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Distribution records of sea turtles in the Montenegrin waters

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ABSTRACT

Data about 49 individuals of three different species of sea turtles in the Montenegrin waters are presented in this paper: loggerhead turtle (36 individuals), green turtle (2 individuals) and leatherback turtle (2 individuals). For 9 individuals we do not know which species they belonged to, because we could not obtain photographs, but we were informed by locals, only. 24 individuals were alive in rather good body condition, 16 were dead, 2 were hurt but alive, while for 7 individuals we do not have any information exept date and place of finding.

Key words: loggerhead turtle, green turtle, leatherback turtle, Montenegro

INTRODUCTION

Three different marine turtle species which live in the Mediterranean are found in the Montenegrin waters: the loggerhead turtle (*Caretta caretta*), green turtle (*Chelonia mydas*) and leatherback turtle (*Dermochelys coriacea*) (Fig. 1). Although these species inhabit Montenegrian waters, their nesting sites have been recorded neither here nor in all Eastern Adriatic (Casale *et al*., 2010a). Main clutch sites of loggerhead and green turtles are in Greece, Turkey, Cyprus, Libya and Syria (Margaritoulis *et al*., 2003; Margaritoulis & Panagopoulou, 2010; Fuller *et al*., 2010; Demetropoulos & Hadjichristophorou, 2010; Hamza, 2010; Türkozan & Kaska, 2010; Rees *et al*., 2010). Nesting of leatherback turtle does not occur in this region, hence individuals in Mediterranean are probably of Adriatic origins (Laurent *et al*., 1999; Casale *et al*., 2010a). The most common species in the Mediterranean is the loggerhead turtle, with the highest density in Alboran Sea, Ionian Sea, North Adriatic Sea, Tunisia-Libya waters as well as Egypt and Turkey waters. Green turtle inhabits mostly Levantine basin, while leatherback turtle occur mostly in the Tyrrhenian and Aegean Sea (Casale *et al*., 2010a). Also in the Montenegrin waters most common species is the loggerhead turtle, while appearance of the green turtle is not so common (only two specimens registered, in 2013 and 2014) (this paper), as well as appearance of leatherback turtle (only two specimens registered, in 1894 and 2016) (Kosić, 1896; 1899; this paper).

Figure 1. A. *Caretta caretta* (photographed by locals); B. *Chelonia mydas* (photographed by Institute of Marine Biology); C. *Dermochelys coriacea* (photographed by Hajrudin Šata)

There are only few published data about sea turtles in the Montenegrin waters (Kosić, 1896; 1899; Lazar *et al*., 2004a; Polović & Čađenović, 2014; Gvozdenović & Iković, 2015). More data are provided for all other countries in the Adriatic, as well as for almost all Mediterranean countries (Casale & Margaritoulis, 2010).

Main threats to marine turtles are human activities such as: incidental catch (pelagic and demersal longlines, trawls, set nets), killing and exploitation (using of eggs and skeleton), habitat degradation (mainly urbanisation), boats collision, pollution (especially plastic waste), dynamite fishing (Margaritoulis *et al*., 2003; Casale & Margaritoulis, 2010).

All three species are listed on the IUCN Red List of Threatened Species. The green turtle is listed as endangered (EN), while the leatherback turtle and the loggerhead turtle are listed as vulnerable (VU), all with decreasing population trends (IUCN, 2016.1). Casale *et al*. (2010a) listed number of different conventions which protect marine turtles in the Mediterranean:

- African Convention on the Conservation of Nature and Natural Resources (1968);
- Convention on International Trade in Endangered Species of Wild Fauna and Flora – CITES (1973);

- Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean – Barcelona Convention (1976);
- Convention on the Conservation of European Wildlife and Natural Habitats – Bern Convention (1979);
- Convention on the Conservation of Migratory Species of Wild Animals (CSM) – Bonn Convention (1979);
- Convention on Biological Diversity – CBD (1992);
- Habitat Directive (1992).

