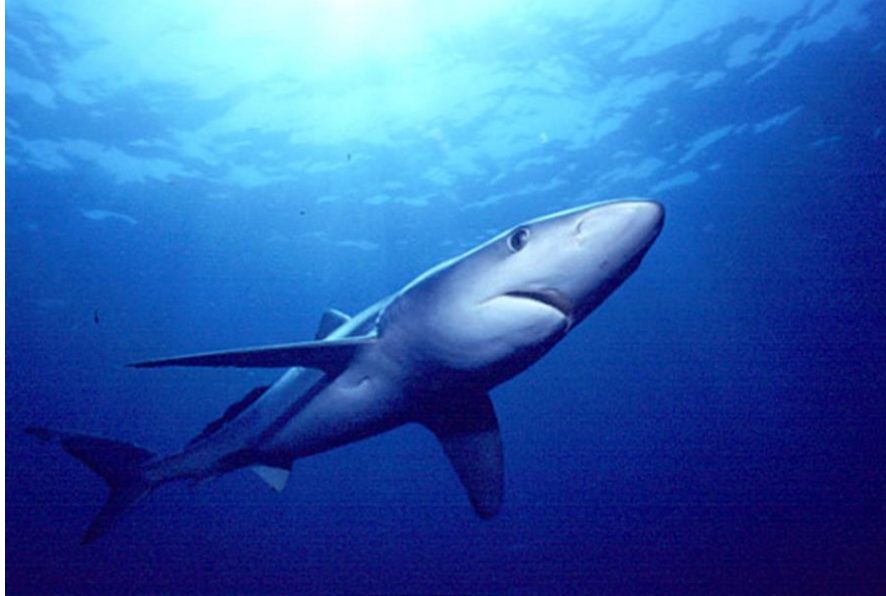# Implementation of the Marine Strategy Framework Directive for sharks and rays

Report phase 3
Working towards solutions: developing management measures for sharks, skates and rays in the North Sea

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Contents

Summary

In the past year the NEV has organized stakeholder dialogues and has worked with partners to develop educative programmes, in order to develop a suite of suitable measures for management of sharks and rays which can rely on support among stakeholders. Building on previous analyses three issues were identified for this step:

- Communication and education within the fisheries chain
- Innovative ways to reduce unintended fisheries mortality for sharks, skates and rays
- International coordination in policy and management

Two meetings were held in Amsterdam with (inter)national participants from fisheries, policy, science and NGOs. During these meetings, practical and workable solutions were discussed on issues such as data collection, management and the landing obligation. There is a general consensus that the stakeholder group created for this process should continue, and that it can provide a platform for the issues surrounding sustainable management of elasmobranchs. Future initiatives should take the entire fishing chain into consideration and seek to identify incentives at each stage.

As far as **data collection** is concerned it is recommended to create a platform for data sharing in order to discuss confidentiality, access to data, developing sharing protocols and common goals. Fish markets and market analyses should be explicitly included in the process. For maximum efficiency a gap analysis should be carried out – who is doing what. Some progress has already been made on this issue. Incentivise data collection by industry by identifying the benefits and creating more transparent communication between parties on how data are used.

For the **management** of elasmobranchs through TACs and quota it might be necessary to rethink the group TAC – maybe adopt a more regional approach and split the group TAC up between fisheries and areas, according to the differences in fisheries and species caught. Finding a way to introduce a spatial (and temporal) element into management would make it possible to adapt measures to the pertaining situation. Carrying out a Management Evaluation Strategy of specific case studies would give insight into how the management of elasmobranchs has performed under the CFP. A solution for policy makers to find a way to manage for the most vulnerable species without impairing fishing for abundant species could be found in an innovative tariff system – Real Time Incentives.

For the **landing obligation** it is suggested to develop a three-point 'best practice' package addressing avoidance, selectivity and on board survival developed by scientists working with fishermen on practically applicable measures. Complementary to the studies on survival currently being carried out, an extensive tagging programme to identify the survival of elasmobranchs after discarding is suggested in close cooperation between fishermen and scientists. In order to build a knowledge base for identifying the vulnerability of shark and rays species an ecological risk assessment should be carried out.

At the request of the NEV a Dutch education institute specialized in education in the maritime sector (ProSea) has developed an education package for fisheries schools in which the typical issues surrounding fisheries and management of shark and rays species are tackled in an accessible way. This will be first trialed at schools in September 2016 and has the potential to help the entire chain from fishermen to those working at fish markets.

1. Introduction

In the period May 2013 to November 2014 the Dutch Elasmobranch Society developed an advisory recovery plan for sharks and rays for the Dutch Ministry of Economic Affairs (EZ). In this advisory plan there is an overview of the types of measures needed to facilitate the recovery of sharks and rays in the North Sea (Walker & Kingma, 2013; Walker *et al*., 2014). These set out what measures could be implemented to achieve the goals formulated in the Marine Framework Strategy Directive for healthy populations of sharks and rays in the North Sea by the Dutch government. Three priorities were identified.

Firstly, as sharks and rays are mainly caught as bycatch in both demersal and pelagic fisheries in the North Sea it is to be expected that measures aimed at increasing selectivity and reduction of bycatch will prove to be most effective in reducing fishing mortality for North Sea populations of elasmobranchs. Success will depend greatly on the level of support from industry and the ability to customise measures for specific fisheries and species. Involving fishermen in examining what the specific issues are when it comes to (by) catches of sharks and rays and in finding innovative, feasible solutions, will lay a basis for further discussion on packages of measures.

The previous reports also described that there still is a lot of scope for improvement when it comes to the reporting of species both by fishermen but also in official landing statistics. Improving species identification skills and raising awareness of the status of species to all stakeholders, is another key part in finding a solution.

Lastly, there are large differences in management of elasmobranchs throughout the North Sea basin and research efforts aren't always aligned internationally. International coordination and harmonization of policy and research would be of added value when it comes to achieving the Marine Strategy Framework Directive goals.

In order to develop a suite of suitable measures which can rely on support among stakeholders, the next step was to consult with stakeholders as to which measures are practical and effective. The three issues which were thought to be most urgent to tackle first were:
- Communication and education within the fisheries chain
- Innovative ways to reduce unintended fisheries mortality for sharks, skates and rays
- International coordination in policy and management

As a first step in achieving these goals the NEV has organized stakeholder dialogues and has worked with partners to develop educative programmes.

2. Approach

2.1 Communication

As a step towards improving the knowledge of species in the fisheries chain and in order to draw attention to the difficulties in identification of species and their protected status, the Dutch fisheries newspaper (Visserijnieuws) published an overview of the most important species, together with the NEV and Dutch Anglers Association, in June 2015 (Figure 1).

