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CETACEAN BYCATCH IN THE BLACK SEA: AN UPDATE FROM NEW RESEARCH AND TESTING MITIGATION MEASURES

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Issue: cetacean bycatch in the Black Sea

1. Action requested

The Scientific Committee is invited to:

a. **examine** the results of the bycatch monitoring activities and of the mitigation measures trials;
b. **advise** on future actions to be undertaken.

2. Background

This document presents an update on the information presented at the Thirteenth Meeting of the Scientific Committee on cetacean bycatch monitoring and mitigation trials in the Black Sea.

Some of the data was collected through a study carried out in Bulgaria, Romania, Turkey and Ukraine in 2019-20 as part of the CeNoBS project. The study focused on developing monitoring and common methodology on bycatch assessment in the Black Sea.

Further data for 2021 was collected within the project "Monitoring and mitigation of cetaceans' bycatch in Bulgarian waters" funded through the ACCOBAMS Supplementary Conservation Funds. In particular, acoustic deterrent devices (pingers) of different models have been tested in Bulgaria as mitigation measures thanks to this project.

Data were collected from questionnaire surveys, onboard observations (focused on turbot catches) following GFCM protocols and practices, and examination of stranded carcasses.

Cetacean Bycatch in The Black Sea: An Update from New Research and Testing Mitigation Measures

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Summary
Incidental catch in fishing gears (bycatch) is a major mortality factor for the Black Sea harbour porpoise. The study during the CeNoBS project in Bulgaria, Romania, Turkey and Ukraine in 2019-20 was focused on developing monitoring and common methodology for bycatch assessment in the Black Sea. Further data for 2021 was collected within project "Monitoring and mitigation of cetaceans' bycatch in Bulgarian waters". Acoustic deterrent devices (pingers) of different models have been tested in Bulgaria as mitigation measures. Data were collected from questionnaire surveys, onboard observations (focused on turbot catches) following the GFCM protocols and practices, and examination of stranded carcasses. In Bulgaria and Romania 60 onboard observer missions were completed, and bycaught cetaceans (mostly, harbour porpoises) were found in 55% of missions, in total 189 cetaceans (182 harbour porpoises). The median number of porpoises bycaught per trip was 1, and the maximum number was 41; the number of bycaught porpoises per km of the net varied between 0 and 3.66 (the median 0.15). In addition, cetacean bycatch was reported in 48% of interviews, and IUU operations were identified as a source of bycatch. Bycatch showed strong seasonality with the high risk during four months, from April to July. The total annual bycatch of harbour porpoises in the Black Sea was estimated from these data (1 individual per trip) and general characteristics of turbot catching fleets (at least 1 620 vessels legally catching turbot, 7.5-10 trips per bycatch season). The minimum estimate of annual bycatch was between 11,826 and 16,200 individuals. Although obtained on a fairly small sample of observation effort and having low precision, these results concurred with two previous independent studies which estimated the annual bycatch level of 20,000 individuals. Bycatch of the harbour porpoise in the Black Sea exceeds thresholds for sustainable levels and poses a significant threat for this subspecies. The main tasks for the future activities are updating fleet and effort assessments, enhancing the bycatch reporting and observation coverage, mortality analysis, validation of data, elaborating background for time-space closure measures, and, the most important, developing techniques for bycatch mitigation, with consideration of local specific features.

In the period 2019-2021 in Bulgaria onboard monitoring was organized to assess bycatch rate of cetaceans in bottom set gillnets for turbot and pingers were tested as mitigation measure. Following devices were used: Future Oceans – 10 kHz, 132 dB NETGUARD; Future Oceans – 70 kHz, 145 dB NETGUARD and Porpoise Alerting Devices (PAL) – 10 kHz, 132 dB by F3: Maritime Technology (Germany). In total 340.76 km of nets were monitored during the three years. Those were set at depths from 45 to 88 m with soaking times from 12 to 31 days. Bycatch numbers were 105 in 2019, 47 in 2020 and 31 in 2021 with 176 of these being harbour porpoises, 4 bottlenose dolphins and 3 common dolphins. Significant increase of bycatch from spring to

summer was observed. PALs spaced at 140 m have shown 77.6% reduction of bycatch during trials in 2020 and 2021. No significant difference in bycatch rates between active and control nets was observed for tested Future Oceans pingers except in 2021 and when used on shorter (less than 5000 m) strings of nets.

