

# **A Drop Camera Survey of the Eastern Shore Archipelago, Nova Scotia**

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A DROP CAMERA SURVEY OF THE EASTERN SHORE ARCHIPELAGO, NOVA  
SCOTIA

by

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## ABSTRACT

Vandermeulen, H. 2018. A drop camera survey of Eastern Shore Archipelago, Nova Scotia. Can. Tech. Rep. Fish. Aquat. Sci. 3258: ix + 71 p.

A drop camera system was used to survey bottom type, macrophyte and invertebrate presence on the Eastern Shore Archipelago, Nova Scotia. The bottom was very heterogeneous, with many reefs and islands and relatively shallow water (30 m) even 15 km offshore. Muddy bottoms with burrows were rarely seen at depth and were most common in small well protected bays. Strong wave and current regimes were observed throughout the bulk of the area.

Macrophytic algae dominated in the shallows, with a heavy cover of kelp. Coralline algae were present throughout, along with red algal turf. Sponge, anemone and sea stars were quite common on hard surfaces at all depths. *Boltenia* was present. Sand dollars were often seen on sand in the shallows and brittle stars occurred on that substrate at depth. Lobsters were sometimes observed in the shallows. Scallops and sea urchins were rare. Cunner was common around rocky bottoms to 25 m.

## RÉSUMÉ

Vandermeulen, H. 2018. Relevé sous-marin dans l'archipel de Eastern Shore, en Nouvelle-Écosse. Rapp. tech. can. sci. halieut. aquat. 3258: ix + 71 p.

Une caméra sous-marine a été utilisée pour connaître le type de fond marin et vérifier la présence de macrophytes et d'invertébrés dans l'archipel de Eastern Shore, en Nouvelle-Écosse. Le fond était très hétérogène : il comportait de nombreux récifs et de nombreuses îles; l'eau était relativement peu profonde (30 m), même à 15 km des côtes. En profondeur, on a observé peu de fonds vaseux et de terriers. Ceux-ci étaient plus fréquents dans les petites baies bien protégées. De forts régimes de vagues et de courants ont été observés partout au cœur de la zone.

En eaux peu profondes, les algues macrophytes dominaient et s'accompagnaient d'une épaisse couche de varech. Des algues coralliennes étaient présentes partout, avec des tourbes d'algues rouges. Les surfaces dures étaient fréquemment recouvertes d'éponges, d'anémones et d'étoiles de mer, et ce, à toutes les profondeurs. De la *Boltenia* était présente. On a souvent observé de petits clypéasters sur le sable en eaux peu profondes, et des ophiures étaient présentes sur le substrat en profondeur. Des homards étaient parfois observés en eaux peu profondes. Les pétoncles et les oursins étaient rares. La tanche-tautogue était répandue autour des fonds rocheux, jusqu'à 25 m de profondeur.

## INTRODUCTION

In June 2016, the Oceans and Coastal Management Division (OCMD) of Maritimes Region's Ecosystem Management Branch outlined research needs for coastal Ecologically and Biologically Significant Areas (EBSAs) in Nova Scotia. This included the Eastern Shore Archipelago EBSA, a reef and island complex to the east of Halifax Harbour (Figs. 1&2). OCMD noted that the EBSA was a unique archipelago ecosystem with a high degree of naturalness. Eelgrass was abundant along with birds and grey seal breeding colonies. A rationale for selecting the site as an EBSA can be found in Doherty and Horsman (2007).

OCMD approached DFO Science Branch on the need to better characterize the area's marine environment (particularly biota) to discover key features, with an emphasis on benthic habitats and species including eelgrass. The author was tasked with examining bottoms in the EBSA deeper than most eelgrass ( $\geq 10$  m) via a drop camera survey.

The objective of the drop camera survey was to collect video to classify bottom type (mud, sand, gravel, etc.), macrophytes and benthic invertebrates. The survey area was large, so a radiating pattern of target sites from key islands and reefs was employed with input from biologists familiar with the area. With this method only qualitative observations or classifications could be made and mobile fauna such as fish would not be captured on video in a reliable manner. The survey was conducted in September and October 2017. A GIS package was created from the survey results and is described here.

## 2.0 MATERIALS AND METHODS

### 2.1 GIS and Survey Design

The GIS platform was ArcGIS (ESRI ver. 10.2.2). Drop camera targets were inserted into the GIS with a hydrographic chart background<sup>1</sup>. Based upon discussions with OCMD staff and outside experts, the survey focused upon key reef complexes and islands. Drop camera targets were selected in a radiating pattern from these key features. Usually three or more transects of drop camera targets were associated with each feature. The targets began at the 10 m contour of each transect with the next target approximately 600 m from that first one. Each subsequent target along the transect was approximately 800 m away from the last one. The deeper transects extended to the outer limit of the EBSA (Figs. 3&4; Table 1)<sup>2</sup>.

Canadian Wildlife Service bird observers were present for all days of the survey and transit days (Fig. 5). The bird data will be presented in other publications (Carina Gjerdrum, pers. comm.).

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<sup>1</sup> The GIS project described in this report is being maintained by OCMD and is accessible for further analysis and exploration.

<sup>2</sup> Of 742 planned drop camera targets, 466 were actually completed. See Results section for details.

## **2.2 Equipment**

The 40' Canadian Coast Guard vessel 'Sigma-T' (based at the Bedford Institute of Oceanography, BIO) was used as the survey platform (Fig. 6). The drop camera video system and electronics are described in Vandermeulen (2018).

The video electronics were arrayed along the back bench of the wheelhouse as shown in Fig. 7. The drop camera was deployed off of the stern gallows as shown in Fig. 8. A deck hand controlled the camera umbilical while the main weight of the camera was held by the wire winch line through the block. The deepest drops possible with the umbilical were approximately 70 m.

## **2.3 Survey Methods**

The survey methods are described in Vandermeulen (2018). Briefly, the field work was completed with a crew of four. Approximately 3 minutes of video was recorded at each drop camera target with the camera light turned on. The camera was held between 10 cm to ~2 m off bottom. The amount of drift at each drop camera target was extremely variable. At some targets, the drift would only be 5 m or so – while at other targets it could be many tens of meters. There was no post processing of data to correct for this effect. Hence, the survey results are spatially approximate while still providing adequate benthic habitat classifications on a bay scale. The survey consisted of three field trips in the fall of 2017.

## **2.4 Video Analysis**

The video clips (\*.MOV format) were embedded into the GIS at the drop camera locations. They were then analyzed visually on playback for bottom type, macrophyte cover and the presence of invertebrates. Example screen shots are shown in figures 9 – 28. The video analysis was presence / absence rather than quantitative.

# **3.0 RESULTS**

## **3.1 Field Conditions and Survey Dates**

Of the 742 stations planned for the survey, 466 were completed. All planned stations could not be sampled due to equipment and vessel breakdowns, illness and extraordinarily harsh winds from the south. Thirteen survey days were completed during three trips (September 6, 8, 9, 10, 12, 13 & 14 – September 26 – October 19, 21, 22, 23, & 24)<sup>3</sup>. An average of 36 drops per survey day was accomplished. That rate is very good considering the long transit distances involved, and allowed almost the entire western portion of the EBSA to be covered.

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<sup>3</sup> The Sigma-T steamed from BIO to Sheet Harbour for each trip, with Sheet Harbour as the base of operations. CWS bird observers were on board for each of the 13 survey days plus the 6 transit days between BIO and Sheet Harbour.

### 3.2 Benthic Classification

The benthic classification arising from the video analysis is summarized in Table 2.

#### *Substrates*

As was the case for Sambro Ledges (Vandermeulen 2018), mud or sand substrates were most common in the shallower drop camera locations nearshore (Fig. 29). At the deeper offshore sites, where one would expect depositional conditions favoring mud or sand, much less of this material was seen. This indicates a very energetically active environment along the outer half of the EBSA. This energetic seaward side of the survey area was dominated by gravel, cobble and boulder deposits, plus expansive ledge formations (Figs. 30 - 32).

#### *Macrophytes*

As would be expected in such an energetically driven environment with abundant hard substrate, coralline algal crusts dominated on almost every available hard surface (Fig. 33). Coralline algae can survive at very low light levels at depth, and these were the only algae seen at the deepest sites (>50 m). Red turf algae accompanied coralline crusts at most drop locations (Fig. 34).

The notable absence of green algae in the survey area can be explained by survey design. All the drop camera sites were at 10 m or greater depths, an environment rarely exploited by green algae (e.g. *Ulva*, *Chaetomorpha*) along the Atlantic coast of Nova Scotia. *Codium* was sometimes observed in the shallows around 10 m.

Three kelp genera seen in the area, *Alaria*, *Saccharina* and *Laminaria* also prefer shallower waters (Figs. 35 - 37). *Alaria* has very specific site preferences, occurring at locations with very strong currents. *Laminaria* has a slightly broader distribution and is common in areas with strong currents or wave action. *Saccharina* was less abundant but scattered throughout the shallows, particularly in areas with lower currents. The brown alga *Desmarestia* was less common than the kelps (Fig. 38). In the author's experience, *Desmarestia aculeata* tends to occur on rocks in slightly deeper waters which are occasionally scoured by sand movement. *Desmarestia viridis* tends to occur in shallower areas. Figure 39 shows the distribution of another kelp genus in the area, *Agarum*. This alga prefers deeper water and is usually found at depths of 5 m or greater.

#### *Benthic Invertebrates*

Invertebrates were difficult to discern in the videos as many were quite small, and cryptic. However, a few larger invertebrates were noted and chief amongst those was the stalked tunicate, *Boltenia*. It was widely scattered throughout the survey area but sparse (Fig. 40). Sponges were abundant, as would be expected in such a current swept area (Fig. 41). Anemones were less common (Fig. 42).

As is usual for their habitat, sand dollars had quite a restricted distribution and were usually seen in shallower waters (Fig. 43). Brittle stars were seen at greater depths (Fig. 44), but they were difficult to discern in the video due to their cryptic coloration and habit. A variety of sea star species were found on hard and soft substrates throughout

the survey area, especially at deeper sites (Fig. 45). Lobsters were found in shallower locations, particularly on softer substrates with algal drift (Fig. 46).

## DISCUSSION

The drop camera survey of the Eastern Shore Archipelago EBSA captured major habitat features at the bay-scale (10s of km). The benthic landscape of the EBSA was unusually heterogeneous, with the four different substrate types occurring at almost any depth or location – this may be driven by the shallow, reef dominated nature of the bottom, where it was commonly only 30m deep even 15km offshore. Soft, muddy bottoms with burrows were rarely seen at depth, but were actually most common in small, well-protected bays. This suggests strong wave and current regimes throughout the bulk of the EBSA, which were definitely observed by the survey vessel.

Macrophytic algae dominated, as would be expected in such an energetic hard bottomed environment. Almost any rock surface of 10cm or larger had a red algal coralline crust plus some other algal cover. There was a definite depth gradient to this cover, with the shallowest drop locations (10m) dominated by kelps (*Alaria*, *Saccharina*, *Laminaria*, *Agarum*) with a red algal canopy mainly composed of *Phyllophora*. At 20m or slightly deeper, *Agarum* was usually the only kelp left, with the red canopy switching to *Ptilota* and filamentous forms. By 40m depth all kelps and *Ptilota* were gone, with only coralline and other red algal crusts remaining, along with a few small red blades (possibly *Turnerella*). Coralline crusts were the only algae present at >50m. The relatively dense algal cover at 10-20m obscured smaller / cryptic benthic invertebrates and impeded their classification<sup>4</sup>.

The tunicate *Boltenia* is distinctive and large enough to be observed within an algal canopy and it was found widely (although sparsely) throughout the survey area wherever its favorite substrate, rough angular ledges, was present. Sponge, anemone, and sea stars were quite common on hard surfaces at all depths but most likely missed by the video camera under dense algal cover in the shallows. Sand dollars were often seen on sand in the shallows, with brittle stars on that substrate at depth.

Lobsters were not frequently observed (which is normal for this type of drop camera survey) but tended to occur most often at 10-20m depth on sandy bottoms dominated by algal drift material piled in distinctive parallel 'windrows' many meters long. Bare sand patches a few 10s of cm to several meters wide occurred between the algal windrows. Rock crabs were not added to the classification in Table 2, but appeared to be more common than lobster and also preferred a sandy bottom at <20m depth. Scallops were rare and at depth on cobble or gravel bottoms. Sea urchins were very rare and cryptic (usually only 3cm or so in diameter) in crevices at depth. The cunner (*Tautoglabrus*) was common around rocky bottoms to 25m, sporting vibrant red and orange colors.

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<sup>4</sup> It was disheartening to observe a very dense cover of *Membranipora* on many kelp and *Phyllophora* blades in the shallows.

The Eastern Shore Archipelago EBSA is certainly one of the more spectacularly beautiful locations the author has surveyed in Nova Scotia. The waters have a “wildness” which is difficult to describe, though certainly aided by bird, whale and porpoise sightings plus astounding leaps of tuna off the bow.

## **ACKNOWLEDGMENTS**

Tana Worcester arranged for the survey funding, and has been a constant supporter of the recent EBSA benthic surveys. Tara Roberts and her team at CCG coordinated crew and Sigma-T time. Raymond Naugle and Charles Hamilton handled the Sigma-T and her equipment flawlessly, as usual. The unrelenting good cheer of Isaac Foley on the working deck kept us going, especially when we all had to dance on beam seas. The author would especially like to thank the good people of Millbrook First Nation, who made their excellent facility at Sheet Harbour available to us and watched over our boat and gear each night.

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Table 1. Geographic coordinates of planned and completed drop camera locations.

location name <sup>5</sup>	longitude	latitude	2017 date visited <sup>6</sup>
long_01	-62.9092	44.68805	October 22
long_02	-62.9126	44.68972	October 22
long_03	-62.919	44.69256	October 22
long_04	-62.925	44.69523	October 22
long_05	-62.9293	44.69773	October 22
long_06	-62.8998	44.68612	October 23
long_07	-62.896	44.6888	October 23
long_08	-62.8916	44.69197	October 23
long_09	-62.904	44.68821	October 23
long_10	-62.904	44.6908	October 23
long_11	-62.9042	44.69581	October 23
long_12	-62.9043	44.70107	October 23
long_13	-62.9045	44.70633	October 23
long_14	-62.9049	44.71101	October 23
long_15	-62.9052	44.71644	October 23
long_16	-62.9122	44.67911	October 22
long_17	-62.9163	44.67927	October 22
long_18	-62.9235	44.67927	October 22
long_19	-62.9306	44.67927	October 22
long_20	-62.9376	44.67944	October 22
long_21	-62.9447	44.67936	October 22
long_22	-62.9527	44.67927	October 22
long_23	-62.8983	44.67894	September 13
long_24	-62.8939	44.67894	September 13
long_25	-62.8866	44.67902	September 13
long_26	-62.8791	44.67894	September 13
long_27	-62.8711	44.67877	September 13
long_28	-62.9083	44.67418	September 13
long_29	-62.9121	44.67226	September 13
long_30	-62.9175	44.66866	September 13
long_31	-62.9225	44.66624	September 13
long_32	-62.9271	44.66399	September 13
long_33	-62.9327	44.66089	September 12
long_34	-62.9381	44.65788	September 12
long_35	-62.9436	44.65479	September 12
long_36	-62.9492	44.65162	September 12

<sup>5</sup> The name refers to the island or reef used as the center for the drop camera target array.

