

## THE NORTHERN RACCOON (*PROCYON LOTOR*) IN URBAN ENVIRONMENT OF KYIV AND PERSPECTIVES OF FORMATION OF ITS WILD POPULATIONS IN UKRAINE

Oleksiy Nikolaichuk, Igor Zagorodniuk

*National Museum of Natural History NAS of Ukraine (Kyiv, Ukraine)*

**The northern raccoon (*Procyon lotor*) in urban environment of Kyiv and perspectives of formation of its wild populations in Ukraine.** — O. Nikolaichuk, I. Zagorodniuk. — Information on findings and status of the raccoon in the fauna of Ukraine and neighbouring countries is presented with an analysis of records in Polissia. The first case of occurrence of the raccoon in winter in a residential area of the Kyiv metropolis is described. The analysis of available sources shows the widespread practice of keeping raccoons as pets, and regular reports of raccoon escapes from captivity. Examples of records of free-living animals are given, that is, raccoons are able to survive without human concern, as well as to find food and shelter on their own. Findings in Kyiv testify the rapid synanthropization of the species, in contrast to exanthropic settlements in the neighbouring regions of Belarus, which by now disappeared. All these facts are considered as evidence for the first stages of formation of a synanthropic population of the species with the prospect of further emergence of a free-living population. Comparison of the data obtained in current surveys on alien species in Europe reveals the coincidence of such findings and the fact that they are a natural continuation of the invasion of the species in Europe with further expansion of the limits of free-living populations to the east. This is due to escapes from contact zoos and other places where the species is held in captivity, as well as the active adaptation to new living conditions due to climate warming and increased chance of survival of the species in natural conditions. The main habitats of the species under current conditions are not natural, but synanthropic locations, in particular residential areas of cities, but the prospect of exanthropization is rather possible. Considering all aspects of the broad expansion of the northern raccoon into the wild in many European countries, we conclude that currently there is a high risk of emergence of a similar situation in Ukraine. Such a scenario may have a negative impact on the local fauna unless we develop an action plan to address this issue.

Key words: northern raccoon, *Procyon lotor*, urban environment, Ukraine.

Correspondence to: I. Zagorodniuk; National Museum of Natural History, NAS of Ukraine; Bohdan Khmelnytsky St. 15, Kyiv, 01030 Ukraine; e-mail: [zoozag@ukr.net](mailto:zoozag@ukr.net); orcid: 0000-0002-0523-133X

Submitted: 07.01.2019 Revised: 21.12.2019. Accepted: 24.12.2019.

### Introduction

The northern raccoon, *Procyon lotor* (Linnaeus, 1758), is one of the most widespread species of carnivores acclimatized in many areas of the Palaearctic, including a number of regions close to Ukraine — the Caucasus, Belarus, Moldova, etc. (Rukovsky, 1958; Pavlov et al., 1973; Bobrov et al., 2008). Findings of the raccoon close to Transcarpathia, Ukraine, were reported from Hungary and other European countries (Heltai et al., 2000; Deegan et al., 2005).

The species' abundance in Europe is growing exponentially (Salgado, 2018), but in Ukraine records of the raccoon have not yet been described (Zagorodniuk, 1999, 2006). The nearest findings are known from the Belarusian Polissia, where in 1954 54 raccoons were released in swamps located on the right bank of the Prypiat river in Petrikov district, Gomel region (Rukowski, 1958). Raccoons had been observed in three districts of the region for 4 years, although in small numbers. Until recently these records have been the only information about the raccoon's occurrence in Eastern Europe. However, currently these data are out of date and it contrasts with the wave of information coming from the west of Europe along with the expansion of raccoons themselves.

The aim of this article is to describe the first case of observation of the raccoon *in situ*, to analyse the distribution of raccoons in captivity and the frequency of escapes, as well as to give a prediction regarding the formation of wild populations of the species in Ukraine.

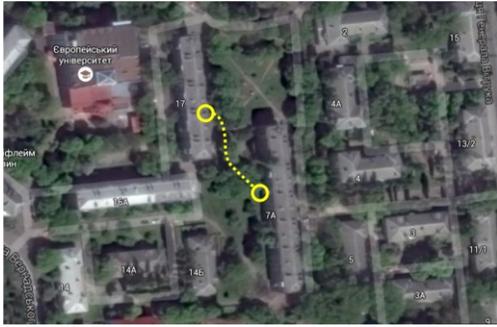


Fig. 1. Record site and the track of the raccoon among buildings of Sviatoshyn residential area (western part of Kyiv).

