Living Resources Committee **ICES CM 2000/G:04**
Ref: ACFM, ACME

REPORT OF THE

WORKING GROUP ON CEPHALOPOD FISHERIES AND LIFE HISTORY

Aberdeen, Scotland
7–11 February 2000

International Council for the Exploration of the Sea

Conseil International pour l'Exploration de la Mer

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1 INTRODUCTION

1.1 Terms of Reference

ICES Council Resolution C.Res.1999/2G04 stated that The **Working Group on Cephalopod Fisheries and Life History** [WGCEPH] (Chair: Dr G. Pierce, UK) would meet at the University of Aberdeen, UK from 7–11February 2000 to:

1. Update currently available landing statistics and information on fishing effort and discards; explore existing resource survey databases for specific information about sampled cephalopods in the ICES area;

2. Continue the compilation of methods and results available for stock identification and estimation of population size of fished cephalopods; review possible precautionary approaches to the management of these cephalopod resources;

3. Review the results of national and transnational projects collecting data on fished cephalopods, especially those projects studying relationships between abundance and environmental conditions, factors affecting recruitment, migration and distribution patterns of juveniles and adults, and trophic interactions; to review research priorities in relation to data requirements for fishery assessment and management;

4. Continue development of a bibliographic database of cephalopod literature relevant to fisheries, including grey literature.

Terms of Reference 1) and 2) are set up to provide ACFM with the information required to respond to requests for advice/information from NEAFC and EC DGXIV. WGCEPH will report to ACFM and ACME before their meetings in May/June 2000 and to the Living Resources Committee at the 2000 Annual Science Conference.

Justification: Cephalopods support important fisheries in the ICES area. However, they remain outside the scope of the European Community's Common Fisheries Policy and understanding of stock dynamics, particularly in European coastal waters, remains poor. Official statistics on cephalopod fisheries are generally of low quality but are currently supplemented by data collected under various research projects. New data and information on the state-of-the-art in cephalopod fishery assessment and management need to be updated and reviewed annually.

1.2 Attendance

The WGCEPH meeting in Aberdeen, February 2000, was attended by 12 of the currently appointed WGCEPH members (names are marked with an *) and 17 observers (mainly participants† in the current *FAIR CT 1520* project on cephalopods which held its Annual Co-ordination Meeting immediately preceding this meeting).

Dr David Agnew	UK	Dr Joanne Murphy†	UK
Nick Bailey*†	UK	Marianne Nyegaard	UK
Prof Peter Boyle*†	UK	João Pereira*†	Portuga
Manuela Morais da Cunha*†	Portugal	Dr Uwe Piatkowski*	Germar
Dr Heather Daly†	UK	Dr Graham Pierce (Chairman)* †	UK
Vincent Denis†	France	Julio Portela*†	Spain
Eileen Dillane†	Ireland	Dr Jean-Paul Robin*†	France
Dr Angel González	Spain	Dr Paul Rodhouse*†	UK
Dr Joaquin Gracía	Spain	Marina Santurtún	Spain
Dr Angel Guerra	Spain	Dr Paul Shaw†	UK
Dr Emma Hatfield	UK	Dr Ignacio Sobrino*	Spain
Dr Lee Hastie†	UK	Gabrielle Stowasser	UK
Dr Drosos Koutsoubas†	Greece	Claire Waluda†	UK
Colm Lordan*	Ireland	Dr Jianjun Wang†	UK
Ana Moreno*	Portugal		

These participants represented 6 ICES member states (France, Germany, Ireland, Portugal, Spain, UK) and one organisation with Observer Status (IMBC, Greece). A full list of participants including contact addresses is given in Annex 1. The names of appointed members to WGCEPH are provided in Annex 2.

The following members notified the Working Group that they were unable to attend: Herman Bjørke (Norway), Teresa Borges (Portugal), Sophie des Clers (UK), Martin Collins (UK), Eilif Gaard (Denmark), Lisa Hendrickson (USA), Begoña Santos (UK), Mike Vecchione (USA)

1.3 Opening of the Meeting

The meeting took place in the Senior Common Room of the University of Aberdeen, Aberdeen from 7-11 February 2000. The agenda of the meeting is given in Annex 3. The 1999 WGCEPH report was formally adopted and the terms of reference for 2000 were reviewed. Emma Hatfield (UK) was appointed rapporteur for the meeting.

1.4 Arrangements for the Preparation of the Report

The Chairman reminded participants that the WGCEPH will report to ACFM and ACME before their meetings in May/June 2000. In view of the early date of the WGCEPH meeting and unavailability of some landings statistics at the time of the meeting it was agreed that some parts of the report would be completed after the meeting (not later than 31 March).

Prior to the meeting, responsibility for preparation and collation of material for the tor, as well as for presentation of the material to the meeting, was delegated to the following members and observers: Uwe Piatkowski (Germany) (a), David Agnew (UK) and Heather Daly (UK) (c), and Begoña Santos (UK) (d). The Chairman agreed to compile material for term of reference (c).

It was agreed that amended text, updated during and following the meeting, would be submitted electronically to the Chairman, who undertook to write and circulate a final draft to members and attendees prior to the review process.

2 CEPHALOPOD LANDING STATISTICS (TOR A)

2.1 Compilation of Landing Statistics

The present report updates landing statistics from 1993 to 1998 and gives preliminary catch data of 1999 for cephalopod groups caught in the ICES area (Tables 1 to 6). The data largely originate from the ICES STATLANT database and from additional national and more precise information supplied by Working Group members. It should be noted that several ICES member countries/regions could yet not supply information for 1999 (i.e., Belgium, Channel Islands, Denmark, France, Isle of Man, and Sweden). In these cases the 1998 catch was taken as a best estimate and listed in the tables as a provisional value for 1999. It is hoped to improve these numbers in the next year's report. In general, we feel that all 1999 data should be considered as preliminary. Discards are covered in section 4.

The data compiled in this report is the most precise information on cephalopod landings within the ICES area that can be obtained. For all major fishery nations (i.e., France, Portugal, Spain, UK) we relied on the statistical information provided by the Working Group members. This information is – as in previous years – not necessarily identical to the data officially reported to the ICES *ATATLANT* fisheries databank This latter information may be consulted at: *http://www.ices.dk/fish/fish.htm*. This discrepancy is particularly obvious for Spain and UK and stresses the inaccuracy with which cephalopod statistics are still handled. (Note: UK data were extracted directly from national databases held at CEFAS and FRS).

Tables 2.1 to 2.4 give information on annual catch statistics (1992-1998) per cephalopod group in each ICES division or sub-area, separately for each nation. The cephalopod groups listed in the tables comprise the following species:

- Table 1. Cuttlefish (Sepiidae). The majority of landings summarised in this table are catches of *Sepia officinalis*, the common cuttlefish, plus small amounts of *S. elegans* and *S. orbignyana*. WGCEPH considers that no bobtail squids (Sepiolidae) occur in the reported catches.

- Table 2. Common squid (including the long-finned squids *Loligo forbesi*, *L. vulgaris, Alloteuthis subulata* and *A. media*). The majority of common squid landings are *L. forbesi* and *L. vulgaris*.

- Table 3. Short-finned squid (*Illex coindetii* and *Todaropsis eblanae*), European Flying squid (*Todarodes sagittatus*), and Neon Flying squid (*Ommastrephes bartrami*).

- Table 4. Octopods (including *Eledone cirrhosa*, *E. moschata* and *Octopus vulgaris*).

A compilation separated into single species is still not possible as all countries report landings for cephalopod groups, mostly in the format as given in the tables.

Table 5 summarises total annual cephalopod landings in the whole ICES area for major cephalopod groups. Table 6 provides information of total annual cephalopod landings in the whole ICES area for major cephalopod groups separated for each fishing nation.

2.2 General Trends

Total reported annual cephalopod landings within the ICES region varied between 39 782 t and 51 505 t during the reported period of 1993 to 1999 (Table 5). Data for 1999 are still provisional, but indicate that the total catch of approximately 42 833 t is in the range of the previous years.

In terms of yields cuttlefish are the most important cephalopods taken in the ICES area. Their landings increased remarkably from 1994 to 1995 (14 744 t and 19 601 t, respectively), mostly due to an increase of catches in the English Channel taken by France and UK. Total landings of common squid decreased slightly since 1997, and catches of short-finned squid decreased tremendously since 1997 after a remarkable increase from 1995 to 1997 (see Tables 2.5 and 2.6). After a considerable decrease from 1996 to 1998, octopod catches seemed to increase again in 1999.

In terms of total cephalopod landings, the most important nations in 1999 were France (17 784 t), Portugal (11 041 t) and Spain (8 730 t) which together took 88% of the total reported cephalopod catch in the ICES region during that year. England, Wales, Northern Ireland and Scotland took another 10% (4 309 t). All other nations reported less than 2% (1 000 t) of the total cephalopod catch in the ICES region in 1999. These percentages have been quite constant during recent years. The major fishing nations, in geographical order from north to south, are briefly reviewed in the following paragraphs:

In Norway only the European Flying squid (*T. sagittatus*) is landed. After its total absence in the early 1990s it appeared again in the fishery statistics in 1995 with a total of 352 t which were caught in autumn. The possible "return" of *T. sagittatus* into North European waters could not be confirmed, because in 1996 only sporadic catches were reported. Landings increased again in 1997 with a total of 192 t, but in 1998 dropped again to only 2 t. In 1999 the species was again caught only sporadically. Thus the status of this species in European waters remains unclear.

In the Faroe Islands region (ICES Division Vb) the common squid *L. forbesi* occurs on the Faroe Bank just southwest of the Faroe shelf. During 1997 and 1998 research has been undertaken to evaluate a possible fishery. There were several research cruises in 1997 and 1998 using bottom trawls. Their catches were quite significant (5.4 and 26 t, respectively) and were sold ashore which indicates a market for that species. This is reflected in the increase of commercial catches in 1998 and 1999, when 38 t and 29 t were caught, respectively (see Tables 2.2 and 2.6).

Landings of cephalopods by UK vessels in Scotland have increased substantially from 1995 onwards, particularly for common squid (Tables 2.2 and 2.6). In 1999 the fishery yielded 1 198 t and made Scotland the second most important fishery nation for common squid within the ICES region. The increase is mostly due to increasing catches in the northern North Sea (ICES Division IVa).

In Ireland cephalopods are an important component of several fisheries. Common squid *Loligo forbesi* are a valuable seasonal by-catch of the otter trawler fleet. Indeed *L. forbesi* are targeted in certain areas when abundant. The two most important of these targeted fisheries are north of Greencastle, Co. Donegal (ICES Sub-area VIa) during October and November and in Dingle Bay (VIIj) between October-November. Catches from both of these directed fisheries were considered disappointing by the fishing industry during 1999. In addition, there is some artisanal jig fishing for *L. forbesi* in Donegal Bay during the late summer, although this fishery did not develop in 1999. Provisional landings data suggest that *L. forbesi* landings during 1999 were down considerably on previous years. Short-finned squid (*I. coindetii*, *T. eblanae*) and European Flying squid (*T. sagittatus*) are by-caught in deeper water otter trawl fisheries targeting monkfish, megrim and hake along the western Irish continental shelf. Highest catches are between December and May. Provisional landings during 1999 were below those recorded in recent years. The bulk of these landings in 1999 were from Irish-Spanish flag vessels. The decommissioning in 1998 of an Irish vessel which had targeted squid for the past 3 years is partly responsible for the reduction in the 1999 catch. The current renewal of the Irish white fish fleet is likely

to result in an increased targeting of this fishery. Over the past eight years Ireland has developed a valuable drift net tuna fishery southwest of Ireland. This fishery is currently being phased out due to EC regulations and is due to stop by 2002. The Neon Flying squid (*O. bartrami*) was an important by-catch (38 t in 1999) and, increasingly, Irish vessels in this fishery are landing them. The octopod *E. cirrhosa* is by-caught by both the otter trawl fleet and the beam trawl fleet. *E. cirrhosa* are normally discarded, although occasionally the beam trawl fleet lands them. Landings in 1999 were negligible at just over 2 t. Cephalopods were routinely identified and measured during all Marine Institute IBTS ground-fish surveys for the first time during 1999. This information is expected to become an important fishery independent data set in future years.

Cephalopod landings reported by England, Wales and Northern Ireland mostly originate from the English Channel (ICES Divisions VIId,e) and the Celtic Sea (ICES Divisions VIIg-k) where an intense fishery takes place. As in previous years, the most important cephalopod group in 1999 was cuttlefish with 2204 t. The total catch of common squid was 836 t. Yields of common squid, however, decreased significantly in 1998 after relatively high catches from 1993 to 1997 (ca. 2000 t each year). Nevertheless, during the last decade England, Wales and Northern Ireland have developed to become the most important cephalopod fishery nation after France, Portugal and Spain (see Table 6).

France remains by far the most important fishing nation concerning cuttlefish (*S. officinalis*) and common squid (*Loligo* spp.) with ca. 13097 t cuttlefish and ca. 4320 t common squid (provisional data) in 1999. Major fishing grounds are the English Channel (ICES Divisions VIId,e) and the Bay of Biscay (ICES Sub-area VIII). From 1993 to 1998 catches varied from 10247 to 13097 t of cuttlefish and from 4320 to 6332 t of common squid (see Table 6). French data for landings have improved recently, with a higher proportion of landings being categorised by ICES rectangle rather than by division.

There were significant changes in the cephalopod landings reported by Spain during the last few years. Reported catches of common and short-finned squid have dropped remarkably since 1997 (Table 6) with common squid decreasing from 2 253 t in 1997 to 642 t in 1999 and short-finned squid decreasing from 5 185 t in 1997 to 1371 t in 1999 (Table 6). However, Spain remains the main fishery nation for short-finned squid in Europe. Octopods (5 218 t), cuttlefish (1 509 t) and short-finned squid (1371 t) were the most important cephalopods resources for the Spanish fishing fleet in 1999 which is concentrated in ICES Sub-areas VIII and IX. A detailed WG document describing the important octopus fishery in the Spanish waters of the Gulf of Cádiz was provided in the 1998 report of WGCEPH. It was estimated that around 50% of octopus landings and more than 50% of common squid landings from artisanal fisheries in Galicia (NW Spain) did not enter official figures. Increasing efforts have been made in recent years to improve data for official landings of cephalopods by the Spanish and Basque fleets landed at Basque Country ports. There it forms an important by-catch in the hake and megrim fisheries, with cuttlefish and common squid occurring mostly in the winter season and short-finned squid during summer. The trawlers from the Basque Country land cephalopods mainly from the Bay of Biscay, as well as the Celtic Sea, Porcupine Bank, western part of Helidor Island and around Rockall Bank. Smaller vessels fish predominantly in the eastern Cantabrian Sea. A detailed Working Paper in the 1999 report of WGCEPH describes the Basque Country fishery and includes landings from 1994 to 1998.

Portugal regularly provides detailed catch statistics of all major cephalopod groups to ICES. All groups form important fishery resources making Portugal the second most important cephalopod fishery nation within the ICES area and the most important one in ICES Sub-area IX. Octopus catches (*O. vulgaris* and *E. cirrhosa*), which decreased from 1996 to 1998 in ICES Sub-area IX from 11 523 t (1996) to 8 680 t (1997) and to 6 350 t (1998), significantly increased again in 1999 to 9 025 t (Tables 2.4; 2.6). In 1996, octopus was the most important economically valuable cephalopod – and was even more important than sardines. It occurs along the whole of the coast, at shallower depths than squid. After a peak of 1 723 t in 1998, cuttlefish landings dropped considerably in 1999 in Sub-area IX with 1 157 t of reported catches. A dramatic decrease of common squid (*L. vulgaris*) catches was observed from 1998 to 1999 (1 011 and 327 t, respectively), and there has been a general downward trend since 1980. The reported catch of short-finned squid remained relatively constant in recent years. A comprehensive review of the Portuguese cephalopod fisheries and their trends was provided as a WG document and is compiled in Annex 5 of the group's 1998 report. It is noteworthy that in the Azores (ICES Sub-area X) the landings of *L. forbesi*, which is subject of an artisanal fishery in the region, dropped considerably from 303 t in 1997 to 98 t in 1998 and to only 45 t in 1999.

2.3 Conclusions

During recent years there have been considerable improvements in compiling cephalopod landing statistics, notably in the data supplied by France, Portugal and Spain. Difficulties still remain in several aspects of data collection. Where cephalopod data are recorded there is frequently uncertainty about the species composition. The extent of this problem varies from country to country, with some making no distinctions, some distinguishing between major groups such as cuttlefish, squid, octopus, and some providing details on individual species. As long as cephalopod species are not

regarded as quota species this situation is unlikely to change. There is presently little regulation of cephalopod exploitation, although minimum landing sizes are specified in some fisheries.

Efforts to improve catch statistics for cephalopods should be continued. A minimum requirement for assessing fishery resources is accurate monitoring of fishery removals. An additional requirement for assessing cephalopod resources may be greater spatiotemporal resolution in fishery statistics. By nature of their short lifespans and sensitivity to their environment, cephalopod stocks generally have wide seasonal variation in recruitment, reproduction and fishery production. Reporting landings by quarter or month (as available for the UK and France) and by smaller geographic units will facilitate more accurate population modelling. Such resolution may not be possible with current data collections systems in every country.

Landings are used here to index stock size. However, patterns in landings may be a poor representation of stock size if there are substantial changes in fishing effort. Therefore, in future it would be useful to compile and report nominal effort statistics where available to help interpret patterns in landings.

3 REVIEW OF RESULTS OF NATIONAL AND TRANSNATIONAL PROJECTS (TOR B).

3.1 Introduction

During 7-9 February presentations were given on behalf of the FAIR cephalopod project. During the business part of the WGCEPH meeting (10-11 February), further presentations on current projects, including summaries of some of the FAIR project material, were given by Joaquin Gracía, Emma Hatfield, Colm Lordan, João Pereira, Uwe Piatkowski, Graham Pierce, Jean-Paul Robin, Marina Santurtún and Paul Shaw.

3.2 Data collection in the Basque country cephalopod fishery (Marina Santurtún)

Marina Santurtún presented an overview of Basque cephalopod fisheries, 1994 - 1999. Further details appear in **Annexe 5**. Cephalopods are mainly a by-catch of the demersal fishery for hake, megrim and anglerfish. Four cephalopod groups are landed: longfin squid (*L. vulgaris, L. forbesi, Alloteuthis* sp.), shortfin squid (*T. sagittatus, T. eblanae, I. coindetii*), cuttlefish and octopus. The fishery is prosecuted in ICES sub-areas VI & VII and divisions VIIIa, b & d, and VIIIc. Many gear types used, including trawls, purse seines, traps, pots, and hooks. Landings and effort data were collected monthly by area and gear; the data almost certainly underestimate the true cephalopod catch. 1999 was a year of high catches. Around 75% of cephalopod catches for the Basque country are from the Bay of Biscay. This area also has the highest concentration of trawl fishing. In the Bay of Biscay, longfin squid are caught mainly in winter, although in sub-area VII catches are highest in spring and are less variable. Cuttlefish are mostly caught in the Bay of Biscay in winter. Sub-area VII most important for octopus catches. Future work will include dividing the cephalopod catch accurately by species name and determining the proportion of each species in catches. These proportions will then be used to split historical catches by species to study trends in catches.

