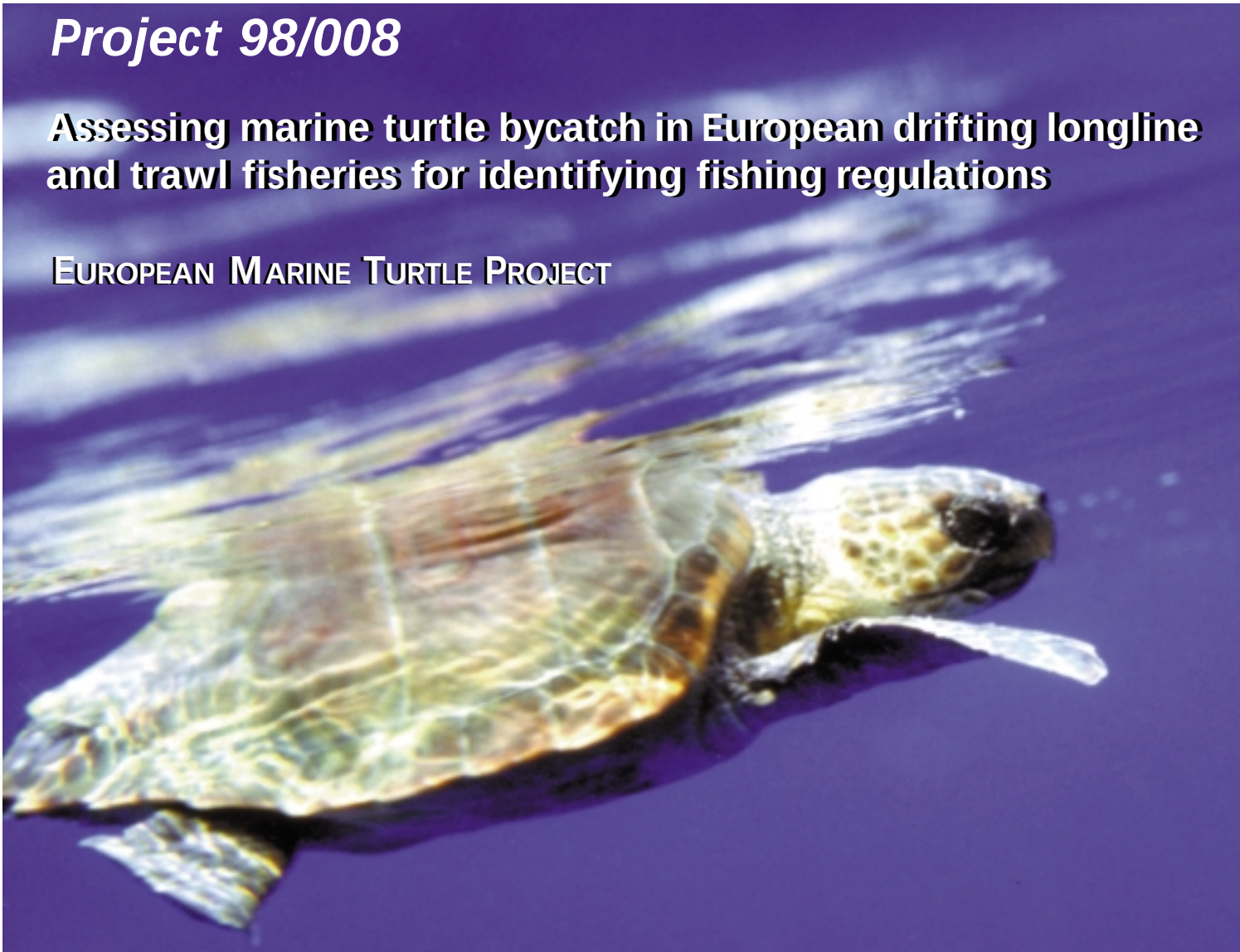
EUROPEAN COMMISSION
DIRECTORATE-GENERAL XIV-FISHERIES

Project 98/008

Assessing marine turtle bycatch in European drifting longline and trawl fisheries for identifying fishing regulations

EUROPEAN MARINE TURTLE PROJECT



PROTOCOL MANUAL

1999

Coordinating Institution
BIOINSIGHT
Biologie de la Conservation - Conservation Biology
27, Bd du 11 Novembre 1918 - Bât. CEI - BP 2132
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PROJECT EC-DG XIV-98/008

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EUROPEAN MARINE TURTLE PROJECT

PROTOCOL MANUAL

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1999

• THIS STUDY HAS BEEN CARRIED OUT WITH THE FINANCIAL ASSISTANCE OF THE EUROPEAN COMMISSION.

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INTRODUCTION

The present manual of protocols is the reference document for the data collection and the overall standard methodologies operated by onboard observers within the framework of the drifting longline and trawl monitoring programs of the project 98/008.

