

PRELIMINARY STUDY OF *GLOYDIUS HALYS* (PALLAS, 1776) ISOLATED POPULATION IN NOVOSIBIRSK REGION: SOME ECOLOGICAL FEATURES

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INTRODUCTION

The Halys pit viper (*Gloydius halys* (Pallas, 1776)) is the most wide distributed species of the *Crotalinae* subfamily in North Eurasia, from Russian Far East (river Zeya) to the East of Transcaucasia and from Sought Siberia to Afghanistan [1]. The north board of its area passes in the lower reaches of the river Zeya, along the southern slope of the Yablonovyy range, valley of the river Selenga and coasts of Lake Baikal to the Stanovoy range, through the Eastern Sayan Mountain, steppes of North Khakasiya, mountains of Kuznetskiy Alatau, north-west foothills of Altai and steppes of North Kazakhstan to the mouth of the Volga river [1, 2, 3]. The modern habitation of Halys Pit Viper (*G. halys caraganus* (Eichwald, 1831)) in the mouth of the Volga river do not supported and unlikely [4].

In the West Siberia territory occur only the *G. h. halys* subspecies [1, 2]. Its distribution there close relative with mountains and foothills of Altai-Sayan mountain system [3]. Peripheral populations of Halys Pit Viper in the north border of its area were recorded in Republic Khakasiya, Kemerovo region (mountains and foothills of Kuznetskii Alatau) and Novosibirsk region [3, 5, 6, 7]. Its distribution there has mosaic character in connection with natural habitat fragmentation [3]. Therefore, some habitat localities in the periphery of its range are not still revealed. It is a typical situation for many reptiles' species on the periphery territory of its area [e.g. 8, 9, 10].

Because of high level of habitat fragmentation and isolation, low numbers and abundance, marginal populations of Halys pit viper are vulnerable and needed in conservation. In the Kemerovo region and Republic Khakasiya this species include in the Red data book (categories II and IV respectively) [5, 6]. Therefore, investigation of ecology of *G. halys* marginal populations is important for elaboration of its conservation strategy.

M. Pestov in 2003 was discovered the isolated population of *G. halys* in the middle part of Berd' river valley [11]. It was the first record of this species on the territory of Novosibirsk region. This investigation was began for obtain more specific information about distribution, ecology and morphology of it species in this territory. In this work, preliminary data about some aspects of *G. halys* ecology from isolated population in Novosibirsk region are presented.

MATERIAL AND METODS

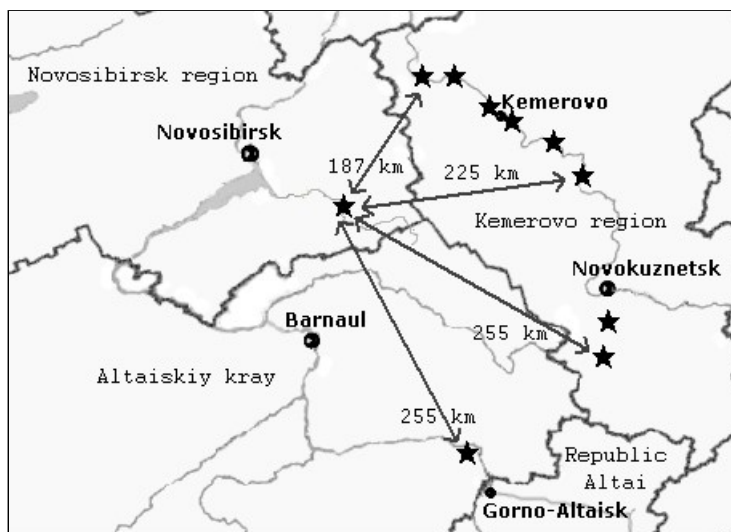


Figure 1. Distances between population in Novosibirsk region and populations in adjacent regions.

Field studies of *G. halys* in the south-east part of Novosibirsk region was conducted in August, 17-21 2006 and July, 6-10 2007 (fig. 1). The study area has situation in the valley of Berd' river on the territory of Maslyaninskiy and Iskitimskiy districts. In this locality the Berd' river traverses north-west branches of Salair range (foothills of Altai-Sayan mountain system). Because this region difficult of access, field studies were not regular and permanent. The geographical characteristic of the study area is following: the relative height is around 100-150 m and the true altitude 300-350 m; average temperature in July +17,7° C; annual average temperature -0,3 °C; accumulated temperatures higher than +10 °C - 1700-1800 °C; precipitation-evaporation

ratio 1,3 [12].

