

Appendix 9-2: Herring Spawning - Technical Report





ORIEL WIND FARM PROJECT

Environmental Impact Assessment Report Appendix 9-2: Herring Spawning Technical Report

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Appendix 9-2: Herring Spawning – Technical Report

Herring Spawning Grounds in the vicinity of the Proposed Oriel Wind Farm
Project
Revision 03



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Glossary

AFBNI	Agri-food & Biosciences Institute Northern Ireland
ANIFPO	Anglo-North Irish Fish Producers Organisation
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
EIAR	Environmental Impact Assessment Report
HAWG	Herring Assessment Working Group
ISAS	Irish Sea Acoustic Surveys
ISEFPO	Irish South and East Fish Producers Association
MI	Marine Institute
MPA	Marine Protected Area
NASC	Nautical Area Scattering Coefficient
OWF	Oriel Wind Farm
OWL	Oriel Wind Farm Limited

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Executive Summary

Following the publication of the 'Ecological sensitivity analysis of the western Irish Sea' study, which informs the future designation of marine protected areas (MPAs), Oriel Wind Farm Limited commissioned BlueWise Marine to produce a complementary technical report focusing on herring (*Clupea harengus*) spawning grounds around the Wind Farm project. The MPA report references Dundalk Bay as a potential MPA primarily due to the presence of herring spawning grounds, supported by modelled data.

This report's objective is to collect available data and information on the timing, location, and extent of herring spawning near the proposed Oriel Wind Farm and cable route. To accomplish this, BlueWise Marine collaborated with relevant scientific organizations, engaged with herring fishers, and conducted a thorough review of relevant studies and publications to gather evidence on herring spawning in the vicinity of the study area.

The data and information gathered indicates that in the Irish Sea, the Mourne herring spawning grounds extend along the Mourne coast of County Down, from Newcastle to the southern part of Dundalk Bay, with autumn/winter spawning occurring from mid-August to December. Further anecdotal evidence from herring fishers and AFBINI suggests winter spawning occurring from December to March.

Further data collection is recommended to gain a better understanding of the specific location of the grounds within Dundalk Bay and the precise timing of the spawning events to validate the extent of the spawning period.

1 Introduction

BlueWise Marine was commissioned by Oriel Wind Farm Limited (OWL) to create a supporting technical report for the 'Oriel EIAR Chapter 9 appendix 9-1: Fish and Shellfish Ecology Technical Report' on the herring (*Clupea harengus*) spawning locations. This was after publication of the 'Ecological sensitivity analysis of the western Irish Sea' study that will inform future designation of marine protected areas (MPAs) (Crowe, et al. 2023a), hereinafter referred to as the MPA Report.

This report aims to establish the timing, location and extent of Herring Spawning Grounds in the proximity of the Oriel Wind Farm area and export cable corridor. BlueWise Marine consulted with relevant scientific organisations, herring fishers and reviewed relevant studies and publications to source evidence on herring spawning grounds in the area. The findings of the review of relevant literature, data and consultations are described in the following sections.

1.1 Background

An independent advisory group was established by the Minister for Housing, Local Government and Heritage to conduct an ecological sensitivity analysis of the western Irish Sea to inform future potential designation of MPAs in the region. In this analysis, herring spawning grounds were categorised as areas of high conservation value, resulting in the identification of Dundalk Bay as a potentially suitable area for the designation of an MPA (Crowe *et al.*, 2023a).

The report also made the claim that, “within the western Irish Sea, herring only spawn in Dundalk Bay, which is thus a vitally important site for this commercial species in the wider Irish Sea region” (Crowe *et al.*, 2023a).

These analyses were carried out to gain a better understanding of herring spawning in the area, considering existing evidence.

2 Study Area

The proposed Oriel Wind Farm Project is situated in the Irish Sea to the East of Dundalk Bay in Co. Louth. Specifically centred 8km SE of Cooley Point and 12.5km NE of Dunany Point, it encompasses an estimated 28km² area. The proposed export cable corridor is approximately 5.3km east of Dunany Point. The route is approximately 11km in length and the offshore export cable corridor occupies an area of about 25km².

The seabed substrates at the Oriel wind farm site are heterogenous ranging from Mud to Rock and Boulders (See Figure 2.1).

To conduct this study, a broader area not limited to the Wind Farm boundaries was considered in order to account for both the area designated in the MPA report as herring spawning grounds and areas to the north of the farm where spawning has been previously reported (See Section 4.4). Therefore, this area, hereinafter referred to as the 'Study Area', included Dundalk Bay and the Mourne herring fishing grounds, that are located off the coast of the Mourne Mountains in Northern Ireland. The Study Area encompasses the North-western segment of the Irish Sea along the North-eastern coast of Ireland, extending from Clogherhead to Annalong (See Figure 2.1).

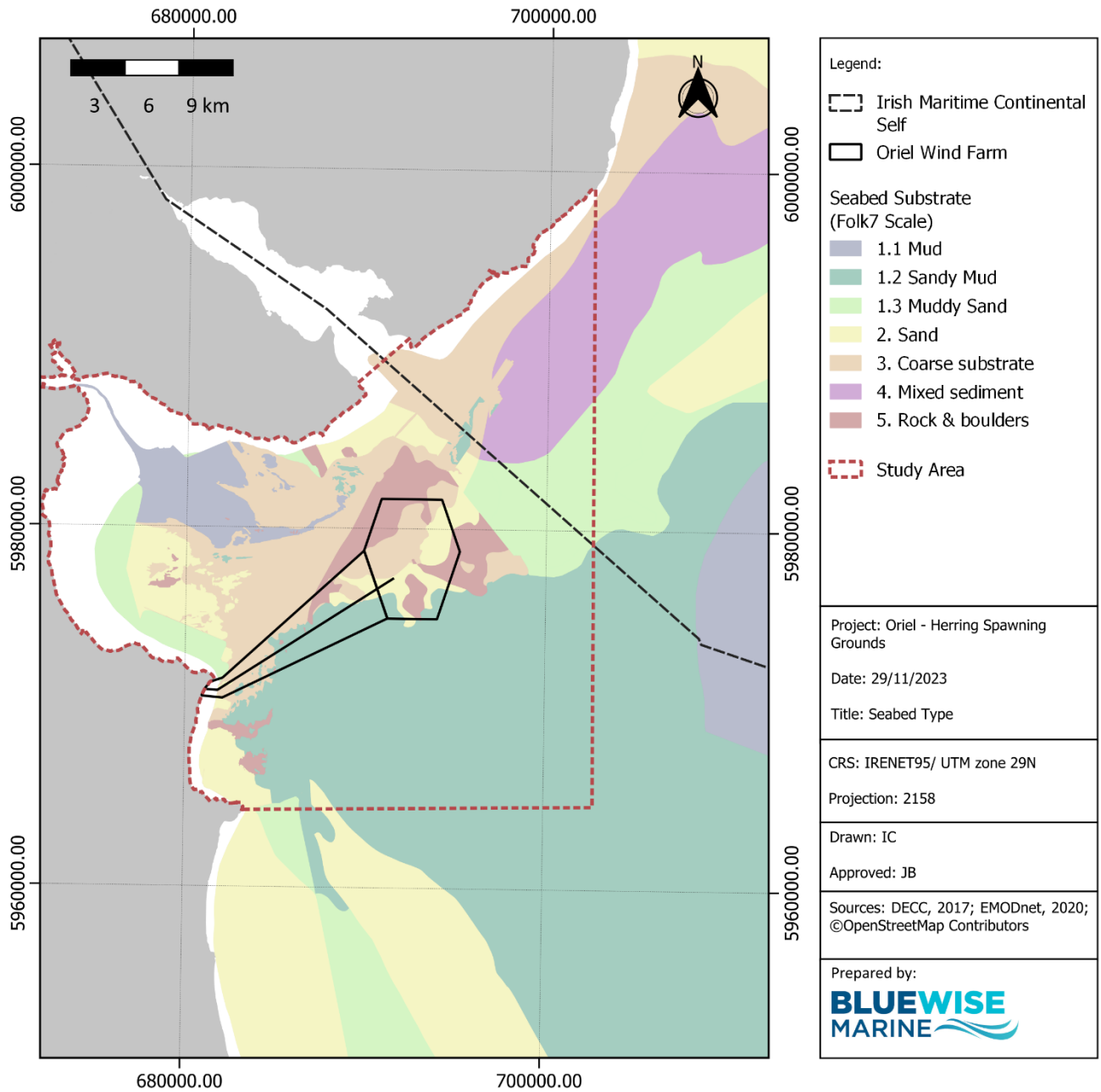


Figure 2.1. Map showing the Study Area considered in this report and the seabed types around Oriel Wind Farm.

3 Methodology

3.1 Desktop Review

The studies in Table 3.1 are referenced within EIAR Chapter 9: Fish and Shellfish and appendix 9-1: Fish and Shellfish Technical Report, the MPA report or acquired through keyword searches in databases such as Web of Science and Google Scholar. Other references and reports were provided during consultation and will be discussed in Section 3.2.

Table 3.1. References used in the literature review process.

