the condition of the population of the Aesculapian Snake in the area of the White Carpathians and Southern Beskydy (the quantification of the population and definition of the areas of the biotope cannot be executed at the time being with regard to limited information available – the objectives will be specified as late as after the collection of basic data on the condition of the Carpathian population, its requirements and threatening factors).

Medium-term Objectives:

Poohří:

1) To found at least 10 efficient hatching places in the current home range
2) To restore biotopes of the urgency 1 and 2 (see the study – Annex 13) and to interconnect this way the isolated micro-populations
3) To maintain other existing biotopes
4) To reduce adverse impacts of road traffic
5) To map potentially suitable biotopes as behind the boundaries of the current home range
6) To collect other data on the species ecology including correlations of species (effects of predators, etc.)

Podyjí:

1) To found at least 10 suitable hatching places in the known places of occurrence where no reproduction activities has been recorded, yet (prefer the square 7,162)
2) To map the occurrence in the square 7,160 and found experimental reproduction points (at least 2)
3) Maintain the existing biotopes – to restore overgrown stonewalls and expose mill ruins to sunshine
4) To map potentially suitable biotopes in the boundary areas of the home range
5) To collect detailed data on the link of Aesculapian Snake to forest using telemetry
6) To collect other data on the ecology of the species including correlations of species (impacts of predators, etc.)

Carpathians:

1) To collect relevant data on the occurrence and threatening of Aesculapian Snake in the White Carpathians and Beskydy mountains
2) To limit adverse impacts of road traffic
3) To collect other data on the ecology of the species including correlations of species (impacts of predators, etc.)
4) To implement adult education measures and, as the case may be, to implement other measures to maintain the condition of the population at the place where occurrence was recorded

3. PLAN OF MEASURES

The plan of measures varies for every home range of Aesculapian Snake due to various nature of the locality, various condition of the population and the level of information available.

The locality of Poohří and Podyjí has been quite well studied, this is why the first phase includes maintenance of the existing and adaptation of new biotopes at identified locations as well as mapping of marginal localities, that means search for the animals and mapping of structures inhabited by the species.

The objective of the first phase in Carpathians will focus first on the collection of relevant data.

The following chapters describe individual measures based on set forth objectives of the Action Plan.

3.1. Biotope Care

3.1.1. Hatching Place Care

Motivation:

Aesculapian Snake often uses anthropogenic substrates for egg hatching (compost, manure heap, sawdust, etc.). The lack of suitable reproduction opportunities is one of principal threatening factors in Poohří and in some localities in Podyjí.

Content of the measure:

Foundation of a sufficient number of places (for the methodology see the Annex 16), their regular replacement and make up of substrate to the existing hatching places. The measures will be implemented in Podyjí and Poohří.

3.1.2. Care for Significant Biotope Elements and Migration Corridors

Motivation:

Aesculapian Snake thrives in a structurally complex landscape where farming/forest husbandry takes places on small-area plots. Stonewalls improve the variability of the ground, offer shelters and cumulate heat and, therefore, they are preferred habitat and often wintering place not only of Aesculapian Snake but all snakes living in the country. They may serve as hatching place, too. However, they have to be sufficiently exposed to sunshine. In connection with the changing landscape, stonewalls and ruins get quickly overgrown by vegetation or even demolished or reinforced becoming so unusable for snakes. The maintenance of such key

biotopes is principal for the preservation of the existing localities where the snake occurs and also their mutual interconnection. At the time, the landscape of Poohří is not very proper for the species due to the occurrence of overgrown integrated plots that are not managed or plots that are too intensively managed, on the contrary, which results into the total integration of non-forest land and elimination of any morphological structures in the landscape. The permeability of the landscape for snakes becomes very limited and the very busy road I/13 Ostov nad Ohří – Chomutov paradoxically becomes a migration corridor. The restoration of chosen old ways flanked with dry stonewalls and hedgerows may replace the missing migration corridors and provide for a safe interconnection of the localities.

