Scottish Wildlife Trust

Consultation Response

Scottish Sea Fisheries National Discussion Paper

Scottish Wildlife Trust

12th July 2019

The health of our natural systems are at a tipping point, the decisions made now will determine their future. The Trust believes a systemic change in management of the marine environment, to an ecosystem-based approach, is required to ensure Scotland's seas are resilient, productive and able to support marine ecosystems, society and economy.

Introduction

The Scottish Wildlife Trust welcomes the opportunity to contribute to the consultation on the Scottish Sea Fisheries National Discussion Paper. We have contributed to and fully support the response of Scottish Environment LINK. Here, we identify the Scottish Wildlife Trust's priorities for the future management of Scotland's sea fisheries.

The Trust promotes marine conservation through its Living Seas programme, which focuses on two key areas: policy and planning of marine activities and industries, and community engagement. The management of Scotland's fishing industry is an important component of both of these areas of work, and we believe the findings of this consultation could have important implications for how Scotland's marine environment is managed as a whole.

Recent reports from the Intergovernmental Panel on Climate Change (IPCC)[1] and Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)[2] demonstrate that we are at a global tipping point for preserving the natural environment that we rely on for many social and economic benefits. At this critical time, the Scottish Government must take transformative action to tackle regional, national and international challenges in order to limit (and in some cases reverse) the deterioration of natural systems. If insufficient efforts are made to stop the biodiversity and climate crises, then the projected continuation, or worsening, of biodiversity declines, climate change effects and inevitable impacts on ecosystem functioning will persist[2].

The IPBES global assessment report on biodiversity and ecosystem services highlighted that 66% of the world's seas have been 'significantly altered by humans', identifying direct exploitation of organisms (mainly fishing) and sea-use change as the pressures having the largest relative impact. Across the globe, commercial fish stocks are overexploited, with 60% fished *at* levels considered maximally sustainable, 33% overharvested and just 7% underfished. In Scotland, 46% of fish stocks are fished unsustainably[3], and we are still receiving reports that some stocks (such as North Sea cod) are being significantly overfished.

The IPCC report on the impacts of global warming emphasised the threats of climate change to our oceans and the need to limit warming to reduce the risks to 'marine biodiversity, fisheries and ecosystems, and their functions and services to humans'. Among the plethora of pressures introduced into the marine environment from human activity, climate change is exacerbating the impact of other drivers on nature simultaneously.

A recent assessment of the UK's progress to achieving Good Environmental Status (GES) for its seas demonstrated that the predominant pressures preventing achievement of GES on a UK-wide scale were commercial fishing and the introduction of marine litter[4]. It also highlighted the concerning reality that some descriptors may not achieve GES before 2020 and the societal cost of degradation if it is not achieved. On a national scale, Scotland's Marine Atlas (2011) highlighted climate change and commercial fishing activity as the two most widespread and significant impacts on our marine environment.

The Trust recognises that Scotland alone cannot combat climate change and that collective action of all countries is required. However, fisheries management is in the control of the Scottish

[1] https://report.ipcc.ch/sr15/pdf/sr15_spm_final.pdf
[2] https://www.ipbes.net/sites/default/files/downloads/spm_unedited_advance_for_posting_htn.pdf
[3] https://nationalperformance.gov.scot/measuring-progress/national-indicator-performance
[4] https://consult.defra.gov.uk/marine/updated-uk-marine-strategy-part-one/supporting_documents/UKmarinestrategypart1consultdocumentfinal.pdf

Government and, therefore, to improve the health of Scotland's seas, it seems logical that the necessary measures are taken to ensure pressure from this activity is minimised.

Scotland's seas contain an array of natural capital assets that provide society with a range of ecosystem services. The Trust considers it essential that our use of the marine environment does not compromise the health of these assets and, subsequently, the provision of valuable ecosystem services. To achieve this, the Trust believes an ecosystem approach, that places environmental health at the core of marine planning and management decisions, must be adopted.

This discussion process provides an opportunity for the Scottish Government to reframe the context within which it manages fishing activity, including how fisheries and marine management can contribute to tackling widespread challenges, such as the climate emergency we currently face. The Trust believes that if the Scottish Government places provision of healthy and productive seas at the forefront of decision-making, then marine industries (including fisheries) will be managed in a way that ensure economic, social and environmental benefits persist in the long-term.

Key Points

- The Trust welcomes the Scottish Government's collaborative approach to obtaining stakeholder opinion on the long-term vision for management of Scottish sea fisheries.
- The Trust considers the discussion paper as an opportunity for the Scottish Government to recognise the current state of climate *and* biodiversity emergency by implementing meaningful changes in the way fishing activities and the marine environment are managed.
- A healthy marine environment forms the foundations of a productive and sustainable fishing industry, and this must be realised in decision-making.
- The Trust considers that the future vision for fisheries management must be underlain by the ecosystem approach, with recovery and sustainability at its core to ensure our oceans are healthy, resilient and able to sustain the livelihoods and services society depends on.
- It is the Trust's view that a natural capital approach to fisheries management, which takes a holistic view of the impact fishing activity has on *all* marine natural capital assets and the ecosystem services they provide, should be adopted.
- The Trust considers it fundamental that all decisions are supported by a strong scientific evidence base, to ensure fisheries are managed sustainably and operate within environmental limits. Currently in the UK, commercial fish stocks are not meeting Good Environmental Status, 24.3% of quotas are being set above scientific advice[5], and 47% of marine quota stocks are fished at or above Maximum Sustainable Yield[6], which must change.
- The Trust is disappointed that the potential impacts of climate change on the marine environment are not recognised in the discussion paper. The Scottish Government must ensure that the fishing industry is prepared and able to adapt to changes in fish stocks by adopting a long-term and flexible approach to fisheries management.
- The Trust considers that monitoring, compliance and enforcement are essential to improve and modernise fisheries management.
- The Trust believes that recent advancements in digital technology, such as artificial intelligence, blockchain, and the 'Internet of Things', can contribute to a world-leading,

[5] https://neweconomics.org/uploads/files/NEF_LTB_ATLANTIC_2019.pdf
[6] https://consult.defra.gov.uk/marine/updated-uk-marine-strategy-part-one/supporting_documents/UKmarinestrategypart1consultdocumentfinal.pdf

sustainable fishing industry. The integration of digital technology can significantly improve data collection and decision-making whilst creating transparency and accountability in the supply chain.

