SEAFISH

The Sea Fish Industry Authority

Seafish Technology

Second Meeting of Interim Executive Committee on Efficient Use of Energy in Fish Harvesting 14-16 August Marine Institute, St. Johns, Newfoundland

Internal Report No. IR1461

Author: J. E. Tumilty
September 1996

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Summary

A second meeting of the Interim Executive Committee on Efficient Use of Energy in Fish Harvesting was held at the Marine Institute in St. Johns, Newfoundland, Canada between 14–16 August 1996. The meeting was convened by the Department of Fisheries and Oceans for Canada as a follow-up to the meeting held on 22–23 February at the International Energy Agency in Paris. The objective of this meeting was to progress some of the ideas put forward earlier and to determine if it where possible to develop sufficient international interest in some of the proposed projects for a number of countries to sign up to an implementing agreement under the auspices of the International Energy Agency (IEA).

The countries represented were Canada, Denmark, Ireland, Norway, United Kingdom and United States of America. A number of projects were received viz:-

1. A collaborative international project involving data collection systems (black box technology).

2. Study of and if necessary revision of modelling and other protocols used in projects involving Flume Tank work.

3. Feasibility in establishing databases on energy consumption/efficiency in fish harvesting units/systems.

The proposed annexes to any implementing agreement were revised and the next steps to be taken for any country wishing to participate in such an agreement were also discussed.

The outcome of the meeting was for the various participants to consider the various projects and their interest in taking part in joint international research in these areas. It would also be necessary to pursue the matter with their national representative on the End User Working Party of the IEA if they wished to sign an implementing agreement.

Table of Contents

1. Introduction

This meeting was convened by the Department of Fisheries and Oceans for Canada (DFO) as a follow-up to the first meeting held on 22/23 February at the International Energy Agency (IEA) in Paris. The purpose of this meeting was to progress some of the ideas put forward earlier and to determine if it would be possible to develop sufficient international interest, in some of the proposed projects for a number of countries to sign up to an implementing agreement under the auspices of the IEA.

2. Meeting Proceedings

A list of participants can be found in Appendix I.

2.1 Introductory Remarks

The meeting was opened by David Balfour, Director General, Programme Planning Co-ordination Fisheries Management, Department of Fisheries and Oceans, Canada who chaired the meeting. It was stated that it was hoped that the outcome of the meeting would be progress towards the signing of a implementing agreement by a number of the countries present. There were obvious benefits to the participants through the ability to have access to areas of research carried out in other countries that would build-up knowledge more cost effectively. The meeting was an opportunity to identify priority areas of work of interest to a number of the participants.

2.2 Minutes of First Meeting

It was agreed that the draft minutes of the February meeting were a true record of the proceedings, apart from some additional information to be included concerning the Irish Sea Fisheries Board. A finalised copy will be circulated along with the official notes of this meeting.

2.3 Explanation of the Role of IEA

Dr. Hamid Mohammed the Canadian representative to the End User Working Party explained the process required to be undertaken by participating countries, in order to sign an IEA implementing agreement for Energy R&D. Details can be found in Appendix VI. It was stated that usually once an implementing agreement was in place with a number of countries participating, other countries would join. The Japanese in particular who generally show hesitation in the first place, often end up as enthusiastic supporters. The Irish delegate stated that before any EU countries participated in such an agreement, he thought it would be appropriate to have a view from the European Commission, as to whether work on energy utilisation was congruent with the Commission Policy. There seemed to be a view prevalent in DG XIV (Fisheries) that the effect of improving efficiency would simply improve the ability of fishermen to increase effort. However the Canadian representative stated that improved efficiency is an element in the Food and Agriculture Organisation (FAO) Code of Practice, for responsible fisheries and that there was interest within the Commission to improve energy utilisation. It would in any case be necessary for representatives to confirm there was official Government interest in being involved in an implementing agreement. It was agreed that there were a number of processes to be pursued before any of the delegates could recommend to their Governments, that they should be party to an implementing agreement. The first and foremost would be to identify projects that would be mutually beneficial.

2.4 Review of Identified Projects

The Canadians have identified a number of projects that they considered appropriate for the development of an action plan. They are as follows:-

1. A collaborative international project involving black box technology.

2. Proposal for studying and where necessary revising modelling and other protocols used in projects involving Flume Tank work.

3. Feasibility into establishing database(s) on energy consumption/efficiency in fish harvesting units/systems.

Details of these projects can be found in Appendix II.

2.4.1 Comments on Proposed Projects
In each of the proposed projects the Canadians have a vested interest in carrying them out and funding would appear to be available from Government sources.

Project 1: A collaborative international project involving black box technology (Data Collection Systems). The work is concerned with remote electronic monitoring systems (REMS) which have been developed with a Newfoundland company New East. Details of the system are shown in Appendix V.

The benefit to the Canadian fishing industry would be to remove the necessity for onboard observers which they have to pay for at C$400 per day. It is unlikely that the idea would be received with much enthusiasm by European fishermen, as they would view it as unwelcome intrusion into their fishing operations. The linking of such a system to energy efficiency also seemed somewhat tenuous. Whilst in Lunenburg, Nova Scotia during the study tour, a visit was made to Clearwater who operate offshore scallopers and such a system was being used to monitor one of their vessels. This was giving the company a great deal of fishery information which in the past has been information kept solely by the skipper, thus enabling them to build-up a database for general company use. It is doubtful if UK or indeed other European skippers who usually own their vessels, would be willing to participate in such a scheme as they would undoubtedly loose previously exclusive information.

Project 2: Study of modelling and other particulars in Flume Tank work. This is also another project that has federal funds allocated. The Marine Institute is anxious for the work to go ahead as they have had particular problems with one of their customers (Hampijan of Iceland), who have had nets tested in both the St. Johns and Hirtshals tanks with noticeable differences in results. It would obviously be advantageous for Seafish to be involved in such a project as a commonality of approach and exchange of information would be welcome between operators of various Flume Tanks in the world. If the project were to proceed it would be advantageous to involve the French and the Australians and possibly Japanese who all operate Flume Tanks.

Project 3: Feasibility study into establishing databases on energy consumption. This was proposed by the Dutch who were not present at the meeting owing to other commitments, however Bob van Marlen of RIVO was keen to co-ordinate the work. The Irish and UK representatives suggested that project was an obvious candidate for application to EU under a concerted action programme, which could incorporate all the European Atlantic states along with Norway and Iceland. Special arrangements are in hand for Canadian participation in EU projects. It therefore seemed appropriate to recommend that this approach should be followed up.

2.4.2 Other Projects

The Norwegian representative recommended a project that examined how catch per unit effort was influenced by stock size and how this related to energy use. It was proposed that higher stock levels reduced energy utilisation. Studies and related work are needed to determine the number of fishing tows, amount of fuel required and other inputs necessary to land one unit of fish.

2.5 Annexes

Following discussion during the meeting, the Annexes that were proposed to be attached to the implementing agreement were revised. These are contained in Appendix III.

2.6 Next Steps

Further discussions then followed as to how the various participants should proceed if there was a willingness to consider signing up to an implementing agreement. It was pointed out that non of the participants had any remit to commit their own country to any agreements. This was understood and the procedure was explained, that as a member of an expert group, proposals should be put to their national IEA/EUWP representative where they would be discussed at the next End User Working Party Meeting due to take place in Ottawa during October.

