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## EXPANSION OF THE RACCOON *PROCYON LOTOR* IN POLAND

### Abstract

Raccoon is one of the invasive species occurring in Poland. The aim of the study was to analyse the process of penetration of the country by this carnivore. Information gathered from a questionnaire that covered a period between 1982 and 2009 showed that the raccoon was recorded at least 306 times. Raccoons have been recorded from the whole area of Poland, but the most numerous records were documented from localities in the western part of the country. In north-eastern Poland, several cases of raccoon breeding were noted. An increase in the number of raccoon records occurred after 2005.

**Keywords:** raccoon, *Procyon lotor*, invasive species, occurrence, Poland

### Introduction

In Europe, 44 alien species of mammals have been recorded (Genovesi et al. 2009). In Poland, 11 species have been reported, so far: European rabbit *Oryctolagus cuniculus*, muskrat *Ondatra zibethicus*, house mouse *Mus musculus*, brown rat *Rattus norvegicus*, black rat *Rattus rattus*, raccoon *Procyon lotor*,

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raccoon dog *Nyctereutes procyonoides*, American mink *Neovison vison*, sika deer *Cervus nippon*, fallow deer *Dama dama*, mouflon *Ovis musimon* (Głowaciński and Pawłowski 2011). This list places our country among the European leaders: France, Lithuania, and Russia, as far as the number of alien species of mammals is concerned.

The raccoon is the most recently recorded alien species in Poland. It belongs to the raccoon family Procyonidae of the order Carnivora. Originally, it occurred in North America. In 1934, two pairs of raccoons were introduced in central Germany and some animals were imported also to Belarus that borders Poland in the east (Stubbe 1999). The individuals migrating from the two directions colonized the area of Poland. Raccoons were also bred as fur-bearing animals in many regions of Europe, including Poland (Bogdanowicz and Ruprecht 1987). Besides, raccoons are kept as pets.

Raccoons established a free living population in western and middle Europe. In the beginning, the population number was stable. However, during the past 20 years, an expansion of the species took place (Canova and Rossi 2008; Bartoszewicz 2011). In Poland, raccoons are game animals to be hunted the whole year round, with no closed season. At the same time, raccoon is listed among the invasive species and has to be registered by local administration if kept in captivity.

The first record of raccoon in Poland dates back to 1970. Since that time, data on the occurrence of this species in northern and western parts of Poland have been provided abundantly (Bartoszewicz 2003; Chmielewski 2005; Lewandowski 2007; Żmihorski 2007; Bartoszewicz et al. 2008; Głowaciński and Pawłowski 2011). However, the process of dispersion of raccoon within the country has not been documented. The aim of the present study was the analysis of data on the invasion and expansion of raccoons in the territory of Poland.

## Material and Methods

Information on the occurrence of raccoons was gathered using a questionnaire addressed to forestry workers who, owing to the character of their job, possess the most precise and the most abundant knowledge on animals in the wild. Moreover, the territory of Poland is divided into areas under State Forests administration. The areas of National Parks are excluded from State Forests administration, therefore a separate questionnaire has been prepared for National Parks workers.

The questionnaires were distributed twice: in 2003 and in 2009. In 2003, 2,381 questionnaires were sent to forest districts in western and central Poland and 1,858 questionnaires were returned (78%). In the period February–May 2009, 5,636 questionnaires were sent by e-mail to forest districts in the whole territory of Poland and all of them (100%) were returned. The questionnaire was supported by a special letter from respective regional directorates. Whenever necessary, in case of the lack of response, the requests were repeated either by e-mail or by phone. Altogether, 8,017 questionnaires were sent and 93% of them were returned. Additionally, information was collected from persons who saw raccoons. A negligible proportion of information was discarded because of laconic content.

The questionnaire contained an inquiry for the date and locality of raccoon sightings, the number and condition and age of individuals (live or dead, young or adult). The type of habitat where raccoons were seen should also have been provided. The data derived from game inventories were treated as approximate and not describing the actual number of individuals. Such records were treated as ‘more than one individual’.

## **Results**

Raccoons were recorded 312 times during the years under the questionnaire study, 1981–2009. At present, the raccoon population is distributed all over Poland, except high mountains (Sudetes, Carpathians) (Figure 1). An increase in the number of records occurred after 2000 (Figure 2). These records made 97% of all records. The highest number of sightings was reported in 2008 (105 sightings). Raccoons were the most often seen in western and north-western parts of Poland. The fewest records were reported from regions in the east of the country.

