

ANNEX 1. SCIENTIFIC COUNCIL SPECIAL SESSION
REPORT OF THE SYMPOSIUM ON DEEP-SEA FISHERIES

Hosted by the Scientific Council of the Northwest Atlantic Fisheries Organization (NAFO)
12-14 September 2001

The Symposium, *Deep-Sea Fisheries*, was held at the Centro de Convenciones de Plaza de América, Varadero, Matanzas, Cuba, with co-conveners J. A. Moore (NAFO), J. D. M. Gordon (ICES), and A. Koslow (CSIRO) during 12-14 September 2001. There were 104 participants from Australia, Austria, Brazil, Canada, Cuba, Denmark, Estonia, Faroe Islands, France, Greece, Iceland, Ireland, Italy, Mexico, New Zealand, Norway, Poland, Portugal, Russia, Spain, United Kingdom, and United States of America.

W. B. Brodie, Chairman of Scientific Council, opened the symposium by welcoming the participants and presenting a brief overview of NAFO and its activities. The participants were welcomed by Mr. E. Oltuski, Ministerio de la Industria Pesquera, Cuba, as the Cuban host, and the President of NAFO and Chairman of General Council.

J. D. M. Gordon welcomed the participants on behalf of the co-conveners. He noted that a theme session on deep-water fish and fisheries at the 1998 ICES Annual Science Conference had resulted in a record number of oral presentations and posters. This meeting had exceeded that number indicating both the rapid development of deep-water fisheries and concerns about their sustainability. He explained that there would be changes to the schedule resulting from the cancellation and/or late arrival of speakers due to the closure of all airports in the USA following the events of 11 September. Regrettably the NAFO co-convener, J. A. Moore, was unable to attend the symposium.

The co-conveners invited D. Power and W. R. Bowering to Chair the sessions on "Redfish" and "Greenland halibut", respectively. M. Clark was invited to Chair the opening session on "Deepwater Fisheries".

The Symposium considered current research, advances and impacts of deep-water fisheries in many different locations around the world. In addition, two sessions were devoted to important deep-water fisheries (Greenland halibut and redfish) of the North Atlantic area.

Three invited speakers addressed specific issues within the six sessions. Thirty-five other oral presentations were delivered and 62 posters were displayed. Posters were highlighted in the Greenland halibut session during which five poster authors presented 5-minute summaries of their work.

SESSION 1. DEEPWATER FISHERIES

The first part of this session, chaired by J. A. Koslow, mostly consisted of descriptions of developing deep-water fisheries. The leadoff invited paper by Koslow and co-authors reviewed recent evidence for high diversity and endemism and highly localized distributions of seamount benthic communities, based on data from the Southwest Pacific. Trawl fishing was shown to be capable of severely impacting these communities, leading to the need to conserve this fauna based on localized networks of representative protected areas.

One paper covered preliminary faunal information from exploratory work at Bear Seamount, just off Georges Bank that had revealed a rich fauna, including 115 species of fish. Another paper described recent trends in the deep-water fishery off southern Brazil and emphasized the need for orderly development of that region's deepwater fishery, based on initial explorations now being carried out with chartered foreign fishing vessels. Their systematic exploration, based on use of a range of gears over that country's deepwater zone, provided a valuable model for deepwater fishery development. In contrast, a paper on the Spanish multi-species deep-sea fishery in the international waters of the Hatton Bank (ICES Sub-area XII) described the rapid development of the Spanish trawl fishery for *Alepocephalus bairdii* (Baird's smoothhead) and *Coryphaenoides rupestris* (roundnose grenadier). Only five years old, the fishery is already Spain's largest deepwater trawl fishery. Data on both the Spanish and Brazilian fisheries is obtained by observers working from commercial vessels. The Spanish fishery already shows signs of declining catch and catch per unit of effort, indicating that a cautious approach to future management of the fishery is warranted. A space in the program was filled by an unscheduled paper by Hareide, Langedal, Garner and Dyb entitled "Hatton Bank resources and catch results – results from Norwegian exploratory fisheries" that presented interesting results from Hatton Bank, showing a clear relationship between the fish assemblages and water mass

characteristics. The fish fauna within the arctic-influenced water to the west of the bank had more coldwater affinities, while the fauna to the east had more typically Atlantic affinities. The authors pointed out that the present division of the region into several ICES sub-areas was probably no longer appropriate scientifically for management of the region.

Another paper on the distribution and density of carnivorous fish species around Lanzarote and Fuerteventura, Canary Islands, used multivariate statistics to extract information from commercial long-line data on community structure in relation to depth and potentially hydrological factors. Their approach illustrated the potential to obtain important ecological information from available commercial catch data. This first session ended with a review of recent catch records, which extend the range for *Hoplostethus atlanticus* (orange roughy) into Canadian waters. The catches were generally quite low, on the order of one individual per set, so the fishery potential appears negligible at present.

J. D. M. Gordon chaired the second part of this much depleted session and presented his invited paper, which aimed to provide an overview of the Rockall Trough (northeast Atlantic) and its deep-water fisheries. Deep-water fishes were first dredged from the area in 1868 and since the 1970s there have been many surveys. The deep-water fishery that began in the 1980s has been well documented and can provide insights into the fishery effects on the ecosystem. The other presentation in this session described a comparison of a long-line and a gill net fishery for *Merluccius merluccius* (hake) in deep-water off southern Portugal.

SESSION 2. GREENLAND HALIBUT

This session, which was chaired by W. R. Bowering, comprised 10 presentations grouped into three themes. Two papers were concerned with the effects of fishing on growth and fishing patterns. Two papers considered stock structure issues and six papers described studies on maturation (e.g. length- and age-at-maturity, ovarian maturation and fecundity). The concluding discussion focused almost entirely on the maturation issues. The key results were 1) that length and age at maturity indicated high interannual variation among stocks throughout the North Atlantic; 2) the interpretation of the maturity cycle can be difficult since it has been shown that the fish may not spawn annually and 3) the length and age at maturity was rather similar throughout the North Atlantic except for NAFO Div. 2J+3K where fish matured at a larger size and age. It was also noted that some imprecision in the length- and age-at-maturity can be caused by errors in the visual interpretation of the immature and resting stages and it was suggested that precision could be improved by using histological techniques for interpreting maturity stages. It was also suggested that some of the annual variation observed in length- and age-at-first-maturity might be removed if sampling could be spread throughout the year. For practical purposes averaging maturity rates over some years may be useful for approximating SSB trends.

At the conclusion of the session it was suggested that it might be useful to consider whether the experience of managing long established Greenland halibut fisheries might have something to offer to the management of some of the new deep-water fisheries. It was noted that all Greenland halibut stocks declined rapidly when F increased even at relatively low average values. SSB remains at low levels in most stocks in the North Atlantic but when F is reduced the population can rebuild fairly rapidly as demonstrated by the NAFO Subarea 2 and Div. 3KLMNO stock. However, it remains to be seen whether the SSB will improve to former levels for this stock. From the experience of Greenland halibut it was clear that other species that live much longer, grow slower and have a lower reproductive potential will be much more sensitive to F, even at much lower values. Any stock rebuilding will take much longer, if it occurs at all.

SESSION 3. DEEP-WATER FISHERIES; IMPACTS ASSESSMENT AND MANAGEMENT

The session, chaired by M. Clark opened with his invited paper describing the deepwater trawl fishery for orange roughy on seamounts off New Zealand. It was shown that seamount habitat could be severely affected by bottom trawling, with extensive removal of coral cover. Another paper showed that the large reefs of *Lophelia* off the Norwegian coast are also vulnerable to bottom trawling. Management action has been taken to close 19 seamounts around New Zealand, and to prohibit trawling in several areas of reef habitat off the Norwegian coast.

A paper described the distribution of deepwater fish and fisheries throughout the ICES area, which was then followed by a paper presenting and discussing options for their assessment and management. This included data requirements, possible stock assessment models and approaches, and management measures. Strong decreases in

catch levels and CPUE in several fisheries highlight the need for immediate management action to limit catches. ICES area boundaries also need to be revised for deep-water species, as they are not consistent with bathymetry or water masses in some areas. Several are also very large, which does not recognize the small spatial scales often necessary to monitor some of these deepwater fisheries to prevent serial depletion of populations/stocks.

Biological data were presented for several deepwater species off Ireland that further advocated a cautious approach to fishery development. Estimates of population replacement rates for deepwater species were much lower than for some shelf species.