Figure 1. Information over protected species for fishermen in the Dutch fisheries paper Visserijnieuws

2.2 Stakeholder dialogue

In the past year the NEV has had intensive discussions with representatives from the Dutch demersal and pelagic fishing sector to identify the main issues in the respective fisheries and to find common ground. The discussions were open and constructive and the meetings were positively experienced by the parties. Following on from these meetings, and in order to achieve the formulated goals, the NEV has organized two expert meetings with (inter)national representatives from fisheries, policy, science and NGOs in December 2015 and February 2016.

The first meeting, which had a limited number of participants, was used to formulate common goals.

COMMON GOALS

All participants see the need of appropriate management of elasmobranch species which should encompass:

- Reducing dead discards
- Avoid quota overshoot → after 2019 this would lead to choke issues
    - Set TAC appropriately
    - Make use of best available avoidance/selectivity/survival methods
- Make most of available data
    - Share data/build trust
    - Uniform data collection format
- Share information / keep track of who's doing what
- Data you have needs to be used to manage the species: making the most of the data available to be able to make informed decisions
- Address the lack of data in general
- International coordination working towards a common approach
- Look at the spatial context in management
- Set appropriate fishing opportunities

These common goals were taken as a starting point for a follow up workshop where 28 participants from diverse backgrounds met for 2 days with the aim to refine the goals, define actions and identify possibilities for collaboration, in order to define the next steps for working towards solutions.

The discussions were structured around 3 themes:

- Distribution, data collection and species identification
- Selectivity, avoidance & survival
- Rethinking the status quo

Some very practical and workable solutions were discussed and there was a general consensus that developing a platform which can contribute to the international dialogue on shark, skate and ray management would be positive for all. As such, it is important to keep the momentum going and to pick up a number of the most important issues in the near future.

The outcomes from the meetings and progress in education are summarised in this document. Detailed reports from both expert meetings are arranged in Annexes 1 and 2. The educative package will be made available at a future date.

3. Working towards solutions

The years to come will present a number of challenges to the current management of sharks and rays. The landing obligation will force policymakers, fishing industry and NGOs to rethink the ways the stocks have been managed and the underlying assumptions. It is clear that big challenges are faced by all. At the Amsterdam meetings first steps were taken to finding solutions based on joint

effort between industry, NGO's and scientists to truly find a workable outcome for all concerned that is effective in managing sharks and rays in the North Sea.

3.1 Distribution, data collection and species identification

All management of fisheries or environment relies on a sound knowledge base. For elasmobranchs this can be problematic as there are only limited data available on many of the species and there is room for improvement in the reporting of sharks and rays caught. There are two aspects that require attention in this regard: (i) addressing the existing data needs for elasmobranchs and elasmobranch (bycatch) fisheries by ways to fill the knowledge gaps on their biology, abundance and distribution; and (ii) looking at ways to increase the identification skills within the whole producer's chain.
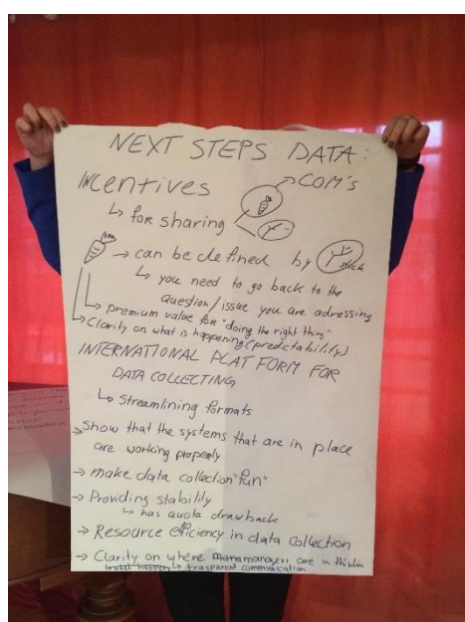
Correct species identification is an ongoing priority and species specific information on life-history characteristics and genetics is needed. Scientific surveys collect catch data on elasmobranchs, which is used for the underpinning of ICES advice. The gear used in IBTS-surveys is not always highly selective for these species. Although MSY estimates have not been calculated by ICES for elasmobranchs (apart from *Squalus acanthias*), the data are robust enough for scientifically sound trend analyses and assessments to be carried out for a number of species if the time series is long enough (at least 7 years). Possible sources of errors in identification have been flagged throughout the reporting process and the resultant data collated by ICES in their DATRAS database are not always accurate. These issues, and others related to data collection were addressed at the recent ICES Workshop on elasmobranch data (January 2016)[1]. Work is being done to rectify some of the more obvious data errors in identification. For example, the tiger shark (*Galeocerdo cuvier*) registered in Dutch waters is actually the lesser spotted dogfish (*Scyliorhynus canicula*), but the identification is based on the Dutch local name 'tijgerhaai'.

Getting data for species on the prohibited species list is challenging and highlights the unintended negative outcome of this measure. For example, since the porbeagle shark (*Lamna nasus*) was placed on the prohibited species list it has become virtually impossible to collect data on this species.

The most important issue to come out of the discussions was the use of ***incentives*** for partners to commit to sharing of data, and to realise that there are different incentives for different groups. We need to define a strategy on how to create incentives – either the stick or the carrot - for improvement in data collection and sharing. It was suggested to create an international platform for

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[1] http://www.ices.dk/community/groups/Pages/WKSHARKS.aspx

data collection and sharing. The rationale for data collection should be clear and related to the question/issue being addressed: what is the specific biological/ecological question you are asking? Also how will the data be used and in which context?

Simplifying the reporting procedures for fishermen, should making it an easier and more approachable process. Modern technology, such as the development of apps, can assist in this. However, the question of 'who owns the data' must always be addressed. In this respect it is important to communicate with industry that efforts are being made to structure the collection and dissemination of data appropriately, and that efforts are being made to make the structures in place work properly.

An interesting potential development could be the acceptance that each fishing vessel could be used as a scientific research platform, and each fisherman could contribute to the evidence base. Industry information is not just anecdotal; it could be very powerful. This so-called 'democratization of science' would be an interesting issue to develop further. Availability of data for people who are not affiliated with universities or governments is an important issue to address.