Forest habitats and regions rich in water resources (rivers, lakes, fish ponds) were the most often reported as sites of raccoon sightings. Raccoons were relatively rare in urban environment (Figure 3). In April 2007, a raccoon was seen in the common buzzard’s nest. In the same year, one individual was found in the nest of the black stork. Raccoons were also spotted in forest nurseries, in grounds rooted by wild boars, sleeping on trees, feeding under apple trees, foraging for invertebrates on a river bank, feeding on carcass (dog, roe-deer, and horse) and waste near a slaughterhouse.

Collisions with vehicles were the main causes of raccoon mortality in Poland (18 individuals). However, the number of raccoons killed on roads is only



Figure 1. Distribution of raccoon *Procyon lotor* in Poland

an indication of a trend because the accidents involving these animals are usually not reported. Nevertheless, until 2009, the road traffic was more important than game hunting as far as raccoon mortality was concerned (Figure 4).

Raccoons were spotted mainly as single individuals. However, 34% of records refer to at least two animals, including records of 2–3 young ones (Figure 5). In certain regions, raccoon family groups were recorded for several years in a row.

Raccoons occur also in protected areas. Records were provided from the following nature reserves: Milickie Ponds (2005–2009), Łuknajno Lake (2009), Valley of Ilanka River (2006–2008), Janie Reserve (2008). The most frequent sightings occurred in Warta Mouth National Park (at least 24 records in 1995–2009) and Drawa National Park (2006–2008 – 9 records). Additionally, raccoons were spotted in Wolin NP (1 record in 1988), NP of Wielkopolska (2007 – 1 record), Słowiński NP (2009 – 1 record), and Gorce NP (2006–2007 – 2 records).

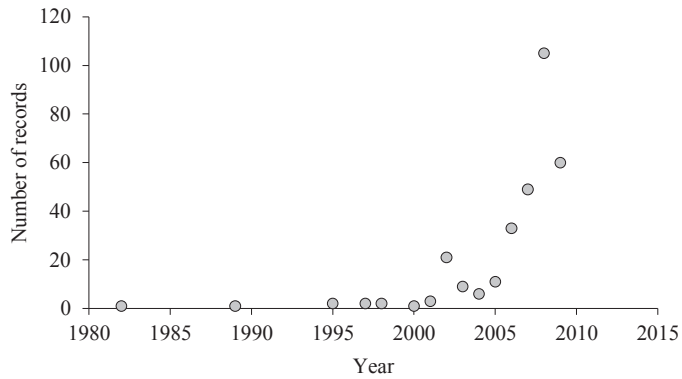


Figure 2. Number of records of raccoon *Procyon lotor* in 1981–2009

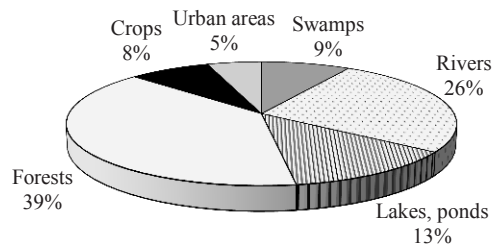


Figure 3. Habitats, where raccoons *Procyon lotor* were recorded in Poland in 1981–2009 (N = 267)



Figure 4. Mortality of raccoons *Procyon lotor* in Poland in 1981–2009 (N = 26)

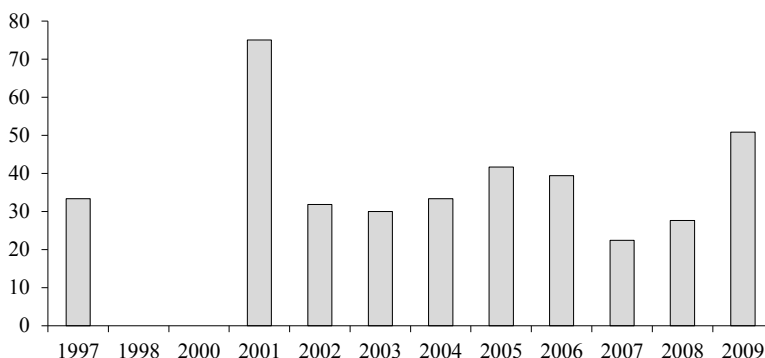


Figure 5. Proportion of records of more than one raccoon *Procyon lotor* in total number of records in a given year in 1981–2009 (%)

#### Inventory of localities where raccoons *Procyon lotor* were recorded in Poland in 1981–2009

Abbreviations. f.d. = forest district, f.r.a. = forest rangers areas, sec. = section, s-d. = sub-district, h.g. = hunting ground, vic. = vicinity, ind. = individual(s), riv. = river, RDSF = Regional Directorates of the State Forests, LP = Landscape Park, NP = National Park.