MATERIAL AND METHODS

In 2012, we started collecting data about occurrence of sea turtles on the Montenegrin coast and in Montenegrin waters. Data were collected by walking routs along the shore, riding with boats in the territorial waters and upon the information obtained from the locals. Data about locality, geographic coordinates, finding date, and pictures were taken. The determination of species was done according to Arnold & Burton (1978). In order to obtain complete data, we also started to collect published literature data.

RESULTS AND DISCUSSION

During study period, three different species of the sea turtles were recorded in the Montenegrin waters: *Caretta caretta*, *Chelonia mydas* and *Dermochelys coriacea*. Total number of recorded individuals was 49. A 73.5% or 36 individuals of loggerhead turtles, only 2 individuals of green turtles as well as 2 individuals of leatherback turtles. Nine individuals were not determined because those findings were by locals who did not take pictures, but only date and place of finding (Table 1).

Since the most common sea turtle in the Adriatic is the loggerhead turtle, it is not surprising that this species is the most common in Montenegrin waters, too. Absence of nesting sites of this species in the Eastern Adriatic (Casale *et al*., 2010a), and presence of important areas for feeding and wintering in North Adriatic (Argano *et al*., 1992; Lazar *et al*., 2000; Lazar & Tvrtkovic, 2003; Casale *et al*., 2003) lead to the conclusion that Montenegrin waters are just one "way stations" for this species. Montenegrin coast counts around 100 natural beaches, and Great beach in Ulcinj, placed on the south of Montenegro, can be potentially nesting site for loggerhead turtle. Great Beach is around 12 km long covered with sand, but during spring and summer months (May - September) this beach is intensively visited by numerous tourists, which can be one of negative factors for potential nesting. Also, intensive urbanisations as well as presence of urban waste represent threatening factors for flora and fauna of this region.

Small number of records of green and leatherback turtle is also not surprising. Occurrence of small number of green turtles was also mentioned for Albania and Croatia (Haxhiu & Rumano, 2006; Haxhiu, 2010; Lazar *et al*., 2004b; Lazar, 2010). Green turtles

mostly live in the Levantine basin and only occasionally enter in the Adriatic Sea (Casale *et al*., 2010a). Only two individuals of leatherback turtle were found in Albanian waters (Zeko & Puzanoi, 1960; Haxhiu, 2010), and eight individuals of this species were recorded in Croatian waters in the period between 1920 and 2007. Findings of leatherback turtle is reported for almost all Mediterranean countries, but nesting sites have never been recorded for this region. Also, small juveniles have never been observed, which indicates that adult animals just accidentaly entered into the Mediterranean (Casale *et al*., 2010a). The highest number of leatherback turtles is from the Tyrrhenian and Aegean Sea, probably because of trophic reasons (Casale *et al*., 2003; Bradai *et al*., 2004; Lazar *et al*., 2008).

A 32.5% or 16 individuals of the total number were found dead (Table 1). For 13 individuals cause of dead was not clear, since they were found on the water surface or on the coast in different stages of disintegration. Two specimens died because of nets and longlines, while one died in collision with boat (Figure 2).

Figure 2. A. Dead *Caretta caretta* in Buljarica (photographed by Aleksandar Simović); B. Dead turtle near island St. Marko (photographed by locals); C. Dead *Caretta caretta* with longline in her mounth on island St. Nikola, Budva (photographed by Nikola Stanišić); D. Dead *Caretta caretta* on Slovenska beach, Budva (Gvozdenović & Iković, 2015)

A 53% or 26 individuals were found alive. A 24 of them were in rather good body condition found in open waters, near the shore, or in the Boka Kotorska Bay. 2 individuals

were injured (probably in collision with boats) and could not go under the water (Figure 3). For 7 individuals we did not have data if they were alive or dead (Table 1).

