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REPORT FROM A FIELD STUDY 7/9-11/9 1992, BRIDLINGTON BAY

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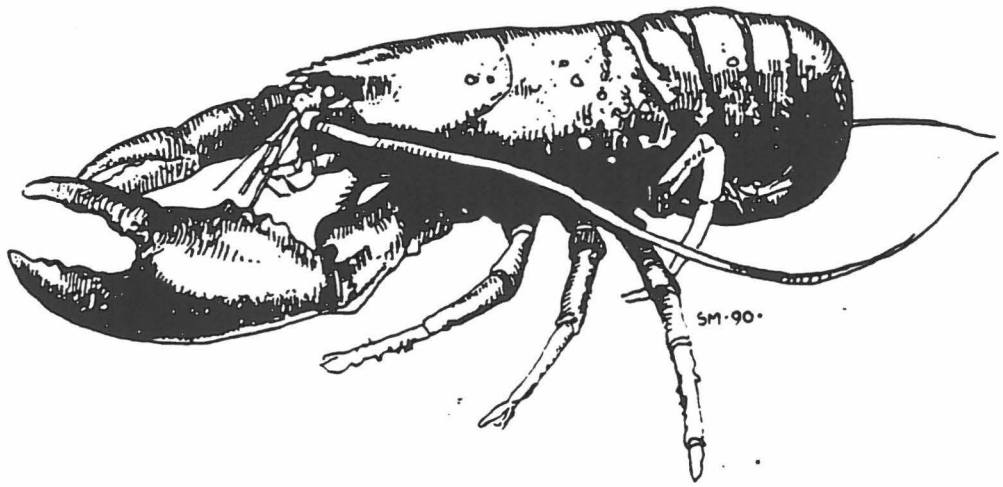

LOBSTER ENHANCEMENT

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CONTENT:

SUMMARY

In cooperation with Dr. C. Bannister and Mr. A. Lawler, both MAFF, Fisheries Laboratory, Lowestoft, the team from the Norwegian Lobster Enhancement Project, Inst. of Marine Research, conducted a field study in Bridlington Bay, 7-11 Sept. 1992. The team were given an introduction to local lobster fishing techniques. Genetic samples and morphometric measurements were taken. Two under water surveys were carried out in Bridlington Bay, by both monitoring the bottom by visual inspection and video recorder.

AIM OF THE STUDY

The aim of the study was to inspect a non-Norwegian commercial lobster fishery. Both the fishery and the habitats were of interest. In addition genetic and morphometric data were collected as a reference to genetic data on Norwegian lobsters. Bridlington Bay (Fig.1) was chosen because MAFF, Fisheries Laboratory, Lowestoft, has been involved in lobster enhancement there since 1983. Their knowledge and experience will be of assistance when the Norwegian recaptures of released lobsters start in October, 1992.

LOBSTER FISHERIES

Traditionally lobster fishing on the English coast is carried out in small boats, 20-30 foot, with an one or two person crew, at depths down to 15-20 metres. The pots, which were traditionally made of steel and wood, are now made predominantly of steel (Fig.2a) and cost approximately £ 10 stg each (100 Nkr). Long lines of pots, called "fleets", containing between 15-30 pots are laod out with both ends of the fleet marked by bouys with flag for identification (Fig.2b). Old mackerel is used as bait.

The large offshore lobster fishing boats use 40 to 50 pots in each fleet, with pots set 20-30 m apart. They fish over depths of 20 and 30 m, more than 20 nautic miles offshore. Work begins, normally, at 2 or 3 am and, depending on weather conditions, up to 10 fleets (500 pots) can be haul, baited and set. The lobster

fishery is the main activity of the crew, continuing from April to October. Seventeen hour working days, seven days a week, during the main season is the rule. A small amount of fishing is carried out during winter. The offshore fishery is limited to relatively few boats. Due to lack of knowledge concerning the offshore lobster population, no increase in the fishing effort is recommended.

The fleets stay one up to four days in the sea, if the weather makes hauling and setting impossible. They can be left longer, giving a higher catch in the next haul, but reduced catch in the long term. This is due both to lobsters killed in the pots, and fewer hauls per month by the lobster boat. The fishermen place crushed crabs or live undersized lobsters in the pots to avoid bycatch of crabs.