**RDSF Warszawa**, (1) f.d. Celestynów, on Vistula Riv., 03.2009, 2 ind.; (2) f.d. Siedlce, f.r.a. Grębków, 03.2009, 4 ind.; (3) f.d. Wyszków and Ostrołęka, f.d. border, vic. Szarłat and Kunin, riv. Orz, 03.2009, 8 ind. **RDSF Krosno**, (4) f.d. Baligród, f.r.a. Polanki, sec. 47, vic. riv. Solinka, 5.10.2008, 1 ind.; (5) sighting near the bridge on Solinka, 7.10.2008 evening, 1 ind.; (6) f.d. Mielec, Trześń near Mielec, 08.2008, 2 ind.; (7) Maślany, 06.2008, 1 ind.; (8) Maślany, 08.2008, 1 ind.; (9) Ostrówek on Vistula Riv. near Połaniec, 09.2008, 1 ind.; **RDSF Toruń**, (10) f.d. Golub-Dobrzyń, vic. Młyniec – Pruska Łąka, 10.03.2009, 10 ind.; (11) f.d. Skrwilno, f.r.a. Huta, sec. 236 a, 09.2008, 1 ind.; (12) f.d. Trzebczyny, f.r.a. Szklana Huta, sec. 123, vic. Zielonka, 03.2007, 1 ind.; (13) f.r.a. Siwe Bagno, sec. 184, vic. Łyski Piec, 05.2007, 1 ind.; (14) f.r.a. Smolarnia, sec. 185, 09.2008, 3 ind.; (15) f.d. Żołędowo, f.r.a. Tryszczyn, sec. 347, 06.2006, 2 ind.; **RDSF Łódź**, (16) f.d. Grotniki, f.r.a. Wola Błędowa, sec. 346, vic. Domaradzyn, 02.2009, 1 ind.; (17) f.d. Kutno, f.r.a. Chodecz, sec. 125–126, lake Lutoborskie, 2007, 5 ind.; (18) 2008, 4 ind.; (19) 2009, 5 ind.; (20) f.d. Płock, h.g. 263, within the city of Płock, 10.03.2009, 4 ind., (21) f.r.a. Miszewo, vic. Gąsewo and Białobrzegi, 10.03.2009, 6 ind.; (22) f.d. Piotrków, f.r.a. Wierzeje, at the edge of the city of Piotrków Tryb., 04.2007, 1 ind.; (23) near the road Piotrków–Sulejów, vic. Korytnica, 06.2007, 1 ind.; **RDSF Katowice**, (24) f.d. Gidle, f.r.a. Gajki, sec. 117, vic. Dąbrowa Zielona, 05–06.2008, 4 ind.; (25) f.r.a. Brzozówki, sec. 55, vic. Garnek, 05–06.2008, 2 ind.; (26) f.d. Kędzierzyn, f.r.a.