3.3 The biology of *Gonatus fabricii* and its importance in the Nordic Seas ecosystems

Work by Herman Bjørke (Norway) on *Gonatus fabricii* was presented by Uwe Piatkowski. The major aims of this work are to study the biology of *G. fabricii* and assess its importance in the Nordic Seas ecosystems. This is part of a regional GLOBEC program called Mare Cognitum. Two articles about *G. fabricii* biology appear in the journal *Polar Biology*, an article about its predators in its deepwater habitat is in press, and an article about its food is under preparation. At present work is focussing on the stomach content of specimens caught in deep waters**.**

3.4 Data Collection for Assessment of Cephalopod Fisheries (CephAssess)

João Pereira (Portugal) summarised the objectives of a recently started EC DGXIV-funded Study Project (99/063) on *Data Collection for Assessment of Cephalopod Fisheries (CephAssess)*. This project runs from January 2000 until December 2001 and involves participants from IPIMAR (Lisbon, Aveiro & Olhão, Portugal), University of Aberdeen (UK), University of Caen (France), Instituto de Investigaciones Marinas (Vigo, Spain), Instituto Español de Oceanografía (Vigo, Spain) and Institute of Marine Biology Crete (Greece). The project objectives are:

- To collect basic fishery and biological data on cephalopod stocks not previously assessed.

- To collect data on previously studied cephalopod stocks to extend time-series of assessments for those stocks for which depletion methods have been shown to be appropriate; to determine stock trends and allow between-year and between-area comparisons.

- To conduct interview surveys at fishing ports with fishermen and to conduct a limited number of onboard observation trips at appropriate locations for (a) estimation of unreported catch and effort and (b) basic economic description on the studied fisheries

- To collect data for improved estimates of natural mortality.

- To estimate the amounts and condition of cephalopods discarded in the studied fisheries, particularly in countries with landing regulations.

- To evaluate alternative assessment methods (depletion methods, production models, etc).

- To maintain previous and newly acquired data to ensure the continued use of a widely employed database thus improving future availability.

- To create regional committees to exchange information between the study participants, the administration and fisheries representatives.

3.5 German studies on North Sea cephalopods

Uwe Piatkowski presented results from German studies on North Sea cephalopods. German catches of cephalopods are from the North Sea (ICES sub-areas IVb. and IVc). In 1999, catches were about 5t, mostly *L. forbesi*. Much research is carried out in Kiel on cephalopod ecology, from data and specimens gleaned from research surveys of the North Sea (German bottom trawl cruises in January and July each year, Danish cruises in January and February each year, both using the same type of net). In 1999 cruises, 7 squid species and 1 octopus species were caught; *A. subulata* was the most abundant cephalopod caught. The results show inter-annual variability, e.g. in a comparison of data from Jan/Feb 1998 and Jan/Feb 1999, *T. sagittatus* was abundant in 1998 but not in 1999. Length/frequency data are compiled each year for each species along with other biological data, e.g., length/weight relationships, sex, maturity. Lower rostral lengths are also measured to obtain ML vs. LRL relationships to aid in predator studies.

3.6 Species composition and distribution of oceanic cephalopods in the area of the Great Meteor Bank and near Bermuda, North Atlantic

Uwe Piatkowski also mentioned new work on "Species composition and distribution of oceanic cephalopods in the area of the Great Meteor Bank and near Bermuda, North Atlantic", funded by the German Research Council (Deutsche Forschungsgemeinschaft, DFG). A brief summary follows: The project will make a first inventory of the cephalopod fauna living on and at the Great Meteor Bank. It will describe the cephalopod species composition and the fine- and meso-scale distribution patterns of this crucial seamount fauna group which is known to form a dominant oceanic nekton component. Cephalopods were sampled during a recent research cruise (M42/3) of RV Meteor to the Great Meteor Bank in 1998. This expedition was based on interdisciplinary oceanographic and biological research at the Great Meteor Bank and its adjacent waters. The overall intention of the project is the description and the modelling of the ecosystem at the Bank and the areas surrounding the Bank, in which nekton such as cephalopods and macrozooplankton are key components. It will improve our understanding of seamount ecosystems in general and the Great Meteor Bank system in particular.

The distribution patterns of cephalopod taxa will be correlated to biological and physical parameters to describe the ecosystem structure and its interrelationships with major oceanographic features at the Bank. By describing the various developmental stages of selected cephalopod species the project will further provide new information on cephalopod ontogeny and life cycles. Investigations are based on nekton and macrozooplankton samples which were collected during the Meteor-Expedition M42/3 to the Great Meteor Bank (August-September 1998). All samples were taken with a modified MOCNESS (BIOMOC) to determine horizontal distribution as well as vertical distribution patterns of target groups. After identification of all cephalopods and the description of abundant species, their distribution patterns will be documented in detail in relation to area, depth, hydrography and daytime. The significance of seamounts for the appearance and ecology of cephalopods (e.g. recruitment of ommastrephid squid such as *T. sagittatus* and *O. bartrami*) will be discussed with the results of other working groups engaged in the project. Data will further be compared and discussed with earlier work performed in the eastern central Atlantic Ocean

The first results of the species composition of early life cephalopods sampled by the MOCNESS at the Great Meteor Bank reveal a typical oceanic teuthofauna. Several hundred specimens belonging to at least 31 species of 17 families have been identified so far. Two families (Onychoteuthidae, Enoploteuthidae) are dominating. The most abundant family with a share of ca. 23% are the Onychoteuthidae. They consist of two genera (*Onychoteuthis*, *Onykia*), with the cosmopolitan species *Onychoteuthis banksi* being most abundant (95%). The Enoploteuthidae, a typical mesopelagic group is second in abundance (21%), occurring with at least three different genera. Description of the small-scale distribution (horizontal and vertical distribution on the plateau and the adjacent deep water) is in progress and indicates a pronounced diurnal vertical migration pattern. Another 291 cephalopods (subadults and adults) which have been caught with a pelagic Youngfish-Trawl have further been examined in detail. Again, a clear diurnal vertical migration can be recognised as more than 92% of all specimens occur in night and twilight samples. 21 species belonging to 15 families have been identified with the genus *Abraliopsis* (Enoploteuthidae) being the most abundant cephalopod. In comparison with a cephalopod collection sampled during a former expedition to the Bermuda region in 1993 the project will give a major contribution to the study of sub-tropical cephalopods in various parts of the Atlantic Ocean. The project forms part of the Meteor priority program of DFG and will contribute to the goals of international projects such as GLOBEC and BIODIVERSITAS.

3.7 General trends in cephalopod landings in Irish fisheries

Colm Lordan summarised general trends in cephalopod landings in Irish fisheries. In Ireland, cephalopods are a by-catch; *L. forbesi* is the most important by-catch species and is occasionally targeted. In 1999, landings were very low - the provisional figure is 243 t (although this is likely to be adjusted). Ommastrephid squid, *I. coindetii*, *T. eblanae* and *T. sagittatus*, are caught on the western shelf. Landings of these species in 1999 were also down, with a combined catch of 286 t. The decrease is partly because one major fishing boat was decommissioned in 1998 as the skipper was buying a new boat. In the last 10 years a drift net fishery for albacore has developed which catches *O. bartrami* - 38 t landed in 1999.

3.8 Development of Software to estimate unreported and misreported catch and effort data and to apply fishery management models

Joaquin Gracía presented an overview of the recently completed project "Development of Software to estimate unreported and misreported catch and effort data and to apply fishery management models" (Study Project 97/0107). This project developed new software, CELTA, to estimate unreported and misreported catch and effort data. In many fisheries, e.g. in Spain, official statistics are poor and this project addressed the question of how to improve data quality. The aims were to (a) develop software to calculate reliable catch and CPUE estimates based on an interview model and (b) estimate annual catches and effort for seven target species: three fish (hake, megrim, monkfish) and four cephalopods (*Loligo, Illex, Sepia, Octopus*) fished in ICES Sub-areas VI, VII & VIII. The software is based on the Gomez-Muñoz model (Gomez-Muñoz, 1990; Simón *et al.*, 1995).

The exercise has been performed so far from Scotland and Galicia - it could be extended to all regions or countries. The Galician fishery is the most complicated situation of all European fisheries. In Galicia, 82 ports were visited. Of these, 55 ports have fish markets and 53 sell all the target species. From these, 36 ports were selected for the study. The ports were categorised based on the fishing grounds and gear used. The port with the highest fishing power for each species, ground and gear type is denoted the mother port and given a value of 1. The other ports are then compared to the mother port and assigned a relative measure of importance. Monthly landings data were obtained for 1997 and 1998. Sale invoices were collected for the eight most important ports for landings of the target species and 508 interviews were conducted across Galicia. A minimum sample size of 30 interviews per port/gear/species is required. The data from the invoices were very different to the official data and from each port's landing data.

Cuttlefish was the first of the target species to be modelled, since the vessels are all similar and thus easier to quantify. In a comparison of inshore versus coastal gillnet boats, only the maximum catches were different. For each vessel from each port the CPUE per trip was calculated, ports were ranked and catches extrapolated from those of the mother port. The modelled total catch thus obtained for Galicia for 1997 was 689 t for the inshore cuttlefish gillnet fishery and 253 t for the coastal fishery. The total modelled catch was 943 t as opposed to 790 t from fishery market statistics. For trawl and gillnet gears, total catch was estimated at about 3,000 t, whereas 1900 t was reported. Work is ongoing to calculate confidence limits for these estimates.

3.9 Cephalopod Resources Dynamics: Patterns in Environmental and Genetic Variation

Graham Pierce introduced a group of presentations about FAIR CT 1520, Cephalopod Resources Dynamics: Patterns in Environmental and Genetic Variation. Presentations were given by Graham Pierce, João Pereira, Jean-Paul Robin and Paul Shaw. Specific objectives of the FAIR project were:

1. To develop a GIS system for cephalopod fisheries in European waters and to integrate fishery, survey, and environmental data at appropriate temporal and spatial scales.

2. To refine the quantitative description of seasonal and inter-annual patterns of distribution and abundance of fished cephalopods and to develop models to predict their abundance from biotic and physical oceanographic parameters.

3. To use microsatellite DNA variation as an indicator of stock structure and interactions of neritic and oceanic cephalopod resources through the use of DNA marker "tags", supplemented with allozyme and mitochondrial DNA (mtDNA) studies.

4. To integrate the new environmental and genetic approaches with recent findings on biological variability in the European cephalopod populations of the north east Atlantic and Mediterranean, to evaluate whether this variation is due to plasticity of responses to environmental conditions or due to underlying genetic variation.

3.9.1 Interannual variation in *L. forbesi* abundance in Scottish waters

Graham Pierce described work on interannual variation in *L. forbesi* abundance in Scottish waters: This work examined the feasibility of developing empirical forecasting models of squid (*L. forbesi*.) abundance around Scotland (UK). Annual fishery abundance indices (1970-96) in coastal waters were positively correlated with several annual environmental indices including average sea surface temperature and salinity in the northern North Sea. Regression models relating fishery abundance in coastal waters to environmental indices provided qualitatively satisfactory fits to observed data. Forecasts from such models were of the right order of magnitude but did not closely match observed trends. Regression models for offshore waters, and for coastal and offshore waters considered together, provided less satisfactory fits and forecasts. A second approach to forecasting, using ARIMA models fitted to monthly (coastal and coastal + offshore) fishery abundances, also provided satisfactory fits to observed data and the models were of similar utility for forecasting 12 months ahead. These models did however produce good predictions one month ahead. Incorporation of environmental predictors into the ARIMA models, using transfer functions, resulted in negligible improvements in model fits.

3.9.2 Distribution and abundance of cephalopods in Portuguese waters

João Pereira gave a presentation on the distribution and abundance of cephalopods in Portuguese waters. Data on abundance indices of cephalopods in Portugal are derived from research cruises. *L. vulgaris* and *I. coindetii* are the most abundant species, followed by *L. forbesi* and then octopus. However, these are trawl surveys and may not reflect octopus abundance. *L. vulgaris* has shown a general downward trend in abundance since 1980. The proportion of mature females is high all year round, inshore. *L. forbesi* reached a peak in 1990 but it has been scarce or absent since then. When mature females are abundant they tend to be concentrated in the southwest at about 200 m depth. *I. coindetii* shows a generally decreasing trend. It occurs all along Portuguese coast; in years of decreased abundance it is still found all along the coast but in lower numbers. There is a greater relative concentration of mature females in the south and southwest, along the 200 m depth contour. The abundance of *T. eblanae* is always low but variable - again it is spread out along the coast. Mature females occur along the 200 m depth contour in the north and south. *O. vulgaris* abundance has tended to increase in recent years. In 1996 it was the most important economically valuable cephalopod and was even more important than sardines. It was very abundant in research cruises in 1996 but has decreased in abundance since then. It occurs along the whole of the coast, at shallower depths than the ommastrephids. In years of low abundance there is no contraction of distribution. Mature females are found mostly along the south and southwest coasts. Cuttlefish (*Sepia* spp.) is the least commercially abundant cephalopod in Portugal. There are variable catches mostly concentrated in the south. In years of lower abundance it is unclear if the distribution contracts or not. Mature females are found inshore in the south and southwest. In relation to environmental conditions, CPUE of *O. vulgaris* is correlated with SST with a 12 month time-lag. This is apparent, to a lesser extent, for *T. eblanae* but no correlations are apparent for the other commercial species.

3.9.3 Cuttlefish in the area fished by French trawlers

Jean-Paul Robin gave presentation on cuttlefish in the area fished by French trawlers, describing spatial and temporal variation and the biological composition of landings. Catch was originally used to give an index of abundance but now an index is computed by averaging catch per ICES rectangle and the index is stratified by area. 1990 was a year of high abundance although catch trends are fairly constant. The new index shows a high concentration of catches in mid-English channel waters , and a high concentration inshore for spawning in the spring. Present work includes analysis of the spatial distribution of abundance and collection of size-frequency data by market sampling. Squid landed are assorted into five commercial categories (category 1 are the largest, 5 are recruits). The ML composition within each commercial category has been fairly constant over time. Data on the size categories have been used to model size; the

average temperature cycle is used to reconstruct the average abundance cycle in *L. forbesi*. The stock structure looks rather constant and recruitment variability seems to be the key element.

3.9.4 Current molecular genetic work on cephalopods

Paul Shaw summarised current molecular genetic work on cephalopods in the FAIR project. The overall aim was to develop genetic (microsatellite) markers for six cephalopod species on a macro-geographic scale and for some of these on a micro-geographic scale. This has been done and some temporal analysis has also been done. The ommastrephid squid *I. coindetii* and *T. eblanae* show little variation across the range. In *L. forbesi*, the Azores population is very distinct and the offshore Rockall Bank population may be distinct too but to a lesser extent than the Azores population; there is no variation throughout the rest of the range. There may be some differences in both *L. vulgaris* and *O. vulgaris*. It is in the cuttlefish, *S. officinalis* that the most extreme differences shown. Studying six sampling sites and seven independent genetic markers every site was genetically different from every other site thus there is very little gene flow between sites. There must be little effective migration and each site could theoretically be considered as an individual stock because of the pattern of isolation by distance. Oceanographic differences might be responsible for differentiation in some instances. To continue this work, it would be useful to sample between the 6 sampled sites to see if there is a continuum of change or isolated stocks throughout (i.e., isolated breeding units).

3.10 Research on cephalopods in the Northwestern Atlantic

Emma Hatfield provided information on recent research at the Woods Hole laboratory. This included a number of projects, which culminated in the assessment of the *Loligo pealeii* and *Illex illecebrosus* stocks in June 1999.

3.10.1 Geographic and temporal patterns in *Loligo pealeii* size and maturity off the northeastern United States

Analysis of 31 years of survey catch data indicated significant patterns in the distribution of *L. pealeii* over the Northwest Atlantic US continental shelf, by geographic region, depth, season and time of day. The results of this study confirmed the mid-Atlantic bight as the area of greatest concentration of the population and confirmed the presence of large numbers of juveniles in shallow waters off southern New England during autumn. These result from observed inshore spawning during late spring and summer. Large numbers of juveniles in the mid-Atlantic bight during spring suggest that substantial winter spawning also occurs. This spawning appears to be on a similar scale to that observed off southern New England, providing the first evidence of a substantial contribution to the population from this source.

3.10.2 Laboratory testing of a growth hypothesis for juvenile squid, *Loligo pealeii* (Cephalopoda: Loliginidae)

This study involved growth modelling of juvenile, wild-caught, *L. pealeii*, to determine the form of growth and to test the hypothesis that an increase in rearing temperature would produce a significant growth rate increase. Elevated temperature increased growth rates. Two clear phases of growth were seen, both exponential in form for the majority of the individual squid. Growth was higher in the first, than in the second, phase. The study was surprising in that small squid continued to grow exponentially for a longer time than has been seen before. The experiment provides the strongest empirical evidence to date, as far as we aware, which establishes “phase specific” temperature sensitivity in squid growth. Until now this has been an uncertainty. It is this temperature differential mechanism which provides later hatched squid the opportunity to catch up with older squid in size, and in turn development, through seasonally increasing water temperatures. It is this mechanism that probably gives rise to the confusing picture obtained from length-frequency analysis of squid populations. This study reiterates the need for age determination in studies of squid populations where age data can compensate for temperature.

3.10.3 Factors influencing the abundance of longfin inshore squid, *Loligo pealeii*

Estimates of relative population abundance and biomass of *L. pealeii* from NMFS annual spring and autumn research vessel bottom trawl surveys (1968 to 1997; Cape Hatteras to the Gulf of Maine) were compared with water temperature anomalies from that region to examine some possible factors influencing abundance and biomass of *L. pealeii* pre-recruits (≤4 cm) and recruits (>4 cm). These exploratory analyses showed some statistically significant ($p<0.05$) relationships between the survey indices and sea surface and bottom water temperature anomalies. Spring survey indices were significantly correlated with spring water temperature anomalies over the Southern New England and mid-Atlantic bight shelf areas. However, spring survey indices are probably confounded by the effects of temperature variability on availability of *L. pealeii* to the survey. In warmer years *L. pealeii* are distributed

further over the shelf and tend to be more available to the survey than in colder years, when the distribution is more restricted to the shelf edge. In the autumn surveys, the biomass indices for *L. pealeii* recruits were significantly correlated with water temperatures from the previous spring, suggesting that higher water temperatures in the spring may enhance the growth of that part of the population, resulting in higher biomass indices. Temperature conditions in the spring may therefore be indicators of potential autumn biomass.

