

# **Data summary of trap camera video obtained during Sablefish bottom longline trap fishing at SGaan Kinghlas - Bowie Seamount, 2014-2015**

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DATA SUMMARY OF TRAP CAMERA VIDEO OBTAINED DURING  
SABLEFISH BOTTOM LONGLINE TRAP FISHING AT SGAAN KINGHLAS -  
BOWIE SEAMOUNT, 2014-2015.

by

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## BACKGROUND

The British Columbia Sablefish (*Anoplopoma fimbria*) fishery has operated at SGaan Kinghlas - Bowie (SK-B) Seamount since 1985 (Murie et al. 1996). The fishery uses conical traps with a bottom diameter of 54-58" (Murie et al. 1996) attached to anchored bottom longlines, usually with 40-80 traps per set. In 2008, the SK-B seamount Marine Protected Area (MPA) was established around three seamounts: Hodgkins, Davidson and SK-B. Hodgkins and Davidson seamounts comprise Zone 3, and the top 457 m of SK-B seamount comprise Zone 1; both are completely closed to fishing (DFO 2015; see Figure 1). A Sablefish bottom longline trap fishery is allowed only in Zone 2 at depths below 457 m on SK-B Seamount (DFO 2015).

Since 2012, Fisheries and Oceans Canada (DFO), Simon Fraser University (Dr S. Cox), and Wild Canadian Sablefish Ltd., have collaborated on a joint research project that developed, and now deploys, an innovative trap camera system designed to collect deep-sea video observations from commercial longline trap fishing gear (Figure 2) for monitoring and assessing potential fishing gear impacts on seafloor ecosystems in Zone 2.

This report summarizes video observations of physical substrate (e.g., bottom type), deep-water corals (Order Alcyonacea, Order Pennatulacea, and Family Stylasteridae), and sponges (Classes Demospongiae and Hexactinellida) from two commercial Sablefish fishing trips to SK-B during May 2014 and May 2015.

## CAMERA DEPLOYMENTS

Deep-water autonomous cameras were mounted in Sablefish traps and the netting from one side of the trap was removed to allow a clear field of view for the camera (Figure 2). Cameras were deployed on the 30<sup>th</sup> trap, near the middle of bottom longline sets that included 60 traps spaced approximately 45 m apart (Murie et al. 1996). Sets also include a variable amount of groundline extending from the terminal trap at each end of the set before the anchor(s). The vessel position was recorded at deployment of the first and last anchors. Although the linear distance between set endpoints ranged from 1.9 to 4.0 km, with a median set length of 3.0 km, the gear position on bottom may differ because of prevailing currents, depth, and/or substrate type. Therefore, camera position is reported only to 2 km by 2 km grid cell resolution (Figure 3).

Cameras were deployed on 59 of the 70 fishing events for the May 2014 trip (May 1 - May 27) and on 28 of the 70 fishing events for the May 2015 trip (May 4 - May 29). Traps with cameras remained on the seafloor for between 20-48 hours, with a median bottom time of 46 hours. Video observations of bottom substrate were successfully obtained from 54 and 26 of the trap camera sets from 2014 and 2015 trips, respectively. There were 7 camera deployments that failed to collect video of the bottom because:

- (1) No video was stored in the camera memory on retrieval, possibly due to shortened battery life (5 sets in 2014),
- (2) The trap rested on its side in a position where the bottom substrate was not visible (1 set in 2015),
- (3) The camera flooded (1 set in 2015)

## VIDEO PROCESSING

Trap camera videos were processed via VideoMiner software version 3.0.8.0 developed by DFO (Available at: [downloads.crmltd.ca/f/Crm1335/](https://downloads.crmltd.ca/f/Crm1335/)). Observations of physical substrate, benthic species, approximate bottom current speed, and trap movement were stored in a Microsoft Access database.

There were between 1 and 10 55-second video clips recorded during each camera deployment in 2014, all of which were processed for this report. In 2015 there were between 13 and 35 1-minute video clips recorded during each set, as new camera software and batteries improved the reliability of video collection. Cameras were programmed to regularly record video at 2-hour intervals while the trap was stationary on the bottom. Accelerometers were used to trigger additional video recordings of gear movement during retrieval. Random subsets of 3 videos were processed to capture movement, bottom type, and species while the trap was stationary. All videos were processed for trap movement during gear retrieval.

All organisms observed in videos were identified to the lowest taxonomic rank possible (e.g. species, genus, family, order, etc.), depending on video quality. Identifying corals and sponges to lower ranks (e.g., family, genus or species) was limited by: (1) observations too distant from the trap camera; (2) poor water clarity because of plankton or suspended particles; (3) views obstructed by trap, boulders or animals; and (4) a lack of physical samples needed for precise identification of some coral and sponge (Cairns 2007, Austin et al. 2013, Reiswig 2015). Considering these issues, we assigned identification confidence scores of “low”, “medium”, or “high” to each taxonomic determination (Appendix 2).