Niezdrowice, sec. 45, vic. Niezdrowice, 09.2008, 2 ind.; (27) f.d. Kobiór, h.g. 166, 2009, 10 ind.; (28) h.g. 181, 2009, 2 ind.; (29) f.d. Rudy Raciborskie, h.g. 153, 2009, 1 ind.; (30) h.g. 163, 2009, 6 ind.; (31) h.g. 129, 2009, 2 ind.; (32) h.g. 138, 2009, 5 ind.; (33) f.d. Siewierz, f.r.a. Łosień, h.g. 56, riv. Biała Przemsza, 2008, 1 ind.; (34) f.d. Prudnik, f.r.a. Wilemowice, vic. Chociebórz, autumn 2008, 1 ind.; (35) f.d. Ustroń, f.r.a. Pruchna, sec. 215–216, 04.2008, 1 ind.; (36) f.r.a. Pierściec, sec. 70, autumn 2007, 1 ind.; **RDSF Wrocław**, (37) f.d. Ruszów, f.r.a. Toporów, autumn 2008, 1 ind.; (38) f.r.a. Jagodzim, sec. 394j, 04.2007, 1 ind.; (39) 05.2007, 1 ind.; (40) sec. 449 I, 05.2007, 1 ind.; (41) f.d. Milicz, Czeszów, natural gas mine, 2000, 1 ind.; (42) f.d. Lwówek Śląski, h.g. 146, 03.2009, 8 ind.; (43) h.g. 180, 03.2009, 2 ind.; (44) f.d. Węgliniec, f.r.a. Osieczna, sec. 428r, 08.2008, 1 ind.; (45) f.r.a. Ołobok, sec. 89, 11.2007, 1 ind.; (46) f.d. Oleśnica Śl., f.r.a. Kątna, sec. 148, Wilczyce-Kielczówek, 09.2008, 4 ind.; (47) f.d. Głogów, f.r.a. Dalków, 216 n, 11.2002, 1 ind.; (48), sec. 277, 03.2003, 1 ind.; (49) Przemkowski LP, vic. Przeclaw, 09.2005, 1 ind.; (50) Ostaszów near Przemków, 09.2007, 1 ind.; (51) Milickie Ponds Reserve, Radziądz, 2005, 4 ind.; (52) 2006, 4 ind.; (53) 2007, 4 ind.; (54) 2008, 4 ind.; (55) 2009, 4 ind.; (56) Milickie Ponds Reserve, Stawno, 2005, 14 ind.; (57) 2006, 14 ind.; (58) 2007 14 ind.; 2008, 14 ind.; (59) 2009, 14 ind.; (60) f.d. Zdroje, f.r.a. Orlica, h.g. 61, 05.2003, 1 ind.; **RDSF Olsztyn**, (61) f.d. Bartoszyce, f.r.a. Rogóz, sec. 7–8, vic. Morawa, 22.10.2008, 6 ind.; (62) f.d. Korpele, f.r.a. Młyńsko, road Szczytno-Ostrołęka, 5.06.2007, 1 ind.; (63) 10.03.2009, 2 ind.; (64) f.d. Mrągowo, f.r.a. Borowo, slaughterhouse dump Moradki, 01.2009, 2 ind.; (65) f.d. Susz, f.r.a. Kamienie, sec. 235d, 09.2008, 1 ind.; (66) f.r.a. Uroczysko, sec. 19, 06.2008, 1 ind.; (67) vic. lake Rucewo Wlk., 2008, 1 ind.; (68) f.r.a. Prusowy Borek, vic. Czarnkowy Dwór, 2008, 2 ind.; (69) „Jez. Łuknajno” Reserve, 08.2009, 1 ind.; **RDSF Szczecinek**, (70) f.d. Białogard, f.r.a. Czarnowęsy, sec. 362a, vic. village Góry, 12.2008, 1 ind.; (71) f.d. Świerczyna, vic. lake Krzemno, 2008, 1 ind.; (72) f.d. Czaplunek, h.g. 127–128, 2006, 1 ind.; (73) f.d. Człuchów, f.r.a. Biernatka, sec. 154a, 09.2008, 1 ind.; (74) f.d. Czarne Człuchowskie, f.r.a. Mszary, wieś Sporysz, 10.2002, 1 ind.; (75) f.d. Damnica, f.r.a. Łojewo, sec. 90a 2008, 1 ind.; (76) f.r.a. Drzeżewo, oddz. 20d, 2008, >1 ind.; f.r.a. (77) Choćmirówko, sec. 31b–44d, 2008, 1 ind.; (78) f.d. Drawsko, f.r.a. Głębokie, sec. 905d, 2008, 1 ind.; (79) f.r.a. Zofiówko, h.g. 181, vic. Sienica, 09.2008, 1 ind.; (80) f.r.a. Borowo, 1014a, 10.2008, 1 ind.; (81) f.r.a. Pożrzadło, sec. 760d, 09.2008, 1 ind.; (82) f.d. Sławno, f.r.a. Kosierzewo, vic. Święcianowo, 10.03.2009, >1 ind.; (83) f.r.a. Janiewice, Ostrowiec, 10.03.2009, 4 ind.; (84) f.d. Świdwin, f.r.a. Batyń, sec. 443, 2002, 1 ind.; (85) sec. 472c, 2002, 6 ind.; (86) f.r.a. Nowy Dwór, 05.2003, 1 ind. **RDSF Piła**, (87) f.d. Kalisz Pomorski, f.r.a. Giżyno, sec. 407 m, vic. village Suchowo, winter 2005, 2 ind.; (88) f.r.a. Cybowo, sec. 408d–409b, vic. village Jasnopole, 2007, 2 ind.; (89) f.d. Durowo, f.r.a. Olszyna, lake Rogoźno, 5.02.2002, 1 ind.; (90) f.d. Człopa, h.g. 239, riv. Cieszynka, 2.03.2009, 10 ind.; (91) h.g. łow 240, riv. Człopica, 2.03.2009, 5 ind.; (92) f.d. Złotów, vic. Ptusza, 03.2009, 4 ind.; (93) f.d. Zdrojowa Góra, f.r.a. Łubianka, sec. 38, 2008, 1 ind.; (94) f.d. Tuczno, f.r.a. Miłogoszcz, sec., 147 I, vic. village Strzalin, 07.2008, 1 ind.; (95) f.d. Lipka, f.r.a.

