Deep Sea Corals Workshop, April 29-30, 2015
Discrete Coral Zone Maps and Data

Introduction

This document was developed for use at the Mid-Atlantic Fishery Management Council's Deep Sea Corals Workshop on April 29-30, 2015 in Linthicum, MD. The information below is intended to supplement the January 2015 Public Information Document (PID),[1] and contains comparative analyses of different potential boundaries for proposed "discrete" deep sea coral zones under the Council's Deep Sea Corals Amendment. Additional information from recent deep sea coral research surveys is also presented, some of which was not available at the time of PID development. For background information and details on the discrete zone analysis supplemented in this document, please refer to the PID.

Data Key

Discrete Coral Zone Boundaries

- **Fishery Management Action Team (FMAT) boundaries (habitat suitability model-based boundaries):** Discrete zone boundaries recommended by the Council's Deep Sea Corals FMAT in 2014, based on high and very high predicted habitat suitability from a Deep Sea Coral Habitat Suitability Model. These boundaries also considered high resolution slope data, historical coral presence records, and available coral data from recent research surveys. For a detailed description of the FMAT's methodology, see Appendix A in the Public Information Document (PID). Geographic coordinates are listed in Appendix B of the PID.
- **Industry-proposed boundaries (2013):** Discrete zone boundaries recommended by a subset of the Council's Squid, Mackerel, and Butterfish Advisory Panel in 2013 for three areas: Baltimore Canyon, Norfolk Canyon, and the Mey-Lindenkohl Slope. For the Mey-Lindenkohl Slope, two options were proposed: one with the landward boundary as a straight line, and one with the landward boundary at the 250 fathom depth contour. Geographic coordinates are listed in Appendix B of the PID.
- **Industry-proposed boundaries (2015):** Discrete zone boundaries submitted to the Council by a group of fishing industry stakeholders, through Garden State Seafood Association, during the amendment public comment period in February 2015.

[1] Available on the Council's website at http://www.mafmc.org/actions/msb/am16.

Recent Research Survey Locations and Observations

A number of recent research expeditions between 2012 and 2014 have surveyed and observed deep sea corals within the Council's proposed discrete zones, using either towed camera systems or remotely operated vehicles (ROVs) to survey in and around the canyons. These expeditions are described in the Public Information Document, and summarized below in Table 1. Resulting data have not been made fully available for all expeditions, but available information is summarized by canyon in this document. General survey locations have also been plotted relative to proposed zone boundaries.

Table 1: *Summary of recent (2012-2014) research expeditions in proposed discrete areas.*

Expedition Identifier	Name	Date	Survey Type	Vessel	Proposed Discrete Areas Surveyed
BOEM	Atlantic Deepwater Canyons Expedition	Aug.-Sept. 2012	ROV	Nancy Foster	Baltimore Canyon, Norfolk Canyon
HB1204	Deep Sea Coral Survey	July 2012	Towed Camera	Henry Bigelow	Mey-Lindenkohl Slope *(Middle Toms Canyon, Toms-Hendrickson inter-canyon Area, Toms Canyon, edge of Hendrickson Canyon)*
HB1302	Deep Sea Coral Survey	June 2013	Towed Camera	Henry Bigelow	Ryan Canyon
EX1304	Okeanos Explorer Northeast Canyons Expedition	Jul.-Aug. 2013	ROV	Okeanos Explorer	Block Canyon and surrounding areas
HB1404	Deep Sea Coral Survey	Aug. 2014	Towed Camera	Henry Bigelow	Mey-Lindenkohl Slope *(Lindenkohl Canyon, Toms Canyon, Carteret Canyon),* Washington Canyon, Accomac Canyon, Leonard Canyon, Wilmington Canyon, Spencer Canyon
EX1404	Okeanos Explorer Our Deepwater Backyard Expedition	Sept.-Oct. 2014	ROV	Okeanos Explorer	Mey-Lindenkohl Slope *(Lindenkohl Canyon, Hendrickson Canyon),* Washington Canyon, Norfolk Canyon, Phoenix Canyon, McMaster Canyon, Ryan Canyon

Other Data

- **Historical Deep Sea Coral Records:** Historical records of deep sea corals from the Deep Sea Coral Research and Technology Program (DSCRTP) database. This data originates from a variety of sources, including peer-reviewed literature, research surveys, museum records, and incidental catch records. The records contained in this database are mostly presence-only, and many areas have not been adequately surveyed for the presence of deep sea corals.

- **Habitat Suitability Model and Buffer:** Areas of predicted "High" and "Very High" habitat suitability for deep sea corals. The Deep Sea Coral Habitat Suitability Model[2] takes known deep sea coral locations (from the DSCRTP historical database), and combines this data with environmental predictor inputs such as depth, slope, temperature, substrate type, and many more variables to generate predictive models of deep sea coral distribution. The habitat suitability model outputs were buffered by 0.4 nautical miles to account for spatial uncertainties associated with the current resolution of the habitat model, and to ensure effectiveness of potential gear-restricted areas.
- **Slope, Areas of High Slope, and Buffer:** High resolution (25m) slope data. Areas of high slope (>30 degrees) were considered in the FMAT discrete zone boundaries, as recent research surveys have indicated that these areas nearly always contain hard bottom habitat, where deep sea corals are commonly observed. These areas were buffered by 0.4 nautical miles to ensure effectiveness of potential gear-restricted areas.
- **200-500 meter depth contours**: Depth contours corresponding to proposed broad coral zone alternatives, with the landward boundary beginning at either 200m, 300m, 400m, or 500m.
- **Observer Haul Tracks**: Observer data from the Northeast Fisheries Observer Program (NEFOP) obtained for bottom trawl, bottom longline, and sink/anchored gillnet gear types for years 2000 through 2013 for the Mid-Atlantic region. Records with incomplete geographic coordinates were removed.
- **Scup Gear Restricted Areas (GRAs)**: The Scup GRAs prohibit trawl vessels from fishing for, or possessing, certain non-exempt species (longfin squid, black sea bass, and silver hake (whiting)) when fishing with mesh smaller than 5.0-inches during the effective periods (January 1-March 15 for the Southern GRA, and November 1 through December 31 for the Northern GRA).
- **National Marine Fisheries Service (NMFS) Statistical Areas**: NMFS Greater Atlantic Region 3-digit statistical areas for monitoring and reporting.
- **Tilefish GRAs:** All U.S. vessels are prohibited from fishing with mobile bottom-tending gear within the four tilefish GRAs, including Oceanographer, Lydonia, and Veatch Canyons within the New England Council region, and Norfolk Canyon in the Mid-Atlantic Council region.
- **Council Region Boundaries:** Mid-Atlantic Council region boundary as defined in the current regulations.[3]

[2] The project description and links to the full digital data package can be found at: http://coastalscience.noaa.gov/projects/detail?key=35.

[3] Council boundaries are defined in the Code of Federal Regulations (CFR), at 50 C.F.R. §§ 600.105(a) and (b), available at http://www.gpo.gov/fdsys/granule/CFR-2001-title50-vol3/CFR-2001-title50-vol3-sec600-105/content-detail.html.

Deep Sea Coral Distribution and Habitat by Canyon

Norfolk Canyon

Table 2: *Summary of historical deep sea coral observations, habitat suitability, and areas of high slope for Norfolk Canyon.*

		Coral Observations		Habitat Suitability		Slope	
Canyon or Complex	**Total area (km^2)**	**Historical Coral Records (all)**	**Encompasses observations from recent fieldwork?**	**Total Area of High/Very High Habitat Suitability**	**Percent High/Very High Hab. Suitability**	**Total area of slope >30 degrees (km^2)**	**Percent area of slope >30 degrees**
Norfolk Canyon							
Model-based boundary	543.7	37	Yes	145.9	26.8%	45.1	8.3%
2015 industry-proposed	57.0	7	Some, not all	48.8	85.5%	7.3	12.8%
2013 industry-proposed	598.4	37	Yes	132.4	22.1%	42.9	7.2%

BOEM Survey Locations

In 2012, research cruises funded by the Bureau of Ocean Energy Management (BOEM) explored Mid-Atlantic deepwater hard bottom habitat, focusing on canyon habitats and coral communities. This survey included dives in Norfolk Canyon. Available data from this cruise is limited, given that the broader study is still ongoing, but general locations are plotted on the Norfolk Canyon map. Deep sea corals were locally abundant, and the surveys resulted in the first observations of the species *Lophelia pertusa* in the Mid-Atlantic. *L. pertusa* is a structure-forming coral commonly found off the coast of the southeastern U.S., and occasionally observed in New England, but has not previously been observed in the Mid-Atlantic. In September 2012, *L. pertusa* was observed in live colonies on steep walls in both Baltimore and Norfolk Canyons, at depths between 381 and 434 m.[4] Several other coral types were observed, including dense areas of *Paragorgia, Anthothela, Primnoa*, and *Acanthogorgia* communities. Sightings of lost fishing gear were also recorded in the two canyons, including traps, fishing lines, and nets.

[4] Brooke, S., and Ross, S.W. In press. First observations of the cold-water coral *Lophelia pertusa* in mid-Atlantic canyons of the USA. Deep-Sea Res. II. http://dx.doi.org/10.1016/j.dsr2.2013.06.011.

EX1404 Okeanos Explorer Our Deepwater Backyard Dive Locations

Table 3: *Relevant excerpts from Okeanos Explorer Our Deepwater Backyard daily updates; Norfolk Canyon.*

Leg 2, Dive 3: Norfolk Canyon, 9/7/2014
Dive 03 was on a shallow section of the southern flank of Norfolk Canyon with the primary objective of locating characterizing deep-sea coral habitat. Remotely operated vehicle *Deep Discoverer* (D2) landed on a rippled soft sediment seafloor with red crabs, hake, and eels. The geology of this portion of Norfolk Canyon was characterized by soft sedimented seafloor with thin layered hard rock outcrops, often heavily colonized with biota, particularly underneath ledges. Shortly after beginning our transit up slope, D2 encountered several colonies of octocorals (including acanthagorgia, anthothela, and bubble gum corals), anemones, hake, squat lobsters, red crabs, a high diversity of sponges, and brittle stars buried in the mud. Other fauna spotted during the dive included bryozoans, beryx, shrimp, hydroids, blackbelly rosefish, a small chaunax, and several schools of squid. D2 also imaged two goosefish attacking squids and several large (>1 meter) bubblegum coral colonies.

Washington Canyon

Table 4: *Summary of historical deep sea coral observations, habitat suitability, and areas of high slope for Washington Canyon.*

		Coral Observations		Habitat Suitability		Slope	
Canyon or Complex	**Total area (km^2)**	**Historical Coral Records (all)**	**Encompasses observations from recent fieldwork?**	**Total Area of High/Very High Habitat Suitability**	**Percent High/Very High Habitat Suitability**	**Total area of slope >30 degrees (km^2)**	**Percent area of slope >30 degrees**
Washington Canyon							
FMAT boundary	554.1	1	Yes	98.1	17.7%	12.0	2.2%
2015 industry-proposed	43.3	0	Some, not all	25.7	59.3%	0.6	1.3%

HB1404 TowCam Survey Locations

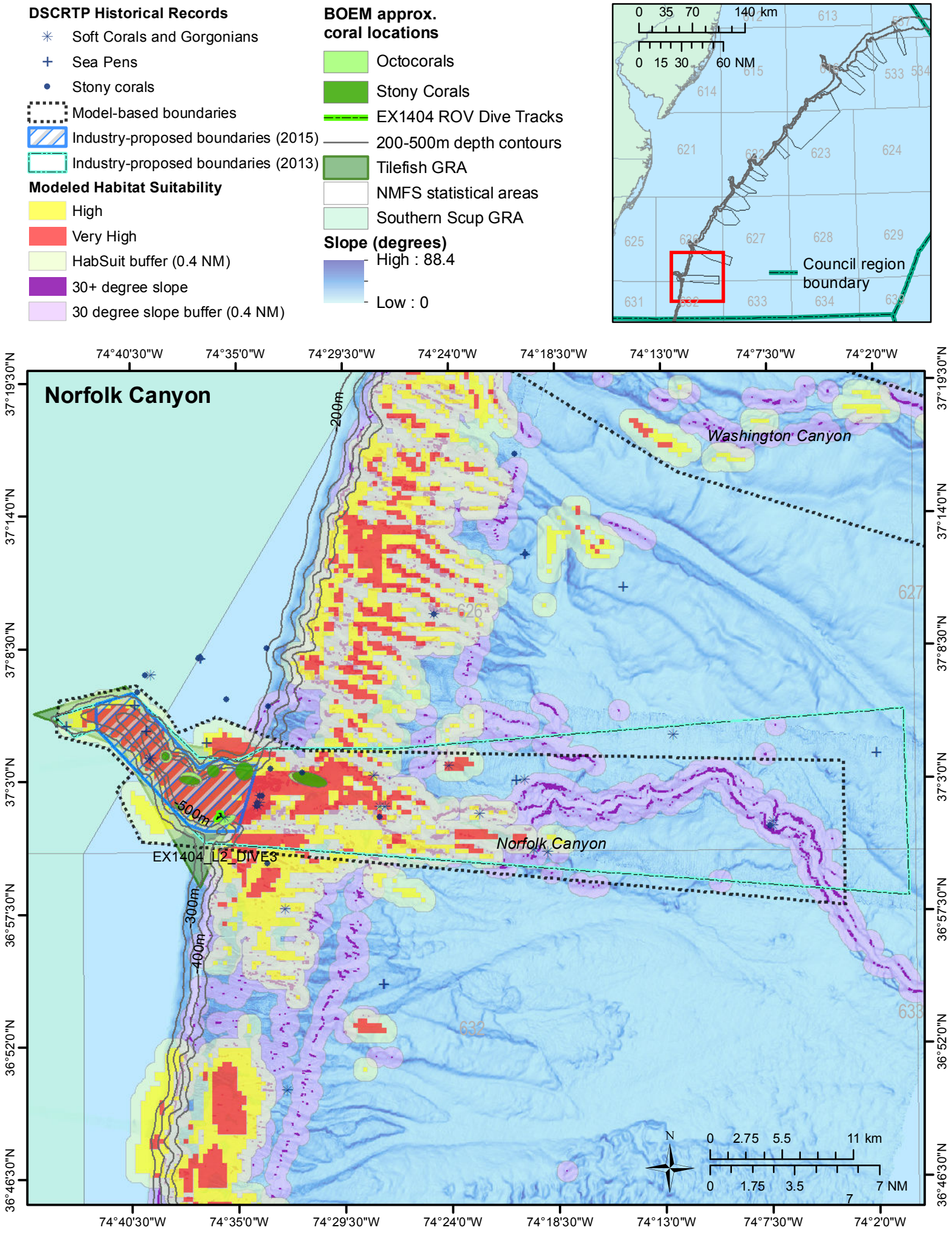
Table 5: *Image survey results for canyon fauna from HB1404 TowCam surveys in Washington Canyon. Images were captured at 10 second intervals throughout each dive. Each image was visually screened for presence/absence of corals.*

TowCam Dive #	Canyon Location	GMT Date	Launch Lat N	Launch Lon W	Recovery Lat	Recovery Lon	Depth range (m)	No. of Images on bottom	No. images with corals	% images with corals
HB1404-01	Washington Canyon	8/6/2014	37 25.087	74 24.824	37 247125	74 24.4262	491-874	1680	70	4.17
HB1404-02	Washington Canyon	8/7/2014	37 22.5827	74 17.2213	37 22.5846	74 17.2227	DIVE ABORTED	x	x	x
HB1404-03	Washington Canyon	8/7/2014	37 22.5858	74 17.2234	37 22.7155	74 17.3077	DIVE ABORTED	x	x	x
HB1404-04	Washington Canyon	8/7/2014	37 22.5815	74 17.2256	37 22.5437	74 17.8913	1126-1294	1004	81	8.07
HB1404-05	Washington Canyon	8/8/2014	37 18.6327	74 13.0820	37 18.7444	74 12.4163	1515-1637	748	745	99.60

EX1404 Okeanos Explorer Our Deepwater Backyard Dive Locations

Table 6: *Relevant excerpts from Okeanos Explorer Our Deepwater Backyard daily updates.*

Leg 2, Dive 2: Washington Canyon, 9/6/2014
Dive 02 investigated the south flank of Washington Canyon. Remotely operated vehicle *Deep Discoverer* (D2) reached the seafloor at a depth of 645 meters and settled over a soft sediment area with several halosaurs and experienced swarms of small crustaceans (amphipods and euphausiids) that would continue throughout the dive. This area was geologically characterized by often burrowed soft sediment, soft sediment outcrops, and a few steep slopes heavily encrusted by biology. Common fauna during D2's transit upslope included red crabs, anemones, sponges, blackbelly rosefish, octopus, hake, and brittle stars buried in the sediment. Some of the highlights the dive included a pair of goosefish, three hydromedusa, a couple of crabs fighting over a recently captured squid, and colonies of deep-sea corals (anthothela and both white and pink morphs of bubblegum corals).


DSCRTP Historical Records
Soft Corals and Gorgonians
Sea Pens
Stony corals
Model-based boundaries
Industry-proposed boundaries (2015)
Industry-proposed boundaries (2013)
Modeled Habitat Suitability
High
Very High
HabSuit buffer (0.4 NM)
30+ degree slope
30 degree slope buffer (0.4 NM)
BOEM approx. coral locations
Octocorals
Stony Corals
EX1404 ROV Dive Tracks
200-500m depth contours
Tilefish GRA
NMFS statistical areas
Southern Scup GRA
Slope (degrees)
High : 88.4
Low : 0
0 35 70 140 km
0 15 30 60 NM
Council region boundary
Norfolk Canyon
Washington Canyon
Norfolk Canyon
200m
500m
300m
400m
EX1404_L2_DIVE3
74°40'30"W
74°35'0"W
74°29'30"W
74°24'0"W
74°18'30"W
74°13'0"W
74°7'30"W
74°2'0"W
37°19'30"N
37°14'0"N
37°8'30"N
37°3'0"N
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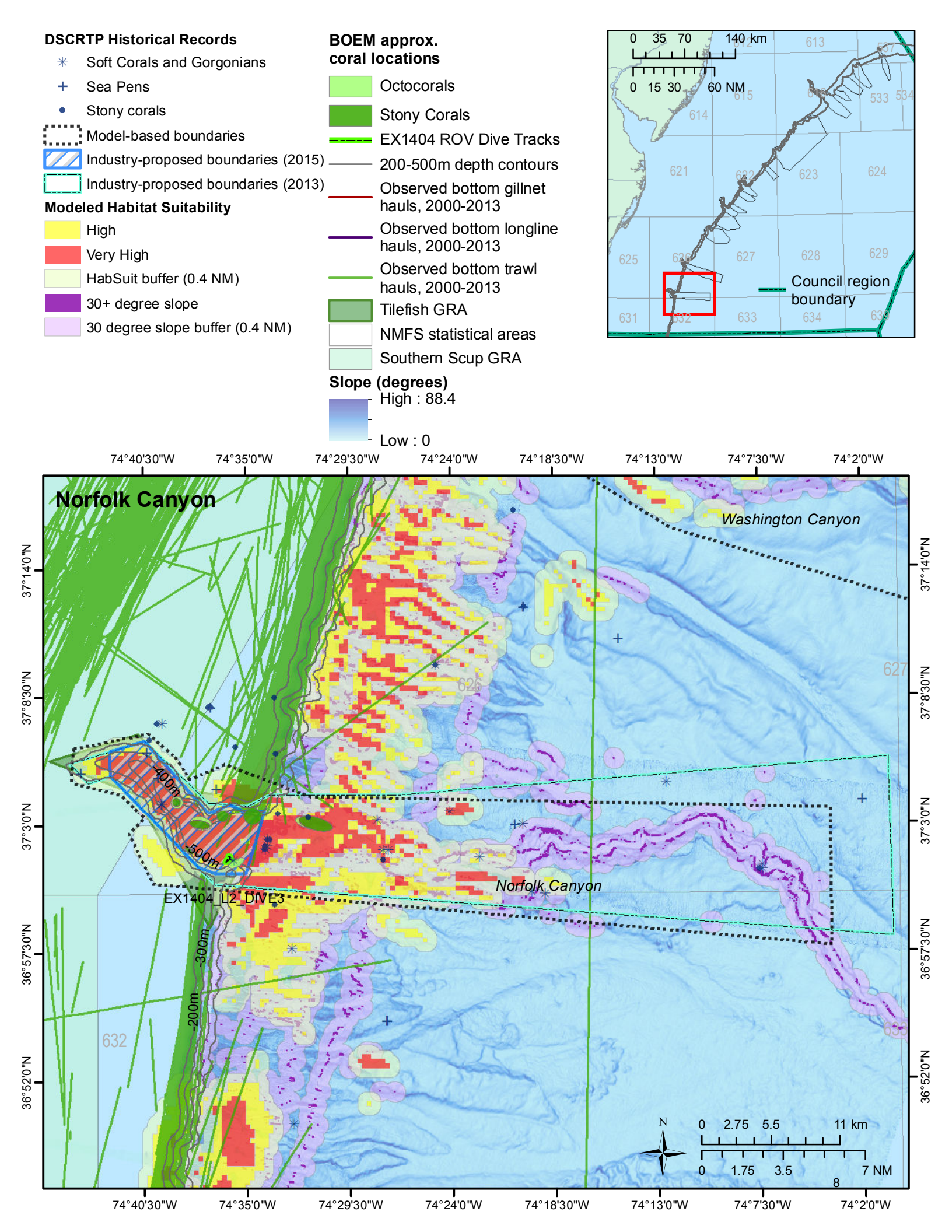
0 2.75 5.5 11 km
0 1.75 3.5 7 NM


