



# JERICO

## Application for Transnational Access to Coastal Observatories



**Description of the project (to be provided in pdf format)**

*Please contact the manager of the infrastructure/installation you wish to use before writing the proposal*

**PART 1: User group details**

Indicate if the proposal is submitted by

- ☐ an individual  
☒ a user group

**Information about the applicants (PI and project partners)**

**Principal Investigator (user group leader)**

Title \_Dr\_ Name and Surname Salud Deudero

Gender ☐ Male ☒ Female

Institution Instituto Español de Oceanografía

Department / Research Group Centro Oceanográfico de Baleares/ Grupo RESMARE

Address Moll de Ponent s/n 07015 Balearic Islands

Country Spain

email [salud.deudero@ba.ieo.es](mailto:salud.deudero@ba.ieo.es)

Telephone +34-971133720

Fax +34-971404945

**Project partners**

*(repeat for each partner of the group)*

Partner # 1

Title \_\_\_ Name and Surname \_\_\_\_\_

Gender ☐ Male ☐ Female

Institution \_\_\_\_\_

Department / Research Group \_\_\_\_\_

Address \_\_\_\_\_







Country \_\_\_\_\_  
 email \_\_\_\_\_

## PART 2: Additional information about the applicant(s) expertise

### **Expertise of the group in the domain of the application**

The group has expertise in the field of aggregation patterns of marine species, littoral ecology, and anthropogenic impacts on coastal ecosystems. The application is focused in detecting changes in marine species and fish aggregations patterns under noise generated from recordings of offshore wind farms (OWF). Since the field of OWF in the Mediterranean is rather new, the group does not have direct expertise in OWF, although some previous experiments and actions have been carried out regarding the design and construction of a remote observation platform. Nevertheless, the PI Dr Deudero is in charge of the task on 'impacts of OWF on marine biota and on the role of OWF considered as new substrate as artificial reefs and fish aggregation devices' within the CENIT project AZIMUT. With this regard, Dr Deudero developed her PhD thesis on fish aggregation devices and has also been involved in several projects of artificial reefs assessing effectiveness. Moreover, the team is engaged in some WP of the 7FP Project COCONET, especially those tasks regarding impacts of OWF.

### **Short CV of the PI**

Dr Salud Deudero Company. Senior Researcher at the Balearic Oceanography Centre COB-IEO, Spanish Oceanographic Institute. University Professor of Marine Biology Laboratory (Universitat Illes Balears, 2001-2008). PhD in Biology (UIB, 1998). Master in Marine Ecology (Univ.Brussels, 1993). Degree in Biology (Univ. of Barcelona, 1991) is member of the Group Marine Reserves RESMARE Balearic Oceanography Centre COB-IEO. Graduate Fellow at Free University of Brussels, Ghent University 1991-93. Crew of MV Moby Dick and Fisheries Biologist for Greenpeace 1994. PhD Student, IMEDEA, CSIC / UIB, 1995-98. Marine Biology Laboratory postdoctoral fellow UIB, 1999. Postdoctoral Researcher, Univ Newcastle, United Kingdom 1999-2001. She has published 51 original papers in journals of impact SCI (23 as first author) and 21 non-ISI journals. She has participated in 28 research projects, being principal investigator of 16 projects. Regular reviewer and evaluating scientific articles, projects and scholarships. She has attended 23 national and international conferences. She has made several visits to foreign research centers (Bermuda, Belgium, England, Brazil, Italy), and 2 national research centers. Master's tutor UIB Marine Ecology, professor in charge of for the subject 'Marine Reserves' at Master Planning Analysis and Coastal Areas UIB, and Master in Global Change at UIMP 'Impacts of global change on marine habitats. She has directed two doctoral theses, 9 bachelors thesis and 9 masters thesis. Dr Deudero performed her PhD thesis on fish aggregations devices (FADS). She is principal investigator of the subcontracting Project on 'Impacts of offshore wind farms OWF on marine biota', and on several tasks of the 7FM project COCONET with regard to OWF and marine reserves. From 2009 to 2011 she has published 20 peer-review ISI scientific papers. On the last 3 years, Dr Deudero has been principal investigator of 4 research projects with external funding at national and international level with a total income of 385000€.





