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Pingers as cetacean bycatch mitigation measure in Bulgarian turbot fishery

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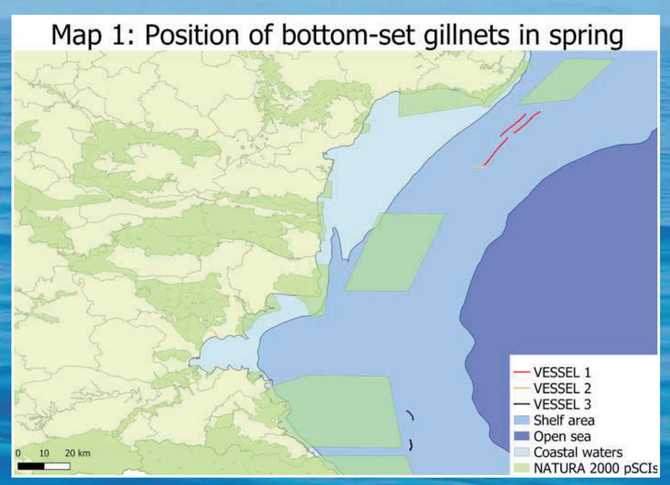
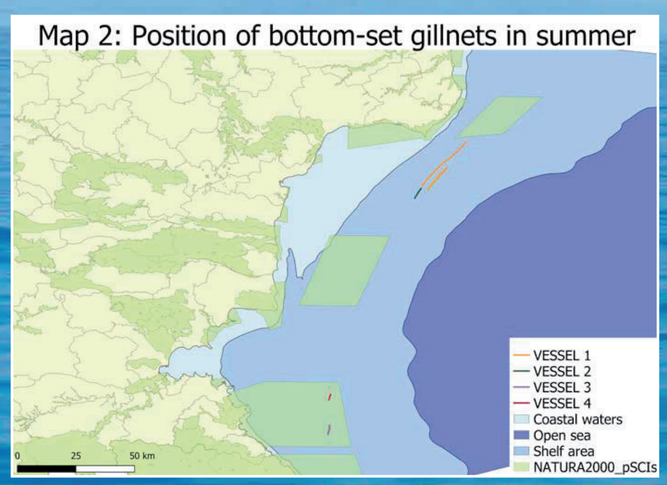
INTRODUCTION

The Black Sea turbot (*Scopthalmus meaoticus* Pallas, 1811) fishery is considered one of the most important threats for small cetaceans due to bycatch. Bycatch is a major problem in a number of gillnet fisheries around the World and Harbour porpoise (*Phocoena phocoena*) is one of the most heavily affected species. Few studies on cetacean bycatch rates in turbot fishery have been implemented in the Black Sea (Turkey - *Tonay, Ozturk* 2003 and *Gönener and Bilgin* 2009; Ukraine - *Birkun Jr. et al* 2009, Bulgaria - *Mihaylov* 2010) - all of these reporting largest share of Black Sea Harbour porpoise – 90 to 98%. Even less are experiments with pingers (acoustic deterrent devices) as mitigation measure to decrease bycatch rate.

MATERIAL AND METHODS

First large-scale use of 200 pingers (Future Oceans 10 kHz, 132 dB – 150 pcs and 70 kHz, 145 dB – 50 pcs) was made during standard turbot fishing operations in Bulgarian waters in 2019 during two seasons - spring and summer. Three vessels have been involved. Pingers were attached to part of the sets (active) while the rest was considered control. Configuration in summer for the sets of vessel 1 was slightly changed limiting the spacing within recommended limits of 100 m for 10 kHz, 132 dB and 200 m for 70 kHz, 145 dB pingers. Soaking time was 19-23 days in spring and 10-20 days in summer. Fishing effort was calculated as km² day by multiplying surface of nets by soaking time in days. Bycatch was then calculated as individuals per km² day.





RESULTS AND DISCUSSION

Table 1: Active and control nets and bycatch by vessel and season

Fishing vessel	Spring				Summer			
	Active km	Bycatch ind.	Control km	Bycatch ind.	Active km	Bycatch ind.	Control km	Bycatch ind.
Vessel 1	16,8	2	17,08	1	14	39	19,6	53
Vessel 2	1,5	0	3	1	1,5	0	3	2
Vessel 3*	8,4	2			5	5		
Vessel 4					2	0		
Total	**26,7**	**4**	**20,08**	**2**	**22,5**	**44**	**22,6**	**55**

*Vessel 3 – spacing of pingers was not compliant to recommended and was at random

A total of 105 cetaceans (1 ind. *T. truncatus* and 104 – *P. phocoena*) were recorded as bycatch in both control and active nets in spring and summer. Fishing effort was greater in spring compared to summer but almost equal between active and control nets. Significant increase in bycatch was registered in both active and control nets from spring to summer: 1,207 to 65,081 and 2,549 to 43,061 ind/km² day respectively.

Two statistical tests (T-test and ANOVA) were made to compare average bycatch rates in active and control nets and between seasons. These have shown that there is not statistically significant difference between active and control nets' average bycatch rates but there is significant difference between seasons.

Table 2: Standardized data on bycatch by vessel and season for active and control nets

Fishing vessel	Bycatch spring, (ind/km² day)		Bycatch summer, (ind/km² day)	
	Active	Control	Active	Control
Vessel 1	1,631	0,771	73,116	73,581
Vessel 2	0	7,123	0	16,026
Vessel 3*	7,3368	0	16,026	
Vessel 4	–	–	0	–
Average	**2,549**	**1,207**	**43,061**	**65,081**

*Vessel 3 – spacing of pingers was not compliant to recommended and was at random

CONCLUSIONS

- Despite small sample size (3.4%) of fishing vessels licensed for turbot fishery the results are showing large bycatch levels in summer suggesting sustainable levels set for the Harbour porpoise in Western Black Sea are exceeded.
- Results have not shown significant bycatch reduction by use of both types of pingers in multifilament nets.
- Positive results were registered only in monofilament nets (0 bycatch in active, 3 porpoises in control) but sample size was small.

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"These environmental data and related items of information have not been formally disseminated by NOAA and do not represent and should not be construed to represent any agency determination, view, or policy."

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