# Report of the 1st EU-UK Expert Workshop on Spurdog

Specialised Committee on Fisheries

23 April 2024

## Contents

# Introduction

This is a report of the proceedings of an expert workshop convened between the United Kingdom and the European Commission on the 23 of April 2024 as part of the work by the Specialised Committee on Fisheries and the commitments in the Written Record published in December 2023 (for 2024). The workshop brought together experts from the UK, Ireland, Germany and the Netherlands to discuss spurdog (*Squalus acanthias*) and its recovery and management. The following is a report of this expert workshop.

## Background

Spurdog is a demersal shark species with worldwide distribution in temperate and boreal waters and has a long history of exploitation. The Internation Council for the Exploration of Seas (ICES) considers there is a single Northeast Atlantic stock ranging from the Barents Sea (Subarea 1) to the Bay of Biscay (Subarea 8).

Spurdog tend to aggregate, are slow growing, have a late maturity and low productivity rendering them highly susceptible to overexploitation. Landings peaked at a total of over 60,000 tonnes in the 1960s (Figure 1) and since then have declined, except for a brief period during the 1980s when targeted gillnet and longline fisheries along the west coast of Ireland and in the Irish Sea developed. In more recent years, an increasing proportion of the total spurdog landings are taken as bycatch in mixed demersal trawl fisheries. The main exploiters of spurdog have historically been France, Ireland, Norway and the UK.

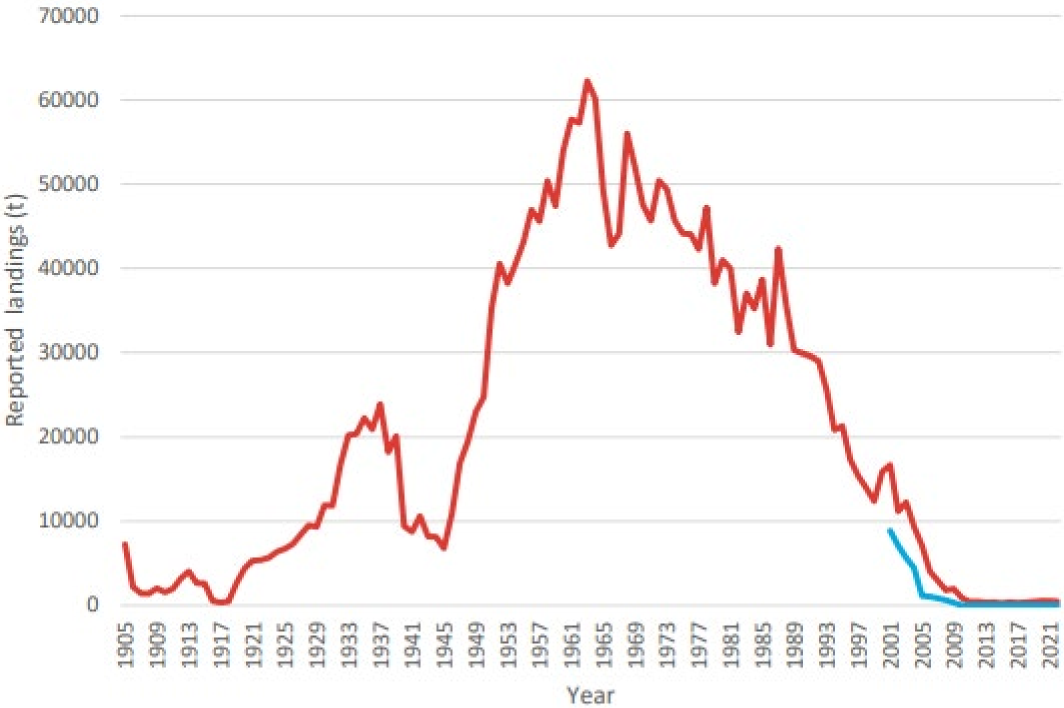

Figure 1: Line graph showing the reported landings (red line) and total allowable catches (blue line) of spurdog across the North East Atlantic in the X axis, and years from 1903-2022 in the Y axis. The reported landings line is steadily increasing towards a small peak in 1937, to a rapid increase between 1961-65, this is followed by an overall declining trend before falling off sharply in 2001 corresponding with restrictive management introduced in 2007. The ban on spurdog catches from 2011 is then reflected. The total allowable catches line shows the introduction of a total allowable catch in 2001 that rapidly declines. Catches are shown to have been above the total allowable catch limit since the introduction of a limit and prior to the closure of the fishery in 2011 (Taken from WGEF, 2023).