**A list of 5 recent, relevant publications of the participant(s) in the field of the project**

*The participants have not published scientific papers on OWF since no OWF are already existing at the Mediterranean, here we list recent publications related with artificial reefs, fish aggregation devices and anthropogenic impacts developed by the group members:*

Deudero, S., Tor, A., Alomar, C., Valencia, J.M., Sarriera, P., Blanco, A., 2012. Integrated multitrophic aquaculture: filter feeders bivalves as efficient reduces of wastes derived from coastal aquaculture assessed with stable isotope analyses. *Aquaculture and the environment. A shared destiny*. Intech. pp. 103-121. Rijeka, Croacia. ISBN 978-953-307-749-9.

Deudero, S., Box, A., Alós, J., Arroyo, N.L., Marbà, N., 2011. Functional changes due to invasive species: Food web shifts at shallow *Posidonia oceanica* seagrass beds colonized by the alien macroalga *Caulerpa racemosa*. *Estuarine Coastal and Shelf Science*. 93, 106-116.

Deudero, S., Box, A., Sureda, A., Tintoré, J., Tejada, S., 2011. Combining stable isotopes and biochemical markers to assess organic contamination in transplanted. Mussels *Mytilus galloprovincialis*. *Mussels: Anatomy, habitat and environmental impact*. Nova Science Publishers, Inc. 11, 263-284. New York, USA. ISBN: 978-1-61761-763-8.

Coll, J., Abad, R., Alvarez, E., Deudero, S., Mas, R., Riera, F., Moreno, I., 2009. State of fish populations and influence on the trammel net fishery at three Balearic Island (Western Mediterranean) artificial reefs a decade after their deployment. *Bulletin of Marine Science* 85, 77-100.

Deudero S., 2001. Interspecific trophic relationships among pelagic fish species underneath FADS. *Journal of Fish Biology*. 58, 53-67.

The participants have already published 2 posters at different congress dealing with impacts of offshore wind parks on marine biota and the link with substrate addition and their role as artificial reefs and fish aggregation devices:

Alomar, C., Deudero, S., Batle J.M, 2011. Assessing substrate addition of offshore wind farms by fractal dimensions. *World Conference on Marine Biodiversity Aberdeen, Scotland*

Camba, C., Deudero, S., Alomar, C., Miquel, J., 2011. Offshore wind farms acting as artificial reefs and fish aggregation devices for species of commercial interest and conservation. *EWEA offshore 2011 Amsterdam, Netherlands*

Other documents related with OWF studies carried out by the group members:

Alomar C, 2011. Development of a remote observation platform as an assessment tool for marine species quantification at Mediterranean Offshore Wind Parks. Master thesis, Marine Ecology program UIB

Gonzalez C & Deudero S, 2012. Síntesis del conocimiento sobre los efectos de los parques eólicos



offshore en el medio marino europeo. Informe de proyecto AZIMUT-CENIT, 67 pp. Spain

### **PART 3: Detailed scientific description of the project**

#### ***List the main objectives of the proposed research***

The main aim of this research is to assess offshore wind farms (OWF) effects on marine biota.

Specific objectives involve:

- Combination of visual and acoustic methodologies for fish quantification associated to artificial substrates simulating OWF
- Testing fish communities naturally associated to an existing Mediterranean offshore platform in function of oceanographic parameters

Developing a set of experiments to quantify fish responses to noise disturbance associated to a Mediterranean offshore platform in function of oceanographic parameters.