Title	Year	Author
Northern Ireland Inshore Fisheries	2013	AFBINI
<i>Clupea harengus</i> Atlantic herring	2008	Barnes
Effect of Pile-Driving Sounds on the Survival of Larval Fish	2014	Bolle, et al.
Spawning beds of Manx autumn herrings	1969	Bowers
The location and extent of the main herring (<i>Clupea harengus</i>) spawning grounds around the Irish coast	1998	Breslin
Spawning season fidelity in sympatric populations of Atlantic herring (<i>Clupea harengus</i>)	2006	Brophy, et al.
Atlantic herring (<i>Clupea harengus</i>) in the Irish and Celtic Seas; tracing populations of the past and present	2008	Burke
Spawning and nursery grounds of forage fish in Welsh and surrounding waters	2021	Campanella and van der Kooij
Fisheries Sensitivity Maps in British Waters	1998	Coull, et al.
Ecological sensitivity analysis of the western Irish Sea to inform future designation of Marine Protected Areas (MPAs)	2023a	Crowe, et al.
Ecological sensitivity analysis of the western Irish Sea to inform future designation of Marine Protected Areas (MPAs) – Appendices	2023b	Crowe, et al.
Fish Landings 2022	2023	CSO
A morphological staging system for the larval development of the herring, <i>Clupea harengus</i> L.	1977	Doyle
Spawning and nursery grounds of selected fish species in UK waters	2012	Ellis, et al.
Hearing in herring	1967	Enger
Herring: Expectations for a new millennium	2000	Hay, et al.

Title	Year	Author
The herring	2004	Holst, et al.
Recommendations adopted by the Herring Committee concerning routine methods and the reporting of herring biological data in the ICES' area	1963	ICES
ICES. 2013. Report of the Herring Assessment Working Group for the Area South of 62 N (HAWG)	2013	ICES
Maturation of the digestive system of Downs herring larvae (<i>Clupea harengus</i> , Linnaeus, 1758): identification of critical periods through ontogeny	2021	Joly, et al.
The Herring Fisheries of Ireland	2006	Molloy
An Inventory of Irish Herring Spawning Grounds	2013	O'Sullivan, et al.
A Long-Standing Hybrid Population Between Pacific and Atlantic Herring in a Subarctic Fjord of Norway	2023	Pettersson, et al.
Essential fish habitat source document. Atlantic herring, <i>Clupea harengus</i> , life history and habitat characteristics	1999	Reid
The role of “ larval retention” in life-cycle closure of Atlantic herring (<i>Clupea harengus</i>) populations	2015	Sinclair & Power
Impact of naval sonar signals on Atlantic herring (<i>Clupea harengus</i>) during summer feeding	2012	Sivle, et al.
Natal homing in a marine fish metapopulation	2001	Thorrold, et al.
The fishes of the British Isles and North-West Europe	1969	Wheeler
Fishes of the North-eastern Atlantic and the Mediterranean= Poissons de l'Atlantique du Nord-est et de la Méditerranée	1986	Whitehead

3.2 Consultation

BlueWise Marine contacted the Marine Institute (MI), Agri-food & Biosciences Institute Northern Ireland (AFBINI), the Irish South and East Fish Producers Organisation (ISEFPO) and the Anglo-North Irish Fish Producers Organisation (ANIFPO). The MI does not currently conduct surveys herring in the Irish Sea. ANIFPO provided contact information for local herring fishers as did AFBINI. Meetings were held with two herring fishers who fish herring in the North Irish Sea off the Mourne Coast and Dundalk Bay. These fishers are the skippers of the MV Havilah, and the MV Stefanie M, respectively.

Reports and anecdotal information provided through these consultations (See Table 3.2) are discussed in Section 4.

Table 3.2. Maps, datasets, and reports provided after consultation with relevant stakeholders.

Title	Year	Author/ Data Source
Irish Sea Acoustic Surveys (ISAS) reports	2019, 2020 & 2022	AFBINI
ISAS raw data (csv format) with biological data from the trawls	2019, 2020 & 2022	AFBINI
CO 4507 Herring Larval Survey & Enhanced Irish Sea Herring Survey	2007	Beggs, et al.,
Irish Sea Young Herring Survey July 1979	1979	Molloy
The results of Young Herring Surveys in the Irish Sea, 1979 and 1980	1980	Molloy
Report on Location of Herring Grounds with Reference to the Proposed Aggregate Extraction Area	2007	Service, M. (AFBINI)

4 Dundalk Bay and Mourne Spawning Grounds

4.1 Herring Biology

The Atlantic herring is a highly abundant and ecologically significant species distributed in several ecosystems in the North Atlantic. As a pelagic species, it typically inhabits the water column and is usually found from the surface down to depths of 200m (Whitehead, 1986; Barnes, 2008). In addition to being a commercial species, with 1,951 tonnes landed in Ireland in 2022 (CSO, 2023), herring plays a crucial role in marine ecosystems as a vital prey species for various marine predators, such as fish, birds, and marine mammals (Holst et al., 2004). As a facultative zooplanktivorous filter-feeder, it can switch to filter-feeding based on the suitability of food density and particle size, although this species primarily relies on copepods (Barners, 2008). Herring engages in migrations, moving between feeding and spawning grounds, and they are known for their adaptability to diverse environmental conditions (Brophy et al., 2006). In the northeastern part of the Atlantic Ocean, there are numerous stocks, and while each maintain their own distinct spawning time and location, larvae and juveniles drift and migrate to the diverse mixed population nursery areas (Burke, 2008; Sinclair & Power, 2015). With a lifespan of between 15-18 years (Reid, 1999), these species reach maturity after 2-3 years (Burke, 2008). ICES Herring committee (1963) established a maturity scale with seven stages based on the gonadal development that herring goes through.

Table 4.1. Maturity scales of Atlantic herring according to ICES Herring committee.

ICES 1963	
I.	Virgin
II.	Virgin maturing
III.	Maturing
IV.	Maturing
V.	Maturing
VI.	Spawning
VII.	Spent & Recovery Spent

Juveniles and adult individuals are included in this classification, being the potential spawners individuals included in stages III, IV, V and VI.

Larval development has been categorised previously in four stages with substages by Doyle (1977) based on external morphological features that include “(1) **yolk-sac** larval stage, (2) **pre-flexion** stage; yolk sac absent and straight notochord, (3) **flexion** of the notochord stage and (4) **post-flexion** stage with visible pelvic fins” (Joly et al., 2021). Larval surveys focus on measuring the length of the larvae and <10mm yolk sac larvae can be used to infer the location of herring spawning grounds (Breslin, 1998). In combination, the presence of Stage VI adults with flowing roe and milt, and the presence of yolk sac larval herrings are a good indicator of spawning grounds (Illes, 1964, Breslin 1998).

4.2 Herring Spawning Behaviour

Herring are benthic spawners which deposit their eggs on gravel or rock in relatively shallow, high energy coastal environments (Wheeler, 1969; Hay et al., 2001; Molloy, 2006). Specific herring spawning assemblages show a degree of seasonal and spawning ground fidelity (Brophy, et al., 2006). It appears that seasonality remains consistent within herring populations, despite mixing during their earlier life stages (Brophy et al., 2006). Regarding the ground fidelity, studies indicate that herring seem to exhibit adaptability in choosing their spawning locations within the vicinity of previously established grounds. While some degree of homing behaviour is observed (Thorrold et al., 2001), it doesn't necessarily lead to highly specific geographical areas, and as long as a suitable substrate is present in nearby regions, successful spawning seems to take place (Haegele & Schweigert, 1985). Coull et al. (1998) indicate that historical spawning grounds can be reclaimed over time (Ellis et al., 2012), so ensuring that the physical nature of these locations doesn't change over time is a management measure to be considered.

4.3 Timing of Herring Spawning

The Fisheries and Aquatic Ecosystems Branch of AFBINI confirmed that from last week of August to the second week of September they carry out annual Irish Sea Acoustic Surveys (ISAS) for herring and sprat onboard the *RV Corystes*. The Irish Sea area they cover in the surveys consists of nine

sectors primarily in UK territorial waters (two sectors include Republic of Ireland territorial waters); the North Channel, the Mourne Coastline to Dundalk Bay, the Louth coastline North of Howth (Republic of Ireland territorial waters), North of Anglesey, the West coast of Lancashire, the West coast of Cumberland, the mouth of Solway Firth, the South coast of Scotland, and the waters surrounding the Isle of Man (See Figure 4.1) (AFBINI, personal communication, 13th November 2023).

