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NEW DETAILS OF THE EURASIAN BEAVER'S, *CASTOR FIBER* (RODENTIA, CASTORIDAE), EXPANSION IN THE LOWLAND PART OF TRANSCARPATHIA, UKRAINE

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New Details of the Eurasian Beaver's, *Castor fiber* (Rodentia, Castoridae), Expansion in the Lowland Part of Transcarpathia, Ukraine. Barkasi, Z. — The present paper contains information on a new beaver colony discovered in the Chornyi mochar tract, which is located in the lowland part of Transcarpathia (= Zakarpattia Region). This rodent species disappeared from the territory of Transcarpathia most likely in the 18th century. Its first reappearance was recorded in 2003. Since, the Eurasian beaver has demonstrated a rapid expansion, primarily along the main rivers. The discovered by us colony allows to suggest that the beaver is continuing its dispersal, entering far into the main river's tributaries and other shallower water bodies. Consequently, we are witnessing not only the expansion of the species' geographical range, but also the enlargement of the number of habitat types occupied by the animal. The possibilities and supposed consequences of the species' further expansion within the tract are shown as well.
Key words: beaver, expansion, Chornyi mochar tract, Transcarpathia, Ukraine.

Introduction

The abundance of the Eurasian beaver (*Castor fiber* Linnaeus, 1758), a formerly widespread in Europe and Asia species, in the result of overhunting for its fur and castoreum (considered having medical properties) to the end of the 19th century has been drastically decreased and in some countries even became extinct (Salvesen, 1928). Already at the beginning of the 20th century, the first attempts on the beaver's reintroduction were made in northern European countries, and for the last 20–30 years beaver reintroduction programs have been implemented in most countries of Europe. The success of such work is guaranteed, because practically there is nothing to limit the beaver's expansion through its former range (Haarberg, 2007). Besides, as practice shows, reintroductions of primary consumers in most cases gave successful results (Zagorodniuk, 2006.).

Relatively little data are available about the beaver's distribution in the territory of the former Hungarian Kingdom, a part of which Transcarpathia was by the end of World War I. Hanák (1853) suggests that the species probably was widely distributed and had relatively large abundance, as it is evidenced by the names of many lakes and human settlements. However, due to overhunting as throughout Europe, by the end of the 18th century beaver populations had been declined rapidly. Besides, some sources mention that beaver meat was also highly valued and used for food during Lent, particularly in monasteries (Földi, 1801; Hanák, 1853). Findings of the animal in the 1790s were known from the Danube River, and from its tributaries on the south of the country (Grossinger, 1793). In the middle of the 19th century, findings of the species were known almost only from the Danube River, and zoologists considered the beaver as a rare and even a threatened species (Feichtinger, 1840; Petényi, 1844). Petényi in his fauna review (1844) encourages scientists carefully examine other water bodies of the country to have more comprehensive data on the beaver's distribution. After all, the last specimen was spotted in 1865 (Hódvisszatelepítés…, 2012), and after the species has not been sighted for more than a century.

Information on the Eurasian beaver's former occurrence and distribution in Transcarpathia are extremely scarce, and the exact time of its disappearance from the territory remains unknown. Turianin (Turianin, 1975) suggests that the beaver disappeared from Transcarpathia in the early 18th century due to overhunting for its fur and decline in food supply (deforestation of softwood species). We have not found data in available sources about the species distribution and abundance in lowland Transcarpathia in general, and particularly in the Chornyi mochar tract (a former wetland) and its vicinities. However, we can suggest that in the past the beaver probably had no high abundance in Transcarpathia. The reason for such assumption is that analyzing the voluminous and multifaceted work *Bereg vármegye monográphiája (Monography of Bereg County)* by Tivadar Lehoczky, a famous and celebrated ethnographer, archeologist and naturalist of the region, we have not found even a single mention of the beaver. Through more than 1800 pages of this enormous contribution, the beaver is never mentioned, neither as a common nor as a game species of the region for a period more than 800 years (Lehoczky, 1881–1882).

