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ORIGINAL ARTICLE

## **SUPPLEMENTARY MATERIAL**

### **Influence of environmental parameters on the abundance, biodiversity and distribution of demersal elasmobranchs in the eastern Sea of Marmara, with a focus on deoxygenation**

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## SUPPLEMENTARY TABLES

**Supplementary Table 1.** Overall view of MD1-10 stations. CTD measurements and CPUE values. Red area indicates the periods with no reliable CTD measurements available. W, winter; Sp, Spring; Su, summer; A, autumn; DO, dissolved oxygen; T, temperature; S, salinity; CPUA, biomass; and CPUN, abundance. Oceanographic parameters (DO, T and S) were measured approximately 1 to 2 m above the seabed, with depth determined by echosounding.

NO	DATE	SEASON	STATION	DEPTH (m)	DO (mg/L)	T (°C)	S (‰)	CPUA (kg/km <sup>2</sup> )	CPUN (ind./km <sup>2</sup> )
1	5.12.2014	W	MD1	82.1	0.5	15.1	38.7	0.0	0.0
2	5.12.2014	W	MD2	68.0	0.9	16.1	38.7	153.3	83.1
3	10.12.2014	W	MD3	97.3	0.5	15.8	38.7	0.0	0.0
4	10.12.2014	W	MD4	86.9	0.6	15.4	38.7	0.0	0.0
5	10.12.2014	W	MD5	65.9	1.3	15.4	38.7	1,013.5	13,582.0
6	11.12.2014	W	MD6	99.3	1.3	15.3	38.7	4.6	83.1
7	11.12.2014	W	MD7	93.9	1.3	15.3	38.7	1,283.4	498.4
8	12.12.2014	W	MD8	46.1	2.1	16.1	38.7	166.1	83.1
9	17.12.2014	W	MD9	40.3	2.2	16.1	38.6	0.0	0.0
10	5.05.2015	Sp	MD1	55.0	N/A	N/A	N/A	0.0	0.0
11	5.05.2015	Sp	MD2	67.0	N/A	N/A	N/A	0.0	0.0
12	5.05.2015	Sp	MD3	94.0	N/A	N/A	N/A	0.0	0.0
13	7.05.2015	Sp	MD4	85.0	N/A	N/A	N/A	0.0	0.0
14	7.05.2015	Sp	MD5	61.0	N/A	N/A	N/A	3,908.9	5,275.0
15	8.05.2015	Sp	MD6	125.0	N/A	N/A	N/A	0.0	0.0
16	8.05.2015	Sp	MD7	94.0	N/A	N/A	N/A	0.0	0.0
17	6.05.2015	Sp	MD8	63.0	N/A	N/A	N/A	573.2	83.1
18	6.05.2015	Sp	MD9	40.0	N/A	N/A	N/A	859.8	1,910.6
19	6.05.2015	Sp	MD10	55.0	N/A	N/A	N/A	0.0	0.0
20	23.07.2015	Su	MD1	85.8	N/A	N/A	N/A	0.0	0.0
21	23.07.2015	Su	MD2	64.0	N/A	N/A	N/A	67.5	45.0
22	23.07.2015	Su	MD3	97.9	N/A	N/A	N/A	0.0	0.0
23	23.07.2015	Su	MD4	84.8	N/A	N/A	N/A	13.0	129.6
24	28.07.2015	Su	MD5	64.8	N/A	N/A	N/A	250.4	200.0
25	27.07.2015	Su	MD6	132.0	N/A	N/A	N/A	2.6	172.8
26	27.07.2015	Su	MD7	93.9	N/A	N/A	N/A	1,125.2	664.6
27	24.07.2015	Su	MD8	60.1	N/A	N/A	N/A	0.0	0.0
28	24.07.2015	Su	MD9	37.5	N/A	N/A	N/A	0.0	0.0
29	24.07.2015	Su	MD10	54.1	N/A	N/A	N/A	0.0	0.0
30	12.02.2016	W	MD1	86.4	0.5	15.1	38.7	194.4	129.6
31	12.02.2016	W	MD2	67.7	0.8	16.1	38.7	61.8	86.4
32	12.02.2016	W	MD3	96.1	0.5	15.8	38.7	43.2	43.2
33	12.02.2016	W	MD4	87.0	0.6	15.4	38.7	0.0	0.0
34	16.02.2016	W	MD5	65.7	1.3	15.4	38.7	198.7	86.4
35	15.02.2016	W	MD6	133.0	1.2	15.3	38.7	1.1	43.2
36	15.02.2016	W	MD7	97.5	1.2	15.3	38.7	1,183.8	623.0
37	9.02.2016	W	MD8	71.3	2.1	16.0	38.6	244.3	205.7
38	9.02.2016	W	MD9	42.1	2.2	16.1	38.6	95.5	41.5
39	9.02.2016	W	MD10	52.3	N/A	N/A	N/A	13.0	43.2

40	2.05.2016	Sp	MD1	86.4	N/A	N/A	N/A	66.5	124.6
41	2.05.2016	Sp	MD2	68.9	N/A	N/A	N/A	0.0	0.0
42	2.05.2016	Sp	MD3	94.3	N/A	N/A	N/A	0.0	0.0
43	16.05.2016	Sp	MD4	87.0	N/A	N/A	N/A	75.9	259.2
44	16.05.2016	Sp	MD5	62.5	N/A	N/A	N/A	479.7	249.2
45	9.05.2016	Sp	MD6	133.0	N/A	N/A	N/A	2,220.5	27,828.5
46	9.05.2016	Sp	MD7	97.0	N/A	N/A	N/A	1,747.3	1,295.9
47	3.05.2016	Sp	MD8	72.7	N/A	N/A	N/A	432.0	373.8
48	2.05.2016	Sp	MD9	44.8	N/A	N/A	N/A	982.9	518.4
49	3.05.2016	Sp	MD10	53.4	N/A	N/A	N/A	0.0	0.0
50	27.07.2016	Su	MD1	86.4	1.1	15.5	38.7	2,552.9	14,557.2
51	27.07.2016	Su	MD2	68.0	1.2	15.7	38.6	8.6	86.4
52	27.07.2016	Su	MD3	95.4	1.0	15.4	38.7	240.9	913.8
53	29.07.2016	Su	MD4	87.5	1.1	15.5	38.7	691.1	4,924.4
54	29.07.2016	Su	MD5	67.1	1.7	15.7	38.5	360.1	249.2
55	26.07.2016	Su	MD6	138.0	1.5	15.3	38.7	1,339.1	14,470.8
56	26.07.2016	Su	MD7	96.0	1.7	15.4	38.7	453.6	216.0
57	25.07.2016	Su	MD8	70.9	1.2	15.5	38.7	57.9	77.1
58	25.07.2016	Su	MD9	44.7	1.7	15.9	38.6	731.9	1,759.9
59	25.07.2016	Su	MD10	48.4	1.3	15.8	38.7	0.0	0.0
60	10.11.2016	A	MD1	84.8	1.6	15.5	38.7	826.1	1,121.4
61	10.11.2016	A	MD2	69.1	2.8	16.3	38.7	198.2	83.1
62	14.11.2016	A	MD3	95.2	1.6	15.4	38.7	780.9	3,239.7
63	14.11.2016	A	MD4	90.2	2.2	15.5	38.7	95.5	41.5
64	14.11.2016	A	MD5	52.9	2.7	16.3	38.7	91.4	41.5
65	11.11.2016	A	MD6	140.0	1.3	15.3	38.7	84.7	415.4
66	11.11.2016	A	MD7	95.2	1.6	15.4	38.7	610.6	706.1
67	18.11.2016	A	MD8	67.9	2.3	15.8	38.7	776.7	249.2
68	10.11.2016	A	MD9	40.3	2.7	16.3	38.7	1,638.6	581.5
69	18.11.2016	A	MD10	53.2	2.4	15.8	38.7	0.0	0.0
70	23.02.2017	W	MD1	86.9	N/A	N/A	N/A	0.0	0.0
71	23.02.2017	W	MD2	69.0	N/A	N/A	N/A	0.0	0.0
72	21.02.2017	W	MD3	90.0	N/A	N/A	N/A	0.0	0.0
73	21.02.2017	W	MD4	96.2	N/A	N/A	N/A	62.3	498.4
74	21.02.2017	W	MD5	58.3	N/A	N/A	N/A	2,380.0	913.8
75	20.02.2017	W	MD6	151.0	N/A	N/A	N/A	89.3	830.7
76	20.02.2017	W	MD7	95.2	N/A	N/A	N/A	265.8	124.6
77	22.02.2017	W	MD8	73.1	N/A	N/A	N/A	332.3	83.1
78	22.02.2017	W	MD9	42.4	N/A	N/A	N/A	0.0	0.0
79	22.02.2017	W	MD10	49.8	N/A	N/A	N/A	39.5	41.5
80	16.05.2017	Sp	MD1	87.5	N/A	N/A	N/A	0.0	0.0
81	16.05.2017	Sp	MD2	69.1	N/A	N/A	N/A	0.0	0.0
82	16.05.2017	Sp	MD3	95.9	N/A	N/A	N/A	0.0	0.0
83	23.05.2017	Sp	MD4	87.2	N/A	N/A	N/A	0.0	0.0
84	23.05.2017	Sp	MD5	63.5	N/A	N/A	N/A	47.4	41.5
85	22.05.2017	Sp	MD6	130.0	N/A	N/A	N/A	0.0	0.0
86	22.05.2017	Sp	MD7	95.2	N/A	N/A	N/A	778.6	664.6
87	17.05.2017	Sp	MD8	71.7	N/A	N/A	N/A	1,734.3	345.6

