



## Ecology

# Predation on turtle nests in the southwestern coast of the Baja California Peninsula

## *Depredación de nidos de tortugas en la costa suroeste de la península de Baja California*

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### Abstract

The coyote (*Canis latrans*) is one of the most widely distributed and opportunistic carnivores in North America. It feeds on a variety of different species, ranging from small- (rodents) to medium-sized mammals (Lagomorpha), reptiles, and birds. Among sea turtles, the main species nesting on the coasts of Baja California is *Lepidochelys olivacea*. Solitary turtles arrive to beaches in low numbers. The aim of this study was to assess the effect of coyote predation on sea turtle nests on pristine beaches of Baja California Sur, Mexico. Of a total of 43 nests observed, 34 (79.1%) were considered as recent, and 9 (20.9%) as old nests; of these, 35 (81.4%) and 8 (18.6%) showed evidence of digging/not digging by predators, respectively. Eggshells were observed around and inside all preyed upon nest holes. Coyotes should be considered an important predator of turtle nests in the Baja California Peninsula.

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**Keywords:** Low abundance; *Canis latrans*; Carnivore; *Lepidochelys olivacea*; Predation; Nesting survival; Olive Ridley Turtle; Marine Turtle

### Resumen

El coyote (*Canis latrans*), es uno de los carnívoros más ampliamente distribuidos y oportunistas en América del Norte. En su dieta incluye diferentes especies, que van desde pequeños (roedores) a mamíferos medianos (Lagomorpha), reptiles y aves. Entre las tortugas marinas, la principal especie que anida en las costas de Baja California es la tortuga golfin. Son solitarias para anidar y llegan a las playas en un reducido número. El objetivo de este estudio fue evaluar el efecto de la depredación en nidos de tortugas marinas en las playas prístinas de Baja California Sur, México. De un total de 43 nidos localizados, 34 (79.1%) se consideraron como recientes y 9 (20.9%) como nidos antiguos; 35 (81.4%) se encontraron sin ninguna actividad de excavación por depredadores; 8 (18.6%) se encontraron con actividades de excavación por depredadores. Se encontraron cáscaras de huevo cerca de todos los nidos depredados. En las playas de la península de Baja California debe considerarse al coyote como un importante depredador de nidos de tortuga.

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**Palabras clave:** Abundancia baja; *Canis latrans*; Carnívoro; *Lepidochelys olivacea*; Depredación; Supervivencia de anidamiento; Tortuga golfin; Tortugas marinas

### Introduction

Baja California is characterized by productive coastal marine waters coupled with unproductive inland habitats (Polis & Hurd, 1996). Inland food scarcity promotes the displacement of coyotes to coastal areas, where they have been observed in high densities (Rose & Polis, 1998).

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The coyote (*Canis latrans*) is one of the most widely distributed and opportunistic carnivores in North America (Bekoff, 1977). This species is the most common predator in arid zones across Baja California (Álvarez-Castañeda, 2000), being considered an omnivorous opportunist (Elliot & Gueting, 1990; Grajales-Tam, Rodríguez-Estrella, & Cancino-Hernández, 2003; Ortega, 1987; Reichel, 1991; Servín & Huxley, 1993; Windberg & Mitchell, 1990). Coyotes prey on different species, ranging from small- (rodents) to medium-sized mammals (Lagomorpha), reptiles and birds; as well, they are scavengers (Álvarez-Castañeda & González-Quintero, 2005; Arnaud, 1993), feeding on dead reptiles and arthropods (Grajales-Tam et al., 2003; Hernández, Delibes, & Hiraldo, 1994).

The role of the coyote as a common predator of turtle nests has been widely documented (Drake, Hagerty, Behm, & Goldenburg, 2001; Minckley, 1966; Pritchard & Márquez, 1973). Therefore, the impact of coyotes in sea-turtle nesting areas should be assessed.

Five of the 7 sea turtle species have been recorded in the southwestern coast of the Baja California Peninsula: black turtle, *Chelonia mydas*; loggerhead turtle, *Caretta caretta*; olive ridley turtle, *Lepidochelys olivacea*; and, to a lesser extent, hawksbill turtle, *Eretmochelys imbricate*; and leatherback turtle, *Dermochelys coriacea* (Kampalath, Gardner, Méndez-Rodríguez, & Jay, 2006). Both *E. imbricata* and *D. coriacea* are considered as critically endangered by IUCN (Mortimer & Donnelly, 2008). *Chelonia mydas* and *Caretta caretta* are considered as endangered (Marine Turtle Specialist Group, 1996; Seminoff, 2004) and *L. olivacea* as vulnerable (Abreu-Grobois & Plotkin, 2008). All of them are protected by the Mexican government (Nom-059-Semarnat-2010 [Semarnat, 2011]).

