



# **The XVth Annual EAFE Conference**

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**SESSION ONE: WTO NEGOTIATIONS WITH SPECIFIC REFERENCE TO MARKET  
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## **1a) SUBSIDIES AND FINANCIAL TRANSFERS**

### **FISHERIES SUBSIDIES: THE WTO AND BEYOND**

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#### **Abstract**

The negotiation on fisheries subsidies currently underway in the WTO presents a significant challenge to policy makers. In seeking to “clarify and improve” disciplines on fishing subsidies, the WTO negotiation provides an opportunity to bring together important aspects of both trade policy, natural resource economics and environmental sustainability. Flowing from the Doha Development Agenda, the WTO process places considerable emphasis on a “win-win-win” outcome for the negotiations, with benefits sought for trade, environment and development. Despite having been going on for three years, detailed negotiations on subsidy disciplines are still at a relatively early stage. A number of countries have provided papers outlining their initial positions on how negotiations should proceed and it is likely that further positions will become known in due course.

This paper reviews the state of play of the negotiations and discusses the economic and management issues that arise when considering fishery subsidy reform. Due to the complexity of the negotiations and that fact that these are still in their early stages the paper does not attempt to provide a scenario for the likely fate of fisheries subsidies. Rather, the paper focuses on the issues that arise in the interaction between subsidies and fisheries management regimes. How fisheries are managed, combined with the effectiveness of enforcement, will largely determine how fishers respond to changes in subsidy policies and the potential impact on fish stocks and supply of fisheries products to the market. The paper draws on recent OECD work on environmentally harmful subsidies to illustrate the issues and challenges facing the WTO negotiations.

**GOVERNMENT FINANCIAL TRANSFERS TO THE FISH HARVESTING, PROCESSING  
AND AQUACULTURE INDUSTRIES  
NORWAY 1990 - 2002**

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**Abstract**

This report investigates and quantifies Norwegian governmental financial transfers (GFT) to primarily the fish harvesting industry, but also the fish processing and aquaculture industries. Focus is on the period 1990 to 2002.

The data sources for this report are mainly public accounts of the Ministry of Fisheries, that channelled the bulk of support measures. We also rely heavily on a set of data on the transfer of funds from the Industrial and Regional Development Fund (SND). Finally, annual reports from the Norwegian Fisheries Bank (NFB) have been employed.

For fish harvesting, support has been divided in four categories, according to purpose: revenue enhancement, social measures, capital support and intermediate measures. In addition to these, tax exemptions on fuel oil and provision of general services to the industry is discussed.

The support for all four categories have shown a sharp decline, particularly from 1991 to 1993, but the trend has continued in the succeeding years. The main factors behind this development has been international obligations from the agreement on the European Economic Area (EEA), increased profitability and government strategy to make the industry self-sustained. Total support has gone down from about 1,100 million Norwegian kroner (NOK) in 1991 to about 250 million NOK in 2001. In 2002 it again fell sharply to about 140 million NOK. These figures exclude tax exemptions on fuel and the provision of general services.

Using the NFB annual reports and the SND database, capital support was investigated further, focusing on which vessel groups have received support for this purpose. The results clearly show the SNDs strategy to prioritize large, multi-purpose coastal vessels.

Data restricted the study on processing and aquaculture to the period 1994 to 2002. Support for aquaculture amounts to considerably less at about 47 million NOK in 2002, but has shown the opposite trend compared to fish harvesting. This probably corresponds to the continuous high growth of this sector during this period. Aquaculture support mainly consisted of investment grants, but also partial financing of development projects has been important.

Support for fish processing increased from about 76 million NOK in 1994 to about 170 million in 1998. This later fell to about 70 million NOK in 2002.

# THE COST OF FISHERIES MANAGEMENT IN ESTONIA

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## Abstract

This paper presents estimates of the cost of fisheries management in Estonia. The costs are split into costs of research services, management services and enforcement services. We also compare the cost in Estonia with costs of fisheries management in several other countries and try to map out the cost of different management regimes and their relative efficiencies.

## **1b) SPECIAL TRADE ISSUES**

### **A REGIONAL BUSINESS MANAGEMENT MODEL FOR FISHERY RIGHTS: THE CASE OF NORWAY**

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#### **Abstract**

It is assumed that fisheries management influences the level of value adding and its allocation among fishers and regions. Fishery economists recommend generally implementing property rights in fisheries to increase the resource rent extraction based on the idea that ownership of quota will motivate fishers to maximize value adding for reasons of both cost efficiency and revenue received. In effect this is a monopoly right to resources previously owned by all citizens in the country in control of the EEZ. Economists therefore propose that any supra rent which companies extract should be returned to the government on behalf its citizens to collect as a resource tax. However this is not the case in most countries implementing property rights and in practice huge windfall profits may be gained by those fortunate enough to be allocated quota at the time when this decision is made. Typically this falls to vessel owners, and need not necessarily include other members of the community who are no less dependent upon fish resources for their livelihood, not to mention future generations to follow.

This paper examines the tendency towards greater concentration of fishing rights in Norway over a 30-year period of governmental management of fishing rights. The number of fishing vessels has been significantly reduced and fishing rights has become concentrated. Trading of rights develops. Sellers withdraw with the resource rent, whilst buyers increase their capital costs. The capacity problem is sustained by capital and running costs being covered from catch value and thereby sustains pressure towards over-fishing, which was itself the main argument for the introduction of property rights. Banks and other capital investors gain at the expense of fishers without capital investments. Ownership concentration has fuelled a Norwegian debate of allocation and management of the fishing rights, and raised fundamental concerns potentially applicable elsewhere.

Recognizing that allocation of fishing rights is the key input factor in coastal industries and economic development, this paper describes a model for regional business management of such rights. The model is based of the assumption that the fish resources belongs to all citizens in a region, who have an interest in maximizing value adding from the rights both as rents and jobs and through other inputs to the welfare and social infrastructure of the community. The main elements in the model are, over time, to move all regional fishing rights to a Resource Enterprise (RE) owned by the regional county (-ies). RE is a professional business management body with a mandate to maximize the value adding for the people in the region from the limited fishing rights. The REs lease the fish rights to the fishers on non-tradable short and long-term contracts. The lease payment may be established according to the resource rent. Non tradable rights mean that the value of the property right is kept in the REs while a flexible leasing market, for example a lease-auction, motivates the fishing vessels to maximize value adding of the rights. Management of fishing rights may not have any influence of TAC management, which still is located within central national authorities. The difference is that Individual share quotas (ISQ) now allocated directly to fishermen goes through the appropriate REs for onwards allocation of rights in the form of leasing contracts to the fishers.

**Key words:** Regional fisheries management, Value adding, Resource rent allocation, Norway

## USING TRADE MEASURES IN THE FIGHT AGAINST IUU FISHING: OPPORTUNITIES AND CHALLENGES

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### Abstract

Illegal, Unreported and Unregulated (IUU) fishing activities are a threat for both the marine environment and society. By undermining effective management systems, IUU fishing activities not only generate harmful effects on economic and social welfare, but also reduce the incentives to comply with rules. The issue of IUU fishing has recently attracted increasing attention. At the June 3, 2003, G8 meeting in Evian, Heads of State adopted a G8 Action Plan (Marine Environment and Tanker Safety) that calls for the urgent development and implementation of international plans of action to eliminate IUU fishing. More globally, the WSSD meeting in Johannesburg in September 2002 also addressed IUU fishing and through the 1990s, laws, regulations and measures have been adopted by the UN and the FAO. In this context, the OECD Committee for Fisheries decided to launch in 2002 a project on the economic and social aspects of IUU fishing. Based on the preliminary findings of this project, the aim of the paper is to explore the potential role trade measures can play in the global fight against IUU fishing.

As general background, the paper first describes the incentives to engage in IUU fishing activities and factors creating these incentives. IUU fishing is an economic activity. Incentives to engage in IUU fishing activities remain economic by nature. Drawing on the general economics of crime and punishment, the basis of which are the works of Becker (1968) and Stieglar (1971), the analysis, however, shows that the underlying factors can be of institutional, economic or social nature.

The paper then lists the different sets of measures that can be envisaged to curb IUU fishing activities. In order to modify IUU operators' incentives structure, actions can be taken to (i) reduce revenues from IUU fishing, (ii) increase operating costs for IUU activities and (iii) increase capital costs of IUU vessels.

Finally, the paper analyses the potential place of trade measures in the regulator's tool box. The term "trade measures" is understood here in its broader sense. It covers, *inter alia*, embargoes, price premiums, documentation and labelling schemes, *shaming* campaign, etc. The analysis draws its empirical evidence from recent experiences of RFMOs (e.g. ICCAT, IATTC, CCALMR), governments and private organisations, and seeks to clarify the benefits, limits and challenge of using trade measures in the fight against IUU fishing.

Key words: IUU fishing, trade measures.

# **TOWARDS A MEDITERRANEAN FREE TRADE AREA FISH TRADE RELATIONS WITHIN THE MEDITERRANEAN BASIN**

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## **Abstract**

The last decades have been characterised by a renewed interest towards regional co-operation. Within the framework of the WTO rules, a number of Regional Trade Agreements (RTAs) have been implemented. Most of them involve European countries and, particularly, EU, on one hand, and its Mediterranean partners, on the other hand. The most representative are the Euro-Mediterranean Partnership (EMP) and the Stabilisation and Association Process (SAP), started by the EU, respectively with South Eastern Mediterranean countries (from North Africa to Middle East) and with countries of South Eastern Europe (Balkan).

The analysis is focused on three groups of countries: a) EU Mediterranean countries (EUMC, France, Greece, Italy and Spain); b) Mediterranean candidate countries (AEUMC, Cyprus, Malta and Slovenia) and c) Third Mediterranean Countries (TMC, Albania, Algeria, Croatia, Egypt, Israel, Lebanon, Libya, Morocco, Syria, Palestine, Tunisia, Turkey and Serbia and Montenegro).

Fish trade relations have been analysed taking into account on one hand, the intra-Mediterranean exchange and, on the other hand, import-export flows between EU and its Mediterranean partners.

The analysis is completed with an overview of the tariff scheme regulating fish exchange trade in the Mediterranean basin.

Data sources of the study are FAO Fishstat plus database and UN-Comtrade, for data on fishery production and on global fish exchange trade, and DG-Trade for data on fish exchange trade between EU and Mediterranean countries.