- Scotland's blue economy, which includes the fishing industry, relies on a healthy marine environment and the appropriate management of all industries operating within Scottish seas. Therefore, the Trust believes that those industries benefiting from a healthy, well-managed marine environment should support measures that aim to improve its protection and enhancement

Question responses

In Chapter 1 the Scottish Government identified a range of areas around achieving our vision for environmentally conscious and sustainable fishing. Therefore, in relation to these discussion points do you have any views or ideas in regarding the areas identified in Chapter 1?

Recent reports by the IPCC and IPBES highlight the concerning status of the world's changing climate and biodiversity loss, respectfully, and the need for significant and meaningful action if we are to avoid climate and ecosystem collapse. These reports were followed by the UK Marine Strategy update, which confirmed that the UK is failing to meet 11 of the 15 indicators of GES, which includes commercial fish stocks[6]. It is therefore essential that management decisions focus on enhancing the health and productivity of the marine environment to ensure the provision of ecosystem services. For Scotland to have healthy and diverse seas, the Trust believes a systemic change in our approach to management of marine activities, and in particular the fishing industry, is required.

On international and domestic scales, there have been great efforts to create the legal tools for protection and sustainable use of our natural systems[7]. Each of these frameworks have criteria and objectives that ratifying nations should be striving to meet. The Trust believes that the Scottish Government should be making decisions and designing management with the aim of meeting these commitments. The starting point for sustainable[8] use of natural marine resources, in line with these high-level frameworks, is to take a holistic approach to management.

The future of Scotland's marine industries is reliant on the actions taken now to ensure recovery, persistence and resilience of marine ecosystems. To meet the Scottish and UK Government's vision for our seas[9], the Trust believes an ecosystem-based approach to management must be utilised, which would require a significant shift from current management of fisheries and the marine environment. The Trust recognises that the fishing industry itself faces many challenges but believes its management must be integrated with all other marine industries, users and environmental concerns.

[7] Such as the United Nations Sustainable Development Goals, the Convention on Biological Diversity, The Marine Strategy Framework Directive, the OSPAR Convention, the UK Marine Strategy and Scotland's National Marine Plan

[8] Sustainability in this document refers to environmental sustainability, where marine activities operate within environmental limits and natural assets are protected to provide long-term societal and economic benefits

[9] 'clean, healthy, safe, productive and biologically diverse seas; managed to meet the long-term needs of nature and people'

The Trust believes a natural capital[10] approach to decision-making and management of the marine environment should be adopted. Currently, fish stocks are managed in isolation from other marine natural capital assets[11], which has resulted in the failure to account for the health requirements and interactions of fish stocks within the wider ecosystem, or the impact of fishing activity on assets that other stakeholders depend on.

Applying a natural capital approach to management goes beyond measuring an ecosystem service purely from an economic benefit perspective (without reference to environmental costs), and requires the 'extent, status and value of natural capital assets and the services and benefits'[12] they deliver to be measured. With this information, 'the impacts of management and development options can be evaluated in the context of defined objectives for environmental exploitation, protection, maintenance and restoration'[12].

Whilst there is a balance to be struck between social, economic and environmental needs, it is important to recognise that a resilient and healthy natural environment, that is able to provide a range of ecosystem services, underpins Scotland's society and economy. The health of our natural systems are at a tipping point and decisions made now will determine their future and, therefore, the benefits society derives from them. The Trust considers this discussion process as an opportunity for the Scottish Government to implement meaningful changes to fisheries management that ensure the marine environment is healthy, productive and able to support all marine industries and users.

To ensure fishing activity is effectively managed and operates within environmental limits, the Trust believes that priority should be given to:

- Increasing monitoring, ensuring compliance and improving enforcement – with particular regard given to utilisation of new technologies (See section 2.4 for further detail)
- Taking decisions on the management of fishing activities on the basis of robust evidence
- Operating within environmental limits to avoid irreversible changes to our marine resources and wider environment
- Accounting for the ecological impacts of fishing activities on the marine environment and ensuring that fisheries are aligned with an ecosystem-based approach to management (considering the ecosystem, other industries and marine users (a natural capital approach))
- Improving spatial management of fishing activities through Regional Marine Planning Partnerships

[10] The World Forum on Natural Capital defines natural capital as 'the world's stocks of natural assets which include geology, soil, air, water and all living things'[10]. From these assets, humans derive direct and indirect benefits from ecosystem goods and services such as food, climate regulation, carbon sequestration, recreation and wellbeing benefits – see https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/608852/ncc-natural-capital-workbook.pdf

[11] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/801512/ncc-advice-marine.pdf

[12] https://www.sciencedirect.com/science/article/pii/S2212041618306478

Chapter 2 explores a range of discussion points around future governance, engagement and accountability. With regards to the areas discussed what are your opinions of the discussion points raised and any related views on the themes identified in Chapter 2?

2.1 Governance, engagement and accountability

The Trust welcomes the early stakeholder-engagement approach the Scottish Government has used to develop a new future fisheries management strategy for sea fisheries. Specifically, having a national discussion around all aspects of fisheries management before a formal consultation is a constructive way of engaging and working with all stakeholders. The Trust recognises the range of opportunities provided for stakeholders to engage with the discussion through the use of: multimedia, social media and discussion events held around the country. The Trust believes it is vital that all efforts are made to ensure the discussion process is as inclusive and representative as possible.

