

International Council for the  
Exploration of the Sea

C.M. 1994/K : 1  
Report of Activities  
Rapport d'activités

## **SHELLFISH COMMITTEE**

by

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## Foreword

If the activities report would continue to be an important summary of the ICES countries for the shellfish, it must be improved by several means :

- all the ICES countries had to ask to their shellfish expert belonging to the committee to write their national report.
- all the national reports have to contain the same quantity and quality of informations.

For that purpose during the next annual statutory meeting we can define a common plan with for each species which is exploited can include for example : recruitment, abundance of adults, landings, mortality studies about life histories, trophic requirement with energetic budget and the different modeling aspect of the shellfish populations.

The literature must be cited in an annex report including the grey literature which is not covered by the international data base.

The national reports could be available on a floppy disk under a common presentation with a common software as Word or Word perfect to simplify the editing work.

A large part of the shellfish work is done in the working groups and the study group of the committee.

The Study Group on Life History, Population Biology and Assessment of *Crangon* met 15-18 March in Hamburg under the Chairman of T. Neudecker.

The Study Group on Spatfall and Recruitment in Bivalve Stocks worked by correspondence under the Chairman of R. Dijkema.

The Study Group on the Biology, Life History, and Assessment of Majiid Crabs worked by correspondence under the Chairman of D. Latrouite.

The Study Group on Life Histories and Assessment Methods of *Pandalus* Stocks worked by correspondence under the Chairman of S. Munch-Petersen.

The Study Group on the Life History and Assessment of Cephalopods worked by correspondence under the Chairman of U. Piatkowski.

Some other groups which are not dependant of the shellfish committee has done interesting work for the shellfish community.

Study Group on Identification Protocols for fish and Shellfish met in Lowestoft under the Chairman of K. Friedland.

Working Group on Pathology and Diseases of Marine Organism met in Moncton under the Chairman of A. Mc Vicar.

Working Group on Introduction and Transfers of Marine Organisms met in Mystic under the Chairman of J.T. Carlton.

Working Group on Ecosystem Effects of Fishing Activities met in Copenhagen under the Chairman of H. Gislason.

Benthos Ecology Working Group met in Yerseke under the Chairman of P. Kingston

Study Group on Seabird/Fish Interactions met in Aberdeen under the Chairman of G. Hunt.

They have all published very interesting reports, which can increase our knowledge of the Shellfish Populations.

## CRUSTACEA

### BELGIUM - BELGIQUE

(F. Redant)

#### *Nephrops norvegicus*

The market sampling programme on the Norway lobster (Botney Gut - Silver Pit stock, Central North Sea) was continued, to evaluate the impact of fishing on population structure and composition, and to complete the existing data-base for analytical assessment studies. The methods used to calculate the LPUEs and the mean sizes of *Nephrops* landed were slightly modified, to produce estimates which are less sensitive to variations in recruitment and fishermen's selection (discarding).

The status of the Central North Sea *Nephrops* stock was assessed using both Jones' LCA and a traditional multi-fleet VPA, with knife-edged age classes derived from the existing annual length distributions of landings and discards.

In cooperation with DIFTA (Hirtshals, Denmark) and EEC-funded research project was carried out to investigate :

- (a) The selectivity of Norway lobster trawls for *Nephrops* and whiting ;
- (b) The composition of the commercial finfish by-catch (particularly cod, whiting, gurnard, dab, plaice and sole), and
- (c) The composition of the finfish and *Nephrops* Discards.

The investigations also comprised survival experiments to determine the instantaneous mortality rates of discarded *Nephrops*. During the September sampling campaign, which was part of the selectivity and discard study, data were collected to establish the maturity ogive of female *Nephrops* in the Central North Sea.

#### Sampling Data for *Nephrops norvegicus*

Belgium 1993

Area	Season	No. of samples		Nos. measured
		Research Vessel	Market samples	
IVbc	1 st Qt		4	600-800 per sample
	2nd Qt		6	600-800 per sample
	3rd Qt		6	600-800 per sample
	4th Qt		6	600-800 per sample

## FRANCE

(D. Latrouite)

#### *Maja squinado*

La campagne d'évaluation directe du recrutement conduite annuellement sur les deux principales nourriceries de Manche, dans le 7E en baie de Saint-Brieuc et sur la côte Ouest du Cotentin, a fourni un indice d'abondance valant à la moitié de celui de l'année précédente. Les captures d'automne et

d'hiver de la campagne de pêche 1993-1994 attestent la valeur de ce résultat. Ce niveau de recrutement intervient après une série de 3 années successives de recrutement élevé (1990, 1991 et 1992).

**GERMANY - ALLEMAGNE**  
(T. Neudecker and U. Piatkowski)

***Crangon crangon***

Investigations focusing on the abundance and geographical distribution of brown shrimp in winter have been continued in January. They exhibit a high proportion of females this year more evenly distributed off the west coast of Schleswig-Holstein and north of the Ems estuary. This survey became necessary because of the concern of the fishery whether the so-called "winter fishery" for *Crangon* might have a negative effect on the brown shrimp stocks (BFA f. Fischerei, ISH, Hamburg).

Larval abundance has been another topic. Preliminary studies have continued in accordance with the winter survey covering parts of the German Bight (BFA f. Fischerei), while intensive sampling was conducted in the northern part of the German Wadden Sea resulting in an annual cycle of the occurrence of *Crangon* larvae in that area (Universities of Hamburg and Kiel). Other studies of the University of Hamburg show results of the annual cycle and abundance of post larval shrimp on the sandy mud flats of the coastal area. The long time series of the BFA f. Fischerei on the proportion of shrimp fishery and other organisms in the catches of the shrimp fishery has been continued but suffered severely from lack of samples due to changes in the fisheries and the application of new, not comparable net types. Indices of different size classes per 1 000 m<sup>2</sup> in some parts of the Wadden Sea area are also available from the trilateral Belgium-Dutch-German demersal young fish survey and reveal a decrease of the larger shrimps fraction in the 20-year time series.