Content of the measure:

The measure will be implemented in Poohří and Podyjí and it will include cleaning and follow up maintenance of overgrown stonewalls or ruins and development of new walls at suitable places for the interconnection of the localities. The restoration of migration corridors will include the trimming of banks of watercourses and chosen ways will be restored respecting their non-reinforced natural nature. The measure also includes the maintenance of stand-alone trees. A database of significant biotope elements and migration corridors has been prepared for Poohří (Annex 13). Suitable biotopes will be mapped in the boundary parts and behind the boundary of the current home range (see the measure 3.6.1). For a detailed methodology of the care for significant Biotope elements and migration corridors see Annex 17).

3.1.3. Care for Other Types of Biotopes

Motivation:

Aesculapian Snake likes to get hidden in various structures formed by humans like sheds, hay heaps, wood piles, metallic sheets, foils, conveyer belts and the like that offer safe shelter and accumulate heat. The creation and installation of such attractive places in the landscape may lead into the interconnection of localities and, at the same time, to facilitate the monitoring of the species in boundary and insufficiently monitored areas. The development of simple attractive biotopes (for instance wooden boards or vegetable materials covered by a dark foil) will result into the concentration of snakes at such places and this is a way how to minimise the risk of conflicts during construction projects or other ground works.

Content of the measure:

The development and maintenance of simple and attractive biotopes at chosen places (for methodology see Annex 18). The measure will be implemented in Poohří and Podyjí, it may be used as a monitoring method in Carpathians, too.

3.1.4. Restoration and Maintenance of Small Water Bodies

Motivation:

An important component of the food chain of young Aesculapian Snake are ectother ground vertebrates, namely reptiles and amphibians (see chapter 1.3.3.). The abundance of common lizard has significantly declined in Poohří due to the overgrowing of the landscape and common frogs or newts have almost disappeared as formerly abundant small ponds have disappeared or have been managed in an improper way. A renovation and maintenance of small water bodies may improve the supply of the food spectre for young snakes and to restore the structural diversity of the landscape.

Content of the measure:

The renovation and maintenance of small water bodies for amphibians. For methodology see Vojar (2007). The measure will be implemented in Poohří.

3.2. Species Care

3.2.1. Protections of Animals when Maintaining Road Ditches

Motivation:

Cleaning of ditches belongs to so-called adverse-positives activities, that means measures involving some positive impacts upon the biotope (regular mowing) and adverse impacts upon individual animals (injury or killing). Aesculapian Snake does not respond too much to external stimulation and relies rather on its non-striking appearance than escape and becomes more vulnerable than other reptile species in the country. Snakes are exposed to maximum risk if they are exposed to sunshine on or below walls.

Proposed measure:

The adverse affects of the cleaning of ditches along roads may be easily prevented by having one (optimally two) employee(s) walking in front of the mowing machine and capturing snakes that should be returned back to the place of the occurrence after the completion of the maintenance. The measure will be implemented in Poohří (for details see Annex 19) and based on the monitoring of the mortality of snakes also in Carpathians.

3.2.2. Protection of Animals Migrating Across Roads

Motivation:

Road traffic may have significant decimation impact upon the population. Tens of snakes get killed on roads in Poohří every year. According to information from local resident, also the

section of the road between Vlárský pass – Svatý Štěpán in Carpathians experiences tens of snakes killed by the road traffic. Such animals are most often sub-adult and young snakes. The most critical period is May.

The reason of the existence of snakes in the proximity of roads in Poohří and Carpathians may differ. Within the territory of Poohří, it is a line occurrence at proper biotopes along the road. Within the territory of Carpathians, snakes are not likely to be present along the road permanently. The elevated mortality rates due to road traffic, in particular in may indicate that such animals are likely to migrate. However, the reason of the migration is not obvious.

