

Supplementary materials

Picciulin et al.

First basin scale spatial-temporal characterization of underwater sound in the Mediterranean Sea

Scientific Report

Table S1. List of published studies on underwater sound monitoring carried in the Mediterranean Sea: time coverage and acoustic recording set-up are highlighted. ID number refers to recording stations as shown in Figure 1 of the manuscript.

ID	Country	Time Coverage	Recording Set-Up	Reference
1	Italy	7-1-2013 / 6-30-2014	continuous (2 minutes on/28 minutes off)	Buscaino et al. 2016
2	Italy	7-2-2012 / 5-10-2013	continuous	Viola et al. 2017
3	Italy	9-2017 / 11-2017	continuous (1 minutes on/4 minutes off)	Pieretti et al. 2020
4	Italy	5-2017 / 9-2017	spot (60-s per station; monthly monitoring)	Cafaro et al. 2018
5	Italy	1-2012 / 12-2012	spot (15-min per station; monthly monitoring)	Codarin and Picciulin 2015
6	Italy	11-20-2020 / 2-13-2021	continuous	Diviacco et al. 2021
7	Croatia	4-2013 / 8-2013	spot (5 to 30 minutes per station)	Vukadin 2016
8	Croatia	10-2018 / 5-2019	continuous	Širović and Holcer 2020
9	Croatia	2007 / 2009	spot (5 minutes - ad libitum per session)	Rako et al. 2013
10	Spain	1-2014 / 12-2014	continuous	Rodrigo-Saura et al. 2019
11	France	5-2015 / 12-2018	continuous (5 minutes on/20 minutes off)	Poupard et al. 2022
12	Greece	02-2013 / 10-2013	continuous	Prospathopoulos et al. 2017
13	Slovenia	2-2015	continuous	Popit 2021
14	France	5-23-2019 / 8-1-2019	continuous	Di Franco et al. 2023

Table S2. Coordinates, bottom depth, sediment types of the recording locations and number of daily events having wind speed over the threshold of 10 m/s. Wind speeds were obtained by extrapolation from the SHYFEM modelling applied to the monitoring stations in the considered target period.

** Ivana D gas production platform collapsed in December 2020 , becoming no longer accessible; the two MS9 positions are few miles apart and the differences in the data collected are regarded not relevant.*

Monitoring station	Position		Depth (m)	Sediment type	N. of days with daily average wind speed > 10 m/s Autumn-Winter	N. of days with daily average wind speed > 10 m/s Spring-Summer
	Longitude (E)	Latitude (N)				
MS1 Venice (IT)	12°30.883'	45° 19.383'	17	Sand	13	4
MS2 Rimini (IT)	12°42.656'	44°10.254'	18	sand	7	2
MS3 Ancona (IT)	13°40.932'	43°31.954'	15	sand	4	0
MS4 Trieste (IT)	13°33.917'	45°37.095'	25	sandy mud	29	9
MS5 Susak Lošinj (HR)	14°17.293'	44°29.545'	40	rocks/sand	14	6
MS6 Lošinj (HR)	14°34.51'	44°32.747'	37	sand	25	10
MS7 Žirje (HR)	15°36.020'	43°37.788'	46	gravelly sand	15	8
MS8 Split (HR)	16°25.336'	43°29.895'	40	slightly sandy mud	14	8
MS9 Ivana D (HR)	13°15.720'	44°46.953'	42	terrigenous sand	14	11
MS9 Ivana E (HR)	13°14.674'	44°46.684'	42	terrigenous sand	-	-

Table S3. Difference (dB re 1 μ Pa) between autumn-winter and spring-summer median SPL values at the (i) 63 and (ii) 500 Hz 1/3 octave bands (TOBs); MS1 Venice (IT); MS2 Rimini (IT); MS3 Ancona (IT); MS4 Trieste (IT); MS5 Susak Lošinj (HR); MS6 Lošinj (HR); MS7 Žirje (HR); MS8 Split (HR); MS9 Ivana D (HR).

