Feed intake as explanation for density related growth differences of common sole Solea solea

Growth of common sole Solea solea is negatively correlated to density, which affects productivity in culture and hence commercial success. Studies of individual feed intake were performed to examine growth and population dynamics at different densities. Three initial stocking densities: 1.0, 2.1 and 3.9 kg m⁻² of individually tagged sole, referred to as low density (LD), medium density and high density (HD), were examined during 145 days. Despite that tank productivity (g m⁻² day⁻¹), was highest for the HD group, the specific growth rate (SGR) decreased significantly with increase in stocking density. Individual size variation was similar between densities, indicating that growth was not associated with hierarchy and dominant behaviour. Individual data indicated that increased density reduced the growth potential of all individuals in a population. Individual feed intake was positively correlated to both fish size and individual SGR. Feed conversion ratio was likewise positively correlated to feed intake. The relative feed intake (g feed g fish⁻¹) was not correlated to fish size at any density tested, but was significantly highest for the LD population. This explains a substantial part of the better growth in the LD group supported by indications of better utilization of the ingested feed.

The influence of twine thickness, twine number and netting orientation on codend selectivity

Based on an experimental Baltic trawl fishery, we tested diamond mesh codends with different twine thicknesses, twine numbers (single or double), and netting orientation (T₀ or T₉₀) to quantify the effects of the twine characteristics on the size selection of cod (Gadus morhua) and plaice (Pleuronectes platessa). For a given twine thickness: going from T₀ to T₉₀ increases selectivity of cod; while going from single to double reduce it. Increasing twine thickness reduces selection but the extent depends on whether the twine is single or double and whether the netting orientation is T₀ or T₉₀. In general, the results demonstrate the benefit of using a relatively thin single twine netting to ensure the appropriate size selection with round fish and the best results were obtained using netting with a T₉₀ orientation. For a given twine thickness going from T₀ to T₉₀ decreases selectivity of plaice. Increasing twine thickness reduces selection for plaice. Our results demonstrate that very different selectivity results can be obtained using the same mesh size, simply by varying the twine thickness, the twine number, and the netting orientation. In some fisheries, the size selectivity could be improved considerably by adjusting these simple design parameters alternatively to produce more advanced and complex designs.
Comparing selectivity of a standard and turned mesh T90 codend during towing and haul-back

In this study, we compared the size selectivity of a T90 codend (netting turned by 90 degrees) with that of a standard codend made of similar netting. Sea trials were conducted in a Norway lobster directed fishery in the Kattegat-Skagerrak area, where there is a need for improved selectivity because of a severe discard problem. The codends were tested by fishing simultaneously with them in a twin trawl rig. Codend covers mounted with Minisamplers were used, which made it possible to catch individuals escaping during towing and haul-back separately. Herein we proposed a model to assess the sequential selection during towing and haul back. This model takes into account the parameter C_{tow}, which can be interpreted as the proportion of fish that comes into contact with the codend meshes during towing and, thereby, has a chance of escape. Compared to the standard codend, the T90 codend retained fewer Norway lobster both below and above the legal minimum landing size (40 mm, cephalothorax length), thereby causing a reduction of commercial catch. The difference was mainly due to a significantly higher escape rate during towing for the T90 codend. For plaice below minimum landing size (27 cm), the retention was slightly but significantly higher for the T90 codend compared to the standard codend. A model developed for both codends showed that not all plaice are able to attempt escapement during the towing process. For cod, the results indicated an increased L_{50} (the length at which 50% of this species is caught) for the T90 codend, but the effect was not statistically significant, probably due to the limited number of cod retained during the sea trials. The results demonstrated that, for all three species, a significant proportion did escape during haul-back in both codends.
Net escapement of Antarctic krill in trawls

This document describes the aims and methodology of a three year project (commenced in 2012) entitled Net Escapement of Antarctic krill in Trawls (NEAT). The study will include a morphology based mathematical modeling (FISHSELECT) of different sex and maturity groups of Antarctic krill (Euphausia superba) to predict basic selective characteristics of different trawl gear and net designs. Results will be used to quantify the theoretic catch efficiency and escape mortality in different net designs and also to construct design guides, to minimize escape mortality, with descriptions of basis selective properties for krill in different trawls.