General information

Three species of odontocetes, each represented by a locally distributed subspecies, Black Sea common bottlenose dolphin (*Tursiops truncatus ponticus* Barabash, 1940), Black Sea short-beaked common dolphin (*Delphinus delphis ponticus* Barabash, 1935), and Black Sea harbour porpoise (*Phocoena phocoena relicta* Abel, 1905) inhabit the basins of the Black and Azov Seas. Of them, the Black Sea harbour porpoise s distinct by its complete geographical isolation from other populations of this species living in the Atlantic. Also, it has been known that incidental catch in fishing gears (bycatch) was a major mortality factor for the Black Sea harbour porpoise throughout decades.

In 2019, in the framework of the ACCOBAMS Survey Initiative, two international teams within two projects "Support MSFD implementation in the Black Sea through establishing a regional monitoring system of cetaceans (D1) and noise monitoring (D11) for achieving Good Environmental Status" (CeNoBS) and "Improving Environmental Monitoring in the Black Sea – Selected Measures" (EMBLAS-Plus) assessed the status of the Black Sea cetaceans. In total 62% of the Black Sea area was covered by aerial surveys. The overall abundance, estimated as a model based value and uncorrected for g(0), was 118328 common dolphins (CV = 0.06, 95% CI = 109398-136922), 18091 (CV = 0.24, 95% CI = 14249-29922) plus 24078 (CV = 0.18, 95% CI = 20954-39621) bottlenose dolphins (estimated separately for two study blocks) and 94219 (CV = 0.07, 95% CI = 85430-109750) harbour porpoises. Moreover, adding g(0) as 0.364 for the harbour porpoise for good weather conditions could probably give a corrected value of abundance for this species after final estimation as about 250,000 individuals. About a half of the population of the harbour porpoise was aggregated in the south-western part of the Black Sea, including coastal and shelf waters, sea slope and some of the deep sea area (ACCOBAMS, 2021).

The pilot bycatch study during the CeNoBS project focused on providing a common methodology for bycatch assessment at regional level. Data were collected from questionnaire surveys, onboard observations (focused on turbot catches) following the GFCM protocols and practices, and examination of stranded carcasses. The questionnaires included data about species, seasonality, gear types and other relevant information. Guidelines for onboard observers were disseminated in cooperation with the GFCM. The special attention was put on turbot catches, the main source of cetacean bycatch in the Black Sea. Additionally, examination of carcasses stranded ashore was conducted. Total bycatch in the five Black Sea countries which comprises the major part of observable fisheries operations in the Black Sea was estimated for harbour porpoises.

In total, 63 interviews were conducted in Bulgaria, Romania, Turkey and Ukraine, covering the main segments of the fleet. In 79% of interviews bycatch was reported, and 48% of respondents reported cases of bycatch of cetaceans; all of them mentioned the harbour porpoise as the bycaught species. Bycatch monitoring aboard vessels fishing turbot was made in Bulgaria and Romania. In total 43 monitoring missions were made covering 10 different vessels. Among them, bycaught cetaceans (mostly, harbour porpoises) were found in 65% of missions, in total 134 harbour porpoises. The median number of porpoises bycaught per trip was 1, and the maximum number was 41. IUU operations were identified as an important source of bycatch both from interviews and stranding records (CeNoBS, 2021).

In addition, during the period 2019-2021 in Bulgaria onboard monitoring was organized to assess bycatch rate of cetaceans in bottom set gillnets for turbot and pingers were tested as mitigation measure. Following devices were used: Future Oceans – 10 kHz, 132 dB NETGUARD; Future Oceans – 70 kHz, 145 dB NETGUARD and Porpoise Alerting Devices (PAL) – 10 kHz, 132 dB by F3: Maritime Technology. In total 345.81 km of nets were monitored during the three years. Those were set at depths from 45 to 88 m with soaking times from 12 to 31 days. PALs have shown better results compared to Future Oceans with overall decrease of 77.6% in bycatch rate. Respective levels of decrease were 61% in 2020 and 100% in 2021.