Biskupiec, sec. 148, 07.2007, 1 ind.; (96) f.d. Wronki, f.r.a. Kłodzisko, sec. 463, Dąbkowa, autumn 2006, 1 ind.; (97) 11.2008, 1 ind.; (98) Krerowo, 10.2006, 1 ind.; (99) f.r.a. Mokrzy/Borek, sec. 346–367, riv. Warta, 03–04.2003, 1 ind.; (100) f.d. Wałcz, f.r.a. Rudnica, sec. 228, 2008, 1 ind.; (101) f.d. Kaczory, f.r.a. Brzostowo, sec. 189i, 06.2008, 1 ind.; (102) f.r.a., Białośliwie, sec. 143, 8.07.2003, 1 ind.; (103), h.g. „Bazant” Białośliwie, area along Noteć Riv., 2003, 2 ind.; (104) f.d. Podanin, f.r.a. Drażki, sec. 344a, 05.2008, 2 ind.; (105) f.r.a. Margonin, sec. 185 c, 10.06.2008, 1 ind.; (106) f.r.a. Smogulec, sec. 218c, 02.2008, 1 ind. (107) f.d. Trzcianka, f.r.a. Runowo, sec. 171b/93, 25.05.2003, 1 ind.; **RDSF Poznań**, (108) f.d. Jarocin, f.r.a. Luboniec, sec. 151, Młodzikowo, autumn 2008, 1 ind.; (109) f.r.a. Potarzyca, sec. 341, autumn 2008, 1 ind.; (110) f.d. Grodzisk, f.r.a. Gnin, sec. 142, 09.2008, 1 ind.; (111) f.d. Góra Śląska, vic. Ryczań, spring 2008, 2 ind.; (112) f.d. Konstantynowo, f.r.a. Dakowy Mokre, sec. 149, 2006, 1 ind.; (113) allotments near Opalenica, 2008, 1 ind.; (114) sec. 75–76, f.r.a. Więckowice, vic. Kałwy, 27.02. 2007, 1 ind.; (115) 2008, 1 ind.; (116) 2009, 1 ind.; (117) f.d. Pniewy, f.r.a. Lwówek, sec. 215–218, Grudzianki, 2006, 2 ind.; (118) f.r.a. Jakubowo, 2003, 1 ind.; (119) f.r.a. Ostrolesie, sec. 193, vic. Lipnica, 31.03.2009, 1 ind.; (120) f.d. Sieraków, f.r.a. Prusim, sec. 202s, 2007, 1 ind.; (121) f.r.a. Tuchola, sec. 10–11, 2007, 1 ind.; (122) f.d. Syców, f.r.a. Turze, city of Kliny, 09.2008, 2 ind.; (123) f.r.a. Marcinki, Kobyla Góra, 11.2008, 2 ind.; (124) f.d. Taczanów, f.r.a. Koryta, sec. 220, 09.2008, 1 ind.; (125) sec. 238, Ligota, 04.2009, 2 ind.; (126) f.d. Oborniki, f.r.a. Objezierze, vic. Żydowo, 06.2007, 1 ind.; (127) f.r.a. Kiszewko, sec. 409c, vic. Boruszyn, 1989, 1 ind.; (128) 2005, 1 ind.; (129) f.d. Gniezno, f.r.a. Wólka, sec. 410, 02.2009, 2 ind. (130) f.d. Konin, f.r.a. Grąblin, sec. 240, 2007, 1 ind.; (131) f.d. Piaski, f.r.a. Smogorzewo, sec. 125 f, autumn 2008, 1 ind.; (132) sec. 125g, autumn 2008, 2 ind.; (133) f.d. Kościan, f.r.a. Bonikowo, sec. 34b, 2008, 1 ind.; (134) f.r.a. Kaczor, vic. village Kaczor, 2007, 1 ind.; **RDSF Zielona Góra**, (135) f.d. Brzózka, f.r.a. Kukadło, sec. 224, Tarnawa Kr. 05–06.2007, 1 ind.; (136) f.r.a. Brzózka, sec. 121f, 10.03.2009, 1 ind.; (137) f.d. Cybinka, s-d. Rudzików, 1997, >1 ind.; (138) 02.2009, >1 ind.; (139) vic. Nowy Młyn, 1.10.2002, 2 ind.; (140) f.r.a. Nowy Świat, sec. 27 l, 11.2002, 2 ind.; (141) sec. 30, 11.2002, 1 ind.; (142) f.d. Gubin, f.r.a. Suchodół, spring 2008, 2 ind.; (143) f.d. Lipinki, f.r.a. Trzebiel, city Trzebiel, 10.2007, 1 ind.; (144) crops 2007, 1 ind.; (145) 2008, 1 ind.; (146) 2009, 1 ind.; (147) f.r.a. Suchleb, sec. 226, vic. Rościce, 2007, 1 ind.; (148) sec. 222–226, 2002, 1 ind.; (149) f.d. Lubsko, f.r.a. Ciemny Las, sec. 188, 2004, 1 ind.; (150) f.r.a. Dąbrowa, sec. 156, 2004, 1 ind.; (151) f.r.a. Tuplice, 2004, 1 ind.; (152) f.d. Krzystkowice, f.r.a. Krzywaniec, sec. 273–247, autumn 2008, 1 ind.; (153) f.r.a. Bieniów, village Gorzupa – Bobrówka, autumn 2002, 1 ind.; (154) f.d. Świebodzin, f.r.a. Dolina, sec. 195, 2006, 1 ind.; (155) f.r.a. Długoszyn, sec. 5–7, on the border of f.ds. Świebodzin–Sulęcín, 2006, 1 ind.; (156) 2007, 1 ind.; (157) 2008, 2 ind.; (158) 2009, 2 ind.; (159) f.d. Torzym, f.r.a. Debrznica, sec. 253d, 04.2009, 2 ind.; (160) f.r.a. Pniów, sec. 81a, riv. Ilanka, 2006, 1 ind.; (161) riv. Ilanka, 10.2007, 1 ind.; (162) sec. 72j, riv. Ilanka, 05.2008, 1 ind.; (163) sec. 72j, 06.2007, 1 ind.; (164) f.r.a. Przęsłice, sec. 47k, 09.2007, 1 ind.; (165) 47b, „Dolina Ilanki” reserve,