<sup>6</sup> 'X' means the location was not visited, no video record.

long_37	-62.9549	44.64852	September 12
long_38	-62.9601	44.64526	September 12
long_39	-62.966	44.64217	September 12
long_40	-62.9716	44.63916	September 12
long_41	-62.9769	44.63582	September 12
long_42	-62.9824	44.63256	September 12
long_43	-62.9878	44.62905	September 12
long_44	-62.9937	44.62604	September 12
long_45	-62.9988	44.62286	September 12
long_46	-63.0041	44.6196	September 12
long_47	-62.9033	44.67042	September 13
long_48	-62.9033	44.66716	September 13
long_49	-62.9035	44.6619	September 12
long_50	-62.9035	44.65671	September 12
long_51	-62.9036	44.65145	September 12
long_52	-62.9037	44.64627	September 12
long_53	-62.9033	44.64075	September 12
long_54	-62.9036	44.63548	September 12
long_55	-62.9036	44.63005	September 12
long_56	-62.9035	44.62495	September 12
long_57	-62.9036	44.6196	September 12
long_58	-62.9033	44.61433	September 12
long_59	-62.9033	44.60906	September 12
long_60	-62.9035	44.60446	September 12
long_61	-62.9028	44.6003	September 12
long_62	-62.899	44.67359	September 13
long_63	-62.8954	44.67134	September 13
long_64	-62.8902	44.66749	September 13
long_65	-62.8853	44.66373	September 13
long_66	-62.8807	44.66014	September 13
long_67	-62.8754	44.65655	September 13
long_68	-62.8701	44.65312	September 13
long_69	-62.8648	44.64936	September 13
long_70	-62.8599	44.64568	September 13
long_71	-62.8547	44.64209	September 13
long_72	-62.8494	44.63833	September 13
long_73	-62.8441	44.6344	September 13
long_74	-62.8384	44.63064	September 13
long_75	-62.8331	44.62687	September 13
long_76	-62.8268	44.62278	September 13
duck_77	-62.9379	44.70512	October 23

duck_78	-62.9379	44.70813	October 23
duck_79	-62.9379	44.7132	October 23
duck_80	-62.938	44.71988	October 23
duck_81	-62.9413	44.70387	October 22
duck_82	-62.9448	44.70571	October 22
duck_83	-62.9504	44.70872	October 22
duck_84	-62.9569	44.71188	October 22
duck_85	-62.9435	44.70189	October 22
duck_86	-62.9498	44.70167	October 22
duck_87	-62.9544	44.70145	October 22
duck_88	-62.9611	44.70123	October 22
duck_89	-62.9672	44.70094	October 22
duck_90	-62.9315	44.70196	October 23
duck_91	-62.9277	44.70409	October 23
duck_92	-62.9218	44.70732	October 23
duck_93	-62.9165	44.71041	October 23
duck_94	-62.9112	44.71335	October 23
duck_95	-62.9396	44.69932	October 22
duck_96	-62.9429	44.69726	October 22
duck_97	-62.9481	44.69396	October 22
duck_98	-62.9542	44.69117	October 22
duck_99	-62.9619	44.68691	October 22
duck_100	-62.9738	44.68213	October 22
duck_101	-62.9813	44.67853	October 22
duck_102	-62.9889	44.67523	October 22
duck_103	-62.9994	44.67137	October 22
goose_104	-62.8897	44.69565	October 23
goose_105	-62.8904	44.69961	October 23
goose_106	-62.8906	44.70292	October 23
goose_107	-62.8918	44.70909	October 23
goose_108	-62.8925	44.71239	October 23
goose_109	-62.8789	44.69947	October 23
goose_110	-62.8747	44.70094	October 23
goose_111	-62.8701	44.70262	October 23
goose_112	-62.8851	44.69352	October 23
goose_113	-62.8806	44.69359	October 23
goose_114	-62.8733	44.69352	October 23
goose_115	-62.8669	44.69359	October 23
goose_116	-62.8603	44.69366	October 23
goose_117	-62.8846	44.69007	October 23
goose_118	-62.8801	44.68808	October 23

goose_119	-62.8738	44.68514	October 23
goose_120	-62.8674	44.6825	September 13
goose_121	-62.8616	44.67941	September 13
goose_122	-62.8553	44.67662	September 13
goose_123	-62.8493	44.67368	September 13
goose_124	-62.8434	44.67089	September 13
goose_125	-62.8377	44.6678	September 13
goose_126	-62.8316	44.66487	September 13
goose_127	-62.8255	44.66185	September 13
goose_128	-62.8208	44.65825	September 13
goose_129	-62.8154	44.65443	September 13
goose_130	-62.8099	44.6512	September 13
goose_131	-62.805	44.64723	September 13
goose_132	-62.8004	44.64421	September 13
goose_133	-62.7973	44.64237	September 13
goose_134	-62.7928	44.63921	September 13
goose_135	-62.7879	44.63521	September 13
laney_136	-62.8006	44.69514	September 9
laney_137	-62.7972	44.69291	September 9
laney_138	-62.7917	44.68949	September 9
laney_139	-62.7862	44.68614	September 9
laney_140	-62.781	44.68266	September 9
laney_141	-62.7756	44.67924	September 9
laney_142	-62.7705	44.67549	September 9
laney_143	-62.7653	44.67195	September 9
laney_144	-62.76	44.66833	September 9
laney_145	-62.7545	44.66465	September 9
laney_146	-62.7496	44.66077	September 9
laney_147	-62.7447	44.65676	September 9
laney_148	-62.7396	44.65302	September 9
laney_149	-62.7329	44.64872	September 9
laney_150	-62.8007	44.69179	X
laney_151	-62.8008	44.68667	X
laney_152	-62.8009	44.68161	X
laney_153	-62.8008	44.67655	X
laney_154	-62.801	44.67122	X
laney_155	-62.8009	44.66603	X
laney_156	-62.8008	44.66084	X
laney_157	-62.8107	44.68975	October 23
laney_158	-62.8124	44.68647	October 23
laney_159	-62.814	44.68128	October 23

laney_160	-62.8184	44.67714	October 23
laney_161	-62.8217	44.67221	October 23
west_162	-62.7565	44.71005	October 24
west_163	-62.7528	44.70802	October 24
west_164	-62.7472	44.70447	September 9
west_165	-62.7416	44.70112	September 9
west_166	-62.7365	44.69797	September 9
west_167	-62.7311	44.69416	September 9
west_168	-62.7255	44.69041	September 9
west_169	-62.7201	44.6866	September 9
west_170	-62.7145	44.68292	September 9
west_171	-62.7097	44.67891	September 9
west_172	-62.7042	44.6751	September 9
west_173	-62.6991	44.67155	September 9
west_174	-62.6941	44.66767	September 9
west_175	-62.6882	44.6634	September 9
west_176	-62.7597	44.71045	October 24
west_177	-62.7599	44.70716	October 24
west_178	-62.7598	44.70197	October 24
west_179	-62.7597	44.69672	October 24
west_180	-62.7597	44.69146	October 24
west_181	-62.7659	44.70887	October 24
west_182	-62.7697	44.70742	October 24
west_183	-62.7762	44.70552	October 24
west_184	-62.7826	44.70335	October 24
west_185	-62.787	44.70197	October 24
west_186	-62.7901	44.70132	October 24
west_187	-62.7641	44.71314	October 24
west_188	-62.7684	44.71307	October 24
west_189	-62.7754	44.7132	October 24
west_190	-62.7827	44.71314	October 24
west_191	-62.7901	44.71307	October 24
west_192	-62.7941	44.71314	October 24
west_193	-62.7705	44.71714	X
west_194	-62.7755	44.71885	X
west_195	-62.7818	44.72128	X
west_196	-62.788	44.72351	X
west_197	-62.794	44.72594	X
west_198	-62.7999	44.7285	X
west_199	-62.8066	44.73113	X
west_200	-62.7521	44.71314	October 24

west_201	-62.7473	44.71314	October 24
west_202	-62.7402	44.71314	October 24
west_203	-62.733	44.71314	October 24
west_204	-62.7258	44.71314	October 24
charles_205	-62.7037	44.73507	October 24
charles_206	-62.7037	44.73198	September 9
charles_207	-62.7037	44.72673	September 9
charles_208	-62.7037	44.72122	September 9
charles_209	-62.7036	44.7159	September 9
charles_210	-62.7035	44.71058	September 9
charles_211	-62.7036	44.70539	September 9
charles_212	-62.7034	44.70026	September 9
charles_213	-62.7098	44.73809	October 24
charles_214	-62.7157	44.73513	October 24
charles_215	-62.7227	44.7312	October 24
charles_216	-62.7285	44.72811	October 24
charles_217	-62.7344	44.72476	October 24
charles_218	-62.7395	44.72108	October 24
charles_219	-62.7177	44.73835	October 24
charles_220	-62.7247	44.73822	October 24
charles_221	-62.7317	44.73815	October 24
charles_222	-62.7387	44.73822	October 24
charles_223	-62.7436	44.73842	October 24
charles_224	-62.7462	44.73815	October 24
charles_225	-62.6943	44.73855	October 24
charles_226	-62.6909	44.73605	September 9
charles_227	-62.6853	44.73251	September 9
charles_228	-62.68	44.72883	September 9
charles_229	-62.6747	44.72496	September 9
charles_230	-62.6696	44.72122	September 9
charles_231	-62.6646	44.71714	September 9
charles_232	-62.6599	44.71314	September 9
charles_233	-62.6554	44.70887	September 9
charles_234	-62.6506	44.70467	September 9
charles_235	-62.646	44.70046	September 9
charles_236	-62.6415	44.69619	September 9
charles_237	-62.6363	44.69218	September 9
charles_238	-62.6313	44.68824	September 9
charles_239	-62.6255	44.6843	September 9
hard_240	-62.7681	44.76709	October 19
hard_241	-62.7726	44.76704	October 19

hard_242	-62.7798	44.76695	October 19
hard_243	-62.7873	44.76695	October 19
hard_244	-62.7929	44.767	October 19
hard_245	-62.7966	44.7669	October 19
hard_246	-62.7722	44.76443	October 19
hard_247	-62.7777	44.7613	October 19
hard_248	-62.783	44.75822	October 19
hard_249	-62.7647	44.76457	October 19
hard_250	-62.7616	44.762	October 19
hard_251	-62.7567	44.75803	October 19
hard_252	-62.7519	44.75397	October 19
hard_253	-62.7471	44.75019	October 19
hard_254	-62.7421	44.74604	October 19
hard_255	-62.767	44.76452	October 19
hard_256	-62.7675	44.7614	October 19
hard_257	-62.7685	44.75645	October 19
hard_258	-62.769	44.75379	October 19
gravel_259	-62.7178	44.77978	September 14
gravel_260	-62.7178	44.77661	September 14
gravel_261	-62.7178	44.77152	September 14
gravel_262	-62.7179	44.76634	September 14
gravel_263	-62.7178	44.76182	September 14
gravel_264	-62.7266	44.77974	September 14
gravel_265	-62.7312	44.77969	September 14
gravel_266	-62.7386	44.77964	September 14
gravel_267	-62.7443	44.77964	September 14
gravel_268	-62.7256	44.77764	September 14
gravel_269	-62.727	44.7753	September 14
gravel_270	-62.7283	44.77302	September 14
tangier_271	-62.6518	44.75317	October 19
tangier_272	-62.6485	44.75085	October 19
tangier_273	-62.6433	44.74714	October 19
tangier_274	-62.6382	44.74363	October 24
tangier_275	-62.6329	44.7396	October 24
tangier_276	-62.6256	44.73426	October 24
tangier_277	-62.6198	44.7303	September 14
tangier_278	-62.6147	44.72647	September 14
tangier_279	-62.6093	44.72289	September 14
tangier_280	-62.6041	44.71912	September 14
tangier_281	-62.5991	44.71535	September 14
tangier_282	-62.5943	44.71157	September 14

tangier_283	-62.5892	44.70793	September 14
tangier_284	-62.5845	44.70397	September 14
tangier_285	-62.579	44.70045	September 14
tangier_286	-62.5732	44.69686	September 14
tangier_287	-62.6578	44.74457	October 24
tangier_288	-62.6577	44.74118	October 24
tangier_289	-62.6575	44.7359	October 24
tangier_290	-62.6575	44.73049	X
tangier_291	-62.6574	44.72553	X
tangier_292	-62.6654	44.75116	October 24
tangier_293	-62.6684	44.74878	October 24
tangier_294	-62.6732	44.74494	October 24
tangier_295	-62.6779	44.74048	October 24
tangier_296	-62.6693	44.75374	October 24
tangier_297	-62.6737	44.75368	October 24
tangier_298	-62.6811	44.75355	September 14
tangier_299	-62.6882	44.75361	September 14
tangier_300	-62.6954	44.75355	September 14
tangier_301	-62.7029	44.75349	September 14
tangier_302	-62.6502	44.75864	October 19
tangier_303	-62.6456	44.75858	October 19
tangier_304	-62.6382	44.75851	October 19
tangier_305	-62.6327	44.75839	October 19
tangier_306	-62.6092	44.75826	October 19
tangier_307	-62.6045	44.75814	October 19
tangier_308	-62.5972	44.75801	X
tangier_309	-62.5898	44.75789	X
tangier_310	-62.6562	44.76536	October 19
tangier_311	-62.6521	44.77032	October 19
tangier_312	-62.6541	44.76756	October 19
iron_313	-62.6411	44.77378	September 8
iron_314	-62.6363	44.77371	September 8
iron_315	-62.6289	44.77365	October 19
iron_316	-62.6218	44.77365	October 19
phoenix_317	-62.6232	44.78137	September 8
phoenix_318	-62.6278	44.78131	September 8
phoenix_319	-62.6326	44.78131	September 8
phoenix_320	-62.6383	44.78118	September 8
phoenix_321	-62.6042	44.7717	October 19
phoenix_322	-62.601	44.76913	October 19
phoenix_323	-62.5965	44.76517	X



phoenix_324	-62.592	44.7609	X
phoenix_325	-62.5851	44.75374	X
phoenix_326	-62.5799	44.75003	September 14
phoenix_327	-62.5748	44.74633	September 14
phoenix_328	-62.5697	44.74275	September 14
phoenix_329	-62.5643	44.7391	September 14
phoenix_330	-62.5593	44.73533	September 14
phoenix_331	-62.5541	44.73175	September 14
phoenix_332	-62.5488	44.72792	September 14
phoenix_333	-62.5428	44.72408	September 14
phoenix_334	-62.5377	44.72056	September 14
phoenix_335	-62.532	44.71692	September 14
phoenix_336	-62.5256	44.71233	X
phoenix_337	-62.5987	44.78219	October 19
phoenix_338	-62.5916	44.78206	October 19
phoenix_339	-62.5842	44.78206	October 19
phoenix_340	-62.5793	44.782	October 19
phoenix_341	-62.5719	44.78194	October 19
phoenix_342	-62.5648	44.78175	October 19
phoenix_343	-62.5944	44.79663	October 19
phoenix_344	-62.5902	44.79788	September 8
phoenix_345	-62.5835	44.79995	September 8
phoenix_346	-62.5766	44.8019	September 8
phoenix_347	-62.5727	44.8029	September 8
ram_348	-62.5987	44.81018	September 8
ram_349	-62.5932	44.81025	September 8
ram_350	-62.5868	44.81018	September 8
ram_351	-62.5808	44.81006	September 8
ram_352	-62.5957	44.80774	September 8
ram_353	-62.5907	44.80416	September 8
ram_354	-62.6	44.8137	September 8
ram_355	-62.5988	44.81759	September 8
ram_356	-62.5979	44.82085	September 8
ram_357	-62.6036	44.81571	September 8
ram_358	-62.6091	44.81866	September 8
ram_359	-62.6151	44.82142	September 8
ram_360	-62.6203	44.82437	September 8
pyches_361	-62.5377	44.79858	October 19
pyches_362	-62.5379	44.79473	October 19
pyches_363	-62.5372	44.7854	September 10
pyches_364	-62.5371	44.78018	September 10

pyches_365	-62.537	44.77487	September 10
pyches_366	-62.5368	44.76948	September 10
pyches_367	-62.537	44.76409	September 10
pyches_368	-62.537	44.75886	September 10
pyches_369	-62.5371	44.75347	September 10
pyches_370	-62.537	44.74841	September 10
pyches_371	-62.5367	44.74328	September 10
pyches_372	-62.5368	44.73805	September 10
pyches_373	-62.519	44.79251	September 10
pyches_374	-62.5162	44.78994	September 10
pyches_375	-62.5115	44.78609	September 10
pyches_376	-62.507	44.78215	September 10
pyches_377	-62.5017	44.77821	September 10
pyches_378	-62.4968	44.77427	September 10
pyches_379	-62.4916	44.77042	September 10
pyches_380	-62.4866	44.76648	September 10
pyches_381	-62.4819	44.76246	September 10
pyches_382	-62.4772	44.75852	September 10
pyches_383	-62.4724	44.75467	X
pyches_384	-62.4677	44.7509	X
pyches_385	-62.4626	44.74713	X
pyches_386	-62.458	44.7431	X
pyches_387	-62.4531	44.73942	X
pyches_388	-62.4481	44.73539	X
pyches_389	-62.4436	44.73145	X
pyches_390	-62.5408	44.81287	September 6
pyches_391	-62.5407	44.81595	September 6
pyches_392	-62.5406	44.82083	September 6
pyches_393	-62.5404	44.82553	September 6
pyches_394	-62.5462	44.81407	September 6
pyches_395	-62.548	44.81681	September 6
pyches_396	-62.5516	44.82297	September 6
pyches_397	-62.5541	44.82784	September 6
pyches_398	-62.5569	44.83357	September 6
pyches_399	-62.5591	44.83768	September 6
pyches_400	-62.5609	44.84118	September 6
boutilier_401	-62.5485	44.84272	September 6
boutilier_402	-62.5535	44.84144	September 6
guilford_403	-62.5109	44.80842	October 19
guilford_404	-62.511	44.80509	October 19
guilford_405	-62.5109	44.79978	October 19

