



ANDERSON MARINE SURVEYS

Report To: Scottish Sea Farms

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Scapa Flow video survey

Introduction

Hydrodynamic modelling of dispersion from cage sites in Scapa Flow has identified an area of predicted accumulation of deposited solids. This report describes findings of a video transect survey of the area carried out in July 2022; with reference to general seabed habitat and condition, visible biota, and the presence of any Priority Marine Features (specifically horse mussel *Modiolus* beds)¹.



Figure 1. Scapa Flow video survey general location

¹ Tyler-Walters et al (2016)

Methods

Survey operations were carried out on 18 and 19 July 2018 from AMSL's 6.7m survey vessel *Mollie B*. Positioning was provided by Positioning and depth data were provided by a Simrad NSS7 evo.2 with fixes at 1s intervals logged directly to PC.

Three 200m visual survey transects were defined (Figure 2):

- The northernmost one captures 100m either side of the 1995 GEMS PMF record.
- The southernmost starts in the vicinity of the 2012 record and passes close to the small area of predicted highest deposition.
- Between the two, a transect spans the width of the patch at approximately the middle of the area.

Transect	Id	LatDDM	LongDDM	OSGB36-East	OSGB36-North	Distance	Bearing
T1	Start	58°53.985'N	03°09.072'W	333769	1001952		
	End	58°53.901'N	03°08.932'W	333901	1001794	206	140
T2	Start	58°53.809'N	03°08.948'W	333882	1001624		
	End	58°53.859'N	03°08.755'W	334069	1001713	207	64
T3	Start	58°53.766'N	03°08.800'W	334023	1001541		
	End	58°53.657'N	03°08.757'W	334061	1001338	206	169

Video survey of defined transects was carried out using a camera frame fitted with a Bowtech DIVECAM-550C-AL-I4 camera, GoPro video camera and two high intensity LED lights. The system was also equipped with two parallel laser pointers at 20cm separation. The camera frame was towed along a pre-determined transect line at approximately 0.5 knots just above the seabed, and allowed to settle briefly on the seabed at frequent intervals.

Site descriptor, position, elapsed time and depth overlays were added to the video post-survey, and deployment and recovery periods edited from the final video files in mp4 format.

Video footage has been examined and interpreted in 2-minute segments. Fauna was identified using standard sources (primarily Southward and Campbell 2006, Naylor 2011, Porter 2012, Wood 2013, Hayward and Ryland 2017, Bowen et al. 2018). Still images of representative views and individual species were captured from the video.

