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NESTING OF THE LOGGERHEAD TURTLE (*CARETTA CARETTA*) IN THE SOUTHEAST ADRIATIC CONFIRMED

Vilma Piroli[1,2],* & Idriz Haxhiu[1]

[1]Herpetofauna Albanian Society , Lagja Sulhaxhi, 1032 Vorë, Albania
[2]University of Shkoder "Luigj Gurakuqi" , Sheshi 2 Prilli, Shkodër, Albania

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The nesting of sea turtles in Eastern Adriatic has not been previously reported, even though the possible nesting of the loggerhead turtle in Albania has been hypothesized. Data for nesting activities have been collected since 2002 along the Albanian coastline. Anecdotal evidence assembled over the years has provided important information regarding the possibility of the nesting of the loggerhead turtle in Albania. This study confirms the nesting of the loggerhead turtle in Albania. Although sporadic, it takes place along the entire Adriatic coast of Albania. This information shifts the border of nesting known so far from the northeast Ionian (Greece) to the southeast Adriatic Sea (Albania).

Key words: loggerhead, nesting, Albania, southeast Adriatic

Piroli, V. & Haxhiu, I.: Potvrđeno gniježđenje glavate želve (*Caretta caretta*) u jugoistočnom Jadranu. Nat. Croat., Vol. 29, Suppl. 1., 23-30, 2020, Zagreb.

Gniježđenje morskih kornjača u istočnom Jadranu dosad nije bilo potvrđeno, iako se pretpostavljalo da postoje moguća gnijezdišta glavate želve u Albaniji. Podaci o gniježđenju duž albanske obale prikupljaju se od 2002. godine. Povremena opažanja prikupljena tijekom godina pružaju važne informacije o mogućim gnijezdištima glavate želve u Albaniji. Ovaj rad potvrđuje gniježđenje glavate želve u Albaniji. Iako povremeno, odvija se duž cijele albanske obale Jadrana. Ta činjenica pomiče dosad poznatu granicu gniježđenja od najbližih sjeveroistočnih jonskih obala prema jugoistočnom Jadranu (Albanija).

Ključne riječi: glavata želva, gniježđenje, Albanija, jugoistočni Jadran

INTRODUCTION

The loggerhead turtle (*Caretta caretta*) is a common and the most abundant sea turtle specimen found in the Mediterranean (Groombridge, 1994). Nesting sites are found mainly along the coastline of the eastern Mediterranean basin, with the highest number of nests reported in Greece, Turkey, and Cyprus (Margaritoulis *et al.*, 2003a; Casale & Margaritoulis, 2010; Casale *et al*., 2018).

Nesting areas of loggerheads in the Ionian have been reported and surveyed since 1977 on Zakynthos Island, Greece (Margaritoulis, 1982), while nesting was found to have occurred almost up to the northern boundaries of Greece, on Corfu Island (Mar-

[1] corresponding author: vilmapiroli@gmail.com

garitoulis *et al*., 2003a; Margaritoulis & Panagopoulou, 2010). Nesting on Corfu island, which is evaluated by Margaritoulis (2000) as "moderate" (20<x<100 nest/season) seems to be the northernmost nesting distribution for the east coast of the Ionian, even though beaches like Krorez, Borsh and Palase have been classified as potential nesting sites in the Ionian coast of Albania (Haxhiu, 2010).