Proposed measure:

Within the territory of Poohří and Carpathians exact places of the most often migration across roads of snakes will be mapped. Te number of killed snakes and number of living snakes will be recorded including the exact location of the finding (GPS) and information from local residents will be used, too. Found individual snakes will be documented (preservation of dead snakes, photographs) Information on the migration and migration corridors will be completed using telemetry in Carpathians. Results will be evaluated and corrective measures will be designed for critical sections in agreement with the administrator of roads concerned including but not limited barriers and suitable underpasses below roads the efficiency of which has already been verified in Poohří (see chapter **1.6.2.2. Measures Implemented in the Czech Republic).**

3.3. Monitoring

3.3.1. Biotope Monitoring

Motivation:

A detailed monitoring of biotopes is necessary for the long-term tracking of the condition of the biotopes, changes of the home range and efficiency of individual measures. Collected information will be used for the preparation of next phases of the Action Plan.

Content of the measure:

The existing occurrence localities will be monitored every year as well as renovated biotopes: What will be monitored are changes of individual biotopes and impacts of such changes upon the population. The measure will be implemented throughout the Action Plan in Poohří and Podyjí (for methodology see Annex 20).

3.3.2. Hatching Place Monitoring

Motivation:

The monitoring of newly developed and existing hatching places is necessary for the evaluation of the efficiency of the reproduction of the population as the basic presumption of the long-term existence of the species in the locality. The collected data will be used for the formulation and optimisation of the next phase of the Action Plan.

Content of the measure:

During the season, the immediate environs of the hatching place will be monitored with aim at recording the presence of pregnant females or newly born snakes. In the autumn, after the hatching of eggs and in the spring of the next year, newly founded hatching places will be restructured and remaining eggs counted, found young snakes will be weighed and metered in order to collect source documents for the comparison of individual hatching places and seasons. The measure will be implemented in Poohří and Podyjí. For detailed methodology see annex 21.

3.3.3. Estimated Number of the Population

Motivation:

The estimate of the number of members of the population using mark-recapture method is necessary for the establishment of the efficiency of the Action Plan. Data will be compared to the initial condition of the population in 2005-2007.

Content of the measure:

After ten years of the Action Plan, a once-off counting of the population will be executed in the framework of a more intensive study based on mark and recapture of snakes. The duration of the study will be at least two years. The measure will be implemented in Poohří and Podyjí based on the results of the collection of basic data or, as the case may be, in Carpathians, too. The current methods will be implemented – MUSILOVÁ & ZAVADIL (2007) for Poohří and MIKÁTOVÁ & VLAŠÍN (2007) for Podyjí.

3.3.4. Collection of Additional Data on the Occurrence of Aesculapian Snake

Motivation:

The collection of additional data on the occurrence of Aesculapian Snake is an important part of the monitoring. Data collected from local residents and volunteers may complete the information concerning the phenology or occurrence in the marginal area. It would be desirable to collect detailed data on the occurrence of snakes in the adjacent regions of Austria and Slovakia.

Content of the measure:

During the entire Action Plan, data will be collected from local residents and volunteers in all areas (Poohří, Podyjí and Carpathians) concerning any observation of duels, mating, young snakes, behaviour and occurrence of Aesculapian Snake in marginal parts of the distribution range, etc. Foreign experts will be addressed and invited to cooperate in order to collect information on the occurrence of Aesculapian Snake in the adjacent areas.

3.3.5. Collection of Basic Data in Carpathians

Motivation:

The region of the White Carpathians and the Southern sector of Beskydy mountains has not been paid sufficient attention from the point of view of wild life survey. One of the objectives of the Action Plan is the filling of the gaps in our knowledge.

Content of the measure:

Targeted mapping should be used to collect data on the distribution, prevailing living style (link to natural biotopes, synantropic links) and factors threatening the local population. The survey will be executed as monitoring using the monitoring or development of simple snake-attractive locations (wood piles, sheets, foils). First results will be used to consider the possible use of telemetry (see chapter 3.4.2.), estimate of the size of the population (see chap. 3.3.3) and other methods.

3.3.6. Verification of the Potential Localities of the Occurrence of Aesculapian Snake in the Czech Republic

Motivation:

Despite all reservations concerning the South Bohemian findings, the occurrence of Aesculpian Snake cannot be fully excluded in the Southern Bohemia. Attention should concentrate to areas in the neighbourhood of known localities on the Austrian side of the border. This includes regions where no special attention was paid to the survey of wild animals (for instance environs of Nová Bystřice, Soběnov). Literature mentions both the published and unpublished observation in the Southern Bohemia with contempt, however, in the light of new research work in Austria, the findings coming from the Southern Bohemia will have to be reviewed.

