ICES WGECON REPORT 2018

Interim Report of the Working Group on Economics (WGECON)

11–15 June 2018

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International Council for the Exploration of the Sea
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Contents

Executive summary

The Working Group on Economics (WGECON) met at ICES Headquarters, Copenhagen, Denmark, 11–15 June 2018. The meeting was attended by experts from Europe and North America in person and by video conference.

Experts agreed a work plan in plenary to address ToR a) and b) in reference to an agreed list of fisheries management issues. Experts decided to work in two sub-groups, each to address both ToR's in reference to some of the issues, which were grouped into issues addressed on a standard basis in the discipline of fisheries economics and issues that were broader in scope, integrating environmental and other maritime issues.

A structured approach was devised and followed by the sub-groups with useful and rich plenary discussions also contributing to new ideas and progress on the ToRs. The work of the group is presented in full in Annex 2 of this report.

An element of ToR b that was not well covered in this meeting was the request for proposals of how to address gaps in economic data that might ultimately be required to fulfil ToR d, evaluating the economic significance of commercial fishing to selected coastal regions within ICES member countries. This question can be addressed at the next meeting.

Experts also referred to ToR d and thought ahead to envisage how economic advice might ultimately be presented to member countries by ICES, as these ideas would guide the responses to questions on priorities for data collection, research and institutional priorities. Two ideas are described in this report:

1) An advice sheet based on robust modelling of biological and economic systems to estimate the maximum of various parameters that policy makers might seek to pursue (e.g. welfare, jobs, profit, food) and advice based on economic theory and evidence of how to organise industry in order to maximise the likelihood of achieving the objectives for the fishing industry and society.

2) A suite of models written in open access code, that can be populated using data collected to standardised methods in ICES countries, and which can be downloaded and used by government and industry groups in ICES member countries. There was discussion about this suite of models being used as a tool to advance understanding of options, policy levers, trade-offs and impacts among both government and industry in any one country, potentially leading to an improved process of co-management for more effective management of commercial fishing. It was noted that this vision could be 15 or 20 years in the future for ICES countries as a whole.

The second idea was thought likely to be more attractive to many ICES countries as it would mean that there was not a group of international experts giving economic advice to national governments, which could be unpalatable, but rather, national governments could generate their own advice using models and data designed by ICES experts.

Overall, very good progress was made on ToR a) and b), and some valuable initial thinking on the ToRs was done and recorded. A key development was a decision to interpret ToR d to mean not only recent, actual economic significance of commercial fishing, but

also, potential future economic significance of commercial fishing. The idea of the suite of models generated some enthusiastic contributions and there were suggestions that experts could possibly produce a suite of one or two useful models for one ICES member country as part of the work of WGECON.

1 Administrative details

Working Group name
Working Group on Economics (WGECON)

Year of Appointment within current cycle

2018

Reporting year within current cycle (1, 2 or 3)

1

Chair(s)

Hazel Curtis, UK

J. Rasmus Nielsen, Denmark

Olivier Thebaud, France

Meeting dates

11–15 June 2018

Meeting venue

ICES HQ, Copenhagen, Denmark

2 Terms of Reference

a) To map the current work and identify future needs for economic science in ICES, giving consideration to useful connections to international marine/ fisheries economics organisations such as IIFET, NAAFE and EAFE.

b) To identify and report on economic data gaps that point to priorities for longer-term data collection, research, institutional needs, and researcher training in all ICES member countries; and where possible propose systems to collect missing data.

c) To define and report on the information flow needed to provide trade-off analysis of fishing impacts and ecosystem services

d) To assess and report on the economic significance of commercial fishing for selected coastal regions in the ICES area

3 Summary of Work plan

Year 1

Start mapping the current work and identify future needs for economic science in ICES (ToR a) and identifying economic data gaps (ToR b). Briefly brainstorm and discuss ideas on how to address and organise work under the remaining ToRs in year 2. Ensure establishing close connections with other relevant groups within and outside ICES. Producing Interim Report.

Year 2

Progress work towards completion of ToR a) and ToR b). Start work on defining the information flow needed to provide trade-off analysis (ToR c) and assessing the economic significance of commercial fishing (ToR d). Producing Interim Report.

Year 3

Finalise ToR c and ToR d, incl. the manuscript. Discuss and plan strategies and concrete steps for future work. Produce Final Report.

4   List of Outcomes and Achievements of the WG in this delivery period

There are as yet no publications, datasets or modelling outputs from WGECON, however, the co-chairs submitted an abstract which was accepted for oral presentation at the IIFET 2018 conference in July in Seattle. This is the biennial conference of the world-wide community of fisheries economists and seafood industry trade and marketing professionals, attended by around 400 delegates this year. The presentation was placed in a session on Fishery Governance, Policy and Management, was titled "Aims, ambitions, challenges and early progress from a new ICES expert group on Economics" and it outlined the initial progress of WGECON. The presented slides will be available in the proceedings of the IIFET conference.

Outreach to the European Association of Fisheries Economists (EAFE) was also discussed at the first WGECON meeting, and it was agreed that a useful approach could be to develop a survey of members, aimed at collecting their views on the ToRs of WGECON. Follow-up discussions on the implementation of such a survey by the next conference of EAFE are underway between WGECON members and the EAFE bureau.

There has also been a proposal for a joint theme session submitted by WGECON and WGSOCIAL to the ICES ASC 2019 to enable presentation of latest outputs from the two groups.

WGECON chairs are actively in contact with WGSOCIAL, and there is valuable overlap in membership with a few experts in both groups. We are seeking to co-ordinate work and obtain synergies where possible to avoid too much overlap and to enhance the usefulness of our outputs. We are in discussions to try to hold 2019 meetings of these groups either simultaneously or consecutively at the same location. WGECON is specifically investigating the possibility of holding the 2019 meeting adjacent to the meeting of the North American Association of Fisheries Economists.

Co-chairs are also investigating the possibility to hold a WGECON meeting immediately before or after a WGIMM (Integrating Ecological and Economic Models) meeting in order to maximise synergies with experts contributing to both groups.

The experts considered mostly ToR a and b, and Annex 2 contains information organised in terms of fisheries economics and management issues, mapping current work and data, highlighting gaps and priorities for future economic data collection and research.

Annex 2 also presents thoughts and ideas relating to ToR d, considering recent actual economic significance, but also hypothetical or optimal future economic significance of

commercial fishing for coastal regions in ICES members countries. Ideas relate to possible future provision by ICES of a suite of models and tools that could be populated by economic data collected under standard systems, and which would enable ICES member countries to conduct scenario analyses relating to their own commercial fishing industries, and to have a better information and evidence base to inform their own trade-off choices and decisions.

5   Progress report on ToRs and work plan

This first ICES WGECON meeting started with a scoping discussion focusing especially on ToRs a) and b). This discussion reviewed the ToRs in more detail, identified boundaries to the expected scope of work, and proposed sub-tasks, as well as sub-groups of experts to address these.

The process was initiated by reviewing the background for establishing the Working Group (WG) which included a plenary discussion on overall aims of the WG, and on more detailed scoping of ToRs a) and b). This process involved reviewing working group members' background and relevant experience, perspectives and expected contributions to the different WGECON ToRs. The plenary discussion also focused on capacity for involvement in inter-sessional work. Sub-groups were also identified to further address the ToRs during the WG meeting.

Background priority of WGECON (as identified in 2017/MA2/HAPISG09)

The background priority of the WG is identified as follows.

Nations are concerned about fish stocks and marine ecosystems not least because they can contribute to human wellbeing; therefore, these natural resources have an economic value. The economic dimension should be an integral part of marine science and scientific advice regarding the use and conservation of marine resources.

Demand for science and advice to address economic considerations is increasing, but ICES does not engage many economists or address economic issues in many member countries in its existing work. The efforts of the Strategic Initiative on the Human Dimension (SIHD) with ICES have served to raise the profile of economics in the last few years, but, with a few exceptions, SIHD efforts are not comprehensively supported and informed by the work of the ICES EG. Further, none of the existing EG that address economic issues are focusing on the development of economic metrics and core economic analyses that are demanded in parts of the ICES network (e.g. further development of ecosystem overviews) and, in some cases, by clients for ICES advice.

