Annex 1 – August 13th 2024 TSB Agenda Item 6

Mussel Surveys and inspections – MORECAMBE BAY

Heysham Flat Mussel Inspection 04-06-24

Officers present: JH, GG, LL

Tides: LW 16:50 1.6m (Liverpool tides)

Officers inspected the mussel on Heysham Flat to assess if mussel was present and if seed mussel had grown on. Access to the outer skears was not possible across Dallam Dyke due to depth of water and timings. Officer notes have been mapped in Figure 1.

The *Sabellaria alveolata* reef is a mixture of remnant reef, dead reef and new live reef structures. There are areas of large reef on the mussel bed and areas where coverage is patchy. To the north and south of the skear is the main extent of the live *Sabellaria alveolata*. A lot of the *Sabellaria alveolata* was covered by mussel (Figure 2).

The size of mussel varied across the bed ranging from small seed up to 40mm (Figure 3, 4 and 5). Small patches of mussel mud were starting to form on parts of the bed (Figure 6). Areas of bare cobble and dead shell (Figure 7) were also present on the bed. Bird species were seen feeding in the area including oystercatchers and gulls.

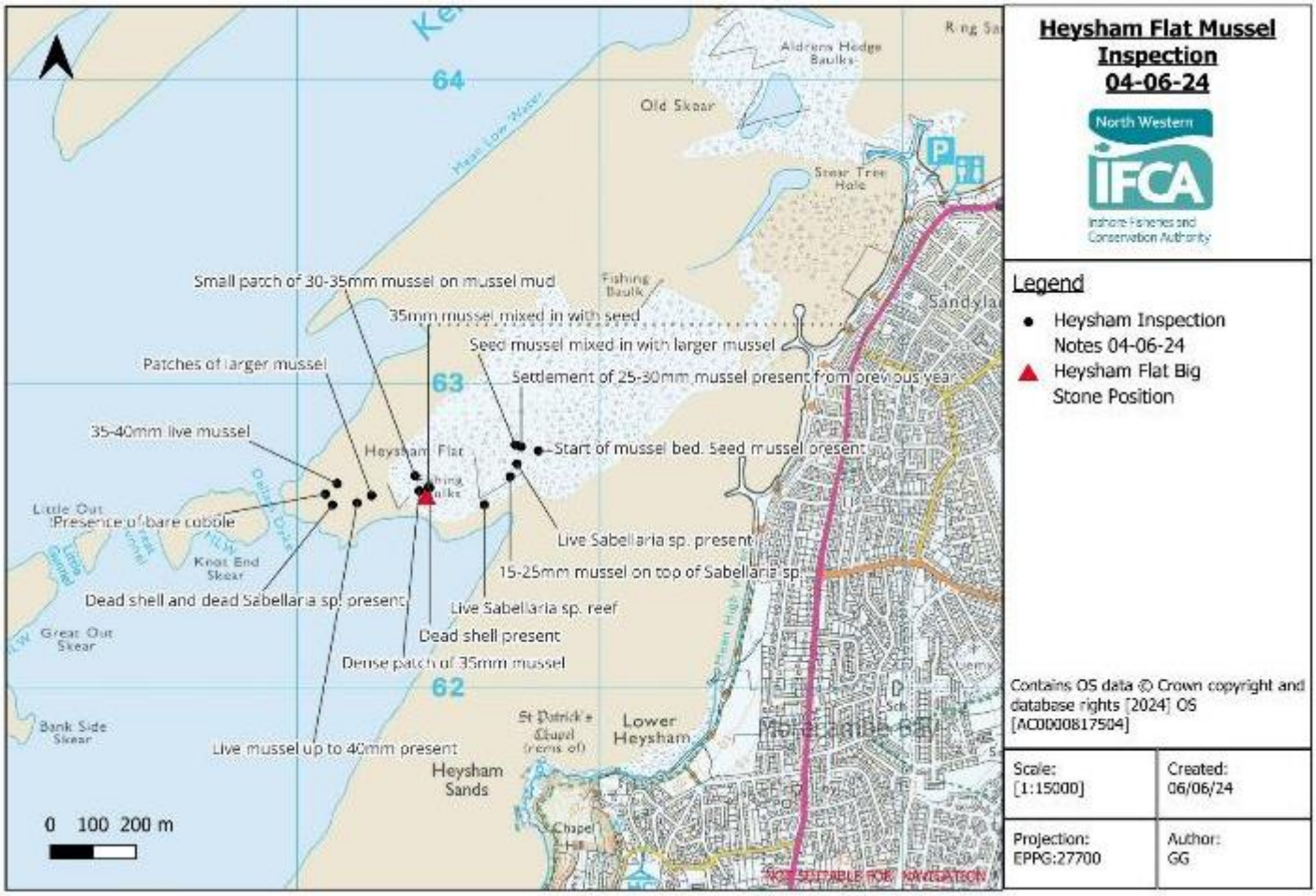


Figure 1. Map showing officer notes on Heysham Flat Inspection 04-06-24.

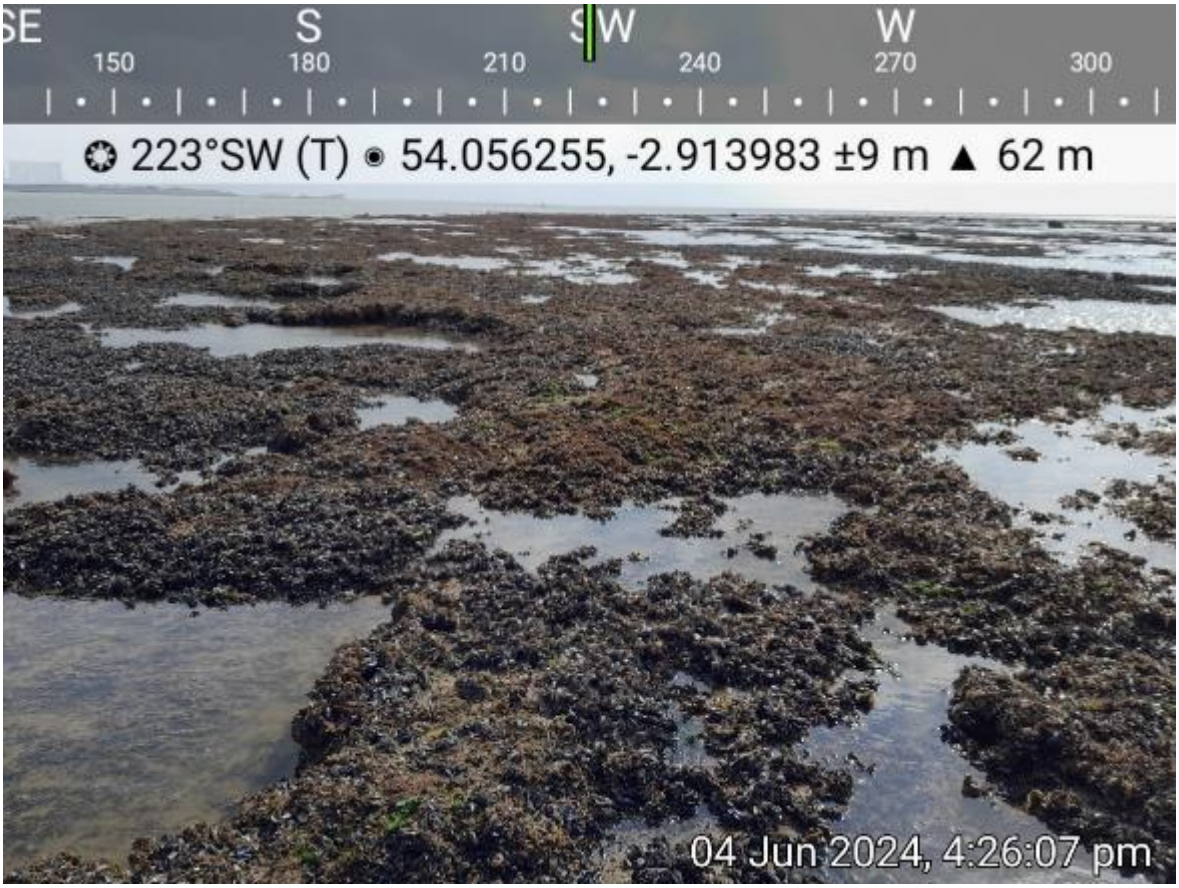


Figure 2. *Sabellaria sp.*, covered in live and dead mussel shell 04-06-24.

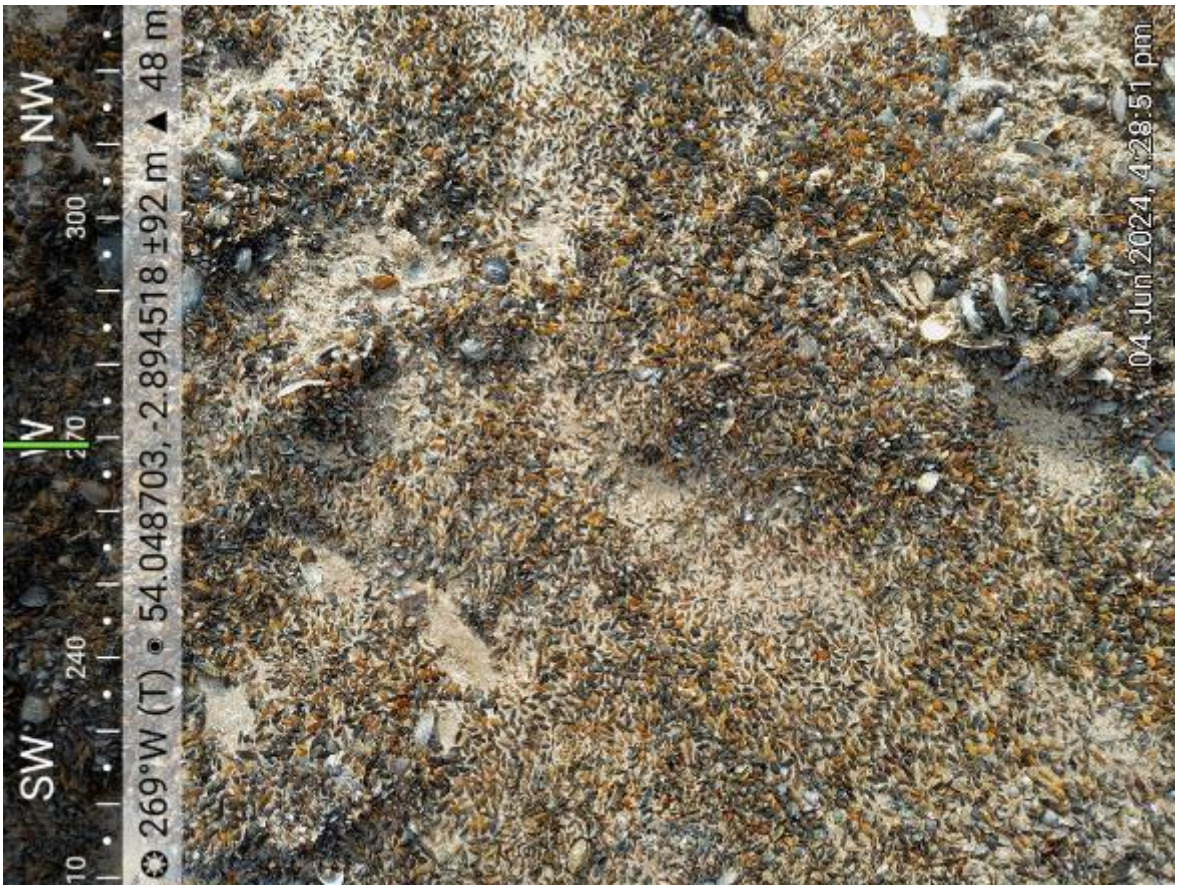


Figure 3. Seed mussel on Heysham Flat 04-06-24.

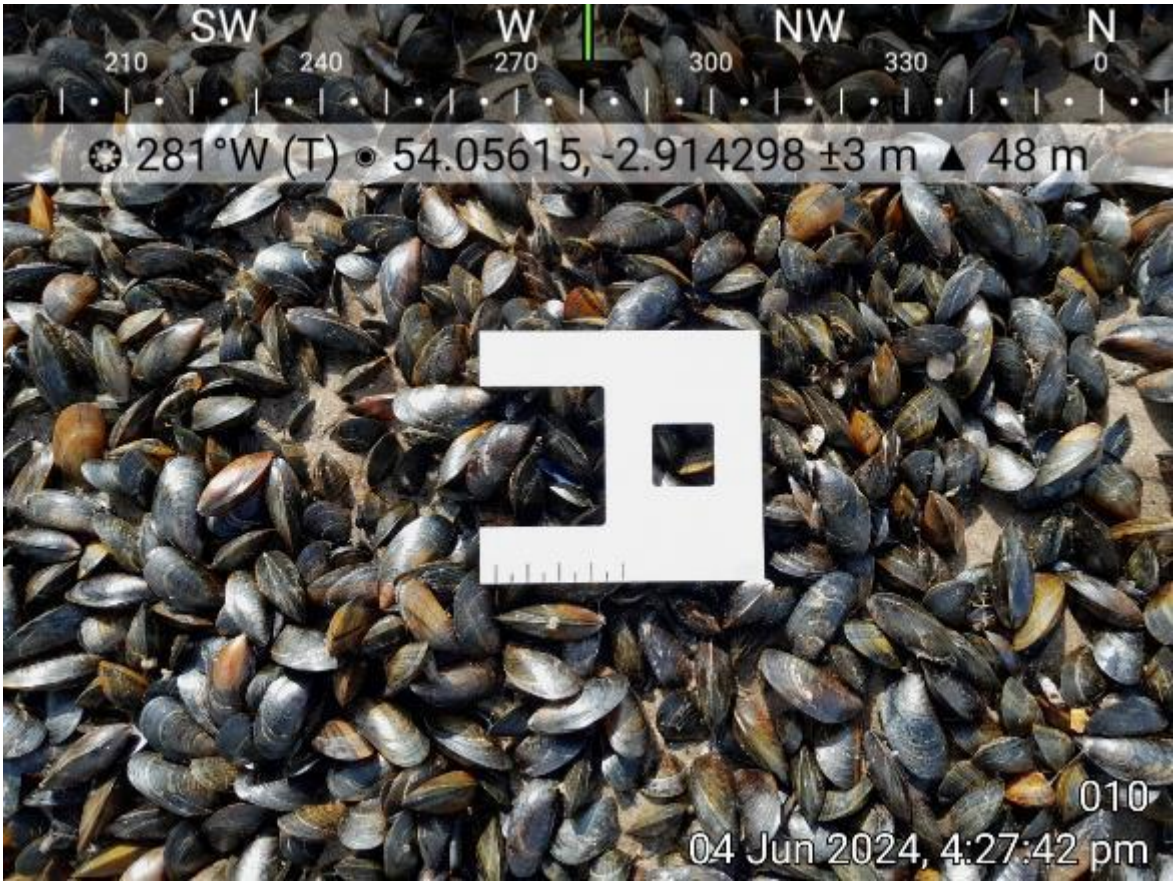
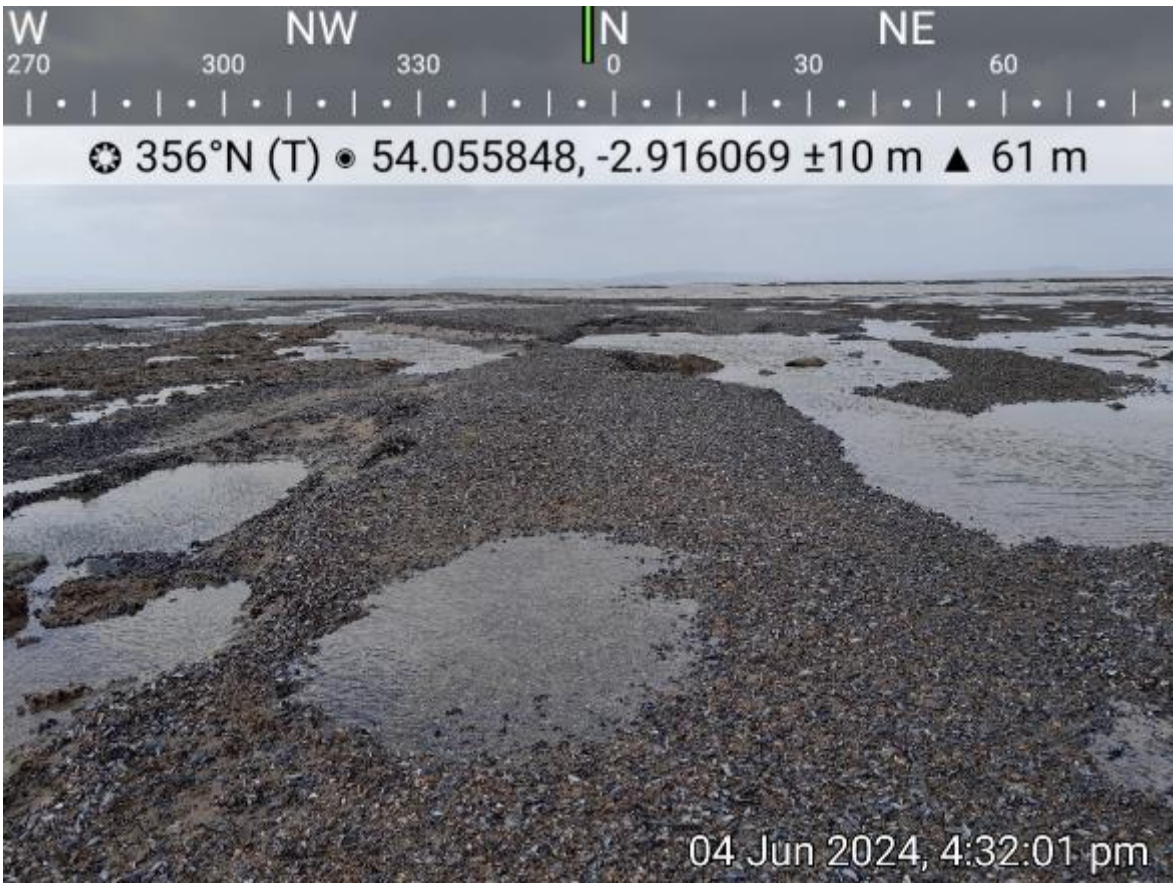


Figure 4. Mussel measuring 30-35mm 04-06-24.

Figure 5. Seed, larger mussel and dead shell 04-06-24.

Figure 6. Mussel on mussel mud 04-06-24.



