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## A potential threat to the Pampas Biome: the introduction of American mink, *Neovison vison* (Schreber, 1777) in Uruguay

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### ABSTRACT

The American mink (*Neovison vison*) has been introduced for fur farming into several countries around the world. In southern South America, although invasive populations have established in Argentina and Chile, no feral minks have been recorded in the Pampas Biome to date. We report a potentially new biological invasion in Uruguay, presenting observations, pictures and a museum specimen of feral minks in the locality Melilla, Montevideo Department, which probably escaped or were released from a local fur farm. We obtained 35 mink records between 2010 and 2020, mostly close to the fur farm, within a 2.5 km radius. Our report provides the northernmost mink records in South America, being the first in the Pampas Biome. American mink is a feared invader in most of the sites where it has been introduced, and therefore these new records are important mainly to plan and apply management interventions.

### RESUMEN

El visón norteamericano (*Neovison vison*) ha sido introducido en múltiples países por la industria peletera. Esta especie está invadiendo el sur de Chile y Argentina, pero no ha sido aún registrada en el Bioma Pampa. Aquí reportamos una serie de registros ocasionales de visones ferales en la localidad de Melilla, Departamento de Montevideo, Uruguay. Probablemente los propágulos provengan de fugas, o liberaciones, de una granja peletera que allí funciona. Reportamos 35 registros de visones, entre 2010 y 2020, ubicados mayormente en un radio de 2.5 km de dicha granja. Estos serían los registros más al norte en Sudamérica, además de los primeros en el Bioma Pampa. Considerando su alto potencial invasor y sus efectos negativos, se recomienda evaluar rápidamente el estado de esta población y tomar medidas de manejo.

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The American mink, *Neovison vison* (Schreber 1777), is an aquatic mustelid native to North America. As a species highly used by the fur industry, it has been introduced into several countries around the world [1]. Consequently, escapes and releases gave rise to invasive mink populations in at least 33 countries in Europe, South America and Asia [2]. *Neovison vison* inhabits coasts of marine and freshwater (rivers, streams, lagoons, wetlands), preferring sites with dense cover of woody plants. It is a solitary species, with crepuscular and territorial habits [3], and a strict generalist carnivore which consumes a wide range of preys, such as insects, crustaceans, mollusks, fish and tetrapods [4–6]. Its great habitat plasticity, high reproductive rate, and delayed embryonic implantation capacity, give the mink a high ability to colonize and invade a wide range of environments [1–3,7]. This mustelid is considered one of the most dangerous global invasive carnivore species [1,2], due to its effects on native

biodiversity (caused by predation, competition and diseases transmission), economy (in production such as aquaculture and poultry [8,9]), and public health (e.g. as vector of diseases [10], and COVID-19 [11]). Its invasion has been the cause of strong population declines of some ground nesting birds and small mammals [12].

The mink was introduced into Uruguay in the 2000s, encouraged by a program for public and private organizations aiming to develop an intensive local fur industry [13]. Subsequently, the Decree N° 828 of 2008 regulated the commercial mink farming in Uruguay, and monitoring was assigned to Livestock Services of the Ministry of Livestock Agriculture and Fisheries; environmental authorities were not involved in enforcement. In fact, this Decree did not establish precautionary measures associated with environmental risks, and only focused on captive mink production and sanitary regulations. Additionally, Resolution N° 1673 of

2014 of the General Tax Directorate exempted payment of certain equipment and facilities taxes, thus generating incentives for mink farming.

Here we report several American mink (*N. vison*) records in Uruguay by presenting new presence data, observations and reports at Melilla, northwest of Montevideo Department. Melilla is a rural area with low human population density and an important horticultural production. This area is close to the mouth of the Santa Lucía river to De la Plata river, and is a lowland with large wetlands. It is located on the edge of the Protected Area with Managed Resources Humedales de Santa Lucía, which belongs to the National System of Protected Areas. Besides its great biodiversity, this site is characterized by providing an important ecosystem service for Uruguay: the supply of drinking water for half of the country's population.

The only mink fur farm in Uruguay has been operating in Melilla since 2008 (El Porvenir S.C., previously Buoy S.A., 34°47'35.42"S, 56°17'17.42"W; Camino de la Redención 8119, Montevideo, Municipio G, Servicio Centro Comunal Zonal 12). This farm started with minks brought to Uruguay a few years earlier at a nearby institute for agricultural research, the Instituto Nacional de Investigación Agropecuaria – INIA [13].

