Joint NWWAC/NSAC Workshop on Skates & Rays Management

Brussels, 02 September 2025

REPORT

1 Welcome & introduction - John Lynch, NWWAC Vice-Chair & Chair of Skates and Rays FG

A warm welcome was extended to all participants at the workshop on skates and rays by the NWWAC Executive Committee Vice-Chair and joint Focus Group Chair **John Lynch**, with appreciation expressed to the Commission for facilitating and to the Secretaries for organising. The focus of the event, building on outcomes from the February 2023 workshop, was on examining group TACs and potential species separation, along with suitable methodologies. Attention was drawn to category 5 stocks requiring improvements in assessment.

Participants were invited to respond to the following question through Mentimeter: **In your opinion, what is the most pressing issue regarding the management of skates and groups?**

All responses are listed here and ranked by popularity:

Number of votes	Response
9	• Sustainable management of the stocks
5	• Getting more data on poor data stocks • Little understanding on the status of economically important stocks • Simplification
4	• To protect what needs protection, including fishers needs
3	• Vulnerable species are less protected • Data-limited species • Correct identification of species for proper management • Management – an arrangement of the best way to manage mixed catches • Lack of data
2	• Group TAC • Socio-economic consequences • Stock assessment for main target species and vulnerable species • Combined TAC, lack of sufficient data • Conservation of vulnerable stocks • Secure sustainable management
1	• Not hunting mosquitoes with canon

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2 **Advancing elasmobranch assessments**: Enhancing the use of survey data (WKSKATE2) – Graham Johnston, Marine Institute

An overview of current work within the International Council for the Exploration of the Seas (ICES) was presented, with particular focus placed on research improvements, survey methods, and stock assessments. Advice for elasmobranchs is produced through the Working Group on Elasmobranch Fishes (WGEF), where more than 50 stocks of skates, rays, dogfish, deep-water and pelagic sharks are reviewed annually. Data are submitted in May, followed by June meetings, report drafting over the summer, and final advice prepared by the Advice Drafting Group Elasmobranch Fishes (ADGEF) in September for October publication.

ICES stock categories were outlined as central to understanding assessments. Category 1 represents full quantitative assessments with reference points and forecasts, applied only to spurdog within WGEF. Category 2, nearly equivalent, now includes nine stocks following intensive benchmarking efforts, notably after some unexpected fishery closures for undulate ray that required justification for reopening. Category 3 covers trend-based assessments, commonly applied to around 20 skate and ray stocks, with survey commercial length data providing proxy reference points.

Categories 4, 5, and 6 were described as data limited. While Category 4 applies to partial bycatch assessments, no skates or rays fall in here. Category 5 was identified as critical, encompassing nearly 20 stocks where only landings data exist, often due to unsuitable survey methods. For example, survey data for blonde ray are limited as vessels cannot effectively sample in shallow waters. A precautionary buffer was explained: every three assessment cycles, a 20% reduction is applied in the absence of sufficient data, which can progressively reduce advice to zero over time. Category 6 stocks were noted as largely protected species, with no catch data available.

Resolving Category 5 stocks is vital, as reliance solely on landings leads to precautionary reductions that undermine sustainable management. Continued improvements in data collection and stock assessment are needed for robust and accurate advice.

Workshops outside the regular ICES advice cycle address specific issues in stock assessment. Past examples include examinations of landings, discards, and deepwater shark distribution. WKSkate focused on improving the use of survey data in assessments. The objective was to ensure that all available and relevant surveys were being utilised, particularly in regions such as the Celtic Sea where multiple national surveys overlap. Combining data across time and space is a cost-effective method to improve assessments.

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The first WKSkate meeting focused on North Sea stocks and parts of the Bay of Biscay and Iberian regions. Standards for survey use were established, including requirements that surveys cover the full species distribution, appropriate depth ranges, and provide consistent time series. Distinctions between exploitable and total biomass were also clarified. These outcomes led to changes in the assessment process for several ray stocks.

The second WKSkate workshop concentrated on the Celtic Seas eco-region but also considered broader areas. Alternatives to traditional fisheries surveys were explored, particularly for regions such as Portugal where survey capacity is limited. Efforts were directed toward exploring possibilities to upgrade data-limited Category 5 stocks to Category 3 by incorporating survey and length-based data. The Irish Anglerfish and Megrim Survey (IAMS), UK Channel surveys, and French surveys were examined. IAMS was noted for its valuable deepwater data, while challenges were acknowledged in stocks such as black-mouthed dogfish (*Galeus melastomus*), where survey coverage remains limited, but has improved.

Special attention was given to common skate species, long recognised as problematic due to misidentification and taxonomic complexity. Survey evidence suggested that advice could now be given separately for *Dipturus flossada* and *Dipturus intermedius* in the Celtic Seas Ecoregion, though formal requests from the EU and UK would be required. Additional improvements included incorporating surveys in the Western English Channel and adjusting methods for length-based assessments, which now play a central role for Category 3 stocks.

Final recommendations included the adoption of IAMS data for black-mouthed dogfish and spotted ray, incorporation of UK and French surveys for thornback ray and upgrade to Category 3 stock, provision of separate advice for common skate species, and technical refinements in the use of length data. Potential use of Norwegian longline spurdog data was also identified for future benchmarks. Transparency, documentation, and openness to peer review were underscored as guiding principles throughout the process.

The ICES Advice Drafting Group was reviewing recommendations in the week of this workshop. If approved, stock assessors within WGES will re-examine the data in May, enabling improved advice to enter the next assessment cycle. Enhanced guidance for certain stocks is therefore expected in future years. Further species may be included as additional data are identified. Dialogue with industry and managers was emphasised as essential for setting priorities and exploring alternatives to traditional surveys. Collaborative data collection, such as projects in France to improve blonde ray assessments, was highlighted as a model. Transparency and cooperation were stressed as vital for progress.

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Michael Andersen of Danish Fishers PO stated that the exercise was important, though concern was expressed about the lack of clarity in stock definitions. Further uncertainty arises when determining whether populations such as Thornback Ray in the Skagerrak and those in the English Channel should be treated as the same stock. The mixture of management units and biological stock units was described as a significant barrier to progress.

Graham Johnston acknowledged that stock definitions within ICES are often artificial, created largely to align with management divisions and subdivisions. For skates and rays, stocks were established in 2012–2013, using distribution data and practical management considerations. While efforts were made to be biologically accurate, limitations were admitted, and some stocks were likely missed or defined inappropriately. Genetic studies have since revealed unexpected differences, such as in thornback ray, where two distinct components were identified in the Bay of Biscay. A stock identification working group exists to review evidence and adjust definitions when necessary. Survey data, tagging, and genetics continue to refine boundaries, though improvements remain ongoing.

