Seed Mussel Survey Report for Castlemaine Harbour – 1/09/2020, 15 and 16/09/2020

Equipment: 400 kHz side-scan sonar, 1 m dredge, 0.1m^{-2} Day Grab with 1000 µm sieve

Area surveyed: Between Inch Point and Rossbeigh Point, from the sand bar (west) to the border of the shellfish order (east)

Survey summary:

A preliminary survey was carried out on September 1st using a local dredger, in the channel areas where mussel settlements have been regularly detected. At that time the side-scan sonar was deployed (van Overmeeren *et al.*, 2009), but due to strong tidal current the data collected was not of sufficient standard to generate a detailed survey report. However, some features were observed, and five marks were investigated using the commercial dredge. Despite strong tidal current (< 3 knots), four tows showed returned seed (Van Lancker *et al.*, 2007).

Following the preliminary survey, it was decided to carry out a more extensive investigation using the BIM inshore survey vessel. Side-scan sonar data was collected at the same location. A further 15 targets were marked for ground-truthing. Each of these targets were investigated using the 1-meter dredge, 13 of those showed variable quantities of seed.

Following the processing and analysis of the acoustic data and the tows, three partially distinctive settlement area were extracted (see Map 1). Their locations and estimated areas are detailed hereafter.

Table 1: Areas coordinates (in Degrees, decimal minutes WGS84):

- ***Western settlement*** (estimated at 19 hectares)

Latitude	Longitude
52° 5.702' N	9° 58.055' W
52° 5.589' N	9° 58.056' W
52° 5.450' N	9° 59.223' W
52° 5.527' N	9° 59.586' W
52° 5.624' N	9° 59.162' W

- ***Central settlement*** (estimated at 51 hectares)

Latitude	Longitude
52° 5.534' N	9° 57.997' W
52° 5.615' N	9° 57.822' W
52° 5.644' N	9° 56.753' W
52° 6.085' N	9° 55.842' W
52° 5.954' N	9° 55.821' W
52° 5.420' N	9° 56.680' W
52° 5.394' N	9° 57.113' W

- ***Eastern settlement*** (estimated at 23 hectares)

Latitude	Longitude
52° 6.135' N	9° 55.774' W
52° 6.422' N	9° 55.368' W
52° 6.458' N	9° 55.069' W
52° 5.884' N	9° 55.646' W
52° 5.845' N	9° 55.801' W
52° 6.135' N	9° 55.774' W

NOTE: These coordinates represent the corners of a simplified polygon of the area of the settlement identified (green border box on Map 1).

The seed mussels across the areas appear to form well attached dense patches. The spat has settled on various substrates: stones, coarse sand, old oyster shells, bryozoans, as well hydroids, which correlate with previous years observations in this location. Few predators (small starfish and green crabs) were observed in most tows and some mortality was detected at the western end of the western bed. No over visible predator impact was observed at the time of the survey. Biometrics measurement were carried as part of the biomass estimation survey.

Biomass estimation survey:

Following the identification of three seed mussel settlement areas in the channel, further sampling was required to facilitate biomass estimation. A total of 32 random sampling points was generated using X Tools on ArcGIS. Due to time constraints, this survey was carried out during challenging tidal conditions with the deployment of the grab not reliable over 1.5 knot. In addition, stones can further impact the reliability of grab samples by keeping the jaw open. The combination of those two factors did not allow us to carry out biomass estimation on the eastern settlement. However, 25 grabs were collected within the two other potential settlement borders highlighted above (see Map 2).