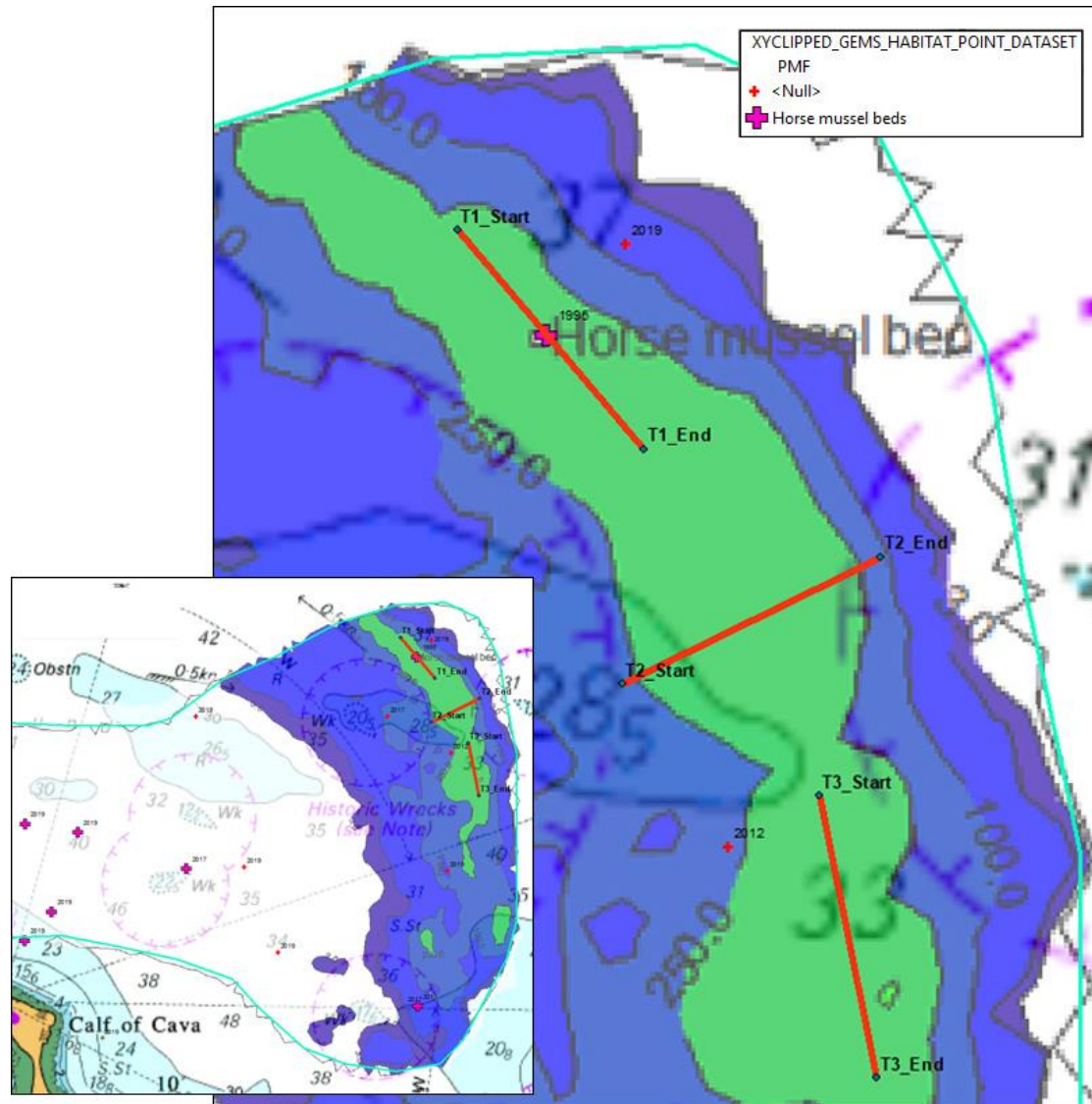


Figure 2. Proposed transects illustrated on an extract from Figure 5.8 of the DHI Scapa Flow Hydrodynamic Modelling Assessment of the cumulative waste solid deposition at PMF 2 for Bring Head and Other fish farms at their existing biomass (average values for the last 90 days), overlain on Admiralty Chart 35-0. (provided by Scottish Sea Farms)

