Ondatra zibethicus
muskrat, rata almizclera

Guillermo A. DEFERRARI[1,2]

[1] Centro Austral de Investigaciones Científicas (CADIC), Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Houssay 200, 9410 Ushuaia, Argentina.

[2] Instituto de Ciencias Polares, Ambiente y Recursos Naturales (ICPA), Universidad Nacional de Tierra del Fuego (UNTDF), Fuegia Basket 251, 9410 Ushuaia, Argentina.

guillermo.deferrari@gmail.com

Resumen. *Ondatra zibethicus*, comúnmente conocida como «rata almizclera» o *muskrat* en su región de origen, es un roedor semiacuático que fue introducido desde Canadá a la Isla Grande de Tierra del Fuego en la década de 1940 para el aprovechamiento de su piel, considerada valiosa en el mercado comercial de pilíferos. En líneas generales, las especies introducidas son en su mayoría especies generalistas y oportunistas que se adaptan más fácilmente y llegan a incrementar rápidamente su población y uso de hábitats. En ese sentido, la ausencia de predadores y de un régimen de caza permitió a la especie colonizar tanto ambientes lóticos como lénticos en la isla, ocupando actualmente la totalidad de los cursos de agua, y tolerando una amplia diversidad de ambientes. La colonización de rata almizclera está asociada a la sucesión de ambientes inundados, incluyendo a aquellos generados por castor (*Castor canadensis*), en donde son importantes los cambios en la profundidad del agua y la heterogeneidad de la vegetación emergente, ya que influyen particularmente en la supervivencia de invierno, cuando el acceso al alimento y la presencia de predadores son críticas. El análisis de su historia de vida demostró que la rata almizclera es 100% herbívora, consumiendo preferentemente plantas acuáticas y terrestres, con las cuales también construye sus casas y madrigueras. La especie no es explotada ni se han presentado planes de manejo históricamente. Su impacto no ha sido mayormente evaluado, aunque es considerado bajo.

General description of the species

Ondatra zibethicus, known as muskrat or *rata almizclera*, is a semi-aquatic rodent of the Arbicolinae subfamily that was introduced into Tierra del Fuego Island (TDF) in the 1940s for its fur. It is the largest species of the Cricetidae family (Fig. 1), reaching a total length of approximately 55 cm and an adult weight between 700 and 1800 g (Willner, 1980).

One of muskrats' main adaptations to semi-aquatic habits are lips that close behind the incisor teeth, allowing them to gnaw while submerged. The small forelegs are used to handle food and burrow-building material, while the hind legs present an interdigital membrane to swim. Muskrats can stay underwater up to 20 minutes, and their coat retains air between hairs, favoring impermeability and increasing thermal insulation.

Muskrats live for 3 to 4 years. Both sexes possess functional musk glands in a perianal position. Females commonly have three pairs of breasts (1 pectoral and 2 inguinal) and sometimes 4 or 5 pairs. Muskrats are considered monogamous (Messier and Virgl, 1992), with a gestation period that varies between 25–30 days.

In general, the reproductive period on TDF extends practically from the end of winter to the beginning of autumn, with a peak of births during the summer. More than one successive calving can occur, with a litter size of 5–6 animals (Deferrari, 1996).

Figure 1. *Ondatra zibethicus* in Tierra del Fuego province, Argentina. (Photo: Guillermo Deferrari).

The environments invaded by the muskrat in TDF are characterized, as in the Northern Hemisphere, by two main types of construction, depending on the environment if the muskrats build houses or dig burrows in the substrate (Messier and Virgl, 1992). The houses have the shape of a dome or conical elevation built with remnants of aquatic vegetation, while the burrows are underground cavities connected by tunnels or channels in peatland or riverside areas. These constructions serve as a protective structure after spring and as a shelter during winter. Houses are built above the water level and connected by underwater tunnels, and in general, construction generally begins using local floating vegetation (Willner, 1980).

Vegetation density, water level and plant phenology influence the degree to which certain plans are used in diet, with the root and base of various hydrophytes being the most important portion of what is consumed in North America and Europe (Danell, 1978).

Despite bibliographic data indicating the consumption of a significant percentage of animal material in the species' native range (Danell, 1978; Convey *et al.*, 1989; Neves, 1989; Parmalee, 1989) its diet in TDF appears to only be vegetarian.