09.2007, 1 ind.; (166) sec. 47b, 04.2007, 1 ind.; (167) sec. 47b, 05.2008, 1 ind.; (168) sec. 49b, riv. Ilanka, 06.2008, 1 ind.; (169) f.r.a. Bobrówka, sec. 64i–66k, 02.2009, 1 ind.; (170) sec. 40b, vic. Bobrówka, 09.2006, 1 ind.; (171) sec. 39g, forest nursery, 09.2006, 1 ind.; (172) sec. 56a, 07.2008, 3 ind.; (173) city Sulęcín, 10.2008, 1 ind.; (174) 10.2008, 1 ind.; (175) f.r.a. Drzewce, sec. 292, 2005, 2; (176) sec. 2710, 2002, 2 ind.; (177) military area, vic. Łągów, 2003, >1 ind.; (178) Trzemeszno, 08–09.2002, 1 ind.; (179) f.d. Wymiarki, f.r.a. Laskowice, sec. 19, vic. Gozdnica, 08.2007, 1 ind.; (180) f.d. Żagań, f.r.a. Stawy, sec. 228, 06.2005, 1 ind.; (181) sec. 228, 12.2005, 1 ind.; (182) f.r.a. Łozy, 2002, 1 ind.; (183) f.d. Przytok, f.r.a. Wielobłota, on flood embankment on Odra riv., 2006, 2 ind.; (184) 2007, 2 ind.; (185) 2008, 2 ind.; (186) 2009, 2 ind.; (187) f.r.a. Zabór, city Łaz, 2008, 1 ind.; (188), vic. Jany, riv. Odra, 2006, 2 ind.; (189) 2006, 2 ind.; (190) 2007, 2 ind.; (191) 08–09.2009, 2 ind.; (192) Przytok, autumn 2007, 1 ind.; (193) Zabór, riv. Odra 2008, 1 ind.; (194) 2009, 1 ind.; (195) Zielona Góra, 11.2006, 1 ind.; **RDSF Szczecin**, (196) f.d. Choszczno, f.r.a. Ziemomyśl, sec. 306, 06.2007, 1 ind.; (197) f.d. Goleniów, f.r.a. Olszanka, 2007, 1 ind.; (198) f.d. Mieszkowice, f.r.a. Czelin, 3.10.2008, 1 ind.; (199) sec. 202, 10.2002, 1 ind.; (200) f.r.a. Rudnica, sec. 46/46a/49/75b, 1982 1 ind.; (201) 09.2009, 1 ind.; (202) sec. 100–102, 09.2009, 2 ind.; (203) 220a–229, 09.2009, 2 ind.; (204) f.r.a. Siekierki, 2002, 1 ind.; (205) f.r.a. Brwice, city Brwice, 06.2008, 1 ind.; (206) f.d. Międzychód, f.r.a. Przedlesie, riv. Warta, 03.2009, 1 ind.; (207) f.r.a. Goraj, sec. 350, city Stryszewo, 08.2008, 1 ind.; (208) sec. 425, 09.2008, 1 ind.; (209) f.r.a. Zawarcie, sec. 425 j, vic. Skwierzyna, riv. Warta, 08.2008, 1 ind.; (210) f.d. Międzyzdroje, vic. Świnoujście, Przytór, 2002, 1 ind.; (211) vic. Kołczewo, 2002, 1 ind.; (212) f.d. Dębno, f.r.a. Mostno, sec. 248n, spring 2007, 1 ind.; (213) f.d. Lubniewice, f.r.a. Lubniewice, sec. 302b, riv. Lubnia, 06.2008, 1 ind.; (214) f.d. Międzyrzecz, f.r.a. Wielowieś, sec. 388a, 11.2008, 2 ind.; (215) f.r.a. Chycina, sec. 34c, 11.2008, 2 ind.; (216) f.d. Ośno Lubuskie, f.r.a. Czarnów, sec. 567–569/563–565, Odra, 2006, 3 ind.; (217) 2007, 3 ind.; (218) 2008, 3 ind., (219) sec. 558–559, 2009, 3 ind., (220) 2001, 2 ind.; (221) 2002, 2 ind., (222) f.d. Rzepin, f.r.a. Nowy Młyn, sec. 107–108/142–143/178–179, 2004, >1 ind.; (223) 2005, >1 ind.; (2224) 2006, >1 ind.; (225) 2007, >1 ind.; (226) 2008, >1 ind.; (227) 2009, 16 ind.; (228) 205–206/183–184, lake Linie, 2009, 16 ind.; (229) sec. 206–207, 09–11.2002, 4 ind.; (230) f.r.a. Zielona Góra, sec. 388c, 20.11.2008, 1 ind.; (231) lake Busko, 10.2008, 2 ind.; (232) f.r.a. Drzecin, vic. village Pławidło, 08.2007, 2 ind.; (233) sec. 37, vic. village Starków, 02.2008, 1 ind.; (234) f.d. Skwierzyna, city Skwierzyna, riv. Obra, 05.2008, 5 ind.; (235) f.r.a. Brzozowiec, sec. 62b, 15.11.2002, 1 ind.; (236) f.d. Smolarz, f.r.a. Smolarz, riv. Noteć, 2008, 1 ind.; (237) f.d. Strzelce Krajeńskie, f.r.a. Danków, sec. 33, 08.2008, 1 ind.; (238) f.r.a. Wielisławice, sec. 172b, 09.2008, 2 ind.; (239) sec. 132b, 06–08.2009, 1 ind.; (240) f.r.a. Złotawa, vic. Zwierzyn, 2008, 1 ind.; (241) vic. Krzęcin, 1997, 1 ind.; (242) 04.1998, 1 ind.; (243) f.d. Sulęcín, f.r.a. Grochów, sec. 153, 2004, 4 ind.; (244) 2005, 4 ind., (245) 2006, 4 ind.; (246) 2007, 4 ind.; (247) 2008, 4 ind.; (248) 2009, 4 ind.; (249) sec. 292, 2004, 6 ind.; (250) 2005, 6 ind.; (251) 2006, 6 ind.; (252) 2007, 6 ind.; (253) 2008, 6 ind.;