Recommendations

Considering the results of the CeNoBS project, including the aerial survey and the pilot bycatch study which highlighted significant link between turbot fishery-bycatch and high seasonal mortality of harbour porpoises in the Black Sea, which threatens the viability of the subspecies, we call for urgent measures to refine estimates of porpoise abundance and bycatch, along with measures to reduce bycatch levels.

Accurate and standardized spatio-temporal recording of fishing effort should be conducted. In addition, the best accurate estimate of the fleet involved in turbot catch operations, including IUU catch, should be achieved. Cooperation with fishermen and fisheries controlling authorities for enhancing the bycatch reporting is crucial in this effort, as well as the overall bycatch monitoring. Better enforcement is needed in the region to minimize IUU.

The retrieval of bycaught animals from vessels should be encouraged by the appropriate authorities in order to obtain biological data, including tissue samples, for a wide range of analyses.

Finally, and the most important, bycatch mitigation measures should be further tested and introduced in the Black Sea, with consideration of local specific features (e.g., assessment of effectiveness of pingers for the endemic Black Sea porpoises). One of the most common mitigation measures implemented worldwide for bycatch is using acoustic deterrent devices, namely pingers. Up to now a few models have been tested in Turkey, Romania and Bulgaria (Gönener and Bilgin, 2009; Bilgin and Köse, 2018; Popov et al., 2020). Recent trials in Bulgaria have shown good results for PAL pingers and trial in Turkey is on course. Meanwhile, modified nets with acrylic glass spheres were also tested in the central part of the Turkish Black Sea. The proper solution should be found to not create the negative effects of pingers such as habituation, habitat exclusion etc. Dolphin-safe fishing gears and technology are needed for the Black Sea cetaceans.

Therefore, we call ACCOBAMS Parties to create an Emergency Task Team with the full participation of the GFCM and DG Mare to identify and implement the best fishery management measures.

Further aerial surveys on density and distribution, as well as studies of population demography of Black Sea cetaceans are also recommended to identify seasonal variations and migrations resulting in interactions with fisheries.

Primary data

Bycatch monitoring aboard fishing vessels licensed for turbot fishing was made in Bulgaria and Romania in 2019 and 2021. In total 60 monitoring missions were made covering 10 different vessels (7 for Bulgaria and 3 for Romania).

Table 1. Primary data on cetacean bycatch recorded by onboard observers in Bulgaria and Romania in 2019-21