All these investigations have led to uncertainties in the timing and growth rates of brown shrimp in the German Bight and require further intensive research. Therefore, the "Study Group on Life History, Population Biology and Assessment of *Crangon*" will meet in Hamburg to elucidate some of the questions.

Technological investigations have shown that higher selectivity for consumption shrimp is possible saving the undersized stock (BFA f. Fischerei).

Technological investigations have shown of an overfished stock because of the instability of catches and the decrease of larger market grades of brown shrimp while the effort is increasing. Some indications supporting these concerns were found like decreasing fractions of larger shrimps in the population and decreases of abundance indices in a tidal channel system being investigated since 1974.

The total annual catch in 1993 was 12.653 tons but with a share of 3.018 tons industrial shrimp included. This means that the total amount of consumption shrimps (9.045 t) remained still below the ten years average.

The effects of discarded fish on seabird populations are the subject of ecosystem and nature-conservancy research programmes (University of Oldenburg).

**Other species**

The abundance of *Cancer pagurus* has been a side project in German Bight fishery research surveys (BFA f. Fischerei) and the small, traditional local lobster fishery (*Homarus gammarus*) around the isle of Helgoland has been under observation by the "Biologische Anstalt Helgoland".



## ACTIVITIES CHECKLIST

Species	<i>Crangon crangon</i>	<i>Homarus vulgaris</i>	<i>Cancer pagurus</i>
Stock/area	North Sea	German Bight	German Bight
Collecting landings ?	Yes	Yes	Yes
effort ?	increasing	stable	stable
log books ?	-	-	-
length/age data	Yes	-	-
Tagging	-	-	-
migration	-	-	-
mark-recapture	-	-	-
Age determination	-	-	-
Growth study	Yes	Yes	Yes
Stock survey	Yes	-	-
area	German Bight	-	-
season	I ; III-XII	-	-
method/gear	beam trawl, seine, stow nets	lobster pots	lobster pots
Fecundity	Yes	-	-
Maturity	Yes	-	-
Condition factor	Yes	-	-
Egg/Larvae study	Yes	Yes	-
Juveniles	Yes	Yes	-
Recruit index	Yes	-	-
Stock-recruit data	Yes	-	-
Recruitment process	Yes	-	-
Gear efficiency	Yes	-	-
Gear selectivity	Yes	-	-
Catchability	Yes	-	-
Behaviour	Yes	Yes	Yes
Seabed impact	Yes	-	-
Pollution	-	-	-
Energetics	-	Yes, larval development	Yes, larval development
Fisheries assessment	Yes	-	-
Harvesting recommendations	Yes	-	-
Experimental studies	Yes	Yes	Yes
Aquaculture/Enhancement	No	No	No
Contact Name and Address	T. Neudecker Institut. Seefischerei 22767 Hamburg	Harms/Buchholz Biologische Anstalt 27483 Helgoland	Harms Biologische Anstalt 27483 Helgoland

## IRELAND-IRLANDE (J.P. Hillis)

### *Nephrops norvegicus*

About thirty-five thousand were sampled in the Irish Sea (see table 1), of which 384 were additionally weighed and measured for biometric data (table 2). A summer cruise in the western Irish Sea (table 3) provided survey data and incorporated replications with the principle net to examine inherent inter-haul variability. Catches obtained with the other nets were used to examine effects of net mesh on position of modes in length-frequency distribution, which however appears to be trivial.

# IRISH NEPHROPS DATA 1993

Table 1 : Commercial samples

Division	Quarter	Number Samples	Sex	Catch	Landings	Discards	Total
Vlla	1	6	Male	1693	375	270	2338
			Female	685	1	234	920
			Unsexed		1812		1812
			Total	2378	2188	504	5070
	2	5	Male	1429	280	602	2311
			Female	1963	35	670	2668
			Unsexed		1789		1789
			Total	3382	2104	1272	6768
	3	11	Male	2619	523	748	3890
			Female	3959	126	1400	5485
			Unsexed		5575		5575
			Total	6578	6224	2148	14950
	4	5	Male	2365	418	419	3202
			Female	1468	2	510	1980
			Unsexed		3139		3139
			Total	3833	3559	929	8321
	Total	27	Male	8106	1596	2039	11741
			Female	8075	164	2814	11053
			Unsexed		12315		12315
			Total	16181	14075	4853	35109

Tableau 2 : Numbers examined for weight, sex, carapace length and abdomen width.

Period		Quarter 1	Quarter 2	Total
Number of samples		1	2	3
	Nos : Male	91	117	206
	Female	54	120	174
	Total	145	237	384

Table 3 : Experimental cruise - Summer 1993

Net mesh	A = 45 mm	B = 60 - 65 mm		C = 15 - 20 mm	
Net used	A	A + C	3*A+1*C	A + B + C	Total
No of stations	13	2	4	10	29
No of hauls	13	4	16	30	63
Total weight caught (kgs)	Total weight sampled (kgs)		Number sampled	Number sampled	Number sampled
1920	237		6,689	12,477	19,166

## PORTUGAL (INCLUDING AZORES)

(M. Morais da Cunha)

Sampling Data for "Stock Dynamics, Interactions and Recruitment of North East Atlantic Squid Fisheries"

***Loligo forbesi***

Area	Season	No. of samples		No. of squid		
		Research vessels	Market samples	Measured	** Aged	* Racial Investigation
IXa	JAN-MAR	5	4	33	-	-
	APR-JUN	4	0	12	-	-
	JUL-SEP	1	0	1	-	-
	OCT-DEC	5	0	7	-	2

\* DNA sequencing will be done from current sampling at the University of Aberdeen.

\*\* Statoliths were collected from all specimens, but not yet processed.

***Loligo vulgaris***

Area	Season	No. of samples		No. of squid		
		Research vessels	Market samples	Measured	** Aged	* Racial Investigation
IXA	JAN-MAR	6	7	253	-	-
	APR-JUN	18	6	565	-	-
	JUL-SEP	6	4	104	-	-
	OCT-DEC	34	7	462	-	100

\* DNA sequencing will be done from current sampling at the University of Aberdeen.

\*\* Statoliths were collected from all specimens, but not yet processed.