88	17.05.2017	Sp	MD9	47.1	N/A	N/A	N/A	497.5	1,272.8
89	17.05.2017	Sp	MD10	51.4	N/A	N/A	N/A	0.0	0.0
90	7.07.2017	Su	MD1	89.0	N/A	N/A	N/A	16.6	41.5
91	7.07.2017	Su	MD2	67.9	N/A	N/A	N/A	0.0	0.0
92	7.07.2017	Su	MD3	96.2	N/A	N/A	N/A	0.0	0.0
93	10.07.2017	Su	MD4	87.8	N/A	N/A	N/A	40.7	83.1
94	11.07.2017	Su	MD5	52.7	N/A	N/A	N/A	270.0	124.6
95	12.07.2017	Su	MD6	126.0	N/A	N/A	N/A	0.0	0.0
96	13.07.2017	Su	MD7	86.9	N/A	N/A	N/A	0.0	0.0
97	6.07.2017	Su	MD8	78.2	N/A	N/A	N/A	27.1	83.1
98	6.07.2017	Su	MD9	43.9	N/A	N/A	N/A	405.0	732.8
99	6.07.2017	Su	MD10	50.7	N/A	N/A	N/A	0.0	0.0
100	19.09.2017	A	MD1	86.0	N/A	N/A	N/A	1,018.4	1,952.2
101	19.09.2017	A	MD2	70.0	N/A	N/A	N/A	0.0	0.0
102	19.09.2017	A	MD3	95.0	N/A	N/A	N/A	63.1	166.1
103	20.09.2017	A	MD4	87.3	N/A	N/A	N/A	0.0	0.0
104	20.09.2017	A	MD5	60.0	N/A	N/A	N/A	28.1	86.4
105	20.09.2017	A	MD6	131.0	N/A	N/A	N/A	556.6	1,246.1
106	20.09.2017	A	MD7	98.4	N/A	N/A	N/A	2,138.2	993.5
107	21.09.2017	A	MD8	72.9	N/A	N/A	N/A	0.0	0.0
108	21.09.2017	A	MD10	49.0	N/A	N/A	N/A	0.0	0.0
109	21.05.2018	Sp	MD1	86.9	N/A	N/A	N/A	0.0	0.0
110	21.05.2018	Sp	MD2	70.3	N/A	N/A	N/A	0.0	0.0
111	22.05.2018	Sp	MD3	95.0	N/A	N/A	N/A	0.0	0.0
112	22.05.2018	Sp	MD5	53.5	N/A	N/A	N/A	759.9	400.0
113	22.05.2018	Sp	MD6	121.0	N/A	N/A	N/A	3.9	38.6
114	22.05.2018	Sp	MD7	94.5	N/A	N/A	N/A	683.9	360.0
115	23.05.2018	Sp	MD8	72.8	N/A	N/A	N/A	0.0	0.0
116	23.05.2018	Sp	MD9	43.4	N/A	N/A	N/A	1,379.9	719.9
117	23.05.2018	Sp	MD10	50.2	N/A	N/A	N/A	0.0	0.0
118	9.07.2018	Su	MD1	86.9	N/A	N/A	N/A	0.0	0.0
119	9.07.2018	Su	MD2	67.6	N/A	N/A	N/A	0.0	0.0
120	9.07.2018	Su	MD3	95.9	N/A	N/A	N/A	24.3	81.0
121	11.07.2018	Su	MD4	87.5	N/A	N/A	N/A	174.9	144.0
122	11.07.2018	Su	MD5	65.9	N/A	N/A	N/A	0.0	0.0
123	11.07.2018	Su	MD6	123.0	N/A	N/A	N/A	0.0	0.0
124	11.07.2018	Su	MD7	92.1	N/A	N/A	N/A	304.7	225.7
125	10.07.2018	Su	MD8	68.7	N/A	N/A	N/A	0.0	0.0
126	10.07.2018	Su	MD9	45.3	N/A	N/A	N/A	530.3	1,311.3
127	10.07.2018	Su	MD10	51.8	N/A	N/A	N/A	0.0	0.0
128	9.10.2018	A	MD1	86.2	1.7	15.9	38.7	259.2	200.0
129	9.10.2018	A	MD2	70.0	1.7	15.6	38.7	0.0	0.0
130	9.10.2018	A	MD3	95.4	1.7	15.4	38.7	36.0	80.0
131	9.10.2018	A	MD4	94.5	1.7	15.5	38.8	860.5	1,696.8
132	8.10.2018	A	MD5	64.2	1.7	15.5	38.7	122.7	58.4
133	8.10.2018	A	MD6	123.0	1.7	15.4	38.7	719.9	1,359.9
134	8.10.2018	A	MD7	93.5	1.7	15.4	38.7	326.0	639.9
135	10.10.2018	A	MD8	72.5	1.7	15.5	38.7	0.0	0.0

136	10.10.2018	A	MD9	45.0	1.7	15.8	38.6	455.1	231.4
137	10.10.2018	A	MD10	51.5	1.7	15.6	37.9	0.0	0.0
138	19.06.2019	Su	MD1	82.8	1.7	15.3	38.7	150.0	480.0
139	19.06.2019	Su	MD2	69.0	1.7	15.5	38.8	0.0	0.0
140	19.06.2019	Su	MD3	91.2	1.7	15.3	38.7	0.0	0.0
141	21.06.2019	Su	MD4	85.2	1.7	15.3	38.7	0.0	0.0
142	18.06.2019	Su	MD8	75.1	1.7	15.4	38.8	15.3	40.0
143	18.06.2019	Su	MD9	35.0	1.9	11.6	30.1	64.8	172.8
144	18.06.2019	Su	MD10	57.8	1.7	15.5	38.8	302.4	129.6
145	24.06.2020	Su	MD1	85.9	N/A	N/A	N/A	0.0	0.0
146	24.06.2020	Su	MD2	66.8	N/A	N/A	N/A	0.0	0.0
147	24.06.2020	Su	MD3	92.8	N/A	N/A	N/A	0.0	0.0
148	24.06.2020	Su	MD4	94.5	N/A	N/A	N/A	270.0	977.1
149	22.06.2020	Su	MD5	60.7	N/A	N/A	N/A	93.8	51.4
150	22.06.2020	Su	MD6	133.0	N/A	N/A	N/A	173.8	102.8
151	22.06.2020	Su	MD7	91.4	N/A	N/A	N/A	0.0	0.0
152	25.06.2020	Su	MD8	72.7	N/A	N/A	N/A	0.0	0.0
153	25.06.2020	Su	MD9	35.0	N/A	N/A	N/A	54.5	120.0
154	25.06.2020	Su	MD10	57.8	N/A	N/A	N/A	0.0	0.0
155	5.11.2020	A	MD1	85.2	N/A	N/A	N/A	88.9	74.5
156	5.11.2020	A	MD2	71.4	N/A	N/A	N/A	291.7	24.8
157	5.11.2020	A	MD3	93.8	N/A	N/A	N/A	134.1	273.1
158	5.11.2020	A	MD4	94.0	N/A	N/A	N/A	641.0	1,737.8
159	2.11.2020	A	MD5	60.0	N/A	N/A	N/A	0.0	0.0
160	2.11.2020	A	MD6	135.0	N/A	N/A	N/A	876.8	2,211.3
161	2.11.2020	A	MD7	91.4	N/A	N/A	N/A	407.3	247.2
162	4.11.2020	A	MD8	76.1	N/A	N/A	N/A	3.7	25.7
163	4.11.2020	A	MD9	44.7	N/A	N/A	N/A	1,182.8	745.7
164	4.11.2020	A	MD10	55.9	N/A	N/A	N/A	0.0	0.0
165	4.06.2021	Su	MD2	71.7	1.0	15.7	38.7	27.2	53.3
166	21.04.2022	Sp	MD1	85.2	0.9	9.0	38.8	0.0	0.0
167	22.04.2022	Sp	MD4	94.0	1.0	9.0	38.8	548.1	102.8
168	20.04.2022	Sp	MD5	60.0	1.3	9.0	38.7	270.7	221.5
169	22.04.2022	Sp	MD6	135.0	0.4	9.0	38.7	14.4	51.4
170	20.04.2022	Sp	MD7	91.4	1.1	9.0	38.8	701.4	800.6
171	21.04.2022	Sp	MD8	76.1	1.0	9.0	38.8	274.6	106.7
172	21.04.2022	Sp	MD10	55.9	1.2	9.0	38.8	649.2	257.1
173	11.06.2022	Su	MD2	66.0	1.4	9.0	38.8	108.1	38.6
174	9.06.2022	Su	MD4	84.0	0.7	9.0	38.8	3,421.8	3,419.7
175	10.06.2022	Su	MD5	60.0	1.1	9.0	38.8	726.4	308.5
176	12.06.2022	Su	MD8	76.1	0.7	8.9	38.8	0.0	0.0
177	11.06.2022	Su	MD9	33.0	2.2	9.0	36.8	951.4	1,249.5
178	12.01.2023	W	MD1	84.0	1.1	8.9	38.8	1,182.7	374.4
179	12.01.2023	W	MD2	60.4	1.6	8.9	38.8	840.9	259.2
180	10.01.2023	W	MD4	82.3	1.0	9.0	38.8	378.7	201.6
181	11.01.2023	W	MD5	60.0	1.5	9.0	38.8	129.6	57.6
182	11.01.2023	W	MD6	126.0	1.1	8.9	38.8	385.9	230.4
183	11.01.2023	W	MD7	94.0	1.2	9.0	38.8	1,794.7	726.9

