

Glass sponge grounds on the Scotian Shelf and their associated biodiversity

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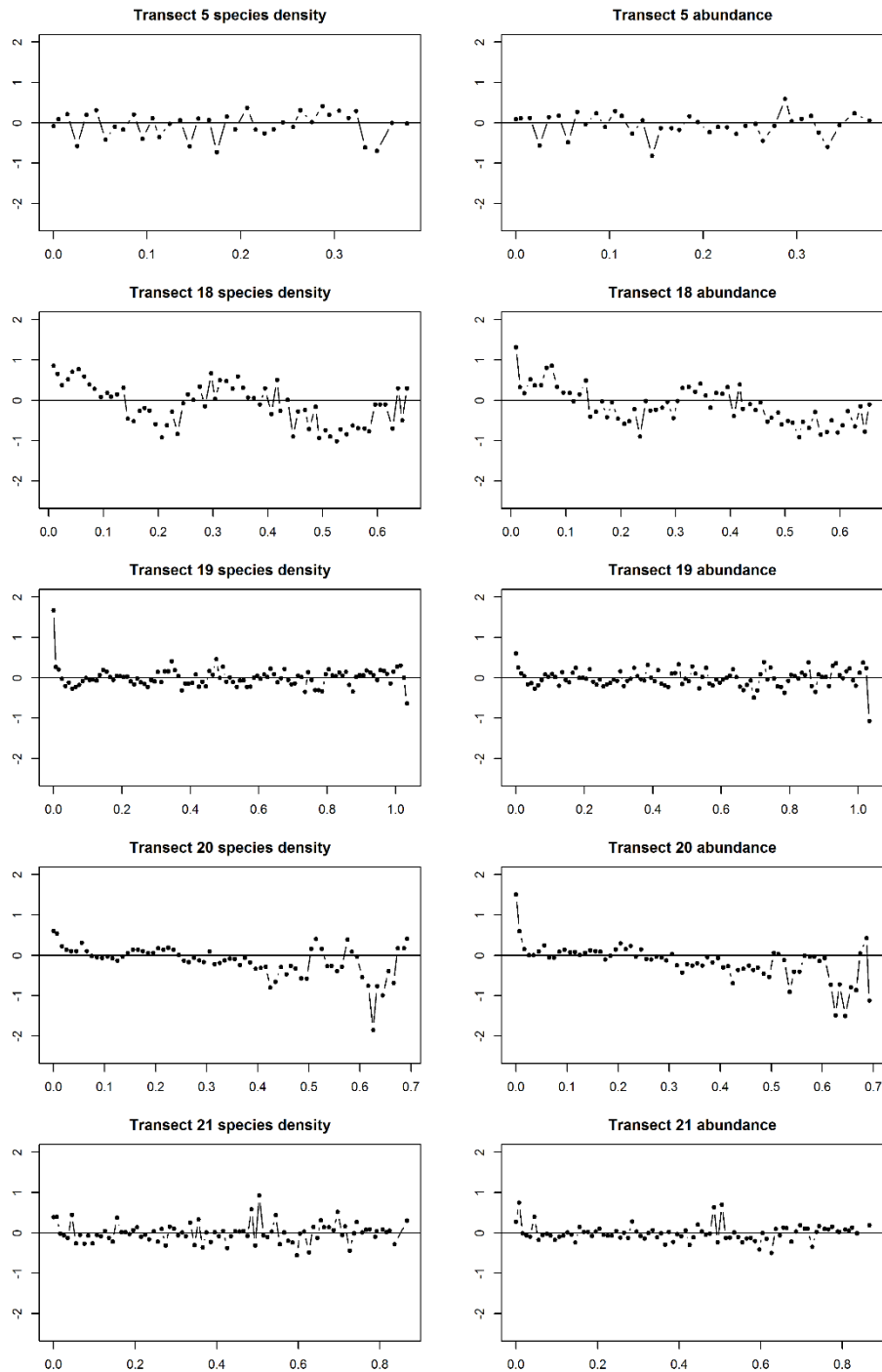


Fig. S1. Spatial correlograms of species density and total abundance of megafauna per photo for those photos (348) used in generalized linear modelling to test the effect of *Vazella* Presence, Transect, and Percent Cover of Hard Substrate. Moran's I was calculated for every 0.10 km, or 10 m.

