

Fishing Vessel Safety

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1. Introduction

The International Maritime Organization (IMO), the International Labour Organization (ILO) and the Food and Agriculture Organization (FAO) are the three specialized agencies of the United Nations system that play a role in fishermen's safety at sea.

The three organizations reached an agreement with respect to principles of cooperation and areas of mutual interest and responsibility: FAO, fisheries in general; ILO, labour in the fishing industries; and the IMO, safety of life, vessels and equipment at sea.

In compliance with this agreement ILO, IMO and FAO have jointly prepared a Code of Safety for Fishermen and Fishing Vessels, which is divided into two parts: Part A, addressed to skippers and crews; and Part B, addressed to shipbuilders and owners.

In 2010 the IMO carried out a study on "Safety recommendations for decked fishing vessels of less than 12 metres in length and undecked fishing vessels" ([pdf](#)).

The ICES-FAO Working Group on Fishing Technology and Fish Behaviour (WGFTFB) met in Copenhagen, Denmark from 31 May – 4 June 2010 and submitted a report which presents all the innovations, projects, etc. which are being carried out in the field of new technologies related to ship stability, fishing gears and equipment worldwide. You can access the report by clicking [here](#).

On 15 October 2010, the President of the United States signed into law new safety statutes for the nation's commercial fishing fleet – the New Commercial Fishing Industry Vessel Safety Act ([CFIVSA](#)). The statutes include a section on Design, Construction and Maintenance Standards for Newly-Built Commercial Fishing Vessels.

Also interesting are the Voluntary Guidelines for the Design, Construction and Equipment of Small Fishing Vessels 2005, whose purpose is to provide information on the design, construction and equipment of small fishing vessels with a view to promoting the safety and health of the crew. They are not intended as a substitute for national laws and regulations, although they may serve as a guide to those concerned with framing such national laws and regulations. The Voluntary Guidelines are available on-line at the IMO Publications section.

Some of the FAO publications refer to the construction of fishing vessels.

Fishing boat designs: 2. V-bottom boats of planked and plywood construction. (Rev.2) FAO Fisheries [Technical Paper](#) T134Rev.2 2004

1.1. References

- ◆ Report of the ICES-FAO Working Group on Fishing Technology and Fish Behaviour ([WGFTFB](#)). 31 May - 4 June 2010. ICES Headquarters, Copenhagen
- ◆ Joint data collection between the fishing sector and the scientific community in Western Waters. FINAL REPORT to the European Commission Directorate-General for the Fisheries and Maritime Affairs. Contract SI2.491885, Ref. FISH/2007/03 Lot 1. [August 2010](#)
- ◆ TECHNICAL CONSULTATION TO DEVELOP INTERNATIONAL GUIDELINES ON BYCATCH MANAGEMENT AND REDUCTION OF DISCARDS. Rome, 6–10 December 2010. [FAO](#)
- ◆ Report of the ICES - FAO Working Group on Fishing Technology & Fish Behaviour ([WGFTFB](#)). 18–22 May 2009. Ancona, Italy
- ◆ Report of the ICES-FAO Working Group on Fish. Technology and Fish Behaviour (WGFTFB). 21-25 [April 2008](#). Tórshavn, Faroe Islands

- ◆ Fishing - ILO Activities. [ILO](#)

2. Ship dynamics under adverse conditions

2.1. Introduction

When searching for information about ship dynamics in adverse conditions we are constantly referred to the term “stability” of the ship.

While conducting fishing operations, sailing at low speed or even at berth, a ship is being hit by the waves and caused to pitch and roll, thus affecting its operating and crew capacity. The ship’s decrease in operating capacity is two-fold: on the one hand, fishing operations turn less efficient, since the disruptive motion combines with the traction or launching of fishing gear (machinery, haulers, etc.), while the deck crew see their tasks’ efficiency decrease. On the other hand, the impact on ship manoeuvring will lead to a decrease in the efficiency of fishing operations, an increase in their length, a drop in catches and a further increase of the effort on manoeuvre elements and fishing equipment. The impact on deck crew will be significant, since strong ship movements – particularly heeling movements – cause an increase of physical and mechanical occupational risks affecting mainly the deck crew. Such occupational hazards include the risk of falls, bumps, crowding, etc. In fact 70% of the fatal accidents which occur on board fishing vessels are caused by a crew member falling over or from a height (in this case, overboard into the sea).

In light of the amount of accidents occurred in the past few years, experts in naval engineering and safety have made it clear that the first point to consider when legislating in this field, aimed at avoiding this kind of accidents, is the stability of fishing vessels. There is no doubt that this is the key to most of the fatal accidents produced. The experts refer not only to legislating on construction parameters, but also on the way inspections regarding stability are carried out.

Below is a list of patents, scientific papers, doctoral theses and other relevant information regarding the stability of fishing vessels.

2.2. European projects

[Intelligent roll stabilisation for fishing vessels \(INTELLISTAB\)](#)

Start date: 2002-01-01

End date: 2004-12-31

Project Acronym: INTELLISTAB

Project status: Completed

[Research and development of intelligent operation of roll damping tanks on fishing vessels and offshore support vessels](#)

Start date: 1999-12-15

End date: 2000-06-14

Project status: Completed

Objective: The existing anti roll systems fitted to fishing and offshore support vessels are tuned for a particular condition of the vessel and in other conditions of the vessel and in other conditions can

be a danger to the vessel. Fishing vessels and offshore support vessels have continually changing stability conditions dependent on catch rates and at sea loading (or discharging) of cargo. The proposed system will monitor the condition of the vessels throughout the voyage and adjust itself accordingly to give a safe and stable working platform as required by Annex 1 of Council Directive 93/103/EC.

2.3. Patents

B63B

SHIPS OR OTHER WATERBORNE VESSELS; EQUIPMENT FOR SHIPPING (air-cushion vehicles B60V; arrangements of vessel ventilation, heating, cooling, or air-conditioning B63J 2/00)

Patent No	Title	Company	Date
CN201012742 (Y)	Net dragging board for fishing boat	XUEMING MAO [CN]	2008-01-30
WO2006066494 (A1)	A LIGHTWEIGHT TYPE FLOATING STRUCTURE WITH DOUBLE-FLOOR STABILIZING BOARD	FU DELI [CN]	2006-06-29
CN2642665 (Y)	Controllable strong umbrella anchor	YAN LIXING [CN]	2004-09-22
US2003041789 (A1)	Flat bottom boat stabilizer	HINCHEE BILLY G	2003-03-06
CN1421351 (A)	Method of making hull of fishing boat and yacht with basalt fiber reinforced material	ZHOU XIANGANG [CN]	2003-06-04

2.4. Scientific papers

A coupled non-linear mathematical model of parametric resonance of ships in head seas

Author(s): Neves MAS, Rodriguez CA

Source: APPLIED MATHEMATICAL MODELLING **Volume:** 33 **Issue:** 6 **Pages:** 2630-2645
Published: JUN 2009

Abstract:

The present paper describes a non-linear third order coupled mathematical model of parametric resonance of ships in head seas. Coupling is contemplated by considering the restoring modes of heave, roll and pitch motions. Numerical simulations employing this new model are compared to experimental results corresponding to excessive motions of a transom stern fishing vessel in head seas. It is shown that this enhanced model matches its results with the experiments more closely than a second order model. It is shown that the new model, due to the introduction of the third order terms, entails qualitative differences when compared to the more commonly used second order model. The variational equation of the roll motion will not be in the form of a Mathieu equation. In fact, it is shown in the paper that the associated time-dependent equation falls into the category of a Hill equation. Additionally, a hardening effect is analytically derived, related to the third order coupling of modes and wave passage effects.

Limits of stability corresponding to the linear variational equation of the coupled roll motion are analytically derived. Numerical limits of stability corresponding to the nonlinear equations are computed and compared to the analytically derived limits. (C) 2008 Elsevier Inc. All rights reserved.

Effect of freeboard and metacentric height on capsizing probability of purse seiners in irregular beam seas

Author(s): Paroka D, Umeda N

Source: JOURNAL OF MARINE SCIENCE AND TECHNOLOGY **Volume:** 12 **Issue:** 3 **Pages:** 150-159 **Published:** SEP 2007

Abstract:

The probability of capsize of purse seiners in irregular beam seas and the effect of freeboard height and metacentric height on trapped water on the deck was investigated. The aim was to quantify a safety level that can be achieved by direct stability assessment for this type of fishing vessel. The amount of trapped water on deck was numerically estimated using a hydraulic flow assumption. The long-term capsizing probabilities were estimated using a piecewise linear approach together with wave statistics from major Japanese fishing areas. The estimated safety level of capsizing probability was compared with that obtained by the IMO weather criterion and by the water-on-deck criterion of the IMO Torremolinos Convention. Numerical results for four typical Japanese purse seiners indicated that the effect of freeboard, on the amount of trapped water on deck, is more important than that of the metacentric height. Besides the metacentric height and the freeboard, it was shown that the danger of capsizing is a function of the rise of floor. The safety level obtained by the capsizing probability approach is generally higher than that based on the IMO weather criterion. However, the water-on-deck criterion provides a higher safety level than the capsizing probability approach for ships with a low rise of floor.

Influence of non-linearities on the limits of stability of ships rolling in head seas

Author(s): Neves MAS , Rodriguez CA

Source: OCEAN ENGINEERING **Volume:** 34 **Issue:** 11-12 **Pages:** 1618-1630 **Published:** AUG 2007

Abstract:

The present paper describes an investigation on parametric resonance in head seas in which a new third-order coupled mathematical model is considered. The restored modes of heave, roll and pitch are contemplated. The discussion is illustrated for the case of a transom stern fishing vessel at different speeds. It is pointed out that numerical simulations employing the new model are successfully compared to experimental results previously obtained for the vessel.

Considering that analyticity is an important tool when handling complex stability issues, some theoretical dynamic characteristics of the equations are discussed. By means of the analysis of the coupled linear variational equation derived from an extended third-order model, the appearance of super-harmonics and increased rigidity proportional to wave amplitude squared due to third-order terms is demonstrated.

In the present paper, an important tool is explored, that is the analysis of the limits of stability obtained from the new model. Limits of stability are a well-known and practical way of looking into the problem of parametric resonance. New limits of stability are derived and compared to the more conventional Strut diagram. Dynamic characteristics associated with the new limits of stability are discussed. The influence of different parameters is investigated, including vessel speed, damping and tuning. Consistent and revealing results are obtained through the analysis of the new limits of stability for different speeds and damping. (c) 2007 Elsevier Ltd. All rights reserved.

Prediction of capsizing probability for a ship with trapped water on deck

Author(s): Paroka D , Umeda N

Source: JOURNAL OF MARINE SCIENCE AND TECHNOLOGY **Volume:** 11 **Issue:** 4 **Pages:** 237-244 **Published:** 2006

Abstract:

The authors have already examined a method for evaluating the capsizing probability of a ship in the dead ship condition based on a piecewise linear approximation of the restoring arm. Here, this method is extended to ships with trapped water on deck. This is because the stability of ships having a relatively high bulwark, such as fishing vessels, could substantially deteriorate due to trapped water on deck. First, the mean amount of water trapped on deck was estimated as a function of the significant wave height and the mean wave period using a model experiment in irregular beam seas. Second, the restoring arm curve with trapped water on deck was calculated hydrostatically and then approximated with a piecewise linear curve. Third, the roll angle was estimated using a nonlinear and uncoupled equation of absolute roll angle under stochastic wave and wind exciting moments. The short-term and long-term capsizing probabilities were calculated for a fishing vessel operating off Kyushu. Numerical results quantitatively demonstrated that the effect on capsizing probability of trapped water on deck cannot be ignored when accurately evaluating the stability of fishing vessels.

On unstable ship motions resulting from strong non-linear coupling

Author(s): Neves MAS, Rodriguez CA

Source: OCEAN ENGINEERING **Volume:** 33 **Issue:** 14-15 **Pages:** 1853-1883 **Published:** OCT 2006

Abstract:

In this paper, the modelling of strong parametric resonance in head seas is investigated. Non-linear equations of ship motions in waves describing the couplings between heave, roll and pitch are contemplated. A third-order mathematical model is introduced, aimed at describing strong parametric excitation associated with cyclic changes of the ship restoring characteristics. A derivative model is employed to describe the coupled restoring actions up to third order. Non-linear coupling coefficients are analytically derived in terms of hull form characteristics.

The main theoretical aspects of the new model are discussed. Numerical simulations obtained from the derived third-order non-linear mathematical model are compared to experimental results, corresponding to excessive motions of the model of a transom stern fishing vessel in head seas. It is shown that this enhanced model gives very realistic results and a much better comparison with the experiments than a second-order model. (c) 2006 Elsevier Ltd. All rights reserved.

A coupled third order model of roll parametric resonance

Author(s): Neves MAS, Rodriguez CA

Editor(s): Soares GG; Garbatov Y; Fonseca N

Source: Maritime Transportation and Exploitation of Ocean and Coastal Resources, Vols 1 and 2 - VOL 1: VESSELS FOR MARITIME TRANSPORTATION - VOL 2: EXPLOITATION OF OCEAN AND COASTAL RESOURCES **Pages:** 243-253 **Published:** 2005

Conference Information: 11th International Congress of the International-Maritime-Association-of-the-Mediterranean (IMAM 2005)

Lisbon, PORTUGAL, SEP 26-30, 2005

Int Maritime Assoc Mediterranean

Abstract:

The present paper describes an investigation in which a complete third order coupled mathematical model is contemplated by considering the restoring modes of heave, roll and pitch. Numerical simulations employing this new model are compared to experimental results corresponding to excessive motions of a transom stem fishing vessel in head seas. It is shown that this enhanced model matches its results with the experiments more closely than a second order model.

Considering that analyticity is an important tool when handling complex stability issues, the theoretical dynamic characteristics of the equations are discussed. It is shown that the new model, due to the introduction of the third order terms, entails qualitative differences when compared to the more commonly used second order model. The variational equation of the roll motion will not be in the form of a Mathieu equation. In fact, it is shown in the paper that the associated time dependent equation falls into the category of a Hill equation. Additionally, a hardening effect is analytically derived, related to the third order coupling and wave effect.

Roll performance of a small fishing vessel with live fish tank

Author(s): Lee SK, Surendran S, Lee G

Source: OCEAN ENGINEERING **Volume:** 32 **Issue:** 14-15 **Pages:** 1873-1885 **Published:** OCT 2005

Abstract:

The concept of live fish tanks in trawlers is to use the catch in a better condition and to reduce marine pollution. It also reduces the infrastructure meant to freeze the catch to preserve it for longer period. But the presence of additional free surface in the vessel challenges the stability of the vessel. This is besides the sloshing effect due to the moving liquid mass in the tank. Roll motions are initiated due to various factors related to the hull characteristics of the vessel, loading and operating conditions and its interaction with the environment. Location of fish tank, its orientation, arrangement of baffles inside the tank to reduce the free surface affects and careful design of tank opening are to be given priority during the design, manufacturing and tank testing. The results obtained from tank test of model are compared with that of analytical method, The non-linear roll performance become further complicated due to the free surface and sloshing effects of the mass in the live fish tank. Wave makers are used for generating waves under laboratory conditions compatible with the scaled down model of the trawler model. The tests are conducted in the towing tank of Pusan National University. (c) 2005 Elsevier Ltd. All rights reserved.

Design of a robust neural network structure for determining initial stability particulars of fishing vessels

Author(s): Alkan AD, Gulez K, Yilmaz H

Source: OCEAN ENGINEERING **Volume:** 31 **Issue:** 5-6 **Pages:** 761-777 **Published:** APR 2004

Abstract:

Stability problem is a vital issue as the total measure of the ship safety. Designers need to use reliable design tools for the definition of stability parameters during the preliminary design stage of ships. These tools are mostly built in the form of approximate expressions with some error level. In this study, a functional and reliable tool is proposed to ship designers for determining initial stability particulars of fishing vessels. It uses a robust neural network (NN) structure with different algorithms based on two fishing vessel databases containing the hull geometry and stability related parameters. The initial stability particulars of fishing vessels are almost exactly determined for an input set of ship data. With this method, using some sample ship data, the vertical center of gravity (KG), height of transverse metacenter above keel (KM) and vertical center of buoyancy (KB) are easily calculated. As a result, the designer can calculate transverse metacentric height (GM) and investigate a possible set of ship parameters affecting the ship's intact stability. (C) 2003 Published by Elsevier Ltd.

Research opportunities identified during the casualty analysis of the fishing vessel arctic rose

Author(s): Borlase GA

**Source: MARINE TECHNOLOGY AND SNAME NEWS Volume: 40 Issue: 4 Pages: 270-277
Published: OCT 2003**

Conference Information: 6th International Ship Stability Workshop

GLEN COVE, NEW YORK, OCT 13-16, 2002

Abstract:

During the course of the U.S. Coast Guard Marine Safety Center's analysis of the sinking of the fishing vessel Arctic Rose, a broad variety of stability issues were encountered that have not yet been addressed in the research community. The effect of freeboard on static and dynamic stability needs to be studied to ensure minimum reserve buoyancy and limit the effects of water on deck. The area of flooding stability, where a vessel's displacement, centers of gravity, and stability characteristics are constantly changing due to progressive flooding, needs to be further investigated. Time-domain analyses of progressive flooding in a seaway are needed, as are model tests of progressive flooding from the weather deck into interior spaces of a vessel. Additionally, a better understanding is needed of the behavior of the vessel between when the vessel capsizes due to loss of righting arm and sinks because flooding weight exceeds reserve buoyancy, and the attitude of a vessel as it falls through the water column to the ocean floor.

Small commercial fishing vessel stability analysis: Where are we now? Where are we going?

Author(s): Womack J

**Source: MARINE TECHNOLOGY AND SNAME NEWS Volume: 40 Issue: 4 Pages: 296-302
Published: OCT 2003**

Conference Information: 6th International Ship Stability Workshop

GLEN COVE, NEW YORK, OCT 13-16, 2002

Abstract:

Small commercial fishing vessels are the largest, most diverse, and constantly evolving class of marine vessels in existence. Yet the methods used to evaluate their stability reflect a one size fits all approach with little improvement over the many decades since their introduction in the early 1900s. This conflict coupled with significant flaws in the methods used to convey stability guidance to the crews leads to unacceptable risks being taken and fishing vessels and their crews being lost. Improvements are needed in all areas of small commercial fishing vessel analysis: better criteria that reflect the true dynamic environment faced by the crews, better means to convey stability guidance, including the current risk of capsize to the crews, and lastly a program to teach stability and how to use the guidance provided.

Analysis of roll motion and stability of a fishing vessel in head seas

Author(s): Neves MAS, Perez N, Lorca O

Source: OCEAN ENGINEERING Volume: 30 Issue: 7 Pages: 921-935 Published: MAY 2003

Abstract:

The present paper describes an investigation on the relevance of parametric resonance for a typical fishing vessel in head seas. Results for different Froude numbers are discussed based on experimental, numerical and analytical studies.

The first region of resonance is investigated. Distinct wave amplitudes are considered. Some intense resonances are found to occur. The paper compares the experimental results with nonlinear time simulations of the roll motion. Very good agreement is found, even when large motions take place.

Finally, in order to analyze the experimental/numerical results, analytic consideration is given to distinct parameters affecting the dynamic process of roll amplification. The influence of heave, pitch, wave passage effect, speed and roll restoring characteristics are discussed. (C) 2002 Elsevier Science Ltd. All rights reserved.

An investigation of the relationship between sea state induced vessel motion and cod-end selection

Author(s): O'Neill FG, McKay SJ, Ward JN, Strickland A, Kynoch RJ, Zuur AF

Source: FISHERIES RESEARCH Volume: 60 Issue: 1 Pages: 107-130 Published: JAN 30 2003

Abstract:

The relationship between sea state induced vessel motion and cod-end selection is investigated. The paper is divided into three parts. Part I reports on sea trials to investigate the relationship between vessel motion and cod-end dynamics. By comparing the average period of longitudinal cod-end pulsing to the most important cyclic component of the tension in the trawl warps and the most important cyclic component of the linear accelerations of the fishing vessel, it is established that the pulsing of the cod-end is a response to sea state induced vessel motion.

Part 2 looks at the hydrodynamics and catch dynamics of a cod-end pulsing in a flume tank. Experiments are carried out on a half scale cod-end where the towing warp is attached to the rotating arm of a hydraulic motor and the catch is simulated using water filled balloons. Three categories of longitudinal cod-end motion are identified and a qualitative description of the hydrodynamic forces that are acting is presented. A number of observations are made concerning the catch dynamics and it is shown that, from a fixed reference frame, the displacement of the balloons is essentially linear and has no rotational component. It is concluded that the dynamic forces acting on the catch must generally be small.

