



HAL
open science

Sea turtles in the Mediterranean Region MTSG Regional - Report 2020

Jacques Sacchi, Catherine Cesarini, Delphine Gambaiani, Françoise Claro,
Fanny Girard, Francois Poisson, Paolo Casale, Sandra Hochscheid, Yakup
Kaska, Aliko Panagopoulou

► **To cite this version:**

Jacques Sacchi, Catherine Cesarini, Delphine Gambaiani, Françoise Claro, Fanny Girard, et al.. Sea turtles in the Mediterranean Region MTSG Regional - Report 2020. Marine Turtle Specialist Group, pp.116-127, 2020. mnhn-04250153

HAL Id: mnhn-04250153

<https://mnhn.hal.science/mnhn-04250153>

Submitted on 19 Oct 2023

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Sea turtles in the Mediterranean Region

MTSG Regional Report 2020



© Sea Turtle Photography/Kostas Papafitsoros

Editors:

Paolo Casale, Sandra Hochscheid, Yakup Kaska, Aliko Panagopoulou

Marine Turtle Specialist Group

Recommended citation for this report:

Casale P., Hochscheid S., Kaska Y., Panagopoulou A. (Eds.) (2020). Sea Turtles in the Mediterranean Region: MTSG Annual Regional Report 2020. Report of the IUCN-SSC Marine Turtle Specialist Group, 2020.

Recommended citation for a chapter of this report:

AUTHORS (2020). CHAPTER-TITLE. In: Casale P., Hochscheid S., Kaska Y., Panagopoulou A. (Eds.). Sea Turtles in the Mediterr Region: MTSG Annual Regional Report 2020. Report of the IUCN-SSC Marine Turtle Specialist Group, 2020.

FRANCE

Jacques Sacchi *, Catherine Cesarini *, Delphine Gambaiani *, Françoise Claro **, Fanny Girard **, François Poisson ***

* RTMMF -SHF Réseau Tortues Marines de Méditerranée Française Société Herpétologique de France

** MNHN Muséum national d'Histoire Naturelle, UMS 2006 PatriNat

*** Ifremer centre Méditerranée, Laboratoire Halieutique Méditerranée

Acknowledgments: Eco-océan Institut, CIMA foundation, Cybelle Planète, ISPRA, ACCOBAMS, AAMP, AFB, Envirolgy, RTMMF observers.

1. RMU: Loggerhead turtle (*Caretta caretta*) Mediterranean

1.1. Distribution, abundance, trends

1.1.1. Nesting sites

No recognized nesting sites but four Loggerhead nests were recorded during these last ten years, two on the Provençal coast (St Tropez, 2006, 171 eggs; St Aygulf, 2016, 74 eggs), one on the coast of Languedoc (Maguelone, 2018, 60 eggs) and, last year, one in Corsica (Ghisonaccia, 2019; 120 eggs [21]) (Fig. 1). Moreover, several nesting attempts with nest remains have been observed on the Corsica coast (Porto Vecchio, 2002; San Nicolao, 2014; Cap Corse, 2016 [6, 19]).

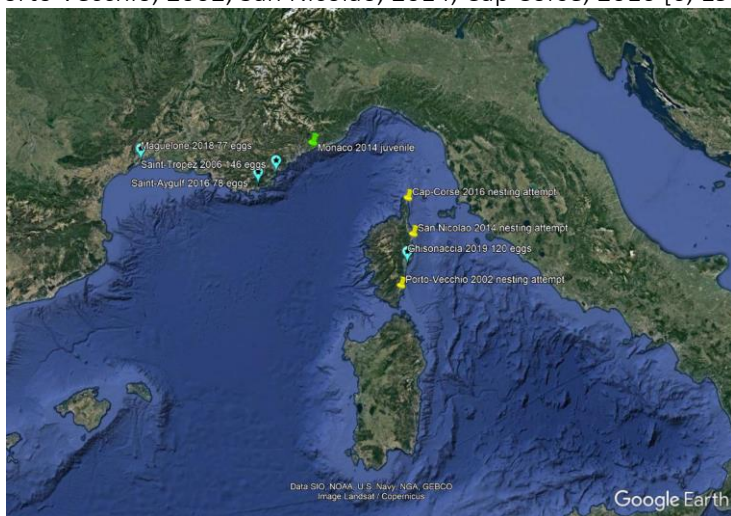


Fig. 1 [Nesting sites (blue pins) and attempts of nesting sites (yellow pins)]

1.1.2. Marine areas

The French Mediterranean waters lie from the French continental coast to South of the Corsica Mediterranean (Fig. 2). Most data on turtle occurrence and size derive from stranding data, fisheries by-catch data and at-sea observations collected by the French network RTMMF¹. From 2007 to 2019 around 1986 marine turtles were observed either caught, stranded or observed at sea (annual average of 150 individuals; Table 5) [2, 14, 17, 20, 21]. *Caretta caretta* is the major species observed with 96% of identified individuals, followed by *Dermochelys coriacea* (3%) and *Chelonia mydas* (1%). Most turtles

¹ Réseau Tortues Marines de Méditerranée Française

observed at sea, not clearly identified (n = 403) were likely loggerhead sub-adults.

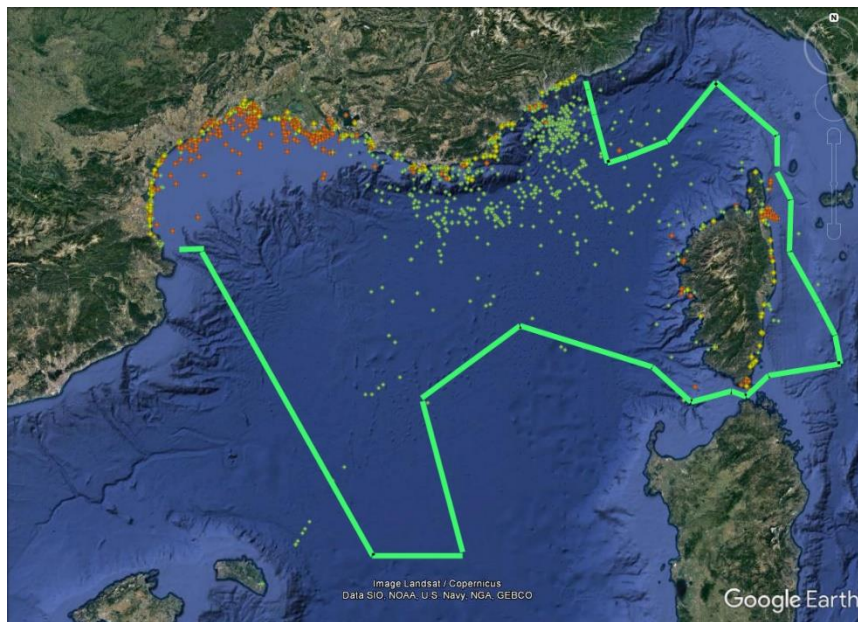
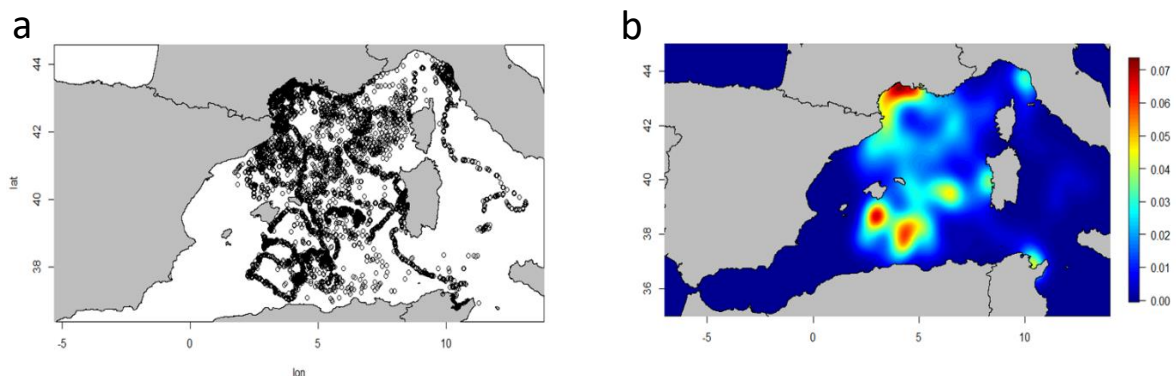


Fig. 2 [Distribution of *Caretta caretta* observations in French Mediterranean waters between 2007 and 2019 (green dots: Observations at sea; brown dots: captures; yellow dots: stranding; green line: limits of French EEZ)]

In addition to these data regularly collected by the RTMMF, 647 undetermined cheloniidae and 2 leatherbacks turtles were observed during aerial surveys in 2011, 2012, 2019 (SAMM) [16], in 2014, 2017 (Marineland Association) [2], and 2018 (ACCOBAMS) [17] (Table 5).

