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Effects of the Extraction of sea sand on the nesting of the Olive Ridley Turtle (Lepidochelys olivacea) on the beaches of San Vicente Canton, Manabí province

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ABSTRACT:

Worldwide, Turtle populations have decreased alarmingly, mainly due to factors such as hunting for tortoiseshell, leather and meat, urban development and sand extraction. Sand extraction is a common activity in the cantons of the Ecuadorian Coast. One of the most threatened sea Turtle species is the Olive Ridley Turtle Lepidochelys olivácea. The canton of San Vicente has an extension of 16 km of beach, of which 12 km are registered nesting sea Turtles, especially the Golfina species, in parallel on this beach sand extraction is carried out, a problem that has been occurring for 30 years, in In this intervention, we intend to verify the impact caused on the nesting of Olive Ridley Turtles as a result of sand extraction, in order to propose actions to mitigate this impact. In this study, it was determined that the extraction of sand carried out in the 10 km from the sector of the residential complex Playa Azul to Punta Napo has been increasing gradually in the last 5 years, which contrasts with the hatching rates of Turtle nests. Golfina (Lepidochelys olivacea) which has been decreasing over these 5 years. Data product of monitoring carried out by the Environment Unit of the San Vicente Canton of the last 5 years were evaluated, both in hatching of nests and sand extraction, in two sectors: from the canoe beach to the recreation area, an area that is partially protected. by residents of the sector, Gad and Isla Corazón wildlife refuge and frigatebirds; and the sector that includes from residential complex blue beach to Punta napo. A comparative analysis was carried out for both cases applying a correlation of variables. It was determined that in the unprotected area the hatching rate is lower than that of the partially protected area, it was also shown that the volume of sand extracted in the unprotected area is considerably greater than in the area that includes from the Canoa beach to the el Recreo.

Key Words: Nesting, ecosystem, impact, beach, sea Turtles.

INTRODUCTION

Beach sand plays a very important role in ecosystems since, in addition to housing a large number of species, it protects the coastal profile from storms and intense atmospheric phenomena. Sand is also a raw material whose demand is growing as fast as the problems that its exploitation entails. Sea Turtles are slow-growing reptiles, they have a complex life cycle that includes various types of habitats during their development and extensive migrations, which exposes them to numerous natural and anthropogenic threats (Cuevas, 2017). Worldwide, Turtle populations have decreased alarmingly, mainly due to factors such as hunting for tortoiseshell, leather and meat, urban development and sand extraction. This concern has led to all species of sea Turtles being included in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and appearing on the red list1 of IUCN2. Similarly, Turtles are included in the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC) and Appendix I of the Convention on the conservation of migratory species of wild animals (CMS). The Ecuadorian coast has favorable characteristics for the reproduction, rearing and development of sea Turtles. In the canton of San Vicente there is a significant number of hatchings of Turtle nests of the Olive Ridley species Lepidochelys Olivacea. This is one of the seven species of sea Turtles that currently exist in the world, they are found in the tropical and subtropical seas of America (Eckert et al., 1999)

Nesting threats are circumstances in which there is conjecture that an event damaging to the species or its habitats will occur and the impacts refer to the set of negative effects caused by the threats (Chacón et al. 2000, 23). The determination of the potential impact is based on the elucidation of the interactions between the hazards and the environmental components.

The extraction of sand in the 16 km of beach in the San Vicente Canton has increased in recent years, especially in the last five.

This activity is carried out manually and also with machinery, there are groups of people who have made this activity their source of economic income and charge per trip or full dump, they fill them manually with shovels, these groups live in San Felipe, via Chone and this is where the dump truck drivers arrive to "negotiate" their filling and then move to the beaches of Napo, Briceño

