



FLOTTE
OCÉANOGRAPHIQUE
FRANÇAISE par l'Ifremer



GREEN MARINE EUROPE

Underwater Noise

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19/01/2021



www.flotteoceanographique.fr

La Flotte océanographique française,
une très grande infrastructure de recherche opérée par l'Ifremer





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General objectives

1. Reduce underwater noise made by ship operations to reduce impacts on marine mammals. Focus on cavitation.
2. Extend to a broader range of aquatic species

5 Levels

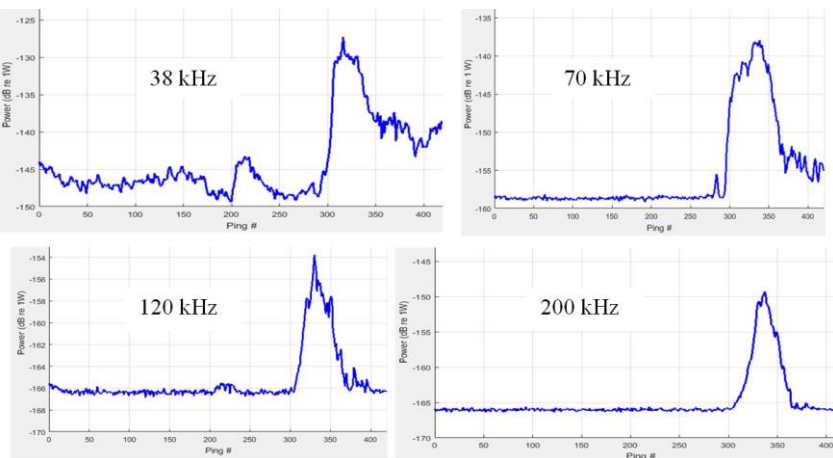
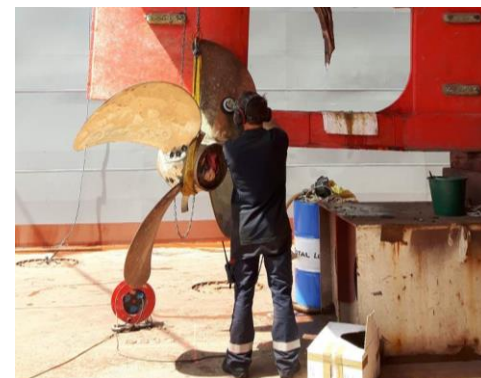
- Level 1:** Assurance that the company is monitoring regulations
- Level 2:**
- Hull cleaning / Propeller maintenance
 - Knowledge of the sensitive areas
- Level 3:**
- Participate in providing whale sighting data in European waters
 - Develop and adopt a Marine Mammal Management Plan
- Level 4:**
- Quieting technologies during retrofits and new vessel construction
 - Measurement of the noise level of at least one vessel
 - Determine the cavitation inception speed for each vessel
- Level 5:**
- Measurement of the noise level of 15% of the vessels (minimum 3)
 - In-depth analysis of vessel noise footprint to identify noise sources

Hull cleaning / Propeller maintenance / Cavitation monitoring



Hull cleaning and propeller maintenance regularly done:

- Self-noise level on sonar systems as low as possible.
- Cavitation (broadband noise) should never exist on an oceanographic vessel.



- The absence of broadband cavitation noise is checked all the time, by carrying out self-noise measurements on the hull sonar systems.
- The maximum speed of our oceanography vessels is lower than the cavitation inception speed.