The need to expand the engagement of ICES in economics was also reflected in the outcomes of many recent meetings, especially the "Understanding marine socioecological systems" (MSEAS) Conference which ICES co-sponsored in Brest in 2016. Also, other ICES working groups have pointed at this need such as the ICES WGIMM (Working Group on Integrated Management Modelling) and ICES WGIPEM (Working Group on Integrated, Physical-biological and Ecosystem Modelling). Other drivers include high level aspirations for Blue Growth in European countries and globally, the interest in managing fisheries for Maximum Economic Yield and a desire to understand economic consequences of human-induced changes in the sea (WGHIST). There is also recognition

in ICES, and from our clients, that it would be desirable to add economic metrics to ICES ecosystem overviews and better recognise people and their livelihoods as part of the ecosystem. Further, in the longer term, ICES growing engagement in aquaculture science will likely lead to overviews of aquaculture activity that will also require economic inputs.

Scoping discussion

The initial scoping discussion allowed the WG to agree on the following points.

- Everyone agreed on the importance of integrating economics in ICES science generally, but it is important to identify different types of problems that can be addressed, as this leads to more concrete / applied discussions on the contributions of economic research. Given that marine resource economics is largely focused on issues relating to the management of activities harvesting these resources, it finds itself largely engaged in the analysis of maritime policies and their implementation and thus end up producing information that may be directly relevant for management advice.

- In addition to a review of the actual and potential contribution of economic research to different management issues, there may be value in selecting one or two specific problems that require the inclusion of economic analysis, to use as demonstrators of the ways in which this can be done, and as guides to the issues that need to be addressed with respect to methods, tools, data, etc.

- While the integration of economic information and analyses in advice is not explicitly mentioned in the description of the group's ToRs, it is specifically referred to in the background provided to ToRs b), c) and d). Hence while the primary focus of the group is on the actual and potential contributions of economic research to ICES science, the group should also dedicate some of its efforts to identifying how this can also contribute to advice.

- The geographical scope of the WG potentially spans across the entire ICES area, so includes a diversity of contexts for the generation and use of economic information and analyses, including but not limited to the EU. The WG should endeavour be inclusive of this diversity. Experience from other regions of the world, such as Australia, should also be considered, when relevant.

- The questions addressed by the WGECON also potentially span across a wide range of maritime activities and ecosystem services. The WG however considers that its primary focus should be on commercial marine fisheries, while also acknowledging the direct and indirect interactions between these and other sectors. From a methodological perspective, links can also be established with other working groups focusing on other sectors, in particular aquaculture.

- Broadly speaking, economic science as applied to marine systems can provide insights regarding (i) the ways in which maritime activities develop, evolve and respond to ecological, economic and institutional changes, given individual and collective decision-making processes; (ii) the assessment of economic trade-offs for society associated to alternative states of these systems; and (iii) the development of integrated scenario analyses in particular regarding alternative management options.

- The focus of the group is clearly on economic research, methods, tools and data. But the questions relating to integration with the other disciplines, in informing on the status of marine socio-ecological systems, should also be considered. This is for example the case with respect to integrated ecosystem assessments, or with the development of integrated bio-economic models. Such analyses must consider trade-offs between biological sustainability indicators and economic (and social) outcomes.

Following this initial scoping discussion, the WG agreed to the following approach to address the ToRs:

- Work from identified problems / needs that drive research and are identified in management or policy;
- With respect to ToR a), map current work and future needs, considering process understanding, economic assessments and integrated scenario analyses;
- With respect to Tor b), continuing from ToR a), identify current data resources and gaps, and needs for additional / new data collection, research, institutional developments and training.
- Identify links with key networks. On this last point, the WG proposed an oral presentation of WGECON at the 2018 IIFET (International Institute for Fisheries Economics and Trade) conference in Seattle, which was accepted. The presentation described the objectives of the WG and invited interested researchers to contribute to its work programme. In collaboration with WGSOCIAL, the terms of reference of which are very similar to those of WGECON, the proposal to co-chair a theme session at ASC 2019 was developed and submitted. The opportunity to use other science meetings to pursue the objectives of the WG was also discussed, including at EAFE 2019 (Santiago, Spain), IMBER OSC 2019 (Brest, France) and MSEAS 2020 (Yokohama, Japan).

Progress on terms of reference

Based on this initial scoping of its work, the WG focused on the key ICES needs in relation to being able to provide economic (including integrated bio-economic) information and advice in the future, using current knowledge and state of the art research, and identifying future developments that would be required. The work to address the ToRs was structured as sub-group working sessions, relying on an initial list of key issues / problems to which economic science is being applied, and a general outline of the approach to address ToRs a) and b). Continuous feedback between the sub-groups was sought through plenary discussions. This cyclic full-feedback working process was followed during the entire meeting, where the sub-group chairs reported additional conclusions and initial reporting on scope and contents to be discussed, and these were clarified and confirmed in plenary.

The general outline of the approach to addressing ToRs a) and b) was defined as follows. First, the group identified a list of key issues / problems that fisheries economists need to address in context of ICES (Table 1), taking into account possibilities and constraints in the short-term and in the longer term. The sub-groups then reviewed each key issue in order to identify the nature of the economic information and research that can be identi-

fied, considering multiple scales of analysis. A framework to describe the context and conditions defining these key issues was identified, as follows:

- Type of management system (with specific regulations involved);
- Type of management questions asked and specific information/advice that can be provided;
- Objectives underlying the management questions and associated needs with respect to trade-off analysis
- Economic operating units and associated needs regarding the analysis of economic behaviour
- Information requirements and data availability / gaps: e.g. costs; revenue; taxes and subsidies; long-term investment decisions and their drivers;
- Evaluation approaches underlying economic and bio-economic analyses, fleet focused as well as including broader social consequences
  - o Economic functions, processes required for models using the above information among other in relation to economic trade-off analyses and management scenario simulations (evaluations) - including functions and processes for fishermen choices and drivers of this, cost dynamics, price dynamics, etc.
  - o Identifying appropriate economic indicators to perform trade-off analyses and evaluate economic efficiency and sustainability with - in relation to trade-offs and comparative evaluations to biological and social sustainability and indicators for this.

The initial outcome of this applying this approach is presented in Annex 2.

An element of ToR b not thoroughly addressed and which therefore still needs to be addressed is: in relation to gaps in economic data, where possible, proposed systems to collect missing data.

6   Next meetings

The WG co-chairs are liaising with WG members in North America to explore possibilities of meeting in Nova Scotia or at Woods Hole in Connecticut, USA. Exact dates and venue to be confirmed.

Annex 1: List of participants

Name	Institute	Country	Email
Alan Haynie (via video-conferencing)	NOAA Fisheries Alaska Fisheries Science Center	USA	alan.haynie@noaa.gov
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J. Rasmus Nielsen (chair)	DTU Aqua -National Institute of Aquatic Resources	Denmark	rn@aqua.dtu.dk
Jorge Holzer Bilbao	University of Maryland College of Agriculture and Natural Resources	USA	jholzer@umd.edu
José Luis Santiago Castro-Rial	Centro Tecnológico del Mar - Fundación CETMAR	Spain	jsantiago@cetmar.org
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Leyre Goti (via video-conferencing)	Thünen Institute Institute of Sea Fisheries	Germany	leyre.goti@thuenen.de

Olivier Thebaud (chair)	Ifremer Centre de Brest	France	Olivier.Thebaud@ifremer.fr
Staffan Waldo	Swedish University of Agricultural Sciences	Sweden	staffan.waldo@slu.se

Annex 2: Fisheries management issues considered for ToR A and ToR B

To address ToR A and ToR B WGECON first identified a list of commonly encountered fisheries management problems to use as context to order the responses to the questions within the terms of reference. The fisheries management issues identified were grouped into two sets: the first is standard fisheries economics issues, which were identified from the experience of WGECON experts working in the field of fisheries economics; second is issues relating to the wider area of marine and maritime economics.

1. **Standard fisheries economics issues (Annex 3a)**
    1. TAC and output-based management systems
    2. Adjustment of capacity to resource potential
    3. Quota and/or fishing access rights allocation
    4. Mixed species fisheries (technical interactions)
    5. Links between catching sector and markets, demand for fish
    6. Small Scale Fleets
    7. Data Limited Situations – fleets, fish stocks
    8. Diversification; commercial fishing / aquaculture connections?

2. **Wider marine, maritime economic issues (Annex 3b)**
    9. Mixed species fisheries
    10. Straddling and shared stocks
    11. Ecosystem services
    12. Area-based and spatial management

The issue of mixed species commercial fishing appears in both lists as this challenge is an issue in economics and wider marine issues.

Answers to questions in ToR A and ToR B were considered in terms of each of the listed issues. Consideration was also given to ToR D, whether each type of data was relevant to and need for an ideal, comprehensive completion of ToR D of WGECON.