**Key words:** WTO, Regional Trade Agreements (RTAs), Free Trade Area (FTA), Euro-Mediterranean Partnership.

## **1c) AQUACULTURE AND GENERAL TRADE CONCERNS**

### **AQUACULTURE SEA BREAM AND SEA BASS TRADE STRUCTURE IN THE MEDITERRANEAN**

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#### **Abstract**

Aquaculture has been promoted in many parts of Europe as an alternative to fisheries where these are in decline, or where other development options are limited in remote regions. Strong market demand is mainly to a) population growth and increased income, b) the world-wide popularity of seafood as both healthy and luxury food, c) declining wild catches of high-value fish species and d) cheaper and easier international trade, transport and communications.

Sea bream and Sea bass are considered two of the high-valued species that are frequently grown for export. One of the largest success-stories in European aquaculture is represented by the Mediterranean Sea bass and Sea bream industry which in less than 15 years time has grown from a few thousand tonnes in annual production to more than 150.000 tonnes today. The six countries dominated total production are: Greece, Italy, Spain, France, Portugal and Turkey. Their role is not confined only to production level, but influence the European trade as well. Nearly 90 per cent of the production is exported from the country of origin, mainly to Italy and Spain. The principal exporter is Greece, exporting about 73 per cent of domestic production though many other countries are entering the European market raising the competition and reducing prices at the same time.

The current study aims to investigate the relative position of each country in the trade chain during the period of 1993-2001, their behavior regarding trade flows in relation to their production, as well as the relevance of apparent consumption to trade indices. The data used are from FAO's statistical base (Fishstat) regarding commodities production and trade. The statistics do not give origin (capture or aquaculture) but since, aquaculture production for Sea bream and Sea bass represents more than 90% of the total production in the six countries, trade indices mostly refer to aquaculture and not capture. The methods used are descriptive statistics, comparative analysis via imports and exports, regression analysis as well as cluster analysis in order to highlight the major exporting and importing countries for sea bass and sea bream.

**Keywords:** Sea bream, Sea bass, exports, imports, comparative analysis

**COMPETITION BETWEEN FARMED AND WILD SALMON: THE JAPANESE  
SALMON MARKET**

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**Abstract**

This paper examines the Japanese market for salmon. This market is of interest since it is the largest and most diversified salmon market in the world with wild and farmed species, from Europe and South and North America, competing in the same market. In contrast to the EU and US- market there have been neither trade conflicts nor trade restrictions. The Japanese market can hence provide information about the impact of bringing substantial quantities of a new product into a market, and the effect of large-scale aquaculture on traditional fisheries.

**Keywords:** Aquaculture, salmon markets, market integration

**SESSION TWO: ECOLOGICAL AND ENVIRONMENTAL INTERACTIONS WITH  
THE ECONOMICS OF FISHERIES**

## **2a) MARINE RESERVES**

### **MARINE RESERVES: A BIO-ECONOMIC MODEL WITH ASYMMETRIC DENSITY DEPENDENT MIGRATION**

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#### **Abstract**

A static bioeconomic model of a marine reserve is introduced, allowing asymmetric density dependent migration between the reserve and the fishable area. This allows for habitat or ecosystem differences within and outside a reserve not described in earlier studies. Four scenarios are studied; a) maximum harvest, b) maximum current profit, c) open access and d) maximum sustainable yield (MSY) in the reserve. These are all analysed within the Induced Sustainable Yield Function (ISYF), giving the relationship between the fish abundance inside the reserve and the harvesting taking place outside. A numerical analysis shows that management focus on ensuring MSY within the reserve under the assumption of symmetric migration may be negative from an economic point of view, when the area outside the reserve is detrimental compared to the reserve. Furthermore, choice of management option may also have negative consequences for long run resource use if it is incorrectly assumed that density dependent migration is symmetric. The analysis also shows that the optimal area to close, a detrimental or attractive ecosystem for the resource in question, may differ depending on the management goal.

**Key Words:** marine reserves, bioeconomics, asymmetric density dependent migration

# USING RESERVES TO PROTECT FISH AND WILDLIFE - SIMPLIFIED MODELING APPROACHES

By

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## Abstract

This paper investigates theoretically to what extent a nature reserve may protect a stock of fish or wildlife against negative effects of harvesting. Two objectives of protection are considered - to avoid stock extinction and to keep the stock at or above a given threshold, the precautionary stock level. The biological model and analysis is kept simple to focus on the effects of reserve creation and size in the case of a homogenous stock and distribution. Two models are formulated and discussed, and in both cases the pre-reserve stock is assumed to follow the logistic growth. For model A post-reserve growth of the total stock is assumed to continue following the logistic growth law with a common carrying capacity. In model B by assumption each sub-stock has its own carrying capacity proportionate to its distribution area. Equilibrium values and stability conditions for the sub-stocks are derived for both models. The critical effort level to fulfill each of the management objectives is derived and it is demonstrated how this depends on migration, natural growth and reserve size. A reserve may fully protect the stock against extinction when migration is small compared to natural growth and the area set aside for the nature reserve is sufficiently large. When migration is large compared to natural growth a reserve as the only management tool can not assure survival of the stock, but combined with a limitation on harvest effort this may protect against extinction.

Effects of reserve shape are also discussed.

**PERFORMANCE INDICATORS OF MARINE PROTECTED AREA  
MANAGEMENT: STAKEHOLDERS' PERSPECTIVES ON SOCIO-ECONOMIC  
IMPACTS OF MPAS ON SICILIAN FISHING COMMUNITIES**

**By**

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**Abstract**

This paper is based on a study of the effectiveness of marine protected area (MPA) performance indicators in the Egadi Islands Marine Reserve (EIMR), located in northwestern Sicily. The overall purpose of this research is to explore and critique the validity of economic, social and ecological performance indicators for MPAs and evaluate the overall performance and socio-economic impacts of the EIMR. Three research questions are addressed. Firstly, what socio-economic impacts has the EIMR imposed on the local fishing community? Secondly, how should performance and success be defined and who should define them in the context of an MPA? Finally, do local stakeholders consider the EIMR to be successful? Using survey instruments, personal interviews and secondary data sources, this case study explores in depth the combination of a characterization of the local fishing sector with an analysis of current MPA management strategies, the socio-economic effects of the MPA on the local community, stakeholder selection of performance indicators, and whether the EIMR can be deemed a success (or failure) according to those indicators.

**TOTAL ECONOMIC VALUE OF FISHERY DEPENDENT AREA CONSERVATION  
IN SRI LANKAN WETLANDS: APPLICATION OF CONTINGENT VALUATION  
METHOD (CVM) AND ANALYTIC HIERARCHY PROCESS (AHP) TO IDENTIFY  
USE AND NON-USE VALUES<sup>1</sup>**

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**Abstract**

Conservation of fishery dependent areas is very important to both inland as well as inshore fisheries. In tropical regions, mangroves and clean water are important aspects of fishery dependent areas, which are considered as the basic requirement for fishery development. The conservation of such areas are dependent on the perception of key stakeholders in the area. A contingent valuation study was carried out to measure the stakeholder willingness to pay (WTP) for conservation of a fishery dependent area in Sri Lanka. A novel approach of one and one-half bound (OOHB) based CVM procedure has been tested to measure the stakeholder WTP on conservation of fish, mangroves and water. Further an AHP procedure has been used to separate use and non-use (passive-use) values from the total value. Results of the survey have been very influential in the recent policy-making process for conservation in dependent areas.

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<sup>1</sup> This research was funded by the Darwin Initiative of the Department for Environment, Food and Rural Affairs (DEFRA), UK.

**FISHERIES AND NATURE CONSERVATION: FISHERIES MANAGEMENT AND  
THE NATURA 2000 – NETWORK**

**By**

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**Abstract**

Two years ago the European Court decided to extend the validity of the EU Flora-Fauna-Habitat Directive for the Exclusive Economic Zone. From now on Member States are responsible for the declaration of protected areas in the 200 sm-zone bordering the shore. Nevertheless, fisheries management will not be affected, except the Council of Fisheries Ministers agrees on common management measures for European fisheries in protected areas.

The status quo of fisheries in the Baltic Sea as well as recommendations for sustainable fisheries and habitat protection are the tenor of a German Federal Agency for Nature Conservation's project on which a group of biologist and economists is working. As far as work shows, future fisheries management will implicate a kind of use concept for the sea and recommendations for sustainable fishing practices in declared areas. The paper will deal with the situation of legislation (nature conservation and fisheries) and Germany's strategy for the Natura 2000-Network in the EEZ. Additionally effects of fisheries on habitats and approaches to reduce external effects on the marine environment because of fishing methods will be discussed.

**Keywords:** Flora-Fauna-Habitat Directive, Fisheries in Protected Areas, External Effects

## **2b) BIODIVERSITY AND CETACEANS**

### **CONNECTING ECOLOGY WITH ECONOMICS IN FISHERIES-DEPENDENT REGIONS: THE CASE OF CORNWALL (UK)**

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#### **Abstract**

Economic activities in coastal fisheries are closely connected with ecosystem health, but coastal ecosystems are under increasing pressures from land and sea developments. The European project PECHDEV proposes to establish a link between Fisheries production and ecosystem indicators in a CGE Model for fisheries-dependent regions.

In most regions, however, fisheries policy is so disconnected from coastal ecosystem management that information is difficult to reconcile or connect. In this paper, we use the case of Cornwall in the UK to argue the ecosystem approach developed in territorial waters (to 6 nautical miles) needs to be extended by achieving a better connection between available data sets and ensuring that fisheries biology information is widely available.

# SOCIO-ECONOMIC IMPACTS OF CETACEAN BYCATCH MITIGATION

By

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Abstract

European Commission project FISH/2003/09 DG FISH-1; Estimation of Cetaceans Bycaught in Pelagic Trawls, was commissioned in December 2003 and awarded to the MacAlister Elliott and Partners Ltd led consortium.

The consortium includes specialists from the following European research institutes: The Sea Mammal Research Unit, St Andrews University (Scotland), IFREMER, France, RIVO, Netherlands, DIFRES, Denmark, BIM, Ireland.

An extensive observer deployment programme has been scheduled for the coming year to cover 5% of fishing effort on European pelagic trawlers operating in fisheries with evidence of a cetacean bycatch problem. To illustrate the magnitude of the problem, a recent study recorded an incident of 30 cetaceans bycaught in a single haul.

Cetacean bycatch mitigation measures come in 2 forms; gear modification and fisheries management options, both come with associated economic impacts to the competent authority and to the fishing industry.

Gear modifications alter the fishing gear thus reducing cetacean bycatch without affecting catch per unit of effort of target species. Such modifications include acoustic deterrents (pingers), acoustically reflective nets, changes in net characteristics, floating head ropes and the addition of separator grids, which are a specific modification to trawls. Implementation of these mitigation measures would have social and economic repercussions on the fishing community and society as a whole. If the implementation of the drift net ban is to be considered, the fishing community will be supported financially through state subsidies and society will gain utility from less cetacean deaths. The willingness to pay of individuals to curtail cetacean death will be identified to quantify the rent gains to society. The assessment of these socio-economic impacts and the identification of optimum cetacean bycatch is the purpose of this study.

