

## Short Note

### Marine Mammal Ecotypes: Implications for Otter Conservation and Management

Dominic J. McCafferty<sup>1,2</sup> and E. Chris M. Parsons<sup>3</sup>

<sup>1</sup>Institute of Biodiversity, Animal Health and Comparative Medicine, College of Medical, Veterinary & Life Sciences, University of Glasgow, Glasgow G12 8QQ, Scotland, UK

<sup>2</sup>School of Education, College of Social Sciences, University of Glasgow, Glasgow G3 6NH, Scotland, UK  
E-mail: dominic.mccafferty@glasgow.ac.uk

<sup>3</sup>The Department of Environmental Science & Policy, David King Building, George Mason University, Fairfax, VA 22030-4444, USA

Six of the 13 species of extant otters are marine living in at least part of their range. Despite this fact, only two species of otter are considered to be *marine* species. We examine the basis on which different species of otters are defined as *marine mammals*. For this group, the term *marine mammal* may be applied inconsistently and, therefore, we consider how the concept of *ecotype* can be used to reclassify coastal otter populations as marine mammals. By broadening our definition of marine mammals, it will allow coastal otter populations to be more fully considered in marine planning and conservation.

Otters found in marine environments include the sea otter (*Enhydra lutris*), marine otter or sea cat (*Lontra felina*), river otter (*Lontra canadensis*), southern river otter (*Lontra provocax*), Cape clawless otter (*Aonyx capensis*), and the Eurasian otter (*Lutra lutra*) (Estes et al., 2009). It is only *E. lutris* and *L. felina* that are regarded as exclusively marine mammal species on the basis that *E. lutris* is only found in the sea and has the ability to derive some of its water from seawater (Costa, 1982), and *L. felina* is mainly restricted to rocky shores from central Peru to Cape Horn (Ebensperger & Botton-Mahan, 1997; Larivière, 1998).

How do you define a marine mammal? Rice (1998) in his review of marine mammal systematics, classifies the sirenians, pinnipeds, and cetaceans as marine mammals but notes that several species of bats and carnivores inhabit marine waters and are "sometimes regarded as marine mammals" (p. 5). These include the bulldog (*Noctilio leporinus*) and fishing bats (*Myotis vivesi*); the polar bear (*Ursus maritimus*); the Arctic fox (*Vulpes lagopus*); and several otters, including the sea otter, marine otter, and Eurasian otter. However, Rice does not give a specific definition of what a marine mammal

is. Reynolds et al. (1999) note that marine mammals: (1) "occupy or rely on aquatic, if not strictly marine, habitats"; (2) "have evolved similar anatomical features, including large body size, streamlined shape (compared to terrestrial relatives), insulation in the form of blubber and dense fur, and in most cases, a modified appendicular skeleton resulting in reduction in the size of appendages"; and (3) "possess some similar physiological adaptations (e.g., for diving, thermoregulation, osmoregulation, communication, and orientation)" (p. 1). Furthermore, their listing is based on species included under the U.S. Marine Mammal Protection Act (U.S. MMPA) 1972 and does not include species such as the North American river otter or fishing bats, which can be dependent, at least in part, on marine ecosystems. The U.S. MMPA sets out a moratorium on the taking and importation of marine mammals and marine mammal products (Marine Mammal Commission, 2007). Section 3(6) of the Act states, "The term 'marine mammal' means any mammal which: (a) is morphologically adapted to the marine environment (including sea otters and members of the orders Sirenia, Pinnipedia and Cetacea), or (b) primarily inhabits the marine environment (such as the polar bear)." Under the Act, sea otters are currently listed as threatened and depleted and marine otters as endangered and depleted and, thus, due to their specific inclusion, they are officially considered to be marine mammals. Section 2 of the New Zealand Marine Mammal Protection Act 1978 defines a marine mammal in a similar way (New Zealand Government, 2011). Many widely used marine mammal field guides (e.g., Jefferson et al., 1994) use these classifications of marine mammals and include polar bears and the sea and marine otter in this group.

