



## Research paper

# The American mink (*Neovison vison*) is a competent host for native European parasites



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## ABSTRACT

The American mink (*Neovison vison*) is a mustelid native to North America that was introduced in Europe and the former USSR for fur farming. Throughout the last century, accidental or deliberate escapes of mink from farms caused the establishment of stable feral populations. In fact, the American mink is considered an invasive alien species in 28 European countries. The present study evaluates the gastrointestinal and cardiopulmonary helminth fauna of the American mink in Galicia (NW Spain) to understand its role as a potential reservoir for parasites affecting other autochthonous mustelids. In the period 2008–2014, fifty American mink (35 males and 15 females) of different ages (22 immature and 28 adults) from the provinces of Lugo, Ourense and Pontevedra were captured and sacrificed. Eight parasite species were found (6 nematodes and 2 trematodes) with the following prevalences: *Molineus patens* (68%), *Aonchotheca putorii* (54%), *Crenosoma melesi* (10%), *Aonchotheca annulosa* (8%), *Angiostrongylus daskalovi* (6%), *Aelurostrongylus* spp. (2%), *Troglostrongylus acutum* (2%) and an unidentified trematode (2%). Eighty-two per cent of the mink harboured helminths, including 15 animals (30%) infected by only one parasite species, 19 (38%) by two species, 5 (10%) by three species and 2 mink (4%) by four species. All helminth species identified are native to European mustelids. Statistical models were used to evaluate if animal characteristics (age, sex and weight), date and capture area influenced the prevalence, intensity or parasite richness. Statistical differences were detected only in models for intensity of *M. patens*, *A. putorii* and *C. melesi*. This is the first report of *Angiostrongylus daskalovi*, a cardiopulmonary nematode, and *A. annulosa*, a gastrointestinal nematode specific of rodents, in American mink. Moreover, although the fluke *T. acutum* has already been cited in American mink, to our knowledge, the present study represents the first report of this trematode in the lung.

## 1. Introduction

The American mink (*Neovison vison* Schreber, 1777) is a semi-aquatic mustelid native to North America, widespread in this area with the exception of the Arctic Circle, the southern of United States and Mexico (Banfield, 1974; Linscombe et al., 1982; Melero and Palazón, 2011). It was introduced in Europe and the former USSR in the early 20s of last century for fur industry purposes (Vidal-Figueroa and Delibes, 1987; Dunstone, 1993; Melero and Palazón, 2011). In Spain, first fur farms were established during the late 1950s (Bravo and Bueno, 1992).

Accidental or deliberate releases consecutive to accidents (fires, windstorms, etc.), limited security measures and/or cessation of farm's activity led to the establishment of feral populations (Vidal-Figueroa

and Delibes, 1987; Palazón and Ruíz-Olmo, 1997). In fact, the American mink is considered an invasive species in 28 European countries (Bonesi and Palazón, 2007). In Spain, the first feral mink was reported in Central Spain (Segovia) in 1978 (Delibes and Amores, 1978) and, since then, this mustelid has progressively colonized Southwest of Galicia (Vidal-Figueroa and Delibes, 1987), Northeastern Catalonia (Ruíz-Olmo, 1987) and Central Spain (Bueno and Bravo, 1990). Currently, three other core populations are established in Cantabria, North of Galicia and Teruel-Castellón (Ruíz-Olmo et al., 1997).

American mink is a generalist and opportunistic species which consumes a wide spectrum of both aquatic and terrestrial preys. Its diet varies depending on the habitat, the prey availability and the presence of other competitor species (Bonesi et al., 2004). Fragmented landscapes, with a wide variety of habitats and food resources, favor its