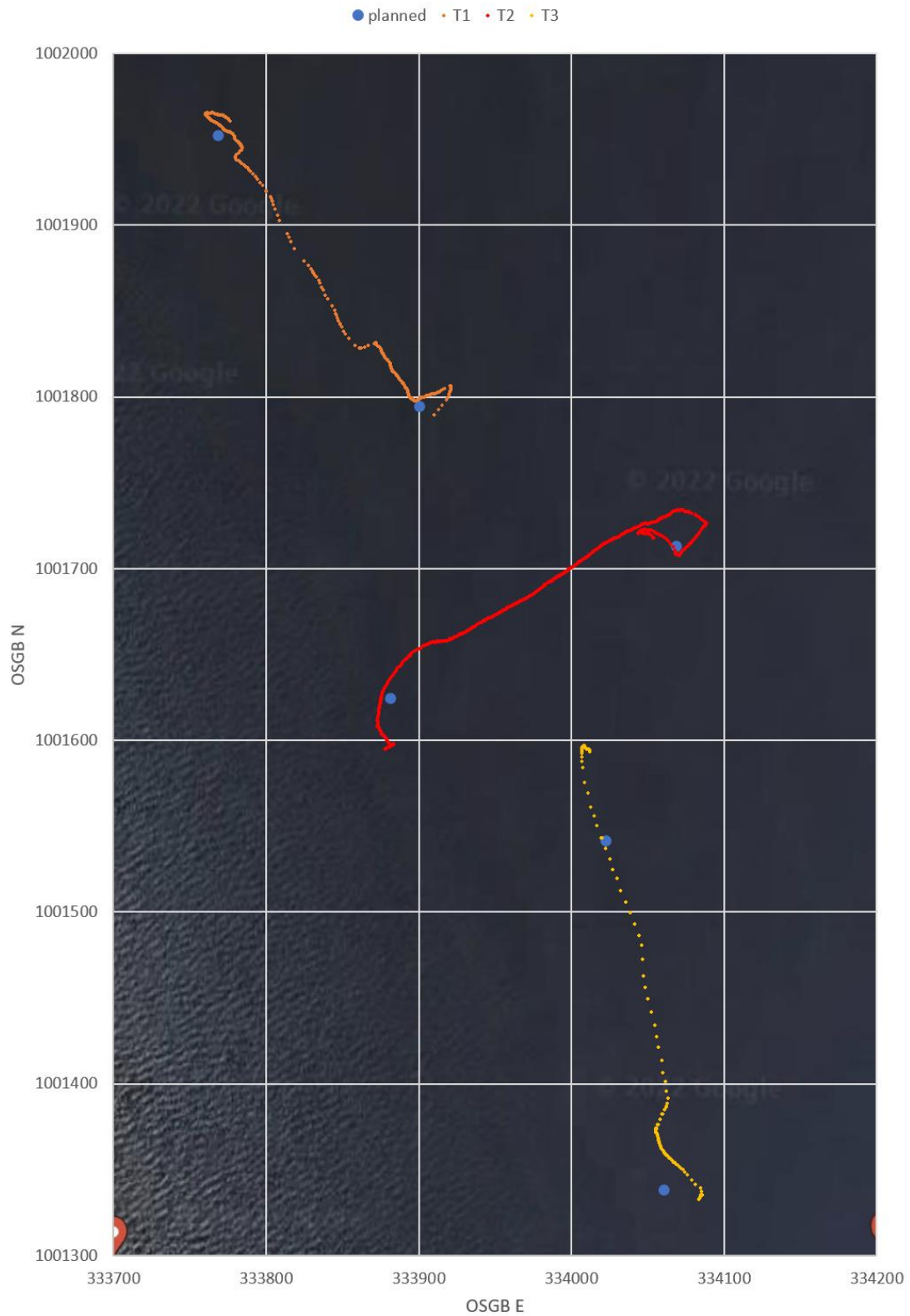


Figure 3. Planned and actual transect tracks

Results

Total transect lengths, calculated as cumulative distance between successive fixes were:

Transect 1 310m
Transect 2 374m
Transect 3 298m

Substrate along the whole of Transect 1 consisted of silty sand and shell, with water depths varying from 33.4 – 37.7 m. Transect 2 covered a similarly limited bathymetric range, 28.7 – 28.9 m, with sediments grading from silty shell gravel at shallower depths to silty fine sand and shell at depths >30mCD. Transect 3 covered a bathymetric range of 30.4 –36.8 m, with sediments consisting of silty sand and shell with increased gravel content at shallower depths around 30mCD. The whole area could be considered as a single habitat/biotope (i.e. silty sand with varying amounts of gravel/shell, corresponding to a version of biotope SS.SMX.CMx, Cirralittoral mixed sediment as defined by Connor et al 2004).

There was no evidence of organic contamination; nor of debris or physical disturbance of the seabed.

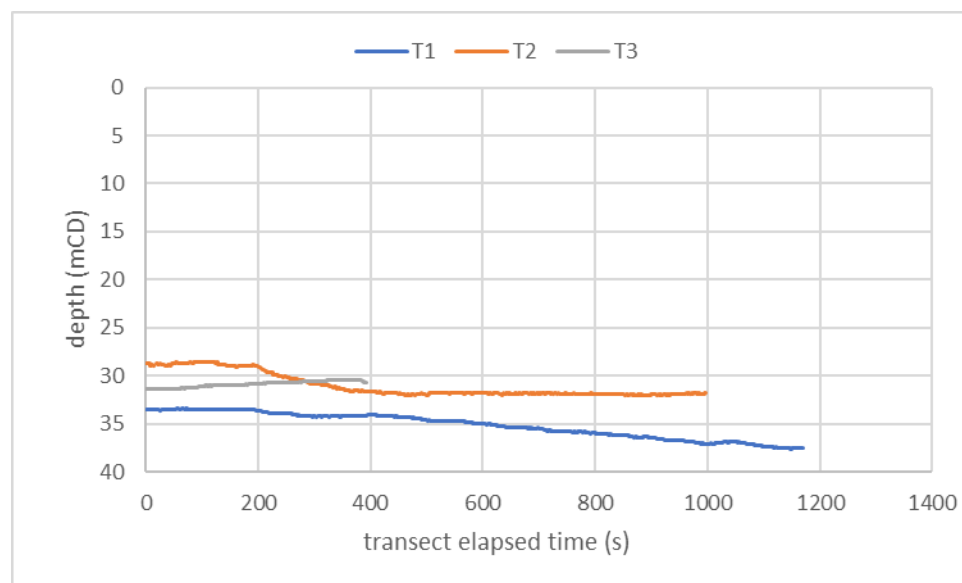


Figure 3. Depth profiles along transects

Representative still images of habitats and species from Transects 1, 2 and 3 are shown in Figures 4, 5 and 6.

Horse mussels *Modiolus modiolus* were observed in all three transects, but only as individuals or, at most, clumps of two or three individuals (Figure 7); and could not be considered as a biogenic reef habitat. Both queen scallops *Aequipecten opercularis* and great scallop *Pecten maximus* were more abundant; the former at densities of up to 5/m² on parts of Transect 2.