General information
Publication status: Published
Organisations: National Institute of Aquatic Resources, Section for Management Systems
Contributors: Herrmann, B., Wienbeck, H., Karlsen, J., Dahm, E., Moderhak, W., Stepputtis, D.
Publication date: 2012
Peer-reviewed: No
Event: Abstract from ICES-FAO Working Group on Fishing Gear Technology and Fish Behaviour (WGFTFB), Lorient, France.
Electronic versions:
WGFTFB12.pdf

Quantifying fish escape behaviour through large mesh panels in trawls based on catch comparison data – model development and a case study from Skagerrak


Based on catch comparison data, it is demonstrated how detailed and quantitative information about species-specific and size dependent escape behaviour in relation to a large mesh panel can be extracted. A new analytical model is developed, applied, and compared to the traditional modelling approach for such data. As a case study, we used data collected with a twin trawl setup. The only difference between the two 120 mm trawls was that a 12 meter long section in the upper panel was replaced with 800 mm diamond meshes (LMTP) in one of them. Based on this very large mesh size, we assumed that all individuals that contacted the panel also escaped through it. The new analytical method was applied to quantify escape behaviour for cod, haddock, saithe and Nephrops of different sizes. There was a need to include the full gear selectivity in the trawl, and we show how this selectivity can bias the interpretation of the length based escapement behaviour over the large mesh panel. Our length based behavioural description is in good agreement with direct observations of the same species in the trawl cavity reported in literature.

Fish behaviour understanding is essential. Observations are often difficult using optical devices such as cameras. The alternative is to use catch data to reconstruct behaviour. Every fish in every haul counts. Bootstrapping can be used. An experimental catch comparison index was calculated. Length frequency distributions and catch comparison rates are not suitable to infer behavioural patterns. A full gear selectivity model was developed in which data of low lengths was deleted and double boot-strapping is used. Catching is a sequential process. Panel contact was assumed leading to escape. Flounder shows strong length dependent escape behaviour. Curves were presented for COD, HAD, LEM, POL, and WTH. Comments made on knife-edge curves found for cod using stochastic simulation, apparently caused by data weakness. LMTP affects fish but not Nephrops.

General information
Publication status: Published
Organisations: National Institute of Aquatic Resources, Section for Management Systems
Contributors: Krag, L. A., Herrmann, B., Karlsen, J.
Publication date: 2012
Understanding the size selectivity of redfish (Sebastes spp.) in North Atlantic trawl codends

General information
Publication status: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Contributors: Herrmann, B., Sistiaga, M., Nielsen, K. N., Larsen, R. B.
Pages: 1-13
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Journal of Northwest Atlantic Fishery Science
Volume: 44
ISSN (Print): 1813-1859
Ratings:
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 0.33 SJR 0.2 SNIP 0.414
ISI indexed (2012): ISI indexed no
Web of Science (2012): Indexed yes
Original language: English
DOIs: 10.2960/J.v44.m680
URLs: http://journal.nafo.int/44/44.html
Source: orbit
Source ID: 314435

Design, udvikling og dokumentation af et selektivt trawl til demersalt fiskeri i Nordsøen

General information
Publication status: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Contributors: Madsen, N., Frandsen, R., Herrmann, B., Seekings, J. P., Krag, L. A.
Number of pages: 13
Publication date: 2011

Publication information
Place of publication: København
Publisher: Ministeriet for Fødevarer, Landbrug og Fiskeri
Original language: Danish

Bibliographical note
Finansieret af EU's fiskerisektorsprogram EFF og Fødevareministeriet
Source: orbit
Source ID: 286509

Development of a codend concept to improve size selectivity of Nephrops (Nephrops norvegicus) in a multi-species fishery

General information
Publication status: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Effect of netting direction and number of meshes around on size selection in the codend for Baltic cod (Gadus morhua)

We investigated experimentally the effect that turning the netting direction 90° (T90) and halving the number of meshes around in the circumference in a diamond mesh codend had on size selection of Baltic cod. The results generally agreed with predictions of a previous simulation-based study. Both modifications had a significant positive effect on the size selection of cod. The best selection results were obtained for a codend in which both factors were applied together. For that codend, very little between-haul variation in cod size selection was detected, especially compared to the reference codend in which none of the modifications were applied.

Influence of grid orientation and time of day on grid sorting in a small-meshed trawl fishery for Norway pout (Trisopterus esmarkii)

General information
In the past, experimental fishing with square mesh codends was conducted with the expectation that this would lead to a better defined size selection indicated by a smaller selection range (SR) of haddock (Melanogrammus aeglefinus) and other gadoid species compared to that provided by traditional diamond mesh codends. However, experimental results demonstrated considerable between-haul variations in the selection parameters (L50 and SR). It was speculated that these results could be linked to differences in morphology of individual haddock of the same length. In the present study we assessed which measures of haddock morphology are important for size selection through meshes. We quantified between-individual variation in morphology and used simulation techniques to estimate that this variation can account for less than 28% (range 15–28%) of the SR values found during experimental fishing. By including a realistic range of mesh openings when simulating the fishing process of a square mesh codend, we were able to explain most of the experimental results. Additionally, we used our method to better understand the seasonal variation in size selectivity reported in the literature and to predict the basic selective properties for haddock for other mesh shapes. Finally, we found that the conditions of our model, which describes mesh penetration for haddock based on assessment of morphology, is very similar to the conditions previously applied in the literature to study size selection of haddock in diamond mesh codends.
A simulation-based attempt to quantify the morphological component of size selection of Nephrops norvegicus in trawl codends