**NORWAY - NORVEGE**  
(E.M. Nilssen)

Species	<i>Homarus gammarus</i>			<i>N. Norvegicus</i>
Stock/area	IVa	Kyrksaettera	IIIa	IIIa
Collecting landings ?	√			√
effort ?	√		√	
log books ?	√		√	√
length/age data	√			√
Tagging	Micro/branding			
migration				
mark-recapture	pilot scale			
Growth study	√			
Stock survey				
area	Kvitsøy/Øygarden			
season	Spring/Autumn			
method/gear	lobster pots			
Fecundity		√		
Maturity	√		√	
Condition factor		√		
Egg/Larvae study		√		
Juveniles	√, gear development	√		
Recruit index	√			
Stock-recruit data	√			
Recruitment process	√, genetic studies			
Gear efficiency	√, juveniles			
Gear selectivity	√, juveniles			√
Catchability	√, juveniles			
Behaviour	√, juveniles			
Seabed damage				
Pollution				
Energetics				
Fisheries assessment	√		√	
Harvesting Recommendations	√		√	
Experimental studies	√	√, egg, larvae, juv.		
Aquaculture/Enhancement			√	
Contact Name and Address	Gro 1. van der Meeren Austevoll Aquaculture Research Station N-5392 Sorebø Norway	Igebrigt Uglem PB 130 N7200 Kyrksaeterøra Norway	Stein Tveite Marine Research Station Flødevigen, N-4817 HIS, Norway	

Species	<i>Pandalus borealis</i>		
Stock/area	IIIa, IVa	I, IIa and b	XIV
Collecting Landings ?	√	√	√
effort ?	√	√	√
log books ?	√	√	√
length/age data	√	√	
Tagging			
migration			
mark-recapture			
Growth study	√	√	
Stock survey	√	√	
area	IIIa, IVa E	I, IIa, b	
season	October	May, June, Aug.	
method/gear	Tr. sur, VPA	Swept area trawl	
Fecundity			
Maturity	√	√	
Condition factor		√	
Egg/larvae study			
Juveniles	√		
Recruit index	√		
Stock-recruit data	√		
Recruitment process			
Gear efficiency		√	
Gear selectivity		√	
Catchability			
Behaviour			
Seabed damage			
Pollution			
Energetics			
Fisheries assessment	√	√	
Harvesting recommendations	√	√	
Experimental studies			
Aquaculture/Enhancement			
Contact Name and Address	Stein Tveite	Michaela Aschan	
Aquaculture/Enhancement	Marine Research Station	Norwegian Institute of Fisheries	
	Flødevigen	PO Box 677	
	N-4817 HIS, Norway	9001 Tromsø	

## RUSSIA - RUSSIE

(V. Shleinik)

Investigations on shrimp *Pandalus borealis*, Icelandic scallop *Chlamys islandica* and king crab *Paralithodes camtschatica* have been continued in the Barents Sea during 1993. Survey for shrimp was conducted in May-June, for king crab - in July-September and all the year round - for scallop.

Joint Russian-Norwegian estimates for shrimp stocks in the Barents Sea and adjacent waters indicated a reduction in this species biomass approximately by 25 % compared to 1991. When maximum of populational abundance was observed. Somewhat increase in the biomass was registered only in the extreme eastern and norther, parts of the area.

As a result of the investigations on Icelandic scallop new sites of its commercial aggregations were found in the south-east of the Barents Sea and ongoing depression of its stocks off the Bear Island-Spitsbergen was recorded.

Investigations on king crab confirmed a self-sustained population of this species to be in the Barents Sea. Places of juvenile aggregations, mature females, availability of two abundant year classes of the Barents Sea origin in length-age structure were noted.

## SPAIN - ESPAGNE (A.C. Farina)

### *Nephrops norvegicus*

The sampling programme of landings and collection of CPUE data for the fisheries of Galician (VIIIc and IXa North), Cantabrian Sea (VIIIc) and Porcupine Bank and close waters (VIIc, j, k) continued in 1993. Numbers of samples and measured are given in the table below.

A project to study the fisheries of spanish Suratlantic region (IXa) has been developed. Within the framework of the study two bottom trawl surveys were carried out in spring and autumn on these waters. Abundance indices, length distributions and selectivity parameters of *Nephrops* and shrimp (*Parapenaeus longirostris*) were obtained.

Annual bottom trawl survey to estimate recruitment indices of southern stock of hake have also give information on abundance, length distributions and sexratio of *Nephrops* in divisions VIIIc and IXa North.

Area	Season	Research vessel	Market samples	N° measured
VII	1		11	2 781
	2		13	3513
	3		11	3779
	4		12	3247
VIIIc	1		24	1 787
	2		21	1 910
	3	33	29	3443
	4	7	28	2721
IXa	1	34	8	2 215
	2	10	7	1 764
	3		7	2 336
	4		8	2 400

### *Carcinus maenas*, *Necora puber*, *Liocarcinus depurator* and *L. arcuatus*

Feeding studies were developed in relation to the influence of mussel raft culture in the Ria de Arousa, NW Spain. Population dynamics of *L. depurator* and *L. arcuatus* is being studied.

### *Maja squinado*

A general study on the fishery and biology of this species is being developed, paying attention to the reproductive cycle, breeding, incubation, maturity, feeding, growth, migrations, larval biology and data on the fishery.

### *Necora puber*

A project on the pot fishery of this species has been initiated, to assess the selectivity of different traps and interactions with octopus catches.

**SWEDEN - SUEDE**  
(H. Hallbäck)

***Homarus gammarus***

As the official landing statistic probably only consist of a small part of the total landings, catch and effort data were collected from special fishermen along the Swedish west coast. Leslie's method has been used on these data to estimate the trend in stock size over the years.

Preliminary results indicate that the stock size has increased in recent years.

A small area has been totally restricted for the commercial fishery during the last four years. To study this "local" stock test fishing, tagging and diving studies have been carried out. New regulations will be introduced during 1994.

