Conservation Plan proposal for the loggerhead turtle *(Caretta caretta)* in the Spanish Mediterranean

First phase 2007 -2012

Developed in the context of the EC LIFE Nature Project

CONSERVATION OF CETACEANS AND SEA TURTLES IN MURCIA AND ANDALUCÍA

LIFE02NAT/E/8610

Sociedad Española de Cetáceos

Action A2 "Management Process" FINAL DRAFT
STEERING COMMITTEE – EXTERNAL ADVISORY COMMITTEE
July 2006

LTCP making process timeline

2005

October
- Deadline first draft for review with LIFE02NAT/E/8610 Steering Committee, External Management and Monitoring Advisory Committee and main action stakeholders

- Sea turtle bycatch coordination meeting

November
- Second phase of bycatch mitigation measure experiments – Italian National Convention on Cetaceans and Marine Turtles (LIFE03NAT/IT/000163)

2006

February
- Deadline revised second draft with inclusion of research programme results of actions D-5 and D-10

- LIFE steering committee review – presentation and discussion with LIFE External Management and Monitoring Advisory Committee

March
- Deadline 2nd review process (Scientific Committee, NOAA Fisheries, WIDECAST, Spanish Oceanographic Institute, CRAM, CARBOPESCA)

- Final report of research carried out in Action D-5 (Analysis of fishery observer data and sea turtle satellite tracking study)

April
- Presentation of final draft to Mediterranean Sea Turtle workshop at World Sea Turtle Conference (Crete 2 – 8 April)

June
- End of LIFE02NAT/E/8610 – Presentation of the final version of LTCP proposal for EC and relevant authorities
- International Cooperation Workshop – Puntarenas, Costa Rica 10-18 June

July - August
- Final revision by Steering Committee

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6. DEFINING THE BASELINES
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A - EXECUTIVE SUMMARY

The particular spatial requirements of marine pelagic species as the loggerhead turtle or the bottlenose dolphin pose a series of important challenges for biodiversity conservation frameworks.

The first of these challenges is certainly our lack of basic knowledge on the loggerhead turtle populations we are dealing with in Europe and the Mediterranean. In the recent history of wildlife conservation, it is precisely with respect to sea turtles that we can observe some of the best examples of why we need to base our management actions on science.

However, obtaining data of these great pelagics at sea is both extremely expensive and logistically difficult, and our biodiversity conservation frameworks require tools that are cost efficient.

Law 4/1989, of March the 27th, for the “Conservation of the Natural Spaces and the Wild Flora and Fauna”, demands the writing of Conservation Plans, and in its case, the protection of the habitat, for species catalogued as "vulnerable".

The elaboration and approval of these plans corresponds to the Autonomous Communities. However, given the characteristics of the species, it is important that regional conservation efforts are carried out under the umbrella of more global frameworks, as the Habitat Directive. The main role of this Loggerhead turtle Conservation Plan is therefore to provide a guide to coordinate actions to achieve a series of common conservation goals.

This coordination is not only intended to link and coordinate regional, national and international biodiversity conservation frameworks, but also to provide a bridge between the diverse relevant authorities that need to intervene in the actions of the conservation plan at each of these levels. It is with this purpose, that the LTCP aims also to contribute to the development of a “National Strategy for the Conservation of the Loggerhead turtle in the Mediterranean”.

The present document outlines the process followed for the development of a Conservation Plan proposal within the context of the LIFE Nature project “Conservation of cetaceans and sea turtles in Murcia and Andalucía”. The process focuses primarily on the establishment of management measures based on a scientific foundation, highlighting the importance of baseline data for the establishment of adequate conservation objectives and monitoring as an essential tool for adjusting actions to achieve these objectives. The result of the process is the establishment of a series of general guidelines as well as concrete actions to be carried out by each of the involved relevant authorities and actors involved.

But perhaps the most interesting aspect of this process is the result of regular meetings held with relevant authorities and other stakeholders, discussing the concrete aspects of possible management actions to be included in the LTCP. Direct involvement and implication of stakeholders in the process has provided a strong support to the feasibility and efficiency of the LTCP actions.

B - INTRODUCTION

B.1. THE LIFE NATURE PROJECT "CONSERVATION OF CETACEANS AND SEA TURTLES IN MURCIA AND ANDALUSIA" – LIFE02NAT/E/8610

In July of 2002 the Spanish Cetacean Society initiated a four year European Commission LIFE Nature project with the partnership of the Spanish Ministry of Agriculture, Food and Fisheries (SG Maritime fisheries) and Environment Ministry (DG of Biodiversity and DG of Coasts), the regional government of Andalusia, Nature Conservation and Fisheries agencies (Junta Andalusia – CAP, CMA), the Regional government of Murcia Nature Conservation and Fisheries agencies (CAP, CMA) and the University of Cadiz (LAV).

The LIFE Nature project LIFE02NAT/E/8610 – "Conservation of Cetaceans and Sea Turtles in Murcia and Andalusia" was conceived as the follow-up of the "Mediterranean Project" (DGCN 2002), a research programme of the Environment Ministry's Directorate General for Biodiversity for the "Identification of Areas of Special Interest for the Conservation of Cetaceans in the Spanish Mediterranean".

The global aim of this project was to contribute to Spain's commitments to the European Unions Habitat Directive (C.D. 92/43/EEC) with respect to the conservation of the three marine pelagic species of the Directive's Annex II, the bottlenose dolphin *(Tursiops Truncatus)*, the harbour porpoise *(Phocoena phocoena)* and the loggerhead turtle *(Caretta caretta)* in one of Europe's most valuable marine sites, the Alboran Sea.

In order to achieve this aim, the project has been developed at three levels:

- Developing diverse cetacean and sea turtle population study techniques in order to establish the most cost efficient tools for the long term **MONITORING** of trends in the conservation status of these species and their habitats
- Developing the **MANAGEMENT** Plans for the SAC's proposed in the region, as well as the Conservation Plans for the target species
- To create a link between the monitoring and the management schemes with the different stakeholders to **IMPLICATE** these in the management process, in order to make biodiversity conservation targets and economic development compatible

B.2. WHY IS A LOGGERHEAD TURTLE CONSERVATION PLAN NEEDED?

B.2.1. THE LOGGERHEAD TURTLE CONSERVATION PLAN

The Loggerhead turtle Conservation Plan (LTCP hereafter) has been developed in the context of Action A-2 of the EC LIFE Nature project LIFE02NAT/E/8610. The document consists of a series of **urgent conservation action guidelines** in the format of a **Conservation Plan Proposal** to be used by the relevant authorities. The LTCP has been designed to cover an initial six year phase focusing on the requirements for the recovery and conservation of the loggerhead turtle *(Caretta caretta)* in the southern Spanish Mediterranean.

This initial LTCP is the result of a long process that started with the detection of an important loggerhead turtle bycatch problem in the Spanish Mediterranean by J.A. Camiñas (I.E.O.), and the initiation in 1992 of a long-term sea turtle and cetacean population monitoring programme in the Alborán Sea, followed by the "Mediterranean Project" as a first phase in the design of protected areas for the most vulnerable species in 1999 and finally the EC LIFE Nature project LIFE02NAT/E/8610 from 2002 to 2006.

B.2.2. WHY IS A LOGGERHEAD TURTLE CONSERVATION PLAN NEEDED?

The importance of the Alborán Sea and its adjacent waters of the Atlantic and Mediterranean for the conservation of *Caretta caretta* in Europe is clearly reflected by the studies carried out in this region since 1992, and notably the EMTP project of the EC DG Fisheries.

Law 4/1989, of March the 27th, for the "Conservation of the Natural Spaces and the Wild Flora and Fauna", demands the writing of Conservation Plans, and in its case, the protection of the habitat, for species catalogued as "vulnerable".

The elaboration and approval of these plans corresponds to the Autonomous Communities. However, given the characteristics of the species, it is important that regional conservation efforts are carried out under the umbrella of more global frameworks, as the Habitat Directive. The main role of this Loggerhead turtle Conservation Plan is therefore to provide a guide to coordinate actions to achieve a series of common conservation goals.

This coordination is not only intended to link and coordinate regional, national and international biodiversity conservation frameworks, but also to provide a bridge between the diverse relevant authorities that need to intervene in the actions of the conservation plan. It is with this purpose, that the LTCP aims also to contribute to the development of a "National Strategy for the Conservation of the Loggerhead turtle in the Mediterranean".

Apart from the requirements of the European Union's Habitat Directive and Spanish national and regional biodiversity conservation frameworks, there are important reasons for the immediate establishment of diverse research and management actions for the conservation of this species in the region.

The region of the Alboran sea and its adjacent waters of the Atlantic and Mediterranean constitutes a migratory passage of unique oceanographic characteristics which result in a very high productivity and biological diversity. Loggerhead turtles of several populations pass through this region during the benthic and pelagic phases of their lives. Sea turtles in the region are exposed to the typical threats nowadays common to all oceans, as toxic pollution, habitat degradation, debris pollution, fishery bycatch, etc.

It is the problem of bycatch in surface longlines that gives this region a special relevance in the context of international conservation efforts of the loggerhead turtle. An estimated annual catch of over 20,000 turtles makes this region rank in top positions of the sea turtle bycatch threat worldwide. From there also the relevance of the present LTCP which highlights Spain's responsibility in the recovery of this species. This relevance is further highlighted by the fact that a large proportion of the turtles affected by this bycatch problem comes from the nesting sites of the eastern coast of the United States, considered presently one of the three main population nuclei for the species together with Oman and Australia.

It is for this reason that the LTCP focuses on the importance of international cooperation with respect to conservation efforts of migratory animals as the loggerhead turtle. Which is why this Conservation Plan has been developed in concordance with the Atlantic Loggerhead Turtle Recovery Plan established by the US Department of Commerce (NOAA – NMFS) and the US Department of the Interior (Fish and Wildlife Service), as well as with the Loggerhead turtle Conservation Plan developed in Italy in the context of the LIFE Nature Project Reduction of the impact of human activities on *Caretta caretta* and *Tursiops truncatus* (LIFE03NAT/IT/000163).

This LTCP delineates a series of actions which have been identified as prioritary. The priorization of actions is the result of an analysis of the importance of the impact of the threats and the feasibility of the possible actions to prevent or mitigate this impact. The priorization process has also taken into account the limitations of our present knowledge of the populations of the target species, the socioeconomic analysis of the region, the impact of threats on the target species or their habitat and the existing legal frameworks in which these actions can be developed.

B.2.3. WHAT WOULD HAPPEN IN THE ABSENCE OF A LOGGERHEAD TURTLE CONSERVATION PLAN?

Our present knowledge on the populations of loggerhead turtle in the region affected by the LTCP does not allow for a precise analysis of what would happen in the absence of the actions for the recovery of the species established in this LTCP.

The detection of the Spanish Mediterranean long-lining fleet bycatch of over 20,000 loggerhead turtles per year dates from approximately two decades ago. Fishermen will often argue that each year they see more turtles, making it seem that the by-catch is not affecting the populations.

However, when analysing trends in bycatch numbers it is important to take into account certain aspects of sea turtles, as their habitat use changes at different phases of their lives, the age of sexual maturity, cycles of migration and nesting, etc. These particularities highlight the urgent need for adequate monitoring but also the fact that often management responses to human impacts on the population(s) will often have to be based on the precautionary principle well before trends in population are detected by the monitoring plan.

Genetic analysis carried out on turtles in the region shows that most turtles are from the Atlantic population. Although no estimates exist for the size of this population, if we consider the nesting records for the main breeding grounds of this species (60,000 nests / season in Florida, LTRP NOAA - NMFS) the figures for bycatch of loggerhead turtles in Spanish Mediterranean surface long lines hardly seem sustainable.

However a closer look at this problem as has been carried out in the context of Action D-5 of the LIFE Nature Project LIFE02NAT/E/8610 highlights several key questions.

Data from stranding networks and analysis of other fisheries indicates that we could have an excessive focus on the Spanish Mediterranean longlining fleet as a result of the greater research effort in this fleet’s operations due to the intensive cooperation of the fishermen with research and conservation groups over the last couple of decades. This is important to be taken into account, as there are clear indications of other bycatch problems that need to be addressed also if we want to ensure a recovery of the Atlantic loggerhead turtle population.

On the other hand, we presently cannot establish how many of the turtles caught on longlines are dying as a result of hooking. Data from studies on hooked turtle recovery seems to indicate that mortality is low, but at the same time highlights the importance of factors as the length of line cut or the turtle handling (hook extractions) in affecting the chances of turtle survival.

It is clear that given the present situation of the Atlantic and Mediterranean loggerhead turtle populations at their nesting sites and the potential threats as bycatch in fisheries in their benthic and pelagic phases, concerted international actions are an urgent requirement.

In this sense, another important justification for the LTCP is the organization of actions. The increasing focus on sea turtles as emblematic species has originated an increase in the number of persons and groups working on the conservation and research of this species. The result of an uncontrolled development of these initiatives is not only a decrease in efficiency and excessive public fund expense. The main worry with regards to this is with respect to the cooperation of fishermen which could change from willingness to confrontation. If we consider the importance of proper hooked sea turtle handling and release as a primary factor affecting chances of survival, maintaining the good will of longliners appears as crucial.

B.3. WHAT DOES A LOGGERHEAD CONSERVATION PLAN NEED TO INCLUDE?

B.3.1. THE MANAGEMENT PROCESS

The particular spatial requirements of marine pelagic species as the loggerhead turtle or the bottlenose dolphin pose a series of important challenges for biodiversity conservation frameworks.

