41. Herring spawning areas/grounds/beds

Irish name: Beitreach sceathraí scadán

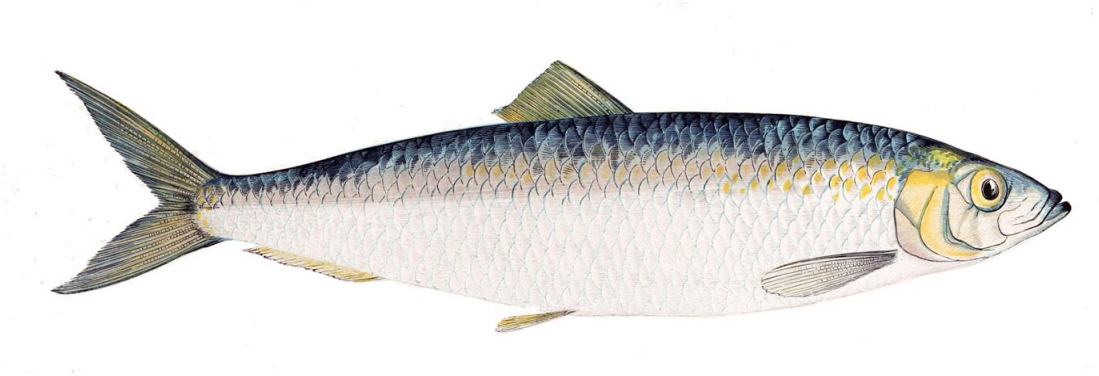

Figure A10.41.1. Atlantic Herring, *Clupea harengus* (Linnaeus, 1758). Source: Gervais et Boulart - Les poissons Gervais (1877).

This case report has been updated from the western Irish Sea case report published in 2023. A new Web of Science literature review was conducted to assess whether any new research on the species had been conducted since the western Irish Sea report was published, and used to inform both the report and the sensitivity analysis.

Background

Herring are a vitally important part of the marine ecosystem, being prey for marine mammals, birds and many predatory fish. They are also a valuable fishery species. Celtic Sea herring is one of three herring stocks that occurs in Irish waters. The Celtic Sea stock encompasses ICES divisions 7.a South (of 52°30'N), 7.g–h, and 7.j–k (South Irish Sea, Celtic Sea, and Southwest of Ireland) and until recently yielded up to 20,000 tonnes per annum with Ireland holding the vast majority of the yearly allowable catch. In the past ten years however the biomass of Celtic Sea herring has dropped to a historical low level, below all stock assessment reference points, and zero catch has been advised by ICES. (Main sources: Marine Institute Stockbook 2023; Molloy 2006, ICES 2023).

Unusually for a marine fish, herring eggs are deposited on the seabed in discrete gravel beds or flat stone. The herring are completely reliant on these spawning beds for reproduction and individuals return to their natal spawning ground each year. Nearby spawning gravel beds are generally grouped into "spawning grounds", which may contain one or more beds. Spawning grounds are further grouped into "spawning areas". The spawning areas, grounds and beds for herring around Ireland are well known and are located close to the coast. The Celtic Sea herring population currently spawns on known,

shallow gravel beds mainly to the south of Waterford each winter (Figure A10.41.3). (Main sources: O'Sullivan et al., 2013; Breslin, 1998; Frost and Diel, 2022)