guilford_406	-62.5108	44.79448	October 19
guilford_407	-62.505	44.80902	October 19
guilford_408	-62.5016	44.80654	September 10
guilford_409	-62.4961	44.80269	September 10
guilford_410	-62.4912	44.79893	September 10
guilford_411	-62.4865	44.79516	September 10
guilford_412	-62.4812	44.79148	September 10
guilford_413	-62.4763	44.78771	September 10
guilford_414	-62.4713	44.78403	X
guilford_415	-62.4659	44.78061	X
guilford_416	-62.4606	44.7771	X
guilford_417	-62.4552	44.77359	X
guilford_418	-62.4497	44.76982	X
guilford_419	-62.4445	44.76614	X
guilford_420	-62.4389	44.76272	X
guilford_421	-62.4332	44.75903	X
guilford_422	-62.4277	44.75561	X
guilford_423	-62.4221	44.75244	X
guilford_424	-62.4166	44.74893	X
guilford_425	-62.411	44.7455	X
guilford_426	-62.5171	44.80962	October 19
guilford_427	-62.5201	44.8074	October 19
guilford_428	-62.5247	44.80329	October 19
guilford_429	-62.5288	44.79961	October 19
guilford_430	-62.5237	44.81416	September 6
guilford_431	-62.5288	44.81416	September 6
guilford_432	-62.5347	44.81416	September 6
guilford_433	-62.5038	44.81381	September 10
guilford_434	-62.4992	44.81373	September 10
guilford_435	-62.4932	44.81364	September 10
guilford_436	-62.4867	44.81356	September 10
guilford_437	-62.4797	44.81356	September 10
guilford_438	-62.5064	44.81732	September 10
guilford_439	-62.5027	44.81937	September 10
guilford_440	-62.4972	44.82237	September 10
guilford_441	-62.4915	44.82545	September 10
guilford_442	-62.4861	44.8287	September 10
guilford_443	-62.4802	44.83229	September 10
western_444	-62.5075	44.84024	September 6
western_445	-62.5085	44.84324	September 6
western_446	-62.5099	44.84708	September 6

western_447	-62.5109	44.84991	September 6
western_448	-62.5138	44.84059	September 6
western_449	-62.5198	44.84135	September 6
western_450	-62.4989	44.8405	September 10
western_451	-62.4932	44.84144	September 10
sober_452	-62.4315	44.81826	October 21
sober_453	-62.4287	44.81561	October 21
sober_454	-62.4235	44.81176	October 21
sober_455	-62.4139	44.80235	X
sober_456	-62.409	44.79867	X
sober_457	-62.4044	44.79465	X
sober_458	-62.3999	44.7902	X
sober_459	-62.3946	44.786	X
sober_460	-62.3897	44.78206	X
sober_461	-62.3849	44.77778	X
sober_462	-62.3802	44.77393	X
sober_463	-62.3752	44.77017	September 26
sober_464	-62.37	44.76631	September 26
sober_465	-62.3657	44.76254	September 26
sober_466	-62.4537	44.81818	October 21
sober_467	-62.4534	44.81475	October 21
sober_468	-62.4533	44.80945	October 21
sober_469	-62.4532	44.80423	X
sober_470	-62.4529	44.79893	X
sober_471	-62.4526	44.79422	October 21
sober_472	-62.4522	44.7902	October 21
sober_473	-62.4477	44.83297	October 21
sober_474	-62.441	44.83315	October 21
sober_475	-62.4346	44.83323	October 21
softwood_476	-62.3956	44.82507	October 21
softwood_477	-62.3892	44.8221	October 21
softwood_478	-62.3727	44.81345	X
softwood_479	-62.3689	44.81149	X
softwood_480	-62.3633	44.80844	X
softwood_481	-62.3574	44.80581	X
softwood_482	-62.3512	44.80267	X
softwood_483	-62.3452	44.79962	X
softwood_484	-62.3392	44.79648	X
softwood_485	-62.3329	44.79325	X
softwood_486	-62.3262	44.79028	X
softwood_487	-62.3204	44.7874	X

softwood_488	-62.3145	44.7846	X
softwood_489	-62.3087	44.78171	X
softwood_490	-62.3012	44.77806	X
softwood_491	-62.409	44.84491	October 21
softwood_492	-62.4132	44.84991	October 21
softwood_493	-62.4194	44.85788	October 21
softwood_494	-62.3845	44.84466	October 21
sutherland_495	-62.3786	44.86169	October 21
sutherland_496	-62.3786	44.86466	October 21
sutherland_497	-62.3788	44.86966	October 21
sutherland_498	-62.3722	44.85737	October 21
sutherland_499	-62.3682	44.85915	October 21
sutherland_500	-62.3624	44.86186	October 21
sutherland_501	-62.3568	44.86424	October 21
sutherland_502	-62.3517	44.86653	October 21
sutherland_503	-62.3339	44.87636	October 21
sutherland_504	-62.3642	44.85008	October 21
sutherland_505	-62.3592	44.84991	October 21
sutherland_506	-62.3515	44.84983	October 21
sutherland_507	-62.3441	44.84983	October 21
sutherland_508	-62.3369	44.84983	X
sutherland_509	-62.3286	44.85008	October 21
sutherland_510	-62.3217	44.85017	October 21
sutherland_511	-62.3142	44.85025	October 21
sutherland_512	-62.3074	44.85	October 21
sutherland_513	-62.3565	44.8416	October 21
sutherland_514	-62.3521	44.83889	October 21
sutherland_515	-62.3471	44.83635	September 26
sutherland_516	-62.3415	44.83304	September 26
sutherland_517	-62.3351	44.83066	September 26
sutherland_518	-62.3289	44.82803	X
sutherland_519	-62.3227	44.82532	X
sutherland_520	-62.3169	44.82235	X
sutherland_521	-62.3105	44.81955	X
sutherland_522	-62.3043	44.81633	X
sutherland_523	-62.2975	44.81378	X
sutherland_524	-62.2907	44.81149	X
sutherland_525	-62.2845	44.80937	X
sutherland_526	-62.2778	44.807	X
sutherland_527	-62.2715	44.80471	X
sutherland_528	-62.2652	44.80233	X

sutherland_529	-62.2592	44.80004	X
sutherland_530	-62.2533	44.79775	X
sutherland_531	-62.2435	44.79402	X
bird_532	-62.279	44.87245	X
bird_533	-62.2801	44.89882	X
bird_534	-62.2798	44.90196	X
bird_535	-62.2799	44.90748	X
bird_536	-62.2798	44.91284	X
bird_537	-62.2861	44.87031	October 21
bird_538	-62.29	44.87184	October 21
bird_539	-62.2959	44.87468	October 21
bird_540	-62.302	44.87736	October 21
bird_541	-62.3083	44.88043	October 21
bird_542	-62.3146	44.88341	October 21
bird_543	-62.3184	44.88525	October 21
bird_544	-62.2893	44.86494	October 21
bird_545	-62.2943	44.86486	October 21
bird_546	-62.3012	44.86494	October 21
bird_547	-62.3077	44.86471	October 21
bird_548	-62.3154	44.86448	October 21
bird_549	-62.3231	44.86425	October 21
bird_550	-62.3304	44.86448	October 21
bird_551	-62.2852	44.8608	X
bird_552	-62.2881	44.85658	X
bird_553	-62.2914	44.85182	X
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bird_555	-62.2987	44.84231	X
bird_556	-62.3018	44.83809	X
bird_557	-62.2775	44.86279	X
bird_558	-62.2776	44.85911	X
bird_559	-62.2774	44.85413	X
bird_560	-62.2777	44.84883	X
bird_561	-62.2779	44.84362	X
bird_562	-62.2782	44.83809	X
bird_563	-62.2781	44.83257	X
bird_564	-62.2713	44.86417	X
bird_565	-62.2652	44.86126	X
bird_566	-62.2597	44.85873	X
bird_567	-62.2537	44.85535	X
bird_568	-62.2413	44.84891	X
bird_569	-62.2355	44.84561	X

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bird_571	-62.2236	44.83894	X
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bird_576	-62.1933	44.82367	X
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bird_578	-62.1814	44.81692	X
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bird_580	-62.2582	44.87583	X
bird_581	-62.2537	44.87736	X
bird_582	-62.2475	44.87951	X
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bird_584	-62.2346	44.8841	X
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halibut_618	-62.1748	44.87629	X
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halibut_631	-62.0964	44.83955	X
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halibut_640	-62.1386	44.89621	X
halibut_641	-62.1316	44.89629	X
halibut_642	-62.124	44.89606	X
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halibut_651	-62.1845	44.90978	X



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halibut_653	-62.1788	44.91422	X
crooks_654	-62.112	44.94405	X
crooks_655	-62.1159	44.94523	X
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crooks_657	-62.1292	44.94833	X
crooks_658	-62.1358	44.95069	X
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crooks_660	-62.1486	44.95261	X
crooks_661	-62.1527	44.95325	X
crooks_662	-62.121	44.93849	X
crooks_663	-62.1257	44.93881	X
crooks_664	-62.1325	44.93924	X
crooks_665	-62.1379	44.93935	X
crooks_666	-62.1426	44.93988	X
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crooks_668	-62.0955	44.94872	X
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crooks_670	-62.1098	44.92501	X
crooks_671	-62.114	44.92127	X
crooks_672	-62.1168	44.91774	X
crooks_673	-62.1259	44.90789	X
crooks_674	-62.0992	44.92587	X
crooks_675	-62.0992	44.92223	X
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crooks_682	-62.0748	44.91121	X
crooks_683	-62.0717	44.90864	X
crooks_684	-62.065	44.90415	X
crooks_685	-62.0619	44.90147	X
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crooks_687	-62.0525	44.89366	X
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crooks_690	-62.0373	44.88081	X
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crooks_694	-62.0185	44.86539	X
little_695	-62.0953	44.89141	X
little_696	-62.093	44.88841	X
little_697	-62.0885	44.88327	X
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little_699	-62.0807	44.87439	X
little_700	-62.076	44.86989	X
little_701	-62.071	44.86582	X
little_702	-62.0673	44.86089	X
little_703	-62.1045	44.8913	X
little_704	-62.1072	44.88809	X
little_705	-62.1099	44.88413	X
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little_707	-62.1179	44.87482	X
little_708	-62.1209	44.87032	X
little_709	-62.1238	44.86582	X
little_710	-62.1266	44.86229	X
goose_711	-62.0585	44.93229	X
goose_712	-62.0554	44.92994	X
goose_713	-62.05	44.92619	X
goose_714	-62.045	44.92234	X
goose_715	-62.0414	44.92009	X
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goose_718	-62.0262	44.90896	X
goose_719	-62.0201	44.90543	X
goose_720	-62.0144	44.90179	X
goose_721	-62.0081	44.89858	X
goose_722	-62.0021	44.89505	X
goose_723	-61.9961	44.89152	X
goose_724	-61.9902	44.88799	X
goose_725	-61.9833	44.88499	X
goose_726	-61.9769	44.88156	X
goose_727	-61.9698	44.87846	X
gull_728	-62.0283	44.91175	X
gull_729	-62.026	44.91474	X
gull_730	-62.0239	44.92031	X
gull_731	-62.0209	44.92469	X
gull_732	-62.0176	44.9294	X
gull_733	-62.0152	44.93304	X

gull_734	-62.0128	44.9371	X
gull_735	-62.0235	44.91068	X
gull_736	-62.0177	44.91078	X
gull_737	-62.0117	44.91089	X
gull_738	-62.0066	44.91089	X
gull_739	-62.0001	44.91089	X
gull_740	-61.9929	44.911	X
gull_741	-61.9855	44.91089	X
gull_742	-61.9792	44.91078	X

Table 2. Benthic classification.

Category	details
<i>Substrate</i>	
mud / sand	flat bottom of small grain size, shell hash often present, ripples
gravel	
cobble / boulder	10 cm and larger
ledge	larger blocks of rock, often extensively fissured
<i>Macrophyte</i> <sup>7</sup>	
coralline <sup>8</sup>	<i>Corallina officinalis</i> L. (mostly at 10m); <i>Lithothamnion glaciale</i> Kjellman; <i>Clathromorphum circumscriptum</i> (Strömfelt) Foslie; <i>Phymatolithon</i> spp.
red turf <sup>8</sup>	10 – 20 m: dominated by <i>Phyllophora pseudoceranoides</i> (S.G. Gmelin) Newroth & A.R.A. Taylor with a canopy mixture of <i>Chondrus crispus</i> Stackhouse, <i>Palmaria palmata</i> (L.) F. Weber & D. Mohr, <i>Phycodrys rubens</i> (L.) Batters and others; filamentous forms including <i>Bonnemaisonia hamifera</i> Hariot, <i>Ceramium</i> spp., <i>Antithamnion</i> spp., <i>Polysiphonia</i> spp. and similar  >20 m: dominated by <i>Ptilota serrata</i> Kützinger and filamentous reds  >40 m: red crusts (most likely <i>Peyssonnelia rosenvingei</i> F. Schmitz, possibly <i>Hildenbrandia</i> ); small blades (most likely <i>Turnerella pennyi</i> (Harvey) F. Schmitz, possibly <i>Dilsea</i> )
Alaria	<i>Alaria esculenta</i> (L.) Greville
Saccharina <sup>8</sup>	the ‘frilled morph’ of <i>Saccharina latissima</i> (L.) C.E. Lane, C. Mayes, Druehl & G.W. Saunders – possibly including <i>S. nigripes</i> (J. Agardh) Lontin & G.W. Saunders
Laminaria	<i>Laminaria digitata</i> (Hudson) J.V. Lamouroux
Agarum	<i>Agarum clathratum</i> Dumortier
Desmarestia <sup>8</sup>	<i>Desmarestia aculeata</i> (L.) J.V. Lamouroux; <i>D. viridis</i> (O.F. Müller) J.V. Lamouroux
<i>Invertebrate</i>	
Boltenia	<i>Boltenia ovifera</i> (L.)
sponge <sup>8</sup>	a variety of species
anemone <sup>8</sup>	a variety of species <sup>9</sup>
sand dollar <sup>8</sup>	<i>Echinarachnius parma</i> Lamarck
brittle star <sup>8</sup>	<i>Ophiura</i> sp.
sea star <sup>8</sup>	a variety of species
lobster	<i>Homarus americanus</i> H. Milne Edwards

<sup>7</sup> Drift material on mud / sand or in deep crevasses was not counted in the classification, although this material may be important to local detrital food webs (Filbee-Dexter and Scheibling 2016).

<sup>8</sup> Grab samples required to confirm species listed in ‘details’.

<sup>9</sup> There may be some soft corals in this mix. The video quality was too poor to discern differences and future grab samples will be required to confirm taxonomy.

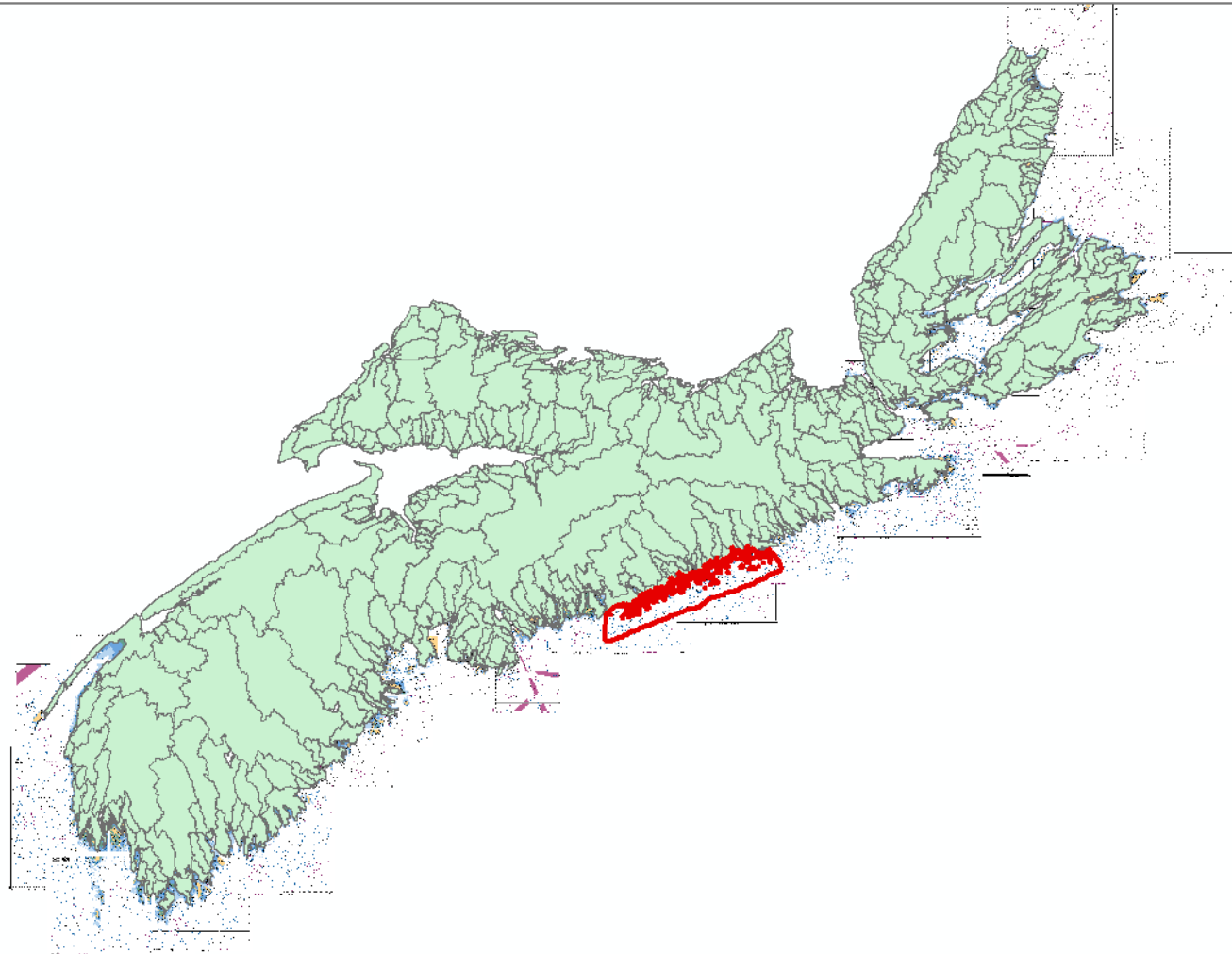


Figure 1: Eastern Shore Archipelago EBSA (red outline) showing main watersheds of Nova Scotia and hydrographic chart layout in GIS.