In a paper reviewing the track record of stock assessment and fishery performance of several deepwater species, the possibility of episodic recruitment in fish like orange roughy was raised. Long periods of low recruitment between strong pulses adds a challenge to develop appropriate population models, and increases the complexity of estimating sustainable annual yields.

An account was presented of the biology and fishery for the deepwater prawn *Aristeus antennatus* in the western Mediterranean Sea. Established fishing grounds could be extended into deeper waters, but care is required to establish migration and life-history links between the areas.

SESSION 4. BIOLOGY AND LIFE HISTORY

The first paper in this session, chaired by J. D. M. Gordon, presented the results of a study of the predator prey relationships of a small, isolated deep-water fish assemblage in the Skagerrak. The food web showed quite clearly the links between the demersal fish and their pelagic prey that appears to be a common feature of the exploited deep-water fishes. A paper on the trophic ecology of the blue whiting in the northeastern Atlantic described the diet and the degree of overlap both within different length classes of the species and also between other pelagics. The role of this species in providing a food source for deep-sea fishes and in transporting the products of the rich plankton blooms of Nordic Seas to the northeastern Atlantic was indicated. How the products of surface production might reach the deeper waters was one of the aspects discussed in a paper on the deep-scattering layers of the Baja California, Mexico.

A study of the behaviour of deep-water fishes in nine habitats observed in the Bay of Biscay using a manned submersible showed that some species were more flexible than others in their choice of habitat. A multivariate analysis of the numerous observed parameters grouped the species in to a number of assemblages associated with one or more habitat types.

Four papers dealt with aspects of the biology of the deep-water witch flounder (*Glyptocephalus cynoglossus*), the deep-water sharks, the blue hake (*Antimora rostrata*) and the roughhead grenadier (*Macrourus berglax*). These four papers, covering a wide range of taxa exemplified some of the many of the characteristics of deep-water species such as slow growth, high age at first maturity, non-seasonal reproduction and missing stages in the life cycle.

SESSION 5. REDFISH

This session was chaired by D. Power and comprised three oral presentations and three posters dealing with various aspects of the biology, ecology and population structure of various species of redfish from the North Atlantic based on both commercial fisheries and fishery-independent surveys.

The three oral presentations covered a variety of topics. The first was a paper on the stock structure and ecology of *S. mentella* and suggested that only a single stock exists in the Irminger Sea. The second paper presented an age validation for *S. mentella* in NAFO Div. 3M and suggested density-dependent growth may be occurring for the 1990 year-class. The final paper provided Norwegian information from a long-line and gillnet fishery for the 'giant' *S. marinus* conducted along the Reykjanes Ridge. The data suggested CPUE declined by 27-85% between 1996 and 1997 before the fishery ceased due to a decline in its economic viability.

The session discussion focused on the population structure and migrations of *S. mentella* in the Irminger Sea. There was no general consensus amongst the participants on whether there were one stock or three.

SESSION 6. FISHERIES ECOLOGY

This session, chaired by J.D.M. Gordon opened with a paper on uncertainties in the age estimation of *Coryphaenoides rupestris* (roundnose grenadier) caused by the removal of the accumulated biomass of older fish at the start of the fishery. Another paper, also utilizing otoliths, described a preliminary attempt to use otolith microchemistry to test the hypothesis that there is only one stock of *Aphanopus carbo* (black scabbardfish) in the North East Atlantic.

A paper describing studies on the distribution growth and exploitation of *Argentina silus* (greater silver smelt) in Norwegian Sea during the early 1980s was followed by a presentation on some of the results of acoustic surveys in the early 1990s. At the start of the fishery this species was managed by TAC but this has now changed to a control of effort by licensing. A paper on the size structure and production of ten demersal species off the Canadian shelf demonstrated the importance of predation as a link between the species in the community and the importance of life history parameters in determining dominance. The deep-bathyal, oligotrophic ecosystem of the western Mediterranean is co-dominated by fish and decapod crustacea. A paper described an analysis of the intensity of faunal change in relation to size and depth using material from two surveys to the southwest of the Balearic Islands.

In the summing up it was noted that otolith collections could be an important record of past history both for age composition and stock identification and should be archived. The Mediterranean, although sharing many of the same deep-water fish species of the Atlantic, is a very different ecosystem (e.g. high temperature, oligotrophic) and the maximum size of many species tends to be smaller. Comparative studies between the Mediterranean and the Atlantic could yield useful insights into processes in the deep-sea.

POSTER SESSION

A total of 64 posters, including the five that were associated with short presentations, were on display throughout the symposium and there was a lunchtime viewing session where the authors were present to answer questions.

SUMMING UP AND DISCUSSION

W. B. Brodie invited each of the chairs of the six sessions to present an overview of their session and to highlight what they considered to be the key results and concerns. The session specific outputs from these summaries have been incorporated in the report of each session described above.

In the general discussion it was considered that the emerging deep-water fisheries could learn from the experience in managing some of the longer established fisheries such as Greenland halibut and redfish. The 2001 report of the ICES Working Group on the Biology and Assessment of Deep-sea Fishery Resources had, at the request of NEAFC, made a first attempt at ranking life history characteristics of deep-water fish in relation to these two species. A recurring theme in many papers had been the fact that the current ICES Sub-areas and Divisions are, in many instances, unsuitable in terms of bathymetry and water masses for reporting information on deep-water species. Given the high discard rates and likely high mortality of escapees in trawl fisheries it was considered to be important to report catch and not simply landings. There is increasing public awareness about the impact of fishing activities on the deep-water ecosystem and the conservation of deep-water coral reefs and seamounts were good examples of how there should be wider involvement in the decision making process. The importance of the use of non-invasive technology for studies in the deep-sea, such as the plans for further exploration of the Bear Seamount, is an area that should be given greater priority.

CONCLUSION

The Chairman of the NAFO Scientific Council thanked the host country and ICES and CSIRO, for their support in making the Symposium possible. He also thanked the co-conveners for organizing such an interesting and varied collection of papers and posters and the session chairs for helping the meeting to run smoothly. The day-to-day organization had been difficult because some speakers, including one of the co-conveners, had been unable to attend the meeting. The efforts of the Secretariat in coping with these changes were gratefully acknowledged. It is intended to publish a selection of the papers in the *Journal of Northwest Atlantic Fishery Science* within a target time frame of one year.

SYMPOSIUM SCHEDULE*

WEDNESDAY, 12 SEPTEMBER 2001

0800-0830 Registration

0830-0900 Introduction

SESSION 1. DEEPWATER FISHERIES (PART 1)

Chair: J. A. Koslow

| Time | Paper No. | Author(s) and Title |
|------------|-----------|--|
| 0900-0930 | 1.1 | Invited paper: KOSLOW, J. A., B. RICHER DE FORGES, and K. GOWLETT-HOLMES. Biodiversity and conservation in the deep sea: the impact of deepwater fisheries. |
| 0930-0950 | 1.2 | MOORE, J. A., M. VECCHIONE, K. E. HATEL, B. B. COLLETTE, J. K. GABRAITH, R. GIBBONS, M. TURNIPSEED, M. SOUTHWORTH, and E. WATKINS. Biodiversity of Bear seamount, New England seamount chain: results of exploratory trawling. |
| 0950-1010 | 1.3 | PEREZ, J. A. A., R. WAHRLICH, P. R. PEZZUTO, P. R. SCHWINGEL, F. R. A. LOPES, and M. RODRIGUES-RIBEIRO. Deep-sea fishery off southern Brazil: recent trends of the Brazilian fishing industry. |
| 1010-1030 | 1.4 | POWELL, S. M., R. L. HAEDRICH, and J. D. MCEACHRAN. The deep-sea fish fauna of the northern Gulf of Mexico. (read by title) |
| 1030 -1100 | | Break |
| 1100-1120 | 1.5 | LORANCE, P., F. UIBLEIN, and R. C. EGUIA. Distribution and density of carnivorous fish species around Lanzarote and Fuerteventura, Canary Islands. |
| 1120-1140 | 1.6 | DURAN MUÑOZ, P., E. ROMÁN MARCOTE. The Spanish multi-species deep-sea fishery at Hatton Bank (North East Atlantic): 1996-2000. |
| 1140-1200 | 1.7 | KULKA, D., D. T. THEMELIS, and R. G. HALLIDAY. Distribution and biology of orange roughy (<i>Hoplostethus atlanticus</i> Collette 1889) in Canadian waters. |
| 1200-1330 | | Lunch |