Moreover, the movements of 16 loggerhead turtles were tracked between 2008 and 2017 using telemetry techniques [Ref. 26, 27, 28, 29]. Satellite-transmitting archival tags were deployed on rescued turtles rehabilitated at the “Centre d’Etude et de Sauvegarde des Tortues marines de Méditerranée”, the Sea turtle Rescue Center (CESTMed²; Grau du Roi). All these turtles measured between 54 and 65 cm (CCL) and were released in the Gulf of Lions.

The tracks and the kernel density estimation plot of 10-year (2008-2017) turtle space-use showed that all the loggerhead turtle remained in western Mediterranean (Fig 3a), but tended to move south towards Italy, Spain and even down to north Africa (Fig. 3).



² Centre d’Etudes et de Sauvegarde des Tortues Marines de Méditerranée

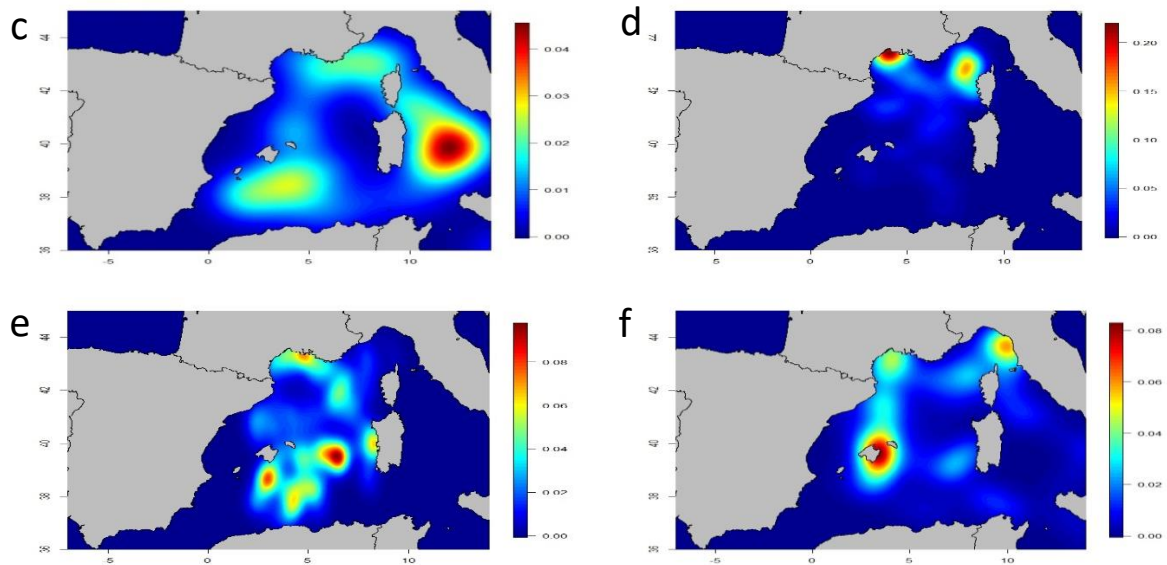


Fig. 3 [Movements and high space use areas occupied by 16 satellite-transmitting archival tagged loggerhead turtles between 2008 and 2017. (a) individual tracks and kernel density plot showing the major areas of prolonged residency for (b) entire dataset or combined per quarter (c) (January to March), (d) (April to June), (e) (July to September) or (f) (October to December) . These tags were funded within the scope of aregional programmes mainly led by CESTMed (Total foundation, Coca cola and other sponsors) and Ifremer (France Filière Pêche :FFP) during theSELPAL project conducted in close collaboration with commercial pelagic longliners from the Association Méditerranéenne des Organisations de Producteurs (AMOP)]

Interestingly, several individuals spent a significant time in lagunas off the French coast (étang de Berre, Leucate) and two turtles migrated to the Gulf of Oristano, an important area for mussel production. Densities of occurrences were estimated based on data collected over the entire study period and aggregated by trimester [26, 27] (Fig. 3).

It is important to note that these preliminary results were obtained using turtles that had remained in captivity for variable periods of time (up to several month) before they were tagged and released.

These data, along with stranding data, at sea observations and aerial surveys [16] suggest that the Loggerhead is present throughout the year long in French EEZ Mediterranean waters and occur all along French coasts (Table 6).

Digestive tract content analysis of dead specimens, satellite tracking and trawl by-catches suggest that the continental shelf of the Gulf of Lions is an important foraging and wintering area for sub-adult Loggerheads occurring in these waters. Other foraging areas are also suspected close to river mouths and lagoons of the Gulf of Lions and Corsica. Pelagic waters of Catalan Liguro-Provençal current could also be an important foraging area for juvenile loggerheads.

In addition, some individuals have been observed mating offshore in the eastern part of the Gulf of Lions.

While no migratory corridor has been clearly identified yet, preliminary genetic analyses of 99 blood and soft tissue samples from juveniles (including two turtles <10 cm and one embryo from the St Tropez 2006 nesting event) suggest that loggerheads entering the French EEZ may originate from three nesting areas: West Atlantic, East Atlantic and East Mediterranean [Ref. 30]. Overall, results from this study were difficult to interpret due to the low diversity of the genetic marker used (D-loop region of mitochondrial DNA). Therefore, complementary studies based on samples collected after 2015 will be needed to confirm the observed trends.

Attempts to estimate abundance were carried out based on aerial surveys over French EEZ waters (SAMM, 2011 -2012 and 2019, Fig. 4a&b; Marineland, 2014 and 2017)[Table 5] [Ref. 16] and recently in Mediterranean waters (ACCOBAMS Survey Initiative, 2018; Fig. 4c), [Table 5].

