

## Sea turtle stranding events along the Mauritanian coast

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**Abstract.** Despite Mauritania's proximity to globally recognized sea turtle nesting hotspots, the Bijagos Archipelago in Guinea-Bissau and Boavista Island within the Cabo Verde Archipelago, data on the status of sea turtle species in Mauritania remain scant. To address this, we conducted an extensive 6-year field study with the aim of gathering data about sea turtle stranding events along the Mauritanian coast. Between 2009 and 2016, our team recorded 1787 stranded sea turtles in various stages of decomposition (fresh to advanced), including dry sea turtle carapaces in or near coastal villages. Individuals comprised green turtle (*Chelonia mydas*, 93%; N=1654), loggerhead turtle (*Caretta caretta*, 5%; N=90), leatherback turtle (*Dermochelys coriacea*, 2%; N=28), and olive Ridley turtle (*Lepidochelys olivacea*, 1%; N=15). Curved carapace length measurements taken from all recorded sea turtles indicated a dominant presence of immature individuals for *C. mydas* and *C. caretta*. Fishing lines, net entanglements, hooks, traces of knife cuts, and the remains of slaughtered individuals found in coastal villages indicated anthropogenic threats and poaching. Our results testify to the need to reinforce better fishing regulations and to combat poaching activities, which pose direct threats to sea turtles inhabiting/visiting the Mauritanian sea and beaches from other well-protected areas. The current status of sea turtles in Mauritania is of regional and global concern, because marine turtles are migratory species and the dangers they are exposed to in this area may directly impact on populations in the West Africa region.

**Key Words.** Atlantic Ocean, Testudines, *Caretta caretta*, *Chelonia mydas*, *Lepidochelys olivacea*, *Dermochelys coriacea*, poaching, Mauritania, West Africa.

### Introduction

In Mauritania, as in other countries of the West African region, several sea turtle species have been recorded: 1) Green turtle (*Chelonia mydas* [LINNAEUS, 1758]), 2) Loggerhead turtle (*Caretta caretta* [LINNAEUS, 1758]), 3) Leatherback turtle (*Dermochelys coriacea* [VANDELLI, 1761]), 4) Olive ridley turtle (*Lepidochelys olivacea* [ESCHSCHOLTZ, 1829]), and 5) Hawksbill turtle (*Eretmochelys imbricata* [LINNAEUS, 1766]) (FRETEY 2001, JALLOW et al. 2004, MARCO et al. 2011, RISKAS & TIWARI 2013, MULLIÉ et al. 2015). The green

turtle species is listed as endangered whereas loggerhead, leatherback and olive Ridley are listed as vulnerable (IUCN 2013). To date, the status of sea turtle species visiting or inhabiting the Mauritanian coast has been poorly studied. Some preliminary studies were carried out by J. Maigret and C. Arvy between the 1970s and 1990s (MAIGRET 1975, 1980, ARVY & DIA 1995, ARVY et al. 2000). Despite the current legislation protecting sea turtles, individuals are still poached by artisan fishermen and other people living in coastal villages and temporary camps for meat and fat used in traditional medicine (FRETEY & MINT HAMA 2012). Be-

tween 2009 and 2012, 312 dead sea turtles of different species were recorded along the Mauritanian coast (FRETEY & MINT HAMA 2012, MINT HAMA et al. 2013). However, these carcasses were not examined in detail.

Even though stranded sea turtles are frequently observed along the Mauritanian coast, no detailed study on the causes of their death was conducted before the beginning of our Digmile project in 2009. In this paper, we analyse data on stranded sea turtle individuals gathered across a 6-year period along the entire Mauritanian coast in order to better describe the population structure of each sea turtle species and identify all possible threats that these species encounter along the coast. Furthermore, because observations on stranded sea turtles can provide additional information about the likely causes of their death (HART et al. 2006, CHALOU PKA et al. 2008, DEEM et al. 2009, CASALE & MARGARITOU LIS 2010), one of the study objectives was to identify all potentially important mortality factors for resident and/or transient sea turtles present in Mauritania.

**Materials and methods**

**Study site and protocol description**

The Mauritanian coastline extends across 754 km from the northernmost to its southernmost points and includes intermittent cliffs from Cape Tafari to Cape Blanc (Fig. 1). Two separate research teams carried out the fieldwork: 1) the Digmile project research team, and 2) the Biodiversity, Gas and Petroleum Program (BGP) in concert with the Mauritanian Institute of Oceanographic Research and Fisheries' (IMROP) research team. We conducted our fieldwork during different periods from October 2009 to October 2016 for 20 days at a time: 1) mid-October 2009, 2) June, July and September 2010, 3) April and September 2011, 4) December and June 2012, 5) February 2013, 6) October 2014, and 7) September and October 2015, and September and October 2016. This study excludes all rocky areas such as the Bay of Levrier, Cape Blanc, and rocky areas within the Banc d'Arguin National Park (PNBA) because of their inaccessibility.