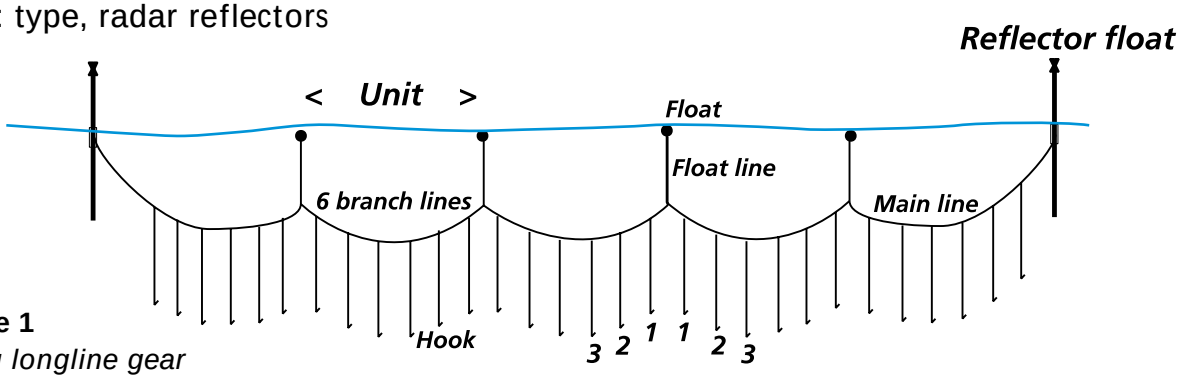
1 - DRIFTING LONGLINE MONITORING PROGRAM

Two data forms in national language are completed by onboard observers to describe marine turtle bycatch in drifting longline fisheries. The first is called "longline set data form", which is used to record parameters dealing with longline gear characteristics and longline set, together with crew behaviour and attitude towards marine turtles. The second data form is the "longline-caught data form" allowing observers to record biologically-related parameters for each longline-caught turtle.

1-1 Longline gear characteristic-related parameters

The **fishing unit effort**: **the number of hooks**[1], and the target species of the fishing gear are systematically recorded and the following data describing the gear (> figure 1) are reported:

- **Hooks**: model, size, material
- **Baits**: type
- **Lightsticks**: used ?, trade-mark, colour, attachment point to branch line, number
- Units (a stretch of main line between two floats): length of the main line within a unit, number of branch lines per unit, distance between two branch lines, number of units per main line
- Branch lines: material, colour, diameter, length, method of attaching branch line to main line (by clip or knot), occurrence of swivel on branch line
- Main line: material, colour, diameter, length
- Float lines (or buoy lines): material, colour, diameter, length
- Floats: type, radar reflectors



> figure 1
Drifting longline gear

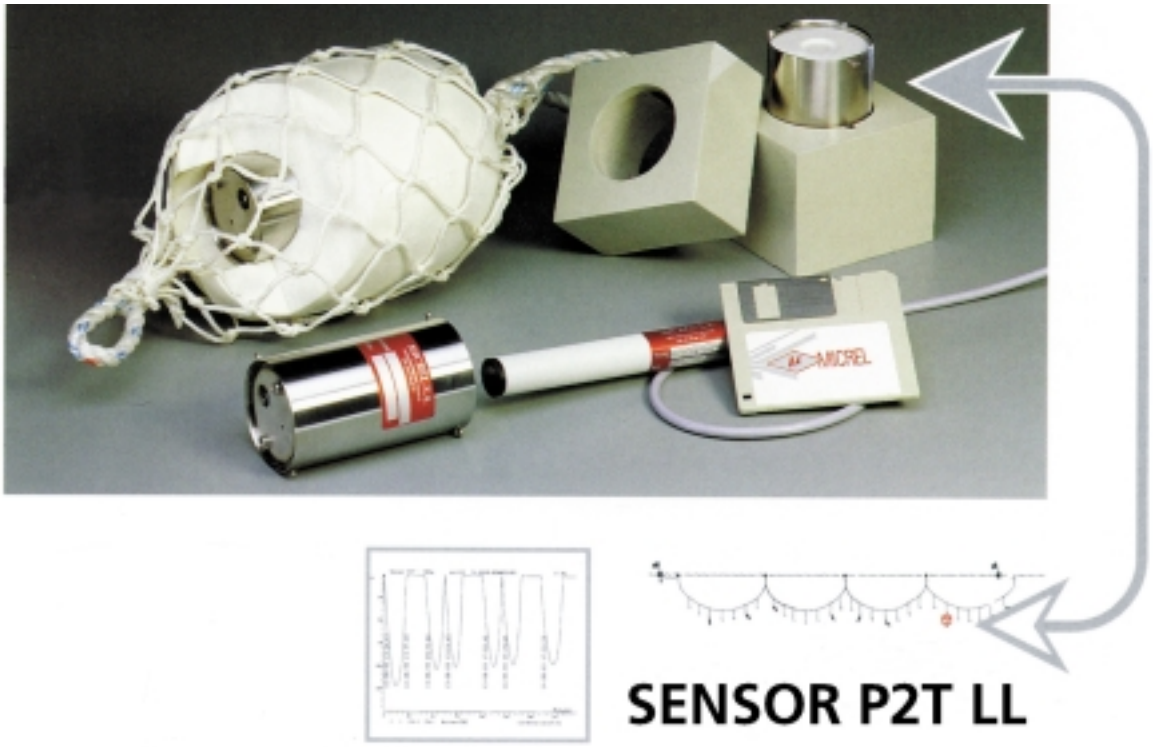
[1] Parameters in bold are priority EMTP parameters.

