Pec Direzione

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Dear Members of the Italian Government,

Enclosed you will find the comments we have submitted to the Government of Croatia on behalf of 19 NGO's and Research Institutes with expertise in marine conservation issues. For your consideration I attach additional information about airguns used for seismic exploration and their impact on marine life.

Hereafter please find brief information about the various aspects of the issue:

THE IMPACT OF AIR GUNS

Offshore exploration for oil & gas primarily use seismic surveys (air gun arrays). Similar surveys are also used for research purposes. Seismic surveys produce sound by introducing air into the water at high pressure, usually directed toward the sea floor, with up to 20 guns being fired in synchrony, while "streamers" of hydrophones listen for echoes. Air gun pulses penetrate tens to hundreds of kilometres into the Earth's crust, after having already travelled through sometimes thousands of meters of water. Surveys can last for many weeks at a time. During the surveys, every air gun in the array produces a pulse of noise lasting 20 to 30 milliseconds which is repeated on average every 10 to 15 seconds, often for 24 hours a day over many weeks. Air guns located 3000 km away were the predominant part of the background noise heard over hydrophones placed in the middle of the North Atlantic Ocean.

As oil and gas reserves become more scarce, offshore exploration is moving into more environmentally sensitive and difficult habitats. Seismic surveys generate a great deal of waste noise (anything over 100 Hz up to as high as tens of kHz) that is unused by the petroleum industry or geophysical researchers. They also produce a loud pulse that is damaging to marine life because it is a sharp sound, with a fast rise time. More environmentally benign alternatives exist, yet these are not being used by industry.

We draw your attention to Annex I: A Review of the Impacts of Seismic Air Gun Surveys on Marine Life

IMPACT ON FISH SPECIES AND FISHERIES

Criticism and concerns are arising within various economic sectors, including tourism, against the proposed exploration of oil and gas resources. In this section we draw your attention to the potential impact of seismic activities on fish stocks and therefore the potential economic harm to the fisheries sector.

Three decades of controlled scientific studies leave no doubt that intense sound damages fish and impacts fisheries. Ocean noise has a negative effect on at least 55 marine species. Even the viability of fish eggs was reduced in one study when the eggs were exposed to moderately loud sound for several days.

In 2003 researchers exposed pink snapper to seismic air gun sounds and found that their ears were severely damaged. The auditory hair cells did not regenerate after almost two months. This damage was seen at exposure levels that might occur several kilometres away from the sound source. The authors note the ears of pink snapper are typical of the majority of commercially important species such as cod, haddock, salmon, and tuna.

The authors also point out that fish with hearing impairment are more vulnerable to predators and less able to locate food and communicate acoustically. A review paper on the effects of noise on fish in 2003 concluded that current studies suggest that noise affects fish behaviour and thereby, fisheries.

In a study done by the Norwegian Institute of Marine Research, air guns caused extensive damage to the inner ears of fish and lowered trawl catch rates 45 to 70% over a 2,000 square mile area of ocean. Catch rates did not recover in the five days surveyed after air gun use stopped. Air gun pulses also caused a catch per unit effort decline of about 50% in the rockfish hook and line fishery off the coast of California.

Several studies show that fish catch rates are significantly lowered by noise from air guns indicating that increasing levels of human-produced noise in the ocean can significantly and adversely impact the food supply, employment and economies of many nations.

A study commissioned by the Namibian government has revealed that the sharp decline in tuna catches is a result of an increase in seismic exploration for oil and gas in the Orange River Basin. The government was concerned that country's tuna catch shrunk to 650 tonnes in 2013 from 4 046 tonnes in 2011, and that the negative effect was as a result of the search for oil and gas on the Atlantic coast driving tuna stock from their normal migratory routes.

A taskforce established to investigate the ecological effects of seismic exploration on tuna fishing has recommended that the government halts further proposed seismic survey for oil and gas in the major tuna fishing ground until more information is available. Industry concerns continued into 2014

Similarly, the Australian tuna industry formally nominated marine seismic surveys as a 'key threatening process' under Australia's environment legislation in 2013. The industry believes that seismic exploration threatens, or may threaten, the survival, abundance or evolutionary development of a native species or ecological community.

These events only underscore the findings made in several studies of significant displacement of commercial fish, and loss of catch, over wide spatial scales. Indeed, the Namibian and Australian events appear to extend those findings to species of tuna, which have not previously been examined.

Noise also results in alterations in fish and squid behaviour, including: alarm responses and changes in schooling patterns, position in the water column and swimming speeds. A relationship between behavioural responses and noise level has also demonstrated.

Disruption of behaviour during critical periods such as mating, spawning and migration could be particularly important. Anecdotally, fishermen around the world have recognized a corresponding drop in fish recruitment in the seasons following a seismic survey, which could indicate that damage might have been caused to larval development or another part of the breeding lifecycle. However, the significant absence of studies before, during and after surveys means that empirical evidence is hard to demonstrate. The absence of studies is mostly because the industry has been reluctant to fund or facilitate the studies. However, *the absence of evidence is not evidence of absence.* Seismic survey proponents cannot empirically demonstrate that their activities cause no harm.

Crustaceans (crabs, lobsters, crayfish, shrimp, krill and barnacles) are the only invertebrates besides insects and spiders that communicate with acoustic signals. An important study carried out on rock lobster has brought forward information that sub-lethal effects have been observed with respect to feeding and serum biochemistry weeks to months after exposure. A cellular change was also noted in the digestive gland of animals that had been exposed 4 months earlier, which may be linked to organ 'stress'. While these studies are not conclusive, they do indicate a need for caution. The effects on snow crab from close exposure (in a controlled experiment) included effects on developing fertilized eggs, bruising of the heptopancreas and ovaries, delayed embryo development, smaller larvae.

Mollusc larvae (in this case scallop) exposed to playbacks of seismic pulses have also been researched. They showed significant developmental delays in the animals and 46 percent developed body abnormalities. Similar effects were observed in all independent samples exposed to noise while no malformations were found in the control groups. Noise exposure during critical growth intervals may also contribute to stock vulnerability, underlining the urgency to investigate potential long-term effects of acoustic pollution on shellfish.

Similar studies have produced similar results for cephalopods (octopuses, squid, cuttlefish and *Nautiloidea*) in a number of parts of the world.

The UN General Assembly on sustainable fisheries has called upon the FAO to carry out studies on the socio-economic impacts of ocean noise pollution on fisheries – namely OP153 of doc A/RES/68/71. Specifically, the FAO: *'[e]ncourages further studies, including by the Food and Agriculture Organization of the United Nations, on the impacts of underwater noise on fish stocks and fishing catch rates, as well as associated socioeconomic effects'.*

The need for such studies should not be underestimated. The use of air guns near fish stocks severely affects their distribution, local abundance as well as trawl and longline catch rates. It has been explained that catch rates do not return to normal even days after noise has abated.

INTERNATIONAL REQUIREMENTS AND OBLIGATIONS

Assessment of likely impacts is an emerging legal requirement in the European Union. Directive 2001/42 /EC and the more recent Environmental Impact Assessment Directive 2014/52/EU requires that Environmental Impact Assessments are carried out before development consent is given to activities (2014/52/EU Art 2.1) to identify impacts to biodiversity with particular attention to species and habitat protected under Directive 92/43/EEC and Directive 2009/147/EC (2014/52/EU Art 3.1).

While seismic surveys are not included in the Annexes, the 2014/52/EU Directive introduction states that:

> *"[w]ith a view to ensuring a high level of protection of the marine environment, especially species and habitats, environmental impact assessment and screening procedures for projects in the marine environment should take into account the characteristics of those projects with particular regard to the technologies used (for example seismic surveys using active sonars)."*

In further support of this imperative, we draw your attention to the recent Convention on Biological Diversity (CBD) *Decision XII/22: Marine and coastal biodiversity: ecologically or biologically significant marine areas (EBSAS)* that encourages Parties:

> ... *"to make use, as appropriate, of the scientific information regarding the description of areas meeting EBSA criteria, including the information in the EBSA repository and information-sharing mechanism, as well as the information from indigenous and local communities as well as relevant sectors, including the fisheries sector, when carrying out marine spatial planning, development of representative networks of marine protected areas, taking into account annex II to decision IX/20, and application of other area-based management measures in marine and coastal areas, with a view to contributing to national efforts to achieve the Aichi Biodiversity Targets"*

Specifically, CBD Decision XII/22 has identified that:

- the Northern Adriatic hosts a population of the highest density of bottlenose dolphins (*Tursiops truncatus*) in the Mediterranean, it is one of the most important feeding grounds in the Mediterranean of the loggerhead turtle (*Caretta caretta*). Moreover, it is a nursery area for a number of vulnerable species and is one of the most productive areas in the Mediterranean Sea. It is ranked high for its 'special importance for life-history stages of species', 'importance for threatened, endangered or declining species and/or habitats' and for 'biological productivity';
- the Jabuka/Pomo Pit hosts the largest populations of Norway lobster (*Nephrops norvegicus*) and is important especially for juveniles in the depths over 200 m. It is ranked high for its 'uniqueness or rarity', 'special importance for life-history stages of species', and for 'biological productivity'; and
- the South Adriatic Ionian Straight contains important habitats for Cuvier's beaked whales (*Ziphius cavirostris*), an Annex II species of the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD Protocol) in the framework of Barcelona Convention, and significant densities of other megafauna such as the giant devil ray (*Mobula mobular*), striped dolphin (*Stenella coeruleoalba*), Mediterranean monk seal (*Monachus monachus*), and loggerhead turtle (*Caretta caretta*), all of which are listed in Annex II of SPA/BD Protocol. It is ranked high for its 'uniqueness or rarity', 'special importance for life-history stages of species', 'importance for threatened, endangered or declining species and/or habitats', 'vulnerability, fragility, sensitivity, or slow recovery' and for 'biological diversity'.

We are of the opinion that no exploration and/or exploitation activities should be permitted within any of the

referenced EBSA sites and/or sites declared as protected zones (including Special Areas of Conservation designated through the Species and Habitats Directive and Areas of Community Importance, including those referenced within the Strategic Environmental Assessment).

We also draw to your attention the recent discussions of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) Recommendations to CBD Parties XVIII/4: Marine and coastal biodiversity that urges Parties to:

> *"take appropriate measures within their mandates to avoid, minimize and mitigate the potential significant adverse impacts of anthropogenic underwater noise on marine and coastal biodiversity,"* and to *"[conduct] appropriate impact assessments before carrying out activities that may have adverse impacts on noise-sensitive species, and carrying out appropriate monitoring".*

SBSTTA also urged CBD Parties to combine acoustic mapping of potential noise impacts with habitat mapping of sound-sensitive species to identify areas where those species may be exposed to noise impacts.

As you are aware, the Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and Contiguous Atlantic (ACCOBAMS) *Resolution 4.17: Guidelines to Address the Impact of Anthropogenic Noise on Cetaceans in the ACCOBAMS Area (ACCOBAMS Noise Guidelines)*:

> *"[r]ecogniz[es] that anthropogenic ocean noise is a form of pollution, caused by the introduction of energy into the marine environment, that can have adverse effects on marine life, ranging from disturbance to injury and death".*

The ACCOBAMS Resolution also encourages Parties to:

> *" address fully the issue of anthropogenic noise in the marine environment, including cumulative effects, in the light of the best scientific information available and taking into consideration the applicable legislation of the Parties, particularly as regards the need for thorough environmental impact assessments being undertaken before granting approval to proposed noise-producing activities".*

The ACCOBAMS Noise Guidelines further detail specific considerations relating to seismic surveys and offshore drilling.

Also, the Convention on Migratory Species (CMS) *Resolution 10.24: Further Steps to Abate Underwater Noise Pollution for the Protection of Cetaceans and Other Migratory Species*:

> *"[s]trongly urges Parties to prevent adverse effects on cetaceans and on other migratory marine species by restricting the emission of underwater noise, understood as keeping it to the lowest necessary level with particular priority given to situations where the impacts on cetaceans are known to be heavy"* and *"[u]rges Parties to ensure that Environmental Impact Assessments take full account of the effects of activities on cetaceans and to consider potential impacts on marine biota and their migration routes and consider a more holistic ecological approach already at a strategic planning stage."*

THE IMPORTANCE OF ENVIRONMENTAL IMPACT ASSESSMENT

The Scientific Council of the Convention on Migratory Species (CMS) recently determined that Environmental Impact Assessments for Offshore Petroleum Exploration Seismic Surveys should provide a science-based tool for decision-makers to better understand the consequences of their decisions, evaluate alternatives and mitigate impacts.

Around the world, offshore exploration proposals are presented to Governments with generalized, unsubstantiated information and often without having conducted basic consultation. Subsequent decision-maker approvals or rejections of such poor Environmental Impact Assessments are being made on the basis of erroneous information and are vulnerable to criticism of bias or tokenism.

Environmental Impact Assessments should provide level of technical information that gives confidence to decision-makers.

Furthermore, Strategic Environmental Assessments (SEAs) as well as Environmental Impact Assessments (EIAs) shall we undertaken with extensive and transparent participation of the public. Such public participation in the decision making process is based on provisions by the Convention on Environmental Impact Assessment in a Transboundary Context (ESPOO Convention) and the Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (AARHUS Convention).

THE DETAIL OF ENVIRONMENTAL IMPACT ASSESSMENTS

The four bodies highlighted above have provided significant clarity about the expectations to conduct Environmental Impact Assessments in order to fully assess and effectively manage impacts associated with offshore seismic and drilling activities, among other underwater noise producing activities.

In our experience, offshore exploration proposals are often presented to governments with generalized, unsubstantiated information and usually without having conducted basic consultation. Subsequent decision-maker approvals or rejections of such poor Environmental Impact Assessments are being made on the basis of erroneous information and are vulnerable to criticisms of bias or tokenism. Environmental Impact Assessments should provide a level of technical information that gives confidence to decision-makers.

The Scientific Council of CMS (CMS ScC) recently determined that Environmental Impact Assessments for Offshore Petroleum Exploration Seismic Surveys should provide a science-based tool for decision-makers to better understand the consequences of their decisions evaluate alternatives and mitigate impacts.

Given the clarity in both Directive 2001/42 /EC and Directive 2014/52/EU and the weight of information through the CBD EBSA, ACCOBAMS and CMS Decisions, as well as the SBSTTA and CMS ScC Recommendations, we urge Governments to to ensure that meaningful and comprehensive Environmental Impact Assessments in the Mediterranean Sea are mandatory, before any activity is approved.

