Marine Biodiversity (2019) 49:1047–1051
https://doi.org/10.1007/s12526-018-0868-7

SENCKENBERG

SHORT COMMUNICATION

Baited videos to assess semi-aquatic mammals: occurrence of the neotropical otter *Lontra longicaudis* (Carnivora: Mustelidae) in a marine coastal island in São Paulo, Southeast Brazil

Fernanda Andreoli Rolim[1,2] · Pedro Furtado Costa Rodrigues[2] · Otto Bismarck Fazzano Gadig[2]

Received: 30 December 2017 / Revised: 19 February 2018 / Accepted: 5 March 2018 / Published online: 22 March 2018

Abstract

A new record of the neotropical otter (*Lontra longicaudis*) in the marine environment near the rocky reef of a coastal island in Brazil is described here, being the first published report of a semi-aquatic mammal by baited remote underwater video system. This species is not usually sighted in marine waters away from the mainland coast, and it has never been reported in this environment in this region. This individual may have increased its feeding grounds further offshore as food resources close to the mainland are reduced. Baited videos present a relatively low cost option to understand better these animals existing in different habitats, improving the monitoring for these species and providing valuable information on their distribution, habitat use, and life history.

Keywords BRUV · Mammalia · Estuaries · Southwestern Atlantic

Introduction

The neotropical otter *Lontra longicaudis* (Olfers, 1818) is a widely distributed semi-aquatic carnivorous mammal of the family Mustelidae, occurring from Mexico to northern Argentina (Foster-Turley et al. 1990; Rheingantz et al. 2017b). The species can be found in rivers, estuaries and, more rarely, in marine coastal regions (Blacher 1987; Chehébar 1990). Despite its wide distribution, few ecological studies have been done on the species, especially concerning habitat preferences, behavior, and the impacts of human disturbance and habitat degradation on populations.

Rheingantz et al. (2014) highlighted the difficulty in assessing the distribution of large aquatic mammals, such as the neotropical otter, employing traditional methods. This is mainly due to high effort and cost of field work, and the elusive and often aggressive behavior of the species. This lack of information makes it difficult to accurately assess the conservation status of the species. Therefore, it is crucial to develop new methods and strategies to gather important information on this species, which go beyond the current approach.

Baited remote underwater videos (BRUVs) comprises a steel frame with a camera system and a bait pack that attracts organisms to the field of view, without the presence of divers. It has been widely used to assess fish assemblages around the world, especially large and mobile species that usually avoid the human presence (Cappo et al. 2006; Whitmarsh et al. 2017). While the potential to assess aquatic and semi-aquatic mammals using BRUVs is evident (Whitmarsh et al. 2017), it is not extensively employed.

The present study aims to report the occurrence of the neotropical otter in a marine coastal island using BRUVs and presents the advantages in this technology and

Communicated by D. M. Paterson

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s12526-018-0868-7) contains supplementary material, which is available to authorized users.

✉ Fernanda Andreoli Rolim
fernandarolim2@gmail.com

[1] Instituto de Biociências, Campus de Rio Claro, Universidade Estadual Paulista (UNESP), Av. 22A, 1515, Bela Vista, Rio Claro, SP 13506-900, Brazil

[2] Laboratório de Pesquisa em Elasmobrânquios, Instituto de Biociências, Campus do Litoral Paulista, Universidade Estadual Paulista (UNESP), Praça Infante Dom Henrique, s/n, Parque Bitaru, São Vicente, SP 11330-900, Brazil

method to assess a wide range of aspects concerning to the behavior, distribution, life history, and habitat use of semi-aquatic mammals.

