

## **PhD project to apply in the framework of the Spanish FPU or Galician GAIN PhD programs**

**“Spatio-temporal dynamics of *Nephrops norvegicus* in the north and northwest Iberian peninsula: Abundance and life-history changes along five decades and comparison with other areas across the distribution range”**

### **Summary**

The PhD project will be focused on studying the population dynamics of the Norway lobster (*Nephrops norvegicus*) in the north and northwest Spanish Iberian waters. The objectives of the project are to understand the multiple factors affecting the spatio-temporal fluctuations in abundance, to study the variability in different life-traits of the species, and how these feed-back on the population dynamics during the last five decades. Moreover, the project aims at comparing patterns and trends across the distribution range of the species.

### **Project description**

#### *Introduction*

*Nephrops* stocks are of great socio-economic importance for European fisheries; however, patterns and trends differ across the distribution range of the species. In the north and northwest Spanish Iberian waters there are three functional units, FU26 (western of Galicia), FU25 (northern of Galicia) and FU31 (Cantabrian Sea), which are independently assessed and managed. These three units have experienced a continuous decline in abundance and biomass resulting in a fishery closure since 2017 for FU25 and FU31 and since 2022 for FU26. However, despite stock rebuilding efforts, the north and northwest Iberian stocks have not yet reached healthy numbers and the principal causes for the plummeting in catches and changes in the spatial distribution are poorly known.

The objective of this PhD project is to study key ecological and fishery questions for an emblematic species, the Norway lobster, *Nephrops norvegicus*, along the north and northwest Spanish coast of the Iberian Peninsula. Formerly an abundant species in these fishing grounds, this decapod is currently facing a continuous decline in abundance limiting its commercial exploitation. However, the factors that have caused this reduction in abundance to the lowest historical levels are unknown. Thus, the identification of the factors involved in the decline of the population is essential for undertaking institutional and community actions to promote the sustainable use of this resource.

### *Specific objectives*

In this project, the PhD student will have to evaluate and interpret fishery, ecological, and historical instrumental and oceanographic data already compiled in past research initiatives and ongoing sampling. The project aims to develop models that help to understand the natural and anthropogenic factors responsible for the population changes of this species.

The specific objectives include:

- i) A thorough analysis of the environmental conditions that characterize the *Nephrops* habitats.
- ii) The development of models to study spatio-temporal shifts in the species distribution and area occupied within the functional units using data from different sources, from scientific surveys undertaken since the 1970s, to onboard data and official information on catch and effort.
- iii) A study of the changes in individual length over time and space for males and females using data obtained from the surveys and onboard observations as a function of biotic and abiotic factors.
- iv) A study of the historical fishery dynamics, and exploration of different stock assessment models.
- v) A comparison of the patterns and trends found in the previous items with other functional units across the distribution range.
- vi) All results are intended to be considered for future management and develop conservation strategies.

### *Material and Methods*

This proposal will benefit from data already compiled in past research projects and long-term and ongoing sampling developed by the host institution and other partners, so as from fruitful collaborative initiatives with the fishers and their professional associations. More specifically, the core of the project would be based on bottom trawling surveys carried out by the IEO during the last five decades, and more recent underwater television surveys. This information will be completed with onboard observers data that are used to evaluate the discards of the Spanish fleet, *ad hoc* surveys conducted in FU25, FU31 and FU26 using commercial vessels, and official catch and effort data. Other data such as long-term climatic variables will be available from public repositories. Furthermore, complementary information such as trends from other locations will be gathered from published literature and international working groups specifically focused on *Nephrops* research.

The working hypotheses will rely on both ecological theory and empirical evidence and will be tested using statistical models. These will include parametric and non-parametric techniques, so as mixed-effects models and Bayesian approaches. The candidate will have to collaborate with

different researchers from various institutions, participate in field surveys, and learn basic biological and oceanographic sampling and data analyzing techniques. Furthermore, during the course of the PhD, the candidate will also have the opportunity to perform short stays in both national and international institutions.

### **Selected literature**

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- Fariña A, Freire J, González-Gurriarán E (1994) *Nephrops norvegicus* in the Galician continental shelf (NW Spain): abundance and distribution. *Fisheries Research* 19: 333–347.
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- ICES (2022) Working Group on *Nephrops* Surveys (<https://www.ices.dk/community/groups/Pages/WGNEPS.aspx>).

- ICES (2022) Working Group for the Bay of Biscay and the Iberian Waters Ecoregion (<https://www.ices.dk/community/groups/Pages/Wgbie.aspx>).
- Johnson MP, Lordan C, Power AM (2013) Habitat and ecology of *Nephrops norvegicus*. *Advances in Marine Biology* 64: 27–63.
- Marta-Almeida M, Dubert J, Peliz A, dos Santos A, Queiroga H (2008) A modelling study of Norway lobster (*Nephrops norvegicus*) larval dispersal in southern Portugal: predictions of larval wastage and self-recruitment in the Algarve stock. *Canadian Journal of Fisheries and Aquatic Sciences* 65: 2253–2268.
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- Sigwart JD, Lundy M, Dick JTA, Becker C (2020) Declining female size at onset of maturity in *Nephrops norvegicus* in long-term surveys (1997–2016). *ICES Journal of Marine Science* 77: 3031–3038.
- Ungfors A, Bell E, Johnson ML, Cowing D, Dobson NC, Bublitz R, Sandell J (2013) *Nephrops* fisheries in European waters. *Advances in Marine Biology* 64: 247–314.

### **Requisites**

Candidates must have a degree in Biology or Marine Sciences with an academic qualification higher than 7, and a master degree preferably in Oceanography, Marine Biology, Statistics or similar topics.

### **Contact persons**

The FPU and GAIN calls usually open by the end of the year thus if interested please contact us as soon as possible. Include a CV so as academic qualifications. The project will be co-supervised by researchers from IEO-CSIC. Contact persons:

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