DSCRTP Historical Records
Soft Corals and Gorgonians
Sea Pens
Stony corals
Model-based boundaries
Industry-proposed boundaries (2015)
Industry-proposed boundaries (2013)
Modeled Habitat Suitability
High
Very High
HabSuit buffer (0.4 NM)
30+ degree slope
30 degree slope buffer (0.4 NM)
BOEM approx. coral locations
Octocorals
Stony Corals
EX1404 ROV Dive Tracks
200-500m depth contours
Observed bottom gillnet hauls, 2000-2013
Observed bottom longline hauls, 2000-2013
Observed bottom trawl hauls, 2000-2013
Tilefish GRA
NMFS statistical areas
Southern Scup GRA
Slope (degrees)
High : 88.4
Low : 0
0 35 70 140 km
0 15 30 60 NM
Council region boundary
Norfolk Canyon
Washington Canyon
Norfolk Canyon
EX1404_L2_DIVE3
400m
500m
300m
200m
74°40'30"W
74°35'0"W
74°29'30"W
74°24'0"W
74°18'30"W
74°13'0"W
74°7'30"W
74°2'0"W
37°14'0"N
37°8'30"N
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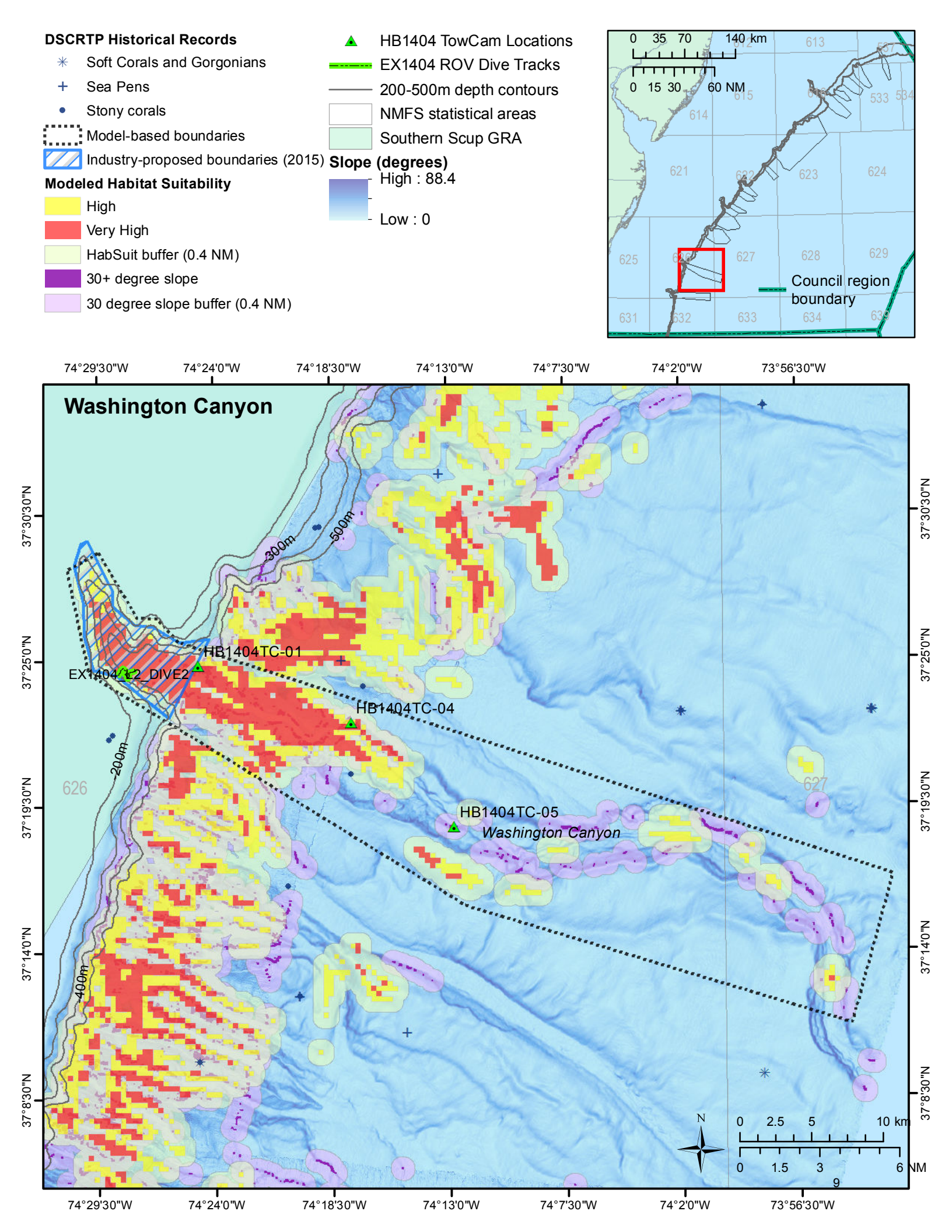
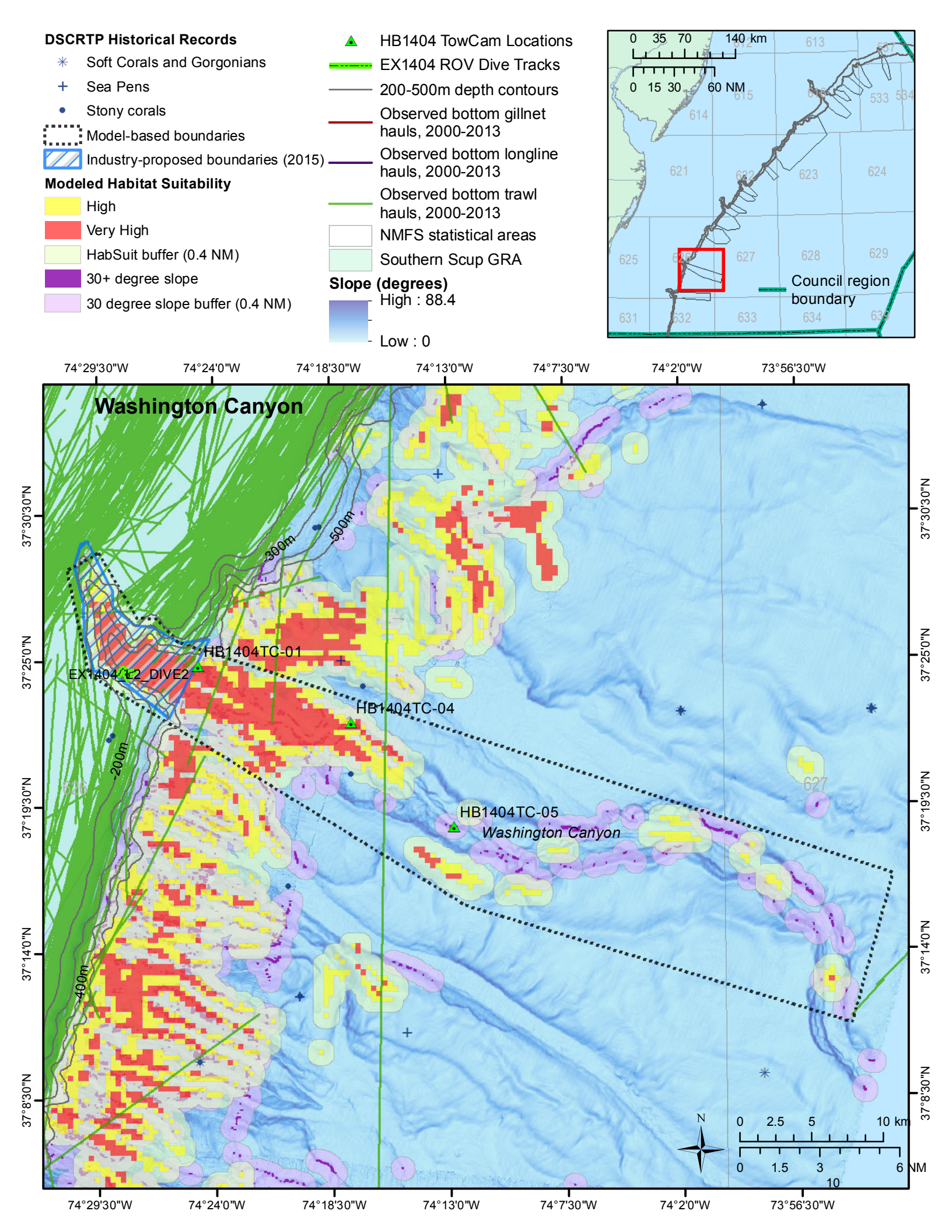
N
0 2.75 5.5 11 km
0 1.75 3.5 7 NM


DSCRTP Historical Records
Soft Corals and Gorgonians
Sea Pens
Stony corals
Model-based boundaries
Industry-proposed boundaries (2015)
Modeled Habitat Suitability
High
Very High
HabSuit buffer (0.4 NM)
30+ degree slope
30 degree slope buffer (0.4 NM)
HB1404 TowCam Locations
EX1404 ROV Dive Tracks
200-500m depth contours
NMFS statistical areas
Southern Scup GRA
Slope (degrees)
High : 88.4
Low : 0
0 35 70 140 km
0 15 30 60 NM
Council region boundary
Washington Canyon
74°29'30"W
74°24'0"W
74°18'30"W
74°13'0"W
74°7'30"W
74°2'0"W
73°56'30"W
37°30'30"N
37°25'0"N
37°19'30"N
37°14'0"N
37°8'30"N
300m
500m
200m
400m
HB1404TC-01
EX1404_T2_DIVE2
HB1404TC-04
HB1404TC-05
Washington Canyon
626
627
N
0 2.5 5 10 km
0 1.5 3 6 NM


DSCRTP Historical Records
Soft Corals and Gorgonians
Sea Pens
Stony corals
Model-based boundaries
Industry-proposed boundaries (2015)
Modeled Habitat Suitability
High
Very High
HabSuit buffer (0.4 NM)
30+ degree slope
30 degree slope buffer (0.4 NM)
HB1404 TowCam Locations
EX1404 ROV Dive Tracks
200-500m depth contours
Observed bottom gillnet hauls, 2000-2013
Observed bottom longline hauls, 2000-2013
Observed bottom trawl hauls, 2000-2013
NMFS statistical areas
Southern Scup GRA
Slope (degrees)
High : 88.4
Low : 0
0 35 70 140 km
0 15 30 60 NM
Council region boundary
Washington Canyon
74°29'30"W
74°24'0"W
74°18'30"W
74°13'0"W
74°7'30"W
74°2'0"W
73°56'30"W
37°30'30"N
37°25'0"N
37°19'30"N
37°14'0"N
37°8'30"N
-300m
-500m
-200m
-400m
HB1404TC-01
EX1404_L2_DIVE2
HB1404TC-04
HB1404TC-05
Washington Canyon
N
0 2.5 5 10 km
0 1.5 3 6 NM
10

Accomac-Leonard Canyons

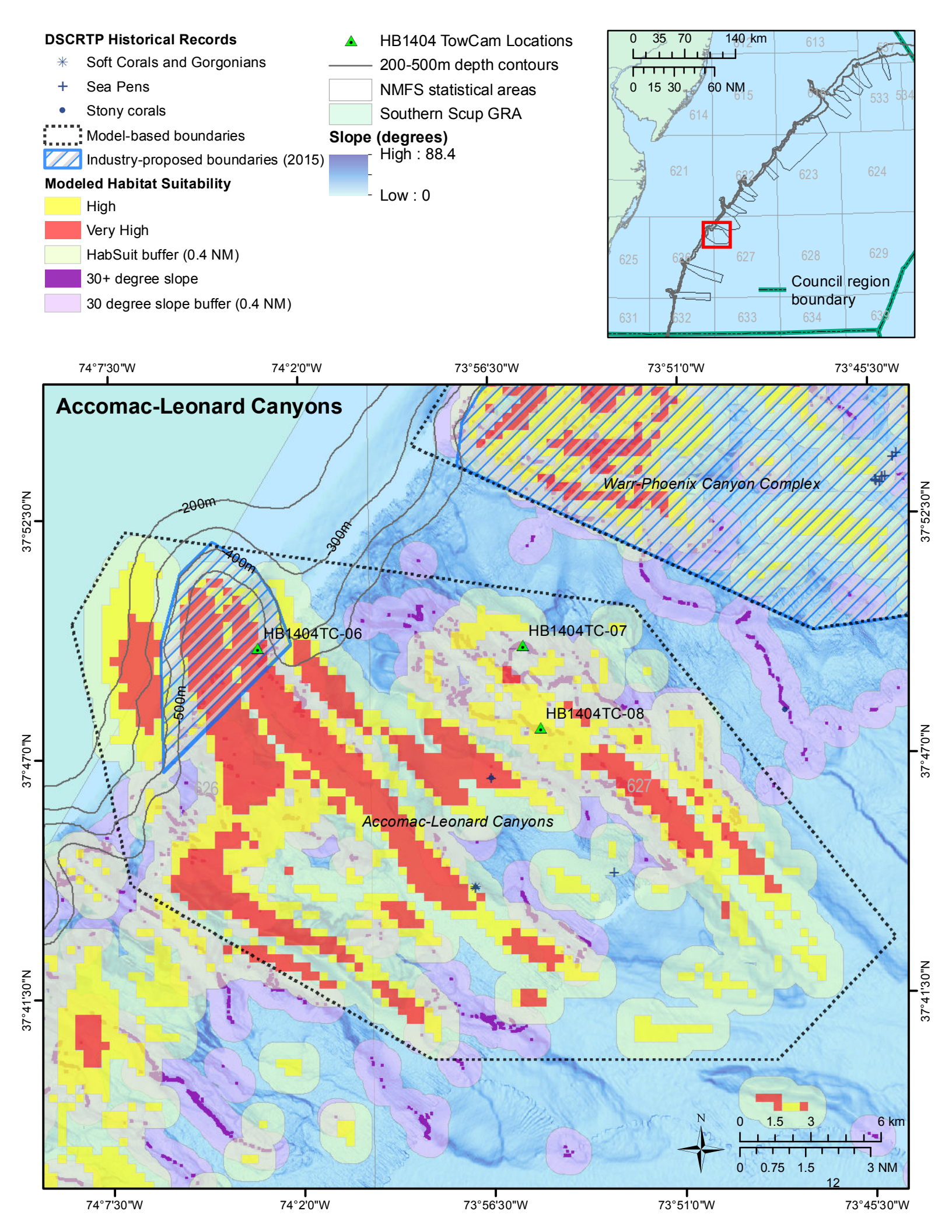
Table 7: *Summary of historical deep sea coral observations, habitat suitability, and areas of high slope for Accomac and Leonard Canyons.*

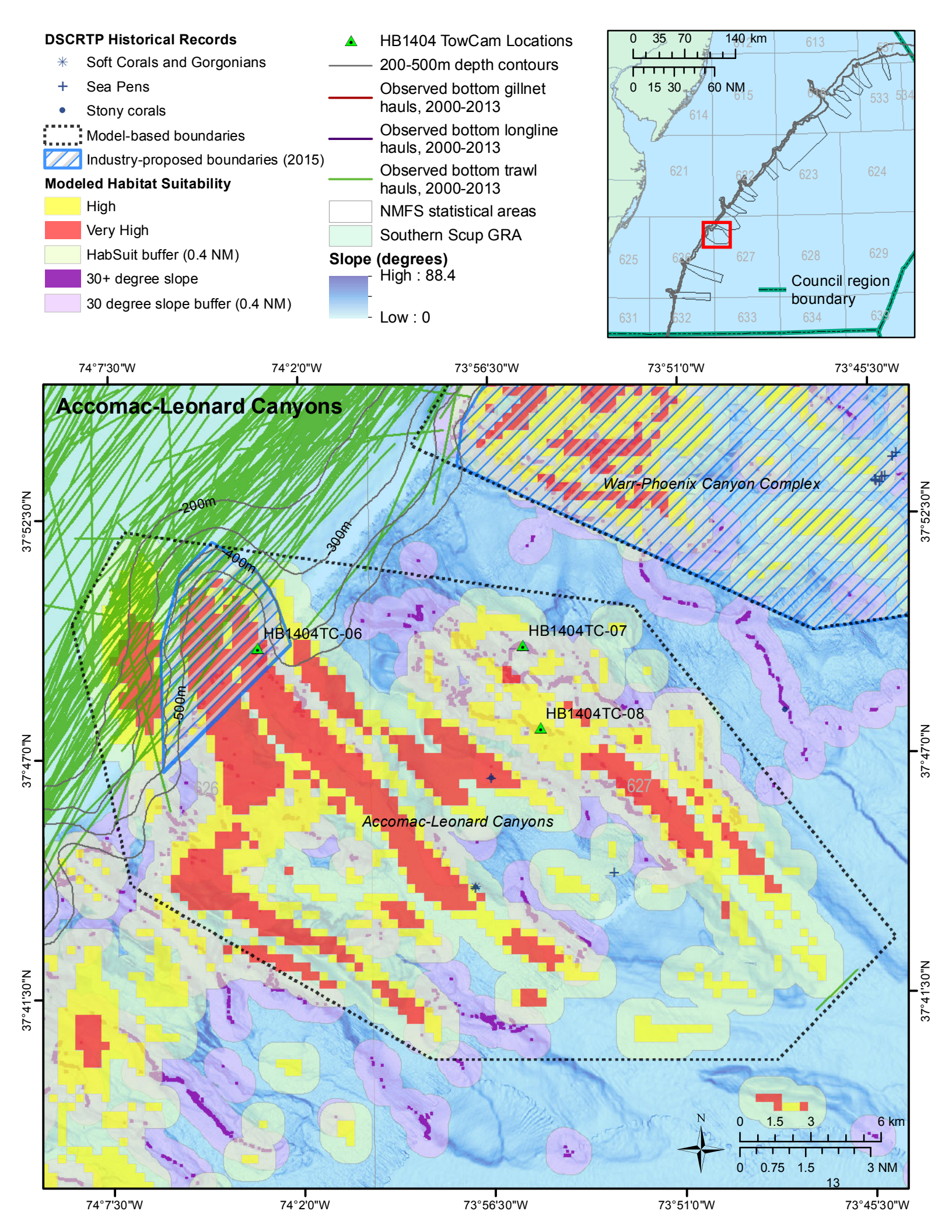
		Coral Observations		Habitat Suitability		Slope	
Canyon or Complex	**Total area (km^2)**	**Historical Coral Records (all)**	**Encompasses observations from recent fieldwork?**	**Total Area of High/Very High Habitat Suitability**	**Percent High/Very High Habitat Suitability**	**Total area of slope >30 degrees (km^2)**	**Percent area of slope >30 degrees**
Accomac-Leonard Canyons							
FMAT boundary	538.2	6	Yes	200.6	37.3%	19.5	3.6%
2015 industry-proposed	30.9	0	Some, not all	19.2	62.2%	1.8	5.9%

HB1404 TowCam Survey Locations

Table 8: *Image survey results for canyon fauna from HB1404 TowCam surveys in Accomac and Leonard Canyons. Images were captured at 10 second intervals throughout each dive. Each image was visually screened for presence/absence of corals.*

TowCam Dive #	Canyon Location	GMT Date	Launch Lat N	Launch Lon W	Recovery Lat	Recovery Lon	Depth range (m)	No. of Images on bottom	No. images with corals	% images with corals
HB1404-06	Accomac Canyon	8/8/2014	37 49.5832	74 03.0897	37 49.4621	74 03.3781	497-825	424	66	15.57
HB1404-07	Leonard Canyon	8/8/2014	37 49.5877	73 55.7825	37 49.4592	73 55.4191	1167-1235	446	43	9.64
HB1404-08	Leonard Canyon	8/9/2014	37 47.5576	73 55.4035	37 47. 5836	73 54.7282	1348-1522	707	574	81.19


DSCRTP Historical Records
Soft Corals and Gorgonians
Sea Pens
Stony corals
Model-based boundaries
Industry-proposed boundaries (2015)
Modeled Habitat Suitability
High
Very High
HabSuit buffer (0.4 NM)
30+ degree slope
30 degree slope buffer (0.4 NM)
HB1404 TowCam Locations
200-500m depth contours
NMFS statistical areas
Southern Scup GRA
Slope (degrees)
High : 88.4
Low : 0
0 35 70 140 km
0 15 30 60 NM
Council region boundary
Accomac-Leonard Canyons
Warr-Phoenix Canyon Complex
200m
300m
400m
500m
HB1404TC-06
HB1404TC-07
HB1404TC-08
Accomac-Leonard Canyons
74°7'30"W
74°2'0"W
73°56'30"W
73°51'0"W
73°45'30"W
37°52'30"N
37°47'0"N
37°41'30"N
N
0 1.5 3 6 km
0 0.75 1.5 3 NM
12


DSCRTP Historical Records
Soft Corals and Gorgonians
Sea Pens
Stony corals
Model-based boundaries
Industry-proposed boundaries (2015)
Modeled Habitat Suitability
High
Very High
HabSuit buffer (0.4 NM)
30+ degree slope
30 degree slope buffer (0.4 NM)
HB1404 TowCam Locations
200-500m depth contours
Observed bottom gillnet hauls, 2000-2013
Observed bottom longline hauls, 2000-2013
Observed bottom trawl hauls, 2000-2013
NMFS statistical areas
Southern Scup GRA
Slope (degrees)
High : 88.4
Low : 0
0 35 70 140 km
0 15 30 60 NM
Council region boundary
Accomac-Leonard Canyons
Warr-Phoenix Canyon Complex
200m
300m
400m
500m
HB1404TC-06
HB1404TC-07
HB1404TC-08
Accomac-Leonard Canyons
74°7'30"W
74°2'0"W
73°56'30"W
73°51'0"W
73°45'30"W
37°52'30"N
37°47'0"N
37°41'30"N
N
0 1.5 3 6 km
0 0.75 1.5 3 NM
13

Warr-Phoenix Canyons

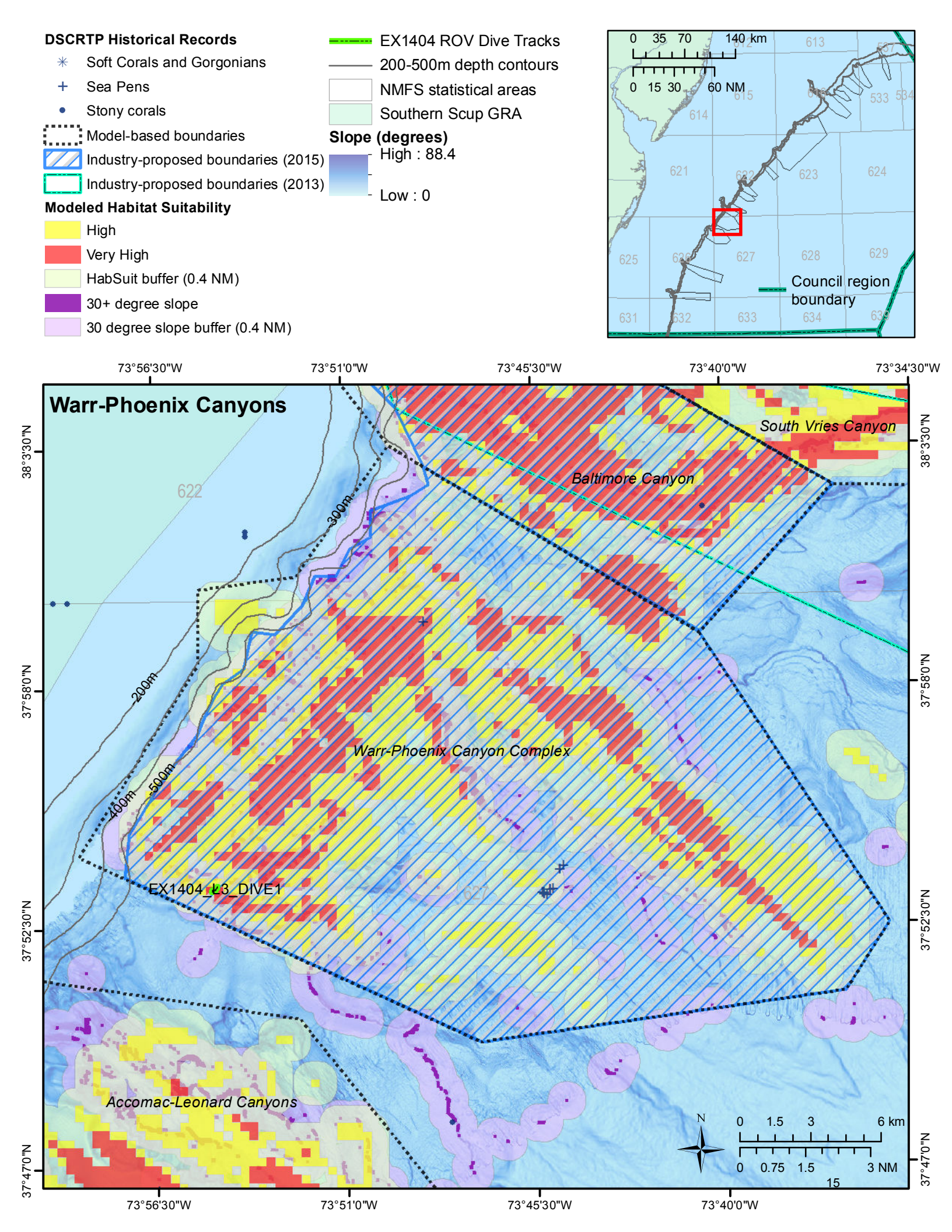
Table 9: *Summary of historical deep sea coral observations, habitat suitability, and areas of high slope for Warr and Phoenix Canyons.*

