



ANDERSON MARINE SURVEYS

Report To: Scottish Sea Farms

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Fishnish A video survey

Introduction

The Fishnish A site is located in the Sound of Mull (Figure 1), and until recently was in production with a 6x2 grid of 24 m square cages. This report describes findings of a video transect survey carried out in July 2018; with reference to general seabed habitat and condition, visible biota, and the presence of any Priority Marine Features¹.

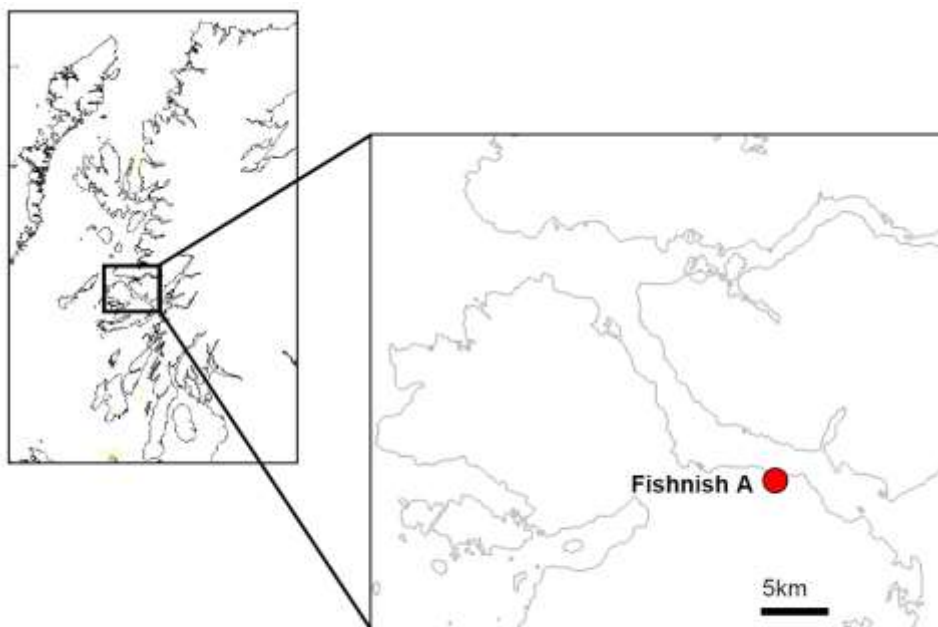


Figure 1. Fishnish A location

¹ Listed in Priority Marine Features in Scotlands Seas, SNH 2014.

<https://www.nature.scot/sites/default/files/2018-05/Priority%20Marine%20Features%20in%20Scotlands%20seas.pdf> accessed 22/08/2018

The survey included one transect at the adjacent site Fishnish B; not reported here.

Previous video survey of the Fishnish A site was carried out by AMSL in 2015. Throughout the surveyed area, the seabed consisted of burrowed muddy sands in 35-40m depth with no evidence of organic enrichment or significant debris from cages or moorings. The seabed was heavily burrowed, with burrow appearance typical of the prawn *Nephrops norvegicus* (also observed) and the thalassinid shrimp *Calocaris macandreae*. Observed epifauna included brittlestars *Ophiura*, burrowing anemones *Cerianthus lloydii*, swimming crabs *Liocarcinus depurator* and squat lobster *Munida rugosa*.

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 transects were defined by start and end points (Figure 2). Transect 1 was run twice with the second run used. Transect 3 was affected by fouling of creel lines at several points. A "spare" transect was also run to the north-east of transect 1; this has not been analysed.

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.

Results

Total transect lengths, calculated as cumulative distance between successive fixes (including periods lifted to clear creel lines for Transect 3) were:

Transect 1 639m
Transect 2 282m
Transect 3 1406m

Positions of individual 2-minute transect segments are shown in Figures 3-5. Descriptive notes for each segment are tabulated in Appendix A. Still images are listed in Appendix B and are available on accompanying electronic media.

Substrate along the whole of Transects 1 and 2 consisted of muddy sand, with water depths varying from 40.4 – 50.3 m. Transect 3 covered a greater bathymetric range, 23.7-51.6 m, with sediments grading from fine sand/shell at shallower depths to muddy sand at depths >30 m. Detached / detrital algal fragments were widespread, including green (*Ulva* sp.), filamentous red and brown species (*Laminaria* sp., *Chorda filum*).

Light linear scarring of the sediment surface (Figure 16) was observed in some places; this was superficial (around 1-2 cm) and most likely resulted from creeling activities. Very little debris was observed (one rope and one tyre).

Muddy sediments throughout the deeper parts of the survey area (>40m) were burrowed by *Nephrops norvegicus* (Figures 6, 8, 12) and *Calocaris macandreae* (not observed but inferred from burrow characteristics, Figure 7). This habitat is a specified PMF. A single individual of the burrowing angular crab *Goneplax rhomboides* was observed (Figure 11). Groups of oval burrow entrances, possibly attributable to the colonial amphipod *Maera loveni* (a PMF species) were also occasionally observed (Figure 17). These sediments also supported dense populations of the brittlestar *Amphiura* spp. (*filiformis* / *chiajei*), with arms exposed for filter-feeding (Figure 6).

Other infaunal species present in moderate densities were the tube anemone *Cerianthus lloydii* (Figures 13, 14), holothurian *Psolus phantapus* and polychaete *Lanice conchilega* (Figure 8). Frequent tubes projecting from the sediment surface (Figure 16) 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*).

