

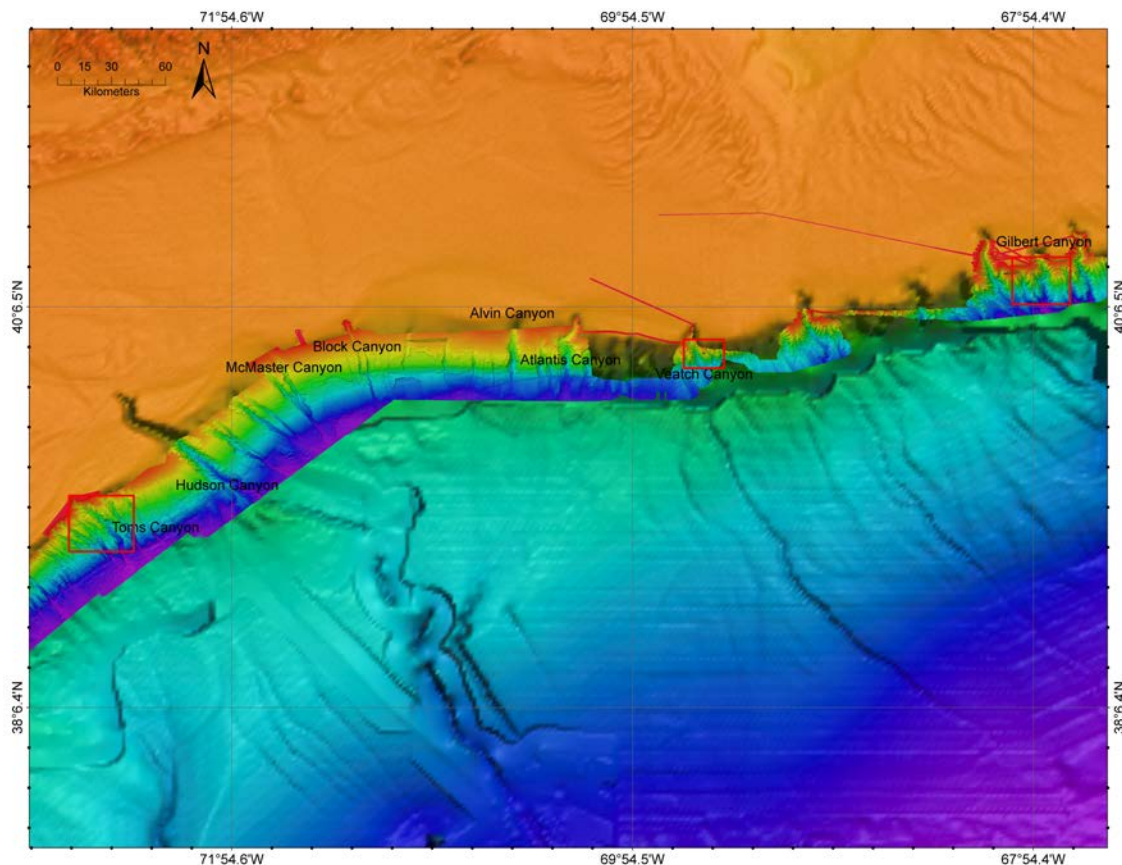
# FSV Bigelow and TowCam Summary

## Canyon Site Characterization 2012

Submarine canyons can contain the most productive non-chemosynthetic habitats described in the deep-sea and may enhance local and regional species diversity, including those vulnerable to anthropogenic activities. Using recently collected fine-scale bathymetry data, we documented and characterized deep-sea coral ecosystems in virtually unexplored northeast and mid-Atlantic canyons. We utilized WHOI's TowCam system on the FSV Henry Bigelow to ground-truth deep-sea coral "hotspots" predicted by the existing model/maps of these areas.

Using the WHOI Towed Camera System *TowCam*, approximately 6 Northwest Atlantic canyon areas were investigated between July 5-18, 2012 including Toms Canyon ( $38^{\circ} 56.3823$  N,  $72^{\circ}25.7944$  W at  $\sim 1804$ m depth), Hendrickson Canyon ( $38^{\circ}57.6673$  N,  $72^{\circ}26.3203$  W at  $\sim 1705$ m depth), Veatch Canyon ( $39^{\circ}51.234$  N,  $69^{\circ}33.0397$  W at  $\sim 1262$ m depth) and canyon limbs extending west of Veatch Canyon, and Gilbert Canyon ( $40^{\circ}17.2029$  N,  $67^{\circ}48.5498$  W, at  $\sim 707$ m depth). A total of 18 camera tow deployments covered 18 target areas for a total of 106 hr 47 min of bottom time producing a total of 38,629 images in order to collect contemporary deep-sea coral and sponge distribution, abundance, and habitat data. Images were taken every 10 seconds at an altitude between 2-6 meters from the seafloor with a 16-megapixel camera (TowCam SN DSC002 set at F7.1 and shutter speed at 1/60 and was flown between 2 to 5 m off the bottom). *TowCam* was equipped with an altimeter to provide accurate depth and altitude for each image. The images from the *TowCam* system were recorded internally and simultaneously transmitted to the surface through 0.68" CTD cable.

Camera tow operations focus on three different regions: Toms Canyon complex (with tows in Toms, Middle Toms, and Henderickson Canyons), Veatch Canyon and Gilbert Canyon. There were 6 tows in Toms Canyon, 4 tows in Veatch Canyon, and 8 tows in Gilbert Canyon.



### Camera Tow Operational Areas

*Northwest Atlantic canyons featuring Toms, Veatch, and Gilbert canyons, which were explored in 2012. Bathymetry derived from the multi-ship mapping ACUMEN 2012 project.*

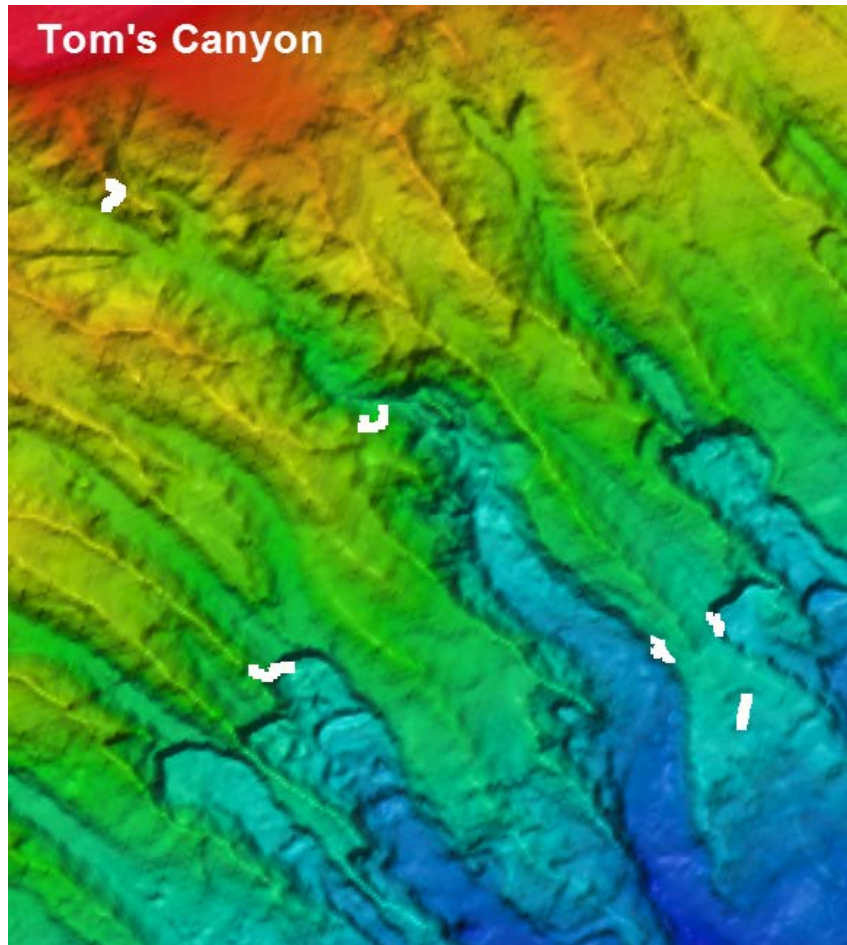
# Site Characterization and Dive Summary Reports

Site Characterization  
Overview

Study Area: **Toms Canyon**  
(including lower east scarp in “Hendrickson Canyon”)

Total Dives: 6      Depth Range: 553m to 1802m

## GENERAL LOCATION AND HABITAT CHARACTERIZATION



**Toms Canyon Ops**

## DIVE SUMMARY FOR SITE

TowCam Dive #	Canyon Location	GMT Date	Launch Lat N	Launch Lon W	Recovery Lat	Recovery Lon	Time on bottom	Total No. of Images	Nominal Depth (m)
01	Toms Canyon SE	7/7/12	38 56.382	72 25.7944	38 55.5772	72 25.627	4:51	2556	1802
02	Toms Canyon Lower West	7/8/12	38 57.178	72 27.2815	38 57.5213	72 27.544	6:31	2749	1736 to 1694
03	Canyon Head	7/8/12	39 06.297	72 38.0914	39 05.8721	72 38.169	4:23	1420	553 to 861
04	Hendrickson Canyon Lower East Scarp	7/9/12	38 57.667	72 26.3203	38 57.5940	72 26.553	5:28	2328	175 to 1705
05	Middle Toms Canyon Mid	7/10/12	38 56.938	72 35.3163	38 56.8551	72 35.005	6:33	2779	1337 to 1591
06	Toms Canyon Mid-East	7/10/12	39 01.6231	72 33.2098	39 01.7749	72 33.174	5:04	2036	1115 to 1216

## Toms Canyon

- 550-860m This depth region was dominated by seemingly monotonous sediment habitats- highly draped with thick sediments: abundant fish, including hake and redfish (*Sebastes*) apparently utilizing seafloor micro-relief, galatheid crabs (*Munida*; long arms) were present but occurred in very low numbers. Overall faunal diversity at these depths was discovered to be low.
- 1800-1812m Surveys conducted above the canyon rim documented fully sedimented habitats (fluffy with lots of micro-relief, rounded burrows). *Ophiomusium*, cerianthid anemones, high dense tan-colored holothurians, *Hygrosoma* urchins, ring burrows, *Anthomastus* (single colony), sea pens (single red stalk), brisingid sea stars (white *Freyella*?), *Acanella* (several to many), a pycnogonid spider sp., and a few *Lepidisis* bamboo whips were observed in this area.
- 1760-1975m Hard bottom habitats dominated with highly angular Canyon margins, areas of extensive chalk. Scleractinian cup corals, *Desmophyllum* and dense ophiuroids (*Ophiomusium*) characterized this depth range. The brisingid sea star *Novodinia* occurred densely on canyon walls *Hygrosoma* urchins (purple), *Actinernus* anemones, rat tails (*Nezumia*), *Echinus* urchins (white) were also present in relatively high abundance. Massive chalk steps hosted what appeared to be carbonate rock resembling shards of lumber with no sessile fauna (perhaps suggesting highly unstable canyon areas or recent activity). The deeper end of this depth range was dominated by sedimented habitats hosting fields of *Acanella* corals, *Lepidisis* whips, *Ophiomusium* brittle stars, skates, and pycnogonids, Small red sea pens were visible on rare rock boulders. Also at this deeper region were *Novodinia*, *Venus*, and stalked sponges, as well as one bright yellow sea star. Toms hosted a wide range of different habitats in this region, and based on the deep dominance of *Acanella* sp. in particular, could be hypothesized to be unlike other canyons in this region.

