



Fisheries & Conservation Science

SCIENCE UPDATE

Crab & Prawn: December 2013

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Brown Crab (*Cancer pagurus*)

The Brown Crab (or Edible Crab) is a significant fishery in Welsh waters. This species is broadly distributed and occupies a variety of habitats, varying with life stage. Brown Crabs in Wales are caught in pots and sold for live export. Little data exists for Welsh populations and this project aims to fill vital knowledge gaps and develop methods to enable long-term monitoring and pan-Wales stock assessments for this species.



This project will investigate the current fisheries statistics, variability in juvenile habitat, and provide an understanding of the environmental parameters contributing to optimal survival for juveniles.

Research aims

1. Catch Statistics: CPUE, By-catch and regional variation
2. Juvenile habitat use & recruitment index
3. Morphometrics, Fecundity and Size at Maturity

Catch statistics

We hope to understand regional variation in catch statistics by looking at catch per unit effort, length frequency distributions, sex ratio of catches and assessing diversity and amount of by-catch.

Methods

On board observing & On board camera system

Progress

The on-board camera system has been designed, trialled and is currently operating on several fishing boats around Wales. This allows the capture of fisheries data without the need for an observer to be on-board. In addition to this we will be conducting on-board observing data from vessels that do not have the on-board camera.

On board observing began in November 2013. From this we are capturing data on CPUE, by-catch, size frequency of catches and discards. Additionally we are also collecting gravid females and morphometric data for other studies.

Future

This data will be collected for at least a 14 month overlapping period, and potentially can be on-going as part of a fisheries monitoring program.

Juvenile Habitat and Recruitment index

By surveying juvenile habitats we will gain an understanding of the habitat required to support the early stages of this important fishery species. This can be used to build a long term dataset to enable a recruitment index for fisheries stock management.

Methods

Shoreline surveys, sub-tidal potting surveys

Progress

Two summers of on-shore data and one summer of sub-tidal potting have been conducted as a series of mini-projects.

8 shore sites were sampled in North Wales in 2012 (MSc project).

This summer 2013 Two MSc projects were undertaken to assess variation in abundance and distribution of juvenile brown crab on the shore. These projects were carried across several sites in North Wales and Pembrokeshire.

This summer 2013 Natalie Hold and I fished small mesh pots and used underwater video to determine what kinds of habitat we can catch juvenile crab and lobsters on. This survey was conducted in Hellsmouth off the Llyn Peninsula.

Interesting results from the on-shore surveys

- Juveniles sampled ranged between 8-112 mm carapace width.
- Juvenile crabs are omnivorous feeders.
- Juvenile crabs are patchily distributed both within and among sites.
- The patchy distribution of juvenile crabs on the shore is more correlated to habitat parameters than it is to food availability.
- The presence and size of boulder habitat may be very important to crab abundance.

Interesting results from the sub-tidal potting survey

The results from this project are so interesting, they have their own report! See report for "Juvenile Crustacean Survey".

Future

This data will be collected for at least a 14 month overlapping period.

A full report on the juvenile crab potting survey will be available soon.

Morphometrics, Fecundity and Size at Maturity

Size at maturity and fecundity has not been assessed for Welsh brown crab stocks. We will undertake this study to determine if the previous research on Brown Crab, undertaken in 2008 in the Kattegat & Skagerrak (Sweden) and in 2001 from the Shetland Islands (Scotland); is relevant for the management of Welsh populations.

Methods

Opportunistic sampling of brown crabs during on-board observing activities (during the winter breeding season).

Measuring undersized and adult crabs on board.

Keeping berried females for fecundity studies.

Histological and morphological analysis of maturity from kept samples of males and females.

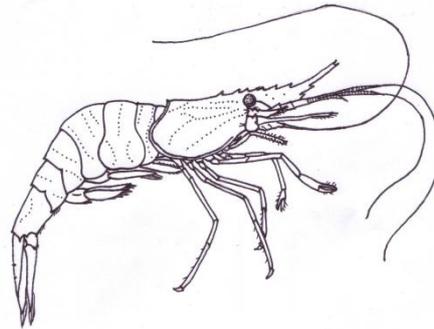
Progress

So far a few hundred adult crabs have been measured for morphology.

