

THE INVASIVE RACCOON DOG (*NYCTEREUTES PROCYONOIDES*, GRAY) – AN UPDATE OF ITS DISTRIBUTION ON THE BALKANS

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ABSTRACT

The raccoon dog, which lives especially near water and is rare in areas with low humidity, has been spreading throughout Europe since its introduction to Western Russia in the beginning of the 20th century. Official accounts of its distribution in Europe are often inaccurate due to scarce data. A literature search was conducted to identify records of the raccoon dog in the Balkans. More than 60 records were identified, including ones unlisted by the cited source from central and western Bulgaria, southern Serbia, Macedonia, Bosnia, Herzegovina, and Greece. The raccoon dog can be found on the Balkans either along the Danube (which is a major corridor for its invasion) or along its tributaries, which might represent secondary invasion pathways.

ZUSAMMENFASSUNG: Der invasive Marderhund *Nyctereutes procyonoides* Gray – eine Aktualisierung seiner Verbreitung auf dem Balkan.

Der Marderhund der besonders in der Nähe von Wasser lebt und in Gebieten mit geringer Feuchtigkeit selten ist, hat sich seit seiner Einführung im Westen Russlands Anfang des 20. Jahrhunderts in ganz Europa ausgebreitet. Offizielle Zahlen für seine Ausbreitung in Europa sind aufgrund knapper Daten oft ungenau. Um Aufzeichnungen über das Vorkommen des Marderhundes auf dem Balkan zu finden, wurde eine Literaturrecherche durchgeführt. Dabei wurden mehr als 60 Einträge identifiziert, darunter solche, die in der zitierten Quelle aus Zentral- und Westbulgarien, Südserbien, Mazedonien, Bosnien und Herzegowina und Griechenland nicht gelistet wurden. Die meisten Fundorte des Marderhunds auf dem Balkan liegen entweder entlang der Donau (die ein wichtiger Wildkorridor für seine Invasion ist) oder entlang ihrer Nebenflüsse, die sekundäre Invasionswege darstellen könnten.

REZUMAT: Specia invazivă câinele enot (*Nyctereutes procyonoides*, Gray) – o aducere la zi a distribuției sale în Balcani.

Câinele enot, care trăiește mai ales în apropierea apei și este rar în zonele cu umiditate scăzută, s-a răspândit în toată Europa, de la introducerea sa în vestul Rusiei la începutul secolului al 20-lea. Semnalările oficiale ale distribuției sale în Europa sunt adesea inexacte, din cauza datelor insuficiente. S-a efectuat o căutare în literatura de specialitate pentru a identifica înregistrările câinelui enot din Balcani. Au fost identificate mai mult de 60 de înregistrări, inclusiv cele din surse nelistate, citate din Bulgaria centrală și de vest, sudul Serbiei, Macedoniai, Bosniei și Herțegovina și Greciei. Cele mai multe dintre locurile cu câini enot din Balcani sunt fie de-a lungul Dunării (care este un coridor major pentru invazie) fie de-a lungul afluenților săi, care ar putea reprezenta căi secundare de invazie.

INTRODUCTION

The raccoon dog (*Nyctereutes procyonoides*, Gray) (Fig. 1) is native to East Asia, but it has been introduced to the Western parts of modern day Russia in the first half of the 20th century. Since then, its range has been expanding throughout Europe, reaching Finland and Sweden to the North, France and Germany to the West, and Romania and Bulgaria to the South (Kauhala and Kowalczyk, 2011; Kauhala and Saeki, 2016).

It has become one of the most successful alien carnivores in Europe, due to its adaptability, omnivory, and high reproductive potential (Kauhala and Kowalczyk, 2011). Its effects on the local wildlife are still poorly understood in many countries.

Data for the raccoon dog's distribution on the Balkans is scarce (Fig. 2), which might have caused inaccuracies in the current distribution maps (Kauhala and Kowalczyk, 2011; Kauhala and Saeki, 2016).