3.10.4 Modelling seasonal production of longfin inshore squid, *Loligo pealeii*

Length-based virtual population analysis, seasonal dynamic pool models, and a quarterly surplus production analysis indicate that the *L. pealeii* stock is approaching an overfished state, and overfishing is occurring. The production model indicates that current biomass is less than the biomass that can produce maximum sustainable yield (B_{MSY}) and near the biomass threshold of 50% B_{MSY}. There is high probability that fishing mortality (F) in 1998 exceeded MSY levels. However, the production model also indicates that the stock has the ability to quickly rebuild from low stock sizes. Length-based analyses indicate that fully-recruited F in 1998 was greater than F_{max}, and stock biomass is among the lowest in the assessment time series (1987-1998). Recent survey indices of recruitment are below average. Stochastic projections suggest that F should be reduced to rebuild stock biomass to B_{MSY}.

3.10.5 New data on maturity, age and growth of the northern shortfin squid *Illex illecebrosus*, from Cape Hatteras to the Gulf of Maine, northeastern USA, and a comparison with *Illex illecebrosus* from Newfoundland

Age, sex, size and maturity data were collected for *I. illecebrosus* from the 1997 autumn NMFS research survey off the coast of the eastern U.S. seaboard. Contemporaneous jigged samples from inshore Newfoundland waters were also taken. These samples provided the first opportunity to compare age data for this species from the US and Newfoundland components of the population. The combined data give similar results for a growth curve for the species. A full model requires squid of all sizes, from hatching to full maturity, to provide an adequate description of growth. The age data show that the two components of the population could radiate away from the hypothesised common population source off Florida.

3.10.6 *Illex illecebrosus* Real-time Management Feasibility Study

The 1999 *I. illecebrosus* Squid RTM Feasibility Study was a co-operative initiative between the U.S. National Marine Fisheries Service (NMFS) and the *I. illecebrosus* squid fishing industry. The study was initiated following closure of the fishery, in 1997, due to harvesting the entire annual quota for the first time since the domestic fishery began in 1982. The study design was based on the real-time management approach implemented in the Falklands for *Illex argentinus*. Tow-based catch, effort and location data were submitted voluntarily by vessel captains on a weekly basis. Shoreside processors provided individual length and weight data for squid collected daily from each vessel. NMFS scientists processed additional length, weight and sexual maturity data. Data trends were posted to a website and the study results were presented at a workshop attended by participating captains. A stock assessment model which accounts for emigration and immigration to the fishing area was developed and in-season, stock size projection models are currently being developed. The study will be continued in 2000 along with electronic data entry at sea and a pre-fishery, swept area survey conducted by industry vessels.

3.11 Conclusions

It remains the case that there is relatively little nationally funded research on fished cephalopods in European waters, and cephalopods are still not routinely included in baseline fishery data collection. Exceptions include the addition of cephalopods to the Scottish discards sampling programme in 1998. The most recent large-scale EC-funded project (Cephalopod Resources Dynamics: Patterns in Environmental and Genetic Variation) finished in March 2000. There is some ongoing baseline data collection on cephalopod fisheries, as well as feasibility studies on cephalopod stock assessment, funded by EC DGXIV (DG Fisheries) Study Projects. These projects have already produced some retrospective depletion assessments of cephalopod stocks for several areas within European waters.

The Study Project scheme is presently scheduled to come to an end within two years and it is by no means clear how baseline data collection will continue in the long-term. On the positive side, there is a great deal of new information becoming available on patterns and trends in cephalopod distribution and abundance and also on stock structure.

Some cephalopod research in the USA is summarised in the preceding sections. As well as studies on basic biology, there is nationally funded work on stock assessment (see section 4 of this report) and research on the feasibility of real-time stock assessment.

4 CURRENT STATUS OF STOCK ASSESSMENT OF FISHED CEPHALOPODS (TOR C)

4.1 Introduction

In previous WCEPH meetings the various techniques available for stock assessment have been reviewed, as well as the range of methods used in cephalopod fisheries. In this section, findings of some recent work on cephalopod stock assessment are reviewed and more general discussions on the nature of fished stocks, stock discrimination and assessments are summarised. The text makes reference to B_{PA} and F_{PA}, defined as follows:

B_{PA}: The ICES parameter describing stock size below which recruitment is impaired.
F_{PA}: The level of fishing where the stock is in danger of falling below B_{PA}.

4.2 Stock assessment in Scotland, France and Spain

In June 1999, a two-year EC-funded Study Project (96/081) '*Data collection for the assessment of fished cephalopod stocks*' was completed. The aim of the study was to develop routine biological and fishery data collection to allow assessment of commercially important cephalopod species, and to provide a model for standardised data collection which would be appropriate for the relevant statutory bodies in the future. The UK (Scotland), France and Spain took part in the project and used depletion methods to carry out preliminary stock assessments for cephalopod species in several ICES fishery subdivisions areas. The species under consideration included the long-finned squid (*L. vulgaris* & *L. forbesi*), short-finned squid (*I. coindetii* & *T. eblanae*), cuttlefish (*Sepia* spp.) and octopus (*O. vulgaris* & *E. cirrhosa*).

The first task in the project was to collect biological data on monthly mean weights of the target cephalopod species from commercial fish markets to allow fishery landings data to be converted into numbers of animals caught. When landings included more than one species, it was also necessary to calculate the proportion of each species in the catch. Data were also collected for the calculation of recruitment indices.

An evaluation of the accuracy of official fishery statistics was carried out by comparing observed landings at markets with official reports, and by comparing independent sources of statistics. It was concluded that, in Scotland and France, official statistics represented a relatively accurate picture of cephalopod landings. An important exception was the artisanal fishery in Spain, where it was estimated that around 40% of *O. vulgaris*, and up to 90% of *L. vulgaris* landings, were unregistered.

Discards of commercially important cephalopod species were monitored using observers on fishing vessels. Cephalopods of commercial value were, in general, only discarded if caught in very small amounts, deemed insufficient to land, or if they were very small animals. The proportion of commercial species discarded can be considered to be negligible compared with landings.

A study of commercial fish diets in Scottish and English Channel waters examined 3,010 stomachs from 23 species and identified 76 cephalopods. Only half of these were cephalopod species of commercial importance, suggesting that cephalopods are not an important component in the diet of commercial fish species. However, the large size of some fish populations means that predation may still have an important impact on cephalopod populations. Some preliminary calculations of total consumption of cephalopods were illustrated in Daly *et al.* (In Press).

Databases of biological data, landings and effort statistics were maintained by all partners. Retrospective preliminary stock assessments were carried out, using the "depletion" method, for most of the target species for the 1997-98 season: *L. forbesi* in ICES are VIa, *S. officinalis* and Loliginid squid in area VIId, *E. cirrhosa* in areas IXa & VIIIc, *T. eblanae* in areas IX a & VIII c and *I. coindetii* in area IXa. The lack of reliable catch and effort data for *O. vulgaris* and *L. vulgaris* in the Spanish artisanal fisheries meant that stock assessment could not be attempted.

Data collection continued in Scotland until the end of 1999 under Study Project 97/0107. Since January 2000, Study Project 99/063 (*Data Collection for Assessment of Cephalopod Fisheries*) funds further data collection in Scotland, France, Spain, Portugal and Greece. This will be valuable in allowing analysis of trends in stock size and between-year and between-area comparisons, as well as facilitating comparison of alternative approaches to assessment (see section 3 of this report).

4.3 Stock Assessment of Longfin inshore squid *Loligo pealeii*

Steve Cadrin and Emma Hatfield of the Northeast Fisheries Science Center carried out assessment for the squid *L. pealeii* (NFSC Reference Document 99-12). The report for the 29th Northeast Regional Stock Assessment Workshop (Sept. 1999) was presented at the WGCEPH meeting (see also section 3). Length based virtual population analysis, seasonal dynamic pool models, and a quarterly surplus production analysis indicated that the *L. pealeii* stock was approaching an overfished state, and overfishing was occurring. The production model indicated that the current biomass was less than the biomass that could produce maximum sustainable yield (B_{MSY}) and near the biomass threshold of 50% B_{MSY}. There was a high probability that fishing mortality (F) in 1998 exceeded MSY levels. However, the production model also indicated that the stock had the ability to quickly rebuild from low stock sizes. Length-based analyses indicated that fully-recruited F in 1998 was greater than F_{MAX}, and stock biomass was among the lowest in the assessment time series (1987-1998). Recent survey indices of recruitment were below average. Stochastic projections suggested that F should be reduced to rebuild stock biomass to B_{MSY}. The *L. pealeii* stock is managed using a T.A.C. based on current stock size and F_{MSY}.

4.4 Review of current knowledge of fished cephalopod stocks in the ICES area

4.4.1 Loliginid (longfin) squid

4.4.1.1 *Loligo forbesi*

Geographic range: The current southern limit for this species is Area VIIe & h, in the west English Channel. Fishing boats from the Basque country in Northern Spain land considerable quantities of Loligo spp. from the Bay of Biscay (Area VIII a), but there are currently no data available on the species composition of these landings. A new sampling programme is planned by Marina Santurtún of AZTI, Spain, which will provide information on the proportion of *L. vulgaris* and *L. forbesi* in the catch. In recent years *L. forbesi* has disappeared from catches in Portugal and Spain – in a study monitoring the species composition of Loliginid landings at markets Galicia from Nov. 1997 until July 1999, *L. forbesi* was found in only 2 months in small quantities. Genetic analysis of *L. forbesi* has shown some geographic variation, with the population at the Azores distinct at sub-specific level, and significant but small differences between coastal populations and those at Rockall and Faroe. There is no evidence for stock divisions throughout the rest of the range.

Spawning grounds: This species is exploited by Scotland, Ireland, France, Spain and Portugal and spawning animals have been found across the whole range between Shetland and the English Channel. Colm Lordan from University College, Cork has also recorded *L. forbesi* egg strings in west Brittany, west of Ireland.

Assessment: Stock assessments have been carried out by the University of Caen for *L. forbesi* in the southern North Sea (area IVc) and the English Channel (areas VIIh & g), assuming one stock across this area. Assessments have also been carried out for the stock in Areas IVa and VIa by the University of Aberdeen. Both these countries carried out assessments using depletion methods as implemented in the CEDA (Catch and Effort Data Analysis) package. Catches of *L. forbesi* are considerably smaller in Ireland than in Scotland and it is thought that assessments carried out by France and Scotland cover the 'hot spots' or areas of highest abundance for this species. In defining separate stocks it is thought reasonable to assess Area VIa and the English Channel separately even though *L. forbesi* is apparently genetically similar in both areas. The latter area contains a mixed stock of the two Loligo species and different fleets are fishing in the two areas.

No assessment has been attempted for the Rockall stock since its sporadic appearance and the short period of the fishery makes application of depletion methods impractical.

It is though that the BPA could be set using retrospective assessments and current recruitment indices.

4.4.1.2 *Loligo forbesi*

Geographic range: The northern limit of *L. vulgaris* is the southern part of the North Sea, Area IVc. It is found in the English Channel and extends south as far as the south of Portugal as well as occurring throughout the Mediterranean Sea and on the Saharan Bank. Loliginids are caught in the Bay of Biscay and landed in the Basque country but no market sampling has been carried out to date to provide information on the proportion of *L. vulgaris* and *L. forbesi* in the catch, although sampling is planned (see above). Data on the proportion of each species in the Bay of Biscay may also be provided from surveys. Genetic analysis has shown some evidence of stock structure, with differences between

eastern Mediterranean populations and those elsewhere, also some evidence of differences between the Northern and Southern ends of the range in the Atlantic.

Spawning grounds: Animals in spawning condition have been recorded all long the coast from the English Channel to southern Portugal. As the spawning grounds of this species extends over such a large area, it is probably not sensible to try and assess the whole population as one stock.

Assessments: Historically, Portugal has assessed the *L. vulgaris* population off their coast and France has also carried out assessments in the English Channel based on depletion methods. During a recent Study Project, the IEO in Galicia, Spain attempted to carry out assessments of *L. vulgaris*. However, as this fishery comprises mainly artisanal vessels which do not contribute to official statistics it proved impossible to obtain sufficiently reliable information on catch, effort or landings to carry out assessments.

4.4.2 Ommastrephid (shortfin) squid

4.4.2.1 *Illex coindetii*

Geographic range: In the north of Portugal and Galicia, there are fisheries for *I. coindetii*, as well as in areas VIIb, h & j, which extend up to the west of Ireland following the shelf edge at the 200m depth contour. It is also found as far south as southern Portugal. Small amounts of *I. coindetii* are also found off the west coast of Scotland (Area VIa) and in the northern North Sea (IVa). The are caught in demersal trawls, usually in small quantities and are always discarded. It is possible that these areas of occurrence are continuous, although there are currently insufficient data to make firm conclusions on stock structure. Results of a sampling programme in which animals over the whole range were sampled simultaneously (part of the FAIR project) should be available soon. Recent work on maturation in *I. coindetii* suggests that they should all be considered as from the same stock.

Spawning grounds: There is a lack of information on this species and it difficult to identify discrete stocks that would be suitable for assessment. One of the main problems with the life-cycle data is the short-term nature of the life-span and fishing season. Unpublished work by Colm Lordan compared Irish and Spanish samples and suggested a homogenous population, with the squid over the whole latitudinal range maturing and growing at the same rate. It is also possible that the *I. coindetii* migrate south to spawn from the northern end of their range. The area west of Ireland may be used predominantly as feeding grounds, rather than for spawning. This is analogous to *Illex illecebrosus* from the South Atlantic that spawn in north flowing currents. Mature females are also found in the south of Portugal.

Assessments: Assessment of *I. coindetii* stocks have recently been carried out by IEO, Spain for Area IXa, using catch and effort from Spanish boats. New work in Spain and Portugal will include *I. counted* in market sampling for assessment. Although information on this species is limited, current evidence suggests that it should be assessed assuming a single stock or unit.

4.4.2.2 *Todaropsis eblanae*

Geographic range: The range of *T. eblanae* is similar to that of *I. coindetii* and they are frequently caught together. *T. eblanae* is also caught in small quantities west of Scotland and in the North Sea.

Spawning animals have been recorded all along the Portuguese coast near the 200m depth contour. A similar situation to *I. coindetii* exists in terms of the data available to define discreet stocks for assessment. Again, this species has been studied in the recent FAIR project and results should soon be available. Recent assessments have been carried by IEO, Spain, for *I. coindetii* in Areas IX a and VIII c.

4.4.3 Cuttlefish (*Sepia* spp.)

The most important species is *S. officinalis* and discussion focussed on this species.

Geographic range: Cuttlefish are found in the English Channel and along the Spanish and Portuguese coasts, as well as in the Mediterranean Sea.

Large amounts of *Sepia* spp. are landed by several countries, e.g. 14 000 t were landed from the English Channel and the Bay of Biscay by France in 1998, with Portuguese landing being around 2-3 000 t annually from Area IX a.

Spawning grounds: Spawning ground for *S. officinalis* are found around the French coast in Areas VIIe and VIIIa. In winter the animals move offshore and are found in Area VIIh and there may be populations in Area VIIe or VIIIa. In Portugal, spawning females are found mainly in the south. If cuttlefish are loyal to spawning areas, i.e. returning to their area of origin to spawn, management would be possible using single spawning groups. As part of the FAIR Project, Paul Shaw from the University of Hull worked on *S. officinalis* population analysis using genetic parameters. This work highlighted the importance of including genetic analysis in stock discrimination. *S. officinalis* from the Spanish and Portuguese coast were sampled from a total of seven sites. Analysis showed that animals from all seven sites were found to be genetically distinct, even over relatively small distances, indicating that they should be considered as separate and distinct stocks. Finer scale sampling is necessary to discern patterns between adjacent sites.

Closed spawning areas are a possible management tool with *Sepia* spp., which has the added advantage of protecting the environment. If this strategy is to be adopted it is important to identify the most important habitat type to protect, such as seagrass beds. However, in some areas in France, the fishermen rely on these spawning populations but are aware of the problems they encounter in eggs being destroyed when traps are raised. and are open to the suggestion of enhanced spawning, e.g. trying to persuade the cuttlefish to lay the eggs elsewhere so that they are not destroyed when the traps are raised.

Assessment: The University of Caen has carried out assessments of *S. officinalis*, on stocks fished by traps or trawlers and assumes that there are different stocks in the English Channel and Bay of Biscay. Cuttlefish are slightly longer lived than other cephalopods and are multi-cohort. French landings from the English Channel have more than doubled since 1992 and this may be bringing the stock to within danger limits. In Portugal, *Sepia* spp. are not assessed although it is though that the *S. officinalis* population in Area IXa can be treated as one stock.

4.4.4 Octopods

O. vulgaris, *E. cirrhosa* and *E. moschata* are all fished in the ICES area. Recent genetic studies on *O. vulgaris* provide evidence for stock separation. This species will be included in ongoing assessment work under the Study Project *Data Collection for Assessment of Cephalopod Fisheries*.

4.5 General discussion

It is clear that for some species, especially the Ommastrephids, further information is required to allow the definition of stocks for assessment. The WGCEPH meeting precedes the final report of *FAIR CT 1520*, which will address many questions relevant to assessment, including genetic and biological variation across their range for the main fished species.

The importance of good estimates of natural mortality is also emphasised and it is important to note that during the decline in the fishing season, the natural decline in the population is coupled with fishing mortality. The possibility of quantifying part of *M* due to cannibalism was also raised, and a new sampling programme, quantifying cephalopod prey (to species level) in predators such as fish would also be advantageous.

Identification of spawning areas and seasons is critical to defining and assessing stocks, and ultimately in applying management tools such as restriction of fishing on spawning grounds or season. Collecting recently spawned eggs in species which attach eggs to the substrate provides a perfect way to accurately identify spawning areas and sampling during surveys may provide some answers to the more problematic oceanic species which spawn in the water column. Management is also complicated by species such as the Ommastrephids which spawn in areas outside the control of any single country, or across areas controlled by several countries.

A new modelling software package, called BUGS, and which uses SPLUS and C+ has recently been developed. This package deals with delta distribution with GLM to address the problems of knowing the degree of targeting of hauls.

It is important to have precautionary measures to clearly define which management tools are most effective if more effort is directed towards cephalopod fishing. Estimations are required in case management advice is requested, such as whether the current fishing levels are close to sustainability or below it.

5 REVIEW OF LITERATURE IMPORTANT TO CEPHALOPOD FISHERIES (TOR D)

Information on literature relevant to cephalopod fisheries published during the last calendar year (1999-2000) was downloaded from BIDS and SIRIS and supplied by WGCEPH members. This information is summarised in Annexes 6 (mainstream literature) and 7 (grey literature).

6 OTHER BUSINESS

Peer review

It was agreed that the draft report would be sent to Steven Cadrin (WGCEPH member not attending the meeting) and Mike Maxwell for peer review.

Terms of reference

The terms of reference were discussed and agreed to still be relevant. The need for information on gear selectivity will be acknowledged in the proposed new terms of reference.