Burrows attributable to the thalassinid crustacean *Callianassa subterranea* (and probably also *Upogebia* spp.) were present on all three transects, with small burrow systems of *Nephrops norvegicus* also observed on T3, along with a single individual.

Other infaunal species present in moderate densities were the tube anemone *Cerianthus lloydii*, and holothurians *Psolus phantapus* and *Neopentadactyla mixta* (Figure 8). Several species of hydroid were frequent (particularly as epizoids on *Aequipecten* shells) although conclusive identification is difficult. *Nemertesia antennina* and *Sertularella* spp. were reasonably confidently identified.

Occasional tubes projecting from the sediment surface were tentatively identified as belonging to the polychaete *Chaetopterus variopedatus*, although it is possible that these were in fact bivalve siphons (although the observed tubes were clearly single, i.e. not paired inhalant/exhalant as typical of most candidate bivalve species; sometimes appearing paired with a similar tube at around 10 – 20 cm distance, which would be typical of the infaunal form of *C. variopedatus*). Other polychaete tubes were attributed to *Owenia fusiformis* and *Lanice conchilega*

Paired feeding palps or tentacles were observed on several occasions, appearing to originate from an infaunal species and extending 10-15cm on the sediment surface (Figure 9). The identity of this species is uncertain; most likely the echiuran *Bonellia viridis*.

Common epifaunal species included the brittlestar *Ophiura ophiura*, hermit crab *Pagurus* sp. (probably *bernhardus*), swimming crab *Liocarcinus depurator*, spider crabs *Hyas araneus* and *Macropodia rostrata*, starfish *Asterias rubens*, and gastropods *Turritella communis* (many of which may have been shells occupied by hermit crabs) and *Buccinum undatum* (egg masses of which were also recorded). These were all present at densities considered typical of natural habitat of this type. The Devonshire cup coral *Caryophyllia smithii* was common on shells and cobbles and a few soft corals *Alcyonium digitatum* and plumose anemones *Metridium dianthus* were also recorded on Transect 2.

Two species of nudibranch were recorded: *Lomanotus genei* and *Polycera quadrilieata* (Figure 10).

On the basis of recorded epifauna, the best fit biotope classification is probably SS.SMX.CMx.CIlloModHo Sparse *Modiolus modiolus*, dense *Cerianthus lloydii* and burrowing holothurians on sheltered circalittoral stones and mixed sediment.