Since 2011, a ban on spurdog landings has been in place due to significant declines in catches. However, a reassessment of the stock status was conducted in 2021 through a benchmark evaluation. The benchmark resulted in a changed perception of the stock, showing a higher stock biomass estimated to be above MSYBtrigger (maximum sustainable yield biomass trigger: a biological reference point which triggers a cautious response within ICES' MSY framework). Consequently, ICES advised that "when the maximum sustainable yield (MSY) approach is applied, catches in 2023 and 2024 should be no more than 17,353 tonnes and 17,855 tonnes respectively", reopening the fishery on spurdog in 2023. The stock will be assessed by ICES in 2024 providing new advice for 2025 to 2026.

As a precautionary measure, the EU and UK agreed in 2023 to introduce a maximum landing size of 100cm to discourage the targeting of mature females. It was agreed this measure should continue to apply in 2024, however, both parties agreed that the effectiveness of the current maximum size in protecting mature females should be reviewed and that potential alternative measures should also be explored as part of this review. The 2024 Written Record also contained commitments on maintaining precaution and the importance of suitable and robust monitoring mechanisms to detect and react as appropriate to significant changes in fishing patterns.

The parties agreed to take forward this work jointly through the Specialised Committee on Fisheries (SCF). This document provides a summary of the first workshop of technical experts held virtually on 23 April 2024. The main goal of the workshop was to gather updates on the recent scientific advancements concerning discard survival, alternative measures, and data collection related to spurdog. The session concluded by highlighting areas of improvement and exploring potential collaborations and next steps to ensure a shared understanding of the latest scientific developments, facilitating informed discussions, and facilitate consistent measures in respective waters.

# Presentations

## UK spurdog management project (The Centre for Environment Fisheries and Aquaculture Science, UK)

The Centre for Environment, Fisheries and Aquaculture Science (Cefas) has undertaken a spurdog management project. The project aimed to understand the response of the fishing industry to the new fishing opportunity for spurdog and to the new management measures. The project will collect evidence to inform management on whether 1) the prohibition on landing larger individuals deters targeting of fecund females, and 2) if 100cm is the most appropriate length at which to set the protected status, and 3) monitoring spurdog catches, including discards, and the proportion of live and dead spurdog caught.

The project consists of 3 main components:

1. Stakeholder engagement.
2. Discard survival evidence.
3. Collation and processing of new catch data.

As part of the stakeholder engagement, a UK stakeholder group was formed, interviews were conducted with skippers, and a smartphone app was adapted to collect information on discards providing information on catches of individuals above and below 100cm. Those interviewed suggested that current quotas are too high, driving down market prices and that the current size limit (more than100cm) isn't effective because larger fish often die after capture, so they proposed allowing the landing of these larger individuals. UK catch data indicate that the majority of spurdog catches fall within the 70 to 90cm range, with only a small proportion of catches consisting of individuals larger than 100cm (Figure 2).