Forthcoming meetings and publications

A mini-symposium on cephalopods is scheduled for the 2001 ICES ASC, on the response of cephalopod populations and fisheries to changing environments and ecosystems. The original proposers were Piatkowski, O'Dor and Borges. Dr Piatkowski indicated that convenors for the symposium were needed and Paul Rodhouse expressed an interest.

Outputs from the 1998 symposium had been reviewed. One batch went to the ICES Journal of Marine Science. The second batch, to be published in Fisheries Research were also ready. However, further papers were needed to make up a full Special Issue.

The forthcoming CIAC Symposium and Workshops on *Cephalopod Biomass and Production* will be held in Aberdeen in July 2000. This will include workshops on GIS and molecular genetics.

It was proposed to hold the next WGCEPH meeting during March 2001 at a venue to be decided at a later date.

7 RECOMMENDATIONS

For 2001, the following terms of reference are proposed:

1. update currently available landing statistics and information on fishing effort and discards; explore existing resource survey databases for information about sampled cephalopods in the ICES area;

2. continue the compilation of methods and results available for stock identification and estimation of population size of fished cephalopods; compile available data on gear selectivity for cephalopods; review possible precautionary approaches to the management of these cephalopod resources;

3. review the results of national and transnational projects collecting data on fished cephalopods, especially those projects studying relationships between abundance and environmental conditions, factors affecting recruitment, migration and distribution patterns of juveniles and adults, and trophic interactions; to review research priorities in relation to data requirements for fishery assessment and management;

4. continue development of a bibliographic database of cephalopod literature relevant to fisheries, including grey literature.

Justification

Cephalopods support important fisheries in the ICES area. However, they remain outside the scope of the European Community's Common Fisheries Policy and understanding of stock dynamics, particularly in European coastal waters, remains poor. Official statistics on cephalopod fisheries are generally of low quality but are currently supplemented by data collected under various research projects. New data and information on the state-of-the-art in cephalopod fishery assessment and management need to be updated and reviewed annually. Since patterns in landings may be a poor representation of stock size if there are substantial changes in fishing effort, in future it would be useful to also compile and report nominal effort statistics where available to help interpret patterns in landings.

Terms of Reference 1) and 2) are in response to the research needs co-ordinated under the Living Resources Committee.

8 CLOSING OF THE MEETING

The chair thanked the Working Group participants for their attendance and participation. He closed the meeting at 13.00 on 11 February.

9 ACKNOWLEDGEMENTS

The Chair wishes to thank Mette Bertelsen and Maria Zarecki at ICES for their assistance, also Steve Cadrin and Mike Maxwell who kindly reviewed the first draft of this report.

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Table 1. Landings (in tonnes) of Cuttlefish (Sepiidae). [+ indicates landings of <0.5 tonnes]

Country	1993	1994	1995	1996	1997	1998	1999P
ICES Division IVb (Central North Sea)							
Belgium	6	+	1	1	2	3	3
ICES Division IVc (Southern North Sea)							
Belgium	25	13	15	5	4	4	4
England, Wales & Northern Ireland	22	47	163	90	22	28	22
France	173	187	234	174	135	141	141
Total	220	247	412	269	161	173	167
ICES Division VIa,b (NW coast of Scotland and North Ireland, Rockall)							
England, Wales & Northern Ireland	+	1	+	+	0	+	0
France	1	1	1	3	1	0	0
Spain	+	+	+	11	14	0	0
Total	1	2	1	14	15	+	0
ICES Division VIIa (Irish Sea)							
Belgium	1	2	2	1	1	1	1
England, Wales & Northern Ireland	11	13	19	8	1	1	1
France	4	0	1	1	0	0	0
Total	16	15	22	10	2	2	2
ICES Divisions VIIb, c (West of Ireland and Porcupine Bank)							
England, Wales & Northern Ireland	0	5	0	0	0	4	0
France	0	2	0	0	0	0	0
Spain	+	+	+	10	13	0	0
Total	+	7	+	10	13	4	0
ICES Divisions VIId, e (English Channel)							
Belgium	24	19	19	11	6	15	15
Channel Islands	2	2	1	11	8	20	20
England, Wales & Northern Ireland	1882	1797	3925	4038	1634	2448	1973
France	7925	5415	8869	8012	5742	7260	7260
Total	9833	7233	12814	12072	7390	9743	9268
ICES Division VIIf (Bristol Channel)							
Belgium	11	14	4	1	1	+	+
England, Wales & Northern Ireland	95	38	42	64	44	42	9
France	28	22	14	33	29	39	39
Total	134	74	60	98	74	81	48
ICES Divisions VIIg-k (Celtic Sea and SW of Ireland)							
Belgium	12	4	5	2	3	+	+
England, Wales & Northern Ireland	114	134	188	367	464	210	199
France	15	14	18	34	21	50	50
Spain	2	4	+	46	57	181	2
Total	143	156	211	449	545	441	251

Table 1. continued.

Country	1993	1994	1995	1996	1997	1998	1999P
ICES Sub-area VIII (Bay of Biscay)							
Belgium	5	4	+	+	0	0	0
England, Wales & Northern Ireland	41	56	2	40	37	19	+
France	3755	4606	3878	4058	5118	5607	5607
Portugal	0	0	0	11	8	11	5
Spain	575	451	194	260	368	593	510
Total	4376	5117	4074	4369	5531	6230	6122
ICES Sub-area IX							
Portugal	1205	1120	981	1625	1415	1723	1157
Spain	832	773	1025	819	1504	1247	997
Total	2037	1893	2006	2444	2919	2970	2154
Grand Total	16766	14744	19601	19736	16652	19647	18015

Table 2. Landings (in tonnes) of Common Squid (includes *Loligo forbesi, L. vulgaris, Alloteuthis subulata* and *A. media*). [+ indicates landings of <0.5 tonnes]

Country	1993	1994	1995	1996	1997	1998	1999P
ICES Division IIIa (Skagerrak and Kattegat)							
Denmark	2	0	1	1	6	8	8
Sweden	0	+	2	+	1	+	+
Total	2	+	3	1	7	8	8
ICES Division IVa (Northern North Sea)							
Denmark	1	1	1	1	2	5	5
England, Wales & Northern Ireland	1	1	+	0	0	3	2
France	2	0	0	0	1	1	1
Germany	+	+	+	+	+	+	+
Scotland	242	93	268	279	453	844	712
Total	246	95	269	280	456	853	720
ICES Division IVb (Central North Sea)							
Belgium	22	13	14	9	7	11	11
Denmark	2	+	+	+	9	3	3
England, Wales & Northern Ireland	22	4	22	21	39	143	64
France	1	1	0	0	0	0	0
Germany	1	1	3	1	3	5	5
Scotland	36	5	25	14	66	211	137
Total	84	24	64	45	124	373	220
ICES Division IVc (Southern North Sea)							
Belgium	84	113	153	87	39	36	36
England, Wales & Northern Ireland	4	3	10	3	3	2	2
France	298	193	188	85	123	93	93
Germany	1	2	6	2	1	6	1
Total	387	311	357	177	166	137	132

Table 2. continued.

Country	1993	1994	1995	1996	1997	1998	1999P
ICES Division Vb (Faroe Grounds)							
England, Wales & Northern Ireland	0	1	+	0	0	+	1
Faroe Islands	+	1	+	+	5	36	29
Scotland	+	+	+	1	1	1	2
Total	+	2	+	1	6	37	32
ICES Division VIa (NW coast of Scotland and North Ireland)							
England, Wales & Northern Ireland	28	144	16	49	40	3	2
France	173	138	98	132	82	129	129
Ireland	78	36	158	104	128	99	93
Scotland	182	91	267	287	301	273	332
Total	461	409	539	572	551	504	556
ICES Division VIb (Rockall)							
England, Wales & Northern Ireland	1	6	2	8	5	3	+
Ireland	5	6	5	6	+	2	3
Scotland	9	28	6	19	5	25	13
Spain	2	2	2	61	76	6	2
Total	17	42	15	94	86	36	17
ICES Division VIIa (Irish Sea)							
Belgium	0	3	2	8	2	5	5
England, Wales & Northern Ireland	174	234	156	218	125	173	40
France	52	31	14	9	5	21	21
Ireland	112	66	192	23	39	22	3
Isle of Man	15	6	7	3	2	2	2
Scotland	10	4	2	2	3	2	2
Total	363	344	373	263	176	225	73
ICES Divisions VIIb, c (West of Ireland and Porcupine Bank)							
England, Wales & Northern Ireland	48	79	96	307	228	2	7
France	60	68	22	84	80	75	75
Ireland	35	11	282	36	15	34	30
Scotland	1	18	1	76	45	+	0
Spain	+	+	+	55	69	+	+
Total	144	176	401	558	437	111	112
ICES Divisions VIId, e (English Channel)							
Belgium	70	132	220	163	77	133	133
Channel Islands	0	0	2	1	6	5	5
England, Wales & Northern Ireland	869	727	672	392	496	415	622
France	3799	2447	2636	2033	2518	2593	2593
Total	4738	3306	3530	2589	3097	3146	3353
ICES Division VIIf (Bristol Channel)							
Belgium	+	4	13	12	6	6	6
England, Wales & Northern Ireland	134	162	132	39	77	29	68
France	442	435	275	164	193	128	128
Total	576	601	420	215	276	163	202

Table 2. continued.

Country	1993	1994	1995	1996	1997	1998	1999P
ICES Divisions VIIg-k (Celtic Sea and SW of Ireland)							
Belgium	2	9	26	63	10	13	13
England, Wales & Northern Ireland	282	600	1002	1381	924	23	28
France	303	225	118	50	69	95	95
Germany	0	0	2	+	+	0	0
Ireland	133	164	405	312	259	451	104
Portugal	0	0	0	3	0	0	0
Scotland	14	34	1	121	127	+	0
Spain	85	39	29	241	302	292	3
Total	819	1071	1583	2171	1691	874	243
ICES Sub-area VIII (Bay of Biscay)							
Belgium	36	17	40	46	14	49	49
England, Wales & Northern Ireland	94	96	55	46	68	8	+
France	1202	2253	1565	1419	1489	1185	1185
Portugal	0	0	0	2	2	2	+
Spain	33	588	196	418	505	282	406
Total	1365	2954	1856	1931	2078	1526	1640
ICES Sub-area IX							
Portugal	508	309	908	463	842	1011	327
Spain	300	210	245	236	1301	325	231
Total	808	519	1153	699	2143	1336	558
ICES Sub-area X (Azores Grounds)							
Portugal*	108	114	250	200	303	98	45
Grand Total	10118	9968	10813	9796	11597	9427	7912

*Landings consist exclusively of *Loligo forbesi*.

Table 3. Landings (in tonnes) of Short-finned Squid (*Illex coindetii* and *Todaropsis eblanae*), European Flying Squid (*Todarodes sagittatus*), and Neon Flying Squid (*Ommastrephes bartrami*). [+ indicates landings of <0.5 tonnes]

Country	1993	1994	1995	1996	1997	1998	1999P
ICES Sub-area I + II (Barents Sea and Norwegian Sea)							
Norway*	0	0	352	+	190	2	+
ICES Division Va (Iceland Grounds)							
Iceland*	0	0	11	3	5	4	+
ICES Division VIa, b (NW coast of Scotland and North Ireland, Rockall)							
France	0	+	+	2	0	0	0
Ireland	0	0	96	110	+	+	46
Spain	+	0	0	43	112	+	+
Total	+	+	96	155	112	+	46
ICES Division VIIa (Irish Sea)							
Ireland	+	66	17	23	+	+	+
ICES Divisions VIIb, c (West of Ireland and Porcupine Bank)							
England, Wales & Northern Ireland	0	0	0	0	8	+	+
France	+	+	0	0	0	29	29
Ireland	0	0	21	36	+	+	134
Spain	+	+	+	38	97	+	+
Total	+	+	21	74	105	29	164
ICES Divisions VIId, e (English Channel)							
England, Wales & Northern Ireland	0	0	+	0	1	2	1
France	1	1	1	1	1	1	1
Total	1	1	1	1	2	3	2
ICES Divisions VIIg-k (Celtic Sea and SW of Ireland)							
England, Wales & Northern Ireland	0	0	29	13	14	4	25
France	2	1	0	0	2	3	3
Ireland	0	0	167	312	+	+	143
Spain	374	643	353	164	427	865	73
Total	376	644	549	489	443	872	244
ICES Sub-area VIII (Bay of Biscay)							
England, Wales & Northern Ireland	0	0	6	0	3	0	0
France	379	317	136	139	372	210	210
Portugal	0	0	0	1	11	5	1
Spain	350	505	360	1830	2013	1038	598
Total	729	822	502	1970	2399	1253	809
ICES Sub-area IX							
Portugal	259	190	101	121	353	383	313
Spain	100	75	149	1495	2536	608	700
Total	359	265	250	1616	2889	991	1013
Grand Total	1465	1798	1799	4331	6145	3154	2278

*Landings consist exclusively of *Todarodes sagittatus*.

Table 4. Landings (in tonnes) of Octopods (*Eledone* spp. and *Octopus vulgaris*). [+ indicates landings of <0.5 tonnes]

Country	1993	1994	1995	1996	1997	1998	1999P
ICES Division IVa (Northern North Sea)							
Scotland	10	2	2	2	6	13	17
ICES Division IVb (Central North Sea)							
Belgium	10	3	0	+	+	2	2
England, Wales & Northern Ireland	1	4	0	0	0	1	1
Scotland	2	1	0	0	0	1	1
Total	13	8	0	+	+	4	4
ICES Division IVc (Southern North Sea)							
Belgium	1	1	2	0	2	+	+
England, Wales & Northern Ireland	+	4	8	4	1	+	+
Total	1	5	10	4	3	+	+
ICES Division VIa, b (NW coast of Scotland and North Ireland, Rockall)							
Belgium	0	0	0	0	1	1	1
England, Wales & Northern Ireland	+	1	0	0	0	+	0
Ireland	0	0	1	1	+	0	0
Scotland	1	2	4	1	1	+	+
Spain	0	0	0	27	35	0	0
Total	1	3	5	29	37	1	1
ICES Division VIIa (Irish Sea)							
Belgium	8	14	14	3	18	26	26
England, Wales & Northern Ireland	4	24	2	0	1	+	+
Ireland	0	+	1	+	0	1	0
Total	12	38	17	3	19	27	26
ICES Divisions VIIb, c (West of Ireland and Porcupine Bank)							
England, Wales & Northern Ireland	+	+	+	4	3	0	+
France	0	0	0	0	0	2	2
Ireland	3	2	2	2	1	0	0
Spain	+	+	+	27	33	+	+
Total	3	2	2	33	37	2	2
ICES Divisions VIId, e (English Channel)							
Belgium	2	+	6	1	1	+	+
England, Wales & Northern Ireland	21	60	77	75	37	17	9
France	21	32	45	23	7	4	4
Total	44	92	128	99	45	21	13
ICES Division VIIf (Bristol Channel)							
Belgium	4	6	9	6	6	3	3
England, Wales & Northern Ireland	13	26	8	6	9	4	4
France	12	3	2	2	1	0	0
Total	29	35	19	14	16	7	7

Table 4. continued.

Country	1993	1994	1995	1996	1997	1998	1999P
ICES Divisions VIIg-k (Celtic Sea and SW of Ireland)							
Belgium	6	10	27	17	13	11	11
England, Wales & Northern Ireland	57	77	144	127	66	28	12
France	1	1	2	0	1	2	2
Ireland	1	2	21	9	6	2	2
Scotland	0	0	0	5	1	9	0
Spain	139	256	452	116	145	301	42
Total	204	346	646	274	232	353	69
ICES Sub-area VIII (Bay of Biscay)							
Belgium	7	6	3	1	4	4	4
England, Wales & Northern Ireland	0	0	+	5	23	0	0
France	183	64	68	49	84	116	116
Portugal	+	154	107	113	75	57	156
Spain	2136	1434	1779	2486	2448	2776	994
Total	2326	1658	1957	2654	2634	2953	1270
ICES Sub-area IX							
Portugal	7099	7319	9708	11523	8980	6350	9025
Spain	2992	3757	3741	2991	3630	2752	4182
Total	10091	11076	13449	14514	12610	9102	13207
ICES Sub-area X (Azores Grounds)							
Portugal*	7	7	8	16	64	39	12
Grand Total	12741	13272	16243	17642	15703	12522	14628

*Landings consist exclusively of *Octopus vulgaris.*

Table 5. Total annual cephalopod landings (in tonnes) in whole ICES area separated into major cephalopod species groups.