SESSION 2. GREENLAND HALIBUT

Chair: W. R. Bowering

| | | |
|-----------|------|---|
| 1330-1350 | 1.8 | HØINES, Å. S., and K. KORSBREKKE. Variation in population structure of Northeast Arctic Greenland halibut (<i>Reinhardtius hippoglossoides</i>) based on data from Norwegian surveys in the period 1992-2000. |
| 1410-1430 | 1.9 | SIMONSEN, C. S., and M. A. TREBLE. Tagging mortality of Greenland halibut. |
| 1430-1450 | 1.10 | HUSE, I., and T. JOHANSEN. Trends in growth parameters analyzed in the light of selection responses to the exploitation of Greenland halibut. |
| 1450-1530 | | Break |
| 1530-1550 | 1.11 | JUNQUERA, S., E. ROMÁN, J. MORGAN, M. SAINZA, and G. RAMILO. Time scale of ovarian maturation in Greenland halibut. |

* The list of documents and the sequence of presentations may have changed during the symposium

| Time | Paper No. | Author(s) and Title |
|-------------|------------------|--|
| 1550-1610 | 1.12 | MORGAN, M. J., W. R. BOWERING, A. C. GUNDERSEN, Å HØINES, B. MORIN, O. SMIRNOV, and E. HJØRLEIFSSON. Comparative analyses of Greenland halibut (<i>Reinhardtius hippoglossoides</i>) maturation for populations throughout the North Atlantic. |
| 1610-1635 | | Poster pursuit: POSTER AUTHORS. 5 min. presentations (max. 3 graphics) of Greenland halibut posters P.1 to P.5 (originally offered as oral presentations) |
| 1610-1615 | 1-P.1 | ALBERT, O. T. Northeast Arctic Greenland halibut (<i>Reinhardtius hippoglossoides</i>) population structure from nursery to spawning area. |
| 1615-1620 | 1-P.2 | GUNDERSEN, A. C., O. S. KJESBU, K. H. NEDREAAS, and O. T. ALBERT. Maturity of northeast Arctic Greenland halibut (<i>Reinhardtius hippoglossoides</i>). |
| 1620-1625 | 1-P.3 | TUENE, S., A. C. GUNDERSEN, W. EMBLEM, I. FOSSEN, J. BOJE, P. STEINGRUND and L. H. OFSTAD. Maturation and occurrence of Atresia on oocytes of Greenland halibut (<i>Reinhardtius hippoglossoides</i> , Walbaum). |
| 1625-1630 | 1-P.4 | GUNDERSEN, A. C., J. BOJE, O. A. JØRGENSEN, E. HJØRLEIFSSON, C. S. SIMONSEN, I. FOSSEN, L. H. OFSTAD, and H.-J. RÄTZ. Variability in fecundity and total egg production for West Nordic Greenland halibut. |
| 1630-1635 | 1-P.5 | HØINES, Å. S., and K. KORSBREKKE. Some aspects of a times series of longline catch-per-unit of effort data for Greenland halibut (<i>Reinhardtius hippoglossoides</i>). |
| 1635-1700 | | Discussion on Greenland halibut |

THURSDAY, 13 SEPTEMBER 2001

SESSION 3. DEEPWATER FISHERIES: IMPACTS, ASSESSMENT AND MANAGEMENT

Chair: M. Clark

| | | |
|-----------|-----|--|
| 0830-0900 | 2.1 | Invited paper: CLARK, M. Deepwater Fisheries and their impact on seamount habitat in New Zealand. |
| 0900-0920 | 2.2 | KOSLOW, J. A., and G. N. TUCK. The boom and bust of deep-sea fisheries: why haven't we done better? |
| 0920-0940 | 2.3 | FOSSÅ, J. H. , P. B. MORTENSEN, T. MOLDSKRED, and D. M. FUREVIK. Protection and management of deep-water coral reefs in Norway. |
| 0940-1000 | 2.4 | SARDA, F., J. B. COMPANY, and F. MAYNOU. Deep-sea shrimp <i>Aristeus antennatus</i> Risso 1816 in the Catalan Sea: a review and perspectives. |
| 1000-1020 | 2.5 | GORDON, J. D. M., O. A. BERGSTAD, I. FIGUEIREDO, and G. MENEZES. The deep-water fisheries of the ICES Area. |
| 1020-1040 | | Break |
| 1040-1100 | 2.6 | LARGE, P., C. HAMMER, O. A. BERGSTAD, J. D. M. GORDON, and P. LORANCE. Options for the assessment and management of deep-water species in the ICES area. |
| 1100-1120 | 2.7 | CLARKE, M. W., P. L. CONNOLLY, and C. J. KELLY. A life-history approach to stock assessment of deepwater fish in the northeast Atlantic. |
| 1120-1330 | | Poster viewing and lunch |

SESSION 4. BIOLOGY AND LIFE HISTORY

Chair: J. D. M. Gordon

| Time | Paper No. | Author(s) and Title |
|-------------|------------------|---|
| 1330-1400 | 2.8 | BERGSTAD, O. A., Å. D. WIK, and Ø. HILDRE. Predator-prey relations and food sources of the Skagerrak deep-water fish assemblage. |
| 1400-1420 | 2.9 | BJELLAND, O., T. MONSTAD, and O. A. BERGSTAD. Trophic ecology of blue whiting (<i>Micromesistius poutassou</i> (Risso), Gadidae). |
| 1420-1440 | 2.10 | UIBLEIN, F., P. LORANCE, and D. LATROUITE. Interspecific comparison of deep-sea fish locomotion behaviour and habitat selection. |
| 1440-1500 | 2.11 | WIGLEY, S E., and J. M. BURNETT. Preliminary estimates of biological and yield characteristics for deep-water witch flounder (<i>Glyptocephalus cynoglossus</i>) in the Georges Bank-Southern New England Region. |
| 1500-1520 | 2.12 | CLARKE, M. W., P. L. CONNOLLY, and J. J. BRACKEN. Biology of exploited deep-water sharks west of Ireland and Scotland. |
| 1520-1550 | | Break |
| 1550-1610 | 2.13 | KULKA, D. W. Distribution and biology of blue hake in Canadian Atlantic waters. |
| 1610-1630 | 2.14 | MURUA, H. Roughhead grenadier (<i>Macrourus berglax</i>) biology and population structure in NAFO Divisions 3KLMN. |
| 1630-1650 | 2.15 | ROBINSON, C. J., and J. GOMEZ-GUTIÉRREZ. On the behavior and composition of dense deep scattering layers related to the shelf-break area along the northwest coast of Baja California, Mexico. |
| 1650-1730 | | Discussion |

FRIDAY, 14 SEPTEMBER 2001

SESSION 1. DEEPWATER FISHERIES (PART 2)

Chair: J. D. M. Gordon

| | | |
|-----------|-----|---|
| 0900-0930 | 3.1 | Invited paper: GORDON, J. D. M. The Rockall Trough, North East Atlantic: an account of the change from one of the best-studied deep-water ecosystems to one that is being subjected to unsustainable fishing activity. |
| 0930-0950 | 3.2 | SANTOS, M. N., K. ERZINI, M. B. GASPAR, C. C. MONTEIRO, R. SÁ, L. BENTES, J. M. S. GONÇALVES, P. G. LINO, and J. RIBEIRO. Comparison of long-line and monofilament gill net selectivity for hake (<i>Merluccius merluccius</i>) in the Algarve (Southern Portugal). |
| 0950-1010 | | Discussion |
| 1010-1040 | | Break |

SESSION 5. REDFISH**Chair:** D. Power

| Time | Paper No. | Author(s) and Title |
|-------------|------------------|--|
| 1040-1100 | 3.3 | SABORIDO-REY, F., D. GARABANA-BARRO, and C. STRANSKY. A review of the population structure and ecology of redfish species in the Irminger Sea and adjacent waters. |
| 1100-1120 | 3.4 | SABORIDO-REY, F. Age and growth of redfish (<i>Sebastes marinus</i> , <i>S. mentella</i> and <i>S. fasciatus</i>) in Flemish Cap (Northwest Atlantic). |
| 1120-1140 | 3.5 | HAREIDE, N.-R., G. GARNES, and G. LANGEDAL. The boom and bust of the Norwegian longline fishery for redfish (<i>Sebastes marinus</i> 'giant') on the Reykjanes Ridge. |
| 1140-1200 | | Discussion |
| 1200-1330 | | Lunch |