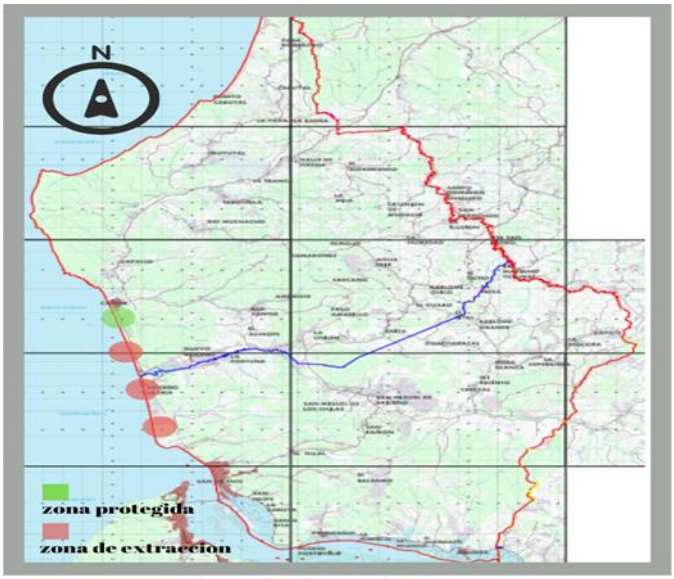
or the Playa Azul sector, depending on how the tide is.

When carrying out the extraction of sand they destroy the nests and the traffic of heavy dump trucks also destroys them. The movement of vehicles along the coastline negatively affects the nesting of sea Turtles at various points along the coast (such as the section between San Vicente and Canoa). According to Baquero et al. (2008a).

This activity is carried out at all hours, but mostly at night when the few existing control personnel are not operational since their working hours are from 8:00 am to 5:00 pm.

The removal of sand affects all the species that live and interact in the coastal strip and in a particular way to species that depend on it for their survival, such as sea Turtles. In this case we are going to focus on describing the impact caused by the extraction of sand on the nesting of sea Turtles, particularly the Olive Ridley species.

The objective of this research is to publicize the impact caused on the nesting sites of the Olive Ridley Turtle, Lepidochelys olivacea, by the extraction of sand on the beaches of San Vicente, which can serve as a strategy to protect the habitat of these species, which They are in danger of extinction.



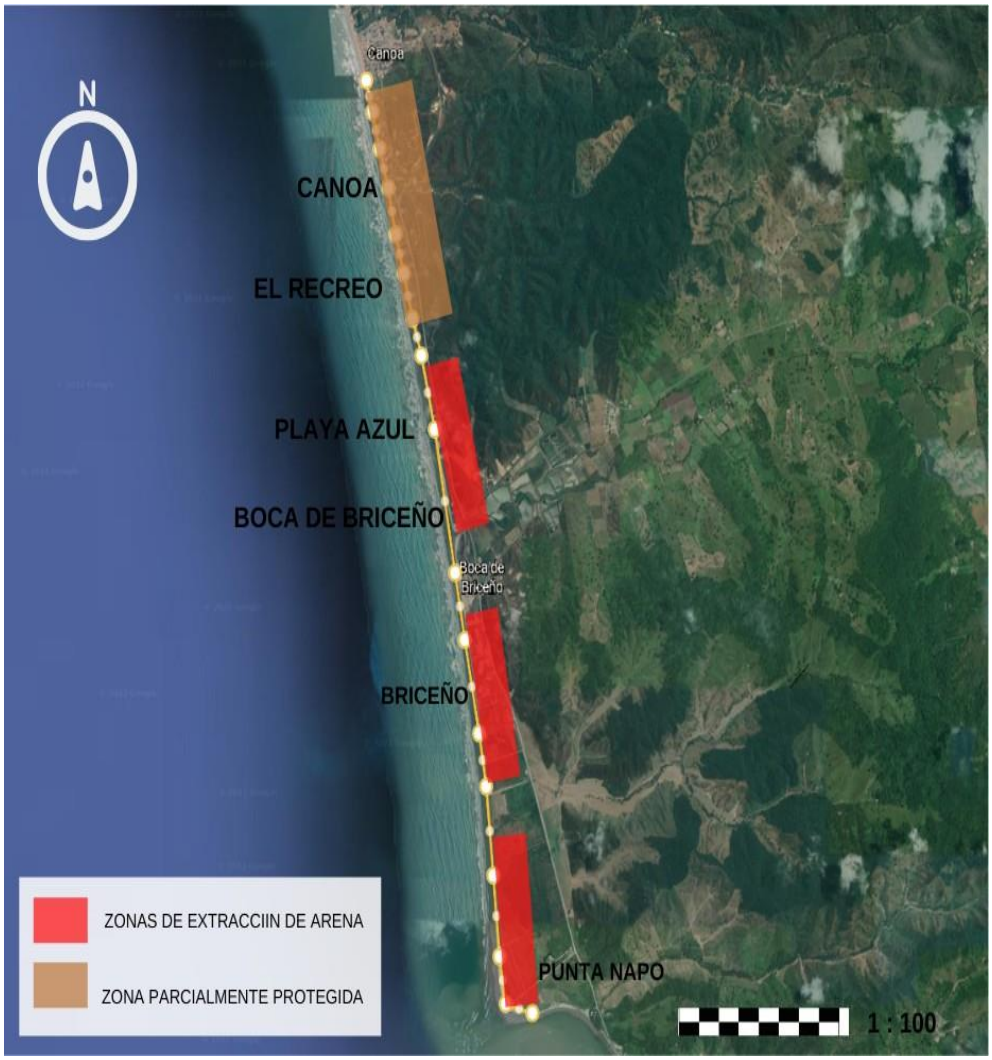
Graphic Nº1. Study Area, Coast of Cantón San Vicente