Michael Andersen expressed concern about the treatment of thornback ray in areas 3a and 4. In 3a, the species is prohibited, meaning catches are released by law and therefore unregistered, despite its importance as bycatch. In contrast, landing is permitted across the boundary in area 4. The inconsistency was highlighted as problematic, since the species is common in both areas. A question was raised as to whether this regulatory difference implied recognition of two distinct stocks, despite the biological overlap.

Jurgen Batsleer explained that uncertainty remained regarding the origin and justification of the prohibition on thornback ray in area 3a. It was suggested that the measure may have been implemented in response to historical declines, with the rationale of safeguarding the stock. However, it was noted that if evidence of recovery exists, revision of the prohibition could be considered.

Graham Johnston clarified that when stocks were initially assigned, the process was conducted without management involvement. A report exists documenting how stocks were scientifically defined, but no records were identified to explain how subsequent management measures were determined. In many cases, the reasons behind prohibitions remain unknown, as decisions were not always based on scientific advice. This lack of documentation was highlighted as a challenge for understanding current management arrangements.

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3 **Comparisons of landings to scientific advice** indicate overshooting within the common TAC for skates and rays in the Northeast Atlantic – Katinka Bleeker, Wageningen Marine Research

A paper co-authored by the speaker was presented, examining how landings compare with scientific advice under the common TAC for skates and rays in the Northeast Atlantic. The study was developed following the 2022 meeting of the Scientific, Technical and Economic Committee for Fisheries (STECF), which explored alternatives such as splitting common TACs into single-stock TACs. Common TACs, first introduced in 1999 and now applied in five regions, group multiple stocks—often non-target or data-limited species—under shared limits. Currently, 29 stocks across 10 species are managed in this way.

The expectation of a common TAC was that catches should reflect stock status and scientific advice, with more abundant species contributing proportionally more to landings. The analysis was designed to test whether this assumption holds true, and whether overshooting or undershooting of individual stock advice occurs.

ICES' estimated landings, scientific advice, and annual common TACs were analysed for 2016 and 2022, covering 26 stocks across eight species. Only stocks with both landings and advice included in common TACs were examined. Biological traits—such as maximum length, maturity size, and fecundity—were incorporated to evaluate whether vulnerable species were disproportionately affected.

The study sought to determine if landings within common TACs align with advice or deviate in ways that may disadvantage certain species. Analysis was conducted to compare landings with single-stock advice within common TACs for skates and rays. To compare landings by ecoregion, advised catches were split using the annual proportion of landings in each ecoregion. Relative and absolute landings were compared to advice from 2016–2022, revealing consistent overshooting for blonde ray and frequent undershooting for thornback ray. Category 5 and 6 (data-limited) stocks were found to be more prone to overshooting. Life-history traits indicated that vulnerable species—high maximum length, late maturity, and low fecundity—were consistently overexploited.

Drivers of overshooting were identified, including economic incentives, species catchability, the ICES advice framework, and common TAC flexibility. High-value species, such as blonde ray, were more frequently landed, but aggregation in coastal areas also increased catchability for other species. The precautionary approach for data-limited stocks, including a 20% precautionary advice buffer, sometimes resulted in catches exceeding the advice. Common TAC flexibility allowed fishers to allocate catches among species, leading to overshooting of abundant or valuable species.

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Skates and rays are often bycatch or non-target species, with high uncertainty in discard data and limited quantitative assessments for small stocks. Existing local measures—including seasonal closures, differing minimum landing sizes, and landing obligations—further complicate exploitation patterns. The importance of continued improvement in stock assessments was emphasised to better align advice, landings, and sustainable exploitation.

Overall, the study highlighted that current common TAC arrangements often fail to reflect stock-specific advice, particularly for vulnerable or economically valuable species, and that more refined management approaches are needed to reduce overshooting and better match catches to scientific recommendations. Advances in stock assessments are improving the quality of advice for skates and rays, with more stocks having an MSY-based approach. However, it was described that this can lead to potential increases in common TACs of which the effects on management, fishing behaviour, and exploitation levels—particularly for vulnerable stocks within the same TAC—remain uncertain. The importance of stakeholder input and industry-led data collection was emphasised to ensure that these vulnerable stocks are protected while accounting for industry impacts.

John Lynch noted that for Category 5 stocks, overshooting may reflect perception rather than factual exceedance, as landings have been relatively consistent year to year. It was noted that new or improved methods for data collection and use are needed, particularly for blonde ray.

Katinka Bleeker noted that work is currently being undertaken to address Category 5 and 6 blonde ray stocks, where advice has historically been based on average landings and a precautionary cap. In areas such as the northern North Sea and area 6, advice has progressively declined due to a lack of information on actual stock status. Efforts are being made to improve data availability, including additional surveys in area 7 by French authorities and the use of landings-per-unit-effort (LPUE) as a proxy to generate trends for assessment. It was emphasised that overshooting of advice is closely linked to limitations in assessment and data policies.

Graham Johnston noted that for blonde ray in areas 4a and 6, advice has been based on average landings from the previous five years since the first recommendations were provided nine years ago. Over four precautionary 20% reductions, the advice has now declined to only 20% of its original level, potentially without any actual changes in the fishery or the stock. This was a key reason for the need to move out of the Category 5 cycle.

Michael Andersen appreciated Bleeker's point that overshooting in Category 5 stocks may result not only from targeting by fishers but also from advice that is potentially too low. Attention was drawn to management implications under a mixed TAC, particularly regarding protection of

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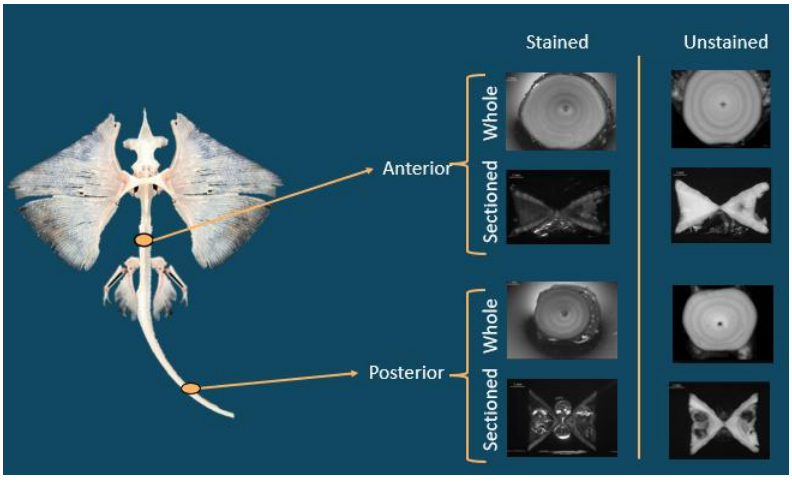
specific species. He suggested to consider a system in which a combined TAC could include a species-specific limit, requiring that individuals of that species be released after capture rather than halting the entire fishery.