***Nephrops norvegicus***

Size and sex distribution in catch and landings are collected from landing ports and landings and effort are obtained from log book data. LPUE has slightly increased in 1993 but the long term trend in LPUE is decreasing. Also the mean size in landings has a decreasing trend. About 859 tonnes were landed in 1993 which 123 tonnes were caught by creels and the rest with trawls. About 60 % of the catch weight is undersized and discarded so selection studies is carried on for sorting out undersized *Nephrops* through square meshes and rists during trawling.

A new fishing independent method for estimation of density and distribution of the *Nephrops* stock is investigated by using video recordings and acoustic sonar data for estimation of number of *Nephrops* burrows per area unit.

Behaviour studies of juvenile *Nephrops* in aquaria is carried out for explanation of recolonization of *Nephrops* to areas with previously oxygen deficiency (eg. SE Kattegat).

***Cancer pagurus***

Stocks and catches are still very good. Collection of catch data continues.

***Pandalus borealis***

Catch data and commercial sampling continued.

**UNITED KINGDOM - ROYAUME UNI**  
**Scotland - Ecosse**  
(N. Bailey)

***Nephrops norvegicus***

*Nephrops* remains the most important shellfish species in Scottish waters in terms of both landings and value. Landings in 1993 amounted to over 19 000 tonnes, a rise on the 1992 figure. The two major areas were the South Minch and the Fladen Ground. Table 1 illustrates that length compositions of the landings were sampled on a regular basis in most of the main areas and Table 2 gives the numbers sampled in each of the areas. A programme of discard sampling also continued in most areas with the exception of the Fladen Ground.

**Table 1** : Numbers of samples of *Nephrops* taken in 1993.

STOCK	ICES					
	IVa		IVb	VIa		
	FLADEN	M FIRTH	F FORTH	N MINCH	S MINCH	CLYDE
Landings Q1	1	6	9	2	24	9
sampled Q2	3	8	9	14	29	13
Q3	2	20	14	18	28	9
Q4	0	18	20	14	16	6
TOTAL sampled	6	52	52	48	97	37
DISCARD Q1	0	0	2	0	2	4
SAMPLE Q2	0	2	1	4	5	6
Q3	0	4	5	7	6	7
Q4	0	2	3	0	2	2
TOTAL sampled	0	8	11	11	15	19

**Table 2** : Numbers of *Nephrops* measured in 1993.

STOCK	ICES					
	IVa		IVb	VIa		
	FLADEN	M FIRTH	F FORTH	N MINCH	S MINCH	CLYDE
Landings Q1	534	2620	4258	1158	12879	4568
No meas. Q2	966	3549	4096	9738	14823	8616
Q3	987	10048	7859	7254	19092	5796
Q4	0	5967	6988	6762	8325	4427
TOTAL MEAS.	2487	22184	23201	24912	55119	23407
DISCARD Q1	0	0	348	0	405	381
SAMPLE Q2	0	413	204	347	795	191
Q3	0	834	1074	307	649	662
Q4	0	1178	388	0	411	156
TOTAL MEAS.	0	2425	2014	654	2260	1390

Assessments of the main stocks were made at the 1993 *Nephrops* WG and apart from the Fladen Ground stock, all appear to be at least fully exploited. Owing to the shortage of length compositions of catches from the Fladen Ground the assessment of this stock was based on the 1992 TV survey which indicated a substantial population.

In 1993, the TV survey was repeated (73 stations) and yielded similar results. It was also extended to include the Firth of Forth (37 stations) and the Moray Firth (31 stations). Results from these areas were of similar magnitude to the results from the analytical assessments. In the future it is hoped to use the independent survey result to "tune" the VPA approach.

Information on the catch rates pertaining in the creel fishery of the west coast continues to be monitored with the help of 14 observer fishermen.

The studentship which began in 1992 to investigate stock structure and characteristics in various fisheries around the Scottish coast continues. Interrogation of the extensive database has produced some interesting findings on the nature of the grounds on the east and west coasts and particularly on some notable features which distinguish the Clyde ground. The relationship of these with *Nephrops* population features is presently under study.

**Lobster (*homarus gammarus*), Edible crab and velvet crab (*Cancer pagurus* and *Necora puber*)**

During 1993, sampling length compositions in the landings took place in most of the major fisheries for lobster and crab species (Table 3). Landings of these species remain provisional at the present



time. Catches of edible crab have been somewhat low recently but it is not thought to be related to a reduction in stock, rather to some change in catchability. The monitoring of catch rates by the use of observer fishermen continues although the coverage has been reduced in the last year.

**Table 3** : Numbers of lobsters, edible crabs and velvet crabs measured in 1993.

STOCK	ICES							
	IV4			IVb	VIa			
	SHET	ORK	EAST	S EAST	HEB	ULL	S MINCH	CLY
Lobster	0	2663	2463	1214	434	321	603	260
Crab	1337	1749	2318	2594	3335	161	756	408
Velvet	0	771	241	0	1131	0	1902	304

### Brown shrimp

The development of a small fishery for Crangon in the Solway Firth, amounting to about 130 tonnes in 1993, led to limited sampling of the catch to obtain information on size and population structure - this is presently being analysed.

## UNITED KINGDOM - ROYAUME UNI England and Wales - Angleterre et Pays de Galles (R.C.A. Bannister)

Crustacean landings, effort and size composition data were collected at the main landing places by the Sea Fisheries inspectorate and by scientific staff. The number of animals measured is summarised by District in table 1. The major sampling efforts is devoted to edible crab, lobster and Nephrops.

**Table 1** : Number of crustacean measurements obtained in 1993 in England and Wales, by district.

District	Edible crab	Lobster	Spider Crab	Crawfish	<i>Nephrops</i>	Velvet crab
North East	260	1261	0	0	12379	0
Humberside	2260	12036	0	0	0	0
Eastern	9972	1547	0	0	0	0
South East	5039	4068	838	0	0	264
South West	3681	67	642	0	0	0
West	8293	2489	2651	1149	0	575
Wales	0	1369	0	0	0	0
North West	0	0	0	0	3822	0
Total	29505	22837	4131	1149	16201	839

### *Cancer pagurus*

Work this year concentrated on biological studies used to assess the possible impact of gravel extraction on stocks of edible crab. The distribution and abundance of crab larvae were investigated in that part of the North Sea between the English Coast and 4° E, and from 52°30'N, with particular emphasis on the southern part where new offshore fisheries have developed, and where sand and gravel extraction licences have been applied for. At one such site an intensive survey is assessing the spatial and temporal distribution of potential spawners using pot surveys, tagging and plankton sampling. A three year PhD study of the behaviour and physiology of ovigerous crabs has commenced in conjunction with Birmingham University. Sampling for size at maturity has been extended from the eastern Channel (Division VII d, e) to the Southern North Sea (Division IVc).

