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Interim Report of the Working Group on the Biology and Life History of Crabs (WGCRA B)

8–10 November 2017

Brest, France



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H. C. Andersens Boulevard 44–46
DK-1553 Copenhagen V
Denmark
Telephone (+45) 33 38 67 00
Telefax (+45) 33 93 42 15
www.ices.dk
info@ices.dk

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Executive summary

The Working Group on the Biology and Life History of Crabs (WGCRA B) met at Ifremer, Brest, France, on 8–10 November 2017. The meeting was attended by 12 participants, representing 6 countries. This working group is focusing on several species, among others: the European lobster (*Homarus gammarus*), the edible crab (*Cancer pagurus*), the spider crab (*Maja brachydactylus*), the king crab (*Paralithodes camtschaticus*) and the snow crab (*Chionoecetes opilio*). For all of these species, each member country presented the available data and reported on the work needed to compile the data sets. Several countries have not collected the same level or quality of data. For some countries, information on the effort data are incomplete and for other countries, some of the data on the size structure are low too. There was an overall discussion on the current strategy of each country to suggest improvements of each national collection practices.

Furthermore, the status of each stock was presented and discussed among groups participants. These discussions help to assess the different methodologies employed to perform the assessment and the choices to communicate the results to stakeholders. The methodologies are mainly driven by the data available and the ongoing knowledge on the biology of species for each stock. In some instances, the quality of the effort data was low, therefore, no index based on abundance was developed. This approach is currently being applied by the Scottish or English fisheries. At the control areas, for the French data, the size structure data is only available for few fleet and do not permit to develop a size structure model. Where the size structure model is applied, the assessment gives reference points as F_{msy} , B_{msy} and B_{lim} and a classical diagnosis on the stock where it is indicated over, under or well exploited. For each Scottish and English stocks, this approach is performed and a diagnosis table sum up the results with associated colours (red, green and blue). The aim is to communicate clearly the data to several stakeholders (e.g. fishermen, managers, advisors? etc...). In this way, the assessment approach is closed to works on the fishes. Many discussions of the working group focus on the assumptions due the crustacean biology and the impact as a result of uncertainties. Some of the stocks, where time-series are modelled for different indices, it is important to have enough year of data to understand the dynamic of the stock and the impact of the fishing effort. It is important to consider that an index only based on abundance is not enough to make scientific assessments. Therefore, the possibilities of having several indexes available can help to bring a global understanding of the stock status. The main difficulty and the main discussion in the working group was on the way to propose reference points and to agree on relevant thresholds. The Canadian snow crab is often taken as example, as a way to propose management options after a synthesis of all the available results.

Three main ToRs were covered during the annual meeting. The first ToR is to propose the same grid of reading to communicate all stock status from a classical assessment approach or from an index time-series approach. The goal is to fix reference points and to communicate the process to stakeholders. National reports on ongoing work are available in Annexes to this report.

The work presented on the biology focused on heavy metal in the edible crab in the Norway region, on the lobster size maturity at the European level and on the new

knowledge on the Hyas Crab spp. in Newfoundland. Other presentations focused on disease of the snow crab and the way to understand the population dynamics.

1 Administrative details

Working Group name Working Group on the Biology and Life History of Crabs (WGCRA B)
Year of Appointment within current cycle 2017
Reporting year within current cycle (1, 2 or 3) 1
Chair(s) Martial Laurans, France
Meeting dates 8–10 November 2017
Meeting venue Brest, France

2 Terms of Reference

- a) Compile data on landings, discards, effort and catch rates (CPUE) and provide standardised CPUE, size frequency and research survey data for the important crab and lobster (*Homarus*) fisheries in the ICES area, and Atlantic Canada and Greenland. Maps will be produced to synthesise the data. One part of these data sets will be provided to the ICES Data Centre.
- b) Evaluate assessment of the status of crab and lobster (*Homarus* sp.) stocks including use of indicators, empirical assessment, analytical assessment in relation to data sources and data quality, development and suitability of reference points for management.
- c) Review the impact of climate drivers (temperature, ocean acidification, changes associated climate change and disease) on important crab and lobster species within the ICES, Atlantic Canada and West Greenland. Studying the effects resulting from changes in decreasing pH (defined as ocean acidification). Specific parts will be achieved to work on the different subjects.
- d) Review research and new knowledge on vital crab and lobster population biology parameters.

