MEDWIN PUBLISHERS
Committed to Create Value for Researchers

International Journal of Oceanography & Aquaculture
ISSN: 2577-4050

About Unprovoked Shark Attacks at Pernambuco's Inshore Waters

Santana CAS*

Rector Ednaldo Bastos Library, Center for Applied Social Sciences, Federal University of Pernambuco, Brazil

***Corresponding author:** Cesar Augusto Da Silva Santana, Rector Ednaldo Bastos Library, Center for Applied Social Sciences, Federal University of Pernambuco, Brazil, Email: cesar.ssantana@ufpe.br

Mini Review

Volume 7 Issue 2

Received Date: April 13, 2023

Published Date: April 27, 2023

DOI: 10.23880/ijoac-16000236

Abstract

Unprovoked shark attacks have suddenly started at Pernambuco's inshore waters from 1990s onwards. Some studies have pointed out different hypotheses to explain the reasons for this anomaly in the coast of Pernambuco. However, inconsistencies concerning some of these hypotheses indicate the need of further investigations to clarify which environmental and anthropic factors are driving such abnormal incidents with sharks in the south coast of Pernambuco.

Keywords: Shark; Shark Attack; Pernambuco; Recife; Suape; Environmental Impact

Abbreviations: SMPR: Shark Monitoring Programme of Recife; MRR: Metropolitan Region of Recife; CEMIT: Committee for the Monitoring of Shark Attack Incidents.

Introduction

Pernambuco is a coastal state in northeastern Brazil. It extends from latitude 7°15'45" to 9°28'18" S and from longitude 34°48'33" to 41°19'54" W [1]. Since last century in the 90s, a huge number of unprovoked shark attacks have suddenly started at Pernambuco's inshore waters. According to the Committee for the Monitoring of Shark Attack Incidents (CEMIT), created by the Government of the State of Pernambuco to address this problematic situation, there were 77 incidents with sharks in the period 1992-2023: 67 unprovoked attacks inshore at the beaches of Enseada dos Corals, Paiva, Candeias, Piedade, Boa Viagem, Pina, Del Chifre, Olinda, Pau-amarelo and Ponta de Pedras, as well as 10 attacks in Fernando de Noronha Islands. It is important to highlight that 26 of these cases were fatal and most of these fatalities have occurred at beaches in Recife, capital city of Pernambuco [2]. Shark incidents are nothing new in Pernambuco; actually, there have been shark attacks in the coast of Pernambuco for centuries. Araújo [3] reports several incidents in the period 1845-1980. Most of these incidents occurred nearby the Port of Recife and beaches at the Municipality of Olinda in the north coast of Pernambuco, only two incidents were reported for the south coast in this period, both at Piedade beach (1947 and 1980). On the other hand, from the 1990s onwards, nearly all the incidents occurred in the south coast of the Metropolitan Region of Recife (MRR), particularly at the beaches of Boa Viagem and Piedade [2,3].

Two species have been reported to perform the attacks: *Carcharhinus leucas* [bull shark] and *Galeocerdo cuvier* [tiger shark] [2,4]. Szpilman [4] States that these species are voracious predators and inhabit coastal waters (coral areas,

beaches, ports, estuaries, shallow water bays and lagoons). They are usually solitary and can be found in temperate, tropical and subtropical waters. In Brazil, they are more common in the North and Northeast Regions. Szpilman [4] also states that tiger sharks are seasonal migratory fish. They move to temperate waters in summer and return to the tropics in winter, feeding on stingrays, dogfish, fish, mollusks, crustaceans, seabirds, turtles, seals, other marine mammals and detritus. The author also states that bull sharks prefer teleosts (bass, catfish, mullet, mackerel and tuna) and small sharks, however, they also feed on stingrays, sea turtles, small dolphins, crabs, shrimp , squid, sea urchins and mammal carrion.

Attack of sharks on humans is not common: 64 attacks per year worldwide [2,5]. Therefore, this problematic situation in the MRR can be considered an anomaly that has enormously concerned stakeholders and general population, given that these incidents pose a risk to the lives of bathers and surfers, provoke irreparable damage to the physical and psychological integrity of victims and their families, as well as huge and negative social and economic impacts.

Strategies have been designed to mitigate these abnormal incidents and to determine the causes driving such unprovoked attacks. Mitigation strategies included the 'Shark Monitoring Programme of Recife (SMPR)', green strategy that aimed capturing, transporting and releasing sharks offshore; prohibition and limitation of nautical activities, such as scuba-diving, surfing and swimming; and environmental education [2,3]. The SMPR was an efficient strategy from 2004 to 2011. This strategy reduced the number of incidents in 97% during the period 2004 to 2011 [2]. It is important to highlight the increasing number of incidents during periods of funding interruption and programme discontinuity [2].