Material and methods

Baited remote underwater video surveys were performed between 2016 and 2017 in four coastal islands (Mar Virado, Tamanduá, Palmas, and Cabras) of São Paulo State, southeast Brazil, southwestern Atlantic (Fig. 1). A BRUV structure consists of a stainless steel frame that supports a camera system with a bait package on an arm 1.5 m in front of the camera (Fig. 2). The bait package consisted of 800 g of fresh sardines (*Sardinella brasiliensis*) which is used for its oily flesh and therefore, high odor plume dispersion. Expeditions aiming to assess fish assemblages were performed bi-monthly from March 2017 to January 2018 in all four islands (March/May/July/October/November/January), totaling six expeditions. In each expedition, two BRUVs were deployed for 90 min on the sandy bottom near the interface of rocky reefs, in water depths 5–10 m, on the leeward side of the islands. All expeditions combined, resulted in 12 BRUV deployments at each island, totaling 48 BRUVs (72 h). Environmental parameters were taken at every deployment using a CTD (Conductivity, Temperature and Depth-Castaway®) throughout the entire water column, and the visibility was estimated using a Secchi disk.

Results

Based on 72 h of video, i.e., 18 h in each island, one specimen of the neotropical otter (*Lontra longicaudis*) was detected during the fourth BRUV expedition (Fig. 3). The occurrence was at approximately 4:00 pm on the 20 October 2016, in Tamanduá Island, northern coast of São Paulo state, Brazil (at 23.596°S 45.294°W) (Fig. 1). The depth of the deployment was 2.5 m. The water temperature was 24.6 °C, salinity of 31.99, and visibility was 6 m at this depth.

Discussion

Currently, our global knowledge on otter biology is limited to their resource and habitat requirements, interspecific interactions, and genetic aspects (Foster-Turley et al. 1990; Almeida and Pereira 2017). Few available data exist regarding the neotropical otter and is primarily focused on trophic ecology and biogeography, in which communication, behavior, and demography are the less studied topics (Almeida and Pereira 2017). The present study aimed to contribute with the habitat uses of the species, as well as introducing a new and supplementary method to assist in monitoring this species.

The occurrence of the neotropical otter in marine environment has been limited to nearshore coastal regions (Blacher 1987; Alarcon and Simões-Lopes 2003), in areas closely associated with the mainland or large islands with freshwater runoff. Although records from small coastal islands are unusual, and a few published articles are available. These studies are based on traces such as feces, urine, footprints, shelters,