Jurgen Batsleer acknowledged that the point raised had not previously been considered, but it was recognised as valid. The issue of choke species was identified as a key element in discussions about transitioning from group TACs to split TACs. Survivability studies were noted as important in applying exemptions for skate discards ("of which" clause), the current one valid until 2027.

Graham Johnston clarified that several participants in the room are members of ICES working groups but do not speak on behalf of ICES. Regarding discard survival, it was noted that WGEF has, for the first time, incorporated discard survivability into some dogfish assessments. The approach is considered applicable to other species where data are available. If survivability information exists for skate species in the North Sea, it can be incorporated into assessments without requiring a separate meeting, following initial expert review, allowing the process to be implemented efficiently.

4 **Skate movement ecology and life history characteristics** – Eleanor Greenway, Wageningen University

The importance of age data for sustainable fisheries management and stock assessments was underlined. In the study, vertebrae were used for determining age, with cleaning and staining methods applied, varying by species. The study aimed to identify the most practical and consistent aging methodology across institutions to improve data comparability.



Vertebrae from anterior and posterior spine regions were analysed using sectioned, whole, stained, and unstained preparations. Results indicated that anterior vertebrae produced higher and more reliable age estimates, while sectioning and staining had minimal effect. Anterior, whole, unstained vertebrae were recommended as cost- and time-effective. Improved aging methods were noted to provide better insights into growth, longevity, reproduction, and stock health, supporting precise stock assessments and more informed catch limits.

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Moving on to movement, the tagging research was introduced. Data storage tags with flotation collars were deployed, allowing tags to float and be returned by beachcombers. Since 2021, 80 recaptures have been recorded, with 12 tags providing over six months of data, enabling seasonal movement analysis. Depth and temperature data revealed that rays utilise the water column extensively, with nocturnal activity and seafloor resting during daylight. Tidal movements were used for geolocation modelling. Long-term tagging showed that rays largely remain within their tagging areas, though some individuals exhibited limited mixing between adjacent areas. Data are preliminary due to limited tag returns.

Graham Johnston asked about the time period in which tagged skates took a loop around the English Channel.

Eleanor Greenway responded it was from September to May, 9 months.

Jurgen Batsleer expressed his surprise regarding Thornback ray movements. While previous expectations suggested migration from 7d to 4c for stock replenishment, the tags indicated movements primarily to 7e, not to 4c. These findings contrast with genetic evidence suggesting mixing, highlighting a discrepancy between observed migration and genetic patterns. Limited data are available near 3a, preventing firm conclusions in that area. Vertical migration behaviour was observed for the first time and was considered novel.

Michael Andersen raised a question regarding the feasibility of age estimation using spine lines, given observed variation across the lifespan.

Eleanor Greenway acknowledged that considerable variation exists in aging results, which is common and expected, even when using otoliths over multiple years. Aging based on vertebrae is inherently imperfect, yet it remains the most practical method currently available.

John Lynch asked whether the study looked at age-length relationship.

Eleanor Greenway responded that in this study, age–length relationships were not extensively examined. Further exploration of the relationship between species length and median age is planned for future work.

Damian Villagra Villanueva, ILVO, noted that the issue highlighted was not disagreement among age readers, but rather differences between the methods used.

Eleanor Greenway responded that specialists from different countries were involved in the study. Italian readers were more experienced with sectioned vertebrae, while readers from ILVO, Ifremer and the Netherlands focused on whole vertebrae. Consequently, some differences in age

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readings were observed, with Italians potentially reading fewer rings on whole vertebrae and others fewer on sectioned vertebrae. A workshop had previously been conducted to train all participants in both methods.

Damian Villagra Villanueva explained that for stock assessment, it is preferred that any deviations between methods remain consistent, so that systematic biases are known and can be accounted for. However, differences in age readings make assessments more difficult and less reliable. It was also noted that the direct application of age readings to stock assessments is somewhat removed from the actual aging process itself.

Jurgen Batsleer noted that the reason for work on aging was to address a gap in stock assessments, specifically the tracking of cohorts over time. Recruitment patterns are better understood for Category 1 stocks, as they are generally inferred from survey data.

Michael Andersen noted that length analysis can be used to infer recruitment peaks, but aging provides a more detailed profile of cohort dynamics. The tracking of year classes over time offers a clearer picture of population changes. Currently, stock assessments are not yet able to fully incorporate this information. Practical challenges also exist, as the study requires whole specimens for anterior vertebrae analysis, rather than using only a portion of the fish.

5 **Species Identification of Skates and Rays:** Developments in AI and Image Recognition– Sander Delacauw, ILVO

A presentation was given on species identification of skates and rays using artificial intelligence (AI) and image recognition. The ecological and management importance of skates and rays is well recognised, but species-level identification onboard is challenged by visual similarity, limited taxonomic expertise, and time constraints. Misidentifications are frequent, affecting data collection, advice, and management decisions.

At ILVO, research is being conducted to automate catch identification, primarily on beam trawl vessels, and more recently on gillnet fisheries, where occlusion and mixed catches complicate species recognition. Tracking and measurement of individual fish are being automated, accounting for movement and positioning on conveyor belts.

Automated age determination is being developed for otoliths and scales, with ring counts used to estimate age. Hyperspectral technology is being employed to assess quality, detect parasites or microbes, and determine freshness. Synthetic data are being generated to supplement limited real-world images, enhancing model training.

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AI outputs are being integrated into scientific workflows and dashboards such as Vistools, where metadata—including GPS, fishing depth, vessel speed, and environmental conditions—are linked with catch and length data to support data-driven fisheries management. Within the Marine Beacon project, sensitive species such as sharks and rays are being identified and classified automatically, both onboard and via mobile applications.

The MOFI app, developed by Anchor Lab, will soon include a tool for ray species identification. Unlike full catch analyses, only classification of specific rays is required. The models for classification have been trained primarily using the RayScan app dataset, which was developed by ILVO but has since been discontinued. These datasets of ray images have been reused to train models now being implemented in both the camera system and the app. Contributions of any additional images from participants were encouraged to address dataset imbalances, which can bias AI predictions.