As recognised in the discussion paper, for co-management to be successful, trust and communication is essential. To achieve this, the Trust considers transparency, monitoring and compliance as essential. The Trust would emphasise that when considering strategic management, it is vital to bring fisheries into the wider context of marine environmental management and planning. Fishing is one of many activities that takes place in Scottish seas, and as such how it interacts with other marine industries and its impact on the natural environment must be considered. To truly achieve co-management of the fishing industry, this diversity in stakeholders must be accounted for.

For inshore fisheries, the devolution of authority from a national to a regional level (one of the guiding principles of the ecosystem approach[13]), would allow a more streamlined and efficient system for policing fishing activity and monitoring environmental health (similar to the establishment of Inshore Fisheries Conservation Authorities in England[14]). If given the appropriate authority, Regional Inshore Fisheries Groups (RIFGs) could contribute to monitoring and regulating inshore fishing activity, e.g. through the issuing of permits and licences and, when required, determining upon infringements, implementing robust sanctions and generating funds for fisheries management[15].

The development of all Regional Marine Plans (RMPs) and Marine Planning Partnerships (MPPs) could provide an opportunity for delegation of management responsibilities. For example, the devolution of spatial management of the inshore zone, inclusive of fishing activities.

Regional stakeholder groups should work together to achieve the best outcomes for their sectors, within environmental parameters, and the objectives as defined by Marine Scotland for that region. This would also 'declutter' the landscape in the sense that the public sector would be able to support stakeholders more effectively as their interests would be fed into these groups, and shared by representatives with the relevant public bodies.

For fishing activity in the UK's exclusive economic zone (EEZ) (by UK, EU and international vessels), and for Scottish vessels that fish elsewhere, Marine Scotland should continue to directly engage with relevant stakeholders, industries, nations and other public bodies to ensure all interested

[13] www.cbd.int/ecosystem/principles.shtml
[14] http://www.association-ifca.org.uk/about-us/defra-guidance-to-the-ifcas
[15] A recent report on financing the costs of fisheries management in Scotland highlighted the IFCAs capacity to raise funds for cost recovery of local fisheries management through by-laws – see https://neweconomics.org/uploads/files/Management-costs.pdf

parties are engaged effectively. The Trust believes that legislative backing is required to make sure that the appropriate mechanisms are in place to ensure governance and accountability of all fishing activity within Scottish seas by vessels of all nationalities and Scottish vessels operating elsewhere.

2.4 Delivering confidence and accountability

Whilst the discussion paper highlights the existing methods (such as quota and information sharing[16]) used to inform retailers and consumers on seafood sustainability, ensuring accountability in Scottish seafood must go beyond this. Traceable, fully documented fisheries that account for all fish, shellfish and bycatch species removed from the marine environment would guarantee fisheries management decisions are scientifically robust, and harvesting is within environmental parameters.

Fish are a public resource, and we are not currently managing them in a way that benefits the public or future generations. Currently, the extent of the impact fishing activity has on the marine environment is not fully understood and a lack of knowledge on the following areas is threatening the long-term sustainability of fisheries and the marine environment:

- Harvesting activities, for example:
    - Catch composition (target and non-target species and biomass) as opposed to landings composition), and
    - Spatial information on where vessels are operating
- The relative impacts of each fleet segment on the marine environment
- The cumulative impact of all fishing activity and other industries on our seas
- The interactions between pressures introduced by fishing activities and other marine industries on different ecological components[17]
- Distribution and population health of all stocks
- Accurate information on how much of each stock is harvested

A combination of historical (and current) overfishing, continued use of damaging gears in sensitive habitats, misreporting, and a poor understanding in some critical areas of fisheries management (see aforementioned list) has inevitably limited progress towards protection and recovery of stocks and marine ecosystems. It is the Trust's view that current management practices are inadequate and that there is a need for a new, innovative approach to the management and monitoring of wild capture fisheries.

The Trust believes that electronic monitoring is vital for effective fisheries management and considers that the benefits of such technology should be realised for the entire fleet regardless of size, catching method, target stock(s) and location. The Scottish Government recognises the need to build on the current progress for monitoring fisheries electronically and the Trust welcomes the acknowledgment of remote electronic monitoring (REM)[18] as a means to improve management, within the discussion paper.

The Trust believes that REM will play a vital role in regulating fishing activity, but also considers there to be great merit in exploring additional, complimentary digital technologies that could

[16] The Trust recognises the use of satellite technology, vessel monitoring systems (VMS) and E-log catch reporting systems as positive contributions to delivering confidence and accountability in the current system

[17] See the ODEMM Linkage Framework for further information on pressure assessments – https://odemm.com/content/linkage-framework

[18] A combination of CCTV cameras, GPS and sensors to monitor fishing gear usage – see https://www.wwf.org.uk/sites/default/files/2017-10/Remote%20Electronic%20Monitoring%20in%20UK%20Fisheries%20Management_WWF.pdf

further improve fisheries management. Digital technologies such as artificial intelligence (AI), blockchain and the internet of things (IoT) are modern advances that could provide significant benefits for management in the future. The Trust believes that advancements in digital technology provide a real opportunity to build transparency and trust within the fishing industry whilst:

- Improving quality and collection of data (and therefore, information available for scientific research, analysis and decision-making)
- Ensuring information is reliable and accurate
- Creating a flexible framework that allows management and regulatory decisions to be made in real-time
- Reducing the costs associated with monitoring, compliance and enforcement
- Improving our knowledge and understanding of how fisheries are operating
- Simplifying management (particularly monitoring, compliance and enforcement, and identifying illegal, unregulated and unreported (IUU) fishing)
- Providing real-time information along the supply chain (improving traceability)
- Building trust with industry, Government and other stakeholders
- Optimising the potential for fishing vessels to contribute to research

Although modern advances in digital technology are cutting-edge and nascent in their real-world application, their potential use in the harvesting and processing of wild-capture fisheries is being recognised around the globe, as evidenced in the following examples.