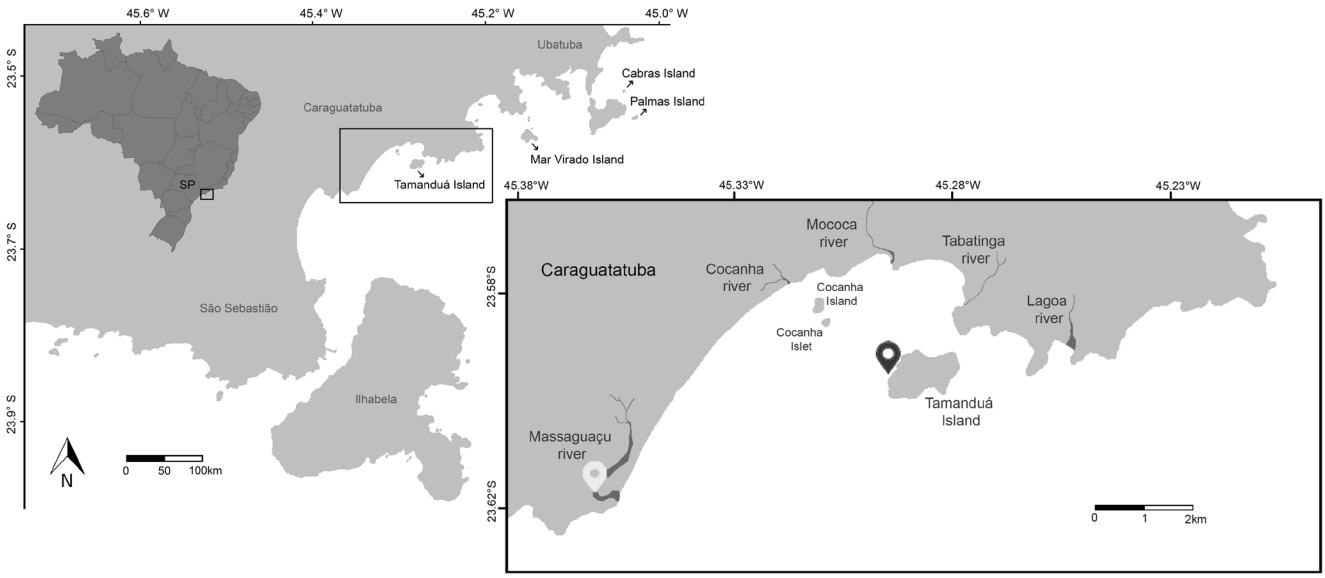

Fig. 1 Coastal islands sampled during BRUV expeditions (Cabras, Palmas, Mar Virado, and Tamanduá islands). In detail, Tamanduá Island and the main estuaries in the region. The neotropical otter occurrence in the present study was around Tamanduá (black spot) and the nearest occurrence registered in the literature was at the Massaguaçu river (gray spot) by Ribeiro and Miotto (2010)

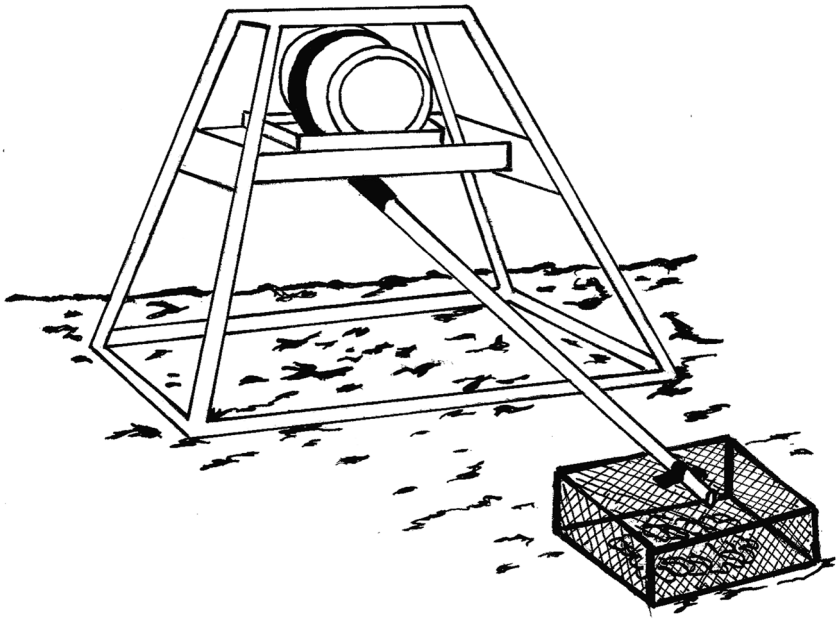

Fig. 2 Schematic illustration of the baited remote underwater video (BRUV) equipment employed in the present study

and mucus in some islands of Santa Catarina state (Southern Brazil), up to 12.7 km from the mainland coast (Carvalho-Junior et al. 2006, 2012). In the present study, the video-recorded individual has moved at least 3 km, which is the distance between the nearest estuary on the mainland and the place of occurrence. The closest recorded occurrence of this species is at a southwest estuary located 6.8 km from where this study sighted the species (Ribeiro and Miotto 2010). These records might indicate a relatively high autonomy and capacity of the species to move away from the coast, with environmental conditions substantially different from local estuaries.

The marine environment is not preferred since this species needs land to breed and rest (Foster-Turley et al. 1990; Santos and Reis 2012), therefore, this occurrence might be related to feeding habits of the species, which is mainly composed by fish and crustaceans in coastal areas (Alarcon and Simões-Lopes 2004). However, habitat partitioning and preference for the marine environment by this otter species is still unknown and requires further detailed investigation.