The broader impacts of AI include more reliable and consistent species-level data, which strengthens scientific analyses and supports evidence-based policy decisions. Continuous image collection at sea allows 24/7 monitoring, providing complementary data without replacing human observers. AI reduces workload and errors and allows faster data collection and decision-making.

Future developments will focus on integrating more cameras, expanding species coverage, creating synthetic data for rare species, linking visual data with metadata such as GPS, and incorporating these streams into precision fisheries trials. AI is expected to become a powerful tool for sustainable marine resource management.

Nair Vilas Arrondo, Spanish Institute of Oceanography, asked whether AI has been tested with common skate species, referring to the *Dipturus* genus, which is known to be very difficult to identify.

Sander Delacauw responded that the app can be downloaded by users, who can then take pictures. At present, the model's performance is limited. However, a data-sharing agreement with Anchor Lab allows the images to be stored. Once a sufficient dataset is collected, the images are sent to ILVO, annotated, and used to retrain the model, enabling continuously improved performance.

John Lynch asked what actions are taken by the AI when a species without any image data is encountered.

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Sander Delacauw explained that the initial aim is to identify rays and sharks based on their distinctive body shapes, which differ significantly from the rest of the catch and therefore should not pose a major challenge. After that, classification is performed at the species level. Each classification is associated with an accuracy score. If this score falls below a predefined threshold, it may indicate a potential misidentification. In cases where the species is not represented in the model, this likelihood increases. Such images are stored separately, manually reviewed, and correctly labelled before being incorporated into future model training.

Graham Johnston asked whether the AI system currently relies solely on fish shape for identification or if additional factors are incorporated.

Sander Delacauw responded that one of the ongoing research lines involves the development of a general AI model as the main research question is whether a general model is enough or if a dedicated model per vessel and/or area is needed. Plans are also being made to train the model on area-specific images once the desired performance is achieved. By tailoring the model to a particular vessel and its operating area, including differences in conveyor belts, identification accuracy is expected to be improved for that vessel and location.

6 **Managing skates and rays:** Evaluating options beyond the current group TAC- Jurgen Batsleer, DG MARE

Historical management of skates and rays, and the evaluation of options beyond the current group TAC, were presented to set the scene for breakout discussions. All species mentioned were used solely for illustration and should not be interpreted as Commission proposals.

The group TAC system was introduced in 1999 for the North Sea and later expanded into five regions, with varying numbers of stocks involved across the North Sea, Celtic Sea, Bay of Biscay, and Iberian Coast. Specific sub-TACs were established for vulnerable stocks such as the Undulate Ray in 7 d-e. Historical proposals for TAC setting included using average percentage changes across all stocks, weighting abundant stocks, and providing maximum tonnage footnotes for vulnerable stocks. Eventually, an average percentage change method was applied, though it was unpopular.

After Brexit, the 2023 TAC methodology shifted to summing ICES advice rather than averaging percentage changes, ensuring closer alignment with scientific recommendations. Proportional landings by stock area were applied to determine implied landings, incorporating discard legislation where relevant.

A roadmap for alternatives to the group TAC was established from 2002 onwards, including benchmarks, joint methodologies, and identification of potential candidates. Current issues persist due to incomplete data coverage, straddling stocks, mismatches between TAC areas and stock distributions, and assumptions of uniform fishing mortality across stocks. Advances such

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as tagging studies, statistical analysis, and genetic work are being applied to better define population and stock structures, aiding in management decisions.

Discard survival has been integrated into recent assessments, and new methods such as proxy reference points for MSY have been implemented. Options for future TAC structures range from maintaining the current group TAC, moving to individual TACs (over 30 stocks), or adopting hybrid/genus-based approaches, each with specific advantages and challenges. Legal obligations to manage stocks at MSY levels and adherence to the Trade and Cooperation Agreement (TCA) with the UK must be respected, while opportunities exist to better align TACs with ICES advice and stock distributions.

7 **Identifying candidates for individual management**: Prioritising stocks within the Group TAC – Jurgen Batsleer, DG MARE

Prioritisation of stocks within the group TAC was discussed, with key considerations emphasised, including adherence to MSY objectives and compliance with the TCA. From the Commission's perspective, no changes to existing shares were intended, ensuring that no Member State gains or loses quota.

Currently, TAC advice for all North Sea stocks is divided according to pre-agreed percentages, irrespective of whether the stock occurs in a given area. The "of which" principle was explained as a method to allocate portions of the TAC to specific target stocks while retaining the remainder within the group TAC. Subsequently, allocations are applied under the TCA framework, with shares further divided among Member States based on existing allocation keys.

Graphs were presented illustrating discrepancies between ICES advice and actual landings, highlighting underutilisation or overshooting for certain stocks, such as blonde ray and thornback ray. Category 5 stocks were shown to have declining advice over time, yet landings increased, indicating potential misalignment between advice and actual exploitation. Excel was used to visualise and manipulate these allocations, including splits by TAC area and by Member State.

Challenges were noted in the Celtic Sea, including significant loss of fishing opportunities for the industry, difficulties in quota swaps, choke species, and lack of stock assessments, particularly for blonde ray. Harmonisation of minimum landing sizes across Member States was suggested to improve management flexibility.

Scientific prioritisation criteria were established in discussions with the UK, including mismatches between ICES advice and landings, coastal versus offshore data-limited stocks, stock vulnerability, and coverage outside formal assessment units. A table was developed to visualise potential inclusion or exclusion of stocks from the group TAC based on these criteria.

Alternative approaches for protecting vulnerable stocks were identified: maintaining the status quo, direct protection by removing specific stocks from the group TAC, or indirect management

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by controlling large commercial stocks to indirectly safeguard vulnerable ones. These options were presented for discussion, emphasising that no formal Commission proposal was being made at this stage.

The importance of stakeholder input, scientific evidence, and management expertise was highlighted.

Michael Andersen raised concerns regarding the splitting of thornback ray between areas 3a and 4, as the underlying data—catch records and abundance estimates—are lacking. It was emphasised that management efforts may be attempting to address a problem that is not clearly established, potentially creating new challenges. Andersen suggested that the focus be placed on identifying actual management bottlenecks and resolving those without unnecessarily limiting fishing activity.

Jurgen Batsleer responded regarding the split in 3a, that the allocation of 1.46%, 53%, and 45% to 3a, the North Sea, and 7d, respectively, was based on historical landings of the species group over a reference period of three to five years. Specific landings of thornback ray in 3a were not available; therefore, proportions were derived from the overall landings of the group of species in that area.