The selectivity for Nephrops (Nephrops norvegicus) in trawl codends generally is poor and the lack of steepness of the selection curve results in high discard rates and/or loss of legal-sized catch. This poor codend selectivity often is attributed to the irregular shape of Nephrops, which to some extent characterizes the problem as insoluble. In the present study, the FISHSELECT methodology was used to examine the selection process of the species in order to identify ways to improve selectivity. The use of three different modes of orientation for contact (contact modes) with the codend meshes explained most of the characteristics of the selection curves for Nephrops obtained experimentally. The contact mode with the smallest cross-section was optimal for mesh penetration and, when evaluated against experimental data, 87.5% of all Nephrops encountering the gear were estimated to meet the netting in this contact mode. The range of configurations of the meshes (e.g., opening angles in the diamond mesh netting) was determinative for the selectivity, and the selective process for Nephrops was found to take place along the entire length of the codend. Simulating selectivity in a diamond mesh codend in which the closed meshes in the forward part of the codend were replaced by more open meshes revealed that the selectivity for Nephrops can be efficiently improved. (C) 2009 Elsevier B.V. All rights reserved.

Assessment of dual selection in grid based selectivity systems

Herein we propose a method to assess dual selection in grid based selectivity systems. This method takes into account the parameter “grid contact likelihood” (Cgrid), which can be interpreted as the proportion of fish that actually makes an attempt to escape through the grid. In a case study of the Barents Sea cod and haddock trawl fishery, we demonstrate that our model describes the experimental data better than the models previously used to fit similar data. For both cod and haddock, Cgrid was significantly smaller than 1.0, which demonstrated the relevance of the proposed model. Cgrid was higher for haddock than for cod, which might be due to behavioral differences between the species. The Cgrid values for both species suggest that the grid functions well, as on average more than 75% of the cod and more than 94% of the haddock were predicted to able to attempt an escape through the device. For both species the contact L50 for the grid (L50grid) was significantly higher than the L50 for the codend (L50codend). These values agree with the experimental observations that most of the escaping fish use the grid to escape, whereas only a very few escape occurs through the codend. By parametric simulation and using the case study results as the baseline, we investigated and compared the precision of the selectivity parameters estimated with our model for two different experimental setups. The results show that except for some extreme situations, the data for such studies need to be collected with a three-compartment setup to...
avoid imprecise estimates of Cgrid, L50grid, SRgrid, L50codend, and SRcodend. In general, only the combined selectivity of the grid and the codend could be estimated with acceptable precision using a standard two-compartment sampling approach.

**General information**
Publication status: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Contributors: Sistiaga, M., Herrmann, B., Grimaldo, E., Larsen, R. B.
Pages: 187-199
Publication date: 2010
Peer-reviewed: Yes

**Publication information**
Journal: Fisheries Research
Volume: 105
Issue number: 3
ISSN (Print): 0165-7836
Ratings:
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.063 SNIP 1.116
Web of Science (2010): Impact factor 1.656
Web of Science (2010): Indexed yes
Original language: English
Keywords: Trawl, Dual selection, Diamond mesh codend, Grid, Contact, SELNET, Haddock, Selectivity, Cod
DOIs: 10.1016/j.fishres.2010.05.006
Source: orbit
Source ID: 263116
Research output: Contribution to journal › Journal article – Annual report year: 2010 › Research › peer-review

Report of the Study Group on Turned 90° Codend Selectivity, focusing on Baltic Cod Selectivity (SGTCOD)

**General information**
Publication status: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Contributors: Herrmann, B., Moderhak, W., Wienbeck, H., Stepputtis, D., Madsen, N., Krag, L. A., Mieske, B., Frandsen, R.
Number of pages: 19
Publication date: 2010

**Publication information**
Original language: English
(ICES CM 2010; No. FTC:05).
Electronic versions:
SGTCOD10.doc
Source: orbit
Source ID: 276917
Research output: Book/Report › Report – Annual report year: 2011 › Research

Bruger vi de mest optimale maskefaconer og størrelser i dansk fiskeri?

**General information**
Publication status: Published
Organisations: Section for Fisheries- and Monitoring Technology, National Institute of Aquatic Resources
Contributors: Herrmann, B., Krag, L. A., Madsen, N., Frandsen, R., Lundgren, B.
Publication date: 2009
Peer-reviewed: No
Electronic versions:
FISHSELECT_DanFish.pdf
Source: orbit
Source ID: 251365
Research output: Contribution to conference › Poster – Annual report year: 2009 › Research
Can codend selectivity of Nephrops be explained by morphology?