It was pointed out that the concept of improved energy efficiency in fishing operations should be an idea that has approval of participants national Government, in the UK this would of course be Ministry of Agriculture, Fisheries and Food (MAFF). European Community members would also have to ensure that such R&D was complimentary to the Common Fisheries Policy. There could of course be differences in the EC between the directorates dealing with fisheries and those dealing with energy.

The need for a costing of the secretariat was also raised. The Canadians appeared to be prepared to continue in this role for the time being as they were the driving force behind the initiative, however costs and who would pay seemed to be suitably vague; evidently only those countries participating in projects are expected to contribute to these costs.

3. Conclusions from Meeting

The meeting once again proved to be a useful forum for exchanging information on work that many of the participants have a mutual interest, such as ghost fishing, Flume Tank operations, towed gear selectivity. A number of good contacts were established and agreement made to correspond with each other in the future on these topics of mutual interest.

However judgement must be reserved on the utility of entering into an implementing agreement. Seafish would have to establish if work on energy efficiency was an area in which the industry and more importantly MAFF had an interest and subsequently the EU. The FAO Code of Practice for responsible fisheries certainly makes mention of energy optimisation as follows:-

> *"States should promote the development of appropriate standards and guidelines which would lead to the move efficient use of energy in harvesting and post harvest activities within the fisheries sector".*

It will therefore be necessary before proceeding any further in these matters to initially establish the official UK policy in this subject.

The need for such a bureaucratic approach to international co-operation is not clear. It was obvious that in some countries entering into such agreements would appear to unlock the door to access Government funding, however this is unlikely in the UK.

An ad hoc arrangement to agree to carry out work in certain areas and to exchange information on an informal basis is probably as effective without the need for the formal approach.

4. Further Action

An approach will be made to the Chief Scientists Group at MAFF to determine if efficient energy utilisation is of interest as an R&D topic. A continuing contact with DFO, Canada and the Marine Institute will be maintained particularly in respect of possible joint investigation of Flume Tank modelling and procedures. The continuing interest of other participating countries in energy utilisation will also be maintained.

Appendix I

List of Participants

Mr. W. Ameru	New England Fishery Management Council, United States of America
Mr. D. Balfour (Chair)	Department of Fisheries & Oceans, Canada
Mr. A. Duthie	Chief Responsible Fishing Operations, Department of Fisheries & Oceans, Canada
Mr. J. Foster	Director, Marine Institute, St. Johns, Newfoundland
Mr. K. Hansen	Danish Institute of Fisheries & Aquaculture, Denmark
Ms. C. Haydrich	Marine Institute Secretariat, St. Johns, Newfoundland
Mr. I. Huse	Marine Institute, Bergen, Norway
Mr. McCormick	An Bord Incaigh Mara, Ireland
Mr. H. Mohammed	Office of Energy R&D Energy, Mines and Resources, Canada
Mr. D. Pugh	Department of Fisheries & Oceans/Canadian Hydrographic Office, Ottawa, Canada
Mr. J. E. Tumilty	Sea Fish Industry Authority, Hull, United Kingdom

Appendix II

Draft Project Proposals

FIRST DRAFT

PROPOSAL FOR ESTABLISHING A COLLABORATIVE INTERNATIONAL PROJECT INVOLVING BLACK BOX TECHNOLOGY

Background

The potential of "Black Box" technology for studying (and improving) the "during trip" consumption of fuel may be significant particularly as part of the developing international satellite-based vessel monitoring technology.

Precise location and vessel speed are becoming standard data routinely monitored through satellite technology. But the amount and type of additional data which could be collected needs to be further explored, as does the application of data gathering to a broader group (i.e. smaller sizes) of fishing vessels.

Objectives

To conduct collaborative experimental work on monitoring of fuel use (and related parameters) by fishing vessels operating in fishing and "steaming" situations in order to reduce fleet and individual vessel fuel use; and

To report the results of this work to participants.

Activities

1. Review current systems in place worldwide (literature studies, etc.).

2. Define parameters to be measured which may be dependent on vessel/gear type, vessel size, fishing location, environmental conditions, etc. paying specific attention to smaller vessels not currently part of this development.

3. Assess existing software and instrumentation

4. Develop new hardware and software

5 Conduct field trials to assess reliability and usefulness of systems

6. Prepare a report on the results of this work for distribution to participants

NOTE: A Canadian project which started last year is using black box monitoring systems for locating (positioning) and tracking purposes. This work is being extended to include 4 black box systems which would be fitted on each of: a 65' crabber, a scalloper, a gillnetter and a distant water shrimp vessel. Further extension of this work to improve the display of information, making it more user-friendly, is underway and alternate systems for incorporating fuel monitoring are being investigated. The data collection, analysis and transmission of appropriate information is expected to have considerable value in monitoring and in avoiding alternate, more costly systems; and also as part of the move towards monitoring fuel use.

Preliminary costing ($ US)

Project costs for practical activities related to this work may be very high unless they can be combined with existing/associated work involving satellite monitoring of fishing.

Activity 1:
Studies and assessments $ 50,000

Activity 2:
Correspondence and one meeting for participating countries
$ 10,000 per country

Activity 3:
Instrumentation and software development work
$ 15,000(minimum) - $ 100,000 (maximum)

Activity 4:
At-sea experiments (assuming piggy-backing on other projects)
Staff time - 40 days @ $ 1000 $ 40,000
Reporting $ 30,000

Activity 5:
Workshop to discuss results and make recommendations for further application of the technology developments in a variety of fisheries monitoring situations of interest to member countries

FIRST DRAFT

PROPOSAL FOR STUDYING AND WHERE NECESSARY REVISING MODELLING AND OTHER PROTOCOLS USED IN PROJECTS INVOLVING FLUME TANK WORK

Background

A number of flume tanks have been established in member and other countries. These facilities provide an economical way of studying fishing gear performance, particularly in the case of mobile gear. Over time, fishing gear development has and continues to become more sophisticated. While achieving maximum spread and height used to be one of the main goals of tank tests, more complex hydrodynamic considerations are now factored into evaluations of gear performance in tanks.

In relation to selectivity, the ability to predict accurately the behaviour of fishing gear is particularly important since evaluating issues like matching drag to vessel power and achieving a minimum of drag with selectivity devices incorporated in the body of the net and the codend all require great precision.

The wide variety of gears (pelagic, semi-pelagic, demersal) requiring testing, and the frequent inclusion of special panels of netting and other mechanisms used to avoid capture of small fish and non-target species which make testing more complex, all combine to make avoidance of duplication highly desirable for tank work. These developments in the evolution of gear and the current costs of tests make urgent the need for collaborative work and exchange of data and results. At the moment this is somewhat difficult because of the use of different scaling techniques and other protocols adopted for use at the various test facilities.

In the case of energy-related studies, the real savings will be achieved in the full-scale gear used in commercial fishing. Because of this, any revisions of protocols and modelling rules must be guided by the requirement that these changes improve the predictive capacity of modelling results in relation to full-scale gear.

The outcome of work described in this proposal will be useful as countries undertake cooperative and collaborative projects aimed at minimizing resistance in gears with selectivity devices installed.

