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< Preference elicitation in fisheries management. A case study of the French component of the English Channel fishery >

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Preference elicitation in fisheries management
A case study of the French component of the English Channel fishery[1]

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1. Abstract

Fisheries management is supposed to achieve various and sometimes contradictory objectives. In the same time, it is submitted to the influence of various and sometimes contradictory interest groups. In order to take into account the first feature, several methods of multi-objective programming have been developed. However, the weights of each objective in the program have to be elicited, which calls for some field survey concerning the preferences of members of each group of stakeholders. The results of such a survey may be used as an input in a model describing the management of a fishery according to the preferences of a group or a combination of groups of stakeholders.

The paper presents an application of the Analytic Hierarchy Process (AHP) method to the elicitation of preferences of stakeholders involved in the management of the French component of the English Channel fishery. According to French law, three groups have been identified : professional organisations of fishermen, government administration bodies (which are supposed to represent the general interest of society), and scientists of Ifremer who play an official advisory role. Each of these groups has been investigated through a field survey concerning a sample of 100 persons. The paper presents the method, the case study and the main results obtained for each group.

2. Keywords

Multi-objective management, preference elicitation, analytic hierarchy process, English Channel fishery.

3. Introduction

The fishing industry of countries with a high economic development is nowadays submitted to a substantial package of regulations. While the basic reasons for public concern with the state of fish resources and fishing activities have been clarified long ago (Gordon, 1954), in many cases the efficiency of fisheries management is still highly questionable (see EC, 2001 for the European case). Unsatisfactory results, both in biological, economic and social terms have given rise to a debate mainly focused on management tools (OECD, 1997), and the interest of economic instruments, such as individual transferable fishing rights, is now being increasingly acknowledged (Shotton, 2000).

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[2] This paper was presented at the XVth annual EAFE Conference, Brest, 15-16 May 2003. A shorter version was published in Kalaydjian, Ed., 2004. It presents the results of a research which was undertaken as part of the EC 5th framework project « Multiple Objectives in the Management of EU fisheries » (QLK5-1999-01273 « MOFISH »).

But part of the problem may have a deeper root, which is the definition of the objectives that are assigned to fisheries management. Fisheries management is usually supposed to achieve various, loosely defined and sometimes contradictory objectives (for a review, see Le Gallic, 2001).

In the European case, the Treaty of Rome (art. 33) assigns the following objectives to the Common Farming Policy and, by extension, to the Common Fisheries Policy (CFP) which stems from it : (*i*) to improve productivity ; (*ii*) to ensure a fair living standard to producers ; (*iii*) to stabilise markets ; (*iv*) to secure food supply ; (*v*) to induce reasonable consumer prices ; (*vi*) to enforce the non-discrimination principle. More specifically, the 1992 regulation which was the legal basis for the CFP during one decade assigned the following objectives to the management of fishing activities : (*i*) to protect and maintain fish resources ; (*ii*) to promote rational and responsible fishing, an expression which is to be understood as the combined fulfilling of the following conditions : (*i*) fishing should be performed on a sustainable basis, (*ii*) under appropriate economic and social conditions, (*iii*) taking into account the impact on marine ecosystems, (*iii*) as well as needs of both producers and consumers (CEE n°3760/92, art.2).

According to the EC, the multiplicity of the objectives assigned to the CFP, their loose definition, and the lack of hierarchy between them was a major cause of inefficiency in this policy (EC, 2001, vo.1, chap. 2). However, considering the list of objectives proposed by the EC for the future PCP (ibid., chap. 4) suggests that pointing the problem may be an easier task than adressing it. A classical difficulty is due to the fact that fisheries management, like many other public policies, is submitted to the influence of various groups of stakeholders, with different visions concerning the hierarchy and sometimes the nature of the objectives to achieve (Charles, 1992)[3].

In order to take into account the multiplicity of objectives assigned to a public policy, several methods of multiple-criteria decision-making techniques have been developed (see Mardle and Pascoe, 1999, for a review of applications to fisheries management). One subset of these techniques, called multi-objective programing, appears to be a particularly suitable set of tools to aid fisheries management, making it possible to introduce the qualitative heterogeneity of objectives into traditional bioeconomic modelling and optimisation. An example of multi-objective programming applied to the English Channel fishery was developed by Pascoe and Mardle (2001).

However, the weights of each objective in such a program have to be elicited, which calls for some survey of the preferences of members of each group of stakeholders. The results of such a survey may be used as an input in a model characterising the optimal management of a fishery according to the preferences of a group, or a combination of groups of stakeholders. This is the philosophy of the EU funded MOFISH research project, based on case-studies concerning four European countries : the UK, France, Spain and Denmark (Mardle et al., 2002). This paper is dedicated to the French part of the project. It is focused on the preference elicitation step. The methodology, the case-study and the results of the survey are successively presented. Finally, these results are used to test the validity of an interpretation of the CFP based on the concept of « triangle of paradigms » developed by Charles (1992).

4. Method

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[3] In theory, cost-benefit analysis offers a way to overcome the difficulty due to the double heterogeneity of objectives and stakeholders, by translating all the impacts of a public policy into a homogenous unit (money). In practice however, this operation may face considerable difficulties. It may also happen that the compensation schemes inducing various stakeholders to accept an efficient change are hindered by the lack of a consensus concerning the distribution of property rights, a typical case in the fishing industry (Boncoeur, Fifas and Le Gallic, 2000).

If the fisheries used as case-studies in the MOFISH project are quite different from each other, a common methodology was applied to all of them. It is basically composed of the following steps :

1. characterisation of the fishery, of its management system and of the groups of stakeholders ;
2. preference elicitation of each group by means of a field survey relying on a common multicriteria analysis method ;
3. building up a bioeconomic optimisation model of the fishery, making use of a common multi-objective optimisation technique ;
4. running the model successively with the preference structures of various stakeholders as weights in the multi-objective function to be optimised, and comparing the solutions obtained.

The Analytic Hierarchy Process (AHP) method was adopted for preference elicitation of stakeholders, and goal-programming was the common multi-objective optimisation technique applied to bioeconomic models developed for each fishery under survey. This paper being focused on stakeholders preference elicitation, the following presentation will be limited to a synthetic description of the AHP method, and its application to the field of fisheries management.

4.1. Overview of the AHP method

AHP, which was developed by Saaty (1980), belongs to the class of multi-criteria decision analysis methods. It involves four main steps : (*i*) develop, under the form of a « hierarchical tree », a hierarchy of decision elements describing the problem to be adressed ; (*ii*) use a quantitative scale (typically composed of nine points) to perform pairwise comparisons on the decision elements ; (*iii*) use the results of the pairwise comparisons to compute the relative weights of the decision elements ; (*iv*) aggregate the relative weights of the decision elements to calculate ratings for the alternative decision possibilities. While the first step is devoted to qualitative modelling of the structure of the problem under survey, the two following steps cover the preference elicitation process, and the fourth step applies the elicited preferences to decision-making.

Being both simple and powerful, AHP has been applied to a diverse range of real-world cases (Zahedi, 1986). However, it suffers from a number of weaknesses, three of which should be underlined here : (*i*) the hierarchy of decision elements which is the basis for pairwise comparisons is subjective ; (*ii*) pairwise comparisons may lead to inconsistent rankings (non-transitivity of preferences) ; (*iii*) if more than one evaluator participates in the preference elicitation, there is no preferred approach for aggregating individual preferences.

