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Littoral and sublittoral Reef habitats of Dún Laoghaire Rathdown County Council area.

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1. Introduction

1.1 Dún Laoghaire Rathdown Marine Study

The Dún Laoghaire Rathdown Marine area comprises a range of man-made structures, natural habitats and species. This includes marine habitats such as intertidal reefs, subtidal reefs and the environment that supports them including marine waters and geological features. Species associated with our marine areas include seals, harbour porpoise, fish species and a range of epibenthic fauna (e.g. anemones and sponges).

There are a number of important sites including EU designated sites (Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) that overlap with our marine areas including:

- South Dublin Bay SAC 00210
- South Dublin Bay and River Tolka Estuary SPA 004024
- Dalkey Islands SPA 004172
- Rockabill to Dalkey Islands SAC 003000

These sites are protected under the EU Birds and Habitats Directives which have been transposed into Irish law in the European Communities (Birds and Natural Habitats) Regulations 2011-2021¹.

There are also proposed Nationally designated sites (proposed National Heritage Areas – pNHAs) as follows:

- South Dublin Bay pNHA 00120
- Dalkey Coastal Zone and Killiney Hill pNHA 001206

Information on these sites can be found on the National Parks and Wildlife website².

Another important designation is the UNESCO Dublin Bay Biosphere which recognises the importance of Dublin Bay for its rare and internationally important habitats and species of wildlife. The core zone of Dublin Bay Biosphere comprises 50km² of areas of high natural value. Key areas include the Tolka and Baldoyle Estuaries, Booterstown Marsh, Howth Head and North Bull Island to the north of the river Liffey and the habitats of South Dublin Bay and Dalkey Island to the south. Biosphere reserves promote solutions reconciling the conservation of biodiversity with its sustainable use. They are also learning areas for sustainable development under diverse ecological, social and economic contexts.

¹ <https://www.irishstatutebook.ie/eli/2011/si/477/made/en/print>

² <https://www.npws.ie/>

MERC Consultants were commissioned by Dún Laoghaire County Council (DLR) Biodiversity to carry out marine habitat surveys as part of the collation of biodiversity data for the county and the associated marine environment. Currently, there is very little information relating to marine habitats and species held by DLR.

This project also fulfils, in part the following actions of the DLR County Biodiversity Action Plan 2021 – 2025 as follows:

Action 1.1 Gather information and map our biodiversity within DLR (2021-2025)

Action 1.2 Map all Locally Important Biodiversity Sites (LIBS) within DLR and identify opportunities to increase the number of sites (2021-2025)

DLR envisage that this study will also feed into the following actions:

Action 1.4 Develop DLR Habitat and Species Action Plans of our terrestrial, coastal and marine areas (2024)

Action 1.7 Identify important biodiversity areas most vulnerable to climate change, including terrestrial, watercourses, coastal and marine areas, and establish measures and projects that assist protection of vulnerable areas (2025)

Action 1.11 Assess the overall state of our biodiversity resource in the county (2024)

Action 3.4 Identify opportunities where ecosystems can be restored and enhanced, including terrestrial, river, coastal and marine ecosystems (2022-2024)

Action 3.5 Develop and implement appropriate rewilding projects in DLR and extend our local biodiversity areas within DLR (2022-2025) *DLR's Biodiversity Officer notes this Action will include marine rewilding.*

While a considerable volume of information has been collated in relation to many of the habitats and species that are recorded and monitored in relation to legally designated sites information for some habitats and species is poor or absent. Within the marine area, the distribution and ecology of reef habitats is one of the most poorly studied ecosystems in Ireland.

In 2021, MERC conducted a desk based review of the littoral (intertidal) reef habitats of the area adjacent to the boundary of Dún Laoghaire Rathdown County Council. The report noted that:

1. Other than within a number of Special Areas of Conservation (SACs) intertidal reef habitat is poorly mapped and described along the east coast of Ireland.
2. The extent of the subtidal reef component is known from INFOMAR surveys although the characteristics of this subtidal component are poorly known.

The purpose of this report, and the surveys that form its basis, is to document and better understand the littoral and sublittoral reef habitats within the marine area off the coast of the jurisdiction of Dún Laoghaire Rathdown County Council. These reef habitats and their associated marine communities form an intrinsic part of both the marine environment and the local amenity area including its natural cultural and economic fabric.

1.2 Reefs

The EU interpretation manual describes the Annex I habitat “Reefs” (EU habitat Code 1170) as either biogenic concretions or of geogenic origin. They are hard compact substrata on solid and soft bottoms, which arise from the sea floor in the sublittoral and littoral zone. Reefs may support a zonation of benthic communities of algae and animal species as well as concretions and corallogenic concretions.

1.2.1 Littoral (intertidal) reef

Littoral reef habitat includes all areas of geogenic rock (bedrock, boulders and cobbles) which occur in the intertidal zone (the area of the shore between high and low tides). The marine communities, and their associated species, that colonise this area are adapted to withstand a range of physical processes, not least the diurnal flooding and ebbing tides. The diurnal tides influence the location of species along a shoreline gradient with some species, e.g. on the higher shore capable of withstanding longer periods of drying. The communities present are also influenced by additional physical processes such as exposure, aspect, shoreline topography and salinity. These factors dictate the diversity and biomass of the intertidal communities present, which can range from highly exposed faunal-dominated communities of barnacles and mussels to more sheltered shores where algal communities dominate.

1.2.2 Sublittoral (Subtidal) reef

The sublittoral reef habitat is generally divided into two categories, infralittoral and circalittoral. The infralittoral reef habitat is the area in the shallow subtidal zone and typically supports seaweed communities. In general, the upper limit of the infralittoral zone is marked by the top of the kelp zone whilst the lower limit is marked by the lower limit of kelp growth, which generally occurs when light penetration is too low to support its growth. However, other algal species such as red seaweeds may still be present in this area. As depth increases, and light levels drop further the circalittoral zone commences. This zone is characterised by animal dominated communities, as opposed to the algae dominated communities of the infralittoral zone. As described above for littoral reef habitats, the exact communities present are determined by a range of physical process and while the influence of diurnal tides is a major factor in the distribution of intertidal reef communities, depth is an equally important factor within the sublittoral.

