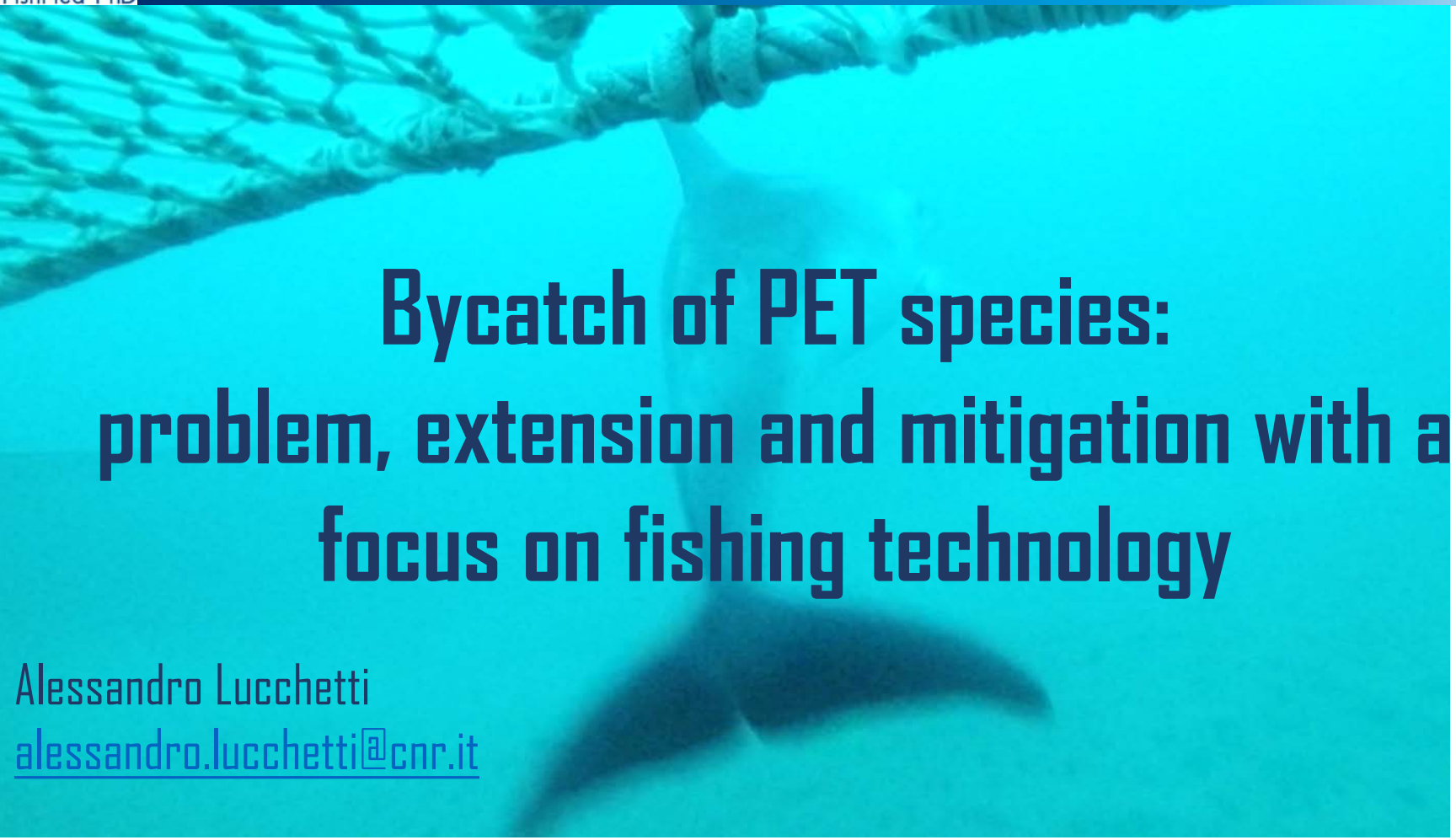


Bycatch of PET species: problem, extension and mitigation with a focus on fishing technology

Alessandro Lucchetti
alessandro.lucchetti@cnr.it

Consiglio Nazionale delle Ricerche
IRBIM - Istituto per le Risorse Biologiche e le Biotecnologie Marine
Sede Secondaria di Ancona
Largo Fiera della Pesca – 60125 Ancona
Tel. +39 071 207881

Goals of the lesson

- What is bycatch
- How to assess bycatch
- Bycatch by groups of species and gears
- Bycatch estimates
- How to mitigate bycatch

Definitions

Vulnerable species

A taxon is considered vulnerable when facing a high risk of extinction in the wild in the medium-term future, unless the circumstances that are threatening its survival and reproduction improve (IUCN, 2017).

Barcelona Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (1995): Appendix II (endangered or threatened species) and Appendix III (species whose exploitation is regulated) of the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean

The most widely accepted classification for the conservation of species is the Red List of Threatened Species of the International Union for Conservation of Nature (IUCN).

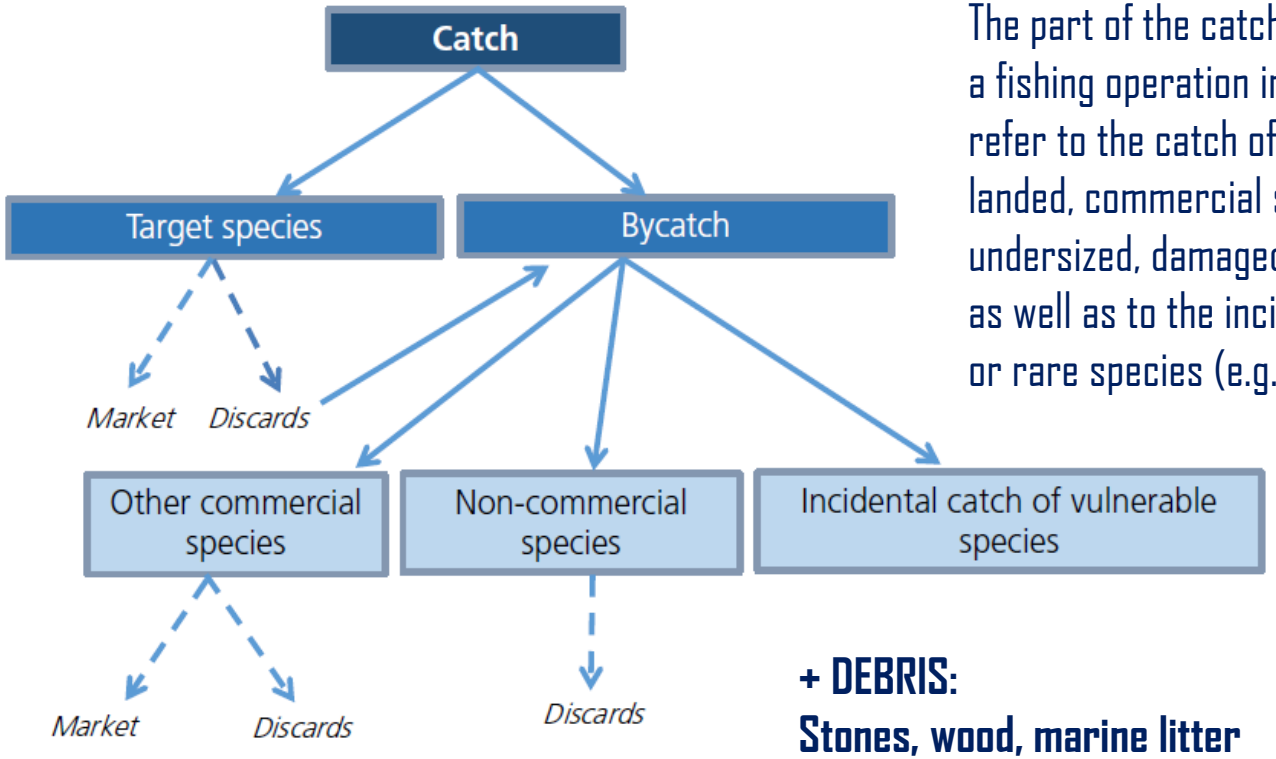
Definitions

IUCN Red List of Threatened Species : it is a comprehensive inventory of the global conservation status of biological species. It uses a set of criteria to evaluate the extinction risk of thousands of species and subspecies

Several categories: 'near threatened', 'vulnerable', 'endangered' or 'critically endangered'. Acronim: endangered, threatened and protected (ETP)

A species is categorized as 'vulnerable' according to such as reduction in population size, reduction in geographic range, or probability of extinction in the wild (IUCN, 2017). Thus vulnerability can be caused by habitat loss or direct mortality as a result of human activities

Definitions



Source GFCM, 2018

BYCATCH:
The part of the catch that is unintentionally captured during a fishing operation in addition to the target species. It may refer to the catch of other commercial species that are landed, commercial species that cannot be landed (e.g. undersized, damaged individuals), non-commercial species as well as to the incidental catch of endangered, vulnerable or rare species (e.g. sea turtles, sharks, marine mammals).

+ DEBRIS:
Stones, wood, marine litter

Definitions

Definitions

Bottom trawl

Bycatch, discard

Bycatch, commercial: *Umbrina cirrhosa*

Bycatch, vulnerable: *Caretta caretta*

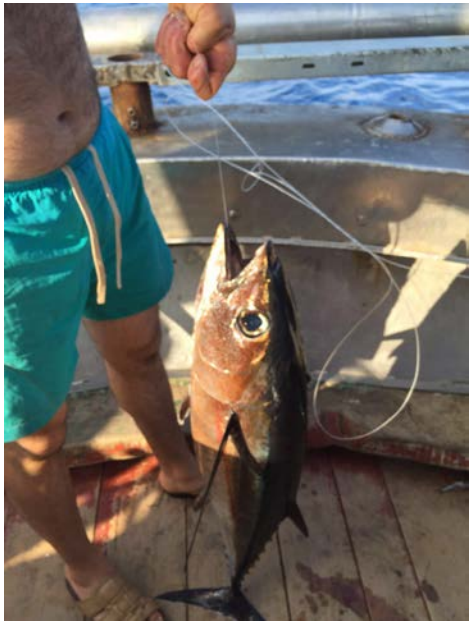
Target species: *Squilla mantis*

Definitions

Longline

Target species: *Xiphias gladius*

Bycatch, vulnerable



Bycatch, commercial:
Thunnus alalunga

Coryphaena hippurus

Problem

Commercial fishing operations are one of the main causes of human-related injury and mortality for vulnerable species

Different fishing gears (trawls, passive nets, longlines etc.) can affect different species and different life stages

- Area
- Depth
- Gear properties (mesh size, net height, hook size and shape etc.)
- Towing speed
- Season

Fisheries can also impact marine animals unintentionally or indirectly by reducing their critical habitat and the availability of their prey

Problem

Bycatch of vulnerable species is a growing concern for

- Conservation organizations
- Scientists
- Fishing industries
- Resource managers

- Large size of first maturity;
- high age of first maturity;
- Low growth rate;
- Long lived;
- Low reproduction output

} "*k strategy*"

Vulnerable species: low reproductive rates, low growth rate, elevated parental care (mammals), and low rates of natural mortality, "k" strategist species, may suffer greater impacts than "r" strategist species

Problem

- DIRECT MORTALITY

Direct mortality occurs when the animal is found dead inside the fishing gear due to drowning, injuries due to entanglement or due to impacts with the fishing gear components

- DELAYED MORTALITY

Delayed mortality occurs when the animal is released in apparently good condition, but dies after hours or days from damage caused by being underwater (anoxia, gas embolism, wounds etc.)

Gaps in knowledge

- Absence of both quantitative and qualitative data: studies on incidental catch of vulnerable species are absent for many fishing gear and countries of the Mediterranean and the Black Sea.

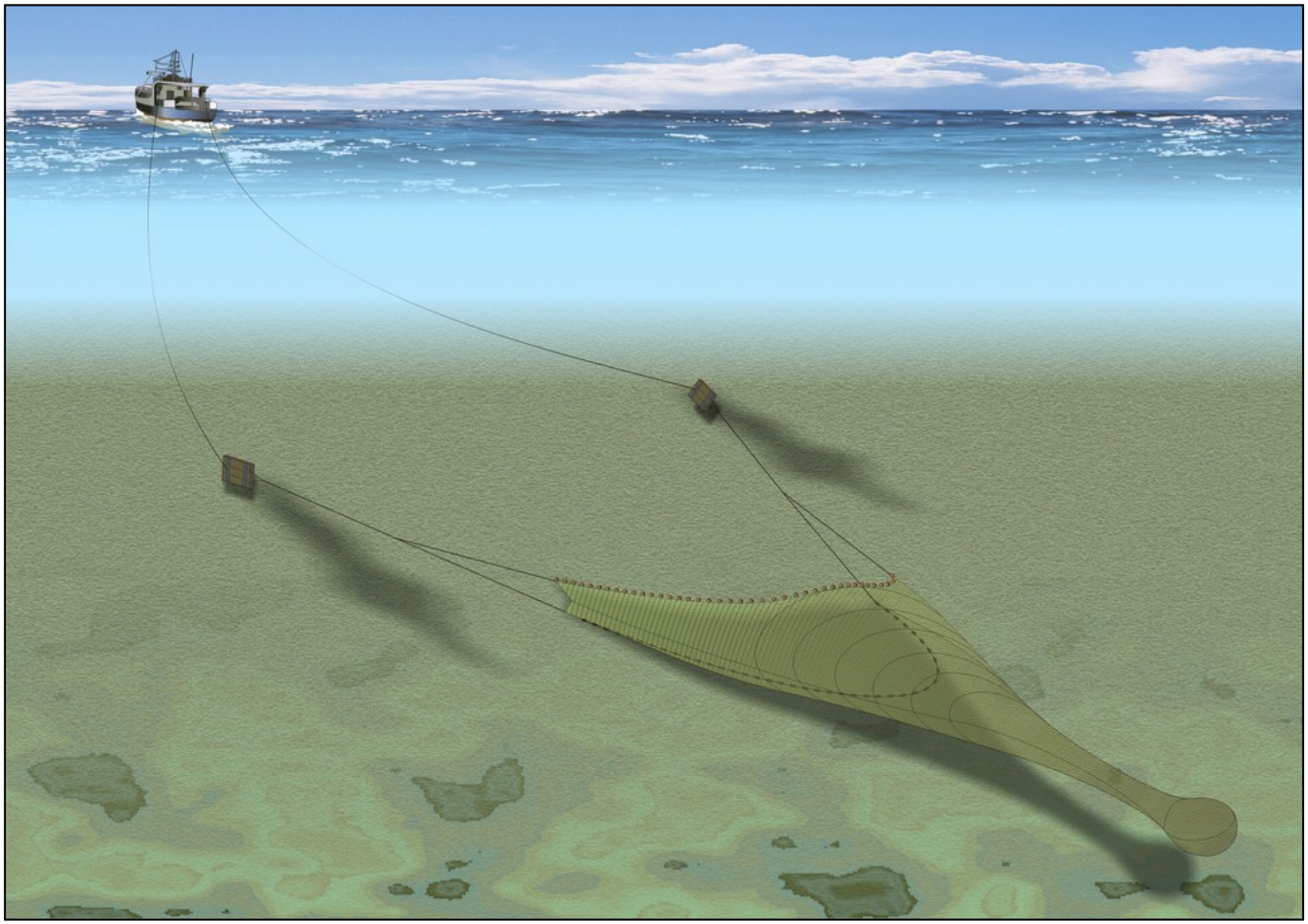
- There is not a standard for monitoring and data collection

- Several databases (local), data gap and consistency

- This means that defining clear management targets for most fisheries is problematic.

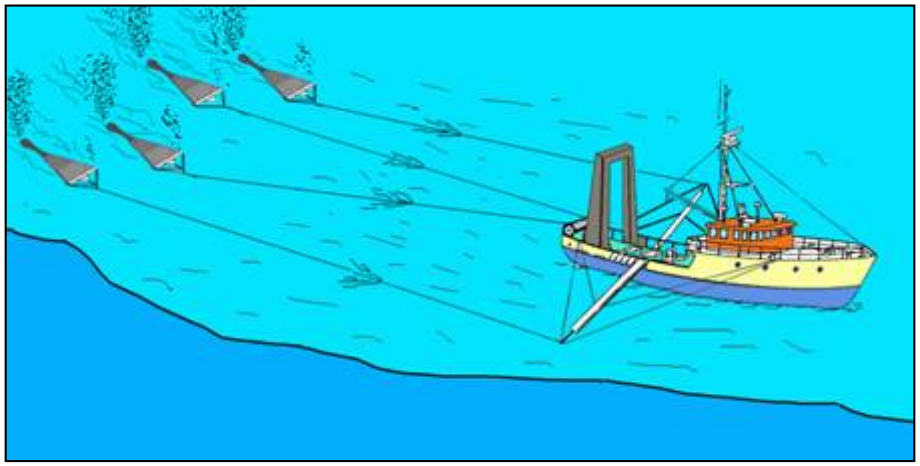
BOTTOM TRAWL

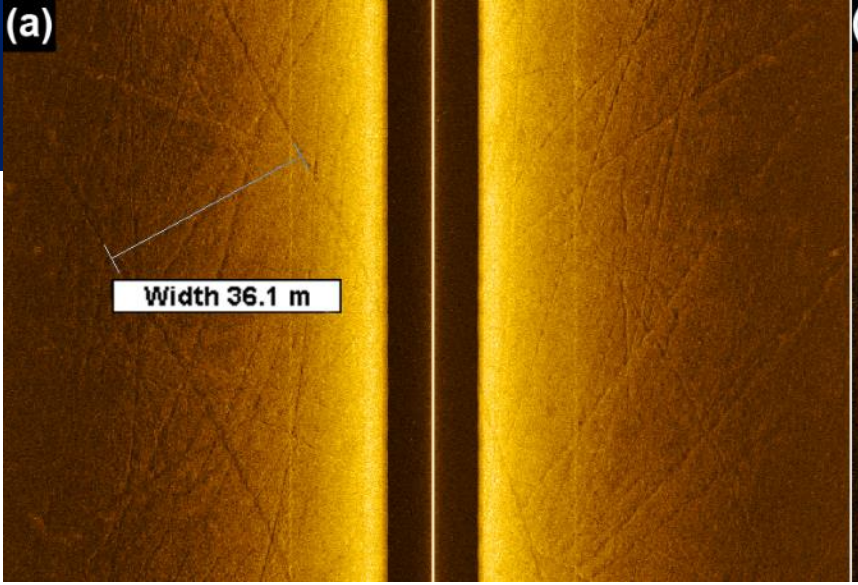
CNR
IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

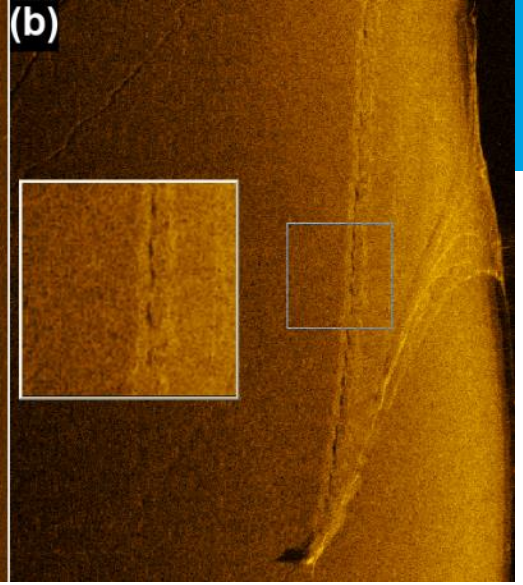


RAPIDO TRAWL

CNR
IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

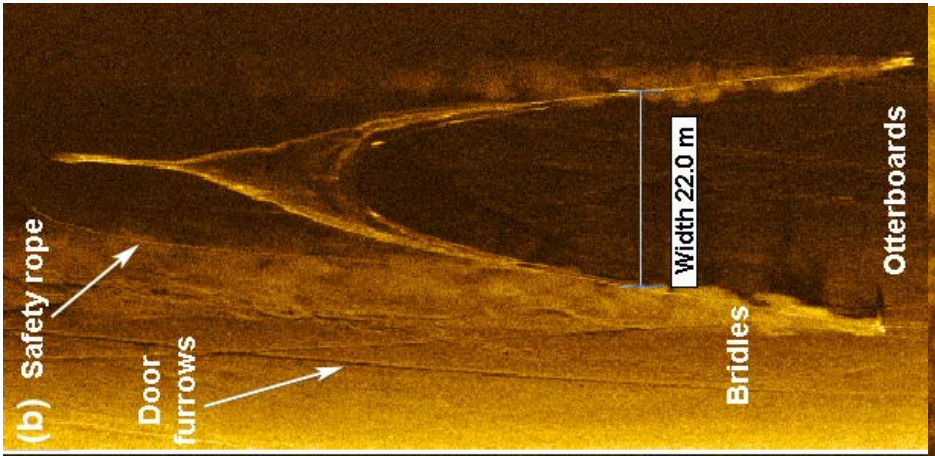


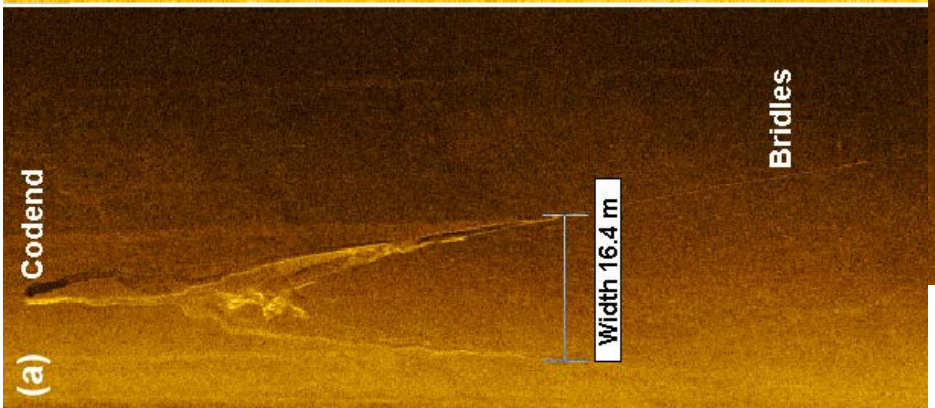


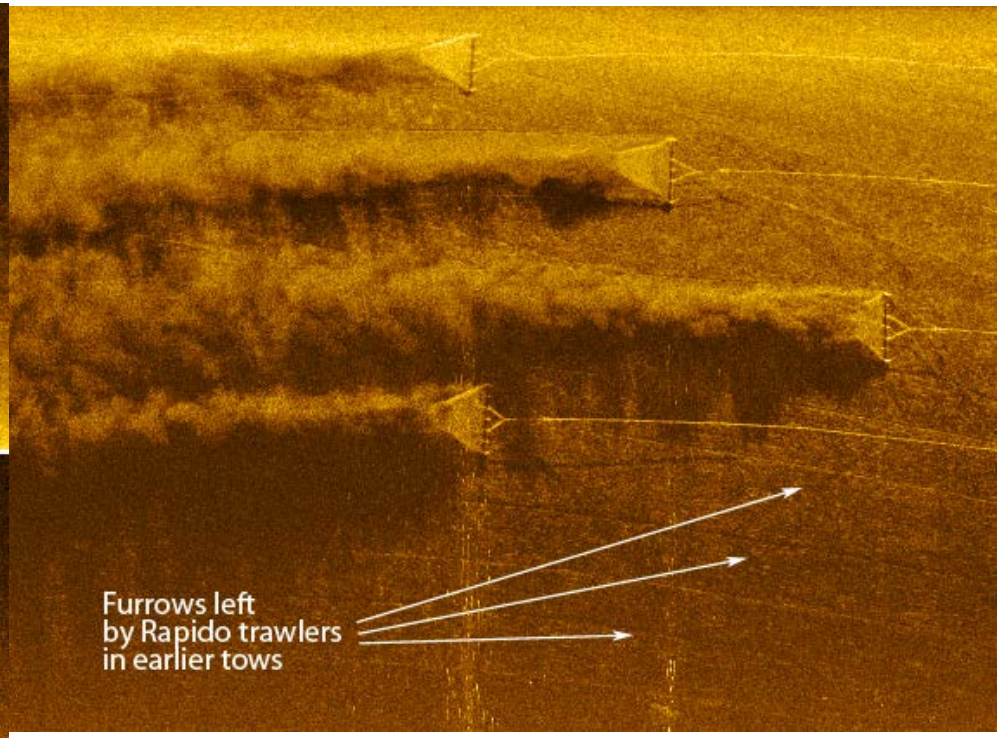


CNR
IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

BOTTOM TRAWLING

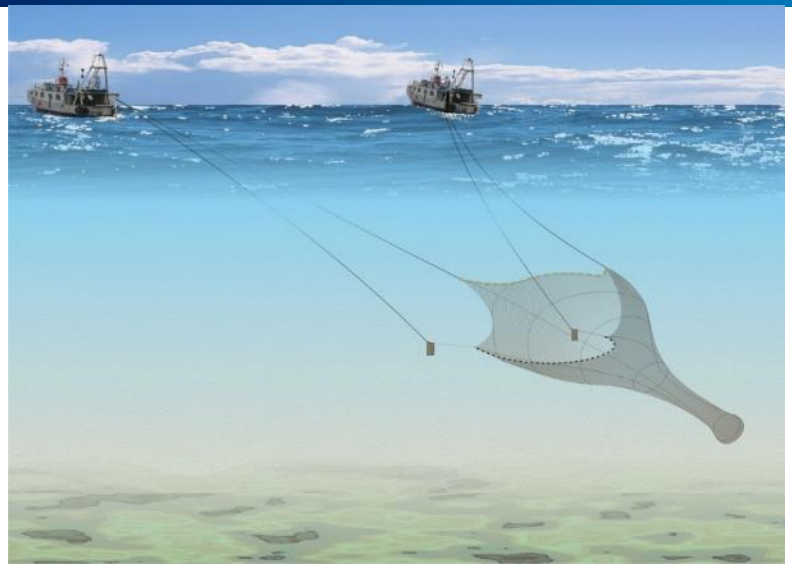






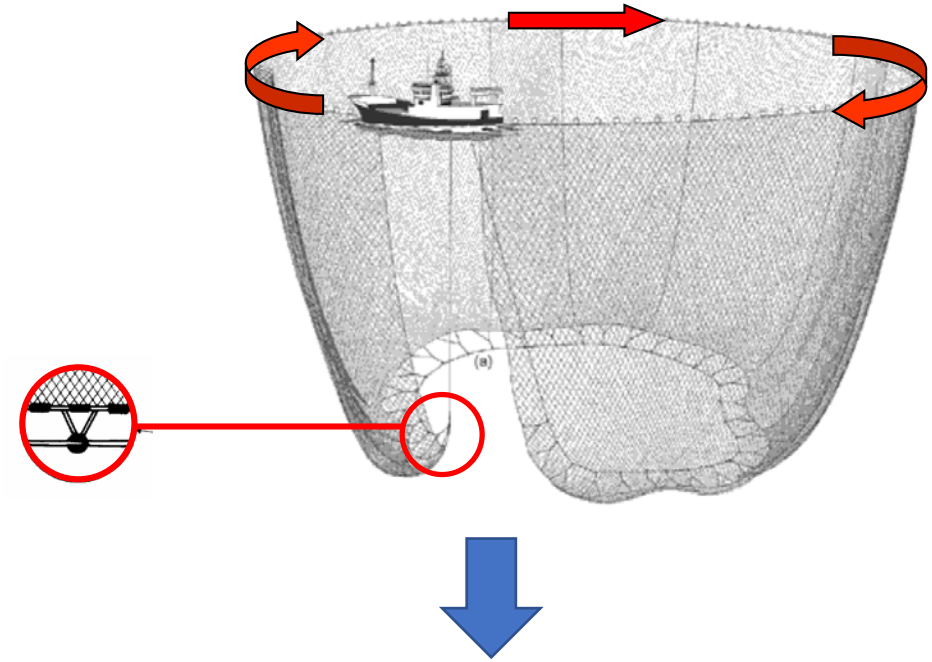
Pelagic pair traw (PTM)

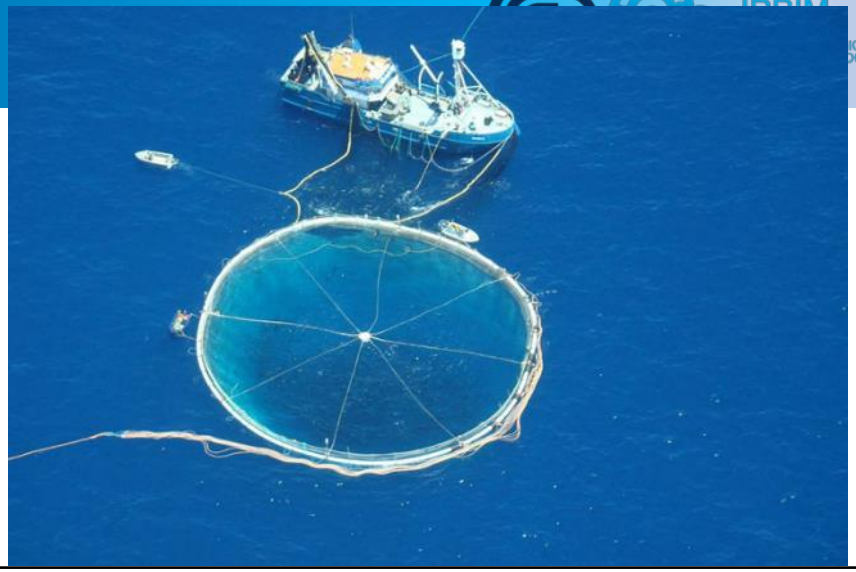
CNR
IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE



PURSE SEINE (PS)

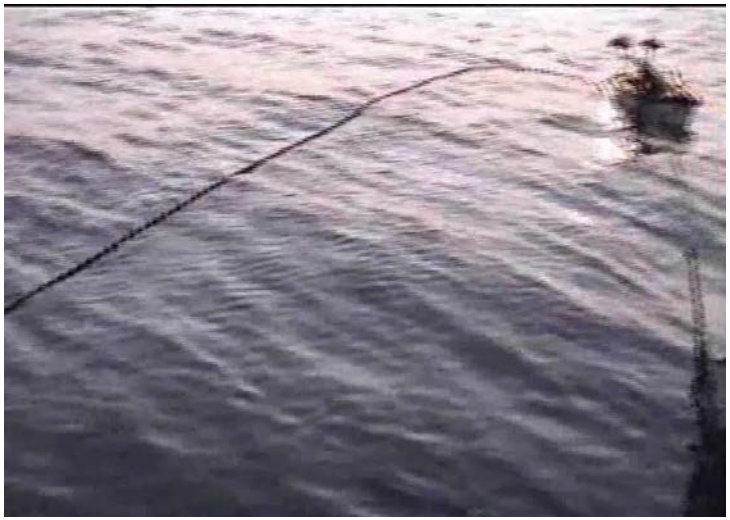
CNR
IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

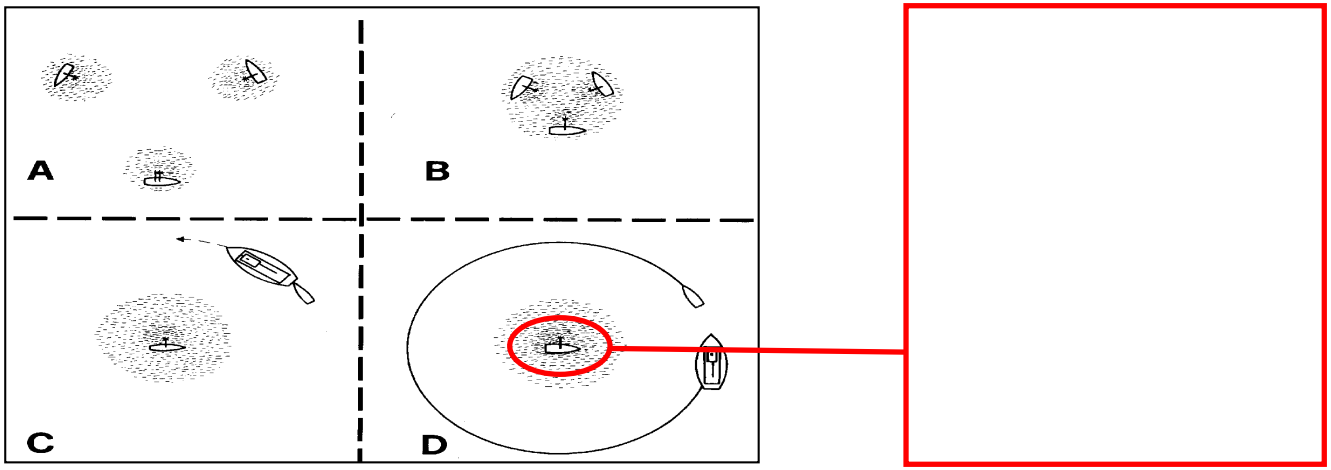




PURSE SEINE WITH LAMPS (PS)

CNR
IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

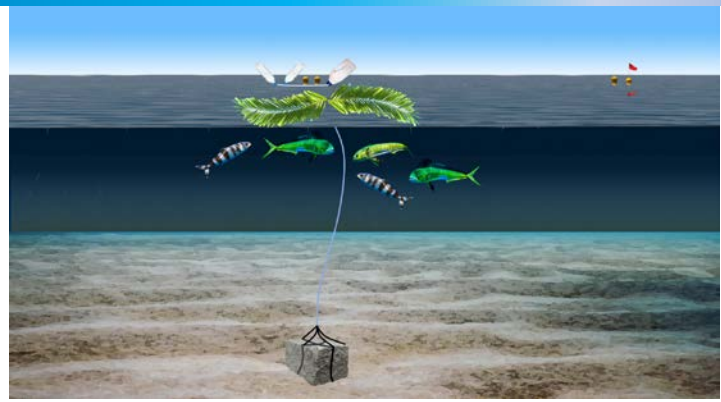




FISH AGGREGATING DEVICES (FADs)

CNR IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Fishing with 'cannizzati' or 'cannizzi' (especially in Sicily and Calabria), also known as 'shadow' fishing, is based on the attraction exerted on various pelagic species, which, once gathered together, are generally caught with surrounding nets. The cannizzi are usually made of palm branches tied together and held on the surface by improvised floats (empty plastic bottles and cans or polystyrene sheets). The cannizzi are connected on the bottom by a line (made of nylon or recycled material) to a weight of 8-10 kg (usually a stone or concrete artefact), Setting depths vary from 100 to 1,500 metres. At certain times of the year, many species such as amberjacks (Seriola dumerili), dolphinfish (Coryphaena hippurus), pilot fish (Naucrates ductor) and bonito (Sarda sarda) find refuge under the cannizzi, making them extremely vulnerable to fishing, especially with small surrounding nets.