184	9.01.2023	W	MD8	75.0	1.1	9.0	38.8	1,124.6	259.2
185	9.01.2023	W	MD9	45.3	3.4	9.1	37.4	795.1	384.0
186	9.01.2023	W	MD10	55.0	1.4	9.0	38.8	1,728.7	403.2
187	18.12.2023	W	MD1	26.3	3.2	17.1	38.3	3,648.3	1,046.3
188	18.12.2023	W	MD2	68.4	1.0	15.4	38.8	373.3	213.3
189	19.02.2024	W	MD1	79.8	1.5	15.5	38.5	32.9	346.6
190	23.02.2024	W	MD2	61.4	2.3	16.2	38.7	76.0	453.3
191	19.02.2024	W	MD4	78.8	1.7	15.7	38.8	27.9	186.7
192	19.02.2024	W	MD5	60.8	2.1	16.0	38.8	74.5	266.6
193	21.02.2024	W	MD6	122.2	1.4	15.3	38.8	41.7	4,852.9
194	21.02.2024	W	MD7	95.8	1.4	15.5	38.8	43.3	266.6
195	22.02.2024	W	MD8	65.9	2.2	16.0	38.8	0.0	0.0
196	23.02.2024	W	MD9	24.6	7.1	12.5	31.9	61.0	373.3
197	22.02.2024	W	MD10	41.5	3.0	16.6	38.5	6.9	80.0
198	8.08.2024	Su	MD1	82.0	1.1	15.5	38.8	893.0	498.4
199	8.08.2024	Su	MD2	61.6	1.5	15.9	38.8	371.3	373.8
200	17.08.2024	Su	MD3	132.0	2.0	15.4	38.8	664.6	83.1
201	8.08.2024	Su	MD4	75.3	1.2	15.7	38.8	1,929.8	1,599.9
202	8.08.2024	Su	MD5	65.6	2.3	16.0	38.8	133.7	207.7
203	9.08.2024	Su	MD6	109.7	1.6	15.5	38.8	1,153.8	332.3
204	8.08.2024	Su	MD7	94.7	1.7	15.6	38.8	189.0	83.1
205	9.08.2024	Su	MD8	79.0	1.3	15.6	38.8	0.0	0.0

**Supplementary Table 2.** Environmentally matched dataset upon which the analysis was performed. W, winter; Sp, Spring; Su, summer; A, autumn; DO, dissolved oxygen; T, temperature; S, salinity; C<sub>PUA</sub>, biomass; and C<sub>PUN</sub>, abundance. Oceanographic parameters (DO, T and S) were measured approximately 1 to 2 m above the seabed, with depth determined by echosounding.

NO	DATE	SEASON	STATION	DEPTH (m)	DO (mg/L)	T (°C)	S (‰)	C <sub>PUA</sub> (kg/km <sup>2</sup> )	C <sub>PUN</sub> (ind./km <sup>2</sup> )
1	5.12.2014	W	MD2	68.0	0.9	16.1	38.7	153.3	83.1
2	10.12.2014	W	MD5	65.9	1.3	15.4	38.7	1,013.5	13,582.0
3	11.12.2014	W	MD6	99.3	1.3	15.3	38.7	4.6	83.1
4	11.12.2014	W	MD7	93.9	1.3	15.3	38.7	1,283.4	498.4
5	12.12.2014	W	MD8	46.1	2.1	16.1	38.7	166.1	83.1
6	27.07.2016	Su	MD1	86.4	1.1	15.5	38.7	2,552.9	14,557.2
7	27.07.2016	Su	MD2	68.0	1.2	15.7	38.6	8.6	86.4
8	27.07.2016	Su	MD3	95.4	1.0	15.4	38.7	240.9	913.8
9	29.07.2016	Su	MD4	87.5	1.1	15.5	38.7	691.1	4,924.4
10	29.07.2016	Su	MD5	67.1	1.7	15.7	38.5	360.1	249.2
11	26.07.2016	Su	MD6	138.0	1.5	15.3	38.7	1,339.1	14,470.8
12	26.07.2016	Su	MD7	96.0	1.7	15.4	38.7	453.6	216.0
13	25.07.2016	Su	MD8	70.9	1.2	15.5	38.7	57.9	77.1
14	25.07.2016	Su	MD9	44.7	1.7	15.9	38.6	731.9	1,759.9
15	10.11.2016	A	MD1	84.8	1.6	15.5	38.7	826.1	1,121.4
16	10.11.2016	A	MD2	69.1	2.8	16.3	38.7	198.2	83.1
17	14.11.2016	A	MD3	95.2	1.6	15.4	38.7	780.9	3,239.7
18	14.11.2016	A	MD4	90.2	2.2	15.5	38.7	95.5	41.5
19	14.11.2016	A	MD5	52.9	2.7	16.3	38.7	91.4	41.5
20	11.11.2016	A	MD6	140.0	1.3	15.3	38.7	84.7	415.4
21	11.11.2016	A	MD7	95.2	1.6	15.4	38.7	610.6	706.1
22	18.11.2016	A	MD8	67.9	2.3	15.8	38.7	776.7	249.2
23	10.11.2016	A	MD9	40.3	2.7	16.3	38.7	1,638.6	581.5
24	9.10.2018	A	MD1	86.2	1.7	15.9	38.7	259.2	200.0
25	9.10.2018	A	MD3	95.4	1.7	15.4	38.7	36.0	80.0
26	9.10.2018	A	MD4	94.5	1.7	15.5	38.8	860.5	1,696.8
27	8.10.2018	A	MD5	64.2	1.7	15.5	38.7	122.7	58.4
28	8.10.2018	A	MD6	123.0	1.7	15.4	38.7	719.9	1,359.9
29	8.10.2018	A	MD7	93.5	1.7	15.4	38.7	326.0	639.9
30	10.10.2018	A	MD9	45.0	1.7	15.8	38.6	455.1	231.4
31	19.06.2019	Su	MD1	82.8	1.7	15.3	38.7	150.0	480.0
32	18.06.2019	Su	MD8	75.1	1.7	15.4	38.8	15.3	40.0
33	18.06.2019	Su	MD9	35.0	1.9	11.6	30.1	64.8	172.8
34	18.06.2019	Su	MD10	57.8	1.7	15.5	38.8	302.4	129.6
35	4.06.2021	Su	MD2	71.7	1.0	15.7	38.7	27.2	53.3
36	22.04.2022	Sp	MD4	94.0	1.0	9.0	38.8	548.1	102.8
37	20.04.2022	Sp	MD5	60.0	1.3	9.0	38.7	270.7	221.5
38	22.04.2022	Sp	MD6	135.0	0.4	9.0	38.7	14.4	51.4
39	20.04.2022	Sp	MD7	91.4	1.1	9.0	38.8	701.4	800.6
40	21.04.2022	Sp	MD8	76.1	1.0	9.0	38.8	274.6	106.7
41	21.04.2022	Sp	MD10	55.9	1.2	9.0	38.8	649.2	257.1
42	11.06.2022	Su	MD2	66.0	1.4	9.0	38.8	108.1	38.6

43	9.06.2022	Su	MD4	84.0	0.7	9.0	38.8	3,421.8	3,419.7
44	10.06.2022	Su	MD5	60.0	1.1	9.0	38.8	726.4	308.5
45	11.06.2022	Su	MD9	33.0	2.2	9.0	36.8	951.4	1,249.5
46	12.01.2023	W	MD1	84.0	1.1	8.9	38.8	1,182.7	374.4
47	12.01.2023	W	MD2	60.4	1.6	8.9	38.8	840.9	259.2
48	10.01.2023	W	MD4	82.3	1.0	9.0	38.8	378.7	201.6
49	11.01.2023	W	MD5	60.0	1.5	9.0	38.8	129.6	57.6
50	11.01.2023	W	MD6	126.0	1.1	8.9	38.8	385.9	230.4
51	11.01.2023	W	MD7	94.0	1.2	9.0	38.8	1,794.7	726.9
52	9.01.2023	W	MD8	75.0	1.1	9.0	38.8	1,124.6	259.2
53	9.01.2023	W	MD9	45.3	3.4	9.1	37.4	795.1	384.0
54	9.01.2023	W	MD10	55.0	1.4	9.0	38.8	1,728.7	403.2
55	18.12.2023	W	MD1	26.3	3.2	17.1	38.3	3,648.3	1,046.3
56	18.12.2023	W	MD2	68.4	1.0	15.4	38.8	373.3	213.3
57	19.02.2024	W	MD1	79.8	1.5	15.5	38.5	32.9	346.6
58	23.02.2024	W	MD2	61.4	2.3	16.2	38.7	76.0	453.3
59	19.02.2024	W	MD4	78.8	1.7	15.7	38.8	27.9	186.7
60	19.02.2024	W	MD5	60.8	2.1	16.0	38.8	74.5	266.6
61	21.02.2024	W	MD6	122.2	1.4	15.3	38.8	41.7	4,852.9
62	21.02.2024	W	MD7	95.8	1.4	15.5	38.8	43.3	266.6
63	23.02.2024	W	MD9	24.6	7.1	12.5	31.9	61.0	373.3
64	22.02.2024	W	MD10	41.5	3.0	16.6	38.5	6.9	80.0
65	8.08.2024	Su	MD1	82.0	1.1	15.5	38.8	893.0	498.4
66	8.08.2024	Su	MD2	61.6	1.5	15.9	38.8	371.3	373.8
67	17.08.2024	Su	MD3	132.0	2.0	15.4	38.8	664.6	83.1
68	8.08.2024	Su	MD4	75.3	1.2	15.7	38.8	1,929.8	1,599.9
69	8.08.2024	Su	MD5	65.6	2.3	16.0	38.8	133.7	207.7
70	9.08.2024	Su	MD6	109.7	1.6	15.5	38.8	1,153.8	332.3
71	8.08.2024	Su	MD7	94.7	1.7	15.6	38.8	189.0	83.1