2. Methods

2.1 Intertidal reef

The intertidal reef survey was carried out by conducting a walkover survey of selected areas of previously mapped (MERC, 2022) intertidal reef habitat within the area of the coast adjacent to the jurisdiction of Dún Laoghaire Rathdown County Council to characterisation the intertidal reef habitat present. This was conducted by a focused survey of 4 intertidal areas along the coastline with an additional five sites on Dalkey Island. At each site the shoreline was walked when the predicated tidal height was less than 0.6 m. A random walkover of the shore was carried out and all species observed and their abundance was

scored. Features (rook pools, boulders, gullies etc.) were noted and recorded, as were any anthropogenic impacts or activities. A photographic record of the shore and the characterising species present was made.

In addition to the ground based survey conducted to characterise the habitat and biotopes present, the intertidal reef mapped as part of a GIS desk based survey (MERC, 2022) were revised and the original shapefiles updated to more accurately reflect (based on field surveys) the extent of the reef habitat present across the entire survey area.

2.2 Subtidal reef

Our knowledge of the distribution of sublittoral reef habitat in Ireland has been greatly expanded in recent years by the data collated as part of the Integrated Mapping for the Sustainable Development of Ireland's Marine Resource (INFOMAR) programme. This programme has provided an enormous level of detail on the distribution and physical structure of reef habitat within Irish waters. It has also provided a valuable tool to target areas of reef for further survey. Prior to the availability of the INFOMAR data, surveys of reef habitats in Ireland generally relied on targeting areas indicated on Admiralty charts. These charts lacked the level of detail required to fully know the distribution of reef habitat in Ireland.

For the present survey of the subtidal reef habitat of the area of the coast adjacent to the jurisdiction of Dún Laoghaire Rathdown County Council, we have used the INFOMAR mapping to create the boundaries of the most likely areas of subtidal reef habitat, extending from the shore out to a distance of 2km from the shore. Within these areas we deployed a spatially encoded 4K dropdown camera to verify the habitat present and obtain and record an overview of the marine communities (biotopes) present. A total distance of 1.75km of video transect was recorded across the target areas of the survey between August 17th and August 25th 2022. This allowed the extent of the geogenic reef habitat to be verified and then mapped as a GIS project.

We then supplemented this data by conducting dives (on SCUBA) within each of the mapped areas. Underwater visibility at the time of survey was extremely poor which hinders the utility of dropdown video. However, by conducting dives within each area, the diver has a greater ability to ascertain the physical nature of the habitat (bedrock, cobble, biogenic habitat etc.), verify the biotope/s present and record the characterising species with greater certainty. All dives were conducted by marine ecologists experienced in the identification of Irish marine species. A total of ten dives were undertaken between August 17th and August 25th 2022.

Video footage and diver derived data were subsequently reviewed to ascertain the characterising biotopes present. Biotope descriptions are based on Connor *et al* (2004).

3. Results

3.1 Intertidal Reef of Dún Laoghaire Rathdown area

The distribution of intertidal reef habitat within the survey area is described in MERC, 2022. The original mapping was prepared from a desk review of the available data layers (e.g. aerial imagery and NPWS mapping) and calculated to be approximately 16ha. A review of this area based on the current field surveys indicates that the area of intertidal reef area is closer to 12ha. Previous areas which appeared to be reef (e.g. shingle) having been removed.

For convenience an overview of this distribution is presented in figure 3.1. This reef is almost entirely comprised of bedrock and boulders. While cobble beds (cobble size >46mm diameter) are also present in some areas. All areas of reef mapped conform to the EU Annex I habitat “Reefs”.



Figure 3.1 Overview of intertidal reef area.

The dominant habitat complexes present are:

LR.LLR: Low energy littoral rock

LR.MLR: Moderate energy littoral rock

Within these habitat complexes the dominant biotopes present are:

LR.LLR.F.Asc.FS: *Ascophyllum nodosum* on full salinity mid eu littoral rock.


LR.LLR.F.Asc *Ascophyllum nodosum* on very sheltered mid eu littoral rock


LR.MLR.BF.FvesB: *Fucus vesiculosus* and barnacle mosaics on moderately exposed mid eu littoral rock.

LR.MLR.BF.Fser.R: *Fucus serratus* and red seaweeds on moderately exposed lower eu littoral rock


A description of the five intertidal reef areas selected for detailed survey is presented in table 3.1. At Dalkey Island a total of five individual reef areas were included for survey.

Table 3.1. Intertidal reef descriptions.

Site No. 1: Seapoint	Grid ref (ITM) East: 722881 North: 728950
Biotope/s	
1. LR.LLR.F.Asc.FS: <i>Ascophyllum nodosum</i> on full salinity mid eulittoral rock.	
2. LR.MLR.BF.FvesB: <i>Fucus vesiculosus</i> and barnacle mosaics on moderately exposed mid eulittoral rock.	
Biotope description	
Two different biotopes are present in this area. A bedrock and boulder area occurs between low water and the mid-shore, sheltering an area of bedrock with <i>Ascophyllum nodosum</i> in the mid-shore area. Rock pools are occasional in mid-shore area. The seaward LR.MLR.BF.FvesB biotope being moderately exposed while the LR.LLR.F.Asc.FS is afforded greater shelter.	
	
Species present	Abundance
<i>Ascophyllum nodosum</i>	S
<i>Fucus vesiculosus</i>	S
<i>Fucus spiralis</i>	F
<i>F. serratus</i>	A
<i>Ectocarpus sp.</i>	F
<i>Cladostephus spongiosus</i>	O
<i>Ulva lactuca</i>	O
<i>Ulva intestinalis</i>	R
<i>Cladophora rupestris</i>	R
<i>Hildenbrandia rubra</i>	O
<i>Rhodothamniella floridula</i>	O
<i>Vertebrata lanosa</i> (Syn. <i>Polysiphonia lanosa</i>)	C
<i>Palmaria palmata</i>	R
<i>Patella vulgata</i>	F

<i>Actinia equina</i>	F
<i>Littorina littorina</i>	O
<i>Littorina saxatilis</i>	R
<i>Mytilus edulis</i>	R
<i>Semibalanus balanoides</i>	S
Site No. 2 Forty foot	Grid ref (ITM) East: 725629 North:728049
Biotope LR.MLR.BF.FvesB: <i>Fucus vesiculosus</i> and barnacle mosaics on moderately exposed mid eulittoral rock	
Biotope description Relatively barren shore with isolate pockets of fucoids. Rock pools frequent in the low and mid shore areas.	
	