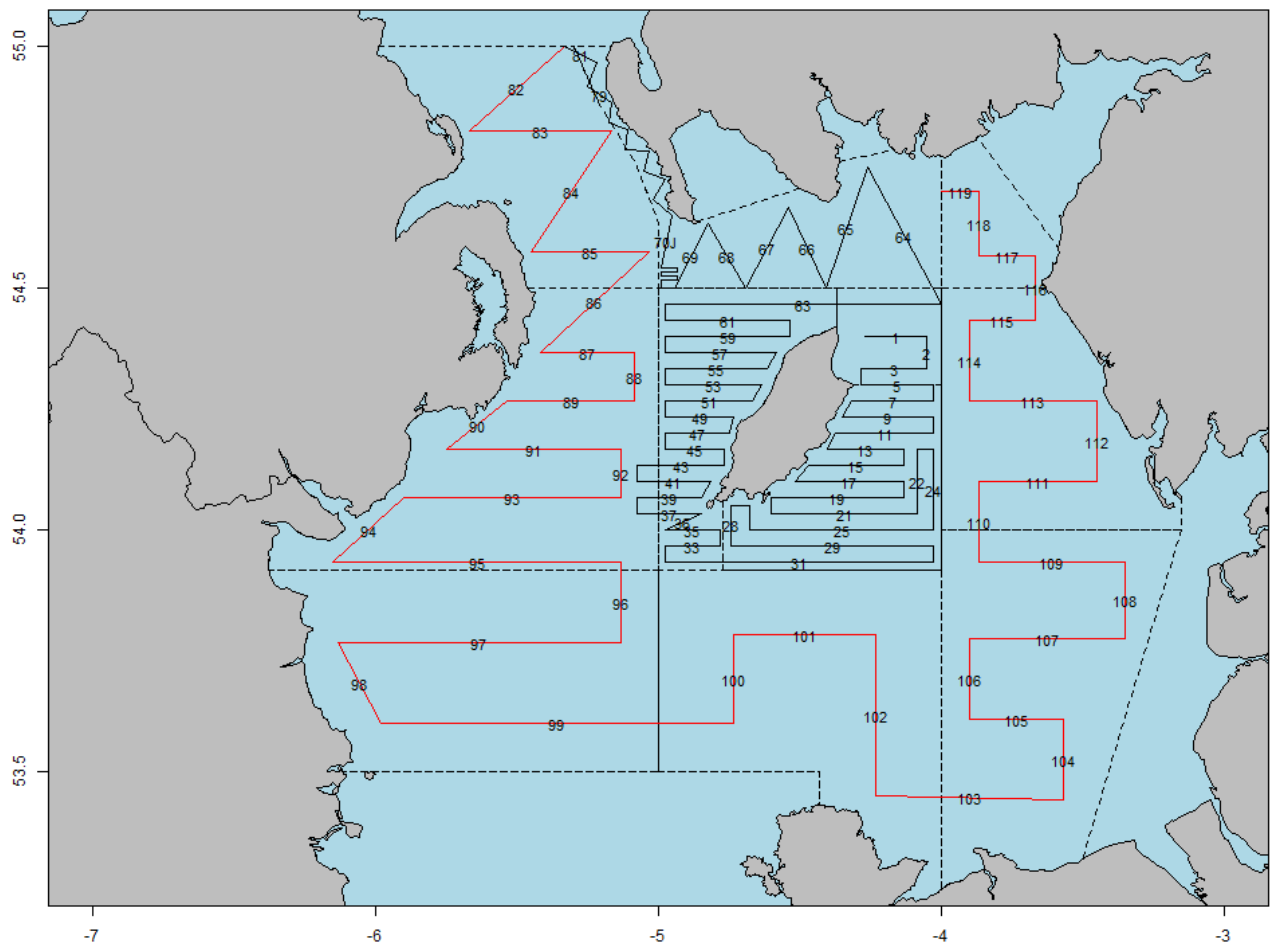


Figure 4.1. Acoustic survey tracks for the AFBINI 2022 Irish Sea Acoustic Survey.

Owing to Brexit, on years 2021 and 2023, the *RV Corystes* was unable to survey within Republic of Ireland territorial waters so there is a lack of data during these years. Apart from the research vessel, there are also acoustic surveys carried out onboard commercial fishing vessels in late September

and early October (AFBINI, personal communication, 13th November 2023). Anecdotally, they believe there are both autumn/winter spawning and winter/spring spawning components in the Study Area from the North Irish Sea and Celtic Sea stocks and they have indicated possible spawning in the Dundalk Bay area from mid-August to early March. AFBINI routinely carry out acoustic surveys in September and the autumn spawning component had been well documented in the literature (Brophy, et al., 2006; Molloy, 1979; Molloy 1980; AFBINI, personal communication, 13th November 2023). However, data to confirm the presence of a winter/spring spawning component is unavailable as there are no acoustic surveys carried out at this time of year (AFBINI, personal communication, 13th November 2023).

Coull et al. (1998) similarly identified the spawning period in the Mourne area as between September to October. Spawning events along the Irish Coast (Mourne grounds) and north of the Isle of Man have been identified as taking place from September to November, starting slightly later for the former (ICES, 2013). Even though there is significant mixing with winter-spawned fish (coming from the Celtic Sea) during the juvenile phase, the spawning assemblages in the Irish Sea primarily consist of autumn-spawned fish (Brophy et al., 2006).

In 2007, AFBINI carried out an analysis of existing information to identify the location of the Mourne spawning grounds due to the potential allocation of an Aggregate Extraction Area in County Down coastline, directly north of Carlingford Lough extending to Outer Dundrum Bay. The report suggests that spawning on the Mourne grounds occurs intermittently along the licensed area between early September and early January (Molloy, 1979). This report also referred to the presence of both an Autumn and Winter/Spring herring spawning components on the Mourne coastline, which were later evidenced and discussed in a report the following year (Molloy, 1980).

The skippers from the *MV Havilah* and *MV Stefanie M* vessels confirmed that herring fishing takes place from Mid-August to early March with spawning fish captured throughout the period (personal communication, 16th, and 17th November 2023), suggesting that there may be Autumn/Winter and

Winter/Spring spawning components in the area. These spawning components may be from two difference stocks: one which moves from the north Irish Sea Southwards and one from the Celtic Sea Northwards (AFBINI, personal communication, 13th November 2023). These fishers have caught Stage VI spawning herring within and outside Dundalk Bay extending to the northwest of the proposed Oriel Wind Farm (See Appendices 1 and 2).

4.4 Location of Dundalk Bay and Mourne Herring Spawning Grounds

4.4.1 Reports and Papers Overview

[Report on Location of Herring Grounds with Reference to the Proposed Aggregate Extraction Area – Matt Service \(AFBINI\) 2007.](#)

Service (2007) used seabed data from the Nearshore Mapping Project, the location of the Mourne Herring Skiff fishery (extracted from DARD Fisheries Division Logbooks), the distribution of recently hatched <10mm herring larvae in the Irish Sea collected during the 6-17th November 2007 herring larvae survey (AFBINI Research Cruise CO4507), and photographic data to infer the location of the Mourne spawning grounds. The result was a heatmap that displayed the potential location of the Mourne spawning grounds, with the most likely area centred around a specific point identified by the larval surveys carried out survey in 2007 as a spawning aggregation site (See Figure 4.2).

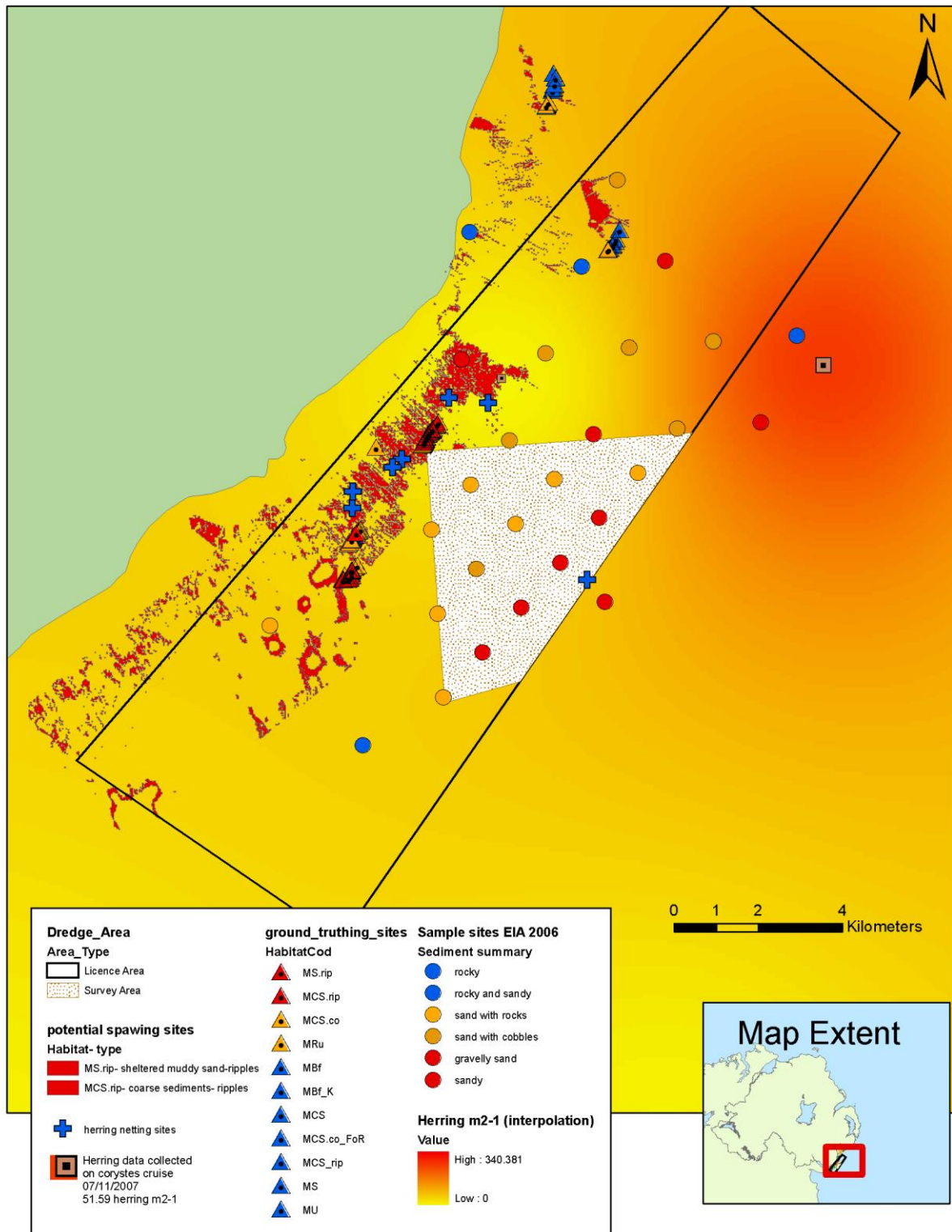


Figure 4.2. Potential spawning grounds in Mourne waters, derived from EIS Data and data from Corystes herring larvae study 2007. Reproduced from Service, 2007.

