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Data about Loggerhead Sea Turtle (*Caretta caretta*) and Green Turtle (*Chelonia mydas*) in Vlora Bay, Albania

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***Abstract*—**This study was conducted in the area of Vlora Bay, Albania. Data about Sea Turtles *Caretta caretta* and *Chelonia mydas*, belonging to two periods of time (1984 – 1991; 2008 – 2014) are given. All data gathered were analyzed using recent methodologies. For all turtles captured (as by catch), the Curve Carapace Length (CCL) and Curved Carapace Width (CCW) were measured. These data were statistically analyzed, where the mean was 67.11 cm for CCL and 57.57 cm for CCW of all individuals studied (n=13). All untagged individuals of marine turtles were tagged using metallic tags (Stockbrand's titanium tag) with an Albanian address. Sex was determined and resulted that 45.4% of individuals were females, 27.3% males and 27.3% juveniles. All turtles were studied for the presence of the epibionts. The area of Vlora Bay is used from marine turtles (*Caretta caretta*) as a migratory corridor to pass from Mediterranean to the northern part of the Adriatic Sea.

Keywords*—Caretta caretta, Chelonia mydas*, CCL, CCW, tagging, Vlora Bay.

I. Introduction

MARINE turtles are emblematic flagship species that inspire coastal and marine conservation, and fascinate people that view them as the symbol for all enigmatic oceanic creatures. They are also regarded as a "keystone or indicator" species and their extinction should cause serious concern regarding the health of the oceans. Their intricate biological cycle makes them an "umbrella" species for conservation, as their protection leads to the preservation of multiple habitats and linked ecosystems. They are migratory throughout their lives, utilising different habitats at different life-stages, and these habitats occur transnationally in different range states, making sea turtles a shared resource. In order to avoid extinction, marine turtles require protection at all life-stages and throughout their habitats and migratory corridors. As marine turtles are long-lived animals, with delayed maturity, these protective measures are required for many decades. Human activities are the greatest threat to sea turtles and their habitats, while they are also likely to be adversely affected by impending climate change [18].

Three of the seven species of sea turtles are found throughout the Mediterranean. The loggerhead (*Caretta caretta*) and green turtles (*Chelonia mydas*) nest in the Mediterranean, and the giant leatherback (*Dermochelys coriacea*) is an occasional visitor. The most common visitors in Albanian waters is *Caretta caretta*, while the other two species are very rare. *Chelonia mydas* is reported for the first time in our waters in May 2003 [5]-[9], [19]. *Dermochelis coriacea* is very rare in the Adriatic and Ionian seas [19]. Another species of sea turtle *Eretmochelis imbricate* is seen in Albania [2], but this species is very rare in the Mediterranean, where are reported only 7 individuals of *Eretmochelis imbricata* [3]. Focused studies on sea turtles in Albania have started after 2002 [10], [11]. Before this period, data on sea turtles (studies and publications), had been very scarce. They consisted of sporadic surveys, mainly on geographical distribution of sea turtles in Albania [5]-[9], [19].

Loggerheads and green turtles are considered endangered species and are protected by the International Union for the Conservation of Nature. Untended fishing gear is responsible for many loggerhead deaths. Turtles may also suffocate if they are trapped in fishing trawls. Loss of suitable nesting beaches and the introduction of exotic predators have also taken a toll on loggerhead populations. Efforts to restore their numbers will require international cooperation since the turtles roam vast marine areas and critical nesting beaches are scattered across several countries. Their relatively high presence in Patoku region (Drini Bay, north Albania) [17],means that this area shows significant ecological importance, rich in habitats that can help in the conservation of endangered migratory species (like marine turtles, etc.). Building knowledge and improving the protection and management of marine and coastal biodiversity in such areas would be of crucial importance.

