COMITATO CITTADINO PER LA BONIFICA MARINA
A TUTELA DEL DIRITTO ALLA SALUTE E ALL'AMBIENTE SALUBRE
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Subject: Addition to Comments on Public Consultations for the Draft Report of the Strategic Environmental Impact Assessment for the Program of Exploration and Production of Hydrocarbons Offshore Montenegro. Request for project rejection (Comments sent on Monday 08/02/ 2016 - 23:56
From: rosanna.rizzi@archiworldpec.it, to: DGSalvaguardia.Ambientale@PEC.minambiente.it, info@mek.gov.me, MESSAGE ID: opec281.20160208235604.00582.05.1.69@pec.aruba.it)

The undersigned Matteo d'Ingeo, as President-spokesman for the " **Comitato cittadino per la Bonifica marina a tutela del diritto alla salute e all'ambiente salubre"** (Citizens' Committee for Marine Reclamation to protect the right to public health and a healthy environment), hereinafter referred to **Comitato Bonifica Molfetta (CBM),** recorded April 3, 2014 with the N. 8987/3, with headquarters in Via F. Campanella, 50, Molfetta (Ba), having as a statutory objective "the protection of the right to public health and a healthy environment", Rosanna Rizzi, on behalf of the "**Coordinamento NoTriv Terra di Bari**", Francesco Masi on behalf of the "**Coordinamento No Triv Basilicata**" and Rosella Cerra on behalf of the "**Unione Mediterranea**" state as follows.

Here, we intend to offer some considerations related to the acidification of the Mediterranean ,already dealt with in other observations, after having noticed that this phenomenon has been systematically ignored. This parameter has an important influence on the propagation and absorption of sound and thus contributes to noise pollution and the disturbance that this has on marine life and on productive species, penalizing an important and vital economic resource.
Factors generally considered as parameters for the propagation of sound include; geological characterization, meteorological marine data, air and water temperature, water level, prevailing winds, wave metric data, current data. In particular, the temperature, salinity and depth, related to pressure.
An analysis of these parameters is made in the Environmental Impact Study of some instances in the Gulf of Taranto from Global Med published on the website of the Italian Ministry for Environment. In SEA_EP_Offshore_Montenegro study Temperature, Salinity and Density Sea is covered in Section 5.4.2.1. The

temperature on the seabed is 12 degrees in the Mediterranean. An increase in temperature corresponds to an increase in the speed of sound. On page 93 it is confirmed that:

"A sound velocity profile appears to be divided into different levels, according to the stratification of sea water. On the surface there is a general increase in speed due to the latter's increase with an increase in the temperature throughout the water mass. As depth increases, as previously described, the temperature decreases and with it also the speed of sound until reaching deep thermocline"

Here it is linked to another determining factor that influences the propagation of speed on the seabed, ie pressure. It continues:

"At constant values, the temperature will no longer influence the speed of sound. Pressure will have a greater effect. The latter in fact, varying directly with the depth, will also increase the speed of sound down to the seabed. "

In relation to salinity it states that:

"The Mediterranean Sea, being a semi-enclosed basin from the Strait of Gibraltar, is characterized by high salinity levels in relation to those of the oceans in low and middle latitudes, of around 37-38 ppt".

And also:
" Salinity has a lesser effect on sound velocity than that of the other two physical properties , just mentioned(www.dosits.org). However, it is no less important, because it is due to the high values recorded in the Mediterranean Sea that the speed values of sound are much greater than those observed in other oceans or seas."

The conclusion is reported in the table which highlights the fact **that the speed of sound propagation is greater in the Mediterranean than in other seas.**