Species present	Abundance
<i>Fucus vesiculosus</i>	O
<i>Fucus spiralis</i>	R
<i>F. serratus</i>	F
<i>Porphyra umbilicalis</i>	O
<i>Palmaria palmata</i>	O
<i>Chondrus crispus</i>	O
<i>Mastocarpus stellatus</i>	O
<i>Osmundea pinnatifida</i>	O
<i>Ulva lactuca</i>	O
<i>Patella vulgata</i>	F
<i>Actinia equina</i>	F
<i>Littorina saxatilis</i>	R
<i>Mytilus edulis</i>	O
<i>Semibalanus balanoides</i>	S



Site No. 3 Bullock Harbour	Grid ref (ITM) EAST: 726088 North: 727828
Biotope LR.MLR.BF.FvesB: <i>Fucus vesiculosus</i> and barnacle mosaics on moderately exposed mid eulittoral rock	
Biotope description	
Boulder shore with low biomass characterised by patchy distribution of furoids among boulders with frequent rockpools.	
	
Species present	Abundance
<i>Fucus vesiculosus</i>	C
<i>Fucus spiralis</i>	O
<i>F. serratus</i>	A
<i>Palmaria palmata</i>	O
<i>Chondrus crispus</i>	O
<i>Membranoptera alata</i>	O
<i>Ulva lactuca</i>	R
<i>Patella vulgata</i>	F
<i>Actinia equina</i>	O
<i>Littorina saxatilis</i>	O
<i>Semibalanus balanoides</i>	S
Site No. 4 Sandycove	Grid ref (ITM) EAST: 725627 North: 728050
Biotope/s	
1. LR.LLR.F.Asc.FS: <i>Ascophyllum nodosum</i> on full salinity mid eulittoral rock.	
2. LR.MLR.BF.FvesB: <i>Fucus vesiculosus</i> and barnacle mosaics on moderately exposed mid eulittoral rock.	



Biotope description

Moderately exposed seaward shore comprised of bedrock and characterised by furoids sheltering an *Ascophyllum nodosum* dominated mid-shore area of bedrock with occasional rockpools



Species present	Abundance
<i>Ascophyllum nodosum</i>	S
<i>Fucus vesiculosus</i>	F
<i>Fucus spiralis</i>	O
<i>F. serratus</i>	A
<i>Hildenbrandia rubra</i>	O
<i>Rhodothamniella floridula</i>	O
<i>Cladostephus spongiosus</i>	R
<i>Porphyra umbilicalis</i>	O
<i>Palmaria palmata</i>	O
<i>Chondrus crispus</i>	O
<i>Membranoptera alata</i>	O
<i>Mastocarpus stellatus</i>	F
<i>Osmundea pinnatifida</i>	F
<i>Ulva lactuca</i>	O
<i>Ulva intestinalis</i>	O
<i>Cladophora rupestris</i>	R
<i>Patella vulgata</i>	F
<i>Actinia equina</i>	F
<i>Littorina saxatilis</i>	R
<i>Mytilus edulis</i>	O
<i>Semibalanus balanoides</i>	S




Site No. 5.1. Dalkey Island northeast	Grid ref (ITM) East:727665 North:726506
Biotope: LR.LLR.F.Asc.FS: <i>Ascophyllum nodosum</i> on full salinity mid eu littoral rock	
Biotope description Boulder shore with pockets of cobble between areas of boulder. Moderately exposed, relatively level shore with no significant features (e.g. rock pools). Carpeted by <i>Ascophyllum nodosum</i> and <i>Fucus vesiculosus</i> with <i>F. serratus</i> frequent on the lower shore. <i>Laminaria digitata</i> abundant just below Low water mark. Bank of <i>Pelvetia canaliculata</i> below the splash zone which is dominated by lichens. Poor faunal community with <i>Patella vulgata</i> , <i>Steromphala cineraria</i> and <i>Littorina saxatilis</i> occasional on boulders.	
Species present	Abundance
<i>Laminaria digitata</i>	F
<i>Ascophyllum nodosum</i>	S
<i>Fucus vesiculosus</i>	A
<i>Fucus spiralis</i>	O
<i>F. serratus</i>	C
<i>Pelvetia canaliculata</i>	F
<i>Chondrus crispus</i>	O
<i>Palmaria palmata</i>	R
<i>Vertebrata lanosa</i> (Syn. <i>Polysiphonia lanosa</i>)	A
<i>Ulva lactuca</i>	O
<i>Ulva intestinalis</i>	F
<i>Cladophora rupestris</i>	O
<i>Patella vulgata</i>	F
<i>Steromphala cineraria</i>	C
<i>Littorina saxatilis</i>	O
<i>Semibalanus balanoides</i>	S