Some of these difficulties may be at least partly overcome. When establishing the « hierarchical tree » of decision elements, the subjectivity of the modeller may be balanced by a litterature review and a preliminary field survey (aimed at testing the relevance of the temptative hierarchical tree with a number of experts of the problem to which it is to be applied). Non-transitivity of preferences is a quite general difficulty affecting decision-making in complex situations, which may not be eliminated by AHP. However, the method allows the computing of an index of inconsistency of answers, which indicates how far the answering person is from the ideal model of perfect transitivity. By making use of this index, it is possible to set up a sensitivity test, in the case where an important number of persons participate in the preference elicitation process. Interindividual preference aggregation is also a general difficulty for multi-criteria decision analysis methods. As it will be illustrated in the case of fisheries management, an appropriate handling of this difficulty is dependent on the institutional context of the problem which is adressed through AHP.

4.2. Application of AHP to fisheries management

Few applications of AHP concern the fisheries sector (Mardle and Pascoe, 1999). The main reference for the MOFISH project was the application, by Leung et al. (1998), of AHP to a management

problem concerning the Hawaii pelagic fishery (the question of limiting the entry of longliners into this fishery). Adressing this particular question led the authors to elicit the preferences of people involved in the decision-making process concerning the management of Hawaii fisheries. For this purpose, two subsequent questionnaires were sent to individuals involved in this process. The first questionnaire aimed at defining a generally accepted hierarchical tree of fisheries management objectives, and the second one included a set of pairwise comparisons in order to calculate the weights attributed to the various management objectives by each answering person.

The hierarchical tree that Leung et al. developed for the Hawaii case-study was a source of inspiration for the MOFISH project. However, due to some particular features of this case, the methodology used for the Hawaii pelagic fishery could not be mechanically transferred to the European context. The main problem was due to institutional differences.

According to the Magnuson Act[4] (1976), fisheries of the US EEZ are managed on a regional basis, by 8 regional councils bringing together public and private interests (commercial and recreational fishing, seafood marketing and processing sector, conservationists...) to participate in the decision-making process. The council responsible for managing the fisheries of the EEZ around Hawaii is the Western Pacific Regional Management Council (WPRFMC). Its structure is precisely defined by law, and consists in 4 bodies : the Council itself ; a Scientific and Statistical Committee ; a Fishing Industry Advisory Panel ; and 4 Fishery Management Plan Teams. The whole structure represents around 70 persons involved in the decision-making process[5], though some of them only with a consultative role. The preference elicitation questionnaire was sent by mail to each member of the 4 bodies of the WPRFMC (66 persons) [6], and individual preferences were agregated on a simple « one man one vote » basis.

Transferring this methodology to the context of European fisheries is problematic, since no equivalent of the US regional fisheries management councils exists in Europe (a situation which might change in the near future, in the context of the reform of the CFP). The problem is double-sided : (*i*) it is difficult to delineate without arbitrariness the set of stakeholder groups to be involved in the preference elicitation process ; (*ii*) it is difficult, if not impossible, to find a non-arbitrary method for aggregating preferences between these groups.

In the French case, the solution which was adopted for handling the first side of the problem (delimitation of stakeholders) was to restrict the survey to groups of individuals playing an explicit and institutionally acknowledged role in the fisheries management decision-making process. Due to this restrictive option, subjectivity may be avoided when selecting groups participating in the preference elicitation process. But the restrictive « institutional » option is also open to criticism, since it leaves out of the scope of the survey some potentially important stakeholders, such as conservationist groups or recreational fishers, who up to now are not explicitly associated, in France, to the management of maritime fisheries.

Concerning the second side of the problem (arbitrariness of preference agregation between groups), it was decided to refrain from calculating an overall preference structure, and to concentrate on the comparison of the preference structures displayed by each institutionally recognised stakeholder

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[4] US Fishery Conservation and Management Act.
[5] not including the administrative staff of the council.
[6] The total number of usable answers was 34 (52% of the population surveyed). The number of incomplete answers was 10 (15%), and 22 persons (33%) did not answer. The response percentage varied according to the bodies of the WPRFMC structure : it was the highest within the Statistical and Scientific Committee, where it reached 80% (Leung et al., 1998).

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group[7]. A side effect of this option was the necessity to have a number of persons participating in the survey large enough to get meaningful results at the scale of each group.

The institutional difference between US and European fisheries was also an opportunity to apply the AHP method to a broader field than in the Hawaii case-study. The questionnaires used in the European case studies[8] included two sets of pairwise comparisons : the first one was dedicated to the objectives of fisheries management (as in the Hawaii survey), and the second one was about the respective importance of each group in the management of the fishery. The aim of this second set of comparisons was to elicit the opinions of the various stakeholders concerning the question : « who actually manages the fishery ? ». In addition, in the French survey, it was decided to include a normative question concerning who, according to the views of the answering person, should play the leading role in the management of the fishery.

5. Case study

This section briefly describes the fishery that was used as a case-study in the French survey, its management system, and the field survey that was realised in order to elicit preferences of stakeholders groups.

5.1. The fishery

The French component of the English Channel fishery was selected as a case study for the development of the MOFISH project in France. Several reasons led to this choice :

- Due to its complexity (Dintheer, Lemoine et al., 1995) and the important role played by various local stakeholders, it was regarded as an interesting case study for the MOFISH project. During the mid-90', the English Channel wass exploited commercially by some 4000 fishing boats, most of them English or French, and coming from the harbours of the Channel. These boats use a number of different types of gear and catch a wide range of species (mainly non quota species), resulting in a substantial number of technical interactions between fleets (Tétard et al., 1995). In addition, many fishers switch gears during the year in response ot environmental and economic conditions. As a result, the Channel may be considered as one large multi-species multi-gear fishery rather than a number of separate fisheries geographically co-located (Boncoeur, Coglan et al. 2000).

- The interest of this case was enhanced by the fact that the UK component of the fishery was selected as a case study for this country. Therefore, co-ordination of investigations by French and UK partners of the project were liable to allow interesting comparisons of both sides of the Channel (Mardle et al., 2002).

- Thanks to former French and UK research (Dintheer, Smith et al., 1995 ; Tétard et al., 1995 ; Pascoe et al., 1996 ; Boncoeur and Le Gallic, 1998) and recent coordinated PhD thesis (Dunn, 1999 ; Ulrich, 2000 ; Le Gallic, 2001), the Channel fishery is well documented, both as regards biology and economy, and experience concerning its bioeconomic modelling was accumulated

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[7] The problem of preference agregation naturally also occurs within each group. However, it is not so acute, because these groups have an explicit and generally well accepted internal structure. As a result, agregating individual preferences along the same procedure as in the Hawaii case-study appeared less arbitrary within a group than between groups. An indication of this difference was given by the fact that this agregating procedure did not raise any objections when it was explained to the individuals participating in the survey (even inside administrative bodies where voting is not a usual decision-making method), while agregating individual answers between groups would have been bitterly criticised due to the lack of consensus on the respective roles to be played by various stakeholders within fisheries management (see below).

[8] Except in the Danish survey.

during a former EU financed project (Ulrich et al., 1999 ; Le Gallic et al., 2000 ; Pascoe ed., 2000), thus allowing the development of cumulative knowledge concerning the understanding of the fishery and its management.

With some 1700 units and 240 000 KW of HP, the set of French commercial fishing boats under 25 metres[9] registered in the districts of Brest to Boulogne approximately amounted to one quarter of the whole French fishing fleet in 1995. At the same time, the landings of this fleet amounted to some 122 000 tons, representing a value of 136 million euros approximately (i.e. some 16% of the total value landed by the French fishing fleet). Figures 1 to 4 provide a synthetic view of this fleet and of the value structure of its landings in the mid-90'.

5.2. Management system and actors

Being wholly included within the UK and French EEZ, the English Channel fishery is submitted to the EU rules of the CFP. The institutions involved in its management are both European and national. Acting within the European framework of the CFP rules, national actors of the management system of the fishery may be divided into the following groups :

- government administrative authorities ;
- interprofessional organisation of maritime fisheries;
- producers organisations (POs) ;
- scientists of Ifremer.