The high correlation of cetacean bycatch rates and effort means that the use of fisheries management tools to reduce overall effort (and bycatch) will be most effective. This includes measures such as temporal/spatial closures, banning certain gear types, reducing soak time and/or net lengths and days at sea limitation. Implementation of a management system would need to be considered on a fishery-by-fishery basis, a measure could be used independently or by means of reducing overall fishing effort. The resulting associated economic implications, which would affect the fishing industry, would need consideration and management.

ASCOBANS (the Agreement on the Conservation of Small Cetaceans in the Baltic and North Seas) advises, according to the most recent scientific evidence available, that an unacceptable anthropogenic removal is one above 1.7% of the best available population estimate. It declares an intermediate precautionary objective to reduce bycatch to less than 1% of the best available population estimate. However if it is recognised that a population has been seriously reduced an acceptable anthropogenic removal may be much less than 1.7%. These environmental objectives will be linked to the quantitative socio-economic impacts.

The anthropogenic capture (bycatch) rate of small cetaceans in pelagic trawls in the northeast Atlantic will be calculated as part of our project. If this rate exceeds 1.7% of the best available population estimate, a decision will then be taken as to the best way to reduce this bycatch rate, by assessing and implementing the most effective mitigation measures.

The project will also analyse subsequent repercussions and knock-on effects to the fishing industry and ecosystem so that they can be identified and remedied before the implementation stage.

## **2c) (ENVIRONMENTAL) LABELS AND PREFERENCES**

### **A COST-BENEFIT ANALYSIS OF A PUBLIC LABELLING SCHEME OF FISH QUALITY**

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#### **Abstract**

The purpose of this paper is to introduce a new method capable of evaluating the economic welfare for quality graded fish products using the hedonic price method for plaice in Denmark. Today no labelling scheme exists for the final consumers of different qualities of fish. A scheme does only exist at the first hand market. On this basis, a general applicable theoretical and empirical method is developed to compare the costs and benefits of the hypothetical choice between the total absence of labelling and the presence of a public labelling scheme, which fully inform consumers on the quality and simultaneously allow the producers to differentiate prices between quality grades. It is shown that the economic welfare associated with a public labelling scheme is at minimum 263,000 euro. Sensitivity analysis shows that this result is robust. The policy implication is that a public labelling scheme should not be implemented as the demand and cost functions have low elasticities, implying that the welfare gain is low.

**Key words:** Co-integration, fish quality, hedonic pricing, public labelling scheme, welfare.

**AQUACULTURE AND THE ENVIRONMENT: PUBLIC PREFERENCES AND  
ECONOMIC VALUES**

**By**

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**Abstract**

The paper reports the results of a survey of public attitudes towards aquaculture, conducted as part of the EU-funded BIOFAQs project. (Q5RS-2000-30305). Using salmon farming in Scotland as a case study, the aim was (a) to identify the priority that people attach to the environmental performance of the salmon aquaculture industry relative to other objectives (i.e. employment, etc.) and (b) to measure the economic benefits to society from growing salmon in a way which causes less damage to the environment. The results demonstrated a clear opinion amongst the public that minimisation of environmental damage should be the most important objective of aquaculture, and this had its parallel in the finding that people were willing to pay a price premium for salmon produced in a more environmentally benign way. The estimated average willingness to pay (WTP) for salmon that was farmed using a method that caused only half the amount of organic pollution was about £4.78 per kg, representing a premium of some 25% over the price of normal salmon. The survey thus showed that the public are not indifferent to the environmental performance of the aquaculture industry, a result which arguably should be taken into consideration by policy makers in the design of guidelines for regulating the activities in fin-fish farming.

## **SESSION THREE: FISHERIES DEVELOPMENT AND EMPLOYMENT**

### **3a) MODELLING TRENDS IN EMPLOYMENT AND WAGES**

#### **FISHERIES VERSUS AQUACULTURE ON A TYPICAL PORTUGUESE COASTAL COMMUNITY**

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#### **Abstract**

Aquaculture has become a very important alternative to fisheries, both in terms of fish production and employment, in some fishing villages of the Algarve (South Portugal). The aim of the present article is to characterise the dynamics of both activities in the region and also investigate the determinants of labour mobility between them. For this purpose a typical coastal community, Fuseta, was selected and questionnaires were undertaken in order to collect information on the socio-economic characteristics of the local inhabitants employed in aquaculture and fisheries. The questionnaires included questions on issues such as the individuals willingness towards geographical and occupational mobility and the perceptions of their jobs. Given the discrete nature of the outcomes, binary logit models were specified and estimated.

It is concluded that although the fisheries sector presents a clear declining trend, both in production and employment, there isn't much mobility from fishing to aquaculture. In fact, fishermen are more willing to change areas to remain fishing than to change jobs within the area. The main variables that determine entry and exit from fisheries and aquaculture are the education level and the age of the people employed in these activities.

**Keywords:** fisheries; aquaculture, discrete choice models; logit

**WAGES IN THE FISHING SECTOR: AN ESTIMATION OF THE WAGE LEVEL  
FOR THE FISHING FLEETS IN THE BASQUE COUNTRY**

**By**

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**Abstract**

The paper focuses on the estimation of fishermen remuneration rates (i.e. wage rates) for the diverse fishing sub-sectors operating in the Basque Country. To do so, first different workforce remunerating systems are explained and justified from the labour economics perspective, stressing the particular uncertainty surrounding fishing activity. Special attention will be paid to the most generalised remuneration system in the Basque fishing sector: the share part salary, which should be linked with a principal-agent and asymmetric information framework. Data obtained from a broad request realised on a representative sample of the inshore fishing sector will be used to undertake the empirical work. Finally, wages in the Basque fishing sector will be compared with the ones related to another similar activities attending their requirement of human capital accumulation. Furthermore, efforts will be made to evaluate potential differences in the fishing salaries of geographically next European states (i.e. Portugal and France). Rather low wages can justify the small succession rate found in the vessel's owners and the increasing percentage of immigrant fishermen.

# VOCATIONAL EDUCATIONAL TRAINING PATHWAYS IN THE MEDITERRANEAN

By

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## Abstract

Only recently Sustainable Fishery concepts entered the discussion of stakeholders, specially policy and decision makers, because till some years ago it was under evaluated and under estimated in terms of its strategically overview for its biological, economical, social and environmental impacts. FISHTRAIN project activities, co-funded by EU under Leonardo da Vinci Programme, title of the project: “Pathways to Vocational Training for Workers in Fishery Sector” cod EL/01/B/F/PP-114012 ([www.fishtrain.net](http://www.fishtrain.net)), are oriented to design, test and evaluate Vocational Educational Training (VET) pathways ”tailored to user needs and requirements” based on Sustainable Fisheries concepts, with particular attention to the Mediterranean situation. According to such perspective of Sustainable Fishery “work force and human factors” in fishery sector become the target group of a new, re-designed VET approach inside a Long Life Learning system. Present initiative aims to provide a concrete contribution to the structural modification of the employment in the sector which shows growing difficulties to involve European youngsters in fishery activities and extra EU workers entering the sector like fishermen.

Keywords: Sustainable Fishery, Vocational Educational Training, VET, fishermen.

### **3b) THE ROLE OF FISHERIES IN DEVELOPMENT**

#### **REGIONAL INCOME GENERATION AND FISHERIES SECTOR LINKAGES IN A DANISH REGION**

**By**

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#### **Abstract**

This paper describes the regional development issues for Danish fisheries dependent regions and relates these to a Social Accounting Matrix developed for the PECHDEV project. The regional industry structure and the linkages between the local community and other regions are described with a focus on the fishery and fisheries-related business activities. Further the specific features of the local community are identified and compared to other Danish and European regions: Finally conditions for stabilisation and development of the local community are discussed.

**DO FISHERIES CONTRIBUTE TO REGIONAL DEVELOPMENT? THE CASE OF  
CORNWALL IN ENGLAND**

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**Abstract**

Over the last two decades, the Fisheries Sector appeared to be condemned in many regions of Europe. It was therefore fashionable to develop incentives to push the fishermen out of the Fisheries sector. Another predominant idea was that small-scale fishery couldn't survive this new age of modernity.

The early 21st century brings surprises: nearly all the value of landings is coming from coastal waters. This means that: First, artisanal fisheries can go through difficulties without disappearing; Second, that the coastal Fisheries Sector has been better managed than that of distant water Fisheries; and Third, that Fisheries policies should attend more to the harmonious development of coastal fisheries and their ecosystems.

This paper will focus on Cornwall in the UK, reporting on work done for the European PECHDEV project. It will underline the development potential of coastal fisheries and propose new ways to define the role of the fisheries sector in the regional development process.

**SESSION FOUR: IMPACT OF FISHERIES MANAGEMENT DECISIONS ON  
FISHERIES**

#### **4a) OUTPUT CONTROLS: TACs**

### **MEASURING CAPACITY IN A PROFIT MAXIMIZING MP SET-UP: SENSITIVITY WITH RESPECT TO LONG RUN STOCK EFFECTS**

**By**

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#### **Abstract**

Fishing is an economic activity. The existence of an unbalance between fishing capacity and available resources can lead to biological overfishing and under-utilisation of the capital assets. Reducing the excess capacity, and thereby a lump of fixed costs, would cause overall profits to rise. Recovery of stocks would eventually enhance the fishing possibilities and affect the balance between capacity and resources. An Economic Management Model for Fisheries in Denmark (EMMFID) has been developed<sup>1</sup> and is set up in a Mathematical Programming (MP) framework. Given access to detailed data and the processing power of today it is possible to develop an all-inclusive model covering the entire Danish fishery<sup>2</sup>. Fleet size and number of fishing days per vessel are the decision variables, and the basic goal for the fishery is to achieve optimal economic yield from the resources while maintaining resources at a sustainable level. The model makes it possible to analyse the optimal capacity and profits with respect to long run stock effects.

A formal and brief presentation of the model is put forward and implementation issues, such as data sources, model dimensions etc., are considered. A comparative analysis of optimal fishing capacity in terms of number of vessels and number of days at sea, and corresponding profit, is then carried out. The situation with the current TACs is compared with the situation of long run TACs.

**Keywords:** Management model, Danish commercial fishery, mathematical programming, capacity, long run TACs.

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<sup>1</sup> The model is part of a project financed by The Directorate of Food, Fisheries and Agri Business under the Danish Ministry of Food, Agriculture and Fisheries (FIFO-SJFI-5).

<sup>2</sup> Vessels below 12 metres of length are excluded for technical reasons.