II. Material And Methods

Early data (1984, 1991) [1] and recent data (2008 – 2014) on marine turtles (*C. caretta and Ch. mydas*) in the area of Vlora Bay are gathered and presented in this study. Vlora Bay is a wide inlet (9 km long, 10 km wide) and includes the Karabarun Peninsula, the Triport Cape, and the harbor, which opens on the west by northwest toward the Adriatic Sea (Fig. 1). The Vjosa Delta, along with the Narte Lagoon, represents the northern boundary of the Vlora Gulf. The height of the Karaburun Peninsula, characterized by steep cliffs along its sides, hides the interior of the gulf. The presence of the low coasts with sandy and gravelly beaches represents the main morphological features of the southern and eastern internal

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sides of the inlet. The bathymetry of the gulf, which reaches its maximum depth (50 m) in the central zone, shows it to be, on average, 20 m.

Fig. 1 Study area (Vlora Bay map)

Several human artifacts (wrecks, weapons, bombs) lie on the muddy bottom, representing an obstacle to the fishing operations and to safe navigation in some part of the gulf. Finally the natural composition of the waters could be affected by human pollution through water discharges from the surrounding cities [15].

Turtles were caught incidentally by fishermen in their nets. We have had a good relationship with most of the fishermen of the area. Anytime they catch a turtle the call us and we go there, study the species (by measuring, tagging and counting all the elements) and at the end we release them again in the sea (see Fig. 2).

The Curve Carapace Length (CCL) and Curved Carapace Width (CCW) were measured for all captured turtles. As a very important taxonomic elements in identifying the individual of turtles within the species and the species of turtles from each other (*C. caretta* from *Ch. mydas*), we have also counted the epidermal scales of the carapace (nuchal, coastal and marginal scales) as well as head scales (prefrontal and frontoparietal). All individuals of *C. caretta* were photographed (the head, carapace, plastron and the tag) and released into the sea [16].

As indicator of the stage sexual development, three measurements were recorded from the tail:

a) Distance from posterior margin of plastron to midline of cloacal opening (Plas – clo).
b) Total tail length (TTL).
c) Distance from tip of tail to posterior margin of the carapace (+/- cara).

Fig. 2 A species of juvenile *Chelonia mydas* going back to the sea, released on 07th of December 2013

All untagged individuals of turtles captured were tagged using metallic tags (Stockbrand's titanium tag) with an Albanian address and the name of the Albanian researcher, Idriz Haxhiu (see Fig. 3). The tag was applied only on the right front limb of turtles. The first turtle tagging project in Albania began at the end of 2002, using Dalton's plastic Rototags (provided by RAC/SPA, Tunis). There were evidences that Rototags may increase the risk of turtles becoming entangled in fishing gear [14], so in this study they were replaced with Stockbrand's titanium tag (these tags lock into a closed u-shape).

Fig. 3 Stockbrand's titanium tag (AL0727) put on the front right flipper of an individual of *C. caretta*

Tagging the individual of sea turtles is an effective method to study them [4]. Tagging a marine turtle gives researchers the opportunity to have a contact with other scientists [12].

Extensive information that provides a tagged animal stimulates the imagination of researchers to find an identification system for these reptiles.

Tagging a marine turtle gives the information about their reproduction biology, migratory routes, foraging habitats as well as their incremental growth.