**Supplementary Table 3.** Number of demersal elasmobranch species sampled at each of the stations annually during period 2014-2024. No demersal sampling could have been conducted in 2021. A 3-alpha codes for the sampled species shown alongside their respective species names as follows: *Galeus melastomus*. SHO; *Sycliorhinus canicula*. SYC; *Mustelus mustelus*. SMD; *Oxynotus centrina*. OXY; *Squalus acanthias*. DGS; *Squalus blainville*. QUB; *Raja clavata*. RJC; *Raja miraletus*. JAI; *Dasyatis pastinaca*. JDP; *Dasyatis tortonesei*. JDO; *Myliobatis aquila*. MYL.

2014											2019											
Species	MD1	MD2	MD3	MD4	MD5	MD6	MD7	MD8	MD9	MD10	Species	MD1	MD2	MD3	MD4	MD5	MD6	MD7	MD8	MD9	MD10	
SHO											SHO											
SYC											SYC											
SMD								2			SMD								1			
OXY											OXY											
DGS					325	2					DGS											
QUB											QUB	8							1	3		
RJC		2			2			11			RJC											
JAI								1			JAI											
JDP											JDP											3
JDO											JDO											
MYL											MYL											
2015											2020											
Species	MD1	MD2	MD3	MD4	MD5	MD6	MD7	MD8	MD9	MD10	Species	MD1	MD2	MD3	MD4	MD5	MD6	MD7	MD8	MD9	MD10	
SHO											SHO											
SYC											SYC											
SMD		1							45		SMD					1					2	
OXY											OXY					1						
DGS				3	107	4	3				DGS											



<i>SMD</i>	5				1					10	
<i>OXY</i>					2						
<i>DGS</i>											
<i>QUB</i>	42		4	14	2	49	6	4	32		
<i>RJC</i>	2				7		36	1	8	1	
<i>JAI</i>											
<i>JDP</i>					16			6	1		
<i>JDO</i>											
<i>MYL</i>								1	1		

<i>SMD</i>	2										6			
<i>OXY</i>														
<i>DGS</i>														
<i>QUB</i>														
<i>RJC</i>	10	7							7	8	21	6	7	
<i>JAI</i>														
<i>JDP</i>	1	2								2		3	9	8
<i>JDO</i>														
<i>MYL</i>														

**2018**

**2024**

Species	MD1	MD2	MD3	MD4	MD5	MD6	MD7	MD8	MD9	MD10	Species	MD1	MD2	MD3	MD4	MD5	MD6	MD7	MD8	MD9	MD10
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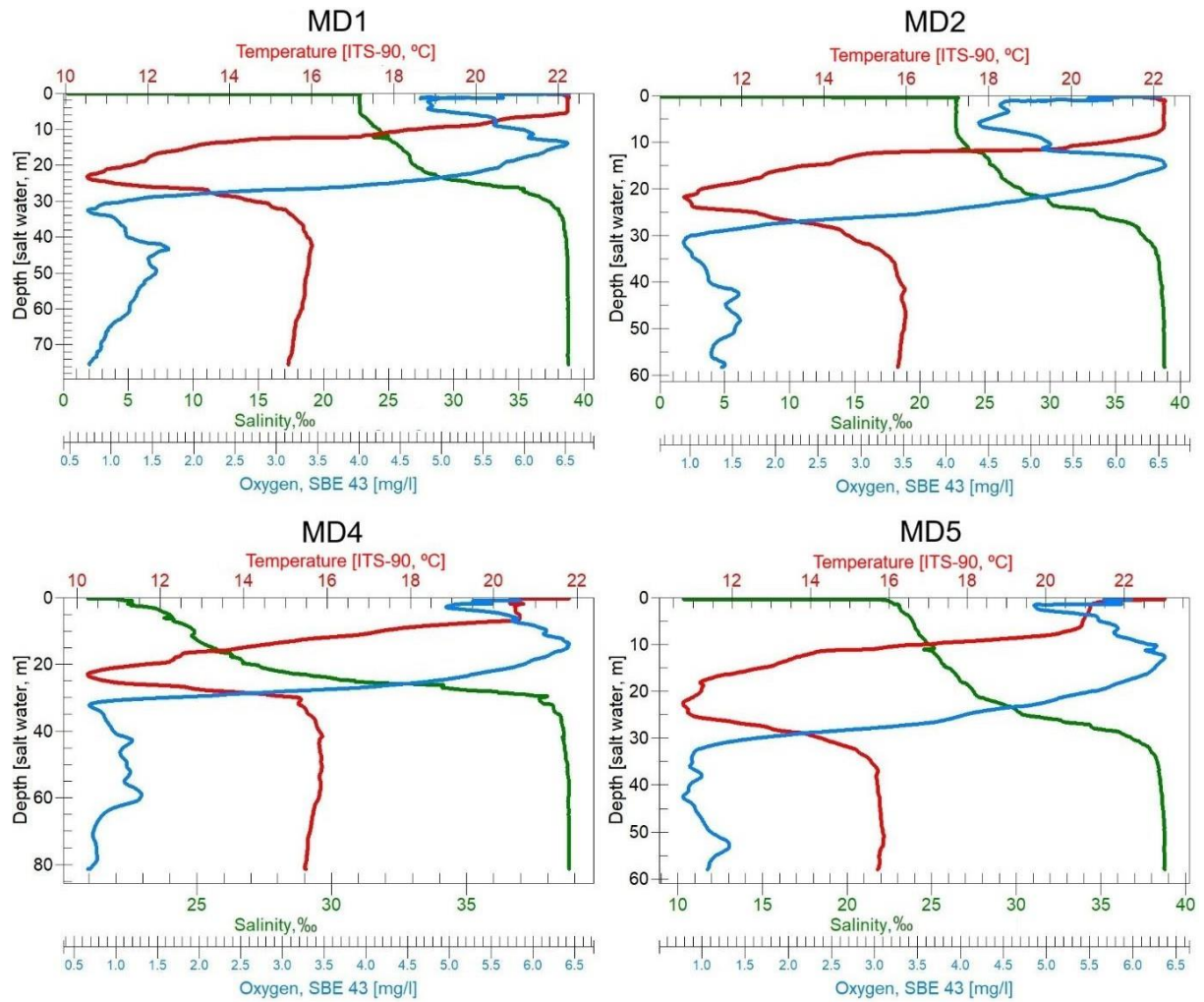
<i>SHO</i>											
<i>SYC</i>											
<i>SMD</i>									44		
<i>OXY</i>											
<i>DGS</i>											
<i>QUB</i>	1		2	27		33	15		5		
<i>RJC</i>	4			3	1	2	14		6		
<i>JAI</i>											
<i>JDP</i>					10				3		
<i>JDO</i>											
<i>MYL</i>											

<i>SHO</i>												
<i>SYC</i>											3	
<i>SMD</i>									2	1		
<i>OXY</i>												
<i>DGS</i>												
<i>QUB</i>									20	4	1	
<i>RJC</i>	12	9							19	1	4	2
<i>JAI</i>												
<i>JDP</i>												
<i>JDO</i>												
<i>MYL</i>												