3 Summary of Work plan

Year 1	Annual standard outputs for a, b. Continue analysis for ToR d, e. Tentative plan for ToR c.
Year 2	Annual standard outputs for a, b. Continue analysis for ToR d, e. Complete evaluation of useful assessment methods to assess crab and lobster species in ICES areas. Complete request to ACOM and SCICOM (being both an assessment, advice and working group).
Year 3	Annual standard outputs for a, b. Combine analysis, research and report ToR d and e.

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

For the lobster, some studies are focused on the reproductive biology in France and Orkney. Looking at the results, it was proposed to compile at European level the difference or not on lobster biology from France to Norway including all the results. The aim is to write a paper where a global state of the art will be considered. During the year 2018, some video-conference meetings will be organised to work intersessionally on this subject.

In England, annual final results on the diagnosis of the different stocks are summarized in stock sheets. The stock assessment report format includes: Introduction, fishery description, assessment methods and uncertainty; followed by a 2-page section per region. The intention is to make this material available and understandable for a wider audience (not just fisheries scientists). We need to reflect on the way to use this approach for others stocks.

The ambition is to describe precisely the way or the standard method to use and to develop for abundance index from CPUE data. What type of data has to be used and what types of model are recommended to produce index which gives a good trend of a stock. Much work has been done in the SeaBass group. WGCRAb could look into the methodology that was selected.

5 Progress report on ToRs and workplan

ToR a): all the data on catch, effort or discard have been presented for each country with a sum up of the management rules in place. All these data allow to have a well view of the crab fisheries in ICES area. For the lobster, only the European fishery is considered for the moment. In future, it will be interesting to integrate in the group scientists from Canada or US for the American lobster. At this level, we can see the difference between the country to get data from their different fleets. For the vessels higher than 12 meters in European water, the logbooks are the main way to get all the data to describe the fishing activity. The situation is not the same for the vessels less 12 meters where data are good in some countries using national fishing sheet or using specific sampling to get activity data. Nevertheless, in other countries only total landings are available without any other information on vessel activities. In this country, there are some ideas to put in place to get

the data organised in a template that is comparable. The main data on the stocks assessed are updated in excel sheets.

How to improve the data available to follow the stocks. In Isle of Man, an on-board camera has been developed in order to take specific pictures of individual caught. The aim is to estimate the size structure developing a software which could analysed each pictures. The first results are quite good and the work is always in progress. In Scotland, there are ideas to get the daily data from the small coastal vessels in order to have enough quality data to calculate CPUE.

Depending on the data sets available, the estimation of CPUE are not always possible. To develop such index, it is necessary to get effort data. As example, in France, Greenland, Newfoundland or Norway, there are enough good quality data to estimate time-series. For the other countries, the effort data available are too poor or absent. For these countries, discussions or projects are in place as in Scotland in order to progress to get effort data.

Some questions touched upon the way to develop abundance index from the CPUE data available.

ToR b): when assessments are done, the results are presented with all the discussions on the assumptions and the data used. Scotland and UK used a size structure model. There are two main assumptions: first, considering a stable recruitment and a size structure data which is an average over 3 years. This method is applied for lobster and edible crab in national management areas. Using this method, the assessment supply reference point as F_{msy} .

For the other countries, times series of index are only used to describe the fishery. As in Newfoundland, several times series (from trawl or trap survey, observers on board) are available to get the more robust information on the stock. In this situation, it is really the trend of the series, which are considered to propose a diagnosis on the stock. After that, the managers adapt the values of the quota.

For some stocks, we need to work in order to propose an assessment where the data of all countries are considered. At the moment, only national assessment are performed, except for the lobster in the Granville Baie area, where some dedicated work is done. From 2018, an assessment at the Western Channel level could be produced for the edible crab. It will be a first stage to continue in the direction to have more structured assessments.

ToR c): the main fisheries data have shown some results is the link between the biomass fluctuations of the stock and the environmental conditions is the snow crab around Newfoundland. The sea bottom temperature seems to influence recruitment success of this specie. For the other fisheries, there are few studies conducted that tend to suggest that some trends may be impacted by environmental fluctuations. The increase of the abundance of lobster in France or the decrease of snow crab in some fjord in Greenland need to be analyse considering the environmental conditions. Except for Newfoundland, where recruitment surveys are in place, elsewhere such data need to be implemented to test if the climate change influence the biomass of the other stocks. In the Barents Sea, the recent presence of a snow crab stock have raised several questions on environmental condition to provide further explanations of the presence of this specie.