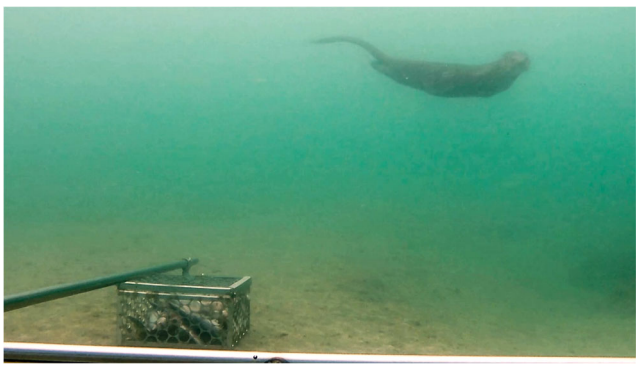

Fig. 3 An individual of neotropical otter (*Lontra longicaudis*) recorded by baited remote underwater video (BRUV) deployment. Complete video in the supplementary material

The neotropical otter is currently classified as near threatened by International Union of Conservation of Nature (IUCN) (Rheingantz and Trinca 2015) since its populations has been exposed to great habitat loss and fragmentation, poaching, conflict with fishermen, pollution, and reduction of food availability (Chehébar 1990; Barbieri et al. 2012; García-Hernández and Gallo-Reynoso 2013; Almeida and Pereira 2017). Concerning the Atlantic forests in Brazil, the species is considered vulnerable (Rodrigues et al. 2013), especially as a consequence of biome destruction. This reduction of resources may result in the species seeking alternate feeding grounds, increasing its home range and occurrence in the marine environment at greater distances from the shore.

The present record was made in the last hours of the day and was a single individual. These characteristics corroborate the behavior described for the species, in which individuals hunt alone or in small groups of two or three (Cheida et al. 2006), demonstrating increased activity during crepuscular hours (Parera 1993; Lariviere 1999).

Whitmarsh et al. (2017) described the potential use of BRUVs to assess other mobile species, such as mammals; however, few official records exist. Some of these records were made by Whitmarsh et al. (2014), in which two mammals belonging to Ostariidae and Delphinidae families occurred in South Australia; however, no studies were done specifically aiming to assess aquatic mammals using BRUVs. Based on the unexpected appearance of the otter during the sampling expeditions to assess fish assemblages, a discussion to explore this technology and method to improve the biological information on the species is raised.

Smell is an important sense for otters, since they widely use chemical cues to communicate (Kruuk 2006) and it may also play an important role in finding food, including underwater, where they hunt fish and crustaceans in waters with variable visibility. The main mechanism of BRUVs is based on attracting animals to the field of view of the camera using a highly smell attractive bait, such as pilchards or sardines. Although quite plastic, feeding habits of neotropical otters in Brazil is mainly based on fish of the family Cichlidae and Loricariidae, as well as Palaemonidae crustaceans (Rheingantz et al. 2017a). Even though sardines have been effective to attract the individual encountered here, testing different bait compositions based on the diet of the species is highly recommended, in order to perfectly adapt the methodology to this group of animals.

Traditional methods to assess otters are mostly based on indirect evidences and traces, such as footprints, feces, urine, smell, scat, and scratches, as well as direct evidences using camera traps. They are useful tools in terrestrial environment, but these methods do not assess underwater habitats. Understanding the importance and habitat use of the different types of water bodies is crucial to assess valuable information on the species, such as habitat requirements, impact of anthropogenic actions, and subaquatic behavior patterns.

BRUVs have been used to study general aspects of nektonic assemblages and behavior patterns (Whitmarsh et al. 2017). Additionally, the non-destructive nature of BRUVs is ideally suited to assess both endangered animals and fragile habitats, such as rocky reefs and estuaries. These characteristics make the methodology appropriate for otter studies in freshwater, estuaries, and saltwater.

