SEVENTH FRAMEWORK PROGRAMME
THEME 2

Food, agriculture and fisheries, and biotechnology

Grant agreement for: **<Small or medium-scale focused research project>**

Annex I - "Description of Work"

Project acronym: **DEEPFISHMAN**

Project full title:

Management And Monitoring Of Deep-sea Fisheries And Stocks

Grant agreement no.: 227390

Date of preparation of Annex I: 19/03/2009

Date of approval of Annex I by Commission: 19/03/2009

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PART A

A.1 Overall budget breakdown for the project:

A3.2:
What it costs

Project Number 1	227390	Project Acronym 2	DEEPFISHMAN

One Form per Project

Participant number in this project 8	Participant short name	Estimated eligible costs (whole duration of the project)					Total receipts	Requested EC contribution
		RTD / Innovation (A)	Demonstration (B)	Management (C)	Other (D)	Total A+B+C+D		
1	IFREMER	395,345.00	0.00	197,892.00	23,606.00	616,843.00	0.00	518,006.00
2	CEFAS	507,631.00	0.00	17,059.00	29,591.00	554,281.00	0.00	427,374.00
3	UoI	463,672.00	0.00	0.00	12,912.00	476,584.00	0.00	360,666.00
4	IMR	200,370.00	0.00	0.00	0.00	200,370.00	0.00	150,278.00
5	IMPERIAL	565,507.00	0.00	3,357.00	0.00	568,864.00	0.00	427,487.00
6	NatMIRC	19,600.00	0.00	0.00	0.00	19,600.00	0.00	14,700.00
7	Tecnalia-AZTI	343,500.00	0.00	0.00	14,176.00	357,676.00	0.00	271,801.00
8	IPIMAR	143,566.00	0.00	0.00	9,420.00	152,986.00	0.00	117,095.00
9	MI	107,656.00	0.00	0.00	8,595.00	116,251.00	0.00	89,337.00
10	HCMR	105,670.00	0.00	0.00	8,890.00	114,560.00	0.00	88,143.00
11	IEO	118,538.00	0.00	0.00	8,278.00	126,816.00	0.00	97,181.00
12	MRI	205,885.00	0.00	0.00	54,024.00	259,909.00	0.00	208,438.00
13	UoP	186,978.00	0.00	2,489.00	10,928.00	200,395.00	0.00	153,650.00
TOTAL		3,363,918.00	0.00	220,797.00	180,420.00	3,765,135.00	0.00	2,924,156.00

A.2 Project summary :

A1: Our project

Project Number 1	227390	Project Acronym 2	DEEPFISHMAN

ONE FORM PER PROJECT

GENERAL INFORMATION			
Project title 3	Management and monitoring of deep-sea fisheries and stocks		
Starting date 4	Start date to be notified; must lie within 1 months of grant agreement signature		
Duration in months 5	36		
Call (part) identifier 6	FP7-KBBE-2008-2B		
Activity code(s) most relevant to your topic 7	KBBE-2008-1-4-02: Deep sea fisheries management		
Free keywords 8		Deepwater, fisheries assessment,management framework, Atlantic, Mediterranean, reference points, FLR, HCRs	

Abstract 9 (max. 2000 char.)

Deepwater fisheries pose particular difficulties for management. Target species are difficult to assess with high levels of uncertainty, they are generally vulnerable to overfishing and sustainable levels of exploitation are low. Ecosystems are impacted by fishing due to the removal of target species, bycatch of numerous fish and other organisms and the crushing of benthos such as e.g. cold water coral and large sponges. However, the impact of fishing on the deepwater ecosystem in general is poorly quantified. DEEPFISHMAN will develop a range of strategy options for the management of deepwater fisheries in the NE Atlantic that will take account of these factors. Firstly, the aim will be to identify new and more effective assessment methods, reference points, control rules and management strategies to be used in the short term, making better use of available data. Secondly, a reliable long-term framework will be developed for which additional data needs will be specified in order to fill current information gaps to achieve reliable long-term management requirements. This work will be developed by examining a range of case studies selected to reflect the different types of deepwater fishery found in the NE Atlantic. In addition two case studies outside the NE Atlantic are selected to give a wider perception of the management and monitoring of deepwater fisheries elsewhere in the world. For each case study current problems with assessment or management will be identified and new methods will be developed and tested. Recommendations for future methods and approaches will be made. The socio-economic profile and projected impact of the management strategy options as applied both through a short- and long-term framework will be examined for selected fisheries. In this way the project outputs will aim to provide robust guidelines for deepwater fisheries management suitable for adoption within the Common Fishery policy. The work will involve an ICPC country.

A.3 List of beneficiaries :

List of Beneficiaries

Beneficiary Number *	Beneficiary name	Beneficiary short name	Country	Date enter project**	Date exit project**
1(coordinator)	Institut Français de Recherche pour l'Exploitation de la MER	Ifremer	France	1	36
2	Centre for Environment, Fisheries and Aquaculture Science	Cefas	UK	1	36
3	Institute of Economic Studies, University of Iceland	UoI	Iceland	1	36
4	Institute of Marine Research	IMR	Norway	1	36
5	Imperial College of London	Imperial	UK	1	36
6	National Marine Information and Research Center	NatMIRC	Namibia	1	36
7	AZTI-Tecnalia Foundation	AZTI	Spain	1	36
8	National Institute of Biological Resources	IPIMAR	Portugal	1	36
9	Marine Institute	MI	Ireland	1	36
10	Hellenic Centre for Marine Research	HCMR	Greece	1	36
11	Instituto Español de Oceanografia	IEO	Spain	1	36
12	Marine Research Institute	MRI	Iceland	1	36
13	University of Portsmouth	UoP	UK	1	36

* Please use the same beneficiary numbering as that used in the Grant Agreement Preparation Forms
** Normally insert “month 1 (start of project)” and “month n (end of project)”

PART B

B1. Concept and objectives, progress beyond state-of-the-art, S/T methodology and work plan :

B1.1 Concept and objectives of the project :

Ø Concept of the project :

The deep-water is generally considered to be the area of the world's oceans beyond the continental shelf; that is, greater than 200 meters depth. Fisheries targeting deep-water species generally take place in depths below 400 meters (ICES, 2005). It is envisaged that this project will address the deep-water species listed in Annex I and II of the EC Deep-water Licensing Regulation (EC, 2002a) (see Appendix 1) and will therefore exclude species such as blue whiting (Micromesistius poutassou). This is consistent with ICES protocols because these species are not included in the remit of the ICES Working Group on the Biology and Assessment of Deep-Sea Fisheries Resources (WGDEEP). Notwithstanding, Greenland halibut (Rheinhardtius hippoglossoides) and oceanic redfish (Sebastes mentella), species similarly excluded from EC deep-sea legislation and ICES deep-sea protocols, are included as Case Studies as examples of comparatively data-rich stocks and, for Greenland halibut, to allow assimilation of the characteristics, strengths and weaknesses of the NAFO management and monitoring regime.

Using information and data currently available, new information from other ongoing projects, knowledge of the management and monitoring of deep-water fisheries/stocks in other parts of the world and outputs from the project, DEEPFISHMAN will develop a range of strategy options for the exploitation of deep-water species in the NE Atlantic. The existing management and monitoring framework for deep-water fisheries/stocks will be reviewed in the context of these options and the information currently available and recommendations will be made with the aim of developing a more effective framework of data collection, assessment, monitoring and management. This will comprise two approaches. Firstly, the aim will be to identify a more effective framework to be used in the short term, making better use of data and information currently available. Secondly, a reliable long-term framework will be developed for which additional data and information needs will be specified in order to fill current information gaps to achieve reliable long-term management requirements. The project will define a prototype ecosystem based management framework for deep-water fisheries in the NE Atlantic as an alternative to the current stock-based management regime.

This general approach will be developed by examining a range of case studies selected to reflect the diverse characteristics of the different types of deep-water fishery found in the NE Atlantic. In addition two case studies outside the NE Atlantic and Mediterranean Sea are selected to give a wider perception of the management and monitoring of deep-water fisheries elsewhere in the world. These studies will include an ICPC country: Namibia. Fisheries data (including all bycatch data) from case studies will be used to examine historical catch data for changes in biodiversity and to identify protocols for monitoring biodiversity (of both vertebrates and invertebrates) in the deep-water ecosystem. The socio-economic profile and projected socio-economic impact of the management strategy options, as applied both through a short- and long-term framework, will be examined for selected fisheries. In this way the project outputs will aim to provide robust guidelines for deep-water fisheries management suitable for adoption within the Common fisheries policy (CFP). All information and data (fisheries, biological, biodiversity and socio-economic etc) collated in case studies will be stored in dedicated DEEPFISHMAN databases.

Involvement of stakeholders will be key to the success of the project, since they offer a source of unique information to undertake proposed approaches. The fishing industry will be requested to contribute to specific work packages and this will largely be through their participation in workshops that will be arranged through the relevant RACs or by the use of questionnaires distributed through RACs. An initial start-up workshop will be convened to formulate the views of stakeholders on the present and possible future management regimes for

deep-water stocks/fisheries in the NE Atlantic. It is anticipated that outputs to stakeholders, policy makers and NGOs will be through a dedicated Stakeholder outreach and dissemination work package.

Having used criteria defined by the project to identify the various types of deep-sea fisheries present in the NE Atlantic (i.e. directed, by-catch, single-species, mixed-species etc and, where possible, a range of intermediate types between these), managers will be able to use the management and monitoring framework developed in DEEPFISHMAN to identify, taking into account precautionary, biological, ecological, socio-economic and bycatch/discard issues, the most appropriate way forward to manage and monitor each fishery. In some circumstances, this may be accompanied by management and monitoring measures at the stock level and these will also be addressed in the framework.

Ø Objectives of the project :

The objectives of DEEPFISHMAN are :

- To review (i) salient characteristics of the deep-water environment in the NE Atlantic, (ii) the major features of selected fisheries (this will require input from the Industry and the collation and analysis of socio-economic data), (iii) the life history characteristics and vulnerability to fishing of the stocks/species targeted in these fisheries, (iv) the current availability of fisheries, ecosystem and biological data, (v) the current methods used for monitoring, assessing and managing the state of stocks, (vi) the current state of deep-water stocks in the NE Atlantic and (vii) the outcomes and guidelines from the Commission of the European Communities, specific RTD programme "Specific Support to Policies", SSP-2004-22745 "Probabilistic assessment, management and advice model for fishery management in the case of poor data availability" (POORFISH) of relevance to deep-water stocks.

- To draw lessons from the current management and monitoring frameworks for deep-water species used internationally, to identify strengths and weaknesses. These will e.g. include approaches employed by (i) EU and NEAFC in the NE Atlantic, taking into account the recent Review of the Management of Deep-water Stocks carried out by the Commission (ECCOM, 2007), the outcomes of a recent European Parliament Workshop on Deep-water Stock Management (EP, 2007) and the views of fishers as expressed through the relevant RACs; (ii) deep-water fisheries New Zealand, using the knowledge gained by Dr Paul Marchal (one of the Key Scientist from the coordinating partner) recently returned from short-term secondment to NZ, (iii) by NAFO for Greenland halibut fishery in the NAFO Regulatory Area, (iv) orange roughy fishery in Namibia and (vi) the effort-based management framework for deep-water and other species in the Mediterranean and (vii) the experience of CCLAMR in assessing and managing stocks of Patagonian toothfish and finally, and importantly, the views of stakeholders.

- To examine and trial stock assessment methods not previously used or not fully developed for use on deep-water stocks in the NE Atlantic, with the primary aim of evaluating the state of stocks.

- To examine appropriate biological reference points (BRPs, e.g. MSY for stocks prosecuted by selected fisheries) and harvest control rules (HCRs) for deep-water fisheries/stocks in the NE Atlantic, and to explore the feasibility of simple approaches (e.g. the use of biological parameters such as trends in mean length and proportion immature : mature in catches) as indicators of the status of stocks.

- To explore catch data from appropriate case study fisheries for trends in biodiversity, to identify protocols for monitoring biodiversity (of both vertebrates and invertebrates) in the deep-water ecosystem and to integrate issues of by catch species and biodiversity in the management of deep-water fisheries.

- To develop a range of strategic options for the exploitation of deep-water stocks, fisheries and ecosystems in the NE Atlantic with the overall aim of developing a short- and long-term ecosystem based management framework with the aim of reversing any negative trends in abundance and reducing impacts of fisheries on biodiversity and, where feasible, vulnerable marine ecosystems (VMEs). Management frameworks will take into account (i) the outcomes of the objectives above, (ii) the FAO

International Guidelines on the Management of Deep-water Fisheries in the High Seas (FAO, 2007), (iii) a hierarchical risk assessment approach developed by Braccini et al (2006) and (iv) the requirement that EU member States commit themselves to maintaining or restoring fish stocks to levels that would produce MSY by no later than 2015[1] .

§ To develop a socio-economic profile of selected fisheries and to evaluate projected socio-economic impacts of management strategy options as applied both through a short- and long-term management framework.

§ To disseminate outputs/results to stakeholders, policy makers and NGOs.

B1.2 Progress beyond the state-of-the-art :

Ø Background in the NE Atlantic :

§ Stock assessment and management :

Most deep-water fish species are long-lived, slow growing, have a low reproductive capacity and are adapted to live in an ecosystem of low energy turnover in which major environmental changes occur infrequently (ICES, 2001). Deep-water ecosystems, including deep-water fishery resources, are highly vulnerable to exploitation (Merrett and Haedrich, 1997; Koslow et al., 2000) and deep-water habitats are sensitive because they are easily damaged and will take a long time to recover and are therefore in need of protection (OSPAR, 2000).

Deep-water fisheries in the NE Atlantic were reviewed by Gordon (2001) and Gordon et al (2003) and summarised by Large et al (2003). There are longstanding artisanal fisheries off the Azores and off Portugal, however high-seas fisheries for deep-water species did not commence until the late1960s and 1970s. A further expansion of high-seas fishing occurred in the late 1980s, partly as a result of improving markets for deep-water species but also because of overfishing of the traditional continental shelf fish stocks and the increasingly restrictive management regimen implemented to rectify this situation.

Almost all deep-water fisheries in the NE Atlantic were, until 2003, unregulated. Current EU management measures comprise biennial TACs (EC, 2002b, 2004, 2006), a vessel licensing scheme with aggregate power and capacity regulations (EC, 2002a) and fishing effort regulations (EC, 2004, 2006).

Most deep-water fisheries in the NE Atlantic developed without programmes in place to collect biological and fisheries data. Data collation and examination only really began in 1994 with the convening of the ICES Study Group on the Biology and Assessment of Deep-water Fisheries Resources (SGDEEP) (Gordon, 1998), and an assessment working group of the same name (WGDEEP) in 2000. The EU vessel licensing Regulation (EC, 2002a) requested Member States participating in deep-water fisheries to set up biological sampling and observer schemes as a condition of licenses.

Stock assessments of the major commercially exploited deep-water species of the NE Atlantic were first attempted at ICES in 1998 (ICES, 1998), and the most recent assessments were carried out by WGDEEP in 2006 (ICES, 2006a). Although progress has been made across this period, many of the problems experienced in earlier years still persist. Very little is known about the stock structure of most species and this can impact on the quality of assessments. A further problem is that there are very few fishery-independent surveys designed to provide time-series abundance data for use in assessments. Consequently, assessments frequently rely on abundance indices derived from commercial catch and effort data and these are often sparse and sometimes of poor quality. Furthermore, assessments are currently carried out at the stock level and there may be a need to revise this approach as a more fisheries-based approach to management may be required.

The methods used in assessments are largely determined by the life history characteristics of each species and the availability of fisheries data and biological data. In addition to CPUE data from commercial fishing vessels, for

[1] World Summit on Sustainable Development, Johannesburg, 2002.

most stocks the only other time-series data available are of total international landings. Available time-series of length data are frequently short and time-series age data are rare, and, where present, are also short or incomplete and often not useable in assessments. Options for assessment methods are therefore somewhat limited, and the main methods used in exploratory assessments have been the Schaefer production model (Schaefer, 1954; Hilborn and Walters, 1992), the Beddington and Cooke procedure (Beddington adn Cooke, 1983), models of long-term trends in standardised CPUE (Basson et al., 2002), separable VPA (Pope and Shepherd, 1982), stock reduction methods (Francis, 1992, 1993; ICES, 2004a) and catch survey analysis (CSA) (Mesnil,2003; ICES, 2006a). The only information currently available on the level of F is from estimates of total instantaneous mortality (Z) calculated from catch curves fitted to annual age compositions based on age determination of species for which estimates of natural mortality (M) are available, and from stock reduction models. Critically, the assessment methods used do not currently provide any reliable information on the relationship between F and catches. This situation has important implications for fisheries management insofar as it has not been possible to evaluate if reductions in TACs and fishing effort have resulted in declining Fs.

- Biodiversity (partly taken from Lorance, 2007) :

Biodiversity is the natural variation in the genetics and life forms of populations, species, communities and ecosystems (MARBEF, MARine Biodiversity And ecosystem Functioning, network of excellence http://www.marbef.org, Hiddink et al, 2008). There are few, if any, ecosystems worldwide for which knowledge on biodiversity according to this definition would be available. What is often known is species richness and the diversity of some taxonomic groups (e.g. fish, genetic varaition in a few species or the distribution of habitats and communities within an ecosystem (Lorance, 2007). Global deep-water diversity is unknown but expected to be high. At regional and local scales, deep-water fish are diverse in terms of morphology, feeding strategy and behaviour (Lorance and Trenkel 2006, Mauchline and Gordon 1985, Merrett and Haedrich 1997). Deep-water benthic communities are also diverse. Cold-water corals, gorgonians and sponges generate 3-dimensional structures on the seabed and are therefore considered to create diversity hotspots. Their biodiversity is not quantified but “they form physical structures, even reefs that rival in size and complexity those in warmer, shallower waters” (foreword of Friewald et al. 2004). Case studies indicate that they are associated with a high diversity of other species, e.g. macrobenthos (Henry and Roberts, 2007) and sponges (Van Soest et al. 2007) to the west of Ireland. Fish species composition and density also differs inside and outside cold-water coral reefs (Roos and Quattrini 2007, Costello et al. 2005). Corals may have some particular role for some fish species, e.g. protection either for gravid female redfish or their offspring (Husebo 2002).

Due to the long life span of many deep-water organisms, damage to deep-water communities and ecosystems are expected to be persistent and recovery to be slow. Therefore, the intensity and frequency of human disturbance that can be sustained by these systems is low.

However, there have been few studies of changes in biodiversity in the deep-water environment in the NE Atlantic even though deep-water fisheries, particularly trawl fisheries, may have a considerable impact on biodiversity of fish assemblages because all discards die due to bathymetric shock and there is probably a high mortality of escapees through trawl meshes due to the effects of abrasion (Connolly and Kelly, 1996, Koslow et al. 2000).

Ecological studies carried out in a study of the effects of fishing on deep-water fish species to the west of Britain (Basson et al, 2002), suggest that there have been changes in catch composition in Scottish Association of Marine Science (SAMS) trawl surveys pre- and post- exploitation, some slight changes in the slope of size-spectra, and, from diversity indices, some evidence of a decline in species diversity but little change in taxonomic distinctness. However, it was emphasised that further more intensive studies are required to confirm these effects and whether they can be attributed to exploitation.

- Deep-water habitats and fisheries impacts (taken from Lorance, 2007)

Towed deep-water fishing gears are heavy and designed to roll over rough seabeds. Trawl doors may weigh 1 t or more and ground ropes can include steel bobbins of 60 cm in diameter. Effects of trawling include long lasting trawling scrapes and ploughs, rolling of large boulders, resuspension of sediments and damage of epibenthic

species (Davies et al. 2007). So far this has not been considered to be of importance for sedimentary bottoms but it is a major subject of concern for coral communities.

About seven species of scleractinian corals (hard coral) occur in the NE Atlantic and two are reef forming: Lophelia pertusa, the most abundant, and Madrepora oculata. Corals such as Lophelia are preferably termed cold-water corals rather than deep-water corals, because they occur over a large range of depths at a global scale. In colder areas, they tend to occur in shallower waters and high water temperature may be the factor controlling their upper depth limit (Mortensen and Buhl Mortensen 2004). For example, on the mid Norwegian continental shelf they are particularly abundant at depths of 200-400 meters (Fossa et al. 2002). In addition to scleractinian corals, gorgonians and sponge form dense communities in some areas.

Occurrence of cold water corals has been known for a long time in the NE Atlantic, and were considered as damaging to fishing trawls as early as the 1920s (Joubin, 1922). The further development of deep-water fishing in the 1990s generated concern about its ecosystem effects and renewed interest in impacts on cold-water corals.

Reviews of the distribution of cold-water corals showed that they occur at discrete locations throughout the European continental slope (Friewald, 1998, Rogers, 1999, Mortensen et al., 2001). Along the Norwegian coast, fishing was shown to have seriously impacted corals, with 30 to 50% being impacted or damaged (Fossa et al. 2002). In Icelandic waters, it is likely that many coral-areas have been destroyed by fishing (Steingrimsson et al. 2006). Although there is no other large-scale survey of the proportion of impacted cold-water corals in the NE Atlantic, there is no doubt that fishing gears impact these corals and that in the past some fishing has occurred on corals. However, the impact in terms of the proportion of impacted reefs or ecosystem effects at the scale of the NE Atlantic or European EEZ is currently unknown.

Similar impacts of fishing on cold-water corals have been noted worldwide. Off Tasmania, where a large fishery for orange roughy (Hoplostethus atlanticus) developed in the 1990s, photographic transects indicated that 95% of the bottom was bare rock on a heavily fished seamount compared with about 10% on the most comparable unfished seamount (Koslow et al 2000). orange roughy fisheries generated similar concerns in New Zealand and elsewhere (Clark 1999, Branch 2001).

Not only towed gears but also passive gears such as longlines (which can be up to 70 km long) and nets are suspected to get entangled in corals and other vulnerable biogenic structures and generate damage. Lost fishing nets have been observed entangled in coral reefs to the west of Ireland (Olu-Le Roy, 2004), and the ghost fishing (the fishing gear is lost but continues to catch fish, those are eaten by scavengers then cleaning the net) effect of such nets may be high (Davies et al. 2007). Concerning longlines, while effects of a single longline is minor compared to a trawl haul; the long-term cumulative impact of passive gears can be significant.
Actions have already been taken in the NE Atlantic to reduce the impact of fishing on the deep-water. After temporary measures, bottom trawls were definitively banned on the Darwin mounds by regulation (EC) N° 602/2004 of the council of 22 March 2004. Two protected areas where bottom trawls and net fishing gears are banned below 200 m are defined in Regulation (EC) N° 1568/2005 of the council of 20 September 2005. Since 2004, the deep-water fish TAC regulation (EC N° 2270/2004 and EC N° 2015/2006) includes large areas to the west of Ireland and Scotland where orange roughy fishing is prohibited. In addition to being a fishery management tool, these closures provide protection of deep-water habitats and communities. Orange roughy has been the main target species in the two most southerly boxes and the closure might reduce the deep-water fishing effort in these areas to low levels, because since the introduction of the closed areas other deep-water species have not been caught there in large quantities.

In the international waters of the NE Atlantic, five seamounts on the Mid-Atlantic Ridge are currently closed to bottom fishing to protect vulnerable deep-water habitats as well as four areas on the Hatton and Rockall banks. The use of deep-water bottom fixed nets is also banned in some areas and at some depths. The question of how much of the deep-water seabed requires protection remains unanswered by science. However, a network of MPA should be designed by 2012 according to international commitments following the World Submit for Sustainable Development (WSSD 2002). The existing Marine Protected Areas designed to protect deep-water habitat and area closures designed for fisheries management in the deep NE Atlantic are a step towards this goal.

§ Importance of socio- and bio-economics for deep-water fisheries management

The goal of fisheries economics is to analyze and maximize the social benefits, which can be derived from the utilization of fish stocks. In this case it may be of special interest to investigate the distribution of these benefits. Before discussing the socio-economic effects of different fisheries management regimes it is necessary to give an outline of the main building blocks of bio-economic modeling and its use in socio-economic analysis.

When it comes to deep-water fish resources, a major social consideration is the value of the resources. A fundamental question for the policy makers is: how much is at risk here? Thus, this kind of evaluation is a very important contribution to the decision process at all levels, and fundamentally it has to be based on bio-economic models.

a) Bio-economic models of deep-water fishing

For the benefit of this project it is feasible to develop a relatively simple (i.e. aggregative biomass-fishing fleet) model for deep-water resources as a general model, and for each case specifically.

This will contribute toward an assessment of; (i) the value of the fisheries involved, (ii) the losses (financial and biological) relatively unchecked utilization will lead to, (iii) good management, (iv) deep-water habitat degradation.

It is possible to extend the benchmark models for each fishery in three important ways:

- Incorporating risk to reflect (a) lack of knowledge, (b) potential losses which are not measures, (c) systemic uncertainty. This risk would be an increasing function of harvest and effort levels. On this basis, show the economic and social sense of precaution.
- Explicitly incorporating the possibilities of irreversibility (or very slow reversibility) of resources.
- Incorporating protection sentiments (real valuables) into the model. This would be hurt by harvesting and thus represent an additional cost.

All of these should be adjustable in the sense that the parameters of the processes can be adjusted and corrected as added information becomes available

b) Management schemes for deep-water resources

A great deal of fisheries management knowledge currently exists (Arnason, 1990; Hannesson, 2004; FAO 2007). The operative word here is fisheries management regime, which incorporates both the fisheries management system and the enforcement system. Although certain fisheries management systems are in principle more effective than others, the realities of the fisheries situation constrain what system can be applied. As regards management schemes, the project will study the appropriate management scheme for each of the cases as well as generally.

There are certain features of deep-water fisheries that affect the appropriate choice of management regimes:

- Deep-water fisheries tend to be operated by larger companies employing relatively advanced technologies and large vessels. This makes enforcement easier.
- Deep-water fisheries tend to involve ocean regions, which are poorly researched and understood. Thus, the relevant biological and ecological data are often comparatively limited. This does not necessarily affect the choice for management systems, although it enhances the reason for employing precautionary points, but it likely influences the setting of management measures.
- Deep-water fisheries often exist outside EEZs and are thus subject to international exploitation, sometimes by IUU fleets. This first of all tends to intensify the race to fish. Secondly, it greatly complicates the fisheries management situation. Now more than one sovereign state is involved and a group of states has to contend with potential new entrants. Obviously this may affect the ideal fisheries management and enforcement systems. The situation can be usefully modelled as a game (competitive and/or co-operative) as has been successfully done in certain cases.

It seems that an appropriate fisheries management regime for a given deep-water resources can be sensibly suggested without an explicit bio-economic model of the resources. Obviously, however, the

management measures within the framework set by the management regime cannot be set, not even approximately, without the support of such a model.

c) Deep-water fisheries games

As already mentioned, many deep- sea fishery resources are found outside national EEZs. This means they are open to international utilization. Thus, provided these resources are valuable, the nations and other parties involved will find themselves playing a game, a fisheries game, against each other to maximize their national benefits from the resource (Munro 1991; Hannesson, 1997). The nature of the game and its likely outcomes is a problem of deep theoretical and practical complexity. The outcome, of course, has major repercussions for the evolution of the resources.

It is clear that deep-water fisheries games are of great importance for the fate of deep-water resources. Thus, it may be that a study of the game-theoretic aspects of deep-water fishery resources is of interest in this study.

It should be realized that the deep-water fisheries game couldn't be successfully analyzed without a bio-economic model of the fish resources. Thus, work on bio-economic models of deep-water fishing is really a prerequisite for employing the fishery games approach.

Ø Overview of deep-water fishery/stock management and monitoring issues (partly based on Large, 2007 and Lorance, 2007) :

§ Strategy for managing stocks

The biomass of any stock is expected to decrease under exploitation: "it is an unfortunate fact of harvesting natural populations that one cannot produce harvest from pristine ecosystems, the more one attempts to maximize yield, the lower the stock will be. It is not widely understood that depleting a stock to 20-40% of its original state is required to achieve the management objective of MSY" (Hilborn et al., 2006). This statement comes from an analysis of management strategies for orange roughy in New Zealand. The ratio of the virgin biomass to the level of biomass that produces MSY is not different in deep-water stocks than in other stocks.

The difference between deep-water stocks and shallower stocks is that they are most often less productive. Clearly deep-water fishes grow more slowly than shallow water fishes and produce less offspring per year. A given biomass of deep-water fish grows less in a year than the same biomass of shallow water fish. As a consequence, to extract MSY from a deep-water stock, the proportion of the current biomass (when at 20-40% of the virgin biomass) that can be extracted every year is much smaller than for shallow water fish. In the extreme case of orange roughy, which is the most long lived and the most slow growing species exploited in the NE Atlantic, sustainable catches are as low as 2% of the virgin biomass.

When considering options for the future management of deep-water stocks in the NE Atlantic two polarised views emerge. The first is that deep fishing should be curtailed due the vulnerability of deep-water stocks and the deep-water ecosystem, evidence that most stocks are heavily depleted, the paucity of fisheries and environmental monitoring and available biological and survey data for assessments, problems enforcing management measures in what are often high seas fisheries in international waters, and, critically, the limited information available as to what level of fishing is sustainable. In contrast, the industry favour less of an interventionist approach based on what they perceive to be doubts about the state of stocks because assessments are based on only limited data. There is also the view that deep-water fishing provides a useful outlet for fishing effort displaced by the strict conservation regimes implemented to encourage the recovery of depleted stocks on the continental shelf.

ICES, whilst not advocating a total ban on deep-water fishing (except for severely depleted stocks such as deep-water sharks and orange roughy), has advised that for existing fisheries, "fishing pressure should in general be reduced considerably to low levels and should only be allowed to expand again very slowly if and when reliable indicators show that harvest are sustainable" (ICES, 2006). This approach takes into account the precautionary approach to fisheries management but recognises that a low level of exploitation of some deep-water stocks may be sustainable assuming there is an effective stock monitoring process in place.

The management of deep-water stocks has lagged considerably behind exploitation. Moreover, attempts to reduce TAC and effort levels significantly have to some extent been compromised by the need to mitigate socio-economic effects. The EC has commented (ECCOM, 2007a) that:

"Many deep-water stocks have such low productivity that sustainable levels of exploitation are probably too low to support an economically viable fishery. It must therefore be recognized that current levels of exploitation on those stocks must inevitably be reduced, either by choice in order to conserve the stocks or else because the stocks become fished to depletion. Moreover, stock recovery times are so long that the reductions in exploitation must be regarded as permanent, not as a means to rebuild stocks to allow higher exploitation rates in the longer term".

There is a need to populate this strategy by identifying species which, on the basis of their life history characteristics, vulnerability to fishing and the long recovery time required for some that already seriously depleted, should not be exploited, as well as those species that are less vulnerable to exploitation and may be capable of sustaining exploitation in the longer term. This is an important aim of DEEPFISHMAN, which will take into account problems with mixed fisheries in progressing this strategy, and the results from within the project regarding the development of BRPs, HCRs, stock indicators etc and the use of new assessment methods to determine estimates of sustainable catches/fishing effort. Progress with these objectives will have a considerable bearing on the nature of both the short-term and long-term management and monitoring frameworks developed in the project. Attention will also be given to evaluating if existing artisanal fisheries are sustainable within the overall strategy adopted.

Little is known about the socio-economic characteristics of deep-water fisheries and these will be evaluated for key fisheries. This will provide a baseline against which the impacts of future management strategies can be evaluated.