Blockchain

Blockchain technology is still relatively new, but its presence has increased over the last 10 years, principally around the growing use of cryptocurrencies (e.g. Bitcoin). Blockchain is a 'decentralised electronic ledger system that records any transaction of value whether it be money, goods, property, work or votes'[19]. Whilst blockchain has been primarily associated with cryptocurrencies and business transactions, it could become a powerful foundational technology across many sectors, and in addressing today's environmental challenges.

Blockchain technology has the potential to address the issue of transparency in the supply chain of the fishing industry. For example, since 2017, WWF-New Zealand have been engaging with a pilot project that incorporates blockchain supply chain traceability into tuna fisheries in Fiji. The pilot aimed to increase transparency of the entire seafood supply chain and allowed the final product in the supermarket to be tracked back to its origin. Improved traceability of tuna fisheries allows the market to reward those who are ethical, responsible fishers and exclude those operating illegally or unethically. Other projects that use blockchain technology to improve traceability in the fishing industry include: Fishcoin, Traceregister, Thisfish, and Provenance.

The Internet of Things

The IoT refers to 'a world where sensors and actuators are embedded into physical objects and are linked through the wireless and wired networks that all live and interact with one another'[20]. The IoT is capable of collecting and sharing information about the environment[21], which can be used to inform decisions.

[19] http://www3.weforum.org/docs/WEF_Building-Blockchains.pdf
[20] https://www.sciencedirect.com/science/article/pii/B9781597497336000061
[21] https://www.sciencedirect.com/science/article/pii/B9780128053959000149

The IoT was integrated into fisheries management in the United States after the introduction of regulations requiring on-board fisheries observers to monitor fish counts and bycatch (due to poor stock health). To ensure the necessary data was collected and the new regulations were being adhered to, the company Inex worked with commercial fishers in Massachusetts to install devices on vessels that collected the same information, without the need for human observers[22]. The IoT-enabled sensors were also installed at the Port of New Bedford to monitor activity and improve the reporting of landings[23].

The IoT has also been trialled as 'a solution' for trawlermen in Oregon to reduce the cost of human observers, this time working with SmartCatch, and their flagship product 'Digicatch', which combines HD video, lighting and sensors (e.g. depth, salinity, location and temperature) to allow fishers to have greater control over their harvest[23]. Using this technology, fishers could monitor the contents of their nets in real time to maximise their quota, minimise bycatch and ensure compliance with relevant regulations[24].

BlueTraker has also developed a suite of technological innovations to monitor fisheries using the IoT to compile information on: the fleet and their fishing activities, remote fuel monitoring systems, and long-range tracking[25].

IoT technology can also be used to: monitor fishing activity within marine protected areas[26] to identify IUU fishing[27], respond to emergencies (e.g. when fishers are in distress)[27], virtualise supply chains (e.g. for distribution of harvested fish)[28], and to monitor and track fishing gear[29].

Artificial Intelligence

The use of digital technology in fisheries increases the amount of data collected and requiring analysis. To manage such an increase in data and to be able to make decisions from this information, the application of other digital advancements, in particular AI, will be essential.

AI can be used to flag unusual or unwanted behaviour, such as vessel movements within MPAs, buffer zones or around sensitive habitats. It can also be used to assist with decision-making by analysing the data used to inform decisions faster, cheaper, and more accurately. For example, Global Fishing Watch (GFW) use machine learning (a component of AI) to analyse big data on vessel movements from boat telemetry. GFW uses this information in their interactive online map to show the spatial footprint and effort of different fishing vessels in oceans across the world.

Similarly, Smartfish-H2020, an international research project co-ordinated by SINTEF Ocean with partners in the UK (including Marine Scotland) is using technological systems to optimise efficiency and reduce the ecological impacts of fisheries. Using technologies such as AI, machine vision, it aims to improve economic efficiency at the pre and post-catch phases of fishing, and record information on environmental impacts[30].

[22] https://www.criticallink.com/2016/04/the-internet-of-fishing-fleets/
[23] https://www.networkworld.com/article/3115408/iot-catches-on-in-new-england-fishing-town.html
[24] https://www.fishermensnews.com/story/2017/02/01/features/internet-of-things-solution-for-trawl-net-fishermen/448.html
[25] https://bluetraker.com/solutions/bluesenz-iot-for-fisheries/
[26] https://www.forbes.com/sites/jamiecartereurope/2019/05/07/do-we-need-an-internet-of-fish-cheap-space-internet-will-bring-90-of-earth-online/#3c91f2b5bf43
[27] https://www.sbs.ox.ac.uk/cybersecurity-capacity/system/files/Harnessing-IoT-Global-Development.pdf
[28] https://www.sciencedirect.com/science/article/pii/S026087741530056X
[29] https://www.thinkmind.org/download.php?articleid=sensorcomm_2017_6_30_18004
[30] http://smartfishh2020.eu/about-smartfishh2020/

The Trust believes that as these accurate and traceable technologies continue to develop and become more affordable, there is great potential for their application in fisheries management. It is important to recognise that, while some of these technologies can provide benefits on their own, it is the combined application that can really advance the management of Scotland's fishing industry, from sea to plate.

As shown, there are a diverse suite of technological innovations available that could be used to enhance fisheries management and decision-making. Digital transformation is becoming commonplace in our daily lives and Scotland could lead the way in creating a modern, dynamic system for managing its fisheries and marine environment. The Scottish Government has an opportunity to determine the most suitable option(s) for Scottish fisheries[31], the first step being to develop criteria for identification of priority vessels for digital transformation.

As a minimum, the Trust believes that all vessels operating in Scottish waters should have accurate and up-to-date GPS tracking systems to monitor their movements and activity. Knowing where different fishing vessels are operating is of particular importance with regard to: improved monitoring and enforcement of MPA management measures, knowledge on the spatial footprint of fishing, and for improved traceability of seafood.

