MERC Consultants
environmental and conservation services

Benthic Survey of Wicklow Harbour Dredge Site

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Contents

1. Introduction

Wicklow County Council propose to carry out dredging of sections of Wicklow Harbour (figure 1). MERC consultants carried out a benthic survey of the dredge site in March and April 2023.

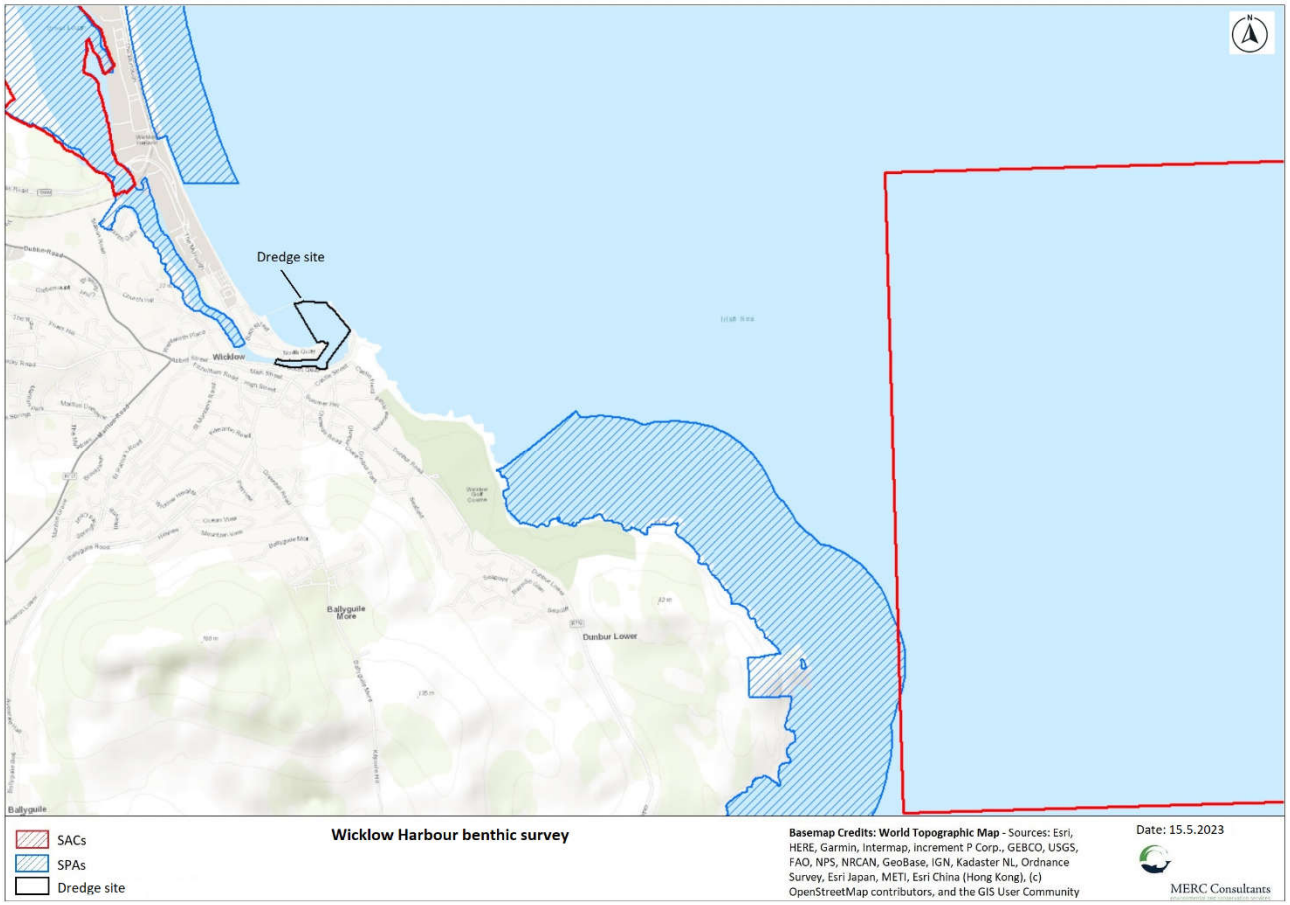

Figure 1. Overview of the location of the dredge site

2. Methods

2.1 Sediment sampling

Four (4) stations were sampled within Wicklow Harbour (figure 2). At each station a 0.1m^2 Day grab was used and 3 replicate samples for faunal analysis and an additional sample for granulometery were collected. All sediment sampling took place on the 13th of March 2023.