Acting units in economic analysis of commercial fishing

Note that in all economic analyses it is important to be clear about identifyig the correct units in relation to decisions and activities in commercial fishing. Not all skippers are owners of the vessel they are skippering and while operational (tactical or day to day) decisions about fishing patterns might be within their remit, longer term strategic business decisions about type of fishing, investments in new gear, targetting different species or stocks and investments in new vessels are reserved for the owners of the vessels, or the management of the vessel-owning company.

The decision making unit needs to be defined in each specific case where economic evaluations and projections or forecast are performed.

The decision-making unit is important in relation to what units should be optimised, maximised or simulated over with respect to scenarios and evaluation of management options where the results and outcomes are driven by specific fishing choices and activity patterns and where economic decicion-making is determining patterns of commercial fishing.

Units for analysis could include: single vessels (with consideration of ownership and split between operational and strategic decision-making), company owning more than one vessel, community, metier, fleet segment, country or national fleet, dependent on issue.

Annex 2a: Standard fisheries economics issues

ToR A: Map existing work and future needs for economic science in ICES

In this section, noted at the end of bullet points:

(ToR a) = this item is relevant for ICES and will be needed in wider scope, e.g. sectoral or geographic, in the future.

(ToR d) = this item is relevant to and needed for ideal, comprehensive completion of ToR d.

PRA = Priority for Research and Analysis (ToR b) to support delivery of a multi-tool advice system envisaged as described in the Background section under ToR d: To support future potential advice requests and development of ecosystem overviews.

Issue 1 – TAC and output-based management systems

a) **Map the current work in economic science** (which will also continue to be needed in the future):

- There is a large amount of published academic literature – a full literature review has not been included as part of these outputs.
- FAO fisheries management technical reports (ToR a).
- **PRA:** IFREMER (& others?) fleet fishing patterns/tactics implications of TAC changes and other regulatory constraints – decisions of vessel operators in response to TAC changes – use of gear, target species, area of sea, discarding, total sea time (ToR a).
- JRC data base on dependency of fleet segments on stocks (ToR a & d).
- **PRA**: STECF Annual Economic Report, includes drivers of economic performance (ToRs a & d). We would need analysis of economic drivers within regions and countries to complete ToR d of WGECON. All ICES countries could benefit from having something similar or equivalent to the STECF AER, with analysis at intra-national regional level.
- Published work on direct effects of TACs on fishing sector and indirect effects, induced effects (ToR a & d).
- **PRA:** Impact assessments of changes in prices of inputs to fishing businesses, e.g. fuel price (ToR a). Would be important to understand business responses to changes in input and sales prices.
- **PRA:** Impact analysis of proposed TACs – currently include fleet economic variables, but crew data not so well reflected/included. Some scale or aggregation shortcomings. NOAA has more social indicators (ToR d).
- **PRA**: LO: Impacts of landing obligation in EU MS, e.g. UK, by Seafish. Sweden – economics of TAC uplift as part of the landing obligation (Gustav). Spain: LO impacts Darocha *et al.* Netherlands: Buisman *et al.* (ToR a & d).

- **PRA:** Bio-economic models, e.g. IAM, FISHRENT, BEMEF, SEAFISH, FCUBE, SIMFISH, EIAA (ref.: Review of bio-economic models – Prellezo, STECF report; Integrated ecological–economic fisheries models—Evaluation, review and challenges for implementation [1]); (ToR a)

- **PRA:** International data bases, FIDES – Fisheries Data Exchange System (belongs to EU Commission), EUROSTAT, STECF data sets, ICES landings data base, FAO data on landings (ToR a & d).

b)   What is needed – **future needs for economic science in ICES**

- Impact assessments of what management measures were implemented in the past (ex-post evaluation) (ToR a)

- Implications if all fish stocks were rebuilt to e.g. MSY level (ToR a)

- Disaggregation of fishing activity (from agriculture, forestry and food production) in national accounts of ICES MS (ToR d)

- Understand political economy (bargaining process between management & industry) of TAC setting (ToR a)

- Inclusion of economic scientific evidence in proposing fishing opportunities (ToR a)

- Economic indicators of any ICES MS landing obligations / discard bans (ToR a & d)

- Fish price flexibility / elasticity / responsiveness and uncertainty (ToR a)

- More disaggregation of fleet economic / crew implications of TAC and other regulatory changes (ToR a & d)

- Total rent implications of TACs (ToR a)

- Normative Optimisation / maximisation modelling outputs. Co-viability analysis (ToR a)

- Cost of uncertainty in quota setting (i.e. precautionary buffers) and role of reporting technologies in reducing management uncertainty (ToR a)

- "Sustainability Impact Assessment" – assessing all impacts of fishing sustainably, including stakeholder participation and qualitative information in the impact assessment process (ToR a).

- Complement ICES advice with fleet overview & impact assessment (ToR a & d)

- An ICES standardised bio-economic modelling approach, set of principles, to apply at MS or regional level (ToR a) to include optimisation modelling, scenario analysis, to illustrate what the natural fish stock resources could contribute to society in various management scenarios.

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[1] Nielsen J.R., Thunberg E., Holland D. S., *et al.* 2017/2018. Integrated ecological-economic fisheries models – Evaluation, review and challenges for implementation. Fish and Fisheries 19(1): 1-29, https://doi.org/10.1111/faf.12232.

- Overview of actual management in ICES member countries and implications, incentives created by the rules in place (ToR a)
- Valuation of marine fish resources under different management regimes (ToR a)
- Data on international quota swaps and swaps within countries between POs etc. (ToR a)

c) Useful connections to international marine & fisheries economics organisations

- IIFET
- EAFE
- NAAFE
- STECF
- ASMFC (USA: Atlantic States Marine Fisheries Commission)
- NOAA fisheries

Issue 2 – Fleet / catching Capacity adjustment

a) **Map the current work in economic science on fleet capacity adjustment** - What is out there:

- STECF reports on the balance between fishing opportunity and fishing capacity of national fleets in EU member states, national evaluations of balance (ToR a & d);
- Balance indicator guidelines;
- Extensive published literature on capacity adjustment (regulatory or market):
  o FAO technical paper on capacity e.g. Data envelopment analysis
  o Buyback designs (many)
  o ITQs implementation (many)
  o Transferable fishing rights systems (many)
  o subsidies

- existing literature and research on capital (including rights) dynamics / ownership; entry/exit dynamics; technical progress in fisheries
- bio-economic modelling work (ToR a);
- co-viability analyses (ToR a)
- Poseidon report on entry / exit scheme analysis

b) **Future needs for economic science on Fleet Capacity Adjustment**

- Data on fishing seasons (ToR a & d)

- STECF Balance Indicators have been the same for a long time. Suggestion is to evaluate the economic indicators to ensure fit for future purpose in EU and other ICES MS (ToR a)
- All ICES regions: an assessment of balance in MS fleets (ToR a)
- Overview of how capacity is influenced in each MS: subsidies, Gross tonnage caps/limits, market measures (ToR a)
- Comparison of national action plans for fleet capacity adjustments, in relation to fishing rights systems (ToR a)
- Viable strategies for inducing adoption of individual property rights, for those MS that want them (ToR a);
- Data needed for estimation of participant profits; assessment of dynamics of fleet consolidation & capacity reduction (ToR a)
- Co-viability (balancing objectives) assessments of alternative capacity adjustment approaches (ToR a)
- Deciding how to deal with uncertainty / stochasticity (ToR a & d)

c) Useful connections to international marine & fisheries economics organisations

- STECF
- FAO
- Economic NGOs (e.g. EDF)
- IIFET
- NOAA fisheries

Issue 3 – Access rights allocation

a) Map the current work in economic science

- Literature - A lot has been done
    - Hoefnagel & Buisman *et al*. 2013, paper on quota trade
    - growing literature on understanding rights allocation dynamics according to regulatory system
    - Luc van Hoof, 2013 ICES Journal: Design or pragmatic evolution? Applying ITQs in EU fisheries management (free access)
- OECD report on market mechanisms for access rights in different countries
- NOAA guidance on allocation of quota, what to consider when allocating. Same for Denmark
- Consulting reports
    - Who gets the fish? NEF
    - MRAG report on EU fishing rights
    - DGMARE study on ownership – MRAG et al

- FAO technical reports

- SECFISH project on valuation of fishing rights

- Sweden, new system introduced in 2017 for demersal stocks, analysis of industry responses to new system

- SEAFISH model on how quota trade influences choke situations under LO

- SIMFISH model includes effects of quota trading

- distributional/ concentration dimensions and social impacts (cf. NOAA reviews) (ToR a)

- lots of empirical modelling on scenarios (Olivier)

- ORBIS data base – includes all publicly-available information about company structures and ownership

b) **Future needs for economic science on access rights allocation** - What is needed

- Overview of systems in ICES MS (ToR a)