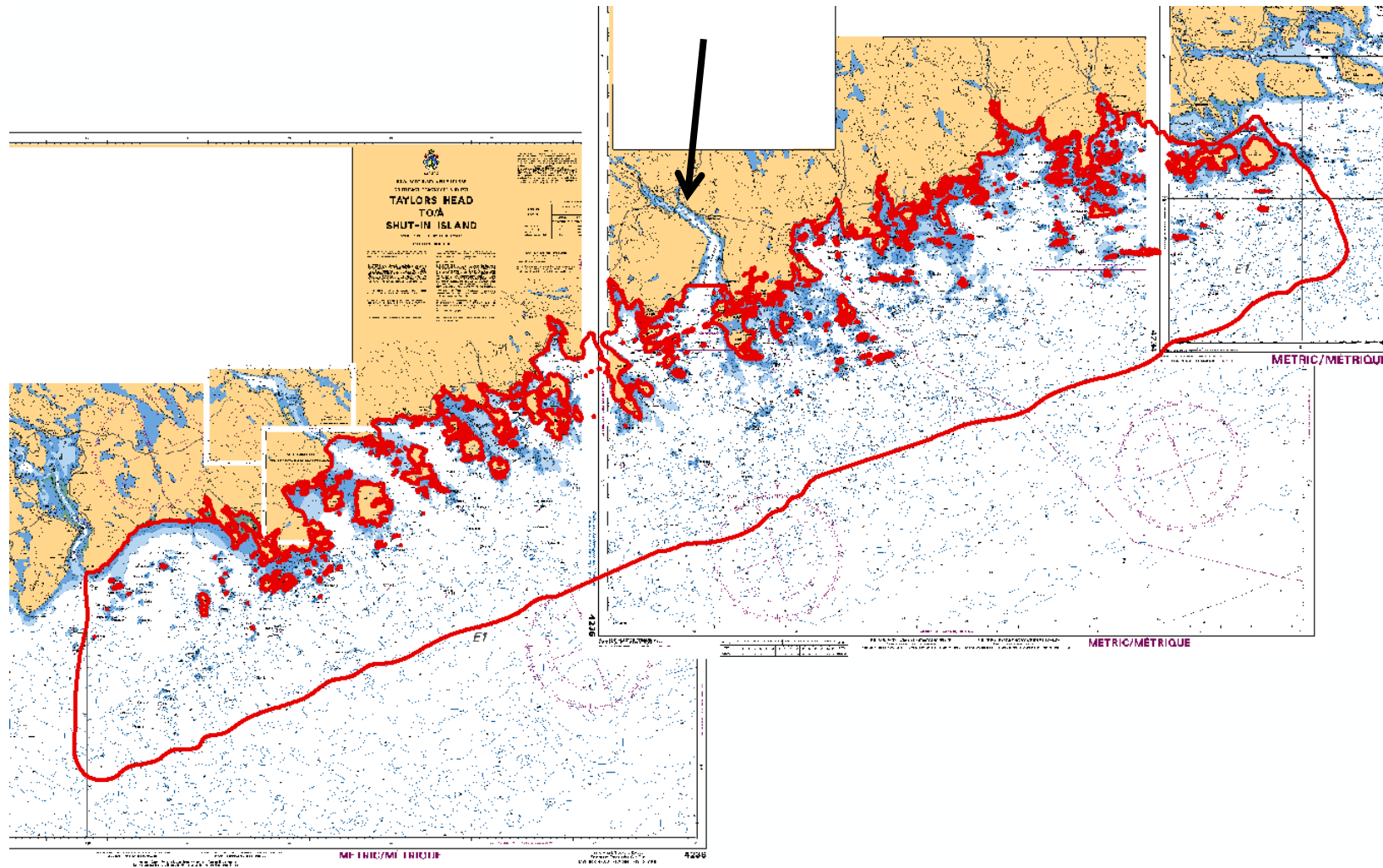


Figure 2: EBSA outlined in red, black arrow indicates Sheet Harbor.

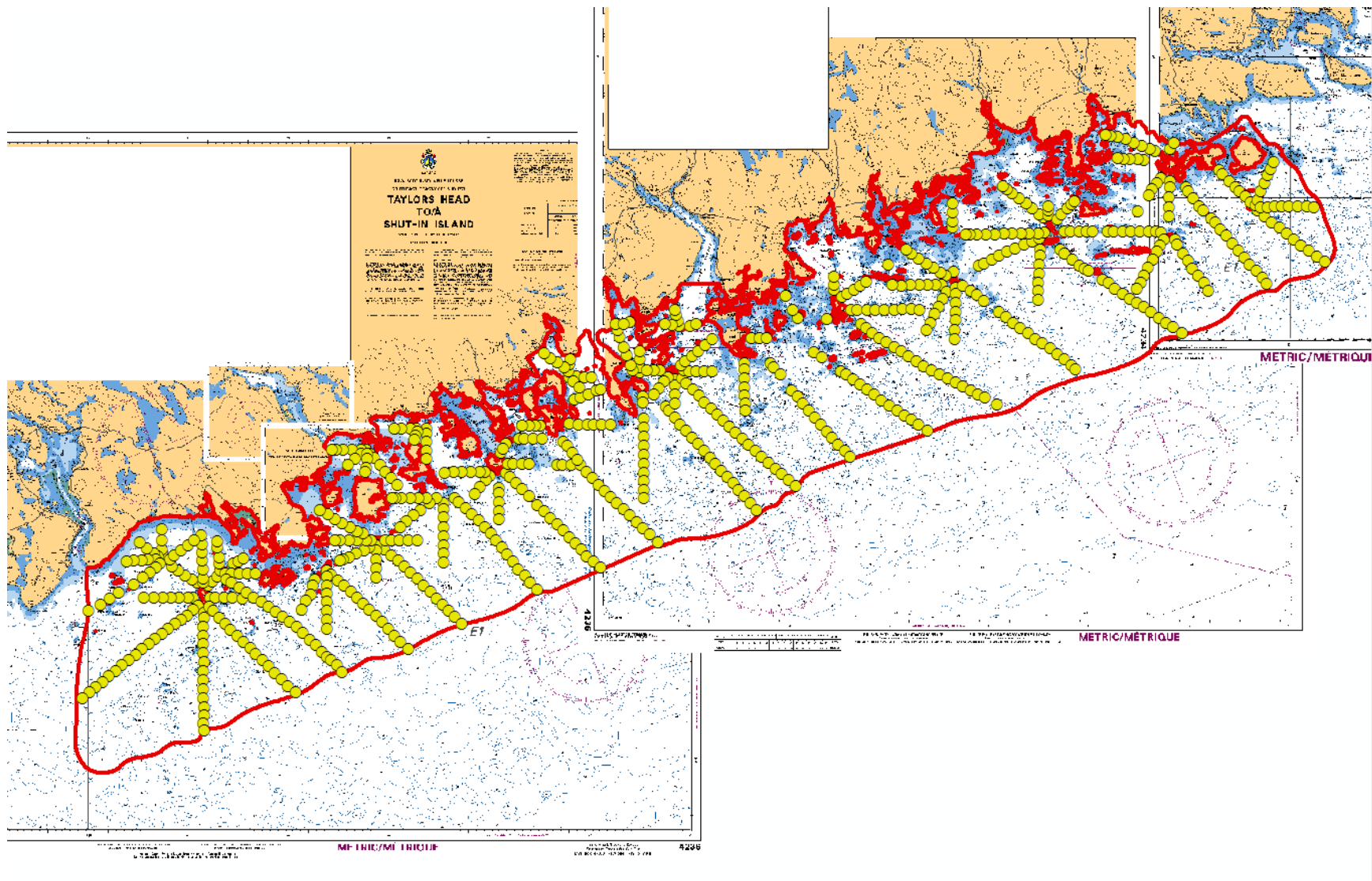


Figure 3: The planned 742 drop camera targets (yellow circles).



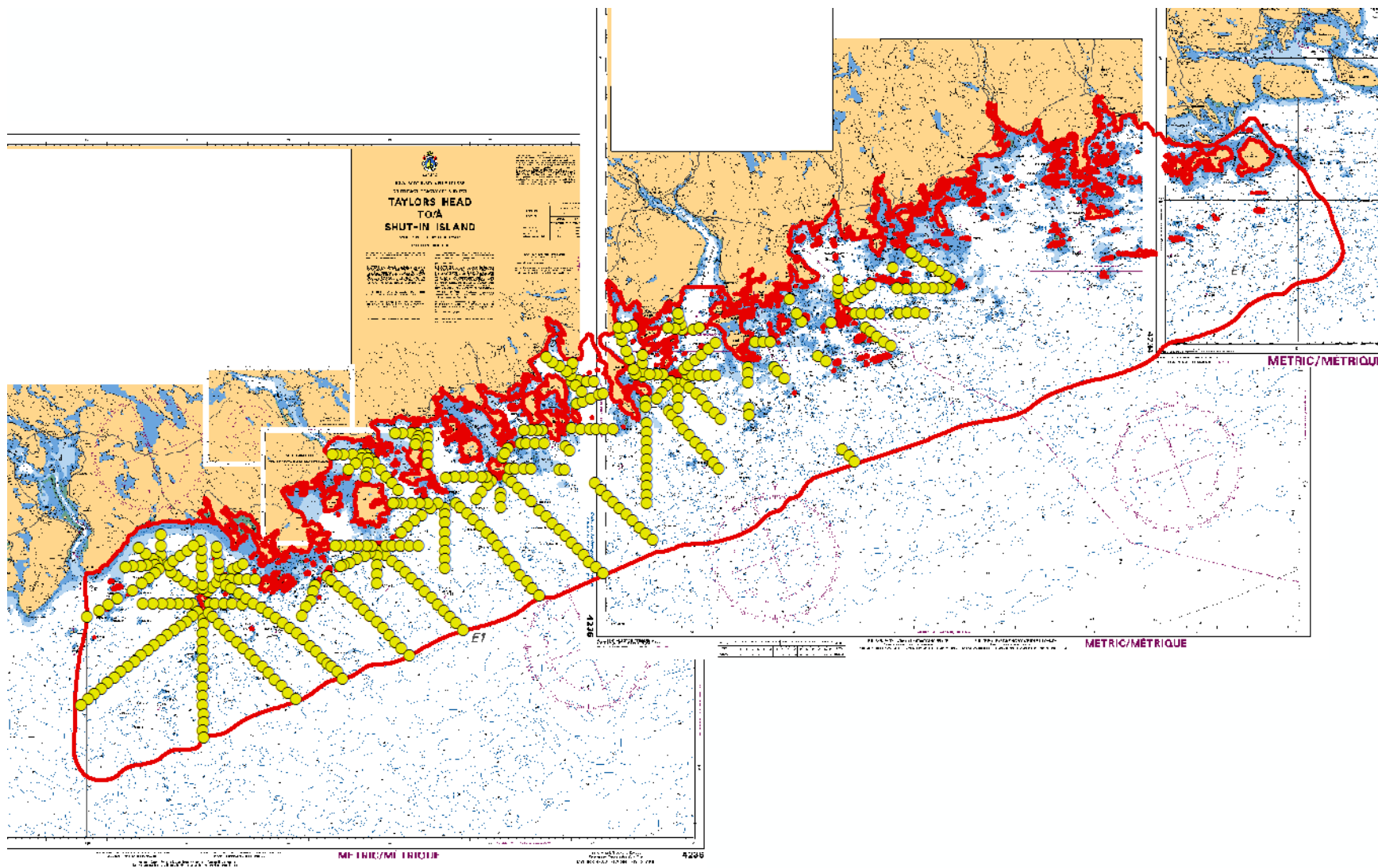


Figure 4: The 466 drop camera targets where video was recorded (yellow circles).





Figure 5: Bird observer in wheelhouse.



Figure 6: Raymond Naugle at Sigma-T helm station with navigation computer.





Figure 7: Video electronics in the wheelhouse.

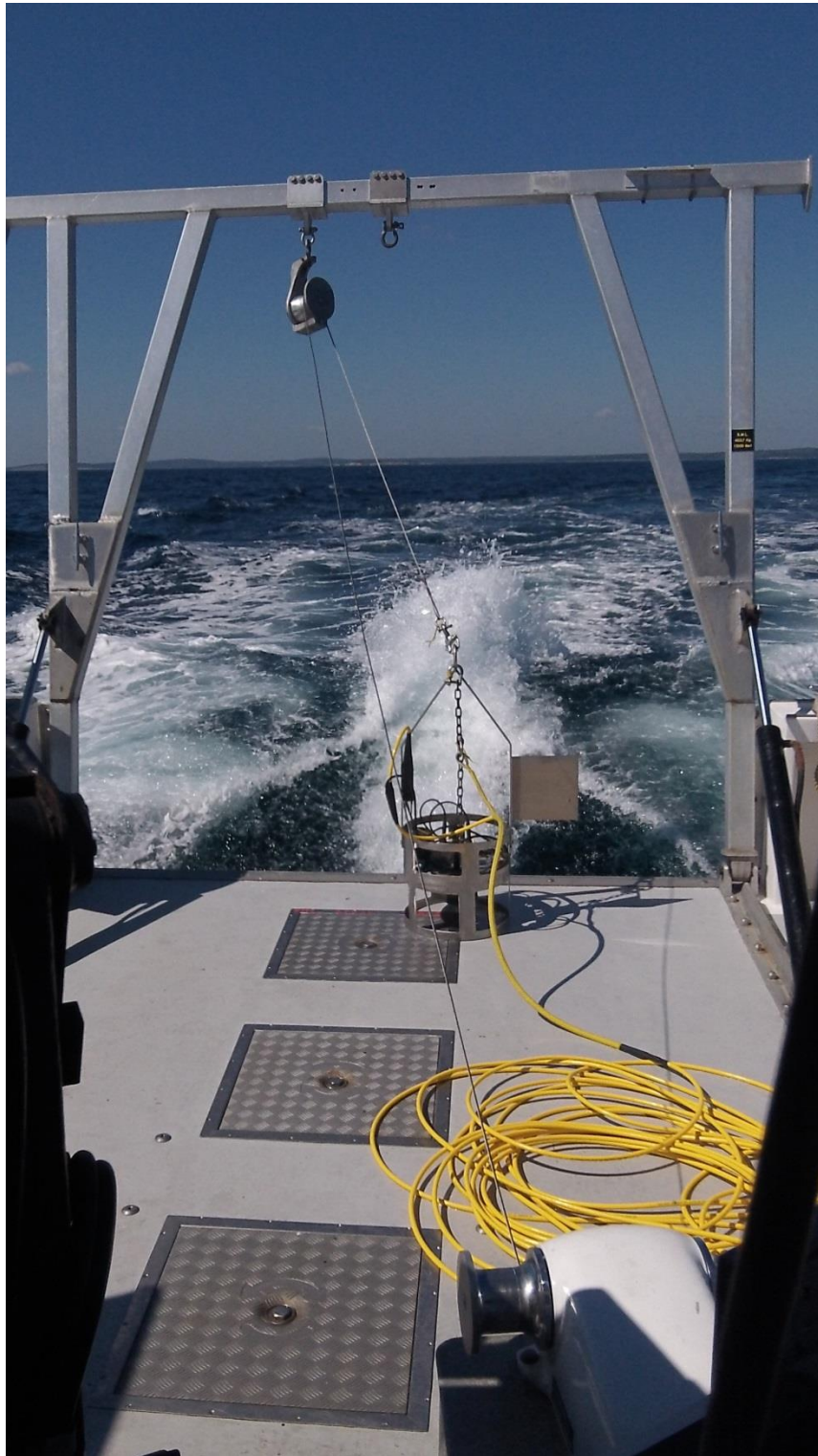


Figure 8: Working deck showing wire winch line, gallows and block, drop camera and yellow umbilical.



Figure 9: Screen shot from video at duck\_80 indicating mud / sand. Red 10 cm laser scale visible in middle of image. Overlay on upper left in yellow shows latitude / longitude of GPS antenna on wheelhouse roof (offset of camera position by approximately 10 m); GMT time and date stamp on upper right in white; local time (approximate) and date on lower left in white.





Figure 10: Screen shot from video at duck\_97 indicating gravel with a cover of silt. Overlay as in Fig. 9.



Figure 11: Screen shot from video at long\_48; cobble and boulder. Overlay as in Fig. 9.





Figure 12: Screen shot from video at long\_39; ledge (arrow indicates a long fissure). Overlay as in Fig. 9.





Figure 13: Screen shot from video at long\_65; coralline crusts (green arrows) on ledge. Overlay as in Fig. 9.