Figure 2. Sediment sampling station locations

All station positions are provided in Appendix 1.

The sampling and analysis protocols were as follows:

Field Methodology

- Grab deployment and recovery rates were maintained at <1 m/sec and <0.5 m/sec for the last 5 metres.
- The winch wire was kept as vertical as possible to ensure a vertical lift.
- The thickness of material at the centre of the grab to the nearest centimetre was recorded. All samples within the harbour area (fine muddy sands) were retained as a full grab penetration was achieved. Outside of the harbour area, soft sediments were generally not encountered, therefore low grab

volumes (normally a criterion for rejection) were retained for analysis. Further information on the rationale for retaining these samples is provided in section 4 of this report.

- Surface colour of the sediment and any smell (hydrogen sulphide, oil residue etc.) was recorded.
- A description of the sediment to include recognisable fauna, surface features, algae etc was made.
- Both the sediment within the grab and the washed fraction retained on the sieve was photographed
- Four grab sample per station were collected. Three for faunal analysis and one for analysis of sediment physico-chemical parameters (Particle Size Analysis (PSA), organic carbon/LOI).
- All sediment samples were frozen (<-18°C) in appropriately sealed containers.
- The faunal grab samples were emptied into a container and the grab rinsed thoroughly to avoid loss of the sample. The sample was then transferred portion by portion onto a 1 mm sieve as a sediment water suspension.
- Fragile animals were picked by hand during sieving to minimise damage.
- Once washed through, all material retained on the sieve was placed in a bucket and fixed in buffered 4% w/v formaldehyde solution.

Laboratory

Sediment Analysis

- *Loss on Ignition (Organic Matter)*

1. The collected sediments were transferred to aluminium trays, homogenised by hand and dried in an oven at 100º C for 24 hours.
2. A sample of dried sediment was placed in a mortar and pestle and ground down to a fine powder.
3. 1 g of this ground sediment was weighed into a pre-weighed crucible and placed in a muffle furnace at 450ºC for a period of 6 hours.
4. The sediment samples were then allowed to cool in a desiccator for 1 hour before being weighed again.
5. The organic content of the sample was determined by expressing the percentage weight of the sediment after ignition over the initial weight of the sediment.

- *Granulometry*

1. Approximately 100 g of dried sediment was weighed out and placed in a labelled 1 L glass beaker to which 100 ml of a 6 percent hydrogen peroxide solution was added and allowed to stand overnight in a fume hood.
2. The beaker was then placed on a hot plate and heated gently. Small quantities of hydrogen peroxide were added to the beaker until there was no further reaction.
3. The beaker was then emptied of sediment and rinsed into a 63 µm sieve. This was then washed with distilled water to remove any residual hydrogen peroxide. The sample retained on the sieve was then carefully washed back into the glass beaker up to a volume of approximately 250 ml of distilled water.
4. 10 ml of sodium hexametaphosphate solution was added to the beaker and this solution was stirred for ten minutes and allowed to stand overnight.

5. The beaker with the sediment and sodium hexametaphosphate solution was washed and rinsed into a 63 µm sieve. The retained sampled was washed into a labelled aluminium tray and placed in an oven for drying at 100ºC for 24 hours.
6. The dried sediment was then passed through a Wentworth series of analytical sieves (>8,000 to 63 µm; single phi units). The weight of material retained in each sieve was weighed and recorded. The material passed through the 63 µm was also weighed and the value added to the value measured in Point 5 (above).
7. The total silt/clay fraction was determined by subtracting all weighed fractions from the initial starting weight of sediment as the less than 63 µm fraction was lost during the various washing stages.
8. Reporting of sediment samples was as a range of particle sizes indicated below:

1	PSA % <63
2	PSA % 63<125
3	PSA % 125<250
4	PSA % 250<500
5	PSA % 500<1000
6	PSA % 1000<2000
7	PSA % 2000<4000
8	PSA % 4000<8000
9	PSA % ≥8000