Country	Locality	Date	Catch	Catch mass	Gear	Gear length, meters	Net in water, days	Bycatch of the harbour porpoise
Bulgaria	Balchik	8.4.2019	Turbot	38	Gillnet	3640	24	0
Bulgaria	Balchik	10.4.2019	Turbot	40	Gillnet	4500	18	1
Bulgaria	Balchik	10.4.2019	Turbot	347	Gillnet	11760	24	2
Bulgaria	Balchik	11.4.2019	Turbot	119	Gillnet	10920	23	0
Bulgaria	Tsarevo	12.4.2019	Turbot		Gillnet	4100	19	1
Bulgaria	Balchik	12.4.2019	Turbot	134	Gillnet	7560	24	1
Bulgaria	Tsarevo	13.4.2019	Turbot	0	Gillnet	3500	7	0
Bulgaria	Tsarevo	13.4.2019	Turbot	0	Gillnet	4300	20	0
Bulgaria	Balchik	27.6.2019	Turbot	1	Gillnet	840	7	1
Bulgaria	Balchik	1.7.2019	Turbot	80	Gillnet	10700	10	14
Bulgaria	Balchik	2.7.2019	Turbot	97	Gillnet	11200	11	36
Bulgaria	Balchik	6.7.2019	Turbot	50	Gillnet	4500	16	2
Bulgaria	Tsarevo	6.7.2019	Turbot	0	Gillnet	5200	19	5
Bulgaria	Balchik	6.7.2019	Turbot	271	Gillnet	11200	16	41
Bulgaria	Primorsko	8.7.2019	Turbot, thornback ray	40	Gillnet	2000	19	0
Romania	Constanta	15.7.2019	Rapana	9625	Beam trawl	n/a	n/a	0
Bulgaria	Primorsko	21.10.2019	Turbot	20	Gillnet	2000	77	0
Bulgaria	Primorsko	4.11.2019	Turbot	60	Gillnet	2000	91	0
Romania	Midia	5.3.2020	Turbot	300	Gillnet	3000	22	0
Romania	Midia	20.3.2020	Turbot	50	Bottom trawl	36	1	0
Romania	Midia	20.3.2020	Turbot	0	Gillnet	4000	14	1
Romania	Midia	20.3.2020	Turbot	0	Gillnet	4000	14	0
Romania	Midia	4.4.2020	Turbot	175	Gillnet	1500	21	0
Bulgaria	Tsarevo	10.4.2020	Turbot, thornback ray	21	Gillnet	2300	31	1
Romania	Midia	10.4.2020	Turbot	180	Gillnet	6800	21	1
Romania	Midia	10.4.2020	Turbot	180	Gillnet	6800	29	1
Bulgaria	Balchik	10.4.2020	Turbot, thornback ray	31	Gillnet	11200	21	1
Bulgaria	Tsarevo	12.4.2020	Turbot, thornback ray	65	Gillnet	3200	15	0
Bulgaria	Kavarna	12.4.2020	Turbot, thornback ray	1020	Gillnet	8800	14	0
Bulgaria	Balchik	12.4.2020	Turbot, thornback ray	17	Gillnet	11480	22	2
Bulgaria	Balchik	13.4.2020	Turbot, thornback ray	28	Gillnet	11480	24	2
Bulgaria	Nessebar	13.4.2020	Turbot, thornback ray	140	Gillnet	16000	17	0
Bulgaria	Kavarna	28.6.2020	Turbot, thornback ray	60	Gillnet	3100	12	0
Bulgaria	Balchik	28.6.2020	Turbot, thornback ray, dogfish	577	Gillnet	11200	12	6
Bulgaria	Balchik	4.7.2020	Turbot, thornback ray	225	Gillnet	11200	14	14
Bulgaria	Balchik	16.7.2020	Turbot, thornback ray	150	Gillnet	11200	12	4
Romania	Midia	21.7.2020	Turbot	172	Gillnet	5000	13	1
Romania	Midia	22.7.2020	Turbot	15	Gillnet	1100	14	0
Romania	Midia	22.7.2020	Turbot	48	Gillnet	3000	14	2
Bulgaria	Balchik	23.7.2020	Turbot, thornback ray	140	Gillnet	11000	11	10

Bulgaria	Balchik	29.7.2020	Turbot, thornback ray	50	Gillnet	11200	13	3
Bulgaria	Balchik	2.8.2020	Turbot, thornback ray	60	Gillnet	10640	10	0
Bulgaria	Balchik	14.10.2020	thornback ray, Turbot	153	Gillnet	3100	7	0
Bulgaria	Balchik	10.4.2021	Turbot, thornback ray, dogfish	1136	Gillnet	10080	14	3
Bulgaria	Balchik	13.4.2021	thornback ray, Turbot		Gillnet	11760	13	2
Bulgaria	Balchik	11.4.2021	Turbot, thornback ray		Gillnet	9240	15	0
Bulgaria	Balchik	11.4.2021	thornback ray, Turbot		Gillnet	840	15	1
Bulgaria	Balchik	11.4.2021	Turbot, thornback ray		Gillnet	2500	15	0
Bulgaria	Primorsko	12.4.2021	thornback ray, Turbot	135	Gillnet	2700	16	0
Bulgaria	Nessebar	13.4.2021	Turbot, thornback ray	60	Gillnet	2000	15	2
Bulgaria	Balchik	2.7.2021	thornback ray, Turbot		Gillnet	10920	12	7
Bulgaria	Balchik	3.7.2021	Turbot, thornback ray		Gillnet	9240	13	0
Bulgaria	Balchik	3.7.2021	thornback ray, Turbot		Gillnet	1680	13	3
Bulgaria	Balchik	4.7.2021	Turbot, thornback ray		Gillnet	11760	14	10
Bulgaria	Balchik	4.7.2021	thornback ray, Turbot		Gillnet	2600	14	0
Bulgaria	Nessebar	15.7.2021	Turbot, thornback ray		Gillnet	3000	25	0
Bulgaria	Nessebar	15.7.2021	thornback ray, Turbot		Gillnet	3300	25	1
Bulgaria	Nessebar	15.7.2021	Turbot, thornback ray		Gillnet	3000	25	0
Bulgaria	Nessebar	15.7.2021	thornback ray, Turbot		Gillnet	2200	26	0
Bulgaria	Nessebar	15.7.2021	Turbot, thornback ray		Gillnet	2500	26	0