1-2 Longline set-related parameters

Time (expressed in hours/minutes) and **location** (geographical coordinates) for beginning and ending set, as well as for beginning and ending retrieval of longline gear are recorded. **Occurrence of marine turtles** in the set catch (longline-caught turtles) is accurately recorded and, in order to avoid confusion, a code number is assigned to each longline-caught turtle reported within a set.

1-2-1 Longline set parameters measured with time-depth-temperature recorders

Hook depth is measured with time-depth-temperature recorders Sensor P2TLL100 type (> photo 1) purchased from the Micrel Company (Hennebont, France). The depth resolution and precision are 0.20 m and +/- 0.50 m, respectively, while the temperature resolution and precision are 0.08°C and +/- 0.18°C, respectively, for number of



> photo 1
Sensor P2TLL100, buoy material Klegecell, net and data pencil connected to a PC portable. Photo by Micrel

conversion bits set to 10. The buoyancy of the Sensor is constant regardless of the depth due to the buoy material Klegecell, and null with the net that enables the Sensor to be attached to longline (> photo 1). Sensor buoyancy is checked when attached to the longline with the special net. In the event of some Sensor+net having positive buoyancy, a small amount of buoy material Klegecell can be removed, 17 cm^3 of material Klegecell being equivalent to 10 g.

The attachment point of Sensor to the branch line for measuring mean hook depth is near the hook which is **baited** for two kinds of branch lines within a unit, the shallowest branch line (close to the float) or the deepest one (in the middle of the unit).The parameters recorded are the sinking time, the variation in settled depth and the rising time of hooks baited. The record of temperatures allows data to be collected regarding sea surface temperature and sea water temperature in relation to depth (thermocline location).

The Sensor stores depth and temperature data for a set or a fishing trip which are then transferred to a PC portable by positioning a connected data pencil near the Sensor (> photo 1), the internal memory with data compression being 32 Ko. The software Winmemo provided by the Micrel company (Hennebont, France) displays the depth and temperature curves according to time, and the temperature curve according to depth to locate eventual thermocline. Depth and temperature data are then exported to other software for statistical analyses.

The standardised setting configuration parameters of the Sensor are:

- measuring condition: >1 m depth
- measure cadence: 5 seconds
- number of measures before stop: 30
- measure mode: start and stop on condition + restart
- waking cadence: 10 seconds
- waiting cycle (number of waking before measuring starting): 0
- storage mode: stop if out of memory

This configuration is checked and then eventually modified in relation to the frequency at which Sensor data are transferred to a PC portable.

1-2-2 Capture time parameter measured with hook timers

Hook timers provided by the Micrel company (Hennebont, France) are used to measure the **capture time** at which a longline-caught turtle hooks the bait and to resolve possible uncertainty in estimating capture depth. Hook timers (> photo 2) indicate the elapsed time between the moment when the turtle swallows the hook and starts the timer, and the moment when the hook timer is read, enabling the capture time to be accurately calculated. Hook timers are made of a waterproof box with a micro controller and a displayer, and a cap containing a magnet. The timer is off when the cap is locked in the box. The timer starts with the extraction of the cap through a magnetic switch. The minimum traction to open the cap is 3 kg. The time passed in whole minutes is read by transparency on the displayer, from 00h00 min to 29h59 min. After 29h59 min the displayer remains fixed. The displayer gets off 5 days after reaching the 29h59 min value. Replacing the cap switches off the displayer.

> photo 2
Hook timer.
Photo by Micrel

Hook timers are attached to a branch line near the knot or the clip, bridging a loop in the line made of four elements: a superior link, the hook timer, an inferior link and an intermediate line. The intermediate line is longer than the whole (hook timer+superior link+inferior link) to guarantee the swallowing of the cap. The cap locked in the box supports the weight of the branch line with the baited hook, and no breaking bond is installed.

Since it is not possible to supply all branch lines of a longline gear with hook timers, hook timer data collection strategies are used as follows:

- hook timers are attached to branch lines that have the highest probability of hooking turtles (data probability obtained in the course of the monitoring program)
- totality of hook timers of a national program are permanently installed on one longline

gear from a specific boat
•totality of the hook timers of a national program are installed on various longline gear during trips randomly sampled during surveys

1-3 Crew-related parameters

Previous behaviour of fishermen towards sea turtles (before the onboard observers program) is determined by talking with the crew. Their behaviour concerning the following points, when there are no observers on board, are reported:

•method of hauling longline-caught turtles
•method of handling longline-caught turtles
•method of releasing longline-caught turtles

Since some fishermen originated from foreign countries where sea turtles are/were traditionally killed and consumed, the structure of the crew (number of fishermen, their nationalities and religions) are also determined in relation to their behaviour and attitude towards sea turtles.