Government administrative authorities

The 9 January 1852 decree regulating maritime fisheries[10], which is the basic national regulation concerning fisheries management, gives extensive powers in this field to government authorities. At the national level, the chief authority is the minister in charge of the fishing industry, who at present is the minister of agriculture and fisheries (MAF).

However, the main part of fisheries management is realised by government authorities at the regional, or inter-regional level (*décret n°90-94 du 25 janvier 1990, article 1*). At this level, the chief government authority is the region prefect (at the head of the various civilian state administrations at the regional level, except justice and education), some region prefects having in charge the management of fisheries for several regions. Concerning the Channel fishery, the involved region prefects are the prefects of Brittany (Western Channel) and Upper-Normandy (Eastern Channel).

Under the authority of the region prefect, the administrative body in charge of fisheries management is the administration of maritime affairs. The territorial organisation of this administrative body was reformed by a decree of 1997[11], which formally suppressed the traditional basic territorial level of this administration, called the maritime district. The territorial organisation of the administration of maritime affairs now has two levels : regional authorities, and departmental authorities. In the Channel case, 4 regional and 7 departmental authorities of maritime affairs are involved in fishery management.

Interprofessional organisation of maritime fisheries

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[9] French commercial fishing boats over this length seldom fish inside the English Channel.

[10] this XIXth century decree was modified several times since its first publication, the last revision being carried by a 1997 law (*Loi n°97-1051 du 18 novembre 1997 d'orientation sur la pêche maritime et les cultures marines*).

[11] *Décret n°97-156 du 19 février 1997 portant organisation des services déconcentrés des affaires maritimes.*

The French interprofessional organisation of the fishing industry was created during world war II by the Vichy régime, according to the corporatist principles which were in honour at that time. It was reorganised in 1945[12]. Its present organisation is the result of a 1991 law[13], also dealing with the specific professional organisation of shellfish farming, and with POs. According to this law, the principles of the so called « interprofessional organisation of maritimes fisheries and marine farming » are the following :

- all people inside the fishing and seafood industry (fishing, fish trade, transformation activities) are compulsory members of the organisation (*art.1*), and must contribute to its financing (*art.17*) ;
- the organisation is composed of three levels (*art.1*) : a national committee, regional committees, and local committees ;
- the committees are under the administrative control of the ministry in charge of the fishing industry, who may suspend the pursuance of their decisions (*art.16*) ;
- each committee is led by a board (*art.3*) composed of representatives of crew members and boat owners (the numbers of representatives of these two categories must be equal, and together they must form at least half of the members of the board), workers and managers of fish trade and fish transformation businesses (the numbers of representatives of these two categories must be equal), and maritime cooperatives[14] ; in addition, part of the board of each regional committee is made up of representatives of local committees within the scope of the regional committee (this part must not be over 1/4), and part of the board of the national committee is made up of representatives of regional committees (this part must not be over 1/5) ;
- the official purpose of the organisation (*art.2*) is (*i*) to represent and promote the interests of the industry ; (*ii*) to participate in the management of fish resources ; (*iii*) to participate in the management of relations between various sectors of the industry ; (*iv*) to participate in economic and social actions in favour of the members of the professions within the industry ;
- while the official role of local committees is mainly advisory (*art.5*), the national committee and the regional committees take part in the fisheries management system with a deliberative, though conditional power ; in order to promote the conservation of fish resources, the national committee and the regional committees may take decisions, such as technical measures concerning gears, limitation of access to some ressources, limitation of total authorised catches and determination of quotas, down to the individual level ; these decisions must be consistent with EU and national rules ; the administrative authority may give these decisions a compulsory character (*art.5*) .

A 1992 decree[15] sets up the number and scope of regional and local committees, as well as detailed rules concerning the organisation of the whole organisation. In the Channel case, 4 regional committees and 14 local committees are involved in the management of the fishery.

As for governement authorities, most management decisions taken by the interprofessional maritime fisheries organisation are adopted at the regional level. Though local committees[16] only have a consultative power, in practice, they may play an important role in the decision process. These

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[12] *Ordonnance n°45-1813 du 14 août 1945 portant réorganisation des pêches maritimes.*

[13] *Loi n°91-411 du 2 mai 1991 relative à l'organisation interprofessionnelle des pêches maritimes et des élevages marins et à l'organisation de la conchyliculture.* Shellfish farming (*conchyliculture*), which represents the bulk of marine aquaculture in France, has its own professional organisation while the rest of marine aquaculture (called *élevages marins* by the law) is administratively tied to the fishing industry.

[14] Representatives of crew members and boat owners are elected, or appointed on the basis of the results of elections organised by local committees ; representatives of other categories are named according to proposals made by their representing organisations (*art.4*).

[15] *Décret n°92-335 du 30 mars 1992 fixant les règles d'organisation et de fonctionnement du Comité national des pêches maritimes et des élevages marins ainsi que des comités régionaux et locaux des pêches maritimes et des élevages marins.*

[16] *Comités locaux des pêches maritimes et des élevages marins (CLPMEM).*

decisions essentially concern the fisheries management in the 12 NM zone, and their major field is the creation and management of special licence systems for inshore fisheries, and the determination of rules of coexistence between various fleets. Voted by the general assembly of the board of the committee, decisions are usually prepared within specialised commissions.

It is true that, according to article 5 of the above mentioned 1991 law, decisions taken by committees become compulsory only if they are approved by government authorities. In practice however, most are approved and, conversely, most of the fisheries management decisions taken by region prefects are the transcription of decisions taken by regional committees[17]. Due to this situation, some observers consider that, despite the appearance of highly centralised and state controlled management, fisheries are in France mainly self-managed by fishers themselves[18], at least in the 12 NM zone[19].

In addition to the decisions taken by the committees themselves, members of their boards participate in various administrative institutions related to the fishing industry and fisheries management, or to more general economic and social topics.

Producers organisations (POs)

According to EU rules[20], POs are created by producers on a voluntary basis, and have two main purposes : (*i*) to promote a rational fishing activity ; (*ii*) to improve the marketing conditions of fish landings. The first function of POs mainly relies on their role in the management of national catch quotas distributed by the EU among countries. They pursue their second function by concentrating the supply of their individual members, and smoothing the evolution of prices in the auction markets where these landings are sold. Officially recognized POs are subject to a set of obligations imposed by the EU and, as a counterpart, may receive public subsidies for pursuing their mission.

In addition to the interprofessional organisation of marine fisheries and the organisation of shellfish farming, the above mentioned 1991 French law also deals with POs. It states that a commercial firm, an economic interest group or an association of producers may be officially recognized by the ministry in charge of maritime fisheries as a PO in accordance with EU rules (*art.13*). The 1991 law states that the rules adopted by a PO for its members may be extended to non-members (*Ibid*.).

Eight POs are located within the French regions bordering the Channel. However, not all of them are involved in the Channel fishery. And POs with a significant activity in the Channel represent only a minority of the French fleet operating the fishery. At the national scale, more than half of all commercial fishing boats, representing approximately 35% of the global HP of the fleet, are not affiliated to a PO (Anon., 1998). The bulk of these boats is to be found in the smaller size classes (the average length of non affiliated boats was 9 m. in 1995, against 15.5 m. for affiliated boats). In contrast with the majority of affiliated boats, non affiliated boats usually operate inshore, target non quotas species and / or do not sell their landings through auction markets. This situation typically corresponds to a large number of boats operating the English Channel fishery.

An other limit to the role of POs in the management of the English Channel fishery is the fact that only two quota species caught in this area are under specific Channel TACs : there are two specific

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[17] This interaction is facilitated by the fact that the administrative authority has the right to participate in the meetings of the boards of the committees, though without voting.