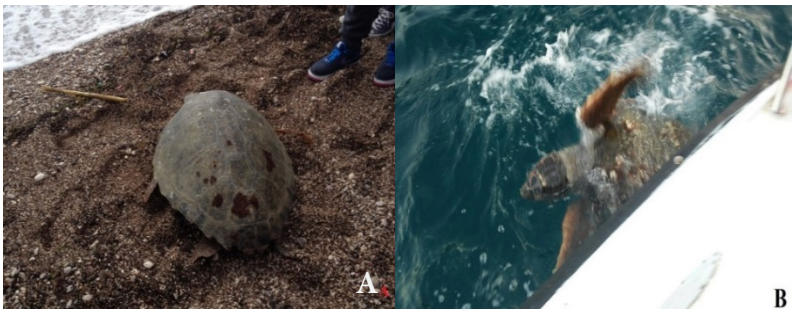

Figure 3. A. *Caretta caretta* caught in the net in Kotor, released in Budva (photographed by Gvozdenović Slađana); B. *Caretta caretta* hurt probably in collision with boat (photographed by Vedran Andrić)

Both green turtles were caught in the fishing nets, saved by the locals and released. On the carapax of one green turtle caught in Orahovac in September 2014, satellite tag was placed by members of Institute of Marine Biology for future following, but this individual was found dead in July 2015 (Figure 4). Both leatherback turtles were alive, one found in 1984, while the second one in 2016. Individual found in 2016 was caught in the fishing net, saved and released by the locals (Figure 1C).

Figure 4. *Chelonia mydas* with satellite tag on the carapax (photographed by Institute of Marine Biology)

Table 1. List of all 49 individuals found in the Montenegrian waters

Species	Locality	Coordinates	Date	No. ind.	Notes	Source
Dermochelys coriacea	Budva	—	1899	1	Catch by hands, male, alive	Kosić, 1896; 1899
Dermochelys coriacea	Ulcinj	—	27.07.2016	1	Catch in net, alive	Locals, Hajrudin Šata
Chelonia mydas	Kotor - Orahovac	N 42° 29′ E 18° 44′	06.09.2014	1	Catch in gillnet, named Žiki marked w/ satellite tag, released in Dobrota, died in July 2015	IMBK, NET-CET project
Chelonia mydas	Kotor - Bigova	N 42° 21.5′ E 18° 41.8′	10.05.2013	1	Catch in gillnet, alive	IMBK, NET-CET project
Caretta caretta	Bar	—	August 2012	1	Hurt, alive	IBMK, A. Joksimović
Caretta caretta	Bar	—	September 2016	2	11 miles away from the shore, alive	Locals
Caretta caretta	Bar	—	28.10.2002	1	Catch in trawl, alive	Lazar *et al.*, 2004a
Caretta caretta	Bar – Čanj	N 41 58 E 18 47	06.06.2013	1	14 km far away from the shore, alive	IMBK, NET-CET project

Table 1. List of all 49 individuals found in the Montenegrian waters (*cont.*)

Species	Locality	Coordinates	Date	No. ind.	Notes	Source
Caretta caretta	Bar - Žukotrlica	N 42° 06′ 48″ E 19° 04′ 58″	28.06.2014	1	Dead	Gvozdenović & Iković, 2015
Caretta caretta	Budva	N 42° 02′ E 18° 28′	06.06.2013	2	38 km far away from the shore, alive	IMBK, NET-CET project
Caretta caretta	Budva - St. Stefan	N 42° 15′ E 18° 53′	15.10.2014	1	Dead, cut neck	Gvozdenović & Iković, 2015
Caretta caretta	Budva - Slovenska beach	N 42° 17′ 05″ E 18° 51′ 04″	17.10.2014	1	Dead, rope around neck	Gvozdenović & Iković, 2015
Caretta caretta	Budva - Jaz beach	N 42° 16′ E 18° 48′	25.04.2015	1	Dead	Gvozdenović Slađana
Caretta caretta	Budva - island St. Nikola	N 42° 16′ E 18° 50′	October 2014	1	Alive	Locals, Goran Ljumović
Caretta caretta	Budva - island St. Nikola	N 42° 16′ E 18° 50′	14.05.2016	1	Dead, with longline in mouth	Locals, Nikola Stanišić

