

Bycatch mitigation measures to reduce the impact of fisheries-related mortality of cetaceans in north Spanish gillnet and purse seine fisheries

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Cetacean bycatch in studied area and acoustic deterrent devices

Current situation of cetacean bycatch

The most important threat to cetaceans in north Spanish fishing grounds in the ICES area is the bycatch in commercial fishing bottom nets (ICES, 2021). The scientific and regulatory effort are focus on the need to adopt measures based on the EU request on 'EU emergency measures to prevent the bycatch of cetaceans in the northeast Atlantic' MERMACIFRA project aims to test mitigation measures to reduce accidental captures of cetaceans during fishing activities.

Objectives & Use of acoustic deterrent devices

The use of acoustic deterrent devices is a technique employed to reduce bycatch in fishing operations (Sacchi, J., 2021). These devices emit underwater sounds to deter non-target species such as dolphins from approaching fishing gears. The objective are warning cetaceans of potential danger, it helps to minimize accidental captures and promote more sustainable fishing practices.

Experimental fishing trials

TRAMMEL VESSELS



Fig. 1: Study area and fishing sets carried out onboard the "Cro Tres" vessel, equipped with the "Net Guard" pingers. Red triangles: with pingers; green triangles: control.

- NetGuard (Future Oceans):**
- Frequency: 60-120 kHz.
 - Sound pressure level: 145 dB.
 - Randomized frequencies.
 - Weight: 150 gr.
 - Pinger spacing: 200 m

- Marexi (Marine Technology):**
- Frequency: 10 kHz.
 - Sound pressure level: 145 dB.
 - Weight: 315 gr.
 - Pinger spacing: 200 m.

Fig. 3: "Net Guard" pinger.

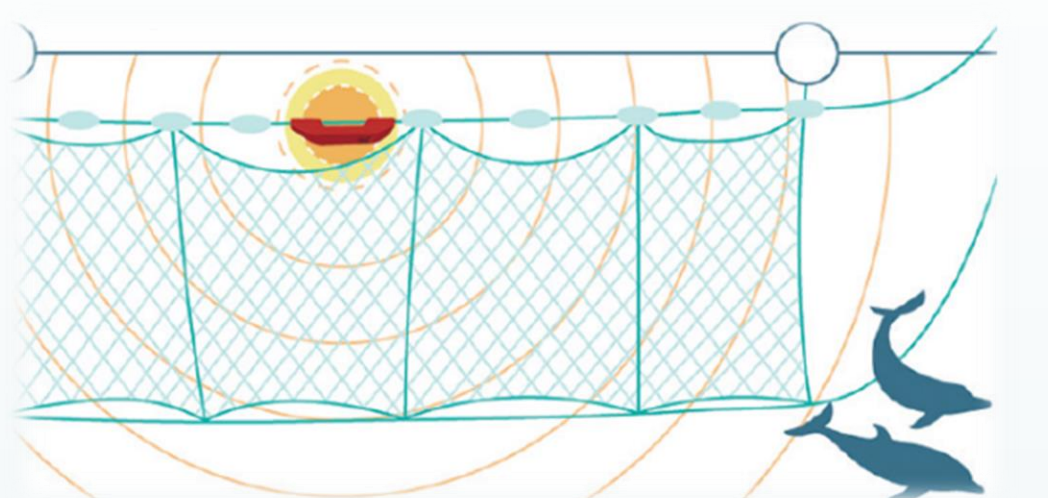


Fig. 4: Assembly of the pinger on a trammel net.



Fig. 7: Study area and fishing sets carried out onboard the "Varamar" vessel, equipped with the "Marexi" pingers. Red triangles: with pingers; green triangles: control.

During the fishing experimental trials on trammel and purse seine vessels, control fishing sets (without pingers) were compared to experimental fishing sets. The nets were equipped with pingers from different commercial brands. Onboard scientific observers obtained data on fishing catch, bycatch and interactions of dolphins and fishing operations. Sightings of cetacean species presence in the fishing area were recorded