Site No. 5.2. Dalkey Island south-southwest	Grid ref (ITM) East: 727812 North:726134
Biotope: LR.MLR.BF.FvesB Fucus vesiculosus and barnacle mosaics on moderately exposed mid eulittoral rock	
Biotope description Steeply sloping bedrock and boulder shore. Slopes steeply down from upper shore with <i>Pelvetia canaliculata</i> , through <i>F. spiralis</i> zone to <i>F. serratus</i> zone and then a sublittoral fringe with <i>L. digitata</i> . Flat bedrock shore below with Grey seals hauled out.	
A photograph showing a rocky coastline. In the foreground, there are large, dark, wet rocks covered in seaweed. The water is a deep blue-grey color. In the middle ground, several grey seals are hauled out on a rock. A white bird is visible in the water to the left, and another white bird is flying in the sky above the water.	
Species present	Abundance
<i>Laminaria digitata</i>	A
<i>Fucus vesiculosus</i>	C
<i>Fucus spiralis</i>	O
<i>F. serratus</i>	F
<i>Pelvetia canaliculata</i>	R
<i>Palmaria palmata</i>	R
<i>Porphyra umbilicalis</i>	C
<i>Mastocarpus stellatus</i>	C
<i>Corallina officinalis</i>	O
Calcareous encrusters	F
<i>Ulva lactuca</i>	R
<i>Ulva intestinalis</i>	O
<i>Cladophora rupestris</i>	O
<i>Patella vulgata</i>	F



<i>Halichondria panicea</i>	O
<i>Semibalanus balanoides</i>	S
<i>Lichina pygmaea</i> (splash zone)	C
Site No. 5.3. Dalkey Island west	Grid ref (ITM) East: 727756 North: 726174
Biotope: LR.LLR.F.Asc <i>Ascophyllum nodosum</i> on very sheltered mid eulittoral rock	
Biotope description Prior to a sublittoral fringe of <i>L. digitata</i> , large boulders with fucoids shelter an area of <i>Ascophyllum nodosum</i> in mosaic with further fucoids.	
	
Species present	Abundance
<i>Laminaria digitata</i>	S
<i>Ascophyllum nodosum</i>	S
<i>Fucus vesiculosus</i>	C
<i>Fucus spiralis</i>	F
<i>F. serratus</i>	F
<i>Dictyota dichotoma</i>	O
<i>Chondrus crispus</i>	O
<i>Palmaria palmata</i>	O
<i>Vertebrata lanosa</i> (Syn. <i>Polysiphonia lanosa</i>)	F
<i>Ulva lactuca</i>	O
<i>Patella vulgata</i>	O
<i>Littorina saxatilis</i>	O
<i>Semibalanus balanoides</i>	S



Site No. 5.5. Dalkey Island north		Grid ref (ITM) East: 727585 North: 726566
Biotope: LR.LLR.F.Asc <i>Ascophyllum nodosum</i> on very sheltered mid eulittoral rock		
Biotope description Boulder shore with coarse sediment. Characterised by <i>Ascophyllum nodosum</i> and <i>Fucus vesiculosus</i>		
		
Species present	Abundance	
<i>Ascophyllum nodosum</i>	S	
<i>Fucus vesiculosus</i>	A	
<i>Fucus spiralis</i>	O	
<i>F. serratus</i>	O	
<i>Pelvetia canaliculata</i>	O	
<i>Dictyota dichotoma</i>	O	
<i>Vertebrata lanosa</i> (Syn. <i>Polysiphonia lanosa</i>)	A	
<i>Ulva lactuca</i>	F	
<i>Cladophora rupestris</i>	R	
<i>Patella vulgata</i>	O	
<i>Steromphala cineraria</i>	O	
<i>Semibalanus balanoides</i>	A	
Site No. 5.5. Dalkey Island northwest		Grid ref (ITM) East: 727598 North: 726485
Biotope: LR.LLR.F.Asc <i>Ascophyllum nodosum</i> on very sheltered mid eulittoral rock		
Biotope description Boulder shore dominated by <i>Ascophyllum nodosum</i> above an area of coarse sediment. Adjacent to small pier.		



Species present	Abundance
<i>Ascophyllum nodosum</i>	S
<i>Fucus vesiculosus</i>	A
<i>Fucus spiralis</i>	O
<i>Pelvetia canaliculata</i>	O
<i>Vertebrata lanosa</i> (Syn. <i>Polysiphonia lanosa</i>)	A
<i>Ulva lactuca</i>	O
<i>Ulva intestinalis</i>	O
<i>Cladophora rupestris</i>	R
<i>Patella vulgata</i>	R
<i>Semibalanus balanoides</i>	A

3.2 Subtidal Reef of Dún Laoghaire Rathdown area

3.2.1 Subtidal reef area

GIS mapping of the subtidal reef area that conforms to the EU Annex I habitat Reef (EU Habitat code 1170) is provided as a separate ESRI shapefile. An overview of the habitat distribution is shown in figure 3.2.