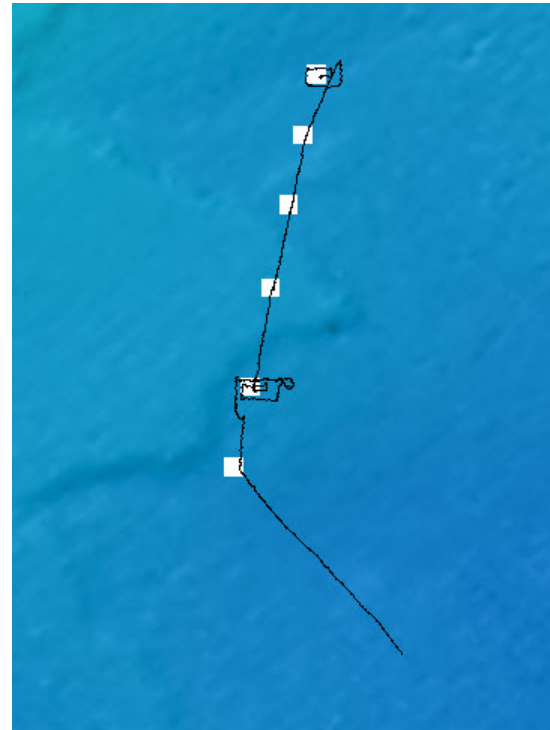
## HB1204-TC01 (7-Jul-2012)

### Survey Summary:

TowCam survey HB1204-01, was a survey line conducted in Toms Canyon in the shallow flat region above the canyon rim, starting at the north end of the line @ 1820 m water depth, proceeding south to a depth of 1845 m. Depth fluctuates 35 m over the 1 km length of the proposed line.

Our first tow, the shake down tow, was conducted in a fairly flat, soft bottom area so everyone could get used to *TowCam* operations, especially deployment and recovery of the system. Also, in this area, there was less likelihood that the camera could be damaged during the tow if something went wrong. We were fortunate to observe some animals of interest that prefer soft sediments.

HB1204-TC01		
Launch Date; Time (GMT)	7/7/2012	14:15
Launch Position (ship)	38 56.3823 N	72 25.7944 W
Launch Depth (m)	1820 m	
Recovery Date; Time (GMT)	7/7/2012	22:21
Recovery Position (ship)	38 55.5772 N	72 25.6275 W
Recovery Depth (m)	1802 m	
Total Tow Time	8hr 06min	
Time on bottom	4hr 51min	
# of images	2556	
# of slurp Stations	1	
# CTD bottles	8	
Camera Type	OIS 16 MP	
Camera s/n	#02	
Camera Settings	F7.1 1/60s	
Camera Interval	10s	
Tow Type	dangle & tow	



**TowCam HB1204-TC01 Ship Track**

*Note: White Pts = Planned waypoints, Black line = track.*

### WayPoints:

WP	Long W	Lat N	Anticipated Strategy	Est. Depth (m)
1	-72.430004	38.939771	Deploy; Test; Dangle	-1827
2	-72.430284	38.938480	Dangle	-1824
3	-72.430584	38.937001	Tow	-1821
4	-72.430965	38.935227	Tow	-1807
5	-72.431403	38.933115	Tow	-1825
6	-72.431750	38.931407	Dangle	-1842

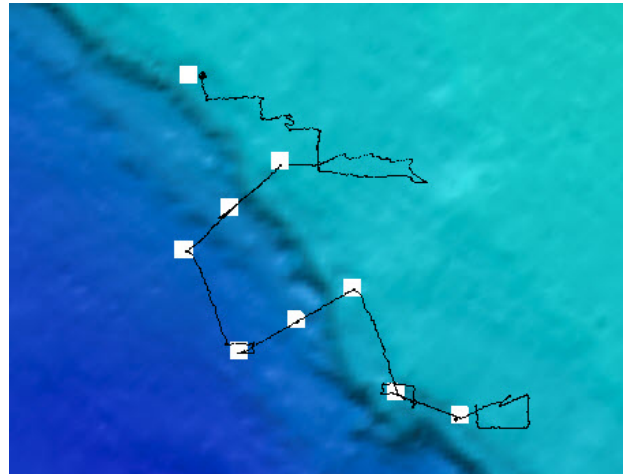
The camera used during this lowering was TowCam OIS SN 002 set at F7.1 and shutter speed at 1/60. The camera was flown between 3.5 and 5 m off the bottom.

## HB1204-TC02 (8-Jul-2012)

### Survey Summary:

TowCam survey HB1204-02, was a survey line conducted in Toms Canyon along the rim and down the rim of the north slope, starting at the northeast waypoint @ 1736 m water depth, proceeding generally in the northwest direction and ending @1694, water depth. Along the way, the canyon rim crossed downslope in the southwest direction, and then upslope (as individual dangles) in the northeast direction.

HB1204-TC02		
Launch Date; Time (GMT)	7/8/2012	4:17
Launch Position (ship)	38 57.1788 N	72 27.2815 W
Launch Depth (m)	1736 m	
Recovery Date; Time (GMT)	7/8/2012	12:54
Recovery Position (ship)	38 57.5213 N	72 27.5442 W
Recovery Depth (m)	1694 m	
Total Tow Time	8hr 37min	
Time on bottom	6hr 31min	
# of images	2749	
# of slurp Stations	1	
# CTD bottles	0	
Camera Type	OIS 16 MP	
Camera s/n	#02	
Camera Settings	F7.1 1/60s	
Camera Interval	10s	
Tow Type	dangle & tow	



**TowCam HB1204-TC02 Ship Track**

*Note: White Pts = Planned waypoints, Black line = track*

### WayPoints:

W P	Long (DD)	Long (MM.MM)	Long (DD)	Long (MM.MM)	Anticipated Strategy	Est. Depth (m)
1	72	27.282173	38	57.18111060	Deploy; Test; Dangle	-1736.23
2	72	27.347311	38	57.20540100	Dangle	-1749.31
3	72	27.391397	38	57.30939780	Dangle	-1723.73
4	72	27.447754	38	57.27827100	Dangle	-1885.55
5	72	27.505396	38	57.24611340	Dangle	-1967.92
6	72	27.560794	38	57.34850040	Dangle	-1942.95
7	72	27.515352	38	57.39018960	Dangle	-1844.47
8	72	27.463978	38	57.43707000	Dangle	-1699.87
9	72	27.555703	38	57.52392060	Dangle	-1712.68

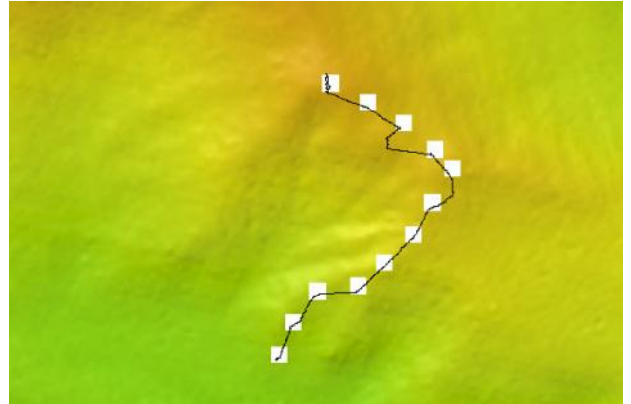
The camera used during this lowering was TowCam OIS SN 002 set at F7.1 and shutter speed at 1/60. The camera was flown between 3.5 and 5 m off the bottom.

## HB1204-TC03 (8-Jul-2012)

### Survey Summary:

TowCam survey HB1204-03, was a survey line conducted along a small shallow ridge within Toms canyon. Starting at the northern waypoint @ 562 m water depth, proceeding SE along the ridge to a depth of 616m, then SW along the ridge to a depth of 875 m.

HB1204-TC03		
Launch Date; Time (GMT)	7/8/2012	19:21
Launch Position (ship)	39 06.2975N	72 38.0914W
Launch Depth (m)	553 m	
Recovery Date; Time (GMT)	7/8/2012	23:45
Recovery Position (ship)	39 05.8721N	72 38.1695W
Recovery Depth (m)	861 m	
Total Tow Time	3hr 25 min	
Time on bottom	4hr 23min	
# of images	1420	
# of slurp Stations	0	
# CTD bottles	0	
Camera Type	OIS 16 MP	
Camera s/n	#02	
Camera Settings	F7.1 1/60s	
Camera Interval	10s	
Tow Type	dangle & tow	



**TowCam HB1204-TC03 Ship Track**

*Note: White Pts = Planned waypoints, Black line = track*

### WayPoints:

WP	Long W	Lat N	Anticipated Strategy	Est. Depth (m)
1	-72.634766	39.105097	Deploy; Dangle	-562.51
2	-72.633790	39.104613	Tow	-587.21
3	-72.632843	39.104055	Tow	-613.39
4	-72.632033	39.103369	Dangle	-616.28
5	-72.631581	39.102873	Dangle	-616.81
6	-72.632101	39.101977	Dangle	-634.15
7	-72.632586	39.101146	Dangle	-663.9
8	-72.633352	39.100402	Dangle	-709.19
9	-72.63403857	39.09979595	Dangle	-750.55
10	-72.63510736	39.09965238	Dangle	-782.92
11	-72.63575005	39.09884982	Dangle	-825.71
12	-72.63611127	39.09799691	Dangle	-875.03

The camera used during this lowering was TowCam OIS SN 002 set at F7.1 and shutter speed at 1/60. The camera was flown between 3.5 and 5 m off the bottom.

## Study Area: Hendrickson Canyon

### HB1204-TC04 (9-Jul-2012)

#### Survey Summary:

TowCam survey HB1204-04, was a survey line conducted in Hendrickson Canyon along the western rim (lower east scarp), starting with the southeastern waypoint @ 1753 m water depth, proceeding in the northwest direction, ending prematurely at approximately waypoint 3 @1720 water depth. Our fourth tow in Henderickson Canyon provided images of bubblegum coral. We made six dives total in this area and were successful in finding a variety of gorgonians, sea pens, and sponges.

<b>HB1204-TC04</b>		
Launch Date; Time (GMT)	7/9/2012	3:15
Launch Position (ship)	38 57.6673 N	72 26.3203 W
Launch Depth (m)	1753 m	
Recovery Date; Time (GMT)	7/9/2012	10:55
Recovery Position (ship)	38 57.5940 N	72 26.5532 W
Recovery Depth (m)	1705 m	
Total Tow Time	7hr 40min	
Time on bottom	5hr 28min	
# of images	2328	
# of slurp Stations	0	
# CTD bottles	0	
Camera Type	OIS 16 MP	
Camera s/n	#02	
Camera Settings	F7.1 1/60s	
Camera Interval	10s	
Tow Type	dangle & tow	



**TowCam HB1204-TC04 Ship Track**

*Note: White Pts = Planned waypoints, Black line = track*

#### WayPoints:

WP	Long W	Lat N	Anticipated Strategy	Est. Depth (m)
1	-72.438747	38.961036	Deploy; Dangle	-1753.51
2	-72.438956	38.961749	Dangle	-1753.28
3	-72.439398	38.962523	Dangle	-1745.35
4	-72.438216	38.962995	Dangle	-1908.38
5	-72.438951	38.963691	Dangle	-1893.93
6	-72.440891	38.964728	Dangle	-1721.68
7	-72.441933	38.966384	Dangle	-1699.59
8	-72.439925	38.965992	Dangle	-1879.48

The camera used during this lowering was TowCam OIS SN 002 set at F7.1 and shutter speed at 1/60. The camera was flown between 3.5 and 5 m off the bottom.

## Study Area: Toms Canyon

### HB1204-TC05 (9-Jul-2012)

#### Survey Summary:

TowCam survey HB1204-05, was a survey line conducted along a low relief ridge on top of the western rim of Tom's Canyon @ ~1400m running from west to east to the canyon rim edge, then proceeding down the canyon wall to the base of the canyon @ ~1627m.

