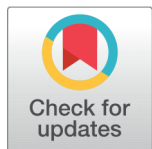


## RESEARCH ARTICLE


 OPEN ACCESS

Received: 05.03.2021

Accepted: 12.06.2021

Published: 22.06.2021

**Citation:** Mohankumar K, Emayavaramban V. (2021). Evaluation of Nesting Grounds and Challenges Faced by Olive Ridley (Sea Turtle) During Hatchling in Nagapattinam District Coast, Tamil Nadu. *Geographical Analysis*. 10(1): 33-39. <https://doi.org/10.53989/bu.ga.v10i1.6>

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**Funding:** None**Competing Interests:** None

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Published By Bangalore University,  
Bengaluru, Karnataka

**ISSN**

Print: 2319-5371

Electronic: XXXX-XXXX

# Evaluation of Nesting Grounds and Challenges Faced by Olive Ridley (Sea Turtle) During Hatchling in Nagapattinam District Coast, Tamil Nadu

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## Abstract

*The Olive Ridley Sea turtle (*Lepidochelys olivacea*) is a medium-sized species of sea turtle found in warm and tropical waters, primarily in the Pacific and Indian Oceans. The olive ridley is a small sea turtle, with an adult carapace length averaging 60 to 70 cm. The heart-shaped carapace is characterized by four pairs of pore-bearing inframarginal scutes on the bridge, two pairs of prefrontals, and up to 9 lateral scutes per side. Olive ridleys are unique in that they can have variable and asymmetrical lateral scute counts ranging from five to 9 plates on each side, with six to eight being most commonly observed. Each side of the carapace has 12–14 marginal scutes. In the Indian Ocean, the majority of olive ridleys nest in two or three large groups near Gahirmatha in Odisha, Chennai and Nagapattinam coast in Tamilnadu. In 1991, over 600,000 turtles nested along the coast of Odisha in one week. Nesting occurs elsewhere along the Coromandel Coast and Sri Lanka, but in scattered locations. Nagapattinam district Department of forests collects more than 100,000 eggs every year and established the artificial hatcheries all along the coast. Nagapattinam district forest department formed three Forest Ranges. Sirkazhi, Nagapattinam, Vedaranyam. The entire Nagapattinam district coast line covered these three ranges. They are established temporary artificial hatcheries. The turtle eggs collected all along the coastal line. Nests were found during month end of December to March. After collecting the eggs from the wild, they were buried in the hatchery clutch-wise and their progress was monitored on a daily basis. The normal incubation period of an Olive Ridley egg is 50 - 60 days. The hatchlings were released in the sea soon after they had emerged from their nests.*

**Keywords:** Olive Ridley; Sea Turtle; Hatchling; Nesting; Hatcheries; Nagapattinam

## Introduction

The Olive Ridley Sea turtle (*Lepidochelys olivacea*) is a medium-sized species of

sea turtle found in warm and tropical waters, primarily in the Pacific and Indian Oceans.

The Olive Ridley is a small sea turtle, with an adult carapace length averaging 60 to 70 cm. The heart-shaped carapace is characterized by four pairs of pore-bearing inframarginal scutes on the bridge, two pairs of prefrontals, and up to 9 lateral scutes per side. Olive Ridelys are unique in that they can have variable and asymmetrical lateral scute counts ranging from five to 9 plates on each side, with six to eight being most commonly observed. Each side of the carapace has 12–14 marginal scutes. The carapace is flattened dorsally and highest anterior to the bridge. It has a medium-sized, broad head that appears triangular from above. The head's concave sides are most obvious on the upper part of the short snout. It has paddle-like forelimbs, each having two anterior claws. The upperparts are grayish green to olive in color, but sometimes appear reddish due to algae growing on the carapace. The bridge and hinge less plastron of an adult varies from greenish white in younger individuals to a creamy yellow in older specimens.