Content of the measure:

Verification of historic and recent findings in the Southern Bohemia and, as the case may be, other potential localities of the occurrence of Aesculapian Snake in the Czech Republic.

3.4. Research

3.4.1. Reproduction Research

Motivation:

For egg incubation, Aesculapian Snakes like to make use of heat generated by "raping" substrates such as composts, manure heaps, sawdust, bark, etc. They lay their eggs to such place often collectively. The foundation of artificial hatching places is one of possibilities of the active support of the population. It is known from literary sources and results of surveys executed in the territory of the Czech Republic that the success of reproduction (in particular in isolated populations) is not by far 100% and quite often 50% of eggs do not complete the incubation process without any reason. A survey focused on this issue could be used to guide our further efforts in this field.

Content of the measure:

The research of the reproduction will be a temporary experiment and it will be executed in the in the first phase of the Action Plan. It will focus on the creation of so called experimental reproduction areas offering individual substrates (sawdust, bark, manure, garden waste) and their various ratio mixtures. Chosen hatching places will be monitored by data loggers in order to find out temperature and humidity conditions in the hatching place. In the autumn after the hatching of eggs or in the spring of the next year, hatching places will be checked and remaining eggs counted, found young snakes will be metered and weighed. Collected data will be compared to the following levels: various substrates, localities, seasons and regions (Podyjí and Poohří). Data loggers will be used to monitor also the existing collective hatching places in Carpathians.

3.4.2 Telemetric Study

Motivation:

Migration of Aesculapian Snake through forest growths was observed in Podyjí. Young snakes are quite often found on forest ways and roads (sometimes killed by bikers). Thus, it is obvious that snakes migrate through the forest, too and make use of it. Their observation in this type of biotope without the application of telemetric systems is very rare. Exact information is missing on what kind of hollow tress snakes prefer and how is the population affected by forest husbandry. Within the territory of Carpathians, snakes were found exposed to a significant risk when migrating across a road. It would be desirable to use telemetry to find what the

circumstance of the snakes´ migration are like (normally, they live in the proximity of the road, they migrate in the mating period, they migrate from wintering habitats to summer habitats, etc.).

Unfortunately, given the snake´s body morphology, there is currently no other possibility but implantation of a radio transmitter to the abdominal cavity and such a procedure involves a high risk of dead for the monitored snakes. Therefore, such studies have to be properly considered and planned so that their outcomes for the protection of the species could outweigh the risk related to this method.

Content of the measure:

To collect detailed data on the relation of Aesculapian Snake to forest using telemetry (Podyjí). Migration in the proximity of the road and across the rod should be verified in Carpathians. The more general applicability of this method will be considered based on the results of the study.

3.4.3. Collection of Additional Data on the Species Ecology and Interspecific Correlations

Motivation:

Other data on the species ecology including but not limited to data on the behaviour at densely populated localities (dry stonewalls, hatching places) will contribute to the knowledge of important phenological characteristics (mating, activity, egg laying and the like). Such data will be used for making the species protection more efficient. From the point of view of interspecific relations, predation plays the dominant role. The natural predators of snakes are carnivorous animals and birds of pray. Within the territory of Poohří and Podyjí, significant losses may be caused by wild pigs (Sus scrofa). However, a potentially high level of risk involve allochthonnous predators including American mink (Mustela vison), racoon dog (Nyctereutes procyonoides) and racoon (Procyon lotor). Such collected data on predation effects will facilitate more efficient intervention, if necessary.