The aim of this study was to collect new or omitted records for raccoon dog presence from the Balkan countries and to provide data for an update of the distribution range. This is vital when studying the species' invasion corridors and its potential effects, and could guide future management actions.

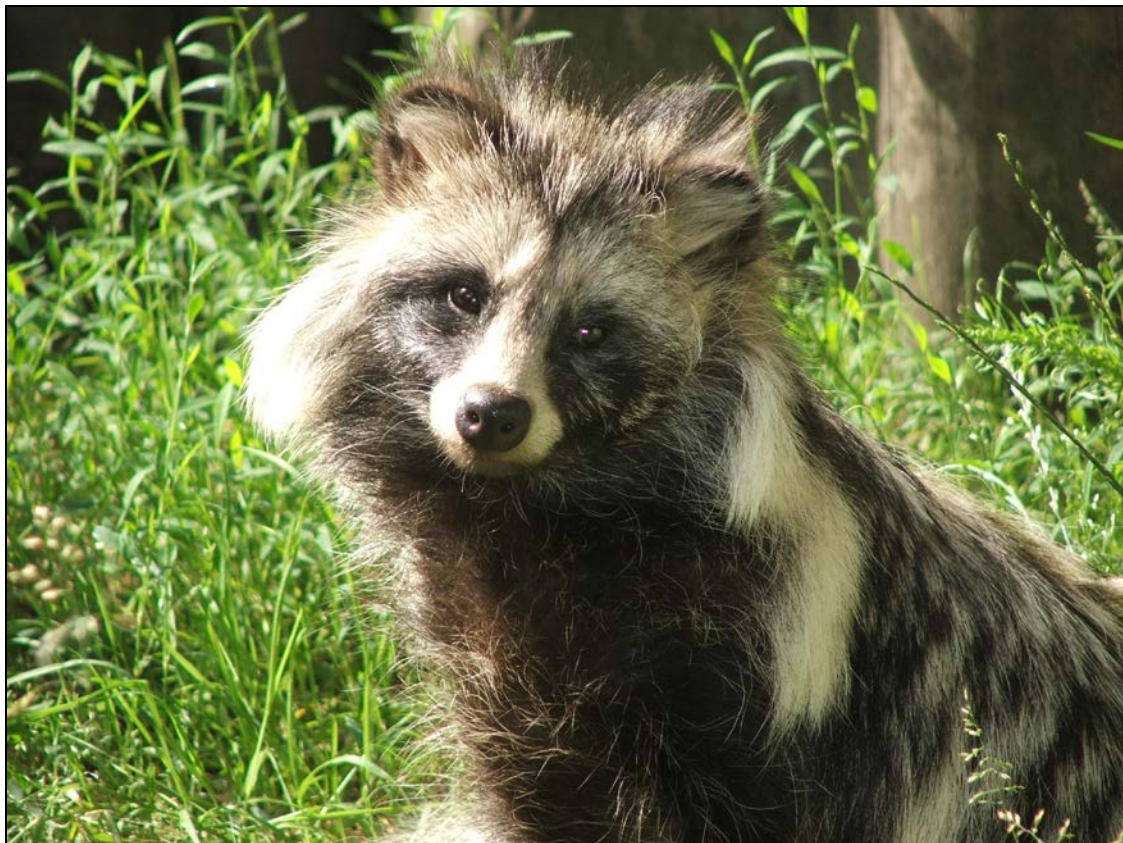


Figure 1: *Nyctereutes procyonoides*, Gray (photo: Kuczynski P.).