Figure 14: Screen shot from video at long\_16; red turf in the shallows dominated by *Phyllophora* heavily encrusted by the bryozoan *Membranipora* (green arrows). Overlay as in Fig. 9.





Figure 15: Screen shot from video at west\_173; red turf dominated by *Ptilota* (red arrows). Overlay as in Fig. 9.



Figure 16: Screen shot from video at long\_40; deep red turf dominated by red crusts (red arrows) on boulder. Overlay as in Fig. 9.





Figure 17: Screen shot from video at long\_52; *Alaria* (red arrow). Overlay as in Fig. 9.



Figure 18: Screen shot from video at west\_167; *Saccharina* (red arrow). Overlay as in Fig. 9.





Figure 19: Screen shot from video at softwood\_476; *Laminaria* (red arrow). Overlay as in Fig. 9.



Figure 20: Screen shot from video at sutherland\_514; *Agarum* (red arrows). Overlay as in Fig. 9.





Figure 21: Screen shot from video at western\_447; *Desmarestia* (red arrow). Overlay as in Fig. 9.



Figure 22: Screen shot from video at pyches\_377; *Boltenia* (red arrow). Overlay as in Fig. 9.





Figure 23: Screen shot from video at pyches\_369; sponge (red arrow). Overlay as in Fig. 9.



Figure 24: Screen shot from video at tangier\_286; anemone (red arrow). Overlay as in Fig. 9.





Figure 25: Screen shot from video at tangier\_312; sand dollars (red arrows). Overlay as in Fig. 9.



Figure 26: Screen shot from video at sutherland\_507; brittle stars (red arrows). Overlay as in Fig. 9.





Figure 27: Screen shot from video at softwood\_491; sea star (red arrow). Overlay as in Fig. 9.



Figure 28: Screen shot from video at guilford\_428; lobster (red arrow). Overlay as in Fig. 9.



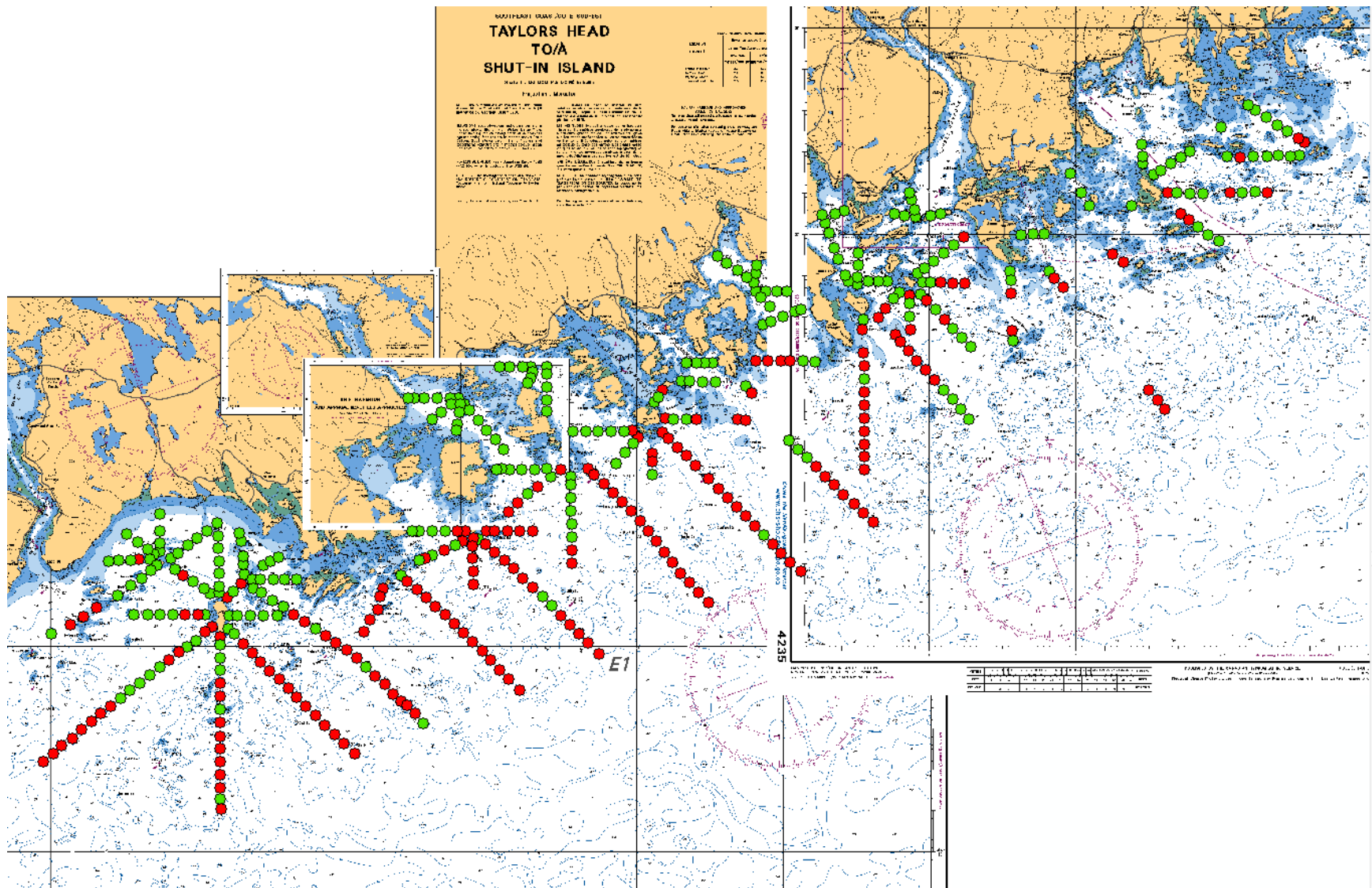


Figure 29: Drop camera locations with a mud / sand substrate seen in video (green circles; red circles=absent).

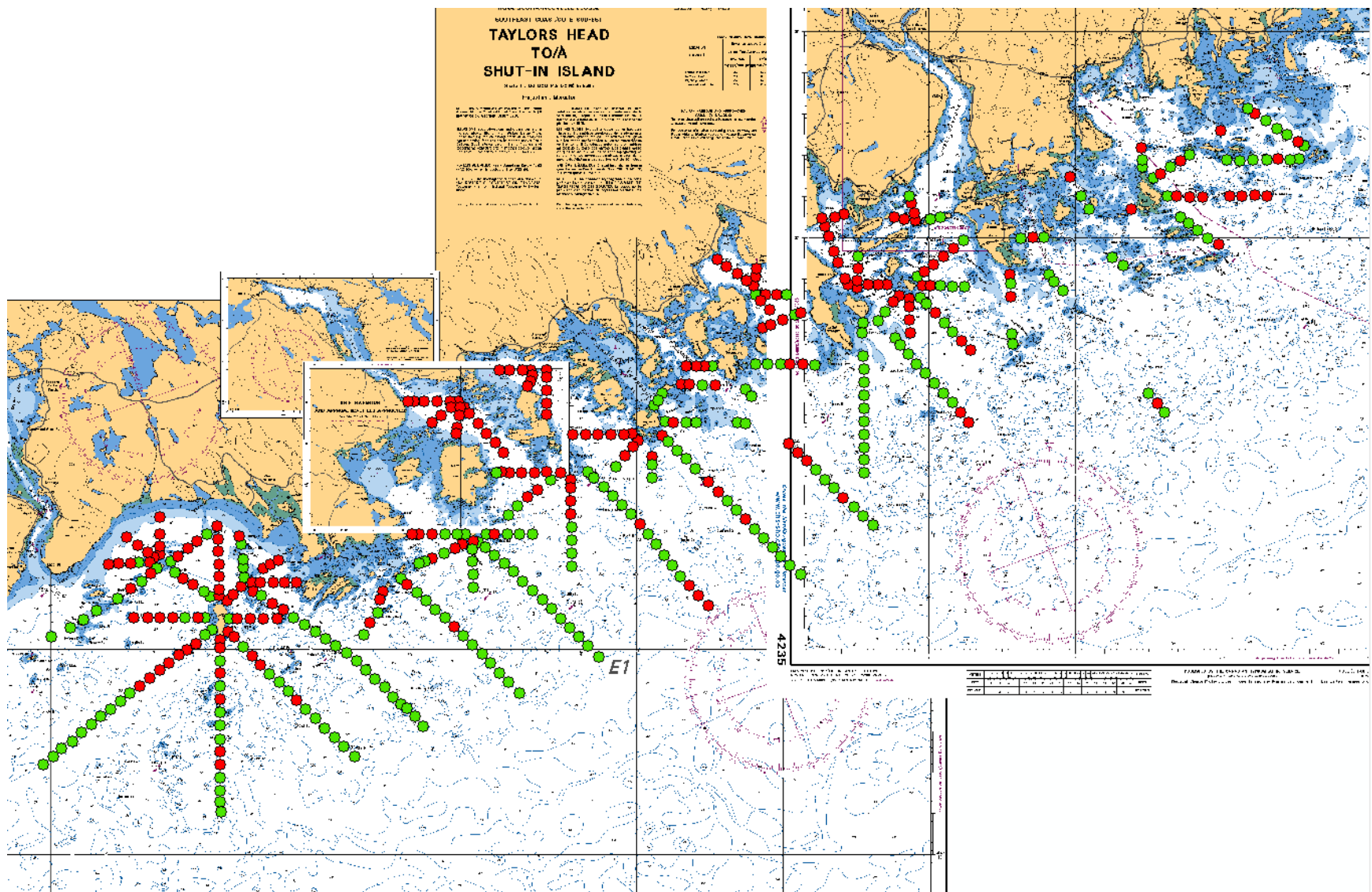


Figure 30: Drop camera locations with a gravel substrate seen in video (green circles; red circles=absent).





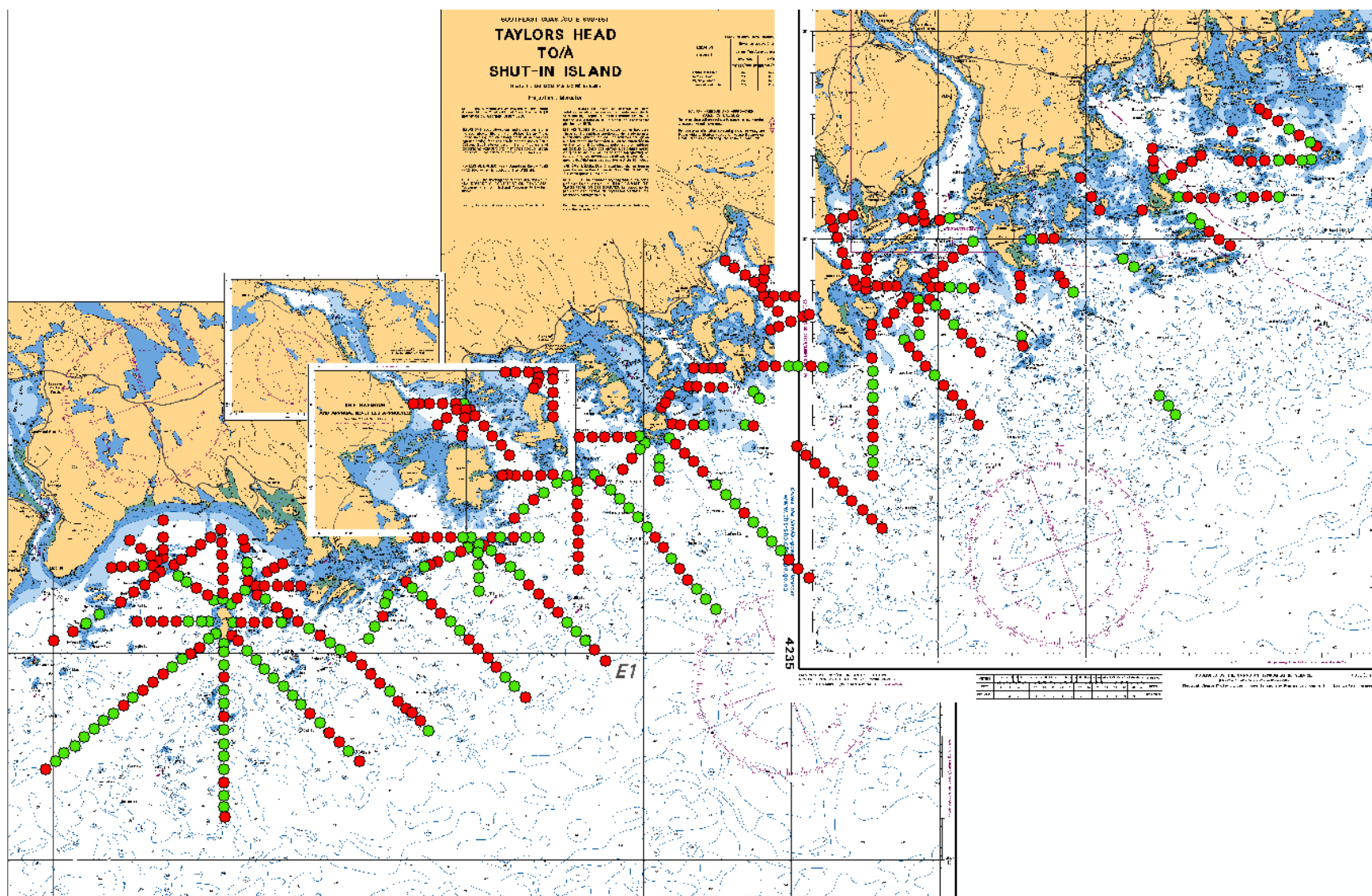


Figure 32: Drop camera locations with a ledge substrate seen in video (green circles; red circles=absent).



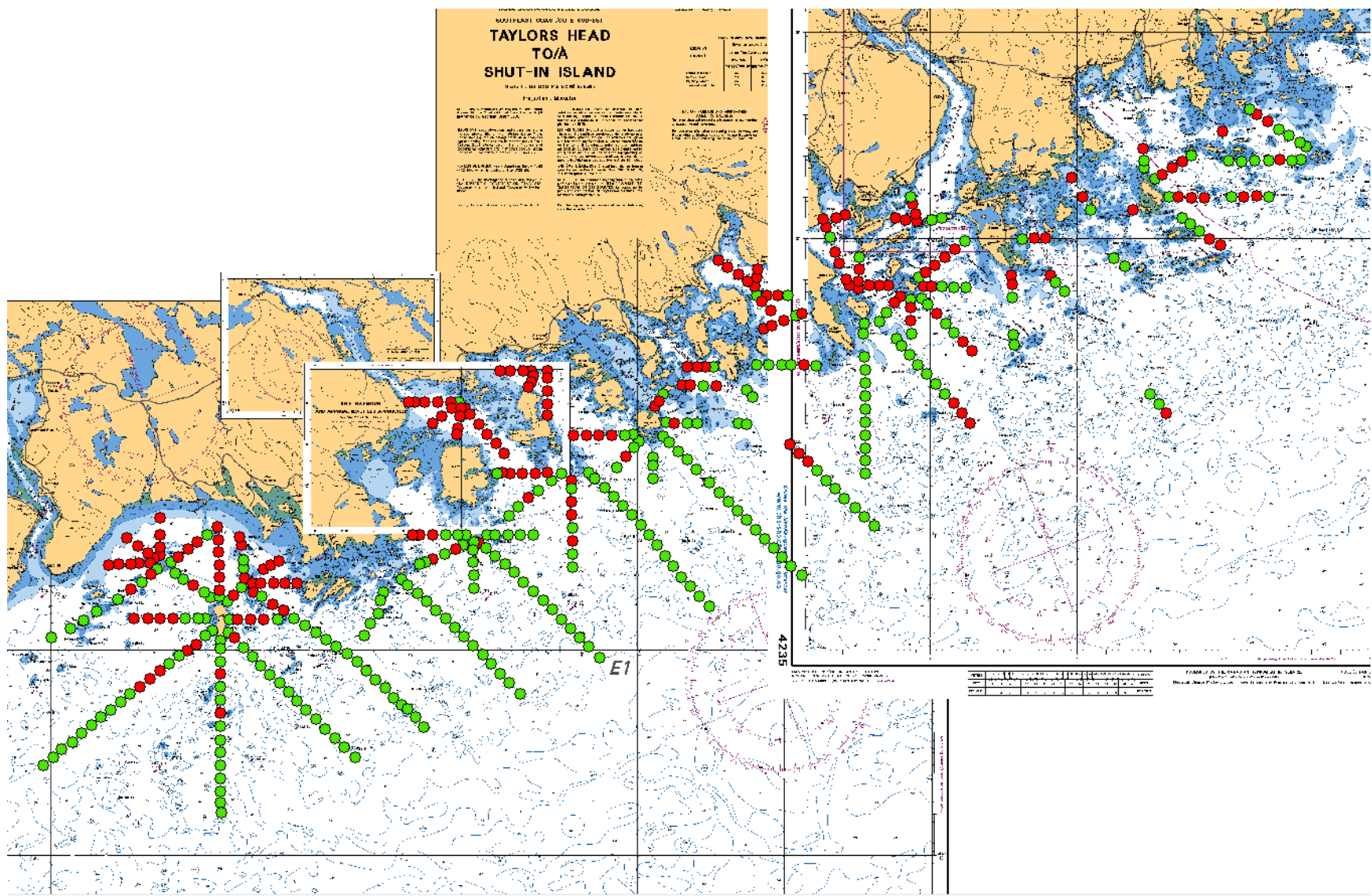


Figure 33: Drop camera locations with coralline crusts seen in video (green circles; red circles=absent).