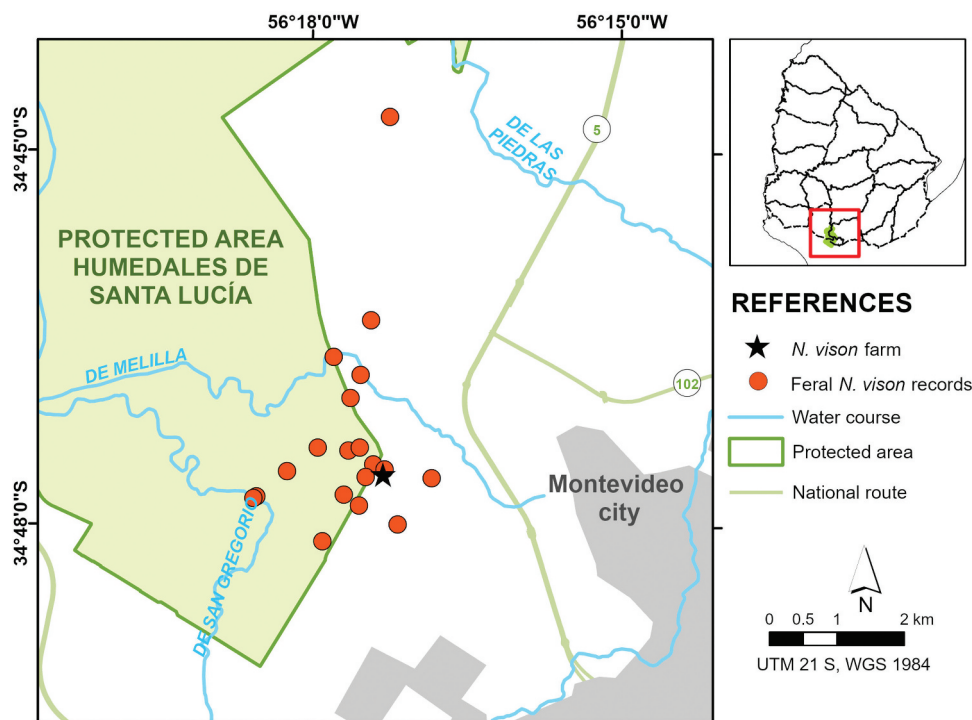
Here we present reports from residents around the mink farm, naturalists, protected area rangers, records posted in social networks (i.e. Facebook, confirmed contacting the publishers), and the authors' observations, from January 2010 to December 2020. All records were confirmed by clear descriptions of

the observed specimens, in most cases with photographs and/or videos. In all cases we recorded observation date, geo-referenced location and site where minks were observed (house: domiciliary or peridomiciliary, road: streets and roads, and natural: grassland and riparian forest). An individual hit by a vehicle on a road was obtained by the authors, and was deposited in the Mammal Collection of the National Museum of Natural History of Montevideo (catalogue identifier MNHN 8208).

In total, we obtained 35 mink records mostly close to the fur farm, within a 2.5 km radius; only one was over 5 km away. Forty nine percent of the records were located inside the protected area and in micro-basins of tributary streams of the Santa Lucía River (Figure 1).

The first record of a mink in the area was in February 2010, only two years after the fur farm was established. It was an extremely docile specimen, found around a family home, easily photographed multiple times. Unaware of the presence of minks in the area, Montenegro et al. [14] misclassified it as a possible case of melanism of the native hurón (*Galictis cuja*, Mustelidae). *Neovison vison* records increased significantly from 2018 to 2020 (Table 1).

The majority of the records occurred in anthropic areas, residential houses or on roads. Fifteen of the records were animals attacked or killed by domestic dogs near their homes, and four were found run over by vehicles on the roads (Figure 2). This was the case of the mink deposited in the MNHN, a female (not neutered) with a total length of 553 mm (tail 164 mm, ear



**Figure 1.** Map of the study area including the protected area with managed resources Humedales de Santa Lucía, of the National System of Protected Areas, Montevideo, Uruguay. Records of feral mink (Orange dots) and fur farm (black star) are indicated.