MATERIAL AND METHODS

There are slight differences between the two raccoon dog maps presented by Kauhala and Kowalczyk, 2011 and the IUCN Red List of Threatened Species (Kauhala and Saeki, 2016), despite the fact that they have a common author. It is unclear how these maps were created and whether the differences are due to spatial inaccuracies or an update of the latter source. Regarding the Balkans, the discrepancies are minimal. For simplicity, we consider only the map accepted by IUCN. We conducted a literature search based on the key words "raccoon dog" and "*Nyctereutes procyonoides*" in combination with the names of the Balkan countries (Bulgaria, Serbia, Macedonia, Turkey, Croatia, Bosnia, and Herzegovina) in the web search engine Google Scholar. The raccoon dog is reported to be present in Romania. An additional search was conducted in Google to detect grey literature on the subject, including management plans for protected areas and online forums for hunters. All of the identified records were classified in two categories (following the methodology applied by Cirovic and Milenkovic, 1999): reliable evidence (captured individuals, photographs, tracks or others, reported by experts) and records without reliable evidence (observations or killed individuals, reported by non-experts) according to the way they were documented. ArcGIS v.10 (ESRI, 2011) was used to map the locations, together with the current distribution map.

RESULTS AND DISCUSSION

A total of 62 new records were identified in six Balkan countries (Tab. 1), of which 42% (n = 26) were records with reliable proof and 58% (n = 36) were without reliable proof. Most of the locations lay outside the current distribution range. We suggest that the Southern border of the range should be moved further south to include at least the reliable records in Northern Bulgaria and Eastern and Northwestern Serbia. These are close to the areas inhabited by the raccoon dog and are likely to be occupied.

Table 1: List of the newly identified locations of raccoon dogs on the Balkans; * Some of these locations are recorded during the time these countries were part of Federal Republic of Yugoslavia.

Country	No. of locations		Total	Time range	Sources
	with reliable evidence	without reliable evidence			
Bosnia and Herzegovina*	–	1	1	1987	Cirovic and Milenkovic, 1999;
Bulgaria	13	21	34	1967-2015	Dragoev, 1978; Genov, 2012; Georgiev, 2010; Green Balkans, 2001; Peshev and Yordanov, 1968; management plans (in project) for NP "Bulgarka", NP "Rusenski Lom" and MR "Atanasovsko ezero";
Croatia	1	1	2	1994-2016	Cirovic and Milenkovic, 1999; Duplić et al., 2016;
Greece	2	1	3	2005-2009	Adamopoulou and Legakis, 2016; Catsadorakis and Bousbouras, 2010;
Macedonia	1	–	1	2001	Ćirović, 2006;
Serbia*	10	12	22	1978-2015	Cirovic and Milenkovic, 1999; Milačić et al., 2015;

The only reliable record from Southern Bulgaria is a camera trap photo taken in the mountainous area of Shiroka Polyana Dam (around 1,500 m a.s.l.) which is surprising, since the most preferred habitats by the species in Europe are at much lower altitudes (Barrat et al., 2010; Drygala et al., 2008; Kauhala and Saeki, 2004). The reliable records in Greece, Macedonia and Northwestern Croatia are isolated and might represent cases of dispersing individuals rather than established populations. However, they may indicate further invasion towards the south and west on the Balkans than previously taught.