<b>HB1204-TC05</b>	
Launch Date; Time (GMT)	7/9/2012 16:31
Launch Position (ship)	38 72 35.3163 56.9385 N W
Launch Depth (m)	1337 m
Recovery Date; Time (GMT)	7/10/2012 1:11
Recovery Position (ship)	38 72 35.0058 56.8551 N W
Recovery Depth (m)	1591 m
Total Tow Time	8 hr 39 min
Time on bottom	6 hr 33 min
# of images	2779
# of slurp Stations	0
# CTD bottles	0
Camera Type	OIS 16 MP
Camera s/n	#02
Camera Settings	F7.1 1/60s
Camera Interval	10s
Tow Type	dangle & tow



**TowCam HB1204-TC05 Ship Track**

*Note: White Pts = Planned waypoints, Black line = track*

#### WayPoints:

W P	Long (DD)	Long (MM.MM)	Long (DD)	Long (MM.MM)	Anticipated Strategy	Est. Depth (m)
1	72	35.321608	38	56.9383698	Deploy; Dangle	-1336.63
2	72	35.225654	38	56.8566834	Tow	-1347.27
3	72	35.058334	38	56.8156146	Tow	-1412.93
4	72	34.960960	38	56.873067	Dangle	-1476.26
5	72	34.904416	38	56.9206002	Dangle	-1503.89
6	72	34.899426	38	56.979879	Dangle	-1505.63
7	72	34.838342	38	56.9897256	Dangle	-1634.88
8	72	34.767658	38	56.9872722	Dangle	-1695.71
9	72	34.6265964	38	56.9944146	Dangle	-1715.04

The camera used during this lowering was TowCam OIS SN 002set at F7.1 and shutter speed at 1/60. The camera was flown between 3.5 and 5 m off the bottom.



## HB1204-TC06 (10-Jul-2012)

### Survey Summary:

TowCam survey HB1204-06, was a survey line conducted in the middle region of Toms Canyon working down the rim wall and then back to near the start point, starting with the southwestern waypoint @ 1141 m water depth, proceeding in the northeast direction to a water depth of 1413 m, and then returning west to a water depth of 1258 m.

HB1204-TC06		
Launch Date; Time (GMT)	7/10/2012	6:04
Launch Position (ship)	39 01.6231 N	72 33.2098 W
Launch Depth (m)	1115 m	
Recovery Date; Time (GMT)	7/10/2012	12:18
Recovery Position (ship)	39 01.7749 N	72 33.1740 W
Recovery Depth (m)	1216 m	
Total Tow Time	6hr 14min	
Time on bottom	5hr 04min	
# of images	2036	
# of slurp Stations	1	
# CTD bottles	0	
Camera Type	OIS 16 MP	
Camera s/n	#02	
Camera Settings	F7.1 1/60s	
Camera Interval	10s	
Tow Type	dangle & tow	



**TowCam HB1204-TC06 Ship Track**

*Note: White Pts = Planned waypoints, Black line = track*

### WayPoints:

WP	Long W	Long W	Lat N	Lat N	Anticipated Strategy	Est. Depth (m)
1	72	33.224483	39	1.6184862	Deploy; Dangle	-1141.6
2	72	33.152417	39	1.6158816	Tow	-1157.35
3	72	33.012781	39	1.6196436	Tow	-1191.33
4	72	32.887027	39	1.6637742	Dangle	-1218.3
5	72	32.825424	39	1.7613144	Dangle	-1239.69
6	72	32.806804	39	1.8678252	Dangle	-1302.37
7	72	32.829168	39	1.9740648	Dangle	-1412.84
8	72	33.186031	39	1.7718768	Dangle	-1258.41

The camera used during this lowering was TowCam OIS SN 002 set at F7.1 and shutter speed at 1/60. The camera was flown between 3.5 and 5 m off the bottom.

## Site Characterization

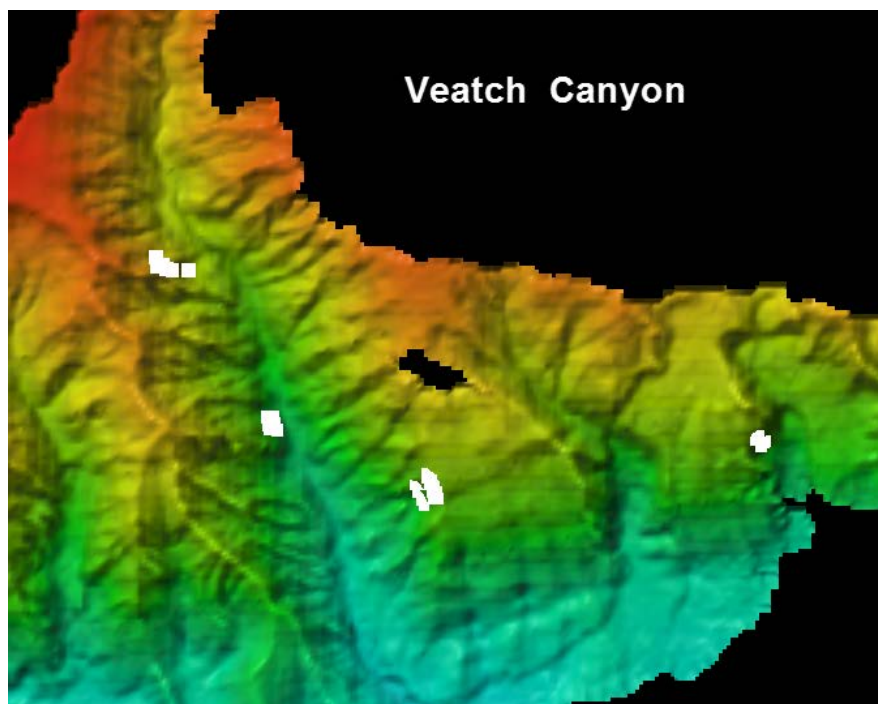
## Study Area: Veatch Canyon

### Overview

In Veatch Canyon, we made four dives. Here, we found paramuricid corals in high abundances as well as an abundance of a solitary hard coral (most likely *Desmophyllum dianthus*) and a variety of sponges living on the steep canyon walls.

Total Dives: 4      Depth Range: 569m – 1424m

## GENERAL LOCATION AND HABITAT CHARACTERIZATION



**Veatch Canyon Ops**

## DIVE SUMMARY FOR SITE

TowCam Dive #	Canyon Location	GMT Date	Launch Lat N	Launch Lon W	Recovery Lat	Recovery Lon	Time on bottom	Total No. of Images	Nominal Depth (m)
07	Veatch Canyon Lower SE	7/11/12	39 51.2384	69 33.0397	39 50.8894	69 33.0097	8:07	3100	1050 to 1262
08	Veatch Canyon Upper East	7/11/12	39 54.2998	69 37.0755	39 54.3186	69 36.7521	4:30	1785	569 to 751
09	Veatch Canyon Mid East	7/13/12	39 52.1195	69 35.4589	39 51.8939	69 35.101	3:50	1351	1219 to 1424
10	Two Canyons West of Veatch - East side	7/13/12	39 51.7737	69 28.1204	39 51.7325	69 27.9462	6:15	2487	1061 to 1190
11	Aborted Dive	41103	39 52.1198	69 23.6992	39 52.1205	69 23.6977	x	328	1156 to 1165
11a	Aborted Dive	41104	39 52.1202	69 23.6985	39 52.1171	69 23.6896	x	262	165

## Veatch Canyon

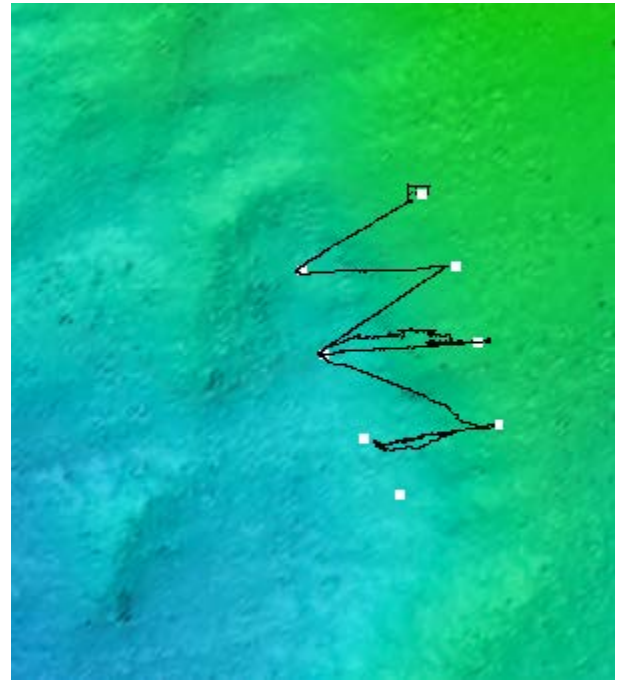
- 570-750m This entire area mostly sedimented habitats, locally with some draped chalky rocks. Dominant fauna are *Chaceon*, tripod fish, striped galatheids, witch flounder, bivalve shells, skates, monk fish, Venus on rock, redfish (*Sebastes*). Some steps of hard bottom- hosting hairy hydroids, and skates on sediment.
- 1050-1250m Hard bottom canyon walls dominated by *Acanthogorgia*, *Neomorphaster*, *Solenosmilia*, Cup corals (*Desmophyllum*) and Echinus urchins. All sparsely distributed.
- 1290-1424m Seafloor dominated by chalky rock bottom intermingling with flat full sedimented areas. On hard bottom rocks and walls: *Actinauge* anemone, *Parmuricea* with associates (locally dense on wall), Single *Desmophyllum*, large white sponges, *Anthomastus* (small clusters), *Parantipathes* (several with ophiuroids and crabs), *Neomorphaster*, pycnogonid, Venus-fly trap anemone, a single colony of pink *Paragorgia*, hexactinellid vase sponge, *Swiftia*, *Clavularia*, *Acanthogorgia*, bamboo- none of these corals appear in high abundance most as single; on sediments, cerianthid anemone, *Anthomastus*, *Chaceon* crabs (few), and a *Chimera*.

## HB1204-TC07 (11-Jul-2012)

### Survey Summary:

TowCam survey HB1204-07, was a series of downslope transect lines conducted in Veatch Canyon along the deeper southern edge of the canyon wall, starting at the northeast waypoint #1 @ 1041 m water depth, proceeding through consecutive transects in a generally southern direction and ending @ 1287 m water depth.

HB1204-TC07	
Launch Date; Time (GMT)	7/11/12 06:33
Launch Position (ship)	39 51.2384 N 69 33.0397 W
Launch Depth (m)	1050 m
Recovery Date; Time (GMT)	7/11/12 15:59
Recovery Position (ship)	39 50.8894 N 69 33.00972 W
Recovery Depth (m)	1262 m
Total Tow Time	9 hr 25 min
Time on bottom	8 hr 07 min
# of images	3100
# of slurp Stations	1
# CTD bottles	0
Camera Type	OIS 16 MP
Camera s/n	#02
Camera Settings	F7.1 1/60s
Camera Interval	10s



**TowCam HB1204-TC07 Ship Track**

*Note: White Pts = Planned waypoints, Black line = track*

### WayPoints:

WP	Long W	Long W	Lat N	Lat N	Anticipated Strategy	Est. Depth (m)
1	69	33.030433	39	51.235188	Deploy; Dangle	-1041.49
2	69	33.197935	39	51.1286778	Dangle	-1226.59
3	69	32.983694	39	51.134151	Dangle	-1066.43
4	69	33.166766	39	51.011475	Dangle	-1288.31
5	69	32.952610	39	51.0274992	Dangle	-1090.77
6	69	33.110780	39	50.892939	Dangle	-1292.76
7	69	32.922718	39	50.91387	Dangle	-1120.82
8	69	33.060411	39	50.81574	Dangle	-1287.08

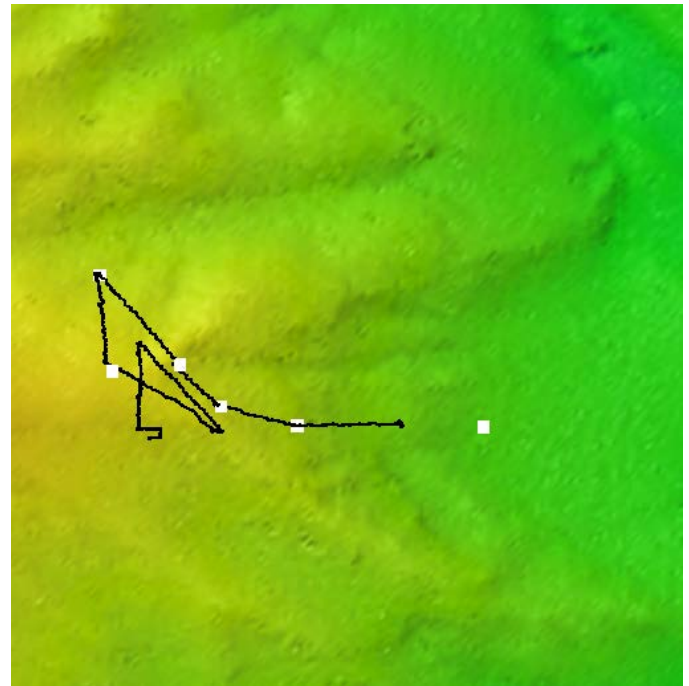
The camera used during this lowering was TowCam OIS SN 002 set at F7.1 and shutter speed at 1/60. The camera was flown between 3.5 and 5 m off the bottom.