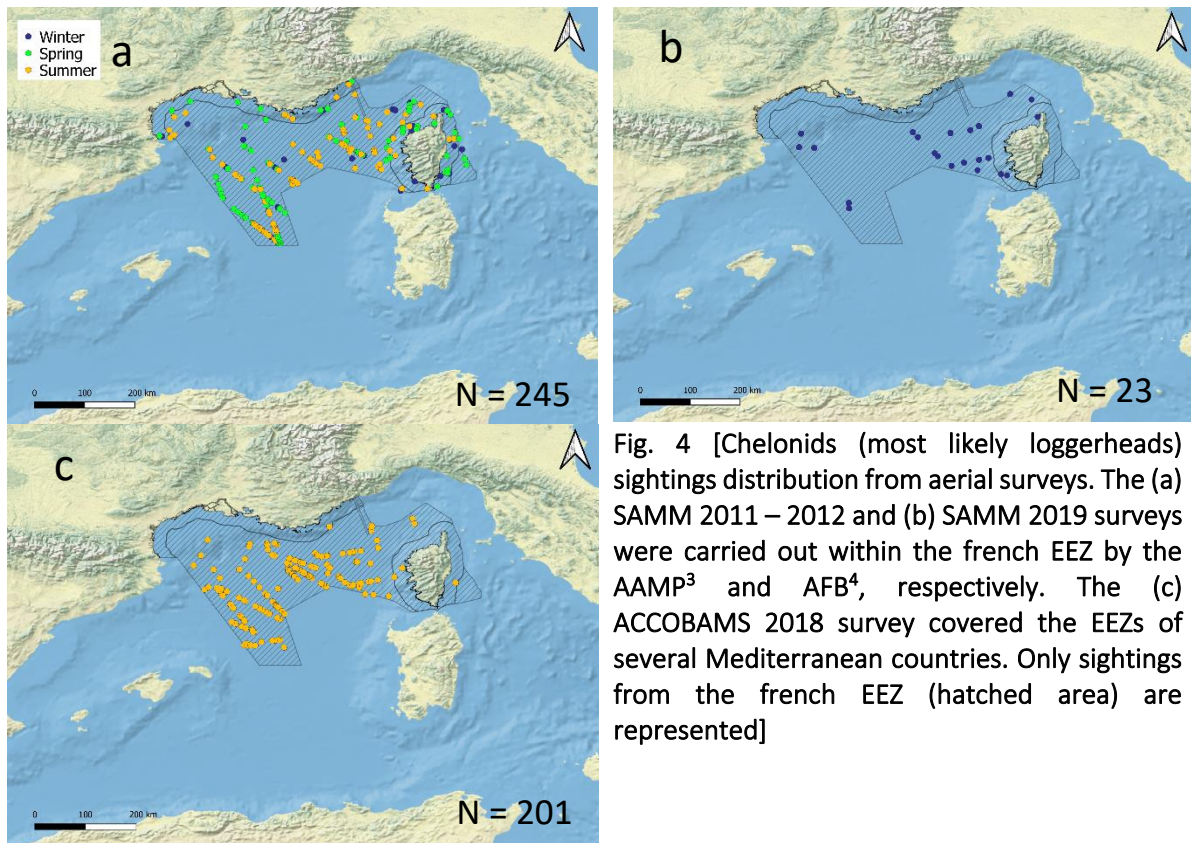
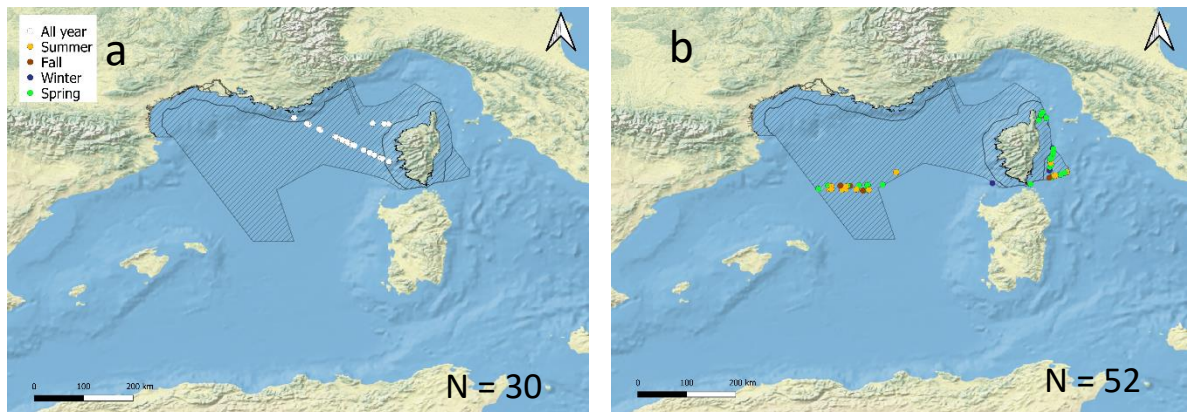


Fig. 4 [Cheloniids (most likely loggerheads) sightings distribution from aerial surveys. The (a) SAMM 2011 – 2012 and (b) SAMM 2019 surveys were carried out within the french EEZ by the AAMP³ and AFB⁴, respectively. The (c) ACCOBAMS 2018 survey covered the EEZs of several Mediterranean countries. Only sightings from the french EEZ (hatched area) are represented]

In addition, sea turtle at-sea observation data were collected by observers onboard ferries in the French Mediterranean. These initiatives were carried out by French (EcoOcéan institut, 2011-2018, Fig. 5a) and Italian (ISPRA, 2013-2017, Fig. 5b and Centro Internazionale in Monitoraggio Ambientale - Fondazione CIMA, 2009-2018, Fig. 5c) institutes [Table 5] within the Fixed Line Transects Mediterranean monitoring Network (FLT Med Net; ISPRA 2016) [Ref. 31].



³ Agence des Aires Marines Protégées
⁴ Agence Française pour la Biodiversité

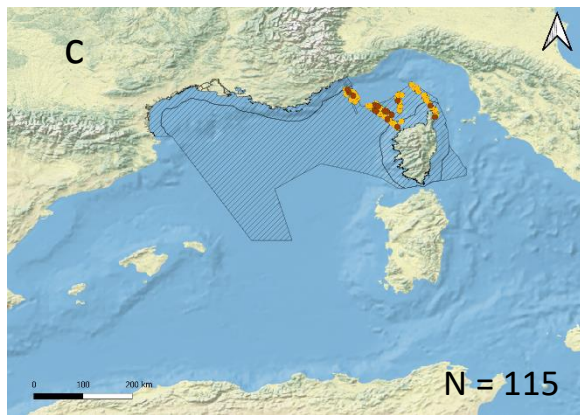


Fig. 5 [Loggerhead sightings distribution based on at-sea observations made by observers onboard ferries. Data collected by (a) EcoOcéan Institut between 2011 and 2018 in the french EEZ, and by (b) ISPRA and (c) the fondazione CIMA between 2013-2017 and 2009-2018, respectively. Only sightings from the french EEZ (hatched area) are represented]

While observations were recorded [Table 5], estimates of abundance or trends are not yet available.

1.2. Other biological data

72 % of measured loggerheads showed CCL between 35 and 65 cm [Tab. 7].

Sex determination is based on phenotypic characters for living specimens and tail length or gonads examination for dead turtles. Among 484 loggerheads examined between 2007 and 2019 (caught or stranded), 47 were Female, 19 Male and 418 unsexed individuals for which length was mainly less than 62 cm standard CCL.

1.3. Threats

1.3.1. Nesting sites

N/A

1.3.2. Marine areas

Given that the Gulf of Lions is potentially an important foraging and wintering area for Loggerheads, bycatch resulting from fishing activities is the most important threat in this area [Ref. 26]. Incidental capture is the main cause of identified mortality, with 34 captures per year on average and 7.3 deaths per year for all gear combined; gillnet and trammels are responsible for 51 % of mortality from all fishing techniques, followed by trawling (20 %). 63 % of trawl catches occur in winter time from November to end of January when trawlers are working in the wintering areas of the Gulf of Lions. Same seasonal patterns occur for turtles entangled in trap-net (fyke-net) set in shallow waters of lagoons. On the opposite, 68 % of catches by static nets occur from April to July (Table 6) [7, 8, 10].

After gillnetting, the second cause of loggerhead morbidity is vessel strikes, with three collisions per year resulting in two deaths per year. However, this number likely underestimates the real intensity of this pressure.

Entanglement of sea turtles is one of the main impacts of marine debris. Abandoned pieces of net are the most frequent material responsible for entanglement. Nevertheless, we find in our observations only 4 cases of loggerhead entangled in fishing materials (Table 8, e) [3, 4].