Crab fishing continues at a high level in the UK part of the eastern and western Channel, where most of the known areas of available stock are fully exploited. The east coast fishery continues to be poor, except in the Norfolk area.

### ***Homarus gammarus***

The long term study of abundance and size composition in the East Coast study area at Bridlington continues. Seven years of such data were used to investigate whether the catch rate of pre-recruits in the fishery could be used as a recruitment index. Results show that in this area pre-recruit catch rates provide a good prediction of recruit catch rates the following year.

Stock enhancement experiments at Bridlington, Aberystwyth, Ardtoe and Orkney continue to recapture hatchery-reared microtagged lobsters, providing information on movement, growth, and recapture rate. Most lobsters are recaptured near to their release sites. For Bridlington, the rate of recapture of microtagged lobsters during sampling at sea is low, but after adjustment for the capture efficiency of traps the results suggest that the survival rate from release at stage XII to recruitment at 4 to 6 years of age may be as high as 50-80 %. Collaborative work between the stock enhancement teams and Leicester University has allowed the quantity of the fluorescent pigment lipofuscin to be assessed in preserved brain tissue from microtagged lobsters of known age. Initial results suggest that the amount of lipofuscin is proportional to age, and may provide an important age determination tool. At Conway, laboratory studies continue into the behaviour of juvenile lobsters cohabiting in the aquarium.

In Poole Bay on the south coast a Southampton University contract team continues to study lobster colonisation and carrying capacity on an artificial reef, as well as the local movement of lobsters both from the reef and from adjacent fisheries. The team use conventional tagging techniques, but are also developing an electromagnetic tracking system.

In most coastal areas lobster fishermen have struggled over the last two or three years to maintain their catch rate of legal sized animals, but the 1993/94 season was notable for an increase in the number of undersized lobsters, suggesting a new pulse of recruitment.

### ***Nephrops norvegicus***

*Nephrops* work is largely confined to the collection and preparation of port based sampling data for the *Nephrops* Working Group, but a short term study of growth of the Farn Deep stocks has recently been completed and is being prepared for publication. A study of the pattern of discarding in the *Nephrops* fisheries is still in progress, but was hampered last year by operational difficulties. Landings and discards continue to be monitored in the Northern Ireland fishery (R. Briggs, pers. comm.).

### ***Maia squinado***

A study of aspects of the fishery and population biology of spider crab in Jersey (Channel Islands) was completed (C.G. Meyer, pers. comm.).

### ***Crangon crangon***

Monitoring of the east coast fishery in the Wash (Division IVc) was supported by a seasonal survey of size composition near the beaches (Dr R. James, pers. comm.). A study is also in progress into the application of the Lassen grid to reduce the whitefish by-catch in shrimp trawls (Humberside University).

### ***Palinurus elephas***

A twelve month to collect fishery and size at maturity data in Cornwall and South Wales (Divisions VII g and h) commenced in April 1993, as a prelude to recommending a minimum landing size.

## MOLLUSCA

### FRANCE (D. Latrouite)

#### **1- *Pecten maximus***

##### **1.1. Manche occidentale**

###### *1.1.1. Gisement de Saint-Brieuc*

La campagne de pêche 1992-1993 s'est traduite par une production de l'ordre de 4 700 tonnes, constituées essentiellement d'animaux de trois ans et plus.

La campagne d'évaluation directe réalisée en septembre 1993 confirme un maintien de l'abondance du stock pour la troisième année consécutive. Le stock repose sur trois classes d'âge (animaux de 2 à 4 ans). La faible croissance des coquilles fait que moins de 1 % des animaux de 2 ans et seulement 79 % des animaux de trois ans atteignent la taille réglementaire au moment de la prospection. Le recrutement des individus de deux ans est en diminution par rapport à l'année précédente (47 millions contre 68 millions). Par contre la biomasse des animaux de trois ans et plus, atteignait 11 000 tonnes contre 5 800 en 1992.

La production de la campagne de pêche 1993-1994, constituée essentiellement d'animaux de trois ans et plus, a atteint 5 300 tonnes.

Une tendance à la baisse est attendue au cours des prochaines campagnes en raison, d'une part de la baisse des effectifs des coquilles de 2 ans, mais aussi des coquilles de un an estimées à 57 millions en septembre 1993 contre 92 millions, 145 millions et 118 millions lors des trois années précédentes.

###### *1.1.2. Gisements sporadiques du golfe normand-breton*

Depuis deux ans, une exploitation s'est développée sur des gisements sporadiques dans le golfe normand-breton, se traduisant par des apports dépassant 1 500 tonnes au cours de la campagne 1993-1994.

##### **1.2. Manche orientale**

La campagne de pêche 1992-1993 a été marquée par l'abondance du stock de coquilles dans toute la Manche-Est, composé en grande majorité de coquilles du groupe 2 (76 % en Baie de Seine et 91 % à l'extérieur). La quasi absence de coquilles du groupe 1 (classe 1991) exigeait d'insister sur la préservation d'une partie du stock par le respect de la taille marchande de 11 cm afin de garder un reliquat pour la saison suivante. Pour mieux garantir ce reliquat et l'adéquation entre la nouvelle taille marchande et le maillage des dragues, IFREMER proposait d'augmenter ce maillage de 72 à 85 mm. Cette proposition a reçu l'aval de toute l'inter-profession mais n'a pu être mise en oeuvre à l'ouverture de la campagne faute de temps.