Paired feeding palps or tentacles were observed on two occasions, appearing to originate from an infaunal species and extending 10-15cm on the sediment surface (Figure 10). The identity of this species is uncertain; possibly a magelonid polychaete, alternatively an echiuran although the appearance does not correspond to any of the species described by Hayward and Ryland 2017.

Common epifaunal species included the brittlestars *Ophiura ophiura* (Figure 9) and *O. albida*, hermit crab *Pagurus* sp. (probably *bernhardus*), swimming crab *Liocarcinus depurator*, squat lobster *Munida rugosa*, starfish *Asterias rubens*, queen scallop *Aequipecten opercularis* and gastropod *Turritella communis* (many of which may have been shells occupied by hermit crabs). These were all present at densities considered typical of natural habitat of this type.

Other epifaunal species recorded occasionally or singly from muddy sand habitat were edible crab *Cancer pagurus*, anemones *Urticina felina* (Figure 13) and *Sagartia*

troglodytes; and on occasional stones and cobbles the plumose anemone *Metridium dianthus* and crinoid *Antedon bifida*.

Vertebrate fauna observed included dogfish *Scylliorhinus canicula*, dab *Limanda limanda* and gobies (probably Fries's goby *Lesueurigobius freisii* which is commensal with *Nephrops*; although possibly *Pomatoschistus* spp.).

Shallower parts of Transect 3 (20-30m) had coarser sediment, muddy gravel with occasional patches of boulders. Sessile epifauna was therefore more abundant, notably sponges *Halichondria panacea* and *Suberites ficus*, hydroids *Nemertesia antennina*, *N. ramose* (Figure 15), *Lytocarpia myriophyllum* and *Halecium* sp. (probably *beanii*), plumose anemone *Metridium dianthus*, soft coral *Alcyonium digitatum*, anemones *Urticina felina*, tubiculous polychaete *Spirobranchus triqueter*, barnacle *Balanus* sp., bryozoan *Securiflustra securifrons* and crinoid *Antedon bifida*.

Conclusions

Habitats and species were as previously observed at the site; and as expected for a moderately tidal location on the west coast of Scotland. Physical disturbance of the seabed and debris was negligible.

Priority Marine Features observed were Burrowed mud (although without seapens and component species *Maxmuelleria lankesteri*, *Funiculina quadrangularis* and *Pachycerianthus multiplicatus*). A few burrows consistent with the component species *Maera loveni* were observed, although the presence of this species cannot be confirmed without further sampling (and/or burrow casting).

References

- Bowen, S., Goodwin C., Kipling, D. and Picton, B. (2018). Sea Squirts and Sponges of Britain and Ireland. Wild Nature Press, Plymouth, UK.
- Hayward PJ and Ryland JS (2017). Handbook of the Marine Fauna of North-West Europe. Second Edition. Oxford University Press.
- Naylor P. (2011). Great British Marine Animals. Third Edition. Sound Diving Publications.
- Porter J. (2012). Seasearch Guide to Bryozoans and Hydroids of Britain and Ireland. Marine Conservation Society, Ross-on-Wye.
- Southward E.C. and Campbell A.C. (2006). Echinoderms: Keys and Notes for Identification of British Species (Synopsis of the British Fauna). Field Studies Council.
- Wood C. (2013). Sea Anemones and Corals of Britain and Ireland. Second Edition. Wild Nature Press, Plymouth, UK.