*(one page maximum)*

#### ***Give a brief description of the scientific background and rationale of your project***

Marine wind energy can become one of the most worthwhile energies in a near future as energy efficiency increases with technological development as a clean energy not contributing to global warming. The first offshore wind park was installed in 2000 with a capacity of 2 MW. Nowadays Europe has 1.371 operative turbines throughout 53 offshore wind parks in 10 countries. United Kingdom and Denmark are the leading countries with 636 installed turbines providing 2.094 MW, and 401 turbines generating 857 MW, respectively (Wilkes et al., 2011). France has installed the biggest and more powerful offshore wind farm in the world (6MW, 150 metres of diameter and 73,5 meters fins).

Construction and operation of offshore wind farms generate several impacts such as noise, electromagnetism and incorporation of new hard substrate into the marine ecosystems. These impacts can affect marine environment and biota (Wilhelmsson et al., 2010). It is essential to study these effects and adopt measures for proper functioning of offshore wind farms.

One of the main effects produced by offshore wind farms is the aggregating effect on marine nearby species, the so-called "Fish Aggregating Device (FAD)" effect. This effect is due to the submerged part of the turbine, which acts as an artificial reef where species can find habitat and protection, and the shadow that the operating wind fins project on the sea surface, which provides a darker area where species can hide from their predators. This FAD effect has been studied in





offshore windmill parks of the *Egmond aan Zee* (Ybema et al., 2009; Lindeboom et al., 2011), *Horns Rev* and *Nysted* (ENERGI E2, 2005) and North Hoyle (May, 2005).

Development of offshore wind farms at the Mediterranean is expected to start in the near future at several Med countries. Therefore, assessment of wind farms effects on the marine species and ecosystems is a key issue for the development of the OWF. In order to minimise impacts and to address the best implementation of wind farms several hypothesis need to be tested and confirmed for Mediterranean species. Many studies have already mentioned biota effects of OWF, although most are centred on Baltic and North Sea species (Gonzalez & Deudero, 2012). As species and ecosystems differ among European seas, and especially at the Mediterranean (Deudero 1999), whatever investigation is carried out in this concern is of great interest. The **rationale** of this project is to perform a series of experiments at the ACQUA ALTA platform to quantify biota responses to OWF and shifts in faunal communities naturally associated to the platform under noise disturbance linked with oceanographic conditions.

The group members have already started experimental work concerning FAD effect at Mediterranean species through the development of a Remotely Operated Platform (ROP). In this sense, acoustic measurements combined with video data are in progress. However, the ROP needs to be incorporated or assembled into a wind turbine in order address natural species aggregations. Up to date, and due to absence of OWF at the Mediterranean the group members need to rely on several alternatives such as artificial reefs, aquaculture cages. The ACQUA ALTA platform is a suitable test field for assessment of OWF effects on marine biota. This is a highly innovative approach and can have high revenue to the scientific community as the first experiments carried out on Mediterranean biota. Several research groups within the 7FP Project COCONET (linked with OWF and networks of marine reserves) might benefit from the results obtained.

Potential seeding links with industry are foreseen and guaranteed since the group members are already in a national project (CENIT-AZIMUT) with the enterprise ACCIONA marine renewables section. This enterprise will be a potential end-user of the results obtained from the experiments carried out at the ACQUA ALTA platform with high expectations in providing advice for OWF best placement and avoiding interferences with natural communities through mitigation measures. Many other industries related with marine renewables, especially OWF development will be profiting of the experiences provided from this project proposal.

*(one page maximum)*

### ***Present the proposed experimental method and working plan***

In order to assess offshore wind farms (OWF) effects on Mediterranean marine biota several simulations of offshore wind farms conditions should be done at the ACQUA ALTA platform. Studies on FAD effect and noise disturbance in function of oceanographic parameters in the Mediterranean can be developed through artificial structures such as this platform having similar characteristics to offshore wind turbines structures that provide new artificial substrate.