The report considered, based on the conditions of the Manx herring spawning ground (Bowers, 1969), that the Mourne herring spawning grounds could be found in areas with a similar substrate to “coarse gravel (0.5 x 0.5 cm), small stones (max 5cm x 3.5 cm), shell fragments, dead and live *Glycymeris* shells” (Service, 2007).

According to AFBINI (personal communication, 13th November 2023), additional investigation is necessary to determine the complete spatial and temporal scope of spawning activity within this region.

Spawning and nursery grounds of forage fish in Welsh and surrounding waters – Campanella and Van der Kooij (2021) (CEFAS)

Campanella and Van der Kooij (2021) identified hot spots for adult herring around the east and south coast of Ireland and map high densities in the Study Area (See Figure 4.3 Figure 4.3). These locations were projected to depict spawning locations.

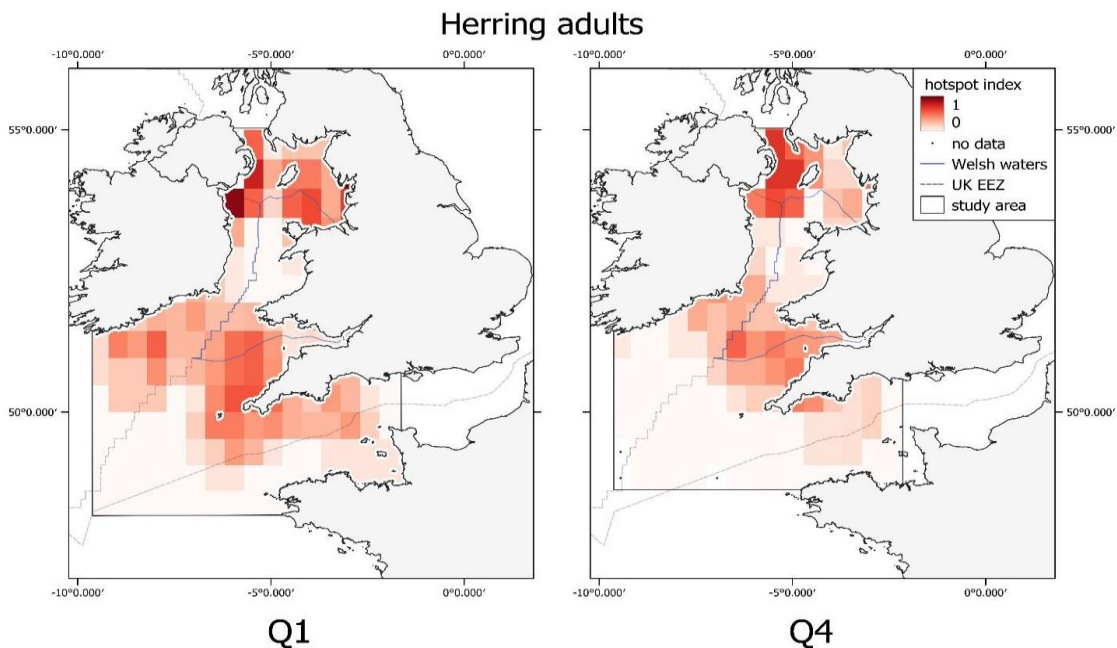


Figure 4.3. Maps from CEFAS report (2021) highlighting the hotspots of adult herring during Quarters 1 (February-April) and 4 (September-December).

[Spawning and nursery grounds of selected fish species in UK waters – Ellis et al., 2012](#)

Additionally, Ellis *et al.* (2012) previously classified the Study Area as a herring spawning ground based on historical data and larval surveys completed in 2008. In Figure 9 of their report, which represents a proportional symbol map depending on the abundance of larvae, it is possible to see that herring larval were collected in the Study Area.

4.4.2 Acoustic and Ground-Truthing Surveys

AFBINI provided NASC (Nautical Area Scattering Coefficient) data collected during Herring and Sprat Irish Sea Acoustic Surveys (ISAS), conducted in 2019, 2020, and 2022 (See Figure 4.4). NASC data are extracted from echo's produced by shoals of herring which can be used to estimate the abundance of herring within the survey area. These data can offer valuable insights into location of herring within the survey area.

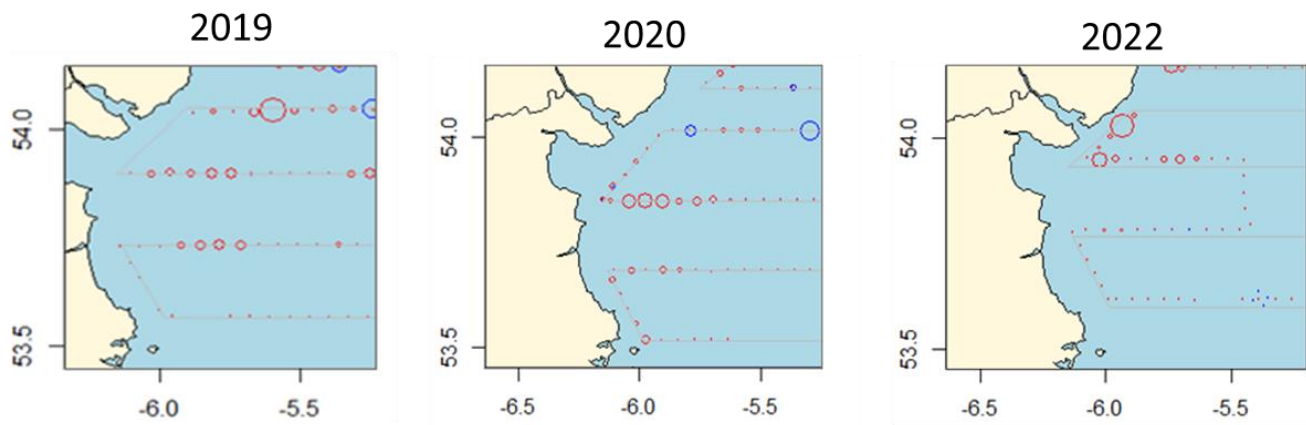


Figure 4.4. Plot showing the distribution of NASC values (size of ellipses is proportional to abundance of fish) obtained during the 2019,2020 and 2022 acoustic survey on RV “Corystes”. Open blue circles are for herring NASC values, and open red circles are for clupeoid mix NASC, which include juvenile herring and sprat. Retrieved from reports facilitated by AFBINI.

During ISAS surveys, midwater trawling is used to ground-truth acoustic data and to gather biological data. These surveys are used to provide abundance estimates for the target species’ and biological sampling is used to classify the stages of sexual maturity. After inspecting the data extracted from

the trawls in the areas where the NASC maps point out the presence of herring, the catches were mainly composed of immature juvenile fish (Maturity Stages I and II). Some trawls within the Study Area contained no herring (i.e., the 2020 sample), or a limited sample. While further data would be required to better infer the location of spawning grounds, the presence of stage VI individuals in the trawls, indicates spawning activity in the area. Figure 4.5 shows the proportion of the different age groups of herring caught in the trawls carried out within and in the proximity of the Study Area (20 individuals were captured in 2019 and 71 in 2022).

