

40. Forage fish (a) sprat, anchovy, and pilchard & (b) sandeel

Irish name: Salán/Stuifín



Figure A10.40.1. Sprat, *Sprattus sprattus* (Linnaeus, 1758), an example from the forage fish species assemblage © Hans Hillewaert, CC BY-SA 4.0.

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, pilchard and anchovy. Of these species in the Celtic Sea area of interest (AOI), herring, sprat, anchovy and pilchard have 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)."

Rationale for spatial protection in the Celtic 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. No species in the assemblage is listed under OSPAR or IUCN. While being an important part of the species assemblage, herring were mostly excluded from the forage fish sensitivity assessment as their spawning beds are included elsewhere (however, some of the selected literature does include herring as a forage fish species).

Although ICES provides catch advice, there is no total allowable catch (TAC) set for sprat in the Celtic Seas. The vast majority of sprat caught in the Celtic Seas are taken by Irish vessels, with coastal areas in the south-east being particularly important for the fishery. There is no assessment or TAC for anchovy or pilchard in the area but both are taken opportunistically when available. There is no targeted fishery for sandeel. (Marine Institute Stockbook 2022).

The Celtic Sea is a significant part of the range of sprat, herring, and sandeel.

Anchovy and pilchard are frequently recorded in large numbers in the AOI on Marine Institute surveys and their range may be expanding north due to warming waters.

Data on the distribution of sprat, herring, anchovy and pilchard in the AOI is available from the annual Celtic Sea Herring Acoustic Survey (CSHAS, Marine Institute). Data on the distribution of sandeel in the AOI is available from the International Bottom Trawl Survey database (IBTS; ICES DATRAS), which covers the Celtic Sea as well as its surrounds.

Based on current knowledge the species assemblage is amenable to spatial protection. Analysis of the acoustic (CSHAS) and bottom-trawl (IBTS) survey data (described below) has identified regions in the Celtic Sea AOI where forage fish are consistently recorded and caught.