Nesting in the Adriatic is occasional, with a few nests reported along the south Italian coast (Basso, 1996; Mingozzi *et al*., 2007, Bentivegna *et al*., 2010), but with no proper nesting sites (Casale, 2010). Nesting of the loggerhead turtle in the eastern part of the Adriatic has not been reported previously, even though through the presence of small sized turtles has been reported and, with anecdotal reports of adult females (Piroli & Haxhiu, in press), nesting on the Adriatic coast of Albania (Haxhiu, 2010), and Croatia has been hypothesized (Lazar *et al*., 2000; Lazar, 2010). Haxhiu (2010) proposed the Adriatic coastline of Orikum, Narte, beaches near the mouth of Semani and Shkumbini Rivers, and Lalzi Bay as possible nesting sites in Albania, and reports the presence of matured eggs found in the oviduct of a turtle killed for culinary purposes in Orikum in 2004. The anecdotal reports, the continuous presence of female loggerheads in Albanian waters (Piroli, 2011; White *et al*., 2011, 2012, 2013; Piroli & Haxhiu, 2012, 2013; Haxhiu & Piroli, 2016, 2018) and the new haplotypes found by mitochondrial DNA analysis in turtles foraging at Drini Bay (Yilmaz *et al*., 2011) were an important stimulus to the searchfor nesting activities in Albania.

METHODS AND MATERIALS

Surveys for possible nesting activities in Albania have been conducted since 2002. They covered data collection along the sandy beaches of the Adriatic and the Ionian coastline (Fig. 1). These surveys took place during the nesting season in the Mediterranean - May to September- and were organized according to the minimum data standards for nesting beach monitoring guidelines (SWOT, 2011) combined with questionnaires for fishermen and the local community. The survey team has been watching for tracks of females or hatchlings left in the sand through early morning beach patrols (5am-10am), before the beach was crowded, and then proceeded with meetings and interviews. When possible (when there was any elevation) beaches were observed with binoculars to cover larger areas, and key events were documented through photographs and by using the necessary equipment for measuring distance, diameter, temperature etc. Questionnaires were prepared and were aimed at collecting as much information as possible concerning possible nesting occurrences and the genuineness of them. To increase the accuracy of data the nesting surveys were combined with awareness campaigns under various projects implemented in both Adriatic and Ionian coastline.

RESULTS

The evidence collected from these surveys provided important information for the possibility of the nesting of the loggerhead turtle in Albania. Hatchlings were reported to have been seen by a fisherman crawling toward the sea at Rana e Hedhun (Drini bay) in August 2007, while at Semani beach turtles were seen by fishermen and citizens moving toward the sand dunes during the night in July 2010 (Fig. 1). The genuineness of these two anecdotal reports, and many others collected over the years, still could not be evaluated as no photograph or any other form of documentation of any of these possible nesting events exists.

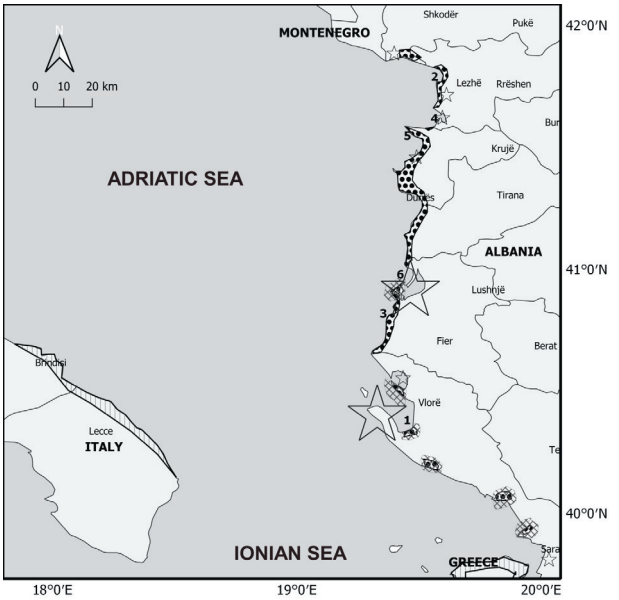

Fig. 1. Beaches evaluated by this study as suitable for nesting with black dots ellipse, Nesting sites proposed by Haxhiu (2010) with a grey mesh ellipse, Protected beaches with a star, Nearest nesting sites in Italy and Greece with grey stripes ellipse; 1- Eggs found in a killed turtle in 2004 (Haxhiu, 2010), 2- Hatchling emerging reported by a fisherman in 2007, 3- Nesting females reported nesting in 2010, 4- Eggs found in a tank in 2010 (Piroli, 2011), 5- Hatchlings emerging on a small beach in 2017, and 6- Nest found in 2018. (Photo by Google maps modified by V. Piroli).