[18] Representatives of fishers (crew and boat owners) form by law the majority of the boards of the committees. In France the vast majority of fishing boats (especially inshore fishing boats) are owned by their skippers.

[19] This self-management power is of course limited by the framework of EU rules of the CFP but, for various reasons, the constraints imposed by EU rules are much looser within the 12 NM than offshore.

[20] Updated in *RCE n°104/2000 du Conseil du 17 décembre 1999 portant organisation commune des marchés dans le secteur des produits de la pêche et de l'aquaculture, titre II.*

TACs for the sole stocks of Western and Eastern Channel, and a specific TAC for the plaice stock of the whole Channel (these TACs are usually distributed between the UK, France and Belgium). Other quota species caught in the Channel are managed under TACs set at a wider scale, and generally catches realised in the Channel represent only a minor part of such TACs (Ulrich, 2000).

Ifremer

Ifremer (*Institut Français pour l'Exploitation de la Mer*) is a public research institute devoted to the various disciplines of oceanography. It was created in 1984 by the merging of two preexisting institutions (ISTPM and CNEXO). A total number of approximately 1250 scientists, engineers, technicians and administrative staff are employed by Ifremer, not including some 600 persons working in subsidiaries. Part of the activity of Ifremer is in the field of fisheries science. Scientists working in this field belong to the department of living resources of Ifremer (*Direction des ressources vivantes, DRV*), and more specifically to its subdepartment of fisheries resources (*ressources halieutiques, RH*).

Ifremer has no decision power as regards fisheries management, but it plays a role in the management process, due to its scientific expertise (stock assessment, analysis of the activity of the fleets, of the impact of technical measures...).

The headquarters of the fisheries department of Ifremer are located in Nantes, and three « coastal laboratories », located in Boulogne, Port-en-Bessin and Brest, are more specifically involved in the management of the English Channel fishery.

5.3. The survey

During the first year of the project, a temptative hierarchic tree representing the structure of fisheries management objectives was designed. It was tested during the spring of 2002 through a preliminary survey based on interviews of 9 key-players in the management system of the fishery[21]. Their reactions showed good support to the project, with provision for one person who was unwilling to participate in a survey that would « give additional information to Europe ». The global structure of the temptative hierarchic tree was regarded as sound. Comments helped to improve the draft, and the modified tree (fig. 5) became the basis for a questionnaire organised according to the AHP method. This questionnaire was accompanied by a short explanation guide (see appendix), designed to overcome some possible interpretation problems that had been raised during the preliminary survey. The interviews performed during this survey also helped to identify more precisely the population to survey, to define the sampling strategy, and to select the most appropriate way to implement the survey.

As explained before, it was decided to concentrate the survey on institutions playing an explicit and officially acknowledged role in the management process of the fishery. According to this choice, three groups were initially targeted : (*i*) governement administration (French administration of maritime affairs) ; professional fishers organisations (fisheries committees and POs) ; scientists (Ifremer fisheries biologists). The individual meetings dedicated to the testing of the preliminary hierarchic tree provided a good opportunity for precising the composition of these target groups :

- Governement administration : senior executive staff of the Region and Department directions of Maritime Affairs ; for the French regions and departments boarding the English Channel, this group was estimated to 16 persons.

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[21] The regional directors of Maritime affairs of the four French regions boarding the English Channel, the presidents of the Regional fisheries committees of the same regions, and the director of the Fish resources Department of Ifremer.

- Professional fishers organisations : elected members of the councils of the Regional committees of maritime fisheries plus permanent staff of these committees ; for the French regions boarding the English Channel, this group was estimated to some 160 persons ; it did not seem necessary to contact POs separately, since POs are represented in the regional committees.
- Scientists : Ifremer biologists working in the Department of Fisheries Resources units located along the English Channel (Boulogne, Port-en-Bessin, Brest), plus biologists of the headquarters of this department (located in Nantes). This group was estimated to 22 persons.

During the preliminary interviews, it was suggested that representatives of local governement bodies should be involved in the survey, since these institutions play an indirect but significant role in fisheries management through their subsidies policy. Following this recommendation, it was decided to include in the first group (public administration) the senior staff members of the regional councils in charge of fisheries affairs, bringing this group to a total number of 20 persons.

The question of the best way of implementing the survey was also discussed during the interviews. The recommendations were the following : (*i*) postal survey for State administration ; (*ii*) direct individual interviews for fisheries committees and regional administration ; (*iii*) local meeting in each lab for Ifremer biologists. Exhaustivity was considered a reasonable target for public administration as well as for scientists, but sampling was unavoidable for fisheries committees, in view of the time and human resources available for the survey. The following sampling strategy which was adopted for the fisheries committees relies on a distinction between two types of people :

- presidents, permanent staff and representatives of POs in the councils of regional fisheries committees : exhaustivity ;
- other members of these councils : random sampling, with a targeted rate of sampling of at least 1/3 ; in the case of Brittany, it was decided to eliminate from the sampling the members from South Brittany, due to the weakness of their links with the fisheries of the English Channel[22].

The survey itself took place between July and November 2002. In order to get a high level of usable answers, a considerable amount of energy was devoted during this time to the realisation of the survey. This implied individual detailed explanations concerning the research project, its organisation, aims and methodology. A total of 98 questionnaires were filled (i.e. almost three times higher than the number of usable answers obtained in the Hawaii survey), most of them by way of direct interviews. The structure of the sample is presented in table 1.

Table 1. Sample structure

Group of actors	Number of answers	Sampling rate	
		targeted	actual
Public administration	18	100%	90%
Fisheries committees	61	33%	37%
Scientists	19	100%	86%
Total	98		

Source : CEDEM survey, 2002.

A total number of 150 persons were contacted. Very few explicit refusals were met but, due to the necessity of arranging face-to-face interviews in most cases, only two thirds of the contacted persons could fill the questionnaires. The exhaustivity target for public administration and scientists was nearly achieved. The targeted sampling rate of at least 1/3 for fisheries committees was achieved, both

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[22] This exclusion measure does not apply to the 1st category of members.

for the whole area and by region[23]. A total of 8 representatives of POs were interviewed, and all the POs with a significant involvement in the English Channel fisheries were covered. Table 2 presents the regional breakdown of the sample (except for the scientists group, where this is not relevant).

Table 2. Regional breakdown of answers (fisheries committees and public administration)

Region	Fisheries committees		Public administration	
	Number of answers	Sampling rate	Number of answers	Sampling rate
Brittany	24	34%	8	89%
Lower-Normandy	17	35%	4	100%
Higher-Normandy	11	58%	4	100%
Nord-Pas-de-Calais	9	41%	2	67%

Source : CEDEM survey, 2002.

The questionnaires were processed with the help of the software ExpertChoice. The main results of this processing are presented and commented in the following section[24].

6. Main results

The results of the survey are presented by group of actors[25]. No overall agregation of preferences is presented, the relative numbers of answers in the three groups being void of any significance in terms of management power or legitimacy. After presenting the results concerning the weights each group attaches to various management objectives, this section displays the results concerning the weights attached to various management institutions by the same groups. Finally, the question of the consistency of answers is adressed.

6.1. Preferences regarding the objectives of fisheries management

Table 3 presents the results of the survey concerning the weights attached by members of each group to the various management objectives located at the lower level of the hierarchic tree. For each objective, the table presents the mean of the weights attached by the members of the considered group, and the variation coefficient (standard deviation / mean). In this table as in the following ones, the two major answers for each group are written in bold characters.