Cephalopod Group	1993	1994	1995	1996	1997	1998	1999P
Cuttlefish	16766	14744	19601	19736	16652	19647	18015
Common Squid	10118	9968	10813	9796	11597	9427	7912
Short-finned Squid	1465	1798	1799	4331	6145	3154	2278
Octopods	12741	13272	16243	17642	15703	12522	14628
Total	41090	39782	48456	51505	50097	44750	42833

Table 6. Total annual cephalopod landings (in tonnes) in whole ICES area by country and separated into major cephalopod species groups. [+ indicates landings of <0.5 tonnes]

Country	1993	1994	1995	1996	1997	1998	1999P
(a) Cuttlefish (Sepiidae)							
Belgium	84	56	46	21	17	23	23
Channel Islands	2	2	1	11	8	20	20
England, Wales & N. Ireland	2165	2091	4339	4607	2202	2752	2204
France	11901	10247	13015	12315	11046	13097	13097
Portugal	1205	1120	981	1636	1423	1734	1162
Spain	1409	1228	1219	1146	1956	2021	1509
Total	16766	14744	19601	19736	16652	19647	18015
(b) Common Squid (Loliginidae)							
Belgium	214	291	468	388	155	253	253
Channel Islands	0	0	2	1	6	5	5
Denmark	5	1	2	2	17	16	16
England, Wales & N. Ireland	1657	2057	2163	2464	2005	804	836
Faroe Islands	+	1	+	+	5	36	29
France	6332	5791	4916	3976	4560	4320	4320
Germany	2	3	11	3	4	11	6
Ireland	363	283	1042	481	441	608	233
Isle of Man	15	6	7	3	2	2	2
Portugal	616	423	1158	668	1147	1111	372
Scotland	494	273	570	799	1001	1356	1198
Spain	420	839	472	1011	2253	905	642
Sweden	0	+	2	+	1	+	+
Total	10118	9968	10813	9796	11597	9427	7912
(c) Short-finned Squid (Ommastrephidae)							
England, Wales & N. Ireland	0	0	35	13	26	6	27
France	382	319	137	142	375	243	243
Iceland	0	0	11	3	5	4	+
Ireland	0	66	301	481	+	+	323
Norway	0	0	352	+	190	2	+
Portugal	259	190	101	122	364	388	314
Spain	824	1223	862	3570	5185	2511	1371
Total	1465	1798	1799	4331	6145	3154	2278
(d) Octopods (Octopodidae)							
Belgium	38	40	61	28	45	47	47
England, Wales & N. Ireland	96	196	239	221	140	50	26
France	217	100	117	74	93	124	124
Ireland	4	4	25	12	7	3	2
Portugal	7106	7480	9823	11652	9119	6446	9193
Scotland	13	5	6	8	8	23	18
Spain	5267	5447	5972	5647	6291	5829	5218
Total	12741	13272	16243	17642	15703	12522	14628

ANNEX 1

WGCEPH MEETING, 7-11 FEBRUARY 2000 IN ABERDEEN, UK

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ANNEX 2

WGCEPH MEETING, 7-11 FEBRUARY 2000 IN ABERDEEN, UK

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ANNEX 3

WGCEPH MEETING, 7-11 FEBRUARY 2000 IN ABERDEEN, UK

WGCEPH Meeting Agenda

Meeting Location, Seminar Rooms 1-3, Central Refectory, Elphinstone Road, Old Aberdeen

Monday 7th February FAIR 1520, Science Co-ordination Meeting

14.30 Scientific Presentations: Cunha, Daly, Moreno, Murphy, Pierce, Robin, Shaw, Valvanis, Wang

Tuesday 8th February FAIR 1520, Science Co-ordination Meeting

09.00 Scientific Presentations

- Ommastrephid fisheries and biology - Contributions:- Arvanitidis, Dillane, Galvin, Koutsoubas, Pereira, Robin, Waluda
- Octopus fisheries and biology - Contributions:- Balguerias, Cunha, Koutsoubas, Murphy, Perales, Portela
- Sepia fisheries and biology - Contributions:- Koutoulas, Perales, Robin, Shaw, Valvanis, Wang

13.00 LUNCH
14.30 Task progress meetings

Wednesday 9th February

09.00 FAIR Project Co-ordination Meeting
13.00 LUNCH
14.30 Study Project meetings

Thursday 10th February WGCEPH business meeting

09.00 Opening of the Meeting

- Introduction
- Appointment of Rapporteur
- Adoption of 1998 Report
- Report of the Chairman
- Terms of Reference

09.30 Work on terms of reference

- Presentations relating to terms of reference, in particular: "*Review the results of national and transnational projects collecting data on fished cephalopods, especially those projects studying relationships between abundance and environmental conditions, factors affecting recruitment, migration and distribution patterns of juveniles and adults, and trophic interactions; to review research priorities in relation to data requirements for fishery assessment and management*"

Presentations including

- Marina Santurtún: Current Cephalopod Catches of the Basque Country in ICES Areas VI, VII and Divisions VIIIabd and VIIIc
- Colm Lordan: 1999 Irish preliminary cephalopod landings
- Uwe Piatkowski: New data on German studies of North Sea cephalopods (ICES IBTS survey by-catch investigations)

- Uwe Piatkowski: Preliminary results of early life cephalopod distributions around seamounts in the sub-tropical Atlantic, in particular the Great Meteor Seamount
- Uwe Piatkowski (on behalf of Herman Bjorke): Mating of *Gonatus fabricii* near the seafloor, north of Iceland (video)
- Emma Hatfield: assessment of *Loligo pealeii*
- Paul Shaw, João Pereira, Graham Pierce - summaries of results from FAIR project

13.00 LUNCH

14.30 Work on terms of reference

- Presentations (continued)
- Preparation of report text for t.o.r.

  - *Update currently available landing statistics and information on fishing effort and discards; explore existing resource survey databases for specific information about sampled cephalopods in the ICES area;* ***Uwe Piatkowski***
  - *Continue the compilation of methods and results available for stock identification and estimation of population size of fished cephalopods; review possible precautionary approaches to the management of these cephalopod resources* - ***Heather Daly***
  - *Review the results of national and transnational projects collecting data on fished cephalopods, especially those projects studying relationships between abundance and environmental conditions, factors affecting recruitment, migration and distribution patterns of juveniles and adults, and trophic interactions; to review research priorities in relation to data requirements for fishery assessment and management* - ***Graham Pierce***
  - *Continue development of a bibliographic database of cephalopod literature relevant to fisheries, including grey literature - Material assembled on behalf of* ***Begoña Santos****.*

Friday 11th February WGCEPH business meeting

09.00 Reports on each term of reference:

- Uwe Piatkowski
- Heather Daly
- Graham Pierce
- Graham Pierce

11.00 Other business

- Peer review of the Working Group Report
- Other Business
- Recommendations
- Close of the Meeting

13.00 LUNCH

ANNEX 4

WGCEPH MEETING, 7-11 FEBRUARY 2000 IN ABERDEEN, UK

Current projects relevant to WGCEPH

EC FAIR programme

TITLE	CO-ORDINATOR	DATES
Cephalopod Resource Dynamics: Patterns in Environmental and Genetic Variation (FAIR CT 1520)	P.R. Boyle (University of Aberdeen)	1997-2000

EC Study Projects

TITLE	CO-ORDINATOR	DATES
Analysis And Evaluation Of The Fishery Status Of The Most Commercially Important Cephalopod Species In The Mediterranean Sea	Fisheries Research Institute N.Ag.Re.F., Kavala, Greece	1998-2000
Data Collection for Assessment of Cephalopod Fisheries (99/063)	João Pereira, IPIMAR, Lisbon, Portugal.	2000-01
Cephalopod Resources Dynamics & Fisheries Trends in the Algarve and Gulf of Cádiz	Teresa Borges, Universidade do Algarve	

EC Training and mobility projects

TITLE	CO-ORDINATOR	DATES
Trophic interactions of pelagic squid and fish in the North East Atlantic: application of stable isotope and fatty acid techniques to improve understanding of pelagic food webs	G.J. Pierce, University of Aberdeen, UK	1999-2002

Other European projects

TITLE	CO-ORDINATOR	DATES
CORRAM - Octopus Cephalopods: Relation of the Resource with the Marine Environment	C. Sousa Reis, University of Lisbon, Portugal	1999-

Projects based in the USA

TITLE	COMMENTS	DATES

ANNEX 5

WORKING DOCUMENT
ICES Working Group on the Cephalopod
Fisheries and Life History
Aberdeen, 10-11 February 2000

OVERVIEW OF THE BASQUE CEPHALOPOD FISHERY IN THE NORTHEASTERN ATLANTIC WATERS DURING THE PERIOD 1994-1999

by

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INTRODUCTION

Since 1994, AZTI has monitored the monthly landings and has estimated the fishing effort by sea area and gear of the Basque Country Cephalopod Fisheries. Compilation and updating of the cephalopods catches made by the Spanish and Basque fleets landed at the Basque Country ports is still in progress. However, an enlarging effort must be made to allocate more accurately the cephalopod landings by species instead of species groups.

Cephalopod catches are considered as by-catches of other directed demersal fisheries operated by the Basque fleet, targeting Hake, Anglerfish and Megrim. These demersal fisheries operate in different sea areas – ICES Sub-areas VI, VII and Divisions VIIIa, b, d (Bay of Biscay) and VIIIc (eastern Cantabrian Sea)- and different gears: bottom trawl, pair-trawlers, longliners, purse-seiners, nets, artisanal hook and lines and traps or pots.

In this document, data for the Basque Country cephalopod landings since 1994 to 1999 are presented. The statistics for the 1999 landings have to be considered as very preliminar because data, especially in relation to the eastern part of the Cantabrian Sea (Division VIIIc), have not been yet processed. Cephalopod landings for 1999 here presented are an underestimation of the real landings.

Landings are not presented by species due to their difficult identification in the fish markets. Thus, as in previous years catch data correspond to groups of similar species comprising more than two or three species, with similar appreciation in the markets. Data available were compiled in the following commercial species groups according to local names:

- Squid: mainly *Loligo vulgaris* and also, *L.forbesi, Alloteuthis media* and *A.subulata*
- Cuttlefish: mainly *Sepia officinalis* and also *S.elegans* and *S.orbignyana*
- Short-finned squid: mainly *Illex coindetii* and also *Todaropsis eblanae*, and European flying squid: *Todarodes sagitattus*,
-Octopus: mainly *Octopus vulgaris* and also *Eledone cirrhosa*.

RESULTS

Most of the large trawlers of the Basque Country catch cephalopods mainly in the Bay of Biscay (Divisions VIIIa, b, d), but also in Sub-area VII (Celtic Sea and Porcupine Bank) and in Sub-area VI (both in the western part of Scotland and around Rockall Bank). Local trawls, artisanal longliners and some pots or trap vessels work usually in the eastern Cantabrian Sea (Division VIIIc).

The target species are usually demersal fish as Hake, Megrim or Anglerfish but together with those, variable quantities of cephalopods are caught. The proportion of these catches varies in relation to the sea area, the gear used and the distinct seasonallity of these species.

1. Landings of cephalopods in Subareas VI, VII and Divisions VIIIa, b, d.

During 1999, the largest landings of squids and cuttlefish were achieved during the first and the last quarter of the year in Divisions VIIIa, b, d. Squid landings reached 73 t in December while cuttlefish landings reached a peak of around 86 t in November. Short-finned squid maxima landings occurred in May being around 30 t. in Divisions VIIIa, b, d and around 25 t for Sub-area VII. Landings of octopus were higher in Divisions VIIIa, b, d during January, March and April reaching around 38 t while for the end of the summer months, around 8 t of octopus were landed in the Basque ports coming from Sub-area VII (Figure 1).

In Figure 2. percentage of landings by species groups and sea area in 1999 are presented. Landings from Divisions VIIIa, b, d comprise 97 % and 99 % of the total landings for squids and cuttlefish, respectively. However, for short-finned squid and octopus landings from Divisions VIIIa, b, d involve 58 % and 78 % of the total landings and also for these species, landings from Sub-area VII reached 42% and 22 % of them.

For the total period studied (1994-1999), 85 % of the total landings of all cephalopods species groups came from Divisions VIIIa, b, d (Figure 3).

Looking at the catch evolution of squid and cuttlefish during the period 1994-1999, the most remarkable feature is the outstanding seasonallity of the landings in Divisions VIIIa, b, d (Figures 4 and 5). The largest landings occur from October to February, also a marked alternancy of years of rather high and low landings is observed. Seasonallity appears to be less remarkable in Divisions VIIIc. No cuttlefish landings were registered in Sub-area VI. The great *reservoir* for both species groups appears to be the sea area comprises within Divisions VIIIa, b, d.

Catches evolution of short-finned squid does not present the marked seasonallity described for the other species groups, however maxima landings are registered from March till May (Figure 6). Octopus landings from Sub-area VII and Divisions VIIIa, b, d are very similar in numbers (Figure 7). However the apparent different seasonallity of the maxima landings from March till September in Sub-area VII and from December till March in Divisions VIIIa, b, d is caused by the absence of the Basque fleet in Sub-area VII during winter months (November-February). Then maxima landings are registered during spring and summer months in Sub-area VII and in autumn and winter months in Divisions VIIIa, b, d.

In Figure 8, summary graphs of the landings evolution of the total cephalopod amount along the period studied are presented by species groups.

Summaries of the total catches of squid, cuttlefish, short-finned squid and octopus by sea area and gear from 1994 till 1999 are presented in Tables 1, 2, 3 and 4. In these tables the fishing gear are summarised in trawlers, longliners, purseiners, nets, artisanal hook and lines and artisanal traps or pots.

Squid catch evolution from 1994 has increased markedly for trawlers in Sub-area VI and also presented an important increase in Divisions VIIIa, b, d of around 80 t since last year (Table 1). Landings for this type of gear are maintained in Sub-area VII. Cuttlefish landings followed a similar pattern than those registered for squid (Table 2). Catches of trawls increased markedly since the last year in Sub-area VII. In Divisions VIIIa, b, d catches decreased at around 60 000 kg.

Short-finned squid catches markedly increased for all trawlers in Sub-area VII (Table 3). In the preliminar data here presented no longliners catches operating in Divisions VIIIa, b, d were registered. Octopus catches for trawlers were maintained at around the same levels in Divisions VIII a,b,d while markedly decreased in Sub-area VII (Table 4).

2. Landings in Division VIIIc. Traditional artisanal cephalopod fisheries

Traditionally these cephalopods fisheries were the artisanal hand-line and the local trawlers that fish for a number of species in the southern Divisions VIIIb and mainly in the eastern part of Division VIIIc (Cantabrian Sea).

Cephalopod fishing in Divisions VIIIc, carried out by small boats using artisanal fishing gear, are deployed by professional fishermen and in a rather large proportion by sport ("amateur") and retired fishermen. Thus, landings as well as fishing and landing effort recorded in the fishing markets and main port of the Basque country is just a part of the total catches registered in this area.

As only preliminary data of the cephalopod catches in 1999 are presented, at this stage no data on catches in Divisions VIIIc in this year were still available. In previous years, the highest squid catches registered in this sea area come from the local trawlers and the artisanal hook and lines, followed by purseiners, nets and longliners respectively. For all these gears, except for trawlers, catches have slightly decreased in the last years (Table1). Nets obtained the largest catches of

cuttlefish in Division VIIIc in 1998. In Divisions VIIIc, local trawlers registered the highest catches of short-finned squid although catches have sharply decreased since 1996 (Table 3). Octopus maxima catches in VIIIc were deployed by trawlers and by artisanal traps or pots. For these fishing gears, catches have been increasing since 1994 (Table 4).

3. Catch per unit effort and Landings per unit effort

The Basque fleet fish in three different Northeast Atlantic areas: Bay of Biscay (Divisions VIIIa, b, c, d), Sub-area VII (mainly in Divisions VIIh, j, k) and in Sub-area VI. As explained before, the artisanal fleet is allocated in the more eastern part of Divisions VIIIc and in the southern area of Divisions VIIIb. In Map. 1 an estimated distribution of the main annual fishing effort (number of hauls by ICES statistical rectangle), during the period 1992-1995 for one of the most representative fleet for the cephalopod fishery of the Basque Country, the "baka" bottom trawl fleet is presented

In a first approximation, fishing effort has been calculated as the number of fishing trips per year by sea area. Although, the number of days per trip differs from one sea area to another, it can be considered as rather stable in the same sea area from one year to another in the period 1994-1999 studied.

No fishing effort and Landings per Fishing Effort (LPFE) are registered for Divisions VIIIc. Also there is a lack of information for the fishing effort deployed by the artisanal fleets: hook and line and traps or pots that operate, principally in this sea area. It has to be also considered that data from 1999 is just preliminar.

Looking at "baka" bottom trawls and mainly at "bou" bottom trawls, their fishing effort has progressively decreased since 1994, because of the drastic diminishing of these fleets. The number of trips per year deployed by pair-trawls increased sharply from 1994, when this fleet started to work, till 1997, in 1999 appeared to slightly increased, at least, preliminarily (Table 9).

For Squid, LPFE has been maintained since 1997 by "baka" bottom trawlers in Divisions VIIIa, b, d and sharply increased in 1999. LPFE increased markedly in 1998 for cuttlefish in Divisions VIIIa, b, d and has been maintained at around the same levels in 1999. The highest LPFE registered for short-finned squid are due to "bou" bottom trawls and pair-trawls fishing in Sub-area VII. Octopus maxima LPFE were registered for "baka" bottom trawls fishing in Divisions VIIIa, b, d although LPFE for this species in Sub-area VII is very close to these values (Table 9).

It has to be pointed out that from 1996 to 1997 there was an important reduction in the total number of ships mainly longliners and bottom trawls above all in relation to the "bou" type. Also, some of these bottom trawlers changed to another way of fishing: trawling in pairs with nets of very high vertical opening focused in demersal species. Nowadays, catches of this fleet compound a very high proportion of total demersal catches registered in the Basque Country.

WORK IN THE NEXT FUTURE

The priority tasks to be attempted in relation to the monitoring of the Cephalopods Fisheries in the Basque Country are:

1. To try to identify the landings from the different fleets and ports by their specific names, in order to allocate by species the more important current catches. Thus, using the appropriate proportions, catches of the past recent years could be splited by species.

2. More precise biological studies could be implemented if economical aid could be obtained for more detailed studies in DivisionsVIIIa, b, d and VIIIc

Table 1. Total Squid Catches (in kg) of the Basque Country during the period 1994-1999 by sea area and gear. Fishing gear is summarised in **trawlers**, **longliners**, **purseiners**, **nets artisanal hook and lines** and **artisanal traps or pots.**

Gear	Area	1.999	1.998	1.997	1.996	1.995	1.994	Mean
All Trawlers	VI	1870	5894	1386	1118	2443	1761	**2520**
	VII	2085	2402	1804	1714	112864	4916	**24740**
	VIIIabd	169560	96811	176769	343204	140353	486579	**248743**
	VIIIc	-	3769	9551	4571	788	327	**3801**
	ALL	**173515**	**108876**	**189510**	**350607**	**256448**	**493583**	**279805**
All Longliners	VI	-	-	-	-	-	-	-
	VII	-	-	-	-	-	-	-
	VIIIabd	-	171	16	-	-	-	**94**
	VIIIc	-	108	555	46	12	-	**180**
	ALL	-	**279**	**571**	**46**	**12**	-	**227**
All Purseiners	VI	-	-	-	-	-	-	-
	VII	-	-	-	-	-	-	-
	VIIIabd	-	-	-	-	-	-	-
	VIIIc	-	1364	1565	636	2202	-	**1442**
	ALL	-	**1364**	**1565**	**636**	**2202**	-	**1442**
All Nets	VI	-	-	-	-	-	-	-
	VII	-	-	-	-	-	-	-
	VIIIabd	-	114	107	-	-	-	**111**
	VIIIc	-	63	152	194	148	-	**139**
	ALL	-	**177**	**259**	**194**	**148**	-	**195**
All Artisanal Hook and Lines	VI	-	-	-	-	-	-	-
	VII	-	-	-	-	-	-	-
	VIIIabd	-	1870	3519	-	-	-	**2695**
	VIIIc	-	3	1866	3645	9597	-	**3778**
	ALL	-	**1873**	**5385**	**3645**	**9597**	-	**5125**
All Artisanal Traps and Pots	VI	-	-	-	-	-	-	-
	VII	-	-	-	-	-	-	-
	VIIIabd	-	-	-	-	-	-	-
	VIIIc	-	-	-	-	-	-	-
	ALL	-	-	-	-	-	-	-
TOTAL ALL GEAR/ALL AREAS		**113634**	**113634**	**197307**	**355128**	**268407**	**493583**	**285612**

Table 2. Total Cuttlefish Catches (in kg) of the Basque Country during the period 1994-1999 by sea area and gear. Fishing gear is summarised in **trawlers**, **longliners**, **purseiners**, **nets artisanal hook and lines** and **artisanal traps or pots.**