The beaver's reappearance in Transcarpathia has been observed since the 2000s. The first beaver lodge was discovered in February, 2005 in the vicinities of Nevitske village, Uzhhorod District (Potish, Bashta, 2005). According to the currently accepted views, the very first beavers came to the territory of Transcarpathia from Hungary and Slovakia. In Hungary, beaver reintroduction programs have been implemented since the 1990s, in frames of which 30 animals have been released in the northeastern, neighboring with Transcarpathia, region of the country. Later it was learned that most individuals immigrated probably to Transcarpathia (Haarberg, 2007). Beaver reintroduction activities have been performed in the neighboring Slovakia as well, however, most individuals of the northern and northeastern part of the country emigrated from Poland (Duha, Majzlan, 1997; Pachinger, Hulik, 1999). Therefore, there is a reason to suggest that the first beavers, which appeared in the territory of Transcarpathia, emigrated from the neighboring countries. As it turned out later, beavers have been spread in Transcarpathia very rapidly and, in 2007, at least 14 inhabited lodges were recorded. The beaver's dispersal occurred along the main rivers such as Uzh, Latoritsia, Borzhava and Tysa, and already in 2009 was known about 25 beaver colonies. As for 2012, the beaver was spotted at more than 60 locations, among which there were at least 50 colonies (Bashta, Potish, 2012).

The aim of the present work is to present a recently found beaver colony in the Mertse channel, which is situated in the Chornyi mochar tract in the lowland part of Transcarpathia, and also to analyze the possibilities of the beaver's further expansion through the drainage system of the tract.

A brief historical and geographical reference on the colony's location

The discovered beaver colony is located within the Chornyi mochar tract, which is a large area of a former wetland. The name "*Chornyi mochar*[1]" (or "*Serne mochar*", in Ukr.: *Чорний або Сернє мочар*, in Hun.: *Feketevagy Szernye-mocsár*) denotes the territory located in the central part of the Transcarpathian lowland, which until the late 19th century represented a huge wetland area. The formation of this unique biotope occurred during the Oligocene as a result of volcano eruption in the bottom of the Pannonian Sea — after the retreat of the sea a lake was formed at the site of the crater (Botlik, 2001). Later waterlogging occurred and the emerged grand complex of wetlands included marshes, peatlands and numerous ponds (Margittay, 2010).

It is worth to pay attention to the area of the tract named as Chornyi mochar and to its scope as considered in the present work. Thus, in the available sources there is a certain contradiction of views on what area exactly was considered under the name Chornyi mochar, formerly Serne mochar. It is known that the first mentioned name of the territory is "Serne mochar" (in Hun.: *Szernye-mocsár*) indicated on a map of Hungary made by Joannes Lipszky in Buda in 1808. The new name "Chornyi mochar" (in Ukr.: *Чорний мочар*) has been used since the 1990s in Ukrainian sources and given because of the characteristic color of peat soils, although such type of soils remained on a relatively small area of the tract (Botlik, 2001). It should also be noted that a relatively large part of the tract (ca. 14,000 hectares) between the villages Hat, Dertsen, Makarovo, Berehuifalu and Velyki Berehy until 1854 was constantly under water and was called "Great Lake" (in Ukr.: *Велике озеро*; in Hun.: *Nagy-tó*). However, on some historical maps, besides the Great Lake, much more territories are indicated as areas constantly or periodically being under water (Botlik, 2001). We have found the name "Serne mochar" on some modern maps as well, referring to the tract exactly in this broader meaning. Therefore, we propose to consider the area of the Chornyi mochar tract in limits determined based on, beyond literature sources, historical and current cartographic data, especially because there are no significant differences between the natural conditions of these areas (fig. 1).

In 1874, large-scale drainage of the territory had been started (Lehoczky, 1881–1882), which was finished in the 1950s (Botlik, 2001). As a result, large areas of peatlands and other unique wetland habitats have disappeared. Nowadays, almost the entire area of the tract is covered by agricultural lands. However, in the eastern part of the tract there are a number of artificial ponds created with the aim to restore a part of the former wetland areas, although these attempts have failed (Fodor, 1999).

Material and methods

About the first signs of the beaver's life activities in the territory of Chornyi mochar, namely within the main drainage channel of the tract called Mertse (in Ukr.: *Мерце*; in Hun.: *Mérce*), the author has been told by local hunters. Therefore, in order to reveal the possibly existing beaver colony we have conducted an observa-

[1] *Mochar* — from the Hungarian *mocsár*, which means a wetland.