### Method

The experimental method relies on the improvement of the remote observation platform (ROP) already developed by the research group. The platform is integrated by an acoustic and visual detection system remotely controlled. The acoustic detection system is composed by an echosounder, a General Purpose Transceiver (GPT) that communicates a signal with information to a given position, a transducer that converts acoustic energy (sound vibrations) to electric energy and a computer with the software programs ES60 and Sonar Data Echoview. A waterproof camera integrates the visual detection system. This systems will be placed on the "AQUA ALTA" platform in order to accomplish the following objectives:

- *Combination of visual and acoustic methodologies for fish quantification associated to artificial substrates simulating OWF.*

The acoustic detection system is used to evaluate fish abundance using an echo integrated electronic system that provides echograms and works in association with the submerged waterproof camera which identifies fish species showing up in the echogram. Both systems are integrated in a PC remotely controlled from a computer via internet allowing real time data transfer.

- *Testing fish communities naturally associated to an existing Mediterranean offshore platform in function of oceanographic parameters*

Artificial substrates such as platforms and OWF can be considered as having a FAD (Fish Aggregation Device) effect, towards nearby species by increasing heterogeneity and providing habitat for species to feeding, reproduction, refuge from predators. Species communities are found associated to these platforms and their abundance and behaviour will be studied with integrated visual and acoustic methods. Data from the tower, obtained with a series of oceanographic instruments (waves, currents along the column with ADCP, temperature at surface and bottom, salinity, turbidity, oxygen, chlorophyll a and sea level) will be correlated to fish species behaviour and abundance around the offshore platform. Patterns in fish abundance will be studied in function of wave height, currents, temperature and turbidity.

- *Developing a set of experiments to quantify fish responses to noise disturbance associated to a Mediterranean offshore platform in function of oceanographic parameters*

Noise effects are not produced by the "ACQUA ALTA" structure but we propose to reproduce operating wind farms noise on the platform and evaluate species abundance and behaviour with acoustic methods under a gradient of noise and oceanographic parameters. Several studies show that some species can get used to noise (Mueller-Blenkle et al., 2010), therefore studies will be conducted to verify the habituation effect.

*(one page maximum)*



**Indicate the type of access applied for**

- ☐ remote (the measuring system is implemented by the operator of the installation and the presence of the user group is not required )
- ☒ partially remote (the presence of the user group is required at some stage e.g. installing and un-installing)
- ☐ in person/hands on (the presence of the user group is required/recommended during the whole access period)

**Indicate the proposed time schedule including expected duration of access time**

The hypothesis to be tested require of several stages:

-The first phase is installation of ROP components (echosounder, desktop computer, wireless, video, hydrophones), and testing of equipment, connections, data integration... with an estimation of 1 week time of 2-3 researchers.

-The second phase is performing quantifications of natural fish communities around the platform under different oceanographic conditions, with an estimated duration of 2 weeks.

-The third phase consists of a battery of sounds simulating OWF noise in order to tests fish responses linked with oceanographic conditions by means of combining echograms and video footages, estimated to be 2 weeks time with external researchers involved. There is also a second part of experimental tasks involving calibration of sound according to observed fish community. This phase should be longer in order to check if fishes get use to noise (habituation) or there is complete evasion from the platform (avoidance) and therefore up to 2 months time might be desirable. This part does not requires external researchers to be at the platforms, instead regular operators can run the echosounder and video surveys while the research group get the data remotely in their home laboratories.

*(half a page maximum)*

**Host infrastructure**

**Indicate the type(s) of JERICO host facility(s) you are interested in**

*(Tick more than one if it is useful for your project)*

- ☐ ferrybox      ☒ fixed platform      ☐ glider      ☐ calibration laboratory

**Indicate the specific JERICO host facility(ies) you wish to choose**

Acqua Alta Oceanographic Tower (ACQUA ALTA)





**Explain briefly why you think your project will be best carried out at the specified host facility(ies)**

Development of offshore wind farms at the Mediterranean is expected to start in the near future at several Med countries. Therefore, assessment of wind farms effects on the marine species and ecosystems is a key issue for the development of the OWF.