Content of the measure:

Web cameras or automatically triggered cameras may be used to collect plenty dated data from chosen habitats where snakes are staying for some time (places of permanent occurrence, hatching places, mating places). As the snakes are not disturbed by the observer, their behaviour is natural and may be better analysed. Collected data will be continuously evaluated. The predation effects will also be monitored by cameras and also using safe traps, analyses of the content of stomach and food vomited by anticipated predators (e.g. wild pig, mink, badger,

buzzard, pheasant). The measure will be implemented in all three occurrence localities.

3.5. Education and Adult Education

Snakes are bound to humans and anthropogenic structures in a different manner in each of the three localities. Thus, the relation of the residents to the snakes differs, too. Therefore, the adult education in every locality has to be approached differently.

3.5.1 Information Boards

Motivation:

Information boards at chosen frequent tourist places may eliminate intentional chasing of snakes because of fear or ignorance. This type of measure will be implemented mainly in the tourist areas in Podyjí and Carpathians. Such information boards were positively received by tourists in Podyjí (e.g. Šobes). Such boards should be installed in a limited extent in Poohří, too in particular at frequently visited places.

Content of the measure:

The installation of information tables containing text informing on the occurrence and the need to protect Aeskulapian Snake at the following places:

- Poohří – 3 boards (environs of Horní Hrad, along the tourist trail mark towards the ruins of the castle Himlštejn at Stráž n. O. and the mineral water spring at Korunní Kyselka).
- Podyjí – Nový Hrádek and outer tourist exposed places- Carpathians – information on the occurrence provided on information boards of nature trails

3.5.2 Information Materials

Motivation:

There are many local residents in Poohří who take pride in the occurrence of Asculapian Snake and they do their best to protect it. However, the region has recently seen quite a massive exchange of the inhabitants as real estate is being purchased by people who are not aware of the problem and they may kill the snakes. It would be desirable to create an information material for the owners of summerhouses, cottages and inhabitants of all municipalities where the species live and such a material would include all basic information on the determination of the species, its origin, life requirements, level of threatening, relation to humans (not venomous, rodent predators) and possibilities of its protection. Such an information material adapted to local conditions could also be distributed in information centres in Podyjí or, as the case may be, in the areas of the observed occurrence in Carpathians.

Content of the measure:

Design and production of folder leaflet or brochure

- in Poohří, the text will specifically focus on the local residents with aim at encouraging people not only to protect but to support snakes by pro-active measures (stonewalls maintenance, foundation of composts, taking snakes into consideration when restoring gardens or buildings). The text will include a reference to other web information sources – web site of the Agency of the Preservation of Nature and Landscape of the Czech Republic with a text describing the Action Plan, members of individual administration authorities or centres of the agency and the like
- Within the territory of Podyjí and Capathians, the target group of users of the information materials are first of all tourists to whom the wording should be adapted

3.6. Other Measures

3.6.1. Mapping of Suitable Biotopes in Boundary Sectors and Behind the Boundaries of the Current Distribution Range in Poohří and Podyjí

Motivation:

The mapping of potentially suitable biotopes behind the boundaries of the current home range in Poohří and in marginal sectors of Podyjí is a very important measure of the Action Plan. The results of the mapping in both regions will serve as a basis for the design of measures aimed at maintaining significant biotope and corridor elements (see the measure 3.1.2). Within the territory of Poohří, the mapping of potentially suitable biotopes in the existing home range requiring an intervention has already been executed (see annex 13).

Content of the measure:

A detailed mapping will create a database of potentially suitable biotopes of Aesculapian Snake (walls, heaps of stones, ruins of buildings and the like) and method of their maintenance and adaptation will be proposed. The mapping will be executed in Podyjí in the squares 7,160 and 7,162. Given the recorded sporadic findings out of the boundaries of the Podyjí National Park , the mapping of the biotopes will not be limited by the boundaries of the national park. Within the territory of Poohří, the mapping will focus on areas as behind the boundary of the current home range. The measure will be implemented in the first phase of the Action Plan so that the species could spontaneously occupy biotopes at suitable places of the original home range (the objective of the Action Plan). For the methodology for both regions see the Database of biotopes in the Framework of the Current Home Range in Poohří (Annex 13).