	MS1	MS2	MS3	MS4	MS5	MS6	MS7	MS8	MS9
63 Hz TOB ship-noise dominated	-0.4	3.3	1.6	10.7	1.8	1.1	0.8	-4.5	1.9
500 Hz TOB Weather dependent	5.3	7.3	3.8	6.5	5.9	2.1	6.5	-2.5	5.7

Table S4. Difference (dB re 1 μ Pa) between the yearly median (April 2020 - March 2021) and the April 2020 median SPLs in the 63 Hz and 125 Hz 1/3 octave bands

Monitoring stations	Median SPL variation (dB re 1 μ Pa)	
	63 Hz	125 Hz
MS1 Venice (IT)	5.1	2.5
MS2 Rimini (IT)	-1.3	-1.2
MS3 Ancona (IT)	5.5	1.9
MS4 Trieste (IT)	0.3	-0.3
MS5 Susak Lošinj (HR)	-0.2	-1.3
MS6 Lošinj (HR)	1.7	2.7
MS7 Žirje (HR)	n.a.	n.a.
MS8 Split (HR)	7.7	6.3
MS9 Ivana D/E (HR)	-1	-0.2

Figure S1- Data coverage per each recording station starting from end of February 2020 to the end of July 2021: data are available only for periods coloured in green, in red the data are missing, MS1 Venice (IT); MS2 Rimini (IT); MS3 Ancona (IT); MS4 Trieste (IT); MS5 Susak Lošinj (HR); MS6 Lošinj (HR); MS7 Žirje (HR); MS8 Split (HR); MS9 Ivana D (HR).

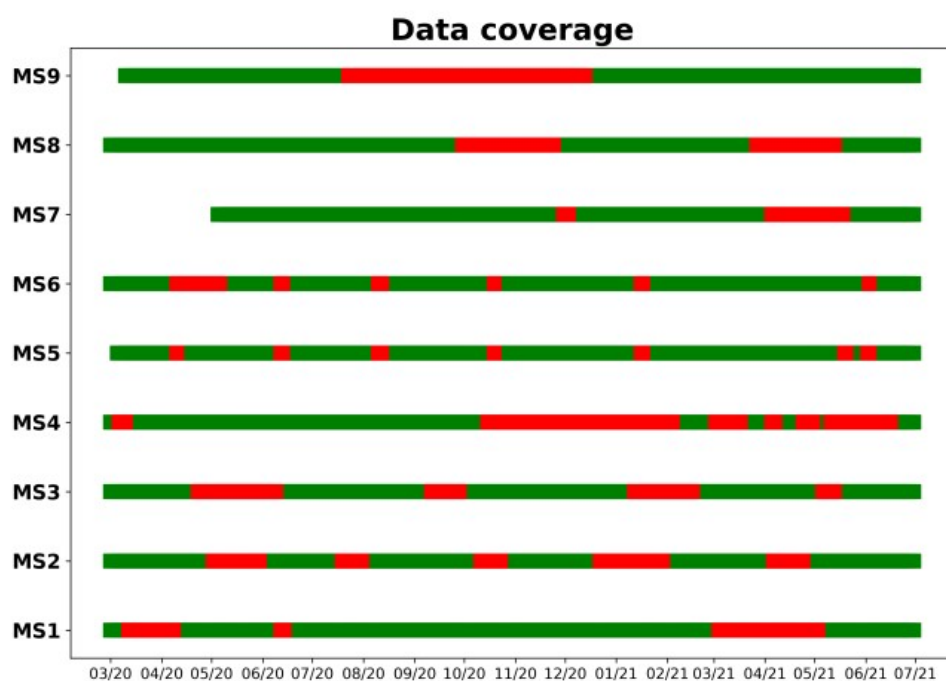


Figure S2 – Inter-1/3 octave bands Spearman correlation based on the median sound pressure levels calculated on all the collected SOUNDScape data; wideband (10-20000 Hz TOB; WBs)