Information in the producers chain – *Seafish* example

Seafish- an organization in the UK that promotes the fishing industry, supports environmental sustainability and cost effectiveness- just launched a Risk Assessment for Sourcing Seafood (RASS), which provides the market with information about i.e. stock status. They don't give advice, but provide information for people to make their own informed decisions. www.seafish.org

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Incentives should take the following into account:
- Economics: find a way to give more sustainably caught fish a premium value
- Peace of mind, clarity of knowing what is happening in the coming years.
    - This would only work at a much higher lever. Stability in policy. This comes at a cost of risk-aversion.
    - Long-term vs. short-term thinking (quota would be lower than they are now, because of the precautionary principle, but probably higher in the long run)
- Keep reminding people about the alternative: i.e. that species will be put on the prohibited list if it decreases too much.
- More transparent communication between parties on how data is to be used
    - Make commitment to involve fishermen in finding solutions for any issue arising from data provided
- Formulate a narrative on the effectivity of the prohibited species listing for conservation purposes, and what the alternatives are.

The real challenge remains knowing what is going on with the elasmobranchs, using the expertise of fishermen, particularly for rare species. The fishermen are the key suppliers of information, and their

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Education - the next generation

Educatiemodule Visserijscholen – Education module for fisheries schools
At the request of the NEV a Dutch education institute specialized in education in the maritime sector (ProSea) has developed an education package for fisheries schools in which the typical issues surrounding fisheries and management of shark and rays species are tackled in an accessible way. This will be first trialed at schools in September 2016 and has the potential to help the entire chain from fishermen to those working at fish markets.

The education package (in Dutch) will be available in the near future.

Harokit
In cooperation with the Fish Auction, the Maritime School and the Rederscentrale (the fisheries representative), the Flemish institute for the sea (VLIZ) , Natuurpunt and the Belgian research institute ILVO developed an ID-guide for fishermen for recognition of shark and rays species and a best practice guide for handling on board. See www.natuurpunt.be/haaien-en-roggen

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knowledge should be an essential component of the knowledge framework.

One positive next step would be to set up an **international platform dealing with data collection** which could streamline some of the above issues. **Case studies** could be carried out to highlight issues of a particular fisheries. The role of advisory councils in providing a platform for discussion of these issues should be also discussed.

3.2 Selectivity, avoidance & survival

With the landing obligation coming into force in January 2019 for all species, a lot of hope is vested in applying the high survival exemption for skates and rays. How likely is it that all information needed to get an exemption will be there before mid-2018 when Member states will have to make the request for survival? Current studies may be able to give ballpark ideas, but there will not be sufficient data to be extrapolated to all species, metiers or areas. Long term in situ survival research is very time consuming and expensive and the research need is such that priorities will be given to more economically important species and fisheries. To prevent unnecessary mortality of sharks and rays post 2019, alternatives need to be considered and reviewed. In this respect looking at options for spatial management (avoidance), technical adaptations (selectivity) and increasing post catch survival should be explored as a matter of urgency.

For this issue it is really important to identify two strands of evidence building:

- On the one hand you want to know what really happens below the surface
- On the other hand, you want to combine and capitalise on the available knowledge of what works in practice

It was suggested to do a **Gap Matrix analysis** of all the initiatives in this respect. This has already been picked up by a Cefas Defra-funded project, and the ICES WKMEDS group.

Spatial management - examples

Modeling abundance hotspots for data poor Irish Sea rays (Simon Dedman)

The modelling of area closure, by taking both the fishing effort of the fishermen and the behavior of the target elasmobranch species into account, gives a novel approach to identifying (real time) closures which have been agreed upon by consensus. The model could be refined by also taking the profits of the fishermen into account. Minimizing the loss of revenue for fishermen is most important. Seasonal closures of targeted fisheries could help, because then you may protect critical stages, but still catch similar amounts of fish, only in a different season.

Combining tagging data with genetics to assess spatial distribution of spurdog (James Thorburn)

Using a combination of conventional tags, static active acoustic monitoring, archival data storage tagging (DST) and population genetics to investigate the movement and wider connectivity of spurdog in Loch Etive on the west coast of Scotland. Within this partially enclosed water body it appears that some spurdog display strong site association and over-winter within Loch Etive. This on its own has large management implications, with wider implications when combined with the genetic study.

Net adaptations could help reduce bycatch. Square panels are used to avoid sharks, but this only works in certain nets. And when using escape panels in the proper position, it is still necessary to fish without the panel as a control, to see if sharks are still caught in that location without the panel. The suggestion is made to (financially) support fishermen who are willing to trial adaptations of their nets (science-industry partnerships). Little is known about behavior in the nets, at least for skates, which is another area of research to explore in order to prevent the animals from getting in the nets. Ideally partners would work together to produce net designs and escape panels and incorporate the knowledge of traditional fishermen and their old-fashioned nets. At the same time issues of competition and conflict within fisheries should be addressed, as well as potentially conflicting conservation goals (fuel efficiency and biodiversity for example).

Wrecks and rocky areas act as natural closed areas in present day fisheries, and could contribute to a network of closed areas. This would require a baseline study on the use and importance of wrecks for elasmobranch species. Furthermore, long term monitoring of an area closure is essential, as is adding a feedback/evaluation loop to the stakeholders. This is all part of the inclusion of a **spatial element** in management, which appears to be important for elasmobranch species.

When the term survivability is used, it usually only refers to on-deck studies of post capture survival which only measure on deck vitality with little indication of long-term survival. A **risk assessment** of which species, fisheries and life stages would be the most vulnerable to fishing mortality could be a good starting point for defining survivability. There are enough data to do something semi-

quantitative with plenty of expert judgment in it, such as a Productivity Susceptibility Analysis or a SICA (scale: intensity; consequence; analysis).

Aquariums have a potential role to play in providing expertise on how to keep fish alive or in survival trials. This would potentially involve veterinary considerations and implications such as human health risks. Alternatives to the traditional antibiotics should be researched. Another suggestion was that live egg-cases from rays and skates caught by fishermen could be collected and hatched in aquaria for re-release at sea.
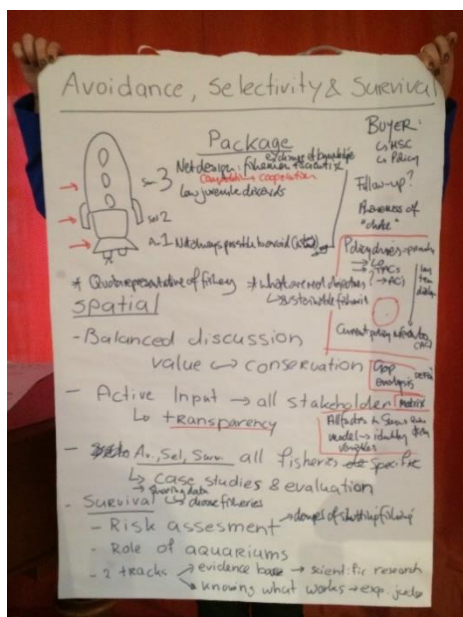
Some suggestions on how to improve onboard survival of discarded bycatch could be:

• A best-practice protocol for the handling of elasmobranchs.