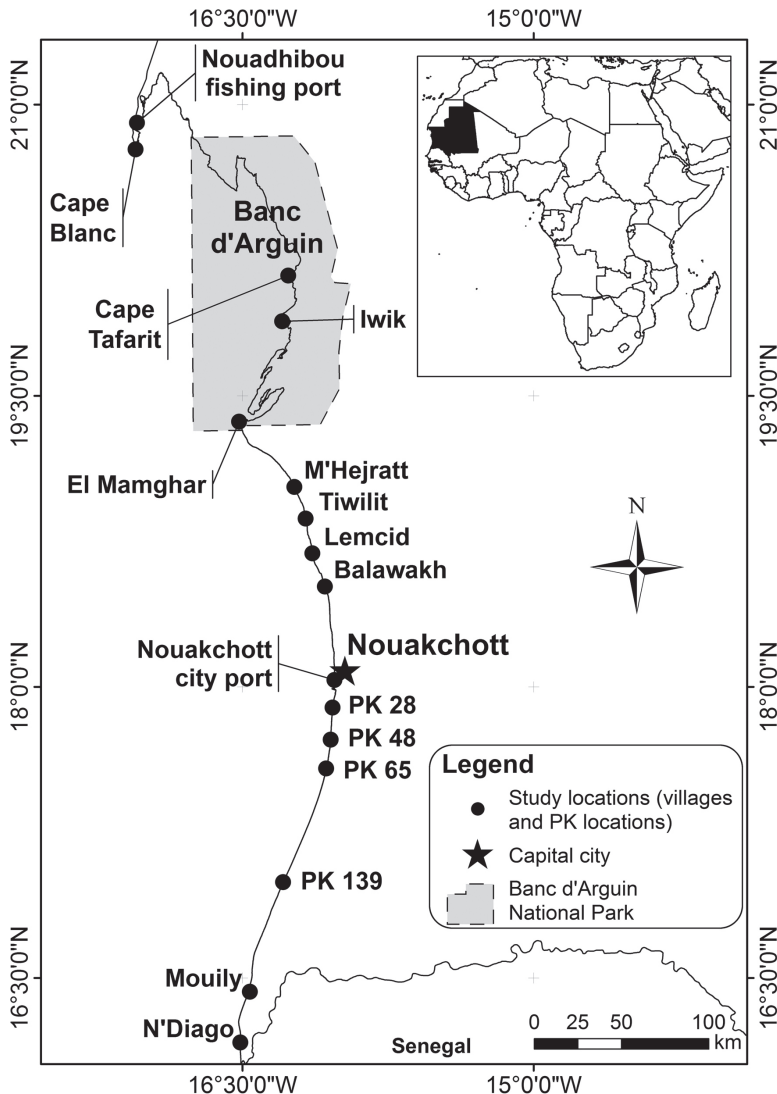


Figure 1. Map of the Mauritanian coastline showing the sea turtle study locations (localities) marked as black spots with their designated names.

### Beach monitoring protocol

Our teams monitored the wide area of the Mauritanian coastline, from Nouakchott to N'Diago in southern Mauritania and from Nouakchott harbour to the Nouadhibou artisan fishing port in northern Mauritania (Figs 1 and 2). The beach areas in the south of Mauritania, located 28 km from Nouakchott at locality PK 28 were also patrolled (Figs 1 and 2). We conducted regular beach monitoring during the day from 7 until 19 h using a slow-moving 4 × 4 all-terrain vehicle close to the tidal wave line. This allowed us to cover long distances and easily spot live and dead stranded turtles. We did not monitor certain beach areas because of their inaccessible terrain.

### Examination protocol of the stranded sea turtles

We defined stranded sea turtles as those that died or were injured at sea and were subsequently washed up onto the beach. Remains of killed sea turtle individuals on the beach

were excluded from the stranded sea turtle count. Upon finding a freshly stranded sea turtle, we conducted an external examination of the carcass, noting the presence of epibiotic organisms, scale aberrations, type of injuries, and the possible cause of death. We photographed dead individuals to allow subsequent species identification and a re-evaluation of scale aberrations and various disease symptoms (i.e., presence of tumours on soft body parts). The curved carapace length (CCL) was measured from the nuchal notch to the supracaudal notch of all stranded sea turtles except those with a severely broken-up carapace or that were completely decomposed. The data gathered (pictures) by the employees of the National Institution and the PNBA did not contain information about causes of death, the state of the individual, or morphometric measurements. Thus, we mention these individuals in the result section but have excluded them from our analysis. The age of each individual was estimated from its CCL. It is worth noting that sea turtle sizes may vary between different regions and even within the same population due to various factors (CHALOUPKA & LIMPUS 1997, HEPPELL et al. 2003, BALAZS & CHALOUP-