APPENDIX A. VIDEO INTERPRETATION

T1	<p>00:00:00 muddy sand, occasional detached algae (Ulva, filamentous red). Holothurian 00:26 Psolus phantapus?. Calocaris burrows. Abundant buried Amphiuira? Nephrops/Munida 00:59, moderate burrow density. Ophiura 01:39. Pagurus sp.</p> <p>00:02:00 As above, Munida (several individuals 02:48). Possible Maera? 02:46 still 1. Asterias rubens. Dogfish 03:22.</p> <p>00:04:00 As above, Liocarcinus 04:27. Psolus 04:29. Ophiura 04:48 still 2. Possible Magelona / echiurid palps 04:49? Chaetopterus tubes? 04:50 and 05:06. Nephrops 05:55.</p> <p>00:06:00 As above. Turritella 06:27 still 3. Psolus 06:31, Chaetopterus? 06:32 still 5. Ophiura 07:24. Munida, Liocarcinus 07:29.</p> <p>00:08:00 As above. Ophiura 08:14 and later.</p> <p>00:10:00 As above. Lanice conchilega 10:02 still 6. Ophiura 10:33 still 7. Palps? 10:48 still 8. Lanice, Liocarcinus 10:59. Lanice 11:03. Goby (Lesueurigobius?) 11:52 still 9.</p> <p>00:12:00 As above. Pagurus 12:00. Liocarcinus, Ophiura. Asterias 13:54 still 11.</p> <p>00:14:00 As above. Lineus? But probably detached Chorda 14:02. Psolus 14:19. Pagurus. Ophiura. Chaetopterus 15:10.</p> <p>00:16:00 As above. "stalks" maybe Sabella? [prob hydroid] 16:03. Asterias 16:31. Ophiura. Munida. Turritella. Liocarcinus. Cerianthus 17:54 still 12.</p> <p>00:18:00 As above. Munida. Turritella. Ophiura. Liocarcinus. Cerianthus 19:07, 19:20. Echinus 19:49 still 13.</p> <p>00:20:00 As above. Ophiura albida and ophiura, goby 20:05 still 14. Goneplax rhomboides 20:12 still 15. Liocarcinus. Munida. Chaetopterus. Lanice. Asterias. Psolus 21:13. Goby 21:24. Hydroid on detached algae 21:55.</p> <p>00:22:00 As above. Cerianthus 22:09. Chaetopterus 22:20. Munida. Cancer 22:38 still 16. Goby, Asterias 22:39 still 17.</p> <p>00:24:00 As above, slightly sandier, few Nephrops burrows. . Light coloured Cerianthus 24:01. Munida. Cerianthus. Metridium. Ophiura. Dogfish 25:07. Liocarcinus. Pagrus. Asterias. Turritella. Lanice.</p>
T2	<p>00:00:00 muddy sand, sparsely burrowed. No Amphiuira. Small flatfish (dab?) 00:40. Lanice. Pagurus. Ophiura, Chaetopterus still 18. Turritella, Asterias. Cerianthus 01:30. Liocarcinus. Sparse Amphiuira.</p> <p>00:02:00 As above. Sparse Amphiuira, occasional Nephrops burrows. Pagurus, Asterias. Ophiura. Munida. Sagartia troglodytes 03:02 still 19. Goby 03:15. Anemone? On stone 03:29. Chaetopterus.</p> <p>00:04:00 As above. Sparse Amphiuira. Aequipecten opercularis 04:04 still 20. Asterias. Pagurus. Munida. Kelp debris. Ophiura 05:32.</p> <p>00:06:00 As above. Ophiura. Pagurus. Dab 07:20.</p> <p>00:08:00 As above. Munida. Aequipecten 09:10. Ophiura 09:24. Amphiuira still 21.</p> <p>00:10:00 Ophiura. Light scarring, e.g. 10:30. Juv Asterias. Antedon bifida 11:27 still 22.</p>
T3	<p>00:00:00 Fine sand, shell debris, 24m. Abundant Cerianthus.Still 23. Nemertesia ramosa 00:23 still 24. Turritella. Pagurus. Sand gobies Pomatoschistus? 00:40. Metridium, Balanus sp. Psolus sp. and Munida on rock 00:45 still 25. Cerianthus example still 26. Amphiuira. Lanice. Halichondria and Amphiuira 01:38 still 27. Nephrops in burrow 01:53 still 28.</p> <p>00:02:00 As above, some Amphiuira. Sagartia 02:19. Munida. Metridium, hydroids on boulder and tyre 02:40. Asterias. Urticina felina 03:07 still 29. Aequipecten 03:20. Turritella. Pagurus. Cerianthus colour morphs 03:38 still 30. Aequipecten 03:55.</p> <p>00:04:00 As above. Nemertesia ramosa on rope 04:14. Munida. Pagurus. Metridium 04:37. Aequipecten 04:41. Turritella. Ophiura 05:54. Asterias 05:59.</p> <p>00:06:00 As above. Nemertesia ramosa, Cerianthus. Amphiuira. Aequipecten with hydroids 06:18. Nemertesia antennina, Spirobranchus 06:39 still 31. Lifted.</p> <p>00:08:00 Lifted</p> <p>00:10:00 Muddy sand, Amphiuira, Chaetopterus. 29m. Still 33. Lifted again</p> <p>00:12:00 lifted</p> <p>00:14:00 Muddy sand, Amphiuira, Nemertesia ramosa. Securiflustra securifrons still 34. Metridium, Antedon on rocks 14:57 on. Aequipecten 15:47 and 15:54. Munida. Halecium ?beanii 15:59 still 35.</p> <p>00:16:00 Muddy sand, hydroids, sparse Amphiuira. Chaetopterus 16:08. Munida. Asterias. Turritella. Sparse Ceriathus. Lytocarpia myriophyllum? 16:28 still 36. Sparse burrows 16:45 Nephrops? Antedon. Nemertesia ramosa, Metridium 16:58. Protanthea simplex 17:05 still 37. Spirobranchus. Pagurus. Aequipecten 17:34.</p> <p>00:18:00 Muddy sand. Munida, Turritella, Asterias. Amphiuira. Pagurus. Sparse burrows. Dab 18:36 still 38. Ophiura. Liocarcinus. Scarring 18:54 probably camera? Nephrops burrow 19:30.</p> <p>00:20:00 Muddy sand, moderate Amphiuira. Light scarring around 20:06 still 39. Hooked about 20:30</p> <p>00:22:00 Lifted</p> <p>00:24:00 Seabed 24:43. Muddy sand, moderate Amphiuira. Calocaris burrows. Ophiura. Pagurus. Chaetopterus 25:52. Liocarcinus.</p> <p>00:26:00 As above. Liocarcinus. Psolus 26:37. Asterias. Chaetopterus 27:07. Munida. Nephrops burrow 27:18.</p> <p>00:28:00 As above. Mooring chain 28:04. Munida. Nephrops burrows. Turritella. Chaetopterus. Cerianthus 28:51 still 40. Lanice. Chaetopterus 29:24 still 41.</p> <p>00:30:00 As above. Chaetopterus (both ends), Munida. Light scarring 30:27 still 42. Hooked?</p> <p>00:32:00 Lifted. Seabed 33:09, as before. Lifted again.</p> <p>00:34:00 Lifted.</p> <p>00:36:00 Lifted, seabed 36:23. As above. Lanice. Nephrops burrows. Turritella. Asterias. Light scarring. Chaetopterus. General seabed 37:55 still 43.</p> <p>00:38:00 As above. Nephrops burrows. Turritella. Chaetopterus. Munida.</p> <p>00:40:00 As above. Light linear scarring. Turritella. Small Nephrops burrows. Ophiura. Bivalve (Astarte? Alive?) 40:49. Munida. Cerianthus. Possible Maera burrows 41:23 still 44. Liocarcinus. Pagurus.</p> <p>00:42:00 As above. Nephrops burrows. Turritella (probably with hermit crabs). Chaetopterus. Lanice. Calocaris burrows. Munida.</p> <p>00:44:00 As above. Nephrops burrows. Munida. Chaetopterus. Turritella. Psolus 45:39. General seabed 45:56 still 45.</p> <p>00:46:00 As above, moderate Amphiuira, small Nephrops burrows. Hooked 46:45?</p> <p>00:48:00 Lifted, seabed 48:19. Lifted again</p> <p>00:50:00 Lifted</p> <p>00:52:00 Lifted, seabed 52:17. As before, muddy sand, moderate Amphiuira. 52:17 still 46. Turritella. Stationary.</p> <p>00:54:00 Stationary</p>