Heysham Flat Mussel Inspection 23-07-24

Officers present: JH, GG
Tides: LW 08:00 1.2m (Liverpool tides)

Officers inspected the mussel on Heysham Flat to assess if mussel was present and if seed mussel had grown on. The outer skears appeared dark in colouration suggesting mussel is present but access to the outer skears was not possible across Dallam Dyke due to depth of water and timings. Officer tracks have been mapped in Figure 1.

The *Sabellaria alveolata* reef is a mixture of remnant reef, dead reef and new live reef structures. There are areas of large reef on the mussel bed and areas where coverage is patchy. To the north and south of the skear is the main extent of the live *Sabellaria alveolata*. New patches of live *Sabellaria alveolata* were found near the channel edge (Figure 3). The majority of the *Sabellaria alveolata* was covered by mussel, with only a few sections now visible on the main skear (Figure 4).

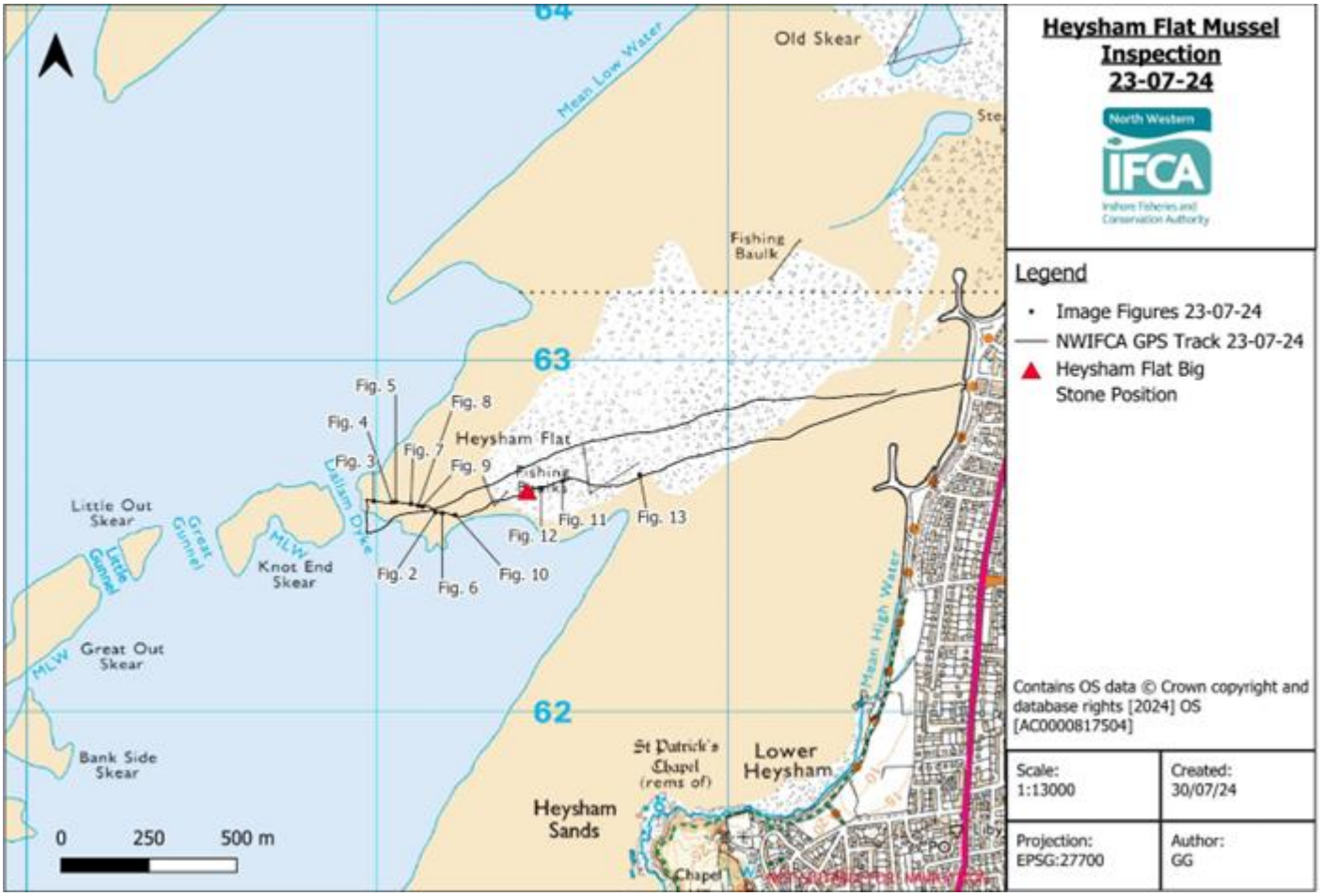


Figure 1. Map showing the officer track and geolocations of survey photos on Heysham Flat Survey 23-07-24.

Mussel coverage varied over the entire skear. There were areas of dense mussel with over 70% coverage (Figure 2 & 9) and areas of patchy mussel with less than 30% coverage (Figure 13). The patches of seed settlement had grown on in size with the majority measuring 20-25mm (Figure 5) The 2024 settlement was mixed in with the 2023 settlement. The mussel ranged in size across the bed from 10mm to 45mm (Figure 6 & 10), and covered all substrates including cobble, dead shell, dead and live *Sabellaria alveolata*. There were also areas of bare cobble (Figure 8). Green algae was present on the skear amongst these substrates (Figure 7) and patches of 20mm-30mm mussel were covered by algae (Figure 11 & 12).Bird species were present in the area including oystercatchers and gulls.

Figure 2. Heysham Flat 23-07-24.

Figure 3. Live *Sabellaria alveolata* 23-07-24.

Figure 4. *Sabellaria alveolata* covered in 20mm mussel 23-07-24.

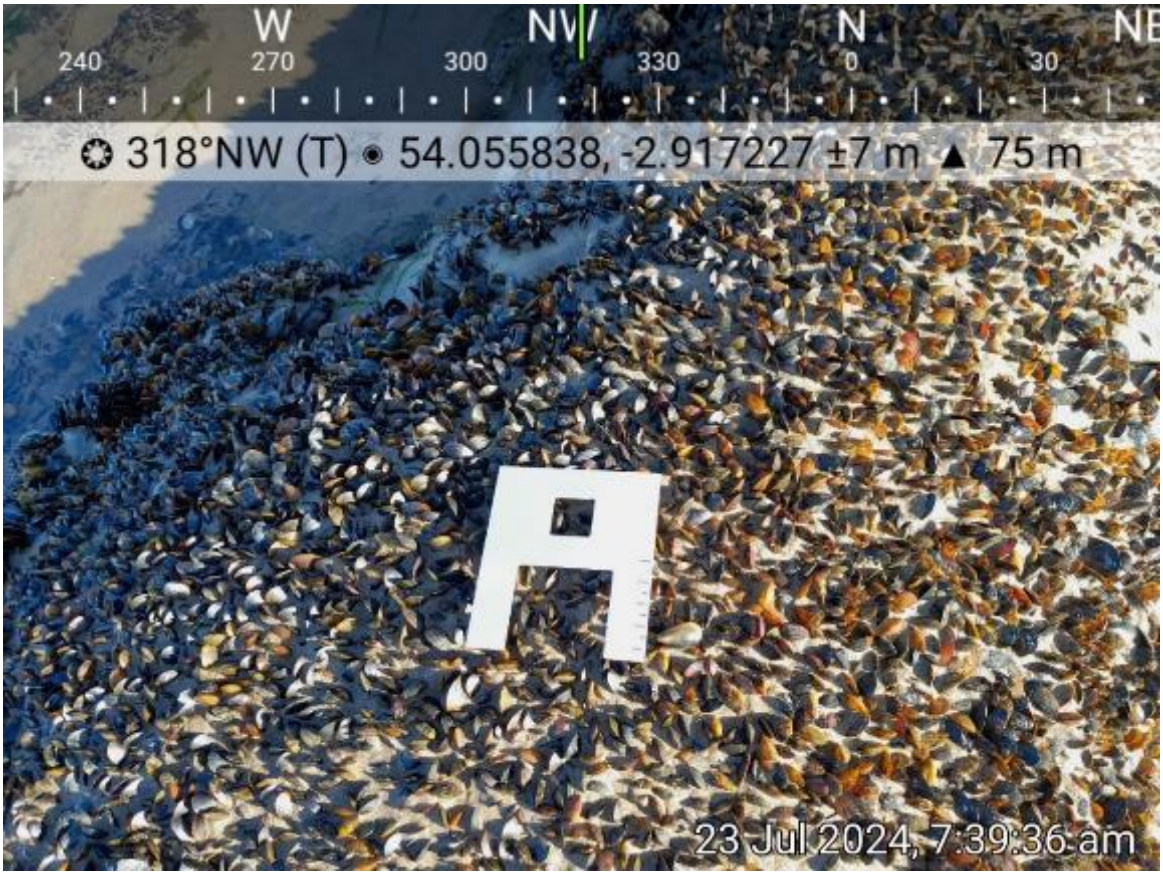


Figure 5. Mussel measuring ~20-25mm on Heysham Flat 23-07-24.

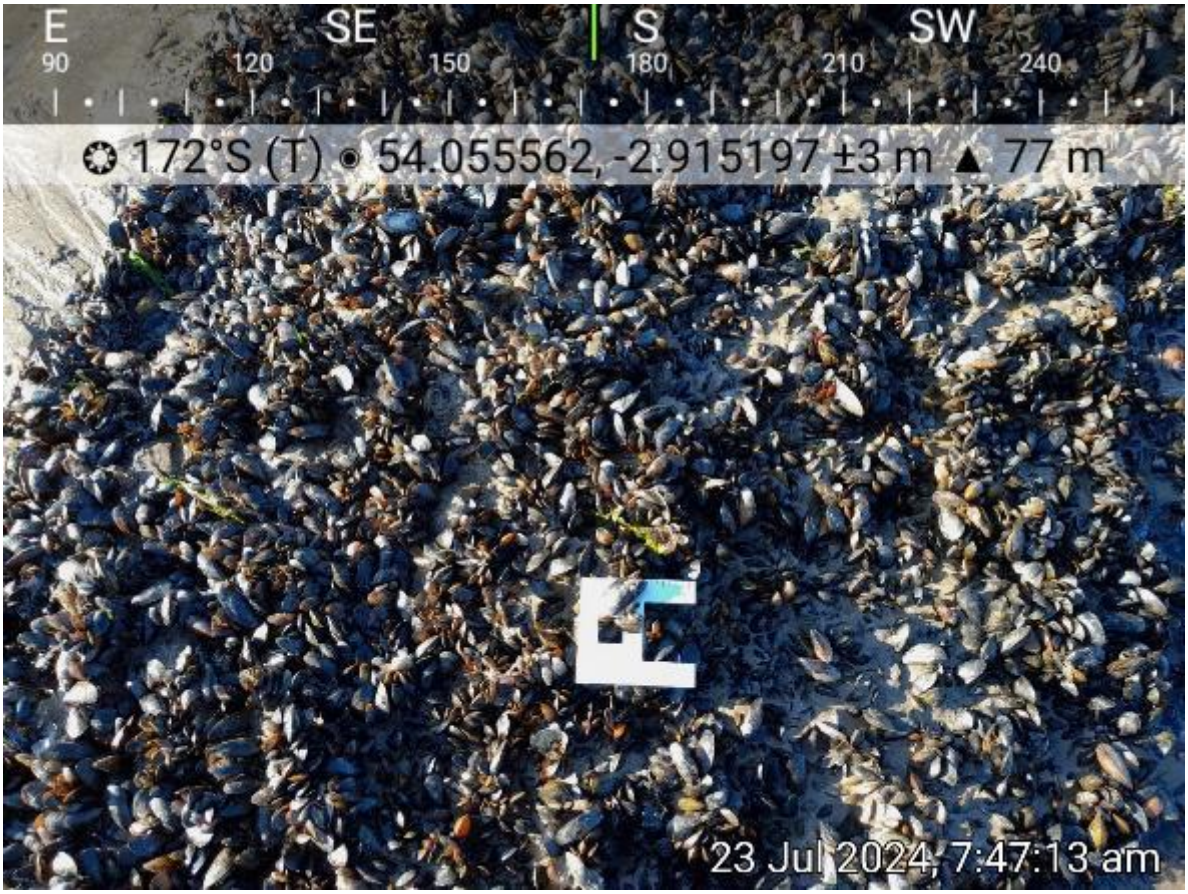


Figure 6. Live mussel varying in size from 10mm – 45mm 23-07-24.

Figure 7. Green algae amongst *Sabellaria alveolata*, live mussel and dead shell 23-07-24.

Figure 8. Bare cobble 23-07-24.

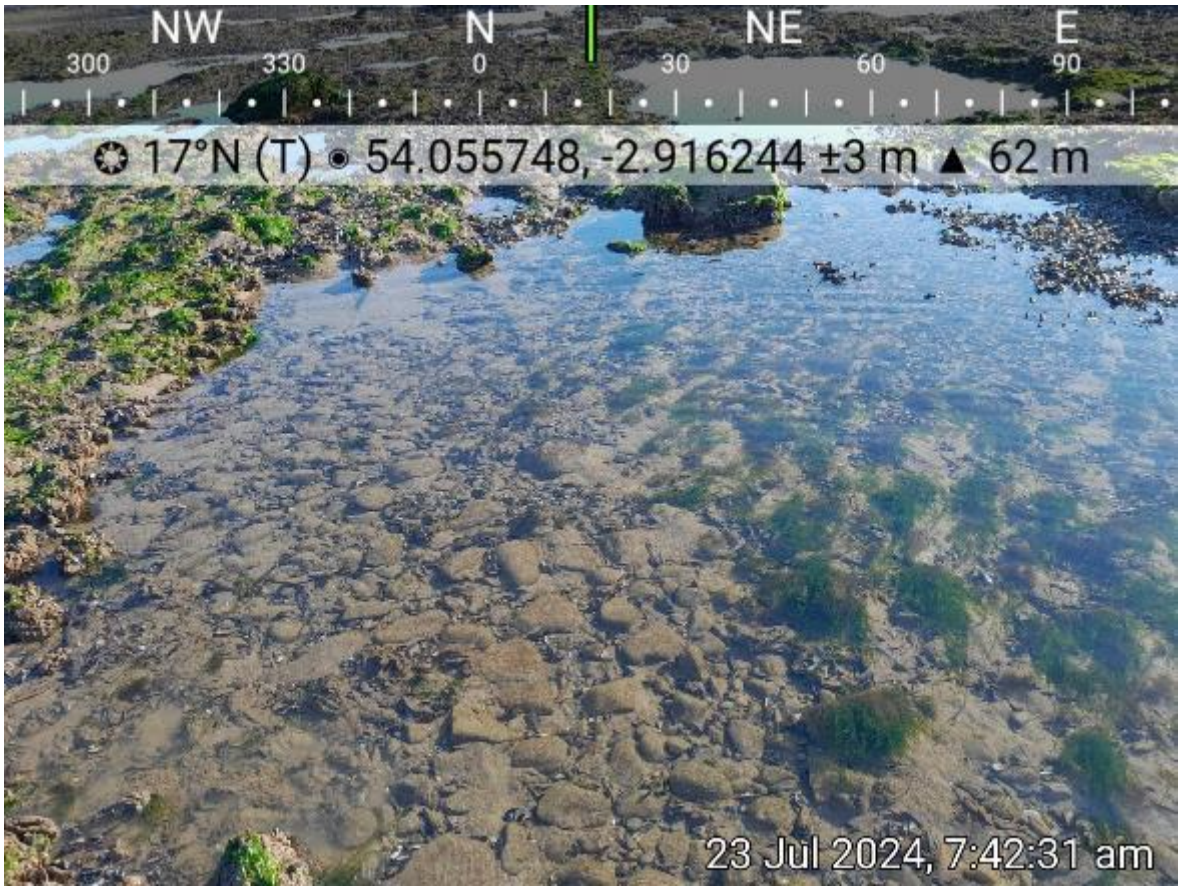


Figure 9. Dense patch of mussel on Heysham Flat 23-07-24.

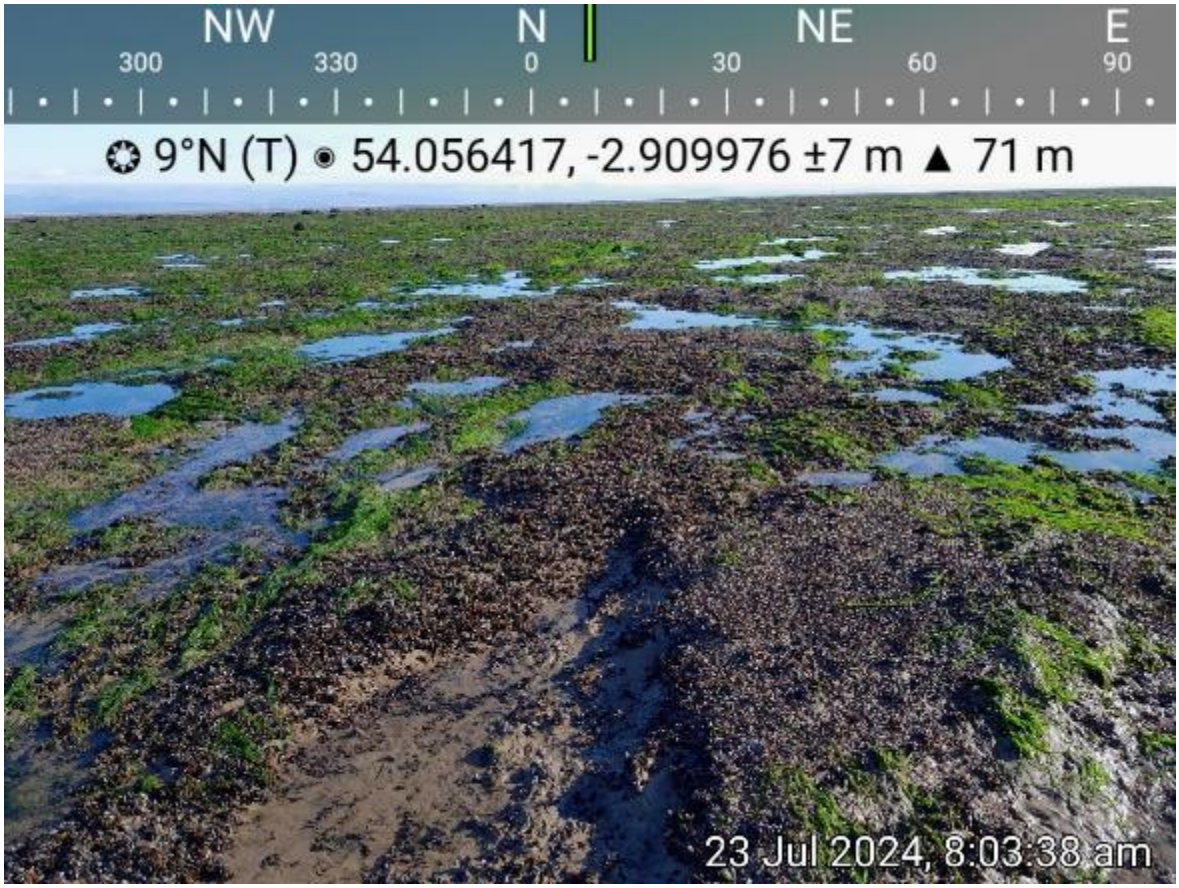


Figure 10. 40mm and 20mm mussel alongside each other on the bed 23-07-24.