Part 3 analyses direct observations of the hydrodynamics, catch dynamics and fish behaviour of pulsing cod-ends at sea. By comparing these observations with the results of the flume tank trials it is concluded that longitudinal pulsing of the cod-end is the predominant factor generating dynamic movement of the cod-end; that the dynamic forces acting on the fish ahead of the catch are small; and that the main component of the movement of these fish relative to the cod-end arises as a result of the displacement of the cod-end.

In the light of these results, an analysis of recorded observations of fish in pulsing cod-ends provides insight into some of the associated hydrodynamic and behavioural mechanisms which may affect the active and passive selection of fish in the cod-end. In particular, a cyclic tilting behaviour and reductions in flow speed are used to explain the dependence that is found between fish escape ahead of the catch and the cod-end motion. When allied to the result of part I of this study a direct link is established between sea state induced vessel motion and cod-end selection. (C) 2002 Elsevier Science B.V. All rights reserved.

Roll damping characteristics of a small fishing vessel with a central wing

Author(s): Chun HH, Chun SH, Kim SY

Source: OCEAN ENGINEERING Volume: 28 Issue: 12 Pages: 1601-1619 Published: DEC 2001

Abstract:

The roll damping characteristics of three models of a 3-ton class fishing vessel representing the bare hull, hull with bilge keels, and hull with bilge keels and a central wing are investigated by the free roll decay tests in calm water and also in uniform head waves in a towing tank. Speed and roll initial angle and OG (distance between the centers of gravity and roll) are varied to check their dependence on roll damping. The experimental results are compared with the numerical results of

mathematical modeling by the energy method and the energy dissipation patterns are also compared for these three models. The bilge keel contributes significantly to the increment of the roll damping for zero speed but as speed increases, the lift generated by the central wing contributes significantly to the roll damping increase. In addition, it is shown that the roll damping is more or less influenced by the regular head waves. 2001 Elsevier Science Ltd. All rights reserved.

Survival analysis of fishing vessels rolling in rough seas

Author(s): Senjanovic I, Cipric G, Parunov J

Source: PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY OF LONDON SERIES A-MATHEMATICAL PHYSICAL AND ENGINEERING SCIENCES Volume: 358 Issue: 1771 Pages: 1943-1965 Published: JUN 15 2000

Abstract:

A new approach to the problem of predicting the safety of vessels rolling in rough seas is described. It is based on the state of the art in nonlinear dynamics of a, single-degree-of-freedom system. The random wave excitation depends on sea state, vessel speed and direction of wave propagation. The differential equation of rolling motion is integrated by the harmonic acceleration method. The procedure is illustrated for the case of a typical fishing vessel. The roll response of an intact and damaged vessel is presented in the time and frequency domain. The fractal erosion of the safe basin in the initial-value plane is analysed. Finally, these results are used to determine the probability of a vessel's survival as a function of sea state, vessel speed and heading angle.

2.5. References

- ◆ RISK EVALUATION OF SHIP DYNAMIC STABILITY IN REGULAR WAVES. Journal of Marine Science and Technology, [Vol. 18, No. 4, pp. 530-536](#) (2010)
- ◆ Probabilistic Assessment of Ship Dynamic Stability in Waves. By Nikolaos I. Themelis. Doctoral Thesis. Athens, [October 2008](#)
- ◆ On the simulation of ship motions induced by extreme waves. A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at George Mason University. Copyright c 2009 by Haidong Lu. All Rights Reserved. [pdf](#)
- ◆ SMALL COMMERCIAL FISHING VESSEL STABILITY ANALYSIS WHERE ARE WE NOW? WHERE ARE WE GOING?. Proceedings of the 6th International Ship Stability Workshop, Webb Institute, [2002](#). John Womack, St. Michaels Ship Design
- ◆ [Capsizing of small vessel due to waves and water trapped on deck](#). Jan Jankowski, Polish Register of Shipping. Andrzej Laskowski, Polish Register of Shipping. Proceedings of the 9th International Conference on Stability of Ships and Ocean Vehicles
- ◆ [HYDRONAV 2010](#) Gdańsk, 12-13 May 2010

3. Improved equipment and fishing gears

3.1. Introduction

Fish capture technology encompasses the process of catching any aquatic animal, using any kind of fishing methods, normally operated from a vessel. The use of fishing methods varies, depending on the type of fisheries, and can range from a simple and small hook attached to a line to large and sophisticated midwater trawls or purse seines operated by large fishing vessels. The targets of capture fisheries can include aquatic organisms from small invertebrates to large tunas and whales, which might be found anywhere from the ocean surface to 2000 metres depth.

The total selectivity of a fishing method is the combined result of the inherent selective properties of the fishing gear and the way it is operated. With most fishing gears it is possible to impair or improve the selectivity by changing the gear configuration or the operation. For example, in trawl fishing the catch of small fish can be reduced by increasing the mesh size and/or by the use of sorting devices like sorting grids or large mesh panels that allow for escapement of the smaller fish. The fisher can also select for target species and sizes by avoiding areas and periods where there is a high probability of catching small fish or otherwise undesired bycatch.

There is an ICES/FAO Working Group on Fishing Technology and Fish Behaviour [[WGFTFB](#)] whose directive is to initiate and review investigations of scientists and technologists concerned with all aspects of the design, planning and testing of fishing gears used in abundance estimation; selective fishing gears used in by-catch and discard reduction; and environmentally benign fishing gears and methods used to reduce the impact on bottom habitats and other non-target ecosystem components, including behavioural, statistical and capture topics.

There is also the “[Canadian Centre for Fisheries Innovation](#)”, based in Canada, which has a Working Group on Fishing Vessel Energy Efficiency that conducts research in the field of innovations in fishing gears. (See “[Fishing Vessel Energy Efficiency Workshops](#)”)

Fishing equipment varies in sophistication depending on the size of the vessel and the technology used. Generally, on-board equipment can be categorized into three categories: related to the wheelhouse, to the fishing environment and to handling.

Environment equipment: this includes devices used during fishing operations, such as medina panels and fisheyes. This equipment can also be fitted to gears, such as turtle excluder devices and bycatch reduction devices, aimed at minimizing adverse impacts to the ecosystem.

Handling equipment: this includes equipment used for on-board fish handling and processing, such as brailers of fish pumps. It also comprises gear handling equipment, such as drums and haulers which are used to spool and bring in nets.

3.2. European projects on fishing gears

[The Development of a Novel Remote Stress Sensing System to Increase Safety, Efficiency and Reduce Environmental Effects in Fishing and Mooring applications](#)

Start date: 2008-11-01

End date: 2011-10-31

Project Acronym: SMARTCATCH

Project status: Execution

Objective: The EU fishing industry is a major source of employment and food providing more than 7.5 million tonnes of fish and employing over 526,000 people of which 88% work within the SME community. The European SMEs in this sector are under increased pressure to increase efficiency due to rising crude oil prices. In addition, there is the EU legislation on Total Allowable Catch or minimum landing sizes and the threat to close areas to fishing and aquaculture in order to recover stock, due to environmental effects of inefficient fishing which could have socio-economic effects on our community. Our need as representatives of the SME industry is to increase efficiency and safety in fishing and aquaculture as well as reduce the environmental effects.

We recognise the need for a technology that will enable fishers to preserve the quality and freshness of fish, reduce trawling times and avoid problems caused by overfull trawls. Trawls are the most commercially used fishing method. It is very large and expensive with typical cost up to 135,000. A fishing vessel dragging the conical shaped net through water consumes a large amount of energy and with fuel being the most expensive expenditure, fisheries are fast becoming unprofitable. The proposed project will develop a stress monitoring system that will increase: efficiency in fishing, safety and life of fishing gear and mooring ropes.

[Research on effective cod stock recovery measures](#)

Start date: 2002-11-01

End date: 2012-04-30

Project Acronym: RECOVERY

Project status: Execution

Objective: This proposal addresses the current critical level of the cod stock in the North Sea and the Irish Sea in support of the EU Cod Recovery Plan. The objective is to develop novel species-selective gear prototypes for the three mixed-species demersal trawl in the North Sea and Irish Sea fisheries with the highest level of cod discard, e.g. otter trawling, beam trawling and Nephrops trawling.

A total of seven institutes work together involving gear technology, fisheries biology and fish behaviour input. The project duration is 38 months. It consists of four work packages, organised in the Task Groups: Co-ordination, and Gear Development. Collaboration with the fishing industry (associations and netmakers) is foreseen.

Objectives

The Cod stocks in some European waters are at critical survival levels. Consequently the European Commission has issued a emergency plan for North Sea cod in 2001 and has also developed a rebuilding plan for cod and hake (COM 2001 (326)).

[Development of fishing Gears with Reduced Effects on the Environment](#)

Start date: 2006-02-01

End date: 2009-09-30

Project Acronym: DEGREE

Project status: Completed

Objective: The objectives of Policies Priority 8.1.B.1.3 Task 12 are:

- ◆ To develop new gears/fishing techniques that have a lower impact on benthic habitats,
- ◆ To quantify the potential reduction of the physical impact as well as the negative effects on benthic communities,

- ◆ To weigh the socio-economic consequences of these changes against those of alternative management measures, e.g. closing of areas.

Eleven participants propose to work together to develop new gears/fishing techniques that have a lower impact on benthic habitats, to quantify the potential reduction of the physical impact as well as the negative effects on benthic communities, to weigh the socio-economic consequences of these changes against those of alternative management measures, e.g. closing of areas. They will do so by focusing on the development of modified towed gears.

A generic approach is chosen in which cases (e.g. North Sea, Mediterranean) can be worked out. The overall ecological impact to benthic systems will be assessed by developing physical/biological models verified by tests at sea. This will provide a tool to fisheries managers to identify gear and sediment type combinations, which will minimise impact to the habitat. A group of experts will work to appraise the socio-economic consequences of the new gears and techniques. Gear types under study involve: otter trawls, beam trawls and dredges.

The project will consist of six work packages, as follows:

- ◆ WP 1 Management and co-ordination
- ◆ WP 2 Modelling and quantification of benthic impact
- ◆ WP 3 Otter trawl modifications
- ◆ WP 4 Beam trawl and Dredge modifications
- ◆ WP 5 Economics
- ◆ WP 6 Dissemination and implementation

The duration of the project will be 38 months. Special emphasis will be given to consultation with and dissemination of the results of the work to the fishing industry through national Industrial Liaison Groups and an adequate implementation of alternative fishing gears and techniques.

Technical developments and tactical adaptations of important EU fleets

Start date: 2002-09-11

End date: 2005-09-10

Project Acronym: TECTAC

Project status: Completed

Objective: The overall objective of TECTAC is to supply fisheries managers with a modelling tool that will allow them evaluating the impact of regulations on the dynamics of fleets and fishing mortality. The carrying Idea of this project is the investigation of the dynamics of the elements that cause fleet dynamics: the technological advances in both gears and vessel equipment, and also the overall tactical adaptation of fishing vessels. How do they occur? Why do they occur? What are their consequences on the resource and their socio-economics? In order to address these Issues, in relation to the overall objective, this study aims, (i) to Identity, analyse and model the fundamental elements underlying fleets dynamics, (ii) to relate fleets dynamics to management regulations and to other externalities, (iii) to evaluate the impact of management on fleet dynamics to management regulations and to other externalities, (iv) to evaluate the impact of management on fleet dynamics, fish resources, fleets and fishing communities.

Results for this Project

- ◆ [Description of the mechanisms of fishers' decision process](#) 03/07/2006
- ◆ [Description of trends in vessel and gear developments](#) 03/07/2006
- ◆ [Development of bio-economic simulation models](#) 03/07/2006
- ◆ [Development of fishers' behaviour models](#) 03/07/2006

- ◆ [Enhancement of the linkage between fishing effort and fishing mortality](#) 03/07/2006
- ◆ [Evaluation of the quality of auxiliary data](#) 03/07/2006
- ◆ [Generation of a common database structure to collect auxiliary fisheries data](#) 03/07/2006
- ◆ [Key processes of the dynamics of métiers allocation](#) 03/07/2006
- ◆ [Key processes underlying fishers' response to changes in management, market shifts and fish stocks density](#) 03/07/2006
- ◆ [Key processes underlying the impact of management tolls on the economic assessment of fleet status and evolution](#) 03/07/2006
- ◆ [Management strategies evaluation](#) 03/07/2006
- ◆ [Production of a fishing effort model accounting for technological developments and fleets adaptation](#) 03/07/2006
- ◆ [Typology and description of fleets and fisheries](#) 03/07/2006
- ◆ [Typology of management measures](#) 03/07/2006

SURVIVAL: An assessment of mortality in fish escaping from trawl codends and its use in fisheries management

Start date: 2002-10-01

End date: 2005-09-30

Project Acronym: SURVIVAL

Project status: Completed

Objective: The survival of fish escaping from towed fishing gears is essential if selective devices are to be used as practical conservation tool. Several studies have attempted to test this principle and assess the mortality of escaping fish. Unfortunately, these early endeavours have recently been shown to be fundamentally flawed in methodology, so there are currently no reliable estimates of escape mortality. This project will develop methods for accurate assessment of escape mortality. The work will start with the development of the techniques to sample fish escaping from a trawl cod-end, without introducing biases into the mortality estimates. These techniques will then be applied in the field to estimate mortality in cod and haddock under various circumstances including: escape at depth and surface; in high intensity fisheries; and at different times of the year. Methods to include escape mortality data in stock assessment models and implement these.

Bio-economic modelling of Mediterranean fisheries

Start date: 2001-11-01

End date: 2004-10-31

Project Acronym: BEMMFISH

Project status: Completed

Objective: The objective of the proposed research is to develop a theoretical bio-economic model for Mediterranean and Mediterranean-type fisheries, and a practical computer simulation model addressed to the management of these fisheries. This model and software should be sufficiently general and flexible to easily accommodate the realities of most Mediterranean fisheries, include multiple species and their interactions, multiple fleets and gear types, and all fisheries management tools currently used by Mediterranean fisheries managers. It should produce a wide range of fisheries performance measures, be dynamic, i.e. capable of simulating the fisheries over a long period of time, be stochastic to incorporate uncertainty in data and models and run on standard operating platforms (Windows, Unix, Linux).

The project will develop an appropriate theoretical background the understanding and general modelling of the key aspects of the Mediterranean fisheries and will review the current management practices in the Mediterranean region. The project will build a conceptual model for Mediterranean fisheries integrating the actual qualitative relationships among the different components involved in the fishery: the biological stocks, the fishing structures, fleets and gears, the market, the fisheries economics and the technological progress.

The project will build a numerical or quantitative model, putting in equations the relationships established in the conceptual model. It will explore new approaches to mathematical modelling and their possible application to Mediterranean fisheries, including: control theory, game theory, Bayesian statistics, fuzzy logics, risk and decision analysis, neural networks and Monte Carlo simulation techniques. The project will make use of external expertise to contribute with additional knowledge and contrasting ideas to complement the team's developments. These external contributions will be channelled through open conferences. The project will elaborate simulation tools allowing the potential end users (scientists, managers and fishermen) to simulate the effects of different management measures. It will also develop a user-friendly computer software to input the facts of particular fisheries and conduct the simulations. The application and validation of the model and software will be through real case studies. The proposal foresees dissemination of the model, the software and the results of case studies among local, national, European and regional interested parties (stakeholders, fisheries researchers, fisheries managers, policy makers). Dissemination of key aspects by means of Internet resources (web site) and convening of a Conference on Mediterranean fisheries bio-economic modelling.

Technical developments and tactical adaptations of important EU fleets

Start date: 2002-09-11

End date: 2012-03-10

Project Acronym: TECTAC

Project status: Execution

Objective: The overall objective of TECTAC is to supply fisheries managers with a modeling tool that will allow them evaluating the impact of regulations on the dynamics of fleets and fishing mortality. The carrying Idea of this project is the investigation of the dynamics of the elements that cause fleet dynamics: the technological advances in both gears and vessel equipment, and also the overall tactical adaptation of fishing vessels. How do they occur? Why do they occur? What are their consequences on the resource and their socio-economics?

In order to address these Issues, in relation to the overall objective, this study aims,

- (i) to identify, analyse and model the fundamental elements underlying fleets dynamics,
- (ii) to relate fleets dynamics to management regulations and to other externalities,
- (iii) to evaluate the impact of management on fleet dynamics to management regulations and to other externalities,
- (iiii) to evaluate the impact of management on fleet dynamics, fish resources, fleets and fishing communities.

Research project for coker fishing gear improvement and environmental impact reduction

Start date: 2000-12-20

End date: 2001-12-19

Project Acronym: GIMPER

Project status: Completed

Objective: Mechanical cockle fishery makes use of a suction dredging system that has been modified continuously in order to minimise damage to the product and by-catch. Further improvement to reduce sediment disturbance are promising but require a scientifically based technological approach. Improvement of the fishing gear and techniques is focused on the reduction of damage to the benthic environment, including sediment, benthos and juvenile cockles and aims for a better product quality (reduction of sand content and damage to the cockleshells). At present the main problem with technical improvement is the adjustment of the water jet in front of the gear and the transport of cockles on-board. The idea is to develop a more gentle flow and still achieve resuspension of cockles meanwhile minimising resuspension of sediment and biota, to develop a more gentle transport system to minimise sand content and damage to the cockle shells and to evaluate the yield as a function of effort.

Development of predictive model of cod-end selectivity

Start date: 2002-10-01

End date: 2012-06-30

Project Acronym: PREMECS II

Project status: Execution

Objective: This proposal develops further a predictive model of cod-end selection so that the selectivity of commercially used cod-ends fished in commercial conditions can be predicted.

The influence of:

- (i) netting materials made from thicker and stiffer twines,
- (ii) the dynamic effects of the interaction of sea state, fishing vessel, trawl gear and cod-end and
- (iii) fish morphology and fish escape behaviour are investigated and included in the model.

An individual Based Model of cod-end selection is also developed. This model is more complex and makes better use of the behavioural information that is available.

Objectives

The overall objective of this project is to further developed a predictive selectivity model, so that it can predict the selectivity of commercially used cod-ends fished in commercial conditions.

Briefly, the influence of

- (i) netting materials made from thicker and stiffer twines,
- (ii) the dynamic effects of the interaction of sea state-fishing vessel-trawl gear-codend.

Nephrops and Cetacean Species Selection Information and Technology

Start date: 2004-03-01

End date: 2007-04-30

Project Acronym: NECESSITY

Project status: Completed

Objective: Twenty-three institutes propose to work together in two Task Groups, i.e. Nehru's and cetaceans to develop alternative gear modifications and fishing tactics in collaboration with the fishing industry to reduce by-catches in the relevant Nehru's and pelagic fisheries, without reducing the catch of target species significantly.

The project consists of ten work packages, as follows:

WP1: Management and co-ordination: Statistical planning, modelling and analysis: Species selective Nehru's gears: Alternative tactics Nehru's fisheries: Biological effects Nehru's fisheries: Cetacean

by-catch and alternative tactics: Gear modifications Pelagic Trawls - Cetaceans: Impact on Cetacean stocks: Socio-economic repercussions

WP10: Dissemination and implementation The duration of the project is 38 months. Special emphasis will be given to disseminating the results of the worktop the fishing industry and recommending proper implementation of alternative gears and fishing tactics, as wells knowledge transfer between partners from North-West Europe and the Mediterranean. Biological and socio-economic effects will also be evaluated.

Mutualization on fisheries and aquaculture European Research Institutes

Start date: 2002-10-01

End date: 2005-09-30

Project Acronym: MUTFISHARE

Project status: Completed

Objective: This Concerted Action aims at contributing to the building of an European Research Area on fisheries and aquaculture and supporting the Common fisheries Policy- Main objectives are to enable the co-ordination and integration of research in these fields in the Community. This Action will allow the different directors of fisheries research organisation from the European Union to develop co-ordinated and joint efforts on key biological issues and parameters for fisheries and aquaculture management.

Results for this Project

Structuring the ERA for aquaculture and fisheries [01/08/2006](#)

Newly improved automatic long line fishing system

Quality validation date: 2006-03-20

Abstract

An Icelandic inventor has developed an automatic long-line fishing system. The system is a computerised device to automatically clean and adjust deformed hooks, replace those beyond repair or missing and then bait the hooks again. The entire process is made simultaneously and there is no delay in hauling the line on board the vessel. When shooting out the computer monitors the entire process and counts the hooks. The company is interested in licensing, joint venture or a manufacturing agreement.

An Icelandic inventor has been developing over the last few years a totally new, fully automated system for long-line fishing and snaps on monofilament snoods on the hooks and the main line.