Within these Environmental Impact Assessments, governments should stipulate that professional sound propagation modelling for all seismic activities is transparently provided to authorities, as well as being verified in the field. This modelling should be based on local environmental data, not on other regions, other surveys or generalist assumptions from industry. Only through such modelling and field verification will authorities be able to determine the cumulative impact from multiple and overlapping seismic activities.

We also believe that it is important that crucial data regarding abundance, distribution, seasonality and habitat use of key species in the region should be collected and known before any activities commence. In particular, the special area of concern in the south Adriatic for *Ziphius cavirostris* requires additional surveying.

Furthermore, we call on Governments when reviewing the future results from Environmental Impact Assessments to encourage the petroleum industry to present all potential options and details about available technologies to reduce sound levels during exploration activities, as recommended within the referenced Resolution CMS 10.24 and ACCOBAMS 4.17, and SBSTTA Recommendation XVIII/4. For instance, stress field detection technology performed from the air, or similar technologies could potentially reduce the need for some seismic airgun surveys by focusing them on only the most promising areas. Marine vibroseis holds promise in reducing the acoustic footprint of seismic surveys, particularly for high-frequency specialists and noise-sensitive marine life such as beaked whales.

Finally, we strongly recommend that quantitative and systematic monitoring should be prescribed before, during and after seismic activities. It should be undertaken by independent experts and also conducted during operation of the potential platforms.

Enclosed you will find the following documents:

- Brochure "Drawning in Sound"
- A Review of Impact of Seismic Airgun Surveys on Marine Life
- Recent International Noise Decisions
- Bibliography peer reviewed Studies on Noise and Fish
- Inventory off shore Seismic explorations in the Mediterranean Sea

Please don't hesitate to contact me if there is anything else I can help you with.

All the best,

Sigrid

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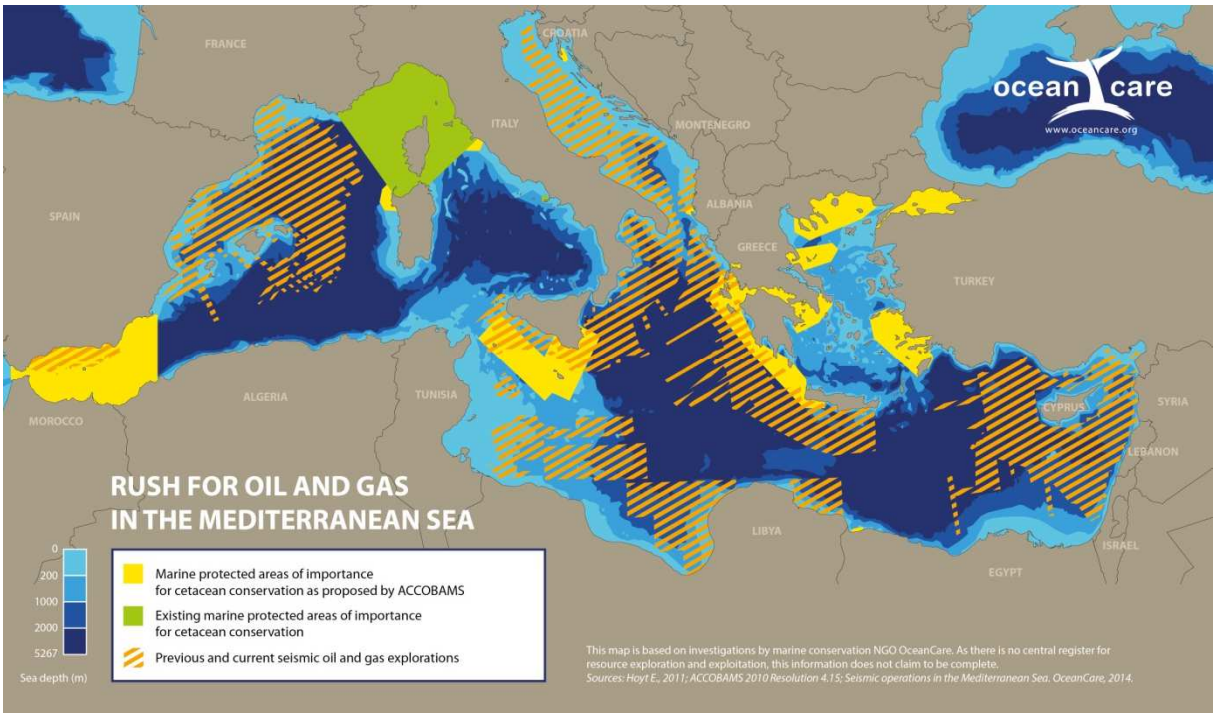
OceanCare is a Swiss non-profit organisation. It was founded in 1989 and has a strong commitment to realistic and cooperative initiatives. The association works at national and international level in the areas of marine pollution, environmental changes, fisheries, whaling, sealing, captivity of marine mammals and public education. OceanCare has the Special Consultative Status with the Economic and Social Council of the United Nations and is an official partner of the UNEP/CMS Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and Contigous Atlantic Area (ACCOBAMS).



Seismic offshore explorations for oil and gas in the Mediterranean Sea

This working paper focuses on the seismic activities going on currently in the Mediterranean Sea as depicted in the map which indicates all recent and ongoing seismic offshore activities since 2006 together with marine protected areas of importance for cetaceans as proposed by ACCOBAMS.

The Scientific Committee of the IWC, at its 2004 meeting, stated that there is compelling evidence implicating anthropogenic sound as a potential threat to marine mammals, at both regional and ocean-scale levels, that could impact populations of animals. The body has consistently called for multinational cooperation to monitor ocean noise, and to develop basin-scale and regional noise budgets. Noise has been included in the body's work since then, including as a priority issue for cetacean research.

We ask the Scientific Committee of the IWC

- to engage in the assessment of the impact of ocean noise pollution through seismic surveys in the Mediterranean Sea on cetaceans in general and on beaked whales in particular and to urge policy makers to ensure that potentially harmful human activities, including anthropogenic ocean noise, are subject to Environmental Impact Assessments that address cumulative and synergistic effects on marine biodiversity; and
- to assist in developing effective guidelines to mitigate or eliminate intense noise-producing activities in critical habitats, including biosphere preserves, UNESCO Marine World Heritage Sites and Marine Protected Areas.

Seismic offshore operations in the Mediterranean Sea (2006 until recently)

An inventory by OceanCare

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INVENTORY OF SEISMIC OFFSHORE EXPLORATIONS FOR OIL AND GAS 4

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Version 05/06/2014

Introductory remark

This is an inventory of seismic offshore explorations for oil and gas conducted in the Mediterranean Sea since 2006. Where available the information includes the indication of exact areas explored and the exploration technologies used. The document served also as a source to create a geographical representation of the seismic operations. The map which is called “Rush for oil and gas in the Mediterranean Sea” shows not only the massive extent of seismic explorations for oil and gas during the past 8 years but also an alarming geographical overlapping with proposed marine protected areas of importance for cetaceans as agreed on by the member Parties of the Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and contiguous Atlantic Area (ACCOBAMS).

The information about the search for offshore oil and gas deposits is not readily accessible. The inventory on hand has been based on intense internet search for respective information. Although a lot of information has been collected the document may not be exhaustive and has to be appraised as a document in progress.

Inventory of seismic offshore explorations for oil and gas

Greece

Evangelos Livieratos, the incumbent minister of energy, has published a statement in June 2013 in which he announces that the Greece government has tasked the *Norwegian Petroleum Services (PGS)* with preliminary research.[1]

According to experts the offshore regions south of Crete and off the Western mainland (Ionian Sea) hold profitable amounts of untapped oil reserves, estimated at around 400 million Euros.[1]

Current Status

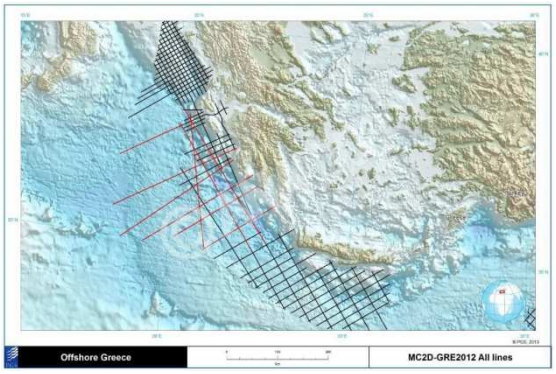

Figure 1: Image of the area survyed by Petroleum Geo-Services in Greece (PGS).

PGS has covered over 12,500 line km of new areas in recent explorations and 6,000 line km previously. As *Figure 1* above clearly outlines, the areas around the Ionian Sea and the regions South of the Islands of Crete are largely affected by *PGS's* explorational campaigns.[2]

The Norwegian *Petroleum Geo-Services* has submitted preliminary findings to the Greek government (Ministry of Energy). The comprehensive results of the seismic explorations, according the companies own executives, were announced for December 2013.

As of the 4th of July 2013 *PGS* has acquiered 2D MultiClient data in Western and Southern regions offshore Greece, commissioned by the Hellenic Republic Ministry of Environemnt, Energy and Climate change (YPEKA). "The first fast-track datasets are now available. Seismic data including marine gravity and magnetic data can be obtained by contacting the PGS MultiClient team at meinfo@pgs.com."[3]

Currently the YPEKA (Ministry of Environment, Energy and Climate Change) is preparing for a licensing round set to open in Q3 of 2014. Up for grabs is more than 200,000 square kilometer of Greece's offshore acreage. Please refer to *Figure 2* below for reference.

Type of surveying activity

PGS has acquired 2D Multiclient Data of the area pictured in *Figure 1* above, using a Geostreamer GS.[3] The Geostreamer GS is a revolutionized technology introduced into the market in 2007.[4] The

[1] http://www.amna.gr/english/articleview.php?id=3353
[2] http://www.pgs.com/en/Data_Library/North_Africa___Middle_East/Greece/
[3] http://www.pgs.com/en/Pressroom/Calendar_of_Events/Campaigns/2013/MultiClient-Newsletter/Europe-Newsletter/PGS-Releases-First-Data-Sets-Ahead-of-Licensing-Round-in-Greece/

Geostreamer allows the involved technicians to remove receiver ghost, thus allowing "greater reservoir resolution and description". [4]

Figure 2: Image of Seismic operations in Greek waters.

SURVEY AREA: (Figure 2) 12,430 line km

ACQUISITION DETAILS: Nordic Explorer, 2012/2013

ACQUISITION PARAMETERS

Acquisition Mode: 2D

Energy Source: 4,800 cu.in.

Shotpoint Interval: 25 m / 37.5 m

Source Depth: 5 m on inner strings and 9 m on outer strings

Streamer Length: 10,050 m

Streamer Depth: 25 m

Group Interval: 12.5 m

Record Length: 10,000 / 14,000 ms

Sampling Rate: 2 ms

Time between shots: Not available

Sound intensity level: Not available

Remarks

PGS has pointed out that their aims was to discover, understand and fully comprehend the structure of the seabed and locate possible oil beds.[5] The purpose of these activities is to give oil companies a comprehensive analyses of the region making it easier to decide whether to invest in further research and possibly place a bid on the licensing ventures. The official document released by the media department of the *Petroleum Services* (PGS) has placed the licensing round at mid 2014, which would respectively be around June/July of 2014. [6]

[4] http://www.pgs.com/en/Geophysical-Services/GeoStreamer-GS/
[5] http://www.phantis.com/news/norwegian-company-completes-seismological-research-oil-gas-greek-waters
[6] http://www.pgs.com/en/Geophysical-Services/GeoStreamer-GS/

Croatia

The Croatian Ministry of economy has contracted Spectrum, a Multi client service company, with acquiring 2D seismic data offshore Croatia. [7] According to the „the drilling contractor" the seismic activity will cover the northern and southern parts of the Adriatic sea and the survey grid "will connect with Spectrum's reprocessed seismic data covering the Italian Adriatic". [8] Ivan Vrdoljak, Croatia's Minister of economy, has claimed: "The acquiring of 12,000 line km of 2D seismic data in the Croatian Adriatic is our next step to encourage oil and gas exploration in Croatia. We have already approved a new hydrocarbon law and overall have attractive legislation in place to encourage investment… This new seismic survey is a precursor to an offshore license round that will be announced soon, with new data available to international oil companies by Q1 2014."[9]

Spectrum aims at attaining 12,000 line km (7,456 miles) approximately of long offset seismic data, focusing mainly, as mentioned above, on the northern and southern regions of the Adriatic Sea.[10]

Current Status

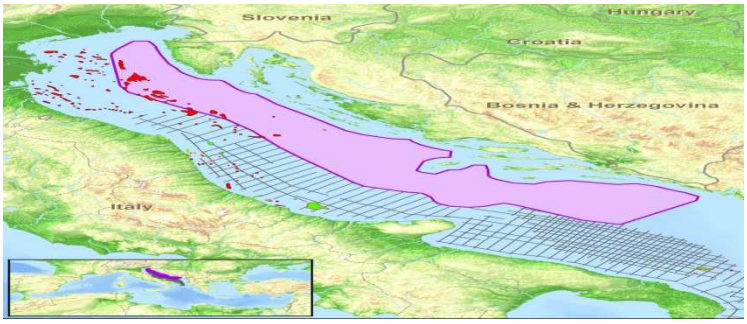

Figure 3: Image of the regions affected by Spectrums seismic data acquisition.[11]

Figure 4: Area surveyed by Spectrum: completed on the 21st of January

[7] http://www.offshore-mag.com/articles/2013/08/spectrum-to-do-2d-seismic-survey-offshore-croatia.html
[8] http://www.drillingcontractor.org/2d-seismic-survey-offshore-croatia-to-lead-into-2014-licensing-round-25334 http://www.spectrumasa.com/press-release/spectrum-to-acquire-2d-multi-client-seismic-offshore-croatia-ahead-of-licensing-round
[9] http://www.drillingcontractor.org/2d-seismic-survey-offshore-croatia-to-lead-into-2014-licensing-round-25334

http://www.spectrumasa.com/press-release/spectrum-to-acquire-2d-multi-client-seismic-offshore-croatia-ahead-of-licensing-round

[10] http://www.epmag.com/Exploration-Geology-Geophysics/Spectrum-Acquires-Seismic-Offshore-Croatia_120676
[11] http://www.spectrumasa.com/wp-content/uploads/Spectrums-Offshore-Croatia-Seismic-Map.jpg

Figure 5: Region as of January 21st explored by Spectrum. Red indicates new acquiered data.