• As part of MSC certification fishermen should better informed on how to handle ETP species, as there is no formal training on how to handle them.

• Looks at different release methods, such as release chutes.

As an alternative to expensive, long term tagging studies an option could be to develop a large-scale tagging study in cooperation with fishermen, where observers go on selected commercial trips and measure and record and tag (with basic analogue tags) all elasmobranchs caught. This would help calculate the actual amount of discards for different fisheries and through recaptures give an indication of survival for a variety of species and gears.

A study like this, combined with a well-founded framework of avoidance, selectivity and survival measures might serve as a for a survival exemption under the landing obligation provided that long term scientific studies into elasmobranch discard survival were also continued. A two track approach like this could provide a win-win situation for the fishermen faced with a landing obligation and the conservation of vulnerable species by decreasing mortality caused by fishing.

3.3 Rethinking the status quo

The current policy framework creates a number of challenges for effective management of sharks and rays. Within the existing policy infrastructure there are three specific areas of concern that need to be addressed:

• Rethinking the group TAC for skates and rays to better fit the reality at sea
• Alternatives to 0-TAC and placing species on the prohibited species list
• Aligning current management with the landing obligations and choke species

Under the TAC & quota regulation TACs have been set for one shark (0-TAC spurdog) and a group TAC for commercially caught skate and rays species. A further 15 elasmobranch species are on the

prohibited species list (article 13 of the TAC & quota regulation). The skate and ray group-quotum is set through a data limited approach based on overall trend as ICES is not yet able to provide MSY advice for these species. Based on the assessment of 2014-2015, three stocks showed a negative trend, one stock showed a neutral trend and three stocks showed a positive trend.

When exploring alternatives to managing through a group TAC for skates and ray it should be considered that individual quota are not advisable as these would all be restrictive due to data limitations and thus create a dozen potential choke stocks. It would also create an extra burden on the control authorities. An alternative option is to only have quota for the commercially interesting species and make other species prohibited, or even have skate and ray **family group quotas**- split up into *Rajidae, Dipturus, Leucorajidae,* etc.
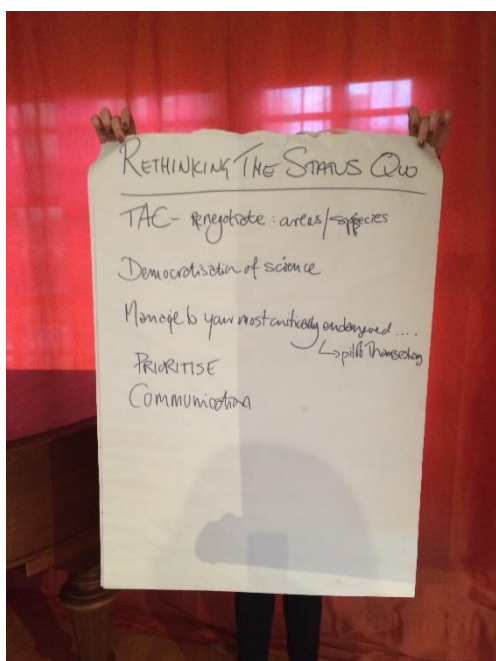
Here it needs to be noted that adding species to the prohibited list is not a protection measure per se. For species that are mostly o fully discarded (starry skate for example) it does not decrease fisheries mortality. As listing on the prohibited list does not require member states to implement additional recovery measures. With many skate and ray species potentially becoming choke species under the landing obligation there is perverse incentive to add more species to the prohibited species to create an option to keep discarding.

Dividing the TAC per family would not necessarily alleviate the problem the current group TAC gives to management. The commercially most interesting species are also the ones with the most complete data available (*Rajidae*). A family based TAC approach could potentially solve the issues for this group but could create a situation where all the other TACs have to be set very low (due to lack of data and rarity of species) thus creating potential for additional choke species and a driver to add these families to the prohibited list as explained above.

A third option would to adapt a more regional management approach and **split the group TAC up between fisheries and areas**, according to the differences in fisheries and species caught. This would be, in effect, a renegotiation of the TAC and would mean a reinterpretation of the relative stability for this specific TAC. The purpose of relative stability is to prevent repeated discussions over how quotas should be allocated, and to provide fishers with an environment that is stable relative to the overall state of the stock in question. However, the landing obligation will require possible rethinking of how quota are distributed, as fisheries that have no quota now because they used to discard all catches of a certain stock or species will now need quota to cover these discards.

Where a certain level of bycatch is inevitable a prohibition or 0-TAC only means all catches will be discarded. Furthermore, a 0-TAC is incompatible with the landing obligation so a solution will have to be found for those species currently under a 0-TAC (spurdog). Maximising avoidance and selectivity and in return allowing the landings of inevitable bycatch could be a solution. In the UK there have been trials with a spurdog bycatch reporting programme. See box below.

Rethinking 0-TAC - example

Spurdog bycatch reporting program Cefas (Stuart Hetherington)

- Report any spurdog catches within pre-defined reporting grids
- Cooperation between fishermen, ministry (DEFRA) and science (CEFAS)
- Generate up to date information on spurdog movement and allow skippers to make informed decision about interactions in order to avoid catching spurdog
- First trials have given promising results

The next CFP reform is scheduled for 2020, this will provide an opportunity to explore new management strategies that no longer rely on strict quota management but can incorporate a fine mesh spatial approach and through the right incentives create a situation where fishermen can make their own choices on where and how to fish. A challenge for policy makers is to find a way to manage for your **most vulnerable species** without impairing fishing for abundant species, instead of managing for the most economically important species. The Real Time Incentive method could offer an alternative. See box.

Rethinking management - example

Real Time Incentives (RTIs) – Dave Reid

An innovative approach whereby the fishing area is divided into areas of differing 'costs' and each vessel gets an annual quota of credits to fish. This tariffs based system means that areas with high abundance or sensitive habitats are not closed but are more expensive to fish in. When you run out of credits you stop fishing. You don't get quota, just credits. The analysis shows that managing for the most sensitive species or habitats is sufficient to manage for most species. If you only manage the species that are in trouble at that time, the other ones will follow. A trial for elasmobranchs could be carried out in the Thames Estuary.