SESSION 6. FISHERIES ECOLOGY**Chair:** J. D. M. Gordon

| | | |
|-----------|------|---|
| 1330-1400 | 3.7 | LORANCE, P., F. GARREN, and J. VIGNEAU. Age estimation of the roundnose grenadier (<i>Coryphaenoides rupestris</i>), effects of uncertainties on ages. |
| 1400-1420 | 3.8 | SWAN, S. C., J. D. M. GORDON, and T. SHIMMIELD. Preliminary investigations on the uses of otolith microchemistry for stock discrimination of the deep-water black scabbardfish (<i>Aphanopus carbo</i>) in the North East Atlantic. |
| 1420-1440 | 3.9 | JOHANNESSEN, A., and T. MONSTAD. Distribution, growth and exploitation of greater silver smelt (<i>Argentina silus</i>) (Ascanius) in Norwegian waters 1980-1983. |
| 1440-1500 | 3.10 | MONSTAD, T., and A. JOHANNESSEN. Acoustic recordings of greater silver smelt (<i>Argentina silus</i>) in Norwegian waters and West of the British Isles, 1989-1994. |
| 1500-1520 | 3.11 | MURILLO, M. N. M. Size structure and production in a demersal fish community. |
| 1520-1550 | | Break |
| 1550-1610 | 3.12 | MORALES-NIN, B., F. MAYNOU, F.SARDÁ, J. CARTES, J. MORANTA, E. MASSUTÍ, J. COMPANY, G. ROTLANT, A. BOZZANO, C. STEFANESCU, AND C. LIRÓ. Size influence in zonation patterns in fishes and crustaceans from the deep-water communities of the western Mediterranean. |
| 1610-1630 | | Discussion |
| 1650-1730 | | Summing up |

POSTER PRESENTATIONS

| Poster No. | Author(s) and Title |
|-------------------|--|
| P.1. | GIL, J., and I. SOBRINO. Studies on reproductive biology of the red (blackspot) seabream (<i>Pagellus bogaraveo</i> (Brünnich, 1678)) from the Strait of Gibraltar (ICES IXa/Atlantic South-west of Spain). |

- | Poster
No. | Author(s) and Title |
|-----------------------|--|
| P.2. | GUNDERSEN, A. C., A. K. WOLL, and I. FOSSEN. Spawning of Greenland halibut (<i>Reinhardtius hippoglossoides</i>) in East Greenland waters. |
| P.3 | BAKAY, YU. I. Results from the analysis of geographical variability in parasite fauna of redfish, <i>Sebastes mentella</i> , from the North Atlantic. |
| P.4. | SOBRINO, I., and J. GIL. Studies on age determination and growth pattern of the red (blackspot) seabream (<i>Pagellus bogaraveo</i> (Brünnich, 1678)) from the Strait of Gibraltar: application to the species migratory pattern. |
| P.5. | VASCONCELOS, P., and N. R. BRAZ. Proximate composition of the deep-sea crab, <i>Chaceon affinis</i> , from an exploratory fishery off Madeira Island (Portugal - Eastern Central Atlantic). |
| P.6. | VASCONCELOS, P., and N. R. BRAZ. Meat yield of the deep-sea crab, <i>Chaceon affinis</i> , from an exploratory fishery off Madeira Island (Portugal - Eastern Central Atlantic). |
| P.7. | CARBONELL, A., M. GARCÍA, P. PEREDA, A. ESTEBAN, G. POMAR, M. GAZA, A. TORRES, AND J. L. PERÉZ GIL. The deepwater red shrimp fishery in the Spanish Mediterranean Sea. |
| P.8. | MADURELL, T., and J. E. CARTES. Spatio-temporal patterns in a demersal fish assemblage of the Ionian Sea (Eastern Mediterranean). |
| P.9. | PAIS, C., M. E. COSTA, S. OLIM, and T. C. BORGES. Biodiversity as a result of the by-catch from the commercial trawl fisheries off the southern Portuguese Coast. |
| P.10. | COSTA, M. E., S. OLIM, C. PAIS, and T. C. BORGES The importance of by-catch from commercial trawl fisheries off the South Coast of Portugal. |
| P.11. | FOSSEN, I., O. A. JØRGENSEN, and C. GUNDERSEN. Roughhead grenadier (<i>Macrourus berglax</i>) in the waters of East Greenland distribution and biology. |
| P.12. | SOBRINO, I., Y. VILA, F. RAMOS and A. MEDINA. Identification and quantification of the age-pigment, lipofuscin, in brains of the deep-water rose shrimp <i>Aristeus antennatus</i> (Risso, 1816). |
| P.13 | KJERSTAD, M., and I. FOSSEN. Utilization of deep-sea sharks at Hatton Bank in the North Atlantic. |
| P.14. | DEMESTRE, M., and J. E. CARTES. Estimating secondary production in the deep-water shrimp <i>Aristeus antennatus</i> in Catalano-Balearic Basin (Western Mediterranean). |
| P.15 | POLITOU, C. Y., S. KAVADAS, CH. MYTILINEOU, A. TURSI, P. LEMBO, and R. CARLUCCI. Fisheries resources in the deep waters of the Eastern Mediterranean (Greek Ionian Sea). |
| P.16. | LEFKADITOU, E., and G. D'ONGHIA. <i>Loligo forbesi</i> and ommastrephid squid by-catches on the North-eastern Ionian slope: preliminary analysis of stock structure based on exploratory trawling. |
| P.17. | MYTILINEOU, CH., P. MAIORANO, S. KAVADAS, G. D'ONGHIA, K. KAPIRIS, and F. CAPEZZUTO. Size structure comparison in some demersal species between two areas of different fishing impact in the deepwaters of eastern-central Mediterranean (Ionian Sea). |
| P.18. | D'ONGHIA, G., C.-Y. POLITOU, F. MASTROTOTARO, CH. MYTILINEOU, and A. MATARRESE. Biodiversity from the upper slope demersal community of eastern Mediterranean: preliminary comparison between two areas with and without fishing impact. |
| P.19. | SION, L, G. D'ONGHIA, A. TURI, and CH. MYTILINEOU. First data on distribution and biology of <i>Squalus blainvillei</i> (Risso, 1826) from the eastern Mediterranean Sea. |
| P.20. | D'ONGHIA G., R. CARLUCCI, P. MAIORANO, and M. PANZA. Discards from deep-water bottom trawling in the eastern-central Mediterranean Sea and effects of mesh size changes. |

**Poster
No.**

Author(s) and Title

- P.21. MAIERS, L., M. TREBLE, M. McPHERSON, and J. REIST. The potential of microsatellite analysis to discriminate stocks of Greenland halibut (*Reinhardtius hippoglossoides*) in the Canadian Arctic.
- P.22. RINELLI, P., T. ROMEO, T. BOTTARI, and S. GRECO. Maturity and growth of *Aristaeomorpha foliacea* in Tyrrhenian Sea (central Mediterranean).
- P.23. GIORDANO D., G. FLORIO, T. BOTTARI, and S. GRECO. Occurrence of *Histioteuthis bonnellii* and *Histioteuthis reversa* (Cephalopoda: Histioteuthidae) in the southern Tyrrhenian Sea (western Mediterranean).
- P.24. DESANTIS S., M. LABATE, F. CIRILLO, G. M LABATE, P. MAIORANO, and G. D'ONGHIA. Testicular activity and sperm glycoproteins in giant red shrimp *Aristaeomorpha foliacea*.
- P.25. HUSE, I., A. C. GUNDERSEN, Å. HØINES, and A. V. SOLDAL. Unaccounted mortality of Greenland halibut in trawl fishery.
- P.26. ERZINI, K., E. PUENTE, J. M. S. GONÇALVES, L. ARREGUI, L. BENTES, P. G. LINO, and J. RIBEIRO. The influence of hook model and size on catch rates, hooking position and by-catch in the hake deep-water semi-pelagic longline fisheries of the Algarve (southern Portugal) and the Cantabrian Sea (Bay of Biscay).
- P.27. BIANCHINI, M. L., D. LEVI, and S. RAGONESE. Exploitation levels and management hypotheses in the red-shrimp (*Aristaeomorpha foliacea*) fishery of the Strait of Sicily (Mediterranean Sea).
- P.28. SAMPEDRO, P., A. C. FARIÑA, and J. VALEIRAS. Morphometric analysis of *Chaceon affinis* (Brachyura: Geryonidae), in the northwest coast of Iberian Peninsula.
- P.29. BRUNO, I., A. C. FARIÑA, J. LANDA, and R. MORLÁN. The gillnet fishery for anglerfish (*Lophius piscatorius*) in deep-water in the northwest of Iberian Peninsula.
- P.30. GORDON, J. D. M., S. C. SWAN, A. J. GEFFEN, and B. MORALES-NIN. Otolith microchemistry as a means of identifying stocks of deep-water demersal fishes (OTOMIC).
- P.31. CROZIER, P. Distribution and reproductive biology of two deepwater squalid sharks, *Centroscymnus coelolepis* (Portuguese dogfish) and *Centrophorus squamosus* (leafscale gulper shark), in the Rockall Trough area of the Northeast Atlantic.
- P.32. CASTRIOTA, L., S. CAMPAGNULUOS, and F. ANDALORO. Shrimp trawl fishery by-catch in the Straits of Sicily (central Mediterranean Sea).
- P.33. TRATHAN, P., A. BRIERLEY, M. BRANDON, and D. BONE. Oceanographic variability and changes in Antarctic krill abundance at South Georgia.
- P.34. REIS, S., D. SENA-CARVALHO, J. H. DELGADO, and M. AFONSO-DIAS. Historical overview of the black scabbardfish (*Aphanopus carbo* Lowe, 1839) fishery in Madeira Island.
- P.35. MORALES-NIN, B. Age determination in deep-water fish. How to validate and verify ages?
- P.36. MACHIAS, A., K. I. STERGIOU, and D. VATSOS. Deep-water trawling discards in the western Ionian Sea.
- P.37. RIHAN, D., C. P. NOLAN, R. OFFICER, F. GUILFOYLE, M. CLARKE, and J. MURRIN. Ireland's development of deepwater fisheries in the NE Atlantic.
- P.38. ANDRADE, C. A. P., and J. R. J. GOMES. Distribution patterns and niche shift in wreckfish *Polyprion americanus* (Teleostei: Poliprionidae).
- P.39. BELCARI P., M. MORI, and C. VIVA. Demographic structure and reproductive biology of *Aristaeomorpha foliacea* (Risso, 1827) in the northern Tyrrhenian Sea (western Mediterranean).

