

Joint NWWAC/NSAC/MAC Workshop on Brown Crab

Paris / Zoom, 16 May 2023

REPORT



WELCOME & INTRODUCTIONS

Norah Parke, Chair of the NWWAC/NSAC/MAC Focus Group on Brown Crab

Norah Parke (hereafter, the Chair) welcomed all participants to the joint NWWAC/NSAC/MAC workshop on brown crab management. She emphasised that the management of brown crab stocks and fisheries is an important subject and there is much work to be done in this respect.

The workshop was joined by a representative from the EU Commission, for which the Chair was grateful, particularly as input from the Commission is key for improving policy. There was also a strong presence from the brown crab sector. The Chair was pleased to welcome UK and Norwegian representatives to the meeting since collaboration between the EU and UK is essential for the co-management of the stock. She commenced a roundtable of introductions and went on to explain the workshop proceedings, starting with presentations of several expert speakers. Then, members were to be divided into smaller breakout groups for more in-depth discussions, facilitated by the NWWAC Secretariat, Mo Mathies and Matilde Vallerani.

To set the scene, the Chair introduced a short film developed by McBride Fishing Company Ltd. It showcased the daily operations of the brown crab fishery and gave an insight into all stages of the supply-chain – from pot fishing on Vivier vessels to unloading catches and to packaging live brown crab for airfreight. The Chair thanked McBride Fishing Company Ltd. for sharing the film and highlighted that large quantities of crab are also caught by small scale inshore vessels (day boats).

BROWN CRAB FISHERIES IN THE CONTEXT OF EU-UK SHARED NON-QUOTA STOCKS

Paulo Vasconcelos, MARE C5

Paulo Vasconcelos presented the findings of a [STECF report](#) that was published in April 2023 on non-quota stocks (NQS). He focussed on the overarching findings and then concentrated on those pertaining to brown crab. The main objectives of the report were to present data and information on the spatial distribution of fishing effort, landings weight, and the respective value of the 20 most important NQS; to evaluate the quality of data on NQS from different sources, and to identify issues and to support stock assessment and fishery management of NQS.



Average landings of NQS across all EU Member States from 2017-2019 demonstrated a total landings weight of 291.1 thousand tonnes, and a landings value of 539.2 million EUR. France, Denmark, and the Netherlands landed the most crab by weight, while France, the Netherlands, and Ireland landed the most crab by value, respectively. Taking both weight and value into account, France had the greatest share of EU landings, followed by Denmark, and then the Netherlands.

Brown crab ranked seventh in the list of most important NQS by landings weight (10.045 thousand tonnes) and ranked fourth by value (25.8 million EUR).

Across six sea basins (North Sea, West of Scotland, Irish Sea, Celtic Sea, Eastern Channel, and Western Channel), there was a consistent decline in landings of brown crab between 2016 – 2020 of approximately 10 thousand tonnes. Landings vary over the course of the year and are typically highest in Q3 (July-September) in all regions.

By sea basin, the West of Scotland, Celtic Sea, and North Sea represented the three most important regions for both brown crab landings weight and value. Ireland, France, and the Netherlands were the most important Member States in terms of landings.

The main fleets and fishing gears targeting brown crab were Ireland and France, with both fleets supporting a range of vessel sizes, from small to large scale. The main gear used in the fishery is pots and traps, but with drift nets, fixed nets, and beam trawls catching crab as bycatch.

Regionally, the West of Scotland supported the highest landings by weight and value, followed by the Celtic Seas, North Sea and finally, the Irish Sea. Apart from the North Sea, all regions have experienced a decline in landings over the years since 2016-2018. The West of Scotland demonstrated a recovery in 2021, but this was not mirrored across other regions. Conversely, in the North Sea, landings remained relatively high between 2019-2021. The majority of landings were taken in Q3, however, in the North Sea, landings were greatest in Q4.

Vasconcelos concluded by stating that he hoped his presentation provided useful background context on the condition and status of the fishery in the context of NQS.