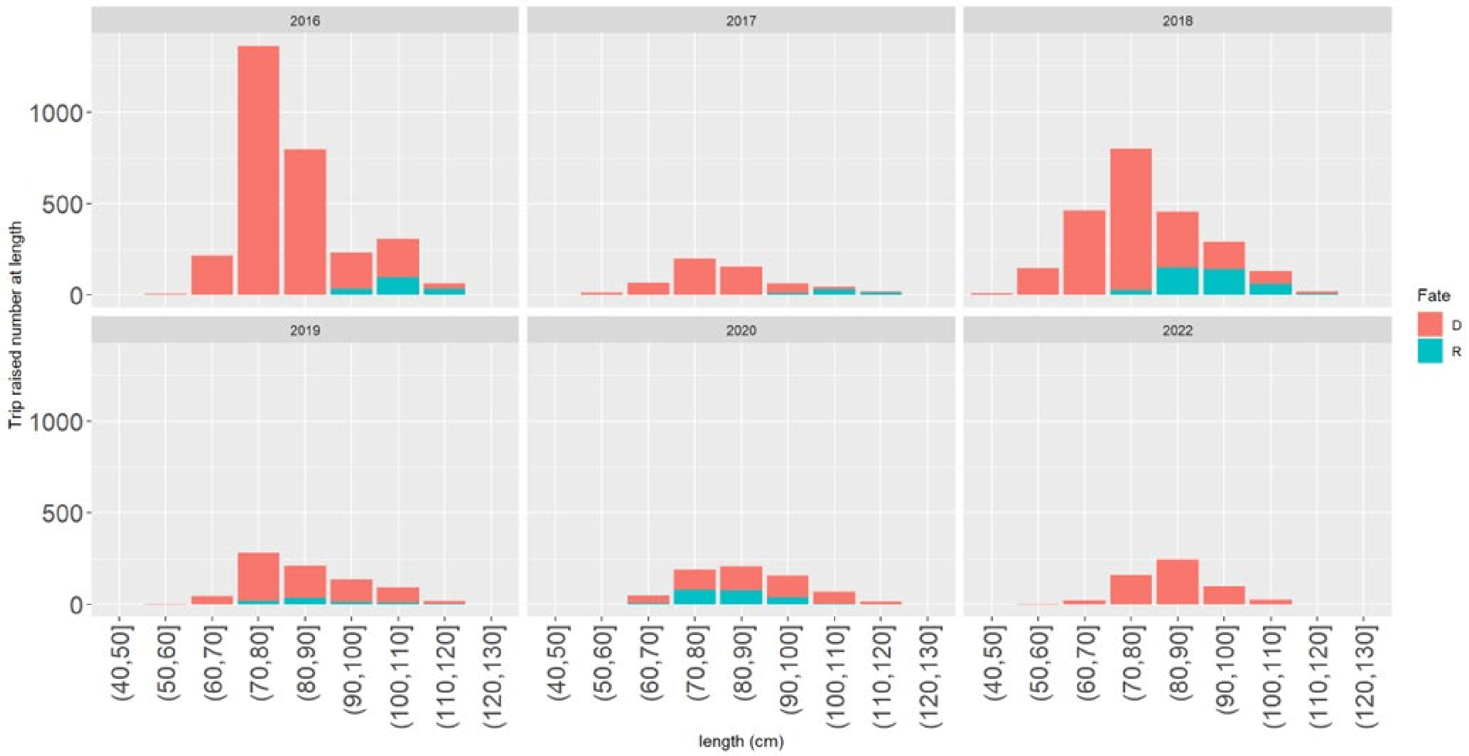


Figure 2: A sequence of six graphs of UK catch data from the years 2016, 2017, 2018, 2019, 2020 and 2022, exhibiting spurdog length frequency against trips. Each graph is showing a bell-shaped distribution even as catch size changes. In the 2016 to 2019 graphs, the most common landing size class was 70 to 80cm, with 80 to 90cm as the second highest. For 2020 and 2022 the most common landing size was 80 to 90cm with the second size class being 70 to 80 cm. In all graphs there are small to very small numbers of fish recorded in the 60 to 70cm size class, with catches diminishing in the smaller size class. Following the same bell shape landings tail off above 100cm. The graphs illustrate the majority of landings fall between the 70 to 90cm range.

CEFAS also collated evidence to inform of discard survival estimates derived from a series of UK scientific projects done in collaboration with commercial fishing vessels between 2009 and 2021. The data included vitality scores based on a visual assessment of the health condition of discarded fish, as well as data from spurdog that had been tagged.

The discard vitality information at the fishery level was derived from the UK Bycatch Avoidance Programme, which recorded whether individuals were dead or alive, with most data coming from gillnetters and to a lesser extent otter trawlers. These studies provided insights into the immediate survival (at-vessel survival) of the species.

To obtain longer-term survival information of 31 data storage tags and 44 pop-up satellite tags were obtained. Survival assessment is based on data from 21 days after release. It should be noted that several assumptions were made:

All discarded spurdog assessed as alive by skippers were in excellent or good health condition.

The proportion of alive and dead discards reported during the UK Bycatch Avoidance Programme is representative of the proportion under the new quota and size regulations.

### Main points

The majority of spurdog catches fall within the 70 to 90cm range, with only a small proportion of catches consisting of individuals larger than 100cm.