Spectrum has signed a contract with the Croatian Ministry of economy in July 2013 and has commenced with the 2D seismic data acquisition in September to be finalized by the fourth quarter of the calendar year 2013.[12]

Figure 5 above indicates the regions in which *Spectrum* has conducted seismic surveys. Red indicates the newest areas subjected to surveys.[13] On the 21st of January 2014 *Spectrum* has completed MultiClient 2D seismic acquisition survey offshore Croatia, including a total of 5,000 km 2D data.[14] Please refer to *Figure 4* for reference.

The Croatian government has opened the first offshore license round on April 2nd, 2014.[15]

Types of surveying activity

Spectrum will conduct a *2D seismic data* acquisition process, according to Rigzone, using a *vessel from SeaBird Exploration*, a provider of marine seismic data and associated products and services vital to the oil industry.

There has been no further information published regarding the depth and the actual equipment used.

Remarks

Offshore Croatia has remained unexplored for the most part of recent years and thus considered untapped but yet also as a highly potential oil exploration territory. In recent months activities by *Spectrum* have attracted high interest by oil companies. In response spectrum has commenced with the promotion of seismic survey in the region.[14]

According to the Croatian Ministry of economy the American oil giants *Exxon Mobile* have hinted at being interested in investing in Croatia.[16] Ivan Vrdoljak has gone on record stating that "When we presented our intentions they (Exxon Mobile) showed interest in coming to Croatia for the exploration and exploitation of oil and gas on our Adriatic coast", in subsequent statements he praised the financial involvement of the US giant listing the economical gains for the Croatian economy.[16]

[12] http://www.epmag.com/Exploration-Geology-Geophysics/Spectrum-Acquires-Seismic-Offshore-Croatia_120676
[13] http://www.spectrumasa.com/press-release/spectrum-adds-more-multi-client-seismic-to-mediterranean-portfolio
[14] http://www.spectrumasa.com/news/spectrum-completes-croatia-2d-multi-client-seismic-precursor-to-1st-offshore-licensing-round
[15] http://www.epmag.com/Technology-Regulations/Croatia-Opens-Offshore-License-Round_131711
[16] http://www.croatiaweek.com/american-oil-giants-exxonmobil-interested-in-croatia/

Cyprus

The Cyprus region in the Eastern Mediterranean offers untapped and unexplored "hydrocarbon plays", the regions in the center of attention include: the Cyprus Arc, the Levantine Basin, Eratosthenes Continental Block, the West Eratosthenes Basin, the Herodotus Basin, the low-stand Messinian Nile Delta and lastly, the Pilo-Pleistocene Deep Nile Delta Fan.[17] *Petroleum Geo-Services*, in cooperation with the Ministry of Commerce, Industry and Tourism of the Republic of Cyprus, have acquired a 2D seismic survey of the offshore region of Cyprus.[17]

Political/legislative aspect:

According to the current Hydrocarbon Prospecting Licensing law, the license is granted for one year, including the surveying activity but excluding the drilling. The Hydrocarbon Exploration license is granted for up to three years and can be renewed twice for another to years at a time, so a total of seven years is possible.[18] The exploration license includes: gravity and magnetic surveys, 2D/3D seismic surveys, as well as exploration drilling.[18]

Current Status

In 2006, the republic of Cyprus and *PGS* have attained approximately 6,770km line of MC2D seismic data, providing a "regional grid of 10 km by 20 km to give a good understanding of the geology in the area".[17] The data acquired during the 2006 exploration was subsequently used as a foundation for the first licensing round that took place in 2007.

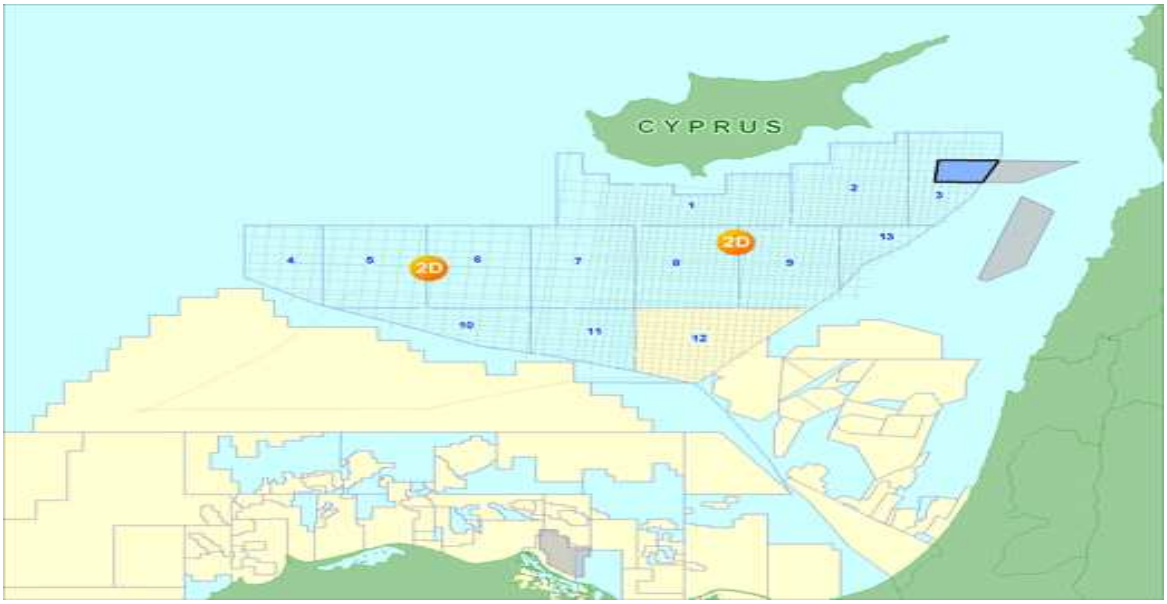

Figure 6: Image of the region subject to 2D seismic surveying (Petroleum Geo-Services)

In 2007 the first 3D seismic survey was attained offshore Cyprus. The survey included approximately 659 km2 and covered the Cyprus-arc region.[17] In the years 2008 and 2009 a 2D data set was acquired. The exploration built on the existing data attained during the 2006 investigation mentioned above, and increased the data available to an 8 km by 10 km grid to the West, and a 5 km by 5 km increase of the grid in the eastern region.[17, 18]

[17] http://www.pgs.com/en/Data_Library/North_Africa___Middle_East/Cyprus/
[18] http://www.ice.org.uk/nearyou/Europe/Cyprus/Offshore-Cyprus-Hydrocarbon-Exploration-Activities

The two areas that seem to have most prospect in terms of hydrocarbon resources are the approximately 1550 km2 region of the south of the Levantine Basin (including the central part). Furthermore the regions to the north, including 1350 km2 covering the northern part of the basin, the Latakia Ridge, and "several other large Syrian- and Cyprus-Arc deformation folds". [19]

In conclusion, the 6,776 line km of MC2D data covering all thirteen blocks served as a basis for the first licensing round, in which Noble energy international Ltd. was granted a three year exploration license for block 12. The second data acquisition program encompassed 12,266 line km of MC2D data covering all 13 blocks, shortening the 2006 data into to a 5 x 5 km grid. [20] The third program included a MC3D data in block 3, the first of its kind in Cyprus. (Please refer to figure 6 above for orientation).

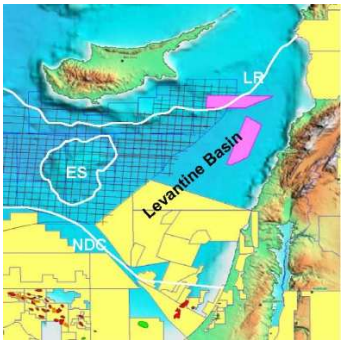

Figure 7: *Image of the eastern Mediterranean area with the two 3D surveys offshore Cyprus and Lebanon highlighted in pink.*

Figure 7 explicitly depicts the offshore regions in Cyprus (and Lebanon) that have been subject to seismic surveying.

First licensing round:

The republic of Cyprus, represented by the Ministry of Commerce, Industry and Tourism, has announced the first licensing round for February 15th 2007. The licensing round included Hydrocarbon exploration licenses and Hydrocarbon exploitation licenses, thus including drilling activities upon discovery.[21] Please refer to *Figure 6* and note at this point that no licensing was granted for block 3 and 13.[21] An exploration license was granted for *Noble energy international Ltd.* on October 24th 2008 for block 12.

Second licensing round:

The second licensing round will include blocks 1-11 and block 13. As mentioned above, block 12 has been granted to *Nobel energy international Ltd*., who has received a three year exploration license. The second licensing round was launched in November 2012, the licenses were to be granted "sometime in 2013", no date has been set.[22] Oil companies from over fifteen countries have submitted a bid in the second licensing round, including companies from: Canada, U.S., Israel, France, Russia, UK, Malaysia, Australia, Korea, Norway, Netherlands, Lebanon, Cyprus, and Indonesia.[22] The exploration area of 51,000 km2 is divided into 13 blocks. Block 1 and the Northern regions of block 2 and 3 are closest to the republic and cover the Cyprus-Arc. Blocks 7 and 8 and the western part of block 11 extend over the Eratosthenes Continental Block and the west regions of the Eratosthenes

[19] http://www.searchanddiscovery.com/documents/2009/10194lie/index.htm
[20] http://www.energy-pedia.com/news/cyprus/new-149215
[21] http://www.ice.org.uk/nearyou/Europe/Cyprus/Offshore-Cyprus-Hydrocarbon-Exploration-Activities
http://www.pgs.com/en/Data_Library/North_Africa___Middle_East/Cyprus/

[22] http://www.energy-pedia.com/news/cyprus/new-150283

Basin. Lastly, the southern parts of block 2 and block 3, along with block 9, 12 and 13 extend over the area of the Levantine Basin.[23]

On the 24th of Janaury 2013, ENI released a press release in which it confirms that they have just signed a exploration and production sharing contracts with the Ministry of Commerce, Industry, and Tourism of the Republic of Cyprus for blocks 2, 3 and 9. Please refer to *Figure 6* above for orientation.[24]

In an article in the Cypru mail, government spokesman Victoras Papadopoulos has stated that the government is looking to negotiate with ENI-KOGAS on blocks 5 and 6. Please note at this point that not licenses have been granted, requests are pending.[25]

Most of the material available on the licensing round in Cyprus is rather complex and lacks the transparency one would expect. For reasons of comprehension and clarity note at this point that during the first and second licensing round Noble Energy was granted block 12, TOTAL was granted blocks 10 and 11 and blocks 2, 3 and 9 were awarded to ENI-KOGAS. Blocks 1, 4, 5, 6, 7, 8 and 13 thus remain up for grabs.[25]

Another aspect that might be of relevance is that 5 and 6 are located southwest of Cyprus Island, an area which Turkey claims to be their territory. Turkey has also expressed interest in exploring blocks 4, 5, 6 and 7 [25], making it close to impossible for the Cyprian government to award any of these areas without consulting the representatives of Turkey.

Types of surveying activity

MC2D CYP2006: first exploration conducted by PGS.

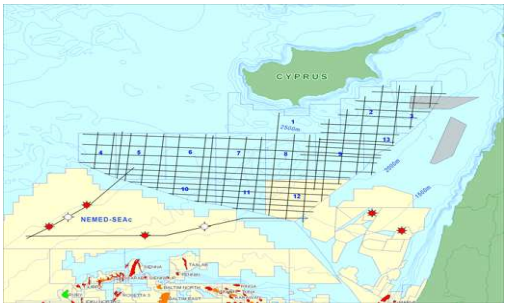

Figure 8: Image of surveyed region by PGS in 2006.

Survey Area: (Figure 8) 6,770line km

ACQUISITION DETAILS: Falcon Explorer, 2006

ACQUISITION PARAMETERS:

Acquisition Mode: 2D

Energy Source: 4,720 cu.in.

Shotpoint Interval: 25 m

[23] http://www.energy-pedia.com/news/cyprus/new-149215
http://www.pgs.com/en/Data_Library/North_Africa___Middle_East/Cyprus/

[24] http://www.eni.com/en_IT/media/press-releases/2013/01/2013-01-24-Eni-Cipro.shtml
[25] http://cyprus-mail.com/2013/11/22/eni-kogas-to-bid-for-blocks-5-and-6/

Source Depth: 8 m

Streamer: 8100 m

Streamer Depth: 10 m

Group Interval: 12.5 m

Fold Coverage: 160

Record Length: 9,216 ms

Sampling Rate: 2 ms

Time between shots: not available

Sound intensity level: not available

MC3D CYP2007: First 3D data acquisition in the Cyprus-Arc

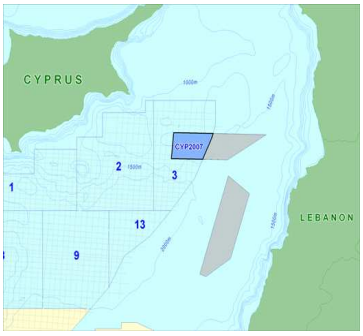

Figure 9: image of first 3D seismic data acquisition in Cyprus.

SURVEY AREA: (Figure 9) 660 sq.km

ACQUISITION DETAILS: Atlantic Explorer, 2007

ACQUISITION PARAMETERS

Acquisition Mode: 3D

Energy Source: 3,090 cu.in

Shotpoint Interval: 25 m

Source Depth: 6 m

Streamer: 6,000 m x 6

Streamer Separation: 100 m

Streamer Depth: 7 m

Group Interval: 12.5 m

Fold Coverage: 60

Record Length: 8,192 ms

Sampling Rate: 2 ms

Time between shots: not available

Sound intensity level: not available

MC2D CYP2008: Second exploration in 2008, supplementing the existing 2D grid of 2006.

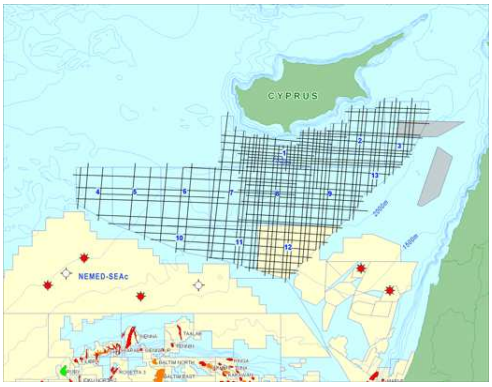

Figure 10: Image of PGS'S 2008 exploration, supplementing the 2006 existing data

SURVEY AREA: (Figure 10) 12,200line km

ACQUISITION DETAILS: Harrier Explorer, 2008-2009

ACQUISITION PARAMETERS:

Acquisition Mode: 2D

Energy Source: 6180 cu.in.