- The importance of monitoring and managing discards

All deep-water fish species brought to the sea surface will die of barotrauma (bathymetric shock) because of the changes in pressure. This is particularly relevant where gears are not especially selective either for species or for fish size, trawls for example. Deep-water trawling may therefore have a substantial impact on the wider fish assemblage in the deep-water, but attempts to demonstrate this in the NE Atlantic have been largely inconclusive (Basson et al., 2002). Data capture and availability is also a problem. There are very few time-series discard data available for stock assessment. The only catch data usually available are of total international landings, so removals from deep-water stocks fished by trawlers are very likely to have been seriously underestimated. There is a need to collect discard data on a wider basis than at present and to make these data available in a format suitable for use in assessments and analyses of the impacts of fishing. The EC is currently reviewing the policy on discards (ECCOM, 2007b), and one option under consideration is a total ban on discarding. For the reasons described above, this option may be particularly relevant for deep-water fisheries although this will have significant financial implications for fleets.

- Deep-water bottom trawling

The Commission has recently tabled a strategy to protect vulnerable deep-water ecosystems (ECCOM, 2007), and some countries, Norway for example, have a strong track record in protecting deep-water habitats from destructive fishing practices, such as all bottom gears including trawls. This EU initiative is fully in line with the recommendations recently issued by the United Nations General Assembly (UNGA, 2006). Most EU vessels fishing on the high seas operate in areas where Regional Fisheries Management Organizations (RFMOs) are already in place or where the process of setting up an RFMO is well underway. In these areas the Commission will work to ensure that measures are implemented to ensure the protection of vulnerable deep-water ecosystems on the basis of a precautionary approach and prior impact assessment. This is currently the situation in the NE Atlantic where the EU works as a Contracting Party within NEAFC and in the southern ocean (CCAMLAR) the EU has recently agreed a specific measure for high-seas waters conforming to the UNGA resolution. However, further restrictions on bottom trawling may be required to protect deep-water ecosystems and prevent the development of new fisheries at those depths. Such a step would be consistent with the Precautionary Approach and with similar management measures in other parts of the world, for example, the recommended ban on

bottom trawling at depths >1000m in the Mediterranean introduced by the General Fisheries Commission for the Mediterranean (GFCM, 2005).

- Accountability of EU observer schemes and deep-water sampling plans

Under the deep-water licensing regulation (EC, 2002a), each Member State (MS) is required to prepare a sampling plan for the deployment of observers and sampling of landings at ports. MSs are required to ensure that data collected are adequate for the assessment and management of deep-water stocks. The sampling plans were to have been evaluated by the Commission within 6 months of the entry into force of the Regulation.

A major shortcoming of the licensing regulation is that there is no clearly defined sampling strategy, which means that even if the requirement to implement a sampling plan is fulfilled, the quality of the data obtained may be poor, or it may be difficult to pool the data from different Member States (ECCOM, 2007a). The problem with the present approach is that it is very much bottom-up and largely driven (and constrained) by MSs funding and staffing. This situation may improve as a result of changes to the EU Data Collection Regulation, which should result in a higher priority being afforded to deep-water stocks than at present.
However, what is also required is very much a top-down process. There is a need to identify the deep-water species/stocks that can be exploited on a sustainable basis, the appropriate assessment methods for each species and to set the minimum sampling levels required to ensure that assessments are accurate and robust within agreed criteria.

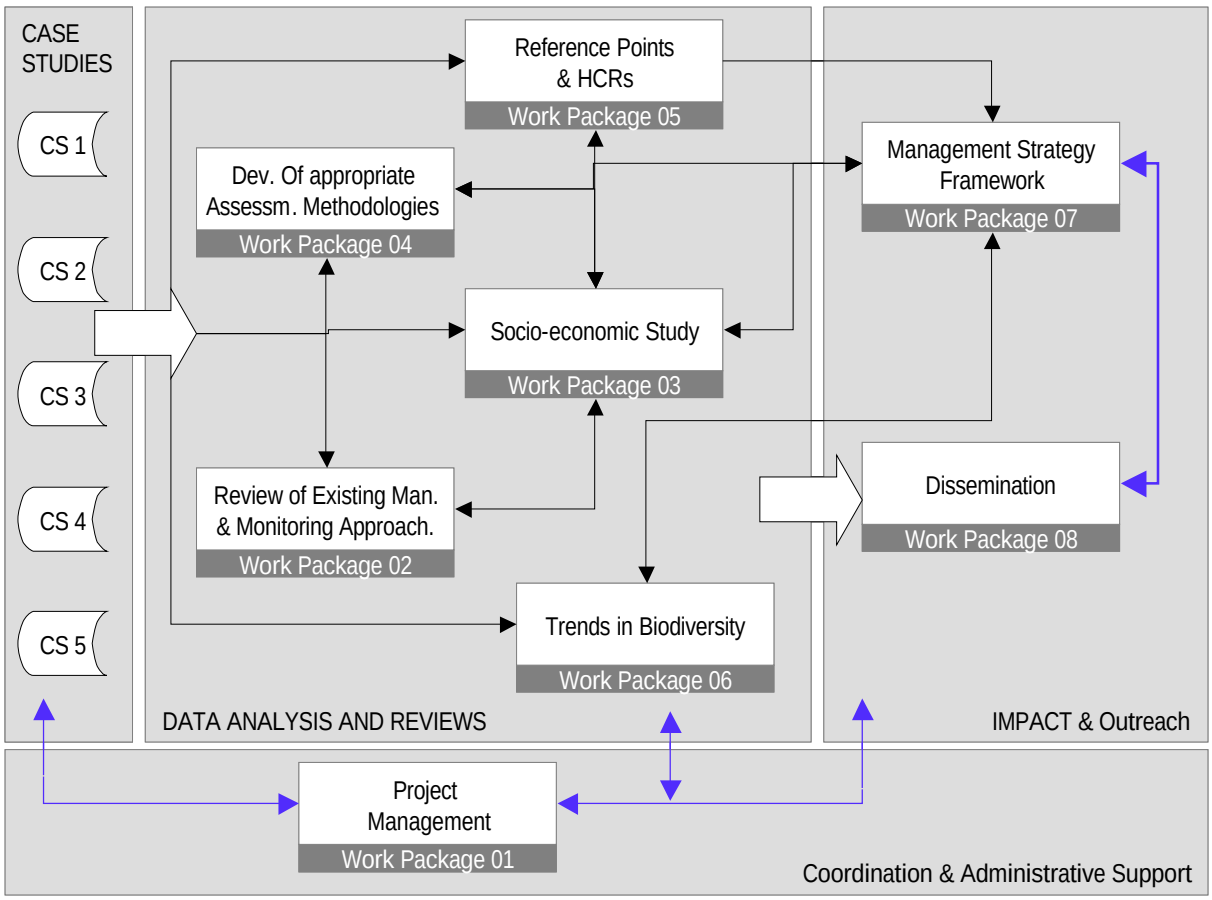
- Management of artisanal deep-water fisheries

EU artisanal deep-water fisheries are mainly found at and around the Azores (largely for the red (blackspot) seabream (Pagellus bogaraveo)) and off the coasts of Portugal and Spain (mainly for black scabbardfish (Aphanopus carbo), deep-water sharks and red (blackspot) seabream). It is not known if the stocks fished by these artisanal fisheries are independent of other stocks of these species in the NE Atlantic. However, many of the fisheries are longstanding and may be sustainable at a local scale. It is important that such fisheries are not summarily halted without due consideration of their social merits by general management measures implemented to control highly mechanized high-seas fisheries in other parts of the NE Atlantic.

B 1.3. S/T methodology and associated work plan

Ø B1.3.1. Overall strategy of the work plan

Figure 1.3 f) Pert diagram, showing the DEEPFISHMAN interaction of work packages



§ Work packages

The DEEPFISHMAN project will comprise 13 partners and 8 work packages. The project will use 5 case studies managed by scientists from relevant countries, selected to illustrate the diversity of deep-water fisheries. This aims to ensure that project outputs are relevant and broadly applicable. The project will be using a multi-disciplinary team consisting of fisheries scientists and socio-economists from a range of European, Nordic and ICPC countries. The list of work packages is shown in table 1.3a and the list of deliverables in table 1.3b.

- Work package 1 :
Management and Project Coordination – IFREMER lead

- Work package 2 :
Review information from other ongoing projects and existing knowledge of the management and monitoring of deep-water stocks in the NE Atlantic and in other parts of the world (Objectives 1, 2) – Cefas lead.

- Work package 3 :

Collation of available socio-economic data, development of socio-economic profiles and evaluation of the socio-economic impacts of the management strategy options developed in DEEPFISHMAN for/on selected fisheries (Objectives 1 and 7) – UoI lead.

- Work package 4 :
Development of appropriate assessment methodologies for deep-water stocks (Objective 3) – Imperial lead.

- Work package 5 :
Development of precautionary reference points, HCRs and stock indicators (Objective 4) – Imperial lead.

- Work package 6 :
Explore trends in biodiversity in time-series catch data from fisheries on the continental slope and evaluate past and potential impacts on VMEs (Objective 5) – IFREMER lead.

- Work package 7 :
Development of overall management and monitoring strategy and short-and long-term management frameworks (Objective 6) – AZTI lead.

- Work package 8 :
Stakeholder outreach and dissemination of results (Objective 8) – MRI lead.

§ Selected Case Studies and Case Study Managers:

Case studies have been selected to provide examples of the diversity found in deep-water fisheries. Using this range of case studies aims to ensure that the proposed management framework will be robust to the specific differences found.

- Case study 1 – Directed single species fisheries:-
Highly vulnerable - orange roughy in Namibian waters – NatMIRC
Highly vulnerable - orange roughy in ICES VI &VII – MI
Less vulnerable - blue ling (Molva dypterygia) in Vb,VI ,VII – Cefas

- Case study 2 – Mixed demersal fishery:-
French trawl fishery for roundnose grenadier (Coryphaenoides rupestris), black scabbardfish, deep-water sharks in Vb, VI and VII – IFREMER

- Case study 3 – Artisanal fisheries :
Vulnerable :
-Fisheries for red (blackspot) seabream in the Gibraltar Strait and Bay of Biscay– IEO
-Fisheries for red (blackspot) seabream in the eastern Mediterranean– HCMR
Less vulnerable : Portuguese fishery for black scabbardfish in IX -IPIMAR

- Case study 4 – Data rich stock – NE Atlantic redfish -IMR

- Case study 5 – Data- rich stock - Greenland halibut stocks in the NAFO area – IEO

The project is constructed so that the 4 central work-packages - numbers 3 to 6, covering socioeconomics, stock assessment and ecosystem management - build on the background developed in the review workpackage (number 2) and feed the management strategy workpackage (7). The latter will act to synthesise all the information for the case studies, develop new management approaches for deep-water stocks fished by the relevant European fleets and test these using management strategy evaluation on selected case studies. The project will be completed by dissemination effort to relevant stakeholders.

Contingency planning and project risk management:

At key milestones in the project the Steering Group will review progress of the overall project work, and the main tasks with converging timelines. Input will be obtained at these critical "Stage/Gates" or decision points in the project to ensure that the key objectives of the work packages and the overall project remain on target. This internal review combined with external advice is deemed critical to ensure that this relatively complex project remains proactively managed throughout its lifetime. Proper contingency planning to manage project risks, both external and internally will be in place and continually updated as the work progresses. The risk management and procedure for maintaining an effective and operational contingency plan is one of the core objectives of WP1 Coordination and project management, and is further described in section 2.1 of the proposal. The List of milestones in Table 1.3.e shows overall project milestones as well as the key milestones that will be used as stage/gate decision review points for approval of work quality and giving a go-ahead for further work. Also the project overall tentative review milestones are listed in table 1.3f. In cases work is not of sufficient quality or not achieved on time resulting in potential slippage of other project work components the SG has the power to react on behalf of the Governing Board to implement necessary corrective actions according to the adopted contingency plans to keep the overall project to schedules.

Ø B1.3.2. Timing of the DEEPFISHMAN WPs and their component – Gantt chart

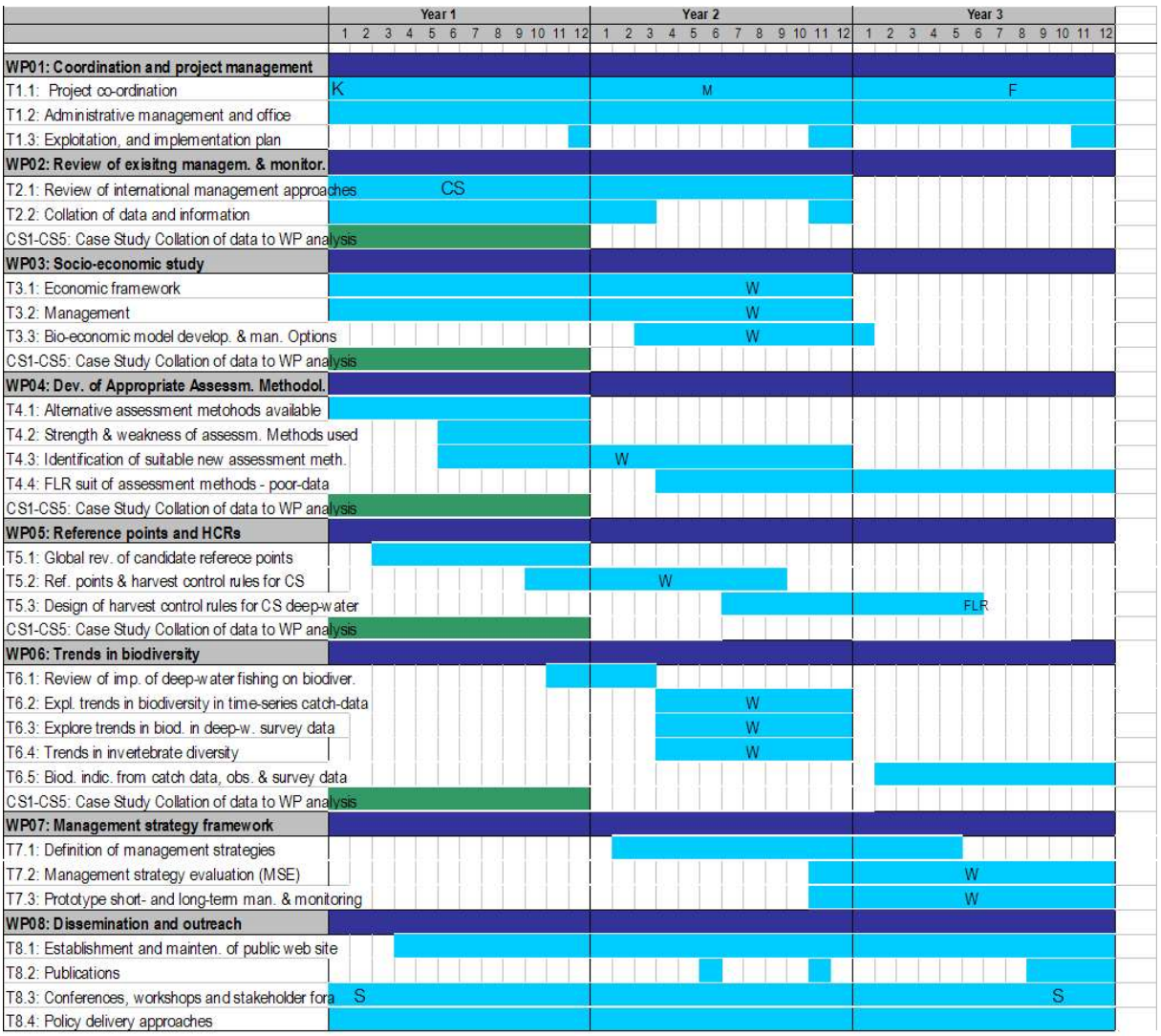
Overview of meetings and workshops during the project (horizontal lines group meeting occurring at the same time/place)

Date	Venue	Duration	WP	Meeting type	Alternative location / comment
Month 1	France	3 days	All	Kick-off meeting	
Month 1	France		All	Governing board meeting	
Month 1	France		All	Steering group meeting	
Month 2	Brussels (*)	1 day	WP8	Stakeholder workshop	Simultaneous translation required
Month 6		4 days	WP2	All case study meeting (invitation of some CoralFish scientists)	Confirm that appropriate data will be available from all case studies and data collection protocols (SOP) adopted
	Mallorca (*)		All	Steering group meeting	Together with all CS meeting Possibly some steering group member via conference call
Month 12	ICES/	1 day	All	Steering group meeting	Venue together with WGDEEP meeting
	Copenhagen		All	Governing board meeting	
Month 14	London/Imperial	2 days	WP4	task 4.3 suitable assessments for EU deep-sea species	Associated with another project meeting
Month 16	Cefas/Lowestoft	2 days	WP5	Work package workshop	Combination with WP4 meeting (month 14), or mid-term meeting
	Nantes	1 day	WP1	Mid term meeting	Venue together with ICES ACS, scheduled in Nantes, France 2010
Month 18	France		All	Steering group meeting	
		2days	WP6	Work package workshop	
Month 20	Iceland	2 days	WP3	Work package workshop	
Month 24	Lowestoft	2 days	All	Steering group meeting	Possibly some steering group member via conference call
	Cefas		All	Governing board meeting	
Month 30	Spain	2 days	WP7	Work package workshop	
	Spain	2 days	All	Project final meeting	Together with ICES ACS/ other conference ?
Month 30	Conference call		All	SG meeting	
Month 32	London/imperial	2 days	WP4	FLR training session	Associated with another project meeting in year 3, either at month 30 in Spain or 34 in London together with the stakeholders meeting
Month 34	NEACF/London	1 day	WP8	Stakeholder workshop	Simultaneous translation required
Month 35	France/Nantes		All	Steering group meeting	As a conference call
Month 35	France/Nantes		All	Governing board meeting	

Additional meetings may be required within Case Studies and work packages. For example some CSs, involving more than one partner (CS 1c, 2, 3a, 4 and 5), may require a meeting at month 10 or 11 to assemble data and reports. As far as possible, these meetings will be backed to other meetings.

As a tourist destination Mallorca is cost-effective thanks to low-cost flights available and cheap accommodation and subsistence. A workshop of the FP6 POORFISH project was successfully organised in Mallorca on 7-9 September 2008. Dr. Beatriz Morales-Nin, the director of IMEDEA, UIB CSIC, Esporles (Mallorca) 07190, Spain, volunteered to host a DEEPFISHMAN workshop, using the facilities from IMEDIA free of charge and contributing as an external participant.

Gantt chart


Year 1
Year 2
Year 3
1 2 3 4 5 6 7 8 9 10 11 12
WP01: Coordination and project management
T1.1: Project co-ordination
T1.2: Administrative management and office
T1.3: Exploitation, and implementation plan
WP02: Review of exisitng managem. & monitor.
T2.1: Review of international management approaches
T2.2: Collation of data and information
CS1-CS5: Case Study Collation of data to WP analysis
WP03: Socio-economic study
T3.1: Economic framework
T3.2: Management
T3.3: Bio-economic model develop. & man. Options
CS1-CS5: Case Study Collation of data to WP analysis
WP04: Dev. of Appropriate Assessm. Methodol.
T4.1: Alternative assessment metohods available
T4.2: Strength & weakness of assessm. Methods used
T4.3: Identification of suitable new assessment meth.
T4.4: FLR suit of assessment methods - poor-data
CS1-CS5: Case Study Collation of data to WP analysis
WP05: Reference points and HCRs
T5.1: Global rev. of candidate referece points
T5.2: Ref. points & harvest control rules for CS
T5.3: Design of harvest control rules for CS deep-water
CS1-CS5: Case Study Collation of data to WP analysis
WP06: Trends in biodiversity
T6.1: Review of imp. of deep-water fishing on biodiver.
T6.2: Expl. trends in biodiversity in time-series catch-data
T6.3: Explore trends in biod. in deep-w. survey data
T6.4: Trends in invertebrate diversity
T6.5: Biod. indic. from catch data, obs. & survey data
CS1-CS5: Case Study Collation of data to WP analysis
WP07: Management strategy framework
T7.1: Definition of management strategies
T7.2: Management strategy evaluation (MSE)
T7.3: Prototype short- and long-term man. & monitoring
WP08: Dissemination and outreach
T8.1: Establishment and mainten. of public web site
T8.2: Publications
T8.3: Conferences, workshops and stakeholder fora
T8.4: Policy delivery approaches
K
M
F
CS
W
S
FLR
K Kick-off meeting
F Final meeting
M mid-term meeting (venue with ICES annual science conference)
CS All case studies meeting
W Other Workshops in work packages (marked accross relevant tasks)
S Stakeholder workshop
FLR FLR training session
Steering group meetings every 6 months and governing board meetings every year are not depicted

Ø 1.3.3. Work Package list/Overview

WORK PACKAGE LIST						
Work package No[1]	Work package title	Type of activity[2]	Lead beneficiary No[3]	Person-months[4]	Start month[5]	End month[6]
1	Coordination and management	MGT	1	13	1	36
2	Review of existing management and monitoring approaches	RTD	2	82.5	1	24
3	Socio-economic study	RTD	3	46	1	26
4	Development of appropriate assessment methodologies	RTD	5	56	1	36
5	Reference points and HCRs	RTD	5	50.5	1	30
6	Trends in biodiversity	RTD	1	32	1	36
7	Management strategy framework	RTD	7	55	13	36
8	Dissemination and outreach	OTHER	12	17.4	3	36
	TOTAL			352.4		

[1] Workpackage number: WP 1 – WP n.

[2] Insert one of the following 'types of activities' per WP (only if applicable for the chosen funding scheme – must correspond to the GPF Forms):
RTD = Research and technological development including scientific coordination applicable for collaborative projects and NoEs
DEM = Demonstration - applicable for collaborative projects
OTHER = Other activities (including management) applicable for collaborative projects, NoEs, and CSA
MGT = Management of the consortium - applicable for all funding schemes
COORD = Coordination activities – applicable only for CAs
SUPP = Support activities – applicable only for SAs

[3] Number of the beneficiary leading the work in this work package.

[4] The total number of person-months allocated to each work package.

[5] Relative start date for the work in the specific work packages, month 1 marking the start date of the project, and all other start dates being relative to this start date.

[6] Relative end date, month 1 marking the start date of the project, and all end dates being relative to this start date.

Ø 1.3.4. Deliverables list

Del no.	Deliverable name	WP no.	Lead Beneficiary	Estimated indicative person-months	Nature	Dissemi-nation level	Delivery date
D1.1	Project Scientific and Management Reports interim and final	1	1	5	R	PU	18, 36
D1.2	Exploitation plans reports – interim and final, including (i) Gender Action Plans, (ii) statistics of presence of DEEPFISHMAN participants at conferences, ICES working groups, STECF groups, RACs meetings	1	2	3	R	PP	8, 18, 36
D1.3	Data format and protocols for CSs and data archive. Comparable and robust databases for all CSs	1	2	1	R/O	PP	12
D2.1	Report of the management and monitoring of deep-water fisheries/stocks in different parts of the world, in a range of RFMO Regulatory Areas. Includes reviews of relevant EC and EP, FAO actions, and the views of stakeholders in NE Atlantic deep-water fisheries.	2	2	20(*)	R	PU	12
D2.2	Compilation report of all case studies (CSs). Management measures applied in Case study fisheries, inventory of available fisheries, biological, biodiversity and socio-economic data.	2	2	34.5(*)	R	PU	15
D2.3	Manuscript of a scientific paper for submission to a peer review journal on the effectiveness of existing management frameworks of deep-sea stocks and fisheries.	2	2	20	R	PU	15
D3.1	Overview of economic management measures and impacts for selected case studies.	3	14	7	R	PU	18
D3.2	Manuscript of a scientific paper for submission to a peer review journal on the economic performance of deep-sea fisheries in Europe	3	3	9	R	PU	25

(*) These include case studies person-months

Del no.	Deliverable name	WP no.	Lead Beneficiary	Estimated indicative person-months	Nature	Dissemi-nation level	Delivery date
D3.3	Manuscript of a scientific paper for submission to a peer review journal on the socio-economic effectiveness of deep-sea fisheries and economics options (M36).	3	14	9	R	PU	36
D4.1	Review of alternative assessment methods available their requirements in terms of data and their potential use in management.	4	5	12	R	PU	12
D4.2	Identification and development of suitable methods to use for deep-sea species, and general issues of risk and identify short- and long- term approaches and data requirements.	4	5	24	R	PU	24
D4.3	Development in FLR of a suite of assessment methods in a format for use in data-poor situations.	4	5	20	R	PU	36
D5.1	Global review of reference points and harvest control rules appropriate for deep- water and data poor situations	5	5	10.	R	PU	12
D5.2	Review of the strengths and weaknesses of current reference points, harvest control rules, and indicators for case study fisheries	5	5	20	R	PU	20
D5.3	Report on suitable harvest control rules for European deep-water fisheries now and in the future.	5	5	20	R	PU	30
D6.1	Evaluation of the relevance of commercial catch data to assess changes in the species composition of deep-water fish assemblages. Definition of indicators of fish diversity based on catch data.	6	1	8	R	PU	18
D6.2	Report on biodiversity indicators, trends monitoring and evaluation of information pertinence for deep-water fish and invertebrates.	6	1	8	R	PU	24

Del no.	Deliverable name	WP no.	Lead Beneficiary	Estimated indicative person-months	Nature	Dissemi-nation level	Delivery date
D6.3	Analyses of patterns of distribution of the fish diversity from survey data in the area of some case study (case studies 2, 3b,3c). Manuscript for a peer reviewed paper.	6	1	10	R	PU	30
D7.1	Assimilation of the management and monitoring recommendations presented for selected case studies and the other WPs, including requirements for future data collection and research.	7	7	5	R	PU	14
D7.2	Development and identification of options for overall management strategies both in the short- and long-term.	7	7	10	R	PU	30
D7.3	Report on identified data gaps and recommendations for future activities on effectiveness of management (technical measures), and. analysis of feasibility of various other types of management options. (32)	7	7	10	R	PU	32
D7.4	Guidelines towards a prototype management and monitoring framework for deep-water fisheries/stocks in the NE Atlantic.	7	7	12	R	PU	36
D7.5	Manuscript 1 for submission to peer review journals on the evaluation of harvest strategies for deep-water fisheries	7	7	12	R	PU	36
D8.1	Public website	8	1	3	O	PU	8
D8.2	External Stakeholder Interactive Communication Plan	8	3	1	O	PU	8
D8.3	Dissemination reports	8	1	1.7	R	PU	18, 36
D8.4	Policy advice Preliminary Report	8	12	3	R	PU	32
D8.5	Stakeholders workshops	8	12	4	O	PU	2, 32
D8.6	Consensus report from stakeholder workshops	8	2	4	R	PU	4, 36

List of internal project deliverables obtained from the Case Studies

These internal deliverables are compiled into a single deliverable of public (PU) dissemination level, D2.3, all these 9 reports have a PP (restricted to programme participants) dissemination level and include reports, i.e. deliverable type R and databases, deliverable type O. All Case Studies deliverables are being delivered as a draft at month 6 and at a final report at month 12. Person month dedicated to Case studies are also counted in WP2.

Case studies - Internal project deliverables for use by WPs		Lead Beneficiary	Estimated indicative person-months
dCS1a	Case study report for orange roughy fishery in Nambia (M12). The report will include the following chapters: - historical development of the fisheries, including catches and fleet. - biological parameters of the target species with up to date description of the current knowledge of their life history pattern, stock structure and status - review of assessment method used so far - inventory of the fisheries, biological, biodiversity and socio-economic data currently available for management and monitoring purposes (1) - review of kown and likely impact of the fishery on deep-water biodiversity - review of current and historical management and monitoring procedures. SWOT (Strength and weaknesses, Opportunities and threats) and gap analysis of past and present scientific projects and data collection programmes in terms of fulfilling the data requirements for adequate management and monitoring regimes.	6	24
dCS1b	Case study report for seamount and mixed slope fisheries for orange roughy in ICES area VI-VII (Chapters as in DCS1a)	9	4.5
dCS1c	Case study report for blue ling fishery in ICES Vb,VI, VII and XIIb (Chapters as in DCS1a)	2	7.5
dCS2	Case study report for the mixed demersal trawl fishery in Vb, VI and VII (Chapters as in DCS1a)	1	3.5
dCS3a	Case study report for the red(blackspot) seabream fisheries in the Strait of Gibraltar and the Bay of Biscay (Chapters as in DCS1a with an additional section on Analysis of growth parameters estimated by otoliths reading (ALKs from 2003 on) and also tagging experiences in the Strait of Gibraltar area.)	11	4
dCS3b	Case study report for the red seabream fishery in the eastern Mediterranean sea (Chapters as in DCS1a)	10	6
dCS3c	Case study report for the Portuguese fishery for black scabbardfish (Chapters as in DCS1a)	8	4
dCS4	Case study report for the NE Atlantic redfish fishery (Chapters as in DCS1a)	4	6
dCS5	Case study report for the NAFO Greenland halibut sub-area 2 and Division 3KLMNO fishery (Chapters as in DCS1a)	11	7

Ø B 1.3.5 Work package descriptions

§ Work package 1

Work package number	1	Start date or starting event:		Month 1			
Work package title	WP1- Coordination and management						
Activity Type	Management						
Participants number	1	2	5	7	8	11	12
Participants short name	Ifremer	Cefas	Imperial	AZTI	IPIMAR	IEO	MRI
Person-months per participants:	10	2					1

Objectives

To coordinate the DEEPFISHMAN consortium research activities ensuring that:

- Project co-ordination and controlling remains efficient
- Providing management of project strategy and direction
- All documentation is developed and maintained, such as project handbook, progress reporting and cost statements
- Project deliverables will be met within project duration.
- Communication platform for document exchange is set up and maintained for reports and decision making
- Results are disseminated within the consortium and the EU.
- Result quality is high and that no replication of activities occurs.
- Gender actions
- To identify and resolve difficulties with the implementation plan (e.g. unexpected delays in deliverable, data compilation, analysis, etc.)
- To liaise with the EC

Description of work and role of participants

The coordinator (Ifremer) will follow the research activities of the consortium partners in collaboration with the work package leaders and the Case Study managers, setting up deadlines for each research activity and ensuring that all partners are fulfilling their project duties and that task time tables and deliverables are met in due time. The coordinator will be responsible for putting together research results and prepare periodic management and technical reports for the EC. All contact between the project consortium and the EC will be undertaken by the coordinator.

Task 1.1: Project co-ordination

This task is responsible for keeping the technical activities converging towards the common overall objectives, and preparation and timely submission of deliverables meeting the quality criteria adopted by the project steering group. The coordinator will act as liaison for the project with the European Commision and ensure delivery of all deliverables on time. Regular communication with partners will keep them informed of developments at EC level and include regular reminders of reporting obligations well in advance of due date.

Particular focus will be put on the timely integration of the outputs from the different work packages, and ensure the most suitable harmonization of the overall project outcomes via the dissemination and outreach initiatives in WP8 to maximize the positive society benefits to be gained by the overall project developments

trough European synergy of joint efforts.

Sub-task 1.1.1 Data management protocol (Ifremer with significant contribution from Cefas)
A DEEPFISHMAN data management protocol, and partner data delivery schedule will be defined by this task. In relationship with Case studies, data formats will be defined in order to compile data in standard format for work package use and archiving beyond the project end. Further, the data collated within the project will be stored in a database compatible with other existing fishery databases/libraries, e.g. PANGEA (www.pangea.de) or other similar (sensitive commercial data form companies / vessels etc. will require some restrictions of data access). Some databases from previous EU project (e.g. TECTAC, CAFE) will be used and updated.