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4. Conclusion and Next steps

There is a general consensus that the stakeholder group created for this process should continue, and that it can provide a platform for the issues surrounding sustainable management of elasmobranchs. Any future initiatives should take the entire fishing chain into consideration and seek to identify incentives from the onset.

Two key words for any future initiatives are 'prioritise' and 'communication'. There are many challenges that need to be overcome in the management of sharks and rays, so it is essential to set the right priorities for the coming years. The objectives for management should be clear form the onset and all efforts should be made to involve all relevant stakeholders in the process. Any future initiatives should take the entire fishing chain into consideration and seek to identify incentives at each stage.

There is a clear need for additional information on elasmobranchs. At the moment we have too little species specific information on the status of populations, their biology, the level of bycatch and many more variables. Cost effective options need to be explored to fill these knowledge gaps.

From the expert meeting a number of ideas have been formulated that should be taken on in the near future in order to keep the momentum going and work towards a sustainable solution for sharks and rays.

4.1 Data collection

Create a platform for data sharing – build on the positive experience from the Amsterdam meetings and organize a dedicated meeting to discuss confidentiality, access to data, developing sharing protocols and common goals. Include the fish markets and market analyses explicitly in the process.

Carry out a *Gap Analysis* on order to identify who is doing what as far as data collection is concerned – actions taken and programmes developed to improve the effective exchange of information and to avoid overlap. Some steps have already been taken in this direction.

4.2 Management

Rethink the group TAC for skates and rays. Look at alternatives such as adapting a more regional management approach and split the group TAC up between fisheries and areas, according to the differences in fisheries and species caught.

In order to gain insight into the advantages of the real time incentive (RTI) approach for fisheries management and the benefits for skates and rays, a trial of this methodology could be carried out in the Thames Estuary.

It is suggested to carry out a Management Strategy Evaluation (MSE) for elasmobranchs under the CFP. An MSE is a tool which is used to determine how well management measures achieve their objectives. The MSE approach provides a simulation-based framework within which harvest strategies, stock assessment methods, performance indicators and research programmes can be compared (Punt *et al.*, 2010). The results from an MSE would be vital for identifying an international approach to shark, skate and ray management.

4.3 Landing obligation

In order to build a knowledge base for identifying the vulnerability of shark and rays species an ecological risk assessment should be carried out. This could be done for the North Sea as basis for the development of best practices for the avoidance, selectivity and survival of elasmobranchs. A first step would be to carry out a SICA analysis (scale; intensity; consequence; analysis) to put the elasmobranchs into context.

As a complementary programme to the current studies on survival it is suggested to carry out an extensive tagging programme to identify the survival of elasmobranchs after discarding. This should be done in a selected number of fisheries and in close cooperation with fishermen and scientists.

At the same time fishermen and scientist could develop a best practice protocol for sharks and rays encompassing optimal measures for avoidance, selectivity and on board survival which are practically applicable in fisheries.

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Annex 1. Report of December expert meeting

Expert meeting on Elasmobranch distribution, bycatch and survival in the North Sea

Held on 8th December 2015 in Amsterdam

The goal of the meeting was to better define the issues that should be dealt with in managing elasmobranchs in the North Sea. Starting with defining the issues and to start thinking about solutions to be able to present of the elements needed for successful management. This meeting is the first to be held. In February 2016 there will be a follow-up 2-day meeting (1st-2nd Feb 2016). See Annex A for a list of participants

The delegates were asked before the meeting to fill in a short questionnaire about the issues surrounding skates, rays and sharks in the North Sea. The answers were used to structure the discussions. The most important issues were: use a species specific management approach; issues dealing with bycatch; and the need for international cooperation. During the course of the discussions the group defined common goals and actions to be taken before the next meeting. The detailed notes from the discussions are shown at the end of the document.

COMMON GOALS
All participants see the need of appropriate management of elasmobranch species which should encompass:

- Reducing dead discards
- Avoid quota overshoot → after 2019 this would lead to choke issues
    - Set TAC appropriately
    - Make use of best available avoidance/selectivity/survival methods
- Make most of available data
    - Share data/build trust
    - Uniform data collection format
- Share information / keep track of who's doing what
- Data you have needs to be used to manage the species: making the most of the data available to be able to make informed decisions
- Address the lack of data in general
- International coordination working towards a common approach
- Look at the spatial context in management
- Retain appropriate fishing opportunity

DETAILED DISCUSSION
Using available data in species specific management

- There appears to be fragmentation of stocks, even the migratory species such as spurdog, which implies more regional/local management.

- Current catches in North Sea fisheries indicate that thornback ray abundance is increasing on the Dutch continental shelf (up to Germany/Denmark). ICES Working Group has identified an increase in numbers in 2015. It is unknown if this means that the stock is rebuilding or not.
- The group TAC is an ill fit for management as it does not allow for increased fishing when one species becomes more abundant as some depleted species are also managed by this. Whilst ICES notes an increase in thornback for other species, such as the cuckoo and blonde rays, ICES advice is to reduce catches.
- Questions to be answered: What alternatives are there to the group TAC? How to deal with species on the prohibited species list?
- Species identification is a problem. Several solutions were discussed: FAO fish ID app; Harokit from ILVO which promotes identification skills and best handling practices. Maybe choose a pragmatic solution such as 'discard everything with spots on it' so that the spotted and blonde rays are thrown back ASAP.
- Getting the species-specific information into the e-logbook is complicated. The sector has offered to look at a way of collecting the data with a simple Excel-sheet. In order to test this, Klaas-Jelle Kofferman has offered to take students out with the fishermen.
- Data on elasmobranchs from the Dutch self-sampling programmes has not yet been analysed for elasmobranchs
- There is a lot of information that is not (yet) being shared. Mutual trust is a condition for exchange of data. Parties are worried that information will be used against them and that the rules of the game change as the game is being played.

Bycatch

- High catches of elasmobranchs will make them a choke species once the landing obligation comes into effect in 2019. There is the option of a high survival exemption to the regulation but this has not yet been studied adequately.
- Experimental design for discard survival needs to take current level of knowledge into account (e.g. CEFAS, Marine Scotland, IMARES). E.g. experiments should be at least 3 weeks (until mortality levels of); take into account long term effect for example that stress can have effects on growth and reproduction.
- Behaviour in the net is unknown. It is advised to research this prior to deciding on measures to reduce bycatch with net adaptations. Involve net builders in the discussions
- Not catching the rays and sharks in the first place will give the highest chance of survival. Look at methods to identify 'hot spots' of species so that they can be avoided in real time. Fishermen in UK are looking at ways of exchanging this sort of information to avoid spurdog aggregations whereby there is turnaround of 12 hrs. max.
- Look to improve current procedures for real time closures. Now there can be a year between high catches and proposals for area closure.