Shotpoint Interval: 25 m

Source Depth: 8 m

Streamer Length: 8100 m

Streamer Depth: 25 m

Group Interval: 12.5 m

Fold Coverage: 160

Record Length: 9216 ms

Sampling Rate: 2 ms

Time between shots: not available

Sound intensity level: not available

Remarks

The following additional bibliographic sources were considered to compile the information as mentioned above:

Beydoun, Z.R., 1988. The Middle East: Regional geology and petroleum resources, Scientific Press, UK, 292 p.

Hall, J., T.J. Calon, A.E. Aksu, and S.R. Meade, 2005. Structural evolution of the Latakia Ridge and the Cyprus Basin at the front of the Cyprus Arc, Eastern Mediterranean Sea, Marine Geology, 221, p. 261-297.

Walley, C.D., 1998. Some outstanding issues in the geology of Lebanon and their importance in the tectonic evolution of the Levantine region, Tectonophysics, 329, p. 37-62.

Lebanon

Due to the large amounts of gas discovered in the Levantine Basin, the offshore regions around Lebanon have subsequently moved into the focus of the oil industry.[26] The Ministry of Energy and Water of the Republic of Lebanon has tasked *Petroleum Geo-Services* with investigating the offshore petroleum potential of the region. PGS, starting as early as 2006, has conducted extensive Multiclient operations, including 8,800 line km of GeoStreamer® 2D data that gives a regional understanding of the geology in the area. In addition seven 3D surveys have been acquired, giving a total coverage of 9,880 km2. The latter two 3D surveys have been acquired utilizing the GeoStreamer® technology, creating the first broadband 3D seismic datasets offshore Lebanon.[26]

Current Status

Please note at this point that the purpose of this section is not to account for all seismic operations conducted by PGS, contracted by the Ministry of Energy and waters of the Republic of Lebanon, but rather to provide a detailed briefing of the current and imminent seismic operations. Furthermore this section will focus on seismic activities closest to the Lebanese shoreline, hence all seismic data acquisition programs dating back to 2011.

MC3D LEB2011:

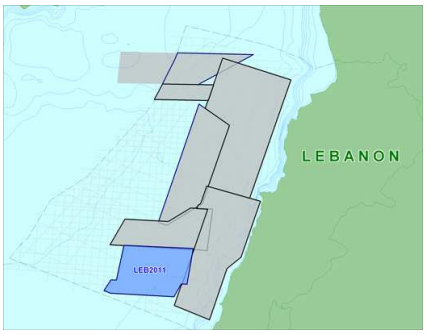

Figure 11: image of the 3D Seismic operations by PGS offshore Lebanon in 2011.

SURVEY AREA: (Figure 11) 1,356 sq.km

ACQUISITION DETAILS: Ramform Vanguard, 2011

ACQUISITION PARAMETERS

Acquisition Mode: 3D

Energy Source: 4,135 cu.in.

Shotpoint Interval: 25 m

Source Depth: 6 m

Streamer: 7,050 m x 12

Streamer Separation: 100 m

[26] http://www.pgs.com/en/Data_Library/North_Africa___Middle_East/Offshore-Lebanon/

Streamer Depth: 8 m

Group Interval: 12.5m

Fold Coverage: 70

Record Length: 9,000 ms

Sampling Rate: 2 ms

Time between shots: not available

Sound intensity level: not available

MC3D LEB2012

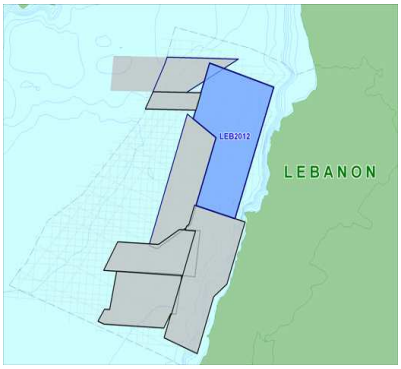

Figure 12: image of 3D seismic operations by PGS offshore Lebanon in Q1 of 2012.

SURVEY AREA: (Figure 12) 2,774 sq.km

ACQUISITION DETAILS: Ramform Vanguard, 2012

ACQUISITION PARAMETERS

Acquisition Mode: 3D

Energy Source: 4,135 cu.in.

Shotpoint Interval: 25 m

Source Depth: 6 m

Streamer: 7,050 m x 12

Streamer Separation: 100 m

Streamer Depth: 8 m

Group Interval: 12.5m

Fold Coverage: 70

Record Length: 9,000 ms

Sampling Rate: 2 ms

Time between shots: not available

Sound intensity level: not available

MC3D LEB2012-2011EX

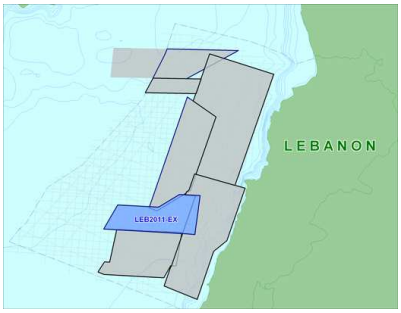

Figure 13: image of 3D seismic operations by PGS offshore Lebanon in Q2 of 2012.

SURVEY AREA: (Figure 13) 1,083 sq.km

ACQUISITION DETAILS: Pacific Explorer, 2012

ACQUISITION PARAMETERS

Acquisition Mode: 3D

Energy Source: 4,130 cu.in.

Shotpoint Interval: 25 m

Source Depth: 6 m

Streamer: 7,050 m x 6

Streamer Separation: 100 m

Streamer Depth: 8 m

Group Interval: 12.5m

Fold Coverage: 70

Record Length: 9,000 ms

Sampling Rate: 2 ms

Time between shots: not available

Sound intensity level: not available

MC3D LEB2013

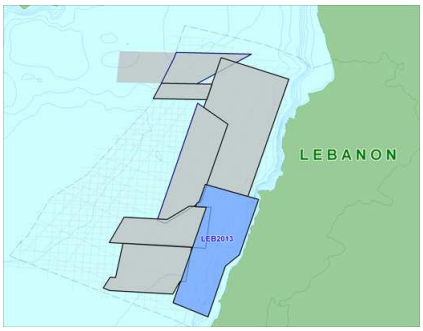

Figure 14: image of 3D seismic operations by PGS offshore Lebanon in December 2012 TO February of 2013.

SURVEY AREA: (Figure 14) 2,143 sq.km

ACQUISITION DETAILS： Atlantic Explorer, 2013

ACQUISITION PARAMETERS

Acquisition Mode: 3D GeoStreamer®

Energy Source: 4,130 cu.in.

Shotpoint Interval: 25 m

Source Depth: 7 m

Streamer: 6,000 m x 6 Streamer

Separation: 100 m

Streamer Depth: 20 m

Group Interval: 12.5m

Fold Coverage: 120

Record Length: 9,000 ms

Sampling Rate: 2 ms

Time between shots: not available

Sound intensity level: not available

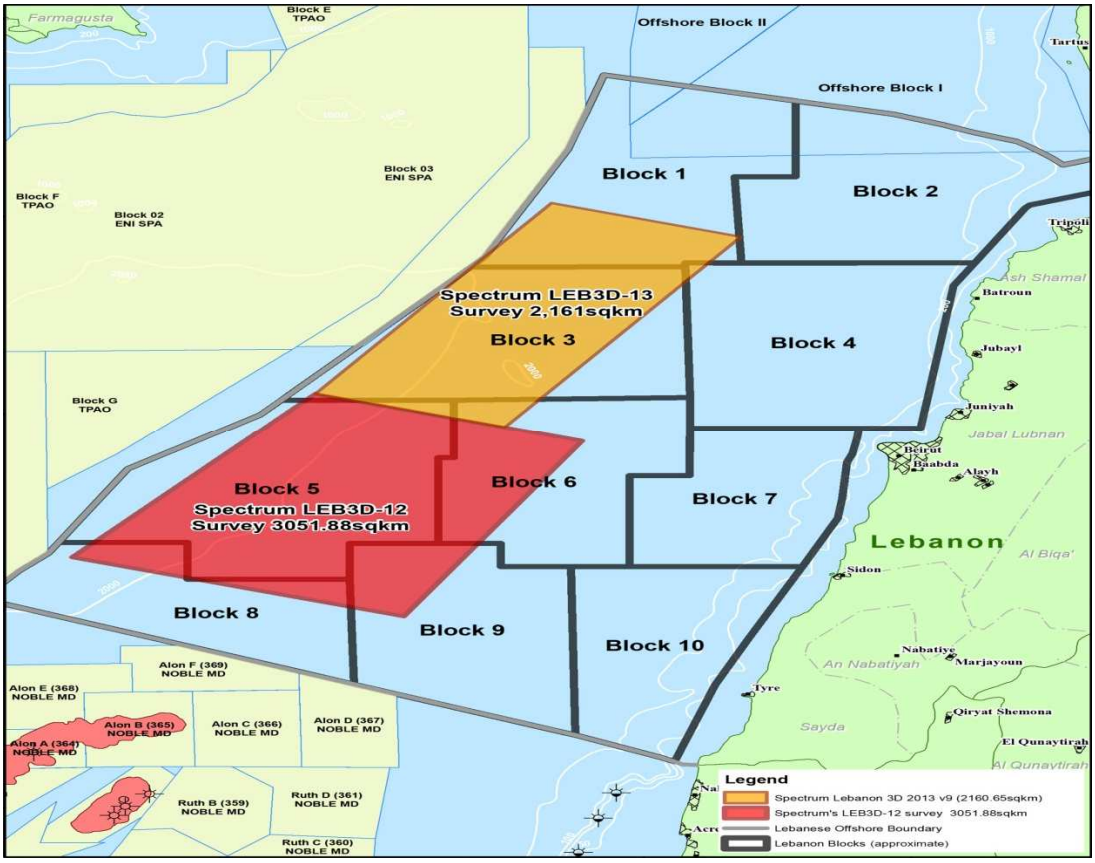

Figure 15: Extended seismic surveying (cover 2,200 square kilometers).

The figure shows the extended and most recent seismic operations by Spectrum/Polarcus

In addition to the information projected above, in a recent press release *Spectrum* has announced that it will start another 3D seismic survey in the Levantine Basin offshore Lebanon.[27] The new extendended seismic operation is to cover 2,200 square kilometers. Note that it is not *Spectrum* who is directly involved in the new data acquisition in the Levantine Basin, but rather *Polarcus* that will be conducting the 3D seismic survey.[27] According to Spectrum the seismic operation was to be completed by mid July and the data made available by the end of August of 2013.[27]

Spectrum Lebanon has conducted 3D seismic surveys covering 5,360 km² (2012-2013). The following link will lead to an interactive map: http://www.lpa.gov.lb/seismicdata.php. The map shows the exact regions in which 3D or 2D data surveying methods were used.

The official first licensing round opened on April 30th 2013, no results have yet been published. *Figure 15* displays the extended seismic operations offshore Lebanon, which was scheduled to finish early June and fast-track results were made available by mid-July 2013.[27]

In the most recent 3D seismic operations it has been *Spectrum* tasked with data acquisition.[27, 28] *Spectrum* is acquiring MC3D (Multiclient) data in the South West offshore Lebanon. Spectrum has contracted *Dolphin Geophysical*, who is using their polar duke vessel intending to acquire 1,500 square miles of data. In addition *Spectrum* is further extending surveys to cover the northern part of the Levantine Basin, thus adding to the *Spectrums*' 3,052 km2 MC3D survey data. At this point it is also relevant to mention that *Spectrum* has contracted *Polarcus*, who is using its 12-Streamer vessel

[27] http://www.spectrumasa.com/press-release/spectrum-extends-lebanon-3d-multi-client-seismic-coverage
[28] http://www.rigzone.com/news/oil_gas/a/120138/Spectrum_Acquires_Seismic_Survey_Offshore_Lebanon

"Adira".[29] According to the Petroleum Administration Lebanon the estimated licensing timeframe is as follows:

February – April 2013	Pre-Qualification
May 2013 – April 2014	Bidding Process
May 2014 – June 2014	Bid Evaluation
June 2014	Award

The licenses will hence not be awarded until June of 2014.[30]

Types of surveying activity

The regions offshore Lebanon have been subjected to both 2D and 3D seismic operation. Please refer to the sections "current status" for more information regarding the exact type of surveying activity in the respected regions.

Remarks

Based on the interpretation by PGS, Spectrum and other companies tasked with the seismic data acquisition, it seems that the data indicates that the areas offshore Lebanon "have a high likelihood for generation and trapping of thermogenic hydrocarbons".[29] For this reason, again basing claims on the data gathered, experts assume that exploration drilling will provide "good" results.

Sicily

Northern Petroleum Limited have, according to their own research, successfully identified potential exploration plays and have managed to attract Shell Italia, a global and influential oil company. Please find further information to the exact areas explored, the technologies used and further information on specific companies involved in the respected operations below in the appropriate sections.

