



## Hellenic Petroleum West Patraikos Exploration & Production of Hydrocarbons S.A.

### PATRAIKOS GULF ACOUSTIC MONITORING PROJECT

Patraikos Gulf Acoustic Monitoring Project has been planned and carried out by Metrica S.A. in collaboration with the Laboratory of Marine Geology and Physical Oceanography of the Geology Department of the University of Patras.

#### Background

Hellenic Petroleum S.A. has undertaken a Marine Seismic Survey (MSS) in West Patraikos Gulf waters of Western Greece. The MSS included acquisition of 3D & 2D seismic data. The purpose of the West Patraikos MSS was to better define subsurface geology within the Contract Area and more accurately define potential prospective petroleum targets for exploration drilling.

West Patraikos Gulf covers an area of 1892 Km<sup>2</sup> and the mean and maximum sea depth is 158m and 466m respectively. It supports a diverse marine mammal fauna including several species listed by IUCN as endangered or vulnerable. Therefore, an Exclusion Zone of 750m from the sound source, as it travels within the gulf, has been determined and monitored to ensure noise levels were within the designated limits .



Application / Survey Area



#### Application Requirements

- **Monitoring of the 4 predefined locations with spot measurements** Apart from the noise monitoring system on-board the seismic vessel, HELPE West Patraikos SA monitored a large number of noise monitoring locations as part of the monitoring program to apply control measures and verify the modelled exclusion zone. The application included:
  - ✓ Acoustic monitoring locations monitored with portable instrumentation with a chartered vessel.
  - ✓ Hydrophones positioned at specific depth below sea surface.
  - ✓ Acoustic data recorded at three phases: prestart period, during seismic vessel's survey and post completion period
  - ✓ Processing of Sound pressure data
  - ✓ Reporting of Sound Pressure level data
- **Verification of exclusion zone:** contingent service that incorporated the deployment of a hydrophones to measure sound Pressure level. The hydrophones were deployed from the chartered support vessel that performed recordings opportunistically and without intervention.



## Application Notes / Success Stories

### Survey vessel

The vessel "Quartetto" was used to carry out the acoustic survey. Quartetto is a 16 meter long motor-yacht modified by the Laboratory of Marine Geology and Physical Oceanography, of the University of Patras, to reach the qualifications of a research vessel. The specific vessel has been chosen due to its ability to travel at higher speeds and its building material (GRP plastic) which causes lower noise interference during the recordings.



### Instrumentation

Two separate portable systems were used for the monitoring of the ambient noise on the four predefined stations. Each unit included:

- ✓ four channel digital recorder EA-SDA14 .
- ✓ two hydrophones
- ✓ laptop with processing software for interfacing with the data (recording and visualization)



### Location of acoustic monitoring stations

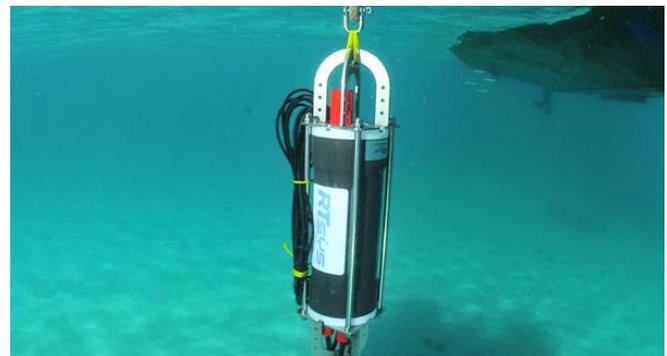
Four specific locations were monitored by portable instrumentation along the coasts of Ithaki, Atokos, Modi, Oxia islands.

### Data processing and reporting

The objectives of this acoustic study was to measure ambient sound levels as a function of sound frequency components, time and position as well as correlate acoustic anomalies to major acoustic sources within the survey areas. To meet the above, a suite of MATLAB codes have been implemented by the Laboratory of Marine Geology and Physical Oceanography, Patras Univ.



**EA-SDA** is a compact autonomous recorder that can simultaneously acquire the data of 4 wideband hydrophones. RTsys systems are thoroughly calibrated to be compatible with all international regulations.



**For the positioning of the vessel** a Global Positioning System (GPS) type Hemisphere VS100 was used. The navigation of the vessel was carried out using the sw package HYPACK 2014 for

- Storing /displaying navigation data
- Continuous graphic presentation of the vessel movement (tracklines)
- Logging time and corresponding geographical coordinates