Table 3. Relative weights of management objectives, by group of actors

Answers of :	Administration		Fisheries committees		Scientists	
Objectives :	mean	var. coeff.	mean	var. coeff.	mean	var. coeff.
Commercial stocks	**18%**	0,45	**20%**	0,46	**31%**	0,36
Non commercial species and ecosystems	7%	0,62	10%	0,78	**21%**	0,40
Profitability	9%	0,65	10%	0,78	6%	0,81

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[23] The sample rate for fisheries committees underrecords reality, since South Brittany was excluded from the sampling (except for the President of the regional committee and representatives of POs). Taking this particularity into account, the actual sampling rate for fisheries committees is around 45%.

[24] In order to interpret and discuss the results of the survey with members of the three groups of respondents, two workshops were organised at the beginning of 2002, in Brest and in Le Havre. A total number of 21 representatives of fishers organisations, administration members and scientists participated in these workshops.

[25] A regional breakdown of answers was also realised for fisheries committees. With a few exceptions, it did not lead to major differences between regions.

Employment in fisheries	10%	0,62	15%	0,55	6%	0,60
Employment in coastal areas	10%	0,77	8%	0,72	9%	0,80
Safety and labour conditions	**25%**	0,43	**17%**	0,74	9%	0,65
Conflicts between professional fishers	11%	0,62	10%	0,77	7%	0,72
Conflicts with other groups	9%	0,89	10%	0,73	11%	0,65
Total	100%		100%		100%	

Source : CEDEM survey, 2002.

For administration members, the two main objectives are (*i*) safety and labour conditions onboard, and (*ii*) commercial stocks conservation . The other objectives are rather far behind.

For professional fishers representatives, the same two objectives are the main priorities, but with a different order : commercial stocks conservation is slightly ahead of safety and labour conditions onboard. The objective of employment in fisheries is not far behind, and, more generally, table 3 suggests that fishers representatives priorities are not so clear-cut as that of other groups : the average range of relative weights is narrower among fishers representatives (1 to 2.5 between last and first priority) than among administration members (1 to 3.6) or, *a fortiori*, among scientists (1 to 5.2), who, on the average, display the most clear-cut preferences.

Unsurprisingly, scientists give priority to biological objectives : commercial stocks conservation and minimisation of impact on non commercial species and ecosystems. This last objective is given by scientists a weight which is more than twice the weight given by fishers representatives, and is three times the weight given by administration members.

For the two major objectives in each group, variation coefficients are lower among scientists than among the two other groups, which suggests a greater homogeneity of this group as regards the priorities attached to fisheries management.

6.2. Weighting the importance of each institution in the fisheries management system

The pairwise comparison technique of AHP was also used to elicit the opinions concerning the relative importance of each institution in the management system of the English Channel fishery. Table 4 displays the relative weights attached to each institution by the respondents of each group.

Table 4. Opinions concerning the relative importance of various institutions in the management of the fisheries of the English Channel

Answers of :	Administration		Fisheries committees		Scientists	
Relative importance of :	mean	v. c.	mean	v. c.	mean	v. c.
EU	**47%**	0,31	**36%**	0,63	**45%**	0,38
French governement	16%	0,41	17%	0,61	18%	0,76
Professional fishers organisations	**23%**	0,50	**25%**	0,87	**27%**	0,68
Scientists	14%	0,99	22%	0,76	10%	0,90
Total	100%		100%		100%	

Source : CEDEM survey, 2002.

There is a relative consensus to consider the European level (EC + council of ministers) as the major level and to rank second, rather far behind, professional fishers organisations. The weight imputed to French governement is limited, and homogenous between groups. The major difference between

groups is about the relative weight of scientists. While scientists regard their own weight as very limited, fishers representatives believe it is significantly more important. According to fishers representatives, the weight of scientists in the management system is nearly as important as their own weight, while scientists believe that the weight of fishers organisations is much more important than their own weight.

6.3. Normative question on institutions

Table 5 depicts the answers to the normative question concerning the role of various institutions in the management system of the English Channel fisheries. The figures in this table cannot be directly compared to the ones in the former tables, since the process of opinions elicitation is different (unique question with 5 different possible answers, instead of a set of pairwise comparisons).

Table 5. Answers to the question : « which institution should play the leading role in the management of the English Channel fisheries ? » (frequencies of answers, by group)

Answers of : Leading role to :	Administration	Fisheries committees	Scientists
Europe	**31%**	6%	**21%**
French governement	15%	9%	**21%**
Professional fishers organisations	8%	**60%**	14%
Scientists	8%	2%	0%
A combination of the four above	**38%**	**23%**	**43%**
Total	100%	100%	100%

Source : CEDEM survey, 2002.

Some 40% of the respondents in the administration and scientists groups refuse to introduce a normative hierarchy between institutions, and choose to answer that the fisheries should be managed by « a combination of the four institutions ».

Nearly one third of administration members declare that the leading role should be played by Europe. This proportion is twice that of respondents who, in the same group, rank French government first. Among scientists, the balance is equal between these two levels : 20% of the respondents in this group declare that Europe should play the leading role in the management system of the English Channel fisheries, and the same proportion is met in favour of the national (governement) level.

Few scientists believe that professional fishers organisations should play the leading role (14%), and the proportion is even lower in the administration group (8%).

No scientist declares that scientists should play the leading role in the management of the English Channel fisheries, and very few administration members are prone to confer them such a role (8%).

The answers of fishers representatives are fairly different from that of other groups. This is first illustrated by the high proportion of fishers representatives who declare that the leading role should be confered to fishers organisations (60%). As in other groups, fishers representatives do not want scientists to play the leading role (2% of answers), but, in this group, this refusal extends to Europe (6% of answers) and French governement (9% of answers). Less than one quarter of the fishers representatives declare that the fisheries should be managed by « a combination of the four institutions », without a hierarchy between these institutions. As opposite to fisheries management objectives, in the field of institutions the results of the survey suggest that the preferences of fishers representatives are more clear-cut than that of administration members and scientists.

6.4. Consistency of individual answers

According to the AHP method, the technique that was used for eliciting management objectives preferences and opinions concerning the actual importance of various institutions in the management of the English Channel fisheries relies on pairwise comparisons. This technique raises the question of the internal consistency of the set of answers given by each respondent : the preferences or weights steming from a sequence of pairwise comparisons may be not fully transitive. In order to estimate the degree of inconsistency of the choices made by each respondent, the software ExpertChoice may be used to compute an index (inconsistency ratio), which is equal to zero if all answers are fully transitive, and increases with the level of inconsistency (non-transitiveness) of the set of answers. The following table presents, for each group of respondents, the distribution of individual inconsistency ratios for each set of pairwise comparisons (management objectives and actual importance of institutions) :

Table 6. Distribution of individual inconsistency ratios, by group and by type of question

Value of ratio	Administration		Fisheries committees		Scientists	
	Objectives	Institutions	Objectives	Institutions	Objectives	Institutions
≤ 0,1	18%	35%	15%	15%	16%	16%
]0,1 ; 0,2]	35%	35%	27%	14%	37%	37%
]0,2 ; 0,5]	35%	18%	31%	46%	37%	37%
> 0,5	12%	12%	27%	25%	10%	10%
Total	100%	100%	100%	100%	100%	100%

Source : CEDEM survey, 2002.

In each group, less than 20% of answers concerning management objectives display an inconsistency ratio not exceeding 0.1. The situation is similar with the answers concerning institutions, except for administration members, where 35% of answers display an inconsistency ratio not exceeding 0.1. In the administration and scientists groups, the inconsistency ratio of a majority of answers does not exceed 0.2. However, the proportion of such answers is only slightly more than one half, except for the answers of administration members to the set of comparisons on institutions, where the proportion is up to 70%. The inconsistency level is higher within the group of fishers representatives, where only a minority of answers are characterised by an inconsistency ratio not exceeding 0.2.