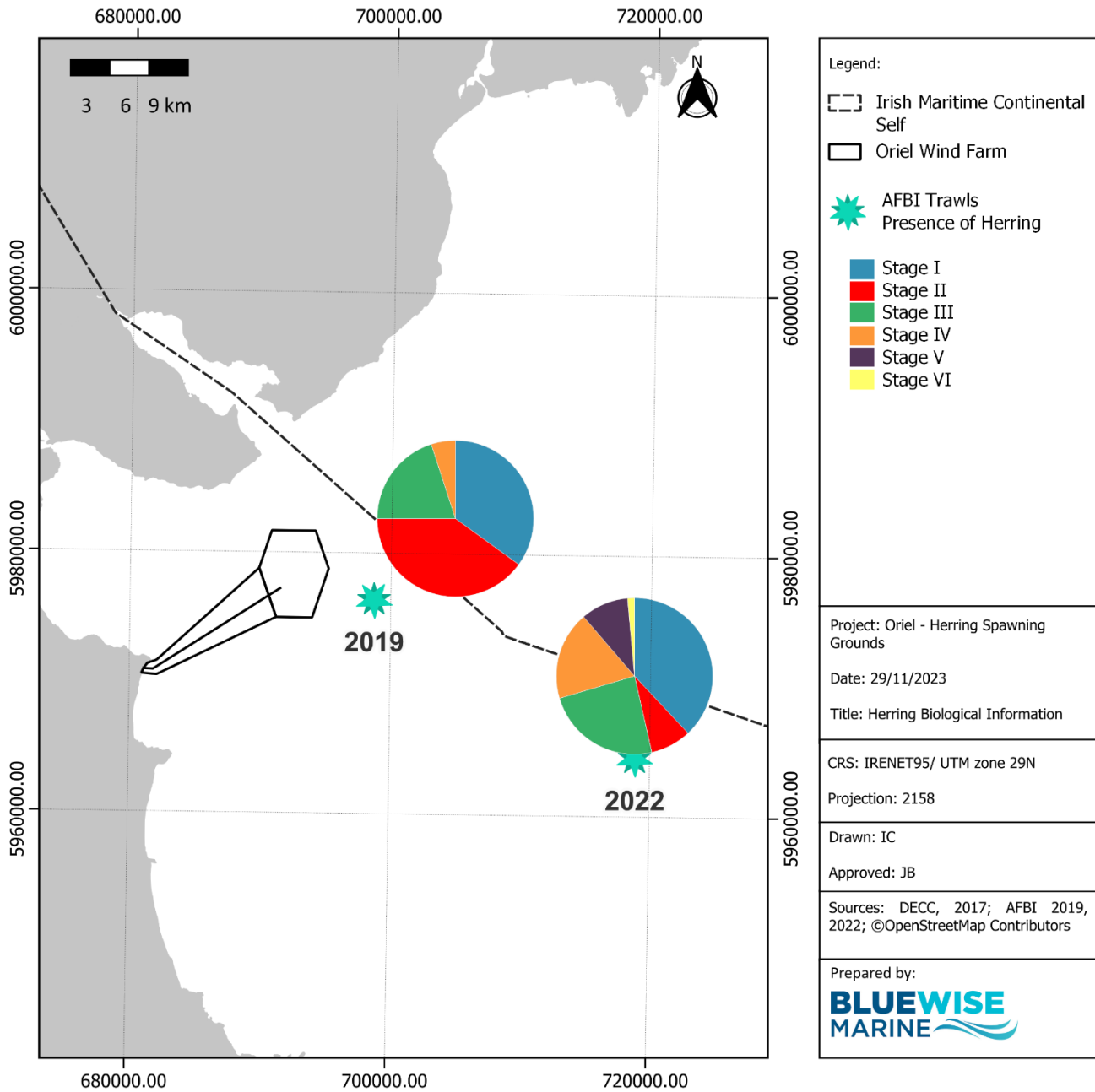


Figure 4.5. Map showing the location of the trawls completed in 2019 and 2022 as part of the acoustic surveys and the proportion of herring stages of development.

4.4.3 Larval Surveys

In 2007, the RV *Corystes* carried out a herring larval survey in the Irish Sea, Irish Sea (north); ICES div. VIIa Cruise CO 4507. In the survey, significant numbers of larval herring were caught in the region of the Mourne herring spawning grounds to suggest active spawning in those areas that year (Beggs, et al., 2007). A heat map showing the spatial distribution of herring larvae documented in these surveys can be seen in Figure 1 of the CO 4507 survey report. While the highest herring larval abundance was recorded east and northeast of the Isle of Man, areas of relatively high herring larval abundance observed just outside of Dundalk Bay due South of Carlingford Lough in 2007 (Beggs, et al., 2007) (See location of larval surveys included in Figure 5.1).

4.4.4 Marine Protected Areas Advisory Group

As previously described in Section 1.1, the MPA Advisory Group, following AFBINI advice, identified areas in the Dundalk Bay area with coarse sediments as the suitable benthic habitat for Herring Spawning grounds (Crowe, et al., 2023a; Crowe, et al., 2023b) (See Figure 4.6). They used the EUSeaMap 2021 created by EMODnet, generated from habitat point data and habitat distribution modelling. In Figure 4.7, it is possible to see that the coarse substrate type extends in a northeastern direction into Northern Ireland, and the area considered in the MPA report was modified to align with the jurisdictional boundaries of the Republic of Ireland.

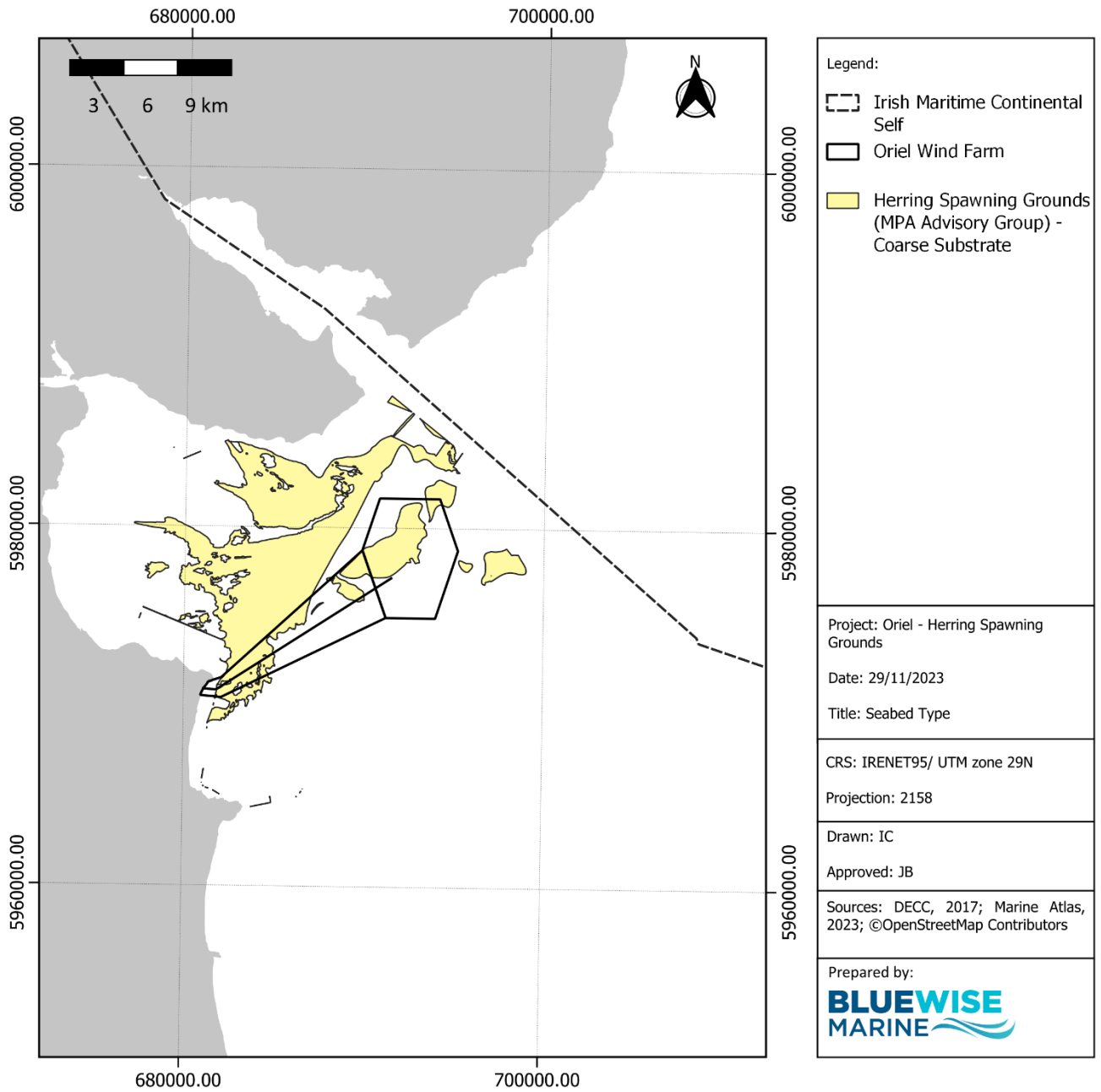


Figure 4.6. Map showing the coarse substrate forming the Mourne herring spawning grounds.

The coarse sediment areas partly overlap with the Oriel Wind Farm boundaries. According to Breslin (1998), rocky areas, including flat rock, have been suitable areas for spawning events around the coast of Ireland. Upon inspection of EMODnet data on seabed type, cross checked with backscatter surveys carried in 2013 by INFOMAR, it was clear that the areas classified as *rock*, should also be included as potential Herring grounds in Dundalk Bay. These zones, excluded from the MPA Advisory group's map, merit consideration as they are suitable habitat for herring spawning and increase the overlap with the wind farm project area (See Figure 4.7).