International cooperation

- Necessary to develop common goals (fisheries and conservation) and a common approach to reach shared objectives

- Identify and share available data and make sure that people are confident that the information they share is not used against them
- Unique selling point is to show what we can achieve in a cooperative group setting – use this as a blueprint for other discussions on fisheries
- Ownership of the problem is important to get commitment
- Working with industry partners from the onset is essential for the success of the project
- Getting the right mix of stakeholders around the table
- There is no sense of urgency on the policy front; high priority and highly relevant in some areas but we don't have traction on all fronts.

There will be a follow up meeting on the 1st -2nd February 2016 where a larger group of stakeholders and scientists will build on the recommendations from this expert meeting in trying to find effective solutions for management.

List of Participants at Expert Meeting on elasmobranch distribution, bycatch and survival in the North Sea; 8th December 2015 - Amsterdam

Klaas Jelle Koffermen	Pensi Pri Solvo
Biem van der Vis	VisNed
Jurgen Batseer	VisNed
Kevin Vanhalst	ILVO
Karen Bekaert	ILVO
Wouter Jan Strietman	LEI
Pieke Molenaar	Imares
James Thorburn	Aberdeen University
Stuart Hetherington	Cefas
Dale Rodmell	NFFO
Paddy Walker	NEV
Irene Kingma	NEV
Herman Verheij	Chairman

Annex 2. Report of February expert meeting

Report of 2nd Expert Meeting on the distribution, bycatch and survival of sharks and rays

Date: February 1st -2nd
Location: The Roos, Amsterdam, the Netherlands
Chair: Irene Kingma & Paddy Walker
Notes: Linda Planthof

List of participants

- Ali Hood
- Anne Doeksen
- Anton Ellenbroek
- Dale Rodmell
- Dave Reid
- David Ras
- Hans Nieuwenhuis*
- Henk Buitjes
- Inger vanden Bosch
- Irene Kingma
- Jan Jaap Poos
- Johan Rispens
- John Lynch
- Jurgen Batsleer

- Kevin van Helst
- Kirsty McGregor
- Klaas Jelle Kofferman
- Krien Hansen
- Linda Planthof
- Martin Pastoors
- Matthias Schaber
- Paddy Walker
- Simon Dedman
- Sophy McCully
- Stuart Hetherington
- Tony Delahunty
- Wim van Urk*
- Wouter van Broekhoven*

* present on February 2nd only

The Dutch Elasmobranch Society has organized two expert meeting with scientists, fishers, NGOs and policy makers to look at new ways to address fisheries, management and conservation issues in elasmobranchs. The first highly successful meeting was held on the 8th of December and an equally successful follow up meeting was organized on the 1st and 2nd of February 2016. During this second meeting the presentations and discussions built on the recommendations from the first meeting in trying to find effective solutions for management.

During this second meeting there were three interactive sessions, with presentations on the subject by 3 or 4 experts from different backgrounds. There was time for broad debates and the results were summed up following the discussions.

Session 1: Distribution, data collection and species identification.
This session addressed on the one hand the data needs for elasmobranchs and ways to fill the knowledge gaps and, on the other hand, looked at ways to increase the identification skills within the whole producers chain.

Session 2: Selectivity, avoidance and survival

This session explored options to reduce fisheries mortality of elasmobranchs by looking at options for spatial management, technical adaptations and increasing post catch survival.

Session 3: Rethinking the status quo

The final session looked at current management, policy and cooperation, as well as innovative ideas for management, and identified where improvement would be needed.

The meeting started with an introduction of the results from the previous meeting and the common goals that were identified.

Common goals defined at December meeting

All participants see the need of appropriate management of elasmobranch species which should encompass:

- Reducing dead discards
- Avoid quota overshoot → after 2019 this would lead to choke issues
  - Set TAC appropriately
  - Make use of best available avoidance/selectivity/survival methods
- Make most of available data
  - Share data/build trust
  - Uniform data collection format
- Share information / keep track of who's doing what
- Data you have needs to be used to manage the species: making the most of the data available to be able to make informed decisions
- Address the lack of data in general
- International coordination working towards a common approach
- Look at the spatial context in management
- Set appropriate fishing opportunities

Goals of second, February meeting

The goal of this second meeting was to build on the recommendation and goals from the first meeting and to:

- refine those goals
- define actions that need to be taken
- explore collaborations between partners

The issues identified in the first meeting were discussed in the three interactive sessions with the following speakers.

Session	Speakers
Session 1: Distribution, data collection and species identification	**Sophy McCully Phillips (CEFAS):** Distribution, data collection and species identification **Anton Ellenbroek FIPS :** Smart Forms (app) **Martin Pastoors (Pelagic Freezer-Trawler Association) :** PFA Self-sampling approach **Jurgen Batsleer (VisNed) :** Demersal fisheries data on elasmobranchs
Session 2: Selectivity, avoidance & survival	**Simon Dedman (Galway Mayo Technical Institute) :** A flexible decision support tool for Maximum Sustainable Yield-based MPA design **Klaas-Jelle Kofferman (Fisherman from Urk) :** Gear adaptations **Stuart Hetherington (CEFAS) :** Long-term discard survival of thornback ray in the eastern English Channel trammel net fishery
Session 3: Rethinking the status quo	**Irene Kingma (Dutch Elasmobranch Society) :** Unravelling the group TAC: Skate and ray management in the EU **Dale Rodmell (National Federation of Fishermens Organisations) :** Fisheries Science Partnerships **Dave Reid (Marine Institute Ireland):** RTI (Real Time Incentives) – a spatial and effort management approach to fisheries management

Session 1. Distribution, data collection and species identification

This session addressed two aspects: (i) the data needs for elasmobranchs and ways to fill the knowledge gaps; and (ii) looked at ways to increase the identification skills within the whole producers chain.

Scientific surveys collect catch data on elasmobranchs which is used for the underpinning of ICES advice. The gears used are not always highly selective for all elasmobranch species. However, the data are robust enough for scientifically sound trend analyses and assessments to be carried out, for a number of species and if the time series is long enough (at least 7 years). Possible sources of errors in identification have been flagged throughout the reporting process and the resultant data collated by ICES in their DATRAS database are not always accurate. These issues, and others related to data collection were addressed at the recent ICES Workshop on elasmobranch data collection held in Lisbon at the end of January[2]. Work is being done to rectify some of the more obvious data errors in

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[2] http://www.ices.dk/community/groups/Pages/WKSHARKS.aspx

identification. For example, the tiger shark registered in Dutch waters is actually the lesser spotted dogfish, but the identification is based on the Dutch name 'tijgerhaai'. Another issue is the level of identification. Rajids used to be separated into subfamilies, but people are moving towards treating them as separate families of skates (long snouts) and rays (short snouts).