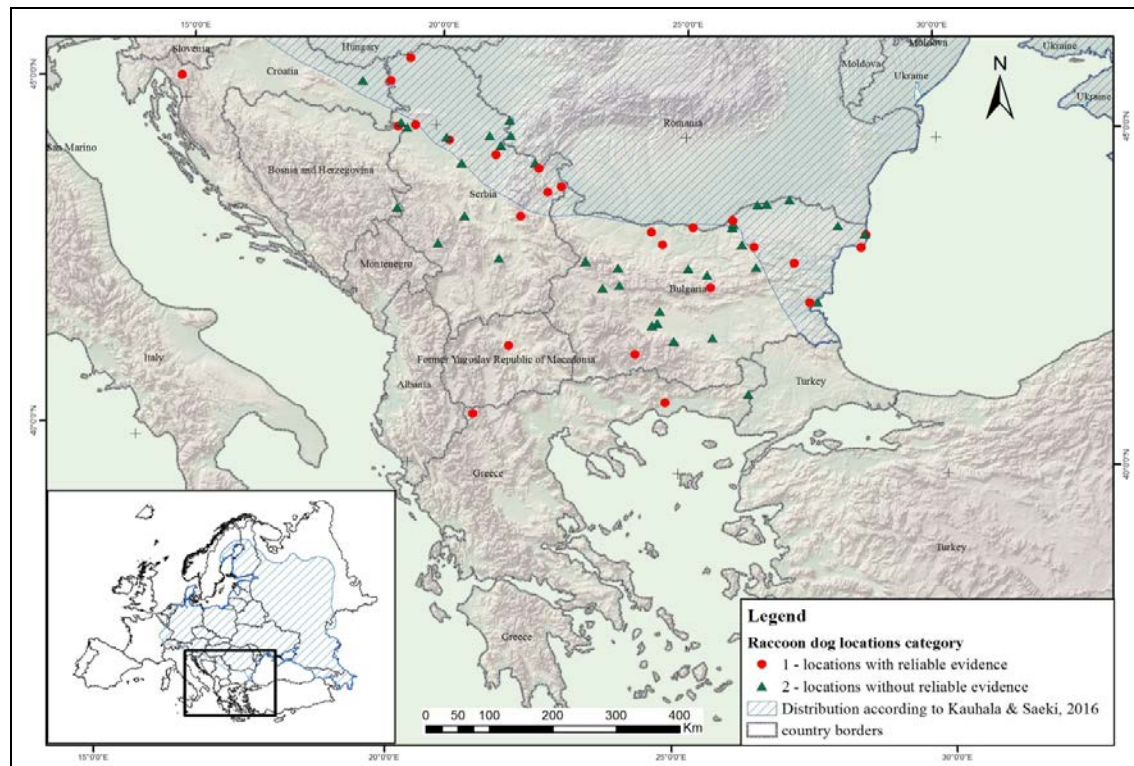


Figure 2: Distribution of the raccoon dogs on the Balkans – distribution and new records.

Many of the collected records lack exact coordinates and only a few contain information regarding habitat characteristics. However, we were able to identify the following places visited by raccoon dogs (only those marked with * are reliable records): lake shores (Bulgaria: Shabla* and Srebarna lakes, Greece: Prespa Lake*), river shores (Bulgaria: Danube River*, Chaya River; Greece – Nestos (Mesta) River*; Serbia: Danube River*, Sava River*, Boljetinska River), Danube island (Bulgaria: Belene Island*), Black Sea shore (Bulgaria: Bolata cove*), marshes (Bulgaria: Kalimok Marsh), agricultural airport (Bulgaria: Krasen Village), landfills (Bulgaria: General Toshevo Village), brines (Bulgaria: Pomorie Lake), dams (Bulgaria: Pyasachnik Dam), rice paddies (Bulgaria: near Plovdiv) and garden at the outskirts of a village (Bulgaria: Malo Konare Village). In two cases raccoon dogs were found on a road, run over by a car (Macedonia: halfway from Titov Veles to Katlanovo*; Greece: by Dialekto, Xanthi*). All of the other records report only the general location (e.g. “surroundings of Nepotin”). Most of the reliable records are along the Danube River, which is an established invasion corridor for the raccoon dog. Many of the others are also near bodies of water (smaller rivers or lakes), which is in accordance with the known habitat preferences of the species (Barrat et al., 2010; Kauhala and Saeki, 2004).

It is evident that most of the data regarding the raccoon dog's distribution on the Balkans is scarce and unreliable. The unconfirmed collected records could be validated by extensive camera trap studies. It is vital to include local people (particularly hunters) in monitoring the raccoon dog's invasion. For this purpose, they need to be properly trained to identify the species and the signs of its presence. Currently, most of the hunters in the Balkan countries have difficulty identifying the species. A comprehensive educational campaign is essential for the Balkans, since most of the people are not aware of the raccoon dog's presence in their countries. Along with systematic research, this would be the important first step towards understanding the scope of the invasion and potential effects. Without this proper scientific foundation, no management plans and actions can be undertaken.

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