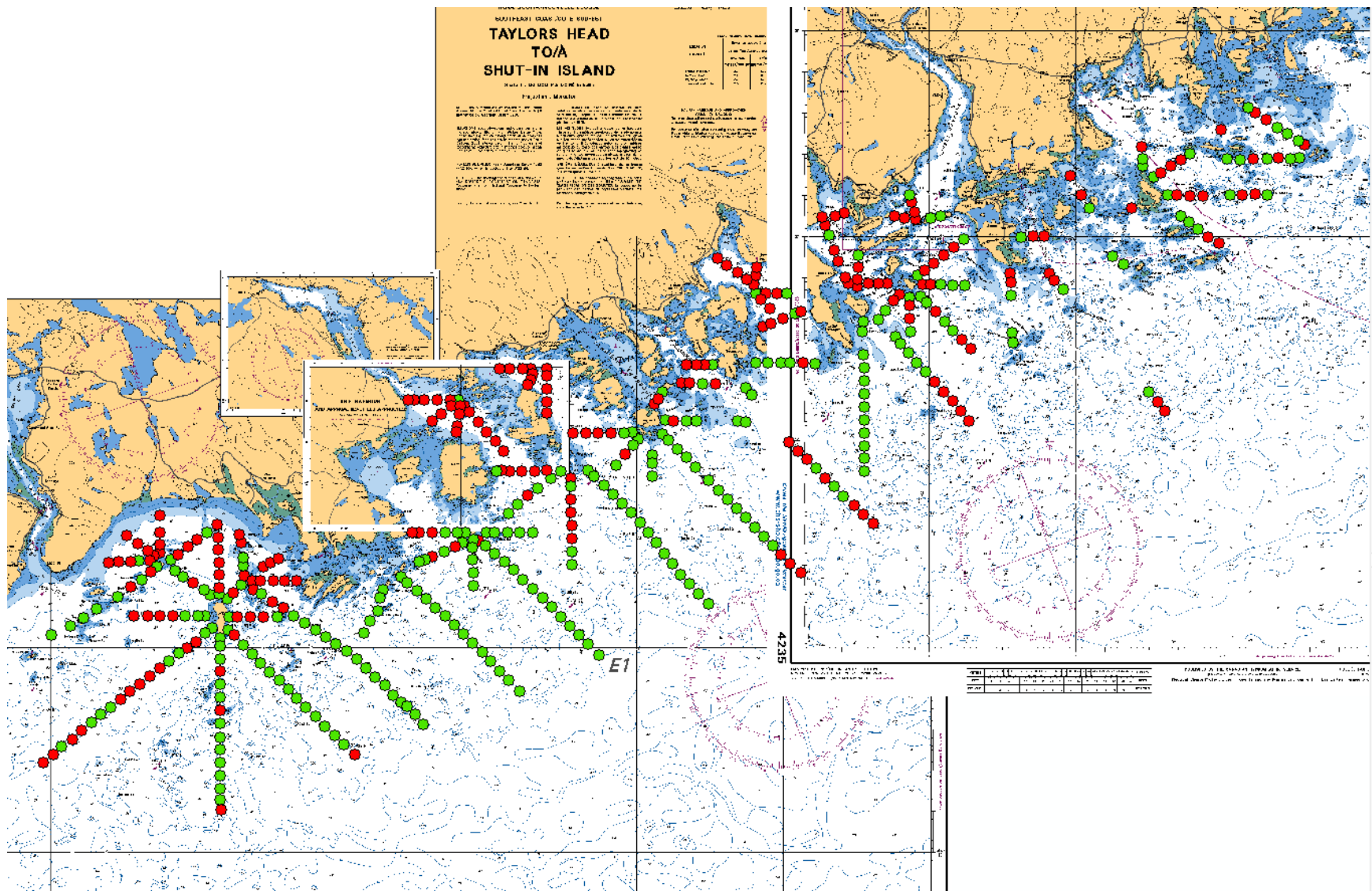


Figure 34: Drop camera locations with red turf seen in video (green circles; red circles=absent).



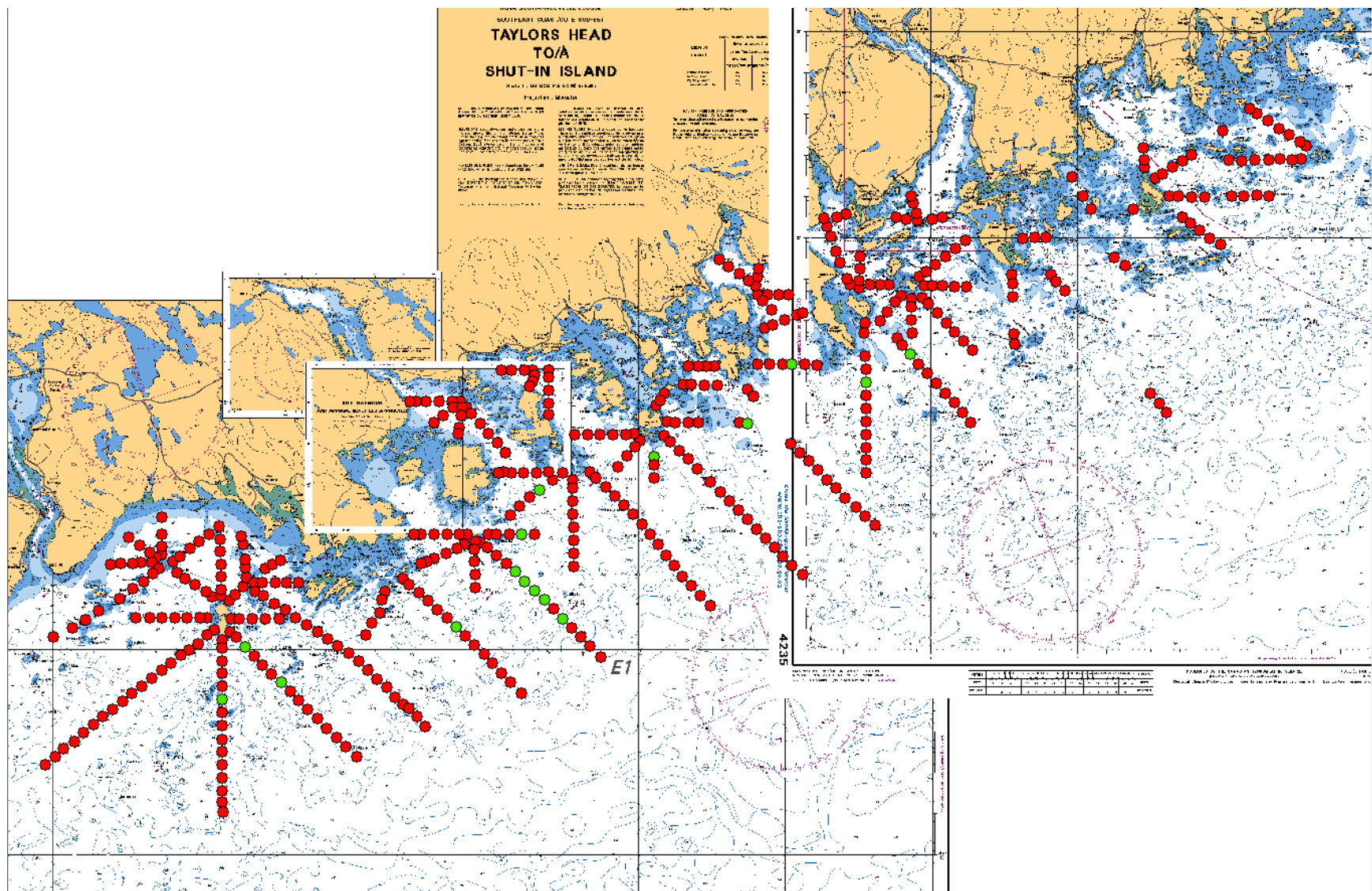


Figure 35: Drop camera locations with *Alaria* seen in video (green circles; red circles=absent).

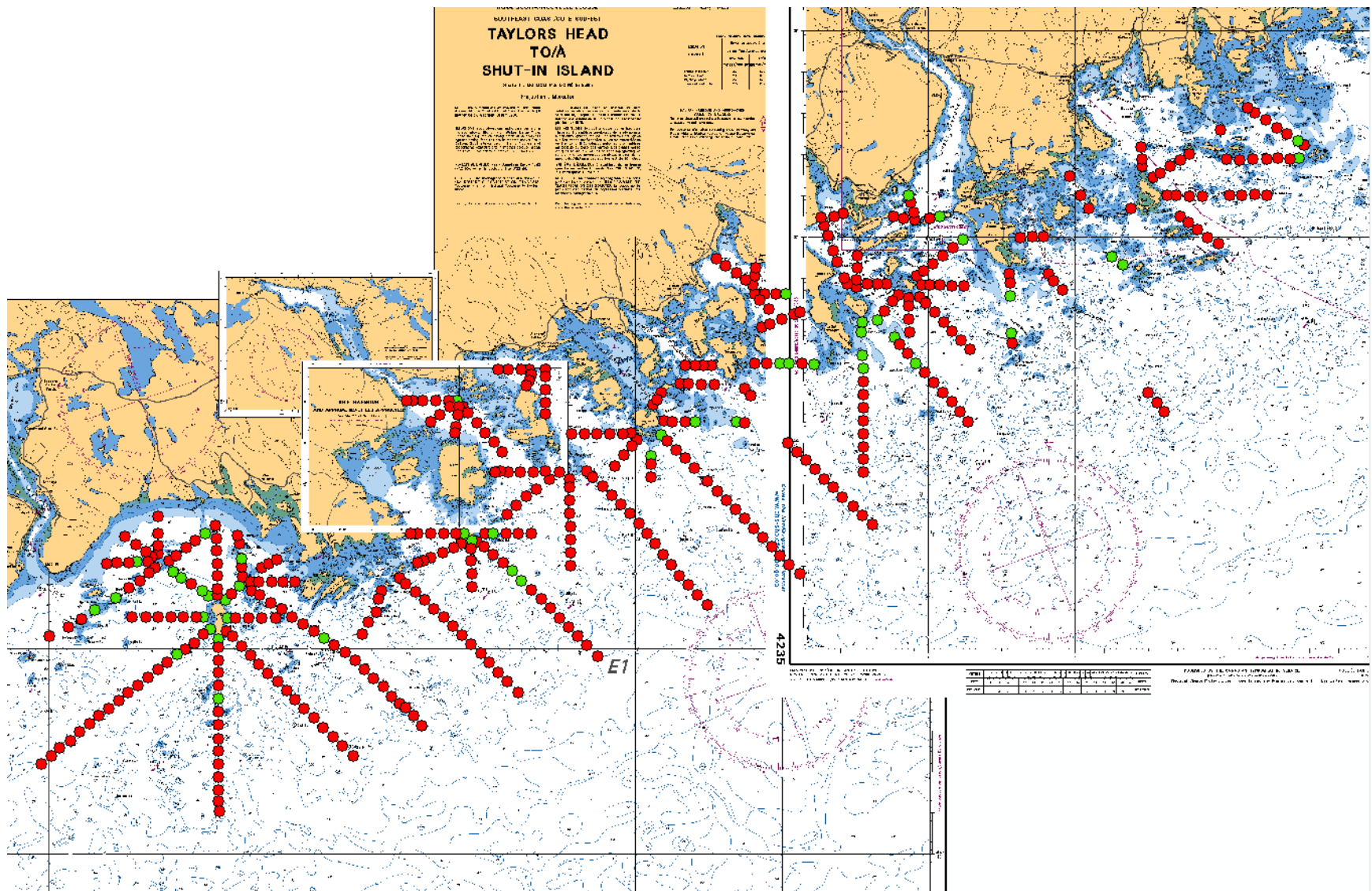


Figure 36: Drop camera locations with *Saccharina* seen in video (green circles; red circles=absent).



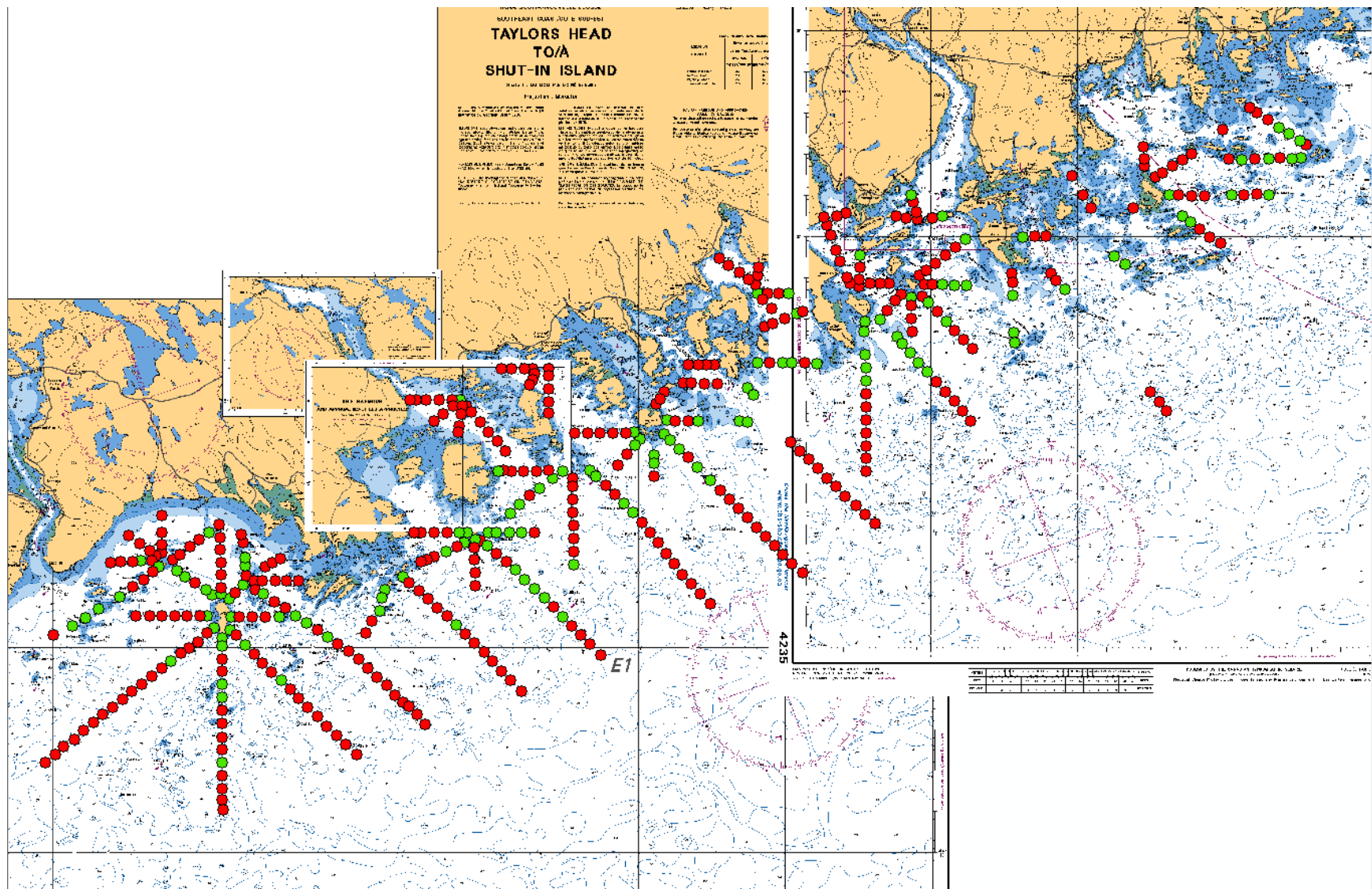


Figure 37: Drop camera locations with *Laminaria* seen in video (green circles; red circles=absent).