Objectives:

The objectives of this project are:

1. To review and standardize and/or change modelling rules so duplication of tank testing is avoided and results can be shared between tanks. (Rules should only be changed to ensure that the results most closely simulate what actually happens at full-scale; that is, changes should not be made simply to improve technical form if this does not also improve the predictive capability of the testing.)

2. To compare the results of model tests in the flume tanks of participating countries with the results of at-sea tests on the same gear at full-scale.

3. To produce a manual which sets out agreed-upon standards for use in flume tank testing.

Activities

1. Review (a) fishing gear modelling rules; e.g., Froude, Newton, and other approaches, and (b) other tank testing protocols and standards; e.g., testing trawls with and without trawl doors, uniformity of flow in cross-sectional areas of the tank and how to account for this, how tests are conducted - hysteresis, float attachments, etc.

2. Review literature which encompasses comparisons between full-scale and model-scale testing results, looking at all results not just those from flume tanks.

3. Choose a design to serve as a full-scale prototype. Using this design, each participating country with a flume tank will make a model and carry out tests designed to compare various modelling rules and to obtain inter-tank calibration and comparison of testing protocols.

4. The selected prototype will them be constructed and tested in full-scale conditions at sea to obtain measurements of the geometry and resistance and other factors for comparison with the model test results.

5. Based on results of the above activities, a manual which sets out agreed-upon standards for use in flume tank testing will be produced and distributed to participating countries.

Project team and management

Fishing gear manufacturers, fisheries management personnel and fishers of many countries are, from time to time, involved in tank testing activities because of the great value of such tests in the process of fishing gear development. Consequently, while this program is of primary interest to countries with tank facilities, the project team could include countries willing to undertake some of the full-scale work as outlined above.

Test programs are the responsibility of countries with flume tanks.

An overall Project Coordinator is required and would be responsible for:

- proving that the agreed standardization procedures are properly articulated and that these standards are communicated to the individual tanks;
- making sur that each participating country can access the same materials; and
- obtaining each country's report and combining these into an overall comprehensive report for distribution to participating countries.

Estimate of costs ($US)

Project Coordination:		
300 man-hours over a 1 year period		$ 50,000
Activity 1:		
10 man days @ $1000 x 3 countries		$ 30,000
Activity 2:		
5 man days @ $1000 x 3 countries		$ 15,000
Activity 3:		
Coordination meeting (select prototype, set procedures, etc.):		
5 man days @ $1000 x 3 countries		15,000
Travel and accommodation @ $3000 x 3 countries		9,000
Scaling model of prototype - 1 man day @ $1000 x 3 countries		3,000
Build model (labour and materials) @ $6000 x 3 countries		18,000
Testing model (10 days tank time and labour) @ $3800 x 3		114,000
Reporting results of Activity 3 - 5 man days @ $1000 x 3 countries		15,000
	Subtotal	$ 174,000
Activity 4:		
Build full-scale trawl (including labour)		20,000
1 person to oversee this process - 2 days @ $1000		2,000
Research vessel rental 10 days @ $6,000		60,000
Scientists - 10 days @ $1000 x 3 countries		30,000
Technicians - 10 days @ $500 x 2		10,000
Travel and subsistence - $3000 per country		9,000
Shipping costs		5,000
Instrumentation rental (included in vessel rental?)		5,000
Reporting results of Activity 4 - 5 man days @ $1000 x 3 countries		15,000
	Subtotal	$ 136,000
Activity 5:		
Preparation, review, editing, printing and distribution of manual		$ 40,000
	Project Total	**$ 445,000 US**

FIRST DRAFT

PROPOSAL FOR A FEASIBILITY STUDY INTO ESTABLISHING DATA BASE(S) ON ENERGY CONSUMPTION/EFFICIENCY IN FISH HARVESTING UNITS/SYSTEMS

Background

While difficult to establish and maintain, databases are useful in showing trends and in determining future fisheries activities. To be successful, such a database must be readily accessible and easy to use. Consistency in the collection of good quality data is essential and information already available should be used.

A feasibility study will be carried out in preparation for work aimed at establishing an international database. Recommendations on data to be contained in such a database will be made in the final report. Information on such items as vessel power, type of gear and total fuel per trip may be of interest but it may be just as important to provide information on past and current projects directed specifically towards ways to reduce energy consumption of fishing units.

Terms of reference for the feasibility study must address a number of points, including:

- who wants the data (what are the actual needs);
- what kind of data should be collected (focus on new data acquisition?, existing information systems containing relevant data?);
- how would the data be used;
- how would the data be handled logistically;
- how would the data be linked with existing databases;
- what are the costs of establishing such a database; and
- other concerns

Objectives

To determine whether a database is desired and can be accomplished within the constraints of an Implementing Agreement and Annex III. This will include:

- defining the type of information which would be most useful; how this information could be most effectively gathered; and what would be the best basic information sharing system for use by all countries eventually wishing to participate in such a database;

- identifying what common, acceptable level of basic information (for example, focusing on ways to reduce energy consumption of fishing units, vessel power, type of gear and total fuel per trip) is being collected in participating countries and what information gathering and sharing processes are now in use in these countries; and

- estimating the cost of implementing and maintaining the database and potential funding sources and mechanisms.

Methods

Project objectives will be accomplished through:

1. a questionnaire/interview process to identify needs and perceptions of industry players; that is, what industry participants (harvesters, gear manufactures, etc.), government departments and agencies, and scientists require in the way of a database; and what they would be prepared to do to help bring this about;

2. a literature search and interviews with operators/users of existing databases to establish what (information and ?) services are already available (and what information they contain?) and to assess the effectiveness of these systems; and

3. Consultations with appropriate technical personnel and possible funding agencies.

Activities, Schedule, and Responsible Parties

1. Determine needs of fishing industry, government departments and agencies, and scientists/ science institutes.

   Based on the results of Activities 1 and 2, the project team will develop (5 days) a standardized process for reviewing, quantifying, and analyzing the needs and perceptions of industry players; that is, what industry participants (harvesters, gear manufactures, etc.), government departments and agencies, and scientists require in the way of a database; and what they would be prepared to do to help bring this about. Interview/input process and analysis of the results (10 days) to be carried out by each participant for their country. (Interim Secretariat to contribute any information gathered during communications with non-participating countries.) Team leader to collect, synthesize and redistribute results (10 days).

2. Literature search

   Each participant to identify their country's existing services (5 days) or the kind of information that is already available in their country and would be contained in a database (5 days). Team leader to collect, combine, and distribute results (10 days).

3. Review of existing information gathering/sharing services

   Based on the results of Activity 1, each participant to review their country's existing information gathering/sharing services by means of, for instance, a standardized list of questions and standardized interviewing techniques (10 days). Team leader to collect, combine, and redistribute results (10 days).

4. Preparation, editing, review, printing, and distribution of final report

   Based on results of Activities 1, 2, and 3, project leader to prepare final report together with other team members. After completion of a review process, report to be printed and circulated to all countries participating under Annex III.

5. Make recommendations

   In the final report, recommendations will be made as to whether a database of this sort is genuinely needed and how such a database might be implemented and maintained.

Project Management

The feasibility study team, consisting of a lead person (acceptable to/nominated by/agreed upon by all participating countries) and people representing at least two other countries, will carry out the project. Team members will be responsible for ensuring that the required tasks are completed for their respective countries. The team lead will also be responsible for the progress of the project as a whole.