## HB1204-TC08 (12-Jul-2012)

### Survey Summary:

TowCam survey HB1204-08, was an exploration of a bathymetric high along the western head wall of Veatch Canyon starting @ 577 m water depth, proceeding northward, then doubling back south along the ridge line, then proceeding eastward down the wall into the canyon and ending @ 878 m water depth.

HB1204-TC08	
Launch Date; Time (GMT)	7/11/2012 21:10
Launch Position (ship)	39 54.2998 N 69 37.0755 W
Launch Depth (m)	569 m
Recovery Date; Time (GMT)	7/12/2012 03:30
Recovery Position (ship)	39 54.3186 N 69 36.7521 W
Recovery Depth (m)	751 m
Total Tow Time	5 hr 20 min
Time on bottom	4 hr 30 min
# of images	1785
# of slurp Stations	1
# CTD bottles	0
Camera Type	OIS 16 MP
Camera s/n	#02
Camera Settings	F7.1 1/60s
Camera Interval	10s
Tow Type	dangle & tow



**Figure 1: TowCam HB1204-TC08 Ship Track**

*Note: White Pts = Planned waypoints, Black line = track*

### WayPoints:

WP	Long W	Long W	Lat N	Lat N	Anticipated Strategy	Est. Depth (m)
1	69	37.12236	39	54.38799	Deploy; Dangle	-577.4
2	69	37.1380434	39	54.5115174	Dangle	-666.21
3	69	37.0355742	39	54.3963708	Dangle	-613.45
4	69	36.9824538	39	54.3432786	Dangle	-633.35
5	69	36.8849196	39	54.3182496	Dangle	-713.57
6	69	36.6458064	39	54.3166614	Dangle	-878.28

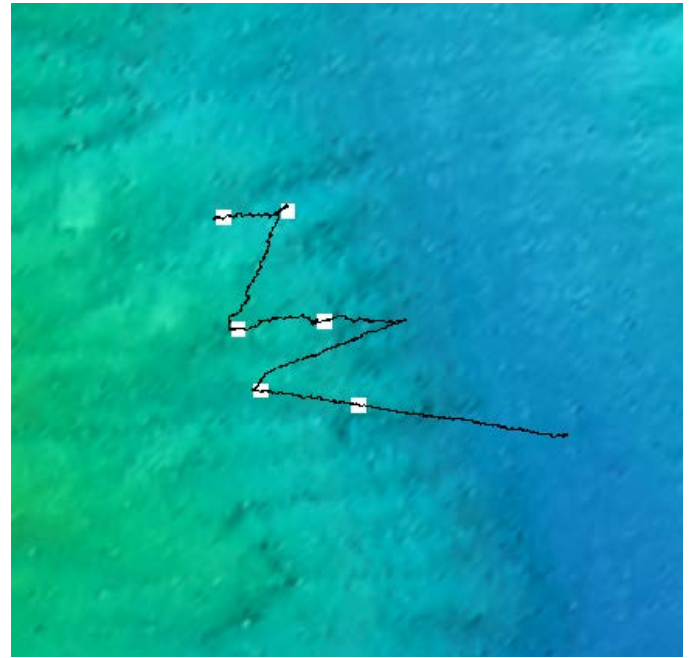
The camera used during this lowering was TowCam OIS SN 002 set at F7.1 and shutter speed at 1/60. The camera was flown between 3.5 and 5 m off the bottom.

## HB1204-TC09 (12-Jul-2012)

### Survey Summary:

TowCam survey HB1204-09, was 3 downslope transects midway down Veatch Canyon along the eastern wall starting at the top of the wall @ 1309 m water depth and finishing @ 1359 m water depth. The transects were completed from north to south.

HB1204-TC09	
Launch Date; Time (GMT)	7/12/2012 15:48
Launch Position (ship)	39 52.1187 N 69 35.4594 W
Launch Depth (m)	1256 m
Recovery Date; Time (GMT)	7/12/2012 20:21
Recovery Position (ship)	39 51.8939 N 69 35.101 W
Recovery Depth (m)	1424 m
Total Tow Time	4 hr 32 min
Time on bottom	3 hr 11 min
# of images	1351
# of slurp Stations	1
# CTD bottles	0
Camera Type	OIS 16 MP
Camera s/n	#02
Camera Settings	F7.1 1/60s
Camera Interval	10s
Tow Type	dangle & tow



**Figure 2: TowCam HB1204-TC09 Ship Track**

*Note: White Pts = Planned waypoints, Black line = track.*

**WayPoints:**

<b>WP</b>	<b>Long W</b>	<b>Long W</b>	<b>Lat N</b>	<b>Lat N</b>	<b>Anticipated Strategy</b>	<b>Est. Depth (m)</b>
1	69	35.4527358	39	52.1209368	Deploy; Dangle	-1309.42
2	69	35.3850372	39	52.126779	Dangle	-1358.37
3	69	35.4369948	39	52.004358	Dangle	-1259.99
4	69	35.3471754	39	52.0122	Dangle	-1340.07
5	69	35.4130866	39	51.9399498	Dangle	-1279.05
6	69	35.3110146	39	51.9249324	Dangle	-1350.47

The camera used during this lowering was TowCam OIS SN 002set at F7.1 and shutter speed at 1/60. The camera was flown between 3.5 and 5 m off the bottom.

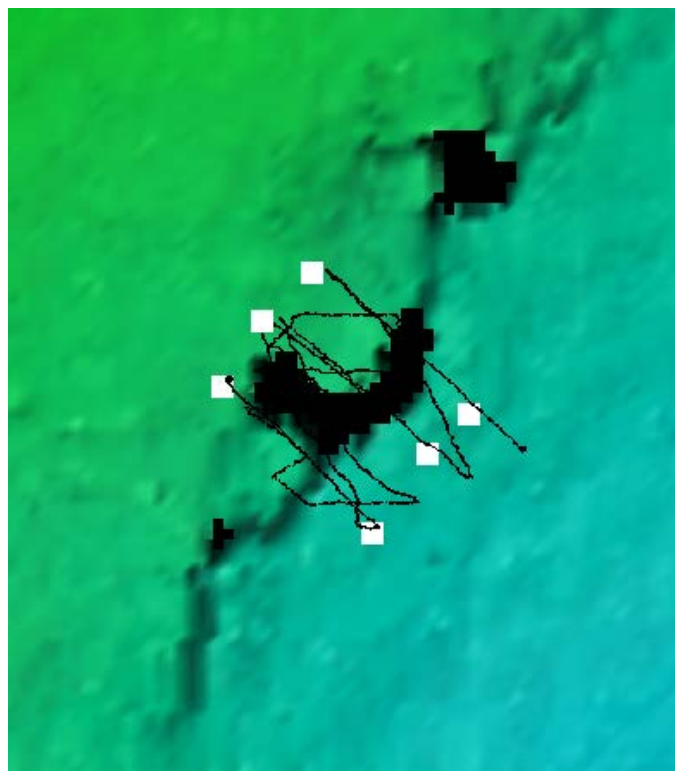
## Study Area: Minor Canyon West of Veatch

### HB1204-TC10 (13-Jul-2012)

#### Survey Summary:

TowCam survey HB1204-TC10 was a survey conducted in minor canyon to the northeast of Veatch Canyon (currently unnamed), starting on the southwestern rim @ 1109 m water depth. The survey followed the rim to the northeast and then backtracked to the southwest before conducting transect down the rim to the canyon bottom @ ~1251 m.

		HB1204-TC10	
Launch Date; Time (GMT)	7/13/2012	03:08	
Launch Position (ship)	39 51.7738 N	69 28.1206 W	
Launch Depth (m)	1061 m		
Recovery Date; Time (GMT)	7/13/2012	10:04	
Recovery Position (ship)	39 51.7319 N	69 27.9484 W	
Recovery Depth (m)	1186 m		
Total Tow Time	6 hr 56 min		
Time on bottom	5 hr 35 min		
# of images	2486		
# of slurp Stations	1		
# CTD bottles	0		
Camera Type	OIS 16 MP		
Camera s/n	#02		
Camera Settings	F7.1 1/60s		
Camera Interval	10s		
Tow Type	dangle & tow		



**Figure 3: TowCam HB1204-TC10 Ship Track**

*Note: White Pts = Planned waypoints, Black line = track*

#### WayPoints:

WP	Long W	Long W	Lat N	Lat N	Anticipated Strategy	Est. Depth (m)
1	69	28.1237532	39	51.7690944	Deploy; Dangle	-1109.4
2	69	28.0356594	39	51.6822498	Dangle	-1251.98
3	69	28.1009892	39	51.8073924	Dangle	-1096.98
4	69	28.0028592	39	51.729354	Dangle	-1237.04
5	69	28.0712274	39	51.8360586	Dangle	-1102.47
6	69	27.9784038	39	51.7526754	Dangle	-1232.7

The camera used during this lowering was TowCam OIS SN 002set at F7.1 and shutter speed at 1/60. The camera was flown between 3.5 and 5 m off the bottom.



## Site Characterization

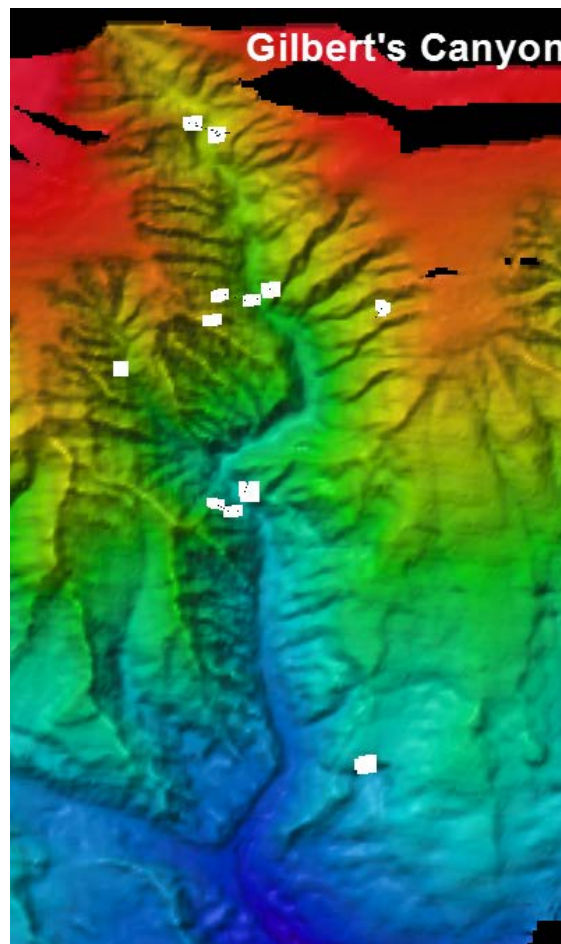
## Study Area: Gilbert Canyon

### Overview

Little was known about Gilbert Canyon prior to our exploration. Coral habitat modeling (led by Brian Kinlan) had predicted that steep slopes in this region would have a high probability of being occupied by deep-water corals. We targeted different depth regions on either side of the canyon (east and west walls) in order to survey and detect differences in fauna based on these two factors. Coral diversity and abundance was relatively high on all tows covering a depth range of ~600m to ~2000m. Coral species were documented on a variety of substrates, with specific coral spp. often occurring coincidentally with particular substrates. Most notable in this regard were the fields of yellow *Paramuricea* sp. corals and sea stars observed on sediments, often below 1,600 meters. Both hard (*affn. Desmophyllum* and *affn. Enallopsamia*) and soft corals (e.g., *Paragorgia*, *Paramuricea*, and bamboo corals) were documented on hard rock bottom, including wall margins, vertical faces, infrequent boulders and cobbles throughout the surveyed depth range (see image collection below). Hard corals appeared to preferentially occupy cracks in the vertical canyon walls. In addition to documenting coral species similar to what we had observed in the first 7 tows in Toms and Hendrickson Canyons, we documented antipatharian black corals (*Bathypathes* ?), attached to hard rock substrate associated with the margin or edge of canyon walls as well as vertical canyon walls. As far as we know, black corals had not previously recorded from this area.