The impact made by marine turtle bycatch on longline fishery activity is investigated by systematically asking the captain the following questions:

•do captures of turtles have an impact on drifting longline activities?
•what kinds of impact:
•loss of time when boarding longline-caught turtles
•loss of time when cutting branch lines that hook longline-caught turtles
•loss of time and money incurred when repairing the fishing gear
•reduction in fishing effort
•estimation of loss of money per longline-caught turtle

The situation of longline-caught turtles is also analyzed with a view to find potential operational mitigation measures. The captain is systematically asked the following question:

•are you prepared in the future to cooperate in minimising the impact of longline operations on the Mediterranean marine turtle by applying Turtle Hauling/Handling/De-Hooking Procedures?

1-4 Longline-caught turtle-related parameters

1-4-1General parameters

Longline-caught turtle is brought onboard to measure turtle related parameters; device such as a gear cup is used in some cases to facilitate the boarding (cases where a longline-caught turtle is not brought onboard, but released after cutting the branch line are reported). The following parameters are recorded:

•**the position of the branch line** that hooked a turtle relative to floatline (branch line adjacent to floatline is labelled by 1, branch line located one hook away from floatline is labelled by 2, etc..)(> figure 1)
•**the elapsed time** displayed by the hook timer as well as the time when the hook

timer is read
•**occurrence of lightstick** on branch line that hooked a turtle, or position of the closest lightstick in terms of number of branch lines (one away, two away or more)
•boarding time

1-4-2 Physical conditions

The **physical condition** of a longline-caught turtle is scored into five categories

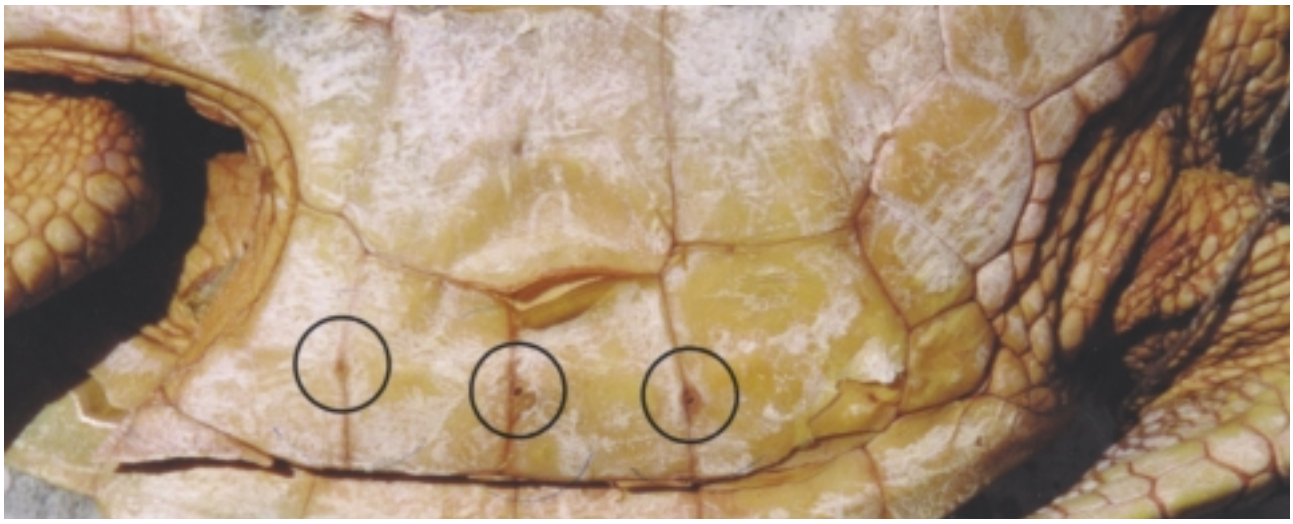
•healthy (moving and flapping)
•injured externally, but healthy (injured descriptive items such as head damage, broken flippers, retroverted anus, erected penis, and other are recorded)
•comatose (dazed, few movements, slight signs of breathing), the turtle is kept 24h as a comatose turtle before considered dead
•dead (no movement, head limp, extended, and flopping to the ground, no sign of breathing, the eyes not responding to touch)
•condition unknown

1-4-3 Status

The **method of capture (hooked, entangled)** is recorded and four main categories are defined

•hooked with a hook in digestive tract (hook location: jaw sheath, mouth, beginning of oesophagus (the hook is visible), deeper in digestive tract (the hook is not visible)
•hooked with a hook not in digestive tract (hook location: flippers, head, neck, body, carapace)
•entangled (entanglement location: flippers, head, neck, carapace; kind of line: main line, float line, branch line)
•status unknown

1-4-4 Species identification



> photo 3
Pores in scales of bridge of a Lepidochelys kempii. Museum of La Rochelle (France) kindly lent the specimen. Photo by Luc Laurent

Longline-caught turtles are identified using a marine turtles identification key (Appendix). Since it is easy to confuse individuals belonging to the *Lepidochelys* genus (rarely observed in the Mediterranean) with the common loggerhead *Caretta caretta*, particular attention is given to the scales of the bridge of each longline-caught turtle. In fact, the only reliable criteria enabling these species to be distinguished is the presence of pores in the scales of bridges in *Lepidochelys* genus (> photo 3). Any individual suspected of belonging to the *Lepidochelys* genus is photographed or kept in order to be shown to a specialist.