Estes et al. (2009), in their entry on marine otters in the *Encyclopedia of Marine Mammals*, state that sea otters and marine otters “are the only Lutrines that feed exclusively in the sea” (p. 807), although they mention marine-inhabiting *L. lutra* and other otter species. In northern latitudes, otters are relatively abundant in marine ecosystems. High levels of productivity in marine areas provide greater prey biomass than freshwaters, and marine-dwelling *L. lutra* in Scotland gain energy more efficiently from the sea than from freshwater (Kruuk, 2006). In general, *L. felina* is considered by many to be a true marine mammal, based on its dependence on the marine environment for food, but marine-dwelling *L. lutra* are not (Estes et al., 2009). However, comparison of the habitat and ecology of these two different species indicates remarkable similarities (Table 1). *L. lutra* occurs in marine habitats throughout Europe and is particularly widespread along Scotland’s north and west coast. Its distribution in these areas is closely associated with the availability of freshwater as this species uses freshwater to wash salt from its fur to maintain good condition for thermoregulation (Kruuk & Balharry, 1990). This behavior has not been reported for *L. felina*, and its fur is rougher and coarser than that of *L. lutra* (Kruuk, 2006). However, *L. felina* “has been known to

use freshwater rivers, but essentially it is a sea-water animal, favouring exposed coasts with large rocks” (p. 18). Furthermore, “When other *Lontra*, *Lutra*, and *Aonyx* species occur in the sea, they are dependent on sources of freshwater for drinking and for washing the salt out of their fur” (p. 18). This has not been entirely ruled out for *L. felina*, but it is likely they do not depend on freshwater as “they occur along coasts with virtually no rainfall and where freshwater is absent” (p. 18). Despite these differences, there is a good argument for classifying populations of several otter species as *marine ecotypes*: “a race or intra-specific group having distinctive characters which result from the selective pressures of the local environment” (Lincoln et al., 1998, p. 95). The marine ecotype of *L. lutra* in Scotland is mainly diurnal, an adaptation optimizing foraging success when prey are least active; this contrasts with the crepuscular and nocturnal behaviour of *L. lutra* in freshwater (Kruuk, 2006). DNA analysis has revealed that remote island populations such as those found in the Orkney and Shetland Isles are genetically distinct from mainland populations in Scotland (Dallas et al., 2002). These particular populations may therefore be both genetically and ecologically adapted to their local marine environment.

**Table 1.** Comparison of the ecology of the marine otter (*Lontra felina*) and coastal Eurasian otter (*Lutra lutra*) in Scotland; data from Ebensperger & Botto-Mahan (1997), Lariviere (1998), and Kruuk (2006).

	Marine otter ( <i>L. felina</i> )	Eurasian otter ( <i>L. lutra</i> )
Geographical distribution	Pacific coast from northern Peru, Chilean coast to Cape Horn and Straits of Magellan	Atlantic and North Sea coasts in Scotland, including both mainland and islands; also found in coastal areas throughout wider NW European range
Habitat	Exposed rocky shores, offshore islands	Exposed and sheltered rocky coasts, estuaries, and offshore islands
Diet	Rock fishes, molluscs, and crustaceans; occasionally birds and small mammals	Bottom dwelling fish, crustacean, birds, and small mammals
Range	Approx. 30 m inland and 100 to 150 from shore	Approx. 100 m inland usually foraging 100 m from shore
Freshwater requirement	Known to ascend freshwater rivers; requirement to wash in freshwater not definitively known	Ascends rivers, lochs, and marshes to feed at certain times; uses freshwater pools/streams to wash salt from fur
Predators	Killer whale ( <i>Orcinus orca</i> ), sharks, birds of prey	Killer whale, grey seal ( <i>Halichoerus grypus</i> ), and white-tailed eagles ( <i>Haliaeetus albicilla</i> )
Conservation status*	Endangered	Near threatened
Current threats in marine environments	Hunting and persecution, bycatch in creels and nets, habitat loss, pollutants, and oil spills	Bycatch in creels; pollutants and oil spills

\*Status from IUCN Red List 2008, Version 3.1

Whether a species is marine or terrestrial has relevance for conservation and management. For example, the U.S. MMPA specifies whether parts or products of an animal are covered, and also specifies which government departments are involved in managing populations. In Europe, *L. lutra* is listed in the *EU Habitats and Species Directives* under Annex II (animal and plant species of community interest whose conservation requires the designation of special areas of conservation) and Annex IV (animal and plant species of community interest in need of strict protection). However, in *UK Biodiversity Action Plans*, otters are not considered to be marine species. They are also not included in marine animal stranding schemes that record the number, distribution, and pathology of dead animals (e.g., Scottish Agricultural College, 2011). Schemes such as these provide systematic data on disease, new causes of mortality, and population trends that may inform conservation policy. Scottish marine-dwelling otters appear to have been excluded in discussions on marine conservation as they were considered to be terrestrial because they were deemed reliant upon a source of freshwater (ECMP, pers. obs.). Manatees are also reliant on freshwater, but they are not considered to be terrestrial (Reynolds et al., 2009). Fisheries' bycatch and oil pollution are threats to otter populations and issues influencing other marine mammals such as cetaceans and pinnipeds (Baker et al., 1981; Strachan, 2007). These particular causes of mortality are likely to be important but are poorly quantified for *L. lutra*. The marine status of *L. lutra* is relevant in Scotland as the Marine (Scotland) Act 2010 has put in place a mechanism for the designation of marine protected areas for wildlife conservation (The Scottish Government, 2011). Although *L. lutra* continues to be protected by European legislation, they could be overlooked in marine planning given their current terrestrial status. It would therefore make sense that national agencies consider all species of coastal marine ecotype otters to be true marine mammals for management and conservation purposes.