Although these technologies are new, their potential is being recognised in many industries, and it is expected that their use in modern life will be ubiquitous. Utilisation of digital technology futureproofs the fishing industry by allowing it to adapt to prospective changes. If Scotland wants to be a world leader in fisheries management, the value of these digital technologies must be recognised and a plan for their integration should be prioritised to ensure the future governance of marine industries is forward thinking, innovative and effective.

Chapter 3 explores areas for discussion around access to our waters and the role of Scotland in future fisheries negotiations as part of the UK. Do you have any views or ideas in relation to the discussion points raised in Chapter 3?

Commercial stocks in Scottish seas are valuable to the fishers, processors and consumers of other nations (as commercial stocks from other countries are to Scotland). As a key stakeholder in the UK's fishing industry, Scotland must be fully engaged with international fisheries management negotiations. We expect the Scottish Government to maintain and build good working relationships with other nations and expect all of the UK's fishing administrations to be in direct communication with one another. Working together is essential when considering the shared nature of the UK's stocks[32], the importance of Scotland in contributing to international data collection, and the impacts of climate change on the distribution of commercially valuable fish.

The Trust supports the Scottish Government's intention to ensure that high standards of management apply to Scottish vessels regardless of where they fish, and to foreign vessels fishing in Scottish waters, and to ensure that the appropriate tools are in place for monitoring and compliance. A large proportion of seafood caught in the UK's EEZ is harvested by foreign vessels (e.g. in 2016, the UK caught 36% (by weight) of fish and shellfish within the UK's EEZ[33]) demonstrating the large international interest in UK fishing grounds however, the equivalent data

[31] It is important that there are further discussions between decision makers and stakeholders to clarify what questions need answering and how the introduction of electronic monitoring systems can help – it may be that different technologies are required depending on the vessel, the method of fishing and the target species

[32] Particularly for stocks that cross international boundaries at different life stages

[33] https://www.nafc.uhi.ac.uk/t4-media/one-web/nafc/research/document/eez-reports/EEZ-Report-11---2018-04-30.pdf

on landings by nationality in Scottish waters is not available. The Trust believes that legislative backing is required to ensure transparency and accountability in fishing activities within Scottish seas by vessels of all nationalities and Scottish vessels operating elsewhere.

The Trust encourages the Scottish Government to lead by example with a fisheries management system that ensures any positions in negotiations are underpinned by accurate and up-to-date scientific evidence. Decisions relating to the management of the marine environment, and the harvesting of the natural resources it provides, should not be to the detriment of Scotland's marine natural capital assets.

Chapter 4 identifies the Scottish Governments aim to establish fishing opportunities for long term future sustainability and accessibility. Accordingly, in relation to these discussion points do you have any views or ideas to the areas identified in Chapter 4?

4.1 A science-based approach to setting quota

We support the intention of the Scottish Government to 'divert resources for science, data collection and analysis towards targeted data limited stocks'. We would encourage the Scottish Government to recognise the importance and potential of digital transformation of the fleet to simplify and improve the data collection and analysis process (see section 2.4 for detail).

The Trust strongly supports the Scottish Government's commitment to lead by example and maintain the highest standards of responsible behaviour when establishing fishing levels and challenging international partners to do the same.

The Trust advocates for evidence-based decision-making and therefore supports the Scottish Government's commitment to using a science-based approach to setting quota. The Trust supports the use of limits on total allowable catches (TACs) to control the amount of fish removed by fishing activities. The Trust would further emphasise that TACs should not be set above scientific advice.

Considering the principles for determining TACs, the Trust believes that catch limits should be set within environmental parameters and based on strong scientific evidence, to ensure fishing activity does not impact the ability of the stock(s) to perform their role(s) in the ecosystem.

In the discussion paper, the idea of a TAC 'plus and minus' feature is raised. The Trust believes that decisions on catch limits must be evidence-based and therefore, 'plus and minus' features to constrain how much TACs may fluctuate may be inappropriate, as increases and decreases should be decided on the scientific advice.

Setting catch limits above scientific advice for sustainable harvesting will result in overfishing and a decline in stock health. Ultimately, fishing beyond safe biological limits will lead to a requirement for more severe measures to recover stocks when they fall to dangerously low levels. The recent announcement of the need to recover North Sea cod being an example of this; despite the Cod Recovery Plan (after its collapse in 2006), and an MSC accreditation in 2017, recent findings in the ICES assessment show that North Sea cod continued to be 'harvested unsustainably'. Even with the recommendation to cut TAC by 47% for 2019, the agreed TAC exceeded scientific advice[34]. Advice for 2020 now shows that fishing pressure continues to be too high, the spawning stock remains

[34] https://www.pewtrusts.org/-/media/assets/2019/03/analysis-of-fisheries-council-agreement-on-fishing-opportunities-in-the-north-east-atlantic-for-2019.pdf?la=en&hash=D3806AA0BBB451B3A113F0E0592B01AFC47A3815

outside of safe biological limits and recruitment has remained poor since 1998[35] leading to the recommendation for a more dramatic cut in TAC by 70%.

The Trust considers it essential that the Scottish Government recognises that, by following scientific advice on catch limits, there will be greater security and consistency in future fishing opportunities as the stock(s) begin to recover, stabilise and increase in size. Fishing above scientific advice can result in a need for drastic fisheries management measures, with North Sea cod being a prime example of this.

4.2 TAC vs effort

The Trust believes that harvesting must be within environmental limits in order to be sustainable. To ensure that fishing activity does not overexploit stocks (specifically, as opposed to sustainably fishing with minimal or no impact on natural assets and ecosystem service provision), there must be a scientific understanding of: stock size, recovery rates and the maximum rate of mortality a stock is able to withstand in order to be routinely exploited without long-term depletion. Therefore, fishing limits that are inclusive of this information, such as TACs, are more appropriate for managing harvesting activity than fishing effort.