1-4-5 Tagging

Location and alphanumerical labels of existing tags are recorded. Longline-caught turtles without tags are **double-tagged** with metal tags (style 1005, size 681C: 25 mm long and 8 mm wide, material: inconel) purchased from the National Band and Tag Company (Newport, United-States). In the Spanish monitoring program smaller metal tags (22 mm long and 7 mm wide) purchased from I.Ö. Mekanista HB (Bankeryd, Sweden) are used on turtles smaller than 40 cm (SCCL). Tags are applied by means of the specific tag applicators 681S supplied by the tag manufacturer. Two tags are attached at the proximal location of the posterior edge of front flippers (one on the right and one on the left front flipper) (> photo 4). The piercing site is in the first axillary large scale as proposed by Limpus (1992)(> photo 4). In the event of a first scale smaller than the tag, the piercing site is in the second axillary large scale (> photo 4). In the event of the thickness of the flipper being wider than the gap within the tag, the piercing site is proximal of and adjacent to the first axillary large scale (Balazs 1999). The tagging procedure is based on the following recommendations presented by Gerosa (1996):

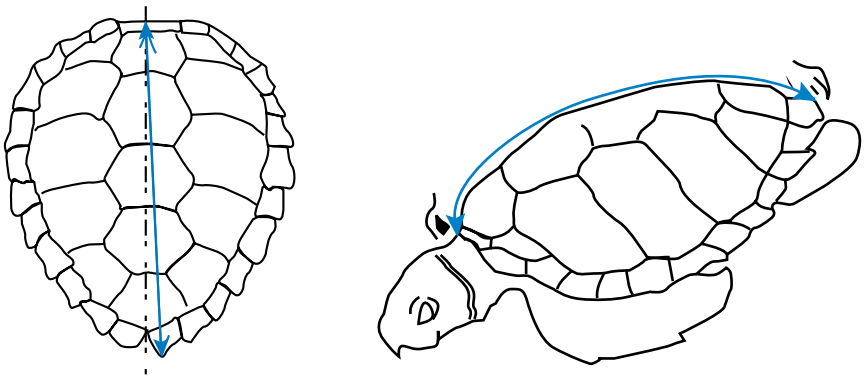
- the distance from the piercing site to the trailing edge of the flipper should be the same, or slightly less, than the length of the tag when locked
- in order to avoid the spring action effect of the tag, when utilizing the applicator the two sides of the tag are slightly squeezed together at a point about one-third from the folding end. Only a minimum pressure is needed

The tagging data (alphanumerical labels, location) are recorded.

> photo 4
Size 681C inconel tag applied to the proximal posterior edge of the right front flipper of a loggerhead turtle. The piercing position is in the first axillary large scale. Photo by Luc Laurent

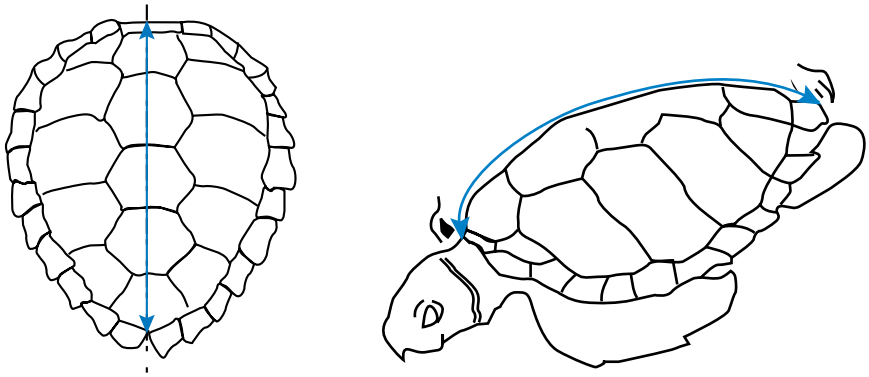
The carapace length of a longline-caught turtle is measured applying three methods of measurement (Pritchard et al. 1983):

Standard Curved Carapace Length (SCCL)