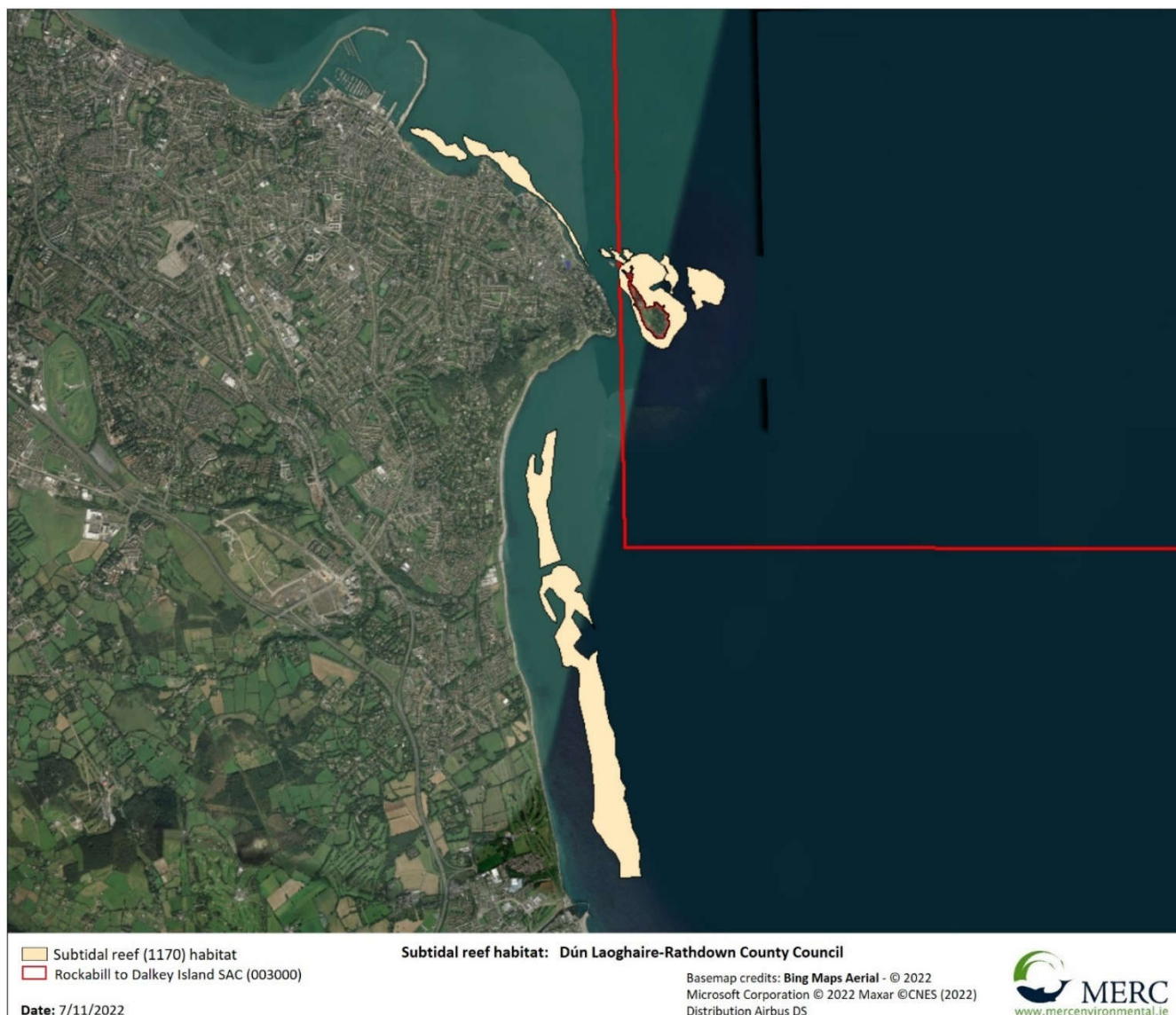


Fig. 3.2 Subtidal reef habitat.

Interrogation of the INFOMAR data indicated that the total area of subtidal reef within the survey area (Blackrock to Bray out to 2km from the shore) was 266ha.

Within the SAC area, NPWS have mapped approximately 53 hectares of subtidal reef around Dalkey Island and Muglins. Interrogation of the INFOMAR data and associated ground truthing recorded an additional area of approximately 6ha of subtidal reef habitat within the SAC area.

Outside of the SAC area a total of approximately 206 hectares of subtidal reef was verified within the survey area based on the INFOMAR data and associated ground truthing.

3.2.2 Subtidal reef biotopes

The characteristic biotope complexes recorded are given in table 3.2 and the species recorded therein are given in table 3.3. Their location is shown in figure 3.3 (please refer to detailed GIS shapefiles for closer inspection and associated attributes).

Table 3.2 Subtidal reef biotopes

Area (FID)	Biotope complex code	Biotope complex name
0	Likely CR.MCR.EcCr	Echinoderms and crustose communities
1	CR.MCR.EcCr	Echinoderms and crustose communities
2	IR.HIR.Ksed	Sediment-affected or disturbed kelp and seaweed communities
	CR.MCR.EcCr	Echinoderms and crustose communities
3	IR.HIR.Ksed	Sediment-affected or disturbed kelp and seaweed communities
	CR.MCR.EcCr	Echinoderms and crustose communities
4	Likely IR.HIR.Ksed	Sediment-affected or disturbed kelp and seaweed communities
5	IR.HIR.Ksed	Sediment-affected or disturbed kelp and seaweed communities
6	CR.MCR.EcCr	Echinoderms and crustose communities
7	CR.MCR.EcCr	Echinoderms and crustose communities
8	CR.MCR.EcCr and	Echinoderms and crustose communities
	CR.HCR.FaT	Very tide-swept faunal communities

The most characteristics biotope complexes recorded were *Echinoderms and crustose communities*, *Very tide-swept faunal communities* and *Sediment-affected or disturbed kelp and seaweed communities*.

The Echinoderms and crustose community and Very tide-swept faunal community was recorded in depths greater than 10 meters. The Echinoderms and crustose community habitat complex mainly occur on exposed to moderately wave-exposed circalittoral bedrock and boulders, subject to moderately strong and weak tidal streams. Echinoderms, faunal and algal crusts (red encrusting algae) dominate this biotope, giving a 'sparse' appearance. Typical echinoderms present are the starfish *Asterias rubens*, the brittlestar *Ophiothrix fragilis* (not recorded during the current surveys) and the sea urchin *Echinus esculentus*. There may be isolated clumps of hydroids. *Alcyonium digitatum* and *Urticina felina* are also frequently recorded. The Very tide-swept faunal communities complex occurs in wave-exposed, tide-swept narrows and straits on circalittoral bedrock and boulders. The biotopes within this complex are characterised by a high abundance of the robust hydroid *Tubularia indivisa* cushion sponges and *Alcyonium digitatum*. Other species present in this high-energy complex are the sponges *Esperiopsis fucorum* and *Pachymatisma johnstonia*, the bryozoans *Alcyonidium diaphanum* and *Flustra foliacea*. *Cancer pagurus*, *Sertularia argentea* and *Asterias rubens* are also characteristic of this habitat complex.

Both of these habitat complexes were recorded below 10 meters in the area around Dalkey Island and the Muglins and also in the deeper sections of reef running parallel to the shore between Killiney and Bray. Here it was characterised by a number of biotopes including:

- CR.MCR.EcCr.FaAlCr.Adig: *Alcyonium digitatum*, *Pomatoceros triqueter*, algal and bryozoan crusts on wave-exposed circalittoral rock.
- CR.MCR.EcCr.FaAlCr.Pom: Faunal and algal crusts with *Pomatoceros triqueter* and sparse *Alcyonium digitatum* on exposed to moderately wave-exposed circalittoral rock
- CR.MCR.EcCr.FaAlCr.Flu: *Flustra foliacea* on slightly scoured silty circalittoral rock
- CR.HCR.FaT.CTub.Adig: *Alcyonium digitatum* with dense *Tubularia indivisa* and anemones on strongly tide-swept circalittoral rock

The shallower sections of the reef recorded in all areas was characterised by the biotope complex:

IR.HIR.KSed: Sand or gravel-affected or disturbed kelp and seaweed communities.