History of the invasion

Muskrat is native to North America, where it occupies almost the entire territory. This species was introduced for the economic value of its pelt. Current areas with introduced populations of *Ondatra* include western Europe, Scandinavia, Japan, Russia (Willner, 1980), and southern South America.

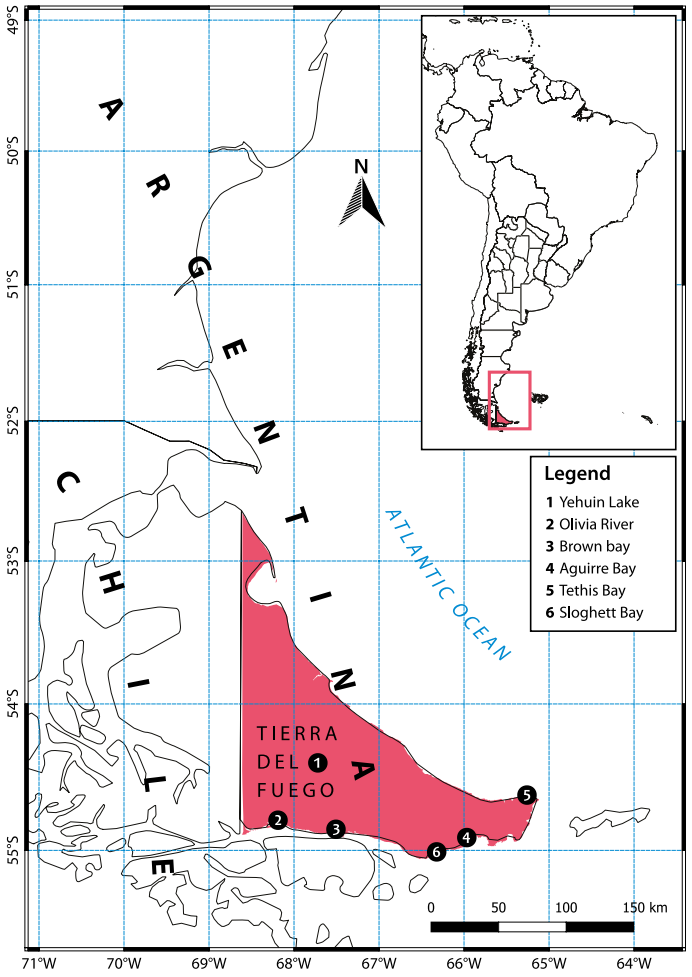

Figure 2. Distribution of *Ondatra zibethicus* in Argentina. Modified from Deferrari (2019). (Mapping: Ian Barbe and Alfredo Claverie).

Between 1940 and 1950, the Argentine Ministerio de Marina decided to introduce several fur-bearing species to TDF to enhance natural resources, and released North American beavers (*Castor canadensis*; Anderson and Roulier, this volume) and muskrats brought from Canada. Daciuk (1978) indicates that 225 individuals (75 males and 150 females) were released in different sites in the island: Yehuin Lake (14 males and 15 females), Olivia River (4 males and 5 females), Brown Bay (10 males and 37 females), Aguirre Bay (28 males and 36 females), Tethis Bay (12 males and 14 females), and the rest of the individuals in Sloghett Bay. These animals have colonized a wide range of habitats, evidencing the plasticity of the species to adapt to different environmental conditions.

Patterns of expansion and current distribution

The native distribution of muskrat is in North America, from Labrador in Canada to Arizona and Louisiana in USA. Due to its fur, muskrat farms were established in Europe, and later escapes resulted in the invasion of this continent and north Asia.

In Argentina, muskrats are present in all freshwater bodies of TDF province, including lentic (lakes, lagoons, wetlands, etc.) and lotic (rivers and streams) environments (Fig. 2). The species was recorded not only in the main island of TDF but also in almost all islands in the Beagle Channel. The Fagnano Lake area is the most beneficial environment for this species, with an estimated abundance of 15–125 individuals per hectare, before and after reproduction respectively (Deferrari, 2007).