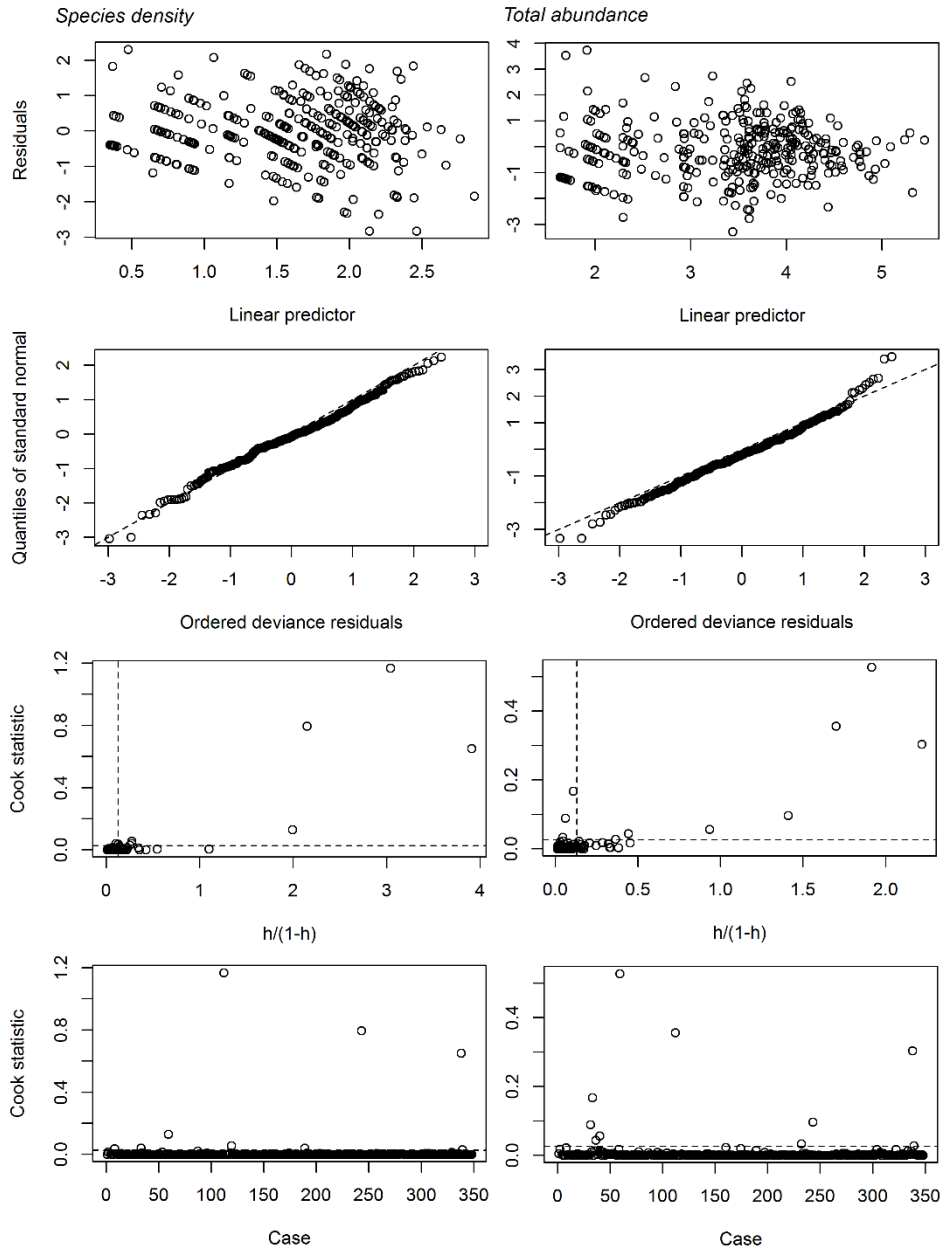


Fig. S2. Diagnostic plots for the generalized linear models (GLM) generated on species density (left column) and the total abundance per photo (right column). First row shows plots of the jackknife deviance residuals against fitted values; second row shows normal Q-Q plots of the standardized deviance residuals; third row shows Cook statistics against standardized leverage; fourth row shows Cook statistics against case number to identify which outlying observations if present, are influential on the model.