This biotope complex is characterised by rock habitats subject to disturbance through mobility of the substratum (boulders or cobbles) or abrasion/covering by nearby coarse sediments or suspended particulate matter (sand). The associated communities can be quite variable in character, depending on the particular conditions, which prevail. The typical *Laminaria hyperborea* and red seaweed communities of stable open coast rocky habitats (IR.MIR.KR) are replaced by those, which include more ephemeral species or those tolerant of sand and gravel abrasion.

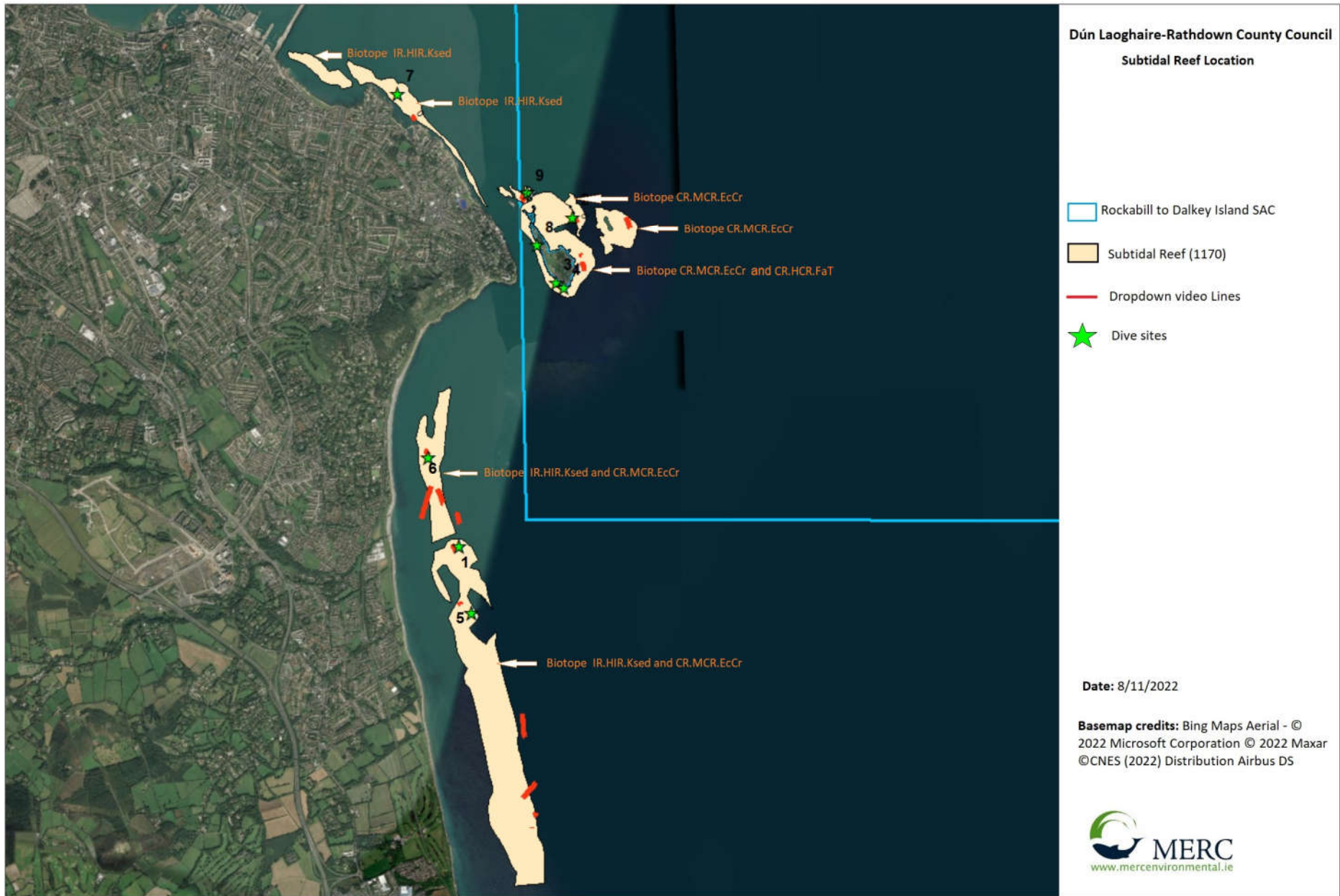


Figure 3.3. Biotopes associated with subtidal reef. Video transect lines and dive locations are also shown.

Table 3.3 Subtidal reef Species (Algal species not recorded). The species lists provided below are non-exhaustive and represent the characterising conspicuous species present.

Killiney Bay (South of outfall)		Easting (ITM)	Northing (ITM)
Site 1		726704	723310
Species	Abundance		
<i>Cliona celata</i>	R		
<i>Alcyonium digitatum</i>	C		
<i>Metridium senile</i>	O		
<i>Sertularia argentea</i>	A		
<i>Pomatoceros triqueter</i>	F		
<i>Palaemon serratus</i>	F		
<i>Homarus gammarus</i>	F		
<i>Cancer pagurus</i>	O		
<i>Necora puber</i>	C		
<i>Alcyonidium diaphanum</i>	O		
<i>Flustra foliacea</i>	C		
<i>Henricia sp.</i>	R		
<i>Asterias rubens</i>	O		
<i>Echinus esculentus</i>	O		
<i>Ctenolabrus rupestris</i>	F		
Northeast of Dalkey Island		Easting (ITM)	Northing (ITM)
Site 2		727929	726845
Species	Abundance		
<i>Cliona celata</i>	O		
<i>Myxilla incrustans</i>	R		
<i>Pachymatisma johnstonia</i>	O		
<i>Amphilectus fucorum</i>	O		
<i>Alcyonium digitatum</i>	C		
<i>Sagartia elegans</i>	F		
<i>Metridium senile</i>	F		
<i>Caryophyllia smithi</i>	O		
<i>Tubularia indivisa</i>	F		
<i>Sertularia argentea</i>	O		
<i>Nemertesia antennina</i>	F		
<i>Pomatoceros triqueter</i>	C		
<i>Palaemon serratus</i>	O		
<i>Cancer pagurus</i>	O		
<i>Necora puber</i>	F		
<i>Alcyonidium diaphanum</i>	F		
<i>Antedon bifida</i>	O		
<i>Henricia sp.</i>	R		
<i>Asterias rubens</i>	O		
<i>Marthasterias glacialis</i>	R		
<i>Echinus esculentus</i>	O		
<i>Asciidiella aspersa</i>	O		