- Implications of different methods for each MS (ToR a)

- Understand and have data on ownership of quotas and vessels (ToR a & d)

- Data on quota or other fishing rights (e.g. in Belgium, capacity) swaps between economic operators (firms) or between countries (ToR a)

- Valuation of both commercial and recreational fishing rights (ToR a)

- Data on probabilities of access by commercial fishers and recreational fishers when catching is not managed with ITQs

- Creation of new management actions or measures

- Include allocation and rights trading processes in bio-economic modelling and scenarios (ToR a)

- DCF data collection to see how to improve data on ownership structure and quota trade (ToR a)

c) **Useful connections to international marine & fisheries economics organisations**

- SECFISH project
- STECF, OECD
- NOAA
- IIFET & EAFE
- FAO rights-based management programme

Issue 4 – Mixed species fisheries / fishing

a) **Map the current work in economic science**

- Work of STEFC-EWG linking economic models to WGMIX (ToR a)
- STECF new Fisheries Dependent Information (transversal data linked to economic data and biological data) (ToR a & d)
- Landing obligation effects on mixed fisheries (ToR a & d)
- Valuation of low value species (ToR a & d)
- Risk pools to address choke situations (ToR a & d)
- Quota setting for the individual stocks involved (Management option?)
- Technical efficiency studies (ToR a)
- SIMFISH model for North Sea, SEAFISH model ("metier" level economic model), FLBEIA & other bio-economic models (ToR a)
- Studies on selectivity of fishing gears including economic efficiency e.g. DISCARDLESS, BENTHIS

b) **Future needs for economic science -** What is needed

- An ICES standardised bio-economic modelling approach, set of principles, to apply at MS or regional level (ToR a), including as particularly related to mixed species fisheries
    - o   scenarios analysis of technical options
    - o   elasticities of output substitution e.g. catches' composition and price effects
    - o   setting multi-year TACS for individual stocks and allowing industry to more quota across years
    - o   MEY for mixed species fishing
    - o   Spatial (re)allocation of fishing effort
- Better understanding of quota RE-distribution between fleets (ToR a)
- Appropriate level of disaggregation of data on time and spatial resolution in transversal data reported, ITQs prices if available
- Studies to disentangle technical constraints from behavioural incentives in determining bycatch, discarding incentives (ToR a)
- Economic impact assessment of fishing gear, selectivity devices and technical measures (e.g. Minimum Conservation Reference Sizes) (ToR a)

c) **Useful connections to international marine & fisheries economics organisations**

- STECF EWGs (Bio-economic modelling, new FDI, AER)
- ICES WGs (FTBC, ELECTRA, MIXED)

- NOAA-Alaska-Northwest Science Center
- EAFE
- National Research Institutes

Issue 5 – Links between catching sector and markets/ demand for fish

a) **Map the current work in economic science**

- National collection of first sales data, DCF in EU and other systems in non-EU ICES MS.
- COMEXT EU data base, containing national stats on imports & exports, time series
- National statistics on imports and exports, by Combined Nomenclature Code, value & quantity per year
- Spain & other MS – national programme of data collection for wholesale and retail of fish, certain species, quantity & value. Panel data resource.
- Supply / demand curve estimation for ground fish species in NE Fisheries Science Centre USA, to determine welfare impacts of shift to new commercial fishing management system
- Consumer segmentation studies including preferences, ad hoc, in some MS, e.g. UK, and PRIMEFISH project
- Recent consumer survey research projects and national initiatives to understand consumer expectations, willingness to pay, value chain and seafood trade (e.g. SUCCESS, PRIMEFISH)
- National level private projects to collect retail price, quantity and total value data, usually have to be purchased (based on point of sale data)
- SECFISH project (collection of data on quantity, value, species of raw material for fish processing sector)
- FAO globe fish reports – market analysis, species, by countries
- EUMOFA (EU market observatory) data and market analyses
- Assessment of costs & benefits of eco-labelling and certification of seafood products and production systems, vessels, etc
- National statistical institutes multiplier tables
- Input / output studies, impact on wider economy, e.g. UK (but old), Spain, & others
- Price elasticity of demand estimates for some species in some MS, at different stages of supply chain, PRIMEFISH for France and Finland for 5 species.

b) **Identify future needs for economic science in ICES**

- Data collection and analysis (business modelling) on different routes to market to support decisions on viability of creating new routes to markets for vessel operators (e.g. community supported fisheries, direct sales to households, etc.)
- Effect of supply chain / value chain analyses for estimating values of MSY and MEY
- Understanding wider market issues and forces, effects of vertical integration and value chain structure in seafood businesses, including international trade, and links with fishing rights allocation – in order to better understand implications of different fisheries management options
- Data and analysis of value chain constraints, consumer preferences, etc. in order to inform fisheries management choices to maximise value to the fishing businesses
- Links between all sources of seafood industry data provided by different organisations, standardisation of practices, categories, etc. to enable more robust, reliable and efficient analysis of data throughout the seafood supply chain

c) **Useful links with international fisheries economics organisations on links between catchers & markets**

- NOAA North East Fisheries Science Center
- OECD
- PGECON (DCF data)
- FAO Globefish
- EUMOFA
- EAFE
- IIFET
- EUROSTAT

Issue 6 – small scale fleets (SSF)

a) **Map the current work in economic science**

- Analysis of business performance, economic contribution or importance of SSF in EU member states. Done in STECF Annual Economic Report reports at national levels; done in various studies (e.g. SUCCESS) at local levels in some individual MS e.g. Socio-ecological system of octopus fishing in Galicia
- Effects of application of public funds, in various ways (infrastructure projects, subsidies), (e.g. EMFF, regional local action groups FLAGS, in the EU) on small-scale fisheries sector – business performance, fleet capacity, etc.
- Definition of SSF by Too Big To Ignore, EU

- Vessels <10m have different reporting methods, work in PGECON is being done to improve data collection robustness, cover, quality etc. (more needed in future too). FAO also has some work on data collection and methods.
- Recreational fishing assessment, various national initiatives, e.g. Belgium (may need to expand), although recreational fishing is not in the ToR of WGECON.
- Data collection systems specific to SSF, in various MS, in addition to national or international data collection systems.
- Data improvement project for SSF in e.g. the UK
- Regional dependency and contribution to economy studies

b) Identify future needs for economic science in ICES

- Study diversification of small scale fishing businesses (e.g. to recreational fishing, other fishing activities) and understand implications for governance and management of the small scale sector (e.g. link with fleet capacity and quota management)
- Management of allocation of fishing rights or access to stocks shared between larger and smaller scale vessels, and between commercial fishing and recreational fishing (especially when small scale commercial vessels are also use for recreational fishing)
- Better quality and more comprehensive data collection for SSF
- Data and analysis of social aspects of SSF, e.g. non-market values, crew issues
- Influence of household economic and social circumstances on business decisions of small scale vessel operators
- Collection and use of relevant qualitative data in economic studies
- Data availability on SSF at more spatially disaggregated levels

c) Useful connections to international fisheries economics organisations:

- STECF groups
- Too Big To Ignore
- EMFF – FLAGS, Local Action Groups
- PGEcon
- Eurostat
- PGECON/STECF/EAFE members/FAO
- Economic NGOs, e.g. EDF

Issue 7 – Data limited situations

a) **Map the current work in economic science in ICES**

- Sweden & other MS - Price matrices (under further development) – imputing average landings prices as prices from landing declarations aren't always available
- EMODnet – European Marine Observation and data network. An umbrella portal to hold data in standardised ways. Identifies gaps in data sets. Collates different data sets on various sectors from across the EU. Relevant information is contained under the Human Activity page
- DGMARE contract with partnership lead by Coffey to assess usefulness and quality of EUROSTAT fisheries Statistics, identifying data gaps and making recommendations
- Individual projects to map and characterise recreational fishing
- Specific studies (in some countries) on economic data relating to distant water fleets and small-scale fleets. E.g. IFREMER project to collect economic data on French overseas territories small scale fleet
- FARFISH project (EU project H2020) to collect economic data on fishing in SW Atlantic and SE Atlantic, and Mauritania, Cape Verde, Seychelles, et al
- STECF AER EWG data call for fleets fishing in International Waters, Other Regions
- Harvest control rules based on time series of catch (e.g. mean, median of catch)
- OECD has done some work on levels of IUU fishing. NGOs have done some stuff on this

b) **Identify future needs for economic science in ICES**

- Setting harvest control rules for data-poor stocks, taking account of economic aspects
- Help with designing price matrices, methodological support
- Costs and benefits, cost effectiveness, who pays, relating to scientific stock assessment surveys
- More details of quota swaps between countries to be made available
- Data on trades of fishing rights at business level (see also issue on management by TAC)
- Illegal fishing and fines, levels and values of detected illegal fishing, estimates of undetected illegal fishing
- Behavioural economics