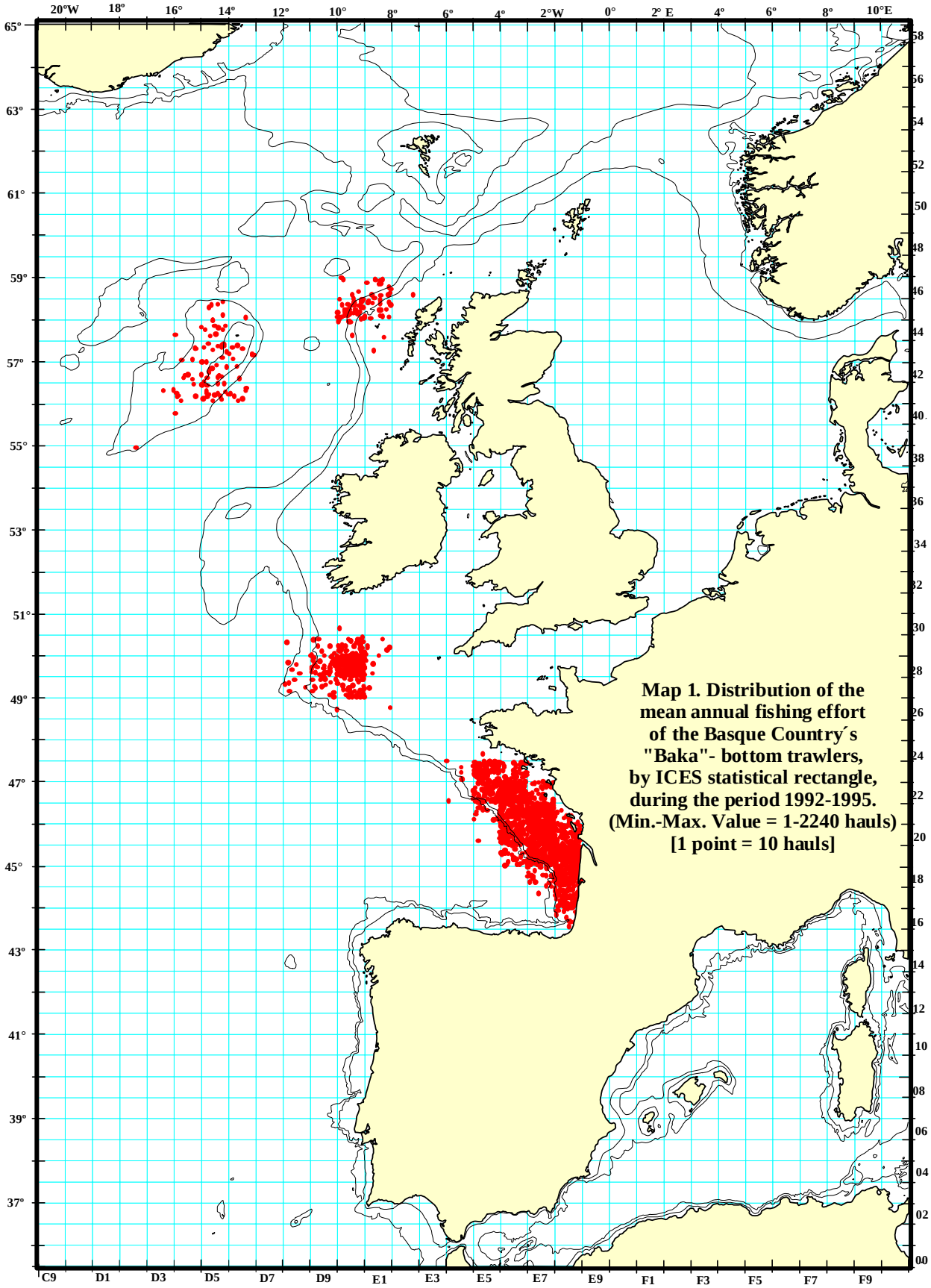
Gear	Area	1.999	1.998	1.997	1.996	1.995	1.994	Mean
All Trawlers	VI	-	-	-	-	-	-	-
	VII	1893	130	34	366	302	4214	**1009**
	VIIIabd	253143	317331	86933	364558	162804	440648	**274455**
	VIIIc	0	1597	1281	2265	527	1204	**1375**
	ALL	**255036**	**319058**	**88248**	**367189**	**163633**	**446067**	**276839**
All Longliners	VI	-	-	-	-	-	-	-
	VII	-		-	-	-	-	-
	VIIIabd	-	237	48	-	-	-	**143**
	VIIIc	-	96	451	155	197	-	**225**
	ALL	-	**333**	**499**	**155**	**197**	-	**296**
All Purseiners	VI	-		-	-	-	-	-
	VII	-		-	-	-	-	-
	VIIIabd	-		-	-	-	-	-
	VIIIc	-	1	21	3	22	-	**12**
	ALL	-	**1**	**21**	**3**	**22**	-	**12**
All Nets	VI	-		-	-	-	-	-
	VII	-		-	-	-	-	-
	VIIIabd	-	5037	4156	-	-	-	**4597**
	VIIIc	-	5723	2764	6599	6230	-	**5329**
	ALL	-	**10760**	**6920**	**6599**	**6230**	-	**7627**
All Artisanal Hook and Lines	VI	-		-	-	-	-	-
	VII	-		-	-	-	-	-
	VIIIabd	-		226	-	-	-	**226**
	VIIIc	-	24	56	433	518	-	**258**
	ALL	-	**24**	**282**	**433**	**518**	-	**314**
All Artisanal Traps and Pots	VI	-	-	-	-	-	-	-
	VII	-	-	-	-	-	-	-
	VIIIabd	-	-	-	-	-	-	-
	VIIIc	-	-	-	428	4	-	**216**
	ALL	-	-	-	**428**	**4**	-	**216**
TOTAL ALL GEAR/ALL AREAS		**325902**	**325902**	**95970**	**374807**	**170604**	**446067**	**282670**

Table 3. Total Short-finned squid Catches (in kg) of the Basque Country during the period 1994-1999 by sea area and gear. Fishing gear is summarised in **trawlers**, **longliners**, **purseiners**, **nets artisanal hook and lines** and **artisanal traps or pots**.

Gear	Area	1.999	1.998	1.997	1.996	1.995	1.994	Mean
All Trawlers	VI	-	-	-	-	-	-	-
	VII	70871	40126	9044	40560	53415	31191	**34867**
	VIIIabd	97904	106213	280662	121833	82675	338064	**185889**
	VIIIc	0	6759	71932	37110	3941	2290	**24406**
	ALL	**168775**	**153098**	**361638**	**199503**	**140031**	**371545**	**245163**
All Longliners	VI	-		-	-	-	-	-
	VII	-		-	-	-	-	-
	VIIIabd	-	415	29	-	9	-	**151**
	VIIIc	-	0	-	20	5	-	**8**
	ALL	-	**415**	**29**	**20**	**14**	-	**120**
All Purseiners	VI	-		-	-	-	-	-
	VII	-		-	-	-	-	-
	VIIIabd	-		-	-	-	-	-
	VIIIc	-	32	200	980	2	-	**304**
	ALL	-	**32**	**200**	**980**	**2**	-	**304**
All Nets	VI	86	-	-	-	-	-	-
	VII	990	**528**	-	-	-	-	-
	VIIIabd	3020	10013	1317	-	-	-	**5665**
	VIIIc	-	**102**	127	1456	619	-	**576**
	ALL	**4096**	**10643**	**1444**	**1456**	**619**	-	**3541**
All Artisanal Hook and Lines	VI	-	-	-	-	-	-	-
	VII	-	-	-	-	-	-	-
	VIIIabd	-	-	-	-	-	-	-
	VIIIc	-	-	-	-	-	-	-
	ALL	-	-	-	-	-	-	-
All Artisanal Traps and Pots	VI	-	-	-	-	-	-	-
	VII	-	-	-	-	-	-	-
	VIIIabd	-	-	-	-	-	-	-
	VIIIc	-	-	-	-	-	-	-
	ALL	-	-	-	-	-	-	-
TOTAL ALL GEAR/ALL AREAS		**168553**	**168553**	**363311**	**201959**	**140666**	**371545**	**249207**

Table 4. Total Octopus Catches (in kg) of the Basque Country during the period 1994-1999 by sea area and gear. Fishing gear is summarised in **trawlers**, **longliners**, **purseiners**, **nets artisanal hook and lines** and **artisanal traps or pots**.

Gear	Area	1.999	1.998	1.997	1.996	1.995	1.994	TOTAL
All Trawlers	VI	-	-	-	-	-	-	-
	VII	41819	82153	115662	230668	320113	148614	**179442**
	VIIIabd	148227	141668	193964	114945	73538	198841	**144591**
	VIIIc	-	30324	76353	17895	652	1006	**25246**
	ALL	**190046**	**254145**	**385979**	**363508**	**394303**	**348461**	**349279**
All Longliners	VI	-	-	-	-	-	-	-
	VII	-		-	-	-	-	-
	VIIIabd	-	451	571	-	-	-	**511**
	VIIIc	-	9749	7624	2108	8199	-	**6920**
	ALL	-	**10200**	**8195**	**2108**	**8199**	-	**7176**
All Purseiners	VI	-	-	-	-	-	-	-
	VII	-	-	-	-	-	-	-
	VIIIabd	-	-	-	-	-	-	-
	VIIIc	-	19	3	2	6	-	**8**
	ALL	-	**19**	**3**	**2**	**6**	-	**8**
All Nets	VI	-	-	-	-	-	-	-
	VII	-	-	-	-	-	-	-
	VIIIabd	-	3090	1830	-	-	-	**2460**
	VIIIc	-	2789	988	1349	2637	-	**1941**
	ALL	-	**5879**	**2818**	**1349**	**2637**	-	**3171**
All Artisanal Hook and Lines	VI	-	-	-	-	-	-	-
	VII	-	-	-	-	-	-	-
	VIIIabd	-	313	854	-	-	-	**584**
	VIIIc	-	415	366	212	325	-	**330**
	ALL	-	**728**	**1220**	**212**	**325**	-	**621**
All Artisanal Traps and Pots	VI	-	-	-	-	-	-	-
	VII	-	-	-	-	-	-	-
	VIIIabd	-	4331	1694	-	-	-	**3013**
	VIIIc	-	9963	9071	7542	2748	-	**7331**
	ALL	-	**14294**	**10765**	**7542**	**2748**	-	**8837**
TOTAL ALL GEAR/ALL AREAS		**270633**	**270633**	**408980**	**374721**	**408218**	**348461**	**362202**



Map 1. Distribution of the mean annual fishing effort of the Basque Country´s "Baka"- bottom trawlers, by ICES statistical rectangle, during the period 1992-1995. (Min.-Max. Value = 1-2240 hauls) [1 point = 10 hauls]

Table 5. Fishing effort (1), in number of trips, and Landings (in tonnes) per fishing effort (LPFE) for Squid (2), Cuttlefish (3), Short-finned squid (4) and Octopus (5), by gear and sea area of the main fleets in the Basque Country, in 1994-1999. (Different types of trawl -"Baka, "Bou" and "PR" (Pair-trawls with net of Very High Vertical Opening)- and longliner are presented). Data from 1.999 has to be considered as preliminar.

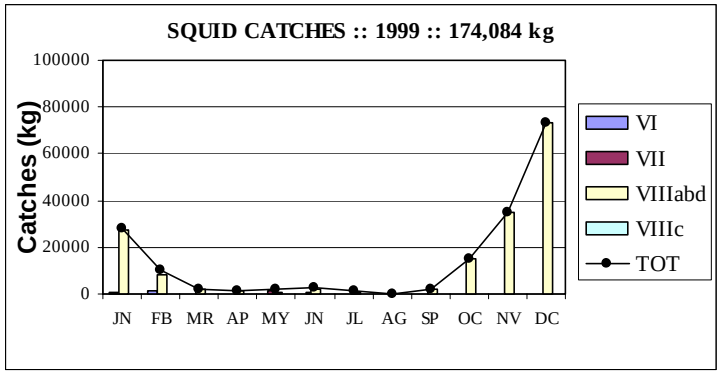
5.1) FISHING EFFORT		1999			1998			1997			1996			1995			1994		
		N. trips			N. trips			N. trips			N. trips			N. trips			N. trips		
Gear	**Type**	VIII abd	VII	VI	VIII abd	VII	VI	VIII abd	VII	VI	VIII abd	VII	VI	VIII abd	VII	VI	VIII abd	VII	VI
Trawl	"Baka"	414	193	119	543	155	102	821	73	87	886	147	92	826	158	83	1050	146	83
	"Bou"	39	2		10	6		110	30		136	44		297	41		367	31	
	"VHVO Pair trawls"	520	64		472	11		515	3		482	8		314			161		
	"Twin net tralw"	7	12																
TOTAL-TRAWL		**980**	**271**	**119**	**1025**	**172**	**102**	**1446**	**106**	**87**	**1504**	**199**	**92**	**1437**	**199**	**83**	**1578**	**177**	**83**
Longliner	PLC+PLB	45	31		47	80	2	16	36	32	166	21	62	252	16	30	270	20	85
	PLI										20			13					
	PLO										2			16					
TOTAL-LONGLINER		**45**	**31**	**0**	**47**	**80**	**2**	**16**	**36**	**32**	**188**	**21**	**62**	**281**	**16**	**30**	**270**	**20**	**85**
Others	Gillnet	14	9	3	66	8	16	23											
	Traps, Pots							21											
TOTAL-OTHERS		**14**	**9**	**3**	**66**	**8**	**16**	**44**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
GRAND TOTAL		**1039**	**311**	**122**	**1138**	**260**	**120**	**1506**	**142**	**119**	**1692**	**220**	**154**	**1718**	**215**	**113**	**1848**	**197**	**168**

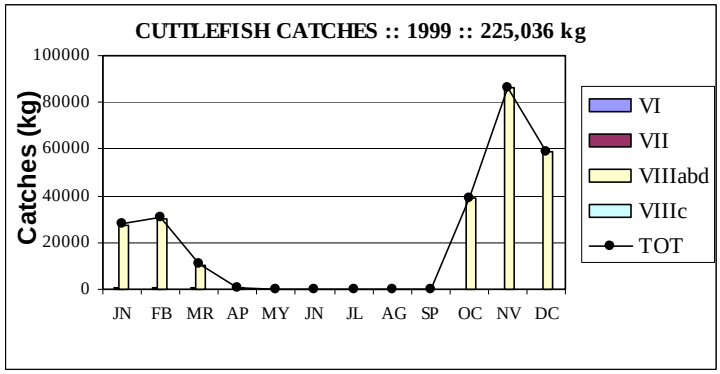
5.2) LPFE for Squid		1999			1998			1997			1996			1995			1994		
		Landings/Trip			Landings/Trip			Landings/Trip			Landings/Trip			Landings/Trip			Landings/Trip		
Gear	**Type**	VIII abd	VII	VI	VIII abd	VII	VI	VIII abd	VII	VI	VIII abd	VII	VI	VIII abd	VII	VI	VIII abd	VII	VI
Trawl	"Baka"	0,311	0,003	0,016	0,113	0,008	0,058	0,131	0,024	0,016	0,310	0,011	0,012	0,152	0,013	0,029	0,437	0,031	0,021
	"Bou"	0,013			0,036	0,004		0,011	0,001		0,007	0,002		0,033	2,703		0,015	0,011	
	"VHVO Pair trawls"	0,077	0,033		0,038	0,108		0,131	0,000		0,007	0,068		0,016			0,142		
	"Twin net tralw"																		
TOTAL-TRAWL		**0,173**	**0,010**	**0,016**	**0,078**	**0,014**	**0,058**	**0,122**	**0,017**	**0,016**	**0,228**	**0,009**	**0,012**	**0,098**	**0,567**	**0,029**	**0,308**	**0,028**	**0,021**
Longliner	PLC+PLB				0,000			0,001											
TOTAL-LONGLINER					**0,000**			**0,001**											
Others	Gillnet				0,010			0,005											
	Traps, Pots																		

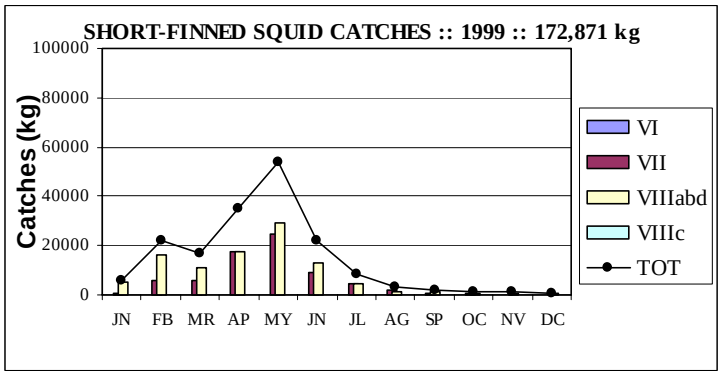
5.3) LPFE for Cuttlefish		1999			1998			1997			1996			1995			1994		
		Landings/Trip			Landings/Trip			Landings/Trip			Landings/Trip			Landings/Trip			Landings/Trip		
Gear	**Type**	VIII abd	VII	VI	VIII abd	VII	VI	VIII abd	VII	VI	VIII abd	VII	VI	VIII abd	VII	VI	VIII abd	VII	VI
Trawl	"Baka"	0,572	0,009	1,575	0,522	0,001		0,091	0,000		0,390	0,002		0,196	0,002		0,416	0,029	
	"Bou"	0,017	0,014		0,075			0,004	0,000		0,013			0,002	0,000		0,005	0,001	
	"VHVO Pair trawls"	0,030	0,001		0,070			0,023	0,003		0,036			0,001			0,012		
	"Twin net tralw"																		
TOTAL-TRAWL		**0,258**	**0,007**		**0,308**	**0,001**		**0,060**	**0,000**		**0,242**	**0,002**		**0,113**	**0,002**		**0,279**	**0,024**	
Longliner	PLC+PLB				0,005			0,003											
TOTAL-LONGLINER					**0,005**			**0,003**											
Others	Gillnet				0,076														
	Traps, Pots																		

5.4) LPFE for Short-finned squid		1999			1998			1997			1996			1995			1994		
		Landings/Trip			Landings/Trip			Landings/Trip			Landings/Trip			Landings/Trip			Landings/Trip		
Gear	**Type**	VIII abd	VII	VI	VIII abd	VII	VI	VIII abd	VII	VI	VIII abd	VII	VI	VIII abd	VII	VI	VIII abd	VII	VI
Trawl	"Baka"	0,085	0,241	0,001	0,092	0,201		0,159	0,106		0,054	0,275		0,065	0,338		0,198	0,201	
	"Bou"	0,249	0,858		0,769	0,007		0,315	0,042		0,164	0,003		0,007			0,301	0,061	
	"VHVO Pair trawls"	0,101	0,357		0,103	0,828		0,225	0,010		0,107	0,005		0,086			0,119		
	"Twin net tralw"																		
TOTAL-TRAWL		**0,100**	**0,262**	**0,001**	**0,104**	**0,234**		**0,194**	**0,085**		**0,081**	**0,204**		**0,058**	**0,027**		**0,214**	**0,176**	
Longliner	PLC+PLB				0,009			0,002						0,000					
TOTAL-LONGLINER					**0,009**			**0,002**						**0,000**					
Others	Gillnet	0,217	0,109	0,029	0,152	0,066	0,090	0,057											
	Traps, Pots																		