Concerning the causes of these sudden incidents with sharks, there are several hypotheses. Hazin, et al. [2], for example, suggest that the high rate of incidents with tiger sharks in Recife could be related to the diversion on its migratory movement towards north to follow the traffic of merchant vessels towards the Port of Suape. For these researchers, since the construction of the aforementioned port in the south of MRR, this species of shark has probably diverted from its natural migratory movement as explained above, later reaching the coastal zone in southern MRR. There is also evidence that these animals would have been attracted to the beaches in the south coast by discharge of pollutants into the Jaboatão River basin that flows in the MRR southern beaches, pollutants such as untreated effluents from the public slaughterhouse in the municipality of Jaboatão and manure from the Muribeca landfill in the same municipality [6]. The environmental impact and degradation of estuaries caused by the construction of the Port of Suape and the consequent imbalance in the trophic web are also pointed out as possible causes for the displacement of these species of sharks from their usual places of reproduction and feeding (estuaries in the surroundings of Suape) to the basin of the Jaboatão River further north and adjacent beach areas, which are used by the population for recreational purposes and water sports [3,6]. The topography of the beaches in Recife with a deep channel (6-8 m) running parallel to the beaches of Boa Viagem and Piedade, places where a greater number of incidents were observed, can also be a factor that contributes to incidents with these animals [3,6]. Araújo [3] suggested that the environmental impact caused by the construction of the Port of Suape, carried out in a very short period of time when compared to the secular process of construction and expansion of the Port of Recife, may have led to a very rapid response of the ecosystem to these anthropic interventions, culminating in the peak of incidents in the 1990s. In addition, Araújo [3] has also suggested that the increasing number of incidents with sharks in the MRR is correlated to the growth of Recife population and the respective recreational usage of beaches. Another hypothesis is that the transit of sea turtles across the region between the Air force Hospital and the Catholic Church at Piedade beach is a factor contributing to the presence of sharks as well, particularly tiger and bull sharks, given that sea turtles are part of their diet [7-9].

Despite the plausibility of the hypotheses aforementioned, there is room for queries in the sense of clarifying some inconsistencies on such hypotheses. Hazin et al. (2008), for example, question the reason for sporadic occurrences of incidents with sharks on the south coast before 1992 (only two cases in 1947 and 1980, respectively), given that: (i) there were no significant changes in the underwater topography; (ii) the shark species involved in the attacks were always around; and (iii) the recreational usage of beaches on the south coast began well before the 1990s [3]. The questions below would also be relevant:

i. If the flow of ships in the Port of Suape was an important factor attracting sharks to the MRR south coast, consequently, increasing the number of incidents with sharks in the 1990s, why was not the same dynamic observed before 1992, when the Port of Recife, close to where the incidents occurred in 1992, was fully operational?

ii. If the discharge of untreated effluents from the Jaboatão slaughterhouse and Muribeca landfill into the Jaboatão River basin attracted sharks to the beaches on the south coast (under the influence of the Jaboatão River), why was not the same dynamic observed earlier, considering that the slaughterhouse and landfill were already in operation in the 1980s?

It is also important to emphasize that the hypothesis

of a greater concentration of migratory sharks in southern beaches at MRR, due to the flow of ships towards the Port of Suape from the 1990s onwards, should imply an increase in the abundance of these animals compared to previous decades. However, Hazin, et al. [10], in a study carried out in 1994-95, have estimated the relative abundances of *C. leucas* and *G. cuvier* and concluded that there is no correlation between them and the incidents with sharks occurring during this period at the area between the north of the Port of Recife and the south of the Port of Suape. These authors also pointed out that the relative abundances of the aforementioned species, estimated by them, were very small, even lower than those estimated by studies in previous decades.

I understand that the environmental impact and degradation of the estuaries around the Suape Basin, due to the construction of the Port of Suape, may be a very plausible hypothesis to explain the high rate of incidents with sharks from 1990 onwards. Possibly, the environmental impact and degradation of estuaries have led to a reduction in primary productivity in these areas of reproduction and feeding of a variety of species [11], and, consequently, to a collapse in the recruitment of important species, regarding the feeding ecology of tiger and bull sharks (predator-prey imbalance). This may have led these voracious species to look for food in new areas, such as the beaches on the south coast of Pernambuco, however, only further studies might confirm this.