The process of hauling in the line, and adjusting or replacing damaged hooks is extremely time-consuming. In addition, because of mistakes made by hand labour, many hooks go undetected and are therefore useless, and reduce the possibility of catching fish.

Big long-lining boats use ca. 30.000 - 80.000 hooks per day. Depending on the type of fish being caught, between 5% and 70% of the hooks are damaged and must be adjusted or replaced. The process of adjusting or replacing the hooks is time-consuming and in many/most cases fishing boats have personnel entirely devoted to the process.

The Automatic Long-line Fishing System offers an alternative. The system is performing all those tasks automatically. Special sensors analyse every hook, which is dealt with accordingly, readjusted or cut off, depending on the demands from the sensor. Those slightly damaged can be used again; they travel forward along the system after a special device has readjusted them. Those beyond repair are cut off and replaced with a new monofilament snood and hook. All this is automatically accomplices by orders from the computer-controlled sensor. After this the hooks are taken upon racks (Mustad racks for example) or into the line-winch, which has been built entirely for that

purpose. The system can manage both monofilament mainline and rational line as well and any kind of hook, including a circular one.

Innovative aspects:

The Automatic Long-line Fishing System simultaneously adjusts deformed hooks and replaces those that are beyond repair or missing, and baits the hooks while shooting out the line. The system can use both monofilament mainline and a traditional one, and any kind of hooks.

Stage of development: Prototype/demonstrator available for testing

Property rights: Patent(s) granted

Collaboration sought: Joint venture agreement, Licence agreement, Manufacturing agreement

Collaboration Detail: The Icelandic inventor is open to most sort of agreements. License agreement, Joint Venture Agreement, Manufacturing Agreement or a total sale of the invention is most suitable.

In case of Manufacturing Agreement, the partner must have extensive knowledge of the fish technology market and the capabilities to aid in further development of the product to make it fully ready for the market.

Generation of a common database structure to collect auxiliary fisheries data

Quality validation date: 2006-07-03

Abstract

One important challenge of the TECTAC project was to merge information from existing surveillance programmes (e.g. log-books) with information that lie outside the traditional recorded measures of fishing effort and yield. Auxiliary data sources have included accountancy records, regulatory orders, and new information from electronic log-books, in-depth interviews and harbour enquiries. A common structure was agreed by the consortium to compile both routinely recorded and newly acquired data into standard tables.

The following tables were generated:

- ◆ EFLALO: Effort and landings, based on combined log-books and sales slips;
- ◆ LASORT: Landings by market sorting categories, based on sales slips;
- ◆ TECVESH: Technological developments of vessel, based on both harbour and on-board enquiries;
- ◆ TECGEAR: Technological developments of gears, based on both harbour and on-board enquiries;
- ◆ TACENQ: Fishing tactics: haul-by-haul data;
- ◆ TACSAT: Fishing activity, based on satellite monitoring;
- ◆ ECOENQ1: Costs and earnings, by year and by vessel;
- ◆ ECOENQ2: Costs and earnings, by year, vessel and fishing trip;
- ◆ MANENQ1: Vessel- and gear- related management measures;
- ◆ MANENQ2: Minimum landing sizes by species;
- ◆ MANENQ3: TAC by species

3.3. Patents related to fishing gears

The section below presents those patents related to fishing gears during the 2000-2010 period.

The International Patent Classification (IPC) subclasses comprised are:

- ◆ A01K 65/00 Fish stringers

- ◆ A01K 69/00 Stationary catching devices for fishing
 - ◆ A01K 69/02 Fixed nets without traps
 - ◆ A01K 69/04 Fixed nets with traps
 - ◆ A01K 69/06 Traps
 - ◆ A01K 69/08 Rigid traps, e.g. lobster pots
 - ◆ A01K 69/10 Collapsible traps
- ◆ A01K 71/00 Floating fishing nets
- ◆ A01K 73/00 Drawn fishing nets
 - ◆ A01K 73/02 Trawling nets
 - ◆ A01K 73/04 Devices for spreading or positioning, e.g. control thereof [2]
 - ◆ A01K 73/045 for lateral sheering, e.g. trawl boards [2]
 - ◆ A01K 73/05 for vertical sheering [2]
 - ◆ A01K 73/053 Ground-line rollers [4]
 - ◆ A01K 73/06 Hauling devices for the headlines
 - ◆ A01K 73/10 Determining the quantity of the catch, e.g. by the pull or drag on the lines
 - ◆ A01K 73/12 Nets held vertically in the water, e.g. seines
- ◆ A01K 74/00 Other catching nets or the like for fishing [2]
- ◆ A01K 77/00 Landing-nets for fishing; Landing-spoons for fishing
- ◆ A01K 79/00 Methods or means of catching fish in bulk not provided for in groups
 - ◆ A01K 69/00
 - ◆ A01K 77/00
 - ◆ A01K 79/02 by electrocution (electric circuits therefor H05C)
- ◆ A01K 80/00 Harvesting oysters, mussels, sponges or the like
- ◆ A01K 99/00 Methods or apparatus for fishing not provided for in groups
- ◆ A01K 69/00
- ◆ A01K 97/00

Patent No	Title	Company	Date
EP2274976	Higher efficiency pelagic trawl door construction	HAMPIDJAN HF [IS]	2011-01-19
JP2010183877	HIGH LIFT OTTER BOARD	TOKYO UNIV OF MARINE SCIENCE & TECHNOLOGY; NICHIMO KK	2010-08-26
WO2010090526	METHOD FOR DETERMINING DIFFERENCE IN DISTANCE	SKJOLD-LARSEN HENNING [NO]	2010-08-12
NZ554796	A pelagic trawl door constructed in a V configuration with an aspect ration of at least 2:1	CANDIS EHF	2010-07-30
US2010139147	FLOATING TRAWL METHODS AND ARRANGEMENTS	AKER BIOMARINE ASA [NO]	2010-06-10
JP2010119325	DEVICE FOR PULLING SINKER PART OF ROUND HAUL NET	KIKUTANI MOKICHI SHOTEN KK; KAWASAKI PREC MACHINERY LTD	2010-06-03

US2010126057	HIGH STABILITY, HIGH EFFICIENCY TRAWL DOOR AND METHODS	SAFWAT SHERIF ADHAM [US]	2010-05-27
NO328745	TRAWL DOOR FOR REMOTE ADJUSTMENT UNDER WATER OF THE ACTIVE SURFACE AREA OF THE TRAWL DOOR	EGERSUND TRAL AS [NO]	2010-05-03
JP2010068737	SUPPORT ROLLER APPARATUS FOR NET-HAULING AND METHOD FOR NET-HAULING	MARINE HYDROTEC CO LTD	2010-04-02
MX2009011262	PERFORATED SLAT TRAWL DOOR	HAMPIDJAN HF [IS]	2010-03-25
US2010064570	NETTING ARRANGEMENT	GALLAGHER DANNY [IE]; MACLEAN DONALD JOHN [IE]; BRESLIN ANTHONY [IE]; HAYDEN KEVIN [IE]	2010-03-18
WO2010015254	TRAWL SYSTEM AND AN UNMANNED, SUBMERGED TRAWL PULLING VESSEL	P F MEST [DK]; JOHANNESSEN THORMUND [DK]	2010-02-11
JP2009297000	FIXED FISHING NET	KUBOTA KENJI	2009-12-24
CN201360476	Fishing net	JUNWU ZENG [CN]	2009-12-16
JP2009261312	NET TREATMENT APPARATUS	SHINWA GIKEN KK	2009-11-12
US7607252	Method of retrieving fishing gear	LORENTZ PATRICK J [US]	2009-10-27
WO2009118482	APPARATUS FOR THE AUTOMATIC ASSEMBLY OF A FISHING NET WITH THE BOLT ROPES THEREOF	JACQUIER ERIC PECHERIE [FR]; JACQUIER ERIC [FR]; BERTHOLON ROLLAND [FR]	2009-10-01
AR067137	INDICADOR DE LA RELACION DE LLENADO, BASADO EN EL ANGULO	SKJOLD LARSEN HENNING [NO]	2009-09-30
EP2098114	Sensor modules for fishing gear	SKJOLD-LARSEN HENNING [NO]	2009-09-09
KR200445679	RUBBER FOR APPARATUS FOR REFLOATING A FISHING NET		2009-08-17
KR20090079735	A TRAWL FISHERY AVAILABLE IN A LOW AND MIDDLE STORY AND METHOD FOR TRAWLING	KIM YOUNG HAN [KR]; KIM IN SOO [KR]	2009-07-22
CN201256588	Open-ocean fishing fixation type fishing net	NIANXIN ZHENG [CN]	2009-06-17
FR2922411	Pulley's driving controlling method for hauling device, involves reducing speeds of tow and intermediary pulleys based on speed of input pulley in progressive manner as input pulley is moved away in scrolling direction of fishing line	ABLE [FR]	2009-04-24
KR100891865	A FISHING NET FOR SORTING AND CAPTURING MARINE ANIMALS	KIM JONG OK [KR]; KIM SEUNG BAE [KR]	2009-04-08
AR063490	FLOATING TRAWL METHODS AND ARRANGEMENTS	AKER BIOMARINE ASA [NO]	2009-01-28
US2008271356	Higher Efficiency Pelagic Trawl Door Construction Employing Universally Available Materials and Method	VIGFUSSON GUDMUNDUR [IS]	2008-11-06
EP1987715	Adjustment of Trawl Doors	INJECTOR TRAWLDOORS AS [DK]	2008-11-05
ES2305895	TRAWL DRIVING DEVICES, ADJUSTMENT DEVICE, METHOD AND SYSTEMS	SKJOLD-LARSEN HENNING [NO]	2008-11-01
JP2008247103	CONTROL METHOD AND DEVICE OF TOWING ROPE LENGTH	KAWASAKI HEAVY IND LTD	2008-10-16
JP2008247101	CONTROL METHOD AND DEVICE OF DEPTH OF TOWED	KAWASAKI HEAVY IND	2008-10-16

	BODY	LTD	
WO2008066879	IMPROVED SEINE NET	LIBERMAN BARNET [US]	2008-06-05
WO2008048107	FLOATING TRAWL METHODS AND ARRANGEMENTS	AKER BIOMARINE ASA [NO]; ROKKE KJELL INGE [NO]; LEITHE HANS JAHN [NO]; ERNSTEN ROBERT [CR]	2008-04-24
WO2008029533	NET MOUTH INCLINATION KEEPING TYPE TRAWL NET FISHERY SYSTEM	UNIV TOKYO NAT UNIV CORP [JP]; HU FUXIANG [JP]; TOKAI TADASHI [JP]; SHIODE DAISUKE [JP]; OZEKI YOSHIOKI [JP]; KUBOTA HIROSHI [JP]	2008-03-13
WO2008026339	TRAWL NET LAYER-BY-LAYER COLLECTING DEVICE	UNIV TOKYO NAT UNIV CORP [JP]; HU FUXIANG [JP];	2008-03-06
CN201025830	Net port of fixing type fishing net	JIHAI LIU [CN]	2008-02-27
JP2008011747	APPARATUS FOR OPENING AND CLOSING FISHING NET AND FISHING NET EQUIPPED THEREWITH	UNIV KAGOSHIMA; TANAKA GYOMO KK	2008-01-24
ES2288337	Rolling device for collection of networks, has intermediate part of tilted pen to guide network collection through fixed pulley driving to nearby part of tilted pen, and hanging support element is also provided	MARINE HYDROTEC CO LTD [JP]	2008-01-01
CN200973305	Folding crab trap	BAI XUE [CN]	2007-11-14
CA2586782	TRAP HAULING APPARATUS	VAN BOMMEL HENRY [CA]	2007-10-28
JP2007244215	METHOD OF TRAWL-FISHING AND OTTER BOARD USED IN THE SAME	FISHERIES RESEARCH AGENCY; NICHIMO KK	2007-09-27
WO2007108702	A TRAWL DEVICE	AKER SEAFOODS HOLDING AS [NO]; ERNSTEN ROBERT [CR]; AARSKOG ROAR [NO]; KJAERSTAD JAN H [NO]	2007-09-27
KR100752320	ROPE PULLING EQUIPMENT FOR FISHING BOAT	JO DONG HO [KR]; CHOI KEUM JIN [KR]	2007-08-20
KR100752319	ROPE FIXING EQUIPMENT FOR FISHING BOAT	JO DONG HO [KR]; CHOI KEUM JIN [KR]	2007-08-20
JP2007195527	APPARATUS FOR HOISTING PURSE SEINE	MORI KOICHI	2007-08-09
CN2922461	Automatic fishing net	ZHANG TIANMING [CN]	2007-07-18
KR100736823	MULTI STEP DRUM AND PULLING METHOD	KEUM JU MARINER CO LTD [KR]; LEE MOON YONG [KR]	2007-07-02
WO0193670	DEVICE FOR LAYING OF A FISHING UTENSIL, IN PARTICULAR FOR SEINING, IN A BIN	TRIPLEX AS	2007-06-16
JP2007143529	NET-PROCESSING MACHINE	SHINWA GIKEN KK	2007-06-14
NO20072299	HIGHER EFFICIENCY PELAGIC TRAWL DOOR CONSTRUCTION EMPLOYING UNIVERSALLY AVAILABLE MATERIALS AND METHODS	CANDIS EHF [IS]	2007-06-01
KR200436112	fishing net for inflow prevention marine life		2007-05-28
CN2899454	Overlapped three layer thorn fishing net	JIN LIXIN [CN]	2007-05-16
CN2896878	Small fish net	WU XIAOSHUN [CN]	2007-05-09

EP1778006	HIGH SPEED, INCREASED HYDRODYNAMIC EFFICIENCY, LIGHT-WEIGHT MOLDED TRAWL DOOR AND METHODS FOR USE AND MANUFACTURE	CANDIS EHF [IS]	2007-05-02
CN2894274	Fishing cage	LI JINGHUI [CN]	2007-05-02
US2007089349	Sensor module for trawl	SKJOLD-LARSEN HENNING [NO]	2007-04-26
CN2891662	Sea culture net cage frame and net cage	HUAYOU INDUSTRY DEV CO LTD SHE [CN]	2007-04-25
CN2888870	Highly efficient fishing apparatus	HE WEIMIN [CN]	2007-04-18
TW275347	Roller device to assist in net hauling and net hauling method using the same	MARINE HYDROTEC CO LTD [JP]	2007-03-11
RU2292713	OTTER BOARD (VERSIONS)	VANTEEV SERGEJ GRIGOR EVICH [RU]	2007-02-10
CN2860090	Overlapping mono-layer gill-net	JIN LIXIN [CN]	2007-01-24
CN1899031	Method for reducing fishing gear model test error	EAST CHINA SEA AQUATIC PRODUCT [CN]	2007-01-24
KR20060127152	FISHERY RESOURCE RESEARCHING METHOD AND APPARATUS	UNIV TOKYO NAT UNIV CORP [JP]	2006-12-11
JP2006311843	DEVICE FOR TREATING NET OF ROUND HAUL NET	MORI KOICHI	2006-11-16
CN2834171	Dragnet web plate	LI WEICHENG [CN]	2006-11-08
CN2829359	Magnetic controlling super large scale net falling machine	TANY GUILIANG [CN]	2006-10-25
CN2819792	Parallel shrimp trawl net	EAST CHINA SEA AQUATIC PRODUCT [CN]	2006-09-27
CN2817427	Rectangular curved otter board with double seams	DONGHAI AQUACULTURE INST CHINA [CN]	2006-09-20
WO2006089985	FISHING TACKLE AND NET HAULING REEL	ALBACORA S A [ES]; LATXAGA BENGOETXEA IGNACIO [ES]; ISPIZUA IZAGUIRRE VICENTE [ES]	2006-08-31
WO2006087736	WIDE BODY TRAWL HAVING IMPROVED MOUTH AND BACK-END OPENING	CANDIS EHF [IS]; SAFWAT SHERIF [US]	2006-08-24
WO2006077811	HOIST WITH TENSION CONTROL FUNCTION AND TRAWLING APPARATUS	MITSUI SHIPBUILDING ENG [JP]; TSURUMI SEIKO CO LTD; DAI ICHI ELECTRIC CO LTD; UEKI SHUJI; DOI HIROHUMI; MIYAJIMA SHOGO; HASEGAWA KENZO; SATOH HIROSHI	2006-07-27
CN2798586	Screen plate for expanding dragnet sleeve and mouth	E CHINA SEA FISHERIES RES INST [CN]	2006-07-26
CN1781368	Flexible horizontal expander for net	EAST CHINA SEA INST OF AQUATIC [CN]	2006-06-07
NO320863	Anordning ved tral	ANDERSEN SVEIN [NO]; ANDERSEN CARSTEN [NO]	2006-02-06
JP2006025780	NET-LIFTING AUXILIARY ROLLER UNIT AND NET-LIFTING	MARINE HYDROTEC CO	2006-02-02

	METHOD	LTD	
KR100550336	DOUBLE DRUM REEL	CHOE JEONG JIN [KR]	2006-02-02
RU2267271	OTTER TRAWL BOARD	PINCHUK MIKHAIL ANTONOVICH [RU]; ZVERKOV MIKHAIL MIKHAJLOVICH [RU]	2006-01-10
EP1609357	Improved cell design for a trawl system and methods	OTTER ULTRA LOW DRAG LTD [KY]	2005-12-28
NO20054699	Drag panel for ice trawl fishing has incurved foil sections attached to middle panel with frame for tow arm	MORGERE SA ETS [FR]	2005-10-12
NO20040464	POSITION MONITORING WITH REGARD TO BOTTOM CONTACT	HENNING SKJOLD-LARSEN [NO]	2005-08-03
US2005160656	Self-spreading trawls having a high aspect ratio mouth opening	SAFWAT SHERIFF A, ; PEREVOSHCHIKOV VALENTIN G	2005-07-28
CN2710360	Net ware monitored and positioned by GPS	ZHANG DINGFENG [CN]	2005-07-20
CN2702619	Long-distance stopping speed regulating control apparatus for hydraulic driftnet hauler	HULUDAO FISHING PORT SUPERVISO [CN]	2005-06-01
WO2005046324	DEVICE, METHOD AND AUTOMATIC HAULING AND STOWING SYSTEM FOR FISHING EQUIPMENT	SM TRIPLEX [NO]; KRISTIANSEN JAN GEIR [NO]	2005-05-26
WO2005039277	METHOD AND DEVICE FOR HANDLING A FISHING LONGLINE IN CONNECTION WITH A FISHINGBOAT	LARSEN ASBJOERN I [NO]	2005-05-06
CN2696324	Head adjustable net hauling machine	SHI ZHENRONG [CN]	2005-05-04
ES1059595	CANCAMO PARA REDES DE PESCA	ALBACORA S A [ES]	2005-05-01
NZ529252	Reduced-bulk, enhanced-resilience, lower-drag netting	HOTNET INC	2005-03-24
JP2005046034	AUTO TRAWL SYSTEM	NICHIMO CO LTD	2005-02-24
KR100472790	NET HAULER FOR FISHING SHIP AND METHOD FOR HAULING NET, WHICH RAISE SURVIVAL RATES OF CAUGHT FISHES BECAUSE NET IS HAULED IN SPREADED STATE	JOO SEONG CHOON [KR]	2005-02-14
US2005023225	Nets for bodies of water	KUMPF ERICH	2005-02-03
CN2666158	Net hauler with safety device	LI SHUJIANG [CN]	2004-12-29
US2004231222	Hauling equipment for fishing vessels	KIM DO-NAM	2004-11-25
JP2004298131	RING HOOK AND OPERATION OF ROUND HAUL NET USING THE SAME	FISHERIES RESEARCH AGENCY; NICHIMO KK	2004-10-28
JP2004298130	MULTI-FISHING METHOD AND FISHING BOAT	FISHERIES RESEARCH AGENCY; NICHIMO	2004-10-28
JP2004298128	METHOD FOR ROUND HAUL NET-FISHING AND FISH CATCHING TOOL THEREFOR	FISHERIES RESEARCH AGENCY; NICHIMO KK	2004-10-28
US2004206285	Electromechanically actuated outrigger	MCCAFFREY JOHN	2004-10-21
ES2215489	MARINE CAGE FOR PELAGIC FISHING	ADVANCED TUNA RANCHING TECHNOL [ES]	2004-10-01
WO2004082375	OTTER BOARD	MORGERE ETS [FR]; MORGERE-PODEUR HELENE [FR]	2004-09-30
JP2004261178	METHOD FOR DRAWING TRAWLING NET AND MACHINE FOR THE SAME	KAWASAKI PREC MACHINERY LTD; NICHIMO KK	2004-09-24
US6779292	Large mesh commercial fishing netting and method of manufacture	MELLY JAMES P	2004-08-24