5.5) LPFE for Octopus		1999			1998			1997			1996			1995			1994		
		Landings/Trip			Landings/Trip			Landings/Trip			Landings/Trip			Landings/Trip			Landings/Trip		
Gear	**Type**	VIII abd	VII	VI	VIII abd	VII	VI	VIII abd	VII	VI	VIII abd	VII	VI	VIII abd	VII	VI	VIII abd	VII	VI
Trawl	"Baka"	0,320	0,216		0,237	0,530		0,213	1,583		0,120	1,569		0,078	2,009		0,171	1,015	
	"Bou"	0,110			0,349	0,002		0,053	0,003		0,021	0,001		0,016	0,066		0,049	0,015	
	"VHVO Pair trawls"	0,022	0,001		0,020	0,012		0,025	0,007		0,012	1,274		0,013			0,008		
	"Twin net tralw"																		
TOTAL-TRAWL		**0,151**	**0,155**		**0,138**	**0,478**		**0,134**	**1,091**		**0,076**	**1,159**		**0,051**	**1,609**		**0,126**	**0,840**	
Longliner	PLC+PLB				0,010			0,036											
TOTAL-LONGLINER					**0,010**			**0,036**											
Others	Gillnet				0,047			0,080											
	Traps, Pots							0,081											







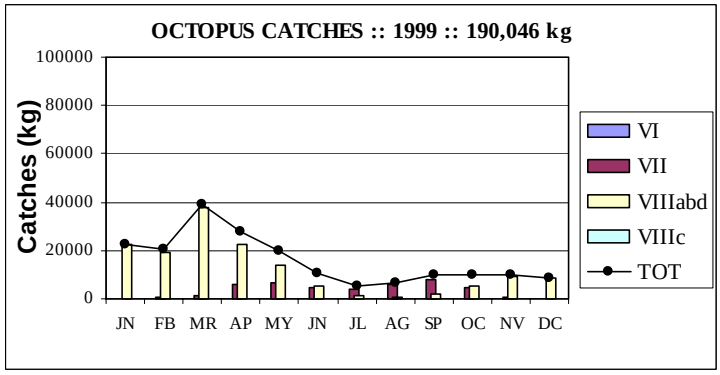
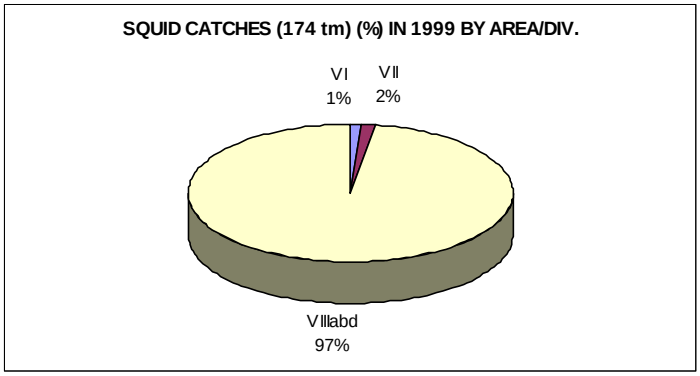
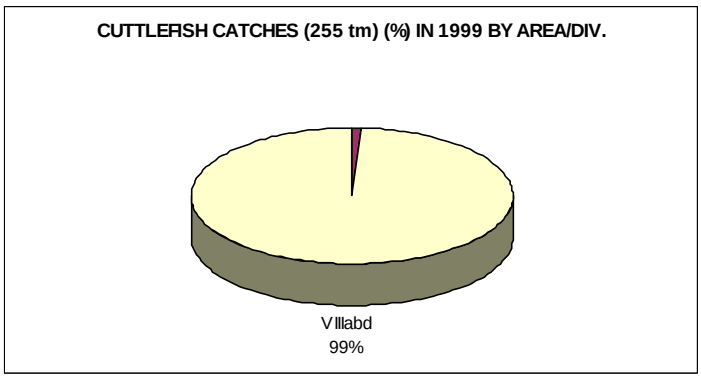
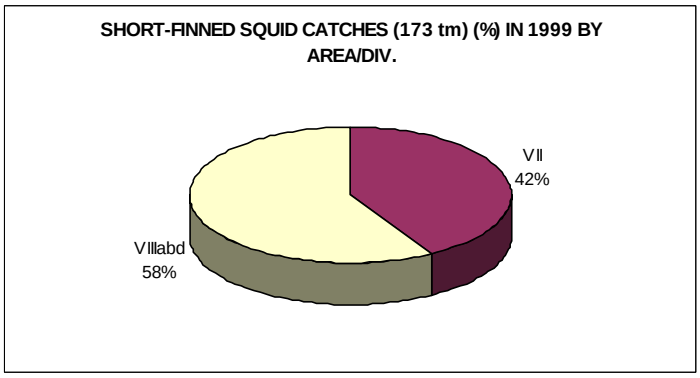


Figure 1. Monthly distribution of the Basque Country Catches (landings) (in kg) of Squid, Cuttlefish, Short-finned squid and Octopus, by sea area, in 1999.







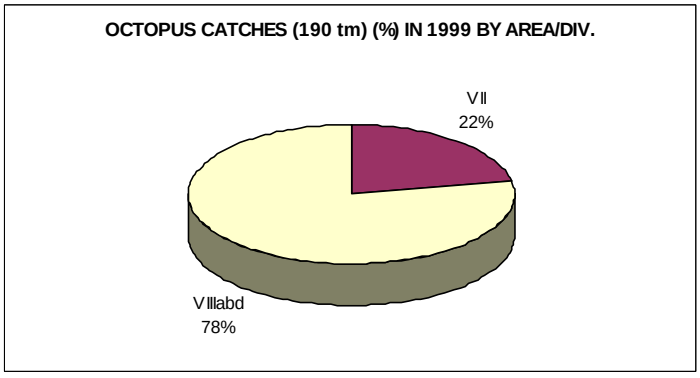
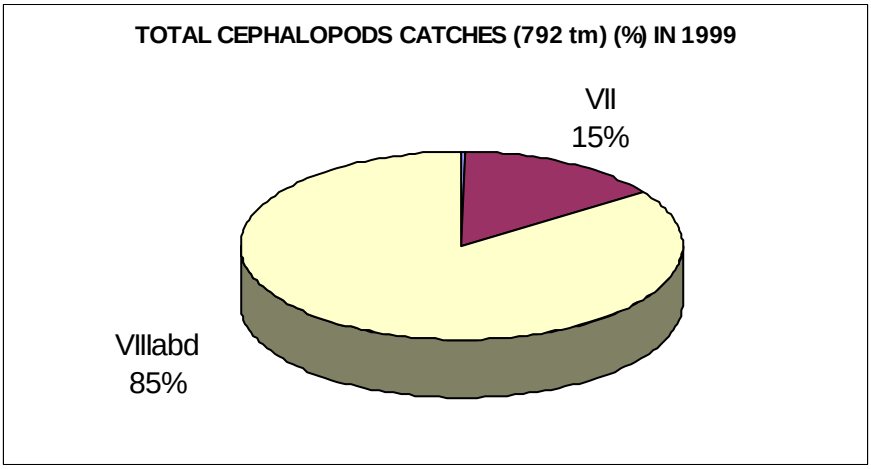


Figure 2. Percentage of the Basque Country Catches (landings) of Squid, Cuttlefish, Short-finned squid and Octopus, by sea area, in 1999.



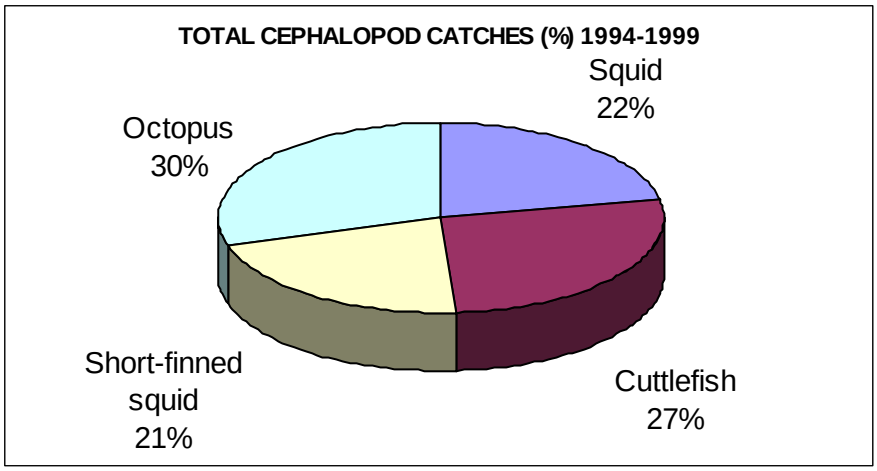
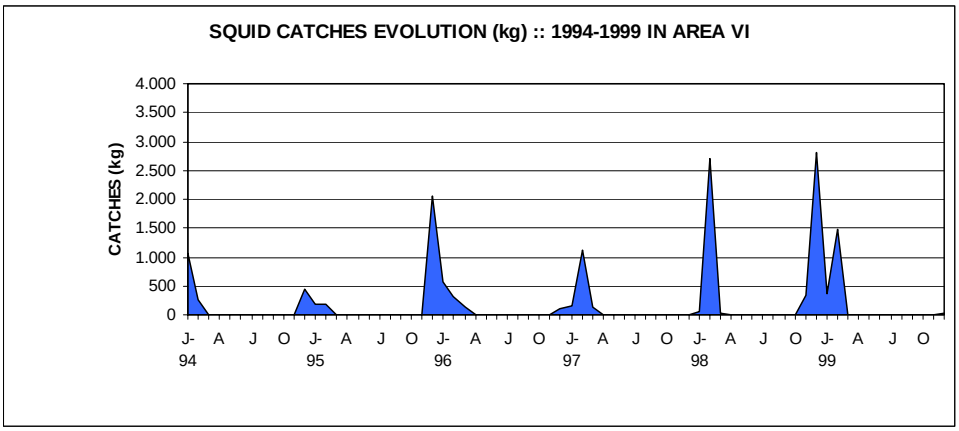
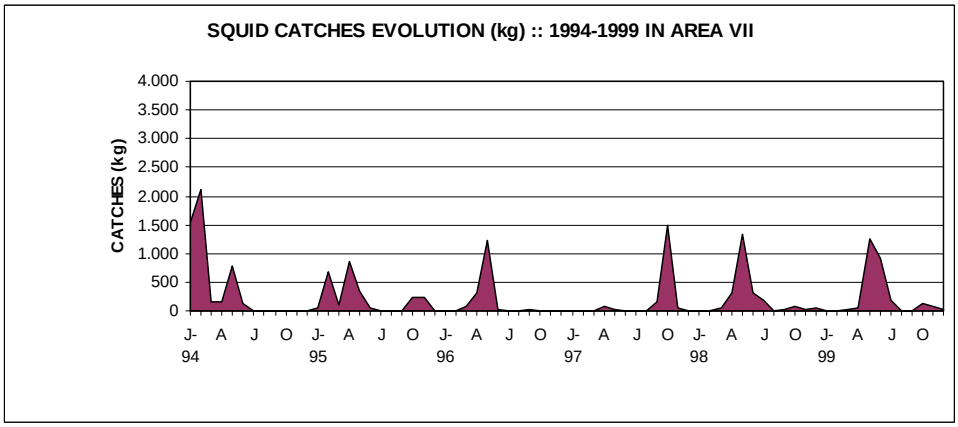
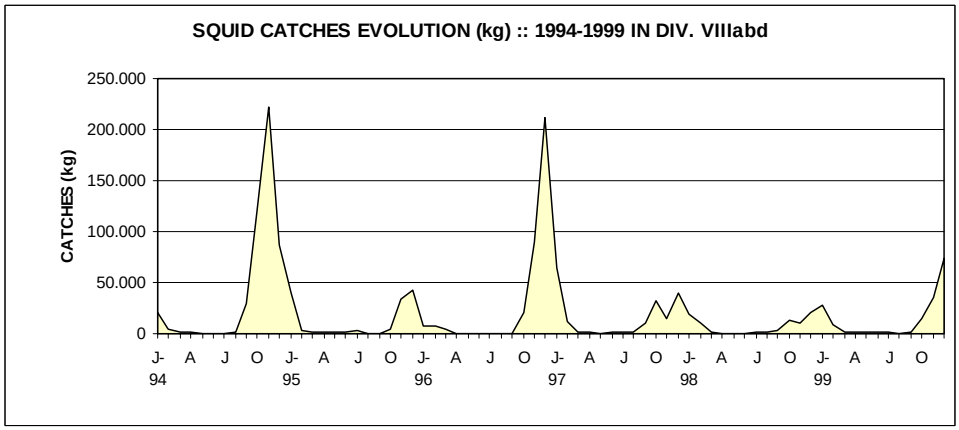


Figure 3. Total composition (in %) of the Basque Country Catches (landings). Above: By sea area for 1999 (preliminary data).Below: By species group for the total period 1994-1999.







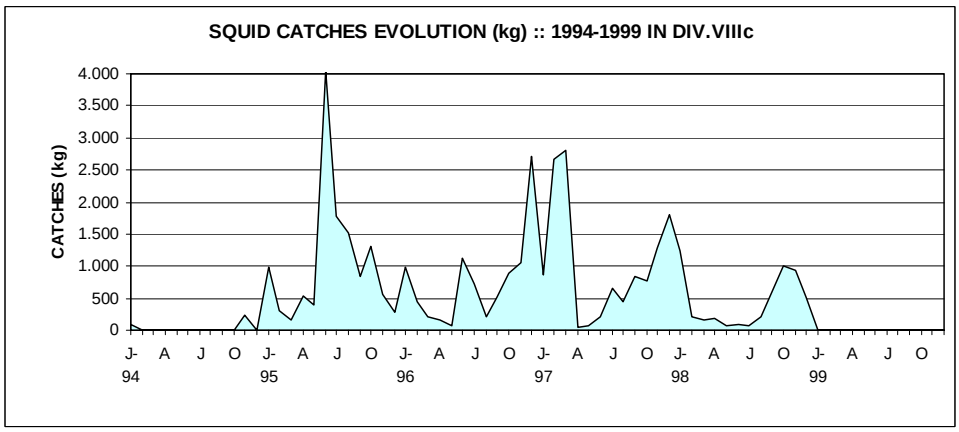
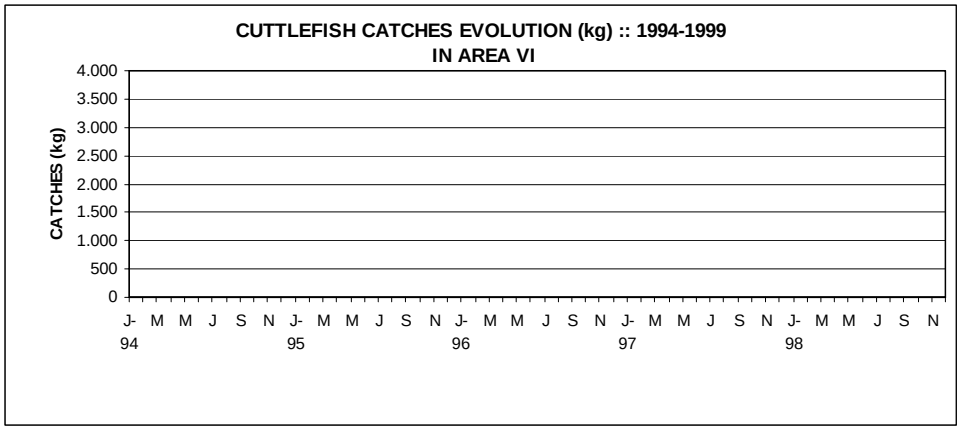
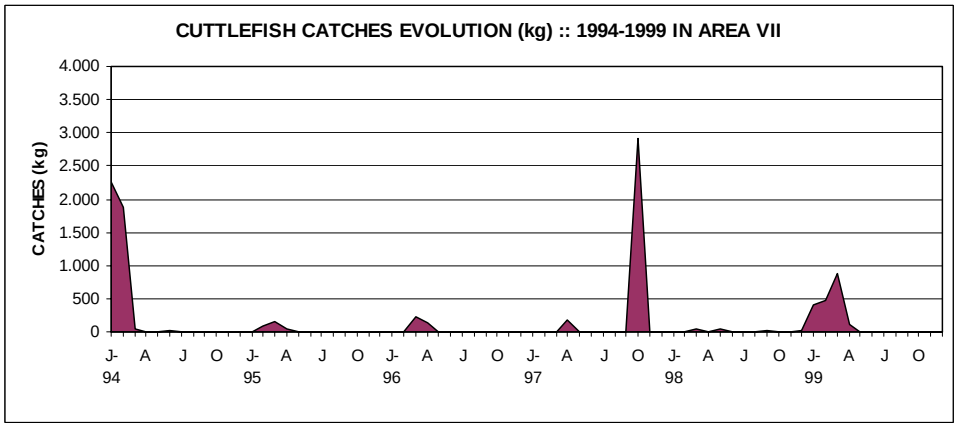
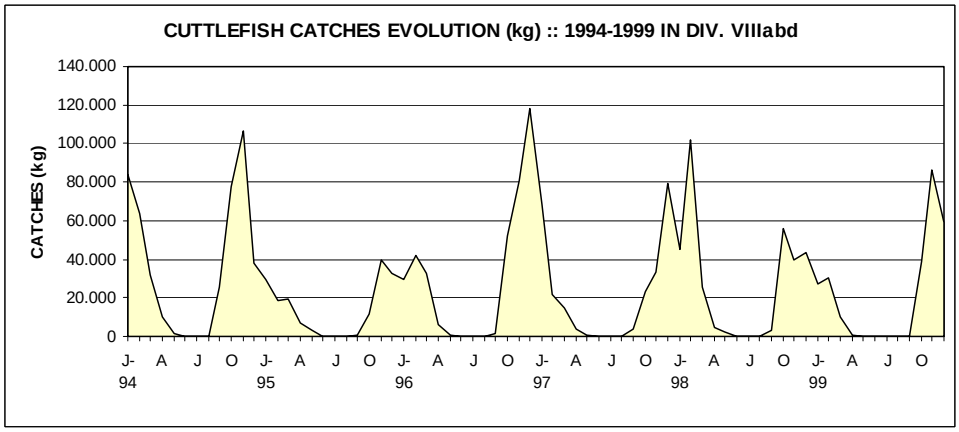


Figure 4. Squid Catches evolution (in kg) of the Basque Country by sea area for the total period 1994-1999







