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# Exploring new sites: the neotropical otter (*Lontra longicaudis annectens*) in Bahía del Tóbari, Sonora, México

# Explorando nuevos sitios: la nutria neotropical (*Lontra longicaudis annectens*) en Bahía del Tóbari, Sonora, México

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Neotropical otter (*Lontra longicaudis annectens*) has a wide distribution in México, the species inhabits rivers, lagoons, estuaries, wetlands, and bays. And from pine-oak woods, subtropical cloud forests to mangroves, from sea level to heights of 2,617 m. The objective of this study was to report the finding of the neotropical otter in a brackish water environment, including artificial islets or tarquinas for foraging and resting at Bahía del Tóbari, Sonora. Otter tracks were recorded while conducting bird census and surveys of nesting sites for seabirds and shorebirds at channels and shores of Bahía del Tóbari, Sonora. We found otter tracks in a small islet tarquina at Bahia El Tóbari, Sonora. We were shown by local inhabitants an almost complete neotropical otter skeleton with dry skin, found on a beach near the locality. We complete the study with previously unpublished records of Neotropical otters in the area. These artificial islets or tarquinas provide otters with available prey since otters eat a variety of aquatic birds, and these structures also offer resting sites. Using brackish water habitats by neotropical otters show the species' plasticity to explore new sites to obtain alternative food resources.

**Key words:** Brackish water; exploratory behavior; food sources; sea level.

La nutria neotropical (*Lontra longicaudis annectens*) tiene una amplia distribución en México, la especie habita en ríos, lagunas, esteros, humedales y bahías. Desde bosques de pino-encino, bosques mesófilos de montaña subtropicales hasta manglares, y desde los 2,617 m hasta el nivel del mar. El objetivo del estudio fue reportar la presencia de nutrias neotropicales en un medio ambiente salobre, incluyendo islotes artificiales o tarquinas para alimentarse y descansar. Se encontraron rastros de nutria neotropical mientras se hacían conteos de aves y la estimación de la anidación de aves marinas y playeras, en los canales y playas de la Bahía del Tóbari, Sonora. Encontramos rastros de nutria en una isleta o tarquina en la Bahía de El Tóbari, Sonora. Los habitantes de la zona nos mostraron un esqueleto con piel seca casi completo de una nutria neotropical encontrado en una playa cercana a la localidad. Completamos el estudio con algunos registros previos no publicados de la nutria neotropical cercanos a la localidad. Estos islotes artificiales o tarquinas proveen a las nutrias presas disponibles, ya que las nutrias depredan sobre una variedad de aves acuáticas, además de que estas estructuras proveen lugares de descanso a las nutrias. Al usar hábitats de aguas salobres, las nutrias muestran la plasticidad de la especie para explorar nuevos sitios y obtener fuentes alternas de alimentos.

**Palabras clave:** Agua salobre; comportamiento exploratorio; fuentes de alimento; nivel del mar.



Neotropical otter (*Lontra longicaudis annectens*) favors hipohaline habitats, such as rivers, lakes, dams, and wetlands, occasionally is found on hypersaline waters or completely isolated from hypohaline waters (Gallo-Reynoso 1997; Gallo-Reynoso and Casariego 2005). The limiting factor for neotropical otter's distribution in brackish waters is not the availability and abundance of prey, there is good diversity of fishes, crustaceans, and water birds susceptible of being preyed by otters (Gallo-Reynoso *et al.* 2008; Vázquez-Maldonado and Delgado-Estrella 2022). Thus, the limiting factor for their distribution must be physiological, hypersaline water affects renal physiology, Neotropical otters lack the presence of multilobed kidneys, able to remove the excess of salt when prey (fish and crustaceans) are ingested together with hypersaline waters (Echenique *et al.* 2018).

It is known that their habitat include large portions of mangrove woods in southeastern México, such as Área de Protección de Flora y Fauna Laguna de Términos (Términos Lagoon Protected Area for Flora and Fauna) where individuals have been found in waters with a low salinity of 2.0 ppm (Vázquez-Maldonado *et al.* 2021), also neotropical otter inhabits the northern coast of Yucatán, at Sisal, San Crisanto and Dzilam de Bravo near to sinkholes with hipohaline waters which flows towards the Gulf of México and Caribbean Ocean (Ortega-Padilla *et al.* 2022). In the western coast of the Gulf of California at Sinaloa state there have been observations of tracks of several individuals at El Verde Estuary, in brackish waters inhabited by river crocodiles, *Crocodylus acutus* (Gallo-Reynoso pers. obs.).

