



**REPORT OF THE
STUDY GROUP ON LIFE HISTORIES OF *NEPHROPS***

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1 INTRODUCTION

1.1 Background

The Study Group on Life Histories of *Nephrops* is the renamed Study Group on the Life Histories and Assessment Methods for *Nephrops* established in 1991. The original group last met in November 1993 and a report of the meeting was presented at the 1994 Annual Science Conference (ICES, 1994). The report dealt with a range of both biological and assessment issues and listed a series of recommendations for areas of future work. The recommendations on future biological studies were taken as the TORs for the new Study Group, thus reflecting the change of emphasis in its role.

1.2 Terms of Reference

C.Res.1994/2:44 states that the Study Group on Life Histories of *Nephrops* under the chairmanship of Mr N. Bailey (UK) will work by correspondence in 1995 and report to the 1995 Annual Science Conference, to:

- a) examine the variability of the growth of *Nephrops* between and within the existing Functional Units;
- b) continue the work on the reproductive biology and behaviour of the male stocks;
- c) estimate mortality rates and the impact of disease (*Haematodinium*);
- d) prepare a standardization in the collection of data on the survival and also collection of discard data;
- e) determine the need for the continuation of the Study Group.

All items on the terms of reference have been addressed to some degree although a few proved rather difficult for correspondence work and responses to requests for information were limited. In some cases there was very little progress to report. The first four TORs (a-d) are covered by individual sections in the report (Sections 3-7). Item d) was expanded somewhat to draw attention to the need for standardization in collection of landings length composition data. The final TOR e) is dealt with in the recommendations (Section 8).

2 PARTICIPANTS

The following scientists are recognized by ICES as members of the Study Group. Appendix 1 contains names of additional persons with particular interests in *Nephrops* to whom letters were sent inviting contributions.

S. Baden	Sweden
N. Bailey (Chairman)	UK, Scotland
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A. Caramelo	Portugal
F. Cardador	Portugal
A. Cascalho	Portugal
C. Chapman	UK, Scotland
A. Charuau	France
H. Eiriksson	Iceland
C. Farina	Spain
M. Figueiredo	Portugal
H. Hallback	Sweden
P. Hillis	Ireland
J. Idoine	USA
T. Macer	UK, England
A. Nicolajsen	Faroe Islands
S. Munch Petersen	Denmark
F. Redant	Belgium
A. Shanks	UK, Scotland
C. Talidec	France
D. Taylor	Canada
M. Ulmestrand	Sweden

3 VARIABILITY IN NEPHROPS GROWTH

Although there have been a number of reports covering variability in *Nephrops* growth rate (e.g., ICES, 1993) these in fact deal with rather few field-based studies. The most recent information, on growth rates in various parts of the Clyde, was presented at the last Study Group meeting (ICES, 1994). While there is some work in progress on growth estimation in a number of areas (including the use of radioisotopes in France), there are no new parameter estimates available. There is insufficient information to provide additional discussion at this stage of variability within and between Functional Units (FUs). ACFM has highlighted the need to collect growth data for FUs where parameters are borrowed and indeed to collect new data where estimates are old. The Study Group endorses this view and suggests that a review of growth variability is appropriate when data are available for more FUs.

Interesting observations on levels of ageing pigments (lipofuchsins) are emerging for the Irish Sea and other areas. One suggestion is that measurements in a number of areas might enable growth rates in different FUs to be ranked. It would be useful to review this new information at the next Study Group meeting.

4 REPRODUCTIVE BIOLOGY OF MALE NEPHROPS

There have been few studies of male reproductive biology; most work has concentrated on female reproduction (for a review, see Sarda, 1995). The Study Group last year reported on estimates of size of first maturity in

Clyde males based on relative growth of the claw (ICES, 1994). Other current work is not known at present but studies covering wider issues would be extremely helpful. Of particular value would be an investigation of the reproductive behaviour and physiology of males in populations where high levels of exploitation on males lead to sex ratios favouring females. This would help in the provision of assessment advice on suitable levels of exploitation which ensure viable populations. A number of the key issues relating to male reproductive biology could be discussed at the next Study Group meeting and suggestions for future work drawn up.

5 MORTALITY RATES AND THE IMPACT OF THE DISEASE *HAEMATODINIUM*

There are no new estimates of natural mortality rates in *Nephrops* and little quantitative information so far with which to assess the impact of *Haematodinium*. Preliminary results on this topic were presented in the previous Study Group report (ICES, 1994); since then work has continued, mainly by Glasgow University and the Marine Station, Millport. The following is a summary of findings.

Improved methods of diagnosis have been developed and compared; in the field the presence of parasites in the blood is readily determined from microscopic examination of pleopods, though this method appears to be less reliable in diagnosing the presence of parasites in other tissues (Field and Appleton, 1995). For more accurate work, an antibody technique has been developed.

The strongly seasonal expression of the disease has been confirmed. Highest prevalences in trawl samples have occurred in spring and early summer. There is also evidence that disease prevalence varies from year to year. In the Firth of Clyde, the infection peaked in 1991 but has since fallen to below 20%. A similar level of infection has been found recently in the Irish Sea. In the North Sea grounds (Firth of Forth, Moray Firth), the level of infection is low, <2% in trawl samples. The host moulting cycle appears to be linked, either with disease expression or transmission, but the precise relationship is not yet clear. Host sex and size relationships with the disease are also apparent, with medium-sized females showing the highest prevalences.