- | Poster
No. | Author(s) and Title |
|---------------|--|
| P.40. | SARTOR P., S. M. SBRANA, B. REALE, and P. BELCARI. Impact on the deep-sea trawl fishery on demersal communities of the northern Tyrrhenian Sea (western Mediterranean). |
| P.41. | SBRANA M., P. BELCARI, B. REALE, and P. SARTOR. The deep-sea crustacean fishery in the northern Tyrrhenian Sea (western Mediterranean). |
| P.42. | ÁVILA-DA-SILVA, A. O., and M. HAIMOVICI. Demersal fish assemblage structure and diversity of southeastern and southern Brazilian continental outer shelf and upper slope. |
| P.43. | HAIMOVICI, M., A. O. ÁVILA -DA-SILVA, S. L. DOS SANTOS TUTUI, and G. C. C. BASTOS. Distribution and relative abundance of demersal fishes vulnerable to bottom longlines from the outer shelf and upper slope of southern and southeastern Brazil. |
| P.44. | RAMOS, A., L. FERNÁNDEZ, and F. SALMERÓN. Composition of demersal fish assemblages in deep waters of the Western Guinean Gulf. |
| P.45. | RAMOS, A., F. MOYA, F. SALMERÓN, P. GARCÍA, A. CARROCEDA, L. FERNÁNDEZ, J. F. GONZÁLEZ. O. TELLO, J. L. SÁNZ, and M. BALLESTEROS. Demersal fauna on deep seamounts of Sierra Leone Rise (Gulf of Guinea, Africa). |
| P.46. | RAMOS, A., F. SALMERÓN, A. CARROCEDA, and L. FERNÁNDEZ. Faunistic composition of catches from the Spanish bottom-longline fishery in deep waters of Mauritania. |
| P.47. | PETRAKIS, G., and C. PAPACONSTANTINO. Catch composition in an unexploited deep-water area in the western Greek coasts. |
| P.48. | MELNIKOV, S. P., A. P. PEDCHENKO, and V. N. SHIBANOV. On status of the pelagic redfish aggregations in NAFO Division 1F. |
| P.49. | PIÑEIRO, C. G., M. CASAS, and H. ARAUJO Results of exploratory deep-sea fishing survey in the Galician Bank: biological aspects on some of seamount-associated fish (ICES Division IXb). |
| P.50. | LEFKADITOU, E., P. MAIORANO, and CH. MYTILINEOU. Cephalopod species captured by deep-water exploratory trawling in the eastern Ionian Sea. |
| P.51. | JUNQUERA, S., P. DURÁN, E. ROMÁN, G. RAMILO, and I. LOUREIRO. Reproductive biology and ovary structure of <i>Alepocephalus bairdii</i> in Hatton Bank (ICES XII). |
| P.52. | FOCARDI S., S. CORSOLINI, N. ADEMOLLO, T. ROMEO, P. RINELLI, and S. GRECO. Organochlorine hydrocarbons in deep-sea fish from Tyrrhenian Sea. |
| P.53. | BORDALO-MACHADO, P., I. FIGUEIREDO, S. REIS, S. SENA-CARVALHO, T. BLASDALE, A. NEWTON, and L. S. GORDO. New findings on the reproductive biology of the black scabbardfish (<i>Aphanopus carbo</i> Lowe, 1839) in the NE Atlantic. |
| P.54. | HEESSEN, H. J. L., G. J. RINK, and C. J. KUITER. The fishery for greater argentine (<i>Argentina silus</i>) to the west of the British Isles by pelagic trawlers from the Netherlands. |
| P.55. | CASAS, J. M., C. PIÑEIRO, and R. BAÑÓN. Maturity and other biological aspects of main deep-water squaloid sharks, in the north and northwest of the Iberian Peninsula (ICES Divisions VIIIc, IXa and IXb). |
| P.56. | SANTOS, M. N., K. ERZINI, M. B.GASPAR, and C. C. MONTEIRO. FANTARED II – a study on ghost fishing in European waters. |
| P.57. | PEDCHENKO, A. P. The effect of oceanographic conditions on the spatical distribution of redfish in the Irminger Sea. |

LIST OF PARTICIPANTS

Co-conveners:

John D. M. Gordon
 Scottish Association for Marine Science
 P. O. Box 3
 Oban, PA34 4AD, United Kingdom
 Phone: +44 1631 559222
 Fax: +44 1631 559001
 Switchboard: +44 1631 599000
 E-mail: jdmg@dml.ac.uk
<http://www.sams.ac.uk>

Tony Koslow
 CSIRO Marine Research
 GPO Box 1538
 Australia
 Phone: +613 62325 082
 Fax: +613 62325 053
 E-mail: tony.koslow@marine.csiro.au

Jon Moore [was not able to attend]
 Florida Atlantic University
 Honors College
 5353 Parkside Drive
 Jupiter, FL 33458, USA
 Tel: +561-799-8668
 Fax: +561-799-8602
 E-mail: jmoore@fau.edu

Tissa Amaratunga (NAFO Contact)
 Assistant Executive Secretary
 2 Morris Drive
 Dartmouth, Nova Scotia
 Canada, B2X 2V9
 Tel: +902-468-9950
 Fax: +902-468-5538
 E-mail: info@nafo.ca

AUSTRIA

Uiblein, F. Institute of Zoology, University of Salzburg, Hellbrunnerstr. 34, A-5020 Salzburg
 Phone: +43 662 8044 5600 – Fax: +43 662 645362 – E-mail: franz.uiblein@sbg.ac.at

BRAZIL

Perez, J.A.A. CTTMar – UNIVALI, Cx. Postal 360, Itajaí, SC Brazil CEP 88.302.202
 Fax: +51 47 341 7633 – E-mail: angel@cttmar.univali.br
 Schwingel, P. R. CTTMar – UNIVALI, Itajai, Rua Urugvái, 458, CEP 88.302.202, Itajai SC Brazil
 Fax: +51 47 341 7714 – Fax: +51 47 341 7715 – E-mail: schwingel@cttmar.univali.br