Total Dives: 8

Depth Range: 615m-1965m



Gilbert's Canyon Ops

## DIVE SUMMARY FOR SITE

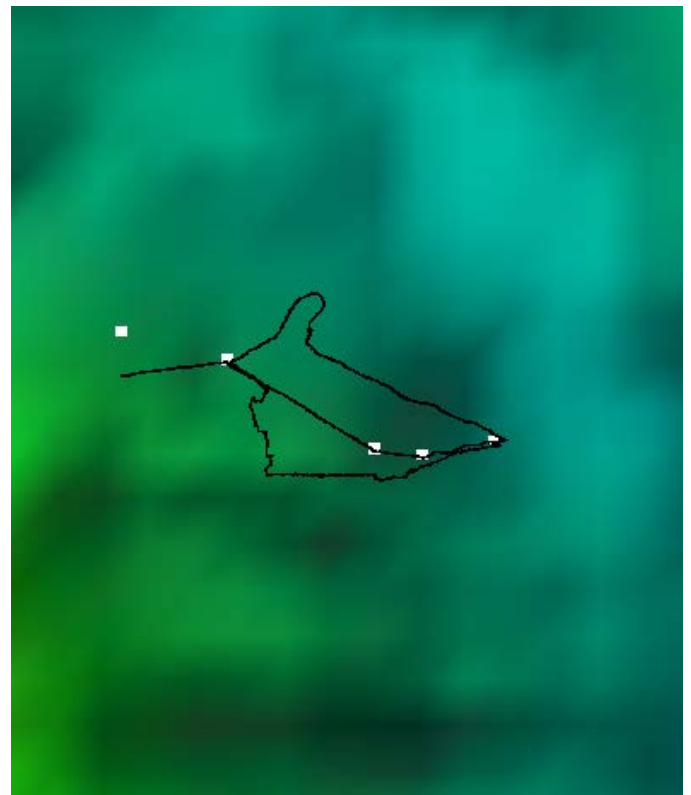
TowCam Dive #	Canyon Location	GMT Date	Launch Lat N	Launch Lon W	Recovery Lat	Recovery Lon	Time on bottom	Total No. of Images	Nominal Depth (m)
12	Gilbert Canyon	7/14/12	40 13.5127	67 51.9247	40 13.4213	6751.4945	6:32	2209	1370 to 1679
13	Gilbert Canyon	7/15/12	40 13.8961	67 51.1268	40 13.4963	6751.0523	5:26	2230	1587 to 1752
14	Gilbert Canyon	7/15/12	40 17.0403	67 51.9791	40 17.446	6751.0304	4:40	1919	671 to 1226
15	Gilbert Canyon	7/16/12	40 08.6382	67 49.1233	40 08.5984	6748.8786	5:06	2138	1867 to 1965
16	Gilbert Canyon	7/16/12	40 16.0795	67 53.6959	40 16.1385	6753.5613	5:25	2112	934 to 1027
17	Gilbert Canyon	7/16/12	40 20.7662	67 52.3532	40 20.5857	6751.6667	6:53	2588	620 to 820
18	Gilbert Canyon	7/17/12	40 17.6519	67 50.7345	40 17.5553	6750.8587	2:58	1262	1030 to 1187
19	Gilbert Canyon	7/17/12	40 17.2029	67 48.6598	40 16.9929	6748.905	4:39	1581	615 to 747

### HB1204-TC12 (14-Jul-2012)

#### Survey Summary:

TowCam survey HB1204-TC12 was a survey conducted mid-center along the western wall of Gilbert Canyon starting @ 1472 m water depth. The survey comprises of two transects down the canyon wall, to ~ 1746 m water depth.

HB1204-TC12	
Launch Date; Time (GMT)	7/14/2012 15:17
Launch Position (ship)	40 13.5127 N 67 51.9247 W
Launch Depth (m)	1370 m
Recovery Date; Time (GMT)	7/14/2012 22:35
Recovery Position (ship)	40 13.4213 N 67 51.4945 W
Recovery Depth (m)	1670 m
Total Tow Time	7 hr 18 min
Time on bottom	5 hr 45 min
# of images	2209
# of slurp Stations	1
# CTD bottles	0
Camera Type	OIS 16 MP
Camera s/n	#02
Camera Settings	F4.0 1/60s (ONE STROBE)
Camera Interval	12s
Tow Type	dangle & tow



**TowCam HB1204-TC12 Ship Track**

*Note: White Pts = Planned waypoints, Black line = track*

#### WayPoints:

WP	Long W	Long W	Lat N	Lat N	Anticipated Strategy	Est. Depth (m)
1	67	51.928236	40	13.5716796	Deploy; Dangle	-1472.56
2	67	51.78816	40	13.534314	Dangle	-1541.92

3	67	51.5935734	40	13.4167848	Dangle	-1546.44
4	67	51.5301864	40	13.4086878	Dangle	-1633.86
5	67	51.435573	40	13.425591	Dangle	-1746.42
6	67	51.1773162	40	13.812438	Dangle	-1665.29

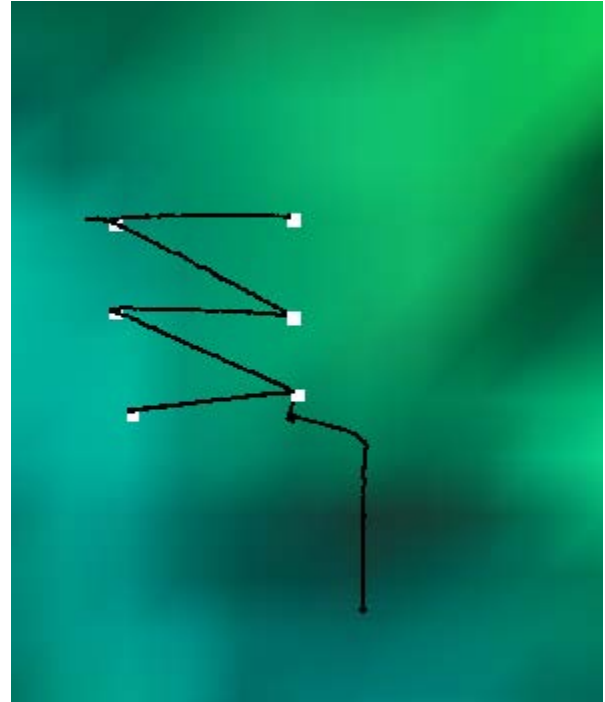
The camera used during this lowering was TowCam OIS SN 002 set at F4.0 (due to using only one strobe) and shutter speed at 1/60. The camera was flown between 3.5 and 5 m off the bottom.

## HB1204-TC13 (15-Jul-2012)

### Survey Summary:

TowCam survey HB1204-TC13 was a survey conducted in Gilbert Canyon, starting on the eastern rim @ 1632 m water depth, and doing three transects westward to the canyon floor. Note that we went to each waypoint in non-sequential order: 3, 4, 1, 2, 5, 6, 5, and then southward to a water depth of ~1720 m.

HB1204-TC13		
Launch Date; Time (GMT)	7/15/2012	03:34
Launch Position (ship)	40 13.8967 N	67 51.1270 W
Launch Depth (m)	1587 m	
Recovery Date; Time (GMT)	7/15/2012	09:47
Recovery Position (ship)	40 13.4967 N	67 51.0525 W
Recovery Depth (m)	1720 m	
Total Tow Time	6 hr 13 min	
Time on bottom	4 hr 38 min	
# of images	2230	
# of slurp Stations	0	
# CTD bottles	0	
Camera Type	OIS 16 MP	
Camera s/n	#02	
Camera Settings	F7.1 1/60s	
Camera Interval	10s	
Tow Type	dangle & tow	



**TowCam HB1204-TC13 Ship Track**

*Note: White Pts = Planned waypoints, Black line = track*

### WayPoints:

WP	Long W	Long W	Lat N	Lat N	Anticipated Strategy	Est. Depth (m)
1	67	51.1218984	40	13.792344	Deploy; Dangle	-1632.19
2	67	51.3034098	40	13.7970666	Dangle	-1780.32
3	67	51.1212174	40	13.8914952	Dangle	-1612.3
4	67	51.3031266	40	13.8873684	Dangle	-1762.55
5	67	51.117417	40	13.7135568	Dangle	-1660.19
6	67	51.2861094	40	13.6939164	Dangle	-1793.81

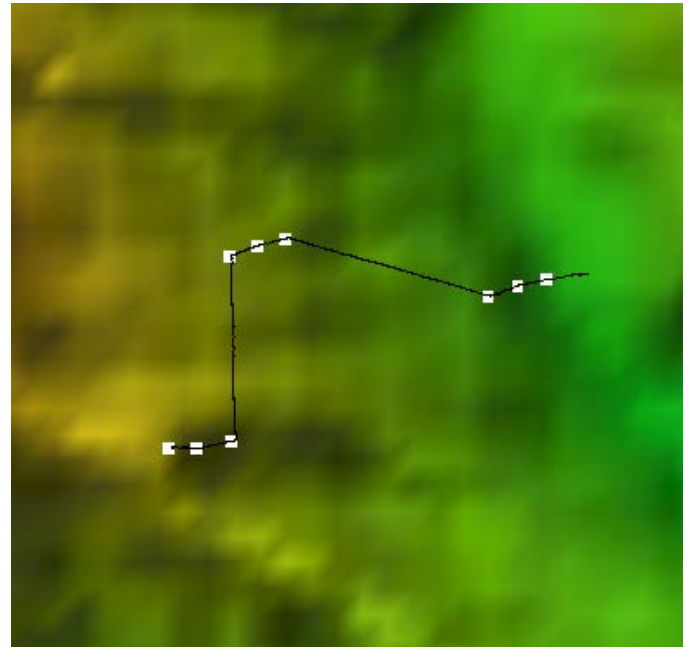
The camera used during this lowering was TowCam OIS SN 002 set at F7.1 and shutter speed at 1/60. The camera was flown between 3.5 and 5 m off the bottom.

## HB1204-TC14 (15-Jul-2012)

### Survey Summary:

TowCam survey HB1204-14 was three short transects within Gilbert Canyon located approximately midway down the canyon. Transect 1 was along the western wall starting @ 703 m water depth, proceeding eastward and ending @ 823 m water depth. Transect 2 was along the western wall a bit north of transect 1 starting @ 840 m water depth, proceeding northeast and ending @ 964 m water depth. Transect 3 was along the ledge of western wall starting @ 1164 m water depth, proceeding northeast and ending @ 1276 m water depth.