When applying TAC limits, scale and regional variability must be considered for discrete stocks and functional units, as fishing limits may be geographically distinct. The Trust considers that catch limits must be determined by a clear understanding of stock health, distribution, and connectivity to avoid the risk of local population declines.

The Trust recognises that there is a need to understand and appropriately manage stocks for which there are not currently catch limits.

4.6 Future catching policy

The Trust believes that any future policies on fisheries management must build on the EU's world-leading series of comprehensive and influential environmental policies[36] aimed at tackling both resource management and conservation. The Trust agrees that a future catching policy 'must protect the sustainability of fish stocks and the wider marine environment as well as deliver accountability and confidence'. In order for a new policy to provide a step change and deliver the aforementioned goals, its implementation must be safeguarded with monitoring and enforcement (see section 2.4).

To measure progress towards sustainable and accountable fishing activities, a baseline needs to be established (particularly as the most recent national assessment of the marine environment is almost a decade old[37]). The concept of establishing a baseline is critical to the long-term management of Scotland's fishing industry. The Trust believes that there needs to be clarification on what the Scottish Government's vision for the future of Scotland's fish stocks is (e.g. is it the long-term goal of fisheries management (specifically) to ensure stability or to increase the biomass of fish and shellfish available to harvest?).

Discarding and non-compliance with the Landings Obligation is widely recognised as a major threat to stock sustainability. Part of ensuring a workable method for discard minimisation is not only accounting for all the fish removed but also improving selectivity when harvesting stocks to reduce

[35] http://ices.dk/sites/pub/Publication%20Reports/Advice/2019/2019/cod.27.47d20.pdf
[36] https://www.sciencedirect.com/science/article/pii/S0025326X1630652X?via%3Dihub
[37] With older data used to inform the assessments of Scotland's Marine Atlas, published in 2011

the amount of unwanted fish captured. New and existing industry-led initiatives to improve selectivity should be supported. Any new policy for waste minimisation should combine improved selectivity measures with the recommendations in section 2.4 to help overcome the issue of discarding and achieving fully documented fisheries.

4.7 Technical and spatial conservation measures

The Trust believes that the introduction of technical and spatial conservation measures should be based on strong scientific evidence. However, when this information is not available, the precautionary approach must be applied.

Improved communication between different stakeholders and the Scottish Government surrounding the introduction, purpose and aim of technical and spatial conservation measures is needed. It is the responsibility of Marine Scotland to clearly identify the aims of such measures, and to emphasise the role of fishers in managing a public resource and the wider marine environment.

Scotland's network of MPAs aims to protect some of its most rare and vulnerable marine natural assets, but the implementation of management measures within the network has been slow. Until these sites have effective and enforceable spatial management measures (and where appropriate guide damaging fishing activity away from sensitive features) they will fail to meet their objectives. The integration of digital technology in the spatial management of fishing activity can provide a more reactive, real-time mechanism for monitoring and ensuring compliance (see section 2.4).

In Chapter 5 the Scottish Government discusses possible options for access to fishing in distant waters and new entrants. With regards to the areas discussed what are your opinions of the discussion points raised and any related views on the themes identified in Chapter 5?

5.1 Fishing capacity

The Trust agrees that fishing capacity should not exceed fishing opportunity. We welcome the need to exercise caution when considering increasing fleet capacity, to ensure that this is not to the detriment of the fish stocks or marine ecosystem health and functioning. The Trust encourages the Scottish Government to ensure that fishing opportunities are set within environmental limits and are managed in such a way that ensures recovery and protection of marine natural capital.

Any decisions relating to capacity constraints should be based on the best available science, and when this is unavailable, the precautionary approach should be applied. Thus far, this has not been the case with almost half of the UK's commercial stocks fished above MSY[38] and 24.3% of the UK's 2019 quotas set above ICES scientific advice[39]. If fisheries management decisions are not made on the basis of robust scientific data, then we risk causing avoidable (and potentially irreversible) changes to our marine environment as highlighted in the recent IPBES report[40].

In the context of additional fishing opportunities (if made available), the relevant authorities should consider the best possible use of the increase. The Scottish Government should decide with other UK Administrations if they should be used to, for example: reward fishers with environmentally sound fishing practices (particularly in the case of oversubscription or for new licences), to act as a buffer for discarding, or to be kept for conservation purposes.

[38] https://consult.defra.gov.uk/marine/updated-uk-marine-strategy-part-one/supporting_documents/UKmarinestrategypart1consultdocumentfinal.pdf
[39] https://neweconomics.org/uploads/files/NEF_LTB_ATLANTIC_2019.pdf
[40] https://www.ipbes.net/news/ipbes-global-assessment-summary-policymakers-pdf

Chapter 6 identifies a broad range of themes and points around the future management of the inshore fishing industry. As a stakeholder what are your opinions of the discussion points raised and any related views on the themes identified in Chapter 6?

6.1 Inshore Fisheries Strategy

Maintaining and building upon the three outcomes highlighted in the 2015 Inshore Fisheries Strategy is critical when considering modernisation of inshore fisheries management and its integration with other marine users and broader social, economic and environmental challenges. The 2015 strategy took an all-encompassing vision of the ecosystem approach, which should be the guiding principle for inshore (and wider) fisheries management.

6.2 Competing priorities

Scotland's inshore waters contain diverse marine habitats and wildlife that support the culturally and economically important inshore fishing industry. Our seas (particularly the territorial sea out to 12 nm) are becoming ever busier, increasing the competition for space and marine resources between different users within and outwith the fishing industry. As such, sophisticated management of our oceans, guided by science, is necessary to ensure that we are controlling the impacts on ecosystem health and functioning.

To balance these competing interests, we need overarching management of the inshore zone to spatially manage and monitor the different activities operating within it. Where appropriate, protecting important habitats from the most damaging fishing practices can enhance ecosystem and environmental health, which in turn brings a wealth of benefits to all marine users and society.