G. halys observed in sample plots (30 x 30 m) and transects, using visual encounter surveys and special search of snakes in shelters (under stones, in rocky crevices and ect.) [13]. In addition, geobotanical description of sample plots was done. Identification of snakes' age was based on value of the snout to vent

length (SVL) amenably with the scheme of N. Kolobaev [14]. Temperatures of air and substrate were measured using a digital thermometer. Mapping of received data was executed in the program MapInfo Professional. The statistical processing of material was conducted in statistical package STATISTICA 6.0.

RESULTS

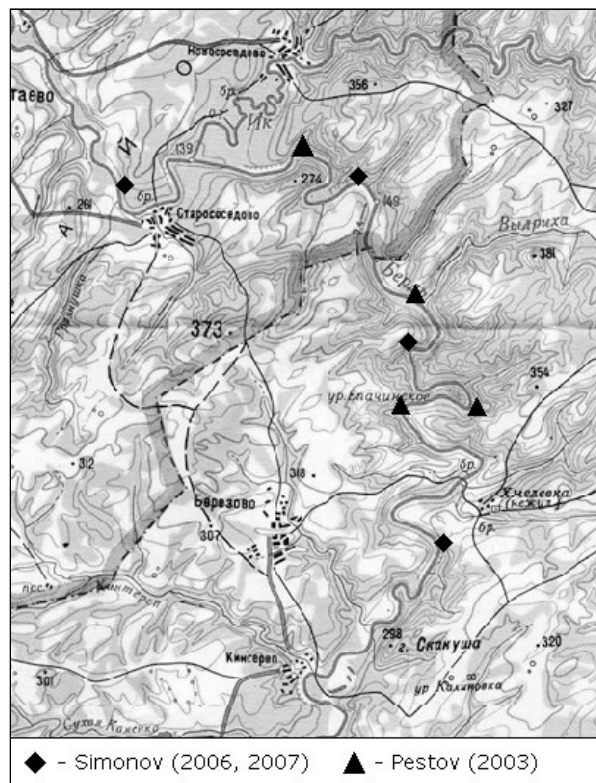


Figure 2. Distribution of *G. halys* in the Novosibirsk region (valley of Berd' river).

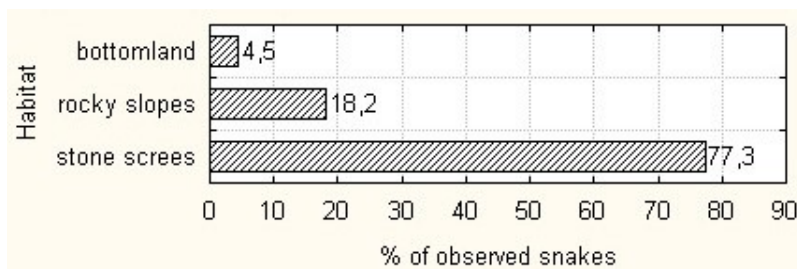


Figure 3. Ratio of *G. halys* observed in different biotopes (with the equal duration) (n = 44).

Was investigated the territory along riverbed of Berd' river in the middle part of its stream and some rock outcrops on 10-12 km distance from the river. Observational evidence that on the territory of Novosibirsk region the *G. halys* have a sporadic distribution and are presented by a series of local micropopulations only along the Berd' river. The total length of riverbed where occur this population around 24 km. The distance between single micropopulations is amount to 2-6 km (fig. 2).

Here, distribution of the *G. halys* closely associated with rock outcrops along the Berd' river. They inhabit only south and south-west stone screes and rocky slopes with rock and steppe plants. Edificators species: *Spiraea hypericifolia* L., *Caragana frutex* (L.) C. Koch, *Orostachys spinosa* (L.) C. A. Meyer, *Stipa* sp., *Artemisia frigida* Wild., *Artemisia* sp. Twice, the *G. halys* was encountered in the bottomland. Thus, the stone screes it is the most preferable habitat for *G. halys* in this region ($P < 0,01$) (fig. 3).