HB1204-TC14	
Launch Date; Time (GMT)	7/15/2012 14:01
Launch Position (ship)	40 17.0405 N 67 51.9787 W
Launch Depth (m)	671 m
Recovery Date; Time (GMT)	7/15/2012 19:23
Recovery Position (ship)	40 17.4415 N 67 50.9882 W
Recovery Depth (m)	1226 m
Total Tow Time	5 hr 21 min
Time on bottom	4 hr 18 min
# of images	1919
# of slurp Stations	1
# CTD bottles	0
Camera Type	OIS 16 MP
Camera s/n	#02
Camera Settings	F7.1 1/60s
Camera Interval	10s
Tow Type	dangle & tow



**TowCam HB1204-TC14 Ship Track**

*Note: White Pts = Planned waypoints, Black line = track*

### WayPoints:

WP	Long W	Long W	Lat N	Lat N	Anticipated Strategy	Est. Depth (m)
1	67	51.986376	40	17.039532	Deploy; Dangle	-703.99
2	67	51.9213726	40	17.0376318	Dangle	-765.58
3	67	51.8413656	40	17.0563506	Dangle	-823.36
4	67	51.8459598	40	17.4888162	Dangle	-840.79
5	67	51.7813812	40	17.5122852	Dangle	-889.66
6	67	51.713343	40	17.5289616	Dangle	-964.31
7	67	51.2390586	40	17.3939478	Dangle	-1164.27
8	67	51.1696584	40	17.4190902	Dangle	-1227.94

The camera used during this lowering was TowCam OIS SN 002set at F7.1 and shutter speed at 1/60. The camera was flown between 3.5 and 5 m off the bottom.

## HB1204-TC15 (15-Jul-2012)

### Survey Summary:

TowCam survey HB1204-15 was three transects down a wall along a scalloped edge at the southeast end of Gilbert canyon. All three transects ran from the top of the wall to the base. Transect 1 started @ 1910 m water depth and ended @ 2019 m water depth. Transect 2 started @ 1887 m water depth and ended @ 2019 m water depth. Transect 3 started @ 1883 m water depth and ended @ 2019 m water depth.

HB1204-TC15		
Launch Date; Time (GMT)	7/15/2012	23:34
Launch Position (ship)	40 08.6392 N	67 49.1250 W
Launch Depth (m)	1867 m	
Recovery Date; Time (GMT)	7/16/2012	05:45
Recovery Position (ship)	40 08.5984 N	67 48.8786 W
Recovery Depth (m)	1975 m	
Total Tow Time	6 hr 11 min	
Time on bottom	4 hr 11 min	
# of images	2138	
# of slurp Stations	0	
# CTD bottles	0	
Camera Type	OIS 16 MP	
Camera s/n	#02	
Camera Settings	F7.1 1/60s	
Camera Interval	10s	
Tow Type	dangle & tow	



**: TowCam HB1204-TC15 Ship Track**

*Note: White Pts = Planned waypoints, Black line = track*

### WayPoints:

WP	Lon N	Lon W	Lat N	Lat N	Anticipated Strategy	Est. Depth (m)
1	67	49.1176404	40	8.6350434	Deploy; Dangle	-1910.33
2	67	49.0579968	40	8.547648	Dangle	-2019.83
3	67	49.0419444	40	8.6826336	Dangle	-1887.93
4	67	48.9998562	40	8.5712874	Dangle	-2019.2
5	67	48.9172686	40	8.7041028	Dangle	-1883.18
6	67	48.8954304	40	8.5746624	Dangle	-2025.55

The camera used during this lowering was TowCam OIS SN 002set at F7.1 and shutter speed at 1/60. The camera was flown between 3.5 and 5 m off the bottom.

## HB1204-TC16 (11-Jul-2012)

### Survey Summary:

TowCam survey HB1204-16, was three transects down a small wall located along the northwestern branch at the mid-section of Gilbert Canyon. All three transect ran from east to west. Transect 1 started @ 978 m water depth and ended @ 1075 m water depth. Transect 2 started @ 969 m water depth and ended @ 1069 m water depth. Transect 3 started @ 976 m water depth and ended @ 1062 m water depth.

	HB1204-TC16	
Launch Date; Time (GMT)	7/16/2012	10:32
Launch Position (ship)	40 16.0795 N	67 53.6959 W
Launch Depth (m)	974 m	
Recovery Date; Time (GMT)	7/16/2012	15:56
Recovery Position (ship)	40 16.1355 N	67 53.5591 W
Recovery Depth (m)	1027 m	
Total Tow Time	5 hr 56 min	
Time on bottom	4 hr 44 min	
# of images	2112	
# of slurp Stations	1	
# CTD bottles	0	
Camera Type	OIS 16 MP	
Camera s/n	#02	
Camera Settings	F7.1 1/60s	
Camera Interval	10s	
Tow Type	dangle & tow	

Loss ship nav / no plot

### WayPoints:

WP	Long W	Long W	Lat N	Lat N	Anticipated Strategy	Est. Depth (m)
1	67	53.6947416	40	16.0819302	Deploy; Dangle	-978.12
2	67	53.5968672	40	16.079619	Dangle	-1075.7
3	67	53.6936922	40	16.1127306	Dangle	-969.18
4	67	53.5992498	40	16.1093412	Dangle	-1069.56
5	67	53.6888424	40	16.1502948	Dangle	-976.43
6	67	53.5970658	40	16.1468346	Dangle	-1062.88

The camera used during this lowering was TowCam OIS SN 002set at F7.1 and shutter speed at 1/60. The camera was flown between 3.5 and 5 m off the bottom.

## HB1204-TC17 (11-Jul-2012)

### Survey Summary:

TowCam survey HB1204-17, was two groups of three transects at the head of Gilbert Canyon. The first three transects ran from west to east down the western wall, while the second three transects ran from east to west down the eastern wall. Transect 1 started @ 686 m water depth and ended @ 817 m water depth. Transect 2 started @ 688 m water depth and ended @ 821 m water depth. Transect 3 started @ 698 m water depth and ended @ 821 m water depth. Transect 4 started @ 763 m water depth and ended @ 849 m water depth. Transect 5 started @ 759 m water depth and ended @ 858 m water depth. Transect 6 was aborted due to a failure of the ships DGPS & DP system.

HB1204-TC17		
Launch Date; Time (GMT)	7/16/2012	20:06
Launch Position (ship)	40 20.7662 N	67 52.3532 W
Launch Depth (m)	640 m	
Recovery Date; Time (GMT)	7/17/2012	3:23
Recovery Position (ship)	40 20.5525 N	67 51.5242 W
Recovery Depth (m)	702 m	
Total Tow Time	7 hr 17 min	
Time on bottom	6 hr 30 min	
# of images	2588	
# of slurp Stations	0	
# CTD bottles	0	
Camera Type	OIS 16 MP	
Camera s/n	#02	
Camera Settings	F7.1 1/60s	
Camera Interval	10s	
Tow Type	dangle & tow	



**TowCam HB1204-TC17 Ship Track**

*Note: White Pts = Planned waypoints, Black line = track*

### WayPoints:

WP	Long W	Long W	Lat N	Lat N	Anticipated Strategy	Est. Depth (m)
1	67	52.3553556	40	20.7716826	Deploy; Dangle	-686.54
2	67	52.2181158	40	20.8077582	Tow	-817.85
3	67	52.3474428	40	20.7447678	Dangle	-688.28
4	67	52.2100896	40	20.779014	Tow	-821.49
5	67	52.342905	40	20.716506	Dangle	-698.77
6	67	52.1977806	40	20.7191292	Tow	-821.63
7	67	51.7732134	40	20.589348	Tow	-763.35
8	67	51.8816952	40	20.594751	Dangle	-849.06
9	67	51.7802472	40	20.5588884	Tow	-759.76
10	67	51.8961024	40	20.5441122	Dangle	-858.98
11	67	51.7851816	40	20.527152	Tow	-764.41
12	67	51.900101	40	20.5003932	Dangle	-863.32

The camera used during this lowering was TowCam OIS SN 002 set at F7.1 and shutter speed at 1/60. The camera was flown between 3.5 and 5 m off the bottom.

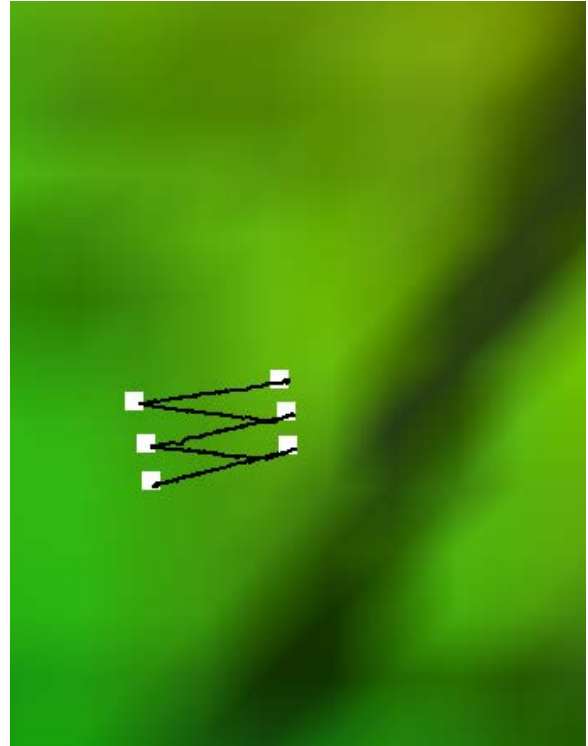


## HB1204-TC18 (17-Jul-2012)

### Survey Summary:

TowCam survey HB1204-TC18 was a survey conducted close to the mouth of Gilbert Canyon on the eastern rim starting @ 1089 m water depth, and doing three transects westward to the canyon floor, with a maximum depth of ~1212 m.

HB1204-TC18		
Launch Date; Time (GMT)	7/17/2012	07:31
Launch Position (ship)	40 17.6519 N	67 50.7345 W
Launch Depth (m)	1055 m	
Recovery Date; Time (GMT)	7/17/2012	11:05
Recovery Position (ship)	40 17.5549 N	67 50.8580 W
Recovery Depth (m)	964 m	
Total Tow Time	3 hr 34 min	
Time on bottom	2 hr 28 min	
# of images	1262	
# of slurp Stations	0	
# CTD bottles	0	
Camera Type	OIS 16 MP	
Camera s/n	#02	
Camera Settings	F7.1 1/60s	
Camera Interval	10s	
Tow Type	dangle & tow	



**TowCam HB1204-TC18 Ship Track**

*Note: White Pts = Planned waypoints, Black line = track*

### WayPoints:

WP	Long W	Long W	Lat N	Lat N	Anticipated Strategy	Est. Depth (m)
1	67	50.741319	40	17.6550552	Deploy; Dangle	-1089.24
2	67	50.8806294	40	17.63421	Tow	-1205.35
3	67	50.735562	40	17.6237022	Dangle	-1090.32
4	67	50.8684908	40	17.5931856	Tow	-1207.38
5	67	50.7334914	40	17.5918524	Dangle	-1098.82
6	67	50.8643784	40	17.5577766	Tow	-1212.88

The camera used during this lowering was TowCam OIS SN 002 set at F7.1 and shutter speed at 1/60. The camera was flown between 3.5 and 5 m off the bottom.

## HB1204-TC19 (17-Jul-2012)

### Survey Summary:

TowCam survey HB1204-TC19 was a survey conducted in a small tributary on the eastern side of Gilbert Canyon, starting @ 668 m water depth, and doing two transects in the northwest direction, with a maximum depth of ~775 m. Additional way points were added to the southwest of the first 4 way points.