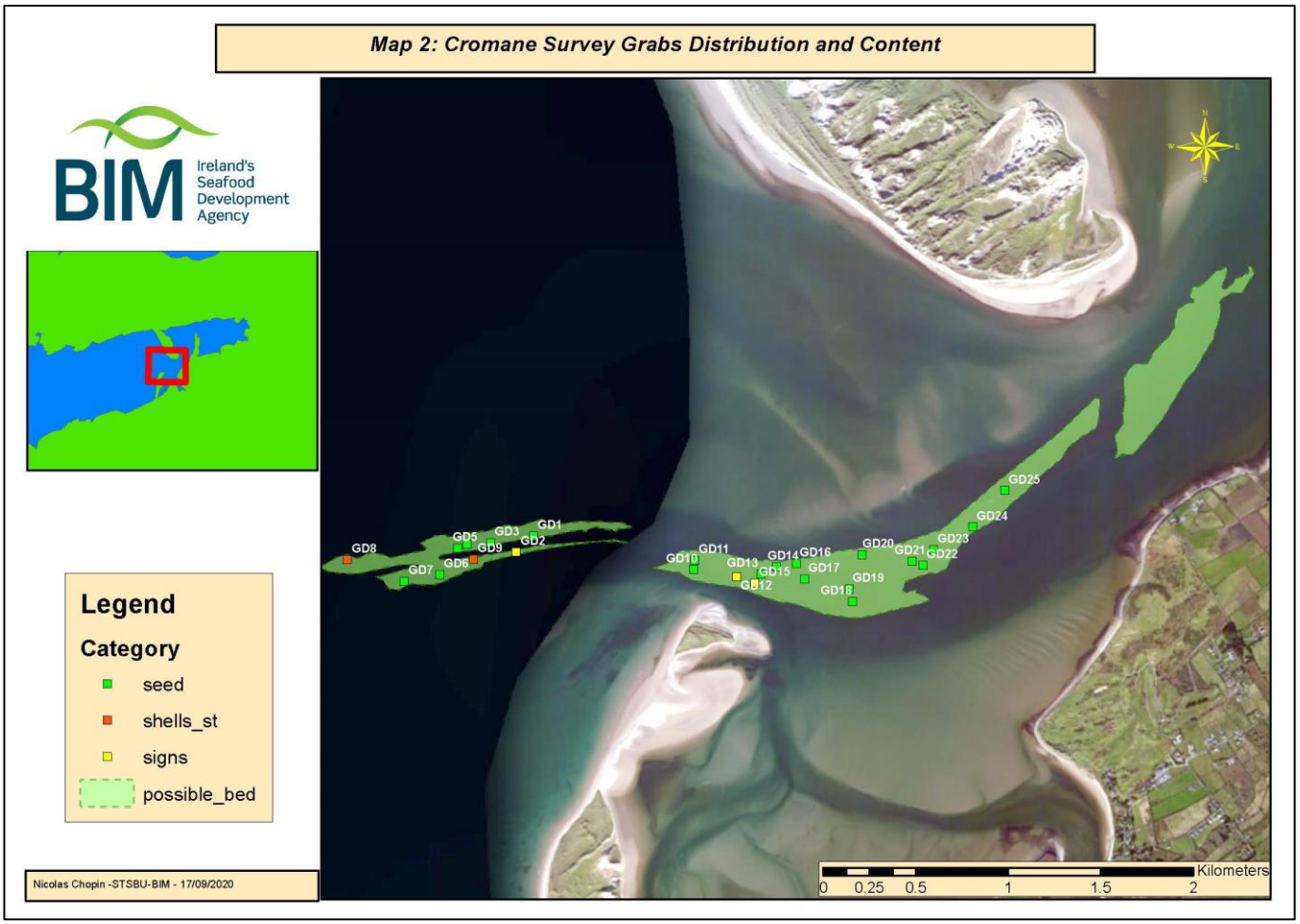

Fig. 1: Grabs locations and content

Of the 25 grabs, 3 did not contain seed mussel (stones/gravel) and 22 were successful. As for previous beds assessed this year, the density throughout the area (western and central cumulated) is highly variable. The western settlement appears to have a slightly higher mussel density than the central bed.

The average weight of seed collected throughout the grabs was 404.05 grams per 0.1 m^{-2}; maximum: 910 g for GD 7, minimum: 100 g for GD 15 (see Map 3). The average amount of waste (including stones and other shells) was 28% across the settlement with the highest level at 77% and the lowest level at 0%. The samples did not highlight specific areas of high waste level throughout bed, but rather a more distributed pattern. It is worth noted that most grabs contained sand, that was removed through the sieving process

Small starfish (< 5 cm diameter) were observed in 11 grabs.