Task 1.2: Administrative management and project office
This task is responsible for the overall administrative project management. A project office for day-to-day work is responsible for effective working. It handles all formal matters, particularly the cost statements and collation of management financial reports. A part-time administrator will be provided by Ifremer to support the administrative work in the project and the project office. This task is furthermore responsible for organizing reviews, audits, and meetings of the Project Governing Board and the Steering Group. Several key meetings in the project will be organized; a kick-off meting, the mid-term and final meetings, a 4 days "all case studies" workshop and facilitation of the work package meetings. The project office will responsible for organizing main partners meetings, and in addition promote efficient use by the partners of e.g. Skype, conference call facilities and video conferencing when necessary.
It provides the different bodies – the Commission included – with relevant information on project results and maintains the follow of information internally and externally.

Task 1.3: Exploitation, and implementation plan
This task evaluates the value of assets being developed in the project and handles Intellectual Property Rights (IPR) and patents. The task promotes the exploitation of results within the consortium based on individual exploitation and use plans of participants taking note of the outcomes of WP7 Management strategy framework, and ensures effective integration with WP8 on overall dissemination and outreach actions.

Sub-task 1.3.1. Develop links with related projects within the EU and internationally (Clustering)
The coordinator and partners 4, 10, 12 (Ifremer, IMR, HCMR and MRI) are already a partners of the CoralFISH (FP7-ENV.2007.213144) project. Several partners where involved in previous related projects (e.g.FP4 FAIR 95-0655, FP6 FISBOAT, TECTAC, EFIMAS, PRONE, POORFISH) from which data and experience are available. Links with other relevant projects worldwide will be established throught contacts in European and International fora. This is further described in section 3.3.

Sub-task 1.3.2. Final exploitation plan for the use and dissemination of the foreground
Interim dissemination plans will be delivered in the first year and updated at the mid-term, with a final plan delivered at the end on the project (D1.2). It will aim to use all appropriate methods to disseminate the findings of the project to the widest possible audience. The exploitation plan will include a public part and a confidential part. The public section will consist of (i) a description of the dissemination measures including scientific publications and other disseminations means (e.g. press releases, newspaper articles, contribution to websites (ii) statistics of presence of DEEPFISHMAN participants at conferences, ICES working groups, Scientific Technical and Economical Fishery Committee (STECF) groups, Regional Advisory Committees (RACs) meetings at national levels with administration, government and stakeholders. Public project documents will remain available on the project website and report will also be stored on institutional archive of the partners (e.g. archimer at Ifremer, http://www.ifremer.fr/docelec/ and at Cefas: http://www.cefas.co.uk/publications/miscellaneous-publications.aspx). Where appropriate testing has occurred, software will also be available on the FLR webpage (www.flr-project.org). Due to the nature of particular pieces of information, there is a need for a confidential section that is available to project participants only. The confidential section will describe data, databases, software compiled or assembled during the project (where that software has not been sufficiently tested).

Parts of the databases that are not subject to confidentiality will be stored on a web-based library (e.g. PANGEA). However, the project will also make use of data where individuals/companies are identified and such data can be made available without appropriate aggregation at e.g. national and/or marine region level. It is not anticipated that the project will apply for patents, trademarks or registered designs.

Deliverables

D1.1 Project Scientific and Management Reports interim and final (months 18 and 36).
D1.2 Exploitation plans reports – interim and final, including (i) Gender Action Plans, (ii) statistics of presence of DEEPFISHMAN participants at conferences, ICES working groups, STECF groups, RACs meetings(8, 18 and 36).
D1.3 Data format and protocols for CSs and data archive. Comparable and robust databases for all CSs (12)

§ Work package 2

Work package number	2	Start date or starting event:			Month 1					
Work package title	WP2- Review of existing management and monitoring approaches									
Activity Type	RTD									
Participants number	1	2	4	5	6	7	8	9	10	11	12
Participants short name	Ifremer	Cefas	IMR	Imperial	NatMIRC	AZTI	Ipimar	MI	HCMR	IEO	MRI
Person-months per participants:	4	11	3	2	24	2.5	10	7(6 subcontracted)	6	9	4

Objectives

- Develop an agreed definition of deep-water fish and fisheries.
- Review the salient characteristics of the deep-water environment in the NE Atlantic.
- Review the management and monitoring framework for deep-water fisheries internationally (e.g. New Zealand, in the Mediterranean, in Antarctic fisheries for the Patagonian toothfish and in the NEAFC, NAFO and SEAFO Regulatory Areas). Summarise the outcomes from recent EC and EP reviews of management of deep-water stocks and fisheries and the FAO recommendations and guidelines for deep-water fisheries. Review the outcomes of the recent FW 6 POORFISH project. Collect and collate the views of major stakeholders in NE Atlantic deep-water fisheries (through a Workshop at the start of the project and possibly also using questionnaires)
- Manage the scientific aims, progress and delivery of outputs from Case studies, to review and develop of an inventory of the biological, fisheries, biodiversity and socio-economic data collated for DEEPFISHMAN case studies and assist IFREMER in compiling a DEEPFISHMAN database.
- Review the historical development and effectiveness of assessments and management measures introduced in Case Study stocks/areas (using inputs from Case Studies). This will provide necessary background information for WP 7.
- Review the deep-water data collected under the EC Data Collection Regulation (DCR) and EU Member State Deep-Water Sampling Plans and the outcomes from ICES Planning Group for North East Atlantic Continental slope surveys (PGNEACS).

Description of work and role of participants

This work package will be led by Cefas working in conjunction with other partners. The work falls within two separate tasks (Cefas leading both).

Task 2.1 – Review of international management approaches
As a first activity, a definition of deep sea fish and fisheries will be developed by Cefas in collaboration with all partners and case study leaders. The definition of deep sea remains open to interpretation, with a number of differing examples available. The DEEPFISHMAN definition will underpin and define the activities throughout the project.

The management and monitoring of deep-water stocks and fisheries varies around the world and between RFMOs areas, and it is useful if best practise in different areas can be identified and embedded in the outputs from DEEPFISHMAN. To facilitate this, the management regime in the Meditearranean and the NAFO, NEAFC and SEAFO Regulatory Areas, and in the CCAMLR area for Patagonian toothfish will be

reviewed, and the outputs from TXOTX will be incorporated. Paul Marchal (Ifremer) will describe his experiences and knowledge gained while on secondment to New Zealand. Additionally, the outcomes from recent EC and EP reviews of management of deep-water stocks and fisheries, and the UN and FAO recommendations and guidelines for deep-water fisheries will be reviewed. The views of stakeholders in NE Atlantic deep-water fisheries, NEAFC and the EC will be obtained and collated. In turn, the outcomes of the EC FW6 "Probabilistic assessment, management and advice model for fishery management in the case of poor data availability" (POORFISH) will be described. The primary objective of POORFISH is to create and an advisory system (assessment, advice, and/or management) approach based on methods able to deal with data poor systems (utilizing both expert knowledge and published information in addition to existing data-sets).

A key concern for deep-water fisheries is their impact not only on the 'target' species, but also the commercial and non-commercial bycatch species, as well as the ecosystem within which they sit. Therefore, the review process will also consider the multispecies nature of deep sea fisheries, examining both the methods used worldwide to integrate by-catch fish species, biodiversity and VME issues, and upcoming legislative drivers (e.g. UN agreements on deepwater fishing in international waters). For example, risk-based approaches used within Australian waters (e.g. Hobday et al., 2007, Smith et al., 2007) that incorporate considerations of the multispecies complex of fishery catches, will be reviewed. Outputs from the PRONE project will also be examined. This will underpin considerations in all subsequent work packages.

This work will be carried out by Cefas and will provide key inputs to WPs 4, 5, 6 and 7.

Task 2.2 – collation of data and information

The review of the salient characteristics of the deep-water environment in the NE Atlantic will provide a generic back-drop to the information on the biology of deep-water species collated in the Case Studies. One partner (MI) will subcontract collation of data in one case study (CS1b) and some technical parts of the review work.

Within this task, the data available from case study fisheries will be catalogued and assimilated. This provides the basis of the work within WP 4, 5 and 7.

Guidance will be administered as to the nature and content of Case Study reports and the production of these will be managed by Cefas

Information on the biological and fisheries data collated for DEEPFISHMAN case studies and the historical effectiveness of management measures introduced for each case study fishery/stock/ecosystem will be reviewed in conjunction with case study leaders in preparation for WPs 4, 5, 6 and 7. An inventory and database of available fisheries, biological, biodiversity, VMEs and socio-economic data for each study will be similarly developed. As the case studies may not reveal strong data regarding discards and bycatch, an interaction with partners in WP6 will be ensured to bring this aspect into the work in this task. Biodiversity and composition of catches information is necessary to provide a common foundation for the analysis work. VME information is required for mapping purposes and to evaluate the impact assessment and encounter protocols currently in place. This work will be carried out by Cefas and Imperial College in conjunction with Case Study leaders.

The sampling strategies and deep-water data collected under the EC Data Collection Regulation (DCR) and Member State Deep-Water Sampling Plans will be described and strengths and weaknesses will be identified. This work will be carried out by Cefas and IFREMER, and the outputs will be used in WP7.

The outcomes from ICES Planning Group for North East Atlantic Continental slope surveys (PGNEACS) will be reviewed to provide an insight into the future availablility of fisheries-independent abundance indices. This work will be carried out by the MI in conjunction with Cefas and the outputs will be used in in WPs 4, 5 and 7.

Deliverables

D2.1 Report of the management and monitoring of deep-water stocks, fisheries and ecosystem in different parts of the world, in a range of RFMO Regulatory Areas. Includes reviews of relevant EC and EP, FAO actions, and the views of stakeholders in NE Atlantic deep-water fisheries. (12)

D2.2 Compilation report of all Case Studies (CSs). Management measures applied in CSs fisheries, inventory of available fisheries, biological, biodiversity and socio-economic data. (15)

d2.a Report on DCR and MS Sampling and the outcomes of ICES PGNEACS, internal project deliverable (12)

D2.3 Manuscript of a scientific paper for submission to a peer review journal on the effectiveness of existing management frameworks of deep-sea stocks and fisheries.

§ Work package 3

Work package number	3	Start date or starting event:		Month 1			
Work package title	WP3- Socio-economic study						
Activity Type	RTD						
Participants number	2	3	7	9	10	11	12	14
Participants short name	Cefas	UoI	AZTI	MI	HCMR	IEO	MRI	UoP
Person-months per participants:	3	23	3.5	2(2 subcontracted)	1	1	1	11.5

Objectives

The overall objective is to analyse the socio-economics of deep-sea fisheries. The work aims to provide new assessment approaches, and new understanding of the social and economic significance (or lack there of) of deepwater fisheries. This is seen to provide a more robust management strategy framework. Further, this work will be carried over to WP7 to develop a robust strategy based on economic analysis for consideration if these fisheries are worth developing in light of the high cost involved in gathering information, enforcement difficulties, and taking note of the long term sustainability. The work package has specific objectives such as:

- To collate available socio-economic data from the selected fisheries cases
- To assess economic performance of deep-sea fisheries
- To analyse functioning of deep-sea fisheries markets
- To study management effectiveness of deep-sea fisheries
- To develop socio-economic profiles, and perform evaluations of the socio-economic impacts of past and current fisheries management options to establish further basis for the improved management strategy regimes developed in the DEEPFISHMAN project (provide basis for further work in WP7).

Description of work and role of participants

Work package three (WP3) is lead by the Institute of Economic Studies (IoES) of University of Iceland. With contributions from partners UoP/Cemare, AZTI, Cefas, MI and Ipimar. MI's contribution to the provision of socioeconomic data from Case study 1b will be subcontracted. WP3 looks at socio-economics of deep-sea fisheries, and the work is organised around the analysis of the economic performance of fleets, the effectiveness of management measures and the functioning of markets. These analyses will provide information for formulating policy options from the economic point of view. The work package is divided in three main tasks:

- T3.1 Economic framework
- T3.2: Management
- T3.3: Modelling

A workshop will be hold in the second year of the project to analyse the application the economic framework to selected case studies and its integration into the management framework (WP7).

Task 3.1: Economic framework (Task leader UoI)
Create the framework for the socio-economic data from project participants for selected case studies under scrutiny, and ensure that data collation is performed according to a unified protocol (see D1.7) regarding data structure from these case studies for further analysis. Special care must be taken to ensure consistency in the data collection for all the different case studies. The data will be imported into case-specific databases and analysis performed to assess the importance of key criteria within each selected

case study. Furthermore comparative studies across the cases will be carried out to highlight important differences. Outputs from case studies on biological data (see WP2) will be in a format compatible with developed socio-economic databases. Further, it should be possible to import or export data from the project archive to external databases.
UoP will contribute to the work in the task, and the task's working group will need to have interactive liaisons with all case studies leaders in order to ensure that the economic framework fits all case studies.

Sub-task 3.1.1: Technical (UoI leading)
Time-series data on the following technological aspects of each selected case will be required from each selected case study and the corresponding WP team:

- Fleets and fleet segments composition
- Calender of Fishing activites with geographical areas
- Fishing technology and gear
- Catch – landings – discards
- Non-reporting
- Surveillance and monitoring

Sub-task 3.1.2: Price data of landings and evaluation of sector overall importance (UoP/Cemare leading)
Price data of landings and evaluation of overall importance of deep-sea fisheries for countries and/or specific regions will be analyzed. This consist first of collecting information on price at auction or port levels and secondly information on various socio-economic aspects such as characteristics of the regions from where the ships operate, information regarding the labour force, both in fishing and processing, gender balance, wages, etc. Various additional information of importance regarding the affected industries/companies that create constraints or opportunities will also be collated and analyzed to obtain a fuller picture the socio-economic drivers involved. The aim is to have a good estimate of the contribution of deep-sea fishery to the economy of coastal regions of Europe. The region unit will be at NUTS 2 or 3 scales.

Sub-task 3.1.3: Fleet Socio-economic data (UoI leading)
The socio-economic data are of two types. First there is information regarding business aspects of each fishery, e.g. revenues, costs and profits for different fleets/companies. Having time-series data on those variables is important to be able to get ideas concerning whether those fisheries are in the phase of contraction or expansion (or in equilibrium). Information on how much fleet are dependent on deep-sea fisheries comparatively to other fisheries for the economic performance is also needed (especially to assess effect of management measures in situation where fleet can reallocate tier fishing effort to other species than deep-sea ones). It is therefore necessary to collect and collate time series data for each selected case study on:

- Revenues, costs and profits
- Share of revenues, costs and profits that belong to deep-sea fishery /other fisheries
- Labor force (fishermen, fish workers) and their welfare, migration
- Migration, labour mobility and regional issues
- Companies (types, size)

Task 3.2: Management (Task leader UoP/Cemare)
As noted in WP2, an overview of the theory of fisheries management is needed as a framework for further analysis and to clear the use of concepts and definitions used. This task runs in parallel with Task 2.2, and is focused through the following linked subtasks of data collation and analysis:

Sub-task 3.2.1 History of deep-sea fisheries management measures (UoP/Cemare leading)

- This sub-task will deliver as internal task (T3.2) report on the history of deep-sea fisheries management measures. The history report is due by M17 for incorporation into deliverable D3.3.

Sub-task 3.2.1: Effects of management (UoP/Cemare leading)

With the history of management measures for each case (input from T2.5) the effect of management measures can be evaluated. This evaluation will focus on socio-economic aspects such as the profitability of the fishing industry, wages, unemployment, migrations between regions and social standing of the populations that depend on the specific fisheries.

- The output from this sub-task will be delivered as in internal T3.2 report, due by month 17 (M17) for incorporation into D3.3

Subtask 3.2.2 Effects of markets changes (UoP/Cemare leading)
As every other fishery, the deep-sea fisheries aim at supplying fish to markets. Changes in the market conditions affect the amount harvested and the fishing technique used. Topics to be studied include e.g. changes in consumption in different markets, the decline or instability of supply to the markets, the substitution between different species and the role of retailers and the increased environmental awareness of consumers in many markets.
This sub-task will deliver a internal T3.2 report on Market changes, which is due by month 17 (M17) for incorporation into D3.3

Task 3.3: Bio-economic model development and management options (Task leader UoI)
The work in this task focuses on constructing a bio-economic model applicable to each case study for which there exist appropriate data. This model will be (a) dynamic, (b) stochastic and (c) capable of incorporating various fisheries management regimes. This model will allow analysing of the socio-economic effects of past and current fisheries policies and thus analyse the probable effects of different management options. The bio-economic models will be developed in close corporation with AZTI-Tecnalia enabling comparison of the socio-economic effects of historical fishing strategies (WP3) with optimal strategies (WP7).

Sub-task 3.3.1: Technical/input restrictions (gear restrictions, etc.) (UoI leading)
This subtask will analyse data relating to effects of technical and other measures affecting the fishery and employ the results in the main model development of T3.3.

Sub-task 3.3.2: Property rights, ITQs/IQs/TURFs (UoI leading).
This subtask will analyse data relating to effects of property rights and their role in the concerned fisheries, and employ the results in the main model development of T3.3

Deliverables

D3.1 Overview of economic management measures and impacts for selected case studies (18)
D3.2 Manuscript of a scientific paper for submission to a peer review journal on the economic performance of deep-sea fisheries in Europe (24)
D3.3 Manuscript of a scientific paper for submission to a peer review journal on the management effectiveness (in socio-economic terms) of deep-sea fisheries and economics options (36).

§ Work package 4

Work package number	4	Start date or starting event:			Month 1				
Work package title	WP4- Development of appropriate assessment methodologies								
Activity Type	RTD								
Participants number	1	2	4	5	7	8	10	11	12
Participants short name	Ifremer	Cefas	IMR	Imperial	AZTI	IPIMAR	HCMR	IEO	MRI
Person-months per participants:	5	10	8	22	3	4	2	1	1

Objectives

- Review alternative assessment methods available for deep-sea stocks and fisheries, their requirements in terms of data and their potential use in management. Include practical current examples of assessment methods used for deep-water fisheries that are both successfully and unsuccessfully managed across the world.
- Assimilate the assessment methods currently used in case study stocks/fisheries, including strengths and weaknesses of previous applications to both shallow- and deep-water stocks, and develop new approaches for selected case studies. This work build on the outputs from WP2
- Identification and development of suitable methods to use for deep-sea species likely to be fished by EU fleets, the data requirements for these assessment methods to be successful, and the most promising approaches to use in the short-term (using existing data) and long-term (and additional data requirements). An assessment may also be made of the likelihood that the relevant data can be collected within the limits required for a sustainable precautionary approach to exploitation.
- Development within FLR of a suite of assessment methods that can be applied in data-poor situations, that are able to include a wide-variety of external data inputs (a variety of life-history parameters, meta-analytic information from more data-rich species) and are readily applicable to deep-water species.

Description of work and role of participants

This workpackage will be led by Imperial College London with a significant contribution from Cefas, Ifremer and IMR. Assessment methodologies will be defined by the data available, its quality, and its time series. Throughout this section, we concentrate upon 'single-species' assessments, as we anticipate that this will be the form of assessment that current data allow. However, drawing upon the reviews performed in WP2 and task 4.1 below, we anticipate that these methods will form the basis for moving forward to multispecies considerations whereby the key species (be they the target species, species indicative of biodiversity, species indicative of the vulnerable species complex; see the risk-based approach of Hobday et al., 2007) are assessed and used as a basis for more holistic management. However, identified approaches that implicitly consider the wider ecosystem are key, and hence we wish to remain flexible so that methods currently unknown to the consortium can be evaluated and developed. Therefore the use of the word 'stock' below does not just represent the improvement of current approaches (Task 4.2) which will help reduce current uncertainties, but the development of approaches that might be applied at all levels of the deep-water ecosystem. Where current data allow these will be incorporated. Where current data is lacking, the developed management framework will define future data collection approaches required to service those needs (WP7).

Task 4.1 Review alternative assessment methods available for deep-sea stocks
The WP coordinator will lead the first objective, the review of alternative assessment methods, drawing

heavily on the results of WP2 and the international research networks being built up in another EC funded project TXOTX (2008 – 2011). This will involve a literature review of existing assessments used in practice for the assessment of deep-sea stocks and ecosystems worldwide and covering, for instance, topics such as:

- Establishment of stock identity and the stock unit
- Establishment of the criteria necessary to identity management units at the fisheries level
- Movement of animals between stock areas and within stocks (this has been found to be a significant challenge for assessments of toothfish; Hillary et al 2006)
- Establishing biological characteristics of and suitable reference points for the stocks
- Indices of abundance (for instance CPUE, camera surveys, research trawl surveys, standardised longline surveys)
- Direct estimates of abundance (camera surveys, attractant methods, research trawl surveys, mark-recapture)
- Assessment methods (VPA type, production models, integrated assessments, rule-of-thumb [Beddington-Cooke, Gulland etc])
- Data requirements and power analysis

The review will receive input from other partners in respect of stocks for which they have particular knowledge.

Task 4.2 Strengths and weaknesses of assessment methods currently used in case study stocks
WP2 will have identified the data and assessments being used in case studies. This analysis will be taken forward in task 4.2 to explore the strengths and weaknesses of the methods used. For stocks where assessments are currently unsatisfactory, new or modified assessment methodologies will be explored and developed. This will involve close collaboration between the case study partners and the workpackage leader. Within the selected case studies there exists a spectrum of data quality and availability, ranging from very good through to little data available for use in a more traditional stock assessment. The project will use this case-study data spectrum, and their associated current assessment methods, to demonstrate a rational approach to choosing the assessment method based upon both data quality and management requirements. For example a range of age-structured assessment models will be explored for certain ICES stocks of roundnose grenadier, black scabbardfish and red (blackspot) seabream.

Task 4.3 Identification of suitable (and, if necessary, new) assessments for EU deep-sea species
The third objective will draw on the case studies, WP2 and Task 4.1 to identify the most promising assessments for stocks currently or potentially exploited by EU fleets, including the case study species and related stocks of concern. Single-species stock assessment methods will be applied to target species and by-catch species (where data is available) using established and identified new assessment methods developed within this Task. A multi-species approach to assessment (i.e. assess which level of catch/fishing mortality would conserve the current species composition including VME species) will also be explored (linking with WP6) using the French deep-water trawl fleet (Case Study 2) as an example. An attempt will be made to assess the current impact of fisheries on vulnerable/indicator species to evaluate options for fisheries management taking account of these ecosystem components (linking with WP 6 and feeding into WP 7).

This will build on the review of current assessment methods for case-study stocks/fisheries in task 4.2 and develop a classification of stocks/fisheries by assessment type and include information on the likely ability to develop meaningful assessments with current and future data sources, the accuracy and robustness of those assessments (bearing in mind that many deep-sea stocks will currently be data poor and most assessment methods may therefore deliver highly uncertain assessments), and the data requirements of such assessments. This will lead directly to proposals for the most promising approaches to be used for each stock in the short term (using existing data) and the long term (with additional data), together with a discussion of the gaps in current data, additional data requirements, the time taken to acquire these data,

and the likely improvement in accuracy of the assessment once they have been acquired. Methods of acquiring data for future assessments will be identified, including surveys (trawl, camera, tagging) and structured exploratory/experimental fishing. These power-analysis type techniques are currently being used in the Antarctic to develop assessments within the precautionary development of an exploratory fishery (CCAMLR, 2007).

Particular attention will be given to the level of fishing required by some assessment methods to develop a robust estimation of the stock, and whether this is likely to exceed the sustainable yield in some circumstances or whether the cost will exceed fishery value for some stocks fished by EU fleets. Assessment methods that are unlikely to ever deliver robust assessment results for certain stocks will be identified, with the aim of clearly outlining a rational approach to the effective selection of assessment methods commensurate with data quality (present and prospective) and economic/scientific reality on a stock-by-stock basis.

This part of the workpackage will be led by the WP coordinator but will involve contributions from other partners with particular expertise. It will be facilitated by a short (2-day) workshop associated with one of the project meetings in the second year of the project.

Methods of estimating precautionary reference points for these stocks will be dealt with under WP5, but clearly assessment methods are important for this task and this will be another link between the workpackages. Additional linkages will be made with WP7 and WP8, where clearly the type of assessment possible now and in the future, the data requirements and accuracy of such assessments, will strongly influence the appropriate type of management of deep-sea stocks.

Task 4.4 FLR suite of assessment methods for use in data-poor situations.
The fourth part of this work package will involve the development in FLR of a suite of assessment methods that are likely to be most useful for the assessment of deep-sea stocks exploited by the EU. In some cases, particularly those stocks, which are data rich and where successful assessments are already in use elsewhere in the world, FLR may not be the most appropriate software to use for the development of new assessments. However, in many cases it is expected that the new methods explored above will relate to the specific data poor situation that pertains to most deep-sea stocks now, and, potentially, in the foreseeable future. Clearly, with data poor situations, we expect high variability in the observations of the stock and also a lack of key biological knowledge. The PRONE project has been developing a probabilistic approach (using a combination of meta-analysis, Monte Carlo approaches and Bayesian statistics) to modelling stock-recruit information. Extensions of this work are clearly applicable to the development of assessment methods that must function with imprecise data, are highly influenced by the more extreme biological characteristics of deep-water species (Orange roughy being the clearest example), and where we have only observations of key parameters from other similar stocks/species. Such approaches to integrating uncertainty and external knowledge, for example in the Bayesian paradigm, have already been explored in other contexts and projects in FLR and this project will add significantly to these existing examples. The development of these methods in FLR provides the opportunity to link the uncertainty deriving from data poor assessments directly into management strategy evaluation within the FLR framework.
A training session will be held in the third year of the project, most likely associated with a project meeting. However. It is expected that outputs will be useable by scientists with little or no experience of FLR

Deliverables

D4.1 Review of alternative assessment methods available their requirements in terms of data and their potential use in management. To base this understanding on practical current examples of assessment methods used for deep-sea stocks/fisheries that are both successfully and unsuccessfully managed across the world. This will be a major report from WP4. (draft review d4.1 at month 12, and manuscript for peer reviewed paper at month 36)
D4.2 Identification and development of suitable methods to use for deep-sea (target and non-target)

species likely to be fished by EU fleets, the data requirements for these assessment methods to be successful, and the most promising approaches to use in the short-term (using existing data) and long-term (and additional data requirements). An assessment may also be made of the likelihood that the relevant data can be collected within the limits required for a sustainable precautionary approach to exploitation. This will be both a stand-alone report on EU stocks which will deal with general issues of risk and identify short- and long- term approaches and data requirements; and specific sections of the case study reports. (24)

D4.3 Development in FLR of a suite of assessment methods in a format for use in data-poor situations, delivered by a brief report, modules for the FLR library and a revision of the FLR manual. (36)

§ Work package 5

Work package number	5	Start date or starting event:			Month 1				
Work package title	WP5- Reference points and HCRs								
Activity Type	RTD								
Participants number	1	2	3	5	7	8	9	10	12
Participants short name	Ifremer	Cefas	UoI	Imperial	AZTI	IPIMAR	MI	HCMR	MRI
Person-months per participants:	7	8	4	20	2.5	4	1	2	2

Objectives

- Global review of candidate biological, multispecies, economic and precautionary reference points and fishery indicators (based on stock assessments or otherwise) and harvest control rules/operational management procedures used for deep-water/data poor species.
- Assimilation of relevant reference points and harvest control rules for deep-water species in the case studies that can address key issues of data quality (accuracy and veracity), level of stock and species information (stock/no stock assessment, life-history data), and technical and economic constraints, and a development of alternatives in the case where they are clearly unsuitable.
- Suggestions for suitable control rules to be used in the short-term using existing data and the identification of parameters/procedures for use in the long-term and any additional data requirements (there is a need here to take account of outputs from WP4).

Description of work and role of participants

This workpackage will be coordinated by Imperial College with a significant contribution from Cefas, Ifremer and IMR. These partners have considerable experience of the definition, use and testing of reference points and harvest control rules in both shallow and deep-water fisheries (for instance in projects EFIMAS and PRONE, and publications such as Hillary et al. (2006) and Beddington et al (2007)). A work package workshop may be organised to review the reference points, HCRs and indicators by Case study (task 5.2). Thsi workshop is scheduled as a stand alone meeting but any opportunity to combine it with another meeting may be used.

Task 5.1 Global review of candidate biological and economic reference points
The global review of candidate (biological, ecological and socio-economical) reference points and harvest control rules will be relatively brief. It will accompany the reviews carried out in WP2 and WP4 of successful management and assessment methods used for deep-water stocks around the world. Their applicability to the EU situation will be assessed. Imperial College will undertake this review with input from other partners.

Task 5.2 Reference points and harvest control rules for case study fisheries/stocks
This task will look in detail at the case studies and identify appropriate indicators, precautionary reference points, harvest control rules and the management strategies for them which can be tested in WP7. Deficiencies in current reference points and harvest control rules will be identified. This part of the workpackage will be undertaken primarily by case study partners for their fisheries/stocks with assistance from Imperial College. Where biodiversity indicators are missing or inaccurate, a precautionary approach to the issue of biodiversity will be however included in the HCRs.

For data poor deep-sea stocks there are a series of existing situations:

- Life history data on some/most of the key processes (growth, maturity, weight-at-length).
- No stock assessment, but with a mixture of available data: catch and effort data, at differing aggregation levels; survey data on abundance and mortality trends; other data such as mark-recapture data.
- Actual stock assessments, conditioned on a subset/all of the available data as detailed in WP4.

For sensitive habitats and ecosystems, there are few situations where the cumulative impact of fishing is known (e.g. proportion of impacted cold water coral reefs in some regions); more frequently, ecosystem impacts of fishing are poorly documented, and while long term changes are likely the factors (fishing vs environmental changes) leading to those changes are unclear.

The identification the key biological and fishery reference points will be done with the level of information available for the given fishery/stock. Methods from WP4 will give us a selection of the following key variables: trends in biomass (relative or absolute) and mortality (total and/or fishing) over time for the relevant stock or ecosystem component.

For a key stock where we have a good understanding of stock status (absolute levels of recruitment, biomass and mortality) then the calculation of such reference points as F_{pa} and B_{pa} are permissible, for example, as well as other key status indicators such as MSY/MEY information and current-to-unfished biomass levels. This part of the work package would then be a linkage to the output coming from the assessment methods developed in WP4 and can be expected to deliver, for each case study, appropriate indicators and reference points.

If we do not possess such an understanding of stock status then the intention is to extract as much relevant information as possible from the available data. Key to this task will be accounting for both parametric and data uncertainty, the utilisation of more simplistic ecological models and the incorporation of information from other related sources (meta-analysis).

Indicators of trends in biomass over time will likely come from either commercial CPUE data, survey data or mark-recapture data. In most of cases CPUE and landings are the only time series available to reflect the trends in deep-water stocks biomass. There is a vast literature describing ways of standardising CPUE so the series better mirror stock fluctuations (e.g. Kimura 1981, Maunder and Punt 2004, Marchal et al. 2007). The factors used to standardise CPUE generally include spatial and seasonal patterns, sequential depletion, changes in depth of fishing, vessel capacity and technical development. However, because the true state of deep-water stocks is generally unknown, it is not possible to quantify the benefits of adjusting catch rates. As a result, there is no real agreement as to which standardisation method might perform the best. This lack of agreement has e.g. prevented ICES from providing consistent CPUE series in recent years. In this project, we will carry out different CPUE standardisations using an artificial dataset, where the status of the stocks and the spatial distribution of deep-water stocks and fishing vessels will be simulated using realistic population dynamics (spatial and within-year stock dynamics including the parametric uncertainty – link to WP4) and fleet behaviour models (using a range of possibilities from EFIMAS/COMMIT/COBECOS).