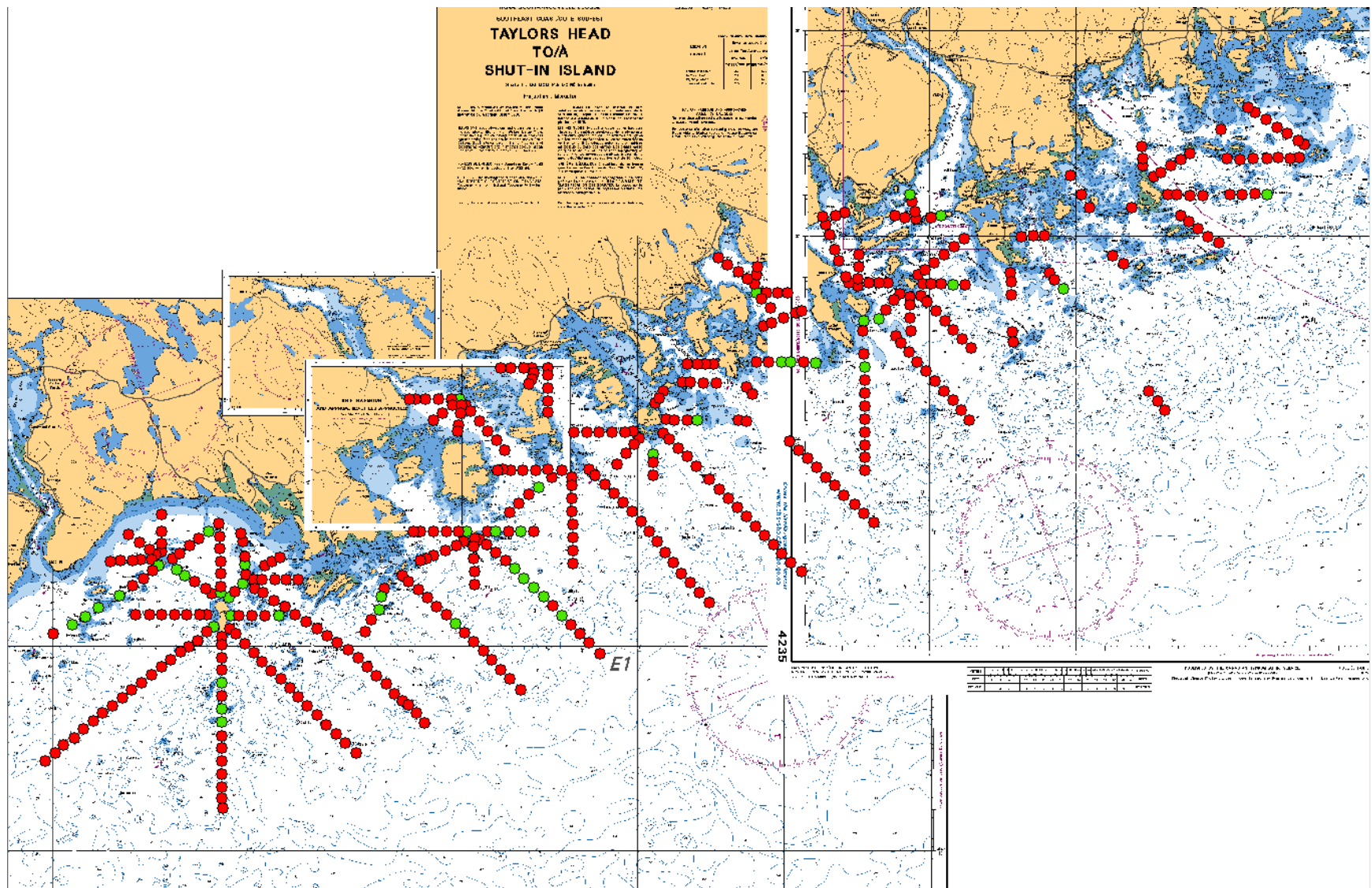


Figure 38: Drop camera locations with *Desmarestia* seen in video (green circles; red circles=absent).



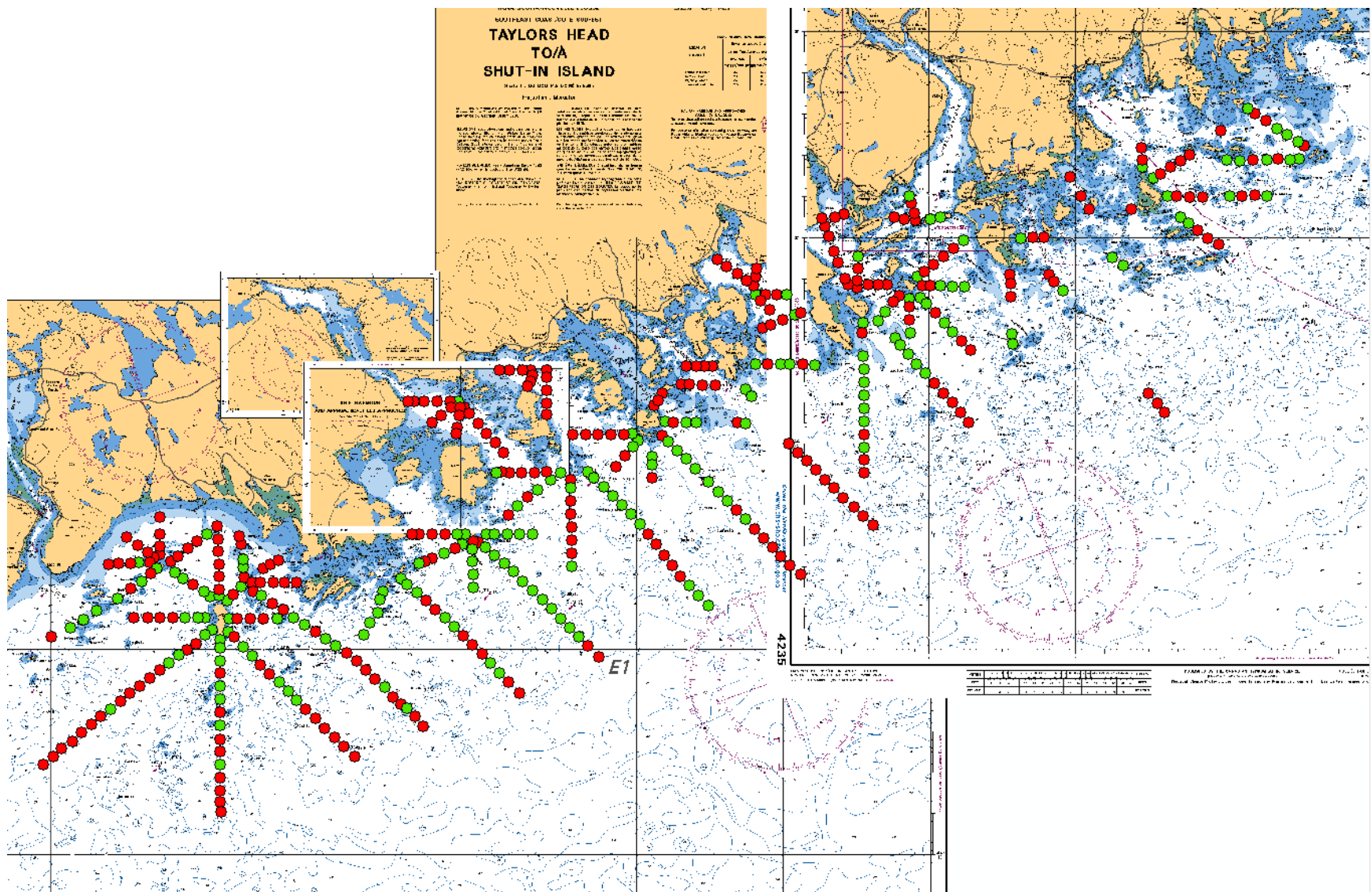


Figure 39: Drop camera locations with *Agarum* seen in video (green circles; red circles=absent).

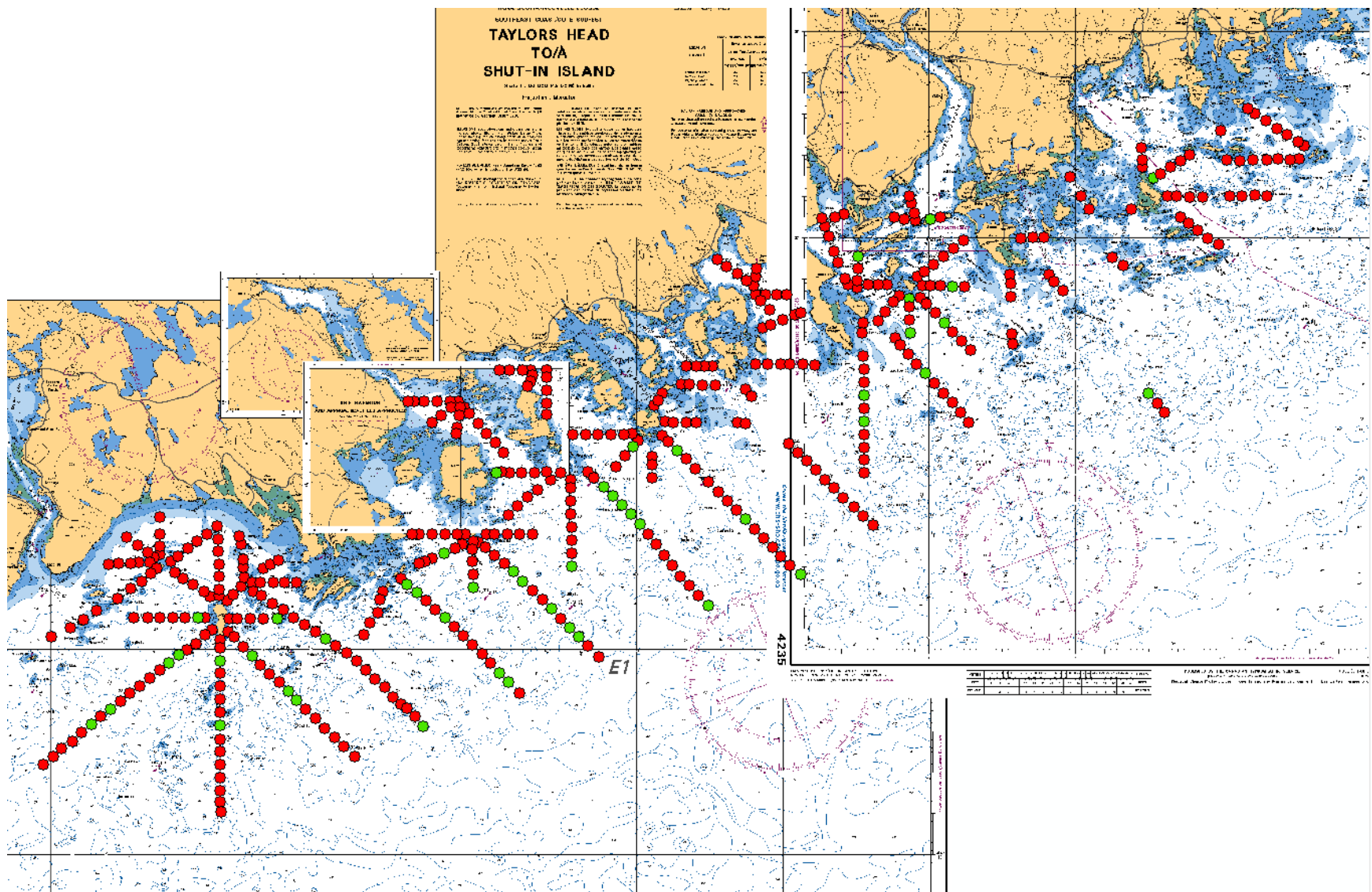


Figure 40: Drop camera locations with *Boltenia* seen in video (green circles; red circles=absent).



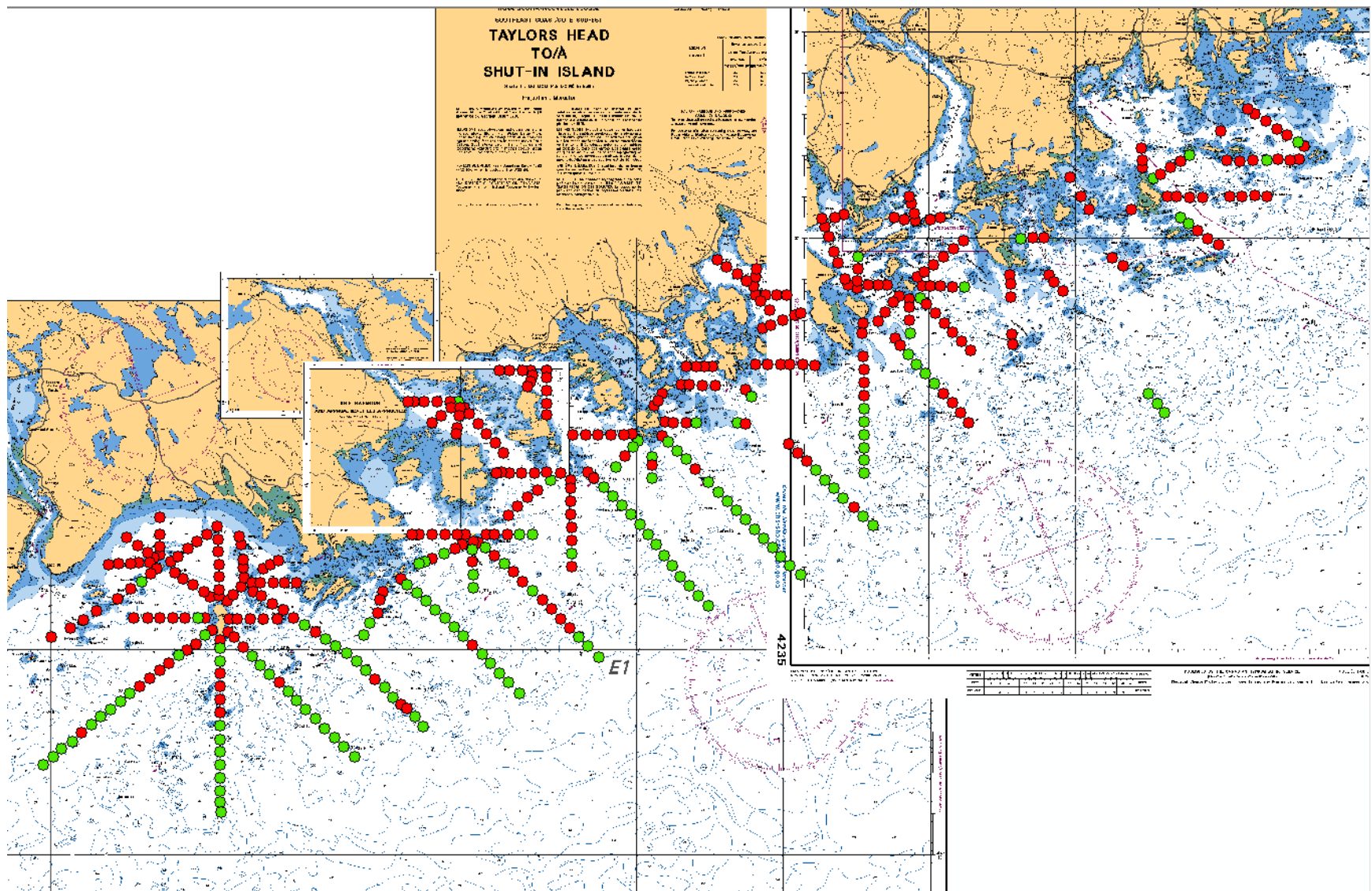


Figure 41: Drop camera locations with sponge seen in video (green circles; red circles=absent).

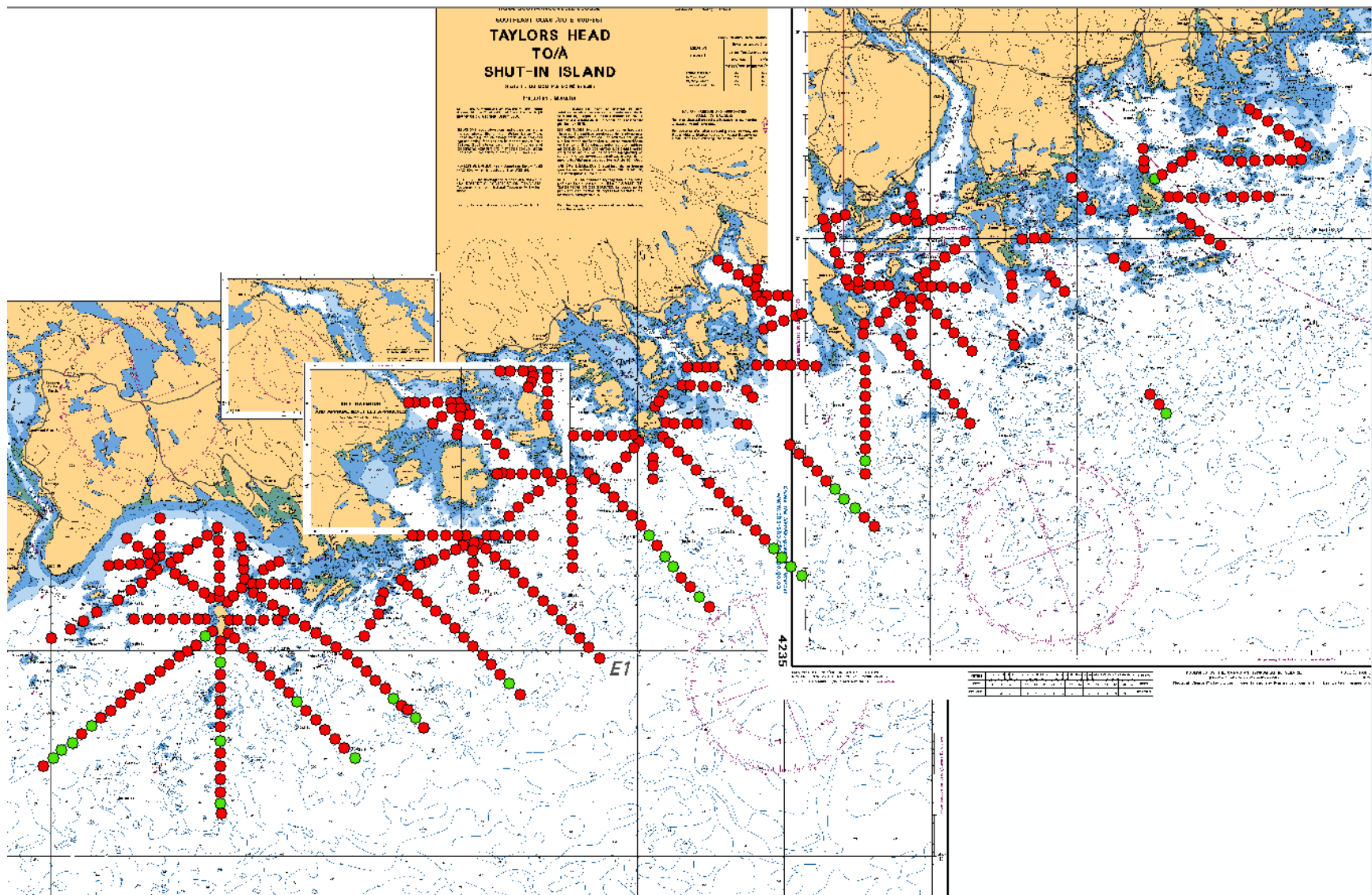


Figure 42: Drop camera locations with anemones seen in video (green circles; red circles=absent).