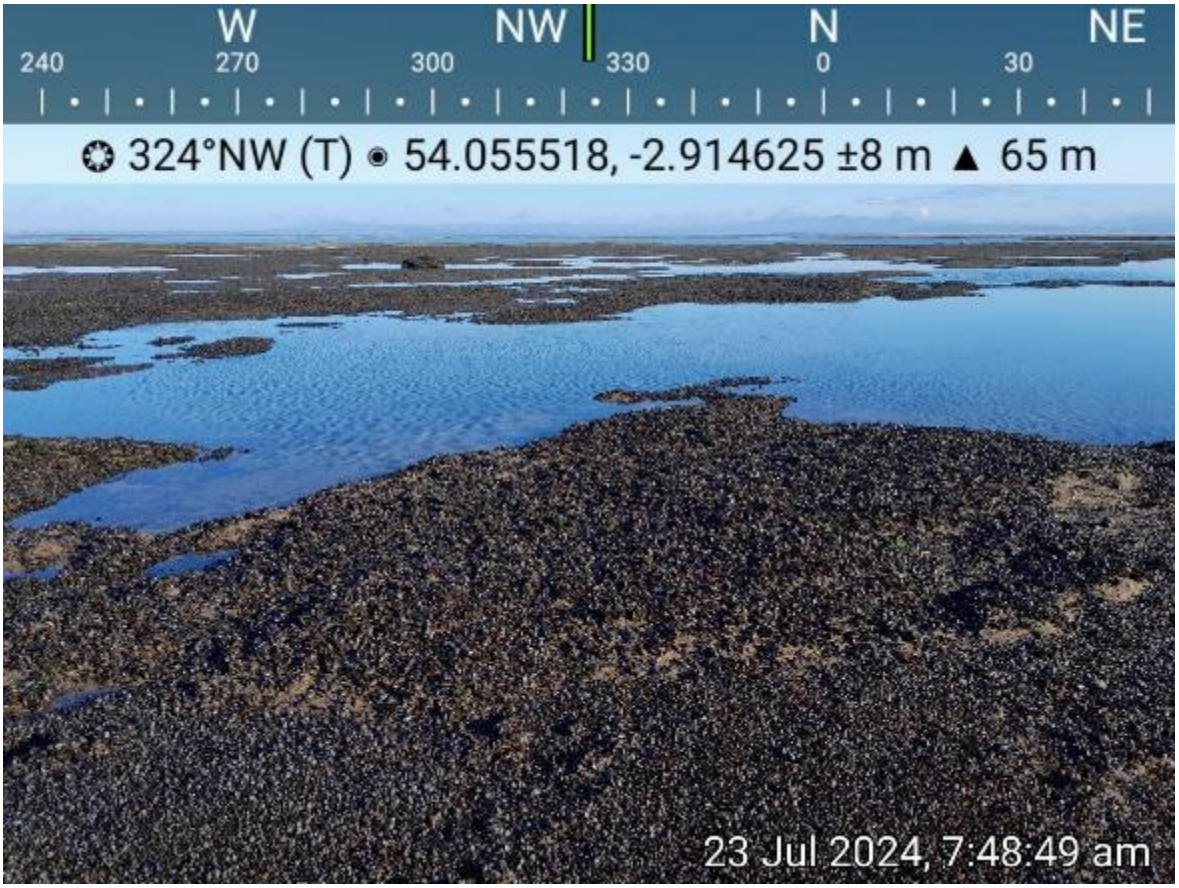


Figure 11. Green algae covering 20-25mm mussel 23-07-24.

Figure 12. Green Algae covering 20mm mussel 23-07-24.

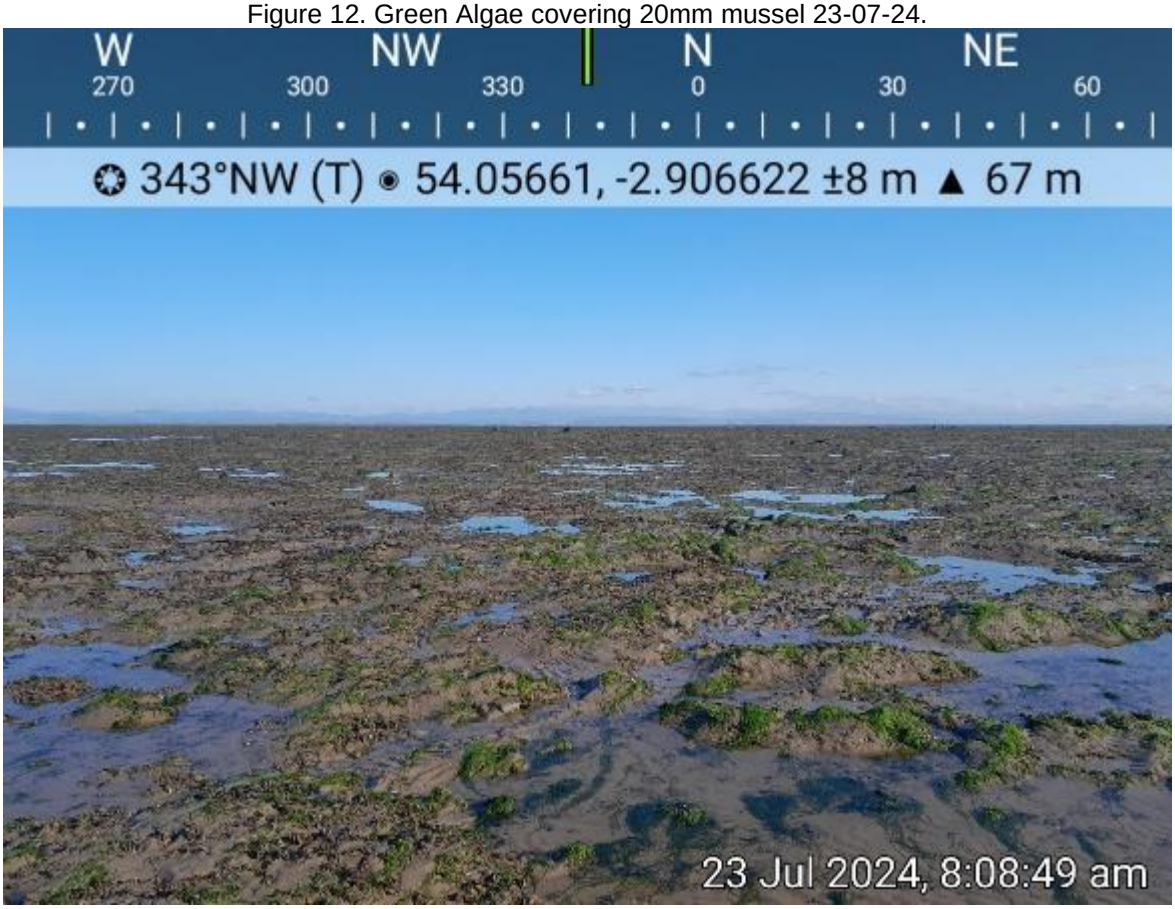


Figure 13. Patchier coverage of mussel on shorewards end of skear 23-07-24.

Wyre End Mussel Inspection 06-06-23

Officers present: JH, MC, LL

Tides: LW 05:55 (1.4m) (Liverpool tides)

An inspection of Wyre End and channel areas of mussel was completed. The area of the main skear was mapped to determine the area shown in Figure 1. Patches of mussel on the channel edge present in the previous years survey had been scoured away leaving patches of mussel mud and very low seed coverage. The area of these patches were not mapped as there was no significant mussel present.

There has been a 2024 settlement of seed mussel, varying in density across the main skear. An area of raised pebble was observed along the eastern edge with none or very low density of seed (figure 2). Seed coverage ranged from 10% - 80% (figures 3, 4, and 5). At the northern end of the bed some 25-30mm mussel was observed, this area also had algae present (figure 6). Small patches of size mussel were observed along the western edge of the bed (figure 7). The extent of these patches could not be estimated due to tide restraints.

Eiders and gulls were present on the bed.