Solène Prévalet flagged the mismatch between stock assessments and management areas as an issue requiring resolution. She suggested alternative reference variables for percentage allocation, as reliance on historical landings produces settled percentages that do not accurately reflect stock distributions and behaviours.

Jurgen Batsleer noted that discussions with the UK regarding changes to the allocation key have not yet been conducted, and it is anticipated that the UK would not be receptive to such changes. A technical exercise examining current landings demonstrated that adjustments would significantly shift the balance between areas 4 and 7d, potentially breaching the TCA by granting the EU more quota than the UK. For the time being, the TCA is not to be altered, and the current allocation percentages remain in place.

Solène Prévalet observed during the Excel analysis that the “of-which” clauses highlighted differences in stock distribution between areas. If the splits between 7d and 4d (SRX/2AC4-C and SRX/07D) were adjusted, the overshoot of the quota for thornback ray could have been avoided.

John Lynch noted that the spreadsheets were reviewed to assess potential impacts on the Irish quota. It showed that if advice were fully implemented immediately, new problems would arise.

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Rapid changes could cause significant disruption to the fishing industry. Some instances of overshooting reflect perceived rather than actual excesses, and this distinction should be addressed alongside any adoption of "of-which" clauses. Such clauses were regarded as a simpler means of applying advice and could be used for specific sub-areas to set maximum catches for vulnerable species, such as cuckoo ray in the Irish Sea, without constraining main commercial species. For blonde ray, improved assessments are needed before substantial changes are made.

Alfred Fisker Hansen, DFPO, raised concerns about the growing abundance of vulnerable species in the Skagerrak, with DTU data indicating a threefold increase between 2023 and 2024. It was argued that a TAC will eventually be required for these species in the Skagerrak. Questions were posed as to whether this should be introduced as a sub-TAC from the North Sea—an approach unlikely to resolve the challenges faced by Skagerrak fishermen—or as an individual TAC specific to the area.

Jurgen Batsleer acknowledged that the original reason for including thornback ray on the prohibited species list is unclear, but it was noted that species can be removed, as demonstrated with spurdog, which was taken off and new advice set the limit at 20,000 tons. A suggested way forward was the provision of necessary data to the ICES working group. From there, consideration could be given within the Commission, without UK involvement, to adjust allocations if justified. It was highlighted that DTU and SLU possess relevant data, including ongoing genetic work on thornback ray. If sufficient evidence emerges, removal from the list could be discussed between the Commission and the administrations of Denmark, Sweden, and potentially Germany.

Michael Andersen noted that hesitation remains in moving toward a fixed management system until unresolved issues, such as those related to thornback ray, are addressed. Adopting a fixed allocation key could prevent adjustments if stock distributions are later shown to differ, creating new problems instead of solving existing ones.

Jurgen Batsleer underlined the importance of this meeting to identify key issues, including those related to thornback ray, while acknowledging that other stocks without such challenges could be addressed more directly. A potential way forward was suggested in which cuckoo ray could be removed from the group TAC, while commercial stocks remain as they are. Since cuckoo ray has limited commercial interest among Member States and previous advice estimated around 80 tons, its separation would represent only a minor adjustment while providing targeted protection for a vulnerable stock.

John Lynch was wary about the potential risks of moving too quickly from a group TAC to a more restricted system. It was noted that overly rapid limitations could inadvertently increase species misidentification, potentially disrupting scientific assessments. Additionally, the review of minimum conservation reference sizes was recommended, acknowledging that different sizes may be required for different species and that this warrants careful consideration.

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Plenary sessions on results from breakout sessions

Falke De Sager reported from Group 1. Regarding the first question (*What general issues do you perceive for removing individual stocks from the Group TAC?*) on general issues, practical complexities on board vessels were highlighted, including species identification, economic impacts of changing the group TAC, and the relative stability key in relation to quota allocation and swaps between states or Producer Organisations. Challenges associated with the diversity of vulnerable species across areas and the effects on catch composition and markets were also emphasised.

For the second question (*In your opinion, what stocks in which areas could be identified already for removal from the group TAC and why?*), stocks with MSY advice were identified, and it was noted that removing a stock from the group TAC—particularly vulnerable species or those with low advice—could be considered, though further technical discussion is required.

For the third question (*If you could redesign skates & rays management, how would you do it?*), minimum sizes and harmonisation of measures across Member States and the UK were discussed. Seasonal closures, other human impacts on assessments, and combined management units from a biological perspective were considered. Increased fisher involvement in data collection was also emphasised, with the conclusion that equality and collaboration between scientists and fishers would positively influence not only skates and rays management but broader policy and management measures.

Tamara Talevska reported from Group 2. On general issues, the following points were identified by the group: separating individual TACs would complicate advice, third-country annual negotiations, and negotiations between EU member states. Potential new choke species could be created, operational complexity for fisheries could increase, and the risk of misidentification could rise, causing additional challenges for science and management. Fluctuating advice and TACs, competing interests, increased administrative burden, the need for additional data collection, unintended ecological consequences from displaced fisheries, and socioeconomic impacts were also highlighted as important considerations.

Regarding which stocks and areas could be removed from the group TAC, several were listed: cuckoo ray in areas 6, 7, and 8 due to its category 2 status and large advice; blonde ray in 4a and 6 due to lack of assessment (though not favoured by the industry); thornback ray in 4 and 3a for its high TAC; spotted ray in 4 and 3a because its status is known and identification is relatively straightforward; sandy ray and shagreen ray in areas 6 and 7 due to low quotas and potential for choke species, though removal was conditional on cuckoo ray being included in removal; and small-eyed ray in 7 e-f, and g as a category 1 stock, which already benefits from an “of-which”

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clause. The UK has previously proposed combining certain vulnerable species into a single TAC, suggesting potential buy-in for this solution.

For question three, regarding the redesign of skate and ray management, it was considered that management should be pragmatic and should avoid introducing more problems than it solves. Spatial and seasonal closures were noted as potentially controversial, as they are often not adaptive and may remain in place despite new evidence. The importance of ensuring buy-in from fisheries was emphasised, as they are responsible for implementing measures; co-creation of management procedures was recommended. Advisory Councils were identified as well suited for facilitating discussions among stakeholders, though disagreement was noted from one participant. Finally, the need for monitoring the effects of minimum conservation reference sizes and closures on fisheries and skate and ray populations was highlighted, along with the requirement to adapt management as new data becomes available.