**OPTIMAL QUOTA CONFIGURATION FOR THE FLEET OF DANISH TRAWLERS  
BELOW 50 GRT: A DUAL APPROACH**

**By**

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**Abstract**

The Danish Fishery is administered by a combination of output-regulation and capacity-regulation, the latter measured in tonnage and horsepower. Until 2003 the Danish fishery has to a high degree been managed through quotas based on the Total Allowable Catches (TAC's). Fishermen have been granted individual quotas that vary depending on the time-span for the quota (weekly running to yearly), and vessel size and gear. As such the Danish fishery generally faces restrictions on the amount of fish landed, i.e. on the output. When the output is restricted through individual quotas the revenue of the fishermen are fixed, and they will try to maximize profit by minimizing their costs. To model the economic behaviour of the fishermen a dual cost-function approach is therefore the appropriate choice. This method will be applied, using a restricted generalized Leontief cost function, to model the cost-structure for the fleet of Danish trawlers below 50 GRT in the period 1995-2000. It will be shown how the estimated cost function can be used to assess the optimal profit maximising quotas in the short run for the fleet.

**COD RECOVERY PLAN: PREDICTED AND REALISED „LOSSES“ IN THE CASE OF GERMANY**

By

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Abstract

The depleted stock of cod in the north sea caused the EU to take some serious measure. The Council fixed on a long-term recovery plan for cod and also hake and whiting which associated each other. The TAC are cut due to the reduced stock biomass. Additionally fishing effort limitations in the North Sea, Irish Sea and west of Scotland are decided to reduce the pressure on the resources.

On request of the German Federal Ministry of Consumer Protection and Agriculture the economic impacts of the effort limitations are investigated, based on the Council Regulation (EC) No 2341/2002 and 671/2003 (ANNEX XVII).

The behaviour, landings and revenues were studied during the period 2000 until 2002. Applying the restrictive rules of regulation the potential losses were estimated. The Data base of the analysis were the individual logbook and landing records. This results were compared with the records of the previous year 2003 where the regulation already came in operation.

About one third of the German vessels were active in the defined area. Half of them were more or less touched by the restrictive regime of the regulation. The predicted total losses, based on the years 2000-2002, were totally around 3000 t fish or 7 Mio. € per year. The per vessel losses on landings and revenue would be on average 40 t and 85,000 € or about 30% respectively 27% of the total catch and revenues.

The demersal trawls equal or greater as 100 mm mesh size (gear type group 4a of the regulation) are seriously attached by the regulation, followed by the beam trawler (mesh size greater than 80 mm, group 4b).

The analysis of the year 2003 shows that only a few boats exceeded the threshold of available days at sea. 8% of the catch and 11% of the earnings are realised outside of the regulation limits from this vessels. There is no information in which extend they used the flexibility of the regulation by swapping seedays between vessels. The economic parameters were similar compared to previous years.

Keywords: cod recovery plan, North Sea, economic impacts

# **THE SCOTTISH WHITEFISH FLEET: IMPACT OF FISHERIES MANAGEMENT DECISIONS**

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## **Abstract**

The December 2003 EU Fisheries Council agreed a complex set of management measures. The expansion of effort control, introduction of a cod conservation box, permits, quotas, and a tougher enforcement regime will directly affect the Scottish whitefish fleet.

Management measures introduced over the last decade have shaped the structure and impacted on the financial performance of the Scottish whitefish fleet. Recent Seafish research has highlighted the fragile financial health of the whitefish fleet (net profit margins were 5.6% in 2003 compared to 18.6% in 1998). Profit margins have been low for the whitefish fleet for the last five years. The whitefish fleet has also experienced a 50% cut in vessel numbers since 2000.

The combination of management measures in 2004 make it very difficult for Scottish whitefish vessels to fish legally and profitably. Low profit margins and the short-term nature of fisheries management measures are currently inhibiting investment.

A successful management strategy must achieve a balance between social and economic objectives, within clearly defined biological and environmental constraints. Those with a direct economic or social interest in the fishery should be central to the decision making process. Devolved management is one framework within which improved fisheries management could be delivered.

This paper will summarise recent Seafish research regarding the economic viability and sustainability of the Scottish whitefish fleet.

#### **4b) OUTPUT CONTROLS: ITQs**

### **OUTPUT REGULATION OF MULTIPRODUCT FIRMS: AN APPLICATION OF THE QUADRATIC PROFIT FUNCTION**

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**and**

**F. Asche and D. Gordon**

#### **Abstract**

The purpose in the paper is to estimate economic aspects for output regulated fishing vessels. Regulation imposes individual vessel quotas on the vessels, whereas other outputs harvested are not restricted by regulation. The paper addresses different economic questions arising for the regulated firms. How do the vessels respond to regulation? What are the shadow prices of additional quotas in the fishery? What about the presence of cost complementarity in the production of the restricted and unrestricted outputs? The questions are addressed by using econometric estimation of the symmetric quadratic profit function (Kohli, 1993). For related literature see Bjørndal and Gordon (2000 MRE), Jensen (2002 MRE) and Squires (1987abc).

**Keywords:** Econometrics, Dual approach, Fish Harvesting, Output Regulation

## **INDIVIDUAL QUOTAS, DISCARDING AND STOCK SIZE**

**By**

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### **Abstract**

In this paper economic analysis is used to improve understanding of the relation between the use of individual transferable quotas (ITQs) and excessive discarding of fish. In particular, the paper analyses how successful an ITQ management system is in bringing a fishery from the open access level to the optimal situation in the presence of discarding. The model developed in the paper extends previous work in this area by including long run effects, firstly to assess whether an ITQ system can lead to a reduction in, or even depletion of, fish stocks through excessive discarding, and secondly, to analyse the effect of discarding on the number of fishers operating in the fishery. It is shown that in an ITQ fishery more fish will be discarded than is optimal and that too many fishers will operate in the fishery. A significant result is that an ITQ system will result in a larger stock size, as compared to open access, even in the presence of excessive discarding. This indicates that the combination of ITQs and excessive discarding will not lead to stock depletion.

# **CAPACITY REDUCTION IN THE ICELANDIC TRAWLER FISHERY**

**By**

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## **Abstract**

One of the expected results from individual transferable quota systems is increased efficiency through better utilization of capital and labor in the fishery. This paper looks at the development of capacity in the Icelandic trawler fishery from 1995 through 2002, with emphasis on the segment of the trawler fleet which targets cod.

The trawler fleet has reduced in numbers over this period but overall capacity is relatively after the year 2000. Detailed analysis of the data shows that the target species within the trawler fleet have changed substantially leading to an effort and capacity reduction in the trawler fleet which targets cod. These findings are interesting since they strongly suggest that the trawler fleet in Iceland is being rationalized under the current individual transferable quota system. The study goes into further detail by estimating a long run cost curve for the Icelandic trawler fishery.

# **SOME LINKS BETWEEN FISH EXPORT MARKETING AND FISHERIES MANAGEMENT: THE CASE OF NORWEGIAN COD**

**By**

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## **Abstract**

Research question and background. This paper explores the interaction of fisheries management and governmental regulations upon for fish export marketing and trade. In the case of Norwegian Atlantic cod (*Gadus morhua*) three significant political and regulatory changes in the early 1990's influenced the supply of cod: the USSR was reconstituted as Russia, Norway joined the European Economic Area (EEA) and the TAC for cod was increased. The new Russian regime changed the Russian trawlers' regulatory environment, which made it more profitable to land and export cod directly in Norwegian harbours to Norwegian importers. The Norwegian participation in the EEA changed the Norwegian regulatory rules of exchange between producers and they're first hand buyers, thus enabling access for all who wanted to enter under certain common rules. Finally, the increased TAC in the first half of the 1990's was based on agreements between Norway and Russia.

Data. Norwegian export statistics for the period 1990-2003 regarding price and export flows of products and to the different markets.

Results. The export pattern of processed products is stable indicating that product mix is a function of biological and technical constraints and less of total of TAC and supply quantity. The export volume of fresh unprocessed fish has increased significantly due to increased prices and demand. The percentage of exported fresh fillets is unchanged indicating that Danish traders take advantage of importing unprocessed fresh fish from Norway which is sorted and processed for re-export to other EU countries.

The deregulation of the first hand market opened up for traders of unprocessed fish and reduced the barriers for export of fresh fish and frozen fish. Technological development has made it possible to utilize frozen cod for production of salted and dried fish (klipfish), which enabled access to the Portuguese and Canadian raw fish markets demanding raw material for their klipfish industry.

Export of round frozen cod has increased significantly to China, where filleting operations are highly competitive because of low labour costs. This value chain has been strengthened by Norwegian investment in cold storages and frozen fish auctions, which have made the product-flow both easier and more profitable for the traders.

The combined result is decreasing operation margins for the traditional Norwegian fish processors, who haven't changed their export-marketing strategies in line with the changes in the market. Bankruptcies and development of more competitive market oriented fresh fish strategies forced upon the actors by the market pressure is therefore a major result of the 1990's institutional changes.

Keyword: Fish export marketing behaviour, Cod products, EU, Russia, China, Canada, Fisheries management, *Gadus morhua*, EEA.

#### 4c) FISHERS' PERCEPTIONS

##### INCENTIVE COMPATIBILITY OF FISH-SHARING AGREEMENTS

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#### Abstract

This paper discusses the incentive compatibility of fish-sharing agreements based on zonal attachment of fish stocks. It is shown that the minor partner in a fish-sharing agreement may not have an incentive to cooperate unless he gets a larger share of the cooperative profits than his share of the stock according to the zonal attachment. This is particularly likely to happen when the unit cost of fish does not depend on the stock.

## **HETEROGENEOUS FISHERMEN – SOME IMPLICATIONS FOR MANAGEMENT**

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### Abstract

While the literature on regulation and incentives has evolved, not much has been done to apply such models to fisheries management, with some notable exceptions. Most standard fisheries management models assume that the fishermen are a homogeneous lot.

Although this assumption of homogeneity greatly simplifies the analysis and those models give important insights into the economic problems of fisheries management, it nevertheless overlooks some important problems that arise when implementing fisheries management tools.

In this paper we present a simple dynamic model with heterogeneous fishermen whose abilities are private information. We analyse the consequences of their heterogeneity for fisheries management and estimate the economic loss and inefficiency of not having complete information on the fishermen's different abilities. We then discuss incentive schemes to minimize those inefficiencies.