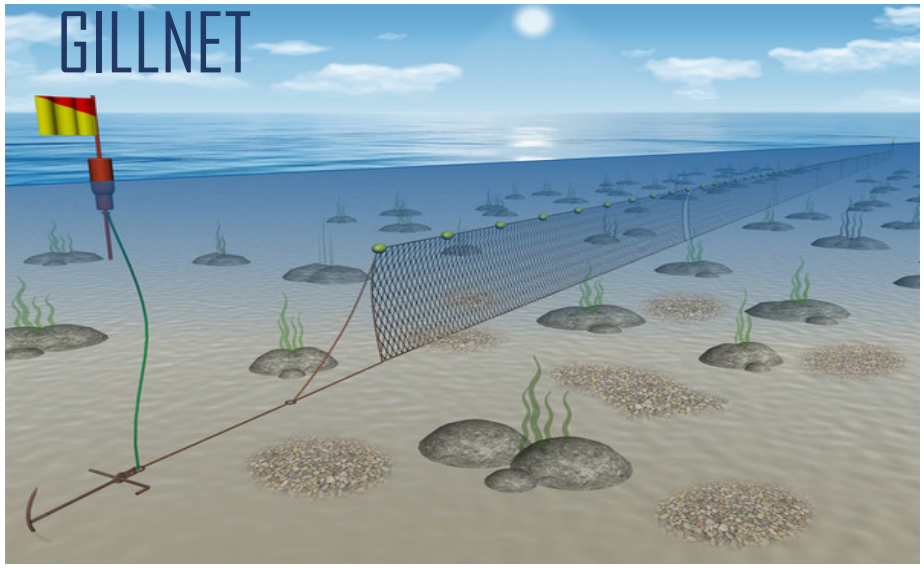
Each vessel sets from 20 to 100 FADs

Around 700 vessels in the MED

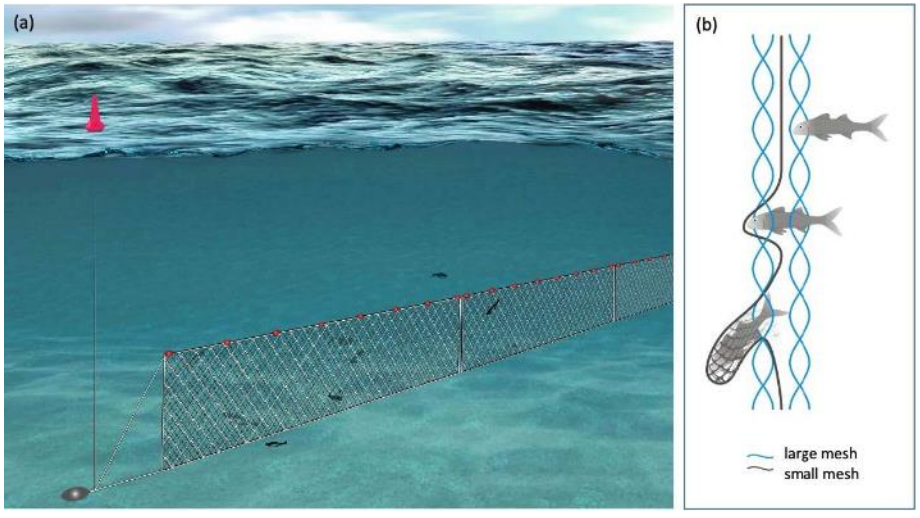
SET NETS

CNR
IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

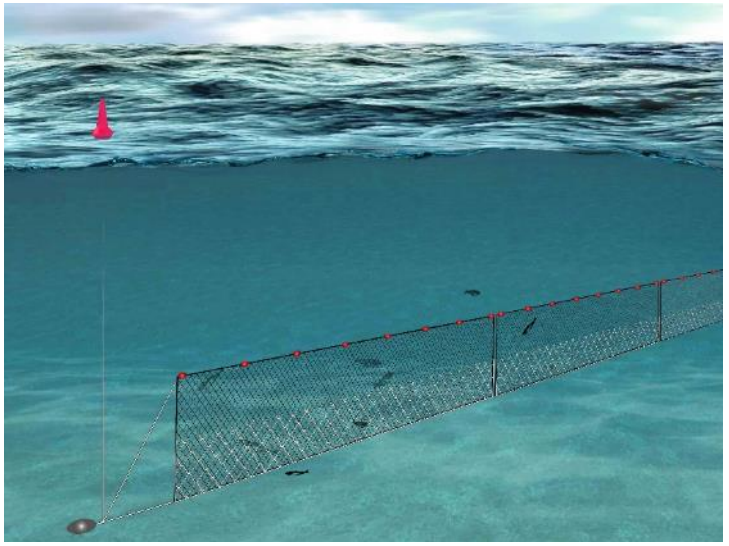
GILLNET



TRAMMEL NET



COMBINED NET



SMALL DRIFTING NETS (LEGAL)

The ferrettare are the only drift nets allowed in Italy. They are gillnets (a single piece of net), generally made of polyamide twine with a knot; they are not anchored to the bottom and can be dropped in midwater or with a headrope on the surface.
They are mainly used in Sicily, Calabria, Campania, Lazio and Liguria. They are banned in Sardinia. When fishing, they can "drift" even over a mile.

Foto Carbonara

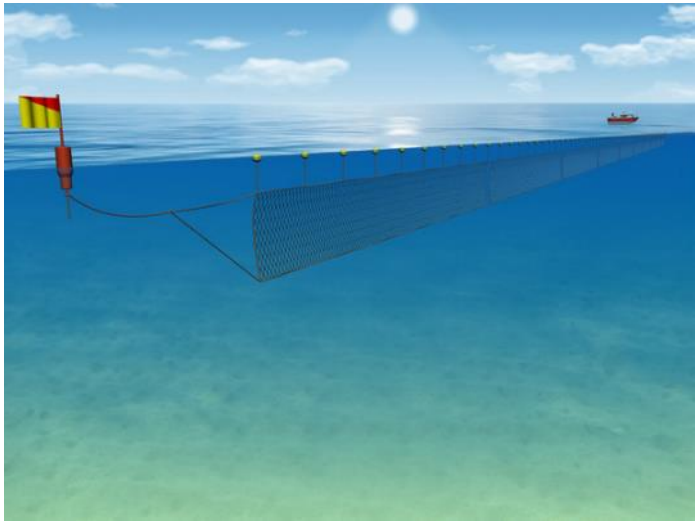


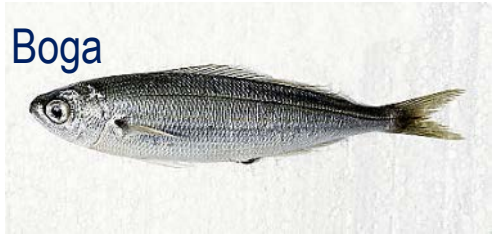
Foto Carbonara

SMALL DRIFTING NETS (LEGAL)

CNR IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

TARGET SPECIES

Boga



Lanzardo

Alletterato

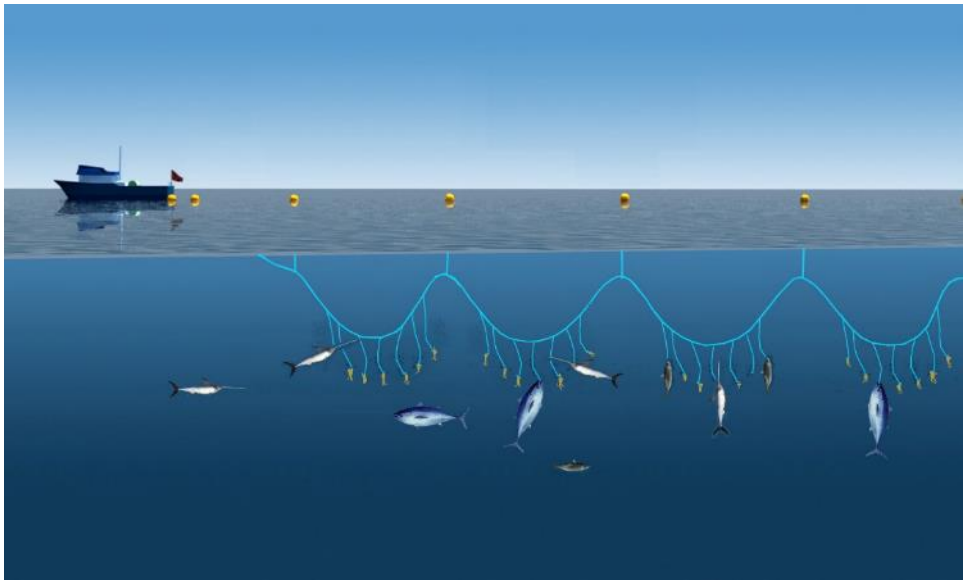
Alaccia

Sgombro

Ricciola

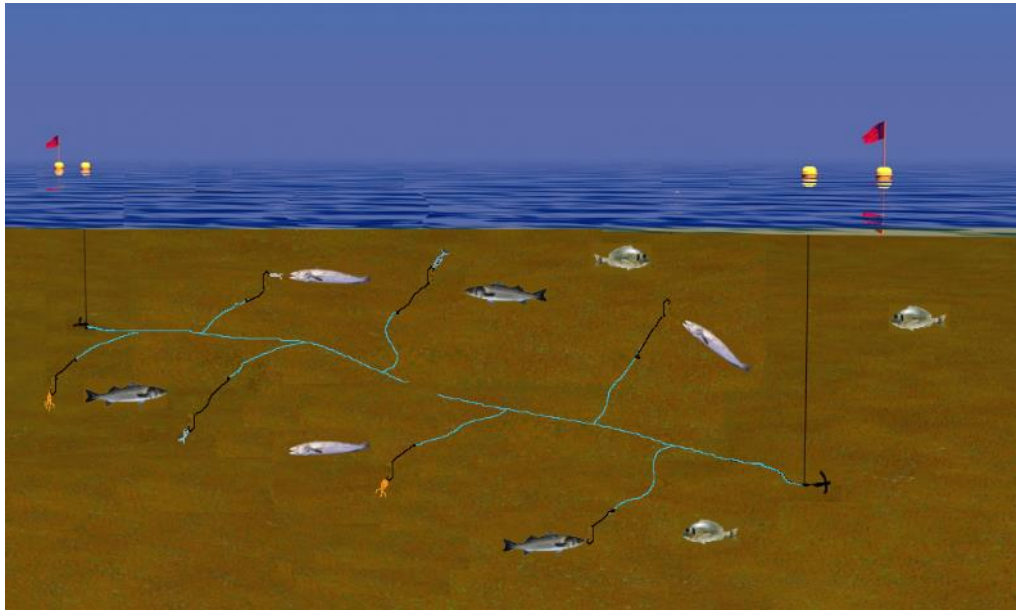
DRIFTING LONGLINE

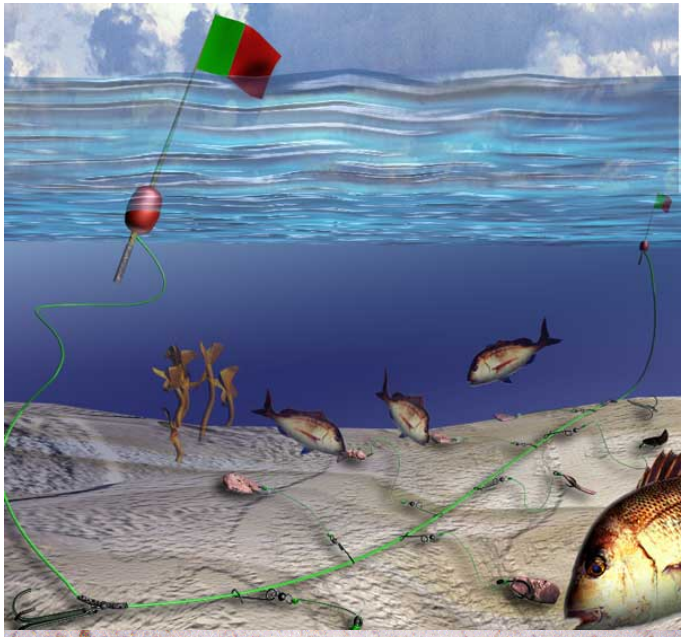
CNR
IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE



BOTTOM LONGLINE

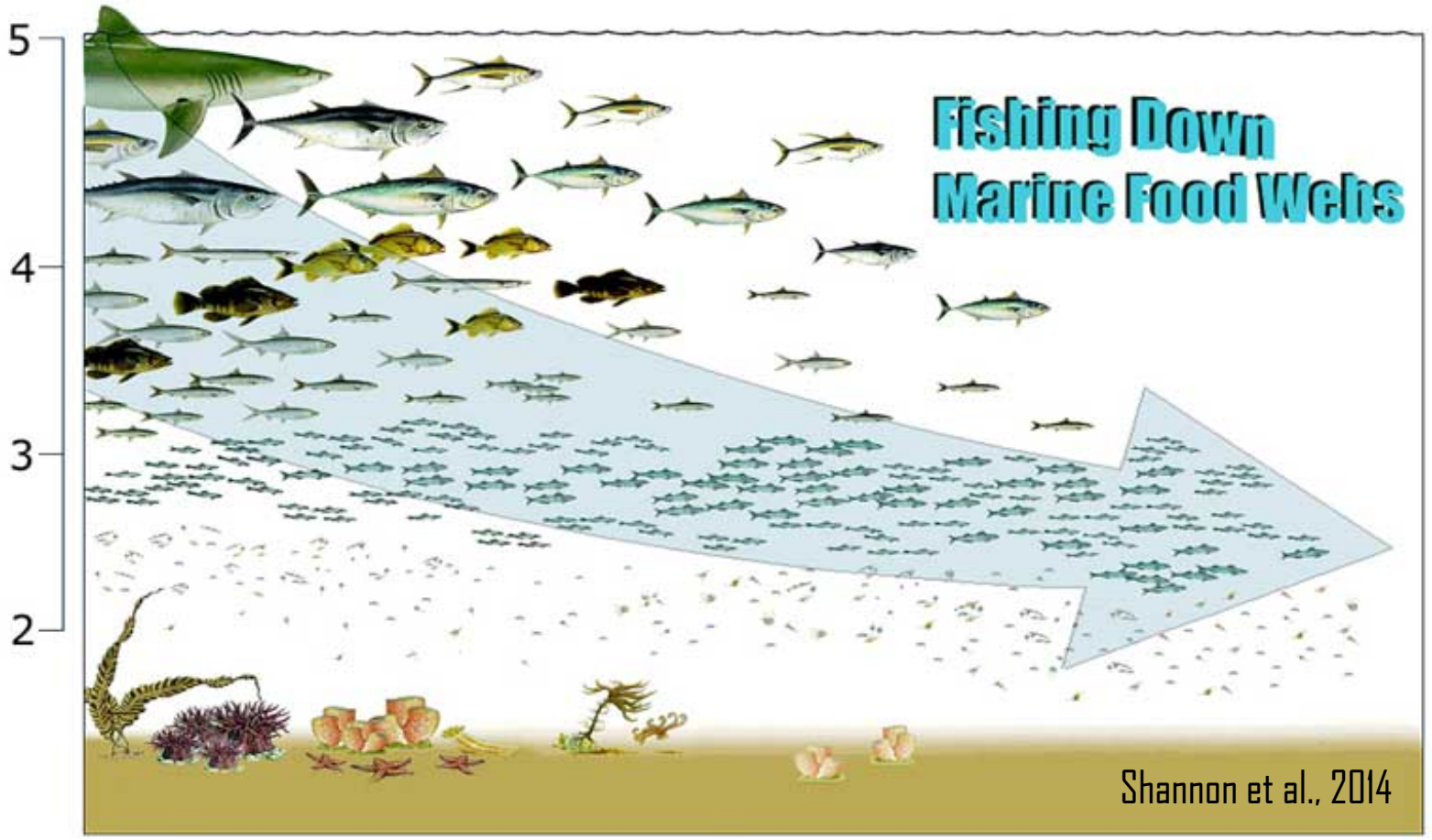
CNR
IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE





IMPACTS ON THE MARINE FOOD WEBS

CNR
IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE



FISHING ACTIVITY = TOP PREDATOR

Data collection

Collection of data on the incidental catch of vulnerable species (e.g. quantities, sizes, locations, fishing gear and timing of such bycatch)

- is key in understanding the nature and extent of this problem
- Identify hot-spots areas and periods (geographical or seasonal trend)
- which fishing gear are most damaging for a given species
- Which technical features of a gear can be modified or which BRD can be used
- improve knowledge on biology and ecology of these species

Adopt management measures for reducing interaction

How to assess bycatch

SOURCE OF DATA

Fishery-dependent data: data are obtained from commercial fisheries.

Fishery-independent data: data are obtained from scientific surveys and ad hoc monitoring programmes

How to assess bycatch

CNR IRBIM ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Fishery-dependent data

Information on incidental catch of vulnerable species, with some biological information

On-board observers (a combination of dep-indep. data)

Self-reporting - logbooks

Telephone surveys - Interviews

Remote electronic video monitoring

How to assess bycatch

CNR IRBIM ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Fishery-independent data

Surveys

They are designed to develop unbiased estimates (e.g. indices of presence, trends in abundance, population size, structure, etc.) that are independent of commercial fisheries.

Data from rescue centres (or data on strandings)*

How to assess bycatch

Positive and negative aspects

Category	Source of data	Costs	Inconvenience to industry	Accuracy/reliability	Representation of normal fishing
Fishery-dependent data	Observers on board	Medium	Medium	High	High
	Interviews	Low	Medium	Low	High
	Self-sampling	Low	High	Low	High
Fishery-independent data	Stranding data	Low	None	Medium	Low
	Surveys with research vessels or chartered	High	None	Medium	Low
	Vessels				

A combination of several methods could give a more-complete image of the bycatch situation

Source: FAO FISHERIES AND AQUACULTURE TECHNICAL PAPER, 640 (2020)

Fishery-dependent data

CNR IRBIM ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Observers on board

- Scientific personnel
- Represent real fishing activity
- High quality data
- More data

Expensive
Disturb on board
Non-random vessel

Data collected

- Interaction with fishing gear
- Number, weight and biological information
- Where and how bycatch has occurred (e.g. hooks)
- Technical properties of fishing gears + Env data (depth, T, bottom etc.)
- Other

Fishery-dependent data

CNR IRBIM ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Interviews

To be used in case of lack of data or limited resources or as preliminary investigation

High number to be reliable

Consider different fishing gears, areas, periods

Represent real fishing activity

Data collected

Quali-Quantitative

Seasonality

Geographical

Technical properties of fishing gears

Illustration cards and maps to help fishers

Misreporting
Underestimate bycatch

Telephone survey: not recommended

Fishery-dependent data

CNR IRBIM ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Self-reporting/logbook

Strong cooperation from the industry

Fishers need to be trained

Represent real fishing activity

APP

Low collaboration
Misreporting
Underestimate bycatch
Species identification

Data collected

Quali-Quantitative

Seasonality

Geographical

Technical properties of fishing gears

Illustration cards and maps to help fishers

Mobile devices for photo, position etc.

Fishery-dependent data

Strandings data

Reliable database: coordination of sightings

Strong network

Protocols for establishing cause of death

Cause of stranding often unknown
Where the bycatch occurred
Only qualitative data

Data collected

Qualitative

Seasonality

General Geographical info

Strong biological data

Fishery-dependent data

CNR IRBIM ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Remote monitoring

- Video recording
- Standardize procedures
- Associated with GPSC
- Download after fishing trip
- To be used in case on board observer is not feasible (Covid)

Data collected

- Qualitative-quantitative
- Seasonality
- General Geographical info

- Privacy – collaboration
- Difficult identify some species
- Time consuming
- Technological issues

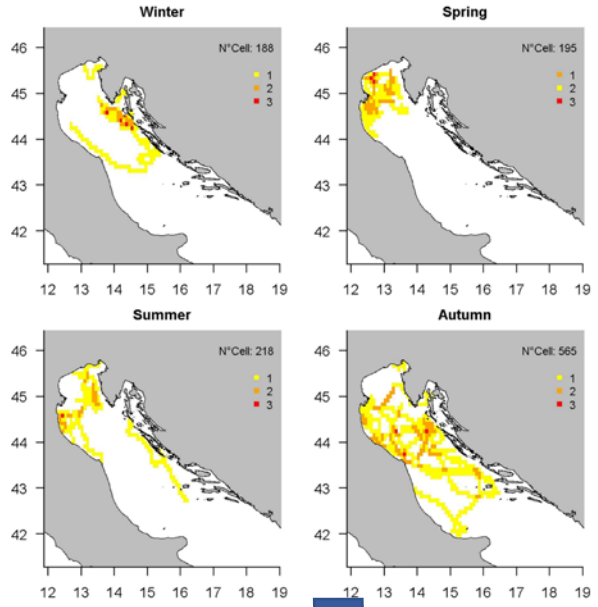
Fishery-independent data

Survey	Data collected
Ship survey	Habitat use
Tracking	Hotspots of abundance
Aerial survey	Diversity
Echosurvey	Collect data from areas not exploited by fishing activities
Expensive Difficult identify some species Time consuming Identify species with long apnoea	When used in tandem with data of fishing effort (e.g. VMS, AIS) it enables to identify hotspot of interaction with fishing

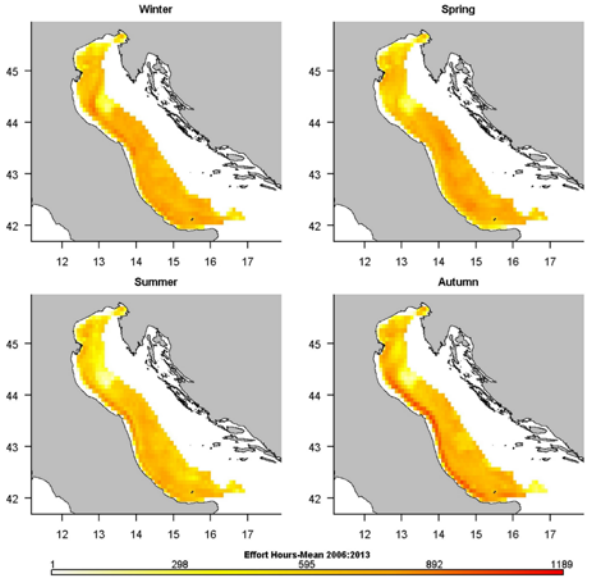
Fishery-independent data

Risk assessment: Combining data from surveys (or tracking) with data on fishing effort

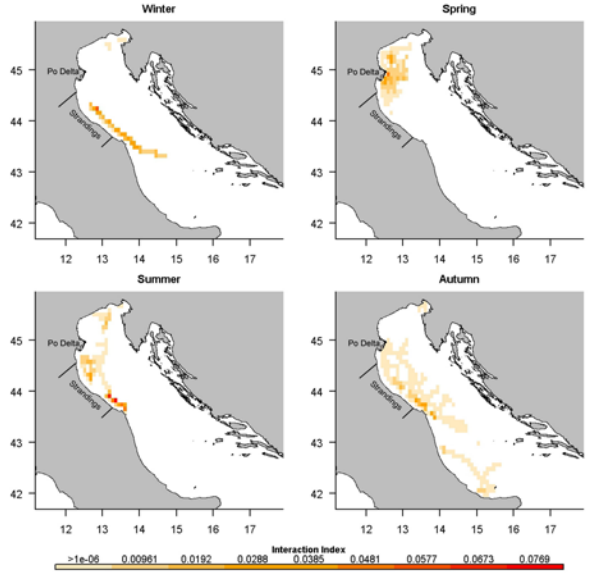
Track data (or sightings)



Effort (AIS)



Hot-spot bycatch



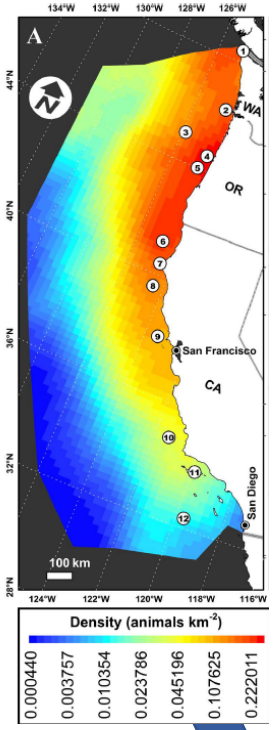
Lucchetti et al., 2016
(Ecol. Indicators)

Fishery-independent data

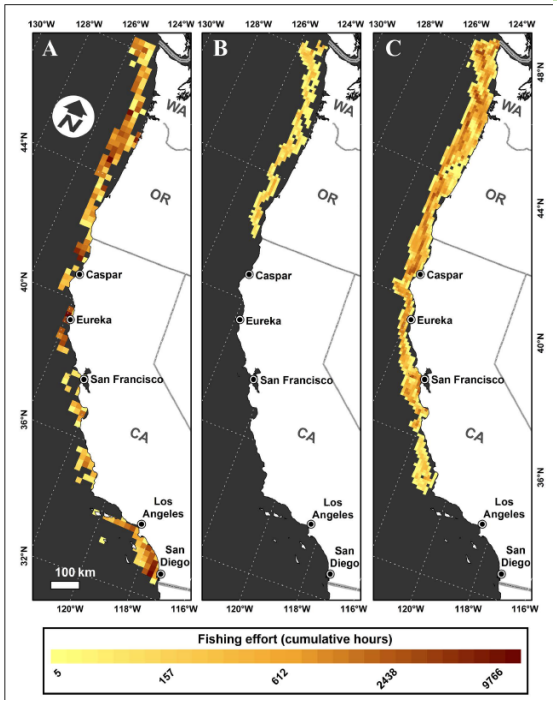
Risk assessment: Combining data from surveys (or tracking) with data on fishing effort

Track data (or sightings)

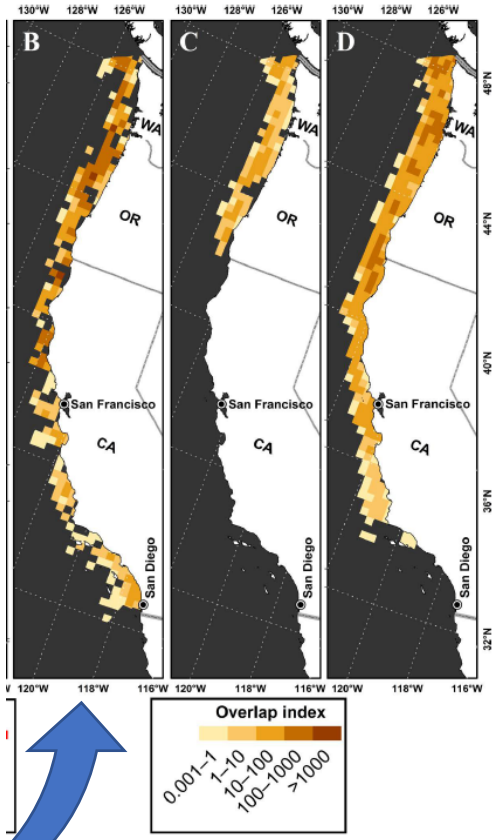
Dall's porpoise (*Phocoenoides dalli*)



Effort (3 gears)



Hot-spot bycatch



Feist et al., 2015

Bycatch estimates

In-depth knowledge of the fisheries of the area to be studied:

1. total number of fishing vessels operating
2. fleet segments operating in the country
3. number of vessels by fleet segment and GSA
4. fishing techniques (e.g. types of gear)
5. fishing effort (e.g. total number of fishing days by fleet segment)
6. Bycatch per vessel of fishing day (CPUE): coverage should range from 2 to 7 percent, although a minimum level of 0.5 percent is often accepted

Bycatch estimates

Variable	Description
N	Sum of number of individuals of each vulnerable species caught in each sampled fishing trip (ni) ($N = \sum_i n_i$)
D	Number of sampled fishing trips
F	Total number of fishing trips carried out during reference year by analysed fleet segment (or an estimate)

Bycatch rate (T), per species and fleet segment, as: $T = \frac{N}{D}$

Estimation of individuals caught (I) by that fleet as: $I = T \times F$

Source: FAO FISHERIES AND AQUACULTURE TECHNICAL PAPER, 640 (2020)

Bycatch estimates

From Interviews

For a specific fleet segment bycatch can be estimated as:
Total bycatch : Catch/Year/vessel × N. vessel

NB: Data from scientific surveys and stranding data should not be used to extrapolate bycatch estimates for a target population, as they are not representative of the commercial fishing bycatch

Marine mammals

Fisheries → Mammals	Mammals → Fisheries
Entanglement	**Steal fish** from the nets, sometimes in a highly selective manner, directly causing commercial losses
Injuries to mammals due to impacts with fishing gears	**Damage and spoil fish** already caught in the nets which, being mutilated, is often no longer tradable
Reduce their critical habitat	**Damage the nets**, that need to be repaired or ne ones to be purchased
Reduce availability of their prey	As indirect economic loss, scare the schools of fish, **reducing the catch rates**; the time spent by fishermen to manage the interactions with dolphins causes a reduction in time spent on fishing activities
Ingestion of nets with letal consequences	**Remove baits** from hooks of longlines
Voluntary injuries	

Interactions dolphins-fishing activity is an environmental, economic and social concern!

Marine mammals

Interactions between marine mammals and fisheries in the Mediterranean and the Black Sea involve the following species:

common bottlenose dolphins (*Tursiops truncatus*)

striped dolphin (*Stenella coeruleoalba*)

common dolphins (*Delphinus delphis*)

monk seals (*Monachus monachus*)

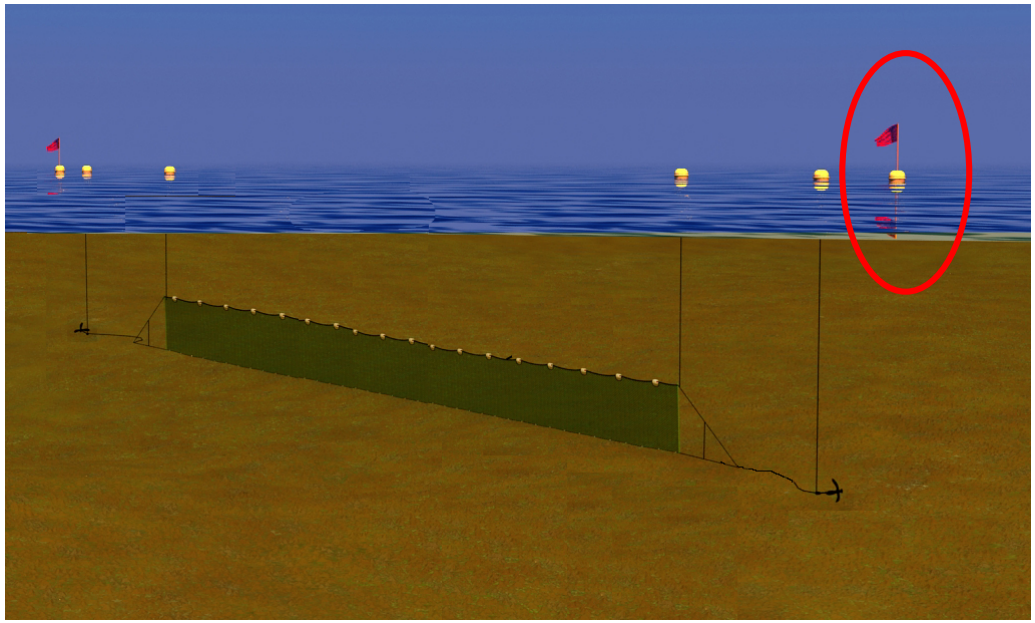
killer whales (*Orcinus orca*)
Morocco

harbour porpoise (*Phocoena phocoena relicta*)
Black Sea

Marine mammals

Interactions between marine mammals and fisheries in the Mediterranean and the Black Sea involve mainly coastal fisheries

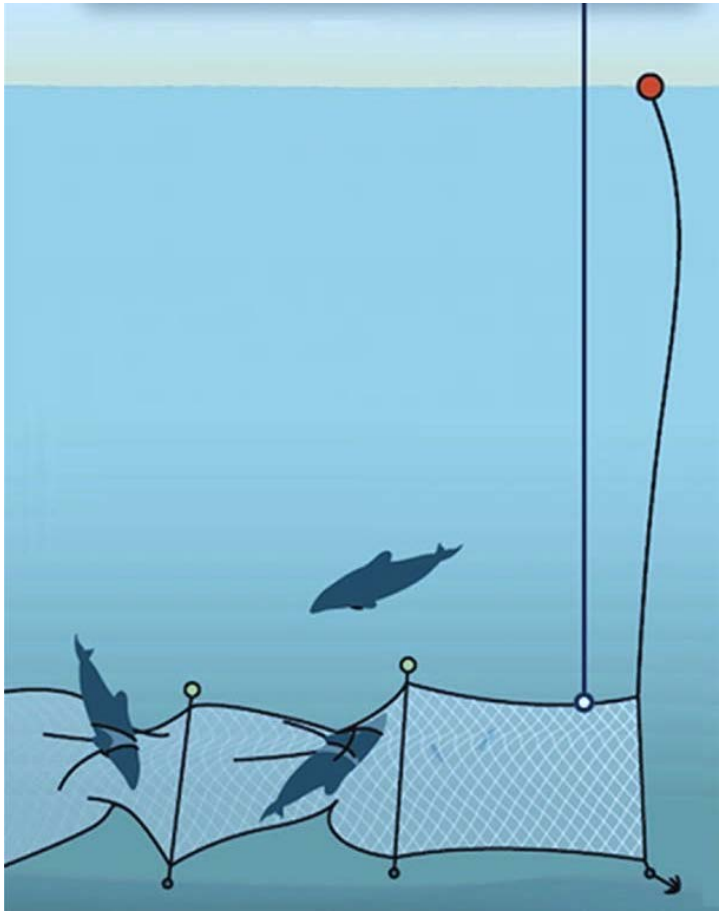
Passive nets (gillnets and trammel nest) are the main threat



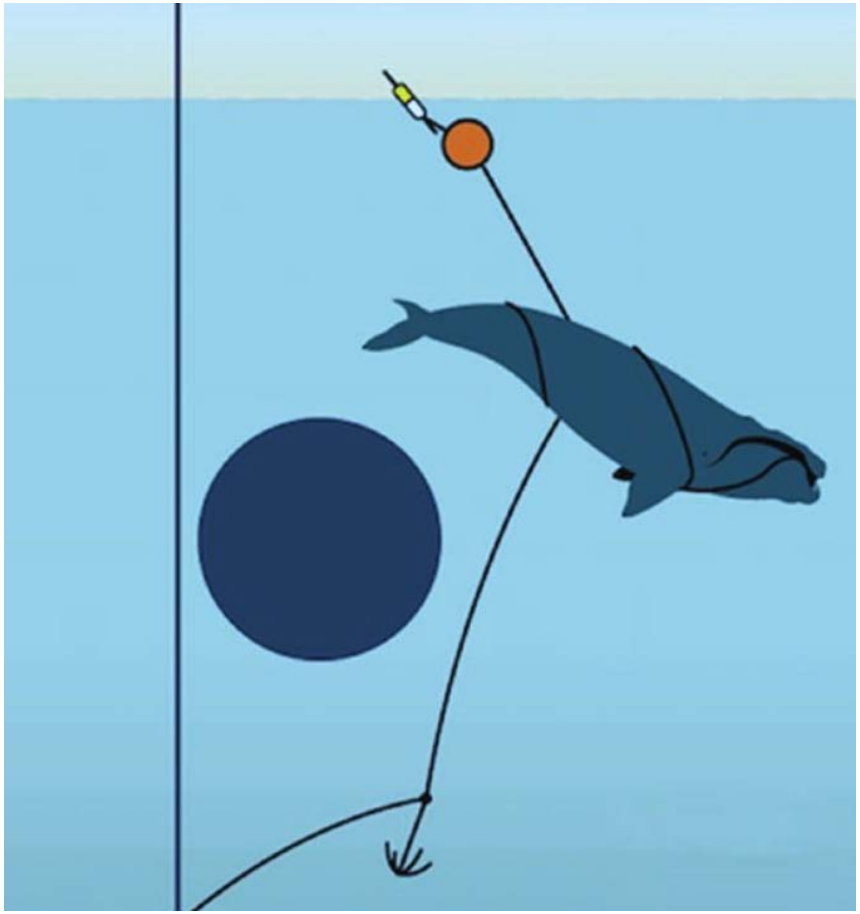
Marine mammals

Passive nets (gillnets and trammel nest)

Entanglement with meshes



Entanglement with ropes, buoys



Marine mammals

Passive nets (gillnets and trammel nest)

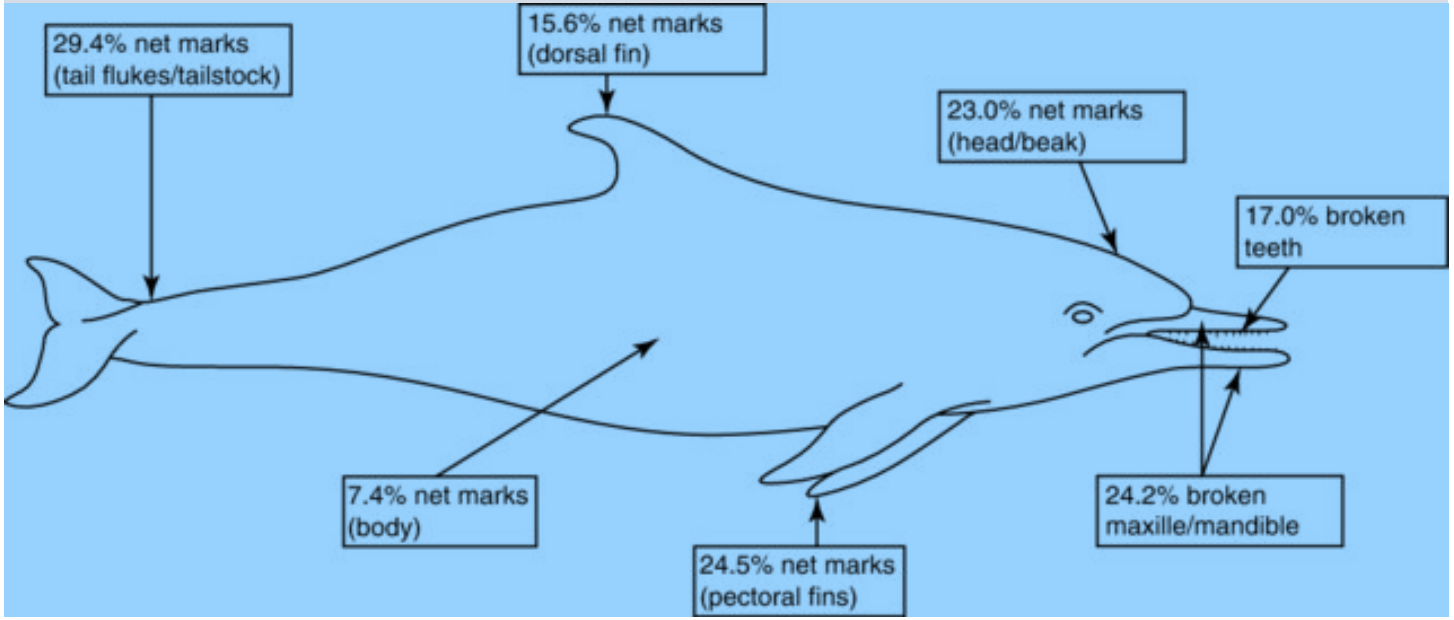
Interaction with passive nets or part of them (floats)