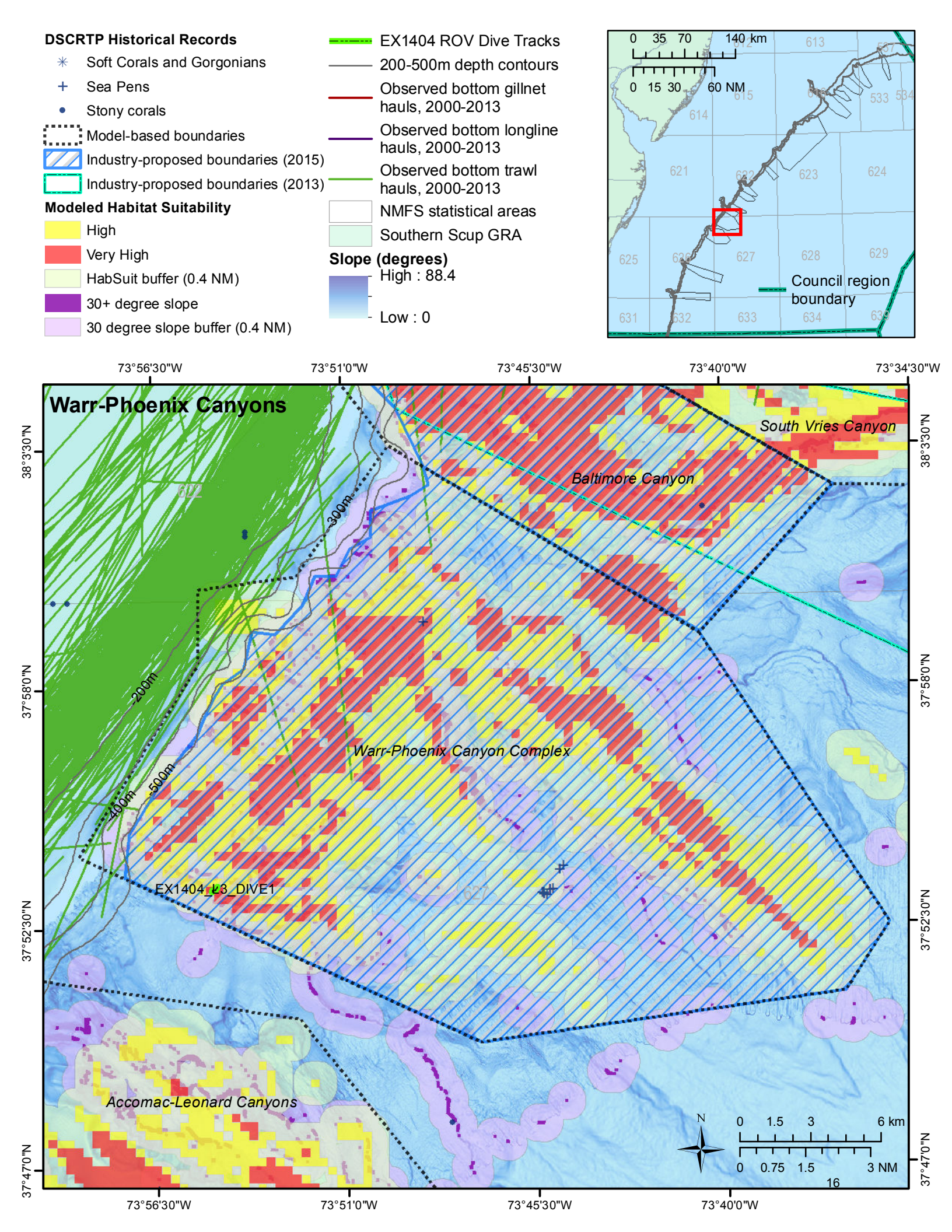
		Coral Observations		Habitat Suitability		Slope	
Canyon or Complex	**Total area (km^2)**	**Historical Coral Records (all)**	**Encompasses observations from recent fieldwork?**	**Total Area of High/Very High Habitat Suitability**	**Percent High/Very High Habitat Suitability**	**Total area of slope >30 degrees (km^2)**	**Percent area of slope >30 degrees**
Warr-Phoenix Canyons							
FMAT boundary	511.6	14	Yes	207.0	40.5%	19.5	3.8%
2015 industry-proposed	475.5	14	Yes	203.5	42.8%	19.8	4.2%

EX1404 Okeanos Explorer Our Deepwater Backyard Dive Locations

Table 10: *Relevant excerpts from Okeanos Explorer Our Deepwater Backyard daily updates; Phoenix Canyon.*

Leg 3 Dive 1: Phoenix Canyon, 9/19/2014
The first remotely operated vehicle (ROV) dive of Leg 3 investigated geomorphology and diversity of habitats along the southern wall of Phoenix Canyon. ROV *Deep Discoverer* (D2) landed on a sedimented seafloor with several species of fish at a depth of 1,136 meters. During the first portion of the dive, D2 encountered several large rocks, with biota including sponges and corals, which appeared to have fallen from walls further upslope. During our transit, D2 encountered five separate species of squid; several octopods and skate; numerous witch flounder; sea stars; and several rock outcrops encrusted with sponges, corals, and anemones. Areas of particular interest were several steep walls with a bivalves, sponges, and high density of cup corals under ledges. Phoenix Canyon had several interesting geologic features, including several large burrows, vertical erosional features, and evidence of a small slope failure. Biological highlights included a juvenile king crab, an eel predating on a squid, two separate sightings of nudibranchs – five on a hydroid colony and one with a bobtail squid, a rattail with a large copepod parasite, and a dragonfish.


DSCRTP Historical Records
Soft Corals and Gorgonians
Sea Pens
Stony corals
Model-based boundaries
Industry-proposed boundaries (2015)
Industry-proposed boundaries (2013)
Modeled Habitat Suitability
High
Very High
HabSuit buffer (0.4 NM)
30+ degree slope
30 degree slope buffer (0.4 NM)
EX1404 ROV Dive Tracks
200-500m depth contours
NMFS statistical areas
Southern Scup GRA
Slope (degrees)
High : 88.4
Low : 0
0 35 70 140 km
0 15 30 60 NM
Council region boundary
Warr-Phoenix Canyons
South Vries Canyon
Baltimore Canyon
Warr-Phoenix Canyon Complex
Accomac-Leonard Canyons
EX1404_L3_DIVE1
200m
300m
400m
500m
622
627
73°56'30"W
73°51'0"W
73°45'30"W
73°40'0"W
73°34'30"W
38°3'30"N
37°58'0"N
37°52'30"N
37°47'0"N
N
0 1.5 3 6 km
0 0.75 1.5 3 NM
15


DSCRTP Historical Records
Soft Corals and Gorgonians
Sea Pens
Stony corals
Model-based boundaries
Industry-proposed boundaries (2015)
Industry-proposed boundaries (2013)
Modeled Habitat Suitability
High
Very High
HabSuit buffer (0.4 NM)
30+ degree slope
30 degree slope buffer (0.4 NM)
EX1404 ROV Dive Tracks
200-500m depth contours
Observed bottom gillnet hauls, 2000-2013
Observed bottom longline hauls, 2000-2013
Observed bottom trawl hauls, 2000-2013
NMFS statistical areas
Southern Scup GRA
Slope (degrees)
High : 88.4
Low : 0
0 35 70 140 km
0 15 30 60 NM
Council region boundary
Warr-Phoenix Canyons
South Vries Canyon
Baltimore Canyon
Warr-Phoenix Canyon Complex
Accomac-Leonard Canyons
200m
300m
400m
500m
EX1404_L3_DIVE1
73°56'30"W
73°51'0"W
73°45'30"W
73°40'0"W
73°34'30"W
38°3'30"N
37°58'0"N
37°52'30"N
37°47'0"N
N
0 1.5 3 6 km
0 0.75 1.5 3 NM
16

Baltimore Canyon

Table 11: *Summary of historical deep sea coral observations, habitat suitability, and areas of high slope for Baltimore Canyon.*

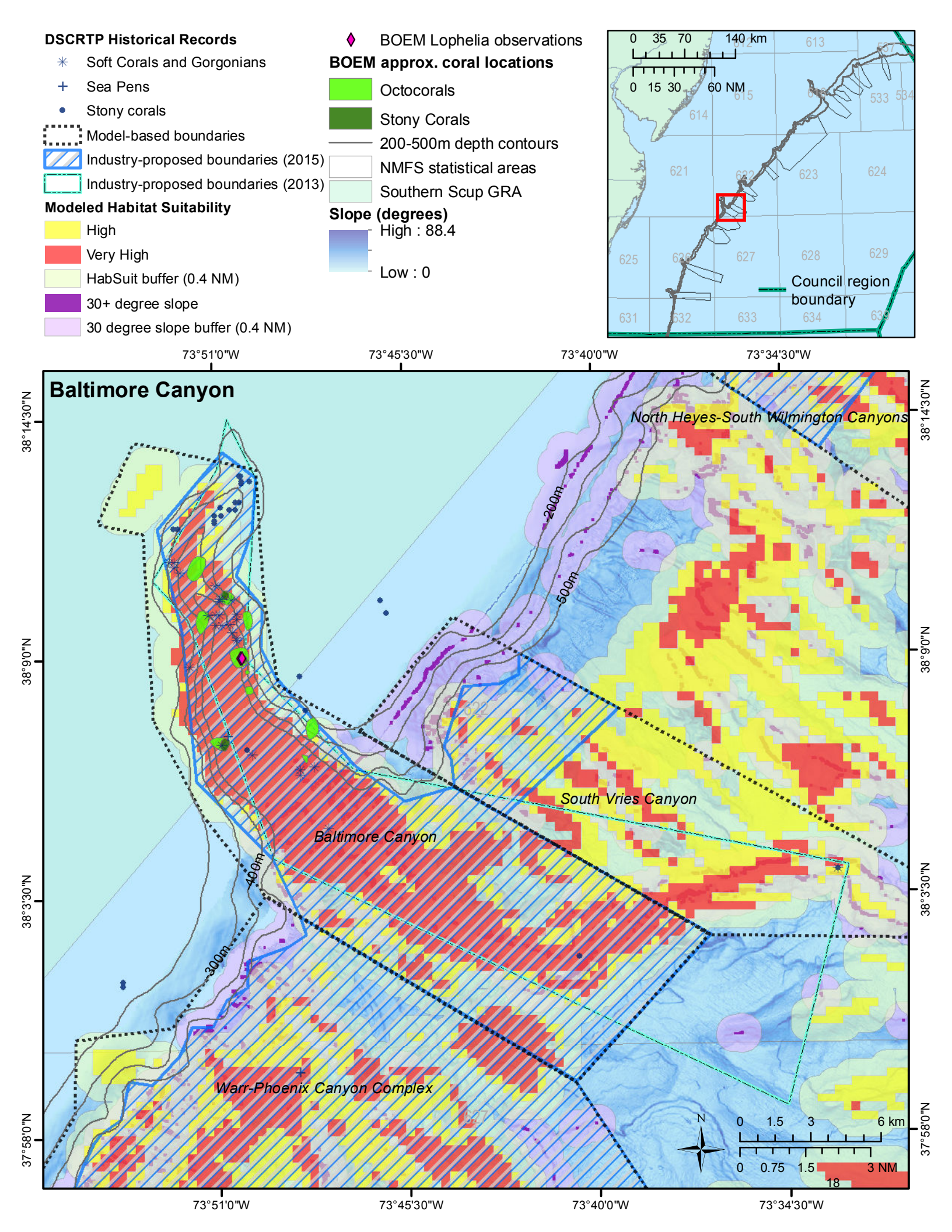
		Coral Observations		Habitat Suitability		Slope	
Canyon or Complex	**Total area (km^2)**	**Historical Coral Records (all)**	**Encompasses observations from recent fieldwork?**	**Total Area of High/Very High Habitat Suitability**	**Percent High/Very High Habitat Suitability**	**Total area of slope >30 degrees (km^2)**	**Percent area of slope >30 degrees**
Baltimore Canyon							
FMAT boundary	231.0	54	Yes	141.1	61.1%	19.5	8.5%
2015 industry-proposed	189.7	53	Yes[c]	135.3	71.3%	11.2	5.9%
2013 industry-proposed	220.7	50	Some, not all	130.6	59.2%	13.2	6.0%

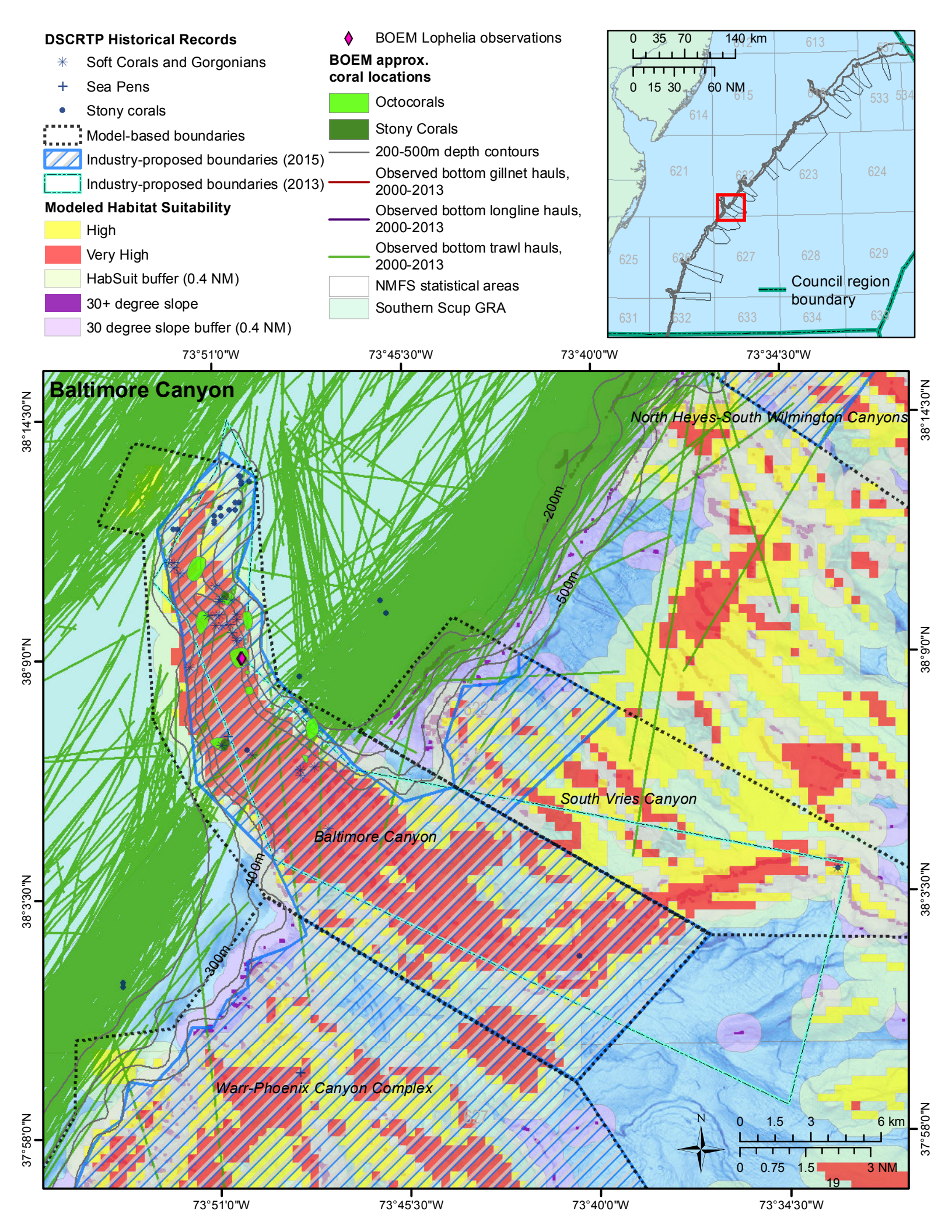
[c] In Baltimore Canyon, at least one set of coral observations nearly overlaps with the 2015 industry proposed line.

BOEM Survey Locations

In 2012, research cruises funded by the Bureau of Ocean Energy Management (BOEM) explored Mid-Atlantic deepwater hard bottom habitat, focusing on canyon habitats and coral communities. This survey included dives in Baltimore Canyon. Available data from this cruise is limited, given that the broader study is still ongoing, but general locations are plotted on the Baltimore Canyon map. Deep sea corals were locally abundant, and the surveys resulted in the first observations of the species *Lophelia pertusa* in the Mid-Atlantic. *L. pertusa* is a structure-forming coral commonly found off the coast of the southeastern U.S., and occasionally observed in New England, but has not previously been observed in the Mid-Atlantic. In September 2012, *L. pertusa* was observed in live colonies on steep walls in both Baltimore and Norfolk Canyons, at depths between 381 and 434 m.[5] Several other coral types were observed in both Baltimore and Norfolk Canyons, including dense areas of *Paragorgia, Anthothela, Primnoa*, and *Acanthogorgia* communities. Sightings of lost fishing gear were also recorded in the two canyons, including traps, fishing lines, and nets.

[5] Brooke, S., and Ross, S.W. In press. First observations of the cold-water coral *Lophelia pertusa* in mid-Atlantic canyons of the USA. Deep-Sea Res. II. http://dx.doi.org/10.1016/j.dsr2.2013.06.011.


DSCRTP Historical Records
Soft Corals and Gorgonians
Sea Pens
Stony corals
Model-based boundaries
Industry-proposed boundaries (2015)
Industry-proposed boundaries (2013)
Modeled Habitat Suitability
High
Very High
HabSuit buffer (0.4 NM)
30+ degree slope
30 degree slope buffer (0.4 NM)
BOEM Lophelia observations
BOEM approx. coral locations
Octocorals
Stony Corals
200-500m depth contours
NMFS statistical areas
Southern Scup GRA
Slope (degrees)
High : 88.4
Low : 0
0 35 70 140 km
0 15 30 60 NM
Council region boundary
73°51'0"W
73°45'30"W
73°40'0"W
73°34'30"W
38°14'30"N
38°9'0"N
38°3'30"N
37°58'0"N
Baltimore Canyon
North Heyes-South Wilmington Canyons
South Vries Canyon
Baltimore Canyon
Warr-Phoenix Canyon Complex
200m
500m
400m
300m
N
0 1.5 3 6 km
0 0.75 1.5 3 NM
18


DSCRTP Historical Records
Soft Corals and Gorgonians
Sea Pens
Stony corals
Model-based boundaries
Industry-proposed boundaries (2015)
Industry-proposed boundaries (2013)
Modeled Habitat Suitability
High
Very High
HabSuit buffer (0.4 NM)
30+ degree slope
30 degree slope buffer (0.4 NM)
BOEM Lophelia observations
BOEM approx. coral locations
Octocorals
Stony Corals
200-500m depth contours
Observed bottom gillnet hauls, 2000-2013
Observed bottom longline hauls, 2000-2013
Observed bottom trawl hauls, 2000-2013
NMFS statistical areas
Southern Scup GRA
0 35 70 140 km
0 15 30 60 NM
Council region boundary
Baltimore Canyon
North Heyes-South Wilmington Canyons
South Vries Canyon
Baltimore Canyon
Warr-Phoenix Canyon Complex
200m
500m
400m
300m
73°51'0"W
73°45'30"W
73°40'0"W
73°34'30"W
38°14'30"N
38°9'0"N
38°3'30"N
37°58'0"N
N
0 1.5 3 6 km
0 0.75 1.5 3 NM
19

South Vries Canyon

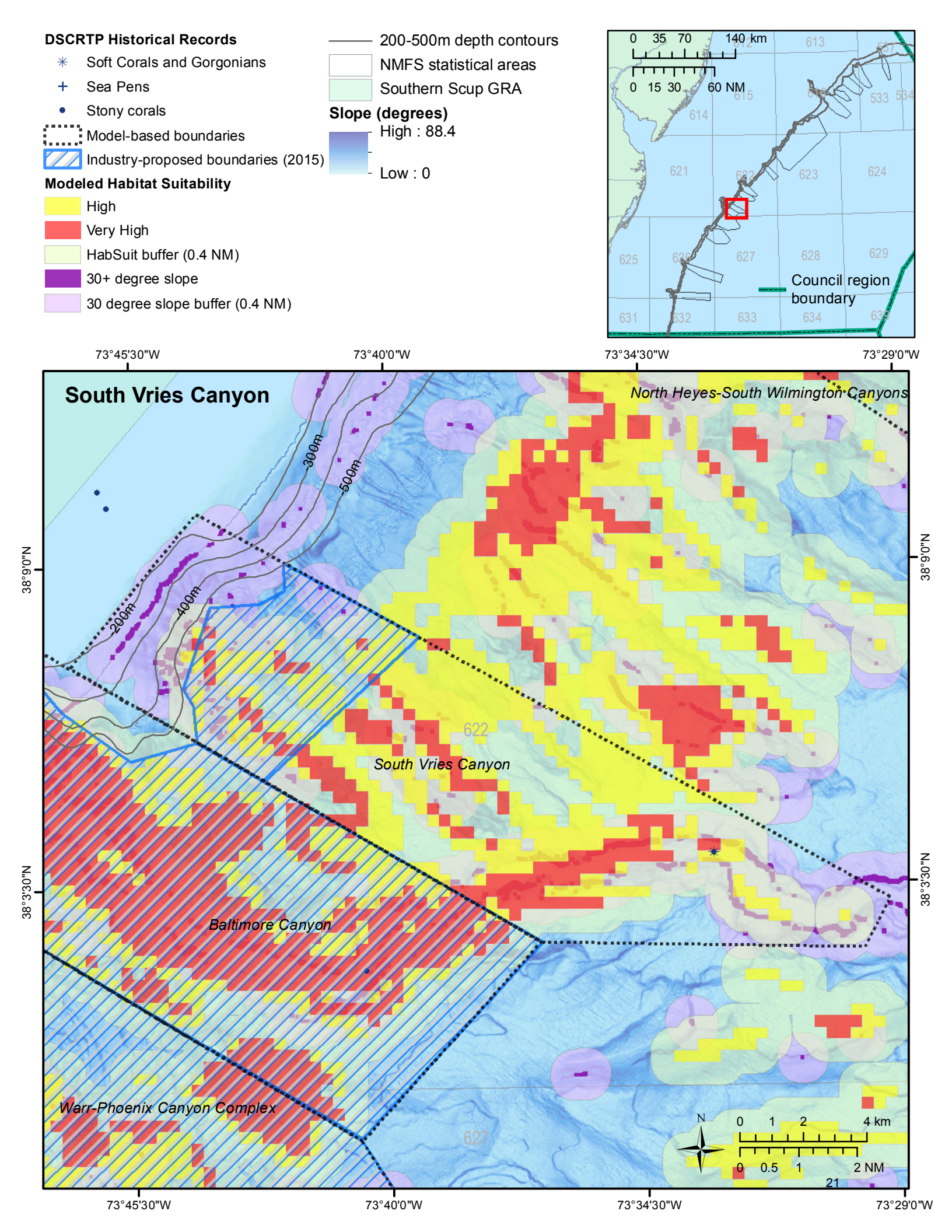
Table 12: *Summary of historical deep sea coral observations, habitat suitability, and areas of high slope for South Vries Canyon.*