Because the results of the feasibility study are intended to be widely applicable and the resulting database(s) readily available, the Interim Secretariat will remain involved by continuing to dialogue with other countries and individuals outside the project and by continuing to encourage other countries to become involved. The Interim Secretariat will be responsible for reporting the concerns and interests of other possible participants to the project leader in a timely manner.

Rough Estimation of Possible Costs

1. Literature search.

Each team member (5 days @ \$ 600 x 3 countries)	\$ 9,000
Team leader (additional 10 days for collation and redistribution x \$ 600)	6,000
Subtotal	\$ 15,000

2. Review of existing information gathering/sharing services.

Each team member (10 days @ $ 600 x 3 countries)	$ 18,000
Team leader (additional 10 days for collation and redistribution x $ 600)	6,000
Subtotal	$24,000

3. Determine needs of fishing industry, government departments and agencies, and scientists/ science institutes.

a. Developing standardized process Activity 3.	
Each team member (5 days @ $ 600 x 3 countries)	$ 9,000
b. Conduct interviews and/or arrange for data input from interested parties and quantify data	
Each team member (5 days @ $ 600 x 3 countries)	$ 9,000
c. Data analysis	
Each team member (5 days @ $ 600 x 3 countries)	$ 9,000
Team leader (additional 10 days for synthesis and redistribution x $ 600)	$ 6,000
d. Input from Interim Secretariat	$ 3,000
Subtotal	$ 36,000

4. Preparation, editing, review, printing, and distribution of final report.

a. Preparation and circulation of draft report	
Team leader (5 days x $600)	$ 3,000
b. Meeting to finalize project report	
Team members (5 days x $600 x 3)	$ 9,000
Travel and accommodation for project team to meet and finalize report, approximately (depending on meeting location) $2,000 x 3	$ 6,000
Interim Secretariat (meeting/project support as required?)	$ 1,000
Subtotal	$ 19,000

Editing, printing and distribution of final report	$ 5,000

Communication costs (total project):

Team members ($1,000 x 3 countries)	$ 3,000
Team leader (additional $1,000)	1,000
Interim Secretariat	2,000

Estimated Total Project Costs $ 100,000 Can ($ 72,000 US)

Appendix III

Draft Annexes

REVISED DRAFT ANNEXES

New text is identified by highlighted text and ⇦ NEW
Minor changes to the draft annexes are indicated by highlighted text only

NOTE: In this draft, text is not highlighted for emphasis or to indicate relative importance, but merely to point out where changes have been made or where new text has been added.

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ANNEX I

Responsible Fish Harvesting Operations (Strategies) Energy Implications

Introduction

Fish harvesting utilizes more energy to produce a kilogram of protein than any other food producing industry. Some countries report that fuel consumed to harvest fish represents a significant proportion of total shipping fuel costs (e.g. up to 50%). In the past, rules have been put in place that lead to energy wastage, e.g., legislated use of energy inefficient vessels. ? ⇦ NEW

The fishing industry must find ways of optimizing its energy consumption. Fish can be a renewable resource but fossils fuels are not. The two key issues are overcapacity and impact on the ecosystem. Responsible approaches to harvesting operations must be found that yield the desired quantity and composition of fish while at the same time being fuel efficient. ⇦ NEW

Recognizing the need for energy optimization, the Food and Agriculture Organization (FAO) of the United Nations is in the process of developing a Code of Conduct for Responsible Fishing. The Canadian government in partnership with industry is also developing a Code for Responsible Fishing Operations and indications are that other countries will pursue similar initiatives.

In order to avoid duplication of effort and to find solutions in a timely manner, it would be opportune to bring together those in the international community who are working on research, development and commercial projects in responsible fishing operations.

Objective

To determine and implement energy-saving approaches through responsible fish harvesting practices (strategies) in fisheries worldwide.

Means

Scope: Energy-saving approaches will be explored and implemented in inshore, middle distance and offshore fisheries. These approaches will consider issues and concerns related to commercial fleeting operations, government policy and regulations and their effects on small-scale fisheries.

Since fishers have a responsibility to ensure energy efficient measures are taken, energy efficient approaches should be explored under commercial conditions for inshore, middle distance and offshore fisheries. Fishers have to be convinced to support conservation harvesting over short-term gains. ⇦ NEW

Subtasks: 1. Study of management (policy/regulations) and their effects on operational activities of fishing fleets/sectors

Various studies are needed to resolve the balance between practices that maximize fuel efficiency while maintaining economically viable and also sustainable fisheries. Study of alternate management systems, for example those suitable for a quota system, should also be considered. ⇦ NEW

To become an important facet of "green" products, energy conservation must have a higher priority with industry and government regulators. At times, regulations which work against energy efficiency may be a problem. There is also a danger of vested interest groups misusing studies and data. ⇦ NEW

2. How energy consuption relates to stock size ⇦ NEW

Studies and related work are needed to determine the number of fishing hours, amount of fuel required, and other inputs necessary to land one unit of fish.

3. Vessels - fishing strategies

Studies and projects are needed on the deployment of low numbers of catch efficient fishing units compared to use of larger numbers of less efficient catching units.

4. Ghost fishing experiments and studies

Various gears that are lost or abandoned continue to fish, negatively impacting the fish resource and the environment. The loss also represents energy waste in itself. To combat this problem projects are needed to determine cause of loss, loss assessment studies and underwater observations aimed at determining the extent of ghost fishing. Full-scale trials and tank testing (simulating various conditions encountered at sea) are needed to observe the effectiveness of new and modified gear.

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This work should be focused on necessary and relevant research rather than interpretation leading to recommendations on related fisheries management issues. ⇦ NEW

5. Vessel - gear sector conflicts

Studies and projects are needed to identify and test options that would allow fishing-vessel operators and other marine users to cohabit the world's oceans and inland waters and to better utilize the resources of these waters. Improved fishing strategy in many fisheries should be achieved.

6. Identify ongoing and planned projects. ⇦ NEW

Ongoing and planned projects should be identified in order to focus on priorities under Annex I.

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ANNEX II

The Role of Data Collection and Display Systems Efficiency in Responsible Fishing Operations

Introduction

The fishing industry has entered a new era of satellite-based technology. This technology meets the demand of industry for integration of data received from various electronic instruments used during fishing activities.

Information from various sources such as hydrographic and biological data and electronic charts can be displayed on one screen allowing a vessel skipper to have immediate access to important and relevant information required for decision making.

Navigational information coupled with information on location and density of fish can easily save 5-10% of normal search times. This translates to substantial savings in energy consumption and related fuel costs already enjoyed by distant water fisheries.

As hardware systems and software become less expensive, this technology will also benefit middle distance and inshore fisheries.

Objective

To assess and promote the use of satellite-based information technologies as a means of implementing responsible fishing practices aimed at optimizing energy efficiency.

Means

Scope: Satellite-based technology has advantages for various fisheries. Purseining and aimed mid-water trawling for pelagic species utilizes this technology to determine the presence, location, density and movements of schools of fish. Since time spent searching is a large proportion of fishing activities that utilize fuel consumption, quick location of schools of fish would result in energy optimization.

In demersal fisheries, this technology can be applied to detect thermoclines where fish of various species and sizes may accumulate. Again, this reduces search time and thus

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fuel consumption.

