

GEA, FLORA ET FAUNA

First detection of invasive coypu, *Myocastor coypus* Molina, 1782 (Mammalia: Roentia: Myocastoridae) into lake Banyoles (Catalonia, north-east Iberian Peninsula)

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Abstract

The coypu (*Myocastor coypus*), a large semi-aquatic rodent native to South America, is reported for the first time in the protected natural area of Lake Banyoles. At the end of February 2020, an individual was sighted in the southern area of the city of Banyoles, specifically in the Terri river, and the device for the control of invasive species contemplated in Royal Decree 630/2013, of August 2, which regulates the Spanish Catalog of Invasive Alien Species. At the beginning of March this same individual was observed in the southern area of Lake Banyoles. It was shoot down on March 13 of 2020 in this zone of the lake. The arrival and establishment of the coypu in Lake Banyoles represents a potential threat for its native habitats or species such as: calcareous fens with *Cladium mariscus* habitat and freshwater muskels (*Unio mancus*, *Unio ravoisieri*). As in the case of other species of invasive mammals in the Iberian Peninsula, such as the American mink (*Neovison vison*) and the muskrat (*Ondatra zibethicus*), among others, the coypu is likely to spread to other Iberian basins, adversely affecting their native ecosystems and species if control measures for that species do not improve.

Key words: Invasive, species, semi-aquatic, rodent.

Resum

Primera cita del coipú invasor *Myocastor coypus* Molina, 1782 (Mammalia: Roentia: Myocastoridae) a l'estany de Banyoles (Catalunya, Nord-est de la península Ibèrica)

El coipú (*Myocastorcoypus*), un rosegador gran semi-aquàtic natiu de l'Amèrica del Sud, s'informa per primera vegada a l'espai natural protegit de l'estany de Banyoles. A finals de febrer de 2020 va ser observat un individu a la zona sud de la ciutat de Banyoles, concretament al riu Terri i es va posar en marxa ràpidament el dispositiu de control d'espècies invasores contemplat en el Reial Decret 630/2013, de 2 d'agost, pel qual es regula el Catàleg espanyol d'espècies exòtiques invasores. A principis de març aquest mateix individu va ser observat a la zona sud de l'estany de Banyoles. Aquest individu va ser abatut el 13 de març de 2020 en aquesta zona de l'estany. L'arribada i establiment del coipú a l'estany de Banyoles representa una amenaça potencial pels hàbitats i espècies natives com per exemple: aiguamolls calcaris amb mansega (*Cladium mariscus*) i les nàiades (*Unio mancus*, *Unio ravoisieri*). Com en el cas d'altres espècies de mamífers invasors a la Península Ibèrica, com el visó americà (*Neovison vison*) i la rata mesquera (*Ondatra zibethicus*), entre d'altres, és probable que el coipú es propagui a altres conques ibèriques, afectant negativament els seus ecosistemes i espècies natives si les mesures de control per a aquesta espècie no milloren.

Paraules clau: invasora, espècie, semi-aquàtica, nativa, rosegador.

Introduction

Invasive species represents a high threat to biodiversity and the health of ecosystems worldwide (D'Amore *et al.*, 2019). In Iberian Peninsula, the acclimation of invasive species is one of the most important negative factors that affecting the survival of endemic species (Elvira, 1998; Collen *et al.* 2014; Chown *et al.* 2015). Several studies have summarized the impacts of invasive species on native species and community structure (Williamson, 1996; Wilcove *et al.*,

1998; Parker *et al.*, 1999; Sala *et al.*, 2000; Stein *et al.*, 2000; Bradley *et al.*, 2019), and the ecosystem-level effects of invasive species are subject to study (Vitousek & Walker, 1989; Hobbs, 2000). In addition, continental water ecosystems are most susceptible to species invasion (Cohen & Carlton, 1998; Thomaz *et al.*, 2015), and the number of accidental or intentional introductions are increasing (Moyle, 1999). *Myocastor coypus* (coypu) is a large semi-aquatic rodent originated in South America including Argentina, Bolivia, southern Brazil, Chile, Paraguay and Uruguay (Ehrlich, 1967; Banfield,

