



## Foreword

# Crustacean fisheries<sup>☆</sup>

The conference on Life Histories, Assessment and Management of Crustaceans was held in La Coruna, Galicia, Spain from 8 to 11 October 2001, and was convened by the EDFAM (European Decapod Fisheries: Assessment and Management) project. This 3-year Concerted Action project is funded by the European Commission under the Fifth Framework Programme (Project QLK5 1999 0131), which aims to review the assessment and management systems for crustacean fisheries in Europe while looking to the rest of the world for examples of best practice.

Fisheries for crustaceans are now of high importance globally with clawed and spiny lobsters, crabs and penaeid shrimps in high demand on world markets. In Europe approximately 22 crustacean species are fished commercially, with the fisheries for species such as *Nephrops norvegicus*, *Cancer pagurus*, *Homarus gammarus*, and *Parapenaeus longirostris* being highly ranked in terms of total landings and value compared to finfish species in a number of European countries.

The EDFAM project was initiated because of the increasing importance of crustacean fisheries in Europe and because assessments and management of these fisheries are in many cases poorly developed. A number of the fisheries are relatively new (10–20 years) and basic distribution and behaviour data are still being collected. Other well established fisheries have expanded offshore in recent years. The conference aimed to bring together plenary and session papers on key topics from leading international researchers that reflects the scope and diversity of re-

search on the biology and assessment of crustaceans currently being undertaken throughout the world.

The conference included themes on biology and life history, assessment of the local population, metapopulations and the management of crustacean fisheries. In these proceedings the papers have been subsumed into two themes; biology and recruitment (Part I) and assessment and management (Part II). A total of 55 papers and were presented at the conference, and 54 manuscripts were submitted for publication, of which 33 were accepted for publication following peer review.

### *Part I. Biology and recruitment*

Pre- and post-settlement constraints on recruitment are key processes in the life history of crustaceans. Their relative importance is reviewed using three case studies by Wahle and is followed by an evaluation of how the small-scale ecological studies used to evaluate the recruitment process is representative of the larger geographic scale (Incze and Wolff). Caputi shows the relationships between different life history stages including the effects of pre- and post-settlement processes on the stock recruitment relationship and landings in the fishery. Butler examines the biological relationships and events in the life history and how a spatially and temporally (climate change) variable environment may affect processes at the level of the individual. The environmental effects on recruitment is also shown by Ramirez-Rodriguez et al. Removal of settlers may impact on recruitment to the fishery depending on the level of density dependent mortality between settling and recruitment to the fishery (Phillips et al.). Zheng and Kruse present a study on stock recruitment modelling. Velasquez and

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Lizarraga-Cubedo et al. present two papers on variability in reproductive patterns that may be related to oceanographic conditions.

The population structure of decapod crustaceans is strongly related to the dispersal of the larval stages. Measuring connectivity between benthic adults through the larval dispersal process is extremely important in identifying the population structure and for the management of exploited populations. The difficulties in measuring this key process in crustaceans is described and compared with approaches being used in coral reef fish research by Sale and Kritzer. Pedersen et al. demonstrate how particle tracking models integrated with key biological information on larvae can be used to measure dispersal. Eaton et al. also show how hydrodynamics can limit the dispersal of larvae and lead to predictable patterns of distribution, whereas behaviour of adults prior to release of larvae may also impact on larval dispersal at least on the local scale as shown by Stevens.

## *Part II. Assessment and management*

In Part II of this volume Smith and Addison review the methods in use for the stock assessment of crustacean fisheries and consider the implications and treatment of uncertainty in the assessment process. Monitoring of catch rates in the fishery is a basic management tool, and it is essential that trends in commercial catch rates can be shown to be directly related to changes in populations rather than to changes in catchability or behaviour of the fleet. Maynou et al., Sbrana et al. and O'Neill et al. investigate variability in catch rates due to changes in fishing power or to other characteristics of the fishing vessels. Addison et al. show how research survey catch rates can be adjusted to remove environmental effects on catchability. Goni et al. show how different fishing gears can affect size related catchability and how this may bias size composition data. Catch and effort data are used by Carbonell and Azevedo in a non-equilibrium production model and by Dichmont et al. in a delay difference model. Dramatic declines in catch rates corresponding to changes in recruitment and population estimates are

described by Farina and Gonzalez Herraiz. Theoretical advances in the use of tag return data for estimation of population density and mortality rates are provided by Bell et al. and Frusher and Hoenig, respectively. The uncertainty inherent in the analytical modelling approach is convincingly demonstrated by Punt, and uncertainty in estimates of natural mortality is quantified by Zheng. Siddeek describes the estimation of biological reference points to assess the impact of fishing on key parameters while Groeneveld et al. describe an experimental assessment of the impact of fishing effort on catch rates. Frusher et al. describe changes in selectivity in trap fisheries and discuss whether this has masked declines in recruitment. Castro et al. describe the potential benefit of live release of discards in protecting overexploited species when caught as by-catch.

Community-based management of local resources is described by Molares and Freire which is facilitated by a Geographic Information System. The volume ends with a paper from Gribble on an approach to ecosystem-based management of fisheries signalling, the increasing awareness of the importance for both fisheries and the environment of an integrated multi-disciplinary approach to management of fisheries.

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Oliver Tully\*

*Zoology Department, Trinity College Dublin  
Dublin 2, Ireland*

Juan Freire

*Departamento de Biología Animal  
Biología Vegetal e Ecoloxía  
Campus da Zapateira s/n  
A Coruña 15071, Spain*

Julian Addison  
*CEFAS, Pakefield Road, Lowestoft  
Suffolk, NR330HT, UK*

\*Corresponding author

*E-mail address: tully@bim.ie (O. Tully)*