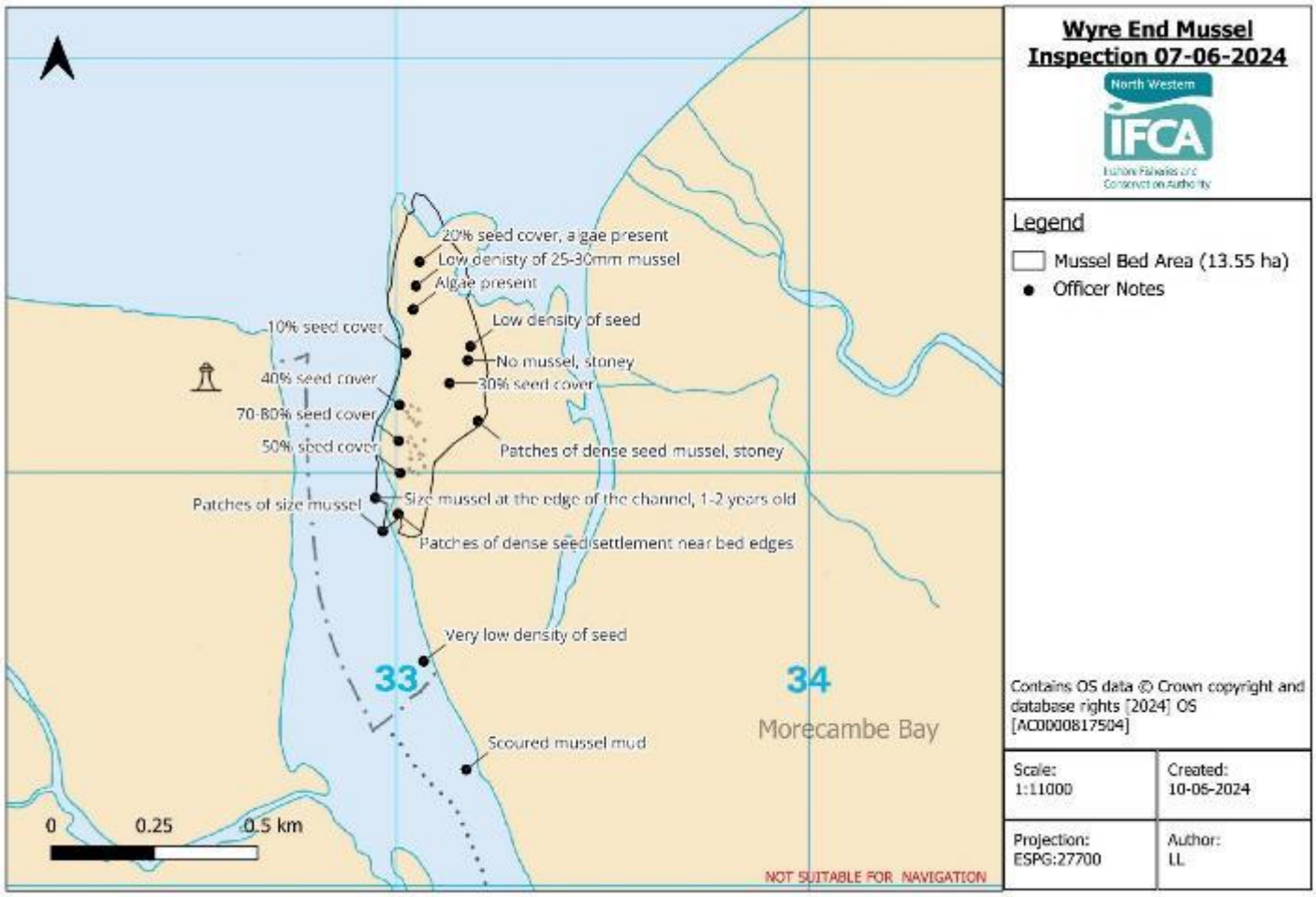


Figure 1: Approximate Wyre End bed area boundary and officer notes 07-06-2024

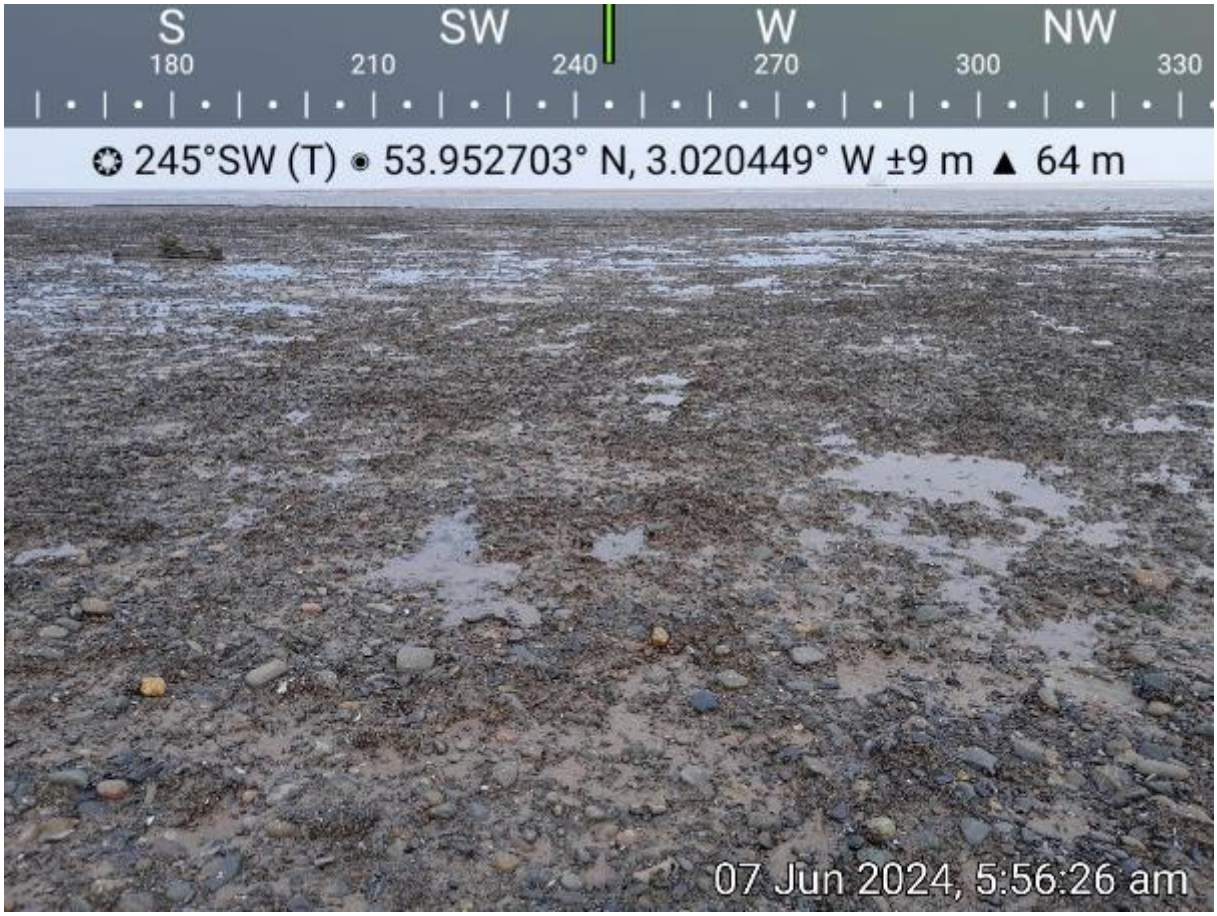


Figure 2: Raised area of pebble

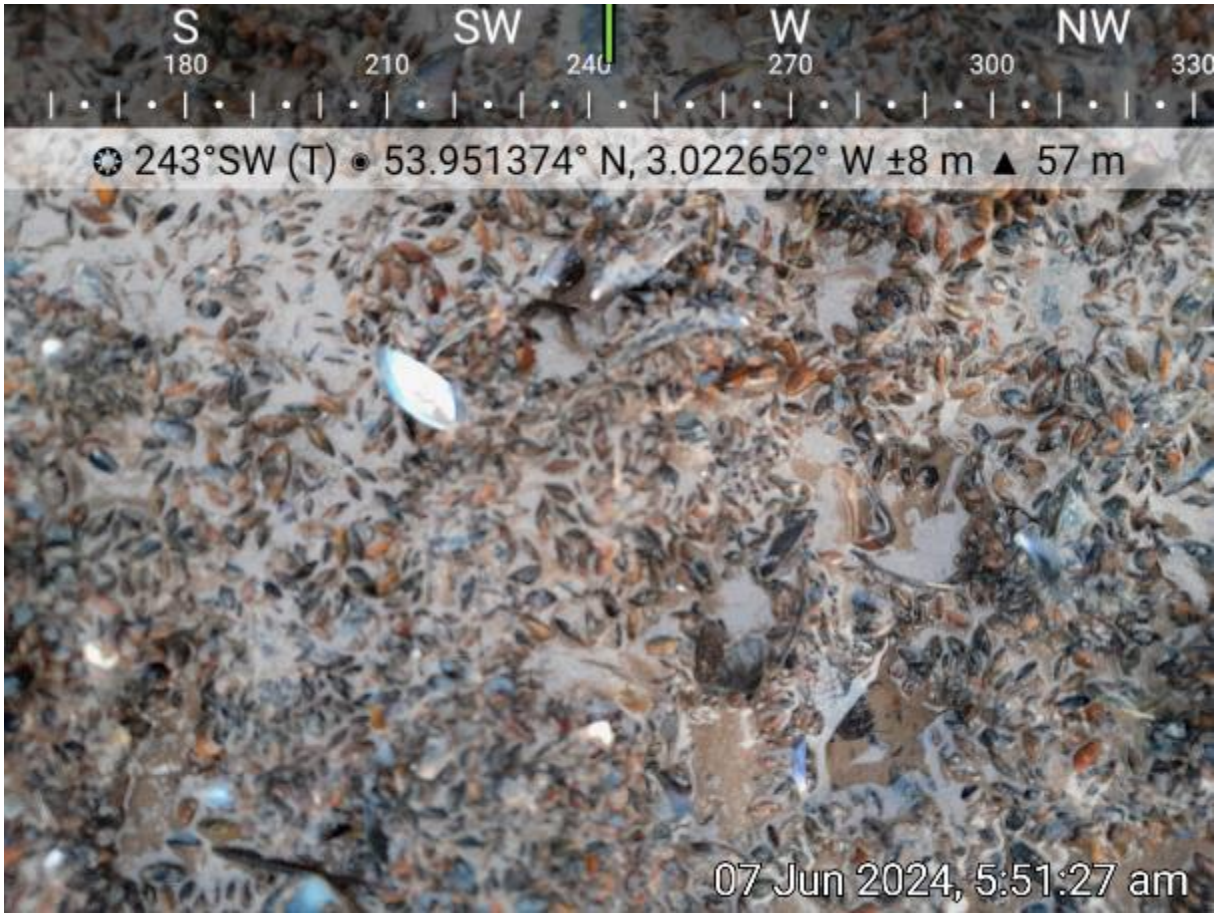


Figure 3: Dense seed settlement

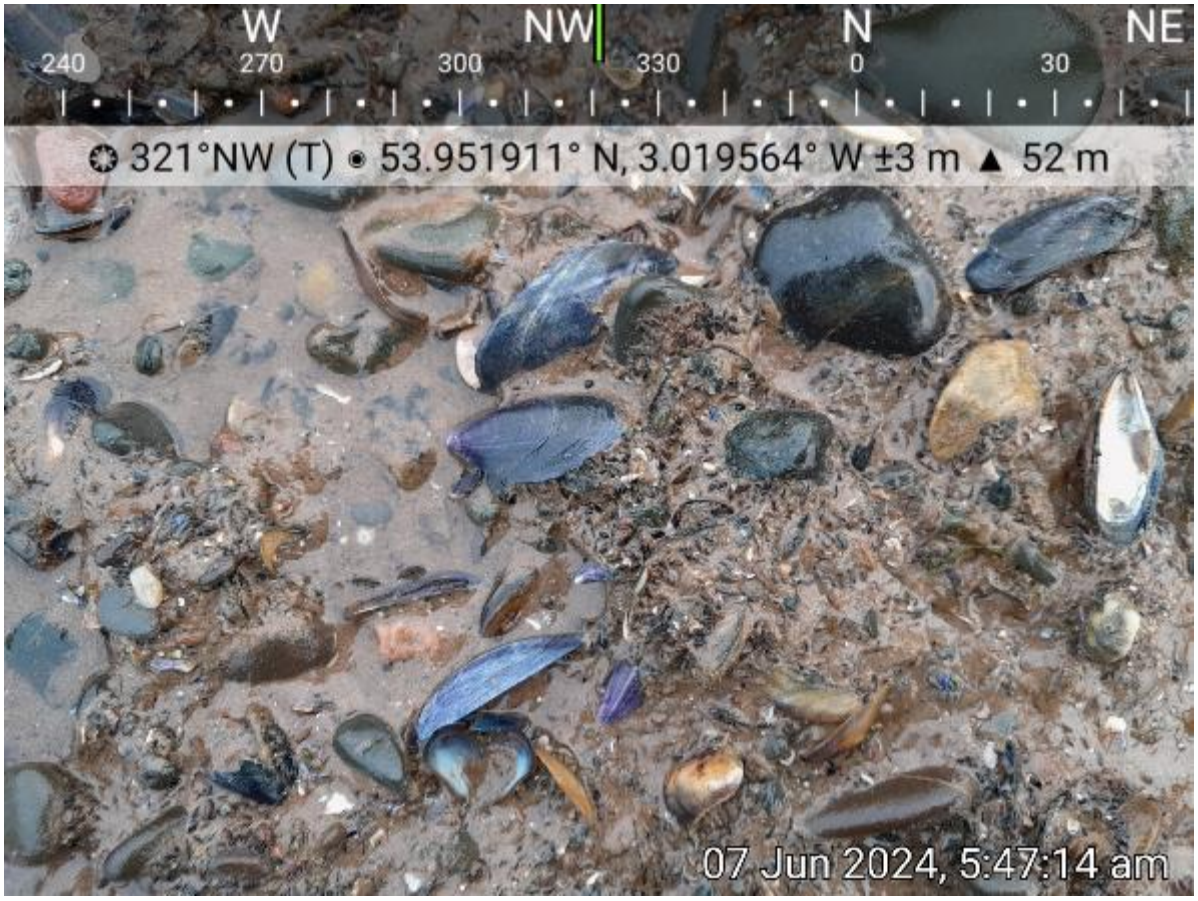


Figure 4: Low seed settlement within the stoney area

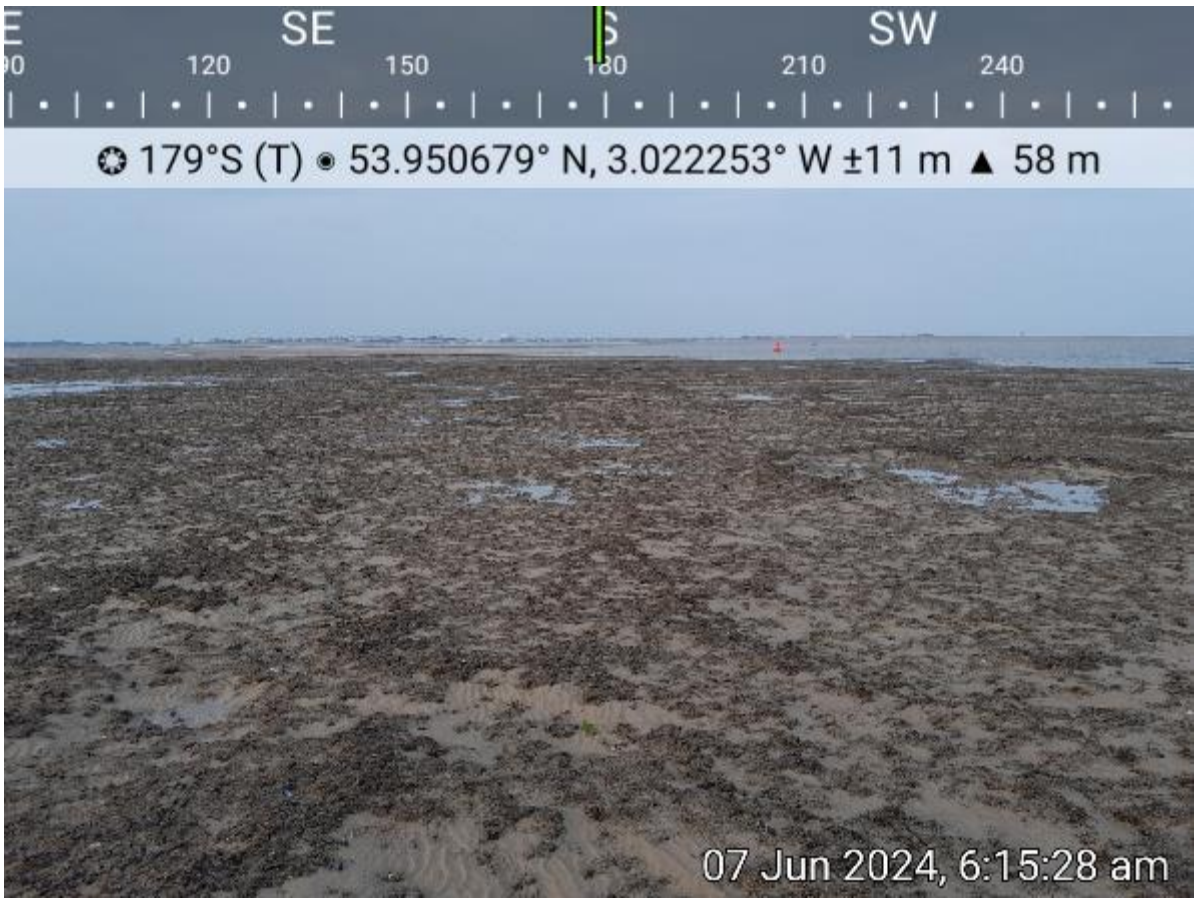


Figure 5: Patches of dense seed mussel settlement

Figure 6: Patches of 25-30mm mussel with algae

Figure 7: Patches of size mussel on the edge of the bed

Fleetwood Mussel Inspection 26-06-24

Officers: JH, GG

LW: 09:39 1.6m (Liverpool Tides)

The Fleetwood mussel beds were inspected starting at Rossall Scar, then proceeding to Neckings, Kings and finishing on Perch and Black Scar as shown in Figure 1.

Rossall Scar

The mussel on Rossall Scar was patchy and interspersed with cobble and small patches of live *Sabellaria alveolata* (Figure 2 & 3). There was a mix in size, and some mussels were heavily barnacled (Figure 4). The full extent of the mussel was not mapped due to inspecting Rossall Scar first to ensure Perch and Black Scar were inspected at low water.

Neckings Scar

As officers are restricted on tide this year access to Neckings Scar was not possible for an inspection, due to depth of water and timings.

Kings Scar

The mussel on Kings Scar was patchy and varied across the bed in density, with some dense areas, and evidence of a 2024 settlement. There were patches of larger mussel measuring 30mm (Figure 5) mixed in with smaller seed (Figure 6). Seed mussel was smothered by green algae (Figure 7 & 8). There were areas of bare cobble with no mussel settlement. The approximate area of the mussel bed was 4.32ha. Kings Scar has a number of structures such as wrecks which have larger mussel which has persisted through the winter. There was a smaller patch of mussel south of the main bed, covering an approximate area of 0.43ha. The mussel was mixed in with areas of cobble and green algae, and ranged in size from 8mm to 30mm (Figure 9).

Perch Scar

Mussel mud covered the main extent of the Northern area with very sparse settlement. The mussel mud was thick and had remained from the 2023 settlement (Figure 10). There was no exposed cobble or bare substrate. The Southern area had a 2024 mussel settlement covering approximately 40-50%. The mussel was approximately 8-10mm in size (Figure 11).

Black Scar

Black Scar has a 2024 settlement of approximately 70% coverage (Figure 12). The mussel was 6-8mm (Figure 13). There was a band of thick mussel mud which had not received a settlement and a strip of bare cobble on the channel edge. The approximate area of the mussel was 2.4ha.

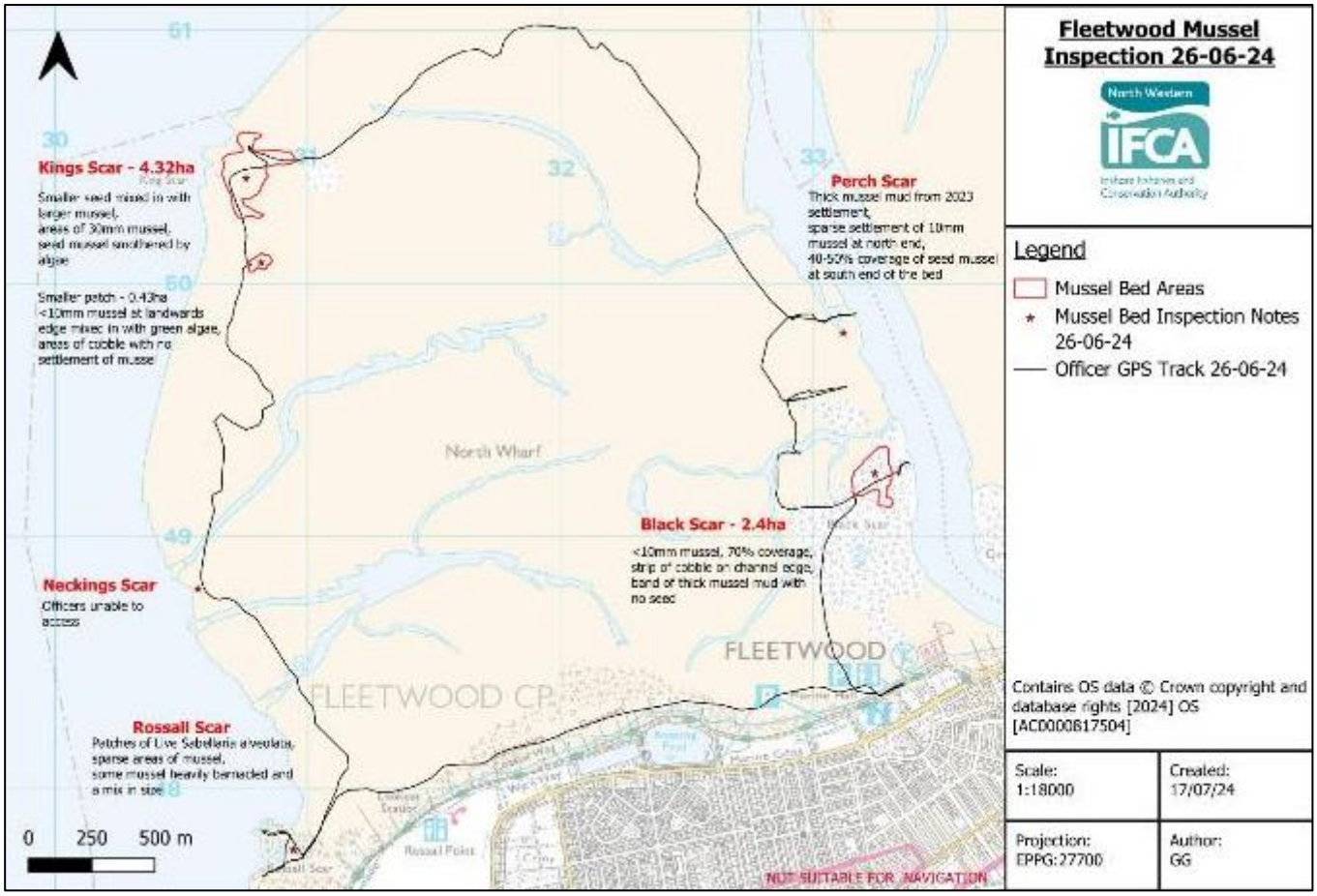


Figure 1. Overview of the mussel inspection 26-06-24.

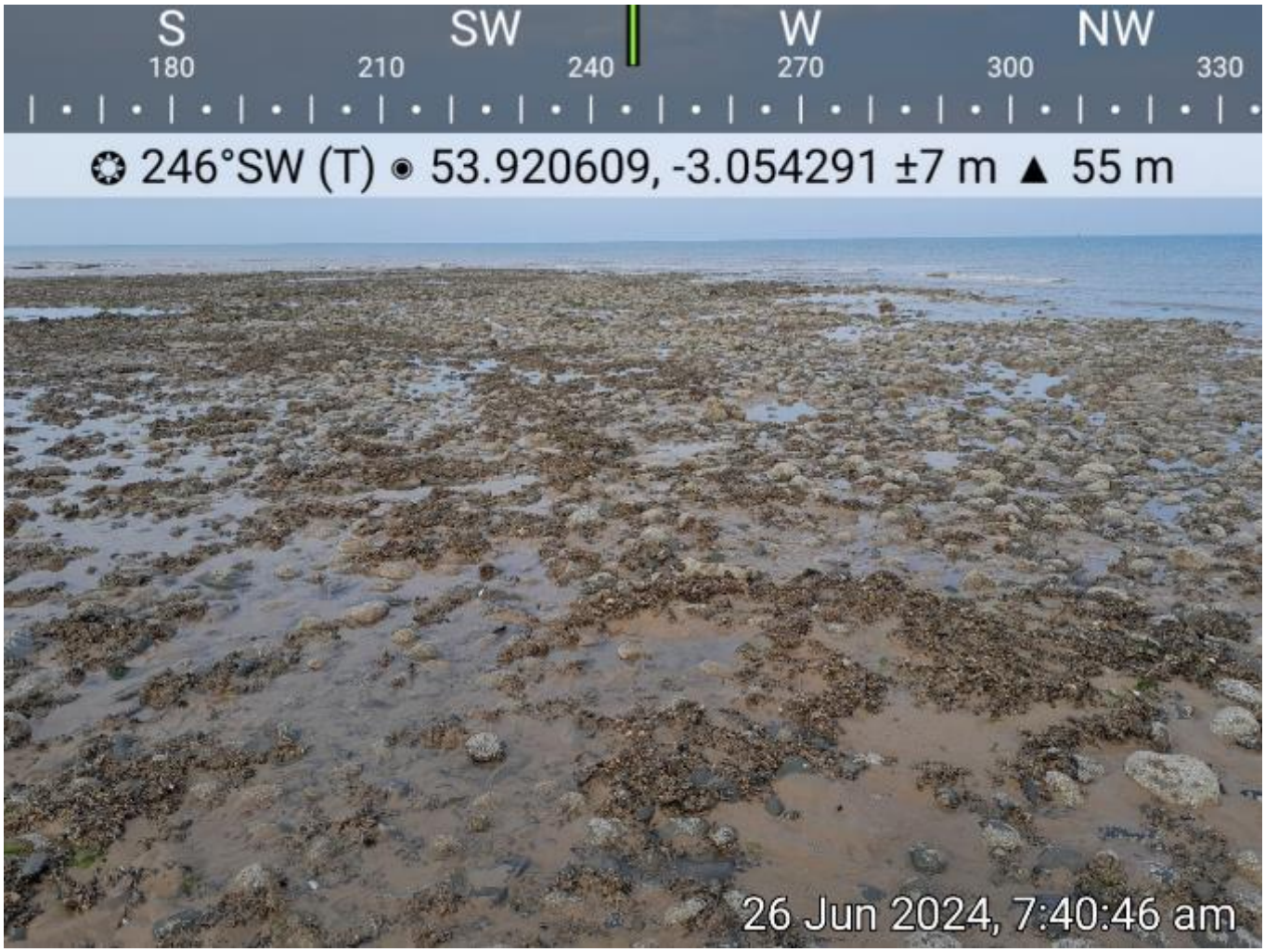


Figure 2. Rossall Scar mussel interspersed with cobble 26-06-24.

Figure 3. Live *Sabellaria alveolata* on Rossall Scar 26-06-24.