In order to assess offshore wind farms (OWF) effects on Mediterranean marine biota several simulations of offshore wind farms conditions should be done at the ACQUA ALTA platform, as there are no existing offshore wind farms at the Mediterranean. Studies on FAD effect and noise disturbance in function of oceanographic parameters in the Mediterranean can be developed through artificial structures such as this platform having similar characteristics to offshore wind turbines structures that provide new artificial substrate.

The main objective of our project is to assess effects of OWF on marine biota by studying species abundance and behaviour around artificial offshore structures. Accomplishing this objectives the platform is ideal since it provides:

- A support structure for deployment of ROP (Remote Observation Platform) equipment
- Continuous power supply for running the ROP
- It provides with a full range of oceanographic sensors
- Has internet connection for remote data transfer
- Is provided with 2 underwater webcams
- Noise disturbance equipment can be attached to the platform
- The platform is under surveillance by expertise

**If possible, list other JERICO facility(ies) where you think your experiment could alternatively be carried out**

#### **Additional information**

**Is there a facility similar to the one you wish to utilize in your country?**

☐ Yes ☒ No

**If yes, please indicate your reasons for requesting access to the JERICO facility you have chosen**

**Have you already submitted an Access Proposal to any of the participating facilities under this or previous EU Programs?**



☐ Yes ☒ No

*If yes, please indicate the name of the institution, submission date and reference number for each such proposal*

*Is this a resubmission of a previously rejected proposal? (Select "yes" if this application is a revised version of a proposal submitted to JERICO before that was rejected by the Selection Panel)*

☐ Yes ☒ No

*If yes, please give the exact reference number and submission date. Kindly describe briefly the changes made in comparison to the rejected version.*

*Is this a continuation of an earlier project funded under a previous call for Transnational Access in JERICO at the same facility?*

☐ Yes ☒ No

*If yes, please give the exact reference number and submission date. Kindly indicate also what has been achieved in the previous experiment and the reasons why the objectives have not been fully met.*

#### **PART 4: Technical information**

*Wherever possible, please specify your requests regarding the use of your chosen facility's equipment/instruments/sensors, including any additional services, data or other requirements.*

*List all material/equipment you plan to bring to the JERICO facility (if any):*

Acoustic equipment:

- General Purpose Transceiver (GPT) 50kHz
- Transducer, Simrad 50-18POR 50kHz





-Computers

Visual equipment:

-Waterproof camera

Internet and data connection:

-HUB concentrator DGS-1008D.

Hydrophones components

Three scuba diving equipment (jacket, scuba diving gear, regulator)

Sampling material

***Please provide a detailed and realistic budget for the expenses you expect to incur for travel/boarding and the shipment of equipment, if applicable in your case (note that a maximum of two travel grants will be assigned to each user group, depending on the length of the requested period of stay).***

*Expected expenses are a total of 4900€ for travelling and shipping:*

*Flight tickets for 3 external researchers @ 2400€ (from Spain to Italy)*

*Travel expenses (trains...) for 3 external researchers @ 500€*

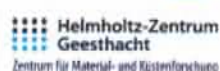
*Shipping of ROP equipment from Spain to Italy: SEUR transport 2000€*

***Please tick the appropriate boxes and give detailed information for the kind of risks associated with your proposed activity***

- ☐ Chemical :
- ☐ Biological :
- ☐ Radiological :
- ☐ Other :



National Research Council of Italy





Date of compilation 2<sup>nd</sup> April 2012

Signature of the PI

Salud Deudero  
Permanent Researcher  
COB  
Spanish Institute of Oceanography

Signature of an appropriate authorised person  
(e.g. Head of Department, Research Office)

Enric Massuti Sureda,  
Director Centro Oceanográfico Baleares  
Spanish Institute of Oceanography

***This section reserved to the JERICO TNA Office***

Date of proposal receipt by email

---

Assigned reference number

---

Signature of receiving officer

---