HB1204-TC19		
Launch Date; Time (GMT)	7/17/2012	11:55
Launch Position (ship)	40 17.2030 N	67 48.6600 W
Launch Depth (m)	634 m	
Recovery Date; Time (GMT)	7/17/2012	16:24
Recovery Position (ship)	40 16.9872 N	67 48.9090 W
Recovery Depth (m)	753 m	
Total Tow Time	4 hr 29 min	
Time on bottom	3 hr 39 min	
# of images	1581	
# of slurp Stations	1	
# CTD bottles	0	
Camera Type	OIS 16 MP	
Camera s/n	#02	
Camera Settings	F7.1 1/60s	
Camera Interval	10s	
Tow Type	dangle & tow	



**TowCam HB1204-TC19 Ship Track**

*Note: White Pts = Planned waypoints, Black line = track*

### WayPoints:

WP	Long W	Long W	Lat N	Lat N	Anticipated Strategy	Est. Depth (m)
1	67	48.6664134	40	17.2046934	Deploy; Dangle	-668.41
2	67	48.732864	40	17.3125368	Tow	-780.75
3	67	48.6328338	40	17.258679	Dangle	-665.12
4	67	48.6661296	40	17.3284902	Tow	-755.07
5	67	48.84288	40	17.0673	Tow	-748.00
6	67	48.91464	40	16.98948	Tow	-812.00

The camera used during this lowering was TowCam OIS SN 002set at F7.1 and shutter speed at 1/60. The camera was flown between 3.5 and 5 m off the bottom.

## CORAL & HABITAT IMAGES FROM TOM'S, VEATCH, & GILBERT CANYONS



A more than 1-m long skate transits just above the seafloor near 1800m depth in Southeast slope of Toms Canyon. Purple sea urchins (above skate), mottled sediment and burrows (sometimes forming “rings”) can be observed on the sedimented seafloor.



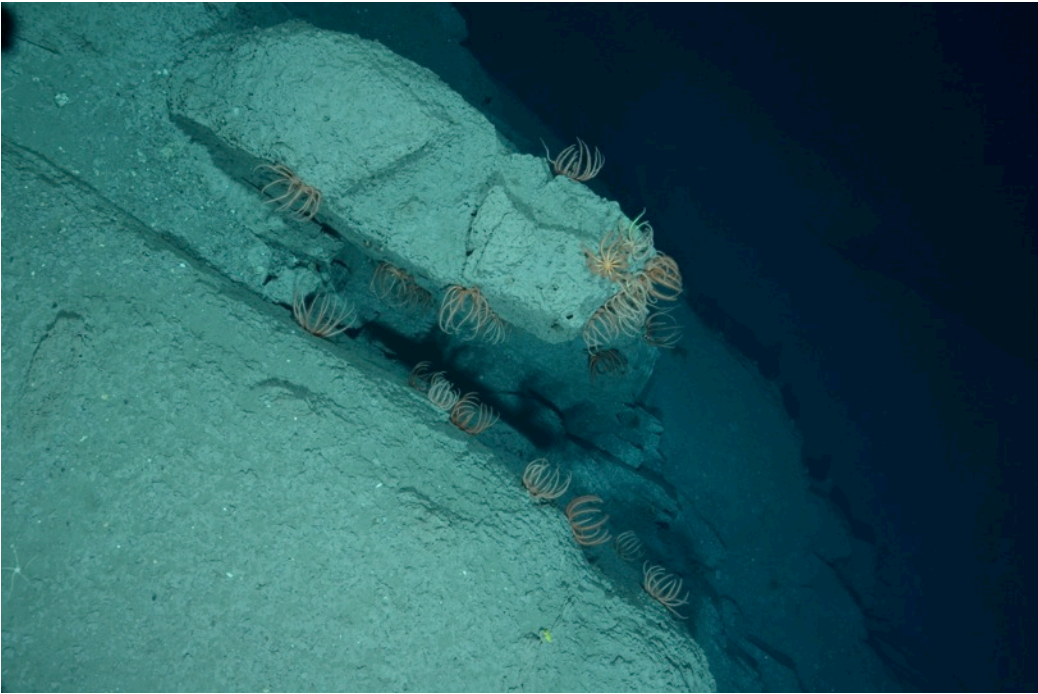
A black morid (*Antimora rostrata*) fish swims along the seafloor next to a white whip coral (>1m long), burrows in the sediment at 1802 meters depth in Southeast Toms Canyon. A white brittle star can be seen at left.



Anemones and white brittle stars (lower center) at 1703m on a sedimented ledge next to a steep scarp in Southwestern Toms Canyon.



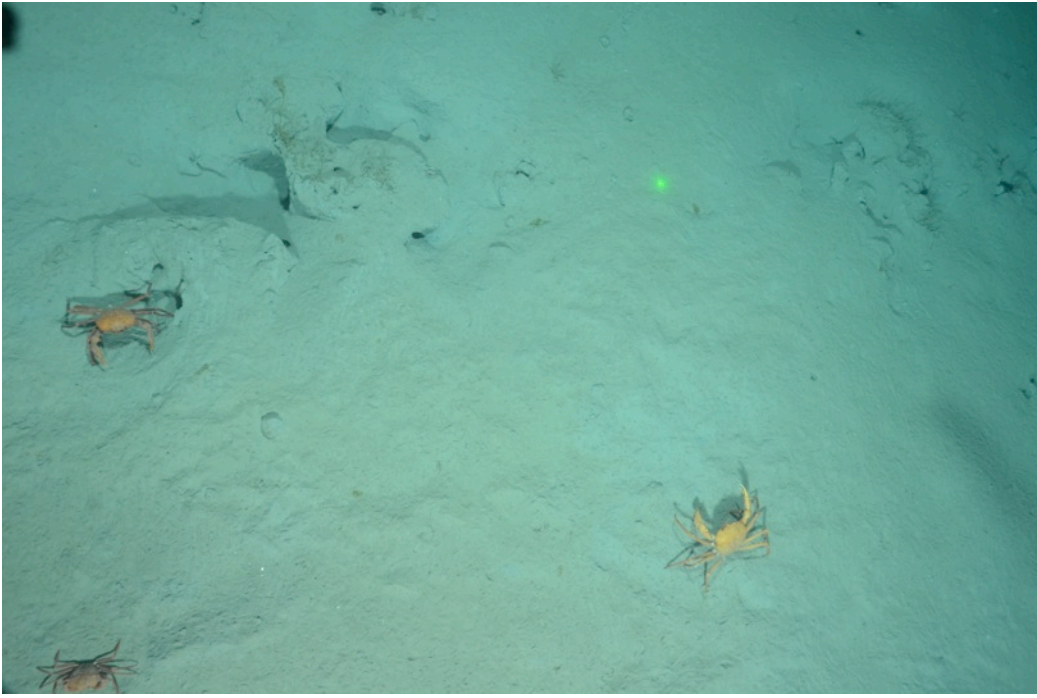
A black morid fish swims over a steep sedimented scarp covered with broken, angular seafloor rock in southwestern Toms Canyon.



Orange brisingid sea stars congregate on a sedimented outcrop at 1703m in southwestern Toms Canyon.



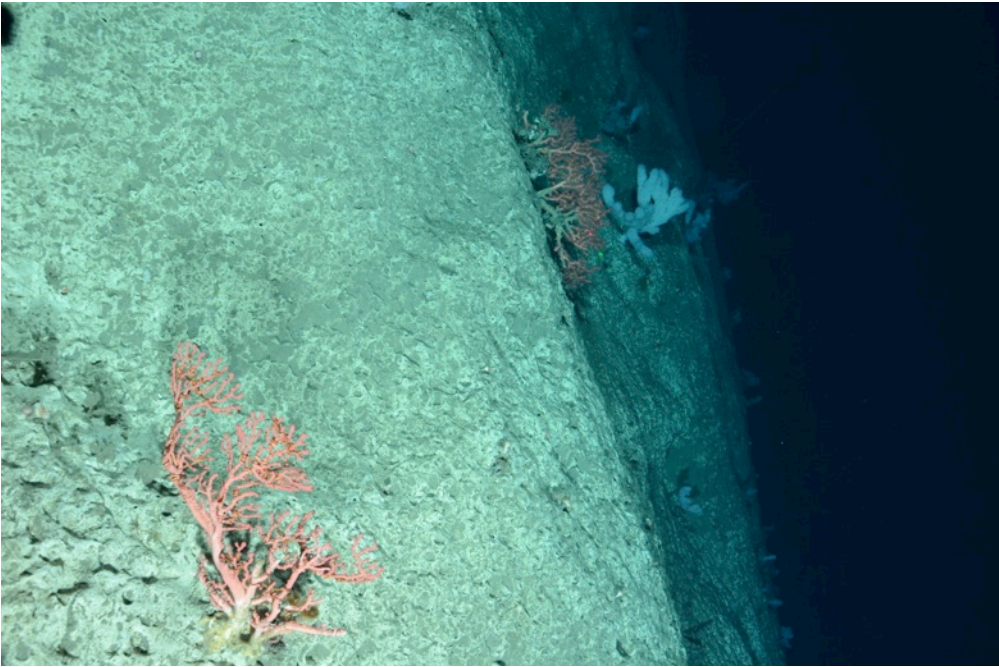
A school of redfish (*Sebastes*) make burrows and swim over mottled sediment at the canyon head of Toms Canyon (depth of 861m).



Red crabs (one on the right in a defensive posture) on soft sediment with burrows at 861m at the canyon head of Toms Canyon.



A fish swims over lightly sedimented seafloor that typically hosts brittle stars, sea urchins, sponges, and corals at a depth of 1705 meters along the Lower East scarp of Hendrickson Canyon.



Bubblegum coral (likely *Paragorgia aborea*) ~140 cm, common in North Atlantic canyons, were observed with sponges living in cracks along the vertical wall of Hendrickson Canyon at 1705 meters depth.



Many species of sponge inhabit canyon margin habitats. These large yellow sponges were observed attached to vertical walls at Middle Toms Canyon at 1591m among coral rubble and ophiuroid brittle stars (top right of image).

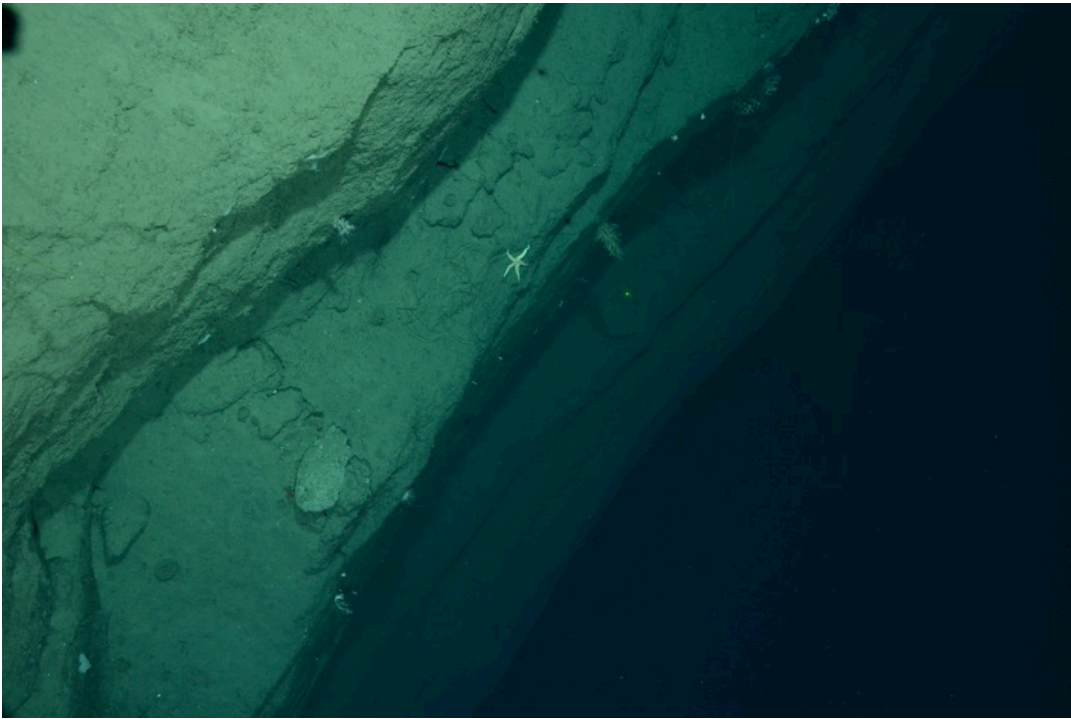


Soft corals, whip corals, chrysogorgid and yellow paramuricid corals were observed on flat sediment at the margin edge of Middle Toms Canyon at 1591m.

