

## 23. Forage and Juvenile Fish

Irish name: Salán/Stuifín



Figure 1. Sprat, *Sprattus sprattus* (Linnaeus, 1758), an example from the forage fish species assemblage © Hans Hillewaert, CC BY-SA 4.0, <https://commons.wikimedia.org/w/index.php?curid=1531023>

### Background

Forage fish are an assemblage of generally small, pelagic, planktivorous, schooling fish species that hold a key position in marine food-webs. They form central links between lower and higher trophic levels, being prey for a number of different seabirds, marine mammals and piscivorous fish. Climate affects forage fish productivity. Commercial fisheries target certain forage fish species for both human consumption and fishmeal.

Typical forage fish species include herring, sprat, sand eel, and anchovy. Of these species in the western Irish Sea, herring and sprat have by far the greatest biomass. On sprat in Irish waters, the Marine Institute Stock Book (2022) states that:

*“Sprat is a pelagic schooling fish usually found inshore, with juveniles sometimes found in estuaries. The species is widely distributed from Morocco to the South of Norway and four different stocks are identified in European waters... Sprat perform seasonal migrations between winter–feeding and summer spawning grounds as well as diel vertical migrations. Sprat reach a total length of 18 cm, size-at-maturity has been estimated at 10.1 cm and is highly variable between areas. Spawning occurs in shallow waters (10–20 m) and egg production ranges 6,000–14,000. There is currently no evidence of spawning site fidelity (homing).”*

During the stakeholder engagement process, it was identified that juvenile whiting were an important prey item for listed elasmobranch species on certain sandbanks at certain times of the year, which justified their inclusion. The rationale for cod and haddock juveniles is covered below.

Norway pout has been identified as a key forage fish species in the North Sea (Engelhard *et al.* 2014) and has therefore been included.

### **Rationale for spatial protection in the western Irish Sea**

Forage fish were included in the features list based on ecological importance, being a key food source for a wide range of species, including some protected species and some commercially fished species. Most species in the assemblage are not listed on OSPAR or IUCN threatened lists, with the exception of cod and haddock. Cod (OSPAR listed and European Red List: threatened) and haddock (Global IUSN: vulnerable) were included in the assemblage - **as juveniles only** - for the following reasons: While they are both listed, they are managed under the CFP and were therefore excluded from the features list in their own right. Further, any spatial protection for the primary purpose of commercial fisheries enhancement would not fall under the definition of an MPA, rather being considered an OECS. However, commercial species have other roles in the ecosystem, occupying certain niches, acting as competitors, predators and prey for the wider system. Including the juvenile stages of these listed species therefore acknowledges their importance in the ecosystem and could lead to benefits for the commercial stocks by protecting their nursery grounds.

**Although ICES provides catch advice, there is no TAC set for sprat in the Celtic Seas (including the Irish Sea).** The vast majority of sprat caught in the Celtic Seas are taken by Irish vessels. The Irish Sea is not a core area for the fishery, but catches are frequent along the eastern Irish coast. The Irish Sea herring stock is currently above all reference points and fished at MSY, mostly by Northern Irish vessels. There is no targeted fishery for sandeel. The Irish Sea cod stock is below all biomass reference points and has ICES advised zero catch for 2023 (Marine Institute Stockbook 2022).

**The western Irish Sea is a significant part of the range of all the species in the assemblage.** Data on the distribution of the species in the Irish Sea is available from the International Bottom Trawl Survey database (ICES DATRAS), which covers the western Irish Sea as well as its surrounds.

**Based on current knowledge the species assemblage is amenable to spatial protection.** Analysis of the bottom trawl survey data (described below) has identified regions in the western Irish Sea where the listed forage and juvenile fish are consistently caught.

### **Sensitivity assessment**

Individual species in the assemblage had varying susceptibility to each pressure so the sensitivity scores were based on the most sensitive species for each pressure. The highest associated sensitivity scoring for forage and juvenile fish was in relation to its targeted and non-targeted removal (bycatch) by fishing (high confidence). High sensitivity to loss and

disturbance of habitat was specifically related to sandeel. A precautionary approach was followed for chemical pollutants and therefore forage and juvenile fish were deemed sensitive to chemical pollutants including transition elements and organo-metal contamination, and hydrocarbon and PAH contamination. Again, this is made more relevant in the case of sandeel due to their association with the substrate.