Mo Mathies reported form Group 3. Regarding the first question on general issues for removing individual stocks, it was asked what scientific basis could justify the removal of a stock, such as whether it is over-exploited, unsustainably harvested, or threatened. It was noted that removal of certain stocks could create unnecessary management scenarios and potentially generate choke situations. Questions were raised about whether species with high survival rates could be released or would need to be landed, and whether non-commercial species could be excluded, as well as the potential consequences. A lack of data for certain stocks was highlighted, and differences between observations at sea and scientific assessments were reported. The starry ray in the North Sea was mentioned, and it was observed that the reference period has become outdated. Simplification was recommended, but it was also noted that removing stocks from the group TAC could increase administrative burdens and reduce flexibility with “of-which” clauses.

For the second question, concerning which stocks and areas could be identified for removal, no specific stocks were proposed; instead, questions and possibilities were discussed. It was suggested that stocks requiring special protection could be listed for assessment. The lack of data for some stocks and potential choke situations were noted. Solutions were recommended to be area-specific, with a transition period and review of old rules to allow for a progressive removal of stocks from the group TAC if certain criteria were fulfilled.

For the third question, on redesigning skate and ray management, it was noted that current management areas are based on administrative borders rather than biological considerations, suggesting a potential new approach. Misalignment of stock areas for mixed fisheries was highlighted, and a more flexible system was recommended. Management was suggested to be based on a more recent reference period to reflect current stock conditions.

Jurgen Batsleer regarded the meeting as very constructive with all relevant stakeholders present. He acknowledged that this topic remains difficult, and no single solution can satisfy

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everyone; maintaining the status quo or implementing changes will inevitably affect some parties.

The way forward will require continued discussion with both the Member States and the UK. The UK has been informed of this meeting and expects feedback on the topics discussed. Constructive paths forward were identified, though progress is expected to be gradual, taking socioeconomic factors into account.

Attention was drawn to the table presented during the meeting, with a request for stakeholders to identify any missing key elements, particularly from an economic perspective. Data on the value of key stocks for different fisheries was highlighted as important, beyond mere landings. The potential removal of sandy ray or shagreen ray from the list was considered unlikely to affect commercial fisheries, but confirmation from stakeholders was deemed essential to fully understand the impacts.

Michael Andersen noted the main concern being the creation of choke species. Species such as shagreen ray or sandy ray were not considered the issue; rather, the potential spin-off effects on other fisheries were highlighted as the key concern. A cautious approach was advocated. It was noted that no direct problems with the rays themselves have been observed, and there is concern that real or perceived problems in other areas could lead to restrictive measures unnecessarily.

Jurgen Batsleer noted that, from a legal perspective under the Commission's framework, adherence to MSY advice would require all stocks categorised under ICES as category 3 to be separated and managed according to individual MSY advice. Secondly, uncertainty regarding certain stocks, such as blonde ray in the Celtic Sea, was highlighted. For these stocks, assessments are limited or conflicting, and landings have increased without clarity on the actual stock impact. This creates potential risks of overshooting.

From a biological sustainability perspective, adjustments are needed to prevent stocks from being overfished. However, it was acknowledged that the majority of skates and rays are currently thriving, and breaking the existing system could disrupt a working balance. Nevertheless, caution was recommended for more vulnerable species, such as sandy ray and shagreen ray. The overall conclusion emphasised the need for careful, gradual management adjustments rather than abrupt changes.

Graham Johnston observed that the luxury of time is currently available because most stocks are in good condition. However, if trends in surveys change in the coming years, external pressures may arise, and insufficient time could be available to properly plan necessary adjustments. It was suggested that the current approach—thinking ahead and preparing for potential future pressures—should be maintained. Historically, stock conditions were much worse, and the current prevalence of favourable indicators highlights that the present period of relative calm will not last indefinitely.

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Vincent Dauchy, DGAMPA, noted that a difference in perception regarding the available time for EU-UK issues. On the EU side, progress on proposals has been slow, whereas the UK has advanced multiple fishery management plans (FMPs) and MPAs within the past two years. The FMP on skates and rays was deemed positive, as it ensures that measures will eventually be proposed, consulted on publicly, and implemented.

Concerns were raised regarding the impracticality of applying "of-which" clauses to certain species, such as blonde ray, even when advice quantities are high, because this would reduce quotas in the group TAC. It was emphasised that current proposals may not be optimal, but gradual progress should be made on measures such as minimum landing sizes and seasonal closures.

The need for a stepwise approach was highlighted, focusing first on species with low or slow advice, so as to avoid immediate impact. It was suggested that incremental action is preferable to inaction, as delays would perpetuate annual discussions without tangible outcomes. Additionally, the complexity of upcoming EU-UK consultations, including zero-TAC advice in the Celtic Sea, was recognised as a factor requiring careful timing of new measures.

Jurgen Batsleer expressed support for gradual progress through a phased approach. Internal discussions had taken place on the possibility of excluding specific species—particularly those with high discard survivability and limited commercial relevance.

The example of shagreen ray was given, with the view that its removal from group TAC would be unlikely to disrupt the entire fishery. Uncertainty was also noted regarding the position of the UK regarding FMPs.

John Lynch thanked DG MARE and all participants for a productive discussion, particularly within the breakout groups, where more ideas were generated than anticipated. Several proposals not involving TAC splitting were highlighted as nearly as important as the ambition to achieve MSY, since any measure that protects species was regarded as a valuable contribution.

The main challenge was blonde ray, with the improvement of its assessment considered a key priority. It was suggested that progress on this front would significantly advance work on group TAC management. The possibility was raised of running models or trials on smaller, more vulnerable components to evaluate potential impacts on the fishery, recognising that effects could vary depending on the area. Although such steps were described as incremental, they were considered a roadmap toward broader solutions.

Jurgen Batsleer emphasised that while blonde ray must be addressed, the focus should not remain solely on that species. Commercial species such as blonde ray could remain within the group TAC, while others might be separated. However, such separation would reduce the group TAC available for blonde ray. Reliance on scientific input and the use of models were identified as necessary next steps.

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John Lynch noted that retaining the main commercial species within the group TAC would not significantly reduce fishing opportunities. Attention was drawn to the current perception that the assessment and advice for thornback ray may be contributing to the overfishing of blonde ray, though this was attributed to uncertainty about stock status.

Jurgen Batsleer expressed support for examining historical LPUE data and for making greater use of existing information within the fishery that has so far remained underutilised. The importance of cooperation between science and stakeholders was emphasised, particularly regarding data collection with careful consideration needed about what types of data should be gathered, how they should be recorded, and how they should reach scientific institutions and stock assessments. The burden on fishers was acknowledged, as extensive data collection at sea was described as time-consuming and challenging to verify.