	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000	12500	16000	20000	WB
10	1.00	0.73	0.58	0.47	0.50	0.18	-0.07	-0.03	-0.03	-0.07	-0.10	-0.23	0.00	0.03	0.32	0.40	0.43	0.57	0.57	0.57	0.52	0.53	0.40	0.20	0.25	0.25	0.18	0.13	0.07	0.08	0.05	-0.03	-0.08	-0.08	0.27
12.5	0.73	1.00	0.88	0.87	0.90	0.63	0.12	-0.02	-0.02	0.22	0.27	0.12	0.30	0.33	0.47	0.52	0.47	0.53	0.53	0.52	0.50	0.38	0.32	0.30	0.22	0.22	0.13	0.17	0.10	-0.07	-0.15	-0.12	-0.27	-0.27	0.43
16	0.58	0.88	1.00	0.87	0.73	0.37	-0.12	-0.20	-0.20	0.02	0.08	0.02	0.15	0.18	0.42	0.50	0.45	0.47	0.47	0.43	0.42	0.27	0.22	0.18	0.03	0.03	0.00	0.12	0.13	-0.08	-0.17	-0.12	-0.30	-0.30	0.35
20	0.47	0.87	0.87	1.00	0.90	0.67	-0.02	-0.15	-0.15	0.17	0.28	0.27	0.42	0.43	0.48	0.53	0.50	0.42	0.42	0.37	0.38	0.17	0.17	0.13	-0.02	-0.02	-0.07	-0.02	-0.05	-0.27	-0.37	-0.28	-0.40	-0.40	0.45
25	0.50	0.90	0.73	0.90	1.00	0.82	0.23	0.05	0.05	0.35	0.43	0.30	0.47	0.45	0.42	0.42	0.38	0.38	0.38	0.33	0.37	0.23	0.20	0.23	0.13	0.13	0.03	0.05	0.00	-0.20	-0.30	-0.23	-0.33	-0.33	0.42
31.5	0.18	0.63	0.37	0.67	0.82	1.00	0.60	0.42	0.42	0.68	0.75	0.62	0.72	0.73	0.47	0.40	0.33	0.28	0.28	0.28	0.30	0.18	0.17	0.23	0.10	0.10	0.03	0.03	-0.10	-0.23	-0.28	-0.15	-0.23	-0.23	0.42
40	-0.07	0.12	-0.12	-0.02	0.23	0.60	1.00	0.95	0.95	0.95	0.90	0.73	0.73	0.72	0.50	0.37	0.32	0.37	0.37	0.35	0.33	0.42	0.35	0.37	0.10	0.10	0.05	0.10	0.03	-0.02	0.07	0.23	0.15	0.15	0.35
50	-0.03	-0.02	-0.20	-0.15	0.05	0.42	0.95	1.00	1.00	0.90	0.82	0.68	0.68	0.67	0.52	0.37	0.33	0.37	0.37	0.32	0.27	0.38	0.28	0.20	-0.08	-0.08	-0.12	-0.07	-0.12	-0.12	0.00	0.15	0.08	0.08	0.23
63	-0.03	-0.02	-0.20	-0.15	0.05	0.42	0.95	1.00	1.00	0.90	0.82	0.68	0.68	0.67	0.52	0.37	0.33	0.37	0.37	0.32	0.27	0.38	0.28	0.20	-0.08	-0.08	-0.12	-0.07	-0.12	-0.12	0.00	0.15	0.08	0.08	0.23
80	-0.07	0.22	0.02	0.17	0.35	0.68	0.95	0.90	0.90	1.00	0.98	0.88	0.88	0.87	0.68	0.53	0.47	0.45	0.45	0.37	0.33	0.33	0.30	0.28	-0.07	-0.07	-0.13	-0.08	-0.15	-0.25	-0.17	0.03	-0.07	-0.07	0.43
100	-0.10	0.27	0.08	0.28	0.43	0.75	0.90	0.82	0.82	0.98	1.00	0.93	0.93	0.92	0.72	0.58	0.52	0.47	0.47	0.38	0.37	0.32	0.32	0.32	-0.05	-0.05	-0.12	-0.07	-0.13	-0.27	-0.20	0.02	-0.08	-0.08	0.52