### Literature Cited

- Baker, J. R., Jones, A. M., Jones, T. P., & Watson, H. C. (1981). Otter (*Lutra lutra*) mortality and marine oil pollution. *Biological Conservation*, 20, 311-321. doi:10.1016/0006-3207(81)90017-3
- Costa, D. P. (1982). Energy, nitrogen, and electrolyte flux and sea water drinking in the sea otter *Enhydra lutris*. *Physiological Zoology*, 55, 35-44.
- Dallas, J. F., Marshall, F., Piernney, S. B., Bacon, P. J., & Racey, P. (2002). Spatially restricted gene flow and reduced microsatellite polymorphism in the Eurasian otter *Lutra lutra* in Britain. *Conservation Genetics*, 3, 15-29. doi:10.1023/A:1014259218632
- Ebensperger, L. A., & Botto-Mahan, C. (1997). Use of habitat, size of prey and food niche relationships of two sympatric otters in southernmost Chile. *Journal of Mammalogy*, 78, 222-227.
- Estes, J. A., Bodkin, J. L., & Ben-David, M. (2009). Otters, marine. In W. F. Perrin, B. Würsig, & J. G. M. Thewissen (Eds.), *Encyclopedia of marine mammals* (2nd ed., pp. 807-816). San Diego: Academic Press.
- Jefferson, T. A., Leatherwood, S., & Webber, M. A. (1994). *Marine mammals of the world*. Rome: Food and Agriculture Organization (FAO).
- Kruuk, H. (2006). *Otters: Ecology, behaviour and conservation*. Oxford, UK: Oxford University Press. doi:10.1111/j.1469-7998.1990.tb04315.x
- Kruuk, H., & Balharry, D. (1990). Effects of seawater on thermal insulation of the otter, *Lutra lutra* L. *Journal of Zoology, London*, 220, 405-415.
- Lariviere, S. (1998). *Lontra felina*. *Mammalian Species (American Society of Mammalogists)*, 575, 1-5. doi:10.2307/3504377
- Lincoln, R., Boxshall, G., & Clark, P. (1998). *A dictionary of ecology, evolution and systematics*. Cambridge, UK: Cambridge University Press.
- Marine Mammal Commission. (2007). *The Marine Mammal Protection Act of 1972 as amended*. Retrieved 5 April 2011 from www.nmfs.noaa.gov/pr/pdfs/laws/mmpa.pdf.
- New Zealand Government. (2011). *Marine Mammal Protection Act 1978*. Retrieved 5 April 2011 from www.legislation.govt.nz/act/public/1978/0080/latest/DLM25111.html.
- Reynolds, J. E., Odell, D. K., & Rommel, S. A. (1999). Marine mammals of the world. In J. E. Reynolds & S. A. Rommel (Eds.), *Biology of marine mammals* (pp. 1-14). Washington, DC: Smithsonian Institution Press.
- Reynolds, J. E., Powell, J. A., & Taylor, C. R. (2009). Manatees, *Trichechus manatus*, *T. senegalensis* and *T. inunguis*. In W. F. Perrin, B. Würsig, & J. G. M. Thewissen (Eds.), *Encyclopedia of marine mammals* (2nd ed., pp. 682-691). San Diego: Academic Press. doi:10.1016/B978-0-12-373553-9.00159-0
- Rice, D. W. (1998). *Marine mammals of the world: Systematics and distribution* (The Society for Marine Mammalogy Special Publication 4). Lawrence, KS: Society for Marine Mammalogy.
- Scottish Agricultural College. (2011). Retrieved 20 April 2011 from www.strandings.org.
- The Scottish Government. (2011). *Marine (Scotland) Act*. Retrieved 5 April 2011 from www.scotland.gov.uk/Topics/marine/seamangement/marineact.
- Strachan, R. (2007). *National survey of otter Lutra lutra distribution in Scotland 2003-2004*. Scottish Natural Heritage Commissioned Report No. 211 (ROAME No. F03AC309). Retrieved 20 April 2011 from www.snh.org.uk/pdfs/publications/commissioned\_reports/Report%20No211.pdf.