In the Indian Ocean, the majority of Olive Ridelys nest in two or three large groups near Gahirmatha in Odisha, Chennai and Nagapattinam coast in Tamilnadu. In 1991, over 600,000 turtles nested along the coast of Odisha in one week. Nesting occurs elsewhere along the Coromandel Coast and Sri Lanka, but in scattered locations. However, Olive Ridelys are considered a rarity in most areas of the Indian Ocean. The Gahirmatha Beach in Kendrapara district of Odisha (India), which is now a part of the Bhitarkanika Wildlife Sanctuary, is the largest breeding ground for these turtles. The Gahirmatha Marine Wildlife Sanctuary, which bounds the Bhitarkanika Wildlife Sanctuary to the east, was created in September 1997, and encompasses Gahirmatha Beach and an adjacent portion of the Bay of Bengal. Bhitarkanika Mangroves were designated a Ramsar Wetland of International Importance in 2002. It is the world's largest known rookery of Olive Ridley sea turtles. Apart from Gahirmatha rookery, two other mass nesting beaches have been located which are on the mouth of rivers Rushikulya and Devi. In Tamilnadu state Nagapattinam district coast is also important nesting ground to Olive Ridley. Department of forests collects more than 100,000 eggs every year and established the hatcheries all along the coast. The investigator desire is to bring out the salient features of suitable nesting ground and season for Olive Ridley's breeding and to find out the innovative ways to conserve the sea turtle from died out level in the study area.

## Definition of the Problem

Declines in solitary nesting of Olive Ridelys have been recorded in the study area. Causes of marine turtle mortality include both natural and anthropogenic factors. The Olive Ridley's foraging grounds are contaminated due to sewage, agricultural runoff, pesticides, solvents, and industrial discharges. These contaminants have been shown to decline

the productivity of the benthic community, which negatively affects these turtles, which feed from these communities. Another major threat to these turtles is power plants. Juvenile and sub adult turtles becoming entrained and entrapped within the saltwater cooling intake systems.

Olive Ridley sea turtles migrate in huge numbers from the beginning of November, every year, for mating and nesting along the coast of Orissa and Nagapattinam coast of Tamilnadu. Nagapattinam coast has the annual nesting figure between one hundred to five hundred thousand, each year. There has been decline in the population of these turtles in the recent past due to mass mortality.

The Olive Ridley is classified as Vulnerable according to the International Union for Conservation of Nature and Natural Resources (IUCN), and is listed in Appendix I of CITES. Conservation successes for the Olive Ridley have relied on well-coordinated national programs in combination with local communities and nongovernment organizations, which focused primarily on public outreach and education. Arribada management has also played a critical role in conserving Olive Ridelys. Globally, the Olive Ridley continues to receive less conservation attention than its close relative, the Kemp's Ridley (*L. kempii*). Study area is important nesting ground to Olive Ridely, which starts from mouth of river Kollidam to Kodiakkarai.

## Threats

- collection of turtle eggs (historically, though continued in some parts of the world)
- killing turtles (historically, though continued in some parts of the world)
- incidental captures in fishing gear
- Shore line Barriers
- long lines, primarily
- trawls
- gill nets
- purse seines
- hook and line, specifically in Central America and the Indian Ocean

## Methodology

- First, the physical feature of study area has been studied thoroughly. The supporting grounds for nesting analysed in the geographical point of view.
- Then, area surveyed by GPS and potential beaches for nesting which mapped in GIS software. The nesting ground identified and mapped.
- The primary information collected from the secondary sources such as Department of Forests and other stakeholders.
- The secondary data collected for ten years from the Department of Forests.



- After commencement of project the nesting season studied.
- Monitoring the nesting of turtle initiated.
- The primary data collected from the field by watching Olive Ridley’s movements and nesting and hatching.
- The egg collected from danger places where human interfered area and it protected in the hatching points. The total egg counted for account in every year during project period.
- After collecting primary data from field for 4 seasons, data analysed to find out changes in the arrival. The reason analysed for arrival or non arrival of turtle.
- Finally the report will prepare.