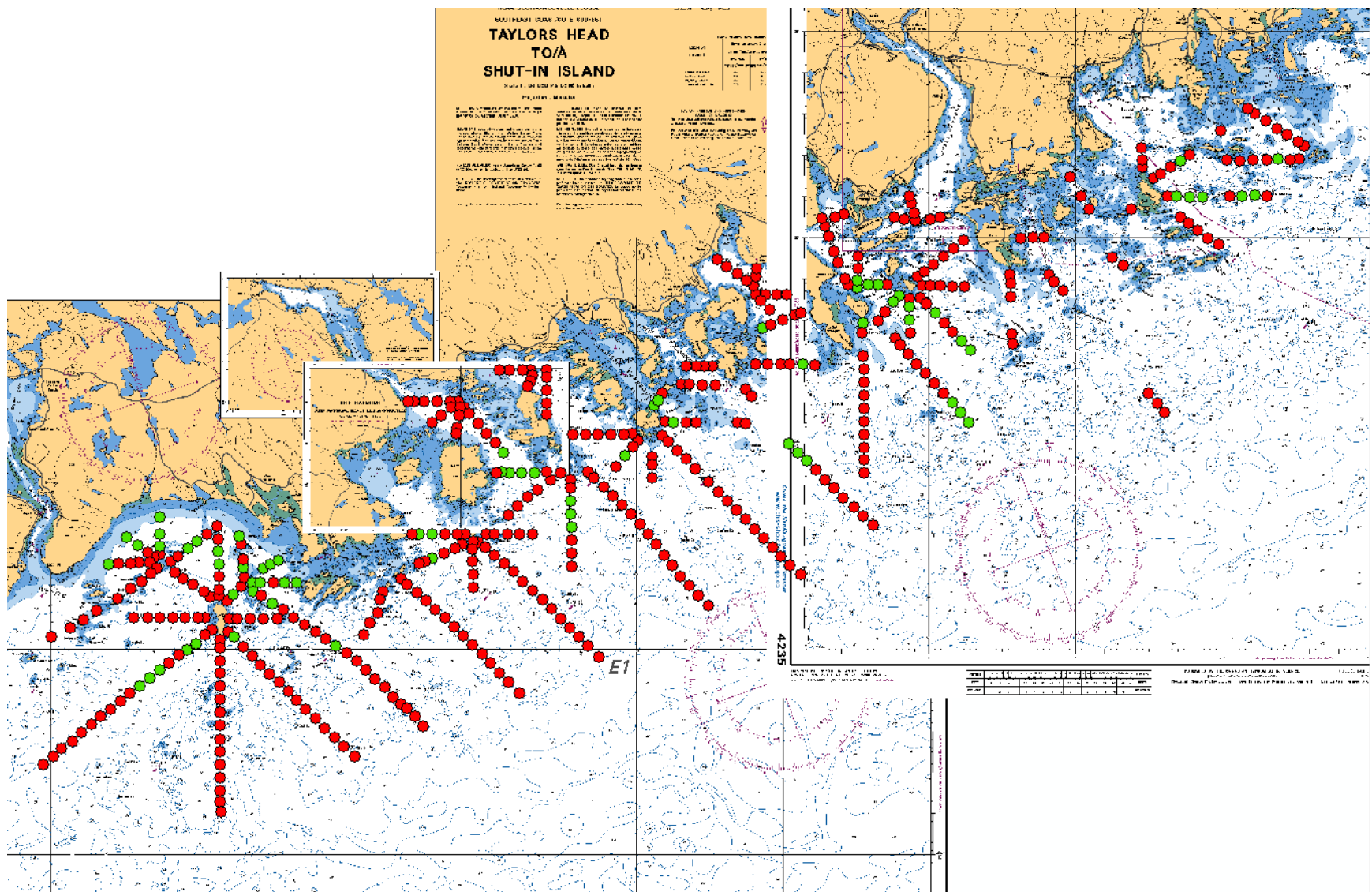


Figure 43: Drop camera locations with sand dollars seen in video (green circles; red circles=absent).

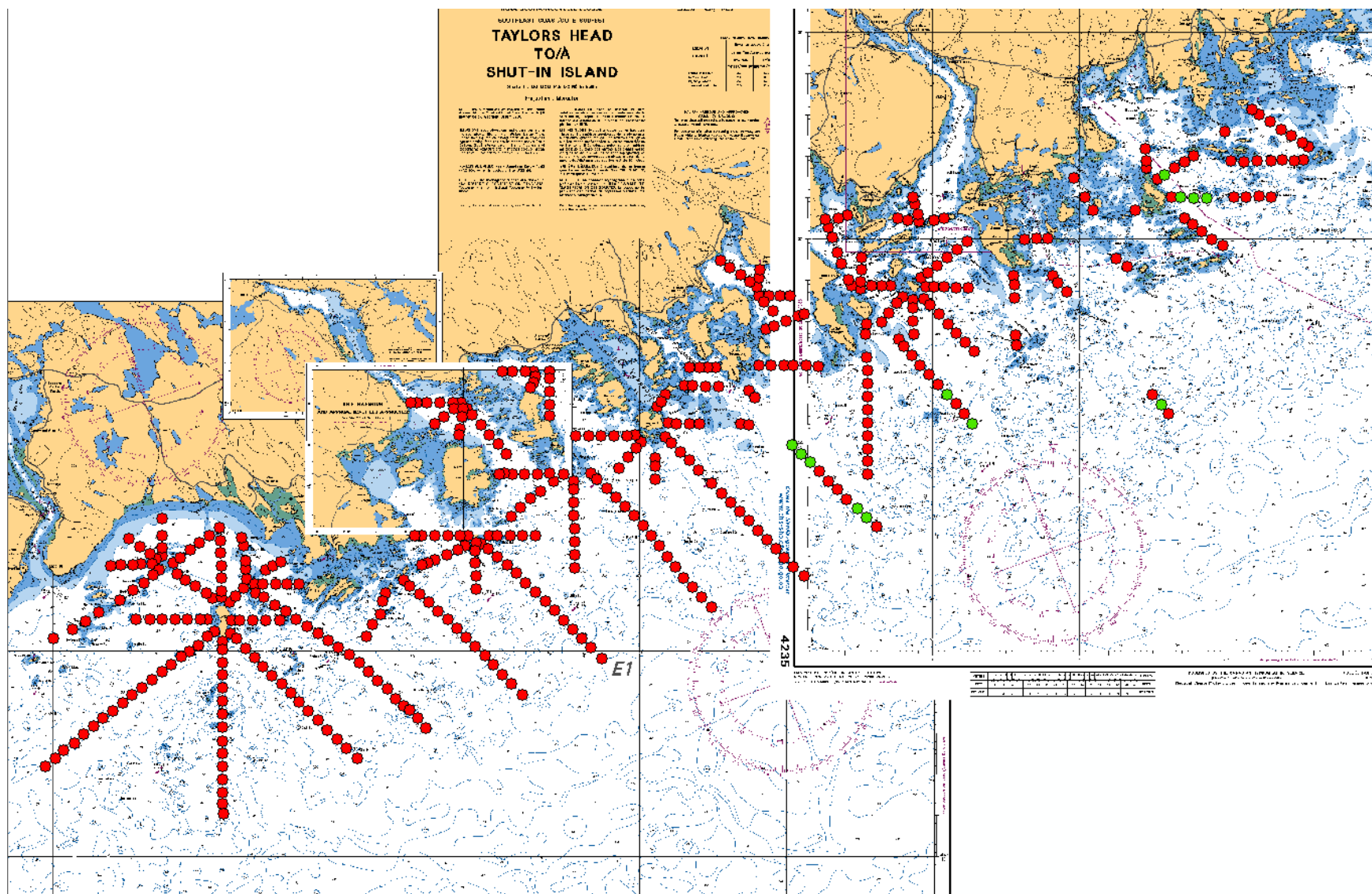


Figure 44: Drop camera locations with brittle stars seen in video (green circles; red circles=absent).



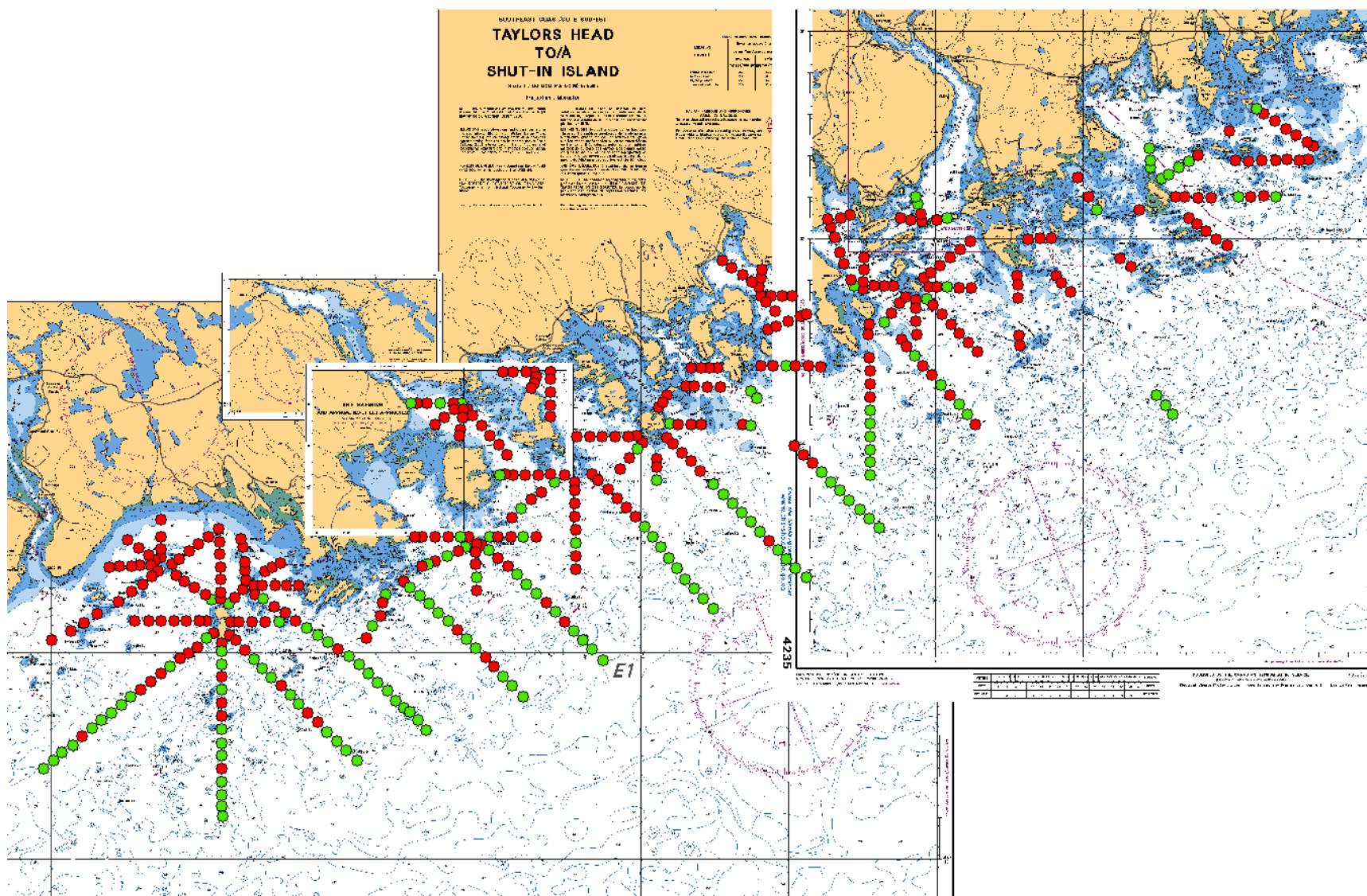


Figure 45: Drop camera locations with sea stars seen in video (green circles; red circles=absent).

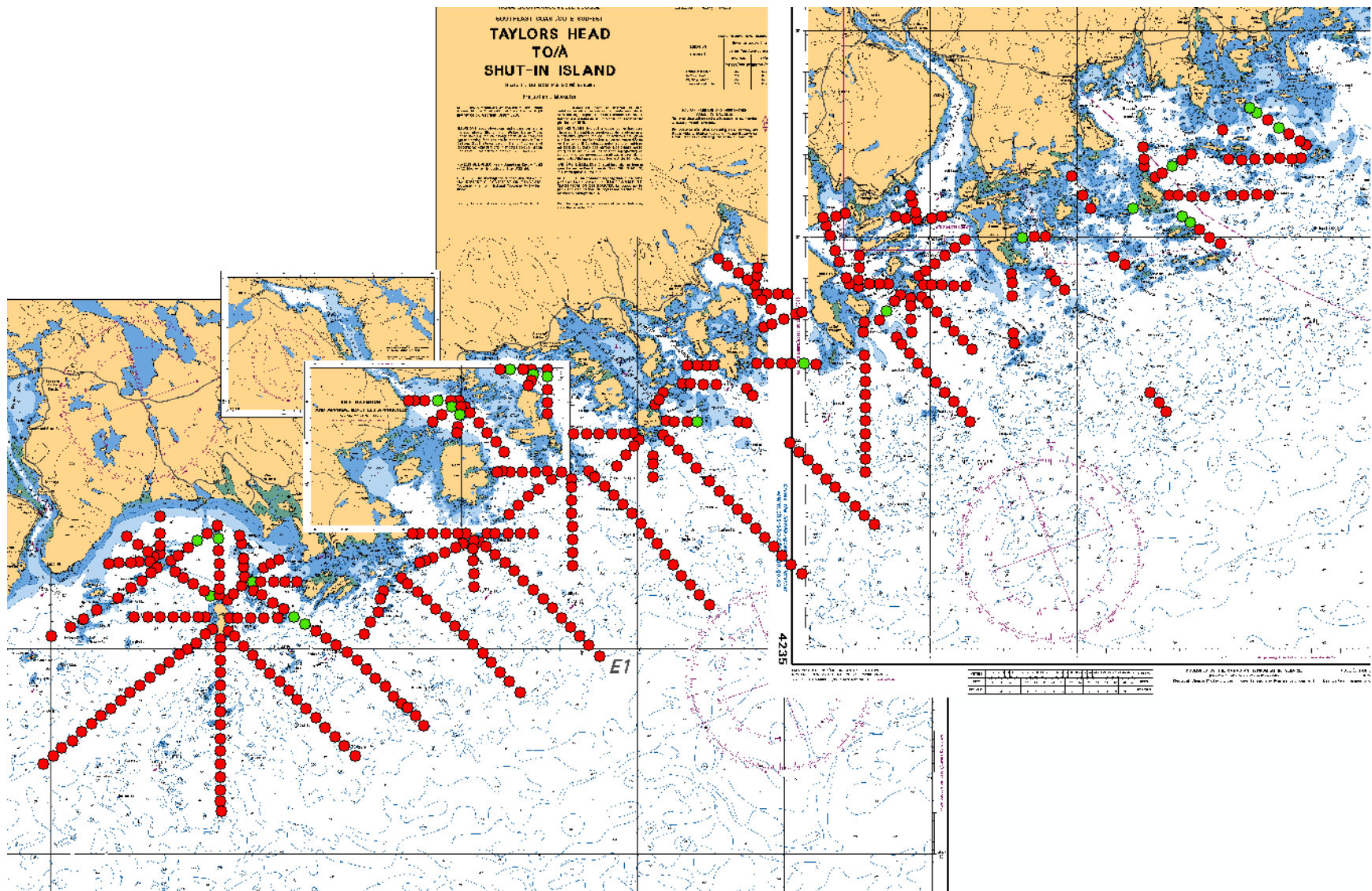


Figure 46: Drop camera locations with lobster seen in video (green circles; red circles=absent).