Members highlighted the data gaps around fishing effort and the importance of obtaining this information to help expound the potential drivers of landings declines, which in turn can support the development of management measures. Vasconcelos agreed and said that while the exact drivers of declines are not known, a combination of overexploitation, climate change, and the prevalence of disease may be having an effect.

REVIEW OF ACRUNET OUTCOMES AND DISCUSSION ON COMMUNICATION TOOLS

Norah Parke, Killybegs Fishermen's Organisation (KFO)

Norah Parke provided an overview of the [Atlantic Crab Resource Users Transnational Network \(ACRUNET\)](#) project. She explained that the project ran from 2010-2014.

The project was first established by brown crab fishermen in Ireland, the UK, and France, as an informal forum to address challenges facing the industry, such as increasing fuel prices, diminishing demand on European markets, competition from cheaper non-EU imports, and quality issues. This led the industry in the UK, Ireland, and France to take a transnational approach to these issues and to attempt to address them through dialogue and co-operation. In taking this initiative, albeit on an ad-hoc basis, it was acknowledged that a lack of trust and competition between countries was further hampering the economic viability of the sector in the face of exogenous challenges. These factors led to the development of ACRUNET, which provided a formalised transnational approach to catching, transport, processing, and selling of brown crab, across 15 project partners spread across five Atlantic Area Member States.

The aim of the project was to ensure and sustain the economic viability of the European brown crab industry through transnational cooperation through the following objectives:

1. Form a transnational industry network to identify and address factors to improve brown crab competitiveness through cooperation, communication, and innovation.
2. Build an industry-science interface with an agreed approach for assessment and monitoring that feeds into management and policy at national, regional and EU level.
3. Develop and encourage the widespread adoption of an accredited European brown crab standard to deliver a responsibly caught, quality product to the marketplace.
4. Increase the economic viability of the entire sector through analysis of the brown crab production chain and improve competitive advantage through the identification of key cost points.
5. Enhance competitiveness through the introduction of innovative practices and products informed by the production chain analysis.
6. Increase the market presence and visibility of brown crab through focused European marketing and consumer education.

Deliverables and outcomes of the collaboration included a series of reports characterising the exploitation status, stock status, and latent capacity levels of the brown crab fishery, an accredited European brown crab standard and handling guide translated into four languages, and promotional materials such as flyers, factsheets, and newsletters.

She concluded that the ACRUNET project could be used as a model for future work, or alternative models could be developed. This would form part of the workshop's discussions.

A member highlighted the value of the promotional materials and suggested sharing them with active fishers through their national bodies. Parke agreed that the materials should not go to waste and that it would be possible to share them widely.



COEXISTENCE WITH OFFSHORE WIND FARM DEVELOPMENTS

Marcel Rozemeijer, Wageningen Marine Research

Marcel Rozemeijer shared a presentation on developing multi-use of passive fisheries in offshore wind farms in the Netherlands. He indicated that a multi-use approach is being explored by the Dutch government as a possible solution to an increasingly crowded North Sea.

He compared and contrasted the old and new policy settings for offshore wind in the Netherlands. Under the old regime, wind farms were not designed for shared use, featuring small turbines and minimal spacing. Rod fishing was first permitted in 2018 with passage of vessels up to 24m from turbines and experiments with passive fishing gear are only permitted with permission of the operator. Under the new regime, while wind farms are still not designed for shared use, the turbines are larger with

more space between them. Additionally, the government sets the rules for co-use activities without the need for permissions from the operator.

The Ministry of Agriculture, Nature and Food Quality in collaboration with Wageningen Marine Research have commenced four research projects on multi-use areas to better understand the practical limitations and potential opportunities for co-use of wind farms.

Research has thus far evaluated the risks, such as anchor/string mobilisation in adverse weather conditions – bruce anchors pose a low risk of mobilisation – and damage to cabling from anchors – this was found to be minimal. Research has also investigated brown and velvet crab catch per unit effort (CPUE) inside offshore wind farms, which was found to be low.