3.6.2. Hollow Tree Care

Motivation:

Hollow trees may serve as hatching places of Aesculapian Snake. Within the territory of Podyjí, egg clutches were found in tree cavities. Such valuable natural hatching places have to be protected and maintained both in open landscape and forest.

Content of the measure:

For the proposed care of hollow trees in open landscape and in forest see the Annex 22.

3.6.3. Support of Small-scale Farming

Motivation:

Aesculapian Snake lives in cultural landscape and considerably depends on farming methods. What is optimal is farming on small plots involving the formation of structurally complex landscape. The full re-implementation of such farming methods is not realistic, although farmers could get stimulated by positive financial environmental farming focused subsidies.

Content of the measure:

The Agency of the Preservation of Nature and Landscape of the CR should prepare proposal making it possible for farmers to make their choice as to one of the below subsidy type. Such subsidies were chosen in a way to make it possible for the creation and maintenance of habitats suitable for the species. The recommended subsidy types are as follows:

- Mezophilous and hydrophilic meadows (with preserved non-mowed strips of vegetation)
- Mountain and xerophilous meadows (with preserved non-mowed strips of vegetation)
- Pastures showing a rich diversity of species (without the obligation to eliminate the left (not grazed) vegetation)

If necessary, farmers will be consulted concerning the problem of environmental farming programmes. As well, they will be provided with support when adapting AEP parameters that require the coordination of OOP (delay of the date of mowing, leaving vegetation strips non-mowed and lifting the obligation to cut down non-grazed vegetation).

Should a convenient subsidy be not possible to be granted, a part of the land may be exempted from AEP and suitable farming methods could be supported from national programme funds.

3.6.4. Minimising Adverse Impacts of Development Projects

Motivation:

Construction works related to the development of new buildings, roads, etc. are highly risky for Aesculapian Snake. Such projects may destruct biotopes and involve conflicts with individual snakes. Therefore, it is vital to monitor the scheduled development projects in the proximity of the home ranges of Aesculapian Snake and prepare timely draft measures in order to eliminate adverse effects of such interventions.

Proposed measure:

Prepare a list of rules, recommendations and draft measures for new development projects in localities of the occurrence of Aesculapian Snake in order to mitigate or compensate adverse impacts. This methodology will be distributed to respective state administration authorities and concerned entities.

3.6.5. Minimising Adverse Effects Resulting from Other Interventions

Motivation:

A number of anthropogenic activities may threaten Aesculapian Snake. Some of such activities cannot be eliminated although their adverse effects affecting Aesculapian Snake may be at least eliminated by means of adherence to specific rules. Some principles may have a positive impact on the biotope (regular cleaning of habitats exposing them to sunshine) meanwhile individual snakes may get killed during their execution (see the chapter 1.4.4).

Content of the measure:

Formulation of principles of the execution of the following activities:

- Development of new and repairs of existing cycling trails (choosing the trail, date of the execution of works, use material)
- Repairs or roads and railways (date of intervention, training of workers)
- Mowing of vegetation below electrical lines (date of intervention, training of workers)
- Extermination of neophytes by employees of the river basin administration (date of intervention, training of workers)
- Operation of cut wood depository places (maintenance of areas, training of workers)
- Mowing of public areas (date and method of intervention, training of workers)