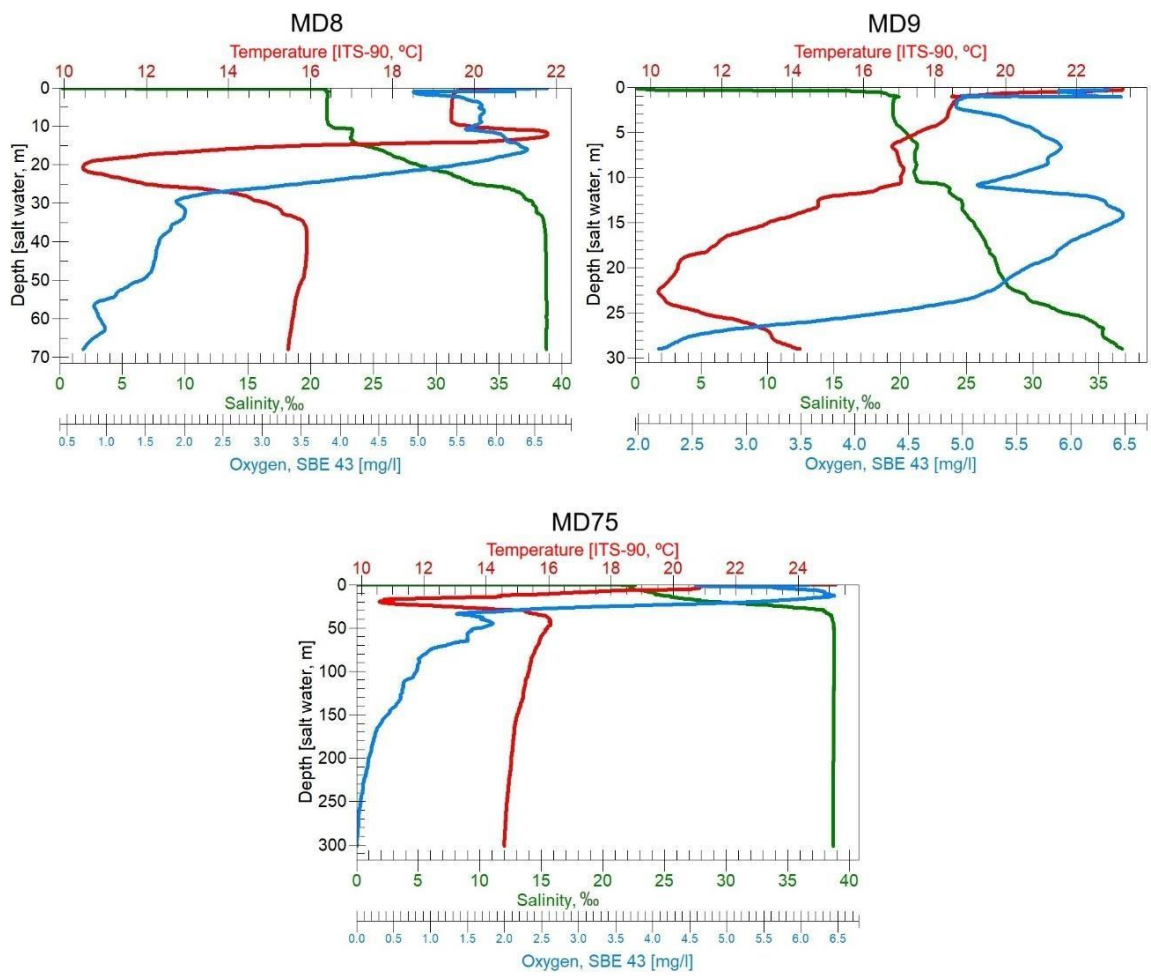
**Supplementary Table 4.** Maximum biomass (kg/km<sup>2</sup>) and frequency of occurrence (F%) in the catch values for demersal elasmobranchs in the SoM reported in previous studies and in this study.  
\*samplings performed with beam-trawl.

Biomass (kg/km <sup>2</sup> )											
	<i>G. melastomus</i>	<i>S. canicula</i>	<i>M. mustelus</i>	<i>O. centrina</i>	<i>S. acanthias</i>	<i>S. blainville</i>	<i>R. clavata</i>	<i>R. miraletus</i>	<i>D. pastinaca</i>	<i>D. tortonesei</i>	<i>M. aquila</i>
JICA (1993)	163.3	62.6	102.5	16.1	31.8	345.3	152.6	-	306.2	-	520.5
Zengin <i>et al.</i> (2004)	-	0.3- 3.3	1.6- 2.04	0.32- 2.16	1.72- 11.48	-	1.88- 4.87	-	0.82- 0.91	-	-
Yazıcı <i>et al.</i> (2006)*	-	0.14	-	-	-	-	28.49	-	-	-	-
Bök <i>et al.</i> (2011)*	-	-	-	-	-	-	5.04	-	-	-	-
Keskin <i>et al.</i> (2011)	-	44.3	-	2.7	0.4	-	145.4	0.1	34.5	-	2.8
Daban <i>et al.</i> (2021)	-	4.4	77.63	1.65	5.91	3.16	71.86	-	31.46	-	14.15
Karadurmuş and Sarı (2024)	-	31.5	21.7	1.6	66.6	-	671.2	8	117.8	-	7.4
This study	6.23	9.06	216.7	38.84	251.9	455.8	347.5	62.30	374.9	346.8	191.3
F%											
	<i>G. melastomus</i>	<i>S. canicula</i>	<i>M. mustelus</i>	<i>O. centrina</i>	<i>S. acanthias</i>	<i>S. blainville</i>	<i>R. clavata</i>	<i>R. miraletus</i>	<i>D. pastinaca</i>	<i>D. tortonesei</i>	<i>M. aquila</i>
Bayhan <i>et al.</i> (2006)*	-	-	0.003	0.01	-	-	-	-	-	-	-
Yazıcı <i>et al.</i> (2006)*	-	0.06	-	-	-	-	11.51	-	-	-	-
Bök <i>et al.</i> (2011)*	-	-	-	-	-	-	0.2	-	-	-	-
Karakulak <i>et al.</i> (2017)	1.01	-	11.11	5.05	8.08	28.28	28.28	1.01	10.1	3.03	4.04
This study	0.03	0.09	5.02	0.18	13.94	62.29	10.87	0.03	2.92	0.89	3.69