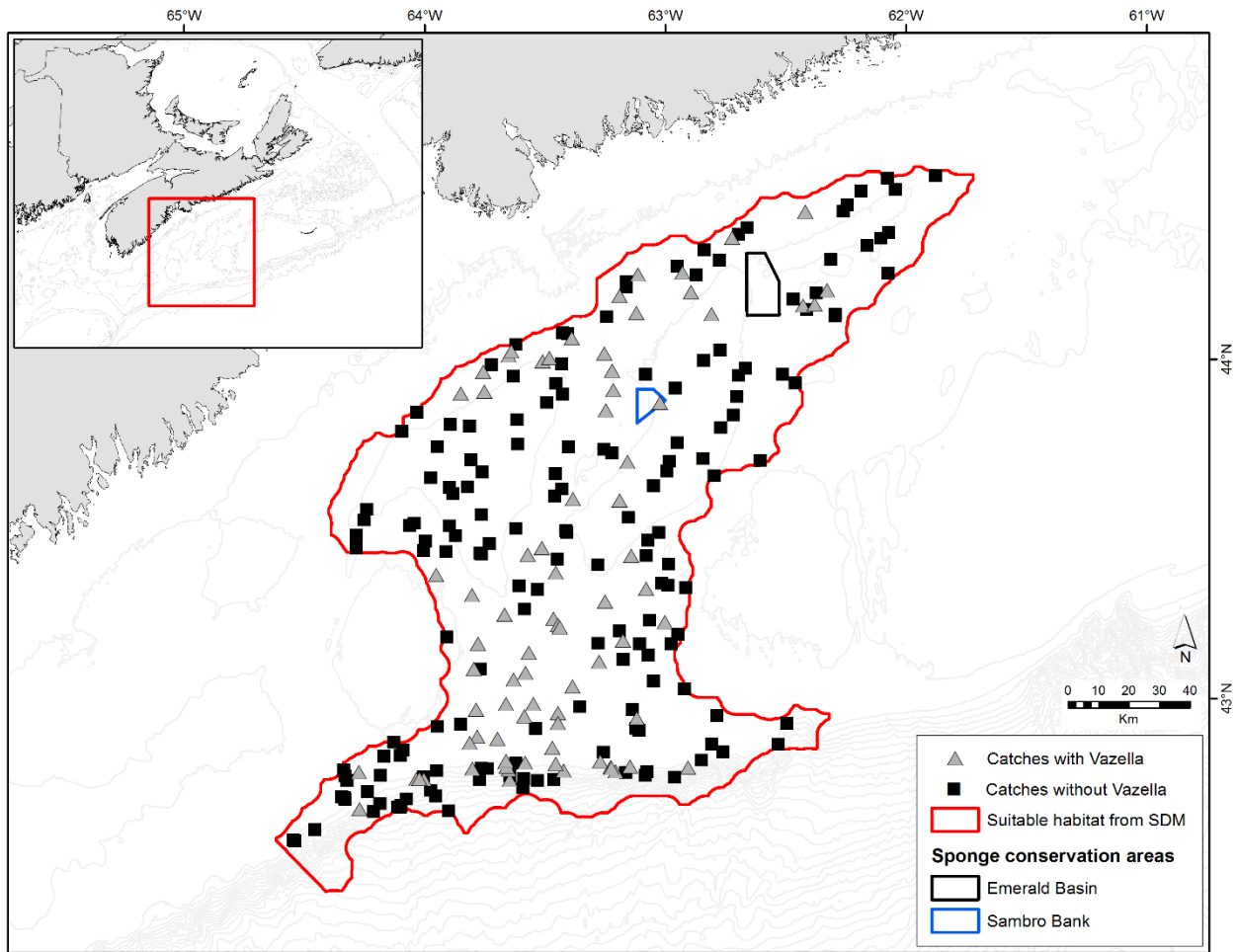


Fig. S3. Location of research vessel trawl start positions (N=246) with *Vazella pourtalesi* in the catch (grey triangles; n=79) and without *V. pourtalesi* in the catch (black squares; n=167) used to assess fish community composition. The red line represents predicted suitable habitat for *V. pourtalesi* (Beazley et al. 2018).

