



ACOUSTIC SERVICES FOR OFFSHORE INDUSTRY AND RESEARCH ACTIVITIES

I –ASSESSMENT OF IMPACTS ON MARINE WILDLIFE CAUSED BY UNDERWATER NOISE FROM OFFSHORE OPERATIONS.

- **Offshore operations**
 - Seismic surveys
 - Exploration and appraisal drilling
 - Decommissioning of infrastructures
 - Pile driving (offshore wind farm construction, pipelines, etc.)
- **Impact assessment**
 - Study/inventory of marine wildlife in the area
 - Identification of species
 - Abundance estimates
 - Census, Encounter ratio
 - Distribution
 - Description of noise sources
 - Criteria to assess underwater acoustic impacts
 - Assessment of impact on cetaceans
 - Damage to tissues
 - Damage to the auditory system
 - Temporary threshold Shift (TTS)
 - Permanent threshold shift (PTS)
 - Auditory Masking
 - Effects on the behaviour
 - Assessment of impact on marine turtles
 - Damage to the auditory system
 - Effects on behaviour
 - Assessment of impact on fishes



II – UNDERWATER ACOUSTIC MODELLING

- **Calculation methodology for modelling**
 - Oceanography and geomorphology
 - Temperature, salinity-speed of sound
 - Loss by acoustic transmission
 - Acoustic data
- **MATLAB® platform** (BELLHOP model, Acoustic toolbar)
- **Results of the modelling**
 - Peak-peak levels
 - Sound exposure levels (SEL)
 - Root Mean square (RMS)





III – DEVELOPMENT AND IMPLEMENTATION OF MITIGATION PROTOCOLS FOR CETACEANS AND MARINE TURTLES

- Definition of exclusion zone derived from the acoustic modelling and the current legislation
- Definition of the working protocol of the MMO and PAM on board
- Definition of the soft-start protocol
- Writing of the final report

IV – PROVISION OF CERTIFIED MARINE MAMMAL OBSERVERS (MMO) AND PASSIVE ACOUSTIC MONITORING TECHNICIANS (PAM)

- **Acoustic equipment**

- Towed hydrophone
 - sensitivity -175dB re 1 μ Pa
 - 2 elements (130kHz)
 - keblar Cable 210 meters long
- Interface
 - Amplifier ROLLS MX54s ProMix Plus
 - Interface Audio E-MU USB 2.0
 - Low frequency filter
- M-Audio Microtrack 24/96 recorder
- High Tech-96 hydrophone
- Acoustic release (500m)
- Remote recorder-EAR (Ecological Acoustic Recorder)



- **Qualified and certified staff**

- MMO, PAM and PSO certifications
- BOSIET (Basic Offshore Safety Induction and Emergency Training)
- Medical offshore certificates