It is important to note that some sets allowed for more bottom area to be viewed than others, due to movement of the trap. Video footage is collected on each set from one location while the trap is stationary, plus a variable amount of additional video footage while the gear is being retrieved. The potential for new bottom observations during gear retrieval depends on: (1) the number of videos collected during gear movement, (2) the time period the gear is moving along the bottom, (3) whether the gear is dragging, rolling or suspended off the bottom, (4) the camera angle or trap orientation, and (5) the amount of sediment disturbed and resulting water clarity.

The primary resources used for identifying coral and sponge taxa were Wing and Bernard 2004, Clark 2006, Cairns 2007, Jamieson et al. 2007, Etnoyer 2008, Stone et al. 2011, Austin et al. 2013; Williams 2013 and Du Preez et al. 2015, and the Monterey Bay Aquarium Research Institute (MBARI) Video Annotation Reference System (VARS) ([www.mbari.org](http://www.mbari.org); accessed December 2015). Nomenclature was verified on the World Register of Marine Species (WoRMS; [www.marinespecies.org](http://www.marinespecies.org); accessed December 2015). A photograph inventory (Appendix 1) includes video stills of the different taxa observed. Note that video stills can be blurry, for example, if the camera or particles in the water are moving. Species identification is typically more reliable from the trap camera videos rather than still images.

## SUMMARY OF VIDEO OBSERVATIONS

### CORALS AND SPONGES

Deep-water corals or sponges were observed in 20 out of 80 (25%) set locations (Table 1). Of these, 15 locations had gorgonian corals (Order Alcyonacea), 4 had Sea whips (Order Pennatulacea), 3 had sponges (Classes Demospongiae or Hexactinellida), and 2 had hydrocorals (Family Stylasteridae). Grid H4 (Figure 3) had the largest number of sets (4) with coral or sponge observations, including 5 gorgonian coral species (*Heteropolypus ritteri* (1), *Swiftia simplex* (2), Primnoidae sp. (1) and Alcyonacea spp. (2)), at least 3 sponge species (*Auletta* sp., Hexactinosida sp. (1), Demospongiae sp. (1) and 2 unidentified sponges) and 2 hydrocorals (Stylasteridae spp.).

<b>Table 1.</b> Number of sets where corals and/or sponges were present based on video observations during May 2014 and May 2015 Sablefish fishing trips at SK-B seamount.				
<b>Observations</b>	<b>2014</b>	<b>2015</b>	<b>Total</b>	<b>%</b>
Gorgonian Corals (Order Alcyonacea)	9	6	15	19%
Sea Whips (Order Pennatulacea)	2	2	4	5%
Sponges (Phylum Porifera)	3	0	3	4%
Hydrocorals (Family Stylasteridae)	2	0	2	3%
Presence of Corals or Sponge	12	8	20	25%
Absence of Corals and Sponge	42	18	60	75%
<b>Total Observations</b>	<b>54</b>	<b>26</b>	<b>80</b>	<b>100%</b>

Two sets in grid D11 and F10 had the most coral observations, with counts of 25 and 42 gorgonian coral colonies (*Heteropolypus ritteri*, *Paragorgia* sp., *Parastenella* sp., Isididae sp., Alcyonacea spp.; see Figure 4 and Appendix 2). Observations from the stationary trap camera footage (e.g., prior to gear retrieval) accounted for only 4 and 8 of the coral colonies observed in grids D11 and F10, respectively. Remaining observations were from videos during the gear

retrieval (3 additional videos from each set) as the gear was dragged and lifted off the bottom, providing new fields of view.

In total there were 128 coral and sponge structures observed over 20 sets and 31 videos in which corals and sponges were present. Camera views from traps suspended during retrieval allowed observations of larger areas and accounted for many of the coral and sponge observations (45), although they accounted for the fewest number of videos (5). Videos while traps were stationary (13) and videos during dragging (13) accounted for 29 and 54 observations of coral and sponge structures, respectively (see Appendix 2 for more details).

## BOTTOM SUBSTRATE

The majority of sets took place on soft bottom with mud or sand as the primary substrate (81%), while the remaining sets had bedrock or loose rock as the primary substrate (Table 2).

<b>Table 2.</b> Number of total camera sets and sets where corals and/or sponges were present arranged by substrate type for video observations during May 2014 and May 2015 Sablefish fishing trips at SK-B seamount.			
<b>Substrate</b>	<b>Number of Camera Sets</b>	<b>Percent of Sets</b>	<b>Sets with Presence of Coral or Sponge</b>
<b><u>Soft bottom as primary substrate:</u></b>			
Soft bottom (mud)	20	25%	2
Soft bottom (sand)	15	19%	1
Sand with gravel	4	5%	1
Soft bottom with cobbles	17	21%	3
Soft bottom with boulders	9	11%	7
<b>Total on soft bottom</b>	<b>65</b>	<b>81%</b>	<b>14</b>
<b><u>Hard bottom as primary substrate:</u></b>			
Gravel with sand	1	1%	0
Gravel with boulders	1	1%	1
Cobbles with sand	1	1%	1
Cobbles with boulders	1	1%	0
Bedrock with boulders	4	5%	2
Bedrock	7	9%	2
<b>Total on hard bottom</b>	<b>15</b>	<b>19%</b>	<b>6</b>
Notes: Hard bottom substrate was classified based on substrate descriptors in 'VideoMiner' software:			
- Gravel, between 1/8 inch and 3 inch (combined observations classified as "pea gravel" or "gravel" in Video Miner database)			
- Cobble, between 3 inches and basketball size			
- Boulders, bigger than a basketball			