Survey data may in some cases be available for deep-water stocks/communities. Fishery survey based populations (total number and biomass, mean size and weight, length quantile, mark-recapture derived indices) and communities (abundance, biomass, geometric mean of population abundance and biomass, k-dominance, ?1 diversity, length quantile) indicators have been developed (Rochet & Trenkel, 2003 ; Trenkel & Rochet 2003) and combined into diagnostics (Trenkel et al., 2007). Similar suites of indicators and diagnostics can be applied to deep-water surveys were data exist (e.g. west of Scotland) and from partners. MRI has data from the Icelandic autumn survey which could deliver indicators of trends in biomass over time, catch composition and give contribution to BRP. Similarly some deep-water species partly distributed on the shelf (such as Bluemouth Helicolenus dactylopterus, Ling Molva molva, greater Forkbeard Phycis blennoides) are caught into annual fisheries research surveys such as western IBTS. We

will investigate which indicators should be used or developed in future to assess stock trends based on North East Atlantic Continental slope (NEACS) surveys and which biodiversity indicators are suitable for incorporation within the deep sea management framework (link with WP6).

The project aims to move beyond the single target-species approach and also test alternative fishery and ecosystem reference points, based on the findings of Task 5.1. A key issue is the multispecies nature of many deep-water fisheries catches, and the need to capture that within the management framework. The work package will review the potential use of existing and potential multispecies biological reference points (e.g. status of indicator species identified using risk-based approaches, maximum biological production levels) within the framework of deep sea fishery management.
The project will also consider how the shifting baseline syndrome can be incorporated within reference points (e.g. the use of reference directions in data-poor situations).

The FISBOAT project investigated developing survey based and in some cases assessment free indicators of stock status (Rochet & Trenkel, 2003; Trenkel & Rochet 2003) – factors such as spatial variation and correlation as well as simplistic metrics such as changes in total mortality/mean length and/or weight/survey-derived relative abundance over time. Given these data can potentially yield useful auxiliary metrics that can be used in a management procedure we will look to estimating these quantities where possible.

Given that we expect to have examples that would be considered data poor we must therefore also consider using meta-analytic methods to estimate key vital rates (productivity, mortality and growth, maturity) based on information on similar species with better data. Meta-analysis and hierarchical methods have been used in the past to estimate key parameters such as stock-recruitment parameters (Michielsens and McAllister, 2004) and the PRONE project is developing generic models for estimating such key parameters that incorporate the key uncertainties in all the relevant data and parameters. These estimates of key vital rates will then be used in conjunction with simple ecological models to yield reference levels of total mortality and stock depletion/catch-to-unfished biomass levels.

Task 5.3 The design of harvest control rules for case study deep-water species and systems
Given the key reference metrics from Task 5.2, assessment method review under Task 4.3, and the information arising from the review of deep-water management (Task 5.1) we will use the case-studies to design and in some case test candidate harvest control rules for deep-water fisheries and stocks. This design and testing will taken place in the FLR framework, will involve Imperial College and selected case study partners, and will feed directly into WP7.

The key fields to be addressed are:

- The incorporation of technical issues with respect to acceptable changes in levels of allowable catch and effort against identified targets that are set using the candidate harvest control rules.
- The inclusion of all the key uncertainties (be they related to stock or system information or errors in implementation) into the design process.
- Consideration of the most suitable management procedures under conditions of current data availability and likely future availability

Any candidate harvest control rule will be designed to incorporate as much of the relevant data as possible and to try and best attain the potential management objectives. Close links to WP4 will identify the assessments and information that is available now, and the information that is likely to be available in the future when new research/data collection has been initiated. Candidate harvest control rules will therefore be developed for the current situation (existing data availability) and future situations (anticipated when new data are available). Any candidate operational management procedures will then be measured against their ability to achieve the management objectives so that we might best identify the most robust procedures to potentially be applied in the management of deep-water fisheries/stocks/ecosystems.

Deliverables

D5.1. Global review of reference points and harvest control rules appropriate for deep- water and data poor situations (12)

D5.2. Review of the strengths and weaknesses of current reference points, harvest control rules, and indicators for case study fisheries (20)

D5.3. Report on suitable harvest control rules for EU deep-water fisheries now and in the future (30)

§ Work package 6

Work package number	6	Start date or starting event:			Month 1			
Work package title	WP6- Trends in biodiversity							
Activity Type	RTD							
Participants number	1	2	5	8	9	10	11	12
Participants short name	Ifremer	Cefas	Imperial	IPIMAR	MI	HCMR	IEO	MRI
Person-months per participants:	6	5	1	4	3	5	1	7

Objectives

- Review the impacts of deep-water fishing on biodiversity.
- Explore trends in biodiversity in time-series catch data from fisheries on the continental slope.
- Explore trends in biodiversity in deep-water survey data.
- Explore options for assessing trends in invertebrate biodiversity (available data, appropriate monitoring framework)
- Identify biodiversity indicators from catch data, on-board observations and survey data [in relation to WP4 and WP5].

Description of work and role of participants

This work package will be lead by Ifremer with a significant contribution from Cefas and MRI. Reviews of knowledge and data on biodiversity will be made in case studies and synthesised here. Existing indicator diagnostics for populations and communities will be applied to deep-water stocks and communities in this work package.

While it is not straightforward to evaluate biodiversity indicators within Management Strategy Evaluation, this will be attempted where possible (see WP7). The findings of this work package will feed directly into the management framework recommendations. For example, where further information is needed to understand the potential impacts of deep-sea fisheries on biodiversity, recommendations will be made. Where existing evidence allows firm conclusions to be drawn on potential impacts, these will be included within the framework recommendations. The work falls within 4 tasks, a workshop is planned at the project mi-term to carry out similar analyses pertaining to tasks 6.2, 6.3, 6.4 over selected Case studies.

Task 6.1 Review of the impacts of deep-water fishing on biodiversity
There have been some studies on the impact of deep-water fishing in most regions of the world where deep-water fisheries occur. Projects involving this topic include HERMES (FP6-SUSTDEV-511234), CoralFISH (FP7-ENV.2007 213144) and other projects such as COMARGE within Census of Marine Life. This task will involve a review of the impact of deep-water fishing on biodiversity (including, impact on biogenic reefs, benthic and pelagic invertebrates, habitats, vulnerable fish and invertebrate species) for all ocean areas in which EU deep-sea fleets are active or are likely to be active using published material and information arising from the above projects.

The project will look beyond deep-water specific studies, to examine potential approaches of use that have been developed within fisheries that have similar multispecies issues. For example, other activities have looked at the impacts of fishing in general on the multispecies complex and developed candidate indicators

for them (e.g. EU STECF SGMED-08) and these considerations will also be incorporated within the review.

In addition to the above general review, reviews of biodiversity knowledge and data, impact of deep-water fishing and availability of biodiversity data will be carried out in each case study and synthesized here.

Task 6.2. Explore trends in biodiversity in time-series catch data from fisheries on the continental slope.

Landings data provide only a limited view of the effect of fishing on biodiversity. Even so, some simple indices of biodiversity can be derived from landings data alone, such as the proportion of large, small or vulnerable species in the catch, or trophic level of the catch. Time series of such ratios, either alone or combined with basic biological information (WP4), will provide indications of which species are more vulnerable to fishing and an early warning of upcoming problems of sustainability. A more complete view of the catch is gained from on-board observation. On-board observations provide estimates of the total catch weight, of the catch of the main landed and discarded species and of the discard rate. However, in the case of trawlers in multi-species fisheries, the full species composition may not be fully described even by observers in particular in the case of deep-water fisheries where the identification of many species is difficult. However, existing on-board observations will be used to investigate the amount and possible temporal trends of discarded fish and invertebrates will be assessed and possible improvement for collecting such data will be proposed. Confirmed and likely effects of the observed changes on the ecosystem functioning will be described and where data are sufficient, analysed.

Task 6.3. Explore trends in biodiversity in deep-water survey data.

Trawl surveys provide more accurate (but more expensive) time series of the species composition of fish communities than commercial catch data, and the Icelandic data series from the autumn survey provide good information in this respect. The observed species composition may of course not be directly proportional to population abundance due to differential catchabilities over species and sizes but standardised surveys may provide reliable trends.

Preliminary attempts to analyse deep-water fish diversity from surveys (Basson et al., 2002) have shown that some insight into changes in species abundance can be gained from comparing and combining surveys carried out with different trawls and vessels of different power. Several diversity indices are useful in the study fish communities using survey data. Usual indices such as species richness, Shannon and Simpson indices, the probability of inter-specific encounters and taxonomic distinctness indices provide different dimensions of diversity. Indices based on size in the community (size spectra, mean weight, quantile) allow assessment of structural effects. Studies carried out so far on the diversity of deep-water fish have rather revealed trends in abundance than in diversity. This may reflect the expected slow dynamics of deep-water communities.

Spatially, beta diversity will be investigated where data allow. This has not been done for deep-water fishes and might be of interest for the detection of areas of higher fish diversity. The main signal under high fishing pressure is that fish biomass declines for all species. However, as time series become longer analyses might be expected to detect signals in species composition, species size and size in the community. A number of longer time series are now available which will be examined for such effects. We will also analyse available trawl survey data in an attempt to define relevant diversity indicators to apply to the North East Atlantic Continental Slope (NEACS) survey for which a plan is being developed in compliance with the requirements of the Data Collection Regulation (DCR)

Task 6.4. Trends in invertebrate diversity

Commercial fishing activities and fishery science surveys are hardly appropriate to provide data for invertebrate. However, focusing on a few vulnerable species or higher taxonomic level may allow to collect data on the impact of fishing from on-board observations (i.e. collect the presence/absence in trawls of corals, gorgonians and sponges). Trawl survey data provide also some information and video data provide data for both abundance of benthic communities and impact of fishing, although at a very small spatial scale. All available data to assess and monitor trends in invertebrate communities will be considered.

The consistency of survey data on invertebrates will be considered. Literature on biodiversity and impact of fishing on benthic fauna based upon trawls, grabs and underwater video systems will be reviewed to

assess the pertinence of data available in case studies for assessment and monitoring the biodiversity of the benthic fauna. The sampling method and amount of data required to monitor deep-water invertebrates biodiversity will be investigated. Outcomes from the CoralFISH project, in particular those of CoralFISH WP1 "Cold water coral settings" and WP4 "genetic fingerprinting of cumulative long-term effects of fishing impacts on corals" will also be taken into account here. Confirmed and likely effects of the observed changes in biodiversity will be analysed.

Task 6.5. Identify biodiversity indicators from catch data, on-board observations and survey data
The final task is to compute suites of diversity indices and indicators from time series of catch composition of the landings, on-board observations and surveys. Distribution and patterns of the diversity of deep-water fish will be investigated based on all available data including on-going surveys such as western IBTS, which extends down to the upper slope. This will include analyses of archive data relevant for comparison to the planned NEACS survey (analyses of fish diversity in areas planned to be sampled by NEACS) and first analyses of the NEACS survey data if this series starts soon enough during the project. Existing on-board observer data will be used to assess which components of the fish community are caught in various commercial fisheries, to understand the most frequently fished depth and areas and to assess which habitat type are most targeted by commercial fisheries. A suite of indices utilising observer data will be defined.
Methods/indicators to identify areas of importance for management (e.g. VMEs) and data requirement for their identification based upon observer and survey data will be investigated.

It should be noted that biodiversity studies of benthos and habitats require different sampling methods such as dredging, video (towed cameras, submersibles). This workpackage does not specifically include plan to use such data as availability in studied areas is not fully known, nor is it a primary objective of project DEEPFISHMAN. Such work will be conducted for coral habitat in the CoralFISH project and some may be underway in HERMES. The DEEPFISHMAN project will ensure links are maintained with these projects, through active partners, and will use any data available within this work package. In particular common workshops may be organised at Case study and projects levels. Partners 1(Ifremer), 4 (IMR), 10 (HCMR) and 12 (MRI) are also partners of CoralFISH so that meetings for biodiversity aspects in Case Studies 2, 3 and 4 can easily be arranged. At project level, there is one single meeting planned in CoralFISH (in addition to steering group meetings). Therefore it is anticipated that DEEPFISHMAN invites some key CoralFISH partners to the DEEPFISHMAN Case study meeting (month 6) to allow them to contribute to the biodiversity aspect of selected case studies (probably CS1b,c, 2, 3a,b and 4).

Deliverables

D6.1. Evaluation of the relevance of commercial catch data to assess changes in the species composition of deep-water fish assemblages. Definition of indicators of fish diversity based on catch data (18).

D6.2. Report on biodiversity indicators, trends monitoring and evaluation of information pertinence for deep-water fish and invertebrates (month 24).

D6.3. Analyses of patterns of distribution of the fish diversity from survey data in the area of some case studies (e.g.Case Study 2). Manuscript for a peer review paper (month 30).

§ Work package 7

Work package number	7	Start date or starting event:			Month 13					
Work package title	WP7- Management strategy framework									
Activity Type	RTD									
Participants number	1	2	3	4	5	7	8	9	10	13
Participants short name	Ifremer	Cefas	UoI	IMR	Imperial	AZTI	IPIMAR	MI	HCMR	UoP
Person-months per participants:	3	11	8	2	5	19.5	2	2	1	1.5

Objectives

- To define case study fishery-specific, stock-specific and/or ecosystem specific management strategies, both in the short and long term, according to the assessment methodologies developed in WP4 and the reference points and HCRs defined in WP5Perform a Management Strategy Evaluation for selected case study fisheries and stock using the management and monitoring strategies defined in order to evaluate the biological, bioeconomic and ecosystem implications of these strategies.
- To assimilate the generic management and monitoring recommendations and develop a prototype short- and long-term management and monitoring framework for deep-water fisheries/stocks in the NE Atlantic, evaluating where necessary using FLR, and to identify any additional data/information required. The framework will provide information to allow fishery managers to decide the balance between conservation, socio-economic and ecosystem priorities (and hence appropriate management strategies to achieve that goal), and will identify additional data requirements for management options.

Description of work and role of participants

This work package will be led by AZTI-Tecnalia with a significant contribution from Cefas and UoI, Imperial college of London and UoP/CEMARE. The Marine Research Unit at AZTI-Tecnalia has considerable experience in conducting management strategy evaluations, and has been heavily involved in EU projects (COMMIT, FISBOAT, EFIMAS, CEVIS, UNCOVER, PRONE, AFRAME) and in the development of FLR libraries. In 2007 a FLR simulation algorithm developed in AZTI-Tecnalia was used to test possible long term management plans for Northern Hake in the STECF (SEC, 2007). The collaboration of several partners in the development of this WP will be also very important. In order to assure the consistency between the definition of the Management Strategy framework and the assessment methods developed in WP3, WP4 and WP6 Imperial College, UoI and UoP/Cemare will be actively involved in this work package. A workshop is scheluded in the last year on the project in particular to review of potential effect of the management framework by Case Study.

The DEEPFISHMAN consortium recognises the aim of managers to move towards an ecosystem-based fishery management (EBFM), as defined in section B3.1 Strategic impact below, rather than stock-based management and monitoring. The framework developed in DEEPFISHMAN will reflect this aim. It will draw upon the socio-economic, biodiversity, multispecies and ecosystem issues identified in work packages 3-6 to combine these aspects, thereby allowing managers to examine the consequences of potential management strategies on these components, and the trade-offs that result.

Task 7.1. Definition of management strategies (AZTI-Tecnalia leading)

This task will involve the definition of appropriate short and long term management strategies (i.e. how the components of the management framework will be used) for key case studies, taking into account the following:

- biological productivity and stock(s) identity;
- -currently available data versus likely future data
- - existing world experience (WP2);
- the robustness of the current assessment;
- the level of uncertainty about the current state of the stock(s);

progress made within DEEPFISHMAN in developing alternative assessments (comprising single stock and/or multispecies assessments and indicators of the impact of fishing on biodiversity and VMEs) and identifying the need for additional data and information or methods in the future (WP4);

- the socio-economic implications inputs from WP3;
- the most appropriate reference points and HCRs in current and future situations (WP5);
- the evidence for the consequences of different harvesting levels on VMEs and the deep-water ecosystem (WP6 and CoralFISH project).
- The defined management strategies will be consistent with the Commission's objectives for precautionary and ecosystem management. In the cases where stocks or ecosystem components are likely to be outside safe biological limits, recovery planning may be necessary.

Management plans will be evaluated on different time horizons (e.g. short (<5yrs), medium (5-10yrs), and long-term (>10yrs), or those relevant to the life histories of the stocks and/or multi-species fisheries considered. In terms of uncertainty in parametrisation of the model (for instance the assumption of multiple or single stocks for some deep waters species), we will define data that will be available and how assessment methods, reference points and HCRs could be used. In this sense, the management plans depending on the status of each stock will define the improvement of data collection needed, especially of length and age time-series, and catches, effort and discard data. Where needed the management plan will recommend the inclusion of additional information necessary to carry out suitable assessment models (see task 7.2 below).

In the case of multi-species fisheries (CS2 and others), the HCRs defined for the different species need to be consistent among them. This can be achieve defining multi-species HCR or applying single-species HCRs and afterwards harmonize them. The Fcube method (ICES, 2008) could be used both to define multi-species HCRs and to tune single-species HCRs in a fleet-based model. This method is being further developed within the EC funded project AFRAME.

As notd in previous work packages, although, some case studies are considered to be fisheries targeting one single stock, their impacts on other commercial and non commercial species, biodiversity and VMEs will not be ignored. CS1b (orange roughy in ICES VI and VII) and CS1ac (blue ling), CS4 (oceanic redfish) and CS5 (NAFO Greenland halibut) produce significant landings of by-catch species, some of which are not being TAC managed. For these CSs, the HCRs must take into account the effect of fishing on commercial by-catches, discarded species and on other components of the ecosystem affected by the fishing activity. The fishing effect of fisheries on all of these species components will be examined on area, season or fleet basis as appropriate, as the catch and discard composition can be highly dependent on these factors. This will draw on the review of methods used worldwide to integrate by-catch fish species and biodiversity issues (WP2 and reference points identified in WP5). If necessary new methods will be developed in collaboration with stakeholders and recognising the outputs of other EU projects, in order to propose up-to-date and potentially original HCRs for these CSs.

For mono-species fisheries, the potential effects of deep-water stocks/fisheries management will be analysed for some CSs in term of effort re-allocation to other resources, which could also include the re-allocation of fleets to target shallow water species or the restructuring in other activities (i.e. aquaculture). This will include at least (i) one longline fishery, e.g. CS3c Portuguese fishery for black scabbardfish

fishery, which catches only or mainly one single target species and (ii) one not TAC managed stocks (i.e. CS3b, red seabream in the Mediterranean Sea).

Task 7.2 Management Strategy Evaluation (MSE) (AZTI-Tecnalia leading)
To test the performance of management plans a management strategy evaluation will be carried out using the FLR framework for selected case studies (Kell et. al 2007). This work will comprise simulation of the key components of the system and the whole management process, taking into account the main uncertainties in both model structure (stock identity, mixing, implementation error) and parameterisation (uncertainty about natural mortality, growth etc). The key components of the ecosystem will be identified within each case study balancing the importance of other components and the complexity of the simulation model.

This task will be also especially linked with the findings of WP3, particularly when considering alternative types of management. The traditional input/output –(effort/TAC) management, when necessary, will be applied at fishery level as a necessary first step towards and ecosystem-based fisheries management as defined in section B3.1 strategic impact. The input/output management will consider the inclusion of regulations such as restrictions on fishing gears, catch (TACs) and effort levels, distribution of effort (e.g. MPAs and closed areas).

The consequences of management actions for different components of the fishery and ecosystem will be examined, and hence these components will need to be considered within the simulation. This will draw on the results of the previous work packages. For example, the economic consequences for different management options will be based on the bio-economic model developed under Task 3.3. Based on the experience already available at the University of Iceland it is possible to provide concrete policy recommendations for policy makers with explicit reference to the costs and benefits of proposed options. In turn, the potential impacts on biodiversity will be examined. In this way, managers will have information with which to identify the trade offs of management actions for the different components of the deep-water system (target and non target stocks, VME species, biodiversity, fisheries, socio-economic factors) which can be used to prioritise actions.

Some new management models will therefore also be tested, depending upon the results of task 7.1, and in addition to the biological/socio-economic/ecosystem indicators (e.g. WP3 and 6) and an evaluation of HCRs in the short and long term.. The will include results gained from CoralFISH (FP7-ENV.2007. 213144) and other new knowledge on effect of deep-water fishing on biodiversity (e.g. abundance of bottom invertebrates and genetic population structure will also be considered through its examination in WP6).

Task 7.3. Prototype short- and long-term management and monitoring framework for deep-water fisheries and stocks in the NE Atlantic (AZTI-Tecnalia leading)
This task will collate, compare and contrast outcomes across all case studies to generalise the findings of the project. It will make recommendations where the proposed approach changes for the short, medium and long term (e.g. in a recovery situation vs the case where the stock is currently exploited sustainably/recovers), and identify the data gaps and practical issues that prevent the proposed management being undertaken currently. Recommendations for future data collection, assessment and management will be developed which will allow the development of reliable long-term management schemes. In the recommendations for future data collection the data needs for an ecosystem approach for deep water fisheries management will be taken into account. For example, data requirements to calculate biodiversity indicators defined in WP6 and multispecies indicators from WP5 as well as fishing activity (i.e. pressure, see e.g. Piet et al., 2006) and ecosystem indicators defined in some EC funded projects (INDENT, INDECO and IMAGE) will be identified. Management and policy outputs from CoralFISH project will be considered by a good collaborative dialogue between the two projects possibly including a joint workshop of DEEPFISHMAN WP3/WP8 and CoralFISH WP8 'Developing tools for ecosystem management: economic models and policy advices' or inviting Dr Claire Amstrong, University of Tromsø, leader of CoralFISH WP8 to the DEEPFISHMAN WP3 meeting. Outputs from work packages 6 "habitat suitability modelling" 7 "identification of sensitive fish habitat" and 8 "economic model and policy advice" of CoralFISH will be of particular interest here, together will other on-going research. The management

framework will also incorporate encounter protocols to address the issue of avoidance of VMEs not protected by closed areas.

The combination of these outputs will be collected into a prototype ecosystem based management and monitoring framework guidelines for deep-water fisheries in the NE Atlantic (D7.3). The framework will include criteria to enable fisheries management bodies (including RFMOs such as NEAFC) to categorise deep-sea fisheries in the NE Atlantic into distinct management types e.g. directed, bycatch, single-species and mixed-species etc and, where possible, a range of intermediate types between these. In some circumstances, this may be accompanied by management and monitoring measures at the stock level and these will also be addressed in the framework. The process of categorising all deep-sea fisheries in the NE Atlantic according to the criteria developed within DEEPFISHMAN, beyond those specific case studies examined, is considered to be outside the scope of the project, given that this is considerable task requiring the appropriate data to be collated for each and every fishery.

Nevertheless, the knowledge of the deep-water ecosystem is likely to remain too limited for a fully evidence-based management. Thus, the precautionary approach becomes indispensable (e.g. Mee et al., 2008); the sustainability of the fisheries must be demonstrated, in particular regarding the conservation of sensitive species and biodiversity (of habitat, communities, species and genes). Precaution is also required due to the ecological complexity of deep-water ecosystems, which by its very nature and remoteness may never be fully understood. For appropriate handling by managers, it is however necessary that the status of all management options and procedure are either evidence-based or based upon the precautionary approach, as will be developed within the monitoring framework and the guidelines (D7.3).

Deliverables

D7.1. Assimilation of the management and monitoring recommendations presented for selected case studies and the work packages, including requirements for future data collection and research. (14)

d7.a. Development of a prototype short- and long-term management and monitoring framework for deep-water fisheries/stocks in the NE Atlantic (internal project deliverable) (28)

D7.2. Development and identification of options for overall management strategies both in the short- and long-term, and evaluation of specific strategies using FLR. (30)

d7.3. Report on identified data gaps and recommendations for future activities on effectiveness of management (technical measures), and. analysis of feasibility of various other types of management options. (32)

D7.4 Guidelines towards a prototype management and monitoring framework for deep-water fisheries/stocks in the NE Atlantic. (36)

D 7.5 Manuscript 1 for submission to peer review journals on the evaluation of harvest strategies for deep-water fisheries (36)

§ Work package 8

Work package number	8		Start date or starting event:								Month 3	
Work package title	Dissemination and outreach											
Activity Type[7]	OTHER											
Participant number	1	2	3	4	5	7	8	9	10	11	12	13
Participant Short name	Ifremer	Cefas	UoI	IMR	Imperial	AZTI	IPIMAR	MI	HCMR	IEO	MRI	UoP
Person-months per participant	2.5	2	0.5		2	1.4	2	1	1	1	3	1

Objectives

- To make available to a wider audience information about the work and outcomes of the DEEPFISHMAN project with the aim of enhancing the uptake of its results.
- To promote and encourage the uptake and use of results by policy makers, stakeholders, and fishery managers in Europe, and prepare the basis for maximum impacts of the results.

Description of work

This work package will be led by MRI.

Task 8.1: Establishment and maintenance of public web site (Ifremer leading)
Ifremer will set up and maintain the project website in cooperation with the partners. This website will be used as a dissemination tool for the presentation and outcome of the project and will serve as a communication and collaboration interface with the relevant stakeholders.

Task 8.2: Publications (all partners)
Project results will be published through relevant journals, magazines and conference proceedings. Leaflet with general project information will be printed and distributed. The partners will work on establishing links to local/national media to promote the general public and industry about the project and its results.

Task 8.3: Conferences, workshops and stakeholder fora (all partners)
Dissemination materials will be made available and appropriate to present and demonstrate the results of the project at conferences, workshops, and regional advisory councils, at seminars, exhibitions and annual international events such as ICES annual science conference anf other scientific symposia. Importantly, a Workshop will be held at the start of the project to solicit stakeholder views on existing and possible future management frameworks.

Close collaboration with relevant RFMOs, RACs, NGOs and other stakeholders will be maintained throughout the project, and a dedicated communication plan will be developed to ensure that the stakeholders can establish interactive communications with the DEEPFISHMAN project to ensure that the research outcomes will be realistic, and with a strong potential for a good buy-in via the solicited feedbacks. This may include the use of appropriate technology-based methods to elicit feedback on proposals (e.g. Wiki web pages, e-mail fora). The communication plan will include regular contact with key representatives of particular stakeholder groups who will be invited throughout the project to contribute to major deliverables and, where contributions are not possible, to scrutinise and comment on the methods used and outcomes.

A 1-2-days workshop for policy makers, stakeholders, NGOs, and fishery professionals involved in the deep-water

[7] Please indicate one activity per work package

fishery in Europe will be organized in cooperation with NEAFC and/or other relevant international bodies (ICES, NAFO, SEAFO) towards the end of the project to introduce key findings and consult stakeholders. Relevant RACs will be informed of the results through correspondence and presentation at relevant meetings.

Task 8.4 Policy delivery approaches (MRI leading)
During the project the Steering Group will establish a formal project link to DG MARE to establish appropriate policy delivery mechanisms for the project results into the CFP.

Deliverables

D8.1 Public website (8)
D8.2 External Stakeholder Interactive Communication Plan (8)
D8.3 Dissemination reports (18 36)
D8.4 Policy advice Preliminary Report (32)
D8.5 Stakeholders workshops (2,32)
D8.6 Consensus report from stakeholder workshop (4,36)

Case study list

The Case Studies below have been carefully selected to provide WPs with a range of information and data from a diverse range of stocks, fisheries, monitoring, assessment and management regimes.

The person month dedicated to Case studies are also counted in WP2.

Case Study number	1a	Start date or starting event:	Month 1
Case Study title	CS 1a - Directed single species fisheries:- Highly vulnerable - Orange roughy in Namibia		
Activity Type	RTD		
Participants number	10		
Participants short name	NATMIRC		
Person-months per participants:	24		

Objectives

- To review the historical development of the orange roughy fisheries in Namibian and SEAFO waters and to describe the main characteristics of the fleets currently involved.
- To review the biology, ecological and other information currently available on biological parameters, including data collected on stock assessment surveys.
- To review and collate the fisheries, biological, biodiversity, VME and socio-economic data, and information currently available for management and monitoring purposes, identifying strengths and weaknesses, and to identify any existing data/information not used or not fully used at present. Collated fisheries data will include all bycatch data, including other commercial and non-commercial fish species, corals, sponges and other benthos, seabirds, marine mammals and turtles.
- To review the known and likely impacts of deep-water fishing on biodiversity and to inventory and collate data on biodiversity in orange roughy habitat/fishing ground. To identify missing data and knowledge of biodiversity, which would be required to assess biodiversity and the impact of orange roughy fishing in Namibian waters.

To review the current and historical management and monitoring procedures/methods (including assessments, biological reference points, harvest control rules, measures to protect and conserve biodiversity (e.g. technical measures, Marine Protected Areas)) and status of stocks, and to identify possible improvements in the current management and monitoring framework by making better use of data currently available. This information will be used in WPs 2, 5 and 7.

Description of work and role of participants

This case study will be led by the National Marine and Information Research Centre (NatMIRC) in Swakopmund, Namibia.

In Namibia orange roughy started off as an exploratory fishery in the mid 1990s with catches of about 6 000 tonnes by the end of 1995. In 1997, orange roughy became a quota managed fishery with an initial allocated TAC of 12 000 tonnes. The observed biomass has since decreased substantially and catch rates have declined.

The work in this case study on orange roughy in Namibia and SEAFO waters will involve a review of the historic development of the fisheries, their spatial distribution and exploitation patterns. The review will use cited literature from peer-reviewed journals and project reports, results from the analysis of landings data including

spatial data, effort data and a profile of the active fleet and their fishing pattern and the incorporation of stakeholder information. The review will also incorporate fisheries data and scientific information collected on research surveys.

The second part of the case study will be to collate, make an inventory and review the fisheries, biological, biodiversity and socio-economic data available for orange roughy in Namibian waters, a review of how this data has been used to evaluate the state of the stock and to formulate management advice. This will include a critical analysis of the strengths and weakness of the data collection programmes and the scientific projects in addressing assessment requirements.

The concluding part of the case study will be a review and an evaluation of the existing management and monitoring framework and suggestions as to how this can be improved by taking into consideration the specific biological and ecological characteristics of the stock(s), the impact of fishing on biodiversity and the technical and socio-economic characteristics of fisheries that exploit orange roughy in Namibian waters.

Deliverables

Draft of the Case study report (internal project document) (M6).

dCS1a. Case study report for orange roughy fishery in Nambia (M12).
The report will include the following chapters:

- historical development of the fisheries, including catches and fleet.
- biological parameters of the target species with up to date description of the current knowledge of their life history pattern, stock structure and status
- review of assessment method used so far
- inventory of the fisheries, biological, biodiversity, VME and socio-economic data currently available for management and monitoring purposes (1)
- review of kown and likely impact of the fishery on deep-water biodiversity
- review of current and historical management and monitoring procedures. SWOT (Strength and weaknesses, Opportunities and threats) and gap analysis of past and present scientific projects and data collection programmes in terms of fulfilling the data requirements for adequate management and monitoring regimes

(1) These data will be collated by the CS leader and made available to and stored in the DEEPFISHMAN database held by Ifremer for use during the project. Data non subject to confidentiality restriction will be stored on a web-based library like PANGEA (http://www.pangea.de/) at the end of the project.