APPENDIX B. CAPTURED STILL IMAGES

transect	still	video file time
T1	1 Muddy sand, Nephrops burrows, Amphiuira	00:02:42
T1	2 Calocaris or possible Maera loveni burrows?	00:02:46
T1	3 Ophiura ophiura	00:04:48
T1	4 Turritella communis	00:06:27
T1	5 Chaetopterus variopedatus?	00:06:32
T1	6 Lanice conchilega, Chaetopterus, Nephrops burrows	00:10:02
T1	7 Ophiura ophiura	00:10:33
T1	8 Palps?	00:10:48
T1	9 Goby (Lesueurigobius?)	00:11:52
T1	10 muddy sand, Amphiuira	00:13:45
T1	11 Asterias rubens	00:13:54
T1	12 Cerianthus lloydii	00:17:54
T1	13 Echinus esculentus	00:19:49
T1	14 Ophiura albida and ophiura , goby	00:20:05
T1	15 Goneplax rhomboides	00:20:12
T1	16 Cancer pagurus, goby	00:22:38
T1	17 Goby, Asterias	00:22:39
T2	18 Ophiura, Chaetopterus	00:01:04
T2	19 Sagartia troglodytes	00:03:02
T2	20 Aequipecten opercularis	00:04:04
T2	21 Amphiuira	00:09:45
T2	22 Antedon bifida	00:11:27
T3	23 Fine sand, shell debris. Abundant Cerianthus.	00:00:02
T3	24 Nemertesia ramosa	00:00:23
T3	25 Metridium, Balanus sp. Psolus sp. and Munida	00:00:45
T3	26 Cerianthus lloydii	00:01:25
T3	27 Halichondria, Amphiuira	00:01:38
T3	28 Nephrops norvegicus	00:01:54
T3	29 Urticina felina, Cerianthus lloydii	00:03:07
T3	30 Cerianthus colour morphs	00:03:38
T3	31 Nemertesia antennina, Halecium, Spirobranchus triqueter	00:06:39
T3	32 Cerianthus lloydii	00:07:25
T3	33 Muddy sand, Amphiuira, Chaetopterus	00:10:11
T3	34 Nemertesia ramosa, N. antennina, Securiflustra securifrons	00:14:49
T3	35 Halecium beanii?, Munida rugosa	00:15:59
T3	36 Lytocarpia myriophyllum?	00:16:28
T3	37 Protanthea simplex	00:17:05
T3	38 Dab	00:18:39
T3	39 Light scarring	00:20:06
T3	40 Cerianthus, Amphiuira	00:28:51
T3	41 Chaetopterus	00:29:24
T3	42 Light scarring, Munida in burrow, Chaetopterus (paired), Amphiuira	00:30:27
T3	43 Muddy sand, Amphiuira, tracks	00:37:55
T3	44 Possible Maera loveni burrows?	00:41:23
T3	45 Amphiuira, unknown burrows	00:45:56
T3	46 muddy sand, Amphiuira	00:52:17