KR20040073018	CANVAS OTTER BOARD TYPE ANCHOVY LIFT NET FISHING GEAR AND FISHING METHOD USING THE SAME	JANG DEG JONG; KIM DAE AN	2004-08-19
MA26218	Line hauling gear esp for use in long line fishing has main driven pulley with additional pulleys to act as capstan	MICHON DOMINIQUE [FR]	2004-07-01
JP2004173674	NET HANDLING UNIT FOR CAST NET	KAIKEN KK	2004-06-24
KR20040049761	FISHING IMPLEMENTS TO OPEN AND CLOSE FISHING NET AND TO BE EASILY OPERATED UP AND DOWN BY APPLYING OPERATION THEORY OF UMBRELLA	YOUN DONG KEUN	2004-06-12
ES1056525	COMPOSITION COMPRISING GROWTH FACTORS	PINEIRO PEREZ ALFREDO [ES]	2004-04-01
JP2004049209	DUAL-ROLLER OF NET-SUPPORTING TYPE NET-WINCH	KAIKEN KK	2004-02-19
PT977479	IMPROVED CELL DESIGN FOR A TRAWL SYSTEM AND METHODS	OTTER ULTRA LOW DRAG LTD [KY]	2004-01-30
KR20040001932	NET HAULER FOR FISH BOAT	CHO HYUNG JUN	2004-01-07
NO20035816	NET HAULING EQUIPMENT FOR FISHING VESSELS	KIM DO NAM [KR]	2003-12-23
JP2003319736	TENSION CONTROLLER OF FISHLINE-WINDING APPARATUS	KANEHACHIJI GYOMO KK	2003-11-11
RU2215412	TRAWL RIGGING SYSTEM	OBOLONSKIY PETR GAVRILOVICH	2003-11-10
CN2577576	Crab cage	ZHOU YUMI [CN]	2003-10-08
DK174692	Bottom trawl net and trawl sinkers along with usage thereof	REMOEY SEA GROUP AS [NO]	2003-09-15
KR100397474	MULTI-FUNCTIONAL NET HAULING DEVICE	REPUBLIC OF KOREA NAT FISHERIE	2003-08-27
PT900003	OTTER BOARD	LARSEN HELGI [DK]	2003-06-30
RU2203543	OTTER BOARD	OBOLONSKIY PETR GAVRILOVICH	2003-05-10
WO03024207	DEVICE FOR HAULING A FISHING LINE	MICHON DOMINIQUE [FR]	2003-03-27
US2003056421	Cast net with throwing device	ARDERN PAUL C	2003-03-27
JP2003070379	APPARATUS FOR HOISTING ROUND HAUL NET	KAIKEN KK	2003-03-11
JP2003052277	SIDE TOWING TRAWL SYSTEM	FISHERIES RESEARCH AGENCY; WATABE TOSHIHIRO; NICHIMO KK	2003-02-25
PT959676	METHOD AND DEVICE FOR OPERATION OF A TRAWL	SCANTROL A S [NO]	2003-01-31
KR20030008178	ROTATABLE DRIFT GILL NET OPERATING APPARATUS	PARK JEONG SUN [KR]; PARK KUM SEOB [KR]; PARK YEONG SIK [KR]	2003-01-24
RU2194388	WING-SHAPED TRAWLER'S BOARD	OOO TEK; HNOMORREMFL0T	2002-12-20
JP2002362479	SHIP ROLLING DETECTOR, AND ROLLING CORRECTION UNIT OF HOIST FOR FISHERY	SANMEI DENSHI SANGYO KK	2002-12-18
UA65640	INDUSTRIAL DEVICE FOR TRAWLING FISHING	SEVASTOPOL STATE TECHNICAL UNI [UA]	2002-12-16
JP2002315472	NET-EXTENDER FOR TROLLING	FISHERIES RESEARCH AGENCY; NICHIMO KK	2002-10-29
WO02076197	NET HAULING EQUIPMENT FOR FISHING VESSELS	GUMJOO MARINER CO LTD [KR]; KIM DO-NAM	2002-10-03

		[KR]	
US6453597	Rigging assembly methods and apparatus for trawling nets	LFS INC [US]	2002-09-24
US6434879	Bi-directional, manufacturable, lift-generating mesh bar	OTTER ULTRA LOW DRAG LTD [KY]	2002-08-20
KR20020062064	DEVICE FOR PULLING FISHING GEAR	REPUBLIC KOREA [KR]	2002-07-25
KR100341304	AUTOMATED APPARATUS FOR HAULING FISHING NET	DAEYEO INDUSTRY CO LTD; KWON BYUNG KOOK; LC TEK CO LTD; LEE CHOON WOO; LEE JU HEE	2002-06-05
US6374531	Trawl system cell design and methods	OTTR ULTRA LOW DRAG LTD [US]	2002-04-23
JP2002034388	APPARATUS FOR PULLING FLOAT OF ROUND HAUL NET	KAIKEN KK	2002-02-05
KR20020009306	APPARATUS FOR ROLLING DRIFT GILL NET	LEE JEON JAE [KR]	2002-02-01
WO0184922	TRAWL DOOR	DEVOL ENGINEERING LTD [GB]; DALRYMPLE STUART [GB]	2001-11-15
JP2001275508	APPARATUS FOR WINDING UP LAVER NET ON BOAT	TAKEUCHI DENKI KOGYOSHO KK	2001-10-09
WO0172118	SUPPORT FOR TROTLINE OR FISH STRINGERS	MULA GIUSEPPE [IT]	2001-10-04
FR2805436	DISPOSITIF DE PECHE POUR LA SEPARATION DE LA CORDE DE FLOTTEURS ET DE LA CORDE DE PLOMB D'UN FILET UNE FOIS CELUI-CI HALE APRES ACTION DE PECHE	HYDROPECHE [FR]	2001-08-31
KR20010067600	APPARATUS FOR CLOSING AND OPENING UMBRELLA TYPED FISHING NET	YOUN DONG KEUN [KR]	2001-07-13
KR20010001222	NET HAULER OF GILL NET	MOON DEOK HONG [KR]; YANG CHANG SHIK [KR]; YANG JOO HO [KR]; YANG JOO WEON [KR]	2001-01-05
JP2000350535	AUTOMATIC NET HAULER FOR FISHING NET AND ITS OPERATION	RI SHUNU; RI SHUKI; KEN HEIKOKU; LC TECH KK; DAIGYO SANGYO KK	2000-12-19
US6120074	Cable eye protector	HAMRICK, BRET A	2000-09-19
JP2000245300	DEVICE FOR SPREADING POUND HAUL NET	KAIKEN KK	2000-09-12
JP2000201572	NET-DRAWN MODE CONTROL UNIT AND TRAWLING FISHERY USING THE SAME	NICHIMO KK	2000-07-25
WO0030438	FISHING NET RETRIEVING APPARATUS FOR FISHING VESSELS	KIM DO NAM [KR]	2000-06-02
FR2783885	STRUCTURE PORTANTE A TOURBILLON MARGINAL REDUIT	GECO AS [NO]	2000-03-31
KR20000015010	WORK AUTOMATING DEVICE OF SCOOP NET FISHING	KOREA NAT FISHERIES RES AND DE [KR]	2000-03-15
JP2000060382	UNDERTOW FISHING IMPLEMENT FOR CAPTURING FISH AND SHELL	OKAWA HIROSHI	2000-02-29
JP2000060357	NET FALLER	IZUMISAWA HIROSHI	2000-02-29

3.4. 3.4 Scientific papers

Integrating vessel monitoring systems (VMS) data with daily catch data from logbooks to explore the spatial distribution of catch and effort at high resolution

Author(s): Gerritsen H, Lordan C

Source: ICES JOURNAL OF MARINE SCIENCE **Volume:** 68 **Issue:** 1 **Pages:** 245-252
Published: JAN 2011

Abstract:

Vessel monitoring systems (VMS) automatically collect positional data from fishing vessels, and the data can be linked to catch data from logbooks to provide a census of spatially resolved catch-and-effort data. The most appropriate and practical method for integrating Irish VMS and logbook data is explored and validated. A simple speed rule is applied to identify VMS records that correspond to fishing activity. The VMS data are then integrated with the catch data from logbooks using date and vessel identifier. Several assumptions were investigated, and the resulting distribution maps of catch and effort appear to be unbiased. The method is illustrated with an example of a time-series of spatially explicit estimates of catch per unit effort. The proposed method is relatively simple and does not require specialist software or computationally intensive methods. It will be possible to generalize this approach to similar datasets that are available within the EU and many other regions. Analysis of integrated VMS and logbook data will allow fisheries data to be analysed on a considerably finer spatial scale than was possible previously, opening up a range of potential applications.

Effects of fishing effort allocation scenarios on energy efficiency and profitability An individual-based model applied to Danish fisheries

Author(s): Bastardie F, Nielsen JR, Andersen BS, Eigaard OR

Source: FISHERIES RESEARCH **Volume:** 106 **Issue:** 3 **Pages:** 501-516 **Published:** DEC 2010

Abstract:

Global concerns about CO₂ emissions national CO₂ quotas and rising fuel prices are incentives for the commercial fishing Fleet industry to change their fishing practices and reduce fuel consumption which constitutes a significant part of fishing costs Vessel-based fuel consumption energy efficiency (quantity of fish caught per litre of fuel used) and profitability are factors that we simulated in developing a spatially explicit individual-based model (IBM) for fishing vessel movements The observed spatial and seasonal patterns of fishing effort for each fishing activity are evaluated against three alternative effort allocation scenarios for the assumed fishermen s adaptation to these factors (A) preferring nearby fishing grounds rather than distant grounds with potentially larger catches and higher values (B) shifting to other fisheries targeting resources located closer to the harbour and (C) allocating effort towards optimising the expected area-specific profit per trip The model is informed by data from each Danish fishing vessel >15 m after coupling its high resolution spatial and temporal effort data (VMS) with data from logbook landing declarations sales slips vessel engine specifications and fish and fuel prices The outcomes of scenarios A and B indicate a trade-off between fuel savings and energy efficiency improvements when effort is displaced closer to the harbour compared to reductions in total landing amounts and profit Scenario C indicates that historic effort allocation has actually been sub-optimal because increased profits from decreased fuel consumption and larger landings could have been obtained by applying a different spatial effort allocation Based on recent advances in VMS and logbooks data analyses this paper contributes to improve the modelling of fishing effort allocation fuel consumption and catch distribution on a much disaggregated level compared to the Fleet-based models we developed so far (C) 2010 Elsevier B V All rights reserved

Life cycle assessment of horse mackerel fisheries in Galicia (NW Spain) Comparative analysis of two major fishing methods

Author(s): Vazquez-Rowe I, Moreira MT, Feijoo G

Source: FISHERIES RESEARCH **Volume:** 106 **Issue:** 3 **Pages:** 517-527 **Published:** DEC 2010

Abstract:

Atlantic horse mackerel (*Trachurus trachurus*) is one of the main target pelagic species of the coastal purse seining and bottom trawling Galician fleets. The goal of this LCA study was to assess and compare the environmental impacts associated with the fishing operations related to Atlantic horse mackerel extraction in these two Galician coastal fisheries. This analysis included the operation of the vessels together with major inputs related to the production of diesel fishing nets or anti-fouling paints. Data regarding vessel operation was obtained from the questionnaires filled out by a total of 54 skippers. Results showed that environmental burdens regarding horse mackerel landing are associated mainly with activities related to diesel production, transport and consumption of the fishing vessels. Furthermore, cooling agent leakage from the cooling chambers was identified as a major impact regarding ozone layer depletion and global warming potentials. Horse mackerel captured by purse seiners presented reduced environmental burdens for all impact categories respect to horse mackerel landings by bottom trawlers. The environmental reduction ranged from 49 to 89% depending on the impact category analyzed. Discard rates for coastal trawlers were also identified as a major environmental impact in this fishery. Revision of fishing quotas and fishing strategies for the horse mackerel fishery and reduction of energy consumption through the introduction of new alternative fuels or technological actions are necessary in order to reduce the environmental impacts of a highly fuel-dependent activity. (C) 2010 Elsevier B.V. All rights reserved.

Reducing interactions between seabirds and trawl fisheries: Responses to foraging patches provided by fish waste batches.

Author(s): Pierre JP, Abraham ER, Middleton DAJ, Cleal J, Bird R, Walker NA, Waugh SM

Source: BIOLOGICAL CONSERVATION **Volume:** 143 **Issue:** 11 **Pages:** 2779-2788
Published: NOV 2010

Abstract:

Seabird bycatch in trawl fisheries is driven by the attraction of birds to foraging opportunities, i.e., the discharge of catch processing waste and the contents of trawl nets. The risk of seabird captures increases with seabird abundance and exposure to fishing gear. We investigated (1) how quickly seabirds responded to discharges of trawl catch processing waste and (2) whether decreasing numbers of seabirds attended trawlers during processing waste discharge events as the time interval between these events increased. Waste was retained onboard the vessel for four different holding periods (30 min, 2 h, 4 h, 8 h), one of which was applied each day using a randomised block design. We determined seabird responses to batch discharge events after the prescribed holding periods using the abundance of large (albatrosses and giant petrels *Macronectes* spp.) and small (all other petrels except cape petrels *Daption capense*, shearwaters and prions) seabirds in a semi-circle of 40 m radius, centred on the stern of the experimental trawler. Seabird responses reflected the type of discharge released: birds moved from the air to the water, as the amount of food available increased from no discharge, through sump discharge to batch discharge. When discharge occurred, seabird abundance increased faster than could be resolved with the 5 min sampling period. However, abundance decreased more slowly over a 10-15 min period after the discharge event. The number of large seabirds attending the vessel during discharge events decreased significantly when waste was held for 4 h. For small birds, significant decrease occurred after 8 h. Such holding periods emphasise the tenacity of foraging seabirds, although we have not evaluated any long-term habituation to a particular discharge regime. While holding waste for less than 4 h may not reduce seabird attendance during discharge events, holding for shorter intervals can still

reduce bycatch risk, e.g., prior to and during net shooting and hauling. (C) 2010 Elsevier Ltd. All rights reserved.

Developing visual deterrents to reduce sea turtle bycatch in gill net fisheries

Author(s): Wang JH, Fislser S, Swimmer Y

Source: MARINE ECOLOGY-PROGRESS SERIES **Volume:** 408 **Pages:** 241-250 **Published:** 2010

Abstract:

Visual cues play important roles in sea turtle foraging behavior and likely influence their interactions with fishing gear. Altering these cues may be a useful strategy to reduce the incidental catch of sea turtles in various fisheries. We examined the potential effectiveness of 3 visual cues-shark shapes placed along the length of the gill net, illumination of nets by LED lights, and nets illuminated with chemical lightsticks-in reducing bycatch of green sea turtles *Chelonia mydas* in gill nets. We then adapted these potential deterrents into commercial bottom gill net fishery to quantify their effects on target fish catch rates and the catch value. Our results indicate that the presence of shark shapes significantly reduced the mean catch rates of green turtles by 54% but also reduced target catch by 45% and, correspondingly, catch value by 47%. In contrast, nets illuminated by LED lights significantly reduced mean sea turtle catch rates by 40% while having negligible impacts on target catch and catch value. Similarly, nets illuminated by chemical lightsticks also significantly reduced mean sea turtle catch rates by 60% while having no significant impact on target catch and catch value. These results illustrate the potential for modifying fishing gear with visual deterrents to effectively reduce sea turtle catch rates.

A novel escape panel for trawl nets used in the Irish Sea Nephrops fishery

Author(s): Briggs RP **Source:** FISHERIES RESEARCH **Volume:** 105 **Issue:** 2 **Pages:** 118-124 **Published:** JUL 2010

Abstract:

A chartered commercial twin-rig fishing vessel was used to compare catches by a standard control trawl net with that of an experimental trawl fitted with a 120 mm square-mesh escape panel (SMP). Although a range of positions for the SMP were tested during the 33-day trial a configuration in which the escape panel was positioned in the top of the net in the tapered section 8.85 m from the cod-end extension piece gave the most significant reduction in discards. This is further up the net than has been shown to be optimum in other Nephrops fisheries e.g. in the North Sea. A 12 mesh wide strip of 80 mm diamond-shaped mesh to divide the 120 mm SMP into two halves prevented the sagging of the SMP observed in earlier trials with a single 120 mm SMP. Following 16 comparative hauls this net configuration allowed 54% of juvenile haddock and 65% of juvenile whiting to escape from the net with no loss in Nephrops catch. (C) 2010 Elsevier B.V. All rights reserved.

Energy audit of fishing vessels

Author(s): Thomas G, O'Doherty D, Sterling D, Chin C

Source: PROCEEDINGS OF THE INSTITUTION OF MECHANICAL ENGINEERS PART M-JOURNAL OF ENGINEERING FOR THE MARITIME ENVIRONMENT **Volume:** 224 **Issue:** M2 **Pages:** 87-101 **Published:** 2010

Abstract:

Recent dramatic rises in the price of diesel fuel have resulted in the questionable viability of sectors of the Australian commercial fishing industry. Many fishing vessels currently operating in the fleet are over 20 years old and operate in a way that is inefficient in terms of the energy input (combustible fuels) in contrast with the useful energy output (catch). Combined with the global

need to reduce greenhouse gas emissions there is a clear need to introduce new efficiencies into fishing vessel operations. This paper reports on the development of an energy audit method for fishing vessels, based on similar systems for land-based industries. It enables the analysis of individual vessels to be made and allows the assessment of their energy usage and current level of efficiency. A sample energy audit has been conducted for an Australian fishing vessel that leads to recommendations for improved efficiencies to combat present and possible future fuel cost increases.

Challenges of Documenting *Tursiops truncatus* Montagu (Bottlenose Dolphin) Bycatch in the Stop Net Fishery along Bogue Banks, North Carolina

Author(s): Byrd BL, Hohn AA

Source: SOUTHEASTERN NATURALIST **Volume:** 9 **Issue:** 1 **Pages:** 47-62 **Published:** 2010

Abstract:

Each fishery presents its own challenges for observers to document bycatch. The North Carolina (NC) stop net fishery is especially challenging because it uses anchored gear (the stop net) that soaks up to 15 days to herd fish, which are then hauled to shore via another gear (a beach seine). Three *Tursiops truncatus* (Bottlenose Dolphin) entanglements in stop nets and six Bottlenose Dolphin strandings, each suspected of having been entangled in stop net gear based on injuries noted (lesions) and spatio-temporal overlap with the fishery, were documented by the NC Marine Mammal Network between 1992 and 2007. In 2001-2002, new observational techniques and surveys were used to observe this fishery to estimate bycatch and to document dolphin behavior around the gear. Techniques included observations from the beach during net retrievals and in situ surveys using a vessel with a sonar-video camera system. No entangled dolphins were observed, and, in fact, observations indicated dolphins were not attracted to stop nets and generally changed direction to avoid the gear. Nonetheless, characteristics of the fishery impose severe limitations on the efficacy of bycatch observer methods, rendering those results unreliable. Given low levels of known or suspected entanglements and the challenges of observing this fishery, stranding network data may be the most practical and effective method to monitor dolphin bycatch.

Estimation of the availability of the power-propulsion and technological system of a fishing vessel at selected operational model

Author(s): Matuszak Z

Source: EKSPLOATACJA I NIEZAWODNOSC-MAINTENANCE AND RELIABILITY **Issue:** 1
Pages: 49-58 **Published:** 2010

Abstract:

The power-propulsion and technological system (PPTS) of fishing vessels will be characterized. The decomposition method will be described in terms of its use for the estimation of fishing vessel PPTS availability. The results of availability estimation will be presented for the following modes of fishing vessel operation: sea passage, running out and holding in nets, trawling operation, drift fishing or stay at a port.

Estimating Fishing Vessel Capacity: A Comparison of Nonparametric Frontier Approaches

Author(s): Walden JB, Tomberlin D

Source: MARINE RESOURCE ECONOMICS **Volume:** 25 **Issue:** 1 **Special Issue:** Sp. Iss. SI
Pages: 23-36 **Published:** 2010

Conference Information: North-American-Association-of-Fisheries-Economists Forum

Univ Rhode Island, Dept Environm & Nat Resource Econ, Newport, RI, MAY 17-20, 2009

N Amer Assoc Fisheries Econ

Abstract:

Fishing capacity has been an important national and international topic for over a decade. Led by the Food and Agriculture Organization of the United Nations (FAO), an international effort was undertaken in 1998 to define and measure fishing capacity, during which three methods to measure fishing capacity were identified: data envelopment analysis (DEA), stochastic production frontiers (SPF), and the peak-to-peak approach. Most estimates of capacity have been carried out using DEA. This study introduces "order-m" frontiers and the free disposal hull (FDH) as additional methods to estimate fishing capacity and compares capacity estimates for a group of fishing vessels based on the DEA, FDH, and order-m models. Our results show a large difference between capacity estimates using DEA when compared to the other two methods.