Table S1. List of 95 epibenthic megafauna recorded from five photo-transects collected in Emerald Basin. Percent contribution to each transect are listed first, followed by standardized counts in parentheses, rounded to the nearest integer. Those marked with an asterisk (*) constitute $\geq 0.25\%$ of the total abundance of any one transect and were analyzed in multivariate statistics. Respective phyla, taxa and brief descriptions are also included for all taxa but those identified to the species level.

Phylum	Taxa	Description	Transect				
			5	18	19	20	21
Annelida	Sabellidae sp. 1	Short erect tube with small white to purple plume.	0 (0)	0 (0)	0 (2)	0 (0)	0 (0)
Annelida	Serpulidae spp.*	Calcareous tubes with a white plume at the end occasionally visible. Observed singly or in large clusters on rock or horizontally across soft sediment.	8.9 (249)	23.6 (188)	10.5 (612)	6.2 (480)	16.9 (178)
Arthropoda	<i>Cancer borealis</i>		0.1 (2)	0 (0)	0 (0)	0 (0)	0.2 (2)
Arthropoda	<i>Cancer irroratus</i>		0 (0)	0 (0)	0 (2)	0 (0)	0 (0)
Arthropoda	Inachidae sp. 1	Species of arrow crab found on <i>Vazella pourtalesi</i> . Body is orange-red in colour and ~1 cm in size. Eight, long, striped legs. Stripes are beige and a darker red-orange than body.	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)
Arthropoda	Malacostraca spp.*	Taxon encompasses several species of shrimp, with many individuals belonging to Family Pandalidae.	2.7 (76)	4.0 (32)	2.9 (166)	3.0 (234)	7.2 (76)
Arthropoda	Pycnogonida spp.	Sea spiders with eight, long legs, and red- orange in colour.	0 (0)	0 (0)	0 (0)	0.1 (10)	0 (0)
Bryozoa	Bryozoa sp. 1*	Erect fan-shaped bryozoan with thin, dichotomous branches. Tan to white in colour.	0 (0)	2.1 (17)	0 (0)	0.7 (51)	2.5 (27)
Bryozoa	Bryozoa sp. 2	Fan-shaped bryozoan, with white relatively thick branches. Branching is dichotomous.	0 (0)	0 (0)	0.1 (5)	0 (0)	0 (0)
Bryozoa	Bryozoa sp. 4	Flattened, white bryozoan with iridescent branches. Single main stem anchored in soft sediment.	0 (0)	0 (0)	0 (0)	0.2 (15)	0 (0)
Bryozoa	Bryozoa sp. 5	Bushy bryozoan found on soft sediment. White in colour with thin dichotomous branches.	0 (0)	0 (0)	0 (0)	0 (0)	0.2 (2)
Chordata	Ascidiacea spp.*	Oblong-shaped ascidians found on rocks or soft sediment. Siphons, when visible, are usually small. Surface often covered in debris.	0.4 (12)	0.3 (2)	0.7 (39)	0.2 (17)	0.7 (7)
Chordata	Didemnidae sp. 1*	Colonial tunicate. White to off-white in colour; growth is typically more lateral than vertical. Punctate surface, with visible siphons that are sometimes 'chimney-like'.	0 (0)	0 (0)	0.5 (32)	0.1 (5)	0.2 (2)
Chordata	<i>Gadus morhua</i>		0 (0)	0 (0)	0 (2)	0 (0)	0.2 (2)
Chordata	<i>Pollachius virens</i>		0 (0)	0 (0)	0 (0)	0 (0)	0.2 (2)
Chordata	cf. <i>Leptoclinus maculatus</i>		0 (0)	0 (0)	0 (2)	0 (0)	0 (0)
Chordata	cf. <i>Lumpenus lampretaeformis</i>		0 (0)	0 (0)	0 (2)	0 (0)	0 (0)
Chordata	cf. <i>Lycodes vahlii</i> *		0 (0)	0.3 (2)	0 (0)	0 (0)	0.9 (10)
Chordata	cf. <i>Glyptocephalus cynoglossus</i>		0 (0)	0 (0)	0 (0)	0 (2)	0 (0)