In order to test the impact of inconsistency of answers on the results of the survey, a subset was extracted from the population surveyed, composed of individual answers with an inconsistency ratio not exceeding 0.2. The results are presented in tables 7 and 8, which compare the results for the whole set of answers, and for the subset with an inconsistency ratio ≤ 0.2. This comparison indicates that most of the results for this subset are fairly close to the ones obtained by the whole population.

Table 7. Mean relative weights of management objectives, by group of actors. Comparison of results for the whole set of answers and for the subset of answers with an inconsistency ratio ≤ 0.2

Answers of :	Administration		Fisheries committees		Scientists	
Objectives :	whole	IR ≤ 0.2	whole	IR ≤ 0.2	whole	IR ≤ 0.2
Commercial stocks	**18%**	**18%**	**20%**	**19%**	**31%**	**34%**
Non commercial species and ecosystems	7%	6%	10%	11%	**21%**	**24%**
Profitability	9%	7%	10%	9%	6%	4%
Employment in fisheries	10%	8%	15%	14%	6%	6%
Employment in coastal areas	10%	7%	8%	8%	9%	8%

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Safety and labour conditions	**25%**	**29%**	**17%**	**17%**	9%	9%
Conflicts between professional fishers	11%	14%	10%	10%	7%	7%
Conflicts with other groups	9%	11%	10%	12%	11%	8%
Total	100%	100%	100%	100%	100%	100%

Source : CEDEM survey, 2002.

Table 8. Opinions concerning the relative importance of various institutions in the management of the fisheries of the English Channel (mean answers, by group). Comparison of results for the whole set of answers and for the subset of answers with an inconsistency ratio ≤ 0.2

Answers of :	Administration		Fisheries committees		Scientists	
Relative importance of :	whole	IR ≤ 0.2	whole	IR ≤ 0.2	whole	IR ≤ 0.2
Europe	**47%**	**46%**	**36%**	**37%**	**45%**	**43%**
French governement	16%	**23%**	17%	20%	18%	13%
Professional fishers organisations	**23%**	17%	**25%**	**23%**	**27%**	**35%**
Scientists	14%	14%	22%	20%	10%	9%
Total	100%	100%	100%	100%	100%	100%

Source : CEDEM survey, 2002.

7. Discussion and conclusion

The survey presented in this paper is part of a larger research project, aimed at integrating preference elicitation of stakeholders groups and multi-objective optimisation bioeconomic modelling of several EU fisheries. By itself, it brings some significant results, shedding some new light on the way fisheries management objectives and institutions are perceived by stakeholders involved in the decision-making process.

The preference elicitation phase of the project, to which this paper is devoted, was the first case of application of the AHP multi-criteria analysis method to European maritime professional fisheries. With a set of nearly 100 usable answers, the French survey represents an important increase in the scale of application of the method, compared to the seminal US survey by Leung et al. (1998). This feature allows a treatment of the survey results which is adapted to the French institutional context, presenting important differences with the US context where the method was first used : instead of aggregating the preferences of all respondents, it was possible to analyse the answers by group of stakeholders[26].

Due to the practical necessity of limiting the number of pairwise comparisons to be achieved during each interview, the set of alternatives which was proposed to the persons participating in the survey was necessarily limited, thus creating a risk of oversimplification in the presentation of management problems[27]. However, the interest in the survey which was demonstrated by the high rate of response,

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[26] The largest and most heterogeneous group of respondents, i.e. fishers representatives, may be split into several subgroups. This operation has been realised, using a geographical criteria. Other criteria may be thought of.

[27] The time dimension, for instance, and the subsequent distinction between short term and long term objectives could not be explicitly integrated in the questionnaire (except under the form of a caveat in the methodological note that was joined to the questionnaire).

and the participation in the subsequent workshops indicate that the proposed hierarchic tree, and more generally the whole elicitation procedure were regarded as sound by stakeholders.

Another limit to the survey is the low level of consistency which is displayed by many answers. This feature confirms the fact that, even with a limited number of alternatives, maintaining a high level of transitivity in a set of subsequent pairwise comparisons is nothing but trivial. However, selecting the most consistent answers within each group does not bring major changes in its hierarchy of preferences, or in the relative importance it attributes to the various institutions involved in the decision-making process.

The answers to the survey may be used to test the validity of an interpretation of the CFP based on the concept of « triangle of paradigms », a framework of analysis developed by Charles (1992) to interpretate both fisheries conflicts and fisheries management. Following this author, actual fisheries management is necessarily a compromise between three visions of the world, which he calls « conservation paradigm », « efficiency paradigm » and « social / community paradigm ». Each of these paradigms assigns a major objective to fisheries management, favours a particular type of management tools, and is backed by a particular set of supporters (fig. 6). According to circumstances, the management of a fishery may be closer to one paradigm or another. Making use of Charles's « triangle of paradigms » in the European context, Boncoeur and Mesnil argued, in opposition to a frequent view (see e.g. Crean and Symes, 1996), that the European CFP is not mainly based on a combination of conservation and rationalization paradigms, but is actually closer to the social / community paradigm (Boncoeur and Mesnil, 1999). The argument mainly relies on such evidences as the systematic gap between the conservation measures recommended by biologists and the ones actually adopted by the EU, the limited use of economic instruments in the management of EU fisheries, the importance of subsidies, the failure to reduce significantly the fishing pressure on stocks[28]. It also makes use of the hypothesis that, usually, governement administrative bodies in charge of the fishing sector have interiorised the views promoted by the industry, or at least by its most influent components. According to this « reverse supervision » hypothesis (Grémion, 1976), the regulation function is imperceptibly transformed into a defence function, as the administrative authority adopts the values and interests of the social group which is theoretically placed under its control.

The results presented above, concerning both management objectives and stakeholders involved in fisheries management, provide some additional empirical evidence that may be used for discussing this argument.

Concerning management objectives, a first evidence is the low ranking of the profitability objective by the three groups, which suggests that the « rationalisation paradigm » is far from the views of the stakeholders taking part in the fisheries management decision-process[29].

A second evidence, concerning management objectives, is the proximity between the preference structures displayed by administration members and fishers representatives, contrasting with the preferences of fisheries biologists. While scientists give a clear priority to the « conservation paradigm », the opinions of administration members and fishers representatives are more balanced, and attribute a similar importance to such objectives as commercial stocks conservation, employment, conflicts prevention, safety and labour conditions (with a particular stress on this last objective

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[28] All these elements have been officially acknowledged by the EC in its 2001 report on the reform of the CFP (EC, 2001).

[29] Although the answers concerning this sensitive topic must be regarded cautiously, due to the possibility of strategic or « politically correct » answers. Whatsoever, the very fact that most fishers representatives are reluctant to admit that profitability may be an important objective for fisheries management is, by itself, an interesting result from a cultural point of view.

concerning administration members). The moderate scores obtained by the objective of commercial stocks conservation, and the poor score attributed to the objective of non commercial species and ecosystems conservation, suggest that the « conservation paradigm » holds a limited place in the views of administration members and fishers representatives, in opposition to the views of scientists.

The survey results also provide some information concerning the respective influences of each of these groups in the decision-making process, or, rather, the way these influences are perceived. The opinions in this field are rather consual, with an exception for the influence of scientists, which is regarded as significantly more important by fishers than by scientists themselves. It appears that all stakeholders attribute the main role to « Europe » (a qualification which conveys some ambiguity since it covers the EC as well as the Council of ministers), and rank second the professional fishers organisations. With provision for the difference noted above, the role of scientists is considered as limited by the three surveyed groups, which conforts the idea that the « conservation paradigm » does not hold a prominent place in the way fishery management actually works. However, the interpretation of these results is controversial : during the workshops which were organised to present and analyse the survey results, it was suggested by some fishers representatives that, in the mind of people belonging to their group, « Europe » and « scientists » were in fact the same set of decision-makers, and therefore their respective scores should be cumulated.