## Nesting Grounds Evaluation and Olive Ridley Faced Challenges

### Artificial Hatcheries and Turtle Hatchling Details

Nagapattinam district forest department wild life division formed three Forest Ranges. Namely Sirkazhi, Nagapattinam, Vedaranyam. The entire Nagapattinam district coast line covered these three ranges. Sirkazhi Forest Range covered Northern part of the district, Nagapattinam Forest Range covers middle part of the coast and Vedaranyam Forest Range covers Southern parts of the district coast. These three Forest Ranges involved the Olive Ridley turtle egg collections under the turtle conservation program. Forest Range office established temporary artificial hatcheries. Each Forest Range office creates minimum two to three artificial hatcheries during the Olive Ridley nesting season. They are appoint the anti poaching watchers and Forest Guards for the turtle egg collections. They are actively participating during mid night times. It is admirable. The turtle eggs collected all along the coastal line. Detection of nests in the wild was carried out by tracing turtle tracks and probing the soil. Nests were found during month end of December to March. The nesting sites were marked with GPS on the beach. After collecting the eggs from the wild, they were buried in the hatchery clutch-wise and their progress was monitored on a daily basis. The normal incubation period of an Olive Ridley egg is 50 - 60 days.

The average weight of a hatchling was found to be 18 gm. The hatchlings were released in the sea soon after they had emerged from their nests.

Table 1 explains the Nagapattinam district total Olive Ridley egg collection and turtle released details from 2009 to 2017. It has three Forest Ranges namely: Sirkazhi, Nagapattinam, and Vedaranyam. The total egg collection of this district is 1, 03,446, Turtle hatched 92,156, the total percentage about 89 and average egg collection of the district is 11,520 (2.8 percentage).

