

# Spatio-temporal distribution of the rough-toothed dolphin, *Steno bredanensis* (Lesson, 1828) in the Wider Caribbean Region (WCR)

## Distribución espacio-temporal del delfín de dientes rugosos, *Steno bredanensis* (Lesson, 1828) en la Región del Gran Caribe (RGC)

## Répartition spatio-temporelle du dauphin à bec étroit, *Steno bredanensis* (Lesson, 1828) dans la Région de la Grande Caraïbe (RGC)

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### EXTENDED ABSTRACT

The rough-toothed dolphin, *Steno bredanensis*, is an oceanic delphinid distributed in tropical, subtropical to warm temperate waters around the globe. However, its spatial distribution is not uniform, and rough-toothed dolphins can be locally common, particularly around oceanic islands. Little is known on the distribution of rough-toothed dolphins in the Wider Caribbean Region (WCR). Records from the published literature, online biodiversity repositories (OBIS SEAMAP and GBIF), and unpublished data from the coauthors were used to examine the spatiotemporal distribution of this species in the WCR. The WCR was divided into seven regions for the analysis: Bahamas Region, Eastern Florida, Greater Antilles, Gulf of Mexico, Central America, Eastern and Southern Caribbean Sea. A total of 348 records were compiled between 1961-2023, of which 334 (96%) were sightings, 12 (3.4 %) were strandings and 2 (0.6%) were direct takes. Records of *S. bredanensis* are not evenly distributed in the WCR, with 123 (35.3%) records in the Eastern Caribbean and 77 (22.1%) in the Gulf of Mexico. Our results suggest that *S. bredanensis* is distributed throughout the WCR, but some regions might have populations where targeted research should be conducted in the future.

### INTRODUCTION

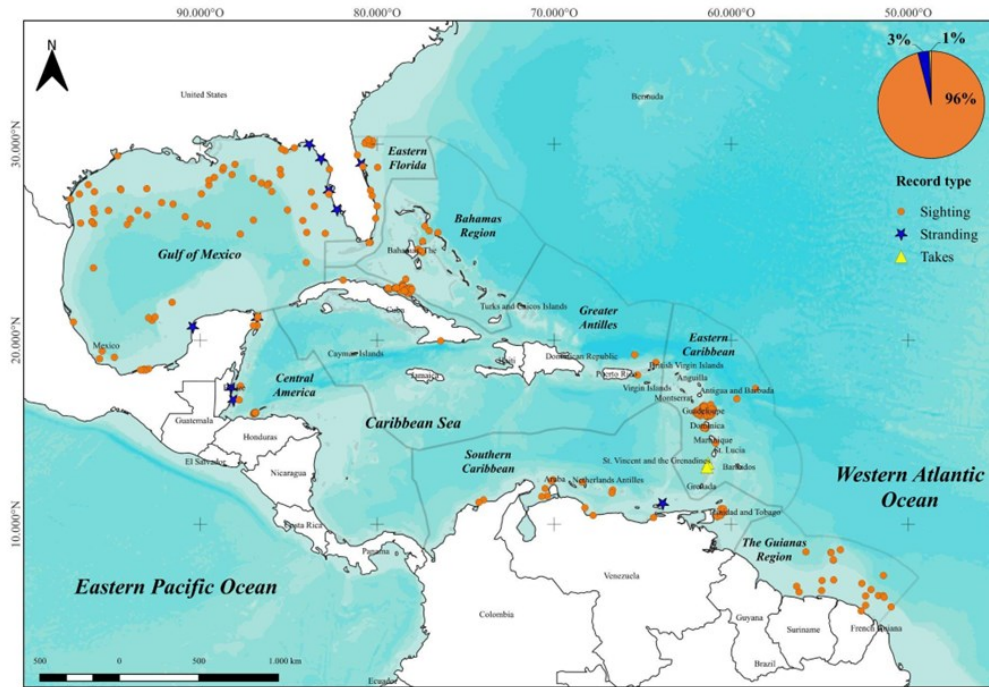
The rough-toothed dolphin *Steno bredanensis* is widely distributed in tropical, subtropical and warm temperate waters of all three major oceans between 40°N and 35°S (Würsig et al. 2018; Herzka et al. 2021). They also occur in semi-enclosed bodies of water, such as the Red Sea, the Gulf of California, the Gulf of Mexico and the Caribbean Sea (Watkins et al. 1987, Notarbartolo di Sciara et al. 2017, Kiszka et al. 2019). Records in the Wider Caribbean Region (WCR) are scattered and there is limited information on the distribution and abundance of this species in the region (Swartz and Burks 2000; Romero et al. 2001; Yoshida et al. 2010; Whitt et al. 2011; Ramírez-León et al. 2021). Under the conservation framework provided by the International Protocol concerning Specially Protected Areas and Wildlife (SPA-W-RAC 2021) of the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (or Cartagena Convention; Anonymous 2007), the aim of this study is compiling all records (sightings, strandings, takes) of rough-toothed dolphins in the WCR to examine broad patterns in occurrence, distribution, and identify areas of potential importance for this species.