Estimation of the availability of the power-propulsion and technological system of a fishing vessel at selected operational model

Author(s): Matuszak Z

Source: EKSPLOATACJA I NIEZAWODNOSC-MAINTENANCE AND RELIABILITY **Issue:** 1
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Abstract:

The power-propulsion and technological system (PPTS) of fishing vessels will be characterized. The decomposition method will be described in terms of its use for the estimation of fishing vessel PPTS availability. The results of availability estimation will be presented for the following modes of fishing vessel operation: sea passage, running out and holding in nets, trawling operation, drift fishing or stay at a port.

Are circle hooks effective in reducing incidental captures of loggerhead sea turtles in a Mediterranean longline fishery?

Author(s): Piovano S, Swimmer Y, Giacomini C

Source: AQUATIC CONSERVATION-MARINE AND FRESHWATER ECOSYSTEMS **Volume:** 19
Issue: 7 **Pages:** 779-785 **Published:** NOV-DEC 2009

Abstract:

1. A known fishing hot spot for loggerhead Sea turtles (*Caretta caretta*) in the Mediterranean Sea is in the waters of the Strait of Sicily where interactions with fish hooks and branchlines are believed to be a major cause of mortality for sea turtles.
2. Hooks with different shapes but a similar gape width (circle hook size 16/0 vs J hook size 2) were tested in order to determine the potential effectiveness of the hook design to both reduce sea turtle capture as well as to maintain acceptable levels of target species capture rates in a shallow-set longline swordfish fishery in the Mediterranean.
3. Seven experimental fishing trips, 30000 hooks total, were conducted on a single commercial fishing vessel (18 m in length) in the Strait of Sicily during the months of July through October over a period of three years from 2005 to 2007. Circle and J hooks were alternated along the mainline.
4. A total of 26 sea turtles were hooked, all immature-size *Caretta caretta*. Turtles were caught at a statistically greater frequency on J hooks than on circle hooks. The capture rate, weight, and Upper jaw fork length of the target species were not significantly different between the two types of hooks employed.
5. Five sea turtles swallowed the hook and in all such cases these were J type. Circle hooks tended to be located externally and were more easily detected by fishermen, and could be removed with the correct dehooking action before returning the turtle to the sea.

6. These findings suggest that 16/0 circlehooks can effectively reduce the incidental capture of immature loggerhead sea turtles in a Mediterranean swordfish longline fishery without affecting the catch size of the target species. Copyright (C) 2009 John Wiley & Sons, Ltd.

The simulation of the geometry of a tuna purse seine under current and drift of purse seiner

Author(s): Kim YH, Park MC

Source: OCEAN ENGINEERING **Volume:** 36 **Issue:** 14 **Pages:** 1080-1088 **Published:** OCT 2009

Abstract:

It was necessary to obtain a more practical interactive precise model of the three-dimensional (3-D) geometry during purse seine operations considering movements of fishing vessel and details of the sea condition. The changes in the shape of a purse seine from shooting to pursing during pelagic skipjack fishing was recorded in the Southwest Pacific Ocean by photographs of the scanning sonar with in situ measurements of water flow by a current meter. The modeling of 3-D geometry during purse seining was established using finite element methods, as resultant force vector from flow drag, buoyancy, sinking force, tension of pulling or pursing acting on net panels in connection with drift of fishing vessel with time elapsed from the start of shooting to the end of pursing. The simulation results were matched closely by field measurements as a heart-like shape in upper net near floatline and a water-drop shape in purse line following drift of ship towards inside net circle during pursing. This model of a purse seine can be extended to almost any kind of purse seine generating real fishing parameters and to modeling fish capture process. (C) 2009 Elsevier Ltd. All rights reserved.

Longlining haddock with manufactured bait to reduce catch of Atlantic cod in a conservation zone

Author(s): Pol MV, Correia SJ, MacKinnon R, Carver J

Source: FISHERIES RESEARCH **Volume:** 94 **Issue:** 2 **Special Issue:** Sp. Iss. SI **Pages:** 199-205 **Published:** NOV 2008

Abstract:

A manufactured bait, Norbait (c) 700E, and two natural baits, clams and herring, were tested to compare catch of haddock and Atlantic cod using longlines in a cod conservation zone. Trials on a commercial fishing vessel demonstrated that the manufactured bait had the lowest catches of cod and the lowest ratio of cod to legal-sized haddock compared to either natural bait. Interactions of bait type, area of set, and trip confounded the effects of bait on catch. Based on the haddock catch per unit effort (CPUE), estimates of economic viability using only the manufactured bait suggested that a fishery may be infeasible. Use of Norbait (c) to limit Atlantic cod bycatch in haddock longline fisheries may require fishery-by-fishery evaluation. Published by Elsevier B.V.

Effects of using bycatch reduction devices on the Colombian Caribbean Sea shrimp fishery

Author(s): Maniarrés L, Duarte LO, Altamar J, Escobar F, García C, Cuello F .

Source: CIENCIAS MARINAS **Volume:** 34 **Issue:** 2 **Pages:** 223-238 **Published:** JUN 2008

Abstract:

Effects of the fishery bycatch reduction device (BRD) and turtle excluder device (TED) on shrimp retention and bycatch reduction were assessed, aiming to increase sustainability and attenuate the ecological impact of shrimp trawls in the Colombian Caribbean Sea. A total of 88 hauls were carried out in two different periods. The four shrimp trawl nets of the fishing vessel were each equipped with a different device configuration: BRD, TED, TED/BRD, and control (without devices). The highest

reduction in incidental catch rates was recorded for the BRD-equipped net, whereas a lower reduction of fish, a higher reduction of invertebrates and discards, and a lower retention of shrimp were recorded for the TED-equipped net. Using BRD, a significant reduction in catch per unit effort was recorded for six (*Lutjanus synagris*, *Lepophidium* spp., *Diplectrum* spp., *Synodus* spp., *Syacium* spp., and *Bagre marinus*) of twelve fish species or species groups selected because of their commercial value or higher catch rates. The results indicate that widespread use of BRDs in the southern area of the Colombian Caribbean Sea would allow a decrease of 727 t of bycatch and 37 t of shrimp in the catches per year, whereas using both TED and BRD, these reductions would be 1529 t of bycatch and 128 t of shrimp per year. Some changes in the device designs currently used are considered feasible in order to increase shrimp retention and reduce the resistance of crews to adopt these devices, but at the same time attenuating the impact of fishing activities on bycatch species and recovering the abundances of the exploited demersal fish populations.

Selectivity in a trawl codend during haul-back operation - An overlooked phenomenon

Author(s): Madsen N, Skeide R, Breen M, Krag LA, Huse I, Soldal AV

Source: FISHERIES RESEARCH **Volume:** 91 **Issue:** 2-3 **Pages:** 168-174 **Published:** JUN 2008

Abstract:

The selectivity of a 99 mm trawl codend was assessed using a codend cover fitted with a MultiSampler, which was acoustically triggered to take separate samples at three different phases of the haul. The first sample was collected during towing, the second during haul-up and the third at the surface. A total of 18 hauls were conducted with a commercial fishing vessel west of Scotland. It was demonstrated that escapes take place not only during the tow but also in the short period when the trawl is hauled back from the seabed and when the codend is at the surface. For haddock (*Melanogrammus aeglefinus*), whiting (*Merlangius merlangus*) and Norway lobster (*Nephrops norvegicus*), respectively, the mean percentages escaping at the surface were 16, 12 and 38% of the total escape while 17, 8 and 28% escaped during the haul-up phase. Compared to towing, the escape rate (no./min) increased for haddock by a factor 2.7 during haul-up and by a factor 1.7 at the surface, whereas the escape rates of whiting were similar for the three phases. The escape rate of Norway lobster increased by a factor of approximately 7 for both the haul-up and surface phases, compared to the towing phase. The selectivity parameters L50 (50% retention length) and SR (selection range = L75-L25) were estimated and compared for the three different phases and for the whole haul for haddock, whiting and Norway lobster. For all three species there was no significant ($P > 0.05$) difference in L50 between the three phases of the haul. There was also no significant difference for whiting and Norway lobster when comparing the SR of the three phases, whereas the SR was significantly lower for haddock when comparing the surface phase with towing and haul-up. The estimate of L50 when towing was about 6 cm lower for haddock and whiting and 9 mm for Norway lobster compared to the selection curve estimated conventionally for the whole haul. Finally, the effect of sea state, duration and codend catch on the selectivity parameters were estimated for the individual phases and for the whole haul. A significant effect of at least one variable was found in all phases. (C) 2007 Elsevier B.V. All rights reserved.

Shrimp loss associated with turtle excluder devices: Are the historical estimates statistically biased?

Author(s): Gallaway BJ, Cole JG, Nance JM, Hart RA, Graham GL

Source: NORTH AMERICAN JOURNAL OF FISHERIES MANAGEMENT **Volume:** 28 **Issue:** 1 **Pages:** 203-211 **Published:** FEB 2008.

Abstract:

Estimates of penaeid shrimp losses associated with the use of turtle excluder devices (TEDs) in offshore waters of the southeastern USA are derived from a single study conducted from 1988 to

1990. The estimates were based on paired tows in which the inboard and outboard nets on one side of the vessel were equipped with TEDs while the nets on the other side were not. Comparison of the mean catch rates from the TED and control nets provided an estimate of shrimp loss. However, the net positions were not rotated by trip, the try net (i.e., a small shrimp trawl fished off one side of the vessel in front of the trailing inboard net) was fished in front of the inner standard net 70% of the time, and the data show that catches in the standard net trailing the try net were significantly reduced by operation of the try net. These findings warranted a new analysis excluding data from inner net pairs, as is done in the modern gear testing protocol. The reanalysis suggests that the shrimp loss rates for Georgia TEDs with and without accelerator funnels were 5.5% and 7.5%, respectively, and that the highest level of shrimp loss (15%) was associated with the "Super Shooter" TED with an accelerator funnel. The results of the historical study indicated that the shrimp loss rate associated with the Super Shooter design was only 1% and that the shrimp loss rates associated with the Georgia TED with and without accelerator funnels were 3.6% and 13.6%, respectively. Overall, we conclude that the historical estimates are biased. A reanalysis suggests that the shrimp loss rate associated with TED use in offshore waters of the southeastern USA is on the order of 6%. We also conclude that a new, well-designed National Marine Fisheries Service-approved study is needed.

Fishing power increases continue in Queensland's east coast trawl fishery, Australia

Author(s): O'Neill MF, Leigh GM

Source: FISHERIES RESEARCH Volume: 85 Issue: 1-2 Pages: 84-92 Published: JUN 2007

Abstract:

The Queensland east coast trawl fishery is by far the largest prawn and scallop otter trawl fleet in Australia in terms of number of vessels, with 504 vessels licensed to fish for species including tiger prawns, endeavour prawns, red spot king prawns, eastern king prawns and saucer scallops by the end of 2004. The vessel fleet has gradually upgraded characteristics such as engine power and use of propeller nozzles, quad nets, global positioning systems (GPS) and computer mapping software. These changes, together with the ever-changing profile of the fleet, were analysed by linear mixed models to quantify annual efficiency increases of an average vessel at catching prawns or scallops. The analyses included vessel characteristics (treated as fixed effects) and vessel identifier codes (treated as random effects). For the period from 1989 to 2004 the models estimated overall fishing power increases of 6% in the northern tiger, 6% in the northern endeavour, 12% in the southern tiger, 18% in the red spot king, 46% in the eastern king prawn and 15% in the saucer scallop sector. The results illustrate the importance of ongoing monitoring of vessel and fleet characteristics and the need to use this information to standardise catch rate indices used in stock assessment and management. Crown Copyright (C) 2007 Published by Elsevier B.V. All rights reserved.

Reducing seabird bycatch in longline, trawl and gillnet fisheries

Author(s): Bull LS

Source: FISH AND FISHERIES Volume: 8 Issue: 1 Pages: 31-56 Published: MAR 2007

Abstract:

With an increasing number of seabird species, particularly albatross and petrels, becoming threatened, a reduction of fishery impacts on these species is essential for their future survival. Here, mitigation methods to reduce and avoid seabird bycatch are assessed in terms of their ability to reduce bycatch rates and their economic viability for longline, trawl and gillnet fisheries worldwide. Factors influencing the appropriateness and effectiveness of a mitigation device include the fishery, vessel, location, seabird assemblage present and season of year. As yet, there is no single magic solution to reduce or eliminate seabird bycatch across all fisheries: a combination of measures is required, and even within a fishery there is likely to be refinement of techniques by individual vessels in order to maximize their effectiveness at reducing seabird bycatch. In longline demersal and pelagic fisheries, a minimum requirement of line weighting that achieves hook sink

rates minimizing seabird bycatch rates should be tailored with a combination of strategic offal and discard management, bird-scaring lines (BSLs) and night-setting, particularly in Southern Hemisphere fisheries. Urgent investigation is needed into more effective measures at reducing seabird interactions with trawl nets and gill nets. In trawl fisheries, a combination of offal and discard management, the banning of net monitoring cables, paired BSLs, and a reduction in the time the net is on or near the surface are likely to be the most effective in reducing seabird interactions with the warp cables and net. Few seabird bycatch reduction methods have been developed for gillnet fisheries, although increasing the visibility of the net has been shown to reduce seabird bycatch. Further studies are required to determine the efficacy of this technique and its influence on target species catch rates.

Impact of technological creep on fishing effort and fishing mortality, for a selection of European fleets

Author(s): Marchal P , Andersen B , Caillart B , Eigaard O , Guyader, Hovgaard H , Iriondo A , Le Fur F , Sacchi J , Santurtun M

Source: ICES JOURNAL OF MARINE SCIENCE **Volume:** 64 **Issue:** 1 **Pages:** 192-209
Published: JAN 2007

Abstract:

Face-to-face interviews were conducted to identify the main changes in gear and vessel technology that may have improved the fishing efficiency of a number of French, Danish, and Basque fleets over the past few decades. Important changes include the gradual appearance of twin trawls (Danish and French trawlers) and trammel-nets (French gillnetters), and the increased polyvalence of Basque bottom trawlers. The results suggest that fishing effort descriptors that are not traditionally measured (gear type, groundrope type, length of net used per day, headline length, crew size, number of winch or net drums) may have a substantial impact on catch rates. Adjusting fishing effort using such descriptors may generally improve the relationship between fishing effort and fishing mortality.

FNET - Real-time FishNet Evaluation Tool

Author(s): Morrison AT, Brown RW, Despres LA, Nordahl VA, Galbraith JK

Book Group Author(s): IEEE

Source: OCEANS 2006 - ASIA PACIFIC, VOLS 1 AND 2 **Pages:** 434-439 **Published:** 2006

Abstract:

The Ecosystems Surveys Branch of the Northeast Fisheries Science Center of the National Oceanic and Atmospheric Administration (NOAA) is engaged in an ongoing effort to more fully characterize, quantify, and understand the behavior of bottom trawl nets while they are being fished. Standardized survey results are critical inputs to population dynamics models of the northeast fishery of the United States. The models contribute to the setting of fishery policy and strongly influence the local economy.

In 2003 we began development of a data visualization utility that could assemble, correlate, record, and present the measurements of a subset of the many disparate sensors logged by the Scientific Computing System installed on NOAA Fisheries Research Vessels. The FishNet Evaluation Tool (FNET) presents this information in graphical and textual formats for interpretation and use by fisheries scientists and vessel crew in near real-time. FNET can also playback recorded measurements from earlier tows to support post-cruise analysis. Development is continuing and FNET is now undergoing trials on the NOAA Ships Albatross IV and Delaware II. Shipboard use will eventually become standard procedure. System architecture, operation, and early results are reported in this paper. The development of expert system features is planned.

Pelagic longline fishing gear: A brief history and review of research efforts to improve selectivity

Author(s): Watson JW , Kerstetter DW

Source: MARINE TECHNOLOGY SOCIETY JOURNAL **Volume:** 40 **Issue:** 3 **Pages:** 6-11
Published: FAL 2006

Abstract:

Pelagic longline gear had several independent evolutions, but the most widespread form appears to have been originally developed by the Japanese as early as the mid-19(th) century. Technological developments such as polyamide monofilament line and modern fishing vessel construction have resulted in the evolution and expansion of this gear type as the primary worldwide method of commercially harvesting large pelagic fishes such as broadbill swordfish and tunas.

Although the adaptability of the gear through changes in materials, lengths, and deployment strategies has resulted in generally high selectivity for many target species, the bycatch of protected species by pelagic longlines is considered a global problem in the conservation effort to sustain populations of sea turtles, sea birds, and some istiophorid billfishes (sail-fished spearfishes, marlins). Recent research on the modification of pelagic longline fishing strategies uses this inherent adaptability of the gear to avoid or reduce the mortality of bycatch species. This is an alternative to the traditional management strategy of closed areas, which fishermen view as less effective and generally more restrictive (limiting) with respect to target catches. This work with academic partners and commercial fishermen has resulted in the development of bycatch reduction strategies which include safe handling and release gear and protocols, use of circle hooks in place of traditional J-style hooks, restrictions on gangion and mainline lengths, and corrole hooks.

Simultaneous web-based real-time temperature monitoring using multiple wireless sensor networks

Author(s): Hayes J, Crowley K, Diamond D

Book Group Author(s): IEEE

Source: 2005 IEEE SENSORS, VOLS 1 AND 2 **Book Series:** IEEE Sensors **Pages:** 281-284
Published: 2005

Abstract:

We outline a system that allows simultaneous temperature monitoring on two or more fishing vessels using multiple wireless sensor networks. The distribution of wireless temperature data loggers across a boat with an associated base station results in the fishing vessel being in effect an individual wireless sensor network. The existence of this wireless sensor network allows for real-time temperature monitoring with the temperature information being accessed over the internet. Previously, web-based real-time temperature monitoring of fish catches has used single sensor networks to monitor temperature, so a user could only monitor the temperature sensors of a single vessel. The system we outline allows for multiple sensor networks to be integrated and for a user to monitor temperature across two or more of these networks. Furthermore the system uses SMS to send warnings and to monitor recent temperature data. The system is built around a web server and bespoke wireless data loggers operating over a GSM network.

Effects of specifications of branch line on sinking characteristics of hooks in Japanese tuna longline

Author(s): Hu F, Shiga M, Yokota K, Shiode D, Tokai T, Sakai H, Arimoto T

Source: NIPPON SUISAN GAKKAISHI **Volume:** 71 **Issue:** 1 **Pages:** 33-38 **Published:** JAN 2005

Abstract:

To develop mitigation measures for reduction in incidental catch of seabirds in tuna longline fisheries, the hook sinking speed in ten types of branch lines used by Japanese tuna longline vessels was investigated. Also, to improve sinking speed of the hook, two new techniques were tested: material of 10 m line close to the hook was altered from polyamide monofilament to fluorocarbon; and a weight of 15-60 gw was added to the hook. The average sinking speed of the hooks from 0 to 10 m in depth varied from 0.16 to 0.23 m/s in the ten types of branch lines. However, assuming the speed of the fishing vessel for casting is 10 knots, no hook of the ten types sank deeper than 10 m within 150 m from stern, that is, the effective area of the bird-scaring streamer (Tori-pole). The sinking speed of the hook with fluorocarbon line was 1.6 times faster than that with polyamide monofilament. The hook with additional weight of 45 gw sank almost two times faster than the conventional one.

Measurement of net-relative flow during a bottom trawl survey

Author(s): Morrison AT, Brown RW, Politis PJ, DeAlteris JT

Book Group Author(s): IEEE

Source: OCEANS '04 MTS/IEEE TECHNO-OCEAN '04, VOLS 1- 2, CONFERENCE PROCEEDINGS, VOLS. 1-4 Pages: 449-452 Published: 2004

Conference Information: Oceans '04 MTS/IEEE Techno-Ocean '04 Conference
Kobe, JAPAN, NOV 09-12, 2004

IEEE; OES; TON; JAMSTEC; Korea Convent Vis Assoc; AESTO; CEROS

Abstract:

The Ecosystems Surveys Branch of the Northeast Fisheries Science Center of the National Oceanic and Atmospheric Administration (NOAA) is engaged in an ongoing effort to more fully characterize and understand the behavior of trawl nets while they are being fished. Survey results are critical inputs to population dynamics models of the northeast fishery. The models, in turn, contribute to the setting of fishery policy and strongly influence the local economy.