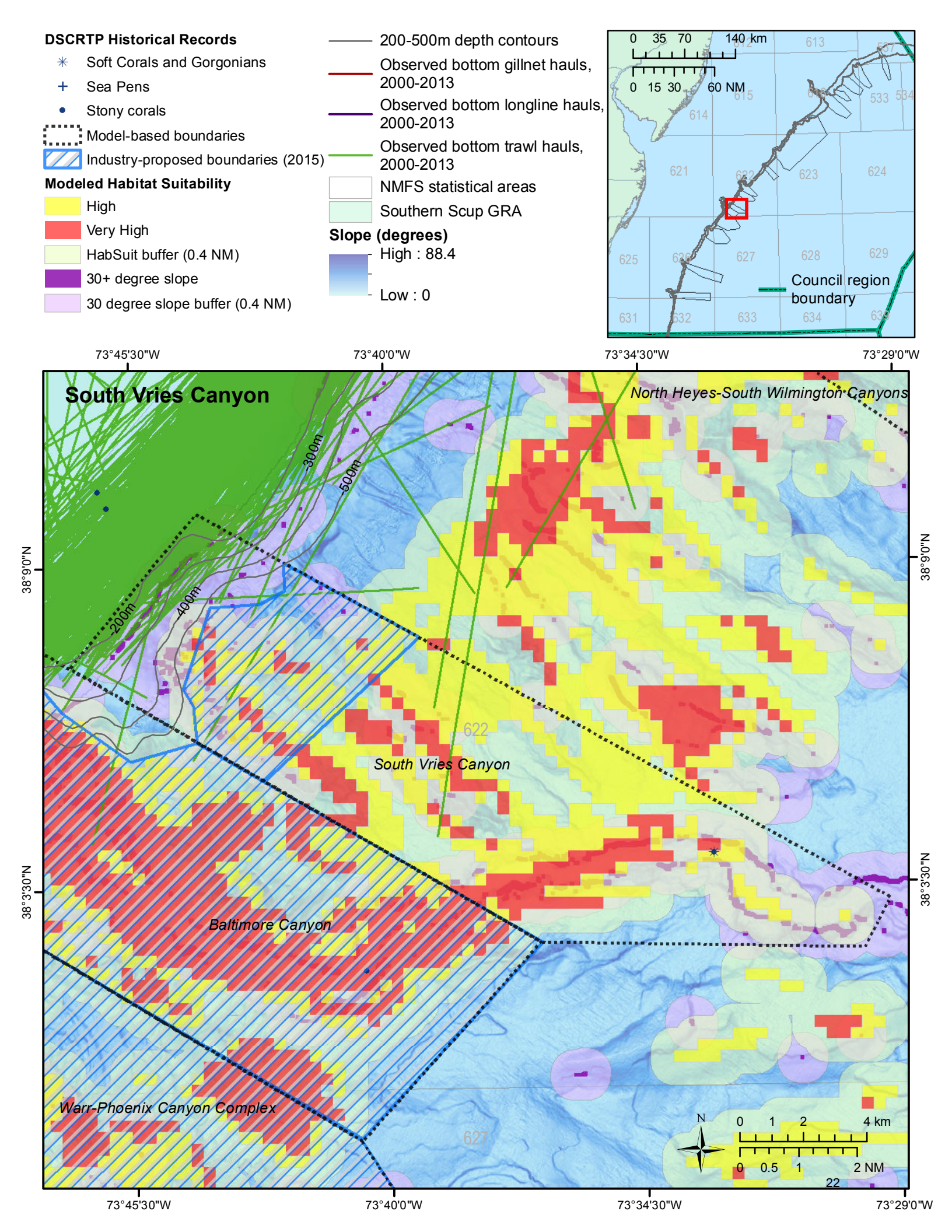
		Coral Observations		Habitat Suitability		Slope	
Canyon or Complex	**Total area (km^2)**	**Historical Coral Records (all)**	**Encompasses observations from recent fieldwork?**	**Total Area of High/Very High Habitat Suitability**	**Percent High/Very High Habitat Suitability**	**Total area of slope >30 degrees (km^2)**	**Percent area of slope >30 degrees**
South Vries Canyon							
FMAT boundary	142.6	2	NA	61.4	43.1%	13.5	9.5%
2015 industry-proposed	27.6	0	NA	11.7	42.3%	1.1	4.2%

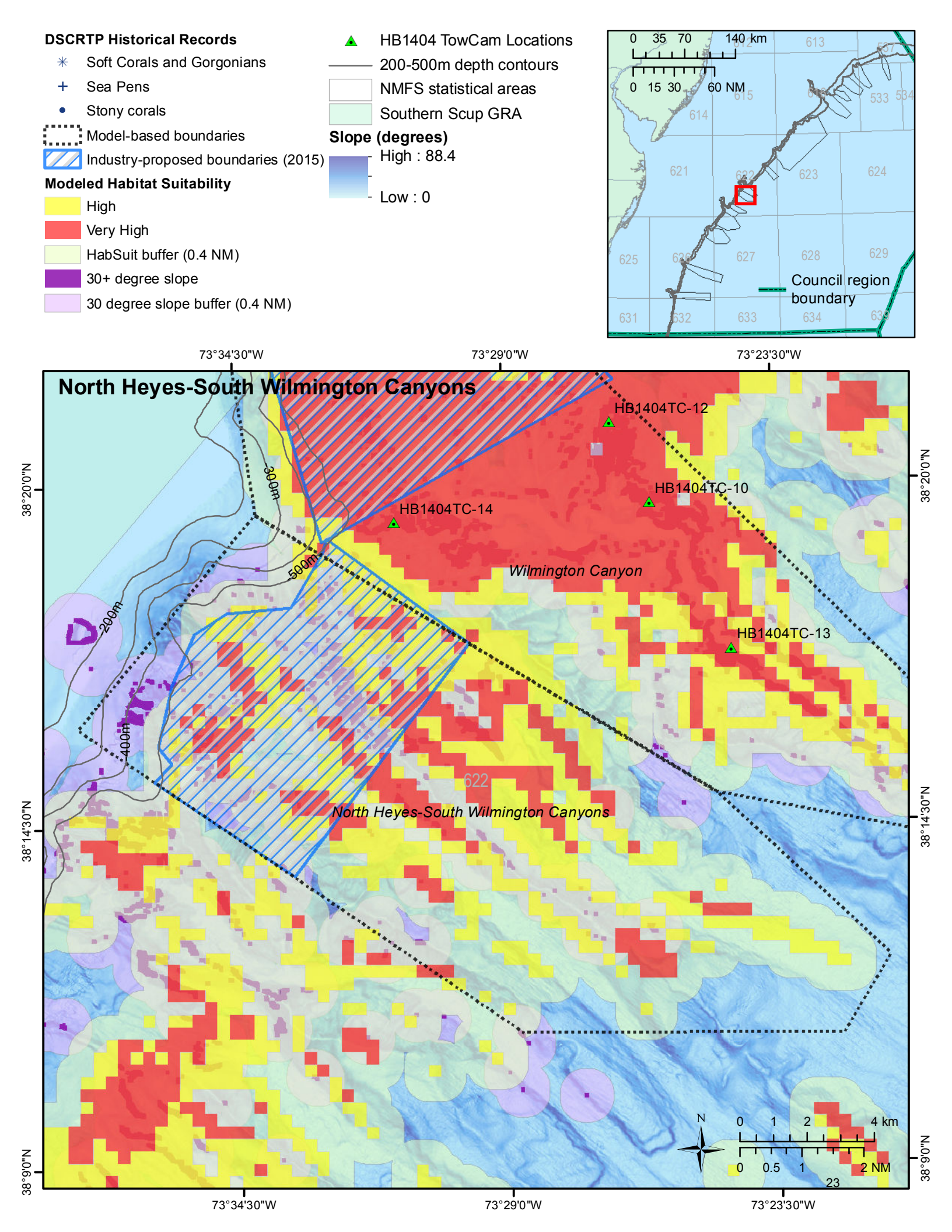
North Heyes-South Wilmington Canyons

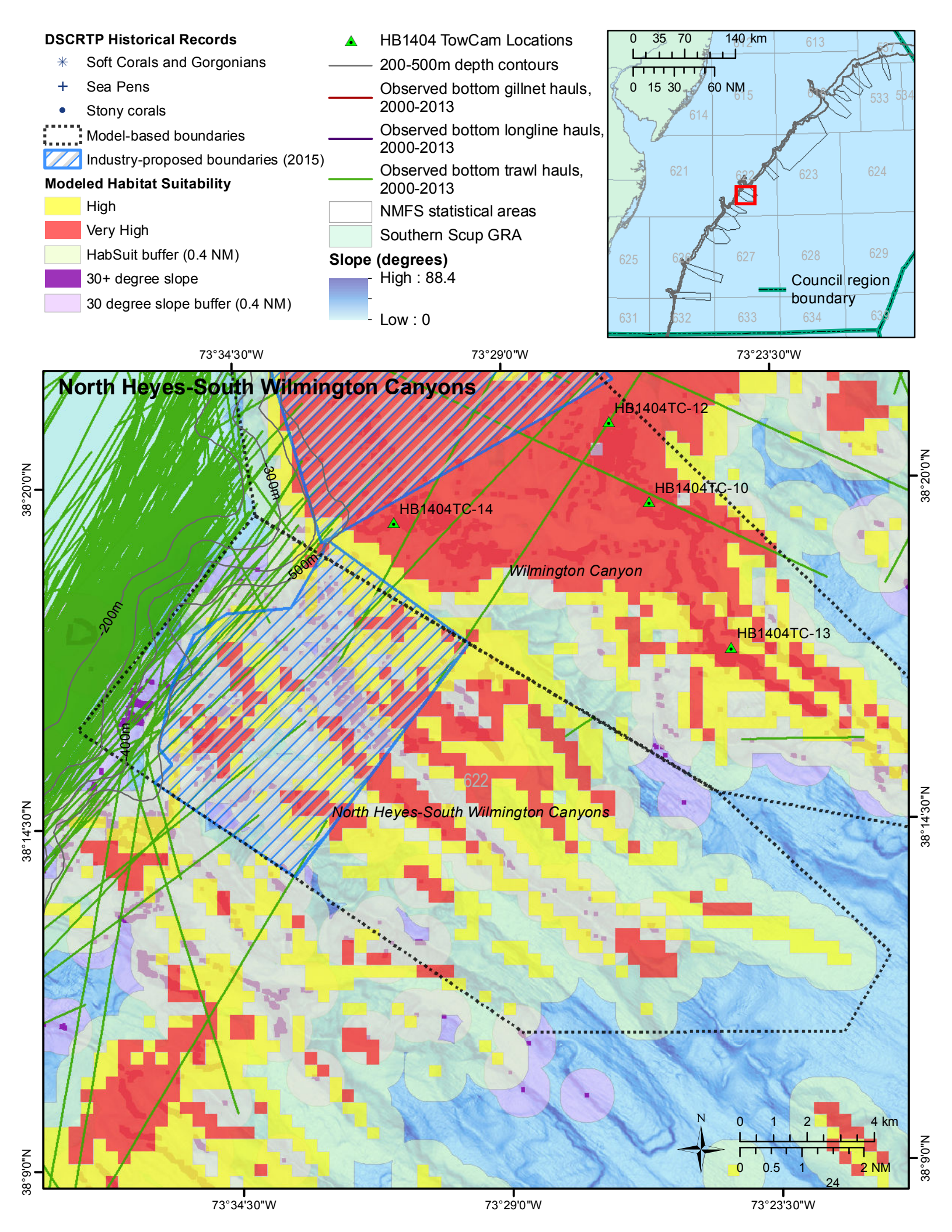
Table 13: *Summary of historical deep sea coral observations, habitat suitability, and areas of high slope for North Heyes and South Wilmington Canyons.*

		Coral Observations		Habitat Suitability		Slope	
Canyon or Complex	**Total area (km^2)**	**Historical Coral Records (all)**	**Encompasses observations from recent fieldwork?**	**Total Area of High/Very High Habitat Suitability**	**Percent High/Very High Habitat Suitability**	**Total area of slope >30 degrees (km^2)**	**Percent area of slope >30 degrees**
North Heyes-South Wilmington Canyons							
FMAT boundary	183.4	0	NA	74.6	40.7%	12.0	6.6%
2015 industry-proposed	50.6	0	NA	27.1	53.5%	7.0	13.8%


DSCRTP Historical Records
Soft Corals and Gorgonians
Sea Pens
Stony corals
Model-based boundaries
Industry-proposed boundaries (2015)
Modeled Habitat Suitability
High
Very High
HabSuit buffer (0.4 NM)
30+ degree slope
30 degree slope buffer (0.4 NM)
200-500m depth contours
NMFS statistical areas
Southern Scup GRA
Slope (degrees)
High : 88.4
Low : 0
0 35 70 140 km
0 15 30 60 NM
Council region boundary
South Vries Canyon
North Heyes-South Wilmington Canyons
300m
500m
200m
400m
622
South Vries Canyon
Baltimore Canyon
Warr-Phoenix Canyon Complex
627
73°45'30"W
73°40'0"W
73°34'30"W
73°29'0"W
38°9'0"N
38°3'30"N
N
0 1 2 4 km
0 0.5 1 2 NM
21


DSCRTP Historical Records
Soft Corals and Gorgonians
Sea Pens
Stony corals
Model-based boundaries
Industry-proposed boundaries (2015)
Modeled Habitat Suitability
High
Very High
HabSuit buffer (0.4 NM)
30+ degree slope
30 degree slope buffer (0.4 NM)
200-500m depth contours
Observed bottom gillnet hauls, 2000-2013
Observed bottom longline hauls, 2000-2013
Observed bottom trawl hauls, 2000-2013
NMFS statistical areas
Southern Scup GRA
Slope (degrees)
High : 88.4
Low : 0
0 35 70 140 km
0 15 30 60 NM
Council region boundary
South Vries Canyon
North Heyes-South Wilmington Canyons
-300m
-500m
-200m
-400m
622
South Vries Canyon
Baltimore Canyon
Warr-Phoenix Canyon Complex
627
73°45'30"W
73°40'0"W
73°34'30"W
73°29'0"W
38°9'0"N
38°3'30"N
N
0 1 2 4 km
0 0.5 1 2 NM
22


DSCRTP Historical Records
Soft Corals and Gorgonians
Sea Pens
Stony corals
Model-based boundaries
Industry-proposed boundaries (2015)
Modeled Habitat Suitability
High
Very High
HabSuit buffer (0.4 NM)
30+ degree slope
30 degree slope buffer (0.4 NM)
HB1404 TowCam Locations
200-500m depth contours
NMFS statistical areas
Southern Scup GRA
Slope (degrees)
High : 88.4
Low : 0
0 35 70 140 km
0 15 30 60 NM
Council region boundary
North Heyes-South Wilmington Canyons
HB1404TC-12
HB1404TC-10
HB1404TC-14
HB1404TC-13
Wilmington Canyon
North Heyes-South Wilmington Canyons
622
300m
500m
200m
400m
73°34'30"W
73°29'0"W
73°23'30"W
38°20'0"N
38°14'30"N
38°9'0"N
N
0 1 2 4 km
0 0.5 1 2 NM
23


DSCRTP Historical Records
Soft Corals and Gorgonians
Sea Pens
Stony corals
Model-based boundaries
Industry-proposed boundaries (2015)
Modeled Habitat Suitability
High
Very High
HabSuit buffer (0.4 NM)
30+ degree slope
30 degree slope buffer (0.4 NM)
HB1404 TowCam Locations
200-500m depth contours
Observed bottom gillnet hauls, 2000-2013
Observed bottom longline hauls, 2000-2013
Observed bottom trawl hauls, 2000-2013
NMFS statistical areas
Southern Scup GRA
Slope (degrees)
High : 88.4
Low : 0
0 35 70 140 km
0 15 30 60 NM
Council region boundary
North Heyes-South Wilmington Canyons
HB1404TC-12
HB1404TC-10
HB1404TC-14
HB1404TC-13
Wilmington Canyon
North Heyes-South Wilmington Canyons
622
300m
500m
200m
400m
73°34'30"W
73°29'0"W
73°23'30"W
38°20'0"N
38°14'30"N
38°9'0"N
N
0 1 2 4 km
0 0.5 1 2 NM
24

Wilmington Canyon

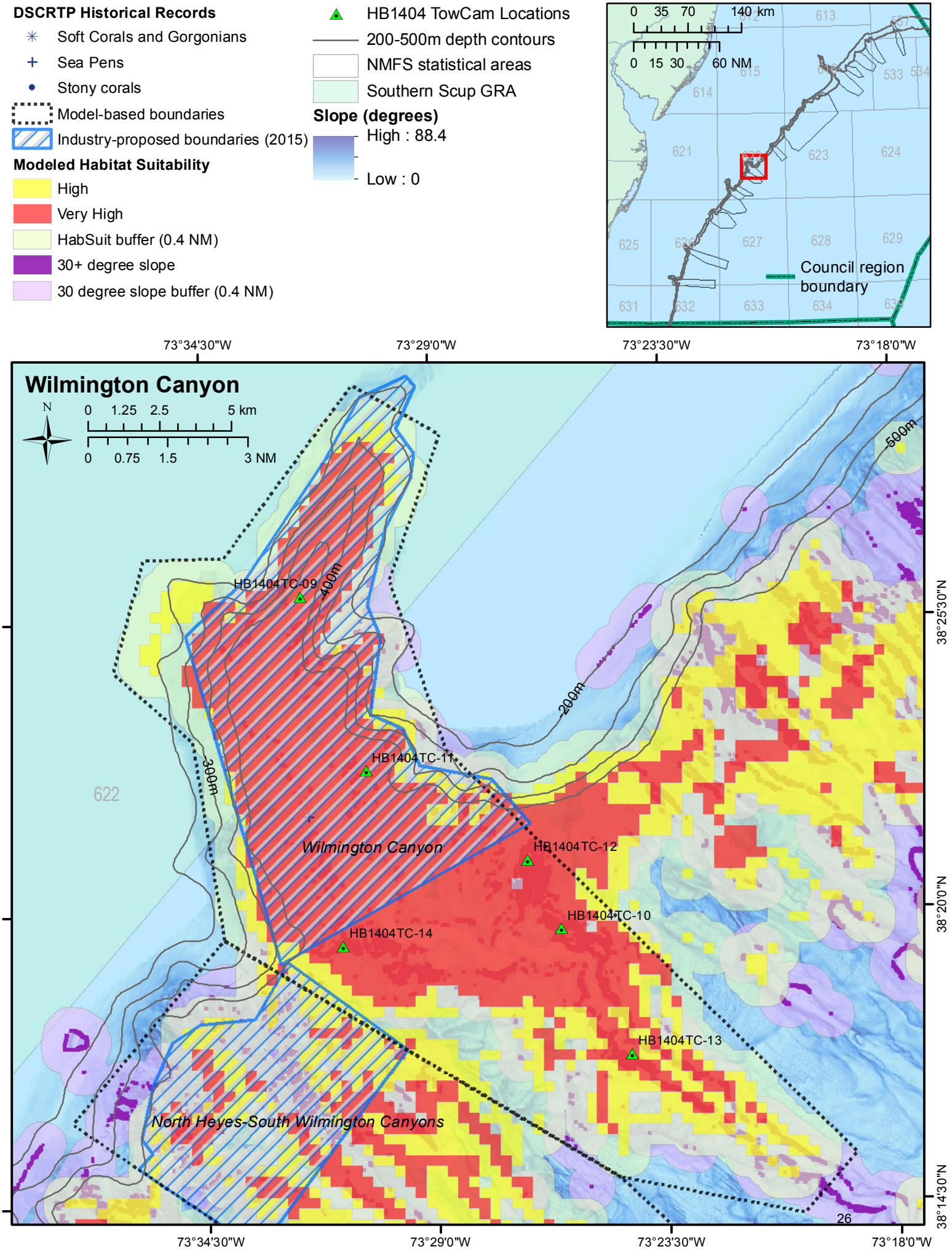
Table 14: *Summary of historical deep sea coral observations, habitat suitability, and areas of high slope for Wilmington Canyon.*

