Preliminary data of herpetofauna inventory in Șinca Nouă’s area (Brașov County, Romania) with notes on used inventory methods

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Abstract. The herpetofauna inventory in the Șinca Nouă area (Brașov County, Romania) yielded 10 amphibian species (one salamander, three newts and six anurans) and six reptilian species (two lizards, four snakes). The distribution data presented is new county records. We provide information about species ecology and threatening factors in the area. The partial failure of the used cover board survey in the reptile survey was due to the elevated position of the study site (influence of neighboring mountains), the habitat type (mostly forested habitat with anthropogenic disturbance on open landscapes), the season of the year (in first part of autumn), the temperature of the environment (low air and soil temperature), the natural spot distribution of mountainous species and the loss of cover boards.

Key words: herpetofauna, inventory, coverboard survey, distribution, threatening factors

Introduction

Conservation of the herpetofauna is only possible with knowledge of the small scale distribution of amphibians and reptiles (e.g. Demeter et al. 2006). Even the large scale distribution of herpetofauna in Romania is a field studied only recently (cited in Ghira et al. 2002, Covaciuc-Marov et al. 2006, Demeter et al. 2006 and Strugariu et al. 2006). Some areas still lack herpetological inventory studies. Thus small areas such as the Șinca depression, have no literature data about the composition of its herpetofauna.

The primary objective of our investigation was to provide an up-to-date assessment of species richness in this area. Secondary objectives involved the estimation of relative abundance, delineation of local ranges for each species, and the implementation of survey methods that would assure the repeatability of the project in the following years. These data will be used in future management of the area.

Materials and methods

The study area is situated in the contact zone between Făgăraș and Peșcani Mountains and is part of Natura 2000 network (Figure 1.a.). The area can be described by high hills of 600-800 m (e.g. Dealul Strâmba with 791 m), in the North-Western part, high peaks of 1,300-1,500 m in the South (e.g. Muchia Lungă with 1,481 m, Făget with 1,415 m, Capul Muntelui with 1,326 m) and high hills in the Eastern corner between 800 and 1,000 m (e.g. Vârful Ciutei with 974 m). All these features together with the depressions of the Șinca (below 550 m) and the Strâmbo Rivers form the geographically closed Șinca valley, were the Șinca Nouă village is situated (Figure 1.c.).

Some data on the herpetofauna in the Șinca Nouă area (Brașov County) was recorded in 2005-2006 (B.P., C.P), whereas a comprehensive inventory of amphibians and reptiles was conducted in autumn 2006 (T.S., J.S.). In 2005-2006 we conducted a general research to identify the presence and distribution of herpetofauna elements in the area; we recorded data on reproduction places of amphibians. In addition, we provide range maps for each observed species in the study area that are based on the presence of the species in 500 x 500 m squares according to the Universal Mercator System (Lehrer and Lehrer 1990). We also provide a map of the main habitat types with predicted influence on the distribution of the herpetofauna in the study area (Figure 1b).

In autumn 2006, our primary inventory methods included...
general and transect research, and in case of reptiles, coverboard surveys (survey of artificial cover objects on transects; Cheung and Gent 1995).

In the autumn session, on the first day of the study (18.08.2006.) we checked the study area for suitable places for coverboard transects. We chose 9 sites where reptile species were seen before or where main characteristics such as structure, exposure, vegetation, etc. appeared suitable for a reptilian habitat. We selected places with S-, SE- or SW-exposure; mainly in habitats with transitional character between grasslands and shrubs or forested area (Figure 1b). The first coverboard transect followed a line between a shrub area and a slope characterized mainly by weed above 1 meter in height. Before the coverboard survey was started, we took note of a *L. agilis* specimen on this site. The second transect was situated on the transitional line between an older forest and a grassland. The third transect intersected a mixed area with parallel grass- and shrub land patches. The fourth transect followed a mellow vegetated grassland near to a forest edge. The fifth transect followed the trees near the path which bordered grasslands next to the village. This area showed the effects of overgrazing. The sixth transect was placed on a warm slope with sparse tree and shrub components. The adjacent area was also overgrazed. This place was inhabited by the *C. austriaca* and *N. natrix*. The seventh coverboard transect followed the line of inclined scrogs near to a grassland. The eighth transect followed the middle belt of a little hill with a transitional aspect between a