Рис. 1. Місця реєстрації та шлях переміщення ракуна у міжбудинкових просторах в житловому масиві «Святошин» (західна частина Києва).

## Observation of the raccoon *in situ*

### *Observations in Kyiv*

The raccoon was spotted by the authors twice in the same locality but in different seasons. The animal was observed in winter and spring 2011 in the centre of Sviatoshyn residential area of Kyiv:

- 1) In mid-January, the raccoon was spotted on a 5-story balcony, where it was feeding from a large bird feeder (the feeder was made of a fluorescent light lampshade 90 x 20 cm in size). The animal was spotted at noon. When approached by the observer, the raccoon stopped eating and moved to the branches of a linden which were reaching to the balcony. Then, being disturbed, it began to move through tree crowns and moved to the roof of the opposite 5-story building, where it disappeared at the entrance to the attic;
- 2) In spring, two or three months after the first record, the raccoon was observed in the crowns of trees (in leafless, early spring time), when it moved towards the same shelter.

The distinctive features of the species, including the striped tail, were clearly visible in both cases. Besides, the raccoon was spotted in the cold both times when the animal should have been hibernating. We can assume that the raccoon had recently escaped from captivity. A year after the raccoon was not spotted. These observations confirm three important details: 1) the raccoon was observed in the wild (*in situ*) under urban conditions of Kyiv, 2) the raccoon showed the possibility to survive under these conditions in winter, 3) the raccoon demonstrated foraging activity in winter.

### *On the records in Central Polissia*

Although researchers claim the extinction of the raccoon population in the Belarusian Polissia, there are mentions of raccoons in the Prypiat valley at the turn of the 20-21st centuries. One of the reports stated that "the findings were noted in Gomel region close to Ukraine, where a wintering group of raccoons was discovered in a tree hollow" (I. Zenina, in: Zagorodniuk, 2006: 24). In the Ukrainian part of the Chernobyl Exclusion Zone, the species has not been found yet: it is not mentioned neither in the review of vertebrates of the Chernobyl Zone (Vishnevsky, 2004; Gashchak et al., 2006), nor in results of recent fauna censuses (D. Vyshnevsky, oral report).

However, a description of the finding of the raccoon in the Chernobyl Zone appeared in a recent publication by I. Byshnev (Byshnev, 2006: 6), an experienced and trained zoologist. His description and details of the ecology of the "raccoon" resembles the characteristics of the of the raccoon dog *Nyctereutes procyonoides*, and, in our opinion, the author could have believed in a hunter's story. Ten years later, a photo of the raccoon taken in an abandoned house in Orevychi village of the Zone appeared in the photo album 'Chernobyl' (Ramanyuk et al., 2016) accompanied by zoological details, including the date of record (14.06.2004, photo by I. Byshnev). According to the letter from colleagues from the Polissia Radiation-Ecological Reserve, "the raccoon has not been noted in the territory since the very creation of the reserve" (L. Tsvirko, 25.06.2016). The investigation revealed that it was a staged shot with the animal brought in (which, as it turned out, was practiced by the mentioned specialist, who unfortunately did not respond to our letters).

The following was stated in a recent survey of the mammal fauna of Belarus: "At present, it is [the raccoon] is recorded only by single individuals ... However, the area of distribution has expand-

ed to the entire Prypiat river floodplain" (Savitsky et al., 2005: 113). The same is stated in a field key published in 2007: "may be found in the Prypiat river floodplain in the territory of the republic" (Kuchmel et al., 2007: 81). According to colleagues, after 2009 no records of raccoons have been reported in Belarus (O. Shpak, G. Januta, oral report). The disappearance of the population in Belarus is also suggested by other researchers, low body weight during winter and related developmental disorders such as pathologies of the skull and nervous system being considered among the main reasons of the species' disappearance (Savarin, 2007).

### ***On fled raccoons in Luhansk region***

The increasing demand for raccoons as pets has generated a wide supply. One of the raccoon breeding points that Ukrainian merchants are actively using is a brooder near Krasnodar (40 km far from the city)<sup>1</sup>. Many raccoons are bred there for sale (ca. 50 individuals), but about the same number of animals inhabit the adjacent forests and vineyards (up to 50 individuals), where the cubs are constantly trapped for sale at a significantly lower price (\$ 30–50). Raccoons often escape from transition points where the animals often remain to live. In particular, such escapes (basically, introductions) only in 2017 took place in two places: 1) Sorokynskiyi (Krasnodonskiy district, Samsonivka village, 7 individuals, summer 2017; 2) Luhansk, Kosiora village, 5 individuals, autumn 2017. Due to the current difficult conditions, such locations are impossible or dangerous to explore, so the fate of these raccoons is unknown.