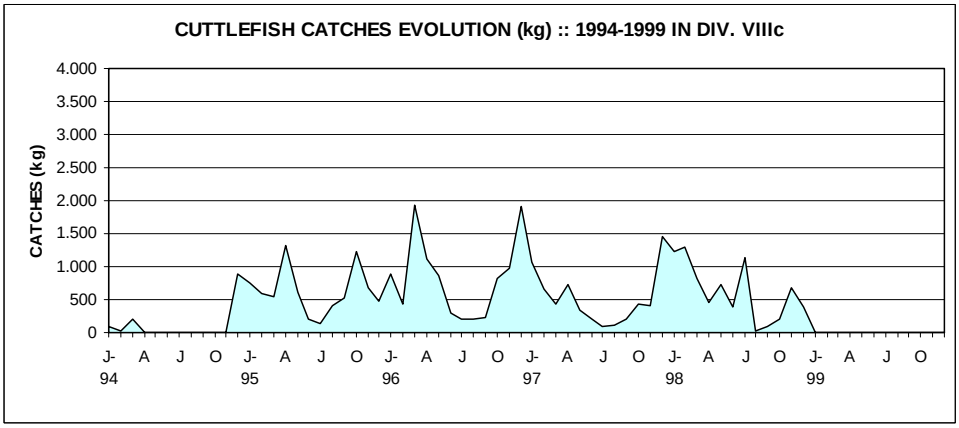
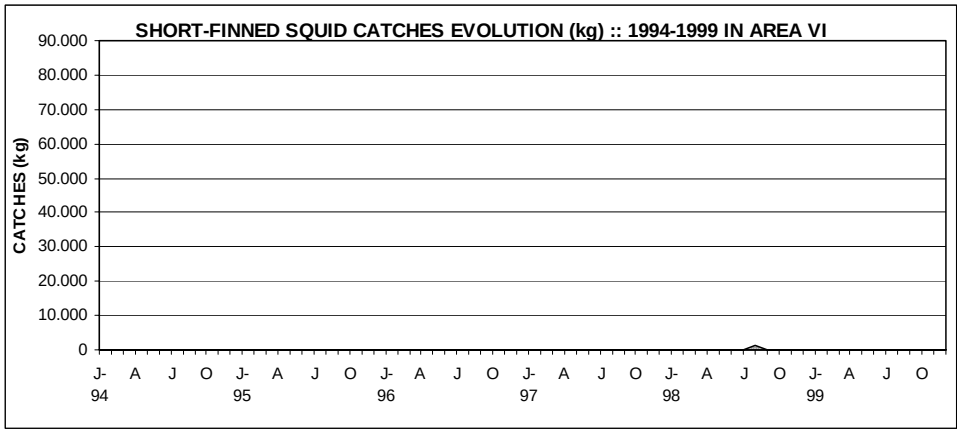
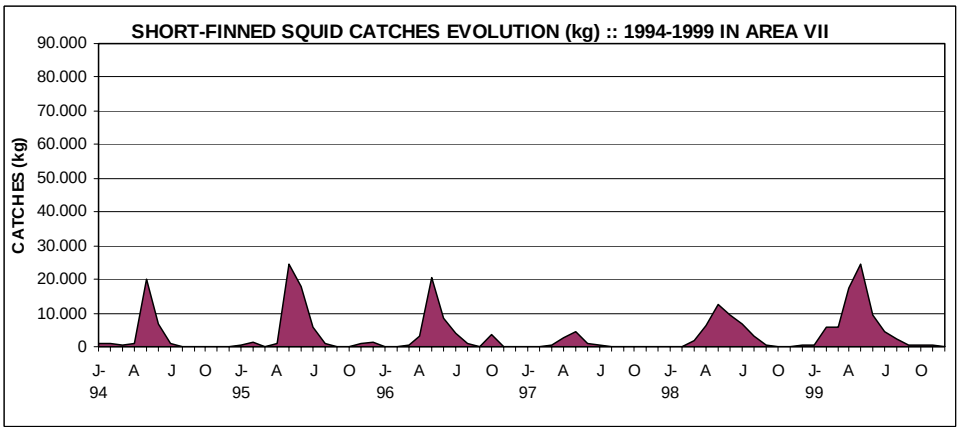
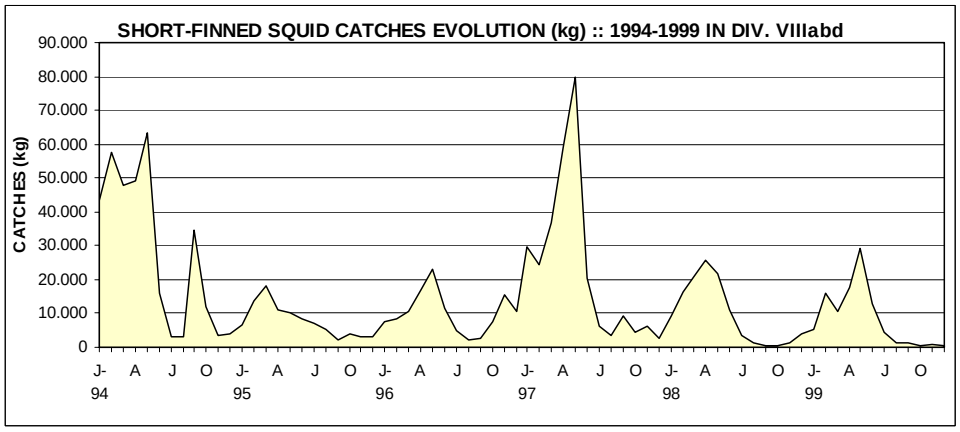


Figure 5. Cuttlefish Catches evolution (in kg) of the Basque Country by sea area for the total period 1994-1999







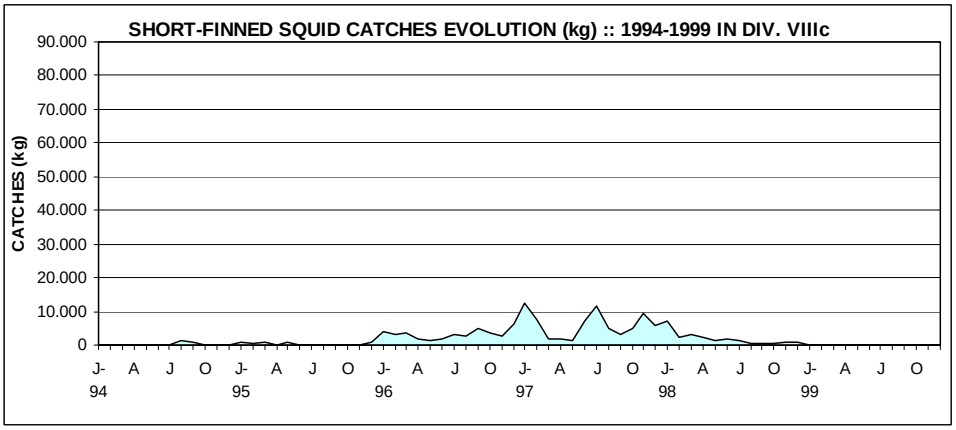
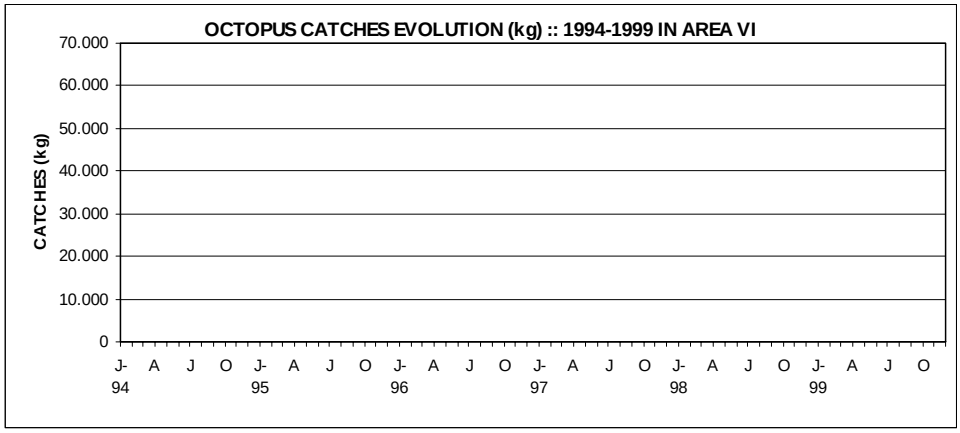
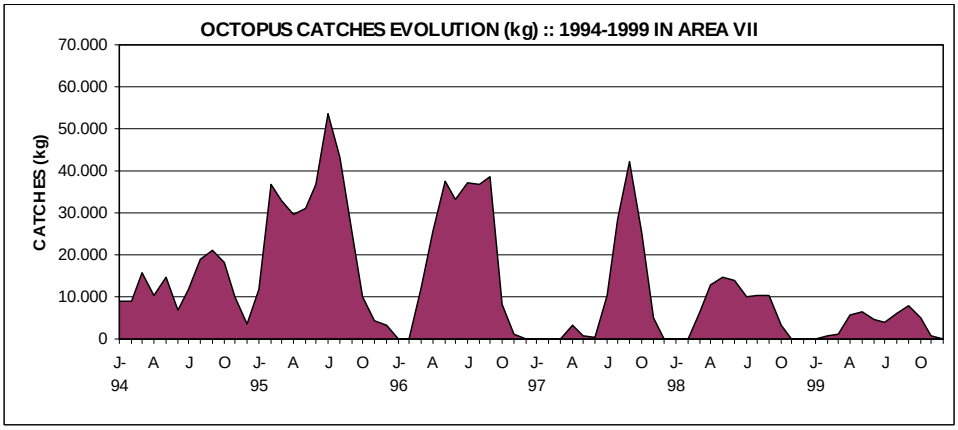
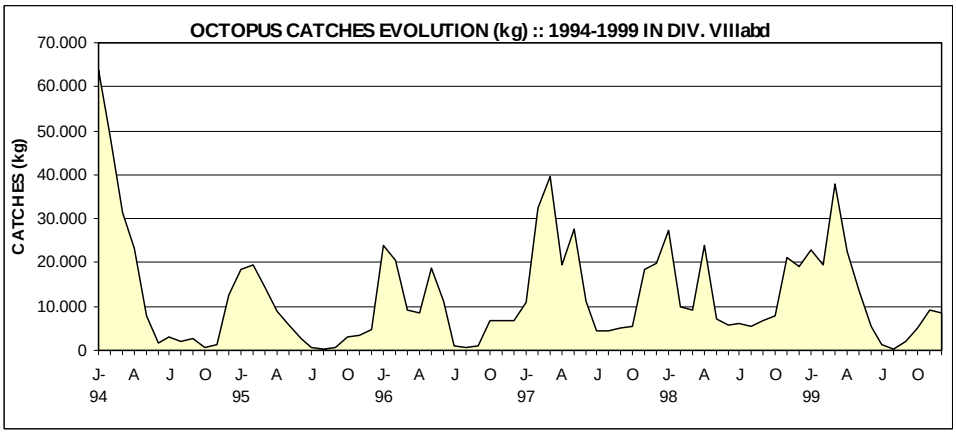


Figure 6. Short-finned squid Catches evolution (in kg) of the Basque Country by sea area for the total period 1994-1999







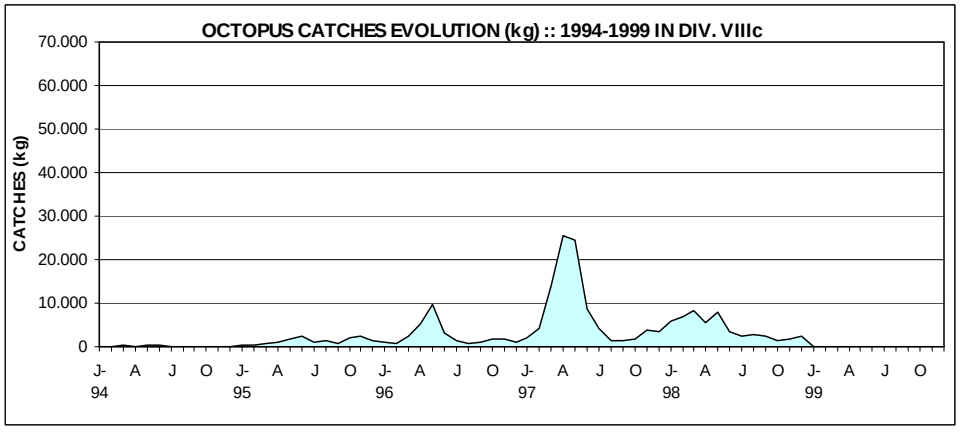
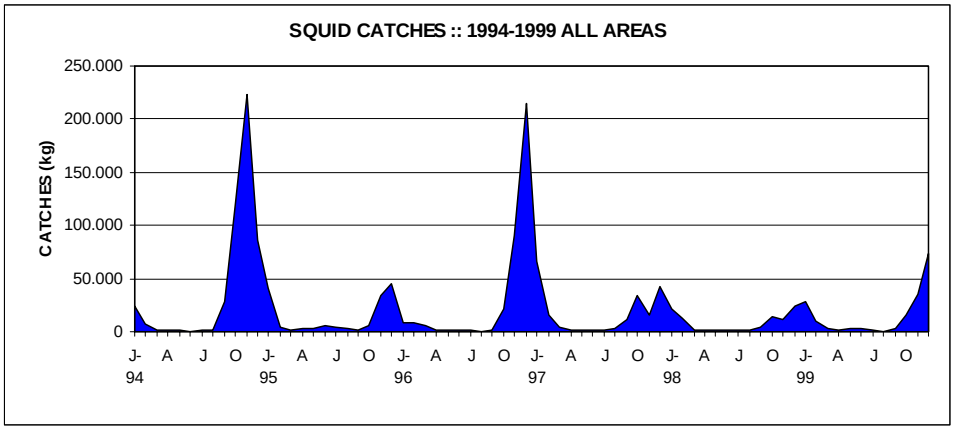
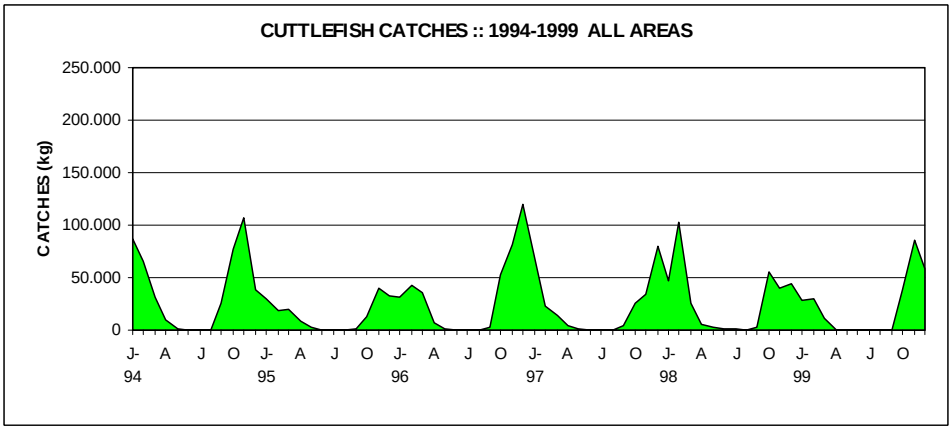
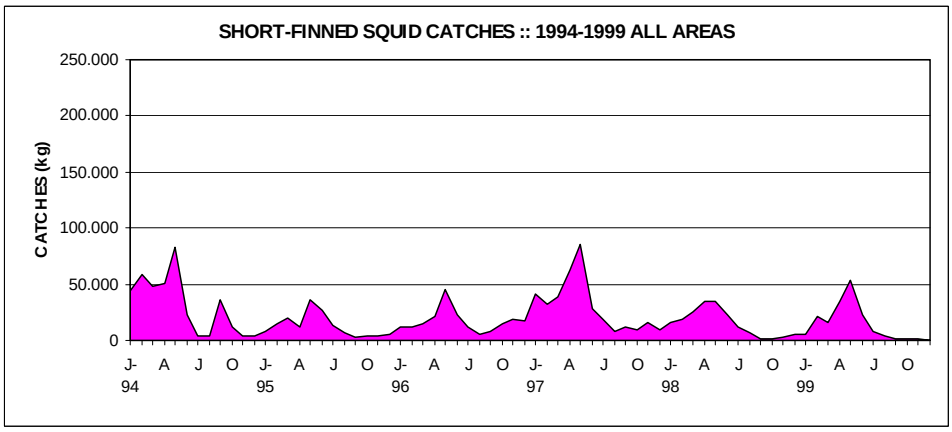


Figure 7. Octopus Catches evolution (in kg) of the Basque Country by sea area for the total period 1994-1999.







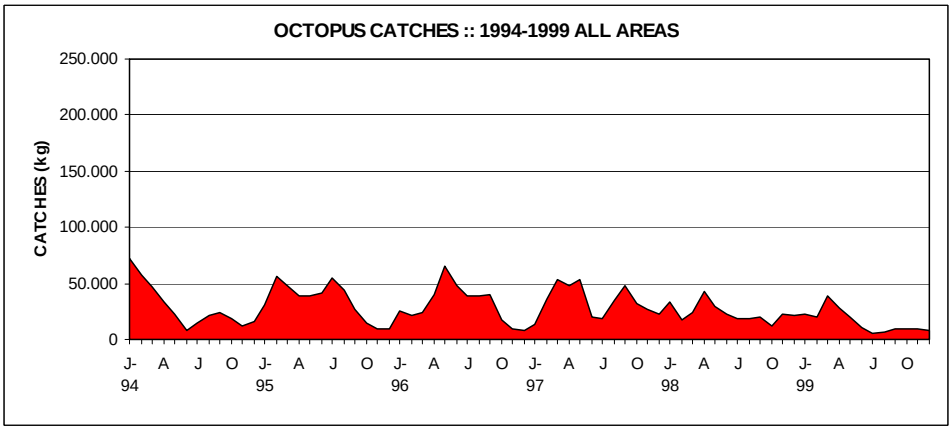


Figure 8. Cephalopods Catches evolution (in kg) of the Basque Country by specie group considering all Areas and Divisions together (VI, VII, VIIIabd and VIIIc) for the total period 1994-1999

ANNEX 6

WGCEPH MEETING, 7-11 FEBRUARY 2000 IN ABERDEEN, UK

CEPHALOPOD REFERENCE LIST 1999-2000

Adamo, S. A. & Weichelt, K. J., 1999. Field observations of schooling in the oval squid, *Sepioteuthis lessoniana* (Lesson, 1830). *Journal of Molluscan Studies* **65**, 377-380.

Adcock, G.J., Carvalho, G.R., Rodhouse, P.G. & Shaw, P.W., 1999. Highly polymorphic microsatellite loci of the heavily fished squid genus Illex (Ommastrephidae). *Molecular Ecology* **8**, 165-167.

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ANNEX 7

WGCEPH MEETING, 7-11 FEBRUARY 2000 IN ABERDEEN, UK

CEPHALOPOD GREY LITERATURE (1999-2000)

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