The first undoubted evidence of the possibility of the nesting of the loggerhead turtle in Albania that we have documented consisted of some eggs found in a tank on July 30th, 2010 (Piroli, 2011). A female loggerhead turtle (AL0274; CCL= 70 cm) found bycaught in set-nets (stavnik) at Drini bay (Fig. 1) was kept overnight by the fishermen in a tank at Patok area to be examined the next morning by the research team. These eggs, laid under stress, were fully matured (Fig. 2), but could not be reallocated for incubation as they had been immersed in water for hours. These eggs would possibly have been laid somewhere along the Albanian coastline since the nearest nesting beaches are in Greece, or Italy at a distance of at least 130 km (Fig. 1).

In 2017 pictures of some loggerhead turtle hatchlings were provided to the survey team (Fig. 3). About fifteen hatchlings were reported to have been found moving around at a small beach at Kepi i Rodonit on August 26th at about midnight. The area – a narrow, white sandy beach about 60m long, about 13m at its widest- was checked upon the reporting and even excavated to find the location of the egg chamber or any other evidence. No results were found, but 4 weeks had passed since the emerging of the hatchlings. The area was a beach highly disturbed by tourists, and the exact location of the nest was not reported. Based on the photographs provided, the hatchlings were of the loggerhead turtle (*Caretta caretta*). According to the emerging date the nest was evaluated to have been laid sometime in the end of May or beginning of June. This area is just few kilometers from the place where the turtle laying the eggs in the tank was bycaught (Fig. 1) and where the bycatch of adult female turtles has been recorded each year.

Fig. 2. Eggs found in a tank at Drini Bay, 2010. (Photo by I. Haxhiu)

Fig. 3. Hatchlings found at Kepi i Rodonit, 2017. (Photo by A. Ligaci)

On June 19, 2018 some tracks were reported to have been found at Divjaka beach (Fig. 1). The tracks, 69cm wide, were of a loggerhead turtle. By following the movement of the tracks and using the stick method, the egg chamber was located and eggs were found (Fig. 4). The nest was 7.5m from the water line, and 2m from the high tide. The nest was laid in a grey small granule beach with temperature measured next to the nest at a depth of 5 cm reaching about 39°C at 2pm, while at a depth of it decreases to 33°C. This temperature is a suitable temperature for incubation, meanwhile the water temperature on the same day at a depth of 0 m was 28°C.

Beach examination for possible nesting (Tab. 1) was conducted along both the Ionian and the Adriatic coastline and several beaches along the Adriatic coast were evaluated as suitable for nesting (Fig. 1). Beach evaluation was based on the elevation, granule size, presence of dunes and vegetation, disturbance and sand temperature. The most probable beaches for loggerhead nesting are: 1- In Drini Bay: some parts of the area known as Rana e Hedhun, Kune-Vain-Tale and some small beaches at the northern part of Kepi i Rodonit, while Godull area, even if it provides the best conditions otherwise,

Fig. 4. The nest found at Divjaka beach, 2018. (Photo by V. Piroli)

is highly polluted with plastic items and we think this diminishes the possibility of nesting; 2- Some small beaches of the southern side at Kepi i Rodonit and Lalzi Bay; 3- The beaches of the Durrës area are suitable for nesting but this area remains one of the most disturbed by tourism which might diminish the nesting possibility; 4- The entire area between the deltas of the Shkumbini e Vjosa River; 5- In Vlora bay: Nartë and Orikum; 6- Ionian sea: some small areas at Palase, Borsh and Krorëz.