Case Study number	1b	Start date or starting event:	Month 1
Case Study title	CS 1b Directed single species fisheries:- Highly vulnerable - Orange roughy in ICES VI &VII		
Activity Type	RTD		
Participants number	9		
Participants short name	MI- lead		
Person-months per participants:	4.5		

Objectives

- To review the historical development of the orange roughy fisheries on the slopes and seamounts in ICES Subareas VI and VII and the main characteristics of fleets involved in the past and present on the highest spatial scale possible.
- To review the biology of orange roughy and information currently available on biological parameters.
- To review, and collate the fisheries, biological, biodiversity, VME and socio-economic data and information of the orange roughy stock(s) in VI and VII currently available for management and monitoring, identifying strengths and weaknesses and any existing data/information not used or not fully used. Collated fisheries data will include all bycatch data, including other commercial and non-commercial fish species, corals, sponges and other benthos, seabirds, marine mammals and turtles.
- To review the known and likely impacts of orange roughy fishing on biodiversity in VI and VII and to inventory and collate data on biodiversity in orange roughy habitat/fishing ground. To identify missing data and knowledge of biodiversity, which would be required to assess biodiversity and the impact orange roughy fishing to the West of the British Isles.
- To review current and historical management and monitoring procedures for orange roughy in in ICES VI and VII (including assessments, biological reference points, harvest control rules, measures to protect and conserve biodiversity e.g. technical measures, Marine Protected areas) and status of stocks and identify possible improvements in current management and monitoring framework. This information will be used in WPs 2, 5 and 7.

Description of work and role of participants

This case study will be led by Marine Institute, Ireland. Collation of data and information will be subcontrated under the supervision by the MI. The Marine Institute has a long history of research into deep-water fisheries. In the nineties a series of deep-water surveys were carried out to investigate the abundance, distribution and biological aspects of deep-water fisheries in the waters west of Ireland. In 2003 the MI commissioned a national study into the assessment of orange roughy stocks west of Ireland using acoustic techniques, while currently an annual deep-water survey programme is carried out to obtain abundance indices and biological information of deep-water stocks. MI is also the current stock coordinator for orange roughy in VI and VII in the ICES WGDEEP.

The characteristics of the orange roughy fishery in ICES VI and VII have been one of high catch rates followed by decline, punctuated by discoveries of fish on new seamounts and its subsequent depletion. It commenced in the northern part of the region (Subarea VI) in the late eighties with a decline in landings in the nineties after local populations were depleted. Orange roughy fisheries in Subarea VII have exhibited a similar pattern with an exponential increase in catches in the early part of the millennium and a subsequent decline. Particular issues that need to be addressed in the management of this stock are the following:

- Orange roughy is a species of high longevity with slow growth rates and late maturity at age, which means it can only sustain very low rates of exploitation.
- Its behaviour of forming spawning aggregations over seamounts allows fishing vessels to execute high levels of exploitation which can lead to local depletions of sub-populations.
- Orange roughy in Subareas VI and VII is exploited by two different fisheries: the targeted seamount fishery and the mixed slope fishery. Although the population structure is not yet completely understood, scientific findings suggest that discrete habitats are utilised by different stages of their life cycle.

The work undertaken in this case study will involve a review of the historic development of the different types of fisheries that have exploited orange roughy, their spatial distribution and exploitation patterns. The review will use cited literature from peer reviewed journals and project reports, results from the analysis of landings data including high resolution spatial data, effort data and VMS where possible, a profile of the active fleet and their fishing pattern and the incorporation of stakeholder information. The review will incorporate fisheries data and scientific information from the main countries that have a history of catching orange roughy in ICES VI and VII.

The second part of the case study will be to collate and make an inventory of the fisheries, biological, biodiversity and socio-economic data available for orange roughy in VI and VII to date, a review of how these data have been used to evaluate the state of the stock and formulate management advice. A critical analysis of the strengths and weakness of the data collection programmes and scientific projects in relation to addressing assessment requirements will be carried out.

The review will also address monitoring issues with special focus on the different fisheries that target orange roughy i.e. the seamount and the slope fishery, how the population is structured and how different monitoring programmes and scientific methods can sample the different life stages and stock components in the study area. It will further address the efficiency of the closed areas for orange roughy and what scientific data is required to monitor stock recovery and assess the impact of orange roughy fishing on biodiversity

The concluding part of the case study will be an evaluation of the existing management and monitoring framework and how this can be improved by taking into consideration the specific biological and ecological characteristics of the stock(s), the impact of fishing on biodiversity and the socio-economic and technical characteristics of fisheries that exploit orange roughy in the NEA.

Deliverables
Draft of the Case study report (internal project document) (M6)

dCS1b. Case study report for orange roughy fishery in ices VI and VII (M12)
The report will include the following chapters:

- historical development of the fisheries, including catches and fleet.
- biological parameters of the target species with up to date description of the current knowledge of their life history pattern, stock structure and status
- review of assessment method used so far
- inventory of the fisheries, biological, biodiversity, VME and socio-economic data currently available for management and monitoring purposes (1)
- review of kown and likely impact of the fishery on deep-water biodiversity
- review of current and historical management and monitoring procedures. SWOT (Strength and weaknesses, Opportunities and threats) and gap analysis of past and present scientific projects and data collection programmes in terms of fulfilling the data requirements for adequate management and monitoring regimes

(1) These data will be collated by the CS leader and made available to and stored in the DEEPFISHMAN database held by Ifremer for use during the project. Data non subject to confidentiality restriction will be stored on a web-based library like PANGEA (http://www.pangea.de/) at the end of the project.

Case Study number	1c	Start date or starting event:		Month 1	
Case study title	Directed single species fishery – less vulnerable southern blue ling (Molva dypterygia) in Vb,VI,VII and XIIb				
Activity Type	RTD				
Participants number	2	7	9	12	Unidentified
Participants short name	Cefas	AZTI	MI	MRI	
Person-months per participants:	3	1	0.5	1	2

Objectives

- To review the historical development of the fisheries on southern blue ling and to describe the main characteristics of the fleets currently involved.
- To review the biology of southern blue ling and information currently available on biological parameters.
- To review and collate the fisheries, biological, biodiversity, VME and socio-economic data and information currently available for management and monitoring purposes, identifying strengths and weaknesses, and to identify any existing data/information not used or not fully used at present. Collated fisheries data will include all bycatch data, including other commercial and non-commercial fish species, corals, sponges and other benthos, seabirds, marine mammals and turtles.
- To review the known and likely impacts of blue ling fishing on biodiversity and to inventory and collate data on biodiversity in blue ling habitat/fishing ground. To identify missing data and knowledge of biodiversity, which would be required to assess biodiversity and the impact of blue ling fishing in Vb, VI, VII and XIIb
- To review the current and historical management and monitoring procedures/methods (including assessments, biological reference points, harvest control rules, measures to protect and conserve biodiversity e.g. technical measures, Marine Protected areas) and status of stocks, and to identify possible improvements in the current management and monitoring framework by making better use of data currently available. This information will be used in WPs 2, 5 and 7.

Description of work and role of participants

Cefas is responsible for this Case Study with assistance from several other partners. Cefas is the Stock Coordinator for southern blue ling at ICES WGDEEP.

Blue ling is typical gadoid species insofar as it is not particularly slow-growing or long-lived, however, historically fisheries have targeted spawning aggregations and this species can be vulnerable to fishing. The southern blue ling stock is now seriously depleted (ICES, 2006). Notwithstanding, it is a useful example of a stock that could respond relatively quickly (compared to more slow-growing, longer lived deep-water species) to improvements in the existing management and monitoring framework.

This stock is currently fished mainly by the French trawl fishery for mixed deep-water species and therefore provides management and monitoring challenges in addition to the urgent need to protect spawning aggregations.

The identification of the spatial and temporal extent of spawning aggregations is an important aim of the POORFISH project and this case study builds on the outcomes from POORFISH by collating a more extensive range of fishery and biological information which will be used to further develop the advisory system (assessment, advice, and/or management) under development in POORFISH in accordance with the

short- and long-term management frameworks developed in WP7.
The work undertaken in this case study will involve a review of the historic development of the different types of fisheries that have exploited southern blue ling, their spatial distribution and exploitation patterns. The review will use cited literature from peer reviewed journals and project reports, results from the analysis of landings data including high resolution spatial data, effort data and VMS where possible, a profile of the active fleet and their fishing pattern and the incorporation of stakeholder information. The review will incorporate fisheries data and scientific information from the main countries that have a history of catching southern blue ling.

The second part of the case study will be to collate and make and review of the fisheries, biological, biodiversity and socio-economic data available for southern blue ling to date, a review of how these data have been used to evaluate the state of the stock and formulate management advice. A critical analysis of the strengths and weakness of the data collection programmes and scientific projects in relation to addressing assessment requirements will be carried out.

The review will also address monitoring issues with special focus on the different fisheries that target southern blue ling. It will further address the efficiency of the closed areas to protect spawning aggregations and what scientific data is required to monitor stock recovery and assess the impact of blue ling fishing on biodiversity

The concluding part of the case study will be an evaluation of the existing management and monitoring framework and how this can be improved by taking into consideration the specific biological and ecological characteristics of the stock(s), the impact of fishing on biodiversity and the socio-economic and technical characteristics of fisheries that exploit blue ling in the NEA.

The outputs from WPs 4, 5 and 7 for this case study may be applicable to other gadoids found in deep-water e.g. ling and tusk.

It should be noted that a contingency fund has been allocated for the collation of data and information from countries not involved in DEEPFISHMAN.

Deliverables

Draft of the Case study report (internal project document) (M6)

dCS1c. Case study report for southern blue ling in Vb, VI, VII and XIIb (M12)
The report will include the following chapters:

- historical development of the fisheries, including catches and fleet.
- biological parameters of the target species with up to date description of the current knowledge of their life history pattern, stock structure and status
- review of assessment method used so far
- inventory of the fisheries, biological, biodiversity, VME and socio-economic data currently available for management and monitoring purposes (1)
- review of kown and likely impact of the fishery on deep-water biodiversity
- review of current and historical management and monitoring procedures. SWOT (Strength and weaknesses, Opportunities and threats) and gap analysis of past and present scientific projects and data collection programmes in terms of fulfilling the data requirements for adequate management and monitoring regimes

(1) These data will be collated by the CS leader and made available to and stored in the DEEPFISHMAN database held by Ifremer for use during the project. Data non subject to confidentiality restriction will be stored on a web-based library like PANGEA (http://www.pangea.de/) at the end of the project.

Case Study number	2	Start date or starting event:	Month 1
Case Study title	Mixed demersal trawl fishery: - French trawl fishery for roundnose grenadier, black scabbardfish and deep-water sharks in Vb, VI and VII.		
Activity Type	RTD		
Participants number	1		2
Participants short name	IFREMER		Cefas
Person-months per participants:	3		0.5

Objectives

- To review the historical development of relevant fisheries and the main characteristics of fleets currently involved.
- To review and collate the fisheries, biological, biodiversity, VME and socio-economic data and information currently available for management and monitoring purposes, identifying strengths and weaknesses, and to identify any existing data/information not used or not fully used at present. Collated fisheries data will include all bycatch data, including other commercial and non-commercial fish species, corals, sponges and other benthos, seabirds, marine mammals and turtles. To review the known and likely impacts of deep-water fishing on biodiversity and to inventory and collate data on biodiversity. To identify missing data and knowledge of biodiversity, which would be required to assess biodiversity and the impact from the mixed demersal trawl fishery in Vb VI and VII.
- To review the data currently available for management and monitoring, identifying strengths and weaknesses and any existing data/information not used or not fully used at present.
- To review the current and historical management and monitoring procedures (including assessments, biological reference points, harvest control rules, measures to protect and conserve biodiversity e.g. technical measures, Marine Protected areas) and status of stocks and identification of possible improvements in current management and monitoring framework by better use of data currently available. This information will be used in WPs 5 and 7.

Description of work and role of participants

This case study will be lead by Ifremer.

Objective 1. To review the historical development of the fishery, fleets involved and target species. The case study will focus on the four main species taken in this mixed fishery.

Roundnose grenadier (Coryphaenoides rupestris) a species widely distributed along the continental slope and deep-water banks in the North east Atlantic at depths 500-2000 m. Roundnose grenadier is characterised by a high longevity (50-70 years), late maturity (10-14 years) and slow growth.

Black scabbardfish (Aphanopus carbo). The area of distribution of black scabbardfish overlaps to a large extend with that of roundnose grenadier and both species are exploited by the same trawl fishery to the west of the British Isles. The longevity of black scabbardfish is still very unclear as different age estimations are derived from whole and sectioned otoliths with no convincing validation work carried out so far.

Two main species of deep-water sharks the Portuguese dogfish (Centroscymnus coelolepis) and the leafscale gulper shark (Centrophorus squamosus). The biological parameters of these sharks are poorly

known. Preliminary and unvalidated age estimations for Centrophorus squamosus suggest longevities over 50 and 60 years for males and females respectively (Clarke, 2000).

Additionally, by-catch species such as greater forkbeard (Phycis blennoides), bluemouth redfish (Helicolenus dactolopterus dactylopterus), chimaerids from the same fishery will be considered to some extent depending on available data.

Objective 2. The second part of the case study will be to collate and make an inventory of the fisheries, biological, biodiversity and socio-economic data available for orange roughy in VI and VII to date, a review of how these data have been used to evaluate the state of the stock and formulate management advice. A critical analysis of the strengths and weakness of the data collection programmes and scientific projects in relation to addressing assessment requirements will be carried out.
Current ICES assessments for the species listed above rely heavily on abundance indices derived from LPUE data from the French trawl fleet. The catch and effort data compiled in the Case Study will available to WPs 4 and 5 for LPUE analyses and modeling.

These indices will be supplemented by abundance indices derived from available survey data. Times series of catch rates and swept area estimates of abundances were assessed in the late 1999 based upon survey data from 1973 to 1999. Additional survey data have now accumulated, in particular Fisheries research Service (FRS) have collected a time-series to the west of Scotland since 1998 and some survey have been carried out by the Marine Institute, Ireland. Therefore, survey data used in 2000 can be expanded and further statistical modeling can be done. The time series used in 2000 is available to the project, other data will be appended to the same database.

Objective 3. Based on published and grey literature, the impacts of the mixed demersal trawl fishery on biodiversity will be reviewed. Available data will be identify

Objectives 3 and 4. This fishery is a very important example of a mixed deep-water fishery in the NE Atlantic. It is anticipated that the outputs from these objectives will provide useful input into WP7 regarding the development of fleet/fishery based management methods.

Deliverables
Draft of the Case study report (internal project document) (M6)

dCS2. Case study report for the mixed demersal fishery in ICES Vb, VI and VII (M12)
The report will include the following chapters:

- historical development of the fisheries, including catches and fleet.
- biological parameters of the target species with up to date description of the current knowledge of their life history pattern, stock structure and status
- review of assessment method used so far
- inventory of the fisheries, biological, biodiversity, VME and socio-economic data currently available for management and monitoring purposes (1)
- review of kown and likely impact of the fishery on deep-water biodiversity
- review of current and historical management and monitoring procedures. SWOT (Strength and weaknesses, Opportunities and threats) and gap analysis of past and present scientific projects and data collection programmes in terms of fulfilling the data requirements for adequate management and monitoring regimes

(1) These data will be collated by the CS leader and made available to and stored in the DEEPFISHMAN database held by Ifremer for use during the project. Data non subject to confidentiality restriction will be stored on a web-based library like PANGEA (http://www.pangea.de/) at the end of the project.

Case study number	3a	Start date or starting event:	Month 1
Case Study title	Fisheries for red (blackspot) seabream in the Strait of Gibraltar (Sub-area IX) and the Bay of Biscay (Sub-area VIII but also includes Sub-areas VI and VII)		
Activity Type	RTD		
Participants number	11	1	
Participants short name	IEO	IFREMER	
Person-months per participants:	3	1	

Objectives

- To review the historical development of relevant fisheries and the main characteristics of fleets currently involved.
- To review the biology and information currently available on biological parameters.

To review and collate the fisheries, biological, biodiversity, VME and socio-economic data currently available for management and monitoring, identifying strengths and weaknesses and any existing data/information not used or not fully used at present. Collated fisheries data will include all bycatch data, including other commercial and non-commercial fish species, corals, sponges and other benthos, seabirds, marine mammals and turtles.

- To review the known and likely impacts of fishing for red (blackspot) seabream on biodiversity and to inventory and collate data on biodiversity in blue ling habitat/fishing ground. To identify missing data and knowledge of biodiversity, which would be required to assess biodiversity and the impact of red seabream fishing in the Strait of Gibraltar and Bay of Biscay.

To review the current and historical management and monitoring procedures/methods (including assessments, biological reference points, harvest control rules, measures to protect and conserve biodiversity e.g. technical measures, Marine Protected areas) and status of stocks, and to identify possible improvements in the current management and monitoring framework by making better use of data currently available. This information will be used in WPs 5 and 7.

Description of work and role of participants

This case study will be carried out by Instituto Español de Oceanografía (IEO) with assistance from IFREMER. The case study will focus on the red (blackspot) seabream (Pagellus bogaraveo) fishery in the Strait of Gibraltar area.

Landings in Sub-areas VI, VII and VIII (from Spain, Portugal, France and UK) were very high in the past, with a peak in the early 1970s to more than 15 000 t per year, and decreased to a low level from 1975 to 1985. The stock has remained at a low level since then.

More recently, since 1982 onwards, a longline fishery has developed in the Strait of Gibraltar. This has a high social and economic importance. The historical development of the Strait of Gibraltar and Bay of Biscay fisheries and the main characteristics of fleets currently involved will be described.

Available fisheries, biological, biodiversity and socio-economic data for these fisheries will be collated and reviewed. As these are artisanal fisheries, fisheries data will be collated at a high spatial and temporal resolution, where possible. These fisheries operate mostly on the same fishing ground as other demersal fisheries and there is little or no data on their interaction with biodiversity. However, available data and knowledge will be reviewed to produce a (most probably short) document of the impact of these fisheries on biodiversity;

Data currently available for management and monitoring will be collated and reviewed and a description of the current and historical management procedures will be provided.
This is will be particularly valuable for red seabream in the Bay of Biscay as it is widely acknowledged that this stock component has collapsed.

Deliverables
Draft of the Case study report (internal project document) (M6)

dCS3a. Case study report for the red seabream fishery in the Strait of Gibraltar and Bay of Biscay (M12)
The report will include the following chapters:

- historical development of the fisheries, including catches and fleet.
- biological parameters of the target species with up to date description of the current knowledge of their life history pattern, stock structure and status
- review of assessment method used so far
- inventory of the fisheries, biological, biodiversity, VME and socio-economic data currently available for management and monitoring purposes (1)
- review of kown and likely impact of the fishery on deep-water biodiversity
- review of current and historical management and monitoring procedures. SWOT (Strength and weaknesses, Opportunities and threats) and gap analysis of past and present scientific projects and data collection programmes in terms of fulfilling the data requirements for adequate management and monitoring regimes

(1) These data will be collated by the CS leader and made available to and stored in the DEEPFISHMAN database held by Ifremer for use during the project. Data non subject to confidentiality restriction will be stored on a web-based library like PANGEA (http://www.pangea.de/) at the end of the project.

Case Study number	3b	Start date or starting event:	Month 1
Case Study title	Artisanal fisheries: Vulnerable - Red (blackspot) seabream fishery in the eastern Mediterranean Sea		
Activity Type	RTD		
Participants number	10		
Participants short name	HCMR		
Person-months per participants:	6		

Objectives

- To review the historical development of relevant fisheries and the main characteristics of fleets currently involved.
- To review the biology and information currently available on biological parameters.
- To review and collate the fisheries, biological, biodiversity, VME and socio-economic data currently available for management and monitoring, identifying strengths and weaknesses and any existing data/information not used or not fully used at present. Collated fisheries data will include all bycatch data, including other commercial and non-commercial fish species, corals, sponges and other benthos, seabirds, marine mammals and turtles.
- To review the known and likely impacts of fishing on biodiversity and to inventory and collate data on biodiversity in red (blackspot) seabream habitat/fishing ground. To identify missing data and knowledge of biodiversity, which would be required to assess biodiversity and the impact of fishing for this species in the Meditearranean.

To review the current and historical management and monitoring procedures/methods (including assessments, biological reference points, harvest control rules, measures to protect and conserve biodiversity e.g. technical measures, Marine Protected areas) and status of stocks, and to identify possible improvements in the current management and monitoring framework by making better use of data currently available. This information will be used in WPs 2, 5 and 7.

Description of work and role of participants

This case study will be carried out by HCMR.

The eastern Mediterranean red blackspot seabream deep-water fishery is a small-scale fishery exercised in the Hellenic waters mainly using long-lines and gill nets. Commercial trawlers, which operate in shallower waters, catch mostly juveniles that are discarded (Mytilineou & Papaconstantinou, 1995). This small-scale fishery started in the early 1980s with long-lines. In 1996, gill nets started to be used also. In the early years of the fishery, the catches were quite high, but very quickly they declined considerably; the main reasons for this were attributed to over-fishing, the introduction of gill nets, the recreational fishery and to ghost fishing (Petrakis et al., 2001; Chilari et al., 2006). Landings data from the National Statistical Services have also shown a declining trend implying the need of urgent management measures taken also into account the protandrous hermaphroditic character of the species (Mytilineou & Machias, 2007).

Two studies have been carried out by HCMR up to now for red (blackspot) seabream fishery in the Greek waters (CT-95-0655 and DGXIV 00/046 EU projects). Data were collected on the characteristics of this fishery as well as biological data from the catches of the species and selectivity parameters. Furthermore, the species is a target of the MEDITS (International bottom trawl survey in the Mediterranean) project, where abundance indices and demographic data are collected yearly since 1994. Population indicators

have been developed in order to use the MEDITS data for diagnostic purposes (MEDITS, 2007; Rochet et al., 2007).

In the framework of this case study, HCMR will review all available fishery, management, survey and biological, biodiversity and socio-economic data and information concerning the stock. Information from literature from peer reviewed journals, project reports, meeting proceedings and from different databases will be used. Information on the fishery data (such as fleet, gears, effort, landings and discards) and biological data will be updated/improved using new data from other ongoing projects. Data and observations on the impact on the fishery on biodiversity will be reviewed.

A synthesis and evaluation of all the existing data useful for management and monitoring purposes will be carried out. Strengths and weaknesses as well as gaps of the available information will be identified. The current status of the stock will be described and suggestions will be made for possible improvements in the management and monitoring framework for red seabream. This information will be used in WP 7.

Deliverables

Draft of the Case study report (internal project document) (M6)

dCS3b. Case study report for the red seabream fishery in the eastern Mediterranean sea (M12)
The report will include the following chapters:

- historical development of the fisheries, including catches and fleet.
- biological parameters of the target species with up to date description of the current knowledge of their life history pattern, stock structure and status
- review of assessment method used so far
- inventory of the fisheries, biological, biodiversity, VME and socio-economic data currently available for management and monitoring purposes (1)
- review of kown and likely impact of the fishery on deep-water biodiversity
- review of current and historical management and monitoring procedures. SWOT (Strength and weaknesses, Opportunities and threats) and gap analysis of past and present scientific projects and data collection programmes in terms of fulfilling the data requirements for adequate management and monitoring regimes

(1) These data will be collated by the CS Leader and made available to and stored in the DEEPFISHMAN database held by Ifremer for use during the project. Data non subject to confidentiality restriction will be stored on a web-based library like PANGEA (http://www.pangea.de/) at the end of the project.

Case Study number	3c	Start date or starting event:	Month 1
Case Study title	Artisanal fisheries – less vulnerable: Portuguese fishery for black scabbardfish in ICES Sub-area IX		
Activity Type	RTD		
Participants number	8		
Participants short name	IPIMAR		
Person-months per participants:	4		

Objectives

- To review the historical development of black scabbardfish fisheries in ICES area IX and the main characteristics of the fleet.
- To review the biology and information currently available on biological parameters of black scabbardfish.
- To review the data and knowledge on the biodiversity of the fishing ground of fishery and its possible impact. To identify missing data and knowledge of biodiversity, which would be required to assess biodiversity and the impact of fishing for this species.
- To review and collate the fisheries, biological, biodiversity, VME and socio-economic data currently available for management and monitoring of black scabbardfish in ICES area IX, identifying strengths and weaknesses and any existing data/information not used or not fully used at present. Collated fisheries data will include all bycatch data, including other commercial and non-commercial fish species, corals, sponges and other benthos, seabirds, marine mammals and turtles.
- To review the current and historical management and monitoring procedures/methods (including assessments, biological reference points, harvest control rules, measures to protect and conserve biodiversity e.g. technical measures, Marine Protected areas) and status of stocks, and to identify possible improvements in the current management and monitoring framework by making better use of data currently available. This information will be used in WPs 2, 5 and 7.

Description of work and role of participants

This case study will be carried out by IPIMAR.

The fishery for black scabbardfish (Aphanopus carbo, Lowe 1839) in ICES area IX was initiated in the early 1980's on the slopes near Sesimbra landing port (south of Lisbon – mainland Portugal). The fleet was composed by small longliners (total length below 20 m) which used a fishing method and gear modified from the traditional Madeira longline fishery. At present, fishing still exhibits artisanal features and occurs in particular areas where individual vessels have their own fishing grounds. Although little objective information is available on the stock structure and dynamics of the species, a single stock in the NE Atlantic area has been hypothesized. However due to the different exploitation patterns and fleets, WGDEEP considers separately a northern component, which includes subarea Vb and areas VI, VII and XII, and a southern component, which includes areas VIII and IX. In both components C. coelolepis and C. squamosus are the two most important by-catch species.

IPIMAR will be responsible for the compilation of the input data for assessment purposes. However, due to the gap of knowledge on stock structure of black scabbardfish, an initial effort will be made towards the understanding of its structure in the NE Atlantic using the available information, including unpublished data. Under this scope it is foreseen a review on information on the species from research surveys carried out

during the first half of the 1980's by IPIMAR held along Portugal mainland and Madeira. The data available include information on fishing activities, fishing effort, environment, catch composition, length frequency and biology. In the review, monitoring issues will be addressed particularly in what concerns sampling the different life stages and stock components of black scabbardfish.

The fisheries, biological, biodiversity and socio-economic data available for black scabbardfish in its distribution area will be collated and a description prepared. A particular emphasis will be put on the provision of results from Portuguese national projects on age and growth, otolith shape analysis and otolith chemical composition. This will also include a review of how this data has been used to evaluate the state of the stock and the formation of management advice with a critical analysis on the strengths and weakness of the data collection programmes and scientific projects in addressing assessment requirements.

A compilation of the information on logbook and Vessel Monitoring System (VMS) from the Portuguese longline fishery will be conducted. Under this subject, work will be done on the revision of the current data mining algorithms for processing of VMS data of artisanal longline fisheries, and the assertion of difficulties and recommendations for the use of this data to derive CPUE or LPUE abundance indices. Spatial-temporal dynamics of the fleet and estimation of standardized effort will be performed for black scabbardfish.

The current and historical management and monitoring procedures/methods (including assessments, biological reference points, harvest control rules) and status of stocks will be reviewed, and possible improvements in the current management and monitoring framework by making better use of data currently available will be suggested. This information will be used in WPs 5 and 7.

Deliverables

Draft of the Case study report (internal project document) (M6)

dCS3c. Case study report for the Portuguese fishery for black scabbardfish (M12)
The report will include the following chapters:

- historical development of the fisheries, including catches and fleet.
- biological parameters of the target species with up to date description of the current knowledge of their life history pattern, stock structure and status
- review of assessment method used so far
- inventory of the fisheries, biological, biodiversity, VME and socio-economic data currently available for management and monitoring purposes (1)
- review of kown and likely impact of the fishery on deep-water biodiversity
- review of current and historical management and monitoring procedures. SWOT (Strength and weaknesses, Opportunities and threats) and gap analysis of past and present scientific projects and data collection programmes in terms of fulfilling the data requirements for adequate management and monitoring regimes

(1) These data will be collated by the CS leader and made available to and stored in the DEEPFISHMAN database held by Ifremer for use during the project. Data non subject to confidentiality restriction will be stored on a web-based library like PANGEA (http://www.pangea.de/) at the end of the project.

Case Study number	4	Start date or starting event:	Month 1
Case Study title	Data rich stock – NE Atlantic oceanic redfish (Sebastes mentella)		
Activity Type	RTD		
Participants number	4	12	
Participants short name	IMR	MRI	
Person-months per participants:	3	3	

Objectives

- To review the historical development of the fisheries on oceanic redfish and to describe the main characteristics of the fleets currently involved.
- To review and collate the biology of oceanic redfish and information currently available on biological parameters.
- To review and collate the fisheries, biological, biodiversity, VME and socio-economic data and information currently available for management and monitoring purposes, identifying strengths and weaknesses, and to identify any existing data/information not used or not fully used at present. Collated fisheries data will include all bycatch data, including other commercial and non-commercial fish species, corals, sponges and other benthos, seabirds, marine mammals and turtles.
- To review the data and knowledge on the biodiversity of the fishing ground of the fishery and its possible impact. To identify missing data and knowledge of biodiversity, which would be required to assess biodiversity and the impact of fishing for this species.
- To review the current and historical management and monitoring procedures/methods (including assessments, biological reference points, harvest control rules) and status of stocks, and to identify possible improvements in the current management and monitoring framework by making better use of data currently available.
- To collate and analyse data on stock structure of oceanic redfish and to identify suitable stock indicators.

Description of work and role of participants

This Case Study will be lead by the Institute of Marine Research, Norway.

This case study will focus on the beaked redfish (Sebastes mentella) a species widely distributed throughout the North Atlantic, including the Barents Sea, the Norwegian Sea, the Irminger Sea and most of the continental slopes bordering the associated basins. As for many deep-water fish populations, S. mentella is characterised by a high longevity (>50y), late maturity (10-15y). These characteristics make the population highly vulnerable to exploitation. The fisheries have developed in the recent decades, first as a bottom trawling fishery in the shallower waters of the Barents Sea and then as a pelagic fishery in the deeper ocean in the Irminger and Norwegian Seas. Management and regulations have followed rather than preceded the rapid increase in the exploitation of this species.

Contrary to most deep-water fish species, there is a relatively long history of observation and sampling for the beaked redfish. However, despite the amount of data collected over years, some issues still remain unsolved. The identification of stock units is still a matter of debate (although a strong research effort has been devoted to this question in the EU-project REDFISH). Second, there is still no quantitative analytical assessment for this stock. Third, there have been important changes in the spatial distribution of the fishing

effort and in the stock productivity over time and it is still unknown how these are related to each other.

Historical changes in S. mentella stock and fisheries, stock indicators

The stock of S. mentella has been surveyed through a series of scientific cruises and commercial records for at least the past two decades. There have been considerable changes in the dynamics of the fisheries targeting redfish during this period with a shift from the Barents Sea and shelf waters of the Norwegian Sea towards the continental slope and the deep waters of the Norwegian Sea. At the same time recruitment of S. mentella has greatly varied and has gone through a period of 15 years of poor recruitment but appears to be increasing in recent years. A large amount of scientific data has been collected and is made available to the ICES Arctic Fisheries Working Group. The objective of the work will be to re-analyse historical data to trace back the history of the stock and of the fisheries for the past two decades. The review will provide critical information on the current state of monitoring activities on the stock and on the fisheries. These will be used to construct recommendation for future monitoring in support to management (WP7).

