# experience and results of ARPA FVG

Antonio Codarin, Federico Pitulaga
Regional Agency for Environmental Protection of Friuli Venezia Giulia – ARPA FVG, Italy
antonio.codarin@arpa.fvg.it federico.pitulaga@arpa.fvg.it

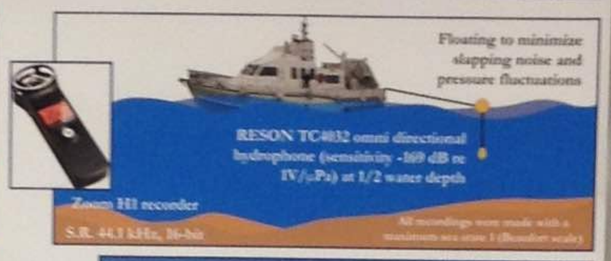
The concern regarding the various types of manmade underwater noise in the environment is recently arises because they may interfere with communication, behaviour and fitness of various species: therefore, during the last years, underwater noise became an important quality parameter of the marine environmental, also thanks to the Directive 2008/56/EC (Marine Strategy Framework Directive).

The monitoring activities of underwater ambient noise started in January 2012 (and they are still in progress) on the Northernmost part of the Adriatic Sea, covering an area roughly 15 x 25 nautical miles. The bottom reaches at its maximum 24 m depth and the area is not actually subjected to any stable impulsive noise source (only 11.2 MSFD indicator).

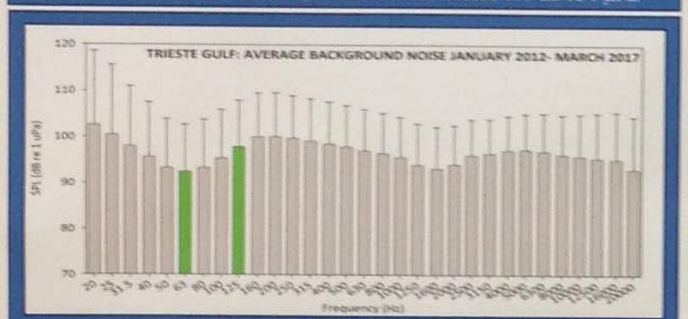
Total of 594 ambient noise samples (10 min length each) have been analysed until March 2017:

- ✓ for the 1/3 octave band standard centre frequencies from 20 to 20000 Hz
- ✓ wideband (40-20000 Hz) sound pressure levels over 10 minutes

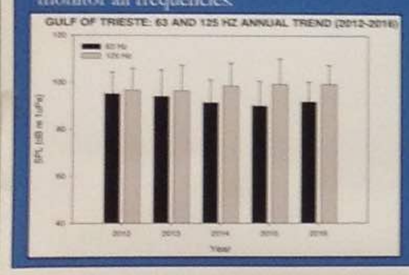
| | NUMBER OF 10' TRACKS | | | | | | | AVG | | | MIN | | | MAX | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Station | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | TOT | 63 | 125 | Wideband | 63 | 125 | Wideband | 63 | 125 | Wideband |
| P555 | 12 | 10 | 12 | 11 | 11 | 1 | 57 | 94.04 | 104.40 | 108.46 | 69.27 | 69.77 | 96.13 | 122.44 | 126.66 | 137.49 |
| D252 | 8 | 10 | 12 | 11 | 3 | 0 | 44 | 97.31 | 98.06 | 116.13 | 75.70 | 71.55 | 96.57 | 126.18 | 121.34 | 137.23 |
| F363 | 11 | 10 | 12 | 11 | 4 | 0 | 48 | 89.68 | 95.79 | 117.58 | 76.00 | 71.57 | 102.71 | 125.20 | 132.92 | 135.49 |
| S151 | 0 | 10 | 12 | 11 | 3 | 0 | 36 | 85.15 | 94.25 | 116.27 | 70.87 | 82.36 | 101.52 | 112.91 | 122.45 | 139.71 |
| C121 | 12 | 10 | 12 | 11 | 5 | 1 | 51 | 98.25 | 103.76 | 118.67 | 76.02 | 72.01 | 102.40 | 124.54 | 121.73 | 136.41 |
| G585 | 11 | 10 | 12 | 11 | 4 | 0 | 50 | 85.87 | 95.45 | 117.96 | 71.88 | 81.96 | 102.42 | 125.78 | 118.30 | 140.89 |
| G343 | 0 | 10 | 12 | 12 | 6 | 1 | 41 | 87.39 | 89.64 | 112.50 | 75.94 | 74.24 | 98.02 | 123.14 | 124.43 | 139.15 |
| A252 | 12 | 10 | 12 | 11 | 5 | 0 | 50 | 101.42 | 103.53 | 123.80 | 81.31 | 91.23 | 106.61 | 118.32 | 121.36 | 140.79 |
| C424 | 8 | 10 | 12 | 11 | 5 | 0 | 47 | 95.74 | 104.87 | 120.24 | 78.39 | 73.96 | 104.93 | 121.06 | 125.34 | 139.50 |
| H272 | 10 | 10 | 12 | 12 | 6 | 1 | 51 | 87.48 | 88.53 | 110.84 | 75.61 | 77.66 | 100.26 | 102.98 | 118.15 | 129.62 |
| H474 | 10 | 10 | 12 | 12 | 6 | 1 | 51 | 91.28 | 99.35 | 119.15 | 69.27 | 90.83 | 106.54 | 124.39 | 124.32 | 142.48 |
| I484 | 12 | 9 | 12 | 11 | 5 | 0 | 59 | 67.42 | 98.21 | 118.96 | 70.26 | 77.64 | 99.09 | 108.41 | 115.66 | 135.52 |
| SMLE3 | 0 | 1 | 1 | 3 | 4 | 0 | 9 | 89.34 | 95.94 | 115.11 | 77.66 | 95.21 | 108.84 | 127.64 | 119.45 | 133.08 |