The first of these challenges is certainly our lack of basic knowledge on the loggerhead turtle populations we are dealing with in Europe and the Mediterranean. In the recent history of wildlife conservation, it is precisely with respect to sea turtles that we can observe some of the best examples of why we need to base our management actions on science.
However, obtaining data of these great pelagics at sea is both extremely expensive and logistically difficult, and our biodiversity conservation frameworks require tools that are cost efficient.

With this in mind, the LIFE02NAT/E/8610 focused specially on carrying out research in order to provide the data necessary for the establishment of management measures. Likewise the LTCP establishes the priority MONITORING and RESEARCH ACTIONS to fill in the gaps of knowledge fundamental for management.

The LTCP has been developed according to a management process which takes us from the science to the management following the steps outlined below:

1. **Analysis** of the situation
2. Establishment of the **Global Conservation Objectives**
3. Definition of the **Attributes** of the target feature of the conservation plan
4. Definition and priorization of the **Specific Conservation Objectives** for these attributes

5. Definition of the **Indicators** and **Targets** for the attributes with respect to the conservation objectives
6. Identification of the **Threats** for the conservation objectives
7. Definition of the **Baselines** for the attributes
8. Establishment of a **Monitoring Plan**
9. Establishment of the **Actions** to be undertaken
10. Identification of **Action relevant authorities and actors**
11. Establishment of an **Action Tracking** process
12. Establishment of the Conservation Plan **Functioning**

The present Loggerhead turtle Conservation Plan is constructed following the order of this "management process", taking us from the first phase of the "Analysis of the Situation" to the concrete details of the actual functioning of the plan.

B.3.2. THE IMPORTANCE OF BASELINE INFORMATION AND MONITORING

B.3.2.1. Baseline information

Baseline information is essential to the LTCP as to any conservation plan, as stated in Article 17 of the European Commission's Habitat Directive, and as has been highlighted by the diverse conservation initiatives carried out with respect to sea turtles (artificial incubation of egg clutches, head starting, bycatch mitigation measures,..)

The definition used in this LTCP for "Baseline Information" is:

> Baseline information is the data foundation to the conservation plan. It consists of the basic information required to scientifically support management actions.
>
> Firstly, it provides the data necessary for establishing the actions that are necessary and can be viable, based on data on target species population and life history as well as data on the human activity or activities implicated.
>
> Secondly, it establishes the reference level(s) which will allow for the monitoring and analysis of trends. These reference levels are to provide each action of the conservation plan with a feed-back mechanism to ensure it can adjust to any changes in order to attain the established action targets in concordance with the plan's conservation objectives.

B.3.2.2. Baseline data deficit -Precautionary Principle

There are occasions in which actions may be considered urgent despite the lack of scientific data to support them. In this case, actions will need to be based on the "Precautionary Principle". However, given the dangerously negative experiences in the recent past of sea turtle conservation efforts, mainly due to lack of basic knowledge on the natural history of these animals, we consider that the application of the precautionary principal needs to be adequately justified.

One of the main challenges encountered in the process of developing this initial version of the LTCP has been that of lack of data, both with regards to basic information on the target species:

- population assessment
- natural history
- habitat use

as with regards to accurate information concerning the human activities and their impact at different levels:

- precise data on "effort / scale" of certain human activities (e.g.)
- precise data on the effect(s) of the human activity on the species (e.g. .)

The present version of the LTCP highlights the important gaps in the baseline information required to strengthen the proposed management measures. In response to this, the present version of the LTCP includes a series of research actions which work towards obtaining:

- the necessary baseline information for the establishment of adequate science based managements actions

B.3.2.3. Monitoring

This urgent need for baseline information is also essential for the monitoring which is to provide the feedback to the LTCP to adjust its actions in order to fulfil its conservation objectives.

As is stated in Article 17 of the EU's Habitat Directive, it is a requirement of the Directive to have tools for measuring the effect of our management actions and to be able to analyse the trends in the conservation status of our target species in order to adjust these actions if necessary to achieve our established conservation aims.

For this reason, the present LTCP includes a series of monitoring actions which work towards obtaining:

- the necessary information for an adequate monitoring of threats and of trends and changes in population and life history parameters.
- the feedback mechanism necessary for the LTCP to adopt the necessary adjustments to be effective

B.3.3. THE ROLE OF SACs

In the framework of the European Union's Habitat Directive, an important emphasis is put on the creation of NATURA 2000, the network of Europe's most valuable natural sites. For the region of Andalusia and Murcia (southern Spain), the regional government nature conservation agencies have the responsibility of presenting Special Areas for Conservation (SAC hereafter) to be designated for the conservation of those species presently included in the Annex II of the Habitat Directive.

Protected areas have been widely used as a tool for the conservation of certain land species and habitats. At sea, marine protected areas (MPAs hereafter) are since several years also

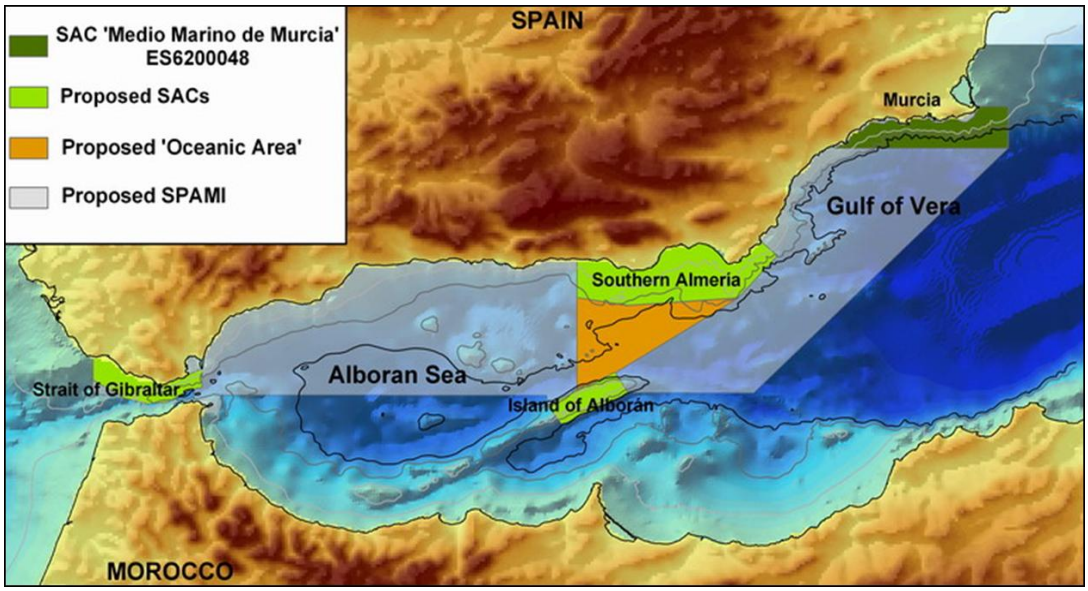
considered a high priority target. MPA's appear also a more tangible form of marine management. One that allows policy makers to connect to the public and develop public awareness actions that will be better understood. However, the marine environment and especially the open seas, remain a difficult terrain for the regulation of human activities, presenting policy makers with additional challenges.

Just as protected areas can provide little protection against "highly mobile" threats as air pollution for instance, in the marine environment many of the threats are not localised. Another added difficulty to the management and monitoring of natural values in the marine environment is the logistical and economical challenge of controlling and observing a vast three dimensional environment which is often hostile to man. Furthermore, when we pretend to focus on the conservation of pelagic species as sea turtles or cetaceans, MPAs of limited size can not be expected to solve all the problems.

The ecology of pelagic species as the bottlenose dolphin, or even more so the loggerhead turtle very clearly illustrates the importance and necessity of management tools that are adjusted to the scales of life in the open oceans. It is for this reason that in the context of the LIFE02NAT/E/8610 project, efforts have focused on the development of a broad scale Loggerhead Turtle Conservation Plan (LTCP) in which MPAs and their respective Management Plans can be one of many actions.

In the case of the loggerhead turtle, the we consider that the present scale of SACs contemplated does not make any sense with respect to the spatial requirements of this species when it is in the pelagic stages of its life, as is the case in the western Mediterranean sea.

Therefore the LTCP stresses that the conservation requirements of marine pelagic species as the loggerhead turtle are at a much larger scale, and that the establishment of SAC or other forms of MPA are not sufficient to ensure the recovery or the maintenance of a favourable conservation status.



Map of the SEC proposal for *Tursiops truncatus* SACs. Even if *Caretta caretta* is included in several SACs of the current Spanish list proposal, these areas are practically irrelevant to the species given its spatial requirements in this important migration corridor

B.3.4. SYNERGY WITH THE BOTTLENOSE DOLPHIN CONSERVATION PLAN

The LTCP has been developed in parallel to the Bottlenose Dolphin Conservation Plan (BDCP) in the context of the LIFE Nature Project LIFE02NAT/E/8610. Sharing the same pelagic environment it is not surprising that the populations of these species, even if very different, suffer from the same pressures to some extent. Considering that one of the main challenges for the success of these conservation plans is their cost efficiency, a special emphasis has been put on finding possible synergies between the LTCP and the LTCP. In order achieve this, the section of actions, the possible synergies are identified.

B.3.5. GENERAL DISPOSITIONS

B.3.5.1. Aim of the plan in the conservation framework

The Spanish law 4/1989, of March 27, for the Conservation of Natural Sites and Wild Flora and Fauna, requires the development of action plans for species as the loggerhead turtle, listed as endangered.

Furthermore, article 8 of the Royal Decree 439/1990, of March 3, establishes that with respect to species listed in the National Endangered Species Act there should be a technical coordination among authorities of the national and autonomous public administrations, including the establishment of orientation guidelines for those species which distribution requires actions beyond the borders of autonomous regions. On the 25th of February 1999, the National Commission for the Protection of Nature agreed that these orientation guidelines should be established as a "Conservation Strategy", under the coordination of the Directorate General for Biodiversity of the Spanish Environment Ministry.

However, as a result of a "Marine Management Competence Analysis" requested by the Environment Ministry from the Spanish Council of State, the management of "highly migratory" marine species as cetaceans and sea turtles would fall under the development of National Species Management / Conservation Plans.

With respect to the Habitat Directive, in which the loggerhead turtle is considered a priority species, the aim of this LTCP is to establish a series of actions for the conservation of the target species that will result in its delisting from the EU Habitat Directive Annex II and in turn the Spanish National Endangered Species Act.

In the framework of the recovery process of the target species the present LTCP is established as an "initiation phase" which will be followed up by successive "Revised LTCPs" until the species is either extinct or delisted from the EU Habitat Directive Annex II and the Spanish National Endangered Species Act.

Furthermore it is important to note that the LTCP also develops a series of actions in the contexts of international conservation frameworks as the European biodiversity conservation strategies (ICZM, EMS,..) or the fishery management frameworks (FAO, RFO's, EC DG for fisheries,..) which are increasingly focusing on the problem of bycatch. In this sense, the LTCP plays an important role in support of the FAO guidelines for the prevention of sea turtle bycatch.

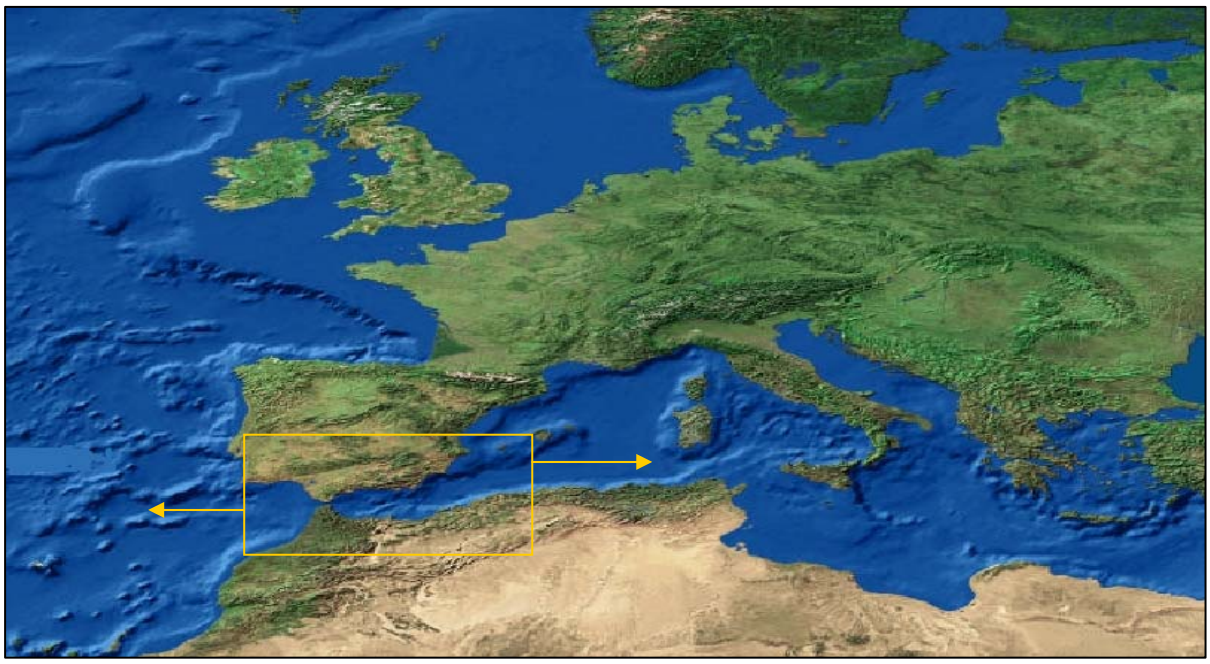
The present LTCP has a duration of 6 years – from January 2007 to December 2013, after which a revised LTCP should provide the follow up.