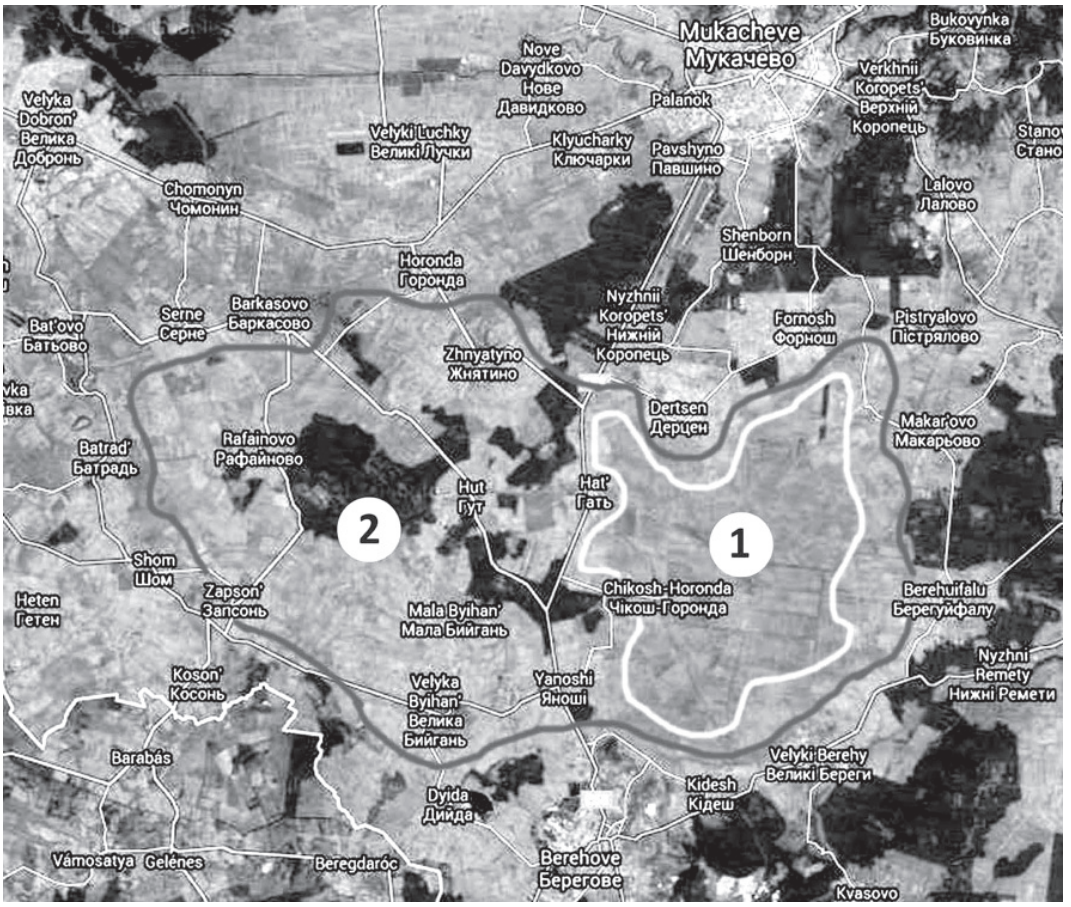

Fig. 1. The Chornyi mochar tract. Google map with modifications:
1 — the area of the former Great Lake; 2 — the general boundaries of the tract accepted in the present work.

tion of an approx. 10 km long portion of the channel in the northwestern part of the tract, downstream from the point upper from which traces of the animal's activity were not detected. During the observation, a certain set of signs of the beaver's activity indicating the possible and/or exact presence of the animal was recorded (a method used before in Bashta and Potish, 2012 and Koval, 2015). The real presence of the beaver within the territory is evidenced by standing, felled and waterborne trees with gnaw marks, also by the gnawed bark, trunks and branches of riparian trees and bushes, by the presence of two beaver dams and a number of beaver canals, trails and slides (figs 2–5). The author has also sighted an animal near the first dam; so did the hunters earlier.

Results and discussion

Description of the newly discovered beaver colony

The Mertse channel is a left tributary of the Latoritsia River and the main channel of the former Chornyi mochar wetland's drainage system. It should be noted that for different portions of the channel different local names had been formed, but we deliberately avoid using them for reasons of consistency and harmonization, and also because those names are not widely known, so they are often quite confusing. The channel is characterized by slow flow and it forms a number of islands of different size. In some places, the sick and dense riparian vegetation makes difficult to detect the beaver burrows. The riparian zone and the islands are covered by well-developed herbaceous and bushy, in some places woody, vegetation (figs 6–7). Willow trees (Salicaceae) predominate among woody plants, while among herbivorous plants — the species of Typhaceae, Cyperaceae and Poaceae. Such species as *Nuphar lutea, Trapa natans, Lemna* sp., and *Ceratophyllum* sp. have the highest density among the aquatic plants.

Fig. 2. A part of the first beaver dam.

Fig. 3. A branch of a riparian willow gnawed earlier.