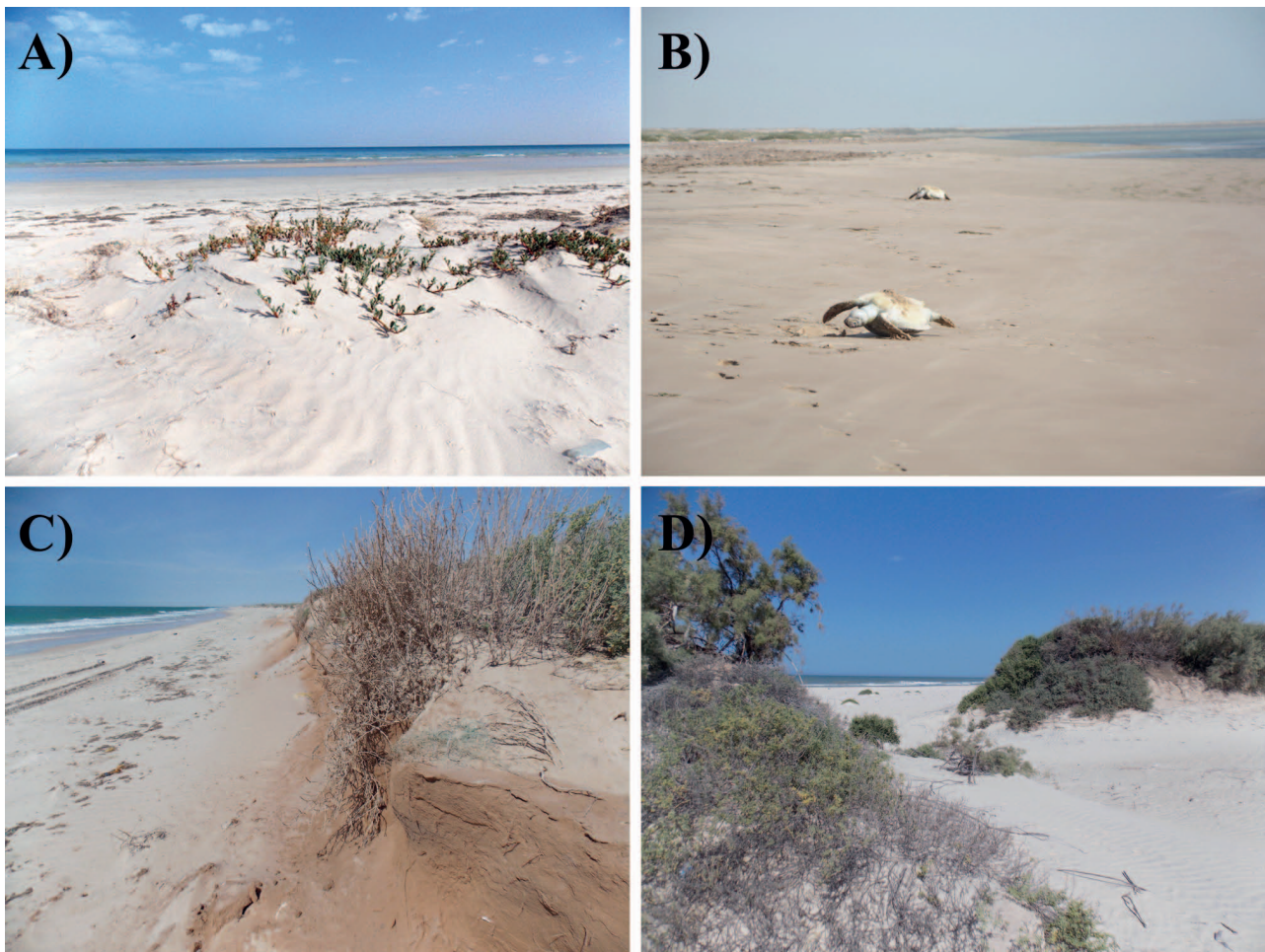


Figure 2. Wide-angle images of the beaches where sea turtle patrols were conducted. A) Low vegetation protruding from the sand dunes bordering the beach zone. B) Wide stretch of sandy beach with two freshly stranded *C. mydas* individuals in close proximity. C) Coastal erosion in the upper beach zone. D) View of the posterior upper beach zone, showing taller sand dunes covered with shrub vegetation.



KA 2004). Size is not necessarily a reliable indicator of age (MILLER 1997). However, taking into account data from the aforementioned literature, we considered the individuals of *C. mydas* and *C. caretta* to be immature with a CCL < 90 cm (CROUSE et al. 1987, CROWDER et al. 1994, LIMPUS & CHALOUPKA 1997) and for *Lepidochelys olivacea* between 57 and 60 cm SCL (straight carapace length) (REICHART 1993, ZUG et al. 2006). We also considered individuals of *D. coriacea* to be immature with a CCL < 145 cm (ECKERT 2002).

Each encountered individual was assigned a specific code number. Our team photographed each dead stranded sea turtle together with its ID number on a slate positioned in front of the carcass to avoid mismatching errors. In addition, we took tissue (i.e., skin, scales or small bones) and/or organ (i.e., heart, liver, muscles) samples from fresh sea turtle carcasses and preserved them in 99% alcohol at -20°C for future genetic and ecotoxicological analyses. We collected intact sea turtle carapaces and skulls and deposited them in the IMROP Museum in Nouadhibou City for conservation purposes.

By conducting an external examination of the stranded sea turtles, we attempted to deduce the most likely cause of death. It was attributed to activities of fishing when we observed: 1) a mechanical injury resulting from a collision with a boat or by a propeller on a body part such as neck, flippers, carapace or plastron, 2) fishing net or rope around the neck or flippers, and 3) nylon fishing line with a hook extending from the mouth or anus. It is difficult to observe injuries like these if the individual is decomposed. This is the reason why our examinations were mostly confined to freshly stranded turtles before the decomposition process was too advanced. It was not possible to deduce the causes of death in decomposed turtles. When there was no evidence of severe injury, death could be considered natural, pathological or caused by asphyxiation while the individual was trapped in a fishing net. If we found cuts and incisions on a turtle's body (i.e., traces of cuts by a knife or another sharp object) discarded in or near fishing villages and camps or at the fishermen's landing sites, death was attributed to human poaching activities.

Geographical coordinates of the study locations were taken using a Garmin eTrex GPS 60CSx. Georeferences were recorded in the WGS 1984 (World Geodetic System 1984) coordinate system, and a map showing the study locations (localities) was created using ArcGIS (ESRI 2009). It is worth noting that these geographical coordinates indicate the places of stranding and not places of capture at sea. Graphs showing the size distribution (CCL) of all measured stranded sea turtle individuals (per species) were made using Statistica® software.

## Results

### Record of sea turtle strandings

#### *Chelonia mydas*

From October 2009 to October 2016, we identified and recorded 1654 individuals of stranded sea turtles along

the Mauritanian coast area between N'Diago and Arkeiss (Fig. 1). The curved carapace length (CCL) of the majority of measured individuals (89%) ranged between 21 and 80 cm. The smallest individual measured 21 and the largest 120 cm (Fig. 3A). Except for one individual, all recorded individuals were dead and decomposing. Most of the individuals (46%) were recorded in the northern beach areas, around the coastal villages near the PNBA and within the Park itself. In the southern study area, from Nouakchott to N'Diago, we found 13% of strandings, whereas the exact location was not recorded for the remaining 41%.

#### *Caretta caretta*

In total, we recorded 90 stranded *C. caretta* individuals. The majority (92%) of measured individuals had a CCL between 33 and 79 cm. The CCL of the largest individual measured 102 cm (Fig. 3B). Among the stranded individuals, we recorded 7% on beaches in the northern sector near the PNBA area and within the Park, and 30% in the southern sector. No exact locations were recorded for the remaining turtles.

#### *Dermochelys coriacea*

We recorded 28 stranded *D. coriacea* individuals whose CCL ranged between 107 and 166 cm (Fig. 3C). However, the majority of measured individuals (89%) had a CCL between 107 and 140 cm. From the total number of recorded individuals, 17% were recorded in the northern sector and 51% in the southern sector. The locations of the remaining individuals were not recorded.

#### *Lepidochelys olivacea*

We recorded 15 stranded individuals of this species. The individuals whose CCL were measured ranged between 56 and 78 cm (Fig. 3D). In total, 40% of individuals of this species were recorded in the southern sector. The locations of the remaining individuals were not recorded.