Rozemeijer reflected that the process of controlling offshore wind in the Netherlands has been refined over time. Operators now have a reduced influence while the government has gained increased influence, thus allowing scientific research to be conducted more readily. He concluded that the Dutch are pioneering a way forward for the development of multi-use regulations, and that there will be significant developments in this space in times to come.



UK EXPERIENCES WITH COEXISTENCE

Mike Roach, National Federation of Fishermen's Organisations (NFFO)

Mike Roach discussed a UK example of coexistence between brown crab fisheries and offshore wind developments. He presented the scale of spatial squeeze on fisheries in northeastern England through a variety of industries.

Roach presented concerns from the static line fishing industry with respect to coexistence of fisheries with offshore wind farms. He noted that although fishing is permitted within wind farms in the UK, this is not always feasible due to placement of turbines and cabling. Roach highlighted that a long-term strategy is needed for government, industry and fisheries to coexist successfully.

Reflecting on barriers and enablers to coexistence, Roach explained that these are often the same and include factors such as site design, environmental conditions, gear type and engagement from developers. He commented that coexistence is often driven by necessity and the need to maintain a productive fishing ground as seen in the Westermost Rough wind farm.

Roach went on to present a [study carried out in Westermost Rough](#), by the Holderness Fishing Industry Group alongside Ørsted. The study examined four field sites: two treatment sites, one within the wind farm development with the other across the export cable, and two control sites outside of the development. Strings of 30 lobster pots were laid down and every animal caught was measured during 4 sampling periods over 6 years. Results showed that brown crab catch per unit effort (CPUE) varied between years however, landing per unit effort (LPUE) varied very little across sites and years. He noted that the size structure of the catch was challenging to understand due to a closure effect observed in the array during 2015, a change in minimum landing size and a significant storm surge in 2018. This highlighted the difficulties in undertaking studies in the field due to factors such as environmental conditions and changes in policy.

Roach identified several caveats to consider when interpreting the results of this study. Most significantly, the survey design focused on lobster as this was the predominant fishery in the area. He highlighted that the study is site specific, season specific and species specific and it should not be applied to every offshore wind development's impact assessment. He went on to compare the Westermost Rough array with the Humber Gateway which is situated 10 miles to the south. He noted that coexistence of static gear fishing is possible within the Westermost Rough array due to the spacing and layout of the turbines, but within the Humber Gateway, turbines are spaced closer together and, when combined with strong tidal conditions, this limits fishing ability.



Looking to the future, Roach discussed the High Wind Project and the implementation of floating wind turbines. He noted that proposed anchor and mooring chains are likely to prevent fishing and navigation through the sites. He also noted that the ecological impacts of these turbines are poorly understood.

To close, Roach reiterated that coexistence is site and fishery specific. He highlighted the need for an improved evidence base and identification of key fishing areas to enable full integration into Marine Spatial Planning. He added the first priority should be to avoid and minimise overlap, but where this is not possible, to mitigate and plan for coexistence in wind developments.

POTENTIAL IMPACTS OF ELECTROMAGNETIC FIELDS (EMF) ON BROWN CRAB

Dr Kevin Scott, St Abbs Marine Station

Dr Kevin Scott began by noting that although offshore wind is currently responsible for a small proportion of the renewable energy produced in Scotland, it is rapidly rising. When considering wind

developments in relation to brown crab fisheries at scale, there is significant overlap. His presentation centred on the impact of electromagnetic fields (EMF) from cabling on brown crab and its inclusion in environmental impact assessments (EIA).