1974; Kinleret *et al.*, 1987; Kinler, 1992). Its conservation status in its native range is Least Concern (LC) (IUCN, 2020). This species has been highly valued for the use of its skins by the fur industry, which has led to its introduction in many countries outside its native range and due to escapes and releases from farms of fur, nowadays; there are large wild populations in North America, Europe, and Asia (Carter & Leonard, 2002). In Iberian Peninsula, is considered an invasive species and, its introduction comes from escapes and releases from fur farms in France and Catalonia since the early 70s of the 20th century (Palazón *et al.* 2015). Currently there are populations located on the Atlantic side (Valle de Arán in Catalonia, Soba in Cantabria; Ribera del Bidasoa in Guipúzcoa; Baztán, Valcarlos and scattered specimens in the Ebro Basin, in Navarra). Palomo *et al.* (2007) found very low-density nuclei on the Catalan Mediterranean slope (Sant Feliu de Buixalleu and Arbúcies, in Montseny), in Girona. The constant presence of coypu in Catalonia was first detected in 2012 and reproduction of the species released in Catalonia is confirmed from the years 2013-2014. Nowadays this species has already reached catalan river basins such as Muga, Fluvià and Ter in north-east of Iberian Peninsula (Palazón *et al.*, 2015).

Many times, when an invasive species is detected in a new area until an action can be taken to eliminate it, it can spend time due to bureaucratic, organizational issues, etc. During this time, the invasive species, as long as it has the minimum potential to become a successful invader such as a suitable reproductive strategy and life-history (Sol *et al.* 2012), often takes advantage to spread through the new area.

Materials and methods

On February 27/2020, a coypu (*Myocastor coypus*) was seen in the northern part of Terri river (tributary of Ter river), in the southern part of the city of Banyoles (Ter river basin, NE Spain). On 11 and 12 March, it was seen what we thought it most likely the same individual, swimming in southern area of Lake Banyoles (Fig. 1). On March 13, an action related to eliminate the individual in the southern area of the



Figure 1. Places where the coypu was sighted in late February (1) and early March (2 and 3).

lake, where this same individual had been seen during two days prior, was organized. In this action participated a group of technicians from Consorci de l'Estany, forest rangers, technicians from the Banyoles City Council and local police officers. The action consisted of, using binoculars and telescopes for wildlife sighting; the coypu was seen swimming in the southern area of the lake. Once the animal was located, a forest ranger, using a 17calibre rifle, shot down the coypu with a single shot when it was going out from the water. This action was carried out following the current European regulations for the management of invasive species (EU Regulation 1143/2014 on Invasive Alien Species and Spanish regulation of invasive species Royal Decree 630/2013, of August 2, which regulates the Spanish Catalogue of invasive alien species).

Results and discussion

The individual was an adult male, weighed 4570 g, it was 85 cm long (body length + tail), it showed the typical brown and yellow-brown fur with a cylindrical tail, it had webbed hind legs, prominent incisors (3.5 cm and 2 cm upper and lower incisors, respectively) and bright orange-yellow (Fig. 2). For its conservation, this individual was frozen in the Consorci de l'Estany facilities.

The invasive species are one of the greatest threats to native biodiversity, and they can have severe negative impacts in freshwater ecosystems (Panlasigui *et al.*, 2018). In Lake Banyoles these impacts can be caused by coypu direct biotic interaction with the native species as *Cladium mariscus* which can be consumed by coypu outside its native range



Figure 2. Incisors of *Myocastor coypus* captured in lake of Banyoles.

(Vereshchagin, 1941) and also it is known that coypu can produce indirect changes in habitat conditions (e.g. turbidity, habitat structure) (Crooks, 2002).