Inshore fishers can contribute greatly to marine planning and management by helping to:

1. Locate and map the most sensitive and vulnerable habitats and species at risk from damaging fishing practices;
2. Map the distribution of effort for different fishing activities and identifying potential areas of conflict; and
3. Map the distribution of all marine activity and identifying potential conflicts between fishermen and other marine sectors

For spatial management of the inshore marine environment and RMPs to be successful, collaboration and information sharing is needed across different stakeholder groups including RIFGs and MPPs. Transparency and data sharing can be facilitated by integrating the technologies recommended in section 2.4 with inshore fisheries management.

6.3 Inshore legislation

There is a longstanding and compelling case for changing management of inshore fishing, as recognised by the current Inshore Fisheries Strategy. We welcome the commitment in the discussion paper to new inshore fishing legislation, should it be required (Please see the Trust's Inshore Fisheries Management policy[41] for more details).

It is the Trust's firm view that any new legislation on inshore fisheries must be compatible with the planning framework set out in the Marine (Scotland) Act 2010 (notably, Scotland's National and

[41] https://scottishwildlifetrust.org.uk/wp-content/uploads/2016/09/SWT-Inshore-Fisheries-Policy_Final.pdf

Regional Marine Plans), in addition to other existing legal tools for protection and sustainable use of our natural systems[42].

6.4 Reactive inshore fisheries management

The Trust welcomes the introduction of new licencing conditions to better regulate inshore fishing activities. Further consultation is needed to decide on a workable approach to implement such measures.

Fisheries management must be more reactive to real-time challenges in the future: see the Trust's priorities for effective management listed in section 1.

Existing legislation provides the framework for regional management of Scotland's inshore waters and can be built upon when considering how best to regulate fishing activity. The Trust believes that the Scottish Government must realise the potential for better regulation using electronic monitoring (see section 2.4).

Possible options for the future funding of the fishing industry are identified in Chapter 7 for discussion. What are your views on the discussion points raised and do you have any other ideas with regards to future funding options or opportunities going forward?

The Trust welcomes the Scottish Government's recognition to exercise the spending of public money in the fishing industry with caution. As there are limited public funds available for fisheries management, they should be spent strategically where they can make the most difference, and where it will be of the most benefit to the public. The Trust would emphasise that funding the core areas needed for effective management, such as enhanced sustainability and research, science and innovation, monitoring and enforcement, and supporting a race to the top are priorities.

The Trust considers the loss of the European Maritime and Fisheries Fund (EMFF) post-Brexit as a concern as it supported a range of projects including sustainable fishing practices, data collection and monitoring. The Trust believes that a similar resource should be made available to support the aforementioned areas.

The Trust believes that greater efforts should be made to review and explore funding opportunities that would generate the largest benefit, and to consider how the industry might be able to contribute to the costs of management (see section 9). The Trust considers it important to recognise that fish are a public resource, and that a history of harmful subsidies, improper management of ecologically damaging harvesting methods, and overfishing have negatively affected the health of this resource and the marine environment. Therefore, the Trust believes that funding should aim to directly and indirectly protect fish stocks and marine ecosystems. Investing in the preservation of marine natural capital assets will improve the flow of benefits to fishers and the wider community due to the services they provide.

Careful attention must be given to the discussion point regarding who should 'support environmental improvements and monitoring' when considering the potential for high environmental standards to deliver an added premium for seafood products. Whilst they are important, industry-driven eco-labelling certifications are not the sole solution to minimising the

[42] Such as the United Nations Sustainable Development Goals, the Convention on Biological Diversity, The Marine Strategy Framework Directive, the UK Marine Strategy

environmental impact of fishing on our marine environment, but one of many tools that can currently be used to encourage best practice.

The requirement for eco-labels indicates that there are still products sold that are not sourced sustainably. The Trust believes that if we manage all our fisheries sustainably and monitor them effectively (e.g. with digital technology as highlighted in section 2.4), eco-labels would not be required as all products would harvested to the required standard and be traceable. This should also be a required standard for all imported seafood products.

The Trust is of the view that effective fisheries management should ensure that all fisheries are harvested sustainably as standard practice, and that digital technology should be used to improve monitoring and identify those operating unethically or illegally.

Whilst eco-labels and transparent supply chains go some way to improving the sustainability of fisheries, ensuring seafood sustainability standards must go further than relying on consumers and retailers to drive sustainable practice through market force. The Trust believes that Governments must ensure that policies, legislation and commitments that set the standards high for marine management are used to ensure fishing activity is sustainable. Realistically this means doing a stock-take of marine industries and their management to identify the necessary changes required.

To ensure long term sustainability of the fishing industry the Scottish Government believe it is right for the fishing industry to contribute to costs associated with science, research and development in the future. Chapter 9 considers options for this but what are your view and thoughts on the discussion points raised in this chapter?

The Trust welcomes the Scottish Government's recognition of the need to invest in enhancement of our scientific base for fisheries management decision making, and to encourage innovation and support development and application of new technology.

A recent report highlighted that 'management costs are paid for through general taxation but the financial benefits of fisheries management is limited to those within the fishing industry and to a lesser extent ancillary industries and consumers in the UK and abroad'[43]. It is the Trust's view that industries that benefit from the natural marine assets, and in particular those that impact the health of the marine environment, should play a significant role in contributing to the costs of management on the basis of the beneficiary pays principle.

When considering Scotland's long-term vision for fisheries, the complex but important issue of financing management costs and research is a key area of work (due to its current inefficiencies and potential for change in the future). As highlighted in the discussion paper, across the globe it is standard practice for fishing businesses (the beneficiaries) to contribute to the costs associated with the delivery of research and development (through cost recovery[44]). Existing cost recovery systems in other countries should be considered when assessing the most suitable option for Scottish fisheries. Such systems[45] elsewhere have meant that 65% of Icelandic, 39% of Australian and 36% of New Zealand's fisheries management costs are recovered[46].