Fig. 4. A beaver slide.

Fig. 5. Recently gnawed branches of a juvenile aspen.

Fig. 6. The channel's course at location 2 (see fig. 8).

Fig. 7. The channel's course at location 3 (see fig. 8).

In June 2015, during the observation of the Mertse channel's selected portion we have discovered a beaver colony located in the channel between the villages Barkasovo (Mukachevo District) and Hut (Berehove District). The colony is situated ca. 40 km far (in beeline) from the first discovered in Transcarpathia beaver lodge (2005) and ca. 20 km far (along the stream) from the Latoritsia River — the closest location inhabited by beavers (2012). Signs of the beaver's activity are distinguishable along the channel up to the vicinities of Hat village — ca. 5.5 km far from the colony's location (fig. 8). Two beaver dams were found in the observed portion of the channel, approximately of the same height (the water level difference is ca. 40 cm) and length (ca. 7 m).

Concerning the rodent's appearance in the Mertse channel, we suggest that beavers, which number in the Latoritsia river has been rapidly increased and they practically occupied the entire riverbed in the lowland part of Transcarpathia (Bashta, Potish, 2012), started to occupy the Latoritsia's tributaries searching for suitable habitats. Such assumption may be confirmed by the phenomenon of the beavers' gradual moving upstream in the channel. Consequently, we can talk about the next stage of the species expansion, namely

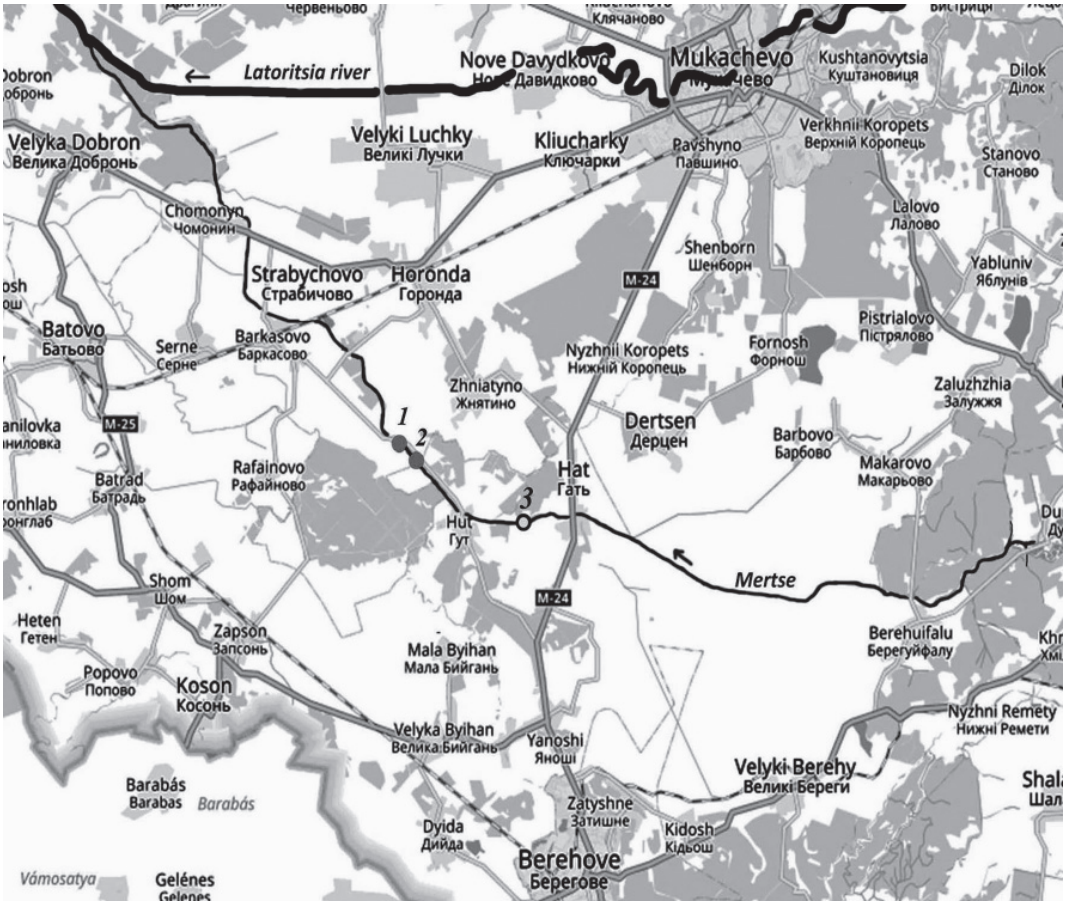

Fig. 8. The Mertse channel. Yandex map with modifications:
1, *2* — beaver dams, *3* — the location upstream from which no signs of beaver activities were detected.

about the exit from the main rivers and penetration into their more shallow tributaries. A similar phenomenon has been observed in the Carpathians, where stable beaver colonies have started to emerge (Koval, 2015).