In field investigations were counted 44 individuals of *G. halys*. Most of them (72,7 %) were found in shelters (under stones) and only 12 snakes were active. Groups of pit vipers (2-4 specimens) were found under large stones most often. Generally, the abundance of *G. halys* greatly changes in different localities even in similar biotopes. It may be associated with seasonal

and day activity of snakes and with many other factors. Therefore, at present, I discuss only the maximal abundance. The maximal fixed values of *G. halys* abundance are 267 individuals per hectare in 2006 and 264 individuals per hectare in 2007, in the same habitat. It is a very high amount was recorded in the one of stone screes with south-west exposition. The detailed description of it is following. The summary area near

840 m²; tilt angle around 55°; stones in screes have 30-60 cm in average length (up to 1,5 m). The projective cover of basic plant species: *Caragana frutex* (1-2%), *Rubus fruticosus* L. (6-8%), *Galium ruthenicum* Willd. (3-5%), *Chelidonium majus* L. (4-5%), *Artemisia frigida* Wild. (3-5%), *Artemisia* sp. (2-3%), *Allium nutans* L. (1-2%). The woody layer is absent. Adjacent biotopes are scattered birch and aspen trees with tangle of *R. fruticosus* in bottomland; rock outcrops (tilt angel 80-90°) with lithophytes around. Respectively, it is the most favorable habitat from investigated for *G. halys*.

Because of the high naturally habitat fragmentation, different abundance in similar habitats and unknown completely area of distribution, the correct estimate of the *G. halys* numbers is very difficult. Approximately, the numbers of snakes makes 2500-3000 individuals as minimum.

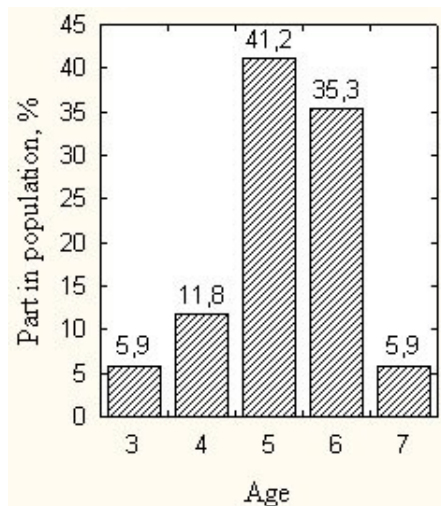


Figure 4. Age structure of the reproductive group of *G. halys*

In the reproductive group of the *G. halys* population are prevail 5-6 year old snakes, they compose 76,5 % (fig. 4). Juvenile snakes (less than 3 year age) were occurring only twice. The ratio of females and males in population are 2,4 : 1 or 70,6 vs. 29,4%. By now, data about daily activity of *G. halys* in the Novosibirsk region is deficient for the statistical analysis. Therefore, I display only data about encounters of active snakes in different time (fig. 5). Observations were conducted with the equal duration during the day and, as evident from fig. 5, the largest number of active pit vipers was recorded in the morning time (when air temperature amount 25-27° C and temperature of ground 22-24° C). At noon, the temperatures under stones less than on the exterior surface on 7-10° C and snakes skulk there. In the evening, temperature of ground is higher than air temperature. Thus, we can speak about morning activity peak of *G. halys* in summer on this territory.

DISCUSSION

In the Novosibirsk region has exist the most isolated (from known) population of *G. halys* in the West Siberia. Distance between this population and known populations in adjacent regions amount to 190-250 km (fig. 1). This locality represents the northwest most point of distribution of *G. h. halys* in Russia [1, 3]. At this territory, *G. halys* is stenotopic, while on the main