Table 1. List of all 49 individuals found in the Montenegrian waters (*cont.*)

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Caretta caretta	Bar – Čanj	N 41 58 E 18 47	06.06.2013	1	14 km far away from the shore, alive	IMBK, NET-CET project
Caretta caretta	Bar - Žukotrlica	N 42° 06′ 48″ E 19° 04′ 58″	28.06.2014	1	Dead	Gvozdenović & Iković, 2015
Caretta caretta	Budva	N 42° 02′ E 18° 28′	06.06.2013	2	38 km far away from the shore, alive	IMBK, NET-CET project
Caretta caretta	Budva - St. Stefan	N 42° 15′ E 18° 53′	15.10.2014	1	Dead, cut neck	Gvozdenović & Iković, 2015
Caretta caretta	Budva - Slovenska beach	N 42° 17′ 05″ E 18° 51′ 04″	17.10.2014	1	Dead, rope around neck	Gvozdenović & Iković, 2015
Caretta caretta	Budva - Jaz beach	N 42° 16′ E 18° 48′	25.04.2015	1	Dead	Gvozdenović Slađana
Caretta caretta	Budva - island St. Nikola	N 42° 16′ E 18° 50′	October 2014	1	Alive	Locals, Goran Ljumović
Caretta caretta	Budva - island St. Nikola	N 42° 16′ E 18° 50′	14.05.2016	1	Dead, with longline in mouth	Locals, Nikola Stanišić

Table 1. List of all 49 individuals found in the Montenegrian waters (*cont.*)

Species	Locality	Coordinates	Date	No. ind.	Notes	Source
Caretta caretta	Budva	N 41° 49′ 14″ E 18° 13′ 27″	28.08.2014	1	Open waters, alive	Gvozdenović Slađana
Caretta caretta	Budva - Buljarica	N 42° 11′; E 18° 57′	June 2016	1	Dead	Aleksandar Simović, AEVB project
Caretta caretta	Budva - Kraljičina beach	N 42° 15′ 37″ E 18° 53′ 35″	May 2016	1	Dead	Locals
Caretta caretta	Herceg Novi -island Mamula	N 42° 23′; E 18° 33′	September 2013	1	Alive	IMBK, NET-CET
Caretta caretta	Kotor - Orahovac	N 42° 29′; E 18° 44′	October 2014	1	Alive, catch in net released in Budva	IMBK, NET-CET
Caretta caretta	Kotor - Orahovac	N 42° 29′ 05″ E 18° 44′ 39″	July and August 2015; June 2016	3	farm COGImar, alive	Gvozdenović Slađana
Caretta caretta	Kotor - Muo	N 42° 26′; E 18° 45′	September 2013	1	-	IMBK, NET-CET
Caretta caretta	Kotor - Ljuta	N 42° 28′; E 18° 45′	May 2015	1	Alive, female	IMBK, NET-CET

Table 1. List of all 49 individuals found in the Montenegrian waters (*cont.*)

Species	Locality	Coordinates	Date	No. ind.	Notes	Source
Caretta caretta	Kotor - Perast, island Gospa od Skrpjela	N 42° 29′ 12″ E 18° 41′ 18″	15.08.2016	1	Alive, violated probably by boats	Locals, Vedran Andrić
Caretta caretta	Kotor - St. Stasije	N 42° 28′ 13″ E 18° 45′ 51″	June 2015	1	Dead	Locals
Caretta caretta	Kotor - Bigova	N 42° 21′ E 18° 42′	07.12.1993	1	-	Lazar *et al.* 2004
Caretta caretta	Tivat - Porto Montenegro	N 42° 26′ 02″ E 18° 41′ 31″	11.08.2015; 09.06.2016	2	Alive	Locals
Caretta caretta	Tivat - island St. Marko	N 42° 24′ E 18° 41′	23.06.2016	1	Dead	Locals
Caretta caretta	Ulcinj, channel Port Milena and Great beach	N 41° 54′ E 19° 14′	2011; 2012	4	-	Polović & Čađenović, 2014
Caretta caretta	Ulcinj, Imperial beach	N 41° 54′ E 19° 15′	25.02.2014	1	Dead	Locals
Caretta caretta	Ulcinj, Great beach	—	April 2014	1	-	IMBK, NET-CET project
Caretta caretta	Ulcinj	—	27.07.2016	1	Alive	Locals, Hajrudin Šata