Chordata	<i>Sebastes</i> spp.*	Redfish with alternating bands of dark and light pink. Large dorsal fin with orange and black at the tip.	0 (0)	0 (0)	0.1 (5)	0 (2)	1.9 (19)
Cnidaria	Actiniaria sp. 8	Large anemone with multiple rows of fleshy tentacles that curl towards their tips. Pink-orange in colour. Possibly from the genus <i>Stomphia</i> .	0.2 (5)	0 (0)	0 (2)	0 (0)	0 (0)
Cnidaria	Actiniaria sp. 9*	Small anemone with numerous semi-translucent tentacles. Tentacles long relative to oral disc and short column. Usually found on rocks.	21.8 (612)	0 (0)	0.3 (19)	0.5 (37)	0 (0)
Cnidaria	Actiniaria sp. 28	Medium-sized anemone with three rows of long tentacles. Oral disc is dark pink and wide. Each row of tentacles, moving outwards, is a lighter shade of pink.	0.2 (5)	0 (0)	0 (0)	0 (0)	0 (0)
Cnidaria	Actiniaria spp.*	Taxon encompasses all non-distinct anemones. Usually small to medium in size, ranging in colour from orange to pale pink.	22.4 (629)	2.8 (22)	18.4 (1070)	40.4 (3132)	0.7 (7)
Cnidaria	Actiniaria/Cerianthidae sp. 1	Large anemone or cerianthid on soft sediment. Small dark red oral disc and very long, thin, semi-translucent tentacles. No apparent column, oral disc and tentacles rest directly on soft sediment.	0 (0)	0 (0)	0 (0)	0 (0)	0.2 (2)
Cnidaria	Actiniaria/Cerianthidae sp. 2*	Medium-sized anemone or cerianthid with no apparent column. Purple oral disc with pale tentacles that are often sediment covered. Tentacles long relative to oral disc.	0.2 (5)	0.3 (2)	0 (0)	0 (2)	0 (0)
Cnidaria	<i>Bolocera tuediae</i>		0.2 (5)	0 (0)	0 (2)	0.1 (5)	0 (0)
Cnidaria	<i>Pachycerianthus borealis</i> *		0 (0)	0 (0)	0.3 (17)	0.3 (22)	0.7 (7)
Cnidaria	<i>Flabellum macandrewi</i> *		0.1 (2)	0 (0)	0 (0)	2.5 (190)	0 (0)
Cnidaria	Zoanthidae spp.*	Taxon encompasses all colonial zoanthids.	0.1 (2)	22.4 (178)	9.9 (573)	4.3 (336)	3.7 (39)
Cnidaria	<i>Pennatula aculeata</i> *		0.1 (2)	0.6 (5)	0 (0)	0 (0)	0.5 (5)
Cnidaria	Hydrozoa sp. 1*	Erect stem with thin branches in a single plane. Tan or sediment-coloured. Main stem thicker than branches.	0.3 (10)	0 (0)	0.5 (27)	0.1 (7)	0.2 (2)
Echinodermata	<i>Henricia</i> sp. 1	Long-rayed, yellow sea star. Small central disc with 5 long arms that curl upwards at the tips. Surface smooth.	0 (0)	0 (0)	0.2 (10)	0 (2)	0 (0)
Echinodermata	<i>Henricia</i> sp. 2*	White, long-rayed sea star with a small central disc and 5 long arms.	0 (0)	0 (0)	0 (0)	0 (0)	0.5 (5)
Echinodermata	<i>Pteraster</i> cf. <i>pulvillus</i>	Short-rayed sea star with robust central disc and 5 short arms. Mostly sediment-coloured with the tips of the arms slightly lighter in colour. <i>Pteraster militaris</i> is also present in the area, and given the sediment cover on these specimens a 'cf.' designation was given.	0 (0)	0 (0)	0 (2)	0 (2)	0 (0)
Echinodermata	<i>Conocrinus lofotensis</i> *		0 (0)	0 (0)	0.4 (22)	0.2 (15)	0 (0)
Echinodermata	Ophiuroidea spp.*	Taxon encompasses all non-distinct	0.1 (2)	2.1	0.7	0.2	0.9

		and partially buried brittle stars.		(17)	(39)	(12)	(10)
Echinodermata	<i>Ophiopholis aculeata</i> *		0 (0)	0 (0)	0.3 (19)	0.1 (10)	0.2 (2)