During cruises in February and March of 2004 we mounted a MAVS-3 acoustic current meter on the head rope of a bottom trawl net and recorded the net-relative flow, attitude, and heading. Observations from the March cruise on NOAA Fisheries Research Vessel Delaware II are reported here. The measurements show strong dynamic variations in the flow around the net that are directly forced by the motion of the vessel.

Reducing incidental mortality of Franciscana dolphin *Pontoporia blainvillei* with acoustic warning devices attached to fishing nets

Author(s): Bordino P, Kraus S, Albareda D, Fazio A, Palmerio A, Mendez M, Botta S

Source: MARINE MAMMAL SCIENCE Volume: 18 Issue: 4 Pages: 833-842 Published: OCT 2002

Abstract:

We conducted a double blind experiment in an artisanal gillnet fishery in Argentina to determine the effectiveness of acoustic deterrents (pingers) at reducing bycatch of the Franciscana dolphin (*Pontoporia blainvillei*). The fishery was conducted by small inflatable and fiberglass vessels operating between 0.5 and 7 km from the coast. Each vessel carried an independent observer who was rotated from vessel to vessel throughout the course of the experiment. Information on the number of dolphins captured, geographic position, depth, configuration of fishing gear, soak time, biomass of fish caught, and sea lion predation in a string/net producing any damage was recorded. Equivalent numbers of active and silent pingers were used during the experiment. A total of 45 dolphins were caught in the silent nets, and seven were caught in the active pinger nets, demonstrating a highly significant reduction in bycatch for this species. However, sea-lions (*Otaria*

flavescens) damaged the fish in active pinger nets significantly more than silent nets, and the damage increased over the course of the experiment. Although pingers show promise as a management tool for this species, pinniped depredation suggests that higher pinger frequencies will be needed to avoid a "dinner bell" effect.

How fast do demersal longlines sink?

Author(s): Robertson G, Moe E, Haugen R, Wienecke B

Source: FISHERIES RESEARCH **Volume:** 62 **Issue:** 3 **Pages:** 385-388 **Published:** JUN 2003

Abstract:

Longlines that sink fast reduce the time available to seabirds to attack baited hooks and are important in efforts to minimise seabird by-catch in longline fisheries. We measured sink rates in still seawater of longlines commonly used in the world's demersal fisheries. Lines with integrated weight (lead cores) sank two to three times faster (45-52 cm/s) than conventional (unweighted) lines. Conventional 9 mm diameter lines made from polyester sank at 23 cm/s compared to 18 cm/s for 9 mm Silver lines (blend of polyester, polyethylene and polypropylene). Samples of lines set by hand in still water sank significantly faster than longlines set from a fishing vessel, presumably because of the effect of the sea swell and upwellings from the propeller on the line set from the vessel. (C) 2002 Elsevier Science B.V. All rights reserved.

The effect of twine thickness on the size selectivity and fishing power of Baltic cod gill nets

Author(s): Holst R, Wileman D, Madsen N

Source: FISHERIES RESEARCH **Volume:** 56 **Issue:** 3 **Pages:** 303-312 **Published:** JUN 2002

Abstract:

Sea trials were carried out on a Danish commercial vessel measuring the size selectivity and fishing power of gill nets used to catch Baltic cod (*Gadus morhua*). A comparison was made of two different twine thicknesses at two different times of the year. Nominal mesh sizes of 70-130 mm were used. Method of capture, condition factor and girths were measured for sub-samples of the cod caught. A model of the size selectivity of the gill nets was adapted to the experimental conditions where two gears were fished on the same population. This model was fitted to the catch data for each set. Subsequently a model was fitted for the mean selectivity taking between-set variation into account. The selectivity Curve that fitted the data best was given by the sum of two normal distributions. It was found that twine thickness and trials period had relatively little effect upon the shape of the selectivity curve. Twine thickness had a substantial effect upon the fishing power of the nets. (C) 2002 Elsevier Science B.V. All rights reserved.

Physical versus harvest-based measures of capacity: the case of the United Kingdom vessel capacity unit system

Author(s): Pascoe S, Coglán L, Mardle S

Source: ICES JOURNAL OF MARINE SCIENCE **Volume:** 58 **Issue:** 6 **Pages:** 1243-1252
Published: DEC 2001

Abstract:

Effective management of fishing capacity requires reliable estimates of current capacity, and to this end most countries have developed a form of capacity measure usually based on some physical characteristics of the fleet. In the United Kingdom, the "capacity" measurement system currently in place is used as the basis of existing capacity reduction programmes. Each vessel has a number of Vessel Capacity Units (VCUs) defined by its size and engine power. An assumption is made that this measure is related to the ability of the fleet to catch fish. More recently, techniques have been

developed to measure capacity directly in terms of potential output. In this paper, the fishing capacity of a sample of UK otter trawlers and a set of bouts that primarily use static gear (i.e. nets and lines) is estimated using data envelopment analysis (DEA). Estimates are made on a species-by-species basis for the key species harvested. These are compared to the existing measures of physical capacity. The results suggest that VCUs may provide a reasonable approximation of fishing capacity for fleets using mobile gear, but may be inappropriate for fleets using static gear. Implications for capacity management based on the physical measures, given the results, are drawn. (C) 2001 International Council for the Exploration of the Sea.

3.5. References

- ◆ [RIM13](#): Design, construction and validation of a new pole prototype for catching Bluefin tuna.
- ◆ Examples of energy conservation and development of sustainable fishing techniques in Europe. [PPT](#)
- ◆ Technical Consultation To Develop International Guidelines On Bycatch Management And Reduction Of Discards. Rome, 6–10 [December 2010](#)

4. Ship design and safety

4.1. Introduction

Fishing fleets are becoming older worldwide, and this is undoubtedly one of the factors which contributes to the safety-related weaknesses of this industry. National and regional scrapping schemes for old fishing vessels should be implemented, as well as programmes aimed at building new safer vessels.

Another relevant aspect we should consider is that of the over-exploitation of fish stocks in coastal areas, which has led to a situation where both undecked and very small boats are being increasingly forced to operate in waters where they were not designed to fish in, thus causing an increasing number of accidents and life losses.

There are several international instruments which establish safety standards for fishing vessels and their crew, all of them approved by UN institutions such as the International Maritime Organization (IMO), the International Labour Organization (ILO) and the Food and Agriculture Organization (FAO). Unfortunately, many of them did not finally enter into force because they were not ratified by enough fishing nations. Other instruments were not adequately implemented and some others require an urgent review, so that the most recent technical changes occurred within the maritime industry are taken into account.

Since there are more and more standards being produced in this field, today's fishing fleet will have to keep up with the new provisions and gradually adapt to them. While it is the European Union that sets these guidelines, each Member State must then adapt and implement them.

Within the European Union there is a European Fisheries Fund ([EFF](#)). In response to the fuel crisis of 2008, the Council adopted temporary exceptions to the EFF in July 2008 to provide an opportunity for the Member States to achieve the necessary restructuring of the fleet. Among such exceptions, there was a proposal to establish Fleet Adjustment Plans which would provide additional support to the enhancement of substantial capacity reductions for those fleet segments consuming more fuel. The exceptions will last for 4 years.

Since more restrictive standards regarding noise and vibrations on board will undoubtedly come up, insulation materials and systems will have to be improved in the future, as well as other factors related to noise absorption, the design of more silent engines, etc.

As far as health and safety at work and fishing capacity are concerned, all new regulations applicable to new vessels or old converted ones must improve working conditions on board, adapt fishing capacity to the optimal fishing regime and include new technologies which favour selective fishing techniques and protect the environment.

One of the projects we should also highlight under this heading is the [BAIP 2020](#) (Spanish acronym for multipurpose, intelligent, autonomous fishing vessel). BAIP 2020 is proposing to research innovative technologies for the design and building of vessels with the following main characteristics:

- ◆ Maximum efficiency in the rational use of energy on board, which can be achieved by using new low-resistance hulls, lighter materials, alternative sources of energy such as dual-fuel or hydrogen, high efficiency propulsion systems, etc. The aim is to reduce maintenance operations and achieve a rational use of energy on board, with the objective of maximizing energy efficiency.

- ◆ Promoting environmental protection by exploiting waste to generate energy, minimising contaminating emissions and enhancing active participation in protecting the marine world.
- ◆ Maximum safety, confort and health on board, offering new distributions and ergonomic solutions.
- ◆ Maximum automation of operations carried out on board, therefore equipping vessels with electronic control and action systems.
- ◆ Adoption of artificial intelligence systems in these processes and in the management of the ship, to provide it with the maximum efficiency level.
- ◆ Diversifying fishing activities to improve the ship's multipurpose character.
- ◆ High life cycle due to the use of new materials and maintenance experts based on the ship's condition.

The list presented below is an attempt to offer all the information related to projects, patents, scientific papers and other relevant references in the field of design and safety of fishing vessels worldwide.

4.2. European projects

Superior life-time operation economy of ship propellers

Start date: 2005-05-01

End date: 2008-10-31

Project Acronym: SUPERPROP

Project status: Completed

Objective: Many old fleets are currently operating without updating the propulsion design to new working conditions. Therefore, propulsion efficiency decays as time elapses inducing the rising of fuel consumption, contaminant gas pollution, engine maintenance costs and vibrations while ship capabilities decrease. Fishing boats and tug boats fleets are the largest fleets of boats operating all over the world.

From the smaller boats sailing near the coast to large trawler vessels, there is a wide range of fishing vessels crossing the seas. An average of the operating life in these kinds of vessels can be estimated around 25 years. Since they use to work in two different conditions (fishing and saling to/from port and searching schools in the fishing areas), the design of the propulsion is conditioned by such different working conditions. With time, propulsion becomes less and less efficient. By an appropriate economic knowledge of the actual situation of such fleets, it is desirable to estimate the cost reduction in fuel consumption and maintenance as well as gas emissions and vibration phenomena.

Economic tools together with engineering tools will be developed for the systematic updating of the propulsive (propeller and stern area) system to the new optimum working point in order to reach the main aim of the proposal. A standard methodology for this updating procedure will be the main outcome of the project.

Intelligent tools for emergency applications & decision support

Start date: 2000-11-01

End date: 2002-10-31

Project Acronym: ITEA-DS

Project status: Completed

Objective: Modern ships become more complex. They operate in more congested waters, with higher speeds and more strict requirements to timeliness and cost of operation. The regulatory impact on ship operations is also dramatically changing. New resolutions or directives that come into force (MARPOL, HAZMAT, ISM, etc), imposing additional load on personnel.

ITEA-DS aims to develop an intelligent ship control and monitoring system that can enhance safety of ships and lower operational costs. This platform will be based on standards and wherever is needed proposals for amendments or new standards will be made. Additional R&D work aims to demonstrate distribution of conventional high level functionality (e.g. maintenance and configuration) to low level instrumentation with the help of new WWW type technology (e.g., Java and XML).

Project website: [A new generation of on-board and ashore integrated tools & Decision Support Systems for emergency, efficiency, maintenance and environmental impact monitoring](#)

[Implementation of a vessel monitoring system on artisanal fishing vessels operating within the Mediterranean sea](#)

Start date: 2001-02-01

End date: 2006-01-31

Project Acronym: ARTMEDSAT

Project status: Completed

Objective: ARTMEDSAT is an Accompanying Measure designed to explore the adaptation of satellite vessel monitoring systems (VMS) - currently limited to large professional and industrial vessels - to the artisanal fleet in the Mediterranean Sea. The project will bring together in a workshop: fishery experts on the artisanal fleet, environmentalists, experts in satellite navigation, communications and maritime electronics, of Greece, Italy, France and Spain, to determine the optimal method for adapting VMS techniques to the physical and technical limitations of artisanal fleet.

In particular, a combination of artisanal fishery data, environmental parameters, satellite position monitoring and mathematical modeling will be considered. The final objective of this Accompanying Measure is to formalize an innovative approach to VMS for artisanal fleet that can serve as the basis for a Fifth Framework RTD project as well as to identify the ideal team of partners to execute that project.

[Enhanced efficiency and flexibility in building of small ships by application of collaborative engineering in CAE systems](#)

Start date: 1999-05-01

End date: 2001-11-30

Project status: Completed

General information: Shipyards belong to one of the oldest traditional sectors of Europe. The shipyards specialised in the building of ships with a length up to + 50 m, such as (motor) yachts, round trip boats, tugs, fishing vessels. Work boats and ferries typically fall in the SME class (25-250 employees). In the shipbuilding sector competitiveness is increasingly determined by the ability to reduce time to market, lower costs and improve production flexibility on an ongoing basis. Computer aided engineering (CAE) is a technology (approach) with a high added value, which has only been introduced/implemented into the SME shipbuilding sector to a limited level (< 50%) and to a limited extent.

The main causes are:

- 1) the knowledge gap/lack of technical expertise of CAD, CAM and in particular CAE systems;
- 2) the way of implementation of said systems and;

3) reservation (caution) for change. The opportunity to be taken advantage of for the small shipyards is to join forces with experts on naval computer aided design, engineering and manufacturing (CAD/CAE/CAM), collaborative engineering software development and management of change, in order to enhance the efficiency and flexibility of the shipbuilding process by collaborative engineering of hull, interior and piping. The overall RTD goals of the project are:

- 1) implementation/integration of the concept of collaborative engineering (hull' interior and piping) into the existing CAE tools;
- 2) extension of existing CAE tools for the small shipyards market and;
- 3) development of an implementation methodology for 1 and 2.

The specific industrial objectives/targets and expected achievements for the shipyards: Linszen Yachts. Skipasmidastodm. Estaleiros Navais do Mondego, Pendennis and FBM Marine are:

- 1) a reduction of the lead time by at least 25%, a reduction of the shipbuilding labour costs by at least 20 %;
- 2) an increase of the flexibility of the shipbuilding process and;
- 3) an improvement of the quality of the ship and of the shipbuilding process.

The potential benefits for the involved shipyards amount to 3 - 5 MECU per year and the potential economic benefits are 90 - 150 MECU/year Europe wide. It is expected that within 6 months after the project the beta version of the developed CAE tools is available for the involved (small) shipyards. Further, it is the expectation that within 12 months the beta version of the CAE tools as well as the implementation methodology and training courses are transformed into marketable products and services and are introduced in the building processes of the shipyards. The listed objectives of the proposed project refer to the priority areas: 1.1.2.S, 1.1.1.M, 1.1.4.M, 1.5.1.S and 3.B.1 of the IMT Workprogramme. Moreover, the project is in accordance with the Maritime Industry R&D Masterplan (tasks: 1.1.1, 1.1.5, 1.1.6 and 1.1.7) and in accordance with the policy of the European Commission as described in the paper: Towards a New Shipbuilding Policy.

4.3. Patents

The section below presents some of the patents related to ship design and safety issues.

Patent No	Title	Company	Date
WO2011009194 (A1)	FISHING BOAT AND METHOD FOR CATCHING FISH	CURMAN IVAN [CA]; PANOVIC VLATKO [CA]	2011-01-27
CN101863305 (A)	Negative-freeboard live fish boat	HANGZHOU QIANDAO LAKE SHIPBUILDING CO LTD	2010-10-20
US2010129191 (A1)	Method and Device for Handling of Fish	LARSEN ASBJOERN INGEMAR [NO]	2010-05-27
RU2377773 (C2)	METHOD AND DEVICE FOR TRAWL FISHING	ROFIA GMBKH [DE]	2010-01-10
JP2008254468 (A)	REFRIGERATION DEVICE OF FISH IN FISH HOLD	MAEKAWA SEISAKUSHO KK	2008-10-23
EP1986491 (A1)	SAFETY SYSTEM FOR A FISHING BOAT	COMMISSARIAT ENERGIE ATOMIQUE [FR]	2008-11-05
CN201077519 (Y)	Multifunctional ship	XIAOFENG CONG [CN]	2008-06-25
JP2008126828 (A)	FISHING BOAT	CHUGOKU ELECTRIC POWER; CHUDEN KANKYO TECHNOS CO LTD	2008-06-05
KR100823314 (B1)	FISHING LAMP FOR A FISHING BOAT	HAN SEUNG HO [KR]	2008-04-17
WO0238439 (A1)	DEVICE AND METHOD FOR SETTING OF FISHING LINE OR OTHER FISHING GEAR	SINTEF FISKERI OG HAVBRUK [NO]; FISKERSTRAND VERFT [NO]; ENERHAUG BIRGER [NO]; ROESVIK HAAVARD [NO]	2002-05-16

4.4. Scientific papers

A Study of Spatial Layout Design of Fishing Vessels

Author(s): Zhu YN, Zhu YH, Liao HJ

Source: 2009 IEEE 10TH INTERNATIONAL CONFERENCE ON COMPUTER-AIDED INDUSTRIAL DESIGN & CONCEPTUAL DESIGN, VOLS 1-3 - E-BUSINESS, CREATIVE DESIGN, MANUFACTURING - CAID&CD'2009 Book Series: International Conference on Computer Aided Industrial Design and Conceptual Design-CAID&CD Pages: 1313-1316 Published: 2009

Conference Information: 10th IEEE International Conference on Computer-Aided Industrial Design and Conceptual Design

Wenzhou, PEOPLES R CHINA, NOV 26-29, 2009

IEEE

Abstract:

Fishing vessels are an industrial product for special purposes. Spatial layout design has great effects on the overall function of a fishing vessel. To make the spatial layout design reasonable, flexible and creative approaches of design are needed to divide and recreate the original space and meanwhile, it is important to coordinate the relationship between people, things, and space. In spatial layout design for a fishing vessel, it is also necessary to do a systematic: study of user demand, identify the main points of the demand and find out targeted solutions. All these are in order to improve fisher folk's quality of life on sea

Failure mode and effects analysis using a group-based evidential reasoning approach

Author(s): Chin KS , Wang YM , Poon GKK , Yang JB

Source: COMPUTERS & OPERATIONS RESEARCH Volume: 36 Issue: 6 Pages: 1768-1779 Published: JUN 2009

Abstract:

Failure mode and effects analysis (FMEA) is a methodology to evaluate a system, design, process or service for possible ways in which failures (problems, errors, risks and concerns) can occur. It is a group decision function and cannot be done on an individual basis. The FMEA team often demonstrates different opinions and knowledge from one team member to another and produces different types of assessment information such as complete and incomplete, precise and imprecise and known and unknown because of its cross-functional and multidisciplinary nature. These different types of information are very difficult to incorporate into the FMEA by the traditional risk priority number (RPN) model and fuzzy rule-based approximate reasoning methodologies. In this paper we present an FMEA using the evidential reasoning (ER) approach, a newly developed methodology for multiple attribute decision analysis. The proposed FMEA is then illustrated with an application to a fishing vessel. As is illustrated by the numerical example, the proposed FMEA can well capture FMEA team members' diversity opinions and prioritize failure modes under different types of uncertainties. (C) 2008 Elsevier Ltd. All rights reserved.

Lessons from offshore: Challenges and opportunities in linking data to promote understanding of accidents and injuries among Newfoundland and Labrador fishers 1989-2001

Author(s): Binkley M , Bigney K , Neis B , Bornstein S

Source: MARINE POLICY Volume: 32 Issue: 6 Pages: 905-912 Published: NOV 2008

Abstract:

The Newfoundland fishery has always been a dangerous industry, but since the collapse of groundfish stocks the pattern of risks has changed. To understand these changes we developed the Fishing Vessel Safety Longitudinal Analysis, a linked database comprising Department of Fisheries and Oceans catch and effort records, Search and Rescue Information System records, and Newfoundland and Labrador Workplace Health Safety and Compensation Commission claims. This paper discusses the methodological challenges and solutions associated with linking these databases. We conclude that improved coordination between these agencies is a prerequisite for linking their respective databases, which would in turn offer greatly enhanced opportunities to contribute to fishing safety. (C) 2008 Elsevier Ltd. All rights reserved.

Analysis of the specific risks in the different artisanal fishing methods in Andalusia, Spain

Author(s): Piniella F , Soriguer MC , Walliser J

Source: SAFETY SCIENCE **Volume:** 46 **Issue:** 8 **Pages:** 1184-1195 **Published:** OCT 2008

Abstract:

Andalusia, Spain, has an important tradition in the fishing industry that makes it one of the areas of the European Union where fisheries policies have a great significance for the population. In order to analyse the sector, a total number of boats to be surveyed was set at 10% of the total population: 202 boats of the total of 2027 in the census. The sample was distributed among the four fishing techniques and gear. This paper deals comprehensively with the so-called "artisanal fleet", with the aim of presenting a new approach in the policies for reducing the risk in this important fisheries sector. We discuss relevant issues related to fishing vessel safety according to the typology of the vessel. The specific risks are summarized. In each type of fishing various specific tasks have to be performed that entail characteristic kinds of risk. The paper concludes that specific risks presented in this study could contribute to maritime safety. Policy implications: policies that reduce specific risks will be effective in reducing fisherman injuries. The present study is part of the presentation of results of the research project financed by the Regional Government of the state of Safety of the artisanal or craft fishing fleet, analyzing, in this case, the typical occupational risks entailed in the fishing activity. Policy makers should find the results of this Study useful in developing regulation and enforcement mechanisms for reducing fishing vessel injuries and total losses. (C) 2007 Elsevier Ltd. All rights reserved.