This will be done in parallel with the development of specific stock indicators which will provide information on demographic structure, stock productivity and spatial distribution. These indicators will eventually contribute to the setting of reference points for redfish (WP5).

An important part of the case study will be to collate and review the fisheries, biological, biodiversity and socio-economic data available for this stock to date, a review of how these data have been used to evaluate the state of the stock and formulate management advice. A critical analysis of the strengths and weakness of the data collection programmes and scientific projects in relation to addressing assessment requirements will be carried out.

Deliverables

Draft of the Case study report (internal project document) (M6)

dCS4. Case study report for the NE Atlantic oceanic redfish (Sebastes mentella) (M12)

The report will include the following chapters:

- historical development of the fisheries, including catches and fleet.
- biological parameters of the target species with up to date description of the current knowledge of their life history pattern, stock structure and status
- review of assessment method used so far
- inventory of the fisheries, biological, biodiversity, VME and socio-economic data currently available for management and monitoring purposes (1)
- review of kown and likely impact of the fishery on deep-water biodiversity
- review of current and historical management and monitoring procedures. SWOT (Strength and weaknesses, Opportunities and threats) and gap analysis of past and present scientific projects and data collection programmes in terms of fulfilling the data requirements for adequate management and monitoring regimes

(1) These data will be collated by the CS leader and made available to and stored in the DEEPFISHMAN database held by Ifremer for use during the project. Data non subject to confidentiality restriction will be stored on a web-based library like PANGEA (http://www.pangea.de/) at the end of the project.

Case Study number	5	Start date or starting event:	Month 1
Case Study title	Data Rich Stock – NAFO Greenland halibut Sub-area 2 and Division 3KLMNO stock.		
Activity Type	RTD		
Participants number	11	8	
Participants short name	IEO	IPIMAR	
Person-months per participants:	4	3	

Objectives

- To review the historical development of the fisheries on NAFO Subarea 2 and Divisions 3KLMNO Greenland halibut stock and describe the main characteristics of fleets involved in the fishery.
- To review the biology of Greenland halibut and information currently available on biological parameters.
- To review the known and likely impacts of Greenland halibut fishing on biodiversity and to inventory and collate data on biodiversity. To identify missing data and knowledge of biodiversity, which would be required to assess biodiversity and the impact from the fishery
- To review and collate the fisheries, biological, biodiversity, VME and socio-economic data and information currently available for management and monitoring purposes, identifying strengths and weaknesses and any existing data/information not used or not fully used at present. Collated fisheries data will include all bycatch data, including other commercial and non-commercial fish species, corals, sponges and other benthos, seabirds, marine mammals and turtles.
- To review of current and historical management and monitoring procedures (including assessments, biological reference points, harvest control rules) and status of stock and identify possible improvements in current management and monitoring framework by better use of data currently available.

Description of work and role of participants

This Case Study will be carried out by the Instituto Español de Oceanografía (IEO) and the Instituto Nacional de Recursos Biológicos (INRB-IPIMAR). IEO and IPIMAR will liaise with DFO who will contribute as part of its own projects. The scientists of these Institutions that participate in this Study Case have considerable experience in the Greenland halibut assessment and fishery. Most of them have participated in NAFO Scientific Council assessment of this species in the last years, as well as in different Study Groups and Workshops related with the NAFO Precautionary Approach and Management Strategies Evaluation.

The Greenland halibut stock in NAFO Subarea 2 and Div. 3KLMNO is considered to be part of a biological stock complex, which includes Subareas 0 and 1.

Prior to the 1990s Canada was the main participant in the fishery followed by USSR/Russia, Denmark (Faroe Islands), Poland and EU-Germany (GDR before 1989) fishing primarily in Subarea 2 and Division 3K. Since then the major participants in the fishery are EU-Spain, Canada, EU-Portugal, Russia and Japan. All except Canada fish in the NAFO Regulatory Area (NRA) mainly in Divisions 3LM and to a lesser degree in Divisions 3NO. In 2003 the NAFO Fisheries Commission implemented a fifteen year rebuilding plan for this stock.

The first objective of this case study will review the historic development of the international fishery that has exploited this stock, their special distribution and exploitation patterns. The review will be based in the

published documents and in the analysis of the available NAFO Scientific Council fisheries data (catches, effort, VMS, etc), as well as the information of the main countries that have been an important role in this fishery. IEO and INRB-IPIMAR will compile the European information and liaise with DFO for the Canadian information.

The second part of this case study will be to collate and prepare a description of the available fisheries, biological, biodiversity and socio-economic data for this stock/fishery. A review will be carried out of how these data have been used to evaluate and monitoring the state of the stock and the formation of management advise. The review will include a study of the data required to monitoring the recovery plan. This will be carred out by the IEO, DFO and INRB-IPIMAR.

The final objective of this case study will be to describe the existing management and monitoring framework and to make suggestions as to how this can be improved upon by taking the specific biological and ecological characteristics of the stock(s) and the fisheries that exploit it into consideration. This will be carry out by the IEO and INRB-IPIMAR (with contacts to DFO) in preparation for WP 5 and 7.

Deliverables

Draft of the Case study report (internal project document) (M6)

dCS5. Case study report for the NAFO greenland halibut Sub-area 2 and Division 3KLMNO stock (M12)
The report will include the following chapters:

- historical development of the fisheries, including catches and fleet.
- biological parameters of the target species with up to date description of the current knowledge of their life history pattern, stock structure and status
- review of assessment method used so far
- inventory of the fisheries, biological, biodiversity, VME and socio-economic data currently available for management and monitoring purposes (1)
- review of kown and likely impact of the fishery on deep-water biodiversity
- review of current and historical management and monitoring procedures. SWOT (Strength and weaknesses, Opportunities and threats) and gap analysis of past and present scientific projects and data collection programmes in terms of fulfilling the data requirements for adequate management and monitoring regimes

(1) These data will be collated by the CS leader and made available to and stored in the DEEPFISHMAN database held by Ifremer for use during the project. Data non subject to confidentiality restriction will be stored on a web-based library like PANGEA (http://www.pangea.de/) at the end of the project.

Ø B 1.3.6 Efforts for the full duration of the project

Template: Project Effort Form 1 - Indicative efforts per beneficiary per WP

Project number (acronym) : 227390 (DEEPFISHMAN)

Participant n°/ short name	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	Total person months
1-IFREMER	10	4		5	7	6	3	2.5	37.5
2- Cefas	2	11	3	10	8	5	11	2	52.0
3-UoI			23		4		8	0.5	35.5
4-IMR		3		8			2		13.0
5-Imperial	0	2		22	20	1	5	2	52.0
6-NatMIRC		24							24
7-AZTI-Tecnalia	0	2.5	3.5	3.0	2.5		19.5	1.4	32.4
8- IPIMAR	0	10		4	4	4	2	2	26.0
9- MI		7	2		1	3	2	1	16.0
10- HCMR		6	1	2	2	5	1	1	18.0
11- IEO	0	9	1	1		1		1	13.0
12- MRI	1	4	1	1	2	7		3	19.0
13-UoP/Cem.			11.5				1.5	1	14.0
Total	13	82.5	46	56.0	50.5	32	55	17.4	352.4

Template: Project Effort Form 2 - indicative efforts per activity type per beneficiary[8]

Project number (acronym) : 227390 (DEEPFISHMAN)

Activity Type	1 IFREMER	2 CEFAS	3 UoI	4 IMR	5 IMPERIAL	6 NatMIRC	7 AZT-Tecnalia	8 IPIMAR	9 MI	10 HCMR	11 IEO	12 MRI	13 UoP	TOTAL ACTIVITIES
RTD/Innovation activities														
WP 2	4	11		3	2	24	2.5	10	7	6	9	4		82.5
WP 3		3	23				3.5		2	1	1	1	11.5	46
WP 4	5	10		8	22		3	4		2	1	1		56
WP 5	7	8	4		20		2.5	4	1	2		2		50.5
WP 6	6	5			1			4	3	5	1	7		32
WP 7	3	11	8	2	5		19.5	2	2	1			1.5	55
Total 'research'	25	48	35	13	50	24	31	24	15	17	12	15	13	322
Demonstration activities														
Total 'demonstration'	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Consortium management activities														
WP 1	10	2										1		13
Total ' management'	10	2										1		13
Other activities														
WP 8	2.5	2	0.5		2		1.4	2	1	1	1	3	1	17.4
Total 'other'	2.5	2	0.5		2		1.4	2	1	1	1	3	1	17.4
TOTAL BENEFICIARIES	37.5	52	35.5	13	52	24	32.4	26	16	18	13	19	14	352.4

[8] Please indicate in the table the number of person months over the whole duration for the planned work , for each work package, for each activity type by each beneficiary

Ø B 1.3.7 List of milestones & planning of reviews

Milestone number	Milestone name	WP N°	Lead beneficiary	Delivery date from Annex I [9]	Comments (Means of verification)
1 M1.1	Format protocols for data completed and issued	WP1	1	4	D1.4 & D1.5
2 CS all	Confirmation that appropriate data will be available from all case studies and data collection protocols (SOP) adopted	WP2	2	4	All case studies workshop minutes
3 M2.1	Reviews of NE Atlantic deep-water environments, stocks and relevant FP6 project reports completed	WP2	2	6	D2.1, D2.2 published
4 CS all	Verification of data collation completion by all Cases studies and consensus decision of robustness of collated economic data	WP2-WP7	2	12	CS reports to WPs
5 M7.1	Compilation for HCR reference points completed	WP5, WP7	5	18	WP7 internal report/memo
6 M3.1	Work completed on Task 3.2 and approved by PCC	WP3	3	18	SG Minutes
7 M6.1	Conclusion for work on relevance criteria for catch data, and D6.1 approved	WP6	1	18	D6.1 published
8 M5.2	Review of appropriate indices and reference points (D5.2) approved for publication by SG	WP5	5	20	Deliverable D5.2
9 M4.1	Analysis of current assessment methods, D4.2	WP4	5	20	D4.2 published
10 M4.2	Identification of assessment methods with the most likely potential for case study and other EU fisheries and data requirements for D4.2	WP4	5	24	By D4.2
12 M5.2	Report on current and future harvest control rules for stocks approved for publication by SG	WP5	5	30	Deliverable D5.3
13 M7.2	Test phase of the performance of the management plans started	WP7	7	31	WP7 memo to partners
14 M4.3	FLR assessment suite draft design (d4.4) approval by WP4 working group	WP4	5	32	By WP4 leader's confirmation notice to SG
15 M8.1	Interactive Stakeholder Workshop completed	WP8	2	34	Proceedings

[9] Month in which the milestone will be achieved. Month 1 marking the start date of the project, and all delivery dates being relative to this start date.

B2. Implementation :

B 2.1. Management structure and procedures:

Ø Project co-ordination :

IFREMER will take responsibility for the administrative co-ordination of the project, and will head the scientific co-ordination. The named co-ordinator is Pascal Lorance.

As administrative coordinator, Dr Lorance will be the intermediary between the Parties and the European Commission and take responsibility for legal, contractual, financial and administrative operational management of the consortium, ensuring day-by-day project management and leading the reporting activities to the European Commission. As chief scientific coordinator, Dr Lorance will take responsibility for co-ordination on a day-to-day basis the progress of the project's technical work and reviewing the deliverables. He will head the Project Steering Group (see below).

IFREMER will be responsible for the overall coordination of the project, while a named partner will coordinate each work package. The decision-making body of the consortium will be the Project Governing Board (GB), which has the highest power in the project and is responsible for the overall management of the project and is composed of an authorised representative for each contractor.

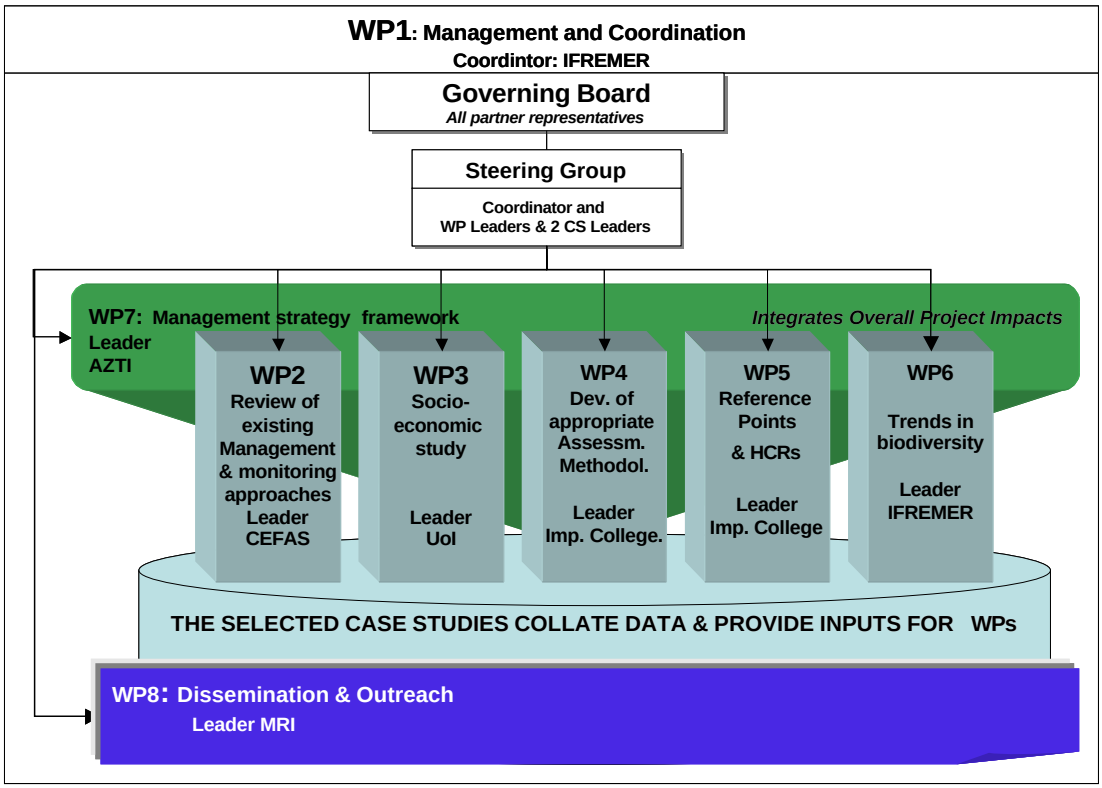


Figure 1 - Project organization, consortium management and relationship to the WPs and cases studies.

Ø Project management, decision-making and executive bodies :

a) The Governing Board (GB)
The Governing Board is the overall decision body of the consortium, and constitutes representatives from all partners presented in B2.2 and any additional contractors that may enter the project during its lifetime. It is this

board, which validates the major decisions concerning the project. The Governing Board is the arbitration body for all decisions proposed by the executive Steering Group (SG). Thus, any Contractor may submit for arbitration by the Governing Board any decision by the SG it deems to be contrary to its interests; the Governing Board is also the decision making body for any issue concerning the proper operation of the Consortium. It is anticipated that formal meetings of the Board will be only held during the annual project meeting. The chairman of the Governing Board will be elected from the members of the Board for periods of 18 months, and cannot be a member of the SG.

The GB will support IFREMER in fulfilling their obligations towards the Commission. The responsibility of the GB is to handle contractual matters and to solve disputes and will therefore meet as needed. Meetings may take place via the web, or through e-mail messages. The Governing Board will decide on the following issues:

- Any necessary changes in work packages (creation, reallocation, or termination) in the light of developing work
- Any necessary changes in budgets, and all budget related matters
- Changes in the technical roadmap for the project
- Approve alterations proposed to the Consortium Agreement
- Acceptance of new parties as well as the exclusion of parties
- Premature completion/ termination of the project or requests for extensions.

b) Executive Steering Group (SG)

The main executive and scientific direction decision body for the project consortium will be the executive Steering Group (SG), which consists of the acting coordinator and the WP leaders, and two representatives elected by the group of Case Study leaders from their group for periods of 18 months. The SG is responsible to set the overall strategic course of the project, and will meet regularly; at least twice a year (one of those meetings can be carried out via a conference call or by other appropriate electronic means), and also in connection with the project Governing Board meetings. Its mandate is to make decisions regarding management issues relating to the project operations, scientific direction and make propositions to the Governing Board relating to any significant modifications of the project work plans, and adapt working procedures for the partnership. The coordinator will chair the meetings of the Steering Group. Actions will be taken at each time to certify that the progress according to the plan is valid. The meeting notes/minutes will be used for monitoring progress and made available to the partners on the partners' private zone on the project homepage.

The Steering Group is responsible for:

- Agreeing press releases and joint publications
- Control measures and audit procedures to ensure the effective day-to-day co-ordination and monitoring of the progress of the technical work.
- Overall progress of the project will be monitoring against the mutually agreed milestones.

c) The decision-making mechanism including conflict resolution and communication

All coordination of technical and RTD activities as well as legal, contractual and administrative activities at consortium level authority is vested in the Project Governing Board, and specific operational and management authority and responsibilities are mandated to the executive project Steering Group and the coordinator to facilitate the specific project activities. The management of the technical details of RTD activities is performed within each work package / case study, and is considered as part of the technical administration within the project. The decisions should be in general the results of teamwork. Each research WP group can make a suggestion about the organisation and development of the project to the Steering Group, which will decide and define actions on these suggestions.

Project progress will be monitored by deliverables and milestones, and the entire contract related reports and critical impact assessment deliverables might receive independent review from external reviewers appointed "ad hoc" for this purpose. Reports that have been defined as deliverables from the project will be annexed to the periodic scientific reports sent to the Commission. The preparation of the periodic Management Reports to the European Commission ensures a regular overall monitoring of costs and financing of the project work progress. The project website will be used for maintaining the project document archive, and along with electronic communications (Email, telephone, conference call meeting facilities etc.) between partners, act as a core internal and as well external communication platform for the project.

- In general, the project management will make sure by its mediation nature that conflicts are prevented.
- In case of conflicts, project management will function as a mediator and help to find a mutual settlement.
- If that cannot be achieved, a proposal will be made to the Governing Board to help to settle a conflict within the project.

d) Work package Management

The WP leaders and CS managers are all very experienced in coordinating RTD projects from previous EU framework programmes. The project coordinator will be responsible for managing WP1 "Project Management" and follow up on the progress within the other WPs. Each work package will be managed as a "core-theme", and the designated WP leader will take the responsibility of coordinating all activities within a given work package, and ensure proper interactions with the other WPs. The WP leaders will be responsible for ensuring that the deliverables from their work packages are completed according to the global project work plan and achieve the necessary levels of quality.

The leaders of each work package will have the roles and functions of:

- Directing the interdisciplinary teams on the planned activities and methods within their work package, and advise on theoretical aspects
- Co-ordinate work of the disciplinary teams of different case studies
- Help the teams with the editing of the reports and other returns
- Support the partners by support missions where necessary
- Develop the theoretical knowledge of the disciplinary teams (e.g. seminars and training)
- Report to the coordinator, and other members of the SG on the state of the work's progress, constraints and the difficulties met or envisaged
- Provide first line of alternative solutions (contingency plan inputs) needed to overcome obstacles that may impede the project work and overall success of the research.

e) Case study management

The Case study teams have the following particular roles and functions:

- Coordinating work at the case study level, across work packages
- Active participation to the development of the technical framework
- Provide data and information in suitable formats
- Carrying out any inquiries, interviews and other field work required.

To ensure the efficient running of the project, special emphasis is placed on rapid communication and progress monitoring, as well as the early detection of potential problems. Key communication opportunities will be through the regular project meetings, and the use of web-based collaboration approaches. For example, a wiki (a website that can be edited by all partners) may be established for collaboration and working on work packages and deliverables. These 'wiki' systems have already been used in a number of research projects (e.g. COMMIT, EFIMAS, POORFISH). Experience has shown that there is a need for such tools to support communication among partners based at different locations.

f) Project meetings

Plenary meetings will be held with participation of all contractors and with timely invitation to the Commission for attending. Experts will be invited to attend as appropriate to review progress and provide advice relating to the direction of the project. The success of the project depends upon strong collaboration between partners and across work packages. This will be encouraged and supported by the use of web-based methods for collaboration, while regular project meetings will be supplemented by meetings as part of related work at International organisations such as ICES, NAFO, NEAFC and SEAFO, where the work of the project will be presented and discussed.

The initial meeting plan is for three annual plenary meetings with all partners, i.e. at the GB level, and a project start up (kick-off) meeting at the beginning of the project. At the Steering Group level the plan is for meetings every six months during the project duration (every second meeting can be carried out via a conference call or by other appropriate electronic means). Other working group meetings at the WP and or CS level may be organized

as required to facilitate the research. Strategic meetings may be planned with relevant industry stakeholders, NGOs, and policy makers and fishery managers to exchange information and consult with them on the research issues arising from the project work.

g) Project management risks and contingency plans

The project operation will need to take account of, and manage potential risks of varying nature. The technological and scientific project risks have been addressed by the careful planning of the work packages themselves. The management role of the WP Leaders will require them to take regularly stock of the progress against the plans during the life of the project, and bring deviations to the attention of the other partners. Such occurrences will also be formally reviewed as a regular agenda point at the meetings of the SG. Deviations from the project schedule or serious cost overrun will be analyzed for impact on interfacing activities or work packages and appropriate recovery measures and/or corrective actions required to the responsible partner institution. If the consequences of the deviation are relevant for the entire Project and cannot be resolved by the Project coordinator bi-laterally with the partner concerned, then the issue will be referred to the SG body for resolution.
There are of course conventional intrinsic risks that are associated with carrying out research in the project. The research project is continuously monitored by project management and will be thoroughly evaluated twice per year. Project management is responsible for monitoring risks in the project. In case of unexpected difficulties in the execution of the project due to scientific risks, project management will take appropriate action such as developing and executing adequate contingency plans.

This ongoing process will ensure the project stays in line with initial and possibly evolving planning, and that the quality of the work, the deliverables and the results is kept at the highest level for wide acceptance. Tight control will identify early on any divergence from the project and Work Package plans. In this way, it will be possible to develop recovery plans and actions. The risk of jeopardizing the project objectives will be minimized by implementing proper quality management procedures. A contingency provision will be integrated in the detailed planning for final execution. Performance indicators, including quality assurance, will be defined in relation to project management.

Particular attention will be paid to specific risks related to the DEEPFISHMAN project. Specific risks identified currently include:

- Availability of technology: As previous projects showed, relying on implementation of standards or availability of standards represents a certain risk.
- Obsolete concepts possibly inherent in DEEPFISHMAN: Given the general and scientific objectives at the time of writing the project proposal, the consortium is not aware of any other project or research consortium that would have taken the DEEPFISHMAN approach as far as providing a threat to the validity of the project's work.

The project management with the support of all work package leaders will exercise risk management based on the following methodology:

- Observe internal and external risks that might occur in and around the project;
- Assess the possible severity of risks and the potential impact on the project;
- Evaluate the probability of the risk;
- Identify the appropriate action to avoid or minimise the risks;
- Identify the measures that may be necessary, if relevant, to minimise the impact of the risk should it nevertheless occur.
- Contingency plans with resulting changes having a minor effect on the project will be approved at project executive Steering Group level;
- Contingency plans with resulting changes having a major impact on the project will be drawn up at executive Steering Group level and put forward to the project Governing Board for evaluation, and followed up by an request for discussion and approval by the European Commission.

h) Project evaluation and quality control

Continuous project evaluation will take place to verify the quality of the deliverables, working documents and research results, measured against the project vision, objectives and quality requirements of the European Commission.

- Project level: The progress of the project versus the implementation plan will be continuously monitored and is subject to regular communication, working meetings and SG meetings. The work package leaders will carry out relevant work planning and control.
- Result compliance with objectives: It is essential that the individual work results support the overall and individual project objectives. In particular, technical co-ordination will in this instance play a vital role in monitoring and controlling the compliance of technical results with project objectives.
- Deliverable schedule: The work in the individual work packages will yield not only technical results but also time formal deliverables established in this description of work. A focus of the project management will be to ensure work on deliverables starts at an appropriate time before they are due.
- Deliverable quality: Before deliverables are submitted to the Commission (and those that are public to the public website), they go through a stringent cycle of technical and editorial steps.

B 2.2. Beneficiaries :

§ Participant 1: Institut Français de Recherche pour l'Exploitation de la MER (IFREMER), France

Ifremer is a public body created in 1984, and is the only French research organisation with an entirely maritime purpose. It operates under the joint auspices of the three Ministries of:

- Higher Education and Research,
- Agriculture and Fisheries,
- Ecology, Sustainable development and Infrastructure.

Being involved in all the marine science and technology fields, Ifremer has the capability of solving different problems with an integrated approach. Ifremer scope of actions can be divided into four main areas, each of them including different topics as described hereunder:

1. Understanding, assessing, developing and managing the ocean resources (knowledge and exploration of the deep sea; contribution to the exploitation of offshore oil; understanding ocean circulation (in relation with the global change); sustainable management of fishery resources; optimisation and development of aquaculture production)
2. Improving knowledge, protection and restoration methods for marine environment
3. Production and management of equipment of national interest
4. Helping the socio-economic development of the maritime world

Role: Project management and coordination, leading of WP1, WP6 and Case study 2, contributes to WP2, WP4, WP5, WP7 and WP8

Key personnel:

Dr Pascal Lorance, PhD in Marine Biology is Fisheries scientist at Ifremer, Nantes. He has been involved with the ICES working group for the assessment of deep-water stocks and fisheries (WGDEEP) since 1998. He is the leader of the Ifremer integrated project 'Ecosystem Approach to Fisheries in the Bay of Biscay'. He has been working on deep-water fisheries, stock assessment, fish biodiversity and the ecosystem approach to fisheries. He has contributed to EU projects (Developing deep-water fisheries: Data for their assessment and for understanding thier interaction with and impact on a fragile environment, EC FAIR CT 95-0655: 1996-1999), TECTAC:2002-2005, IMAGE:2006-2009). He is a member of the EU MARBEF Network of Excellence.

Dr. Paul Marchal, has a background in fish stock assessment and mixed fisheries modeling. Over the past 15 years he has worked in fisheries research labs in England (Cefas), Denmark (DIFRES), France (IFREMER) and most recently New Zealand (SeaFIC). Paul chaired the ICES (International Council for the Exploration of the Sea) working group for the assessment of deep-water stocks and fisheries (2006-2007). He has also coordinated and/or contributed to several European projects pertaining to the impact of management regulations on fleet behaviour and the pressure they exert on commercial fish stocks (FER: 1999-2001, TECTAC: 2002-2005, CAFÉ: 2006-2009). Paul is currently undertaking a bio-economic evaluation of the New Zealand's Individual Transferable Quotas system (TRANZEF project: 2007-2009).

Dr. Lionel Pawlowski, PhD in marine biology specialised in modeling, is a junior scientist who joined Ifremer Lorient in October 2007. During his 3-years Postdoc at MBARI and University of Maine (USA) he worked on coupled ecosystem models of the California Current System and investigated the influence of El Niño events on local fisheries. He has also been involved in the development of data collection and comparison tools for the US project 'Autonomous Ocean Sampling Network'. He currently works on stock assessment methods for various ICES workgroups including WGDEEP.

Dr Verena Trenkel, PhD in biostatistics, has been working on wildlife and fish stock assessment models in a single and multi-species context as well as the indicator approach to fisheries management for over fifteen years. She has recently participated in the EU project Fisboat on survey based single species stock assessments, in particular by developing methods for combining indicators and carrying out stock assessments in data poor situations. Other recent research has been on methods for estimating trawl catchability and direct methods of abundance estimation.

§ Partner 2: The Centre for Environment, Fisheries and Aquaculture Science (Cefas), UK

Cefas an Agency of the Department for Environment, Food and Rural Affairs (Defra) is a multidisciplinary scientific centre specialising in fisheries science and management and marine monitoring and assessment. Cefas employs over 550 people and provides its services to a large number of UK and international public and private sector clients. Cefas enjoys an outstanding reputation within the world community of fisheries science and management and plays a leading role within the ICES and other international organisations such as NEAFC, SEAFO, NAFO, ICCAT, and IWC. Work, directed towards the collection and analysis of appropriate data on fish and fisheries in their broadest sense, is aimed at providing coherent management advice to the Ministers of the member states so that the Common Fisheries Policy can be implemented and improved.

Role: Lead WP2, and case study 1b) Directed single species fisheries; Less vulnerable - blue ling. Participate in all WPs.

Key personnel
Phil Large BSc- Senior Fisheries Scientist - recognized as the Cefas expert on the assessment and management of deep-water fish species. He has been a member of the ICES Working Group on the Biology and Assessment of Deep-water Fisheries Resources (WGDEEP) since 1996 and is the Assessment Co-ordinator for the Group. He was a member of a 'Group of Experts' convened by the EU to discuss regulatory options to ensure effective management of deep-water species in the NE Atlantic and he recently gave a presentation in a European Parliament workshop on the management of deep-water stocks. He represents Cefas at NEAFC and EU meetings on deep-water issues and represents the EU on the NAFO Scientific Council and the SEAFO Scientific Committee, where is currently the Chair-person, and at ad hoc technical meetings on the management of deep-water fisheries resources in the southern Indian Ocean. He was Project Leader for an international project to evaluate the effects of fishing on deep-water fish species to the west of Britain and is involved in the FW 6 Project POORFISH.

Dr Graham M. Pilling - Fisheries Biologist & Advisor, Head of Assessment in Support of Policy Team - Over thirteen years experience working in tropical, temperate and polar marine and freshwater ecosystems, gaining in depth experience in the practical assessment and management of pelagic and demersal fisheries through a wide range of methodologies. Fisheries studied include industrial tuna fisheries and artisanal reef fisheries in the tropics and Arabian Gulf. The impacts of anthropogenic influences such as oil spill events and climate change on fish stocks and fisheries have been examined. Designed and developed models to simulate the long-term impacts of uncertainty in stock assessments on the management of fisheries. Member of a number of Marine Stewardship Council accreditation teams assessing fisheries for sustainability against the MSC principles. Has played a key role at international commissions in tropical and polar regions. Work has contributed significantly to the institutional strengthening of fisheries institutions in the tropics. Extensive experience in the administration and management of fisheries and environmental development and research programmes, including provision of technical support, project and programme management and strategic development, institutional development, and fiscal management.

Dr Laurence Kell - Senior Fisheries Modeller - Has extensive experience in conducting and managing strategic research into the sustainable exploitation of marine resources and in providing advice to both the UK government and the European Commission and in participating in a variety of International and Regional management bodies including ICES, STECF, ICCAT and the IWC. Between 1999 and 2000 was a visiting research fellow at the University of Miami. He has previously coordinated four EU projects related to the evaluation of management strategies.

Other staff involved - Dr Andrew Kenny -Senior Fisheries Biologist; He was Chair of an ICES Study Group 'Regional Ecosystem Group for the North Sea' which produced an integrated assessment of the North Sea ecosystem. Dr Iago Mosqueira - Fisheries Modeller; Dr Stephen Dye – Oceanographer; Dr Beatriz Roel – Senior Fisheries scientist.