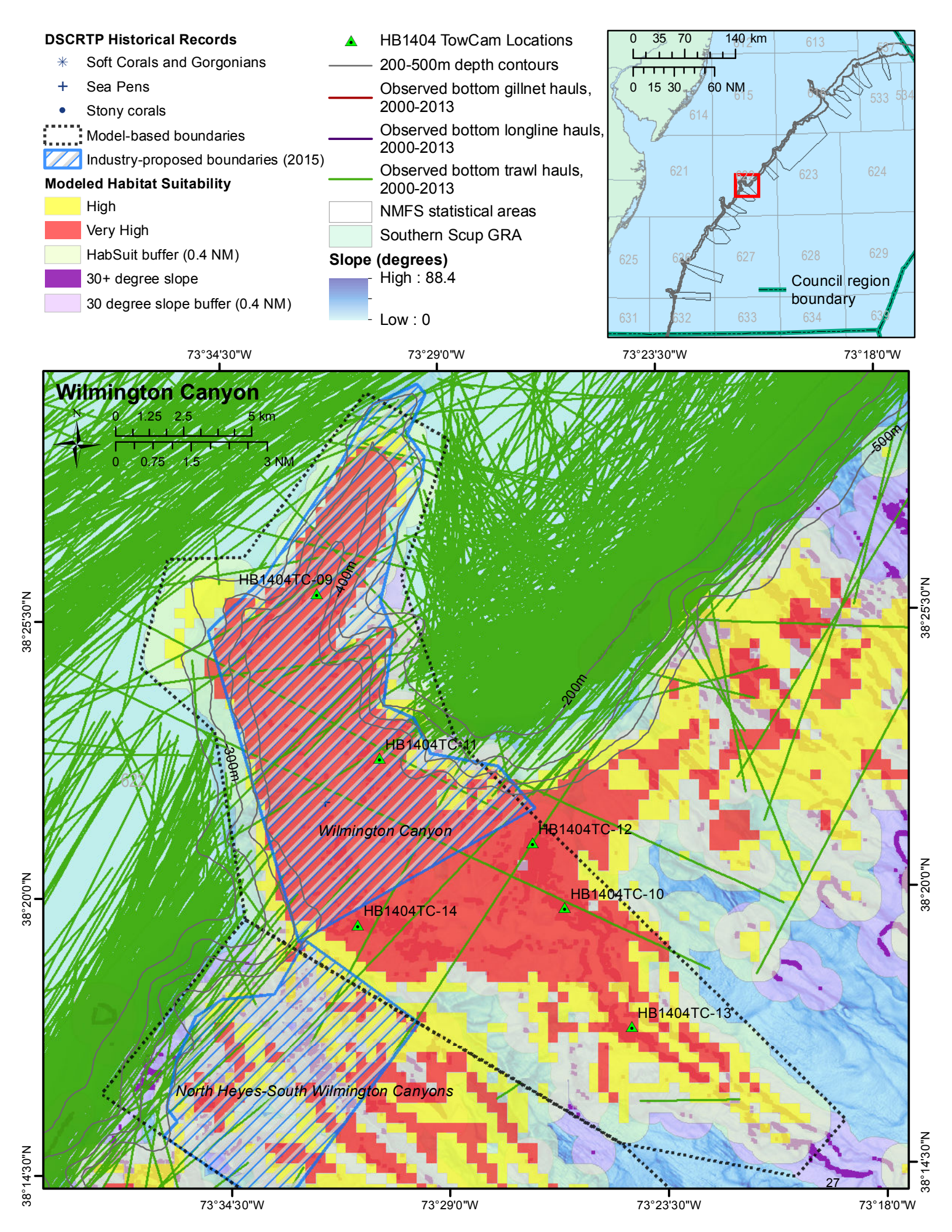
		Coral Observations		Habitat Suitability		Slope	
Canyon or Complex	**Total area (km^2)**	**Historical Coral Records (all)**	**Encompasses observations from recent fieldwork?**	**Total Area of High/Very High Habitat Suitability**	**Percent High/Very High Habitat Suitability**	**Total area of slope >30 degrees (km^2)**	**Percent area of slope >30 degrees**
Wilmington Canyon							
FMAT boundary	268.1	2	Yes	180.9	67.5%	24.1	9.0%
2015 industry-proposed	103.9	2	Some, not all	90.9	87.6%	8.4	8.0%

HB1404 TowCam Survey Locations

Table 15: *Image survey results for canyon fauna from HB1404 TowCam surveys in Wilmington Canyon. Images were captured at 10 second intervals throughout each dive. Each image was visually screened for presence/absence of corals.*

TowCam Dive #	Canyon Location	GMT Date	Launch Lat N	Launch Lon W	Recovery Lat	Recovery Lon	Depth range (m)	No. of Images on bottom	No. images with corals	% images with corals
HB1404-09	Wilmington Canyon	8/9/2014	38 26.2101	73 32.5511	38 25.6822	73 31.8554	370-540	1321	401	30.36
HB1404-10	Wilmington Canyon	8/10/2014	38 19.9080	73 26.4575	38 19.2323	73 25.4968	1130-1492	1156	124	10.73
HB1404-11	Wilmington Canyon	8/10/2014	38 22.7823	73 30.3828	38 22.6162	73 30.8392	640-818	700	0	0.00
HB1404-12	Wilmington Canyon	8/10/2014	38 21.2480	73 26.7960	38 20.6120	73 26.5101	574-1031	1362	4	0.29
HB1404-13	Wilmington Canyon	8/11/2014	38 17.1090	73 24.7006	38 17.5566	73 24.0859	1466-1610	932	737	79.08
HB1404-14	Wilmington Canyon	8/11/2014	38 19.2628	73 30.9987	38 19.3828	73 31.4621	661-847	671	1	0.15


DSCRTP Historical Records
Soft Corals and Gorgonians
Sea Pens
Stony corals
Model-based boundaries
Industry-proposed boundaries (2015)
Modeled Habitat Suitability
High
Very High
HabSuit buffer (0.4 NM)
30+ degree slope
30 degree slope buffer (0.4 NM)
HB1404 TowCam Locations
200-500m depth contours
NMFS statistical areas
Southern Scup GRA
Slope (degrees)
High : 88.4
Low : 0
0 35 70 140 km
0 15 30 60 NM
Council region boundary
Wilmington Canyon
N
0 1.25 2.5 5 km
0 0.75 1.5 3 NM
73°34'30"W
73°29'0"W
73°23'30"W
73°18'0"W
38°25'30"N
38°20'0"N
38°14'30"N
HB1404TC-09
HB1404TC-11
HB1404TC-12
HB1404TC-10
HB1404TC-14
HB1404TC-13
400m
300m
200m
500m
622
Wilmington Canyon
North Heyes-South Wilmington Canyons
26


DSCRTP Historical Records
Soft Corals and Gorgonians
Sea Pens
Stony corals
Model-based boundaries
Industry-proposed boundaries (2015)
Modeled Habitat Suitability
High
Very High
HabSuit buffer (0.4 NM)
30+ degree slope
30 degree slope buffer (0.4 NM)
HB1404 TowCam Locations
200-500m depth contours
Observed bottom gillnet hauls, 2000-2013
Observed bottom longline hauls, 2000-2013
Observed bottom trawl hauls, 2000-2013
NMFS statistical areas
Southern Scup GRA
Slope (degrees)
High : 88.4
Low : 0
0 35 70 140 km
0 15 30 60 NM
Council region boundary
Wilmington Canyon
N
0 1.25 2.5 5 km
0 0.75 1.5 3 NM
HB1404TC-09
HB1404TC-11
HB1404TC-12
HB1404TC-10
HB1404TC-14
HB1404TC-13
400m
300m
200m
500m
Wilmington Canyon
North Heyes-South Wilmington Canyons
73°34'30"W
73°29'0"W
73°23'30"W
73°18'0"W
38°25'30"N
38°20'0"N
38°14'30"N

Spencer Canyon

Table 16: *Summary of historical deep sea coral observations, habitat suitability, and areas of high slope for Spencer Canyon.*

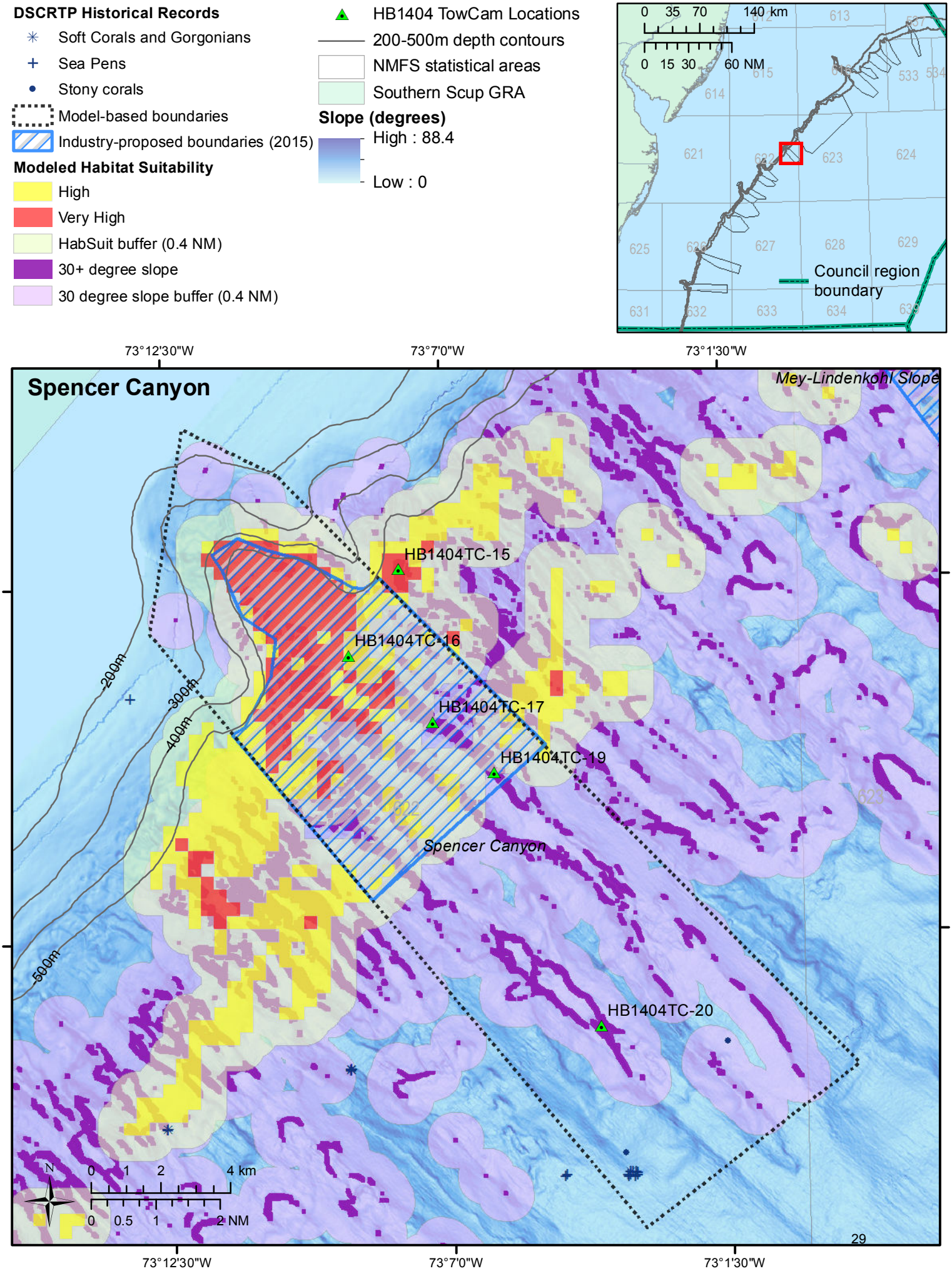
		Coral Observations		Habitat Suitability		Slope	
Canyon or Complex	**Total area (km^2)**	**Historical Coral Records (all)**	**Encompasses observations from recent fieldwork?**	**Total Area of High/Very High Habitat Suitability**	**Percent High/Very High Habitat Suitability**	**Total area of slope >30 degrees (km^2)**	**Percent area of slope >30 degrees**
Spencer Canyon							
FMAT boundary	163.3	12	Yes[b]	28.4	17.4%	22.6	13.8%
2015 industry-proposed	50.0	0	Yes[b]	25.7	51.4%	18.1	36.2%

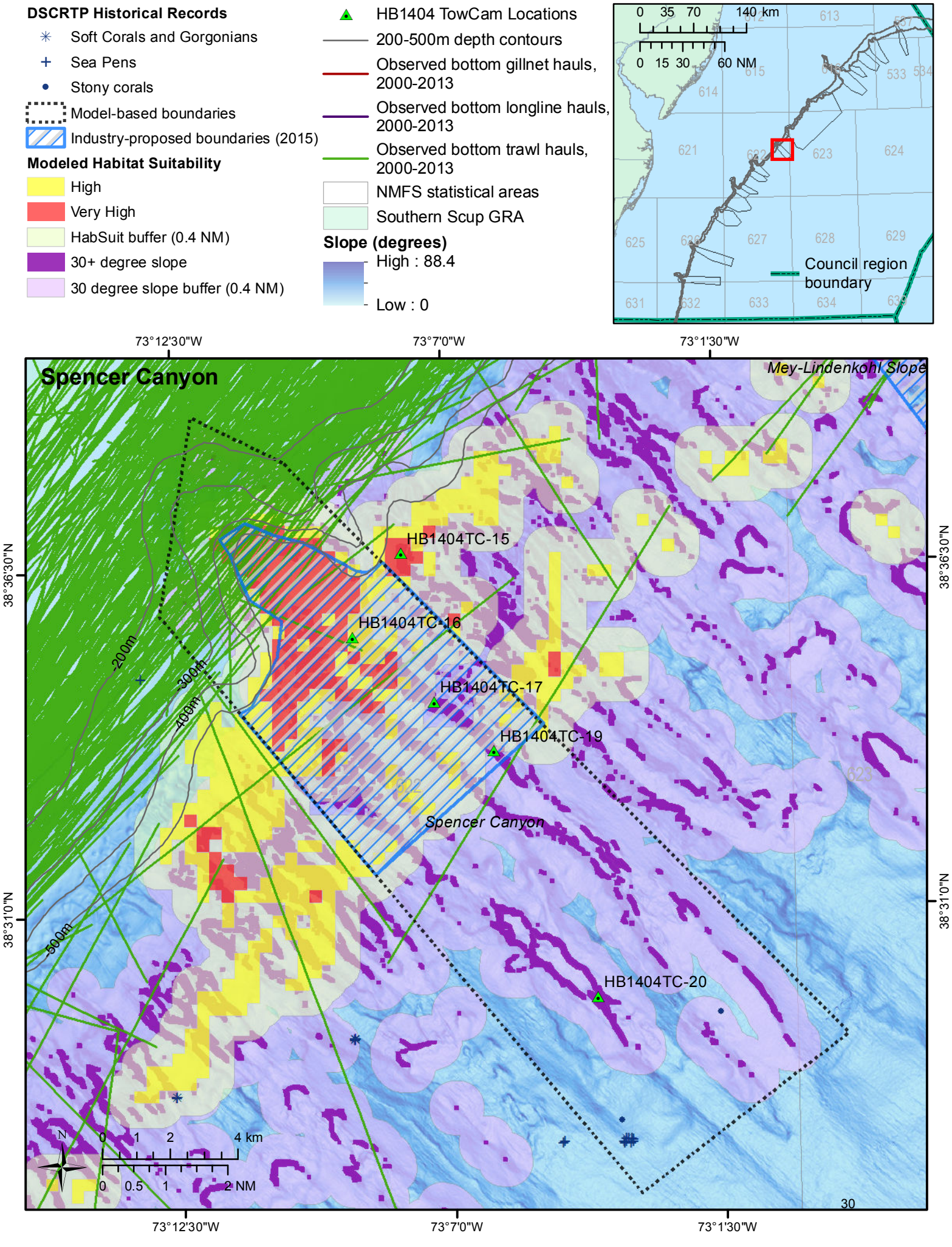
[b] In Spencer Canyon, though there were two TowCam dive sites not encompassed by the model-based or industry-proposed boundaries, no corals were observed on these dives (0 analyzed images included corals, out of 796 bottom images for Dive 15 and 440 bottom images for Dive 20).

HB1404 TowCam Survey Locations

Table 17: *Image survey results for canyon fauna from HB1404 TowCam surveys in Spencer Canyon. Images were captured at 10 second intervals throughout each dive. Each image was visually screened for presence/absence of corals.*

TowCam Dive #	Canyon Location	Date	Launch Lat N	Launch Lon W	Recovery Lat	Recovery Lon	Depth range (m)	No. of Images on bottom	No. images with corals	% images with corals
HB1404-15	Spencer Canyon	8/12/2014	38 36.7995	73 07.9232	38 36.6291	73 7.7906	526-700	796	0	0.00
HB1404-16	Spencer Canyon	8/12/2014	38 35.7369	73 08.8504	38 35.0430	73 09.0364	757-1020	659	286	43.40
HB1404-17	Spencer Canyon	8/12/2014	38 34.4928	73 07.2639	38 34.1771	73 07.1344	1035-1313	1117	122	10.92
HB1404-18	Spencer Canyon	8/13/2014	38 33.9234	73 06.3917	38 33.9026	73 04.8420	DIVE ABORTED			x
HB1404-19	Spencer Canyon	8/13/2014	38 33.6988	73 06.1232	38 33.3535	73 05.9664	1302-1522	472	268	56.78
HB1404-20	Spencer Canyon, very deep	8/13/2014	38 29.5745	73 04.1680	38 29.5526	73 03.9679	2002-2121	440	0	0.00


DSCRTP Historical Records
Soft Corals and Gorgonians
Sea Pens
Stony corals
Model-based boundaries
Industry-proposed boundaries (2015)
Modeled Habitat Suitability
High
Very High
HabSuit buffer (0.4 NM)
30+ degree slope
30 degree slope buffer (0.4 NM)
HB1404 TowCam Locations
200-500m depth contours
NMFS statistical areas
Southern Scup GRA
Slope (degrees)
High : 88.4
Low : 0
0 35 70 140 km
0 15 30 60 NM
Council region boundary
Spencer Canyon
Mey-Lindenkohl Slope
HB1404TC-15
HB1404TC-16
HB1404TC-17
HB1404TC-19
HB1404TC-20
Spencer Canyon
200m
300m
400m
500m
73°12'30"W
73°7'0"W
73°1'30"W
38°36'30"N
38°31'0"N
0 1 2 4 km
0 0.5 1 2 NM
N
29


DSCRTP Historical Records
Soft Corals and Gorgonians
Sea Pens
Stony corals
Model-based boundaries
Industry-proposed boundaries (2015)
Modeled Habitat Suitability
High
Very High
HabSuit buffer (0.4 NM)
30+ degree slope
30 degree slope buffer (0.4 NM)
HB1404 TowCam Locations
200-500m depth contours
Observed bottom gillnet hauls, 2000-2013
Observed bottom longline hauls, 2000-2013
Observed bottom trawl hauls, 2000-2013
NMFS statistical areas
Southern Scup GRA
Slope (degrees)
High : 88.4
Low : 0
0 35 70 140 km
0 15 30 60 NM
Council region boundary
Spencer Canyon
Mey-Lindenkohl Slope
HB1404TC-15
HB1404TC-16
HB1404TC-17
HB1404TC-19
HB1404TC-20
Spencer Canyon
200m
300m
400m
500m
73°12'30"W
73°7'0"W
73°1'30"W
38°36'30"N
38°31'0"N
0 1 2 4 km
0 0.5 1 2 NM
30

Mey-Lindenkohl Slope

Table 18: *Summary of historical deep sea coral observations, habitat suitability, and areas of high slope for the Mey-Lindenkohl Slope.*

		Coral Observations		Habitat Suitability		Slope	
Canyon or Complex	**Total area (km^2)**	**Historical Coral Records (all)**	**Encompasses observations from recent fieldwork?**	**Total Area of High/Very High Habitat Suitability**	**Percent High/Very High Habitat Suitability**	**Total area of slope >30 degrees (km^2)**	**Percent area of slope >30 degrees**
Mey-Lindenkohl Slope							
FMAT boundary	2818.2	74	Yes	550.5	19.5%	178.9	6.3%
2015 industry-proposed	2500.9	73	Yes	496.6	19.9%	179.7	179.7
2013 industry-proposed; Depth-based	2458.8	62	Yes	503.9	20.5%	175.3	7.0%
2013 industry-proposed; Straight line	2445.3	65	Some, not all	443.5	18.1%	172.4	0.0%

EX1404 Okeanos Explorer Our Deepwater Backyard Dive Locations

Table 19: *Relevant excerpts from Okeanos Explorer Our Deepwater Backyard daily updates; Mey-Lindenkohl Slope.*

Leg 2, Dive 1: Lindenkohl Canyon, 9/5/2014
This dive focused on engineering testing. D2 landed on a flat bench feature with a soft sedimented seafloor along the wall of Lindenkohl Canyon at a depth of 665 meters. Common fauna included squid, red crabs (including a couple mating pairs), siphonophores, jellyfish, euphausiids, and a few different species of fish. D2 was recovered from a depth of approximately 660 meters.
Leg 3, Dive 2: Hendrickson Canyon, 9/20/2014
Today's dive investigated a steep wall face along the southern side of Hendrickson Canyon. The ROV (D2) reached the boulder-strewn bottom at a depth of 1,670 meters. As D2 moved upslope along our transect, the sheer canyon wall was characterized by several scrapes on the chalky wall surface, evidence of previous failures (some recent), several chutes, and occasional manganese staining. By far, the most abundant fauna of the dive were cup corals, which were generally located under frequent overhangs and outcrops along the sheer wall. Other common fauna encountered included several species of octocorals, black corals, scleractinian corals, fish, octopods, sea pens, corallimorphs, sea spiders, sea urchins, and sponges. Highlights from today's dive included a dandelion siphonophore, an acrobatic chimaera, a large vertical crack that had a high diversity of corals and sponges as well as several octopods, and the first deployment of D2's new sediment probe, affectionately called "Sepoke."