Ingestion of fishing nets

Marine mammals

Passive nets (gillnets and trammel nest)

Types of injury

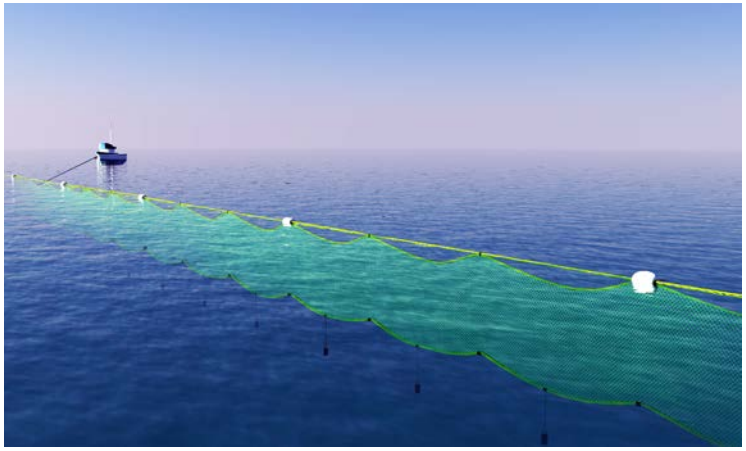


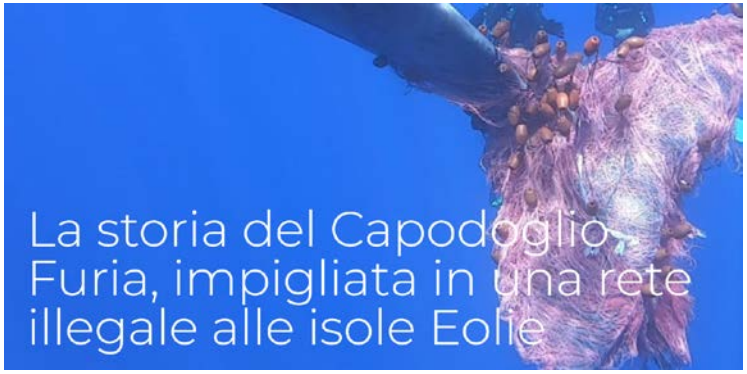
Source: Dolman and Moore, 2017

Marine mammals

Illegal driftnets targeting swordfish (spadara nets) are still a matter of concern

Illegal since 1998: Council Regulation (EC) No 894/97 of April 29th 1997, amended by Council Reg. no. 1239/98 e Council Reg. no. 809/2007





Marine mammals

CNR IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

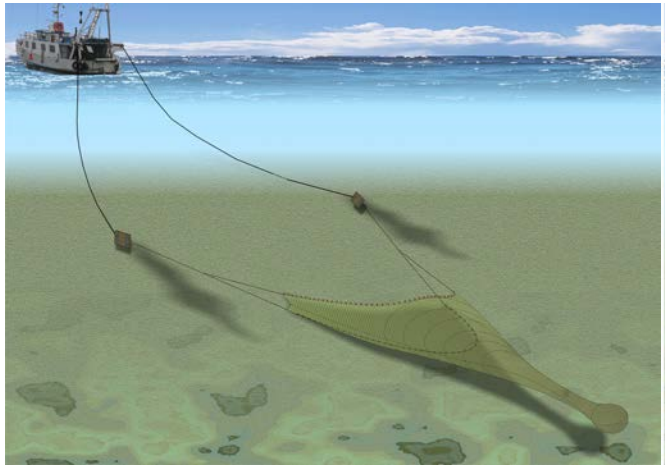
Illegal driftnets targeting swordfish (spadara nets) are still a matter of concern

MITIGARE LE INTERAZIONI CON LA PESCA
life DELFI

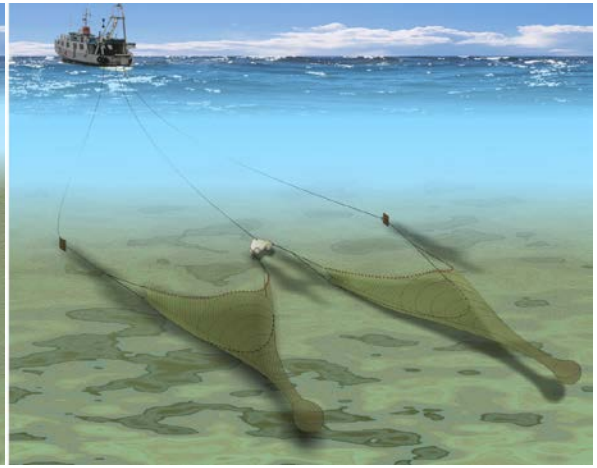
Marine mammals

Trawling (bottom and pelagic trawling)

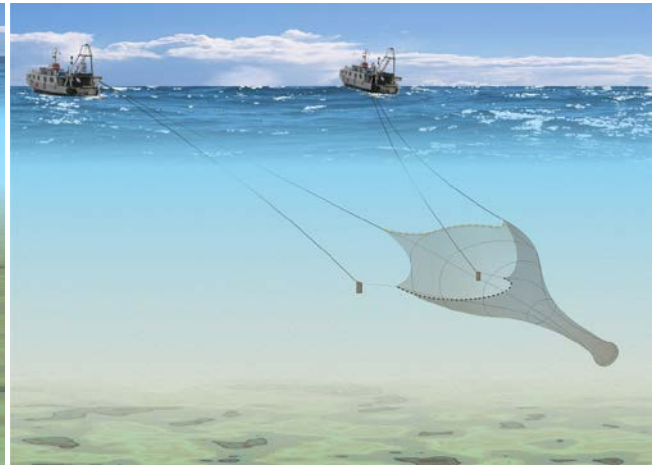
Bottom trawl



Twin trawl



Mid-water trawl

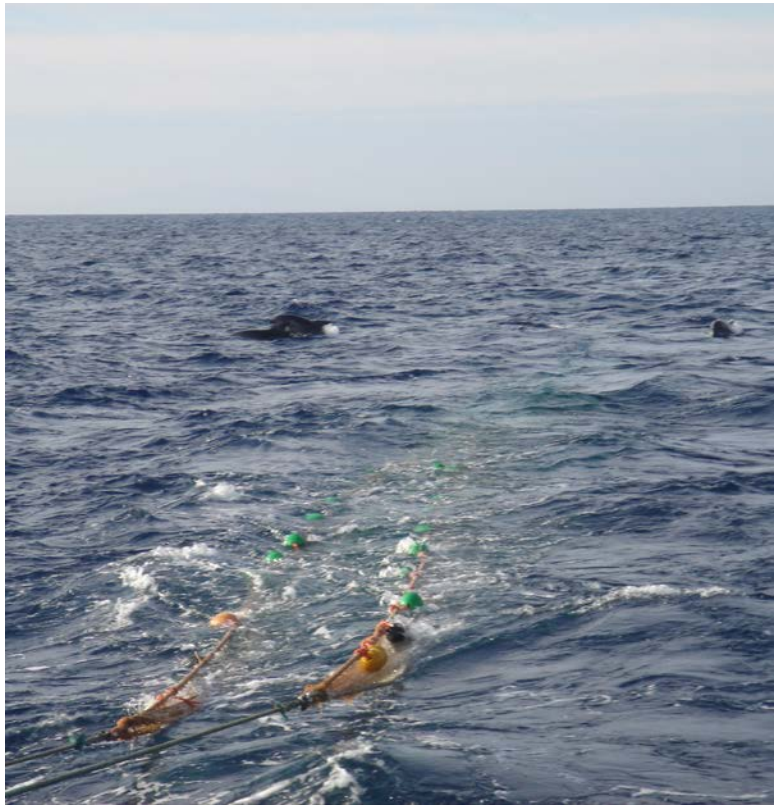


Marine mammals

Trawling (bottom and pelagic trawling)

Depredation

Dolphins have been reported to follow trawlers to take advantage of discarded fish or to seize fish from the net



Marine mammals

CNR IRBIM ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

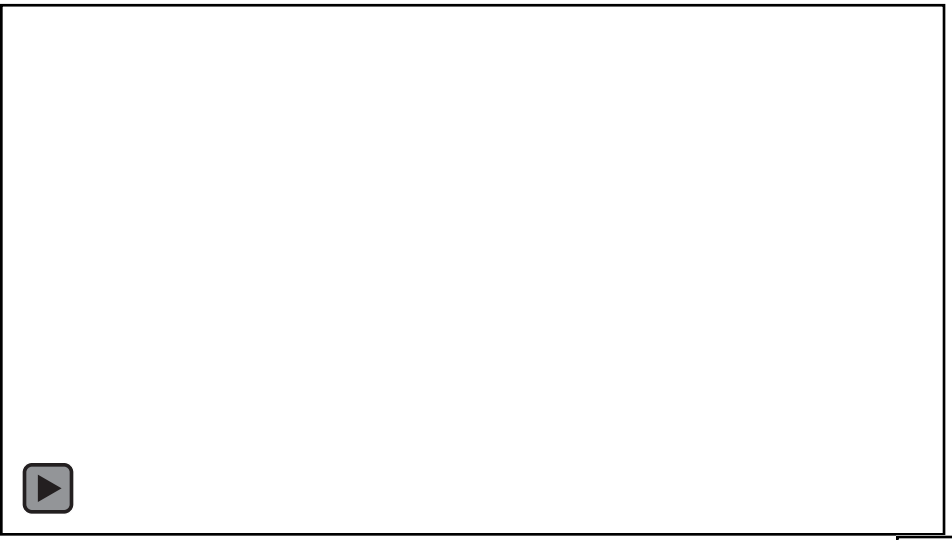
MITIGARE LE INTERAZIONI CON LA PESCA
Life DELFI

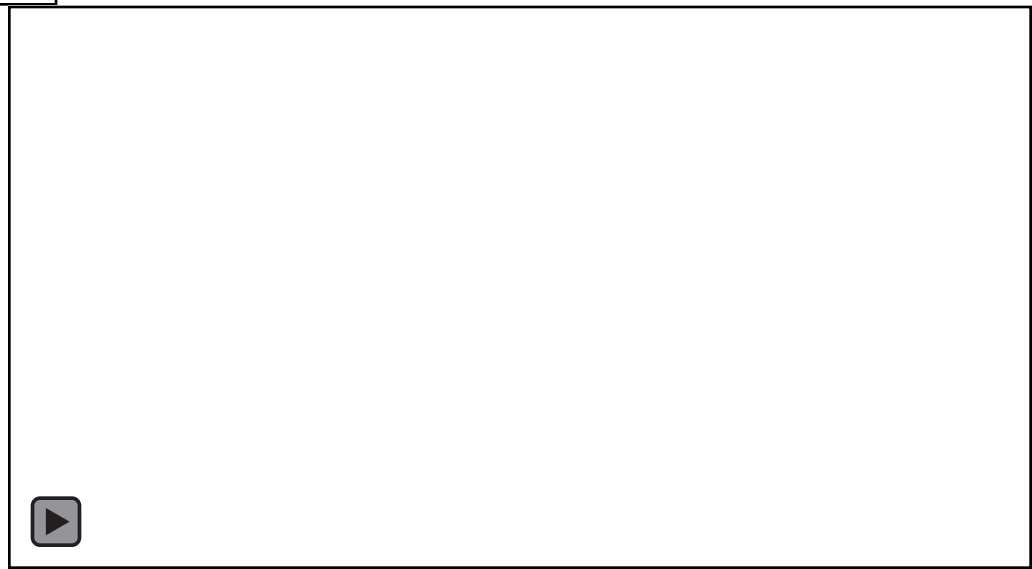
Trawling (bottom and pelagic trawling)

Bycatch

Marine mammals

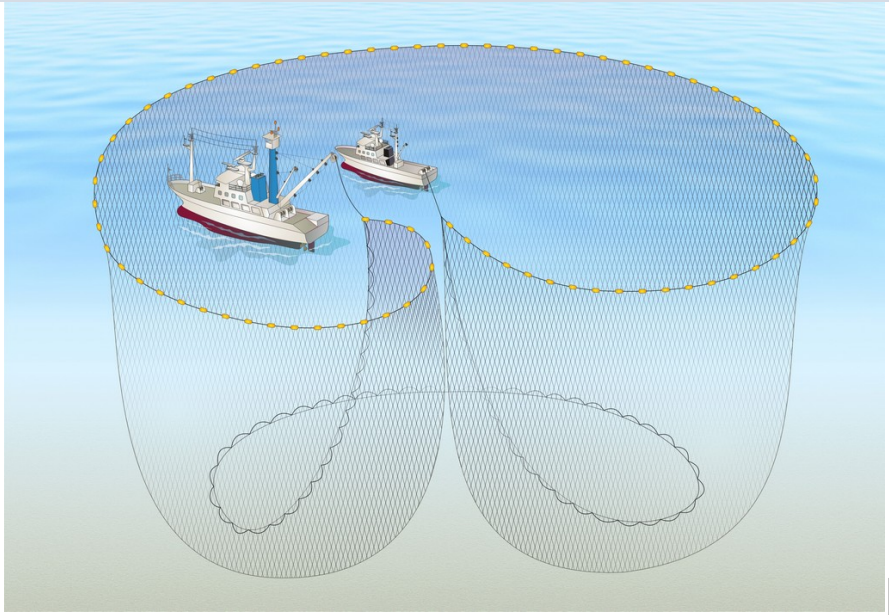
Trawling (bottom and pelagic trawling)





Marine mammals

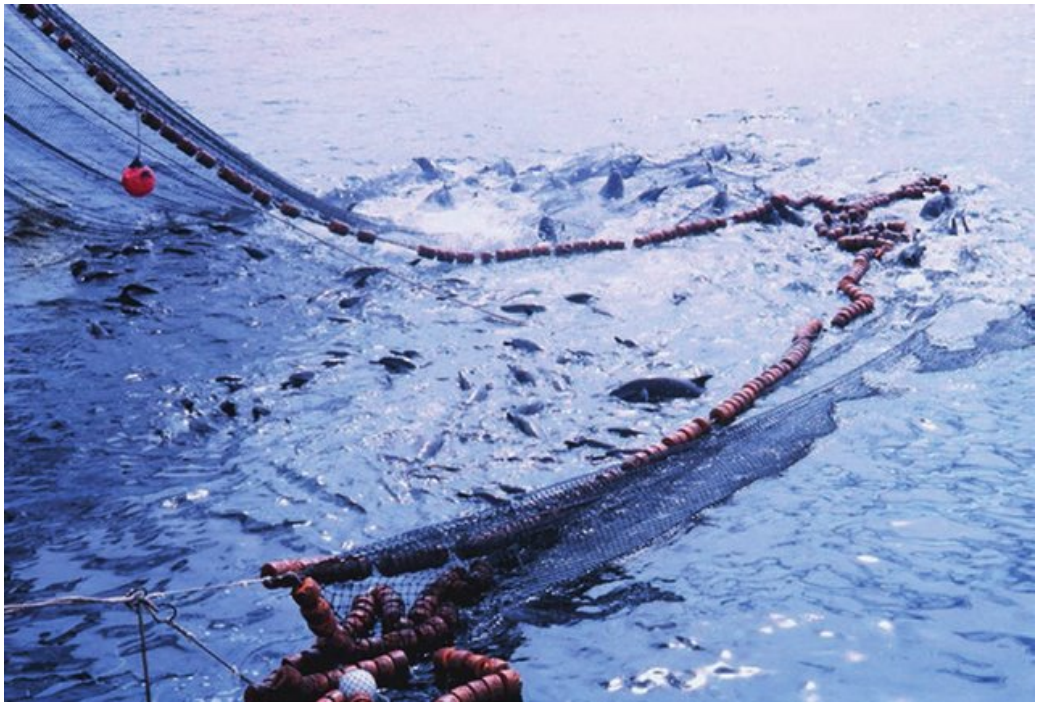
Purse seine



Marine mammals

Purse seine

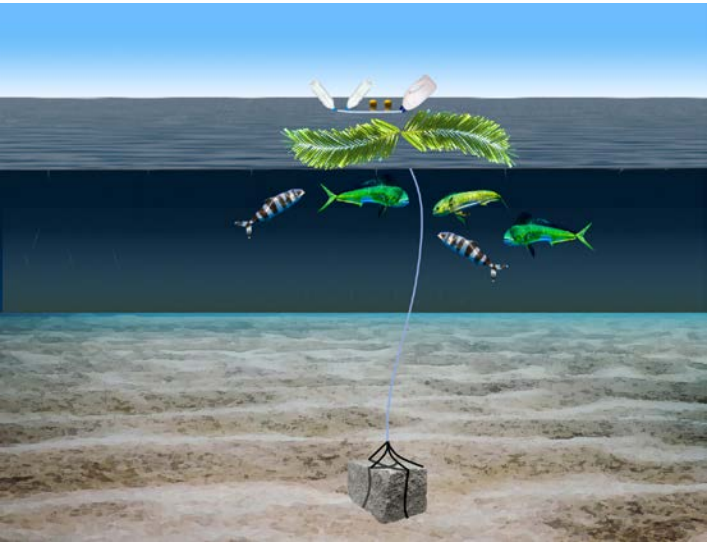
Fish Aggregating Device



Marine mammals

Purse seine

Fish Aggregating Device, in Italy: Cannizzi



Each vessel sets from
20 to 100 FADs

Around 700 vessels
in the MED

Sea turtles

Sea turtles can be affected at all life stages by anthropogenic factors: from eggs (destruction-modification of the nesting beaches) to young and adults (including fishing operations). As a result, all sea turtle species are subjects of conservation concern

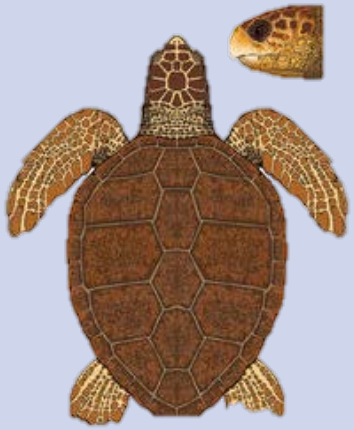
Most of fishing gears involved

Fisheries → Turtles	Mammals → Fisheries
Entanglement	**Steal fish** from baited hooks reducing catch efficiency
Injuries to turtles due to impacts with fishing gears especially trawling	**Loss of time to disentangle**
Ingestion of hooks with letal consequences	Damage to fishing nets
Voluntary injuries	

Sea turtles

Interactions between turtles and fisheries in the Mediterranean and the Black Sea involve the following species:

Loggerhead turtle (*Caretta caretta*)



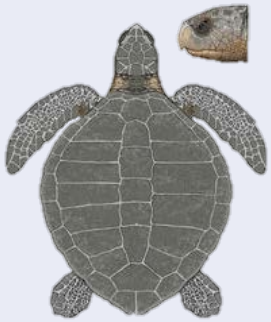
Green sea turtle (*Chelonia mydas*)

Sea turtles

Interactions between turtles and fisheries in the Mediterranean and the Black Sea RARELY involve the following species:

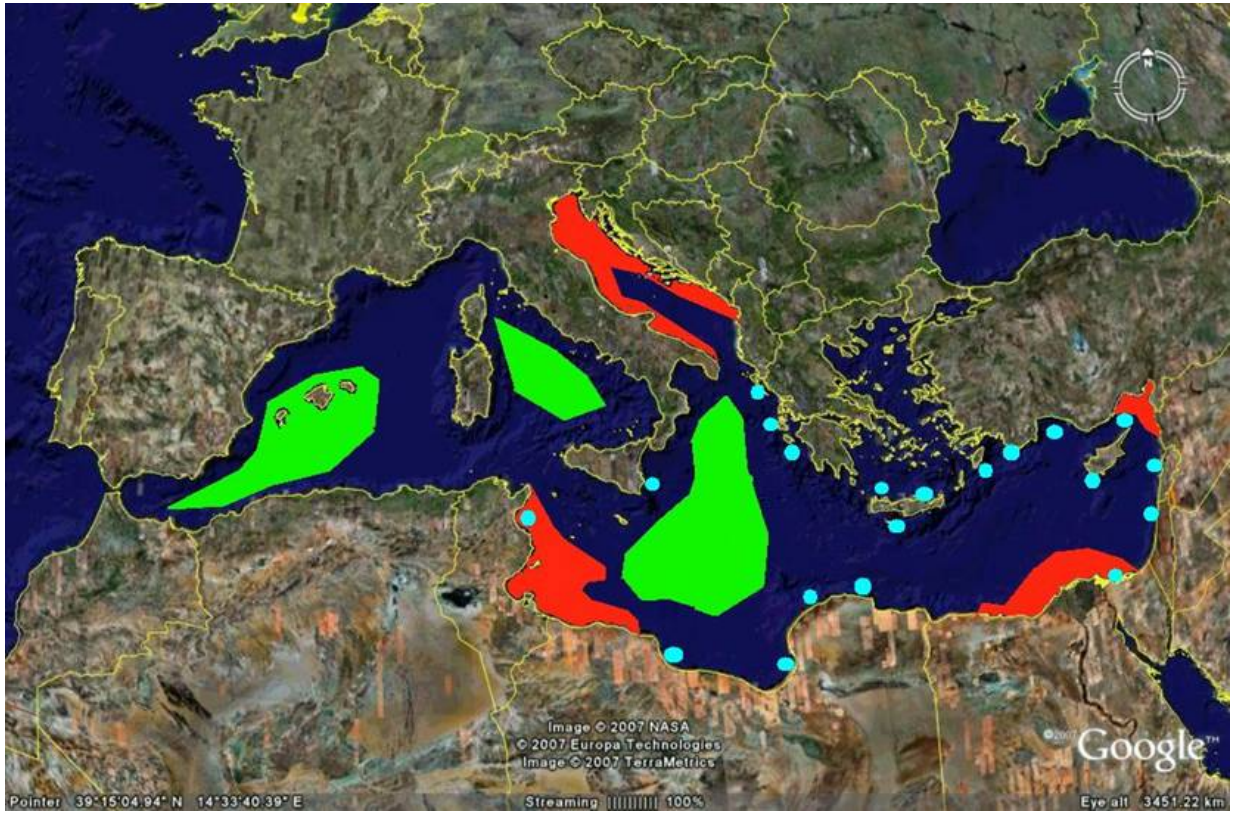
Leatherback turtle (Dermochelys coriacea)

Olive ridley turtle (*Lepidochelys olivacea*)



Sea turtles

Fisheries affect different ecological phases of sea turtles



Caretta caretta

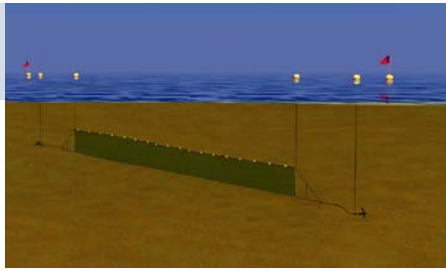
PELAGIC HABITATS (PELAGIC PHASE)

BOTTOM HABITATS (DEMERSAL PHASE)

MAIN SPAWINING AREAS

Sea turtles

Passive nets (gillnets and trammel nest)

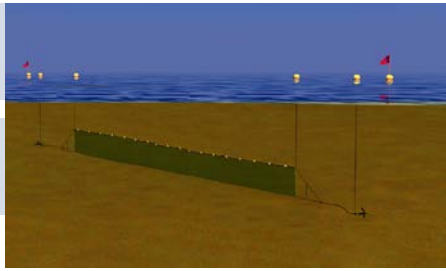


- Interactions between sea turtles and passive nets is a matter of concern because of high direct mortality due to drowning

- Most of interactions occur when turtles try to feed on preys already caught by nets (depredation)

Sea turtles

Passive nets (gillnets and trammel nest)



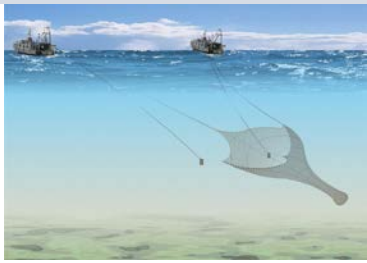
Parameters affecting sea turtle bycatch

- Mesh size: the larger mesh size the higher is the probability of bycatch
- Trammel net more dangerous than gillnet
- Hanging ratio: nets with a high slack
- Net height
- Soak time
- Bottom depth
- Habitat: e.g. south river Po, north Adriatic
- Buoys

Sea turtles

Trawling (bottom and pelagic trawling

Interactions between sea turtles and bottom trawling occur especially in neritic habitats (shallow waters) when turtles feed on prey on the bottom



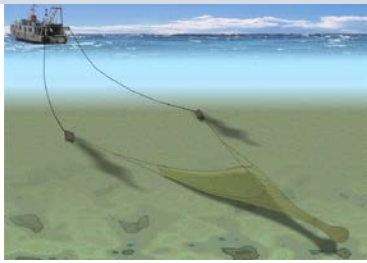
Pelagic trawling

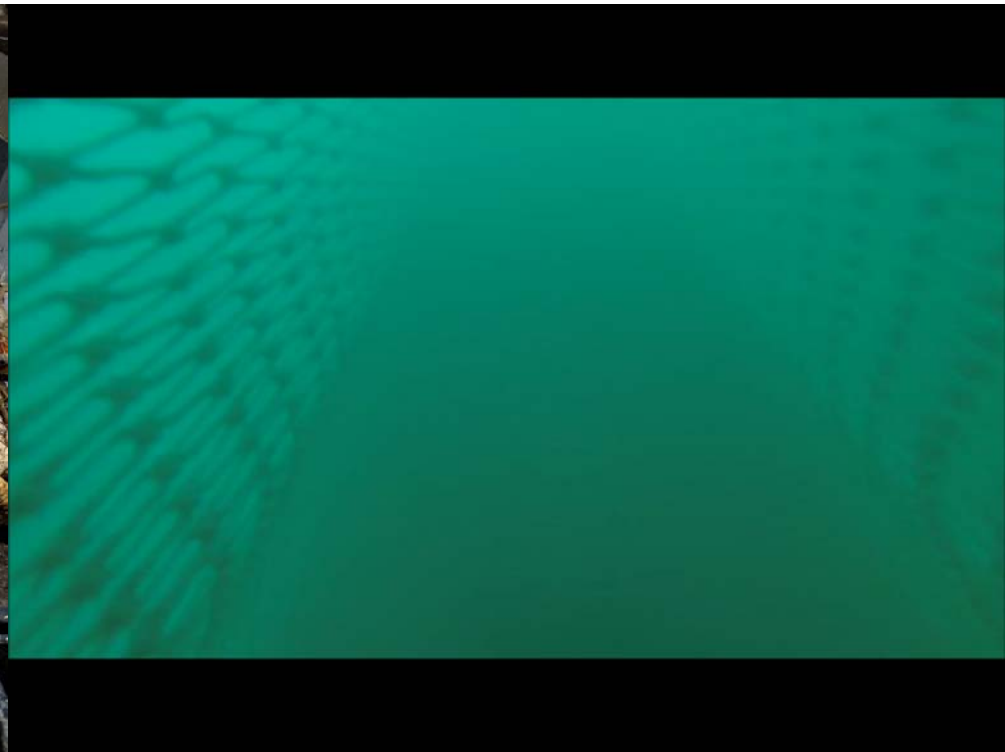
Sea turtles

CNR IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Bottom trawling

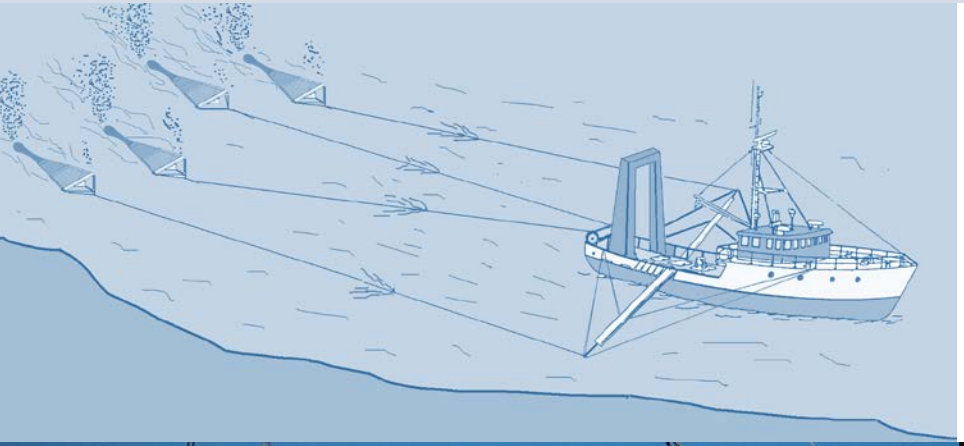
Interactions between sea turtles and bottom trawling occur especially in neritic habitats (shallow waters) when turtles feed on prey on the bottom



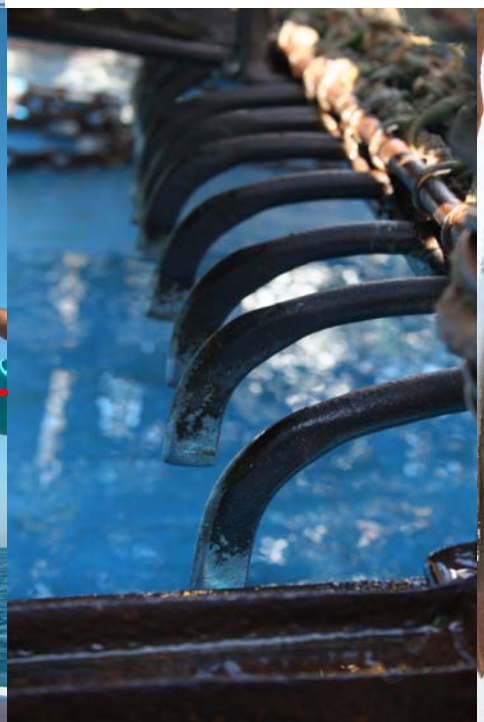


Sea turtles

Rapido trawling



It's a kind of beam trawl targeting common sole



Sea turtles

CNR IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

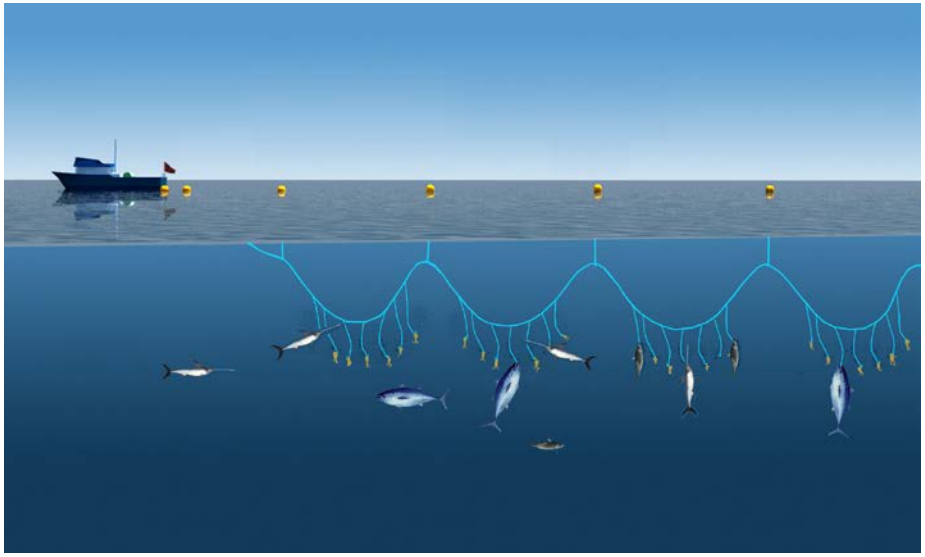
Rapido trawling

Sea turtles

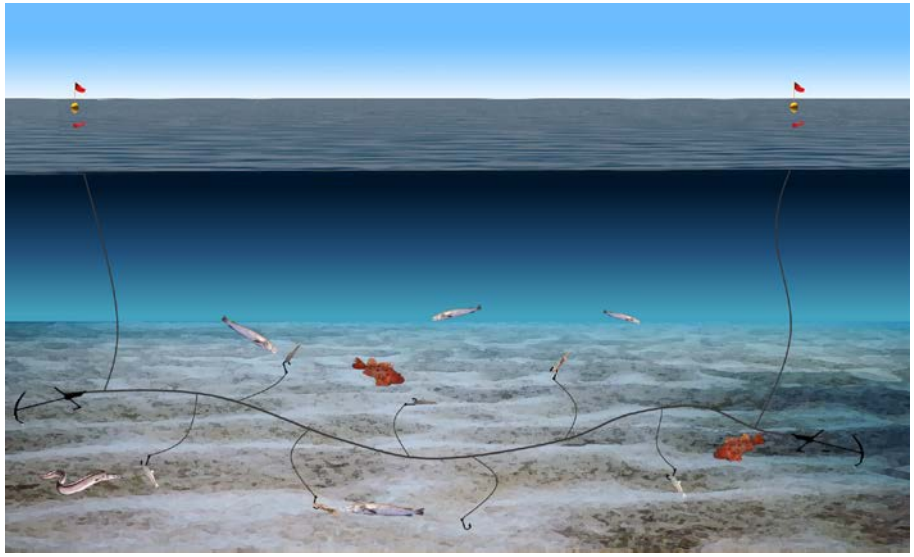
Longlines

- Interactions between sea turtles and longlines mainly occur when turtles try to feed on the bait on hooks
- Turtles can also get tangled on the main line or in the branchlines
- Thousand of hooks up to 60 km in length

Surface or drifting longline



Bottom longline



Sea turtles

CNR IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

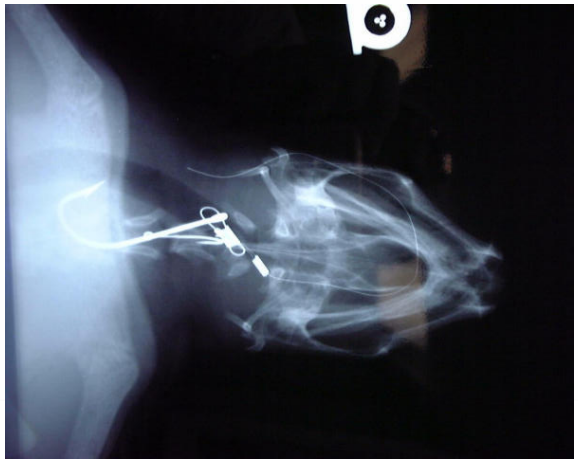
Drifting Longlines

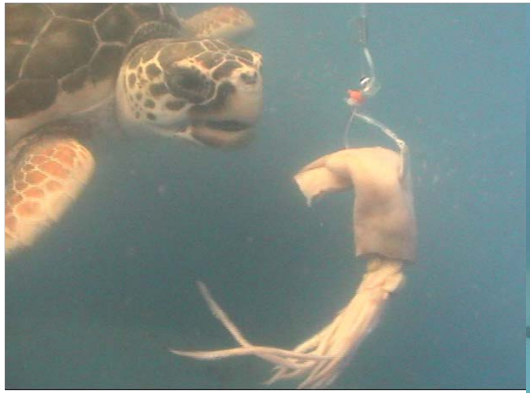
Sea turtles

Longlines

Parameters affecting sea turtle bycatch

- Hook size (length, gap etc.)
- Hook shape
- Type of bait (mackerel, squid, artificial bait)
- Depth setting
- Soak time
- Branchline length





Sharks and rays (SARs)

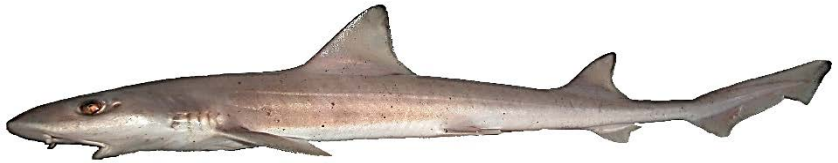
Main threats

- Sharks and rays are exploited by several fishing gears (passive nets, trawling, longlines, mostly).
- Only a few species are "formally protected"
- Several species have a commercial value, some of them are a target

Sharks and rays (SARs)

Common species of sharks in fishing activities

Spiny dogfish (*Squalus acanthias*)



Common smooth-hound (*Mustelus mustelus*)

Small-spotted catshark (*Scyliorhinus canicula)*

Blue shark (*Prionace glauca*)

Sharks and rays (SARs)

Common species of rays in fishing activities

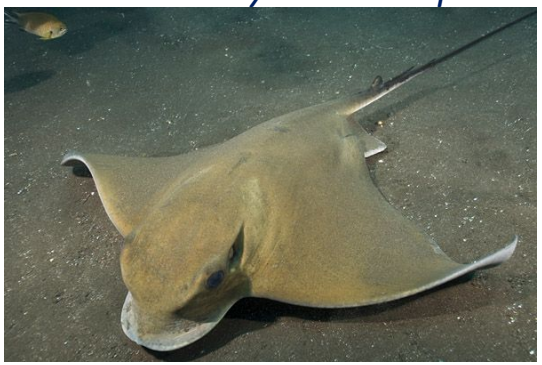
Raja clavata

Raja miraletus

Torpedo marmorata

Raja asterias

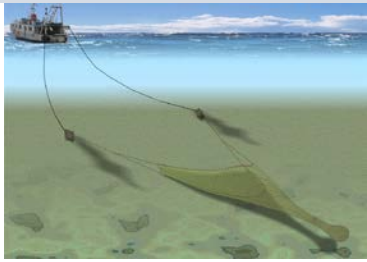
Myliobatis aquila



Sharks and rays (SARs)

CNR IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Bottom trawling



Sharks and rays (SARs)

CNR
IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

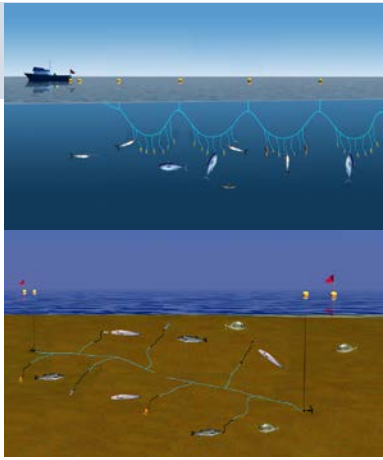
Rapido trawling

Sharks and rays (SARs)

CNR IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Longlines

- Interactions between sharks and rays and longlines mainly occur when SARs try to feed on the bait on hooks



Target species: swordfish

Bycatch species: swordfish

Sharks and rays (SARs)

Bottom longline

Target species: Sparids, hake, Serranids etc.