Ingestion of marine debris, which occurrence may reach 100% (Corsica) according to necropsy analysis, could be also an important cause of delayed morbidity and mortality but this remains difficult to evaluate to date [1, 5, 9, 11, 22].

1.4. Conservation

All sea turtle species and their habitats are protected by a national law (*Arrêté ministériel du 14 octobre 2005*) and France ratified the international conventions (Bern, Bonn, Barcelona, OSPAR) dedicated to environmental and species conservation, including sea turtle species. Furthermore, as European Member State, France is actively involved in the MSFD⁵ and Habitats Directive monitoring

⁵ Marine Strategy Framework Directive

and reporting processes. The Ministries and agencies in charge of fisheries and environment, as well as the national committee for fisheries, are involved in designing practical measures with NGOs. The permits procedure for operating on protected species is facilitated through a national scientific program (*Observatoire des Tortues Marines de France Métropolitaine*) which allows stranding networks to operate easily on the field (*Arrêté ministériel du 25 octobre 2016*). National funding has increased since the MSFD monitoring program has been launched.

At the moment, the main measures for conserving sea turtles in the French Mediterranean aim to mitigate bycatch, mostly through informing fishermen about onboard best practices to reduce post-release mortality, and rescue turtles in sea turtle rescue centers. Guidelines, technical sheets and a video have been designed and disseminated [Ref.23, 24, 25, 35]. In certain areas, the tight relationships with fishermen and their involvement in scientific programs (through collaborative and Participatory Action Research programs for instance) contribute to increase the chances of survival, since they feel included in conservation actions and are encouraged to bring back turtles to the rescue center. However, this effort should be extended to all the coastline. Mitigating the marine debris issue is one of the top priorities of the French State, and initiatives for cleaning the environment (ghost fishing gears, packaging) are encouraged through national calls for funding.

Since an increasing breeding activity has been observed on the French coastlines and nearby waters, it is recommended to pay a special attention to tracks on beaches. A program with sniffing dogs is currently under development for finding possible undetected nests. Furthermore, communication about the potential mounting of sea turtles on beaches has been initiated but should be developed.

1.5. Research

There is an important need to develop genetic analyses with the aim to determinate the origin of populations entering French Mediterranean waters, combined with skeleto-chronology analyses for assessing the age of individuals encountered in this area. These studies are planned to start in 2019-2020 as part of the MSFD monitoring program.

Knowledge on spatial and seasonal distribution obtained independently from fishery information is also urgently required in order to identify habitats and hot-spot areas. While around 25 satellite tags were used between 2003 and 2017 (Fig. 3; [Ref. 26]), a special effort on telemetry should be initiated. This would not only provide information of important habitats, but also inform management on by-catch reduction. For this purpose, aerial or sea survey should be carried out at the EEZ scale.

To help develop appropriate mitigating measures, knowledge on the intensity of by-catch due to various French fishing methods is also urgently needed; this study should be carried out based on the survey protocol adopted at the GFCM⁶ level.

The work on interactions between sea turtles and marine debris initiated by France [Ref. 1, 5, 9, 11, 32, 33, 34] led to a European project INDICIT I (2017-2019) followed by INDICIT II (2019-2021), supporting MSFD and the regional sea conventions OSPAR and Barcelona. Data on diet and marine debris ingestion based on digestive contents collected in France and by the INDICIT consortium should be published soon.

2. RMU: Green turtle (*Chelonia mydas*) Mediterranean

2.1. Distribution, abundance, trends

2.1.1. Nesting sites

Not applicable. This RMU does not breed on the French coast.

2.1.2. Marine areas

This species is only occasionally found in Mediterranean French waters but can be seen all year long [12, 13]; only 26 Green turtles were observed between 1965 and 2019 with 3 stranded, 6 captured, and 17 observed at sea; 19 of them have been recorded between 2007 and 2019 (Fig. 6).

⁶ General Fisheries Commission for the Mediterranean

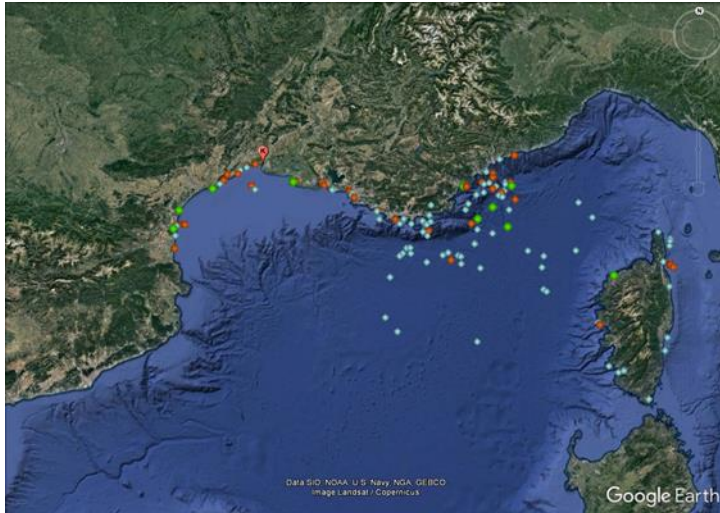


Fig. 6 [Distribution of observations of *Chelonia mydas* (green dots), *Dermochelys coriacea* (red dots), undetermined Cheloniidae (blue dots) and *Lepidochelys kempii* (red pin) between 2007 and 2019].

Their recorded CCL were between 31 to 50 cm.

No estimates of abundance or trends are available.

2.2. Other biological data

Only one male and 18 unsexed individuals were identified among the 19 green turtles recorded between 2007 and 2019.

2.3. Threats

2.3.1. Nesting sites

Not applicable

2.3.2. Marine areas

As for loggerhead, small scale coastal fishing is the main anthropic impacting activity (when Green turtles come near shore on seagrass beds) with 6 catches by coastal gill nets, 1 by longline and 1 by ghost net (trammel).

2.4. Conservation

Protection status in France is the same for all sea turtle species. No specific conservation measures have been developed.

2.5. Research

Tagging and genetic analyses could provide valuable information on the origin of green turtles coming into French waters.

3. RMU: Leatherback Turtle (*Dermochelys coriacea*) Atlantic (unknown)

3.1. Distribution, abundance, trends

3.1.1. Nesting sites

Not applicable (no nesting area in the Mediterranean Sea)

3.1.2. Marine areas

Leatherbacks can be observed in French Mediterranean waters all year long but in small numbers. From 2007 at 2019, 45 Dc were observed at the rate of 3.5/year either caught [7], stranded [7], observed at sea [29] or during aerial survey [1] (Fig. 6). Size recorded are between 142 and 190 cm CCLs.

3.2. Other biological data

No data

3.3. Threats

3.3.1. Nesting sites

Not applicable

3.3.2. Marine areas

Leatherbacks can be also affected by fishing activities, mainly through entanglement in surface long lining (6 with a mortality rate of 14% between 2007 and 2019).

Fatal injuries caused by vessel strikes were noted for two cases between 2007 and 2019.

3.4. Conservation

Protection status in France is the same for all sea turtle species. No specific conservation measures have been developed.

3.5. Research

Studies specifically focusing on the occurrence of Leatherback in Mediterranean waters are lacking. International tagging programs carried out on the two sides of the Atlantic may be useful.

4. Others

4.1. Kemp's turtle (*Lepidochelys kempii*) Atlantic (unknown)

Kemp's ridleys have been observed only twice in French Mediterranean waters (Fig. 6). The first one was caught in July 2001 [Ref.15]. The second Kemp's ridley was caught in the Gulf of Lions in July 2015 [18]. The turtle was freshly dead and had a CCL of 33.5 cm.