The potential of AI technologies was underlined, with applications such as automated identification of species, length, and weight from discard monitoring, as well as the use of auction data, were identified as valuable sources of information that could strengthen stock assessments.

Falke De Sager noted that cameras present a valuable opportunity for scientific use, as fishers initially felt involved and listened to when engaged in such projects. However, concern was expressed that the subsequent introduction of the control regulation caused the industry to perceive cameras as a surveillance tool, leading to resistance.

It was emphasised that the situation is not beyond repair, and that renewed dialogue could align regulatory requirements with scientific benefits. If framed positively and communicated carefully, camera use could both satisfy control obligations and provide valuable data collection, while strengthening trust with fishers.

Michael Andersen noted that large amounts of data are available and should be connected, raised concerns about the many knowledge gaps that remain. Thornback ray was highlighted as the most common bycatch in Danish fisheries—including the North Sea, Skagerrak, and Kattegat—yet little to no data exist on the species. Although it is recorded in the DTU Aqua database, it is discarded immediately due to landing prohibitions, leaving major gaps in assessment.

It was cautioned that without sufficient knowledge, more problems may be created than solved, underscoring the need for better data collection and understanding before further measures are introduced.

Jurgen Batsleer emphasised that placing species on the prohibited list immediately halts data collection, creating significant gaps. Although exercises such as WKSKATE2 have examined ways to continue gathering information and potentially reintroduce species into quota systems, the resulting reports have not been acted upon.

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Starry ray was given as an example: despite being abundant and well known in certain Dutch fisheries, it remains unregistered due to prohibition, leaving no official data for scientific use or stock assessments.

It was suggested that electronic monitoring and AI could play a role by documenting species presence without requiring landings.

Mo Mathies recalled that advice on the prohibited species list had previously been submitted by the focus group. Uncertainty was expressed regarding how this advice had been used, if at all. A suggestion was raised that the focus group review the advice, resubmit it, and request follow-up from the Commission.

John Lynch noted that advice had been provided previously, but at the time, no mechanism existed for removing species from the prohibited list once added. Since then, however, the removal of spurdog from the prohibited species list has demonstrated that a mechanism for such removals now exists.

Graham Johnston recalled that a process for adding and removing species from the prohibited list had been recommended at the STECF meeting held several years ago. Initially, the list functioning was clear, prohibiting the capture of specific endangered species. Over time, however, restrictions became inconsistent, with sudden gear- or area-specific bans introduced, and the original intention of the list was diluted.

These changes were not based on scientific decisions, and no track record exists on how they occurred. The processes recommended by STCF, if accepted, should now be incorporated into scientific advice provided to the Commission for managing updates to the prohibited species list.

Tamara Talevska recalled that two or three pieces of advice on the prohibited species list had previously been submitted. The first, from NSAC, received no response, while the most recent joint advice was met with a reply stating that no action could be taken until clarity from the UK was obtained.

It was suggested that a new letter be drafted and presented in January, taking advantage of the recently established stakeholder engagement mechanism in developing ICES requests, to request the establishment of clear guidance for listing species on the prohibited list using independently verifiable criteria. The idea was to submit this as joint advice, and to table the issue on the agenda for discussion at the upcoming meeting with DG MARE Scientific Unit.

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Participants responded to Mentimeter**: In your opinion, what should the FG concentrate on in its future work?**

All responses are listed here and ranked by popularity:

Number of votes	Response
4	• Which stocks should be taken from the group TAC • Removal of non-commercial and/or highly vulnerable species from group TAC • Harmonisation of landings size
3	• Data collection for data-limited stocks • Prohibited species list request update • How can industry provide data for data-limited stock assessments • Improvement of quantity & quality of data, in collaboration with fishers
2	• Identify stocks in relation to management areas • Practical suggestions on how to improve data collection for category 5 stocks • Focus on Excel file TAC figures to look for acceptable proposals to discuss
1	• At least 1 stock that could be removed • Simulations on the stocks, areas that could be out of the group TAC • Minimum landing sizes which are based on maturity stage (e.g. L50) • Management without creating new problems such as choke species • Intensive cooperation between scientists and fishermen for more and better data

7 **Closing statement** by John Lynch, NWWAC ExCom Vice-Chair

John Lynch concluded that the day had been highly productive, with valuable dialogue taking place among all participants, including Member States, scientists, industry representatives, and stakeholders. Appreciation was expressed for the Commission's facilitation and for the longstanding constructive discussions on skates and rays, which have contributed to progress over the past decade.

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PARTICIPANTS

Name	Organisation
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Eamon Aylward	Permanent Representation of Ireland to the EU
Jurgen Batsleer	DG MARE
Ilaria Bellomo	NWWAC Secretariat
Katinka Bleeker	Wageningen Marine Research
Guillermo Bravo Téllez	Ministerio de Agricultura Pesca y Alimentación
Martin Crowley	Permanent Representation of Ireland to the EU
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Dirk Van Guyze	Agentschap LV ABCO dienst zeevisserij
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ANNEX

The following annex contains questions put to the participants in form of a questionnaire inviting written comments during the workshop. These are included for additional information purposes only and reflect individual participants' opinions and not consensus agreement.

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Issue	Comments
What general issues do you perceive for removing individual stocks from the group TAC?	• First improving data and ICES advice • Complexity of group TACs • Additional complexity • complexity of swaps • Increased complexity with quota uptake and quota swaps • TAC current split between areas does not reflect stock distribution, so that creates significant limitations when individualising some of the stock (e.g. RSC in 7d) -> fishing opportunity will be greatly reduce for some fisheries • Fisher behaviour will have to change, i.e. no more flexibility for certain species • Lack of buy in from all stakeholders • The UK • Only remove stocks that are perceived as “at risk” • Possible increasing discards / high-grading • increase discards of the species/stocks in the group TAC • relative stability key/ economic considerations • effect on relative stability key • administrative burden • need for clear but flexible management framework. Rigid decisions now might be very hard to change in the future. • need more exemptions under L.O. • choke species • survivability exemption • Economic consequences • economic concerns – opportunities could be very much depleted or reduced

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	• economic impact
Issue	**Comments**
In your opinion, what stocks in which areas could be identified already for removal from the group TAC, and why?	• Socio-economic impact assessments are needed • Removes those with MSY advice or remove vulnerable species • Possibly vulnerable species • Highly vulnerable species, i.e. those most important for species recovery and to prevent stock collapse, e.g. *Dipturus sp*., vulnerable species in particular areas • Vulnerable species • of which" clause for most vulnerable species • Stocks for which quantitative assessments are available, i.e. Cat, 2 and 3 stocks, MSY advice given. This will also protect the more vulnerable stocks or data-limited stocks. • Data abundant stocks (or these ones kept in) – exclude (sensitive for which at least cat.3) • Look at stock with MSY advice • Non-commercial species (or not affected by the fishery) • Cuckoo ray from 6, 7, 8 due to differing scale of the advice • Blonde ray – more vulnerable and needs more protection • Thornback ray because it is the most common species in area 3 and 4 • North Sea: Thornback Ray, cuckoo ray • But looking to the rules: taken out gives less flexibility for the fishermen – please be careful • It is important to look at areas, not necessarily believing a species is in need of protection everywhere just because it is scarce somewhere.