III. Result and Discussion

A total number of 17 individuals of *Caretta caretta* and 2 individuals of *Chelonia mydas* were studied during two periods of time: **1.** 1984 – 1991; **2.** 2008 – 2014. Data from the first period (1984 – 1991) were gathered from other authors [13] and analyzed using recent methodologies of studing marine turtles. Data from second period of time (2008 – 2014) were gathered in the field by authors in collaboration with the local fishermen. In Table I is given capture history of *C. caretta* and *Ch. mydas* during the two periods of time and some data related to them. Turtles of the first period (1984 – 1991) belong all to the species *C. caretta* (the first 8 individuals in Table I). Carapace length (CCL) and carapace width (CCW) of individuals of turtles were measured and sex was identified, while as we see from the table there was no tag. The last two individuals of *C. caretta* which had a number tag, were tagged outside of Albania (Albania did not have a tagging system). Those individuals were tagged from Zakinthos Island in Greece and Institute of Zoology, Rome [1] and were captured in Albanian waters (Marine Turtles are migratory species). Turtles of the second period (2008 – 2014) belong to *C. caretta* (9 individuals) and *Ch. mydas* (2 individuals). These individuals were tagged by using Stockbrand's titanium tag with an Albanian address (AL 0003, AL 0004, AL 0539, AL 0725, AL 0727), except of individual no 11 in Table I, found dead by the local fishermen in Albania, which was tagged by Institution of Tagging, Napes, Italy (FB – 0194).

Health status of individuals (*C. caretta* and *Ch. mydas*) of the second period of time was: 6 individuals (54.6%) **healthy** (active and able to swim easily); 2 individuals (18.2%) **injured** (not so active and swimming very slow); 3 individuals (27.2%) **dead**. One of the individual injured (*C. caretta*, AL 0003) had the front right flipper missing (maybe from the propeller of the engines), which was released after it was held in a hotel in Orikum (Vlore) for 18 months. The other injured individual (*C. caretta* AL 0727) had a fishing line coming out of cloaca and was very difficult to take it out by outer intervention. This individual was released into the sea with fishing line inside its body (In Albania does not exist a Veterinary Center for recuperation of injured turtles).The first dead individual (*C. caretta*, FB – 1094) was found from the fishermen of Radhima region (Vlora), which was tagged in Italy and had a weight of 23 kg (reported by fishermen). It was not known the cause of death for this individual. The second dead individual was found from the fishermen of Radhima region (Vlora), it was untagged and looked very damaged (many parasites and epibionts on it), but there were not parasites the real cause of death for this individual. We did a dissection and noticed that inside the intestine and stomach of this animal were deposited small pieces of plastics (we thought to be the real cause of death). The last dead individual was found by the fishermen of Himara region; it was untagged and had a weight of around 60 kg (according to the fishermen). A fishing line was found inside the dead animal.

TABLE I
Capture History of *Caretta caretta* and *Chelonia mydas* in the Vlora Bay for the Periods 1984 – 1991 and 2008 – 2014

First period of time (1984 – 1991)							
No	**Species**	**Date**	**CCL (cm)**	**CCW (cm)**	**Sex**	**Tag number**	**Health status**
1	*C. caretta*	19/02/1984	74	57	F		
2	*C. caretta*	15/03/1984	83	61	F		
3	*C. caretta*	16/03/1984	69	56	M		
4	*C. caretta*	25/03/1984	74	64	F		
5	*C. caretta*	02/05/1984	76	58	M		
6	*C. caretta*	02/05/1984	83	67			
7	*C. caretta*	29/06/1984				K 903	
8	*C. caretta*	09/01/1991				K 674	
Second Period of time (2008 – 2014)							
9	*C. caretta*	20/09/2008	70	65	M	AL 0003	Injured
10	*C. caretta*	20/12/2008	73	70		AL 0004	Healthy
11	*C. caretta*	13/06/2012				FB – 1094	Dead
12	*C. caretta*	30/03/2013	69	63	F	AL 0539	Healthy
13	*C. caretta*	03/12/2013	57	53	J	AL 0725	Healthy
14	*Ch. mydas*	07/12/2013	31	27,5	J	no tag	Healthy
15	*C. caretta*	14/01/2014	52	48	J	untagged	Dead
16	*C. caretta*	01/04/2014	61,5	59	F	AL 0727	Injured
17	*C. caretta*	12/04/2014		No data			Healthy
18	*Ch. mydas*	12/04/2014		No data			Healthy
19	*C. caretta*	05/06/2014		No data			Dead

From these data we see a high level percentage (45.4 %) of unhealthy animals (injured + dead individuals). So, threatened factor is very high to these animals, that are disturbed constantly by the human activity (mainly fishing activity and water pollution).