Selectivity of Nephrops in trawl codends is in general poor with resulting high discard rates and/or loss of legal sized catch. In the present study, the FISHSELECT methodology has been used to attain a profound understanding of the selection process of the species in order to identify means to improve the selectivity. It was found the size selection of Nephrops in trawl codends can be explained by combining contributions resulting contacts with the meshes for three different modes of orientations of the Nephrops.

Investigation of the paired-gear method in selectivity studies

We estimated selectivity parameters using simultaneously the paired-gear and covered codend method for two fish species and four different selection systems, for a total of eight study cases. The deviation (Δ) in L50 and SR between these sampling methods observed in a former simulation study was repeated throughout the eight cases in this investigation. When using the paired-gear method, the distribution of the estimated L50 and SR is wider; the distribution of the estimated split parameter has a higher variability than the true split; the estimated mean L50 and SR can be biased; the estimated between-haul variation is different from that estimated by the covered codend. ΔL50 and ΔSR decrease when the number of fish in the codend increases, but they do not necessarily progress towards zero. ΔL50 and ΔSR are positively correlated with the deviation between the split and the true split. We recommend that the methodology used to obtain selectivity estimates using the paired-gear method be reviewed.
Modelling axisymmetric cod-ends made of different mesh types

Cod-ends are the rearmost part of trawl fishing gears. They collect the catch, and for many important species it is where fish selection takes place. Generally speaking they are axisymmetric, and their shape is influenced by the catch volume, the mesh shape, and the material characteristics. The shape of cod-ends is of importance as it determines mesh opening and consequently influences the selectivity of fish from the cod-end. Selectivity is the process whereby a gear retains large fish and releases small ones. In recent years, as many fish stocks have become more threatened, understanding the selectivity process has become more important. This paper presents a model of the deformation of an axisymmetric cod-end. The twine tension and the catch pressure acting on the knots of each mesh along the cod-end profile are calculated, and a Newton-Raphson scheme is used to estimate the equilibrium position of the netting. The software package developed to solve this problem is freely available. Comparisons are carried out with a previous model and experimental data.
Modelling escapement during the fishing process as a dual sequence - Introducing SELNET

General information
Publication status: Published
Organisations: Section for Fisheries- and Monitoring Technology, National Institute of Aquatic Resources
Contributors: Herrmann, B., Madsen, N., Sistiaga, M., Grimaldo, E.
Publication date: 2009
Peer-reviewed: No
Event: Poster session presented at ICES Working Group on Fishing Technology and Fish Behaviour (WGFTFB), Ancona, Italy.
Electronic versions:
SELNET_Surface.ppt
Modelling escapement during the fishing process as a dual sequence.doc

Bibliographical note
Poster presentation with abstract
Source: orbit
Source ID: 243589
Research output: Contribution to conference › Poster – Annual report year: 2009 › Research

New approaches to selectivity studies in the Barents Sea

General information
Publication status: Published
Organisations: Section for Fisheries- and Monitoring Technology, National Institute of Aquatic Resources
Contributors: Sistiaga, M., Herrmann, B., Nielsen, K., Larsen, R. B.
Publication date: 2009
Peer-reviewed: No
Event: Poster session presented at ICES Working Group on Fishing Technology and Fish Behaviour (WGFTFB), Ancona, Italy.
Electronic versions:
Fishselect poster abstract.doc
FISHSELECT_MANU_Final Poster.ppt
Source: orbit
Source ID: 243593
Research output: Contribution to conference › Poster – Annual report year: 2009 › Research

Prediction of selectivity from morphological conditions: Methodology and a case study on cod (Gadus morhua)
The FISHSELECT methodology, tools, and software were developed and used to measure the morphological parameters that determine the ability of cod to penetrate different mesh types, sizes, and openings. The shape of one cross-section at the cod's head was found to explain 97.6% of the mesh penetration results obtained in a laboratory experiment. Design guides predicting the 50% retention length (L50) of different mesh types, sizes, and openings were produced and compared with results from sea trials. Results show that the morphology-based simulations can be used to explain both the within-haul and the between-haul variations previously reported from sea trials. Finally, based on the results obtained, ideas to improve the size selection of cod in towed gear are presented.