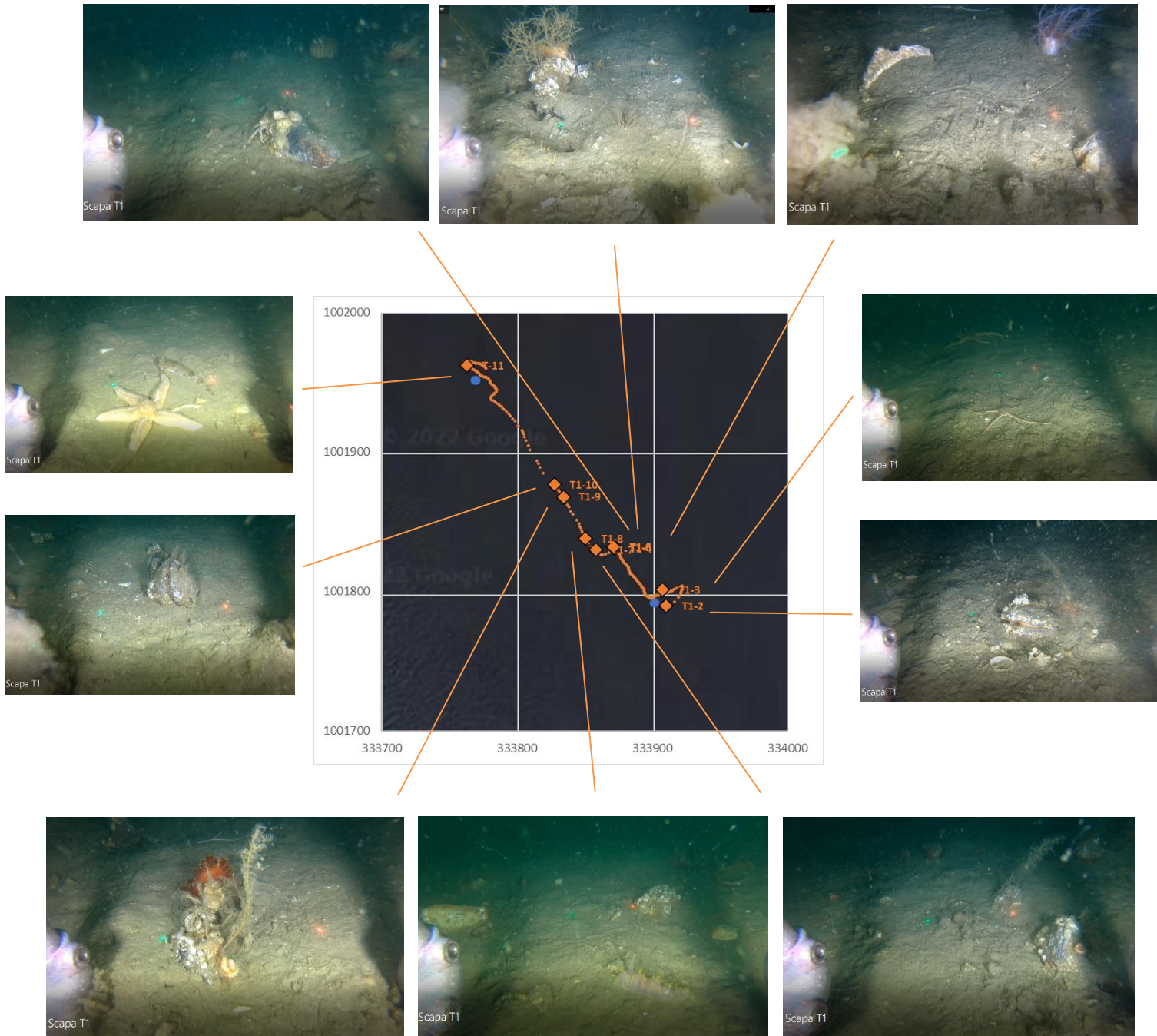


Figure 4. Transect 1 selected stills.

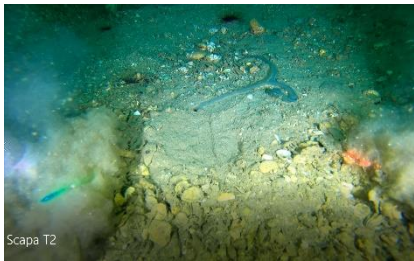
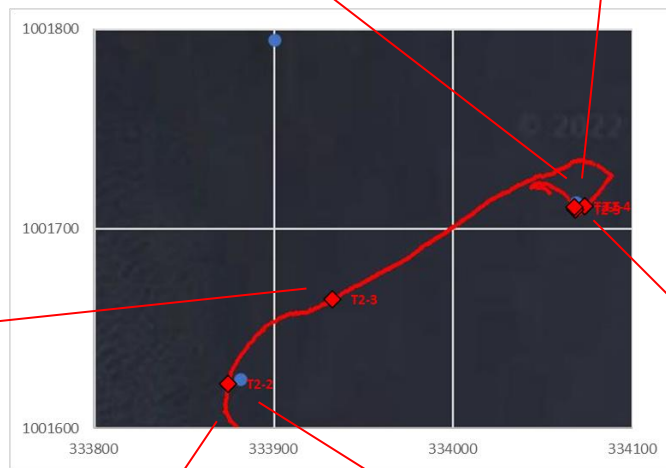
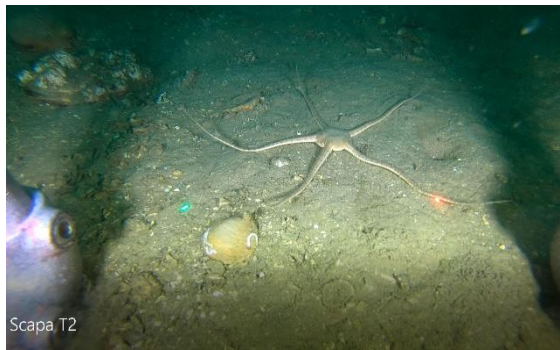


Figure 5. Transect 2 selected stills.