Devices improving the manoeuvrability characteristics of ships - Part II - "Doerffer's Rudder" - experience learnt from tests carried out on real ships

Author(s): Doerffer JW (Doerffer, Jerzy W.)

Source: POLISH MARITIME RESEARCH **Special Issue:** Sp. Iss. 1 **Pages:** 88-92 **Published:** 2007

Abstract:

An account of research activities on the devices improving the manoeuvring abilities carried out at the Gdansk University of Technology were presented in Part I of the paper. Experience from implementation of open rudders on real ships is presented in Part II. Open rudders were fitted on two full size ships: a 1000 BHP harbour tug and a 2500 BHP long line fishing vessel. Designs were made for four types of ships: motor sailing passenger ship "Gwarek" (2 x 1.032 BHP and 1800 m² Sail area); arctic expedition sailing ship m/y "Polarex" (length 40,4 m, 1200 BHP); rescue vessel R-27 (two engines a 600 BHP with single propeller); harbour tug m/t "Atlas" (2500 BHP). None of these designs was implemented due to financial difficulties of the owners. Further model experiments with a self propelled model of a cargo liner m/s "Hollandia" exceeding 20 knots were carried out on the lake as well as with a model of a twin screw vessel.

F/V Bay Islander: A history of change and increased capacity

Author(s): McKernan JC (McKernan, J. Cameron)

**Source: MARINE TECHNOLOGY AND SNAME NEWS Volume: 43 Issue: 4 Pages: 153-169
Published: OCT 2006**

Abstract:

This paper describes the evolution of a medium-sized dry hold fishing vessel into a larger refrigerated salt water (RSW) tanked hold fishing vessel over a period of several years. The changes were driven by economics and shaped by regulations. The economic conditions and regulatory aspects are discussed and the technical changes described.

An improved lifting line model for the design of marine propellers

Author(s): Celik F, Guner M

**Source: MARINE TECHNOLOGY AND SNAME NEWS Volume: 43 Issue: 2 Pages: 100-113
Published: APR 2006**

Abstract:

This paper describes a procedure for the design of marine propellers where more realistic representation of the slipstream shape by the trailing vortex system is taken into account. The slipstream shape behind the propeller is allowed to deform and to align with the direction of local velocity, which is obtained by the sum of the inflow velocity and induced velocities due to the trailing vortices. In classical lifting line approaches, that deformation is neglected. Applications for an autonomous underwater vehicle (AUV) and a fishing vessel are carried out to demonstrate propeller design and the effect of the slipstream contraction. Furthermore, a computational fluid dynamics (CFD) analysis based on the finite volume method and experimental validation of the method are carried out for the propellers. CFD analysis and experimental results are compared with the results obtained from present method.

Commercial fishing: Has technology made the industry safe ... enough?

Author(s): Dwyer KM , Burns RJ

**Source: MARINE TECHNOLOGY SOCIETY JOURNAL Volume: 40 Issue: 3 Pages: 32-39
Published: FAL 2006**

Abstract:

The Fishing Vessel Safety Act, signed into law on September 9, 1988 was the first comprehensive legislation to be enacted in this country with the goal of reducing industry fatality rates. Paramount in the new regulations were provisions for the mandatory carriage of safety equipment aboard all commercial fishing vessels, depending on the vessel's route size, and build date. The introduction of this technology had a measurable impact on reducing both vessel losses and fatalities but the downward trends seen within the first ten years of the Act's enactment have since leveled off and are holding steady at what remains unacceptably high rates in comparison to other industries. This article argues that human and economic factors are limiting the effectiveness of available technology and contributing to this statistical plateau. Specific examples of these factors are provided, and possible solutions examined in the context of fishing vessel casualties and safety enforcement. Additionally, this article examines the roles of industry members and regulators as they work towards the shared goal of realizing a safe commercial fishing industry. However inherent in this goal is realizing when these objectives have been achieved - and, given the complex nature of fishing vessel casualties, this realization may be the most difficult challenge of all.

Recent developments of refrigeration technology in fishing vessels

Author(s): Wang SG, Wang RZ

Source: RENEWABLE ENERGY Volume: 30 Issue: 4 Pages: 589-600 Published: APR 2005

Abstract:

Modern large and fast ocean fishing vessels include mechanical refrigeration, but all of them consume precious fuel or electricity to achieve refrigeration. Fishing vessels with tonnage at about 100 tons cannot attach compressor-icemaker onboard because of their small horsepower of diesel engine. These vessels always have to carry a lot of ice for caught fish preservation. At the same time, waste heat dissipated in the hot exhaust gases in most of the fishing vessels is rejected to the atmosphere. At present, some effort has been devoted to the utilization of the vast amount of the waste energy for refrigeration. In this paper, several types of refrigeration technology in fishing vessels are introduced, such as vapor-compression refrigeration systems, heat recovery systems to power absorption refrigeration plant, adsorption systems for producing chilled water, and adsorption icemaker systems, especially an adsorption icemaker prototype in our laboratory. The better perspectives of applications for the lattermost exist in fishing vessels. (C) 2004 Elsevier Ltd. All rights reserved.

Reform of fishing vessel regulations

Author(s): Whitelaw T

Source: NAVAL ARCHITECT **Pages:** 94-94 **Published:** FEB 2005

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IDS Number: 9070L

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An analysis of fishing vessel accidents

Author(s): Wang J, Pillay A, Kwon YS, Wall AD, Loughran CG

Source: ACCIDENT ANALYSIS AND PREVENTION **Volume:** 37 **Issue:** 6 **Pages:** 1019-1024
Published: NOV 2005

Abstract:

In this paper, accident data collected from the Marine Accident Investigation Branch are presented and an analysis is carried out to determine the most common causes of accidents on fishing vessels. Discussions on fishing vessel-safety assessment and data problems are given. (c) 2005 Elsevier Ltd. All rights reserved.

An analysis of fishing vessel accidents in fishing areas off the northeastern United States

Author(s): Jin D, Thunberg E

Source: SAFETY SCIENCE **Volume:** 43 **Issue:** 8 **Pages:** 523-540 **Published:** OCT 2005

Abstract:

Commercial fishing is one of the least safe occupations. Fishing vessel accident probability and vessel trip probability for fishing areas off the northeastern United States were modeled using logit regression and daily data from 1981 to 2000. Fishing vessel accident probability declined over the study period. Higher wind speeds are associated with greater accident probability. Medium size

vessels had the highest accident probability before 1994. Within the study region, accident probability was lower in southern New England and Mid-Atlantic waters than on Georges Bank and in the Gulf of Maine. Accidents are more likely to occur closer to shore than offshore. Accident probability is lower in spring and fall. Changes in fishery management in 1994 have not lead to a general increase in either accident or vessel trip probability. Although higher economic payoff (i.e., revenue of landings) induces more vessels to go fishing, this is not associated with an increase in accidents. The probability models are important building blocks in development and quantitative assessment of management mechanisms related to safety in the commercial fishing industry. (c) 2005 Elsevier Ltd. All rights reserved.

Classification and coding of commercial fishing injuries by work processes: An experience in the Danish fresh market fishing industry

Author(s): Jensen OC, Stage S, Noer P

Source: AMERICAN JOURNAL OF INDUSTRIAL MEDICINE Volume: 47 Issue: 6 Pages: 528-537 Published: JUN 2005

Abstract:

Background Work-related injuries in commercial fishing are of concern internationally. To better identify the causes of injury, this study coded occupational injuries by working processes in commercial fishing for fresh market fish.

Methods A classification system of the work processes was developed by participation in fishing vessel trips where observations and video recordings of the work operations on board were collected. Subsequently the system was pilot tested using the Danish Maritime Authority injury reports.

Results The developed classification system contains 17 main categories and up to 13 sub-categories of the work processes for each of the five different types of fishing. A total of 620 injury reports were reviewed and coded. Five percent (n = 33) of these were fatal injuries. The working processes were identified and coded according to the developed classification system for 553 (89%) injury reports: Danish seiner (n = 83), gill-netter (n = 122), beam trawler (n = 71), twin-trawler 2-T (n = 96), single/pair trawler 1-T (n = 181). Sixty-seven (11%) of the reports were unclassifiable due to lack of information. Preparing, shooting, and hauling of the gear and nets accounted for 50% of the injuries; they were most serious type of injuries such as fractures and sprains. Walking about the ship, in particular embarking and disembarking, climbing and descending ladders accounted for nearly one-fifth of the injuries.

Conclusion We found that the working processes related to working with the gear and nets vary greatly in the different fishing methods. Coding of the injuries to the specific working processes allows for targeted prevention efforts. (c) 2005 Wiley-Liss, Inc.

Study of adsorption ice-maker driven by the exhausted heat of diesel engine

Author(s): Wang SG, Wang RZ, Wu JY, Wang LW

Book Group Author(s): CSTP

Source: Proceedings of the World Engineers' Convention 2004, Vol F-A, Resources and Energy Pages: 573-577 Published: 2004

Conference Information: World Engineers Convention 2004

Shanghai, PEOPLES R CHINA, NOV 02-06, 2004

Shanghai Baosteel Grp Corp; Shanghai Automot Ind Corp; China Natl Petroleum Corp; China Petrochem Corp; State Grid Corp China; Shanghai Huizhong Automat Mfg Co Ltd; China Aerosp Sci & Technol Corp; China Yangtze Three Gorges Project Dev Corp; China Natl Nucl Corp; BMW Grp Beijing; Chun Wo Construct & Engr Co Ltd; Shui On Land Ltd; Air China

Abstract:

A two-adsorber activated carbon-methanol adsorption ice-maker prototype for fishing vessels, which is operated with a heat and mass recovery cycle, is developed and tested. A new consolidated adsorbent block made of activated carbon mixed with a binder with good heat transfer and enhanced mass transfer properties has been developed and implemented in a novel adsorber. The design is focused on the adsorber consisting of copper finned tubes and carbon blocks. Vapor flow channels are reasonably distributed in the adsorbers. Experimental tests have been performed at ice making operating conditions with a direct production of flake ice. This paper presents the experimental results of such an ice-maker operating with a cycle time of 40 minutes including heat recovery time of 1.5 min and mass recovery time of 1 min. Good performances have been achieved due to enhanced heat and mass transfer. The COP (coefficient of performance) over the whole cycle reaches 0.18 whereas the SCP (specific cooling power) achieved is 27 W/kg carbon to produce 18 - 20 kg/h of flake ice at mean temperature of - 7 degrees C.

A model of fishing vessel accident probability

Author(s): Jin D, Kite-Powell HL, Thunberg E, Solow AR, Talley WK

Source: JOURNAL OF SAFETY RESEARCH Volume: 33 Issue: 4 Pages: 497-510 Published: WIN 2002

Abstract:

Problem: Commercial fishing is one of the least safe occupations. Method: The researchers develop a fishing vessel accident probability model for fishing areas off the northeastern United States using logit regression and daily data from 1981 to 1993. Results: The results indicate that fishing vessel accident probability declined over the study period. Higher wind speed is associated with greater accident probability. Medium-size vessels have the highest accident probability, while small vessels have the lowest. Within the study region, accident probability is lower in the southwestern section than in the northeastern section. Accidents are likely to occur closer to shore than offshore. Accident probability is lowest in spring. Impact on Industry: The probability model is an important building block in development and quantitative assessment of management mechanisms related to safety in the commercial fishing industry. (C) 2002 National Safety Council and Elsevier Science Ltd. All rights reserved.

Is it safe on deck? Fatal and non-fatal workplace injuries among Alaskan commercial fishermen

Author(s): Thomas TK, Lincoln JM, Husberg BJ, Conway GA

Source: AMERICAN JOURNAL OF INDUSTRIAL MEDICINE Volume: 40 Issue: 6 Pages: 693-702 Published: DEC 2001

Abstract:

Background Commercial fishing in Alaska accounts for an occupational fatality rate that is 28 times the rate for all U.S. workers. Most deaths are attributed to vessel sinking or capsizing. However, many deaths and most non-fatal injuries are not related to vessel loss. This paper describes injuries that occur on the dock or on the fishing vessel.

Methods Data from fishing fatalities and non-fatal injuries between 1991-1998 were analyzed using the Alaska Occupational Injury Surveillance System and the Alaska Trauma Registry.

Results There were 60 workplace deaths unrelated to vessel loss; most from falls overboard, others from trauma caused by equipment on deck. There were 574 hospitalized injuries, often from falls on deck, entanglement in machinery, or being struck by an object.

Summary Fishing boats are hazardous working environments. Further efforts are required to prevent falls overboard and on deck, and to redesign or install safety features on fishing machinery and equipment. Published 2001 Wiley-Liss, Inc.dagger.

SWATH fishing platform with higher propulsor efficiency

Author(s): Guner M, Atlar M, Soylemez M

Source: MARINE TECHNOLOGY AND SNAME NEWS **Volume:** 38 **Issue:** 4 **Pages:** 233-240

Published: OCT 2001

Abstract:

This paper presents the potential advantages of adapting a SWATH concept for a fishing vessel role with a specific emphasis on energy saving due to the use of a suitable unconventional propulsor. A fixed guide vane (or propeller/stator) type of propulsor, with its modest amount of efficiency improvement, has been recognized as one of the least complicated and robust unconventional energy saving devices among others. Thus, the paper presents a design methodology for this type of device and illustrates its successful application to a SWATH fishing vessel. The design methodology involves a three-dimensional model to predict the wake velocities around the axisymmetric SWATH lower hulls and an advanced lifting line procedure, which includes the deformation of the propeller's slipstream for the theoretical modeling of the stator and the propeller. The design application is carried out for a middle distance, water SWATH fishing platform, and efficiency gain due to the use of the stator is presented over a conventional screw propulsion system. The sensitivity of the stator design, with respect to main design parameters, which are the number of stator blades and the distance of the stator from the propeller, are investigated in addition to the advantages of adapting the SWATH concept as a fishing platform.

A vessel is its own best lifeboat: Prevention of casualties through education

Author(s): Miller TC, Paitl GJ

Source: MARINE TECHNOLOGY AND SNAME NEWS **Volume:** 38 **Issue:** 1 **Pages:** 26-30

Published: JAN 2001

Abstract:

The U.S. Coast Guard has observed the death rate for commercial fishermen decline steadily during the years following the enactment of the Fishing Vessel Safety Act of 1988. This Act called for requirements of survival Equipment and fire fighting equipment, among other items, targeted at minimizing the consequences of a vessel capsize, sinking, fire or other casualty that required the crew to abandon ship. In recent years, the death rate has plateaued with minimal to no decreases and even a slight increase in 1996. While of concern, this plateau seems logical because the primary focus over the last eight to ten years has been on reducing the consequences of commercial fishing casualties (response). However, fishing vessels continue to capsize or sink before crew members are able to access survival equipment and lives are being lost. In order to continue to decrease the industry death rate, regulators and those responsible for oversight of this industry must shift the focus from reducing the consequence of casualties (response) to decreasing the likelihood of casualties occurring (prevention). This paper details the most recent initiative the U.S. Coast Guard has undertaken in its Fishing Vessel Safety Program and describes the Fishing Vessel Training Suite developed to facilitate this industry-wide education. The Training Suite consists of three trainers and a document titled, "Best Practices Guide to Vessel Stability." The three trainers include: (1) Interactive Stability Trainer, (2) Small Vessel Damage Stability Trainer, and (3) Small Vessel Damage Control Trainer. The U.S. Coast Guard has received very positive feedback from the commercial fishing industry and lives have been saved as a result of the use of this Training Suite.

The safety of commercial fishing: Determinants of vessel total losses and injuries

Author(s): Jin D, Kite-Powell H, Talley W

Source: JOURNAL OF SAFETY RESEARCH **Volume:** 32 **Issue:** 2 **Pages:** 209-228 **Published:** SUM 2001

Abstract:

Problem: Commercial fishing is one of the least safe occupations. This study investigates determinants of vessel total losses and number of fatal and non-fatal crew injuries resulting from commercial fishing vessel accidents. Method: An injury and vessel damage accident model is developed. Total vessel loss and crew injury models are estimated using probit and negative binomial regressions, respectively, and a unique micro data set of commercial fishing vessel accidents. Results: Estimation results indicate that the probability of a total loss is the greatest for a capsizing, followed by a sinking accident. Fire/explosions and capsizings are expected to incur the greatest number of crew fatalities - 3.5 and 3.8 for every 100 such accidents. For every 100 collisions, 2.1 nonfatal crew injuries are expected. The probability of a total loss and the expected number of crew fatalities vary inversely with the price of fish catches. Discussion: We discuss relevant issues related to fishing vessel safety management and regulation. Important vessel safety measures are summarized. Summary: Policy implications: (a) policies that reduce capsizings and sinkings will be effective in reducing fishing vessel accident total losses; (b) policies that reduce fire/explosions and capsizings (collisions) will be effective in reducing fatal (non-fatal) injuries. Impact on Industry: Policymakers should find the results of this study useful in developing regulation and enforcement mechanisms for reducing fishing vessel injuries and total losses. (C) 2001 National Safety Council and Elsevier Science Ltd. All rights reserved.

Robust stabilization of large amplitude ship rolling in beam seas

Author(s): Chen SL, Shaw SW, Khalil TK, Troesch AW

Source: JOURNAL OF DYNAMIC SYSTEMS MEASUREMENT AND CONTROL-TRANSACTIONS OF THE ASME **Volume:** 122 **Issue:** 1 **Pages:** 108-113 **Published:** MAR 2000

Abstract:

The dynamics and control of a strongly nonlinear 3-DOF model for ship motion are investigated. The model describes the roll, sway, and heave motions occurring in a vertical plane when the vessel is subjected to beam seas. The ship is installed with active antiroll tanks as a means of preventing large amplitude roll motions. A robust state feedback controller for the pumps is designed that can handle model uncertainties, which arise primarily from unknown hydrodynamic loads. The approach for the controller design is a combination of sliding mode control and composite control for the controller design is a combination of sliding mode control and composite control for singularly perturbed systems, with the help of the backstepping technique. It is shown that this design can effectively control roll motions of large amplitude, including capsize prevention. Numerical simulation results for an existing fishing vessel, the twice-capsized Patti-B, are used to verify the analysis.

4.5. Technology requests and offers

Reference 0128542

EAN Code 09 NO 79EL 3CRW

Submitted 02/02/2010 **Ends on**01/02/2011 **Type** Offer

Title: Tailor-made system for installation on board vessels to reduce fuel consumption as well as reducing emissions of greenhouse gases

Abstract

A Norwegian SME has developed a system for vessels to reduce fuel consumption, maintenance cost, as well as reducing emission of greenhouse gases (CO₂/NO_x). The main reason for this is that the system makes it possible to utilize the main engine to power the electric generator. The company is searching for commercial agreement with technical cooperation for testing of new applications, adaption to specific needs and installation of the system in fishing vessels or other smaller vessels.

Description

A Norwegian SME has developed a system for vessels that utilises the main engine's favourable fuel consumption to power the electric generator. It is a tailor-made solution for installation on board fishing vessels and other smaller vessels to reduce fuel consumption and maintenance cost as well as reducing emissions of the greenhouse gases CO₂ and NO_x. The main feature is that the system is designed to maintain a stable frequency (50/60Hz) even if the main engine speed varies greatly. This is a new and innovative product on the market, and it is easy to install. The system has been tested on board Norwegian and international vessels over a prolonged period, and has proven to be outstandingly reliable in operation. One test reports: "By eliminating the need for an auxiliary engine to run the vessel's electrical system, the fuel savings achieved with the system are quite substantial. Furthermore, another huge benefit is the reduction of NO_x emission by 45 to 50%". Innovative Aspects: The system has the following advantages: • Eliminates unnecessary use of the auxiliary engine thus reducing fuel consumption, maintenance cost as well as emission of CO₂ and NO_x. • Optional main engine speed means optimal propulsion economy. • The software for the control system is tailored to each individual vessel and engine. • Self regulating without bypass oils. Correct design dimensions and installation mean a long useful life. Requires minimum maintenance only filter changes (and oil changes, if applicable) at recommended intervals.