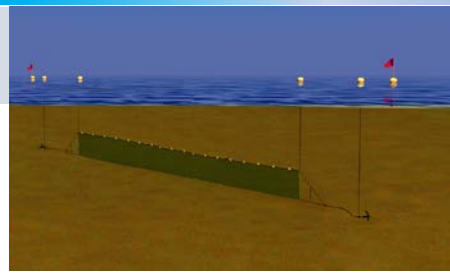
Bycatch species: demersal sharks

Hexanchus griseus

Sharks and rays (SARs)

CNR IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Passive nets (gillnets and trammel nets)



Interactions between sharks and rays and passive nets targeting turbot (*Scophthalmus maximus*) and rays

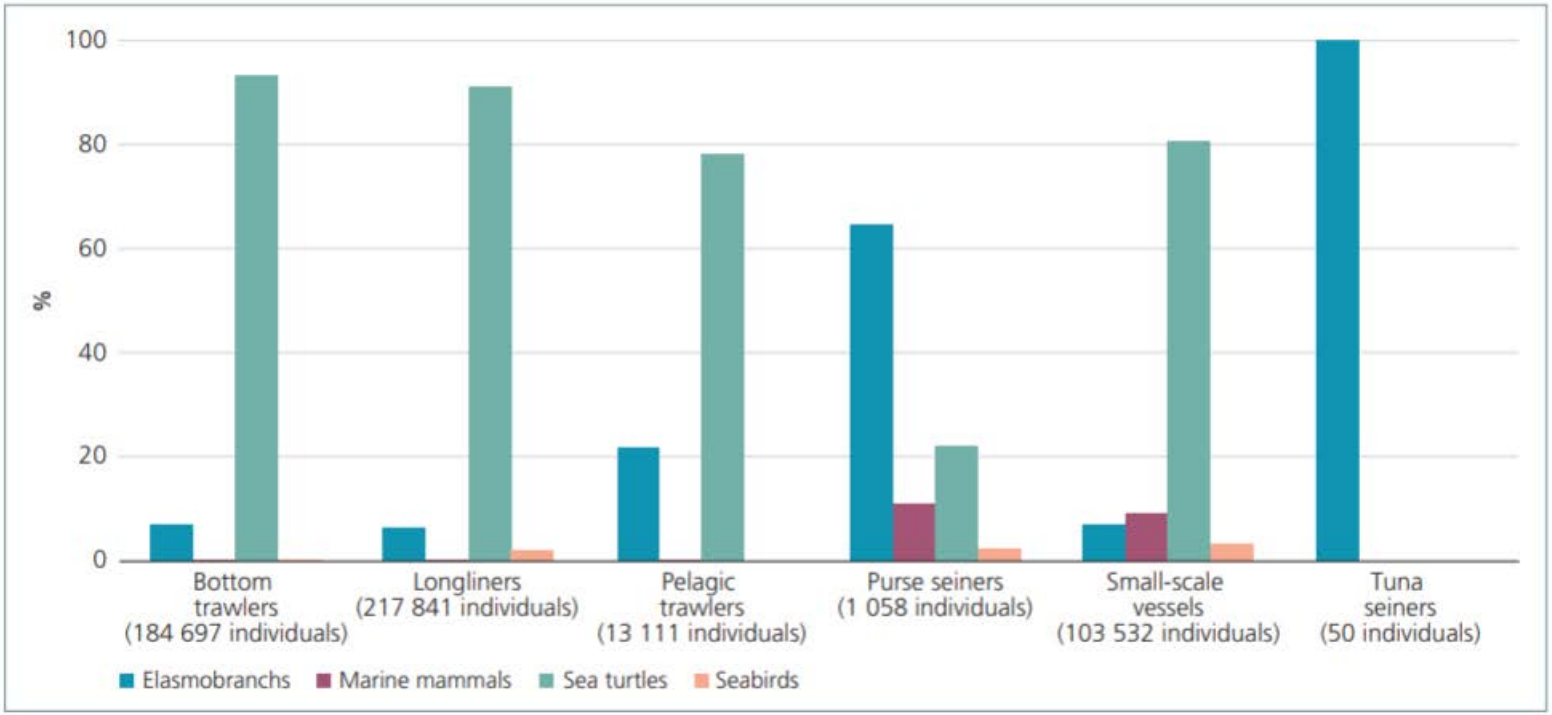
Sharks and rays

Longlines

- Interactions between sea turtles and longlines mainly occur when turtles try to feed on the bait on hooks
- Turtles can also get tangled on the main line or in the branchlines

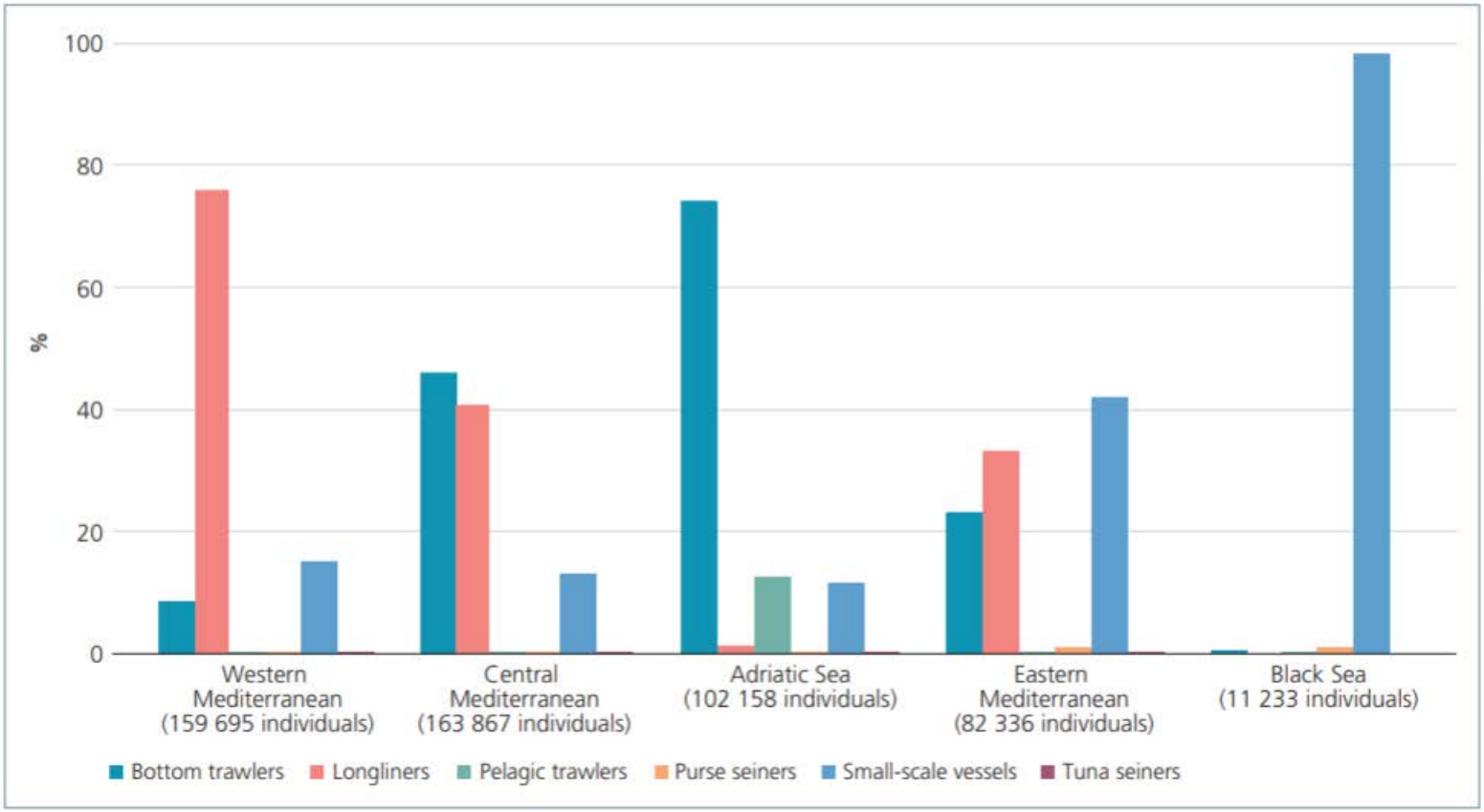
Bycatch estimates

Reported incidental catch by species group and vessel group (in relative terms) in the GFCM area of application, 2000–2020 (Source GFCM, 2020)



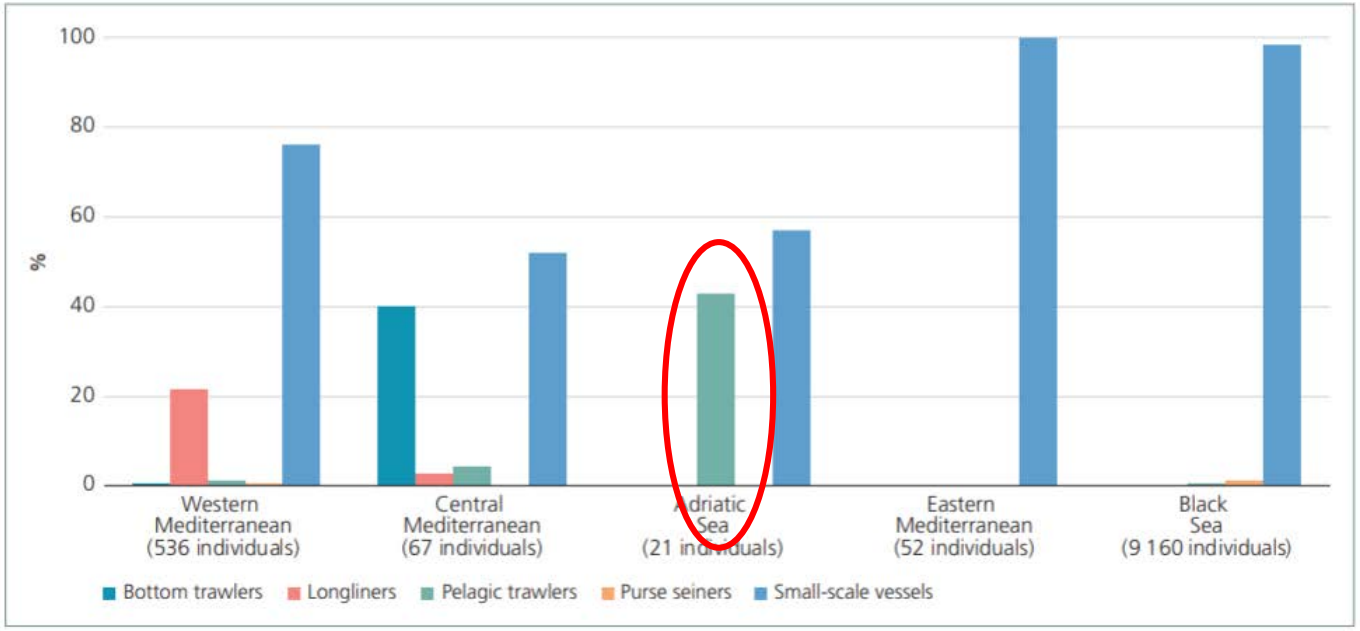
Bycatch estimates

Reported incidental catch by vessel group and GFCM subregion (in relative terms), 2000–2020 (Source GFCM, 2020)

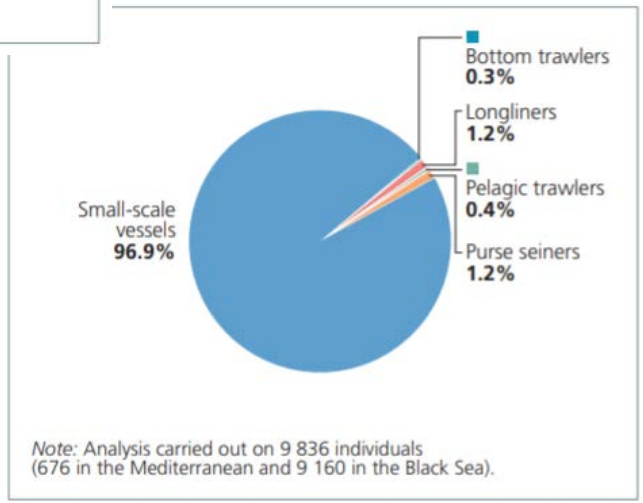


Bycatch estimates

Marine mammals



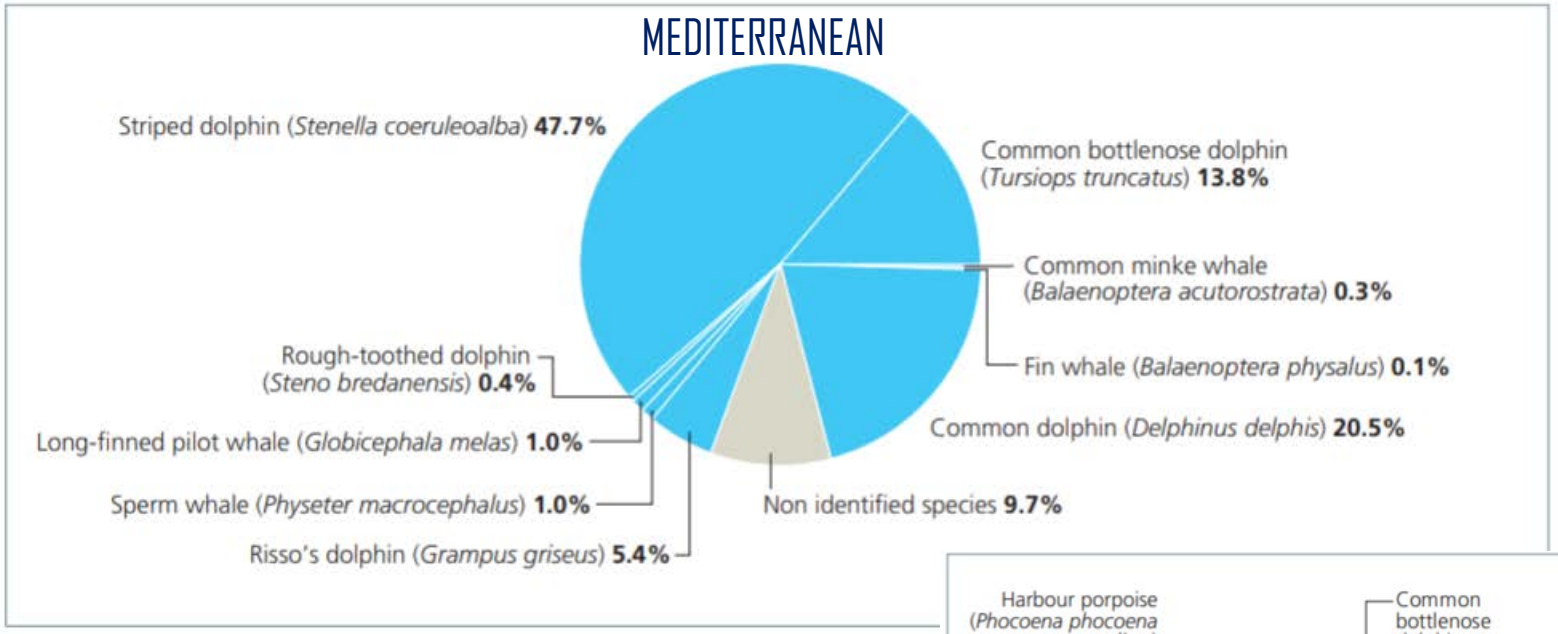
Reported incidental catch of marine mammals by vessel group and GFCM subregion, 2000–2020. Source, FAO-GFCM, 2020

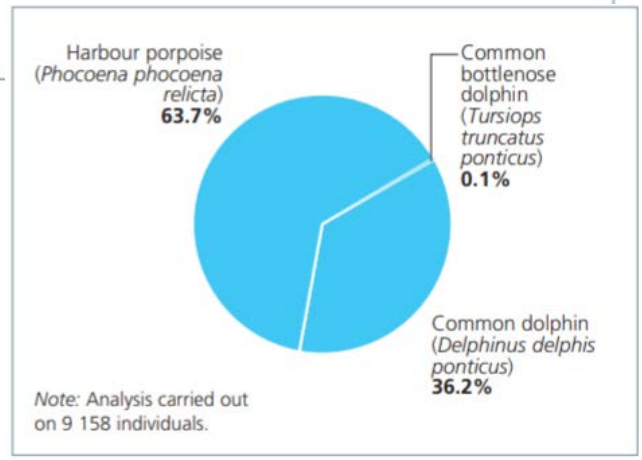


Bycatch estimates

Marine mammals

Reported incidental catch of the main cetacean species, 2000–2020





Bycatch estimates

Marine mammals: Pinnipeds

Pinnipeds (Pinnipedia) are represented in the area by a single species, the Mediterranean monk seal, Monachus monachus (Hermann, 1779)

- As a whole, the Eastern Mediterranean population is estimated to count about 350 mature individuals (Karamanlidis et al., 2015)
- In Greece significant breeding concentrations of monk seals are reported (around 200 individuals).
- In Turkey, monk seals are present along both the Aegean and Levantine coasts (around 60 and 40 individuals),
- Cyprus is also known to host mature monk seals (<10 individuals), there is evidence that pupping still occurs
- Vagrant individuals were episodically sighted elsewhere in the Mediterranean, also in recent times, suggesting a possible return in some of the former areas, such as Spain, Italy, Croatia, Albania, Syria, Lebanon, Israel, Egypt and Libya

Bycatch estimates

Marine mammals: Pinnipeds

Monachus monachus (Hermann, 1779)

- Most of interactions are with passive nets and abandoned nets (ghost fishing effect)

- The typical damage produced by seals is made by holes about 20-30cm in diameter with a characteristic triangular three-hole pattern, representing the animal's mouth and foreflippers (Goedicke, 1981; Johnson, 1988).

- Monk seals are not an exception with incidental entanglements, as a direct consequence of the interactions with fishing gears.

Bycatch estimates

Marine mammals: Pinnipeds

Monachus monachus (Hermann, 1779)

- In Italy, in the cave known as the Grotta del Bue Marino, in the Tyrrhenian island of Gorgona all 8 specimens perished entangled in the nets of a local fisherman during the 1980's (Guarrera, 1999)
- Androukaki et al. (1999) revising the cause of death of 182 seals found dead in Greek in previous years, showed that deliberate killings accounted for 65% of these cases (118 individuals)

Bycatch estimates

Marine mammals: Cetaceans - trawling

In the past, most of the cetacean catches derived from large mesh size driftnets; once they were banned the cetacean mortality in fishing gears dramatically dropped

Bottom trawling: only a few accidental catches of bottlenose dolphin, with some cases in the Adriatic. High catches in Israel (26 dolphins)

Pelagic trawling: only a few accidental catches of bottlenose dolphin and striped dolphin, with some cases in the Adriatic. Around 15 *D. delphis* in the Black sea (Ukraina)

Bycatch estimates

Marine mammals: Cetaceans - trawling

Adriatic Sea

In the period 2006-2008, 745 successful fishing trips and 3,141 hauls were monitored in the Adriatic. A total of 609 groups of bottlenose dolphins were sighted close to the net in over 30% of the hauls, often interacting with the fishing operation. Only 3 bottlenose dolphins were caught,

A survey was carried out between February 2015 and February 2016. Overall, 464 fishing trips were monitored for a total of 1,797 hauls and out of 587 individuals of bottlenose dolphins interacting during fishing operations, only one accidental catch was recorded

Bycatch estimates

Marine mammals: Cetaceans - passive nets

Some individuals found entangled in the Tyrrhenian and Adriatic sea (mostly stranded individuals)

Most of by-catches occur in the Black Sea: the main gears are gillnets and trammel nets for turbot (Scophthalmus maeoticus), and spiny dogfish, (*Squalus acanthias*).

Ukraina: survey carried out between 2006 and 2009: observers monitored 4,769 bottom-set gillnets (354.1 km) targeting turbot or dogfish, recording the unwanted catches of 515 harbour porpoises and five bottlenose dolphins

Bycatch estimates

Marine mammals: Cetaceans - passive nets

Bulgaria: survey carried out on 543 vessels deploying 760,865 km of nets targeting different species, allowed a **total estimated annual bycatch of 1,539 harbour porpoises and 1,211 dolphins** (Birkun et al. (2014).

Bulgaria: Mihaylov (2011) monitoring directly onboard the fishing vessels in the central part of the Bulgarian coast 24 sets for a total of 982 turbot gillnets, with a total effort of 88.4 km, reported unwanted catches of 21 cetaceans (19 harbour porpoises and 2 bottlenose dolphins)

Bulgaria: A survey carried out monitoring 812 turbot gillnet fishermen allowed Birkun et al. (2014) to calculate that at least 945 662 km of nets were annually deployed in all the Bulgarian waters, estimating an annual catch of **3,016 porpoises and 1,895 bottlenose dolphins**

Bycatch estimates

Marine mammals: Cetaceans - passive nets

Romania: Radu and Anton (2014) reported, from 2002 to 2011, 129 porpoises and 2 bottlenose accidentally caught in the fishing gears (gillnets, pound nets, pelagic trawl) used in the Romanian fisheries.

Romania: The authors estimate a potential bycatch of 2.71 porpoise/boat/year as long as one assumes that responses are not biased (Birkun et al., 2014).

Turkey: it could be estimated that **2,011** (SE ± 742) **harbour porpoises were caught in 2007** and 2,294 (SE ± 806) in 2008. The estimated number of **bottlenose dolphins** caught was 168 (SE ± 156) in 2007 (Tonay (2016)

Bycatch estimates

Marine mammals: Cetaceans - passive nets

Tunisia: around 25 bottlenose dolphins per year (Karaa et al., 2012)

Croatia: around 12 bottlenose dolphins per year (Gomercic et al., 2009)

Bycatch estimates

Marine mammals: Cetaceans - longlines

Spain: Between 2000 and 2009, a large survey was carried out in Spanish waters in order to assess the interactions of the artisanal pelagic longliners with cetaceans; **2,877 fishing sets were observed, resulting in 57 individuals caught**, belonging to four species: 33 Risso's dolphins, 8 striped dolphins, 6 short-beaked common dolphins and 4 long-finned pilot whales and 6 unidentified dolphins**: mortality rate 22%** (Macías López et al., 2012).

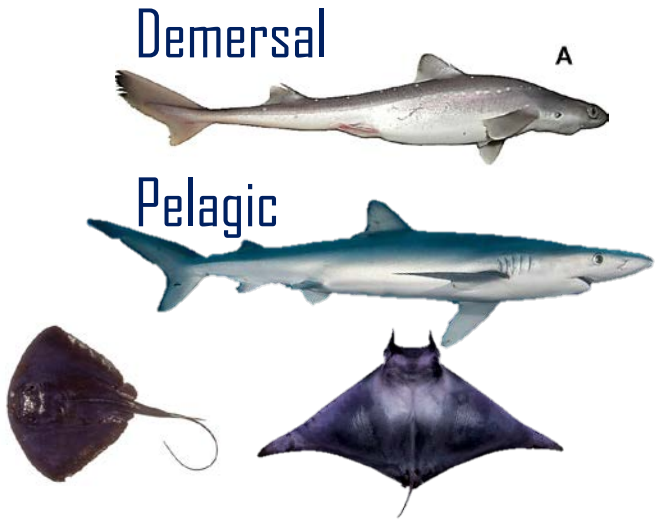
Bycatch greatly varies according with type of longline

Bycatch estimates

Sharks and rays

48 species of sharks and 38 of batoids in the Mediterranean

- Of the 48 Mediterranean shark species, about half have demersal habits
- Of the 38 batoids, only two species (*Pteroplatytrygon violacea and Mobula mobular*) have pelagic habits
- Longliners, set and drifting grouped together and bottom trawlers are by far the vessel groups with the greatest impact on conservation priority elasmobranch species
- Most of species are not protected



Only 13 cartilaginous species are assumed to live in the Black Sea

- the most commonly elasmobranchs species caught in the Black Sea, the picked dogfish (*S. acanthias*) and the thornback ray (*Raja clavata*)

Bycatch estimates

Sharks and rays

- Some species are among the main **commercial** ones of certain fisheries: in the upper Adriatic, in the Channel of Sicily, in the Gulf of Gabes, in the Black sea where vessels using gillnets targeting smooth-hound sharks (*Mustelus* sp.), dogfish sharks (*Squalus* sp.), guitarfishes (*Rhinobatos* sp.)

Bycatch estimates

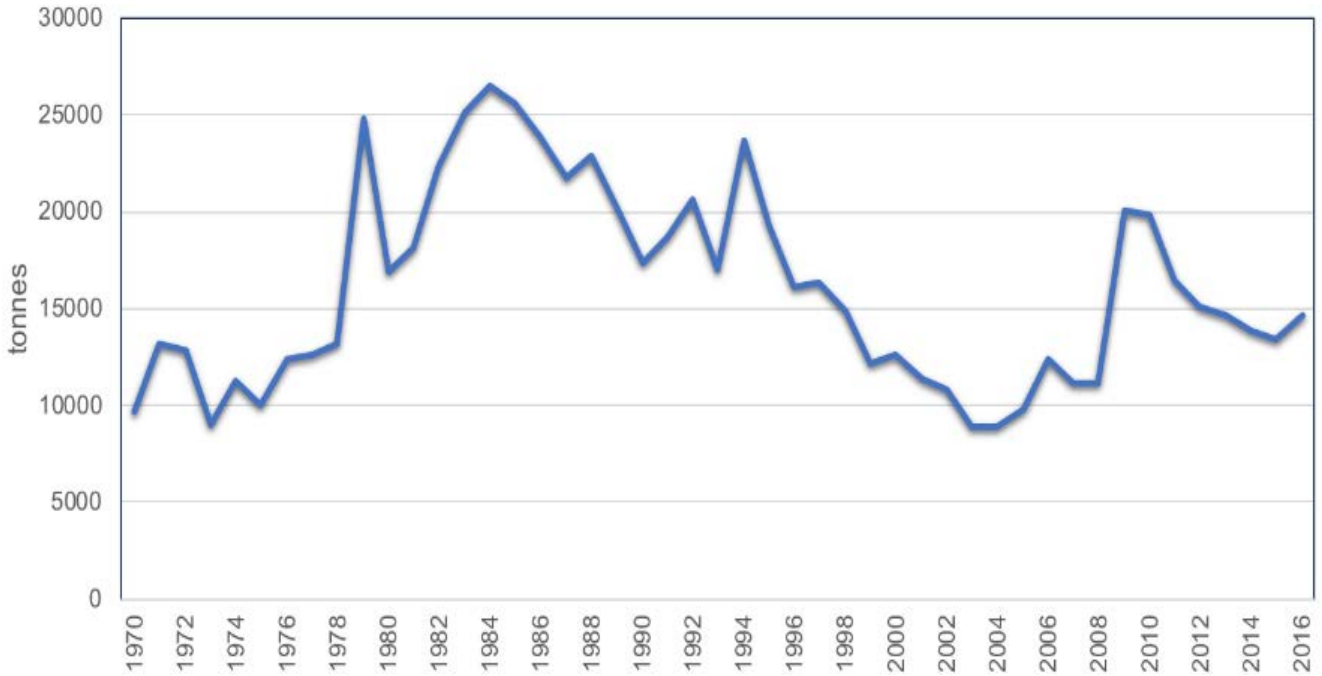
Sharks and rays

Recommendation GFCM/36/2012/3 on fisheries management measures for conservation of sharks and rays in the GFCM area.

	Annex II (Protected species, fishing is prohibited in the Mediterranean Sea. The reporting of any incidental catch is mandatory)	Annex III (Fishing of this species is allowed in the Mediterranean Sea, but the reporting of any catch is mandatory)
1	Carcharias taurus Rafinesque, 1810	Alopias vulpinus (Bonnaterre, 1788)
2	Carcharodon carcharias (Linnaeus, 1758)	Carcharhinus plumbeus (Nardo, 1827)
3	Cetorhinus maximus (Gunnerus, 1765)	Centrophorus granulosus (Bloch & Schneider, 1801)
4	Dipturus batis (Linnaeus, 1758)	Heptranchias perlo (Bonnaterre, 1788
5	Galeorhinus galeus (Linnaeus, 1758)	Mustelus asterias Cloquet, 1821
6	Gymnura altavela (Linnaeus, 1758)	Mustelus mustelus (Linnaeus, 1758)
7	Isurus oxyrinchus Rafinesque, 1810	Mustelus punctulatus Risso, 1826
8	Lamna nasus (Bonnaterre, 1788)	Prionace glauca (Linnaeus, 1758)
9	Leucoraja circularis (Couch, 1838)	Squalus acanthias Linnaeus, 1758
10	Leucoraja melitensis (Clark, 1926)	
11	Mobula mobular (Bonnaterre, 1788)	
12	Odontaspis ferox (Risso, 1810)	
13	Oxynotus centrina (Linnaeus, 1758)	
14	Pristis pectinata Latham, 1794	
15	Pristis pristis (Linnaeus, 1758)	
16	Rhinobatos cemiculus (Geoffroy Saint- Hilaire, 1817)	
17	Rhinobatos rhinobatos (Linnaeus, 1758)	
18	Rostroraja alba (Lacépède, 1803)	
19	Sphyrna lewini (Griffith & Smith, 1834)	
20	Sphyrna mokarran (Rüppell, 1837)	
21	Sphyrna zygaena (Linnaeus, 1758)	
22	Squatina aculeata Cuvier, 1829	
23	Squatina oculata Bonaparte, 1840	
24	Squatina squatina (Linnaeus, 1758)	

Bycatch estimates

Sharks and rays



Historical series of Chondrichthyan landings in the Mediterranean and Black Sea (source FAO-GFCM 2018).