La campagne d'évaluation directe effectuée en 1993 en Manche-Est a confirmé la quasi absence de coquilles de la classe 1991. Ces coquilles âgées de 2 ans ne représentent que 28 % de la population échantillonnée en Baie de Seine et moins de 10 % à l'extérieur. La saison de pêche 1993-1994 reposera essentiellement sur l'exploitation des coquilles des groupes 3 et plus, reliquat de la saison de pêche 1992-1993, épargnées grâce au respect de la taille marchande de 11 cm.

Le pré-recrutement se situe à un niveau proche de la moyenne des dix dernières campagnes et ne pourra à lui seul assurer une bonne production lors de la saison 1994-1995.

Le maillage des engins à l'ouverture de la saison 1993-1994 sera de 85 mm pour tous les bateaux armés à la coquille en Manche-Est. La recommandation essentielle portera sur le strict respect de la taille marchande.

## **2. *Mytilus edulis***

Les moulières en eau profonde de l'Est Cotentin (secteur 7d) ont fait l'objet, comme chaque année depuis 1981, d'une prospection printanière par dragage. Un échantillonnage a été réalisé sur tous les gisements habituellement exploités : Barfleur, Moulard, Réville et Ravenoville.

Les observations effectuées au cours de cette prospection ont permis de mettre en évidence, sur l'ensemble des gisements, un stock de moules particulièrement abondant. Sur trois des quatre gisements, les rendements pondéraux par minute de traîne sont les plus élevés depuis 1981. L'abondance de moules de taille commercialisable issues des importantes fixations de 1991 a permis une exploitation intensive des gisements du 19 avril 1993 au 4 mars 1994. Une production particulièrement importante a été enregistrée en fin de saison : environ 30 000 tonnes.

La proportion de moules de taille inférieure à 40 mm, issue des fixations de 1992, est par contre peu importante. La saison de pêche 1994 sera donc, en partie, basée sur le reliquat laissé en fin de saison 1993.

## **3. *Spisula sp***

Les recrutements sont faibles ou nuls sur tous les gisements de Manche et Atlantique. En conséquence l'exploitation est très marginale.

## **4. *Tapes rhomboïdes***

L'exploitation dans le golfe normand breton reste faible en raison de difficultés commerciales, malgré un potentiel de capture réel.

## **5. *Glycymeris glycymeris***

L'exploitation se maintient à quelques milliers de tonnes sur les gisements de Manche-Iroise. Il est en deçà du potentiel biologique pour des raisons commerciales.

# **GERMANY - ALLEMAGNE** (T. Neudecker and U. Piatkowski)

## ***Mytilus edulis***

The heavy spatfall of *Mytilus edulis* from 1991 resulted in good catches of mussel seed for the fisheries. Heavy predation by birds decimated relaid mussels on culture plots especially in the East-Frisian Wadden Sea. This and reduced success of new recruitment resulted in reduced catches in 1993 (approx. 25000 t).

The "Ecosystem Research Wadden Sea" programme (University of Kiel and the National Park Administration) preliminarily finished its sampling activities in the Wadden Sea of Schleswig-Holstein in late 1993. Data have been collected from 1989 onwards. Location and boundaries of most intertidal and of some subtidal mussel beds have been mapped on a yearly basis. One subtidal and one intertidal bed have been sampled on a biweekly to monthly basis. These samples have been analyzed concerning length distribution, abundance and total biomass. Data on abundance, length distribution and length/weight relationships of mussels and cockles are available now which cover

representatively the remaining beds of the whole area in irregular intervals. Data on abundance and size distribution of bivalve larvae in the surface layer of three main tidal inlets have been recorded over a period of three years on a biweekly to monthly basis as well as abundance and size distribution of mussel larvae on natural and artificial substrates in more irregular intervals. Experiments with different types of spat collectors have been carried out. Measurements of condition index and maturity of mussels have been carried out on a monthly basis, covering a period of more than two years. The daily activity reports from fishermen are presently analyzed concerning landings, origin of spat, transported amounts of mussels from one location to another and culture success of the different culture lots.

Numbers of Eider ducks (*Somateria mollissima*) in the whole area and on the culture lots have been counted monthly from 1987 onwards, and the predation pressure of the ducks on the mussel stocks has been estimated.

### ***Spisula solida***

This fishery is practiced only during calm weather from March to October. For the year 1994 a closed season from May 1 to June 30 has been agreed upon. Large stocks of *Spisula solida* have been found in the German Bight. Exploitation has started on a low level due to difficulties caused by adverse weather conditions. The stocks seem to be approx 3-4 years old and have settled on areas cleared from other organisms e.g. by a series of gales. The total catch in 1993 : approx. 5000 t. (BFA f. Fischerei).

The location of some *Spisula solida* beds at the most western border of the Wadden Sea of Schleswig-Holstein has been determined in 1993. From one of these beds data on spawning season, unbiased length distribution, age distribution, growth, length/weight relationships based on fresh weight, dry weight and AFDW as well as information on by-catch species have been collected. The landings have been recorded and CPUE values have been estimated (University of Kiel).

### ***Cerastoderma edule***

Following the political ban of cockle fishery in Germany based on concerns of nature conservancy agencies the fisheries research board ceased from assessment work on cockle stocks (BFA f. Fischerei).

### ***Crassostrea gigas***

No research is being conducted at present as only company is relaying half grown seed using French poches and trestles (BFA f. Fischerei).

### **Bivalve larvae**

In collaboration with IFREMER in Arcachon, France, studies on the influence of turbulence and turbidity on growth and survival of laboratory-reared larvae have been continued and are being evaluated now (University of Kiel). A new collaboration with IFREMER in Arcachon to investigate the effects of hydrogen sulphide on bivalve larvae has begun (University of Bremen).

### **Cephalopods**

Investigations on distribution and abundance of cephalopods in the North Sea were continued. Data were obtained from by-catches fishery research cruises.