Scott went on to explain that there are three main types of marine renewable energy devices (MREDs) used throughout the UK: wind, tidal and wave. Each of these devices has subsea power cables (inter-array cables, export cables etc) and any cables that have electricity running through them produce electromagnetic fields (EMF). Despite cable insulation to prevent electric field leakage, magnetic field leakage persists and when the magnetic field from one cable interacts with another this creates an 'induced EMF'. Scott highlighted that, with the current quantity of cabling, this induced field can impact the whole area surrounding a deployment. Scott considered that many cables are buried where possible and most cables are buried several metres below the seabed, where practical. However, an increased EMF can still be detected up to 10 metres away from the 'average' cable (with changes in EMF depending on the cable type). This means the residual EMF can be passed through the seabed, affecting benthic species. He noted that these issues are also prevalent in floating offshore wind farms, which may exacerbate impacts on marine life by bringing cabling into the water column.



Scott went on to critique the proposed mitigation approach to EMF using the EIA for an offshore wind development. Using the proposed EIA, impacts on benthic species such as brown crab are deemed to be 'negligible' and no mitigation measures are stated, furthermore, proposals show no monitoring is required despite knowledge gaps.

Scott noted there are problems with EMF research, including a lack of understanding about how organisms detect and are affected by EMF and variability of EMF in the field. He went on to say that, to date, there has been a *'lack of productive collaboration between researchers and energy companies.'* However, he noted this is beginning to change and that energy companies are taking the results of pilot research into account, and funding further research to inform their practice.

He noted that it is difficult to recreate EMF of the same size, shape and strength as experienced at sea which makes research difficult. Additionally, it is challenging to understand exactly how strong the fields generated by sub-sea cables are. Researchers typically use large strengths when conducting experiments while developers predict these to be low, creating a discrepancy between research reports and those from studies at sea. He explained how EMF is generated in the lab to replicate measurements recorded at sea. He noted that when studying how EMF affects species such as brown crab, there is a need to consider a variety of impacts, including sensory, behavioural and physiological implications.

Scott presented a study suggesting that brown crab is attracted to EMF at the expense of feeding, sleep and mating behaviours. These behavioural changes have the potential to have an impact at the population level. He stressed that responses vary between species and vary with EMF strength. Further research has shown that EMF also affects egg and larval development, including changes in size, physical deformities and lowered swimming fitness.

Scott wrapped up his presentation by highlighting that: (i) more data are needed in the impacts of EMF on species, (ii) multiple studies need to be done because impacts are site-specific, and (iii) collaboration on a 'standard' approach to future EMF research will help progress the area of research further.

Members highlighted that there are many data-gaps across the whole ecosystem. They agreed that the group should acknowledge the data-gaps presented this morning. Members also critiqued the lack of a precautionary approach to renewable energy deployment considering development has increased rapidly in response to the 'climate crisis.' Mike Roach shared that a review by Cefas found that of over 3000 peer-reviewed publications of offshore wind and fisheries, only 200 considered field research and evidence alongside computer and data modelling. Furthermore, due to knowledge gaps, EIAs often return 'minor' or 'negligible' results when considering potential impact on species and fisheries. It was noted that this is a barrier to securing funding for research to monitor and evaluate impacts of development as EIAs do not highlight the need for further monitoring.

THE TRADE OF BROWN CRAB BETWEEN THE NETHERLANDS AND CHINA, INCLUDING BILATERAL AGREEMENT AND RECOGNITION OF HEALTH CERTIFICATES

Mike Turenhout, Visfederatie

Mike Turenhout presented the processes involved in developing a bilateral agreement with China for the trade of live brown crab. He started by providing an overview of the history of the live brown crab trade agreement, explaining that the market has been open to China since 2018 following requests from the industry. Following talks between the Netherlands ministry, the competent authority and the Chinese government, the Netherlands provided further information to China on their legal framework via a questionnaire and a field visit to China to discuss the legal system of the trade. This was followed by a visit to the Netherlands to view facilities and understand the legislative and trade procedures. Following discussion between the Chinese Delegation and Trade Authority in the Netherlands, agreements were made on bilateral trade between the Netherlands and China.

Turenhout explained the processes behind the development of a bilateral agreement which was created between the governments of the Netherlands and China. The development of a health certificate was an important factor for the export, to guarantee food safety. A physical control was required including monitoring of heavy metals and microbiology of the product and the competent authority was needed to finalise the certification and monitoring plan.