The present study required only 18 h of baited videos around the island to record an otter in an unusual area, within a project aiming fish. Studies to assess otter populations, and other carnivores, usually requires greater effort, both time and spatially, to make direct encounters. Most of the studies are based on traces and do not cite the presence of individuals. For example, in Ribeiro and Miotto (2010), an encounter only occurred after 4 years of searching for traces; and Rheingantz et al. (2012) and Quadros and de Araújo Monteiro-Filho (2002) studied traces such as holts, sprainting sites, and scats for approximately 2 years, and did not record a direct sighing. Few studies, such as Leuchtenberger et al. (2013), register individuals using camera traps and telemetry; however, these studies require a high amount of time on the field, as well as large financial costs and time to process data. Furthermore, the majority of information generated from these studies concerns the land use by the species. The use of baited videos presents the potential to increase the records, giving more information about the species in the underwater environment.

Studies concerning the environmental degradation and population dynamics, as well as the long-term monitoring, behavior, and ecological aspects of the species are valuable (Almeida and Pereira 2017; Rheingantz et al. 2017b). For these topics, BRUVs can be also a useful tool. However, the visual aspect of this method limits its use to waters with adequate visibility, which in most cases, is 1.5 m or the distance from the camera to the bait package. This work aimed to describe and record a non-usual occurrence of the neotropical otter (*Lontra longicaudis*) at a marine island using underwater baited videos, contributing to the distribution and habitat preferences of the species, as well as to suggest a new application for these methods to assess semi-aquatic mammals.

Acknowledgements The authors are thankful to the Chico Mendes Institute for Biodiversity Conservation (ICMBio) for the permits and field support and also to the Universo Marinho Dive Company for sampling assistance and equipment. We also thank the anonymous reviewer for improving the paper and BSc. Todd Bond from the University of Western Australia for the valuable contributions in the text.

Funding The work was supported by the Boticario Foundation for Nature Protection (Project # 1043_20151) and by the National Council for Scientific and Technological Development (CNPq), Brazil.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval This article does not contain any studies with animals performed by any of the authors.

Sampling and field studies All necessary permits for sampling and observational field studies have been obtained by the authors from the competent authorities and are mentioned in the acknowledgements.

References

Alarcon GG, Simões-Lopes PC (2003) Preserved versus degraded coastal environments: a case study of the neotropical otter in the environmental protection area of Anhatomirim, southern Brazil. IUCN otter spec. Group Bull. 20:6–18

Alarcon GG, Simões-Lopes PC (2004) The neotropical otter *Lontra longicaudis* feeding habits in a marine coastal area, southern Brazil. IUCN otter spec. Group Bull 21:24–30

Almeida LR, Pereira MJR (2017) Ecology and biogeography of the neotropical otter *Lontra longicaudis*: existing knowledge and open questions. Mammal Res 62:313–321

Barbieri F, Machado R, Zappes CA, de Oliveira LR (2012) Interactions between the Neotropical otter (*Lontra longicaudis*) and gillnet fishery in the southern Brazilian coast. Ocean Coast Manage 63:16–23

Blacher C (1987) Ocorrência e preservação de *Lutra longicaudis* (Mammalia: Mustelidae) no litoral de Santa Catarina. Boletim da Fundação Brasileira para Conservação da Natureza 22:105–117

Cappo M, Harvey E, Shortis M (2006) Counting and measuring fish with baited video techniques—an overview. In: Lyle JM, Furlani DM, Buxton CD (eds) Australian Society for Fish Biology Workshop Proceedings. Australian Society for Fish Biology, Tasmania, pp 101–114

Carvalho-Junior O, Banevicius NMS, Mafra EO (2006) Distribution and characterization of environments used by otters in the coastal region of Santa Catarina State, Brazil. J Coast Res Special Issue 39:1087–1089

Carvalho-Junior O, Fillipini A, Salvador C (2012) Distribution of neotropical otter, *Lontra longicaudis* (Olfers, 1818) (Mustelidae) in coastal islands of Santa Catarina. Southern Brazil IUCN Otter Spec Group Bull 29:95–108

Chehébar CE (1990) Action plan for Latin American otters. In: Foster-Turley PA, Macdonald S, Mason C (eds) Otters: an action plan for their conservation. IUCN/SSC Otter Specialist Group, Gland, pp 64–73

Cheida CC, Nakano-Oliveira E, Fusco-Costa R et al (2006) Ordem Carnivora. In: Reis NR, Peracchi AL, Pedro WA, Lima IP (eds) Mamíferos do Brasil. Nelio R. dos Reis, Londrina, pp 231–276

Foster-Turley P, Macdonald S, Mason C (1990) Otters: an action plan for their conservation. IUCN/SSC Otter Specialist Group, Gland.