These new technologies can provide up-to-date, real-time information on sea bed conditions that provide a real advantage to demersal fisheries that use Scottish seines, dragging by single or pair boats, or longlines and gillnets. Information can then be used to make tactical decisions that make these fishing operations more efficient. Information can also be used to build data bases that delineate good fishing grounds or indicate rough grounds to be avoided.

As advancements are made, the adoption and adaptation of these technologies to a wider spectrum of fish harvesting operations offers an opportunity for the international community to cooperate in joint research and testing efforts.

However, there is clearly a need to employ systems that are as simple as possible and to use technology only when appropriate. It is also necessary to avoid duplication of work already being done, for example, through ICES. ⇦ NEW

In terms of the scope of useful information that can be used routinely if integrated by state of the art equipment, there are several areas that need to be examined. Examples are:

Environmental -	Water temperature, presence of plankton, salinity, clarity, depth and currents.
Biological -	Measurement of amount and size of fish and determination of species.
Navigational -	Precise location of fishing vessel and location of other vessels, presence of birds, mammals and other species as recorded on electronic charts.
Monitoring of - Vessel/gear	Speed, performance of propeller and other auxiliary gear, fuel consumption, gear measurements (loading and geometry of mobile gear), other gear loads and distances between components.

Subtasks: 1. Use of D.C.S. ~~black-box~~ technology ⇦ NEW

Evaluation of the effectiveness of decision making support systems and monitoring of entire fleets through the use of DCS ~~black-boxes~~ should be carried out *by reviewing the success of existing similar systems and by undertaking a limited study over a small area.*

2. To develop systems for middle distance and inshore vessels

Based on the technologies available to larger vessels involved in the offshore

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fishery, the international fishing community should cooperatively develop systems to be used by other fisheries and types of vessels.

3. Expand electronic charting

The coverage of electronic charting should be increased specifically in areas that are important to international fisheries.

4. Improve product quality ⇦ NE

Quality of final product could be improved by tracking fish through capture, processing and market chains.

5. Literature search ⇦ NEV

Conduct a literature search for information on what is already being done.

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ANNEX III

Establish Data Bases Describing Energy Consumption/Efficiency in Fish Harvesting Units/Systems

Introduction

There exists vast quantities of data on the engineering performance of fishing units (vessels and gear) under a wide variety of water depths, currents and other marine conditions. Many of these data have direct relevance to the estimation and/or indirect measurement of fuel and energy use in fishing.

Access to this data, through appropriate data bases would provide a wealth of useful material for the creation of new or improved fishing units (vessel plus gear). While further experimental work is needed, existing data can be used to complement new results and assist in the task of reducing the research and development work required to improve energy efficiency. Facilitating the exchange of data between institutions and countries represents a major role for fishing data bases.

Past experience indicates that databases are more difficult to establish than anticipated and not easy to maintain. But a widely acessible, international database containing vessel, gear and other harvesting information is needed to assist with energy optimization. Successful existing systems include: Ireland's Marine Database Centre; ⇦ NE

Netherland's "black box" system;
UK's charts displaying hydrographic information;
Norway's fish tracking for quality; and
Mar Source site on the Internet.

Objective

To define, produce and make readily available, databases in a computerized and/or printed format to fisheries researchers, commercial fishers and fisheries managers. (These clients can use this information to complement new data and to avoid duplication of data collection effort.)

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Means

Scope: Considerable information on the energy consumption of fishing systems exists both in the published literature and in government and industry reports. This material will be collected and organized into a computerized data base for distribution on computer disk and/or in print.

During the search, it may become clear that information for certain fishing systems or crucial parts of some fishing systems is lacking. These gaps will be identified. Recommendations for further work on systems at sea or in tanks will be made. The need for commercial testing or more controlled trials will be suggested.

Subtasks: 1. Feasibility study ⇦ NEW

While difficult to establish and maintain, databases are useful in showing trends and in determining future fisheries activities. To be really useful, data should be easily accessible and in simple useable format. Consistency in the international collection of good quality data is essential. Information already available should be used and, it is suggested that data input should be focused on information such as vessel power, type of gear, and total fuel per trip.

Terms of reference for the feasibility study must include a number of points, for example:

- who wants the data (actual needs);
- what kind of data should be collected (focus on new data acquisition; existing information systems containing relative data?);
- how would the data be used;
- how would the data be handled logistically;
- how would the data be linked with existing databases; and
- what are the costs of establishing such a database?

2. Small-scale database project ⇦ NEW

A feasibility study should be followed by a small-scale database project, involving a limited geographic area and limited specific data, designed to work out potential problems before starting work on a larger database.

3. Broaden the database effort based on the results of subtasks 1 and 2.

Through literature searches and written/personal communications, compile a computerized data base of information on the energy consumption of fishing

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vessels and gear used for different fishing operations throughout the world.

4. Where information is lacking, design a variety of means to measure the energy consumption of these fishing systems (or components thereof) through:

    (i) work at sea with full-scale fishing systems under commercial operations or controlled conditions.

    (ii) work with models, for example in flume tanks.

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ANNEX IV

Energy Optimization by Fishing Unit (Vessel plus Gear)

Introduction

There is a real need to improve energy efficiency of fishing gears and overall harvesting systems ⇦ NEW

For the purpose of this Annex, a fishing unit includes a fishing vessel (complete with propulsion engines and navigation and gear handling equipment), a complete set of gear, fish handling capability and storage/freezing capacity all of which can be optimized in terms of energy consumption. A number of these units may be deployed by the industry in their strategies covered in Annex I.

Each fishing gear type and the types of vessels and equipment needed to tow or operate them can be made more selective, energy efficient and less hazardous to the environment. Reduction of various forms of pollution associated with these fishing units can also involve e.g. energy use, gear loss and unnecessary seabed disturbance.

Objective

To educate fishers and the general public that energy efficiency is pursued to ensure reasonable return and protect the environment, not to increase capacity. ⇦ NEW

To provide or facilitate the necessary research and development work in order to improve the energy efficiency of fishing units. This work should be aimed at the broad issue of sustainable fishery, for example: matching vessels to gear, improvements in gear selectivity, and reduction of drag. All energy inputs should be considered, for example: energy inputs related to making twine for nets, and energy used in transportation of product. ⇦ NEW

Means

Scope: The work would include all traditional and developing fishing gear types currently operated and would address the matching of gears to vessels, fishing tactics and the relationship between catching capacity and the appropriate on-board handling/ storage capability.

Subtasks: 1. Experimental work on fish behaviour in regard to fishing is required to complement engineering studies of fishing gear.

The importance of the fish catching process requires that direct and other methods of observing fish behaviour be carried out in parallel with studies on the physical

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and geometric aspects of fishing gear operation.

2. Recognizing the close interaction between vessels and gear, studies/experiments of vessel performance in relation to energy consumption, will be made. Consideration of the age, state of maintenance/repair, fishing tactics, auxiliary equipment and handling methods and other factors will be included together with necessary calibrations.

3. Measurements are needed of the engineering characteristics of fishing gears, especially the selectivity and catch rates of gear to enable comparisons to be made within gear type and between gear types.