The first step of the health certificate required companies wanting to export to China to register to trade in live aquatic animals. Companies are required to meet EU-legislation and become an EU-approved company. Together with the competent authorities, a monitoring plan was designed and introduced requiring the product to undergo checks for microbiology and heavy metals.

In line with this monitoring plan, Turenhout explained the process for testing the product. An initial study was undertaken where crabs are collected, and brown and white meat was extracted. The meat was then tested for four heavy metals: cadmium, arsenic, mercury and lead, as well as presence of

pathogenic microorganisms. In line with the EU monitoring plan, testing is carried out on 20 crabs per quarter. The monitoring plan was an important part of the agreement because it meant that crab meat did not have to be tested retrospectively for heavy metals which is a time-consuming process. Instead, if tests are above a threshold, the Netherlands government has to discuss this with Chinese regulators to develop next steps to stop the export of crabs with high loads of heavy metals or pathogens.

To be eligible for export, crabs must be collected within a set number of ICES areas (within Dutch waters, crabs must be caught within ICES area 27.4b). Turenhout explained that a proposal to increase the number of ICES areas eligible for export did not proceed due to the Covid-19 outbreak, however a new proposal for increased ICES areas for future trade is currently in progress.



HEAVY METAL CONTAMINANTS AND THEIR IMPACTS ON CRAB EXPORTS

Bernard O'Donovan, Sea Fisheries Protection Authority (SFPA)

Bernard O'Donovan explained that the SFPA is the national competent authority for seafood certification for import and export in Ireland. He noted that the UK, Ireland, Norway and France are the top brown crab producing countries and, together, land 94% of EU brown crab landings. EU brown crab exports are split roughly 50/50 between live crab and processed crab products, although crab product exports show recent decline. In Ireland, production has increased over 2020-2022. The main markets for Irish crab are intra-EU (France and Spain), and global exports to Vietnam, Korea, China, Japan and Canada.

He explained that due to crab feeding and water filtering behaviours, heavy metals can bioaccumulate in these organisms. Heavy metals occur naturally in the environment, but concentrations vary according to the specific environment and factors such as agricultural run-off. The Chinese regulation for brown crab export is a standard known as GB 2762 – first published in 2017, which has since been revised and renamed to GB 2762_22. This standard presents a safe threshold of heavy metals that is permitted in the export of brown crab products and is broadly based on the EU standard for heavy metals.

O'Donovan went on to explore the heavy metal regulations in the EU and China. The revision of the 1881 EU regulation, due in May 2023, aims to harmonise terminology across standards, however, there

is no change to the maximum levels of contaminants which remain at 0.5 mg per kg of crab meat. He noted that there is no arsenic limit for crab in EU legislation at present, but this may change as proposals for limits of fish and fisheries products are being considered.

He went on to compare this to Chinese regulations surrounding cadmium levels for the export of EU crab to China. The revised Chinese standard for 2022 increased the acceptable level for cadmium in crab from 0.5 mg/kg to 3 mg/kg and tested all parts of the crab product, including the liver and pancreas, where most bioaccumulation happens. This is a significant increase and due to come into effect on 30 June 2023, which may cause export challenges. For arsenic, the previous standard remains at 0.1 mg/kg.

He then summarised the regulations for arsenic and cadmium. EU standards for arsenic in crab do not exist, but Chinese regulations have a limit of 0.1 mg/kg in white meat only. For cadmium, EU legislation remains at 0.5 mg/kg for white meat, however for Chinese standards this has been increased to 3 mg/kg and applies to the whole crab product.