In Sonora neotropical otters inhabit several major rivers such as Bavispe, Aros, Yaqui and Mayo, middle sized rivers like Sahuaripa, Mátape and Cuchujaqui, in many creeks, and in on all the larger dams, and in temporary rainy season water courses (Gallo 1996; Gallo-Reynoso *et al.* 2008; Rangel-Aguilar and Gallo-Reynoso 2013). Since the second half of the past century the area of Bahía del Tóbari has experienced several modifications related to economic activities for urban development (Escofet and Bravo-Peña 2007). The irrigation system and wastewater drainage of the agricultural area became a sediment trap and agrochemical wastes flow to the lagoon complex (García-Hernández 2004; Jara-Marini *et al.* 2013). There are also several shrimp farms which add wastewater to the system, their establishment involved the modification of the environment by clearing of coastal vegetation which included mangroves and halophytes (García-Hernández 2004; Escofet and Bravo-Peña 2007). Moreover, the construction of a rock-based dirt road together with a concrete bridge for a tourist development program that involved connecting the continent to Isla Huivulai (1965-1966), had negatively affected the lagoon complex. This dirt road divided Bahía del Tóbari by altering the water flow pattern of circulation and sedimentation, greatly increasing the sedimentation rate and the increment of shallow water and marshes, the bay retained silt and sand and diminished the amount and residence time of water in the complex (Escofet and Bravo-Peña 2007).

To counter the social and environmental problems created by the rock-based dirt road and bridge, several governmental organizations (CONAGUA, CONAPESCA, CONANP) and the fishing cooperatives (Federación Regional de Sociedades Cooperativas de Producción Pesquera y Acuícola Paredones Unidos, S. C. de R. L. (FRSCPPAPU)) presented a project to solve the problem; the aims were 2 main activities: 1) the total removal of the bridge and the rock-based dirt road, and 2) the dredging of the lagoon's principal channels to increase the flow of water along the bay. The project was realized from 2010 to 2012, when the rock-based dirt road and the bridge were completely removed, and the dredging consisted of making 2 channels. The first channel with a length of 17.37 km, producing 937,833.56 $m^3$ of dredged material, and the second channel with a length of 8.3 km, producing 281,378.58 $m^3$ of dredged material. A suction dredge pumped the sediments to 11 sedimentation areas made with a perimetral wall built with geotextil mesh. This sedimentation area produced a series of small artificial islets called tarquinas (CIBNOR 2013).

The newly built tarquinas (Figure 1 and 2) promoted new habitats, resting and nesting areas for marine and shorebirds. Also gave a new ecosystem's configuration for their biotic and abiotic factors and conservation of original characteristics, involving their use by different bird species, creating interactions, and serving other secondary functions (Hobbs *et al.* 2009). There has been a monitoring program of these artificial islets and their use by birds since 2017; of 11 tarquinas, 10 are used by birds, with exception of tarquina number 8 which is partially covered during high tide and remain as a sandy shallow area only uncovered by seasonally very low tides (García-Hernández and Leyva-García 2017; Leyva-García and García-Hernández 2018). The dry surface of all remaining tarquinas has been estimated from 1.18 to 6.54 ha (measured by us via Google Earth®).

The neotropical otter in México is listed as a threatened species by NOM-059-SEMARNAT-2010 (SEMARNAT 2010), it