![Figure 1a. Location of the study area](image)

![Figure 1b. The main habitat types with predicted influence on the distribution of herpetofauna elements in the area and the location of the coverboard transects (black line - road, grey line - river, white - complex cultivation field and arable land, light grey - locality and pastures, dark grey - transitional woodland and shrubs, broad-leaved, coniferous and mixed forest.](image)
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Figure 1.c. The elevation levels of the study area

...grass-shrub land and a young forested belt. The place was inhabited by the *C. austriaca* and *N. natrix*. The ninth transect followed the circular edge of a glade at the base of the Făget peak. On the second and third day (29–30.08.2006) we placed the coverboards at their chosen transect, arranging 15-16 cover boards per transect (Table 1). The coverboard transects length were moving between 100-150 m. Each coverboard transect was visited and checked twice during the study, on 11th-12th and 18th-19th September 2006. In these time periods, the weather was convenient for a reptile search, according to this part of the year except for the last day (Table 2). The temperature of air in shade with 1 m under the refuge, the refuge air temperature (before searching) and the refuge soil temperature were sampled.

**Results and discussion**

**Data on distribution of the species**

The *Salamandra salamandra* (Linnaeus, 1758; Figure 2.a.) here is a typical inhabitant of deciduous (mainly the beech forests) and mixed forests (Fuhn 1960, Cogălniceanu, 1991, Török 2001). It prefers undisturbed forested areas (Sos 2007). Locally it is threatened by deforestation and chemical pollution (e.g. fisheries) of streams used by their larvae (Lftime 2001).

*Mesotriton/Ichthyosaura alpestris* (Laurenti, 1768; Figure 2.b.) is usually a common species at this altitude, connected to forested habitats (Cogălniceanu et al. 2001). Based on the first investigation we could predict that the *M./I. alpestris* is not abundant in the area due to the lack of the undisturbed breeding ponds. Several suitable breeding ponds, which are located on pastures near to forested areas are frequently disturbed by the great number of grazing cattle. The species are using ponds located in the undisturbed zone such as the forest. It is threatened also by the destruction of small periodical pools by big machines used in deforestation and by deforestation itself (e.g. Gherghel and Ile 2006, Strugariu et al. 2006).

*Lissotriton vulgaris* (Linnaeus, 1758; Figure 3.a.) is a lowland species, but it may appear even in mountains (Cogălniceanu et al. 2000), usually in the marginal areas of mountains (Török 2001). It breeds in sun-exposed small forest pools and in puddles on forest paths, but in higher elevation like this area it uses pools situated in open area like pastures and meadows, where the pools are warmer with rich
water vegetation (Fuhn 1960). Its distribution in the area is limited by the climatic factors, by the lack of breeding places and by the pool disturbance by cattle.

The typical habitats of *Triturus cristatus* (Laurenti, 1768; Figure 3.b.) are larger and deeper stationary water bodies (Cogălniceanu et al. 2000, Hartel et al. 2005). At lower elevations it can be found in both forested and open landscapes, at higher elevations it prefers pools situated in open areas (Nečas et al. 1997), such as the entrance of Strâmba valley. The distribution of this species in here is under the effect of climatic factors and the disturbance of the breeding places.