4. Study and where necessary revise modelling rules and establish standards for tank measurements which would improve the potential for cooperation among countries and enhance interpretation of project test results. ⇦ NE

5. Investigate potential for appropriate use of stationary gears which are often more energy efficient than mobile ones. ⇦ NE

6. Work designed to tailor fishing capacity to the resource so that selectivity, responsible fishing and quality issues are the focus for fish harvesters. Such projects might include those that improve the quality of fish products. A better quality product would make the fishing industry more competitive in the food market. Energy costs related to transportation of product are often a significant part of industry's energy use. ⇦ NE

7. Model and full-scale studies should be undertaken to explore various issues related to energy, fishing platforms, and fishing gears. ⇦ NE

8. An inventory of old and new studies should be created. ⇦ NE

Appendix IV

Process for Signing Implementing Agreements

Process for Establishing and Signing
an IEA Implementing Agreement for Energy R&D

1. Expert Group meet to identify: areas (annexes) for cooperation, actual project (s) (in each annex) that will be put forward, which countries are interested in participating and in which annexes and which countries are interested in leading the proposed annexes. Hopefully this meeting will complete all of this.

2. After the Expert Group has dealt with the items above, a penultimate draft IA is prepared by the lead country (in this case Canada) and circulated to all the interested countries (IEA End Use Working Party Members, Members of the Expert Group and any others identified by the preceding people) for comment.

3. A final draft will be prepared by Canada incorporating comments received and sent to the IEA secretariat who will send it to IEA legal office.

4. The IEA will then send it to all representatives of the IEA End Use Working Party and members of the Expert Group. The country representatives on the End Use Working Party will contact the expert as well as the appropriate people in departments of fisheries in interested countries.

5. Members of the Expert Group will have to talk with their IEA/EUWP representatives. Together they will seek final approval from the appropriate people in their countries to get the agreement signed.

6. Implementing Agreements are usually signed by Ambassadors to the OECD or other people identified by interested countries.. Once your country has decided to sign the agreement the Secretariat will deal with the signing process with help from your End Use Working Party representative..

7. Of course your country could decide at this point that it is not interested in participating in this IA and would not sign.

8. In the case of this Implementing Agreement, after it has been signed the member countries will formally delegate representatives to the Executive Committee (which in most, if not all, cases will be the members of the Expert Group). These delegates will meet and formally ratify the Chair and Secretariat and start on cooperative work. In a number of cases cooperation has started before signature under an Interim Executive committee.

9. You should note that: the IA will be approved by the IEA for a period of 3 - 5 years and is renewable; the Chairperson serves for a 3-year term which is also renewable; and new annexes can be added any time by (generally) three or more countries.

Appendix V

Canadian Work on Energy Optimisations

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CANADIAN RESEARCH AND DEVELOPMENT PROJECTS ON ENERGY OPTIMIZATION IN FISH HARVESTING

Example I
Ener-Sea Project - Atlantic Canada (1983-88)

INTRODUCTION

In 1983, fuel consumption was estimated to be 65% of the direct costs of operating a fishing vessel or 20% of total costs, excluding labour. With the increase in the high cost of fuel brought on by OPEC Crises, fishers sought solutions to reducing costs. In response, the Department of Fisheries and Oceans established the Ener-Sea program. The program was designed to train inshore fishers in techniques that would reduce operating costs. The program targeted 30-65 foot vessels (including trawlers, gillnetters and longliners) that use diesel engines under 700 horse power with 3-4 blades. A major component of the program, the vessel efficiency analysis system, provided fishers with individual vessel analysis.

VESSEL EFFICIENCY ANALYSIS SYSTEM

Developed specifically for the Ener-Sea program, the vessel energy efficiency analysis system is a computer software program designed to perform an energy audit of individual fishing vessels. Audit results are used to assist fishers in making changes to their vessels so that energy efficiency is increased. The vessel analysis Vacs system has five modules. The more widely used modules are the matching of propellor to vessel module that predicts the performance of the existing propellor configuration and provides specifications on the optimum propellor (diameter, pitch and number of blades) and the operating profile model that predicts the speed and fuel savings at various RPM levels.

ESTIMATED SAVINGS AND ACTUAL RESULTS

Potential savings due to a reduction in speed (1 knot from maximum) and installation of a more efficient propellor was calculated for the entire Newfoundland inshore fleet. Calculations

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indicated a $30-53 million saving over a 10-year period (based 1987 fuel costs). Savings were calculated by combining savings from reduction in speed and savings from changes to propellor as follows:

Potential upper and lower limit savings from a reduction in speed by 1 knot from maximum were calculated using the following formula:

Potential Savings (Upper and Lower Limit) = Number of Boats Per Year x Fuel Cost Saved x % of Fuel Saved

Total savings were estimated at $2,757,815 per year (lower limit) to $4,998,471per year (upper limit).

A similar formula was applied to obtain potential savings from suggested propellor changes. Savings were estimated at $206,934 (lower limit) to $329,839 (upper limit).

Projected Total Fleet Savings (combined RPM reduction and propellor changes) for 10 years:

Lower Limit = $29,647,490

Upper Limit = $53,283,100

Following the delivery of the Ener Sea program and as part of monitoring and evaluation, fishers were surveyed by telephone and rigorous field tests were conducted on vessels to measure actual savings from reduction in speed and the use of optimum propellor.

Results of these activities showed that a large number of vessels did take advantage of the program by changing their operations and propellors. The actual savings can be summarized, for the Newfoundland vessels, as follows:

RPM reduction: **$ 762,00 per year (1.93 million litres at 39.45 cents/litre)**

Propellor change: **$ 62,000 per year**

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CANADIAN RESEARCH AND DEVELOPMENT PROJECTS ON ENERGY OPTIMIZATION IN FISH HARVESTING

Example II
British Columbia Pelagic Pair Trawling Projects (1995-97)

INTRODUCTION

Started in 1995 under the Canadian Program of Energy Research and Development (PERD), experimental trials to investigate the potential energy savings and catches through use of pair trawling as an energy efficient alternative to single boat fishing were conducted. Subsequent to the closure of foreign large-scale driftnet fishing, various pelagic species, e.g., flying squid and tuna are being targeted by the Canadian fleet. These are important developments because of the potential for diversification of fishing and reduced reliance on traditional species, and because of expected savings in fuel use compared with single boat harvesting technology. In essence, as these fisheries develop, the lower number of vessel necessary and reduced time at sea are expected to greatly limit fuel requirements.

PAIR TRAWLING FOR SQUID

The project has particular application in the case of flying squid. Although there is still much work to be done in predictably targeting the resource (e.g., distance from shore, precise position in the water column), a large resource has been recorded through consistent catches of 300,000 tons of squid per year by foreign vessels using large-scale gillnets up to 1988. Following the large-scale gillnet ban in 1988, fishing for this species had not been renewed up to 1995. If it is assumed that a much smaller fishery (e.g. a 10,000 ton fleet quote for flying squid) is developed to be harvested by an environmentally suitable and energy efficient gear type then, by selecting pair midwater trawling instead of single vessel trawling, an estimated savings in fuel costs of over $ 1,000,000 per year can be obtained.

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ANTICIPATED RESULTS

Advantages of pair trawling over traditional trawling include:

- pair trawling eliminates the need for otter boards to keep the mouth of the net open. Otter boards account for up to 30% of the gear drag experienced by traditional ottertrawlers; and

- verified by tests at sea, the technique provides a much larger swept area per vessel than otter trawling.