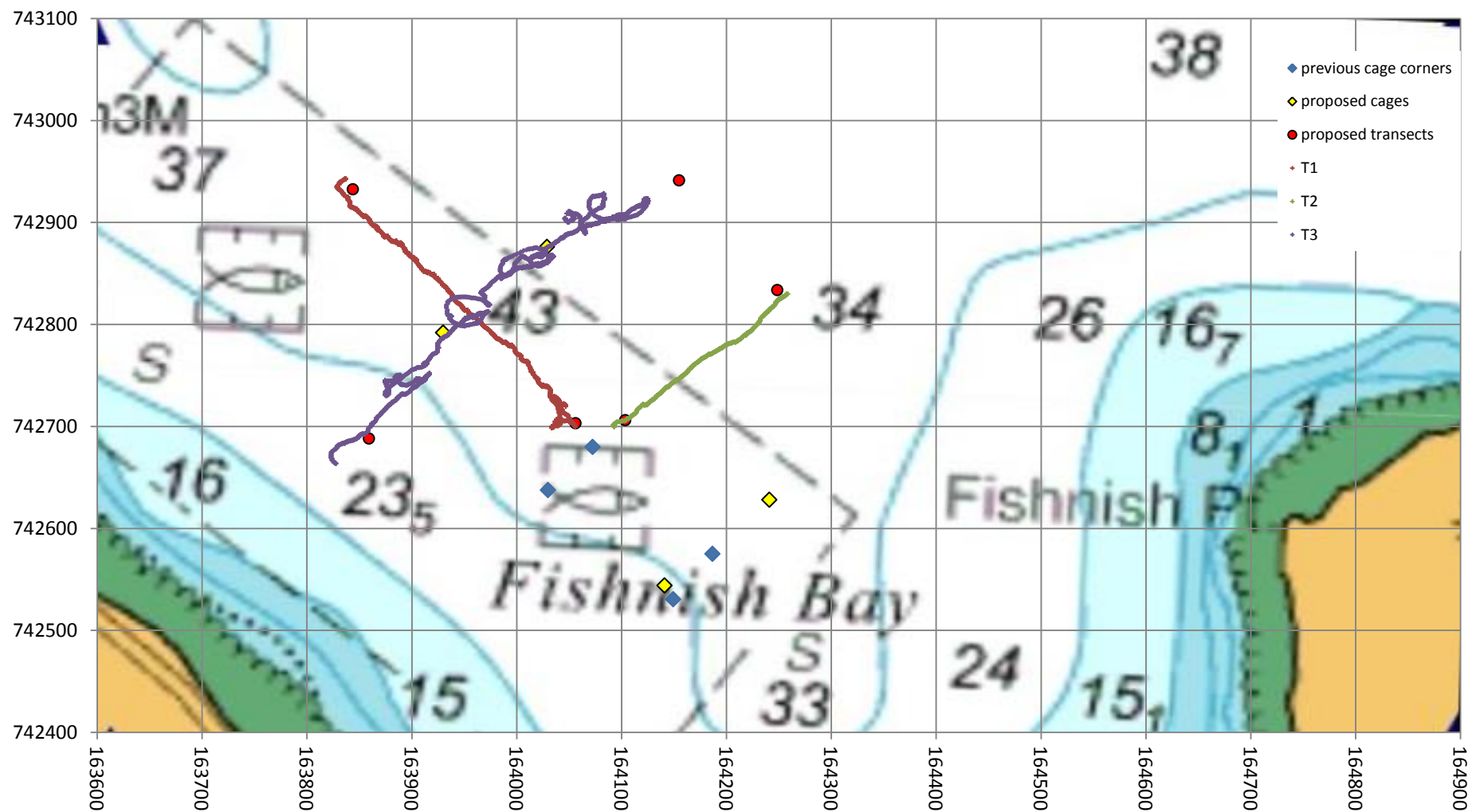


Figure 2. Proposed and actual transect tracks, Fishnish A

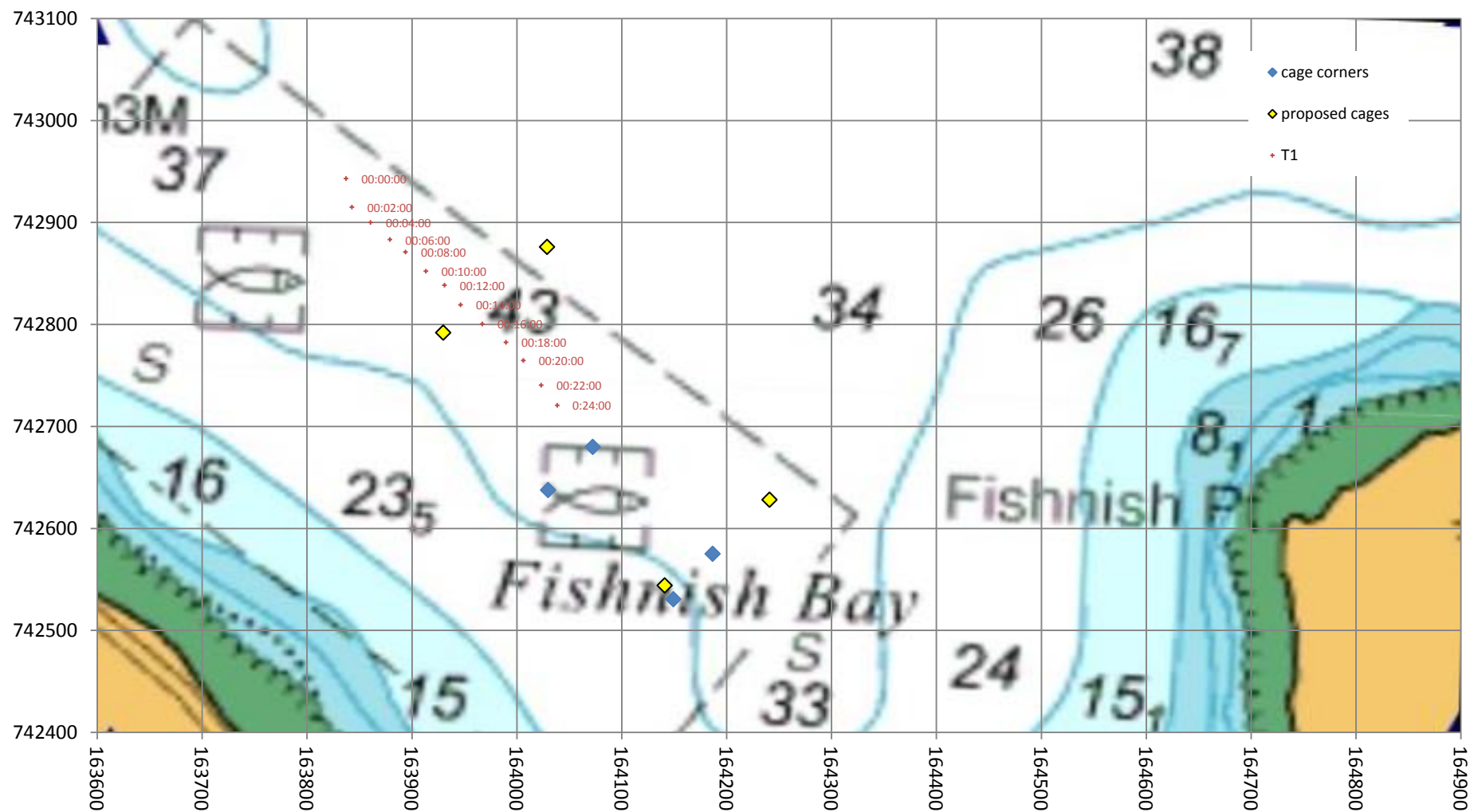


Figure 3. Transect 1, 2-minute interpretation segments