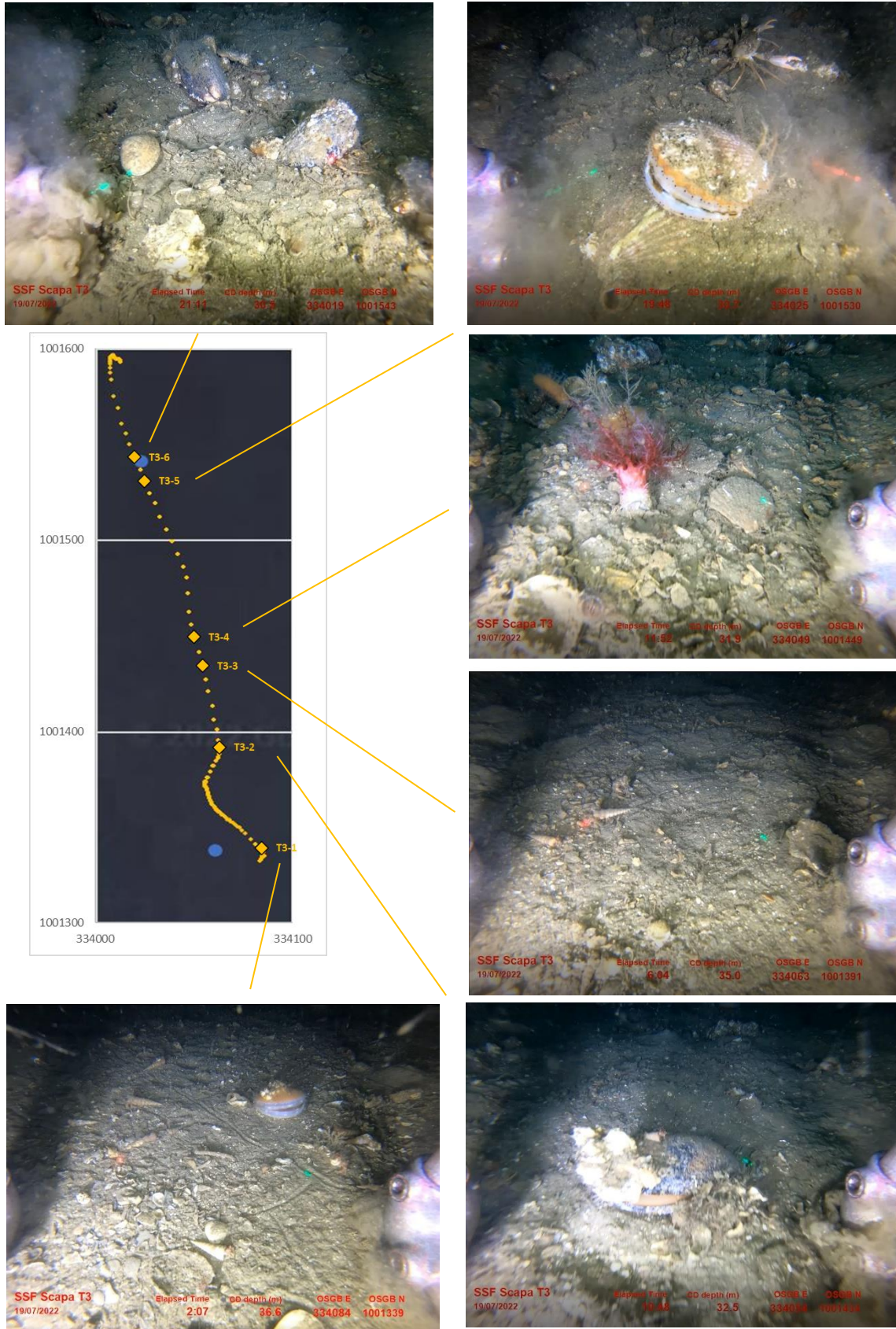


Figure 6. Transect 3 selected stills.