#### *Eretmochelys imbricata*

Only one individual of this species and one jawbone were recorded during our fieldwork. The carapace length of this individual measured 37.5 cm; its carapace is now kept in the Phoque Moine Museum in Cap Blanc.

#### Stranding records from other sources

In May 2010, a team that included Abdoulaye Wagué, Abdallahi O. Samba (IMROP) and Sidi O. Khelifa (ONISPA) recorded sea turtle carcasses belonging to 25 individuals of *C. mydas* and 2 individuals of *L. olivacea* in advanced stages of decomposition. From the photographs taken by the IMROP fisheries investigator (Ismael Samba Talla, pers. comm.) near Mamghar village between June and August 2011, and April and June 2012, we counted 45 *C. mydas* individuals belonging to different age groups (juveniles and adults). This investigator took only pictures, but no morphometric data or notes on the possible causes of death and the conditions of the stranded sea turtles. In addition to our observations in 2013, a conservation activist from the

Diawling National Park observed and photographed nine stranded sea turtles within the same area (between Mouily and N'Diago: six *C. mydas*, two *C. caretta*, and one *L. olivacea*). The Diawling National Park conservation activist did not take down detailed information about possible causes of death, conditions of the animals, or CCL measurements.

#### Examination of stranded sea turtles

##### *Chelonia mydas*

The recorded individuals of this species were usually found decomposing or their remains were very dry. It was difficult to identify the causes of death for most of the recorded individuals or to observe any kind of injury or pathology because of their advanced stages of decomposition. Our data show that only ~ 2% of the stranded turtles had suffered from visible injuries or pathological fibropapillomatosis, possibly indicating asphyxiation or drowning as causes of death for the remaining 98% individuals. Among the 1654 stranded sea turtles, 10 individuals had flipper and neck

injuries, four had neck and carapace injuries with flippers entangled in fishing nets or ropes/lines, and one had damaged claws (Figs 4 and 5). Interestingly, only 1% (N=15) of the stranded turtles displayed signs of fibropapillomatosis. In November 2013, we observed a severely dehydrated sub-adult *C. mydas* individual at the locality PK 48 and one decomposing adult *C. mydas* individual at PK 139 (Fig. 5). External examination of its remains, followed by a necropsy, revealed broken claws. This injury may possibly have been caused by fishing gear or inflicted by Senegalese fishermen that use sea turtle claws in their traditional medicine (for the prevention of sickness in children after growing their first teeth). During fieldwork in October 2014, our team found five slaughtered *C. mydas* adults in different fishing villages along the Mauritanian coast (Fig. 6). In October 2016, we recorded three recently poached and slaughtered *C. mydas* adults in the fishing camp at locality PK 28.

##### *Caretta caretta*

Most of the recorded individuals were found in advanced stages of decomposition that made examination difficult.