Members expressed concern that the increase of a safe limit to 3mg/kg of cadmium and the inclusion of the pancreas in testing will affect the amount of viable export, especially considering differing interpretations regarding testing of white meat only or all parts of the crab product between the EU and China. O'Donovan shared that it is possible that the pancreas may be excluded from future Cadmium testing matrices in China but noted that this has not been confirmed in writing. He added that variations in the implementation of food safety import controls across geographically diverse Chinese border control posts could also be a challenge. Further questions were raised on when the testing for Cadmium will be carried out within Ireland and the EU. O'Donovan stressed the need for a single government position following discussion with the industry. This will then be confirmed with Chinese authorities so that continued exports can be ensured. The audience also requested additional thoughts on regulatory issues with arsenic in crustaceans. O'Donovan explained that, to date, he is not aware of any issues surrounding regulation but noted there may be concerns from the industry with changing regulations.

ROUNDTABLE DISCUSSIONS IN BREAKOUT GROUPS

The participants were divided into three groups (one group online, two groups in the meeting room in Paris) and were asked to reflect on the following topics:

1. **Management** – How can brown crab fisheries management be improved?
2. **Markets** – What are the main market challenges facing brown crab fisheries, and possible solutions and/or recommendations?
3. **Stock issues** – How can stock issues be addressed (i.e. falling crab populations, overfishing, disease)?
4. **Fishing issues** – How can the fishing sector remain resilient in the face of intensifying pressures (i.e. quota reductions, displacement from offshore renewable energy development, increased overheads)?



PLENARY SESSIONS ON RESULTS FROM BREAKOUT SESSIONS

Group 1 (online)

The group agreed that decisions informing brown crab fisheries management should be based on reliable science and baselines, to establish the size and composition of the population supporting the fishery. This would help to facilitate the development of sustainable extraction and harvest control measures that the stock can sustain. Some attendees also felt it would be important to take into account the migration patterns of the species. There was broad consensus that there is a recruitment problem facing the fishing industry as a whole, which is the case across many states but exemplified in Norway. Additional fisheries management considerations raised by the group included minimum landing size, legislation for catching soft or moulting crab, the use of crab for whelk bait, the impacts of recreational fishing, and latent capacity within the sector.

In relation to markets and certification, it was widely felt that sustainability is strongly aligned with the good optimisation of markets. There was agreement that sensible approaches to biological sustainability and good stock management are consistent with the demands of the marketplace. The Fishery Improvement Project (FIP) process was regarded as very important, especially where there is a requirement for the refinement and development of management measures in the fishery. Pertaining to certification, some participants also emphasised the importance of establishing thorough guidance on heavy metals to export markets. It was also felt that the mixing of edible crab parts could lead to elevated levels of heavy metals that could exceed the regulations that are planned to come into effect in 2023.



On stock issues, namely declining crab populations and landings, the group emphasised that there need to be improvements in scientific knowledge around brown crab. There was reference to the ICES Working Group on crab, where a lot of work is taking place to understand landings declines. Several key issues were identified that may have contributed to the falling population. These were increased fishing effort and the open-access nature of the fishery, climate change, new and emerging disease. Overall, it was highlighted that the science and regulation underpinning brown crab fisheries is severely lacking.

The group considered that the growth of offshore renewable energy developments will become increasingly problematic for fisheries. In reality, coexistence between fishing and offshore wind farms is rarely possible and even when coexistence might be indicated, the insurance position will not make this viable. Ultimately, this will lead to the exclusion of fishing activities. There was an appetite for clear, government guidance on whether or not offshore wind farms coexistence with other marine

stakeholders, and if not, adequate fisheries compensation should be considered as part of that assessment.

The group also briefly discussed the effects of EMF on crab species and catches per unit effort, and the impacts of pollutants from salmon farming. The take-home message from the discussions by Group 1 was that there is a lot of research to be done in relation to the management of brown crab.

Group 2

Group 2 did not support the dissociation between coastal and offshore areas in brown crab management but recognised that there is a need for harmonised measures between countries. Examples of possible measures included the prohibition of parlour pots for brown crab, an obligation to report fishing effort, increase the minimum landing size to 15 cm for the first six months of the year (during the breeding season), and the development of precise stock assessment areas.