Rationale for spatial protection in the Celtic Sea

Herring is not a species listed by OSPAR or IUCN. Fishing restrictions for herring are in place under the Common Fisheries Policy (2015) but these do not relate to the spawning habitat. The spawning areas/grounds/bed were included in the features list as they are an essential part of the life-cycle for this important commercial and forage fish species. The Celtic Sea is a significant part of the range of herring albeit on the south-western limit of its distribution. There are a number of known spawning beds in the area of interest, some are still in use each winter while others, particularly to the west, have not been utilised by spawning herring in a number of years. Yet, documented recolonization of formerly abandoned spawning grounds on the west coast of Scotland, the North Sea and Norway highlight the importance of maintaining these essential habitats to increase stock resilience (Frost and Diele, 2022 and references therein). In the North Sea, when herring were at low abundance, they remained within the main spawning grounds and expanded to surrounding spawning grounds as stock size increased (Dickey-Collas et al., 2010). Spawning grounds in the eastern Celtic Sea have been highlighted with strong importance and when kept undisturbed and protected can further support stock biomass (Volkenandt et al., 2015). Migration patterns from juvenile to adult areas and from feeding to spawning areas, are generally regarded as being relatively constant over periods of several years despite environmental variation (Corten, 2001). Herring distribution during the spawning migration is not influenced by temperature or salinity, but rather by the physical properties of the spawning grounds and spawning ground fidelity (Volkenandt et al., 2015). Based on the discrete and well documented substrate requirements, herring spawning beds are highly amenable to spatial protection.

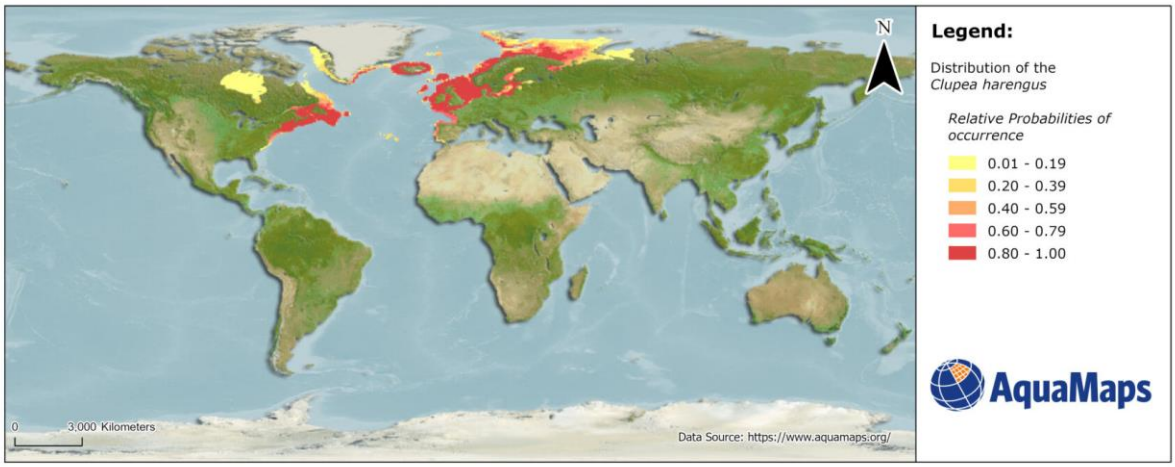

Figure A10.41.2. Global geographic distribution of Atlantic herring, *Clupea harengus,* from www.aquamaps.org.

Sensitivity assessment

The highest associated sensitivity scoring for herring spawning grounds was in relation to physical loss or disturbance to the seabed. Herring spawning beds are vulnerable to anthropogenic disturbance of the seabed including but not limited to dredging, sand and gravel extraction, dumping of dredge spoil and waste from fish cages (high confidence). The International Council for the Exploration of the Seas advice for herring in the Celtic Sea has consistently stated (e.g. ICES, 2021):

"*Activities that have a negative impact on the spawning habitat of herring, such as the dumping of dredge spoil, the extraction of marine aggregates (e.g. gravel and sand), and the erection of structures such as wind turbines in the vicinity of spawning grounds are a cause for concern*"

and advises that

"*Activities that have a negative impact on the spawning of herring should not occur unless the effects of these activities have been assessed and shown not to be detrimental to the productivity of the stock*"

Smothering of gravel spawning beds via sediment plumes and noise during works would also cause disruption to herring spawning behaviour (high confidence).