## **FISHERIES IN EUROPE: A SURVEY OF FISHERMEN PERCEPTIONS**

**By**

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### **Abstract**

For three years, a multidisciplinary group of researchers in social sciences has analysed how fishermen perceive the state of fisheries and their management. This programme “ELSA-pêche”, funded under the Ethical, Legal and Social Aspects (ELSA) line of the FAIR programme has conducted an extensive interview and questionnaire survey. This communication will present the results of a questionnaire based survey to which 1600 European fishermen have answered either by postal way or direct interview. Boat owners from ten of the EU countries plus Norway and Iceland have been contacted. The questionnaire was divided in four themes. The first is about the perception of the state of marine ecosystem and of the fisheries. The second is about the hierarchisation of the causes of difficulties in fisheries. The third addresses the conditions for a good governance of human to nature relation in fisheries. And the last theme is about the human to human relations, or institutional conditions, in fisheries management. The results of the survey are analyzed using multivariate analysis tools. These shows elements of convergence but also great oppositions regarding the key issues debated in Europe between different parts of Europe and across the main segments of the industry.

**MEASURING THE EFFECTS OF DISTANCE TO FISHING GROUNDS IN  
LOCATION CHOICE MODELLING**

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**Abstract**

The study of short-term fisher decision making has become a key research topic within fisheries economics and modelling. This is due to the need for more detailed (spatial) analyses for the provision of advice to management. The growing importance of fishing exclusion zones (or marine protected areas) to fisheries management plans has been a factor. It is generally surmised that the need to understand the spatial movement of fishers to predict potential fisher activity in the light of such regulation can assist in the identification of more effective management. For the location choice problem, random utility (or discrete choice) modelling has become the established tool. In this framework, one can include both vessel characteristics (e.g. vessel length and engine power) and choice attributes (e.g. ICES rectangle fished, trip revenue). Distance from port to fishing grounds and associated variable costs would be expected to influence the location choice decision of the fisher. In this paper, a nested logit model is considered for the mixed fisheries of the English North Sea beam trawlers in 2000. Trip level data is used for the most important of the potential 200 ICES rectangles for this fleet, including distance travelled to grounds with costs. Further, attributes are included for 1999 vessel activity to indicate some immediate historical fishing pattern. The analysis is undertaken with the knowledge of the imposed 2001 temporary closed area in the North Sea.

**Keywords:** location choice, discrete choice modelling, fisher behaviour.

# **FISHERIES MANAGEMENT IN THE NORTH SEA: ANALYSING FISHERMEN PERCEPTIONS**

**By**

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## **Abstract**

Based on the “ELSA Pêche”<sup>2</sup> postal survey, this paper presents a specific statistical analysis of the data base, focused on the North Sea bordering regions. It analyses fishermen perceptions on the stakes for the future of North Sea fisheries and on the management system, according to major characteristic of type of activity (gear), area of activity (coastal/ offshore). This analyse is realised in the context of the “Policy and Knowledge in fisheries management” - PKFM project funded under the 5<sup>th</sup> Framework Programme.

**Keywords:** Fisheries management; fishers perceptions; North Sea; Common fisheries policy

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<sup>2</sup> « Ethical, Legal and Social Aspects of Fisheries Management in Europe » project funded under the EU-FAIR programme.

#### **4d) OTHER MANAGEMENT MEASURES**

##### **A COMPARATIVE ANALYSIS OF ITALIAN BUY BACK PROGRAMS**

**By**

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#### **Abstract**

Programs to buy back fishing vessel and licenses represent one of the key alternatives to address issues of overcapacity, to increase economic rents, or to reduce fishing pressures on some marine resources.

Three different buyback programs have been experienced in Italy: “the clams program”, the swordfish drifnets plan (“piano spadare”) and the general EU program of capacity reduction.

The paper will discuss, for each of the three programs, if their objectives have been met, strengths and weaknesses of each program and their impact on fishing capacity and rents.

A comparative analysis will be useful to understand why some programs have been successful and others have failed to meet their objectives and to determine common linkages between programs and the likely application of successful programs for the future.

**Key words:** fishery management, buy back, fishing capacity

**THE ECONOMIC IMPACT OF A FISHING BAN – THE CASE OF THE NEPHROPS  
FISHERY IN THE BAY OF BISCAY (FRANCE)**

**Paper submitted to the XVIth Annual EAFE Conference  
Food and Agriculture Organization of the United Nations (FAO)  
Rome, Italy, 5-7 April, 2004**

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**Abstract**

Amongst management measures, a fishing ban is considered such as technical measures. Indeed, time and area closures could be implemented to limit a “race for fish”. Another framework of fishing ban must be considered under a tie-up scheme for targeted fleets. These management tools are discussed in a first part of the paper. The effectiveness of technical measures relies on displayed objectives by stake-holders. In a second part, the nephrops fishery in the bay of Biscay (France) is described (VIIIa,b,d, ICES). Economic fishery data are available for trawlers fleet harvesting the stock of nephrops in these areas. Bookkeeping and landings value are processed by the Economic Observatory of Fisheries in Brittany from the 1994 year. The third part is devoted to statistical estimation for a set of 17 fishing vessels on 8 years. Cost and earnings are calculated on a monthly and quaterly basis. The two alternatives regimes to limit the period of production, area closure and tie-up scheme, are analysed according to obtained statistical results. In last section, conclusive remarks suggest a debate on the efficiency of technical measures, such as a fishing ban, and potential distributional effects on fishermen.

**INCORPORATING BIOLOGICAL AND SOCIO-ECONOMIC OBJECTIVES INTO  
THE MANAGEMENT OF ATLANTIC SALMON (*SALMO SALAR* L.) ON THE  
RIVER LUNE, NORTH WEST ENGLAND**

By

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Abstract

The River Lune in North West England supports important recreational rod-and-line and commercial net fisheries for Atlantic salmon (*Salmo salar* L.). The total economic value of the net and rod fisheries (1998 prices) was estimated to be £65.5K and £540K per year, respectively. In addition, the net fishery generated gross revenues of £40K per year and the rod fishery generated gross expenditure of £675K per year. In the ten-year period from 1990 to 1999, the salmon fishery supported 37 commercial net fishermen, the highest number of any single estuary in England and Wales and provided an average total annual catch of 1,994 ( $\pm 875$ ) salmon. The average annual catch to the rods in the same period was 1,476 ( $\pm 573$ ) salmon. The annual run of salmon entering the river, as enumerated by a resistivity fish counter, averaged 5,289 ( $\pm 1,342$ ) over this period. The exploitation rates for the net and rod fisheries were 27.4% and 29.3% respectively.

In managing salmon populations in England and Wales, the Environment Agency uses a spawning escapement target-based approach. This method involves establishing the optimum number of spawning adults for each salmon river and assessing the compliance against this target annually. It was estimated that, for the Lune, at least 4,981 spawning salmon were required to ensure compliance. On average, only 3,800 salmon were spawning in the River Lune between 1990 and 1999. In order to achieve the optimum spawning target, it was therefore estimated that an extra *c.* 1,200 salmon were required to spawn each year.

The management objective for the Lune salmon stock was to ensure that it achieved its spawning target four years out of five (the Environment Agency's test of compliance), while also maintaining an economically viable and sustainable fishery. In order to achieve the additional 1,200 fish escapement, net exploitation would need to be reduced to 15%, equivalent to 13 nets. However, 19 nets claimed to be economically dependent upon the fishery, equivalent to 16.5% exploitation. In order to ensure that those extra fish made available by reducing the net exploitation, were not removed by the rod fishery, a restriction in rod catch also needed to be imposed. Restricting the net fishery to the 19 dependent netsmen was estimated to contribute 1,054 salmon to stock conservation each year. In addition, restricting the annual rod bag limit to 4 salmon per year was estimated to contribute at least 270 salmon to stock conservation. This combination of restrictions was imposed in 2000.

In the four years (2000-2003) since the imposition of the exploitation reductions, the average annual net catch has fallen to 1,386 ( $\pm 336$ ) salmon, the average annual rod catch has fallen to 1,072 ( $\pm 368$ ) salmon, and the average annual run of salmon over the fish counter has risen to 7,758 ( $\pm 1,003$ ). Consequently, exploitation rates by the net and rod fisheries have fallen to 15.2% and 13.8% respectively, and the river has complied with its spawning target in each of these years.

# THE SAM MATRIX FOR THE GALIZIAN FISHING SECTOR: WHAT DO WE LEARN FROM IT?

By

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## Abstract

The aim of this paper is threefold. In the first place, we want to build the Social Accounting Matrix (SAM) for the Galizian fishing sector. The second target is to use the information of the SAM in order to analyse the interactions of the fishing and aquaculture activities in the regional development of Galizia, taking into account economic and social variables. And, finally, we shall use this instrument to evaluate the impacts of different policies and/or changes in the final demand.

The structure of the SAM is as follows. First, both the activities and the commodities have been split into two blocks: Fishing and Non-fishing. The Fishing activities include: 1) Fishing, classified according to the following fleet segments: Inshore, Coastal, Deep sea and Industrial Fishing; 2) Shellfishing; 3) Aquaculture; 4) Preserving Industries. Since we are studying the Galizian fishing sector, it is necessary to treat separately, on the one hand, Shellfishing which stands for more than 15% of the landings and that is intensive in labour, and, on the other hand, aquaculture where Galizia is a leader not only in Spain (it concentrates most of the Spanish activity) but in Europe as well. The non-fishing sector activities included in the SAM have been selected according to their relationship to the fishing sector. The "Fishing" commodities considered include twenty different species. The selection has been carried out depending on the value of the landings, bearing in mind that each fleet segment should have, at least, one key species. With respect to income distribution, two factors have been included: labor and capital, and in the Institutions part, the Household sector has been also split, into Non-fishers and Fishers Households. For the main part of the analysis, Government, Rest of the World and Capital accounts are taken as exogenous.

We have focused in the Galizian fishery which is the most important one in Spain. As a matter of fact, the Fishing sector in Galizia accounts for half of the Spanish Fishing sector and a fourth of the European one. The Fishing sector influences most of the economy in Galizia not only due to its business and labour volume but because of its multiplier effect in the economy. An industrial complex, related to fishing, has been created in Galizia. The two more important segments, in terms of value of landings, are Deep Sea and Industrial Fishing, and, in terms of species, hake, anglerfish, horse mackerel and sardine. Due to the fact that Deep Sea Fishing takes place in European waters, it makes sense to analyse the impacts that the CFP has had and will have on the regional economy. Nevertheless, we are aware that the coastal segment of fisheries are very important for regional development, in fact, the majority of the Galizian fleet is working in this fleet segment, and its landings represent 50%, in volume, of the landings in "ports galegos" and 30% in value. For this reason, we also make a detailed analysis of the implications of coastal fishing in the main economic indicators for this Autonomous Community of Spain.

Given that most of the measures established in the CFP are supply-oriented, some adjustments have to be made to the SAM in order to be able to evaluate the policy impacts in the Galizian regional development.