Regarding the market, the group once again supported the harmonisation of rules across the EU to ensure clarity and a level playing field. This would contribute to market stability among producer countries and aid the implementation of cross-border scientific projects such as ACRUNET. The group also touched on health certificates and agreed that there is a need to harmonise sanitary test certificates and analysis at an EU level.

On fisheries issues, participants recommended that there would not be a targeted brown crab fishery to provide whelk bait with only limited use of such bait, and emphasis on alternatives such as spider crab.

Concerning the drivers of stock declines, it was highlighted that climate change may bring new predators for brown crab such as octopus, as well as parasitic diseases, which may impact spawning and recruitment. The group did not believe fishing to be the sole cause of stock declines because fishing effort has remained constant, providing little evidence to suggest overfishing.

On the competition for marine space with offshore renewables, the group felt that coexistence should be possible, however, long-term monitoring and research are needed to quantify the impacts on stocks and fisheries as this sector is only just emerging, albeit expanding at a fast pace.

Group 3

Group 3 reflected on new management approaches for crab and lobster that are underway in England. A Fisheries Management Plan (FMP) is being crafted to establish management measures based on size, sex, and seasonality, although this work is ongoing and so the content of the FMP is not yet known. The group also discussed potential quota for brown crab and quantifying fishing effort (days at sea, gear worked). The main issue with setting quota is the requirement for a Total Allowable Catch (TAC), for which there is a lack of scientific evidence across the board when it comes to understanding stock boundaries and sizes, which are essential for developing a TAC. Thus, it was felt that there are vast data gaps and a need to prioritise areas for data collection. It was highlighted that analysing landings data without effort data is meaningless, particularly for an open access fishery like brown crab.



With regards to the role of the market, there was agreement that markets are intrinsically linked to management. Historically, market drivers managed fishing effort but with the advance of technology and the rise in larger Vivier vessels, the fishery has expanded from a seasonal fishery to a 12-month fishery in most localities. There is also market demand for poor quality crab catches for whelk bait, on top of existing demands for lesser quality crab at certain times of year when demand is relatively high and supply is low, especially for the live crab market. A prime example of a market driver is the Chinese market, which, when opened to brown crab, caused fishing effort to rise dramatically, evidencing that the two are intrinsically linked. Participants supported a more holistic approach to the stock that takes account of the market's influence. On health certificates, the administrative and economic burden with regard to veterinary availability for inspection of live catch, particularly for the Irish industry, was highlighted as an issue.

With regards to falling crab populations, key contributors to the declines were categorised, namely, fishing effort, climate change effects, pathogens and disease. Additionally, the fact that stock assessments are not routinely carried out hinders the accurate monitoring of populations. Significant further investigation is needed on crab ecology and habitat preference and consideration of the fact that typical crab habitat tends to act as safe fishing zones for static gears, as it is not fishable by mobile gears. It highlights that much of the spatial information derived from fisheries dependent data is influenced by other sectors.

The grading and conditioning of hauled crabs would benefit from unique methods beyond relying on fisher experience. It needs to be quantifiable to prevent the landing of lesser quality crab. The expected climate change factors that will affect crab populations were listed as changes in temperature, salinity, CO₂ concentration, stock distributions and boundaries due to ocean warming, possible changes to oceanic currents affecting larval phases, and mismatches in the timing of important life history stages (particularly larvae and plankton) with food source availability and environmental conditions. There could also be an increased likelihood of disease outbreaks and influxes of invasive species with climate change.

On crustacean disease and heavy metal accumulation specifically, there is now more monitoring and reporting than ever before because fishermen are more aware of the signs and symptoms.

The group agreed that there is a lack of research about the ecological effects of offshore renewable energy developments, with many unquantified assumptions about the impacts on brown crab. These need to be evidenced and quantified at a population level. The quoted potential benefits of offshore wind, namely spill-over effects, stepping-stone effects, and biodiversity increases are poorly evidenced, with limited information on what they mean for brown crab populations. The costs and benefits of ecosystem engineering within offshore renewable energy areas to fisheries were also discussed, as well as the issue of displacement to both fishing and navigation depending on the rules in different Member States. The myriad of insurance and access issues present additional burdens for fishermen. It was also felt that most offshore wind farms are developed using a site-by-site approach, leading to poor cumulative decision-making and regional planning across the North Sea. The group agreed that quantifying displacement and determining a metric for comparison between wind farms sites, is key.