- Unlike otter trawlers, the pair trawl vessels do not pass directly over the species to be harvested, and herd into the net rather than disturb them.

Based on results in other fishing areas, estimated catch rates for single boat trawling are 3 ton/day. A very conservative estimate of pair trawling efficiency would place the catch rate at 9 ton/day (4.5 ton/vessel). Verification of these estimates is in progress through sea trials.

CALCULATION OF COST SAVINGS

Based on the above estimate of catch rates, and a modest commercial landing quota of 10,000 tons per year (fleet total), the vessel requirements would be as follows:

	Number of Vessels Needed	Fuel (Millions of Gallons)	Dollars Fuel Costs (Millions)
Single boat midwater trawl	55	2.93	$3.54
Pair boat midwater trawl	38 (19 pairs)	1.98	$2.37
Savings		0.95	$1.14

This $1.14 million saving only accounts for the increased efficiency which requires fewer boats, and reflects a very small quota. A larger quota would mean greater savings. In addition, further fuel savings of up to 10% are expected due to the lack of otter board drag in pair trawling.

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CANADIAN RESEARCH AND DEVELOPMENT PROJECTS ON ENERGY OPTIMIZATION IN FISH HARVESTING

Example III
Twin Trawling Experiments with Shrimp - Atlantic (1996-)

INTRODUCTION

Planned to start in July 1996, this joint (PERD, industry and governments) project involves making minor (easily reversible) modifications to shrimp vessels; and design, construction, installation and testing of twin trawl gear in order to confirm expected energy savings, reduce vessel operating costs and improve product quality. European experiences with twin trawls have been extremely positive. The wide fishing gear opening (swept area) coupled with grading devices has proven to be a highly efficient and cost effective. The main basis of the improvement over traditional shrimp trawls being the greatly reduced sea-time required to harvest a shrimp quota and also the quick return to port which limits the time for shrimp quality deterioration after capture. At the same time, use of grading/ selectivity devices will enhance the conservation-fishing characteristics of the twin trawl and assure maximum market value for shrimp caught.

As an example of the need to improve product quality, shrimp processors in New Brunswick have consistently asked vessels to reduce the number of days per trip. Trip durations have been reduced for 1996, and these new measures have created problems when the shrimp fleet has to typically steam 30 hours to the grounds. Fishing time is being cut to a level where the voyage is unproductive unless catch rates can be improved while on the grounds.

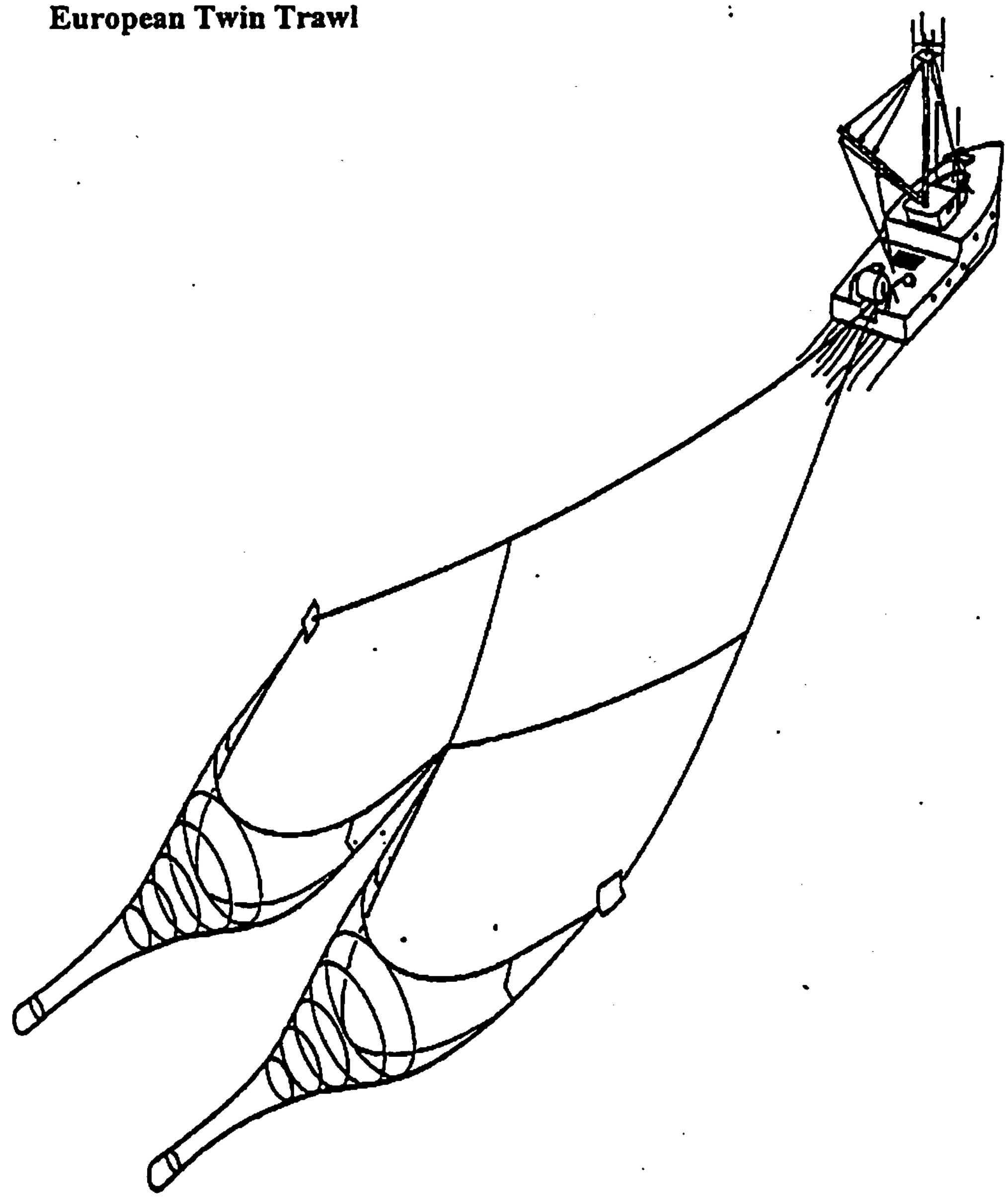
PROJECT EXECUTION

The project will develop gears to precisely match existing vessels starting from up-to-date European designs. Flume tank work on models followed by full-scale tests at sea will be involved. The latter will benefit from the presence of an European fishing captain with extensive experience in the operation of twin trawls.

ESTIMATED FUEL SAVINGS

European experience suggests that catch rates of or exceeding 50% greater than traditional trawls can be expected. Thus, based on the corresponding reduction of 25% in sea (trawling) time required, a savings of $13,500 per year per vessel can be expected. Thus, assuming fuel costs of $450/day/vessel for 60 vessels, a New Brunswick fleet saving of $810,000 per year is anticipated.