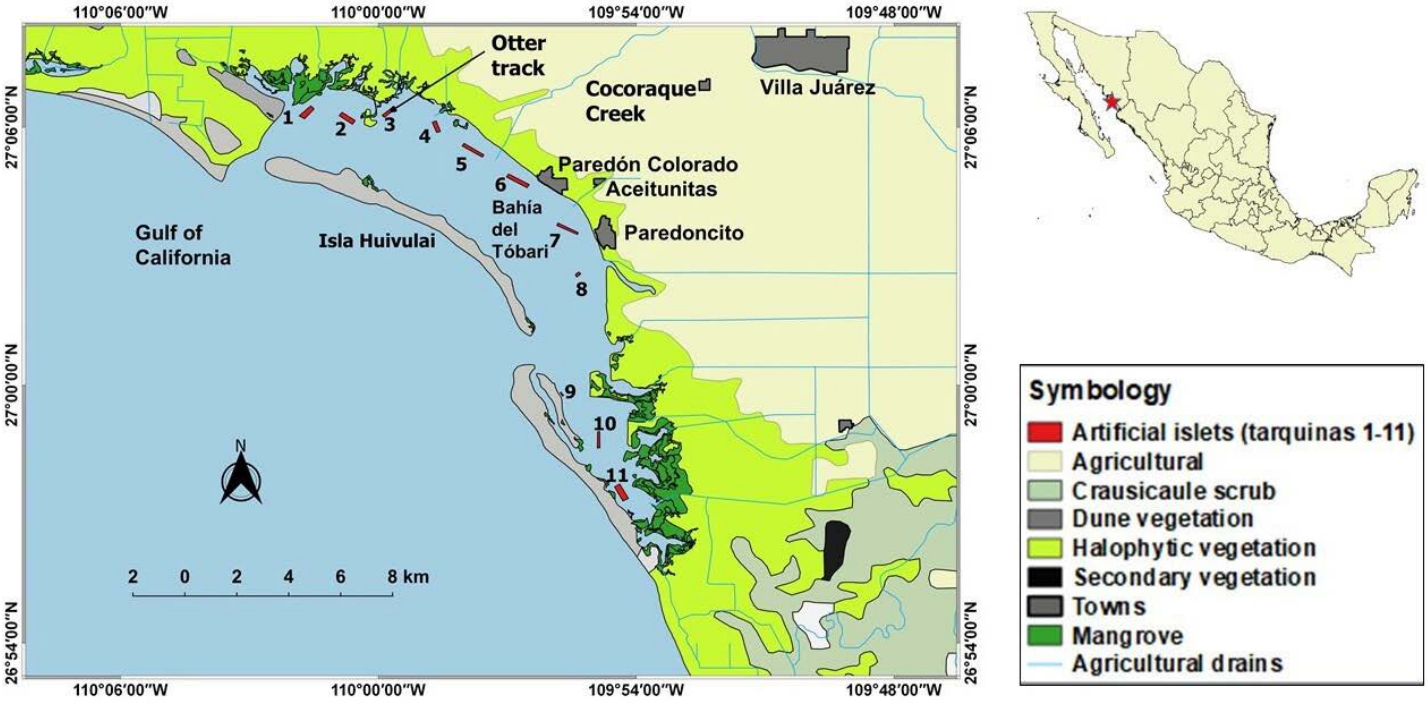


**Figure 1.** Location of man-made islets or tarquinas (1 to 11), neotropical otter tracklocation is indicated at tarquina number 3.

**Figure 2.** The general view of a tarquina or artificial islet, with new vegetation, shows the area used by several species of mammals, birds, and reptiles. Photo by I. Acuña.

is also registered in the red list of the IUCN as near threatened (Rheingantz *et al.* 2021). The neotropical otter has a wide distribution in México, it has been recorded from sea level to heights of 1,989-2,617 m in pine-oak woods and subtropical cloud forests (Hernández-Romero *et al.* 2018; Esparza-Carlos *et al.* 2022). Also inhabits rivers, lagoons, wetlands, rocky shores and areas with some anthropogenic activities and impacts, showing some tolerance to them, *e.g.*, ponds, channels and drainages close to human settlements (Gallo-Reynoso 1997; Larivière 1999), near homes, bridges, fishing settlements and ranching activities (Mayagoitia-González *et al.* 2013; Gallo-Reynoso *et al.* 2019). The objective of this study was to report the presence of the neotropical otter on this brackish water environment, including tarquinas and their bird fauna for probable foraging.

The Bahía del Tóbari estuarine system is found in southern Sonora, it has an area of 16,700 ha, of which 8,200 ha are formed by subtidal wetlands made up of non-consolidated substrate. The system is delimited by the Gulf of California, and by Isla Huivulai, which is a 14 km long and 0.5 km wide sand barrier island with dunes covered by different types of vegetation, from halophytes to several species of Sonoran Desert cacti, thorn brush, and trees, introduced date palms and red mangrove (*Rhizophora mangle*). The island has a northern and a southern mouth that led to Bahía del Tóbari inner lagoon complex. This lagoon complex involves 15 coves and estuaries. The coastal vegetation is represented by red mangrove, halophytes, coastal dunes, bushes, Sonoran Desert cacti and trees (CIBNOR 2013). Behind the coastal vegetation, land is used in wide agriculture and cattle growing areas (Arizmendi and Márquez-Valdelamar 2000). There are 3 human rural settlements in the area: Paredón Colorado, Paredoncito and Aceitunitas, the overall number of human inhabitants is near to 6,000, which are direct users of the lagoon complex for artisanal fishery (INEGI 2020).