4.6. References

- ◆ [RIM15](#): Technological innovations integrating fish and handling improvement, health and safety at work and fish quality in Basque live bait tuna fishing fleet
- ◆ Fishing Vessel. Safety Digest 2010. [Maib](#)
- ◆ NTSB (National Transportation Safety Board) Public Forum on Fishing Vessel Safety. October 13-14, 2010. Read more [here](#).
- ◆ European Maritime Safety Agency. [EMSA](#)
- ◆ IMO AND THE SAFETY OF FISHING VESSELS: PAST, PRESENT AND FUTURE. PLAZA MONTERO, Fernando ; LÓPEZ PULIDO, Rubén. [pdf](#)
- ◆ MARINE SAFETY PERFORMANCE PLAN. FY 2009-2014 NOVEMBER 2008 . U N I T E D S T A T E S C O A S T G U A R D . [Pdf](#)
- ◆ [INNOVATIVE APPROACHES TO INVESTIGATING AND PREVENTING FISHING VESSEL CASUALTIES](#). Tuesday, October 24, 2000
- ◆ [An analysis of fishing vessel accidents](#) J. Wang , A. Pillay , Y.S. Kwon , A.D. Wall , C.G. Loughran Accident Analysis and Prevention 37 (2005) 1019–10
- ◆ El Plan Sectorial de Prevención de Riesgos Laborales en el Sector Pesca de la CAE.- [ITSASPREBEN](#)
- ◆ Fao [Safety at sea](#)
- ◆ An Overview of Fishing Vessel Energy Efficiency Work in Newfoundland and Labrador, Canada . First International Symposium on Fishing Vessel Energy Efficiency E-Fishing, Vigo, Spain, May [2010](#)
- ◆ ESTIMACIÓN DE LOS EFECTOS DE LA EFICIENCIA TECNOLÓGICA SOBRE LA FLOTA PESQUERA DE LA UNIÓN EUROPEA. BOLETÍN ECONÓMICO DE ICE Nº 2982 DEL 1 AL 15 DE FEBRERO DE 2010. [pdf](#)
- ◆ An Overview of Fishing Vessel Energy Efficiency Work in Newfoundland and Labrador, Canada. 1 Ocean Engineering Research Centre (OERC) Faculty of Engineering, Memorial University of Newfoundland, St. John's, Newfoundland and Labrador, Canada. Dag Friis, Don Bass, Wei Qiu1, Christian Knapp, Robert McGrath, Stephen Lane, Alex Gardner. [pdf](#)
- ◆ Fishing Fleet Development Measure. Towards Competitiveness, Safety and Operational Efficiency in the Whitefish Fleet. [Irlanda](#)

- ◆ 2nd International Symposium on Fishing Vessel Energy Efficiency. [E-fishing](#)

5. New technologies on board fishing vessels

5.1. Introduction

The arrival of ICTs altered radically the relationship between fishing vessels and the mainland. These tools, which provide a highly reliable connection system, are an essential part of the wheelhouse instrumentation, while at the same time allow us to comply with all the legal requirements establishing the need to possess an approved global aid equipment and, for vessels above 15 metres length, a monitoring system based on what we call 'Blue Box'. There are also many cases where skippers must periodically report catches to the relevant authorities.

The use of ICTs is mainly and above all related to the finding and location of a specific resource in different fishing grounds. Another typical application would be to use them to receive daily weather forecasts, optimize sales, order food supplies, communicate with relatives and other vessels, contact with the company and other various kinds of technical communications.

Inmarsat Standard-C is still the most broadly used satellite communication system, despite its limited transfer capacity and relatively high cost, which imposes restrictions on access to some services and requires that users change to other systems to communicate with their families. On the other hand, the use of e-mail technology remains quite marginal. Only one third of the ships are adequately equipped to use this system, which is usually only found on board the largest vessels.

Satellite telephones are still also relatively scarcely used.

Communication instruments are vitally important for the safety and for general communication (including among crew). These include simple radio devices to EPIRBs and global maritime distress systems.

5.2. European projects

Fisheries Computer Aided Management

Start date: 2002-01-01

End date: 2003-12-31

Project Acronym: EESD-3

Project status: Completed

Objective: The objective is to develop modular software packages that can be utilised by the commercial fishing industry to better direct its catch and effort activities. If the present plight of fisheries is to be reversed, then all sectors of the industry are in need of enhanced decision support systems. The development of software aimed at key levels of the industry will result in greater efficiency of fisher effort, reduced economic inputs and real time data to regional managers. Improved data acquisition will allow fishery authorities to accomplish a greater range of monitoring and assessment, as well as environmental and economic analyses. The project will broaden the portfolios of the SMEs involved, and will contribute significantly to the EU's "Sustainable, Agriculture, Fisheries and Forestry" and "Sustainable Marine Ecosystems" thematic programmes.

Maritime transport security A European research project provides draft amendments to existing VDR standards

It is over a decade since International Maritime Organisation (IMO) adopted the Voyage Data Recorder (VDR) performance standard which was formulated to be deliverable by and compatible with the technology available at the time. Technological advances over the last 10 years mean that VDR could and should now be required to deliver more for the investment involved.

In order to investigate just what might be required and achievable, the European Maritime Data Management (EMDM) project set up in March 2007 with €2.8 million budget. Its aim is to study and develop new applications, functionalities and proposals for specifications and standards for enhanced, interactive VDRs and electronic logbooks (ELBs).

EMDM project co-ordinator is the French company SODENA, specialised in on board navigation software such as ECDIS and RADAR, supported by Euroquality for the administrative and financial management of the project.

The consortium is composed of 8 partners including the three main European VDR and electronic logbook manufacturers : Consilium Navigation (SW), Kelvin Hughes (UK) and Kongsberg Maritime (NW), three SMEs : Avenca (UK), Euroquality (FR), SODENA (FR), the Joint Research Centre of the European Commission (JRC) and the University of Southampton (UK).

One intention, when the two-year project concludes in February 2009, is that it will deliver better and more objective analysis of the causes of incidents and accidents in European waters and subsequently lead to the improvement of maritime safety. The project has already placed much of its investigative work in the public domain at: www.euroqualityfiles.net/emdm/index.php.

Reports have been produced on (S)VDR legislation, VDR data technical access and handling, survey results and draft amendments for existing VDR standard, specifications for Low Cost VDR adapted for work boat have been write and prototype tried on board Fishing vessel in Brittany. These reports provide a useful retrospective view of VDR up to the inception of EMDM, and insight into how VDR could meet the challenge of the modern maritime environment. Equipment can take advantage of factors such as lower cost, higher density data storage capacity, increased processing power and the change of technology architectures based upon simple, robust, standardised communication networks that distribute data locally and globally.

5.3. Patents

The section below presents a list of patents comprised under the following IPC codes:

B63B 43/00

Improving safety of vessels, e.g. damage control, not otherwise provided for (fire-fighting in ships A62C 3/10)

B63B 39/00

Equipment to decrease pitch, roll, or like unwanted vessel movements; Apparatus for indicating vessel attitude

B63B 49/00

Arrangements of nautical instruments or navigational aids (nautical measuring instruments G01C; radio navigation, analogous arrangements using other waves G01S)

Some patents which do not share the previous IPC codes are also presented below, since they are related to our search field.

Patent No	Title	Company	Date
CN101844610	Fishing vessel safety work warning equipment	DONGPING FANG; YONGHE XIE; UNIV ZHEJIANG OCEAN	2010-09-29

KR20090072067	TOW-FISH LOSE PREVENTION SYSTEM	KOREA OCEAN RES DEV INST [KR]	2009-07-02
GB2452414	Vessel instrument network	FURUNO ELECTRIC CO [JP]	2009-03-04
KR100805894	SYSTEM FOR MONITORING INFORMATION OF VESSEL	CHEJU NAT UNIV IND ACAD COOP [KR]	2008-02-20
JP2007331507	MOUNTING STRUCTURE OF VIBRATOR FOR FISH DETECTOR	SUZUKI MOTOR CORP	2007-12-27
CN2808725 (Y)	Intelligent remote-control fishing boat	WANG YADONG [CN]	2006-08-23
FR2810294	Safety device for preventing sinking of a fishing boat when the fishing net is caught in an obstacle on the sea bed comprises a strain sensor for the traction cable, which send message to an automated device that stops the propeller	CHARDEY ROLAND AUGUSTE JEAN [FR]	2001-12-21
JP2001272248	OVERALL MONITORING SYSTEM FOR SHIP AND ITS UTILIZATION APPARATUS	KODEN ELECTRONICS CO LTD; SAITEKKUSU MARINE ELECTRONICS	2001-10-05
CA2298389	TOWED BODY YAW ANGLE SENSOR	L 3 COMM CORP [US]	2000-08-23

5.4. Scientific papers

Spatial cluster detection for the Fishing Vessel Monitoring Systems

Author(s): Su YY , Chang SJ

Book Group Author(s): IEEE

Source: OCEANS 2008 - MTS/IEEE KOBE TECHNO-OCEAN, VOLS 1-3 **Book Series:** OCEANS-IEEE **Pages:** 879-882 **Published:** 2008

Conference Information: International Conference OCEANS 2008 and MTS/IEEE Kobe Techno-Ocean '08

Kobe, JAPAN, APR 08-11, 2008

Marine Technol Soc; IEEE Ocean Engn Soc; MTS Japan Sect; IEEE OES Japan Sect; Techno Ocean Network; Kobe Convent & Visitors Assoc; Japan Agcy Marine Earth Sci & Technol; AESTO; NEC Corp; Off Naval Res Global; Alec Elect Co Ltd; Hakodate Dock Co Ltd; Imabari Shipbuilding Co Ltd; Namura Shipbuilding Co Ltd; Oshima Shipbuilding Co Ltd; Sanoyas Hishino Meisho Corp; Sasebo Heavy Industries Co Ltd; Shin Kurushima Dockyard Co Ltd; Toyohashi Shipbuilding Co Ltd; Tsuneishi Holdings Corp

Abstract:

Fishing Vessel Monitoring System (VMS) is an effective tool of fisheries monitoring, control and surveillance measures to counter over-fishing. It can also help the coast guard to safeguard vessels more efficiently. As VMS is widely implemented, more and more efforts focus on mining the VMS database to discover knowledge and clues that would further enhance the benefits. This paper reports on a density-based spatial cluster detection method developed for and implemented into the VMS of Taiwan. The request was to constantly identify wherever there are at least three fishing vessels within 10 nautical miles of range. The proposed solution was based on DBSCAN clustering algorithm. The performances in accuracy and run-time were evaluated and improved with vessel position prediction, partitioning of datasets, data structure and algorithm design. With the promising results, this solution has been recognized by the fisheries management and VMS operation experts to be of many extended use in VMS.

Rudder roll stabilization for fishing vessel using neural network approach

Author(s): Alarcin F , Gulez K

Source: OCEAN ENGINEERING **Volume:** 34 **Issue:** 13 **Pages:** 1811-1817 **Published:** SEP 2007

Abstract:

This paper presents a neural network (NN) controller for a fishing vessel rudder roll system. The aim of this study is to build a NN controller which uses rudder to regulate both the yaw and roll motion. The neural controller design is accomplished with using the classical back-propagation algorithm (CBA). Effectiveness of the proposed NN control scheme is compared with linear quadratic regulator (LQR) results by simulations carried out a fishing vessel rudder roll stabilizer system. (c) 2007 Elsevier Ltd. All rights reserved.

Fishing vessels monitoring systems

Author(s): Gulin D

Editor(s): Kos T; Grgic S

Book Author(s): Grgic M

Source: Proceedings ELMAR-2005 **Pages:** 369-372 **Published:** 2005

Conference Information: 47th International Symposium ELMAR-2005 on Multimedia Systems and Applications

Zadar, CROATIA, JUN 08-10, 2005

Croatian Soc Elect Marine; Univ Zagreb, Fac Elect Engn & Comp, Dept Radiocommun & Microware Engn; Tankerska Polvidba Zadar; IEEE Signal Proc Soc; IEEE Reg 8; IEEE Croatia Sect; European Assoc Singal, Speech & Image Proc; Croatian Acad Engn; Minist Sci, Educ & Sports Republ Croatia; Minist Foreign Affairs & European Integrat Republ Croatia; Minist Sea, Tourism, Transport & Dev Republ Croatia; Univ Zagreb; Univ Dubrovnik

Abstract:

This paper provides an overview of recent developments in the European Union with respect to satellite based vessel monitoring systems (VMS) for fishing vessels. In particular, it contains some background information on the approach to fisheries control and enforcement in the European Union, as well as a brief description of the current status of VMS. The paper also indicates areas for further development of VMS as a tool for monitoring, control and surveillance in the international context and impact of the Croatian fisheries.

Reserach on key technologies of Fishing Vessels Simulator

Author(s): Sun XF, Yin Y, Zhang XF

Editor(s): Chen Z; Peng XY; Wang ZG; Duan HB; Fan WH; Li N; Li N; Tan J; Tang SQ; Zhang P; Zhao G

Book Author(s): Zhang LX

Source: System Simulation and Scientific Computing, Vols 1 and 2, Proceedings **Pages:** 36-40 **Published:** 2005

Conference Information: Asia Simulation Conference/6th International Conference on System Simulation and Scientific Computing

Beijing, PEOPLES R CHINA, OCT 24-27, 2005

Chinese Assoc Syst Simulat; Korea Soc Simulat; Japanese Soc Simulat Technol; Soc Modeling & Simulat Int; Federat European Simulat Soc; Int Assoc Math & Comp Simulat; Beijing Univ,

Aeronaut & Astronaut; Natl Nat Sci Fdn China; Beijing Simulat Ctr; Beijing Electro-Mech Engrn Inst; Acad Armored Force Engrn; Natl Univ Defence Technol; Tsinghua Univ; Harbin Inst Technol; Harbin AF Flight Simulat Technol Inst

Abstract:

Mathematical model and 3D visual system are two key technologies of Fishing Vessels Simulator. According to MMG theory, a three-DOF manoeuvring mathematical model for fishing vessels is established, which can be used in ordinary-speed and low-speed fields. The model also considers the influences of wind and Current. Based on Netherlands Ship Model Basin's open-water tests, Controllable Pitch Propeller model is achieved: firstly amends propeller's pitch, then by interpolating the results of B-serial propellers tests, gets propeller's four-quadrant thrust and torque coefficients under different pitches, finally gains the thrust and torque. Meanwhile, three control modes of CPP, including separated mode, variable-pitch mode and combinator mode, are realized. Comparisons between simulation results and sea-trial tests of a fishing vessel verify the model's rationality. To improve environment realism of system, a 3D-engine of visual system is developed with Scene Management Software, OpenGVS.

Simulation of fishing vessel polarimetric signatures as first step to vessel classification

Author(s): Margarit G, Blanco P, Sanz J, Mallorqui JJ, Rius JM

Editor(s): Posa F

Source: SAR IMAGE ANALYSIS, MODELING, AND TECHNIQUES VI **Book Series:** PROCEEDINGS OF THE SOCIETY OF PHOTO-OPTICAL INSTRUMENTATION ENGINEERS (SPIE) **Volume:** 5236
Pages: 154-163 **Published:** 2004

Conference Information: Conference on SAR Image Analysis, Modeling and Techniques VI
Barcelona, SPAIN, SEP 08, 2003

SPIE; Soc Espanola Opt; NASA; European Opt Soc

Abstract:

This paper presents a numerical tool able to generate realistic SAR images from accurate vessel models for a given orbital sensor. Its capability to extract high resolution radar signatures converts this SAR simulator in a useful tool for vessel classification studies and, furthermore, to define a future constellation of SAR sensors bound for carry on an automatic vessel monitoring system. This SAR simulator has low computational requirements as it is based on high frequency electromagnetic calculations making feasible to run it in a simple PC. In this paper, the main scheme of the simulator and its capability to consider the vessel velocity and the ocean waves, which can produce an important distorting effect in the final SAR images, will be presented as well as some validation results and particular aspects of vessel modeling. Finally, some examples of radar signatures of precise fishing vessel models are exposed.

Orbital SAR simulator of fishing vessel polarimetric signatures based on high frequency electromagnetic calculations

Author(s): Margarit G, Blanco P, Sanz J, Mallorqui JJ

Book Group Author(s): IEEE; IEEE; IEEE

Source: IGARSS 2003: IEEE INTERNATIONAL GEOSCIENCE AND REMOTE SENSING SYMPOSIUM, VOLS I - VII, PROCEEDINGS - LEARNING FROM EARTH'S SHAPES AND SIZES
Book Series: IEEE International Symposium on Geoscience and Remote Sensing (IGARSS)
Pages: 4459-4461 **Published:** 2003

Conference Information: 23rd International Geoscience and Remote Sensing Symposium (IGARSS 2003)

TOULOUSE, FRANCE, JUL 21-25, 2003

IEE; IEEE Geosci & Remote Sensing Soc; Ctr Natl Etudes Spatiales; NASA; Natl Ocean & Atmospher Adm, US Dept Commerce; Off Naval Res; eesa; NPOESS; NASDA; Ball Aerosp & Technol Corp; uRSi

Abstract:

This paper continues the work developed in [1] related to a numerical tool able to simulate the full-polarimetric raw data for a given orbital SAR system from a realistic vessel model. This simulator makes possible the construction of a precise database of vessel radar signatures that will be used to develop classification algorithms. The simulator Will be also useful to determine the system parameters of a future orbital SAR sensor dedicated to sea activity monitoring. this paper is focused on the validation tests and the new improvements developed.

Commercial fishing vessels, automatic acoustic logging systems and 3D data visualization

Author(s): Melvin G, Li YC, Mayer L, Clay A

Source: ICES JOURNAL OF MARINE SCIENCE **Volume:** 59 **Issue:** 1 **Pages:** 179-189
Published: FEB 2002

Abstract:

Over the past five years we have investigated and used commercial fishing vessels and their associated acoustic hardware as platforms for acoustic surveying and data collection. During this period we developed an automated acoustic logging system that will simultaneously record data from the ship's existing sounder, sonar, and navigation systems. The system was designed to be self contained and easy to activate. Once calibrated, the vessel's vertical echo sounder can be used for quantitative fish biomass estimates in a manner similar to a scientific echo sounder. Sonar data are collected in the form of digital images with a navigation file header. Post processing, editing, and visualization tools were developed to scale the sonar images according to range setting and tilt angle. Thereafter, both the sounder and sonar data are combined into a 3D visualization package for presentation, observation, and school area estimates. Industry based acoustic surveys of herring spawning grounds have been used to estimate spawning stock biomass and for near real-time decisions regarding harvest levels in NAFO Statistical Division 4WX since 1997. Currently, there are eight systems deployed on commercial purse seiners within the region. For the past four years data from structured surveys and fishing excursions have played a key role in the assessment of herring spawning stock biomass. While the application of the technology has been driven by a stock assessment mandate, its potential use is more far reaching. The spatial nature the data means that detailed and quantitative studies of fish behaviour, vessel avoidance, fish distribution, and target area can be undertaken from commercial fishing vessels with the addition of minimal equipment. However, quantification of sonar images is restricted to area/volume estimates as no digital amplitude data are available from the commercial fishing units.

5.5. References

- E-log systems in the EU fleet. August 2010 www.intrafish.com. pdf TIC
- SISTEMA DE LOCALIZACIÓN Y SEGUIMIENTO DE EMBARCACIONES PESQUERAS. Tecnimap 2006. pdf TIC
- The future of VMS systems. We are we going. Pdf TIC

6. Conclusions

Stricter regulations regarding safety on board fishing vessels are being adopted throughout the world. But these regulations are not always observed, despite the fact that it should be the affected countries that guaranteed their compliance.

Enforcing these regulations involves a high cost, whether it applies to newly-built vessels or to those which must undergo some repair. Radio communication systems, for example, are very expensive.

When building a ship, the shipowner's objective is to make the most out of the fuel stowage and cargo spaces, which sometimes poses some difficulties for ship designers.

The decrease of fish stocks in coastal areas requires that vessels have to look for alternative deep-sea fisheries. This forces boats which were designed to fish in coastal waters to sail offshore and face the risks posed by it. In some other cases ships are modified without the inspection authorities detecting such changes.

Increasing fuel prices are forcing the publication of many studies and patents aimed at improving energy efficiency and reducing consumption. Various patents on how to improve fishing gears have also been issued, and increasing importance is being attached to fish discards and to the protection of the seabed.

If there is a field where there is less research and innovation it is that of safety, ship design and the implementation of new technologies. This may be due to their high cost and the scarce aid provided by national governments to promote improvements in fishing vessels.

The ICES-FAO Working Group on Fishing Technology and Fish Behaviour (WGFTFB) submitted a very important report which presents all the innovations, projects, etc. which are being carried out in the field of new technologies related to ship stability, fishing gears and equipment worldwide. You can access the report by clicking [here](#).