West side Dalkey Island Site 3	Easting (ITM)	Northing (ITM)
	727749	726140
Species	Abundance	
<i>Alcyonium digitatum</i>	F	
<i>Sagartia elegans</i>	R	
<i>Nemertesia antennina</i>	O	
<i>Pomatoceros triqueter</i>	F	
<i>Palaemon serratus</i>	F	
<i>Galathea strigosa</i>	O	
<i>Cancer pagurus</i>	O	
<i>Necora puber</i>	F	
<i>Calliostoma zizyphinum</i>	R	
<i>Eledone cirrhosa</i>	P	
<i>Alcyonidium diaphanum</i>	C	
<i>Flustra foliacea</i>	O	
<i>Henricia sp.</i>	R	
<i>Asterias rubens</i>	O	
<i>Marthasterias glacialis</i>	R	
<i>Echinus esculentus</i>	R	
<i>Clavelina lepadiformis</i>	R	
<i>Ctenolabrus rupestris</i>	O	
South tip Dalkey Island Site 4	Easting (ITM)	Northing (ITM)
	727834	726086
Species	Abundance	
<i>Cliona celata</i>	O	
<i>Myxilla incrustans</i>	R	
<i>Alcyonium digitatum</i>	F	
<i>Urticina felina</i>	R	
<i>Sagartia elegans</i>	F	
<i>Caryophyllia smithi</i>	R	
<i>Tubularia indivisa</i>	F	
<i>Nemertesia antennina</i>	C	
<i>Nemertesia ramosa</i>	O	
<i>Pomatoceros triqueter</i>	F	
<i>Palaemon serratus</i>	F	
<i>Homarus gammarus</i>	F	
<i>Galathea strigosa</i>	F	
<i>Cancer pagurus</i>	O	
<i>Necora puber</i>	F	
<i>Calliostoma zizyphinum</i>	R	
<i>Alcyonidium diaphanum</i>	C	
<i>Flustra foliacea</i>	O	
<i>Antedon bifida</i>	F	
<i>Henricia sp.</i>	R	

<i>Asterias rubens</i>	C	
<i>Marthasterias glacialis</i>	O	
<i>Clavelina lepadiformis</i>	O	
<i>Aplidium punctum</i>	O	
<i>Asciidiella aspersa</i>	R	
<i>Squalus acanthias</i>	P	
<i>Callionymus lyra</i>	P	
<i>Ctenolabrus rupestris</i>	O	
<i>Pomatoschistus flavescens</i>	F	
Shankill	Easting (ITM)	Northing (ITM)
Site 5	726838	722591
Species	Abundance	
<i>Alcyonium digitatum</i>	C	
<i>Metridium senile</i>	O	
<i>Nemertesia antennina</i>	O	
<i>Nemertesia ramosa</i>	R	
<i>Sertularia argentea</i>	C	
<i>Pomatoceros triqueter</i>	F	
<i>Alcyonidium diaphanum</i>	R	
<i>Flustra foliacea</i>	C	
<i>Asterias rubens</i>	R	
<i>Echinus esculentus</i>	R	
<i>Clavelina lepadiformis</i>	R	
<i>Ctenolabrus rupestris</i>	O	
Killiney Bay	Easting (ITM)	Northing (ITM)
Site 6	726369	724258
Species	Abundance	
<i>Cliona celata</i>	O	
<i>Alcyonium digitatum</i>	C	
<i>Metridium senile</i>	R	
<i>Sertularia argentea</i>	F	
<i>Pomatoceros triqueter</i>	F	
<i>Palaemon serratus</i>	O	
<i>Homarus gammarus</i>	O	
<i>Cancer pagurus</i>	O	
<i>Necora puber</i>	C	
<i>Alcyonidium diaphanum</i>	O	
<i>Flustra foliacea</i>	C	
<i>Echinus esculentus</i>	O	
<i>Asterias rubens</i>	R	
<i>Henricia sp.</i>	R	
<i>Asciidiella aspersa</i>	O	
<i>Clavelina lepadiformis</i>	R	

<i>Squalus acanthias</i>	O	
East of Bullock Harbour	Easting (ITM)	Northing (ITM)
Site 7	726037	728172
Species	Abundance	
<i>Cliona celata</i>	O	
<i>Amphilectus fucorum</i>	R	
<i>Alcyonium digitatum</i>	C	
<i>Metridium senile</i>	O	
<i>Nemertesia antennina</i>	O	
<i>Pomatoceros triqueter</i>	F	
<i>Alcyonidium diaphanum</i>	R	
<i>Flustra foliacea</i>	C	
<i>Asterias rubens</i>	R	
<i>Echinus esculentus</i>	R	
<i>Asciidiella aspersa</i>	O	
<i>Syngnathus acus</i>	P	
North west Dalkey Island	Easting (ITM)	Northing (ITM)
Site 8	727546	726544
Intertidal area. Dived at High water to video Grey seals		
Northeast of Maidens Rock, Dalkey Island	Easting (ITM)	Northing (ITM)
Site 9	727436	727436
Species	Abundance	
<i>Cliona celata</i>	R	
<i>Pachymatisma johnstonia</i>	R	
<i>Alcyonium digitatum</i>	C	
<i>Metridium senile</i>	O	
<i>Pomatoceros triqueter</i>	C	
<i>Palaemon serratus</i>	O	
<i>Cancer pagurus</i>	O	
<i>Necora puber</i>	C	
<i>Luidia ciliaris</i>	R	
<i>Henricia sp.</i>	O	
<i>Asterias rubens</i>	O	
<i>Echinus esculentus</i>	O	
<i>Clavelina lepadiformis</i>	O	
<i>Ctenolabrus rupestris</i>	F	