HB1204 and HB1404 TowCam Survey Locations

Table 20: *Image survey results for canyon fauna from HB1204 TowCam surveys in the Mey-Lindenkohl Slope. Images were captured at 10 second intervals throughout each dive. Each image was visually screened for presence/absence of corals.*

TowCam Dive #	Canyon Location	Date	Launch Lat N	Launch Lon W	Recovery Lat	Recovery Lon	No. of Images on bottom	No. images with corals	% images with corals	Nominal Depth (m)
HB1204-01	Toms Canyon SE	7/7/2012	38 56.3823	72 25.7944	38 55.5772	72 25.6275	1734	828	47.75	1802
HB1204-02	Toms Canyon Lower West	7/8/2012	38 57.1788	72 27.2815	38 57.5213	72 27.5442	2067	557	26.95	1736 to 1694
HB1204-03	Toms Canyon Canyon Head	7/8/2012	39 06.2975	72 38.0914	39 05.8721	72 38.1695	1226	11	0.9	553 to 861
HB1204-04	Hendrickson Canyon Lower East Scarp	7/9/2012	38 57.6673	72 26.3203	38 57.5940	72 26.5532	1148	291	25.35	175 to 1705
HB1204-05	Middle Toms Canyon Mid	7/10/2012	38 56.9385	72 35.3163	38 56.8551	72 35.0058	1963	1016	51.76	1337 to 1591
HB1204-06	Toms Canyon Mid-East	7/10/2012	39 01.6231	72 33.2098	39 01.7749	72 33.1740	1781	154	8.65	1115 to 1216

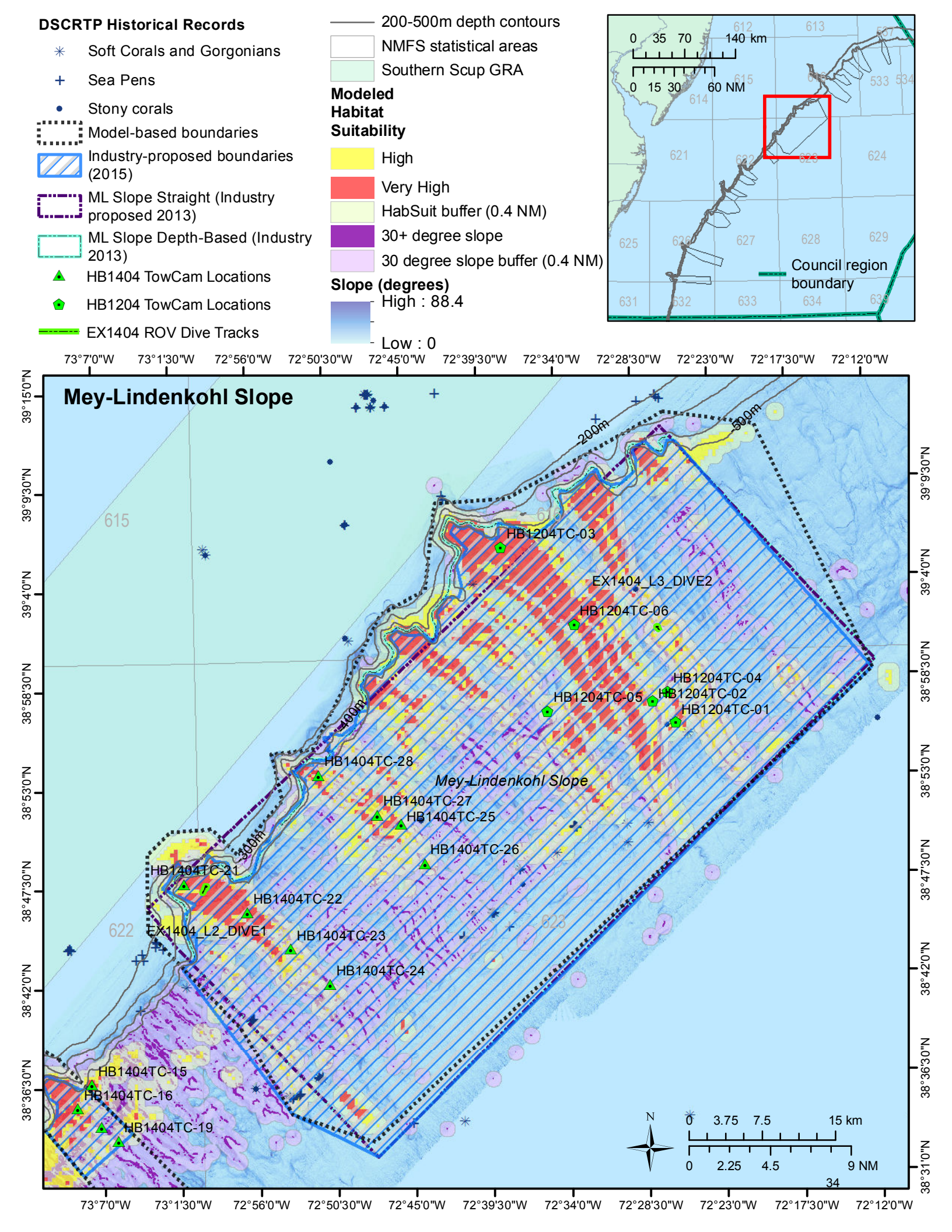
Table 21: *Image survey results for canyon fauna from HB1404 TowCam surveys in the Mey-Lindenkohl Slope. Images were captured at 10 second intervals throughout each dive. Each image was visually screened for presence/absence of corals.*

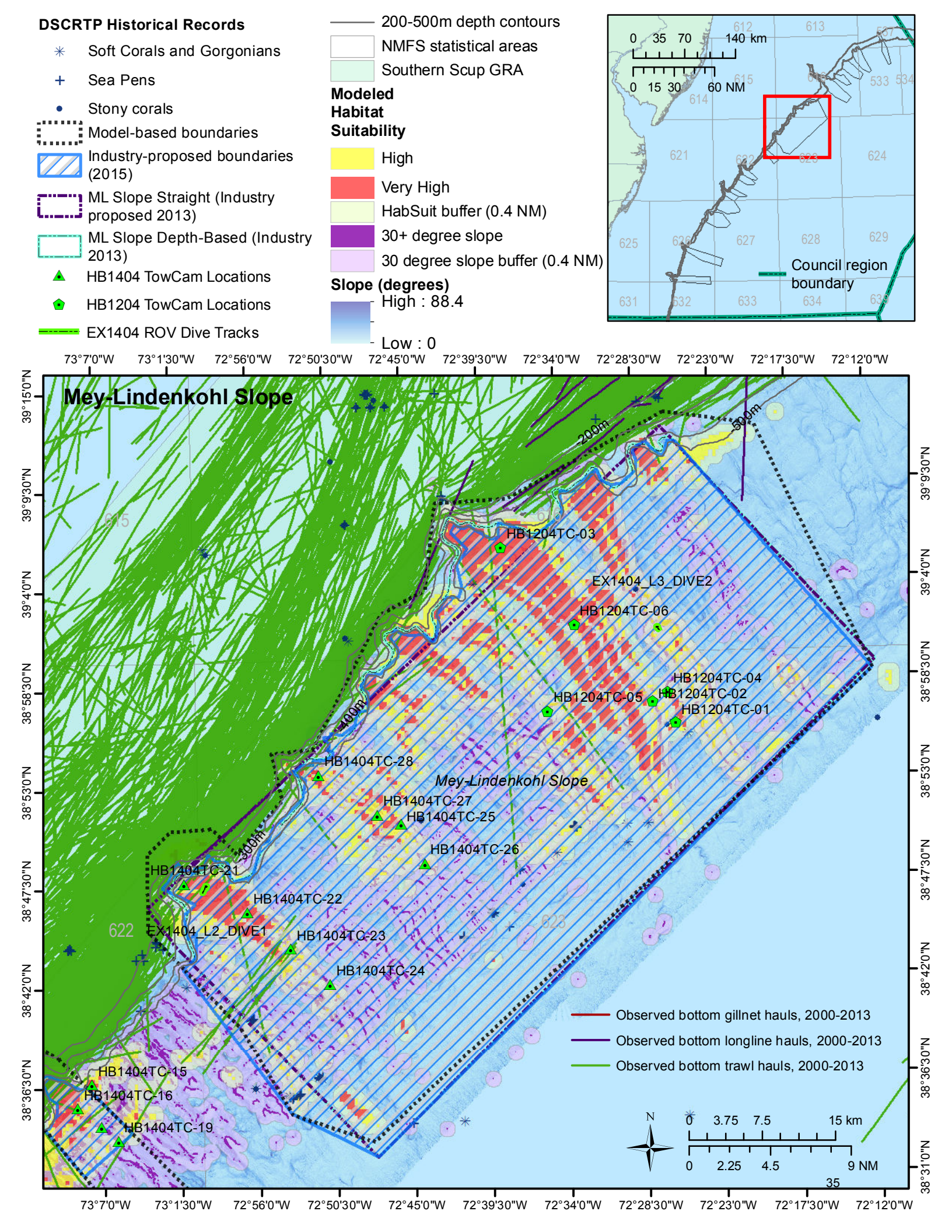
TowCam Dive #	Canyon Location	Date	Launch Lat N	Launch Lon W	Recovery Lat	Recovery Lon	Depth range (m)	No. of Images on bottom	No. images w/ corals	% images with corals
HB1404-21	Lindenkohl Canyon, Shallow	8/14/2014	38 47.6467	73 01.2698	38 47.7220	73 00.8393	546-664	390	13	3.33
HB1404-22	Lindenkohl Canyon, Mid	8/14/2014	38 46.1905	72 56.5147	38 45.9626	72 56.6090	945-1139	576	288	50.00
HB1404-23	Lindenkohl Canyon, Deep	8/14/2014	38 44.0860	72 53.6111	38 43.9139	72 53.5711	1527-1607	238	206	86.55
HB1404-24	Lindenkohl Canyon, Very deep	8/14/2014	38 42.0646	72 50.8507	38 41.9557	72 50.8198	1762-1946	390	215	55.13
HB1404-25	Carteret Canyon, Deep	8/14/2014	38 50.9024	72 45.6454	38 50.7350	72 45.5056	1373-1478	309	105	33.98
HB1404-26	Carteret Canyon, Very Deep	8/15/2014	38 48.6365	72 43.8868	38 48.5267	72 43.9589	1651-1724	288	144	50.00
HB1404-27	Carteret Canyon, Mid	8/15/2014	38 51.2950	72 47.1788	38 51.3254	72 47.2947	1200-1286	382	230	60.21
HB1404-28	Carteret Canyon, Shallow	8/15/2014	38 53.7168	72 51.3923	38 53.4874	72 51.3237	627-823	909	154	16.94

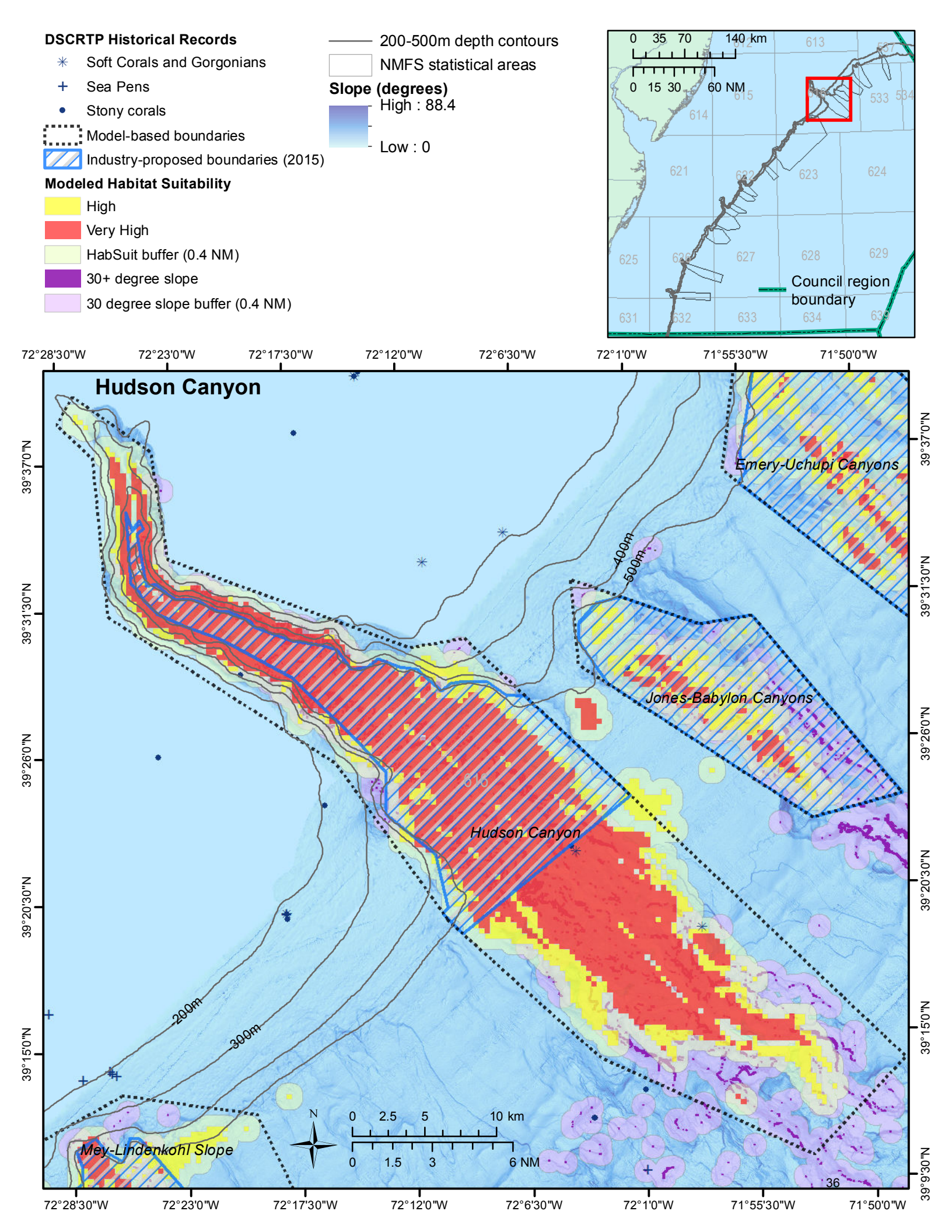
Hudson Canyon

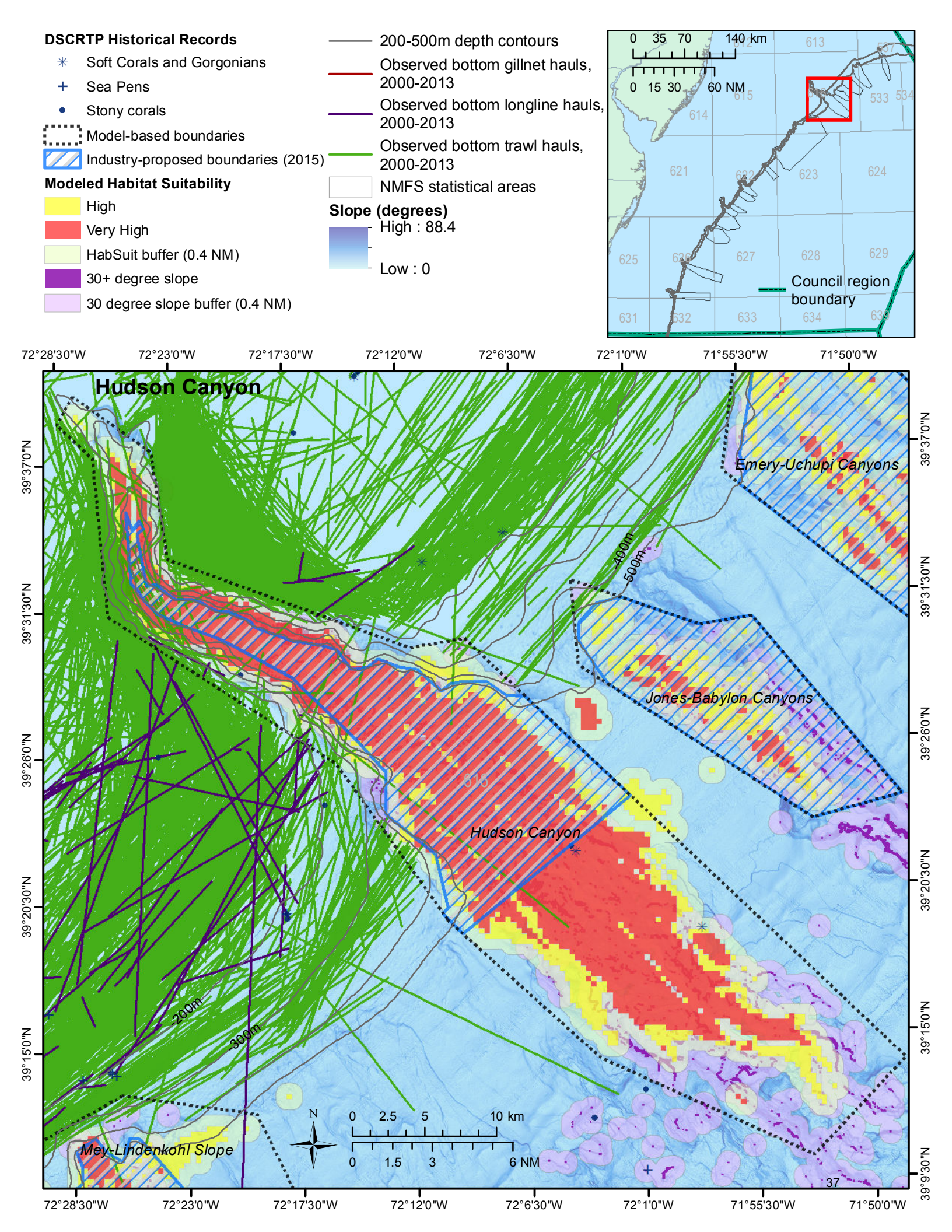
Table 22: *Summary of historical deep sea coral observations, habitat suitability, and areas of high slope for Hudson Canyon.*

		Coral Observations		Habitat Suitability		Slope	
Canyon or Complex	**Total area (km^2)**	**Historical Coral Records (all)**	**Encompasses observations from recent fieldwork?**	**Total Area of High/Very High Hab. Suitability**	**% High/Very High Habitat Suitability**	**Total area of slope >30 degrees (km^2)**	**Percent area of slope >30 degrees**
Hudson Canyon							
FMAT boundary	770.8	5	NA	445.4	57.8%	82.7	10.7%
2015 industry-proposed	237.2	0	NA	210.7	88.8%	31.5	13.3%


DSCRTP Historical Records
Soft Corals and Gorgonians
Sea Pens
Stony corals
Model-based boundaries
Industry-proposed boundaries (2015)
ML Slope Straight (Industry proposed 2013)
ML Slope Depth-Based (Industry 2013)
HB1404 TowCam Locations
HB1204 TowCam Locations
EX1404 ROV Dive Tracks
200-500m depth contours
NMFS statistical areas
Southern Scup GRA
Modeled Habitat Suitability
High
Very High
HabSuit buffer (0.4 NM)
30+ degree slope
30 degree slope buffer (0.4 NM)
Slope (degrees)
High : 88.4
Low : 0
0 35 70 140 km
0 15 30 60 NM
Council region boundary
Mey-Lindenkohl Slope
200m
300m
400m
500m
HB1204TC-03
EX1404_L3_DIVE2
HB1204TC-06
HB1204TC-04
HB1204TC-02
HB1204TC-05
HB1204TC-01
HB1404TC-28
Mey-Lindenkohl Slope
HB1404TC-27
HB1404TC-25
HB1404TC-26
HB1404TC-21
HB1404TC-22
EX1404_L2_DIVE1
HB1404TC-23
HB1404TC-24
HB1404TC-15
HB1404TC-16
HB1404TC-19
N
0 3.75 7.5 15 km
0 2.25 4.5 9 NM
34
73°7'0"W
73°1'30"W
72°56'0"W
72°50'30"W
72°45'0"W
72°39'30"W
72°34'0"W
72°28'30"W
72°23'0"W
72°17'30"W
72°12'0"W
39°15'0"N
39°9'30"N
39°4'0"N
38°58'30"N
38°53'0"N
38°47'30"N
38°42'0"N
38°36'30"N
38°31'0"N


DSCRTP Historical Records
Soft Corals and Gorgonians
Sea Pens
Stony corals
Model-based boundaries
Industry-proposed boundaries (2015)
ML Slope Straight (Industry proposed 2013)
ML Slope Depth-Based (Industry 2013)
HB1404 TowCam Locations
HB1204 TowCam Locations
EX1404 ROV Dive Tracks
200-500m depth contours
NMFS statistical areas
Southern Scup GRA
Modeled Habitat Suitability
High
Very High
HabSuit buffer (0.4 NM)
30+ degree slope
30 degree slope buffer (0.4 NM)
Slope (degrees)
High : 88.4
Low : 0
0 35 70 140 km
0 15 30 60 NM
Council region boundary
Mey-Lindenkohl Slope
200m
300m
400m
500m
HB1204TC-03
EX1404_L3_DIVE2
HB1204TC-06
HB1204TC-04
HB1204TC-02
HB1204TC-05
HB1204TC-01
HB1404TC-28
Mey-Lindenkohl Slope
HB1404TC-27
HB1404TC-25
HB1404TC-26
HB1404TC-21
HB1404TC-22
EX1404_L2_DIVE1
HB1404TC-23
HB1404TC-24
HB1404TC-15
HB1404TC-16
HB1404TC-19
Observed bottom gillnet hauls, 2000-2013
Observed bottom longline hauls, 2000-2013
Observed bottom trawl hauls, 2000-2013
N
0 3.75 7.5 15 km
0 2.25 4.5 9 NM
35
73°7'0"W
73°1'30"W
72°56'0"W
72°50'30"W
72°45'0"W
72°39'30"W
72°34'0"W
72°28'30"W
72°23'0"W
72°17'30"W
72°12'0"W
39°15'0"N
39°9'30"N
39°4'0"N
38°58'30"N
38°53'0"N
38°47'30"N
38°42'0"N
38°36'30"N
38°31'0"N


DSCRTP Historical Records
Soft Corals and Gorgonians
Sea Pens
Stony corals
Model-based boundaries
Industry-proposed boundaries (2015)
Modeled Habitat Suitability
High
Very High
HabSuit buffer (0.4 NM)
30+ degree slope
30 degree slope buffer (0.4 NM)
200-500m depth contours
NMFS statistical areas
Slope (degrees)
High : 88.4
Low : 0
0 35 70 140 km
0 15 30 60 NM
Council region boundary
Hudson Canyon
Emery-Uchupi Canyons
Jones-Babylon Canyons
Hudson Canyon
Mey-Lindenkohl Slope
200m
300m
400m
500m
0 2.5 5 10 km
0 1.5 3 6 NM
N
72°28'30"W
72°23'0"W
72°17'30"W
72°12'0"W
72°6'30"W
72°1'0"W
71°55'30"W
71°50'0"W
39°37'0"N
39°31'30"N
39°26'0"N
39°20'30"N
39°15'0"N
39°9'30"N
36


DSCRTP Historical Records
Soft Corals and Gorgonians
Sea Pens
Stony corals
Model-based boundaries
Industry-proposed boundaries (2015)
Modeled Habitat Suitability
High
Very High
HabSuit buffer (0.4 NM)
30+ degree slope
30 degree slope buffer (0.4 NM)
200-500m depth contours
Observed bottom gillnet hauls, 2000-2013
Observed bottom longline hauls, 2000-2013
Observed bottom trawl hauls, 2000-2013
NMFS statistical areas
Slope (degrees)
High : 88.4
Low : 0
0 35 70 140 km
0 15 30 60 NM
Council region boundary
Hudson Canyon
Emery-Uchupi Canyons
Jones-Babylon Canyons
Hudson Canyon
Mey-Lindenkohl Slope
200m
300m
400m
500m
615
N
0 2.5 5 10 km
0 1.5 3 6 NM
37
72°28'30"W
72°23'0"W
72°17'30"W
72°12'0"W
72°6'30"W
72°1'0"W
71°55'30"W
71°50'0"W
39°37'0"N
39°31'30"N
39°26'0"N
39°20'30"N
39°15'0"N
39°9'30"N