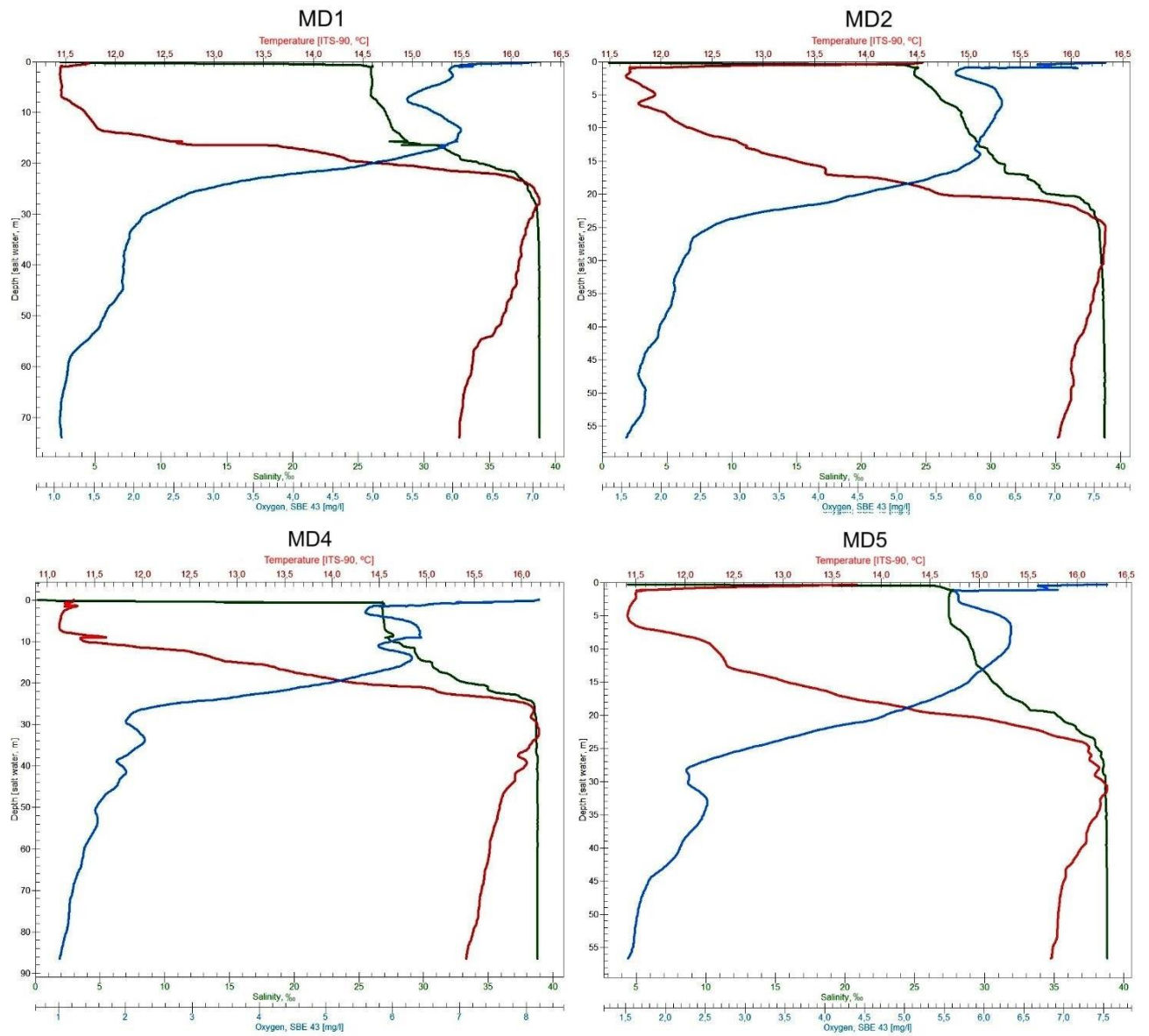
## SUPPLEMENTARY FIGURES



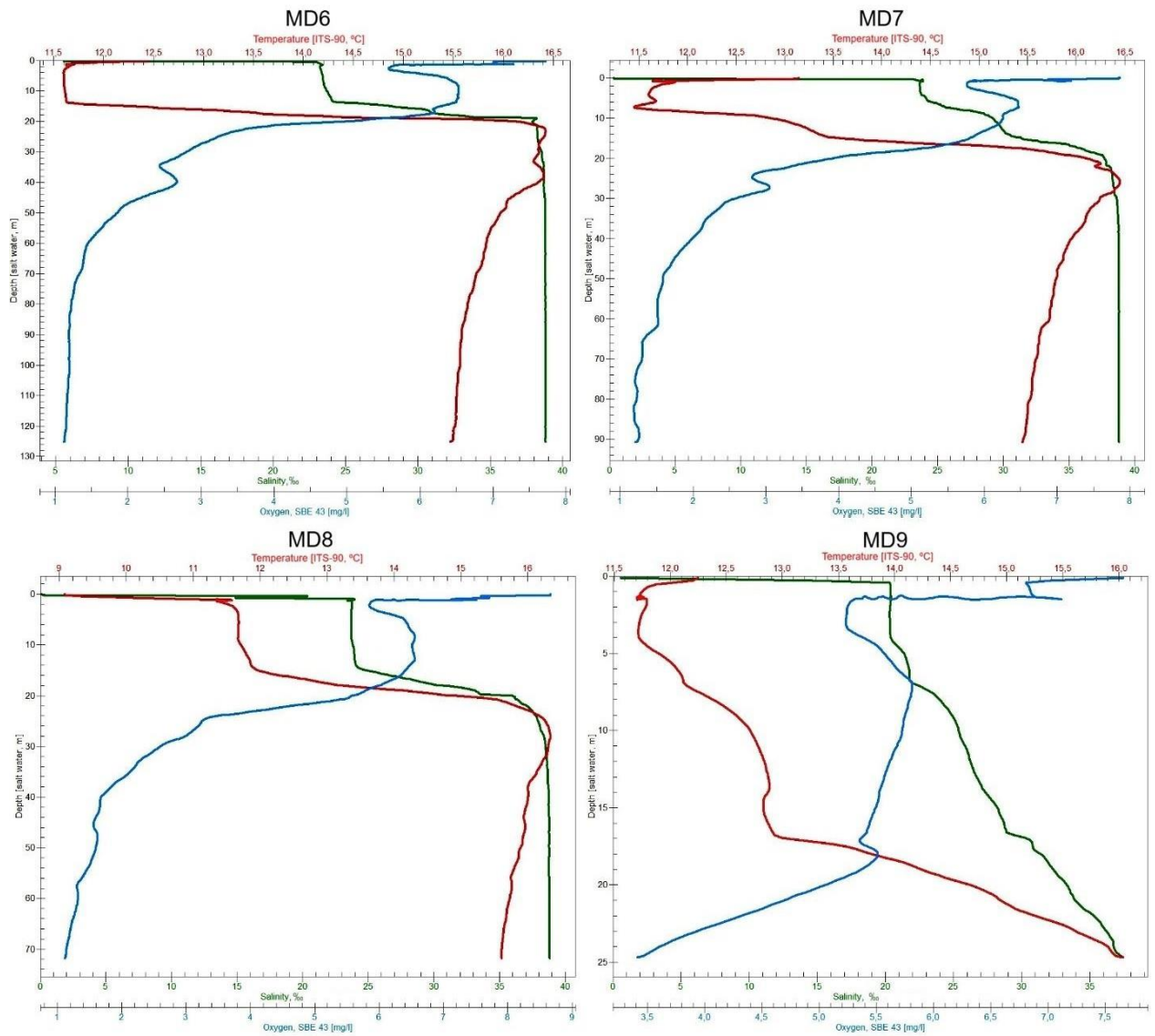
**Supplementary Fig. 1.** CTD measurements of dissolved oxygen (blue), temperature (red) and salinity (green) carried out at stations MD1, MD2, MD4 and MD5 (as of June 2022).



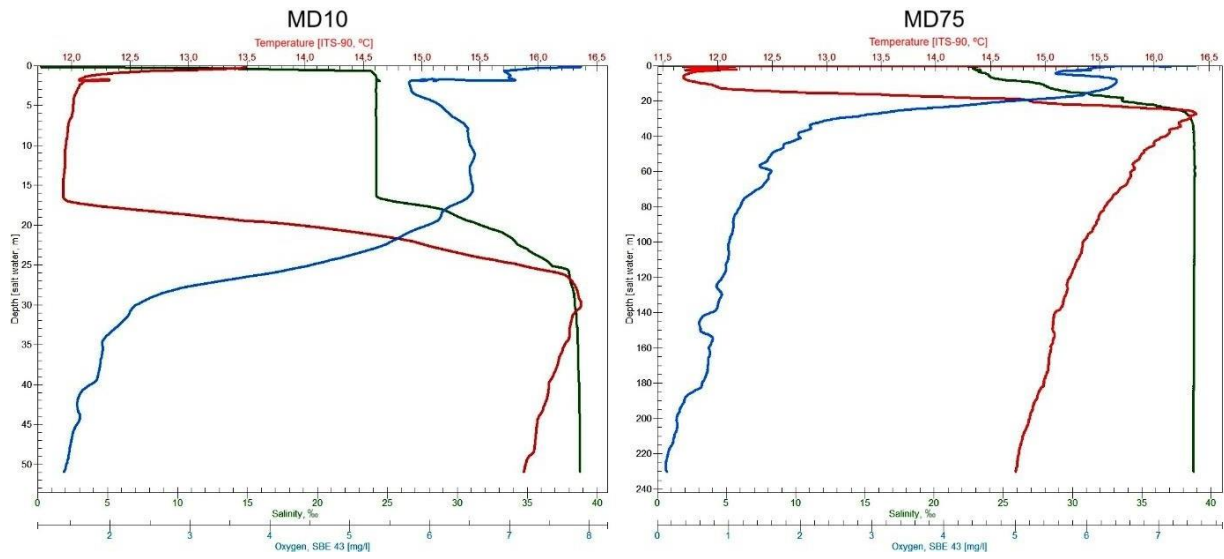
**Supplementary Fig. 2.** CTD measurements of dissolved oxygen (blue), temperature (red) and salinity (green) carried out at stations MD8, MD9 and MD75 (as of June 2022).



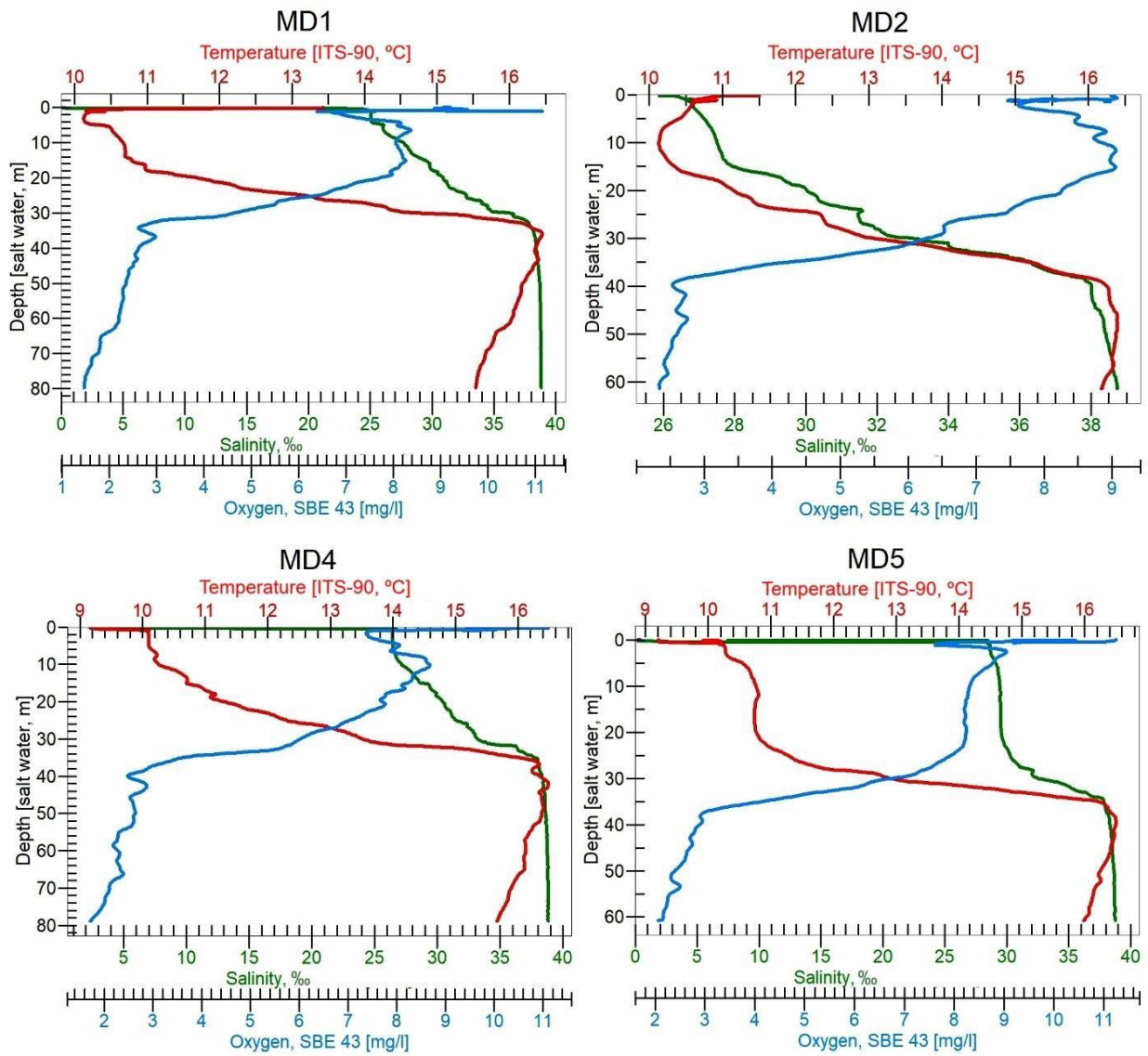
**Supplementary Fig. 3.** CTD measurements of dissolved oxygen (blue), temperature (red) and salinity (green) carried out at stations MD1, MD2, MD4 and MD5 (as of January 2023).