As far as we know, this is the first record of *Myocastor coypus* in Lake Banyoles and we have been able to observe how it had been feeding on *Thypha angustifolia*, *Scirpus littoralis* and *Dorycnium rectum*. The coypu in Iberian Peninsula, as in other parts of Europe, is a serious threat to native species, habitats or ecosystems (Scalera *et al.*, 2012). In Spain it has been included in the Spanish List of Invasive Exotic Species, approved by Royal Decree 1628/2011, of November 14, and its introduction into the natural environment, possession, transport, traffic and commerce, is prohibited in Spain. In fact, the coypu is considered one of the most damaging invasive species (Gosling & Baker, 1996), due to the damage that this species causes to crops, native flora and fauna and drainage systems (Salsamendi *et al.*, 2009; Scalera *et al.*, 2012). All these negative effects of invasive coypu become more relevant, if the invasion occurs in a protected natural area such as Lake Banyoles. Lake Banyoles is listed as a Site of Community Importance (one of the protection figures provided in the European Nature 2000 network) and as a Wetland of International Importance of great ecological interest since species of protected flora and fauna.

Although, coypu has been recorded in several areas of the Iberian Peninsula, it has never been recorded before in. As we said before, when we detected the coypu near to Lake Banyoles, we started the protocol of control of invasive species quickly. We believe that to act quickly to coordinate the elimination action of the individual, helped us to eliminate it, and we think that this is a key factor to control to spread invasive species in invasive new areas. The coypu eliminated, probably came from a known population in Ter river, which in turn connects with Terri river, which is fed by the waters of Lake Banyoles through small streams that connecting lake with Terri river (see details in «Ajuntament de Banyoles» web site). The arrival of the coypu to Lake Banyoles represents a serious threat to the conservation of its native species and communities, because, this species can strongly affect plant communities and, consequently, affect native animal species that depend on aquatic ecosystems, such as birds, otters, beavers, crustaceans, molluscs, etc. (Nowak 1991; LeBlanc, 1994). Coypu also can become a potential carrier of diseases such as: equine encephalitis, leptospirosis, pasturellosis, paratyphoids, and salmonellosis, and parasitic diseases such as: nematodes, giardiasis, and tapeworms, which can transmit to different types of native animals, domestic livestock, and even humans (Álvarez-Romero & Medellín, 2005). Furthermore, coypu is not tolerant to cold weather and its populations can decrease up to 80 percent with cold winters (Carter & Leonard, 2002). Even some populations can collapse in harsh winters (Doncaster & Micol, 1990). Therefore, in countries of Europe and North America with cold winters, the coypu would see its distribution limited. Conversely, in countries with milder winters, as would be the case of the Iberian Peninsula, the coypu could see its expansion, colonization and establishment of new territories fa-

voured, since it increases its rate of reproduction and survival in a very notable way (Kaeslin *et al.*, 2012). In addition, this fact also could be favoured by climate change. All these data we suggest that, as it is known with other invasive mammal species such as the American mink (*Neovison mink*) and the muskrat (*Ondatra zibethicus*) among others, the coypu is likely to spread to other Iberian basins, negatively affecting their ecosystems and native species if the control measures for this species do not improve.