The offshore lobster boat "Three Fevers" hauled and set 495 pots on September 10th, getting a cacth of about 400 legally sized lobsters, near 250 kg, considered as an ordinary catch. Catches of crabs, particularly the worthless "soft crab", and undersized lobsters were significant.

The lobster prices at delivery were, in September 1992, £ 6-8 £ stg (60-80 Nkr) per kg. A crew of three earned between £ 300-400 (approx. 4 000 Nkr) per week, each.

The lobster fishery of the Yorkshire coast is of a larger scale than the fisheries in Norway. In Norway the fishing is done as one man work in small, open boats. Up to 50 single pots are set daily per boat during the season from October to December. Fishing depth is between 10 and 30 m. Most of the Norwegian coast is unsuitable for fleet fishing, due to large kelp forests, rough bottom formations and weak lobster populations. The total delivery of lobster in Norway is registered at about 30 tons per year. The value to the fishermen is between 130 to 180 Nkr per kg (£ 13 to 18). Norwegian lobster populations need both stock enhancement and the opportunities to reproduce, before an increase in the fishery is initiated.

The following report is concerned about Bridlington Bay, with a short comparison between the habitat there and typical Norwegian habitats.

MATERIALS AND METHODS

On 7th September 1992 the Norwegian project team; G.I. van der Meeren, MSc, Ms. E. Farestveit and Mr. H. Næss (research assistants), arrived in Bridlington, Yorkshire, with diving equipment, underwater videocamera (super 8mm) and equipment for transportation of frozen genetic samples. Dr. R.C.A. Bannister, MAFF, gave an introduction to the local fishery, geographical information and an outline of their own work. Mr. A. Lawler, MAFF, joined the Norwegian team for the rest of the week.

During the study, Harald Næss joined a commercial lobster fishing boat, "Three Fevers", fishing for lobsters offshore. "Three Fevers" was fishing about 24 nautic miles off the coast, between N 53 53 00 E 00 10 00 and N 53 49 00 E 00 10 07. His report of the fishery is presented in the first part of this report.

Whilst waiting for good diving conditions, the team worked in the fishery harbour, taking genetic and morphometric samples from the local lobsters held in tanks. One walking leg (pereiopod) was taken from each lobster and frozen. Measurements taken were carapace length (CL), total length (TL), carapace width (CW) and tail width (TW) of the first major tail segment posterior to the carapace. Sex and external roe were noted. Genetic sampling of microtagged lobsters was conducted the last days of the study.

Two dives per day, over two days, were planned for G.I. van der Meeren and E. Farestveit. These were weather dependent and had to be taken at the best opportunities. Only two dives were carried through, due to strong wind. The diving boat "Volante", of Bridlington, went out to selected sites where lobsters had been released in the years from 1983 to 1988 (Aldborough, N 53 49 30 E 00 01 09, and Withers Hole-Skipsea, N 53 58 18 W 00 09 18). The dives were conducted at slack tide (low water). Both dives were conducted from "Volante", with a crew of two men. The diving team was completed by a combined emergency diver/diving officer (Mr. A. Lawler). Buddy lines and line to buoy on the surface were used. Underwater observations were conducted by eye and Sony super 8 mm video recorder. Representative bottom habitat

types and organisms were recorded. The tables of registered organisms are compiled both from the video tapes and from the visual study.

The video tapes show representative recordings of all the bottom substrates seen by the divers. Photographs were taken on board the fishing boat and from the harbour area.

Before returning to Norway all collected materials, including the frozen samples, were secured to avoid loss or destruction during to the transport.

RESULTS

Diving surveys

All the described bottom types are presented on the tapes. Species observed are listed in tables 1 and 2.

First dive, Aldborough

The divers floated southwards with the slack current along the bottom on 12 -10 m depth for 55 min, covering a field of about 6 m width and 100 m length.

Bottom substrate.