9. Folk classification was then derived from the results of PSA.

Preservation and storage of faunal samples

- Upon return to the laboratory, samples were washed of formalin and preserved in 70% alcohol
- Prior to sorting and identification, the alcohol was removed from the sample by rinsing through a 1 mm sieve. The sample retained on the sieve was then transferred, by backwashing, into a white sorting tray.
- All the fauna was extracted by hand, using forceps or pipette, with the aid of a low power microscope and placed into suitable labelled containers. Specimens were stored in 70-80% industrial methylated spirits/water preservative.
- The fauna belonging to the major taxonomic groups was identified and enumerated using binocular stereo and compound microscopes. Standard identification keys for each phylum were used.
- Identification of major taxonomic groups to species level was made. Other minor groups (e.g. Porifera, Nemertea, Nematoda, Echiurida) were identified to the lowest possible taxonomic level.
- Species were assigned a code (AphiaID) in accordance with the WoRMS (World Register of Marine Species[1]).

[1] http://www.marinespecies.org/index.php

2.2 Video survey

A drop down video survey of the benthic sampling stations and their environs was carried out on 13th April 2023. A Cathx Ocean 4K underwater video survey system with strobe lighting and associated RemoteGeo spatial encoding was employed for this purpose. Dropdown video was deployed over the same areas where benthic grab samples were taken and in the surrounding area.

The spatially encoded video recorded was subsequently reviewed and, where video quality was adequate, a description of the habitat and characterising species was prepared.

3. Results

All of the data collected from the benthic sampling and video survey is provided as a series of appendices to this report as follows.

Appendix 1: Benthic grab sample environmental data sheets.
Appendix 2: Benthic sediment image catalogue (grab and sieve images).
Appendix 3: Spatially encoded dropdown video imagery.
Appendix 4: Shapefiles (Dropdown video locations).
Appendix 5: Benthic faunal and granulometry data.
Appendix 6: Dropdown video descriptions.

4. Discussion

4.1 Overview

The sediments within Wicklow harbour, the dredge area, are consistent with estuarine sediments including muds and sands as would be expected due to the influence of the Leitrim River, which enters the harbour area from the northwest. Video imagery of this area indicated no surface hard substrata or epifauna at the stations sampled. However, a scour channel, caused by the inflow of the Leitrim River, is apparent along the centre of the harbour, between the north and south quay walls as evident by a number of failed grab attempts within this area. The river inflow results in softer sediment being deposited along the margins of the harbour area, leaving a typical scour channel through the centre. Towards the mouth of the harbour the sediments become coarser and therefore obtaining an adequate Day grab sample was not possible.

4.2 Review of benthic sediment data

The sediments within the dredge area are characterised by fine estuarine sediments including muds and sands.

The sediments of stations 1, 2, 3 & 4 were comprised mainly of fine and very fine sands (63-249µm), the percentage of these fractions ranged from 50% at station 4 to 79% at station 2. Station 1 and 4 contained a significant proportion of silt/clays (<63µm) at 24% and 33% respectively. This fraction was present at stations 2 & 3 but in much smaller amounts (~5%). Coarser sands and gravels fraction were also present at these stations. Total organic carbon was low to moderate, ranging from 1.68% at station 3 to 6.28% at station 4. The higher the proportion of silt/clays, the higher the amount of total organic carbon.

Faunal communities identified at these stations were typical of finer sediment, estuarine habitats and contained few taxa and individuals. Taxa common to all stations included the polychaetes *Nephtys hombergii*, *Tharyx robustus* and *Spio martinensis*. Animals from other phyla were less common but included the amphipod *Ampelisca brevicornis*, the bivalves *Macomangulus tenuis* and *Abra alba* and a few bryozoans.

4.3 Review of dropdown video data

Drop down video analysis indicated the seabed in the harbour area, at the sample stations, to be comprised of fine sands. While the quality of the video was poor, due to low underwater visibility at the time of survey, it is clear that this habitat is comprised of fine sands with little or no epifauna.

4.4 Habitat assessment

The harbour sediments sampled are characteristic of the biotope Infralittoral mobile sand in variable salinity (estuaries) (SS.SSa.SSaVS.MoSaVS).