4. IMPLEMENTATION SCHEME

Tab. 5: ***IMPLEMENTATION SCHEME***

No.	Measure	Priority	Implem. period	Measure frequency	Link to other	Note
3.1.	**Biotope Care**					
3.1.1.	Care of hatching place	1	Throughout the plan	Every year	Will be completed by measure 3.4.1	
3.1.2.	Care of significant biotope elements and migration corridors	1	Throughout the plan	Every year	Measure partly follows up measure 3.6.1.	
3.1.3.	Care of other types of biotopes	1	Throughout the plan	Repeated measure	Measure partly follows up measure 3.6.1.	
3.1.4.	Restoration and maintenance of small water bodies in Poohří	2	Throughout the plan	Repeated measure		in Poohří, only
3.2.	**Care of species**					
3.2.1.	Protection of individual snakes when cleaning of ditches along roads	1	Throughout the plan	Every year		in Poohří and possibly in Carpathians (in connection with the measure 3.3.5. a 3.4.2.)
3.2.2.	Protection of individual snakes when migration across roads	1	Throughout the plan	Every year		in Poohří and in Carpathians
3.3	**Monitoring**					
3.3.1.	Monitoring of biotopes	1	Throughout the plan	Every year		
3.3.2.	Monitoring of hatching places	1	Throughout the plan	Every year		
3.3.3.	Estimate of the population size	1	Every 10 years (2 years study)	Repeated measure		
3.3.4.	Collection of add. data on snake occurrence	2	Throughout the plan	Repeated measure		
3.3.5.	Collection of basic data in Carpathians	1	By 2018	Every year		
3.3.6	Verification of other potential occurrence localities in the CR	3	As necessary			

3.4.	**Research and preparatory studies**					
3.4.1.	Reproduction research	1	By 2018	Every year		
3.4.2.	Telemetric study	2	By 2018	Repeated measure		Will be implemented in Podyjí and Carpathians
3.4.3.	Collection of ad. data on species ecology and interspecies correlations	2	By 2018	Repeated measure		
3.5.	**Education and adult education**					
3.5.1.	Information boards	3	Throughout the plan	Repeated measure		
3.5.2.	Information materials	2	Throughout the plan	Repeated measure		
3.6.	**Other measures**					
3.6.1.	Mapping of suitable biotopes in marginal sectors and behind boundaries of the current home range in Poohří and Podyjí	1	By 2018	Once-off measure		
3.6.2.	Care of hollow trees	2	Throughout the plan	Repeated measure		
3.6.3.	Support of small-scale farming methods	3	Throughout the plan	Repeated measure		
3.6.4.	Minimising adverse effects of construction	2	Throughout the plan	Repeated measure		
3.6.5.	Minimising adverse effects of other interventions	2	Throughout the plan	Repeated measure		

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6. ANNEXES

1) Current home range of Aesculapian Snake (*Zamenis longissimus*)

2) Fossil findings of Aesculapian Snake (*Zamenis longissimus*) above the Northern boundary of the current coherent distribution range

3) Distribution of Aesculapian Snake (*Zamenis longissimus*) in neighbouring countries

4) Database of findings of Aesculapian Snake (*Zamenis longissimus*) in the region of Poohří, Podyjí and Carpathians based on squares and credibility

5) Map of the current distribution of Aesculapian Snake (*Zamenis longissimus*) in Poohří

6) Database – verification of historic findings of Aesculapian Snake (*Zamenis longissimus*) in Poohří

7) Map of the current distribution of Aesculapian Snake (*Zamenis longissimus*) in Podyjí

8) Changes of the distribution of Aesculapian Snake (*Zamenis longissimus*) in Poohří

9) Map – Interconnection of localities and most significant migration of Aesculapian Snake (*Zamenis longissimus*) in Poohří

10) Photo documentation of factors threatening Aesculapian Snake (*Zamenis longissimus*)

11) Photo documentation of up-to-now measures for the protection of Aesculapian Snake (*Zamenis longissimus*) implemented in Poohří

12) Photo documentation of measures for the protection of Aesculapian Snake (*Zamenis longissimus*) implemented in neighbouring Germany

13) Results of detailed mapping of existing and potential biotopes of Aesculapian Snake (*Zamenis longissimus*) in Poohří

14) Map of biotopes proposed for renovation for the maintenance and interconnection of micro-populations of Aesculapian Snake (*Zamenis longissimus*) in Poohří

15) Map of the current and proposed home range (objective of the Action Plan) of Aesculapian Snake (*Zamenis longissimus*) in Poohří

16) Development of hatching places and follow-up care

17) Care of significant biotope elements and migration corridors

18) Care of other types of biotopes

19) Methodology – Protection of individual snakes when maintaining road ditches

20) Methodology – Monitoring biotopes of Aesculapian Snake in Poohří

21) Methodology – Monitoring of hatching places

22) Care of hollow trees