Bycatch estimates

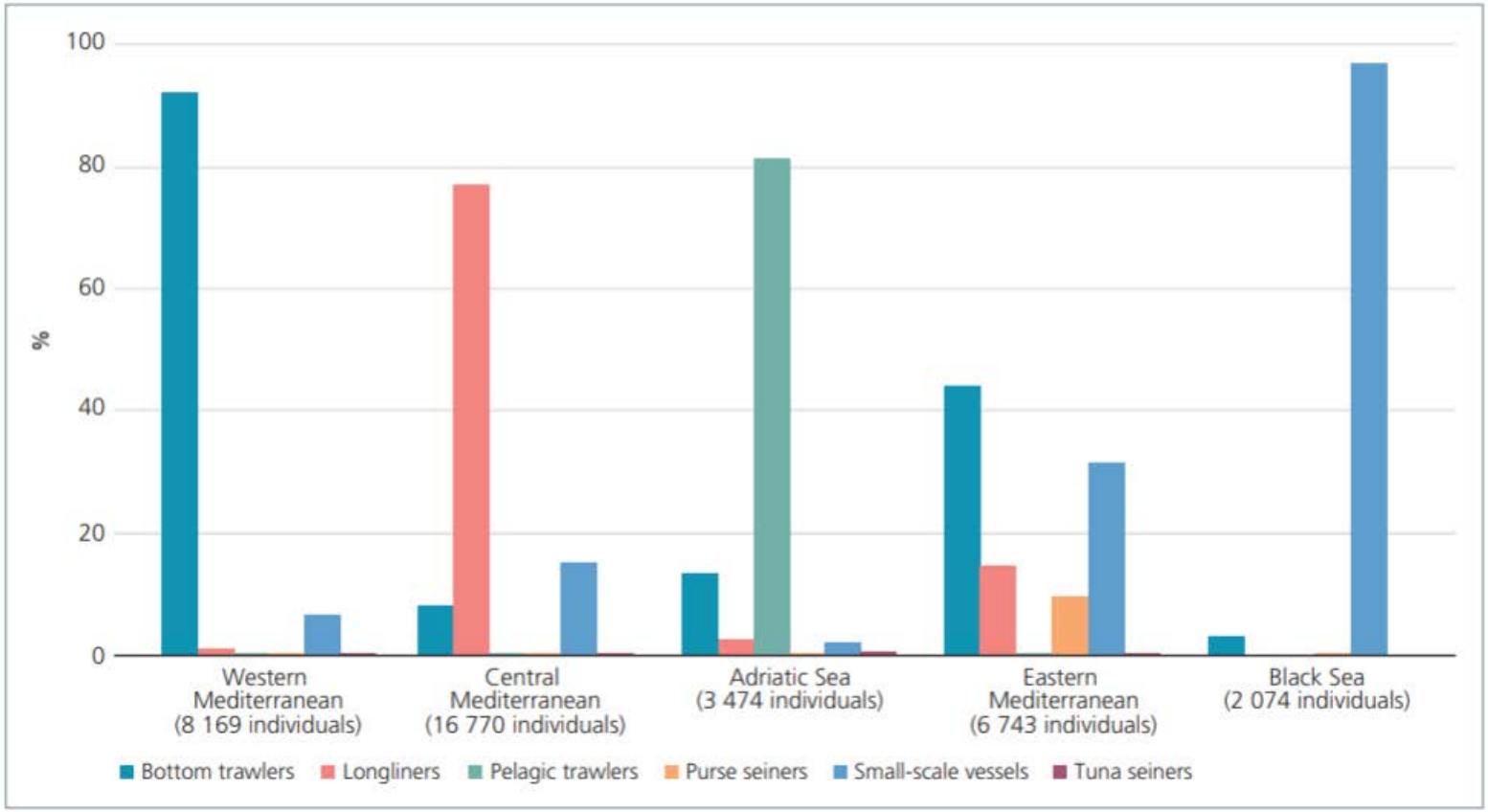
Sharks and rays

- **In the Adriatic Sea**, the bulk of the records comes from **pelagic trawlers** (around 81 percent).
- **In the western Mediterranean**, almost all the elasmobranch bycatch is attributed to **bottom trawlers** (92 percent).
- In the **central Mediterranean, longliners** (77 percent) represent the vessel group with the absolute highest number of available records (around 12 910 individuals reported in the area).
- In the **eastern Mediterranean, trawlers** (44 percent) still represent the vessel group with the highest incidental catch, with traditional coastal purse seiners (about 10 percent) also responsible for a considerable portion of the elasmobranch bycatch in the area.
- In the **Black Sea**, around 97 percent of the bycatch is attributed to **passive gear** (i.e. trammel nets and gillnets)

Bycatch estimates

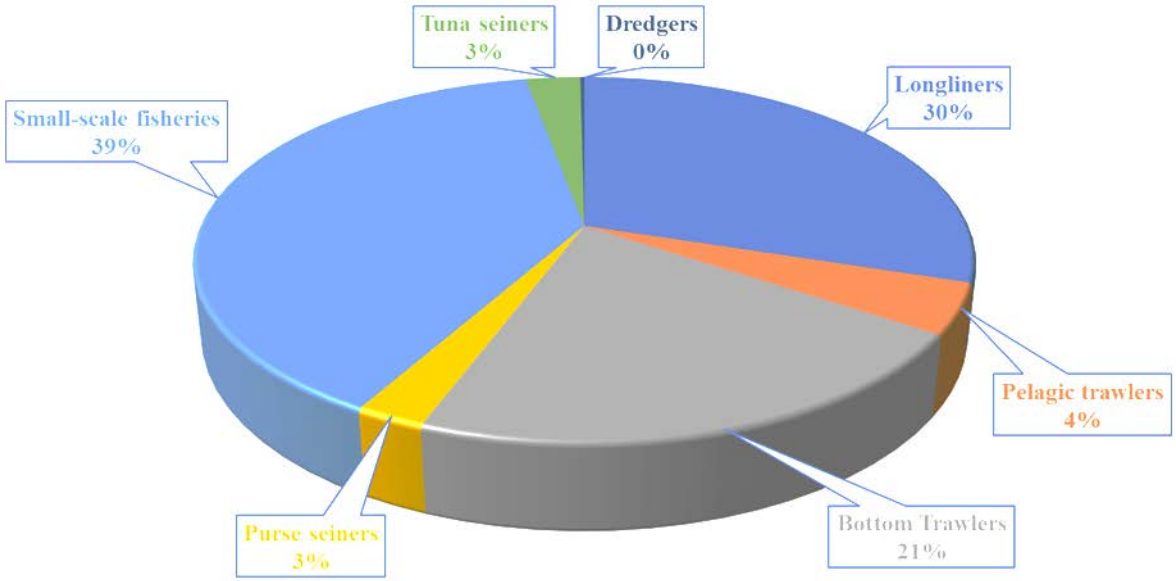
Sharks and rays

Reported incidental catch of elasmobranchs by vessel group and GFCM subregion, 2000–2020. Source GFCM, 2020



Bycatch estimates

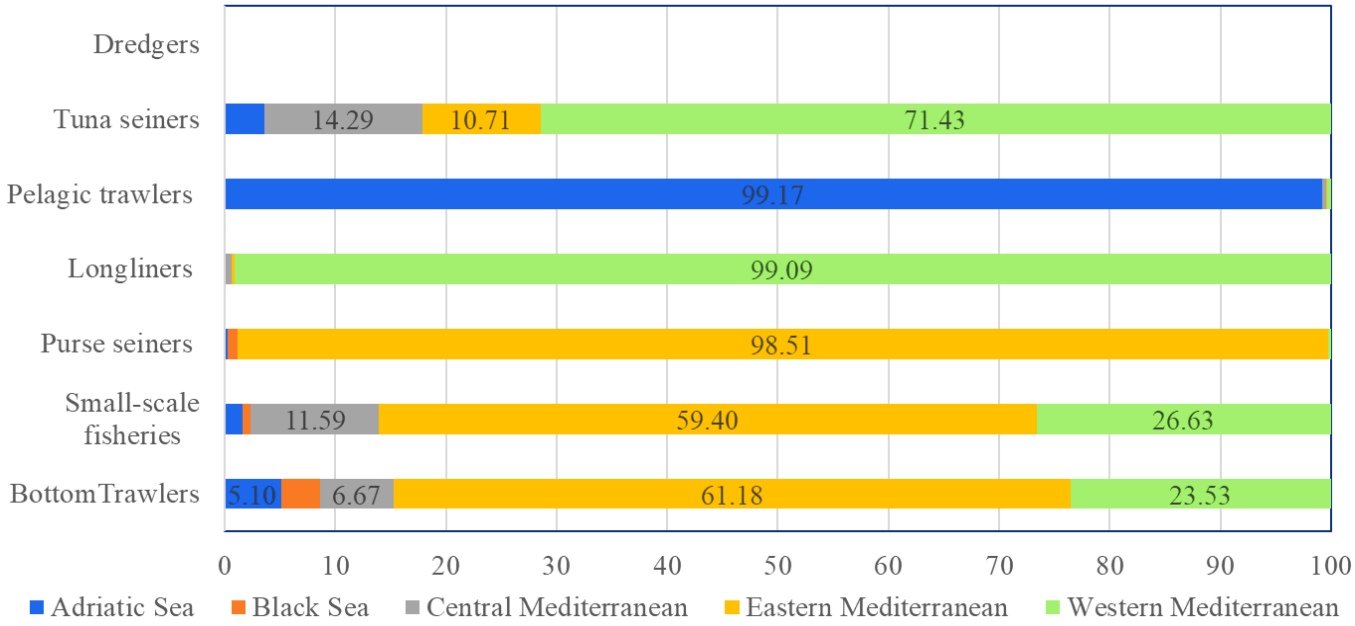
Sharks and rays



All fleet segments involved in the bycatch of the elasmobranch species in the GFCM subregions (2008-2018).

Bycatch estimates

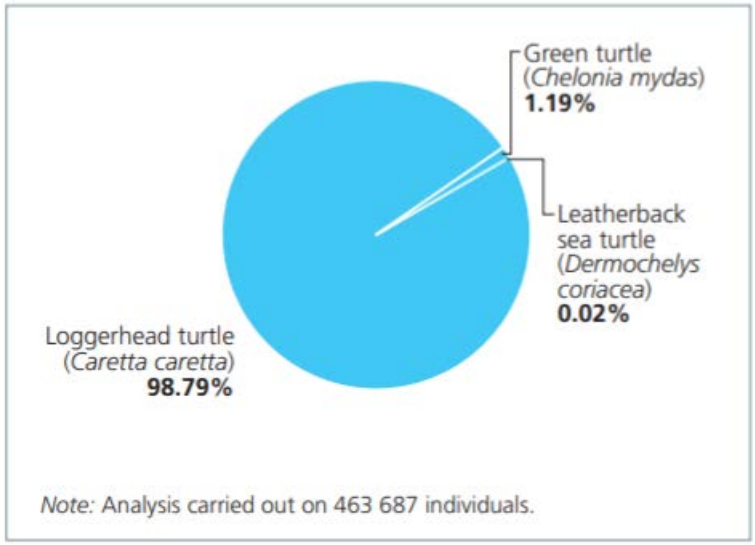
Sharks and rays



Amount of the bycatch, expressed as a percentage, determined by the various fleet segments in the different GFCM areas (2008-2018)

Bycatch estimates

Sea turtles



Source FAO-GFCM, 2020

A few specimens of *D. coriacea bycaugth*

Bycatch estimates

Sea turtles

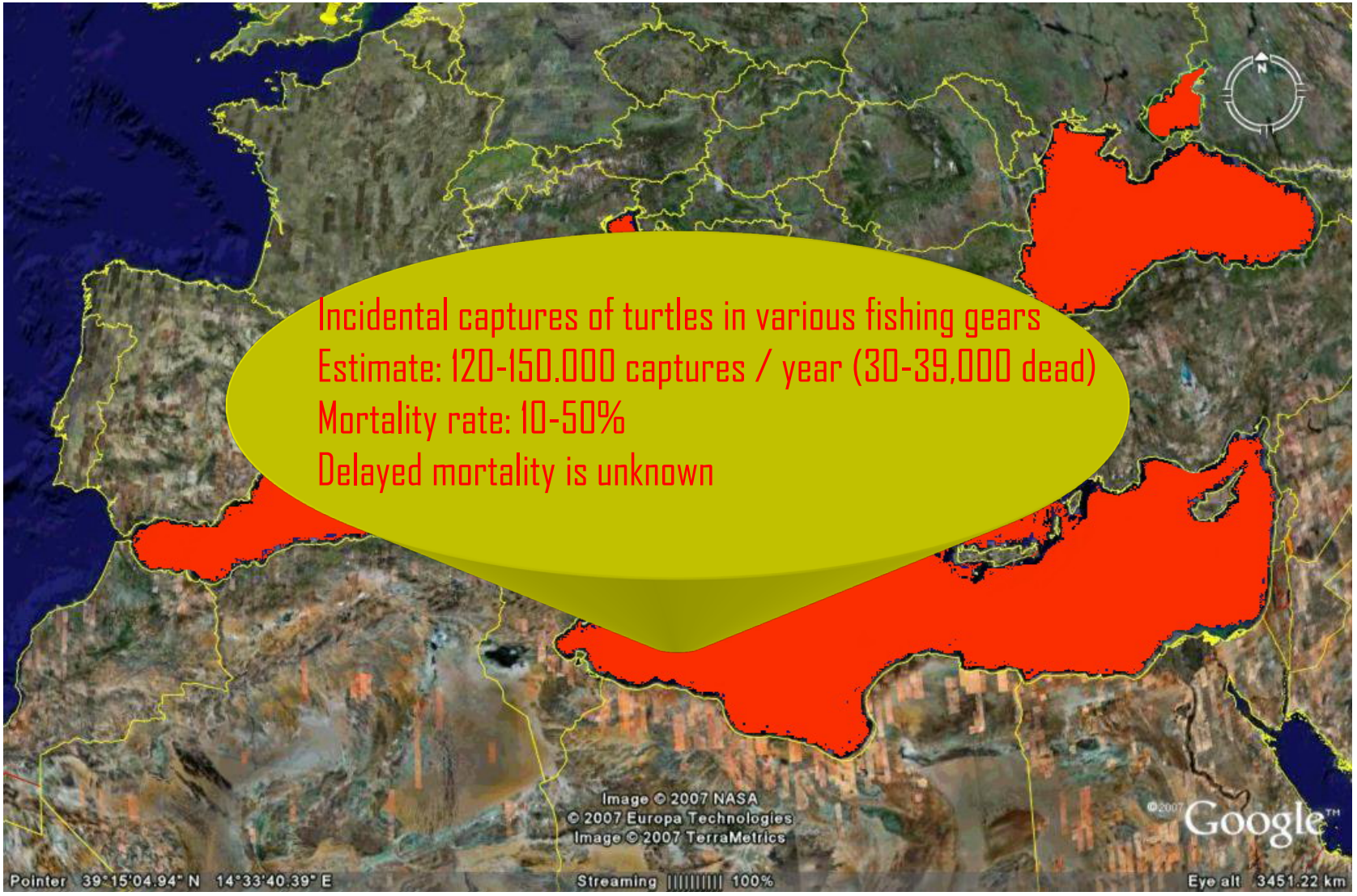
	Bottom trawl (mean mortality 18%)		Drifting longline (mean mortality 20%)		Small-scale (mean mortality 51%)		Set longline (mean mortality 23.9%)		Total	
	Bycatch	Dead	Bycatch	Dead	Bycatch	Dead	Bycatch	Dead	Bycatch	Dead
Adriatic Sea	18 204	3 277	1 251	250	8 908	4 543	0	0	28 363	8 070
Central Mediterranean	19 732	3 552	14 472	2 894	6 157	3 140	5 270	1 260	4 5631	10 846
Eastern Mediterranean[1]	10 430	1 877	2 210	442	13 826	7 051	6 843	1 635	33 309	11 006
Western Mediterranean	2 300	414	8 786	2 410	2 058	1 050	258	62	13 402	3 382
Western Mediterranean[2]			37 828	7 566					42 444	9 091
Total	**50 666**	**9 120**	**26 719**	**5 344**	**30 949**	**15 784**	**12 371**	**2 957**	**120 705**	**33 204**
Total[2]			**55 761**	**11 152**					**149 747**	**39 013**

Notes:

1. Loggerhead and green sea turtle data are reported together because separate information on the two species is not always available.
2. Bycatch and direct mortality estimates in grey calculated by Casale (2011) for drifting longline bycatch in Spain and Morocco.

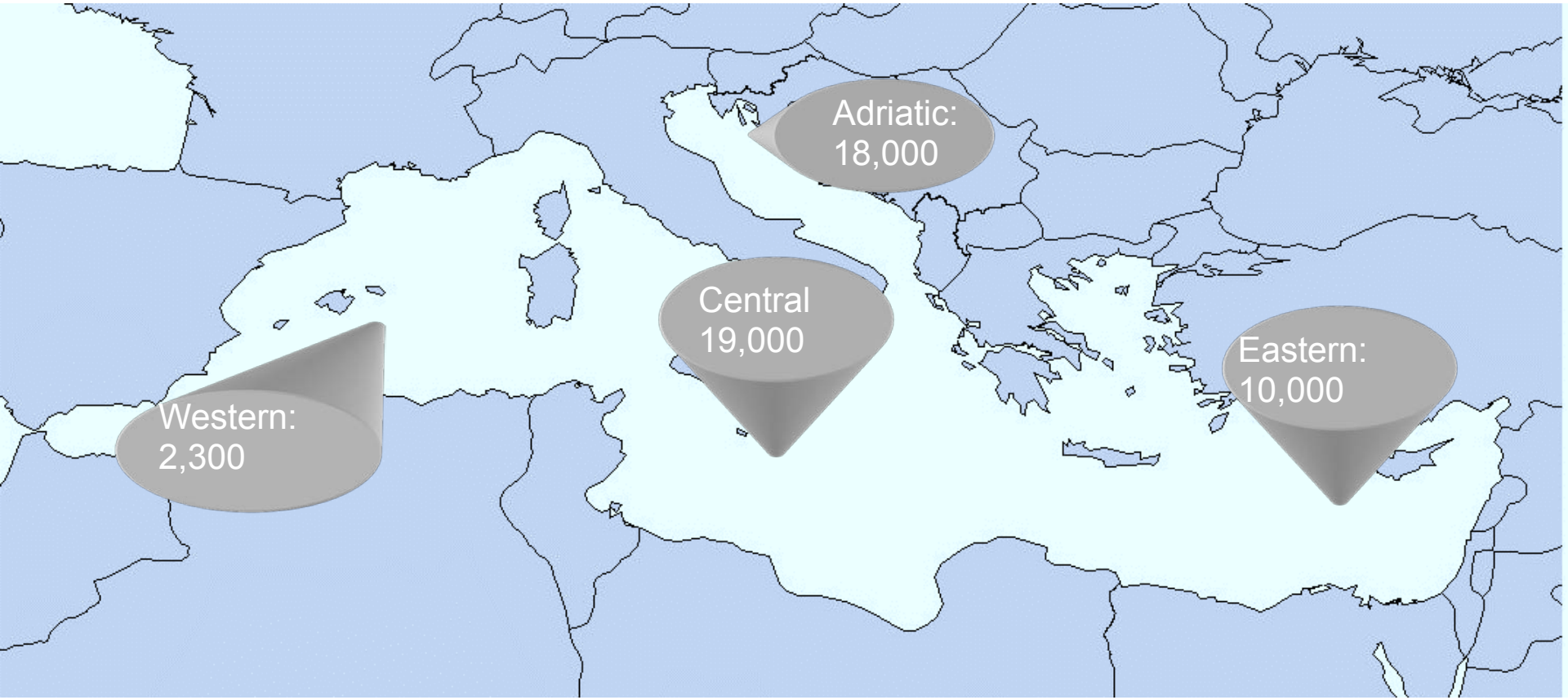
Bycatch estimates

Sea turtles



Bycatch estimates

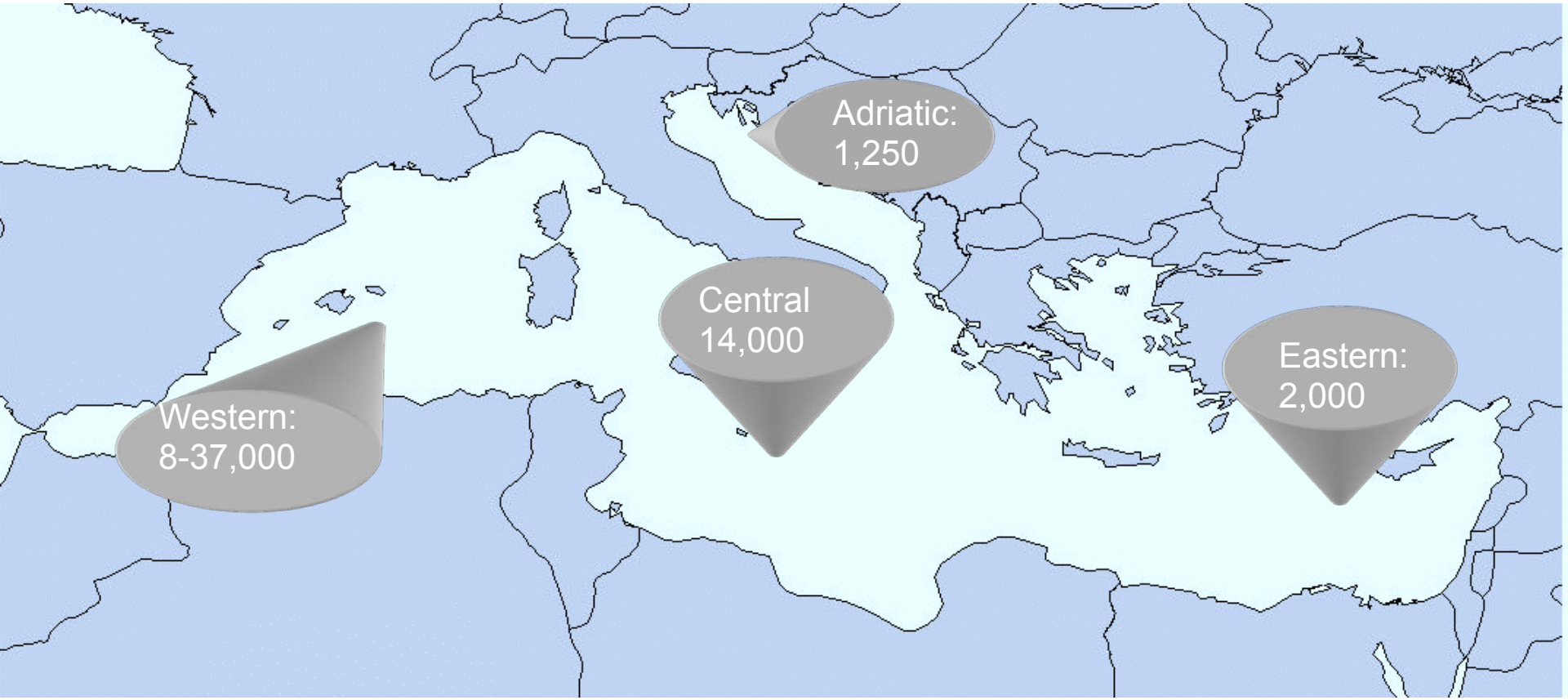
Sea turtles: bottom trawl



Direct mortality: 18%; around 9,000 death

Bycatch estimates

Sea turtles: drifting longline



Direct mortality: 20%, around 2-7,000 death

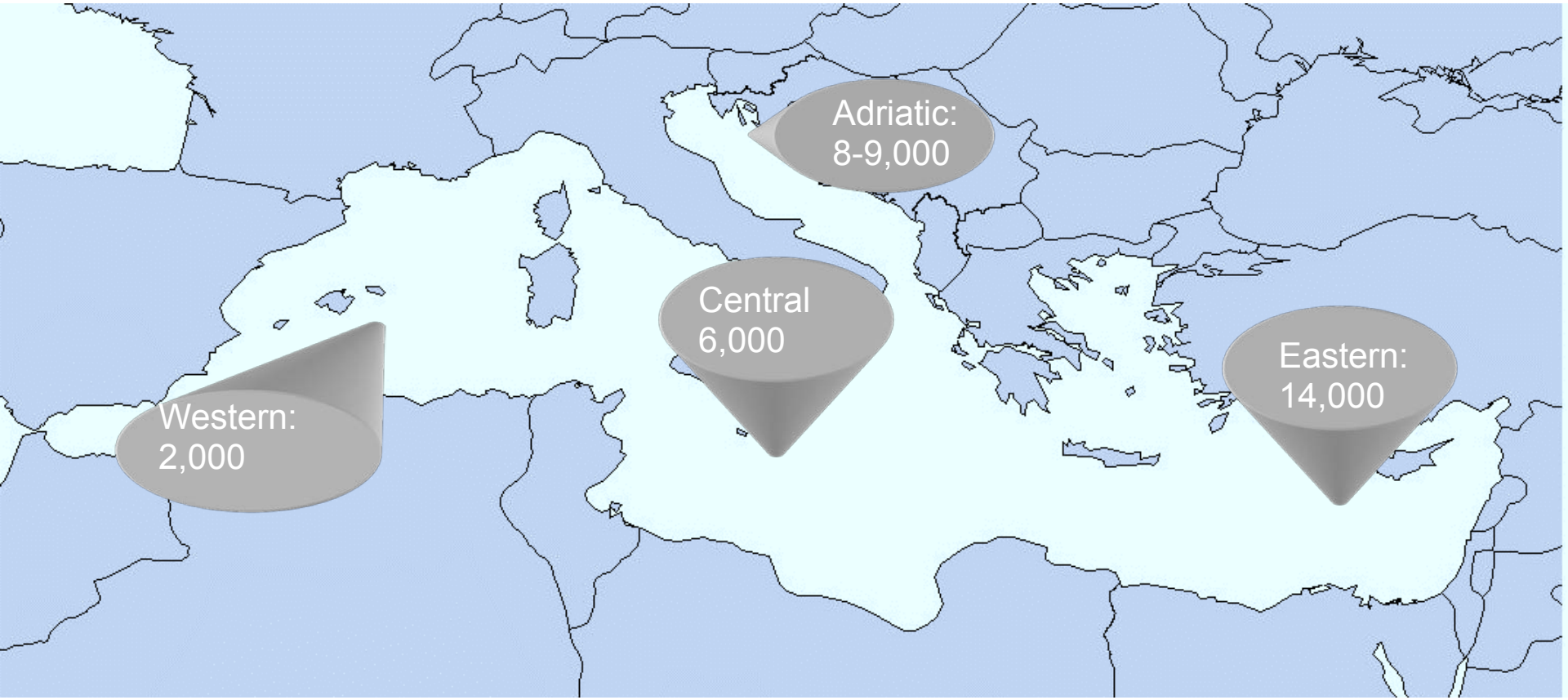
Bycatch estimates

Sea turtles: demersal longline

Direct mortality: 24%, around 3,000 death

Bycatch estimates

Sea turtles: small scale, passive nets



Direct mortality: 51%, around 15-16,000 death

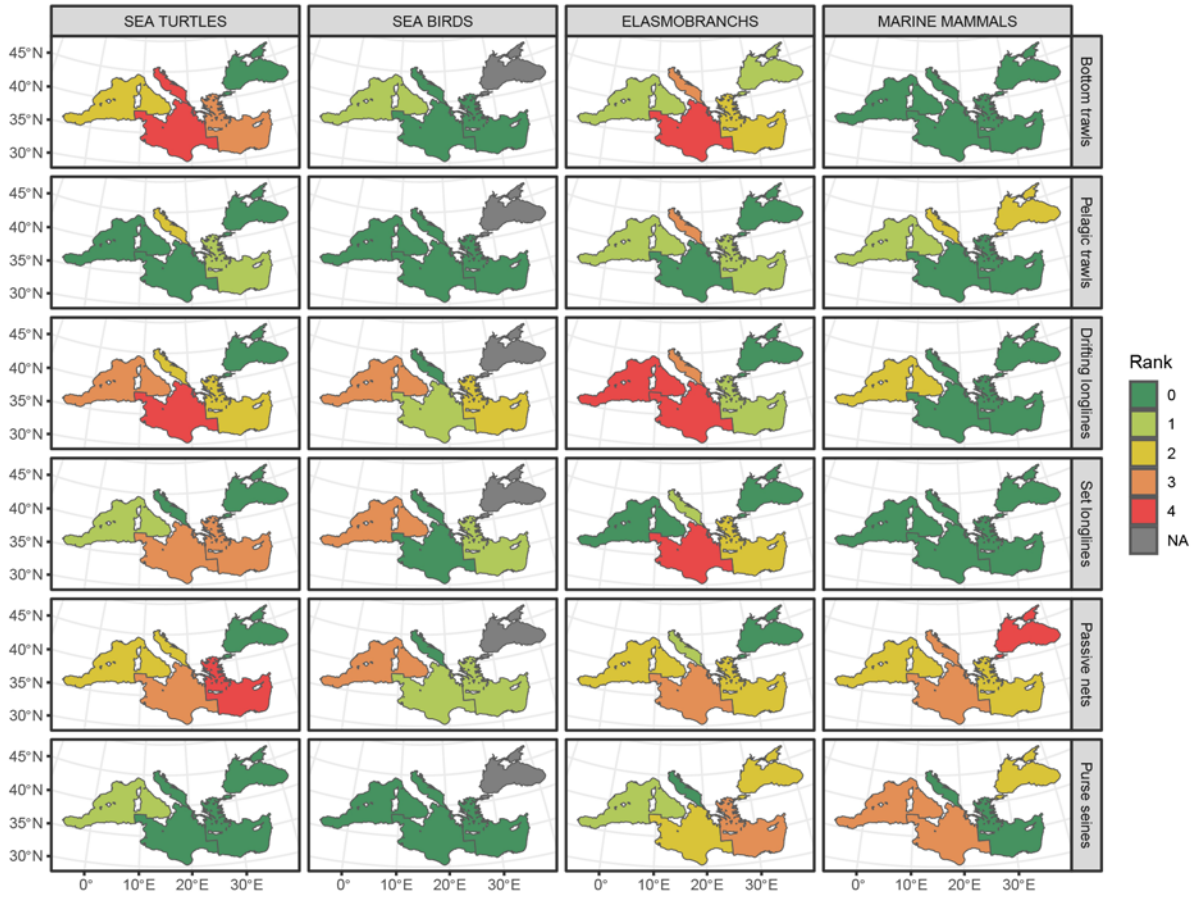
Bycatch estimates

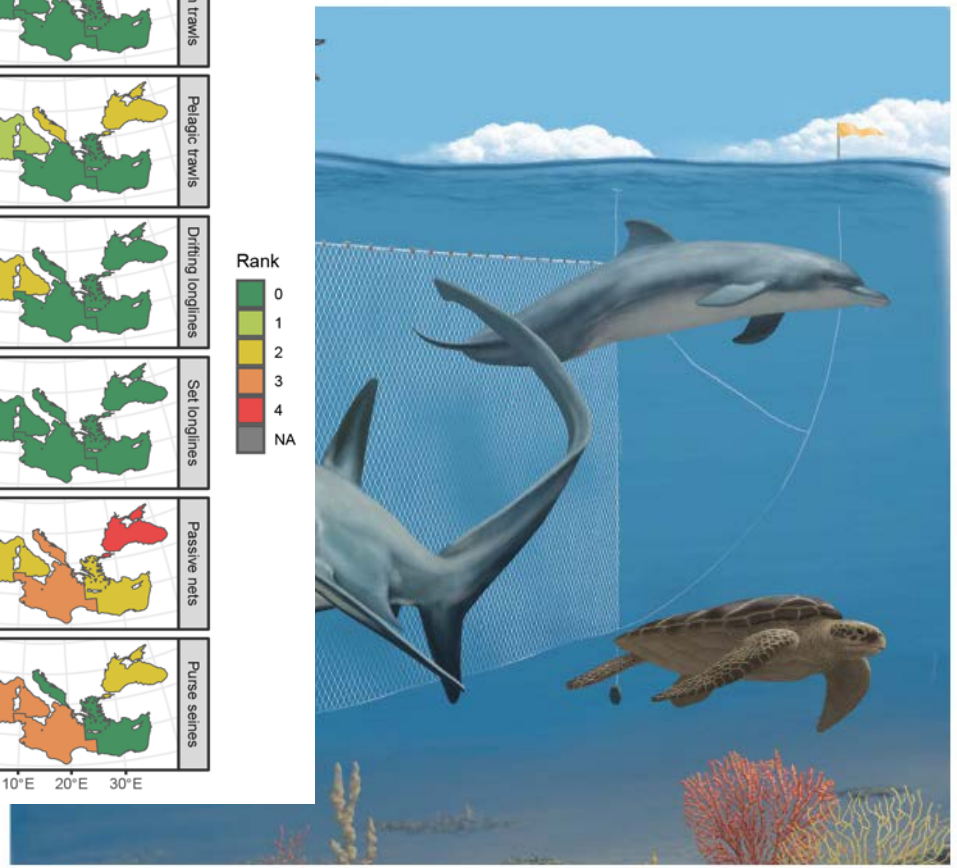
Food and Agriculture Organization of the United Nations

General Fisheries Commission for the Mediterranean
Commission générale des pêches pour la Méditerranée

STUDIES AND REVIEWS 101

INCIDENTAL CATCH OF VULNERABLE SPECIES IN MEDITERRANEAN AND BLACK SEA FISHERIES A REVIEW





Bycatch Reducing Devices (BRDs)

CNR
IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Bycatch Reducer Devices – BRDs: device that aims at reducing the catch of incidental catch of unwanted species

Two types of advanced technology can be introduced in a fisheries:

- some technology can be adopted by fishermen voluntarily – e.g. to help catch more fish – a clear short-term benefits not obvious.
- Some technologies can be introduced as management measure to ensure a fishery is sustainable (BRD). In this case fishermen may need persuasion – e.g. more selective fishing gears to reduce discards – a longer-term benefit which is not obvious.

The first may need to be controlled or at least monitored (to avoid overexploitation)

The second may need to be initiated by management

Bycatch Reducing Devices (BRDs)

CNR IRBIM ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Before introducing a new technology it should take into account

- What are the problems to be solved and what are the targets (high discards of young fish (which species?, high discards of non-target species)
- Which of the possible solutions is best: a need to extend fishing to new areas, uneconomic fishing operations, new gears, modified gears etc

Experimental trials are essential in order to find out the right setup and to reduce the short term economic loss

Bycatch Reducing Devices (BRDs)

CNR
IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Before introducing a new technology it should take into account: What are likely the consequences

- Environmental impact (physical impact, type of bottom impacted)
- Selectivity (juveniles conservation, fishing mortality etc.). What are consequences for each fish stock affected
- What are the consequences for the total effort applied
- Economic benefit (working time, fish quality etc.)
- Social consequences (eg number of fishermen employed)
- Time scale
- How to evaluate the results

Bycatch Reducing Devices (BRDs)

CNR IRBIM ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Before introducing a new technology it should take into account: main issues

There are usually 3 issues

- the practical problem of introducing a new gear
- the immediate short-term effect on the economics of fishing (often a loss)
- and the longer term effect of a change when the stock has responded (should be a benefit of course!)

But fishermen usually do not like the long terms!!!

