



FISHERIES AND DELPHINIDS:

A CONSERVATION ISSUE AT EASTERN SPAIN WATERS

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1. BACKGROUND

- Fisheries by-catch is a persistent threat for cetaceans worldwide, with severe impacts on the health and viability of many populations, also in the Western Mediterranean waters.
- A way to assess interactions between cetaceans and various types of fisheries are face-to-face interviews with fishers and historical stranding data, besides other sources.
- Despite the existing overlap between fishing grounds and cetacean distribution, there is limited information available on their interactions with each active fishery.

2. MATERIALS AND METHODS

- Face-to-face interviews were held in the Valencia region fishing ports (Figure 1) in 2020 and 2022 to gather information about dolphin interactions with bottom trawling and artisanal vessels.
- Data on the average annual economic loss estimation resulting from gear damage caused by dolphins, and the incidents of dolphin by-catch in the year prior to the interview were collected. Cetacean by-catch rate (C) was calculated for each species according to reported annual captures (C_{obs}) and reported fishing effort on a fishery (F_{obs}) as $C = \frac{C_{obs}}{F_{obs}}$
- We compiled data about delphinid strandings along the Valencia region coast (1990-2020) with fisheries interaction signs; [(1) entanglement in fishing gear, (2) net marks and superficial skin lesions, (3) jaw/skull fracture, (4) amputations/incisions, and (5) remains of fishing gear].
- The spatial distribution of common bottlenose dolphin and striped dolphin strandings was analyzed using Kernel Density Estimation (KDE) to identify the core stranding areas in the region.

3. RESULTS AND DISCUSSION

- Bottom trawling interviewees reported a by-catch of 16 dolphins for October 2019–November 2020. Two years later, 15 dolphins were reported by interviewees for period October 2021–November 2022. This meant a monthly dolphin by-catch rate of 0.01 individuals captured per boat.
- Artisanal fishers reported 1 unidentified dolphin in 2020, and 4 common bottlenose dolphins caught accidentally in 2022.

TABLE 1. Summary of reported by-catch per species, according to interviewees in 2020 (n=148) and 2022 (n=141), and each by-catch rate (C) according to bottom trawling fishery study area subdivision (Fig. 1).

SPECIES	<i>Tursiops truncatus</i>				<i>Stenella coeruleoalba</i>			
	2020		2022		2020		2022	
	By-catch	Rate (C)	By-catch	Rate (C)	By-catch	Rate (C)	By-catch	Rate (C)
SUBAREA 1	5	0.012	3	0.007	-	-	2	0.004
SUBAREA 2	3	0.018	2	0.01	1	0.006	-	-
SUBAREA 3	1	0.003	1	0.003	2	0.006	2	0.007
SUBAREA 4	-	-	2	0.004	1	0.002	1	0.002
TOTAL	9	0.006	8	0.006	4	0.003	5	0.003



- 90% of the interviewed artisanal fishers reported negative interactions with common bottlenose dolphins. The average annual economic loss per artisanal vessel was estimated at 2,998.10 ± 2,095.02 € during 2020; while in 2022 at a rate of 3,726.13 ± 4,066.89 € per vessel.
- Estimates were higher in the Valencia province and for those vessels that had used nets for a greater number of months the previous year of the interview.

4. CONCLUSION

Striped dolphin and common bottlenose dolphin are highly interacting with fisheries in the study area according to face-to-face interviews and historical stranding data, especially interaction seems to be increasing with the second one. This must be considered in management plans to assure both species conservation and fisheries sustainability in the region.