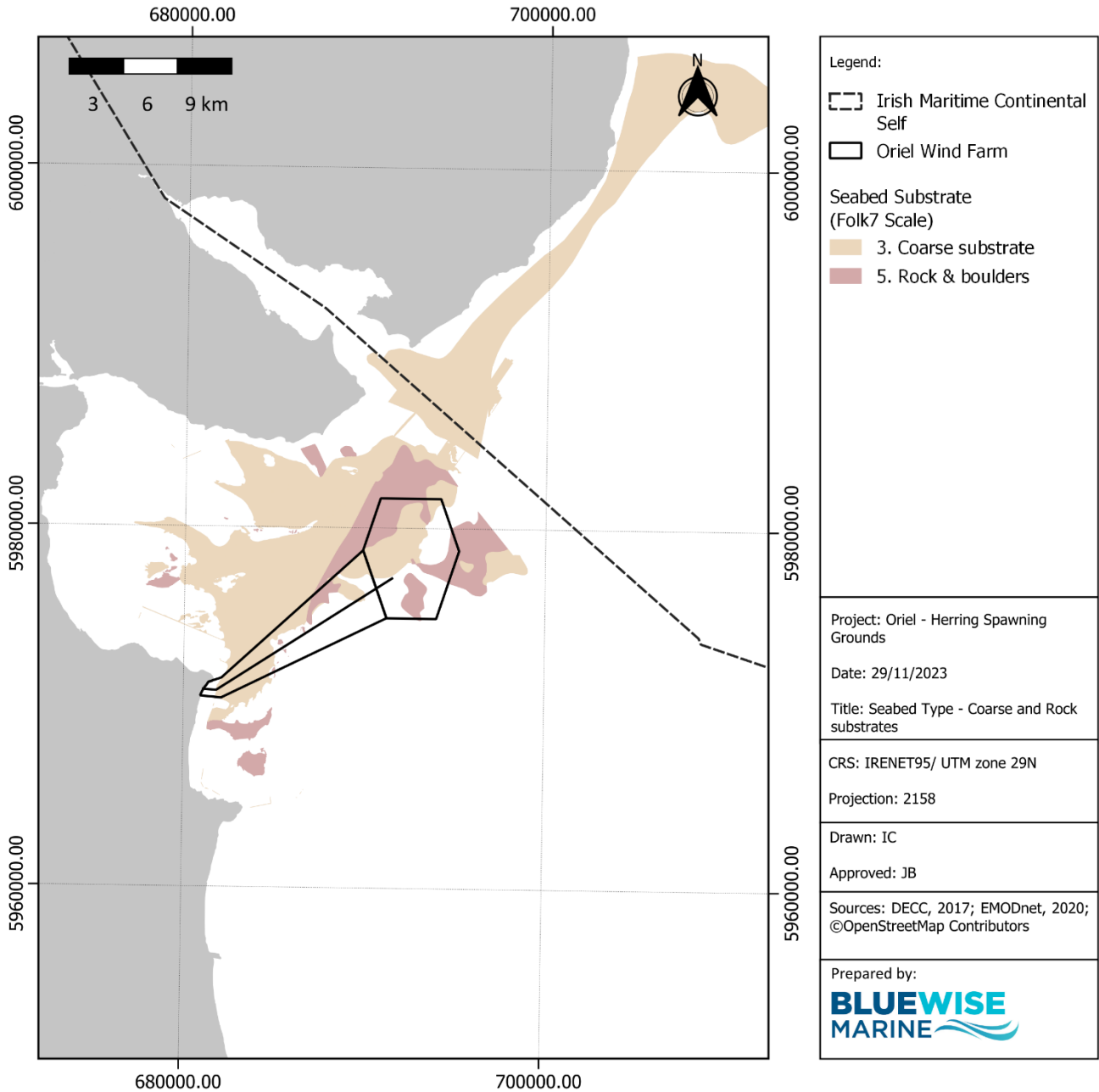


Figure 4.7. Map showing the coarse and rock and boulders substrates as potential areas for herring spawning grounds.

4.4.5 Commercial Fisheries Data

Meetings with fishers were held onboard two pelagic herring fishing vessels to gain a better understanding of the location and extent of the spawning grounds and the timing of the spawning

period. The consulted fishers confirmed that in their opinion, the spawning beds are located on coarse substrates, i.e., shells, gravel, and stones within and to the north and east of Dundalk Bay. Information on the location of capture of spawning herring was provided by reviewing plotter information showing previous tows and vessel track data when fishing for herring. The positions supplied by fishers have been mapped in relation to the location of the proposed Oriel wind farm (See Figure 4.8). Fishers did not supply additional locations of their fishing grounds the North as our consultation efforts were concentrated on the vicinity of the wind farm area. The Skipper of the *MV Havilah* indicated an approximate location for the spawning ground which is highlighted by a red diamond shape on the map.

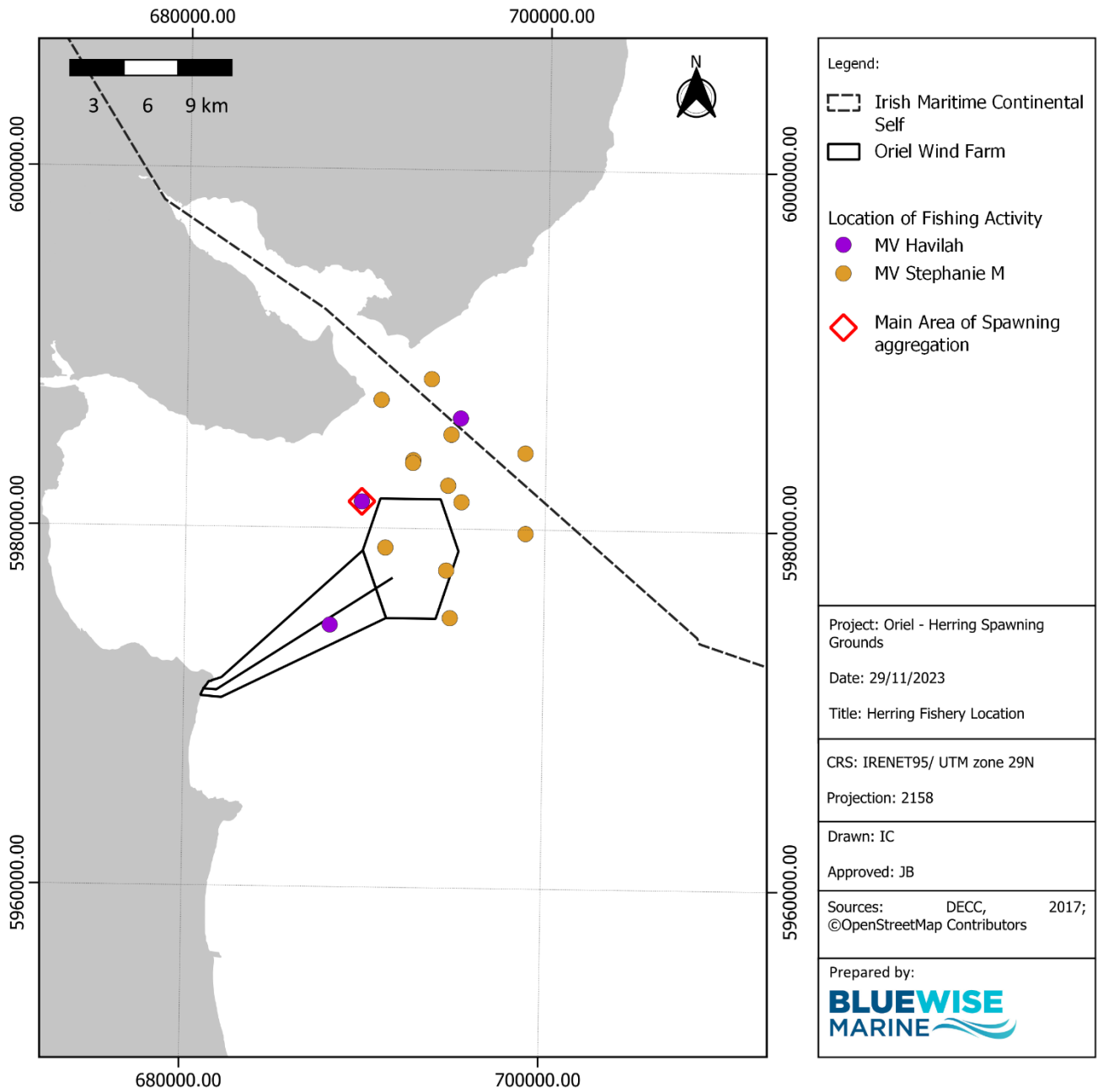


Figure 4.8. Map showing the points provided by the fishers through plotter data.

MV Havilah

On the vessel's plotter, the cursor marks specific locations where MV Havilah captured frequently spawning herring (See Figure 4.9). The vessel owner sees these areas as critical spawning grounds and emphasises the importance of these areas for herring reproduction (See the red diamond-shaped point in Figure 4.8 to understand its position relative to the OWF). The additional screen grabs shown in Appendix 1: *MV Havilah* Plotters Data depict further areas where fishing occurs.

