

## POPULATION DYNAMICS, BIOLOGY AND STATE OF EXPLOITATION OF THE NORWAY LOBSTER (*NEPHROPS NORVEGICUS*) IN THE BALEARIC ISLANDS

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### Abstract

The Norway lobster (*Nephrops norvegicus*) is the target species of the deep-water bottom trawl fishery carried out in the upper slope (250-500 m) off Mallorca (Balearic Islands). This study aims to analyse the trends in its catches per unit of effort, as well as its population dynamics and biological parameters, and to assess its state of exploitation. Biological information has been calculated for this species in this area for the first time and used as input parameters for the stock assessment. The current fishing mortality is higher than the reference point  $F_{0.1}$ , which indicates that the stock is subjected to overfishing.

**Keywords:** *Decapoda, Population Dynamics, Stock assessment, Growth, Balearic Islands*

The Norway lobster (*Nephrops norvegicus*) is one of the main fishing resources of the deep-water bottom trawl fleet from the Balearic Islands, representing up to 7% in biomass and 10% in economic value from all the deep-water crustaceans landed [1]. Although landings from this species showed a negative trend between 1986 and 1995 [2], an improvement in its state of exploitation, using indicators, has been detected [3]. Even though it is the main target species from the upper slope, between 250 and 500 m depth, no previous studies have been carried out on its biology in the area, with a lack of information for parameters such as growth curve, length-weight relationship or maturity ogive.

The objectives of this study were: (i) to analyse the annual, seasonal and geographical trends of the catches per unit of effort of *N. norvegicus* from the bottom trawl fleet off Mallorca; (ii) to analyse the population dynamics of this species and calculate its growth parameters; (iii) to analyse the reproductive biology (spawning period, maturity ogive, fecundity) and other biological traits such as condition index and length-weight relationship and (iv) to assess the state of exploitation of the species using traditional assessment methods. Data were obtained from different sources: (i) official landings from the bottom trawl fleet; (ii) monthly sampling on-board trawlers; (iii) annual bottom-trawl surveys; and (iv) on-board and in-laboratory individual biological sampling. Annual, seasonal and geographical trends were analysed by Generalized Additive Models and the state of exploitation was analysed by Extended Survivor Analysis (XSA) and Yield per Recruit (Y/R) analysis.

Data analysed from the commercial fleet covered years between 2000 and 2011 and from the scientific surveys from 2001 to 2011. Biological sampling was performed seasonally between 2010 and 2012 and annually between 2001 and 2011. Annual landings from the bottom trawl fleet off Mallorca oscillate between 5 and 32 tons, with an average size of approximately 36 mm carapace length (CL, Figure 1). Length-weight relationship showed a positive allometry ( $b = 3.4$ ) and length at first maturity for females was established at 37 mm CL. The Von Bertalanffy growth function parameters were estimated as  $L_{\infty} =$  and  $k = 0.126$ , showing a slow-growth performance.

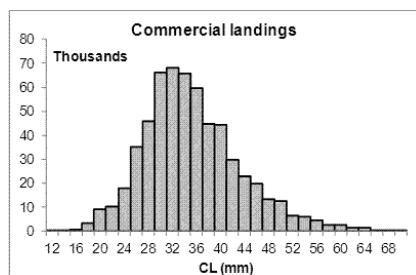


Fig. 1. Size frequency distribution of *N. norvegicus* from the bottom trawl commercial landings (average 2002-2011).

XSA showed a quite stable population during the years analysed (Figure 2a), with its total abundance around 10.5 million individuals, recruitment abundance around 5.5 million individuals, total biomass around 95 t and spawning stock biomass around 46 tons. Fishing mortality was estimated between 0.3 and 0.6, with a current value of 0.45 (average of the last three years). Y/R (Figure 2b) showed this current fishing mortality higher than the reference point  $F_{0.1}$  (0.13), which indicates that the stock is subjected to overfishing.

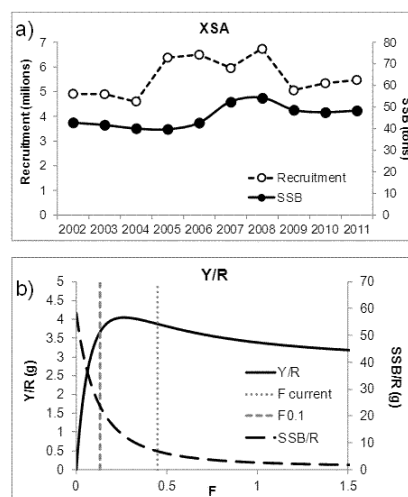


Fig. 2. Results from the Extended Survivor Analysis (XSA, a) for *N. norvegicus* showing the recruitment abundance and spawning stock biomass (SSB) and from the Yield per Recruit analysis (Y/R, b), showing the current  $F$  (0.45) and the reference  $F_{0.1}$  (0.13).

### References

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