# **THE NEED OF INTERNATIONAL REGULATION: THE CASE OF FAD IN OCEAN TUNA FISHERIES**

**By**

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## **Abstract**

The territorial access strategy to fish stocks has played an important place in history in front of the difficulties to establish the individual property rights. The territorial division of fishing areas has been a solution to organize the access and exclusion of fishers to stocks. The modern ways of regulations have leaved out territoriality as the most important method of fisheries management.

Paradoxically new ways of territoriality have emerged in tuna fisheries. This kind of territoriality differs in the forms from those indicated previously but it works also for access to fish stocks in these case based in new techniques. In tuna fishing has emerged strongly a gear or a method of fishing named FAD (Fish-Aggregating Devices) that works as mobile attractors of small tuna schools in the ocean, creating territorial focus of attraction in the middle of tuna migratory itineraries. These FAD are first settled on the ocean and next localized and suited by means of satellite detection instruments from the ship. The migratory passageways of tunas are at the same time built-up in fishing 'territorial' areas by industrial tuna fleets in different zones of world oceans. This fleets today are coming from different states, and they catch far from the territorial waters and EEZ waters when possible, and with preference out of states regulations.

The present paper is concerned with taking account of this phenomenon and with its consequences related to access to stocks, taking into consideration that this kind of strategies are based in the new techniques used. But with this gears and strategies, exclusion from fishery is very difficult to organize. In international waters everybody can adopt the same fishing method, and some kind of regulations are needed. So, this phenomenon put states and international regulatory commissions in front of new questions and new challenges. But at the same time it put the fisher and fishing corporations in front of new needs of cooperation to take self-regulations measures and co-management type rules to regulate their activities and to stop the risk of the 'tragedy of commons'. The paper will analyse which kind of measures have been taken about this gear in the regulatory direction and which problems remain waiting to solve.

## **SESSION FIVE: RESEARCH ISSUES**

## **5a) BIO-ECONOMIC MODELLING**

### **A NEW FORMULATION OF THE SCHAEFER MODEL**

**By**

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Abstract

In this paper we present a modified Schaefer model that includes technical progress. In the Schaefer model the catchability coefficient is assumed to be constant, so the change in technology cannot be accounted. We try to generalize the Schaefer Model considering a varying catchability coefficient affected by new investments as a measure of technology improvement. Assuming catchability as a function of the state of technology, we consider variations on catchability caused by accruing capital, as a substitution factor of the fleet capacity. With this approach a generalised Schaefer model can be obtained to accommodate variability into catchability by using a variable which measures the level of new investments in fisheries. Such new formulation could overcome concerns about using logistic models for general bio-economic model building.

Key words: Schaefer model, catchability, investments.

**FROM BIOLOGY TO ECONOMY: DEVELOPMENT OF A COMPUTABLE  
GENERAL EQUILIBRIUM MODEL (CGEM) APPLIED TO THE FRENCH  
FISHERY SECTOR**

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**Abstract**

Classic bio-economic approaches have shown their interest but also their limits in helping decisions makers in fishery management. Many authors have emphasized the discrepancy between predictions of these models and current problems mainly dealing with fish resource scarcity and regulation of the fishery sector through the market.

Since a decade, other methodologies based on General Equilibrium Modelling applied to the fishery sector have emerged (Bernard, 1998). In this context, the PECHDEV project financed by the European Union aims to develop those methods to account for the contribution made by the activities of fishery and aquaculture to the development of regions dependent on fishing.

This paper presents a first step in modelling based on the whole French fishery sector. It aims to show the relations linking the economic and biological frameworks by simultaneously integrating optimisation behaviours of the economic actors and fish population dynamics. Two biological production functions are estimated in the North-east Atlantic, one for the whole resources and another one for the demersal gadoid group in order to analyse their potential impact on the fish production sector in France. The production functions defined allow to take account for different types of reactivity in effort allocation for the foreign fishing fleets targeting the same stocks as the French fleet. Besides the technical aspects, some simulation results are presented regarding the consequences of a variation in some tools of economic policy (taxes for instance) on the whole market and on the state of the stocks. Some sensitivity analyses are conducted to test the assumptions made and discuss the results obtained.

**Key words:** Computable General Equilibrium Models (C60), Renewable resources (Q20), Fishery management (Q22)

**ECOLOGICAL SUSTAINABLE FISHERIES ON THE LONG-TERM –  
ECONOMICAL MISERY FOR THE FISHERMEN ON THE SHORT-TERM  
SIMULATION OF THE IMPACTS OF MESH-SIZE REGULATION ON THE  
PROFESSIONAL GILL NET FISHERIES IN THE ARCHIPELAGO SEA REGION,  
FINLAND**

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**Abstract**

The Archipelago Sea is the most important fishing area for small-scale fisheries at the Finnish coast. The most valuable species for professional fishermen is pikeperch (*Sander lucioperca*), which is almost exclusively caught with gill nets. In the Archipelago Sea the minimum mesh size (bar length) for pikeperch gill-net fishing is currently 43-45 mm. From the biological point of view, the sustainability of pikeperch fisheries could be improved by enlarging the mesh size. This measure has been strongly criticized by fishermen, who argue that it would hazard the profitability of fisheries. The impacts of an increase of the mesh size to 50 mm were analysed using a bio-economic simulation model. According to simulation, the yield would be cut down by 50 % during the first year, but after some years it would stabilize on a level 20 % higher than before the shift. The short-term impacts on the profitability of commercial fishing would be negative, because it would take three years before the expected present value of the catch exceeds the value prior to the change in mesh size, and eight years before the expected net present value of the catch would be positive.

**FISHING SELECTIVITY AND EFFORT TAX IN THE MULTI-GEAR HAKE  
FISHERY (SOUTHERN STOCK)**

**By**

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**Abstract**

The optimal management of a multi-gear fishery in which the fishing technology affects the growth rate of resource is examined. Besides, since EU discarded the use of individual transferable rights, effort taxes are proposing as regulatory mechanism. The analysis is applied to the European southern hake stock. The results show the equilibrium levels for the tax to be applied to each fleet depend on shadow price, marginal productivity of effort and effect of gear selectivity on natural growth of biomass. And the greater effect of fleet is technology (in negative way), the greater tax level is obtained for this fleet.

**Keywords:** Bio-economic model, Multi-gear fishery, Fishing selectivity, Tax on effort, European Hake.

**ANALYTICAL AND METHODOLOGICAL TOOLS FOR FISHERIES  
MANAGEMENT: THE ADRIATIC SEA**

**By**

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**Abstract**

An important issue in the management of economic production activities which - like fishing - use renewable resources is the interdependence of the economic and the biological aspects. Capital dimensioning as related to the efficiency of production activities, possibly the most important issue in fisheries management, is an economic factor that cannot be addressed separately from the consideration of natural resource availability, a biological factor.

Given this interdependence, any analytical approach based on a single discipline cannot account for the interactions that characterize the fisheries system; its understanding as well as its management require a multidisciplinary approach.

The main multidisciplinary approaches are represented by the bio-economic models.

However, the characteristic features of multi-species/multi-system fisheries - like those of the Mediterranean and particularly of the Adriatic - and the consequent lack of data do not allow to use these models effectively.

The problem thus arises of identifying suitable interpretive models.

Clearly, the biological data - the state of resources, absolute biomass availability and the amounts that can be harvested without undermining the ecosystem's regeneration capacity while maintaining stocks abundance - constitute the very base of fisheries management.

One of the main problems in identifying the appropriate analytical tools as well as for the adequate management of fishing in the Adriatic has long been the lack of biological data on the actual availability of the exploited resources, and more in general of biological information that can provide sound premises for the effective and efficient stocks management in the basin. For the first time, this problem has, at least partially, been addressed by the "Mediterranean" Programme, which by means of research campaigns conducted since 1996 throughout the Adriatic, has allowed to gather information indispensable to assess the biomass availability of 36 demersal species in the basin, and has made available the biomass index data for the species studied.

Starting from this essential information, the present work - which addresses the identification of a suitable analytical method for the determination and the potential application of the principles of sustainable fishing to Adriatic fisheries management - focuses on the study of cod and red mullet in the area defined by the GFCM as M.U. 37.2.1.a., which broadly corresponds with the High and Middle Adriatic.

Given the limited methodological scope of the “Meditis” Programme as well as the numerous assumptions made in the processing of such data, the present work should to be viewed as an exercise performed with real figures.

Despite these limitations, the study clearly evidences the difficulties posed by the selection of appropriate analytical tools when addressing multi-species and multi-stock fishing in areas where such stocks are shared by several countries.

The reasons for the unsuitability of the bioeconomic models for application to the study of Adriatic fisheries are highlighted, as are the advantages afforded by the utilization of indicators, valuable tools for the sustainable management of the sector.

Indeed, preliminary indications on the bioeconomic interrelations of the two species studied come from the analysis of some indicators devised and interpreted in this work.

A proposal is also advanced on a possible way to collect information of various nature with a view to overcoming the impossibility of developing more detailed multidisciplinary analyses and to learning more on the regularities that characterize the interrelations between environment and economics in the Adriatic.

Such analyses should represent sound scientific bases for decision-making in fisheries management.

# **AN ECONOMETRIC APPROACH TO COMPARE THE EFFECTS OF VARIATIONS OF FISHING CAPACITY AND ACTIVITY**

**By**

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## **Abstract**

In this study we applied a Vector Auto Regressive technique (VAR) in order to compare long-term implications of reducing fishing effort by varying fishing capacity and/or activity. The analysis has been performed by using data from Northern and Central Adriatic fishing area (GCFM-GSA 17) collected by Irepa within BEMMFISH research project (Contract Q5RS-2001-01533).

The so-called Vector Auto Regression is commonly used for forecasting systems of interrelated time series and for analysing the dynamic impact of random disturbances on the system of variables. It is useful when available information is not rich enough to provide a tight specification of the dynamic relationship among variables, principally when estimation and inference are complicated by the fact that endogenous variables appear on both the left and right sides of the equations. In other words, it is useful when the interrelationships are not well structured. This method considers every endogenous variable (in this case study, catches, capacity and activity) as function of all the endogenous variable lagged values. Since there is no issue of simultaneity in the equations system, the Ordinary Least Square method (OLS) can be applied.

In empirical applications, the main uses of the VAR are the Impulse Response Analysis (IRA). An impulse response function traces the effect of an exogenous shock on current and future values of the endogenous variables. In this sense, VAR is useful for analysing the dynamic impact of random disturbances on the system of variables.

In order to produce quantitative results about implication of reducing fishing effort, an impulse response analysis has been performed and results have been plotted through a 30 years period, in order to cover short and long-run effects.