## **Discussion**

***Raccoons and raccoon dogs in search systems.*** The raccoon *Procyon lotor* has a number of Ukrainian vernacular names, which complicates the analysis of reports on its findings. Some of these names, in particular the name "jenot [єНОТ]" coincide with vernacular names of the raccoon dog *Nyctereutes procyonoides*. For instance, *Procyon lotor* (L., 1758) is known in the Ukrainian scientific literature as "common jenot, or poloskun" (Markevych, Tatarko, 1983: 172), "jenot-poloskun" (Zagorodniuk, 1999: 204), "poloskun, or rakun" (Zagorodniuk, 2006: 24), and "northern raccoon" (Zagorodniuk, Emelyanov, 2012: 20).

Therefore, when monitoring the information space and interviewing colleagues and hunters, the authors explained data on which species exactly were being collected. Recently, there has been a clear tendency towards fixation of the name "rakun" (raccoon), which is noted both in the checklists of the mammal fauna of Ukraine (Zagorodniuk, Dykyy, 2012) and on the zoo websites (e.g., Kyiv Zoo)<sup>2</sup>, while the names "jenot" and "jenot-like dog" [= raccoon dog] were confined to *Nyctereutes procyonoides* (Zagorodniuk, Emelyanov, 2012). However, confusions arise regularly and when searching for information it is necessary to analyse what kind of "jenot" is being considered, since the animal market still widely uses the Russian "jenot" for the raccoon.

***Information about raccoons on the animal market.*** Analysis of online sources shows that raccoons are constantly offered to lovers of exotic animals. In particular, at the time of preparation of this paper (autumn, 2016) 7 offers of the "jenot-poloskun" were available on the electronic auction service <http://prom.ua>, all from one address in Obolon district of Kyiv. On the OLX sales site, dozens of "jenot" ads are available, including "jenot-poloskun" (*Procyon lotor*), "jenot-nosukha" [= white-nosed coati, or coatimundi] (*Nasua narica*), "coati" [= mountain coati] (*Nasuella olivacea*), "Ussuri jenot" [= raccoon dog] (*Nyctereutes procyonoides*), etc. (<https://bit.ly/2SIPBRG>).

The fact that raccoons are actively sold in Ukraine as pets is evidenced by the information on the website "Company of Planet of Animals": "Rare exotic animals — jenot-poloskuns [= raccoons] — have been raised in the brooder. They are already accustomed to living in an apartment... A fun toy for children. There are individuals for zoos, private collections, circuses"<sup>3</sup>. There are many

<sup>1</sup> The brooder is called "Your Raccoon" and it has been specialised on breeding raccoons, coatis, badgers and other species for more than 20 years (web-site of this brooder: <http://www.tvoi-enot.ru/>).

<sup>2</sup> Web-site: <https://zoo.kiev.ua>: article "Common raccoon, or jenot-poloskun, *Procyon lotor*" <https://bit.ly/34JMIT6>.

<sup>3</sup> Web-page "Jenot-poloskun, buy a jenot" on website "Animal Planets Company": <http://goo.gl/EgVlLv>

similar advertisements in different regions (Kyiv, Kharkiv, Lviv, etc.). The authors are also aware of the case of a raccoon escaping from an exotic animal seller in Luhansk in summer 2013, and apparently escapes happen quite often. Many raccoons are kept in petting zoos, including close to the wild, for example in such hotel-entertaining complexes as "Baika" and "Legend of the Carpathians" in Kosiv region<sup>4</sup>. It is clear that animals escape regularly from such facilities.

**Prospects of formation of a wild population.** Analysis of online sources showed not only the popularity of raccoons as objects of purchase and sale and keeping at home or in petting zoos, but also a significant number of cases of their escape from captivity, as well as their unexpected occurrence in various places in cities, particularly in outbuildings, garage cooperatives, and offices. Such cases have been noted for Kyiv and a number of more northern cities — Smolensk, Kaliningrad, Saint Petersburg, etc., mainly after 2010. Therefore, we have analysed the web resources of European research projects, including DAISIE and NOBANIS. These sources indicate that raccoons actively spread across Europe and have reached significant numbers in Central Europe (Stubbe, 1993; Winter, 2009; Bartoszewicz, 2011). The distribution map is shown in Fig. 2.