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If you could redesign skates & rays management, how would you do it? How could change best be achieved?	• Minimum sizing but harmonisation of measures (UK and EU) • Consider impact of other human activities in the assessment • Combined units (management – biology) • Increased involvement of fisheries in data collection • If there were no constraints from the EU-UK point of view, a revision could be advocated for regarding the split between 3/4/7d as these percentages are not reflecting distribution anymore. At some point this will have to be done do it would be better to start this process now. Once this is done there will be less constraints on the individualisation as it will reflect and match the actual catch. • The scientific advice should be closer to reality, maybe an IA tool could be used to assess the stocks in real time. • The advice should take into account more socio-economic factors and not only environmental ones. • Think about technical measures (other than closures), maybe harmonise the capture sizes in the Member States. • Have minimum landing sizes se at 50% length maturity -> ideally this would be species-specific but maybe an average (of some kind) across species • Unrealistic to efficiently manage skates as a group, should move towards a species-specific approach even if there are multiple TACs. There should be more ICES working groups dealing with fewer species which would make handling stocks more manageable. • More monitoring of populations • Look into the alignment of stock unit and management unit, advice of stocks does not align with how the common TAC is distributed among the areas, e.g., use proportion of landings of a stock within the different areas to create (common) TACS • Two steps – Year 1: 2 groups of TACs; Year 6 or later – further stocks with individual TACs • Be aware of nor creating choke problems • Stock identification vs areas • At least: “of which” clause for much vulnerable species

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	• Same MLS for Member States – harmonisation • Flexible enough to not drag behind science • North Sea -> group for RJC/M/H and single species TAC for the rest. But allow to limit TAC for components of the group TAC if threshold (ref. point) is exceeded • Introduction of common MCRS for each species • Look at temporal restrictions to protect females during egg distribution, i.e. no targeted fishing • Involve more fishing vessels in data collection • Understand real spatial distribution of species/stocks • Improve the knowledge of fishing effort and species habitats • Improve data on discards (observers) • Based on the above redefined areas/stocks based on biological point of view and catch
Are there any crucial elements missing from the prioritisation list?	• In an ideal world we would test a new system, would evaluate and adopt/improve/go back if needed. To what extent is this possible in this situation regarding S&R management? • Minimum landing sizes • Construction of wind farms and increase in electricity cables • Misidentification of species, how this can affect the correct management • Most of the main issues are included – landings, advice, life history, distribution. Maybe a trend (+/-) according to biomass survey index

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What challenges do you perceive with the use of AI?	• Data analysis by administrations • AI is still being developed and trained; not ready for widespread use • Risks with biased data mistakes might need something like a margin of tolerance • Acceptance of AI on board of vessels • That it will evolve in a way to control and enforce fisheries • The same challenges as CCTV • It could be a powerful tool and really help management of skates and rays but it is only at the beginning and we need to find solutions quickly. • Takes a lot of data and effort to develop AI models but is a great initiative and would increase monitoring data (and discard data) for all elasmobranchs • Advantages: better assessment, simulations of management options • Don't put too much trust in it before you have demonstrated that it works – also in unusual circumstances • Implementing it before it is fully developed – could provide insufficient/wrong data • Models do not seem to be ready yet • Considered as the golden egg, but still has to prove it. • Trust -> from science, industry… • Expectation management • Qualitative training dataset (variability, balanced set…) • The correct identification of cryptic species • Implementation on board due to cost and fishermen's distrust • It could be an important tool for species identification or estimating abundance from images. Or depending on the data or variable used predict significant areas for certain species.

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Could the management of certain stocks be moved under the Multi-Annual Plans (e.g. cuckoo ray)?	• Need for further study with specific proposals • Yes, and cuckoo ray is a good example • Perhaps • Yes • Yes, it could be a good option for those stocks with limited information and/or whose biomass is decreasing
How can industry / science collaboration be strengthened for skates & rays, e.g. to improve on ICES cat. 5 stocks?	• Observers on board • Information exchange • Scientists on board of fishing vessels • Observations at sea • Industry surveys which are done a lot, e.g., New Zealand. In the North Sea there is an industry survey for turbot and brill which is now used in the assessment for turbot. • Industry survey (i.e. turbot survey) • Surveys with fishing vessels: create trust, conversation and collaboration (+positive effects for overall management advice) • Take fishers observations into account • From EU legislation POs have the possibility to manage quota usage in order to have landing/catch opportunities year-round, for example catch restrictions per trip. POs could make more use of this possibility and perhaps also adapt this to seasonality or other ecological important periods. • Fund project for tagging or genetics • We should work on a way to collect data necessary to improve the cat. 5 stocks, maybe like the fishery of undulate rays in area 8. Maybe work on an application that fishers could use or a sampling form. • Have routine ageing for skates, leading to better age/ maturity scales to track age cohorts/recruitment • Give clear guidelines on the data needed to improve assessments and how we can optimise surveys to collect this data. • More meetings like this, ACs are a good communication route.

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	• Show their capacity to identify difficult species – exchange with science • Sharing their different points of view and their principal problems • Industry or fishers providing more information on fishing grounds, catches and lengths • Science, design and implement research surveys focussed on these species/stocks
Additional comments	• Would there be opportunities for minimal landing sizes for all Member States? Now this is/ is not done on national level, and all different sizes. • This work is necessary but not at any cost. It seems that we only consider the "of which" clause whereas other scenarios could be studies too. It needs time, we should not work too quickly, there is a lot at stake. • If a fisherman can tell the difference between herring and sardine or whiting and pollock they can do this for blonde and spotted rays but there is no incentive. • Choke risk • For coastal species, such as *R. undulata* or *R. brachyura* an increase in knowledge of essential habitats (spawning, nursery) or lengths could help to establish spatial or seasonal closures. Besides limiting fishing depths could help management for shallower of deep species.

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