Echinodermata	<i>Ophiopholis aculeata</i> / <i>Ophiacantha bidentata</i>		0.1 (2)	0 (0)	0 (0)	0 (0)	0 (0)
Mollusca	<i>Astarte</i> sp. 1	Bivalve with a rounded-triangular shape. Concentric growth rings with a lighter umbo.	0 (0)	0 (0)	0 (0)	0.2 (12)	0 (0)
Mollusca	Anomiidae sp. 1*	Ovate shell attached mainly to rocks. Surface has a slight sheen and often lighter spots.	2.2 (61)	0.3 (2)	4.0 (232)	6.1 (470)	2.5 (27)
Mollusca	Gastropoda sp. 1	Long, narrow, white gastropod with many whorls.	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)
Nemertea	Nemertea spp.*	Relatively short and thick, fleshy worm. No segmentation observed and appears relatively flat. Red-pink in colour.	0.3 (7)	0 (0)	0.1 (5)	0.1 (7)	0 (0)
Porifera	Porifera sp. 1*	Thin, grey-translucent sponge encrusted on rock. Surface 'dotted' in appearance.	0.6 (17)	1.2 (10)	0.8 (46)	0.3 (27)	0.2 (2)
Porifera	Porifera sp. 3*	White, spherical sponge. Surface appears soft and covered in small oscula.	0 (0)	0.3 (2)	0 (0)	0 (0)	0 (0)
Porifera	Porifera sp. 4*	Opaque white cushion sponge encrusted on rock. Oscula, flat or with 'chimneys', sometimes visible.	8.2 (229)	4.0 (32)	3.7 (214)	4.1 (319)	1.4 (15)
Porifera	Porifera sp. 8*	Thick cushion sponge, white to off-white and semi-translucent in colour. Surface tuberculated with the appearance of white speckles. Small oscula visible.	0.3 (7)	0 (0)	1.6 (93)	0.8 (58)	0 (0)
Porifera	Porifera sp. 12	Grey sponge encrusted on rock. Surface conulate with small oscula occasionally visible. May have oscular chimneys.	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)
Porifera	Porifera sp. 14*	Yellow cushion sponge on rock with one large osculum. Some individuals appear conulated and others appear smooth. This is thought to be due to image quality and view, but more than one species might be present.	0.8 (22)	0 (0)	0.2 (12)	0.6 (46)	0.7 (7)
Porifera	Porifera sp. 16*	White-grey, thick cushion encrusted on rock. Oscula of varying sizes with raised edges are visible. Irregularly shaped, surface smooth with striation lines that appear to form a starburst like pattern.	0.3 (10)	0 (0)	0.1 (7)	0.1 (7)	0.2 (2)
Porifera	Porifera sp. 21*	Cushion sponge encrusted on rock. Oscula visible. White in colour with a green tinge.	0.3 (10)	0 (0)	0.7 (39)	0.3 (24)	0.5 (5)
Porifera	Porifera sp. 22*	Grey and sheet-like encrusted on rock. Small oscula visible and often quite numerous.	2.6 (73)	0 (0)	1.1 (66)	0.9 (68)	0 (0)
Porifera	Porifera sp. 25*	Relatively thick cushion sponge. Oscula have slightly raised edges. Surface smooth and white in colour.	0.1 (2)	0 (0)	0.3 (20)	0 (2)	0 (0)
Porifera	Porifera sp. 26*	White globular sponge found on a clump of dead <i>Vazella pourtalesi</i> , but likely not one because lack of spicules. A few oscula are visible.	0.5 (15)	0 (0)	0.1 (5)	0.3 (27)	0 (0)
Porifera	Porifera sp. 39*	White-grey cushion sponge.	0.4	0 (0)	1.6	0.2	0.2 (2)

		Tuberculated surface with fairly large oscular chimneys.	(12)		(95)	(17)	
Porifera	Porifera sp. 40	White to tan globular sponge. Occasionally sediment covered.	0.1 (2)	0 (0)	0 (2)	0.1 (10)	0 (0)