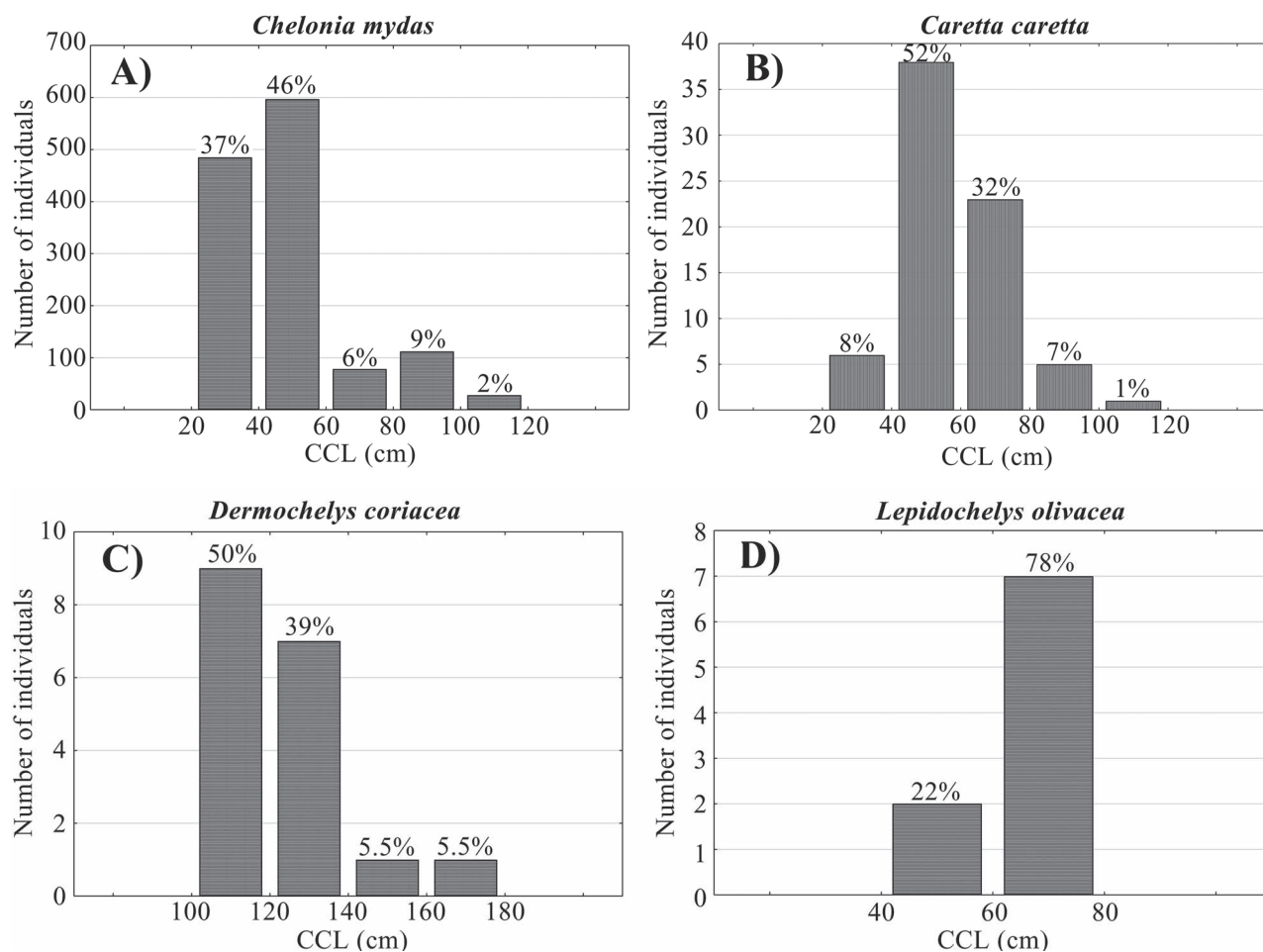


Figure 3. Size distribution of stranded turtles. A) green turtles (N=1300; not measured = 354), B) loggerhead turtles (N=73; not measured = 17), C) leatherback turtles (N=18; not measured = 10), D) olive Ridley turtles (N=9; not measured = 6) found along the Mauritanian coast between 2009 and 2016. N – total number of observed sea turtles; CCL – Curved carapace length.

However, six of the recorded individuals had remains of nets and hooks still attached to their body parts. The necropsy of two freshly stranded individuals revealed they had ingested long-line fishing hooks (Fig. 7).

#### *Dermochelys coriacea*

Among the 28 recorded individuals, six were in advanced stages of decomposition and had severely damaged carapaces. This made it impossible to accurately measure their CCLs. Seven individuals were found to have been slaughtered with sharp tools (i.e., knives), which was evident from the fact that the junctions between carapace and plastron were slashed with sharp cuts and incisions (Figs 7C+D). This indicated they were slaughtered by human hand. Four stranded individuals were found entangled in fishing lines around their necks and flippers (Figs 7E+F).

#### *Lepidochelys olivacea*

All dead *L. olivacea* individuals were found desiccated or in advanced stages of decomposition, which made examination difficult (Fig. 8). We could not deduce if the individuals of this species had been washed up on the beaches after

they died or after they were injured by fishing equipment (nets and gear) or predators, or if they had become victims of poaching.

## Discussion

The year-round presence of green turtle in the sea grass areas within the Banc d'Arguin National Park was reported by MAIGRET & TROTIGNON (1977). During our study period, we recorded that 93% of stranded sea turtles belonged to this species. These instances of stranding were mainly observed near coastal villages and on the beaches surrounding the PNBA. Both juvenile and adult individuals were recorded. However, the CCLs of most individuals measured between 21 and 80 cm. The presence of small-sized individuals in Mauritanian waters implies the existence of ontogenetic or feeding area(s). In his tracking study, GODLEY et al. (2010) demonstrated that some adult green turtle females migrate from Poilão (Guinea-Bissau) to the PNBA where they remain for feeding during long periods of time. Data from marine currents and genetic analyses suggest that some green turtle juveniles from Guinea-Bissau disperse into the eastern Atlantic, which includes the Canary Current and waters of Senegal, Mauritania and Cape Verde (GODLEY et al. 2010, MONZÓN ARGÜELLO et al. 2010). However, studies on the origins of juveniles found in Mauritanian waters are still too few, and we believe that more genetic and tracking studies encompassing other areas in the region should paint a more informative picture. It is likely that, because of the existence of vast sea grass areas within the PNBA and overall rich marine biodiversity, some juvenile sea turtles come to Mauritanian waters from other parts of the region to feed and grow. Even though juveniles are known to disperse across the whole Atlantic, their movements are also associated with productive foraging areas that coincide with convergence zones, upwells, major gyre systems, and eddies (CARR 1987, BOLTEN et al. 1998). A large-scale genetic analysis, tracking or tagging of sea turtle individuals found in Mauritania are still needed to clarify their origins, movements, behaviour, and



Figure 4. A dead *Chelonia mydas* individual with a fishing line around its neck (Photo: JACQUES FRETEY).



Figure 5. A) A stranded and B) a live but dehydrated *Chelonia mydas* individual on the Mauritanian coast at localities PK 139 and PK 48, respectively (Photos: ABDALLAHI SAMBA).



the composition of the existing population(s). In addition, these approaches would help to identify the presence of foraging and potential ontogenetic area(s) for adults and juveniles, respectively. Moreover, because of the potentially interlinked importance for breeding and feeding (GODLEY et al. 2010), future conservation efforts should focus on unveiling possible connections between Mauritanian coastal areas (PNBA) and other recognized and already protected areas in the region such as the Poilão National Marine Park (Guinea-Bissau).

In this study, the stranded loggerhead turtles that represented 5% of all observations had CCLs ranging mostly (92%) between 33 and 79 cm. Similarly, ARVY et al. (1996) mentioned the observation of *C. caretta* individuals with CCLs ranging between 45 and 49 cm, which may indicate

the existence of feeding and ontogenetic areas in Mauritanian waters for this species. Previously, ARVY & DIA (1995) indicated a seasonal presence of this species in Mauritanian waters that increased during the rainy period (July–September). Because our research did not cover all the months of each year, we cannot add information on the seasonal presence of this species. However, most of the strandings during our study period were recorded between October and June. HAWKES et al. (2006) and EDER et al. (2012) previously hypothesized that *C. caretta* individuals with CCLs < 90 cm feed in the large area between the Cape Verde Archipelago and the African mainland (i.e., Senegal, Mauritania). Our observations of *C. caretta* individuals along the Mauritanian coastline support this hypothesis. Previous satellite tracking studies of adult turtles showed that