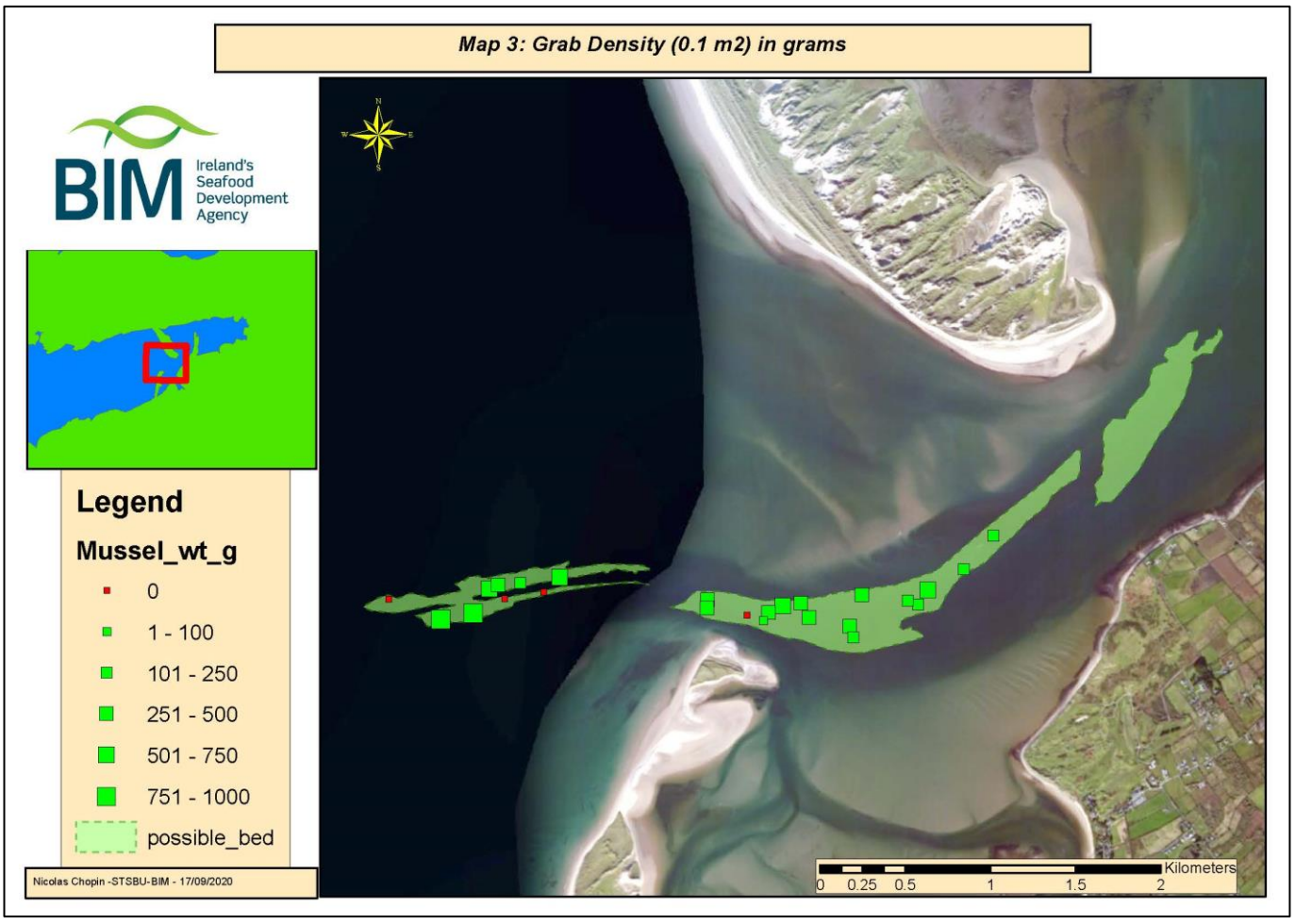

Fig.2: Grab density

The data collected was interpolated using the IDW (Inverse Distance Weighting) tool in ArcGIS (see Map 4), which was previously used to assess biomass on cockle beds (Hervas *et al.*, 2008). For the purpose of the analysis, both areas were cumulated as one settlement.