§ Partner 3. Institute of Economic Studies (IoES), University of Iceland (UoI), Iceland

The Institute of Economic Studies (IoES), founded in 1989, is a research institute within the Faculty of Economics at the University of Iceland. The main ambition of the Institute is to create a research environment characterised by high competence in economic analysis with special emphasis on natural resources and environmental economics. The institute regularly published working papers and is engaged in various research and consultation projects. The IoES and its individual staff members have long experience with both the theoretical aspects of bio-economic modelling but also the implementation of such models. The IoES has played a key-role in providing advice to the government concerning the economic aspects of fisheries management in Iceland.
Role: Will lead work package three (WP3) on socio-economic analyses.
Specific activities include:

- Lead WP3
- Participate in WP7 on developing the management strategy frameworks
- Participate in WP5 on inputs from WP3 relating to economic reference points
- Participate in dissemination WP8

Key personnel

Dr Ragnar Arnason is a professor of fisheries economics and the chairman of the Institute of Economic Studies at the University of Iceland. Professor Arnason has primarily conducted his research in the area fisheries economics and fisheries management where he has a publication record of over 100 scientific articles and several books. Professor Arnason has played an important role in the development of the Icelandic tradable fisheries quota system (ITQs). He was a member of the country's Committee on Natural Resources, which was charged with the responsibility of proposing the best arrangements for natural resource utilization. Professor Arnason has also provided advice on fisheries management and environmental issues to the governments of several countries in Europe, America, Africa and Asia. He has been active in various European scientific projects (e.g. BEMMFISH).

Dr Sveinn Agnarsson is a senior researcher at the IoES and has a long experience in bioeconomic modelling and economic analysis of fisheries management systems. He has been engaged in various projects, including an evaluation of the Icelandic fisheries management system and its effect on the fishing industry and urban development. Agnarsson has extensive experience in both the design and implementation of bio-economic models and has on various occasions been a consultant to government ministers on fisheries management measures.

Dr Gunnar Haraldsson is director of the IoES. He has a long experience with bio-economic modelling and has been involved in European research projects (e.g. BEMMFISH).

Dr Daði Már Kristófersson is a researcher at the IoES and a specialist in natural resource economics. He has published extensively in academic journals on various topics. He has been involved in various scientific projects.

§ Partner 4. Institute of Marine Research (IMR), Norway

The Institute of Marine Research (IMR), is the principal research and advisory body for fisheries, marine resources, environment and aquaculture in Norway. IMR has excellent facilities for both experimental and survey studies and is one of the largest and most comprehensive Marine Research Institutes in Europe. The IMR possess some of the most advanced marine research ships and laboratories in the world. Its facilities, which extend from the southern to the northern part of the country, include a chain of research and field stations, laboratories and 10 research vessels, ROVs and AUVs. In total, the Institute employs 650 persons and has an annual budget of 80 million Euro (www.imr.no). IMR has first-class expertise and experience in performing studies in the assessment, ecology and genetics of a range of marine organisms. The Institute has had long years of experience with coordinating and administering large-scale research projects both at national and international levels. The most recent is the MAR-ECO project (http://www.mar-eco.no/), where scientists from 16 nations around the northern Atlantic Ocean (including the USA and Canada) are participating in research of the waters around the mid-Atlantic Ridge from Iceland to the Azores.

Group profile
The current IMR research group consists of an interdisciplinary specialist team from several different IMR Research Divisions. It covers the deep-sea fisheries research group (B. Planque and O.T. Albert) the genetics research group (J.-I. Westgaard), the fisheries dynamics research group (K. Nedreaas) and demersal fish research group (D. Howell). Altogether, these groups have extensive experience in field sampling, genetic analysis, population dynamics modeling, assessment and fisheries dynamics.

Role: Case study leader for CS 4 Data rich stock – NE Atlantic redfish

Key personnel
Dr. Benjamin Planque is a marine ecologist (PhD 1996). He worked in the field of plankton ecology within the Continuous Plankton Recorder survey (1993-1996) with emphasis on the role of climate fluctuations on plankton populations in the North Atlantic. During 1997-2000 he worked forCefas (UK) on the impact of large-scale climate fluctuations on fish stocks and in particular on demersal and flatfish recruitment. During 2000-2007 he was employed at Ifremer (France) where his worked on coupled hydrodynamic-biological models, and the role of climate fluctuations on the dynamics of small pelagic fishes (recruitment, spatial distribution and habitats). Since January 2008 he is a member of the deep-sea fisheries research group at IMR-Tromsø where his work is focused on the population ecology and assessment of redfish and Greenland halibut. He will work on the development of assessment models for S. mentella (WP4) and the reconstruction of historical time series of S. mantilla and the associated fishery (WP5) and will be leading the redfish case study (CS4).

Dr Daniel Howell has been employed as a senior scientist at IMR since 2002, and previously at MRI, Iceland. He is currently working in the Barents Sea Research Group on detailed age-length structured numerical modelling of Cod, Capelin, Herring, and Redfish stocks in the Barents Sea. Scientific interests include numerical modelling, simulation of fish population dynamics, and the interaction between models and real-world data. He has been involved in several ICES working groups, notably the SGASAM and the Methods Working Group, both concerned with improving methodology in modelling fish populations. Education: PhD. from the University of Wales, Aberystwyth, and a MSc. from Keele University. He has previously been involved in the DST2 and currently BECAUSE and UNCOVER EU projects. Dr. Howell will be involved in WPs 4 and Case Study 4 as a numerical modeller.

Dr. Kjell Harald Nedreaas is a senior research scientist at IMR in Bergen, and is the leader of the Fisheries Dynamics Research Group. He has a PhD on Genetic studies and age-determination of northeast Atlantic redfish, has been leading Norwegian research and advice on redfish since 1987, was Chairman of the ICES Study Group on Stock Identity and Management Units of Redfishes in Bergen 2004, and was Norwegian coordinator for the EU project Analysis of the redfish populations in the Northeast Atlantic: stock discrimination, reproduction and growth (2000-2004). He has also broad scientific background from studies of other deep-sea fish, e.g., Greenland halibut, tusk, ling and blueling, and was co-chairman of the joint ICES/NAFO Workshop on age determination of Greenland halibut in Reykjavik 1996.

§ Partner 5. Imperial College of London (Imperial) United Kingdom

Established in 1984, the Aquatic Resource Ecology Group (formerly Renewable Resources Assessment Group) is an interdisciplinary research group within the Division of Biology at Imperial College, specializing in fisheries bringing together expertise in the biological, mathematical, statistical, information and economic sciences. For many years, the Fisheries Group has had a strong international reputation for its research on marine and freshwater fish stock assessment and management, in both the developed and developing world. Major areas of focus include statistical modeling and fisheries management strategy evaluation. Topics of specific contribution include Bayesian stock assessment methodologies, survey design and data analysis, multi-stock, multi-area, age structured operating models of fish population dynamics, statistical methods to analyse mark-recapture data, the design of experiments for testing gear designs aimed at mitigating the effects of fishing on the ecosystem, Antarctic, high latitude and deep-water fisheries biology, statistical decision analysis methodologies for fisheries stock assessment, and bio-economic and game-theoretic models for fisheries management policy advice, including biological/socio-economic effects and mitigation of IUU fishing.

The Group has considerable experience in the assessment of deep-sea stocks. In particular, it has pioneered the use of integrated models and mark recapture methods for the deep (500-2000m) longline fishery for toothfish in the Antarctic. In addition to providing a very robust estimate of the target population dynamics the modelling approaches developed by the group address bycatch species, both in terms of direct estimation of sustainable yields and risk assessments of impact. Other fisheries that the group has performed assessments of (and in some cases has provided management advice on) include very short-lived species (squid in the Falkland Islands and Gulf of Carpentaria prawns) and medium length life cycle species (other finfish around the Falkland islands, tuna in the Indian Ocean and in the past has worked on orange roughy assessments. The group has experience of a wide range of RFMO/RFOs, including ICES, IOTC, CCAMLR, ICCAT, CCSBT, WCPFC and has strong connections with a wide range of international scientists. It is currently a member of the EFIMAS, COMMIT, FISBOAT, PRONE, CAFÉ, TXOTX and COBECOS EC research projects with emphasis on developing biological operating models and the FLR software framework. The contributions to the project will be delivered by Fisheries Group staff.

Dr. Kai Lorenzen is a Senior Lecturer in the Division of Biology at Imperial College, and Head of the Aquatic Resource Ecology Group. He also currently holds the Mote Eminent Scholar Chair in Fisheries Ecology at Florida State University. Dr Lorenzen's research focuses on fish population biology and fisheries management. A major interest of his has been the development of population dynamics theory and quantitative methods for assessing the role of enhancements within fisheries management systems. His research combines mathematical modelling with large-scale field studies, and often engages directly with management initiatives. Dr Lorenzen will be PI of the project and will coordinate IC's input.

Dr. Richard Hillary is Lecturer in Statistical Modelling at Imperial College, whose role will be to develop the detailed technical input, including MSE, interacting primarily with the case studies. Dr Hillary has developed assessments for deep-water species such as toothfish in the Antarctic as well as for southern bluefin, bigeye and yellowfin tuna in the Indian Ocean. Dr Hillary will direct Imperial College work on FLR code generation and management strategy evaluation.

Dr Polina Levontin is a Research Associate in the Fisheries Group at Imperial College with masters degrees in both mathematics and environmental modelling and a PhD in fisheries assessment methods. Her research work involves evaluating management strategies for Baltic salmon, North Sea nephrops and herring. She will develop code specific to the assessments and work particularly on WP4.

Dr Charles Edwards is a Research Associate who has just joined the Imperial College Fisheries Group. Previously he was working on stock assessment of South African fisheries (hake, lobster, abalone) at the University of Cape Town. He will work primarily on WP5.

Dr. David Agnew is a Reader in Fisheries and Population Biology and Head of the Fisheries Group. He will be PI of the project and will coordinate IC's input. He is a member of the Marine Stewardship Council's Technical

Advisory Board and is the UK's Scientific Committee Representative to the Commission for the Conservation of Antarctic Marine Living Resources. Dr Agnew has more than 25 years experience of stock assessment, particularly for the data poor Antarctic and south Atlantic fisheries. He coordinates research and assessments for, and provides fisheries management advice, to the UK Government (FCO) and the Falkland Islands and South Georgia governments.

Other staff involved : Dr Pia Orr (Research associate)

§ Partner 6. National Marine Information and Resaerch Center, Namibia (NatMIRC)

Description: Namibia has a small but competent research facility in Swakopmund called the National Marine Information and Research Centre (NatMIRC). Research includes work on commercial stocks and the marine environment. Stock assessment is based on the application of two separate approaches for each commercially exploited stock. The one is based on direct survey methods, typically swept-area trawl surveys, hydro-acoustic surveys and tagging. The other is based on analysis of catch, effort and biological data from commercial fishing. The Ministry operates two research vessels, and also make use of commercial fishing vessels to conduct stock assessment surveys.

Key Personnel
Mr. Rudi Cloete started his career at the Ministry of Fisheries in 1992. He holds a BSc (Hons) degree in Fisheries Science and a MSc degree (Univ. Of Hull) in Fisheries Management. His research experience includes stock assessment surveys (acoustics and swept-area), ichthyoplankton and zooplankton studies. Mr. Cloete is currently heading the Demersal Sub-division at NatMIRC. He is also the vice-chairman of the SEAFO scientific committee.

Dr. Carola Kirchner joined NatMIRC in 1994 as a fisheries biologist. She holds a BSc (Hons) degree in analytical chemistry and a PhD (Univ. of Port Elizabeth) on stock assessment and population dynamics of Namibian kob. She is currently responsible for stock assessment modelling of Namibia's commercial fish stocks.

§ Partner 7. AZTI –TECNALIA (AZTI) (Fisheries and Food Technological Institute) Spain

AZTI-Tecnalia is a non-profit foundation governed by both the Regional Basque Government and the private sector. AZTI is a centre of excellence in the research, technological development and transference in the areas of Oceanography and Marine Environment, Fisheries and Food Technology. It has two centres, and a third one devoted to food research is being built. The staff consists of more than 180 people mainly allocated into two research divisions: Marine Research Division and Food Research Division. The Marine Research Division is composed by more than 92 people directly involved amongst others in biological studies, fisheries monitoring, fish stock assessment, and fishing gear technology. The unit conducts work to contribute to the study of the fish stocks of major importance to the Basque fleet. During the last 25 years AZTI has carried out fisheries research in co-ordination with several other institutes in Europe aiming at getting relevant information for local, national and international bodies. Its ultimate purpose is to contribute equitably to the establishment of technical and scientific basis for reliable assessment and responsible exploitation of fish stocks.

AZTI-Tecnalia is currently participating in 27 projects from the previous FP6, from which, 20 belong to the Marine Research Division.

Role: Lead WP7

Key personnel

Dr Guzman Diez has been working in AZTI since 1998 in projects funded by the European Commission, Spanish Government and Local Founds related to fisheries management (DELASS: UE, DG XIV 99/055, CEVIS 022686), acoustic and laser marine technology (SEAQUEST), aquaculture of bluefin tuna (Interreg IIC, EA-BIF, 2.11) effects of contaminants in marine fishes (VEM2003-20082-C06-05, IMPRES) and parasitism of fishes. He's also member of the ICES/CIEM Working Groups on the Biology And Assessment Of Deep-water Fisheries Resources and on Elasmobranch Fishes, and has participate as expert in the WG of Biological effects of contaminants, WG on hake, monkfish and megrim, and in the STCEF, Subgroup on Resource Status (SGRS) Elasmobranch Fisheries.

Ms Dorleta García, Junior Scientist. Bachelor in Mathematics. Currently doing her PhD on mathematical models in partial differential equations with application to population dynamics. She has participated in PhD Courses in the University of Miami (RSMAS): "Advanced Population Dynamics and Modelling". She participates in ICES WGHMM and Study Group on Simple Mixed Fisheries Management Models (WKMIXMAN). She participated in the STECF groups on the evaluation of Northern Hake Long-Term Management Plans, SGBRE-07-03 and SGBRE-07-05. In AZTI she has been involved in several EU projects dealing with management plans and management strategy evaluation such as, COMMIT, EFIMAS, CEVIS and UNCOVER. She has been in charge of developing the operating models and management procedures for Northern Hake within FLR framework.

Ms Marina Santurtún, Chief Scientist. Responsible of internal and EU Projects conducted by the AZTI Management of Demersal Species Area in the Fisheries Unit. She participates in ICES Working Groups dealing with these species, especially the WGHMM, Working Group on Fish Stock Assessment and Cephalopods Biology and Life History Working Group. She also participates in the Study Group on Development of Fishery based forecasts, and the STECF Subgroup on Mixed Fisheries. In the past she participated in the Study Group on Discards and By-catch Information. She has been involved in several EU funded projects; she has been responsible of the Case Study related to Hake in Bay of Biscay in EFIMAS and COMMIT projects. She was responsible in AZTI for the EU Q5RS-2002-01291 (TECTAC) and the EU Concerted Action QOL-2001-5.1.2 (CEPHSTOCK) and she was in charge of the discard sampling program. She has been recently mainly involved in several EU funded projects on the biology of demersal species: EU Study contract 95/038 (BIOSDEF), EU Study contracts 97/015 (DEMASSESS), EU Study contract 99/013 (GESSAN), and 98/095 (Western Waters discards project), CAFÉ, UNCOVER and CEVIS. Actually, she is the Project Coordinator of coordinates the international project AFRAME (A framework for fleet and area based fisheries management) (Proposal/Contract no.:044168).

§ Partner 8. IPIMAR-INRB: National Institute of Biological Resources (IPIMAR) Portugal

IPIMAR is the governmental research organisation in Portugal in the area of fisheries and marine resources, integrated in the National Institute for Biological resources (INRB) of the Ministry of Agriculture, Rural Development and Fisheries. IPIMAR aims to promote and support a sustainable and competitive fishing industry and aquaculture, to manage fish stocks to maintain maximum sustainable exploitation, to contribute for the protection of marine environment, and to monitor and upgrade the quality of fishery and aquaculture products.

IPIMAR has about 200 researchers and technicians with permanent positions distributed by four Departments: Marine Resources, Aquatic Environment, Aquaculture and Fish Products, and 60 graduated students, PhD and post-doc. The Institute is responsible for providing the scientific recommendations for the assessment of the commercial marine stocks to the European Community. IPIMAR is the national delegate institution at ICES. The Institute has three research vessels aimed at providing information on the state of the living marine resources. IPIMAR undertakes a wide range of research projects and monitoring activities financed by the Ministry of Agriculture, National Research Council, European Community and Public and Private Companies.

Key personnel

Dr Ivone Figueiredo has large experience in fisheries and marine ecology at IPIMAR. She completed a master on Probability and Statistics by Statistical Department of the University Lisbon and the PhD on the biology and ecology of deep-water species at the University of Lisbon. She has participated in several national and international (UE funded) research projects on elasmobranch and deep-water species such as EC Fair Project CT95/0655, BASBLACK Study project CT97/0084, DELASS project CFP 99/055. She is a member of the ICES Working Group on Elasmobranch Fishes (WGEF), and ICES Working Group on the Biology and Assessment of Deep-Sea Fisheries Resources (WGDEEP).

Dr. Olga Moura is Graduate in Mathematics by the University of Lisbon and has a 35 years experience in fisheries science. Among her fields of interest it can be included: stock assessment, sampling theory, principal components analysis, cluster analysis, spectral analysis, time series analysis, fractal geometry, and spatial statistics (kriging). She has participated in several surveys on demersal, pelagic and deepwater species and has been involved in UE projects, namely EVARES.

Dr. António Avila de Melo, Graduated in 1979 in Biology by the University of Lisbon – Faculty of Science. Senior Research since 2004 of the IPIMAR-INRB (PhD. Degree equivalent). Large experience in fish stock assessments and data quality. Co-responsible of the IPIMAR-INRB research group on North Atlantic far-sea fisheries (NAFO and NEAFC) since 1988. Member of the EU Delegation in the NAFO Scientific Council since 1988. NAFO Div.3M Redfish (Sebastes spp.) stock Designated Expert since 1996. NAFO Div.3LN Redfish (Sebastes spp.) stock Designated Expert since 2003. Chairman of the NAFO Standing Committee on Research Coordination (STACREC) in 1992 and 1993. Participation and coordination of 8 EU projects from 1989 to 2001. Involved in the "National Program for Biologic Data Collection" since 2002. Participation in research surveys (some as scientific leader). Participation in fisheries administration and sector meetings. Participation in NAFO workshops/symposiums.

Dr Ricardo Alpoim, Graduated in 1989 in Biology by the University of Lisbon – Faculty of Science. Research Assistant since 2004 of the IPIMAR-INRB (M. Sc. Degree equivalent). Co-responsible of the IPIMAR-INRB research group on North Atlantic far-sea fisheries (NAFO and NEAFC) since 1989. Member of the EU Delegation in the NAFO Scientific Council since 1997. NAFO Div.3M American plaice (Hippoglossoides platessoides) stock Designated Expert since 1999. Nominated in 2007 Chairman of the NAFO Standing Committee on Research Coordination (STACREC) and Vice-chairman of the NAFO Scientific Council

§ Partner 9. Marine Institute (MI) Ireland

MI is the national agency for marine research and development (R&D) in Ireland. Its mission is to "undertake, to co-ordinate, to promote and to assist in marine research and development and to provide such services related to marine research and development that in the opinion of the Institute will promote economic development and create employment and protect the marine environment". The General Duties of the MI include to advise the Minister on policy relating to marine research and development; to carry out policy as may be specified by the Minister on marine research and development; to undertake, develop, promote and market marine research and development services; to promote and assist the improvement, development and application of technical and other processes for the exploitation and development of the marine resource and to collect, maintain and disseminate information relating to marine matters.

Fisheries Science Services (FSS) is a service group within the Marine Institute which is mainly concerned with the assessment of fish stocks exploited in the waters around Ireland. Its mission is "to assess, research and advise on the sustainable exploitation of marine fisheries resources". FSS is running a deep-water research programme since 1992. As part of the programme, deep-water research surveys are carried in the deep waters to the west of Ireland And FSS participates in the deep-water ICES working groups of WGDEEP, WGDEC and WGEF Leonie Dransfeld is a team leader in FSS, leading the team of ecosystems and deep-water fisheries. She is responsible for the provision of fisheries advise relating to ecosystem issues and deep-water fisheries and part of this role is to oversee the deep-water fisheries surveys. She is currently chairing the ICES planning group PGNEACS. She is further involved in the analysis of fisheries data sets for assessment and is a member of WGDEEP.

§ Partner 10. Hellenic Centre for Marine Research (HCMR) Greece

HCMR is a highly active centre for marine research, created in 2003 from the merger of the National Centre for Marine Research with the Institute of Marine Biology of Crete. HCMR consists of 5 institutes concerning oceanography, fisheries (Institute of Marine Biological Resources-IMBR), aquaculture, marine biology and genetics and inland waters. The Centre has been extremely active in all the EU framework programmes, involved in numerous projects as coordinator or partner (e.g. FAIR, AIR, MAST, Environment, QoL, FP6, Interreg etc.) and has regular exchange of personnel and students with well-known research institutes in Europe.

The staff of the Institute of Marine Biological Resources (IMBR) has coordinated or participated in many projects concerning deep-water fisheries and resources, demersal fishing, fishing gear impacts and fisheries stock assessment. The IMBR group involved in this project has a long experience on both fisheries-ecosystem and fisheries assessment and management studies, gained through many EU projects (MEDITS, DEEP-WATER FISHERIES, RESHIO, DESEAS, FISBOAT, EFIMAS, CAFÉ, CoralFISH, AFRAME), as well as through participation in international working groups (e.g. ICES, GFCM etc.).

Key personel:
Chrissi-Yianna Politou is a senior researcher in the Institute of Marine Biological Resources (fisheries). She will coordinate IMBR contribution to the project. She has a B. Sc. in Biology, M.D. in Ecology and PhD in fish biology/ecology. She has been working in HCMR for 20 years as coordinator or principal scientist in numerous international and national projects related to demersal fisheries resources (fish, crustaceans), exploration of deep waters and gear selectivity. She is member of the MEDITS coordination committee.

Chryssi Mytilineou is a researcher in the IMBR and she has a 23-year experience in Fisheries Biology, Ecology and Dynamics. In the last 10 years, she has been dealing more with the IMBR research activity 'New Fisheries Resources' particularly with Deep-water Resources and Fisheries through participating and coordinating research projects funded by EU, collaborating with other experienced scientific teams in this activity, participating in symposia and publishing scientific works.

Chris Smith is a senior researcher in the IMBR. He has a B.Sc. (hons.) in Marine Biology and PhD in benthic ecology and has been working in Greece for 18 years in a wide variety of projects related to invertebrate fisheries, fisheries-environment interactions and the application of new technologies (remote imaging techniques). He has particular experience in a number of EU-projects working on gear selectivity, biology and fisheries as well as impacts of trawling on the benthic habitat.

John Haralabous is a biologist research assistant for the last 17 years in IMBR fisheries' survey design, data management, biostatistical processing and modelling. Specialised in Geostatistical analysis and mapping of fish stocks' spatial distribution, in design of Artificial Neural Networks for pattern identification/classification of fish formations, in fisheries time-series ARIMA modelling, in fisheries-environment modelling and in fish stock assessment and management operating models using FLR.

John Dokos is a computer engineer in IMBR for the last 12 years. He is an expert programmer in Delphi , C, Visual Basic, JAVA. He has participated in several national and EU Projects in data base design and implementation, data analysis, checking data integrity, data collection. He is an expert on GIS systems and worked on various projects involving such systems.

§ Partner 11. INSTITUTO ESPAÑOL DE OCEANOGRAFÍA (IEO) (Spanish Institute of Oceanography), Spain

Description: The Instituto Español de Oceanografía is an organisation belonging to the Ministry of Education and Science of Spain. It assists the Spanish Government about the exploitation and management of the marine resources. Due to the great fishing fleet of Spain, which operates around the world, the IEO's researchers work in the assessment of various marine species. IEO researchers are also involved in ecological studies of the structure and functioning of ecosystems where those species lives, and the impact of human activities on them. These studies are carried out under the coordination of International Commissions or Organisations, such as ICES, NAFO, ICCAT, GFCM… in which IEO participates actively. The assessment requires an initial structured data base of the Spanish fleet operations (catches, fishing effort, length distributions) and the basic biological parameters (reproduction, growth, stock identity..) of the target species. In addition fishery independent information is also obtained from research surveys where environmental variables are also obtained. The IEO coordinates databases from seven Laboratories dislocated in Spain. The human resources and the infrastructure are adequate to carry out projects dealing with fisheries.

Key personnel

Dr Juan Gil Herrera, Fisheries Biologist, IEO R&D Expert. Obtained his Ph.D. on Marine Sciences (University of Cádiz) working on the red (blackspot) seabream population of the Strait of Gibraltar in 2006. He has been working in IEO since 1995, firstly as contracted biologist and now as civil servant. Participant in different research projects co-financed by the EU. From 1997 resides in Cádiz (Spain), firstly being a part of a Project for the study of the artisanal fisheries and at the moment developing their investigation labour on the red sea bream fishery of the Strait of Gibraltar. For this reason he is involved in the ICES Working Group on the Biology and Assessment of Deep-sea Fisheries Resources. His research experience includes studies as biological parameters of red seabream (reproduction and growth), resources assessment in ICES areas, development of sampling programs (sampling design, data collation and its analysis) and coordination of research cruises and tagging experiences.

Mr Fernando González Costas, Bachelor of Science in biology, degree obtained in the University of Santiago de Compostela in 1985. Permanent researcher in the Oceanographic centre of Vigo attached to the "North Atlantic Far Fisheries" Team of the Instituto Español de Oceanografía (IEO). His professional experience has been developed in the field of the assessment and management of fishing resources in the North Atlantic. In the 1995-1999 period he was working in different European Union (EU) projects to improve the sampling and data collection for assessments of the stocks of the International Council for the Exploration of the Sea area (ICES). Since 2001, he is a regular member of the European Union Delegation in NAFO Scientific Council and he is the NAFO Designated Expert for the Subarea 2 and 3 grenadiers stocks, his work in NAFO Scientific Council is mainly related with stocks assessment. He is the responsible for the Spanish fisheries in NAFO Area in the IEO. He has participated in different Study Groups and Workshops related with the NAFO Precautionary Approach and Management Strategies Evaluation.

§ Partner 12. Marine Research Institute (MRI), Iceland

The Marine Research Institute (MRI) is a government institute under the auspices of the Ministry of Fisheries in Iceland. MRI conducts various marine researches and provides the Ministry with scientific advice based on its research on marine resources and the environment. The institute has around 170 employees and two research vessels.

At MRI, deep-water stocks like redfish, Greenland halibut, blue ling, ling and tusk (Greater silver smelt to less extend) have been investigated in the long term in Icelandic waters. MRI conducts regular surveys (spring and autumn surveys) relevant to those fisheries and participates in International acoustic trawl surveys in the Irminger Sea and adjacent waters. Apart from scientific surveys, regular biological sampling is conducted on these species directly from the commercial fleet. During annual autumn ground-fish surveys, MRI conducts also extensive biological sampling on several non-targeted deep-water species, such as deep-water sharks/dogfishes, deep-water skates, roundnose grenadier (C. rupestris), rough head grenadier (M. berglax) , blue antimora (A. rostrata) and North Atlantic codling (L. eques). MRI participates within ICES in stock assessment working groups of redfish, Working Group on the Biology and Assessment of Deep-water Fish Resources, NWWG and SGRS, providing basis for sustainable use of these species in Icelandic waters. Along with regular monitoring of targeted species MRI has also conducted several exploratory deep-water surveys aimed for general assessment of biodiversity on the slope and on the Reykjanes ridge area. MRI took part in a EUFP5 project (REDFISH, QLK-CT1999-01222) on redfish population structure, reproductive strategy and demography. Further MRI participated in the EU project (FAIR CT 95 0655) with the title: Developing deep-water fisheries: data for the assessment of their interaction and impact on a fragile environment.

Role: MRI is the partner responsible for leading the dissemination and outreach activities work package, and contribute data analysis to biodiversity assessment work in WP6, and data collation for the case studies for blue ling, and possibly comparative Icelandic data on Greenland halibut, and deep-water redfish.

Specific activities include: Leader of WP8 dissemination. Participant in WP 2, 4, 5, 6 and 7.

Key personnel
Mr. Thorsteinn Sigurdsson is the head of the Marine Resources Section at the MRI. He was previously the stock co-ordinator for redfish at MRI and was the leader of the Icelandic part in the previous EU FP5 Project (REDFISH, QLK5-CT1999-01222). He has lead the development of the UTE on the behalf of MRI from the beginning and co-authored number of articles on the subject. On the behalf of MRI, he participates in ICES WG on the Biology and Assessment of Deep-sea Fisheries.

Klara Jakobsdóttir is currently finishing her PhD thesis in fisheries biology and population genetics. She participated in the EU project FAIR (CT 95 0655) on deep-water fisheries where data was collected and analyzed for the assessment of their interaction and impact on a fragile environment. She contributed to analytical work and co-authored several publications and reports related to the subjects of this project.

Mr. Birkir Bardarson is at the final stages of his PhD study on the ecology of lanternfish (Family: Myctophidae). He participated in the following international projects: REDFISH, MARECO and ECOMAR and co-authored several articles related to the subjects of his work. Further, he has participated (sometimes as a shift leader) in several of MRIs surveys, including spring and autumn groundfish surveys and International acoustic trawl surveys in Irminger Sea and adjacent waters.

§ Partner 13. University of Portsmouth, UoP (CEMARE), United Kingdom

The Centre for the Economics and Management of Aquatic Resources (CEMARE) is a specialised research centre within the Department of Economics at the University of Portsmouth. It was established in the early 1960s to promote multi-disciplinary research into marine resources, with an emphasis on the economic analysis of fisheries. Since then it has developed into an international centre for the multi-disciplinary research of aquatic resources and is actively involved in research, consultancy, training and advanced studies, particularly in fisheries economics. The areas of expertise have expanded to include aquaculture economics and management, recreational fisheries, freshwater fisheries and coastal zone management. In addition, the Centre provides economic, institutional and legal specialisations within the broad area of the management of aquatic resources. The results of research and consultancies are published in core scientific journals and.

Key personnel:

Pierre Failler is a Senior Research Fellow, who has been with CEMARE since 1997. He is currently leading two major European (6th RF) Research Projects: ECOST, "Ecosystems, Societies, Consilience, and the Precautionary Principle: Development of an assessment method of the societal cost for best fishing practices and efficient public policies" (2005-2009), with 23 partners in Asia, Africa, South Pacific, Europe and Caribbean, and POORFISH, "Probabilistic assessment, management and advice model for fishery management in the case of poor data availability" (2005-2008), with 12 partners in the North of Europe, Mediterranean and West Africa. He has led many research programmes including: 1-DGXII Research Programme PECHDEV "General Equilibrium Model applied to maritime activities contribution to Regional Development" (Feb. 2002-Jan. 2005); 2-The FAO project "Agriculture toward 2015/2030" (Dec. 1999-Avril 2003); 3-DFID Research Policy Programme "European Union fishing agreement with third countries: commitment to the principle of Responsibility" (January 2001-Déc 2002); 5-(with A. Neiland) EU/FAO/Dfid Regional and National Public Polices in West Africa (Jan. 2002-Dec. 2002);

Dr Christos Floros is both a Lecturer in the Department of Economics and a Research Fellow at CEMARE, University of Portsmouth since January 2003. His PhD in Economics is from the University of Wales Swansea. Christos has also a Master in Economics, a Master in Mathematics (with distinction) and BSc in Mathematics with Operational Research. He has been involved in modelling and programming analysis for the DGXII Research Programme PECHDEV "General Equilibrium Model applied to maritime activities contribution to Regional Development" (Feb. 2002-Jan. 2005). His current research interests in fisheries modelling include the development of bioeconomic models, the use of econometric models for forecasting purposes, and modelling technical efficiency using advanced quantitative methods. Dr Christos Floros is a co-ordinator of a research project on "Technical efficiency in Greek fisheries", while he is also involved in the "Bioeconomic and cost-benefit analysis of the Deep Sea Red shrimp" (both projects are funded by the Greek Ministry of Rural Development and Food). Dr Christos Floros is currently involved in two European research projects, namely POORFISH.