García-Hernández J, Gallo-Reynoso JP (2013) Heavy metals in the habitat and throughout the food chain of the neotropical otter, *Lontra longicaudis*, in protected Mexican wetlands. Environ Monit and Assess 185:1163–1173

Kruuk H (2006) Otters: ecology, behaviour and conservation. OUP Oxford

Lariviere S (1999) Lontra longicaudis. Mamm Species 609:1–5

Leuchtenberger C, Zucco CA, Ribas C et al (2013) Activity patterns of giant otters recorded by telemetry and camera traps. Ethol Ecol Evol 26:19–28

Parera A (1993) The neotropical river otter *Lutra longicaudis* in Iberá lagoon, Argentina. IUCN otter spec. Group Bull. 8:13–16

Quadros J, de Araújo Monteiro-Filho EL (2002) Sprainting sites of the neotropical otter, *Lontra longicaudis*, in an Atlantic Forest area of southern Brazil. Mastozool Neotrop 9:39–46

Rheingantz ML, Trinca CS (2015) *Lontra longicaudis*. In: The IUCN Red List of Threatened Species 2015: e.T12304A21937379. https://doi.org/10.2305/IUCN.UK.2015-2.RLTS.T12304A21937379.en. Accessed 28 Nov 2017

Rheingantz ML, Oliveira-Santos LG, Waldemarin HF, Pellegrini Caramaschi E (2012) Are otters generalists or do they prefer larger, slower prey? Feeding flexibility of the neotropical otter *Lontra longicaudis* in the Atlantic Forest. IUCN Otter Spec Group Bull 29(2):80–94

Rheingantz ML, de Menezes JFS, de Thoisy B (2014) Defining neotropical otter *Lontra longicaudis* distribution, conservation priorities and ecological frontiers. Trop Conserv Sci 7:214–229

Rheingantz ML, de Menezes JFS, Galliez M, dos Santos Fernandez FA (2017a) Biogeographic patterns in the feeding habits of the opportunist and semi-aquatic neotropical otter. Hydrobiologia 792:1–15

Rheingantz ML, Santiago-Plata VM, Trinca CS (2017b) The neotropical otter *Lontra longicaudis*: a comprehensive update on the current knowledge and conservation status of this semi-aquatic carnivore. Mamm Rev 47:291–305

Ribeiro JPN, Miotto RA (2010) Mammalia, Carnivora, Mustelidae, *Lontra longicaudis* Olfers, 1818: occurrence record in an estuary area in the state of São Paulo, Brazil. Check List 6:445–446

Rodrigues LA, Leuchtenberger C, Kasper CB et al (2013) Avaliação do risco de extinção da lontra neotropical *Lontra longicaudis* (Olfers, 1818) no Brasil. Avaliação do Estado de Conservação dos Carnívoros–ICMBio/IBAMA Biodiversidade Brasileira 3:216–227

Santos LB, dos Reis NR (2012) Use of shelters and marking sites by *Lontra longicaudis* (Olfers, 1818) in lotic and semi-lotic environments. Biota Neotrop 12:199–205

Whitmarsh SK, Fairweather PG, Brock DJ, Miller D (2014) Nektonic assemblages determined from baited underwater video in protected versus unprotected shallow seagrass meadows on Kangaroo Island, South Australia. Mar Ecol Prog Ser 503:205–218

Whitmarsh SK, Fairweather PG, Huveneers C (2017) What is big BRUVver up to? Methods and uses of baited underwater video. Rev Fish Biol Fish 27:53–73