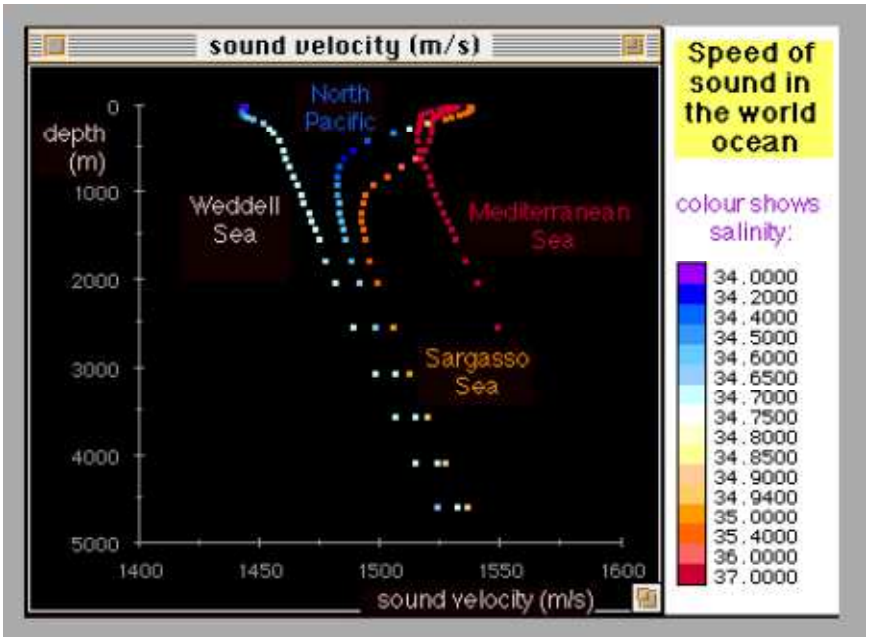

Table 1, in the additions *Table 8.15 – Speed of sound along the column of water in the Weddell Sea (Antartic Sea)), of the northern sector of the Pacific ocean,of the Sargassi Sea (Atlantic Ocean) and the Mediterranean (source: www.flinders.edu.au)*

As can be seen in the table, up to 1000-2000 meters depth these are different, a sign that the factors evaluated have a certain influence, while at greater depths the differences diminish and the values tend to be equal. The Mediterranean Sea has a depth that does not reach 3000 meters.

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These considerations still lack an important parameter. No reference is made to the acidification of the Mediterranean Sea, a parameter which has an influence on the propagation of the sound wave as well as its attenuation and absorption. On the website DOSIT the pH value and thus the degree of acidification of the sea, is not a negligible parameter.

As reported in http://www.dosits.org/science/soundsinthesea/oceanacidification/, where it states:

> ""***Acidity affects sound absorption.*** *As sound travels through the ocean, some of the energy in the sound wave is absorbed and converted into heat, causing the sound wave to become weaker. Sound absorption in seawater is much greater than that in pure water. Two chemicals present in seawater in small amounts, magnesium sulfate and borate* ***ions****, are primarily responsible for the additional sound absorption."*

Acidity and salinity are two different features of water. The DOSIT site also states :

"Acidity is characterized using the pH scale, which is a logarithmic scale ranging from 0-14. A pH of 7 is neutral (neither acidic nor basic). A pH below 7 is acidic, and a pH above 7 is basic. "

Moreover:

> *"**As the ocean becomes more acidic, sound absorption at low frequencies decreases.** This has generated concerns about possible impacts on background noise levels in the ocean."*

We can reasonably assume that if the acidity were to increase, **the sound intensity that reaches the seabed could exceed the figure usually valued and expected.**

We want at this point to return to the acidity of the water and point out how this will affect the attenuation of sound intensity.
The formula for the variation of intensity of a sound wave, I1 to I2, to travel a distance R, in the sea is the following:

$I_1 I_2 = e ^ (- \alpha R)$

α is the attenuation coefficient and depends on several factors, including the frequency and the acidity.

In this regard we report an emblematic result of the study on measurements of the coefficient α made by Mellen and Browing in the Pacific , which pointed out that, at frequencies of 50 100kHz,there was a smaller value of α than that measured in the Atlantic, highlighting a different chemistry between the two oceans. This difference is actually given by pH: the average Pacific pH is about 7.7 and that of the Atlantic 8.1. This difference is sufficient to change the attenuation coefficient; in the Pacific it is about half that of the Atlantic, at the same frequency.

Figure 1. NUSC ATTENUATION EXPERIMENTS, 1967 to 1973

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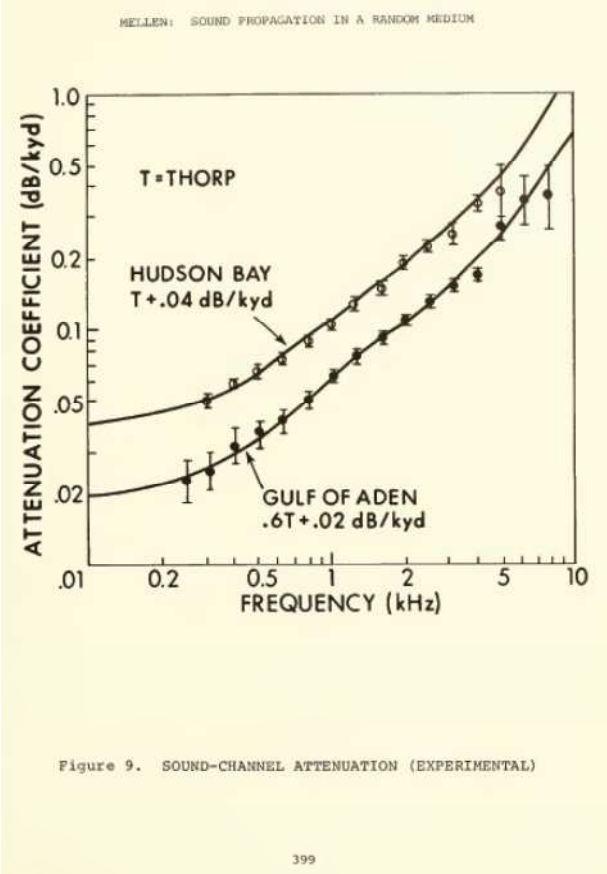