Gravid females (berried hens) are just now being to appear in fishers pots and so we are waiting for dispensation to collect these.

The size at maturity study requires many samples of undersized and adult crabs during the winter. This study is also dependant on a dispensation to collect undersized animals.

Common Prawn (*Palaemon serratus*)



Background

Palaemon serratus is an important static gear crustacean fishery in Welsh waters. Although some fisheries specific data has been collected for Cardigan Bay, very little other data exists for Welsh populations. This project will compare abundance, habitat use and sex ratios between recruits, fished and un-fished adult populations. This project aims to collect data to enable a future stock assessment.

Sex ratio (number of males and females in the population) may be skewed towards males as females are larger and hence are more likely to be picked off by predators. This sex ratio may be further skewed if fisheries are preferentially retaining females or only catching females during a spawning migration.

Little documentation exists on the ontogenetic (life stage) habitat shifts of juvenile to adult *Palaemon serratus*. It is not known where *Palaemon* females release their larvae but late stage larvae settle into shallow water coastal environments in warmer months (July – August). What we do know is that larval duration is temperature dependent and display little tolerance to low salinities. Juveniles display a higher tolerance (compared to larvae). This is important when we consider how much rain fall plays in the success of recruitment to adult populations.

Research Aims

1. Catch statistics (size frequency, by-catch)
2. Size at maturity
3. Environmental influences on catch abundance (temperature, salinity, turbidity).
4. Habitat use by juveniles and adults
5. Recruitment patterns

Catch, maturity & habitat use

We hope to understand regional variation in catch statistics by looking at catch per unit effort, length frequency distributions, sex ratio of catches and assessing diversity and amount of by-catch. We also hope to understand how these patterns change under the influence of environmental variables.

Methods

Collecting 2 scientific pot samples each month from fishers in Swansea, Fishguard, Llyn Peninsula and Anglesey. The CBFA project will collect samples from New Quay to Aberdyfi.

We measure and weigh the shrimp, note if berried and will retain for fecundity studies and size at maturity. Drop down cameras will be used to equate catch with habitat.

Progress

North and South samples have been collected since May 2013 and are currently being processed. Sampling from the CBFA project will start in December 2013.

Recruitment

We hope to begin the data collection for a long term recruitment index which can be used for stock assessment. This is a long term goal with important short term results. The short term results will provide a much better understanding of the habitat requirements of juvenile stages. Importantly we wish to understand the relationship between juvenile abundance and habitat type, salinity and temperature as these will have important knock on effects for the fishery in the following years.

Methods

Inshore netting and potting for *Palaemon sp.*

Progress

This summer 2013 two MSc projects were undertaken to look at the variability of shrimp catches in inshore environments. The two projects developed important sampling protocols that will inform future sampling.

The full thesis contents of the Pembrokeshire study is available on our website.

Future

Summer inshore sampling 2014!

Common Whelk (*Buccinum undatum*)



Background

Whelks are slow growing animals with limited potential for movement, they have direct development and are thought to have low (per individual) recruitment. Their life history strategies make them vulnerable to over fishing and populations may require long recovery times from overfishing.

Currently MLS is set at 45mm. Whelks in southern populations are known to mature at sizes greater than this (French, 2012). Currently there is no closed season for Whelk fishing. Females lay their eggs over winter (from November to January), this is also when some whelk fishers turn to scallop fishing. The EFF “fishers knowledge” interview will help us understand this relationship somewhat. Spatial variability in whelk abundance, size structure or sex ratio is not well documented. Environmental drivers for whelk abundance are not well understood.