Stakeholders involvement: fishermen, netmakers, suppliers, scientists, enforcement officers as well as managers and the environmental bodies)

Bycatch Reducing Devices (BRDs)

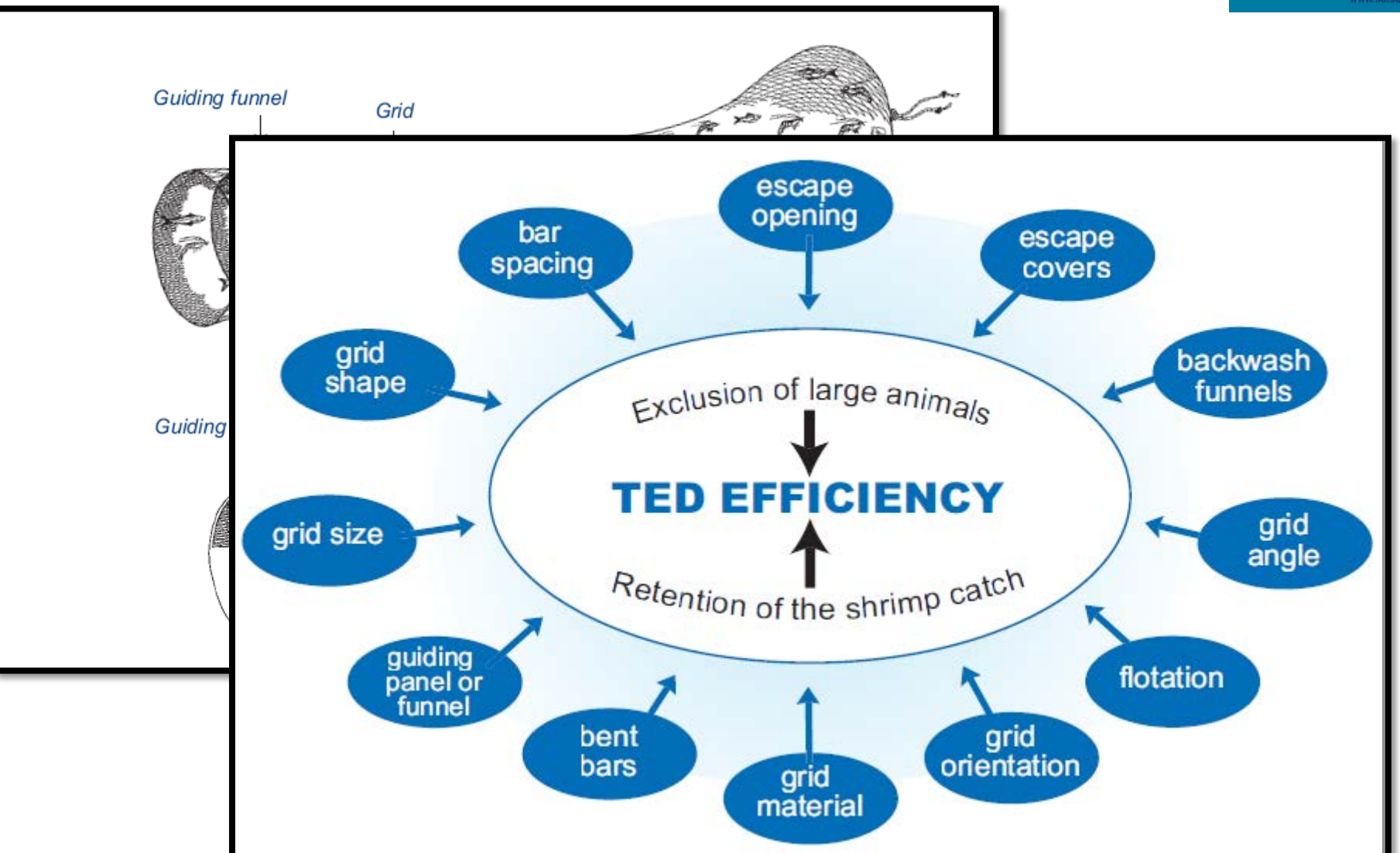
CNR
IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Before introducing a new technology it should take into account: new technology should be

- Practical at sea (do not involve major changes to the common practices, easy to use and cheap to maintain)
- Acceptable for fishermen (Economically viable)
- Acceptable for management (achieves the management, biological targets)
- Enforceable (easy to be controlled)

Reducing turtle bycatch

Turtle Excluder Devices (TEDs)

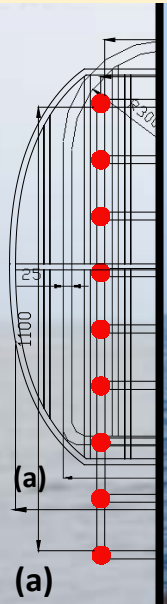


Reducing turtle bycatch

CNR IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

TartaLife
PESCA TARTAFREE
WWW.TARTALIFE.EU

Turtle Excluder Devices (TEDs)



(a)

Reducing turtle bycatch

CNR IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Turtle Excluder Devices (TEDs)

TartaLife
PESCA TARTAFREE
WWW.TARTALIFE.EU

Reducing turtle bycatch

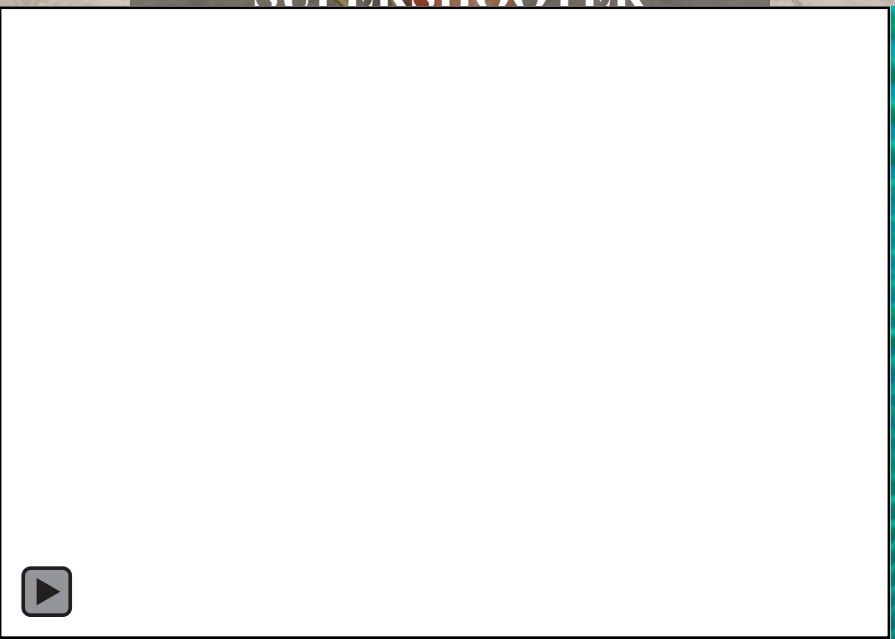
CNR IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Turtle Excluder Devices (TEDs): Flexible TED

TartaLife
PESCA TARTAFREE
WWW.TARTALIFE.EU

4 modelli di TED:
Classico a 7 barre verticali
Classico di grandi dimensioni
A barre strette
Con due fori laterali

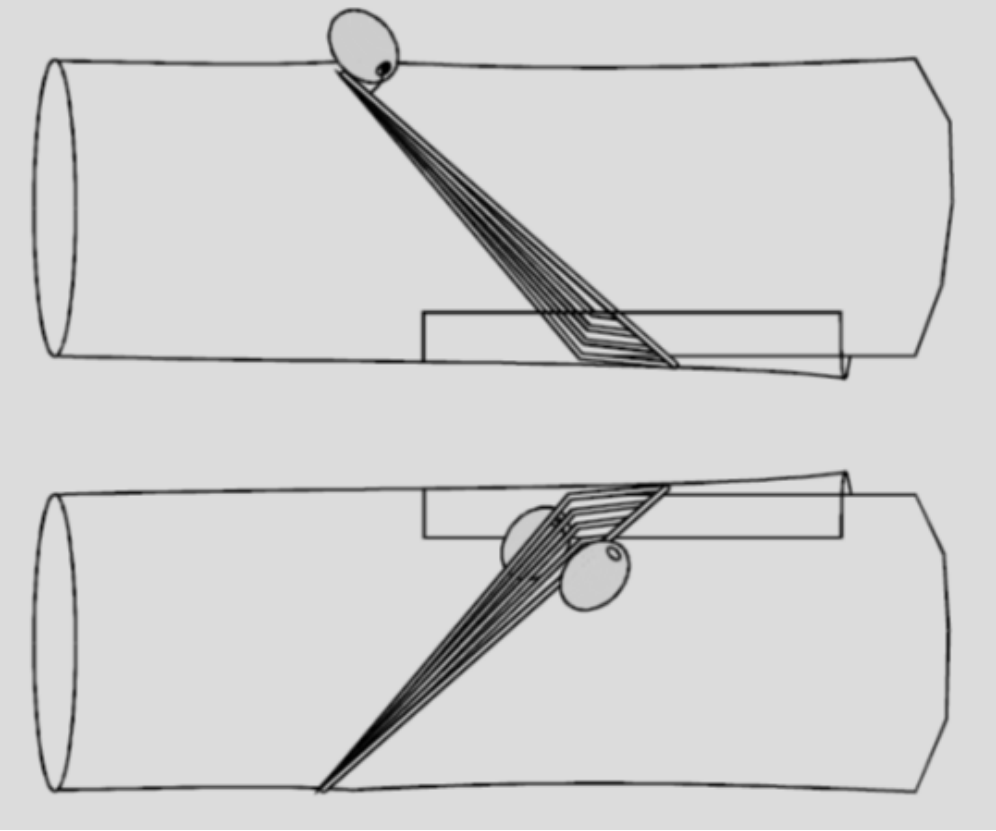
Turtle Excluder Devices (TEDs): Flexible TED



Reducing turtle bycatch

Turtle Excluder Devices (TEDs)

EXIT HOLE POSITION



Adv.: discard reduction

(fishermen approval)

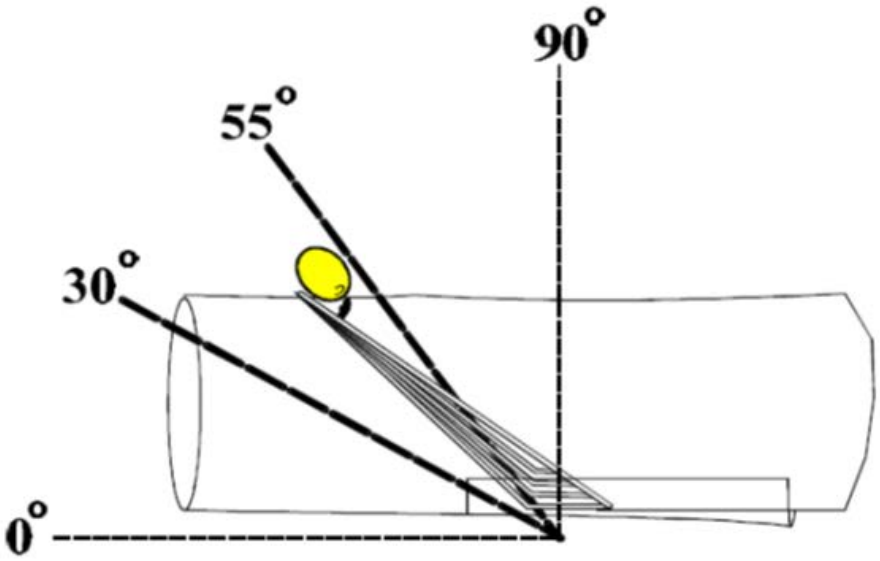
Adv.: easier turtle escape

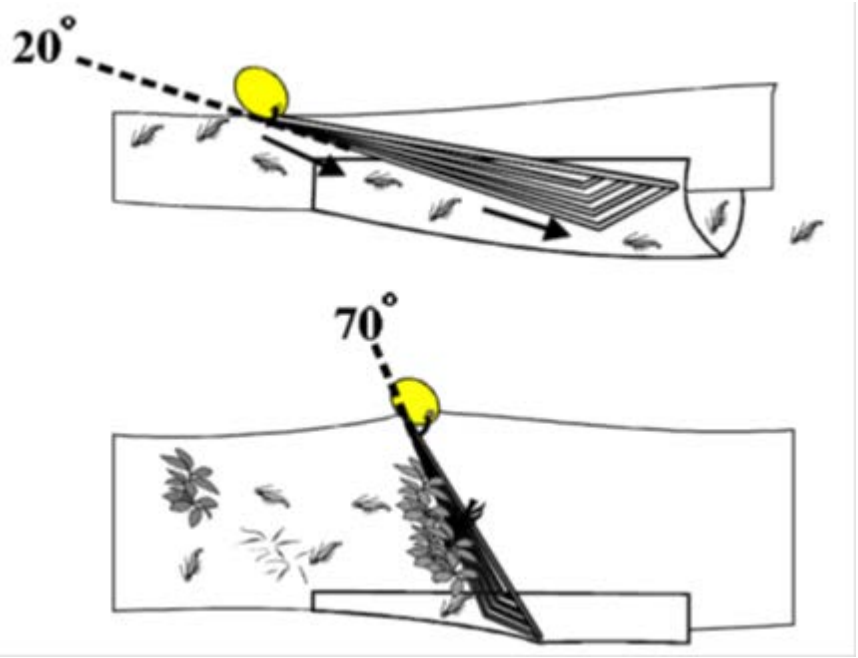
Reducing turtle bycatch

Turtle Excluder Devices (TEDs)

TED ANGLE

All hard TEDs must be installed at angles between 30° to 55° from the horizontal



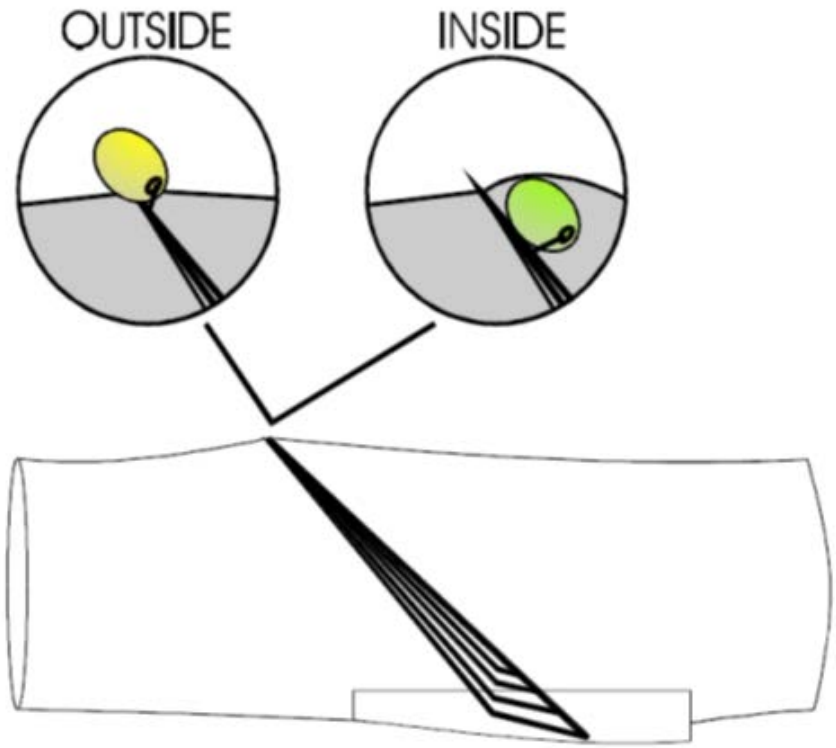


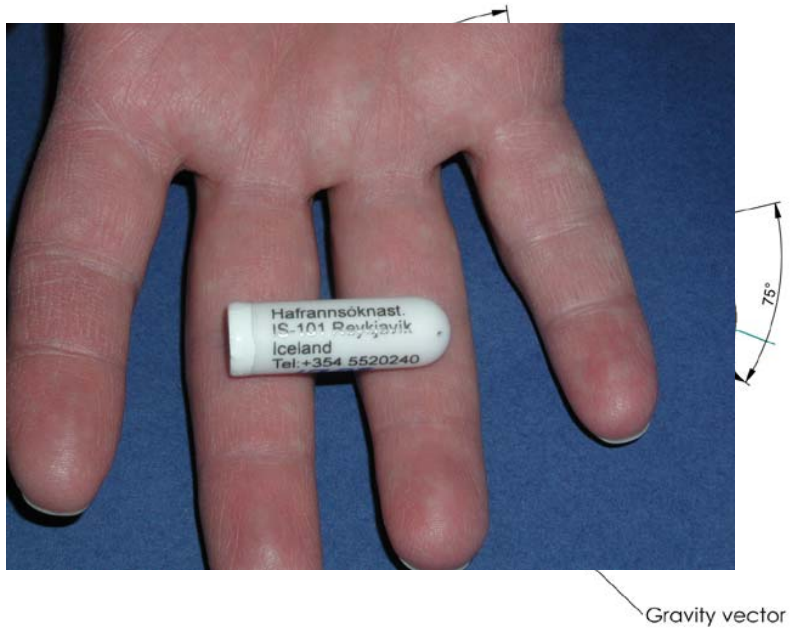
Reducing turtle bycatch

Turtle Excluder Devices (TEDs)

FLOATING

Floats help stabilize the TED in the water and prevent it from rolling over during deployment or retrieval





Reducing turtle bycatch

CNR IRBIM ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Turtle Excluder Devices (TEDs): Flexible TED

Aquat. Living Resour. 29, 201 (2016)
© EDP Sciences 2016
DOI: 10.1051/alr/2016016
www.alr-journal.org

Aquatic Living Resources

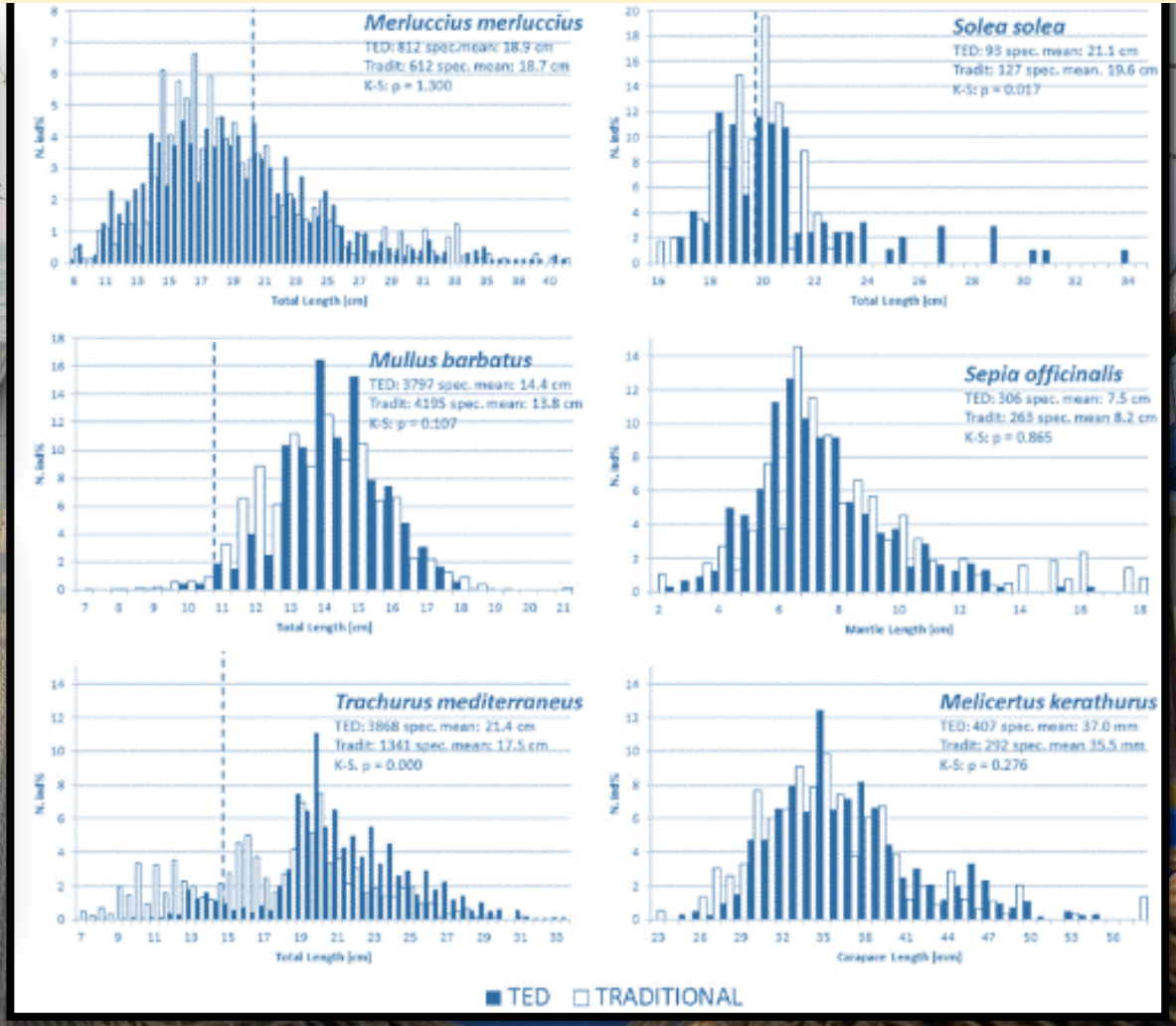
Flexible Turtle Excluder Device (TED): an effective tool for Mediterranean coastal multispecies bottom trawl fisheries

Alessandro LUCCHETTI[a], Elisa PUNZO and Massimo VIRGILI

National Research Council (CNR), Institute of Marine Sciences (ISMAR) of Ancona (Italy), Largo Fiera della Pesca 1, 60125 Ancona, Italy

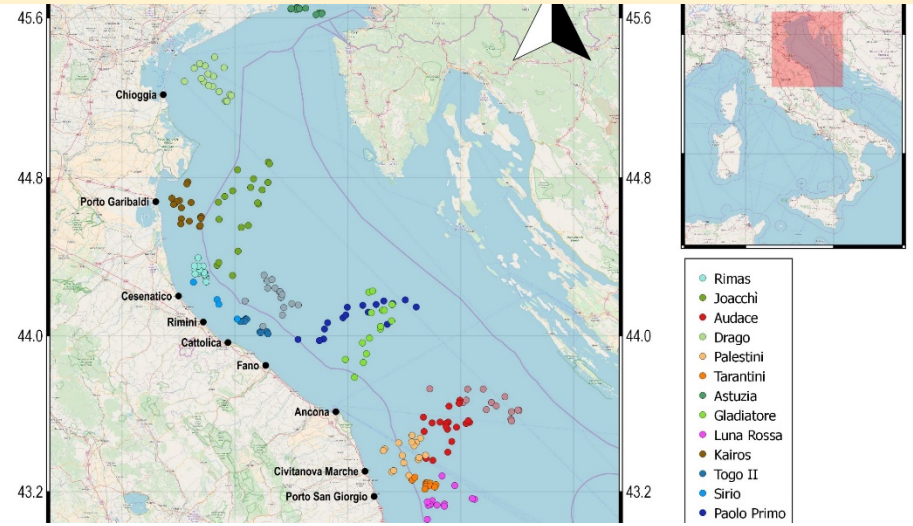
Received 15 January 2016; Accepted 18 April 2016

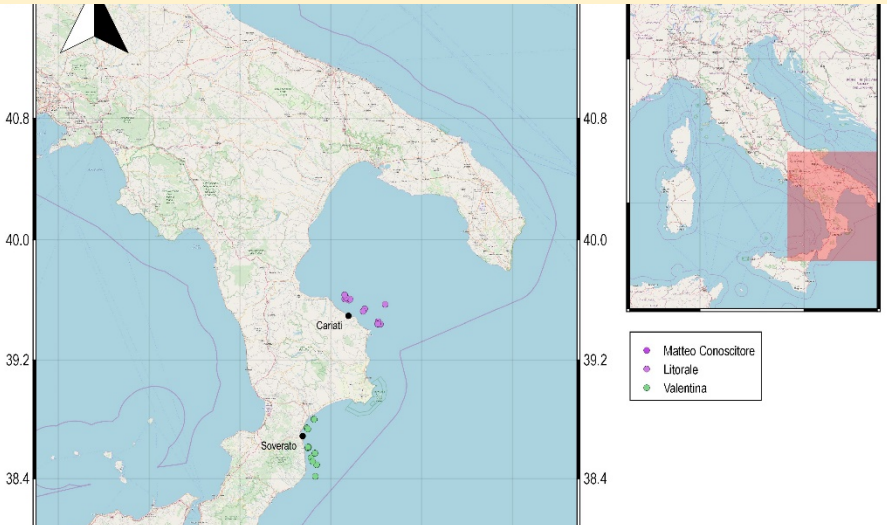
Abstract – The effect of a flexible Turtle Excluder Device (TED) on the catching efficiency and performance of a commercial bottom trawl was tested in a gear comparison study for a Mediterranean coastal multispecies bottom trawl fishery. The device affected neither bottom trawl technical performances (horizontal and vertical net opening and door spread) nor did it increase the required towing force, hence fuel consumption remained constant. Comparison of commercial catches for the major species demonstrated that using the TED did not affect catching efficiency, while it reduced the amount of debris. The device did not influence the size of commercial species, leaving the selective performance of the trawl unmodified. Underwater video camera recordings documented that fish caught in the net swam through the grid and easily reached the cod-end, missing the TED escape opening. Easy storage and improved catch retention compared with previous devices tested in this area make the present flexible TED a practical and valuable solution to reduce turtle bycatch in coastal Mediterranean demersal multispecies fisheries.

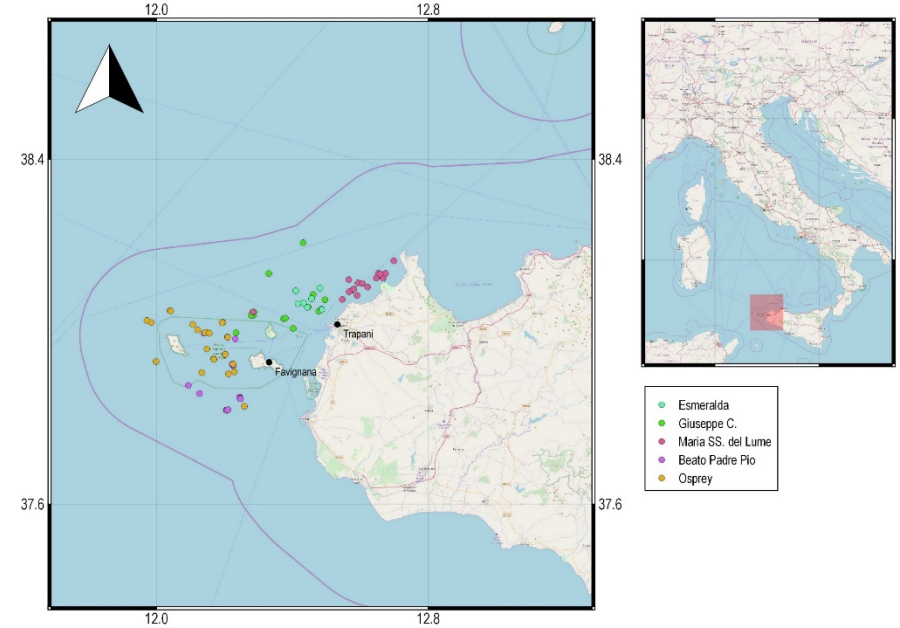


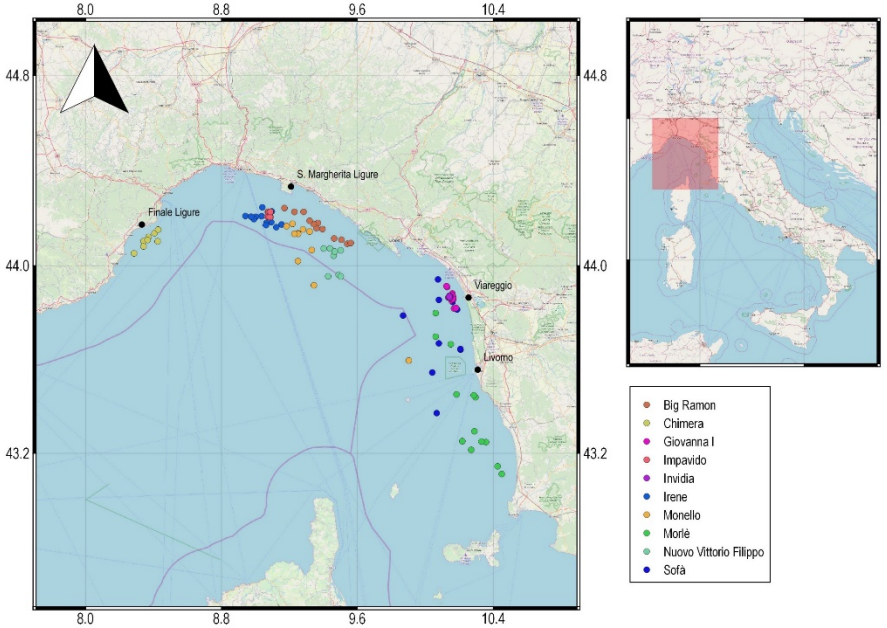
Reducing turtle bycatch

Turtle Excluder Devices (TEDs): Flexible TED





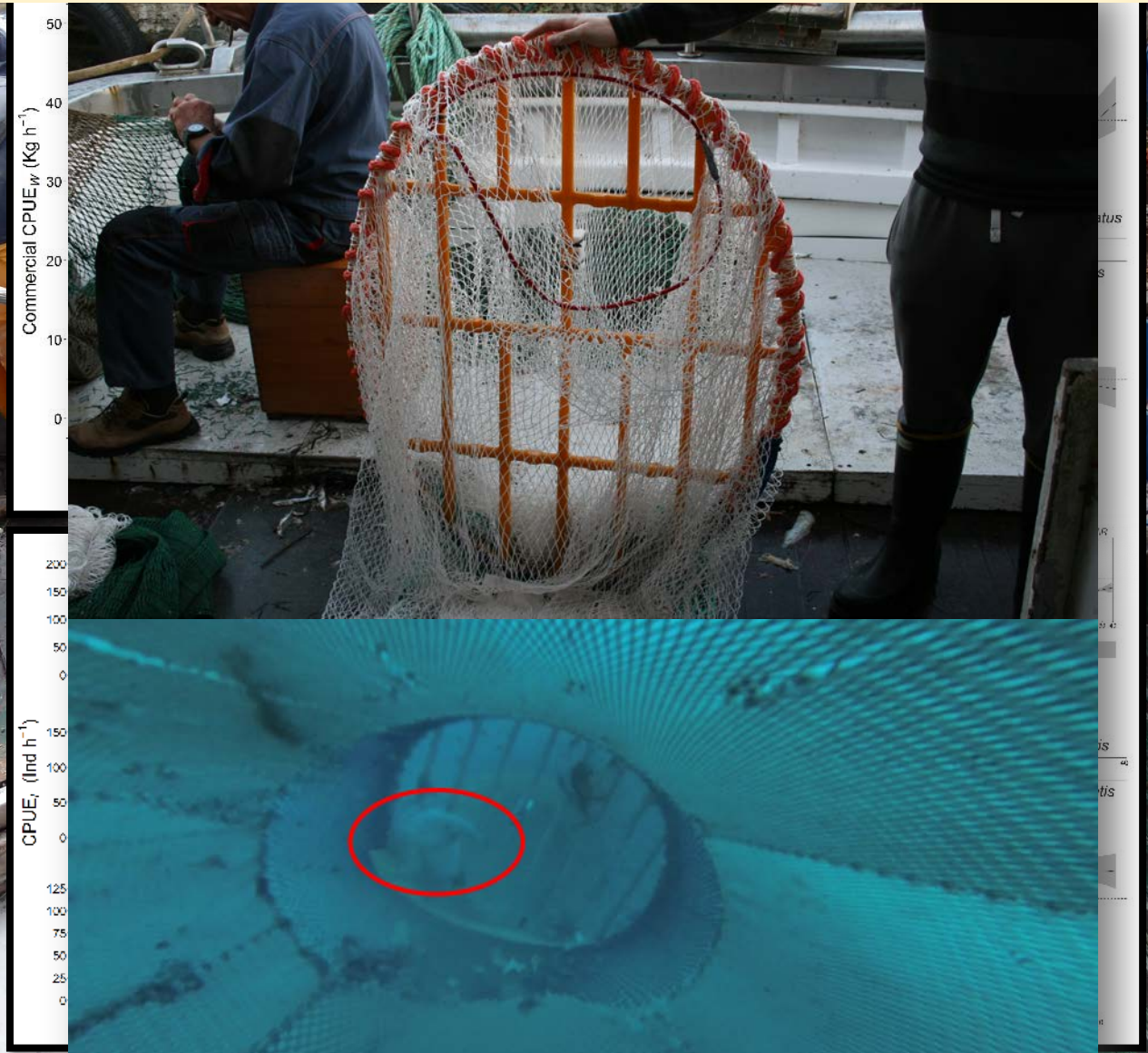


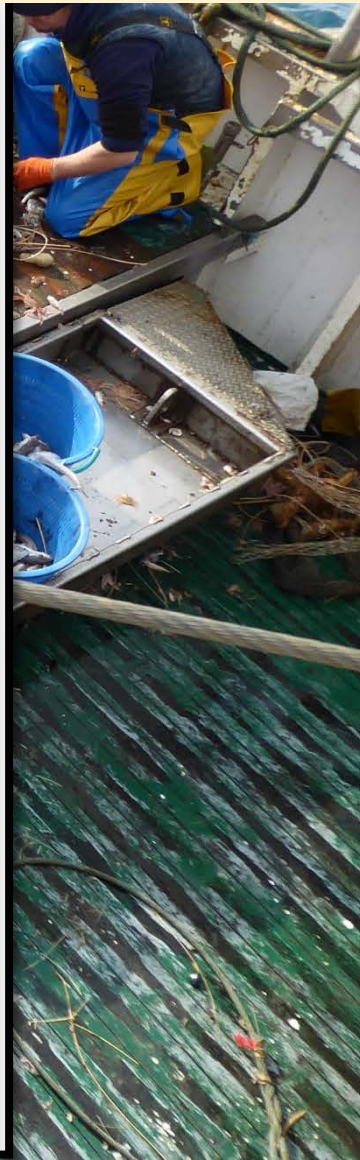


Reducing turtle bycatch

CNR IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

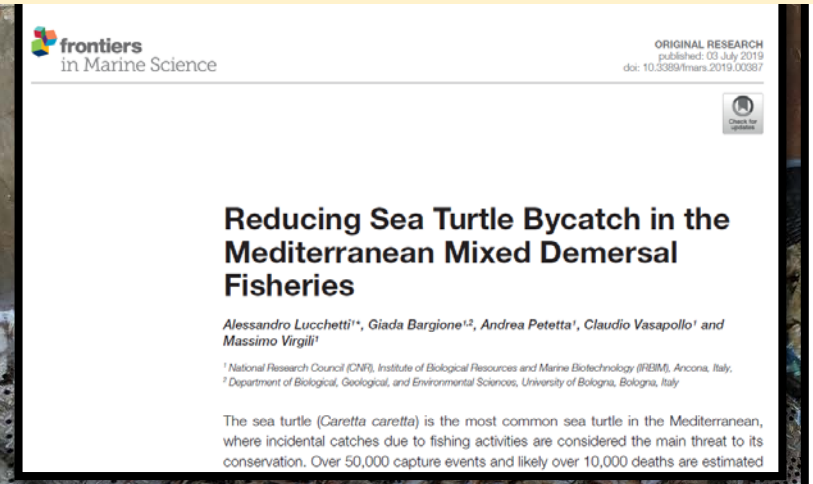
Turtle Excluder Devices (TEDs): Flexible TED





Reducing turtle bycatch

Turtle Excluder Devices (TEDs): Flexible TED


frontiers in Marine Science

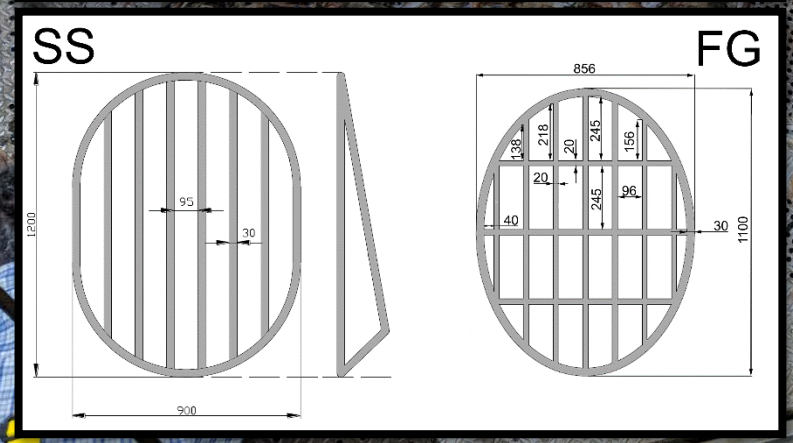
ORIGINAL RESEARCH
published: 03 July 2019
doi: 10.3389/fmars.2019.00387

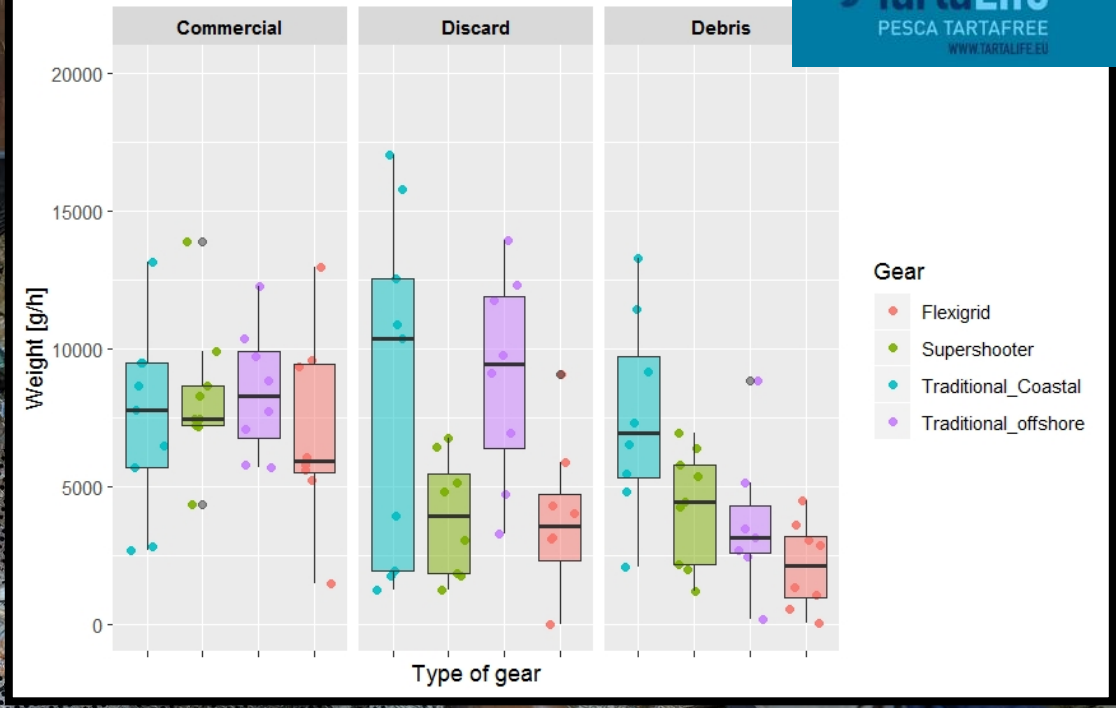
Reducing Sea Turtle Bycatch in the Mediterranean Mixed Demersal Fisheries

Alessandro Lucchetti[1], Giada Bargione[1,2], Andrea Petetta[1], Claudio Vasapollo[1] and Massimo Virgili[1]*

[1] National Research Council (CNR), Institute of Biological Resources and Marine Biotechnology (IRBIM), Ancona, Italy,
[2] Department of Biological, Geological, and Environmental Sciences, University of Bologna, Bologna, Italy

The sea turtle (*Caretta caretta*) is the most common sea turtle in the Mediterranean, where incidental catches due to fishing activities are considered the main threat to its conservation. Over 50,000 capture events and likely over 10,000 deaths are estimated

