Estimation of the number of female Loggerhead marine turtles in Mounda Beach in Kefalonia

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Introduction

Loggerhead turtles are emblematic species of Greek and Mediterranean water. Kefalonia's island is one of the northernmost nesting sites of sea turtles in the world. Mounda Beach, at the south west of the island, is the main *Caretta caretta* nesting place in Kefalonia.

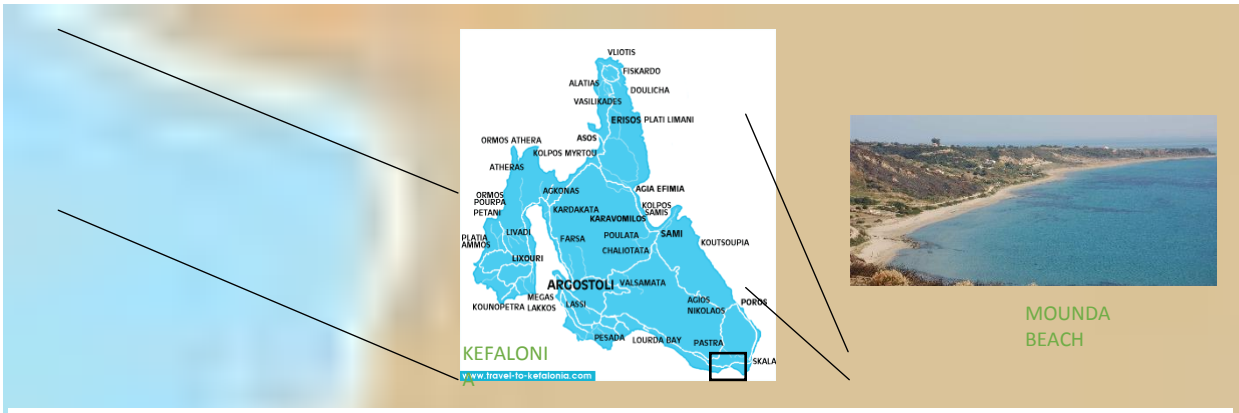


Figure 1 Mounda Beach, Kefalonia, the study site for this project

Thanks to the fine granulometry of the sand, the place is a perfect nesting habitat and is very adapted for the sea turtle laying [1].

According to *The Red Data Book of Threatened Animals of Greece* (Athens, 2009)[2], the loggerhead turtles is an endangered species. So since 1994, Katelios Group have been involved in the research and the protection of the Loggerhead sea turtles and their living place in the context of the Marine Turtle Project. The program has been included in the European Network "NATURE 2000". Each year, since 1999, during the nesting period, the group take a census of 100 exits in average in Mounda Beach[3].

Turtle tracks

Every marine turtle species leave on their trail on the sand a characteristic track[4]. *Caretta caretta*'s track are identifiable thanks to their alternate gait, plastron drag and rear flipper mark (Figure 2).

Firstly, the measurement of each turtle tracks are different, they vary between 70 and 124 centimeters[4]. Nevertheless, most of the time, the measurement in the returning crawl is wider than the emerging crawl maybe under the influence of earth's gravity because of the slope of the beach. Secondly, sometimes the plastron drag have few distinct mark (Figure 3). To follow this study we should consider that each turtle track is unique.

Figure 2 Example of a characteristic plastron

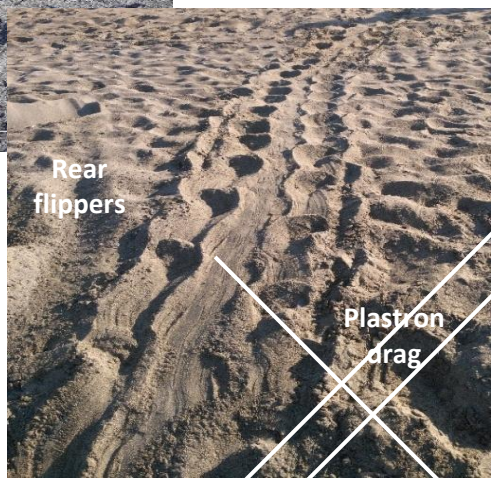


Figure 3 Example of one turtle track

Context and Problematic

During the nesting period, volunteers of Katelios Group do patrols every nights to tag female turtle as much as possible. However, the limited number of volunteers and the distance of the beach (2,8km) avoided to count all turtles and consequently to estimate the population of Loggerhead which comes in Mounda Beach. When volunteers can't tag one turtle, the only indication of its pass through on the beach is its tracks. Nevertheless, the number of exits isn't equivalent to the number of turtles in Mounda Beach. Indeed, one turtle can come several times during the nesting period. So, how can we count the number of female Loggerhead marine turtle in Mounda Beach thanks to their tracks?