## ACTIVITIES CHECKLIST

Species	<i>Mytilus edulis</i>	<i>Spisula sp.</i>	<i>Cerastoderma edule</i>
Stock/area	North Sea	Coastal North Sea	German Wadden Sea
Collecting landings ?	Yes	Yes	-
effort ?	stable	stable	-
log books ?	-	-	-
length/age data	Yes	Yes	Yes
Tagging	-	-	-
migration	-	-	-
mark-recapture	-	-	-
Age determination	-	-	-
Growth study	Yes	Yes	Yes
Stock survey	Yes	Yes	Yes
area	German Wadden Sea	Coastal North Sea	German Wadden Sea
season	Yearround	Summer/Autumn	-
method/gear	dredging, collectors	Dredging, lobster pots	-
Fecundity	Yes	-	-
Maturity	Yes	Yes	-
Condition factor	Yes	Yes	-
Egg/Larvae study	Yes	-	-
Juveniles	Yes	Yes	-
Recruit index	Yes	Yes	-
Stock-recruit data	Yes	-	-
Recruitment process	Yes	-	-
Gear efficiency	Yes	-	-
Gear selectivity	Yes	-	-
Catchability	Yes	-	-
Behaviour	Yes	-	-
Seabed impact	Yes	-	-
Pollution	-	-	-
Energetics	-	-	-
Fisheries assessment	Yes	-	-
Harvesting recommendation	Yes	-	-
Experimental studies	Yes	-	-
Aquaculture/Enhancement	No	No	No
Contact Name and Address	M. Ruth, IFM Kiel 24105 Kiel R. Meixner, ISH Hamburg 22767 Hamburg	M. Ruth, IFM Kiel 24105 Kiel F. Buchholz, BAH 27483 Helgoland	M. Ruth, IFM Kiel 24105 Keil

## NETHERLANDS - PAYS-BAS (Renger Dijkema)

### Production trends

Production figures for season 1993-1994 (partly estimates) :  
(values in metric tons)

#### Molluscs

#### Mussels (*Mytilus edulis*)

Consumption mussels : ± 39,520 (provisional)  
Seed mussels : 37,200



Oysters ( <i>Ostrea edulis</i> )	± 250
( <i>Crassostrea gigas</i> )	± 2,000
Cockles ( <i>Cerastoderma edule</i> )	44,700
Cut trough shell ( <i>Spisula subtruncata</i> )	58,333
Whelks ( <i>Buccinum undatum</i> )	n.a.

After a period of 3 years with poor mussel and cockle spatfall, a good yearclass of mussel seed in 1991 provided sufficient prime material for the industry. However, mussel recruitment has been again in 1992 and 1993. Mussel production in 1993 was somewhat lower than in 1992. Recruitment of cockles, however, was satisfactory. Unknown quantities of whelks were landed as bycatch of flatfish trawlers.

The molluscan industry in 1993 had to deal with new national legislation, mainly aimed at protecting natural values in the coastal area. The two main production areas, the Wadden Sea and the Oosterschelde, had earlier been declared natural reserves. Additionally, in order to safeguard the undisturbed development of eelgrass fields, mussel and cockle banks, and also food supply for birds, a part of the intertidal fishing areas for mussel seed and cockles were closed, and a part of the cockle stock will have to be spared in years of low cockle availability for birds, mainly eiderducks (*Somateria mollissima*) and oystercatchers (*Haematopus ostralegus*). This has led to restrictions for the fishery for seed mussels and cockle fishing in the Wadden Sea. On basis of yearly stock assessments, fishing plans are made every year by the industry, which have to be agreed upon by government.

The existing monitoring programmes for bacteriological water quality and for the occurrence of (potentially) toxic phytoplankton and shellfish biotoxins in the coastal water were intensified, following new EC legislation. The number of production areas covered was increased, as was the sampling frequency.

#### New research activities

The Netherlands Institute for Fisheries Research is responsible for the new national monitoring programmes for bacteriological water quality, toxic phytoplankton and biotoxins. The program is financed by both the government and the shellfish industry.

A study of the relation between eutrophication of the Wadden Sea and growth and condition of mussels, was undertaken and will be completed in 1994. Landing statistics of mussels make valuable time-series possible of mussel condition and growth rate in a number of production areas since the 1950's. This decrease of the eutrophication in the coastal water.

#### Ongoing research programmes

Monitoring programmes for stocks of cockles and mussel seed are carried out yearly, to provide information on the amount of cockles and mussel seed available to the fishery and to wild birds.

Research into modelling of the ecosystems of the Wadden Sea, carried out by the Institute for Forestry and Nature Research (IBN-DLO), the Netherlands Institute for Sea Research (NIOZ) and the National Institute for Coastal and Marine Management (RIKZ) is continuing. Special attention is also paid to modelling of the role of bivalves: mussels and cockles as well as non-commercial species, as a food resource for birds.

### RUSSIA - RUSSIE

(V. Shleinik)

Investigations on shrimp *Pandalus borealis*, Icelandic scallop *Chlamys islandica* and king crab *Paralithodes camtschatica* have been continued in the Barents Sea during 1993. Survey for shrimp was conducted in May-June, for king crab - in July-September and all the year round - for scallop.

Joint Russian-Norwegian estimates for shrimp stocks in the Barents Sea and adjacent waters indicated a reduction in this species biomass approximately by 25 % compared to 1991. When maximum of populational abundance was observed. Somewhat increase in the biomass was registered only in the extreme eastern and norther, parts of the area.

As a result of the investigations on Icelandic scallop new sites of its commercial aggregations were found in the south-east of the Barents Sea and ongoing depression of its stocks off the Bear Island-Spitsbergen was recorded.

Investigations on king crab confirmed a self-sustained population of this species to be in the Barents Sea. Places of juvenile aggregations, mature females, availability of two abundant year classes of the Barents Sea origin in length-age structure were noted.

**SWEDEN - SUEDE**  
(H. Hallbäck)

***Mytilus edulis***

During the autumn 1993 the highest value in 1990th of diarrhetic shellfish poisoning was registrated in the *Mytilus* and landings were prohibited from large areas. Landings in 1993 were about 11 tonnes.

***Ostrea edulis***

The extent of diarrhetic shellfish poisoning analyse is much smaller for *Ostrea* than for *Mytilus* but in 1993 there was sign of DSP also in *Ostrea*. About 4 tonnes were landed in 1993.