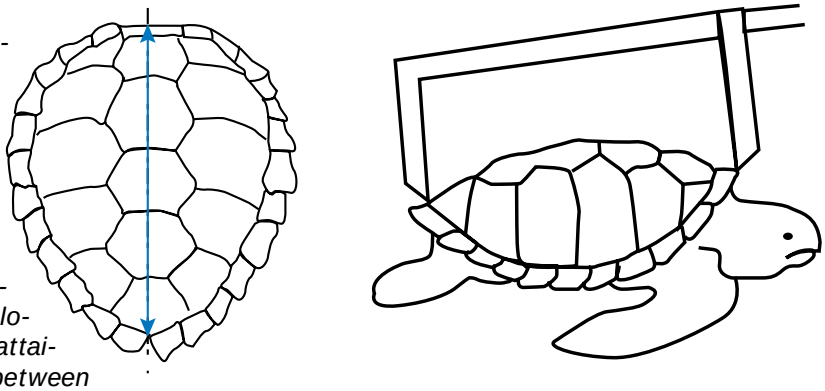
Nuchal scute at midline (from the junction of the skin and carapace) to the distal tip of posterior marginal scutes (carapace tip) using flexible measuring tape in mm and after removing barnacles that are likely to interfere with measurement (= notch to tip)

Minimum Curved Carapace Length (MCCL)



Nuchal scute at midline (from the junction of the skin and carapace) to the posterior point of midline (posterior notch) using flexible measuring tape in mm and after removing barnacles that are likely to interfere with measurement (= notch to notch)

Minimum Straight Carapace Length (MSCL)

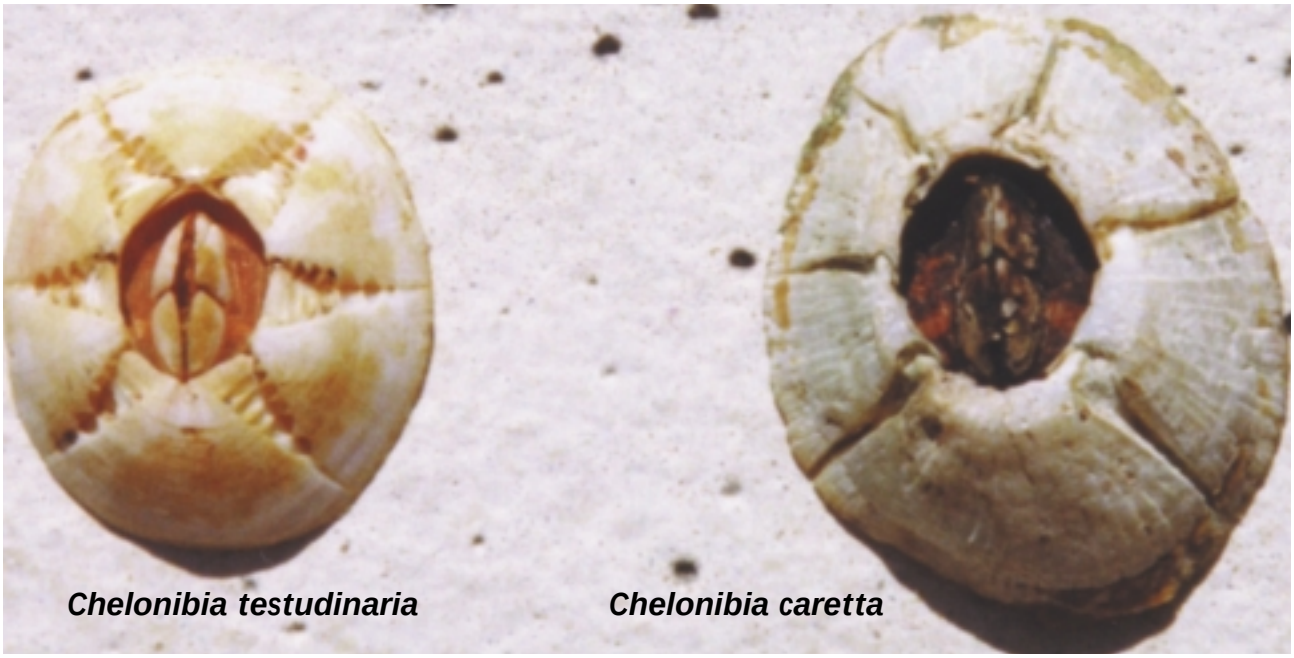


Nuchal scute at midline to posterior point of midline (posterior notch), using an aluminium caliper graduated in mm on both sides purchased from Haglof (Sweden) (= notch to notch). The two legs of the caliper were shortened to reduce the joke and the distance from the carapace, allowing greater accuracy to be attained. The point of contact between the caliper and the carapace is made with the internal tip of each leg of the caliper

The dorsal tail length is measured with flexible measuring tape from the distal tip of posterior marginal scutes (carapace tip) to the tip of extended straightened tail in mm (0 is recorded where the tail is shorter than the carapace).