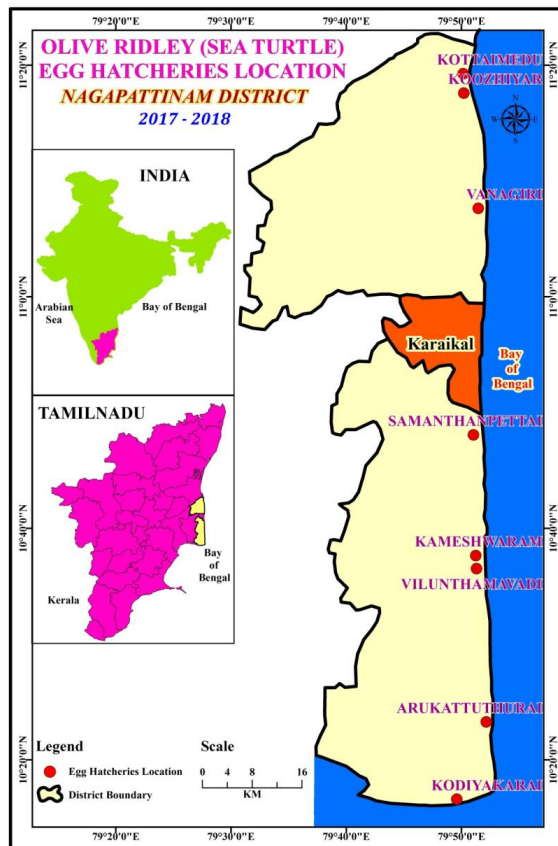


Fig. 1. Study map location

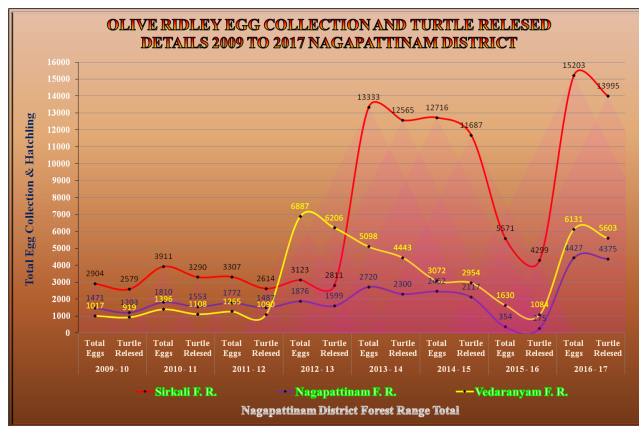


Fig. 2. Olive Ridley Egg collection and turtle released details



**Table 1. Year Wise Sea Turtle Egg Collection and Turtle Released Details Nagapattinam District Total 2009 to 2017**

Name of the Hatchery	2009 - 10		2010 - 11		2011 - 12		2012 - 13		2013 - 14		2014 - 15		2015 - 16		2016 - 17	
	Total Eggs	Turtle Released	Total Eggs	Turtle Released	Total Eggs	Turtle Released	Total Eggs	Turtle Released	Total Eggs	Turtle Released	Total Eggs	Turtle Released	Total Eggs	Turtle Released	Total Eggs	Turtle Released
Sirkazhi Forest Range	2904	2579	3911	3290	3307	2614	3123	2811	13333	12565	12716	11687	5571	4299	15203	13995
Nagapattinam Forest Range	1471	1203	1810	1553	1772	1487	1876	1599	2720	2300	2452	2117	354	275	4427	4375
Vedaranyam Forest Range	1017	919	1396	1108	1265	1090	6887	6206	5098	4443	3072	2954	1630	1084	6131	5603
Total:	5392	4701	7117	5951	6344	5191	11886	10616	21151	19308	18240	16758	7555	5658	25761	23973
Forest Range	4701	÷	5951	÷	5191	÷	10616	÷	19308	÷	16758	÷	5658	÷	23973	÷
Total	103446		103446		103446		103446		103446		103446		103446		103446	
Percentage:	× 100 = 4.5		× 100 = 5.8		× 100 = 5.0		× 100 = 10.3		× 100 = 18.7		× 100 = 16.2		× 100 = 5.5		× 100 = 23.2	
Nagapattinam District Total Egg Collection: 1,03,446									Turtle Released Total: 92,156							
Nagapattinam District Forest Range Percentage Total: 89%									Average Egg Collection: 11,520. (2.8%)							

Figure 2 shows that Sirkazhi Forest Range collect more number of turtle eggs 52 percentages then Vedaranyam Forest Range secure 22.6 percentages finally Nagapattinam Forest Range collects very less amount of turtle eggs 14.4 percentages.

**Nesting Grounds**

Sirkazhi 11°20'29.64"N 79°50'12.87"E 11° 5'8.38"N Latitude, 79°51'22.43"E Longitude Pazhayar Vanagiri

Mostly beach sand deposited in this surrounds. The average slope of the area is gentle.

Mostly Sirkazhi forest range area beach is calm and clean compared the other coastal areas of this district. Fisherfolk village location evenly spread up to Tirumullai vassal village that's why human intrusion is very less and fisherfolk people are aware about the turtle conservation in the surroundings areas.

Nagapattinam Forest Range undertakes the middle part of the coast. The nesting grounds extended from 10°49'19.87"N Latitude, 79°51'3.46"E Longitude to 10°33'53.37"N Latitude, 79°51'31.06"E Longitude. The range covered area stated from Nagoor Patinachery fisherfolk village to Vellapallam fisherfolk village. Above the Figure focused Nagapattinam forest range coastal nesting sites.

Nagapattinam Port and Velankanni Tourist place is the major problem of turtle arrival. The shore line shows clay mixed soil that's also another barrier of turtle arrival in these surroundings. Fisherfolk villages also located very nearby

so human intrusion disturbance affected the turtle arrival. Nagapattinam Forest Range surrounding beaches are more polluted by the Velankanni tourists.

Vedaranyam Forest Range situated southern part of the coastal area. It extended from 10°24'0.09"N Latitude, 79°52'4.09"E Longitude to 10°16'27.84"N Latitude, 79°45'6.96"E Longitude. The area stated from Vellapallam fisherfolk village to Kodiayakarai fisherfolk village. The Figure number 2.30 to 2.33 focused Vedaranyam Forest Range coastal nesting sites. Vedaranyam area beach some area has deep slope mixed with clay that is another important barrier of turtle arrivals. Wild boar and domestic animals are stolen the turtle eggs.

**Climatic Influences**

Above the Figure shows that rainfall is very high on month of December 560mm so the turtle nesting is very low 761, after that rainfall is decrease on the month of January 118mm the egg collection is very high 11863. So rain fall influencing the major roll of turtle hatchling. The other climatic variables not influence to the turtle nesting.