References

- ÁLVAREZ-ROMERO, J., & MEDELLÍN, R. A. 2005. *Myocastor coypus*. Vertebrados superiores exóticos en México: diversidad, distribución y efectos potenciales. Instituto de Ecología, Universidad Nacional Autónoma de México. Bases de datos SNIB-CO-NABIO. Proyecto U020. México.D.F.
- BANFIELD, A. W. F. 1974. The Mammals of Canada. University of Toronto Press, Toronto, xxv + 438 pp.
- BRADLEY, B. A., LANGERHANS, B. B., WHITLOCK, R., ALLEN, J. M., BATES, A. E., BERNATCHEZ, G., DIEZ, J. M., EARLY, R., LENOIR, J., VILÀ, M., & SORTE, C. J. B. 2019. Proceedings of the National Academy of Sciences May 2019, 116 (20) 9919-9924.
- CARTER, J., & LEONARD, B. P. 2002. A review of the literature on the worldwide distribution, spread of, and efforts to eradicate the coypu (*Myocastor coypus*) Source. Wildlife Society Bulletin, 30 (1) : 162-175.
- CHOWN, S. L., HODGINS, K. A., GRIFFIN, P. C., OAKESHOTT, J. G., BYRNE, M., & HOFFMAN, A. A. 2015. Biological invasions, climate change and genomics. *Evolutionary Applications*, 8(1), 23-46.
- COHEN, A.N., & CARLTON, J. T. 1998. Accelerating invasion rate in a highly invaded estuary. *Science*, 279: 555-558.
- COLLEN, B., WHITTON, F., DYER, E. E., BAILLIE, J. E. M., CUMBERLIDGE, N., DARWALL, W. R. T., POLLOCK, C., RICHMAN, N. I., SOULSBY, A. M. & BÖHM, M. 2014. Global patterns of freshwater species diversity, threat and endemism. *Global Ecology and Biogeography*, 23: 40-51.
- CROOKS, J. A. 2002. Characterizing ecosystem-level consequences of biological invasions: the role of ecosystem engineers. *Oikos*, 97, 153-166.
- D'AMORE, D., POPESCU, V. & MORRIS, M. 2019. The influence of the invasive process on behaviours in an intentionally introduced hybrid, *Xiphophorus helleri-maculatus*. *Animal Behaviour*, 156: 79-85.
- DONCASTER, C. P., & MICOL, T. 1990. Response by coypus to catastrophic events of cold and flooding. *Ecography*, 13 (2): 98-104.
- EHRlich, S. 1967. Field studies in the adaptation of nutria to seasonal variations. *Mammalia*, 31: 347-360.
- ELVIRA, B., ALMODOVAR, A., & NICOLA, G. 1998. Fish communities of the middle-upper Tagus River (central Spain): A story of river regulation and exotic introductions. *Polskie Archiwum Hydrobiologii*, 45: 165-171.
- GARDE, J. M., & ESCALA M, C. 1993. Situación actual de la rata de agua *Arvicolasapidus* Miller, 1908 (Rodentia, Arvicolidae) en Navarra. *Revista del Centro de Estudios Merindad de Tudela* 5: 121-130.
- GOSLING, L. M., & BAKER, S. J. 1996. *Coypu*. In: Corbet G.B. and Harris S. (eds), The Handbook of British mammals. Blackwell Science, London, 267-275.