4.2. Hawksbill turtle (*Eretmochelys imbricata*) Atlantic (unknown)

Only five Hawksbill turtles were recorded in French Mediterranean waters between 37 and 44 cm of CCL, and since the last capture of one specimen in July 1989 there has been no more validated observation of this species until now.

References

1. BRAY, L., DIGKA, N., TSANGARIS, C., CAMEDDA, A., GAMBAIANI, D., DE LUCIA, G.A., MATIDDI, M., MIAUD, C., PALAZZO, L., PEREZ-DEL-OLMO, A., RAGA, J.A., SILVESTRI, C., KABERI, H., 2019. DETERMINING SUITABLE FISH TO MONITOR PLASTIC INGESTION TRENDS IN THE MEDITERRANEAN SEA. ENVIRONMENTAL POLLUTION 247, 1071-1077.
2. CATTEAU, S. 2017, OBSTORTUEMED, LA CAMPAGNE D'OBSERVATION DES TORTUES MARINES DE MÉDITERRANÉE. ANN. MUS. HIST. NAT. NICE, XXXII: 91-97.
3. CLARO F., DARMON G., LIRIA LOZA A., BRADAI M., DE LUCIA G.A., KABERI E., KASKA Y., LIRIA LOZA A., MATIDDI M., PHAM C.K. AND TOMÁS (2018). IS "ENTANGLEMENT" A RELEVANT INDICATOR OF IMPACT OF MARINE LITTER ON BIOTA? THE CONTRIBUTION OF THE INDICIT EUROPEAN PROJECT. 2018 J. 6TH IMDC, SAN DIEGO.
4. DARMON G., CLARO F., LIRIA LOZA A., MATIDDI M., MIAUD C., ATTIA EL HILI H., BRADAI M.N., CAMEDDA A., CHAIEB O., DE LUCIA G.A., KABERI H., KASKA Y., NOVILLO O., PARAMIO L., PHAM C.K., SILVESTRI C., SOZBILEN D., TOMÁS J., TSANGARIS C., VALE M., VANDEPERRE F., 2018 IMPACT OF LITTER ON SEA TURTLES AND MARINE FAUNA: AN EVALUATION OF INGESTION AND ENTANGLEMENT AT THE EUROPEAN AND REGIONAL SEA CONVENTION SCALES. 2018. INTERNATIONAL SYMPOSIUM ON SEA TURTLES TS 38TH KOBE, JAPAN (POSTER).
5. DARMON, GAMBAIANI, DELL'AMICO, SENEGAS, CATTEAU, SACCHI, BEFORT, CLARO, GALGANI, MIAUD. 2018 LITTER INGESTION BY DEAD AND ALIVE SEA TURTLES IN THE ATLANTIC AND THE

- MEDITERRANEAN FRENCH WATERS – LESSON FOR THE IMPLEMENTATION OF THE INDICATOR “DEBRIS INGESTED BY SEA TURTLES”. 2018. INTERNATIONAL SYMPOSIUM ON SEA TURTLES TS 38TH KOBE, JAPAN (POSTER).
6. DELAUGERRE, M. & CESARINI, C., 2004. CONFIRMED NESTING OF THE LOGGERHEAD TURTLE IN CORSICA. MARINE TURTLE NEWSLETTER, 104, 12.
 7. GAMBAIANI, D., 2017. PROJET D’ATTÉNUATION DES INTERACTIONS NÉGATIVES ENTRE LES ESPÈCES MARINES MENACÉES ET LES ACTIVITÉS DE PÊCHE: PÊCHERIES AU FILET MAILLANT DANS LA RÉGION CAMARGUAISE. MOU ACCOBAMS NO. 02/2016, 63 P
 8. GAMBAIANI, D., SENEGAS, J.B., DARMON, G., POISSON, F., SACCHI, J., CLARO, C., MIAUD, C., FOUR, A., RIALLAND, S., 2018. INVOLVEMENT OF FISHERMEN IN SEA TURTLE CONSERVATION: A CASE STUDY IN THE FRENCH MEDITERRANEAN SEA. POSTER PRESENTATION, 38TH ISTS KOBE, JAPAN.
 9. GAMBAIANI, D., MARTIN, J., DARMON, G., SABATTE, M.A., LEFEBVRE, C., MIAUD, C., 2018. DO TURTLES INGEST PLASTIC INADVERTENTLY? INNOVATIVE METHODS FOR THE STUDY OF DIET AND PLASTIC SELECTIVITY BY LOGGERHEADS IN THE NORTH WESTERN MEDITERRANEAN SEA. POSTER PRESENTATION, 6TH MEDITERRANEAN CONFERENCE ON MARINE TURTLES, CROATIA.
 10. GAMBAIANI, D., SENEGAS, J-B, CLARO, F., DARMON, G., FOUR, A., MAROBIN-LOUCHE, D., POISSON F., 2018. IMPLICATION DES PÊCHEURS DANS LA CONSERVATION: LE CAS DES PETITS MÉTIERS DE LA ZONE NATURA 2000 CAMARGUE. POSTER PRESENTATION, FAO FISH FORUM, ROME, ITALY.
 11. HANKE, G., GALGANI, F., WERNER, S., OOSTERBAAN, L., NILSSON, P., FLEET, D., KINSEY, S., THOMPSON, R., VAN FRANEKER, J.A., VLACHOGIANNI, T., ET AL., 2013. GUIDANCE ON MONITORING OF MARINE LITTER IN EUROPEAN SEAS. MSFD GES TECHNICAL SUBGROUP ON MARINE LITTER (TSG-ML), PUBLICATIONS OFFICE OF THE EUROPEAN UNION.
 12. LESCURE J., CATEAU S., SÉNÉGAS J.-B., OLIVER G., DE MASSARY J.-C., POISSON F., CESARINI C., SACCHI J., 2015, PRÉSENCE DE LA TORTUE VERTE, CHELONIA MYDAS (LINNAEUS, 1758), EN MÉDITERRANÉE FRANÇAISE. BULL. SOC. HERP. FR. 156, 1–14.
 13. MASCORT, RAMON. (2018). LA TORTUGA VERDE (CHELONIA MYDAS L.) EN EL MEDITERRÁNEO OCCIDENTAL: DATOS HISTÓRICOS, BIOMÉTRICOS Y ECOLÓGICOS. THE GREEN SEA TURTLE (CHELONIA MYDAS L.) IN THE WESTERN MEDITERRANEAN: HISTORICAL, BIOMETRIC AND ECOLOGICAL DATA. CONFERENCE: XV CONGRESO LUSO-ESPAÑOL DE HERPETOLOGÍA / XIX CONGRESO ESPAÑOL DE HERPETOLOGÍA (AHE), AT SALAMANCA, 5-8 DE SEPTIEMBRE DE 2018.
 14. NIVIÈRE M. ET CLARO F.(2018). RAPPORT D’ACTIVITÉ 2016-2017 DE L’OBSERVATOIRE DES TORTUES MARINES DE FRANCE MÉTROPOLITAINE. UMS 2006 PATRIMOINE NATUREL. AFB-CNRS-MNH, PARIS. 42PP.
 15. OLIVER G. & PIGNO A., 2005 –PREMIÈRE OBSERVATION D’UNE TORTUE DE KEMP, LEPIDOCHELYS KEMPII (GARMAN, 1880), (REPTILIA, CHELONII, CHELONIIDAE) SUR LES CÔTES FRANÇAISES DE MÉDITERRANÉE. BULL. SOC. HERP. FR., 116: 5-12.
 16. PETTEX E., STÉPHAN E., DAVID L., FALCHETTO H., DORÉMUS G., CANNEYT O.V., STERCKEMAN A., BRETAGNOLLE V., RIDOUX V., 2012, SUIVI AÉRIEN DE LA MÉGAFaUNE MARINE DANS LA ZEE ET ZPE DE FRANCE MÉTROPLITAINE ETE 2012 RAPPORT DE CAMPAGNE.
 17. ACCOBAMS-[HTTPS://ACCOBAMS.ORG/FR/DONNEES-DE-LACCOBAMS-SURVEY-INITIATIVE/](https://accobams.org/fr/donnees-de-laccobams-survey-initiative/)
 18. SÉNÉGAS J.B., SACCHI J., J. LESCURE, 2016 SECONDE OBSERVATION D’UNE TORTUE DE KEMP LEPIDOCHELYS KEMPII (GARMANN, 1880), EN MÉDITERRANÉE FRANÇAISE. BULL. SOC. HERP. FR. (2016) 158: 17-21.
 19. SÉNÉGAS, J.B., S. HOCHSCHEID, J.M. GROUL, B. LAGARIGUE & F. BENTIVEGNA. 2009. DISCOVERY OF THE NORTHERNMOST LOGGERHEAD SEA TURTLE (CARETTA CARETTA) NEST. MARINE BIODIVERSITY RECORDS 2: 1-4.
 20. OLIVER G., 2009, LES TORTUES MARINES DES CÔTES FRANÇAISES DE MÉDITERRANÉE, UNIVERSITÉ DE PERPIGNAN-VIA DOMITIA ET RÉSEAU TORTUES MARINES DE MÉDITERRANÉE FRANÇAISE, 6P