We have conducted 4 surveys of aquatic and shore birds in several nesting areas, channels, coast and at tarquinas from fiberglass skiffs at Bahía del Tóbari, from 2017 to 2022; in summer of 2017, upon observing mammal tracks at the tarquina, we walked at the tarquinas following tracks and observing scats of mammals, which were identified with specialized guides (Aranda 2012).

Complementary we conducted some informal interviews with fishermen and our boat conductors to know about the neotropical otter in the area. Additionally, we added not published reports of neotropical otters in upriver areas of the Río Yaqui's basin which irrigation channels drains to the Tóbari lagoon complex.

On July 6, 2017, at the Tóbari lagoon complex (Figure 1) and at tarquina number 3 (Figure 2), we found tracks of a neotropical otter (*L. l. annectens*; Figure 3a), tarquina number 3 is found in a brackish water environment. This tarquina number 3 is an important nesting site for least tern (*Sternulla antillarum*), snowy plover (*Charadrius nivosus*), Wilson's plover (*C. wilsonia*) and American oystercatcher (*Haematopus shoshone*), these species are enlisted with a conservation status at NOM-059-SEMARNAT-2010 (SEMARNAT 2010). To this moment (2017-2022) there are 11 species of nesting birds in these tarquinas, *Thalasseus elegans*, *T. maximus*, *Sternula antillarum*, *Gelochelidon nilotica*, *Leucophaeus atricilla*, *Larus heermanni*, *Rynchops niger*, *H. shoshone*, *Charadrius wilsonia*, *C. nivosus* and *Eudocimus albus,* with a maximum of 17,968 reproductive pairs counted in 2018 (Leyva-García pers. obs.), which is potential food for the neotropical otter.

The most recent record of a neotropical otter in the area, was obtained by local inhabitants of Paredoncito on April 4, 2022, consisting in a dead otter that was found in a beach of Bahía del Tóbari, the carcass of the otter was already dry but presented key characteristics for its identification such as the typical otter's skull, elongated with forward eye sockets and large carnassial teeth, and the presence of an interdigital membrane between the fingers (Figure 3b). Regardless of if the carcass was brought to the area by rains through a channel output, or if the otter died there, it is an important sign of the species presence in the area.

Our study area is a potential site for neotropical otters' occupation due to the presence of riparian habitat consisting in mangrove forests and large extensions of aquatic vegetation such as cattail (*Thypha domingensis*) forests, agriculture irrigation channels, shrimp farm drainages, and the Cocoraque creek, which is a natural effluent of the hydrological Cocoraque sub-basin that flows to Bahia El Tóbari. The closest record of a reproductive neotropical otter population is found at the Oviachic dam, on the Río Yaqui, 78 km northeast from Bahía del Tóbari (Gallo-Reynoso *et al.* 2008) which waters are used for the irrigation of Valle del Yaqui, major irrigation channels are interconnected, and waters from the Oviachic Dam reach Bahía El Tóbari, therefore the presence of otters are likely in the vicinity of the bay. At El Oviachic area, neotropical otters predates on several species of abundant birds such as neotropical cormorant (*Phalacrocorax brasilianus*), Mexican duck (*Anas diazi*); great egret (*Ardea alba*); yellow-crowned night heron (*Nyctanassa violacea*), brown pelican (*P. occidentalis*), and several fish species (Gallo-Reynoso *et al.* 2008; Rangel-Aguilar and Gallo-Reynoso 2013). Down water from the Oviachic dam, we have found records of the neotropical otter's presence, at 45 km to the northwest, from Bahía del Tóbari, involving their use of irrigation channels and drainages that stream to Dren Esperanza which flows to Bahía El Tóbari. The record consists in tracks and two otter spraints on a bridge (27° 26' 0.729" N, 110° 18' 0.156" W) that crosses above that drainage. The analyses of the spraints showed that they feed mainly on tilapia (*Oreochromis* sp.) and common carp (*Cyprinus carpio*), but also feed on other items such as regal horned lizard (*Phrynosoma solare*), grasshoppers (*Schistocerca shoshone*), and insects (Isoptera, Odonata and Coleoptera; Gallo-Reynoso, pers. obs., August 24, 2006).