1-4-7 Occurrence of epibionts and fouling on carapace

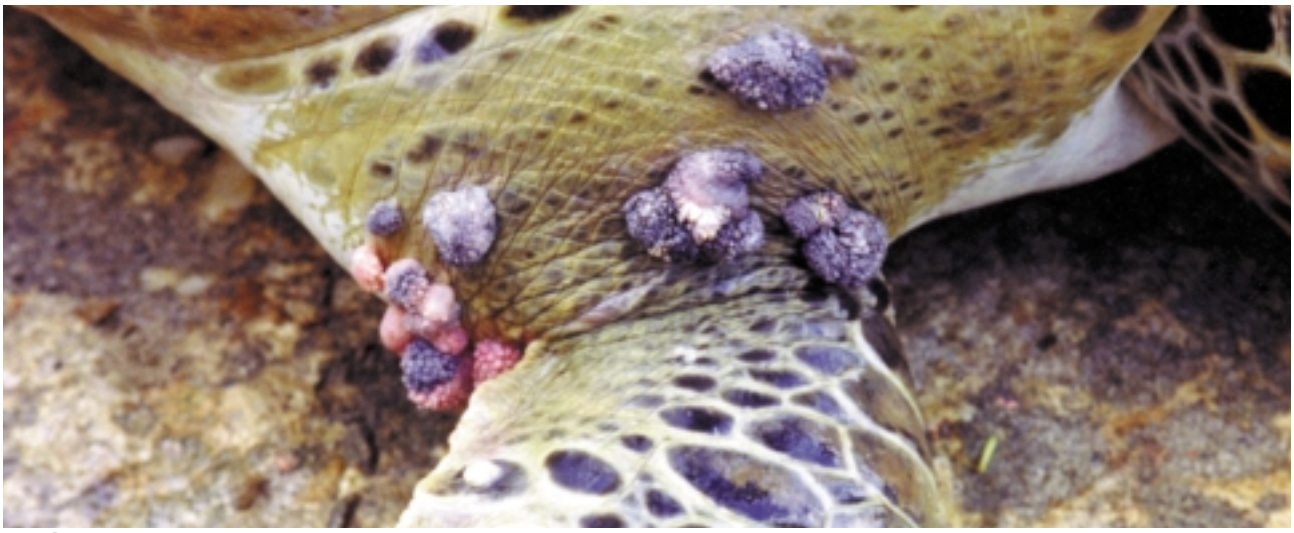
The number of barnacles (*Crustacean Cirrpedia*) (> photo 5) with a diameter greater than 1 cm on the carapace are reported. The distribution of other epibionts are also recorded.



> photo 5
The most common barnacles found on marine turtles in the Mediterranean (x1.6). Photo by Luc Laurent

1-4-8 Occurrence of fibropapilloma tumours

Cutaneous fibropapillomatosis is a major epizootic disease affecting a variety of species of sea turtles. The predominant lesions associated with this disease are fibromas, cutaneous papillomas, and fibropapilloma tumours (George 1997). This disease has never been documented in the Mediterranean. Occurrence of fibropapilloma tumours (> photo 6) on longline-caught turtles is recorded and photographed.



> photo 6
Green turtle affected with fibropapilloma tumours observed in Trinidad and Tobago. Photo by Luc Laurent

1-4-9 Fate

The fate of each longline-caught turtle is recorded.

2 - TRAWL MONITORING PROGRAM

Three data forms in national language are completed by onboard observers to describe marine turtle bycatch in trawling activities. The first is called "haul data form", which is used to record parameters dealing with trawl net and haul operations as well as with sea floor. The second concerns the crew behaviour and attitude towards marine turtles. The third data form is the "trawl-caught turtle data form" allowing the observers to record biologically-related parameters for each trawl-caught turtle.

2-1 Trawl net-related parameter

The type of trawl nets, *i.e.* bottom trawls (otter trawls, twin otter trawls and pair trawls) or midwater trawls (otter trawls, pair trawls), and target species are recorded. The **headrope length** is measured with a flexible measuring tape as the length of the principal upper frame of a net to which the netting is attached. Information about the height of the vertical opening trawl expressed in meters is requested from the captain.

2-2 Haul-related parameters

The **haul beginning** (expressed in hours/minutes) is defined as the moment when the trawl net starts fishing on the bottom, and the **haul ending** (expressed in hours/minutes) is defined as the moment when the otter boards are fixed on the trawler. These two recorded parameters enable the **haul duration** to be determined. **Location** (expressed in geographical coordinates) and **depth** (in meters) for the haul beginning and ending are also recorded as well as the mean speed of the trawler during the towing operation.
Information on the type of bottom substrate on which the trawl net is towed is provided by the captain using the following descriptive items: sand, mud, sand-mud, *Posidonia oceanica* beds, other seagrass beds, mollusc shell fragments, calcareous algae fragments, and others.
Each haul catch is observed after the opening of the codend. Dominant benthos bycatch, *e.g.* green *Posidonia* leaves, gastropoda, bivalva and live crustacea as well as sponges and algae, are recorded. The number of rays (whatever the size), big fish (sharks, Sparidae, Serranidae, etc...) larger than 50 cm long as well as large anthropogenic debris are reported.
Occurrence of marine turtles in the haul catch (trawl-caught turtles) is accurately recorded and in order to avoid confusion a code number is assigned to each trawl-caught turtle observed within a haul.