Jones-Babylon Canyons

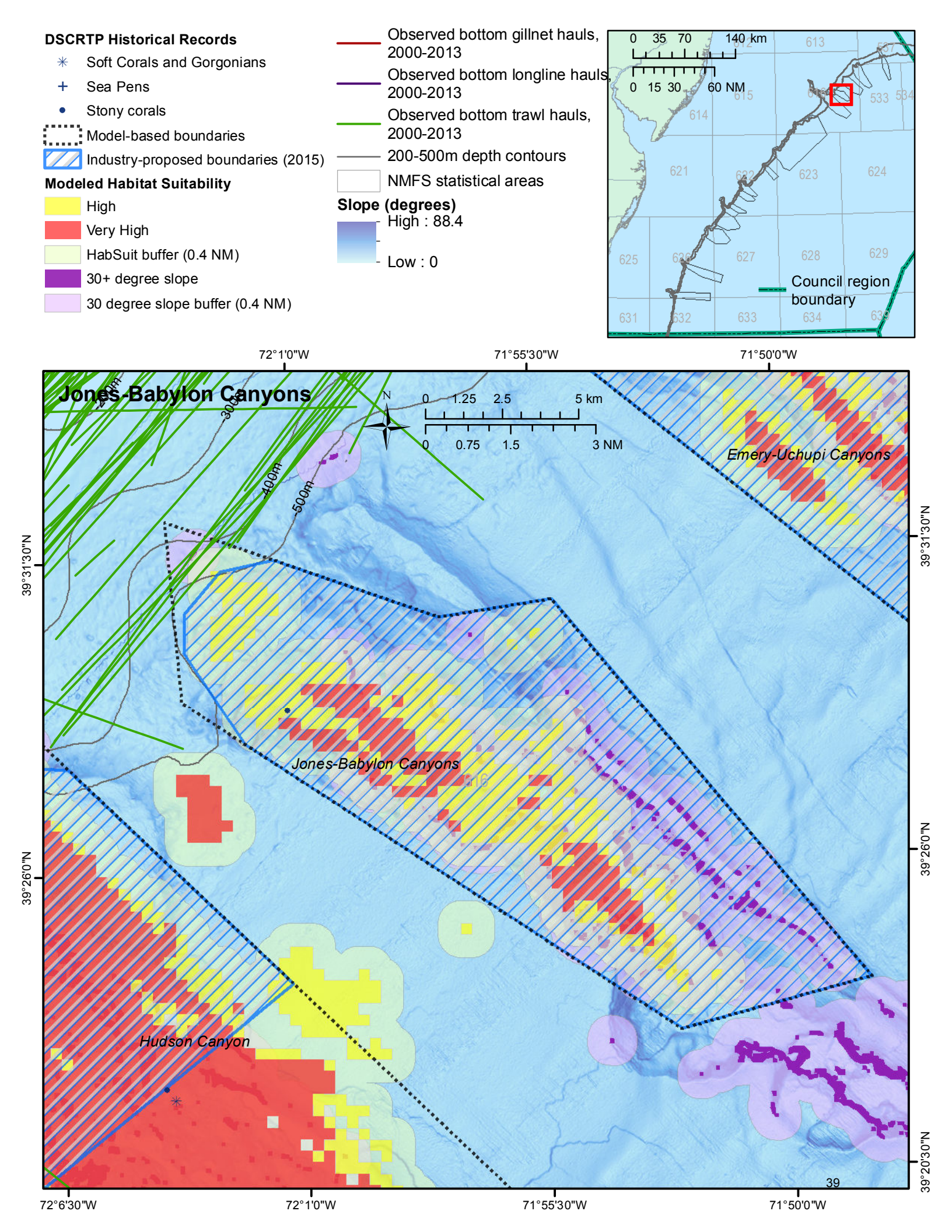
Table 23: *Summary of historical deep sea coral observations, habitat suitability, and areas of high slope for Jones and Babylon Canyons.*

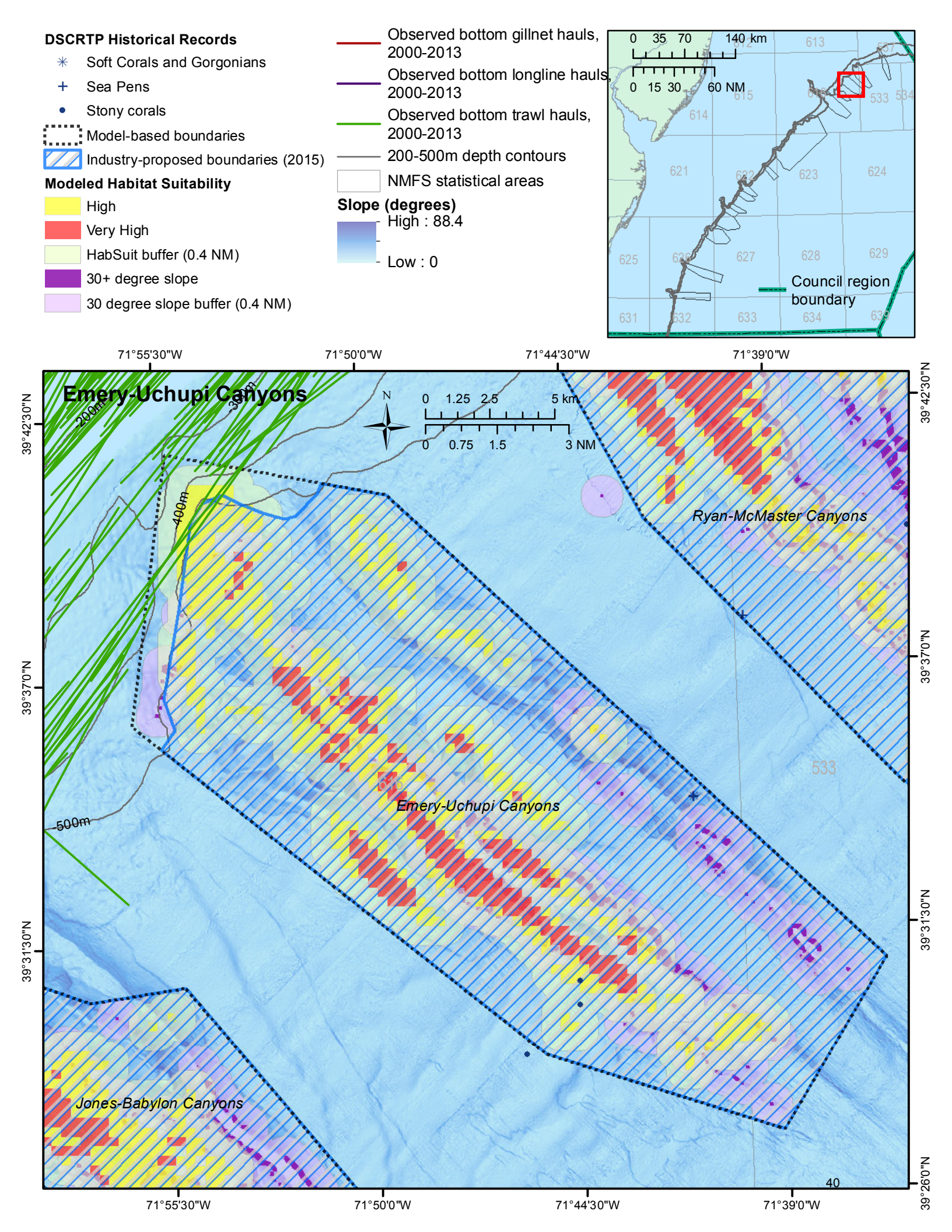
		Coral Observations		Habitat Suitability		Slope	
Canyon or Complex	**Total area (km^2)**	**Historical Coral Records (all)**	**Encompasses observations from recent fieldwork?**	**Total Area of High/Very High Hab. Suitability**	**% High/Very High Habitat Suitability**	**Total area of slope >30 degrees (km^2)**	**Percent area of slope >30 degrees**
Jones-Babylon Canyons							
FMAT boundary	166.1	1	NA	46.8	28.2%	9.0	5.4%
2015 industry-proposed	159.5	1	NA	46.8	29.4%	8.7	5.5%

Emery-Uchupi Canyons

Table 24: *Summary of historical deep sea coral observations, habitat suitability, and areas of high slope for Emery and Uchupi Canyons.*

		Coral Observations		Habitat Suitability		Slope	
Canyon or Complex	**Total area (km^2)**	**Historical Coral Records (all)**	**Encompasses observations from recent fieldwork?**	**Total Area of High/Very High Hab. Suitability**	**% High/Very High Habitat Suitability**	**Total area of slope >30 degrees (km^2)**	**Percent area of slope >30 degrees**
Emery-Uchupi Canyons							
FMAT boundary	369.2	6	NA	80.6	21.8%	12.0	3.3%
2015 industry-proposed	349.2	6	NA	78.3	22.4%	10.5	3.0%


DSCRTP Historical Records
Soft Corals and Gorgonians
Sea Pens
Stony corals
Model-based boundaries
Industry-proposed boundaries (2015)
Modeled Habitat Suitability
High
Very High
HabSuit buffer (0.4 NM)
30+ degree slope
30 degree slope buffer (0.4 NM)
Observed bottom gillnet hauls, 2000-2013
Observed bottom longline hauls, 2000-2013
Observed bottom trawl hauls, 2000-2013
200-500m depth contours
NMFS statistical areas
Slope (degrees)
High : 88.4
Low : 0
0 35 70 140 km
0 15 30 60 NM
Council region boundary
Jones-Babylon Canyons
0 1.25 2.5 5 km
0 0.75 1.5 3 NM
N
300m
400m
500m
Emery-Uchupi Canyons
Jones-Babylon Canyons
Hudson Canyon
72°1'0"W
71°55'30"W
71°50'0"W
39°31'30"N
39°26'0"N
39°20'30"N
72°6'30"W
39


DSCRTP Historical Records
Soft Corals and Gorgonians
Sea Pens
Stony corals
Model-based boundaries
Industry-proposed boundaries (2015)
Modeled Habitat Suitability
High
Very High
HabSuit buffer (0.4 NM)
30+ degree slope
30 degree slope buffer (0.4 NM)
Observed bottom gillnet hauls, 2000-2013
Observed bottom longline hauls, 2000-2013
Observed bottom trawl hauls, 2000-2013
200-500m depth contours
NMFS statistical areas
Slope (degrees)
High : 88.4
Low : 0
0 35 70 140 km
0 15 30 60 NM
Council region boundary
Emery-Uchupi Canyons
200m
300m
400m
500m
N
0 1.25 2.5 5 km
0 0.75 1.5 3 NM
Ryan-McMaster Canyons
Emery-Uchupi Canyons
Jones-Babylon Canyons
71°55'30"W
71°50'0"W
71°44'30"W
71°39'0"W
39°42'30"N
39°37'0"N
39°31'30"N
39°26'0"N
40

Ryan and McMaster Canyons

Table 25: *Summary of historical deep sea coral observations, habitat suitability, and areas of high slope for Ryan and McMaster Canyons.*

		Coral Observations		Habitat Suitability		Slope	
Canyon or Complex	**Total area (km^2)**	**Historical Coral Records (all)**	**Encompasses observations from recent fieldwork?**	**Total Area of High/Very High Habitat Suitability**	**Percent High/Very High Habitat Suitability**	**Total area of slope >30 degrees (km^2)**	**Percent area of slope >30 degrees**
Ryan-McMaster Canyons							
FMAT boundary	390.3	16	Yes	121.0	31.0%	15.0	3.9%
2015 industry-proposed	356.1	16	Yes	115.0	32.3%	26.0	7.3%

HB1302 TowCam Survey Locations

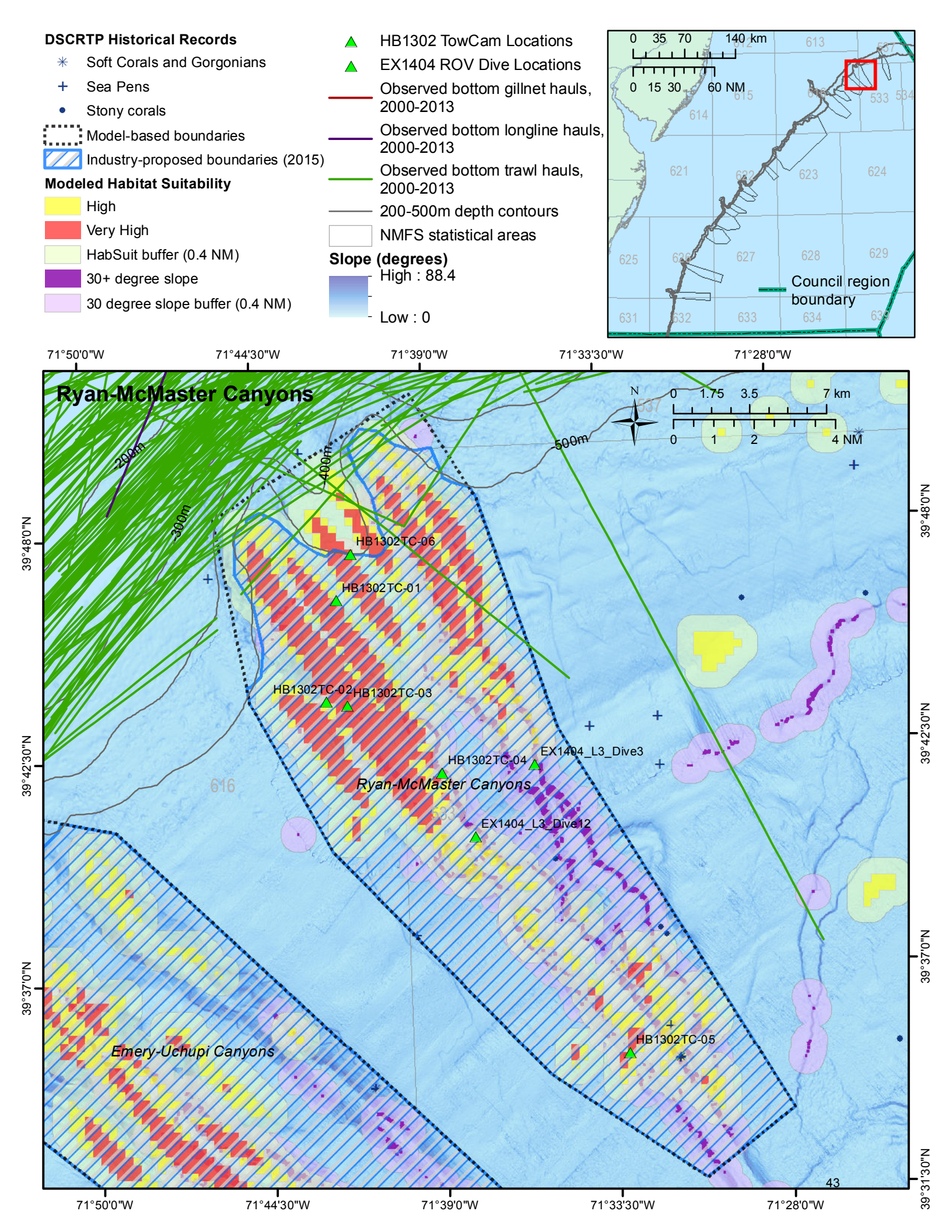
Table 26: *Image survey results for canyon fauna from TowCam surveys in Ryan and McMaster Canyons. Images were captured at 10 second intervals throughout each dive. Each image was visually screened for presence/absence of corals.*

TowCam Dive #	Canyon Location	Date	Launch Lat N	Launch Lon W	Recovery Lat	Recovery Lon	No. of Images on bottom	No. images with corals	% images with corals	Nominal Depth (m)
HB1302-001	Ryan Canyon	6/10/2013	39 46.4979	71 41.9049	39 46.3115	71 41.9738	649	0	0	599
HB1302-002	Ryan Canyon	6/11/2013	39 43.8514	71 42.6188	39 43.9435	71 41.9149	420	2	0.48	771
HB1302-003	Ryan Canyon	6/12/2013	39 43.8357	71 42.1705	39 43.3885	71 41.3225	2262	48	2.12	992
HB1302-004	Ryan Canyon	6/12/2013	39 42.3582	71 38.6827	39 41.5694	71 38.3807	2079	62	2.98	1135
HB1302-005	Ryan Canyon	6/13/2013	39 34.7145	71 33.3316	39 35.317	71 32.6441	1358	584	43	1965
HB1302-006	Ryan-McMaster Inter-canyon area	6/13/2013	39 47.5719	71 42.7850	39 47.3285	71 40.5977	2230	1	0.04	498

EX1404 Okeanos Explorer Our Deepwater Backyard Dive Locations

Table 27: *Relevant excerpts from Okeanos Explorer Our Deepwater Backyard daily updates; Ryan and McMaster Canyons.*

Leg 3 Dive 3: McMaster Canyon, 9/21/2014
During Dive 03, we conducted two transects up the eastern wall of McMaster Canyon, approximately 80 miles south east of Long Island. Remotely operated vehicle *Deep Discoverer* (D2) landed on a silty sedimented seafloor with eels, sea urchins, fish, and several instances of anthropogenic debris. During the first transect, the lower portion of the canyon wall was chalky and highly sculpted with little benthic life. Further up the wall, D2 encountered several large colonies of octocorals and high-density groups of cup corals, anemones, bivalves, and sponges. Transect two show similar patterns and high diversity as seen in Hendrickson Canyon, with large groups of corals living under overhangs and outcrops along the steep wall. Other fauna encountered during the dive included several swimming sea cucumbers, sea stars that our experts have never seen alive, squat lobsters, brittle stars, a king crab, and octopods.
Leg 3, Dive 12: Ryan Canyon, 10/4/2014
Remotely operated vehicle (ROV) Deep Discoverer (D2) conducted the first-ever ROV exploration of Ryan Canyon today. D2 landed on a silty seafloor with multiple sea stars, fish, urchins, and human debris at a depth of 1,524 meters. As D2 transited, we encountered shrimp, several species of fish and eels (including witch flounder, cusk eels, chimeras, rattails, hake, a dogfish, an oreo, and eel pouts), brittle stars, occasional cup corals, sea stars, coral rubble, a sea spider, and thousands of sea cucumbers along the seafloor. Upslope, D2 scaled a chalky wall partially covered with a thin layer of soft sediment and large groups of stony corals with bivalves on areas with no sediment cover. Highlights of the dive included a king crab eating a pancake urchin and a coral skeleton that had been colonized by a member of almost every major grouping of benthic cnidarians. Overall, corals were rare with very low diversity during this dive. Also, similar to Dive 03 in adjacent McMaster Canyon, D2 encountered several instances of trash and derelict fishing gear, potentially due to its proximity to shipping channels into large cities on the U.S. East Coast.


DSCRTP Historical Records
Soft Corals and Gorgonians
Sea Pens
Stony corals
Model-based boundaries
Industry-proposed boundaries (2015)
Modeled Habitat Suitability
High
Very High
HabSuit buffer (0.4 NM)
30+ degree slope
30 degree slope buffer (0.4 NM)
HB1302 TowCam Locations
EX1404 ROV Dive Locations
Observed bottom gillnet hauls, 2000-2013
Observed bottom longline hauls, 2000-2013
Observed bottom trawl hauls, 2000-2013
200-500m depth contours
NMFS statistical areas
Slope (degrees)
High : 88.4
Low : 0
0 35 70 140 km
0 15 30 60 NM
Council region boundary
Ryan-McMaster Canyons
N
0 1.75 3.5 7 km
0 1 2 4 NM
200m
300m
400m
500m
HB1302TC-06
HB1302TC-01
HB1302TC-02
HB1302TC-03
HB1302TC-04
EX1404_L3_Dive3
EX1404_L3_Dive12
HB1302TC-05
Ryan-McMaster Canyons
Emery-Uchupi Canyons
71°50'0"W
71°44'30"W
71°39'0"W
71°33'30"W
71°28'0"W
39°48'0"N
39°42'30"N
39°37'0"N
39°31'30"N
43

Block Canyon

Table 28: *Summary of historical deep sea coral observations, habitat suitability, and areas of high slope for Block Canyon discrete zone boundaries.*

		Coral Observations		Habitat Suitability		Slope	
Canyon or Complex	**Total area (km^2)**	**Historical Coral Records (all)**	**Encompasses observations from recent fieldwork?**	**Total Area of High/Very High Habitat Suitability**	**Percent High/Very High Habitat Suitability**	**Total area of slope >30 degrees (km^2)**	**Percent area of slope >30 degrees**
Block Canyon							
FMAT boundary	231.6	0	Some, not all[a]	19.2	8.3%	16.5	7.1%
2015 industry-proposed	206.9	0	Some, not all[a]	17.4	8.4%	22.8	11.0%

[a] Three dives occurred in areas east of Block Canyon.

EX1304 Okeanos Explorer Northeast Canyons Expedition Dive Locations[6]

Table 29: *Relevant excerpts from Okeanos Explorer Northeast Canyons Expedition daily updates; Block Canyon.*

Leg 1, Dive 1: East of Block Canyon, 7/9/2013
The first remotely operated vehicle dive of the expedition was conducted at a site east of Block Canyon, transiting up a steep slope to investigate headwall scarps of a large landslide scar on the lower continental slope. The dive started at approximately 1,870 meters, transiting over a fairly flat, soft-sedimented bottom toward the base of the slope feature (or headwall scarp). A number of large angular boulders, likely detached from the adjacent vertical walls, and sea spiders, several species of sea pens, and a variety of fishes were encountered. Hardbottom habitats were encountered as we surveyed upslope: two large vertical rock walls with relief of more than 15 meters and separated by a steeply sloped ledge, and several other smaller walls and rock/boulder outcrops. Numerous corals colonized the faces and tops of the large hard features and cup corals were observed attached to the underside of ledges. The top of this feature at approximately 1,621 meters depth was covered with soft sediment composed of silt and silty clays and was home to few animals except halosaur fish and cutthroat eels. The sessile fauna was dominated by *Acanella* sp., a type of bamboo coral that commonly occurs on both soft and hard substrates.