B.3.5.2. Geographic scope of actions

The geographic scope of the LTCP is limited to the Alboran Sea and its adjacent Mediterranean and Atlantic waters of Spain, comprising the Autonomous regions of Andalusia and Murcia. However, it is considered necessary to establish a wider Spanish national scope conservation plan through the creation of a Spanish Sea Turtle working Group.

Considering the migratory nature of the loggerhead turtle and the fact that the populations affected by the LTCP are from nesting grounds from the eastern Mediterranean as well as the Atlantic, the scope of the actions needs to be placed in a more global context, linked to the efforts of conservation of this species in the Caribbean, East Coast of the USA, Azores, Madeira, Canary Islands, Italy, Greece, Turkey, etc.

With respect to the longline bycatch problem, the geographic scope of the LTCP is conditioned by the movements of the long lining fishing fleet of Murcia and Andalusia which are affected by the LTCP. This fleet, based in the ports of Andalusia and Murcia operates as far northeast as the Balearic Sea, and as far west as the Azores and the Canary Islands.



Geographic scope of the LTCP

B.3.5.3. Reach of actions and legal measures

The proposed actions of this LTCP are subdivided into six different categories:

- Research actions
- Monitoring actions
- Legislative actions
- Management actions
- Capacity building actions

- Public awareness actions

It is clear that depending on the categories, the implementation requirement of each of these categories differs greatly from the obligatory character of legal actions as can be certain regulations of fishing practises to more "voluntary" actions as can be those included in the category of "Public awareness actions".

NOTE: In the guidelines for conservation plans for the Canary Islands 3 categories of actions are considered:

1. DIRECT APPLICATION ACTION – For instance the identification of an area that should have the condition of "critical habitat" (SAC).
2. DEVELOPMENT or INDIRECT APPLICATION ACTION –
3. RECOMMENDATION ACTION –

Three levels of priority have been given to the actions as a result of the combined analysis of the relative importance of each particular action and its feasibility.

PRIORITY LEVEL 1 – High priority action

Actions that are essential for avoiding the extinction or decline of the species. These actions should be compulsory throughout the duration of the LTCP. These are considered "critical measures". The realisation of these actions will be fundamental, among other things for establishing the success of the Plan. The non implementation of these actions should result in the revision or conclusion of the Plan.

PRIORITY LEVEL 2 – Medium priority action

Actions necessary for avoiding a significant decline of the population, its distribution area or the quality of its habitat. The execution of these actions can be halted only if adequately justified at the time the action is to take place. The development of the Conservation Plan will establish whether these actions are critical measures or not with respect to factors unpredictable at the initiation of the Plan.

PRIORITY LEVEL 3 – Low priority action

Other actions that are recommended for the adequate recovery of the species. The execution of these actions is not obligatory. These are non critical measures for the execution timeline of the Plan.

This initial LTCP is intended to have a duration of 6 years before its revision which should in January of 2014 give place to a second four year LTCP. This time plan is subject to change if necessary if any unexpected events (e.g. catastrophe) or the malfunctioning of any of its actions required it. It is the role of the monitoring plan of the present LTCP to guarantee that any adaptations or urgent actions are taken in time as a response to any changes in the species conservation status or threats.

B.3.5.4. Limiting factors in the development of the LTCP

a) Data requirement

As stated earlier, the main obstacle encountered in the process of developing this initial LTCP has been the lack of critical data for the management of a species' populations and data on the exact scale of human activities and on to what extent these human activities have an impact on individuals or populations of the target species. This problem will need to be solved by

guiding future research through the LTCP monitoring and research actions in view of filling in the present gaps of information.

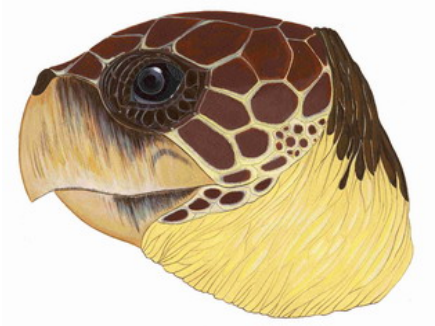
b) Importance of stakeholder implication

In the process of developing the LTCP special emphasis has been put on identifying the actors or stakeholders involved in each action. This is important as many of the actions require the consensus of all interested parts. For certain actions included in this LTCP, the process of identifying and implicating stakeholders has already been initiated through the LIFE02NAT/E/8610 project. For others this process of implication is highly recommended in order to ensure that actions are positively received.

c) Establishment of competences

Certainly one of the major challenges of the LTCP is that of competences and responsibilities of the relevant authorities. This LTCP has tried to clarify the situation with respect to most of its actions. In some cases the LTCP in fact prescribes actions precisely to carry out such responsibility clarification processes.

D - ANALYSIS OF THE SITUATION



The feature - the loggerhead turtle *(Caretta caretta)*

Drawing by Vidal Martín

D.1. GENERAL CHARACTERISTICS OF THE SPECIES

The description of the characteristics of the species is based mainly on the information available from research projects conducted in the Mediterranean sea and the "Recovery Plan for U.S. Population of Loggerhead turtle" of the US National Marine Fisheries Service and US Wildlife Service.

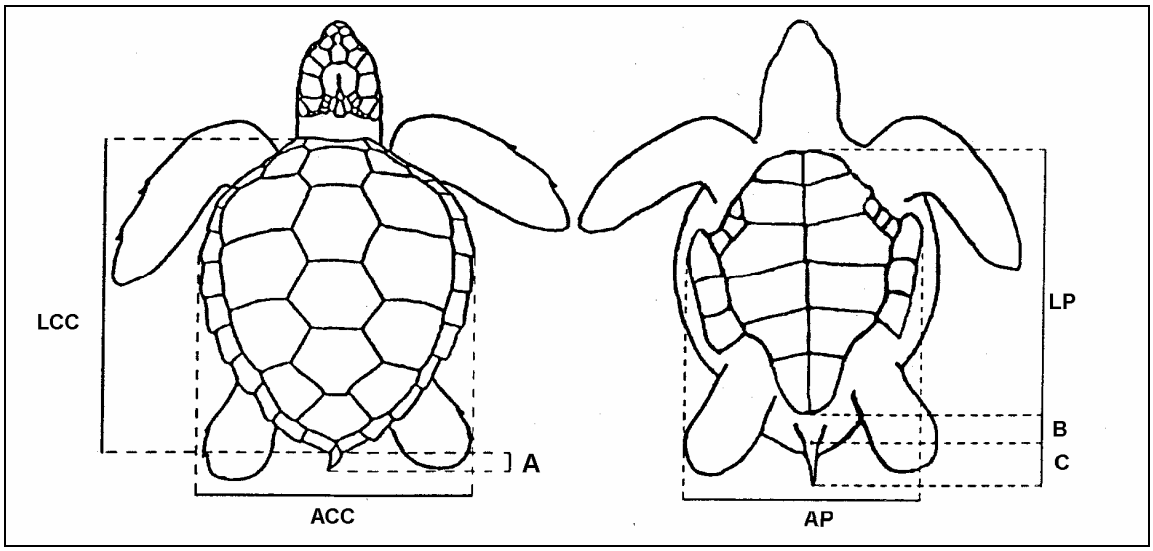
D.1.1. Taxonomy

Marine turtles evolved from land turtles approximately 100 million years ago, adapting to life in the open ocean. Today eight species of sea turtle are still present in the oceans of the world. The loggerhead was described by Linnaeus (1758) and named *testudo caretta*. After two centuries during which the species has had 35 different names, there is now general agreement on *Caretta caretta.*

D.1.2. Description

The carapace of adult and subadult loggerhead turtles is reddish-brown. The dorsal and lateral head scales and the dorsal scales of the extremities are also reddish brown, but with light yellow margins that vary enough in extent to provide considerable disparity in appearance among individuals. The unscaled area of the integument (neck, shoulders, limb bases) are dull brown above and medium yellow laterally and ventrally. The plastron is also medium yellow. The thick, bony carapace is covered by non-imbricated horny scutes. There are five pairs of costals (pleurals), 11 or 12 pairs of marginals, 5 vertebrals and a nuchal (precentral) that is in contact with the first costal. Ventral there are usually three pairs of poreless inframarginals, paired with gulars, humerals, pectorals, abdominals, femorals and annals. An interanal is variable and inconstant. Mean straight carapace length of adult southeaster United States loggerheads is about 92 cm; corresponding to a mean body mass of 113 kg. Elsewhere, including populations nesting in the eastern Mediterranean basin, loggerheads are somewhat

smaller on average. Loggerheads rarely exceed 122 cm in straight carapace length and a body mass of 227 kg.



Hatchlings lack the reddish tinge and vary from light to dark brown dorsally. Both pairs of appendages are dark brown above and have distinct white margins. The plastron and other ventral surfaces may be described as dull yellowish tan and there is usually some brown pigmentation in the phalangeal portion of the web ventrally. At hatching mean body mass is about 20 g and mean straight carapace size is about 45 mm. Hatchlings have three dorsal keels and two plastral ones.

D.1.3. Global distribution

The geographic distribution of *Caretta caretta* includes the temperate and tropical waters of both hemispheres. The species inhabits the continental shelves and estuarine environments along the margins of the Atlantic, Pacific and Indian Oceans. In the Western Hemisphere it ranges as far north as Newfoundland and south as Argentina. The nesting range is confined to lower latitudes, but loggerhead nesting is clearly concentrated in the north and south temperate zones and the tropics. The largest known nesting sites are in Florida and S. Carolina (USA) with around 60,000 nests per season, the Masirah and Kuria Muria Islands of Oman with around 70,000 nest per season and Australia, together representing 88% of loggerhead nesting distribution. In the Mediterranean basin main nesting beaches are found in Greece, Turkey, and Lybia. Nesting in other regions of both the western and eastern Mediterranean occurs only sporadically and in small numbers. Although accurate data is inexistent, it is calculated that there are around 3,000 nests per season for the entire Mediterranean biogeographic area.

It is impossible, at present, to estimate the size of the loggerhead population. Estimates of nesting females is at present used as the most useful index to population size and stability. For the southeastern coast of the United States there is an estimate of 14,150 nesting females for 1983. Given the stochastically derived mean number of nests per female of 4.1, this provides us an estimate of approximately 60,000 nesting females worldwide and less than 20,000 nesting females for the Atlantic and Mediterranean.

D.1.4. Habitat

As a generality, adult female loggerheads select high energy beaches on barrier strand adjacent to continental land masses for nesting. There is some evidence that steeply sloped beaches with gradually sloped offshore approaches are favoured. After leaving the beach, hatchlings apparently swim directly offshore and eventually become associated with *Sargassum* and / or debris in pelagic drift lines that result from current convergence fronts. The evidence suggests that when post – hatchlings become part of the *Sargassum* raft community they remain there as juveniles, riding current gyres for several years and growing up to 40 to 50 cm in straight carapace length. At that point they abandon the pelagic habitat, migrate to near shore and estuarine waters along the continental margins and utilize those areas as the developmental habitat for the sub-adult stage. In the case of western Atlantic sub populations, most near-shore waters in the Southeast US, adults and sub-adults appear to use the same habitat. In some of the inshore waters sub-adults are virtually isolated from adults, whose foraging areas outside of the nesting season are apparently around the Bahamas, the Antilles or the Gulf of Mexico. Remote recoveries of females tagged in Florida indicate that many migrate to the Gulf of Mexico, often to turbid, detritus-laden, muddy bottom bays and bayous of the northern Gulf Coast. Still others apparently occupy the clear waters of the Bahamas and Antilles, with sandy bottoms, reefs and shoals that constitute a completely different type of habitat. In the Mediterranean, the waters off the south coast of Turkey and the sea grass prairies of the Gulf of Sfax in Tunisia have also been shown to aggregate turtles in a similar way. Nothing is known of the relative periods of time that loggerheads may spend in these disparate habitats or of their propensity to move from one to another.

D.1.5. Diet

While the list of food items eaten by the loggerheads is lengthy and includes invertebrates from eight phyla, it is clear that sub-adult and adult loggerheads are, first and foremost predators of benthonic invertebrates such as gastropod and pelecypod molluscs and decapod crustaceans. Coelenterates and cephalopod molluscs are also taken by larger turtles but these vertebrates are especially favoured by loggerheads in the pelagic stage. Post hatchling loggerheads evidently ingest macroplancton associated with “weed lines”. This species is not a fish eater in a primary sense. Loggerheads may scavenge fish or fish parts or ingest fish incidentally in some circumstances. In the Alboran sea, feeding on squid and jellyfish has been reported.

D.1.6. Growth

While a number of authors have reported growth rates of post-hatchling and juvenile loggerheads in captivity, such information is totally lacking for these stages in the wild. In captivity young loggerheads can grow up to 63 cm in curve length and 37 kg in mass in 4.5 years. In wild sub-adults, linear growth rates of 1.5 cm/year in Australia and average linear growth rates of 5.9 cm/year in Florida have been reported. It seems clear now that growth rates of sub-adults decrease with increasing carapace length (i.e. growth is not linear). Estimated age of maturity is 12 to 30 years.