## **CONCLUSION**

In total, 140 longline trap fishing sets were deployed on the May 2014 and May 2015 fishing trips to SK-B Seamount and 80 of these included video observations of the bottom type and biological communities. Corals (Alcyonacea, Pennatulacea, Stylasteridae) or sponges (Demospongiae, Hexactinellida) were present at 20 set locations and absent at 60 set locations.

Primary bottom substrates (by set) were predominantly soft (81%) consisting of either sand or mud followed by hard substrates (19%) consisting of gravel, cobbles, boulders or bedrock. There was loose rock present in nearly half of the sets (30 out of 65) where the primary substrate was soft bottom.

Gorgonian corals were observed in 9 locations where the primary substrate was a soft bottom (mud or sand) with a secondary substrate of loose rock (gravel, cobbles, or boulders) and in 6 locations where the primary substrate was hard bottom (gravel, cobbles, bedrock and boulders) (see Appendix 2). Sea whips (in grids E5 and H6) and sponges (in grid F3) were the only groups observed in locations where there appeared to be soft bottom only (e.g. no loose rock observed).

The highest observed concentration of gorgonian corals occurred along the southwestern (e.g., grids G3, H2, H3, H4) and northeastern (e.g., grids C10, D11, E11, F10) flanks of the seamount (Figure 4 and Appendix 2). There were limited observations of hydrocorals, sea whips and sponges without any obvious consistency in their locations.

## **ACKNOWLEDGEMENTS**

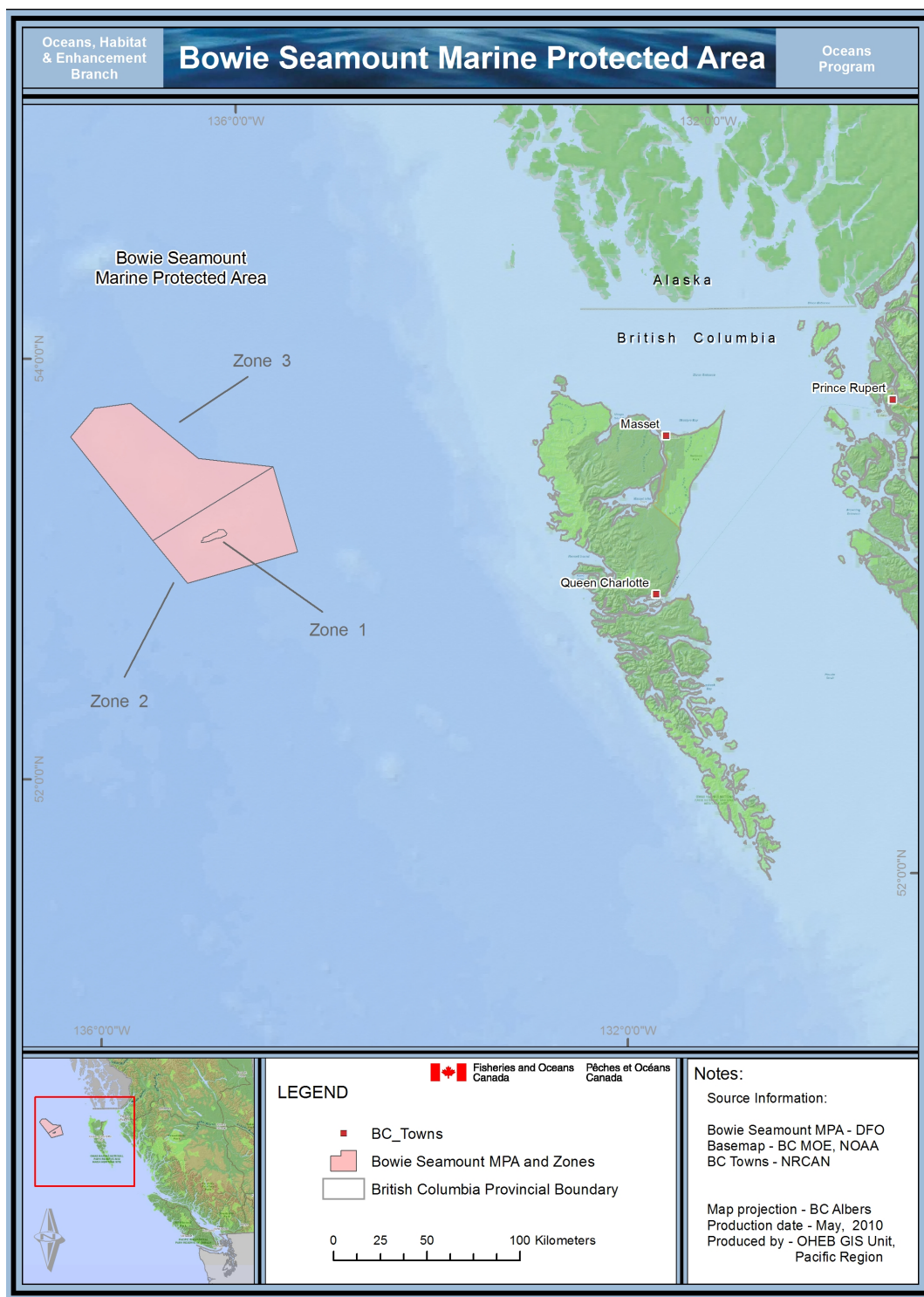
The authors would like to thank Wild Canadian Sablefish Ltd. for funding the development of the trap camera systems, allowing permission to use the data and specimen photos, and supporting this project through their sustainable fisheries research program. We also owe enormous thanks to the captains, crew, and observers who made this project possible, DFO staff K. Anderson, L. Lacko and M. Wyeth who assisted with data collection, equipment preparation, and training of at-sea observers for deploying trap cameras on commercial fishing trips, as well as provided feedback on improvements to the camera system software, and to J. Boutillier, J. Chu, M. Gauthier, N. McDaniel and A. McMillan for assistance with species identification. Funding for the video analysis portion of this project was provided by DFO.