Recent data collection showed that the quota uptake (UK share) in the first year following the introduction of the TAC (total allowable catch) was very low.

There has been a substantial decrease (up to 83%; average price per kilo) in the market value of spurdog since the reopening of the fishery reflecting the price differential between the large and small grades.

Discard survival estimates of less than 42% for trawlers, less than 63% for gillnetters (not size specific, no observed difference less than 100cm or more than 100cm), are not considered robust and are likely overestimates due to the assumptions and extrapolations made.

## Presentation on discard survival (Bord Iascaigh Mhara: Ireland’s Seafood Development Agency, EU)

Following positive advice on spurdog stock status, the fishery reopened in 2023. Spurdog has traditionally been targeted by gillnet vessels in Ireland with more sporadic catches taken in bottom trawls. Fisheries mainly occur inshore along the west coast. The Irish fishing industry is keen to assess spurdog survivability towards potential landing obligation exemptions in trawl and gillnet fisheries.

Short-term studies conducted in the US and UK demonstrated reasonably high survival of trawl-caught spurdog but poorer survival in gillnets. Longer-term observations of spurdog survival are needed as a survival rate of at least 50% after a minimum of 15 days observations is generally needed before a plausible case for an exemption can be made.

Conducting fish survival experiments can be expensive and present technical and logistical challenges. Assessing fish condition through comprehensive criteria regarding injuries and body movement (for example, vitality scoring) helps evaluate the practicality of such studies. Vitality scoring typically involves visually inspecting the fish to evaluate various indicators of vitality, such as overall appearance, responsiveness, behaviour, and signs of injury or distress. The scoring system may use specific criteria to assign scores or grades to different aspects of fish condition, which can then be used to analyse the survival potential of discarded fish under different conditions or management measures.

The study primarily evaluated discard survival in gillnet and otter trawl fisheries, which are the fisheries with the highest spurdog catches. Regarding gillnets, 5 daytrips were conducted aboard a gillnet vessel, resulting in the capture and sampling of a total of 90 fish. Spurdog catches were low, with a relatively even distribution between fish in better (V1, V2) and poorer condition (V3 to V5). A relatively narrow size range of spurdog, between 60 and 100cm, was observed in the gillnets, with no clear size trend observed in relation to fish condition. More observations on board gillnet vessels with greater catches of spurdog are needed.

| Size class | Count (N) | V1 (%) | V2 (%) | V3 (%) | V4 (%) | V5 (%) |
|---|---|---|---|---|---|---|
| **Less than 60** | 1 | 100 | 0 | 0 | 0 | 0 |
| **61 to 70** | 8 | 13 | 25 | 38 | 13 | 13 |
| **71 to 80** | 43 | 14 | 49 | 9 | 12 | 16 |
| **81 to 90** | 33 | 15 | 21 | 15 | 21 | 27 |
| **91 to 100** | 5 | 20 | 40 | 20 | 0 | 20 |
| ***(80 to 100)** | 52 | 12 | 31 | 13 | 19 | 25 |

Table 1: Count (N) and vitality (%) by size class for gillnet-caught spurdog. *Tagged spurdog size range.

Five trips with an otter trawler were made under normal fishing conditions, off the west coast. During these trips, 428 spurdog were sampled from a total catch of 1019 spurdog across 13 hauls. The largest catch of spurdog observed in a single haul was 371 fish. Overall, the condition of the trawl-caught spurdog was relatively poor, with just over 26% of fish in perfect or good condition. However, there was a clear relationship between condition and size, with most spurdog over 80cm in length observed to be in better condition. Conversely, smaller fish were in poorer condition (Table 2).

| Size Class (cm) | Count (N) | V1 (%) | V1 (%) | V3 (%) | V4 (%) | V5 (%) |
|---|---|---|---|---|---|---|
| **Less than 31** | 2 | 0 | 0 | 50 | 50 | 0 |
| **31 to 40** | 10 | 0 | 0 | 30 | 70 | 0 |
| **41 to 50** | 140 | 0 | 5 | 37 | 58 | 0 |
| **51 to 60** | 65 | 3 | 9 | 28 | 60 | 0 |
| **61 to 70** | 74 | 3 | 19 | 45 | 32 | 1 |
| **71 to 80** | 93 | 13 | 34 | 30 | 23 | 0 |
| **81 to 90** | 23 | 17 | 39 | 39 | 4 | 0 |
| **91 to 100** | 12 | 75 | 25 | 0 | 0 | 0 |
| **More than 100** | 9 | 89 | 11 | 0 | 0 | 0 |
| ***(80 to 100)** | 45 | 38 | 38 | 20 | 4 | 0 |

Table 2: Count (N) and vitality (%) by size class for trawl-caught spurdog. * Tagged spurdog size range.