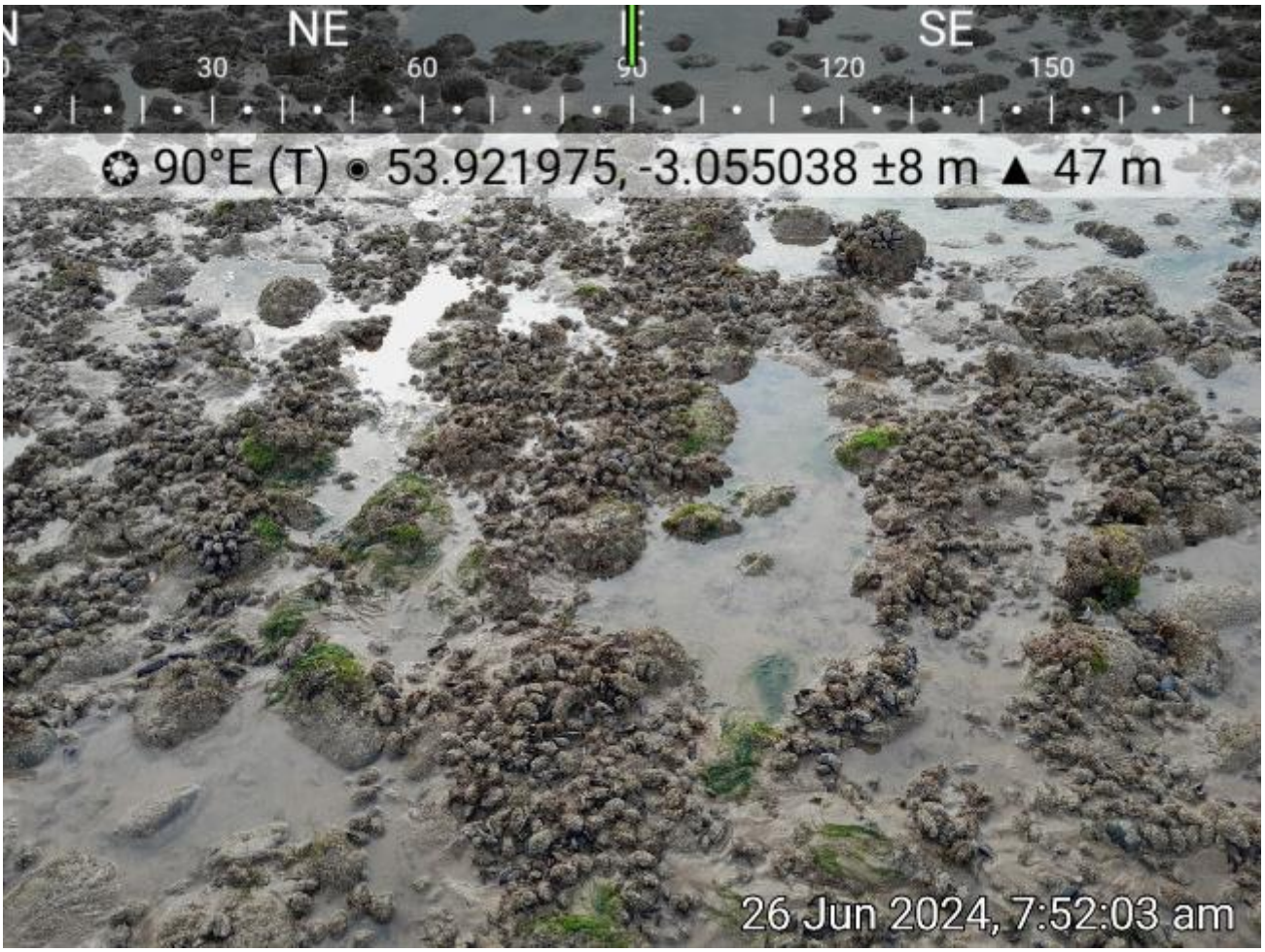


Figure 4. Barnacled mussel on Rossall Scar 26-06-24.

Figure 5. Kings Scar – 30mm mussel 26-06-24.

Figure 6. 2024 mussel on Kings Scar 26-06-24.

Figure 7. Green algae covering seed mussel on Kings Scar 26-06-24.

Figure 8. Green algae covering Kings Scar mussel bed 26-06-24.

Figure 9. Kings Scar - mussel interspersed with cobble and green algae 26-06-24.

Figure 10. Thick mussel mud on Perch Scar 26-06-24.

Figure 11. Perch Scar 2024 mussel settlement 26-06-24.

Figure 12. Black Scar 2024 mussel settlement 26-06-24.

Figure 13. Black Scar 2024 mussel settlement 26-06-24.

South America Mussel Inspection (Boat) 24-07-24

LW: 08:46 1.0m (Liverpool tides)

An inspection of South America was completed to assess the condition of the mussel on the bed, officers had not been able to access the area due to channels changing and the lack of big spring tides with daylight hours since Autumn 2023. Access to the bed was drying a boat out on the bed at low water. Officers got approximately one hour of access.

Figure 1 shows officer tracks (grey), the estimated area of mussel (blue) and the geolocations of the photographic evidence provided below.

The mussel bed can be split into two areas, the main bed which has been present for several years (Figures 2 to 13) and the area of newly exposed stony substrate which received a 2023 settlement (Figures 14 to 20). There is a raised bank consisting of mainly of shell debris and stone (Figures 21 and 22), which did not have any live mussel on it. Figures 23 to 25 are aerial images taken for a drone of each area.

Bed area 1 consisted primarily of size mussel (50mm+) mixed with seed across the extent of the bed. Areas towards the centre had denser mussel between 40-50% coverage of size mussel with some seed mixed in. The mussel was predominantly over sand, with little cobble exposure. Towards the lower portion of the bed, more seed mussel coverage was observed, but was still highly mixed with size and no discrete patches of mainly uniform seed identified. Size mussel was typically clean and greater than 45mm.

The southern extent of bed area 2, consisted predominantly of size mussel 45-60mm on a sandy substrate at a density of 40-50%, with the area of highest density (60-70%) mussel on the southern tip of the bed. From the centre of the bed moving North the mussel is smaller, 30-40mm, reduces in density (20-40%) with more exposed cobble and a thinner layer of sand.

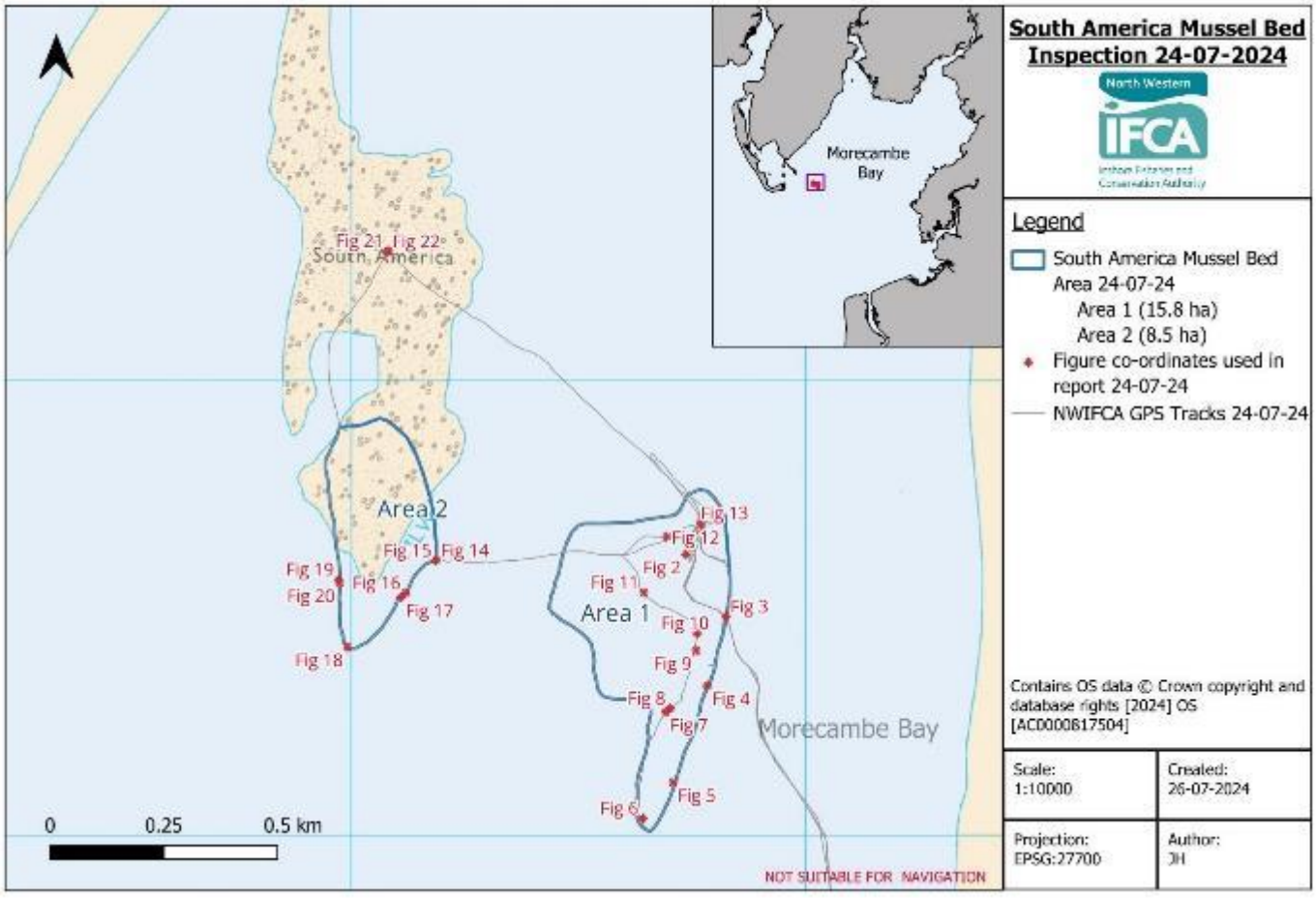


Figure 1. The extent of the South America mussel bed in Morecambe bay, and the geolocations of survey photos.

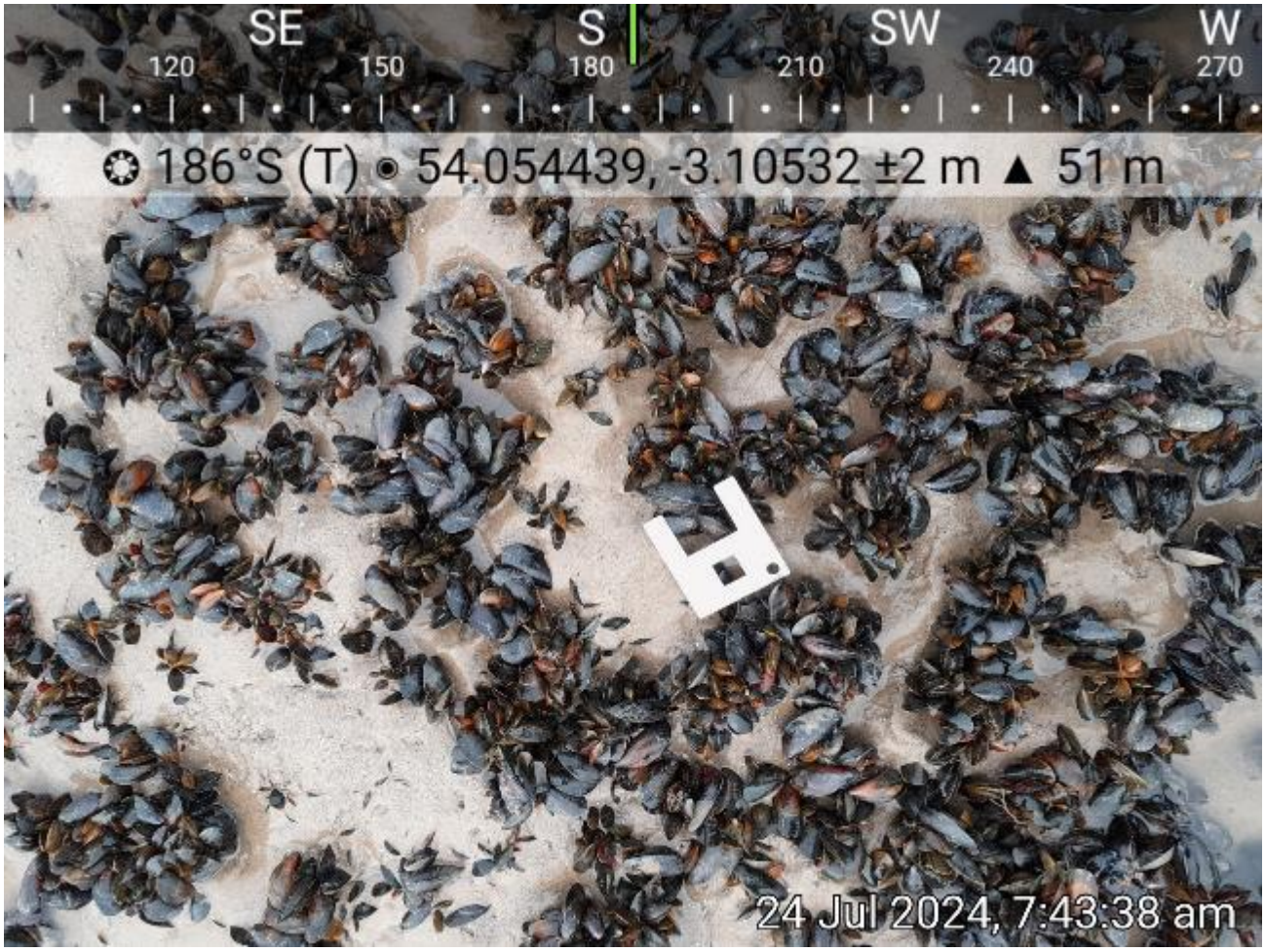


Figure 2. Size and seed mussel mix 24-07-24

Figure 3. Sparse, patchy size mussel and sand 24-07-24

Figure 4. Seed and size musel over sand, 30% coverage 24-07-24

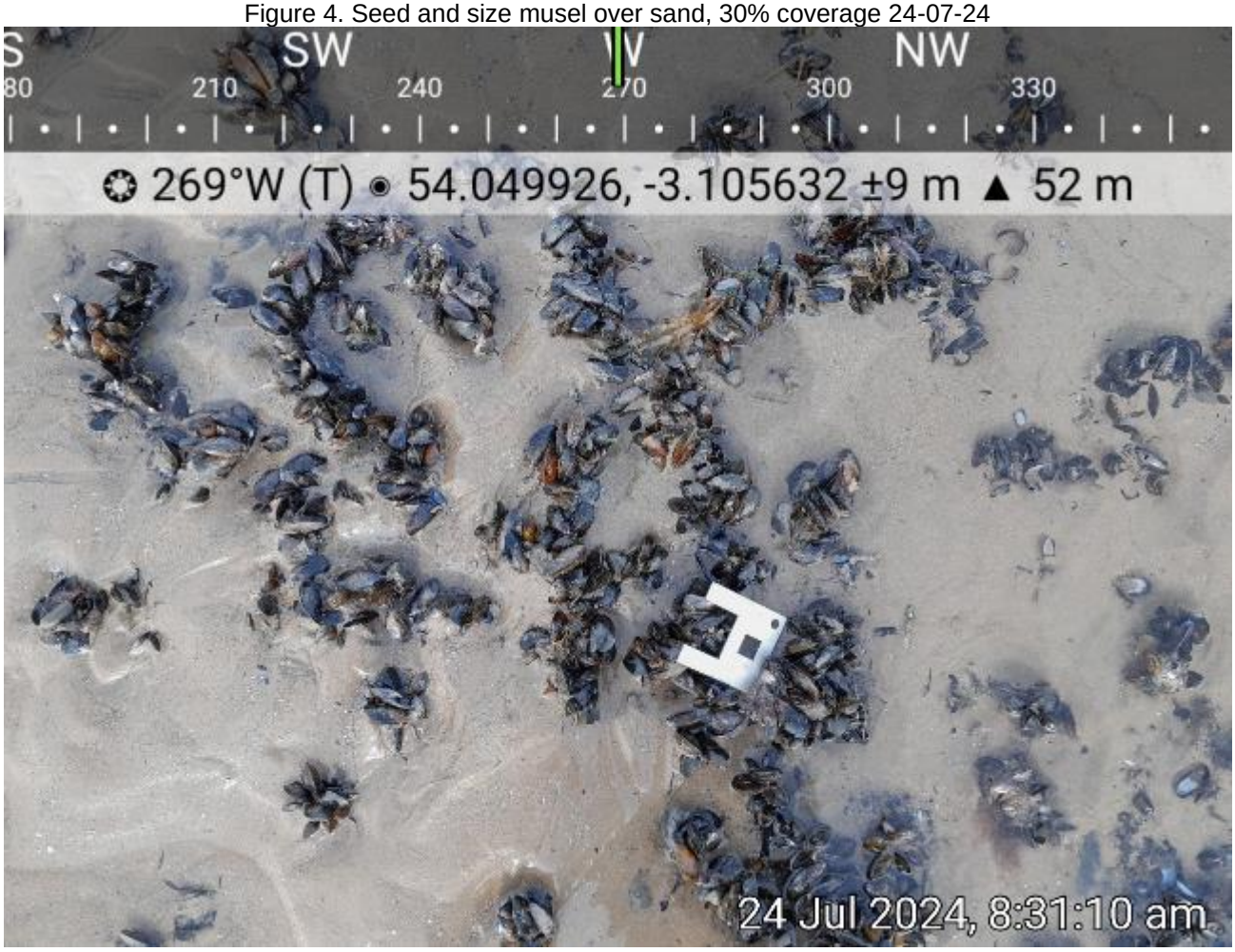


Figure 5. Patchy size mussel near the end of the bed area 1 24-07-24

Figure 6. Size mussel over sand 24-07-24

Figure 7. Mix of size and seed areas towards the central part of the bed area 1 24-07-24