**Table 1.** The summarized results of the coverboard survey in the two time period. Abbreviations: Tr – transect, Cb – coverboard, juv. 2006. - 2006’s hatchlings

<table>
<thead>
<tr>
<th>Nr. Transect</th>
<th>Cb nr. (29-30.08.06.)</th>
<th>Animal disturbed Cb</th>
<th>Animal Reptile under Cb</th>
<th>Animal Reptile on Cb</th>
<th>Animal Reptile in open</th>
<th>Other animals Cb nr. (11-12.08.06.)</th>
<th>Animal disturbed Cb</th>
<th>Animal Reptile under Cb</th>
<th>Animal Reptile on Cb</th>
<th>Animal Reptile in open</th>
<th>Other animals</th>
</tr>
</thead>
</table>
Table 2. Weather conditions in survey days.

<table>
<thead>
<tr>
<th>Data</th>
<th>Shaded air temperature</th>
<th>Light intensity*</th>
<th>Cloud cover percentage</th>
<th>Wind</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.09.2006</td>
<td>15-25°C</td>
<td>bright</td>
<td>0-25%</td>
<td>slight breeze</td>
</tr>
<tr>
<td>12.09.2006</td>
<td>15-25°C</td>
<td>bright</td>
<td>0-25%</td>
<td>slight breeze</td>
</tr>
<tr>
<td>18.09.2006</td>
<td>20-29°C</td>
<td>bright</td>
<td>0-25%</td>
<td>slight wind</td>
</tr>
<tr>
<td>19.09.2006</td>
<td>10-12°C</td>
<td>hazy</td>
<td>75-100%</td>
<td>slight wind</td>
</tr>
</tbody>
</table>

* categories are: bright, hazy, dull

The Bombina variegata (Linnaeus, 1758; Figure 4.a.) is a specific mountain species. It seems to be the most common species of this area, but that estimation might be erroneous, because the species is strongly associated with the small temporary water bodies, where it is easy to detect (Schmidt 2005, Sos 2007). In reality the species is overrun by the number of the B. bufo. B. variegata inhabits a great variety of habitats (Fuhn 1960). It is not threatened in the area. It can also breed in disturbed pools (e.g. Cogălniceanu, 1991). The population size depends on the number of pools, thus locally the species is abundant.

Bufo bufo (Linnaeus, 1758; Figure 4.b.) mostly inhabits the zone of mixed forests in mountainous landscapes, but it often appears near human settlements (Nečas et al. 1997). This is true for the population around Șinca Nouă as well. It reproduces in pools and forest ponds (Cogălniceanu et al. 2000, Hartel et al. 2005). In Strâmba valley the oldest fishpond is used by a great number of B. bufo for reproduction. Even in the middle of summer and in autumn a considerable number of toads are killed on the not frequently(!) used forest road in Strâmba valley. The area can support a large population of B. bufo due to the high percentage of forest cover and the lack of frequently used roads (Hartel et al. 2006). The fish occurrence in the oldest fishpond seems to bee low. We also saw one B. bufo specimen on a coverboard transect (Table 1.).

Hyla arborea (Linnaeus, 1758; Figure 5.a.) prefers open sun-exposed habitats near small and medium-sized pools with littoral vegetation (Nečas et al. 1997, Cogălniceanu et al. 2000). Reproduction takes place in small periodical pools or small fishponds. In the study area, the species is threatened by loss and disturbance of breeding places (e.g. Iftime 2001).

Pelophylax ridibundus (Pallas, 1771; Figure 5.b.) is a predominantly aquatic, thermophilous frog (Nečas et al. 1997). It can be found in fishponds and rivers (Hartel et al. 2006). In this area the population growth is limited by the climatic factors and by the small number of proper habitats. It is represented only by few exemplars. Specimens with characters similar to P. esculentus klepton were identified.