The entities of the variations on catches varying capacity and maintaining activity fixed and vice versa indicates that catches react to variations on activity more than to variations on capacity. The catch impulse response to variation of activity are very high both in the short and long-run period.

**Key words:** VAR, elasticity of factor, IRA.

## 5b) DATA SAMPLING, INDICATORS AND TIME-SERIES

### A SOCIAL ACCOUNTING MATRIX FOR LOCAL FISHERY ASSESSMENT (LF-SAM)<sup>3</sup>

By

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#### Abstract

This paper describes the methods used to set up a Social Accounting Matrix (SAM) for the economic activities in the province of Salerno, with a special focus to the fishery sector.

The set-up of this SAM, which is called here LF-SAM is finalised to the local application of a computable model of general equilibrium (CGEM) developed, within the PECHDEV project, to analyse the contribution of halieutic activities to regional development. The CGEM will also be modelled so to take into account biological and ecological constraints, related to the exploitation of marine resources.

A SAM is a general macroeconomic accounting framework, which in a systematic way describes economic activities in a given geographical area and, therefore, useful for measuring the degree of dependence of local fisheries. In this study, the geographical unit for LF-SAM is the province (in Italy, NUTS III level), an intermediate level between a region and a municipality.

The paper focus on the problems connected to data availability, to the estimation procedures and the methodology of "regionalization" of national input/output tables, following the ATECO 2002 classification of economic activities, the Italian version of NACE Rev. 1.1.

Key words: social accounting matrix (SAM), national accounts, regional development, coastal fishery.

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<sup>3</sup> The content of this paper has been developed within the PECHDEV project (*Development and application of a computable model of general equilibrium to analyse the contribution of halieutic activities to regional development*), EU Contract Q5RS-2001-02277 in collaboration with CEMARE (UK), UCL (UK), ENSAR (FR), LEN-CORRAIL (FR), IEP (SP) and IME/SDU (DK).

**OPTIMIZATION OF A SAMPLING PLAN BASED ON PREVIOUSLY COLLECTED  
DATA: AN APPLICATION TO THE ATLANTIC FRENCH FLEET**

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**Abstract**

In 2000, the European Council decided to establish a community framework to collect economic data for the conduct of the Common Fisheries Policy (Council Regulation (EC) n°1543/2000). According to this regulation, data must be gathered by groups of vessels and a minimum precision level has to be reached for economic indicators. In France, Ifremer is in charge of collecting these economic indicators by direct surveys.

The aim of this paper is to present the methodology which has been applied to optimize the sample plan for the year 2004. The first part deals with theoretical aspects of sample techniques. The total sample size necessary to reach precision levels by fleet segment is estimated on the basis of data observed the previous year. The second part analyses how to improve the sample by taking into account specific features of the French fleet (spatial location, diversity of size ...). The results are discussed in the last part of the paper.

**Keywords:** Sampling plan, Optimization, Precision levels, Statistical reliability, Economic indicators

**IMPLEMENTING A HARMONISED METHODOLOGY FOR COMPARING  
BOOKKEEPING AND FIELD SURVEYS IN THE CASE OF BRITTANY FISHING  
FLEETS (FRANCE)**

**By**

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Abstract:

Most fleets in Brittany (France) are characterized through multi-gears and multi-species fisheries. Consequently, economic studies need a standard methodology to define precisely indicators on economic performances. Difficulties appear when multi-production is the rule and not the exception (multi-gears, passive and mobile, and multi-species). Moreover, economic fisheries data, if they are available, are managed by different institutions and used according to multiple objectives. Consequently, a concerted action between different institutes, such as Ifremer and the Regional Economic Observatory of Fisheries in Brittany, is a basic requirement to define a common typology and suggest harmonised indicators. In a first part, objectives and challenges related to the collection of economic fisheries data are recalled. The second part is devoted to a description of the fishing fleet in Brittany. If the statistical coverage in the field surveys managed by IFREMER is enlarged to the national level, the survey area for bookkeeping data processed by the Economic Observatory is regional. However, Brittany is the first landing region for fish in France (around 50% of aggregate turnover of the French fishing industry). A panel of harmonised indicators is suggested, fuelled by the two main methods in the collection of economic fisheries data. This third section emphasises the differences observed in each methodology and focuses on a few inputs and indicators. Results for fishing fleets located in Brittany are discussed in a fourth part.

This paper is based on a research developed by the EC funded TECTAC research project (QLK-2001-01291).

# THE RECREATIONAL FISHING IN THE CENTRAL AND WESTERN EUROPEAN MEDITERRANEAN FRAME

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## Abstract

In the European Mediterranean region, recreational fishing is becoming, not only an important leisure activity that increases the pressure on the resources, but also in a poor studied economic activity. This paper tries to present the analysis methodology as well as the results that from an economic perspective can be obtained from this activity in the Central and Western European Mediterranean frame. In the paper we present the advances on the results achieved within the Communitarian project SFITUM (Sport Fishing: an informative and economic alternative for tuna fishing in the Mediterranean) by the GEM of the University of Barcelona.

The project has a multidisciplinary approach, it focus on the deep water recreational fishing in Spain, France and Italy. It has been designed an universe of study, an economic classification of the activity, a process of several systems of samples with indicators to evaluate their weighed importance, considering the direct and indirect economic activity and the added value generation that recreational fishing contributes in the countries economies. For the analysis design it has been adapted in part the analytical methodology developed in the Northern Europe project *Economic Value of Recreational Fisheries in the Nordic Countries* to the conditions of Mediterranean Sea as well as it has been developed with own methodology.

In this paper, it is also tried to estimate in terms of the pressure over the resources and value added generation the importance of the recreational fishing in comparison with the professional fishing activity for the fisheries. It is also pretended to obtain reference point indicators in order to apply Communitarian action policies in the recreational fishing.

Keywords: recreational fishing, SFITUM, Sport Fishing, direct and indirect economic activity, value added generation, pressure over the resources.

**SMALL PELAGIC FISHERY OF THE CENTRAL-NORTHERN ADRIATIC SEA:  
PRODUCTION DYNAMICS AND RELEVANT FACTORS**

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**Abstract**

Small pelagic species are of key importance for the Adriatic Sea fisheries, historically making up most of the total catch of Eastern Adriatic countries and contributing up to 85% of the Italian total small pelagic catch.

Total landings of both demersal and small pelagic capture fisheries of Adriatic coastal countries (Albania, Croatia, Montenegro, Italy, Slovenia and former Yugoslavia) during the thirty-year long period from 1970 to 2000 reached its highest levels in the 1980s followed by a decreasing trend, particularly marked in the case of the anchovy (*Engraulis encrasicolus*) and sardine (*Sardina pilchardus*), the two main target species of the small pelagic fishery. This work focuses on the analysis of available time series from the second half of the 1980s to 2002. Available data are those concerning the central and northern Adriatic Sea (FAO-GFCM Geographical sub-area 17) and, with particular detail, those of the Ancona based fishery. The analysis takes into consideration both anchovy and sardine fisheries, as well as variables such as landed quantities, estimated biomass at sea, average annual price at landing and the Ancona fleet (mid-water pelagic trawlers) size over time. Monthly data from the Ancona fishery are also used for recent years (1997-2003). The paper aims to highlight the temporal pattern of the variables considered and their relations. Relevant factors influencing the Adriatic small pelagic fishing industry are discussed.

## **SESSION SIX: INDUSTRY ISSUES**

## 6a) THE SALMON INDUSTRY

### FIRM CONCENTRATION AND VERTICAL INTEGRATION IN SALMON FARMING: EMPIRICAL EVIDENCE FROM CHILE AND NORWAY

By

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#### Abstract

In the Chilean salmon aquaculture industry both firm concentration and vertical integration are increasing. The largest firms in Chile are vertically integrated from egg production to the final product, e.g. packed boneless salmon fillets in ready-to-cook portions. The same development is taking place in Norway, but to a lesser degree. Increasing firm concentration often reflects economies of scales. We try to identify what are the economies of scales and potentially other factors in salmon farming that have led up to this development. In particular, we point to differences in input costs and regulations to explain structural differences between the salmon farming industries in Chile and Norway. Due to increasing focus on supply chain arrangements as a means of bringing large volumes of salmon with consistent quality to customers, we argue that concentration will continue to increase.

## **VERTICAL INTEGRATION, CONTRACTUAL RELATIONSHIPS OR OPEN MARKETS IN THE SALMON AQUACULTURE INDUSTRY?**

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### Abstract

The organisation of the value chain for farmed salmon is undergoing significant changes towards tighter vertical coordination. Major driving forces are increased competition in international salmon aquaculture leading to declining prices, increasing scale economies and capital intensity in packing, and the relative growth of the increasingly demanding retail market segment as final buyer of salmon. Over time we have also seen a higher degree of asset specificity in several stages of the value chain due to changes in both production technologies and buyer requirements. This asset specificity is related to capital equipment, human capital, location and timing of production activities. Increasing asset specificity is in general an important rationale for abandoning open markets and enter into long-term supplier-buyer relationships, or even full vertical integration.

In the 1980s and early 1990s the transactions between subsequent stages in the value chain for farmed salmon was largely done in open markets. But the trend has been towards an increasing degree of vertical integration, between salmon fingerling production, grow-out farms, packers and marketing. In principle, the need for increased vertical coordination could be solved through long-term contractual arrangements between, for example, salmon farmers and packers. However, long-term contracts between farmers and packers are relatively rare in the salmon industry.

To shed light on the choice of vertical coordination mode it is useful to compare salmon aquaculture with livestock sectors. Of particular interest is livestock sectors where the industrial organisation has been less constrained by government regulations, such as the poultry, hogs and cattle industries in the U.S. In these sectors we observe that long-term contractual relationships is the predominant form of vertical coordination between farmers and packers. There are important structural similarities between terrestrial livestock production and salmon aquaculture in several stages of the value chain. However, there are also some differences, for example, the relative power of the farming and packing stage. It can be argued that salmon packers face a larger raw material supply risk than meat packers in the U.S.

This paper provides results from a survey of medium-sized and large salmon companies on the organisation of their activities through the value chain. The companies in the survey represented 40% of the total Norwegian production of 550.000 tonnes in 2002. This survey sheds some light on the driving forces behind organisational choices from both the production and market side.

Finally, based on the comparative analysis with livestock sectors and our empirical studies of the salmon sector, we make predictions regarding future changes in the structure of value chains for salmon.