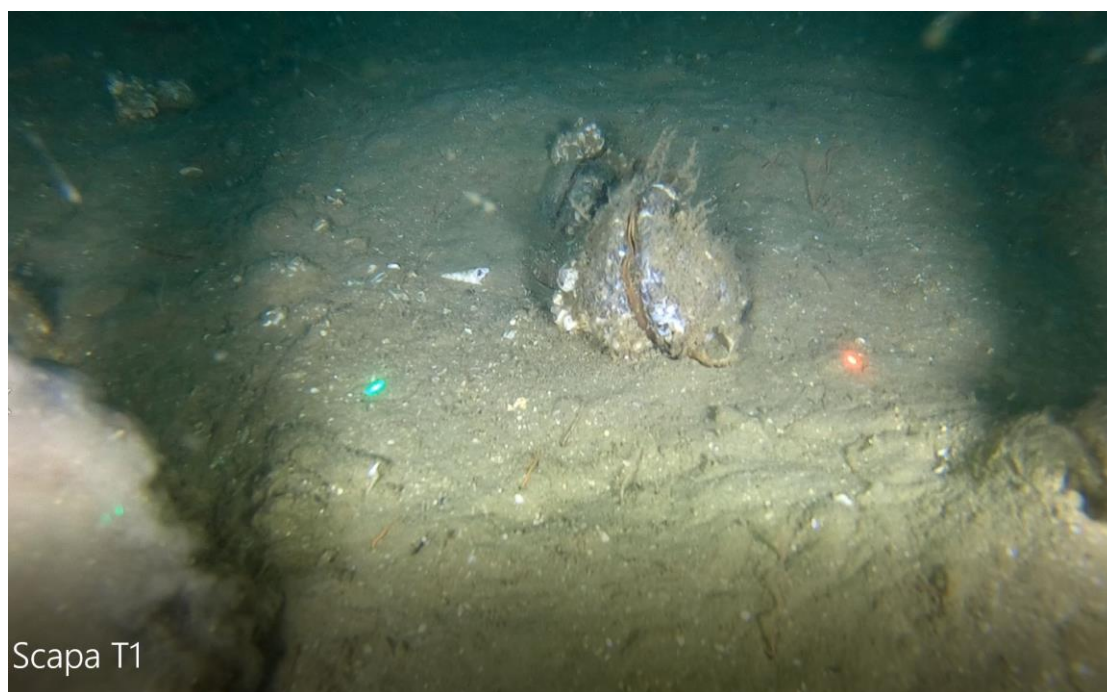
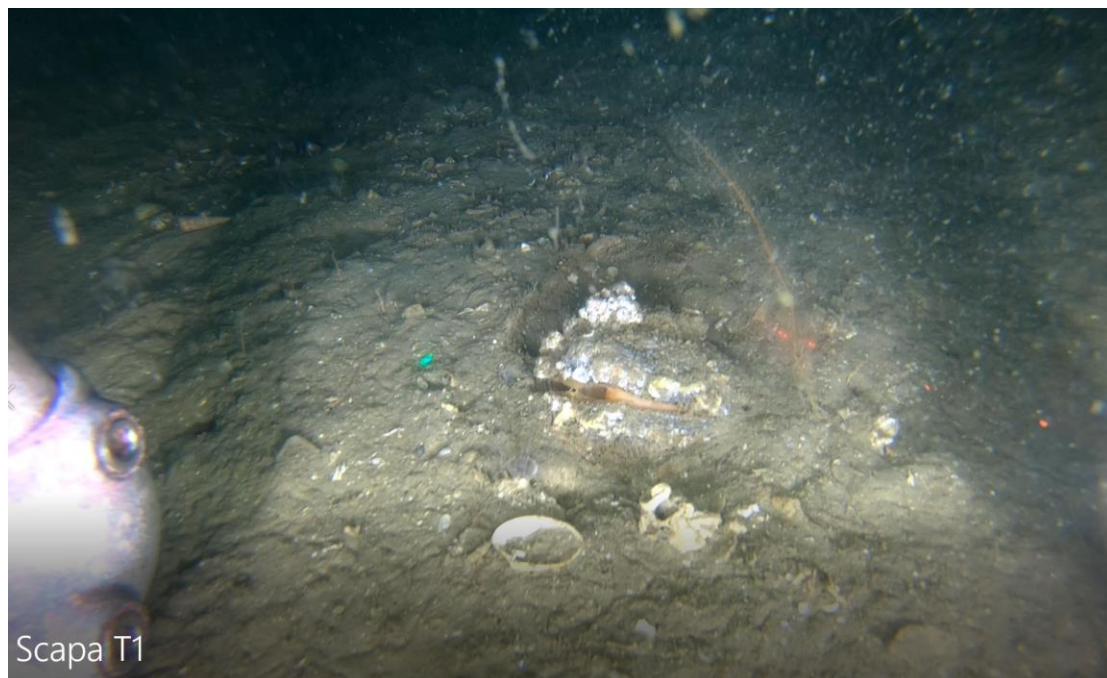


Figure 7. *Modiolus modiolus*: stills T1-1 (top) and T1-10 (bottom)