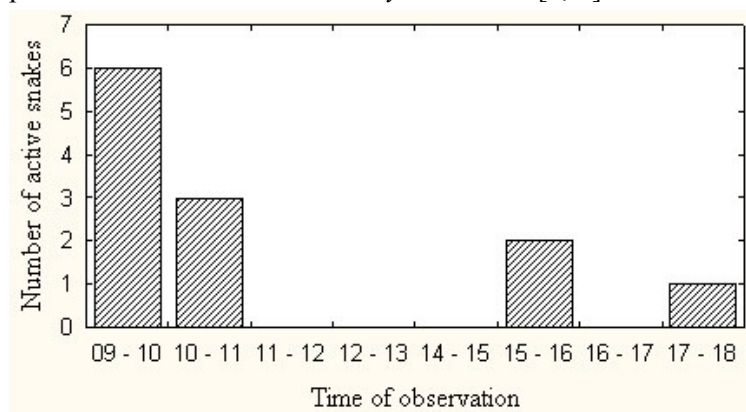


Figure 5. Occurrence of *G. halys* during the day

territory of its range it species inhabit different biotopes, include steppes, stone screes, brush woods, coniferous forests, subalpine meadows [1, 15, 16]. In the adjacent Kemerovo region, the Halys pit viper is stenotopic too, and live in similar habitats; but its distribution there is lot vaster [6, 7]. The similar situation in the northeast most point of its area (river Zeya) to be observed [14]. Thus, in the north periphery of its range, *G. halys* occur only in very district types of biotopes. These habitats provide for Halys pit viper favorable microclimatic conditions in the

adverse macroclimatic environment. Therefore, we can speak about high level of natural habitat fragmentation and restricted area of suitable habitats as about main factors limiting its distribution and numbers.

Data about abundance and numbers of local populations of *G. halys* is relatively poorly. In the Kemerovo region, the maximal abundance is 18-20 individuals per hectare [7]. In the Sought-East Kazakhstan (for *G. h. caraganus*), the maximal value 88 individuals per hectare and relative with structure of microrelief and plant cover [17]. Pestov (2003) don't made special counts, but he comment, that minimal abundance of *G. halys* in the valley of Berd' river is 10-15 individuals per hectare. Conducted counts display, that abundance of Halys pit viper in the southeast of Novosibirsk region have very high value comparatively known data from another areas. It abundance determined of the very small area of habitats (most often – less than 1 hectare) and snakes concentrate in this localities. Such situation is formed in similar conditions at some species of reptiles [e.g. 9, 18].

According to literature, the reproductive activity of *G. halys* set in 3 year age, when they have snout to vent length about 420-460 mm [15, Kolobaev N. unpublished data]. Data about age structure of its population in adjacent regions is absent. In the Zeya sanctuary (Amur region) *G. halys* have the similar structure of reproductive group when prevail 5-6 year old snakes, as in Berd' population [Kolobaev N.N. unpublished data]. Information about sex ratio in *G. halys* population is insufficiently too. Long-term counts in Zeya sanctuary display that female-male proportion in the Halys pit viper population is amount 1:1 [Kolobaev N. unpublished data]. But in the present study the sex ratio is 2,4:1. This result can be interpreted as bias of estimate because of different external factors influence on females and males. In the some research was showed that abiotic factors have influence on the frequency of snakes' occurrence [e.g. 19, 20]. Such

data about *G. halys* concerning differences in occurrence of females and males is absent. Further long-term researches for solving of this problem are necessary.

Depending on climatic conditions, weather, character of a habitat *G. halys* can be active in the afternoon, in twilight or at night [17, 21]. In the Berd' population the summer's morning peak of pit viper activity was recorded. Thus, in the summer a count of active snakes in transects may provide only in 8-11 a.m. In the rest of the daytime only observations in sample plots (with special search of snakes in shelters) are acceptable. However, additional data about evening and night activity are needed for analysis.

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ПРЕДВАРИТЕЛЬНЫЕ ДАННЫЕ ИЗУЧЕНИЯ ИЗОЛИРОВАННОЙ ПОПУЛЯЦИИ *GLOYDIUS HALYS* (PALLAS, 1776) В НОВОСИБИРСКОЙ ОБЛАСТИ: НЕКОТОРЫЕ ОСОБЕННОСТИ ЭКОЛОГИИ

Симонов Е.П.

Рассмотрены экологические особенности - распространение, биотопическая приуроченность, плотность, численность, половозрастная структура и суточная активность щитомордника обыкновенного (*Gloydius halys*) из изолированной популяции в Новосибирской области. Показано, что в настоящее время вид представлен стабильными микропопуляциями, его ареал здесь носит мозаичный характер в связи с естественной фрагментацией местообитаний. Наиболее предпочитаемые биотопы – каменные осыпи южной или юго-западной экспозиции с горно-степной растительностью (проективное покрытие 20-24%). Плотность отличается высокими значениями (до 267 особей/га) из-за крайне ограниченной площади пригодных местообитаний. В репродуктивной группе преобладают особи 5-6 года жизни (76,5%). В летнее время у обыкновенного щитомордника из данной популяции зафиксирован утренний пик активности.