125	-0.23	0.12	0.02	0.27	0.30	0.62	0.73	0.68	0.68	0.88	0.93	1.00	0.97	0.95	0.78	0.67	0.62	0.48	0.48	0.37	0.35	0.23	0.30	0.25	-0.17	-0.17	-0.22	-0.18	-0.23	-0.37	-0.28	-0.05	-0.12	-0.12	0.58
160	0.00	0.30	0.15	0.42	0.47	0.72	0.73	0.68	0.68	0.88	0.93	0.97	1.00	0.98	0.85	0.75	0.72	0.60	0.60	0.48	0.47	0.35	0.38	0.28	-0.12	-0.12	-0.18	-0.17	-0.23	-0.37	-0.30	-0.08	-0.15	-0.15	0.65
200	0.03	0.33	0.18	0.43	0.45	0.73	0.72	0.67	0.67	0.87	0.92	0.95	0.98	1.00	0.87	0.78	0.73	0.62	0.62	0.53	0.50	0.37	0.40	0.30	-0.08	-0.08	-0.13	-0.12	-0.22	-0.33	-0.27	-0.05	-0.13	-0.13	0.67
250	0.32	0.47	0.42	0.48	0.42	0.47	0.50	0.52	0.52	0.68	0.72	0.78	0.85	0.87	1.00	0.97	0.93	0.87	0.87	0.73	0.67	0.53	0.55	0.35	-0.08	-0.08	-0.15	-0.12	-0.17	-0.30	-0.22	-0.03	-0.15	-0.15	0.75
315	0.40	0.52	0.50	0.53	0.42	0.40	0.37	0.37	0.37	0.53	0.58	0.67	0.75	0.78	0.97	1.00	0.98	0.93	0.93	0.85	0.80	0.65	0.68	0.48	0.08	0.08	0.03	0.07	0.02	-0.12	-0.05	0.12	0.00	0.00	0.85
400	0.43	0.47	0.45	0.50	0.38	0.33	0.32	0.33	0.33	0.47	0.52	0.62	0.72	0.73	0.93	0.98	1.00	0.95	0.95	0.87	0.83	0.70	0.73	0.50	0.12	0.12	0.07	0.08	0.05	-0.07	0.00	0.15	0.07	0.07	0.87
500	0.57	0.53	0.47	0.42	0.38	0.28	0.37	0.37	0.37	0.45	0.47	0.48	0.60	0.62	0.87	0.93	0.95	1.00	1.00	0.95	0.92	0.85	0.85	0.65	0.32	0.32	0.25	0.27	0.23	0.13	0.20	0.32	0.22	0.22	0.87
630	0.57	0.53	0.47	0.42	0.38	0.28	0.37	0.37	0.37	0.45	0.47	0.48	0.60	0.62	0.87	0.93	0.95	1.00	1.00	0.95	0.92	0.85	0.85	0.65	0.32	0.32	0.25	0.27	0.23	0.13	0.20	0.32	0.22	0.22	0.87
800	0.57	0.52	0.43	0.37	0.33	0.28	0.35	0.32	0.32	0.37	0.38	0.37	0.48	0.53	0.73	0.85	0.87	0.95	0.95	1.00	0.98	0.93	0.93	0.78	0.53	0.53	0.50	0.52	0.45	0.38	0.43	0.53	0.43	0.43	0.88
1000	0.52	0.50	0.42	0.38	0.37	0.30	0.33	0.27	0.27	0.33	0.37	0.35	0.47	0.50	0.67	0.80	0.83	0.92	0.92	0.98	1.00	0.95	0.97	0.85	0.62	0.62	0.58	0.60	0.55	0.47	0.50	0.60	0.52	0.52	0.92
1250	0.53	0.38	0.27	0.17	0.23	0.18	0.42	0.38	0.38	0.33	0.32	0.23	0.35	0.37	0.53	0.65	0.70	0.85	0.85	0.93	0.95	1.00	0.97	0.85	0.67	0.67	0.63	0.65	0.62	0.58	0.63	0.70	0.63	0.63	0.78