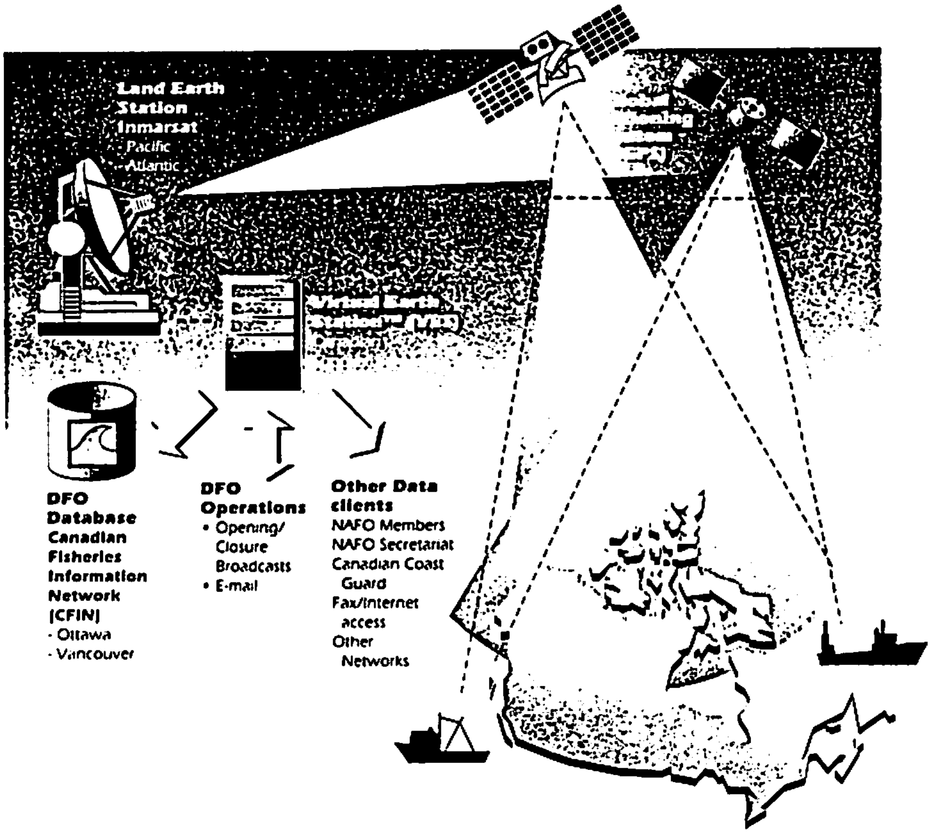
European Twin Trawl



FISHERIES AND OCEANS

REMS

Remote Electronic Monitoring System



Remote Electronic Monitoring System ~ REMS

Canadian Department of Fisheries and Oceans has integrated satellite tracking and communications technology as a new component of the Department's increasing MCS (Monitoring, Control and Surveillance) activities.

The Remote Electronic Monitoring System (REMS) is delivered through a Canadian Service Provider. The primary functions of Rems for DFO are as follows:

- Automatic Vessel Positioning
- Vessel Catch Reporting including:
  - Catch on-board when entering an Area
  - Catch for a particular period of time (Daily / Weekly)
  - Catch composition (species)
  - Catch product reporting (i.e. Head-on, Gutted, etc.)
- Vessel transshipment reports
- Vessel Entry and Exit reports for NAFO Regulatory Area
- Vessel Transit reports between fishing zones
- Vessel course and speed (in relation to position information)
- Water depth (can indicate the type of species being fished)
- Notification of fishing closures
- Deployment of enforcement platforms / resources (aircraft, vessels, vehicles, observers, Fishery Officers)
- Provides a secure message network for Fishery Officers and Observers
- Near real-time database entry and access

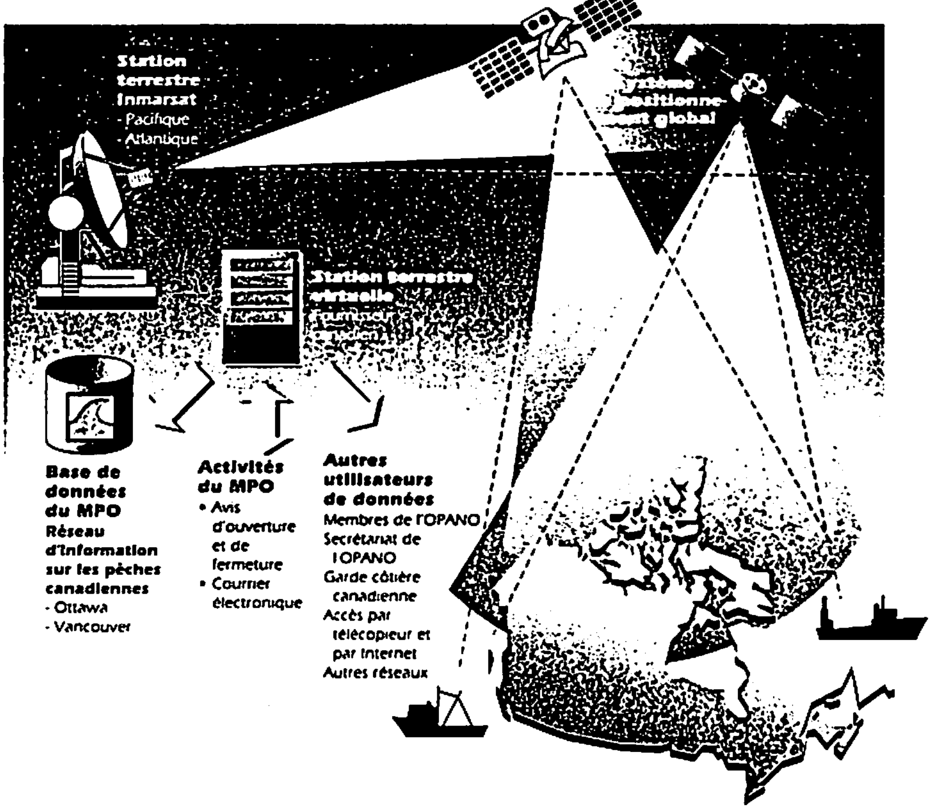
Fisheries and Oceans | Pêches et Océans

Canada

PÊCHES ET OCÉANS

SESD

Système électronique de surveillance à distance



Système électronique de surveillance à distance – SESD

Le ministère des Pêches et des Océans du Canada a intégré la technologie des communications et du repérage par satellite à ses activités de plus en plus intensives de contrôle et de surveillance.

Le Système électronique de surveillance à distance est offert par un fournisseur de services canadien. Le système s'acquitte des fonctions suivantes pour le MPO :

- Positionnement automatique des navires
- Rapport sur les prises des navires
  - prises à bord à l'entrée d'une zone
  - prises au cours d'une période précise (quotidiennes, hebdomadaires)
  - composition des prises (espèces)
  - rapports sur les produits de la pêche (poissons entiers, éviscérés, etc.)
- Rapports sur les transbordements
- Rapports sur les entrées et les sorties de zones réglementées par l'OPANO
- Rapports sur les déplacements des navires entre les zones de pêche
- Cours et vitesse des navires (par rapport à l'information sur la position)
- Profondeur de l'eau (peut indiquer le type d'espèces pêchées)
- Avis de fermeture des pêches
- Déploiement des plates-formes et des ressources en matière d'application des règlements (aéronefs, navires, véhicules, observateurs, agents des pêches)
- Réseau de messages fiable pour les agents des pêches et les observateurs
- Entrée et accès à une base de données en temps quasi réel

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