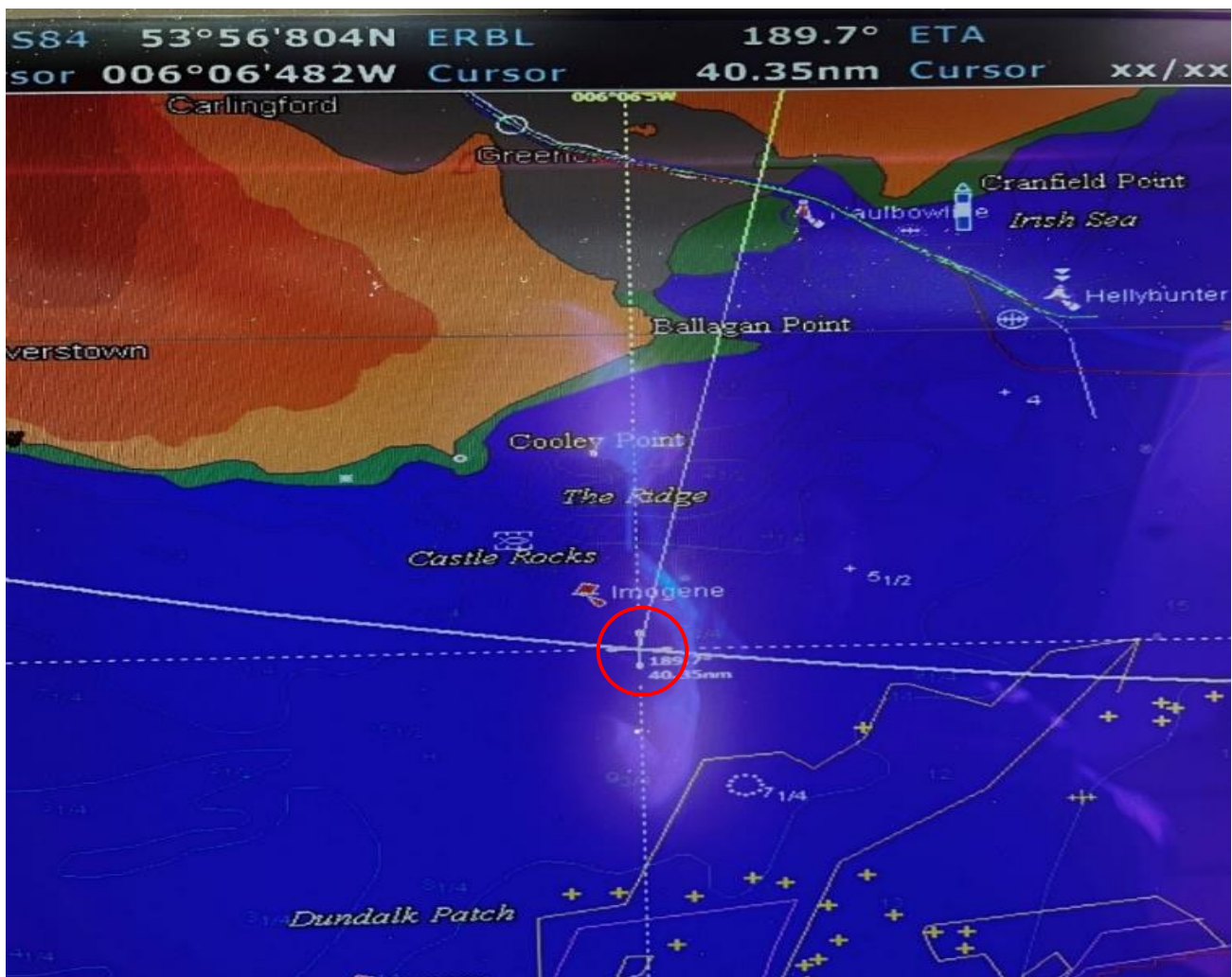


Figure 4.9. Photo of plotter screen of the vessel MV Havilah showing the main location where spawning herring was fished. Red circle denoting the cursor position.

MV Stefanie M

The specific areas where MV Stefanie M finds and catches herring are shown in the vessel plotter in Figure 4.10. The red-circle zones emphasize the main locations where the vessel operator focuses his fishing efforts due to the consistent presence of herring in those regions. The supplementary screen grabs displayed in Appendix 2: *MV Stephanie M* Plotters Data offer further insight into additional areas where they have recorded herring fishing activity.

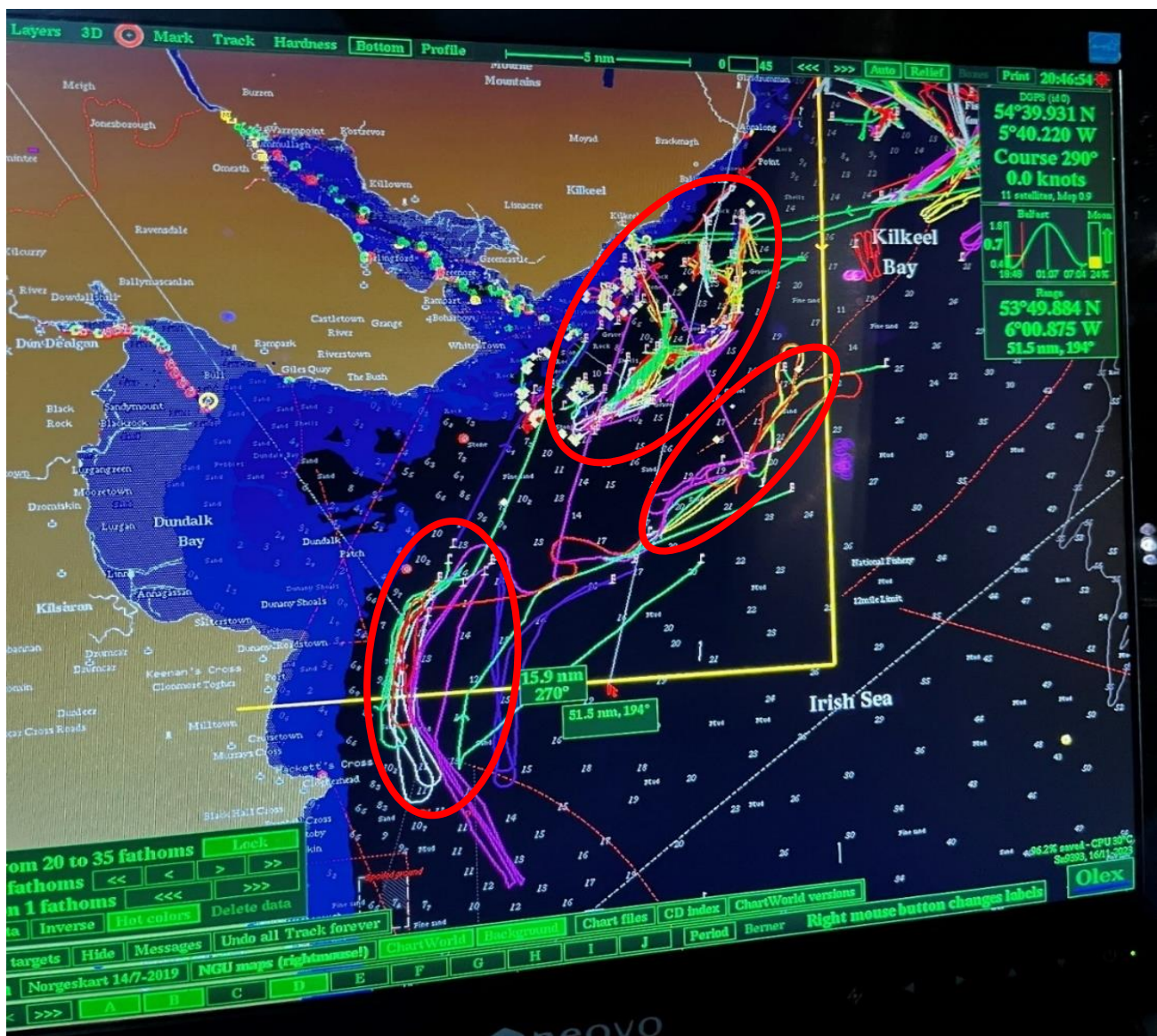


Figure 4.10. Vessel plot containing information of the fishing areas. Red circles representing the areas with higher fishing effort.

5 Potential Location of Spawning Grounds in Dundalk Bay

Potential herring spawning beds in the Dundalk Bay area (See Figure 5.1) have been mapped following this analysis of literature, reviewed reports, seabed characteristics, available larval surveys and insights shared through consultation with herring fishers.