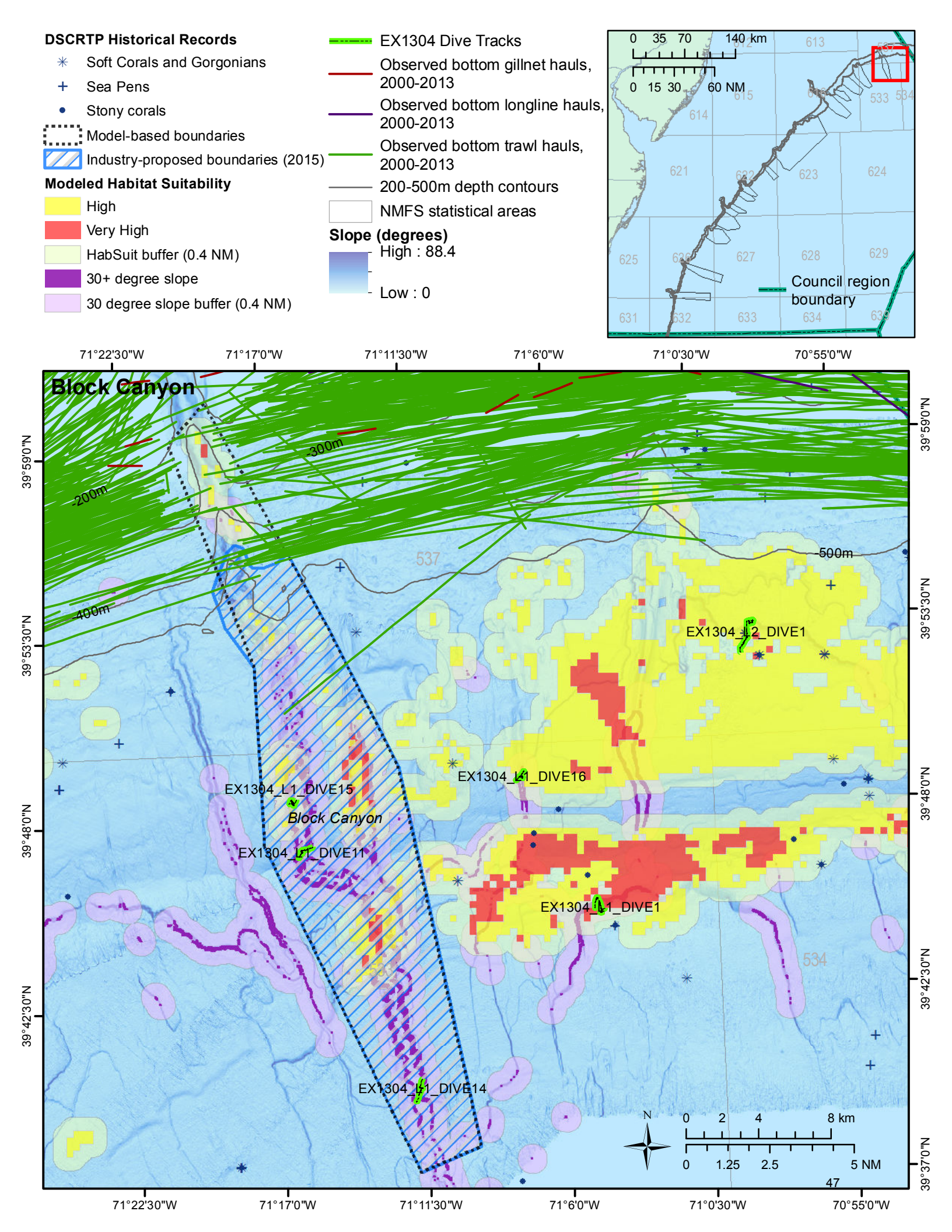
[6] http://oceanexplorer.noaa.gov/okeanos/explorations/ex1304/dailyupdates/dailyupdates.html

Table 29, Continued:

Leg 1, Dive 11: Block Canyon, 7/19/2013
Dive 11 explored the geomorphology and benthic habitats of Block Canyon. The ROV (D2) descended to a soft bottom seafloor with scattered rock rubble and boulders and an abundance of red crabs and cutthroat eels along the eastern wall at a depth 1,340 meters. Flytrap anemones, hydroids, bamboo corals, and octocorals were attached to the rocks, with many being small recruits. Potential new species of black coral and bubblegum coral were observed. The ROV moved upslope to a promontory feature hosting a high abundance of coral rubble. Dense and diverse sponge and coral communities with numerous species of bamboo corals, cup corals, and large black coral were growing on the wall as we ascended to the top of the feature. D2 then came back down slope to a depth of 1,335 meters to begin the next vertical transit. At the base, coral rubble was dense. The ROV moved upslope, noting similar corals in high abundance and numerous squat lobsters, shrimps, and brittle star associates en route to the top of the wall at 1,239 meters. Of note, chirostylid squat lobsters were only observed living on black corals. At least one skate egg case was observed during this dive. Hard substrate in this area was visually similar to those in both Alvin and Atlantis Canyons and all are possibly in the same age range (Cretaceous/Eocene).
Leg 1, Dive 14: Block Canyon, 7/22/2013
Dive 14 was conducted deep in Block Canyon, exploring the geomorphology and benthic communities on the east canyon wall from a depth of 2,131 meters. Upon reaching the bottom, the ROV discovered soft sediment composed of silt and clay scattered with medium size boulders. Overall, few fishes and megafauna (animals visible through imagery) were observed, and sessile (stationary) fauna were sparse, including stalked crinoids, throughout this dive. In contrast, brittle stars and white sea urchins were abundant. Extensively bio-eroded mudstone boulders and blocks with a notable lack of faunal colonization were documented. A few small cup corals were attached to the sides of the blocks, and octocorals and glass sponges were the dominant fauna. D2 reached the base of the canyon and continued to move up slope along a wall feature appearing younger, weaker, with portions of the surface showing collapsed features, and extensive debris fields were noted at the base. As the ROV continued moving up slope to the top of the wall, fewer attached fauna were noted on the wall surface. After the sedimented top was documented, D2 transited down slope toward another promontory. Octocorals were observed on the wall surface at 2,087 meters and several cup corals were encountered under a small overhang. The ROV left bottom at a depth of 2,062 meters.

Table 29, Continued:

Leg 1, Dive 15: Block Canyon, 7/23/2013
Dive 15 focused on exploring the geomorphology and biological communities of Block Canyon starting at a depth of 1,134 meters. The ROV (D2) descended onto a soft sedimented seafloor composed of silt and clay mixed with scattered rocks and boulders of various sizes. Numerous fishes were evident, including cutthroat eels, red crabs, blue cod, witch flounder, and grenadier. Rocks were colonized sparsely by small bamboo corals accompanied by mysid shrimp hovering around the colonies. As D2 transited to the base of a vertical rock wall, octopus and coral colonies, including one hosting a ring anemone and a brittle star, were observed. At 1,111 meters D2 reached the base of the vertical wall, which was horizontally stratified with layers of carbonate and porcellanite, a hard, dense sedimentary rock somewhat similar in appearance to unglazed porcelain, which here appeared stronger and less bio-eroded compared with the carbonate layers. Continuing upslope, bamboo coral, limid bivalves, and two species of stony corals were observed before reaching a promontory feature near 1,030 meters – the most extensive area of concentrated colonization. The most abundant fauna were bivalves, occurring in linear arrays along the wall. Octocorals, bamboo corals, and a few black coral colonies with brittle stars, polychaetes, and mysid shrimp associates were observed. D2 moved downslope until reaching the base at a depth of 1,116 meters, and then returned upslope, noting the same patterns of faunal colonization along this traverse. D2 left bottom from a depth of 995 meters.
Leg 1, Dive 16: Gauntlet Minor (east of Block Canyon), 7/24/2013
Dive 16 was conducted in an inner canyon area (in an unnamed minor canyon) informally named “Gauntlet Minor.” The purpose of this dive was to conduct a first-order characterization of the geomorphology and benthic habitats on both the east and west walls. The ROV reached a slightly sloped area covered in soft sediment in the northern region between the east and west walls at a depth of 1,110 meters. Anthropogenic trash and debris, including monofilament line and balloons, were observed in this area. Fishes were prevalent, including cutthroat eels, witch flounder, and several rattails. Boulders, disarticulated bivalve shells, and coral rubble, including dead, broken attached pieces of cup corals and a branching stony coral, were apparent on the seafloor. Several octocoral colonies were seen on the boulders. D2 moved up slope and reached a vertical wall face with a higher abundance of fauna (animals), including stony corals and octocorals, from 1,078 - 1,030 meters. The ROV continued upslope over a thicker sediment cover with no corals to the top of the wall at 1,020 meters. D2 then moved northward and came back down slope, seeing an abundant line of coral colonization at approximately 1,030 meters, with the same dominant fauna. The ROV continued west over a mostly soft sediment bottom with scattered coral and rock rubble at the base of the western canyon wall. Moving upslope on the western wall, it was noted that the same type of faunal assemblages was observed as on the east wall, yet with greater apparent density at 1,070 meters depth. Near the end of the dive, a few additional corals were observed that were not seen on the east wall, including an unidentified black coral and a few bamboo corals. The ROV departed from the seafloor at a depth of 1,030 meters.
Leg 2, Dive 1: East of Block Canyon, 8/1/2013
The first dive of leg 2 explored deep-sea landslide debris and scarps between Alvin and Block Canyons, at U.S. Geological Survey Hazards 1 site. We transited through a landslide debris field and continued up slope, where we finished the dive exploring the top of the scarp. Few rocks of various sizes were scattered on the sediment surface. Some of these rocks were fairly clean, with few animals, while others were heavily populated by flytrap and unknown anemones, hydroids, snails, and hermit crabs. The sediment topography included small hummocks, large burrows, and clay balls scattered over the sediment surface in some places. Squat lobsters, red crabs, and shrimp were observed residing within burrows made of semi-consolidated mud. Throughout the course of the dive, we observed several species of fish, including rattails, flatfish, and eels.


DSCRTP Historical Records
Soft Corals and Gorgonians
Sea Pens
Stony corals
Model-based boundaries
Industry-proposed boundaries (2015)
Modeled Habitat Suitability
High
Very High
HabSuit buffer (0.4 NM)
30+ degree slope
30 degree slope buffer (0.4 NM)
EX1304 Dive Tracks
Observed bottom gillnet hauls, 2000-2013
Observed bottom longline hauls, 2000-2013
Observed bottom trawl hauls, 2000-2013
200-500m depth contours
NMFS statistical areas
Slope (degrees)
High : 88.4
Low : 0
0 35 70 140 km
0 15 30 60 NM
Council region boundary
Block Canyon
-200m
-300m
-400m
500m
EX1304_L2_DIVE1
EX1304_L1_DIVE16
EX1304_L1_DIVE15
Block Canyon
EX1304_L1_DIVE11
EX1304_L1_DIVE1
EX1304_L1_DIVE14
N
0 2 4 8 km
0 1.25 2.5 5 NM
47
71°22'30"W
71°17'0"W
71°11'30"W
71°6'0"W
71°0'30"W
70°55'0"W
39°59'0"N
39°53'30"N
39°48'0"N
39°42'30"N
39°37'0"N

Fishery Effort Data by Canyon

See Public Information Document for an explanation of effort analysis.

Table 30: *NEFOP observed bottom trawl hauls and trips by target species, 2000-2013, intersecting the proposed discrete zones.*

Bottom Otter Trawl - Observer Data		
Canyon or Complex	**Trips**	**Hauls**
Block Canyon: FMAT	**26**	**51**
GROUNDFISH, NK	--	3
HAKE, SILVER (WHITING)	--	14
MONKFISH (GOOSEFISH)	--	33
SQUID, ATL LONG-FIN	--	1
Block Canyon: 2015 Industry	6	**14**
HAKE, SILVER (WHITING)	--	3
MONKFISH (GOOSEFISH)	--	11
Canyon or Complex	**Trips**	**Hauls**
Ryan-McMaster Canyons: FMAT	**8**	**13**
HAKE, SILVER (WHITING)	--	4
MONKFISH (GOOSEFISH)	--	5
SQUID, ATL LONG-FIN	--	4
Ryan-McMaster Canyons: 2015 Industry	**5**	**7**
MONKFISH (GOOSEFISH)	--	3
SQUID, ATL LONG-FIN	--	4
Canyon or Complex	**Trips**	**Hauls**
Emery-Uchupi Canyons: FMAT	**6**	**12**
HAKE, SILVER (WHITING)	--	7
MONKFISH (GOOSEFISH)	--	2
WHITING, BLACK (HAKE, OFFSHORE)	--	3
Emery-Uchupi Canyons: 2015 Industry	**1**	**3**
HAKE, SILVER (WHITING)	--	3
Canyon or Complex	**Trips**	**Hauls**
Jones-Babylon Canyons: FMAT	**4**	**6**
HAKE, SILVER (WHITING)	--	4
WHITING, BLACK (HAKE, OFFSHORE)	--	2
Jones-Babylon Canyons: 2015 Industry	**0**	**0**
NONE	--	0
Canyon or Complex	**Trips**	**Hauls**
Hudson Canyon: FMAT	**197**	**488**
DORY, BUCKLER (JOHN)	--	1
FLOUNDER, SUMMER (FLUKE)	--	15
HAKE, RED (LING)	--	1
HAKE, SILVER (WHITING)	--	41
MONKFISH (GOOSEFISH)	--	2
SCUP	--	21
SEA BASS, BLACK	--	3
SHRIMP, ROYAL RED	--	12
SQUID, ATL LONG-FIN	--	373
SQUID, NK	--	2

SQUID, SHORT-FIN	--	5
WHITING, BLACK (HAKE, OFFSHORE)	--	12
Hudson Canyon: 2015 Industry	**19**	**23**
HAKE, SILVER (WHITING)	--	2
SQUID, ATL LONG-FIN	--	15
SQUID, NK	--	1
SQUID, SHORT-FIN	--	4
WHITING, BLACK (HAKE, OFFSHORE)	--	1
Canyon or Complex	**Trips**	**Hauls**
Mey-Lindenkohl Slope: FMAT	**172**	**571**
FLOUNDER, SUMMER (FLUKE)	--	66
HAKE, SILVER (WHITING)	--	14
SCUP	--	13
SEA BASS, BLACK	--	14
SHRIMP, ROYAL RED	--	1
SQUID, ATL LONG-FIN	--	349
SQUID, NK	--	8
SQUID, SHORT-FIN	--	104
WHITING, BLACK (HAKE, OFFSHORE)	--	2
Mey-Lindenkohl Slope: 2015 Industry	**28**	**43**
FLOUNDER, SUMMER (FLUKE)	--	4
HAKE, SILVER (WHITING)	--	1
SCUP	--	1
SQUID, ATL LONG-FIN	--	27
SQUID, SHORT-FIN	--	10
Mey-Lindenkohl Slope: 2013 Industry, Depth-Based	**24**	**30**
FLOUNDER, SUMMER (FLUKE)	--	2
HAKE, SILVER (WHITING)	--	2
SCUP	--	1
SQUID, ATL LONG-FIN	--	16
SQUID, SHORT-FIN	--	9
Mey-Lindenkohl Slope: 2013 Industry, Straight Line	**69**	**151**
FLOUNDER, SUMMER (FLUKE)	--	8
HAKE, SILVER (WHITING)	--	1
SCUP	--	4
SEA BASS, BLACK	--	1
SQUID, ATL LONG-FIN	--	83
SQUID, SHORT-FIN	--	54
Canyon or Complex	**Trips**	**Hauls**
Spencer Canyon: FMAT	**91**	**248**
FLOUNDER, SUMMER (FLUKE)	--	1
SCUP	--	4
SQUID, ATL LONG-FIN	--	119
SQUID, NK	--	6
SQUID, SHORT-FIN	--	118
Spencer Canyon: 2015 Industry	**21**	**40**
SQUID, ATL LONG-FIN	--	13
SQUID, SHORT-FIN	--	27

Canyon or Complex	Trips	Hauls
Wilmington Canyon: FMAT	**112**	**215**
FLOUNDER, SUMMER (FLUKE)	--	15
MACKEREL, ATLANTIC	--	1
SCUP	--	4
SEA BASS, BLACK	--	5
SQUID, ATL LONG-FIN	--	108
SQUID, NK	--	1
SQUID, SHORT-FIN	--	81
Wilmington Canyon: 2015 Industry	**30**	**55**
FLOUNDER, SUMMER (FLUKE)	--	7
MACKEREL, ATLANTIC	--	1
SCUP	--	1
SEA BASS, BLACK	--	3
SQUID, ATL LONG-FIN	--	15
SQUID, SHORT-FIN	--	28
Canyon or Complex	**Trips**	**Hauls**
North Heyes-South Wilmington Canyons: FMAT	**33**	**49**
SQUID, ATL LONG-FIN	--	15
SQUID, SHORT-FIN	--	34
North Heyes-South Wilmington Canyons: 2014 Industry	**8**	**19**
SQUID, ATL LONG-FIN	--	6
SQUID, SHORT-FIN	--	13
Canyon or Complex	**Trips**	**Hauls**
South Vries Canyon: FMAT	**58**	**121**
SQUID, ATL LONG-FIN	--	41
SQUID, SHORT-FIN	--	80
South Vries Canyon: 2015 Industry	**1**	**3**
SQUID, ATL LONG-FIN	--	2
SQUID, SHORT-FIN	--	1
Canyon or Complex	**Trips**	**Hauls**
Baltimore Canyon: FMAT	**117**	**267**
FLOUNDER, SUMMER (FLUKE)	--	80
SEA BASS, BLACK	--	13
SQUID, ATL LONG-FIN	--	89
SQUID, SHORT-FIN	--	85
Baltimore Canyon: 2015 Industry	**34**	**64**
FLOUNDER, SUMMER (FLUKE)	--	6
SEA BASS, BLACK	--	3
SQUID, ATL LONG-FIN	--	20
SQUID, SHORT-FIN	--	35
Baltimore Canyon: 2013 Industry	**34**	**45**
FLOUNDER, SUMMER (FLUKE)	--	8
SEA BASS, BLACK	--	1
SQUID, ATL LONG-FIN	--	12
SQUID, SHORT-FIN	--	24

Canyon or Complex	Trips	Hauls
Warr-Phoenix Canyons: FMAT	**30**	**72**
SQUID, ATL LONG-FIN	--	43
SQUID, SHORT-FIN	--	29
Warr-Phoenix Canyons: 2015 Industry	**2**	**4**
SQUID, ATL LONG-FIN	--	3
SQUID, SHORT-FIN	--	1

Canyon or Complex	Trips	Hauls
Accomac-Leonard Canyons: FMAT	**37**	**87**
FLOUNDER, SUMMER (FLUKE)	--	5
SQUID, ATL LONG-FIN	--	40
SQUID, SHORT-FIN	--	42
Accomac-Leonard Canyons: 2015 Industry	**10**	**27**
SQUID, ATL LONG-FIN	--	8
SQUID, SHORT-FIN	--	19

Canyon or Complex	Trips	Hauls
Washington Canyon: FMAT	**47**	**93**
FLOUNDER, SUMMER (FLUKE)	--	19
SCUP	--	1
SEA BASS, BLACK	--	11
SQUID, ATL LONG-FIN	--	27
SQUID, SHORT-FIN	--	35
Washington Canyon: 2015 Industry	**32**	**63**
FLOUNDER, SUMMER (FLUKE)	--	18
SEA BASS, BLACK	--	8
SQUID, ATL LONG-FIN	--	10
SQUID, SHORT-FIN	--	27

Canyon or Complex	Trips	Hauls
Norfolk Canyon: FMAT	**50**	**178**
CROAKER, ATLANTIC	--	1
FLOUNDER, SUMMER (FLUKE)	--	2
SQUID, ATL LONG-FIN	--	49
SQUID, SHORT-FIN	--	126
Norfolk Canyon: 2015 Industry	**12**	**32**
SQUID, ATL LONG-FIN	--	10
SQUID, SHORT-FIN	--	22
Norfolk Canyon: 2013 Industry	**36**	**86**
CROAKER, ATLANTIC	--	1
FLOUNDER, SUMMER (FLUKE)	--	2
SQUID, ATL LONG-FIN	--	20
SQUID, SHORT-FIN	--	63

Table 31: *VTR model-estimated revenue (USD) by proposed discrete zone, shown as a percentage of coastwide revenues for each species-gear combination, 2007-2012, Maine through Virginia. BOT = bottom otter trawl; BLL = bottom longline; DRG = dredge; RCRAB = red crab.*

Canyon or Complex	Total area (km^2)	BOT-SQUID	DRG-SCALL	BOT-FLUKE	POT-RCRAB	LL-TILE	BOT-HAKE	TOTAL	MOBILE GEARS ONLY
Block Canyon									
Model-based boundary	231.6	0.06%	0.00%	0.10%	0.13%	0.14%	0.22%	0.02%	0.01%
2015 industry-proposed	206.9	0.04%	0.00%	0.07%	0.12%	0.09%	0.16%	0.01%	0.01%
Ryan-McMaster Canyons									
Model-based boundary	390.3	0.13%	0.00%	0.18%	0.30%	0.22%	0.34%	0.03%	0.03%
2015 industry-proposed	356.1	0.11%	0.00%	0.16%	0.27%	0.19%	0.28%	0.03%	0.02%
Emery-Uchupi Canyons									
Model-based boundary	369.2	0.12%	0.00%	0.14%	0.33%	0.32%	0.23%	0.03%	0.02%
2015 industry-proposed	349.2	0.11%	0.00%	0.13%	0.29%	0.28%	0.21%	0.02%	0.02%
Jones-Babylon Canyons									
Model-based boundary	166.1	0.08%	0.01%	0.06%	0.17%	0.44%	0.12%	0.02%	0.02%
2015 industry-proposed	159.5	0.07%	0.00%	0.06%	0.17%	0.41%	0.11%	0.02%	0.01%
Hudson Canyon									
Model-based boundary	770.8	1.27%	0.04%	0.56%	1.13%	3.50%	1.20%	0.22%	0.18%
2015 industry-proposed	237.2	0.42%	0.01%	0.16%	0.65%	1.41%	0.44%	0.07%	0.06%
Mey-Lindenkohl Slope									
Model-based boundary	2818.2	2.14%	0.19%	1.17%	3.47%	1.65%	0.32%	0.42%	0.39%
2015 industry-proposed	2500.9	1.67%	0.15%	0.91%	2.75%	1.08%	0.23%	0.32%	0.30%
2013 industry-proposed; Depth-based	2458.8	1.66%	0.15%	0.91%	2.78%	1.13%	0.23%	0.33%	0.31%
2013 industry-proposed; Straight line	2445.3	1.74%	0.15%	0.91%	2.64%	1.07%	0.22%	0.33%	0.31%
Spencer Canyon									
Model-based boundary	163.3	0.46%	0.02%	0.09%	0.24%	0.01%	0.00%	0.06%	0.06%
2015 industry-proposed	50.0	0.17%	0.01%	0.03%	0.10%	0.00%	0.00%	0.02%	0.02%

Wilmington Canyon									
Model-based boundary	268.1	1.64%	0.08%	0.17%	0.77%	0.13%	0.02%	0.21%	0.20%
2015 industry-proposed	103.9	0.82%	0.04%	0.09%	0.35%	0.08%	0.01%	0.10%	0.10%
North Heyes-South Wilmington Canyons									
Model-based boundary	183.4	0.53%	0.03%	0.06%	0.42%	0.02%	0.01%	0.07%	0.07%
Feb 2015 industry-proposed	50.6	0.20%	0.01%	0.02%	0.17%	0.01%	0.00%	0.03%	0.02%
South Vries Canyon									
Model-based boundary	142.6	0.36%	0.02%	0.04%	0.28%	0.01%	0.00%	0.05%	0.05%
Feb 2015 industry-proposed	27.6	0.10%	0.00%	0.01%	0.07%	0.00%	0.00%	0.01%	0.01%
Baltimore Canyon									
Model-based boundary	231.0	0.73%	0.05%	0.16%	0.80%	0.02%	0.01%	0.11%	0.11%
2015 industry-proposed	189.7	0.58%	0.04%	0.10%	0.68%	0.02%	0.00%	0.08%	0.08%
2013 industry-proposed	220.7	0.55%	0.04%	0.10%	0.60%	0.02%	0.00%	0.08%	0.08%
Warr-Phoenix Canyons									
Model-based boundary	511.6	0.62%	0.05%	0.10%	0.98%	0.03%	0.01%	0.10%	0.09%
2015 industry-proposed	475.5	0.52%	0.04%	0.09%	0.87%	0.02%	0.01%	0.08%	0.08%
Accomac-Leonard Canyons									
Model-based boundary	538.2	0.33%	0.05%	0.10%	0.87%	0.02%	0.01%	0.08%	0.07%
2015 industry-proposed	30.9	0.03%	0.00%	0.01%	0.10%	0.00%	0.00%	0.01%	0.01%
Washington Canyon									
Model-based boundary	554.1	0.22%	0.05%	0.10%	0.64%	0.00%	0.00%	0.07%	0.06%
2015 industry-proposed	43.3	0.05%	0.02%	0.03%	0.10%	0.00%	0.00%	0.02%	0.02%
Norfolk Canyon									
Model-based boundary	543.7	0.34%	0.01%	0.03%	0.88%	0.01%	0.00%	0.04%	0.04%
2015 industry-proposed	57.0	0.11%	0.00%	0.01%	0.10%	0.01%	0.00%	0.01%	0.01%
2013 industry-proposed	598.4	0.42%	0.02%	0.04%	1.13%	0.01%	0.01%	0.05%	0.05%
Coastwide									
Model-based boundary	7881.3	9.00%	0.60%	3.06%	11.43%	6.51%	2.48%	1.50%	1.40%
2015 industry-proposed	4838.3	4.99%	0.33%	1.87%	6.78%	3.59%	1.45%	0.85%	0.79%