

## Estimation of *Nephrops* Biomass in the Irish Sea

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### Summary

This is an EU funded project (DGXIV 1995/015) set up to establish a basis for estimating *Nephrops* biomass using the annual larval production method. *Nephrops* are the most valuable single species exploited in the Irish Sea with a first sale value of around £10 millions. Early attempts to assess the state of *Nephrops* stocks were based on mean size data, which despite being poor indicators of the state of exploitation are still used to provide an overview of temporal trends. Research has demonstrated that *Nephrops* are subject to large variations in population structure within relatively small geographic areas and in the Irish Sea this spatial variability is more marked than temporal change (Briggs, 1995). Age-based assessment of *Nephrops* stocks are hampered because they are crustaceans with a typical calcified exoskeleton which is regularly shed, leaving no hard bony tissue from which annual ring markings can be distinguished. Methods have been developed, however that utilise growth and other biological information on *Nephrops* to slice size frequency distribution data into year classes, providing an estimate of catch age composition. This development has enabled age-based assessments of *Nephrops* stocks similar to those performed on finfish stocks. The other method used to assess *Nephrops* stocks (Anon., 1997a) is based on the analysis of size composition data (length cohort analysis). Both of these methods rely upon commercial fishery data and assumptions which are more applicable to finfish stocks such as homogeneity of the stock (Chapman and Howard, 1988), equal capture availability and stock redistribution criteria following capture of part of the stock (Caddy, 1975).

The current project is aimed at providing a fishery independent estimate of *Nephrops* biomass in the Irish Sea using the annual larval production method. Comprehensive data on Irish Sea *Nephrops* larvae were made available from surveys performed as part of a recently completed project on the estimation of finfish biomasses (Anon. 1997b). These larva data will be used to back calculate *Nephrops* biomass from realised fecundity estimates.

Over 200 ovigerous female *Nephrops* caught by trawling and potting were held in an upwelling aquarium system consisting of individual compartments. Many of the animals held in the system extruded their eggs while in captivity which has enabled detailed records of potential fecundity (number of eggs extruded) and eggs detached from females during incubation to be maintained. The captive *Nephrops* were fed cooked mussel meat and both the animals and their environment were closely monitored. The eggs incubated by the ovigerous females during the first phase of the project hatched during April-May 1997 and data on hatching success were obtained. Problems encountered with larval culture to obtain stage duration are being addressed in the second phase (1997-98) of the project. It is planned to use these data to estimate daily larval production from results of larva surveys.

Other work completed during the first year of the project included collation of the time series of commercial catch data held by the Department of Agriculture (DANI) and the CEFAS

Laboratory in Lowestoft. Sex ratio and female maturity, assessed according to an arbitrary index of 1-5 described by Briggs (1988), were extracted and compiled into a single database. Analysis of these data demonstrated a seasonal variation in sex ratio due to the different emergence patterns of males and females, with ovigerous females tending to remain in their burrows during the winter months. The data suggest that July as the month to obtain a reliable assessment of true sex ratio, i.e. the period of maximum female emergence. A sex ratio of 0.5 expressed as mature females to mature females plus all males was derived for the Irish sea *Nephrops* population. This is the sex ratio of the spawning stock and assumes that all males encountered are mature (Anon. 1997a). The data did however show important differences between east and west populations. The main difference was that the eastern population has a higher proportion of females and these females are larger but with a smaller proportion ovigerous. These differences will need to be taken into account when calculating biomasses by the annual larval production method during the second year of the project. A maturity ogive was generated for the western Irish Sea female *Nephrops* and the 50% maturity size was 23mm carapace length.

This database will be extended in the second year of the project to include research cruise trawl data from DANI and the Marine Institute, along with commercial data held by the Marine Institute in Dublin. Population data will be used in conjunction with the larval survey data and the estimated realised fecundity from the *invitro* studies to back calculate the biomass of Irish Sea *Nephrops*. Biomass estimates obtained will be compared with those from analytical assessments and earlier ALP studies (Thompson et al, 1986, Nichols et al, 1987) and from underwater TV surveys based on *Nephrops* burrow cluster counts.

## **References**

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