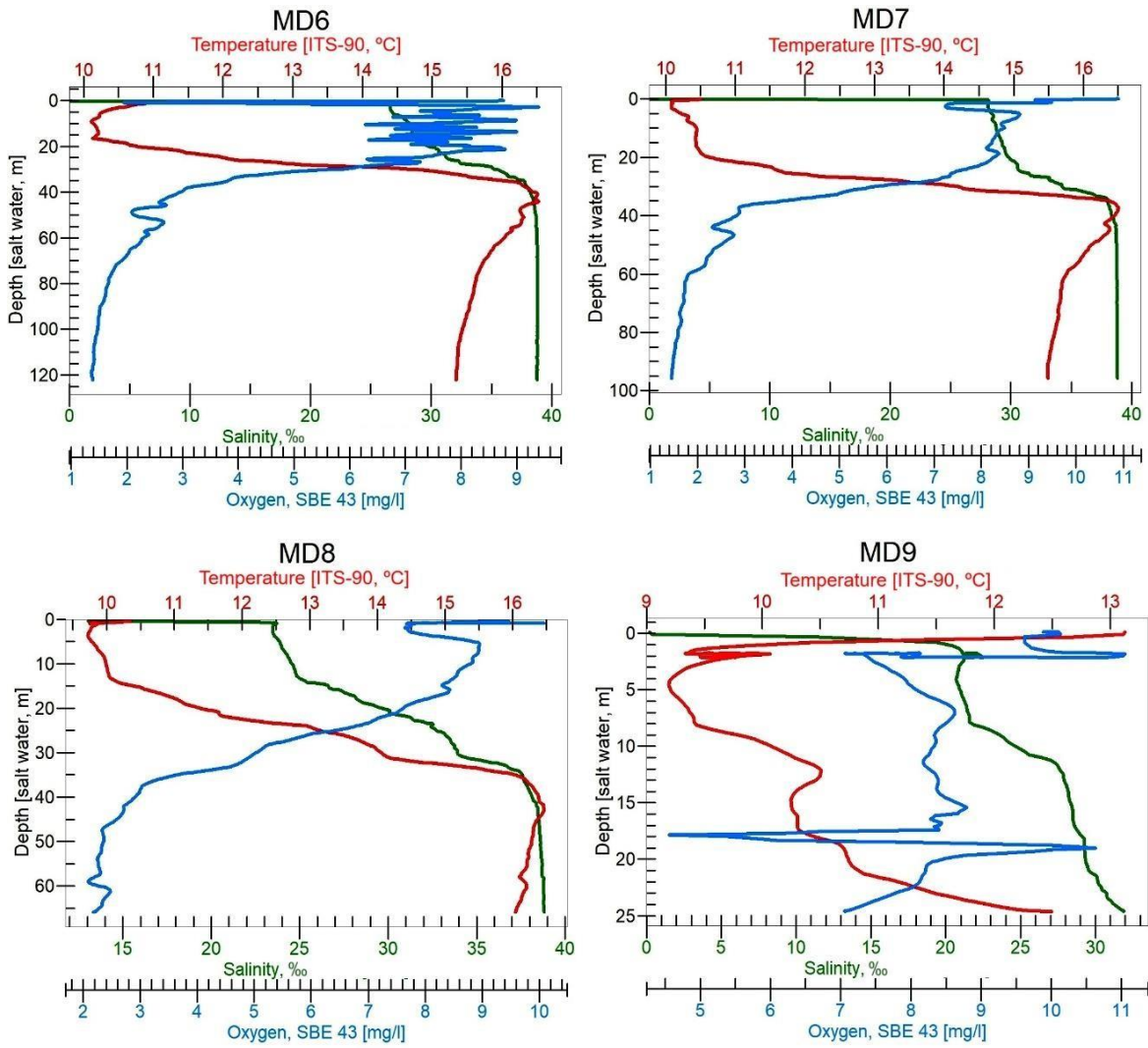
**Supplementary Fig. 4.** CTD measurements of dissolved oxygen (blue), temperature (red) and salinity (green) carried out at stations MD6, MD7, MD8 and MD9 (as of January 2023).



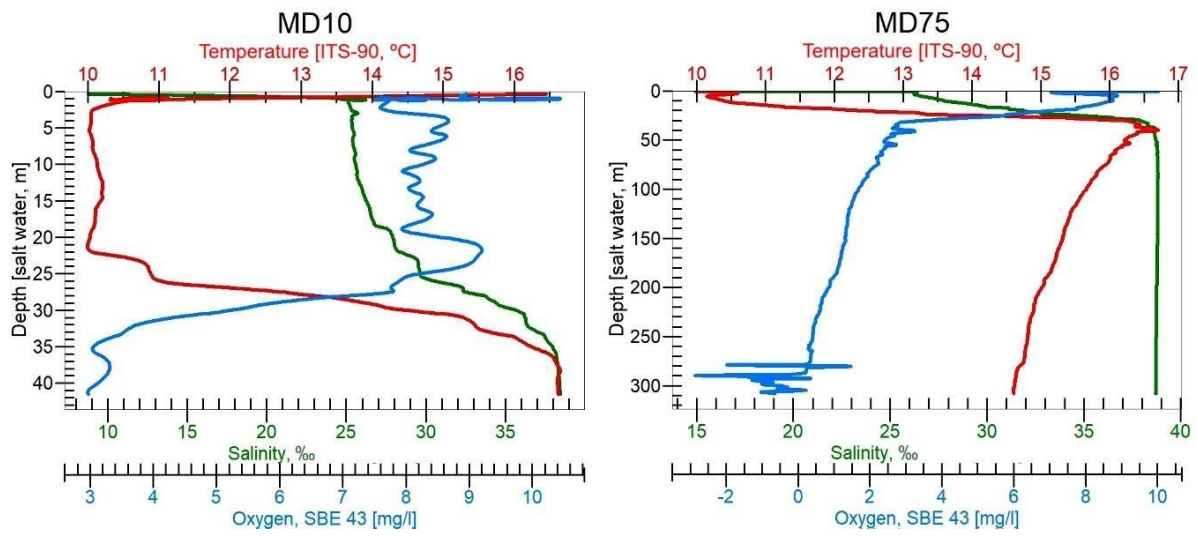
**Supplementary Fig. 5.** CTD measurements of dissolved oxygen (blue), temperature (red) and salinity (green) carried out at stations MD10 and MD75 (as of January 2023).



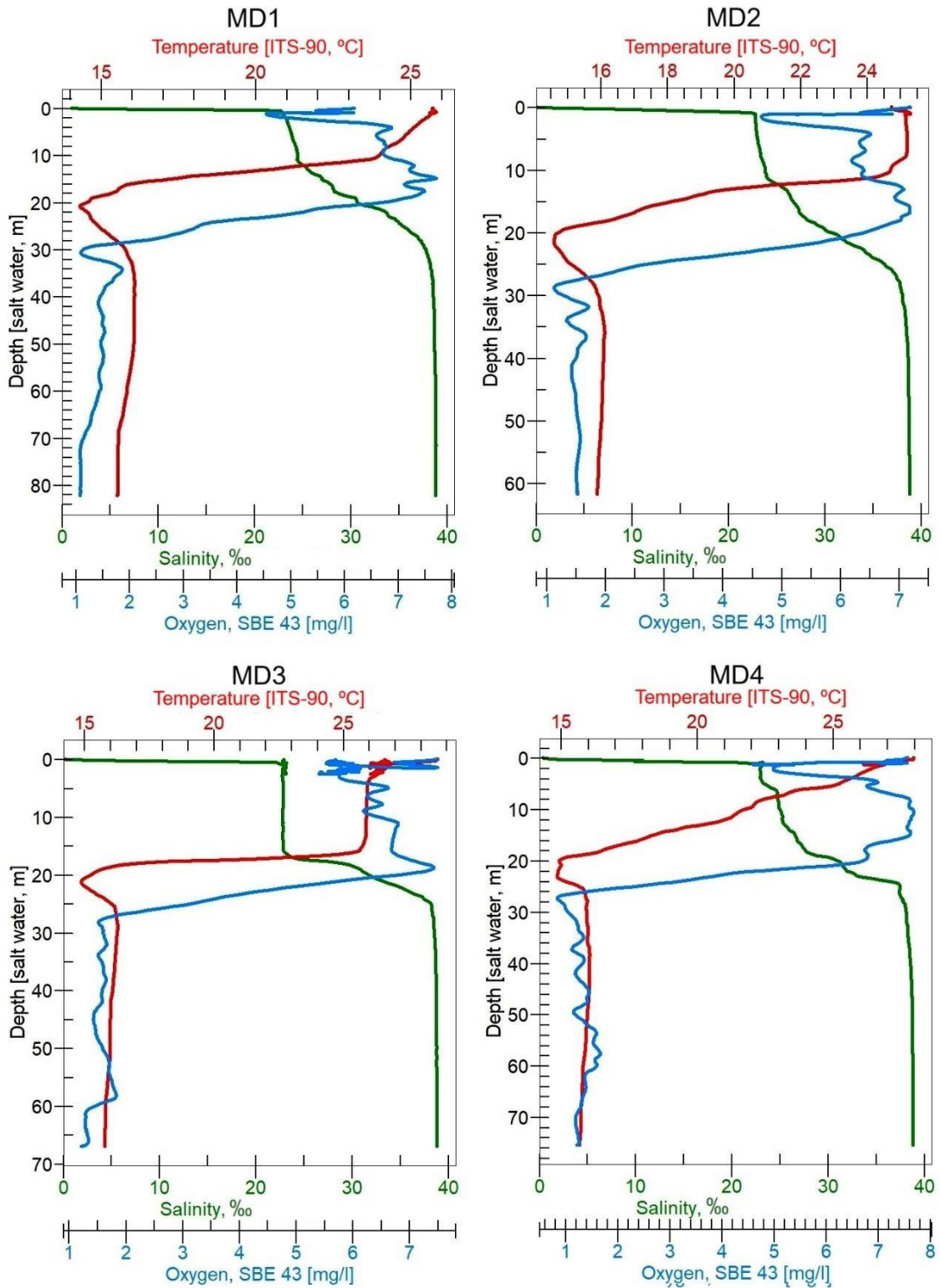
**Supplementary Fig. 6.** CTD measurements of dissolved oxygen (blue), temperature (red) and salinity (green) carried out at stations MD1, MD2, MD4 and MD5 (as of February 2024).