D.1.7. Reproduction

It has been suggested that males migrate with females from distant foraging areas to waters off nesting beaches and that courtship and mating take place there. The few reports concerning the seasonality of mating clearly place it in late March to early June. In Florida few adult males may remain off the Florida coast throughout the year, most of them apparently departing by about mid-June, leaving the females to ascend the nesting beaches and deposit clutches throughout the summer. Nevertheless, courtship and mating are not well studied in loggerheads (or other sea turtles), and there is no doubt that this and virtually every other aspect of the biology of male loggerhead turtles needs further research and clarification.

Females generally begin to nest as early as early April (some years) and they continue to do so until early September. Nesting activity is greatest, however, in June and July. Loggerheads are known to nest from one to seven times within a nesting season, the mean being 4.1. The inter-nesting interval varies around a mean of 14 days. There is general agreement that females mate only once prior to the nesting season and then lay multiple clutches of fertile eggs throughout some portion of the nesting season. Mean clutch size varies from 100 to 126 for the different nesting regions.

Loggerheads are nocturnal nesters, but exceptions to the rule do occur infrequently. Multi-annual remigration intervals for nesting are generally between two and three years, but can vary from one to six years. Natural incubation periods average from 53-55 days to 63-68 days depending on characteristics of nesting site. The length of the incubation period is inversely related to the nest temperature. Sex determination in loggerhead hatchlings is temperature dependent and the species apparently lacks sex chromosomes. Natural hatching success rates generally range from 55 to 74 % in adequate undisturbed nesting conditions.

D.1.8. Movements

Loggerhead hatchlings engage a “swimming frenzy” for about 20 hours after they enter the sea and that frenzy takes them about 22 to 28 km offshore. At some point thereafter they become associated with *Sargassum* rafts and / or debris rafts at current gyres. Upon reaching about 45 cm in straight carapace length they abandon the pelagic existence and migrate to near-shore waters. Little is known of their seasonal movements there, but reports indicate a tendency for sub-adults to aggregate in certain regions (e.g. Port Canaveral Florida) to disperse more widely in spring and early summer. Also sub-adults in Chesapeake bay have been known to exhibit a variety of movements between waters of differing temperatures and salinities. As adults, loggerheads become migratory for the purpose of breeding. Recoveries of females tagged while nesting on the Florida coast and loggerheads tagged at sea in the Mediterranean suggest widely dispersed foraging areas in the Gulf of Mexico, Cuba, Bahamas, Azores, Madeira and Mediterranean sea. While conclusive evidence is lacking as yet, it is assumed that these females remigrate hundreds or thousands of kilometres at multi-annual intervals to nest on good, high energy nesting beaches.

D.1.9. Global status

In the US the loggerhead turtle was listed in 1978 on the Endagered Species Act of 1973. In Spain the loggerhead turtle is listed on the National Endangered Species Act.

Internationally the species is considered “vulnerable” by the IUCN and is listed in Appendix I of the Convention of International Trade in Endagered Species of Flora and Fauna (CITES).

In a recent review, Erhart (1989), considered consequences of life tables and population models (Richardson and Richardson, 1982; Frazer, 1983; Crouse *et al*., 1987), mortality rates in the Southeast US; population declines in South Carolina and Georgia; and Murphy and Hopkins' (1984) estimate of annual mean clutch production per female. Erhart concluded that the stock of loggerheads represented by nesting females of the US southeast coast to be declining.

D.2. THE LOGGERHEAD TURTLE IN THE REGION OF THE LTCP

D.2.1. Population assessment

Genetic analysis shows that most of the turtles found in the region of the Alboran sea and contiguous waters are from the Atlantic.

It is impossible at present to establish the absolute abundance for this species in the entire region of interest to this LTCP. Abundance estimates exist for the Spanish territorial waters of Valencia and Murcia based on aerial surveys carried out during the "Mediterranean Project" (Gómez de Segura *et al*. in prep.).

D.2.5. Habitat use

Nesting beaches

There are no major nesting beaches along the Spanish Mediterranean coast. However, anecdotal nesting and nesting attempts in recent years and historical data indicates the existence of several potential nesting sites.

Benthic habitat

Satellite telemetry and local studies on foraging behaviour indicate that loggerhead turtles use the canyons and escarpments along the Spanish Mediterranean shores as a benthic feeding habitat. In the region we can highlight three main regions; the continental shelf and its edge east of the Strait of Gibraltar and the escarpments and canyons of Garrucha and Mazarron.

Oceanic habitat

Satellite telemetry, data from the observer programmes onboard longliners and survey data shows the importance of the region of the Alboran and the Balearic sea for loggerhead turtles in their pelagic phase. Turtles are found throughout the basin in open waters but do appear to aggregate in certain frontal systems as the Almeria – Oran Front, along the North African Current and along the shelf edge between Cabo de Palos and the Balearic Islands. An area highlighted as especially important is the extension of the Mazarron Escarpment south of the Balearic Islands. Prediction Models, still being developed at present seem to indicate a strong correlation with sea surface anomalies and depth.

In the area of greatest sea turtle concentrations coinciding with the Spanish longlining fishing ground, analysis of diving patterns showed an interesting aspect of the turtle's behaviour with important implications for fisheries management (i.e. deeper setting of hooks).

D.3. POSSIBLE THREATS FOR THE LOGGERHEAD TURTLE

D.3.1. Threats on nesting grounds

The variety of threats that occur during the nesting phase of sea turtles has certainly until recent decades the main focus of conservation efforts. Harvesting of nesting females, poaching of clutches, mechanical destruction of beaches and coastal habitats, obstacles and lights on beaches are mayor problems that can have and have had an important negative impact on sea turtle populations. In the context of the Loggerhead Turtle Conservation Plan for the Spanish Mediterranean, there are no regular nesting sites in this region. However, several potential sites exist and a few nesting attempts are registered annually. The threats identified with respect to possible nesting in the region are:

- Mechanical destruction of beaches and coastline

Beach armouring, building of jetties, sea walls, roads, ports and marinas constitute an important threat altering sea turtle nesting habitat. Dredging both for the regeneration of beaches lost to erosion or the prevention of silting up of marinas can affect both potential nesting sites as coastal benthic habitats important for the foraging of the loggerhead turtle.

- Cleaning of beaches with heavy vehicles

The greater part of sandy beaches along the region's coast are exploited for tourism. Most of these beaches are cleaned in the early morning hours with tractors equipped with rakes. The passing of such vehicles over possible nests could cause their destruction.

D.3.2. By-catch in fisheries

At sea one of the main threats for sea turtles worldwide is that of accidental captures or by-catch in diverse fishing operations. In the region of the Spanish Mediterranean waters the problem of by-catch is certainly the main threat to the species.

By-catch in long lines

Incidental capture by surface long-lines is the main threat to the survival of loggerhead turtles in the Spanish waters of the Western Mediterranean. The use by the Spanish fleet of hooks with bait such as red squid, chub mackerel and other fish of low commercial value (mainly to catch swordfish, *Xiphias gladius*), is part of the reason for a high rate of incidental catch that is estimated to be 20,000 to 30,000 loggerhead sea turtles per year.

There are a number of fishing parameters that can affect incidental catch, such as hook size, fishing depth, bait type, time and duration of the lowering, oceanographic and meteorological conditions, etc. In addition, biological parameters can affect the rate of capture, including turtle size and vital signs, etc. Turtles generally get caught by the hook when trying to consume the bait or become entangled in suspended fishing tackle. Immediate mortality is very low since the length of the line enables the turtles to return to the surface to breathe, but medium- and long-term mortality is not well known and could be significant.

Normally turtles are freed by cutting the line during collection operations. But because it is difficult to lift the turtle on board, and due to the loss of time and the danger of being injured by the hook, fishermen prefer to release the turtle with the hook and several metres of line. Thus the hook is left in the mouth or the intestines where it can cause serious injury or death

to the turtle. During 2000, 48% of the turtles stranded alive and encountered by the Network of Volunteers of the Andalusian Coast showed clear indications of interactions with fishing activities; 72.9% of these stranded as a result of an interaction with long-lines. The remaining 27.08 % of the turtles which stranded alive showed signs of interaction with other types of fishing gear.

By-catch in pelagic driftnets

The use of pelagic driftnets is prohibited in Spain since 1988 and in waters of the European Union since 2001 (effectively since 2003). However these nets have been in use regularly throughout the western Mediterranean basin either operated out of countries outside the European Union or by the French and Italian fishing fleets under a different name. These pelagic driftnets are used for catching swordfish and blue-fin tuna primarily. Although no precise data on by-catch exists, the incidental catch of cetaceans and sea turtles is estimated to be high, especially along the coast of Morocco and east of the Balearic islands.

By-catch in bottom trawlers

Whereas in other regions of the Mediterranean (Egypt, Tunisia) and the Atlantic (U.S.A.) by-catch of turtles in trawl fisheries appears to have important impact, in the region of Andalusia and Murcia (southern Spain) by-catch numbers appear at present to be low in comparison with other fisheries as surface long-lining.

The estimated number of loggerheads killed annually by the offshore shrimping fleet in the south-eastern United States Atlantic and Gulf of Mexico is 5,000 to 50,000. Most of the turtles caught appear to be juveniles and sub-adults, the age classes most critical for the stability and recovery of marine turtle populations (Crouse *et al*., 1987). In the Mediterranean although no accurate estimates of by-catch are available, there is growing concern on this issue in certain areas.

Bycatch in stationary gill nets

Stationary gill nets are utilized in most inshore waters throughout the area. Mesh size is dependent on the size of the fish which is targeted but gear is considered non-selective in the species impacted. Trammel nets are the most common type of gill net used by the traditional Spanish Mediterranean fleet. Marine turtles are vulnerable to entanglement and drowning in gill and trammel nets, specially if gear is left unattended as is the case in this regional fishery. Estimates of by-catch and mortality of loggerhead turtles in this type of fishing gear based on fishery observer data and interviews to fishermen is relatively low compared to the by-catch in the long-lining fishery.

By-catch in other fishing devices

Recent studies around the Mediterranean coast of Spain, based on interviews and fishery observer programmes show that by-catch is common also in other fishing devices. However numbers of by-catch remain small especially in comparison to those of other fisheries as long-lining.

D.3.3. Collisions

Turtles in the region of the Alboran sea and Atlantic and Mediterranean contiguous waters spend most of their time close to the surface and are often found basking in a "sleepy" state that can make them very vulnerable to being run over by ships. The entire region is subject to the continuous passage of cargo ships and tankers, as over 25% of the World's maritime traffic transits through here. A specially high risk is present at the Strait of Gibraltar, where in addition to the normal maritime traffic fast ferrys lines between Europe and Africa have recently been developed. Closer inshore and especially along the core zones of beach tourism of Cadiz and Malaga, motor yachts and jet skis could also constitute a threat to surfacing turtles.

D.3.4. Debris pollution

Marine turtles have been found to ingest a wide variety of abiotic debris items such as plastic bags, raw plastic pellets, plastic Styrofoam pieces, tar balls, rope and balloons. Effects of debris ingestion can include direct obstruction of the gut, absorption of the toxic by-products and reduced absorption of nutrients across the gut wall. Physiological studies have indicated a possible interference in energy metabolism or gut function, even at low levels of ingestion. Of particular concern is the co-occurrence of persistent marine debris and the early life history pelagic stages of loggerhead turtles along convergence zones. Young turtles are dependent upon these drift-lines for their food supply, and hence the likelihood of debris ingestion is increased. While quantitative data on population effects are undetermined, the impacts of debris ingestion are considered serious.

Entanglement is another possible impact of debris pollution. Turtles tend to close in on floating objects when basking on the surface. Turtles are affected to an unknown but potentially significant degree by entanglement in persistent marine debris, including discarded nets, long line buoys, plastic bags, ropes, etc.

D.3.5. Toxic pollution

The effects of pollutants resulting from industrial, agricultural or residential sources are difficult to evaluate. Pesticides, heavy metals and PCB's have been detected in turtles (including eggs), but levels which result in adverse effects have not been quantified.

D.3.6. Oil and gas exploration

Oil and gas exploration, exploitation and transportation: Marine turtles would be at substantial risk if they encountered an oil spill or large amounts of tar in the environment. Physiological experiments indicate that the respiration, skin, some aspects of blood chemistry and composition, and salt gland function of marine turtles are significantly affected. Exploration and exploitation by marine oil drilling platforms on live bottom areas may disrupt foraging grounds by smothering benthic organisms with sediments and drilling muds.

Oil and tar are also released into the marine environment during bilge pumping operations on large vessels. In a review of available information on debris ingestion, Balazs (1985) reported that tar balls were the second most prevalent type of abiotic debris ingested by marine turtles.

D.3.7. Dredging

The effects of dredging are evidenced through the direct destruction or degrading of habitat and incidental take of marine turtles (mainly close to nesting grounds). Canalization of inshore and near shore habitat and the disposal of dredged material in the marine environment can destroy or disrupt foraging grounds as grass beds and coral reefs.

D.3.8. Marina and dock development

The development of marinas, jetties, beach armouring and other constructions in near shore waters can negatively impact turtles through the destruction and degradation of foraging habitat. Additionally, the development of marinas and commercial ports leads to increased boat and vessel traffic which may result in a higher propeller and collision related mortality. The installation of fuelling facilities and dry docks in turn increase the risk of discharged of oil, gas, paints and other toxic substances into sensitive coastal habitat.

D.4. HUMAN ACTIVITIES IN THE REGION

The region of this LTCP is not only important to sea turtles. At an international scale it is of special relevance as one of the main passages for maritime traffic. Over 25 % of the world's shipping transits through here, including 30% of dangerous cargo vessel traffic. Along the coast of southern Spain urban and agricultural development is important and so is its impact on the marine environment, especially along the continental shelf. Fishing is not so much an important factor in local economics as a deeply rooted socio-cultural activity. The Socioeconomic analysis of the region, developed in the "Mediterranean Project" and completed by the LIFE02NAT/E/8610 clearly highlights the importance of counting on the identified stakeholders in order to ensure the social acceptance of the LTCP.