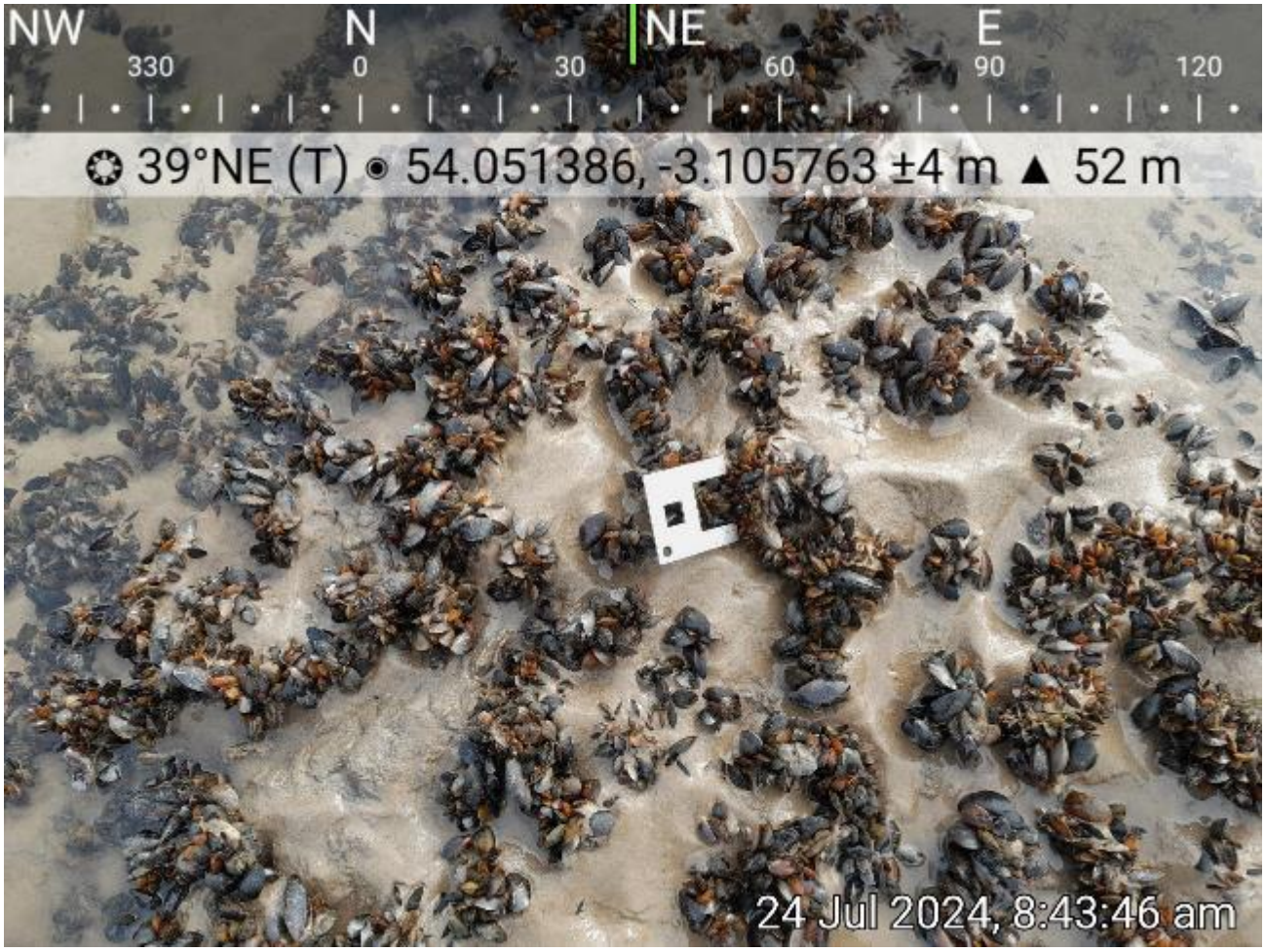


Figure 8. Mix of seed and size mussel on sand 24-07-24

Figure 9. Low hillocks of mussel in the central part of bed and bare sand 24-07-24

Figure 10. Cobble exposure 24-07-24.

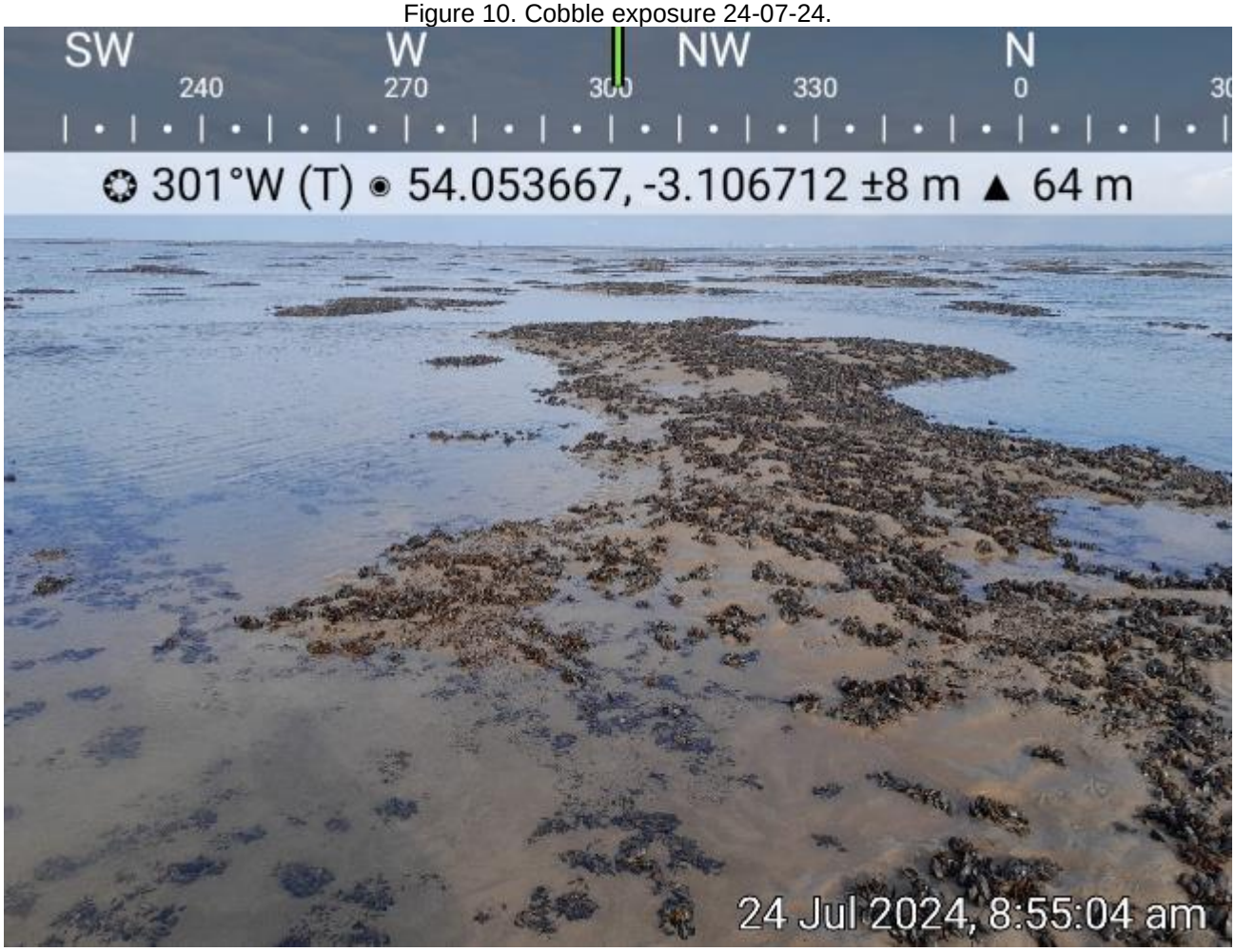


Figure 11. Patches of size mussel 24-07-24.

Figure 12. Size mussel 50mm+ 24-07-24.

Figure 13. Sparse size mussel coverage towards the top of the historical bed area 1 24-07-24