1600	0.40	0.32	0.22	0.17	0.20	0.17	0.35	0.28	0.28	0.30	0.32	0.30	0.38	0.40	0.55	0.68	0.73	0.85	0.85	0.93	0.97	0.97	1.00	0.92	0.72	0.72	0.68	0.68	0.65	0.60	0.65	0.73	0.68	0.68	0.88
2000	0.20	0.30	0.18	0.13	0.23	0.23	0.37	0.20	0.20	0.28	0.32	0.25	0.28	0.30	0.35	0.48	0.50	0.65	0.65	0.78	0.85	0.85	0.92	1.00	0.87	0.87	0.83	0.85	0.82	0.73	0.75	0.83	0.77	0.77	0.82
2500	0.25	0.22	0.03	-0.02	0.13	0.10	0.10	-0.08	-0.08	-0.07	-0.05	-0.17	-0.12	-0.08	-0.08	0.08	0.12	0.32	0.32	0.53	0.62	0.67	0.72	0.87	1.00	1.00	0.98	0.93	0.87	0.88	0.85	0.82	0.82	0.82	0.52
3150	0.25	0.22	0.03	-0.02	0.13	0.10	0.10	-0.08	-0.08	-0.07	-0.05	-0.17	-0.12	-0.08	-0.08	0.08	0.12	0.32	0.32	0.53	0.62	0.67	0.72	0.87	1.00	1.00	0.98	0.93	0.87	0.88	0.85	0.82	0.82	0.82	0.52
4000	0.18	0.13	0.00	-0.07	0.03	0.03	0.05	-0.12	-0.12	-0.13	-0.12	-0.22	-0.18	-0.13	-0.15	0.03	0.07	0.25	0.25	0.50	0.58	0.63	0.68	0.83	0.98	0.98	1.00	0.97	0.90	0.93	0.90	0.87	0.87	0.87	0.47
5000	0.13	0.17	0.12	-0.02	0.05	0.03	0.10	-0.07	-0.07	-0.08	-0.07	-0.18	-0.17	-0.12	-0.12	0.07	0.08	0.27	0.27	0.52	0.60	0.65	0.68	0.85	0.93	0.93	0.97	1.00	0.97	0.95	0.92	0.92	0.87	0.87	0.47
6300	0.07	0.10	0.13	-0.05	0.00	-0.10	0.03	-0.12	-0.12	-0.15	-0.13	-0.23	-0.23	-0.22	-0.17	0.02	0.05	0.23	0.23	0.45	0.55	0.62	0.65	0.82	0.87	0.87	0.90	0.97	1.00	0.95	0.92	0.92	0.87	0.87	0.42
8000	0.08	-0.07	-0.08	-0.27	-0.20	-0.23	-0.02	-0.12	-0.12	-0.25	-0.27	-0.37	-0.37	-0.33	-0.30	-0.12	-0.07	0.13	0.13	0.38	0.47	0.58	0.60	0.73	0.88	0.88	0.93	0.95	0.95	1.00	0.98	0.93	0.93	0.93	0.28
10000	0.05	-0.15	-0.17	-0.37	-0.30	-0.28	0.07	0.00	0.00	-0.17	-0.20	-0.28	-0.30	-0.27	-0.22	-0.05	0.00	0.20	0.20	0.43	0.50	0.63	0.65	0.75	0.85	0.85	0.90	0.92	0.92	0.98	1.00	0.97	0.97	0.97	0.32
12500	-0.03	-0.12	-0.12	-0.28	-0.23	-0.15	0.23	0.15	0.15	0.03	0.02	-0.05	-0.08	-0.05	-0.03	0.12	0.15	0.32	0.32	0.53	0.60	0.70	0.73	0.83	0.82	0.82	0.87	0.92	0.92	0.93	0.97	1.00	0.97	0.97	0.47
16000	-0.08	-0.27	-0.30	-0.40	-0.33	-0.23	0.15	0.08	0.08	-0.07	-0.08	-0.12	-0.15	-0.13	-0.15	0.00	0.07	0.22	0.22	0.43	0.52	0.63	0.68	0.77	0.82	0.82	0.87	0.87	0.87	0.93	0.97	0.97	1.00	1.00	0.40
20000	-0.08	-0.27	-0.30																																