The annexes of the LTCP include the socioeconomic analysis of the "Mediterranean Project" and the LIFE02NAT/E/8610. In the context of the LIFE project socioeconomic analysis carried out in relation to the LTCP and the Bottlenose Dolphin Conservation Plan (BDCP) a listing of all socioeconomic impact analysis was used to identify priorities for the conservation plans based on the importance of the impact of the activity as well as the viability of possible actions to mitigate these impacts.

D.5. LEGAL FRAMEWORK

D.5.1. Species conservation

- The Loggerhead turtle *(Caretta caretta)* is presently listed as "vulnerable" in the Spanish National Endangered Species Act. Protected by the National Law which prohibits the incidental take of the species as well as the display or any form of use of its products.
- The Spanish law 4/1989 - March the 27th for the "Conservation of Natural Sites, Fauna and Flora, requires the development of Action Plans and if necessary the protection of habitat for those species listed as "vulnerable" in the National Endangered Species Act.

- The species is listed under Annex II of the European Union's Habitat Directive, which requires also the establishment of a Conservation Plan and the designation of protected areas (SACs) to preserve its habitat.
- Spain is a signatory of the Washington Convention on International trade of Endangered Species, in which the loggerhead turtle is listed in Annex I which prohibits any form of international trade of this species or its products.

Apart from the national and European legal framework, with regards to the turtles of the nesting grounds of the east coast of the United States, the 1982 Convention on the Law of the Sea and the 1983 Convention on the Conservation of Migratory Species (Bonn Convention), state that: "endangered species are prohibited to be taken while migrating on the high seas". Further, "Nations that host nesting and developmental habitats for marine turtles have some level of jurisdiction over these animals on geographically remote feeding grounds, even if those feeding grounds are within the territorial boundaries of another nation".

D.5.2. Fisheries regulations and guidelines

- FAO Guidelines
- ICCAT
- ICES
- GFCM (FAO)
- SGPM Longlining regulations (length longline, number of hooks)
- SGPM Bottom trawling regulations
- SGPM Fisheries reserves
- EU banning of pelagic driftnets

D.5.3. Habitat conservation

- UN - UNCLOS – UNESCO – UNEP MAP
- MARPOL
- IMO – Maritime traffic TSS
- Ley de Costas – coastal habitats
- Ley de Montes – SACs
- Habitat Directive – SACs

E – LTCP PROCESS

One of the priorities in the development of the conservation and monitoring plans under Actions A-2 and A-3 of the LIFE02NAT/E/8610 project was to establish a process that could be useful for future similar projects involving cetaceans and sea turtle conservation in Europe and abroad.

In order to do this, we established a "science based" linear management process that should serve as the vertebral column for the LTCP. This is the LTCP process outlined in this section, as it appears on the flow chart below. However, it must be stressed that this does not necessarily implicate a plan too heavily based on a scientific foundation. As would probably be the case for most conservation plans, there were a series of parallel processes to this "central" linear process. The combination of these is necessary to provide a feasible conservation plan. However, establishing the "scientific based" management process as vertebral column to the LTCP we can provide a more solid argument to the actions, establishing clear needs for more information in order to reduce the risks involved in actions based on the precautionary principle.

The complete LTCP process in reality is the result of two lines of development which tackle the potential conservation problems from different ends. On one end we have the management process that follows the established "science based" line, and which is given special importance in order to force the process into place. This line of development involves also the integration of the science in the conservation frameworks and strategies. In the end the outcome is really turning out to be slightly less linear. The flow chart below outlines a parallel process starting at one end with factors dealing with the population level, and at the other with those dealing with the human activities or threats level.

On the other end we have the work "on site" with stakeholders, which starts with a regional socioeconomic analysis, taking human activities one by one and establishing potential threats resulting from these activities. Gradually working from the identification of stakeholders towards one to one meetings has led to a dynamic discussion along the development of the LTCP in order to ensure consensus over the proposed actions. The result of this process has been a very dynamic LTCP development with feedback from both lines of development accelerating events. Identification of problems in the scientific process would drive to meetings with stakeholders in which common interests would often come up, resulting in the establishment of discussed action drafts and sometimes new actions.

In this process we can highlight the extreme importance of implicating stakeholders and its utility especially in situations where urgent conservation actions need to depend more on the dynamism of people on site acting than on the slow and often merely theoretical steps of public policy.

DEVELOPING THE "SCIENCE BASED" VERTEBRAL COLUMN TO THE LTCP

ESTABLISHMENT OF THE GLOBAL CONSERVATION OBJECTIVES

↓

DEFINING THE ATTRIBUTES TO CONSERVE

↓

ESTABLISHING THE SPECIFIC CONSERVATION OBJECTIVES

↓

DEFINING THE TARGETS AND INDICATORS

↓

IDENTIFYING THE THREATS TO THE SPECIFIC CONSERVATION

↓

OBJECTIVES

↓

DEFINING THE BASELINES

↓

ESTABLISHING THE MONITORING MECHANISM

↓

SELECTING THE ACTIONS

↓

IDENTIFYING RELEVANT AUTHORITIES AND ACTORS

THE PARALEL PROCESS LINKING THE "SCIENCE BASED" VERTEBRAL COLUMN TO THE BIODIVERSITY CONSERVATION FRAMEWORKS

Initial evaluation to determine whether a Conservation Plan is needed
Primary issue here is whether there is a conservation problem and what may be anthropogenic causes (can only mange humans not animals!)

If yes, examine possible legal framework as that may influence all future considerations – in particular are there limits on geographical boundaries?

Set overall conservation objectives (n.b. population not individual level)
e.g. with respect to abundance, geographical distribution

ANIMALS

'Attributes - select'
Decide what aspects of the animals can be used to assess 'status' in the past, now and in the future – taking practicality of measurement into account
e.g. population identity, abundance, distribution, biological parameters, health

'Attributes - baseline'
Establish baseline values and natural variation for chosen attributes *or* a programme to establish them if any are not known

'**Attributes - establish 'sub-objectives' or 'Targets'**
Explore conservation sub-objectives for chosen attributes – then choose final set, taking ability to detect change into account, and if appropriate assigning priorities and short- medium- and long term targets
e.g. maintain or increase current numbers, maintain present distribution

Monitoring and feedback
Establish a monitoring programme to determine whether short- medium- and long-term objectives are being met both in terms of **animals** *and* **reduction of threats**. If not requires major re-evaluation of plan (including geographical extent)

THREATS

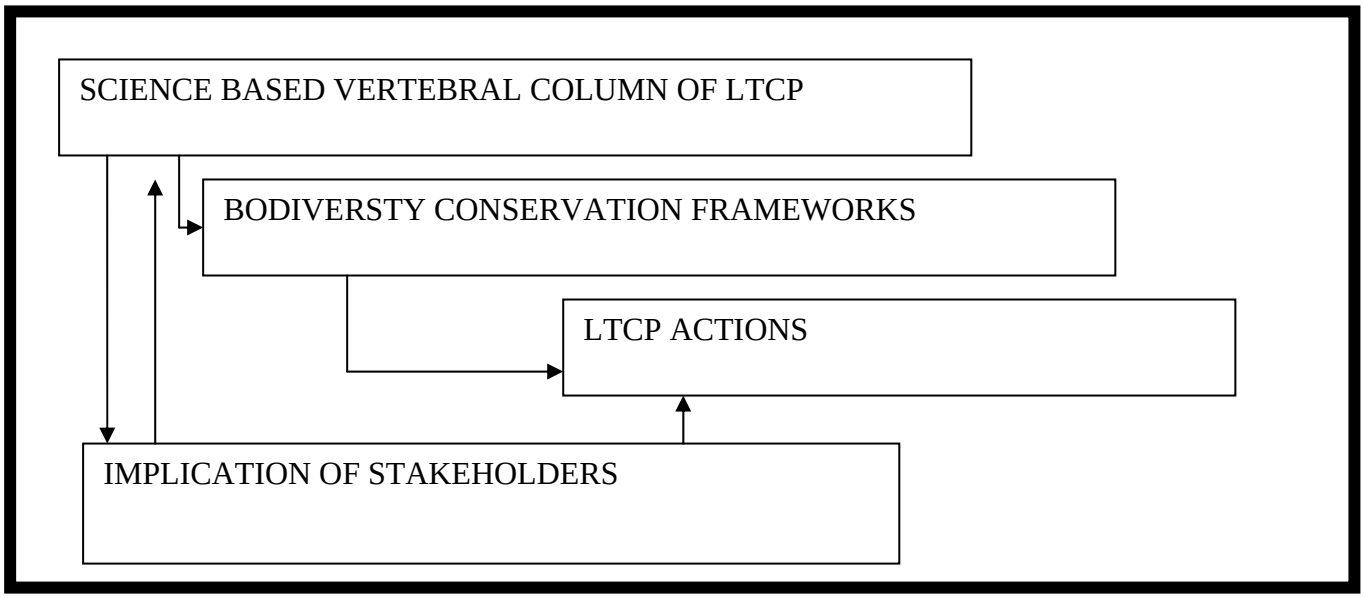
Potential threats - identify
Identify (and categorise if possible) actual and potential anthropogenic threats to animals
e.g. direct threats (such as bycatch, ship strikes); indirect threats (such as habitat degredation)

Potential threats - prioritise
Evaluate, and if possible, determine likely quantitative effects of threats *on populations* –if a potential threat has significant implications *for population(s)*, establish programme to determine whether an actual or potential threat

Potential threats – mitigation measures
Examine actual and potential mitigation measures to the prioritised threats. Where practical measures exist, implement them *with suitable oversight* and consultation with stakeholders and include short-, medium- and long-term targets
Where no measures exist for actual threats, establish a programme to develop them involving stakeholders.
All aspects of mitigation measures must be considered, including scientific, practicality, legal framework, education and awareness.

Must be an appropriate administrative framework to ensure the effective working of the plan (including effective implementation of mitigation measures) and to ensure that the results of monitoring programmes are modified and CP updated as necessary

THE WORK “ON SITE” ---------- “DEEDS NOT WORDS”



E.1. ESTABLISHMENT OF THE LTCP GENERAL CONSERVATION OBJECTIVES

In the process of establishing the CONSERVATION OBJECTIVES for the species and its habitats in the region, two levels of objectives have been set:

- **GENERAL OBJECTIVES** (Objective of LTCP as a whole)
- **SPECIFIC OBJECTIVES** (Objective of LTCP actions)

E.1.1. ESTABLISHMENT OF THE GENERAL CONSERVATION OBJECTIVES

Establishing overall conservation objectives is the first and most fundamental step in the process of developing a Conservation Plan.

In the present case of a Conservation Plan for loggerhead turtles, the framework is the European Union's Habitats Directive, in which this species is listed under Annex II. While the Habitats Directive does not expressly require the establishment of conservation objectives, it 'assumes' that there will be conservation objectives for each Natura 2000 site. Not only does the Directive not require objectives, it does not specify what form they should take, or the precise role they play in the management of sites. However, three general aims for the Habitat Directive have been established as statutory requirements:

(a) conservation of biodiversity (Article 2.1);

(b) maintenance or restoration of favourable conservation status of the habitats and species in Annexes I and II of the Directive (Article 2.2); and

(c) Natura 2000 network to enable the achievement of favourable conservation status (Article 3.1).

According to the *Guidelines for Developing Conservation Objectives for Marine SACs* (EN *et al*. 2001), this implies that for Natura 2000 sites 'Conservation objectives must represent a site's appropriate contribution to the achievement of favourable conservation status, and the wider goal of biodiversity conservation, based on the features for which it has been selected'.

Since this conservation plan is being developed within the Habitats Directive framework, even if the geographic scope of application is much wider than a single Natura 2000 (SAC) site, for the purpose of the Conservation Plan for loggerhead turtles, (b) above, to *maintain* or *restore* a *favourable conservation status*, is the most appropriate.

According to Article 1(i) of the Habitat Directive, the *conservation status of a species* means the sum of the influences that act over it, and which can affect the natural abundance and distribution of its populations, in the long-term, within the European territories of the member States. According to the same Article 1(i), the conservation status will be assumed as '*favourable*' when:

- the data on the species population dynamics indicate that it is being maintained in the long-term as a viable component of its natural habitat, and
- the natural range of the species is not being reduced, and it is not probable that it will be reduced in the near future, and
- there is, and probably there will be in the future, a sufficiently large habitat to maintain its populations in the long-term

From this, we can establish two Overall Objectives for this Conservation Plan:

- to maintain, at least, the abundance of the species in the entire area covered by the Plan; and
- to maintain, at least, the distribution or level of usage of the species in the area.

These objectives must necessarily work from a baseline. In most cases this will be the current situation, because of the lack of historical data to allow estimation of the distribution or abundance of the species in this region, prior to possible changes as a result of anthropogenic impacts. Thus the minimum objective is to maintain at least the present situation and, if possible, to improve it

E.2. DEFINING THE ATRIBUTES TO CONSERVE

Following the terminology used in previous Conservation Plans for marine species and habitats in the European Union (Ceredigion County Council *et al*. 2001; Moray Firth cSAC Management Group 2003), the 'Feature' of a plan is the species or habitat for which the plan has been developed; in this case the loggerhead turtle.