San Vicente has 16 km of beach, it is located in the South American Pacific on the north coast of the Province of Manabí, but our study is focused on the 12 km of existing beach from Punta Napo located between the coordinates Latitude 0° 34' 11' ' S , longitude 80° 25' 55" W and Latitude 0° 27' 59" S , longitude 80° 27' 22" W, (Figure Nº 1) this study will be developed in this extension of beach since we can distinguish two areas, one that is not protected and the other that has a certain degree of protection by the inhabitants of the canoe area and the Autonomous Municipal Government of San Vicente Canton with the support of the Isla Corazón y Fragatas Wildlife Refuge, based on to this research we intend to develop an alternative to mitigate the possible impacts to the Olive Ridley Turtle nesting in the study site.

MATERIALS Y METHODS.

The months in which more nesting is recorded are from July to December, with the month of September being the one with the highest hatching peaks of the entire season, as also explained by (Martínez LM and Páez VP), through the investigative method of collecting and tabulating information, both hatching and sand extraction volumes, the existing data in the Gad San Vicente Environment Unit will be evaluated, both nesting reported by people living near the partially protected area in the area from Canoa to Recreo, which has an extension of 2 km, with delimited areas and protection signage implemented by the Ministry of the Environment and Gad San Vicente, as in the area from Playa Azul to Punta Napo, an area where sand extraction is carried out manually and sometimes using heavy machinery such as backhoes, this area has an extension of 10 km being the points where more sand is extracted: Punta Napo, Briceño and the blue beach sector.