CANADA

Allen, C.J. Fish. & Biodiversity Sci. Dir., Dept. of Fish. & Oceans, 200 Kent St., Ottawa, Ontario K1A 0E6
 Phone: +613-990-0105 – Fax: +613-954-0807 – E-mail: allenc@dfo-mpo.gc.ca
 Atkinson, D.B. Science, Oceans & Envir. Br., Dept. of Fish. & Oceans, P.O. Box 5667, St. John's, Nfld. A1C 5X1
 Phone: + 709-772-2027 – Fax: + 709-772-6100 – E-mail: atkinsonb@dfo-mpo.gc.ca
 Bowering, W.R. Science, Oceans & Envir. Br., Dept. of Fish. & Oceans, P.O. Box 5667, St. John's, Nfld. A1C 5X1
 Phone: + 709-772-2054 – Fax: + 709-772-4188 – E-mail: boweringr@dfo-mpo.gc.ca
 Brodie, W.B. Science, Oceans & Envir. Br., Dept. of Fish. & Oceans, P.O. Box 5667, St. John's, Nfld. A1C 5X1
 Phone: +709-772-3288 – Fax: +709-772-4105 – E-mail: brodieb@dfo-mpo.gc.ca
 Kulka, D.W. Science, Oceans & Envir. Br., Dept. of Fish. & Oceans, P.O. Box 5667, St. John's, Nfld. A1C 5X1
 Phone: + 709-772-2064 – Fax: + 709-772-5469 – E-mail: kulkad@dfo-mpo.gc.ca
 Morgan, M. J. Science, Oceans & Envir. Br., Dept. of Fish. & Oceans, P.O. Box 5667, St. John's, Nfld. A1C 5X1
 Phone: +709-772-2261 – Fax: +709-772-4105 – E-mail: morganj@dfo-mpo.gc.ca
 Power, D. Science, Oceans & Envir. Br., Dept. of Fish. & Oceans, P.O. Box 5667, St. John's, Nfld. A1C 5X1
 Phone: +709-772-4935 – Fax: +709-772-4105 – E-mail: powerd@dfo-mpo.gc.ca
 Price, J. Dept. of Fisheries & Oceans, 7 Eaton Place, St. John's, Newfoundland A1E 6A9
 Phone: +709-772-4427 – Fax: +709-772-6306 – E-mail: pricejo@dfo-mpo.gc.ca
 Murillo, M.N.M. Dept. of Biology, Memorial University of Newfoundland, St. John's, Nfld. A1B 5S7
 Phone: +709 737 3507 – E-mail: s76mmm@morgan.ucs.mun.ca
 Maiers, L. Dept. of Fish. & Oceans, Central & Arctic Region, 501 University Cr., Winnipeg, Man. R3T 2N6
 Phone: +204-984-4628 – Fax: +204-984-2403 – E-mail: maiersl@dfo-mpo.gc.ca
 Treble, M.A. Dept. of Fish. & Oceans, Central & Arctic Region, 501 University Cr., Winnipeg, Man. R3T 2N6
 Phone: +204-984-0985 – Fax: +204-984-2403 – E-mail: treblem@dfo-mpo.gc.ca

CUBA

- Oltuski, E. Ministerio de la Industria Pesquera, Barloventa, Jaimanitas, Municipio Playa, Havana
Phone: + 537 209 7008 – Fax: +537 209 7117 – E-mail: oltuski@fishnavy.inf.cu
- Valdes, E. Centro de Investigaciones Presqueras, 5ta. Ave y 248, Barlovento, Sta Fe, Playa C. Habana 19100
Phone: +537 209 8055 – Fax: +537 339168 – E-mail: evaldes@cip.fishnavy.inf.cu

DENMARK

- Jørgensen, O.A. Danish Institute for Fisheries Research, Charlottenlund Slot, DK-2900 Charlottenlund
Phone: +45 33 96 33 00 - Fax: +45 33 96 33 33 – E-mail: olj@dfu.min.dk
- Munch-Petersen, S. Danish Institute for Fisheries Research (DIFRES), Charlottenlund Castle, DK-2920 Charlottenlund
Phone: +45 33 96 33 90 – Fax: +45 33 96 33 33 – E-mail: smp@dfu.min.dk

ESTONIA

- Saat, T. Estonian Marine Institute, 18b Viljandi Road, EE-3600 Tallinn
Phone: +372 6281 570 – Fax: +372 6281 563 – E-mail: tsaat@sea.ee

FAROE ISLANDS

- A. Kristiansen Ministry of Fisheries and Maritime Affairs, Yviri við Strond 17, P. O. Box 87, FO-110 Torshavn
Phone: +298 35 3030 – Fax: +298 35 3037 – E-mail: andrask@fisk.fo
- Mikkelsen, B. Museum of National History, Fútalág 40, FO-100 Tórshavn
Phone: +298-31 8588 – Fax: +298-31 8589 – E-mail: bjarnim@ngs.fo
- Nicolajsen, A. Fiskorannsóknarstovan, Noatun, Postboks 3051, FR-1100, Torshavn
Phone: +298 1 50 92 – Fax: +298 1 8264 – E-mail: arninic@frs.fo
- Ofstad, L.H. Faroese Fisheries Laboratory, Nóatún 1, Box 3051, FO-Tórshavn
Phone: +298 31 5092 – Fax: +298 31 8264 – E-mail: liseo@frs.fo

FRANCE

- Ghiglia, M. UAPF, 59 Rue des Matmurs, 75008 Paris
Phone: +33 1 42 66 32 60 – Fax: +33 1 47 42 91 12 – E-mail: uapf@wanadoo.fr
- Girard, M. PROMA, 6 rue Alphonse Rio, 56323 Lorient cedex
Phone: +33 (0) 2 97 37 3111 – Fax: +33 (0) 2 97 37 7842 – E-mail: marine.girard@ifremer.fr
- Lorance, P. IFREMER, 150 QUAI Gambetta, B. P. 699, 62321 Boulogne sur mer
Phone: +33 3 21 99 5600 – Fax: +33 3 21 99 5601 – E-mail: pascal.lorance@ifremer.fr
- Missonnier, T. FIDIPENOR, 16, rue du Commandant Charcot, 62200 Boulogne Sur Mer
Phone: +33 3 21 30 0343 – Fax: +33 3 21 30 3322 – E-mail: fromnord@wanadoo.fr
- Plormel, J.-P. Bretagne, B. P. 422, 29184 Concarneau, Cedex
Phone: +33 2 98 97 4888 – Fax: +33 2 50 7020 – E-mail: bretagne@wanadoo.fr

GREECE

- Lefkaditou, E. National Centre for Marine Research, Aghios Kosmas, Helliniko, 16604 Athens
Phone: +30 1 982 2557 – Fax: +30 1 982 3835 – E-mail: teuthis@posidon.ncmr.gr
- Madurell, T. National Centre for Marine Research, 16604 hellinikon, Athens
Phone: +01 982 2557 – Fax: +01 983 3095 – E-mail: tmadurel@posidon.ncmr.gr
- Politou, C.-Y. National Centre for Marine Research, Aghios Kosmas, Helliniko, 16604 Athens
Phone: +30 1 982 2557 – Fax: +30 1 982 3835 – E-mail: c-y@ncmr.gr

GERMANY

- Rätz, H.-J. Institute of Sea Fisheries, Palmaille 9, D-22767 Hamburg, Federal Republic of Germany
Phone: +49 40 389 05169 – Fax: +49 40 389 05263 – E-mail: raetz.ish@bfa-fisch.de
- Stein, M. Institut für Seefischerei, Palmaille 9, D-22767 Hamburg, Federal Republic of Germany
Phone: +49 40 389 05174 – Fax: +49 40 38905 263 – E-mail: stein.ish@bfa-fisch.de
- Stransky, C. Institut für Seefischerei, Palmaille 9, D-22767 Hamburg, Federal Republic of Germany
Phone: +49 40 38905 228 – Fax: +49 40 38905 263 – E-mail: stransky.ish@bfa-fisch.de

ICELAND

Sigurdsson, T. Marine Research Institute, Skúlagata 4, Pósthólf Box 1390, 121 Reykjavik
Phone: +354 552 0240 – Fax: +354 562 3790 – E-mail: steini@hafro.is

IRELAND, REPUBLIC OF

Clarke, M. Marine Fisheries Services Division, Marine Institute, Abbotstown, Dublin 15
Phone: +353 1 822 8200 – Fax: +353 1 820 5078 – E-mail: maurice.clarke@marine.ie

Nolan, C.P. An Bord Iascaigh Mhara (B.I.M.), P. O. Box 12, Crofton Road, Dun Laoghaire, Co. Dublin
Phone: +353 1 214 4104 – Fax: +353 1 230 0564 – E-mail: conor@squidrow.demon.co.uk

Rihan, D. An Bord Iascaigh Mhara (B.I.M.), P. O. Box 12, Crofton Road, Dun Laoghaire, Co. Dublin
Phone: +353 1 214 4104 – Fax: +353 1 230 0564 – E-mail: rinhan@bim.ie