The bottom was flat and uniform. Most of the area was covered with pebbles and small rocks (10-100 mm diameter) in firm clay bottom. Larger blocks and small boulders were scarce and when presented occured singly. No soft silt was seen, with the bottom having a "clean", almost newly swept appearance. Small areas of fine mineral sand, usually less than 10 m long and 2 m wide were seen. The sand was firm and difficult to dig by hand, but showed wave markings. A ridge consisting of layers of small rocks (100-250 mm diameter) intermingled with small boulders was found in one end of the searched area. The length of this rocky area was not estimated, but width was about 3-5 m. This area offered more shelter than the other bottom types and seemed to function as a reef.

Seaweeds.

Larger pebbles and the boulders often had some scattered

tufty red algae, not more than 50 mm long (unspecified). A larger, fleshy red alga species was also seen once (*Kallymenia reniformis* ?). The rocky area had denser growth of tufted red algae than the other areas.

Fishes.

Some small gobies (< 40 mm) occured all over the bottom, probably sand gobies (*Pomatschisteus minutus,* Pallas). Only one butterfish (*Pholis gunnellus*, L), about 200 mm long, one small flounder (*Platichthys flesus*, L), about 150 mm and one bullhead (*Acanthocottus* sp.) were seen on the pebble/sandy bottom. A small shoal of juvenile fish, probably cod (*Gadus morhua*, L) was seen close to the bottom in the rocky area.

Molluscs and polychaetes.

No molluscs were seen, but siphons in the sand and clay substrate indicated that they may have been in the substrate.

Some siphons may also have been those of polychaetes. Calciferous tubes, probably keelworms (*Pomatoceros triqueter*) were common on stones.

Echinoderms.

Several seastars were seen, mostly the common sunstar (*Solaster papposus,* L), but also common starfish (*Asterias rubens*, L., *Stichastrella rosea* and *Henricia* sp.). The only indication of the presence of sea urchins was a single dead urchin (*Echinus esculentus,* L) was seen.

Tunicata and Hydrozoa.

Several colonial tunicates, probably of the species (*Aplidium proliferum,* Milne Edw.), were found spread in the area. Small sea anemones, probably dahlia anemone (*Tealina felina,* L) and colonial hydrozoes were common in the whole area, as shown in the video recordings.

Crustaceans.

The bottom fauna seemed to be dominated by decapod

crustaceans, especially the edible crab (*Cancer pagurus*, L). These crabs were found in all sizes, though smaller ones were most common. They were found between and under stones, and walking or digging in the bottom with some medium and larger crabs were standing on top of boulders. Squat lobsters, probably both *Galathea strigosa* (L), *G. dispersa* and possibly *G. intermedia*, were numerous, especially in the rocky area. A few larger spider crabs (*Hyas araneus*, L ?), hermit crabs and one shore crab (*Carcinus maenas*, L) were also observed. Of the three lobsters (*Homarus gammarus*, L) seen, both the largest (about 100 mm CL) and the smallest (about 40 mm CL) were hiding in holes dug underneath small boulders. Both lobsters are shown on video recordings. The third lobster was hidden between two stones. The largest lobster was seen on pebble covered ground, while the two other were seen close to each other (< 1 m) in the rocky area. One edible crab and a lobster were seen hiding by the same stone.

Second dive, Withers Hole

Due to a stronger current a distance of about 200m was covered. Reduced visibility decreased the width of the area to about 4 m. The depth was 12-13 m.

Bottom substrate.

The bottom was flat, but did not give an uniform impression. Many stones and boulders varying from about 100 mm to 400 mm diameter, were spread all over. Everything was covered by a very thin layer of soft, brown silt, resulting in a "dirty" impression. In areas 1-2 m wide and up to 10 m long, the bottom consisted of a fine, but firm, sandy substrate, usually penetrated with numerous small holes (< 10 mm in diameter). This substrate was not possible to dig by hand.

Seaweeds.

No seaweed except some unidentified tufts of threadlike algae was recorded.

Fishes.

Small (< 40 mm) sand gobies were abundant and *Cottus bubalis* (L) were seen regularly during the dive. Also common were small, about 100 mm long, flat fish, possible dab (*Limanda limanda*, L). A single whiting (*Gadus merlangus*, L), 300 mm long, and a small cod were also seen.

Molluscs and polychaetes.