Finally, it was felt that the brown crab fishery is not resilient, due to a lack of adaptability and opportunity for change. The industry is facing recruitment issues and there is a negative public perception of fishing jobs that is also feeding into the recruitment problem. More needs to be made of the positive stories associated with crab fishing, such as low discard mortality, the low ecological footprint of the fishery, and potential nature enhancement effects.



PLENARY SUMMARY NEXT STEPS

Norah Parke, Chair of the NWWAC/NSAC/MAC Focus Group on Brown Crab

The Chair summarised the emerging themes relating to brown crab management that arose from the workshop discussions. She reported that there is a general feeling that landings are increasing, however, she highlighted that this does not mean that the stock is growing, because effort is also increasing, she noted that there is no data to evidence an increase in effort.

The existing management measures are not sufficient to ensure a sustainable brown crab fishery. It is an open fishery and so the science underpinning management decisions must be robust and widely available in order to support all management measures. Currently, some vessels are fishing to establish a track record in the belief that quotas might be introduced. There is an urgent need to fill the existing data gaps, such as the number of pots being fished, the number of potential new entrants, and the number of days at sea. To ensure that only the best quality crab is harvested, a uniquely applicable approach for grading is needed.

Regarding markets, the Chair highlighted that highly developed and increasing Asian markets for brown crab have created a strong financial driver of fishing effort. Quality efforts are undermined by high prices that are available during times when poor quality crab is landed due to scarcity. One of the key challenges with the Asian markets is the issue around health certificates, which is not faced in EU markets. This has not deterred the development of increasing exports but may lead to additional uncertainty and potential financial burden. A holistic approach is needed to reconcile management and market drivers.

On the effects of climate change, impacts are starting to be seen, though research is needed to establish if there is an actual decline in the stock or if northward migration is the main driver of changes in catch. Up-to-date information on brown crab spatial distribution is urgently needed.

The offshore renewable energy sector is growing at an unprecedented rate. The industry is extremely concerned about the spatial spread of the sector and feels many assumptions are being made regarding the impacts of these developments on the environment. It is essential that the same rules are observed when carrying out Environmental Impact Assessments within the offshore renewable energy industry, in line with the Habitats and Birds Directive, for example. Data gaps pertaining to the impacts offshore wind energy developments on brown crab need to be urgently filled, such as the effects of EMF on crab at all life stages.

CLOSE

Mo Mathies, NWWAC Executive Secretary

Mo Mathies thanked the Chair and all participants for their contributions. She explained that the workshop results will be discussed within the NWWAC/NSAC/MAC Focus Group on Brown Crab in order to develop recommendations to the Commission.

PARTICIPANTS

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Beshlie	Pool	South Devon and Channel Shellfishermen Ltd.
Nikolaus	Probst	Thünen-Institute
Erwan	Quemeneur	CDPMEM 29
Mike	Roach	National Federation of Fishermen's Organisations
Anna	Rokicka	Polish Association of Fish Processors
Marcel	Rozemeijer	Wageningen Marine Research
Kevin	Scott	St Abb's Marine Station
Liam	Strachan	ATU Galway
Oliver	Tully	Marine Institute
Mike	Turenhout	Visfederatie
Paulo	Vasconcelos	DG MARE
Ilja	Voorsmit	Ministry of agriculture Nature and foodquality
John	Woodlock	Irish Seal Sanctuary
Arthur	Yon	FROMNord



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NOROCCIDENTALES



NSAC
North Sea Advisory Council

MAC
Market Advisory Council

Mo	Mathies	NWWAC
Matilde	Vallerani	NWWAC
Pedro	Reis Santos	MAC