Based on all stated above, it is clear that there is a need for further scientific investigations, in order to clarify inconsistencies related to several hypotheses related to incidents with sharks, as well as to identify which environmental or anthropic variables may be determining this anomaly on the coast of Pernambuco. Furthermore, it would also be important the development of novel mitigation strategies. Despite of the SMPR has been a successful strategy from 2004 to 2011; there is no studies about its feasibility in long-term. Perhaps, a deep learning approach with real-time autonomous surveillance systems linked to an efficient warning system could be a good idea [12]. Environmental education has also an important role in discussing environmental issues and safety measures concerning shark incidents. However, it would be important the inclusion of such environmental topics in the syllabus of public educational system since elementary school, instead of being restricted to environmental interventions with beach users on holidays and weekends.

Conclusion

Indeed, after recent incidents (March 2023) and corroborating with all the explanation above, the Government of the State of Pernambuco have released a call for funding scientific researches framing the following specific themes: (i) diagnosis of the causes of shark incidents; (ii) technologies for monitoring, prognosis and mitigation of Shark Incidents; (iii) safety and environmental education and (iv) assessment of the socio-economic impact of shark attacks [13]. It is expected that this initiative may help to find short- and long-term solutions for reducing the number of incidents with sharks in Pernambuco and minimizing the socio-economic impact caused by them.

References

1. Lima DA (2007) Phytogeographic Studies of Pernambuco. Annals of the Pernambuco Academy of Agricultural Sciences 4: 243-247.

2. Hazin FHV, Afonso AS (2014) A Green Strategy for Shark Attack Mitigation off Recife, Brazil. Animal Conservation 17(4): 287-296.

3. Araújo MC (2019) Space-Time Analysis of Shark Incidents on the Coast of Pernambuco. Dissertation (Master)-Graduate Program in Development and Environment, Federal University of Pernambuco, Brazil, pp: 101.

4. Szpilman M (2004) Sharks in Brazil: Practical Identification Guide. Aqualittera, Brazil, pp: 160.

5. Burgess GH, Buch RH, Carvalho F, Garner BA, Walker CJ (2010) Factors Contributing to Shark Attacks on Humans: A Volusia County, Florida, Case Study. 1st (Edn.), In: Sharks and their relatives II-Biodiversity, Adaptive Physiology, and Conservation, CRC Press, USA, pp: 541-565.

6. Hazin FHV, Burgess GH, Carvalho FC (2008) A Shark Attack Outbreak off Recife, Pernambuco, Brazil: 1992-2006. Bulletin of Marine Science 82 (2): 199-212.

7. Hazin FHV, Afonso AS, Castilho PC, Ferreira LC, Rocha BCLM (2013) Regional Movements of the Tiger Shark, *Galeocerdo cuvier*, off Northeastern Brazil: Inferences Regarding Shark Attack Hazard. An Acad Bras Cienc 85 (3): 1053-1062.

8. Dicken ML, Hussey NE, Christiansen HM, Smale MJ, Nkabi N, et al. (2017) Diet and Trophic Ecology of the Tiger Shark (*Galeocerdo cuvier*) from South African Waters. Plos One 12(6): e0177897.

9. Ferreira LC, Thums M, Heithaus MR, Barnett A, Abrantes KG, et al. (2017) The Trophic Role of a Large Marine Predator, the Tiger Shark *Galeocerdo cuvier*. Scientific Reports 7(1): 7641.

10. Hazin FHV, Wanderley-Júnior JAM, Mattos SMG (2000) Distribution and Relative Abundance of Sharks on the Coast of the State of Pernambuco, Brazil. Marine Science Archives 33(1-2).

11. Neumann VH, Medeiros C, Parente L, Neumann-Leitão S, Koening ML (1998) Hydrodynamism, Sedimentology, Geomorphology and Plankton Changes at Suape Area (Pernambuco-Brazil) after a Port Complex Implantation. Annals of the Brazilian Academy of Sciences 70(2): 313-323.

12. Barbelian MA, Dinu C, Pietreanu CV (2021) Deep Learning Approach on Shark Attack Risk Assessment Using Real-Time Autonomous Surveillance Systems. UPB Sci Bull 83(4): 61-72.

13. Facepe (2023) Notice FACEPE 02/2023-Prevention and Mitigation of Incidents with Sharks and Lionfish Invasions in Pernambuco. FACEPE, USA, pp: 17.