One small white opisthobranch mollusc, probably a Coryphellidae, was seen feeding on hydroids. Small, less than 30 mm wide, queen scallops (*Chlamys opercularis*, L), were common. Many siphon tubes in the sandy spots indicated high densities of digging molluscs or polychaetes.

Several places long, slender polychaete tentacles were stretched out from holes in between stones. Calciferous tubes, probably keelworms, occured.

Echinoderms.

A small number of sea urchins were seen. Sea stars were less common than on the first dive site. Brittle stars, (*Amphiura* sp.), were most common, both underneath and between stones. Several individuals of a yellowish species with small, fine spines on the arms, were clinging to Dead Mans Fingers (*Alcyonium digitatum*, L).

Hydrozoa, Bryozoa and Porifera.

Both hydroid polyps and colonies of white Dead Mans fingers were common. Some dahlia anemonas were seen. Bryozoa colonies were very common, especially the hornwrack (*Flustra foliacea* (L)). In some places the hornwrack, up to 100 mm high, covered the rocks completely. Sponges (class demospongia) covered other stones (probably bread-crumb sponge (*Halicondria panicea*, Pallas).

Crustaceans.

Decapod crustaceans seemed to dominate. The density of edible crabs was not as high as at the previous dive site. Small,

camouflaged specimens of spidercrabs *Macropodia* sp. seemed to be the most common decapods, walking on the bottom or clinging on to rocks throughout the site. Squat lobsters were common, and three lobsters of varying size were seen. All lobsters had hidings in holes in the sand under stones. Squat lobsters and lobsters were seen sharing the same stones. The smallest lobster was found on the edge of a fine, sandy area, as described above. This lobster was between 15 to 20 mm CL. In one lobster hole several shrimps (*Palaemon* sp.) were seen.

Genetic and morphometric samples

Two complete test series of 192 local lobsters were collected. From tagged lobsters, 52 samples were taken. Measurements of these lobsters are presented in table 3. Genetic analyses will be carried out later on.

DISCUSSION.

The difference between "good lobster habitat" (rocky bottom with kelp forests) in Norway and the Yorkshire coast with the flat bottom with very little algae, was striking. The rather strong tidal current and occurrence of only scattered single stones on the sandy bottom, seemed to give limited shelter for most decapod crustacean. Still, we have never before seen such high densities of different decapod species in one place, some even occupying the same stones for shelter. Single stones occupied by either lobster and edible crab or lobster and squat lobster or lobster and shrimps, have not yet been seen in the Norwegian lobster habitat research. Such habitat sharings can be caused by the low availability of shelter. Even if few possible fish predators were seen, lack of predators cannot be the reason for the high decapod density. Much food must be present. Observation of digging by crabs and the abundance of siphon holes seem to indicate that the main food resource is hidden in the sediment.

Juvenile lobsters are known to select bottom habitat with good hiding possibilities: rocky crevices or mud which does not collapse (Howard & Bennet, 1979; Hudon, 1987; Barshaw & Bryant-

Rich 1988; Wahle & Steneck, 1991). Although the sediments found in this study were firm and impossible to dig by hand, they were soft enough for animals specialized for digging to penetrate, leaving holes which do not collapse easily. Thus, the sandy habitats can offer space for an infinite number of digging organisms. Large lobsters probably gain from the high density of prey organisms, in spite of the scarceness of shelter.

In large areas of the Norwegian coast, the bottom is rocky, giving a high but fixed number of crevices as living space for both predators and prey. Food must be considered as a limiting factor under these conditions, restricting the number of lobsters which can survive within specific areas.

EVALUATION

This field study gave important input to the Norwegian lobster enhancement research. We obtained a good genetic and morphometric sample for use as a base reference when comparing local Norwegian lobster populations. This sample can also be important for investigating impact on local lobster populations of escaped british lobsters near Norwegian commercial lobster landings.

