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## Love is a Losing Game. Loggerhead Turtle in Corsica vs. Tourism = Nesting Failure

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For several years, scientists have been studying the impact of tourism or opportunistic observation (turtle watching) on the behavior of nesting sea turtles. Several activities that may influence the behavior of nesting females were identified, including the flashlights of observers, flashes of cameras (Lutcavage *et al.* 1997; Salmon & Witherington 1995), distance, orientation, position and/or sudden movements of the observer relative to the turtle (Hailman & Elowson 1992; Witherington 1992). These disturbances may lead to abandonment of nesting attempts (Davis & Whiting 1977) and a shift in nesting locality (Jacobson & Lopez 1994) to potentially less viable beaches for successful reproduction and to beaches that require an increase in energetic costs (Lutz & Musick 1997). Aborted nesting attempts (“false crawls”) are a common feature of loggerhead nesting with false crawl rates ranging from about 28 to 50% (Dodd 1988). Most of the females that false crawl return to nest on average 1.082 days later and 87.5% of them return to the same beach (Dodd 1988). These false crawls may be due either to improper temperature cues, to human disturbance or to other unknown factors. After the identification of these disturbances, several “codes of conduct” have been developed (Bauer & Dowling 2003; Birtles *et al.* 2004; Newsome *et al.* 2002), however they are not always strictly enforced. Several studies indicate the percentages of interaction causing disturbances (*e.g.*, 33% (Osborne unpubl. data), 51% (Waayers *et al.* 2006), but all studies agreed that the observations of turtle nesting (even controlled) were harmful to sea turtles, threatening their conservation (Taylor & Cozens 2010). However, guided visits to nesting areas are also essential for public awareness and environmental education because they promote sea turtle conservation techniques and they help to prepare a foundation for people to want to participate in future conservation practices (Margaritoulis *et al.* 2003).

In the Mediterranean, loggerhead turtle (*Caretta caretta*) nesting sites are mainly located in the eastern end and in the center of the basin, while the western part of the basin hosts turtles for feeding activities (Margaritoulis *et al.* 2003). Loggerheads have nesting cycles every two to three years (Dodd 1988) and the total nesting effort for each female in the Mediterranean ranges from 1 to 5 nests per season (Broderick *et al.* 2003). The loggerhead nesting season in the Mediterranean occurs mostly during the summer, from the beginning of June to early August (Margaritoulis *et al.* 2003). The

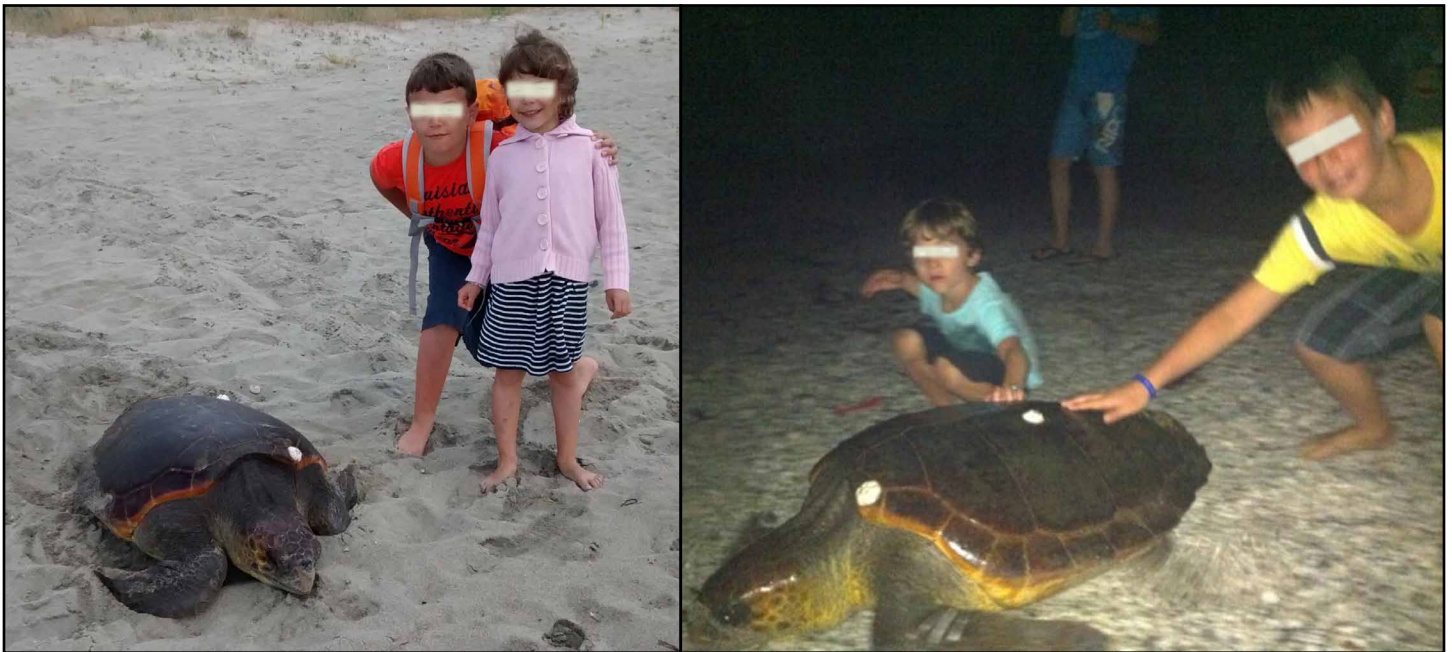
possibility of historic nesting of the loggerhead turtle in Corsica was investigated by Delaugerre (1987), with probable nesting sites located on the sandy beaches of the eastern coast of Corsica during the 1940s. In 2002, in southeast Corsica, a high tide exposed shell remains and two scattered eggs, one of which contained an embryo (Delaugerre & Cesarini 2004), identified as an advanced stage loggerhead embryo. This discovery was the first evidence of a loggerhead turtle nesting site in Corsica and metropolitan France.