Rana dalmatina (Fitzinger in: Bonaparte, 1838; Figure 6.a.) is a typical inhabitant of light deciduous forest margins, clearings and meadows close to the forest or to the transitional wooded paths (Fuhn 1960, Nečas et al. 1997). This is characteristic for the population of Șinca Nouă too. It breeds in different water body types ranging from small pools to fishponds. After the mating period it is widespread in the area even in the damp meadows. The sedentary exemplars are easy to detect in rainy periods. It’s threatened by deforestation and by loss of breeding pools (e.g. Iftime 2001). This frog is common species in the study area. We also found one R. dalmatina specimen using a board during the second coverboard survey time period (18-19.09.2006.; Table 1.).

Rana temporaria (Linnaeus, 1758; Figure 6.b.) prefers wet and shaded habitats near water bodies (Cogălniceanu 1991). In the reproduction period it occupies even water bodies with large fish popu-
lations (Cogălniceanu et al. 2001). In the depression of Șînca Nouă this frog is less abundant than the *R. dalmatina*. Probably the open depression is not preferred by the *R. temporaria*, and for that reason the frog appears near tree covered river valleys (see also Sos 2007). An inter-specific competition between the two brown frogs is also possible (Hartel 2005). Also in the mountainous areas this species is quite common (e.g. Török 2001).

In the Șînca Nouă area, the *Lacerta agilis* (Linnaeus, 1758 also with *L. a. var. erythronotus* Fitz. form; Figure 7.a.) inhabits various dry and moderately warm habitats: edges of forests and fields, meadows, gardens (Fuhn and Vancea 1961), but it avoids parts of the area with intensive reaping (Graham 1995). In this altitude, where a change of a few degrees in the average environmental temperature can largely effect the surface of habitat available for reptiles (Thomas et al. 1999), the *L. agilis* is restricted to slopes with S- and SW-exposition. We can meet a well-preserved population we can meet on the NW shore of the oldest fishpond. The small but reproductive population is supported by the perfect nesting sites with S-exposure, a 30-40° slope with light, sandy soil, and available prey species (e.g. Orthoptera). In the other part of the area populations are less concentrated. Where possible this lizard follows the clearings along the road margins (Stugren 1957).

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**Figure 2.** The distribution of *S. salamandra* (a) and *M./I. alpestris* (b) in the study area.

**Figure 3.** The distribution of *L. vulgaris* (a) and *T. cristatus* (b) in the study area.
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**Figure 4.** The distribution of *B. variegata* (a) and *B. bufo* (b) in the study area.

**Figure 5.** The distribution of *H. arborea* (a) and *P. ridibundus* (b) in the study area.

**Figure 6.** The distribution of *R. dalmatina* (a) and *R. temporaria* (b) in the study area.
On transect during the first survey period (11-12.09.2006) we found one *L. agilis* skin underneath a coverboard, which proved the use of coverboards by a lizard (Table 1). Two *L. agilis* hatchlings used the upper part of the board for thermoregulation. 10 active *L. agilis* hatchlings were seen on different transects. In the second survey period (18-19.09.2006) we did not find any reptiles using coverboards. But were seen 15 in open active *L. agilis*.

The area interestingly lacks *Zootoca vivipara* (Jacquin 1787). At higher elevations in same habitats such as the ones adjacent to Șinca Nouă, the *L. agilis* is usually replaced (as the altitude gradually increases) by *Z. vivipara* (Stugren 1957). The cause of its absence is unclear in comparison with its distribution of the lizard in the neighboring areas. Distribution data of this species in Brașov County is deficient, and just recently is it under research, but it seems to follow the forested southern part of the county at higher elevations (Amphibian and Reptile WorkGroup, Milvus, unpublished data 2006). We identified the remains of a proper habitat for the *Z. vivipara* and *V. berus* in the S-E part of the area, destroyed by overgrazing. In the lower part of the area the over-reaping of the meadows, which replaces the transitional character of the habitats made the reptiles populations sensitive too.