**UNITED KINGDOM - ROYAUME-UNI**  
**Scotland - Ecosse**  
(N. Bailey)

**Scallops (*Pecten maximus* and *Chlamys opercularis*)**

The scallop *Pecten maximus* continued to be exploited around the Scottish coast with the fishery in the North Sea continuing to expand. Queen fisheries were largely confined to the Irish Sea with the small fishery in Shetland being severely curtailed by restrictions on fishing imposed following the "Braer" oil-spill.

Sampling of scallops continued throughout 1993 when 62483 scallops were aged and measured from 276 samples ; 18862 queen scallops from 86 samples were also measured.

Age structures in the landings were ostensibly similar to those in previous years with a relatively high proportion of older scallops which, in earlier assessments, resulted in low values of fishing mortality. Overall biomass was also low however, probably as a result of poor recruitment. Recent signs of improvements are coming into the fishery but full assessments were not repeated - it is hoped that new data from surveys and tagging experiments can be used to improve the analytical approach in the coming years.

The second of an annual series of scallop dredge surveys was carried out on the West Coast of Scotland in 1993. During the survey a total of 10930 minute hauls were made in 14 statistical rectangles. Catch rates varied from 0 to 925/hour. Comparison of catch rates with the 1992 survey indicated that the abundance of prerecruit and fishable sized scallops was higher in 1993 than in 1992. In areas subject to heavy commercial fishing catches consisted largely of four, five and six year old scallops while in areas where the exploitation rate was lower catches were largely composed of old scallops.



A similar scallop survey lasting 8 days was carried out in the Moray Firth area during May 1993. During the cruise 31 hauls covering 8 statistical rectangles were made. The catch rates ranged from 4 to 162/hour and showed a similar pattern in most rectangles with four, five and nine plus age group scallops predominant.

Mortality experiments set up in Loch Gairloch during 1992 were abandoned due to outside interference. A new natural mortality experiment on a more secure site was set up in October 1993. Eleven hundred scallops were tagged and released.

### **Cockles (*Cerastoderma edule*)**

Scottish landings in 1993 were reduced to 271 tons due to the Solway Firth fishery remaining closed to suction dredging. A suction dredge survey of this area was carried out in May 1993 on a charter vessel. A total of 248 stations were sampled. The survey indicated that stocks remained at a low level and that the high numbers "0" group cockles seen during the December 1992 survey had suffered significant mortality over the winter period.

Two shore based cockle surveys were carried out to estimate the abundance of cockles in other parts of Scotland. In the first, 381 stations were sampled covering potential cockle beds on the Islands of Barra, North and South Uist, and Benbecula. In the second survey in the Moray Firth area, 102 stations were sampled between Nairn and Findhorn. The Traigh Mhor beach on the Island of Barra was the only one of these areas with reasonably high cockle densities.

### **Squid**

A multinational EC project under the AIR programme commenced in 1993. This is coordinated by Aberdeen University and involves Scotland, Germany, France, Spain and Portugal (including the Azores). Scottish input concentrated, in 1993, on furnishing catch statistics disaggregated to statistical square level for use in determining population distributions and, in the future, attempting to make estimates of population size. Scottish research vessel survey data were also provided for gaining insight into population size structure.

The results of the previous project under the FAR programme are to be published shortly in a special volume of the Journal of Fisheries Research.

**UNITED KINGDOM - ROYAUME UNI**  
**England and Wales - Angleterre et Pays de Galles**  
(R.C.A. Bannister)

### ***Pecten maximus***

The distribution, abundance and size structure of scallops in the western Channel (Division VIIe) were surveyed by research vessel and charter vessel in mid summer.

Since 1988, fishing in the area has largely been maintained by the recruit size classes. Survey indices are being transformed to age group abundance using size-specific dredge efficiency data and growth curves based on microgrowth (striae) patterns. Comparative dredging trials show that research vessel catch rates are 71 % of those of commercial scallopers in this area. The causes of recruitment variation in *Pecten* are still not understood, but possible dispersal pathways for larvae in the western Channel continue to be studied using modelling techniques, and suggest that there could well be several sub stocks. In Lume Bay (Division VIIe) the Devon Wildlife Trust has proposed that certain priority reef areas should be closed to scalloping because they support epifauna of high ecological value. A three year contract to evaluate the sea bed impact of scallop dredges at an experimental site at the Isle of Man has been awarded to Liverpool University, and will be supervised by MAFF Conwy. Conwy is also making good progress with experiments to rear juvenile scallops in the hatchery.

Subsequent relaying and on-growing will be based on techniques being tested by the Sea Fish Industry Authority in West Scotland.

In the Irish Sea (Division VIIa) there is strong evidence from surveys and fishery sampling that stocks round the Isle of Man are overexploited (A Brand, pers. Comm.). The country Down stock continues to be surveyed regularly, and a log book scheme has been established (R. Briggs, pers. Comm.).

### ***Cerastoderma edule***

Annual stock surveys were carried out in the Wash and the Thames Estuary (Division IVc), and in the Burry Inlet in South Wales (Division VIIf). The 1993 spatfall was good but patchy in the Wash, moderate to poor in the Thames, and very good in the Burry Inlet. The fisheries continue to be heavily exploited and to pose management problems. This historical trend of recruitment in the Wash was analysed for the Yerseke recruitment workshop. The interdependence between cockle stocks, cockle fisheries and predation by wading birds, continues to be of concern to conservation groups, and field studies are either in progress (J. Goss Custard, pers. comm.) or are planned (K. Norris, pers. comm.).

### ***Ostrea edulis***

The annual survey of the Solent oyster stock was carried out. Small fluctuations in pre-recruits and in spawning stock continue to occur, and analysis of data back to 1976 suggests that there is some evidence of positive density dependence in the historical time-space pattern. Spatfall is being monitored using specially laid *Pecten* shell which are attractive to oyster spat. The resulting index has varied by a factor of five since 1989.

### ***Mytilus edulis***

Surveys of mussel stocks have been suspended because of lack of resources. Spatfall continues to be poor in the Wash (Division IVa), but has improved in north west England (Division VIIa).