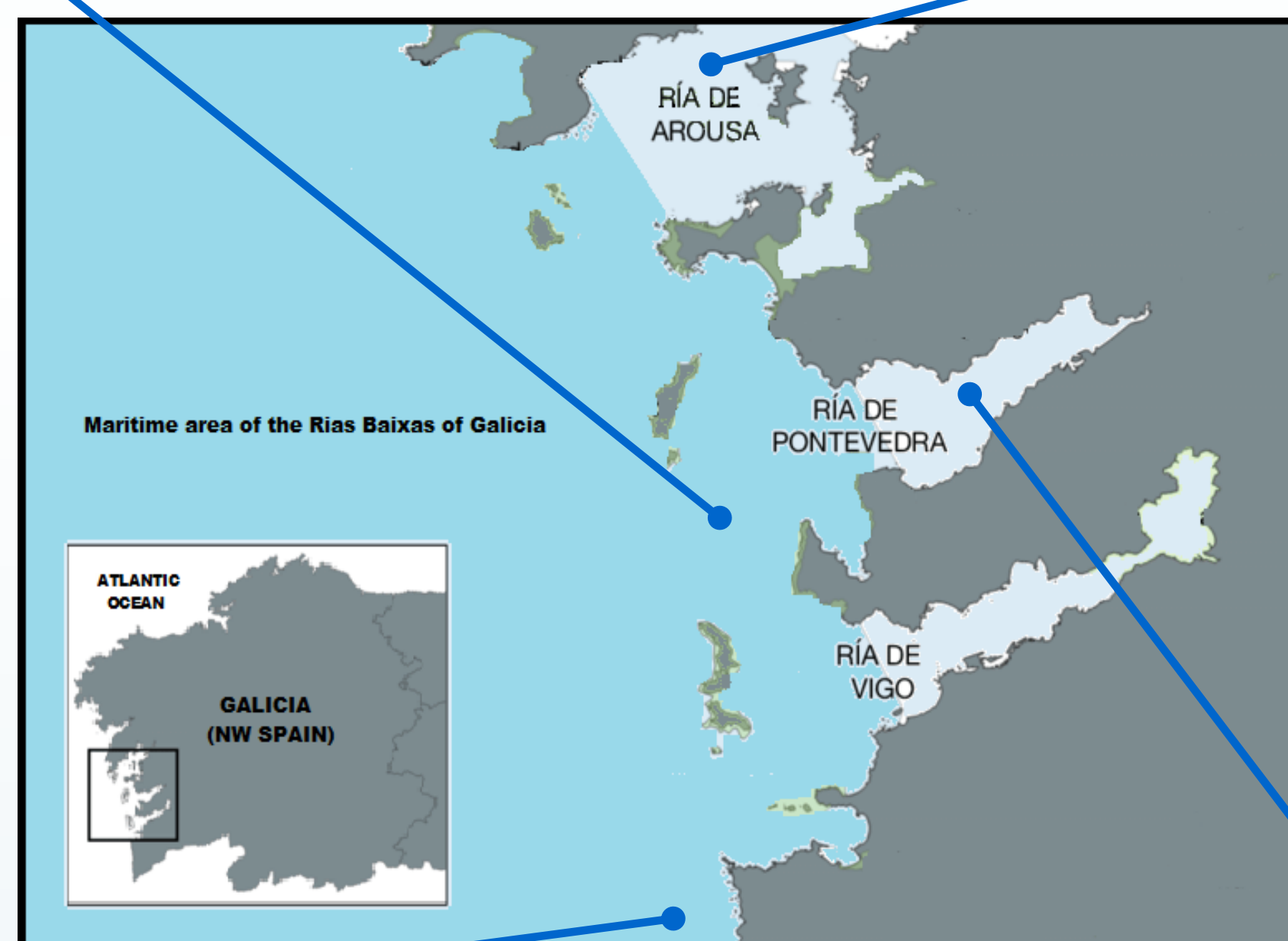


Fig. 5: Map of the study area with the sampling zones for each vessels on the maritime area of the 'Rias Baixas' of Galicia (NW Spain).



Fig. 8: "Marexi" pinger.

Fig. 9: "DDD03H" STM pinger.