Describing the distribution of the species in Europe, the author of the DAISIE raccoon article points out that "There is a trend of range expansion towards South and East Europe. It is expected that the raccoon will expand its range in the already invaded countries very quickly", while regarding the ways of emergence the author states that "Escapes from fur farms, zoological gardens and from animal husbandries have occurred in France, Russia and several other countries in Europe" (Winter, 2009). This, in fact, is happening now. This process may become more active under global warming conditions, although urban landscapes still provide conditions suitable for the species, including mild winters, unlimited feeding sources and a significant number of anthropogenic shelters.

**Threats of introductions and expansion.** First, it is important to note that all of the studied cases of alien species impact on natural complexes are negative. This is a generally acknowledged fact. Secondly, it is important to remember that all countries where the raccoon expands its range programs to counteract were urgently adopted (Salgado, 2018; CABI, 2019). The species' particular niche (predatory arboreal mammal) practically does not overlap with that of other species (partly with the niche of the wildcat and pine marten), but its expressive polyphagia (Bartoszewicz, 2011) makes the raccoon much more competitive than all local predatory mammals. Particularly striking are the effects of its predation on "low" nesting and terrestrial nesting birds and their clutches, which numbers can fall by 10 % in 10 years (Schmidt 2003; Winter, 2009). Another possible threat is potential involvement in zoonoses (Winter, 2009, etc.). However, as our studies have shown, records in the Rabies Bulletin Europe database regarding Ukraine and submitted as "raccoon" should be interpreted as "raccoon dog" (!) (Zagorodniuk, Korobchenko, 2007), which is related to the above mentioned confusion in the vernacular names of these predators. Accordingly, reports on the "raccoon's" participation in zoonoses refer to the "raccoon-like dog", i.e. *Nyctereutes procyonoides*.



Fig. 2. Distribution range of the raccoon in Europe according to the review on web-resource DAISIE (Winter, 2009) and the location of the record described here from Kyiv and of the species' release in Luhansk region.

Рис. 2. Ареал ракуна північного в Європі за оглядом на веб-ресурсі DAISIE (Winter, 2009) та географічне положення описаної тут знахідки в Києві та місць випуску на Луганщині.

<sup>4</sup> For example, "Hotels in the Ivano-Frankivsk region keep wild animals [raccoons] in violation of the law". Magazine «Paralleli» (Online Edition). 16 March 2011. <https://bit.ly/2ZiyZMk>

## Conclusions

1) On the example of Kyiv, we can state the cases of keeping the raccoon as common pets rather than rare exotic animals occur quite often as well as their escapes into wild.

2) The described here case and other cases know from the media and social networks of raccoons being found in the wild and the facts of their escapes followed by practically free existence indicate the possibility of the species survival without human care, that is, they demonstrate the ability to find shelter and food and avoid predation during a long period of time.

3) Finding the species in the Kyiv metropolitan area confirms that the species is able to form synanthropic populations rather than exanthropic settlements previously known from adjacent regions of the Belarusian Polissia and which since have likely disappeared.

4) Formally, the raccoon may be included into the list of the fauna of Ukraine not as a phantom species, as it was indicated in surveys of 1999–2012, but as a species living in the wild. Although there is no reliable reason to state that a free-living raccoon population have already emerged, this process has obviously started.

## Acknowledgements

The authors sincerely thank the colleagues who contributed to the collection of information on raccoons in Polissia, including I. Zenina, O. Shpak, D. Vyshnevsky, and L. Zvirko. We sincerely thank P. Foroshchuk for valuable information about raccoons in eastern Ukraine. Our thanks to the reviewers for the important comments. Many thanks to Mariia Yahya for the English translation of the manuscript.