The term 'Attribute' is a standard term defined by the UK Joint Nature Conservation Committee (JNCC 1998) as: 'a characteristic of a habitat, biotope, community or population of a species which most economically provides an indication of the interest feature to which it applies'. For our purposes, then, the attributes are those characteristics of the loggerhead turtle that provide an indication of its conservation status within the geographical scope ('region' from now on) of the Conservation Plan.

The "*Guidelines for Developing Conservation Objectives for Marine SACs*" (EN *et al*. 2001), states that the attributes can include 'a combination of (a) quantitative characteristics (such as abundance or viability of a population and related characteristics such as its distribution or if its spatial occurrence is discrete or continuous); (b) qualitative characteristics (e.g. age / sex structure, reproductive rate or even certain health aspects of individuals); and (c) processes that maintain or affect the species, as physical environmental factors (e.g. hydrological processes, water quality, sedimentation processes, etc.). All attributes used should be quantifiable in one way or other to allow for their monitoring and evaluation'. The use of the term "qualitative" under (b) is misleading; the examples given by EN *et al*. 2001 under 'qualitative characteristics' are quantitative measures.

In finally choosing appropriate attributes, one must take into account the practicality of (a) measuring them and (b) being able to detect changes in them within a reasonable time. Given the identified overall objectives in the previous section, the following potential attributes have been identified for the Conservation Plan for loggerhead turtles:

a. Genetic structure of population

   This includes establishing whether there is one or more population or subpopulations within the region, the genetic variability within them and relationships with adjacent populations.

b. Abundance

   Unless the region contains all of the animals from the population(s) of interest, then this attribute will have to be the mean number of animals that use the area, rather than

the absolute abundance. This is certainly the case for loggerhead turtles. The animals that are using this region frequently use also areas outside the region.

c. Distribution and habitat use

   This refers to the extent of the region used by the population(s) as well as the frequency, intensity and manner of usage (feeding, breeding, migrating, etc.).

d. Health and nutritional status

   These are a number of characteristics of the health and nutrition of individuals that may give an indication of the health and nutritional status of the population(s).

e. Prey (attribute of the habitat)

   The availability of food resources may be a key factor in the overall status of the population(s).

E.3. DEFINITION OF THE SPECIFIC CONSERVATION OBJECTIVES FOR THE ATTRIBUTES

For each Attribute there must be at least one associated Specific Conservation Objective, derived from the Overall Conservation Objectives of the Plan. These objectives must be prioritized according to their usefulness and the feasibility of measuring whether they are being met. The Specific Conservation Objectives proposed for the Attributes defined in previous section are:

a. Genetic population structure

   Specific Conservation Objective 1: To maintain the genetic variability of the population(s)

   Specific Conservation Objective 2: To avoid the fragmentation of the population and the genetic isolation of any sub-units (maintain or increase gene flow between population nuclei).

b. Abundance

   Specific Conservation Objective 3: To maintain, or increase in the long term the abundance of the species in the region.

c. Distribution and habitat use

   Specific Conservation Objective 4: To avoid the reduction (spatial and temporal) on a long term basis of the usage of areas suitable for the species (areas that offer the conditions / characteristics necessary for usage by the species in one way or another).

d. Health and nutritional status

   Specific Conservation Objective 5: To avoid deterioration in the health and nutritional status of animals in the population(s).

e. Prey

   Specific Conservation Objective 6: To maintain or increase the availability of food resources for the animals.

E.4. DEFINITION OF THE INDICATORS AND TARGETS FOR THE ATTRIBUTES WITH RESPECT TO THE CONSERVATION OBJECTIVES

Each Attribute must have a Target that can be defined in a quantitative way, representing the desirable condition of the Attribute with regard to its specific conservation objectives. In order to verify where we stand with respect to these targets, a series of indicators need to be established, on which the monitoring plan (see below) will provide information to assess how far the present situation is from the Target. These indicators therefore need to be quantitative or at least be able to be expressed as a range of values. A priorization of the targets of the conservation objectives should be done based on their importance to maintaining a favourable conservation status of the population(s).

Table of Indicators and Targets of the Attributes of the Population

Attribute	Conservation Objective	Indicator	Target	Priority
Genetic structure of the population	To maintain the genetic variability of the population	Level of genetic diversity: - Deviances form the Hardy Weinberg equilibrium - Allelic richness - Nucleotidic diversity	To be defined, based on the present values (information available in autumn 2006)	Medium
	To avoid fragmentation of the population and the genetic isolation of its sub-units (maintain or increase gene flow between population nuclei)	Genetic structure of the population: - Level of intrapopulation differentiation - Level of interpopulations differentiation - Migration rate	To be defined, based on the present values (information available in autumn 2006)	High
Abundance	To maintain or increase in the long term the abundance of the species in the region	Abundance of turtles and trends	Lower limit of abundance:	High
Distribution and habitat use	To avoid the reduction (spatial and temporal) on a long term basis of the usage of areas necessary for the species	Size of the areas used by the turtles and shifts in time	To maintain at least the extent of the important areas used by the turtles as defined by the surface maps	Medium
		Frequency of use of the areas and trends	Minimum frequency of usage of the important areas by the turtles to be determined	Medium
		Site fidelity of the animals	Minimum level of site fidelity to be determined	Low
Health and nutritional status of the population	To avoid a deterioration of the health and nutritional status of the animals			Medium
		Level of pollutants in the animals tissues	To minimize to 'natural levels' (maximum level to be determined)	Medium
		Levels of pathologies in the animals	To minimize to 'natural levels' (maximum level to be determined)	Medium
		Percentage of time used in searching for food	To be determined	Low
		Number of mortalities which cause is identified as 'human activity'	Maximum level to be determined	High
		Composition of the diet of the animals	To avoid reduction in variety, quality and quantity of prey in the diet (to be determined) To decrease feeding on longline bait discard	High
Prey	To maintain or increase the availability of food resources for the animals	Abundance of the main prey species for loggerhead turtles	To maintain or increase the abundance of the main prey species for loggerhead turtles (to be determined)	Low

E.5. IDENTIFICATION OF THE THREATS FOR THE CONSERVATION OBJECTIVES

The threats to the loggerhead turtle in the region have been identified. The main threat or more conspicuous threat for the loggerhead turtle in the region has been already exposed previously in this LTCP as the problem of bycatch in surface longlines. However, we consider it important to follow such a process in order to make sure that each potential threat is given an appropriate response without creating any bias on threats just because past research and conservation efforts have thrown them into the light.

In the first step of the Conservation Plan, the analysis of the situation, a general overview of the main threats that affect or can potentially affect loggerhead turtles in the region is provided. Nevertheless, in this step a more exhaustive and structured review of the threats should be done, classifying them with regard to which Attributes and associated Conservation Objectives are or are potentially being affected.

It is important to take into account that threats are very varied and can have an effect either only at the individual or also at the population level. All threats have impact individuals from simple disturbance to causing the death or negatively affecting the health or life history parameters (such as reproductive success) of particular individuals. But if an animal's fitness is not affected, the threat will not impact on the population. In a species conservation plan, we should focus on those threats that affect the status of the population. Concerns for individual animal's welfare, despite being legitimate, need to be carefully addressed when dealing with emblematic species as sea turtles as these could direct excessive efforts towards actions that despite being very conspicuous may be absolutely irrelevant in terms of conservation.

For each possible threat the following are identified:

- *Cause of threat*

  Main human activities that are known or suspected of being a source of the threat considered

- *Indicator of threat*

  Variable that indicates that the identified activity (source of the threat) is taking place

- *Attribute affected*

  Attribute on which the identified threat is having or may likely have an effect

- *Conservation objective threatened*

  Specific conservation objective for the Attribute on which the identified threat is having or may likely have an impact

- *Possible impact of the threat on the Attribute*

  Possible effect or impact of the identified threat on the Attribute and its specific conservation objective

- *Indicator of possible impact*

  Variable that indicates if the identified activity (source of threat) is producing an impact on the conservation objective of the Attribute, and if so, at what level

- *Intensity / occurrence of cause of threat*

Relative intensity or level of occurrence at which the identified activity (source of threat) is taking place in the area (low – medium – high)

- *Severity of impact on the conservation objective*

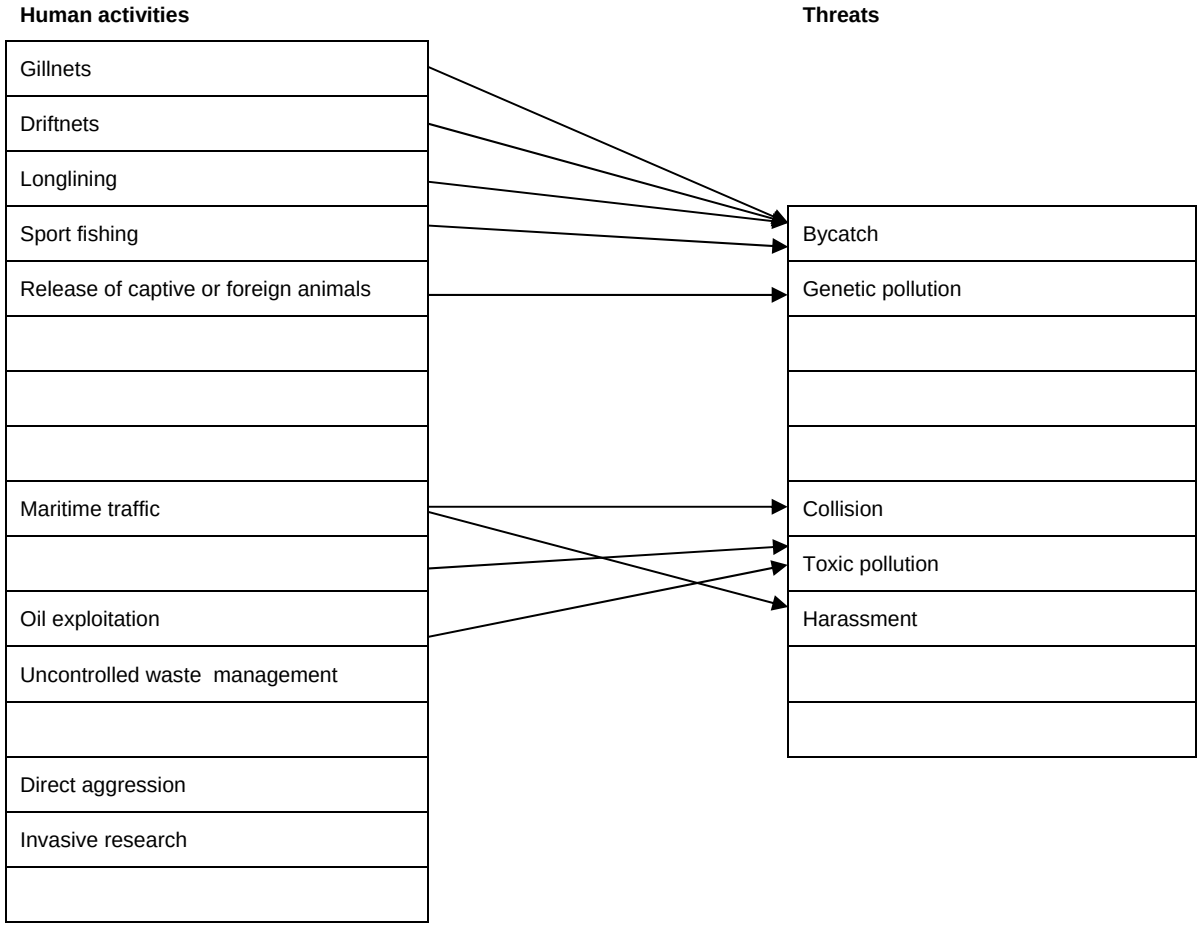
  Severity that the threat may have on the conservation objectives of the Attribute if it occurs

- *Impact level on Attribute*

  Level of impact of the effect that the threat may have on the conservation objectives of the Attribute, which is a combination of the intensity and the severity of the threat.

The last three items inform the priorization process of the actions (see below).

Some human activities may cause several threats, and some threats may be caused by several human activities. The flow chart below shows the synergies and links between different human activities and threats.



Flowchart of links among human activities and threats

Table of threats to the population, their causes, their impacts, indicators and priority levels.

Threat	Cause	Indicator of threat	Attribute affected	Conservation Objective threatened	Possible impact on Attribute	Indicator of possible impact on Attribute	Priorization		
							Severity of impact on conservation objective	Intensity / occurrence of cause of threat	Impact level on Attribute
Bycatch	- Longlines - Gillnets - Driftnets	Bycatch rate	Genetic structure of the population	To maintain the genetic variability of the population	Imbalances in Hardy-Weinberg equilibrium and loss in variability if bycatch is selective		High	Very high bycatch rate	Suspected very high
			Abundance	To maintain or increase in the long term the abundance of the species in the region	Death of individuals	Proportion of animals by-caught in the population	High		
					Disruption of the age/sex structure if bycatch is selective	Decreased reproductive rate	High		
Genetic pollution	Release of captive or foreign turtles Introduction of eggs	Number of releases of captive turtles Number of clutch reintroductions	Genetic structure of the population	To maintain the genetic variability of the population	Genetic pollution		Low	None at present, but plans	Low
Introduction of diseases	Release of captive or foreign turtles Introduction of eggs	Number of releases of captive or foreign turtles Number of clutch reintroductions	Health and nutritional status of the population	To avoid a deterioration of the health and nutritional status of the animals	Pathologies	Increase of 'new' pathologies	Medium	None at present, but plans	Medium (to be determined if occurring)
Injury or death	Direct aggression	Turtles found (dead or alive) with signs of aggression	Health and nutritional status of the population	To avoid a deterioration of the health and nutritional status of the animals	Injury (slight to severe) or death	Num. of turtles found (dead or alive) with signs of aggression	Medium	Low	Low
	Maritime traffic (collision)	Turtles found (dead or alive) with signs of collision				Num. of turtles found (dead or alive) with signs of collision			
	Yachting (collision)								
	Invasive research (involving direct contact or capture)	Turtles found (dead or alive) with signs of mishandling				Num. of turtles found (dead or alive) with signs of mishandling			

(continuation) Threats to the population, their causes, their impacts, indicators and priority levels.