- HOBBS, R. J. 2000. *Land-use changes and invasions*. A: Mooney, H.A. i Hobbs, R.J. (eds). *Invasive species in a changing world*. P. 31-54. Island Press, Washington.
- KAESLIN, E., REDMOND, I., & DUDLEY, N. 2012. *Wildlife in a changing climate*. FAO Forestry Paper 167. Food and Agriculture Organization of the United Nations. Rome.
- KINLER, N. W. 1992. *Biology and ecology of nutria*. P. 75. In: Proceedings of the thirteenth annual meeting of the American Society of Wetland Scientists 31 May- 6 June 1992, New Orleans, Louisiana, USA.
- KINLER, N. W., LINScombe, G., & RAMSEY, P. R. 1987. *Nutria*. P. 326-343. In: M. Novak, J. A. Baker, M. E. Obbard, and B. Malloch, editors. *Wild furbearer management and conservation in North America*. The Ontario Trappers Association, Ontario Ministry of Natural Resources Toronto, Canada.
- LEBLANC, D.J. 1994. *Nutria*. In: (R. M. Timm, ed.) *Prevention and control of wildlife damage*. Cooperative Extension Division, Institute of Agriculture and Natural Resources, University of Nebraska, Lincoln, NB. pp. B71-B80.
- LESSA, E., OJEDA, R., BIDAU, C., & EMMONS, L. 2008. *Myocastor coypus*. The IUCN Red List of Threatened Species 2008: e.T14085A4388658. Downloaded on 30 March 2020.
- MOYLE, P. 1999. Effects of invading species on freshwater and estuarine ecosystems. In: Sandlund, O. T., Schei, P. J. and Viken, A. (eds), *Invasive species and biodiversity management*. Kluwer Academic Publishers. P. 177-194.
- NOWAK R. M. 1991. *Walker's mammals of the world*. Johns Hopkins University Press, Baltimore, Maryland, EUA, 1629 p.
- OJEDA, R., BIDAU, C. & EMMONS, L. 2016. *Myocastor coypus* (errata version published in 2017). The IUCN Red List of Threatened Species 2016: e.T14085A121734257. Downloaded on 13 November 2020.
- PALAZÓN, S., DURÀ, C., & VENTURA, J. 2015. Situación actual del coipú, un mamífero exótico semiacuático, en Catalunya. *Galemys*, 27: 63-66.
- PALOMO, J., GISBERT, J., & BLANCO, J. 2007. *Atlas y Libro Rojo De Los Mamíferos Terrestres De España*. Dirección General para la Biodiversidad, SECEM-SECEMU, Madrid, 588 p.
- PANLASIGUI, S., DAVIS, A., MAGIANTE, M., & DARLING, J. 2018. Assessing threats of non-native species to native freshwater biodiversity: Conservation priorities for the United States. *Biological Conservation*, 224.
- PARKER, I. M., SIMBERLOF, D., LONSDALE, W. M., GOODELL, K. & WONHAM, M. 1999. Impact: toward a framework for understanding the ecological effects of invaders. *Biological Invasions*, 1: 3-19.
- RUEDA, F. J., MORENO-OSTOS, E., & ARMENGOL, J. 2006. The residence time of river water in reservoirs. *Ecological Modelling*, 191: 260-275.
- SALA, O. E., CHAPIN, F. S. III., ARMESTO, J. J., BERLOW, E., & BLOOMFIELD, J. 2000. Global biodiversity scenarios for the year 2100. *Science*, 287: 1770-1774.
- SALSAMENDI, E., LEIRE, L., & O'BRIEN, J. 2009. Current distribution of the coypu (*Myocastor coypus*) in the Basque Autonomous Community, northern Iberian Peninsula. *Hystrix*, 20: 155-160.
- SCALERA, R., GENOVESI, P., ESSL, F., & RABITSCH, W. 2012. The impacts of invasive alien species in Europe.
- SOL, D., MASPONS, J., VALL-LLOSERA, M., BARTOMEUS, I., GARCÍA-PEÑA, G.E., PIÑOL, J., FRECKLETON, R.P. 2012. Unraveling the life history of successful invaders. *Science*, 337: 580-583.
- STEIN, B., KUTNER, L. S., & ADAMS, J. S. 2000. *Precious Heritage: The Status of Biodiversity in the United States*. Oxford: Oxford Univ. Press. 399 p.
- THOMAZ, S. M., KOVALENKO, K. E., HAVEL, J. E., & LEE, B. K. 2015. Aquatic invasive species: general trends in the literature and introduction to the special issue. *Hydrobiologia*, 746: 1-12.
- VERESHCHAGIN, N. K. 1941. Establishment of the nutria in West Georgia. *Tray. Inst. Zool. Acad. Sci. R.S.S.G.*, 4: 3-42.
- VITOUSEK, P. M., & WALKER, L. R. 1989. Biological invasion by *Myrica faya* in Hawaii: plant demography, nitrogen fixation, ecosystem effects. *Ecological Monographs*, 59: 247-265.
- WILCOVE, D.S., ROTHSTEIN, D., DUBOE, J., PHILLIPS, A., & LOSOS, E. 1998. Quantifying threats to imperiled species in the United States. *BioScience*, 48: 607-615.
- WILLIAMSON, N. M. 1996. *Biological Invasions*. New York: Chapman & Hall. 244 p.