Current Status

Northern Petroleum Limited has announced in an official press release that it has completed its 2D seismic operations in the West Sicily offshore thrust belt (*Figure 16)*.[31, 32] The seismic acquisition program commenced on February 13th 2009 and encompasses approximately 2,463 km of data.[31]

On January 14th 2010 *Northern Petroleum Limited* has announced on their website that the company has commenced with 3D seismic operations in the West Sicily thrust belt. The seismic acquisition is aimed to include 1,520 km2 of data, again funded by Shell Italia E&P S.p.A.[33]

In June 2009 the *Petroleum Geo-Services* conducted surveys encompassing 869 line km, tying numerous exploration wells, most of which were in the Vega field and one in Maltese Waters.[34]

[29] http://www.spectrumasa.com/press-release/spectrum-extends-lebanon-3d-multi-client-seismic-coverage
[30] http://www.lpa.gov.lb
[31] http://www.marketwire.com/press-release/Offshore-Sicily-Seismic-Survey-Completed-LSE-NOP-962690.htm
[32] http://www.northpet.com/operations/italy/
[33] http://www.northpet.com/operations/commencement-of-offshore-sicily-seismic-3d-survey/
[34] http://www.pgs.com/en/Data_Library/North_Africa___Middle_East/SICILY/Sicily-MC2D/

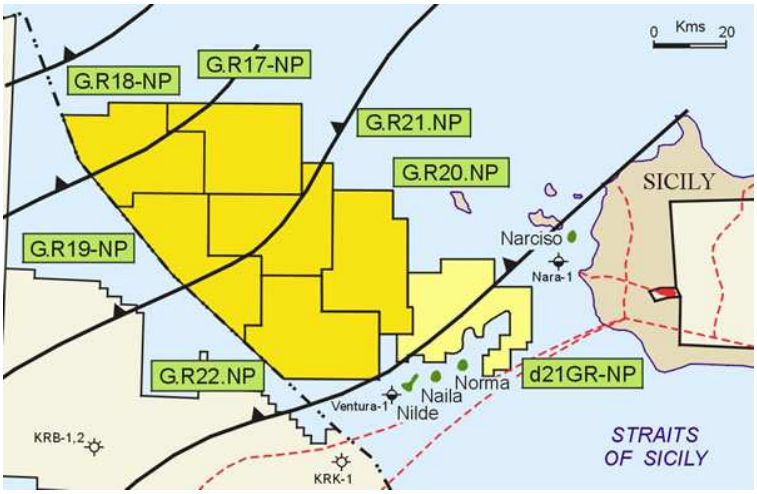

Figure 16: Image of area subjected to seismic activity by Northern Petroleum Limited

At this point it is important to mention that the information availbale on the seismic surveys offshore Sicily is intransparent and incomplete. However after follow up research the following information could be extracted:

Northern Petroleum has given Shell operational oversight of six permits, which is fifty-five percent of all stakes. In addition Shell was granted the rights of decision-making in matters of drilling.[35]

Types of surveying activity

Northern Petroleum Limited: Acquired the respected data using the Vessel "BOS Angler" contracted from Bergen Oilfield Services.[36] (Refer to *Figure 16* for orientation)

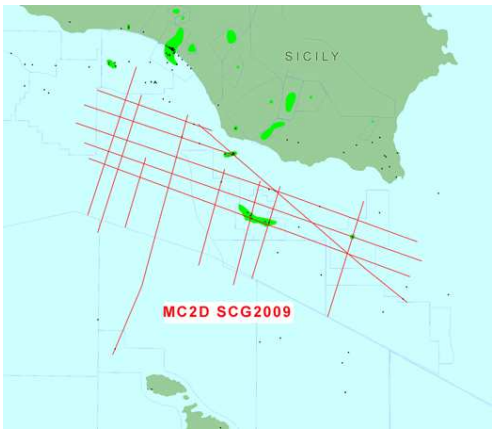

Figure 17: Image of area subjected to seismic operations by Petroleum Geo-Services.

SURVEY AREA: (Figure 17) 869line km

ACQUISITION DETAILS: Harrier Explorer

1 x 3090 cu in

1x 8100m GeoStreamer

[35] http://www.proactiveinvestors.co.uk/companies/news/27074/northern-petroleum-shell-takes-control-of-offshore-sicily-permits-as-it-mulls-future-drilling-27074.html#

[36]http://www.rigzone.com/news/oil_gas/a/74107/Northern_Petroleum_Wraps_Up_Seismic_Survey_in_6_West_Sicily_Licenses

Streamer depth : 25 m

ACQUISITION PARAMETERS:

Shotpoint Interval : 25m

Record Length: 9s/ Sample rate: 2ms

Time between shots: not available

Sound intensity level: not available

Spain

Please note, this section contains only information about the spanish offshore regions in the Canary Islands and in the Mediterranean Sea.

Current Status

The Spanish government approved a permit for the oil exploration offshore the Canary Islands in March 2012. Since the beginning of the financial crisis countries affected most by the economic downfall have been on the look out for means to increase government revenues, and the search for natural resources seems to be the latest trend.[37] On the *Repsol's* company website there is an interactive map showing the company's oil discoveries starting 2007 leading up to 2013. The first discovery of oil in Spain, by Repsol, took place in 2008.[38]

According to various newspaper articles by granting *Repsol* the permition to explore and drill for oil, the Spanish government is allowing exploratory surveys 60 km off the coast of Lanzarote and Fuerteventura (set to start in May 2014).[39] As of September 25, 2013 the public consultation/ comment period on the environemental impact report is over.[40] The study has now been passed on to the Spanish Agriculture, Food and environment ministry and is pending comment. In sum, Repsol is requesting permission to drill up to three wells off the coast of Fuerterventura and Lanzarote.[40]

According to an El Pais newspaper article the head of *Repsol*, Antonio Brufau, traveled to Gran Canaria in November 2013 with the aim of setting up bases in the respective ports of Fuerterventura (port: Rosario) and lanzarote (port:Arrecife), seemingly without success.[41] The exact amount of potential oil in the area is unknown. However, estimates by *Repsol* state that the region of interest may carry up to "1,4 billion barrels of petroleum and produce 140,000 barrels a day (bpd) of crude oil".[42]

As this point it is worth mentioning *Cairn Energy's* activities in the region. As of October 2013 the company has started its oil exploration activities in the Moroccoan terrirtory adjacent (555 km northeast of the Canary Islands) to that of *Repsol*.[42] Not only does that mean additional constrain for marine life but furthermore increases the risk of oil spills in the region.

In 2009 Repsol has made two large offshore oil discovieries in mainland Spain. These include Montanazo (D-5) and Lubina (Lubina-1), please refer to *Figure 18* below. The press release of the company states that the discoveries of these two wells can produce oil for about five to seven years.

[37] http://online.wsj.com/news/articles/SB10001424052702304459804577285013152121238
[38] http://www.repsol.com/es_en/corporacion/conocer-repsol/nuestra-actividad/upstream/exitos-exploratorios/
[39] http://elpais.com/elpais/2013/12/16/inenglish/1387200351_258064.html
[40] http://www.businessweek.com/news/2013-09-26/repsol-canaries-drilling-plan-passes-milestone-stirs-critics
[41] http://elpais.com/elpais/2013/11/15/inenglish/1384541218_758089.html
[42] http://latino.foxnews.com/latino/news/2013/09/22/spain-and-morocco-plan-oil-exploration-near-canary-islands/

As for the financial aspect, the company has invested 135 million Euros for the discovery and estimates further investments of 50-60 million Euros.[43]

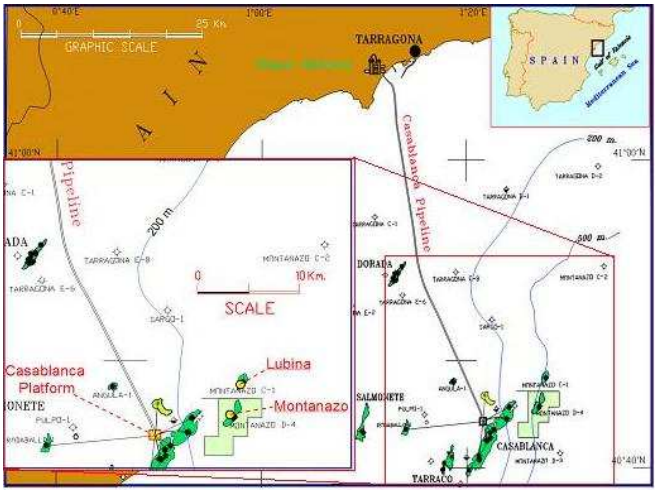

Figure 18: Shows the regions that include Repsol's 2009 oil discoveries (Montanazo D-5 and Lubina-1).

Besides the presence of *Repsol* in the Spanish offshore regions another company, *Cairn Energy*, seems to have been increasing its presence since 2011. In 2011 the Spanish government awarded *Cairn Energy* five exploration permits in the Gulf of Valencia, covering an estimated area of 3,922 km2.[44]

Types of survey

Cair Energy intends to use 2D and 3D models of the sub-surface. The following was directly extracted from their own press release: "At sea especially equipped ships tow strings of cables which emit sound directed at the sea bed and record the reflected sound waves as seismic data."[45] These type of survey (both 2D and 3D) apply for Gulf of Valencia and if bids are granted in coming months or years the same method will be used for the Gulf of Lion off the Catalonian coast.

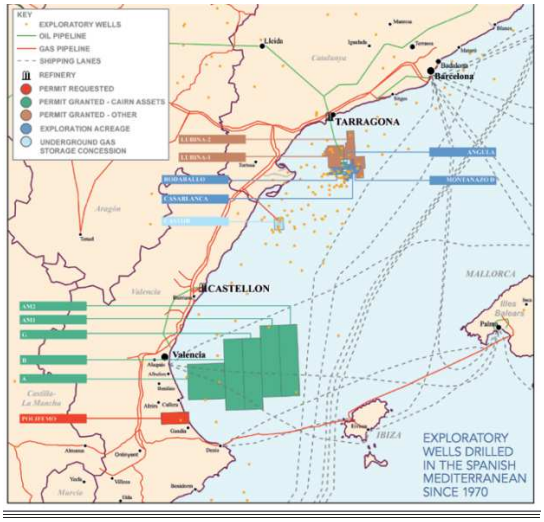

Figure 19: Shows the areas Cairn Energy included in their exploration endeavours.

[43] http://www.repsol.com/es_en/corporacion/prensa/notas-de-prensa/ultimas-notas/prueba2.aspx
[44] http://www.cairnenergy.com/assets/files/cms/CRNP_17467_Cairn_in_Spain_Brochure_ENG_AW6_FINAL.pdf
[45] http://www.cairnenergy.com/assets/files/cms/Capricorn_Spain_statement_on_proposed_seismic_campaign_in_the_Gulf_of_Valencia.pdf

France

Current Status

Please note at this point that the information regarding the areas of the French Mediterranean are extremely scarce and limited. The intent of the following sections is to provide the available information regarding the seismic exploration endeavours off the coast of France (Mediterranean part), placing main focus on the Bouches de Rhone/Golf de Lyon.

In 2002 the French government awarded the British company *Melrose Resources* an exploration permit for an area of 25,000 km2 offshore Marseilles, France. Since the beginning of 2012 *Melrose Resources* have been looking to renew the licence until 2015. However due to the strong public opposition the extension was not granted.[46] In addtion, President Sarkozy strongly opposed the granting of further exploration permits in the region, thus providing the political capacity to resist dominance by the oil industry. On April 6th 2012 the license was not renewed for Melrose Resources.[47]

Figure 20: Shows the regions of Melrose Resources exploration-extension of permit denied.

Types of survey

NA

Libya

According to a *SCAN Geophysical* press release on the 25th of April 2008 the company announced and confirmed that *Hess Libya Exploration Limited,* hereafter referred to as *Hess,* signed a contract with the company, permitting the acquisition of approximately 4,000 km of 2D seismic data. [48]

In the online newspaper "Gulf and Gas: Grow your business" the involvment of *ExxonMobile* in the Libyan oil drilling industry was confirmed on July 16th 2009. According to a press release of ExxonMobile Libya, an affiliate company of the American entity, the company has started conducting its first deepwater oil drilling activites in the Sirte Basin, located northeast of the City of Misrata.[49]

Current status

More recent information regarding oil exploration and oil drilling in Libya was found in the Arabian Gazette. On November 1st 2012 the newspaper published an article quoting a senior petroleum official saying that *BP (British Petroleum)* will resume its activities in the African nation, after beeing forced to a hault during the uprising in 2007.[50] In the past *BP* has acquired 17,000 km2 of 3D seismic data in the Sirte Basin. In adddition the company has acquired 14,000 km2 of 3D data in the

[46] http://www.naturalgaseurope.com/melrose-noble-france-offshore
[47] http://www.keepersofthecoast.com/combats/bouches-du-rhone-renouvellement-du-permis-rhone-mediterranee/
[48] http://www.investegate.co.uk/article.aspx?id=20080425191500H3738
[49] http://www.gulfoilandgas.com/webpro1/MAIN/Mainnews.asp?id=8571

Ghadames Basin and are set to explore 12 further wells (refer to *Figure 21* for orientation). Please note at this point that there are still various security risks in the country and thus the planned activities may change.

In August 2013 *BP* was planning on committing $2 Billion into a deep-sea drilling program under a joint exploration and production agreement with the *National Oil Cooperation*, a Libyan oil company controlling 70% of the country's oil output.[50]

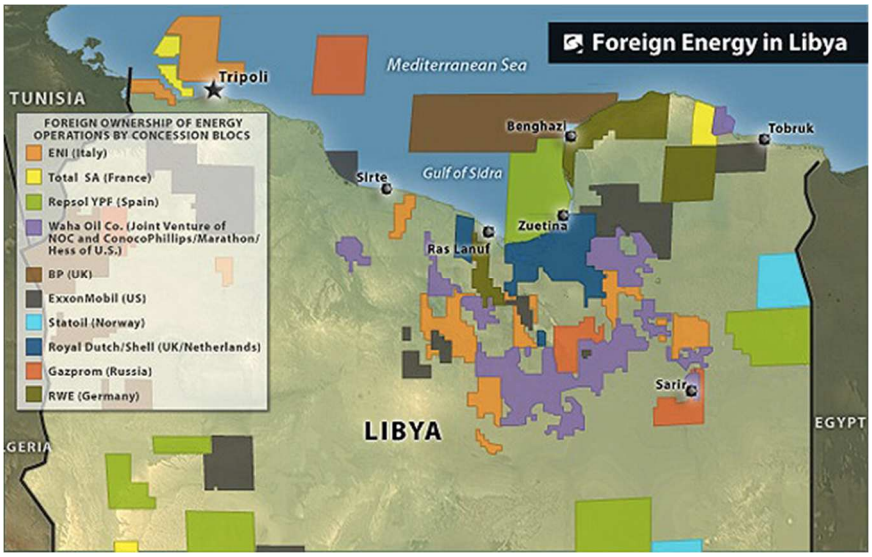

Figure 21: Displays the areas of BP exploration and drilling activities.

Types of survey

SCAN Geophysical has conducted the exploration activites through 2D seismic data collection. That beeing said, the company also has vessels capable of the 3D seismic data acquisition.

ExxonMobile Libya is operating off a rig privately contracted from *Noble Africa Limited*. The rig is capable of operating in waters that are up to 7,200 feet deep and can DRILL upto 30,000 feet in depth. The article in the "Gulf and Gas: grow your business" also mentions that *ExxonMobile Libya* has used 2D (contracted areas 20, 21) and 3D seismic data acquisitions (contracted areas 40, 20, 21).[50]

Italy

Current situation

Please note, this section contains only information about the offshore regions of Calabria and Apulia. Information on both of these regions is rare. On the 3rd of Janaury 2008 the magazine "Offshore" published an article on the exploration revival off the coast in southern Italy.[51] The main oil production in the region comes from Vega field off Southern Sicily and Aquila off the coast of Puglia.[51] *Eni's* main oil discoveries were at Rovesti in the offshore region of Brindisi in Puglia.[51] In a document released by *Eni's Exploration and Production Division*, labeled Frontier exploration project Italy, it becomes clear which activities are planned in the regions surrounding the southern and southwestern part of Italy.[52]

In the deep water regions of the *Ionian Sea*, *Eni* plans on acquiring Geological and Geophysical data,

[50] http://www.libya-businessnews.com/2013/01/28/bp-reconsiders-libya-drilling-plans/
[51] http://www.offshore-mag.com/articles/print/volume-68/issue-3/special-report-italy/independents-leading-exploration-revival-off-southern-italy.html
[52] http://www.assomineraria.org/news/attach/laura_3.pdf

aiming at evaluating the region and possibly discovering the existance of a petroleum system. *Figure 22* below shows the region that is being referred to in Eni's document. At this point it is also worth mentioning that there is currently no explorational activites in the region and that it is not open to exploration.