The release of 50 000 lobsters, from 1983 to 1988, to the large population on the Yorkshire coast, has resulted in 1.8 percent of the lobster catch in 1990 being released lobsters (Bannister et. al. 1991). The Norwegian releases at Kvitsøy are both of a larger scale and released into a much smaller population (van der Meeren et.al. 1990). We can expect a greater impact on the Norwegian Kvitsøy stock compared to the British project. With only a few active lobster fishermen, we can keep in close contact with each. We will gather data on release time, capture time, growth, reproductive state, movements, habitat choice and contribution to the total captures by each release cohort, together with information regarding time and place of the captures.

ACKNOWLEDGEMENTS

We are indebted to our collegues Dr. Colin Bannister and Mr. Andrew Lawler, MAFF, Fisheries Laboratory, Lowestoft, for invaluable assistance and patience when arranging and carrying through this study. Thanks also to the Ivanhoe Hotel, for excellent service and hospitality and to the crew on "Volante" and "Three Fevers". Terje van der Meeren deserves thanks for being a responsible father, coming along to care for little Frode when his mother was busy working over and under water. At last, marianne Holm and Aengus Parsons must be thanked for giving much needed corrections and remarks on the draft of this report.

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Fig. 1 Map over the study area of Bridlington Bay

Fig. 2a. Setting of the lobster pots.

Fig. 2b. Emptying of the pot.

Table 1. Species observed during the first dive, Aldborough.

No exact identification was done, some of the species are suggestions.

Seaweeds	Tufty red algae	Scattered, on stones
	Kallynemia reniformis	One, on an isolated stone
Fishes	*Pomatoschisteus minutus*	3-4 per square meter
	Pholis gunnellus	One on sandy bottom
	Platichthys flesus	One on sandy bottom
	Acanthocottus sp.	One on sandy bottom
	Gadus morhua, juveniles	20-30 over the reef
Crustacea	*Homarus gammarus*	3 under or between rocks
	Galathea strigosa	5-10 per square m
	Galathea dispersa	on rocky bottom
	Galathea intermedia	
	Hyas araneus	On both sand and rocks
	Carcinus maenas	On sandy bottom, scarce
	Cancer pagurus	2-4 per square meter
Echinodermata	*Solaster papposus*	1 per 2 square meter
	Asterias rubens	Scattered
	Henricia sp.	Scattered
	Stichastrella rosea	Scattered
	Echinus esculentus	One, dead
Mollusca	Siphons	Many in sandy bottom
Polychaeta	Siphons	Many in sandy bottom

	Pomatoceros triqueter	Scattered
Tunicata	*Aplidium proliferum*	One colony per 10 m
Hydrozoa	*Tealina felina*	Patches with 2 per meter
	Colonial hydrozoes	Scattered

Table 2. Species observed during the second dive, Withers hole.
No exact identification was done, some of the species are suggestions.

Seaweeds	Threadlike tufts	Scarce
Fishes	*Pomatschisteus minutus*	5-10 per square meter
	Cottus bubalis	Scattered
	Limanda limanda	Scattered
	Gadus merlangus	One
	Gadus morhua	One
Crustacea	*Homarus gammarus*	Three, all under stones
	Galathea sp.	One per 2 square meter
	Palaemon sp.	Patchy, 4-8 together
	Cancer pagurus	One per 5 square meter
	Macropodia sp.	One per 1 square meter
Echinodermata	*Asterias rubens*	Scarce
	Henricia sp.	Scarce
	Solaster papposus	Scattered
	Amphiura sp.	Common under stones
	Yellowish, striped arms	Common on *Alcyonium digitatum*
	Echinus esculentus	Scattered
Mollusca	Siphons	High density in sand
	(Coryphellidae) snail	One on a hydroid
	Chlamys opercularis	3-8 per 1 square meter

Polychaeta	Siphons and tentacles	High density in sand and between stones
	Pomatoceros triqueter	Scattered
Hydrozoa	Colonial hydrozoes	Scattered
	Hydroid polyps	One per ten meter
	Alcyonium digitatum	One per five meter
	Tealina felina	Scattered
Bryozoa	*Flustra foliacea*	Dense cover on rocky substrate
Porifera	*Halicondria panicea*	Patchy, one per 10 meter

Table 3a. Lobsters taken for genetic tests; Wild lobsters (without tag): carapace lenght (CL), carapace width (CW), telson length (TL), telson width (TW), total length (Tot.L), sex and external eggs.