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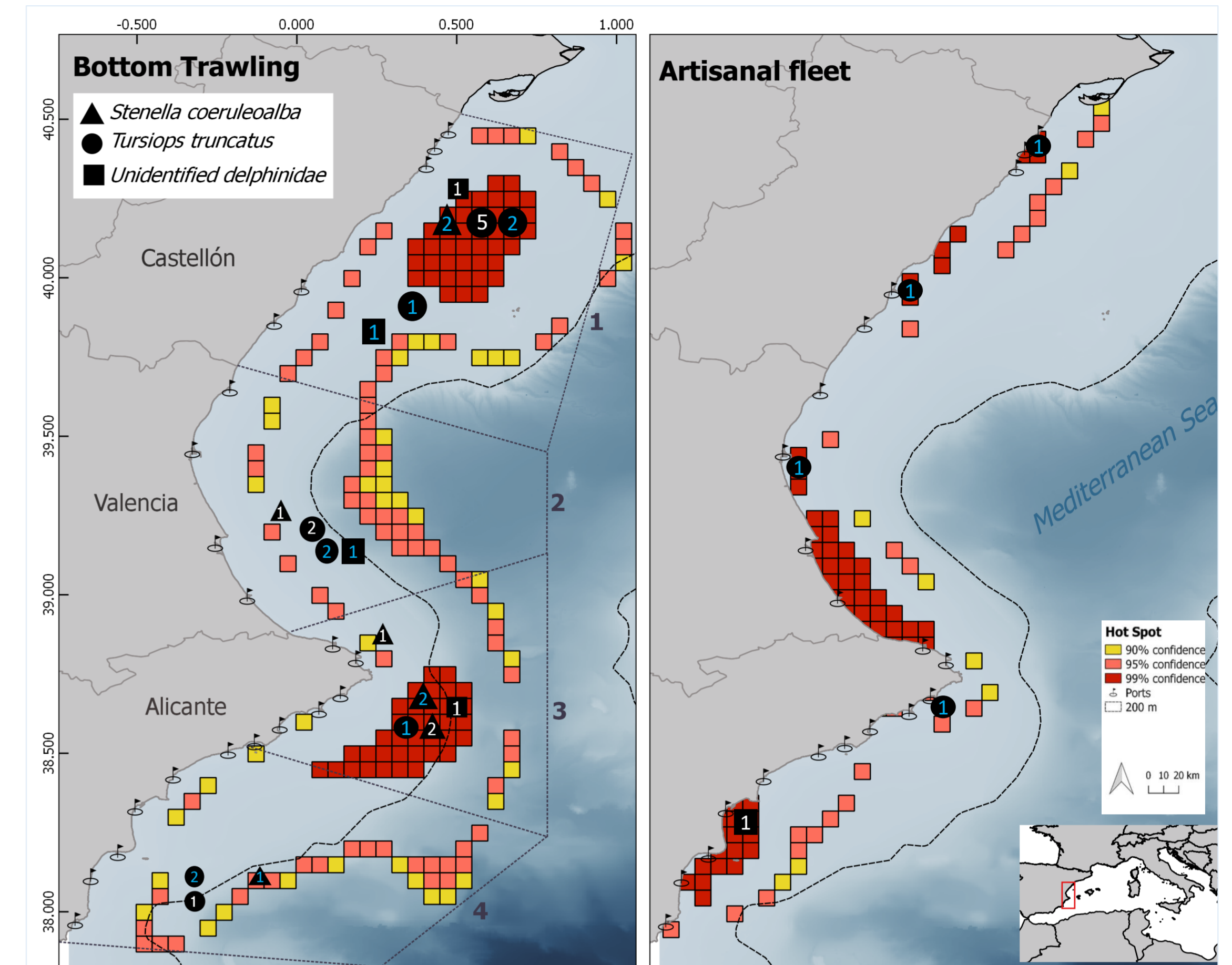
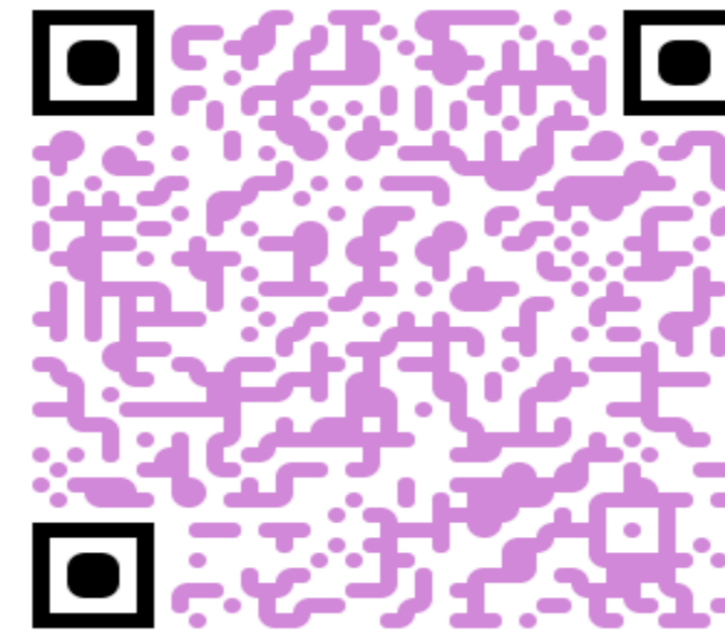


FIGURE 1. Map of the study area (Eastern Spain, Western Mediterranean) showing the hot spots of fishing activity of bottom trawling (left) and artisanal fleet (right) during the interview campaign performed with Hot Spot Analysis tool. The black symbols show the by-catch events reported by the interviewed vessels in 2020 (white) and 2022 (blue). The map includes the distribution of 21 surveyed ports. The bathymetry is depicted with darker shades of blue representing deeper waters and the 200-m bathymetric contour. Study area stratification is shown in the subzones established for the bottom trawling fishery (left).

STRANDINGS

- Striped dolphins and common bottlenose dolphins are the species with the higher number of stranding records in the study area (116 common bottlenose dolphins and 759 striped dolphins between 1990 and 2020).
- T. truncatus* was the species with the highest % of strandings with fisheries interaction evidence (Table 2). A positive trend in strandings with fisheries interaction signs was detected for the 1990–2020 period ($p < 0.001$) and the 2009–2020 period ($p < 0.01$) for this species.
- KDE common bottlenose dolphin and striped dolphin stranding analysis showed a correlation with fishing fleet distribution in the south of the study area.



TABLE 2. Stranded delphinids (N) on the Valencia region coast between 1990 and 2020. For each species, the number of individuals that exhibited evidence of fisheries interaction (N_f), and its percentage.

SPECIES	N	N _f	%
<i>Tursiops truncatus</i>	116	31	26.72
<i>Stenella coeruleoalba</i>	759	49	6.46
<i>Delphinus delphis</i>	27	3	11.11
<i>Grampus griseus</i>	42	3	7.14
<i>Globicephala melas</i>	23	0	-

FIGURE 2. Delphinids with fisheries interaction evidence stranded in the study area. (A, D) Remains of fishing gear on the body cavity, (B) incisions of anthropogenic origin, (C) net marks and skin lesions.