General statistics

N	60
Min	0
Max	41
Sum	182
Mean	3.03
Std. error	0.95
Variance	54.41
Stand. dev	7.38
Median	1
25 percentile	0
75 percentile	2
Skewness	4.06
Kurtosis	17.73
Geom. mean	0
CV	243.2

Therefore, bycaught cetaceans (mostly, harbour porpoises) were found in 55% of missions, in total 189 cetaceans (182 harbour porpoises). The median number of porpoises bycaught per trip was 1, and the maximum number was 41; the number of bycaught porpoises per km of the net varied between 0 and 3.66 (the median 0.15). High variance, skewness and kurtosis are explained by high incidence rate which is comparable to that of target fish species.

Bycatch showed strong seasonality with the high risk during four months, from April to July. All the cases but two exceeding the median number of bycaught porpoises per trip were recorded between June 27 and July

29 (the rest two cases were reported in April), whereas the cases exceeding median number per km were recorded between March and July.

Estimate of bycatch of the Black Sea harbour porpoise

Rationale. The most robust measure for fisheries assessment in the Black Sea is the fleet size (the number of vessels licensed for catch, e.g., turbot in this case), and the for fishing effort it is the number of trips, as these data are the most consistent and the best quantified across the region.
Therefore, the bycatch is estimated using th formula:

$N_{byc} = f$ (number of vessels; bycatch per trip; number of trips)

Median values were used instead of arithmetic means as better corresponding to the non-parametric nature of bycatch events, as well as for eliminating bias due to outliers – cases of extremely high bycatch events shifting the mean values. Thus, the most conservative estimate was obtained. Also, the average number of trips per the bycatch season directly recorded by onboard observers is presented below as the best measurement; however, this number can be somewhat higher and reach 10 per season, as seen from the questionnaire survey during the CeNoBS project.

Table 2. Estimated bycatch of the harbour porpoise in the Black Sea

<table>
<tr><th>Source of data on fleet</th><th>Country</th><th>Total number of vessels catching turbot</th><th>Fishing effort during the bycatch season, trips</th><th>Total estimates of bycatch</th></tr>
<tr><td rowspan="2">FAO, 2020</td><td>Bulgaria
Romania</td><td rowspan="2">1440</td><td>7.5</td><td rowspan="3">11,820</td></tr>
<tr><td>Russian Federation
Turkey</td><td>n/a</td></tr>
<tr><td>CeNoBS, 2021</td><td>Ukraine</td><td>180</td><td>n/a</td></tr>
<tr><td colspan="2">Species</td><td>BS abundance estimate g(0)-uncorrected</td><td>BS abundance estimate g(0)-corrected</td><td>1%</td></tr>
<tr><td colspan="2">Habour porpoise</td><td>94,000</td><td>258,000</td><td>940-2580</td></tr>
</table>

An alternative parameter of 10 trips per season leads to increase of this estimate of the annual bycatch by 16,200.

The obtained conservative estimate of the bycatch rate concurs with the previous research (Birkun et al. 2009, 2014; Tonay, 2016; Zaharieva et al., 2021); also, Birkun et al. (2014) estimated the annual bycatch rate in the Black Sea as 20,000 harbour porpoises, and that estimate does not seem exaggerated. Moreover, the updated result obtained by us means that even at the most conservative analytical approach the bycatch

rate for the harbour porpoise in the Black Sea is several folds higher than any conventional sustainable level. This bycatch level is among the highest in the world, and it can be about 2-4% of the worldwide cetacean bycatch (Read et al., 2006).