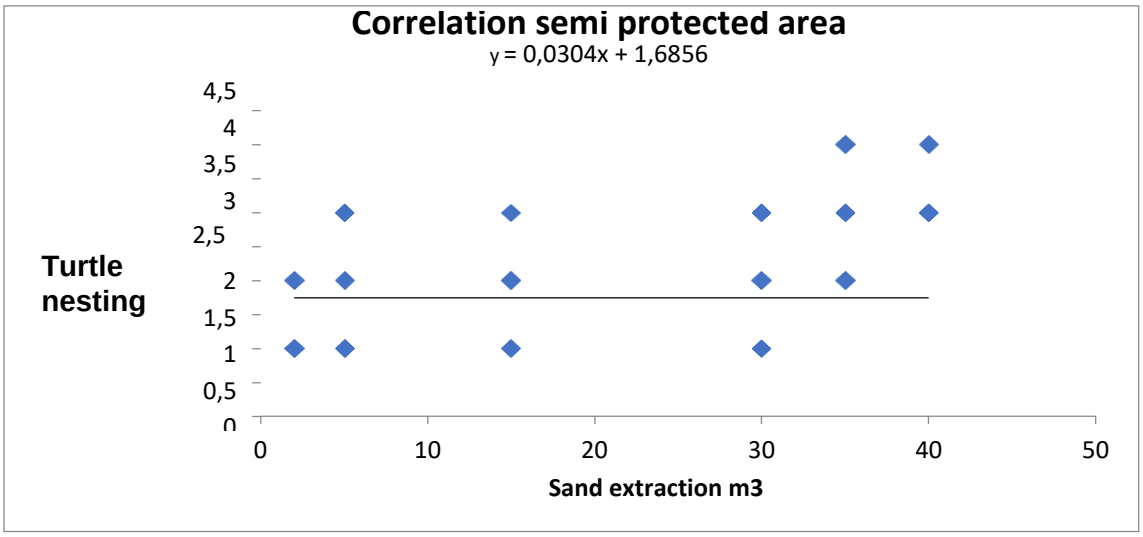
The Environment Directorate of the GAD San Vicente, carried out daily monitoring in the 12 km of beach from Punta Napo to San Andrés de Canoa, which basically consisted of making two daily trips along the coastline, according to the tide table, the schedules were coordinated, the nests are detected in the monitoring by the footprints that The Turtles leave when they move to the berm area where they proceed to spawn, sometimes the residents of the coastal strip report the nests.



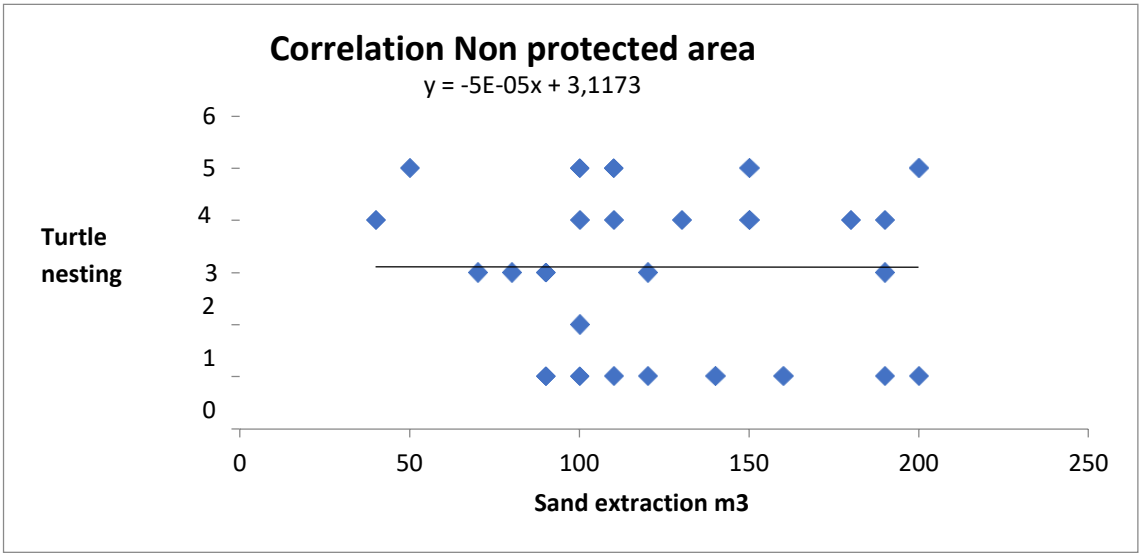
Graphic Nº2. Beach zone limits.

Existing monitoring data of the last 5 years of the Hygiene and Environment unit of Gad San Vicente will be evaluated

In addition, an analysis of the existing information in the Gad San Vicente on sand extraction in the last 5 years was carried out, to later compare it with the Turtle nesting data in the same places where sand extraction is carried out, in this way we will determine if there is a correlation between these two variables, the Pearson method was used to perform the statistical analysis.