Cultivation of the parasite *in vitro* has been achieved and the life cycle elucidated, but so far, attempts to infect healthy *Nephrops* have been unsuccessful. Laboratory studies strongly suggest that heavy infection is fatal to the host but further work is needed before the fishery implications are clear.

The work at Glasgow and Millport is continuing and it is hoped that work including host mortality estimates and modelling the dynamics of the host/parasite rela-

tionship with *Nephrops* fishery trends will provide information on its potential impact.

6 COLLECTION OF DISCARD SURVIVAL DATA

Estimates of *Nephrops* discard survival rates in Scottish waters and at the Botney Gut were presented at the last Study Group meeting (ICES, 1994). It was unclear whether differences in the estimated rates were real or the result of different experimental techniques. The Study Group suggested that the methods should be standardized but there has been insufficient opportunity to investigate fully the most appropriate methods. In any case, there have been relatively few investigations of discard survival; thus, prescribing a definitive approach would be premature.

Recently, a major EC contract on survival of a) *Nephrops* escaping through nets, and b) discarded *Nephrops*, was awarded to several institutes whose staff are involved in the Study Group. Since this project commences in April 1996 it would be timely if the Study Group again addressed measurement of discard survival at a proposed meeting about the same time.

7 COLLECTION OF DISCARD AND LANDINGS DATA

The Working Group on *Nephrops* Stocks has, in the last few years, summarized length composition sampling levels for landings and discards in each Functional Unit. At its last meeting the Study Group suggested that the different approaches to sampling, evident from the summaries, should be examined and if possible standardized. For this report, it was suggested that a more detailed inventory be prepared covering the methods used in various countries, but responses were received from only two countries, France and Belgium. This exercise will be carried out at the next meeting of the Study Group when the detailed information already received will be presented along with information from other countries.

It is evident from the limited submissions that considerable attention has been paid to the sampling approaches used in those countries and that each offers advantages and disadvantages. It is not immediately obvious which sampling strategy is 'best' and there is a need for an objective examination of the length compositions collected. One way forward has been suggested by Belgium. This is to apply a variety of sampling strategies (including those in operation) to simulated populations of *Nephrops* and to examine how well the samples reflect the length compositions in the population. This could be taken a stage further by using the length compositions in assessments to examine how conclusions on

the state of stocks could vary with different approaches to sampling.

It is also evident from the submissions that a variety of constraints (financial, etc.) operate to modify 'ideal' sampling systems. A simulation exercise of the type described may point to the most effective way to sample, given limited resources.

8 RECOMMENDATIONS

8.1 Need for the Continuation of the Study Group

Numerous areas of *Nephrops* life history have been somewhat neglected and require attention, and there remains a need to review and update parameter values presently used by the assessment Working Group. At its May 1995 meeting, ACFM suggested that parameter values collected some time ago should be re-examined. The workload of the assessment Working Group implies that a Study Group is required to deal with these tasks.

ACFM considered that for some species, including *Nephrops*, annual assessment advice is probably not required, and suggested that assessments every other year are adequate, with a meeting of the Study Group in the intervening years. The Study Group considers this to be a very constructive proposal, and an improvement over the present situation.

8.2 Venue and Dates

At a recent meeting of the *Nephrops* Working Group, one suggestion for a venue in 1996 was Lorient, France. Since the Working Group is deferred until 1997, it is proposed that a meeting of the Study Group be held in 1996 in Lorient. It is further proposed that the Study Group should meet for 4 days in 1996, preferably from 9-12 April. Other possible dates include 19-22 or 26-29 March.

8.3 Terms of Reference (TORs)

Since a number of the TORs listed for this correspondence report could not be fully addressed, the Study

Group proposes that some of them be carried forward and addressed at the proposed meeting in 1996; the terms of reference should be to:

- a) report new findings on variability within and between *Nephrops* stocks and discuss the implications for assessment and management;
- b) review input parameter values used in *Nephrops* assessments and update them where more recent data are available;
- c) report on progress in the use of ageing pigments (Lipofuchsin) to age Nephropid lobsters;
- d) draw up a list of recommendations for future research on male reproductive biology;
- e) review sampling procedures for *Nephrops* landings and discards and, if possible, identify minimum requirements;
- f) advise on appropriate procedures for collection of information on discard survival.

9 REFERENCES

- Field, R.H., and Appleton, P.L. 1995. A *Hematodinium*-like dinoflagellate infection of the Norway lobster *Nephrops norvegicus*: observations on pathology and progression of infection. *Dis. aquat. Org.*, 22: 115-128.
- ICES. 1993. Report of the Working Group on *Nephrops* and *Pandalus* Stocks. ICES CM 1993/Assess:11.
- ICES. 1994. Report of the Study Group on Life Histories and Assessment Methods of *Nephrops* stocks. ICES CM 1994/K:9.
- Sarda, F. 1995. A review (1967-1990) of some aspects of the life history of *Nephrops norvegicus*. ICES mar. Sci. Symp., 199:78-88.

APPENDIX 1

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