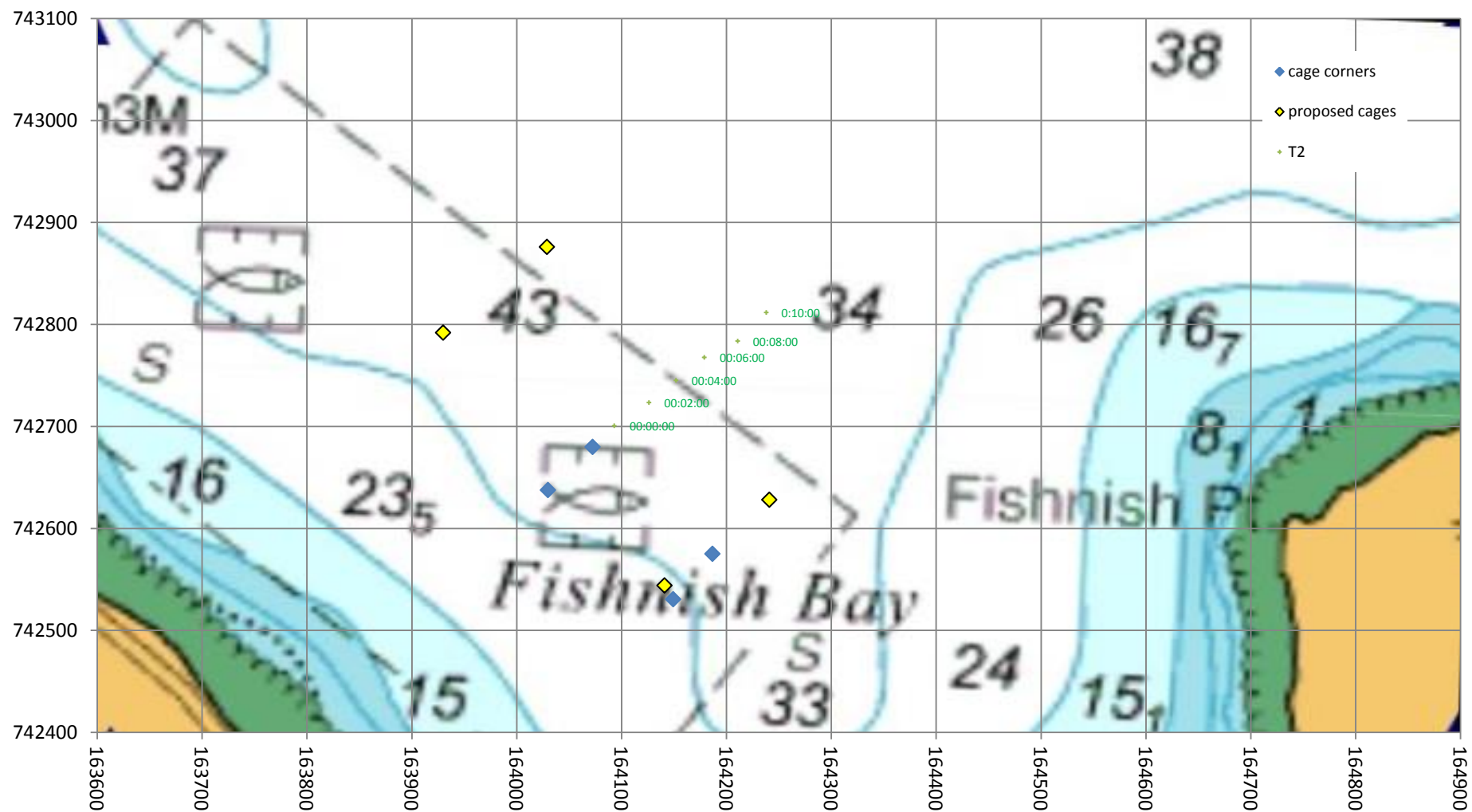


Figure 4. Transect 2, 2-minute interpretation segments

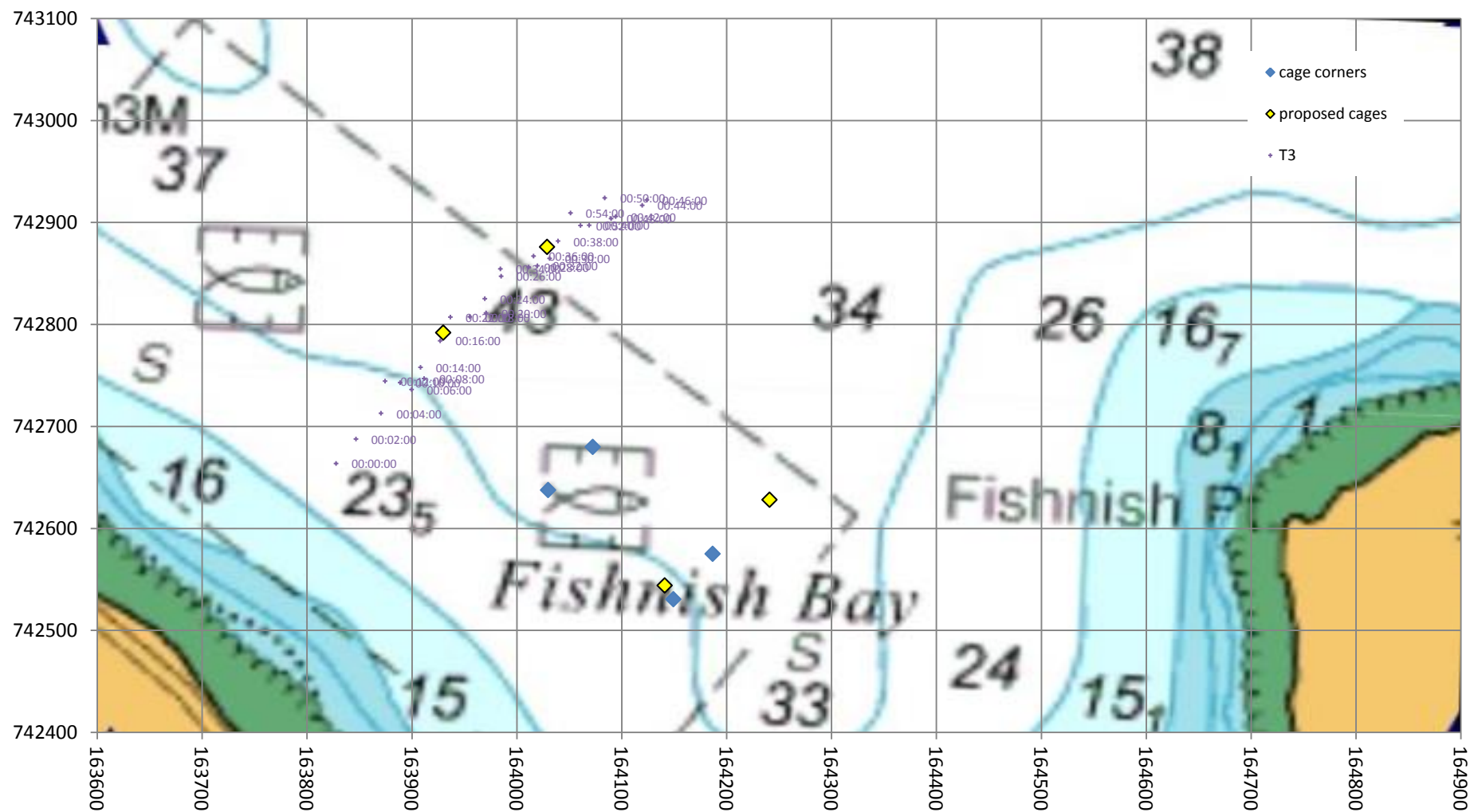


Figure 5. Transect 3, 2-minute interpretation segments