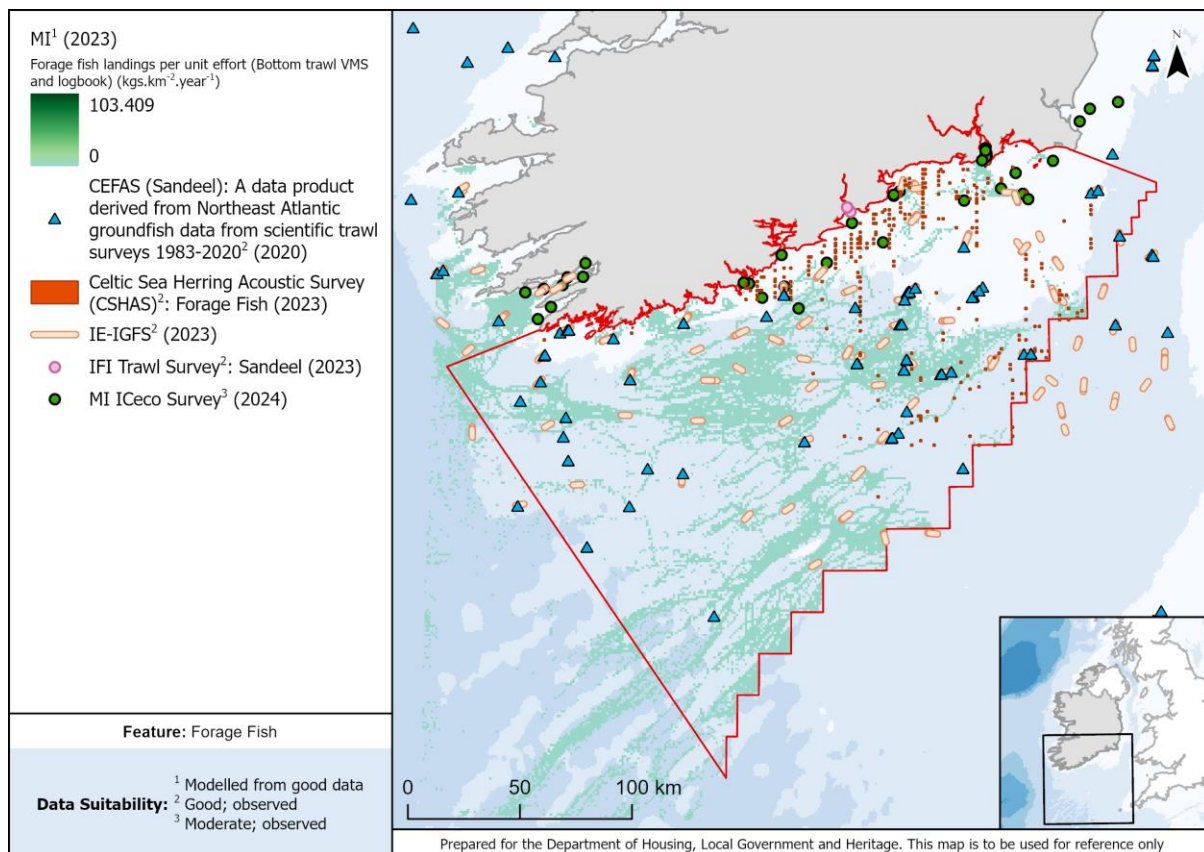


Figure A10.40.2. Data available for forage fish a & b. Sprat, anchovy, and pilchard: Density of the combined forage fish species assemblage for the years 2014-2023 from the annual Celtic Sea Herring Acoustic Survey (CSHAS). Counts of acoustic registrations were gridded to the 1x1 km planning units and filtered to >4 observations per cell over the time-series to identify cells where forage fish are consistently present in October. Sandeel recorded in bottom-trawl surveys (2014-2020) per grid-cell. (Source: ICES DATRAS via Lynam and Ribiero, 2022) and Marine Institute inshore ICeco survey. IGFS data layer shows all trawl stations, including those where no sandeel were recorded.

Sensitivity assessment

Due to the different life-history traits of sandeels vs. pelagic forage fish, two separate sensitivity tables were produced, one for sandeel and one for sprat, anchovy, and pilchard. 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 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 sandeel were deemed sensitive to chemical pollutants including transition elements and organo-metal contamination, and hydrocarbon and PAH

contamination of the substrate. Sprat were assessed as sensitive to underwater noise, with numerous studies citing dispersal of sprat schools due to sounds such as pile-driving during the day.

Further research needs

Knowledge on the populations of sandeel in the Celtic Sea remains limited and requires further investigation. The stock structure of sprat in the Celtic Seas is unknown. 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). Further work could produce well-grounded species distribution models of forage fish species in the Celtic Sea.

Data sources available

Since sandeel are more closely associated with the substrate and 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 sandeel than acoustic surveys or linked logbook/VMS data. A cleaned and processed data product from the ICES DATRAS was used (Lynam and Ribiero, 2022).

Density and persistence of the combined forage fish species assemblage for the years 2014-2023 was calculated from the annual Celtic Sea Herring Acoustic Survey (CSHAS). Counts of acoustic registrations were gridded to the 1x1 km planning units and filtered to >4 observations per cell over the time-series to identify cells where forage fish are consistently present in October.

The results were checked for consistency with other datasets (commercial catch), and similar studies (e.g. Ellis *et al.* 2012).

For explanation of data suitability, refer to Table 3.2.1 Main Report. For information on how data were prepared for use in prioritization analyses, and for visualisation of layer used, see Appendix 5e, section 5e.4.

References

Ellis, J.R., Milligan, S.P., Readdy, L., Taylor, N., & Brown, M.J. (2012). *Spawning and nursery grounds of selected fish species in UK waters*. Science Series Technical report no. 147, Cefas Lowestoft, 56. <https://www.cefas.co.uk/publications/techrep/TechRep147.pdf>

Lynam, C., & Ribeiro, J. (2022). A data product derived from Northeast Atlantic groundfish data from scientific trawl surveys 1983-2020. Cefas, UK. V1.
<https://doi.org/10.14466/CefasDataHub.126> (Data link: <https://data.cefas.co.uk/view/21421>).

Marine Institute (2022). *The stock book 2022: annual review of fish stocks in 2022 with management advice for 2023*. Report to the Minister for Agriculture, Food and the Marine. Galway, Ireland. <https://oar.marine.ie/handle/10793/1805>