Dr. Haoran Pan is a Research Fellow at the Centre for the Economic and Management of Aquatic Resources (CEMARE), University of Portsmouth. He has been working on integrated modelling of economic, environmental and social systems for many years. Dr. Haoran Pan specializes in applied quantitative economic methods such as input-output analysis, general equilibrium modelling, econometric estimation and forecasting.

B 2.3. Consortium as a whole :

The DEEPFISHMAN project is composed by a consortium of 13 partners who bring to the project a very complimentary trans-national expertise in different disciplines. Many of them have worked together in previous EU funded projects, and many have experience of being coordinators of such projects. In order to run a highly efficient and successful project of this type, careful consideration has been given to its conceptual design and expertise available with its partners. The proposed consortium is well balanced and will allow for the maximum integration of knowledge, expertise and experience between the partners, and with external stakeholders through targeted efforts directed outside of the project.

The consortium combines considerable experience in the national and international assessment and management of deep-water fisheries. It encompasses world-renowned experts in the field of deep-water fish biology, data collection, assessment and management from both within and outside European Union waters. Care has been taken to include experience from key organisations that have already attempted to achieve the sustainable management of vulnerable deep-water resources, including New Zealand (IFREMER), CCAMLR (Imperial), NAFO (IEO, IPIMAR, Cefas), NEAFC, SEAFO (Cefas). In turn, the consortium includes key case study leaders who have in depth experience of the diversity of fisheries to be considered, and access to the key data sets that will be required for the project to be successful.

The coordinating institute Ifremer, gained key experience in New Zealand where Dr Paul Marchal worked for one year at a bio-economic evaluation of the ITQ system. It has also wider experience in co-ordinating EU projects both technically and scientifically. Ifremer can also call upon a wide range of skills and resources, which means that it is able to take a strong leadership role in the project and provide support and modelling resources as required.

The project will develop links between experts in fisheries management, fisheries economics, and ecology, that is essential for the successful development of measures to achieve a successful management framework for deep-water fisheries. The project will create links between areas that are doing complementary work but would not normally collaborate (e.g. between ICES and CCAMLR, NAFO).

One partner institute in the consortium is from an emerging economy country in Africa, and the Namibian partner brings a valuable added ICPC country dimension to the project, and will enable the project to compare two different cases for orange roughy fishery in Case Studies 1.

There are also already strong partnerships in place within the project, and partners are proven collaborators. Partners already collaborate extensively in both international bodies (including ICES, NFAO) and EU projects such as (e.g. FEMS, EFIMAS, COMMIT, FISBOAT and UNCOVER) concerned with the sustainable utilisation of commercial fish stocks and development of bio-economic models.

There is also wide experience within RMOs and other management bodies at which ongoing results of the project will be presented that will help both in dissemination and ongoing review of the work.

Institute from EU countries (Ifremer, Cefas, AZTI, IEO, IPIMAR) are also strongly involved is relationships and meetings with RACs which will be used as fora to disseminate results to stakeholders.

Each work package is being lead by an expert in the field and has been planned in detail, and links to other work packages made clear. This will result both in strong leadership within a discipline, ensure the capacity to do the work, commitment to it and recognition of the importance of collaboration across disciplines. Furthermore, the case study leaders, who will liaise with the work package leaders to transfer the depth of their experience in the diversity of fisheries to be considered, and work alongside the develop the approaches and provide the ‘reality check’ to ensure theory can be put into successful practice.

Ø Subcontracting :

No major activities of the projects work and research activities needs to be subcontracted as the partners in the consortium have access to the necessary facilities and know how needed. Some partners may sub-contract audits costs of the project for minor budget (e.g. Imperial for 3 357 €). Any subcontracting will proceed according to the national and EU commission financial regulations.

Partners 8 IPIMAR and 9 MI intend to subcontract minor part of the work.

The work subcontracted by IPIMAR to be carried on is in consonance with some of the objectives of WP4 (development of appropriate assessment methodologies), particularly, the development and adjustment of state space population models using sequential importance as a resampling method.

In the past IPIMAR collaborated with the Fundação da Faculdade de Ciências da Universidade de Lisboa (FFCUL) for similar work. FFCUL is a non-profit foundation aiming the advance of Portuguese science. It is support scientifically by the Departments of the Faculty of Sciences of the University of Lisbon, and gave administrative support to projects conducted by those Departments. The Departments that will support scientifically the FFCUL in this project will be the Statistics and Operational Research Department (DEIO). Those Departments are teaching, and fundamental and applied research units in their fields of study. Staff contacts are:

- Dr. Lucilia Carvalho, she is a professor at the Department of Statistics and Operational Research of the Sciences Faculty, Lisbon University. She has participated in several projects for deep-water fisheries, namely BASBLACK and DELASS.

- Dr. Isabel C. Natário has a 5 years degree in Applied Mathematics (specialization in Probability and Statistics, 1995), a master in Probability and Statistics (1999) and she is a Doctor in Probability and Statistics (2005). More recently she has been handling dynamic models for animal populations, also under an empirical or totally Bayesian framework.

The work to be carried out by the sub-contractor pretends to guarantee the continuity of the studies in this field that have been carried out between IPIMAR and FFCUL in a more consistent way. To do so this entity must have high skills particularly in computer programming and advance statistics to allow the development of complex statistical models to perceive the underlying dynamics of exploited deep-water species.

Financial amount of the costs for this subcontracting was estimated as 35 528€.

For subcontracting IPIMAR will proceed according to the national and EU commission Financial regulations. Regarding the matter of acquisitions, the IPIMAR, as public entity must act according with the provisions of the Portuguese Code of Public Contracts - Decree-Law No. 18/2008, 29/01/2008. For this subcontracting will be chosen the acquisition process foreseen at point a) of Article 20th, which will be developed as established in Articles 112th to 127th of TITLE III – CHAPTER I.
FFCUL is a suitable candidate for this subcontract and already collaborated with IPIMAR in research projects related to deep-water and data poor species analysis. However, conditions of transparency and equal treatment of tenders will fully apply. Several Portuguese organisms may have the particular computer and advance statistics skills required for this subcontracts.

The work subcontracted by MI will include the collation of biological and fisheries data (not already covered by the EU Data Collection Regulation (EC) No 1543/2000 and No 199/2008) as well as the historic review of the fisheries in the case study CS1b of Orange Roughy in VI and VII. In addition, the collation of socio-economic data of the same case study will be subcontracted. For subcontracting MI will proceed according to the national and EU commission financial regulations. Regarding the issuing of contracts the MI will follow european financial regulation to ensure the best value for money, transparency and equal treatment. Subcontracts will be tendered in two lots according to the technical expertise required to conduct the work. “Lot one” (6 months) on the collation of biological data and the historic review for the case study will require expertise in the analysis and interpretation of fisheries data with particular reference to deepwater fisheries. The successful tenderer will be required to demonstrate experience in analyzing and reviewing fisheries data including their management and their interaction with the environment. Evaluation will be weighted towards demonstrated knowledge of deepwater fisheries and in particular knowledge on the biology, ecology and management of the Orange Roughy fishery in VI and VII. The work will be conducted in close collaboration with the MI and MI will provide internal fisheries data

to the subcontractor as required. There are several research institutions in Ireland with a strong background in deepwater fisheries and ecology and it is hoped that their expertise will enhance work package delivery.

"Lot 2" (2 months) will be the collation of socioeconomic data on the Orange Roughy fishery and expertise are seeked in the area of fisheries socioeconomics. MI does not have this expertise and it is hoped that subcontracting this task will improve the quality of the work. There are several research institutions in Ireland specializing is social economics, some of which have worked with MI in the past and or are currently collaborating with the MI on the provision and interpretation of socioeconomic data of fisheries.

Financial amount of the costs for this subcontracting was estimated to be a maximum of 48744 €. The exact costs will be known at the stage when the tender is awarded, whereby one of the selection criteria will include best value for money.

All the DEEPFISHMAN subcontracts will follow the EU Commission regulations as well and according to the principles of best value for money, transparency and equal treatment.

Ø Third parties (other than subcontractors)
No part of the work is foreseen to be carried out using financial resources or resources in kind provided by third parties, as no third parties have been identified by the partners of DEEPFISHMAN.

Ø Other countries:

Only one member of the consortium comes from a country defined as an emerging economy and is on the list of International Co-operation Partner Countries (ICPC), namely partner 6 MFMR from Namibia. The formal approval process for their participation in the project is ongoing with the Namibian Ministry of Fisheries at the time of submitting the proposal.

Ø Additional partners:

The consortium does not foresee the need to add partners to the consortium at the time of presenting this proposal.

B 2.4. Resources to be committed :

The DEEPFISHMAN project builds upon and integrates the work of many previous EU projects. This ensures that the project is both cost effective, and that it ensures the uptake and extension of previous EU funded work.

Models developed to evaluate management plans in fisheries (e.g. in FEMS, EFIMAS, COMMIT, FISBOAT) and knowledge, approaches and data for data poor fisheries (e.g. POORFISH, bio-economic models from BEMMFISH, and environment and biodiversity findings from CoralFISH) will be combined to develop the management framework.

Partners will perform the work in parallel with ongoing work under their national programmes which will ensure integration both of national research and of solutions developed on a local, regional and global scale.

The project also brings together expertise from a wide range of areas and will take advantage of work in various fields (fisheries research, marine ecology) and fisheries bodies (e.g. ICES, CCAMLR, NAFO) funded by a variety of national governments outside Europe. Collaboration with ICPCs and RMOs will ensure that European science remains at the forefront of world science and that full benefit of developments elsewhere will be taken.

The duration of the project will be of 36 months. The total budget of the project is 3.8 million € of which 2.9 million € are requested as EU contribution and 0.9 million € will be covered by the research institutes' and academic bodies own funds. Less than seven percent of the total budget will be used for coordinating and administrative and dissemination purposes whereas the remaining 93 % will be dedicated to the research activities of the project.

- Personnel costs:

The largest project costs are invested into personnel, i.e. salaries for scientists, graduate students and technicians. DEEPFISHMAN will require over 350 person months of activity spread between 13 partners over 3 years. This equals assembled human resources representing a total of about 26.5 full time employees over its 36-month duration. In addition, the partners will make available their own facilities and equipment in order to carry out all the necessary work described in the work plan.

- Equipment costs:

No significant equipment will be purchased for the project as all the partners are well equipped for conducting the intended research, and such investments only represent a very minor part of the project budget.

- Consumables:

Some minor funds are required to cover expenses relating to computing and data collation. Additional costs are for maintenance of instrumentation, computer software and software licenses etc.

- Travel & subsistence:

Support of travelling and subsistence is needed for attending project meetings and workshops, for presenting DEEPFISHMAN results on conferences, and for personnel travelling to and from field trials.

- Other costs:

It should be noted that a small proportion of total funds (60 000 €) will be allocated to a range of other countries and organisations which will participate in DEEPFISHMAN e.g. NEAFC, SEAFO and NAFO and other countries/Institutes participating in Work Packages/Case Study fisheries. Regarding the latter, funds should cover any data collation, manipulation and provision costs. A provision to cover this type of cost is maintained under the coordinator's budget, and will be managed according to the financial rules applicable for the FP7 programme contracts.

B3. Impact

B 3.1 Strategic impact :

Three important elements will be in the focus of DEEPFISHMAN:

- Design a framework for managing deep-sea fisheries on the basis of monitoring of fisheries and stocks, using data and information currently available
- Identify gaps in knowledge that severely limit the basis for management decisions
- Describe what is needed for implementing reliable long-term management schemes

DEEPFISHMAN will focus on specific case studies from which a generic management framework will be developed. Noting the vulnerability of deep-water ecosystems, it specifically includes a key work package investigating this aspect. In turn, as fisheries are an economics-driven activity, there is a cross-cutting economic work package examining the unique characteristics of deep-water fisheries, which if ignored could lead to the failure of any proposed management framework.

In the following, the impact of DEEPFISHMAN on each of the elements is described.

§ Design a framework for managing deep-sea fisheries on the basis of monitoring of fisheries and stocks, using data and information currently available

Building on the management and monitoring framework already in place, DEEPFISHMAN will appraise this in light of deficiencies already identified, best practice in deep-water fisheries in other parts of the world, information collected in case studies, and perceived weaknesses in the present framework, and propose a modified short-term framework consistent with the data and information currently available. A range of management strategies and options will be evaluated and short-term recommendations will be made at the species/stock level. The impact of these strategies and options on the state of stocks and the socio-economic characteristics of fleets will evaluated for selected case studies.

§ Identify gaps in knowledge that severely limit the basis for management decisions

DEEPFISHMAN will identify gaps in fisheries, biological, ecological and socio-economic information and data that currently limit the basis of for management decisions under the existing management framework, and describe how these have been addressed in the new short-term framework developed in DEEPFISHMAN.

§ Describe what is needed for implementing reliable long-term management schemes

Following on from point 2), and building on the proposed short-term framework, DEEPFISHMAN will identify a long-term management and monitoring framework and identify the additional information and data required to ensure that this framework is operable. A range of management strategies and options will be evaluated and long-term recommendations will be made at the species/stock level. The impact of these strategies and options on the state of stocks and the socio-economic characteristics of fleets will evaluated for selected case studies.

Strategic impacts on science:

Throughout the project, review activities will be used to learn from not only local and regional activities in the management of deep-water resources, but the approaches undertaken in relevant science carried out around the world. In turn, reviews will not be limited to the fisheries realm. Activities and approaches used in other fields of applied ecology that are of relevance to the project (for example where concern over ecosystem impacts have had an important impact on management practices; e.g. spatial marine management, ICZM) will be investigated where relevant.

It expected that the outputs from DEEPFISHMAN will represent state of the art regarding the management, assessment and monitoring of deep-water stocks and, as such, may be relevant to other deep-water fisheries around the world.

Contribution to policy developments:

Impacts on management and the CFP:

World fisheries are, with few exceptions, in a state of crises. Long-term negative trends in abundance and decreased biodiversity are the main dangers faced by those who derive their livelihoods directly from the fisheries but also those responsible for managing fish stocks and habitat. This project will directly contribute to ameliorating those grave problems. A better understanding of how different management measures affect the stocks and habitat is crucial. But that is only one side of the coin. The other side has to do with the interplay between management, resources and habitat on the one hand and human welfare on the other hand. That is the goal of any serious socio-economic analysis. Conserving stocks for their own sake may be worthwhile for its own sake but the goal of every management regime, including the CFP, must be to enhance the welfare of those affected. Not just those who are directly affected by fisheries management or mismanagement but also those indirectly affected such as neighbouring communities, national economies or the world economy as a whole.

Given the fact that deep sea fisheries are often conducted in international or trans-boundary waters it is important to study the management of deep sea fisheries in a consortium of scientists where many different scenarios are studied and experience is drawn from more than one or two geographical regions. Due to the fact that the European Union is concerned both with its local resource management issues and also with international issues regarding resource use and that European firms and scientists work on an international level it seems natural that the Europe aims at building up the necessary knowledge and expertise to be able to have lead role in such important matters. Work on national or local level would never acquire the breadth and width necessary for such an important supra-national issue.

Given that the necessary data is obtained in this study there is no doubt that the outcome of the research strategy will have a direct impact, both with regards to the scientific output and also with regards to mapping viable, feasible and efficient management measures to the benefit of all.

Ecosystem approach

Political commitments to ecosystem-based fisheries management (EBFM) are increasingly numerous (FAO 2003). EBFM is intended to ensure that the planning, development and management of fisheries will meet social and economic needs, but without jeopardizing the options for future generations to benefit from the full range of goods and services provided by marine ecosystems (FAO 2003). EBFM requires that managers take account of a wide range of fisheries impacts when setting objectives, and attempts to meet these objectives will need to be supported by reliable scientific advice and effective management decision making (Murawski 2000; Pope and Symes 2000; Link 2002; Sainsbury and Sumaila 2003; Browman and Stergiou 2004; Hall and Mainprize 2004; Pikitch et al. 2004). Indicators support the decision making process by (1) describing the pressures affecting the ecosystem, the state of the ecosystem and the response of managers, (2) tracking progress towards meeting management objectives and (3) communicating trends in complex impacts and management processes to a non-specialist audience (Garcia et al. 2000; Rice 2000, 2003; Rochet and Trenkel 2003).

In DEEPFISMAN an attempt will be made to develop ecological, socio-economic indicators to support EBFM, consistent with political aspirations for achieving ecological, economic and social sustainability (WSSD 2002). Within the EU, the fundamental legal basis for treating environmental protection as an integral part of EU policy lies in the Treaty. The reformed Common Fisheries Policy (CFP) requires measures to 'limit the environmental impact of the CFP' and explicitly refers to the application of the precautionary principle and the progressive implementation of an ecosystem-based approach to fisheries management (EBFM).

At the operational level, it is expected that indicator-based management systems to monitor the integration of environmental protection requirements into the CFP will principally operate at the RAC scale. It is notable that the

regional basis of management is also recognised in other emerging policy, such as the European Marine Strategy (EC 2004a) and Maritime Policy.

DEEPFISHMAN will develop short- and long-term management and monitoring frameworks consistent with the development of an ecosystem approach to deep-water fisheries. The project will integrate the status of the targeted stocks, the socio-economics of the fisheries and indicators of biodiversity into the management frameworks.

The "Technical Consultation" hosted in February 2008 at the UN Food and Agriculture Organization (FAO) headquarters underlines the international concern over deep-water fisheries and ecosystem management. This meeting was designed to negotiate a set of International Guidelines for the management of deep-sea fisheries on the high seas, and to assist RFMOs and countries engaged in deep-water fishing on the high seas to implement the 2006 UN General Assembly resolution (Resolution 61/105) calling for the protection of vulnerable marine ecosystems (VMEs) such as deep-water corals, seamounts, sponges, and hydrothermal vents from damage from high seas fishing operations. The management and monitoring frameworks developed in DEEPFISHMAN will be cognisant of the ecosystem concerns prevalent where vulnerable deep-water habitats may be affected by fishing.

B 3.2. Plan for the use and dissemination of foreground

- *The management of knowledge and intellectual property*
- *The plan for the use of results (e.g. further research or commercial exploitation) and for the dissemination of the foreground (knowledge generated during the project) beyond the Consortium; both during the lifetime of the project and afterwards.*

Ø Plan for using and disseminating knowledge

The dissemination plan of the project will be produced fairly early in the project in order to guide the dissemination activities throughout the lifetime of the project, and will be managed as a separate work package (WP8). The dissemination plan will specify specific events (conferences, meetings, workshops, etc.), which will be organised by DEEPFISHMAN partners and/or where DEEPFISHMAN will be represented and actively promoted. DEEPFISHMAN partners will target selected professional and academic publications to publish results of the project. In addition, an internal dissemination plan will be produced. This plan will be the basis for communications among partners and other interested parties / stakeholders throughout the project. Partners are expected to leverage their local and international positions and influence in order to publicise the outcomes of this project as widely as possible. DEEPFISHMAN partners plan to create communications and collaboration channels with complementary initiatives, especially European ones, in order to support DEEPFISHMAN project objectives.

The senior scientists and other research group partners in the consortium have an extensive experience in scientific communication. The partners will use their experience and connections to disseminate the information from this project. The project will be particularly address the critical interaction with the various industry stakeholders, authorities, fishery managers and the policy makers. In this context the relevant Regional Advisory Committees (RACs) will be targeted for creating a ongoing dialogue on the management schemes under development in the DEEPFISHMAN project.

Within the overall exploitation and dissemination strategy, dissemination has to be effective during the project lifecycle to be of impact and create the demand for information, understanding and solution that address the requirements for the developed outputs:

- Dissemination is grouped into four major kinds of activities:
- Website and presentation; A continual supply of information will be presented at the group website.
- Conferences and publications; Major peer reviewed publications in fisheries research, and environmental sciences, such as, ICES Journal of Marine Science, Canadian Journal of Fisheries and Aquatic Sciences etc. Also the results will be presented at ICES and NAFO working groups and advisory committees, and to the North East Atlantic Fisheries Commission (NEAFC).

- Strategic conferences, workshops and seminars.

- The dissemination objectives

The objective and presentation of the website is intended to provide an entrance point for the interested community and make sure that DEEPFISHMAN is appropriately presented and represented to ensure that

- The project is widely known and information is easy to access;
- The project objectives, aims and scientific approaches are well understood; In particular the fisheries research community must be aware of the project and its progress and be prepared for the future use of the project results in formulating fishery advice. It will be presented initially through scientific research presentations and later through practical policy advisory notes /communications
- Project consortium members are well informed about all project activities.

The consortium will make use of the large network built up from individual researchers as well as the numerous events attended by the consortium either actively (e.g. through giving presentations) or passively. The objective of the participation in conferences and the submission of publications are to ensure that:

- The scientific concepts and approaches are widely discussed and feedback solicited; and
- The understanding of the DEEPFISHMAN developments penetrates not only the academic, but even more importantly the industrial community, and that of the fishery managers.

The objective of the participation in international conferences, workshops and seminars is to ensure that

- Particularly the policy makers, fishery industry and other stakeholders and the ultimate end user and market players (e.g. retailers, consumers) are aware of the DEEPFISHMAN developments for ensuring better fishery management strategies to preserve stock structure, and habitats of an important commercial deep-water species and to avoid overexploitation of the deep-water stocks.

- Internal dissemination

Every organisation participating has to report regularly on its internal dissemination activities and plans to make sure that the relevant parts (e.g. business units) of its own organisation are aware of DEEPFISHMAN activities and results to have maximum impact. DEEPFISHMAN will disseminate information internally on relevant development activities to ensure that every participant is well informed and can use the latest developments. Training activities are part of internal dissemination.

- External dissemination

According to the dissemination objectives, individual activities are planned to include a variety of methodologies, tools and channels.

The public deliverables of DEEPFISHMAN will be available via the website. Relevant news will be published on the same location and DEEPFISHMAN material will be kept continually updated. Regarding publications, DEEPFISHMAN partners distinguish between those in journals and at conferences. For journals in general, no submission deadlines exist.

- Clustering

DEEPFISHMAN sees a great potential for co-operation with other projects sharing the same strategic objective and beyond. Because of its focus establishing the basis for implementing reliable long-term management schemes, and derived socio-economic benefits for segments in European and ICPC societies relying on the fisheries, DEEPFISHMAN has initially identified the following organisations, and ongoing research projects, and coordinators of previously funded European projects as potential collaborators as mentioned in Section 1:

- ICES / NAFO / NEAFC / RACs / STECF
- FP7 projects; CoralFISH
- FP6 projects; COMMIT, FISBOAT, EFIMAS, CEVIS, PRONE, POORFISH

ØThe management of knowledge and intellectual property

The consortium agreement will spell out and identify pre-existing knowledge and the provisions for intellectual property rights (IPR) safeguards and management. Further details relating to IPR issues are provided in section 3.2 of this proposal. The issues of access to data and safeguarding of IPR will recognise wherever appropriate that the timely, free and unrestricted international exchange of data and scientific results for dissemination within scientific circles, industry, policy makers and the general public will be laid down in the DEEPFISHMAN dissemination policy to be adopted, and a well qualified member of the consortium will be appointed by the SG to lead the work on IPR management. A special work package (WP8) is dedicated to the outreach and dissemination activities to ensure a balanced approach and at the same time achieving a maximum impact from the project

Ø Risk assessment and related communication strategy

Note from DOW guide: Any potential risks (real or perceived) for society/citizens associated with the project and the communication strategy adopted in this regard should be fully described.

The project implies no specific technological risk or hazard for society/citizens. There are no experiments, use of hazardous substances or marine operation funded by the project, which mostly aim at (i) scientific and grey literature reviews; data mining, data collection and compilation; assembling and delivering databases (WP2 and CSs) (ii) data analysis (e.g. stock assessment, socio-economy, indicator) (WP3-WP7); (iii) modeling (WP3 and WP4); (iv) programming (mainly WP4, WP5 and WP7); (v) definition of management strategies (WP7); project management and outreach (WP1 and WP8). Nevertheless, the outcome of the project have implication for society through e.g. assessment of socio-economic impact of deep-water fisheries, management strategy including biodiversity issues and policy delivery mechanism.

The project implies no technological risk or hazard for society/citizen

B4. Ethical Issues

There are no ethical issues expected to arise in the proposal. The consortium declares that the proposed work does not present concerns in relation to ethical aspects since it does not involve any of the following research activities:

- Research activity aimed at human cloning for reproductive purposes,
- Research activity intended to modify the genetic heritage of human beings which could make such changes heritable
- Research activity intended to create human embryos solely for the purpose of research or for the purpose of stem cell procurement, including by means of somatic cell nuclear transfer.

Ethical issues table

	YES	PAGE
Informed Consent		
• Does the proposal involve children?		
• Does the proposal involve patients or persons not able to give consent?		
• Does the proposal involve adult healthy volunteers?		
• Does the proposal involve Human Genetic Material?		
• Does the proposal involve Human biological samples?		
• Does the proposal involve Human data collection?		
Research on Human embryos/foetus		
• Does the proposal involve Human Embryos?		
• Does the proposal involve Human Foetal Tissue/Cells?		
• Does the proposal involve Human Embryonic Stem Cells?		
Privacy		
• Does the proposal involve processing of genetic information or personal data (e.g. Health, sexual lifestyles, ethnicity, political opinion, religious or philosophical conviction)		
• Does the proposal involve tracking the location or observation of people?		
Research on Animals		
• Does the proposal involve research on animals?		
• Are those animals transgenic small laboratory animals?		
• Are those animals transgenic farm animals?		
• Are those animals cloning farm animals?		
• Are those animals non-human primates?		
Research involving Developing Countries		
• Use of local resources (genetic, animal, plant etc)		
• Benefit to local community (capacity building i.e. access to healthcare, education etc)		
Dual Use		
• Research having potential military / terrorist application		
I CONFIRM THAT NONE OF THE ABOVE ISSUES APPLY TO MY PROPOSAL	YES	

B5. Consideration of gender aspects

§ Gender issues

No specific gender issues have been identified at the proposal stage as being relevant to the DEEPFISHMAN project, and in case any specific such matters will be identified at the early stage in the project this will be dealt with in the Gender Action Plan for the project. One of the WP leaders is a woman (WP8). A list of gender balance in DEEPFISHMAN participant's organization is categorized by sex in the list in Table 5.1 below.

§ Women and employment

This project includes employment opportunities for women, and efforts will be made to include higher number of women in the research groups. This depends on the availability of female seniors scientists in this field, which unfortunately at this stage is limited, however, the DEEPFISHMAN project aims to have a positive impact in this direction. As shown in Table 5.1 the research groups behind the proposal include members of both sexes, even though the majority of active researchers at the proposal stage is male (M: 58 %, F: 42 %). (Table5.1 does not show that, it provides numbers in organisations).

Many participating organisations have equal opportunities policy that are designed to encourage women into the organisation. For example, Cefas' policy specifies that: "Cefas is committed to building and maintaining a truly diverse workforce and therefore applications from people of all backgrounds and cultures are very welcome. Part-time working and job share applicants are also welcome. We guarantee an interview to any candidate who has declared a disability provided they meet the minimum essential criteria set for the post". The issues of race, religion, ethnicity and disability are all embodied, within this policy of providing equal opportunities to people of all backgrounds, and with the issue of gender equality the same principles apply.

Several female and several male scientists will carry out the project work, and there are equal opportunities between women and men in the project work. The consortium holds a number of qualified women.

According to data available in the participants'organisations, the figures in table 5 are no fully consistent. For some organisations, the number given is that of researchers, for other all organisation staff (e.g. for IMR given numbers are total staff including vessels crew).

Involvement of women in participants'organisations

Participant	No. of Females in Research	No. of Males in Research
1- Ifremer	111	292
2- Cefas	125	214
3- UoI	134	309
4- IMR	235	472
5- Imperial	709	1293
6- NatMIRC	10	10
7- Technalia-AZTI	70	79
8- IPIMAR	126	69
9- MI	51%	49%
10- HCMR	220	260
11- IEO	252	346
12- MRI	33	112
13- UoP	48	80

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Appendix 1: Species listed in Annex I and II of the EC Deep-water Licensing Regulation (EC, 2002a)

ANNEX I

List of deep-sea species

Scientific name	Common name
Aphanopus carbo	Black scabbardfish
Apristuris spp.	Iceland catshark
Argentina silus	Greater silver smelt
Beryx spp.	Alfonsinos
Centrophorus granulosus	Gulper shark
Centrophorus squamosus	Leafscale gulper shark
Centroscyllium fabricii	Black dogfish
Centroscymnus coelolepis	Portuguese dogfish
Coryphaenoides rupestris	Roundnose grenadier
Dalatias licha	Kitefin shark
Deania calcea	Birdbeak dogfish
Etmopterus princeps	Greater lanternshark
Etmopterus spinax	Velvet belly
Galeus melastomus	Blackmouth dogfish
Galeus murinus	Mouse catshark
Hoplostethus atlanticus	Orange roughy
Molva dypterigia	Blue ling
Phycis blennoides	Forkbeards
Centroscymnus crepidater	Longnose velvet dogfish
Scymnodon ringens	Knifetooth dogfish
Hexanchus griseus	Six-gilled shark
Chlamydoselachus anguineus	Frilled shark
Oxynotus paradoxus	Sailfin roughshark (Sharpback shark)
Somniosus microcephalus	Greenland shark

ANNEX II

Additional list of deep sea-species referred to in Article 9

Scientific name	Common name
Pagellus bogaraveo	Red (blackspot) seabream
Chimaera monstrosa	Rabbit fish (Ratail)
Macrourus berglax	Roughhead grenadier (Rough ratail)
Mora moro	Common mora
Antimora rostrata	Blue antimora (Blue hake)
Epigonus telescopus	Black (Deep-water) cardinal fish
Helicolenus dactylopterus	Bluemouth (Blue mouth redfish)
Conger conger	Conger eel
Lepidopus caudatus	Silver scabbard fish (Cutlass fish)
Alepocephalus bairdii	Baird's smoothhead
Lycodes esmarkii	Eelpout
Raja hyperborea	Arctic skate
Sebastes viviparus	Small redfish (Norway haddock)
Hoplostethus mediterraneus	Silver roughy (Pink)
Trachyscorpia cristulata	Spiny (Deep-sea) scorpionfish
Raja nidarosiensis	Norwegian skate
Chaecon (Geryon) affinis	Deep-water red crab
Raja fyllae	Round skate
Hydrolagus mirabilis	Large-eyed rabbit fish (Ratfish)
Rhinochimaera atlantica	Straightnose rabbitfish
Alepocephalus rostratus	Risso's smoothhead
Polyprion americanus	Wreckfish