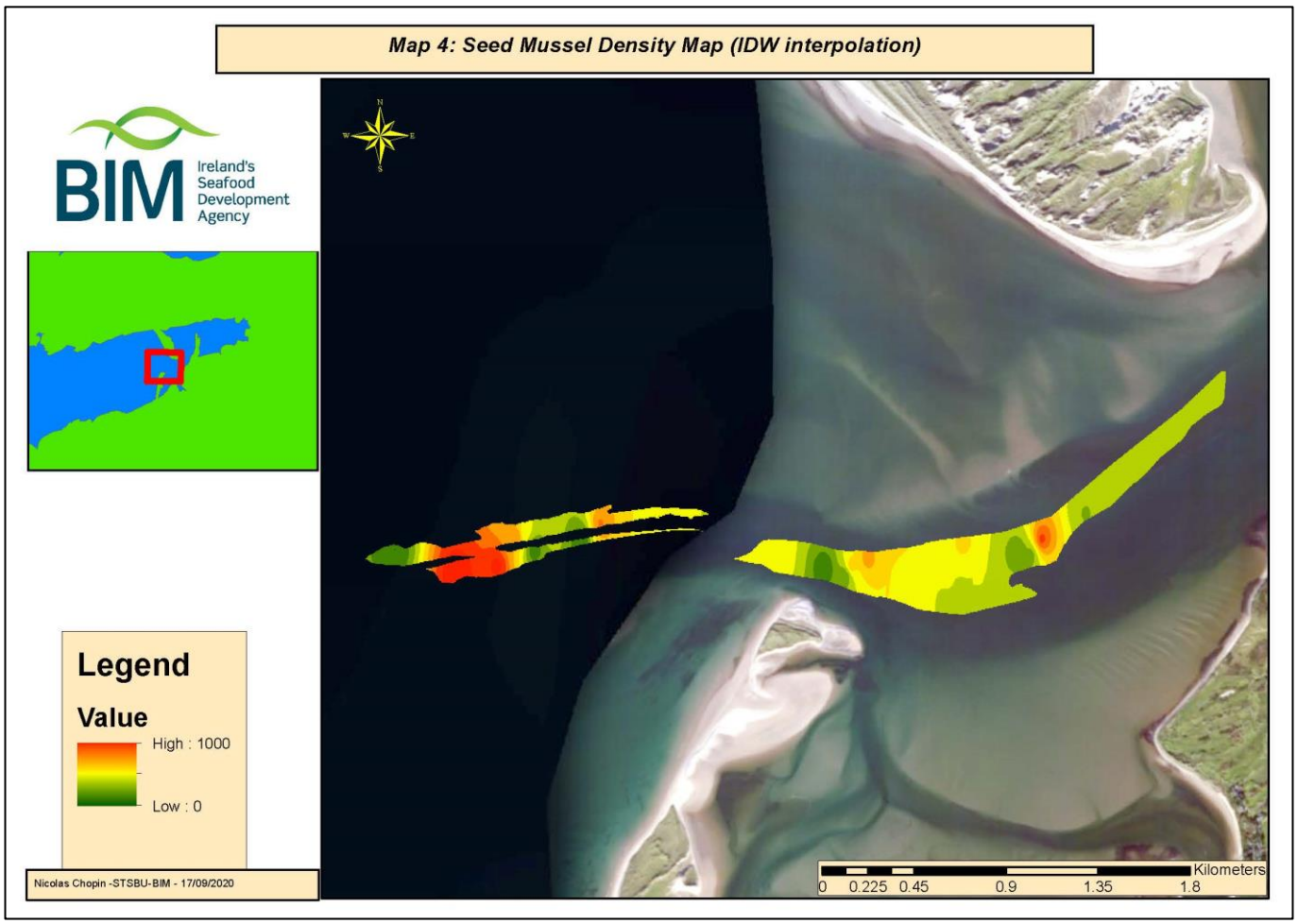

Fig.3: Seed mussel density interpolation (IDW)

Based on the weight of seed collected in each grab, 10 density classes were defined and used to classify the interpolated grid within the bed boundaries. The extent of each class (Hectares) was then calculated (see table 2) and the biomass generated by multiplying the mean weight by the area for each class.