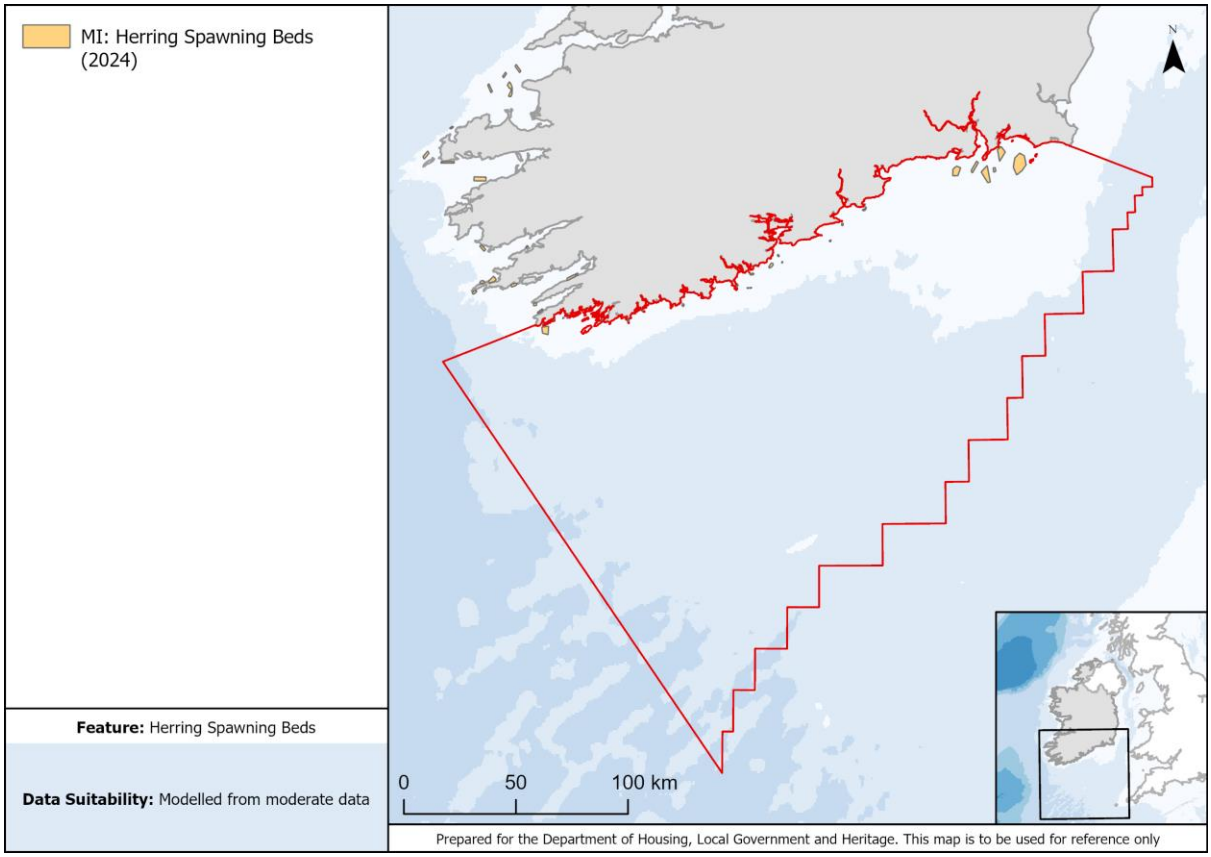

Figure A10.41.3. Herring spawning beds in the Celtic Sea AOI.

Data sources available

Known spawning grounds in the Celtic Sea AOI were filtered from the Inventory of Irish Herring Spawning Grounds (O'Sullivan et al., 2013). 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.

Further research needs

Evidence to identify the potential effect of multiple pressures was insufficient to form an assessment. The potential cumulative effect of multiple ORE installations between herring feeding grounds and spawning grounds (i.e. on the migration route) is poorly understood and could not be assessed. As well as being a possible physical barrier to movement, the effect of underwater noise on herring movement warrants further investigation. Other such pressures included transition elements and organo-metal contamination, hydrocarbon and PAH contamination, synthetic compound contamination and introduction of other substances.

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