In Table II are given some statistics referring to Curved Carapace Length (CCL) and Curved Carapace Width (CCW).

TABLE II
STATISTICAL DATA (CCL, CCW IN CM) FOR INDIVIDUALS OF *C. CARETTA* AND *CH. MYDAS*

	CCL	CCW
Mean	**67.11**	**57.57**
Standard Error	3.91	2.99
Median	70	59
Mode	74	
Standard Deviation	**14.12**	**10.81**
Sample Variance	199.58	116.91
Kurtosis	2.66	4.79
Skewness	-1.47	-1.91
Range	52	42.5
Minimum	31	27.5
Maximum	83	70
Sum	872.5	748.5
Count	**13**	**13**
Largest (1)	83	70
Smallest (1)	31	27.5
Confidence Level (95.0%)	8.53	6.53

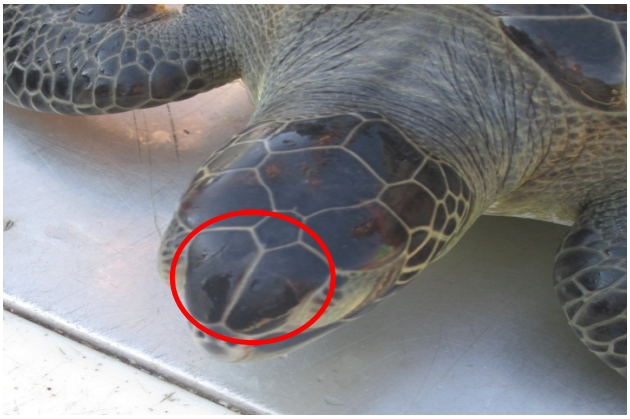

Fig. 4 Head of an individual of *Chelonia. mydas* (with 2 prefronatls epidermal scales circled with red).

From the data statistical table it is seen that the mean for all individuals studied (n=13) was 67.11 cm for CCL and 57.57 cm for CCW, while the largest CCL was 83.0 cm and CCW 70.0 cm (a female individual of *C. caretta*). The smallest CCL was 31.0 cm and CCW 27.5 cm (a juvenile of *Ch. mydas*).

To identify the different species of marine turtles (*C. caretta* and *Ch. mydas*) as well as the individual of the same species we counted the epidermal scales of head and carapace. Loggerhead sea turtle (*C. caretta)* has 5 coastal scutes both sides on carapace, where the front pair is smaller and in contact with nuchal scute and has always 4 more than 4 prefrontal epidermal scales on the head. Green sea turtle (*Ch. mydas*) has 4 coastal scutes both sides on carapace, where the front pair does not touch the nuchal scute and has always 2 prefrontal epidermal scales on the head (see Figs. 4 and 5).

The sex of marine turtles was determined and the individuals were classified into: female, male and undetermined (juvenile). The sex was determined based on some secondary characteristics features as: tail length; size and morphology of carapace; the hole in the plastron (concave plastron to adult males and flat plastron to adult females) or the development of nail in the front limbs of a male individual. The most obvious feature to an adult male was the tail (too long and extend outside the carapace) (see Figs. 6 and 7).

Fig. 5 Head of two different individuals of *Caretta caretta* (one with 4 and the other with 6 prefrontal epidermal scales)

Fig. 6 The extended tail of an adult male loggerhead (*C. caretta*)

Adult female individuals can be easily traced because they have a short tail and in most cases the length of the tail does not extend out of carapace.