c) **Useful links to international fisheries economics organisations**

- EUMOFA
- NOAA fisheries

- ASMFC
- DGMARE for FIDES data base
- National level research institutes

Issue 8 – diversification, fisheries–aquaculture connections

a) Map the current work in economic science

- Assessing the effects on economy of the projects run by FLAGS. Economic assessment of the results of FLAGS projects
- Conference hosted by CETMAR on diversification in commercial fishing sector (5 editions)
- Max Nielsen *et al.* work on market integration. JAgEcon 2009 Market Integration in Fish in Europe
- Economic dependency of fleets on specific fishing activities and/or stocks. Studies done by various EU research projects, national institutes, etc. Published in annual Seafish fleet economic reports, STECF balance reports, JRC work on portal on stock dependencies (Fabrizio Natale *et al.* paper in Marine Policy fisheries dependencies)
- Workshop by Ministry of Agriculture in Sweden, June 2018, between fishing and aquaculture sectors; to review, standardise data and methods
- SUCCESS project – work to standardise method to assess economic sustainability of fishing and aquaculture sectors. This work also assessed dependencies on species, on imports, on feed inputs, etc.
- Economic evaluation of the importance of different marine industrial sectors, with respect to marine spatial planning, in some countries

b) Identify future needs for economic science in ICES

- Investigate the effectiveness of any actions to diversity business activities of commercial fishing
- Competitiveness analysis, Business modelling, of business diversification options (e.g. online marketing) Research investigating the influence of incentives to diversify
- Analysis of market integration (substitutability of wild-caught fish and farmed fish) and price formation when commercial fishing and aquaculture production compete in the same markets
- Analysis of economic and welfare implications of coastal zone management regimes; using multi-criteria analysis
- Non-market values of fishing activities for medium and large scale commercial fishing

c) Useful links with international fisheries economics organisations

- Coastal Zone Management group?
- ICES working groups on aquaculture and marine spatial planning, et al
- EUMOFA
- EMFF and FLAGs
- STECF EWG on aquaculture
- Ministry of Agriculture (SWE)

ToR B Economic data gaps

For each of these standard fisheries economics questions, WGECON considered data gaps and identified those that point to priorities for longer-term data collection, research, institutional needs, and researcher training in all ICES member countries.

List of issues:

1) TAC and output-based management systems

2) Adjustment of capacity to resource potential

3) Quota / fishing access rights allocation

4) Mixed fisheries (technical interactions)

5) Links between catching sector and markets / demand for fish

6) Small Scale Fisheries / Fleets

7) Data Limited Situations – fleets, fish stocks

8) Diversification; fisheries-aquaculture connections?

In Table 1, the issue numbers correspond to the list above. Data gaps are presented with their level of relevance to each issue (Y = yes, y = somewhat relevant) and whether they are a priority (P) or not (n) for future data collection, in the context of future provision of economic advice by ICEs.

Table 1. Economic data gaps.

Categories of data gaps	Priority or not?	Issue number							
		1	2	3	4	5	6	7	8
Absence of log book information e.g. level of effort and landings per type of fishing gear	P	Y	Y		Y		Y		
Trip level log book information, actual or imputed costs	P				Y				
Absence of remote monitoring data e.g. Absence of spatial data	P				Y		Y		
ICES countries have no standardised fleet economic database	P	Y	Y	Y	Y	Y	Y		
Cost recovery of fisheries management e.g. stock assessments – not established centrally for most ICES countries	n	Y	Y	Y	Y			Y	
Cost of stock assessment and management and who pays	n	Y			Y			Y	

Countries with no national standardised fleet economic data collection programmes	P	Y	Y	Y	Y	Y	Y		
Crew data – numbers, remuneration, age, gender, skill level, etc. Now included in EU DCF, but not standard for ICES countries	P	Y	Y	Y				Y	
Some variables are weaker or poorer quality e.g. data on finance and debt of fishing companies, estimates of net profit, subsidies	n	Y	Y	Y	Y	Y			
Data on proportion and quantity of raw material that is certified / labelled "sustainable" "responsible"	n	Y				Y			
Environmental accounting at national level, non-market values – not fully done and no standard approach in ICES countries	n							Y	
Even if national economic data collection programmes, data for smaller vessels is less comprehensive, less accurate	P	Y	Y	Y	Y		Y		
Illegal fishing and fines, levels of detected illegal fishing, estimates of undetected illegal fishing	P		y		Y			Y	
Information on initial, original, first time allocation of fishing rights, systems used	n	Y	Y	Y	Y			Y	
Information on substitutability between species and product formats	n	Y			Y	Y			
International trade – lack of species and product format level data	n	y				Y			
Lack of data on fish buyers, fish buying companies, raw material, they buy, quantity, price, species, etc.	n					Y	Y		
Links to recreational fishing – complementary activities and competitive activities	n	Y	y	Y	Y		Y		
Quality and completeness of log book data on distant water fleets, areas of activity, gear, landings, etc.	n							Y	
Non-market values of fishing activities for medium and large scale commercial fishing	P								Y
Ownership of fishing rights.	P	Y	Y	Y	y	Y	Y		
Ownership structure of fishing companies, seafood companies, all ICES countries	P		Y	Y	y	Y	Y		
Prices along the supply chain	n	Y		Y		Y			
Quota (and other fishing rights) trade and prices – most countries	P	Y		Y	Y	Y	Y		
Retail and consumption data – not standard across all ICES countries. Not done on standard national annual basis	n	y				Y			
Self-consumption and informal private sales of landed fish	n	y			y		Y		
Spatial data on use of sea areas for e.g. aquaculture, other uses	n	y			y				Y
Variations in quayside prices according to "quality" of fish landed (e.g. chilled, stored without damage, shelf life, traceability)	P	Y				Y	Y		
Data on fishing business employment on shore (directly linked to the fishing unit)	P	Y	Y		Y		Y	Y	Y
Transversal and Economic Data on recreational fishing	n	Y							Y
Economic data on trials of gear selectivity and gear efficiency (Expert knowledge on practical constraints?)	P	Y			Y	Y			

Priorities for longer term research: The big vision

The WG considered what possible outputs from ICES might be developed that would inform the longer term priorities for data collection, research etc., as requested in ToR b of WGECON.

Experts discussed ideas around designing an economic analytical system for ICES to apply to commercial fishing industries and fleets in ICES countries – presentation of quantified and qualitatively described options that could be achieved with different industry management regimes. E.g. if the country wants to maximise jobs, here is how the country could organise industry to achieve it; if a country wants to maximise revenues, this is what sustainable revenues could be and how the country could manage its fleets, allocate fishing opportunities, etc. to achieve it.

Considering current presentation of biological advice, experts imagined presenting, for example, four scenarios or choices as ICES economic advice: what would be an estimate of and how most likely to achieve: Max jobs; fish; revenues; profit. A sketch was prepared to illustrate this idea:

ICES economic advice on "*Eastern ICESlandia*" fishing industry and opportunities, 2035.

	Values in 5 years' time	principles	Risks & uncertainty:
Scenario			
Max FTE jobs	5500 FTEs		
Max fish (food)	800 000 tonnes		
Max revenues	$1bn		
Max profit	$150m		
Max welfare			

There was further discussion that ICES member countries might prefer to devise their own economic scenario analyses using tools and data provided by ICES WG. The idea was that ICES could provide a programme or model to ICES countries that they can download and run to see their own outputs and possibilities, customise their own choice of assumptions in the model, choose their own trade-offs.

This would mean creating tools to help managers and industry to understand the system they are working in / with. The tools could be used to help people understand the levers within the system, the strength and effects of levers. Use of this suite of tools could help everyone understand what their choices are and what the implications and trade-offs of their choices are.

All input data and model assumptions and rules would be transparent so that discussions between industry and government within a member country would not be about the validity of the analyses, but rather about political choices and comparisons of outcomes and how risky or likely they are, etc.

Apply the principle of ensuring that discussions between stakeholders, NGOs, industry, government etc. are less about the validity or usefulness of the evidence on the choices being discussed, and more on the policy questions and desired outcomes for society from having a commercial fishing industry, preference for risk, etc.

The suite of tools envisaged could be something similar to the NOAA FishSET tool, either to download or access online, so that users (governments or industry) can choose input values of various parameters and run scenarios and consider the possibilities in their choices of fisheries management.

Experts envisaged proposing a tool box of models and how to create the dataset to populate this type of tool box and that then would drive all the work that ICES would have to do in order to provide to its members a populated, accessible suite of models.