### MATERIALS AND METHODS

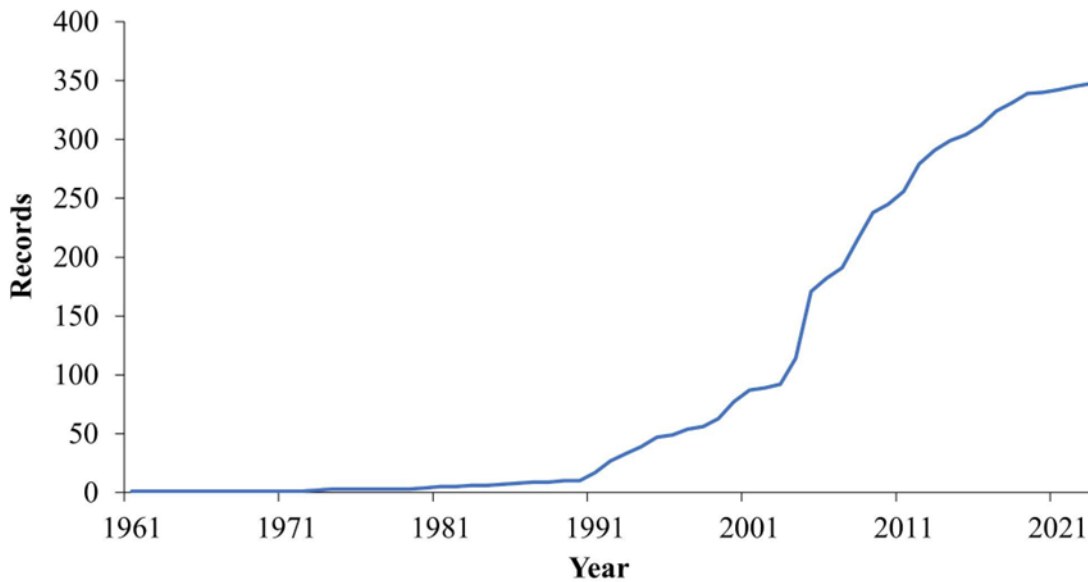
#### Study area

The Wider Caribbean Region (WCR) includes the marine environment of the Gulf of Mexico, the Caribbean Sea and the adjacent areas of the Atlantic Ocean south of 30° north latitude, and includes 28 sovereign states and 18 overseas territories of France, the United Kingdom, the United States of America (USA) and the Netherlands.

For analysis purposes, the WCR was divided into eight subregions: Bahamas, Central America, Eastern Caribbean,



**Figure 1.** Geographic location of the Wider Caribbean Region (WCR) and the spatial distribution of *S. bredanensis* records. Record type: sightings (orange dots), strandings (blue stars) and direct takes (yellow triangles).