→ Contribution to Levels 2 & 4

Knowledge of the sensitive areas & regulations

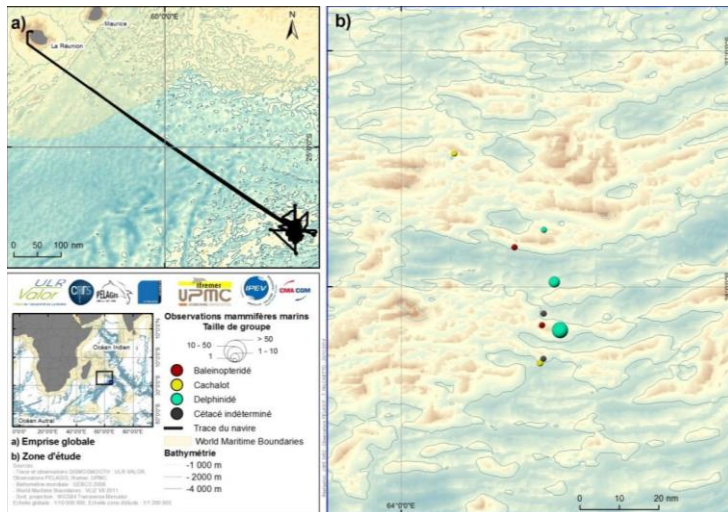
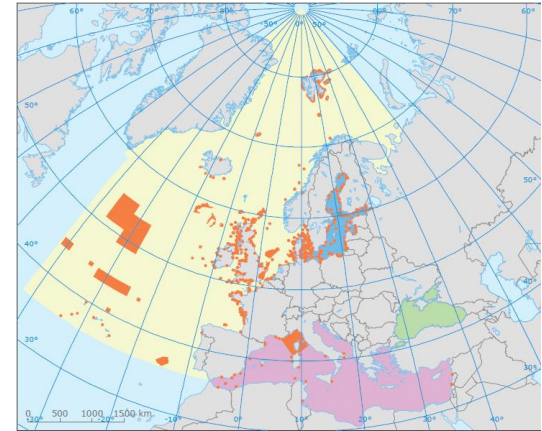
Whale sighting data



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IFREMER's oceanographic vessels transit and have scientific operations in Marine protected areas:

- Mediterranean Sea, including Pelagos Sanctuary
- Black Sea
- Atlantic Ocean, including Azores Sanctuary
- Pacific Ocean, including the Coral Sea Marine Park
- Indian Ocean Sanctuary



- PELGAS cruises since 2000 on board FRV *Thalassa* : mammal observations.
- During loud seismic operations, MMOs perform the maximum possible observations.
- Whale sighting data are recorded in a database and presented in an observation report.
- Reports and logbooks are shared with Sanctuary management teams and cetacean research institutes.

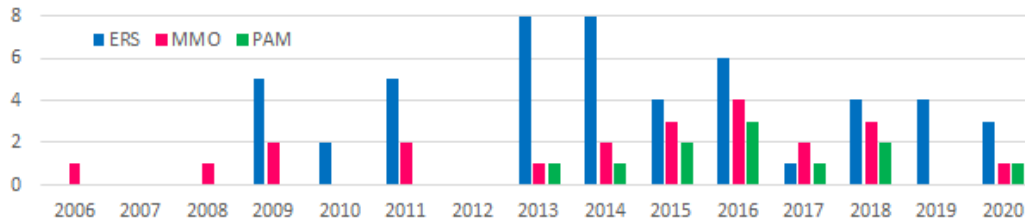
→ **Contribution to Levels 1, 2 & 3**

Marine Mammal Management Plan

→ to limit acoustic impact risks on marine mammals.



- IFREMER has drawn up and adopted since 2011 a MMMP, applied during some works at sea involving high noise levels.
- Scientific campaigns using Class-1 seismic sources ($V > 500 \text{ in}^3$): acoustic risk analysis and suitable cautionary measures.
- Last update in 2019:
 - Sea turtles are now part of the species concerned
 - Campaigns at periods of low biological activity
 - Visual monitoring protocol (MMOs)
 - Acoustic monitoring protocol (PAM operators)
 - Definition of an alert area and an exclusion zone
 - Pre-watch period and Soft start
 - Possibility of immediate shutdown of sound emissions
- **50 noise risk analyzes have been carried out and 22 cruises applied this protocol.**



→ **Contribution to Level 3**

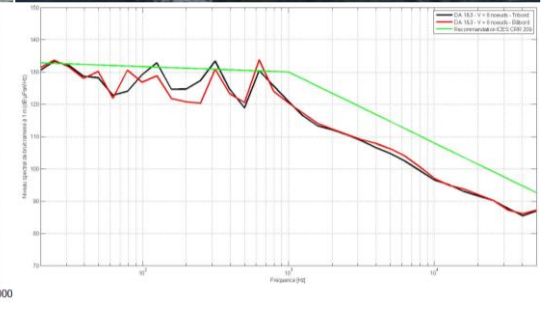
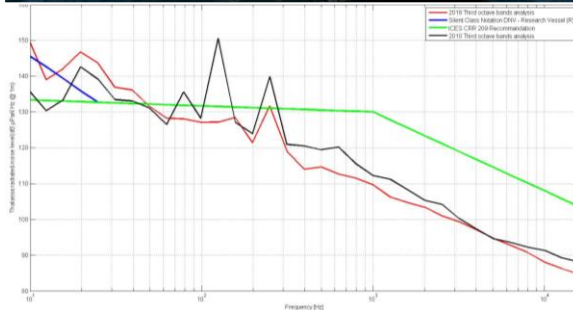
Ship noise level Measurement