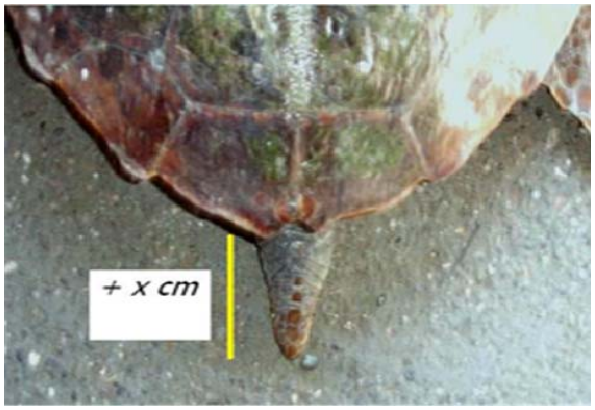

Fig. 7 An adult male of loggerhead (*C. caretta*) with the tail extended out of the carapace

In Fig. 8 it is seen that 45.4% of individuals were females, 27.3% males and 27.3% juveniles. As it is seen we have quite a large number of females. This data can be considered as very important, because so far in Albanian coastline has not been found any nesting activity. Considering the high percentage of females we can say that in the future Albanian coastline can be a potential nesting habitat especially for *Caretta caretta.*

The presence of males is another important data, because the distribution and lifestyle of male turtles is not as well-known as that of females (males spend all their life-cycle on the sea and is very difficult to study them). As the distribution and marine ecology of male turtles is poorly understood, this unusual assemblage can be considered an important and highly-significant finding.

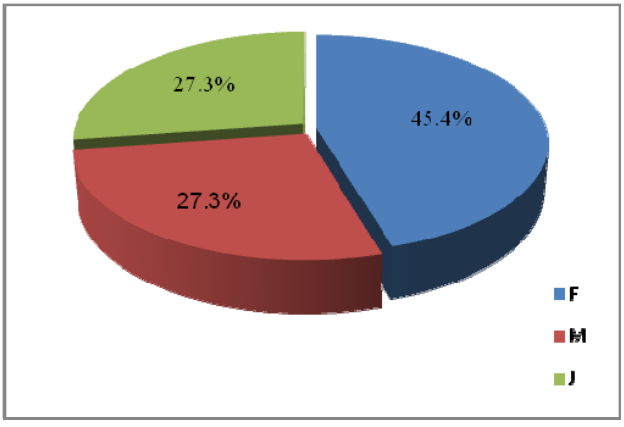

Fig. 8 The distribution of individuals of marine turtles classified as F – females; M – males; J- juveniles

All individuals of marine turtles (*C. caretta* and *Ch. mydas*) were studied for the presence of epibionts (epibiontic flora and epibiontic fauna), that are very widespread in species of marine turtles [13].

In this study resulted that 57.1% of all individuals were covered with epibionts (*Balanus* sp. were common; *Lepas* sp. were occasional, gastropods and bivalves were relatively rare, Serpulida worms etc,) (see Fig. 9), while 42.9% were not covered with epibionts (they were clean).

Fig. 9 An individual of loggerhead C. caretta covered with epibionts (mainly *Balanus sp.*)

These epibionts does not cause any damages to turtles, except of making their body a little heavy for swimming. Thus, they are not parasite to sea turtles, but they use the shell of these animals to fix on it and while turtles are swimming in different habitats they feeds.

From a three year project (2008-2010), focused on the monitoring and conservation of important sea turtle feeding grounds in the Patoku area, Drini Bay (northen Albania) supported by MEDASSET, Greece and Ministry of Environment, Albania, was concluded that Drini Bay is a regionally and nationally important habitat that is used by sea turtles for foraging, as a refuge and as part of a key migratory corridor between the Ionian and Adriatic Seas [12]. The presence of marine turtles in Vlora Bay shows that they use this area as a migratory corridor to pass from Mediterranean countries coast (Italy, Tunisia, Egypt, Turkey, Greece, etc.,), where the lay the eggs, into northern Albanian waters (Drini Bay), where they stay and feed) and to pass northern more into Montenegro and Croations coast.

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