(254) 2009, 6 ind.; (255) f.r.a. Sulęcín, sec. 181b–182b, Ostrów, 2006, 2 ind.; (256) 04–06.2008, 2 ind.; (257) sec. 207a, Tursk, 2006, 1 ind.; (258) 2007, 1 ind.; (259) 2008, 1 ind.; (260) f.r.a. Jeziora sec. 111, vic. Żubrów, 11.2008, 2 ind.; (261) sec. 441/451–452, 2001, 2 ind.; (262) 15.01.2009, 3 ind.; **RDSF Białystok**, (263) f.d. Czerwony Dwór, f.r.a. Rogonie, sec. 248 m, vic. village Borki, 20.12.2008, 1 ind.; (264) sec. 205d, vic. Leśny Zakątek, 17.01.2008, 1 ind.; (265) f.d. Suwałki, f.r.a. Krasnopol, h.g. 16, riv. Marycha, 2007, 4 ind.; (266) 2008, 1 ind.; (267) 2009, 1 ind.; **Drawa NP**, (268) Protective zone Knieja, sec. 311d, 31.05.2006, 1 ind.; (269) sec. 312, 2.07.2006, 1 ind.; (270) sec. 133a, vic. Konotop, 11.07.2006, 1 ind. (271) sec. 113, vic. Podegrodzie, 12.08.2006, 2 ind. (272) sec. 131, vic. Barnimie, riv. Drawa, 17.09.2007, 1 ind.; (273) sec. 324k, channel Sicieński, 15.06.2008, 1 ind.; (274) Animal Protective Zone, vic. Konotop, 8.09.2008, 1 ind.; (275) Protective Zone Sitno, sec. 8, 8.06.2006, 1 ind.; (276) Barnimie, 2006, 1 ind.; **Gorce NP**, (277) on the park border, red trail between Obidowiec and Turbacz, 27.08.2006, 1 ind.; (278) sec. 206b/207b, vic. Górna Poręba, 7.03.2007, 1 ind.; **Słowiński NP**, (279) 2009, 1 ind.; **Warta Mouth NP**, (280) Witnica, meadows, 07.2008, 1 ind.; (281) Kostrzyn on Odra, road Kostrzyn-Szczecin, 16.10.2008, 1 ind.; (282) northern embankment, 26.03.2009, 1 ind.; (283), meadows, 17.04.2009, 1 ind.; (284) northern embankment, Witnica, 2.07.2008 1 ind.; (285) 21.09.2008, 1 ind., (286) 20.03.2009, 1 ind.; (287) 2.07.2008, 1 ind.; (288) 29.07.2008, 1 ind.; (289) 21.08.2008, 1 ind.; (290) 17.09.2008, 1 ind.; (291) 14.04.2009, 1 ind.; (292) 21.04.2009, 1 ind.; (293) 21.08.2008, 1 ind.; (294) 2.02.2009, 1 ind.; (295) 3.02.2009, 1 ind.; (296) 6.02.2009, 1 ind.; (297) 10.02.2009, 1 ind.; (298) 3.04.2009, 1 ind. (299) between Słońsk and Kostrzyn, 1995, 1 ind.; (300) riv. Postomia, 1995, 1 ind.; (301) vic. Rzepin, road A2, 2001, 1 ind.; (302) vic. Górzycyca, 2003, 2 ind.; (303) vic. Górzycyca, 11.2002, 3 ind.; **Wielkopolski NP**, (304) Protective Zone Wypalanki, city Wypalanki and Konaszewo, spring 2007, 1 ind.; **Wolin NP**, (305) Protective Zone Wiselka, 1 km from fishing base on the shore, 25.03.1998, 1 ind.; (306) sec. 22h, 1 km from fishing base, 25.03.1998, 1 ind.