Impacts

Muskrat impacts have been mainly studied in Europe and Asia, where the species high density generates problems of habitat degradation due to its tunneling activities in river banks, leading to control actions in different countries (Le Boulenge, 1972). The impacts on TDF, Argentina, are not quantified, but they may not be significant given their relatively low abundance. Additionally, the species seems to be controlled, at least to some degree, by the invasive American mink (*Neogale vison*; Valenzuela *et al.*, 2014). The species is not affected by human presence, since individuals have been recorded inside houses or even in urban areas, where dogs could limit their activities.

Management

Muskrat exploitation was regulated in 1981, more than 30 years after its introduction. However, this activity was not successful due to several issues, such as lack of biological information in TDF, adequate traps, management plans, etc.

Muskrat trapping is open through the year in TDF as a way to control its population; however, until now, annual harvesting is practiced in a very small scale by few seasonal hunters, mostly due to the low value and use of their fur. Even when muskrats' musk glands are used in the perfume industry, the exploitation of the species remains at low levels. In TDF, the use of Conibear® 110-2 traps was recommended (Lizarralde *et al.*, 1996).

References

Anderson, C.B. and Roulier, C. This volume. *Castor canadensis*. North American beaver, castor americano, pp. 249–254.

Convey, L., Hanson, J.M. and MacKay, W.C. 1989. Size-selective predation on unionid clams by muskrats. *Journal of Wildlife Management* 53: 654–657.

Daciuk, J. 1978. Notas faunísticas y bioecológicas de Península Valdés y Patagonia. IV. Estado actual de las especies de mamíferos introducidos en la subregión araucana (Rep. Argentina) y del grado de coacción ejercido en el ecosistema. *Anales de Parques Nacionales* 14: 105–132.

Danell, K. 1978. Population dynamics of the muskrats in a shallow Swedish lake. *Journal of Animal Ecology* 47: 697–709.

Deferrari, G., Lizarralde, M.S., Escobar, J., Álvarez, S. and Camilión, C. 1996. [*Situación actual de la población de rata almizclera introducida en Tierra del Fuego y su estudio cromosómico*. Publicación técnica Nº 3. CADIC – Subsecretaría de recursos Naturales y Ambiente Humano. Provincia de Tierra del Fuego. 14 pp. Unpublished.]

Deferrari, G. 2007. [*Biología y ecomorfología poblacional de la rata almizclera* (Ondatra zibethicus) *en Tierra del Fuego*. Doctoral Thesis, Universidad de La Plata, 127 pp. Unpublished.]

Deferrari, G. 2019. *Ondatra zibethicus*. In: SAyDS – SAREM (eds.), *Categorización 2019 de los mamíferos de Argentina según su riesgo de extinción. Lista Roja de los mamíferos de Argentina*. https://cma.sarem.org.ar/es/especie-exotica/ondatra-zibethicus.

Le Boulenge, E. 1972. État de nos connaissances sur l'ecologie du rat musqué *Ondatra zibethica* L. *Terre et Vie* 1: 3–37.

Lizarralde, M.S., Escobar, J., Deferrari, G., Álvarez, S. and Camilión, C. 1996. [*El trampeo de animales: un ensayo para el trampeo de castor y rata almizclera con trampas Conibear 330-2 y 110-2*. Publicación técnica Nº 4. CADIC – Subsecretaria de recursos Naturales y Ambiente Humano. Provincia de Tierra del Fuego. 12 pp. Unpublished.]

Messier, F. and Virgl, J. 1992. Differencial use of bank burrows and lodges by muskrats, *Ondatra zibethicus*, in a northern marsh environment. *Canadian Journal of Zoology* 70: 1180–1184.

Neves, R. 1989. Muskrats predation on endangered freshwater mussels in Virginia. *Journal of Wildlife Management* 53: 934–941.

Parmalee, P. 1989. Muskrats predation on softshell turtles. *Journal of the Tennessee Academy of Science* 64: 225–227.

Valenzuela, A.E.J., Anderson, C.B., Fasola, L. and Cabello, J.L. 2014. Linking invasive exotic species and their ecosystem impacts in Tierra del Fuego to test theory and determine action. *Acta Oecologica* 54: 110–118.

Wilner, G., Feldhamer, G., Zucker, E. and Chapman, J. 1980. *Ondatra zibethicus*. *Mammalian Species* 141: 1–8.