Tables 2 e 3 *taken from Mellen e Browing*

In this regard ISPRA (Italian Institute for Advanced Environmental Research) recalls in the "Guidelines for the study and regulation of anthropogenic noise introduced into the sea and inland waters - Part One" that:

"... As reported recently by members of the Intergovernmental Panel on Climate Change IPCC (Intergovernmental Panel on Climate Change) the increasing level of acidification of the seas, due to the greater amount of dissolved carbon dioxide (CO2) in the water causes an increase in submarine acustic pollution, since such an increase in the degree of acidity corresponds to a reduction of the capacity of water to absorb and attenuate the acoustic frequencies. "

To sum up, the lesser the value of Ph, and thus the higher the acidity, the lower is the attenuation coefficient, and thus the wave "attenuates" less.
But there is a further consideration to be made about this factor. At the present there are insufficient studies to permit assessments on the actual acidification of the Mediterranean. As stated in an ISPRA study presented July 30, 2013 at the Forum on ISPRA Research concerning the issue of marine acidification illustrating the work carried out in accordance with the Marine Strategy Directive (MSFD) and in particular Art. 8: Initial assessment Marine acidification: current knowledge and future perspectives:

Results of simulations regarding future trends , indicate that even with the reduction of CO2 emissions , the inertia of the atmosphere-ocean system is such that the acidification process will continue exposing the biota to conditions never experienced before in evolutionary history .
To the changes produced by marine acidification must be added other environmental changes , particularly those related to the rise in temperature.
From pre -industrial times to the present there has been a decrease in the pH value of surface waters of the oceans of 0.1 units .
The level of marine acidification of the Mediterranean Sea is between -0.14 and -0.05 pH units (Touratier and Goyet , 2011) " .

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The Mediterranean Sea due to its chemical / physical characteristics seems one of the regions most affected by marine acidification..

Station	n	Minimum	1st Q	Mean	Median 2nd Q	3rd Q	Maximum	Standard deviation	M.A.D.
Ligurian Sea	9520	7.84	8.196	8.271	8.30	8.40	8.70	0.1266	0.1426
Western Mediterranean Sea	20041	7.70	8.10	8.215	8.20	8.30	8.60	0.1637	0.1483
Tyrrhenian Sea	11580	7.19	8.20	8.335	8.30	8.40	9.17	0.1547	0.1483
Central Mediteranean Sea	9980	7.73	8.20	8.285	8.30	8.30	8.6	0.1030	0.1483
Ionian Sea	20363	7.50	8.20	8.344	8.40	8.50	8.8	0.2058	0.1483
Southern Adriatic Sea	10632	5.94	8.30	8.428	8.40	8.50	9.63	0.2250	0.1483
Central Adriatic Sea	782	7.70	8.096	8.30	8.23	8.47	9.065	0.2699	0.2224
Northern Adriatic Sea	20798	7.70	8.30	8.477	8.50	8.60	9.50	0.2452	0.1483

Tab.1 Measures of location and variability calculated at various Assessment Areas

The acidification therefore also varies relatively to the periods of the year, with variable values also at different points. Returning to the conclusions of the study of Mellen, with pH values from 7.7 to 8.1, the attenuation coefficient can also be halved.
As you can see from the table, in the Adriatic Sea pH values higher than 9 have been recorded Thus, values which more than halve the value of the attenuation coefficient. This parameter must therefore be taken into consideration when making intensity attenuation prediction models of the sound that hits the seabed. A high value of this intensity could alter the state of the seabed, disturbing what has been resting there , including the submerged remnants of war over the years, as extensively documented in our previous observations which are being integrated here. We can reasonably assume that because of the long period of time that the bombs, drums and loads have been on the seabed, the containers of hazardous materials are no longer in an undamaged condition, and therefore even small perturbations and vibrations could cause them damage or rupture, and thus it is prudent to avoid any source of disturbance and external stress.

In addition, the ISPRA study goes on to state that:

"The research is specifically oriented to study the combined impact of increased Water Temperature, acidification, dissolved oxygen depletion, pollutants. In the Adriatic there are ongoing studies on the impacts due to the acidification of molluschiculture products (mussel, clams) ".

The Critical section highlights:

" The lack of research projects specifically targeted at Italian seas ,that are still poorly documented with many different aspects yet to be investigated and understood, especially in view of a proper risk assessment and effective planning of intervention policies".