Threat	Cause	Indicator of threat	Attribute affected	Conservation Objective threatened	Possible impact on Attribute	Indicator of possible impact	Priorization		
							Severity of impact on conservation objective	Intensity / occurrence of cause of threat	Impact level on Attribute
Mechanical destruction of prey aggregating benthic habitat	Trawling	Trawling effort (spatial and temporal)	Abundance	To maintain or increase in the long term the abundance of the species in the region	Increased mortality rate by reduction of availability of food resources in the area	Reduction in abundance of animals	High	High	High
					Reduction in reproductive success by reduction of availability of food resources in the area	Reduction in reproduction rate			
			Distribution and habitat use	To avoid the reduction (spatial and temporal) on a long term basis of the usage of areas important for the species	Exclusion by reduction of availability of food resources in the area	Reduction (spatial or temporal) on the usage of the important areas			
			Health and nutritional status of the population	To avoid a deterioration of the health and nutritional status of the animals	Malnutrition by reduction of availability of food resources in the area	Increase in number of emaciated animals			
			Prey	To maintain or increase the availability of food resources for the animals	Reduction of availability of food resources in the area	Reduction in abundance of food resources			
	Dredging	Num. and extent of dredging operations	Distribution and habitat use	To avoid the reduction (spatial and temporal) on a long term basis of the usage of areas important for the species	Exclusion by reduction of availability of food resources in the area	Reduction (spatial or temporal) on the usage of the important areas	Low	Low	Low
	Infrastructure construction (e.g. ports, wind farms)	Num. and extent of infrastructure constructions	Distribution and habitat use	To avoid the reduction (spatial and temporal) on a long term basis of the usage of areas important for the species	Exclusion by reduction of availability of food resources in the area	Reduction (spatial or temporal) on the usage of the important areas	Low	Medium	Low

(continuation) Threats to the population, their causes, their impacts, indicators and priority levels.

Threat	Cause	Indicator of threat	Attribute affected	Conservation Objective threatened	Possible impact on Attribute	Indicator of possible impact	Priorization		
							Severity of impact on conservation objective	Intensity / occurrence of cause of threat	Impact level on Attribute
Depletion of prey	Trawling	Trawling effort and catches (spatial and temporal)	Genetic structure of the population	To avoid the fragmentation of the population and the genetic isolation of its sub-units	Longer distances between sub-units and decreased migration rate due to reduction in abundance	Decreased gene flow	Low	Low	Low
			Abundance	To maintain or increase in the long term the abundance of the species in the region	Increased mortality rate by reduction of availability of food resources in the area	Reduction in abundance of animals			
					Reduction in reproductive success by reduction of availability of food resources in the area	Reduction in reproduction rate			
			Distribution and habitat use	To avoid the reduction (spatial and temporal) on a long term basis of the usage of areas important for the species	Exclusion by reduction of availability of food resources in the area	Reduction (spatial or temporal) on the usage of the important areas			
			Health and nutritional status of the population	To avoid a deterioration of the health and nutritional status of the animals	Malnutrition by reduction of availability of food resources in the area	Increased number of emaciated animals			
			Prey	To maintain or increase the availability of food resources for the animals	Reduction of availability of food resources in the area	Reduction in abundance of food resources			
	Sport fishing	Sport fishing effort and catches (spatial and temporal)	Abundance	To maintain or increase in the long term the abundance of the species in the region	Increased mortality rate by reduction of availability of food resources in the area	Reduction in abundance of animals	Low	Low	Low
					Reduction in reproductive success by reduction of availability of food resources in the area	Reduction in reproductive rate			
			Distribution and habitat use	To avoid the reduction (spatial and temporal) on a long term basis of the usage of areas important for the species	Exclusion by reduction of availability of food resources in the area	Reduction (spatial or temporal) on the usage of important areas			
			Health and nutritional status of the population	To avoid a deterioration of the health and nutritional status of the animals	Malnutrition by reduction of availability of food resources in the area	Increase in number of emaciated animals			
			Prey	To maintain or increase the availability of food resources for the animals	Reduction of availability of food resources in the area	Reduction in abundance of food resources			

(continuation) Threats to the population, their causes, their impacts, indicators and priority levels.

Threat	Cause	Indicator of threat	Attribute affected	Conservation Objective threatened	Possible impact on Attribute	Indicator of possible impact	Priorization		
							Severity of impact on conservation objective	Intensity / occurrence of cause of threat	Impact level on Attribute
Depletion of prey	Gillnets	Gillnets effort and catches (spatial and temporal)	Abundance	To maintain or increase in the long term the abundance of the species in the region	Increased mortality rate by reduction of availability of food resources in the area	Reduction in abundance of animals	Low	Low	Suspected low (to be determined)
					Reduction in reproductive success by reduction of availability of food resources in the area	Reduction in reproductive rate			
			Distribution and habitat use	To avoid the reduction (spatial and temporal) on a long term basis of the usage of areas important for the species	Exclusion by reduction of availability of food resources in the area	Reduction (spatial or temporal) on the usage of the important areas			
			Health and nutritional status of the population	To avoid a deterioration of the health and nutritional status of the animals	Malnutrition by reduction of availability of food resources in the area	Increase in number of emaciated animals			
			Prey	To maintain or increase the availability of food resources for the animals	Reduction of availability of food resources in the area	Reduction in abundance of food resources			
Alteration of foraging strategies	Longlining	Proportion of bait discard in turtle diet	Health and nutritional status of the population	To avoid a deterioration of the health and nutritional status of the animals	Dependence and laziness Hanging around longlines Entanglement	Proportion of turtles foraging on longline bait	High	High	High
	Gillnets	Proportion of turtles foraging around gillnets				Proportion of turtles foraging around gillnets		Medium	
						Entanglement numbers		Medium	

(continuation) Threats to the population, their causes, their impacts, indicators and priority levels.

Threat	Cause	Indicator of threat	Attribute affected	Conservation Objective threatened	Possible impact on Attribute	Indicator of possible impact	Priorization		
							Severity of impact on conservation objective	Intensity / occurrence of cause of threat	Impact level on Attribute
Harassment	Research, pleasure boats, jet skis)	Num. and severity of reported cases of harassment	Distribution and habitat use	To avoid the reduction (spatial and temporal) on a long term basis of the usage of areas important for the species	Exclusion by increased perturbation	Reduction (spatial or temporal) on the usage of the important areas	Low	Low / medium (area dependant)	Low
			Health and nutritional status of the population	To avoid a deterioration of the health and nutritional status of the animals	Stress and associated effects	Increased indicators of stress in stranded animals	Medium		
	Invasive research (involving direct contact or capture)	Num. and severity of reported cases of harassment	Health and nutritional status of the population	To avoid a deterioration of the health and nutritional status of the animals	Stress and associated effects	Signs of stress in animals	Medium	Low	Medium

(continuation) Threats to the population, their causes, their impacts, indicators and priority levels.

Threat	Cause	Indicator of threat	Attribute affected	Conservation Objective threatened	Possible impact on Attribute	Indicator of possible impact	Priorization		
							Severity of impact on conservation objective	Intensity / occurrence of cause of threat	Impact level on Attribute
Toxic pollution	Oil exploitation	Num. and extent of oil spills	Distribution and habitat use	To avoid the reduction (spatial and temporal) on a long term basis of the usage of areas important for the species	Exclusion by reduction of quality of the habitat	Reduction (spatial or temporal) on the usage of the important areas	Medium? (to be determined)	Low but increase foreseen	Medium? (to be determined)
			Health and nutritional status of the population	To avoid a deterioration of the health and nutritional status of the animals	Pathologies, immunosuppression, disruption of reproduction	Levels of toxic pollutants in turtle samples			
	Uncontrolled waste management	Waste management control reports	Abundance	To maintain or increase in the long term the abundance of the species in the region	Increased mortality rate	Reduction in abundance of animals	Medium? (to be determined)	High	High? (to be determined)
					Reduction in reproductive success	Reduction in reproductive rate			
			Health and nutritional status of the population	To avoid a deterioration of the health and nutritional status of the animals	Pathologies, immunosuppression, disruption of reproduction	Levels of toxic pollutants in turtle samples			
	Maritime traffic	Num. of oil spills from maritime traffic	Distribution and habitat use	To avoid the reduction (spatial and temporal) on a long term basis of the usage of areas important for the species	Exclusion by reduction of quality of the habitat	Reduction (spatial or temporal) on the usage of the important areas	Medium? (to be determined)	High	Medium? (to be determined)
			Health and nutritional status of the population	To avoid a deterioration of the health and nutritional status of the animals	Pathologies, immunosuppression, disruption of reproduction	Levels of toxic pollutants in turtle samples			
		Num. of maritime accidents with toxic substances spills	Distribution and habitat use	To avoid the reduction (spatial and temporal) on a long term basis of the usage of areas important for the species	Exclusion by reduction of quality of the habitat	Reduction (spatial or temporal) on the usage of the important areas	Medium? (to be determined)	Low	Medium? (to be determined)
			Abundance	To maintain or increase in the long term the abundance of the species in the region	Increased mortality rate	Reduction in abundance of animals			
					Reduction in reproductive success	Reduction in reproductive rate			
			Health and nutritional status of the population	To avoid a deterioration of the health and nutritional status of the animals	Pathologies, immunosuppression, disruption of reproduction	Levels of toxic pollutants in turtle samples			

E.6. DEFINING THE BASELINES FOR THE ATTRIBUTES

In this step of the process, an exhaustive analysis of the information available on the loggerhead turtle and its habitat has been done, to determine the status of each Attribute with respect to its Conservation Objectives. This constitutes the baseline information. In some cases there is information available from the studies carried out in the area (e.g. abundance in the study area, trends and fluctuations in recent years, distribution and habitat preferences). But in other cases the information will be very limited or nonexistent, which means that the necessary mechanisms to ensure the collection of such information should be established.

Baseline information that should be available for each Attribute of the population(s) and habitat and their present availability. This table links up to the associated monitoring requirements and tools (see below). The same scheme is applied for the human activities level, defining in the first place what are the human activities for which it is necessary to have baseline information.

E.7. DESIGNING THE MONITORING PLAN

E.7.1. The Monitoring Plan

A Monitoring Plan has to be an integral part of the Conservation Plan. It is of fundamental importance to develop a feedback mechanism to the Conservation Plan; the results of monitoring periodically inform the Plan. In this way, the Actions can be adapted to new situations. The requirement for baseline information is at two levels: monitoring of the population (the Attributes defined above) and of the human activities. In all cases it is necessary to prioritize the monitoring actions according to their usefulness and feasibility.

The Monitoring Plan must include the specific conservation objective established with respect to an attribute, the selection of an indicator value, the selection of a monitoring tool (including data collection and analysis) and finally the outcome which is to serve as feedback to the Conservation Plan. The following table shows the Monitoring Plan for the population in a schematic way, together with the baseline information required.

As with the collection of baseline information, it is also important to consider here the synergies between monitoring methods. Some methods for collecting data or for analysis are the same or very similar for monitoring several Indicators of Conservation Objectives. This should be an important aspect to consider when prioritizing monitoring actions. For example, the sampling methods could be summarised, in general, into four categories and can provide data for a variety of analytical methods, both for the monitoring of the populations.

Sampling from fishery (observer campaigns:

- Habitat preference models
- Abundance estimates
- Human activities
    - Bycatch data
- Turtle “catching” for tagging and biopsies (genetics, toxicology, stable isotopes)

Sampling from line transect survey with systematic design:

- Habitat preference models
- Abundance estimates
- Human activities

Sampling from line transect survey with non-systematic design:

- Habitat preference models
- Abundance estimates
- Turtle “catching” for tagging and biopsies (genetics, toxicology, stable isotopes)
- Human activities

Strandings and by-catches

- Pathology
- Genetics
- Causes of mortality
- Stable isotopes
- Toxicology

E.7.2. MONITORING vs RESEARCH vs ACTION TRACKING

It is important to note the difference between the research carried out in the context of the MONITORING PLAN, with the RESEARCH ACTIONS and also with the ACTION TRACKING of the project.

The research carried out in the MONITORING PLAN corresponds to the long-term collection of the vital information for the analysis of trends that are required for the running of the conservation plan with respect to its conservation objectives. Scientific studies developed with the aim of obtaining essential baseline data where this is requires, are also included under MONITORING actions.

The RESEARCH ACTIONS are established where there is an urgent need for data to solve a specific problem (i.e. testing bycatch mitigation measures).

The ACTION TRACKING is the "self evaluation" mechanism established for each action of the LTCP

E.8. ESTABLISHING PRIORITIES

Establishing priorities for the programme of actions of the conservation plan is the major challenge to ensure that the conservation goals are met in the most cost efficient and rapid way.

E.8.1. FOCUSING ON THE POPULATION

In this LTCP we have taken special interest in making sure that we are coming up with "species conservation plan" and not an individual turtle welfare plan. When dealing with emblematic species we need to fight the strong lobby for spectacular mediatic actions that focus effort and funds that in terms of conservation only have an impact at the individual level. It is for this reason that the above tables serve a purpose for basing priorities on the needs of the populations that we need to preserve, and not on our humane urge to cure the individual if this does not lead anywhere, however cute the individual may be.