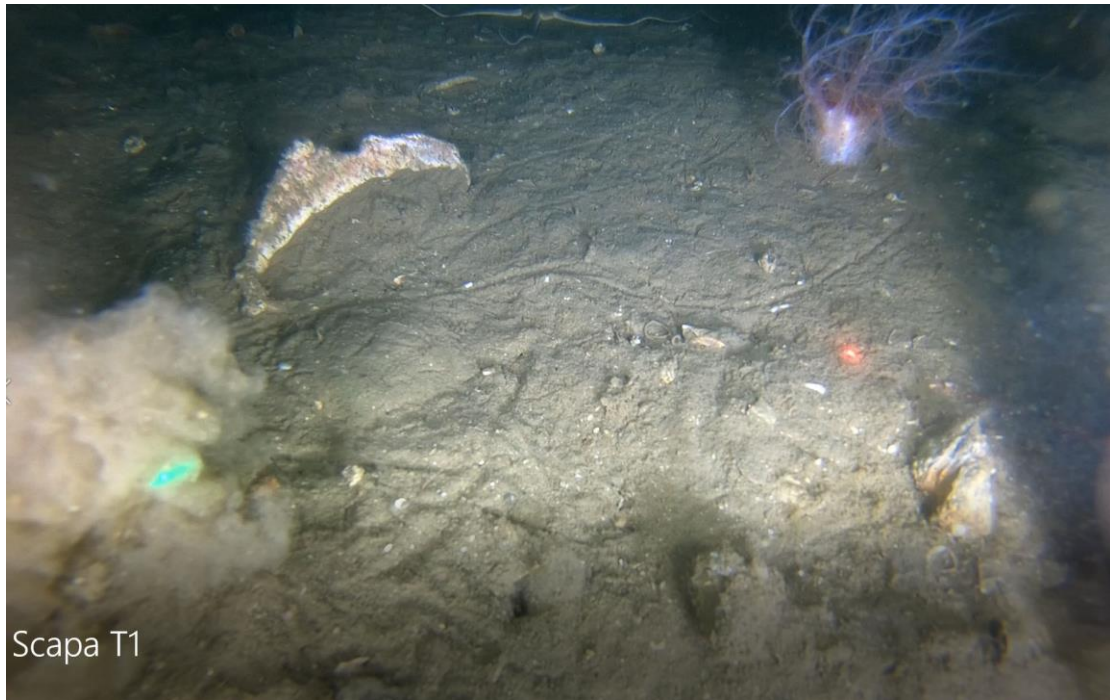


Figure 8. Holothurians: still T1-4 *Neopentadactyla mixta* (top) and still T3-4 *Psolus phantapus* (bottom)

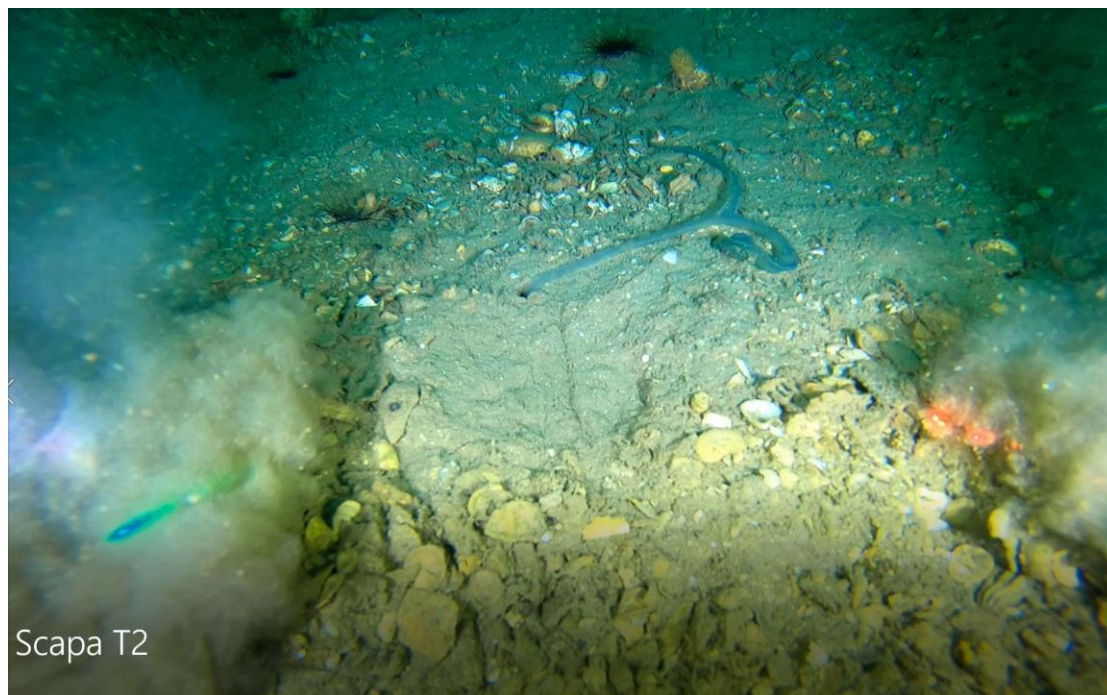


Figure 9. Echiuran *Bonellia viridis*: still 2-3



Figure 10. Nudibranchs: still T1-8 *Polycera quadrilineata* (top) and still T1-9 *Lomanotus genei* (bottom)

Conclusions

Habitats and species were as previously observed in Scapa Flow; and as expected for a moderately tidal location with no evidence of organic particulate accumulation. Physical disturbance of the seabed and debris were absent.

No Priority Marine Features were observed, although the horse mussel *Modiolus modiolus* was present at low densities.

References

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