[43] https://neweconomics.org/uploads/files/Management-costs.pdf

[44] This has been examined in the Scottish context in a 2018 New Economics Foundation and Sustainable Inshore Fisheries Trust report – see https://neweconomics.org/uploads/files/Management-costs.pdf

[45] All cost recovery systems in these countries were put in place with the aim of 'ecological and environmental sustainability and optimising resource utilisation'

[46] https://onlinelibrary.wiley.com/doi/abs/10.1111/faf.12147

There is potential for cost recovery to be achieved through: licencing, taxation, auctions, levies and loans. The Trust believes that a new and well-resourced funding system for fisheries management will lead to a more environmentally sustainable industry. In order to implement a workable cost recovery system for fisheries management, the Scottish Government should work closely with stakeholders to design an appropriate system for the different fleet segments, which will likely require further consultation.

The Trust considers investment and research into the digital transformation of the fishing industry as essential for improving fisheries management. The integration of new technologies (as discussed in Section 2.4) has the potential to tackle multiple challenges by: increasing the size and accuracy of the scientific evidence base, increasing transparency, reducing management costs, improving decision-making, effectively monitoring activities, and enforcing regulations

Finally, thinking about ensuring the long-term sustainability of the Scottish fishing industry for future generations do you have any other ideas or proposals that you would like to be considered that are not covered elsewhere in the discussion paper?

i. Climate change adaptation and mitigation

The Scottish Government recently declared a climate emergency, which included a commitment to achieve net-zero emissions by 2045. The Trust recognises that the Scottish Government's declaration came after the launch of the discussion paper but remains disappointed that the future impacts of climate change on the marine environment and Scotland's fishing industry were not addressed. The current and future effects of climate change on the marine environment must be recognised to ensure that fisheries (and their management) are well equipped and flexible enough to adapt to change.

The North Sea has been recognised as a hotspot for warming temperatures, which will have a direct impact on Scotland's fishing fleet. The impacts of increased sea surface temperatures are uncertain but could affect the Scottish fishing industry in many ways including:

- Altering the distribution and migration of commercial fish stocks[47]
- Changing the size and growth rates of commercial species
- Increasing ocean deoxygenation and low oxygen areas which may impact primary productivity (the base of marine food webs) and available habitat for commercial stocks
- Desynchronisation between species and phenological events (with knock-on effects for interspecies interactions, breeding success and survival)[48]
- Effects on ecosystem functioning (which commercial fish stocks rely on)
- Possible synergistic, additive and cumulative effects of the interactions of warming with other pressures (e.g. bivalves under stress from warming exacerbated further by e.g. ocean acidification)
- Direct mortality[49]

The expected change in species distribution could be a significant concern for the industry as many of the stocks that the Scottish fleet currently benefit from (e.g. herring, cod and haddock) could potentially move out of UK waters and be replaced by other northward moving species (e.g. squid, bluefin tuna and small pelagic species (e.g. anchovies)). To utilise these 'new' stocks, Scottish fishers

[47] This is a particular concern as there is a lack of knowledge surrounding the impact that climate change may have on species distribution – see https://onlinelibrary.wiley.com/doi/full/10.1111/gcb.12513
[48] https://www.nature.com/articles/nature18608
[49] https://www.theguardian.com/environment/2019/jun/28/california-mussels-cooked-heat

would need to: use different fishing techniques and gears, have increased knowledge of behaviour and life-cycles of new stocks, and adapt to changes in catch limits of stocks that were traditionally important in Scottish waters.

To ensure the fishing industry is well prepared to adapt to these challenges, the Trust believes an increase in the collection and monitoring of all harvested catch is essential to identify changes in species distribution. Increased use of digital technology in fisheries (e.g. AI and the IoT as previously mentioned) could be vital in identifying how catch composition is altering and where these changes are occurring. Without effective monitoring, the Scottish Government may miss critical information to help inform fisheries management decisions, and an opportunity to have reactive management, based on accurate information.

A key component to tackling the effects of climate change is improving the state of our natural environment. Scotland's Marine Atlas (2011) highlighted the denuded and poor state of Scotland's marine environment and identified commercial fishing (and climate change) as the most significant and widespread pressures. Therefore, to improve the health of Scotland's seas, it seems logical to introduce new measures that ensure the environmental impact of commercial fishing is minimised.

It is important that the opportunity for Scottish seas to sequester carbon is recognised and that all efforts are made to increase that potential. The distribution and health of 'blue carbon' habitats in Scotland (e.g. maerl beds, flame shell beds, and seagrass meadows) is still largely unknown. Understanding, protecting and restoring these habitats are among the natural climate solutions, which, alongside significant cuts in emissions, are critical to achieving new ambitious climate change targets. Spatial management of bottom-contact gear is an important step in ensuring that blue carbon habitats are adequately protected and given the opportunity to recover.

The Trust considers it equally important that, as well as certain habitats, fish stocks are also considered as blue carbon stores. Fish store organic carbon, the larger and healthier the stock is, the more carbon they can store. In addition to being an important organic carbon store, fish also produce precipitated carbonates (inorganic carbon) in their intestines, which they then excrete. On a global scale, it has been estimated that marine fish contribute 3 to 15% of total oceanic carbonate production[50]. It is predicted that precipitated carbonates from fish may become increasingly important in the inorganic carbon cycle as their production may rise in response to increased carbon dioxide in the environment. The Trust considers it vital that the role of fish in sequestering carbon and the potential for larger, healthier stocks to contribute to mitigating the effects of climate change is recognised.

The Trust also considers carbon emissions from the fishing industry as a concern. Currently fishing vessels (powered by fossil fuels) and transport of seafood (imports and exports) around the globe have a considerable carbon footprint, which must be reduced to address the current climate emergency.

[50] https://science.sciencemag.org/content/323/5912/359