The opinion that actual fisheries management in the EU is dominated by some form of « social / community » paradigm is not disqualified by the results of the field survey dedicated to preference elicitation of stakeholders groups of the French component of the English Channel fishery. Further results of the project, integrating the preference structure of each group into bioeconomic modelling of the fishery, should shed additional light on this subject.

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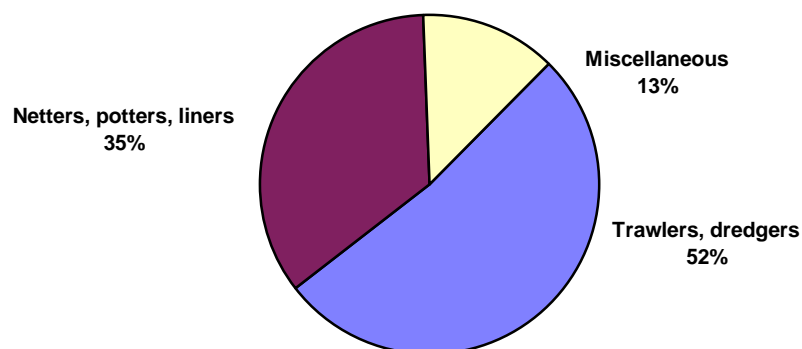
fig. 1. French commercial fishing fleet of the English Channel (boats < 25 metres)
Regional composition

Brittany (North)
43%

Nord-Pas-de-Calais
12%

Upper-Normandy
9%

Lower-Normandy
36%
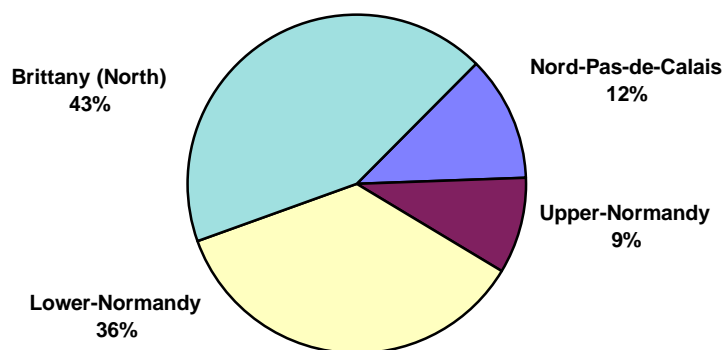
fig. 2. French commercial fishing fleet of the English Channel (boats < 25 metres)
**Composition by length class**

[16 - 25 m.[
14%

[10 - 16 m.[
34%

< 10 m.
52%
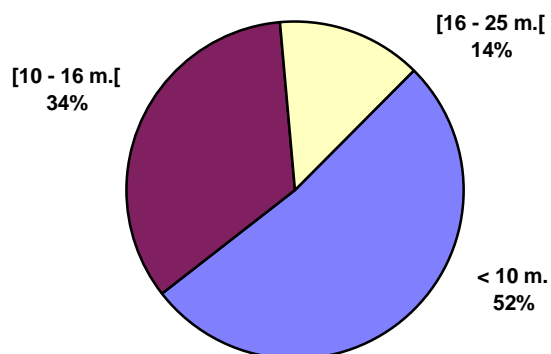
fig. 3. French commercial fishing fleet of the English Channel (boats < 25 metres)
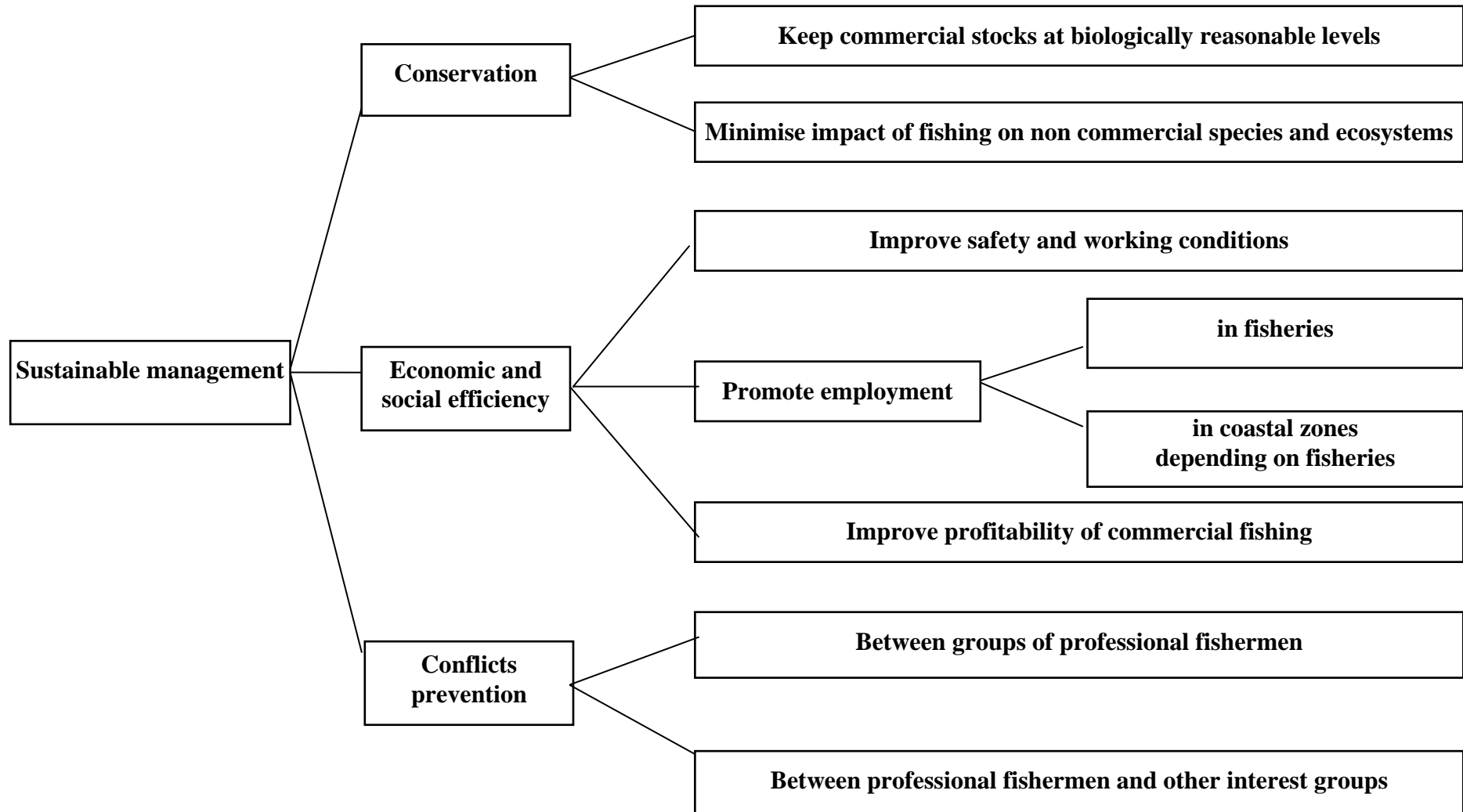**Composition by fleet**