Graphic Nª 3. Correlation semi protected area



Graphic Nª 4. Correlation Non protected area

The study area for the hatching variable was evaluated in two sectors: A partially protected area which has permanent monitoring by the people who live in the sector, which already has an extension of 2.19 km. And on the other hand, the area in which sand extraction is carried out that has an extension of 9, 81 km that includes from Punta Napo to the sector of the Playa Azul residential complex (Graphic Nº 2). For the sand extraction variable, the existing data in the Gad San Vicente was evaluated.

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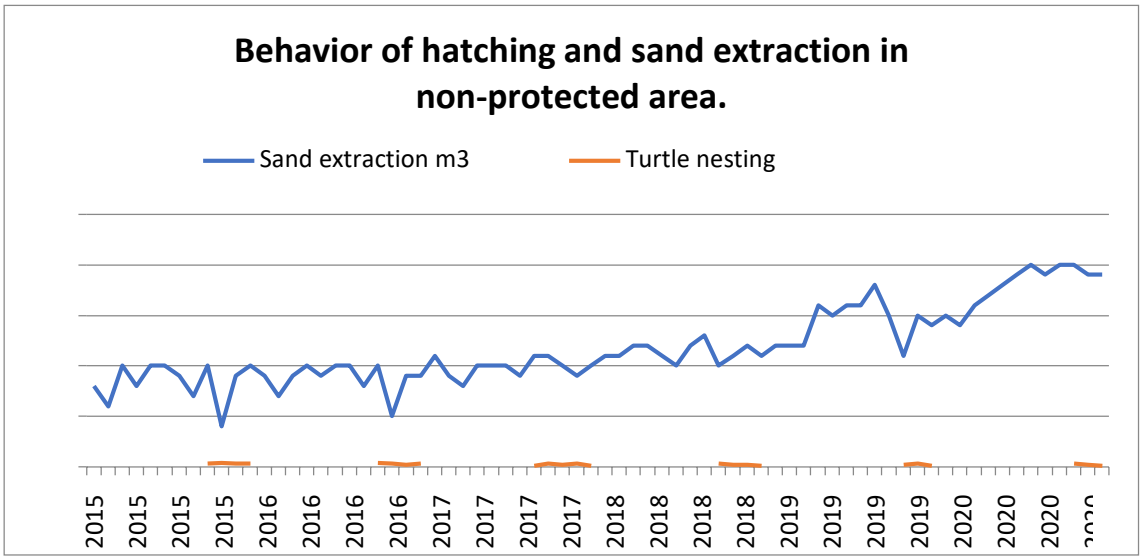

Graphic 5. Behavior of hatching and sand extraction in non-protected area.

RESULTS Y DISCUSION

According to the existing data from the monitoring carried out by the Environment Unit of Gad San Vicente, we can see that the extraction of sand in the non-protected area, that is, from the Sector of the Playa Azul residential complex to Punta Napo has increased by the last 5 years more than 100%. A situation that contrasts in the partially protected area, since the extraction of sand in this area is less and it has been decreasing in the last 5 years. (Figure No. 3).

As far as nesting is concerned, it has remained stable and has even had a slight growth over the last 5 years (Graphic Nº3), in the partially protected area that includes the 2 km of beach from the southern zone. from the Canoa boardwalk to the Recreo sector, this is due in a certain way to the actions implemented by the residents of the sector in coordination with Gad San Vicente and the Isla Corazón y Fragatas Wildlife Refuge, who have placed informative and prevention signage as well as workshops on the identification of nests and protocols to follow in case of hatching of sea Turtle nests, contrary to this, the area that is not protected, has low nesting rates, which have been gradually decreasing in the last 5 years (Graphic Nº4).

An analysis of the existing information in the Gad San Vicente on sand extraction in the last 5 years was carried out, in order to

later compare it with the Turtle nesting data in the same places where sand extraction is carried out, in this way it has been possible to determine that there is a correlation between these two variables.

When evaluating the sand extraction data and the hatching rates in the two sectors of the beach from Punta Napo to Canoa, it can be observed that there is a relation between the increase in sand extraction and the decrease in the hatching of Olive Ridley Turtle nests in the area including from the Playa Azul residential complex to Punta Napo.