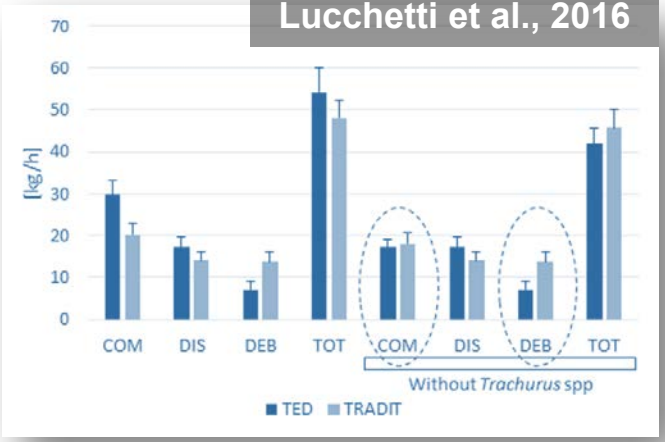


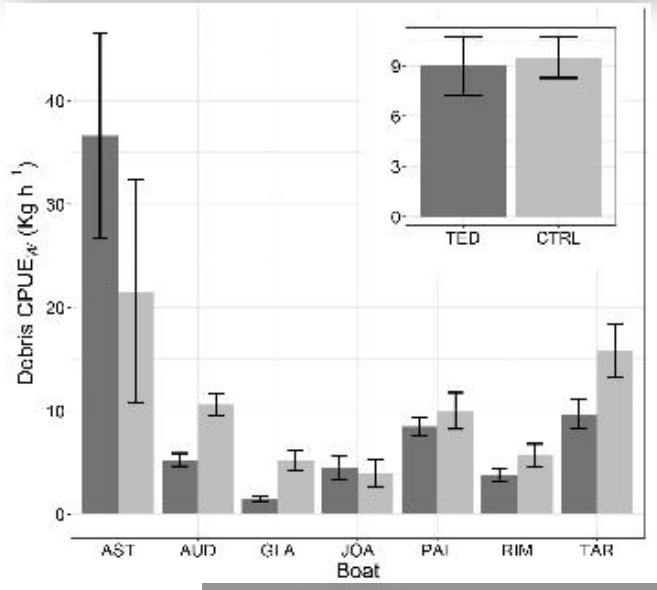


Reducing turtle bycatch

Turtle Excluder Devices (TEDs): Flexible TED

Lucchetti et al., 2016



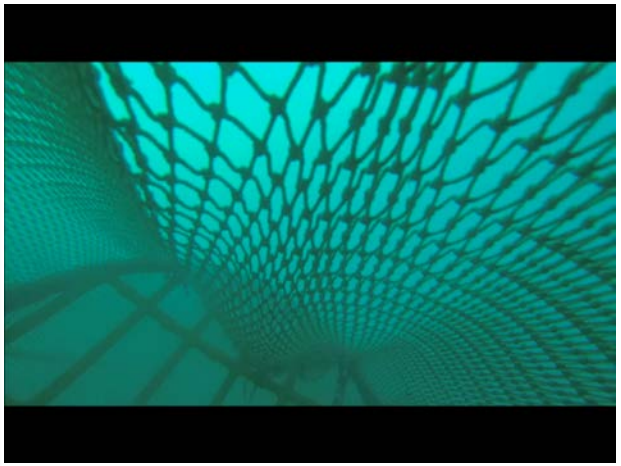


Vasapollo et al. Submitted

Reducing turtle bycatch

CNR IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Turtle Excluder Devices (TEDs): Flexible TED



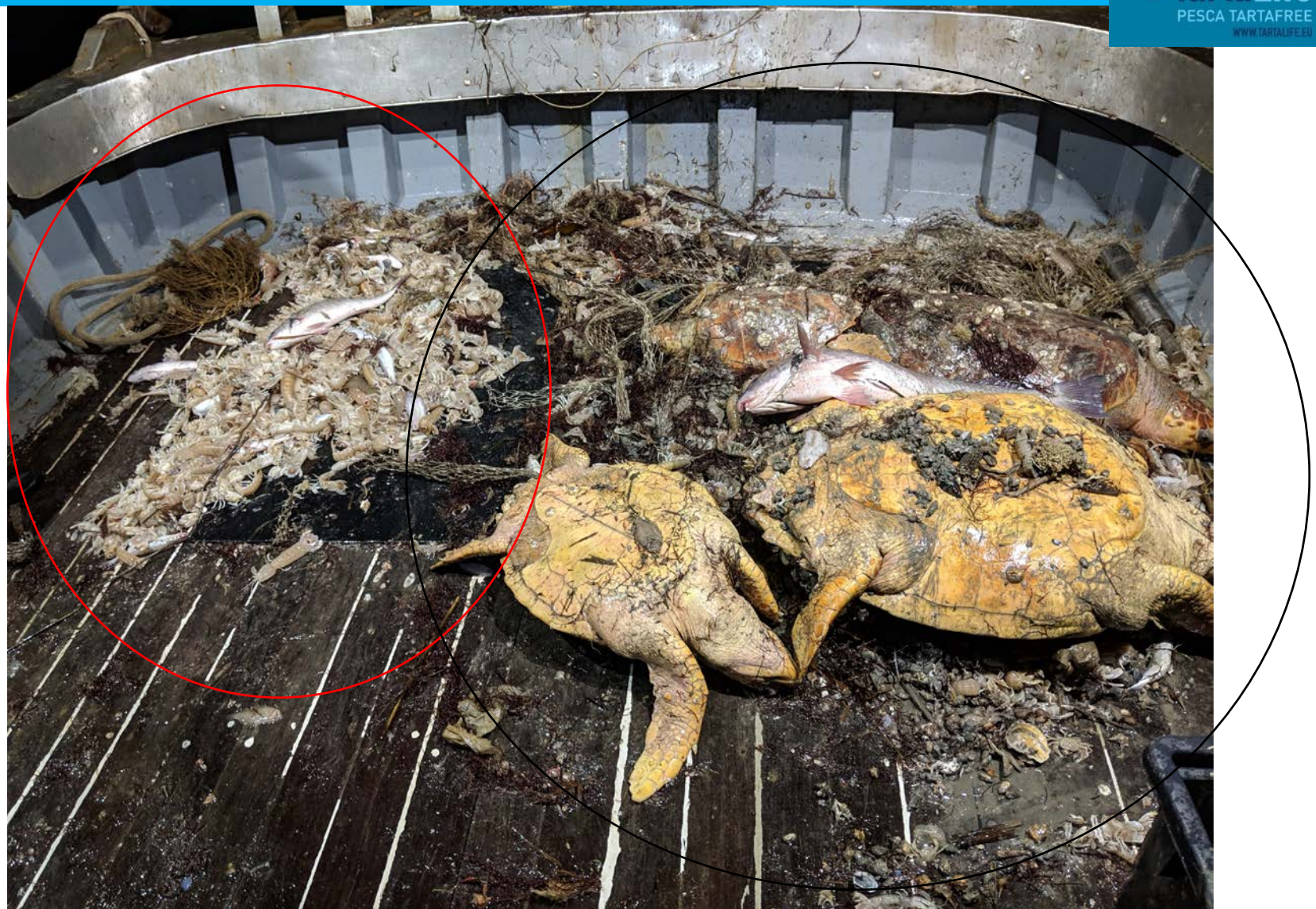
Reducing turtle bycatch

Turtle Excluder Devices (TEDs): Flexible TED

13 turtles caught without TED

Reducing turtle bycatch

Turtle Excluder Devices (TEDs): Flexible TED



Reducing turtle bycatch

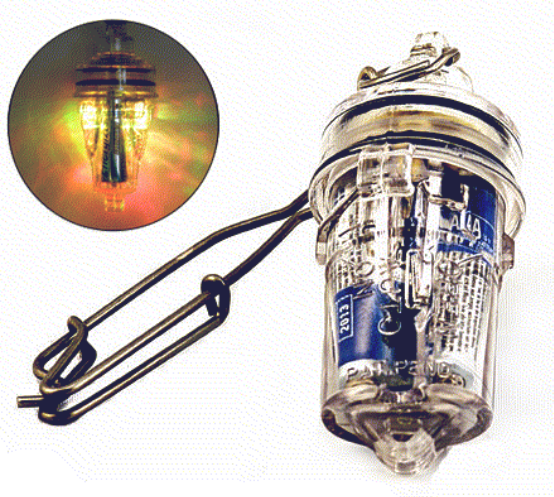
Turtle Excluder Devices (TEDs): Flexible TED

Reducing turtle bycatch

Turtle Excluder Devices (TEDs): Flexible TED

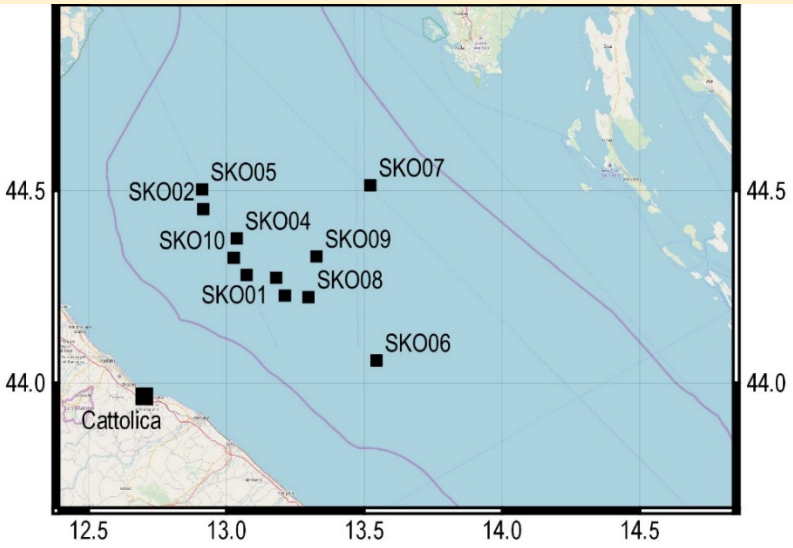
Reducing turtle bycatch

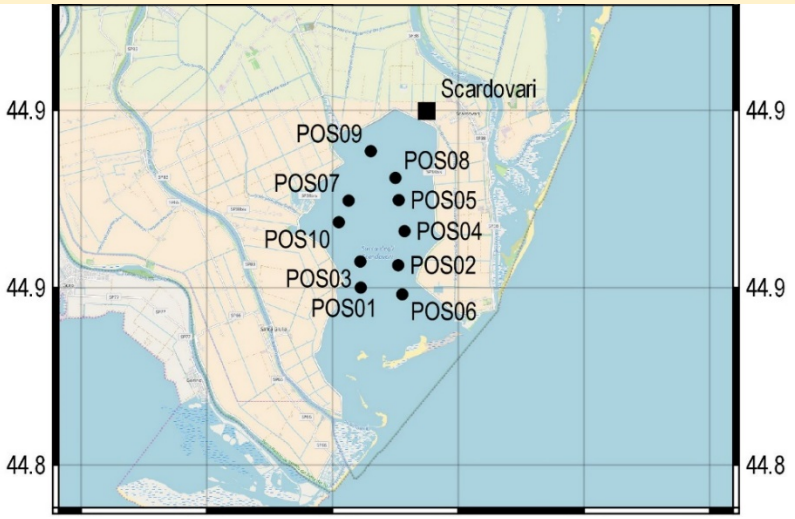
Turtle Excluder Devices (TEDs): Flexible TED

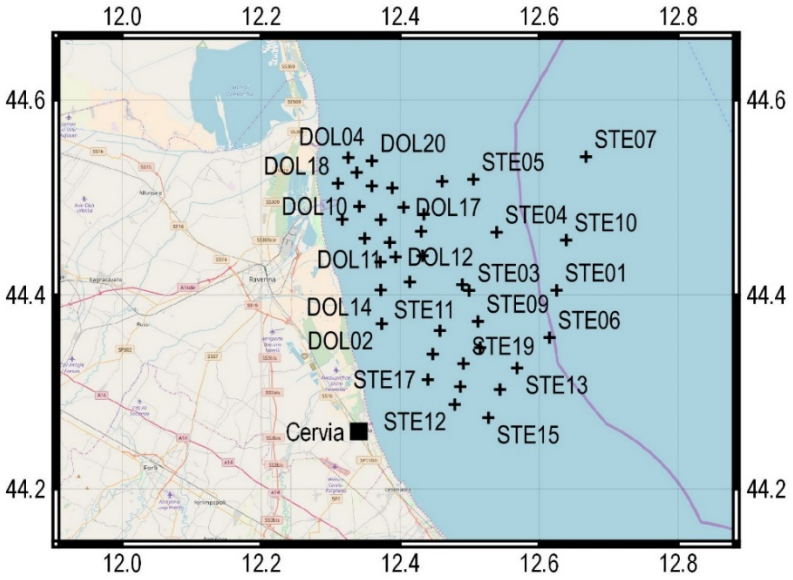


Reducing turtle bycatch

Turtle Excluder Devices (TEDs): Flexible TED



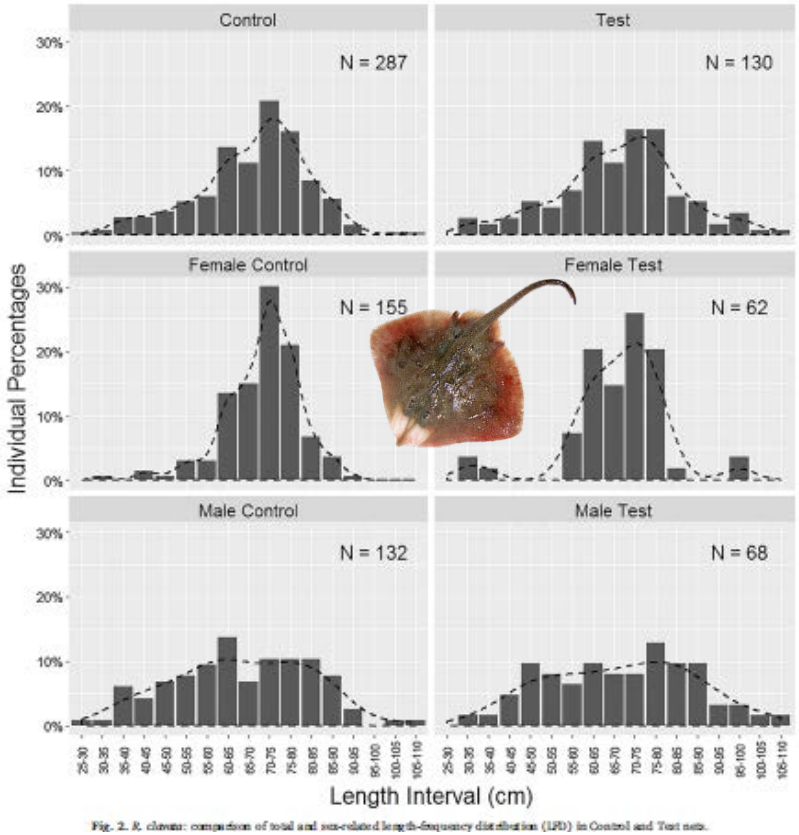




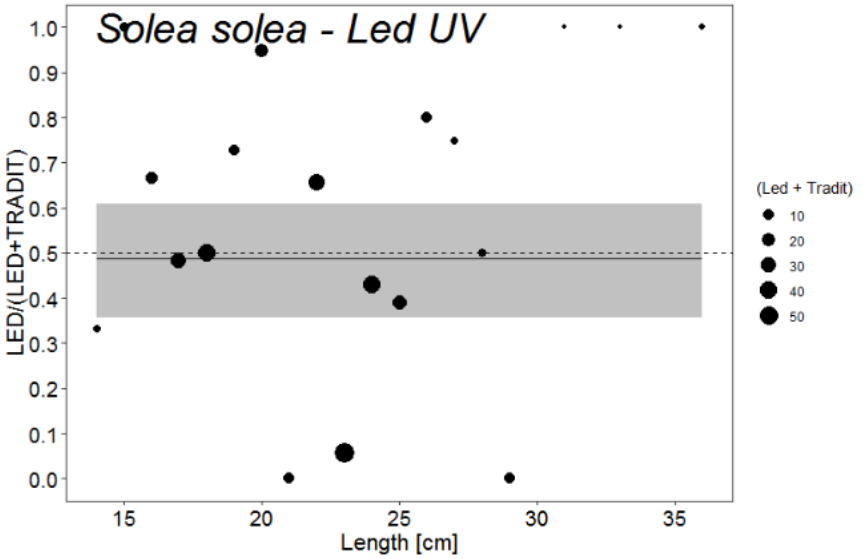
Reducing turtle bycatch

Turtle Excluder Devices (TEDs): Flexible TED

The results show that there is no significant difference between the catch performance of the gear in the presence or absence of LED-UV, with average catch amounts per haul for the cmmercial fraction being completely comparable.



Virgili et al. 2018



Lucchetti et al. 2019

Reducing turtle bycatch

CNR IRBIM ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Turtle Excluder Devices (TEDs): Flexible TED

All 11 turtles caught were caught in the absence of the light with a mortality rate of 30%.

Reducing turtle bycatch

CNR IRBIM ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Turtle Excluder Devices (TEDs): Flexible TED

CARAPAX

TRAPULA

Reducing turtle bycatch

CNR IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Turtle Excluder Devices (TEDs): Flexible TED




Small-single chamber



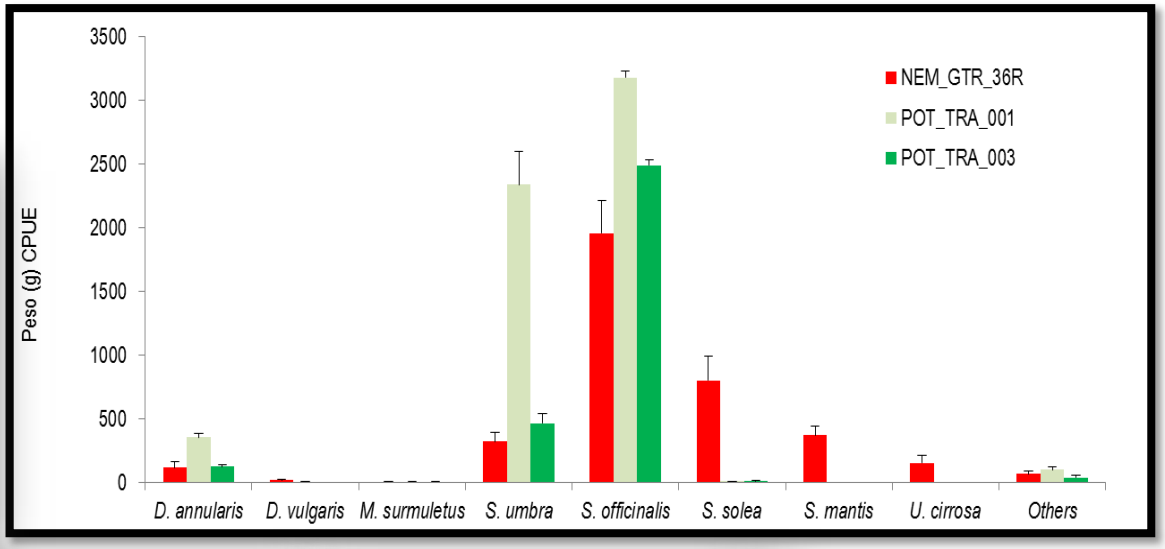
Big-single chamber



Big-triple chamber

Reti da posta - Attrezzi alternativi

Turtle Excluder Devices (TEDs): Flexible TED



Reducing turtle bycatch

CNR IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

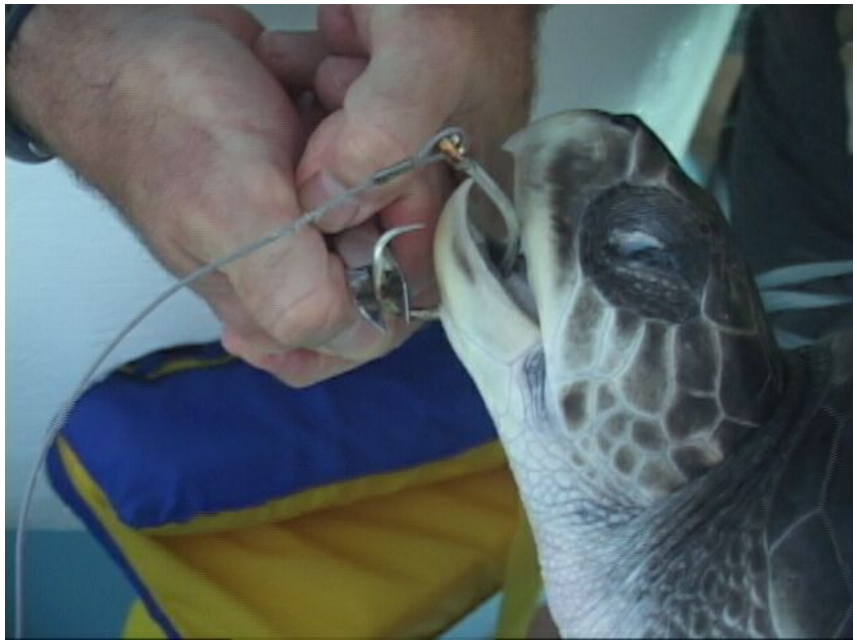
TartaLife
PESCA TARTAFREE
WWW.TARTALIFE.EU

Turtle Excluder Devices (TEDs): Flexible TED

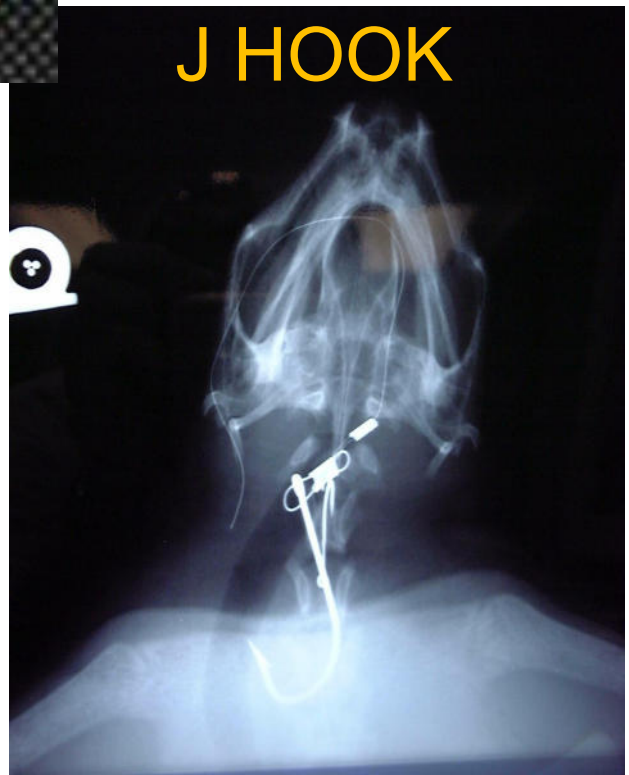
Reducing turtle bycatch

Hook shape: J hook vs CIRCLE hook

CIRCLE HOOK



J HOOK



Reducing turtle bycatch

Hook size: selectivity

11-03 **SWO**

RECOMMENDATION FOR MANAGEMENT MEASURES FOR MEDITERRANEAN SWORDFISH IN THE FRAMEWORK OF ICCAT

Technical characteristics of the fishing gear

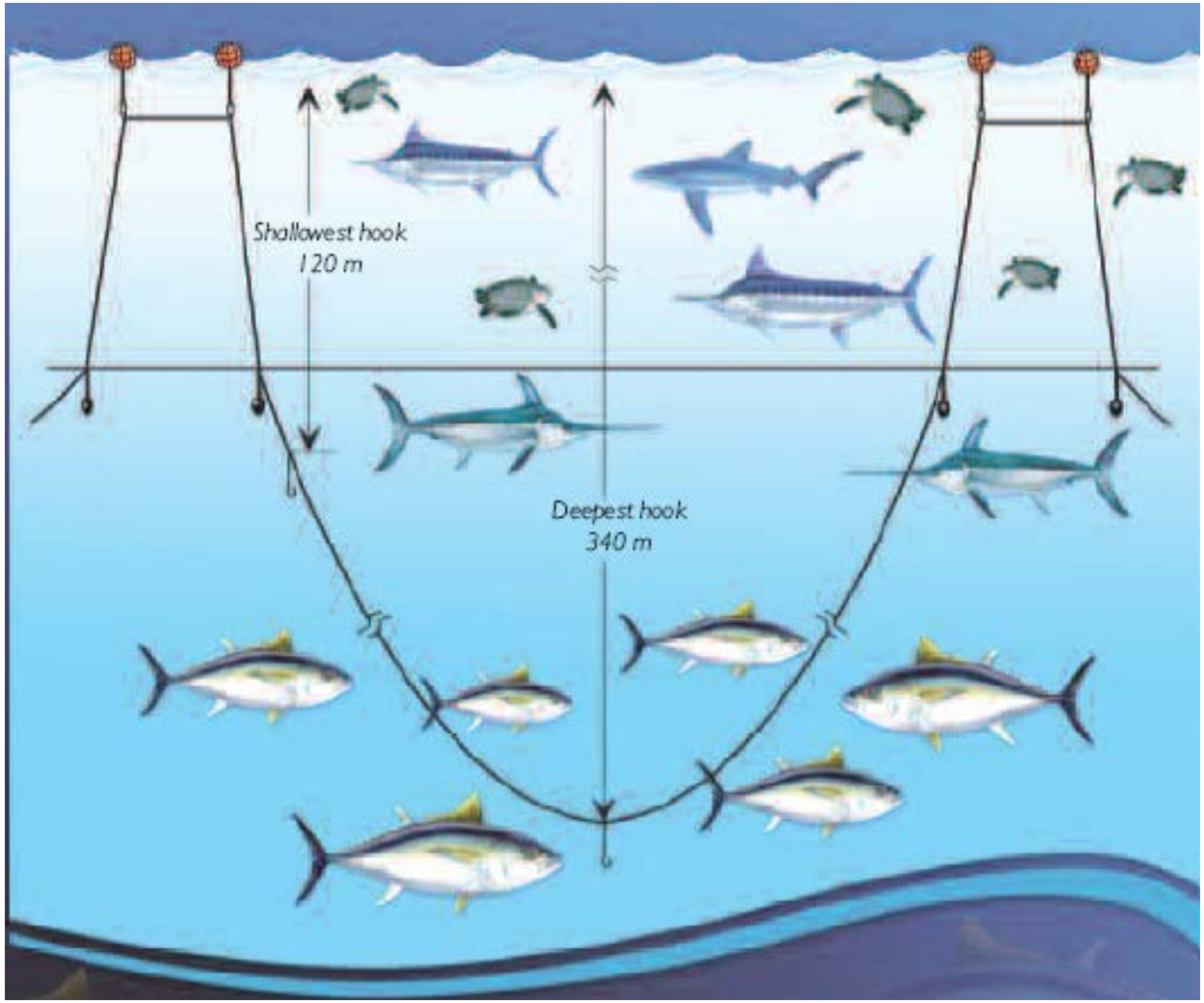
9. The maximum number of hooks that can be set or taken on board of vessels targeting swordfish should be fixed at 2800 hooks for swordfish fishery. A second set of rigged hooks may be allowed on board for trips longer than 2 days provided that are duly lashed and stowed in lower decks so that it may not readily be used.

10. Hook size should never be smaller than 7 cm of height for fishing targeting swordfish.

11. The length of the pelagic longlines will be of maximum 30 NM (55 km).

Reducing turtle bycatch

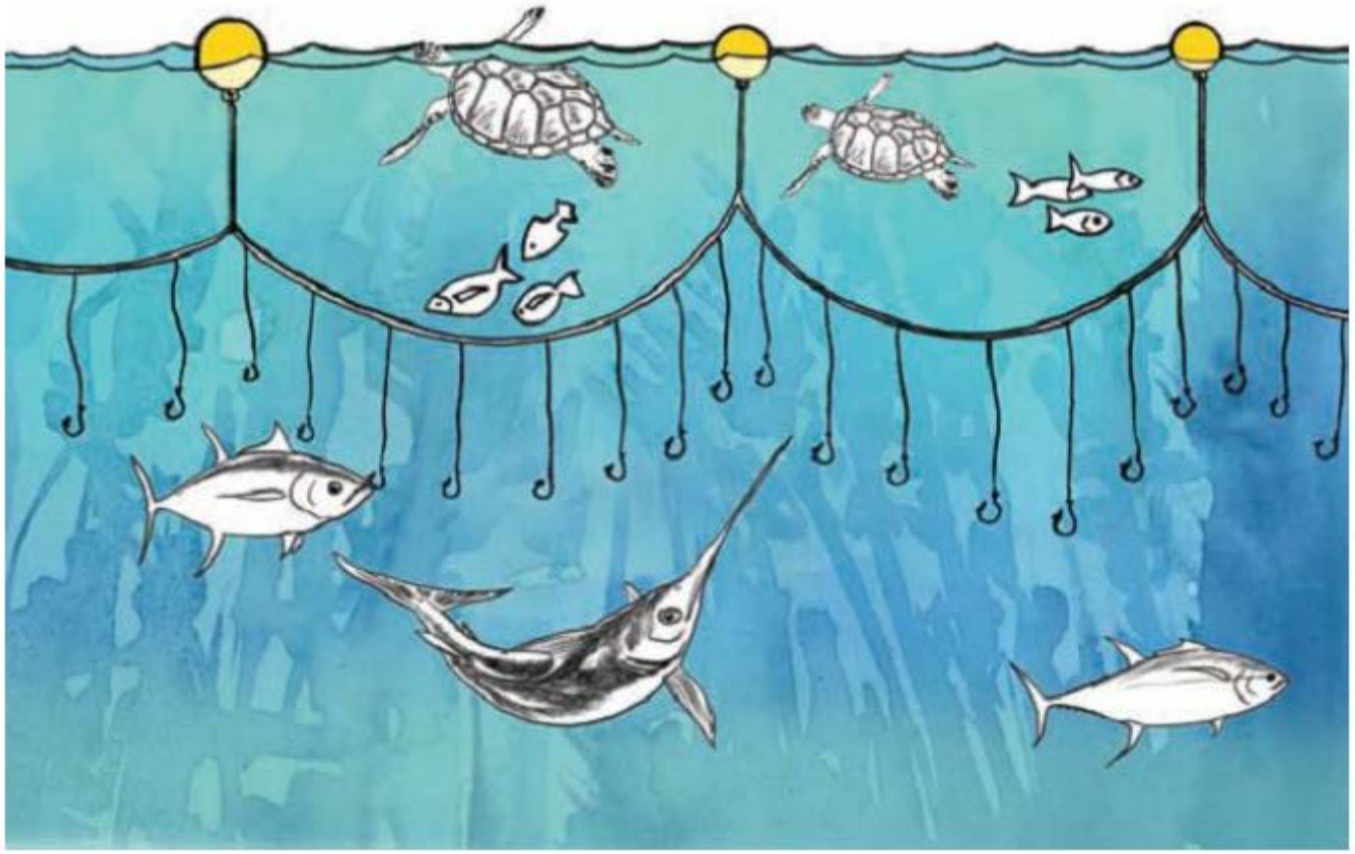
Depth setting



Reducing turtle bycatch

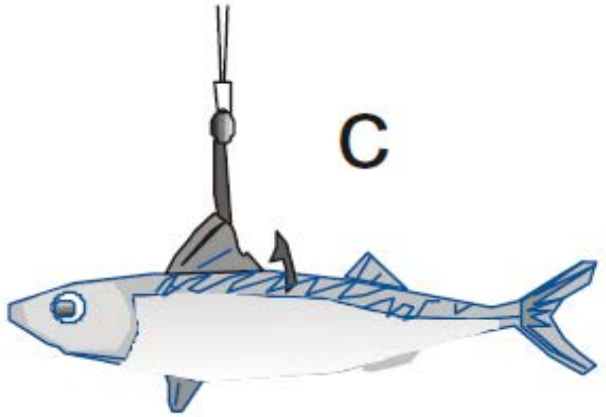
CNR
IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Shallow waters: Reducing tyme setting, daytime setting



Reducing turtle bycatch

Bait type

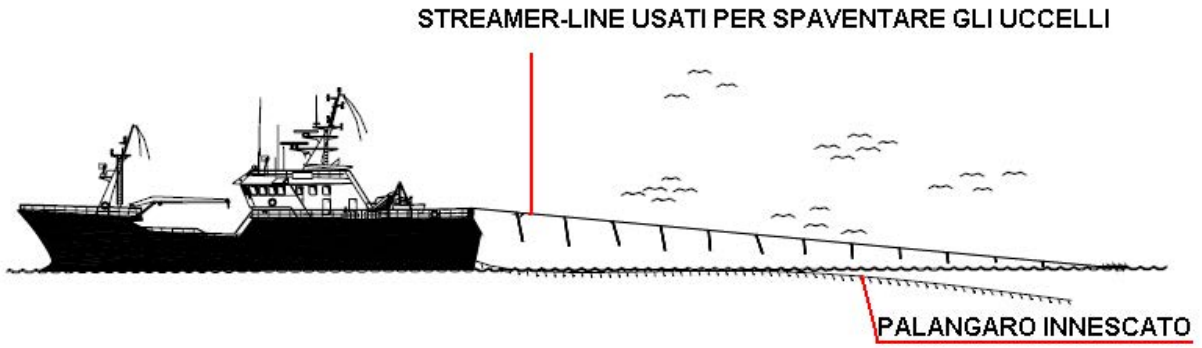


It seems to reduce turtle bycatch by maintaining the catch efficiency

Different types of bait:
a) Squid; b) mackerel (vertical set); c) mackerel (horizontal set)

Reducing seabird bycatch

Streamer-line



Reducing seabird bycatch

CNR IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Underwater shooting

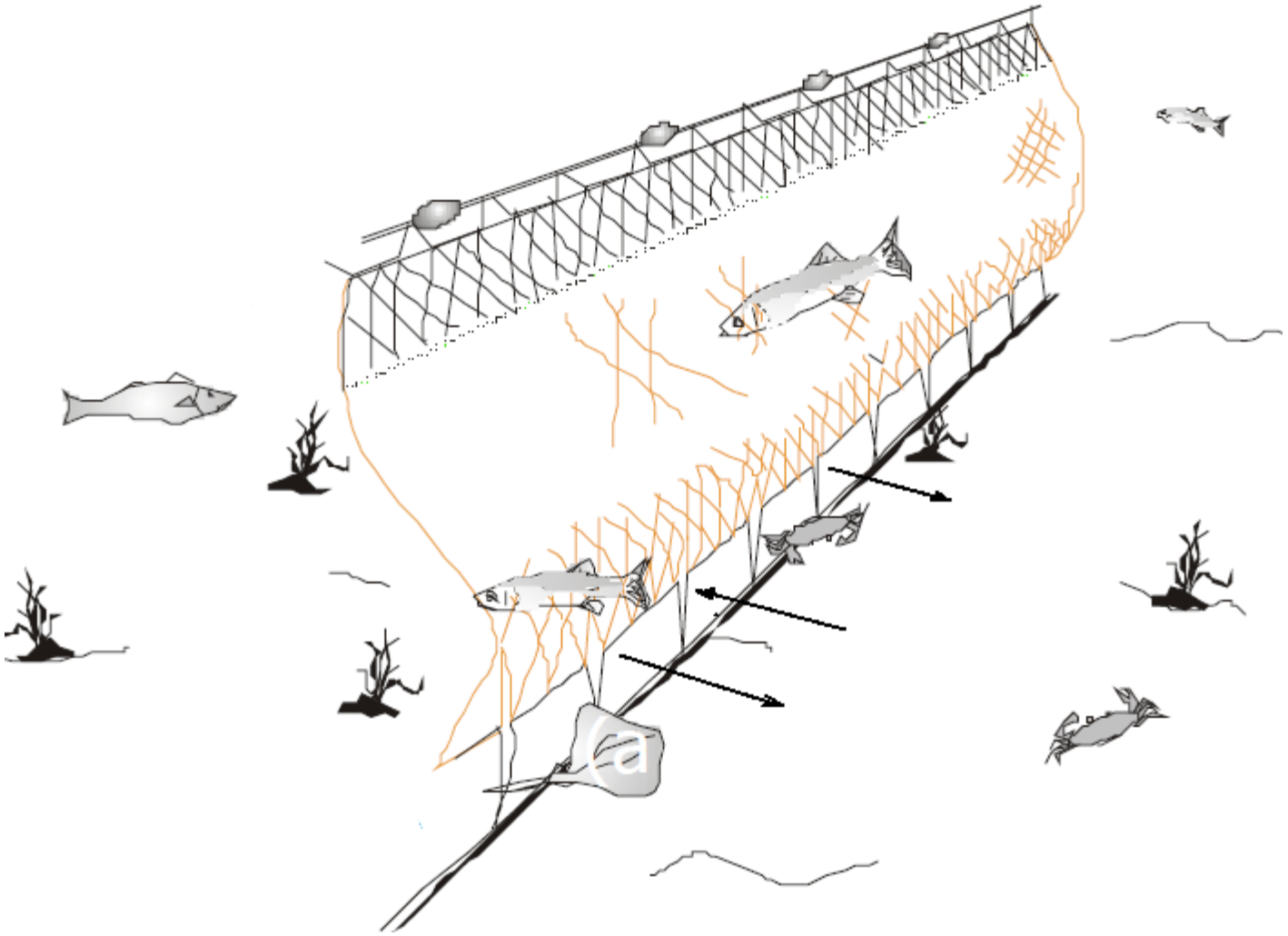
Reducing shark bycatch

Longlines: Repelling shark magnet

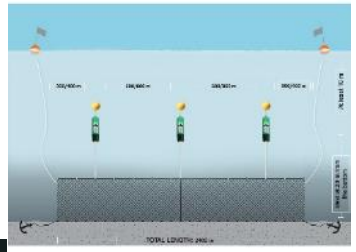
(*from Sacchi*)