Table 1. List of all 49 individuals found in the Montenegrian waters (*cont.*)

Species	Locality	Coordinates	Date	No. ind.	Notes	Source
?	Kotor	N 42° 25′; E 18° 46′	25.08.2016	1	Alive	Locals, Nikola Radonjić
?	Kotor - Bigova	N 42° 21′; E 18° 42′	18.09.2015	1	Dead	Locals
?	Herceg Novi - Bijela	N 42° 26′; E 18° 39′	July 2015	1	Shipyard, dead	Locals
?	Herceg Novi -Đenovići	N 42° 26′; E 18° 36′	August 2015	1	Alive	Locals
?	Herceg Novi -Verige	N 42° 28′; E 18° 41′	July 2015	1	Dead	Locals
?	Herceg Novi -Zelenika	N 42° 26′; E 18° 34′	July 2015	1	Dead	Locals
?	Budva - Platamuni	N 42° 16′; E 18° 47′	July 2015	1	Alive	Locals, Ilija Ćetković
?	Budva	N 41° 44′ 96″ E 18° 11′ 57″	29.09.2014	1	Open waters, alive	Gvozdenović Slađana
?	Budva - Slovenska beach	N 42° 16′ 53″ E 18° 50′ 17″	07.11.2013	1	Dead	Gvozdenović & Iković, 2015

Incidental catch seems to be the most serious conservation threat for marine turtles. In almost all Mediterranean countries this threat is the most common for the loggerhead and the green turtle (bottom trawl, drift nets, longline, midwater trawl, pelagic longline, demersla longline, set nets) (Casale *et al*., 2010a; Casale *et al*., 2010b). Casale (2008) estimated around 50,000 deaths per year for loggerhead turtle in the Mediterranean caused by fishermen nets. Incidental catch can also be considered as one of the biggest negative impacts for sea turtles in the Montenegrin waters.

Killing of adult individuals by fisherman and exploitation (consummation) of eggs of all sea turtles are very common in Egypt and Greece (Nada & Casale, 2010; Margaritoulis & Panagopoulou, 2010). In other Mediterranean countries (including Montenegro), this threat is not so intensive, or is absent completely.

Water pollution, collision with the boats and dynamite fishing are very common in many countries, especially in Lebanon, Syria and Greece (Casale *et al*., 2010a). Urban waste, dynamite fishing as well as uncontrollable and fast boat rides are not strange in Montenegro, hance they could be consider as negative factors for sea turtle in Montenegrin waters, too.

As Gvozdenović & Iković (2015) mentioned there are several solutions which may help in conservation of sea turtles in Montenegrin waters:

- Use of delivery systems on fishing nets which may enhance escape of individuals from the nets;
- Use of circle hooks instead of traditional J-shaped hooks may prevent swallowing because circle hooks are wider and much less likely to be swallowed by the turtles;
- Protection of sandy beaches eg. Great beach in Ulcinj which can be consider as potentially nesting site for loggerhead turtle;
- Establishment of centres for turtle's care and protection;
- Regulation of human waste and chemical pollutants that are dumped in the sea.
- Education of fishermen and locals are essential for long-term conservation of sea turtles in Montenegro. More efforts and commitments of government and inspections in reducing of illegal dynamite fishing, waste disposal, coastal development and beach reconstructions could have positive results not only for sea turtles but also for all marine ecosystem.

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