ITALY

Belcari, P. Dipartimento Scienze Uomo Ambiente, Via Volta 6 – 561 Pisa
Phone: +39 050 502 715 – Fax: +39 050 49694 – E-mail: belcari@discat.unipi.it

Bianchini, M. L. Via Monte del Gatto, 298, 00188 Roma (Italy)
Phone: +39 063346033 – Fax: +39 0668804211 – E-mail: imarbo@mclink.it

Capezzuto, F. Dept. of Zoology, University of Bari, Via Orabona, 4 – 70125 Bari
Phone: +39 80 544 3350 – Fax: +39 80 544 3350 – E-mail: f.capezzuto@biologia.uniba.it

Carlucci, R.R. Dept. of Zoology, University of Bari, Via Orabona, 4 – 70125 Bari
Phone: +39 80 544 3350

Desantis, S. Dept. of Zoology, University of Bari-Via E. Orabona, 4 – 70125 Bari
Phone: +39 080 544 3349 – Fax: +39 080 544 33 58 – E-mail: s.desantis@biologia.uniba.it

Labate, M. Dept. of Zoology, University of Bari, Via Orabona, 4 – 70125 Bari
Phone: +39 80 544 3349 – Fax: +39 80 544 3358 – E-mail: m.labate@biologia.uniba.it

Mastrototaro, F. Dept. of Zoology, University of Bari, Via Orabona, 4 – 70125 Bari
Phone: +39 80 544 3350 – Fax: +39 80 544 3350 – E-mail: f.mastrototaro@biologia.uniba.it

Matarrese, A. Dept. of Zoology, University of Bari, Via Orabona, 4 – 70125 Bari
Phone: +39 80 544 2871 – Fax: +39 80 544 3350 – E-mail: a.matarrese@biologia.uniba.it

Sion, L. Dept. of Zoology, University of Bari, Via Orabona, 4 – 70125 Bari
Phone: +39 80 544 2228 – Fax: +39 80 544 2495 – E-mail: l.sion@biologia.uniba.it

MEXICO

Gomez-Gutiérrez, J. Instituto de Ciencias del Mar y Limnología, UNAM, Apartado postal 70-305, C.P. 04510
Phone: +52 5 622 5786 – Fax: +52 5 616 0748 – E-mail:

NEW ZEALAND

Clark, M. National Institute of Water & Atmospheric Research, P. O. Box 14-901, Kilbirnie, Wellington
Phone: +64 4 386 0300 – Fax: +64 4 386 0574 – E-mail: m.clark@niwa.cri.nz

NORWAY

Albert, O.T. Norwegian Institute of Fisheries & Aquaculture Ltd., (Fiskeriforskning), N-9291 Tromsø
Phone: +47 77 629000 – Fax: +47 77 629100 – E-mail: ole-thomas.albert@fiskforsk.norut.no

Bergstad, O.A. Institute of Marine Research, Flødevigen Marine Research Station, N-4817 His
Phone: +47 37 05 9019 – Fax: +47 37 05 9001 – E-mail: odd-aksel@imr.no

Bjelland, O. Institute of Marine Research, P.O. Box 1870 Nordnes, N-5024 Bergen
E-mail: otte@imr.no

Fosså, J.H. Institute of Marine Research, P.O. Box 1870 Nordnes, N-5817 Bergen
Phone: +47 55 23 85 00 – Fax: +47 55 23 85 84 – E-mail: jhf@imr.no

Fossen, I. Møre Research, Sec. Of Fisheries, P. O. Box 5075, N-6021 Ålesund
Phone: +47 70 16 13 50 – Fax: +47 70 13 89 78 – E-mail: inge.fossen@als.moreforsk.no

Gundersen, A.C. Møre Research, Sec. Of Fisheries, P. O. Box 5075, N-6021 Ålesund
Phone: +47 70 16 13 50 – Fax: +47 70 13 89 78 – E-mail: agu@als.moreforsk.no

Hareide, N.-R. Støyleråsa 3, 6065 Ulsteinvik
Phone: +47 700 11755 – Fax: +47 700 12279 – E-mail: nilsroar@online.no

- Høines, Å. Institute of Marine Research, P. O. Box 1870 Nordnesgt, N-5817 Bergen
Phone: +47 55 23 8674 – Fax: +47 55 23 8687 – E-mail: aage.hoines@imr.no
- Jakobsen, T. Institute of Marine Research, P. O. Box 1870 Nordnesgt, N-5817 Bergen
Phone: +47 55 23 8636 – Fax: +47 55 23 8687 – E-mail: tore.jakobsen@imr.no
- Johannessen, A. University of Bergen, Dept. of Fish. & Marine Biology, P. O. Box 7800, N-5020 Bergen
Phone: +47 55 58 84460 – Fax: +47 55 58 4450 – E-mail: arne.johannessen@ifm.uib.no
- Kjerstad, M. Møre Research, Sec. Of Fisheries, P. O. Box 5075, N-6021 Ålesund
Phone: +47 70 16 113 50 – Fax: +47 70 13 89 78 – E-mail: mkj@als.moreforsk.no
- Monstad, T. Institute of Marine Research, P. O. Box 1870 Nordnesgt, N-5817 Bergen
Phone: +47 55 23 8698 – Fax: +47 55 23 8687 – E-mail: terje.monstad@imr.no
- Simonsen, C.S. Greenl. Inst. of Natural Resources, C/O Inst. of Marine Res., P.O. Box 1870, Nordnes, N5817 Bergen
Phone: +47 55 23 86 42 – Mobile: +47 41 55 0796 – Fax: +47 5523 8687
E-mail: claus@imr.no / claus@natur.gl

POLAND

- Szemioth, B. Director, Parkowa 13/17/123, Warsaw
Phone: +48 22 84 08920 – Fax: +48 22 84 08920 – szemioth@alpha.net.pl

PORTUGAL

- Alpoim, R. Inst. de Investigacao das Pescas e do Mar (IPIMAR), Av. de Brasilia, 1400 Lisbon
Phone: +351 21 302 7000 – Fax: +351 21 301 5948 – E-mail: ralpoim@ipimar.pt
- Avila de Melo, A. Inst. de Investigacao das Pescas e do Mar (IPIMAR), Av. de Brasilia, 1400 Lisbon
Phone: +351 21 302 7000 – Fax: +351 21 301 5948 – E-mail: amelo@ipimar.pt
- Bordalo-Machado, P. Inst. de Investigacao das Pescas e do Mar (IPIMAR), Av. de Brasilia, 1449-006 Lisbon
Phone: +351 21 302 7108 – Fax: +351 21 301 5948 – E-mail: bmachado@ipimar.pt
- Costa, M.E. Centre of Marine Sciences (CCMAR), Universidade do Algarve, 8000 Faro
Phone: +351 289 800900 – Fax: +351 289 818353 – E-mail: mecosta@ualg.pt
- Gomes, J.R. Vila da Calheta, Funchol Madeira, Centro de Maricultura la Calheta, 9370-133 Calheta
Phone: +351 291 820220 – Fax: +351 291 820439 – E-mail: jricardojg@hotmail.com
- Olim, S. Universidade do Algarve (Ualg), Campus de Gambelas, FCNA, 8000-117 Faro
Phone: +351 289 800900 – Fax: +351 289 818353 – E-mail: solim@ualg.pt
- Reis, S.M. Direcção de Serviços de Investigação das Pescas Direcção Regional das Pescas Estrada da Pontinha
9000-017 Funchal
Phone: +351 291 203200 – Fax: +351 291 2330850 – E-mail: sarareis@hotmail.com
- Santos, M. N. IPIMAR – CRIPSul, Av. 5 de Outubro s/n 8700-305 Olhão
Phone: +351 289 700504 – Fax: +351 289 700535 – E-mail: mnsantos@ipimar.ualg.pt