There would also be guidance on how to collect the required data on an ongoing basis, how to apply a standardised method to analyse the data, upload to the tool, (input data framework), how to interpret results (an output data framework).

The tool box would have several programmes or separate tools to be used for different challenges in fisheries management, e.g. spatial analysis (e.g. reactions to MPAs), changes in fishing opportunities, changes in fishing rights allocation systems, possible strategies for fleet capacity adjustment, responses to substantial changes in species proportions, mixed fisheries issues, marketing boxes etc.

There was mention of the PRIMEFISH website, which from February 2019 would include a suite of models related to marketing, but the concept could be similar.

Ideally, member countries would be able to download the tool box contents, including code, so that each country's government could be satisfied with functions in each model, and their scientists could potentially modify if desired. Everything could be built using open source codes or readily available software for data input, modelling, and generation of data and graphical outputs.

This idea could be in line with the modular approach using the Transparent Assessment Framework (see ICES).

It was also noted that the trade-off workshop, WGFBIT fisheries benthic impact trade-off, has a mock advice sheet. Important to include some environmental trade-offs in illustrating management choices and choices relating to desired outcomes. Marginal revenue vs marginal impact assessment.

Priorities for longer term institutional needs

Most EU countries (with a fishing fleet) have a team that collects and analyses economic data for the DCF obligations for the fishing fleets and/or fish processing sectors, and/or aquaculture sectors.

- For all ICES countries, it is a priority to identify and, if absent, create, a team or department, possibly within an existing institute, to conduct Economic Fisheries Data Collection Programme.
- There is a need for appropriate research team to conduct associated economic and social analysis and research – this could be the same team in the same in-state that conducts data collection, or could be separate team. There could be more than one team in more than one institute conducting research, e.g. a national institute and a university or universities. Some ICES countries already have these teams but they are not linked, identified, of correct funding, etc.

- Issues to consider include the key issue of whether the owners and managers of the fishing businesses trust the institute collecting the data to sufficiently protect their commercially sensitive data and protect their anonymity.
- Teams should be considered independent, neutral science teams, not influence by industry or political lobbying.
- Teams should have access to all appropriate data from national fisheries departments, specifically fleet register, log book data, etc.
- Institutes should build an ongoing respectful and trusting relationship with industry business owners and operators, to ensure higher quality data and outputs and industry satisfaction with outputs of data analysis (while remaining an independent scientific team / institute).
- Funding of Economics team? Ideally, funding for this function should be secured for the longer term for this type of work, without having to apply or justify on a project-by-project basis.
- Collaboration with non-economic social scientists and with relevant natural scientists is important.

International level

- Data collection and aggregation and associated analysis should be conducted in a standardised fashion, e.g. as is done in EU DCF and guided by an ICES planning group on economic methodological issues.
- It is a priority for ICES to have a planning group on economic methodological issues on data collection issues, one on bio-economic modelling or assessments.
- These groups should have access to appropriate national level data sets. (n.b. cannot have vessel or business-level data shared outside the organisation that collects it in each country – realistically business owners won't give their private costs and non-fishing income data if they think it will be shared with other organisations).
- Sharing best practices for data collection and analysis
- ICES can ensure more integrated (social & natural science) working groups in all topics

Priorities for longer term researcher training (for all ICES countries)

- It is necessary for economists and biologists to have high level of interaction to improve understanding of approaches, language, vocabulary, concepts, etc. between disciplines.
- Data collection research design, survey instruments
- Understanding the cycle of data collection, analysis, reporting, showing outcomes and use of evidence, to inform future industry contributors of data
- Qualitative research design and data analysis
- Interviewing techniques
- Design of economic experiments

- Stakeholder interaction skills
- Fisheries biology for non-biologists
- Fisheries economics and other relevant social science for non-economists and non-social scientists
- Business accounting for economists (and biologists)
- Marketing for economists
- Experience on board fishing boats
- Writing for non-technical audiences, training on dissemination of findings to non-technical audiences, especially industry audiences
- Econometrics and economic, bio-economic modelling
- Use of modelling languages and statistical packages
- Training in non-financial values of fishing

Annex 2b: Wider marine, maritime economic issues

The wider marine and maritime economic issues that were identified and under which headings ToR A and ToR B were addressed:

9) Mixed species fisheries

10) Straddling and shared stocks

11) Ecosystem services

12) Area-based and spatial management

ToR A: Map existing work and future needs for economic science in ICES

Issue 9 – Mixed species fisheries

Underlying conditions required for understanding and evaluating processes and drivers for economic behaviour significantly impacting Management Strategy Evaluation (MSE)

Management systems: policy objective of MSY; joint TAC setting (for example, work of the ICES WG MIXFISH group for the North Sea); Landing obligation regulations; Extension of TAC systems to non-commercial species (birds, mammals, other fish …). Setup for quota (re)allocation (eg is there a quota trading system in place).

Type of management questions asked (and advice that could be required): (i) annual decisions on TACs and problems of quota under-utilisation; (ii) assessment of technical interactions and choke species problem.

Sectors: commercial fishing fleets (subdivided in to segments); possible extension to recerational segments, although recreational fishing is not in scope of current WGECON ToR. Objectives: (i) Economic welfare (short-run or long-run depending on the time horizon) – producer surplus at fishery scale; consumer surplus where relevant; (ii) Social objectives (producer surplus at segment level or regional level or a mix; activity and employment; etc.); Food provison objective (MSY); Biological/Ecological objectives (maitain long-term status of target and non-target stocks; protect non commercial species and habitats) – mean and variance (temporally and spatially).

Actual operating units: vessels, companies, producer organisations / coops, coastal authorities, nations.

a) **Map the current work in economic science**

Process understanding, drivers of behaviour, decision-making

- TAC definition and allocation process: quite some research on the quota allocation regimes once TACs have been set (modelling), but limited research on the TAC setting process itself (research in political science? Political economics? Public choice literature?)
- Identification of stock-fleet segment interactions (JRC TAC dependency tool)

- Short-term projections of the changes in nominal fishing effort allocation (between métiers) and drivers of these changes (elements of this)
- Long-term projections of changes in fleet segment activities (e.g. FISHRENT)
- Analysis of effort displacement (vessel level) in response to changes in regulations

Impact assessment, economic evaluation, multi-objective considerations

- Bio-economic modelling research on both short-term (BEMEF, Fcube, …), and long-term (DISPLACE, IAM, FLBEIA, …)
- Analysis of impacts of effort responses (e.g. on habitat)

Integrated scenario analyses: Explorative: forward simulation of various scenarios, a lot done for mixed fisheries, both short and long-term

b) Identify future needs (research, data, tools, models, …)

- TAC definition and allocation process: research on the TAC setting process and on allocation and reallocation possibilities (considering multiple decision levels: individual companies, POs, regional authorities, nations).
- Recreational fishing choices, patterns, activity – although out of scope of WGECON current ToR, there may be some relevance to economics of commercial fishing
- Ensuring appropriate decision-making unit is identified and correct level data used, e.g. vessel level or company level.
- Need to include non-fishing income sources (e.g. processing, leasing out fishing rights, oil industry guard duties) as is already included in EU Data Collection Framework.
- Research on market dynamics and price responses to changes in species landings mix
- Research on factors influencing tactical and strategic decisions by vessel owners and operators, especially importance of value placed on non-financial factors.

Impact assessment, economic evaluation, multi-objective considerations

- Develop a meta-model for evaluating mixed species fisheries with standardised definitions and assumptions, especially relating to fishing decisions of vessel owners and operators
- Integrating explicit modelling of quota (re)allocation processes in economic analyses
- Data standardisation questions (commercial fishing)
- Although recreational fishing is not in scope of WGECON ToR, it may be important for economic assessment of commercial fishing to consider objectives for recreational segments (incl. charter boats/companies)

- Economic value of ecological side-effects – such as ecosystem services.