Figure 14. Size mussel 45-60mm 24-07-24

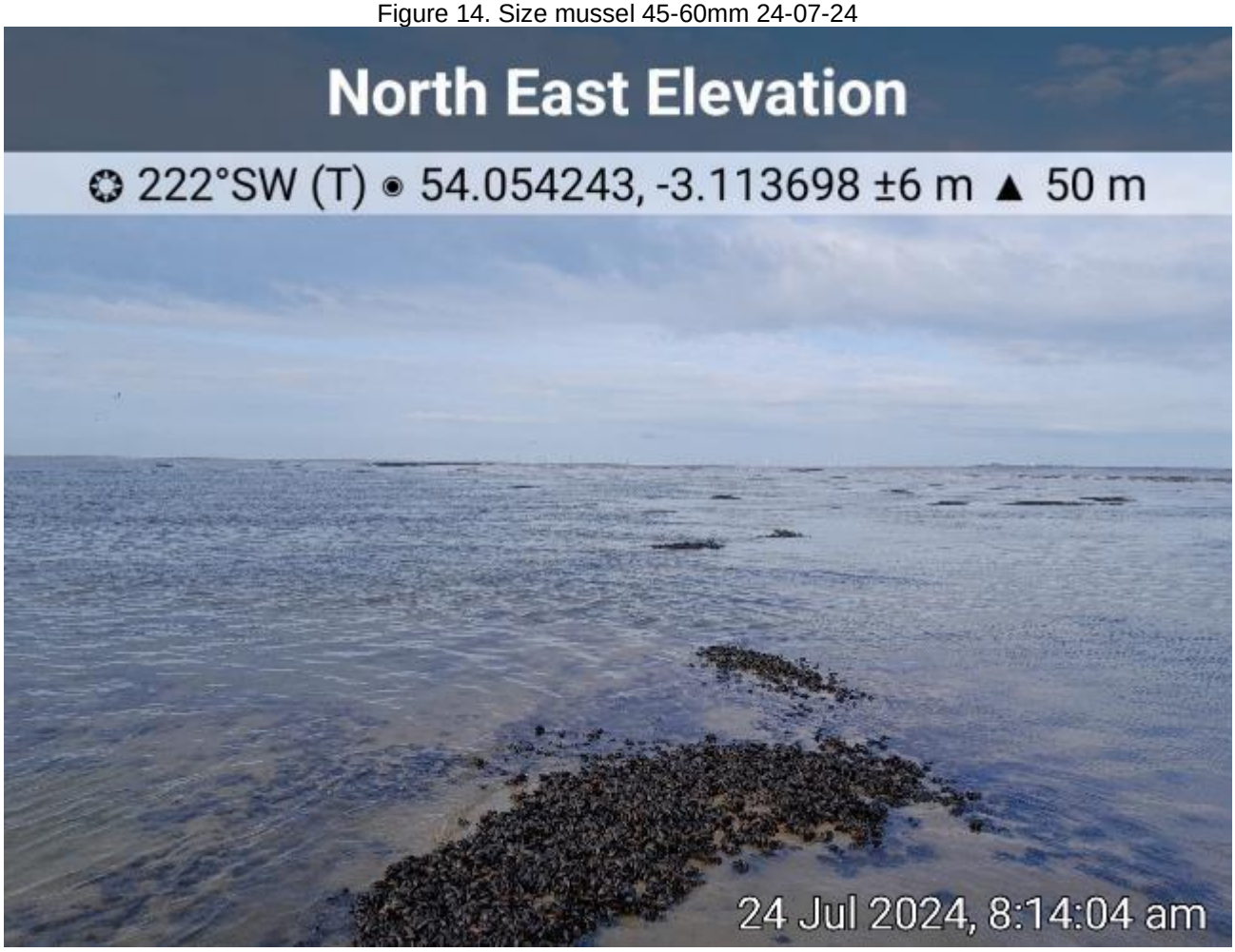


Figure 15. Patches of size mussel on a sandy substrate 24-07-24

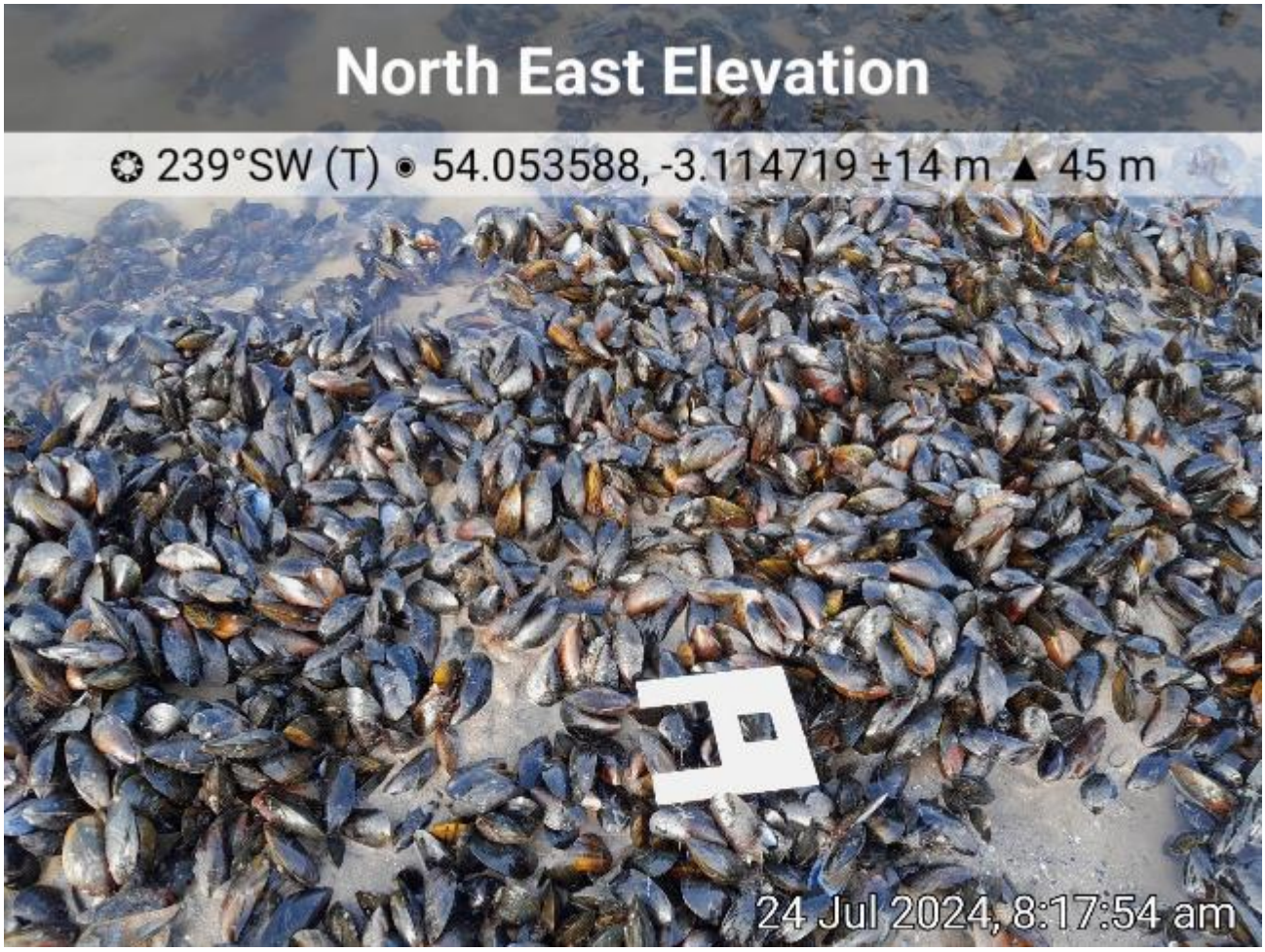


Figure 16. 40-60mm mussel on a sandy substrate 24-07-24

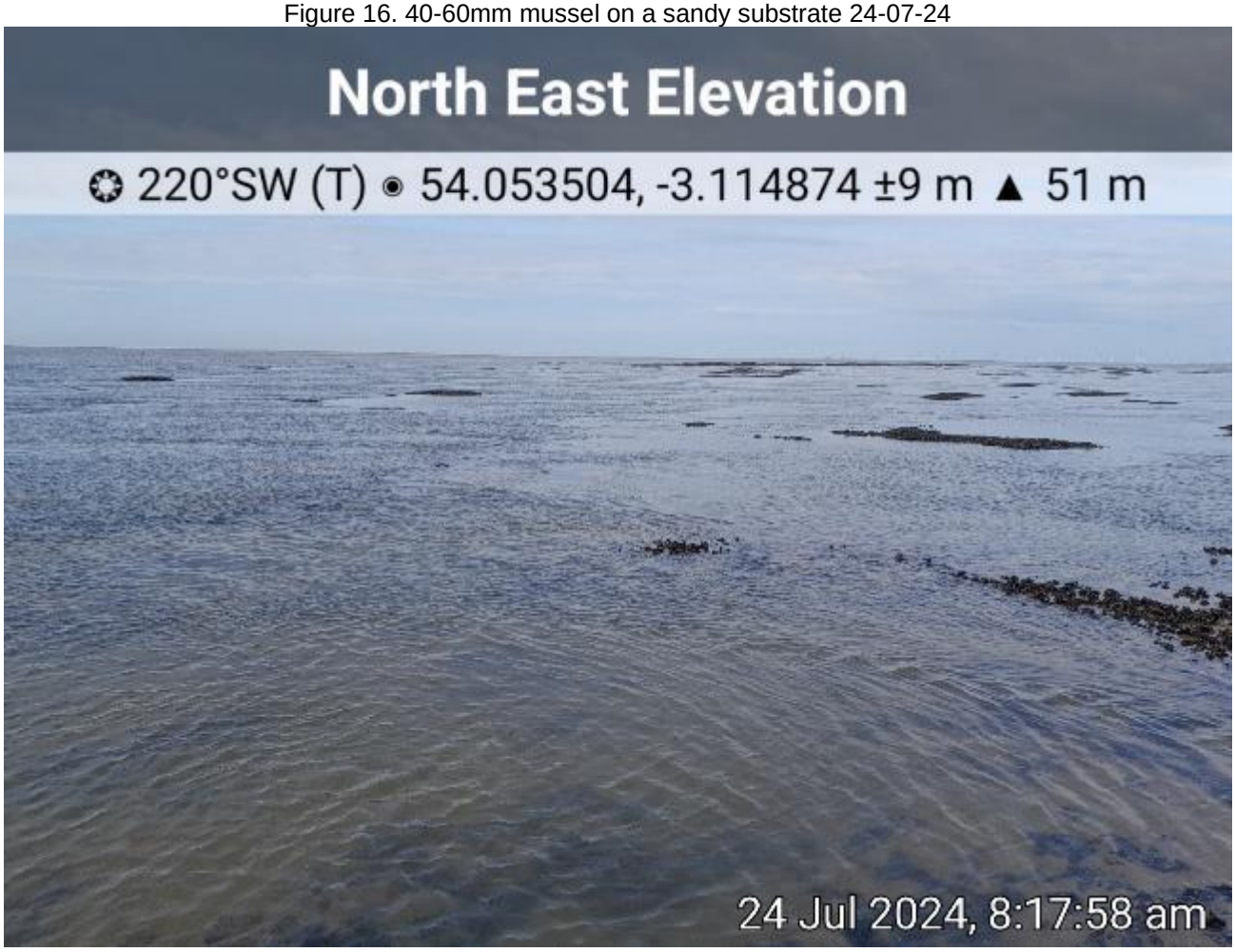


Figure 17. Patches of size mussel on a sandy substrate 24-07-24

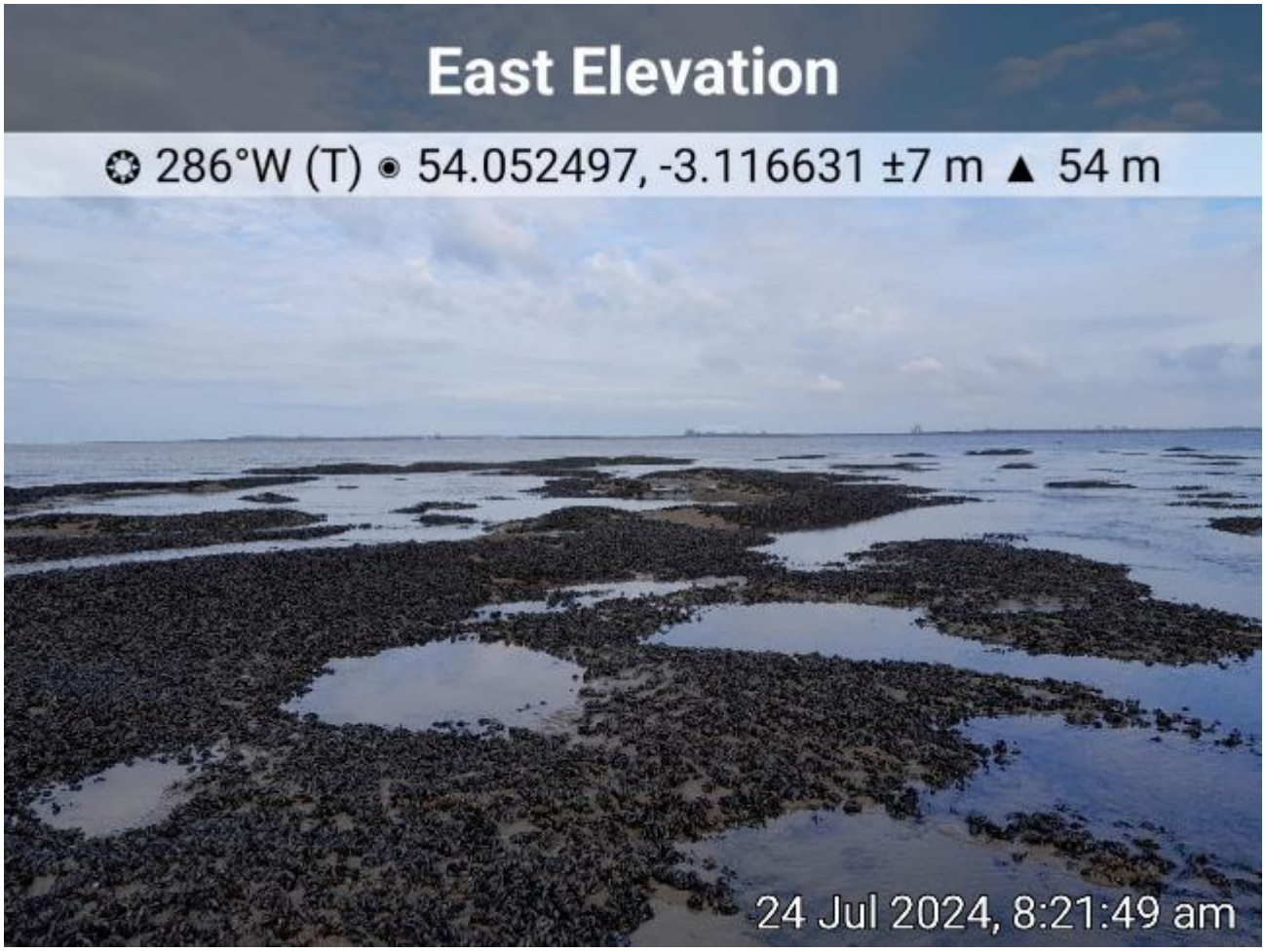


Figure 18. Raised area of denser 45-60mm mussel 24-07-24

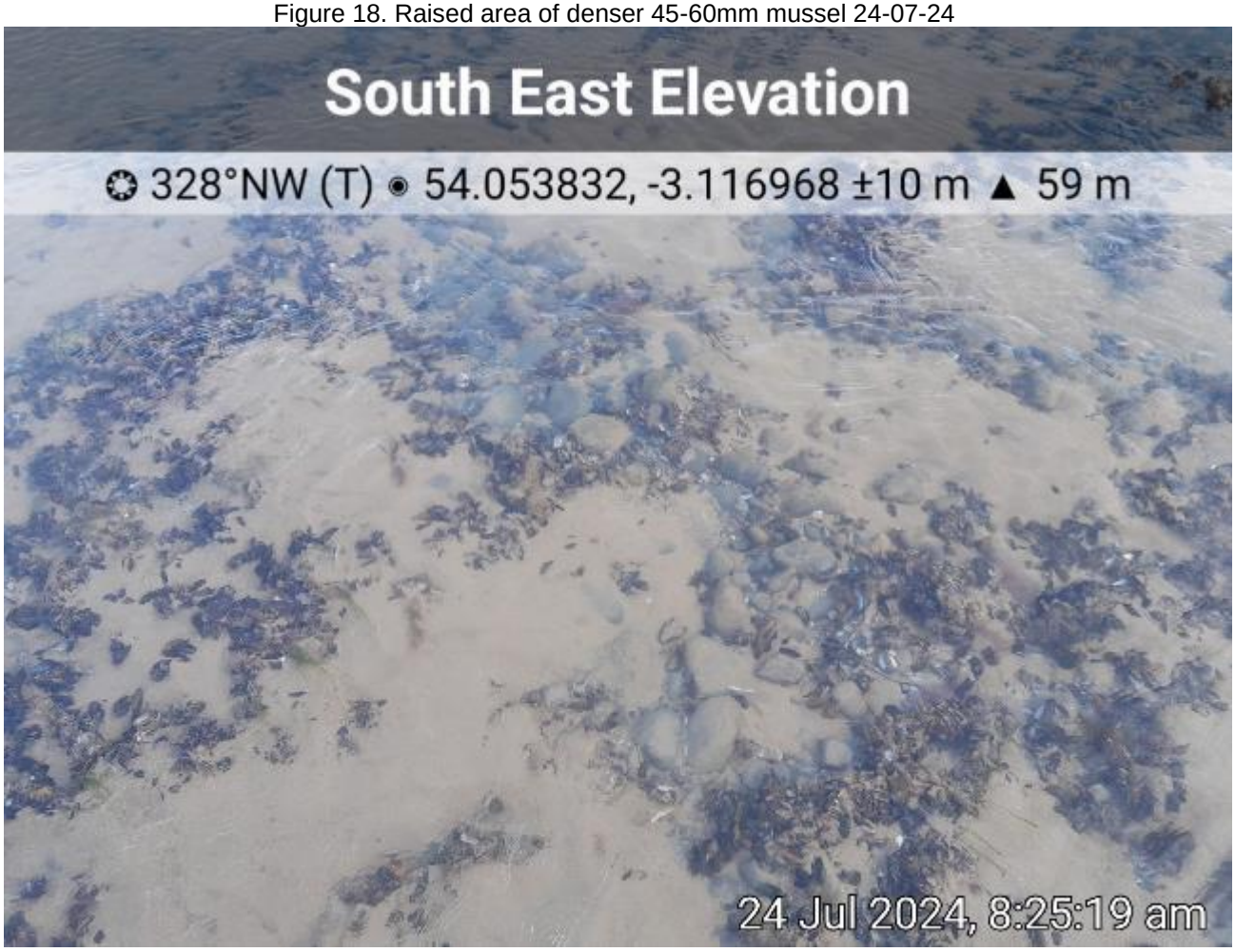


Figure 19. Exposed stoney substrate, 30-40mm mussel on thin sediment veneer 24-07-24

Figure 20. Mussel thinning out with more exposed stoney substrate, 30-40mm mussel 24-07-24

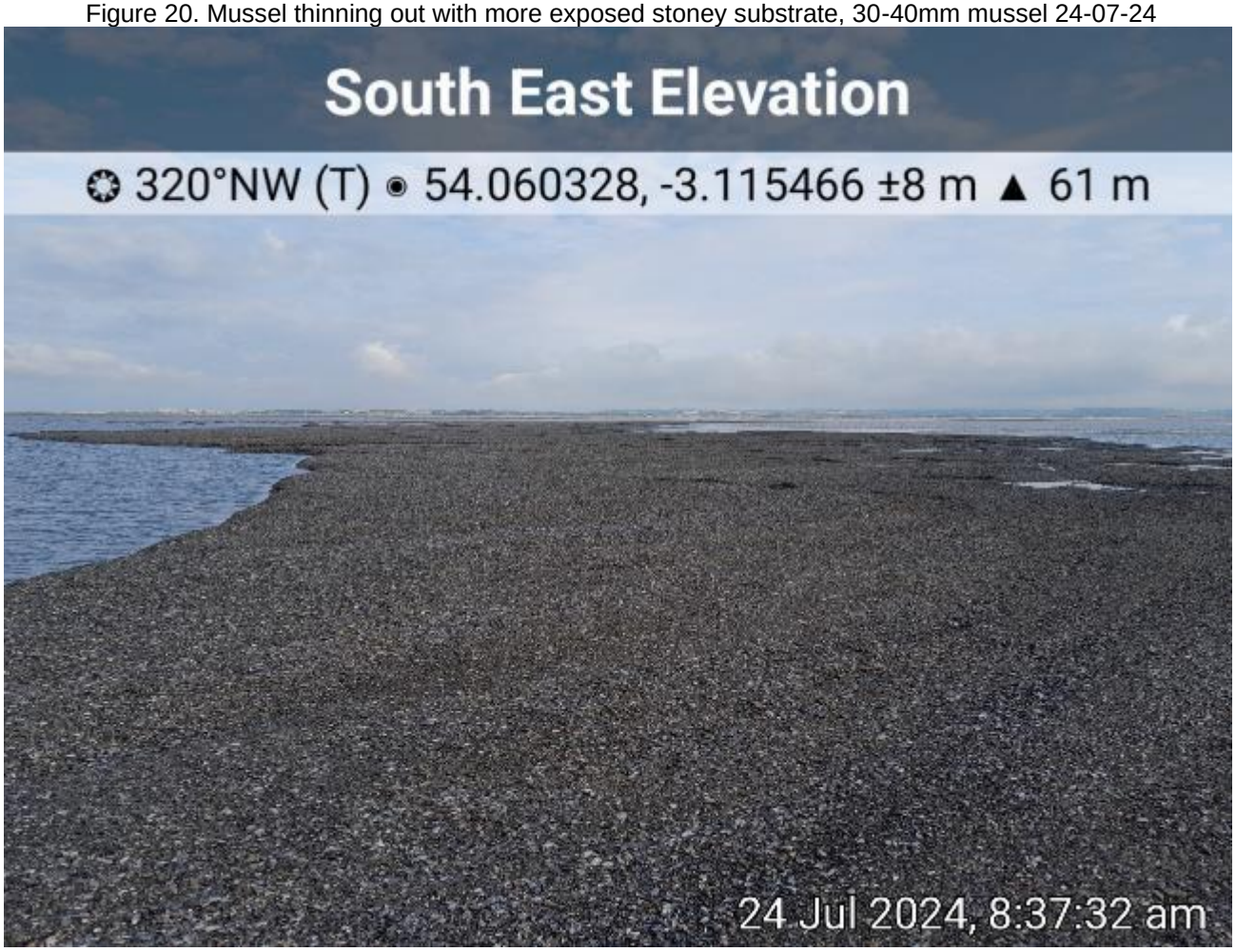


Figure 21. Raised bank consisting mainly of shell debris and stone 24-07-24

Figure 22. Raised bank consisting mainly of shell debris and stone 24-07-24

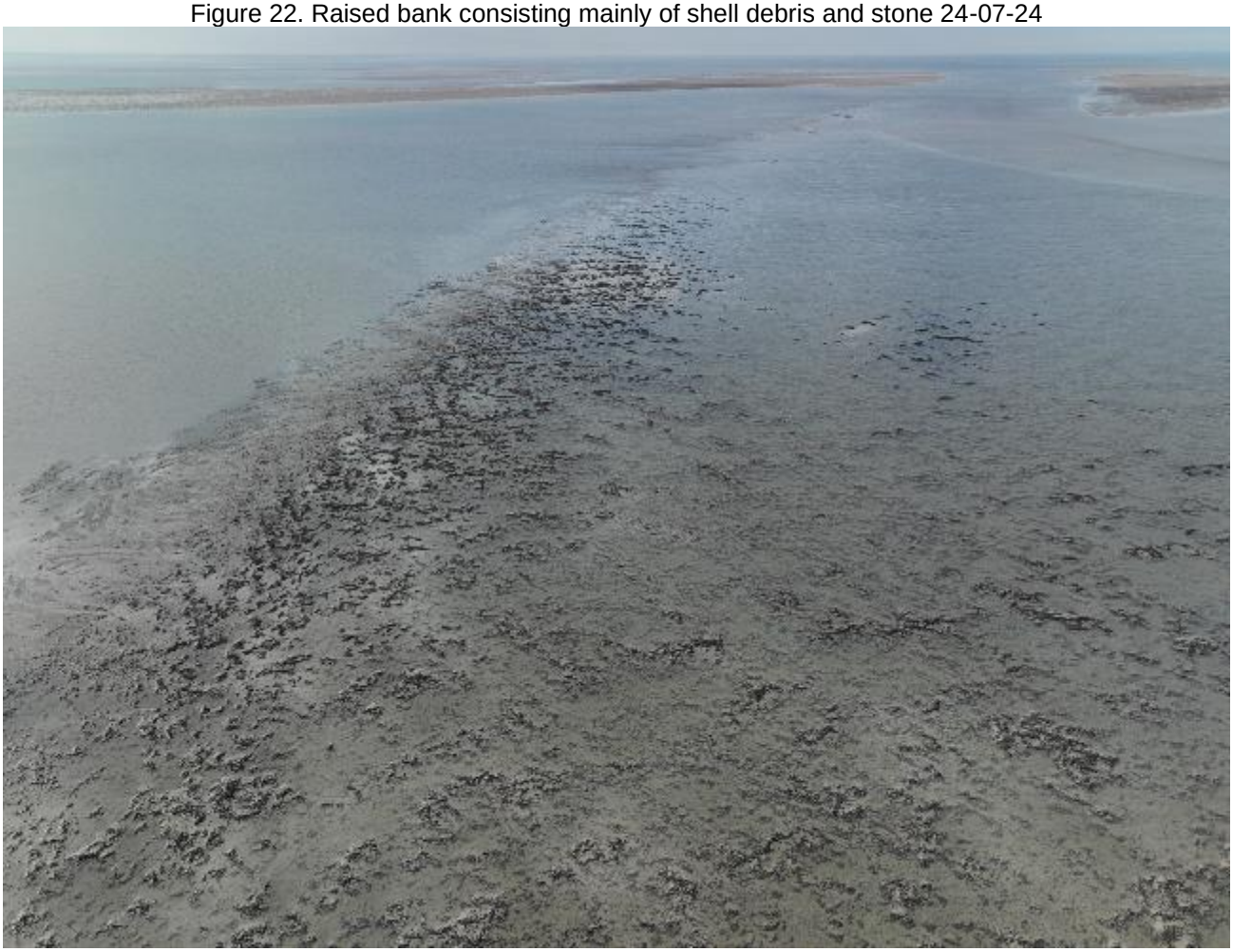


Figure 23. Drone image of the Southern extent of Area 1 24-07-24

Figure 24. Drone image of the Northern extent of Area 1 24-07-24

Figure 25. Drone image of the of Area 2 24-07-24

West Kirby Mussel Inspection 11-06-24

Officers present: GG, LL

Low Water: 09:51 2.2m (Liverpool Tides)

Officers were unable to safely walk the full perimeter of the mussel bed which in 2023 covered 6.8 hectares. The bed area appeared similar in size to the previous year apart from one section where the perimeter was slightly smaller. Figure 1 shows the area of the bed in 2023, the estimated bed area this year and the officer track from this survey.

The majority of the mussel was between 45-65mm (Figure 2 & 3), meaning It had remained and grown on since the previous survey. Only very occasional undersize mussel was present on the bed. No spat settlement was observed. The substrate of the bed was thick mud, over half a metre deep in areas (Figure 4). and the mussel present was partly buried in the mud and heavily barnacled (Figure 5). Bird species were seen feeding in the area including gulls and egrets.

Figure 1. Map of West Kirby mussel bed 11-06-24.