*Anguis fragilis colchica* (Nordmann, 1840; Figure 7.b.) prefers open wood margins, clearings, and places along the roads. Because it is a slow reptile, living in shelters, its habitat is characterized by a dense grass cover, high levels of humidity and with sun-exposed parts or natural shelters (rocks, logs, etc.; Sos 2007). We predict that it is widespread in the transition zone between the meadows and woodlands or forests but not concentrated. Sometimes they are killed by locals due to the lack of proper information (Covaciuc-Marcov et al. 2006).

In the first survey period (11-12.09.2006.), we found two specimens of *A. f. colchica* under two cover boards in two different transect (Table 1.). In the second survey (18-19.09.2006) one active *A. f. colchica* was noticed.

*Natrix natrix* (Linnaeus, 1758; Figure 8.a.) seems to be the most common snake species in the area (e.g. Török 2001), but similarly to *B. variegata* it is associated with the existent water bodies, and at these sites its population is concentrated. However it can be occasionally found far from water, were it hunts brown frogs or even toads (Sos 2007). Its number mostly depends on the existence and state of wet habitats, food availability, and the presence of undisturbed nesting sites.

*Coronella austriaca* (Laurenti, 1768; Figure 8.b.) is a hiding, solitary snake, which occurs in low density (Neças et al. 1997). In Șinca Nouă its predicted distributions follows the warmer and heterogeneous transition zone between the meadows and the transitional woodlands or forests. It is absent from compact forests and agricultural landscapes.

One dead specimen of *Zamenis longissimus* (Laurenti, 1768) was found in the south-east part of the study area. We (B.P. and C.B.) found two more dead individuals and one alive, crossing the main road between Șinca Noua and Șinca Veche in spring/early summer 2007. The possible habitat of this species can be the S-W exposed flank of Șercaia river valley with proper sun-exposed forest margins, bushy slopes, forest clearings and thin deciduous forests. The stony terraces of roads in close vicinity of forests or bushes, offering some wet places can be a proper habitat too (Forvith, E., pers. com). However it frequently reaches elevations near 650 m, the snake is considered to be a rare snake in the area (Fuhn and Vancea 1961).

Two dead specimen of *Vipera berus* (Linnaeus, 1758) were identified near of the main road near to the north-west entrance of the village: one, with smashed head, probably thrown into the ditch after people had killed and another one crashed by car (Hegyeli Zs., pers. com.). Because the common viper avoids modified landscapes by human activity and deforested areas (Neças et al. 1997), relict populations still exist in sun-exposed but humid habitats covered at least partly with forests in undisturbed areas.
Results of coverboard survey

The coverboards were used by a small number of reptiles (L. agilis and A. f. colchica; Table 1.). Surprisingly, 2 amphibians, 1 B. bufo and 1 R. dalmatina were found using the coverboards too.

The factors, which explain partially the poor results for the coverboard survey (see Table 1.) are pointed out below.

1. The elevated location of the study area. The study site is situated in a mountain area (Figure 1.c.). The autumn is coming sooner and the temperature is always lower than in the lowland parts of the country. The annual activity cycle of the reptile is constrained to be shorter than in the lowland zones (Gvoždík 2002).

2. Habitat type. The study area is mainly a forested area (Figure 1.b.). The open parts of the landscape are under the influence of anthropogenic activity, thus the reptiles are restricted to the transitional line between the grassland and shrubs or forested areas (Cogălniceanu et al. 2001). The north-facing hillsides are colder with not enough insolation.

3. The season of the year. The first part of autumn (September) is at the end of the reptiles’ annual activity cycle (Grbac and Bauwens 2001). The daily activity has one peak in the middle of the day between 11 and 16 o’clock due to the temperature. For that reason the coverboard survey has limited time. The main activity of the reptiles is migration to the hibernation sites (Fuhn and Vancea 1961). Some
of them stop feeding (mainly the snakes). The only reptiles active and feeding are the hatchlings of the current year. The case of the adult *A. f. colchica* is particular (see *The environmental temperature factor*).