Integrated scenario analyses: Normative: backward calculation of strategy to achieve a pre-determined objective or set of objectives, less of this is done (e.g. MEY strategies, co-viability strategies)

c) Useful connections to international marine & fisheries economics organisations

- ICES Mixed fisheries group; WGHIST
- JRC
- STECF (for bioeconomic modelling)
- NOAA & DFO
- IIFET, EAFE, NAAFE
- IAERE, EAERE
- MARE
- EDF, NEF, WWF, …
- World Bank, FAO (sunken billions approach)

Issue 10 – Straddling and shared stocks

a) Map the current work in economic science

Agents/ Acting units

- Company level primarily with respect to fishing patterns (or behaviour);
- Contracting parties (legal units) level with respect to management (very explicit)

Management type

- CP?? quota shares, IQs, individual effort quotas (e.g. seabass), gear technical measures; Management

Management dimensions

- Most Long Term MPs

Objectives

- Ecosystem services mainly fishery (single stock TAC); CP and industry stakeholders and NGOs;
- TAC definition and allocation process: quite some research on the quota allocation regimes once TACs have been set (modelling), but limited research on the TAC setting process itself

Reviews (current)

- EU Economic Reports; OECD COFI Reports; FAO Reports; NOFIMA Reports; TemaNord NCM Reports;

- NOAA, DFO, Iceland, Faroe Islands, Norway, Industry Connections (how to parameterise models and understand drivers in the systems appropriately)

- Studies evaluating management (governance, compliance, enforcement/control) costs in context of mixed fisheries to consider cost effectiveness

To some extent isolated studies and research exist on:

- Identification of stock-fleet segment interactions (JRC TAC dependency tool)

- Long-term projections of the changes in fleet segment activities

- Analysis of effort displacement (vessel level) in response to changes in regulations

- Research on market dynamics and price responses to changes in types of fisheries

Costs – key processes, parameters and functions

- Variable costs: Variable costs very fleet specific; annual information can be seasonally re-distributed according to effort (fishing days) by vessel category; area specific costs redistributed according to area specific catch amounts;

- Other context-based costs; Costs on eco-labelling, education, input compliance (VMS, reporting logbooks, etc) already included in administrative costs;

Impact assessment, economic evaluation, multi-objective considerations

- Standard methods and information in most cases for providing economic impact assessments;

- Multi-objective considerations: e.g. goal programming or game theory or institutional economics

- Methodological approaches for economic evaluation: Analysis of impacts of TAC responses on stocks according to MSY

Integrated scenario analyses: Explorative: forward simulation of various scenarios, short and long-term

   b) Identify future needs (research, data, tools, models, …)

Management and objectives

- Processes leading to TAC setting and access rights; TAC definition and allocation process: research on the TAC setting process and on allocation and reallocation possibilities (considering multiple decision levels: individual companies, POs, regional authorities, nations). (Research in political science? Political economics? Public choice literature?)

- Further political considerations: Explore potential obstacles/negative incentives negotiators/industry): Potential lack of interest in having economic in-

formation available when initiating quota negotiations and access rights between legal parties (game theory issues) – can long term harvest strategies potentially minimize such incentives(?)

- Ensuring appropriate decision-making unit is identified and correct level data used, e.g. vessel level or company level.

- Need to include non-fishing income sources (eg processing, leasing out fishing rights, oil industry guard duties) as is already included in EU Data Collection Framework.

- Valuation of biological / trophic / ecosystem interactions according to multi-species and alternative harvest strategies; that involves improvement of existing ecosystem and multi-species models.

- Valuing and evaluating different international TAC/gear & spatial technical measures on international basis (Management Strategy Evaluation with simulation of scenarios) & optimisation on national level.

Institutional structures for improving scientific knowledge

- Institutional structures and costs for providing regular economic advice (economic assessment working groups)

Further research needed on standardising the following:

- Identification of stock-fleet segment interactions (JRC TAC dependency tool)
- Long-term projections of changes in fleet segment activities
- Analysis of decisions to change target species and effort displacement (vessel/company level) in response to changes in regulations
- Research on market dynamics and price responses to changes in types of species supplied

Costs – key processes, parameters and functions

- *Variable costs*: From different fleet segments we need information on remuneration systems;
- *Other context-based costs*: Need more detailed information on quota purchase, quota leasing, quota swaps;
- *Public costs* – costs of RFMOs? Cost of negotiations? Cost recovery (New Zealand), Iceland - fishing fee? Loss of resource rent.

Revenue – processes, parameters and functions

- Income from quota sales or leases

Nation-specific difference in taxation systems: fishing fees including licenses among others, resource rent capture, subsidies, such as negative taxes on e.g. fuel, technical improvements, purchase of selective gears, fuel efficient engines, decommissioning schemes, price guarantee);

- Impact assessment: Potential lack of international agreement on TACs of shared stocks can be problematic for impact assessments and this needs to be considered;

- Multi-objective considerations: Further considerations on drivers and methods concerning multi-objective aspects and political requirements for obtaining agreement (public choice considerations);

- Methodological approaches for economic evaluation: Bio-economic modelling research on both short-term and long-term basis to obtain more standardised and broader applied methods for economic evaluation; working towards the development of a meta-model on regional basis for straddling stock fisheries with standardised definitions of alternative assumptions about business owner decisions on fishing patterns and investment;

- Integrating explicit modelling of quota (re)allocation processes in economic analyses;

- Data standardisation questions (commercial fishing);

- Inclusion of impacts on non-commercial species and broader community impact.

Integrated scenario analyses: Normative: backward calculation of strategy to achieve a pre-determined objective or set of objectives, less of this is done (e.g. MEY strategies, co-viability strategies)

c) **Useful connections to international marine & fisheries economics organisations**

- Science and Advice with respect to processes and management: Further connection to World Bank, FAO (sunken billions approach), OECD, NCM, WWF, National institutes, JRC
- STECF (bioeconomic modelling)
- NOAA & DFO
- IIFET, EAFE, NAAFE
- IAERE, EAERE
- MARE
- Environmental Defense Fund, New Economics Foundation

Issue 11 – Ecosystem services issues

  a) **Map the current work in economic science**

Process understanding, drivers of behaviour, decision-making

- Valuation of the end-product but not intermediate product (see provisional/ regulating/ cultural services)
- Standard methodology with regards to valuation technique (stated/ revealed preference) including survey bias minimisation methods

Impact assessment, economic evaluation, multi-objective considerations

- Most current work has a single-objective focus
- Risk modelling of contamination (e.g. aquaculture impact on natural stock) – although not clear if this is current economic work or more environmental.

  b) Identify future needs (research, data, tools, models, …)

Process understanding, drivers of behaviour, decision-making

- Low priority: basic supporting service valuation
- Better understanding of the drivers for choices with regards to cultural services

Impact assessment, economic evaluation, multi-objective considerations

Integrated assessment of trade-offs between different service - Indirect effects reflected by future prices (e.g. stock rebuilding and its side effects –conservation of whale habitats → increase of whale worm populations→cod (decrease in price, develop of layer to protect from worms)→potential human allergy) → extending existing model

Integrated scenario analyses

Where to set the boundaries of the ecosystem service for complex models (e.g. carbon sequestration, ocean acidification, terrestrial runoffs)

  c) Useful connections to international marine & fisheries economics organisations

- ICES WGRMES, integrated assessment; cultural service
- local/national ecosystem service groups and natural capital

Issue 12 – Area-based and spatial management

Underlying conditions required for understanding and evaluating processes and drivers for economic behaviour significantly impacting Management Strategy Evaluation (MSE)

Management systems: Spatial regulation of fishing possibilities (in relation to stock preservation / habitat impacts); Fisheries closures (protection of essential fish habitats); Marine protected areas policies (biodiversity conservation, sensitive habitats); regulations of fisheries access to waters; spatial reservation for other industries (aquaculture, energy, transport, mineral extraction, military, marine recreation …); Marine Spatial Planning.

Type of management questions asked (and advice that could be required): (i) trade-off analysis (cost-benefit analysis, multicriteria evaluation); (ii) displacement effects for fishing and associated ecosystem and fisheries impacts; annual decisions on TACs and problems of quota under-utilisation; (iii)

Mismatch of spatial allocation of access rights with (changing) spatial distribution of fisheries resources; (iv) spatial conflicts between mutually exclusive gears; mismatch between spatial allocation of effort and spatial distribution of fish resources (and associated access regulation question: eg spatial quota).

Sectors: commercial fishing fleets (subdivided into segments), with multiple potentially conflicting gears; other sectors (aquaculture, energy, transport incl. harbours, mineral extraction, military, …); conservation organisations; marine recreation industries; people!...

Objectives (for a social planner): (i) Fishery economic welfare (short-run or long-run depending on the time horizon) – producer surplus at fishery scale; consumer surplus where relevant; (ii) Social objectives (producer surplus at segment level or regional level or a mix; activity and employment; etc.); Food provison objective (MSY); (iii) Biological/Ecological objectives (maitain long-term status of target and non-target stocks; protect non commercial species and habitats) – mean and variance (temporally and spatially); (iv) political objectives (?)