21. GÉRIGNY O., CLARO F., MOISSON P., FLORI G., GALGANI F., GAMBIAIANI D. & CESARINI C., 2019. HATCHING EVENTS OF THE LOGGERHEAD TURTLE IN CORSICA ISLAND, FRANCE. MARINE TURTLE NEWSLETTER.
22. CLARO F. AND HUBERT. 2011. IMPACT DES MACRODÉCHETS SUR LES TORTUES MARINES EN FRANCE MÉTROPOLITAINE ET D'OUTRE-MER. RAPPORT GTMF-SPN 1. MNHN-SPN, PARIS, 51P.
23. MNHN-GTMF, CNPMM, MEDDE, IFREMER 2012. LIBÉRATION DES TORTUES MARINES CAPTURES LORS DES ACTIVITÉS DE PÊCHE EN MÉDITERRANÉE FRANÇAISE. FICHES TECHNIQUES À L'USAGE DES PROFESSIONNELS DE LA PÊCHE. 1. CLÉ D'IDENTIFICATION DES TORTUES MARINES DE MÉDITERRANÉE; 2. CAS DE LA PÊCHE AU FILET; 3. CAS DE LA PÊCHE AU CHALUT; 4. RÉACTIVITÉ- RÉANIMATION- LIBÉRATION; 5. CAS DE LA PÊCHE À LA PALANGRE; 6. LISTE DES OUTILS NÉCESSAIRES. PARIS, FRANCE. 6PP.
24. MNHN, 2013. PROTOCOLE À SUIVRE LORS DE LA CAPTURE DE TORTUES MARINES PAR LES ENGINS DE PÊCHE PROFESSIONNELLE. VIDEO IN FRENCH LANGUAGE. PARIS, FRANCE.
25. POISSON F., WENDLING B., CORNELLA D., SEGORB C. 2015. GUIDE DE BONNES PRATIQUES POUR RÉDUIRE LA MORTALITÉ DES ESPÈCES SENSIBLES CAPTURÉES ACCIDENTELLEMENT PAR LES PALANGRIERS PÉLAGIQUES FRANÇAIS EN MÉDITERRANÉE. PROJETS SELPAL ET RÉPAST. 60 PAGES.
26. POISSON F., J. SACCHI, J.B. SENEGAS, S. CATTEAU, DEMARCQ H., CESARINI C. , D. GAMBIAIANI POTENTIAL FISHERIES INTERACTIONS WITH SEA TURTLES ON THE FRENCH MEDITERRANEAN COAST: INSIGHTS FROM OBSERVERS AND SATELLITE DATA ISTS38_KOBE, 18-23 FEB 2018
27. POISSON F., MÉTRAL L., BRISSET B., WENDLING B., CORNELLA D., SEGORB C., MARCHAND M., CUVILLIERS P., GUILBERT G., BAILLEUL D., ARNAUD-HAOND S. SÉLECTIVITÉ DE LA FLOTTILLE PALANGRIÈRE FRANÇAISE CIBLANT LE THON ROUGE SUR LA CÔTE MÉDITERRANÉENNE FRANÇAISE, 2017. RAPPORT DE FIN DE PROJET. PROJET SELPAL. 125P.
28. STELLARIS (2020). [HTTP://WWW.STELLARIS-ASSO.ORG/TRACKING_PAGE/](http://www.stellaris-asso.org/tracking_page/)
29. CESTMED (2020). [HTTP://WWW.CESTMED.ORG/SUIVI/](http://www.cestmed.org/suivi/)
30. SAVELLI M.P. 2015. GÉNÉTIQUE DES POPULATIONS ET ORIGINE DES TORTUES CAOUANNE (CARETTA CARETTA) DE MÉDITERRANÉE FRANÇAISE. RAPPORT DE MASTER 1. UNIVERSITÉ DES SCIENCES ET TECHNIQUES DU LANGUEDOC. 24 PP.
31. ISPRA, 2016. AGREEMENT "FIXED LINE TRANSECT MONITORING USING FERRIES AS PLATFORM OF OBSERVATION FOR MARINE MEGA AND MACRO FAUNA AND MAIN THREATS". TECHNICAL ANNEX I - MONITORING PROTOCOL FOR CETACEANS AND SEA TURTLES. PP.19.
32. DARMON, G., MIAUD, C., CLARO, F., DOREMUS, G., & GALGANI, F., 2017. RISK ASSESSMENT REVEALS HIGH EXPOSURE OF SEA TURTLES TO MARINE DEBRIS IN FRENCH MEDITERRANEAN AND METROPOLITAN ATLANTIC WATERS. DEEP SEA RESEARCH PART II: TOPICAL STUDIES IN OCEANOGRAPHY, 141, 319–328. DOI:10.1016/J.DSR2.2016.07.005.
33. DARMON, G., GAMBIAIANI, D., DELL'AMICO, F., SÉNÉGAS J.B., CATTEAU, S., SACCHI, J., BEFORT, J., CLARO, C., GALGANI, F., MIAUD, C., 2018. LESSON FOR THE IMPLEMENTATION OF THE INDICATOR "DEBRIS INGESTED BY LOGGERHEAD AND LEATHERBACK TURTLES": COMPARISON BETWEEN THE ATLANTIC AND THE MEDITERRANEAN FRENCH FACADES FROM DEAD AND LIVE INDIVIDUALS. POSTER PRESENTATION, 38TH ISTS KOBE, JAPAN.
34. DARMON, G., GAMBIAIANI, D., LEFEBVRE, C., MARTIN, J., SABATTE, M.A, MIAUD, C., 2018. UNE MER DE DÉCHETS : MISE EN PLACE DE PROTOCOLES DE QUANTIFICATION ET DE PRESSION SUR LA BIODIVERSITÉ. PRÉSENTATION POSTER, JOURNÉE D'INAUGURATION DE LA COLLECTION BEV AU CEFE DE MONTPELLIER.
35. SACCHI J., CH. EGGERT, 2018 OBSERVATOIRE DES TORTUES MARINES DE FRANCE MÉTROPOLITAINE 2018. GUIDE L'OBSERVATEUR DU RÉSEAU TORTUES MARINES DE MÉDITERRANÉE FRANÇAISE. 22P. MNHN, PARIS, FRANCE.