4 Pressures and threats

4.1 Invasive Alien Species

As noted in MERC, 2022. The Invasive Alien Species (IAS) *Sargassum muticum* has become widespread in Ireland and is recorded on the intertidal reef area at Sandycove. This species is likely to further colonise areas of both the intertidal and subtidal in the future and measures to control the spread (in other locations in Ireland and the UK) have not, thus far, proved to be successful.

A number of additional IAS such as the Leathery Sea squirt (*Styela clava*) Wakame (*Undaria pinnatifida*) and Japanese skeleton shrimp (*Caprella mutica*) have been recorded in Dún Laoghaire Harbour and the Carpet Sea squirt (*Didemnum vexillum*) is recorded from other areas of Dublin Bay (Poolbeg) and constitute a significant threat to the local biodiversity of the area. The control of marine IAS is particularly problematic due to the nature of the marine environment. While numerous publications resulting from research projects have attempted to address the issue of marine IAS and international regulations to address issues such as the release of ships ballast water have been come into force, marine IAS are likely to continue to provide a significant challenge in the future.

4.2 Eutrophication and urban run-off

Eutrophication and urban run-off are one of the most significant threats to coastal water bodies. However significant evidence of eutrophication was not recorded at any of the areas mapped. For example, an overabundance of opportunistic *Ulva* sp. was not recorded at any of the sites surveyed.

4.3 Fishing

The use of both mobile and static fishing gears are a feature of the east coast of Ireland. Static fishing gear is particularly evident around Dalkey Island and Muglins and to a lesser extent on the reef habitat south of Killiney Bay. Pots are deployed by both commercial operators and also the general public. A high level of potting has the potential to lead to abrasion of the reef habitat and loss or damage to the species vulnerable to abrasion (e.g. sponges and anemones) in addition to impacts on the target species (e.g. lobster). Discarded/lost fishing gear can represent a threat to certain species which can become entangled in it or ingest it. Such gear was noted on the west shore at Dalkey Island together with additional plastics which had been washed up on the shore.

4.4 Habitat loss and construction related impacts

Habitat loss in built up areas where development occurs adjacent to intertidal reefs areas can result in significant habitat loss (e.g. construction of defence walls, slipways and jetties). Construction related impacts such as the run-off of cementitious material during the creation and resurfacing of roads, harbour areas and other developments can cause significant impacts to both intertidal and subtidal reef habitats. Much of the coastline within the Dún Laoghaire Rathdown County Council area has already been altered over the years and the remaining reef habitats are at risk if future development does not adequately consider its vulnerability to development related impacts.

5. Discussion

Mapping of the intertidal reef habitat of Dún Laoghaire Rathdown County Council area indicates approximately 12 hectares of geogenic intertidal reef habitat. Mapping of the subtidal reef habitats has indicated approximately 266ha of geogenic subtidal reef habitat. It is important to note that that much of the reef habitat (both intertidal and subtidal) is outside of the areas designated under the Natura 2000 network of European sites.

Interrogation of the INFOMAR data indicated that the total area of subtidal geogenic reef within the survey area (Blackrock to Bray out to 2km from the shore) was 266ha. Marine Strategy Framework Directive (MSFD) also provides indicative polygons of combined areas of Shallow sublittoral rock and biogenic reef. However it does not distinguish between them. Both habitats conform to the EU Annex I habitat Reef (1170).

Within the SAC area, NPWS have mapped 53ha of subtidal reef around Dalkey island and Muglins. Interrogation of the INFOMAR data and associated ground truthing recorded an additional area of approximately 6ha of subtidal reef habitat within the SAC area.

Outside of the SAC area a total of 206ha of subtidal reef was verified within the survey area based on the INFOMAR bathymetric mapping data verified by ground truthing.

Additional Information, based on Marine Strategy Framework Directive (MSFD) interpolated predominant habitat types, within the survey area, indicates further areas of potential reef habitat. Such areas are classified as “Shallow sublittoral rock and biogenic reef” and are available through the MSFD Irelands Marine Atlas v1. However, it was outside of the scope of this project to ground truth these areas during the course of this project.

Nonetheless the reef area characterised during the present survey is significant, especially in the context of the relatively low extent of this habitat on the east coast of Ireland and very low level of ground truthing previously carried out. The areas surveyed indicate that a significant area of the Annex I (1170) reef habitat is present off the coastline of Dún Laoghaire Rathdown County Council which is characterised by an interesting and diverse suite of infralittoral and circalittoral faunal and algal communities.

It is important to note that the mapping presented does not reflect an absolute value in terms of the distribution and characterisation of reef habitat within the survey area or preclude the need for site specific surveys to facilitate impact assessment related to projects or plans.

6. References

MERC (2022). Intertidal reef habitats of Dún Laoghaire Rathdown County Council area. Report prepared on behalf of Dún Laoghaire Rathdown County Council.

David W. Connor, James H. Allen, Neil Golding, Kerry L. Howell, Louise M. Lieberknecht, Kate O. Northen and Johnny B. Reker (2004) *The Marine Habitat Classification for Britain and Ireland* Version 04.05. JNCC, Peterborough ISBN 1 861 07561 8.

7. Appendices

The following data sets are provided as separate appendices to this report.

1. ESRI ARCGIS shapefiles for Sublittoral Reef habitats
2. ESRI ARCGIS shapefiles for littoral Reef habitats
3. ESRI ARCGIS shapefiles for video transects
4. ESRI ARCGIS shapefiles for dive locations
6. Examples of video footage derived from diver surveys throughout the survey area.