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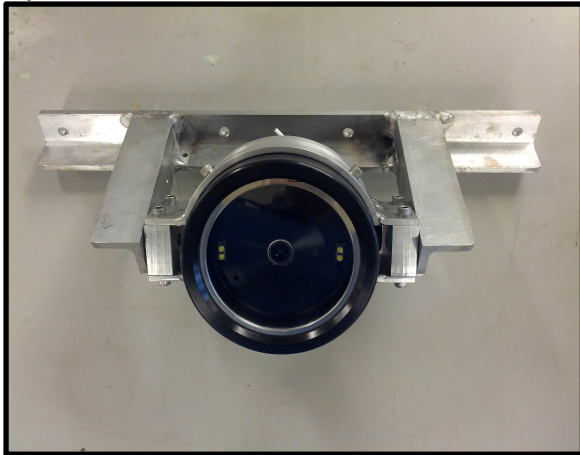
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# FIGURES



**Figure 1.** Map of Bowie Seamount Marine Protected Area (Reproduction of map originally published in DFO 2011).

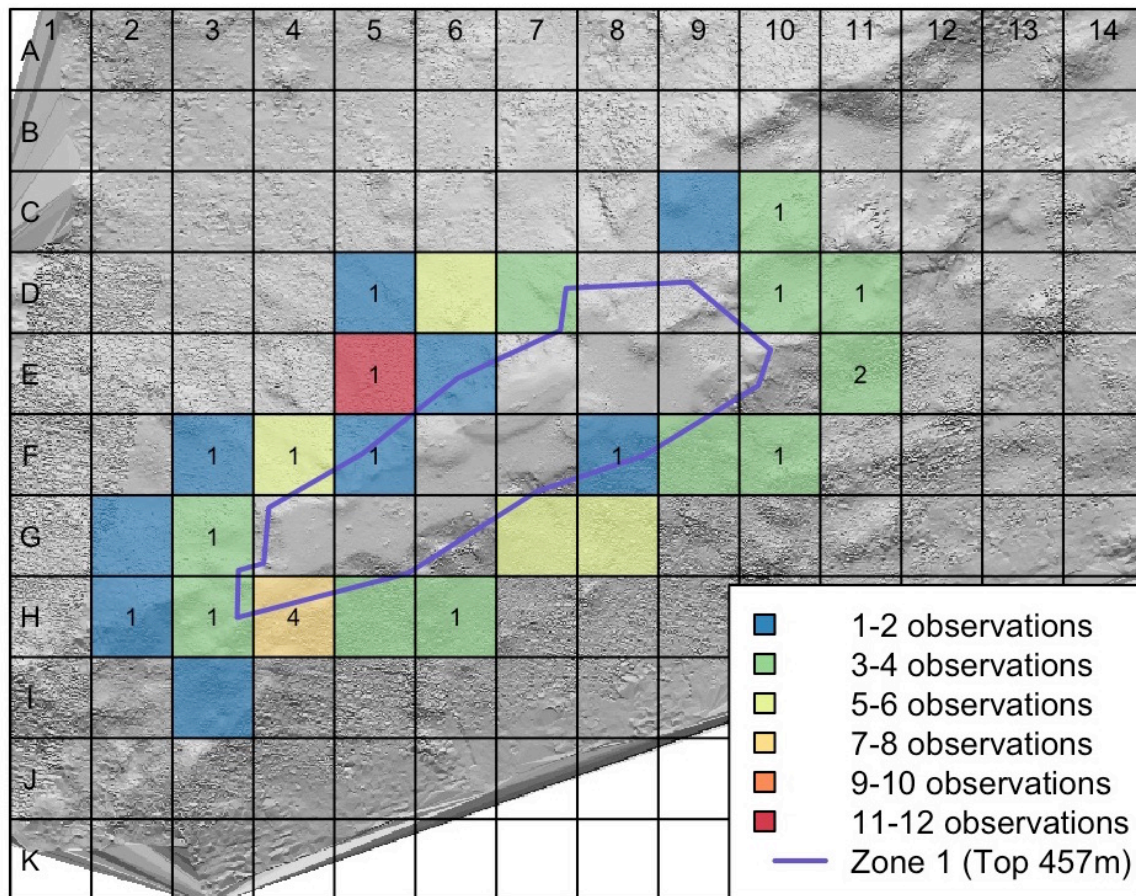
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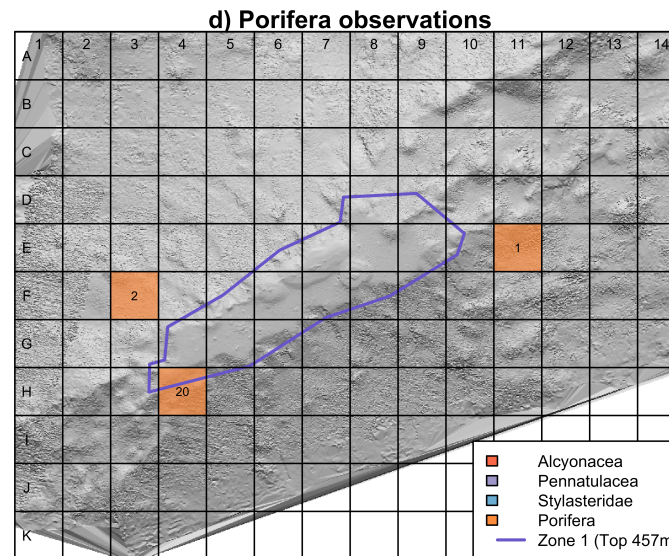
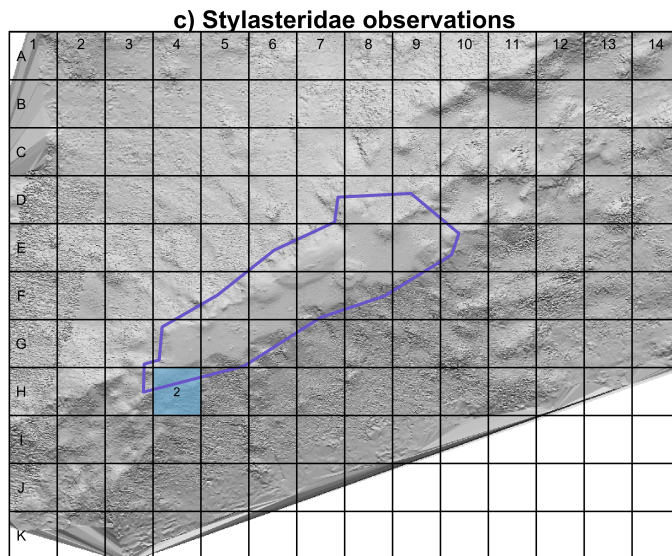
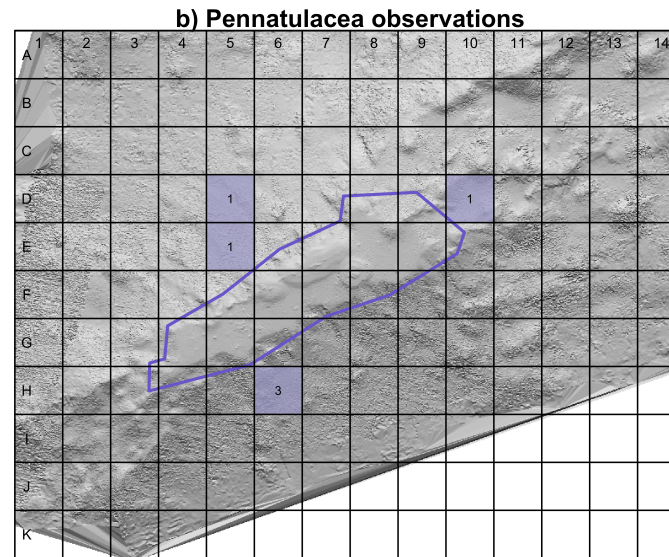
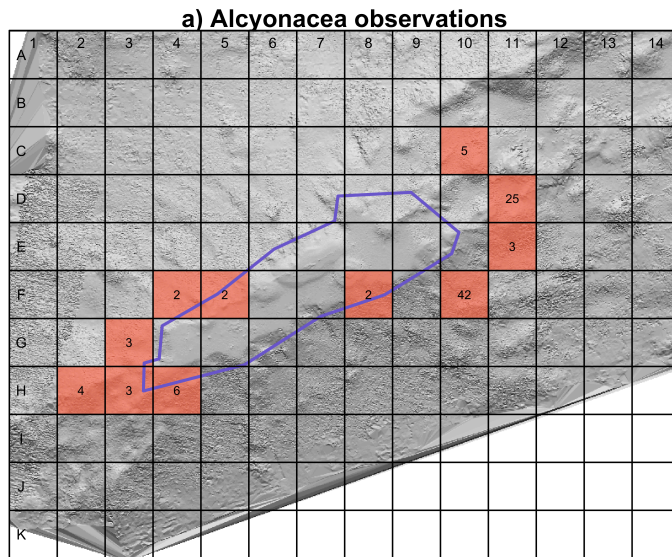
B)