## References

- Bartoszewicz, M. 2011. *Procyon lotor*. Online Database of the European Network on Invasive Alien Species (NOBANIS). www.nobanis.org. Accessed on 20 June 2016. <https://goo.gl/67ht4X>
- Bobrov, V. V., A. A. Varshavsky, L. A. Khlyap. 2008. *Alien Species of Mammals in Ecosystems of Russia*. KMK, Moscow, 1–232. (In Russian)
- Byshnev, I. 2006. The Chernobyl Jungle. *Birds and We*. No. 8: 4–8. (In Russian)
- CABI. 2019. *Procyon lotor* (raccoon). *Invasive Species Compendium*. Web-site. CAB International, Wallingford, UK. <https://bit.ly/36gTs6f>
- Delegan, I. V., I. I. Delegan, I. I. Delekan. 2005. *Biology of Forest Birds and Animals*. Polly, Lviv, 1–600. (In Ukrainian)
- Gashchak, S. P., Vyshnevsky, D. O., Zaliskyi, O. O. 2006. *Vertebrate Fauna of the Chornobyl Exclusion Zone (Ukraine)*. СТРЯВРВР, Slavutych, 1–100. (In Ukrainian)
- Heltai, M., L. Szemethy, J. Lanszki, S. Csányi. 2000. Returning and new mammal predators in Hungary: the status and distribution of the golden jackal (*Canis aureus*), raccoon dog and raccoon (*Procyon lotor*) in 1997–2000. *Beiträge zur Jagd- und Wildforschung*, 26: 95–102.
- Kuchmel, S. V., L. D. Burko, B. P. Savitsky. 2007. *Key to Mammals of Belarus*. BSU, Minsk, 1–168. (In Russian)
- Markevych, O. P., K. I. Tatarko. 1983. *Russian-Ukrainian-Latin Zoological Dictionary: Terminology and Nomenclature*. Naukova Dumka, Kyiv, 1–412. (In Ukrainian)
- Pavlov, M. P., I. B. Korsakova, N. P. Lavrov. 1973. *Acclimatization of Game Mammals and Birds in the USSR. Part 1. Volga-Vyatka Book*, Kirov, 1–536. (In Russian)
- Romaniuk, D., J. Byshnev A. Kleschuk. 2016. Chernobyl. Illustrated Album. 2nd edition, revised. Publisher Romanyuk D. M., Minsk, 1–256. (In Belarusian)
- Rukovsky, N. N. 1958. The modern and “possible” range of the raccoon-striped raccoon (*Procyon lotor* L.) in the USSR. *Problems of Land Zoogeography*. Lviv State University, Lviv, 221–228. (In Russian)
- Salgado, I. 2018. Is the raccoon (*Procyon lotor*) out of control in Europe? *Biodiversity and Conservation*, 27 (9): 2243–2256.
- Savarin, A. A. 2007. On the cause of the disappearance of the raccoon (*Procyon lotor* L., 1758) in the Belarusian Polesie (pathophysiological aspect). *Modern Problems of Nature Management, Hunting and Animal Husbandry*. Kirov, 365–366. (In Russian)
- Savitsky, B. P., S. V. Kuchmel, L. D. Burko. 2005. *The Mammals of Belarus*. Publishing Centre of BSU, Minsk, 1–319. (In Russian)
- Schmidt, K. A. 2003. Nest predation and population declines in Illinois songbirds: a case for mesopredator effects. *Conservation Biology*, 17 (4): 1141–1150.
- Stubbe, M. 1993. *Procyon lotor* (Linné, 1758) — Waschbär. In: J. Niethammer, F. Krapp. (eds). *Handbuch der Säugetiere Europas*. Aula Verlag, Wiesbaden, 331–364.
- Vyshnevsky, D. 2014. Features of Zoocenoses of the Chernobyl Exclusion Zone in the Post-Emergency Period. *Scientific Bulletin of the Uzhgorod University. Series Biology*, 15: 20–23. (In Ukrainian)
- Winter, M. 2009. *Procyon lotor* (Linnaeus), raccoon (*Procyonidae*, Mammalia). In: J. A. Drake. (ed.). *Handbook of Alien Species in Europe*. Springer Science + Business Media B.V., 368. (Springer Series in Invasion Ecology; Volume 3).
- Zagorodniuk, I. 2006. Adventive mammal fauna of Ukraine and a significance of invasions in historical changes of fauna and communities. *Proceedings of the Theriological School*, 8: 18–47. (In Ukrainian)
- Zagorodniuk, I., Korobchenko, M. 2007. Distribution and dynamics of rabies in mammal populations in Luhansk province. *Visnyk of the Lviv University. Series Biology*, 45: 127–138. (In Ukrainian)
- Zagorodniuk, I., I. Dykyy. 2012. Hunting mammal fauna of Ukraine: species list and vernacular names. *Visnyk of the Lviv University. Series Biology*, 58: 21–44. (In Ukrainian)
- Zagorodniuk, I. V., I. G. Emelianov. 2012. Taxonomy and nomenclature of mammals of Ukraine. *Proceedings of the Nat Museum of Natural History*, 10: 5–30. (In Ukrainian)