**Table 1.** Minks records in Melilla, Montevideo Department, Uruguay. UTM 21S coordinate system, Datum WGS 1984.

LATITUDE	LONGITUDE	DATE (MONTH/ YEAR)	NUMBER OF INDIVIDUALS	ENVIRONMENT	INDIVIDUAL CONDITION
-34.745333	-56.287444	02/2010	1	HOUSE	Alive
-34.789583	-56.292000	05/2012	1	HOUSE	Dead, domestic dog attack
-34.777472	-56.296278	07/2012	1	RIPARIAN FORES/ GRASSLAND	Dead, hit by a vehicle on a bridge
-34.779833	-56.291889	08/2012	1	HOUSE	Alive
-34.792806	-56.303750	04/2013	1	RIPARIAN FORES/ GRASSLAND	Dead, hit by a vehicle on a bridge
-34.792495	-56.287909	02/2018	2	HOUSE	Dead, domestic dog attack
-34.797304	-56.292058	02/2018	2	STREET ROAD	Alive, on a road
-34.791784	-56.289783	08/2018	1	HOUSE	Dead, domestic dog attack
-34.792495	-56.287909	08/2018	1	HOUSE	Dead, domestic dog attack
-34.772525	-56.290269	10/2018	1	STREET ROAD	Alive, on a bridge
-34.791784	-56.289783	01/2019	1	HOUSE	Dead, domestic dog attack
-34.793519	-56.290980	01/2019	2	STREET ROAD	Alive
-34.802160	-56.297904	08/2019	1	HOUSE	Alive
-34.789612	-56.298801	11/2019	1	STREET ROAD	Alive
-34.792495	-56.287909	12/2019	2	HOUSE	Dead, domestic dog attack
-34.791784	-56.289783	01/2020	3	HOUSE	Dead, domestic dog attack
-34.792495	-56.287909	01/2020	3	HOUSE	Dead, domestic dog attack
-34.793519	-56.290980	01/2020	1	HOUSE	Dead, domestic dog attack
-34.789959	-56.293810	02/2020	1	STREET ROAD	Alive
-34.799823	-56.285784	02/2020	1	STREET ROAD	Alive
-34.793576	-56.280265	02/2020	1	STREET ROAD	Alive
-34.782961	-56.293556	03/2020	2	STREET ROAD	Alive
-34.795878	-56.294503	05/2020	2	STREET ROAD	Alive
-34.796181	-56.308708	06/2020	1	STREET ROAD	Dead, hit by a vehicle on a road
-34.796417	-56.309139	06/2020	1	STREET ROAD	Dead, hit by a vehicle on a road (MNHN 8208)

**Figure 2.** Feral American mink records in Melilla, Montevideo Department, Uruguay (a). Most records were from anthropogenic areas, such as roads or bridges (b), or houses, commonly detected by domestic dogs (c).

22 mm, paw with claw 61 mm). This specimen did not have macroscopic ectoparasites, had no stomach content, and had clear signs of internal impact damage.

The data presented herein evidence the existence of persistent records of *N. vison* for ten years at Melilla, showing a growing trend during the recent past years. Considering the proximity of the fur farm and the tamed behavior of the observed minks towards humans, we can assume that they were released or escaped from this facility. In addition, it is the only mink farm in Uruguay, and we are not aware of other introductions (such as pet trade), so this would be the only possible introduction path. These records are alarming due to the suitability of the local habitat for this species [15], and require a rapid response to be generated to prevent an invasion from occurring [16]. Anyway, we must consider our observations with caution. As there was no individual identification, our data could include repeated sightings of the same individuals, since the area delimited by the records would be within the expected home range for mink [17]. However, considering that many of these observations correspond to specimens killed by dogs or being run by vehicles, we can assume that there is a persistent release of propagules from the local fur farm. This sustained and increasing pressure for mink propagules could result in the establishment of an invasive population in the area [18].

The high proportion of the recorded mink observations in anthropic environments is surely due to a bias in the data collected. These occasional observations have a higher chance to occur close to houses and roads than in natural habitats. Given the threat posed by this species on native biodiversity, it is essential to study and monitor the mink population in the area, through active sampling and not just analyzing occasional sightings, in order to confirm if there is feral reproduction and manage the situation accordingly [19].

In most cases, invasions are found in advanced stages, when control actions are expensive and usually ineffective [19]. This is the case of the mink in southern South America, being the most widely distributed invasive carnivorous mammal, occupying almost all of Patagonia, with strong impacts on local biodiversity [3]. The potential invasion of *N. vison* in the Pampas Biome would be a serious threat to its native biodiversity, especially for birds and mammals. Our early detection provides a unique opportunity for its management [9,16].

The intentional introduction of exotic species for productive purposes is one of the main invasion paths [1,20]. Paradoxically, many of the species repeatedly introduced for productive purposes have already been classified as invasive elsewhere, which predicts their potential as invaders [21]. Uruguay has had a policy of introducing risky exotic animal

species for productive purposes many times, for example carp (*Cyprinus carpio* [22]), American bullfrog (*Lithobates catesbeianus* [23]), and Nile tilapia (*Oreochromis niloticus* [24]). The results in most cases are established invasive populations that need to be controlled. For this reason, we alert the authorities about the involved risks and the need to end these policies, fulfilling the commitment assumed in the Convention on Biological Diversity and the Aichi Targets.

The protected area Humedales de Santa Lucía is a priority for Uruguay due to its ecosystem services. Invasive alien species are one of the major threats to protected areas conservation, but little has been done to prevent them [25]. Bullfrog farms established in the 80s on the same zone as the mink fur farm, has generated a recently detected invasion [26]. Based on these experiences, the introduction of exotic species productive ventures in this area should be avoided, and actions should be taken to control or eradicate invasive species already detected in natural systems.

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## Disclosure statement

No potential conflict of interest was reported by the author(s).

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