Objective

The main goal is to estimate the population of Loggerhead which come laying in Mounda Beach every year. These results will allow to compare data with next years and to realize impacts of different factors (human activities, environmental…).

Figure 4 Measurement of turtle track

Methods

During the morning patrol in the nesting season, the group takes photographs and measurements of turtle tracks. Firstly, we take three measurements of the length of the plastron drag and secondly three measurements of the distance between the two back flippers (Figure 4). We do it for the emerging crawl and for the returning crawl. Pictures of the tracks are taken just in the emerging crawl and we especially take one of the plastron because of its feature.

All this data are listed in two different charts, one for unknown turtles (Chart 1) and another for identified turtles (Chart 2). Indeed, thanks to the night patrol, it's possible to combine an individual with its track, but there are some tracks that we can't identify because of the impossibility to see the combine turtle.

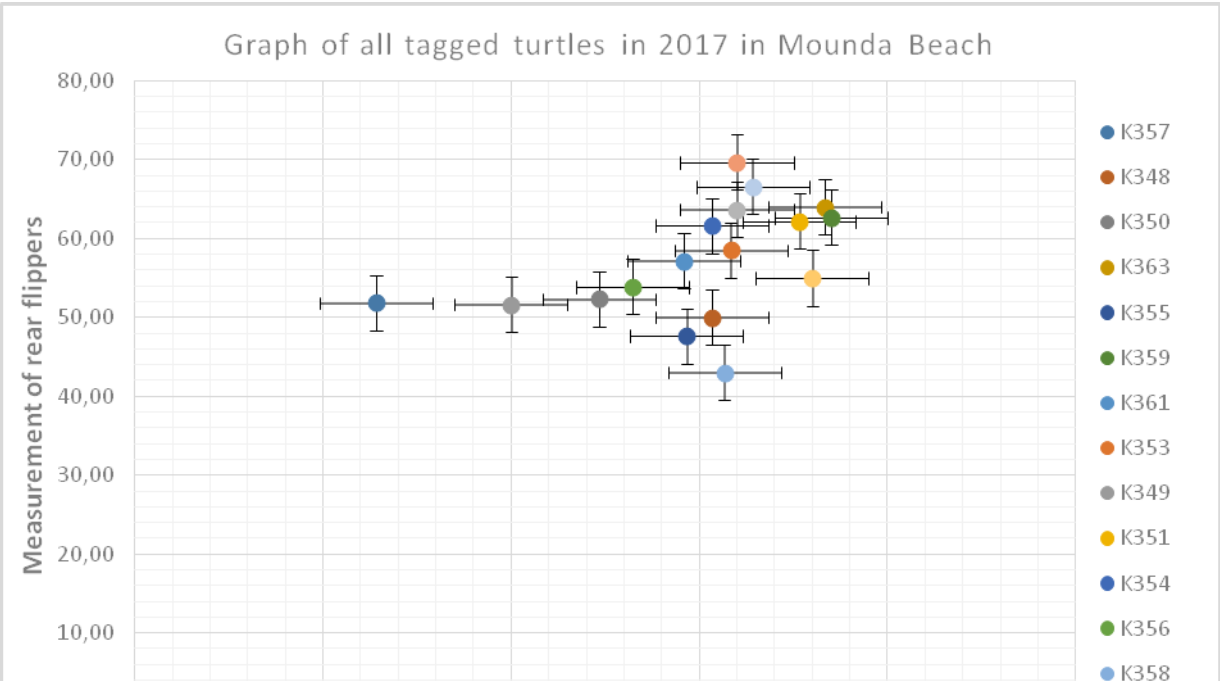
Chart 1 Measurements of the first one unknown turtle track