Actual operating units: vessels, companies, producer organisations / coops, coastal authorities, nations

Note: in a full EBM perspective, we should consider the other sectors fully and develop the expertise to analyse behaviour, assess outcomes and develop scenarios for these, but seem beyond the scope of the resources currently available, at least in WGECON.

a) **Map the current work in economic science**

Process understanding, drivers of behaviour, decision-making

- Spatial mapping of fishing effort and catches (volume and value): WGSFD,
- Conflict analysis e.g. assessment of spatial overlap between different types of fishing
- Short-term fishing effort allocation dynamics (statistical and process model-ling)

- Longer-term changes in spatial distribution of fishing effort (game theory)
- Bioeconomic models including spatial dimensions (fast growing literature)
- Some key biophysical processes (ability to disperse of species, ocean circulation) are crucial in the economic analyses

<u>Impact assessment, economic evaluation, multi-objective considerations</u>

- Impacts of alternative spatial access regulation measures
- Bio-economic modelling research on both short-term and long-term effects of management measures
- Analysis of economic impacts of changes in fishing effort on habitats

<u>Integrated scenario analyses - </u>Explorative: forward simulation of various scenarios, short and long-term

b) Identify future needs (research, data, tools, models)

<u>Process understanding, drivers of behaviour, decision-making</u>

- Cost-benefit analysis / cost-effectiveness analysis of inter-sectoral spatial interactions
- Research on factors influencing tactical and strategic decisions by vessel owners and operators, especially importance of value placed on non-financial factors.
- Further research on spatial choices of fishing vessel operators and owners.
- Study of spatial access regulation measures
- Work closely with colleagues in biophysical research to assess extent of understanding of key processes

<u>Impact assessment, economic evaluation, multi-objective considerations</u>

- Impacts of alternative spatial access regulation measures
- Mapping the economic value of different areas to the fisheries sector
- Bio-economic modelling research on both short-term, and long-term
- Producing spatially resolved status reports on economic aspects of marine fisheries and their spatial interactions with other sectors

<u>Integrated scenario analyses - </u>Normative: backward calculation of strategy to achieve a pre-determined objective or set of objectives, there seems to be less of this (e.g. MSFD protection/restoration objectives; optimal conservation strategies; co-viability strategies).

c) Useful connections to international marine & fisheries economics organisations

- ICES working groups on key spatial biophysical processes
- ICES WG on marine spatial planning

- International fisheries economics associations, IIFET, EAFE, NAAFE

ToR B Economic data gaps

Issue 9 – Mixed species fisheries issues

a) **Available economic data and current practices using it**

Data collection

Transversal data (catch and effort)

- ICES InterCatch database
- ICES data calls for WGMixfish (effort & landings per quarter and region)
- Are transversal data collected in non-EU countries, US, Canada?

Economic data

- DCF data coming from STECF AER for the EU, aggregated at fleet segment level
- Not clear what is available in non-EU countries, US, Canada?

Data integration

Multiple / non-standardized approaches to integrating the different data sources to address Mixfish issues

Institutional needs

Large diversity of setups for accessing transversal and economic data

Researcher Training

- Course on research methods in non-economic social sciences, for non-social scientists.
- Stock assessment science methods for non-biologists.

b) **Data and institutional gaps and priorities for data collection and integration**

Data collection

- Historical TAC & quota (re)allocation and uptake at multiple levels: national, POs & co-ops, individual companies
- Generic gaps in economic information are also important in mixed species fisheries analysis: partially a resolution question; partially a question of collecting additional information (e.g. compliance, capital dynamics (cf. Nøstbakken *et al.* paper in Marine Resource Economics), opportunity costs of fishing, …)
- Costs associated with mixed catch handling under alternative regulatory obligations (such as the Landing Obligation in the EU) and observed responses to changes in these obligations

Data integration

- Need for systematic / stable mapping or mapping protocols to define fishery units / métiers / fleets between the different data sets, groups, regions, … (InterCatch, ICES data calls, STECF AER, etc.)

- DCF segmentation too aggregated to be useful for mixed fisheries analysis / ICES segmentation driven by biological considerations → gaps and need to go beyond these: see DCF métier workshop (22-26 January 2018)

Institutional needs

- Routines / protocols to facilitate integration whatever the institutional setup
- Common data sets for standardized analyses?

Researcher Training

- Standard core training in fisheries economics
- Bio-economic Modelling
- Choice modelling

c) **Systems, approaches and institutional structures to integrate and use new data**

- DCF métier workshop;
- Others?

Issue 10 – Straddling and shared stocks

a) **Available data and current practices using it**

Data collection

Transversal (catch and effort) data:

- ICES InterCatch database
- FAO;
- NEAFC;
- ICES data calls for straddling stocks in for respective working groups (effort & landings per quarter and region)
- Legal Entity (e.g. national) Databases – e.g. vessel register, logbooks, landings data, sales slips, cooperate tax accounts, statistical office data;
- Industry (catch sector, processing sector);
- Not so clear what is currently available in non-EU countries, US, Canada?
- OECD – not known exactly what data is held

Economic data:

- DCF data coming from STECF AER for the EU: aggregated at fleet segment level
- OECD COFISH;
- EUMOFA;
- EUROSTAT; Legal Entity? (e.g. national) Databases – e.g. vessel register, sales slips, cooperate tax accounts, statistical office data; Industry (catch sector, processing sector);
- Various sets of economic data in non-EU countries, US, Canada?

Data integration

- Only limited level of standardisation of formats and aggregation levels of data between legal entities and international database platforms;
- Multiple / non-standardised approaches to integrating the different data sources to address straddling stock fishery issues.

Institutional needs

- Large diversity of arrangements? for accessing transversal and economic data

Researcher Training

- Course on research methods in non-economic social sciences, for non-social scientists.

b) **Data and institutional gaps and priorities for data collection and integration**

Data collection

- Not all countries collect economic data on similar levels and in standardised formats/aggregation levels;
- Standardisation of procedures for data provision and certainly raising according to aggregation levels;
- Costs for collecting data on national level needs to be considered;
- Legal aggregation levels for providing the data;
- Compliance, enforcement, control: access to available information on control and enforcement (including management costs), differences between reported and actual catches, functions for incentive relationships, incentives / compliance, national differences between countries,
- Institutional and financial needs (costs) for providing, compiling, hosting and making the cross ICES economic information available are overarching the below needs…(access to data on regular basis, data calls, etc.)

Data integration

- Increase level of standardisation of formats and aggregation levels of data between legal unities

- Level of standardization of formats and aggregation levels of data between legal unities can be improved;
- Data standardization questions (commercial fisheries)
- Need for systematic / stable mapping or mapping protocols to define fishery units / métiers / fleets between the different data sets, groups, regions, … (InterCatch, ICES data calls, STECF AER, etc.)
- DCF segmentation too aggregated to be useful for straddling stock fisheries analysis / ICES segmentation driven by biological considerations → gaps and need to go beyond these: see DCF métier workshop (22–26 January 2018)

Institutional needs

- Consider legal restrictions on sampling personal sensitive and economic data – necessary to use current institutional set-up for sampling that type of data?
- Routines / protocols to facilitate integration whatever the institutional setup
- Common data sets for standardized analyses?

Researcher Training

- Bioeconomic Modelling
- Choice modelling

Issue 11 – Ecosystem services

a) **Available data and current practices using it**

Data collection

- Food web
- Control of the supply chain on quality

b) **Data and institutional gaps and priorities for data collection and integration**

Data collection

- Interdependence of final product along the food web with exogenous factor (regulating service)
- Data on e.g. carbon sequestration in order to be able to valuate
- Individual socio-economic data

Data integration

- Further development of valuation of cultural service and better understanding
- Marking of fishing gears into cost assumptions
- Diverse set of survey data from projects to be combined

c) **Systems, approaches and institutional structures to integrate and use new data**

Data collection

- integrate of climate change data/model (but be aware of double-counting)
- marine litter research?

Data integration

- social science integration (e.g. commercial fishing impact on coastal community)

Issue 12 – Area based, spatial management

a) **Available data and current practices using it**

Data collection

Transversal data (catch and effort)

- ICES InterCatch database
- ICES data calls for VMS data
- Not so clear what is available in non-EU countries, US, Canada

Economic data

- Harbour-based analysis of catch and effort data is possible, but otherwise, data is very limited
- Not so clear what is available in non-EU countries, US, Canada

Data integration

Multiple / non-standardised approaches to integrating the different data

Institutional needs

Large diversity of arrangements for accessing transversal and economic data

b) **Data and institutional gaps and priorities for data collection and integration**

Data collection

- Spatial economic (cost) data
- Generic gaps in economic information are also important for spatial management
- Importance of spatial bio-physical information

Data integration

- Develop shared / standardised products

<u>Institutional needs</u>

- Routines / protocols to facilitate integration whatever the institutional structures
- Common data sets for standardised analyses?