General information
Publication status: Published
Organisations: Section for Fisheries- and Monitoring Technology, National Institute of Aquatic Resources
Pages: 59-71
Publication date: 2009
Peer-reviewed: Yes

Publication information
Journal: Fisheries Research
Volume: 97
Issue number: 1-2
Relevance of dual selection in grid based selectivity studies

General information
Publication status: Published
Organisations: Section for Fisheries- and Monitoring Technology, National Institute of Aquatic Resources
Contributors: Herrmann, B., Sistiaga, M., Grimaldo, E., Larsen, R. B.
Publication date: 2009
Peer-reviewed: No
Event: Poster session presented at ICES Working Group on Fishing Technology and Fish Behaviour (WGFTFB), Ancona, Italy.
Electronic versions:
Dual selection poster abstract.doc
Poster Dual final.ppt
Source: orbit
Source ID: 243590
Research output: Contribution to conference › Poster – Annual report year: 2009 › Research

Report of the Study Group on Turned 90° Codend Selectivity, focusing on Baltic Cod Selectivity (SGTCOD)

General information
Publication status: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Contributors: Herrmann, B., Moderhak, W., Wienbeck, H., Valentinsson, D., Priour, D., Sala, F. A.
Number of pages: 23
Publication date: 2009

Publication information
Place of publication: Copenhagen
Publisher: International Council for the Exploration of the Sea
Original language: English
(ICES CM; No. FTC:05).
Source: orbit
Source ID: 277992
Research output: Book/Report › Report – Annual report year: 2009 › Research

A user-guide to the FISHSELECT software tool

General information
Publication status: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Contributors: Herrmann, B.
Number of pages: 34
Publication date: 2008

Publication information
Place of publication: Hirtshals
Publisher: DTU Aqua
Original language: English
Electronic versions:
Comparison of selective properties for nettings when used in normal direction versus in 90 degrees turned direction

General information
Publication status: Published
Organisations: Section for Fisheries- and Monitoring Technology, National Institute of Aquatic Resources
Contributors: Herrmann, B., Krag, L. A., Madsen, N.
Publication date: 2008
Peer-reviewed: No
Event: Poster session presented at ICES Working Group on Fishing Technology and Fish Behaviour (WGFTFB), Tórshavn, Faroe Islands.
Source: orbit
Source ID: 232407
Research output: Contribution to conference › Poster – Annual report year: 2008 › Research

Simulation-based study of precision and accuracy for methods to assess size selective properties of codends

General information
Publication status: Published
Organisations: Section for Fisheries- and Monitoring Technology, National Institute of Aquatic Resources
Contributors: Herrmann, B.
Publication date: 2008
Peer-reviewed: No
Event: Poster session presented at ICES Working Group on Fishing Technology and Fish Behaviour (WGFTFB), Tórshavn, Faroe Islands.
Source: orbit
Source ID: 232408
Research output: Contribution to conference › Poster – Annual report year: 2008 › Research

Simulering af selektivitet i fiskeredskaber

General information
Publication status: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Section for Monitoring
Contributors: Herrmann, B., Krag, L. A., Frandsen, R., Lundgren, B., Madsen, N., Staehr, K.
Publication date: 2008

Publication information
Place of publication: Charlottenlund
Publisher: DTU Aqua
Original language: Danish
Electronic versions:
Rapport - Simulering af selektivitet i fiskeredskaber1.pdf
Source: orbit
Source ID: 259199
Research output: Book/Report › Report – Annual report year: 2008 › Research

Udvikling af selektive trawl til danske fiskerier - SELTRA

General information
Publication status: Published
Organisations: Section for Fisheries- and Monitoring Technology, National Institute of Aquatic Resources
Contributors: Madsen, N., Frandsen, R., Krag, L. A., Herrmann, B., Holst, R., Lundgren, B.
Number of pages: 47
Publication date: 2008

Publication information
Place of publication: Hirtshals
Publisher: DTU Aqua, Institut for Akvatiske Ressourcer, Sektion for Fiskeriteknologi
**Bibliographical note**
Finansieret af EU's fiskerisektorprogram FIUF og Fødevareministeriet
Source: orbit
Source ID: 233085
Research output: Book/Report › Report – Annual report year: 2008 › Research

---

**Undervålshummere sorteret fra**

**General information**
Publication status: Published
Organisations: Section for Fisheries- and Monitoring Technology, National Institute of Aquatic Resources
Contributors: Frandsen, R., Madsen, N., Herrmann, B., Holst, R., Krag, L. A.
Pages: 18
Publication date: 2008
Peer-reviewed: Unknown

**Publication information**
Journal: Fiskeri Tidende
Volume: 15
Issue number: 52+01
ISSN (Print): 0909-7325
Original language: Danish
Source: orbit
Source ID: 249848
Research output: Contribution to journal › Contribution to newspaper - Newspaper article – Annual report year: 2008 › Communication