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- Dedicated device to measure ship Radiated Noise.
- Acoustic raft in drift mode (flow-noise limitation).
- Low-frequency digital-hydrophone (35m below surface).
- Two-way Wi-Fi transmission ship/raft (GPS & acoustic data).

Acoustic measurements : 3 offshore vessels (~50% of the gross tonnage of the fleet)

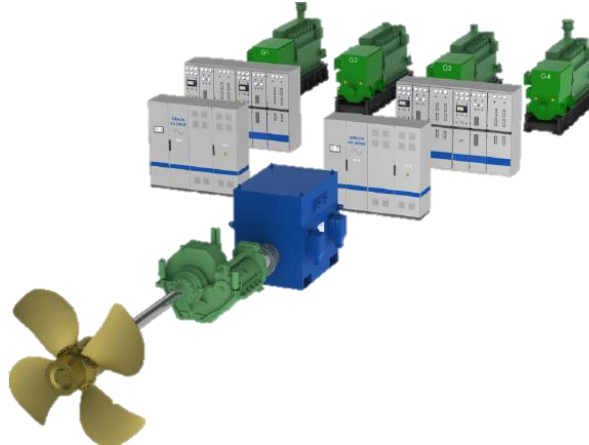


→ Contribution to Levels 4 & 5

Incorporate quieting technologies during retrofits and new vessel construction



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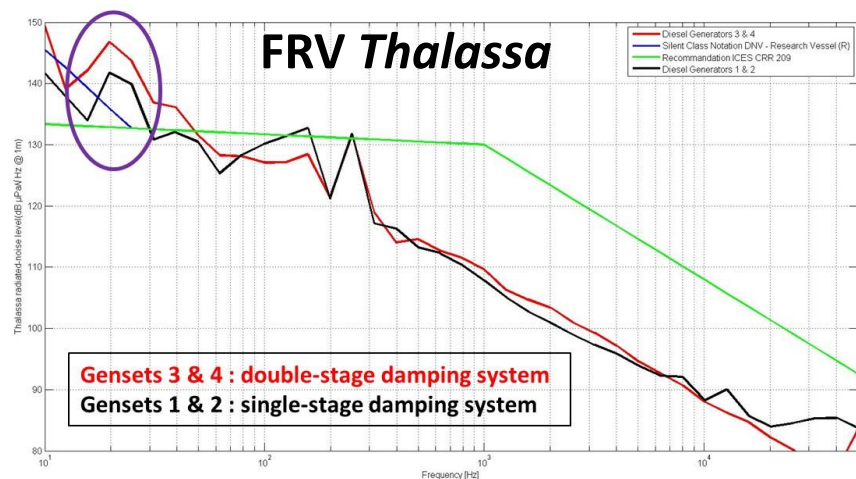
- Hull and propeller design (with a good adaptation to each other).
- Diesel-Electric propulsion for offshore vessels, extended to all new vessels.
- Severe specifications regarding the noise level:
 - **ICES CRR 209** noise specification for our FRV *Thalassa*
 - A **radiated noise level < 140 dB** (ref. 1μPa/Hz @ 1m) for offshore vessels.
- Request to genset suppliers to respect structure borne vibration levels and airborne noise level consistent with the radiated noise specifications.
- Work plan concerning the maintenance and cleaning of the propellers and the hull.

→ **Contribution to Level 4**

In-depth analysis of vessel noise footprint to identify main noise sources



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- After modernization and genset replacement in 2017, the FRV *Thalassa* meets ICES 209 standard above 50 Hz.
- Work planned to improve the genset elastic suspension in order to meet the ICES 209 standard in the frequency range [10, 50 Hz].
- Work planned to equip the gensets and the main engine with accelerometers in order to monitor in real time the vibratory level of these structures and therefore to indirectly monitor the evolution of the ship radiated noise.

→ **Contribution to Level 5**