The discovered colony has its peculiarities. On the one hand, it is most likely a burrow-type beaver colony, which could be indicated by relatively steep banks of the channel on its portion occupied by the beavers, as well as by the absence of beaver lodges. On the other hand, despite the fact that, according to literature, beavers can feed by a number of woody plants (Dyakov, 1975; Voloh, 1977), within the Mertse's course gnaw marks were detected exclusively on willow and aspen trees and bushes (Salicaceae). Furthermore, beavers settled in locations where relatively dense willow thickets occur.

Based on the revealed signs of the rodent's activities we can conduct a primary census of the colony. Thus, on current stage of the colony's investigation we have used the statistical beaver census method (according to Dyakov, 1975). This method has been widely used to determine beaver reserves in many countries and includes calculation of beaver settlements, followed by multiplication of their number by a calculation coefficient (in the former USSR the accepted coefficient is 4 or near it). As we could reveal two clearly distinguishable beaver settlements, we suggest that the colony consists of approx. eight individuals. Taking into consideration the size of tooth marks (4.25–8.20 mm) and the diameter of gnawed trees (7–45 cm), we can also suggest that all age groups (in particular young, one-, two- and more years old) are represented in the colony. Since detailed census and age structure analysis were not among the main goals of the present works, we are planning to conduct a complete re-census using more complex methods in order to estimate the colony's real state. Such data are required for further monitoring of the colony's growth.

Possibilities and supposed consequences of the beaver's further dispersal within the studied territory

Regarding the beaver's further dispersal along the Mertse, we believe that it will be promoted in particular by the presence of riparian willow thickets upstream and by the nearly stable natural hydroregime of the channel — during the last few years winter and summer floods did not occur, however they were common by the end of the 1990s.

Considering the intensiveness of the dynamics of the rodent's expansion in Transcarpathia, we can suggest that we should expect the emergence of new settlements on other portions of the channel. We also cannot exclude the possibility of the appearance of beaver settlements in those streams of the tract's drainage system where the water depth is higher than 0.5 m (Skorobogatov, Atemasova, 2012), as well as the appearance of new beaver dams built in order to adapt the habitat to the animal's needs.

There are agricultural lands, pastures and oak forests along the Mertse. Signs of the beaver's activity on these areas, i. e. beyond the channel's course, were not detected. This is most likely due to the relatively large amount of riparian and aquatic vegetation, which fully satisfies the animals' needs at the current stage of the population dynamics. In our opinion, beaver–human conflicts may occur in case of further expansion of the beaver upstream along the Mertse and secondary drainage channels of the Chornyi mochar. In those areas, the food supply and the riparian and aquatic flora are less diverse, which may cause the beaver's appearance on the neighboring agricultural lands, gardens and forests. The increase of the beaver's engineering activity is also possible in order to adapt the habitat and the hydroregime to the animal's own needs.

Concerning the still failed artificial attempts of restoration at least a part of former wetland complexes within the Chornyi mochar, it is worth to pay attention to the possible role of the beavers in this process. We have in mind that reintroductions give ability to communities and ecosystems to regain some of their lost features (Zagorodniuk, 2006). Consequently, beavers possibly will able to promote the restoration of wetland habitats with its specific flora and fauna on at least a part of the tract.

Conclusions

1. The beaver expands its range in the Transcarpathian lowland and penetrates the tributaries of the main rivers. In particular, it is evidenced by the discovery of a beaver colony in the Mertse channel, which is a left tributary of the Latoritsia River and the main channel of the Chornyi mochar's drainage system.

2. According to the detected signs of the beaver's activity, a stable colony exists in the channel, and the species is moving upstream searching for favorable habitats to colonize. The beaver's appearance in other parts of the former wetland's drainage system is also possible, where beaver dams and ponds could be constructed to control the channels' hydroregime and to create appropriate habitat conditions.

3. In case of the rodent's further dispersal within the Chornyi mochar a beaver–human conflict may occur due to the beaver's appearance on agricultural lands covering the most part of the mochar's territory, and also in the result of increasing of the beaver's engineering activities in order to adapt the environment to its own needs.

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