These results justified the implementation of a full-scale survival experiment on larger trawl-caught spurdog. The species generally need to swim to breathe, and we identified survivorship pop-up satellite archival tags as the optimal method for assessing survival (Figure 3).

Figure 3: A photograph showing Spurdog with survivorship pop-up satellite archival tag affixed to primary dorsal fin ready for release.

We tagged and released 10 spurdog caught under normal fishing conditions. We restricted tagging to spurdog between 80 and 100cm in line with the size of fish capable of carrying tags, the maximum conservation reference size of 100cm, and condition assessments results. Nine out of ten or 90% of the tagged spurdog survived the full 30-day monitoring period and demonstrated typical vertical behaviour by occupying deeper water during daytime and shallower water at nighttime.

## Main points

Based on the condition assessment work conducted to date, the preliminary survival estimate for trawl-caught spurdog between 80 and 100cm is 68%.

All trawl-caught spurdog over 100cm in length were observed to be in excellent or good condition. Study results suggest it highly likely that these fish survive the capture process.

The report can be downloaded from the BIM website.

## Main gaps

Further tagging work of fish in poorer condition is planned, but assuming similar vitality scores occur in future trips, 68% is a minimum survival estimate for spurdog between 80 and 100 cm.

More survivors in the V3 or V4 category will likely result in greater survival estimate. Two spurdog between 80 and 100cm in V3 condition have already been tagged pop-up satellite archival tags and were found to survive. This bodes well for a higher overall survival rate when tagging work is complete.

Most of the catches in Irish fisheries consist of individuals less than 100 cm. Important to obtain more information on the discard survival estimate of different length classes. Especially more than 100cm as sample size is low.

Spurdog survival was assessed in early autumn when water and air temperatures were still relatively high. The observed sea surface temperature of $15^{o}C$ is close to the maximum off the west coast of Ireland. This bodes well for the survival of spurdog caught at other times of the year when temperatures are lower, and fish are likely to be in better condition when released.

# Bycatch Avoidance Tool with mapping (Scottish Fishermen’s Organisation, UK)

Scottish mixed demersal vessels have been operating a system for sharing information on high catches of stocks where there is limited or no quota, including spurdog, in real-time. The system was developed by the Scottish Fishermen’s Organisation, University of Aberdeen and software developer Chordata LLC, and is loosely based on a concept developed for use in the Alaskan pollock fishery.

Vessels record all catch information for selected species in the BATmap (Bycatch Avoidance Tool with mapping) mobile app. Data are stored and processed securely on an online server using automated protocols. When catches of a given species exceed a previously agreed threshold, a high catch alert is sent to all participants, providing details on the location and amount of the high catch. This enables fishers to make informed decisions on where they fish and helps to avoid areas of high concentrations of unwanted catch. Figure 4 shows the spatial distribution of high catch alerts reported in the system in the west of Scotland.