4. The environmental temperature factor. The microhabitat under the coverboards is specific due to the exposure, the habitat type and structure (Huey et al. 1989). The coverboard air temperatures in considerable number of cases exceed the shaded air temperature. The refuge soil temperatures are the lowest sampled data (Figure 9.a,b,c,d). The preferred body temperature of *L. agilis* ranges between 30-33°C (Avery 1982), of *A. f. colchica* and *C. austriaca* is around 23°C (Cheung and Gent 1995, Gaywood and Spellerberg 1995) and for *N. natrix* around 26°C (Cheung and Gent 1995). The species can experience and tolerate sometimes broad range changes of body temperature (e.g. *A. f. colchica* 14-29°C, *N. natrix* 15-36°C; Cheung & Gent 1995, *C. austriaca* 10-31°C; Gent and Spellerberg 1996), but they use thermoregulation to keep the body temperature preferred by them. If the temperatures of the microhabitats are not suitable for the thermoregulation they will stay inactive. Lower body temperatures than preferred are experienced at the beginning of daily activity, at that time the main activity of reptiles is thermoregulation (Huey 1982). For a long activity time reptiles need to spend more time on temperature in the preferred range, but we can see in the figures that the shaded air and the refuge soil reach the preferred temperature rarely, even in the warmer middle of day (Figure 9.a, b, c, d). The suitable temperatures for activity are higher than shaded air and the coverboard air temperature. But the key factor of the reptile’s activity is the soil temperature, which in this time of the year is too low for reptiles. The sun is not capable to increase the soil temperature which is just a few percent higher than the colder night soil temperature. Even under refugue the soil temperature is very low, mainly due to the conductivity of the surrounding colder soil layers. The reptiles’ refuges in the colder nights are the holes and fissures of the soil. The activity is started just when the soil temperature reaches a certain level. In this part of the year this temperature is rarely reached, and when it is reached, it lasts only a short period. Under this condition the reptiles choose to remain under the surface to save energy. In case of a colder day (e.g. 19.09.2006.; Figure 9.d) the daily temperature falls below the temperature zone preferred by reptiles and even if the next day is warm the soil temperature just partially recovers.

The activity temperature of *A. f. colchica* is greatly influenced by its prey’s ecology: earth-worms and slugs (Fuhn and Vancea 1961). The lizard is capable of activity at lower temperature due the avoidance of warmer temperature by the prey items. For that reason the activity period of this species is longer even at elevated zones. The hatchlings of the current year are still active in this colder part of the year. They try to profit in these last warmer days to gain energy by hunting.

5. Spot distribution of the mountain species. The use of coverboards transects for the mountain species is more difficult due to species in the area (Cogălniceanu 1991, Török 2001). The difficult applicability in case of the snake species is even higher, because they have a solitary life style. The concentration of the snake population is inhibited by the lack of not fragmented suitable habitats. This has both, natural and anthropogenic causes.

6. Coverboard loss. The use of coverboards is highly compromised by activity of local people. 36% of the boards were missing by the end of this study. The coverboards of two transects were partly, while coverboards from another two transects totally were totally removed. The rule will be: if the coverboard transect is crossed by a road or pathway, the boards next to the road or pathway will disappear. This method can be used only far from human activity. Wild animals did not significantly disturb the boards. Small mammals can present a minor disturbance on reptiles, using the boards, when they are using the boards in the daylight (Table 1).

The small number or reptiles found on transects and the missing coverboards make the count of relative abundance impossible, the method provides just data for distribution of the species in the area.
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Figure 9. The correlation results between shaded air temperature and the refuge air (black) and soil temperature (white) sampled in the 11.09.06. (a.; time period: 1213-1751), 12.09.06. (b.; 1132-1435), 18.09.06. (c.; 1207-1424) and 19.09.06. (d.; 1035-1238) survey days. The effect of the shaded air is in small percent responsible for the pattern of the two other temperature data. The striated area is the preferred temperature range of local reptile.

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References