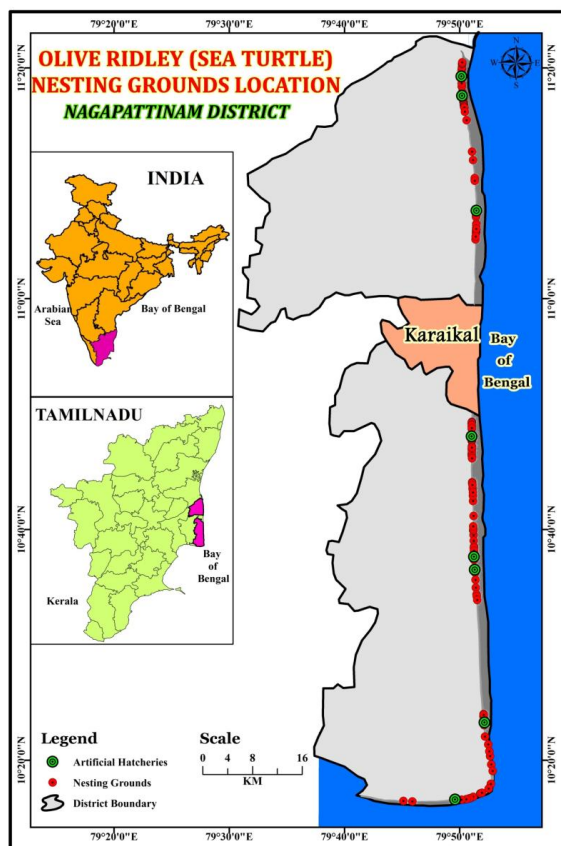
**Barriers of Olive Ridley**

Sirkazhi Forest Range has two boat jetties like Pazhayar and Thirumullaivasal so build the anti sea wall for boat jetties protection that's why turtle would not entering the shoreline.



**Table 2. Climatic Conditions 2017 Nagapattinam District**

Year	Month	Turtle Eggs	Rain Fall (mm)	Monthly Total	Avg. Temperature °C	Avg. Humidity %
2016	Dec	761	560		30	80
2017	Jan	11863	118		28	77
2017	Feb	8796	240		29	79
2017	Mar	2493	295		30	82
2017	Apr	1848	118		32	80

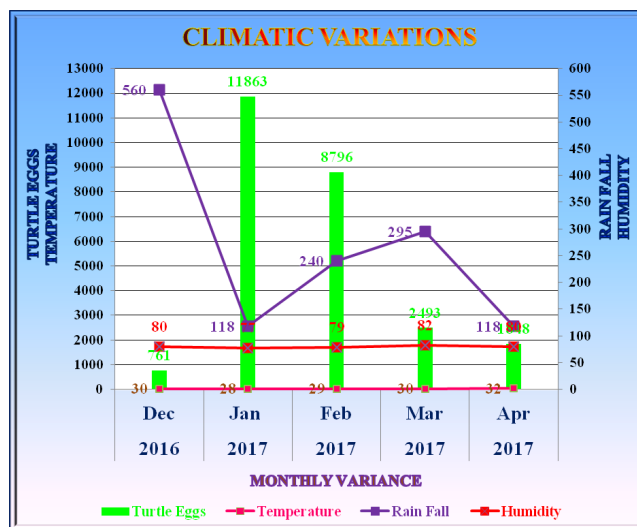


**Fig. 3. Study location**

Nagapattinam Forest Range has International Harbor and Poombuhar Fishing Harbor so the Nagapattinam, Akkaraipettai, Kallar, Velankanni, Vanagiri, Seruthalaikkadu Areas build with anti sea wall protection that's the result Nagapattinam forest range secure only 14.4 percentage of turtle egg collection.

Vedaryam Forest Range surrounding shore line's some places has deep slope and also shore line pollution is very high that's also a barrier of turtle entering the shoreline.

Piper Boat and Mechanized Craft Propellers is a major threatening of Sea Turtles. Propeller sharp blades cut the sea turtle while entering the shore line. Because most of the



**Fig. 4. Climatic variations**

fishermen's involving the fishing activity on that particular time 2 to 4 A.M. this is also a major reason of sea turtle kills.