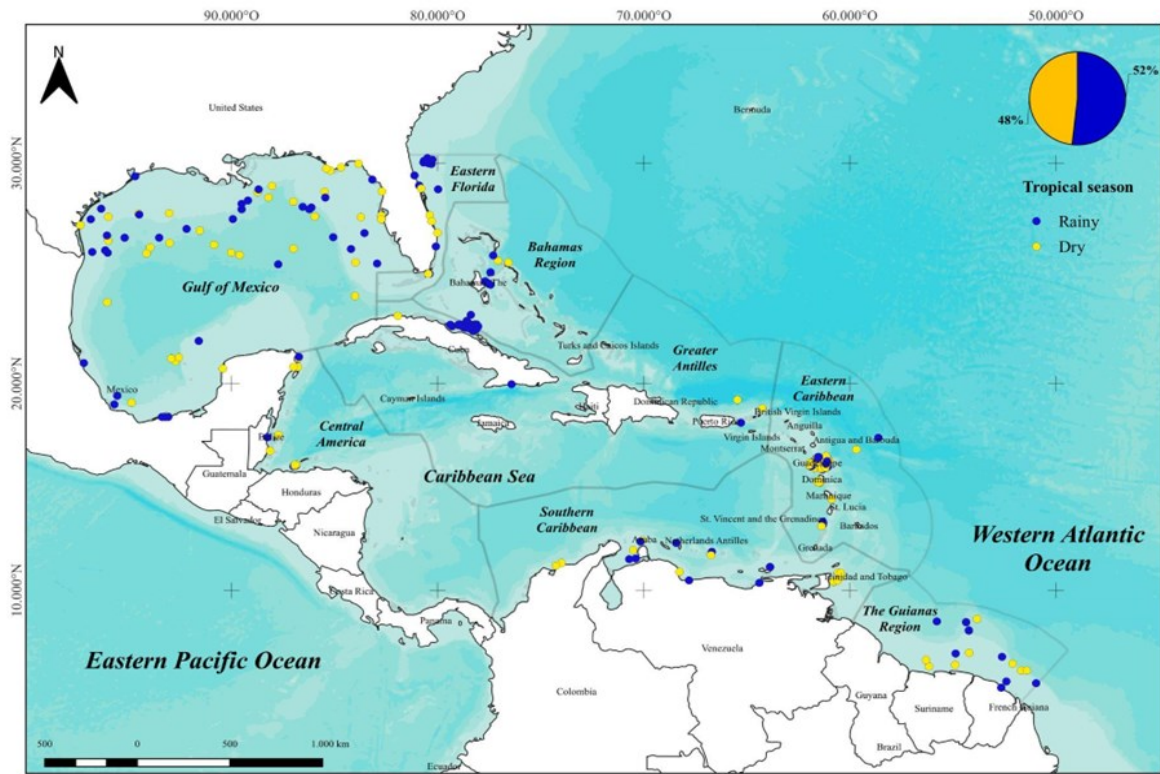
**Figure 2.** Cumulative frequency curve of the historical records of *S. bredanensis* in the WCR from 1961 to 2023.

Eastern Florida, Greater Antilles, Gulf of Mexico, Southern Caribbean and The Guianas (Figure 1).

**Records**

The records of the presence of *S. bredanensis* were

obtained from published literature, unpublished data from multiple organizations (academic institutions and NGOs) and online databases, OBIS SEAMAP (<https://seamap.env.duke.edu/>) and GBIF (<https://www.gbif.org/>)



**Figure 3.** Spatial distribution of *S. bredanensis* records by season in the WCR (n=330): dry season (yellow dots) and rainy season (blue dots).

es/), as well as the field notebooks of all the authors. Records included sightings, strandings and direct takes.

#### Data analysis

The records obtained were georeferenced to build distribution maps of *S. bredanensis* in the WCR, according to the type of record, the tropical season described for the WCR (dry and rainy season; Courtin et al. 2023) and the established subregions. The program used for this was QGIS version 3.28.7. (QGIS.org, 2023).

#### RESULTS AND DISCUSSION

A total of 348 records were compiled between 1961-2023, of which 334 (96%) were sightings, 12 (3.4%) were strandings and 2 (0.6%) were direct takes (Figure 1). Most of the records were related to research projects/activities or reports in scientific articles (n=345; 99.1%).

An increase in reports probably due to increasing research efforts in the region, particularly since the 1990s (Figure 2). The rough-toothed dolphin was recorded during all months of the year, with 172 records collected during the rainy season and 160 during the dry season (Figure 3).

Records of *S. bredanensis* are not evenly distributed in the WCR, with 123 (35.3%) records in the Eastern Caribbean, 77 (22.1%) in the Gulf of Mexico, 31 (8.9%) in the Greater Antilles, 30 (8.6%) in the Western Caribbean,

25 (7.2%) in The Bahamas, 23 (6.6%) in the Southern Caribbean, 21 (6%) in The Guianas Region and 18 (5.2%) in the east coast of Florida.

The results of this research confirm that *S. bredanensis* is distributed throughout the WCR. However, the spatial variation of records is most likely driven by observation effort throughout the region, with more effort in the Gulf of Mexico or in the eastern Caribbean. Conversely, records were rare along the Caribbean coast of Central America. A similar pattern was found for other cetacean species of the region (Bolanos-Jimenez et al. 2023), confirming that effort is a major driver of the occurrence of sightings.

This work highlights the importance of the WCR as critical habitat for the rough-toothed dolphin, therefore, it should be considered a priority the development of national marine mammal management plans, that promote collaboration and increase regional research efforts, as well as how to support citizen science initiatives, in a way that improves knowledge about the distribution and abundance of these organisms in the WCR, which can guide SPAW Contracting Parties towards developing their own national strategies and frameworks for the conservation of marine mammals (Borobia et al. 2023). Thus, future work will aim at identifying suitable rough-toothed dolphin habitats using presence-only sighting records in

the region.

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**KEYWORDS:** Caribbean Sea, Gulf of Mexico, Cetacean, Conservation, Marine mammal

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