Porifera	Porifera sp. 44*	Thin encrusting sponge and white, semi-translucent in colour. Surface appears striated.	0.3 (7)	0 (0)	0 (0)	0.3 (27)	0 (0)
Porifera	Porifera sp. 45	White cushion sponge with a conulate surface. Large spicules protrude from the cones.	0 (0)	0 (0)	0.1 (5)	0 (0)	0 (0)
Porifera	Porifera sp. 46	Bright orange cushion sponge with visible oscula. Surface appears wrinkled.	0 (0)	0 (0)	0 (2)	0 (2)	0 (0)
Porifera	Porifera sp. 48*	Cushion sponge with numerous ostia visible. Ranging from white to orange in colour.	0.4 (12)	0 (0)	0 (2)	0 (2)	0 (0)
Porifera	Porifera sp. 49*	Rigid arborescent sponge. White in colour with distinct pores. Branches are irregular in form and truncated at the end. Mostly found on or in close proximity to <i>Vazella pourtalesi</i> . Possibly a species of <i>Hamacantha</i> .	0 (0)	0 (0)	0 (0)	0 (2)	2.3 (24)
Porifera	Porifera sp. 58	Small (~1 cm) stalked sponge with a single osculum at the terminal end.	0.1 (2)	0 (0)	0 (0)	0 (0)	0.2 (2)
Porifera	Porifera sp. 60	Small, tubular-shaped sponge attached to spicules. Surface smoother than <i>Vazella pourtalesi</i> .	0 (0)	0 (0)	0 (0)	0.1 (7)	0 (0)
Porifera	Porifera sp. 61*	Yellow-green cushion sponge encrusted on rock. Ostia or pore sieves appear to be visible.	0 (0)	0 (0)	0 (0)	0 (2)	0.7 (7)
Porifera	Porifera sp. 62*	Cushion sponge encrusted on rock. Light yellow in colour. Surface appears slightly soft or fuzzy. Small oscula visible.	0.1 (2)	0 (0)	0.6 (37)	0.4 (32)	0 (0)
Porifera	Porifera sp. 63	Large cushion to massive sponge encrusted on rock. White to pale blue in colour and partially sediment-covered. Surface uneven forming small mounds. Oscula present.	0.2 (5)	0 (0)	0 (0)	0 (0)	0 (0)
Porifera	Porifera sp. 64*	Cushion sponge on rock. Completely sediment covered, only oscula with raised edges visible. Shape irregular.	0.2 (5)	0.6 (5)	0.2 (10)	0.3 (24)	1.4 (15)
Porifera	Porifera sp. 65	Large branching, erect sponge with several prominent tubular growths stemming from the central body. Oscular openings are visible at the apical ends, which are outlined by a flared, thin rim of tissue. The surface is soft in appearance with visible pores. Possibly a species of <i>Schaudinna</i> .	0.2 (5)	0 (0)	0 (0)	0 (0)	0 (0)
Porifera	Hymedesmiidae sp. 1*	Thin to thick, almost globular in morphology, cushion encrusting on rock. Bright blue-green in colour. Surface covered in large circular pore sieves with raised edges. Some observed in the process of closing or closed.	0.5 (15)	0 (0)	0.7 (39)	4.5 (349)	7.2 (76)

Porifera	Hymedesmiidae sp. 4*	White cushion encrusted on rock. Often partially sediment covered. Surface covered in large circular pore sieves with raised edges.	3.6 (102)	0.3 (2)	3.2 (188)	4.9 (380)	3.0 (32)
Porifera	Hymedesmiidae sp. 5*	Surface always covered in sediment and relatively even. Covered in large circular pores with raised edges. Very thin, almost sheet-like.	3.0 (85)	0.3 (2)	0.3 (17)	0.8 (58)	0 (0)
Porifera	<i>Polymastia andrica</i> *		0 (0)	0 (0)	0 (2)	0 (0)	3.0 (32)
Porifera	<i>Polymastia</i> cf. <i>uberrima</i> *		0 (0)	0 (0)	0 (0)	0 (0)	0.5 (5)
Porifera	<i>Stylocordyla borealis</i>		0 (0)	0 (0)	0 (0)	0 (2)	0 (0)