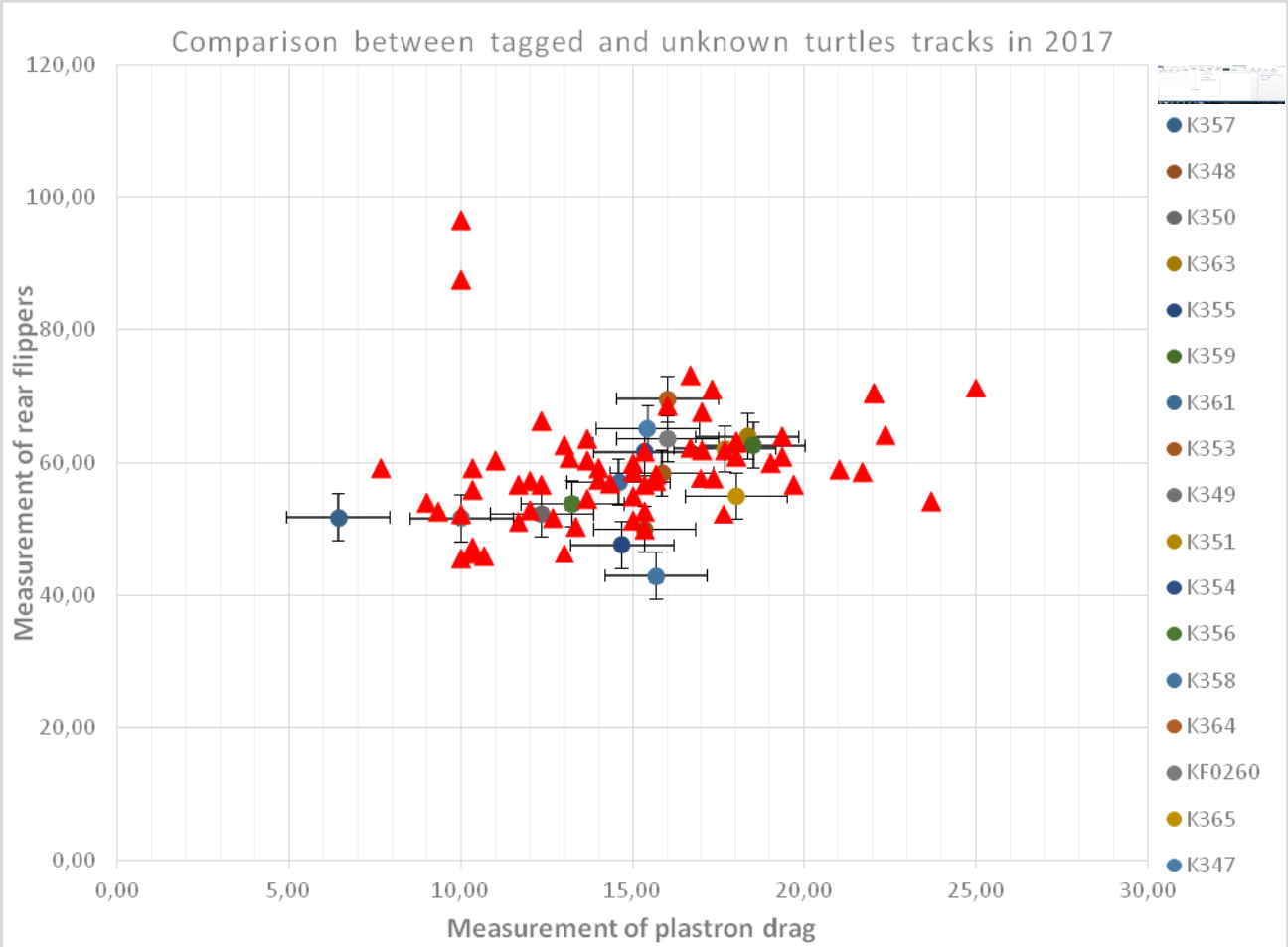
Turtle not tagged		Emerging crawl			Average (cm)	Returning crawl			Average (cm)
Unknown turtle n°1	Plastron drag	14	17	15	15,33	15	16	15	15,33
	Rear Flippers	51	55	52	52,67	50	55	52,50	52,50

Chart 2 Measurement of the K348 turtle track

Tag		Emerging crawl			Average (cm)	Returning crawl			Average (cm)
K348	Plastron drag	16	14	16	15,33	17	18	17	17,33
	Rear Flippers	49	50	51	50,00	50	53	52	51,67

Then, with tagged turtle chart, we create a graph (Figure 5) depending on the measurement of the plastron and the back flippers. For each point, we introduce an uncertainty of measurement find thanks to a same turtle which came many times in the season.





turtles. Secondly, although some turtles have distinct tracks, other one have very common plastron without any particularity. So photograph can't help the recognition between two turtle tracks. Finally, there are a lot of external parameters like weather conditions which prevent measurements and taking pictures.

Acknowledgements

[1]Shyamoli Mehta, The University of Reading School of Animal and Microbial Sciences, *Nest site selection of Caretta caretta*,Septembre 1997

[2] Legakis Anastasios, Maragos Panagiota, *The Red Data Book of Threatened Animals of Greece,* Athens, 2009, 525p.

[3]Data from The Katelios Group for the Research and Protection of Marine and Terrestrial Life

[4] Ningaloo Turtle Program, *Turtle monitoring field guide*, edition 7, juin 2015, 79p. Website: http://www.ningalooturtles.org.au/pdf_downloads/training-guides/NTP-Turtle-Monitoring-Field-Guide-Edition_7-wCover.pdf