## Discussion

The rate of increase in the introduced population of raccoons in Poland appeared greater than it had been assumed. The range of occurrence of raccoons reached beyond the Vistula River much earlier than expected, that is, sooner than in the second decade of 21st century (Głowaciński and Pawłowski 2011). A significant increase in the number of records occurred after 2005. In Germany, raccoon hunting started in the beginning of the 50s of the 20th century and in the 60s, more than 1,000 individuals were hunted each year (more than 8,000 animals in 2008) (Hohmann 2001). This trend shows a rapid growth in raccoon population number.

It is likely that the expansion of raccoons in the territory of Poland occurs from two directions and the animals recorded in the north-eastern part of Poland migrated from beyond the eastern border of the country. Some of the records might have concerned animals from amateur rearing. Nevertheless, regardless of what is the source of new raccoons in the area, these animals are always able to start a new population, start breeding, and colonize a vast area (García et al. 2012).

In 1990s, the estimated density of raccoon in its preferred habitats was 1–2 individuals per hectare (Stubbe 1999). In Lower Saxony, 2–4 individuals occur within 100 hectares but in the neighbourhood of big cities in Hesse, where the availability of food is greater than elsewhere, the density is 100 animals in 100 ha (Hohmann 2001; Hohmann et al. 2001). In western Poland, the density of raccoon population seems very high (Bartoszewicz et al. 2008). Raccoons are a constant component of natural environment, at present. They occur in big cities, such as Zielona Góra, and in smaller ones. In Słubice, the border town to Germany, whole families of raccoons resting on trees can be observed.

Raccoons are versatile carnivores, hunting mainly on birds and mammals (Bartoszewicz et al. 2008). Therefore, the invasion of protected areas of natural importance by raccoons is alarming. The oldest and seemingly the most expansive population of raccoons in Poland occurs in Warta Mouth NP. Raccoons have been reported also from some of the most precious European ornithological nature reserves protected under Ramsar Convention (Milickie Ponds, Łuknajno Lake).

The parasitic roundworm nematode *Baylisascaris procyonis* is also a threat to humans and animal species that are intermediate hosts. It was recorded in the raccoon feces collected in western Poland in 2006–2007 (Bartoszewicz et al. 2008; Popiołek et al. 2011).

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## EKSPANSJA SZOPA PRACZA *PROCYON LOTOR* W POLSCE

### Streszczenie

Szop pracz jest jednym z gatunków inwazyjnych zasiedlających obszar Polski. Celem pracy było prześledzenie procesu zasiedlania kraju przez tego drapieżnika. Metodą ankietową zebrano informacje stwierdzające występowanie szopa w latach 1982–2009. W tym okresie potwierdzono występowanie szopa co najmniej 306 razy. Najwięcej stanowisk zlokalizowanych jest w zachodniej części kraju, ale szopy występują w zasadzie na całym obszarze. W Polsce północno-wschodniej odnotowano również przypadki rozmnażania się szopów. Wzrost liczby obserwacji szopów nastąpił po 2005 roku.

**Słowa kluczowe:** szop pracz, *Procyon lotor*, gatunek inwazyjny, występowanie, Polska

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