RUSSIA

- Babayan, V.K. Russian Federal Research Institute of Fisheries & Oceanography (VNIRO), 17, V. Krasnoselskaya,
Moscow, 107140
Phone: +70 95 264 6983 – Fax: +70 95 264 9187
- Boltnev, A.I. Knipovich Polar Research Institute of Marine Fisheries and Oceanography (PINRO),
6 Knipovich Street, Murmansk 183763
Phone: +7 8152 47 32532 – Fax: +7 8152 47 3331 – E-mail: boltnev@pinro.murmansk.ru
- Rikhter, V.A. Atlantic Scientific Research Institute of Marine Fisheries and Oceanography (AtlantNIRO),
5 Dmitry Donskoy Street, Kaliningrad 23600
Phone: +70 112 22 5547 – Fax: +70 112 21 9997 – E-mail: atlant@baltnet.ru
- Samoylova, E. Knipovich Polar Research Institute of Marine Fisheries and Oceanography (PINRO),
6 Knipovich Street, Murmansk 183763
Phone: +7 8152 47 34 61 – Fax: +47 789 10 518 – E-mail: inter@pinro.murmansk.ru
- Shibanov, V.N. Knipovich Polar Research Institute of Marine Fisheries and Oceanography (PINRO),
6 Knipovich Street, Murmansk 183763
Phone: +7 8152 47 34 61 – Fax: +47 789 10 518 – E-mail: inter@pinro.murmansk.ru

SPAIN

- De Cárdenas, E. Institute Español de Oceanografía, Avenida de Brasil 31, 28020 Madrid, Spain
Phone: +34 91 417 5911 – Fax: +34 91 597 4770 – E-mail: e.decardenas@md.ieo.es

- Duran, P. Instituto Español de Oceanografía. Programa de Pesquerías Lejanas. Centro Oceanográfico de Vigo. Apartado 1552, 36280 Vigo, Spain
Phone: +34 986 492111 – Fax: +34 986 492351 – E-mail: pablo.duran@vi.ieo.es
- Garabana-Barro, D. BarroInstitute of Marine Research, Eduardo Cabello, 636208 Vigo, Spain
Phone: +34 86 29 27 62 – Fax: +34 86 23 1930 – E-mail: lola@iim.csic.es
- Gil, J. Instituto Español de Oceanografía, unidad de Cádiz, Puerto Pesquero, juelle de Levante s/n. Apartado 2609, E-1106 Cádiz
Phone: +34 56 26 2333 – Fax: +34 56 26 3556 – E-mail: juan.gil@cd.ieo.es
- González Costas, G.F. Instituto Español de Oceanografía, Apto 1552, E-36280 Vigo (Pontevedra)
Phone: +34 9 86 49 2111 – Fax: +34 9 86 49 2351 – E-mail: fernando.gonzalez@vi.ieo.es
- Junquera, S. Instituto Español de Oceanografía, Apto 1552, E-36280 Vigo (Pontevedra)
Phone: +34 9 86 49 2111 – Fax: +34 9 86 49 2351 – E-mail: susana.junquera@vi.ieo.es
- Mayou, F. Institut de Ciències Del Mar, CSIC, Pg. Joan de Borbo s/n, 08039 Barcelona
Phone: +34 93 221 6416 – Fax: +34 93 221 7340 – E-mail: mayhnouf@icm-csic.es
- Morales-Nin, B. Director Natural Resources Department, CSIC/UIB-Institut mediterrani d'Estudis Avançats Miguel Marques 21, 07190 Esporres, Mallorca
Phone: +34 9716 11721 – Fax: + 34 9716 11761 – E-mail: ieabmn@clust.uib.es
- Murua, H. Fisheries Resources – AZTI Foundation, Herrera Kaia, Portualde z/g, 20110 Pasaia, Basque Country
Phone: +34 9 43 00 48 00 – Fax: +34 9 43 00 48 01 – E-mail: hmurua@azti.es
- Pastor, P.G. Unidad de Biología Marina, Facultad de Ciencias, Universidad de Alicante, E-03080 Alicante
Phone: +34 96 59 29433 – Fax: +34 95 59 03464 – E-mail: pabgarciapastor@latinmail.com
- Palomera, I. Institut de Ciències de Mar, P. Maritim de la Barceloneta, 39, 08003 Barcelona
Phone: +34 93 230 9554 – Fax: +34 93 230 9555 – E-mail: isabel@icm.csic.es
- Piñero Alvarez, C. Instituto Español de Oceanografía. Programa de Pesquerías Lejanas. Centro Oceanográfico de Vigo. Apartado 1552, 36280 Vigo
Phone: +34 986 49 2111 – Fax: +34 986 49 2351 – E-mail: carmen.pineiro@vi.ieo.es
- Ramos, A. Instituto Español de Oceanografía, Centro Oceanográfico de Málaga, Puerto Pesquero s/n, E-29640 Fuengirola (Málaga)
Phone: +34 95 2 47 69 55 – Fax: +34 95 2 46 3808 – E-mail: ana.ramos@ma.ico.es
- Saborido-Rey, F. Instituto Investigaciones Marinas, Eduardo Cabello 6, 36208 Vigo
Phone: +34 986 21 4466 – Fax: +34 986 29 2762 – E-mail: fran@iim.csic.es
- Sampedro, M.P. Instituto Español de Oceanografía, Muelle de Ánimas s/n, 15001-A Coruña
Phone: +34 981 20 5362 – Fax: +34 981 22 9077 – E-mail: paz.sampedro@co.ieo.es
- Sarda, F. Institut de Ciències de Mar s/n, Pg. Joan de Borbó s/n, 08039 Barcelona
Phone: +34 93 221 6416 – Fax: +34 93 221 7340 – E-mail: siscu@icm.csic.es
- Sobrino, I. Instituto Español de Oceanografía, unidad de Cádiz, Puerto Pesquero, juelle de Levante s/n. Apartado 2609, E-1106 Cádiz
Phone: +34 56 26 2333 – Fax: +34 56 26 3556 – E-mail: ignacio.sobrino@cd.ieo.es
- Vazquez, A. Instituto de Investigaciones Marinas, Eduardo Cabello 6, 36208 Vigo
Phone: +34 9 86 23 1930 – Fax: +34 9 86 29 2762 – E-mail: avazquez@iim.csic.es

UNITED KINGDOM

- Crozier, P. Scottish Association for Marine Science, Dunstaffnage Marine Laboratory, Oban, Argyll PA34 4AD
E-mail: pcroz@dml.ac.uk
- Hoydal, K. NEAFC, 22 Berners Street, London W37 1DY
Phone: +44 7631 0016 – Fax: +44 7636 0225 – E-mail: K.Hoydal@fish.maff.gov.uk
- Large, P. A. CEFAS Fisheries Laboratory, Pakefield Road, Lowestoft (Suffolk), England NR330HT
Phone: +44 1502 524 491 – Fax: +44 1502 524 511 – E-mail: p.a.large@cefass.co.uk
- Rolles, B. Fish Stocks & Conservation, Sea Fish.Div., The Scottish Executive Rural Affairs Department, Pentland House, 47 Robb's Loan, Edinburgh EH14 1TV, Scotland
Phone: +44 131 244 3358 – Fax: +44 131 244 6288 – E-mail: benjamin.rolles@scotland.gsi.gov.uk
- Swan, S.C. Scottish Association for Marine Science, Dunstaffnage Mar. Lab., Oban, Argyll, PA34 4AD
Phone: +44 0 1631 559223 – Fax: +44 0 1631 559001 – E-mail: scs@dml.ac.uk
- Trathan, P. BioSciences Div., British Antarctic Survey, High Cross, Madingley Road, Cambridge CB3 0ET
Phone: +44 (0) 1223 221602 – Fax: +44(0) 1223 362616 – E-mail: pnt@pcmail.nerc-bas.ac.uk

UNITED STATES OF AMERICA

- Correia, S. J. Massachusetts Division of Marine Fisheries, 50A Portside Drive, Pocasset, MA 02559
Phone: +508-563-1779 Ext. 111 – Fax: + 508-563-5482 – E-mail: steven.correia@state.ma.us

Hendrickson, L.C. National Marine Fisheries Service, NEFSC, 166 Water St., Woods Hole, MA 02543
Phone: +508-495-2285 – Fax: +508-495-2393 – E-mail: lisa.hendrickson@noaa.gov

Mayo, R.K. National Marine Fisheries Service, NEFSC, 166 Water St., Woods Hole, MA 02543
Phone: +508-495-2310 – Fax: +508-495-2393 – E-mail: ralph.mayo@noaa.gov

Serchuk, F.M. National Marine Fisheries Service, NEFSC, 166 Water St., Woods Hole, MA 02543
Phone: +508-495-2245 – Fax: +508-495-2258 – E-mail: fred.serchuk@noaa.gov

NAFO SECRETARIAT

T. Amaratunga, Assistant Executive Secretary
D. C. A. Auby, Secretary
F. D. Keating, Administrative Assistant
S. Goodick, Accounting Officer