---

**FISHSELECT - Development of methodology**

**General information**
Publication status: Published
Organisations: Section for Fisheries- and Monitoring Technology, National Institute of Aquatic Resources
Contributors: Herrmann, B., Lundgren, B., Krag, L. A., Frandsen, R., Madsen, N., Stæhr, K.
Publication date: 2007
Peer-reviewed: No
Source: orbit
Source ID: 225733
Research output: Contribution to conference › Poster – Annual report year: 2007 › Research

---

**FISHSELECT - Study of cod (Gadus morhua)**

**General information**
Publication status: Published
Organisations: Section for Fisheries- and Monitoring Technology, National Institute of Aquatic Resources
Contributors: Krag, L. A., Herrmann, B., Frandsen, R., Stæhr, K., Madsen, N., Lundgren, B.
Publication date: 2007
Peer-reviewed: No
Event: Poster session presented at Presented at ICES/FAO Working Group on Fishing Technology and Fish Behaviour (WGFTFB), Dublin, April, Dublin.

**Bibliographical note**
Poster
Source: orbit
Source ID: 226299
Research output: Contribution to conference › Poster – Annual report year: 2007 › Research
**FISHSELECT - Study of plaice (Pleuronectes platessa)**

**General information**
Publication status: Published
Organisations: Section for Fisheries- and Monitoring Technology, National Institute of Aquatic Resources
Contributors: Frandsen, R., Herrmann, B., Krag, L. A., Stæhr, K., Lundgren, B., Madsen, N.
Publication date: 2007
Peer-reviewed: No
Event: Poster session presented at Presented at ICES/FAO Working Group on Fishing Technology and Fish Behaviour (WGFTFB), Dublin, April, Dublin, .
Source: orbit
Source ID: 225447
Research output: Contribution to conference > Poster – Annual report year: 2007 > Research

**Main factors affecting cod end selectivity**

**General information**
Publication status: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Number of pages: 55
Publication date: 2007
Publication information
Original language: English
Source: orbit
Source ID: 259202

**Modelling axi-symmetrical cod-ends made of different mesh types**

**General information**
Publication status: Published
Organisations: Section for Fisheries- and Monitoring Technology, National Institute of Aquatic Resources
Contributors: Priour, D., Herrmann, B., O’Neill, B.
Publication date: 2007
Peer-reviewed: No
Source: orbit
Source ID: 237669
Research output: Contribution to conference > Conference abstract for conference – Annual report year: 2007 > Research

**PRESEMO - a predictive model of codend selectivity - a tool for fishery managers**
The codend selectivity simulation model PRESEMO is a predictive model based on an understanding of the physical, biological, and behavioural mechanisms that underpin codend selection. In this paper, PRESEMO is used to predict the selectivity of a large range of codends of varying design. In particular, the selectivity of codends with mesh sizes in the range 80-160 mm, number of meshes around in the range 60-140, and netting twine thickness in the range 3-6 mm are predicted and, where possible, the predictions are validated with experimental data. Using the simulated data, the codend selectivity parameters are expressed in terms of the gear design parameters and in terms of both catch size and gear design parameters. The potential use of these results in a management context and for the development of more selective gears is highlighted by plotting iso-(50) and iso-sr curves used to identify gear design parameters that give equal estimates of the 50% retention length and the selection range, respectively. It is emphasized that this approach can be extended to consider the influence of other design parameters and, if sufficient relevant quantitative information exists, biological and behavioural parameters. As such, the model presented here will provide a better understanding of the selection process, permit a more targeted approach to codend selectivity experiments, and assist fishery managers to assess the impact of proposed technical measures that are introduced to reduce the catch of undersized fish and unwanted bycatch.

**General information**
In this paper, the paired-gear and covered cod-end methods for estimating the selectivity of trawl cod-ends are compared. A modified version of the cod-end selectivity simulator PRESEMO is used to simulate the data that would be collected from a paired-gear experiment where the test cod-end also had a small mesh cover. Thus, estimates of the selectivity parameters of the test cod-end can be made using both the paired-gear method and the covered cod-end method. These estimates are compared and, as it is assumed that the covered cod-end method is objective, we conclude that the paired-gear method is biased. We demonstrate that extreme parameter estimates as well as discrepancies between the paired-gear and covered cod-end experiments do not necessarily reflect physical or biological mechanisms. We believe that this phenomenon may help explain cases in the literature where the covered cod-end and paired-gear methods produce different estimates of cod-end selectivity.
Simulation-based study of the combined effect on cod-end size selection of turning meshes by 90 degrees and reducing the number of meshes in the circumference for round fish

General information
Publication status: Published
Organisations: Section for Fisheries- and Monitoring Technology, National Institute of Aquatic Resources
Contributors: Herrmann, B., Priour, D., Krag, L. A.
Pages: 222-232
Publication date: 2007
Peer-reviewed: Yes