# **AGGLOMERATION EXTERNALITIES WITHIN AND BETWEEN INDUSTRIES: A FIRM LEVEL COST FUNCTION APPROACH**

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## **Abstract**

Agglomeration externalities have received substantial attention during the last decade in the managerial economics literature (Porter, 1990) and in economics (Krugman, 1991). Such externalities provide scale economies external to a firm, but internal to industries or locations. Hence, agglomeration externalities can be important in explaining firm or industry location since firms become more productive or production costs are lower at locations where agglomeration externalities are present. Approaches founded in microeconomics based on a production function following Hall (1990) or more recently a cost function (Paul and Siegel, 1999) have been used when measuring the effect of agglomeration externalities empirically. Independently of whether a production function or a cost function approach has been used, empirical studies on agglomeration effects generally have in common that highly aggregated data are used, mostly two digit SIC level data. The focus has been on the existence of external economies of scale, and to what extent internal economies of scale at the industry level are overestimated if the external economies are not accounted for.

In this paper we focus on regional industrial clusters, but using models founded in economic theory and statistical tests rather than the more informal test related to Porter's diamond. Here, cost functions are estimated on firm level data. This approach provides us with measures of the productivity gains, or cost savings, due to agglomeration externalities. Furthermore, by using firm data we avoid aggregation biases and can test a rich set of hypotheses on how these externalities affect the structure of costs at the firm level. Of particular interest is whether there are inter- or intra-industrial agglomeration externalities or both. We focus on the Norwegian salmon aquaculture industry and two related industries, fisheries and fish processing. Our econometric results suggest that for salmon aquaculture firms, positive agglomeration externalities within the salmon industry dominate spillovers from the related industries.

**EMPIRICAL ASSESSMENT OF MARKET POWER FOR FRESH SALMON  
PRODUCTS IN THE UK RETAIL MARKET**

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**Abstract**

The empirical assessment of market power using structural models is widely used in the New Empirical Industrial Organisation (NEIO) literature. The basic approach depends crucially on estimated market level demand, and cost specifications after taking into account specific strategic objectives of firms.

Most empirical studies of market power use ad hoc demand specifications, which do not satisfy all the restrictions of consumer theory. The estimated market power parameters may imply violation of the basic tenets of economic rationality.

In this paper, a well-behaved utility function is used to specify the flexible Linear Approximate Almost Ideal Demand System (LAIDS). LAIDS allows the imposition of theoretical restrictions to simultaneously estimate; demand functions, marginal cost functions and market power parameters for fresh salmon products in the UK retail market. This method of estimating market power in several markets at once permits the examination of shock in one market and the effect on market power in another market. This provides a significantly better understanding of the salmon industry's pricing behaviour.

## 6b) SUPPLY-SIDE ISSUES

### RATIONAL INEFFICIENCY IN FISHERIES

By

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#### Abstract

Evaluating the efficiency of Decision Making Unit is performed ex post and not ex ante. This may be a harsh method of evaluation, especially if the DMUs are operating in environments, which are characterised by significant uncertainty. Fishermen are often considered to operate in such an environment. The output arising from using given inputs is seldom known with certainty, because external factors such as availability of fish, equipment performance and weather (Gates, 1984) may have a significant influence. Thus, when fishermen decide the inputs to bring on a trip, they try to be in the best possible position to handle the expected uncertainty. This may result in bringing excess inputs that are not used, and therefore being interpreted as inefficiency in ex post analysis despite that it may have been rational to bring these. One can denote such inefficiency as rational inefficiency.

In this paper, we investigate which input factors fishermen can be considered to primarily use for handling uncertainty ex ante, thus giving rise to rational inefficiency or rational slack in ex post efficiency analysis. We use the method from Bogetoft and Hougaard (2001) to find the allocation of slack that is consistent with rational behavior. Based on data from 308 Danish vessels, we show that fishermen tend to allow for the highest flexibility in crew payments, followed by fuel costs. Sales costs and ice/provision costs seem to be the ones with the lowest flexibility. Based upon specific utility functional forms, we find support for these conclusions.

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# **THE EVOLUTION OF THE PERFORMANCE OF DUTCH BEAM-TRAWLERS**

**By**

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## **Abstract**

In the past ten years a system of more or less individual sea-days allocations was in force for the Dutch flatfish beam-trawler fleet. Annual allocations were based on ITQs of the main target species of plaice and sole and the average catching performance of boats of similar engine power in former years. The catching performance was expressed in the average landing value of plaice and sole together per (beam-trawling) day at sea. Annual performance data were originally derived from the LEI costs and earnings panel and since 1995 from logbook data, covering the whole beam-trawler fleet.

The pattern of annual average performances related to engine power shows a remarkable stability throughout the years. This paper explores some of the reasons that may lie behind this stability and at the same time seeks to explain the relation between fishing effort, catching performance, quotas and fish stock sizes. The findings on the latter could be of use for the estimation of effort flexibilities that are applied in the EIAA-model.

# **CAPACITY ANALYSIS OF THE NORTH SEA FLATFISH FISHERY: AN INDUSTRY ALLOCATION MODEL APPROACH**

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## Abstract

Fisheries managers often see the management of regional fisheries as a more pertinent approach than managing separate national fleet units that exploit numerous fish stocks. In this paper an industry approach is hence taken to shed light on the exploitation of the North Sea flatfish fishery by a multi-national fleet, identifying overcapacity and possible reductions of the current fleet. The paper uses data envelopment analysis (DEA) in a two-stage approach, a firm model stage and an industry allocation model stage. The former helps to estimate the capacity output of the national fleets in isolation giving an indication of relative efficiency of vessels for each country. The industry allocation model then compiles the results in a single industry analysis to estimate the capacity output of the multi-national fleet as a whole, by projecting observed input/output combinations onto an industry frontier.

The results indicate the extent of fixed factors that could be removed from each national fleet to give a more optimal capacity structure in the North Sea flatfish fishery. The analysis estimates that there is an overcapacity of approximately 25%, using vessel input/output data for 1998, and suggests the optimal reallocation of fixed factors of each national fleet. The impact of possible quota reductions and restrictions of equal capacity reduction across nations are also considered. A discussion of management implications concludes the paper.

Keywords: North Sea flatfish fishery, Data Envelopment Analysis, frontier technologies, capacity output, industry allocation, multi-national fleet

## 6c) MARKET ANALYSES

### **RELATIONSHIPS OF CONTRACTUALISATION BETWEEN PRODUCER AND FOOD RETAILER IN THE FISHING SECTOR: QUALITY, SUPPLY AND PRICES**

By

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#### Abstract

New forms of coordination, organization adapted to competition have appeared recently in the fishing sector. They modify significantly the relationships between the main actors of the seafood sector and otherwise, result in having quite significant effects on the fishing practices and the exploitation of the resource. Two main reasons have led to these restructurings:

- On the basis of research for better quality, and improved traceability, the terms of the contracts and the nature of the transaction costs are changing significantly and on a long-term basis. This leads to new strategic behaviours between actors on the basis of quality conventions and new working logics between partners.
- Due to the new strategic competition of a certain number of hypermarkets groups, which defines the forms of organisation of this sector, from a partnership having various degrees of commitment with the upstream actors to the upstream vertical integration

This work presents first the new involvement of the retailing industry in fishing sector. Two qualitative market surveys have been realized jointly:

- A first survey in the fishermen and wholesalers to analyse the supplying, the quality perception and marketing of the fishing products.
- A second survey in the central buying offices retailers and in the store retailers (integrated and independent) to explain the supplying, the quality policies in the marketing mix practices concerning the seafood products.

In its first part, this paper analyses the nature and diversity of the contract (quality, supply, prices...). The second part of the paper deals with the economic and commercial incidences for the whole fishing sector.

Key words: Contractualisation, supplying, quality perception, convention, marketing strategies, market surveys

# **ANALYSIS OF UK VALUE CHAINS FOR COD, HADDOCK AND NEPHROPS**

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## **Abstract**

Seafish was asked by members of the UK seafood industry to analyse the UK supply chains for cod, haddock and nephrops initially, in order to estimate the total flows of materials, sources of supply, products created, business types involved, destinations, value added. A key purpose was to highlight possible opportunities for businesses, including vessels, to change their marketing or fish supply practices, by illustrating the routes to market which offer the best chances for adding value.

Seafish engaged the KPMG Centre for Fisheries and Aquaculture in Norway to help with this research, and worked closely with them throughout the project. Data were gathered from published sources and direct from businesses at every stage of the chain and from some key European countries exporting to the UK. Interviews to get contextual information examined motivation for current purchasing and marketing practices in companies at every stage of the chain, from vessels to caterers.

Analysis shows total flows of product at stated control points in the chain for each species, and estimates total value at each control point. More detailed diagrams illustrate further breakdowns of volume and value information by product type and business type. Total consumption and exports are estimated.

This work also incorporates data from research commissioned by Seafish into the consumption of seafood in the UK food service sector.

This paper will summarise the research methods used and present some of the key findings relating to each species. Implications for different customers of this information will be highlighted.

# MODELLING AND FORECASTING MONTHLY FISHERIES PRICES: EVIDENCE FROM CORNWALL

By

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## Abstract

In this paper we report the forecasting competition between Autoregressive (AR), Moving Average (MA) and ARMA models of the monthly average fisheries prices. We consider twelve species landed into Cornwall: Anglerfish, Cod, Crabs, Dogfish, Haddock, Hake, Lemonsole, Mackerel, Plaice, Saithe, Sole and Whiting.

We compare the forecasting techniques based on symmetric error statistics: Root Mean Square Error (RMSE), Mean Absolute Error (MAE) and Mean Absolute Percent Error (MAPE). In addition we report the Theil inequality coefficient.

The results show that ARMA(p,q) models perform well in terms of forecasting monthly average prices of main species landed into Cornwall. We find that eight species can be modelled by ARMA(1,1), ARMA(2,1) and ARMA(1,2) as they give superior forecast results. Furthermore, our results show that simple AR(1), AR(2) and MA(1) models provide superior forecasts of monthly fisheries prices for four species.

In the case of RMSE, the results show that ARMA(2,1) model provides the smaller error statistics measure in three species. According to RMSE, ARMA(2,1) model tend to be preferred.

In the case of MAE, the ARMA(2,1) and ARMA(1,1) models clearly produce the most accurate forecasts for six out of the twelve species. Furthermore, in terms of MAPE, these models also provide the best forecasts for the same species landed into Cornwall.

Turning our attention to the results based on the Theil inequality coefficient, we see that ARMA(1,1) provides the best forecasts for four out of twelve species. So, with regards to the Theil inequality coefficient for monthly fisheries prices, ARMA(1,1) is found to be superior to other time series models. The ARMA(2,1) model provides the second best price forecast behind ARMA(1,1).

Overall, in this paper we evaluate the out-of-sample forecasting accuracy of ten models for monthly fisheries prices in twelve Cornish species, and show that ARMA(p,q) models generally prove to be the best forecasting models.

Keywords: Fisheries prices, Forecasting, Cornwall.