

# Human-assisted Movements of Raccoons, *Procyon lotor*, and Opossums, *Didelphis virginiana*, between the United States and Canada

RICK ROSATTE<sup>1,2</sup>, DENNIS DONOVAN<sup>1</sup>, MIKE ALLAN<sup>1</sup>, LAURA BRUCE<sup>1</sup>, and CHRIS DAVIES<sup>1</sup>

<sup>1</sup>Ontario Ministry of Natural Resources, Wildlife Research and Development Section, Trent University, 2140 East Bank Dr., Peterborough, Ontario K9J 7B8, Canada

<sup>2</sup>Corresponding author (e-mail: rick.rosatte@ontario.ca) Tel. (705) 755-2280, Fax (705) 755-1559

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Movements of Raccoons (*Procyon lotor*) ( $\bar{x}$  = 479 km) and Opossums (*Didelphis virginiana*) ( $\bar{x}$  = 688 km) by means of transport trailers and a train from the USA and Quebec into Ontario were significantly greater than Raccoon movements ( $\bar{x}$  = 15 km) from Ontario to New York State determined by mark-recapture. Human-assisted movements of wildlife could have significant impacts with respect to cross-border movements of diseases such as rabies. Proactive communication programs, especially at International border crossing areas, should be encouraged to decrease the occurrence of the unintentional movement of wildlife and associated diseases.

Key Words: *Didelphis virginiana*, Opossum, *Procyon lotor*, Raccoon, movement, disease, rabies, Ontario.

The movement of wildlife and domestic animals by humans has resulted in the national, international, and sometimes global movement of diseases such as rabies, West Nile virus, bovine tuberculosis, parvovirus, chronic wasting disease (CWD), and bovine spongiform encephalopathy (BSE) (Jenkins and Winkler 1987; Nielson and Brown 1988; Woodford and Rossiter 1993; Williams and Barker 2001). The international movement of Raccoons (*Procyon lotor*) from the United States to Ontario, Canada, has been documented previously (Rosatte et al. 1997, 2001); however, those publications did not document the distances moved or geographic areas involved.

During January 1997 and December 2005, a total of 14 Raccoons were documented as having moved across the St. Lawrence and Niagara Rivers from Ontario, Canada, to New York State. Those Raccoons were ear-tagged and released in Ontario as part of a wildlife rabies control program during 1997-2005 (Rosatte et al. 1997, 2001). They were later recaptured or found dead in the vicinity of Buffalo or Ogdensburg, New York (Figure 1). Exact locations were known for 13 of those. Mean movement of the 13 Raccoons was 15 km (SD=9.0) (range = 3-30 km). The sex and age were known for 11 of the 13 Raccoons. More adult males (9) than adult females (2) moved from Ontario to New York (Chi Square = 8.9;  $P < 0.0028$ ). Mean movement (18 km, SD=8.4) (range = 6-30 km) of adult male Raccoons was greater than mean movement of adult females (7.5 km, SD=6.4) (range=3-12 km) ( $t=1.65$ ;  $P=0.13$ ).

In addition, during 1998-2005, a total of 14 Raccoons and two Opossums (*Didelphis virginiana*) were found in transport trailers and in a box car on a train in the greater Toronto area. The point of departure of those vehicles included Ohio, Illinois, Tennessee, New York, Michigan, Quebec, and Ontario (Figure 1). In most cases the trailer or container was locked and sealed

at the point of departure and was not opened until it arrived in Ontario. Mean movement of Raccoons by vehicle from the USA and Quebec ( $n=11$ ) to Ontario, Canada, was 479 km (SD=250) (range=250-890 km). This was significantly greater ( $t=6.9$ ,  $P < 0.00002$ ) than movements of Raccoons noted above that did not involve transport via vehicles. The two Opossums moved 1000 km from Tennessee and 376 km from Michigan, respectively.

In Ontario, rabid Raccoons have been documented as having moved 0.7-4.1 km (Rosatte et al. 2005, 2006). Median movements of non-rabid Raccoons in Ontario were generally less than 1 km, with movements rarely exceeding 50 km in distance (Rosatte 2000; Rosatte et al. 2006). However, those movements were assumed not to have been due to human involvement (intentional or otherwise) (i.e. by vehicles). The exceptional movements for Raccoons, as well as Opossums, documented in this paper, indicate that those species have the potential to move infectious diseases such as rabies significant distances. In view of this, people should be vigilant for wildlife such as Raccoons riding on vehicles. Transport trailer drivers (as well as operators of other vehicles such as ferries, trains, boats) should be encouraged to check their vehicles and trailers for wildlife prior to departure to minimize the unintentional movement of animals. This will assist in decreasing the movement of wildlife diseases. Signage at international border crossing areas advising drivers to check their vehicles for wildlife should also be posted. These tactics were used during the 1990s in Ontario in an attempt to prevent the movement of Raccoon rabies from the United States to Canada (Rosatte et al. 1997).

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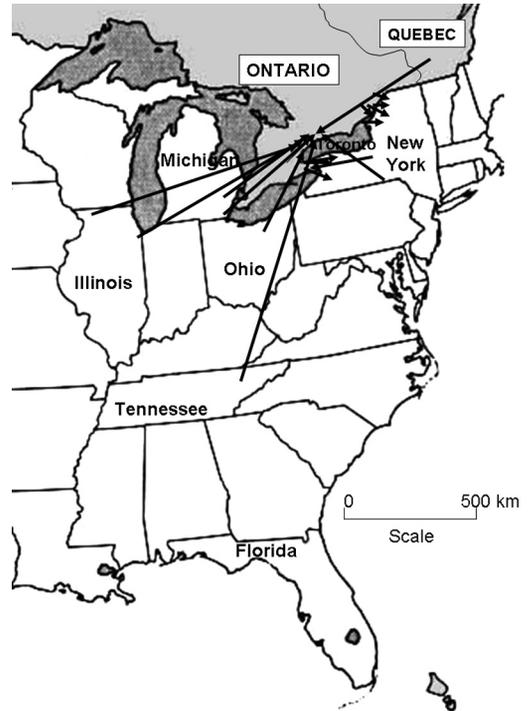


FIGURE 1. Map depicting Raccoon movement to and from Ontario, Canada. Direction of arrows represents direction of Raccoon movements. Arrows depicting movements of > 30 km represent Raccoon movement via transport trailers. One arrow in Michigan represents Raccoon movement on a train. Arrows depicting movements of < 30 km probably represent natural Raccoon movements (i.e. not human assisted). Locations of arrows are approximate.

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