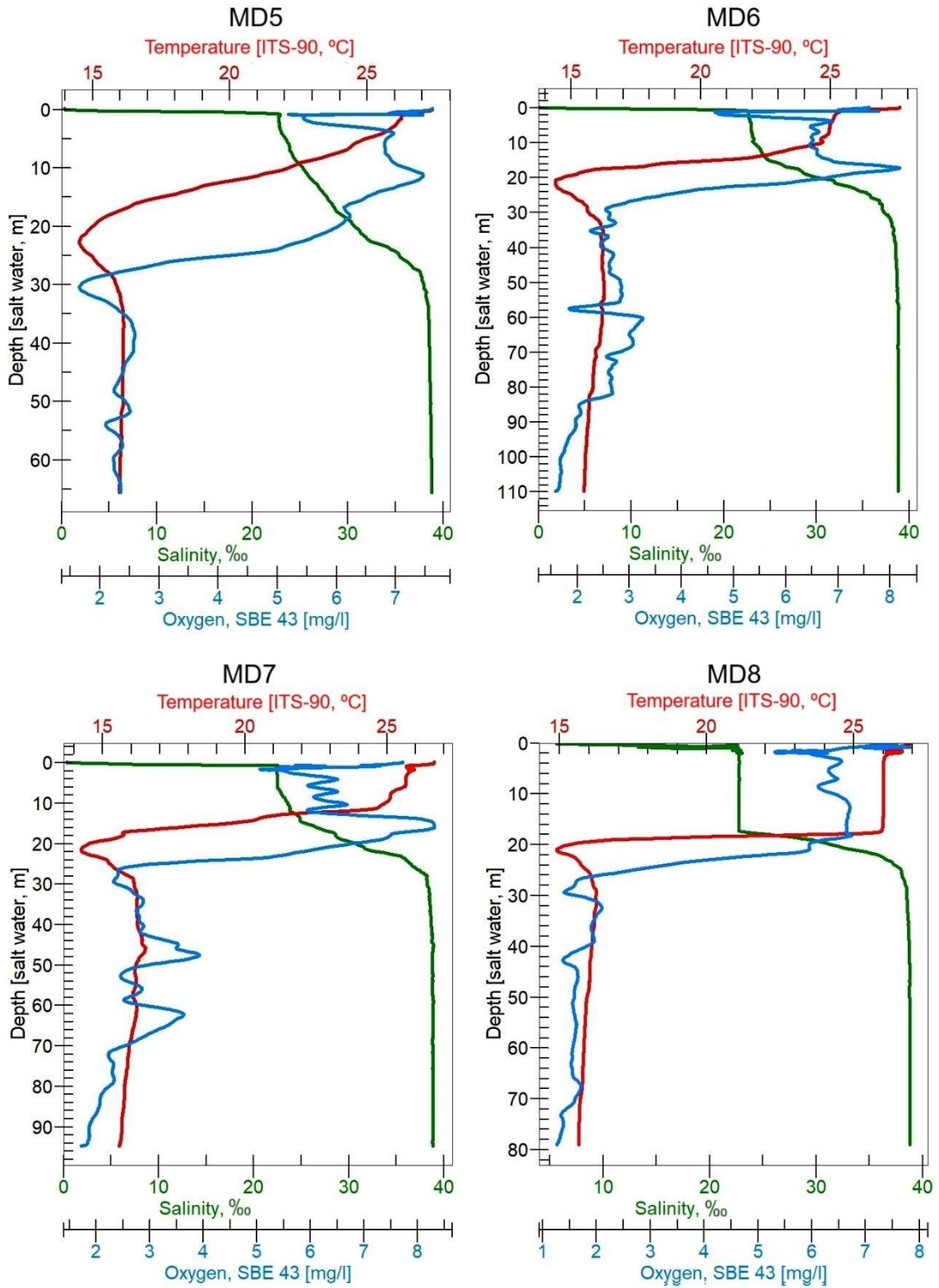
**Supplementary Fig. 7.** CTD measurements of dissolved oxygen (blue), temperature (red) and salinity (green) carried out at stations MD6, MD7, MD8 and MD9 (as of February 2024).



**Supplementary Fig. 8.** CTD measurements of dissolved oxygen (blue), temperature (red) and salinity (green) carried out at stations MD10 and MD75 (as of February 2024).



**Supplementary Fig. 9.** CTD measurements of dissolved oxygen (blue), temperature (red) and salinity (green) carried out at stations MD1, MD2, MD3 and MD4 (as of August 2024).



**Supplementary Fig. 10.** CTD measurements of dissolved oxygen (blue), temperature (red) and salinity (green) carried out at stations MD5, MD6, MD7 and MD8 (as of August 2024).

#### References of Supplementary Table 4:

- Bayhan, Y.K., Çiçek, E., Ünlüer, T., Akkaya, M. 2006. Güneydoğu Marmara'da algarna ile karides avcılığında av kompozisyonu ve hedef dışı av (Catch and by-catch composition of the shrimp fishery by beam trawl in the southeastern Marmara Sea). *Ege Journal of Fisheries and Aquatic Sciences*, 23(3-4), 277-283.
- Bök, T., Göktürk, D., Kahraman, A.E. 2011. Bycatch in 36 and 40 mm PA Turkish twin rigged beam trawl codends. *African Journal of Biotechnology*, 10(37), 7294-7302.
- Daban, İ.B., İşmen, A., Şirin, M., Yığın, C.Ç., Arslan İhsanoğlu, M. 2021. Analysis of demersal fish fauna of the Sea of Marmara, Turkey. *COMU Journal of Marine Sciences and Fisheries*, 4(1), 20-31. <https://doi.org/10.46384/jmsf.912403>
- JICA. 1993. Marmara, Ege ve Akdenizde demersal balıkçılık kaynakları sörvey raporu (Survey report on the demersal fish stocks of the Sea of Marmara, Aegean and the Mediterranean. Japan International Cooperation Agency (JICA), T.C. Tarım ve Köyişleri Bakanlığı Tarımsal Üretim ve Geliştirme Genel Müdürlüğü, Ankara, 579 pp.
- Karadurmuş, U., Sarı, M. 2024. Distribution and diversity of elasmobranchs in the Sea of Marmara: A 2023 status report. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 34(3), e4121. <https://doi.org/10.1002/aqc.4121>
- Karakulak, F.S., İşinibilir, M., Yıldız, T., Uzer, U., Türkeri, E.E., Doğan, O., Peksu, M., *et al.* 2017. Doğu Marmara Denizi'nde demersal balıkların stok tespiti (Assessment of demersal fish stocks in the eastern Sea of Marmara). University of Istanbul, 42 pp.
- Keskin, Ç., Ordines, F., Guijarro, B., Massutí, E. 2011. Comparison of fish assemblages between the Sea of Marmara and the Aegean Sea (north-eastern Mediterranean). *Journal of the Marine Biological Association UK*, 91(6), 1307-1318. <https://doi.org/10.1017/S0025315410002213>
- Yazıcı, M.F., İşmen, A., Altınağaç, U., Ayaz, A. 2006. A study on the catch composition and bycatch of shrimp beam trawl in the Sea of Marmara (in Turkish). *Ege Journal of Fisheries and Aquatic Sciences*, 23(3-4), 269-275.
- Zengin, M., Polat, H., Kutlu, S., Dinçer, A.C., Güngör, H., Aksoy, M., Özgündüz, C., *et al.* 2004. Marmara Denizi'ndeki derin su pembe karidesi (*Parapenaeus longirostris* Lucas, 1846) balıkçılığın geliştirilmesi üzerine bir araştırma. Sonuç raporu (A study on the development of deep-water pink shrimp (*Parapenaeus longirostris* Lucas, 1846) fisheries in the Sea of Marmara. Final report). (TAGEM/HAYSUD/2001/09/2004), T.C. Tarım ve Köyişleri Bakanlığı Tarımsal Araştırmalar Genel Müdürlüğü. <https://kutuphane.tarimorman.gov.tr/vufind/Record/20150> (accessed 17 April 2026).