Of the sea turtles mentioned above, the main species nesting along Baja California coasts is the olive ridley turtle (*Lepidochelys olivacea*) (WWF & UABCS, 2004). Most olive ridley turtles breed annually and display an annual migration from pelagic foraging areas to coastal breeding and nesting grounds, and then back to the open sea. This sea turtle is generally found on beaches with high humidity levels, which are suitable for nesting, mostly near river mouths or estuaries (Casas-Andreu, 1978; Márquez, Peñaflores, & Vasconcelos, 1996).

The Baja California Peninsula is the northernmost nesting area for the olive ridley turtle (Casas-Andreu, 1978); however, in contrast to its nesting behavior in other areas mentioned above, this sea turtle arrives as solitary individuals in low numbers (López-Castro, Carmona, & Nichols, 2004; Márquez et al., 1996).

On the other hand, coyotes are also found in some coastal areas of Baja California; as opportunistic carnivores, their diet includes crustaceans and fish (Grajales-Tam et al., 2003). Therefore, it is necessary to document whether coyotes are observed on the same beaches where turtles arrive to nest; and if so, the magnitude of turtle nest predation by coyotes should be assessed.

## Materials and methods

With the aim to evaluate the extent of turtle nest predation, therefore surveys along 40 km on a pristine beach

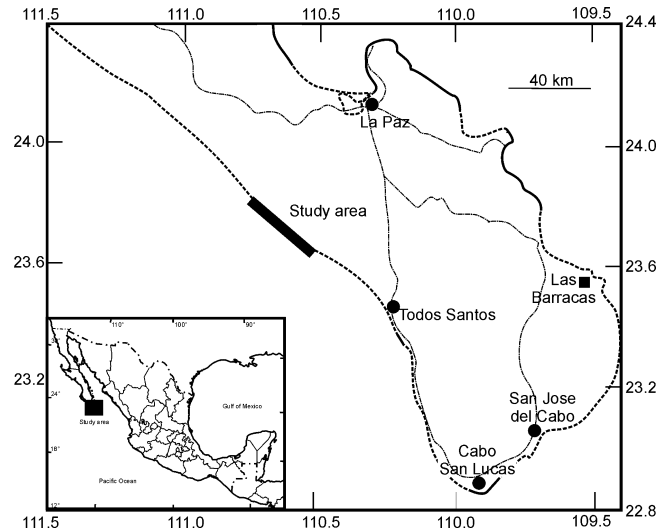


Figure 1. Map of the location of each of the study areas in Baja California Sur, México. The narrow bold line is the survey area. The dash line areas are the sandy coastal areas in which the turtles can lay their eggs. The bold line shows the rocky coastal areas, and the dash-points are the highways. Las Barracas is one of the most important areas for turtle nesting in the peninsula.

called Punta Marques, in the western part Baja California Peninsula ( $23^{\circ}53'32.99''$  N,  $110^{\circ}47'57.17''$  O;  $23^{\circ}39'16.15''$  N,  $110^{\circ}30'50.18''$  O) were performed monthly from June to September 2013. No human settlements, crop fields, tourist developments, or commercial fishing activities were found in this area. The only access to this beach is by traveling 40 km of unpaved road (Fig. 1).

Transects were covered using 2 ATV motorcycles in 2 parallel lines at an average speed of 20 km/h. The surveys began from north to south in the morning, and the same route was covered heading north in the afternoon. All turtle tracks and dead specimens found on the beach were recorded. Each nest was geo-referenced. The distance between nests was obtained using geo-references in Google Earth (<https://earth.google.com>). During the study, some olive ridley turtles (*Lepidochelys olivacea*) were found digging their nests. Photographs of the tracks of those specimens were used for assigning species to the tracks found during the study. Four canid species inhabit the study area. The gray fox (*Urocyon cinereoargenteus*) and the desert fox (*Vulpes macrotis*) have very small tracks, whereas the coyote (*Canis latrans*) and the dog (*C. familiaris*) have large tracks such as those found around all nests. The tracks found are most likely to belong to coyotes (*C. latrans*), for the following reasons: (A) the area does not include human settlements from which dogs could travel to the beach; (B) the study area has a high density of coyotes; (C) the size of canid tracks was similar in all nests, and (D) the shape and size of the tracks correspond to coyote tracks previously observed in the Baja California Peninsula. The latter 3 points are supported in more than 25 years of working with mammals across the Baja California Peninsula by the second author of this paper.

For analysis, nests were divided into 2 groups: (A) new nests, showing turtle tracks from sea-beach-sea; (B) old nests, with no evidence of turtle tracks. The third survey (September 15,

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