Although there are other factors that can influence a decrease in hatching of sea Turtle nests, such as attacks by other animals, rising sea levels, incidental fishing, high levels of salinity (wood and bjorndal, 2000), as well as such as the granulometry of the sands (Akerman, 1997), based on the analysis of the variables object of the present study, we can determine that there is a direct influence of the sand extraction activities on the hatching rates of Olive Ridley Turtle nests in the San Vicente Canton beaches.

CONCLUSIONS.

In the comparative analysis of the variables of hatching and sand extraction rates both in the partially protected zone and in the unprotected zone, it was determined that the hatching rates are higher in the partially protected zone as well as the volume of sand extracted is lower, However, there is extraction in said area, on the other hand, in the unprotected area, a much larger volume of extracted sand is observed, which has increased in the last 5 years and the hatching rates are considerably lower than those analyzed in the partially protected area. After analyzing the data obtained in this investigation, it was established that there is a direct correlation in the sand extraction activity that affects the hatching of Olive Ridley Turtle nests in the areas where this activity is carried out (Graphic Nº 5)

One way to mitigate this problem would be to implement a 24/7 monitoring system, with a team of trained people who carry out permanent monitoring tours in-situ, this actions must be coordinated between the community and the institutions that have competences in this regard, this multidisciplinary team must have the necessary equipment that allow them to carry out this monitoring in a constant and sustainable method, generating a database which allows evaluating its progress in order to propose improvements that help to stop this activity that affects the existence of this species, sea Turtle.

It is also important to work on socioeconomic assistance programs for people who are dedicated to the activity of extracting sand from the sea, so that they can have alternatives and job options for a living, this would help together with a correct control and monitoring action plan to reduce the volume of sand extraction and at the same time increase the hatching rate of the olive Ridley Turtle and in this way this important marine species and its natural habitat can be protected.

REFERENCES.

1. Cuevas, Eduardo. Spatial and temporal dimensions of the processes of selection of critical habitats by sea Turtles. Journal of Marine Biology and Oceanography, vol. 52, no. 2, August, 2017, p. 187-199, University of Valparaiso, Viña del Mar, Chile.
2. Ackerman, R. A. 1997. The nest environment and the embryonic development of sea Turtles. In: Lutz, P.L. & Musick, J. A. (Eds.). The Biology of Sea Turtles. Boca Raton, Florida: CRC Press, pp. 83-106.
3. Baquero, A., J. Muñoz y M. Mosquera, M. (2008a). Identification of sea Turtle nesting beaches on the coast of Ecuador and their main threats. First evidence of nesting on some beaches in the country. Book of Abstracts II Symposium on Sea Turtles in the Eastern South Pacific. Lima, Peru: pp97-98.
4. Chacon, D., B. Dick, E. Harrison, L. Sarti, and M. Solano. (2008). Manual on management and conservation techniques for sea Turtles on nesting beaches in Central America. Pro Tempore Office of the Inter-American Convention for the Protection and Conservation of Sea Turtles (CIT), San José, Costa Rica. http://www.iacseaTurtle.org, contact@iacseaTurtle.org.
5. Eckert, S. A., Eckert, K. L., Ponganis, P. & Kooyman, G. L. 1989. Diving and foraging behaviour of leatherback sea Turtles (Dermochelys coriacea). Canadian Journal of Zoology 67 (11): 2834-2840. DOI: 10.1139/z89-399
6. Wood, D. W. & Bjorndal, K. A.. 2000. Relation of temperature, moisture, salinity, and slope to nest site selection in loggerhead sea Turtles. Copeia1: 119-128. DOI: 10.1016/j.jembe.2007.12.007
7. Martínez, L. M. and V. P. Páez (2000). Nesting ecology of the olive Ridley sea Turtle (Lepidochelys olivacea) in La Cuevita beach, Pacific coast of Chocoana, Colombia. Current. Biol. 22(73): pp131-143