Project ideas :

"In order to address the shortcomings highlighted in the first phase of the MSFD it is necessary to plan future strategies aimed at:

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preparation of a National Network for Integrated Long-term monitoring of the level of acidification (pH) and alkalinity (CO2 flows) in Italian waters to supplement the existing stations in areas useful to the characterization of sub-regions as defined in the MSFD;

The network could initially include existing observational systems and operating (CNR, ISPRA, OGS) with observation platforms semi-equipped to collect geochemical and physical parameters in the long term.

Continuation in collaboration with the relevant bodies and institutes of the National Research (CNR, CONISMA) ".

The work presented in that forum is the first step, which should have been followed by the desired and necessary research stages, which however has still not been initiated.

The pH of 'Water is also a very important parameter to assess the state of the ecosystem. Omission of this factor, and the lack of assessments about the impact of high intensity sound sources means that the study is inadequate.

For our part we not only expect, but demand that further intensive studies are carried out before proceeding to give any concessions, regarding prospecting, research and exploitation of hydrocarbons in the Mediterranean. Until such research is conducted regarding the necessary assessments described above, we feel it is necessary to appeal to the precautionary principle, where it is argued that:

" Where there are threats of serious or irreversible damage , lack of scientific certainty should not be used as a reason to avoid the adoption of measures to prevent environmental degradation " .

We attach links to some articles on related topics

http://www.science20.com/news_releases/an_unexpected_side_effect_to_ocean_acidity_whales_will_call_70_per cent_farther

http://www.nature.com/ngeo/journal/v3/n1/full/ngeo719.html
http://scitation.aip.org/content/asa/journal/jasa/128/3/10.1121/1.3425738
http://onlinelibrary.wiley.com/doi/10.1029/2008GL034913/abstract
http://scitation.aip.org/content/asa/journal/jasa/61/3/10.1121/1.381357
http://onlinelibrary.wiley.com/doi/10.1029/2008GL034913/full
http://scitation.aip.org/content/asa/journal/jasa/128/3/10.1121/1.3431091

Consider the first link as an example:
http://www.science20.com/news_releases/an_unexpected_side_effect_to_ocean_acidity_whales_will_call_70_per cent_farther

This effectively sustains that:

> *"According to a paper to be published this week by marine chemists at the Monterey Bay Aquarium Research Institute, these changes in ocean temperature and chemistry will have an unexpected side effect— sounds will travel farther underwater".*

The illustration below gives an idea of the effect of acidification on the propagation of sound .

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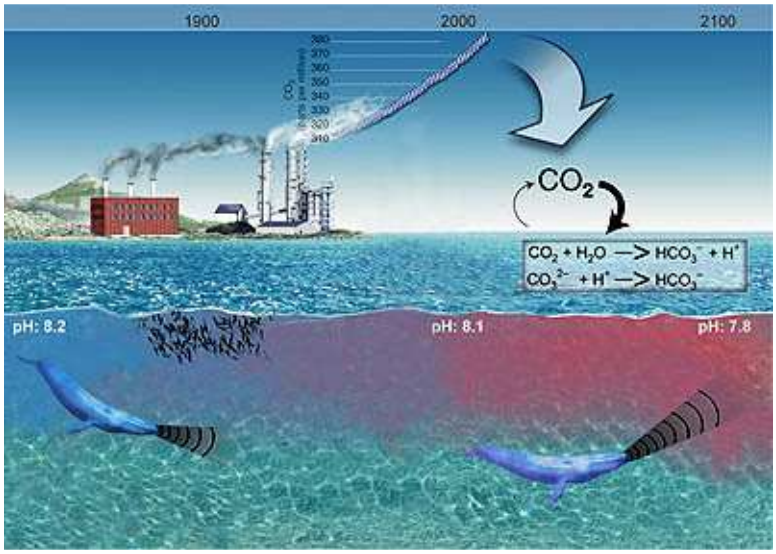

Figure 4*. This illustration shows how increasing carbon dioxide in the atmosphere leads to an increase in the acidity of seawater, which in turn allows sounds (such as whale calls) to travel farther underwater. Image: (c) 2008 MBARI. Base image courtesy of David Fierstein.*

For these reasons, the **C.B.M. Molfetta, Coordinamento NoTriv Terra di Bari, Coordinamento No Triv Basilicata and Unione Mediterranea ask to Ministry of Economy of Montenegro to reject the "Program of Exploration and Production of Hydrocarbons Offshore Montenegro ".**

This request for dismissal is also based on the lack of any proposed mapping, prospecting and geo-referencing of unexploded ordnance present in a wide overlapping or bordering area, not only within the survey areas affected by today's requirements, but also within the others present in the Adriatic Sea.

Bari, 29.02.2016

for "**Comitato Bonifica Molfetta"**
Matteo d'Ingeo

for **" Coordinamento NoTriv Terra di Bari"**
Rosanna Rizzi

for "**Coordinamento No Triv Basilicata**"
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