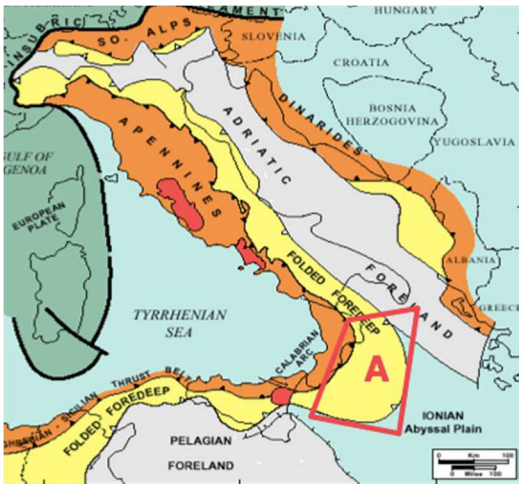

Figure 22: The figure shows the region (point A) in the Ionian Sea that is of interest to Eni.

Eni is also interested in exploring the *deep Thrust Belt* in the western area of Sicily. Eni is interested in the region that is just above the Perlgian Foreland and plans to acquiere a 90 km global seismic line (seismic data) and explore for the existence of a petroleum system. The goal of Eni's activity in the region is to improve the seimic imaging knowledge in the region and identify carbonated structures. The depth of the region is approximated at around 6 kilometers.

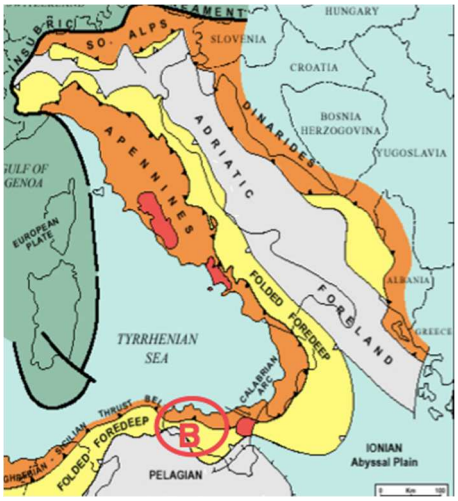

Figure 23: Region (Point B) that is of interest to Eni in the deep Thrust Belt (Western Sicily) and is located right above the Pelagian Foreland.

The third region that Eni shows interest for is the *Eastern Streppenosa Basin*. This area has previously been subjected to exploration activities but was deemed inconsistent in regards to its outputs. Eni aims at acquiring seismic activity and to enhance deep seismic visibility.[53]

[53] http://www.assomineraria.org/news/attach/laura_3.pdf

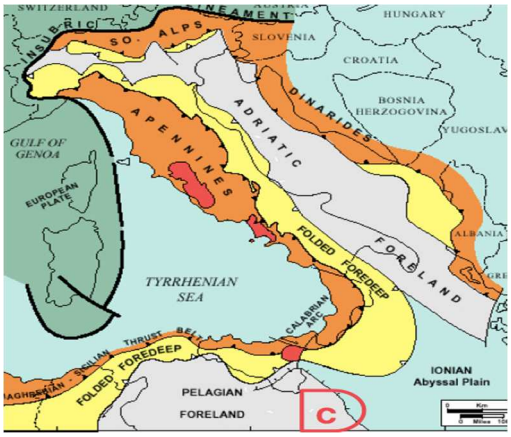

Figure 24: Eni's interest in the region (point C) West of the Pelagian Foreland and in close proximity to the Ionian Abyssal Plan.

Types of Survey

It is not clarified whether the 2D or 3D data acquisition method is going to be used. However, it is important to point out that, especially in the Eastern Streppenosa basin, deep water acquisition processes are planned.

A Review of the Impacts of Seismic Airgun Surveys on Marine Life

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Noise from a single seismic airgun survey, used to discover oil and gas deposits hundreds of kilometers under the sea floor, can blanket an area of over 300,000 km^2, raising background noise levels 100-fold (20 dB), continuously for weeks or months (IWC 2005, IWC 2007). Seismic airgun surveys are loud enough to penetrate hundreds of kilometers into the ocean floor, even after going through thousands of meters of ocean. Since this exposes large portions of a cetacean population to chronic noise, the International Whaling Commission's Scientific Committee noted "…repeated and persistent acoustic insults [over] a large area…should be considered enough to cause population level impacts." (IWC 2005). A recent report by the Convention on Biological Diversity noted that "...there are increasing concerns about the long-term and cumulative effects of noise on marine biodiversity..." and "...there is a need to...take measures [to] minimise our noise impacts on marine biodiversity..." and "...effective management of anthropogenic noise in the marine environment should be regarded as a high priority for action at the national and regional level..." (CBD 2012).

Nieukirk et al. (2012) analyzed 10 years of recordings from the Mid-Atlantic Ridge, finding that seismic airguns were heard at distances of 4,000 km from survey vessels and present 80-95% of the days/month for more than 12 consecutive months in some locations. When several surveys were recorded simultaneously, whale sounds were masked (drowned out), and the airgun noise became the dominant part of background noise levels.

To compare the total energy output per year (in joules) of the various human-made underwater noise sources, the highest is 2.1 x 10^{15} J, representing the contribution from nuclear explosions and ship-shock trials (explosions used by the Navy to test the structural integrity of their ships). Immediately following in contribution are seismic airgun arrays at 3.9 x 10^{13} J. Next, are military sonars (2.6 x 10^{13} J) and supertankers, merchant vessels, and fishing vessels at 3.8 x 10^{12} J (Hildebrand 2005).

Marine mammals

Gordon et al. (2004) found that marine mammals can be impacted by the intense, broadband pulses produced by seismic airguns through hearing impairment (temporary or permanent threshold shift, TTS or PTS), physiological changes such as stress responses, indirectly by impacting their prey, behavioral alterations such as avoidance responses, displacement, or a change in vocalizations, or through masking (obliterating sounds of interest). Humpback and fin whales appear to communicate over distances of at least tens of kilometers (e.g. Watkins and Schevill 1979), so reducing this distance would compromise their ability to communicate.

Around 250 male fin whales appeared to stop singing for several weeks to months during a seismic survey, resuming singing within hours or days after the survey ended (IWC 2007). Assuming male fin whale songs have a reproductive function, such as attracting and finding mates (Croll et al. 2002), it would be difficult to believe that such an effect would not be biologically significant. McDonald et al. (1995) noted that a blue whale stopped calling in the presence of a seismic survey 10 km away.

A different blue whale population showed the opposite reaction. Even a seismic survey using a low-to-medium power sparker caused blue whales in the St. Lawrence Estuary to modify their vocalizations (Di Iorio and Clark 2010). Blue whales called consistently more on days when the seismic survey was operating than when not, and more during periods within those days in which the sparker was on vs. off. The number of blue whale calls increased within the 1-hr block after sparker onset. The authors postulated that the blue whales were attempting to compensate for the additional introduction of noise, and noted that whales probably received a fairly low level of noise (131 dB re 1 mPa (peak to peak) over 30–500 Hz, with a mean sound exposure level of 114 dB re 1 μPa^2 s). Thus, they suggested that even low source level seismic survey noise could interfere with important signals used in social interactions and feeding (Di Iorio and Clark 2010).

Marine mammals also avoid seismic noise by vacating the area. Castellote et al. (2012) showed extended displacement of fin whales by a seismic survey which lasted well beyond the survey length. Weir (2008) found that Atlantic spotted dolphins showed stronger responses to seismic airgun exposure than humpback or sperm whales. These dolphins were found significantly farther away from the airguns when they were on vs. off and only approached the seismic vessel when the airguns were silent. An analysis of cetacean responses to 201 seismic surveys in UK waters exhibited evidence of disturbance (Stone and Tasker 2006). During active seismic surveying, all small odontocetes, killer whales, and all mysticetes were found at greater distances from the seismic vessel than when it was not shooting. Small odontocetes showed the greatest horizontal avoidance, which reached to the limit of visual observation. Sighting rates for mysticetes, sperm whales, pilot whales, and killer whales did not decrease when airguns were off vs. on, but mysticetes and killer whales showed localized avoidance. During seismic shooting, fewer animals appeared to be feeding, smaller odontocetes seemed to swim faster, and mysticetes appeared to remain longer at the surface where sound levels are lower. Reactions were stronger to larger volume seismic arrays. Stone and Tasker (2006) theorized that smaller odontocetes may vacate the area entirely during exposure to seismic, whereas slower-moving mysticetes may remain in the area, simply increase their distance from the noise.

Responses can differ according to context, sex, age class, or species. Bowhead whales avoided seismic air-gun noise at received levels of 120–130 dB (rms over pulse duration) during their fall migration, though they were much more tolerant of noise when feeding in the summer, staying away from levels of 158–170 dB, which are roughly 10 000 times more intense (Richardson et al. 1995, 1999). Humpback cows and calves in key habitat evaded seismic air guns at 140–143 dB re 1 µPa mean squared pressure, which was lower than the reaction of migrating humpbacks at 157–164 dB re 1 µPa mean squared pressure (McCauley et al. 2000). Species with similar hearing capabilities and audiograms showed markedly different responses to airgun noise off British Columbia, with harbor porpoises appearing to be the most sensitive, responding to seismic noise at distances of >70 km, at received levels of <145 dB re 1 µPa rms (Bain and Williams 2006; IWC 2007).

Reactions to seismic airguns can also be quite subtle and hard to detect. Sperm whales in the Gulf of Mexico did not appear to avoid a seismic airgun survey, though they significantly reduced their

swimming effort during noise exposure along with a tendency toward reduced foraging (Miller et al 2009). Miller et al. (2009) tagged 8 sperm whales with tags recording sounds and movement while exposing them to operating airgun arrays. The longest resting bout ever observed in any sperm whale (265 min.) happened to the whale most closely approached by the actively firing seismic survey vessel, with the whale finally diving 4 min. after the final airgun pulse. Whales significantly reduced their fluke stroke effort by 6% during exposure to seismic noise compared with after, and all seven sperm whales studied reduced their fluke strokes on foraging dives in the presence of seismic noise. Moreover, there were indications that prey capture attempts were 19% lower during airgun noise exposure (Miller et al. 2009). The authors note that even small reductions in foraging rate could result in lower reproductive rates and have negative consequences for the population.

Though summering bowheads showed no detectable avoidance of seismic surveys, no change in general activities or call types, and no obvious alteration of calling rate, they dove for shorter periods and their respiration rate was lower than non-exposed bowheads (Richardson et al. 1986). Such changes were observed up to 54–73 km from seismic surveys at received levels that could be as low as <125 dB re 1 µPa (Richardson et al. 1995).

Seismic noise has been thought to at least contribute to some species' declines or lack of recovery (Weller et al. 2006a, 2006b; IWC 2007). Critically endangered western gray whales off Sakhalin Island, Russia, were displaced by seismic surveys from their primary feeding area, returning only days after seismic activity stopped (IWC 2005). This change in distribution closely followed the timing of the seismic surveys (IWC 2005, 2007; Weller et al. 2006a). Whales exposed to seismic noise levels of about 153 dB re 1 µPa zero-to-peak and 159 dB peak-to-peak on their feeding grounds also swam faster and straighter over a larger area with faster respiration rates during seismic operations (Weller et al. 2006b; IWC 2007).

Parente et al. (2007) discovered a reduction in cetacean species diversity with increasing numbers of seismic surveys during 2000 and 2001 off Brazil, despite no significant oceanographic changes in this period. Between 1999 and 2004, there was a negative relationship between cetacean diversity and the intensity of seismic surveys.

When exposed to a single airgun or small airgun array, gray seals showed avoidance and switched from foraging to transiting behavior. They also began hauling out, possibly to escape the noise. Harbor seals exhibited a slowing of their heart rate together with dramatic avoidance behavior and stopped feeding (Thompson et al. 1998).

Seismic air guns are a probable cause of whale strandings and deaths as well, especially in beaked whales (Hildebrand 2005). A stranding of two individuals was tied very closely in space and time to a seismic survey in the Gulf of California. Even if impacts are fatal, only 2% of all cetacean carcasses are detected, on average (Williams et al. 2011). The authors state that for cryptic mortality events such as acoustic trauma, analytical methods are necessary to take into consideration the small percentage of carcasses that will be recovered.

A pantropical spotted dolphin suffered rigidity and postural instability progressing to a catatonic-like state and probable drowning within 600 m of a 3D seismic survey firing at full power (Gray and Van Waerebeek 2011). The authors explained the initial aberrant behavior by a possible attempt by the dolphin to shield its sensitive rostrum and hearing structures from the intense acoustic energy of the

airguns, by lifting its head above the water's surface. They believed the seismic survey could have caused this observed behavior, presumably resulting from severe acoustic distress and even injury. Other explanations were examined and considered less likely (Gray and Van Waerebeek 2011). It may be of significance that Weir (2008) found the closely related Atlantic spotted dolphin to be the species "with the most marked overt response" to airgun noise of the three cetacean species examined.

Stress effects or physiological changes, if chronic, can inhibit the immune system or otherwise compromise the health of animals. These can be very difficult to detect in cetaceans. Indications of increased stress and a weakened immune system following seismic noise broadcasts were shown for a whale and dolphin (Romano et al. 2004). Loud, impulsive noise produced from a seismic water gun caused significantly increased mean norepinephrine, epinephrine, and dopamine levels immediately after a high, but not low-level exposure in a captive beluga whale (Romano et al. 2004). All three of these stress hormones increased significantly with increasing noise levels. These hormone levels remained high even 1 hour after noise exposure, which is surprising given their short half-life, according to the authors. In a captive bottlenose dolphin, the seismic water gun produced significant neuro-immune values, namely increases in aldosterone and a decrease in monocytes. Aldosterone is one of the principal stress hormones in cetaceans and may surpass cortisol as a more sensitive indicator of stress (Romano et al. 2004).