**Figure 2.** A) Camera in bracket. B) Front view (left) and top view (right) of camera (grey bracket) and accelerometer (orange bracket) mounted in Sablefish trap.



**Figure 3.** Location of trap camera deployments in 2 km by 2 km grid cells for May 2014-2015 fishing trips at SK-B. Numbers in colored cells indicate the number of sets where coral or sponges were present for a given cell.



**Figure 4.** Locations of Alcyonacea (a), Pennatulacea (b), Stylasteridae (c), and Porifera (d) observations in 2 km by 2 km grid cells from trap camera deployments during May 2014-2015 fishing trips at SK-B. Numbers in colored cells indicate the number of different coral colonies or sponges observed in that grid cell.

# APPENDIX 1 - CORAL AND SPONGE VIDEO STILLs

## PHYLUM CNIDARIA

### CLASS ANTHOZOA

#### Order Alcyonacea - Gorgonian corals

##### Family Alcyoniidae - Mushroom Corals

*Heteropolypus ritteri*<sup>1</sup>

**Image Credit:**

Wild Canadian Sablefish Ltd.

**Photos:**

Grid H4 (left), Grid F10 (right)

**Observed in:**

Grids F5, F10, G3, H4

**Observer Depths:** 719 - 984 m



<sup>1</sup> Until recently binomial nomenclature was *Anthomastus ritteri* (Molodtsova 2013)

##### Family Isididae - Bamboo Corals

Unidentified Isididae sp.

**Image Credit:**

Wild Canadian Sablefish Ltd.

**Photos:**

Grid H3

**Observed in:**

Grids D11, H3

**Observed Depths:** 648 - 752 m



Family Paragorgiidae - Bubble Gum Corals

*Paragorgia* sp.

**Image Credit:**

Wild Canadian Sablefish Ltd.

**Photos:**

Grid C10

**Observed in:**

Grids C10, D11

**Observed Depths:** 752 - 789 m



Family Plexauridae

*Swiftia simplex*

**Image Credit:**

Wild Canadian Sablefish Ltd.

**Photo:**

Grid H4

**Observed in:**

Grids F5, F8, H4

**Observed Depths:** 709 - 985 m



Family Primnoidae

*Parastenella* spp.

**Image Credit:**

Wild Canadian Sablefish Ltd.

**Photos:**

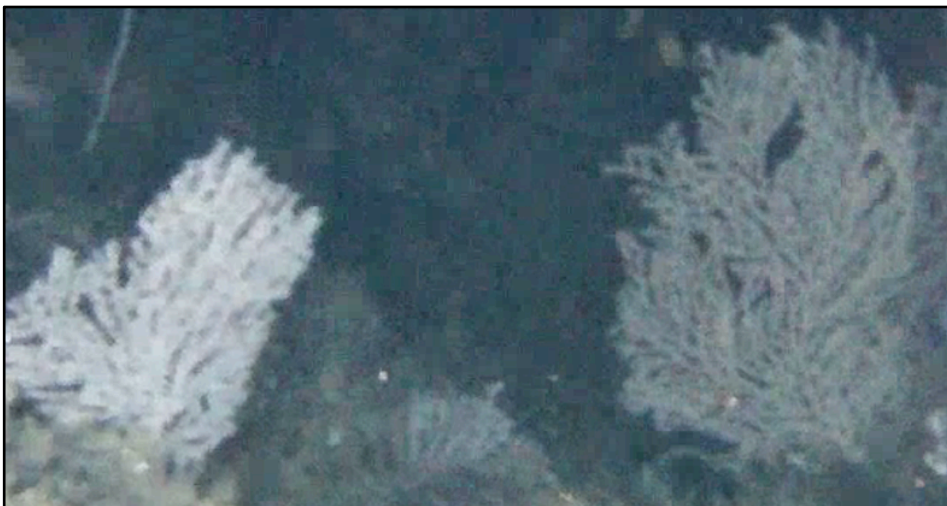
Grid D11 (top)

Grid F10 (middle and bottom)

**Observed in:**

Grids D11, F10

**Observed Depths:** 752 - 863 m



## **Order Pennatulacea - Sea whips and sea pens**

Unidentified Pennatulacea spp.