E.8.2. URGENCE

The severity of threats and the urgency of a response to limit its impact on the populations is certainly the first criteria used.

E.8.3. FEASABILITY

Actions also need to be feasible, and this is why the analysis of feasibility plays also an important role in the process that leads us to the selection of actions.

Table of: Baseline information required and scheme of Monitoring Plan for the population and habitat attributes

Attribute	Conservation Objective	Indicator	Baseline information			Monitoring Plan						
			Information required	Current data availability	Current analysis availability	Data requirement	Data collection methods requirements	Analytical methods requirements	Output	Sampling temporal plan	Feasibility	Priority
Genetic structure of the population	To maintain the genetic variability of the population	Level of genetic diversity of the population	Genetic diversity of the population: - Deviances from the Hardy Weinberg equilibrium - Allelic richness - Nucleotidic diversity	Partially available (more samples needed)	Not available yet, but foreseen for 2006	Skin biopsies or skin swabbing of animals from the region and from adjacent areas	Ship-board surveys	- Molecular analysis of mitochondrial DNA and microsatellites - Statistical analysis	- Deviances from the Hardy Weinberg equilibrium - Allelic richness - Nucleotidic diversity	Every 5 years	High	High
						Skin or other tissues from stranded or by-caught animals in the region and in adjacent areas	Strandings and by-catches			All stranded and by-caught animals	High	High
	To avoid the fragmentation of the population and the genetic isolation of its sub-units (maintain or increase gene flow between population nuclei)	Genetic structure of the population	Genetic structure of the population: - Level of intrapopulation differentiation - Level of interpopulations differentiation) - Migration rate	Partially available (more samples needed)	Not available yet	Skin biopsies or skin swabbing of animals from the region and from adjacent areas	Ship-board surveys	- Molecular analysis of mitochondrial DNA and microsatellites - Statistical analysis	- Level of intrapopulation differentiation - Level of interpopulations differentiation - Migration rate	Every 5 years	High	High
						Skin or other tissues from stranded or by-caught animals in the region and in adjacent areas	Strandings and by-catches			All stranded and by-caught animals	Medium	High

(continuation). Baseline information required and scheme of Monitoring Plan for the population and habitat attributes

Attribute	Conservation Objective	Indicator	Baseline information			Monitoring Plan						
			Information required	Current data availability	Current analysis availability	Data requirement	Data collection methods requirements	Analytical methods requirements	Output	Sampling temporal plan	Feasibility	Priority
Distribution and habitat use	To avoid the reduction (spatial and temporal) on a long term basis of the usage of areas important for the species	Size of areas used by turtles and shifts in time	Size of the areas used by the turtles	Available	Available for the Alborán Sea through spatial analysis. For the rest of the areas foreseen for 2006	Effort and sightings data	Ship-board surveys Fishery observer campaigns	Spatial analysis	Surface maps of habitat preference	Seasonal and yearly	Medium	High
		Frequency of use of the important areas and trends	Frequency of use of the adequate areas	Available	Not available			Statistical analysis	Seasonal and annual frequency of use of the areas	Seasonal and yearly	Medium	High
		Site fidelity of animals	Site fidelity of animals	Available	Not available	Tagging		Mark-recapture	Levels of site fidelity of individual animals	Seasonal and yearly	Medium	Medium

(continuation). Baseline information required and scheme of Monitoring Plan for the population and habitat attributes

Attribute	Conservation Objective	Indicator	Baseline information			Monitoring Plan						
			Information required	Current data availability	Current analysis availability	Data requirement	Data collection methods requirements	Analytical methods requirements	Output	Sampling temporal plan	Feasibility	Priority
Abundance	To maintain or increase in the long term the abundance of the species in the region	Abundance of turtles and trends	Current abundance in southern Spanish Mediterranean	Not Available	Not available	Line transect data in southern Spanish Mediterranean	Ship-board surveys in southern Spanish Mediterranean	Spatial analysis	Abundance estimate and trends and surface maps of density	Seasonal and yearly	High	High
						Tagging		Mark-recapture	Abundance estimate and trends Catalogue of identified animals	Seasonal and yearly	High	Medium
			Current abundance of population (as informed from genetics) in Mediterranean Sea	Not available.	Not available	Line transect data in Mediterranean Sea	Ship-board surveys in Mediterranean Sea	Distance sampling	Abundance estimate and trends	Every 10 years	High	High
								Spatial analysis	Abundance estimate and trends and surface maps of density			
			Viability of the population (including reproductive rates and survival)	Not available	Not available	Reproduction rates	Tagging	Population Viability Analysis	Prediction of the viability of the population	Every year	Medium	Medium
						Survival - tagging						

(continuation). Baseline information required and scheme of Monitoring Plan for the population and habitat attributes

Attribute	Conservation Objective	Indicator	Baseline information			Monitoring Plan						
			Information required	Current data availability	Current analysis availability	Data requirement	Data collection methods requirements	Analytical methods requirements	Output	Sampling temporal plan	Feasibility	Priority
Health and nutritional status of the population	To avoid a deterioration of the health and nutritional status of the animals	Level of pathologies in animals	Level of pathologies in animals	Not available	Not available	Stranded or by-caught animals	Strandings and by-catches	Clinical and pathological examinations	Description and levels or proportions of pathologies	All strandings and by-catches	Low	Low
		Level of pollutants in animal tissues	Level of pollutants in animal tissues	Not available	Not available	Skin, fat and other tissues	Strandings and by-catches	Toxicological analysis	Quantitative levels of pollutants in the tissues of the animals	All strandings and by-catches	High	Medium
						Skin biopsies of animals	Ship-board surveys				High	Medium
			Nutritional status of animals	Not available	Not available	Stranded or by-caught animals	Strandings and by-catches	Measure of the blubber thickness	Blubber layer thickness	All strandings and by-catches	Medium	Low
						Sightings and behavioural data	Ship-board surveys	Statistical analysis	Proportion of time spent searching for food	Seasonal and yearly	Low	Medium
		Number of mortalities the cause of which is identified as 'human activity'	Number of injuries and mortalities the cause of which is identified as 'human activity'	Bycatch data	Bycatch data	Number of injuries and mortalities the cause of which is identified as 'human activity'	Strandings and by-catches	Analysis of the causes of mortality	Estimated number and proportion of injuries and mortalities caused by different types of human activities	All strandings and by-catches	High	Medium
							Observations at sea	Statistical analysis		All visual surveys	High	Medium
							Inquiries to fishermen			Yearly	High	Low
							Observers on fishing boats			Seasonal and yearly	High	High
		Composition of the diet of animals	Diet	Partially available through stable isotopes (not to species level)	Partially available through stable isotopes (not to species level)	Potential prey samples	Markets, fishing boats, etc.	Stable isotopes	Stable isotopes profiles for turtles and prey	Seasonal and yearly	High	High
						Biopsy samples	Ship-board surveys				High	
						Skin, fat and other tissues	Strandings and by-catches	Stable isotopes		All strandings and by-catches	High	High
								Stomach contents	Stomach contents		High	Low

(continuation). Baseline information required and scheme of Monitoring Plan for the population and habitat attributes

Attribute	Conservation Objective	Indicator	Baseline information			Monitoring Plan						
			Information required	Current data availability	Current analysis availability	Data requirement	Data collection methods requirements	Analytical methods requirements	Output	Sampling temporal plan	Feasibility	Priority
Prey	To maintain or increase the availability of food resources for the animals	Abundance of the main prey species for loggerhead turtles	Spatial distribution of potential prey	Partially available (IEO)	Partially available (IEO)	Spatial distribution of CPUE (catch per unit effort) of potential prey species	Oceanographic surveys	Spatial analysis	Surface maps of distribution of potential prey	Yearly	Low	High
			Abundance of potential prey	Partially available (IEO)	Partially available (IEO)	CPUE of potential prey species	Oceanographic surveys	Statistical analysis	Abundance of potential prey	Yearly	Low	High

Baseline information required and scheme of Monitoring Plan for the human activities

Human activity	Baseline information required (and Indicator for the Monitoring Plan)	Present availability	Monitoring methods		Output	Sampling temporal plan	Priorization	
			Requirement of data	Analytical requirements			Feasibility	Priority
Gillnets	Fishing effort	Partial availability (IEO – SGPM – CAP data).	Number of ships, and hours of fishing	Statistical analysis	Number of ships and hours of fishing	Yearly	High	Medium
	Diversity and volume of catches	Partial availability (IEO – SGPM – CAP data).	Catch statistics	Statistical analysis	Volume of catches by species	Yearly	Low	Medium
	Fishing areas	Partial availability (IEO – SGPM – CAP – Alnitak data).	On site data from visual surveys	GIS	Maps of fishing areas	Yearly	High	Medium
Driftnets	Fishing effort	Partially available (WWF)	Number and length of nets	Statistical analysis	Number and length of nets	Yearly	Low	High
	Fishing areas	Not available	On site data from visual surveys	GIS	Maps of fishing areas	Yearly	Low	High
Longlining	Fishing effort	Partial availability (IEO – SGPM – CAP data).	Number and power of ships, and hours of fishing	Statistical analysis	Number and power of ships and hours of fishing	Yearly	High	High
	Diversity and volume of catches	Partial availability (IEO – SGPM – CAP data).	Catch statistics	Statistical analysis	Volume of catches by species	Yearly	High	High
	Fishing areas	Partial availability (IEO – SGPM – CAP – Alnitak data).	On site data from visual surveys	GIS	Maps of fishing areas	Yearly	High	High
Sport fishing	Fishing effort	Not available	Number of ships, and hours of fishing	Statistical analysis	Number of ships and hours of fishing	Yearly	Medium	Medium
	Diversity and volume of catches	Not available	Catch statistics	Statistical analysis	Volume of catches by species	Yearly	Low	Medium
	Fishing areas	Partially available (visual surveys in Alborán Sea)	On site data from visual surveys	GIS	Maps of fishing areas	Yearly	High	Medium
Release of captive or foreign sea turtles	Number of releases	Recovery centre data	Number and plans of releases	None	Number and plans of releases	Continuous	High	Medium
Dredging	Dredging effort	Available (official records)	Official records	Statistical analysis	Amount and intensity of dredging	Yearly	High	Low
	Dredging areas	Available (official records)	Official records	GIS	Map of dredging areas	Yearly	High	Low
Infrastructure construction	Present number and extension of infrastructure constructions (ports, wind farms, oil plants, etc.)	Available (official records)	New construction projects	GIS	Number and maps of new construction projects	Yearly	High	Low

F – LTCP ACTIONS

The main tool of a Conservation Plan is the programme of Actions. These are the necessary actions to be undertaken in order to reach the Conservation Objectives. They are designed to minimise the impact of the threats on the species and its habitat. Therefore, the programme of Actions is the result of a careful analysis of the threats, their possible effects on the population(s), and the possible palliative or preventive measures that could be taken in a realistic way.

F.1. STRUCTURE OF THE ACTIONS

All the Actions included in the Conservation Plan describe:

- IDENTITY including: a) Type of action; b) Name of action and c) Level of priority

- DESCRIPTION including: a) Specific objectives it is developed for; b) Specific threats it is aimed to mitigate; c) Target; d) Method and materials; e) Expected results; f) Implementation; g) Timeline; and h) Cost

- LEGAL FRAMEWORK

- ACTORS including: a) Relevant authority; and b) Executers (operators – receivers)

- EVALUATION including: a) Indicator values; and b) Monitoring tool

F.2. TYPES OF ACTIONS

The Actions can be classified in several categories, following to large extent those established in similar conservation and recovery plans established for the same sea turtle populations in the Mediterranean and Atlantic Ocean.

1. **Monitoring Actions**

   Actions involving lines of research on specific aspects of the species, the habitats or the human activities and their impact on the species. These research actions focus on filling the scientific information gaps that are essential for effective conservation. Monitoring Actions also ensure that there is a systematic recording of those essential values that have been identified as indicators for the analyses of trends in the conservation status of the species and their habitats and in the threats and human activities that cause them. These Actions will assess, therefore, if the conservation objectives are being accomplished.

2. **Research Actions**

   These Actions are established where there is an urgent need for data to solve a specific problem (i.e. testing bycatch mitigation measures) or to obtain essential baseline data.

3. **Management Actions**

   Actions designed to manage human activities such as fisheries, whale-watching, pollution, etc.

4. **Legislative Actions**

   Actions that involve the creation or modification of laws, regulations, guidelines, etc. and the creation or ratification of agreements, conventions, etc. This also refers to certain actions to allow the better implementation of existing regulations.

5. **Capacity building Actions**

   Actions that contribute to the monitoring, legislative and management actions through the better involvement of stakeholders in the process, both at an institutional and at an individual scale. Institutional capacity building actions would be designed to promote the appropriate activities towards the Conservation Objectives by the institutions (administrative, education, research, etc. both governmental and non-governmental), providing them with the necessary information and/or mechanisms for it. Individual capacity building actions would be designed to provide adequate information and training to individual persons (teachers, press, managers, researchers, etc.) so they can reach the necessary capacity to act in favour of the Conservation Objectives of the Plan.

6. **Public Awareness Actions**

   Actions that link the Conservation Plan and in general the regional, national and international biodiversity conservation strategies with the general public (students, fishermen, managers, etc.) providing them with attractive and educational information.

The detailed actions are described in the Spanish version of the Conservation Plan.