### Further research needs

Knowledge on the populations of sandeel in the western Irish Sea remains limited and requires further investigation. The stock structure of sprat in the western Irish Sea is unknown. Similarly the mixing of Irish Sea and Celtic Sea herring in the area is known but not yet accounted for in stock assessment. In addition, evidence to identify the potential effect of multiple pressures was insufficient to form an assessment. These pressures included chemical (transition elements and organo-metal contamination, hydrocarbon and PAH contamination, synthetic compound contamination and introduction of other substances) and physical pressures for species other than sandeels (abrasion/disturbance of substratum surface or seabed, penetration or disturbance of substratum subsurface and barriers to species movement).

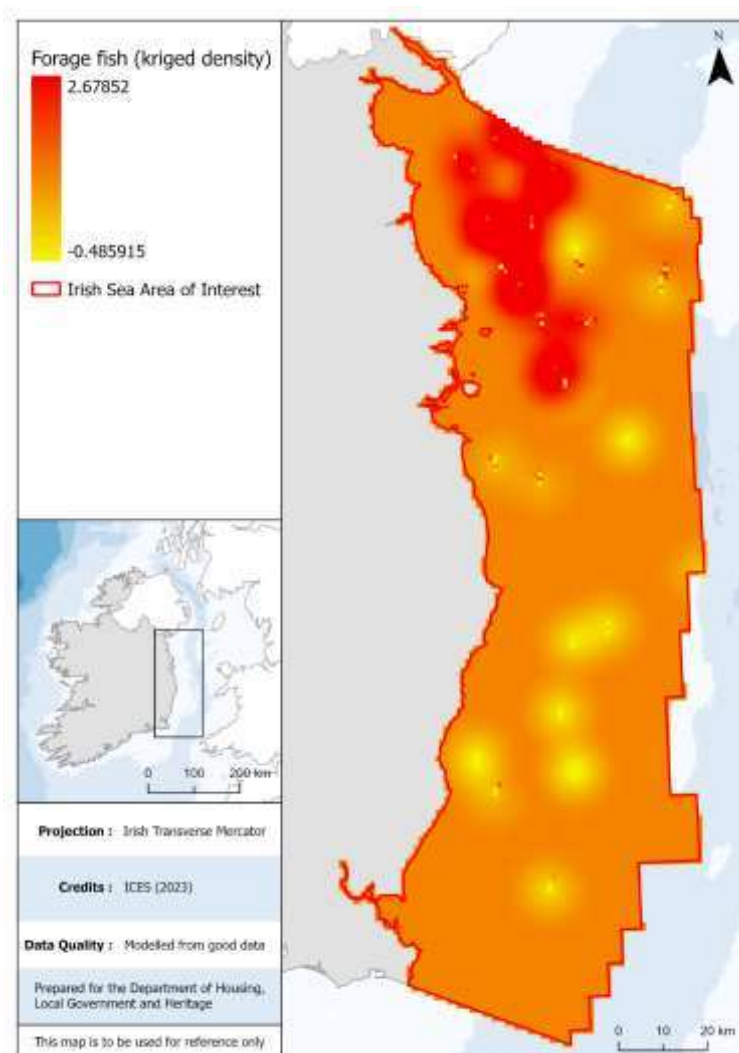


Figure 2. Density of the combined forage and juvenile fish species assemblage for the years 2011-2021 (using kriged CPUE from the International Bottom Trawl Survey [ICES DATRAS]).

## Data sources and quality

Dataset Name	Data Owning Organisation	Dataset Quality	Metadata URL	Comments
International Bottom Trawl Survey (IBTS) Fisheries Database of Trawl Surveys (DATRAS)	International Council for the Exploration of the Seas	Modelled from good data	<a href="#">IE-IGFS</a> and <a href="#">NIGFS</a>	

Since the standard trawl used in the IBTS is more selective to smaller fish than the typical commercial trawl, the DATRAS survey data was deemed more representative of the spatial distribution of juvenile and forage fish than linked logbook/VMS data. To address the issue of the relatively large distances between survey hauls in some areas, the density was interpolated to fill in the blank areas (i.e., the catch per unit effort per haul was kriged over multiple years). The results were checked for consistency with other datasets (commercial catch), other surveys (AFBI acoustic survey) and similar studies (e.g., Ellis *et al.* 2012).

## References

Ellis, J.R., Milligan, S.P., Readdy, L., Taylor, N. and Brown, M.J. 2012. Spawning and nursery grounds of selected fish species in UK waters. Sci. Ser. Tech. Rep., Cefas Lowestoft, 147: 56 pp.

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Marine Institute Stock Book (2022) Report to the Minister for Agriculture, Food and the Marine. Annual Review of Fish Stocks in 2022 with Management Advice for 2023