**Image Credit:**

Wild Canadian Sablefish Ltd.

**Photo:**

Grid H6

**Observed in:**

Grids D5, D10, E5, H6

**Observed Depths:** 794 - 1090 m



Note: All video observations of sea whips were of poor quality and thus taxonomic identification was only possible to the order level. Sea whips were observed in 4 different grid cells and may comprise more than one species.

## **CLASS HYDROZOA**

### **Order Anthoathecata**

#### **Family Stylasteridae - Hydrocorals**

Unidentified Stylasteridae spp.

**Image Credit:**

Wild Canadian Sablefish Ltd.

**Photo:**

Grid H4

**Observed in:**

Grid H4

**Observed Depth:** 521 - 709 m



## PHYLUM PORIFERA

### CLASS DEMOSPONGIAE - DEMO SPONGES

Unidentified Demospongiae sp.

**Image Credit:**

Wild Canadian Sablefish Ltd.

**Photo:**

Grid H4

**Observed in:**

Grid H4

**Observed Depth:** 521 m



#### Order Halichondria

##### Family Axinellidae

*Auletta* sp.<sup>1</sup>

**Image Credit:**

Wild Canadian Sablefish Ltd.

**Photo:**

Grid H4

**Observed in:**

Grid H4

**Observed Depth:** 521 m



<sup>1</sup> A sample and analysis of spicule morphology is required to confirm species identification. The tube-shaped morphology of the highlighted sponges is also seen in lyssacine sponges (e.g., *Acanthascus* spp., *Rhabdocalyptus* spp., *Staurocalyptus* spp.; Leys et al. 2007)

## CLASS HEXACTINELLIDA - GLASS SPONGES

### Order Hexactinosida

Unidentified Hexactinosida sp.

**Image Credit:**

Wild Canadian Sablefish, Ltd.

**Photo:**

Grid H4

**Observed in:**

Grid H4

**Observed Depth:** 521 m



Note: The budding from the base of the sponge highlighted in the photo is typical of dictyonine sponges (Chu and Leys 2010)

## APPENDIX 2 - SUMMARY OF CORAL/SPONGE BOTTOM OBSERVATIONS

Order/Phylum	Taxa	Count	Depth (m)	Trap Status	Grid	ID Confidence	Substrate
Alcyonacea	Alcyonacea	1	789	dragging	C10	Low	soft bottom with boulders
Alcyonacea	Alcyonacea	1	789	dragging	C10	Low	soft bottom with boulders
Alcyonacea	Alcyonacea	2	752	stationary	D11	Low	bedrock
Alcyonacea	Alcyonacea	2	752	dragging	D11	Medium	bedrock
Alcyonacea	Alcyonacea	1	752	dragging	D11	Medium	bedrock
Alcyonacea	Alcyonacea	3	752	suspended	D11	Medium	bedrock
Alcyonacea	Alcyonacea	3	752	suspended	D11	Medium	bedrock
Alcyonacea	Alcyonacea	1	920	stationary	E11	High	bedrock with boulders
Alcyonacea	Alcyonacea	1	1165	stationary	E11	Low	bedrock with boulders
Alcyonacea	Alcyonacea	1	1165	stationary	E11	Low	bedrock with boulders
Alcyonacea	Alcyonacea	2	863	dragging	F10	High	bedrock
Alcyonacea	Alcyonacea	1	863	dragging	F10	Medium	bedrock
Alcyonacea	Alcyonacea	2	863	suspended	F10	High	bedrock
Alcyonacea	Alcyonacea	1	622	dragging	F4	Low	soft bottom with boulders
Alcyonacea	Alcyonacea	1	622	dragging	F4	Low	soft bottom with boulders
Alcyonacea	Alcyonacea	2	719	dragging	G3	High	cobbles with sand
Alcyonacea	Alcyonacea	1	822	dragging	H2	High	soft bottom with boulders
Alcyonacea	Alcyonacea	1	822	dragging	H2	Medium	soft bottom with boulders
Alcyonacea	Alcyonacea	2	648	dragging	H3	Medium	sand with gravel
Alcyonacea	Alcyonacea	1	917	stationary	H4	Low	soft bottom with boulders
Alcyonacea	Alcyonacea	1	521	dragging	H4	Low	soft bottom with cobble
Alcyonacea	<i>Heteropolypus ritteri</i>	3	863	dragging	F10	Medium	bedrock
Alcyonacea	<i>Heteropolypus ritteri</i>	1	776	dragging	F5	Medium	soft bottom with boulders