Table 2: Tonnage estimation following IDW interpolation

Density Classes	Areas in hectares	N samples	Mean Wt. per 0.1 m^{-2} in Kg	Tonnes/Area
0 to 100 g	3.13	4	0.00	0.00
100 to 200 g	5.43	4	0.14	77.81
200 to 300 g	25.17	3	0.22	559.55
300 to 400 g	19.49	5	0.35	675.16
400 to 500 g	6.38	3	0.43	274.61
500 to 600 g	3.85	2	0.57	220.46
600 to 700 g	1.96	1	0.61	119.63
700 to 800 g	2.93	1	0.73	212.09
800 to 900 g	1.59	1	0.83	131.68
900 to 1000 g	0.20	1	0.91	18.11
Total area	***70.12***		***Total tonnage***	***2289.10***

The total area was estimated to be **70.12 hectares** for a possible biomass of **2,289.10 tonnes** for the western and central bed. It is likely that the settlement could yield more with the addition of the eastern bed, which appears to be of similar density distribution according to the amount of seed collected in the two tows carried out in the area.

Biometric analysis:

A total of 300 individual mussels were measured from three randomly selected grab samples. The size range of the recent survey was as follows; 62 % of the individuals were comprised between 6 and 12 mm. The average size across is 9.47 mm (highest: 28.68 mm, lowest: 1.93). Some very small spat was observed in the most eastern samples of the central bed. The combination of those observation (large range size and recent spatfall) can indicate that settlement has happen constantly over the last few months, this pattern has previously been observed during previous seed mussel survey in Castlemaine.

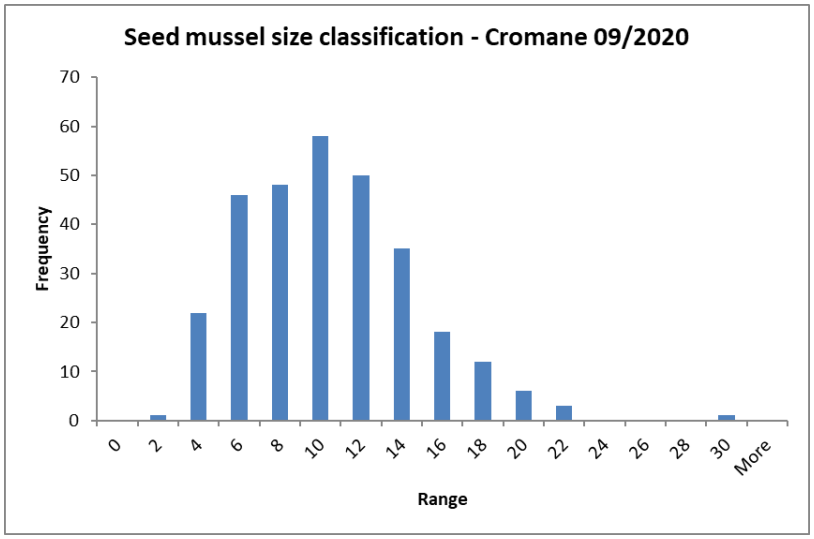

Fig.4: Population size distribution

Recommendation:

The current settlement in Castlemaine could potentially yield over **2,500 tonnes** of seed (including the eastern area). Considering potential future weather deterioration and following consultation with the local industry, the opening of the fishery should be prioritised for September 24th.

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References:

Hervas, A. et al. (2008) Assessment, Monitoring and Management of the Dundalk Bay and Waterford Estuary Cockle (Cerastoderma edule) Fisheries in 2007, Fisheries Resource Series.

Van Lancker, V. et al. (2007) 'Habitat signature catalogue, Belgian Part of the North Sea'.

van Overmeeren, R. et al. (2009) 'Acoustic habitat and shellfish mapping and monitoring in shallow coastal water - Sidescan sonar experiences in The Netherlands', Estuarine, Coastal and Shelf Science. Elsevier Ltd, 85(3), pp. 437–448. doi: 10.1016/j.ecss.2009.07.016.