Mitigation measures to safeguard whales against high noise exposures are very inadequate. Generally, only the area within 500 m of the seismic vessel is observed, yet high noise levels can occur at much greater distances. Madsen et al. (2006) discovered that in the Gulf of Mexico received levels can be as high at a distance of 12 km from a seismic survey as they are at 2 km (in both cases >160 dB peak-to-peak). Received levels, as determined from acoustic tags on sperm whales, generally fell at distances of 1.4 to 6–8 km from the seismic survey, only to increase again at greater distances (Madsen et al. 2006).

Moreover, determining an exposure level that is "safe" for marine mammals is fraught with difficulty. For instance, a harbor porpoise exposed to airgun pulses was found to have lower (more sensitive) masked TTS levels than any other cetacean that has been tested, namely 164.3 dB re 1 µPa2·s SEL or 199.7 dB pk-pk re 1 µPa (Lucke et al. 2009). The noise level required to cause hearing loss (temporary threshold shift or TTS) in whales is still very uncertain, especially for seismic airguns, as there are so few empirical measurements. Between-individual variability, the population's average sensitivity (how representative of the population was the tested animal), and the validity of extrapolating between species, particularly between captive small dolphins or porpoises (on which the few tests have been done) to free-ranging large baleen whales are all unknown. Gedamke et al. (2011) model how various factors and assumptions can change the percentage of whales exposed to damaging levels. When factoring in uncertainty and sources of variability, 29% (10-62%) of whales within 1-1.2 km of a seismic survey would experience levels sufficient to produce TTS onset. Without considering these factors, no whales beyond 0.6 km would be at risk for TTS, showing how even fairly small degrees of uncertainty can have a large effect on risk assessment (Gedamke et al. 2011). If management decisions are to be based on so little data, uncertainty must be taken into consideration. At close ranges, avoidance by whales of the seismic survey actually increased their exposure slightly as their speed was slower than the seismic vessel. Overall, Gedamke et al. (2011) concluded that TTS in baleen whales is plausible at ranges up to several kilometers.

Many (36-57%) of the stranded or entangled dolphins or toothed whales have been shown to have profound hearing loss, implying that impaired hearing could have led to their stranding/entanglement (Mann et al. 2010).

Marine Turtles

Marine turtles show a strong initial avoidance response to air-gun arrays at a strength of 175 dB re 1µPa rms or greater (O'Hara and Wilcox 1990; McCauley et al. 2000; Lenhardt 2002). Enclosed turtles also responded progressively less to successive airgun shots which may indicate reduced hearing sensitivity (TTS). One turtle experienced a TTS of 15dB, recovering two weeks later (Lenhardt 2002). McCauley et al. (2000) estimated that a typical airgun array operating in 100–120 m water depth could impact behavior at a distance of about 2 km and cause avoidance at around 1 km for marine turtles. DeRuiter and Doukara (2010) found that 51% of turtles dived at or before their closest point of approach to an airgun array.

Fish

A wide range of acoustic impacts on fish has been observed. Seismic air guns extensively damaged fish ears at distances of 500 m to several kilometres from seismic surveys. No recovery was apparent 58 days after exposure (McCauley et al. 2003). Behavioral reactions of fish to anthropogenic noise include dropping to deeper depths, milling in compact schools, ‘‘freezing’’, or becoming more active (Dalen and Knutsen 1987; Pearson et al. 1992; Skalski et al. 1992; Santulli et al. 1999; McCauley et al. 2000; Slotte et al. 2004). Reduced catch rates of 40%–80% and decreased abundance have been reported near seismic surveys in species such as Atlantic cod, haddock, rockfish, herring, sand eel, and blue whiting (Dalen and Knutsen 1987; Løkkeborg 1991; Skalski et al. 1992; Engås et al. 1996; Hassel et al. 2004; Slotte et al. 2004). These effects can last up to 5 days after exposure and at distances of more than 30 km from a seismic survey. The impacts of seismic airgun noise on eggs and larvae of marine fish included decreased egg viability, increased embryonic mortality, or decreased larval growth when exposed to sound levels of 120 dB re 1 µPa (Kostyuchenko 1973; Booman et al. 1996). Turbot larvae showed damage to brain cells and neuromasts (Booman et al. 1996). Neuromasts are thought to play an important role in escape reactions for many fish larvae, and thus their ability to avoid predators. Increases in stress hormones have been observed in fish due to noise (Santulli et al. 1999).

Invertebrates

Invertebrates also do not appear to be immune from the effects of anthropogenic noise. Nine giant squid mass stranded, some of them live, together with geophysical surveys using air guns in 2001 and 2003 in Spain (Guerra et al. 2004). The squid all had massive internal injuries, some severe, with internal organs and ears badly damaged. Another species of squid exposed to airgun noise showed an alarm response at 156-161 dB rms and a strong startle response involving ink ejection and rapid swimming at 174 dB re 1µPa rms (McCauley et al. 2000). Caged squid also tried to avoid the noise by moving to the acoustic shadow of the cage. McCauley et al. (2000) suggest that the behavioral threshold for squid is 161-166 dB rms. A bivalve, *Paphia aurea*, showed acoustic stress as evidenced by hydrocortisone, glucose, and lactate levels when subjected to seismic noise (Moriyasu et al. 2004). Catch rates also declined with seismic noise exposure in *Bolinus brandaris*, a gastropod, the purple dye murex (Moriyasu et al. 2004). In snow crab, bruised ovaries and injuries to the equilibrium receptor system or statocysts were also observed (DFO 2004). Seismic noise-exposed crabs showed sediments in their gills and statocysts, and changes consistent with a stress response compared with control animals.

Conclusions

It is clear that a human-caused modification that extends across 300,000 km^2 or distances of 4,000 km from the noise source 80-95% days of the month, year-round, is an ecosystem-wide impact. That seismic airguns are the second highest contributor of human-caused underwater noise in total energy output per year, following only nuclear and other explosions, should underline this point. At least 37 marine species have been shown to be affected by seismic airgun noise. These impacts range from behavioral changes such as decreased foraging, avoidance of the noise, and changes in vocalizations through displacement from important habitat, stress, decreased egg viability and growth, and decreased catch rates, to hearing impairment, massive injuries, and even death by drowning or strandings. Seismic airgun noise must be considered a serious marine environmental pollutant.

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Recent International Decisions in Relation to Marine Mammals and Anthropogenic Underwater Noise

CONVENTION ON BIOLOGICAL DIVERSITY
October 2012

UNEP/CBD/COP/DEC/XI/18: Marine and coastal biodiversity: sustainable fisheries and addressing adverse impacts of human activities, voluntary guidelines for environmental assessment, and marine spatial planning

Impacts of anthropogenic underwater noise on marine and coastal biodiversity

17. *Notes* that anthropogenic noise may have both short- and long-term negative consequences for marine animals and other biota in the marine environment, that this issue is predicted to increase in significance, and that uncontrolled increases in anthropogenic noise could add further stress to oceanic biota;

18. *Encourages* Parties, other Governments and relevant organizations, according to their priorities, to:

(b) Promote awareness of the issue among relevant stakeholders, both nationally and regionally;

(c) Take measures, as appropriate, to minimize the significant adverse impacts of anthropogenic underwater noise on marine biodiversity, including the full range of best available technologies and best environmental practices where appropriate and needed, drawing upon existing guidance; and

(d) Develop indicators and explore frameworks for monitoring underwater noise for the conservation and sustainable use of marine biodiversity, and report on progress to a meeting of the Subsidiary Body prior to the twelfth meeting of the Conference of the Parties;

20. *Noting* the gaps and limitations in existing guidance, including the need to update it in the light of improving scientific knowledge, and recognizing a range of complementary initiatives under way, requests the Executive Secretary to collaborate with Parties, other Governments, and competent organizations, including the International Maritime Organization, the Convention on Migratory Species, the International Whaling Commission, indigenous and local communities and other relevant stakeholders, to organize, subject to availability of financial resources, an expert workshop with a view to improving and sharing knowledge on underwater noise and its impacts on marine and coastal biodiversity, and to develop practical guidance and toolkits to minimize and mitigate the significant adverse impacts of anthropogenic underwater noise on marine and coastal biodiversity, including marine mammals, in order to assist Parties and other Governments in applying management measures, as appropriate, and also requests the Executive Secretary to make the report of the workshop available for consideration by a meeting of the Subsidiary Body prior to the twelfth meeting of the Conference of the Parties. The workshop should cover issues such as the development of acoustic mapping of areas of interest, among other things;

This CBD Decision builds on the important scientific synthesis on the impacts of underwater noise on marine and coastal biodiversity and habitats (UNEP/CBD/SBSTTA/16/INF/12) that was prepared for the sixteenth meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (UNEP/CBD/SBSTTA/16/6)

CONVENTION ON MIGRATORY SPECIES
November 2011

UNEP/CMS/Resolution 10.24. Further steps to abate underwater noise pollution for the protection of cetaceans and other migratory species

2. *Confirms* the need for international, national and regional limitation of harmful underwater noise through management (including, where necessary, regulation), and that Resolution 9.19 remains a key instrument in this regard;

3. *Strongly urges* Parties to prevent adverse effects on cetaceans and on other migratory marine species by restricting the emission of underwater noise, understood as keeping it to the lowest necessary level with particular priority given to situations where the impacts on cetaceans are known to be heavy; and where noise cannot be avoided, urges Parties to develop an appropriate regulatory framework or implement relevant measures to ensure a reduction or mitigation of man-made underwater noise;

4. *Urges* Parties to ensure that Environmental Impact Assessments take full account of the effects of activities on cetaceans and to consider potential impacts on marine biota and their migration routes and consider a more holistic ecological approach already at a strategic planning stage;

5. *Recommends* that Parties apply Best Available Techniques (BAT) and Best Environmental Practice (BEP) including, where appropriate, clean technology, in their efforts to reduce or mitigate marine noise pollution; and further recommends that Parties use, as appropriate, noise reduction techniques for offshore activities such as: air-filled coffer dams, bubble curtains or hydro-sound dampers, or different foundation types (such as floating platforms, gravity foundations or pile drilling instead of pile driving);

6. *Encourages* Parties to integrate the issue of anthropogenic noise into the management plans of marine protected areas (MPAs) where appropriate, in accordance with international law, including UNCLOS;

7. *Invites* the private sector to assist in developing mitigation measures and/or alternative techniques and technologies for coastal, offshore and maritime activities in order to minimize noise pollution of the marine environment to the highest extent possible.

ACCOBAMS
November 2010

Resolution 4.17. Guidelines to address the impact of anthropogenic noise on cetaceans in the ACCOBAMS area.

4. *Encourages* Parties:

- to address fully the issue of anthropogenic noise in the marine environment, including cumulative effects, in the light of the best scientific information available and taking into consideration the applicable legislation of the Parties, particularly as regards the need for thorough environmental impact assessments being undertaken before granting approval to proposed noise-producing activities;

- to integrate the issue of anthropogenic noise in management plans for marine protected areas;

- to avoid or minimize producing noise in marine protected areas, as well as in particular in areas containing critical habitat of cetaceans likely to be affected by man-made sound;

5. *Strongly requests* Parties to emphasize the need for a precautionary approach and to envisage the appropriate mitigation measures, including a provision for expert review by specialists and a provision for the action to be taken if unusual events, such as atypical mass strandings, occur;

7. *Directs* the Secretariat to work with Parties to collect information on noise levels and noise sources in the ACCOBAMS area, and directs the Scientific Committee to evaluate such information, in order to detect the most affected sites within the region and determine if cetacean critical habitats are involved, and to report its findings to the next Meeting of Parties;

13. *Directs* the Working Group established in Resolution 3.10, in cooperation with the Secretariat, the Scientific Committee, and Parties, to further develop the guidelines presented in the Annex, with the aim of testing the application of the guidelines in particular areas to make them implementable by the Parties and operators, and to report about progress made in implementing this resolution to the next Meeting of Parties.

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OBRAZAC

SUDJELOVANJA U SAVJETOVANJU

1. Strateška studija o vjerojatnom značajnom utjecaju na okoliš Okvirnog plana i programa istraživanja i eksploatacije ugljikovodika na Jadranu

2. Netehnički sažetak Strateške studije o vjerojatnom značajnom utjecaju na okoliš Okvirnog plana i programa istraživanja i eksploatacije ugljikovodika na Jadranu

3. Okvirni plan i program istraživanja i eksploatacije ugljikovodika na Jadranu

Naziv nacrta zakona, drugog propisa ili akta	Strateška studija o vjerojatnom značajnom utjecaju na okoliš Okvirnog plana i programa istraživanja i eksploatacije ugljikovodika na Jadranu i Okvirni plan i program istraživanja i eksploatacije ugljikovodika na Jadranu
Naziv tijela nadležnog za izradu nacrta	Ministarstvo gospodarstva
Razdoblje savjetovanja *(početak i završetak)*	16.01.2015. do 16.02.2015.
Naziv/ime sudionika/ce savjetovanja (pojedinac, udruga, ustanova i sl.) koji daje svoje mišljenje i primjedbe na nacrt zakona, drugog propisa ili akta	*OceanCare* *Sigrid Lueber, President* *Oberdorfstrasse 16* *CH-8820 Waedenswil, Switzerland*
Tematsko područje i brojnost korisnika koje predstavljate, odnosno interes koji zastupate	**International requirements and obligations and the Environmental Impact assessment** ***On behalf of 19 NGOs, namely*** Animal Welfare Institute, USA Blue World Institute of Marine Research and Conservation, Croatia Centro de Conservación Cetacea, Chile Cetacean Society International, USA Eastern Caribbean Coalition for Environmental Awareness, Martinique ECOCARE, Maldives Environmental Investigation Agency, International M.E.E.R. e.V., Germany Morigenos - Slovenian Marine Mammal Society, Slovenia NRDC, International Ocean Conservation Research, USA Ocean Mammal Institute, USA Oeanomare Delphis ONLUS, Italy