Time series of independent surveys generally need to be 7 years long, to compare the last two years to the previous five. Even though for numerous species there are no reference points (such as MSY), some qualitative trends can be observed. Still not all countries are landing their skates in species-specific categories. It is likely that misreporting increases as the Commission increased quota restrictions.

The current data needs can be summarized as species-specific information on:
- Genetic/ movement data to identify stock boundaries
- Life history stages
- Breeding periodicity
- Fecundity

The most important issue to come out of the discussions was the use of *incentives* for partners to commit to sharing of data, and to realise that there are different incentives for different groups. We need to define a strategy on how to create incentives – either the stick or the carrot - for improvement in data collection and sharing. It was suggested to create an international platform for data collection and sharing. The rationale for data collection should be clear and related to the question/issue being addressed: what is the specific biological question you are asking? Also how will the data be used.

Simplifying the reporting procedures for fishermen, should making it an easier and more approachable process. Modern technology, such as the development of apps, can assist in this. However, the question of 'who owns the data' must always be addressed. In this respect it is important to communicate with industry that efforts are being made to structure the collection and dissemination of data appropriately, and that efforts are being made to make the structures in place work properly.

Incentives should take the following into account:
- Economics: find a way to make more sustainably caught fish more premium
- Peace of mind, clarity of knowing what is happening in the coming years. This would only work at a much higher lever. Stability in policy. This comes at a cost of risk-aversion. Long-term vs. short-term thinking: quota would be lower than they are now, because of the precautionary principle, but probably higher in the long run. This may not be within our span of control. However, giving of a signal may be conducive.
- Keep reminding people about the alternative: i.e. that species will be put on the prohibited list if it decreases too much.
- More transparent communication between different levels in the chain.

- Formulate a narrative on why prohibited species listing is merely cosmetic conservation and what the alternatives are.

Information from the Dutch pelagic fleet was presented showing that the bycatch is sharks, not skates. The PFA does not have a lot of information about bycatch of elasmobranchs, except from an observer program done by IMARES in the light of the Data Collection Framework. The handling of fish occurs on separate parts of the ship; smaller species are transported to the factory part of the ship, and larger species remain on the deck. The access of observers is sometimes restricted to the factory part of ship, due to safety regulations, so therefore their data is probably and underestimate in terms of sharks. The pelagic fleet is actively looking for solutions to bycatch and for data collection.

The Dutch demersal fisheries is starting a project looking at survival of skates and rays in the cutter fisheries. The large administrative burden for registration of (ETP) species is seen as a bottleneck to improving data collection.

The real challenge remains knowing what is going on with the elasmobranchs. We should be using the expertise of fishermen, particularly for rare species. The fishermen are the key suppliers of information, and their knowledge should be leading. The market should also be targeted more as there seems to be a lack of expertise in the market to identify skates, rays, or sharks.

The prohibited species list has both positive and negative outcomes. The undulate rays (*Raja undulata*) becoming prohibited species stimulated research. But when a species can't be caught, we cannot get data.

In order to create more transparency in the fisheries chain Seafish (an organization in the UK that promotes the fishing industry, supports environmental sustainability and cost effectiveness) has just launched a Risk Assessment for Sourcing Seafood (RASS), which provides the market with information about the relevant fisheries, i.e. stock status. They don't give advice, but provide information for people to make their own informed decisions. See: www.seafish.org.

One of the conclusions of this session was that an international platform dealing with data collection could streamline some of the above issues.

Session 2. Selectivity, avoidance & survival

This session explored options to reduce fisheries mortality of elasmobranchs by looking at opportunities for spatial management, technical adaptations and increasing post catch survival.

The modelling of area closure, by taking both the fishing effort of the fishermen and the behavior of the target elasmobranch species into account, gives a novel approach to identifying (real time) closures which have been agreed upon by consensus. The model could be refined by also taking the profits of the fishermen into account. Minimizing the loss of revenue for fishermen is most

important. Seasonal closures of targeted fisheries could help, because then you may protect critical stages, but still catch similar amounts of fish, only in a different season.

Net adaptations could help reduce bycatch. Square panels are used to avoid sharks, but this only works in certain nets. And when using escape panels in the proper position, it is still necessary to fish without the panel to see if you would catch sharks in that location without the panel, as a control. The suggestion is made to (financially) support fishermen who are willing to try adaptations of their nets. We still do not know enough about the behavior in the net, at least for skates. It is known how the animals behave enough to entice them into getting caught in the nets, however not enough to articulate how to avoid their catch. Ideally partners would work together to produce net designs and escape panels and incorporate the knowledge of old-fashioned fishermen and their old nets. However, it is important to understand that there could be an issue of competition, or even rivalry, here. Also, regulations potentially conflict with conservation goals. For instance, sometimes you are not allowed to use bigger meshes.

Wrecks and rocky areas are basically naturally closed areas. There are up to 30,000 wrecks in the North Sea, and the suggestion was made to designate these as part of the network of closed areas as a way to achieve national goals for area closure. A good place to start is to close off the places fishermen go only once a year. It is essential to monitor the closed areas to see if the closure helps. This feedback loop or evaluation loop is often missing. Avoidance of juveniles in catches should have priority.

We often say survivability, but often only on-deck vitality is measured and there is little indication of long-term survival. The suggestion was made to make a risk assessment of which species, fisheries and life stages would be the most vulnerable to fishing mortality. There is enough data to do something semi-quantitative with plenty of expert judgment in it, such as a Productivity Susceptibility Analysis.

The question was raised if aquariums can play a role in keeping fish alive for re-release? This would potentially involve veterinary considerations and implications such as human health risks. Alternatives to the traditional antibiotics should be researched. Another suggestion was that live egg-cases from rays and skates caught by fishermen could be collected and brooded out in aquaria, again for re-release at sea.

There were a number of ideas to improve onboard survival of bycatch and discarding:

- A best-practice protocol for the handling of elasmobranchs. Fishermen should be informed on how to handle ETP species, as there is no formal training on how to handle them.
- Looks at different release methods, such as release chutes.

