# PATTERNS IN SPAWNING AND SETTLEMENT OF 0-GROUP PLAICE (*Pleuronectes platessa* L.) IN THE EASTERN IRISH SEA, WITH REFERENCE TO A POTENTIAL PREDATOR (*Crangon crangon*)

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## Introduction

Plaice in the Irish and North Seas are important fishery resources, with annual landings to the UK worth around £0.5 million and £20 million respectively (Lee 2001).

Here we report initial data collected under a **Defra** programme (M0423) designed to develop more biologically realistic population models for these stocks. The initial program of work focuses on the Irish Sea (Figure 1).

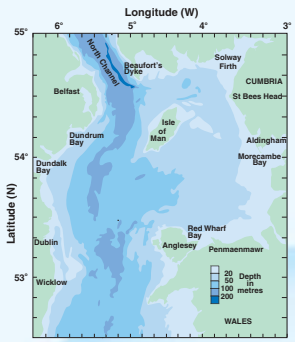


Figure 1: Bathymetry of the Irish Sea

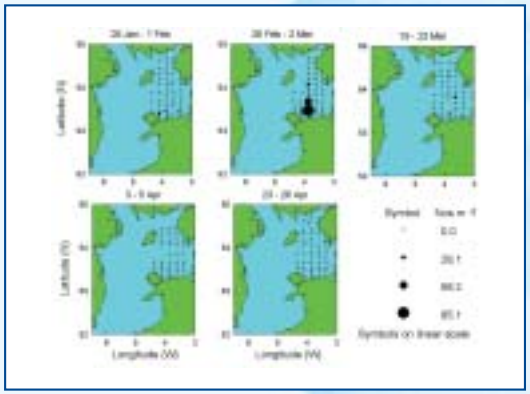

Figure 2: Plaice stage 1 egg distribution in 2001

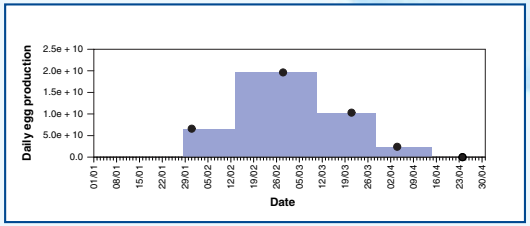


Figure 3: Plaice stage 1 egg production in 2001

## Spawning and egg production

Plankton sampling has been undertaken in the eastern Irish Sea in 1995, 2000 and 2001. Samples have been collected using the Gulf VII high-speed plankton net (Nash *et al.*, 1998), followed by laboratory sorting and staging of plaice eggs.

Figure 2 presents the egg distributions from 2001. Spawning is concentrated off the North Wales coast with smaller areas of spawning extending northwards. Figure 3 shows the temporal pattern in egg production (circles indicate egg production estimates at the mid-points of sampling cruises, grey bars indicate extrapolated egg production histogram). Spawning began in early January and was completed by mid-April. Comparisons of these data with historical survey results suggest that there has been little change in the location of spawning in the eastern Irish Sea over the last forty years (Simpson 1959, Nichols *et al.*, 1993, Fox *et al.*, 2000).

Figure 4: Sandy beach at Blackpool

Figure 5: Mudflats at Heysham

## Settlement

Following metamorphosis, juvenile plaice settle in shallow, coastal nursery areas. 2 m beam trawls fitted with a 10 mm stretched mesh liner were used to sample 0-group plaice from around the margins of the eastern Irish Sea. At each site, four samples were collected by towing the net towards the shore over a measured 100 m. All collections were made at low water. Juvenile habitats range from relatively narrow, sandy beaches such as the one at Blackpool (Figure 4) to large areas of shallow, organically rich mudflats (Heysham - Figure 5).

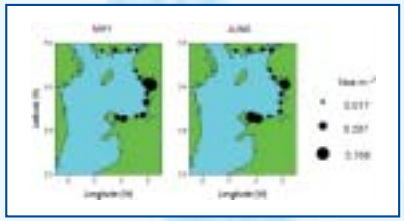

Figure 6: Average numbers of plaice caught at low water (4 replicate beam trawl tows at each location)

The map above (Figure 6) shows the distribution of juvenile plaice (fish < 50 mm total length) during May and June. Numbers have been adjusted assuming an average gear efficiency of 30 % (Iles & Beverton 1991). The main areas of settlement were along the coastline south of Morecambe Bay, but juveniles were also found as far north as the Solway estuary. Compared with the North Sea, plaice eggs and larvae in the eastern Irish Sea are transported over relatively short distances from spawning to settlement sites (van der Veer *et al.*, 1998).

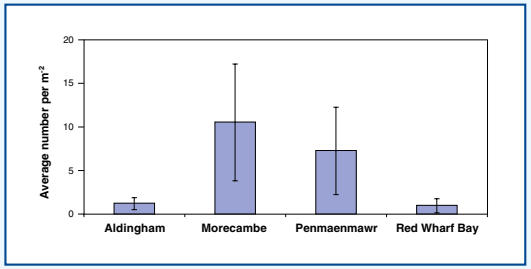


Figure 7: Densities of shrimp >30mm total length on selected sampling sites at low water during May

## Predation on settling juveniles

In the North Sea, predation by brown shrimp (*Crangon crangon*) is considered to be the main cause of mortality of 0-group plaice during and shortly after settlement (van der Veer & Bergman 1987). Shrimp down to 30 mm total length are capable of capturing and consuming settling and newly settled plaice (van der Veer & Bergman 1987, Wennhage 1999). In the current study, abundances of shrimp above this size varied both between and within sites. Figure 7 shows the difference in average numbers between 4 selected sampling areas during May 2001. Densities of a similar range have been reported for plaice nursery grounds in the Wadden Sea (van der Veer & Bergman 1987), and off the west coast of Sweden (Wennhage & Pihl 2001). On a plaice nursery ground off the west coast of Scotland however, no evidence for control of plaice populations by shrimp predation was found (Burrows *et al.* 2001). For this particular site, it was suggested that other predators such as crabs and fishes may be more important than brown shrimp. While this may also be a factor in the eastern Irish Sea, it is likely that shrimp do have some impact on the numbers of settling plaice.

## Further studies

The basic sampling program described here is being repeated in 2002 and 2003. Associated activities within the program include:

- Development of Individual Based particle tracking models for the egg and larval stages
- Analysis of juvenile otoliths to determine birth date distributions compared with spawning dates
- Development of spatially resolved assessment models for Irish Sea plaice
- Comparison of the controls on recruitment for plaice in the Irish and North Seas

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