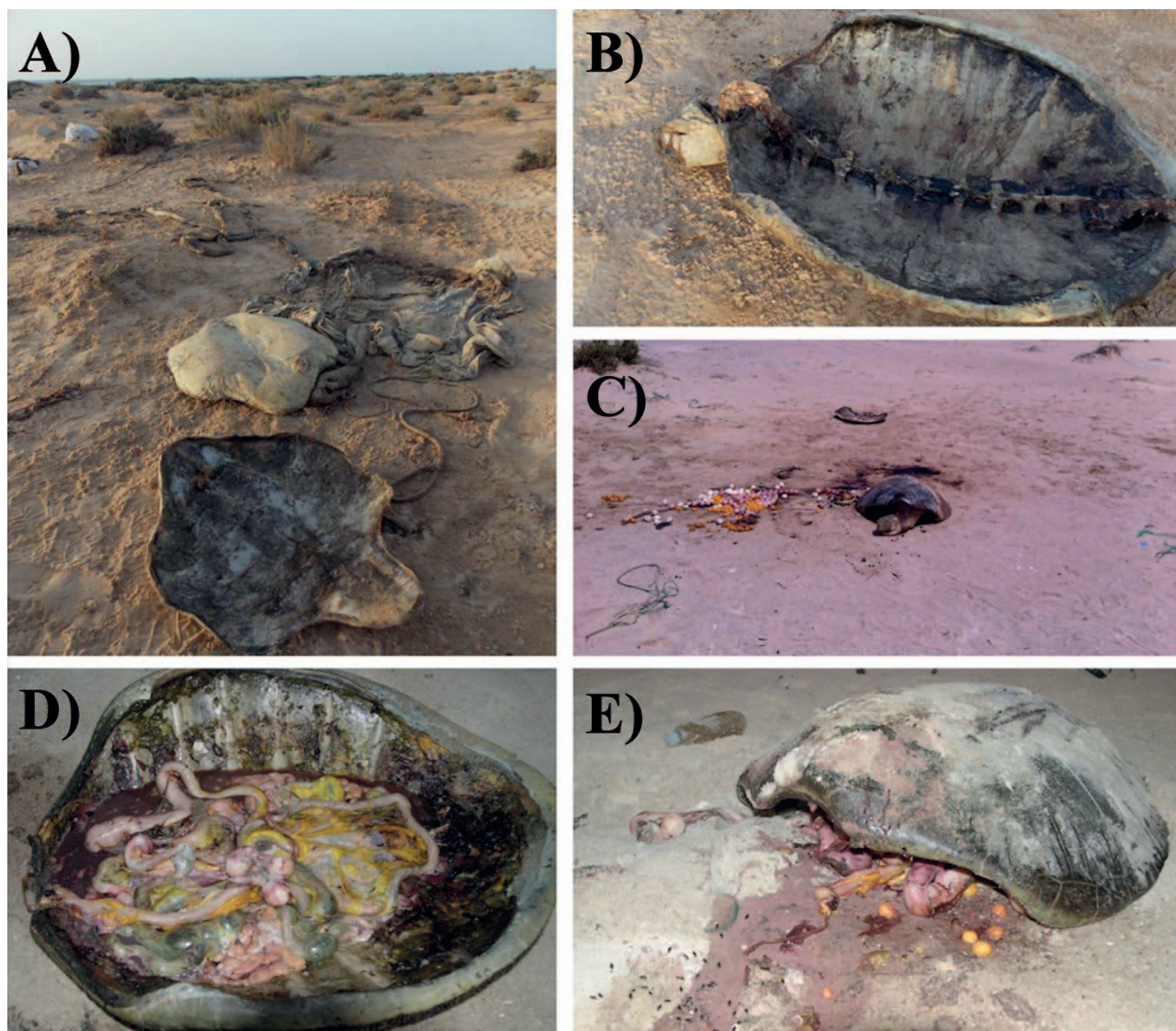


Figure 6. Frames marking remains of adult *Chelonia mydas* individuals slaughtered in different Imraguen villages within (A and B; northern Mauritanian coast) and outside the Banc d'Arguin National Park (C, D and E; southern Mauritanian coast). A) and B) depict remains found in Iwik village, C) at village PK 65, and D) and E) in village PK 28. (Photos: JACQUES FRETEY, MOULAYE WAGNE and FEITOU MATT LEMATT HAMA).



some individuals were observed heading to the coastal areas between Mauritania and Sierra Leone during their non-reproductive seasons (HAWKES et al. 2006). Additionally, it was reported that larger female turtles migrate south to benthic feeding grounds along the coast of Sierra Leone,

whereas small-sized females migrate to the oceanic waters of Mauritania, Gambia and Senegal (HAWKES et al. 2006). Our team hypothesizes that a population of locally breeding adult loggerheads may coexist with immature individuals of the same species migrating from the Cape Verde Ar-