Miscellaneous
13%

Netters, potters, liners
35%

Trawlers, dredgers
52%

Source : Ifremer

**fig. 4. French commercial fishing fleet of the English Channel (boats < 25 metres)
Composition of landings (value)**

Seaweeds
1%

Molluscs
36%

Crustaceans
5%

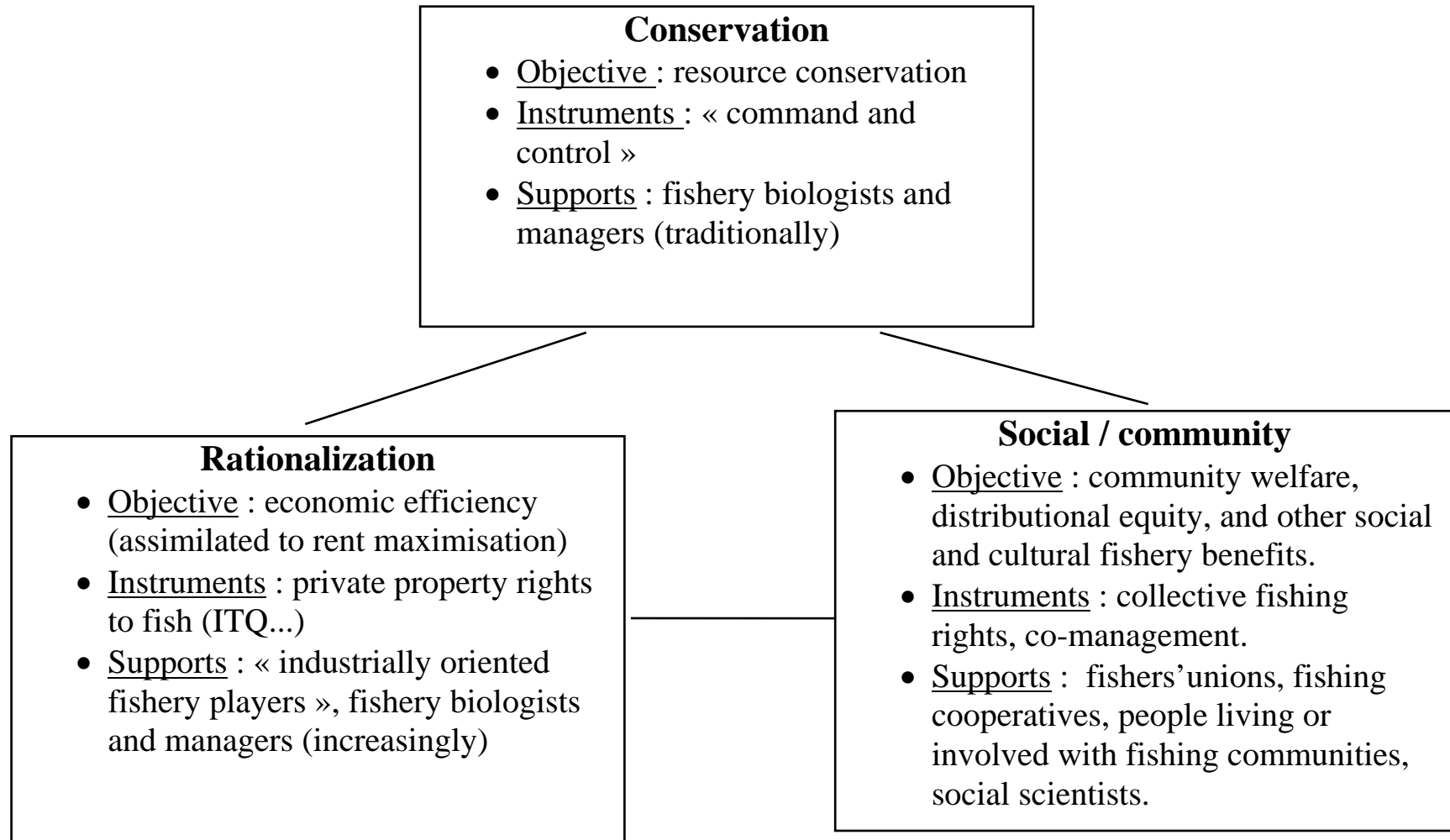Pelagic finfish
9%

Demersal and benthic
finfish
49%
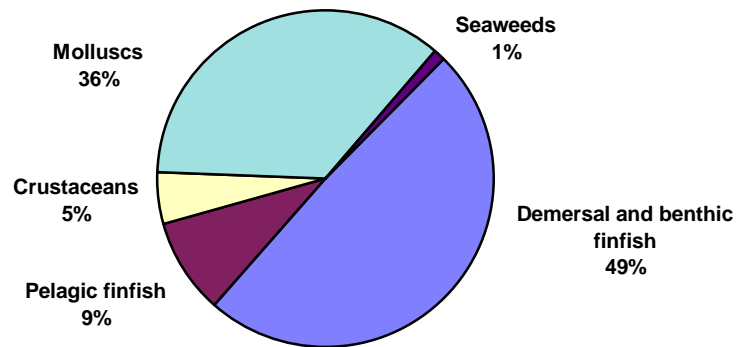
Source : Bahamas database

Figure 5. Preference elicitation concerning fisheries management objectives. Hierarchic tree (CEDEM survey)

fig. 6. Anthony Charles's « triangle of paradigms »

Conservation
- Objective : resource conservation
- Instruments : « command and control »
- Supports : fishery biologists and managers (traditionally)

Rationalization
- Objective : economic efficiency (assimilated to rent maximisation)
- Instruments : private property rights to fish (ITQ...)
- Supports : « industrially oriented fishery players », fishery biologists and managers (increasingly)

Social / community
- Objective : community welfare, distributional equity, and other social and cultural fishery benefits.
- Instruments : collective fishing rights, co-management.
- Supports : fishers'unions, fishing cooperatives, people living or involved with fishing communities, social scientists.

Appendix
Methodological note and formulation of objectives included in the questionnaire.
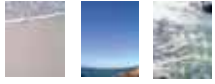
Methodological note

In order to help identifying your preferences, you are asked to make pairwise comparisons of the relative importance of the following objectives. Each pair of objectives appears at two ends of a scale. Please indicate on this scale, by selecting the appropriate number, the degree of importance which you attach to one objective compared to the other. The closer to one end of the scale the number you select is, the greater the relative importance you attach to the corresponding objective. If you believe that both objectives are of equal importance, please select number 1 in the middle of the scale.

Please note that the following objectives do not necessarily contradict each other, especially in the long run. However, some management options may give priority to some objectives, and managers have to make choices. In each pairwise comparison, the problem to be adressed is of the following type : suppose you have to choose between two management options, each one giving a relative advantage to a different objective (at least in the short run) ; according to your own professional experience, what would be your priority, in most circumstances ?

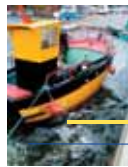[*In the questionnaire the methodological note is followed by an example*]

List of objectives and explanatory notes

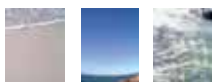| Objectives	Explanatory notes
1. Keep commercial stocks at biologically reasonable levels (*maintien stocks*)	Means ensuring that global biomass and age structure of the stocks do not lead to collapse
2. Minimise impacts of fishing on non commercial species and ecosystems (*minimiser impacts*)	Bycatches, impact of gears on the bottom, etc.
3. Improve safety and working conditions onboard (*sécurité et conditions de travail*)	Includes length of boat trips, ship condition, fishing techniques, etc.
4. Promote employment in fisheries (*emploi pêche*)	Promote is to be understood as « maintain » and, whenever possible, « increase ».
5. Promote employment in coastal zones depending on fisheries (*emploi local*)	Jobs in upstream and downstream activities, and jobs locally induced by the final consumption of fishers households.
6. Improve the profitability of commercial fishing (*rentabilité pêche*)	Global profitability of the fishing activity, regardless of distributive aspects (i.e. efficiency not equity, which is captured by objective 7).
7. Prevent conflicts between groups of professional fishermen (*prévention conflits internes*)	Towed gears vs. fixed gears, inshore vs. offshore fishing boats, local fishers vs. foreign fishers, etc.
8. Prevent conflicts between professional fishermen and other interest groups (*prévention conflits externes*)	Recreational fishermen, downstream activities, tourists, aquaculture, extracting activities, environmentalist groups...

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