Acronyms

AAMP Agence des aires marines protégées (now called Office français pour la Biodiversité)
ACCOBAMS Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area
AFB Agence Française pour la Biodiversité (now called Office français pour la Biodiversité)
AMOP Association Méditerranéenne des Organisations de Producteurs
CESTMed Centre d'Etude et de Sauvegarde des Tortues marines de Méditerranée
CIMA foundation Centro Internazionale in Monitoraggio Ambientale
EEZ Exclusive Economic Zone
FLT Med Net Fixed Line Transects Mediterranean monitoring Network
GFCM General Fisheries Commission for the Mediterranean
INDICIT European project "Implementation Of Indicators Of Marine Litter On Sea Turtles And Biota In Regional Sea Conventions And Marine Strategy Framework Directive Areas"
ISPRA Istituto Superiore per la Protezione e la Ricerca Ambientale
MNHN Muséum national d'Histoire Naturelle
MSFD Marine Strategy Framework Directive
RMU Regional Management Unit
RTMMF Réseau Tortues Marines de Méditerranée Française
SAMM campaign "Suivi aérien de la Mégafaune marine"
SELPAL research project "Sélectivité Palangre"
SHF Société Herpétologique de France
TED Turtle Excluder Device

Table 1: Main biology and conservation aspects of sea turtle Regional Management Units (RMU) occurring in France.

TOPIC	REGIONAL MANAGEMENT UNIT					
	CC- MED	Re f #	CM- MED	R ef #	DC- ATL	Ref #
Occurrence						
Nesting sites	Y		N		n/a	
Pelagic foraging grounds	JA		Y		n/a	
Benthic foraging grounds	Y	14 , 20	n/a		n/a	
Key biological data						
Nests/yr: recent average (range of years)	n/a		n/a		n/a	
Nests/yr: recent order of magnitude	n/a		n/a		n/a	
Number of "major" sites (>20 nests/yr AND >10 nests/km yr)	n/a		n/a		n/a	
Number of "minor" sites (<20 nests/yr OR <10 nests/km yr)	n/a		n/a		n/a	

Nests/yr at "major" sites: recent average (range of years)	n/a		n/a		n/a	
Nests/yr at "minor" sites: recent average (range of years)	n/a		n/a		n/a	
Total length of nesting sites (km)	n/a		n/a		n/a	
Nesting females / yr	n/a		n/a		n/a	
Nests / female season (N)	n/a		n/a		n/a	
Female remigration interval (yrs) (N)	n/a		n/a		n/a	
Sex ratio: Hatchlings (F / Tot) (N)	n/a		n/a		n/a	
Sex ratio: Immatures (F / Tot) (N)	n/a		n/a		n/a	
Sex ratio: Adults (F / Tot) (N)	n/a		n/a		n/a	
Min adult size, CCL or SCL (cm)	72 CCL		n/a		n/a	
Age at maturity (yrs)	n/a		n/a		n/a	
Clutch size (n eggs) (N)	n/a		n/a		n/a	
Emergence success (hatchlings/egg) (N)	n/a		n/a		n/a	
Nesting success (Nests/ Tot emergence tracks) (N)	n/a		n/a		n/a	
Trends						
Recent trends (last 20 yrs) at nesting sites (range of years)	n/a	n/ a	n/a		n/a	
Recent trends (last 20 yrs) at foraging grounds (range of years)	n/a		n/a		n/a	

Oldest documented abundance: nests/yr (range of years)			n/a		n/a	
Published studies						
Growth rates	N		N		N	
Genetics	N		N		N	
Stocks defined by genetic markers	N		N		N	
Remote tracking (satellite or other)	Y		N		N	
Survival rates	N		N		N	
Population dynamics	N		N		N	
Foraging ecology (diet or isotopes)	Y		N		N	
Capture-Mark-Recapture	N		N		N	
Threats						
Bycatch: presence of small scale / artisanal fisheries?	Y (PLS,GND, GNT, OTB)	7, 8, 10	Y (PLS,GND, GNT, OTB)		Y (PLS, GND, GNT)	
Bycatch: presence of industrial fisheries?	N		N		N	
Bycatch: quantified?	Y		Y		Y (PLS, GND, GNT)	
Take. Intentional killing or	N		N		N	

exploitation of turtles						
Take. Egg poaching	n/a		n/a		n/a	
Coastal Development. Nesting habitat degradation	n/a		n/a		n/a	
Coastal Development. Photopollution	Y		n/a		n/a	
Coastal Development. Boat strOkes	Y		Y		Y	
Egg predation	n/a		n/a		n/a	
Pollution (debris, chemical)	y	1, 3, 4,5,11	n/a		n/a	
Pathogens	Y		n/a		n/a	
Climate change	Y		n/a		n/a	
Foraging habitat degradation	y		n/a		n/a	
Other	Y (see text)		Y (see text)		N	
Long-term projects (>5yrs)						
Monitoring at nesting sites (period: range of years)	n/a		n/a		n/a	
Number of index nesting sites	n/a		n/a		n/a	
Monitoring at foraging sites (period: range of years)	n/a		n/a		n/a	
Conservation						
Protection under national law	Y		Y		Y	

Number of protected nesting sites (habitat preservation) (% nests)	n/a	n/a	n/a	n/a	n/a	
Number of Marine Areas with mitigation of threats	0		0		0	
N of long-term conservation projects (period: range of years)					0	
In-situ nest protection (eg cages)	n/a		n/a		n/a	
Hatcheries	n/a		n/a		n/a	
Head-starting	N		N		N	
By-catch: fishing gear modifications (eg, TED, circle hooks)	N		N		N	
By-catch: onboard best practices	Y	7, 8,10,23, 24,25	Y		n/a	
By-catch: spatio-temporal closures/reduction	N	N	N	N	N	
Other	Y (see text)	Y (see text)	Y (see text)	Y (see text)	Y (see text)	

Table 5. Annual number of sea turtles recorded per type of observation from 2007 to 2019

Cc	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Average	%	
Captured	18	25	17	20	42	29	12	41	42	63	75	43	18	34	32%	445
Stranded	20	5	6	8	9	13	6	14	14	26	38	29	17	16	15%	205
Obs. at sea	13	5	19	14	70	4	62	108	57	94	174	72	106	61	58%	798
Total	51	35	42	42	121	46	80	163	113	183	287	144	141	106		1448
Ferry (EcoOcean)					3				6	9	5	7		-	-	30
Ferry (ISPRA)							6	12	10	10	14			-	-	52
Ferry (CIMA)			47	16	3	0	7	9	11	6	9	7		-	-	115
Total ferry obs.			47	16	6	0	13	21	27	25	28	14				197
Dc	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Average	%	
Captured	0	0	0	0	0	0	0	0	0	6	1	0	0	1	16%	7
Stranded	0	0	1	1	0	0	0	0	0	3	0	2	0	1	16%	7
Obs. at sea	2	0	1	1	0	2	2	3	1	11	6	2	0	2	70%	31
Total	2	0	1	2	0	2	2	3	1	20	7	4	0	3		44
Ferry (EcoOcean)					0				0	0	0	0				0

Ferry (ISPRA)							0		0	0	0					0
Ferry (CIMA)			0	0	0	0	0	0	0	0	0	0				0
Total ferry obs.			0	0	0	0	0	0	0	0	0	0				0
Cm	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Average	%	26169
Captured								2				0		-	-	2
Stranded				1			1		1			0		-	-	3
Obs. at sea	0	0	0	1	0	0	1	2	0	1	3	1	4	1		13
Total	0	0	0	2	0	0	2	4	1	1	3	1	4	1	99%	18
Ferry (EcoOcean)					1				0	0	0	0				1
Ferry (ISPRA)							0		0	0	0					0
Ferry (CIMA)			0	0	0	0	0	0	0	0	0	0				0
Total ferry obs.			0	0	1	0	0	0	0	0	0	0				1
Cheloniidae	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Average	%	
Captured (RTMMF) nd			1							4	3					8
Stranded (RTMMF) nd		2	2	2	1					4	3	2				16
Obs. at sea (RTMMF) nd	15	2	164	8	1	22	20	2		26	56	32	31	32		379