How likely is it that we'll have information before 2019 to advice on survivability? Current studies may be able to give ballpark ideas, but there will not be sufficient data to be extrapolated to other species or areas. The research is also very expensive. The alternative suggestion was made to develop a large-scale tagging study in cooperation between scientists and fishermen, where observers go on selected commercial trips and measure and tag a designated number of elasmobranchs in order to estimate survival. This needs careful thought as far as objectives, variables etc. are concerned.

For this issue it is really important to identify two strands of evidence building:

- What do we know that works
- What really happens

It was suggested to do a Gap Matrix analysis of all the initiatives in this respect. This has already been picked up by a Cefas Defra-funded project, and the ICES WKMEDS group.

The current priorities in policy and how to work within the existing policy infrastructure are important in this issue:

- Alternatives to 0-TAC and putting species on the prohibited species list
- Landing obligations and choke species
- Group TAC

The role of advisory councils in providing a platform for discussion of these issues should be discussed.

Availability of data for people who are not affiliated with universities or governments is still a problem. The suggestion is made again to develop a platform to exchange knowledge and ideas.

Communication, monitoring, and feedback are important.

Session 3. Rethinking the status quo

The final session looked at current management, policy and cooperation, as well as innovative ideas for management, and identified where improvement would be needed.

Presentations were on the limitations of the group TAC for skates and rays, fisheries-science partnerships and a new methodology for managing fishing – Real Time Incentives.

The current TACs & quota for sharks and skates and rays covers one shark species (0-TAC spurdog) and 15 skate and rays species in a group TAC. A total of 15 shark and ray species are on the prohibited species list. The skate quotum was decreased with 20% in 2015 because it is data limited with a negative trend, despite the fact that the thornback ray, for example, appears to be increasing.

Options for alternatives were discussed. Individual quota are not an option due to the data limitations and the trouble with control and enforcement. It was suggested that there could be a quota for only the commercially interesting species, or even have skate and ray **family quotas**- split up into *Rajidae, Dipturus, Leucorajidae,* etc.

Relative stability is when TACs for each stock are shared out between the Member States of the EU according to a fixed allocation key based on their historic catches. The purpose of relative stability is to prevent repeated arguments over how quotas should be allocated, and to provide fishers with an environment that is stable relative to the overall state of the stock in question. The landing obligation will require us to rethink this. It was never meant to be a set in stone measure.

Prohibited species are always discarded and the prohibited species list is being misused, because data poor species are included even though they might not be doing badly.

One option is to adapt a more regional management approach. Once you have a group TAC you could maybe split it up between fisheries and areas, according to the differences in fisheries and species caught. This would be, in effect, a renegotiation of the TAC.

A very interesting potential development could be the acceptance that each fishing vessel could be used as scientific research platform, and each fisherman could contribute to the evidence base. Industry information is not just anecdotal, it could be very powerful. This so-called 'democratization of science' would be an interesting issue to develop further. There are however a number of challenges in the fisheries – science partnerships:

- Data deficiency to inform decision making
- Precautionary management
- Reconciliation of more complex array of management objectives; MSY; mixed fisheries, ecosystem effects, Landing obligation
- Increased regulatory burden on fisheries and managers
- Contracting public finances

Possible incentives could be: improved fishing opportunity; longer term investment considerations and assurance.

Where a certain level of bycatch is inevitable, a prohibition or zero TAC only means discarding. Solutions for high discarding with 0-TAC could be developed in close consultation with the industry. Concrete proposals to deal with the 0-TAC for spurdog were:

- Report any spurdog catches within pre-defined reporting grids
- Generate up to date information on spurdog movement and allow skippers to make informed decision about interactions

Real Time Incentives (RTIs) is an innovative approach whereby the fishing area is divided into areas of differing 'costs' and each vessel gets an annual quota of credits to fish. This tariffs based system means that areas with high abundance or sensitive habitats are not closed but are more expensive to fish in. When you run out of credits you stop fishing. You don't get quota, just credits. The analysis shows that managing for the most sensitive species or habitats is sufficient to manage for most species. If you only manage the species that are in trouble at that time, the other ones will follow. A trial for elasmobranchs could be carried out in the Thames Estuary.

General conclusions

There seems to be a general consensus that this group should continue, and that it can provide a platform for the issues surrounding sustainable management of elasmobranchs. Maybe other fora could host a meeting or special session, e.g. at the European Elasmobranch Association Annual Science Conference (to be held late October/early November 2016 in Bristol).

Two key words for any future initiatives are 'prioritise' and 'communication'.

It is important to know how the elasmobranchs are doing. What is the status of the populations. This is largely unknown, especially in the coastal areas, and for the pelagic species.

Any future initiatives should take the entire fishing chain into consideration and seek to identify incentives at each stage.

Working towards solutions: developing measures for sharks, skates and rays in the North Sea

A short summary of the meeting (below) was presented at the North Western Waters Advisory Council skate and ray working group meeting on February 3rd in Paris and at the Demersal Working Group of the North Sea Advisory Council on 9th of February.

Main issues in shark and ray management:
a) Lack of data
   - The fishing gear used in in scientific surveys is not necessarily selective for elasmobranchs
   - There are issues with identification throughout the supply chain
   - Unwillingness to share data because of potential implications
b) Management through TAC & quota is a bad fit for protection of species
   - Group TAC is restrictive for abundant species and does not protect depleted species
   - A 0-TAC leads to increased discarding without addressing mortality
   - Moving species to the prohibited species list does not trigger any protective management
c) Landing obligation
   - Takin into account the current level of discarding skates and rays will become a choke species many demersal fisheries
   - A 0-TAC is incompatible with the LO
   - It highly improbable that there will be evidence for high survival for all species in all areas and metiers by mid-2018.

Working towards solutions
a) Lack of data
   Incentivise data collection by industry by
   - Making clear what the benefits and consequences are (carrot and stick)
   - Transparency on where and how data is to be used
   - Commitment from policy makers to operators providing data that the will be involved in mitigating issues arising
   - Streamlining data collection formats (make use of new techniques like apps)
   - Resource efficiency in data collection
   - Premium value for 'doing the right thing'

b) Management through TACs and quota
   - Find a way to introduce a spatial element into management
   - Use escapement as a way to protect a core of the biomass
   - Work out specific case studies and evaluations
   - If closures are needed look at seasons/gears
   - Should not displace fisheries with other economic drivers
   - GAP analysis of actions taken/programs developed
   - Case studies of different fisheries/scenarios
   - Manage to your most vulnerable species

c) Landing obligation
   - 2 tracks:
       i. increase scientific evidence base for survival
       ii. develop a package of 'best practice' measures addressing avoidance, selectivity and survival.
   - Ecological risk assessment incorporating species/area/fisheries
   - Make objectives for management clear