In the summer of 2014, a loggerhead sea turtle emerged twice on eastern Corsican beaches to attempt to nest. The animal, measuring >80 cm curved carapace length (CCL), was identified both times by the obvious presence of epibiota (barnacles) on its carapace (one on the marginal scute and the other on the costal scute; Fig. 1 and cover photo).

The first nesting attempt occurred on 12 July 2014 on San Nicolao beach (Haute-Corse, Moriani; 42° 22' 36.3576" N and 9° 31' 56.8518"E) at around 19:00 (local time). The turtle landed on the beach, climbed the small sandy dune and started the movements to dig a nest. Its presence was noticed by tourists who closely approached the turtle, shouted and took pictures. The turtle abandoned its nesting attempt and returned to the sea.



**Figure 1.** Photo identification of the turtle on 19 August on the beach at Meria, Corsica. Note presence of epibiota (barnacles) on its carapace, on a marginal and a costal scute, (compare to cover photo). Photo taken by C. Agostini.



**Figure 2.** Human interaction with the loggerhead during its nesting attempt. In people's collective thinking, they may need to immortalize the event by touching the turtle. Left panel: 12 July 2014 on the beach at San Nicolao, Corsica; photo by R. Bard. Right panel: 19 August 2014 on the beach at Meria, Corsica; photo by C. Agostini.

About a month later (19 August 2014, at 23-23:30 local time), 80 km North of San Nicolao, the same turtle was again observed on the Meria beach (Haute-Corse, Cape Corse, 42° 56' 2.81" N and 9° 27' 54.65" E). The animal landed on this narrow beach thrice and each time was subsequently returned to the sea by a local. Despite the late hour, several people were present on the beach because of a beach bar. Certainly, the presence of these people helped to publicize the event, but at the expense of the turtle, which was harassed during its nesting attempt. In addition, the Meria beach is small and narrow with heavy pedestrian traffic (due to the beach bar) and does not necessarily appear to be a very suitable place to nest. Was this supposedly "less suitable" beach selected as a result of the failure of the previous nesting attempt? Did an intermediate - successful or aborted - nesting event take place in the meanwhile (Jacobson & Lopez 1994; Lutz & Musick 1997)? Those questions remain open. In the Mediterranean, loggerhead turtles have a mean nesting interval of 14.6 days in Greece and 23.4 days in Turkey, with a range of 13-28 days (Dodd 1988). The turtle could have nested successfully once or twice between the two observation dates without being noticed.

The main nuisance of human behavior on the turtles during nesting are lights (lamps, flashes); distance, direction, position of observers over the turtles; sudden movements and tactile interactions. For the two observed nesting attempts in Corsica, turtles were systematically harassed by people (Fig. 2). Sea turtles are emblematic species and therefore physical contact with them is frequently desired by people. This symbol is double-edged, as it promotes public sympathy toward turtles, which is an asset for their protection while simultaneously encouraging tactile interactions, which could have negative effects in some cases if they are not controlled through awareness programs.

These two observations confirm that loggerhead turtles still come to nest on eastern Corsican beaches. This phenomenon is considered to be rare in the Western Mediterranean (Bentivegna *et al.* 2008;

Delaugerre & Cesarini 2004; Llorente *et al.* 1993; Mingozi *et al.* 2006; Tomas *et al.* 2002) and corresponds to one of the northernmost nesting locations in the Mediterranean (Senegas *et al.* 2009). The number of tourists visiting these beaches, as well as the lack of public awareness is an obstacle to turtles nesting in that region. For the conservation of the species and that of Corsican nesting sites, it would be very useful to develop a public information network to maximize the nesting success of loggerhead turtles in the region. The Mediterranean is now the leading global touristic destination with more than 100 million tourists per year, with peak tourist season occurring in summertime (Amelunga & Vinerb 2006) when sea turtle females are most vulnerable to disturbance. It is therefore imperative that each country that has nesting sites takes the necessary measures to preserve this endangered species.

**Acknowledgements.** We thank R. Bard, C. Agostini, B. Filippi, Y. Baldi and F. Kowtun for having transmitted information about the nesting attempts and for their pictures of the events. The data were collected as part of the Réseau des Tortues Marines de Méditerranée Française (RTMMF) and in collaboration with F. Claro, Service du Patrimoine Naturel - Muséum National d'Histoire Naturelle /Groupe Tortues Marines France (SPN-MNHN/GTMF).

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# Marine Turtle Newsletter

Issue Number 148

January 2016



Adult female loggerhead emerging on the beach at San Nicolao, Corsica, on 12 July 2014  
(see pages 12-14). Photo credit: R. Bard

## Editorial

Comments on the Identification and Proposed Listing of Eleven Distinct  
Population Segments of Green Sea Turtles (*Chelonia mydas*).....**P Bennett & U Keuper-Bennett**

## Articles

Hawksbill Satellite-tracking Case Study:  
Implications for Remigration Interval and Population Estimates..... **AR Sartain Iverson *et al.***  
Hawksbill Turtle Stranding Events in New South Wales, Australia Between 1996 and 2011.....**R Ferris**  
Love is a Losing Game. Loggerhead Turtle in Corsica vs. Tourism = Nesting Failure.....**O Gerigny *et al.***

## Book Review

## Obituary

## Recent Publications