Slutrapport TEMAS (Technical measures - development of evaluation model and application in Danish fisheries)

General information
Publication status: Published
Organisations: National Institute of Aquatic Resources, Section for Management Systems, Section for Fisheries- and Monitoring Technology
Number of pages: 31
Publication date: 2007

Assessment of reliability of results obtained from surveys using trawl gears

General information
Publication status: Published
Organisations: Section for Fisheries- and Monitoring Technology, National Institute of Aquatic Resources
Contributors: Frandsen, R., Herrmann, B., Holst, R., O'Neill, F.
Publication date: 2006
Peer-reviewed: No
Experimental and theoretical study of red mullet (Mullus barbatus) selection in codends of Mediterranean bottom trawls

General information
Publication status: Published
Organisations: Section for Fisheries- and Monitoring Technology, National Institute of Aquatic Resources
Contributors: Sala, A., Priour, D., Herrmann, B.
Pages: 317-327
Publication date: 2006
Peer-reviewed: Yes

Publication information
Journal: Aquatic Living Resources
Volume: 19
Issue number: 4
ISSN (Print): 0990-7440
Ratings:
Scopus rating (2006): SJR 0.652 SNIP 0.99
Web of Science (2006): Indexed yes
Original language: English
DOIs: 10.1051/alr:2007002

Investigation of the paired gear method

General information
Publication status: Published
Organisations: Section for Fisheries- and Monitoring Technology, National Institute of Aquatic Resources
Contributors: Frandsen, R., Herrmann, B., Holst, R.
Publication date: 2006
Peer-reviewed: No
Event: Poster session presented at ICES Symposium on Fishing Technology and Fish Behaviour (WGFTFB), Izmir, April.
Source: orbit
Source ID: 225448
Research output: Contribution to conference → Poster – Annual report year: 2006 → Research

Modelling the effect of interaction between fish morphology and mesh shapes on discard levels in mixed fisheries

General information
Publication status: Published
Organisations: Section for Fisheries- and Monitoring Technology, National Institute of Aquatic Resources, Section for Management Systems
Contributors: Lundgren, B., Herrmann, B., Krag, L. A., Frandsen, R., Madsen, N., Stæhr, K., Eigaard, O. R.
Publication date: 2006
Peer-reviewed: No
Event: Poster session presented at Fishing technology in the 21. century, Boston, MA.
Source: orbit
Source ID: 238723
Research output: Contribution to conference → Poster – Annual report year: 2006 → Research

Prediction of size selectivity in trawl codends by simulation

General information
Publication status: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Contributors: Herrmann, B.
Number of pages: 32
Publication date: 2006

Publication information
Place of publication: Hirtshals
Publisher: Danish Institute for Fisheries Research
Original language: English
Electronic versions:
Prediction of size selectivity in trawl codends by simulation.pdf
Source: orbit
Source ID: 259204
Research output: Book/Report › Report – Annual report year: 2006 › Research

PREMECS-II: Development of predictive model of cod-end selectivity

General information
Publication status: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Contributors: Priour, D., O'Neill, F., Sala, A., Chevalier, P., Herrmann, B.
Number of pages: 265
Publication date: 2006

Publication information
Original language: English
URLs:

Bibliographical note
Contract n° Q5RS-2002-01328
Source: orbit
Source ID: 259201
Research output: Book/Report › Report – Annual report year: 2006 › Research

Simulation of catch and discard for a fishing gear - demonstrating the PRESEMO software

General information
Publication status: Published
Organisations: Section for Fisheries- and Monitoring Technology, National Institute of Aquatic Resources
Contributors: Herrmann, B., Madsen, N., Krag, L. A., Frandsen, R., Lundgren, B., Priour, D., O'Neill, B.
Publication date: 2006
Peer-reviewed: No
Event: Poster session presented at Fishing technology in the 21st century, Boston, MA, United States.

Bibliographical note
ICES BOS06 2.066P
Source: orbit
Source ID: 229025
Research output: Contribution to conference › Poster – Annual report year: 2006 › Research

Simulation of cod-end deformation - demonstrating the FEMNET software

General information
Publication status: Published
Organisations: Section for Fisheries- and Monitoring Technology, National Institute of Aquatic Resources
Contributors: Priour, D., Herrmann, B.
Publication date: 2006
Peer-reviewed: No
Event: Poster session presented at Fishing technology in the 21st century, Boston, MA, United States.
Source: orbit
Source ID: 237671
Research output: Contribution to conference › Poster – Annual report year: 2006 › Research
Theoretical study of the effect of round straps on the selectivity in a diamond mesh cod-end

FEMNET, a numerical tool based on the finite element method, was applied to estimate the shapes of various diamond-mesh cod-end designs during fishing. The only design differences rest in the use of round straps of different lengths, positions and numbers. The cod-end shape estimates were then entered in the selectivity simulation tool PRESEMO to simulate the selectivity processes of the various cod-end designs under the same varying fishing conditions. This enabled us to demonstrate how one or two round straps along the cod-end axis may change the selectivity of the cod-end compared with a reference cod-end, without round straps. We predict that in cod-end designs, which comply with the EU legislation, the 50% retention length (L50) may be reduced by up to 1.5 cm (5%) for haddock.