Aerial surveys (SAMM)					18	363							23	-	-	404
Aerial surveys (ASI/ACCOBAMS)												201		-	-	201
Aerial surveys (MarineLand)			17					10		3	12			-	-	42
Dc	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Average	%	
Aerial surveys (SAMM)					0	0							0	-	-	0
Aerial surveys (ASI/ACCOBAMS)												1		-	-	1
Aerial surveys (MarineLand)										1				-	-	1

Table 6. Monthly distribution of loggerhead number par type of observation from 2007 to 2019

Cc	Jan	Feb	Mar	Apr	May	Jun	Jul	Au	Spt	Oct	Nov	Dec	Total
Capture d	24	9	16	47	48	99	32	25	25	37	56	27	445
Stranded	9	4	10	24	18	51	36	19	7	13	11	3	205
Obs at sea	1	1	5	17	62	113	212	223	109	47	3	5	798
Total	34	14	31	88	128	263	280	267	141	97	70	35	1448

Table 7. Distribution of CCL in cm for loggerhead from 2007 to 2019

<20	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60	60-65	65-70	70-75	75-80	80-85	>85	Total
1	4	11	50	95	82	65	46	48	60	37	27	13	5	4	548

Table 8. Monthly distribution of catch of loggerhead per type of fishing gear from 2007 to 2019 (Ent : entrapment in abandoned piece of fishing gears)

Month	Trawl	Gillnet	Longline	Trapnet	Others	Ent	Co	Po	Total
		& trammel			. gears				
Jan	21	1		1	1		2	1	24
Feb	6	1		1	1				9
Mar	10	3	2		1	1	3	1	17
Apr	19	22	1		5	3	2	1	50
May	10	26	8		4	1	3		49
Jun	5	66	10		18	6	9	1	105
Jul	3	20	5		4		13	1	32
Au	5	18			2	5	5	1	30
Sep	2	12	6		5		2		25
Oct	14	14	6		3	2	2	1	39
Nov	42	11			3		2	1	56
Dec	20	4	1		2	1	2		28
Total	157	198	39	2	49	19	45	8	464
mortality	19	49	7	2	10	8	27	3	125
Mortality rate/interaction	12%	25%	18%	100%	20%	42%	60%	38%	
Total Mortality rate	15%	39%	6%	2%	8%	6%	22%	2%	

Table 9. Mortality per type of interaction and per species (2007- 2019)

interactions	Cc	Cm	Dc	Nd	Total

Fishing *	95			1	96
Collisions	27		2	3	32
Pollution	3				3
Nd	192	4	8	26	230
Total	317	4	10	30	361

* including entrapment in loss fishing materials

Table 3. International conventions protecting sea turtles and signed by France.

International Conventions	Signed	Binding	Compliance measured and reported	Species	Conservation actions	Relevance to sea turtles
Barcelona Convention	y	y	y	CM, CC, DC	to assess and control marine pollution to ensure sustainable management of natural marine and coastal resources; to integrate the environment in social and economic development; to protect the marine environment and coastal zones through prevention and reduction of pollution, and as far as possible, elimination of pollution, whether land or sea-based; to protect the natural and cultural heritage;	Specific Action Plan for the conservation of Mediterranean Marine Turtles with objectives: Development, implementation and enforcement of legislation; • Protection and effective management of nesting areas (include adjacent sea); • Protection and management of feeding, wintering and mating areas and key migration passages; • Minimization of incidental catches and elimination of intentional killings. • Restoration of degraded nesting beaches

Convention on Biological Diversity	y	y	y	AL	<p>a) Establish a system of protected areas or areas where special measures need to be taken to conserve biological diversity;(b) Develop, where necessary, guidelines for the selection, establishment and management of protected areas or areas where special measures need to be taken to conserve biological diversity;(c) Regulate or manage biological resources important for the conservation of biological diversity whether within or outside protected areas, with a view to ensuring their conservation and sustainable use;(d) Promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings;(e) Promote environmentally sound and sustainable development in areas adjacent to protected areas with a view to furthering protection of these areas;(f) Rehabilitate and restore degraded ecosystems and promote the recovery of threatened species, inter alia, through the development and implementation of plans or other management strategies;(g) Establish or maintain means to regulate,</p>	
------------------------------------	---	---	---	----	--	--

				<p>manage or control the risks associated with the use and release of living modified organisms resulting from biotechnology which are likely to have adverse environmental impacts that could affect the conservation and sustainable use of biological diversity, taking also into account the risks to human health;(h) Prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species;(i) Endeavour to provide the conditions needed for compatibility between present uses and the conservation of biological diversity and the sustainable use of its components;(j) Subject to its national legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilization of such knowledge,</p>	
--	--	--	--	--	--

					<p>innovations and practices;(k) Develop or maintain necessary legislation and/or other regulatory provisions for the protection of threatened species and populations;(l) Where a significant adverse effect on biological diversity has been determined pursuant to Article 7, regulate or manage the relevant processes and categories of activities; and(m) Cooperate in providing financial and other support for in-situ conservation outlined in subparagraphs (a) to (l) above, particularly to developing countries.</p>	
Convention on the	y	y	y			

International Conventions	Signed	Binding	Compliance measured and reported	Species	Conservation actions	Relevance to sea turtles
Conservation of Migratory Species of Wild Animals						
Convention on International Trade in Endangered Species of Wild Fauna and Flora	y	y	y	CC, CM, DC, EI, Ek		
Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention)	y	y	y		promote national conservation policies promote measures against pollution promote educational and informative measures sco-ordinate efforts to protect migratory species establish legislative and administrative measures	

Table 4. Sea turtle conservation projects in France

#	RMU	Country	Region / Location	Project Name or descriptive title	Key words	Start date	End date	Leading organization	Public/Private	Collaboration with	Reports / Information material	Current Sponsors	Primary Contact (name and Email)
T4.1	CC-Mediterranean, CC-Atlantic Northeast, CC-Atlantic Northwest	France, Italy, Spain, Greece, Portugal, Turkey, Tunisia	EU, BARCELONA AND OSPAR CONVENTIONS	INDICIT (Implementation Of The Indicator Of Marine Litter On Sea Turtles And Biota In Regional Sea Conventions And Marine Strategy Framework Directive Areas)	marine litter, bio-indicator, marine strategy framework directive	01/02/2017	01/02/2019	CNRS-EPHE, Center of functional and evolutionary ecology, Montpellier, France	Public	CNR-IAMC (IT), DEKAMER (TR), FRCT (PT), HCMR (GR), IMAR (PT), INSTM (TN), ISPRA (IT), MNHN (FR), ULPGC (ES), UNIVERSITY OF VALENCIA (ES), SZN (IT)	https://indiciteuropa.eu/	EU	coordination@indiciteuropa.eu

T4 .2	CC- Mediterranean, CC- Atlantic Northeast, CC- Atlantic Northwest	France	France MAINLAND	OBSERVATOIRE DES TORTUES MARINES DE France METROPOLITAINE	stranding, species occurrence and distribution, rescue, anthropogenic impacts, observers, samples storage, tagging, training	Museum National d'Histoire naturelle	SHF RTMMF, Aquarium La Rochelle RTMAE, OFB French office for biodiversity	http://gtmf.mnhn.fr/25-oct-2016-arrete-donnant-subdelegation-au-mnhn-pour-observatoire-des-tortues-marines-en-france-metropolitaine/	claro@mnhn.fr
----------	---	--------	--------------------	---	---	--	---	---	--