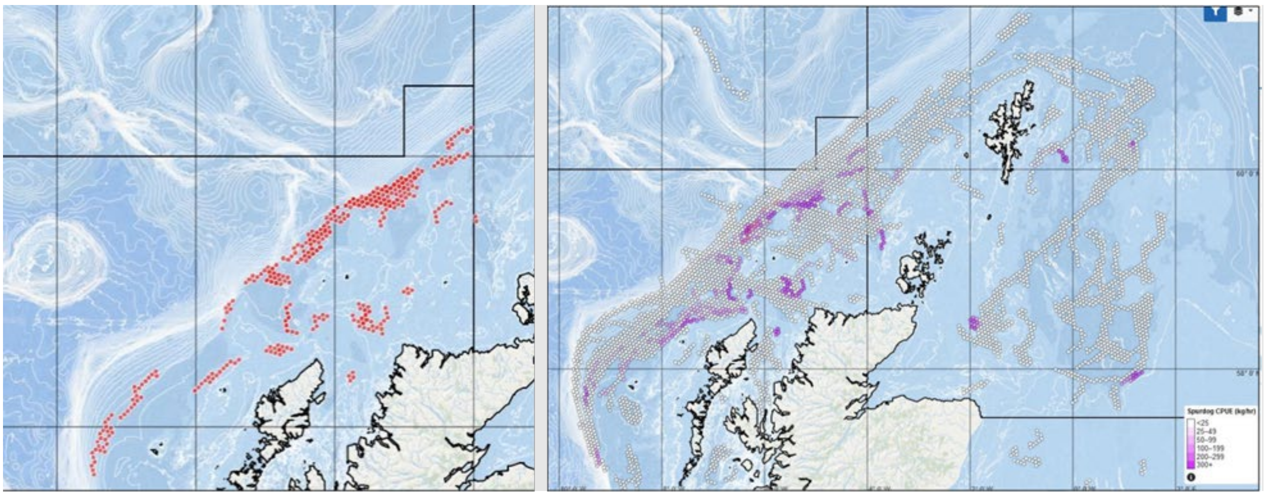

Figure 4: Two marine charts of northwestern Scotland. The left-hand chart shows the spatial distribution of high catch alerts from BATmap, with higher alerts recoded along the shelf edge. The right-hand marine chart shows locations of aggregated catches per unit effort (CPUE) this shows smaller cluster of higher CPUE both off the west and east coasts.

In addition to high catch alerts, the BATmap system generates highly resolved spatial data on catches of the reported species. These high-resolution data provide a level of spatial and temporal detail on spurdog not currently available through traditional catch sampling and recording methods.

Further details on the system are available on the BATmap website.

## Literature review on survivability and alternative measures for spurdog (EU-Framework Contract assignment, EU).

The study utilised a literature review to gather pertinent and up-to-date publications on discard survival and bycatch mitigation measures concerning sharks. From this review, a total of 432 papers and reports were identified, out of which approximately 30 were deemed relevant and selected for further analysis.

There were 7 publications reviewed for discard survival. These studies primarily focused on assessing at-vessel mortality and short-term survival (up to 48 to 72 hours after capture). Vitality scoring was a common method used to evaluate the condition of individuals post-capture, although comparing studies proved challenging due to variations in vitality scales. Additionally, external damage to the fish was considered an indicator of condition.

Tagging serves as a valuable method in examining discard survival, facilitating the tracking of discarded individuals and estimation of longer-term survival rates. A range of tags, such as external mark ID tags, data storage tags, and acoustic tags, are employed to monitor fish post-release. However, studies utilising tagging frequently outline several concerns affecting survival estimates, including potential tag-induced stress, tag retention rates or failures, and the potential bias of tagging only selected individuals that are deemed fit or large enough for tagging, leading to a skewed representation of discard mortality.

At-vessel mortality found in the reviewed papers is generally low in all gear types, between 72% and 100% of the individuals survived the catch process. Short-term survival was between 66% and 100%. Signs of external damage ranged from mesh marks on the head or girth to puncture/gash wounds. The main gear types for which survival studies were carried out were gillnets, trammel nets and bottom trawls.

Based on the review it was concluded that even though at-vessel mortality for spurdog is low, the long-term survival remains a knowledge gap. There is no standardised protocol for vitality scoring in the species, making it difficult to compare results from studies using a different grading scale. There as limited data available on tag-and-release, though tags are placed on only the vital individuals, leading to a bias in the survival rate of these species.

The literature review showed that research on bycatch reduction primarily focused on employing gear selectivity methods, including various techniques such as shark deterrents (for example, magnets, metals), different hook types, hook positions, and the implementation of divider grids in trawl nets. Findings from these studies often presented conflicting results; for instance, while magnets and metals on hooks led to increased shark catches in some cases, circle hooks demonstrated a decrease in catches and mortality for certain species but increased catch rates for others. Some results on technical measures were promising, such as the use of a trawl excluder grid resulting in a reduction of spurdog catches, whereas the catch of target species remained unaffected. These findings underscore the complexity of bycatch mitigation measures and highlight the need for careful evaluation of their effectiveness across different species and fishing contexts.