**Fig. 5. Barriers of Olive Ridley**

### Conclusion

1. The Sirkazhi Forest Range area beach has gentle slope and also human intrusion very less compare then other

- areas.
2. Between the fisher folk villages and boat landing places locating with gradual distance so people could not disturb turtles, which is also a reason more number of turtles arrived the Sirkazhi and surrounding coastal areas.
  3. Compare the other Forest Range coastal pollution very less in Sirkazhi Forest Range. Only Pazhayar, Thirumullai Vasal, Tharangambadi, Poombuhar and Vanagiri areas has are not suitable for turtle nesting because of boat jetty and anti sea wall construction is the barrier of turtle arrival.
  4. Middle part of the Nagapattinam Forest Range area beaches with clay mixed soil deposited the shore line. Karaikal and Nagapattinam has constructed Port and anti sea walls. So that case turtle arrival is very low compare than other ranges.
  5. Mechanized crafts frequency very high so the turtle met with accident by the craft engine then human intrusion also more seashore pollution creates by the tourists that is the reason turtle nesting is similarly decreases in the region.
  6. The southern part undertake by the Vedaranyam Forest Range. This area mainly occupies Point Calimere wildlife and birds sanctuary.
  7. Some area has deep slope then wild boar and coastal pollution is the major problem of turtle nesting is this range.
  8. The Sirkazhi Forest Range collect more number of turtle eggs 60,068. It contains 52 percentage of egg collection. Coastal physiographic, less human intrusion, pollution free, people awareness to conserve the turtle these are the main reason for collected more number of turtle eggs.
  9. The Vedarayam Forest Range secures 26,496 eggs. Totally it gets 22.6 percentages. Compare the Sirkazhi Forest Range it collects only 40 percentages of eggs. Because domestic animals and wild boar, mechanized craft, bottom trawl nets, coastal pollution, deep slope these are major reason for decline the egg collection of this range.
  10. Nagapattinam Forest Range collects very less amount of turtle eggs 16,882 it has 14.4 percentages. Because Nagapattinam Port occupy waste area beach for boat landing.
  11. Anti sea wall construction affects for turtle arrival and mechanized craft movement frequently high, gill net and bottom trawl usage, predominate human intrusion,

- domestic animals, coastal pollution, recreation place also located near the shore that's also affects so result of egg collection is very low than the other Forest Ranges.
12. The data availability is 2009 to 2017 Nine years. In this connection this analysis clearly finds out the relationship between rainfall and turtle nesting.
  13. The overall analysis Rainfall play the major roll in turtle nesting. Whenever the rainfall increases above 150 mm at Breeding Season the total egg collection is very less.
  14. Even if rainfall decreases the turtle nesting is increase but there are no changes between other climatic factors like temperature and humidity.
  15. The Nagapattinam district coastline is slightly differing from other coast line. The delta regions river carries and deposits some clay along with the coastline.
  16. The northern coastline is very gentle slope but the southern region beaches sand mixed with clay the shoreline also not a gentle. So northern area has high nesting found comparatively south has decline

## Suggestions

1. During the turtle spawning season, piper boats could be avoided from operating between 12a.m to 4am or permissible to operate only on boat jetties so as to avoid spawning turtles being hit by propellers and dying.
2. The government should create awareness among the fishermen about the protection of sea turtle
3. Coastal pollution is very high in Nagapattinam district and it should be cleaned immediately and action should be taken to prevent further pollution.
4. Fishermen should be warned not to dump damaged fishing nets and plastic debris in the sea and on the beach so that turtles and other marine life species can get trapped and die.
5. Fishermen and humans are stealing turtle hatching eggs and the government should provide protection to stop it.
6. It is learned during the survey that the tortoise egg collectors are not being paid properly by the forest department so the government should pay them a fair wage.
7. The government should also provide proper safety measures like Torch Light, Tent, Hand Glows, Boots, and Sweater during night egg collection.
8. The government should issue an order mandating the use of Turtle excluder technology in fishing nets.

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