Although neotropical otters forage mainly on fish and crustaceans, foraging on birds has been documented by several authors that describe their feeding on cormorants, brown pelicans, ducks, egrets, coots and other birds in several rivers of México and on the Rio Yaqui in Sonora (Gallo-Reynoso 1997; Gallo-Reynoso *et al.* 2008); as well as coots and flamingos in the northern coast of Yucatán (Ortega-Padilla *et al.* 2022), showing the trophic adaptability of neotropical otters and their probable ecological value as a regulator of bird populations (Vázquez-Maldonado and Delgado-Estrella 2022). The presence of neotropical otters at this particular tarquina generates the hypothesis of the otter's exploratory behavior over the presence of available prey, such as marine bird's nesting and resting there, similar to what have been reported by Gallo-Reynoso *et al.* (2008) upriver in the same Yaqui River basin and in other areas of México such as the northern coast and marshes of the Yucatán peninsula (Ortega-Padilla *et al.* 2022).

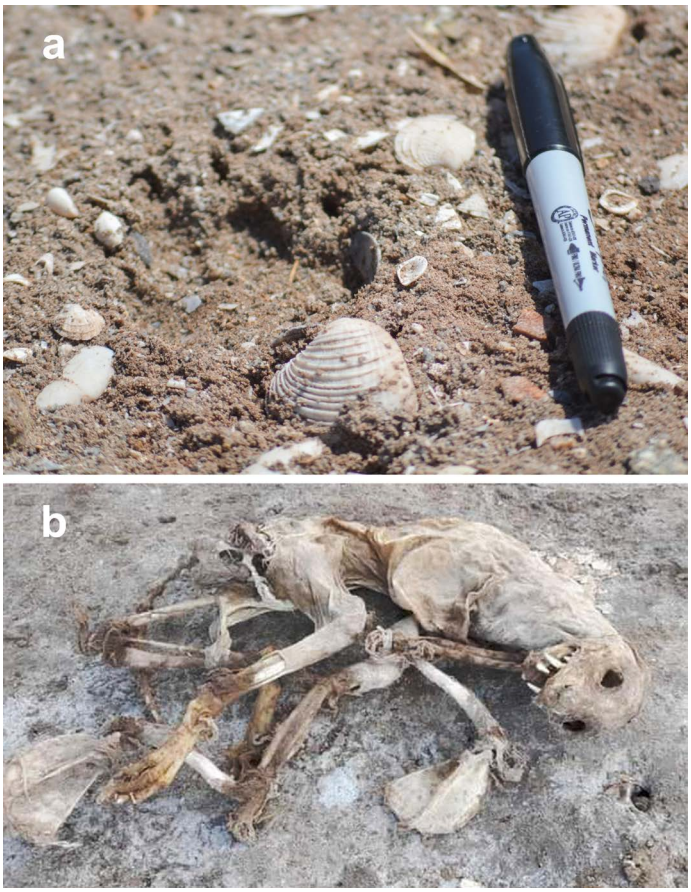


**Figure 3.** Neotropical otter (*Lontra longicaudis*) records at Bahía del Tóbari, Sonora: a) Right front footprint of a neotropical otter showing the interdigital membrane and claws at tarquina number 3 (Photo by G. Leyva); b) Weathered carcass of a neotropical otter found in a beach near Paredoncito fishing town (Photo by L. Enrique Ortiz).

There are other mammals that visit that tarquina, we recorded tracks of coyote (*Canis latrans*), dog (*Canis familiaris*), gray fox (*Urocyon cinereoargenteus*), raccoon (*Procyon lotor*), bobcat (*Lynx rufus*) and jackrabbits (*Lepus* sp.); these species can get across from the continent to the islet due that their distance is of few hundred meters (0.15 a 0.44 km). Tarquina number 3, is at 155 m from the coast, a short distance for these mammals, and the surface is exposed in low tide which gives access to colonizers and potential predators.

The artificial islets or tarquinas might provide otters with available prey due that otters eat a variety of sea birds, and that these structures also might offer resting sites. The use of brackish water habitats by neotropical otters shows the species' plasticity to explore new sites to obtain alternative food resources. The probable impact of seabird predation by neotropical otters on these modified habitats must be the objective for future studies at Bahia del Tóbari.

Finally, these 2 records show that neotropical otters can exploit marginal areas such as drainages of wastewater from irrigation areas and brackish water habitats to find their prey in this and other areas and coasts of México, and that together with anthropogenic impacts, such as irrigation areas, the presence of otters in these areas must be thoroughly explained.

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