2-3 Crew-related parameters

Previous behaviour of fishermen towards marine turtles (before the onboard observers program) is determined by talking with the crew. Their behaviour

concerning the following points, when there is no observers on board, are reported

•method of boarding turtles: how high from the deck is the codend of trawl when opening the trawl containing turtles ?
•method of handling turtles: what does the crew do after opening the trawl containing turtles ?
•method of releasing turtles

Since some fishermen originate from foreign countries where sea turtles are/were traditionally killed and consumed, the structure of the crew (number of fishermen, their nationalities and religions) are also determined in relation to their behaviour and attitude towards sea turtles.
The impact made by marine turtle bycatch on trawl fishery is investigated by systematically asking the captain the following questions:

•do captures of turtles have an impact on trawling activities?
•what kinds of impact:
•damage to the fish in the trawl net
•loss of time when handling and releasing a trawl-caught turtle
•damage to the trawl net
•loss of time and money incurred when repairing the fishing gear

The situation of trawl-caught turtles is also analyzed with a view to implementing potential operational mitigation measures. The captain is systematically asked the following questions:

•do they sometimes catch turtles which are dazed, showing only slight signs of breathing, and appearing lifeless?
•what do they usually do with such turtles?
•is there a place on the deck where such a turtle could be kept for some hours without disturbing onboard activities?
•what would be the best moment to release such a turtle without disturbing onboard activities and without injuring the releasing turtle (engine in neutral and net not trawling)?
•are you prepared in the future to cooperate in minimising the impact of trawling operations on Mediterranean marine turtles and to apply Turtle Recovery Procedures to turtles found in a weak condition in trawl nets?

2-4 Trawl-caught turtle-related parameters

2-4-1 Physical condition

The **physical condition** of trawl-caught turtle is scored into six categories:

•healthy (moving and flapping)
•injured externally, but healthy (injured descriptive items such as head damage, broken flippers, retroverted anus, erected penis, and others are recorded)
•comatose (dazed, few movements, slight signs of breathing)
•dead (no movement, head limp, extended, and flopping to the ground, no sign of breathing, the eyes not responding to touch)
•decomposed dead
•condition unknown

> photo 7
Trawl-caught turtle on the deck of a Mediterranean trawler just after the opening of the codend.
Photo by Luc Laurent

2-4-2 Species identification (see 1-4-4)

2-4-3 Tagging (see 1-4-5)

2-4-4 Size (see 1-4-6)

2-4-5 Occurrence of epibionts and fouling on carapace

The number of barnacles (*Crustacean Cirripedia*) with a diameter greater than 1 cm on the carapace and distribution is identified and measured (> photo 5).
The distribution of other epibionts is also recorded as well as the occurrence of mud on turtle head and anterior part of carapace.

2-4-6 Occurrence of fibropapilloma tumours (see 1-4-8)

2-4-7 Fate

The fate of each trawl-caught turtle is recorded.

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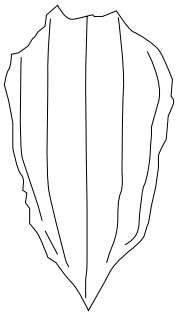
IDENTIFICATION KEY

Carapace with
5 distinct ridges
no large scales

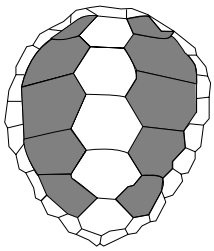


Dermochelys coriacea
(Leatherback turtle)

Carapace with
no continuous ridges
large scales

4 pair costal scales

5 pair or more costal scales
no pores in scales of bridge



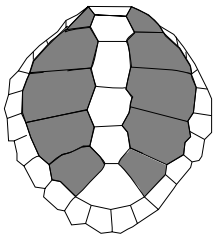
carapace longer than
wide
color red-brown to brown

Caretta caretta
(Loggerhead turtle)

5 pair or more costal scales
pores in scales of bridge

Lepidochelys sp.

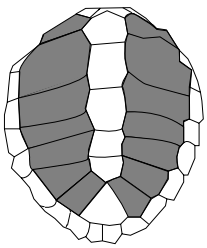
5 pair (rarely 6) costal scales



carapace approximately circular
color grey green

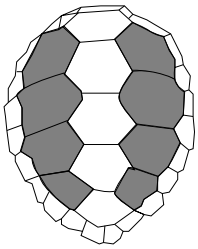
Lepidochelys kempii
(Kemp's Ridley turtle)

6 pair or more (rarely 5) costal scales, usually 6 to 8

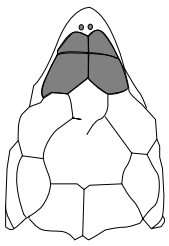


carapace approximately
circular
color grey green

Lepidochelys olivacea
(Olive Ridley turtle)

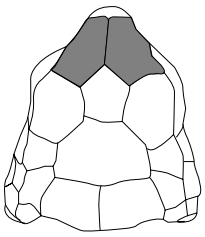


2 pair prefrontal scales
thick overlapping carapace scales



Eretmochelys imbricata
(Hawksbill turtle)

serrated lower jaw
1 pair prefrontal scales
no thick overlapping carapace scales



Chelonia mydas
(Green turtle)

Criteria in bold print are categorical

Modified from the indo-Pacific Marine turtles Identification Key published by Greenpeace and Queensland Department of Environment and Heritage 1991