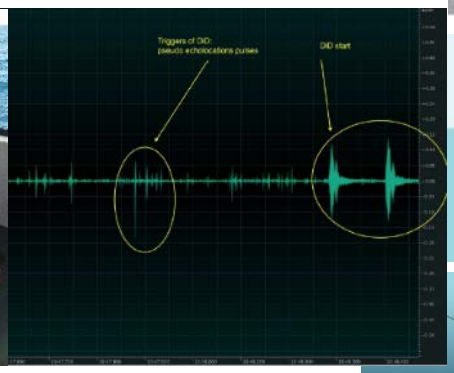
Reducing seabird bycatch

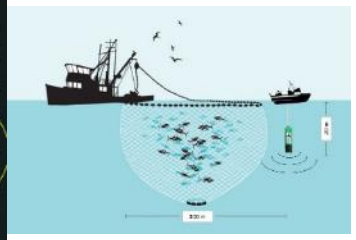
Passive nets: raised footrope

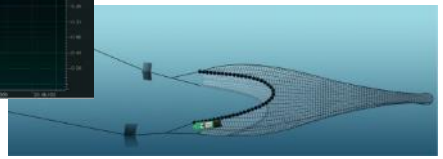


Marine mammals









Reducing marine mammals bycatch

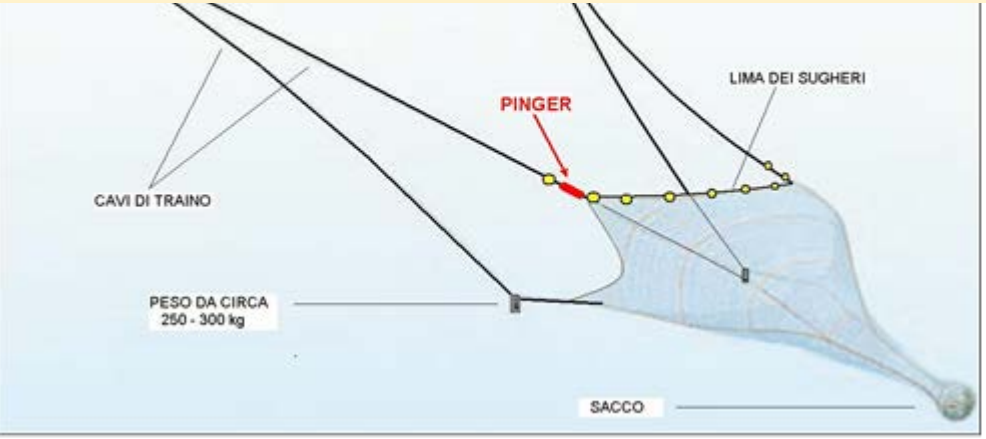
CNR
IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Acoustic deterrents

Reducing marine mammals bycatch

CNR IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

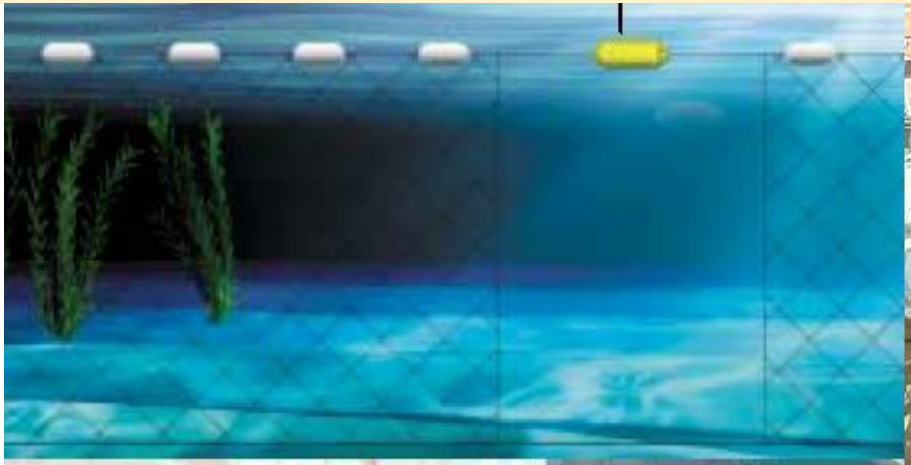
Acoustic deterrents

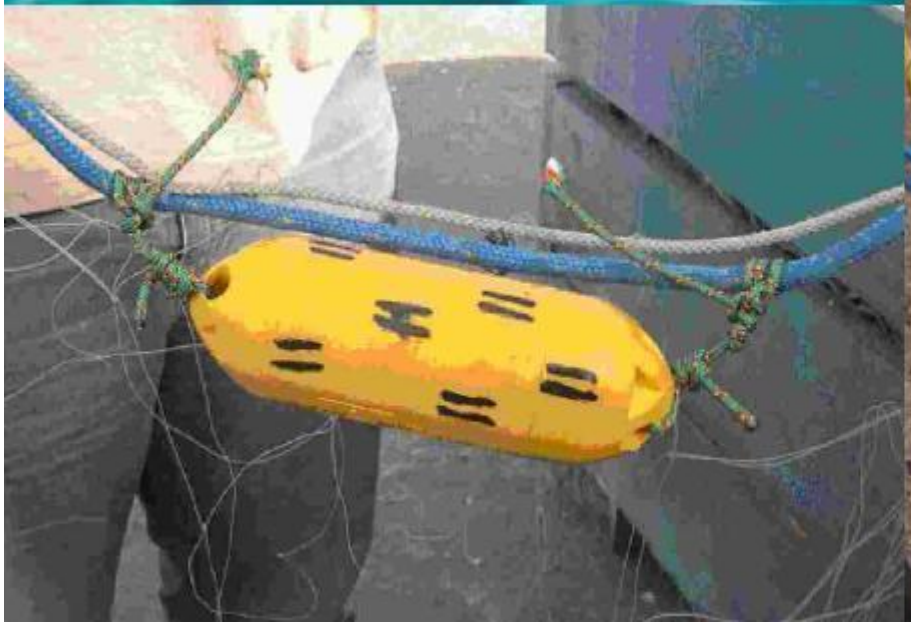


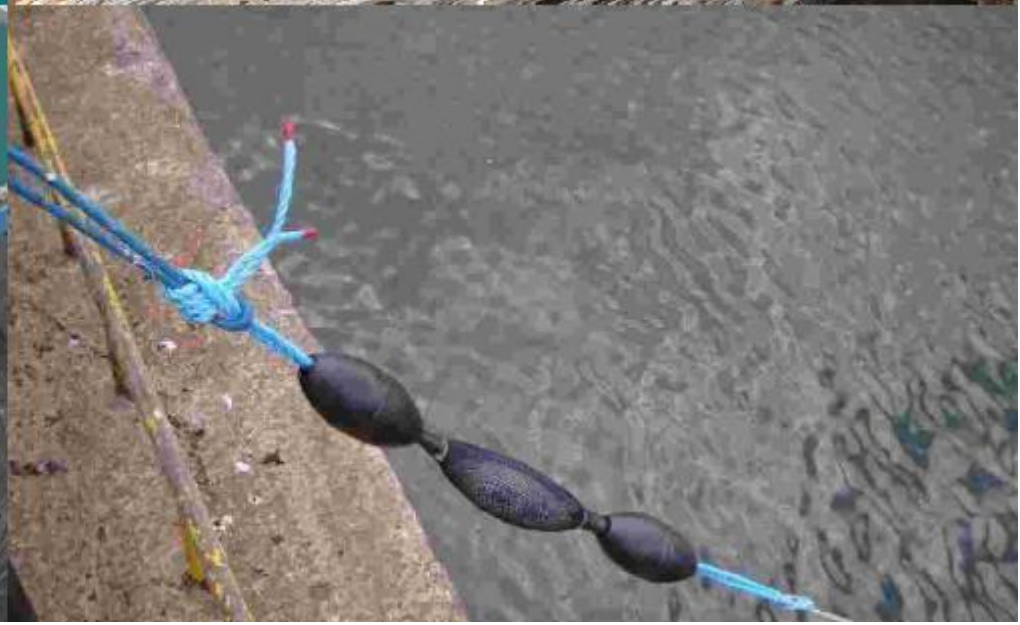
Reducing marine mammals bycatch

CNR IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Acoustic deterrents

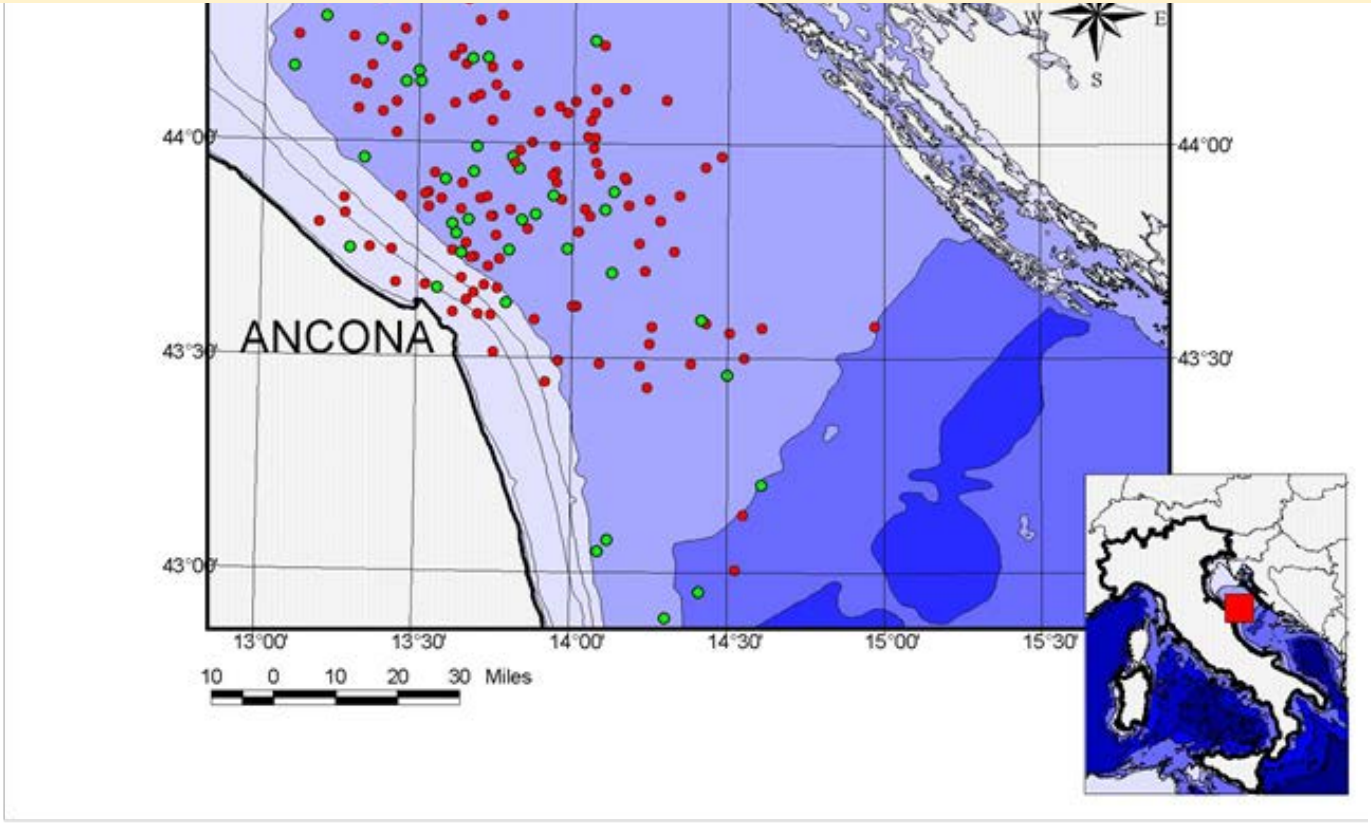






Reducing marine mammals bycatch

Acoustic deterrents



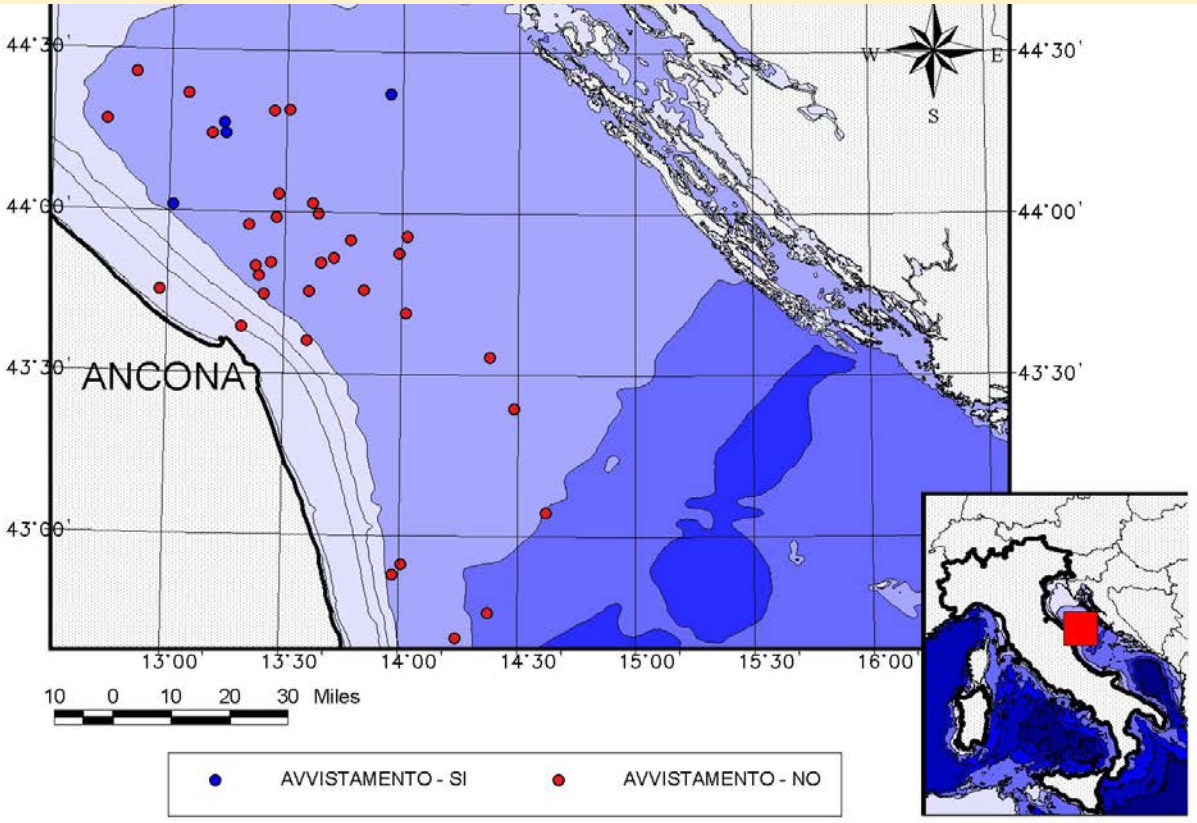
Green: hauls with pingers

Red: Hauls without pingers

Reducing marine mammals bycatch

Acoustic deterrents

pingers



Blue: sightings

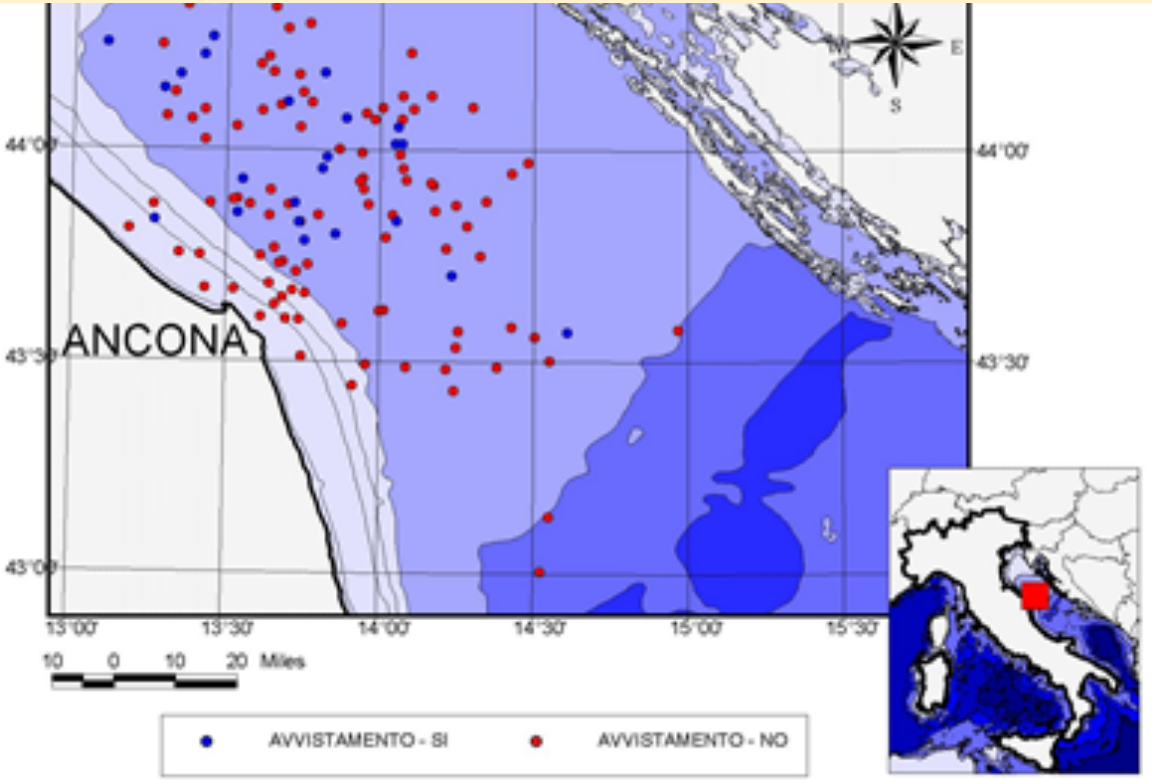
Red: no sightings

11%

Reducing marine mammals bycatch

Acoustic deterrents

pingers



Blue: sightings

Red: no sightings

20%

Reducing marine mammals bycatch

CNR IRBIM ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Acoustic Passive Reflectors

- To minimize bycatch of toothed whales (odontocetes) in gillnets
- increasing gillnet detectability for echolocating animals by making the nets more recognizable
- small, passive reflective objects (acrylic glass spheres) that can improve the visibility of gillnets at a broad range of frequencies
- Modifications of the netting material itself

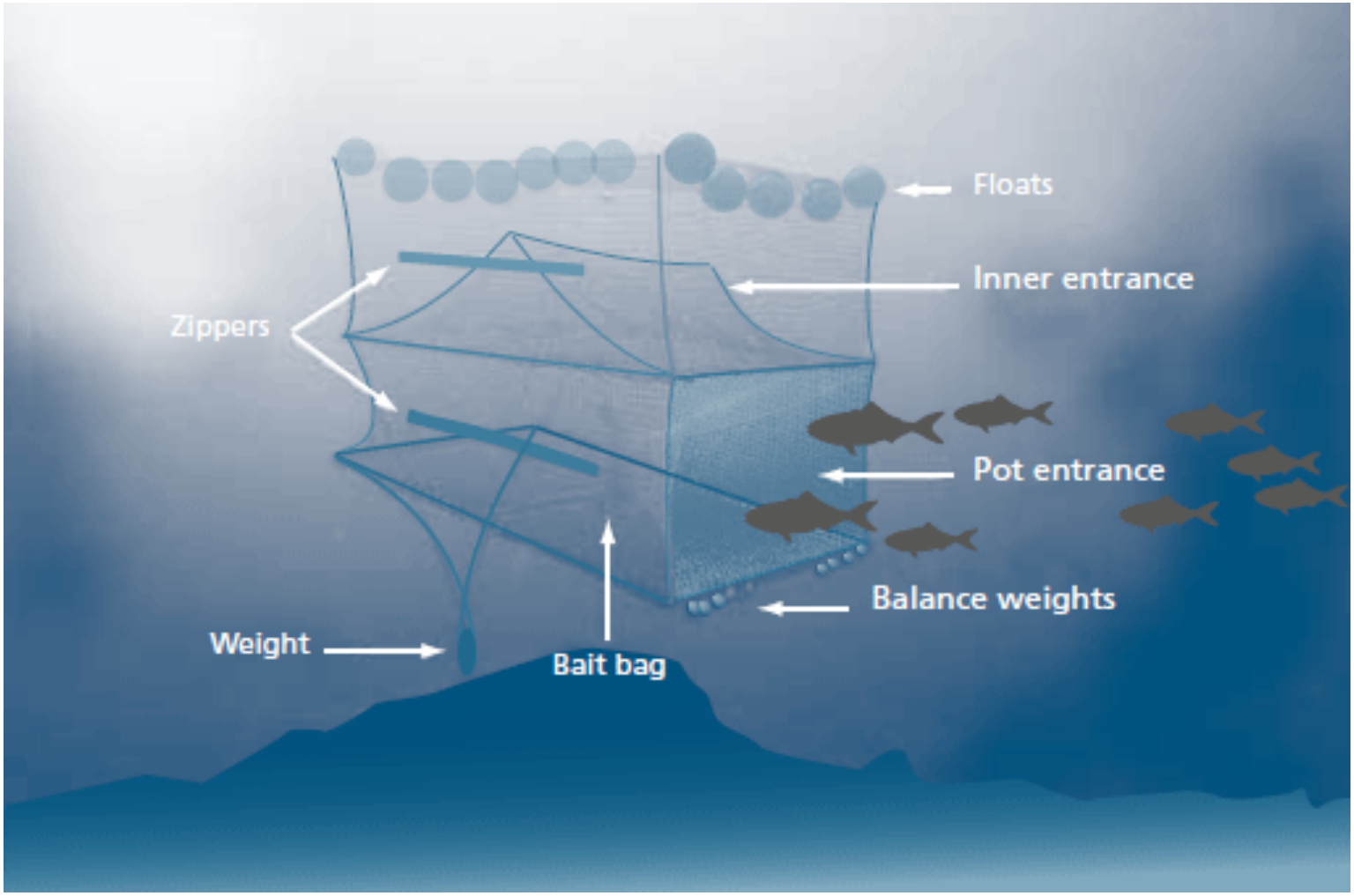
Alternative gears

More selective: pots

The main problem with the use of pot is the storage onboard!!!!!

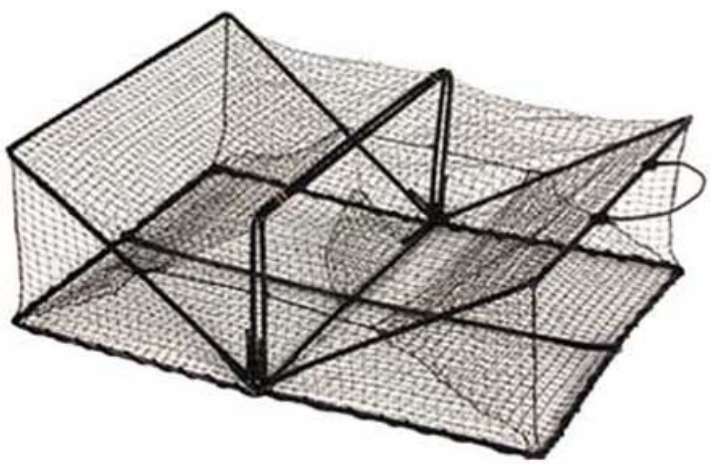
Reducing bycatch

Foldable pots



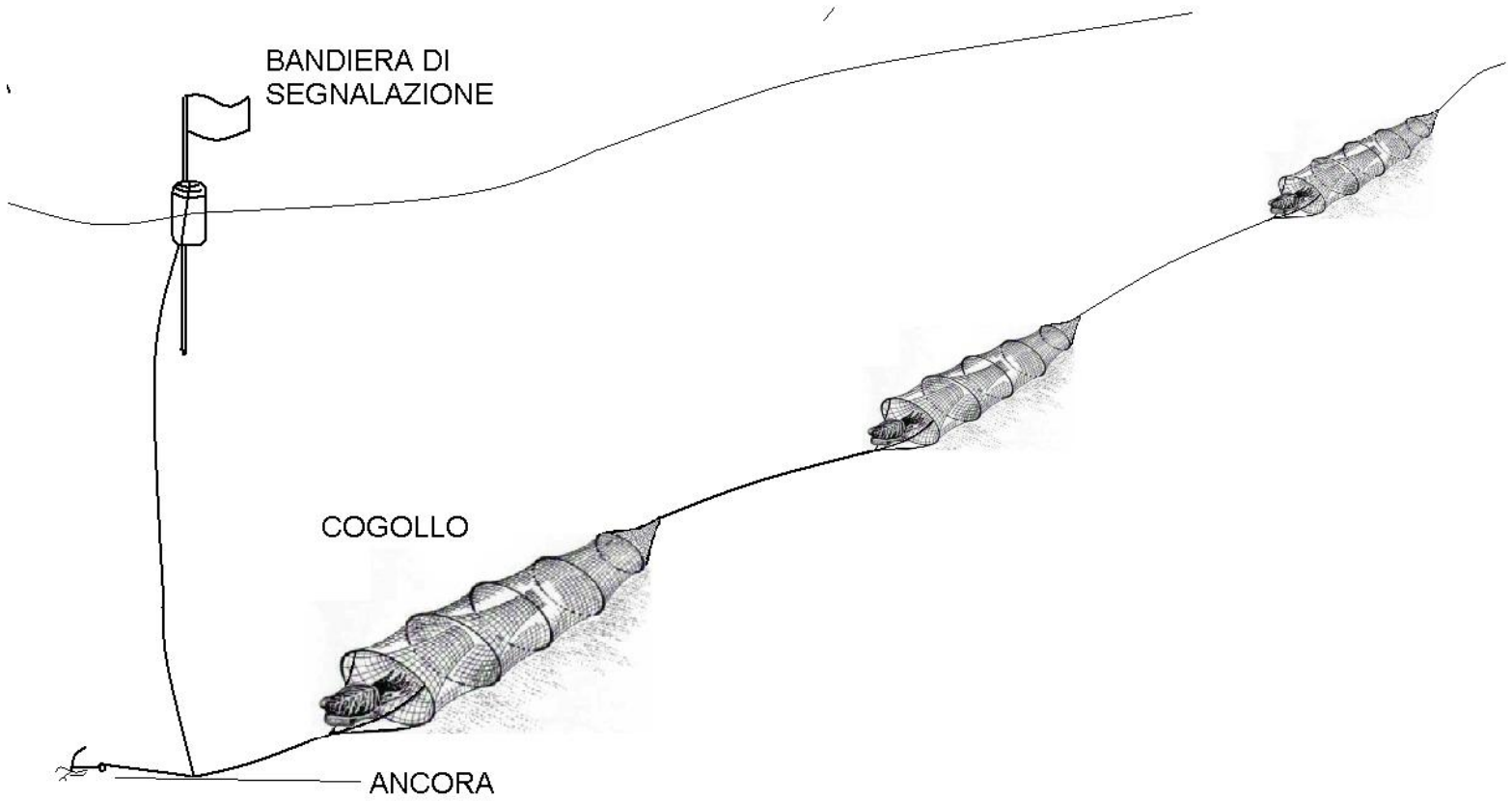
Reducing bycatch

Foldable pots



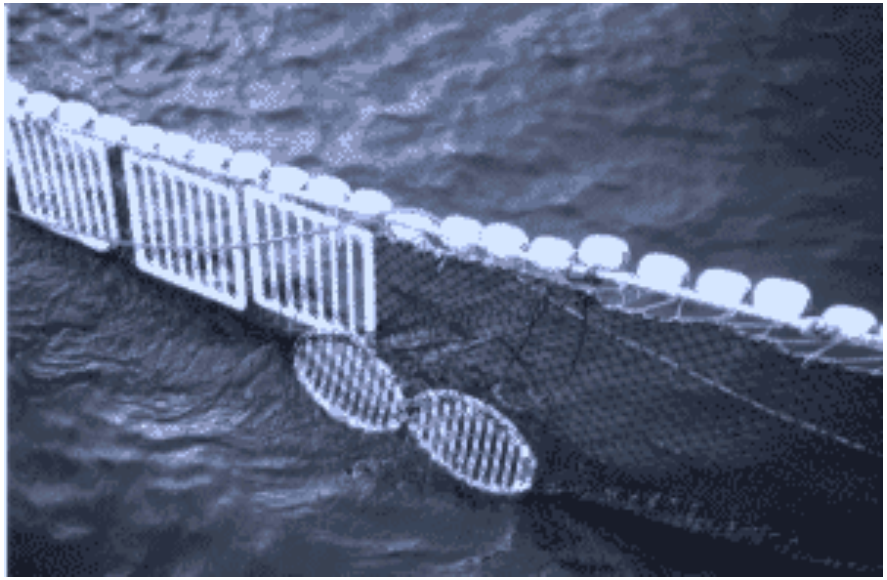
Reducing bycatch

Foldable pots



Reducing marine mammals bycatch

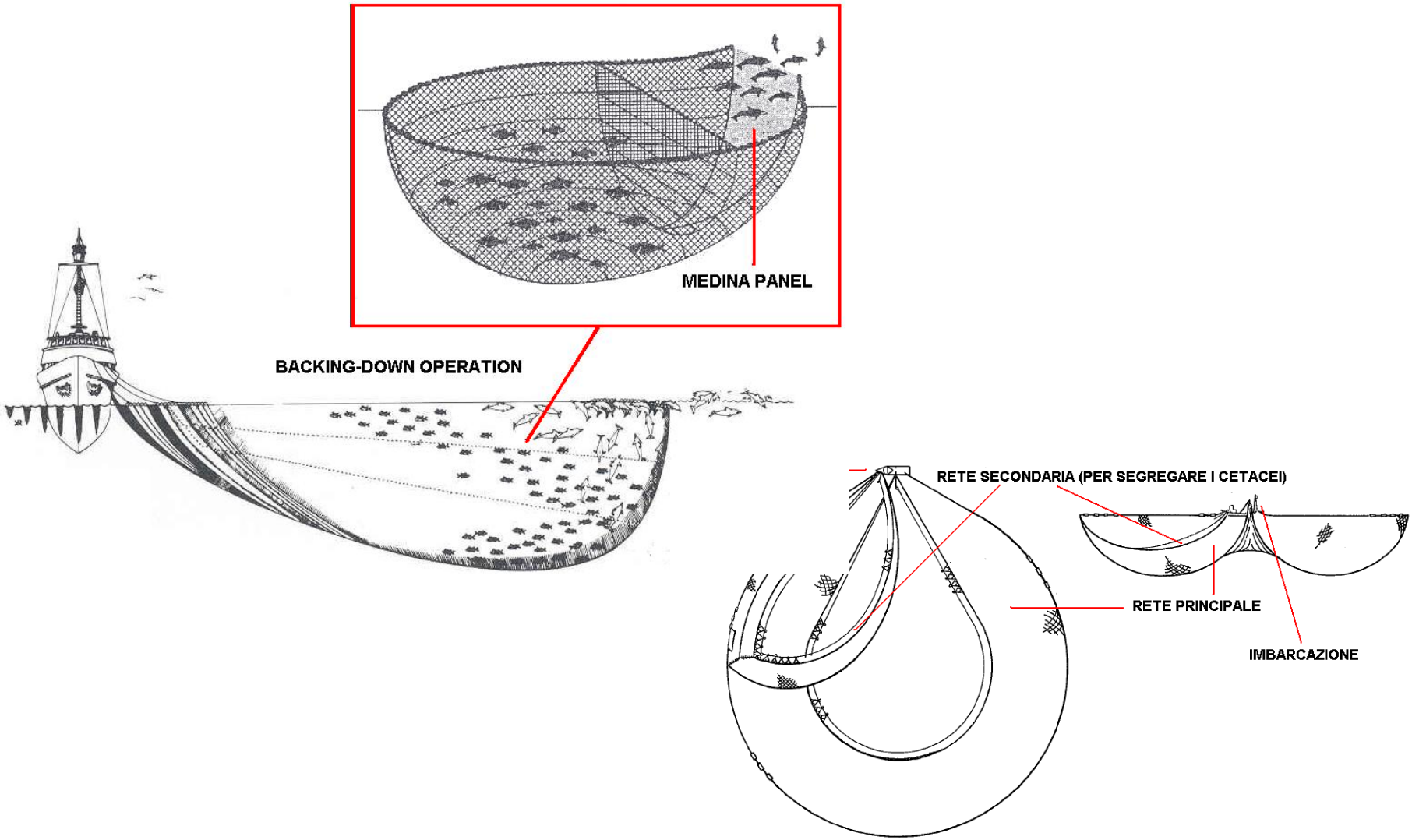
Grids mounted on a purse seine



From Sacchi

Reducing marine mammals bycatch

Backing-down operation and Medina panel



BUILDING A PROJECT

CNR IRBIM ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Main issue: PET species bycatch → Does your question fit the call?

Problems: Gaps in knowledge

- Estimates and bycatch rates
- Delayed mortality/survivability
- Bycatch Reducing Devices (BRDs)

Needs

Improved monitoring →
- Monitoring surveys
- Technologies (REM, PAM)
- Tagging

Key areas (Hot spots) →
- Species distribution
- Effort

→ Risk assessment

Effective BRDs →
- Technical
- Socio-economic

CNR
IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Call for proposal

- Date of publication, reference number, deadline
- Programme (LIFE, Horizon, Interreg etc.)
- Objectives
- Type of eligible actions
- Duration (min-max)
- Financing (max) – EU contribution
- % of financing (co-financing request)
- Number of possible financed projects
- Selection criteria

CNR IRBIM ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Budget

Points of view

EU Commission

- Contributes to reach the general targets of the Programme
- Is in line with general rules
- Demonstrates project's capability of the beneficiary
- Respect the priciple: best-value-for-money
- Is in line with GA
- Monitored during and after the project

Project manager

- Convenient
- Enough detailed but flexible
- In line with the internal rules of the beneficiary
- Administrative manageable

Auditors

- Was everything spent?
- Respect the GA?
- Respect the general rules?

CNR
IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Budget

- Should be: clear, realistic, transparent, comprehensible
- Costs must be eligible! (this depends on type of project)
- Consider Co-financing

- Expenses must be done DURING the project
- Expenses should be done according to the GA
- Data and costs supported by documents and Info

Budget: direct costs

They are directly assigned to project and supported by documents of expenses

- Personnel
- Equipment or durable goods
- Service or external assistance (it is based on best offer, therefore it is not feasible to insert the name of a company in the proposal)
- Consumables
- Travel
- Other costs (i.e. Renting boats)

CNR
IRBIM
ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Budget: indirect costs (general costs or overheads)

They are non directly assigned to project, they are linked to the general activity of the beneficiary (i.e. Expenses for energy, water etc.)

- Usually do not request supporting documents
- Usually they are based on a flat rate of direct costs (i.e. 25% of direct costs)

Direct costs + indirect costs = Eligible costs

CNR IRBIM ISTITUTO PER LE RISORSE BIOLOGICHE E LE BIOTECNOLOGIE MARINE

Budget: Start from where?

Preliminary considerations

- How much is the total financing of the call
- How's the total percentage of the financial contribution
- How much is the maximum total contribution?
- Which are internal resources to be allocated to the project?
- Which external services/competences do I need to involve?

- Is the project appealing? Financial contribution, enhancement of knowledge, feasible
- Sustainable? Can we spend all the budget?
- Are we able (personnel, devices boats etc.)

Guidelines for applicants

Budget: Application form

- Administrative section (data of all partners)
- Technical section
- Financial section