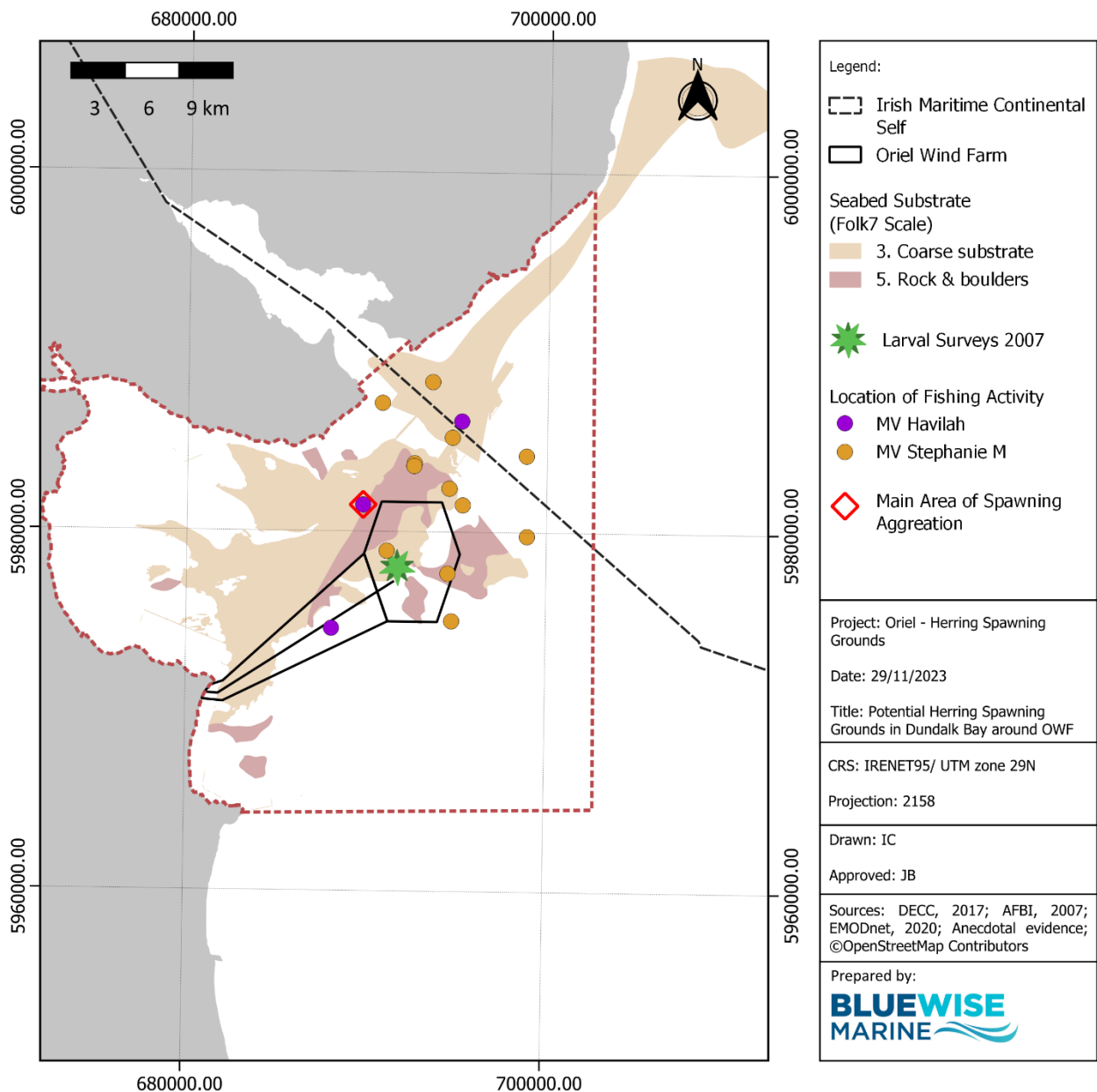


Figure 5.1. Map with the potential herring spawning grounds around OWF.

6 References

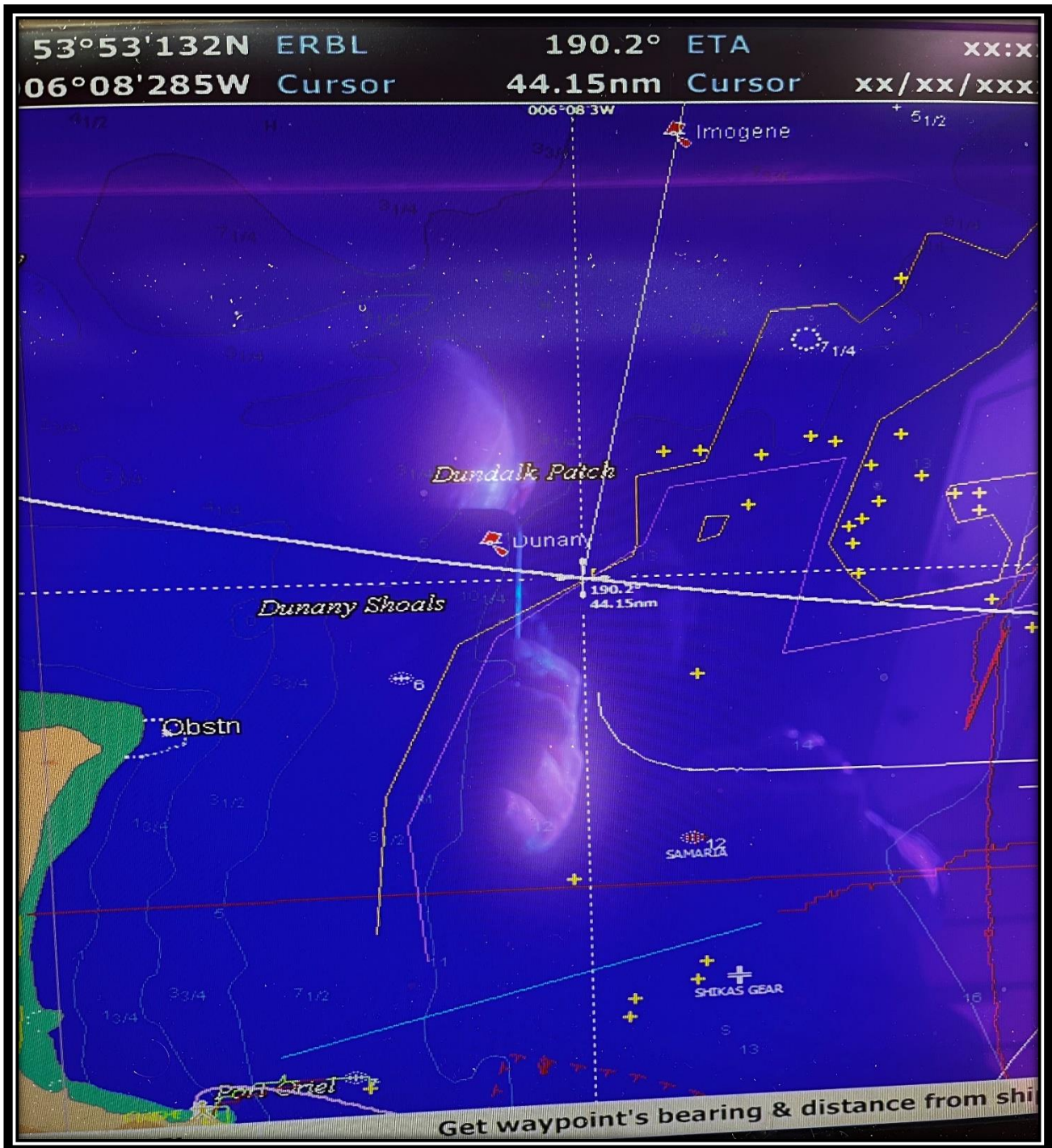
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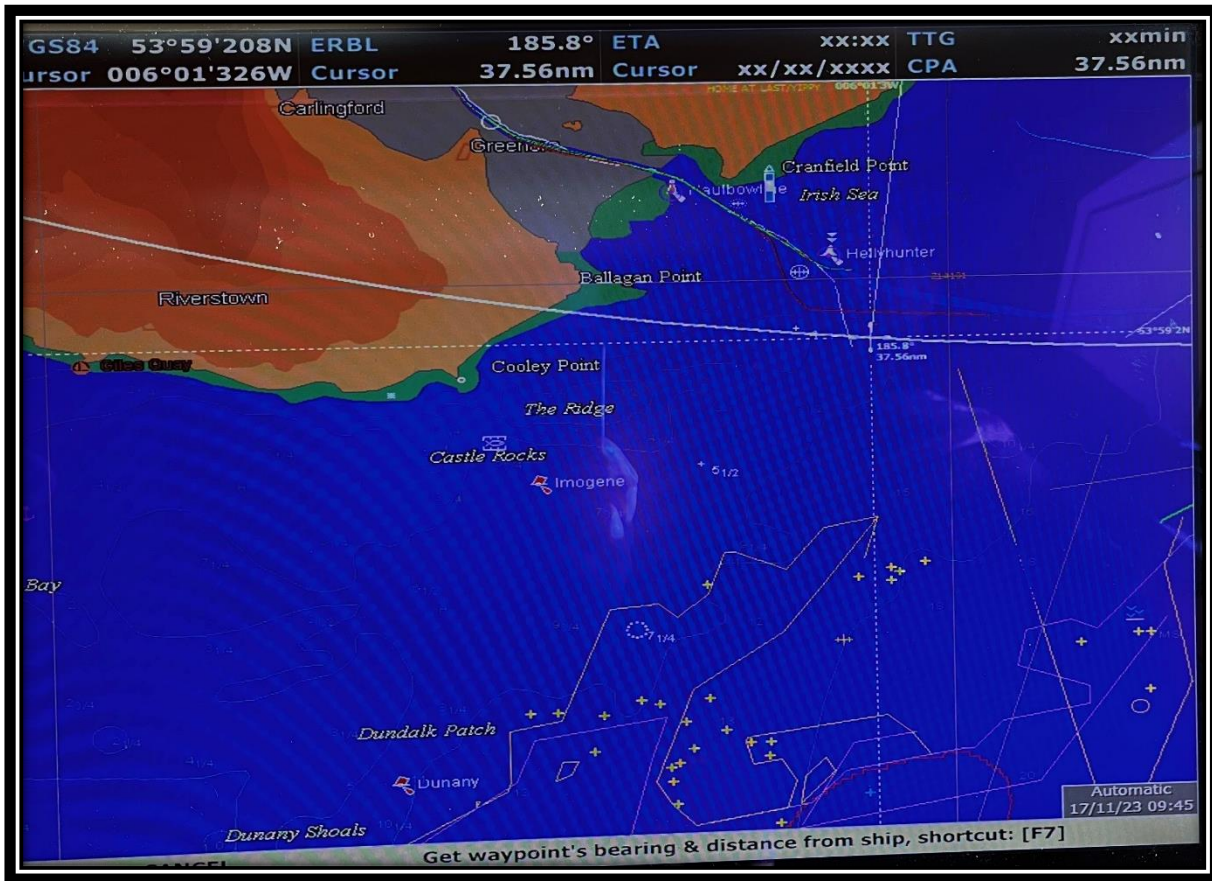
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Appendix 1: *MV Havilah* Plotters Data





Appendix 2: MV Stephanie M Plotters Data