Maximum values offshore and near by the port of Trieste, here the average intensities of 63 and 125 Hz 1/3 octave bands exceed 100 dB re 1 μPa.

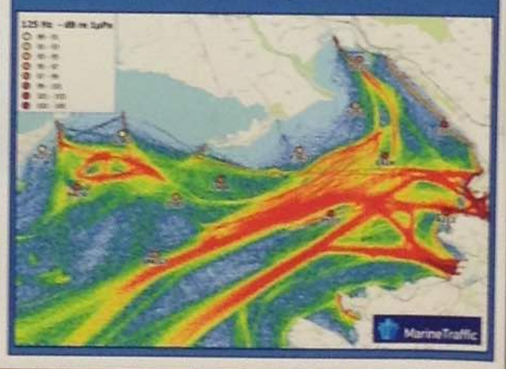



Average value is 116.9 ± 18.1 dB re 1 μPa for the 40 Hz - 20 kHz frequency range. 63 and 125 Hz aren't the noisiest bands, it's better to monitor all frequencies.




Yearly trends from 2012 to 2016 regarding the 63 and 125 Hz bands do not highlight positive or negative fluctuations.

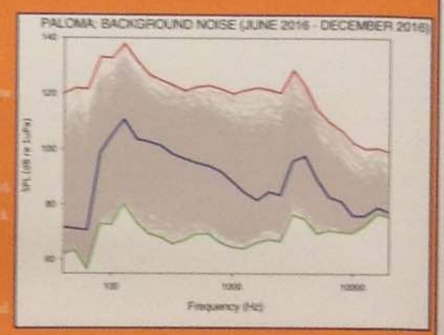

Spatial distribution of underwater noise seems to depend from vessel spatial density.



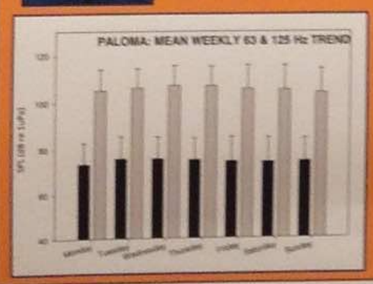

## An overview about long-term monitoring

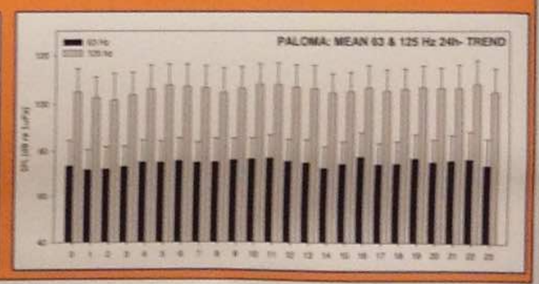
The observational activity is carried on in the framework of scientific collaboration between CNR-ISMAR, owner of the PALOMA oceanographic buoy (P555) and Arpa FVG which is in charge for marine acoustic underwater measurements using an open source autonomous recording unit.

- ✓ Over 3900 tracks (10' length every 15 min.) have been recorded between June and December 2016
- ✓ Low variability among different days of the week or over daily cycles
- ✓ Average values for 63 and 125 Hz bands are 71 and 110 dB re 1 μPa respectively
- ✓ Average values over the entire band have reached 111 dB re 1 μPa




| Month | Tracks per month | 24h | Tracks per hour |
|---|---|---|---|
| January | 0 | 0 | 159 |
| February | 0 | 1 | 166 |
| March | 0 | 2 | 158 |
| April | 0 | 3 | 160 |
| May | 0 | 4 | 165 |
| June | 521 | 5 | 153 |
| July | 591 | 6 | 166 |
| August | 367 | 7 | 151 |
| September | 1223 | 8 | 160 |
| October | 0 | 9 | 158 |
| November | 0 | 10 | 153 |
| December | 1234 | 11 | 160 |
| | | 12 | 145 |
| tot | 3936 | 13 | 171 |
| | | 14 | 170 |
| | | 15 | 171 |
| | | 16 | 180 |
| | | 17 | 167 |
| | | 18 | 182 |
| | | 19 | 172 |
| | | 20 | 169 |
| | | 21 | 169 |
| | | 22 | 169 |
| | | 23 | 173 |
| | | tot | 3936 |

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ISMAR

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Agenzia Regionale per la Protezione dell'Ambiente del Friuli Venezia Giulia