http://www.bim.ie/our-publications/aquaculture/

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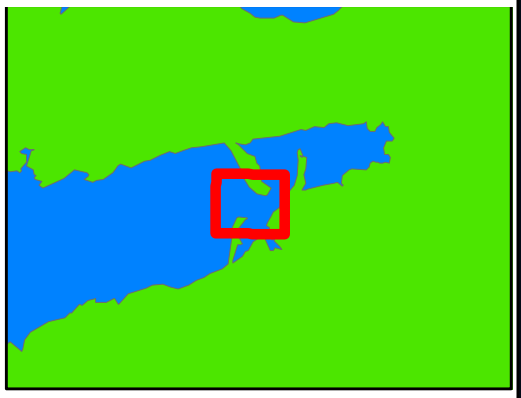
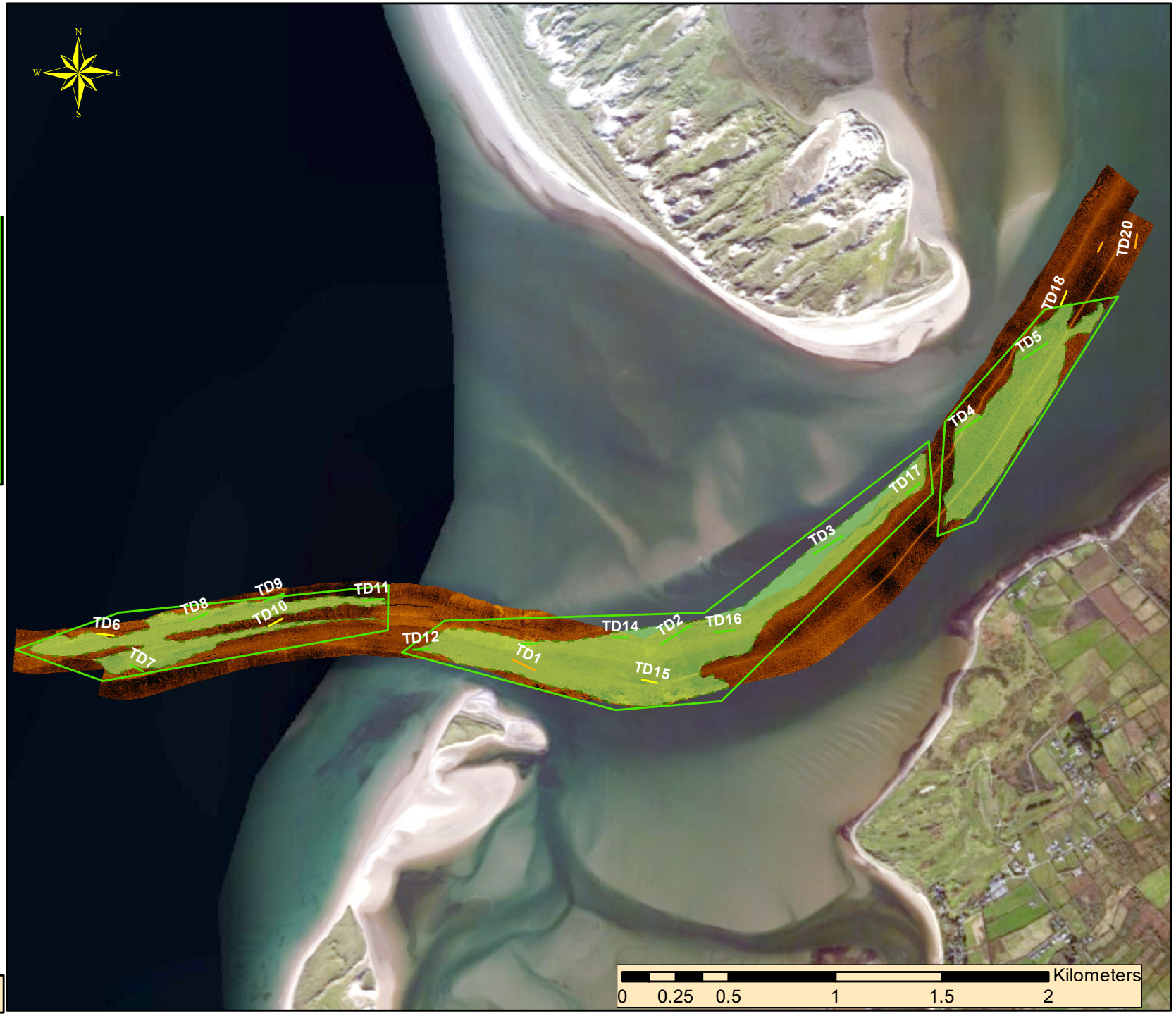
Map 1: Cromane Seed Mussel Survey Extent

BIM Ireland's Seafood Development Agency





Legend

- seed_tows
- signs_tows
- Shells_stones_tows
- side_scan_sonar_track
- possible_bed
- bed_extent

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