	Pro Wildlife e.V., Germany Tethys Cetacean Research Institute, Italy VIVAMAR Society for the Sustainable Development for the Sea, Slovenia Whale and Dolphin Conservation Wild Migration, International
Načelne primjedbe na predloženi nacrt	We welcome the opportunity to comment on the *Strateška studija o vjerojatno značajnom utjecaju na okoliš Okvirnog plana i programa istraživanja i eksploatacije ugljikovodika na Jadranu* (Strategic Study) for Croatia's compliance with the Directive 2001/42 /EC of the European Parliament and of the Council on the Assessment of the Effects of Certain Plans and Programs on the Environment (Strategic Environmental Assessment Directive) and Croatia's domestic legislation. We commend the Croatian Government for progressing this Strategic Environmental Assessment and for releasing the Strategic Study for comment. Given that the potential impacts discussed are of a transboundary nature, we would have hoped that such an important document would be released in other languages so that it was accessible to an international audience, including neighbouring countries. None-the-less we take the opportunity to comment on the Strategic Study by recalling the obligations based on international decisions. In general, we wish to emphasise that any further activity to explore and/or exploit hydrocarbon resources in the Adriatic Sea requires a comprehensive Environmental Impact Assessment, as laid out in our original comments in 2013. **International requirements and obligations** As Croatia has identified, assessment of likely impacts is an emerging legal requirement in the European Union. Directive 2001/42 /EC and the more recent Environmental Impact Assessment Directive 2014/52/EU requires that Environmental Impact Assessments are carried out before development consent is given to activities (2014/52/EU Art 2.1) to identify impacts to biodiversity with particular attention to species and habitat protected under Directive 92/43/EEC and Directive 2009/147/EC (2014/52/EU Art 3.1). While seismic surveys are not included in the Annexes, the 2014/52/EU Directive introduction states that: *"[w]ith a view to ensuring a high level of protection of the marine environment, especially species and habitats, environmental impact assessment and screening procedures for projects in the marine environment should take into account the characteristics of those projects with particular regard to the technologies used (for example seismic surveys using active sonars)."* In further support of this imperative, we draw your attention to the recent Convention on Biological Diversity (CBD) *Decision XII/22: Marine and coastal biodiversity: ecologically or biologically significant marine areas (EBSAS)* that encourages Parties:

	... "*to make use, as appropriate, of the scientific information regarding the description of areas meeting EBSA criteria, including the information in the EBSA repository and information-sharing mechanism, as well as the information from indigenous and local communities as well as relevant sectors, including the fisheries sector, when carrying out marine spatial planning, development of representative networks of marine protected areas, taking into account annex II to decision IX/20, and application of other area-based management measures in marine and coastal areas, with a view to contributing to national efforts to achieve the Aichi Biodiversity Target*s" Specifically, CBD Decision XII/22 has identified that: • the Northern Adriatic hosts a bottlenose dolphin (*Tursiops truncatus*) population having one of the highest densities in the Mediterranean", it is one of the most important feeding grounds in the Mediterranean of the loggerhead turtle (*Caretta caretta*). Moreover, it is a nursery area for a number of vulnerable species and is one of the most productive areas in the Mediterranean Sea. It is ranked high for its 'special importance for life-history stages of species', 'importance for threatened, endangered or declining species and/or habitats' and for 'biological productivity'; • the Jabuka/Pomo Pit hosts the largest populations of Norway lobster (*Nephrops norvegicus*) and is important especially for juveniles in the depths over 200 m. It is ranked high for its 'uniqueness or rarity', 'special importance for life-history stages of species', and for 'biological productivity'; and • the South Adriatic Ionian Strait contains important habitats for Cuvier's beaked whales (*Ziphius cavirostris*), an Annex II species of the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD Protocol) in the framework of Barcelona Convention, and significant densities of other megafauna such as the giant devil ray (*Mobula mobular*), striped dolphin (*Stenella coeruleoalba*), Mediterranean monk seal (*Monachus monachus*), and loggerhead turtle (*Caretta caretta*), all of which are listed in Annex II of SPA/BD Protocol. It is ranked high for its 'uniqueness or rarity', 'special importance for life-history stages of species', 'importance for threatened, endangered or declining species and/or habitats', 'vulnerability, fragility, sensitivity, or slow recovery' and for 'biological diversity'. We are of the opinion that no exploration and/or exploitation activities should be permitted within and around any of the referenced EBSA sites and/or sites declared as protected zones (including Special Areas of Conservation designated through the Species and Habitats Directive and Areas of Community Importance, including those referenced within the Strategic Environmental Assessment). We also draw to your attention the recent discussions of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) Recommendations to CBD Parties XVIII/4: Marine and coastal biodiversity that urges Parties to:

	"take appropriate measures within their mandates to avoid, minimize and mitigate the potential significant adverse impacts of anthropogenic underwater noise on marine and coastal biodiversity," and to *"[conduct] appropriate impact assessments before carrying out activities that may have adverse impacts on noise-sensitive species, and carrying out appropriate monitoring".* SBSTTA also urged CBD Parties to combine acoustic mapping of potential noise impacts with habitat mapping of sound-sensitive species to identify areas where those species may be exposed to noise impacts. As you are aware, the Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and Contiguous Atlantic (ACCOBAMS) *Resolution 4.17: Guidelines to Address the Impact of Anthropogenic Noise on Cetaceans in the ACCOBAMS Area (ACCOBAMS Noise Guidelines)*: *"[r]ecogniz[es] that anthropogenic ocean noise is a form of pollution, caused by the introduction of energy into the marine environment, that can have adverse effects on marine life, ranging from disturbance to injury and death".* The ACCOBAMS Resolution also encourages Parties to: *" address fully the issue of anthropogenic noise in the marine environment, including cumulative effects, in the light of the best scientific information available and taking into consideration the applicable legislation of the Parties, particularly as regards the need for thorough environmental impact assessments being undertaken before granting approval to proposed noise-producing activities"*. The ACCOBAMS Noise Guidelines further detail specific considerations relating to seismic surveys and offshore drilling. Also, the Convention on Migratory Species (CMS) *Resolution 10.24: Further Steps to Abate Underwater Noise Pollution for the Protection of Cetaceans and Other Migratory Specie*s: *"[s]trongly urges Parties to prevent adverse effects on cetaceans and on other migratory marine species by restricting the emission of underwater noise, understood as keeping it to the lowest necessary level with particular priority given to situations where the impacts on cetaceans are known to be heavy"* and *"[u]rges Parties to ensure that Environmental Impact Assessments take full account of the effects of activities on cetaceans and to consider potential impacts on marine biota and their migration routes and consider a more holistic ecological approach already at a strategic planning stage."*

	The detail of Environmental Impact Assessments The four bodies highlighted above have provided significant clarity about the expectations to conduct Environmental Impact Assessments in order to fully assess and effectively manage impacts associated with offshore seismic and drilling activities, among other underwater noise producing activities. In our experience, offshore exploration proposals are often presented to governments with generalized, unsubstantiated information and usually without having conducted basic consultation. Subsequent decision-maker approvals or rejections of such poor Environmental Impact Assessments are being made on the basis of erroneous information and are vulnerable to criticisms of bias or tokenism. Environmental Impact Assessments should provide a level of technical information that gives confidence to decision-makers. The Scientific Council of CMS (CMS ScC) recently determined that Environmental Impact Assessments for Offshore Petroleum Exploration Seismic Surveys should provide a science-based tool for decision-makers to better understand the consequences of their decisions evaluate alternatives and mitigate impacts. Given the clarity in both Directive 2001/42 /EC and Directive 2014/52/EU and the weight of information through the CBD EBSA, ACCOBAMS and CMS Decisions, as well as the SBSTTA and CMS ScC Recommendations, we urge the Croatian Government to take this opportunity to ensure that meaningful and comprehensive Environmental Impact Assessments in the Adriatic Sea are mandatory, before any activity is approved. Within these Environmental Impact Assessments, the government should stipulate that professional sound propagation modelling for all seismic activities is transparently provided to authorities, as well as being verified in the field. This modelling should be based on local environmental data, not on other regions, other surveys or generalist assumptions from industry. Only through such modelling and field verification will authorities be able to determine the cumulative impact from multiple and overlapping seismic activities as well as their acoustic interaction with other sound sources from anthropogenic activities, as for example shipping. We also believe that is it important that crucial data regarding abundance, distribution, seasonality and habitat use of key species in the region should be collected and known before any activities commence. In particular, the special area of concern in the south Adriatic for *Ziphius cavirostris* requires additional surveying. Furthermore, we call on the Croatian government when reviewing the future results from Environmental Impact Assessments to encourage the petroleum industry to present all potential options and details about available technologies to reduce sound levels during exploration activities, as recommended within the referenced Resolution CMS 10.24 and ACCOBAMS 4.17, and SBSTTA Recommendation XVIII/4. For instance, stress field detection technology

<table>
<tr><td></td><td>performed from the air, or similar technologies could potentially reduce the need for some seismic airgun surveys by focusing them on only the most promising areas. Marine vibroseis holds promise in reducing the acoustic footprint of seismic surveys, particularly for high-frequency specialists and noise-sensitive marine life such as beaked whales.

Finally, we urge that quantitative and systematic monitoring should be prescribed before, during and after seismic activities. It should be undertaken by independent experts and also conducted during operation of the potential platforms.

We would be pleased to provide further elaboration on any of these points, and look forward to the positive conclusion of the Strategic Environmental Assessment.</td></tr>
<tr><td>Primjedbe na pojedine članke nacrta zakona, drugog propisa ili dijelove akta</td><td>Annex - CBD Decision XII/22, Table 7: Description of areas meeting the EBSA criteria in the Mediterranean
<table>
<tr><th>Location and brief description of areas</th><th>C1</th><th>C2</th><th>C3</th><th>C4</th></tr>
<tr><td>1. Northern Adriatic

• Location: Part of the Northern Adriatic Basin, off the coasts of Italy, Slovenia and Croatia. The area is roughly delimited by the 9 m isobaths, encompassing the area above the strait line linking Ancona (Conero) and the island of Ilovik. The area is located in the northern part of the North Adriatic Sea Basin, with an average depth of 35 m and is strongly influenced by the Po river plume.
• It includes mobile sandy bottoms, seagrass meadows, hard bottom associations and unique rocky outcrops called “trezze” and “tegnue”. The area is important for several threatened species. It hosts a population of the highest density of bottlenose dolphin (Tursiops truncatus) in the Mediterranean, it is one of the most important feeding grounds in the Mediterranean of the Loggerhead turtle (Caretta caretta) and it is a nursery area for a number of vulnerable species (blue shark (Prionace glauca), sandbar shark (Carcharinus plumbeus), anchovies (Engraulis encrasicolus), etc.). The area hosts a strong diversity of benthic and pelagic habitats due to an important gradient of environmental factors from its western portion to its eastern coasts. It is also one of the most productive areas in the Mediterranean Sea.</td><td>M</td><td>H</td><td>H</td><td>M</td></tr>
<tr><td>2. Jabuka/Pomo Pit

• Location: The area encompassing three distinct, adjacent depressions, with maximum depths of ca. 270, respectively. The area extends 4.5 nautical miles from the</td><td>H</td><td>H</td><td>M</td><td>M</td></tr>
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	200 m isobath. The area encompassing the adjacent depressions, the Jabuka (or Pomo) Pit is situated in the Middle Adriatic Sea and has a maximum depth of 200 - 260 m. • It is a sensitive and critical spawning and nursery zone for important Adriatic demersal resources, especially European hake (*Merluccius merluccius*). This area hosts the largest populations of Norway lobster (*Nephrops norvegicus*) and is important especially for juveniles in the depths over 200 m. Based on available scientific data it is a high density area for the giant devil ray (*Mobula mobular),* an endemic species listed on Annex II SPA/BD protocol and listed as endangered on the IUCN Red List. The Pit could function as a favourable environment for some key life history stages of the porbeagle shark, and *Lamna nasus*, which is critically endangered (IUCN 2007), and both of which are listed on Annex II SPA/BD Protocol. Regarding benthic species, several types of corals can be found (*Scleractinia* and *Actiniaria*).				
	3. South Adriatic Ionian Strait • Location: The area is located in the centre of the southern part of the Southern Adriatic basin and in the northern part of the Ionian Sea. It includes the deepest part of the Adriatic Sea on the western side and it encompasses a coastal area in Albania (Sazani Island and Karaburuni peninsula). It also covers the slopes in near Santa Maria di Leuca. The area is located in the centre of the southern part of the Southern Adriatic basin and the northern Ionian Sea. • It is characterized by steep slopes, high salinity and a maximum depth ranging between 200 m to 1500 m. Water exchange with the Mediterranean Sea takes place through the Otranto Channel, which has a sill that is 800 m deep. This area contains important habitats for Cuvier's beaked whales (*Ziphius cavirostris*), an Annex II species of the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD Protocol) in the framework of Barcelona Convention, and significant densities of other megafauna such as the giant devil ray (*Mobula mobular)*, striped dolphin (*Stenella coeruleoalba*), Mediterranean monk seal (*Monachus monachus*) and loggerhead turtle (*Caretta caretta*), all of which are listed in Annex II of SPA/BD Protocol. Benthos includes deep-sea cold-water coral communities and deep-sea sponge aggregations, representing important biodiversity reservoirs and contributing to the trophic recycling of organic matter. Tuna, swordfish and sharks are also common in this area.	H	H	H	H
	Key to the tables				

	RANKING OF EBSA CRITERIA **Relevance** **H: High** **M: Medium** **L:Low** **-:No information**	**CRITERIA** • **C1**: Uniqueness or rarity • **C2**: Special importance for life-history stages of species • **C3**: Importance for threatened, endangered or declining species and/or habitats • **C4**: Vulnerability, fragility, sensitivity, or slow recovery • **C5**: Biological productivity • **C6**: Biological diversity • **C7**: Naturalness
Ime i prezime osobe/a koja je sastavljala primjedbe ili osobe ovlaštene za zastupanje	*Sigrid Lueber, OceanCare*	
	Kontakt E-mail: slueber@oceancare.org Telefon: +41-44-7806688	
Datum dostavljanja obrasca	*February 16, 2015*	
Jeste li suglasni da se ovaj obrazac, s nazivom/imenom sudionika/ce savjetovanja, objavi na internetskoj stranici nadležnog tijela?[1] *Would you like to allow publishing of your name as the author of the comments on the web page of the Ministry of economy didicated to*	**DA (yes please publish our comments)**	NE (no)

[1] Sukladno Zakonu o zaštiti osobnih podataka (NN 106/12), osobni podaci neće se koristiti u druge svrhe, osim u povijesne, statističke ili znanstvene svrhe, uz uvjet poduzimanja odgovarajućih zaštitnih mjera.
Anonimni, uvredljivi ili irelevantni komentari neće se objaviti.

this consultation.		

Važna napomena:

Popunjeni obrazac dostaviti na adresu elektronske pošte rudarstvo@mingo.hr zaključno do 16. veljače 2015. godine