General information
Publication status: Published
Organisations: Section for Fisheries- and Monitoring Technology, National Institute of Aquatic Resources
Contributors: Herrmann, B., Priour, D., Krag, L. A.
Pages: 148-157
Publication date: 2006
Peer-reviewed: Yes

Publication information
Journal: Fisheries Research
Volume: 80
Issue number: 2-3
ISSN (Print): 0165-7836
Ratings:
Scopus rating (2006): SJR 1.028 SNIP 1.294
Web of Science (2006): Indexed yes
Original language: English
DOIs:
10.1016/j.fishres.2006.04.018
Source: orbit
Source ID: 225740
Research output: Contribution to journal › Journal article – Annual report year: 2006 › Research › peer-review

Theoretical study of the influence of twine thickness on haddock selectivity in diamond mesh cod-ends

Using the cod-end simulation model PRESEMO, the influence of twine thickness on cod-end selectivity is investigated. The reduction of lateral mesh opening that arises as a result of both twine bending stiffness and the physical presence of the twine is considered. While it is shown that this leads to a reduction in cod-end selectivity with an increase of twine thickness, it does not fully explain the relationship found in the available experimental data. The effect twine thickness may have on the ability of a fish to deform a mesh during the early part of a haul and how netting made of thicker twine may discourage a fish from making escape attempts is investigated. The influence that these factors may have is examined and when included in PRESEMO the resulting simulations are a much better representation of the experimental data.

General information
Publication status: Published
Organisations: Section for Fisheries- and Monitoring Technology, National Institute of Aquatic Resources
Contributors: Herrmann, B., O’Neill, F.
Pages: 221-229
Publication date: 2006
Peer-reviewed: Yes

Publication information
Journal: Fisheries Research
Volume: 80
Issue number: 2-3
ISSN (Print): 0165-7836
Ratings:
Scopus rating (2006): SJR 1.028 SNIP 1.294
Web of Science (2006): Indexed yes
Original language: English
DOIs:
10.1016/j.fishres.2006.04.008
Source: orbit
Source ID: 225739
Effect of catch size and shape on the selectivity of diamond mesh cod-ends: II. Theoretical study of haddock selection

A series of computer simulations were carried out to predict how the selectivity of haddock in a diamond mesh cod-end varies according to total catch, by-catch, entry time of by-catch and the shape of the catch build-up in the cod-end. Results were compared to those from sea trials. I also investigated the predicted selectivity on the assumption that the shape of the cod-end does not change as the catch accumulates. The latter investigations were carried out for various shapes of the cod-end. The simulations indicated that the 50% retention length (L50) increases with both the total catch and the by-catch weight. They also indicated that the entry time of the by-catch may have an important influence on both the 50% retention length and selection range (SR). The shape of the catch in the cod-end had a similar effect, for the cases analyzed. Different cod-end shapes showed very large differences in the values for L50 as well as more narrow SRs, assuming that the shape of the cod-end remained constant during the tow. The simulations strongly indicate that the change of shape of the diamond mesh cod-end as the catch builds up during towing is a major contribution to the SR.

Effect of catch size and shape on the selectivity of diamond mesh cod-ends: I. Model development

An individual-based model that simulates fish selection processes in diamond mesh cod-ends of towed fishing gears is outlined. The model is implemented in a computer program called PRESEMO. A typical simulation can be carried out within a few minutes on a personal computer. Up to four different populations of fish entering the cod-end during a tow can be accounted for. Each fish is assigned a weight, girth, width and height according to its length, and is assumed to have an elliptical cross-section. Fish are allocated a period of travel time down the cod-end, a period for swimming in the cod-end without being exhausted, a period between escape attempts and a packing density for those swimming ahead of the catch. An escape attempt is deemed successful if a fish can pass through the mesh opening at the position in the cod-end
where the escape attempt takes place. The mesh opening value is obtained from information on the shape of the cod-end, which depends on the catch weight. The cod-end shape is updated dynamically as the catch builds up during the tow. During a simulation the selection process is continually visualized, that is, the entry, movement and escape attempts of individual fish are shown as well as the changes in the cod-end geometry. At the end of a simulation, a logistic function is automatically fitted to the selection data to obtain estimates of the 50% retention length and the selection range.