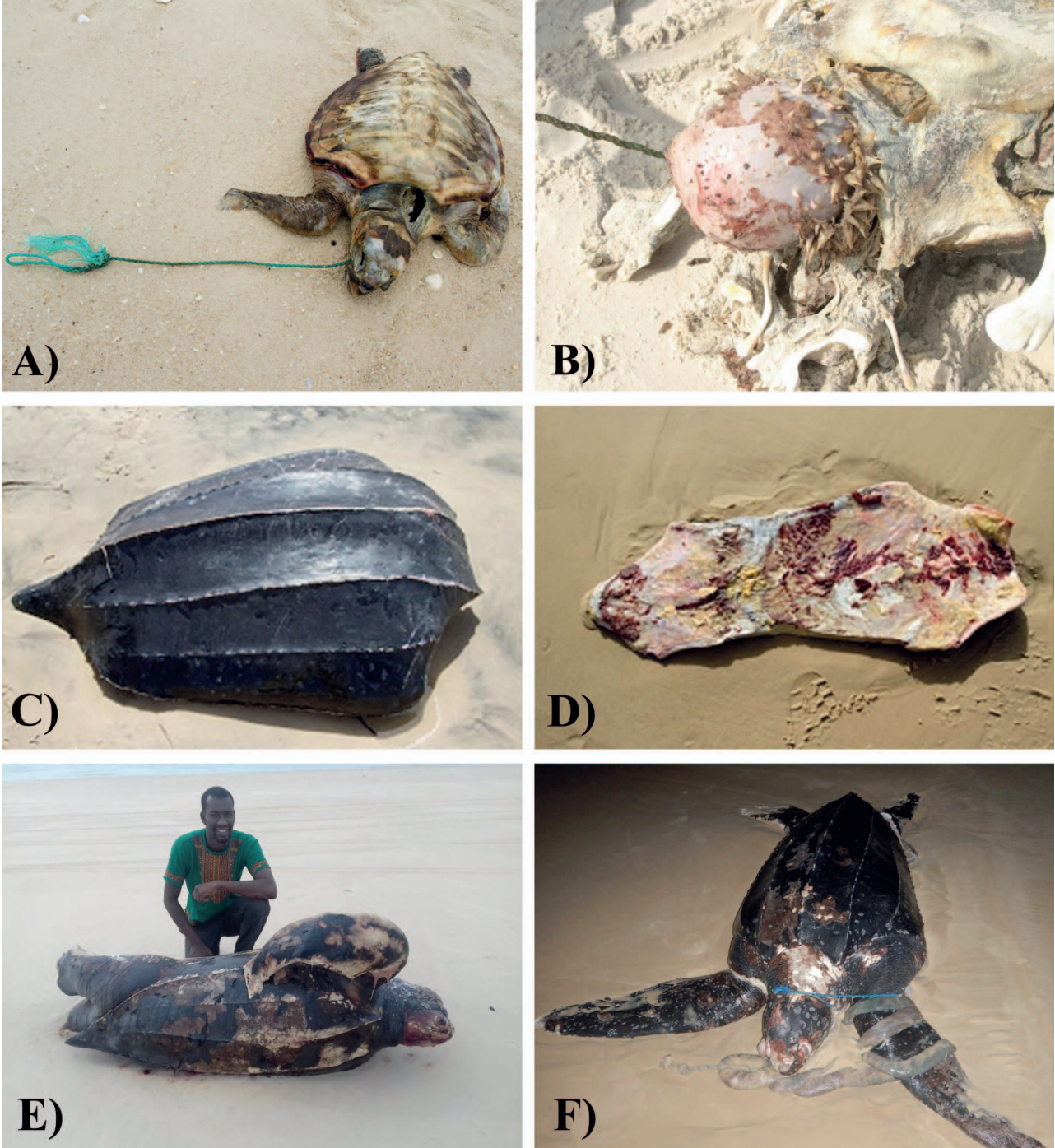


Figure 7. A+B) Decomposing stranded *Caretta caretta* individuals that died from swallowing long-line fishing hooks, C) carapace and D) separated plastron of the same *Dermochelys coriacea* individual found on the Mauritanian coast, E) Leatherback turtle stranded on a Mauritanian beach, and F) a leatherback turtle entangled in fishing line. Photos: WIM MULLIE, FEITOU MATT LEMATT HAMA (A+B), WIM MULLIE (C+D), ABDALLAHI SAMBA, FLORENCE DOVILLEZ (E+F).



chipelago. However, future studies still need to verify this hypothesis. Leatherback turtles stranded along the Mauritanian coastline were reported by MAIGRET (1975, 1980). This species accounted for 2% of our observations. Most of the individuals seemed rather small (CCL < 145 cm) and probably had not yet reached sexual maturity. The recorded size classes may indicate a possible foraging/feeding area in this region, as was previously suggested by ECKERT (1998) and ECKERT et al. (2006). According to these authors, Mauritania could be an important feeding area for nesting *D. coriacea* females that may come here from the northeastern parts of South America. FERRAROLI (2004) also demonstrated by means of satellite tracking that females of this species nest in French Guiana and visit the rich marine areas between Cape Verde and Mauritania.

Stranded olive Ridley individuals make up for 1% of our observations, with both subadults and adults being recorded. CARR (1957) was the first to observe *L. olivacea* in Mauritania at Port Etienne (Nouadhibou). From the carapaces found at Joal and Kayar, MAIGRET (1983) inferred that Senegal might be the northern distribution limit of this species, but observations of this species along the Mauritanian coast by ARVY & DIA (1995) then set Mauritania as its northernmost boundary in the Eastern Atlantic (comp. FRETEY 2001). VILLIERS (1958) and GOWTHORPE (1993) also mentioned finds of *L. olivacea* carapaces, and ARVY & DIA (1995, 1996) recorded and collected three *L. kempii* carapaces on the Mauritanian coast; they measured 38, 39 and 56 cm in length, respectively. However, the disappearance of these carapaces and the absence of photographic evidence limit us in the discussion of these data. Since we never observed stranded individuals or carapaces of *L. kempii* in village garbage dumps from the beginning of our research activities in 2009, we strongly doubt the correct identification of this species. We much rather believe that these were specimens of *L. olivacea* that had 5 pairs of symmetrical costals, as is normally seen in *L. kempii*, which probably misled the mentioned observers. So far, no



Figure 8. A stranded olive Ridley turtle in an advanced stage of decomposition on a Mauritanian beach (Photo: MOULAYE MOHAMED WAGNE).

*L. kempii* has been observed offshore below the Canary Islands or on the coast of Morocco, including Western Sahara (CARR 1968, MACHADO 1989, PASTEUR & BONIS 1960). The northern boundary separating the range of *L. olivacea* from that of *L. kempii* has already been discussed in detail by FRETEY (2001). However, the activities and movements of *L. olivacea* in Mauritanian waters are still unknown. The occasional presence of *L. olivacea* in this region was discussed in more detail by VARO-CRUZ et al. (2011).

The presence of various sea turtle species in Mauritanian waters, gaps in research, and the obvious lack of data about these species in the studied area pose a variety of questions regarding to their origins, movements, migratory behaviours, population structures, possible conservation approaches, and marine resource management measures. This is why further studies focusing on gonad examination, diet analyses, tracking, and skeletochronology are needed.