Order/Phylum	Taxa	Count	Depth (m)	Trap Status	Grid	ID Confidence	Substrate
Alcyonacea	<i>Heteropolypus ritteri</i>	1	719	dragging	G3	Medium	cobbles with sand
Alcyonacea	<i>Heteropolypus ritteri</i>	1	984	stationary	H4	Medium	soft bottom with boulders
Alcyonacea	Isididae	2	752	stationary	D11	High	bedrock
Alcyonacea	Isididae	1	752	dragging	D11	Low	bedrock
Alcyonacea	Isididae	2	752	dragging	D11	Low	bedrock
Alcyonacea	Isididae	3	752	suspended	D11	High	bedrock
Alcyonacea	Isididae	1	648	stationary	H3	High	sand with gravel
Alcyonacea	<i>Paragorgia</i> sp.	2	789	dragging	C10	Low	soft bottom with boulders
Alcyonacea	<i>Paragorgia</i> sp.	1	789	suspended	C10	High	soft bottom with boulders
Alcyonacea	<i>Paragorgia</i> sp.	1	752	dragging	D11	Low	bedrock
Alcyonacea	<i>Parastenella</i> sp.	3	752	dragging	D11	High	bedrock
Alcyonacea	<i>Parastenella</i> sp.	2	752	dragging	D11	Medium	bedrock
Alcyonacea	<i>Parastenella</i> sp.	6	863	stationary	F10	Medium	bedrock
Alcyonacea	<i>Parastenella</i> sp.	2	863	stationary	F10	Medium	bedrock
Alcyonacea	<i>Parastenella</i> sp.	7	863	dragging	F10	Medium	bedrock
Alcyonacea	<i>Parastenella</i> sp.	6	863	dragging	F10	Medium	bedrock
Alcyonacea	<i>Parastenella</i> sp.	13	863	suspended	F10	Medium	bedrock
Alcyonacea	Primnoidae	2	822	dragging	H2	Low	soft bottom with boulders
Alcyonacea	Primnoidae	1	521	suspended	H4	Medium	soft bottom with cobble
Alcyonacea	<i>Swiftia simplex</i>	1	776	dragging	F5	Medium	soft bottom with boulders
Alcyonacea	<i>Swiftia simplex</i>	2	985	stationary	F8	Medium	gravel with boulders
Alcyonacea	<i>Swiftia simplex</i>	1	917	stationary	H4	Low	soft bottom with boulders
Alcyonacea	<i>Swiftia simplex</i>	1	709	stationary	H4	High	soft bottom with boulders
Anthoathecata	Stylasteridae	1	521	dragging	H4	High	soft bottom with cobble
Anthoathecata	Stylasteridae	1	709	stationary	H4	High	soft bottom with boulders
Pennatulacea	Pennatulacea	1	794	stationary	D10	Medium	soft bottom with cobble

Order/Phylum	Taxa	Count	Depth (m)	Trap Status	Grid	ID Confidence	Substrate
Pennatulacea	Pennatulacea	1	925	stationary	D5	Medium	soft bottom with cobble
Pennatulacea	Pennatulacea	1	832	stationary	E5	Medium	soft bottom (sand)
Pennatulacea	Pennatulacea	3	1090	dragging	H6	High	soft bottom (mud)
Porifera	<i>Auletta</i> sp.	5	521	suspended	H4	Low	soft bottom with cobble
Porifera	<i>Auletta</i> sp.	1	521	suspended	H4	Low	soft bottom with cobble
Porifera	<i>Auletta</i> sp.	1	521	dragging	H4	Low	soft bottom with cobble
Porifera	<i>Auletta</i> sp.	4	521	suspended	H4	Low	soft bottom with cobble
Porifera	<i>Auletta</i> sp.	5	521	suspended	H4	Low	soft bottom with cobble
Porifera	Demospongiae	1	521	suspended	H4	Medium	soft bottom with cobble
Porifera	Hexactinellida	1	1165	stationary	E11	Low	bedrock with boulders
Porifera	Hexactinellida	1	521	suspended	H4	Low	soft bottom with cobble
Porifera	Hexactinosida	1	521	suspended	H4	High	soft bottom with cobble
Porifera	Porifera	2	772	stationary	F3	Medium	soft bottom (mud)
Porifera	Porifera	1	521	suspended	H4	High	soft bottom with cobble

**Notes:**

Locations are estimated as the midpoints between start and end surface deployment locations measured by fishing vessel. The vessel position at the surface is recorded at deployment of the first and last anchors; the position of the gear on the bottom may differ due to prevailing currents, depth of fishing, and the nature of the substrate. The set is unlikely to lie in a straight line between the recorded endpoints for the same reasons. Thus, the position of the camera is reported only to the resolution of a 2 km by 2 km grid cell.

- When available, depth is the mean bottom depth measured from Seabird SBE39 depth sensors deployed in traps. When SBE39 data were not available depths were taken from trap camera depth sensors. When depth data was not available from either SBE39 or trap camera depth sensors, depths are estimated as the midpoint of the set.

- Hard bottom substrate was classified based on substrate descriptors in 'VideoMiner' software:

- Gravel, between 1/8 inch and 3 inch (combined observations classified as "pea gravel" or "gravel" in database)
- Cobble, between 3 inches and basketball size
- Boulders, bigger than a basketball