

On the occurrence of juvenile lobster *Homarus gammarus* in intertidal habitat

Adrian Linnane*^{†‡}, Brendan Ball[†], Brian Munday[†] and John P. Mercer*

*The Shellfish Research Laboratory, National University of Ireland, Galway, Carna, County Galway, Ireland.

[†]The Martin Ryan Marine Science Institute, National University of Ireland, Galway, Ireland.

[‡]Corresponding author: The Martin Ryan Marine Science Institute, National University of Ireland, Galway, Ireland.

E-mail: Adrian.Linnane@nuigalway.ie

The early benthic phase (EBP) European lobster *Homarus gammarus*, and the habitat to which it recruits, remains largely undiscovered. Following reports that juvenile lobsters were being located within an intertidal lobster fishery in Johnshaven, Scotland, a three day census was undertaken. The shore consisted of a wave cut platform with a red sandstone/cobble conglomerate substratum. Three juvenile lobsters of 28, 32 and 45 mm carapace length (CL) were located in a crevice type habitat. It is hypothesized that in some areas of coastline, intertidal crevices act as a peripheral habitat for juvenile lobsters.

The life cycle of the European lobster *Homarus gammarus* is believed to follow that of a typical marine benthic invertebrate comprised of a pelagic dispersal phase followed by settlement onto a preferred substratum on the seabed (reviewed by Svane & Young, 1989). While the postlarval stage of the European lobster has been identified in nature (Tully & O'Ceidigh, 1987), the early benthic phase (EBP) and the habitat to which it recruits, remains largely unidentified. This has led to a severe paucity of information as to the general ecology and ethology of juvenile lobsters. With the re-stocking or enhancement of populations of homarid lobsters having been the focus of several research projects in recent years (reviewed by Addison & Bannister, 1994; Gendron, 1998), researchers are keen to bridge this critical gap in the life cycle so that long-term stock and fisheries management strategies for *H. gammarus* can be determined and assessed.

The life history of *Homarus gammarus* appears to be quite similar to its American counterpart *H. americanus* (Aiken & Waddy, 1980). In the US, recent advances in benthic sampling such as the airlift suction sampler (Incze & Wahle, 1991), have successfully censused EBP lobsters in certain types of substrata and thus identified their early habitat requirements. Early benthic phase American lobsters appear most abundant in cobble–boulder habitats where they prefer to occupy the interstices of rocks or other existing shelters (Hudon, 1987; Incze & Wahle, 1991; Wahle, 1993). This phase is the most habitat-restricted segment of the life history and appears to be an adaptation to predation and food supply (Lavalli, 1989). However, despite extensive suction samples of cobble substratum in European waters (Wahle, 1998), to date no newly settled European lobsters have been located.

In 1997, reports were received concerning the finding of juvenile European lobsters within an intertidal habitat on the east coast of Scotland. The shoreline in question is located 29 miles south of Aberdeen at Johnshaven (56°47'N 02°20'W). A traditional intertidal fishery for adult lobsters is maintained in the area, primarily during the summer months of July and August. This is undertaken in the lower shore under spring tidal conditions. Local fishermen remove adult lobsters from intertidal crevices using a wire hook of ~1.5 m in length. Periodically, fish-

ermen also report finding juvenile lobsters within the crevices, apparently cohabiting with adults.

In July 1998, a three day census was conducted on the shoreline at Johnshaven using the traditional 'hook' fishing method. The shoreline consists of a wave cut platform with a red sandstone/cobble conglomerate rock type dating back to the Devonian period. In the lower shore area, crevice type openings have been eroded into the rock at the waterline (Figure 1). The crevices are several metres in length and extend for a considerable distance into the rockface. In total, ten lobsters were retrieved. Of these, seven were adults and three were juveniles (Figure 2). The carapace length (CL) of the juveniles (two males, one female) was 28, 32 and 45 mm. As previously reported by fishermen, juveniles were found in the same crevice as adults. The area of coastline where the lobsters were located also received a substantial volume of freshwater inflow via an outlet pipe from a school and a local stream.

Speculative theories exist as to why juvenile lobsters utilize intertidal crevice habitat. It is reasonable to speculate that lobsters are exposed to a reduced range of predators or competitors in this environment, a factor which may outweigh the obvious risk involved in migrating to such areas. While there is no direct evidence to support this, the 'honeycombed' nature of the crevice habitat does suggest that smaller fish such as eels, rocklings or gobies may be the only effective predators. Such cryptic behaviour by juvenile decapods in response to predation is well documented (Wahle, 1992; Wahle & Steneck, 1992).

Intertidal crevice habitat may also provide a suitable food source for juvenile lobsters. Cooper & Uzmann (1980) indicated that the walls and roofs of crevice shelters are generally heavily encrusted with soft-bodied invertebrates which may comprise a major food source. Juvenile lobsters also have the ability to generate a current through their shelters by means of pleopod fanning, allowing them to feed on plankton which are filtered from the incoming water (Lavalli & Barshaw, 1989).

Lobsters are known to survive in salinities as low as 10 psu (Jury et al., 1994) and populations of the American lobster *H. americanus* are known to inhabit estuarine coastlines (Wahle, 1993; Rockel & Watson, 1996). Why juveniles would inhabit an



Figure 1. A typical intertidal crevice at Johnshaven where juvenile lobsters are found.



Figure 2. The three juvenile lobsters that were found during the census at Johnshaven.

area of coastline that experiences substantial freshwater input is unclear. A speculative hypothesis would again point towards the considerable reduction in predator and competition pressure within this low salinity environment. Interestingly, the smallest lobster captured from the shore fishery in Ireland (male, 43 mm CL) was located in Maree, County Galway, an area that is known to experience substantial freshwater upwelling (A.L., personal observations).

The low numbers of juvenile lobsters found suggests that intertidal crevices are not the main habitat of EBP animals but are, instead, a peripheral lobster environment. That the animals were located in crevices which are several metres deep reinforces the hypothesis that the European EBP animal is highly cryptic in behaviour and may well be out of reach of current sampling equipment. This concept should be addressed when future sampling for EBP lobsters is undertaken.

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