Figure 6 (still 1). Muddy sand, *Nephtys* burrows, *Amphiura*

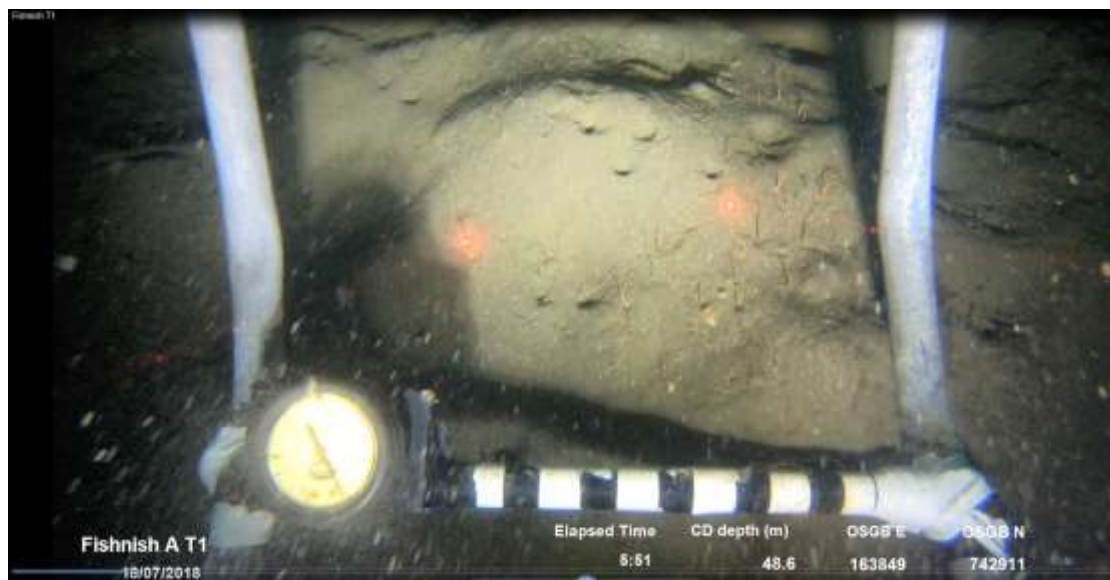


Figure 7 (still 2). *Calocaris macandreae* and possible *Maera loveni* burrows?