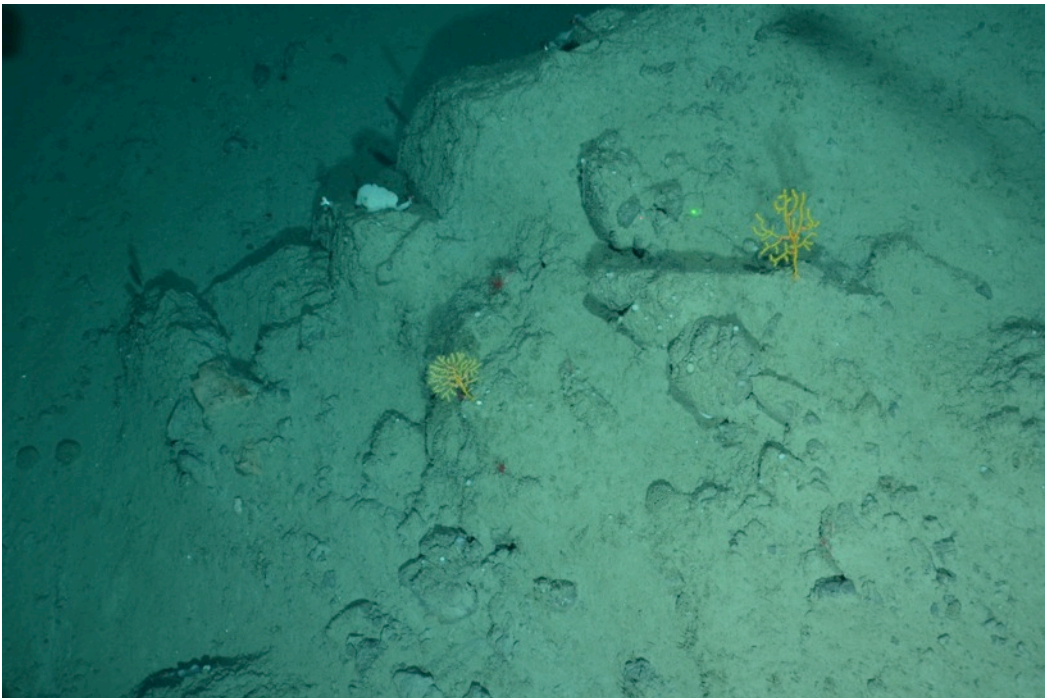


An oreo fish (*Neocyttus* sp.) swims alongside a vertical wall covered with living coral (pink tissue) and coral rubble (white skeleton) at 1231meters depth in Toms Canyon.





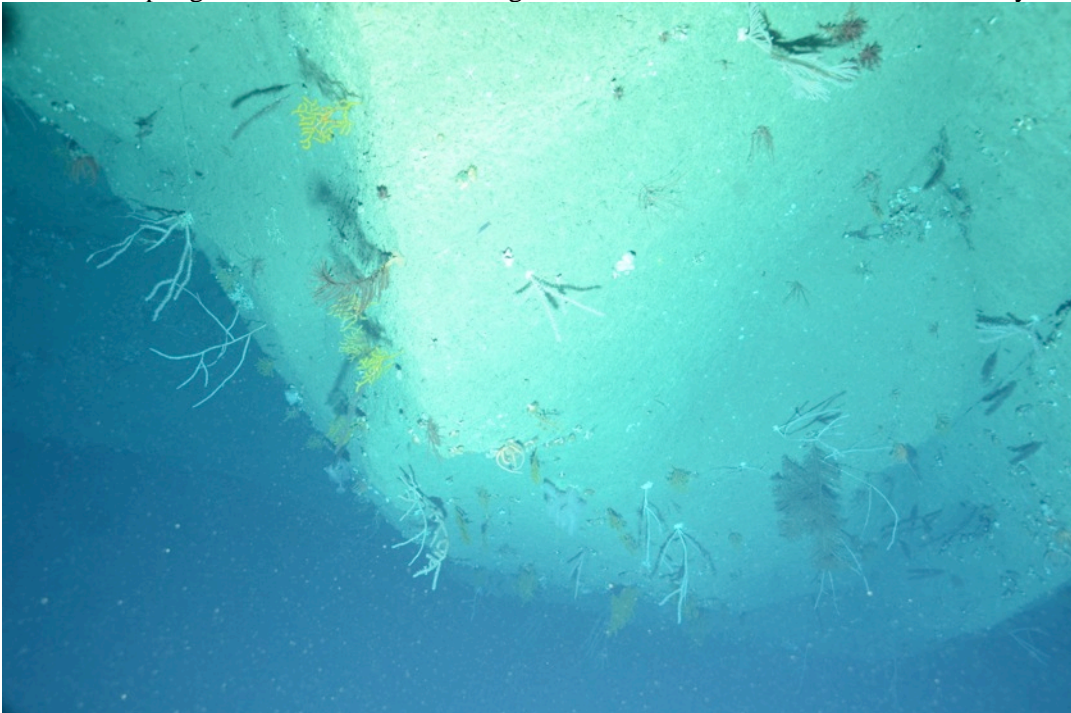
Fishing line (center image) was observed wrapped around corals and a sea star at 1255 meters depth on the vertical wall of the lower South Eastern side of Veatch canyon. Smaller urchins and sponges were also attached here.



Paramuricid corals, white sponges and xenophyophores observed on sedimented rocky outcrops at 1419 meters on the mid-Eastern side of Veatch Canyon.



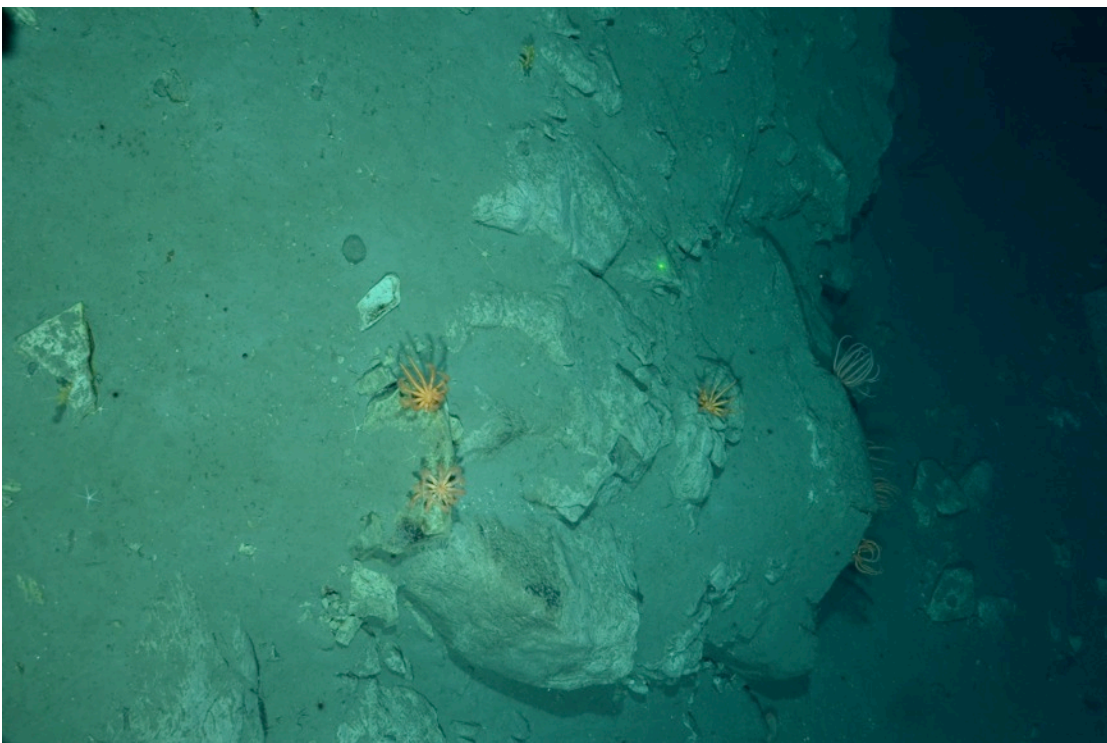
Yellow paramuricea coral with brittle star associates, cup corals and red soft corals were observed with anemones and white vase sponges on this sedimented margin wall at mid-Eastern side of Veatch Canyon at 1419 meters depth.



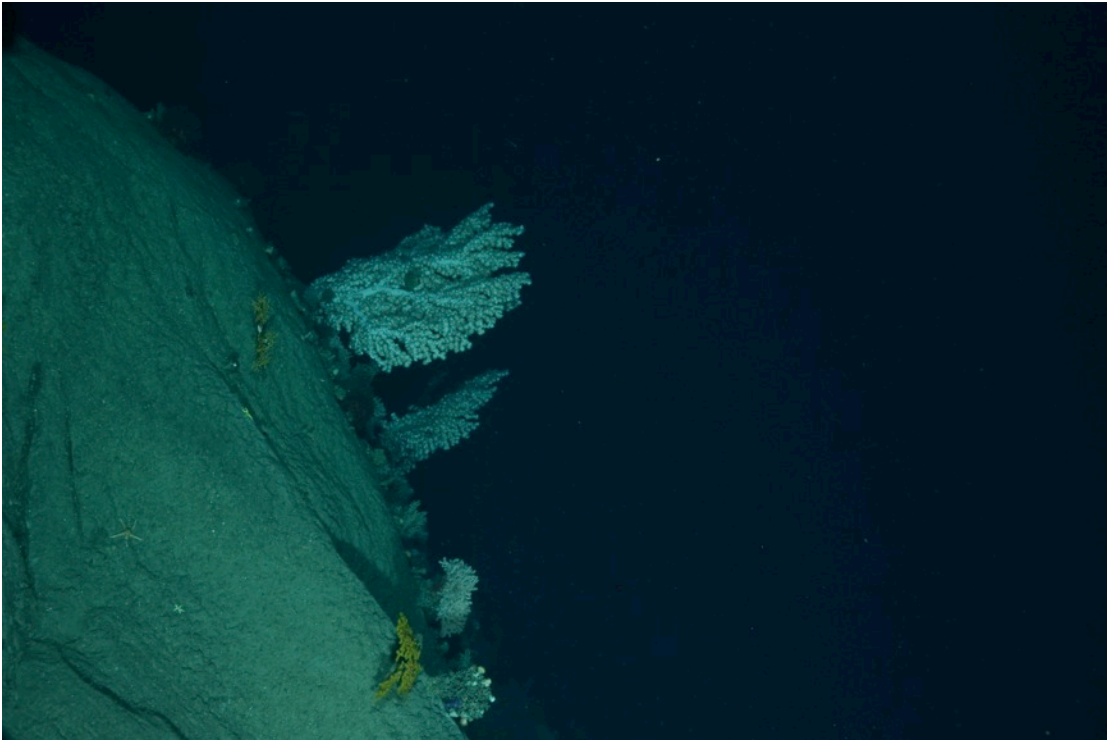
Gilbert Canyon showed a high diversity of corals along the margin extending down into the canyon wall at 1679 meters depth.



Fields of yellow paramuricea coral shown above from Gilbert Canyon at 1679 meters depth.



Brisingid sea stars are common along rocky outcrops at 1752 meters depth in Gilbert Canyon.



Large bubblegum coral (likely *Paragorgia aborea*) and smaller yellow *Paramuricea* coral attached to the wall of Gilbert Canyon at 1221 meters depth.