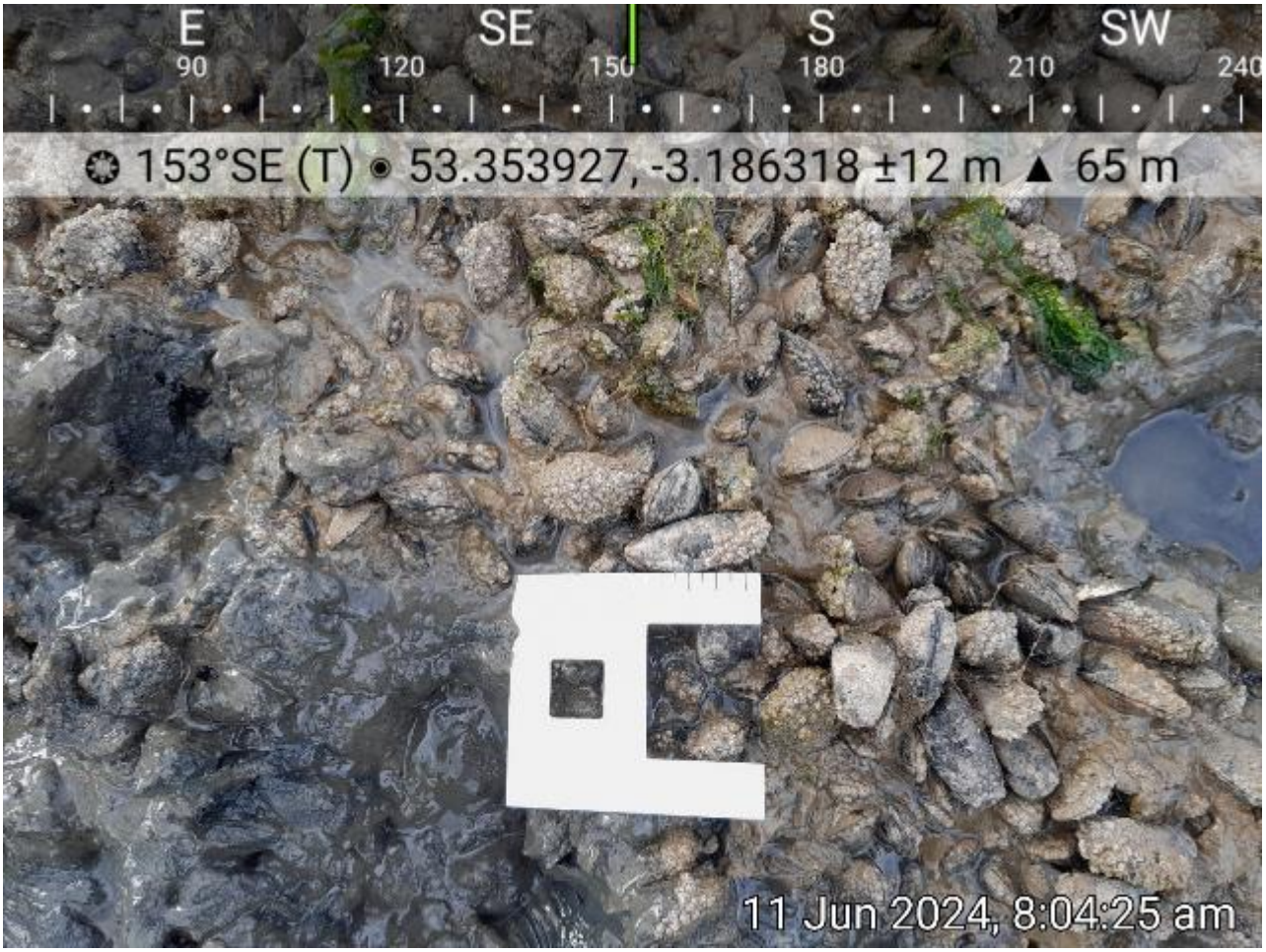


Figure 2. Mussel on West Kirby Bed 11-06-24.

Figure 3. West Kirby Mussel Bed 11-06-24

Figure 4. Mussel patch on deep mussel mud.

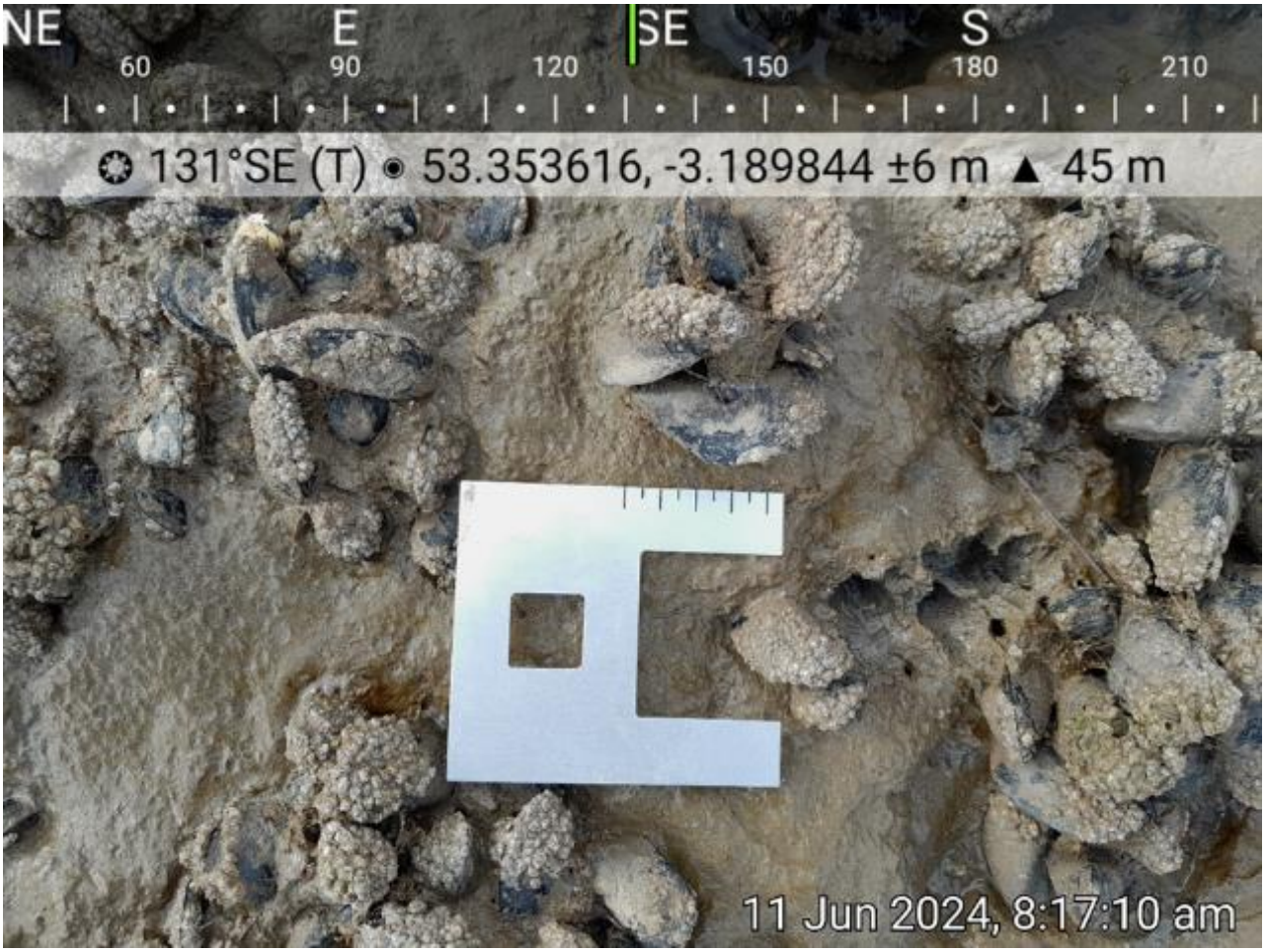


Figure 5. Barnacled mussel at West Kirby 11-06-24.

Thurstaston Mussel Inspection 11-06-24

Officers present: MC, JH

Low Water: 09:51 2.2m (Liverpool Tides)

Officers walk between two areas of mussel split by a sandy channel, due to the soft nature of the sediment, and that the low density of mussel making it hard to distinguish the edge of the bed, it was not possible to walk the full extent of the bed, and therefore only a visual estimate of the bed area has been provided in Figure 1.

From observations there has been an increase in the area of mussel with an overall decrease in the density. The coverage of mussel ranged from 5 to 25 percent coverage and was mixed in size across the bed, containing mussel from 30-65mm in length. All the mussel was heavily barnacled and there were no signs of a 2024 mussel settlement.

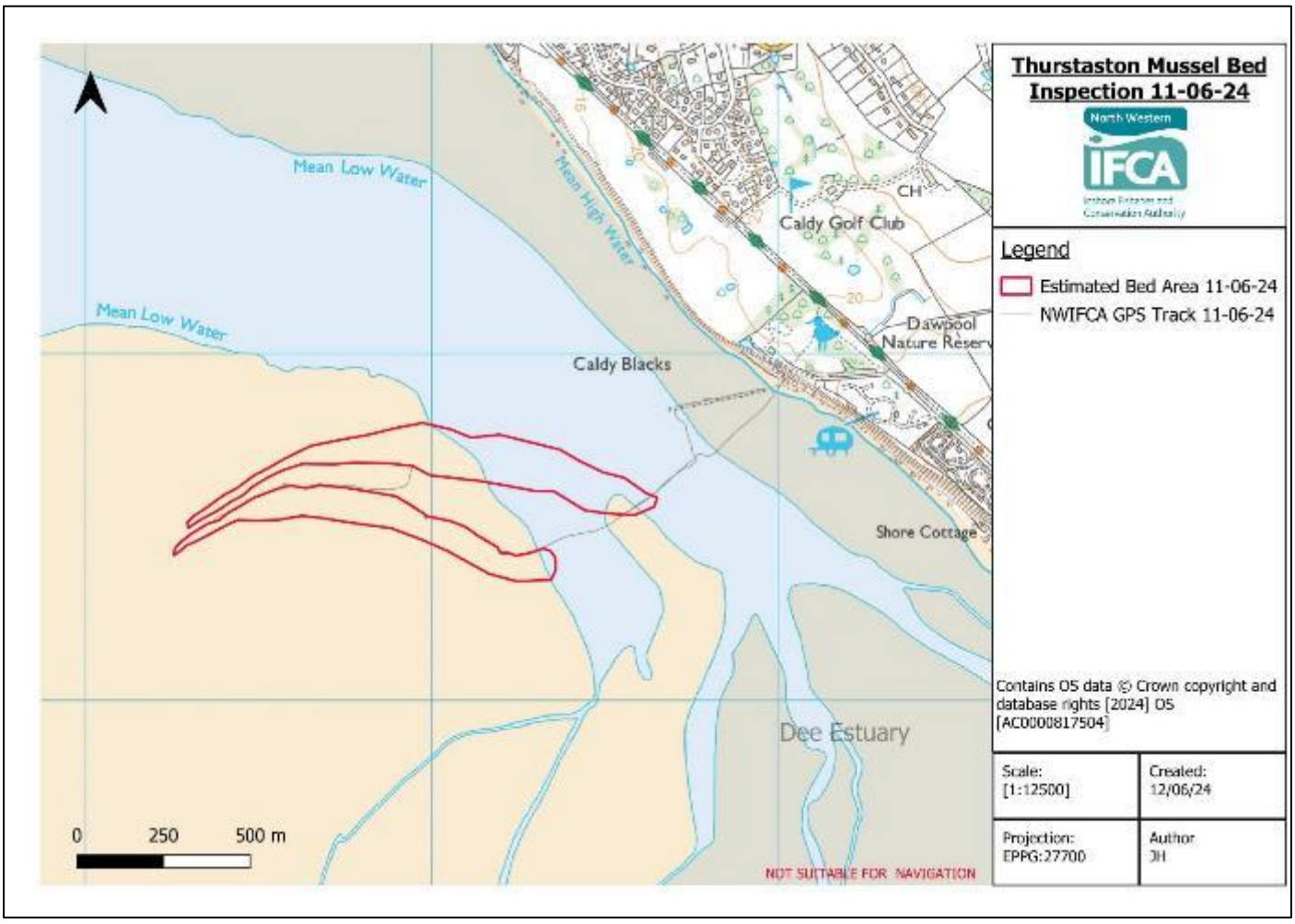


Figure 1. Map of the Thurstaston mussel beds 11-06-24.

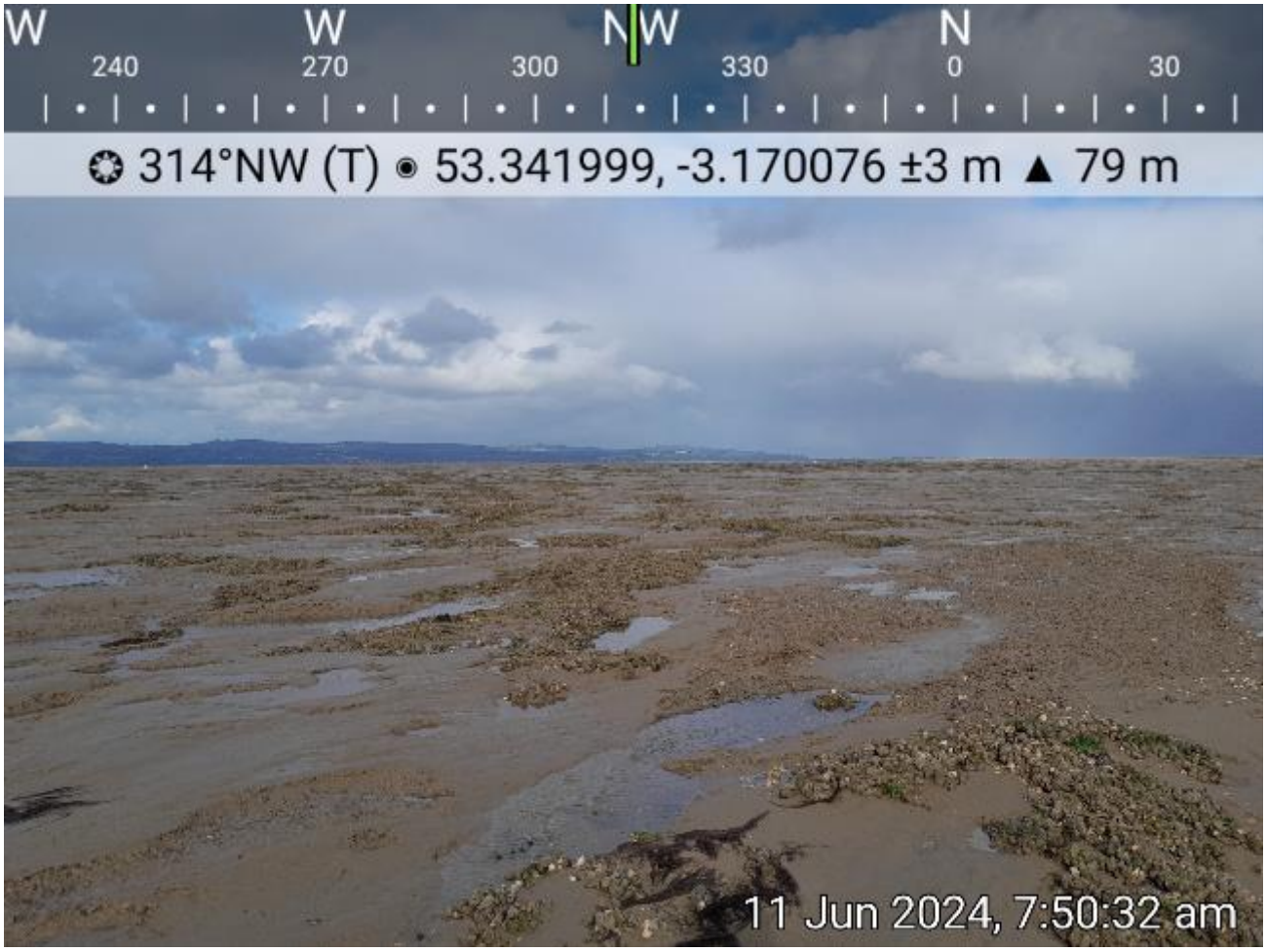


Figure 2. Thurstaston Mussel Bed 11-06-24.

Figure 3. Mussel on Thurstaston bed 11-06-24.

Figure 4: Thurstaston Mussel Bed 11-06-24.

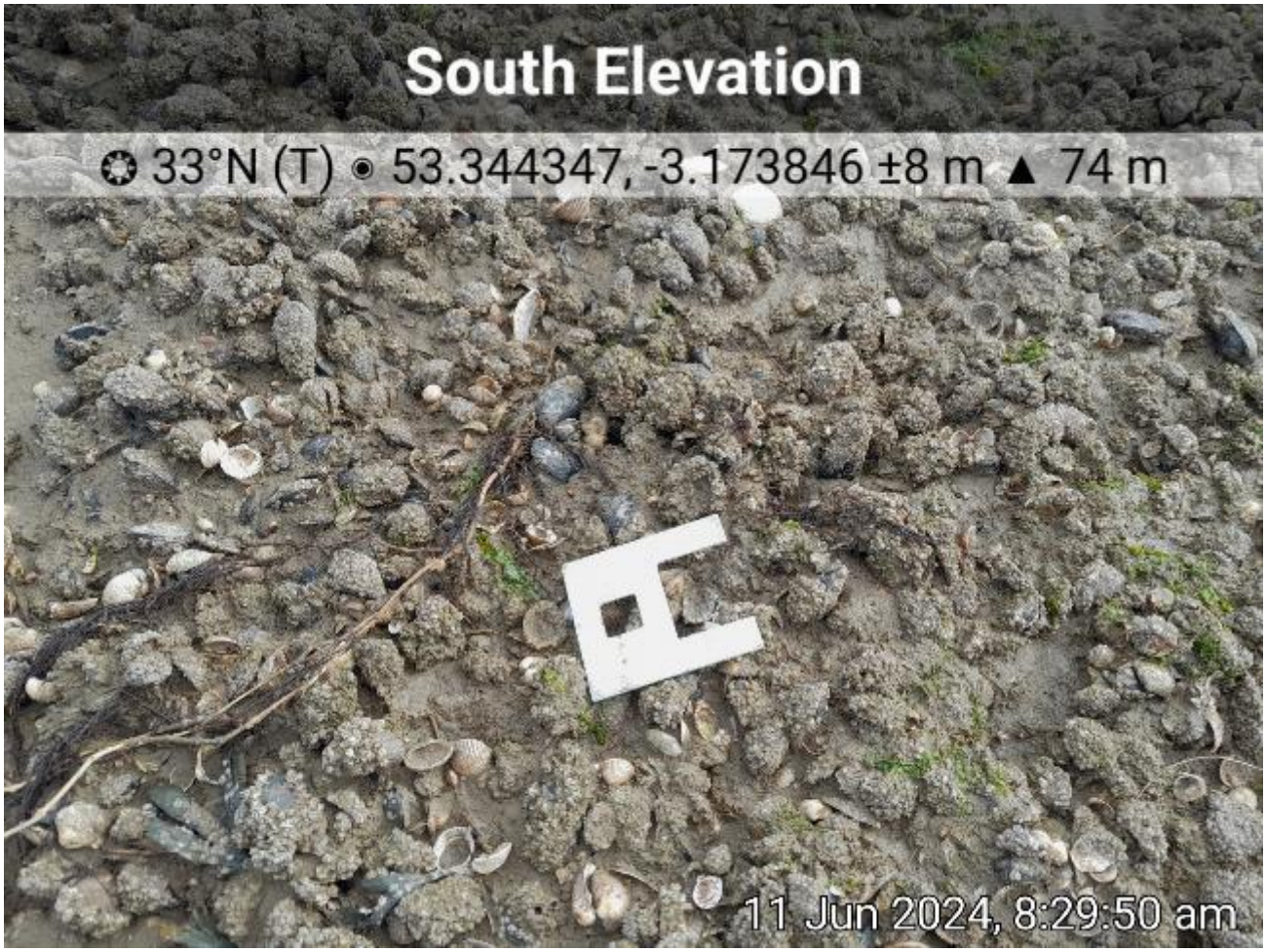


Figure 5: Mussel on Thurstaston bed 11-06-24.