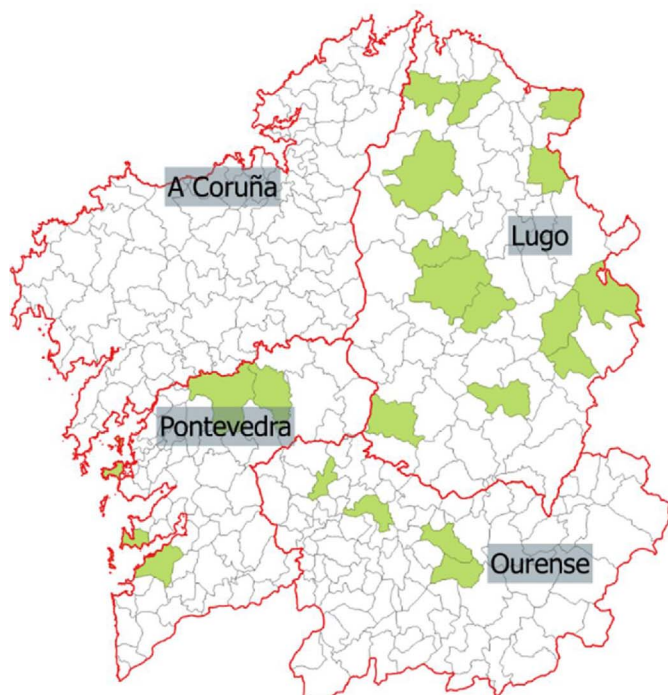
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presence (Rodríguez and Zuberogoitia, 2011). This mustelid preferably inhabits territories with well-structured riparian vegetation (Zuberogoitia et al., 2006; Zabala et al., 2007; Melero et al., 2008b; Melero and Palazón, 2011).

American mink can cause adverse effects on autochthonous prey populations (Bonesi and Palazón, 2007), such as European crayfish (*Austropotamobius pallipes*), Pyrenean desman (*Galemys pyrenaicus*), water vole (*Arvicola sapidus*) and Mediterranean water shrew (*Neomys anomalus*) (Palazón and Ruíz-Olmo, 1997; Bergmans and Blom, 2001; Palomo and Gisbert, 2002; García-Díaz et al., 2013). Moreover, it could have a negative impact on the populations of other carnivores, such as the European mink (*Mustela lutreola*), the otter (*Lutra lutra*) and the European polecat (*Mustela putorius*), due to the competition for space or food resources (Sidorovich et al., 1999; Melero et al., 2012). Furthermore, the introduction of an invasive species can have unpredictable epidemiological consequences, because it can carry alien agents potentially pathogenic for native host species or, alternatively, the same alien species can act as a new reservoir for autochthonous infectious agents (Sepúlveda et al., 2014; Sherrard-Smith et al., 2015). For all these reasons, a national specific regulation was published in Spain, and the Ministry of Agriculture, Food and Environment developed the program “Management strategy, control and eradication of the American mink in Spain”.

The American mink’s control programs in mainland areas are quite complex and, moreover, the area from which the species is removed can be easily recolonized (Bryce et al., 2011). For these reasons, this carnivore is likely to persist in Spain over a long period of time. Therefore, it is important to acquire further information about the epidemiological role of this mustelid in the maintenance and diffusion of infectious pathogens. The aim of this study was to describe the gastrointestinal and cardiorespiratory macroparasites of the American mink in Galicia (NW Spain), an area where the species is present since the 1980s (Fig. 1).



**Table 1**  
Distribution of the American mink (n = 50) by month of capture, sex and age.

Month	Number of mink				Total
	Sex		Age		
	Male	Female	Immature	Adult	
January	1	0	0	1	1
February	10	2	5	7	12
March	6	2	3	5	8
April	1	0	1	0	1
May	4	2	2	4	6
June	0	2	2	0	2
July	3	4	5	2	7
August	2	0	0	2	2
September	2	0	0	2	2
October	1	0	0	1	1
November	3	2	2	3	5
December	2	1	1	2	3
Total	35	15	21	29	50

**2. Material and methods**

**2.1. Sampled animals**

American mink included in this study were caught in river basins from Lugo, Ourense and Pontevedra provinces (Galicia, northwest Spain). The climate in Galicia is predominantly oceanic. The average annual rainfall is 1180 mm, with a homogeneous distribution throughout the year, and the average annual temperature is 13.3 °C, with limited yearly variations (Castillo-Rodríguez et al., 2007).

Between 2008 and 2014, fifty American mink (the sample distribution by sex, age and month of capture is shown in Table 1) were captured during the official control plan implemented by the Galician administrative authority (Consellería de Medio Ambiente, e Ordenación do Territorio).

Captured mink were sent to the Wildlife Recovery Centers of O Veral (Lugo), O Rodicio (Ourense) and Cotorredondo (Pontevedra),



**Fig. 1.** Map showing the sampling zones in Galicia (northwestern Spain).

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