Long-term trend of olive ridley turtles nesting in brazil reveals one of the largest rookeries in the atlantic

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Introduction

The conservation status of sea turtles is usually assessed based on long-term monitoring of females and nesting grounds. The abundance of females and/or their nests usually serve as the primary metrics to monitor trends in sea turtle populations[1,2] (Fig 1). Northeastern Brazil supports an important population of olive ridley turtle (*Lepidochelys olivacea*) (Fig 2).

Objective

We present an update on the long-term trend in olive ridley nests observed throughout 16 years of beach surveys in Brazil

Material and methods

Study area

We surveyed 330 km between latitudes 10°51'S and 12°96'S (Fig. 3), comprising the northern Bahia and the entire Sergipe state coastlines, the main nesting site for olive ridleys in Brazil.[3]

Annual nest counts

Daily surveys occurred from 15 September to 31 March, between the 2003/2004 and the 2018/2019 nesting seasons.The total number of olive ridley nests was defined as:

$N_t = N_{obs} + N_{est}$

N_{obs} = the number of nests known to belong to olive ridley turtles
N_{est} = the number of olive ridley nests estimated from nests for which the species was not identified (unknown nests).

The equation to the estimated number of olive ridley nests was:

$N_{est} = N_{ni}(N_{obs}\ N_{sp}^{-1})$

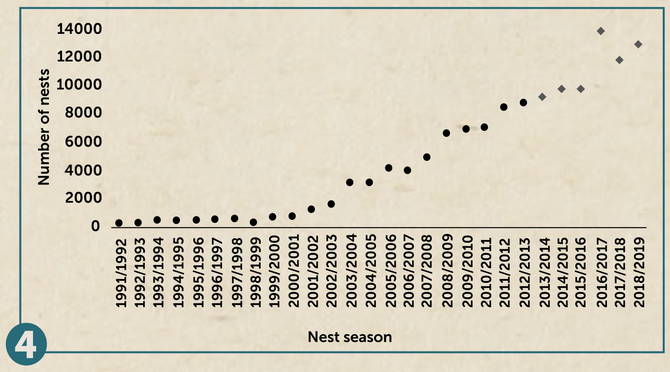
N_{ni} = the number of unknown nests,
N_{obs} = the number of nests known to belong to olive ridleys,
N_{sp} = the number of nests of known species.

Statistical analysis

We evaluated the nesting trend using a Generalized Least Square Model with log transformed nest counts and autocorrelation errors to account for any temporal correlation using the nmle package in the R software version 4.1.1 (R Core Team 2021).

Estimating female abundance

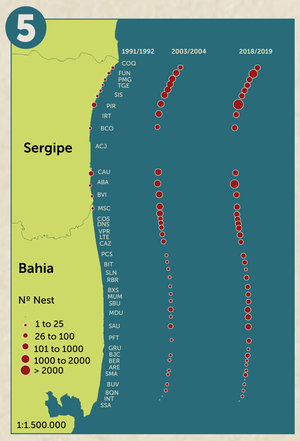
We estimated the minimum number of females nesting by dividing the average number of nests laid in the past 3 years by clutch frequency (CF). CF was determined from approximately 5,000 individual nesting females over 16 years in Sergipe.



Number of Olive Ridley Sea Turtle (*Lepidochelys olivacea*) nests recorded during each reproductive season in northeastern Brazil between 1991/1992 and 2018/2019 (Silva et al. 2007 and present study). Closed circles are nesting counts along study area between 1991/1992 and 2012/2013 nesting seasons. Grey diamonds represent number of nests estimated between 2013/2014 and 2018/2019 nesting seasons.

Results

- Upward trend in annual nest counts between 2003/2004 - 2018/2019 (Fig 4)
- 50-fold increase: from 252 nests counted in 1991/1992 to 12,709 nests estimated in 2018/2019 (Fig. 5).
- Estimated 11,923 females nest annually over the study area in recent years.
- Brazil currently supports the second largest population of olive ridley in the Atlantic, with 12,669 nests annually (2016/2017 to 2018/2019) (Fig 6).



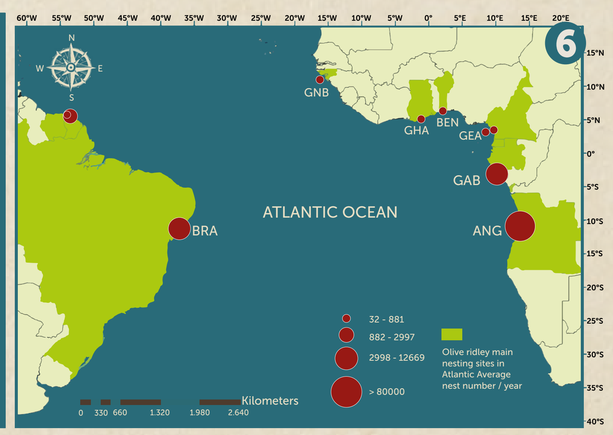


Figure 5
Estimated average number of nests of olive ridley during the 1991/1992, 2003/2004, and 2018/2019 nesting seasons in Brazil.

Figure 6
Annual number of nests for the main olive ridley nesting sites in the Atlantic Ocean. SUR = Suriname; FRG = French Guiana; BRA = Brazil; GNB = Guinea Bissau; GHA = Ghana; BEN = Benin; GEA = Equatorial Guinea; CAM = Camaroon; GAB = Gabon; and ANG = Angola. (Lasfargue et al. 2021; Morais and Tiwari 2022; this study).

Discussion

- The significant increase in number of nests and abundance of nesting females is probably the consequence of conservation actions carried out in the Atlantic, both at the foraging and nesting grounds
- In Brazil, uninterrupted conservation actions were promoted over four decades by Projeto Tamar, based on an adaptive threat management framework and community-based development strategy to achieve sea turtle conservation goals[4].
- Large knowledge gap in olive ridleys ecology, especially regarding juveniles in the Southwestern Atlantic. Questions about foraging grounds and composition of mixed stocks still need to be addressed.
- High levels of mortality of mature olive ridleys due to incidental catch in trawl fishery is a matter of concern for conservation and population stability in Brazil.[4,5]
- The low enforcement capacity, especially related to fisheries, remains a problem and needs to be urgently addressed by the Brazilian government.

Conclusion

- Brazil currently supports the second largest population of olive ridleys in the Atlantic.
- The remarkable recovery of the population reported here is probably a result of 40 years of uninterrupted research and conservation efforts, and in-water actions over the past 18 years.
- Persistence of high mortality of adults may lead to a future population decline in the next few generations.
- Conservation efforts will be weakened without law enforcement, and expected population recovery may not be fully achieved.

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