Figure 8 (still 6). *Lanice conchilega*, *Chaetopterus*, *Nephrops* burrows



Figure 9 (still 7). *Ophiura ophiura*



Figure 10 (still 8). Unidentified feeding proboscis (echiuran?)



Figure 11 (still 15). *Goneplax rhomboides*



Figure 12 (still 28). *Nephrops norvegicus*

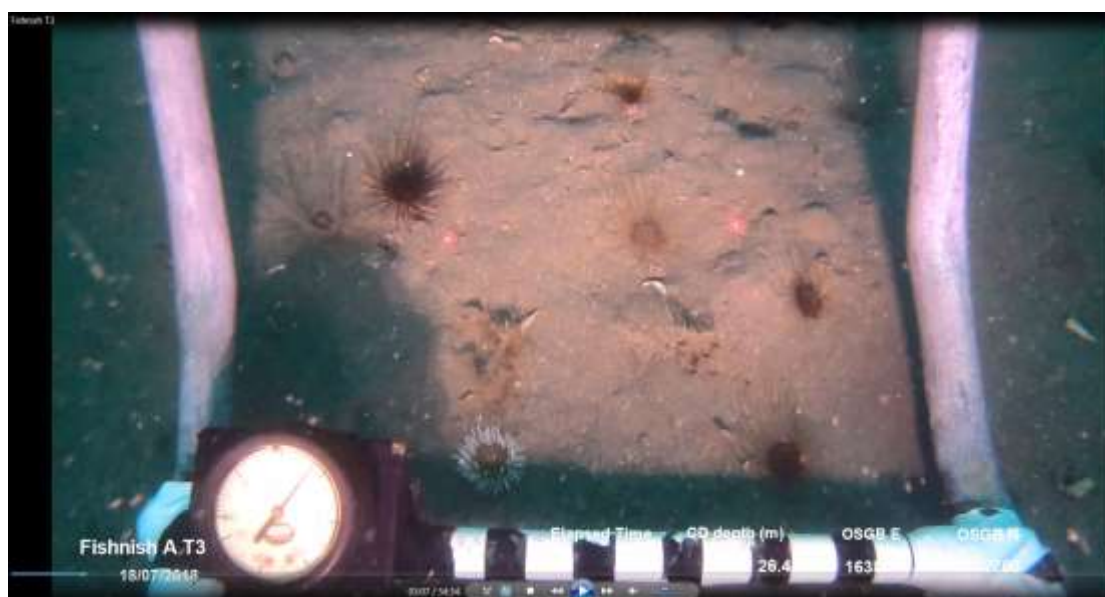


Figure 13 (still 29). *Urticina felina*, *Cerianthus lloydii*



Figure 14 (still 32). *Cerianthus lloydii*

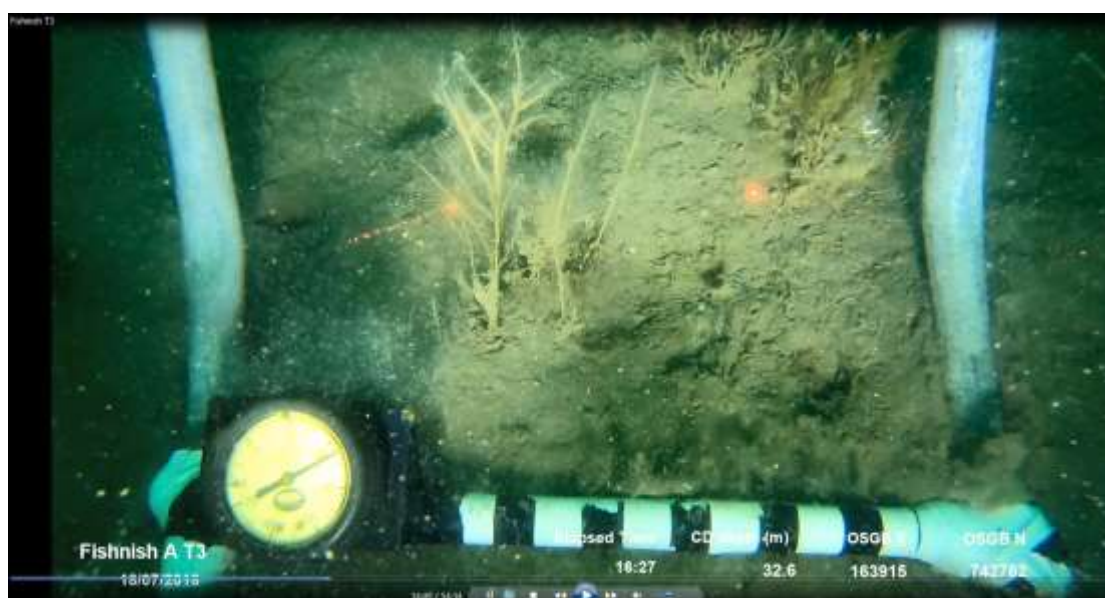


Figure 15 (still 34). *Nemertesia ramosa*, *N. antennina*, *Securiflustra securifrons*



Figure 16 (still 42). Light sediment scarring, *Munida rugosa* in burrow, *Chaetopterus*, *Amphiura*



Figure 17 (still 44). Possible *Maera loveni* burrows?