Porifera	<i>Vazella pourtalesi</i> *		5.3 (149)	3.7 (29)	7.7 (448)	6.5 (500)	4.6 (49)
Porifera/ Chordata	Porifera/Ascidiacea sp. 1	Grey and oblong with a distinct round opening on top. Resembles both a sponge and ascidian.	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)
Porifera/ Chordata	Porifera/Didemnidae sp. 1*	White, globular to lobose in morphology. Resembles both a sponge and didemnid ascidian.	0 (0)	0.6 (5)	0.3 (15)	0 (2)	0.2 (2)
Unidentified	Unidentified 21*	Small erect branching organism. Sediment coloured with all branches extending from axial stalk. Possible foraminiferan.	1.3 (37)	2.1 (17)	0.6 (37)	0.3 (27)	4.6 (49)
Unidentified	Unidentified 22*	Tubes on <i>Vazella pourtalesi</i> .	1.7 (49)	1.8 (15)	3.2 (188)	2.6 (202)	4.4 (46)
Unidentified	Unidentified 30*	Sediment covered white colonial organism. Possible zoanthid, but no tentacles are visible.	0 (0)	1.2 (10)	0 (0)	0 (0)	0 (2)
Unidentified	Unidentified 32	Small, orange, thin worm- or tentacle-like organism. Partially sediment covered. Could be a Nemertea.	0.1 (2)	0 (0)	0.1 (5)	0 (2)	0 (0)
Unidentified	Unidentified 33*	Thin erect stalk with a curled tip. Similar in appearance to a question mark.	7.3 (205)	24.8 (197)	21.1 (1226)	4.3 (334)	20.4 (214)
Unidentified	Unidentified 54	White flat disc-shaped organism. Protruding from rock.	0 (0)	0 (0)	0 (2)	0 (0)	0 (0)
Unidentified	Unidentified 82	White rock-shaped organism with specks that could be oscula. Possible sponge.	0 (0)	0 (0)	0 (2)	0 (0)	0 (0)
Unidentified	Unidentified 86	Light blue organism found on soft sediment. Slightly dome-shaped with a distinct lighter patch in the middle. Possible nudibranch.	0 (0)	0 (0)	0.1 (5)	0 (0)	0 (0)
Unidentified	Unidentified 87*	Sediment coloured sac-shaped organism. Possibly a sponge or tunicate.	0 (0)	0 (0)	0 (2)	0 (0)	0.7 (7)
Unidentified	Unidentified 114*	Sediment covered thick tube-shaped object on rock. Possibly a worm from family Terebellidae.	0.2 (5)	0 (0)	0.4 (24)	0.3 (22)	0 (0)
Unidentified	Unidentified 142*	Very thin, sediment-covered organism in a spiral arrangement.	0.4 (12)	0 (0)	0 (0)	0.4 (32)	0 (0)
Unidentified	Unidentified 169*	Globular encrusting organism on rock. Small openings possibly seen.	0.2 (5)	0 (0)	0.5 (29)	0.1 (10)	0 (0)
Unidentified	Unidentified 199	Transparent organism approximately 2 cm. Concentration of pigments in 'head' region.	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)
Unidentified	Unidentified 207	Small, red object in <i>Vazella pourtalesi</i> spicules. Possible bivalve.	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)

Unidentified	Unidentified 209*	Pale beige encrusting organism. Possible sponge.	0.4 (12)	0 (0)	0.1 (7)	0.2 (17)	1.4 (15)
Unidentified	Unidentified 226	Red-pink, tube-like encrusting organism approximately 2 cm. Found on rock adjacent to a spicule mat.	0 (0)	0 (0)	0.1 (5)	0 (2)	0 (0)
Unidentified	Unidentified 275	Polychaete- or nematode-like organism, roughly 1 cm in length. White-pink in colour.	0 (0)	0 (0)	0 (0)	0 (0)	0.2 (2)
Unidentified	Unidentified 285	Possible brachiopod.	0 (0)	0 (0)	0 (0)	0 (0)	0.2 (2)