As seen from the observer coverage calculator proposed by Curtis and Caretta (2020), data presented here are somewhat limited due to the small sample size, mainly because of high variance of cetacean bycatches. The coverage by onboard observers, which can be recommended using this calculator for obtaining the CV value of 0.5, is at least 193 trips for the whole Black Sea. However, given the whole bulk of available evidence, low precision of our estimates poses concern as they can be underrated.

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References

ACCOBAMS, 2021. *Estimates of abundance and distribution of cetaceans in the Black Sea from 2019 surveys*. By Paiu, R.M., Panigada, S., Cañadas, A., Gol'din, P., Popov, D., David, L., Amaha Ozturk, A., Glazov, D. Ed. ACCOBAMS - ACCOBAMS Survey Initiative/CeNoBS Projects, Monaco, 54 pages.

Bilgin, S., and Köse, Ö. 2018. Testing two types of acoustic deterrent devices (pingers) to reduce harbour porpoise, *Phocoena phocoena* (Cetacea: Phocoenidae), by catch in turbot (Psetta maxima) set gillnet fishery in the Black Sea, Turkey. *Cahiers de Biologie Marine*, *59*: 473-479.

Birkun, A., Krivokhizhin, S., Masberg, I., and Radygin, G. 2009. Cetacean by-catches in the course of turbot and spiny dogfish fisheries in the Northwestern Black Sea. In Abstract Book, pp. 15, 16. *23nd Annual Conference of the European Cetacean Society*, Istanbul. 194 pp.

Birkun Jr, A., Northridge, S. P., Willsteed, E. A., James, F. A., Kilgour, C., Lander, M., & Fitzgerald, G. D. 2014. *Studies for Carrying Out the Common Fisheries Policy: Adverse Fisheries Impacts on Cetacean Populations in the Black Sea.* Final report to the European Commission, Brussels, 347p.

CeNoBS, 2021. Detailed Report of the pilot(s) on bycatch monitoring, including recommendations to further develop D1C1 criterion. By Gol'din, P., Vishnyakova, K., Popov, D., Paiu, R.M., Tonay, A. M., Düzgüneş, E., Timofte, C., Meshkova, G., Panayotova, M., Amaha Öztürk, A. CeNoBS Project, Odesa, Ukraine, 57 pages.

Curtis, K. A. and Carretta, J. V. 2020. ObsCovgTools: Assessing observer coverage needed to document and estimate rare event bycatch. Fisheries Research 225: 105493. [The calculator: https://kacurtis.shinyapps.io/obscov/]

FAO. 2020. *The State of Mediterranean and Black Sea Fisheries 2020*. General Fisheries Commission for the Mediterranean. Rome. https://doi.org/10.4060/cb2429en

Gönener, S., and Bilgin, S. 2009. The effect of pingers on harbour porpoise, *Phocoena phocoena* bycatch and fishing effort in the turbot gill net fishery in the Turkish Black Sea coast. *Turkish Journal of Fisheries and Aquatic Sciences*, *9*(2): 151-157.

Popov, D. V., Meshkova, G. D., Hristova, P. D., Gradev, G. Z., Rusev, D. Z., Panayotova, M. D., & Dimitrov, H. A. 2020. Pingers as Cetacean Bycatch Mitigation Measure in Bulgarian Turbot Fishery. *Acta Zoologica Bulgarica,* S15: 235-242.

Read, A. J., Drinker, P., & Northridge, S. 2006. Bycatch of marine mammals in US and global fisheries. *Conservation biology*, 20(1): 163-169.

Tonay, A. M. 2016. Estimates of cetacean by-catch in the turbot fishery on the Turkish Western Black Sea Coast in 2007 and 2008. Marine Biological Association of the United Kingdom. *Journal of the Marine Biological Association of the United Kingdom*, 96(4): 993-998.

Zaharieva, Z. A., Racheva, V. V., & Simeonovska-Nikolova, D. 2021. Cetacean Bycatch in Turbot Gillnets by Bulgarian Fisheries in the Black Sea. Acta Zoologica Bulgarica *http://www.acta-zoologica-bulgarica.eu/2021/002545*