Research Aims

1. Catch statistics (size frequency, by-catch)
2. Size at maturity
3. Environmental influences on catch abundance
4. Age structure of population
5. Regional estimates of abundance

Methods

For most research aims, the method is to fish 2 scientific pots in various locations around Wales. Currently 4 pots are fished in Swansea, 2 in Fishguard, 2 off the Llyn Peninsula and 2 off Anglesey.

The animals are weighed and measured, and are removed from their shell and their gonads are assessed for maturity. The shell, foot and operculum are kept for aging.

Understanding the age of the population fished is important for appropriate management of the stocks. The operculum shows growth rings and these are often used to determine age. The operculum aging method is unreliable as physical damage can cause a whelk to lose the operculum and will regrow it (hence only showing the growth rings since it was lost). There is a small statolith (a hard bony structure about 1mm in size) inside the foot of the whelk which also contains growth rings and cannot be lost during the life of a whelk. We will compare the statolith growth rings to the

operculum growth rings and determine a damage index from the shells. This comparative method will determine if aging from just the external structures is appropriate for whelk populations.

The regional estimates of abundance are additional work on whelks, not planned for under the initial EFF project proposals. To have this extra project done we have put it up as an MSc project for the summer of 2014. This project is only possible if students choose this topic to research. We will know in early January if we have a student to undertake this work. The method will be a mark-recapture and depletion experiment in 3-4 locations around Wales. It will require close collaboration with both fishers and MSc students.

Progress

2807 whelks have been processed and assessed for maturity stage. Shells, operculum and feet are in freezer storage until aging can be undertaken (either as a MSc project in Summer or by the EFF team in the Autumn of 2014).

Four methods of tagging are currently being used for *B. undatum* but few retention studies were available in the literature. Here we present the results from four tagging methods currently being used for marine gastropods.

Interesting results

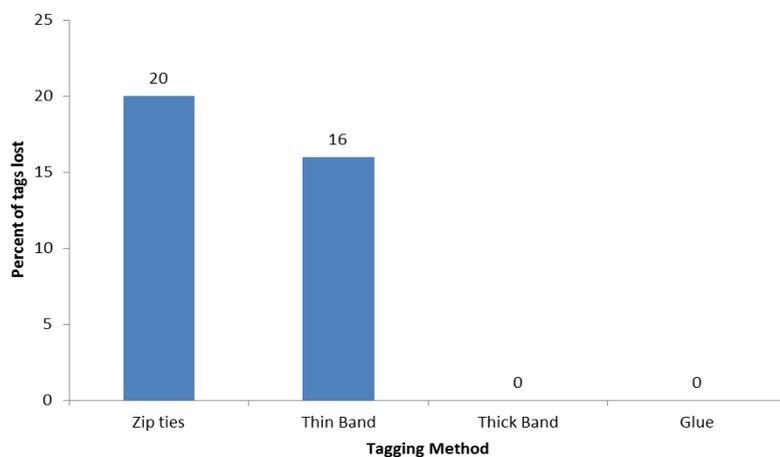


Figure 1. Percent loss of four different tag types on whelks held in an aquarium over two months (October and November 2013). Here we see that thick bands and glue were 100% retained and are a better option in tagging studies when compared to zip ties or thin elastic bands. These methods will be used to determine abundance estimates.

We have some preliminary results from the 2000+ whelks that have been processed so far. We have size at maturity and other catch statistics. We are also assessing the structure of catches from different regions. These will be publicly available after extensive consultation with the fishers involved in this whelk project.

Future

There may be some cases for regional variation in whelk maturity; we are currently investigating this possibility. We are revisiting all of the whelk shells we have in storage and measuring the thickness as there is some suspicion that two morphological varieties exist: a thick-shelled and a thin-shelled morph. The hypothesis is that the thick shelled morph may remain smaller and mature at a smaller size than the larger thin shelled morph. We will soon begin measuring shells and a full report on the data to date will be available early next year after consultation with industry members. Whelk sampling will conclude in July 2014 and a final write up and report on the fisheries samples will be available after this.