PURSE SEINE VESSELS

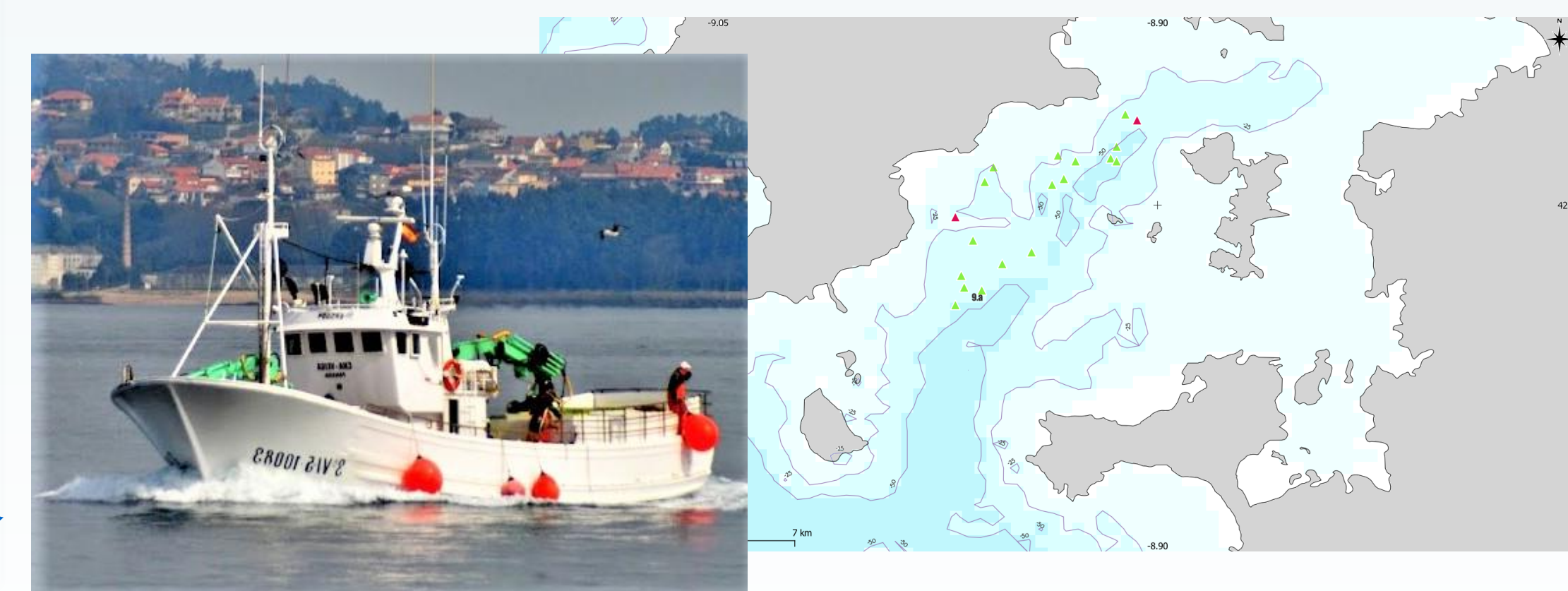


Fig. 2: Study area and fishing sets carried out onboard the "Chaveiga" vessel, equipped with the "DDD03H" pingers. Red triangles: with pingers; green triangles: control.



Fig. 6: Assembly of the pinger on a purse seine vessel.

- DDD03H (STM Products):**
- Frequency: 5-500 kHz.
 - Sound pressure level: 165 dB.
 - Randomized frequencies.
 - Weight: 940 gr.
 - Pinger spacing: 300-500 m
 - Pinger deployed on starboard side, at 10 m depth (Manufacturer's specification).