#### Poaching and fishing activities

Many sea turtle populations are known to be under increasing worldwide anthropogenic pressure (MARQUEZ 1990, LIMPUS 1995, PRITCHARD 1997, PAVIS et al. 2001). Both our previous and recent observations have indicated that sea turtles are often killed along the Mauritanian coast. Previously, we reported that the local native people of the Imraguen and migrant fishermen slaughter many immature and adult *C. mydas* for their meat and eggs (FRETEY & MINT HAMA 2012). Activities to this effect were mainly observed along the northern Mauritanian coast, near Balawakh, Lemcid, M'hejratt, Mamghar and Iwik villages (Fig. 1). MAIGRET & TROTIGNON (1977) were the first to record Imraguen fishermen catching sea turtles along the Mauritanian coast. Decades later, ARVY et al. (1996) also reported female sea turtles being captured by natives. In their IMROP-ONISPA mission report, WAGUÉ et al. (2010) reported having found a leatherback turtle slaughtered by fishermen at the locality PK 80.

From our discussions with representatives of the Imraguen, we noted that local Mauritanian fishermen view hunting adult *C. mydas* individuals as part of their traditional way of life. They usually use harpoons for killing them and sometimes take advantage of *C. mydas* individuals when these are engaged in mating and thus extremely vulnerable. In the past, they hunted in the sea grass areas within the PNBA that appears to constitute a large feeding area for *C. mydas*. The evidence that vividly confirms the ongoing sea turtle slaughter is the presence of sea turtle remains riddled with cuts and incisions in and near coastal villages and the camps of fishermen (FRETEY & MINT HAMA 2012, MINT HAMA et al. 2013). The detailed explanations of fishermen and local people about the process of killing and extracting fat from *C. mydas* and *D. coriacea* further confirms that poaching along the Mauritanian coast is still ongoing. It should be noted that the Imraguen and other local fishermen also use oil from *D. coriacea* as an insect repellent when they dry-preserve fish (FRETEY

et al. 2015). Because of their poor living conditions, these communities rely on sea turtle meat and fat for food as well as a source of traditional medicine to treat some diseases. However, sea turtle hunting has been officially outlawed since the establishment of the Banc d'Arguin National Park in June 1976. Another major threat to sea turtle populations in Mauritania is the seasonal presence of migrant fishermen (from Senegal, Mali, Sierra Leone, Ghana, etc.) working for Mauritanian wholesale fish traders. They also capture and use sea turtles as a source of food. According to the fishermen that we talked to, many turtles are slaughtered and consumed right on the pirogues (canoes) at sea while their remains (carapace, viscera, flippers, and plastron) are thrown overboard to leave no evidence of illegal activities. Additionally, during our discussions, some Imraguen admitted to deliberately ("if there was need for food") catching sea turtles of various sizes (age groups).

Interestingly, we recorded only one live immature *C. mydas* individual stranded on the beach with symptoms of severe dehydration. Due to its physical condition and age, this observation most probably constituted a case of basking rather than a nesting event. Its presence on the coast may also be due to injury or illness not clearly detectable by our first inspection. This individual had a whitish carapace inferring its being weakened, stressed and dehydrated. It is likely that similar cases have escaped our attention.

According to IMROP's observations, *C. caretta* and *D. coriacea* are also often caught in trawler nets at sea. Our observations additionally reveal that some stranded loggerhead turtles swallow long-line fishing hooks, and some leatherback turtles become entangled in fishing lines. One cause of their strandings could be the activity of artisan and industrial fishing within the Mauritanian Exclusive Economic Zone. However, there are no official data regarding the deliberate and accidental catching of sea turtles in Mauritanian waters.

Contrary to other West African waters, a low percentage of instances of fibropapillomosis was recorded on the Mauritanian coastline. In Central Africa, there are three *C. mydas*-related feeding grounds where turtle fibropapillomatosis is known to be present: 1) Corisco Bay on the border with Gabon (Equatorial Guinea) where prevalence is estimated at 17% (FORMIA et al. 2007), 2) Principe Island in the Republic of Sao Tome and Principe with a prevalence of ~34% among juvenile and subadult individuals (LOUREIRO & MATOS, 2009, DUARTE et al. 2012), and 3) Loango Bay in Congo with a fibropapilloma prevalence of 9.25% (GIRARD 2014, GIRARD et al. 2013). However, little is known about how common this pathology really is in West Africa. Its existence was reported from Senegal and Gambia by BARNETT et al. (2004) and in Guinea-Bissau by CARRY et al. (2009). In 2007, 6.6% (N=274) of examined green turtles on Poilao Island had tumours. FRETEY & SOUMAH (2015) reported six cases of this disease among juveniles and subadults in the Marine Protected Area in the Tristao and Alcatraz Islands (Guinea). Currently, three factors are suspected to contribute to the spread of the fibropapilloma-causing herpes virus: pollution, metal ring tagging, and

leeches (GREENBLATT et al. 2004, GIRARD 2014). The only obvious type of pollution on the Mauritanian coast is the presence of plastic waste. No other industry than fishing exists along the entire Mauritanian coast. Second, a few turtles were tagged in West Africa during the breeding season and these were mainly females from Poilao Island. To date, we have never tagged a single turtle in Mauritania. Also, we have never observed leeches on freshly stranded and captured turtles. Altogether, the absence of these three fibropapilloma-related factors may partly explain the rarity of turtle fibropapilloma in Mauritanian green turtles.

Therefore, except for some cases of fibropapillomatosis (MINT HAMA & FRETEY 2014), poaching and sea turtles killed by hooks and fishing nets, most of the stranded individuals (*C. mydas* and *C. caretta*) did not show evidence of injuries. This may suggest that these individuals died from asphyxiation or drowning or from other unknown reasons, which did not result in evident physical injuries. Even though the exact causes of these sea turtle stranding events are not fully understood, we suspect that waste, in particular pieces of fishing gear such as nylon and plastic materials, may contribute significantly to the overall number of stranding events, compromising sea turtle survival in this region. Artisan and industrial fishing in Mauritanian waters may thus be partly responsible for the observed mortality of sea turtles. We must note that our data do not reveal the extent to which fishing impacts on sea turtle populations in Mauritania. Nonetheless, from our data presented in this study, it is evident that improvements in fishing regulations with a better control in Mauritanian fishing areas should help to reduce both the deliberate and accidental catching of sea turtles in Mauritanian waters.

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