CONCLUSIONS

This evidence definitely confirms that the nesting of loggerhead turtle in Albania does happen, even if only sporadically. This new finding shifts the border of nesting known so far from the northeast Ionian (Greece) to the southeast Adriatic (Albania). The knowledge about the presence of the juvenile and adult loggerhead turtles at Drini Bay needs to be supplemented with information on movement patterns and genetic, to find any possible link with the new haplotypes found in loggerheads of this area (Yilmaz *et al*., 2011). We think that hatchlings found at Kepi i Rodonit, the eggs laid in a tank in Patok, and the significant presence of the female turtles at Drini Bay (Piroli & Haxhiu, in press) are evidence that Drini Bay is not just a development and foraging area, but an interesting habitat for female loggerhead turtles at the same time.

Nesting in Albania seem to happen as early as the end of May and the beginning of June so further studies regarding findings of the abundance and recurrence of nesting of the loggerhead turtle in Albania need to start as early as May.

Nesting, based on this evidence and the results of beach evaluations, seems to happen sporadically along almost the entire Adriatic coastline, from Drini Bay to Vlora Bayand possibly in some small areas along the Ionian coastline. Further research is needed to understand the situation better, especially on collecting data regarding hatching success, finding any genotypic variation, hatchling sex ratio, threats, and especially with all the changes foreseen within the global warming/climate change scenario,

Tab. 1. Beach evaluation for loggerhead turtle nesting possibility in Adriatic and Ionian coastline of Albania.

No	Name of the beach	Appropriate for nesting			Presence of	
		Elevation	Granule size	Sand temperature	Dunes & Vegetation	Human disturbance (1 no disturbance--5 high)
1	Velipojë	✓	✓	✓	✓	3
2	Rana e Hedhun	✓	✓	✓	✓	1
3	Shëngjin	✓	✓	✓	✓	5
4	Kune	✓	✓	✓	✓	3
5	Vain	✓	✓	✓	✓	2
6	Tale	✓	✓	✓	✓	3
7	Godull	✓	✓	✓	✓	1
8	Kepi i Rodonit north beaches	✓	✓	✓	✓	2
9	Kepi i Rodonit south beaches	✓	✓	✓	✓	2
10	Shën Pjetër	✓	✓	✓	✓	4
11	Rrushkull	✓	✓	✓	✓	2
12	Porto Romano	✓	✓	✓	✓	5
13	Sektor Rinia	✓	✓	✓	✓	5
14	Kallm	✓	✓	✓	✓	5
15	Currila	✓	✓	✓	✓	5
16	Vollga	✓	✓	✓	✓	5
17	Plepa	✓	✓	✓	✓	5
18	Golem	✓	✓	✓	✓	5
19	Shkëmbi i Kavajës	✓	✓	✓	✓	5
20	Karpen	✓	✓	✓	✓	2
21	Domen	✓	✓	✓	✓	2
22	Spille	✓	✓	✓	✓	2
23	Divjakë	✓	✓	✓	✓	3
24	Seman	✓	✓	✓	✓	4
25	Darzezë e Re	✓	✓	✓	✓	4
26	Pishë Poro	✓	✓	✓	✓	1
27	Zvërnec			✓	✓	3
28	Nartë	✓	✓	✓	✓	4
29	Vlorë	✓	✓	✓		5
30	Radhimë			✓		5
31	Orikum	✓	✓	✓	✓	5
32	Gadishulli i Karaburunit			✓		1
33	Palasë	✓		✓		5
34	Dhërmi	✓		✓		5
35	Gjipe	✓		✓		5
36	Jalë	✓		✓		5
37	Himarë	✓	✓	✓	✓	5
38	Porto Palermo			✓		5
39	Qeparo	✓		✓	✓	5
40	Borsh	✓		✓	✓	5
41	Lukovë	✓		✓		5
42	Sarandë			✓		5
43	Ksamil			✓		5

which might cause an increase of nesting in Albania in the future. From all the beaches evaluated as suitable for egg incubation only Divjakë beach has some degree of protection as it is a recreational site within the territory of the Divjake-Karavasta National Park. In the event of any increase of nesting events in the future and/or the finding of areas with continuous nesting events, there will be a great need for mitigation and protection of the area.

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