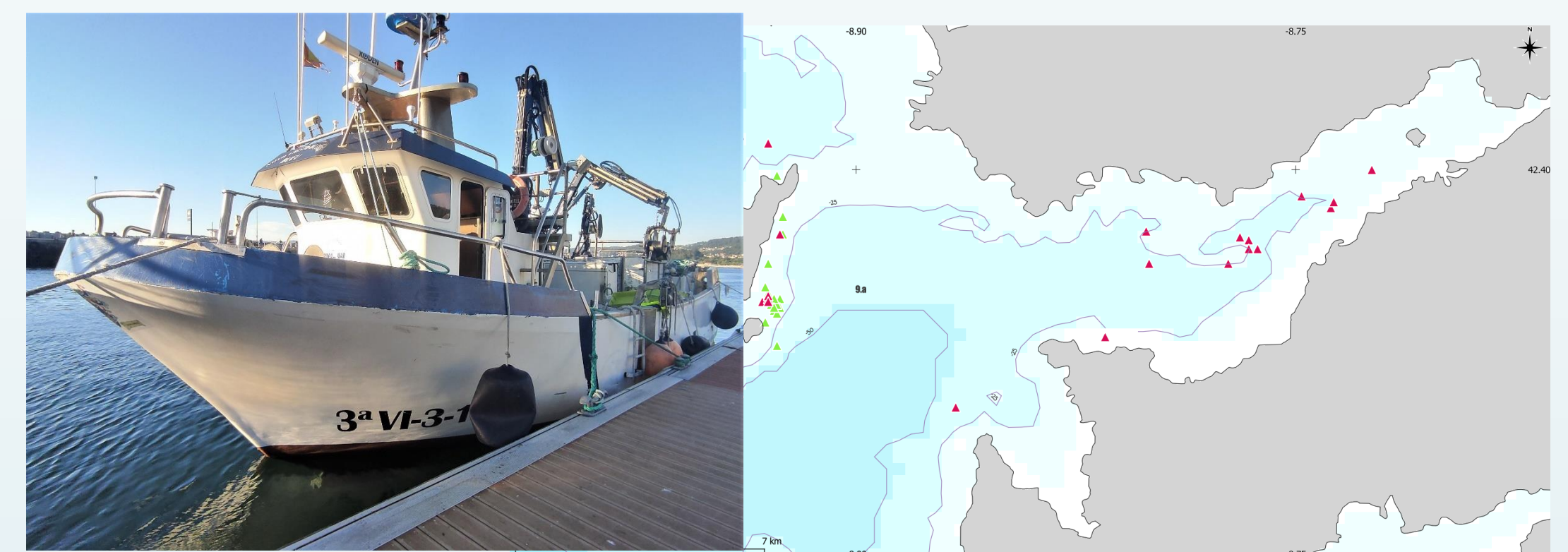


Fig. 10: Study area and fishing sets carried out onboard the "Novo Cristo da Laxe" vessel, equipped with the "Net Guard" pingers. Red triangles: with pingers; green triangles: control.

RESULTS

No accidental capture of cetaceans has occurred during fishing operations monitored by observers. Sightings of common dolphin (*Delphinus delphis*) and bottlenose dolphin (*Tursiops truncatus*) have been carried out during the trials (fishing sets/fishing route), observing 3 interaction events in the purse seining.

Table 1. Experimental trials during the project

Vessel Name	Fishing Gear	Date	TOTAL Fishing Sets	Hauls Without Pingers	Hauls With Pingers	Pinger	Cetacean Interactions
Varamar	Trammel nets	March-April	23	20	3	Marexi	0
Cro Tres	Trammel nets	March-May	54	34	24	Net Guard	0
Chaveiga	Purse seine	June	19	17	2	DDD03H	2
Nvo C. da Laxe	Purse seine	July	40	17	23	DDD03H	1

Table 2. Sightings during the surveys (DEL: Delphinidae Not Identified; TTR: *Tursiops truncatus*; DDE: *Delphinus delphis*.)

Date	Vessel	Type Of Sighting	Species	Number
15/03/2023	Cro Tres	Fishing set	DDE	3-4-6
22/03/2023	Cro Tres	Fishing set	TTR	2-2-2
20/06/2023	Chaveiga	Fishing route	TTR	4-4-5
20/06/2023	Chaveiga	Fishing set	DNI (DDE/TTR)	1-1-1
21/06/2023	Chaveiga	Fishing route	TTR	4-5-6
22/06/2023	Chaveiga	Fishing route	TTR	3-3-4
22/06/2023	Chaveiga	Fishing set	DNI (DDE/TTR)	1-2-2
04/07/2023	Nvo. C. da Laxe	Fishing route	DNI (DDE/TTR)	1-2-2
04/07/2023	Nvo. C. da Laxe	Fishing set	TTR	1-1-1
11/07/2023	Nvo. C. da Laxe	Fishing route	TTR	1-1-1
11/07/2023	Nvo. C. da Laxe	Fishing route	TTR	1-2-3
11/07/2023	Nvo. C. da Laxe	Fishing route	TTR	1-1-1
11/07/2023	Nvo. C. da Laxe	Fishing route	TTR	1-2-2
11/07/2023	Nvo. C. da Laxe	Fishing route	TTR	1-2-2
13/07/2023	Nvo. C. da Laxe	Fishing route	DNI (DDE/TTR)	3-3-4

KEY CONCLUSIONS

- Technical characteristics of pingers are different and they fit differently in gillnet. NetGuard pingers are accepted better by the fishermen, because they are stronger and easier to attach to the fishing net, but no accidental catches have been obtained to demonstrate their effectiveness in mitigate entanglement of dolphins and depredation.
- Evidence on deterrent effect of DDD03H pinger in purse seine was observed during interactions with bottlenose dolphins. The conflict in purse seining is that dolphins cause economic damage by breaking the nets and scaring away schools of pelagic fish, complicating the fishing catch. Fishermen were interested in testing the effectiveness of pingers.
- The use of pingers is not mandatory in fisheries and this study constitutes the first attempt to introduce the use of effective pingers adapted to the characteristics of the nets used in NW Spanish waters. Purse seining data indicates potential outcomes to minimize interactions and reduce fishermen's losses. In trammel nets it is necessary to obtain more robust evidence that pingers can reduce dolphin entanglement.

References:
 - ICES (2021). Working Group on Bycatch of Protected Species (WGBYC). ICES Scientific Reports. 3:107. 168 pp.
 - Sacchi, J. (2021). Overview of mitigation measures to reduce the incidental catch of vulnerable species in fisheries. Studies and reviews No. 100 (General commission for the Mediterranean). Rome, FAO.

Acknowledgments:
 We would like to thank skippers and crew of fishing vessels for kindly collaborate during IEO samplings by observers onboard. The authors acknowledge to SGP-MAPA. This work was made within the MERMACIFRA project funded by General Secretary of Fisheries under the NextGenerationEU.