Additionally, it was highlighted there are knowledge gaps concerning site association and spatio-temporal patterns in spurdog population dynamics. Specifically, the impact of potential spatio-temporal measures, such as area or seasonal closures, on spurdog populations remains uncertain and requires further investigation. These gaps in understanding underscore the need for continued research efforts to better inform management strategies aimed at mitigating the impacts of fishing activities on spurdog.

# Acoustic study of spurdog (Thünen Institute, EU)

In October 2022 a large aggregation of spurdog and herring was encountered in the Kattegat during the annual Baltic International Autumn Acoustic Survey. Hydroacoustic broadband in-situ measurements with concurrent biological (catch) information were collected (Figure 5). Subsequently, a modelling approach was followed to identify the backscattering properties of spurdog, taking shape and size as well as main contributors into account (Figure 6).

Initial target strength modelling using Kirchhoff-Ray-Mode models for spurdog and a combination of modelled and known herring backscattering properties lead to the development of promising discrimination algorithms. Ex-situ acoustic measurements of spurdog were performed in a public aquarium to corroborate and refine the previous measurements in a controlled environment. Currently, refined backscattering models are being developed based on 4 scattering components (body, liver, and 2 spines) (Figure 5).

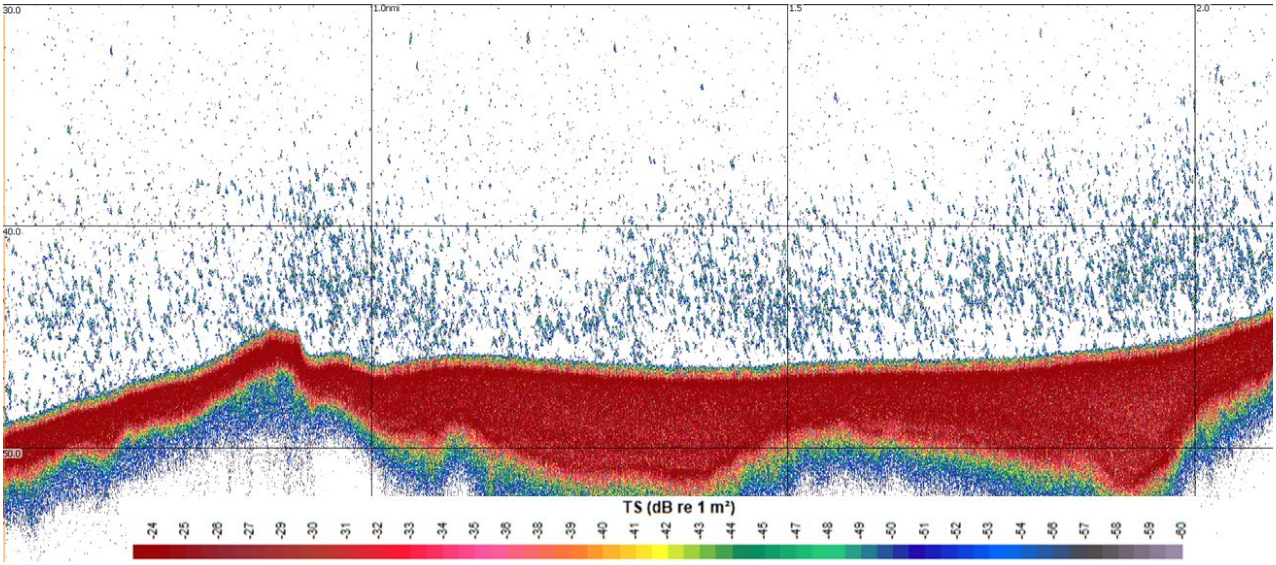


Figure 5: An acoustic scientific echosounder image taken during the annual Baltic International Autumn Acoustic Survey 2022 in the Kattegat. The scattered dots above the sea floor (red) illustrate the acoustic signal of a large mixed aggregation of herring (*Clupea harengus*) and spurdog (*Squalus acanthias*).