ToR d) several areas of work are in progress on the species targeted by fisherman. It is the case of the lobster with results on the reproductive biology or on the ecology. For the snow crab, a study focuses on the spatial distribution of the bitter crab disease and the impact of the environmental fluctuations. The cadmium effects are often described as a problem for the edible crab due to the level reaches in some individuals. Currently, a Phd student is undertaking research to understand if some elements (either from the environment or from anthropologic sources) can explain the cadmium levels observed in the specie. Data from trawl surveys conducted in the Barents sea to collect information on the distribution of the snow crab, some works is in progress to understand the quick increase of the biomass of this stock.

6 Revisions to the work plan and justification

No change to the current ToRs. There are ongoing discussions regarding the way to integrate the data in the ICES database.

7 Next meetings

Next meeting will take place on Jersey Island, on 6–8 November 2018.

Annex 1: List of participants

NAME	COUNTRY	EMAIL
AnnDorte Burmeister	Greenland	anndorte@natur.gl
Darrell Mulloway	Newfoundland (DFO)	darrell.mullowney@dfo-mpo.gc.ca
Ann Merete Hjelset	Norway (IMR)	ann.merete.hjelset@imr.no
Carlos Mesquita	Scotland (Marine Lab)	c.mesquita@marlab.ac.uk
Jack Emmerson	England (University Bangor)	j.emmerson@bangor.ac.uk
Matthew Coleman	Orkney Sustainable Fisheries	matt@orkneysustainablefisheries.co.uk
Ann Lisbeth Agnalt	Norway (IMR)	ann-lisbeth.agnalt@imr.no
Paul Chambers	Jersey	P.Chambers@gov.je
Rosslyn Mcintyre	England (Cefas)	rosslyn.mcintyre@cefas.co.uk
Laurans Martial	France (Ifremer)	Martial.laurans@ifremer.fr
Jan Sundet	Norway (IMR)	jan.h.sundet@hi.no
Martin Wiech	(NIFES, Bergen, Norvège)	Martin.Wiech@hi.no

Annex 2: Agenda

Tuesday, November the 7th

09.30-13.00 **TOR a.** Compiling data on landings, discards, effort and catch- rates (CPUE) and provide standardized CPUE, size frequency and research survey data for the important crab and lobster fisheries in the ICES area.

Lobster - Presentations

Martial Laurans (France), Carlos Mesquita (Scotland), Paul Chambers (Jersey)

Agnalt Ann-Lisabeth (Norway), New regulations in the Norway lobster fishery, includes registration of all fishers on the net (recreational and commercial).

14.00 – 18:00 **TOR a.** Continued **Crab – presentations**

Snow Crab

Ann Dorte Burmeister (Groenland)

Mullowney Darrell (Newfoundland)

Hjelset Ann Merete Norway in Barent Sea ?

King Crab

Jan Sundet

Wednesday November the 8

09.00 – 13.00 **TOR a cont.**

Visio Conference – presentations

ROSSLYN (CEFAS), Lobster and Edible Crab

Jack EMMERSON, Innovation in Data-capture Technique for Static Gear Fisheries

Matthew Coleman (Spawning potential of Lobster in Orkney Island)

14.00- 16.00

TOR a. Compiling data on landings, discards, effort and catch- rates (CPUE) and provide standardized CPUE, size frequency and research survey data for the important crab and lobster fisheries in the ICES area.

Edible crab

Hjelset Ann Merete (Norway), Carlos Mesquita (Scotland), Martial Laurans (France)

Spider crab

Martial Laurans (France)

TOR b and d. Evaluate assessments of the status of crab stocks, identify gaps in assessment programs, and review the application of biological and management. Review the impact of climate divers on important crab and lobster species within the ICES,

Mullowney Darrell, Bitter Crab Disease in Newfoundland and Labrador Snow Crab: Efficacy of visual monitoring and anticipated impacts under ocean warming (ToR C). Mullowney Darrell

Martial Laurans, What about our French Super Females

Discussion around the biology of the European Lobster. How we can make an overall review of the size at maturity along its distribution range ?

Discussion around model to develop abundance indice.

Thursday, November the 3

09.00 – 13.00

TOR b and d. Evaluate assessments of the status of crab stocks, identify gaps in assessment programs, and review the application of biological and management. Review the impact of climate divers on important crab and lobster species within the ICES,

Mullowney Darrell, An alternative approach to reference points: Developing a precautionary approach for Newfoundland and Labrador snow crab

Martial Laurans, Reflection around an european networks for recruitment

11.00 – 13.00 **TOR e.** Review research and new knowledge of vital crab population biology parameter.

Mullowney Darrell, Development of a monitoring program for Hyas Crab spp. in Newfoundland

Martin (Cadmium Level of edible crab in Norway water)