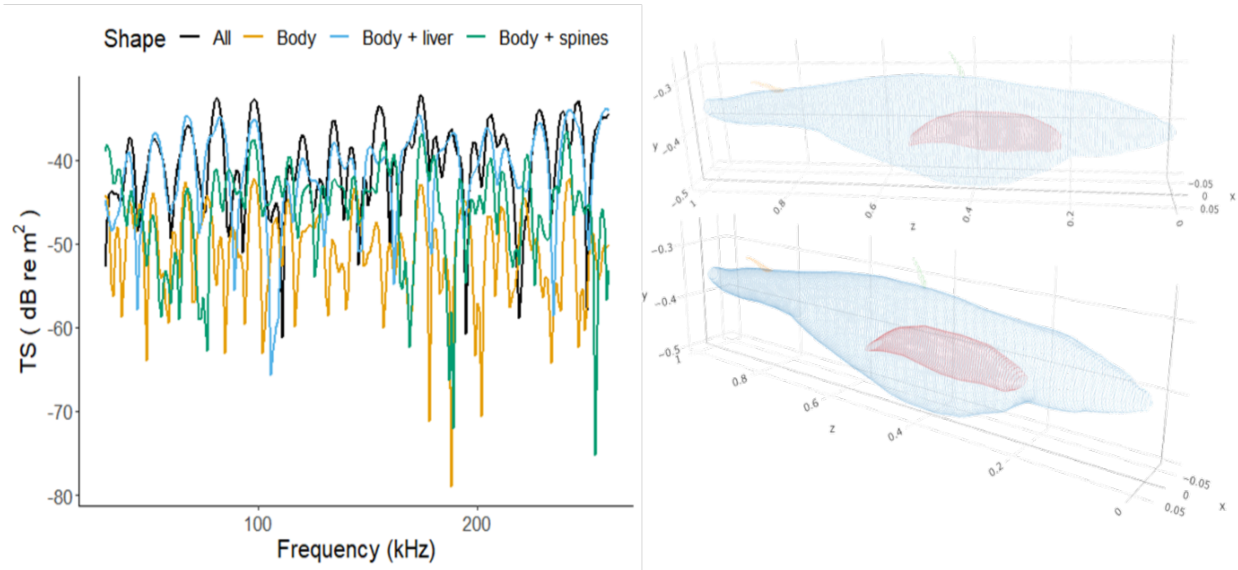


Figure 6: Consists of two illustrative images – the left-hand one is an example of modelled backscattering properties such as spines or liver (target strength) at different incident frequencies. The right-hand 3-D imagine illustrates the liver shape in relation to body shape for a large female spurdog specimen (dimensions are in metres). The liver in red provides its main backscattering components.

Understanding the scattering properties of spurdog could contribute substantially to the identification of spurdog during routine acoustic trawl surveys and also contribute to the reduction of bycatch in this vulnerable shark species.

# Next steps

Overall, it was a well-attended workshop where EU and UK experts made presentations to stimulate collaborative work on discard survival of spurdog. There was ample room for discussions and both parties concluded that there are still many unknowns regarding discard survival as well as in a broader context on the life-history dynamics of the species.

Both parties recognised and endorsed collaborative efforts to continue to work to work together. This could include conducting a comprehensive gap analysis aimed at identifying missing information such as discard survival estimates of fish in poor condition, size range (meaning larger individuals), more fleet segments, and over a larger geographical area. This is supported by the European Commission's Scientific Technical Economic Committee for Fisheries who determined that more data are necessary to back a requested exemption for spurdog based on high survivability submitted under the Joint Recommendations. Both Ireland and the UK expressed keenness to follow-up on work around survivability, tagging and vitality scoring, jointly. Closing these knowledge gaps will require dedicated projects, although some data deficiencies may be addressed by evaluating and extrapolating existing information.

Furthermore, the group discussed the option of conducting additional studies on spurdog discards ("gap analysis") aimed at constructing different management scenarios to evaluate their impact on stock dynamics and catch advice and related consequences like market price. These scenarios could involve incorporating discard survival by metier or size or age classes or establishing minimum or maximum catch lengths in the stock assessment. Such efforts could offer invaluable insights into the overall status and resilience of the population. Further efforts are required to develop relevant scenarios (either within ICES or externally). These could then be used by ICES for consideration. ICES could utilize these scenarios in 2025 to update the stock assessment, providing managers with the opportunity to make better-informed decisions.

The EU and UK recognise the scientific endeavours made and identified the ongoing tasks ahead. It's agreed that a follow-up workshop between the parties is essential to explore potential management implications in greater depth.